A Gauge O Steam Loco for beginners.

★

Part 1. Introduction.

By

" 1121."

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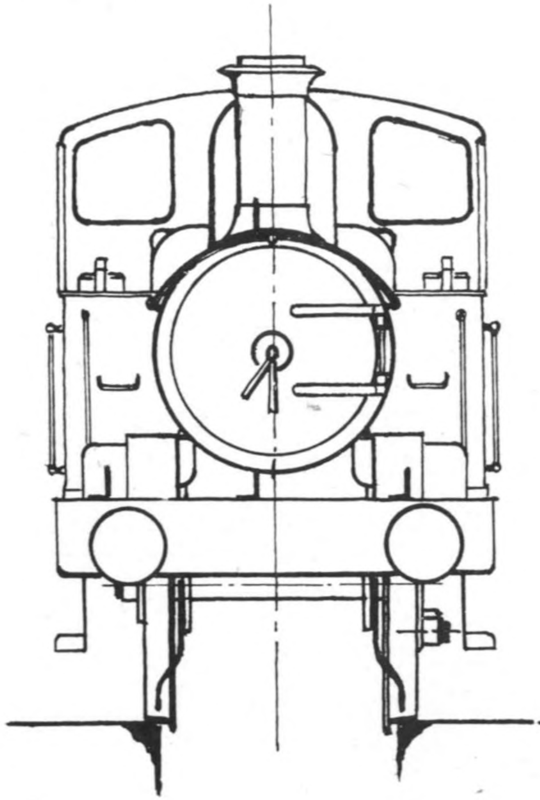
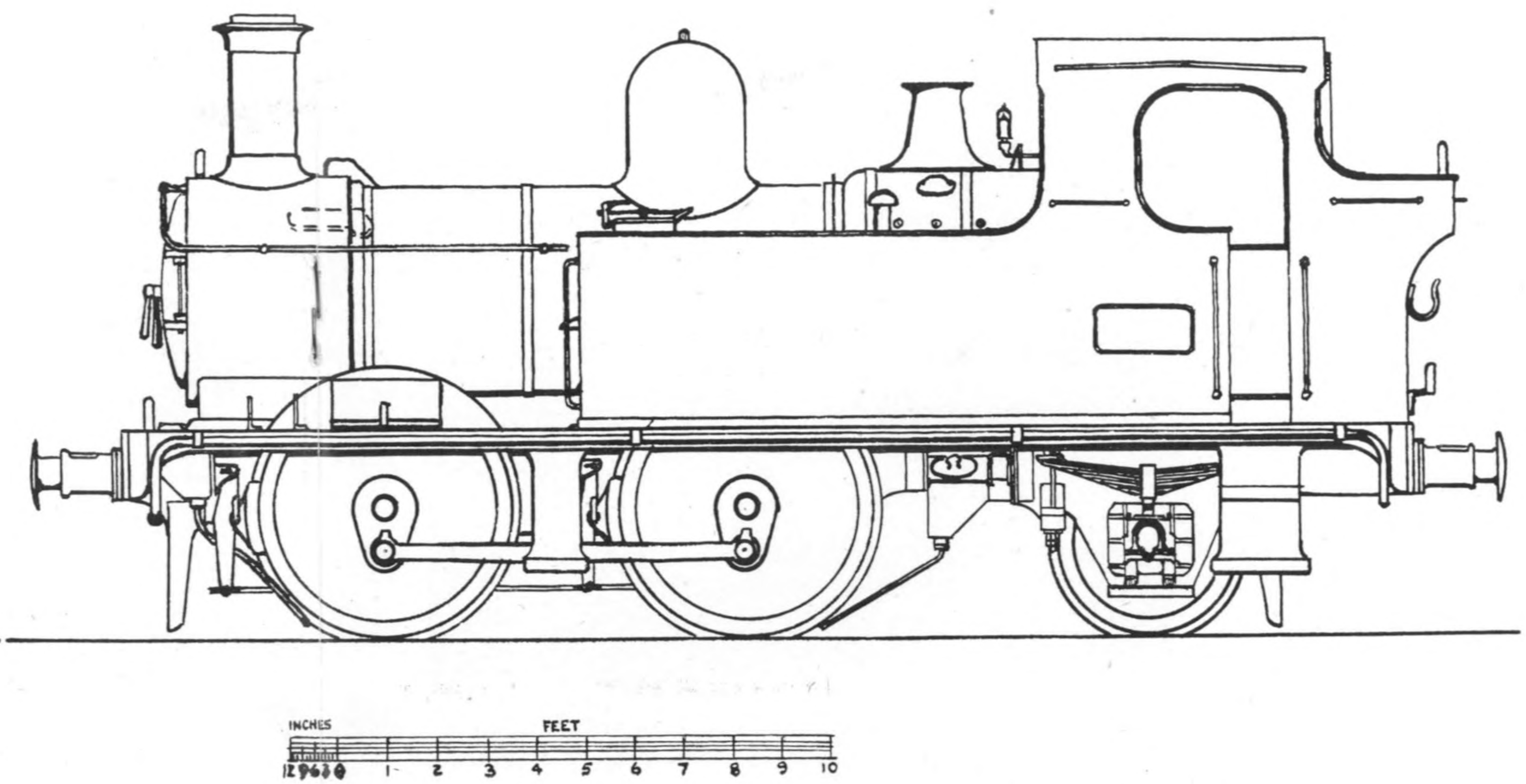
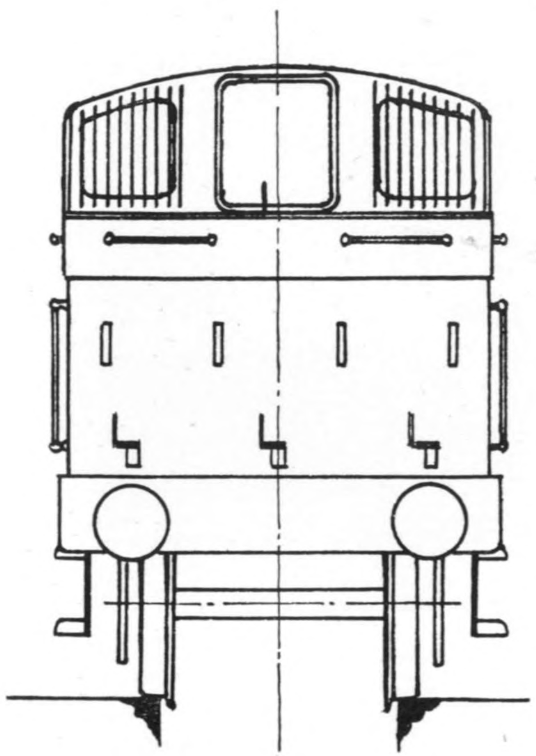
Drawings actual size 7mm. sca'e.







G.W.R. 0-4-2 TANK 1400 CLASS SIDE AND END ELEVATIONS.

Having dealt in past issues of the *Model Railway Constructor* with various fundamental aspects of steam loco building, maintenance and running, it was only natural that our attention should turn to the idea of building a complete loco from start to finish.

Many and thorough have been the discussions between the Editor and ourselves and the outcome has been the conviction that it would be advisable to introduce the subject of steam loco building gently, by means of a simple gauge O engine, before diving into anything large and ambitious.

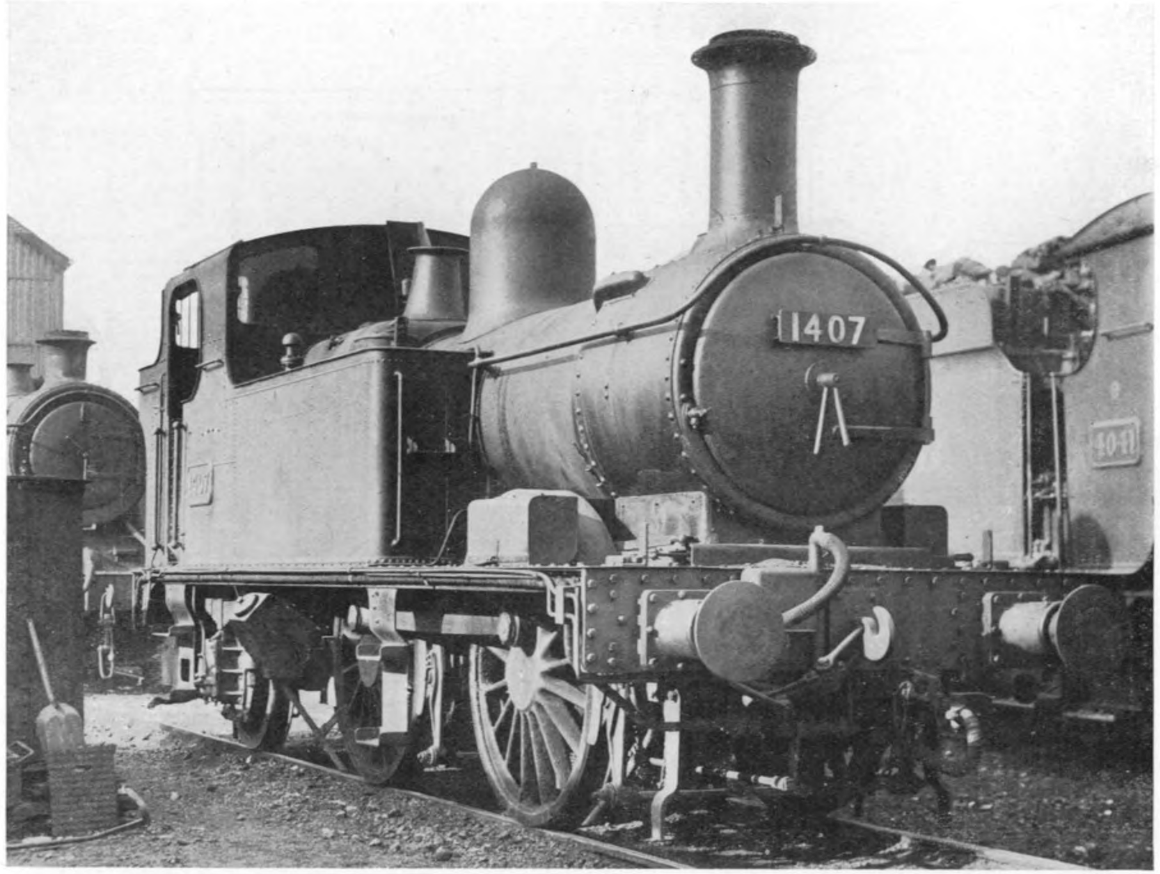
This principle having been agreed, the problem arose of finding a prototype which would prove popular without having already been done to death either in the steam or electric fields, while still being suitable for our particular job.

Let us see what this job is. In the first place we have set ourselves certain standards and conditions to which our model must conform, and perhaps the most important of these is that, while being a working steam job, it shall still be a scale model in the strictest possible sense of the term. We, and probably readers also, have no time for the "maximum power" abortion, distorted out of all recognition from prototype proportions, and with whatever outline is possesses spoiled in some conspicuous place by some fitting yelling "steam" at you. Any builder may "super-detail" our engine externally to his heart's content, and its appearance will bear comparison with any electrically-powered model built to the same standard of workmanship. We must admit that it will need to be "driven," but doesn't a full-sized loco? If you have any heart for the loco itself as a personality, isn't it conceivable that you will find your fun in handling the "baby" in a way at least approaching that in which the full-sized machine is handled?

If your layout abounds with incredible curves and impossible gradients it will be necessary to "drive" the engine in an appropriate manner at such points, which must be done on the spot unless you care to devise some elaborate remote-control system of which examples have been made in the past. Our own opinion, however, is that over-control of this kind reduces the loco to the level of a soulless automatic robot; we would rather handle our little engine as the live thing it is, although we beg the reader not to deduce from this remark that it will be so live as to be wild and uncontrollable, needing unrestricted running powers during its period of activity. We venture to predict that some readers may be surprised at the degree of control possible, bearing in mind this particular engine's extreme simplicity of design, and we suggest that she may give her owner a new outlook in the matter of model railway operation, and show him how much more this can involve than the cold-blooded automaton proceedings of so many electric layouts. We have a great admiration for the mechanical and electrical organisation that can enable a loco to back on to a train, couple itself up, and carry out elaborate shunting operations, coupling and uncoupling at the command of an unseen hand. But have you ever seen a real one do it?

Several years ago the writer and some friends operated an O gauge line powered entirely by steam locos of types similar generally to the one we are about to describe. We operated time-tables, which had to be worked out to suit the limitations of our motive power, as any real time-table has to be worked out. Our engines did their turns of duty, which might be an express run, a spell of shunting, or some goods to be conveyed from here to there, and they returned to sheds for cleaning, refilling and relighting-up in time for the next turn of duty, and what fun we and our engines had. For the first time we could use a water-tower for its intended purpose!

Now, it is obvious that our little engine's extreme simplicity of construction must not be too apparent in operation. Her simple slip-eccentric reversing gear will inevitably necessitate movement by hand for a half-turn of her driving wheels to enable her to go ahead after backing on to her train, but we feel that the sight and sound



The prototype of our model. [*Photo*: M. W. *Earley*.

of her gradually gathering speed as she puffs off with her load will compensate for this, and we promise that she will not drip, spray or squirt any undesirable substances over the track or adjacent scenery.

We have to organise our subject so that it can be got through as expeditiously as possible, while yet not losing sight of the fact that many readers embarking on the building of our engine are likely to be beginners at much of the types of work involved, and clarity of instruction for such people has from the start been a fundamental of the whole idea.

We must ensure the availability of the various materials specified for the job, and we have arranged for Messrs. Crescent Industries, 1, Blenheim Crescent, London, W.11, to supply whatever is called for without delay. Any reader, of course, is free to make what other arrangements he likes. "Stock" materials—rod, bar, tube, etc. are all "standard"; we are avoiding "odd" sizes and sections which may be difficult to get. We have also so designed the engine, and are so describing its construction, that only the very minimum of extra tools will be required, over and above those likely to be found in any existing kit. Lucky readers with more efficient equipment will, of course, know how to use it, and will see where they can by-pass our instructions and get the desired results by quicker methods. At the end of this article will be found a list of materials which will be called for next month, when we shall start straight in with construction, so that readers may, if they wish, set about collecting these ready to go right ahead. We also recommend a selection of tools which the builder will need, so that he will not get stuck in the middle of a job for want of some particular item.

The Prototype.

It will be observed that our engine is the pretty little 1400 class 0—4—2 tank of the late G.W.R. With her 5ft. 2in. (36mm.) driving wheels she will prove reasonably fast when a spot of speed is desired, and at the same time possess a good reserve of power for heavy work. To help adhesion we have arranged for very simple springing of the trailing wheels, although any builder desiring the ultimate in simplicity is at liberty to dispense with the spring gear and run the axle in plain axleguards.

Her boiler is the plainest possible "pot" type, fired by a rather special spirit lamp to obviate the need for any external water-tubes. The flame of the lamp is completely hidden by the side-tanks, which also help to keep the heat in to the boiler. She has a single cylinder, with orthodox slide-valve, and loose-eccentric reversing. A finely-adjustable screw-down valve inside the boiler, worked from the cab, does duty as a regulator, and cylinder lubrication is looked after by a small displacement lubricator completely out of sight inside the smokebox.

We think we should give her a name, if only for future reference—readers must please themselves as to whether they perpetrate the sacrilege of adding name-plates! What about "Aladdin"? He had a lamp that was a bit out of the ordinary, too!

Materials required for frames.

18 S.W.G. mild steel or hard brass plate, for frames, buffer-beams.

$\frac{1}{4}$in. brass or steel angle, for frame brackets.

8 B.A. ch. h'd. steel screws, $\frac{1}{8}$in. long, or next longer obtainable.

$\frac{1}{16}$in. brass or iron snaphead rivets, $\frac{3}{16}$in. long, or next longer obtainable.

$\frac{5}{16}$in. dia. phosphor bronze or brass rod, for axle bushes.

Tools recommended for first stage of construction.

Toolmaker's clamp (small or medium).

6in. steel rule, with inches to 1/64in. and millimetres.

Scriber.

Square (small to medium).

Centre-punch (the "Eclipse" automatic punch is extremely useful).

Files: flat, half-round (2nd cut and smooth). Needle files, square and round.

Hacksaw—(the miniature type is cheap, and will do all that is required).

Small pliers.

Small screwdriver.

Countersink bit.

Ball-pane hammer (light to medium).

Small Slocomb centre-drill.

Small tap-wrench—get a good one, it's worth it.

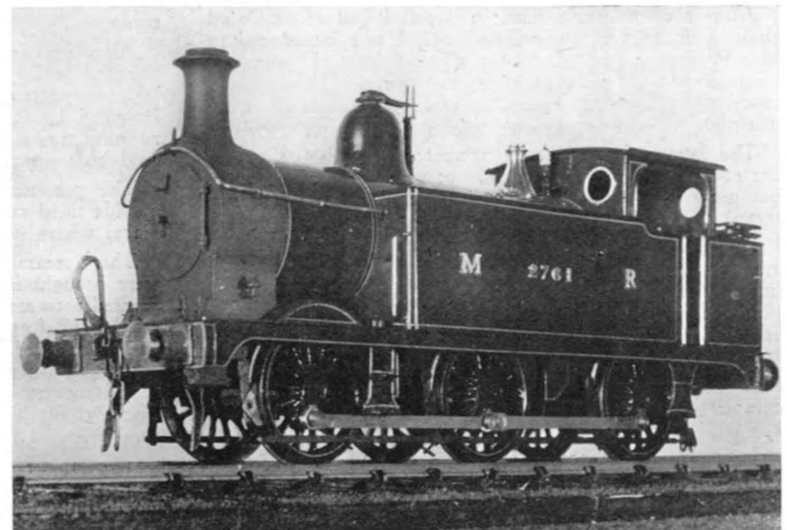
Drills: $\frac{1}{4}$in., $\frac{1}{16}$in., Nos. 12, 43, 51.

Tap: 8 B.A. Taper.

G.N.S. Railway.

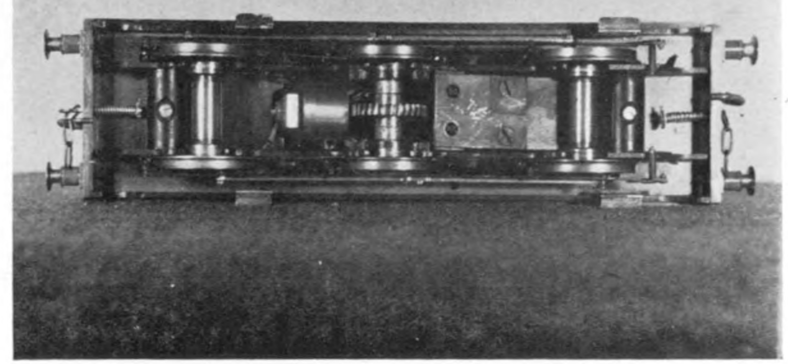
Mr. J. A. N. Emslie, 83, Viewpark Drive, Burnside, Rutherglen, Glasgow, is interested in modelling stock of the Great North of Scotland Railway and would like to hear from readers willing to supply information or lend blueprints or photo negatives of G.N.S. equipment, H.R. locos, coaches and wagons and goods stock of the C.R. and N.B.R.

A 7mm. Scale Gauge O Midland Railway 0-6-0 Tank.



The pictures show a Johnson Midland 0—6—0 tank built by Messrs. K's as the latest addition to the already well-known Derby Museum 7mm. scale model of the Midland Railway.

The underside photo shows the method by which the model was two-railed. The frame was "split" with two Tufnol spacers and the axles mounted in Tufnol tubes, and the Romford motor was then mounted on a metal plate which was fitted to the frames by two Tufnol supports.



The frames being insulated no pick-ups were needed and the running was improved by the absence of the friction that usually goes with brush pick-up. To help in the smoothness of the running the model was fitted with ball races on the driving axles and the motor was "flywheeled" with the result that the 24 volt loco would run smoothly and noiselessly on 3 volts.

By way of warning, it was found that if the stub axles were forced into plain Tufnol tube the latter almost always split open and it was found necessary to cover the Tufnol with a thin walled brass tube.

A 7 mm. HIGHLAND RAILWAY—*continued.*

H.R. No. 126 "Loch Tummel" on down mail train. Fencing not yet completed.

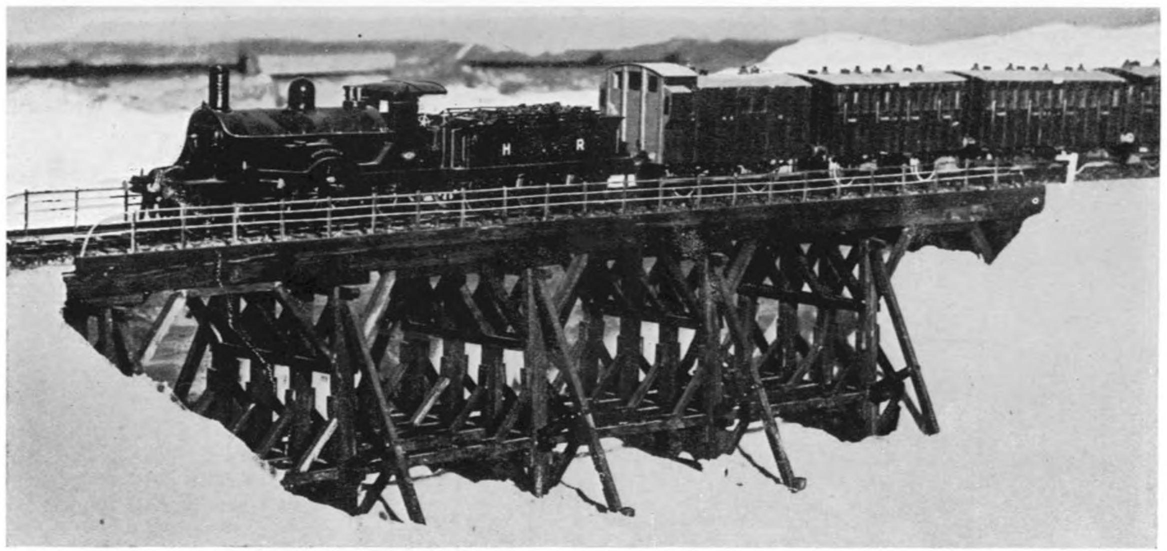


Photo: James R. Smith, Kirkcaldy.
H.R. No. 95 "Strathcarron" and train of old rib-sided stock on Altnaslanach bridge. Photo taken before scenery painted.

Please!

When sending orders for prints, back numbers or any other items do please check that your address is on the letters and that your signature is legible. It may sound elementary but once or twice a week we receive orders without any indication of the writer's address with the result that after a delaying period we get a further communication often alleging all manner of inefficiency on our part. We like to give a prompt service but these occasions just leave us up in the air until we hear further from the sender. With regard to the illegible and flowing signatures so beloved by some people, we do our best to decipher them and as a last resort will address the communication to "The Occupier," but we do prefer to have the name correct if possible.

A Gauge O Steam Loco for Beginners.

Part 2.

By "1121."

Main frames.

Right at the start we run into a slight complication—the driving and coupled wheels come *outside* the frames, in the orthodox manner, but behind the driving axle the frames widen out, and come outside the trailing wheels. There is no need to panic, however; we will describe a very simple way to construct them, and the arrangement has one great advantage in providing a good big space at the rear end of the engine for our spirit tank.

Cut two pieces of 18 s.w.g. mild steel plate to the overall dimensions (or hard brass would do if you've got it), and on one of them scribe the outline and mark out all the hole centres, with the exception of those for the cylinder fixing screws. (Fig. 1.) Carefully centre-pop each hole position. Hold the two pieces of plate together by means of a toolmaker's clamp. Make sure the edges of the two plates coincide truly all round, and tighten the clamp up well so that they can't move. Drill *one* of the screw-holes at each end, right through both plates. Put an 8 B.A. screw through each of these holes, screw nuts on and do them up tightly. You can now remove the clamp. Drill the remaining No. 43 holes, and also the axle-bush holes with the same drill. These will be opened out to ¼in. diameter later; the small hole put through at this stage will act as a "pilot" hole, as the ¼in. drill would be liable to "wander" off position if you tried to put it straight through without a "pilot" hole to guide it, and would probably produce a hole that was oversize, and any shape but round.

All drilling of this kind should be done in a drilling-machine, if you have one, to ensure the holes going through truly at right-angles to the surface of the job. If you haven't, do it in the lathe, with the drill in the chuck and the work held back flat against a drilling-pad in the tailstock. This applies to all drilling in the future. Never rely on hand drilling unless it is definitely specified for some particular reason.

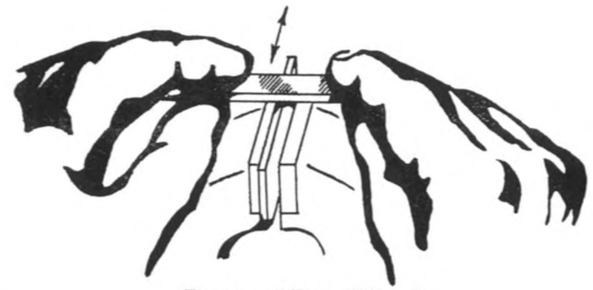


Fig. 2. "Draw-Filing."

Saw and file the frames to outline and make sure the top edges coincide, and the ends, as these are the datum points for all our dimensions. Any discrepancy will throw the frames out of truth when they are assembled. If one frame sticks out a tiny bit beyond the other, judicious filing will correct matters.

To avoid marking work with the vice-jaws, make up a pair of "clams" out of sheet copper or aluminium. These merely hang down between the jaws, being bent over them at the top.

Now number the frames, so that you know which is which, and which are the outside and inside surfaces, so that they finally go together in the same relative positions.

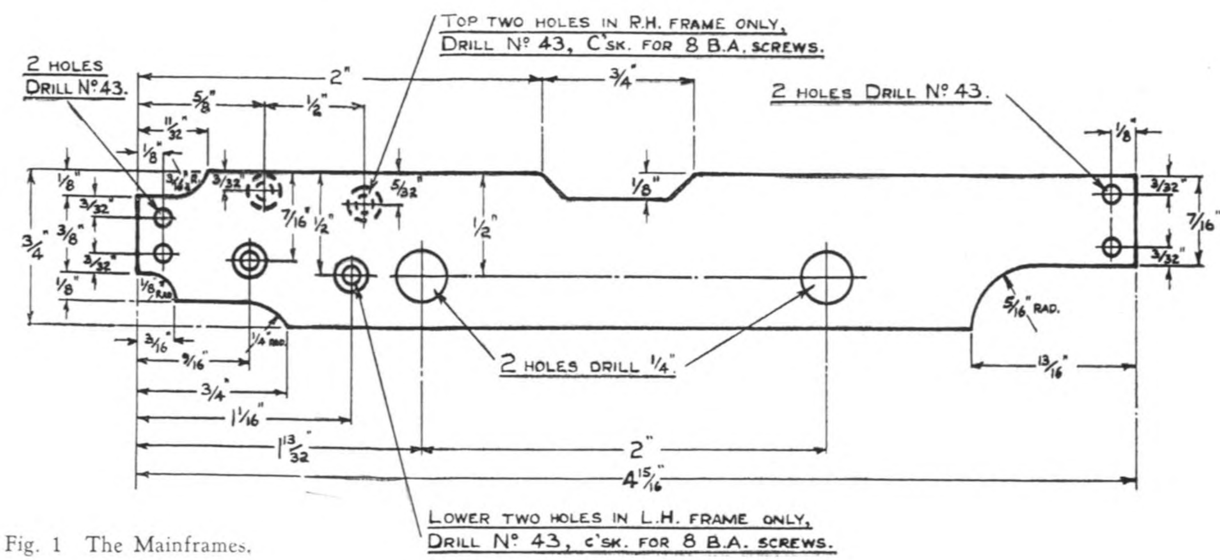


Fig. 1 The Mainframes.

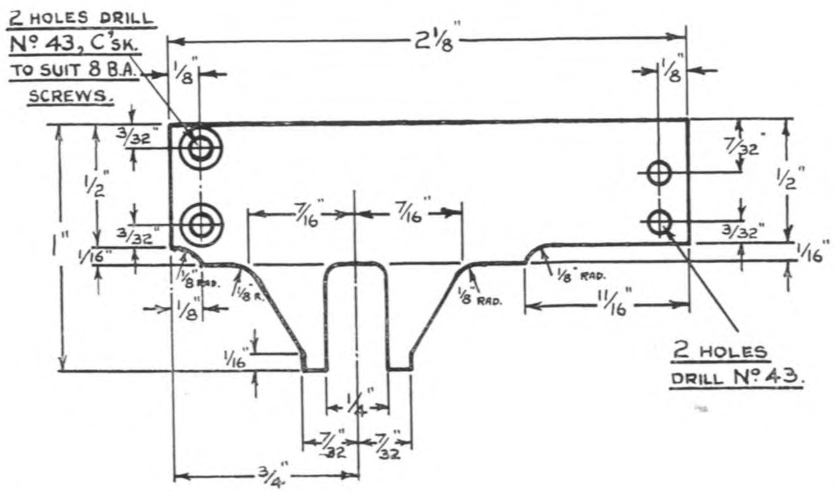


Fig. 3. Rear Frames.

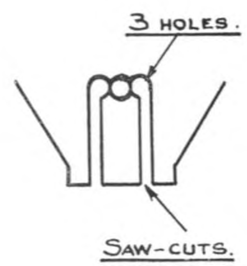


Fig. 4. Cutting Axlebox Slots.

If you haven't any small number-stamps, put one centre-pop mark on the left-hand frame, on the outside, and two together on the right-hand frame, somewhere where they won't spoil the beauty of the engine—say at the front end between the two screw-holes.

Take the frames apart, and remove all burrs. To remove burrs from holes use a larger drill, and to clean up the edges of the plates use a smooth flat file laid flat on the plate, *not* scraped across the corner. Never be afraid of removing burrs in between operations, even though you know you are going to knock up some more immediately. It makes the job much nicer to handle, and in some cases the presence of a burr is enough to throw a job out of truth when it is held down on a drilling-machine table, for example, resulting in mysterious errors cropping up in a subsequent operation.

Open out the axle holes to ¼in. diameter, running the drill slowly. Hold the plate down on a flat piece of wood as firmly as you can, or the big drill will dig in and twist it out of your fingers. If you aren't used to such jobs, and are at all apprehensive about it, use a big piece of wood that you can hold easily, and clamp the plate down to it with wood-screws round the edge. File off the burrs from both sides, not forgetting that this process will push another burr into the hole all round. Remove this with a round file, otherwise this internal burr may deceive you into thinking that the hole is smaller than it really is, when it comes to fitting the axle bushes later on.

Go round the edges of the plates removing file-marks by the process known as "draw-filing," which is illustrated in Fig. 2. The plate is held in the vice, and a dead-smooth file is laid straight across the edge. Standing at one end of the job, hold one end of the file in each hand and move it towards and away from you in a perfectly parallel motion with no longitudinal movement of the file itself. An alternative is a piece of fine emery-cloth wrapped round a bit of wood, but this takes longer.

You can now mark the positions of the two cylinder fixing screw-holes in each frame, noting that they are lower in No. 1 frame than in No. 2. These holes must be carefully positioned, as there isn't a lot of room in the cylinder-block for the screws. The holes are shown as being countersunk on the drawing, but don't countersink them at this stage—that will be done after we have finished using the holes as guides for drilling the cylinder-block, as will be explained when the time comes.

Rear frames.

Repeat the whole process exactly to make the rear frames (Fig. 3). Note the method of cutting out the slot for the axlebox, as shown in Fig. 4. Drill the three little holes, say about $\frac{1}{16}$in., and saw down to the outer two. Put the pair of frames, still bolted together, in the vice, lower edge upwards, with these holes showing just above the jaws. Separate the two little tongues by pushing a screwdriver between them, and then a bit of waggling with a pair of pliers will break them off. Clean up the slot by filing, trying carefully for width and parallelism with a piece of ¼in. square bar, or ¼in. plate. Number the frame plates, separately and clean up as before. Don't countersink the front two holes yet.

Buffer-beams.

These can be made from the same material as the frames, and call for no special comment, except the warning about pilot-drilling for the $\frac{3}{16}$in. holes. The drawbar slots are shown in the drawing (Fig. 5), as required for the hooks which will be described in due course. If you are proposing to use commercial hooks, or some special pet couplings of your own, you will, of course, make provision to suit. The same goes for the buffer-holes, but note that the buffers on the rear beam come just in the way of the frames, so we cannot use buffers which involve any fixing behind the beam.

The marking-off of your centre-line, and so on, should be done on what is to be the back of the beam, so that you can at the same time mark two lines to indicate the positions of the outer faces of the angle-brackets. These are of $\frac{3}{16}$in. or ¼in. angle, whichever you can get, and are rivetted to the beams with $\frac{1}{16}$in. snaphead rivets, put through from the back. Now, you *can* fiddle about holding these little brackets on the beam with a toolmaker's clamp while you drill the rivet-holes, but our pet method for this sort of job is to solder them on, although we would certainly never rely on solder alone. Steel can be soldered quite easily—clean it up nice and bright, and use an acid flux, such as Baker's soldering fluid. The solder probably won't "take" at first, but put some more Baker's on the steel *while it's hot*, so that it sizzles and bubbles, and you

will have no further trouble. Tin the back of your bracket, and sweat it on, using plenty of heat, so that the solder flows well, and hold the bracket down firm until it sets. Check that your two brackets are the right distance apart

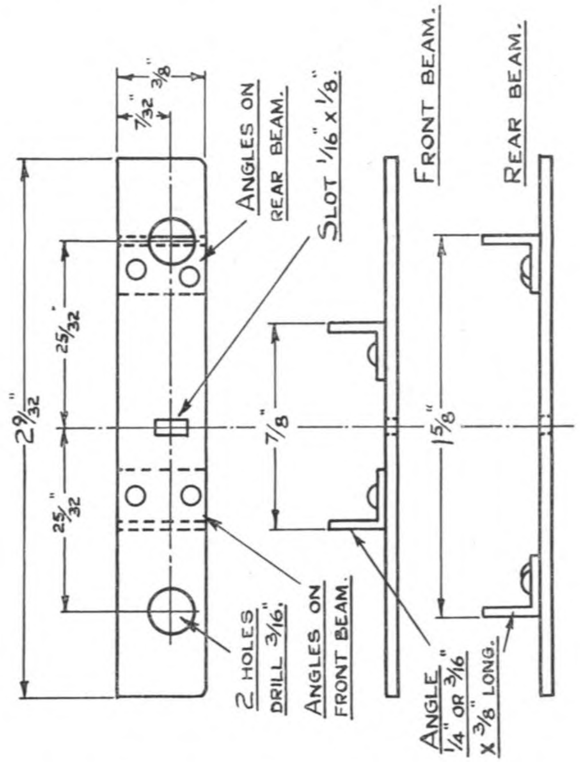


Fig. 5. Buffer Beams. Below: Photo—M. W. Earley.

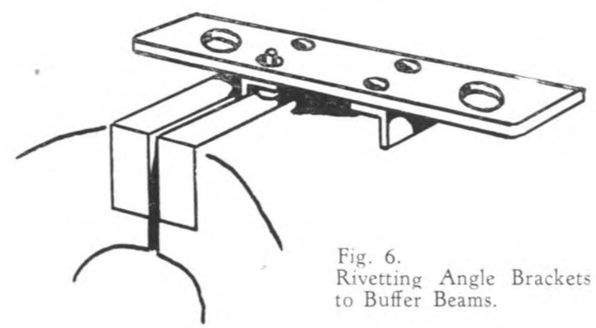
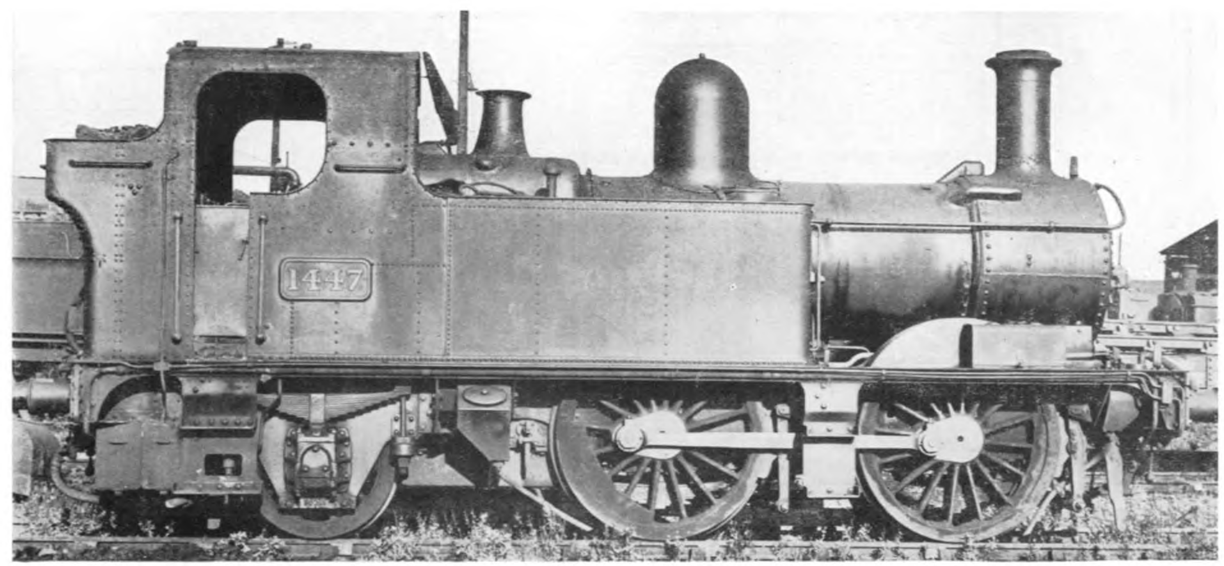


Fig. 6.
Rivetting Angle Brackets to Buffer Beams.

—there's no room for inaccuracy here—and are equidistant from the centre-line, also that they will hold the frames truly vertical. When you are satisfied, pop the $\frac{1}{16}$in. drill through from a couple of centre-pop marks on the bracket. The exact positions of these holes are not important—they should be as far apart as practicable without breaking out of the edge anywhere. Note, however, that the lower hole in each bracket on the rear buffer-beam will have to be positioned fairly carefully, as the buffer-hole doesn't leave you very much room.

Remove the burrs on the angle side of the holes with a bigger drill twiddled in the fingers, and a trifle more so on the face of the buffer-beam, to form a shallow countersink. Put a $\frac{1}{16}$in. rivet through from the back, and hold the projecting leg of the bracket gently in the vice, with the head of the rivet resting on top of the jaw. (Fig. 6.) If you have to use over-length rivets, cut the end off with wire-cutters or side-cutting pliers to project about $\frac{1}{16}$in. above the surface of the buffer-beam. Now carefully rivet down into the countersink, using for preference the "ball" end of a ball-pane hammer, avoiding, however, the production of dents all over the surface of the buffer-beam. Every smack should be on the rivet! When the rivet is down tight, file off any excess flush with the surface. Do all the rivets the same, and when the beams are painted nobody will be any the wiser, and you will have the strongest possible job.



A Gauge O Steam Loco for Beginners.

Part 3. By "1121."

Cross-stay.

The flat plate which goes across at the junction of the main and rear frames (Fig. 7) is built up with its two brackets on each side in exactly the same way as the buffer-beams, and calls for no further instructions.

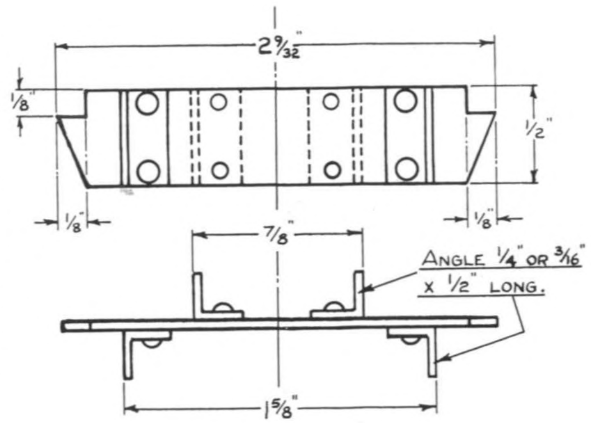


Fig. 7. Frame Cross-stay.

Frame Assembly.

Clamp the front end of one mainframe on to its appropriate bracket on the front buffer-beam, with the toolmaker's clamp, making sure it is the right frame, the right way round, and that the buffer-beam is the right way up, also that the top edges of frame and buffer-beam are level. Gently tap the front of the buffer-beam, to make sure it is truly in position against the end of the frame, before finally tightening the clamp. See that one of the screw-holes is showing, and just touch the No. 43 drill through it to make a small dimple in the right position on the angle-bracket. Rest the underside of the bracket on the corner of a piece of thick plate to do this, with the table of the drilling-machine swung round so that the buffer-beam can hang down beside it. (Fig. 8). If you haven't a drilling machine you will hardly be able to do an awkward job like this in the lathe—you will have to

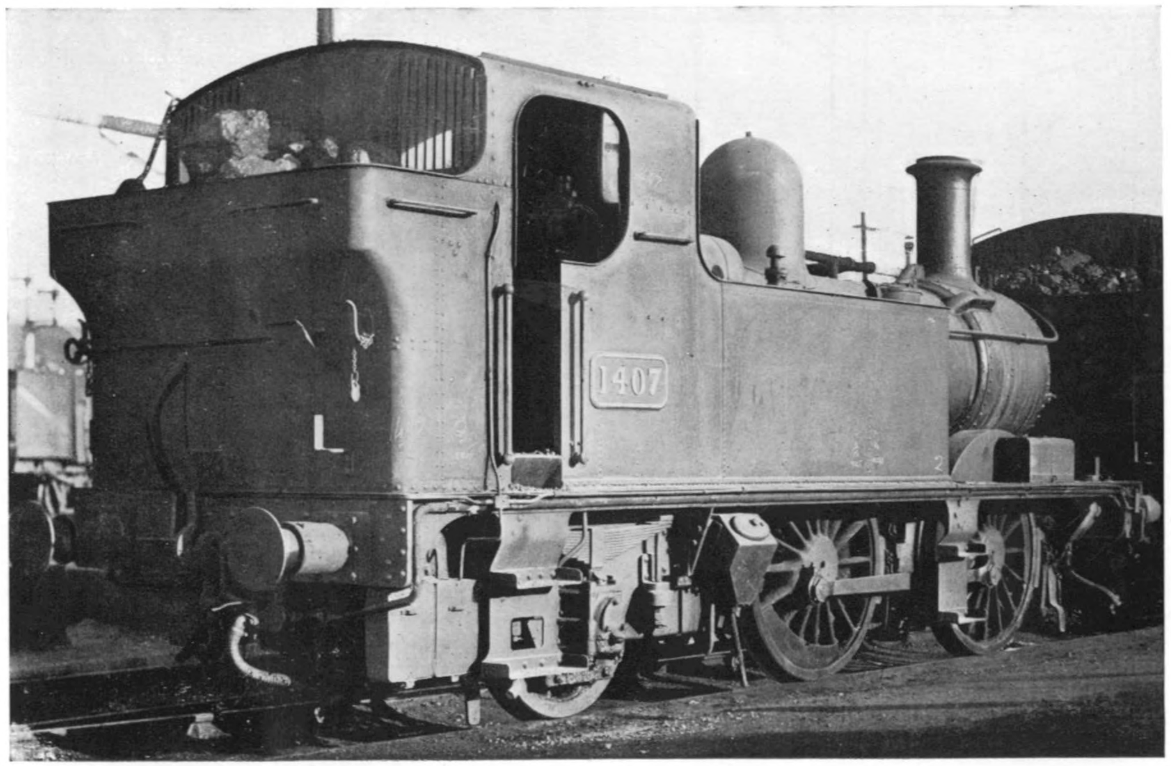


Photo: M. W. Earley.

use a hand-brace, but make sure you keep it truly perpendicular to the job.

Remove the frame, drill the bracket No. 51, tap 8B.A., and remove burrs from surface of bracket.

Tapping Without Tears.

The tapping of these brackets forms a useful exercise in preparation for more difficult jobs to follow. Ho'd the buffer-beam up on end in the vice, and start putting in the taper tap, squinting at it from various directions to make sure it is vertical. (Fig. 9). If you are using brass angle-brackets, the tap will probably stand being screwed straight in, but if they are steel it may need to be "cleared" occasionally by being turned backwards half a

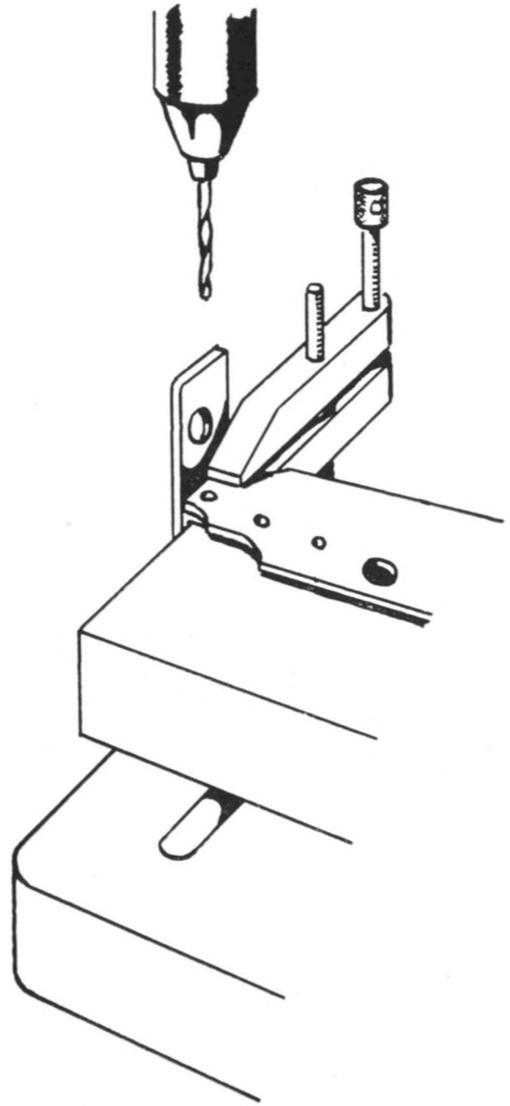


Fig. 8. Transferring screw holes from frame to angle bracket.

