THE MODEL ENGINEER

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THE MODEL ENGINEER

EVERY THURSDAY

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CONTENTS

Our Cover Picture

The charm of an old-world English farmhouse kitchen is admirably captured by this group of models, constructed by Mr. F. Slater, of Bury, Lancs, and exhibited in the loan section of this year's Northern Models Exhibition. Each individual item is correct in scale and character, and will bear the closest inspection ; this applies to both the woodwork and metalwork. The chair and table legs and spars are turned, and the methods of construction employed in these and other pieces of furniture are true to type ; the same applies to the numerous metal utensils and fittings, including the warming pan, the horse brasses, candlesticks, etc. In the wide fireplace, a log fire is laid ready for lighting, with the fire-irons on the hearth and bellows all ready to assist combustion when required. Even the Dutch wall clock, and the pipe racks on wall and mantelpiece, are not forgotten, and the ship in a bottle gives a final touch to the scene. Apart from its merits as a fine example of model craftsmanship, this collection provides a homely sidelight on the domestic arrangements of an age when the work of the craftsman was everywhere in evidence, and duly appreciated by the community.

SMOKE RINGS

The Birmingham Exhibition

NEXT MONDAY, May 4th, the Right Worshipful the Lord Mayor of Birmingham, will open the "Coronation Year" exhibition organised by the Birmingham Society of Model Engineers. The ceremony takes place at 3 p.m. at the Bingley Hall, and the exhibition will be open each day until the Saturday, May 9th. Neighbouring societies are collaborating to ensure that the cream of the work of model engineers in the Midlands will be on show, and local dealers and manufacturers will be displaying tools, castings and materials specially produced for our hobby. Passenger-carrying on the locomotive track will be a constant attraction throughout the period of the show. It is some years since Birmingham had its own model engineering exhibition, and from what we hear, this one bids fair to be the best ever held there.

Prennez le Crampton

AS WE anticipated, the appearance of the first of Mr. E. W. Twining's articles on "British Crampton Locomotives," has aroused a lot of interest and approval. One reader writes : "How pleasant to find a contribution from Mr. Twining, and one on such an interesting subject, so beautifully illustrated ; one looks forward to the rest of the series with the keenest anticipation.

"As you say in your foreword, Crampton locomotives had a great vogue in France, and perhaps to a lesser extent in some other Continental countries, too ; so much so in the first-named country that, at one time, 'Prennez le Crampton' was the accepted phrase for 'Take the train.'"

Another reader writes to say that for a long time he has wanted to build a working model of a Crampton locomotive, but has had difficulty in finding enough information to enable him to prepare a really satisfactory working drawing ; he adds : "You can imagine my joy when I saw Mr. Twining's article in your March 12th issue. Your foreword states that this is the first of a series of articles, and I am eagerly looking forward to the others, especially if the drawings are all to the same standard as the first lot. Please hurry them forward ; you are giving us the most interesting locomotive material we have had for many a long year."

This latter correspondent was especially anxious to have particulars of the Crampton engine, *London* ; so he did not have long to wait, since this engine was the subject of the second article, published only two days after he had written his letter ! We can assure our readers that this unique series of articles covers all the known examples of British Crampton engines and will be published as rapidly as possible.

Slough and Windsor Exhibition

IN AUGUST of each year, the Slough and Windsor District Holiday Carnival is held at Agar's Plough, Windsor Road, Eton. This year, the dates will be from August 1st to the 8th, and in connection with the carnival, the organisers will be staging a hobbies exhibition.

To celebrate Coronation year, a special effort is being made to put on a really interesting exhibition, and manufacturers are being offered a unique opportunity of presenting their products to a large section of the public. The organisers do not require purely static displays, but would be glad to hear from manufacturers who would be prepared to put on demonstrations of their products which would be of general interest. There is no charge for space.

Intending exhibitors, or anyone desiring further information, should get into touch, as soon as possible, with Mr. Robert S. Williams, 33, Shaggy Calf Lane, Slough, Bucks.

L.B.S.C.'s "Canterbury Lamb" in $3\frac{1}{2}$ in. Gauge

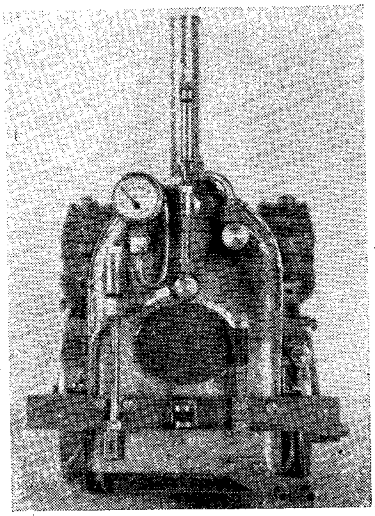
● DETAILS OF THE TENDER

THE number of little *Invictas* under construction has far exceeded anything I ever dreamed of! I naturally thought that the little reincarnation of the "old lady who stands in the market place" would find favour in her home county, but she has "caught on" all over the world; and photographs have come to hand from many unexpected sources.

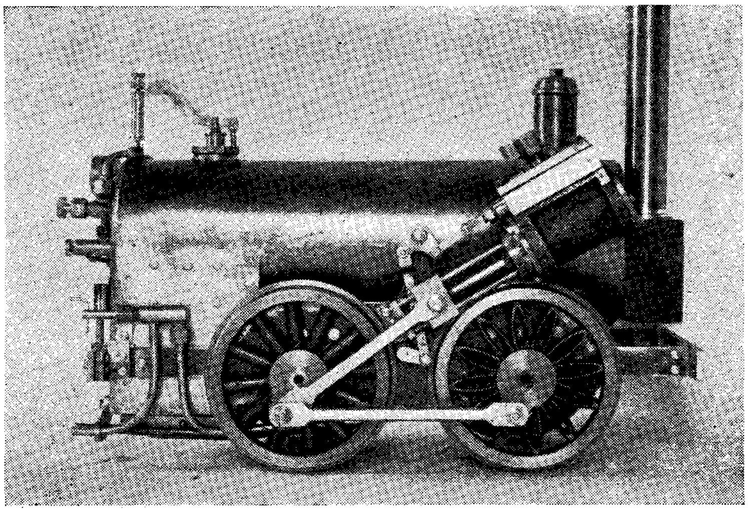
Jack Hewitson, of Montreal, whose four-cylinder "Super" 4-4-0 with Holcroft valve gear was illustrated a short time ago, side-tracked his big 4-8-4 and started on an *Invicta*, to such good purpose that he caught up with the notes, and started to "run ahead of schedule." A few days ago, time of writing, he forwarded a batch of photographs, some of which are reproduced here, and they speak for themselves, so there is no need for me to try to gild the lily. One of his innovations is a clack inside the smokebox, discharging the water from the feed pump into a perforated hollow stay. The safety-valve is a work of art, and so are the backhead fittings. The smokebox front shown in the picture, is a wooden dummy, put on temporarily for photographic purposes; Jack is using a cast front, and at the time the photographs were taken, the casting was running late. Congratulations are certainly due on this job, which work perfectly under air pressure. I hope to show some pictures of other builders' efforts, some of whom have now completely finished the engine part. Well, let's get on with it—mustn't keep the good folk waiting!

The tender soleplate will need a piece of 16- or 18-gauge sheet brass, preferably hard-rolled, which should be perfectly flat; the overall size is $7\frac{3}{8}$ in. × $4\frac{1}{2}$ in. The end which will be at the back, is rounded off on both corners as shown. The first job is to drill the holes for the two union fittings and the strainers. The hole for the bypass connection is $3\frac{5}{16}$ in. from the front edge, and $1\frac{3}{8}$ in. from the right-hand side; use $\frac{1}{4}$-in. drill. The hole for the hand-pump feed-pipe union is $\frac{13}{16}$ in. from the back edge, and $\frac{5}{8}$ in. to the left of the centre line; another $\frac{1}{4}$-in. hole. The two $\frac{1}{2}$-in. holes for letting the water into the well, are drilled $\frac{5}{8}$ in. each side of the centre line, approximately $3\frac{1}{4}$ in. from the back edge. These are covered with circles of fine brass or copper gauze, soldered on.