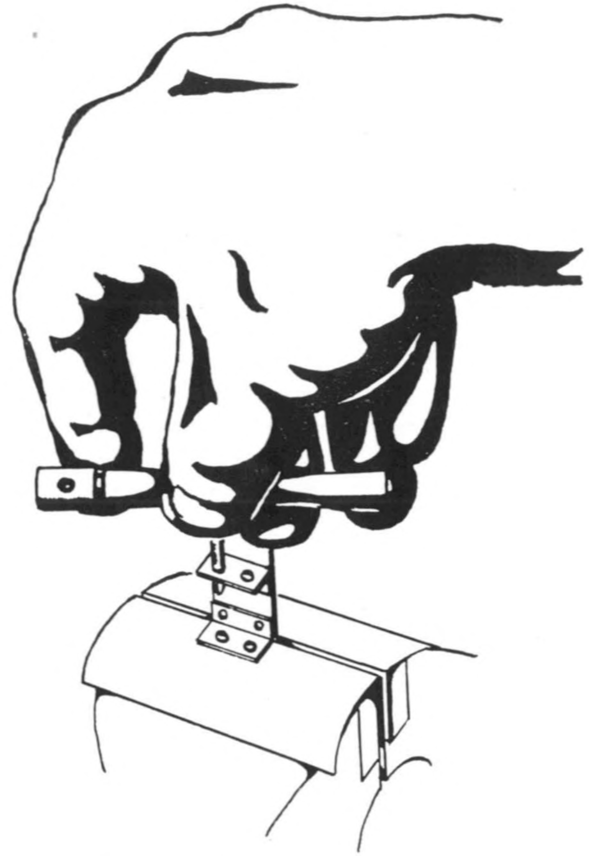
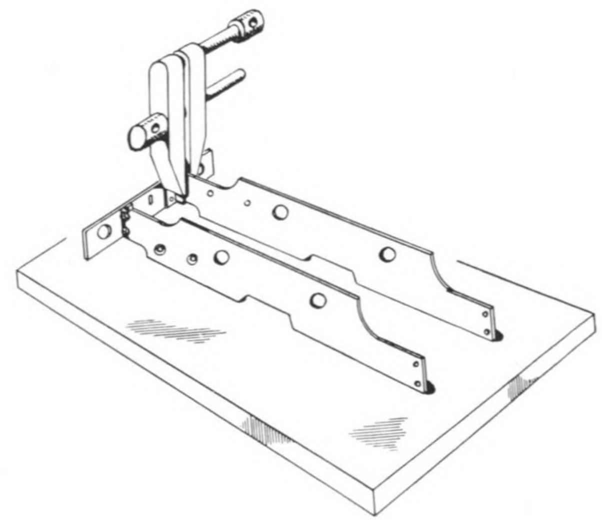


Fig. 9. Tapping the angle brackets.



F'g. 10. Square up the frame assembly on the surface plate at all stages.

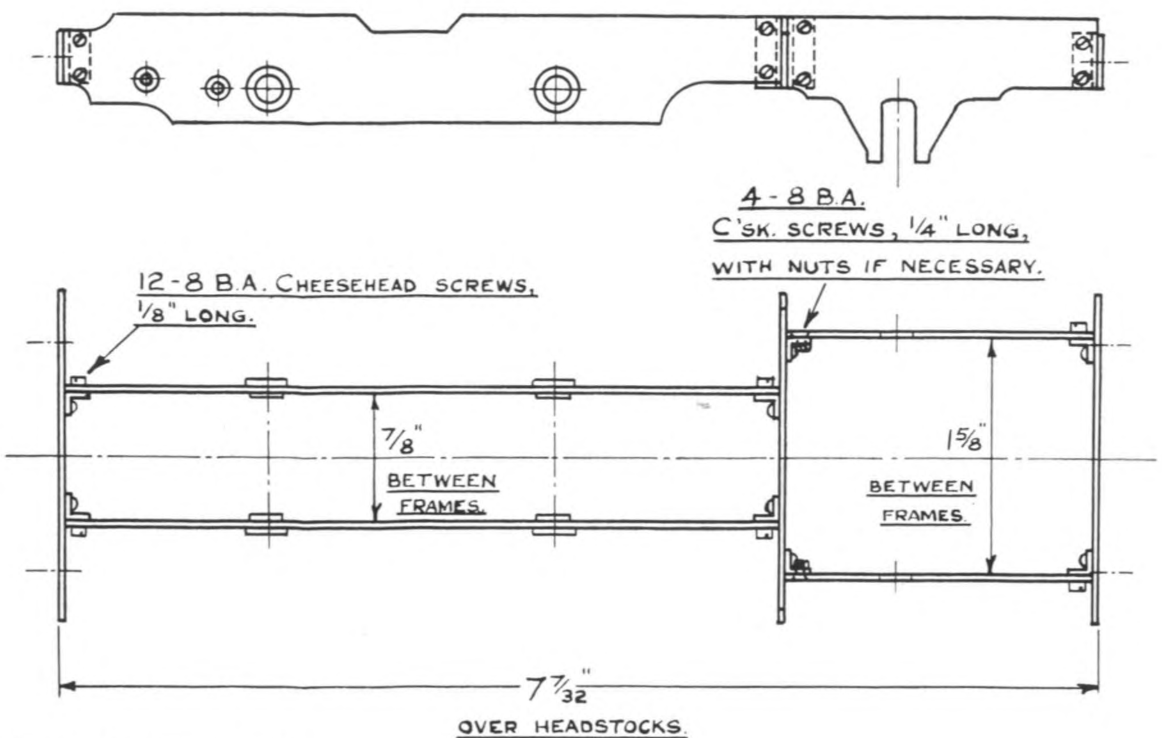


Fig. 11. The Frame assembly.

turn or so for every bit of inward cutting. Unfortunately this is not a process for which we or anybody else can give very definite instructions—on paper, at any rate. It is just necessary to learn from experience how much a little tap will stand before breaking. One thing we *can* tell you, however: lack of *concentration* breaks more taps, and other tools, than anything else. Keep your mind on the job. When you glance up to see the time, that's when the tap snaps off. When you look round to see who's walked into the workshop—that's when you twist your last hacksaw blade in the cut and break it in half. When you look out of the window to see if it's raining—that's when the end falls off that 1/16" drill.

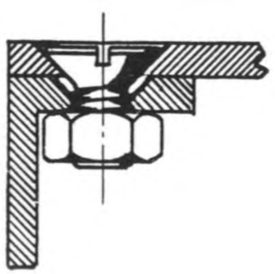
Some sort of lubricant is definitely essential for most tapping jobs, particularly deep holes in steel; the best we have struck being an animal fat. Cadge a small pot of old fat from the kitchen when you come to this sort of work, but kindly note that we, and "The Model Railway Constructor," disclaim all responsibility for and knowledge of the idea in the event of domestic strife resulting from the pilfering of large portions of the weekly lard ration.

In the case of thin brass, little lubricant is likely to be needed, an occasional small application of lick usually being sufficient.

Screw the frame to the bracket with a short 8B.A. cheesehead screw, and put the clamp on again over the furthest corner of the bracket and spot through the other hole with the No. 43 drill in the same way, remove frame, drill bracket No. 51, tap 8B.A. and remove burrs as before.

Do exactly the same with the other frame on the other bracket, but before you clamp up finally for transferring the second hole, screw the first frame on again with two screws and lay the whole thing on a surface-plate on the top edges of the frames—the assembly upside-down, that

Fig. 12.
The tapped hole in the bracket may need countersinking to allow the head of the screw to come through, in which case a nut would be advisable.



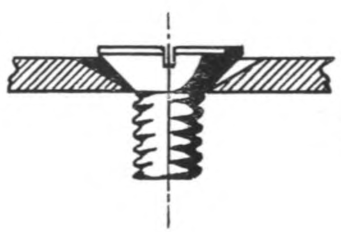


Fig. 13.
The screw-head will not seat down into a countersink made with an ordinary drill point.

is to say. If you haven't a surface-plate, a piece of plate glass is a very good substitute, or failing that use the table of the drilling machine, or the bed of a flat-bed lathe. Make sure the two frames bed down firmly, with no rocking, and tighten up the clamp on the second frame. (Fig. 10). Now transfer with No. 43, dismantle, drill bracket No. 51, and tap as before.

Fit the cross-stay to the rear ends of the main frames, by its front two brackets, by exactly the same process, and then add the rear frames and rear buffer-beam. Note that the top of this comes 1/8" below the tops of the frames, to bring it level with the front beam. Make sure the whole thing beds nicely down on your surface-plate—you don't want a sagging engine.

You will note that we have shown countersunk screws at the front ends of the rear frames, on the frame assembly drawing Fig. 11. You can countersink *all* the holes if you like, should you prefer to use countersunk screws throughout, but it's not *necessary* elsewhere, as the screw-heads won't show when the engine is finished. These two on each side, however, *must* finish flush to allow the two little dummy angle-brackets to be added later on, as seen on the outline drawing given previously. We can't have any "super-detail" people complaining that our "steam" construction is cramping their style! Make sure that you countersink these holes sufficiently deeply to allow the screw-heads to go right down flush.

The dimensions of the heads of commercial screws sometimes vary a bit from batch to batch, so you *may* find that the heads come right through the frame and down on to the bracket. In this case, depending on the thickness of the brackets, the process of slightly countersinking the tapped hole *may* leave rather less threads than is desirable for a firm hold on the screws, and it may be advisable to add 8B.A. nuts inside the brackets. (Fig. 12).

A good countersinking bit, if you haven't got one, can be made from the stub end of a broken drill, say about 1/4" diameter, by grinding the point to a 90-degree included angle. (You can check this with your square). The ordinary drill-point is too obtuse, and a hole countersunk with an ordinary drill won't let the screw-head go right down. (Fig. 13).

Loco Underframes on Buckinghamshire Branch Line.

By **PETER B. DENNY, B.A.**

Locomotive underframes can be, I believe, comparatively expensive items in the model railway builder's budget, but also somewhat difficult to construct accurately at home when one possesses neither drilling machine nor much experience in metal work. The following method is an attempt to find a way around this problem. Briefly it consists of replacing the usual threaded stretchers, to which the side frames are screwed, by a solid lead casting, the side frames being held in position with nuts and the problem of tapping thereby eliminated. I first used this method five years ago and it has proved so successful that, with certain modifications, it has been used ever since. As so much has been written about locomotive construction I shall limit myself to describing my method of (a) drilling the side frames; (b) constructing the underframe; and (c) assembling two-rail pick-up gear.

DRILLING THE FRAMES.

While it is, I believe a comparatively simple matter to drill side frames out accurately on a drilling machine, my attempts to do this with a hand brace have not been too successful. I have found it impossible to keep the brace at right angles to the work with the result that the holes were either crooked or had become enlarged owing to the lateral movement of the brace, and such holes are completely useless for axle bearings. A simple contraption has been devised therefore which holds the hand brace in the correct position while the holes are being bored—Fig. 1. It consists of two wooden uprights "A" screwed to a base and joined at the top with a piece of wood "B." These uprights must be braced "C" and "D"—"Meccano" strips are useful here—so that they are held at right angles to the base from all directions. A further piece of wood "E" fits in between the uprights "A" and is arranged so that it can be held in position at various heights with screws "F." A hole should be cut in this piece of wood large enough to take freely that part of the drill brace shaft between the pinion gear and the chuck. The purpose of making this part movable is so that drill bits of various lengths can be used and on most drills the length of shaft here is not great enough to permit any extensive vertical movement. A small recess "G" in the cross member "B" is arranged to take the upper part of the brace between the wheel pivot and the top handle, care being taken to see that the centres of (i) this recess and (ii) the hole in "E" are in a line that is at right angles to the base from all directions. It may not, of course, be possible to fix all types of drill braces into a frame like this (actually the drill I used was one from Messrs. Woolworths costing the moderate sum of 5/-), but various adaptions of the principle will no doubt suggest themselves. I need hardly add that obviously the frame must be built up around the drill. The drill is inserted by removing the chuck, passing the shaft through the lower hole and replacing the chuck. The top part is then fitted into the recess and held in place with a "Meccano" strip "A"—Fig. 2—the end holes of which have been opened up to slip over screws. If a hole is drilled right through the base it will be found quite easy to pass the drill bits through here and secure in the chuck. Perhaps I should add that this is not a contraption which could be used extensively since in time the wooden bearings will wear away, but for the few occasions when it is required to drill locomotive underframes it has proved itself extremely useful.

The frames can now be drilled out in the normal way. Very briefly my method is to solder two pieces of 1/16" brass strip together and mark out and centre punch the position of the axle holes. A pilot hole is then drilled with a number 60 drill and this is gradually enlarged until 1/8" in diameter is reached and which can then be reamed with 1/8" steel rod. Additional holes 1/16" diameter must be drilled for holding the frames together and in this particular method it is important that these should be clear of all the wheels—see Fig. 3 where these holes are indicated at "A."

A Gauge O Steam Loco for Beginners.

Part 4.

By " 1121."

Sharpening Drills.

Don't be afraid of this drill-grinding business—a lot of people make a great science of it, with wonderful patent jigs, and what-not. Hold the cutting edge of the drill against the periphery of the grinding-wheel, at a tiny bit *above* the centre-height of the wheel. With your left hand holding the drill near the point, the fingers resting on the support, and your right hand holding the tail end of the drill and resting inside your left hand, the whole

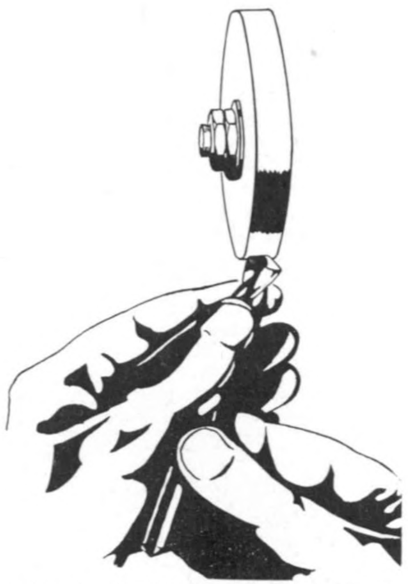


Fig. 14. Drill Grinding. The beginning of the movement seen from above.

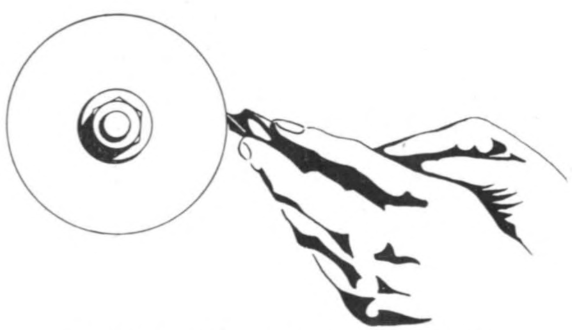


Fig. 15. Drill Grinding seen from the left.

thing will look like Fig. 14, while a spectator viewing the proceedings from your left would see Fig. 15. Now you must perform three motions simultaneously—lift the point of the drill, keeping it in contact round the surface of the wheel with the left hand, bring the shank downwards and to the left with the right hand, and twist the drill round with the fingers of the right hand, in a clockwise direction Figs. 16 and 17 show the same two views after you have completed this movement. What you must aim at is making the end of the drill, on either side of the point, slope back away from the cutting edge or " lip," (Fig. 18) *especially close to the point.* Obviously, the cutting-edges must get down to the bottom of the hole first, otherwise the drill will rub and not cut. The angle of the point produced on the drill will depend, of course, on the angle at which it is offered to the grinding-wheel.

All this sounds a bit complicated, and takes a lot of words to explain, but it is really very simple once you get the hang of it, and we thought it worth while to deal with it fully at the outset—few things cause more misery in this world than trying to make holes with blunt drills. Furthermore, they heat up, and soften or even burn

Fig. 16. The finish of the movement seen from above.

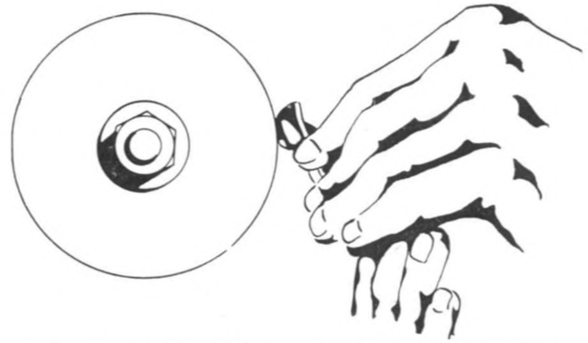


Fig. 17. Finish of the movement seen from the left.

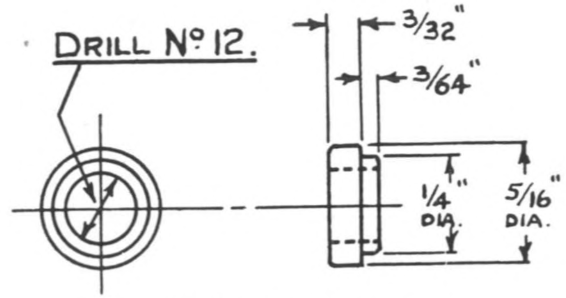


Fig. 19. The axle bush.

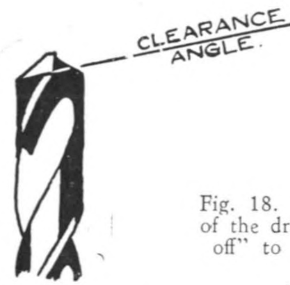


Fig. 18. The cutting edges of the drill must be "backed off" to provide clearance.

themselves in the process, and then no amount of sharpening will make them cut.

Before you start sharpening, take the biggest drill you have that's been properly ground, and hold it against the *stationary* grinding-wheel, in the position shown. Now try to follow the movements as described, at the same time watching how the surface of the wheel follows round the form of the end of the drill. Do this a few times, and you will soon see what you are after. Don't forget that the drill must be ground so that the point is in the middle, if you get our meaning, not with one cutting lip longer than the other. This would make it cut over-size, a fact which, however, is sometimes useful in providing side-clearance for a drill when drilling very deep holes.

Axle Bushes.

We shall need to make four little bushes as bearings for the driving and coupled axles. Ordinary brass rod would do, but phosphor bronze s best.

We remember reading in these pages some time back that phosphor bronze was terrible stuff to machine. Don't you believe it! It's just a matter of knowing how. True, the biggest mistake is to treat it as a particularly obstinate kind of brass—it is a "sticky" kind of metal, but if you operate on it with good, sharp tools, with plenty of clearance and " rake," it will cut nearly as easily as mild steel.

The bush is shown in Fig. 19, and is made from 5/16" rod. Hold a piece tightly in the three-jaw chuck, with only just enough sticking out to make one bush. Face the end with a tool set as shown in Fig. 20. This tool should be ground to a point, and then have the extreme tip removed to form a very tiny radius. A dead-sharp point will never produce a smooth surface. Make

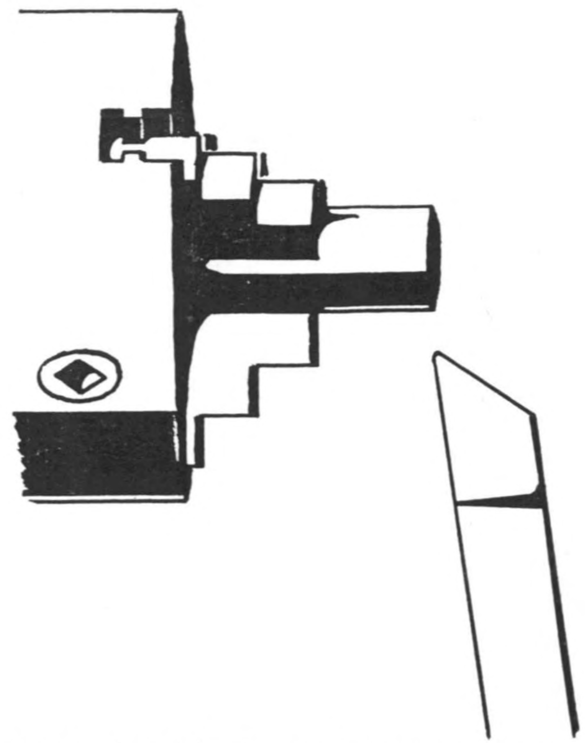


Fig. 20. A tool this shape can be used for facing and turning at the same setting.

sure the tip of the tool is at the height of the centre of the bar—you will soon discover whether you are right or not when you face into the centre. If you are, you will be able to face the bar right off flat without leaving any " pip." Leaving such a pip is not disastrous in itself—it can always be removed with a flat file, but the complete absence of pip indicates that the tool is at the correct height for turning the diameter of the bush without difficulty later on.

Hold a small centre-drill, of the type known as a " Slocomb," or the short stub of a broken drill re-ground to a point, in the tailstock drill-chuck, and centre the end of the bar. If the barrel of your tailstock wobbles a bit as most do, steady it by tightening the barrel clamping screw until the barrel is fairly stiff to screw out. Next put in a small "pilot" drill for about 5/16" deep withdrawing frequently to clear chips, and finally open out with a No. 12. You will find paraffin makes a very good cutting lubricant, applied with a brush, for "sticky" metals like bronze or aluminium, and in fact it can be used for your mild steel turning if you don't want to go to the trouble of obtaining proper cutting-oil. Don't use any lubricant on ordinary brass when turning—only when drilling.

Now, without changing the setting of the tool, turn the bush down to ¼" diameter. It won't matter a lot if you get it slightly small for the hole in the frame—you can always solder it in, but it's much nicer to make it a press fit, and is useful exercise for more important work to come. If you haven't a micrometer, you can turn it to calipers set from a piece of ¼" diameter rod, or the shank of a ¼" drill gradually reducing the diameter of the job until the calipers push over it with just a tiny bit tighter "feel" than they do over the ¼" rod or drill, indicating that the job is just a few "thous" over the ¼" diameter. Slightly chamfer the end of the job with a flat file, and try the frame on it, without altering the cutting depth of the tool. If it will just begin to push on, you're right. If it still seems tight, running the tool over the job again without increasing its depth should be enough to remove the "gnat's whisker" required. Experience will tell you more than we can here, as so much depends on the amount of "springiness" in your job and tool, and your "feel" with the calipers. When making the last cut, run the point of the tool well into the corner under the "head" of the bush, without jamming it in roughly enough to cause a "dig-in," and then wind the tool out so as to face the underside of the head off flat. This will leave a slight burr, which should be removed at this stage with the flat file.

You can please yourself now whether you saw off the bush or part it off. Sawing would undoubtedly be quicker than changing the tools over, if you haven't a parting-off blade permanently set up on the back of the cross-slide. If you really want to part it off, however, remember that the great secret is rigidity—maximum rigidity of the tool, minimum slackness in the cross-slide and headstock mandrel, and minimum overhang of job from chuck jaws. Whichever way you elect to remove the bush from the the bar leave a little bit on the thickness of the head for facing off afterwards. Even a good parting-tool can rarely be relied on to leave a smooth or flat surface, and a hacksaw certainly can't!

Now pull the bar far enough out of the chuck to do the next bush. You should find a dimple already there, left by the point of the drill. Face the end of the bar off flat and observe whether this mark is running dead true. If it is, or can be persuaded to do so by gentle tapping of the bar to one side or the other, you can go straight ahead with your pilot again. If it won't, you will have to face the dimple right away and re-centre, and proceed as before.

Finish all four bushes to this stage, and then hold them one by one on the ¼" diameter, and face off the heads to thickness. Put a slight chamfer on the corner with the file, touch a large drill in the hole to remove the burr, and there you are. Don't hold them too tightly in the chuck, as the wall is only 1/32" thick, and you may squash the hole. Likewise you will have to do the facing *very* carefully, to avoid hooking the job out of the chuck, particularly if you have an uneven sawn-off surface to deal with.

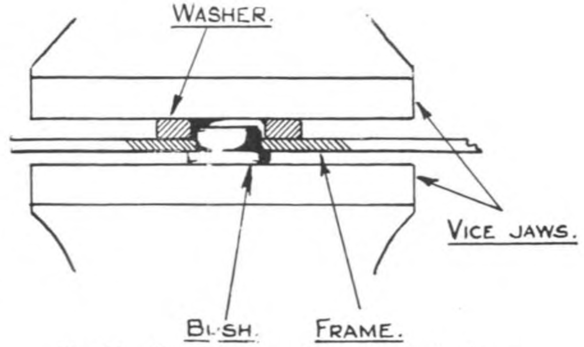


Fig. 21. Pressing the axle bush into the frame.

Before you press the bushes into the frames make sure that the holes in the frames have a slight chamfer to receive any small radius which you may have left under the heads of the bushes. Start the bush in the hole by hand, remembering the head comes on the *outside* of the frame. Hold a thick washer or something similar with a hole in it slightly bigger than ¼" diameter, against the inside of the frame, so that the end of the bush can come through into it, and squash the whole thing up together in the vice. (Fig. 21).

In our next instalment we shall be dealing with the buffers and the following tools and materials, additional to those previously listed, will be required. All or any are available from Crescent Industries, 1, Blenheim Crescent, London, W.11.

Tools.
Drills, 5/32" or No. 22
11/64" or No. 17
1/8" or No. 30.
Tap, 2 B.A. plug.
Soldering iron.

Materials.
5/16" square brass or steel bar.
3/8" dia. steel bar.
3/16" dia. steel bar.
"Easiflo" silver-solder.
"Easiflo" flux.
Soft solder.
Flux ("Baker's Fluid" recommended.)
1/32" brass sheet, or strip 5/32" wide.

To the Editor.

G.W.R. 1400 Class Loco.

Dear Sir,

We note with interest the excellent photographs of the G.W.R. 1400 class Locomotive which appeared in your last three issues (June, July and August).

It may be of interest to your readers to note that among the range of Sayer Chaplin photo engraved loco. parts which we distribute there is a set of parts for this particular Loco.

In view of the fact that your magazine appeals to the more proficient modeller where that extra detail counts, we would point out that the parts available for constructing the 1400 class produce a finished body with all the details shown in these photographs.

Yours faithfully,
R. G. Bradshaw.
GEORGE BRADSHAW (SUSSEX), LTD.

Electric Firing for Small Steam Locos.

By **M. DRINKWATER.**
(*Merseyside M.R.S.*)

The writer's interest in steam operation dates from 1925, when, at a comparatively tender age, he acquired one of the first of Bassett-Lowke's famous "Moguls," and it is this original locomotive that has formed the subject of the experiments described herein.

In the early days "13000," subjected to the enthusiasm and inexperience of its youthful owner, must have covered many miles circling the bedroom floor before the unhappy day when a major derailment at speed resulted in a large scorch mark on the carpet. The court of enquiry which followed this disaster ruled that either the railway should be banished to the garden or it should revert to clockwork propulsion. The former alternative was unhesitatingly accepted, and thus the pleasures of outdoor operation were savoured for the first time. A major disappointment, however, was the complete unreliability of the steam loco in the open air, due to the impossibility of keeping the lamp alight and burning properly even in the calmest weather, and "13000" accordingly assumed a place of honoured retirement. At one time it was even offered for sale at £2. 10. 0. but fortunately there were no takers.

Recently, construction of the writer's Gauge O L.M.S. system has commenced in earnest. This will eventually embrace a fairly lengthy outdoor section, and it is primarily designed for 24 volt stud-contact operation. Steam being the first love, however, it was decided to see what could be done with an electric immersion heater unit fitted to the "Mogul" in the place of the spirit lamp, and the results have been most encouraging. The conversion has been carried out with simple tools, has cost only a few shillings and required nothing more than a reasonable competence with a soldering iron, but before going into details it might be as well to have a look at the pros and cons of this system of firing. There are several major advantages.

Firstly the loco is completely draught-proof and will function perfectly well out of doors whatever the weather, subject to reasonable track cleanliness. Secondly, there is no burning of the paintwork, no smell, and no danger of fire or damage to the boiler in the event of derailment, and finally there is a considerable measure of remote control to be attained after a little practice in regulating the heater current. With the heat sufficiently turned down, the engine can be kept stationary while in steam for as long as may be desired without any overheating or blowing off, and when required to move off full pressure can be obtained in a few seconds with the heat turned up to maximum.

There are, however, some difficulties to be overcome, the main one being the supply of the heater current. The power consumed is much in excess of that taken by a comparable electric locomotive, and either the voltage or the current, or both, must be much greater.

Experiments were first carried out with various heater units in an open trough of the same basic dimensions as the "Mogul" boiler and so far as could be judged by the time taken to boil a given quantity of water a 150 watt heater element gave approximately the same performance as the original spirit lamp, but as, within reason, the more heat the better, a 250 watt element was decided upon for the loco itself.

Without delving too deeply into electrical theory, the relationship between the applied voltage (E), the current in amps. (i), the resistance in ohms. (R), and the power consumed in watts (W) in any electrical circuit, or any part of it, are given by the standard equations $E = iR$ and $W = iE$.

By substitution, any one of these four quantities can be expressed in terms of any two of the others, and the most convenient forms for our calculation are:—

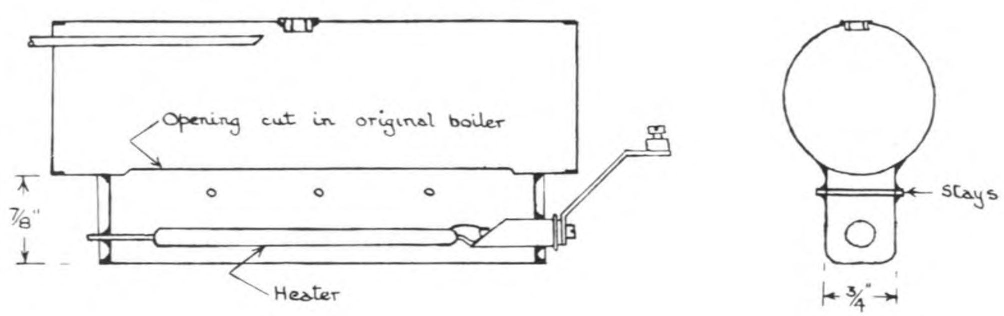
$$R = \frac{E^2}{W}, \quad i = \frac{W}{E} \quad \text{and } i = \sqrt{\frac{W}{R}}$$

Hence it can be seen that for a 250 watt heater and a supply voltage of 24 say, the resistance of the heater must be $\frac{24^2}{250}$ or 2.3 ohms, and the full current taken from the supply will be $\frac{250}{24}$ or 10.4 amps!

Such a current requires a fairly sizeable power unit by ordinary model standards, though this need only consist of a transformer if A.C. mains are available as A.C. or D.C. may be used at will. However, it also requires properly bonded track, and track feeders of not less than 14 s.w.g. copper, and correspondingly hefty windings on the controller. I am using this voltage at present as I happened to have a suitable transformer available, but have decided to change the supply voltage to 50 or 60 when opportunity offers, as a reasonable compromise between safety and efficiency.

A 250 watt heater at 50 volts would require to have a resistance of 10 ohms and would take a current of 5 amps on full load. 18 s.w.g. copper would suffice for track feeders, and it will be seen that by doubling the voltage the current has been halved and the resistance of the

Fig. 1. Sectional Elevations of Modified Boiler.



Part 5.

A Gauge 0 Steam Loco for Beginners.

By " 1121."

Buffers.

If you are content with commercial solid buffers, all you will have to do is to cut off whatever shank they may have, in the case, at any rate, of the rear buffers, and solder them directly to the beam, while the front ones can be put through the holes and secured with nuts behind in the orthodox way. If you want to *make* solid buffers, turn them out of 5/16" square bar to the outline of the finished article as shown in Fig. 22. We are not proposing to devote further space to this process, as we consider it a pretty safe bet that the majority of "Aladdin" builders will prefer spring buffers. As no existing commercial spring buffer that we know of, at time of writing, fulfills the necessary condition of no projection behind the buffer-beam, we have had to scheme one out specially, and much cogitation has been entailed in evolving a design sufficiently robust to withstand the abuse inseparable from a buffer's duties. We cannot deny that they are tricky little items to make, but still within the capabilities even of a beginner, given only care and accuracy. Our "Official Suppliers" will be marketing the buffers complete by the time these notes appear in case anybody should prefer to purchase them.

To make the body, or housing, hold a piece of 5/16" square brass or steel bar in the four-jaw chuck, adjust the jaws until it runs true, and face the end off flat exactly as detailed for the axle bushes. The successive stages of forming the shape of the body are shown in the little diagrams (Fig. 23) and you can please yourself whether you do the reduced part in the middle with hand tools, or from the slide-rest. Our pet dodge is to do a job of this kind entirely with what amounts to a parting-tool with the end ground to a radius instead of being square, but naturally it is essential to take great care that such an un-robust tool doesn't get wrecked in the process. All you have to do to shape the reduced part of the buffer is to traverse the tool backwards and forwards between the base and the ridge on the outer end, gradually increasing the depth of cut until you arrive at the right diameter. Then a touch with a file will do all the "rounding-off" necessary to finish the shape.

Without disturbing the job in the chuck, centre the end and drill 5/32" diameter, or No. 22 Morse, which is near enough the same size, by about 7/16" deep.

Replace the tool in the slide-rest by an ordinary square-ended parting tool, and part off. Be careful how you feed the parting-tool in, with those square corners coming round. Finish all the buffer housings to this stage.

The only other lathe operation on this part of the buffer is to counterbore the hole from the back end. With the 5/32" drill still in the tailstock chuck, thread the buffer body over it, the other way round. Wind the tailstock barrel out until the square part of the job enters the

(Continued on page 206).

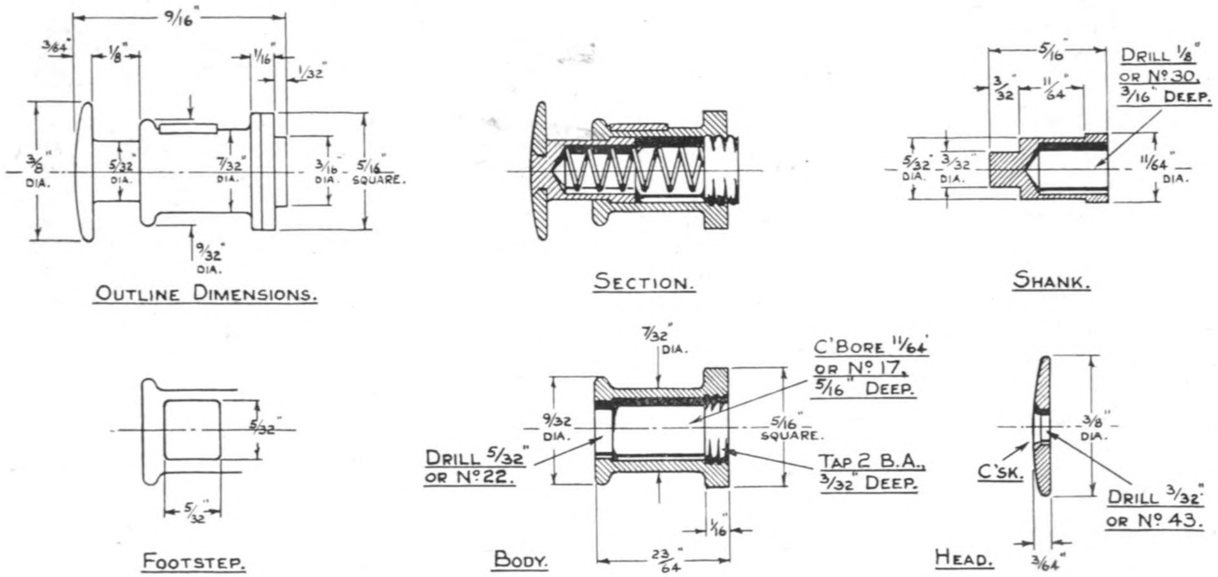


Fig. 22. Buffer details. Outline dimensions for solid buffer, sectional view of complete spring buffer and dimensions of components.

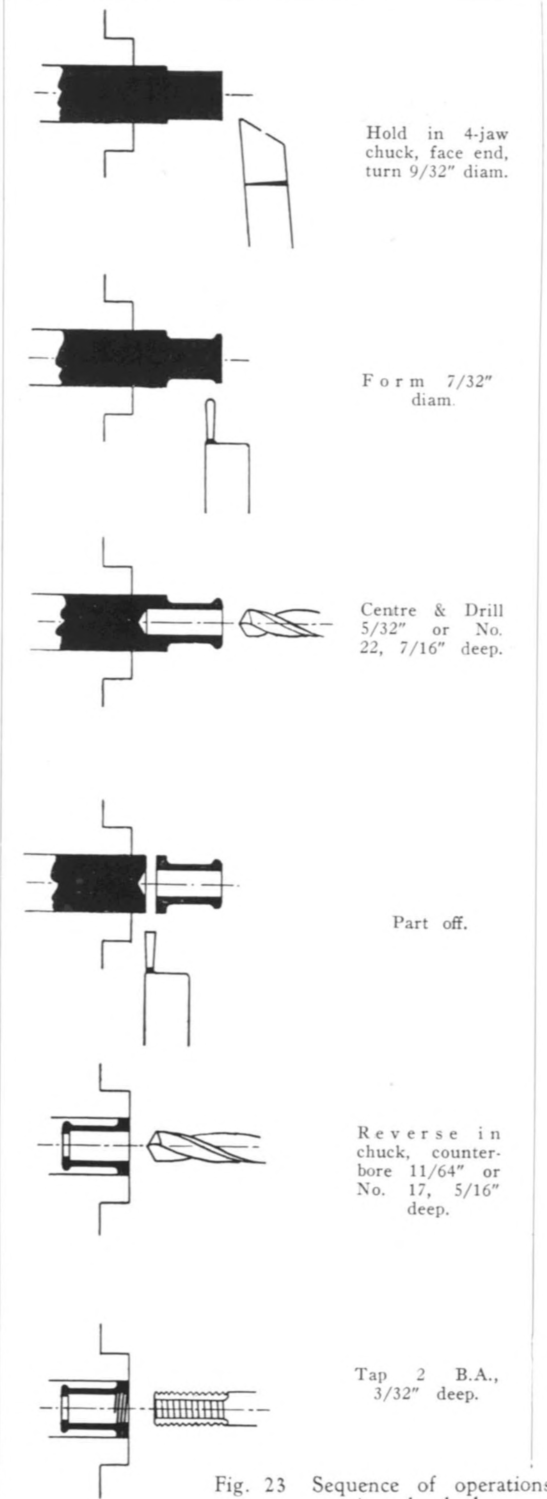
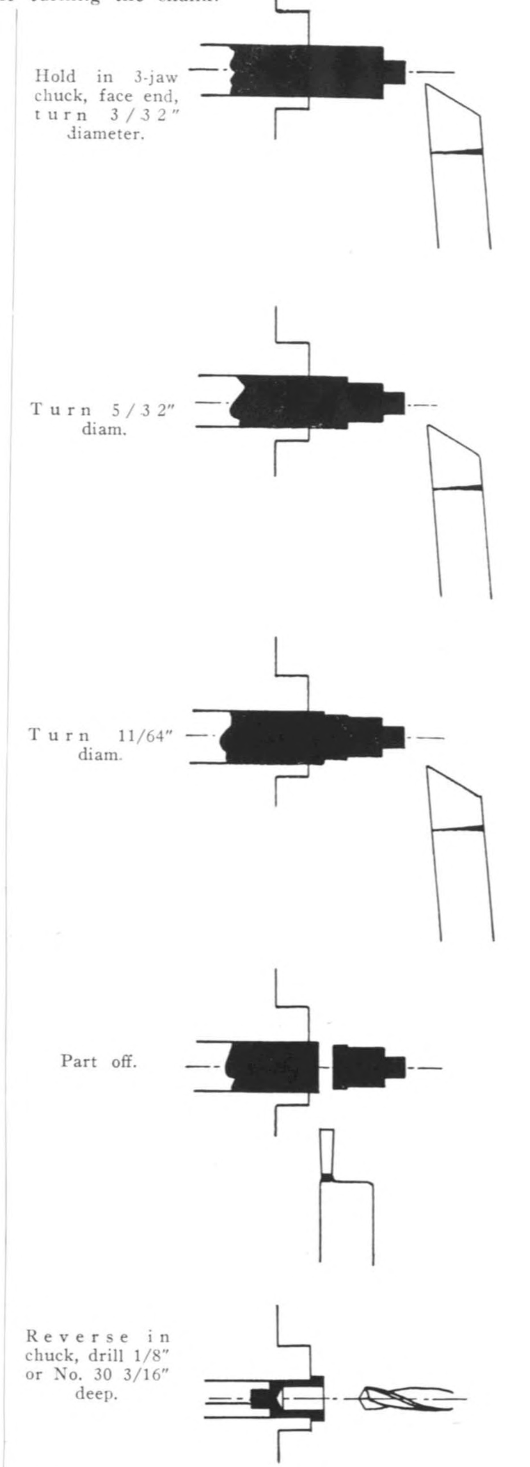


Fig. 23 Sequence of operations for turning the body.

Fig. 24. Sequence of operations for turning the shank.



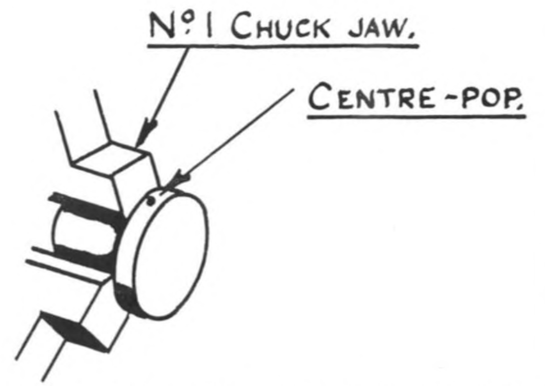


Fig. 25. Making split bush for holding the buffer shank for drilling—marking the bush before drilling to ensure subsequent correct location in chuck.

chuck jaws, and gently tighten them up. This is an easy way to re-insert a job in the chuck when there is no other means of ensuring that it is reasonably true—kindly note for the future. With the job thus held, replace the drill by a 11/64" or No. 17, and open out the hole with it to a depth of 5/16", and tap 2B.A., 3/32" deep. This will be far from a complete thread, owing to the comparatively large diameter of the hole, but its only purpose is to hold the screw which keeps in the spring while the buffer is being fitted to the beam.

Tapping in the Lathe.

This thread in the back of the buffer housing will present no difficulty whatever, for the reason given above, but as it constitutes our first bit of tapping in the lathe we will take the opportunity to deal with the subject in full now for future reference.

As the average "Aladdin" builder is not likely to possess all sorts of elaborate friction-drive tap-holders, we will describe our own method of using an ordinary tailstock drill-chuck. In the case of a big tap, you just wind it into the hole in the job and heave the lathe round by hand at the same time, occasionally reversing the process to clear the chips, but taps in the smaller sizes need handling a little more gingerly if we are to avoid an appalling rate of mortality among them. Wind the tailstock barrel out until the end of the tap is almost entering the hole. Now grab hold of the body of the tailstock chuck and give it a twist to release it from the tapered socket in the tailstock. Push the tap into the hole, and pull the lathe round. Although the stem of the chuck is now loose in the tailstock mandrel, it is still guided by it sufficiently to keep it true enough for all practical purposes, and the drill chuck is held in the hand only sufficiently tightly to make the tap cut, but not tightly enough to break it should it get stiff or encounter some obstruction, such as the bottom of a blind hole. In such an event the chuck slips round in the hand and no harm comes to the tap. As soon as this happens, pull the lathe backwards again to withdraw the tap, and have another go. Start with a taper tap and finish with a plug—you

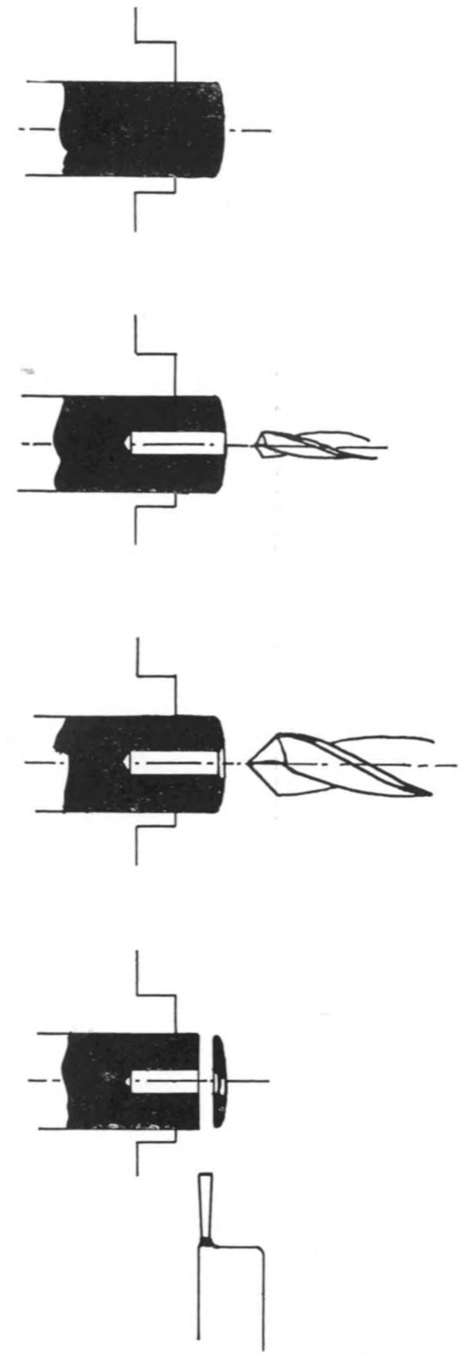


Fig. 27. Sequence of operations for turning the buffer head.
1. Hold in 3-jaw chuck, round off with file.
2. Centre & Drill 3/32" or No. 43 deep enough for 4 heads.
3. Countersink.
4. Part off to finished thickness.

should have no difficulty in brass, while in steel some species of lubricant will be found beneficial, as advised in the instructions on hand tapping.

The buffer shank is made from 3/16" diameter mild steel. Follow the series of operations shown in Fig. 24, allowing only just enough to project from the chuck to do the whole piece at one go. Saw or part off, and repeat for the other three. Now turn the pieces round, holding them on the 5/32" diameter, face the ends off to length, centre, and drill 1/8" or No. 30 3/16" deep.

Now, if your chuck jaws have seen better days, the process of holding this little piece to revolve sufficiently truly to get the hole dead in the middle may present something of a problem. There is a method, however, by which such a job can be done in *any* chuck, and as we shall certainly be bringing it into use later on to do really important jobs, we might as well get the information across here and now in case you would like to use it to make sure of this one.