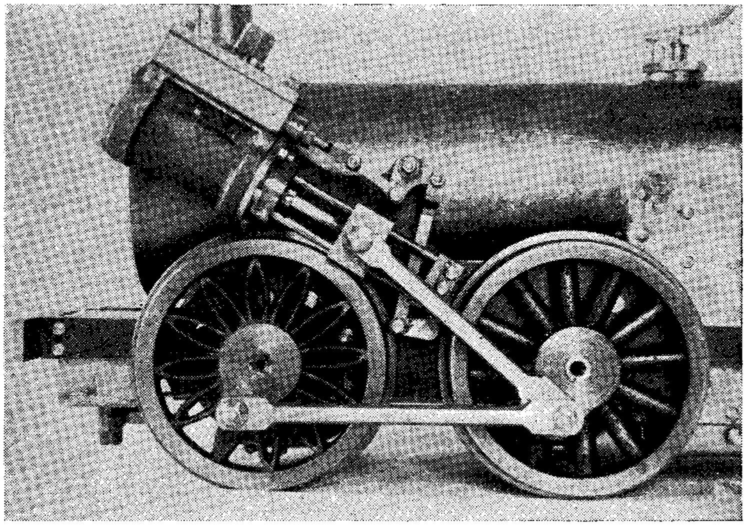
The sides and back of the tender body are made from a single piece of 20- or 22-gauge sheet brass, approximately $15\frac{1}{2}$ in. long and $2\frac{1}{2}$ in. wide. Mark off one corner, and cut to the outline shown; lay the cut-out piece on the other corner, run a scriber around it, cut to outline, and then the two corners can't help being exactly alike. It is easier to do this while the piece is still flat. Then bend to an arch shape, like a section of Anderson shelter, of not-so-blessed memory. Next, fit the front piece, and the front end of the tank; these are merely pieces of the same kind of metal as the body, with $\frac{1}{4}$ in. at each end, bent at right-angles to form flanges. Rivet with $\frac{1}{16}$ in. brass or copper rivets; you can form pimples on the outside, if you prefer them, or rivet flush. Pieces of $\frac{1}{4}$ in. × $\frac{1}{16}$ in. angle are riveted to the upper edge, at $\frac{3}{16}$ in. from the top (see section) to carry the tank cover; don't bother to bend the angle to the radius of the back of tank, just put a little piece on, at each side, as shown in plan view. Put a piece along the top of the tank front, at $\frac{1}{16}$ in. below the edge, also put four short lengths along the bottom edge, for strengthening up the joint between



Backhead fittings under way

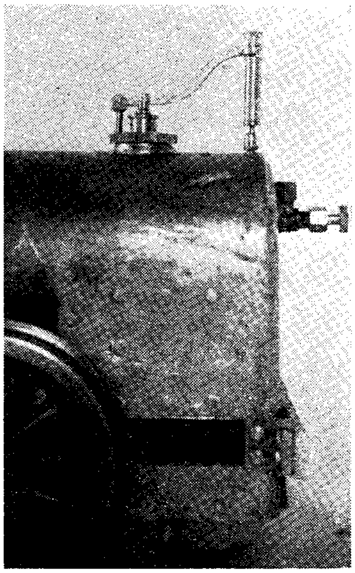


Mr. Jack Hewitson's "Invicta"

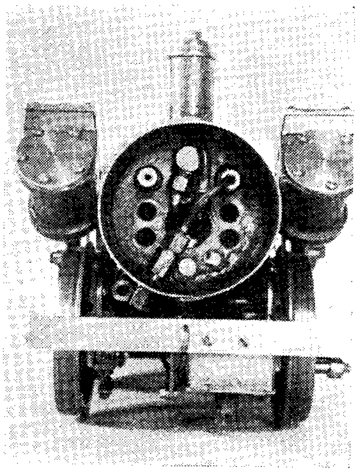


"The works"

pump barrel. Use 23/64-in. drill for these, then ream with a $\frac{3}{8}$-in. reamer, just sufficiently to allow the $\frac{3}{8}$-in. pump barrel to squeeze in tightly. The pump barrel is a $1\frac{9}{16}$ in. length of $\frac{3}{8}$-in. brass treblet tube, which is—or should be !—smooth enough to need no internal finishing. If it isn't, teach it good manners with a bit of fine emery-cloth wrapped around a stick, so that it fits the bore. Square off the



Rear end—note safety-valve

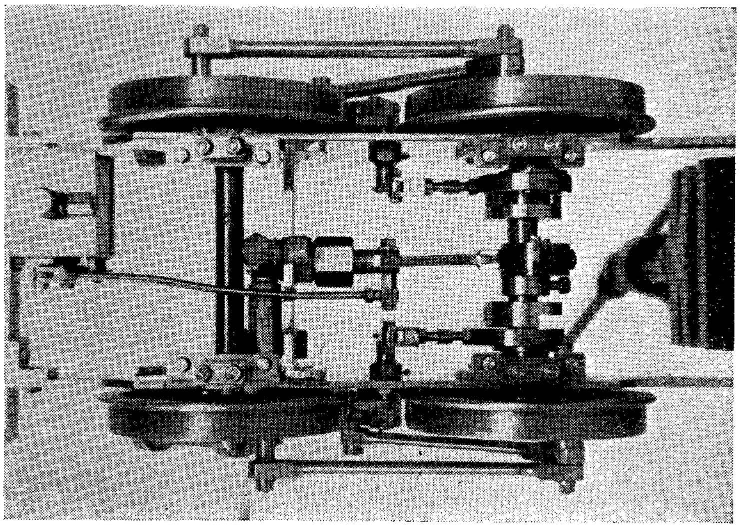


An unusual feed arrangement !

Next, make the hand pump, and the bypass fitting. The hand pump is only for emergency use, but it is good "insurance" ! There is no need to detail out all the construction as it is my "standard" pattern which has been fully described umpteen times already. Although the stand is shown $\frac{1}{8}$ in. thick, 3/32-in. metal will do just as well, if you have a strip handy ; it is $\frac{3}{4}$ in. wide, and bent as shown. Drill one No. 30 hole in the top, and two in each lug ; also, two for the

body and soleplate, as shown in the view of the front end. Here again, there is no need to fit angle all around, as there is neither heat nor pressure to withstand.

Place the body on the soleplate in the position shown in the plan view ; attach the bits of angle to the soleplate by $\frac{1}{16}$ in. brass screws, or rivet them if you like. Then solder all around on the inside, and up the joints between the tank sides and the bent-over ends of the front plate of the tank. If any solder oozes through, scrape it off on the outside, with an old file which has had the end ground off square.



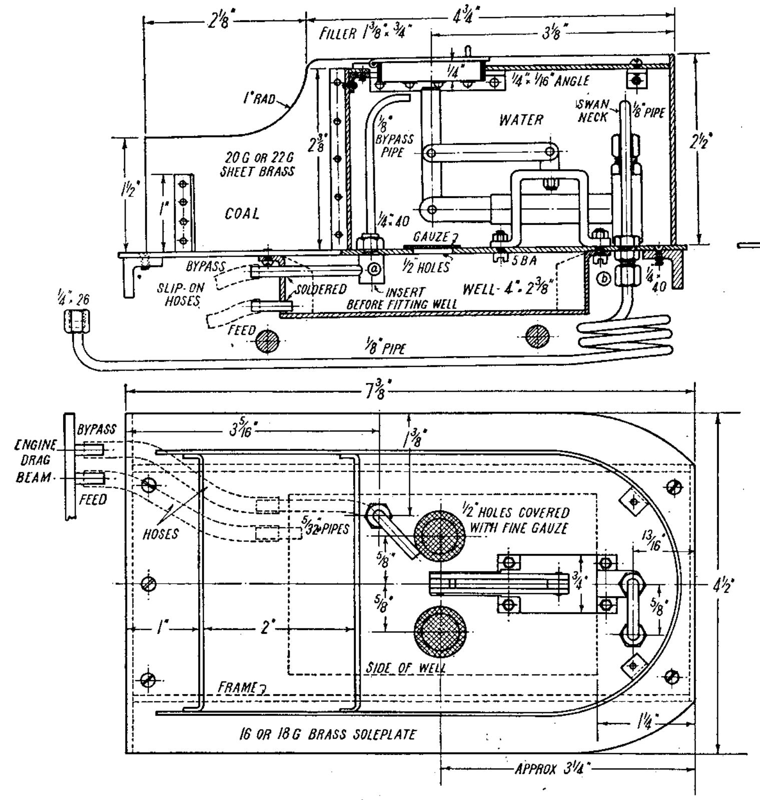
Underside view of motion

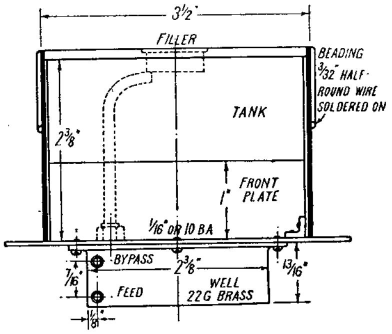
ends in the lathe, and fit the end piece as shown in the section.

The valve-box is made from a bit of $\frac{3}{8}$-in. round rod, $\frac{13}{16}$ in. long, by exactly the same process as described for the eccentric-driven pump; but a $\frac{3}{16}$ in. × 40 hole is drilled and tapped in the side, to accommodate the barrel spigot (see section) and the bottom plug has no union, but is faced off flush and cross-slotted. After screwing in the barrel, squeeze it through the holes in the stand, set the valve-box up straight, and solder all the joints, just as a precautionary measure. If you haven't a bit of rod handy, that will slide into the barrel to form the ram, turn it from $\frac{3}{8}$ in. round. An easy sliding fit does fine; it needn't be as exact as a piston fit. Form a $\frac{3}{16}$ in. packing groove at $\frac{1}{8}$ in. from the end; and slot the other end to take the lever. The slot should be $\frac{1}{8}$ in. wide, and about $\frac{1}{2}$ in. deep; drill the cross hole No. 43, for a 3/32-in. pin.