Hold a piece of 5/16" diameter steel rod in the chuck, and turn it down to about 1/4" dia., for 1/4" long. Saw or part it off, and turn it round and hold it in the chuck on the diameter just turned, with the shoulder well up against the face of the chuck jaws. Make a centre-pop mark on the "head" somewhere where you can replace the thing in the chuck in exactly the same position any number of times. The usual place is just in the middle of No. 1 chuck-jaw (Fig 25). Carefully face across the head, and centre and drill the size to hold the job, in this case 5/32" or No. 22. The little bush should now be held in the vice and split for its whole length with the baby hacksaw, in a position diametrically opposite to the centre-pop mark. (This is to ensure that the split comes between two of the chuck jaws.) See Fig. 26. Remove the burr from inside the hole, along the saw-cut, with a small round file, and now you can pop it in the chuck, in the right position, and when one of your buffer-shanks, or whatever the job

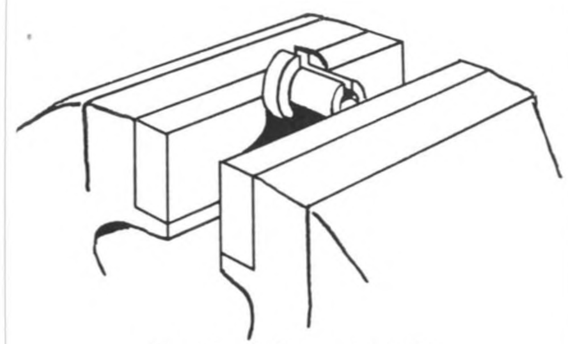


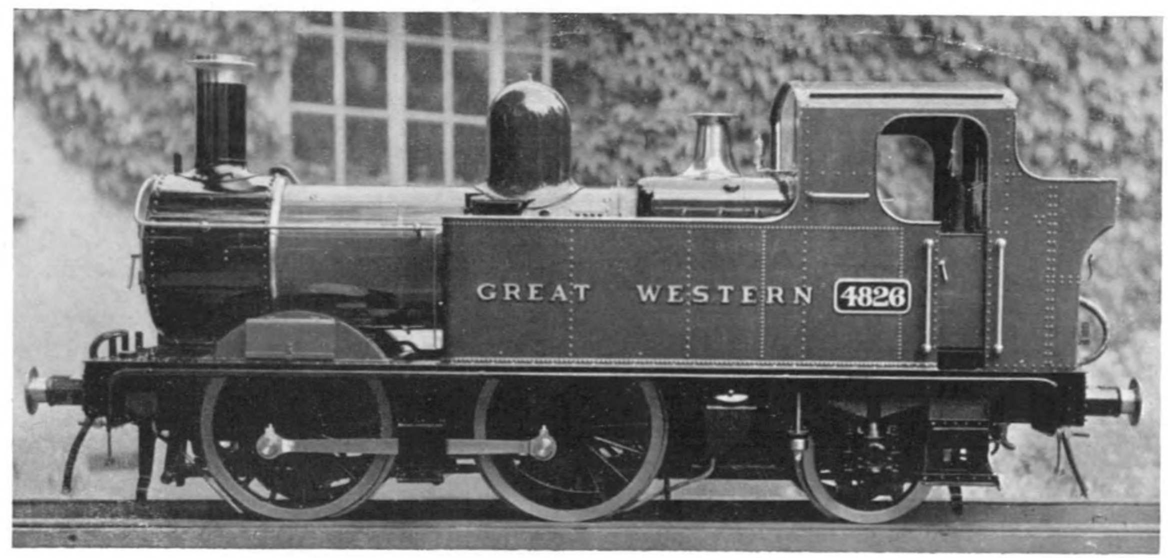
Fig. 26. Splitting the bush.

is, is put in and the whole lot tightened up together, the job should run as truly as if it were in a proper collet.

The buffer-heads are made from 3/8" round mild steel. Face the end of the bar, round off to shape with a file, centre, drill 3/32" or No. 43, and countersink slightly, and part off to finished thickness. (Fig. 27). (These *must* be *parted* off, not sawn, as you'll never be able to hold a thin disc like this to face the back.) Before parting right through to the hole, round off the back edge with the file. The initial drilling can be done deep enough for all four heads.

Silver-soldering—Lesson One.

Before assembling the parts of the buffers we must organise the little footsteps—these are tiny squares of thin sheet brass, and they will need to be silver-soldered on. If they were only soft-soldered they would fall off when soldering the buffers to the beams. They will form a useful "first lesson" in silver-soldering in preparation for more important work to come. We recommend a certain amount of silver-soldering to any modellers who go in for



A 7¼" gauge G. W. R. 0-4-2 tank built by James S. Beeson. Photo: A. S. Taylor.

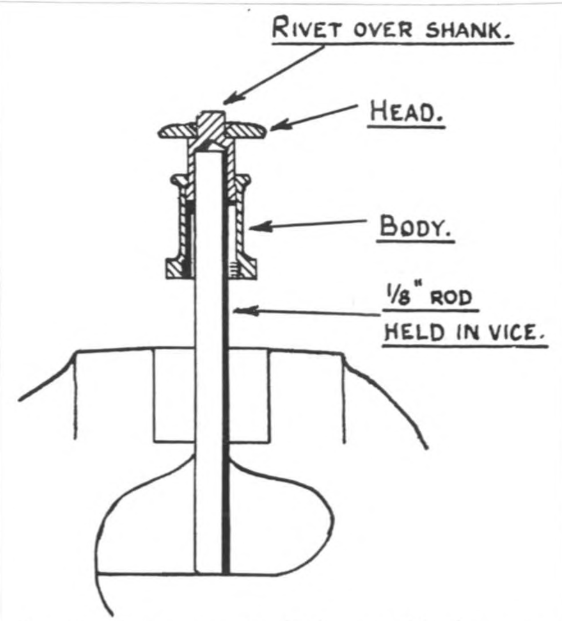


Fig. 28. Supporting the buffer assembly for riveting on the head.

fine detail. The higher melting-point enables a part to be fabricated and then fixed in position as a whole, or further added to by means of soft-solder without falling to pieces. The process itself is no more difficult, merely requiring greater heat. Arm yourself with some low melting-point silver-solder (as distinct from the very hard stuff you do come across sometimes). We always use "Easiflo," and the special flux to go with it, although ordinary borax from a chemist can be used as flux for an easy job like brass. You will also require some soft iron binding-wire, to hold the parts together. A small blowlamp, or gas blowpipe of the "self-blowing" bunsen kind will provide all the heat necessary for any silver-soldering encountered on an engine this size.

File a little flat on the buffer body, in the correct place, into which the step will fit, making sure that it will come parallel to one of the sides of the square base. Mix up a little borax to a stiff paste with water, and put a dab on this flat part. If you are able to file the flat to just such a width that the step will jam into it, it will hold itself in place, but if it is loose it will need to be secured with a bit of the iron wire twisted round the body. Now heat up the whole thing to red, the best way to hold it being to thread it over a length of stiff steel wire. Warm up the end of your strip of silver-solder, so that it doesn't chill this tiny job as soon as it touches it, but at the same time not heating it sufficiently to cause it to melt and blob all over the job before you are ready, and then carefully apply it in the joint between step and body. You will be able to find a place in the end of the flame which is just hot enough to keep the job at the right heat while you operate, without the danger of its over-heating and melting, which brass has been known to do. The silver-solder will run into the joint just like soft-solder, but the merest touch is sufficient—if you put in more than necessary it will run all over the job, waste the solder, which is expensive stuff, and all have to be laboriously cleaned off by hand afterwards.

Put the job on one side to cool, while you do the others in the same way, afterwards cleaning them all up with emery-cloth or steel wool.

Assembling the Buffers.

Put a short length of 1/8" diameter rod in the vice, standing vertically. Insert the buffer-shank into the body (from the back, of course), and then place the whole thing over the bit of rod. (Fig. 28.) Put a buffer-head over the end of the shank, and rivet the latter over carefully into the countersink. Clean up the rivetted end with file and emery, until there's nothing to show how it was done. For the sum of one penny you can procure at the local tobacconist's a long spring as used in cigarette lighters to hold the flint against the wheel. One of these, cut into 3/8" lengths with wire-cutters, will provide all four buffer-springs. They will work more freely if their ends are squared off by touching them on the grinding wheel. Pop one of your springs into the back end of the first buffer, and screw in behind it a 2B.A.screw (any old 2B.A. screw), and try the buffer for pressure. You can adjust the length of the spring by stretching it longer, or grinding it shorter. When you are satisfied, saw off the screw and trim it down with the file until it projects 1/32" from the buffer housing—just enough to form a location in the hole in the buffer beam. Repeat for the other three.

We need hardly tell you, when you come to solder the buffers into the beams, to avoid running solder all over the buffer-beams and buffers. If the iron is hot enough, *and clean enough*, it can be applied at the back of the beam only, and the heat will go through to the front.

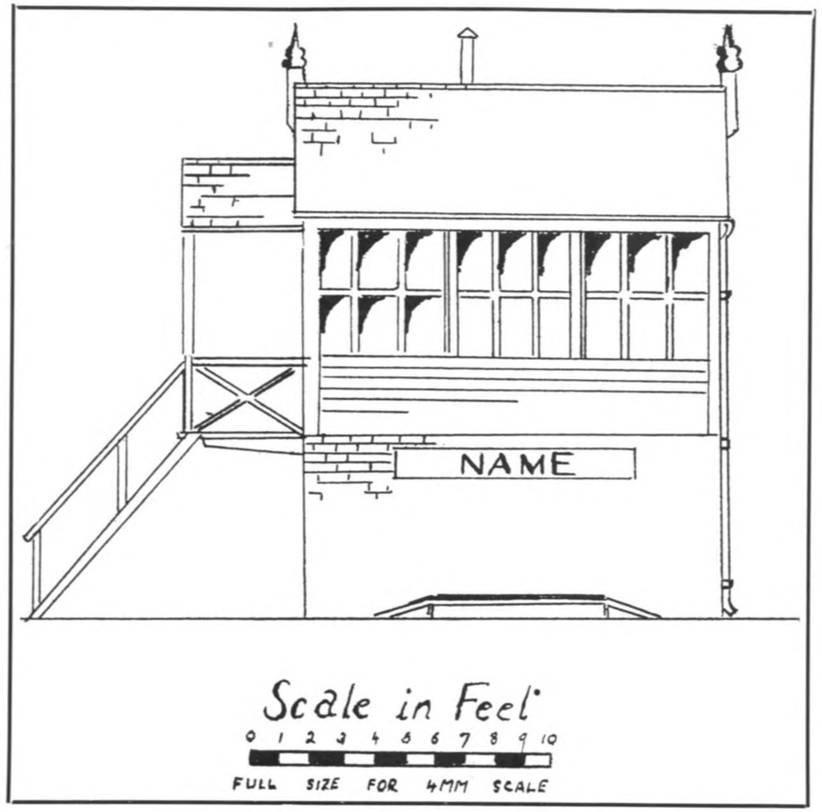
A SMALL GREAT WESTERN SIGNAL BOX

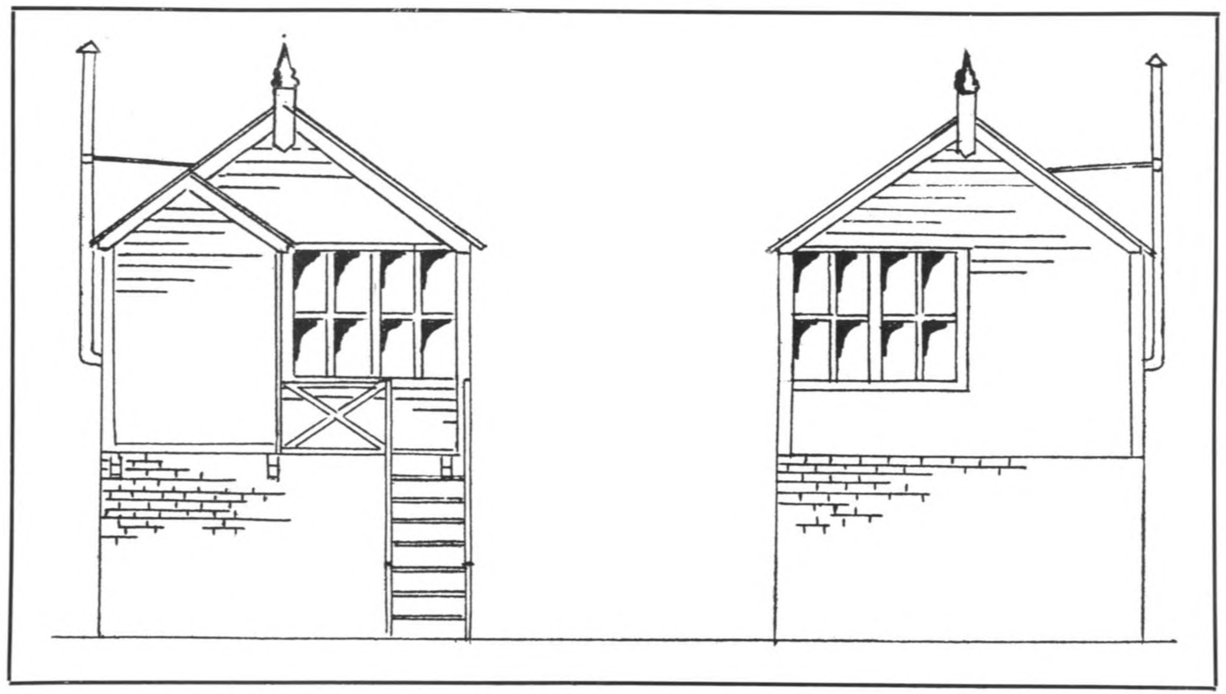
by B. H. HARPER.

Drawings actual size 4 mm. scale.

I found that there are very few signal box drawings available, so when I built "Lansdowne," a small G.W. branch terminus, I was not surprised to find that I had to design my own.

The signal box was designed to take about twelve levers, and can well be built of card. The steps and hand-rails, however, are best made of wood owing to their slender proportions. The lower portion of the signal box was finished in brick while the upper half is wood weather-board which was painted buff. The main timbers, barge boards, gutters, stove and fall pipes are painted brown. The roof is grey slate.





Part 6.

A Gauge O Steam Loco for Beginners.

By "1121."

Wheels and Axles.

To deal with wheels and axles the following additional tools and materials will be required:—

Tools. Drills Nos. 13 and 31.
Reamers. 3/16″ and 1/8″.
Dies. 2 B.A. and 8 B.A.
Taps. 6 B.A. taper and plug.

Materials. 2 driving wheels castings to machine to 1 7/16″ dia.
2 coupled wheel castings to machine to 1 7/16″ dia.
2 trailing wheel castings to machine to 1″ dia.
1/8″ dia. mild steel rod for crankpins.
3/32″ x 3/8″ mild steel strip for crank webs.

You can, of course, buy any standard finished wheels of the right diameter, although they should be iron castings, not die-cast wheels fixed with nuts, or you can get the special castings as advertised for the job. The original "Aladdins" wheels were machined from ordinary "standard" castings—the special ones had not been produced at the time. Those now being advertised by our "Official Suppliers" have been made from special patterns, with the right number of spokes and correct balance-weights and bosses.

Do each operation right through all six wheels, the first being to face the backs. Here you must do a little calculation—you can, of course, machine your wheels to any "standard" thickness you like, but if you choose the finer standard you must make sure you face the back down sufficiently to ensure that you don't get down to the spokes when facing the front of the rim to thickness later on. Nothing looks worse than the fronts of the spokes half faced away. The castings are being made plenty thick enough to allow for a wide tread if this is desired. You must measure the thickness of the spokes to see how much to take off the back to leave the right amount at the front for your own pet tread width. The dimensions involved are shown in Fig. 29.

To face the backs, hold the wheels by the tread one by one in the three-jaw chuck. You may have to use "outside" jaws if your chuck is a small one. Adjust the casting until the back runs reasonably true. Cast-iron needs a very slow turning-speed—about 60 revolutions per minute for this size of wheel would be right. Back-gear is the thing, of course, if your lathe has it. If it hasn't, get it running just as slow as you can, or it will take the edge off your tool before you start. With the lathe revolving slowly like this, it has a good bit of power, which means that a deeper cut is within its capacity than would be the case with a faster speed. A deep cut, in any case, is desirable with cast iron, especially on the surface, so that you avoid rubbing the cutting-edge of the tool across the rough outside of the casting, with all its stray sand and other impurities. Aim to remove the whole uneven surface at one fell swoop, however slowly you have to feed the tool across. Then continue with lighter cuts until you are down to your predetermined thickness, and don't forget that the centre boss comes down at the same time to the same level. Before disturbing the wheel in the chuck, carefully centre with the slocomb and drill through with a small drill, opening out afterwards with No. 13. Finish the hole with a 3/16″ reamer, but *don't put it right through*, or the wheel will be loose on the axle. The end of a reamer has a slight "lead" or taper, and we shall use this to produce a slightly tapered hole into which to press the axle. Use a bit of your axle-steel as a gauge, making sure it has no burr on the end, trying it in the hole until you can push it about two-thirds of the way through the wheel with your fingers. Remove the wheel from the chuck, and do the same with the others, including the two trailing wheels.

For the next operation a simple jig is required, consisting of a short length of 1½″ round bar, or a 1½″ blank, ¼″ or so thick, and it can be of steel, brass, aluminium, or anything else you can dig up. Even an old wheel casting will do, if it has no hole through the middle.

First screw the end of a bit of 3/16″ rod, in the lathe, with the die held in the tailstock die-holder. The thread can be 2 B.A. or 3/16″ Whitworth, for a length of about ½″. Hold the blank, or whatever you are using for the jig, in the three-jaw chuck, and face it off flat. This will automatically show you where the centre is. Take it out of the lathe, and lay one of your partly-machined *trailing* wheels on its faced surface, so that the faced surface of the jig and the faced back of the wheel are in contact, and get the wheel as nearly central as you

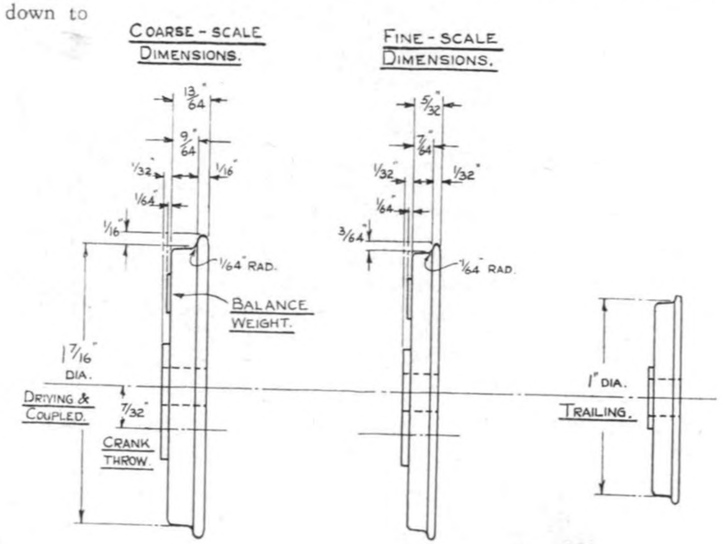


Fig. 29.

Wheel dimensions—fine and coarse standards. Certain slight liberties have been taken with the B.R.M. S.B. figures in converting them all to the nearest fractional equivalents. This has been done to keep the dimensioning in line with the accepted steam practice, the standard sizes of materials used in such work always being measured in fractions of inches. We have known people put off from starting model work by the mixtures of decimal, metric and other systems to be found on certain drawings.

Note: Drawing actual size.

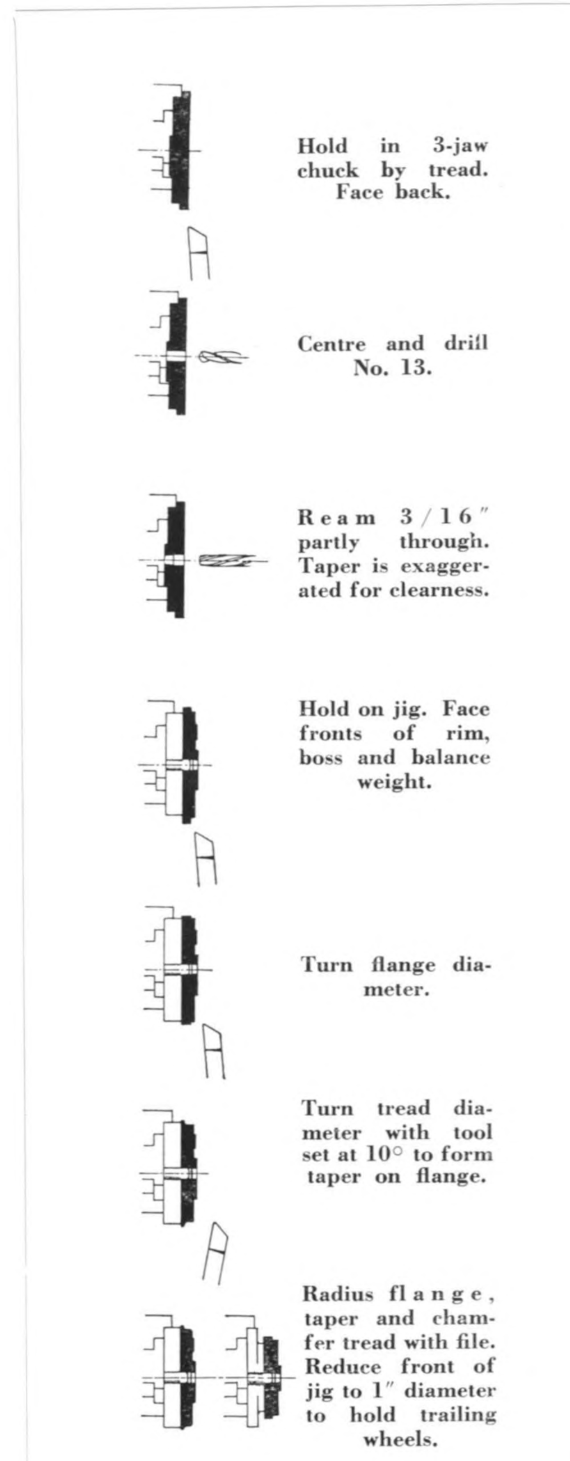


Fig. 30. Sequence of operations for turning wheel castings.

Cab fittings of the 7¼″ Gauge G.W.R. 0-4-2 Tank built by James S. Beeson. Photo: A. S. Taylor.

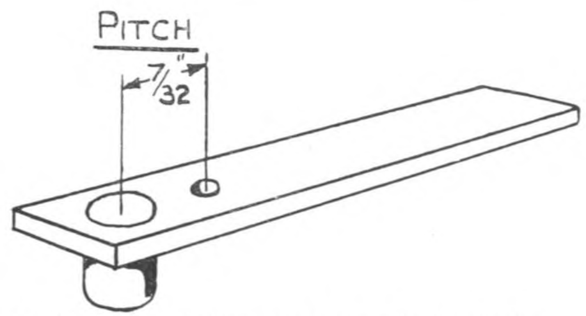


Fig. 31. Jig for drilling crankpin holes in wheels.

can judge. Make a little mark with the scriber on the jig, in between two spokes of the wheel, out fairly close to the rim. Do the same over the opposite side of the wheel, so that you have two marks roughly diametrically opposite, and approximately the same distance from the centre. In these positions will go a couple of screws to hold the wheel on to the jig.

Now put one of your driving (or coupled) wheels on, and make sure that the two marks are again visible between spokes. If they aren't make two more somewhere else to be used for the larger wheels. Centre-pop on the two (or four) marks, and drill and tap 6 B.A. holes. Put the jig back in the chuck, running as true as you can judge, and then face over it again to make sure it is absolutely true. *It must not be moved again until all your wheels are finished.* Centre with the Slocomb, from the tailstock chuck, and drill and tap to suit the screwed rod. Screw this tightly into the hole, and saw it off, leaving about 1/8" projecting from the jig. Remove burrs from the end. Now you have a true running jig and spigot, the latter locating in the hole in the wheel, ensuring that its outside diameter will be truly concentric with the axle, and the faced surface of the jig ensures that the wheel will run " flat," without side-wobble.

Fix a wheel to the jig with a couple of 6 B.A. countersunk screws, the heads of which will come down below the machined surfaces, so that they won't get in the way of the tool.

You can now finish each wheel right off in turn (Large wheels first)—we suggest first facing the rim to your selected thickness, remembering previous instructions for machining cast-iron. Stop as soon as you reach the diameter where the rim joins the spokes—don't face across the balance-weight at this stage. Now face the centre boss and the balance-weight together, to be 1/32" thicker than the rim. (You can check this by measuring with a rule from the faced rim to the point of the tool as you wind the tool back towards you). Now face the surface of the balance-weight down to project 1/64" only from the rim.

Next turn the edge of the flange to the correct diameter to give you your pet flange depth, checking it with calipers set, of course, to tread diameter plus twice flange depth. Finally turn the tread. This should be checked carefully, preferably with another pair of calipers which you can leave set. The precise diameter of the wheels is not vital, but whatever it is they *must* all be the same—wheels of all different sizes cause slipping of the engine. If you have only one pair of calipers, we suggest leaving them set for the flange diameter, and finishing each wheel only this far, replacing them on the jig again for the final operation, with the calipers re-set for the tread diameter.

If you set the tool round at angle of about ten degrees when doing the treads, it will produce the proper tapered shape to the flange, as shown in the "sequence of operations" diagrams Fig. 30. The tool is shown at the right angle, so the drawing can be used for comparison if you have no other means of setting the tool. The edges of the flange can finally be rounded off with a file, and a slight chamfer put on the front edge of the tread in the same way. If you want to be very correct, file the tread to a very slight taper, but do it carefully so as not to take too much off the diameter.

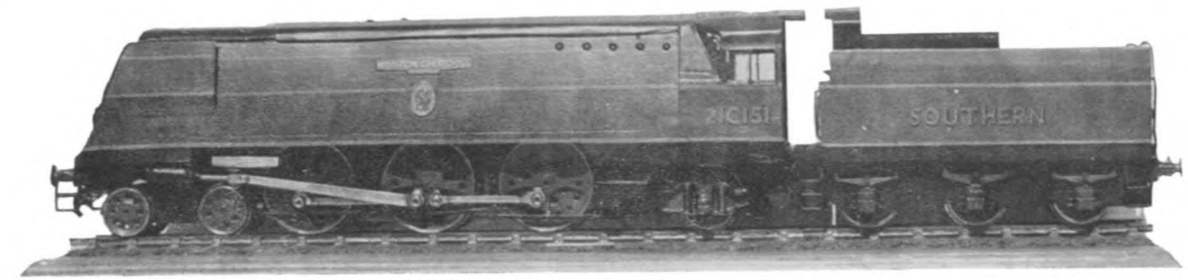
Aim to get a decent machine-finish on the treads and flanges, but don't do any fancy polishing—real wheels aren't polished, and ours will grip the rails much better for a bit of roughness. The models with a "chromium-plated" finish never pull so well!

Finally turn the outside diameter of the jig down to about 1", for a short distance, to leave room for manoeuvring the file when finishing off the flanges of the trailing wheels.

To drill the crankpin holes another simple jig is required, to ensure that all four wheels are made with the crankpin exactly the same distance out from the centre. What that distance actually is is not vital, but it is vital that they all the same, otherwise the coupling-rods will not run freely, or may jam up altogether. The jig is merely a bit of steel strip or plate, say not less than 1/16" thick, with a couple of holes in it, 7/32" apart. Drill them both some small size—your No. 43 would do. Open out one hole with your No. 13 drill.

Put a piece of 3/16" axle-steel in your lathe chuck, and gently file it, while revolving, to a very slight taper, with a smooth flat file, until your bit of plate will push on to the end. Force the plate right on by screwing the tailstock barrel out against it, until the tapered end of the rod is sticking out 1/8" or so. Saw off the rod flush with the other side of the plate. You will now have a plate with a projecting peg, the diameter of which is reduced so that it will enter the hole in the front side of the wheel, which, you will remember, is smaller than 3/16", as the reamer was not put right through.

Scibe a line down the centre of the crankpin boss of each wheel, push the peg of the jig into the front side of the first one, and put the toolmaker's clamp right over wheel and jig, so that it clamps the jig squarely to the boss. Before finally tightening it up, get the scribed line on the boss of the wheel showing central across the other hole in the jig. Now drill into this hole with the same small drill, and right through the wheel, making sure that the wheel is held down flat so that the drill goes through squarely. Remove the jig, open out the hole in the wheel No. 31, and finally ream 1/8" partly through, just as was done for the axle holes, only from the front this time, so that the crankpins can be pressed in tightly. The jig is shown in Fig. 31.



A 7 MM. SCALE "BATTLE OF BRITAIN" LOCO.

By R. W. INKSTER *(Manchester M.R.S.)*

This machine is the first O Gauge locomotive I have made with any pretensions to accuracy to the modern formula. The Bulleid Pacifics are, I think, somewhat harder to model than the more conventional types, and this one has given me some valuable experience in many forms of metal-working to fairly fine limits.

The main frames and cross members are brass, and the "can" (Spam?) is made from brass, copper, nickel silver, phosphor bronze and monel metal, each metal being used where its own particular properties would prove useful.

The driving wheels are mild steel, the tyre and back of each wheel being one piece, and the part with the clover-leaf holes and boss being another. The back part is bored out to receive the front part, with about .005" interference. The pairs were pressed together in the vise, with a bit of pipe on the vise-handle. Bogie, pony truck and tender wheels are straight turnings, with lots of drill holes of various sizes.

All wheels excepting the geared drivers are sprung. On the unsprung pair the axleboxes are "dovetailed" into the horns and locked in place by the keep plates. This somewhat complicated arrangement is to enable the wheels to be dropped out for cleaning and maintenance. All wheels and gears are force-fitted on their axles and spindles. The coupled wheels run in sprung cannon boxes, which also act as valuable oil reservoirs. The carrying wheels also run in rather simpler cannon boxes, soldered to flat leaf springs.

Several years ago the M.M.R.S. acquired some tiny motor-generators, ex-U.S.A.F. These are beautifully-made and came in blocks of six, all geared together—something to do with constant voltage for electronic work, I believe. Anyone requiring one just sawed one off the block! Amongst other unusual features, they had solid silver commutator bars. One of these, somewhat rebuilt, and with its seven-pole armature rewound by my friend George Leech, forms the smooth, quiet, but very powerful motor for this model, which it drives by a polished steel worm, P/B worm wheel and two spur gears (out of Mk.

in the form of split potential and stud contact have also been well featured.

No review of the year, however brief, would be complete without a reference to the attractive cartoons which have graced our pages each month—indeed we know many households where the lady makes a priority claim on the Magazine to see the latest problem of our typical railway wife.

To our contributors whose efforts have done so much to maintain the variety and interest in our pages we would express our sincere thanks and shall look forward to receiving further material from them.

Binding Volume 19.

Sets of parts for binding may now be sent to 104a, West Street, Farnham, Surrey. We should like to receive these not later than 31st January, 1953 as odd sets received after that date are subject to delay in that we have to assemble a minimum quantity for binding in order to keep prices as low as possible. The arrival of large numbers of binding orders places a heavy seasonal burden on our limited staff and readers will help us considerably if they will note the following:—

"What a husband—the only curves that interest you are those with a six-foot radius."

1. The price is 10/6 per volume post free and this remittance should be included with the order.

2. If acknowledgement of receipt is required, include a stamped addressed postcard.

3. Remember to include with your parts the 1952 index which is supplied with this issue.

4. If you wish to retain the cover pictures detach these before sending your parts.

5. The January and February, 1952 issues each contain a single extra page not printed on art paper. Remember to include these. The remaining ten issues each contain an extra four pages in addition to the art section. Generally it is preferable for us to have the complete magazines to avoid risk of error, but the removal of the outside orange cover if desired will not cause any complications.

6. We have only one standard of binding i.e. the 242 numbered pages which comprise the volume. We regret that we are unable to include advertising pages, covers or any other extraneous matter.

7. Volumes previous to Volume 19 can be bound at the same price. The appropriate index should be included in all cases.

8. Before requesting us to supply missing issues to complete any volumes sent for binding, please check the list of back numbers to make sure that these issues are available. We have only those numbers in stock which we detail in the advertisement.

2 Rails and 3 Wires.

By R. W. GRIFFIN.

Mr. Sumner's article in the November issue is most clear and convincing, and I for one, am almost convinced that he is right. I say "almost" because there remains only a small difficulty, which, however can be overcome.

He refers to my previous small contribution, stating that he had progressed beyond my " simple scheme," but in self defence I must state that I long ago adopted the wiring system he illustrates in his Fig. 3. John Ahern describes the general principles very clearly in his little " Handbook on Two Rail:" the main thing to remember is that any layout can be broken up into a number of groups of diverging lines, each fanning out from an initial turnout, on the facing side of which the current is fed in.

The disadvantage alluded to above is that each controller must consist of a rheostat and a D.P.D.T. switch, requiring two operations instead of one for reversing. By the use of two separate and equal sections of resistance and a reversing switch incorporated into the operating knob and spindle, as with the Hornby-Dublo controller, the whole thing closely resembles the split potential system in operation. The great advantage in this arrangement is that the knob is always turned in the direction in which the loco is required to move and the further one turns it the faster the loco travels.

Some of the difficulties referred to in my previous contribution are entirely overcome by using a change-over switch, but there is still the problem of synchronising controller settings in a large layout to be solved.

Part 7.

A Gauge 0 Steam Loco for Beginners.

Crankpins and Axles.

By " 1121."

Crankpins.

These, as shown in Figs. 32 and 33, are a straightforward turning and screwing job, from ⅛" diameter mild steel, or if you have it use silver-steel, which will be better for wearing. Saw or part the crankpins off to length, clean up the back ends, making sure there are no burrs left, and press them into the wheels in the vice, making sure they go in squarely. A nut temporarily screwed on to the end is a fitter's dodge to protect the threads from damage during such operations as this. (Fig. 34.)

We should give a warning that little wheel castings will not stand unlimited abuse in the matter of pressing axles and crankpins into them, without splitting. The pressing-in should be only tight enough to ensure that the axle or crankpin is firmly held. If it seems to be taking a lot of pressure to get it in it is safest to tap it out again from the other side, with a punch or bit of rod, with the boss of the wheel supported squarely on the end of a piece of tube, with the axle or crankpin hanging down inside it. On no account try to drive it out with the wheel supported only by the rim, or you will snap off the spokes. It is extremely difficult to state in words just *how* tight such fits should be—the exact knowledge can only come with experience, but it is a fairly safe guide to say that if it is *just* possible to move the wheels round by gripping one at either end of an axle with the hands and

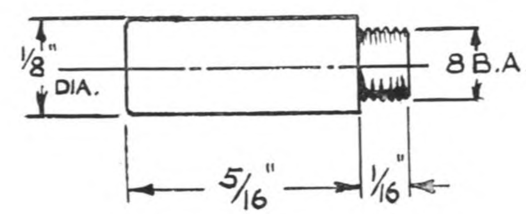


Fig. 32. Wheel crankpins.

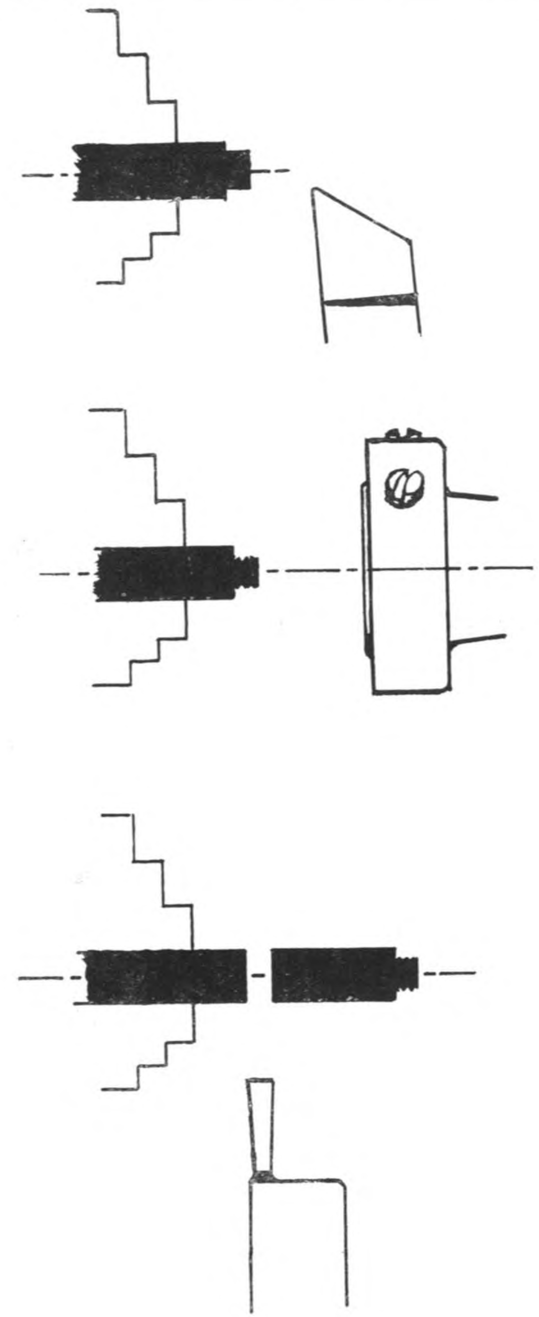


Fig 33. Sequence of operations for turning crankpins.

Top: Hold in 3-jaw chuck, turn .087" dia. (Can be checked with calipers from No. 43 drill).

Centre: Thread 8B.A. (The side of a die with the markings on it has a "lead" or taper for starting the thread, the other side finishing square. The die can thus be reversed for a second cut to continue the thread right up to a shoulder.)

Bottom: Part off.

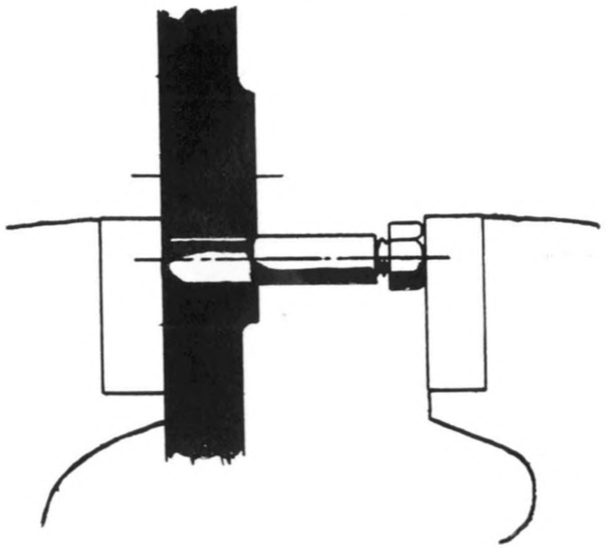


Fig. 34. Pressing crankpin into wheel.

screwing really hard, they will do, but would be better a teeny bit tighter (in this size, at any rate.) That may not be much help, but it's the best we can think of, and should give you *some* idea.

Axles.

These are shown in Fig. 35, and it will be seen that the coupled (front) axle is a plain piece of $\frac{3}{16}$" diameter mild steel rod, $1\frac{1}{2}$" long for fine-scale or 1-9/16" for coarse. The driving axle, however, is a very different kettle of fish, as we shall now expound.

To make it, start off with a plain axle, exactly identical with the front one. For the crank webs, mark the end of a bit of mild steel strip 3/32" by $\frac{3}{8}$" (cut from 3/32" plate if you have no strip) as shown in the "sequence of operations" diagrams Fig. 36. Centre-pop the hole centres, and from each mark, with the dividers, scribe the arc of the *other* end of the web. The $\frac{1}{4}$" centres of these holes *must* be accurate. Pilot-drill the two holes first, and then open out No. 13. Cut the piece off roughly to length, and clamp it to the end of the strip. Transfer one hole through with the No. 13 drill, and then ream the two together right through $\frac{3}{16}$", without removing the clamp. Cut a little bit of the $\frac{3}{16}$" axle-steel, slightly under $\frac{3}{16}$" long, and pop it into the hole in the two pieces, as a "dowel" to hold them together. You can now remove the clamp, and shift it to a new position covering this hole,

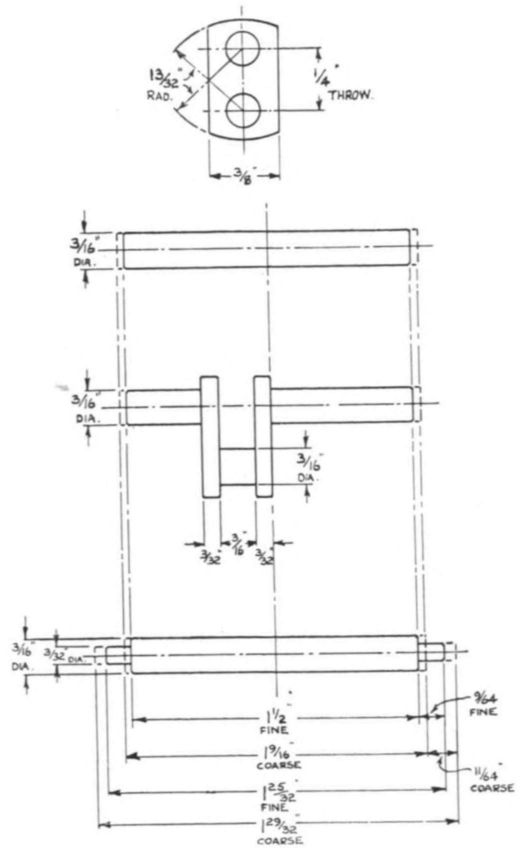


Fig. 35. The axles. Fine scale shown full, coarse scale shown dotted. (Actual size.)

which will leave the other hole exposed for drilling through and reaming exactly the same.

Saw off again, and hold the two pieces, still dowelled together, in the vice (copper clams, please), and file the ends to shape, and clean up generally. Slightly counter-sink both sides of the holes.

Slip the two webs over the axle, annointing with borax-paste as you do so, and cut another bit of the axle-steel $\frac{3}{8}$" long, for the crankpin. Slip this into position, again making sure the borax gets right through the joints—where the borax goes, the silver-solder will follow.

Like this. **Not like this!**

Fig. 37. How the crank axle should look when assembled.

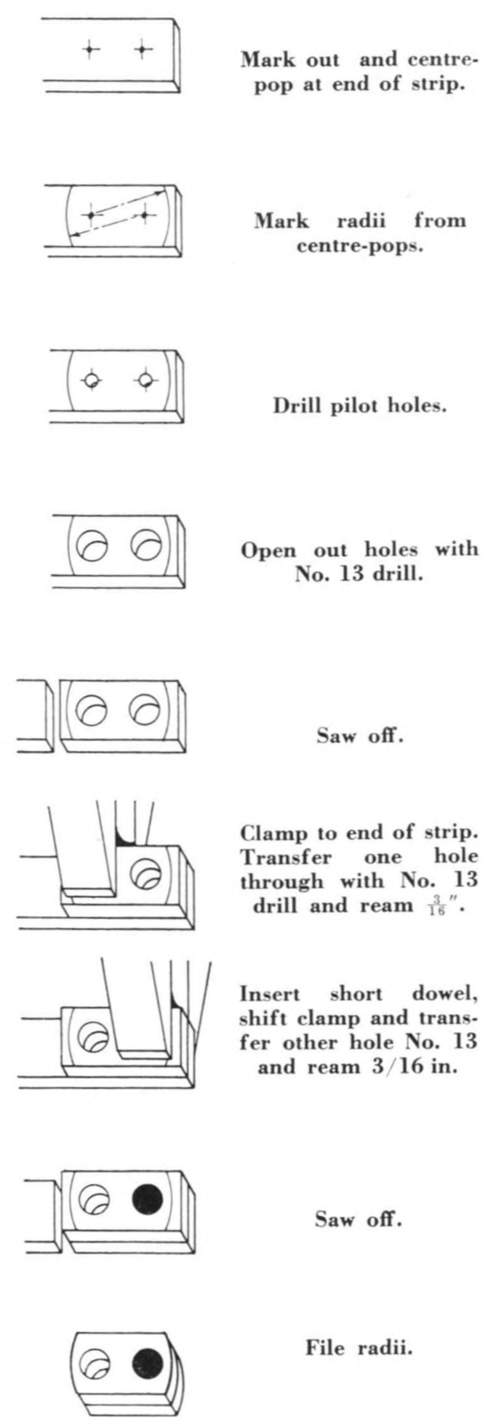


Fig. 36. Sequence of operations for making crank webs.

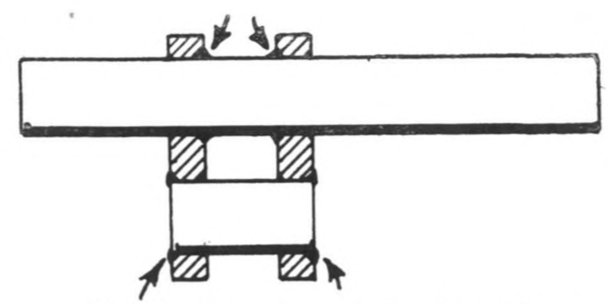


Fig. 38. Where to apply the silver solder.

Lay the whole thing on an asbestos mat, and have a good look to make sure the crankpin is laying truly parallel with the axle (Fig. 37), and check up that the webs are in the right position along the axle. (This is with the outside of one web coinciding with the centre-point of the axle—measure the centre and make a mark with the corner of a file here before you start.)

Now get busy with the heat, and get the whole thing to a nice bright red, before applying the silver-solder. When you apply it, do this in the places shown in Fig 38, which will prevent getting loads of silver-solder all over the crankpin and the ends of the axle. The counter-sinks in the webs will help to start the silver-solder flowing, but have a bit of bike-spoke or similar thin stiff steel wire handy, sharpened to a point, and stick it in the borax and scratch around the joint if the silver-solder is at all obstinate. The secret with steel is to get the job hot as quickly as you can, so that you can get the silver-solder running into the joint before the job has time to get dirty. Keep cooking the job after you have applied the silver-solder, to give it a chance to get right through the joints.

Last operation—saw out the unwanted bit of axle, and clean up with files and emery-cloth.

The trailing axle is cut to the overall length, and then turned at each end, in a split bush if your chuck is not true, as described in the article on buffers. Always put these away in a little box as you make them, and you will thus gradually build up a stock which will, in time cover any job for which their use is desirable. They will not last for ever, however. For one thing, as your chuck wears more they will no longer compensate for its inaccuracy, and will need to be replaced.

Do *not* press any wheels on to axles yet.

L.N.W.R. DRAWINGS.

We have had requests for details of issues remaining in print which contain L.N.W.R. drawings and would mention that the following are still available at 1/2 each post free.

June 1947. 50 ft. Luggage Van.
Sept., 1949. "Experiment" 4-6-0 Loco. (Part 1.)
Oct., 1949. "Experiment" Loco. (Part 2.)
May, 1950. L.N.W.R. Loco Shed.
Feb., 1951. L.N.W.R. Signal Box.
June, 1951. 19 in. Goods Loco.

Our Cover Picture.

Shows a view on the outdoor Gauge 1 layout operated by Mr. E. C. Griffith of Farnham.

Part 8.

A Gauge O Steam Loco for Beginners.

The Eccentric and Stop Collar.

By "1121."