The anchor lug for the links is made from $\frac{1}{4}$ in. × $\frac{1}{8}$ in. flat rod; the two links from $\frac{1}{16}$ in. × $\frac{1}{4}$ in. strip, and the lever from $\frac{1}{8}$ in. × $\frac{1}{4}$ in. flat rod; all very simple jobs. Then assemble the whole bag of tricks, as shown in the drawing, making the pins from 3/32 in. bronze rod. Stand the completed pump on the soleplate, with the centre line of the valve-box at $\frac{13}{16}$ in. from the back end (see illustration), and put the No. 30 drill down the holes in the lugs, making countersinks on the soleplate. Now note: the nuts have to go on top, instead of being underneath as usual, owing to the well. Two of the screwheads will be inside the well, completely isolated from the world at large; and if the screws drop down inside the well after the whole lot has been soldered up, you've had it, and boy! wouldn't there be some extra words to add to the dictionary of railroad Esperanto! Prevention is always better than cure, so drill the two holes nearest the handle of the pump, with No. 40 drill, at the countersinks on the soleplate; tap $\frac{1}{8}$ in. or 5 B.A., and put two brass screws through from the underside. Then solder over the heads; and if *that* doesn't keep the so-and-so's in place, nothing will! The two holes nearest the back end, are drilled No. 30, as the screwheads come outside the well, and they can be put through the flange of same, as shown, thus killing two birds with one shot.

Don't screw the pump down "for keeps" yet, but make the two fittings shown at *a* and *b*. The former is just a $\frac{5}{8}$-in. length of $\frac{5}{16}$-in. brass rod, with $\frac{1}{4}$ in. of one end turned down to $\frac{1}{4}$ in. diameter and screwed $\frac{1}{4}$ in. × 40, and furnished with a locknut. It is drilled with No. 32 drill, and a piece of $\frac{1}{8}$-in. pipe about $2\frac{3}{4}$ in. long, fitted in the hole. Another hole is made in the side, with No. 23 drill, and a $1\frac{1}{2}$-in. length of 5/32-in. pipe fitted into it, both pipes being silver-soldered. Poke this through the hole indicated, from underneath, and screw the locknut on, from the top, keeping the short pipe parallel to the tender centre-line; see section. The vertical pipe can be bent over, after the tank cover is made, to squirt the bypassed water across the filler hole.

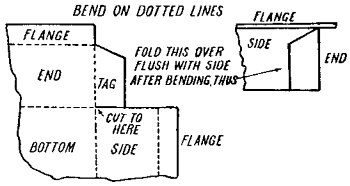




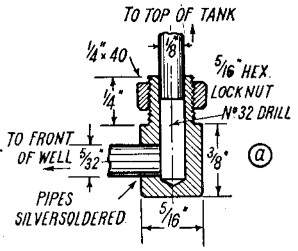
Section of tender body, front end view, and plan, showing soleplate and fittings

Fitting *b* is made from a $\frac{1}{2}$-in. length of $\frac{5}{16}$ in. hexagon brass rod, $\frac{3}{8}$ in. of it being turned down to $\frac{1}{4}$ in. diameter and screwed $\frac{1}{4}$ in. × 40. Do this before parting off the bit of rod to length. Make a locknut to suit. Centre deeply, and drill right through with No. 40 drill. Open out the hexagon end with No. 32 drill for about $\frac{1}{8}$ in. depth; and in it, silver-solder a piece of $\frac{1}{8}$-in. pipe long enough to make a swan-neck for connecting to the top union on the pump valve-box. The end of the swan neck is furnished with the usual nut and coned nipple.

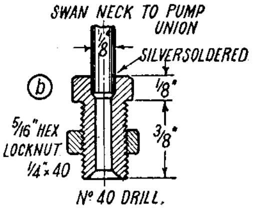
The well needs a piece of 22-gauge sheet brass measuring $4\frac{1}{2}$-in. × $6\frac{1}{8}$ in. Scribe a line $\frac{1}{4}$ in. from all four edges, and another ditto $\frac{13}{16}$ in. from the four already scribed, leaving a rectangle measuring 4 in. × $2\frac{3}{8}$ in. in the middle. Cut out the corners, but leave a tag in each corner, as shown in the detail