We are now beginning to get some idea of the reactions of readers to "Aladdin" and the articles dealing with the engine. It is possible to say now that she is proving extremely popular, and a large number of engines are being built. One criticism which has reached us from certain quarters is that the articles are progressing too slowly for some people, who have the necessary knowledge and experience to get moving on the engine without the help of all sorts of incidental instructions about sharpening drills and things like that. One gentleman even went so far as to say that if a man didn't know how to sharpen a drill he had no right to be building an engine at all! We feel that there should be an answer to this somewhere, and we think it must be that if a man *can* sharpen a drill, then *he* has no right to be building "Aladdin!" We are tickled to death at the idea that some of the "experts" want to build our little engine, but we beg to remind them that she is first and foremost a simple little job for *beginners*, as has been made quite clear right from the start. She is, in fact, intended largely as a convenient means to put over just the very information to which the more experienced people are objecting. This means that in the earlier stages of the series progress is necessarily rather slow, but as this elementary information is got through things will automatically speed up as the work can be described without frequent diversions.

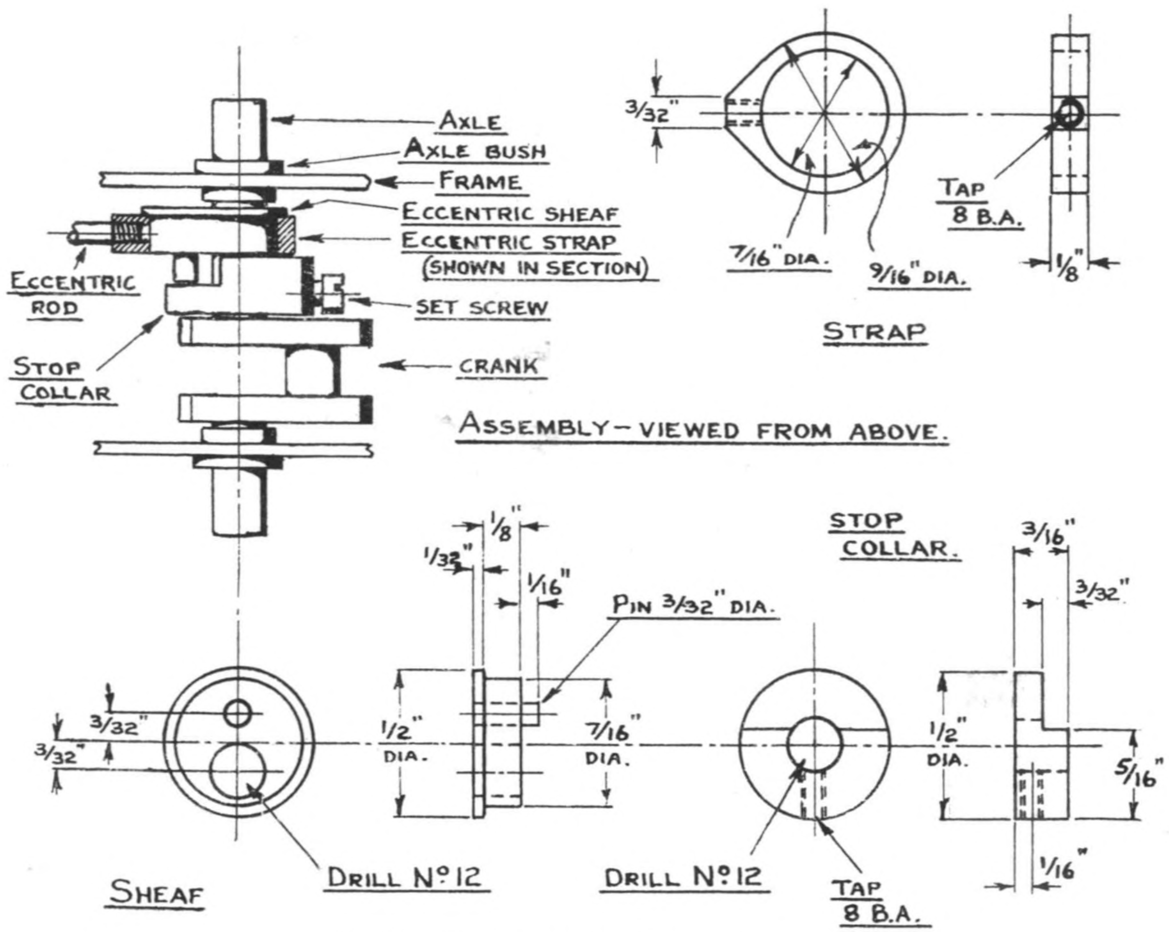


Fig. 39. The valve gear and its components.

Fig. 40. How a big drill "snatches" in brass and how this can be avoided by grinding off the cutting "rake."

To sum up, we beg more experienced readers to remember that they, at one time, were beginners, and were glad of opportunities to learn, and unless we receive instructions to the contrary from the Editorial Powers that Be, we refuse to be rushed, believing that it is better to provide beginners with a sound foundation of knowledge as to *why* we are instructing them to do this, that and the other, rather than merely telling them to "follow the instructions," without giving them a clue as to the technical why's and wherefore's.

Eccentric and Stop Collar.

The valve gear assembled on the axle, and its separate components, are shown in Fig. 39. Make the "strap" first—it is easier to turn the sheaf to fit it rather than trying to bore out the strap to fit the sheaf, and they *must* be a good running fit, as slackness here will communicate itself to the valve.

Cut a piece of ⅛ in. phosphor bronze or hard brass plate about ⅝ in. square. Hold this in the 4-jaw chuck and get it set with the surface running as true as you can (without side-wobble) and the centre of the square running reasonably in the middle. Centre with the slocomb from the tail-stock and start drilling successively larger holes up to the nearest you have under 7/16 in. Now, a drill ground in the ordinary way is liable to "snatch" in brass, which doesn't matter a lot in small sizes, but a big drill suddenly screwing itself into a comparatively small thin bit of brass is likely to carve things up a bit. For this reason it is advisable to remove the "rake" from the cutting lips, and the collection of little sketches (Fig 40), show this, and how it is done. A lathe tool similarly, cuts hard brass better if it has a flat top with no rake, and there is no difference between a lathe tool and the edge of a drill, except that one is cutting vertically and the other horizontally.

Finish the hole with a 7/16 in. reamer if you have one, reaming out from a 27/64 in. drilled hole. If you haven't, finish the hole with your boring tool, checking the diameter with inside calipers set to the rule. Remove

Fig. 41. Sequence of operations for making eccentric strap. Drawn full size. From top to bottom :
- **(a) Hold in four-jaw chuck, drill and ream 7/16 in.**
- **(b) File off three corners.**
- **(c) Flatten corner, drill and tap.**

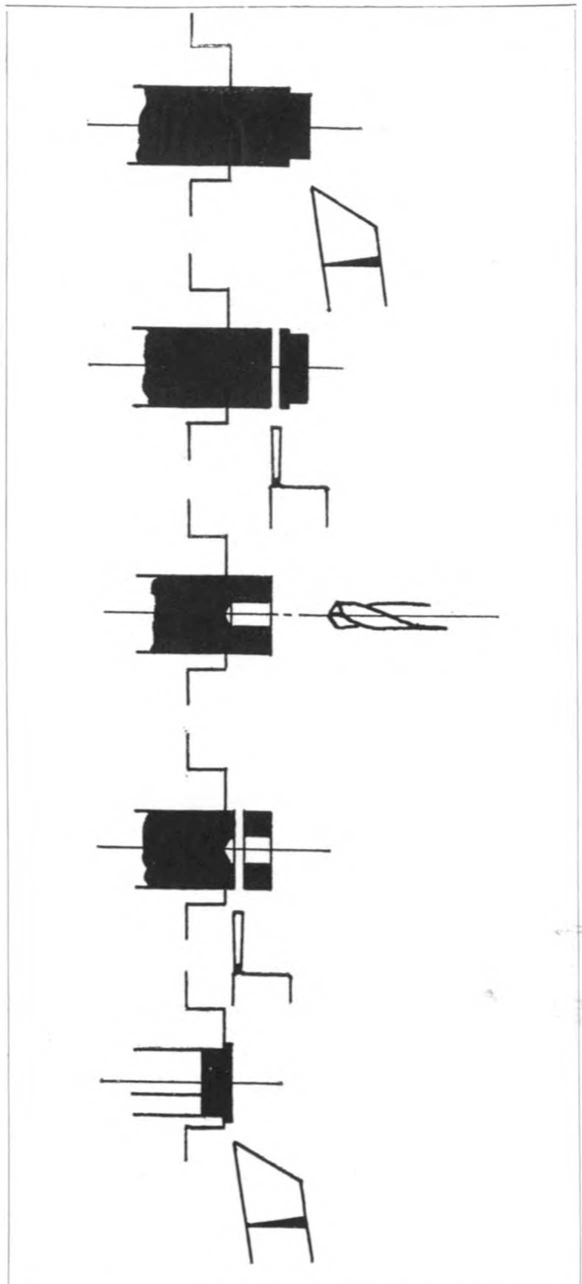


Fig. 42. Sequence of operations for turning eccentric sheaf and stop collar. From top to bottom :
(a) Face end, turn 7/16 in. diam.
(b) Part off sheaf.
(c) Centre drill No. 12.
(d) Part off collar.
(e) Hold sheaf on 7/16 in. diam. face back.

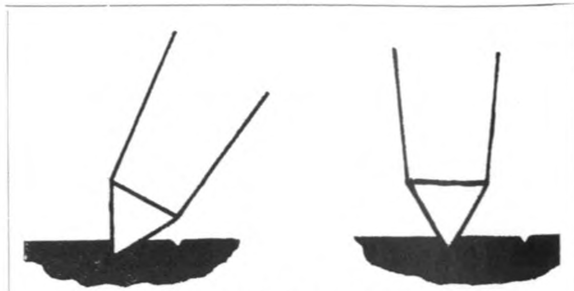


Fig. 43. How to shift a centre-pop mark.

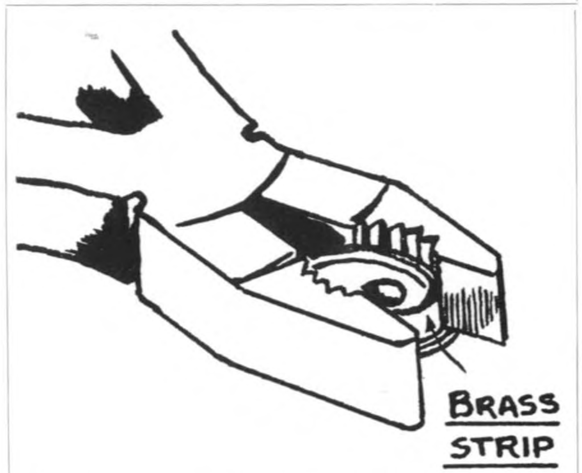


Fig. 44. Holding the eccentric sheaf for drilling.

from the chuck, saw off *three* of the corners, and file to shape. (See "sequence of operations," Fig. 41.) File off the remaining corner just enough to centre-pop, drill No. 51 and tap 8 BA. for the eccentric-rod to be screwed in later. Remove all burrs and clean up generally.

The eccentric sheaf, and the stop collar which drives it, are turned at the same time from ½ in. dia. mild steel bar. Chuck a short length, face the end, and turn the 7/16 in. dia. until it will just slip into your eccentric-strap without shake. Get a good finish on this diameter to avoid the surface causing excessive wear in the strap. Part off the sheaf, and face the end of the bar again, and centre and drill No. 12 about ¼ in. deep, and part off the collar. (Fig. 42.) Hold the eccentric sheaf in the 3-jaw chuck again, the other way round, with the flange pressed up against the fronts of the jaws. Don't hold it too tightly, or you will make marks on the turned diameter. Face across the back of the sheaf, taking light cuts so as not to hook it out of the chuck. Do the same with the collar, re-inserting it in the chuck by the dodge of threading it over the No. 12 drill, as described in the article on making buffers.

The travel of our valve is to be 3/16 in, which means that the throw of the eccentric must be 3/32 in., and this must be pretty accurate if the valve is to do its job properly. The facing-marks on the smaller side of the sheaf will show you the true centre of the 7/16 in. diameter, and the position of the axle-hole must be carefully marked off from this side. A light centre-pop in the middle will help in measuring off the other centre, which is then also centre-popped. Have a good look to make sure that the centre mark is really in the middle, and that the axle-centre really is 3/32 in. from it. If you find you are slightly out, a centre-pop mark can be shifted by attacking it carefully with the punch leant over at an angle, the corrected position then being established by a blow with the punch held vertically. (Fig. 43.)

Put a small pilot-hole through, making sure the part is held truly flat under the drill. You will not be able to open out the axle-hole with the sheaf held down with the fingers, and we suggest holding it tightly in a pair of pliers, with a little strip of soft brass, copper or aluminium to protect the job. If it went round on the drill while being gripped in the pliers, it would get horribly chewed up, but will come to no harm with the soft metal there. Open out to No. 13, and ream 3/16 in. (Fig. 44.)

The only other job on the eccentric sheaf is to put in the pin by which it is driven by the stop-collar. The position of this is shown in the drawing, and although it might appear at first sight that this is not very important, in actual fact it is, as if it is placed on a larger radius out from the centre of the axle its angular amount of rotation from one side to the other of the stop-collar during reversing of the engine will be affected. The pin is merely a bit of 3/32 in. mild steel or silver-steel rod, pressed in to a No. 43 hole.

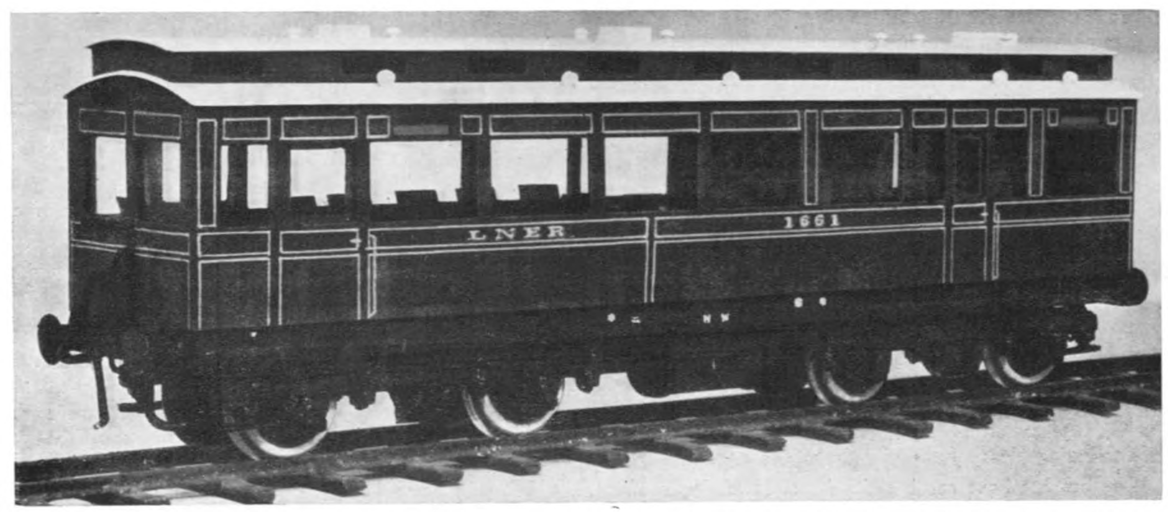
The stop-collar has a step filed across it as shown. The position of this step relative to the centre of the axle is also important. To finish the collar, drill the thick side No. 51 and tap 8 BA., and fit a little set-screw to secure it to the axle.

Second Thoughts.

We wish to refer back to a couple of points concerning parts of "Aladdin."

The first of these concerns the axle bushes, described in the October, 1952 issue, in which a rather extraordinary mistake occurred in the drawing. Fig. 19, gave the thickness of the head as 3/32 in., and the length of the ¼ in. diameter which presses into the frames as 3/64 in. These dimensions should, in fact be reversed, the length of the bush under the head being 3/32 in., and the thickness of the head 3/64 in. We are very sorry about this, and just cannot imagine how the mistake got through our checking system, as the *drawing* was incorrect; it wasn't just a mistake in dimensioning. Luckily, the effects of the error are not very serious—anybody who has made the bushes only need press them out of the frames, hold then gently on the ¼ in. diameter in the 3-jaw chuck, with the underside of the head pressed squarely against the fronts of the jaws, and carefully face the head down to the right thickness. The fact that this will leave the total length of the bushes less than was intended does not matter a lot—the main thing is that the dimension over the bushes and frames should be reduced to clear the back-to-back distance between the wheels. Apologies, once more, and we will try not to do it again!

The other point we would like to mention is that we gave no figure for the amount the crankpins should project from the wheels, in the last (Jan., 1953) article. frames, hold the gently on the ¼ in. diameter in the from the face of the boss. The coupling rods being 3/32 in. thick at the ends, this gives 1/32 in. clearance when the nuts are screwed on tightly. These nuts can be standard 8 B.A. hexagons, or, to look better, the special ones which will be described later on when we are ready to fit the rods for keeps.



A gauge OO model of the original N.E.R. Chief Mechanical Engineers vehicle which came out in the 70's and is still used on the L.N.E.R. at York for various purposes. The model is depicted in its present style and finish which has not altered much from the original, the major addition being the letter "L" in front of the N.E.R. The crest of the N.E.R. was carried until the 30's. The model was built to special order by Messrs. Edward Exley for Mr. J. Jackson of Chelford, Cheshire. Photo: H. L. Overend.

Part 9.

A Gauge 0 Steam Loco for Beginners.

Coupling Rods.

By "1121."

We can't put the wheels on yet, as for two reasons we must first make the coupling rods—firstly we are going to use the axle-bushes in each frame as a jig to drill the eye-holes in the coupling-rods, and we can't do that with the axles in, and secondly we need the rods to assist in getting the wheels on correctly. Most of the jobs are being described in a carefully-thought-out order!

To save a lot of donkey-work, the rods are made from 1/16 in. mild steel strip ¼ in. wide if you have it, otherwise slices of 1/16 in plate, and the bosses thickened up separately. Cut your strips a little over the required length, to allow for cleaning up later, and number them one and two, so that you will know which is which. Clamp No. 1 rod to No. 1 mainframe, on the outside, right across the heads of the axle-bushes, with the same amount of spare projecting at either end. You needn't take the frames apart to do this, if you've got them assembled, although they will have to be dismantled shortly to put in the wheels and axles. You will need, however, to insert a bit of packing in the middle, between the frame and the rod, the thickness of the heads of the axle-bushes. (Fig. 45). Now put the No. 12 drill right through the two bushes and spot one end of the rod (Fig. 46). Do the same for the other end of the rod, and dismantle and repeat the process the other way up for the other side rod.

Now in the positions marked drill the rods No. 30, or if you have no drill in this size they can be drilled 1/8 in. and eased out with a small round file. Put the file into the hole and twist round in an *anti*-clockwise direction, as if you were trying to screw it *out*, otherwise if you screw it in it will jam up, refuse to rotate any more, and you may break it without achieving enlargement of the hole. The rods should slip quite easily over the crankpins—there is no point in trying to make them a wonderful fit in this small size.

We now need a couple of 6BA steel washers for each rod, which are sweated on the front to thicken up the bosses at the ends. They must be well stuck on, otherwise subsequent operations may knock them off, so we refer you to previous remarks re soldering steel. Attach them with the hole as nearly central with the hole in the rod as you can judge, and then put the No. 30 drill through from the rod side. The rods can now be filed to shape. We suggest first sawing down on either side of the lubricator, and then sawing in to meet these cuts, finally filing away the centre part of the rod, and rounding off where necessary (Fig. 47). It is worth taking a little care to get the shape of the rods right, as they

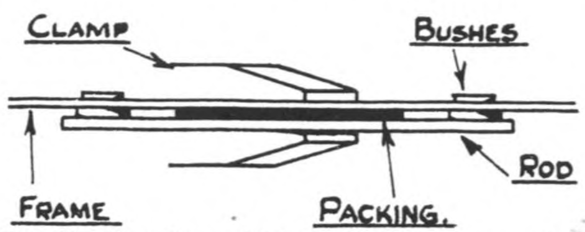


Fig. 45. Coupling-rod blank clamped to frame for spotting through.

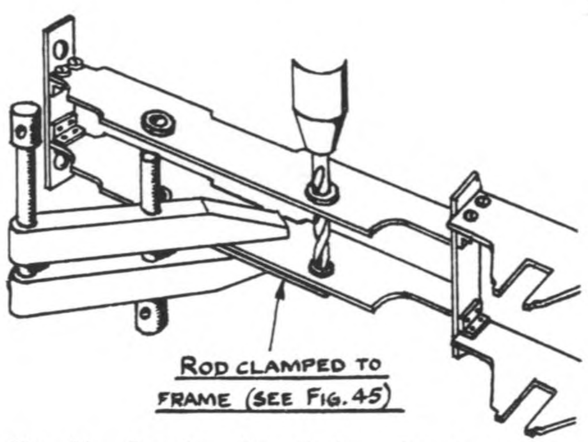


Fig. 46. Spotting through into the coupling rod blank through axle bushes.

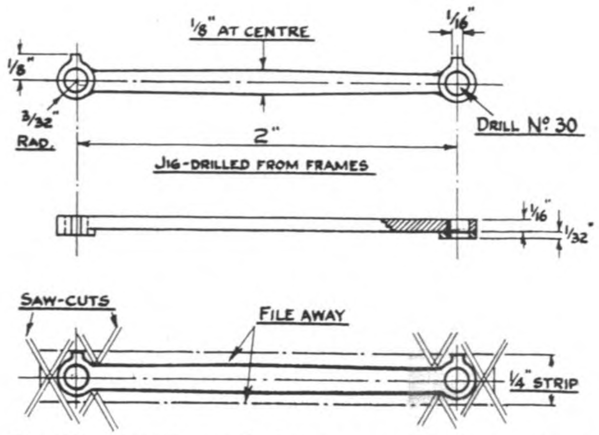


Fig. 47. Coupling rod, showing suggested method of cutting to shape. (Actual size 7 mm. scale.)

are conspicuous on any engine and can ruin its appearance if clumsily executed.

Now we can get the driving axle assembled into the frames, ready for fitting up the motion, but the front coupled wheels should *not* yet be assembled to the axle. These come over the cylinder-fixing screws, so must not be put on until the cylinder is made, installed and tested. Put the *short* end of the driving axle through the rear bush in No. 1 (the left hand) frame, and press a driving-wheel on to this end of it, making sure it is one of the right wheels, if the castings you are using are different for the driving and coupled wheels. (The front coupled wheels will have the balance weight diametrically opposite to the crankpin, if this is the case, while the driving wheels will have it adjacent to the crankpin, as can be seen in the photographs previously published.)

We recommend pressing on the wheels in the drilling-machine or lathe, to ensure that they go on square. Hold the other end of the axle firmly in the drilling-machine or lathe chuck, and spin the machine for a few turns to make sure it is true. Find a bit of plate, not less than 3/16 in. thick, and put a hole through it not less than ⅛ in. diameter, on which the wheel can be rested with the crankpin down the hole. Get the wheel in position under the end of the axle, and bring the axle down until the end goes into the wheel. In the lathe, of course, you will have the bit of plate held back against the end of the tailstock mandrel. It is necessary to jam a bit of packing of the right thickness into the gap between the crankwebs while you do this, to avoid bending the axle. (Fig 48.)

In the following order, thread on to the long end of the axle the stop-collar, with the step side outwards, away from the crank web, the eccentric sheaf, with the strap over it, and with the driving pin next the stop-collar and the flange outwards, and No. 2 frame. Assemble the frame back on to the front buffer-beam and cross-stay brackets. Push the other driving wheel on to the other end of the axle hand-tight only, so that you can twist it about. Turn it round until its crankpin is pointing towards the back of the engine when the left-hand crankpin is pointing approximately downwards, which will give you the correct "right-hand leading" relative positions of the two wheels.

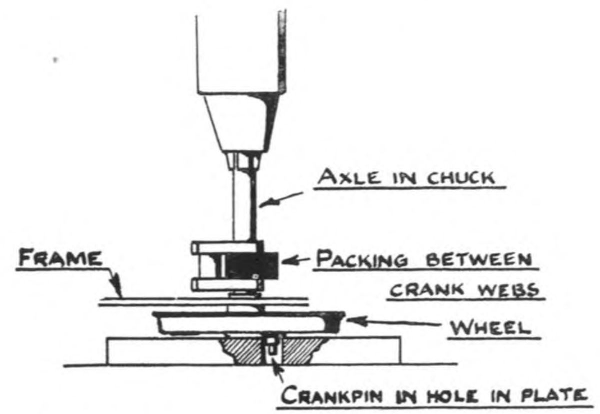
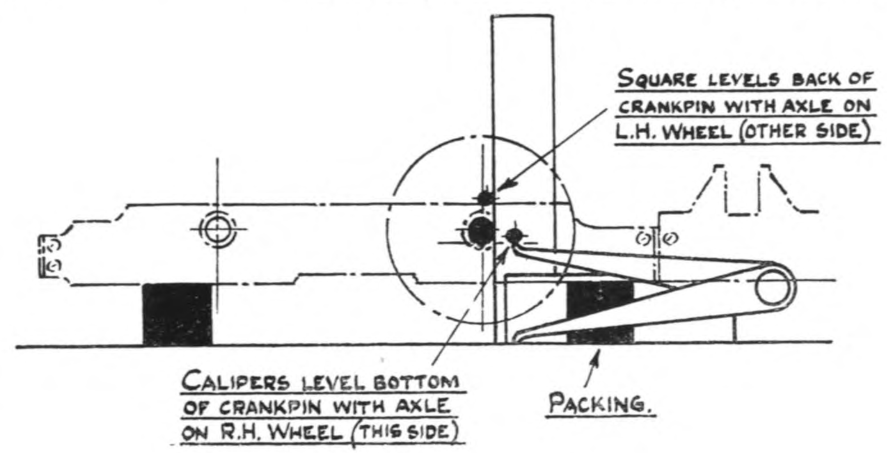


Fig. 48. Pressing the left-hand wheel on to the short end of the driving axle in the drilling machine.

With the wheels in this position, turn the frames upside-down on a couple of bits of packing of the same thickness, on your surface-plate, so that the wheels are clear. Stand your square with the butt on the surface-plate and the blade alongside the left-hand wheel, with its edge against the rear side of the crankpin. Set your inside-calipers to the height from the surface-plate to the lower side of the end of the axle, where it shows through the wheel. Now adjust the right-hand wheel on the axle until, with the square still up against the crankpin of the left-hand wheel, it just passes level with the front of the axle on that side, when the calipers are touching the underside of the crankpin on the right-hand side. There will be an error, of course, owing to the fact that the crankpins are smaller than the axles, but the error will cancel itself out if the checking is done in the positions we have stipulated, and the crankpins will be at right-angles to each other, or the wheels will be "quartered," as we say, as near as makes no odds. All this sounds a bit complicated in words, but we have produced the sketch Fig. 49 to make things quite clear.

In actual fact, of course, the accuracy of the quartering is not really vital in an engine of this type—if we were

Fig. 49. How the square and calipers are used to "quarter" the driving wheels.



dealing with an engine with outside cylinders, driving direct on to the wheel crankpins, rather special care should be advisable, otherwise the engine would have uneven exhaust-beats.

At this stage the right-hand wheel should be left tight enough to avoid its being moved accidently, and it can now be pressed right home with the lathe tailstock or drilling-machine, not forgetting the packing in between the crank-webs.

The lengths given for the axles will ensure that the wheels are to correct gauge when the ends of the axles come flush with the outsides of the bosses. The back-to-back dimension should be checked, however, as this dimension is more important that the gauge. The gauge of a pair of wheels can hardly be measured, anyway, being taken from indefinite point on the radius at the root of the flange. If the back-to-back is correct, however,—1 - 3/32 in. coarse and 1 - 9/64 in. fine, and the wheels have been turned reasonably near the right contour, the gauge will look after itself.

Second Thoughts.

A builder of "Aladdin" draws attention to a small discrepency between the drawings and the text in last month's article on the eccentrics—the sheaf is shown as drilled No. 12 in the drawing, while the text says ream 3/16 in. This was undoubtedly a change of mind while doing the drawings, thinking that the clearing hole would be quite good enough but forgetting to alter the text, and while we can only agree that such human lapses should not be allowed to occur, we feel that this is a very minor case, and it is only necessary to ensure that the sheaf is free on the axle.

The same correspondent points out that, "it is normal practice to use a snap to support the snap-head rivets, not rest the heads on the vice-jaws as in the August issue." Well! no doubt it is, and it is also "normal practice" to go and buy a milling machine rather than to perform some of the contortions which we shall be describing to do certain milling jobs in the lathe. The point is that we are recommending the purchase of only a minimum number of special tools for this job. Our own original "Aladdin" was riveted up in precisely the manner shown, with quite satisfactory results, and we are only concerned with ensuring to the best of our ability that anyone else can do the same as we have done.

For all this criticism, however, our friend says that he is enjoying building the loco, which, after all is the main thing.

Second second Thoughts.

By one of those little bits of cussedness that occasionally crop up in the best regulated circles, the information we endeavoured to give last month concerning the projection of the crankpins from the wheels somehow got tangled up in the printing department with the result that just the very line containing the required figure was missing. The sentence should have read "There should be ⅛ in. of plain ⅛ in. diameter projecting from the face of the boss."

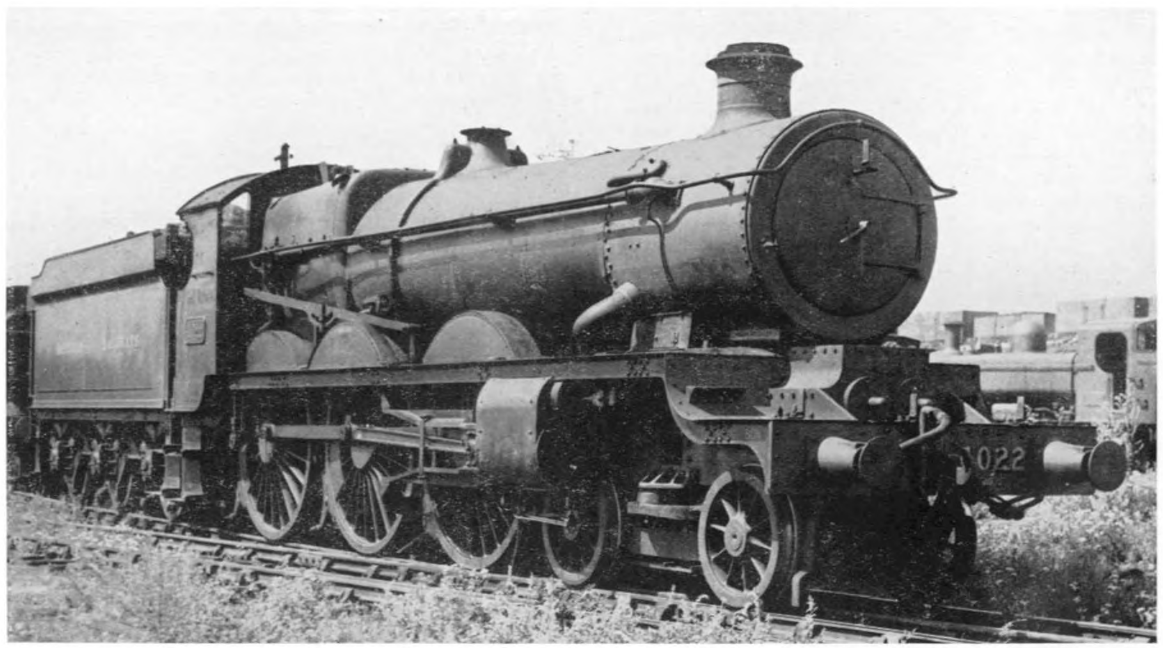


Photo: Maurice Earley.
Western Region "Star" Class 4-6-0 loco No. 4022. Originally named "King William" and subsequently "Belgian Monarch" on the introduction of the 6000 Class "Kings."

7 mm. Fine Scale G.N.R. Ivatt Locomotives.

Part 2.

By E. J. Henshaw.

The 0-6-0 J6 goods locomotive was Mr. Ivatt's last design for the G.N.R. and it has always appealed to me as a handsome representative of the 0-6-0 type, though the later style of the chimney has detracted somewhat from its appearance. Before the war in the Nottingham area they were used on fast goods trains and on excursions to the Lincolnshire coast. I remember well the characteristic "smack" of the snifting valve when the regulator was opened, and the hectic career of a fast goods train at night down the 1 in 100 gradient towards Basford station near Nottingham.

The typical G.N.R. footplate was made in my usual way, viz., by first cutting from plywood a strip with the reverse curves and fitting both plate and valance to it before soldering up. Frames on top are dummy and at scale distance apart. The front splashers presented a problem, as they merge into the sandboxes, and the top of the splasher continues forward to form the rear side of the sandbox. This top projects slightly from the sand box, yet remains flush with the beading of the splasher.

The splasher-cum-sandbox sides were cut out and shaped together and the curve of the beading was clearly marked. The splasher top was prepared as shown, with the reduction in width beginning at a point A on the splasher just behind the maximum height, and soldered to the side. The projection was then carefully filed so as to make an exact fit with the beading (1/32 in. wide brass strip) which was bent to shape and sweated on. The front side was added, then the top at C,

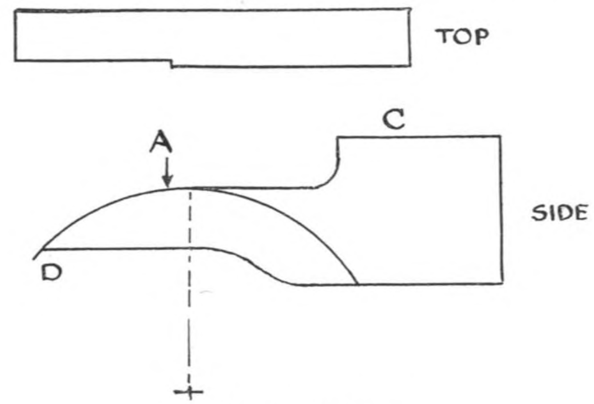
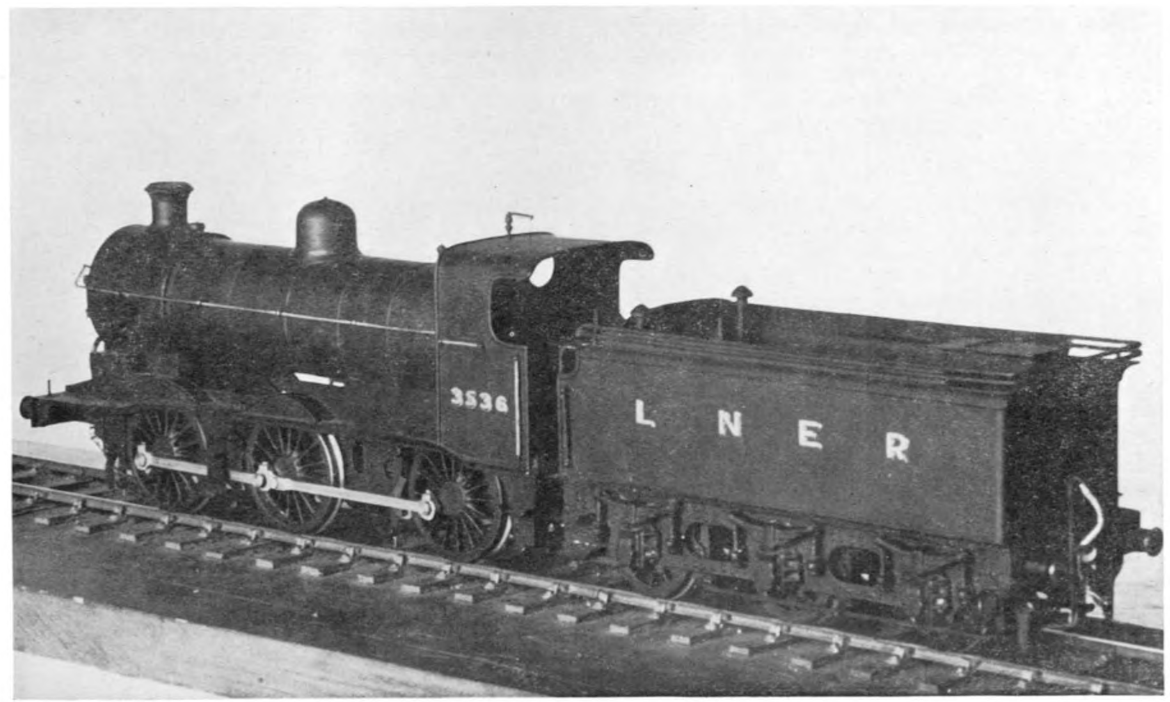


Fig. 1. Splasher.



L.N.E.R. (ex-G.N.R.) Class J6 0-6-0 Locomotive No. 3536. **Photos: A. Henshaw.**

Part 10.

A Gauge 0 Steam Loco for Beginners.

By "1121."

Cylinder Block.

This is a ¾ in. length of ⅝ in. square phosphor bronze or gunmetal—preferably cast. Pistons and cylinder bores, valves and port faces, and so on, should always be made from dissimilar metals to improve their resistance to wear and possible seizing. Thus we prefer cast bronze or gunmetal, or even brass, for the cylinder block, and drawn brass rod for the piston and valve, although we have made a number of small pistons of duralumin, including that for the original "Aladdin," and it seems quite all right. If you use cast stick for the block it will undoubtedly be rough and oversize, so will require cleaning up all over. The easiest way to do this is in the lathe, holding the sawn-off piece of bar in the 4-jaw chuck, making sure it is pressed well back to maintain squareness. Face across each side in turn, remembering about removing burrs when you shift it, to avoid these producing false location and throwing the block out of square. Machine the surface which is to be the port face last, so that you won't risk marking the important face with a chuck jaw, and make sure it is nice and smooth and flat. Face the ends of the block, again in the 4-jaw chuck, but put a piece of soft packing —brass, copper, aluminium etc.— over the port face, so that it doesn't get marked by the jaw. Make sure that all jaws are down tight, so that the block is held true, and clean up the first end. Turn it round the other way, and face the second end down to finished length. Mark the position of the centre of the bore on this end, noting that it is *not* central with the width of the block (Fig. 50) and make a centre-pop there so that you can see the position easily. We suggest a centre-pop mark on the top side of the block, up close to the front end.

Now put your block back in the chuck again with the back end outwards (the end with the bore-centre marked on it) and adjust the chuck-jaws so that this mark runs as true as you can get it. Put a pilot-hole, say about ⅛ in., right through, from the tailstock, and then open it out to ¼ in. or 5/16 in. —the biggest you've got. Whether you propose to finish the bore with a ⅜ in. reamer, or by boring, it is still advisable to true it up with a boring tool first. Your centre-pop, and therefore your hole, will be running dead true, and if a reamer is put through a hole running out of true it will produce a tapered bore. The exact *size* of the bore is not important, provided it is round and parallel and smooth, so if you have no ⅜ in. reamer you only need to set your inside calipers to ⅜ in. by your rule, or micrometer if you have one, and bore the block out until they just slip in.

Making a boring tool— hardening and tempering.

You can easily make a diminutive boring-tool, if you have not got one small enough, by the following method:-

Heat up the tip of the tang of an old flat or square file to red-heat, and bend it over as shown in Fig. 51. Harden it by heating again to bright red and plunging it into clean cold water. This will now be "dead hard," like glass and will need to be "tempered." Polish up one side of the tang with emery cloth until it is bright and start heating it again

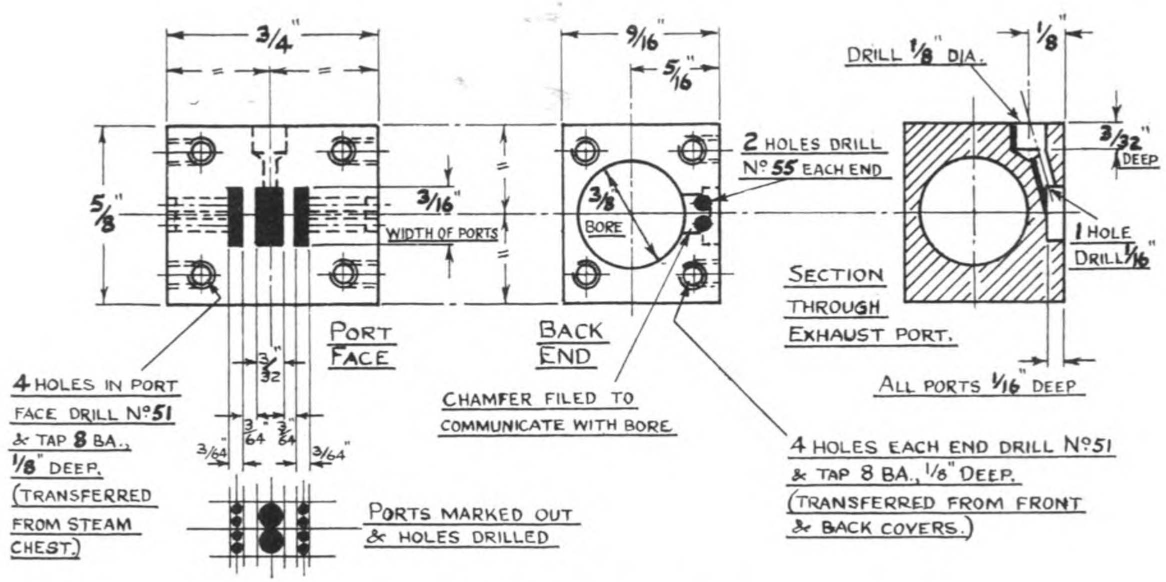


Fig. 50. The Cylinder Block.

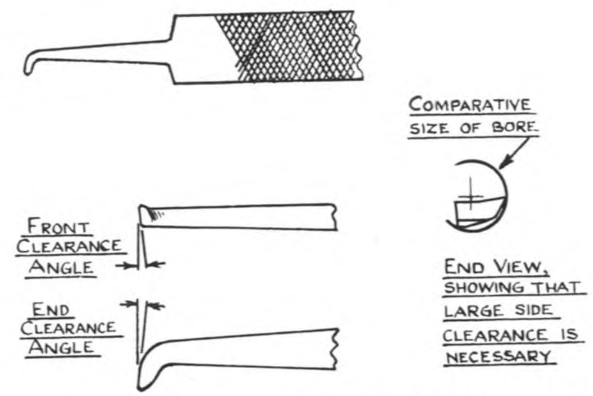


Fig. 51. A boring tool made from the tang of an old file.

about an inch or so back from the tip. After a little heating you will see colours appearing on the polished surface, and they will chase each other down towards the tip as the heat spreads along the metal. First there will come a barely-perceptible pale yellow, known officially as "light straw", gradually blending into a rich "dark straw". Behind this comes a purply sort of colour, followed by a deep blue. For most turning tools, such as this one, which are not expected to take sudden shocks, it is safe to temper at the light straw, this being, of course the nearest to dead hard. All you have to do is watch the colours move along following them up with the flame to keep them going if necessary As soon as the desired colour arrives at the extreme tip of the tool, quickly stick it in the water again. If you have been a bit premature, and the colour hadn't quite got there after all, another dose of heat and subsequent quenching will correct matters. If you have let the colours get too far, you will have to re-harden, re-polish and re-temper.

While on the subject we would mention that tools such as centre-punches, cold chisels, etc. which will get rather rougher treatment, should be tempered down to dark straw, which is still hard enough to cut but not so brittle as light straw, while things such as springs, which require to be definitely distorted in use, should be tempered down to blue. This is the general principle of hardening and tempering "carbon" steel, including the variety known as "silver steel," and although details of the method may vary slightly in individual cases, generally speaking this will be what we mean if we stipulate "harden and temper to dark straw"—or whatever it may be —in making tools in the future.

Our boring tool must now be ground to the correct shape, which, we hope, can be gathered from the sketches. Note that a boring tool requires a good "clearance" under the cutting edge, or it will rub in a small hole. Note also that the point should be slightly rounded, not dead sharp, in order to produce a finish in the bore. The shape of tool shown will enable you to bore right down to the bottom of a "blind" hole—not necessary for the present job, of course, but you may find it useful at some other time.

If you are going to finish your bore by reaming, you should bore the hole out as big as you dare without going too big—the secret of producing a mirror-like surface with a reamer is to make it remove as little metal as possible—just enough to make it clean out the marks left by the boring-tool. If you make the reamer take out an excessive amount of metal it will produce a rough bore probably worse than that left by the boring tool. As explained previously, a reamer has a slight taper at the front end, and the hole should be bored out until this will enter.

If you are finishing right off with the boring tool the last few cuts should be very light—in fact you can pass it through, very slowly, with the lathe running fast, to finish up with, without increasing the depth of the cut at all—there will be enough spring in the tool to give several fine cuts. Your phosphor-bronze, particularly if it is cast stick, will take the edge off your tool in a very short time, so even though this job may not involve enough work for this it is as well to bear in mind, so that if a mysterious deterioration of the finish takes place, you will be able to remedy matters by touching up the tool before taking the final cuts.

Put a little chamfer on each end of the bore, to make sure there is no burr projecting either in to the bore or out on the end of the face, and in the case of the back end to make sure the cover fits right down flat against the end—there may be a slight radius left when you turn the spigot on this cover later on.

Steam and Exhaust Ports.

These are carefully marked out on the port face, and lightly centre-popped for drilling the holes, as shown. Some people would make a special cutter to mill the ports, taking a couple of hours to make it, another half-hour to set up the block in the lathe to do the cutting, and about one minute to do the job. This is all right if you are anticipating making a dozen or more cylinder blocks, but for the moment we are assuming that most builders are only concerned with building one "Aladdin" and would rather spend the time on getting that one right. We suggest that only given unhurried care the ports can be chiselled out by hand quite successfully by anyone who is keen on making a good job of the engine. Make no mistake about it—these ports are about the most important part of

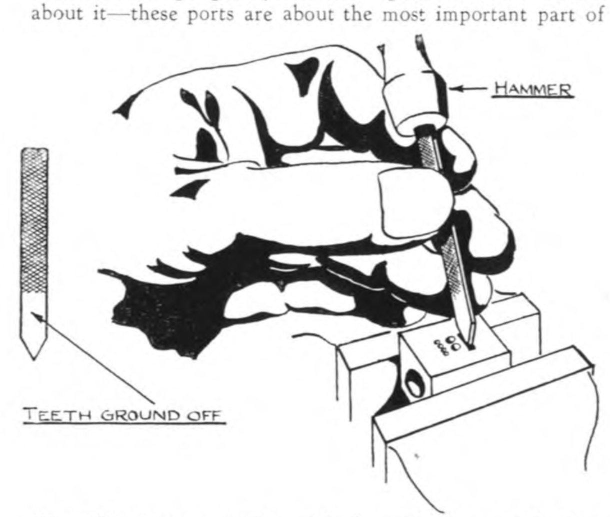


Fig. 52. A port-cutting chisel made from a broken piece of flat file and the chisel in use.

the whole engine, and are an example of what we were talking about in the very first paragraph of the first article in our old "Finding Fault" series— Page 46 March 1950, if anybody is interested in referring back.

The steam ports should be drilled some size well under 3/64 in. to make sure the holes don't encroach over the marked-out size should they be not quite on the centre-line of the port. No. 60 would be a good size to start with—you can always open them up with slightly bigger drills if you find you have room. The exhaust port can be drilled with a couple of No. 43 holes —its dimensions are not quite so vital as those of the steam ports, as it is virtually only a "way out" for the exhaust steam, and its edges don't do anything.

Our favourite chisel for cutting ports is ground from a broken bit of flat needle-file—there are plenty of these about in most workshops, including ours! grind both edges at one end until you have a nice square cutting edge, remove the teeth from either side near this end, and you will have a nice little chisel with a curled grip. (Fig.52). We show also the method of holding it while you tap the top end with a light hammer (practice alone will tell you where the top end is while you are looking at the point!) with the cylinder-block held in the vice. Always chisel towards yourself, as shown, turning the block round in the vice to deal with the other end of the port. Constantly check dimensions, not only of each port or "bridge" between them individually, but also of the 9/32 in. length over all three ports, and the 3/16 in. distance between the inner edges of the two steam ports, so that all possible combinations of dimensions still come out all right against your rule. When you are getting nearly out to size, the edges of the ports can be trimmed with a small file—there is no harm in the actual edge being a slight chamfer in a slightly narrower port.

Passage-ways.

Stand the block on end on your drilling-machine, first putting a couple of centre-pops alongside the bore, midway between it and the port face, and drill the passage-ways right down into the steam-port that end Be careful as your drill breaks into the port—if it breaks through a bit lop-sided it may snatch and snap off. If your machine has a depth-stop we recommend setting it to show you how deep you are getting, and prevent you from ploughing on into the exhaust port inadvertently. We have shown the passage-ways drilled No. 55, but this is not fussy, and any drill you have about this size will do. If the holes look a bit vague at the bottom of the port, dig around with your chisel until you have a nice clear way through.

File a little chamfer at the end of the block to connect the ends of the passage-ways with the ends of the bore, being careful to avoid continuing the chamfer out beyond the holes to the side of the block—you don't want steam going out that way. Turn the block over and deal with the other end in the same way.

The exhaust passage-way is a little more involved, as it goes in at an angle, and it is necessary that it misses the cylinder bore but still doesn't come out of the port face before it reaches the exhaust port. The method of tackling the job is shown in three stages in Fig. 53—the position of the exhaust-hole is marked and centre-popped —half-

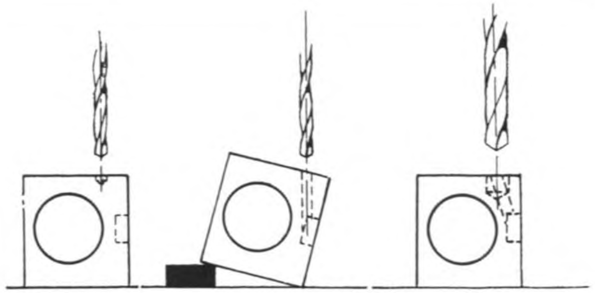


Fig. 53. Sequence of operations for drilling the exhaust passage way.

1. **Drill 1/16 in. for a short distance with block held flat.**
2. **Continue 1/16 in. hole through to exhaust port, with block tilted on ⅛ in. packing.**
3. **Open out to ⅛ in. for 3/32 in. deep, with block held flat.**

way along the length of the block and ⅛ in. in from the port-face. The 1/16 in. drill is then put in for a short distance just far enough to start it on the slope without the point side-slipping down the hill. The block is now cocked up on a bit of packing about ⅛ in. thick, which should bring it to about the right angle, but this should be checked by eye by pushing the drill down past the end of the block when you will be able easily to gauge whether or not the hole will take a nice line past the side of the bore and in the exhaust port. Finally lay the block flat again and open out the top end of the hole to ⅛ in. dia., 3/32 in. deep, for the end of the exhaust pipe to go in at a later date.

THE STORY OF 7 mm. SCALE W.D. 90618.

By H. Seaton.

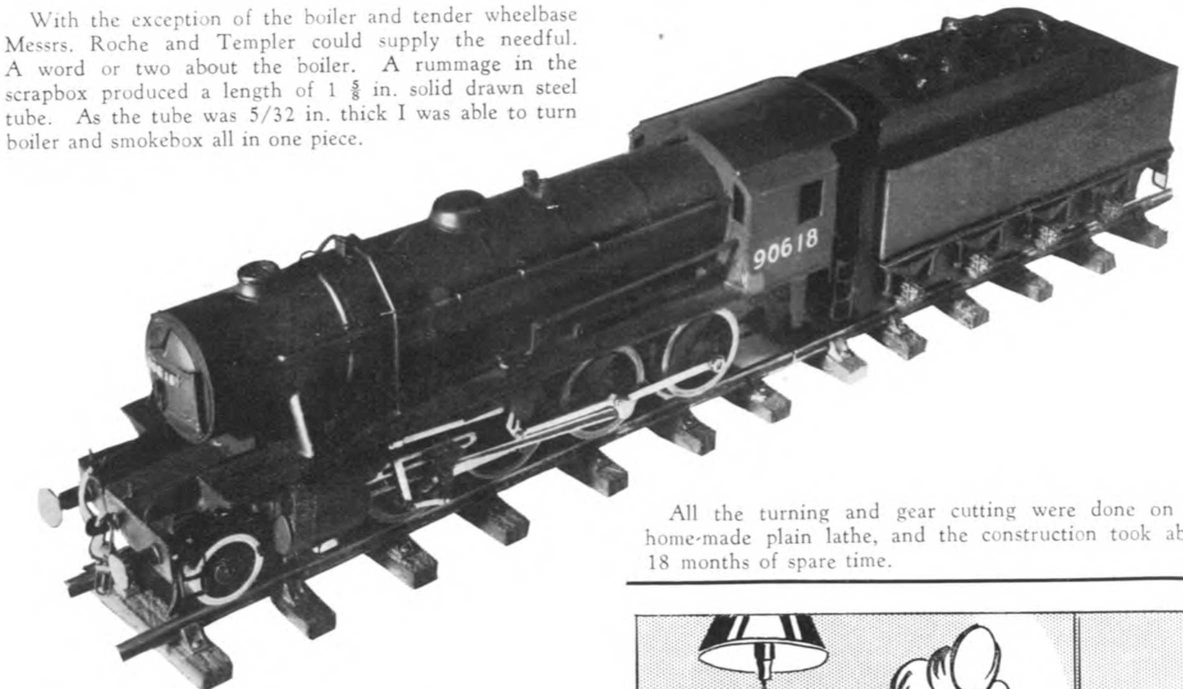
During the summer of 1950 I was fortunate enough to enjoy a trip on the footplate of W.D. 90618 and as I had just completed a 7 mm. scale model of a Tilbury tank I decided to commemorate the occasion by building the W.D. 2-8-0 in the same size.

Through the auspices of a friend, official drawings were procured and building commenced. Driving and coupled wheel castings (c.i.), also tender axleguards, were bought from Rocket Precision, Ltd., everything else being made from "scrap." The wheel castings supplied the first snag. Correct balance weights could not be supplied so I turned the original ones flush with the spokes and tried to sweat sheet metal ones, cut to shape, on top.

Ever tried tinning cast iron? It can be done! After several failures I was "tipped off" to use "Self Flux"—a solder paste This preparation will tin cast iron.

Pony truck and tender wheels were turned from 1 in. mild steel bar. As my lathe is too light to part off 1 in. mild steel bar I cut ten ¼ in. discs by hacksaw (much sweat here). The rest was just plain turning.

With the exception of the boiler and tender wheelbase Messrs. Roche and Templer could supply the needful. A word or two about the boiler. A rummage in the scrapbox produced a length of 1 ⅝ in. solid drawn steel tube. As the tube was 5/32 in. thick I was able to turn boiler and smokebox all in one piece.



All the turning and gear cutting were done on my home-made plain lathe, and the construction took about 18 months of spare time.

The firebox was turned sufficient to allow "tinplate" to be bent round and waisted to scale width frames. The motion work is made from stainless steel, being correctly forked and pinned with 14 B.A. nuts and bolts.

Slide bars were filed from the solid and press fitted into back cylinder covers. Cab, tender sides, running boards, etc., were made from 22 gauge leaded steel sheet. This material is just the "cats whisker" for the job. It works easily and takes solder well, also it is completely rust-proof. My own samples were "scrounged" and as my "contact" has disappeared into the blue, I cannot give any further gen about it.

A 24 volt home-made motor, housed in the tender, supplies the motive power through a 30-1 worm and wheel on the rear coupled axle. The connection between the two is by Woolworth's curtain spring. This is quite successful at low speed but tends to whip at a scale 40 m.p.h.

If any reader can supply me with information on tender drives I should be much obliged. I would like to add that the motor is complete with fly-wheel.

Spring buffers are fitted and the model is fully braked and the cab complete with fittings. Readers will have noticed that steel has been used throughout and as far as I am concerned, I'll never use brass again.

I would like to take this opportunity of thanking Mr. S. Devine for the remarkably fine photograph accompanying this article, also to his good lady for fixing the transfers. When you are "ham fisted" like me you simply have to farm such jobs out. Many thanks to Messrs. Roche and Templer. They certainly helped to improve the "breed."

"That's the third time I've put the soldering fluid in the Yorkshire pudding!"

I nodded wisely.

"Subsequently," he continued, "through the exciting of the calibrator filaments, a communicatory current build-up circulating in sympathy with the centrifugal tripper-gear, establishes a milli-cycle sequence in the smooth-wave Razzini contour-selectors."

I scratched my leg and looked cunning.

"Finally," he went on, "when the mercury sphere split throw rotary seimic breaker is closed through all its baffle bars, the low voltage Glauber circuit will complete the pressure accumulation in the subsidiary arc-zones, so liberating the overload on the correcting condensers, resulting in the isolating of the shunt windings in the laminated ball screen. This, of course, will bring in the Graffe Compensator Relay actuating the self-centring armature feeder key. The Windle poloid jacket will short out the vector blades and complete the circuit to the McKillick conveyer-notcher. Thus is carried the ultimate current valuations to the final stages."

"In short," I ventured.

"In short" he said magnificently drawing himself to his full height and fixing me with a look of fanatical fervour—"In short—my 0-6-0 Tank will run round the track!"

I bounded to my feet—"It was never in doubt," I cried, and helped him to refold his masterpiece.

"Thank you for your valuable advice, Mr. Scorpio," he said, his voice deep with feeling.

I polished the fingernails of my right hand against my lapel, and smiled diffidently. "You're welcome," I told him generously—"If you never ask, you never learn!"

"SCORPIO."

THE JUBILEE OF SCALE MODEL TRACK.

By J. L. K. MANN.

I feel that a few comments are necessary on the Guest Editorial by Mr. H. A. Robinson in the April issue.

Development since 1903 has certainly not been at a consisent rate. For nearly twenty years, between the wars, "steam-roller scale" gauge O satisfied the vast majority of modellers. The firm responsible for the inauguration of "scale model track" seemed perfectly content to stick to its 1903 ideas, and the present day standard O gauge loco carries on the "steam-roller" tradition, along with "new" electric mechanisms on the now ancient principle of two side-plates held together by screws. On the other hand, the Leeds Model Company produced models accurate to prototype and on wheels of an admirable profile; furthermore, the finish and lining was a long way different from the printed tinplate effect of some model firms.

Surely the greatest steps forward in ideals and standards were made in the ten years following 1936. By this time OO had appeared and was beginning to win converts from O gaugers; electric propulsion was cheaper in the smaller scale (at any rate, as far as 'capital cost' went), and a finer degree of detailing was beginning to be the fashion. Soon came the war, and in the gap caused by the ceasation of manufacturing several individuals and groups came forward with ideas of their own, along with new standards—especially fine scale. Bond's was the only firm in pre-1939 days to produce a near-scale O gauge track; most modellers probably left it alone because cheap wheels to suit were not very readily available. In any case very many modellers in that period preferred to buy a loco in a box rather than to set to and make their own

In my opinion, the greatest single cause of the metamorphosis of the model railway man from the model-buyer to exacting model-maker is the continuance throughout the war, often under hazardous conditions, of the modelling journals. Men on active service, or working away from home had only the monthly magazine as a link with their hobby; the prototype drawings, particularly of pre-1923 examples, produced the desire for really true-scale work, even to a particular period. In addition, the photographs and descriptions of models by men intent on positive realism, such as Michael Longridge and F. J. Roche, produced the desire to do likewise. Furthermore, the new standards recommended by the B.R.M.S.B. were given full publicity; all this in addition to the many hundreds of hints, tips, and wrinkles on all matters of construction, from coach lining to baseboard structure and scenic work. Truly the editors and staffs of the modelling journals have every reason to feel pride, in looking round the present- day healthy state of the modelling hobby, that they themselves are responsible for much of the improvement since the "toys-for-boys-of- all-ages" era.

Our Cover Picture

Shows Westbury Station on the 4 mm. scale, 16.5 mm. gauge layout built and operated by Mr. C. Humphrey Leach of Cleckheaton. The scenic effects are very realistic and the Red Lion conveniently situated for travellers who require fortification for their journeys. Mr. Leach's layout will be described in our pages.

Correction.

Mr. E. H. Halliwell, whose Gauge O 4-6-4 ex-L & Y tank was featured on the cover of the July issue wishes to point out that the engine was not built by himself but was the work of Mr. Edward Exley of Bradford.

Publications.

"Western Region Shed Allocations."

Published by the Locomotive Club of Great Britain, 44, Shelburne Road, High Wycombe, Bucks. 42 pages including art inset of 8 pages of photographs. Price 1/9 nett.

This is the second of a series of books dealing with the regional allocations of locomotives. The first which covered the Southern Region was reviewed in our June issue.

The presentation of the Western Region book follows that of its predecessor with loco. dimensions, names, numbers and shed allocations and the information is correct to 27th May, 1953. A supplementary sheet takes the record to June. All diesels and gas turbine locos are included and a lot of information has been packed into the pages. We anticipate that G.W.R. enthusiasts will welcome the publication.

Part 11.

A Gauge O Steam Loco for Beginners.

By "1121."

Front Cover.

The front cover is simplicity itself, consisting merely of 1/16 in. brass plate attached to the block with four screws. Cut the plate to size (Fig. 54) mark out the hole positions carefully and clamp it to the front end of the block with a piece of soft packing under the other jaw of the clamp to protect the other end of the block. Make sure, when doing a job of this sort, that the clamp jaws close parallel at least, or even "toe-first"—never "heel-first" on the edge of the job. (Fig. 55). Rest the job on two parallel blocks to clear the clamp (Fig. 56) and drill the four holes No. 51 through the cover and into the block about 3/16 in. deep. If you can't avoid your clamp covering up one of the hole positions, leave this one out and drill it later with the cover held in position by the other three screws. Put a centre-pop mark on the top edge of the cover to correspond with the similar mark on the top of the block, so that you know which way it goes on. Remove the clamp, tap the block 8 B.A. open out the holes in the cover No. 43, and remove all the burrs. This latter is very important—you'd be surprised how often we've had complaints about paper joints blowing out, only to find that the builder had omitted to remove the burrs round the holes, between the two parts, so that the paper joint was not being held at all.

It is possible that drilling and tapping the screw-holes in the block may slightly bulge the metal into the bore at the end, which will cause trouble when fitting the piston later, by causing the end of the bore to appear to be slightly smaller than it really is, so this must be watched for and any excess metal reamed, filed or scraped out. The same applies to the port-face.

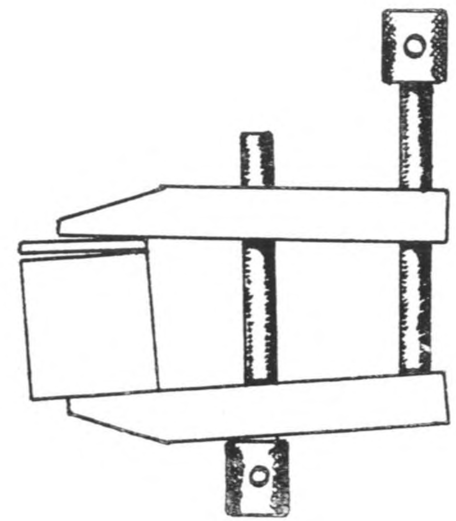


Fig. 55.

Keep the jaws of the toolmaker's clamp parallel —not like this!

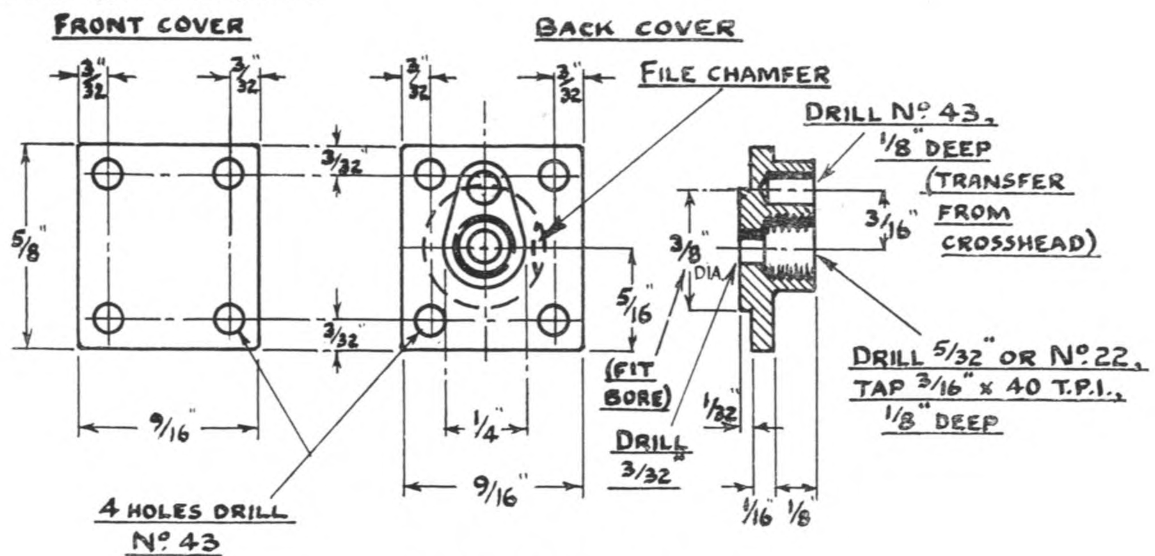


Fig. 54. The two cylinder covers

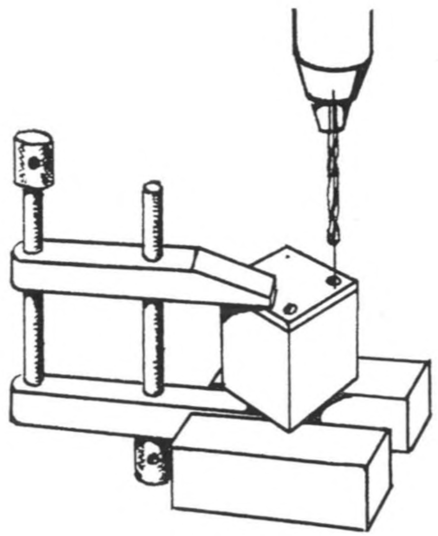


Fig. 56.
Drilling the fixing holes in the front cover and cylinder block in one operation.

Back Cover.

This is another bit of brass plate, this time ⅛ in. thick, cut a little over size, and the pear-shaped boss, made from the same material, or ⅛ x ¼ in. strip, silver-soldered on in approximately the correct position. The boss is centre-popped for the piston-rod hole, and the whole thing held in the 4-jaw chuck, with the centre-pop running true and the surface of the plate running as flat as possible. The 3/32 in. drill is now put right through at the centre-pop mark, and the hole then opened out to 5/32 in. diameter for a depth of ⅛ in., and tapped 3/16 in. x 40 threads per inch with a plug tap—this can be put straight in as these fine threads are very easy to tap in brass. Note, incidentally, that when we give a certain depth for a drilled hole, this depth is to the "shoulder" of the drill, not to the extreme point. In other words, we need this depth of full diameter hole.

The inner side of the back cover has a short spigot turned on it to fit the end of the cylinder-bore, and a little low cunning has to be introduced at this point

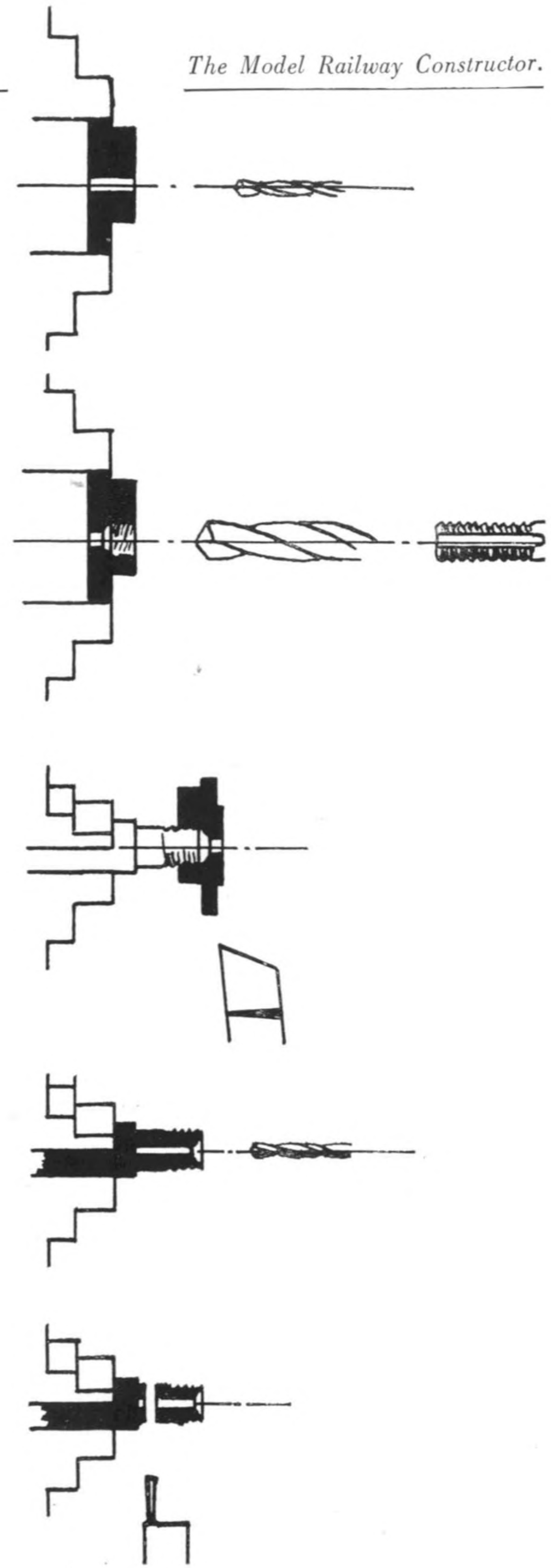


Fig. 57.
Sequence of operations for machining back cover and gland screws. Top to bottom.

1. Hold in 4 jaw chuck on edges of plate with boss outwards, centre and drill 3/32 in.

2. Open out to 5/32 in. for 1/8 in. deep, tap 3/16 in. x 40 T.P.I. full depth.

3. Turn and screw bar 3/16 in. x 40 T.P.I., screw on cover and turn spigot.

4. Remove cover, centre bar, drill 3/32 in., counter-sink to full diameter.

5. Part off and repeat for second screw.

to ensure that this spigot is truly concentric with the piston-rod hole. It will be appreciated that no effort must be spared to be certain that no eccentricities creep in between the two, or between the piston and its rod, otherwise severe binding will result. The next stage, therefore, is to hold a piece of brass or bronze rod in the 3-jaw chuck and turn it down to 3/16 in. diameter and screw 3/16 in. x 40 threads per inch for a length of 3/16 in. The rod you use for this can be anything over 3/16 in.—¼ in. would be a convenient size— unless you are one of the lucky ones with a collet lathe you cannot rely on using 3/16 in. rod and getting a true thread on it, as this bit is destined to become one of the gland screws and the above remarks on concentricity apply. When you do all this, have as short a length of rod sticking out of the chuck as you can conveniently manage. Now screw your half-finished back cover on to the thread, and very carefully start turning the spigot, using the end of the bore in the cylinder-block as a gauge, until it will just push on. Watch out for the corners of the plate coming round as you feed the tool in, and aim to get a flat surface on the plate where it comes against the end of the block, and a sharp corner where this surface joins the spigot. The spigot must only be 1/32 in. long, which means that the plate being ⅛ in. thick you have got 1/32 in. spare to experiment with when getting the diameter right, which surplus 1/32 in. is subsequently faced off to bring the plate down to 3/32 in. thickness.

When you've finished all this, centre the end of the bit of bar, drill it up 3/32 in. diameter (you can do this before you screw on the cover for machining, if you are at all afraid of knocking the bar out of truth when unscrewing the cover) and cut it off ¼ in. long overall. This whole sequence of operations is shown in Fig. 57. While you are at it, make another gland screw which

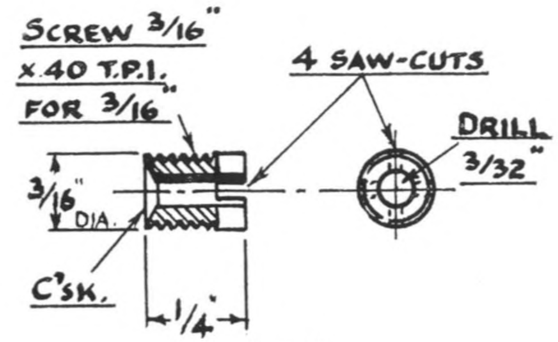


Fig. 58.
Gland screws (2 required for piston rod and valve spindle).

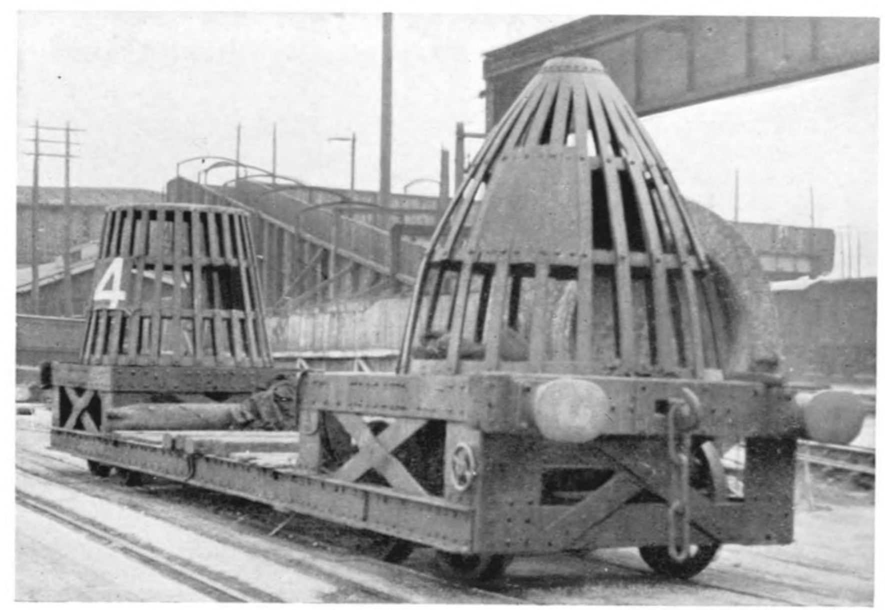
will be needed later on for the steam chest. They are both the same, and are shown in Fig. 58, from which it will be seen that they have four little notches the full 1/16 in. depth of their heads, formed by sawing right across the end at right-angles, and cleaning up with a thin flat file. These little notches are for digging into in order to screw the glands up later on.

The back cover is now held on the end of the cylinder block, with the pear-shaped boss as near as you can judge vertical (make sure it is pointing towards the top side of the block) and the scriber run round the back to mark its finished size. File it down all round almost to the lines, and finally trim it down while it is clamped on to the block itself, only take care of that port face. Remove burrs, mark out hole centres, and drill in place exactly as detailed for the front cover. The hole for the guide bar is *not* drilled at this stage.

LIKE SOMETHING UNUSUAL FOR THE LAYOUT?

The picture shows a Buoy Wagon used at Heysham Harbour (L.M. Region) and will interest readers who own layouts with docks. For the benefit of photographers, the photo was taken on a dull day at 1/50th sec. at f8 using Ilford H.P. 3 film.

Photo: Christopher Hood.



wherein were kept the cream of our models. The little boys dropped the items of stock which they had been clutching, and clustered eagerly around. I felt that the time had arrived for some defensive work. Gently levering Father's fingers from the catch of the door, I stood before the showcase.

"Not these, Sir, please," I said. "They are rather expensive and easily damaged." Father looked hurt.

"Come along boys," he called, giving me a dirty look—

"If the gentleman doesn't want us to see his toy trains we'll go along to Woolworth's—they've got just as good ones there."

I opened the shop door, and they left haughtily.

. . . . That night, I beat my wife.

A GAUGE O STEAM LOCO FOR BEGINNERS.

Part 12

By "1121"

Piston.

This of course, is another rather important bit, but there is nothing particularly difficult about it. It is only necessary to ensure that it is a good fit in the cylinder

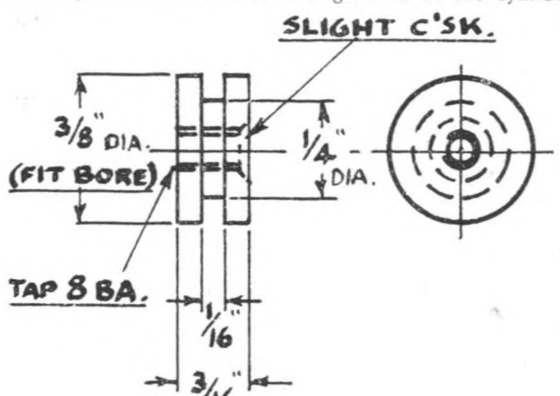


Fig. 59. The Piston.

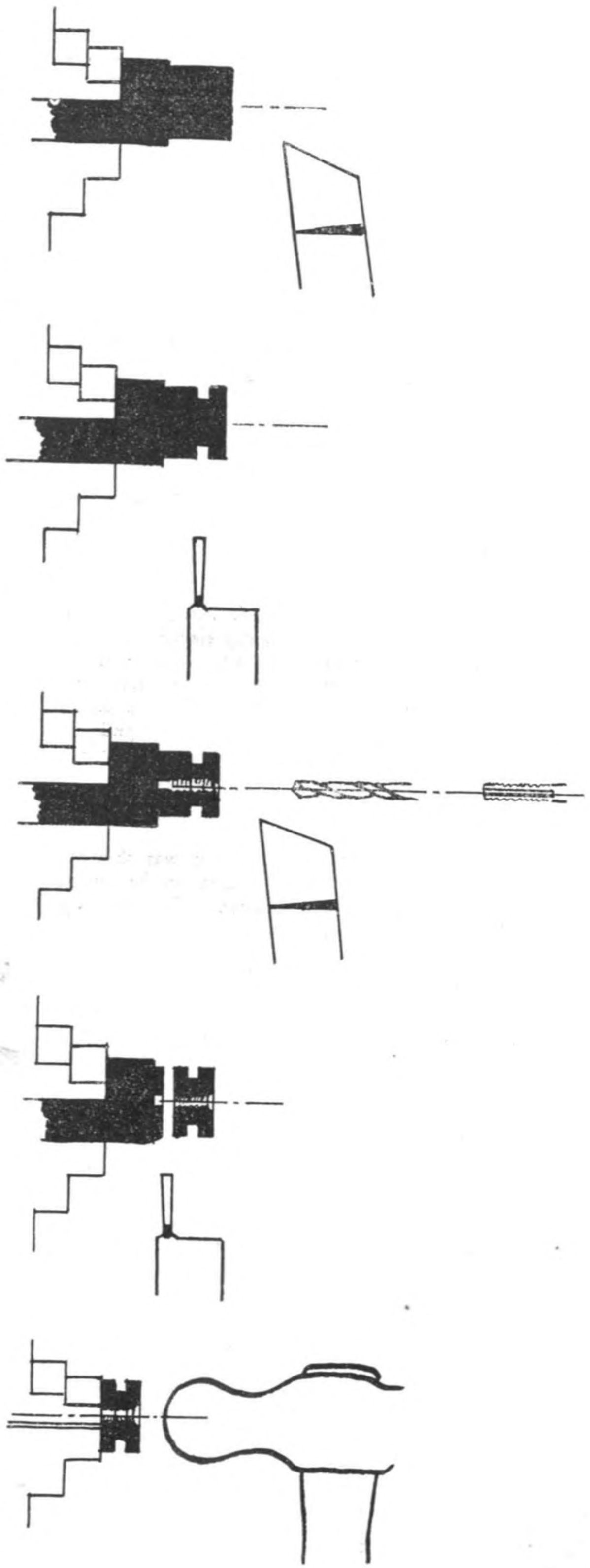


Fig. 60.

Sequence of operations for turning piston and fitting to rod. Top to bottom:

1. Face end, turn to 1/64 in. over finished diameter.

2. Form packing groove with parting tool.

3. Centre, drill No. 51, tap 8 B.A., countersink slightly.

4. Part off.

5. Screw on to rod, hold rod in 3 jaw chuck, with piston against jaws, lightly rivet over end of rod into countersink.

bore, and that the piston rod is fitted truly in the centre. For this reason, unless, again, you possess true-running collets, it should be turned and centred at one setting from 7/16 in. diameter rod and the finished article is shown in Fig. 59. As detailed in the "sequence of operations" diagrams in Fig 60. the end of the bar should be turned down to a little, say 1/64 in., over finished diameter, and the packing groove then put in with the parting-tool. The width and depth of groove shown make just about the right space to take a single wind of ordinary commercial graphited asbestos yarn, which is used to perfect the seal between piston and cylinder-bore, and provide a certain degree of continuous lubrication. The groove being put in before the piston is finally turned down to size, it is not a very serious matter if you accidentally knock the bar slightly out of true, as it will still clean up on the final operation. Furthermore, any burr produced will be projecting *into* the groove from either side, not outwards to the surface, and you need not risk marking the piston by trying to file it off.

A word or two on the technique of turning a bar to an accurate fit without the aid of accurate measuring devices may not be out of place at this point. The cylinder-block is, of course, used as a gauge to check the diameter, and operations are commenced only on the extreme end of the bar, say for a length of 1/32 in. or so. If you then find you have turned it down a bit small, you haven't scrapped the whole job, and can start again using the undersize end diameter as a "witness" to produce a more correct size, afterwards facing off the unwanted end. The original "roughing-down" turning should be carried back to a sufficient length, and the packing groove put in sufficiently far back from the end, to allow for such an eventuality.

This short length of "pilot" should, ideally, be turned to be a very tight fit in the end of the cylinder bore—too tight to push right in by hand, but tight enough for the block to stick on the end. When you reach this stage you can go ahead and turn back the remainder of the piston, with the knowledge that if you don't *quite* get down to this "pilot" diameter you are still safe. With the point of your tool hovering over the "pilot" diameter you can now carefully increase the depth of the cut until the tool *just* touches, and then wind it along the bar at that setting.

Now, there is always a certain amount of "spring" in the best lathe, and in the tool-holder and tool, and in the bar projecting from the chuck, and this, as we have seen before, causes the tool to remove a little more metal if a second cut is taken even without increasing its depth. The point is—and this is the principle underlying this system of arriving at a required diameter—the deeper the previous cut has been the greater is this amount of "spring." We are putting a *very* light cut on our "pilot" diameter, and then taking this through a slightly larger diameter which we have left on the rest of the bar, and although cutting on the "pilot" is not likely to produce any "spring," when we get along to the "step" this larger diameter *will* do, and if, having taken this cut, we were to take another at the same tool setting we should find that our tool would cut no deeper on what was the "pilot" portion, but would start to do so as soon as it encountered

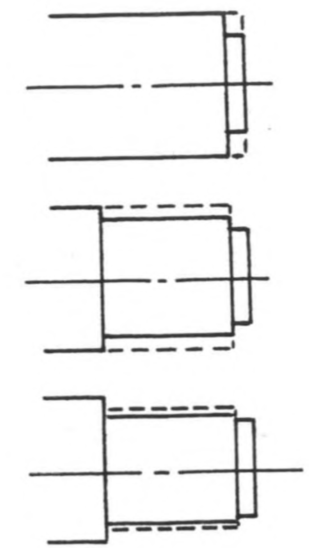


Fig. 61.

Sequence of operations when beginning to turn a rod to an accurate diameter. (Packing groove not shown). Top to bottom:

1. "Pilot" turned to be too tight for bore.

2. Remainder turned down almost to pilot diameter.

3. A cut over the remainder at pilot diameter leaves "step" due to spring. A further cut at the same setting removes this step.

Note Relative sizes have been much exaggerated for clarity—dotted lines show previous diameter turned in each case.

the slightly larger diameter on the next bit, left by the "spring" of the tool on the previous cut. That is quite a lot of complicated wordage, and we think it is about time we introduced some sort of diagram to illustrate, step by step, what we have been endeavouring to describe up to this point (Fig. 61).

With our piston at this stage—we have just taken an infinitesimal cut over the "pilot," and know that the "spring" in the tool has left the remainder a little bit bigger—we should try on our cylinder-bore. It it slips nicely over the "pilot," we can run the tool along at the the same setting, and know that we are removing no more metal from the "pilot" but are reducing the remainder down (or nearly down, due to further "spring") to pilot size. If the bore will now go right on, we are O.K. If it still only goes over the "pilot," obviously the remainder is still a little bigger, and another cut at the same setting should eliminate this increase of diameter.

To go back to the beginning of our last paragraph, if our bore will *not* slip on the "pilot," then the whole thing is still too big, and a little more cut should be put on to reduce the diameter of the pilot *and* the remainder of the bar, with everything once more reproduced—"spring," increased diameter behind the "pilot," and all. Then, once more, we try on our cylinder, and continue thus until we reach the desired stage of the bore going over the "pilot," but no further.

Now, if we overstep the mark when putting on our cut, we shall find that the cylinder slips over the "pilot" *too* easily, but due as we have been explaining, to "spring," it should still not go past the "step" behind the "pilot," unless we have been *very* heavy-handed with our cut, in which case, we must start again.

With our "pilot" now too small, and the rest of the job too big, it is easy to see that our required diameter lies somewhere between the two, and we can now commence operations on the *next* bit of diameter, producing *another* "pilot" behind the first to help us to get the rest of the job down to the size we want, and when we are finally there we can face off our all our "experimenting" from the end of the bar, and get it down to the correct 1/16 in. from the packing groove.

All this explanation is of a very old precision-turning dodge which is nothing like so complicated as it sounds and comes as second nature to an "expert" turner. We quite anticipate that we are now due for severe trouble from such folk for taking up so much space over it. It is done, however, and like some of the other similarly detailed "how-to-do-it" instructions we have been delivering in the course of this series, we hope it will last for all time and cover any future occasion when we merely write "turn the so-and-so to be a good fit in the so-and-so" —and let it go at that! One reader, we should mention, has been kind enough to write and say "Please do not curtail your detailed instructions by even one word. Most of us need and appreciate all the help we can get." *He's* happy anyway!

Now to get back to our piston. When we have got the diameter right, and the end faced off, it should be centred and drilled No. 51. The centering of course, is important, and we refer you to previous remarks (top of page 186 Oct. 1952) on the subject. Drill deep enough to ensure that you can tap a full thread deep enough to take in the whole 3/16 in. thickness of the piston. If you are using phosphor bronze, you will have to be careful with that tap, as you don't want to leave the end in there after all that turning work. We refer you back again to "Tapping without Tears" p. 175 Sept. 1952,

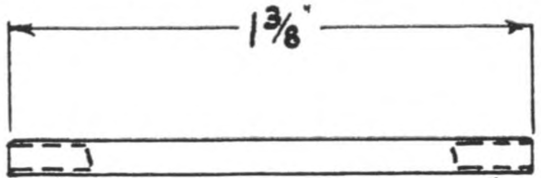


Fig. 62. The piston rod.

and "Tapping in the Lathe," p.206, Nov. 1952. Put a *slight* countersink in the end of the hole, and part off the piston to finished thickness. Alternatively saw it off as square as you can, and screw it temporarily on to the piston rod with this side outwards, hold the rod in the 3-jaw chuck with the side of the piston flat against the fronts of the jaws, and *carefully* face the piston down to size.

The piston rod, as shown in Fig.62, is a plain length of 3/32 in. stainless steel (rather hard to work—commercial grades vary a lot) or phosphor bronze rod, threaded 8 B.A. diameter each end. 3/32 in. in actual fact, is rather bigger than 8 B.A. diameter, but your die will screw it all right if it is opened up well for the first cut. Your tailstock or other die-holder should have three screws in it, and the centre one can be screwed into the "split" in the die, which will force it open.

Withdrawal of this screw and tightening of the other two closes the die up, so that within limits an adjustment of diameter of thread cut can be achieved. In this manner the thread should be cut successively smaller until the piston will just screw on tightly. Do the crosshead end of the rod the same, again using the piston as a gauge, but this time reducing the thread to a slightly easier fit for the crosshead.

Hold the piston rod tightly in a pair of pliers, with something soft wrapped round to avoid marking the rod, and screw the piston on tightly, countersink side outwards. The end of the rod should project through 1/32 in. or so—if it doesn't, remove the piston and give it a slight countersink on the rear side to let the thread enter a little further.

Hold the rod in the lathe with the piston firmly back against the chuck jaws, and very gently rivet over the end of the rod into the countersink. It doesn't want much—it is only to prevent the rod from coming unscrewed.. If the rivetted-over end still projects a little, face or file it flush at this stage.

To the Editor.

A Gauge OO Layout.

Dear Sir,

With reference to Mr. Stainsby's article in the July issue, I do hope he does not base his Watlington Branch line exactly as his photos. It will surely be stretching the imagination too much! These points for instance:—

1. After leaving Princes Risborough there are no signals, points being operated by ground frames.

2. No tunnels—there's only one overbridge.

3. A Mogul never! Only 0—6—0T, 57xx, 54xx etc., 0—4—2T and 2—4—0 Metro (now scrapped).

4. Single track—not double, and no long trains as I think that at the most only three corridor can be run round maybe only two.

Since the last war even excursions are worked by the only auto trailer, the excursions being joined at Princes Risborough. As an afterthought, even the trailer is not used as push-pull as most locos are not fitted.

I hope this does not sound too drastic, but I am quite willing to help in any way with information.

Yours faithfully,

L. Howse.

THE WESTBURY LINES OO GAUGE LAYOUT

Part 2. **By C. HUMPHREY LEACH.**

The space available as indicated by the plan, is very restricted. Sixteen feet by eleven feet plus a large bay is hardly my conception of a model railway space in 4 mm. scale. It is of course a space in which much pleasure can be known and hours of enjoyment can be spent. However, there were times when I wondered whether I had sufficient room or whether the scale was too big! I decided the scale was admirably right because I did not want to lose sight of my valve gears in motion, of drivers turning. I did not want to lose the flanges where they should not be removed and I required that every semblance of realism should be known from the operational point of view. It was necessary, therefore, to construct a through station and where the continuous run was required the station would have to be used each time round.

I was not prepared in any circumstances whatever, to restrict my station platforms beyond the absolute minimum of seven feet because that wasn't really suitable—I required platforms twelve feet long, and I was not prepared to wriggle my track around like tram lines.

Until such time as I can arrange my sixty foot room with a minimum width of twenty-five feet I shall enjoy the snaking effort of my trains and—go through the station every complete circuit. I have never regretted my firmness on this point and would only have 'climbed down' had I been going to operate small locomotives and wagons. Now I do not expect all modellers to stick rigidly to these ideals, but it must be appreciated my pleasure consists in operation of a realistic nature, not construction. And when you understand 60 ft. x 25 ft. is my ideal for OO gauge you will readily appreciate the theme is on 'running' and creating the impression of the real thing.

And what of O gauge then? In my opinion, so far as indoor operation is concerned, it is a gauge for the constructor, because the running effect is far away from realism. Gauge O is the kind of gauge which permits of detail for a photograph. The lines will not lend themselves to realism, neither in operation nor appearance, unless a vast area is available. So far as operation and running is concerned, together with

Off loop to engine shed. 0—4—0 shunter (colliery) bringing up empties.

reversing block, motion and driving wheels have been retained with only minor modifications. The lubricator has also been retained, but reduced in diameter to fit the scale diameter smokebox, while the boiler and superstructure are completely new and other additions include the remote control gear, stud-contact and outer-third pickups, and a pressure-gauge, mounted horizontally immediately below the sliding ventilators in the cab roof, which are made to open, thus rendering the gauge readily visible. Another useful addition is a water trap in the exhaust pipe which catches all liquid expelled from the cylinders and drains it into a drip tray incorporated into the pony truck, leaving the steam to exhaust in the proper manner.

Before describing these components in more detail, it might be as well to give some general notes on the operation of this locomotive. A special controller has been built for it incorporating a variable resistance for regulating the heater current, and a telephone type key which is virtually a double-pole, double throw switch with central "off" position for the D.C. control motor current. It will be appreciated that the ability to control both the rate of steam generation and the throttle setting simultaneously enables the locomotive to be driven in a very realistic and satisfying manner, though the incorporation of a more sensitive regulator would still further improve matters. Moreover, one has to learn to drive an engine of this type, and this is all part of its charm. It has certainly made my once-prized electric locomotives seem dull and lifeless things by comparison, and I never noticed before what an objectionable noise they make!

A very large measure of speed control can be obtained after a little experience by the use of the heat regulator alone, and when non-stop running is called for I normally run the engine with the throttle wide open and adjust the boiler pressure to suit the load and speed required. Start-stop running however calls for rather higher boiler pressure and use of the throttle for speed control. When the first experiments with remote control were carried out it soon became apparent that this gear should be rapid in its operation to give the best results, though the faster it is the more difficult it becomes to obtain fine adjustment of the throttle. If the operation of the gear is too slow, however, it will not be possible to start and stop the engine in a reasonably short distance, and shunting operations become somewhat hazardous as a consequence. With the gear as finally assembled the engine can be started and stopped in a distance of about four inches, and now that I am acquiring a bit of skill, I find little difficulty in running it on to the turn-table and off again without any undignified pushes to get all the wheels on the table at once. As for hauling power, the locomotive will comfortably handle trains of ten coaches and will steam continuously with this load on rather less than full power, though I should mention that most of my passenger stock, which started life as commercial products weighing some 30 ounces each, have been reduced in weight to an average of just under a pound a piece, and run on needle bearings. Any appreciable increase in load above this figure results in excessive wheel-spin and consequent rapid loss of steam, and in this connection it is presumably the uneven torque of the steamer that makes it noticably more prone to slip than an electric locomotive of comparable weight. However, as No. 2537's normal workings only call for trains of seven or eight coaches I am not unduly bothered about this, but my next engine, when I get around to it, will have sprung drivers and better bearings for the driving axles, in the hope that improved adhesion and reduced frictional resistance will appreciably add to the maximum hauling capacity.