How to make the well



Bypass fitting



Union for hand pump feed pipe

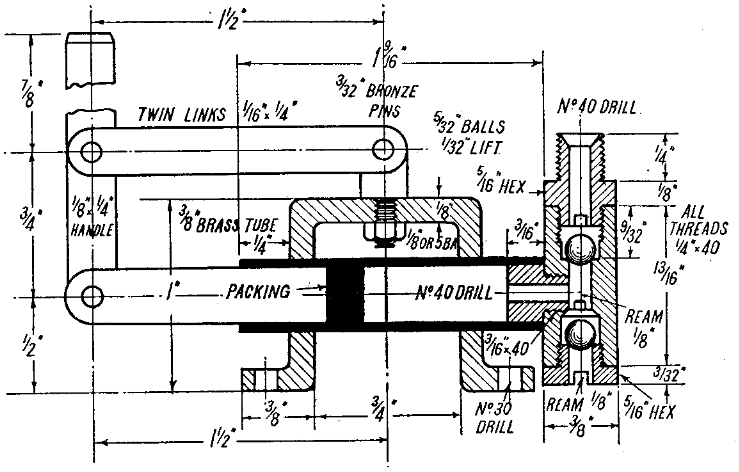
sketch. Bend on the dotted lines, to form a flanged open box, or sump ; bend the tags around each side, and hammer down closely, as shown. Soft-solder all four corners, sweating right through the tags. Drill three or four No. 51 holes in each flange, except the back one, and attach the well to the underside of the soleplate by $\frac{1}{16}$ in. or 10-B.A. brass screws. In the back flange, run the No. 30 drill down the two rear holes in the soleplate, for attaching the pump, and put the two brass screws in with temporary nuts on top, to hold the flange tightly in position. Note : in the right-hand front corner of the well, just below the flange, drill a No. 21 hole for the bypass pipe to come through ; put the well on ahead of the pipe, and slide it backwards, so that the pipe projects through the hole, as shown in the section. At $\frac{7}{16}$ in. below, drill another 5/32-in. or No. 23 hole, and fit a $\frac{1}{2}$ in. length of 5/32-in. pipe in it, for the feed. Then solder up the whole issue, going right around the flange, covering the screwheads, and soldering around the two projecting pipes. When through, give the whole doings a jolly good wash under the domestic tap, to remove all traces of flux. Don't use a paste flux, on any account ; use a liquid flux, such as killed spirits of salts (chloride of zinc), Baker's Soldering Fluid, or any similar preparation.

The body thus far assembled, can now be erected on the chassis. Incidentally, some correspondents object to that word, as reminiscent of the railway's greatest competitor. If they can give me a " pure railway " word as comprehensive, I'll gladly use it. Attach the soleplate to the tops of the buffer and drag beams, by two or three by 3/32-in. or 7-B.A. countersunk screws at each end, through clearing holes (No. 41) in the soleplate, into tapped holes in the beams. Put two brass screws through the angles at the top of the frame, into tapped holes in the soleplate ; smear the threads with plumbers' jointing. The pump can then be placed in the tank, the projecting screws in the soleplate going through the holes in the lugs ; secure with brass nuts. Put the swan-neck union nut over the top of the screw on the valve-box, and tighten up ; the fitting at the bottom, goes through the hole provided in the soleplate, and is secured underneath by the locknut as shown in the section of the tender body.

The top plate which covers the tank is made from a piece of 20- or 22-gauge sheet brass, cut to fit snugly between the sides, curved back, and front plate of the tank section of the tender body. If you follow the example of young Curly in the days of long ago, when bawbees were michty scarce the noo, first cut a piece of stiff paper or thin cardboard to the size required, and when you have fitted it exactly, use it to mark out the sheet brass, which will avoid any waste.

On the centre-line, mark out a rectangle with rounded corners, $\frac{3}{4}$ in. wide and $1\frac{3}{8}$ in. long; the front end of this should be approximately $\frac{3}{8}$ in. from the front plate of the tank (see section). Cut out a strip of brass, $\frac{1}{4}$ in. wide, bend it to the same shape, fit it to the hole, so that about 3/32 in. projects above the plate, and solder it in. The join should be in the middle of the narrow side nearest the front plate of the tank. The lid is a piece of the same kind of metal, or slightly thicker if you wish, about 1/32 in. bigger all around. When cutting out, leave two tags about $\frac{1}{8}$ in. wide, and about $\frac{1}{4}$ in. apart at one of the shorter ends. Bend these into loops with a small pair of round-nose pliers. Cut a short strip to fit between the loops, and bend that into a loop also ; a bit of 16-gauge brass wire put through the lot, assembles them into a nobby hinge. Cut the end of the strip to about $\frac{1}{2}$ in. length, and bend it so that when the lid is resting in place on the filler hole, the strip lies flat on the tank top. Secure it with a screw, or a touch of solder, which you prefer. Near the other end of the lid, fit an arch-shaped or flat-topped wire handle, drilling two holes for the ends to go through, and either riveting over the ends under the lid, or soldering them.

(*Continued on page* 527)



Section of hand pump

A set of door chimes

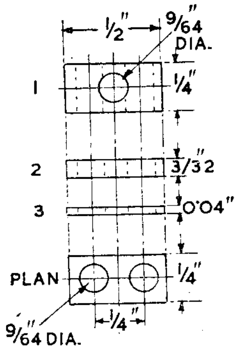
Constructional details of a useful domestic appliance

BY "ARTIFICER"