The use of an outer-third rail for control purposes is admittedly something of a drawback, particularly on a system that was converted from outer-third to stud-contact partly to improve the appearance of the track. However, use of an extra rail could have been avoided by using insulated rims on the drivers and supplying the control current on the two-rail principle. Apart from the difficulty in obtaining suitable wheels and other complications, this would have meant scrapping the track-circuiting already in use on my layout and modifications to all existing stock. This was considered to be not worth while and so outer"-third" it had to be. Of course, this rail need only be laid in comparatively short sections, though early on I learned the wisdom of providing it on a fairly liberal basis to begin with, until a certain amount of experience has been obtained in operation, when lengths which are found in practice to be unneccessary can be taken up again.

The principle dimensions of the model are closely to scale, and it is unusual for an O Gauge steamer in conforming to seale loading gauge. The principle departure from correct outline is the leading extension to the footplate, which is rather longer than it should be. However, this was deliberately left unaltered in an effort to counteract the visual effect of the over-scale cylinders. The

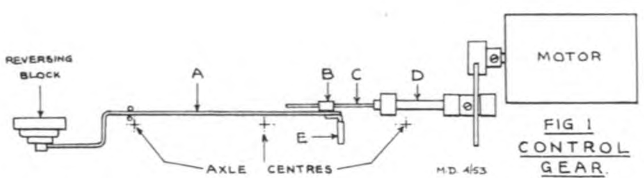


FIG 1 CONTROL GEAR.

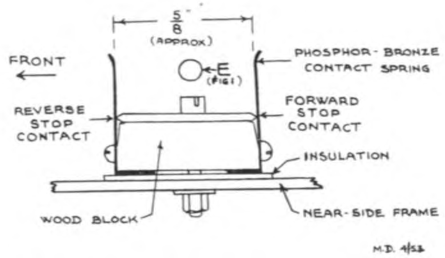


FIG 2. MOTOR STOP CONTACTS

width over the cylinders is also too great, but this could be reduced if fine-scale wheels were fitted.

So much for the general details, and now for some notes on the various components. I do not intend to trespass too much on our Editor's valuable space by describing the construction in great detail, but will confine my remarks to a general indication of the design and function of each part, taking them in order of assembly.

The First Stage.

The "Mogul" was first completely stripped down and a set of drawings prepared in which the outline of the completed engine was superimposed on the "Mogul" frames and the positions of the remote control motor and other parts determined as accurately as possible. After this the frames and footplates were cut, drilled and filed where required, the reversing block replaced, and the remote control gear assembled.

The Remote Control Gear.

Readers familiar with the "Mogul" will know that the combined throttle and reverse control consists of a commutator block operated by a shaft normally moved to and fro by a lever in the cab. When the shaft is moved fully backwards steam is admitted to the inner valve ports, and the outer ports are connected to the exhaust, the return cranks usually being set so that this results in forward running. When the operating shaft is moved fully forwards the block reverses the steam and exhaust connections to the valves, thus reversing the engine, and in the mid-way position steam is shut off. It is a fairly simple matter, as other writers have shown, to operate this control electrically by connecting the shaft to a nut traversing a rotating threaded shaft driven through suitable gearing by a reversable motor.

The arrangement finally adopted is shown in Fig. 1, in outline form. The operating shaft A is fashioned from the original part and to the end of it is soldered the 8 BA traversing nut B (more of this anon). The threaded portion of the rotating shaft C is a $1\frac{1}{2}$ in. length of 8 BA steel rod, and this is securely soldered into a hole drilled centrally in the end of the main rotating shaft D, which is a length of Meccano axle—No. 43 drill, by the way. On the end of this shaft is a 50-tooth Meccano gear which engages a 19-tooth pinion on the motor shaft, these two gears being at 15/16 in centres. The bearings for the rotating shaft are simply Meccano collars soldered to the inside of the offside main frame in such a position that the whole mechanism just clears the upper surface of the coupled axles. Before leaving this, mention must be made of the insulated projection E on the operating shaft. This is so arranged that when the shaft reaches the limit of its travel in either direction the projecting arm opens an electrical contact and stops the control motor automatically. The Motor Stop contact assembly is illustrated in Fig 2. Its sole function is to prevent the threaded shaft from jamming tight by forcing the reversing block hard against its stops, and it will be seen from the wiring diagram Fig. 5 (next month) that while the opening of the appropriate contact prevents further rotation of the motor in one direction it does not prevent rotation in the opposite direction when the control key is changed over.

A GAUGE O STEAM LOCO FOR BEGINNERS.

Part 13.

By "1121"

Cross head.

This is a simple block of phosphor-bronze, made from 3/16 in. x 5/16 in. bar. (This size bar an be used for several other bits on the engine later on). Cut off a piece to clean up to 3/8 in. long and mark the positions of the piston rod and guide bar holes on one edge, as shown in Fig. 63. *Do not* mark or drill the cross-hole for the pin at this stage. It is obviously important that the two holes should be truly parallel, so the piece should preferably be held in a machine-vice for this operation. If you haven't one stand the crosshead alongside a square block of metal, and clamp the two together with the toolmaker's clamp, so that the piece is held vertically and can't shift during drilling. Drill both holes No. 51, the guide bar hole right through and the piston-rod hole for a depth of 3/16 in. Open out the guide-bar hole with a 3/32 in. drill. Put your 8 BA tap in the drill chuck and get it started in the piston-rod hole by rotating the chuck by hand. Release the chuck leaving the tap sticking out of the hole. You can now continue tapping by hand and be reasonably sure that the tapped hole is parallel with the guide bar hole. Finish tapping with a plug tap to get the threads as deep as possible. Note that little bits of metal can get down in the bottom of the hole and prevent the tap going right in, so the tap should be removed and these bits knocked out. You will probably find that the tap will then go in a bit deeper.

Assembly.

Push the piston-rod through the back cylinder-cover. You will almost certainly be prevented from doing this due to a little bit of metal which the die has left projecting where it finished the thread, so this should be

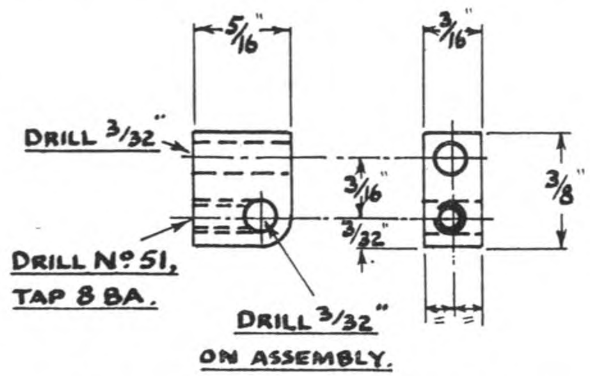


Fig. 63. Crosshead. (Shown finished but the cross-head-pin hole is *not* drilled at this stage).

filed off carefully. Whenever a piece of threaded rod has to be pushed through a hole a mysterious reluctance to go through can usually be traced to this cause. Thread the gland screw over the outer end of the rod, and before screwing it into the boss on the cover wrap a little bit of a single strand of graphited packing round the rod, and stuff it into the hole in the cover. Screw the gland screw down on to it tightly, then withdraw it again, and if necessary put a little bit more packing in until the screw goes into the hole two or three threads. It doesn't need to be in very tight—little more than finger-tight is necessary, otherwise it will cause excessive binding on the rod.

Next screw an 8 BA nut on the other end of the rod, followed by the crosshead, and lock the two together firmly.

Make a pair of brown-paper joints or gaskets for the front and back cylinder covers respectively. These should be of good hard quality brown paper, not woolly stuff, and are cut out as follows. First rub a little bit of the paper over with oil, and stick it down on to the end of the cylinder-block. You will be able to see the shape of the block through the paper, and the first thing to do is to push the point of your scriber into the four screw-holes. Now very gently tap round at the end of the bore with the ball-pane of your hammer, which will cut through the paper far more neatly than you could do it any other way, and fish the unwanted circle of paper out of the middle. This hole should be cut in the front joint as well as the back one, otherwise the exposed bit of paper in the end of the bore will go soggy when the steam gets at it, and you will have tremendous trouble through it stopping up the steam passage-ways, and getting under the valve and preventing it from seating properly on the port-face. You can either cut away the excess paper round the outside of the block by tapping round the edge with the hammer, or prune it off with a razor blade after the cover is screwed on.

Push the piston into the back end of the block, and screw the cover down firmly with 8 BA cheesehead screws, $\frac{1}{8}$ in. long, and attach the front cover in the same way. The crosshead itself is now used as a jig for drilling the hole for the guide bar in the back cover—twist it round until it stands vertically when checked with your square with the block standing on the surface-plate. Put your toolmaker's clamp right over the whole thing—it can rest on the screw-heads on the front cover if necessary—and rest it on a pair of pieces of metal the same thickness, to clear the clamp jaw, (Fig. 64). Now spot through into the small end of the boss on the back cover with the 3/32 in. drill through the guide-bar hole in the cross-head. Replace the drill with the No. 43, and put this in $\frac{1}{8}$ in. deep.

The guide bar is a $1\frac{3}{16}$ in. length of 3/32 in. diameter silver-steel, and the outer end should be filed to a slope on the underside, as shown in the assembly drawing Fig. 65, to clear the top of the connecting rod. It doesn't need very much taking off—the rod only just fouls it. Make sure you leave no burrs when doing this, as these will jam in the crosshead, and similarly remove any others you can find on any part of the guide bar. Slide the guide bar through the hole in the crosshead, and try the end for fit in the back cover. If it seems too tight, file a slight "lead" on the end in the lathe or drill.

When it will begin to stick into the hole, push it in tightly by bringing the drilling-machine chuck down on to the end of it, checking first that the chamfer at the outer end is in the right position.

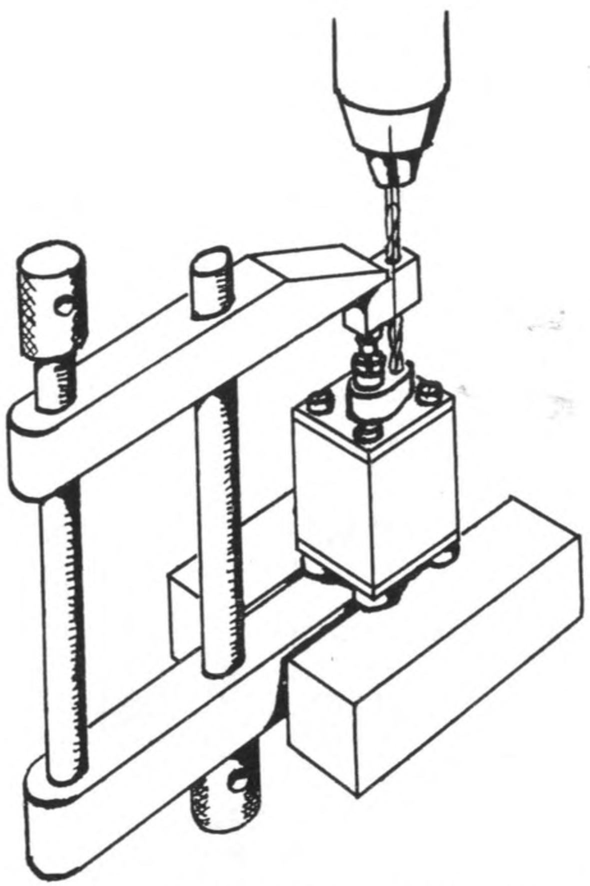


Fig. 64. Spotting through the crosshead to position the guide-bar hole. (See Fig. 55)

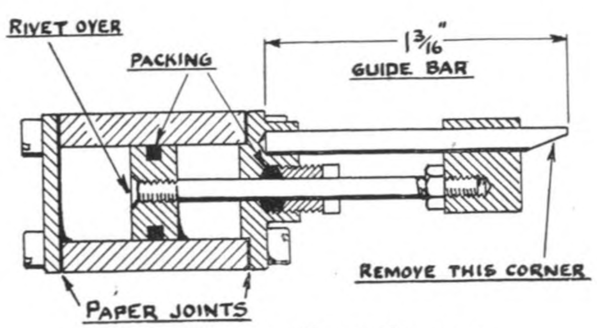


Fig. 65 The assembly at this stage.

Publications.

'TRAMWAYS OF THE WEST OF ENGLAND' by P. W. Gentry. 140 pages, 85 tramcar illustrations, 75 ticket illustrations and 17 maps and diagrams. Published by Gentry and Walker, 245, Cricklewood Broadway, London, N.W.2. 14/6 board sides, 16/6 full cloth.

This book gives detailed descriptions of 12 tramway systems in the West Country and ranges from the Lynton and Lynmouth Cliff Railway to the elaborate systems of Bristol, Bath and Plymouth, etc. The painstaking research which has gone into this volume is a credit to the author and it is to be hoped that he will produce further volumes on the same subject.

The photographs are extremely well selected and constitute an admirable record of a form of transport which has now nearly passed into history. A particularly interesting chapter is that devoted to the Camborne layout which was the only street tramway ever constructed in Cornwall and was one of the first and only lines of its kind to cater for mineral traffic.

We can thoroughly recommend this book and know that it will be welcomed by the large army of tramway enthusiasts as well as those interested in all other branches of transport.

'RAILWAY MODELLING' by E. F. Carter. 88 pages, 21 diagrams, 5 half-tones. Published by W. G. Foyle Ltd., 119-125, Charing Cross Road, London W.C.2. at 2/6 nett.

To the Editor.

Model Tramways.

Dear Sir,

I must congratulate you on following the lead of your American contemporary 'Model Railroader' in publishing articles of tramway interest. After all the principle of rail traction is the same in both cases, therefore, the tram should not be despised by British railway modellers.

An interesting prototype for the man who is short of space would be the inter-urban electric railway. Such lines, examples of which may be found in America and most European countries, operate heavy electric trains on both street track and private right of way A train may consist of anything between one and five cars.

Models of inter-urban cars may be constructed using Standard British motor bogies, such models should be able to traverse a 9 inch radius curve in OO gauge.

Yours faithfully,

F. W. HUNT.

Congratulations. Merseyside.

As we close for press we learn that the Exhibition organised by the Merseyside Model Railway Club from 24th—26th, September attracted over 11,000 visitors just over 5,000 of whom attended on the last day.

Change of address.

Messrs. True Model Co., have acquired new premises at 284, Upper Richmond Road, London, S.W.15 where Mr. E. Miskin will be pleased to welcome old and new customers. A full range of models, tools and accessories are available and the premises are laid out to give the best possible service to modellers.

Club Notes.

Bletchley & Dist. Model & Exp. Society.

Will readers please note that the post of Hon. Sec. has now been taken over by S. C. Langford, 36, Walnut Drive, Bletchley, Bucks, to whom all communications should now be addressed.

Billericay Society Model Engineers.

The Society has been fortunate enough to secure permanent headquarters in Billericay and a welcome is extended to all modellers in the district. All branches of modelling are catered for and an extensive programme has been planned for the winter months.

Hon. Sec. R. Leach, 6, Mayflower Road, Billericay, Essex.

The "Four and Two" M.R. Club.

The Gunnersbury M.R.C., late of 526 High Road, Chiswick, W.4., which had to be disbanded owing to the loss of premises, has now been reformed and renamed "The Four and Two M.R.C."

New premises have been obtained in Chiswick and the Club meets every Friday evening at 8 p.m. The OOO (2 mm) layout as shown at the 1951 and 1952 Exhibitions at Central Hall, Westminster has been installed and is now in the process of modification. It it hoped to make a start on the OO(4 mm) layout based on the original Gunnersbury M.R.C. layout early in the New Year. All the necessary equipment is available.

There are vacancies for new members in both the OO and OOO Groups and all interested should contact the Hon. Sec., Major C.D.A. Provo, M.B.E., 143, Watchfield Court, Sutton Court Road, Chiswick, W.4.

May to December each contain five such extra pages. Remember to include all these. Generally it is preferable for us to have the complete magazines to avoid risk of error, but the removal of the outside orange cover if desired will not cause any complications.

6. We have only one standard of binding i.e., the 262 numbered pages which comprise the volume. We regret that we are unable to include advertising pages, covers or any other extraneous matter.

7. Volumes previous to Volume 20 can be bound at the same price. The appropriate index should be included in all cases.

8. Before requesting us to supply missing issues to complete any volumes sent for binding, please check the list of back numbers to make sure that these issues are available. We have only those numbers in stock which we detail in the advertisement.

Our Cover Picture.

The Manchester Model Railway Society's Gauge O track will be an important feature of the Exhibition which the Society is staging from 18th to 20th December. Although in fine scale the track is laid to standards which allow a large range of wheel and flange dimensions to operate satisfactorily.

Our photograph shows the Secretary "Bill" Tate driving home the last main line chair pin under the rather critical eye of Barry Paterson.

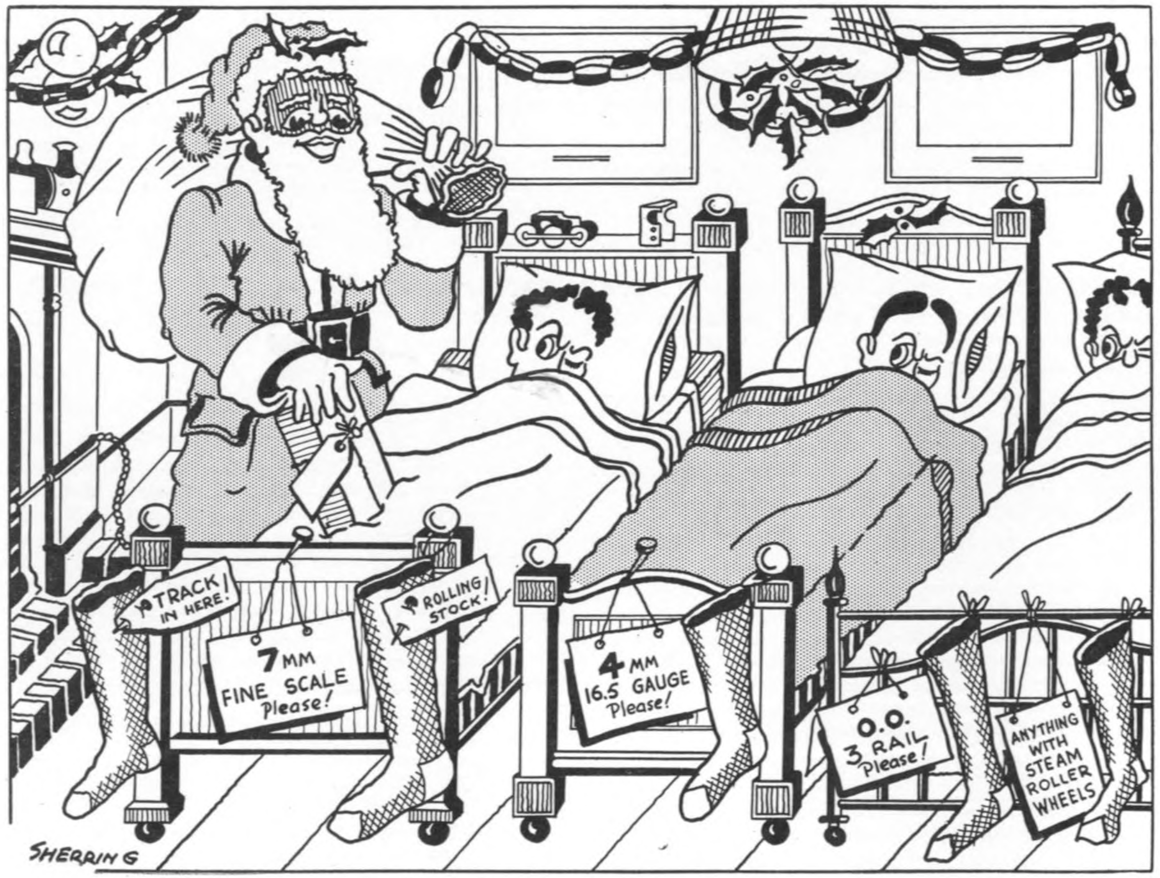
A description of this very interesting Gauge O layout is scheduled for publication.

"The Link."

The Manchester Model Railway Society's journal 'The Link' has always been one of our favourite Club publications, and it was particularly pleasing to note that the current issue bears the number 200. As might be expected it is something of a "Special" celebration number, and the atmosphere is well set by the brightly printed cover bearing a photograph of the Southern Railway Adams class 02 locomotive No. 200.

The 24 page issue contains some interesting extracts from earlier copies of the Magazine which was launched in 1934, as well as the usual items we have come to associate with this well edited publication.

We wish the Society every luck in the attainment of their third centenary.



"That's what I like to see—organisation!"

Part 14.

A Gauge O Steam Loco for Beginners.

By "1121."

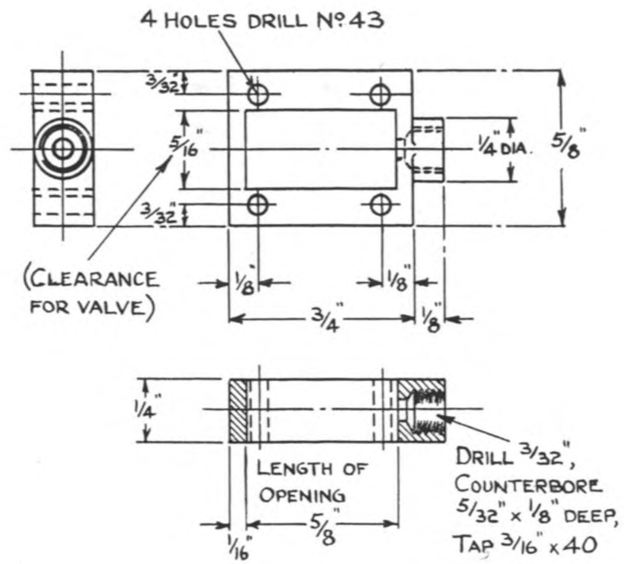
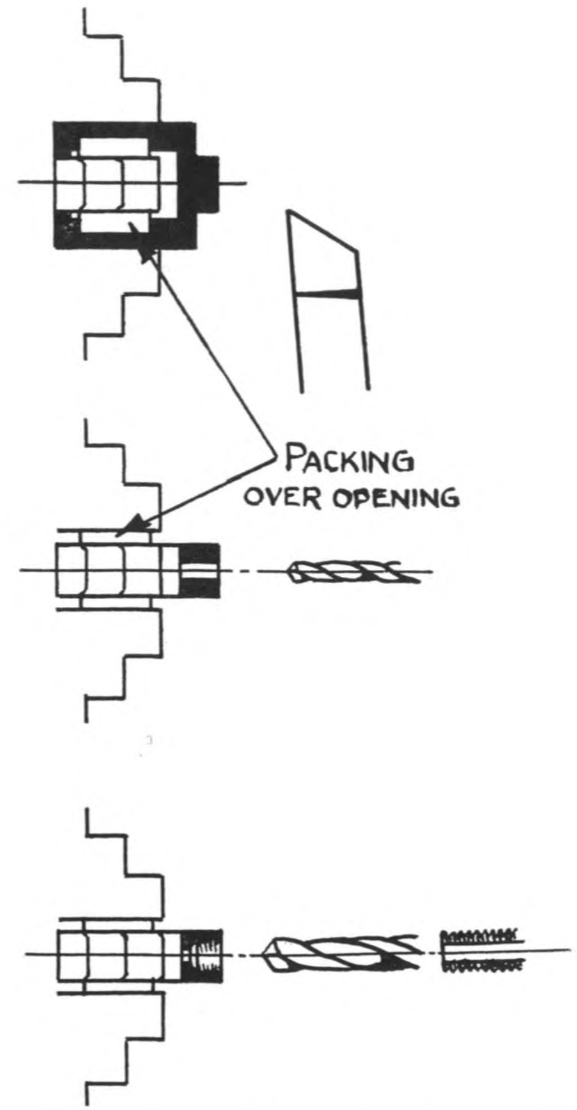


Fig. 66. The steam-chest.



Steam-chest.

This, shown in Fig. 66, is made from a piece of brass bar, $\frac{1}{4}$ in. x $\frac{5}{8}$ in. by $\frac{7}{8}$ in. long. There are two alternative ways of forming the large rectangular opening in the middle—either by drilling two 9/32 in. holes and then filing them out to the finished shape, (this drilling would be best done before cutting the piece off the end of your bar, to give you something by which to hold on to it) or else by drilling a string of little holes, say $\frac{1}{8}$ in. and then breaking the middle bit out and cleaning up by filing. Both methods are shown in the sketch Fig. 67. Next hold the piece in the four-jaw chuck, with pieces of packing as shown in the "Sequence of operations" diagrams Fig. 68, and turn the boss, face the end, centre,

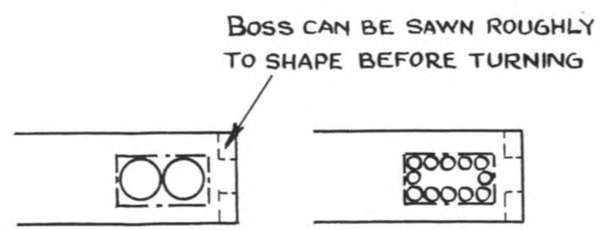


Fig. 67. Alternative methods of forming the opening in the steam-chest.

Fig. 68. Sequence of operations for machining end of steam-chest. (actual size.)

1. **Hold in 4-jaw chuck, with packing as shown. Turn boss.**
2. **Centre, drill 3/32 in.**
3. **Counterbore 5/32 in. 1/8 in. deep tap 3/16 in. x 40 threads per inch.**

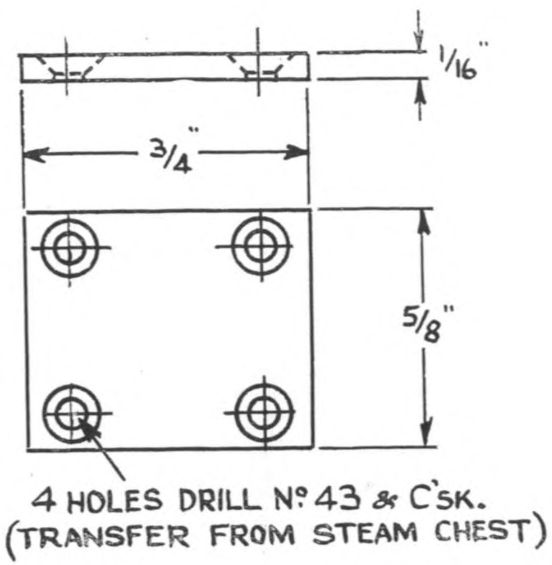


Fig. 69. The Steam-chest Cover.
(Twice full size.)

drill 3/32 in. open out to 5/32 in. and tap 3/16 in. x 40 T.P.I. Clean up all over, and particularly make sure that the two sides are flat. This is most essential, in order to ensure getting a good contact between the steam chest and the cover on one side and the cylinder block on the other, as although we shall be having paper joints between them, these will simply blow out if they are not held firmly all round. About the only way for the amateur with limited equipment to get these three surfaces right is to hold them down firmly and rub them up and down a large smooth file, being careful not to allow the piece to tip and round off its corners.

Mark out the positions of the screw-holes, and drill them first No. 51. Clamp the steam-chest to the cylinder-block, and transfer these holes through, making sure you don't go too deep and find yourself breaking into the bore! At this stage make a mark of some kind on one or other face of the steam-chest, so that you will know later on which face goes against the cylinder block. Cut the steam-chest cover from 1/16 in. brass plate (Fig. 69) Deal with one side as before to make sure it fits flat against the steam-chest, and then clamp the two together and transfer the holes through from the steam-chest. Now open out the holes in these two parts with the No. 43 drill, countersink the outer side until the heads of your 8 BA. screws go right down flush, and tap the holes in the cylinder block. Make sure the screw-heads will go right down, if necessary slightly countersinking the tapped holes in the cylinder block to clear them.

Valve.

All remarks made about accuracy of dimensions when the cutting of the ports was described apply equally to the valve. It's not much good having the ports right

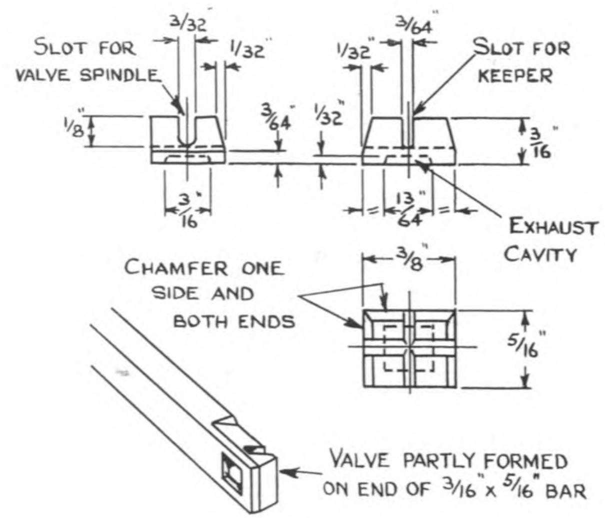


Fig. 70 The Slide-valve.

if the length of the valve or its cavity are wrong. The valve also is peculiarly prone to leaping out of your fingers and disappearing under the bench, by the time you have pruned most of the corners off it and you have nothing to hold, so keep your eye on it! It is made from the same 3/16 in. x 5/16 in. bronze bar as was used for the crosshead, and again it is most convenient to do as much work on it as possible before cutting it off the bar. Mark out the size and position of its cavity, leaving a little more space than you actually need between the end of the cavity and the end of the bar. It is easiest to trim it off to exact length later. Now get busy with your chisel, and dig four little grooves along the four sides of the cavity, afterwards chipping away the middle piece. The depth of the cavity is not terribly important, so long as it is enough to provide a clear get-away for the exhaust steam. Likewise the width of the cavity across the valve is not vital, provided it more or less matches up with the 3/16 in. width of the ports. The length, however, is important, as on this depends the correct timing of the exhaust, the extra 1/64 in. providing an early exhaust and preventing back-pressure on the piston. Make sure the ends of the cavity are truly square across it—they can be trimmed up with a small flat file after chiselling.

Turn the bar over in the vice, put the saw-cut across the centre and file off one corner. This will be the top edge of the valve as it sits in the steam-chest, and the chamfer is there to ensure a clear way through for the steam entering the steam-chest. File the chamfer on the end of the bar, and then cut the piece off a little over-length. File the chamfer on the other end of the valve, and then hold the piece long-ways in the vice and set about producing the longitudinal slot where the the valve-spindle lays in. Our method of doing a wide slot like this is to use two hacksaw-blades together in the hacksaw frame, finishing the slot to shape afterwards with small files. The slot must be deep enough to clear the

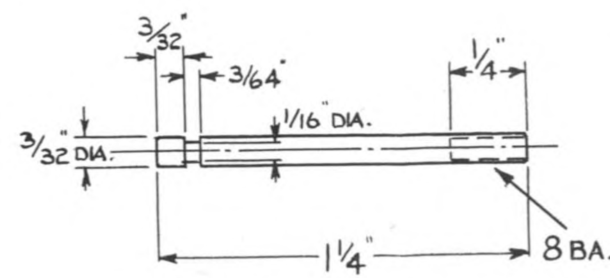


Fig. 71. The Valve Spindle.

valve-spindle, but not deep enough to break through into the exhaust cavity! The slot can best be checked by inserting the valve in position in the steam chest, on a flat surface, and pushing the valve spindle through the hole in the steam chest (with the gland-screw in place to keep it square), making sure that it will pass through the slot in the valve and allow the latter a small amount of "lift." The dimensions of the valve are shown in Fig. 70, and the final operation is to trim it to finished length, being particularly careful to leave the cavity an equal distance from either end, otherwise you will have the valve doing different things at either end of its stroke. Make sure there are no burrs anywhere, and rub the valve on your flat file to get its under surface flat and smooth. Make sure you don't round off any of the four bottom edges.

Valve spindle.

This is simply a length of 3/32 in. phosphor bronze or stainless steel, threaded at one end 8 BA., and provided with a groove at the other, as can be seen in Fig. 71. By rights, of course, this groove should be turned, if you have a 1/32 in. parting-tool and a high-speed collet lathe, and the "know-how" to use them both. Otherwise it can be put in with a small flat file, using the edge, with the face held against the front of the chuck-jaws.

The valve keeper, Fig. 72 must surely be the fiddliest bit on the whole engine, and like the valve and any similar parts should be finished as far as possible before

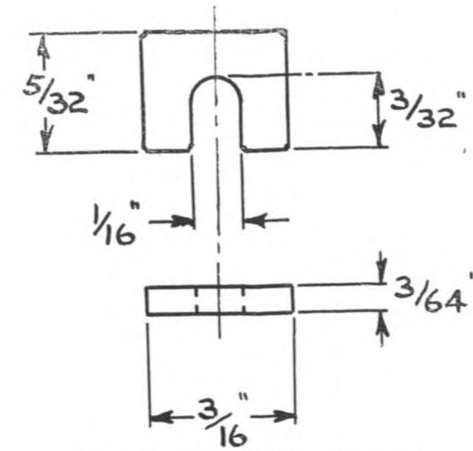


Fig. 72. The Valve Keeper.
(four times full size.)

cutting it off the end of the strip. If the groove in your valve-spindle comes out a little wider than the 1/32 in. shown, this little plate should be made from proportionately thicker material, as there must be no longitudinal shake of the valve on the spindle to cause "lost motion" on the valve. Make sure there are no burrs, particularly round the edges of the little slot in the keeper; in fact you can go round this slot with your small files and put a little chamfer all round it, in case there is a slight radius in the bottom of the groove in the spindle.

We show the assembly of the valve in the steam-chest in Fig. 73, so that you can see how it will go together, but for the present the steam-chest and its cover should be assembled to the cylinder-block *without* the valve or spindle.

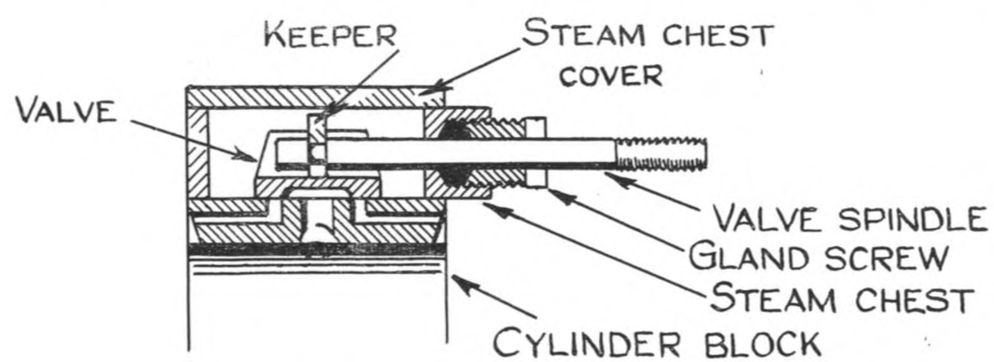


Fig. 73. Assembly of the Valve in the Steam-chest.

I have been greatly indebted to a number of correspondents who have kindly supplied information which has enabled this article to be prepared, particularly Messrs. F. E. Box, W. E. Hayward, R. Lloyd-Holt, H. J. Pritchard and G. F. Tull.

Previous articles on the Lynton & Barnstaple Railway rolling stock appeared in the following issues:—

Part 1.—(1) March, 1951.* (2) April, 1951.* Manning Wardle Locomotives.
Part 2.—August, 1951. Third Class Coaches.
Part 3.—November, 1951. Coach Details.
Part 4.—February, 1952. Composite Brake Coaches.
Part 5.—October, 1952.* 4-wheeled Goods Vehicles.
Part 6.—May, 1953. Bogie Wagons.
*Out of Print.

British Railways Apprenticeship Scheme.

Every boy who starts with British Railways as an apprentice trainee is given an attractively illustrated 32 page brochure which not only helps him to understand the particular course of training he will undergo, but points out its relationship to the other courses and indicates the general railway background against which he will work.

The Derby Locomotive Works Training School covers theoretical and practical training as well as physical education in the well equipped School Gymnasium. Every boy selected for employment as an apprentice spends twelve months in the Works Training School prior to commencing an approved apprenticeship in the main workshops.

For the ambitious boy there are now open many avenues of promotion, details of which are published in the brochure.

Copies of the brochure are also supplied to parents and educational authorities seeking information about the apprentice training scheme.

Part 15.

A Gauge O Steam Loco for Beginners.

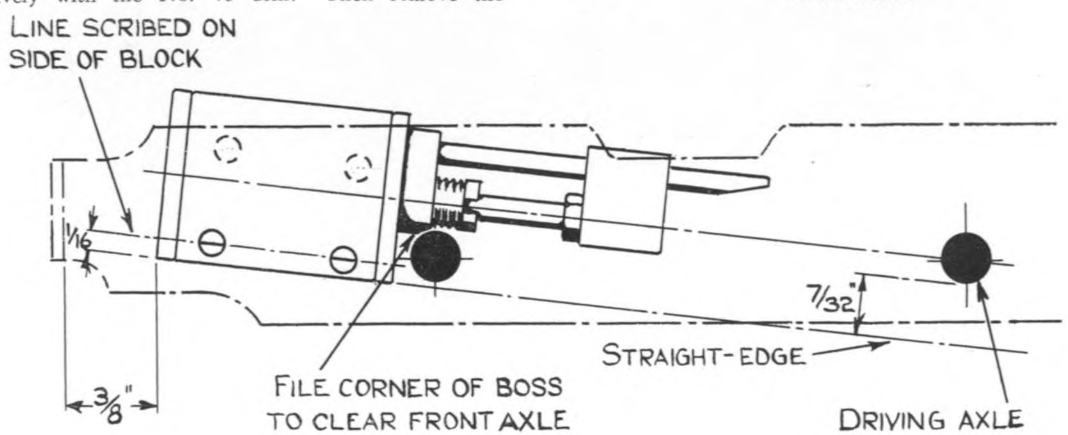
By "1121."

It is important that the cylinder block should be correctly positioned in the frames and the diagram (Fig. 74) shows just where it goes. The main thing to watch is that the piston-rod gland screw shall clear the leading coupled axle, and that the centre-line of the piston-rod shall be truly in line with the centre-line of the driving axle; we show how this latter point is checked by means of a straight-edge. Assuming that your cylinder is made to the correct dimensions, the centre-line of the piston-rod will be $\frac{5}{16}$ in. above the under-surface of the block, and subtracting half the diameter of the axle from this $\frac{5}{16}$ in. gives the $\frac{7}{32}$ in. dimension between the underneath of the axle and the top of the straight-edge, which can be measured with your rule or checked with inside calipers, if you have any small enough.

The cylinder is kept in place by means of the toolmaker's clamp right over the frames, and when you are sure it is in the right position spot through the holes in the frames into the cylinder block and steam chest cover respectively with the No. 43 drill. Then remove the clamp and take out the cylinder. Unscrew the steam chest and cover, and continue with the No. 51 drill into the block, right through the steam chest cover, and tap both 8 BA (Fig. 75). Temporarily attach the steam-chest cover to the inside of the righthand frame with two short 8 BA countersunk *brass* screws, and carefully saw and file the inner ends of these off flush with the inside of the cover, as you don't want them sticking through inside and getting tangled up with the valve. All this being done, the cylinder-fixing holes in both frames can be countersunk, remembering to give the tapped holes a touch with the countersink if necessary to clear the screwheads.

If you would like a further check on the position of the cylinder block in the frames before you spot through

Fig. 74. Locating the Cylinder in the frames. Note that the $\frac{3}{8}$ in. dimension is between the bottom corner of the front cover, and the inside of the buffer-beam.



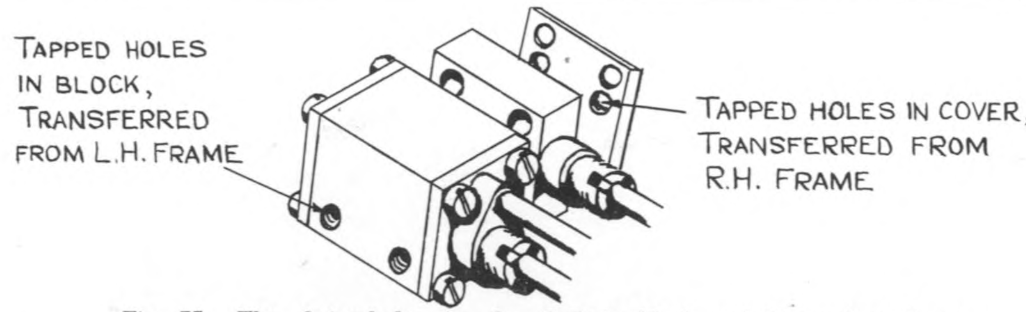
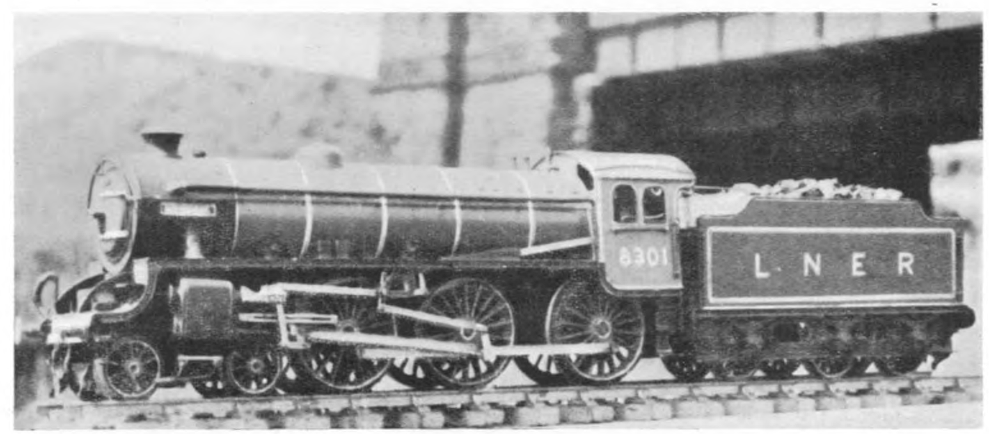


Fig. 75. The fixing-holes in the Cylinder-block and Steam-chest Cover.

with the drill, you can scribe a line along the side of the block which goes next the lefthand frame, at $\frac{1}{16}$ in. from the bottom face of the block. The two screws on this side should come approximately on this line, so that when you are getting the block clamped in you can look through the holes in the frame and see that the line goes approximately across their centres. This line is indicated in the diagram, to give the idea.

A 7 mm. Scale Ex-L.N.E.R. Class B.1 Loco.

By J. B. CLEGG.



Some time ago a friend suggested that I should model a B1, as it would be a simple prototype for a beginner. After completing the model I am inclined to disagree with him.

This engine is 7 mm. scale (stud contact) and driven by a Romford motor, which is a credit to the manufacturers, in that it can be varied from a crawl to a scale speed of 120 m.p.h.

The frames and the whole of the superstructure, with the exception of the boiler is made from nickel silver, which I found to be an excellent material to work with. The boiler is made from brass tube salvaged from an old telescope, the thickness being only 1/64 in. made the soldering of the boiler mountings, etc., a piece of cake. The beading round the tender and cab windows was made from copper wire filed half flat and soldered in place.

Now came the difficult part—the cylinders and motion. I cut the cylinders from solid brass—never again! In future they will be fabricated from plate. Ever tried soldering solid cylinders to thin frames? The desired result was achieved after a lot of "sweating" over the gas ring.

The moving parts in the motion work are secured with 'Hobbies' brass pins, soldered behind and the surplus length cut off. This proved more satisfactory than screws at they tend to work loose.

Finally, just a few words about the painting. The model was given two coats of flat paint and then lined out with a mapping pen and Indian ink. Some modellers prefer a ruling pen, but I find a mapping pen more suitable. The boiler bands are thin strips of white paper, lined out and glued to the boiler. The lettering was blocked in white ink and then given a coat of yellow poster colour. When the whole thing was dry a thin coat of semi-gloss varnish was applied.

In conclusion I should like to take this opportunity of thanking B. R. Wing for his excellent photograph and H. F. Darnbrough for the developing and enlargement. A natural background seems to have a wonderful effect on a model.

What else happened? Only a good number forgot to include the index which we had to write and request. Another section took out the wrong pages which we had to retrieve. Another group specialised in sending cash for issues to complete the volume which were out of print and we had to return parts and money. Quite a few who had overlooked a stamped addressed card to acknowledge the parts have since written to enquire if we received them safely. Anything else? Oh yes, we had to return sundry letters (often unposted), bills, leaflets and other oddments which had been left in the pages of the issues and just be on our guard against the fellow who included a June 1952 issue instead of 1953 in the set.

All in all it was the worst binding season we have had and we hope it will not occur again. And if you want to write and say that you didn't do anything like this with *your* set of parts, don't forget to put your address at the top.

Our Cover Picture.

Shows a view on the Gauge O layout built by Mr. N. S. C. Macmillan. The engines are an H.R. "Castle" and a Caledonian Railway 0-4-4 tank. We shall be describing these locomotives in more detail in a future issue.

INTERURBAN CARS.

An American reader—Mr. J. G. Dickinson—describes his HO model cars.

Readers will doubtless be interested in these HO scale American Interurban Cars constructed by M. J. G. Dickinson, Durham, North Carolina, U.S.A. The following notes are supplied by Mr. Dickinson.

The centre picture shows a Budd RDC-1 Car in 3.5 mm. scale and operating on 16.5 mm. track. The motor is inside the car at the right hand end.

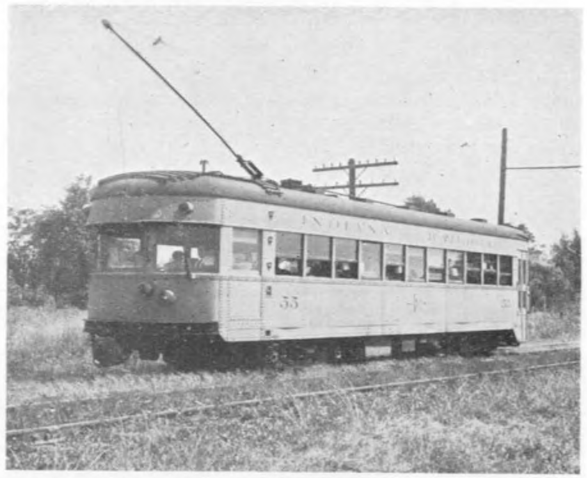
The right hand picture is of a model of a PCC Car (President's Conference Committee) and is a newer type of vehicle. This car is a somewhat standard design and is used by several surface lines such as Boston, Cleveland and Los Angeles. The model is No. 16 and is equipped with couplers so that it can "MU" with my Indiana cars.

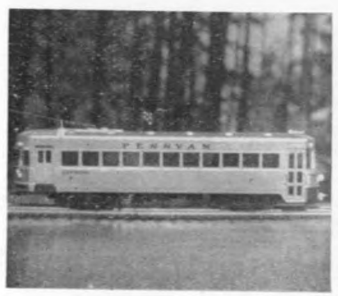
The left hand photo shows a model of an Interurban Car which operated in the State of Indiana about ten years ago. The prototypes were built in 1931 and scrapped for their aluminium content around 1941. Speed was 75 m.p.h. and they could operate in trains up to three cars. Weight was 52,000 lbs. and they were known as "The Indiana Railroad High-Speed Lightweight Single End MU Interurban Cars." This is quite a long title for such a short car of only 46 ft. overall length.

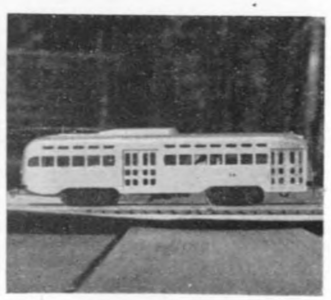
Note that the entrance door at the front end is only on one side (the right side), similar to the Talyllyn coaches, as is the express door at the rear. My model has such an express door which I cut in the body casting myself.

The car shown is No. 7 and is one of the six cars that I own. This car is my standard car and I have two of these with a passenger-express combination and four as straight passenger coaches. Of the six cars four are motored and two are trailers.

The remaining picture shows the prototype car and it will be noted how closely the model follows the original. The model is a die-casting, body and floor, two pieces and held together by two screws. The motor comes installed in the floor piece. Body casting has plenty of detail such as rivets, roof walks and vents on the roof and the model costs $22.50. Its length is 6½ inches overall and like the prototype has current pick-up through the trolley or can operate on two-rail.







A Gauge O Steam Loco for Beginners.

Part 16. By "1121."

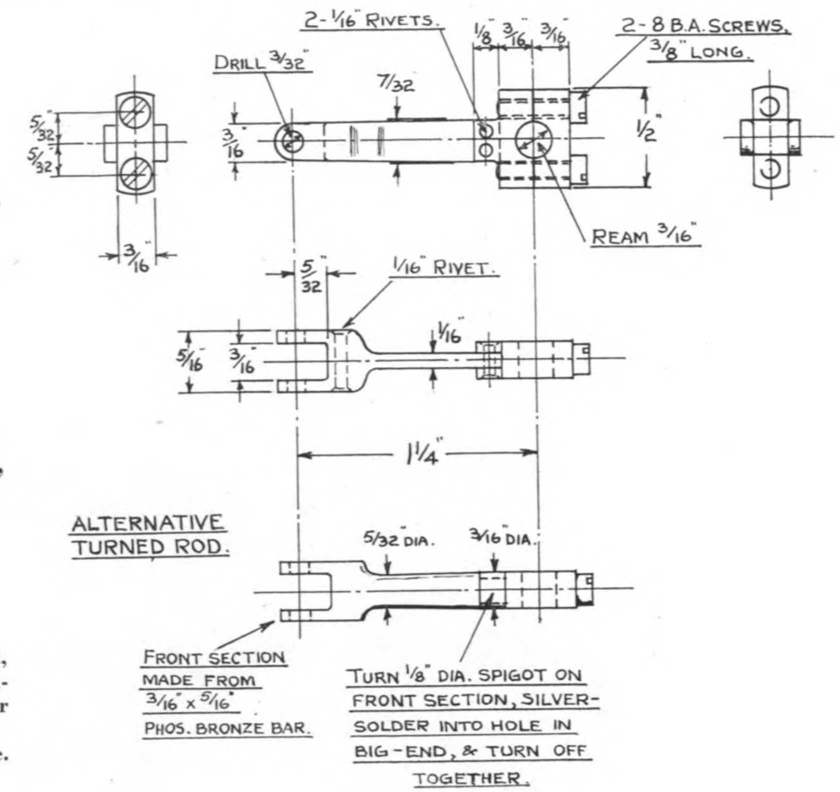


Fig. 77. The connecting rod, showing also an alternative all-turned rod for those who prefer it. (Drawing actual size for model.) Photo: M. Longridge.

There is one little job to do on the steam-chest, and that is to drill and tap the hole in the top into which screws the lubricator, this fitting also combining the entry of steam into the steam-chest. As this hole has to be truly vertical it is easiest to drill and tap it with the block in place in the frames, and thus held at the correct angle. The position of the hole is shown in Fig. 76, and it is a simple matter to mark and centre-pop it on the centre-line of the top edge of the steam-chest, and drill it with the frames on the drilling-machine table.

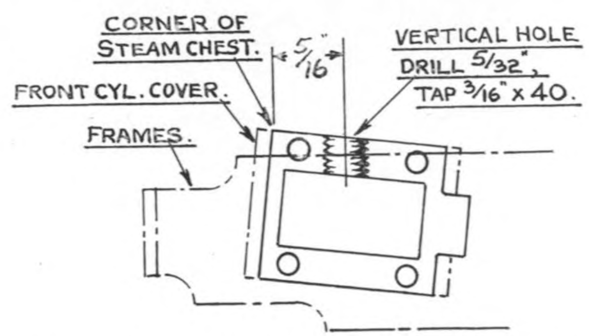


Fig. 76. Showing the position of the steam entry hole in the steam-chest, drilled with the cylinder-block in the frames.

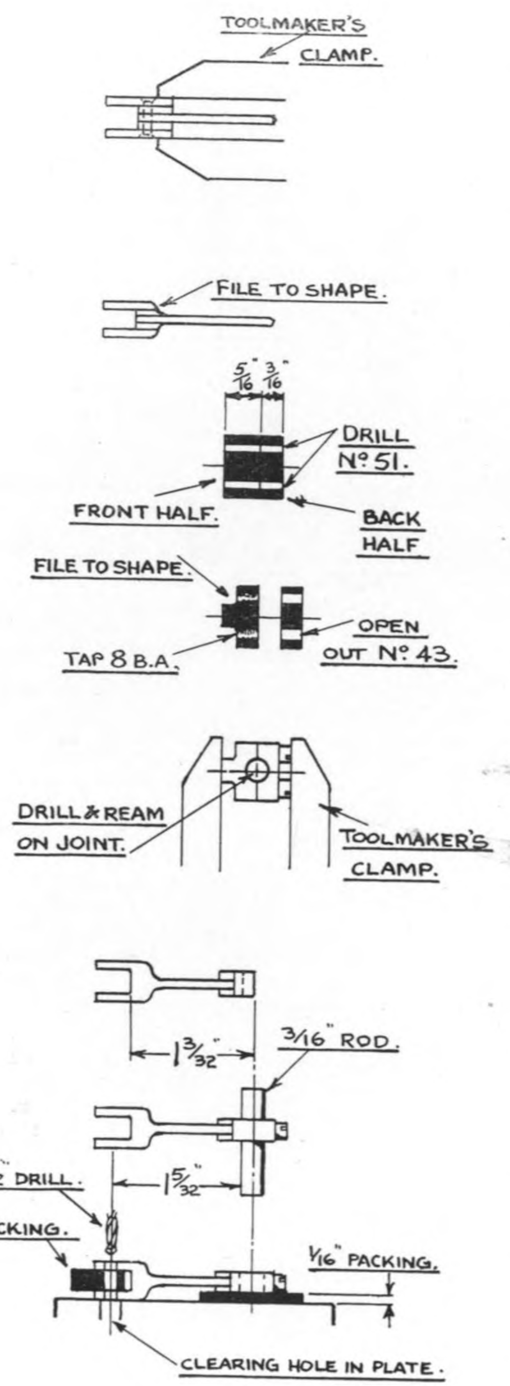
The valve and spindle should *not* be in place in the steam-chest while this is being done, and next time the block is removed from the frames the burrs should be cleaned off the inside.

CONNECTING-ROD.

A drawing of this complete is shown in Fig. 77, and we are stipulating a flat rod built up from 1/16 in. by ½ in. steel strip or 1/16 in. plate, as this is about the easiest method for a beginner a little shaky on fancy taper-turning in the lathe, but those with more experience may prefer to turn up the proper little marine-type rod shown as an alternative, and will know how to go about it from the information given.

The "sequence of operations" diagrams, Fig. 78, show how the flat rod is built up, the "little-end" fork being made first on the end of your strip, the method being to produce a sandwich with two other little bits of the same material on each side, the whole thing being held together with the tool-makers's clamp while a 1/16 in. drill is put through all five pieces. The job is then held together with a long rivet, made from a piece of 1/16 in brass wire if you haven't a rivet long enough, and the whole lot silver-soldered up solid and cleaned to a nice shape by filing.

The "big-end" is made from two bits of 3/16 in. by 5/16 in. phospor-bronze bar, cut sufficiently over the finished ½ in. length to allow for cleaning up, the back half being sawn down to be only 3/16 in. square, as shown. These two pieces are now temporarily soft-soldered together, making sure they lay flat and true, and at this stage it is a good idea to make a small centre-pop mark in each half at adjacent corners so that after



dismantling they may be re-assembled again correctly. On the back end of the assembly centre-pop the positions of the two bolt holes, and holding the block so that it is truly upright in both directions in the machine-vice, or clamped up against a square block of metal, drill them No. 51 right through. Now unsolder, and cut the front half to shape as shown. Tap this half 8 B.A. right through both holes, and open out the back half No. 43. Remove all solder and burrs. Assemble the two halves again with 8 B.A. cheesehead steel screws, $\frac{3}{8}$ in. long, and put the toolmaker's clamp over them as shown to hold them firmly together for the next operation.

This is to centre-pop on the joint between the two pieces, and on their horizontal centre-line, and drill right through at this point No. 13 and ream 3/16 in. Put a slight chamfer or radius on both ends of this hole, and file up the remaining edges of the two blocks together to finish to shape. Dismantle and remove any burrs between the two halves.

The vertical slot into which the rod fits is now sawn and filed, and the rod portion cut to length so that it will fit in to give the dimension of 1-3/32 in. to the inside of the fork. The end of the rod is pushed into this position in the slot (if it is not a tight fit the slot can be closed up very slightly to make it so) and the two parts soft-soldered together. A pair of 1/16 in rivets should now be put right through, finished into slight countersinks on either side and filed off quite flush.

With a bit of axle-steel through the big-end hole the position of the crosshead-pin hole in the fork can now be marked as shown in operation 7, Fig. 78, the figure being 1-5/32 in., this allowing for half the diameter of the big-end hole. The crosshead-pin hole can now be drilled 3/32 in. right through both sides of the fork at one go, with a bit of 3/16 in. brass or aluminium plate jammed in the fork to protect it from the drill pressure. It is important, of course, that this hole should be truly parallel with the big-end hole (both, that is to say, being square with the centre-line of the rod), otherwise stiffness of running will result: To achieve this squareness the rod should be set up on 1/16 in. packing as shown,

Fig. 78. Sequence of operations for making the flat-type connecting rod.

1. The five pieces of 1/16 in. plate clamped together, drilled and rivetted to make the little-end fork.

2. Silver-solder and file to shape.

3. Soft-solder together the two parts of the big-end, and drill right through No. 51.

4. Separate the two halves, file front half to shape and tap 8 B.A. Open holes in back half No. 43.

5. Screw halves together, hold with toolmaker's clamp, centre-pop, drill and ream on joint

6. Cut slot in front half, cut rod to length to fit in slot to give 1 3/32 in. length.

7. Mark position of crosshead-pin hole from rod through big-end.

8. Drill crosshead-pin hole with rod packed level.

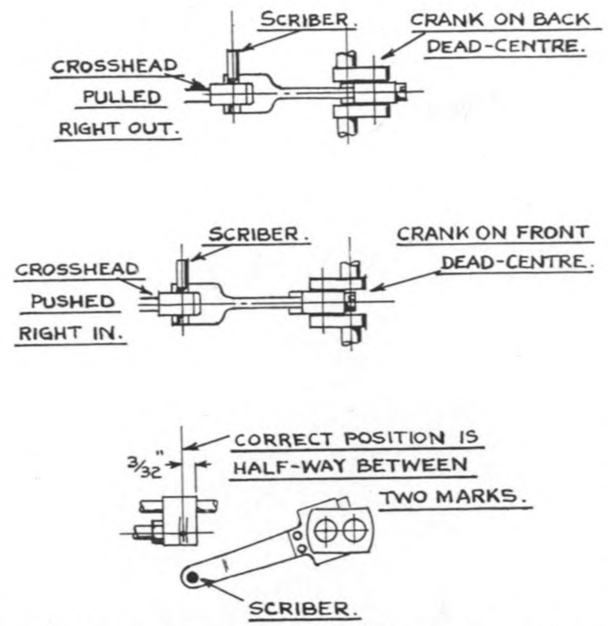


Fig. 79. Marking the crosshead by means of the special scriber in the connecting-rod little-end.

which will bring it level while the hole is drilled on a piece of plate with a hole in it to let the drill through. After drilling, a piece of 3/32 in. rod through the little-end hole can be checked for parallelism against the 3/16 in. rod through the big-end, and squinting along the length of the rod from the front end will show whether the two rods lay parallel from that aspect. Any slight error here can be corrected by a little judicious twisting of the rod. Now finish the whole rod off to shape, and clean off burrs from inside the little-end fork.

The rod should now be assembled in position on the crankpin, making sure it runs quite freely but without end-slackness, and also is quite free between the crank-webs when the crank is rotated, and from any position will slip over the crosshead. With the cylinder still in the frames, we can now use the rod for the purpose of marking the position of the hole in the crosshead. This position obviously must be such that the piston will clear both cylinder-covers by about the same amount at the ends of its stroke, and the method of ensuring this is as follows.

Make up a special little scriber by running a bit of 3/32 in. silver-steel in the lathe and filing the end to a rather obtuse point (like the point of a drill), making sure the point is reasonably central. Cut it off about $\frac{1}{4}$ in. long (there is no need to harden it for this job). Pull out the piston-rod to its fullest extent, turn the crank until it is as near as you can judge on its back dead-centre, put the sharp end of your little scriber into the hole in one side of the little-end fork, and make a little mark with it on the crosshead by swinging the connecting-rod up and down. If your fingers are of the fat variety and won't go in there you can easily hold the scriber in the hole with something a bit thinner, such as your rule. Do exactly the same thing with the piston-rod

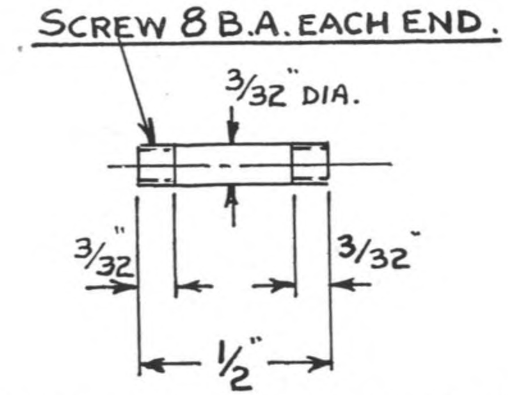


Fig. 80. The crosshead-pin. Material 3/32 in. silver-steel.

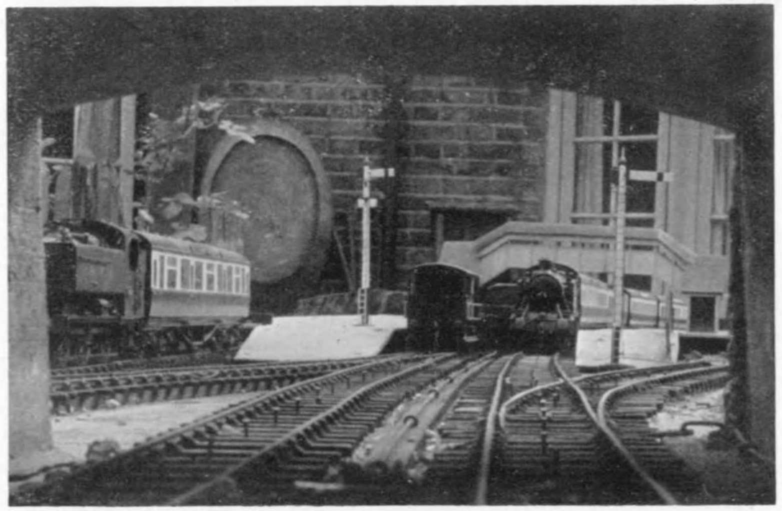
pushed right in as far as it will go and the crank on front dead-centre. You will now have two little arcs scribed on the crosshead, and half-way between them is the position of the crosshead-pin (Fig 79). This position should be at approximately 3/32 in. from the back of the crosshead. If, somehow or other, you have got it wildly out of position you can adjust the crosshead on the piston-rod by rotating the latter and tightening up the locknut, and remark the crosshead. When you are satisfied, remove the cylinder-block from the frames, mark a horizontal line on the same side of the crosshead at the centre-height of the piston-rod, centre-pop in the right position, and hold the crosshead down firmly on your piece of plate with clearing hole and drill through 3/32 in. Finally round off the bottom corner of the crosshead.

The connecting-rod is most easily pinned to the crosshead while the block is out of the frames, any subsequent dismantling being done from the crankpin end. The crosshead-pin is a simple enough job, and is shown in Fig. 80 It is merely a bit of 3/32 in. silver-steel, $\frac{1}{2}$ in. long, screwed 8 B.A. at both ends. Remember two things—firstly that 8 B.A. size is a bit smaller than 3/32 in., so you should open your die up a little for the first cut, or it will chew the thread to pieces through having too much to take off. Then run the die over again in its normal position to finish the thread, and check with a nut. Secondly, if you are not used to working with silver-steel, we should mention that due to the process by which the bars are cut off, the extreme ends of a new bar are often "dead hard" and will ruin a die or lathe-tool, although this is more noticeable in the larger sizes. It is always a good idea, therefore, either to grind over the end or saw off $\frac{1}{8}$ in. or so when starting a new bar. We implore you not to forget this, as such unaccountable wrecking of tools is one of those things which can turn the beginner away in disgust at his own inability or of model engineering and model engineers generally, due merely to the need for knowing about and understanding a simple little "trick of the trade."

Screw an 8 B.A. nut tightly on to one end of the crosshead-pin, put it through the little-end fork and the crosshead and screw on the other nut. One other thing—watch out for a little burr pushed up by the die at the inner end of each length of threading, and preventing the pin from going through the holes. Reassemble the cylinder into the frames, and check that the connecting-rod clears the end of the guide-bar when it swings over the top of its circle. Another possible fouling-point is the top corner inside the little-end fork against the back of the crosshead, which can be cured by filing a small radius in the fork.

A 7 mm. Scale Outdoor G.W.R. Layout.

Part 2. By G. E. MANN.



Churston from rail level. Up local waiting to depart with 2—6—2T No. 6117. Brixham auto train in bay. Photo: M. Longridge.

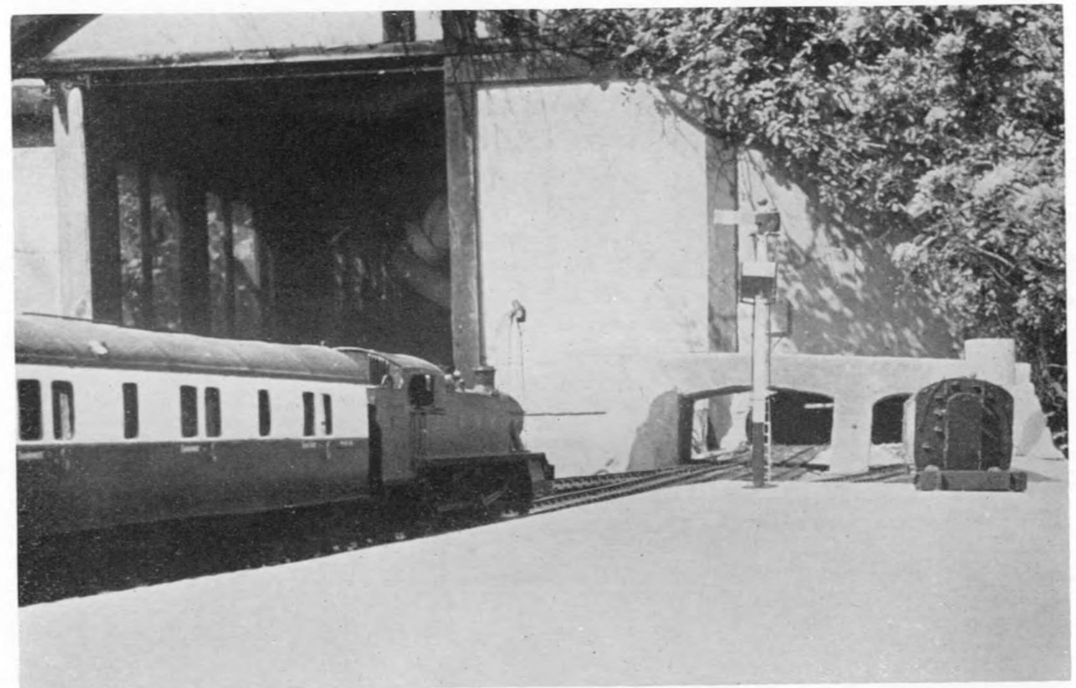
Storage of rolling stock and locos is a great problem. To store them indoors means taking them out, assembling trains and so on, and at the end of an operational session it has to be done in reverse. With a stud of 8 coaches and 4 locos time spent in this way is considerable and with the increases in stock which are down for construction, the period will be further lengthened. However, some easing of the situation is in sight. My wife, after holding out for some time, has now given me "running powers" into the pantry. By putting a shelf under one of the existing ones and knocking a hole in the wall for entrance and exit, I can lay 3 sidings 5 feet long. The connecting line will join the main circuit about 20 feet out. But I shall still have to pack and unpack coaches and goods stock—the latter non-existent so far, except for a 20 ton brake van.

Signals and points are interlocked with the power, so that it is impossible for a train to overrun a signal, while if a crossover is set for crossing, the tracks behind the points are 'dead,' so no train can collide with another, or run against the points. This effect is achieved by a remarkable lever frame, which would make Heath Robinson absolutely green with envy. A sketch was given last month (Fig. 3) showing the idea, and how it works —it does too. Signals and some points are solenoid operated through Zenith levers and "passing contact" fittings. Rods run from the lever's extremities and through a brass bearing. On the rod, made of 1/16 in. steel, is forced a fibre bush, or bushes which as the rod moves to and fro, pass over spring brass contacts, the free ends of which when pressed down by the bush make contact with a brass screw on which is soldered the appropriate lead. A second frame is being installed by Greenway Tunnel. This will control the "open" side of the line. Mechanical interlocking between points and signals is also installed.

Much still remains to be done. The signals on the "open" side of the line have yet to be made, also scenic effects station buildings, signal cabin and other items, to say nothing of the Pantry line. New stock down for building is made up of 3 locos, 10 coaches and about 20 freight vehicles, enough to keep me busy for some time. I think at this point I should pay tribute to my wife's unfailing patience, which is sorely tried at times when trying to do jobs in the kitchen with its table permanently decorated with a vice and tools, and the gas stove with soldering bits. So far no brass filings in the pastry! But I do owe much to her co-operation and understanding.

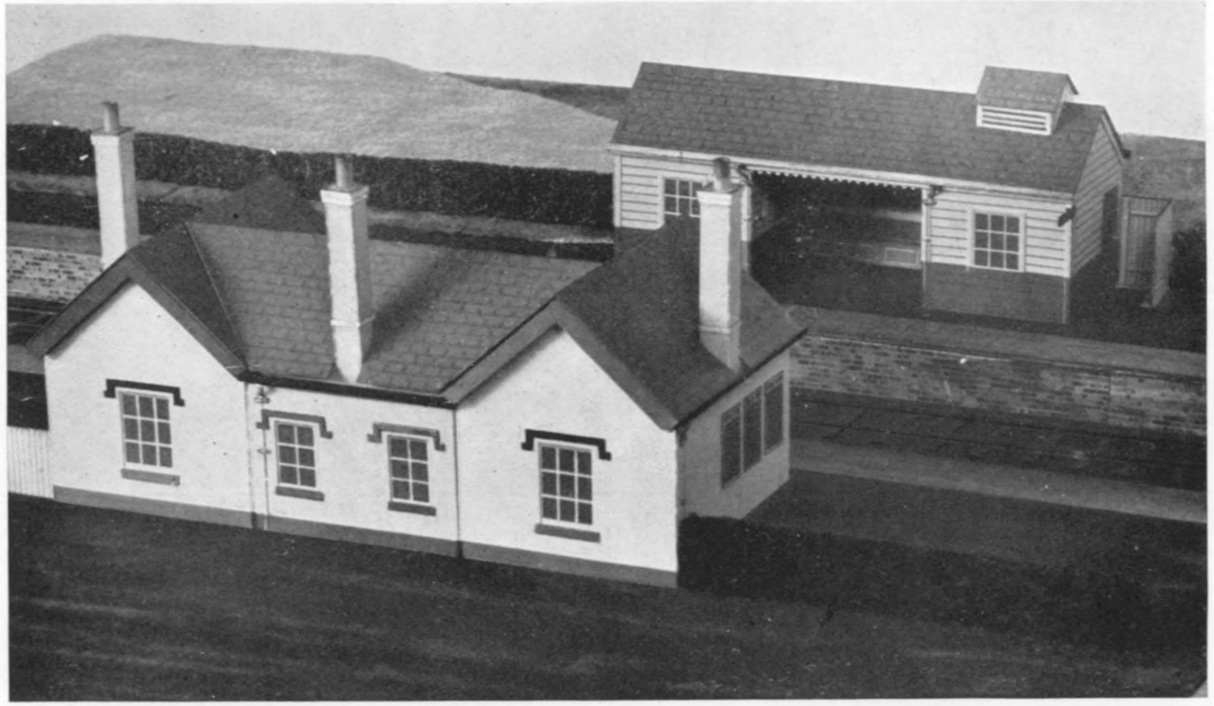
Operation is as on my last line. A train leaves the garage and arrives at Churston Down platform, another train has left the garage by the Greenway Tunnel and (*Continued on page* 80.)

An interested spectator from next door watches the operations.



Up local leaving Churston with 2—6—2 Tank No. 6117. Photo: M. Longridge.

The prototype of Mr. Mann's Layout. A view of Churston Station by C. Gordon-Watford. "Hall Class loco No. 6975 is entering Churston with a down stopping train for Kingswear. 14xx 0—4—2T No. 1466 heads the Brixham branch train in the bay.



The familiar Bilteezi Sheet No. 1 produces these two models.

concide with the dimensions of the window openings. Wonders can be accomplished by the method of forming sashes with very thin cellotape strips, as I have described earlier, and this tape can be had in so many shades and colours that the worker's taste might be followed in his choice. White or green might be found most suitable, perhaps. The main thing is to cut the strips straight and fine. Perhaps a little alteration of the design might be made by way of eliminating the house front door, which would probably be at the rear rather than the front, and substituting some form of public entry to a ticket office on the ground floor. Where there are steps in the main approaches of a station, especially in the vicinity of the platform itself, these should if possible be excluded, and a level footway provided. It is again fortunate that the external finish of the inn is exactly in keeping with that of the station building supplied.

This building is now treated as before. There should be two sheets, and they should be erected as a wing on each side of the main house, or, if preferred, one wing only may be used, as in the sketch.

I have given in Fig. 4 a dimensioned drawing for the station which includes the semi-detached houses.

British Railways News.

G.W.R. Loco No. 5017 (St. Donats Castle) was renamed "The Gloucestershire Regiment" at Gloucester Central Station on 24th April—the anniversary of the Imjin River battle.

New British Railways loco No. 71000 recently completed at Crewe has been named "Duke of Gloucester" in commemoration of the Duke's Honorary Presidency of the International Railway Congress held in London 19th-26th May.

Our Cover Picture.

Shows Mr. K. R. Herring's Gauge 1 Station and includes a cab view of an L.N.E.R. Pacific, a G.N.R. Atlantic on the left and "Sir Sam Fay" entering the station on the right. (Photo: K. R. Herring).

"Britain's Railways To-day."

Edited by John St. John. Published by the Naldrett Press Ltd., 91-93, Baker Street, London, W.1, at 15/- nett. 192 pages. 92 photographs.

With an introduction by Mr. D. S. M. Barrie this book contains 14 chapters on locomotives, their design, electric and diesel locos and trains, track, signalling, rolling stock, research, freight traffic, railway architecture and traffic control etc.

Each of these chapters has been contributed by a specialist in that section and the writers are mainly members of British Railways staff. In this respect the book is a welcome change from similar publications where one man has endeavoured to cope with the whole field of railway activity.

A nice touch is the inclusion of seven "Railway Profiles" written by the Editor and delightfully illustrated by Richard Zeigler. These pen pictures describe the work of various members of the railway staffs—Guard, Signalman, Porter and Engine Crew etc.

A very attractive book which we think will appeal to modellers and prototype enthusiasts alike.

A GAUGE O STEAM LOCO FOR BEGINNERS

PART 17. BY "1121."

Connecting up the Valve Gear.

Having connected up the piston we must now do the same for the valve and for this we need first of all the valve-spindle fork-end, shown in Fig. 81. The simplest way to make this is from ¼ in. dia. round mild steel rod, holding it in the 3-jaw chuck to centre, drill and tap 8 B.A. for the valve spindle and turn the 5/32 in. diameter. It is best to drill the 3/32 in. cross-hole before cutting off the bar, so that you can be reasonably sure of holding it true. (See "sequence of operations, Fig. 82.) Saw off the piece to length, saw and file the slot, and file the flat on each side, then file off the sharp edges round the slot. Screw the fitting on to the end of the valve spindle, with an 8 B.A. nut to lock it.

Valve Rod.

This is a plain length of 3/32 in. silver-steel, threaded each end 8 B.A. as shown in Fig. 83—all remarks applying as for the crosshead-pin in the last article. Its end-fitting (Fig. 84) is made exactly as the valve-spindle fork-end, except that it is filed to a tongue, which, of course, has to fit into the slot in the fork. Fit it to the end of the valve rod with a lock-nut, and screw the whole thing into the eccentric-strap, again with a lock-nut. You will appreciate that these two screwed joints provide a fair amount of preliminary adjustment, the final setting to the position of the valve being accomplished by rotating the valve spindle to screw it into or out of its fork-end. At present, however, get the length of the assembled rod right as near as you can judge (Fig. 85), make the connecting-pin, (Fig. 86), and join up with two 8 B.A. nuts exactly as for the crosshead-pin.

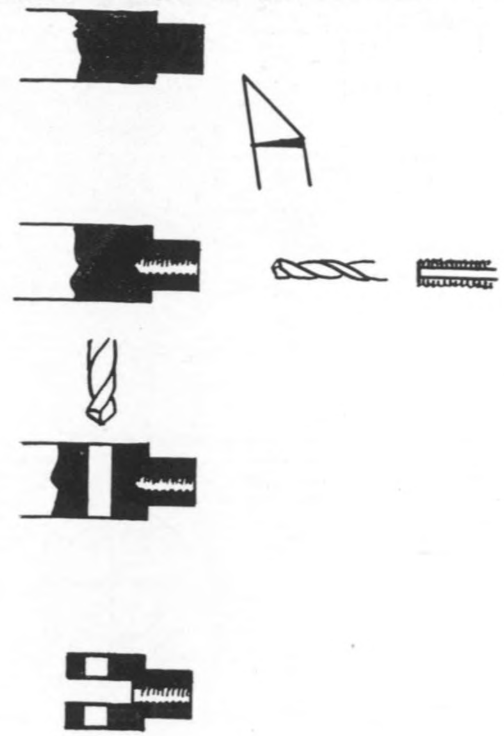


Fig. 82. Sequence of operations for making the Valve spindle fork-end.

1. **Turn 5/32 in. diam.**
2. **Centre, drill No. 51 and tap 8 B.A.**
3. **Drill 3/32 in. cross hole.**
4. **Cut off to length, form slot and clean up.**

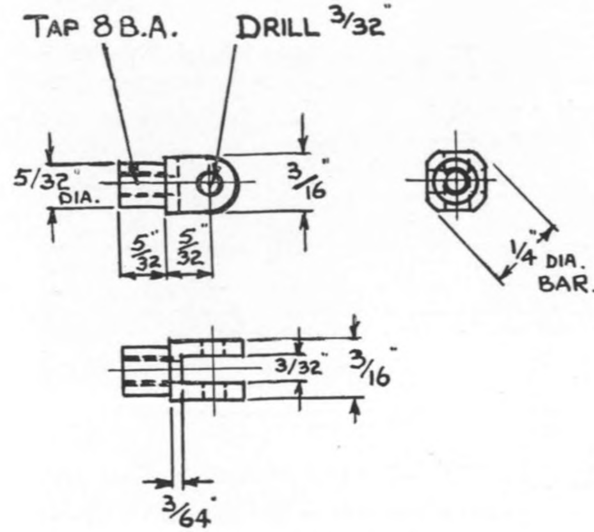


Fig. 81. Valve spindle fork-end.

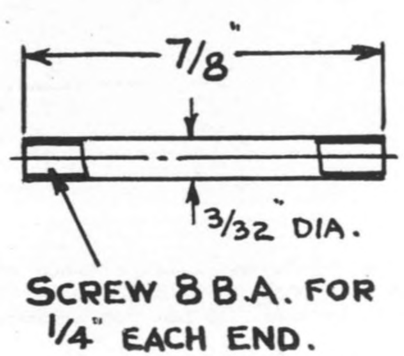


Fig. 83. The Valve Rod.

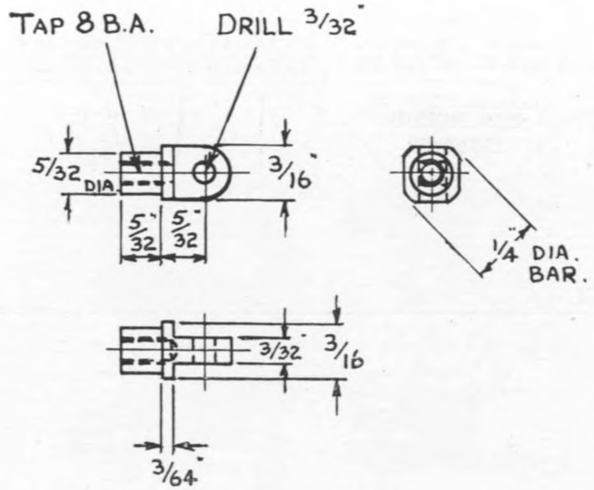


Fig. 84. Valve Rod end.

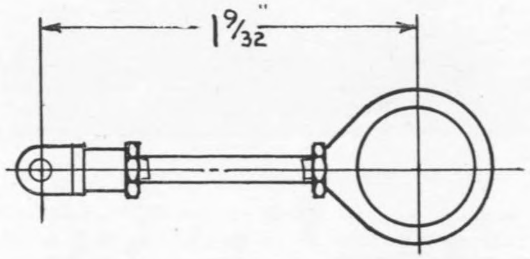


Fig. 85. Assembly of valve rod and eccentric strap.

Setting the Valve.

In order to make this job a little easier, we suggest that the steam-chest should now be assembled to the cylinder-block, complete with valve and spindle, *but without the steam-chest cover*, the long screws merely holding the steam-chest in the right position. If the block is now replaced in the frames, and held in position by the two screws into the cylinder-block through the left-hand frame only, the movements of the valve as the spindle is pushed in and out can be seen through the two screw-holes in the right-hand frame, if a strong light is shone into the space between the steam-chest and the frame. Alternatively, you may find it easier to do your squinting through this gap, with the light shone into the holes.

Fig. 87 gives a complete picture of the motion, as viewed from the right-hand or steam-chest side, so that all the bits can be seen clearly. In Fig. 88 is the same thing in diagrammatic form. It will be observed that the crank is shown in the back dead-centre position.

It is unfortunately common practice when setting valves merely to guess this position of the crank; we would point out, however, that clearly the eccentric, when the

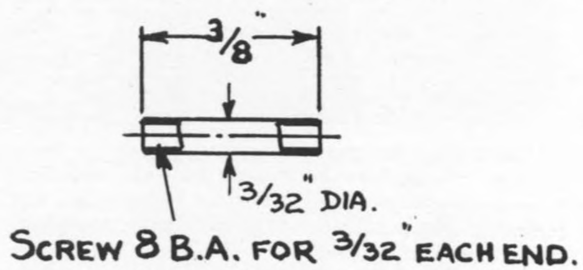


Fig. 86. Valve rod joint pin.

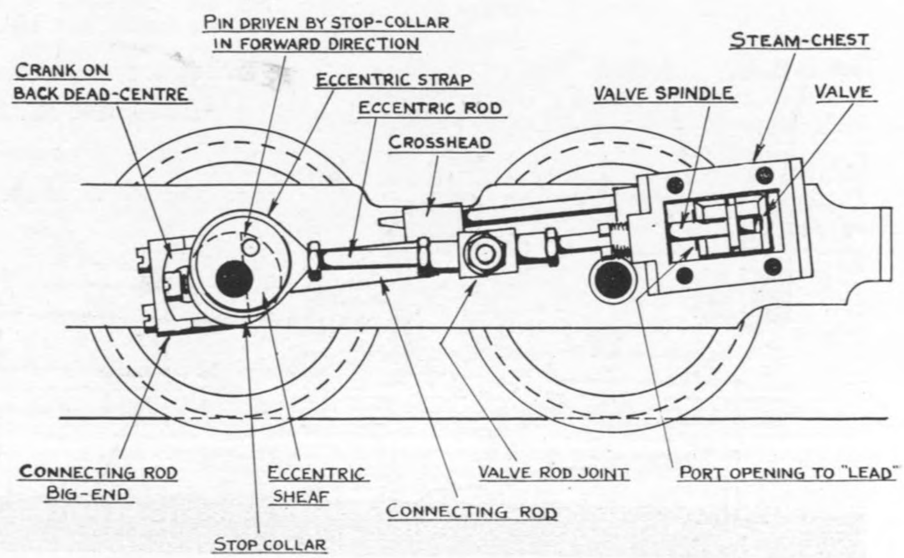


Fig. 87. The layout of the valve gear parts. (Actual size).

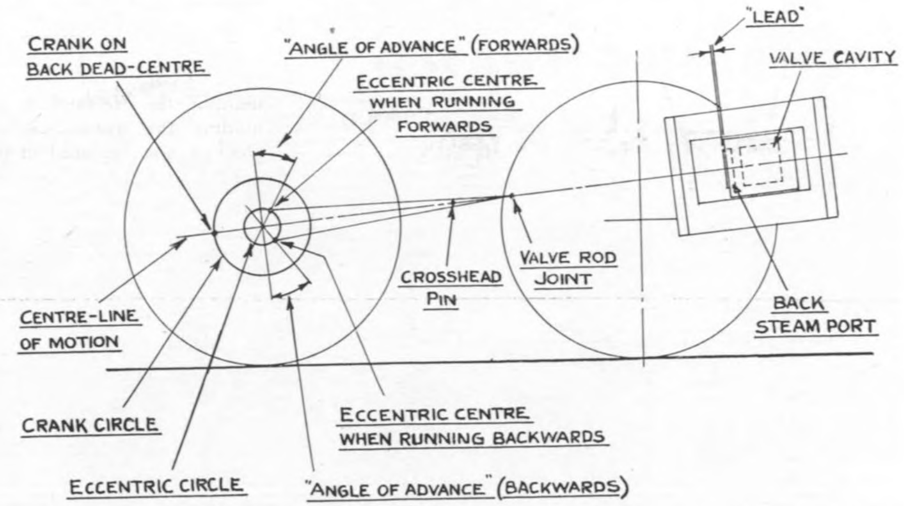
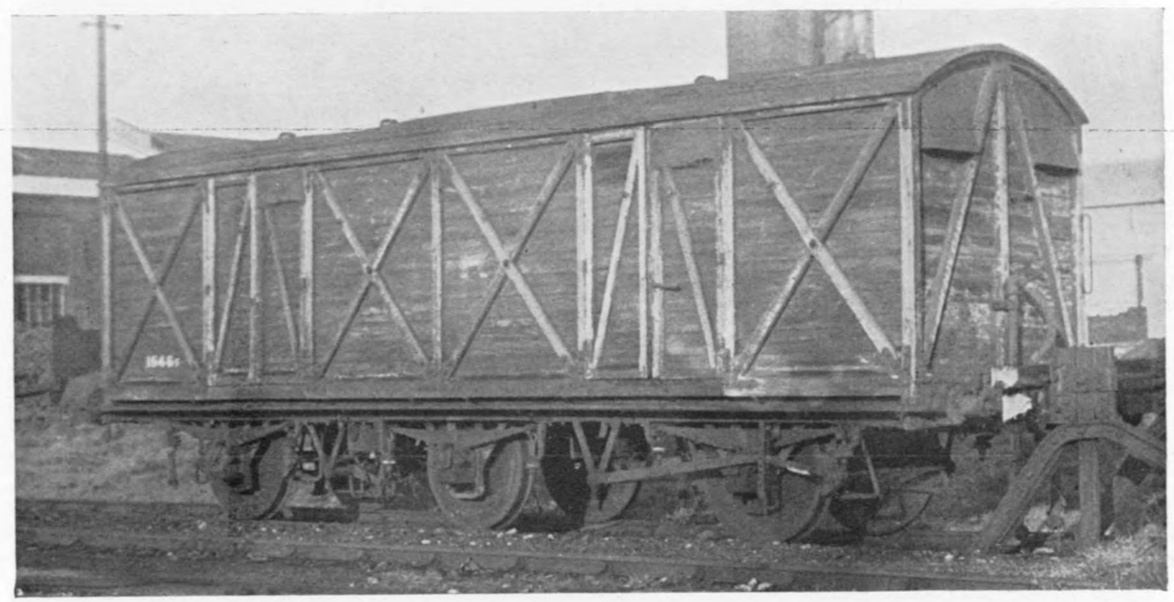


Fig. 88. Diagram of the valve gear, showing forward and backward positions of eccentric.

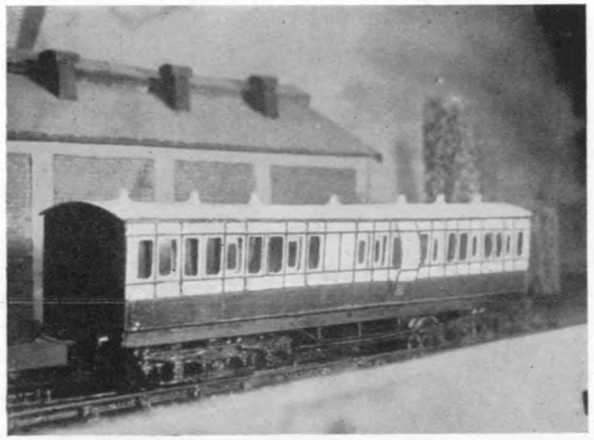
(Actual size).

main crank is in this position, is fairly close to its top or bottom centre, according to which way the engine is running and therefore the valve is moving almost at its fastest over the ports, and a slight angular error of this dead-centre position of the crank will make no difference at all to the position of the *piston*. The impression therefore may be that an approximation is near enough, but this error is having a maximum of effect on the position of the valve, which is what matters. The process of finding accurately the *correct* dead-centre position of the crank is identical for *any* engine, and is so simple, but by all accounts so little known even among the more experienced of the loco-building fraternity that we make no apology for including it, along with the valve-setting methods, in this "stock-pile" of general information for future use, which we are endeavouring to build up within these "Aladdin" articles.

Speaking technically for the moment, the method consists of "stopping" the movement of the piston at some point along the cylinder. The position of this point itself is not terribly important; what *is* important is that the position is exactly the same round the top and bottom arcs of the crank. Bisection of these two points thus gives the exact end-of-stroke position of the piston, which translated into terms of crank rotation, gives the dead-centre position.



Ex-L.B.S.C. Railway Luggage Van—see drawings on page 154.

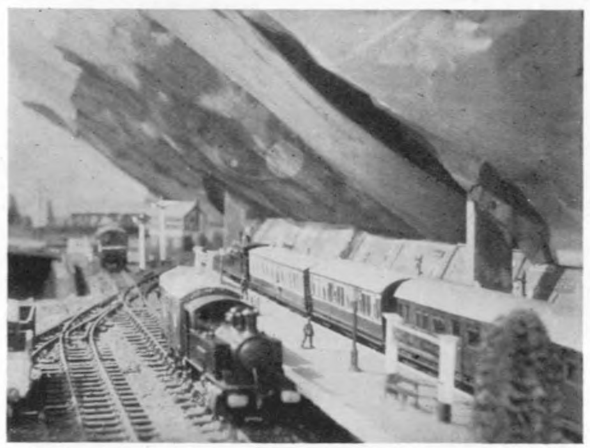


Gauge O Caledonian 45 ft. non-corridor Brake Compo coach. Built from drawings in the 'Railway Engineer.'

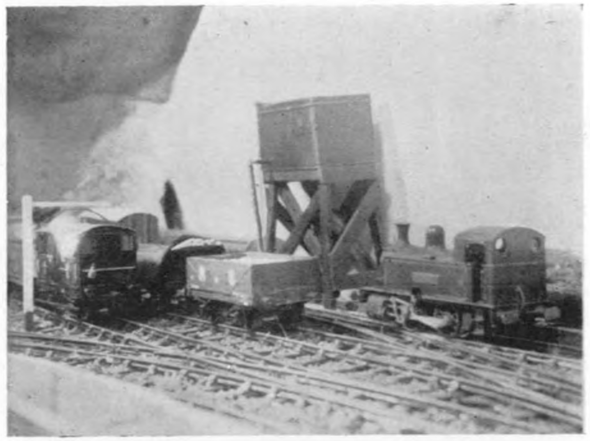
The stock is rather odd in proportion as apart from motive power mentioned I have built my first H.R. loco, a 4-4-0 small "Ben" type now No. 2 "Ben Alder" with a Walker's Romford type worm drive mechanism, which has proved quiet and powerful. A H.R. "Barney" 0-6-0 goods loco No. 18, with a Mills mechanism rebuilt from a G.N. Stirling 0-6-0, only the footplate and boiler being used in the rebuilding

A Caledonian 45 ft. 1st/3rd brake compo coach was built from a photo copy drawing from the 'Railway Engineer.' For the time being two ex-Great Western railcars in H.R. colours are being used and the bow-ends with windows are not unlike the H.R. chariot ended coaches. Of course these are long coaches for my 3 ft radius curves but most of the stock to be built will probably not be over 48 ft. scale length, one advantage of the pre-group modelling.

A 6 wheeler in C.R. colours has been built. This was intended for the Great Western so is not quite a scale



Craigimore Junction with mixed H.R. & C.R. train in platform 2. Freelance C.R. 0-4-0 tank in bay.



Glenthorne Yard with freelance 0-4-0 tank shunting. The loco. is now in C.R. colours. Also showing H.R. type water tank.

C.R. 6 wheeler. The list of jobs to be done and stock to be built is long but the layout is getting a Scottish air about it.

Our Cover Picture

Shows the latest British Railways type engine to be built. It is the 4-6-2 Class 8 type with a tractive effort of 39,080 lbs. No. 71000, the first of the class, is named "Duke of Gloucester." (Photo: British Railways.)