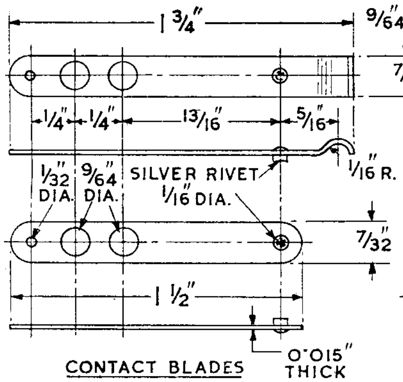
THE contact block, with its insulating strips, may be made from ebonite, vulcanised fibre, or any of the bakelite compositions ; the material I used was found in the scrap box, and is believed to be paxolin. Three pieces, all identical in plan view but of different thicknesses, are cut out and drilled, to form a sort of multi-deck sandwich, in which are interposed the two contact blades, of hard brass or german silver. The method of assembly is similar to that employed in the multiple contacts of relays, Dewar switches and jacks of various types ; readers who have used these devices in radio or telephone apparatus will be quite familiar with it. Two insulating bushes, which should be a good push fit in the holes passing through the assembly, keep everything lined up and prevent the blades shorting against the clamping screws. The blades are extended at the rear end, and drilled to facilitate soldering or bolting the connections.

It will be observed that the lower insulating strip is shown as 0.040 in. in thickness ; this happened to be the case in the strip actually used, but the figure is not at all important, as it serves only to space the keep plate a little way from the contact blade so as to give scope for the adjusting screw, which presses against the blade to influence the contact pressure. Insulating washers are fitted under the clamping screw heads to prevent contact with the keep plate.

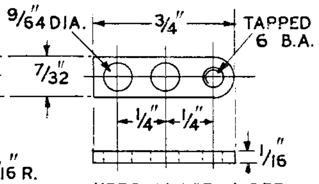
The silver contact rivets can often be found in " surplus " electrical apparatus ; in fact, with luck it is by no means beyond the bounds of possibility to find a complete contact assembly which may be used for this job with little or no alteration, if one looks long and far enough. A view of the complete contact assembly, from the underside, is shown in the isometric drawing. In place of the curled end of the wiper blade, a solid rubbing pad may be soldered on ; I have already mentioned that if a metal cam is used, a fibre pad or roller would be advisable to minimise friction. The assembly is attached to the backplate by a single 4-B.A. screw through the insulating block ; this permits of swivelling adjustment, and nothing more elaborate than this has been found necessary. Note that the insulating bushes will foul the sides of the hole in the block, so that after the contacts are clamped in place it will be necessary to pass a drill or reamer through this hole to give a clear passage for the mounting screw. Adjust the angle of the assembly so that when the wiper blade is resting on the circular part of the cam, the contacts are closed, but when the gap in the contour is reached, they spring open. Very little contact pressure is necessary, and it should be kept as light as possible to minimise friction, but if found insufficient to give electrical efficiency it can be increased by advancing the screw in the keep plate. See that the blades are clear of the backplate, and also the side of the worm wheel when assembled.



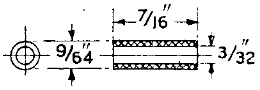
INSULATORS
1 OFF EACH



CONTACT BLADES
1 OFF EACH



KEEP PLATE 1 OFF



INSULATING BUSHES
2 OFF

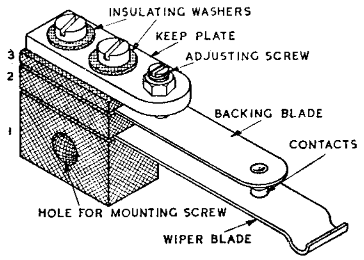
Hammer Mechanism

The components for this are made in four identical sets, except for the spacing bush, the object of which is to take up the end play on the hammer pivot, at the worm wheel end. For the hammer tail, the material recommended is mild-steel, which may with advantage be case-hardened, as the end acts like the tail of a trip hammer, and encounters a good deal of wearing friction from the pins in the barrel. These items are somewhat tricky to make, but they can be machined either from ¼ in. by ⅜ in. bar, or ¼ in. by 13/16 in. bar, according to the method adopted. The latter is preferable, as it is possible to mill or plane a length of material down to half its thickness on one side, as shown in the end view, then set it up in the four-jaw chuck to centre the pivot hole, which is then drilled centrally, and the boss turned on the front; then a parting tool may be used to turn the rear boss before parting off. All four tails are dealt with in this way, and they can then be chucked endwise for drilling and tapping the hole for the rod, also turning the boss on the end. A reamer or D-bit should be used to finish the pivot

Concluded from page 472, April 16, 1953.

hole to a smooth running fit on the pivot bolts.