G.W.R. Dean 0-6-0 Locomotive.

Mr. W. G. H. Anderson, 29, Elizabeth Street, Elsternwick, S.4, Melbourne, Victoria, Australia, is anxious to obtain a photograph of the cab fittings of a G.W.R. Dean 0-6-0 locomotive. If any reader could assist it would be greatly appreciated.

Coarse standard Gauge O Highland Railway 4-4-0 Loco. No. 12 "Ben Hope" of the small "Ben" class. Body and chassis built by the author and fitted with Walker Romford type mechanism. The loco. has since been rebuilt as "Ben Alder" No. 2. (The last of the class.)

A GAUGE O STEAM LOCO FOR BEGINNERS

Part 18.

By "1121."

Setting the Valve.

The method of "stopping" the piston is quite simply to locate it against some fixed part of the engine, the easiest way of doing this being to trap a small piece of metal packing between the cross-head and the back cylinder-cover. This bit of packing, in our case, should be about ⅝ in. wide, and the two diagrams in Fig. 89 show it "trapped" with the crank in the "up" and "down" positions respectively. While the crank is in each of these positions, a mark is made on the back of one wheel, again from some fixed point on the engine, the simplest way of producing such a point being to hold a piece of plate across the engine frames, as shown in Fig. 90. This plate is used as a guide to scribe a little line on the wheel. It will be seen that this gives two marks, one for each setting, and finding the point mid-way between these two marks round the wheel is a simple "schoolboy's geometry" process with a pair of dividers. The marking should, of course, be on some fixed radius from the wheel-centre, and if your machining has been so good there is no convenient tool-mark to give you a circle to work on it is very easy to produce one by rotating the wheel against the point of a scriber held firmly down on the frame. The bisection-point can be consolidated with a centre-pop mark so that it will not subsequently get lost sight of, and will be there for all time in case any future servicing on the engine necessitates fresh valve-setting. When this mark is placed in position against your piece of plate, the crank will be on back dead-centre. (Fig. 91.)

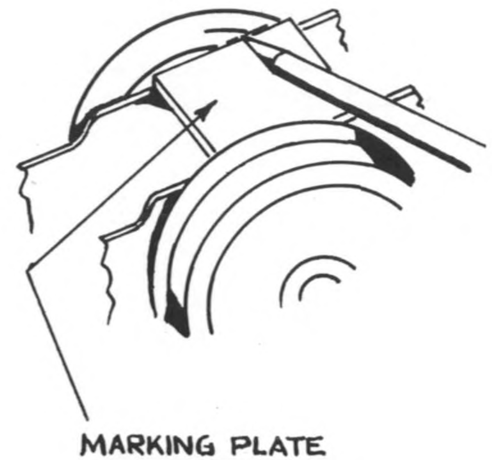


Fig. 90 How the marks are made.

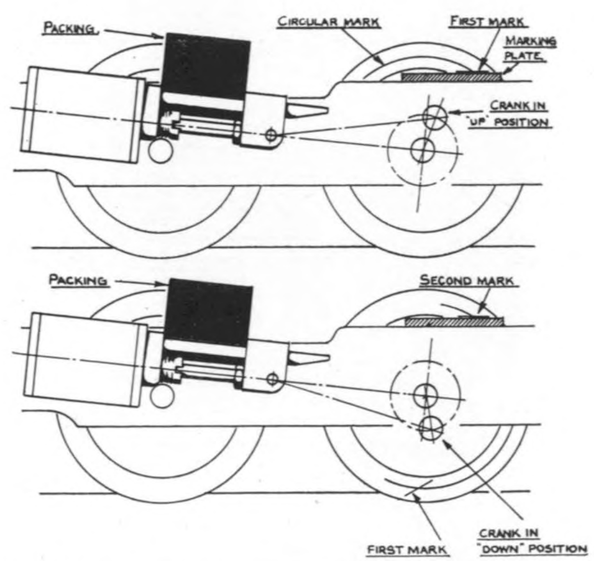


Fig. 89 Finding the back "dead centre" position of the crank. Top—making the first mark. Bottom—making the second mark.

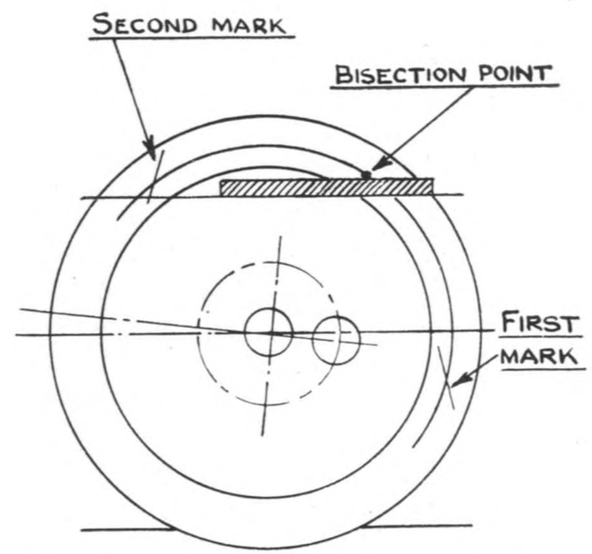


Fig. 91 When the point round the wheel mid-way between the two marks is placed against the marking plate, the crank is exactly on back "dead centre."

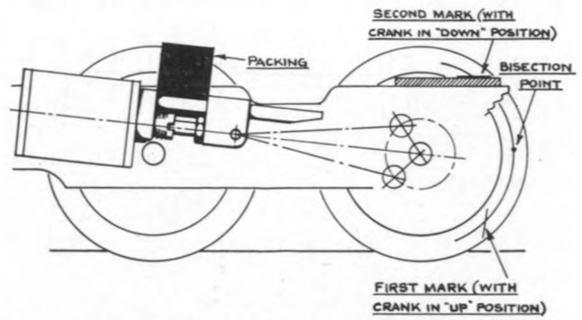


Fig. 92 The whole thing repeated to find the dead centre position.

The process is now repeated for front dead-centre, using this time ⅜ in. of packing between the crosshead and cylinder-cover (Fig. 92.). Your " marking-off " plate should, of course, be preserved in your box of "Aladdin " tools and spares, as its thickness is obviously an important factor in the calculations.

Set the stop-collar on the axle with the set-screw approximately in line with the main crank. It can be seen in this position in one of the photographs of Mr. Terry's " Aladdin " chassis reproduced in the March issue. Incidentally, how very interesting it is to see such an obviously nice job being made of our little engine, and to find the interest being shown in effecting little improvements such as Mr. Terry has done. We hope other readers with " bright ideas " will bring them forward for we know the Editor would welcome them. For our own part, of course, we are keeping the design as simple as possible, both for the benefit of the beginners who want it that way and so as not to prolong the articles beyond their already lengthy proportions. Regarding the back cover screws which Mr. Terry mentions, we cannot quite understand what must have happened to his dimensions, as there is plenty of clearance here on our original "Aladdin," and when making the drawings we actually set the cylinder-block a little further forward than on our own engine expressly to make quite sure about this.

Gauge 00 Cardboard N.E. Van.

By S. M. BANKS.

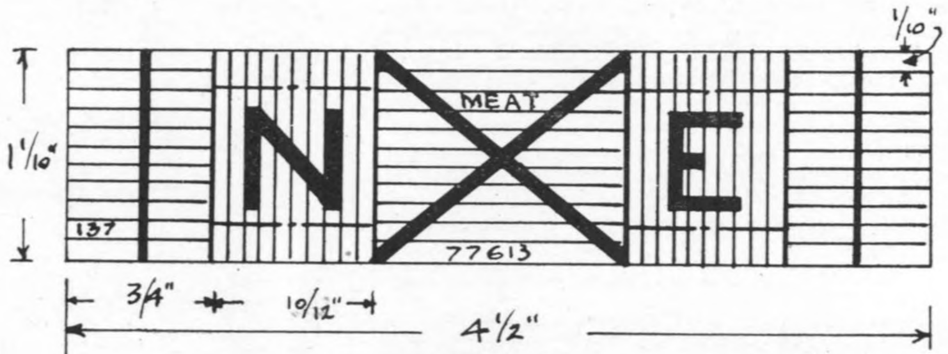


FIG. 1

Having heard quite a lot about cardboard as a medium for modelling, I decided to try it for myself. The model I selected was that of a N.E. long wheelbase Meat Van—I do not know whether there was such a van used on British Railways, but if there isn't, it's just too bad.

The material used was ½ mm. card and the sides drawn out as in the diagram. Planks were scribed with a pin. The sides were made up of three layers of card, the outer layer only being scribed. The doors, which are raised, are also built up of three layers.

FIG. 2.

Actual size 4 mm. scale.

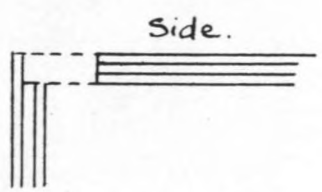


FIG 3

Planks are 1/10 in. wide on the main sides and the door planks are 1/12 in. wide. After the doors had been attached, the strapping was added as in Fig. 1.

Ends are produced in a similar manner, differing only in that the three layers of card used on the sides are equal in length, whereas the two inner layers on the ends are not so wide. This may be seen in Fig. 3 and produces a very strong joint.

When the sides and ends are built up they are glued together and held firmly until the adhesive is hard.

For the roof a single layer of card was used. The body with roof attached is then mounted on a piece of card which forms the floor.

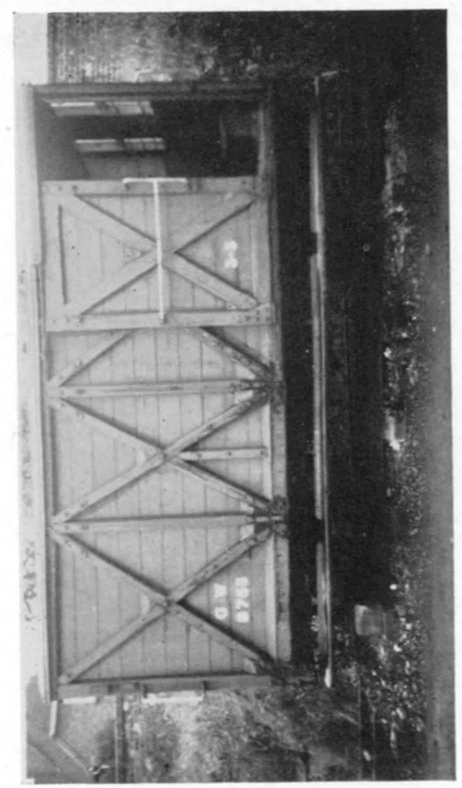
Axleguards, wheels and buffers were obtained commercially. The axle guards were glued to the floor and the wheels inserted. Buffers were attached in the same way, and although the method of fixing may cause amusement to professional modellers, I must say that both axleguards and buffers are still as firm as rocks.

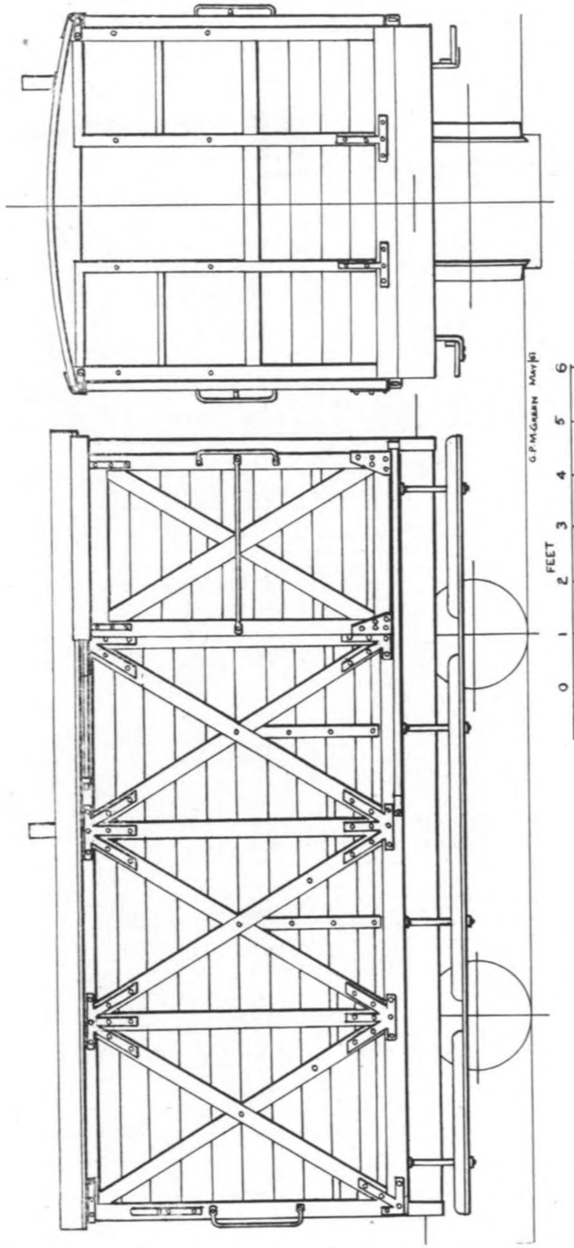
Painting was in dark grey and the lettering added in white. The roof was also finished in white.

It is my first attempt at modelling rolling stock and if any of the old hands care to pass on some tips or criticism they will be gratefully received.

The drawings are actual size for 4 mm. scale

Welshpool & Llanfair Railway Rolling Stock





No. 3. Guards Van. *By G. C. Green.*

There are differences between the present form of the van and its condition in 1903, particularly in the pattern of outside framing for the body, and in the sliding doors. The 'Railway Magazine' photograph shows a conventional type of van with an open verandah leading to the van body through a hinged door.

Previous drawings—Part 1. Cattle Truck (June, 1953) and Sheep Truck (June, 1954).

A GAUGE O STEAM LOCO FOR BEGINNERS

Part 19. **By "1121."**

The first process in setting the valve is to see that it is in the right position with relation to the cylinder-block and ports, so that whatever it may be doing, it is at least doing the same thing at either end of its travel, even if it is temporarily doing so all at the wrong times. When the eccentric is at one end or the other of its "throw," the edge of the valve at the *other* end should have opened the port just to its fullest extent—no more and no less. When the eccentric is turned over to the opposite centre, the opposite port should just be fully opened. If, for the sake of argument, the valve is observed to open the front port and still travel further beyond its inner edge when the eccentric is at its back position, and doesn't open the back port fully with the eccentric towards the front, then obviously the valve is too far back, and should be drawn further forward by unscrewing the spindle a little way out of its forked-end—or vice-versa. (Fig. 93.)

Having got this right, we must now check the setting of the eccentric. Theoretically, and if everything has been made *exactly*, it should be possible to say that when the stop-collar is in this position with its screw in line with the crank, the valve is bound to be correctly set, with no need to say more. We have a rooted dislike, however,

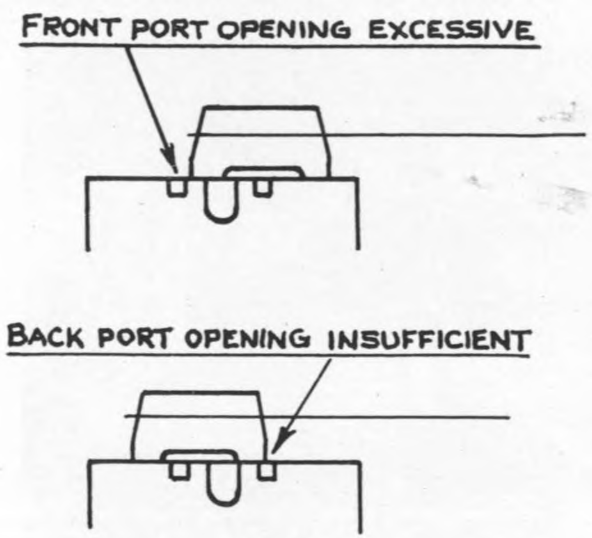


Fig. 93.

Adjusting the position of the valve. It is shown above at the back end of its travel and below at the front end. The position shown is giving an unequal port opening, and the valve requires setting further forward by unscrewing the spindle a little way out of its fork-end.

for the "follow-the-instructions-on-the-label-and-it-is-bound-to-work" type of article, and we are therefore quite happily risking the wrath of the experts who, despite all we have said, are still niggling at us for treating the whole thing in such detail, by giving some information here as to *why* the valve works and what it is supposed to be doing anyway (and, more important, what is wrong if it doesn't do it). We never cease to wonder just why it is that these clever folk, who get so annoyed at our detailed instructions for doing every job, should not be able to go right ahead and design and build the engine themselves, instead of having to wait for us to get through the job in our own time. We will repeat once more that we are endeavouring to provide fairly complete information in this series to cover most of the work involved *in loco-building to this size generally*, so that just that much ground-work will be already done and can be referred back to in any future project.

How the Valve Works.

The first job our valve has to do in its "cycle of events" is to open the port at one end—say the back end—of the cylinder, so that the steam may enter it from the steam-chest. This steam, taken directly from the boiler, is known technically as "live steam," as distinct from "exhaust steam," which is steam which has finished its work in the cylinder, and please note that this is what we mean when we refer at any time to "live steam." The term "a live steam engine" is often loosely, incorrectly and misleadingly applied to some engine, by which we are expected to understand it as being possessed of wonderful virtues missing from any others.

Our "live steam," then, has to be admitted to the cylinder when the piston is at such a position in the bore that it will derive the greatest benefit from it. In most cases, and at any rate in the case of "Aladdin," this means that when the crank is on either "dead-centre," and the piston thus at one end of its stroke, the port at that end should be actually open by a very small amount, so that the steam may by then have begun to find its way through the passage-way and be already building up its pressure against the piston. This amount of port-opening at dead-centres is called "lead," and we said a bit about it in our old "Finding Fault" series (May, 1950). The amount, at any time, is quite tiny, and in our present small model it only works out to about eight one-thousandths of an inch, or a half a 1/64 in.

Working, then, on our back dead-centre position, rotate the eccentric-sheaf in a backwards direction until its projecting pin comes up against the "step" in the stop-collar (this being the forward-running position) and see where the valve is. It should show a black line of port-opening (the back port of course) which looks about like the half-of-one-sixtyfourth which is our "lead." If it

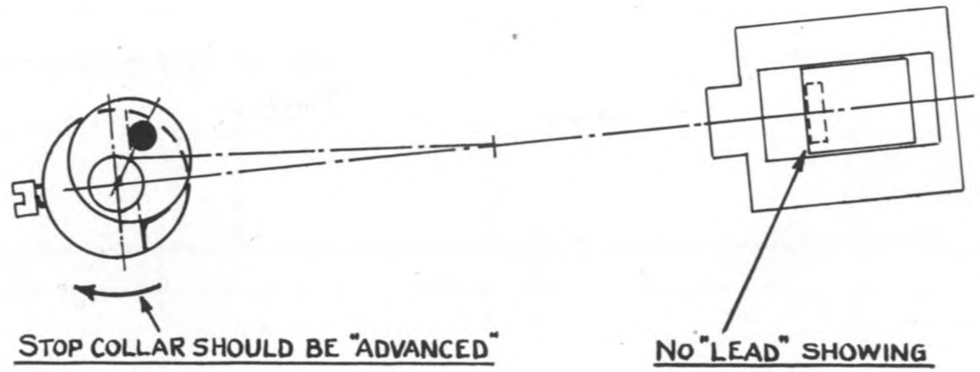


Fig. 94.

Adjusting the angular position of the stop-collar to give the correct amount of "lead." The crank is not shown, but is assumed to be in the back dead centre position, and the engine is running forwards.

shows less, our valve is working "late" in the cycle of events, and should be "advanced" a little by slight forward rotation of the stop-collar. If it is "early," of course, the stop-collar should be "retarded." (Fig. 94.) Now observe the valve with the crank on front dead-centre, seeing how much lead shows on the front port, with the eccentric still back so that it is in the position of being rotated forwards by the stop-collar. If your valve-spindle is correctly set, the amount of lead showing will be the same. If it is more, the valve is still too far back, and if less, the valve is too far forward, and the spindle should be adjusted in the fork-end accordingly.

When you are satisfied that the lead is about the right amount, and (more important), is the same at both ends, repeat the whole performance for backwards running. With the crank still on front dead-centre, turn the eccentric forwards until it is in position against the other "step" of the stop-collar, as it would be when being driven backwards by it, and see what sort of lead you've now got at the front end. If it looks less than in forward-gear, you may have been a bit generous with the amount of lead before. In any case, correct it by rotating the stop-collar backwards a little, thus pushing the eccentric round and "advancing" it a little more for back-gear running. If, on the other hand, you seem to have too much lead in backwards gear, your eccentric may be over-advanced for backwards running, and the stop-collar should be turned forwards a little. *You cannot tell how much lead your gear has until you have in this way ensured that it is the same for both directions of running.* Increasing it for one reduces it for the other. Now that this is done you can make up your mind whether the amount of lead is right—or too much or too little. If it is too much the eccentric is being driven too far advanced for both directions of running—the "step" in the stop-collar is too high. It is not easy to reduce it now that the motion is assembled, but the pin in the eccentric can have a small flat filed on it where it comes round against the collar. The lead is not likely to be insufficient—such a small amount is all that is necessary that the merest "crack" of port is enough, and if you have inadvertently made the ends of your valve, or the edges of your ports, without absolutely dead-sharp corners this will act as a sort of "false lead," and so this checking should be looked upon as making sure that the lead is not excessive, and if it is not, leaving well alone. Excessive lead would be likely to cause undue jerkiness of the engine at low speeds, and with a single cylinder that is the last thing we want to encourage.

The above remarks assume that everything else has been made correctly to dimensions—the valve length, the size and spacing of the ports, and the "throw" of the eccentric, and we should not be tempted to start making alterations to any part before making quite certain that the fault does not lie elsewhere. There are so many things happening at once when the valve is working, and they are so tied up together that two "wrongs" definitely will not make a "right"—they are more likely to produce a third or fourth "wrong!"

If you are quite satisfied that you have got everything *exactly* right, then there is no more we can tell you, and if the engine doesn't run properly the fault is not here. This is unlikely to happen, however; in nine out of ten cases of an unsatisfactory engine of a type as simple as this the cause will be in the steam-chest, or steam "blowing past" a badly-fitting piston or valve, or out through a leaky cover joint.

Our Cover Picture

Is provided this month by Mr. E. D. Bruton and shows a Bangor-Llandudno Junction stopping train emerging from under the Conway Tubular Bridge. It is an impressive setting for the train and may suggest some scenic possibilities to modellers. Reproduction of the bridge would be a major undertaking and demanding upon space, but a short tunnel mouth of this type might be worked in a corner of the layout with advantage especially as the demand on space would mainly be vertical rather than lateral.

A GAUGE O STEAM LOCO FOR BEGINNERS

Part 20. **By "1121."**

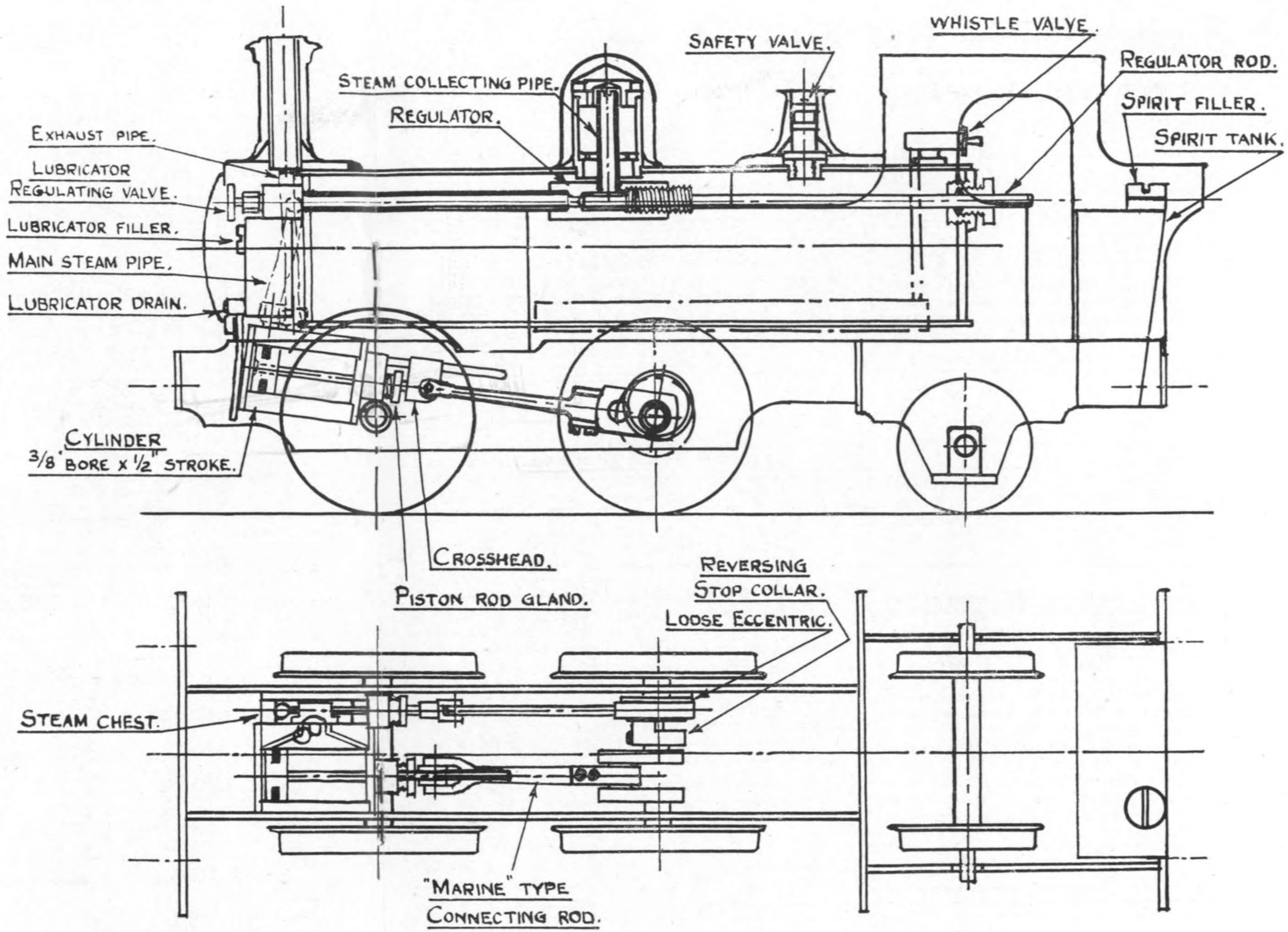
The other " Valve Events."

In passing, learners might like to be told something of the remainder of the valve's functions, which do not by any means stop at getting the steam into the cylinder, and this is very easy with the chassis actually in front of you.

We have seen that when the crank is on the back dead-centre the valve has opened the back port to " live steam." As the piston moves forwards along the cylinder the port opens wider until the valve gets to the front end of its travel, and is closed as the valve moves back again. When the valve moves back far enough to cover the port again, obviously no more steam can get into the back end of the cylinder, and this is called the " cut-off " point. This point is measured as the distance the piston has moved along its stroke when it occurs, expressed as a percentage of the total stroke. In our case, if you care to do some measuring, you will find that when the valve reaches " cut-off " the piston will have travelled inwards for ⅜ in., which is three-quarters of the full stroke of ½ in. so we can say that the engine works at 75% cut-off.

The valve is greater in length than the distance over the outer edges of the ports. This means that its front end is still overlapping the front port by a considerable amount, and that it has not yet moved back to its mid-travel position. That is why the eccentric is not set at a right-angle in advance of the crank, but further in advance of it than this, the extra angle being termed the " angle of advance," and shown in Fig. 88. If our valve were to be made exactly the same length as the distance over the ports, the eccentric would be set exactly at right-angles in advance of the crank, with no " angle of advance," and the steam would not be cut off until the piston had reached the front end of its stroke, or in other words the engine would be working at 100% cut-off—a wasteful proceeding as explained in the " Finding Fault " article. This way, too, the valve travel would have to be less—only as much as would be required merely to open each port. Thus, it will be seen that the more the valve is increased in length the earlier in the piston's stroke will be the point of cut-off, and the greater must be the valve-travel to take up this extra length. The amount of this extra length, over and above the distance over the ports, added to each end of the valve, is called " steam lap," and we can say that the total valve-travel equals twice the port-length plus twice the " lap."

The exhaust events of the valve are not so easily seen and followed, but with the engine in front of us, and bearing in mind that, the valve exhaust cavity being near enough the same length as the distance *between* the steam-ports, we can see that the cavity will just be starting to open either port to exhaust according to which way the valve is moving, when it is in its mid-travel position, and we can observe where the piston is in the cylinder when the valve is in this position, with the eccentric on top or bottom centre. If our valve cavity is too short, this exhaust-opening will be later in the piston's stroke, and the closing again will be earlier in the return stroke. If



General arrangement of Gauge O steam loco—not to scale.

the exhaust closes too soon, excessive compression may be caused in the end of the cylinder as the piston finishes its stroke. Our dimensions for the valve-cavity (1/64 in. longer than the distance between the ports), ensures that this does not occur, the exhaust actually closing at about 95% of the stroke.

Air-test.

We hope that this has given you some idea of what is happening in the steam-chest, and we are quite sure that by now you will be wanting to see some wheels going round under their own power, if not under their own steam. This can very easily be arranged with any source of compressed air, from a bicycle-pump upwards, it being only necessary to make up an adaptor, one end of which will be screwed 3/16 in. by 40 T.P.I. to go into the entry-hole in the top of the steam-chest. The thread should only be about ⅛ in. long, or the end may project into the steam-chest and foul the valve. The other end of the adaptor is made to suit whatever source of air you are using—a bicycle-tyre valve with the inner end cut off could be soldered into it to provide a connection for your pump. Naturally, the cylinder-block must first be removed from the frames, and fitted up complete with its steam-chest cover, and all paper joints, piston and gland packings, etc., installed.

These paper joints go in everywhere where there would otherwise be a metal-to-metal joint, namely, under both the front and back cylinder covers, between the steam-chest and cylinder-block, and under the steam-chest cover. They are made from brown paper, a stiff and hard rather than a soft and woolly variety, a small piece first being cut and smeared over with oil on both sides. Lay the piece over the end of the cylinder-block, in the case of the cylinder cover joints, and push the point of your scriber through the paper into the screw-holes in the block. This will produce a kind of paper burr which will anchor the paper on to the block while the subsequent operation is performed.

This consists of cutting out the hole in the middle, the best and easiest way of doing this being to tap all round the end of the cylinder-bore with the ball-pane hammer, which will cut out the circle far more neatly than it could be done any other way. Note that this circle must also be cut out of the front cylinder cover joint, even though there is nothing to project through the hole. If any paper is left exposed it will break up as soon as the steam gets at it, and you will have awful trouble through little bits getting stuck in the passage-ways. Trim the outside edges with a razor-blade after screwing down the cover.

Exactly the same process is used to make the two steam-chest joints, the rectangular opening being cut out of each by tapping round the edge of the opening in the steam-chest. Once again we repeat—make sure there are no burrs anywhere on these components, or your joints will blow straight out!

The piston's groove is packed as full as possible with graphited asbestos string. Beware of some varieties we have discovered, which have a very fine brass wire running through the string. This would be all right for some purposes, but it isn't very clever to find an end of wire, which you can't get rid of, all ready to get jammed in between the piston and the cylinder bore! The same stuff is used for the two glands. Cut off a little bit—enough to go about twice round the piston rod or valve spindle, whichever you are doing, and stuff it into the gland. Screw the gland-screw in fairly tightly, take it out again, and if it seems to need it, put a little more in and press it down again with the screw. Finally, release the screw, and leave it only a little more than finger-tight—just tight enough so that it won't unscrew itself, without being so tight as to cause excessive friction.

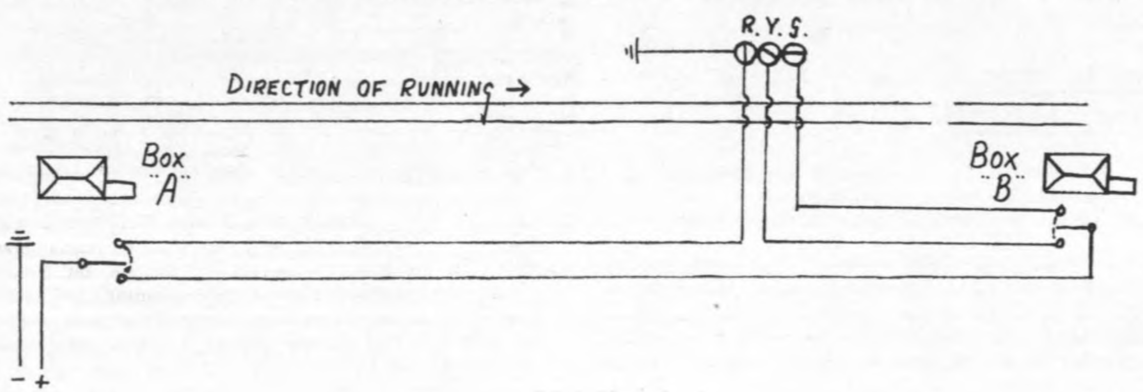
Colour Light Signals

By C. T. GOODE.

Single colour light signals add a business-like atmosphere as well as a touch of variety to a mechanically signalled layout, and the one shown in the diagram can be quite easily installed. The unit is here serving as a starting signal for Box " A," as well as a distant signal for Box " B," and the circuit diagram should make it clear how the three aspects may come to be shown. In the normal position at "A" the current would pass through one pole of the two-way switch and light up the " danger " indication. On reversing this switch the current would then flow through to the next Box " B," where it would take whatever path was made for it, i.e. whether the switch at " B " was normal (yellow), or reverse (green).

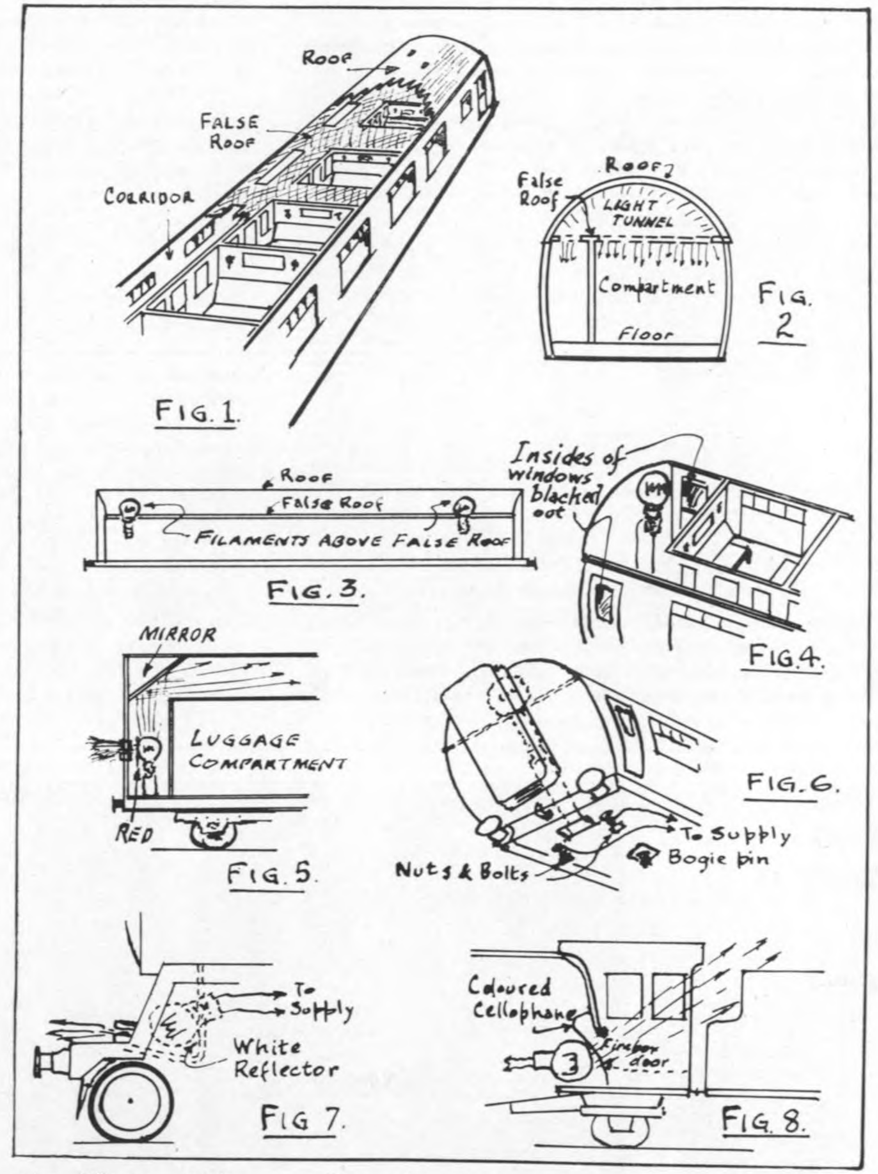
Simple though the circuit may seem, the results obtained by its incorporation are pleasing, and it is most realistic to see the red turn to yellow, then to green as the operator ahead 'sets up the road,' finally to return to red again when the 'starter' lever (or switch) is replaced.

The idea lends itself, too, as a solution at locations where it is difficult to operate a distant semaphore, due to distance from the frame, curves or an intervening tunnel.



"Night Travel on the 4 mm"

By A. H. J. BARNETT



Modelling to 4 mm. scale has produced some really lovely examples of craftsmanship, yet I think I am right in saying that, in the main, the fixing of lights, whether to coach interiors, engines or brake vans, has to a great extent been ignored. In the commercial field we have seen attempts at placing lights in the form of a bulb in the middle of the smoke-box door of tinplate O gauge locos, which gave the impression of a 24 in. search-light on a local train from Kings Cross to Hertford! I recently saw a gauge 1 model (or toy?) carrying a red tail light that was dazzling in almost broad daylight. More recent 4 mm. commercial productions appear to be going in for coach, loco, brake van, station and signal lighting, and very good they appear to be—as far as commercial productions go—though in my opinion they are far too bright (they probably have to be, in order that the public can see what they are buying, for usually these things are on sale in a brightly lighted store!)

Many modellers go to great lengths to obtain accurate information measuring, photographing and drawing a particular item of their choice, and have at their command, documentary proof as they build their pet piece of equipment. When it comes to details of *light* as opposed to the lamp or material object, the problem is quite different. Light changes its density according to distance, and as many people have pet ideas about scale speeds yet never seem to agree, I trust that this will not act as a starting gun for " scale light " argument. As I see it, the answer can only be based on a sound observation of prototype railway lighting, followed by trial and error with a model, the trials being made in absolute darkness.

If a model railway is going to be equipped with lighting it should be operated in the dark. I have tried limited experiments on these lines, and it is amazing how a source of light, which is almost invisible on a layout when a 100 watt electric " sun " is shining merrily overhead appears just right when the " sun " is switched out and the entire track darkened. This point can be proved in prototype practice. Unless you look up at the ceiling of a compartment in which you are travelling

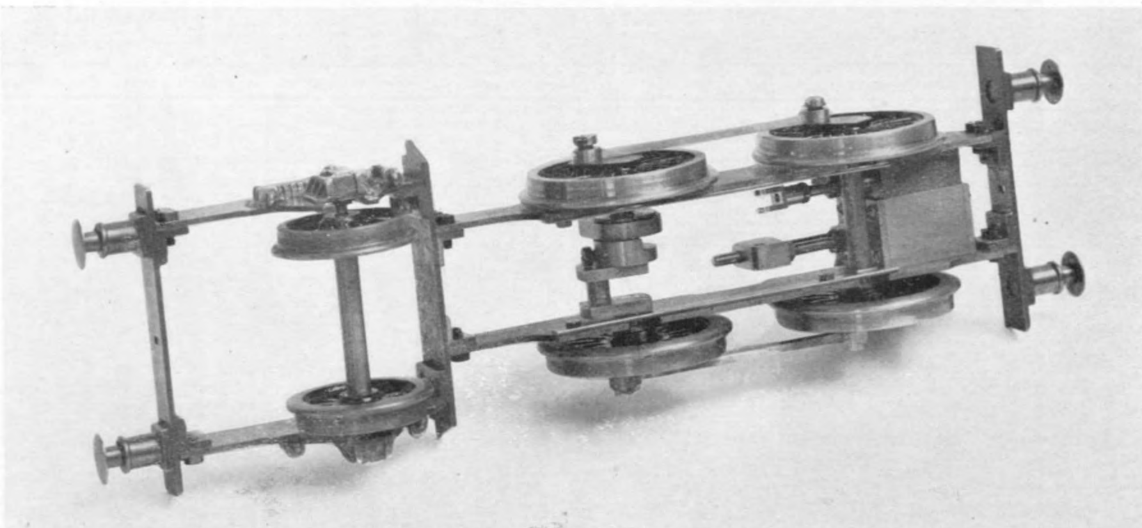
Building A Gauge O "Aladdin."

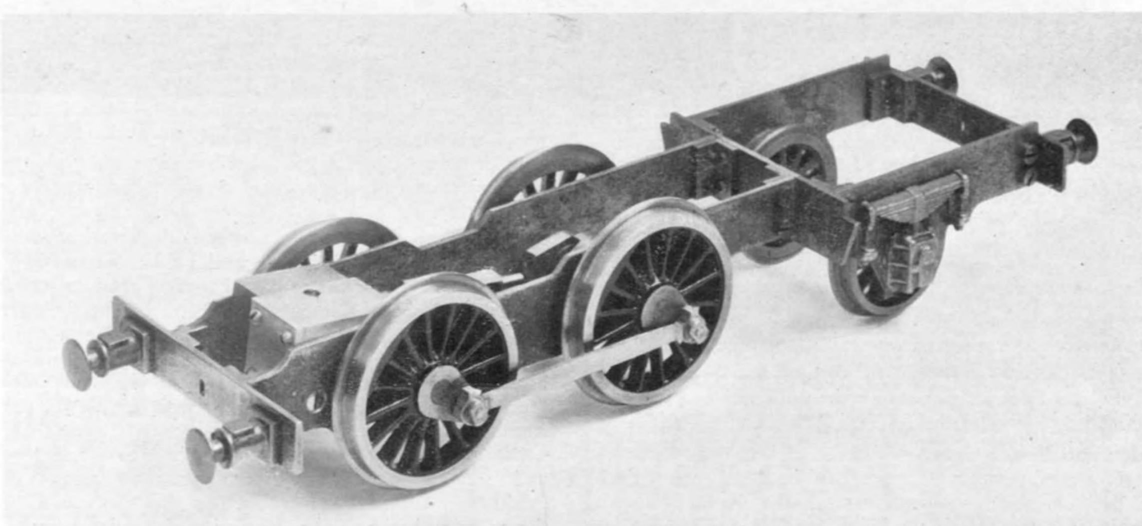
By K. S. TERRY.

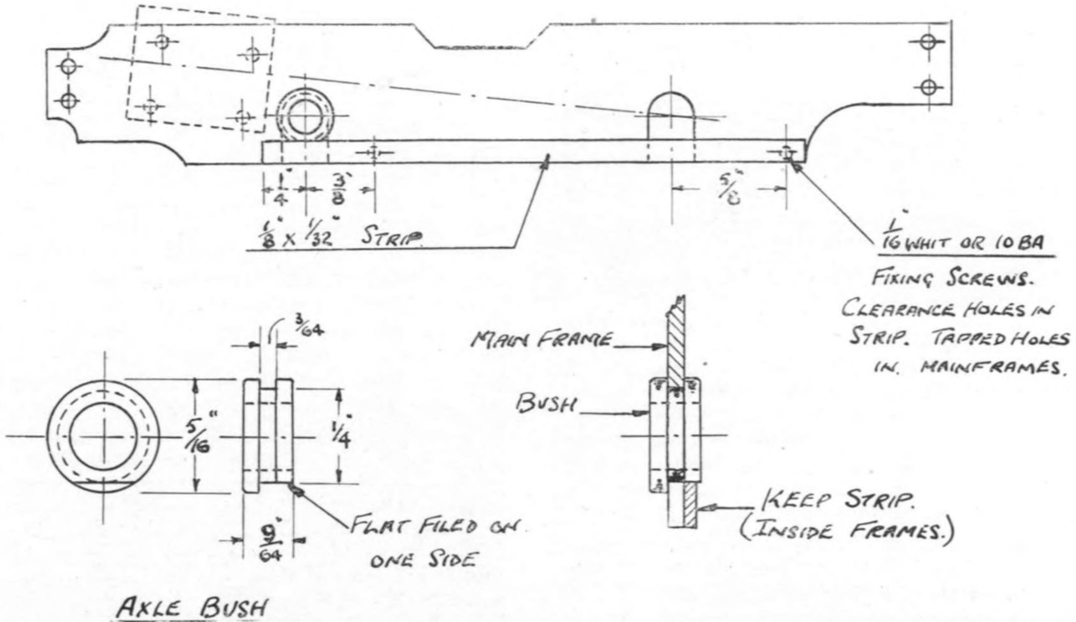
As readers will note the chassis is rather more advanced than is covered by the articles to date in the *Model Railway Constructor*. I have been closely following the description of the "Gerry" in the 'Model Maker' also by "1121," and as the cylinder block of this engine is identical to "Aladdin's" I have carried on and completed the steam chest, etc.

Before I tapped and drilled the cover fixing holes I tried the cylinder block and steam chest in the frames and found that there did not seem to be enough clearance between the back cylinder cover and the leading axle for 8BA cheese head screws, so I have used 10BA round heads for all screws in the covers, as in any case these are quite strong enough.

The driving and coupled wheels were originally intended for a L.S.W.R. Drummond tank that was never completed and after these had had the flanges turned off, and steel tyres shrunk on were re-turned up to "Aladdin" dimensions. The trailing wheels are Bond's as are the brass dummy axle boxes and springs.







To enable one to dismantle the loco should the need arise, I have modified the frames and axle bushes slightly, as can be seen by Mr. Dempster's photographs and the sketch. I have used this idea on my L.M.S. 3F 0-6-0 tank quite successfully as it can be adapted to suit any locomotive if the axles are not sprung.

A 4 mm. Scale Locomotive Stud.

Part 6. By A. S. TAYLOR.

G.W.R. 4-6-0 No. 1013 "County of Dorset."

This engine was professionally built for me by Mr. E. N. Nineham of Ringwood and I am delighted with the result that he has obtained. The model is fully detailed including such items as cylinder draincocks, full brake gear, ejector piping, crosshead pump and engraved name and number plates. Power is derived from a Romford 7 pole motor and collection is attained by spring loaded studs working on the inside rims of the driving wheels. Full advantage has been taken of the space available for lead and a fast and powerful locomotive has resulted. The model was spray painted by myself and lined in red and gray by Mr. Eric Longbottom, a friend of mine. He has made a very fine job of the lining and added not a little to the final appearance.