Brass or steel may be used for the hammer head, which is drilled and tapped at the top for a grub screw, and opened out at the bottom to



Inverted view of contact assembly

take an inserted pad, which should be of rather soft fibre, rawhide or leather. Alternative materials are the hard rubber composition as used for boot soles, or "p.v.c." plastic belting. It should be possible to pare down the inserts with a sharp razor blade to fit tightly in the hammers, but if desired they may be cemented in with Bostik or Chatterton's compound. The hammers are cross-drilled and reamed to fit the rods, which are made from $\frac{1}{8}$ in. brass or steel rod $3\frac{1}{2}$ in. long, plus the screwed end, which is turned down about 15 thou. under size to take a 6-B.A. thread. The rods are screwed tightly into the hammer tails, making certain that the ends do not foul the pivot hole; they may with advantage be sweated in as a safeguard against subsequent loosening. They are bent as required to suit the location of the chiming rods; some thought was given to the possibility of providing individual adjustment to them but this would add to the complication and would not be readily accessible when everything was assembled. A little thought will show that it is only by bending the rods, or some alternative method of altering the relative angular location of the hammer head to the tail, that adjustment can be obtained while maintaining *full lift* of the hammers. The simple method of fitting adjusters to the hammer rest will certainly enable the drop to be adjusted, but only at the expense of limiting the lift.

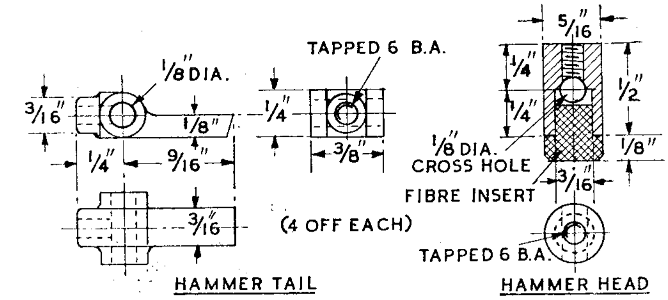
Fan Brake

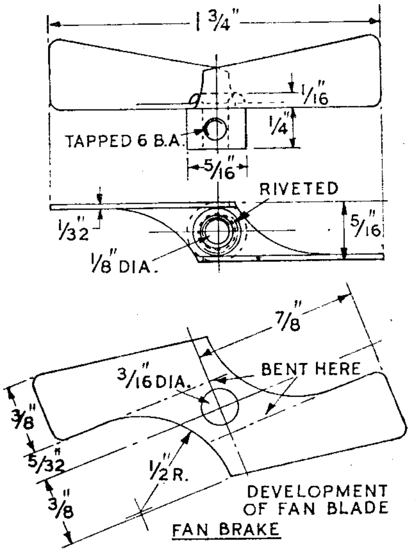
This is made of thin sheet brass or other metal, cut out to the shape shown and bent up at right-angles; the simplest way to ensure bending it neatly and accurately is to use a piece of rectangular bar, of the appropriate width ($\frac{5}{16}$ in.), with a hole drilled and tapped exactly in the centre to take a 4-B.A. screw to hold the sheet metal in place, and locate it accurately from the centre hole, which should be drilled undersize at first. The hub is made from brass rod, drilled and reamed to fit the end of the motor shaft, and with a shoulder to take the blade, which is then riveted on by using a centre punch to spread the end of the spigot. A cross hole is drilled and tapped to take a 6-B.A. grub screw for securing the hub to the shaft. When mounted, the fan should be checked to see that it runs reasonably truly and in good balance; it may be corrected if necessary by bending, or filing the tips of the blades. The diameter of the fan should be kept as large as possible, within the limits allowed; a larger fan than that shown would be an advantage if it could be accommodated.

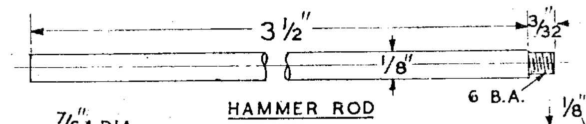
Assembly

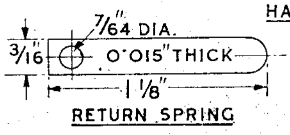
Assuming that the components have been made, and such details as the meshing of gears have been attended to in the course of construction, as advised, assembly is quite straightforward. I have not made any mention so far of the fitting of the pins to the barrel, as it is advisable to leave this until all parts are ready to put together. The endwise location of the pins is indicated in the detail drawing of the barrel on page 470 of the April 16th issue; their angular location, or "indexing," will depend on the sequence of the notes and also the intervals between them, which leave scope for individual taste. I have arranged equal intervals between the notes, but in order to experiment with their sequence, have made screwed pins of $\frac{1}{16}$ in. german silver rod, so that it is possible to interchange their positions; in other words, to "ring the changes," if desired.

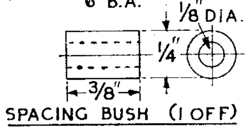
The circumference of the barrel is divided into five equal divisions, and at four of these, holes are drilled and tapped 10 B.A. to receive the pins, which are made long enough to project $\frac{1}{8}$ in. when fitted; the fifth position is an idle one, the object of which is to allow time for stopping and starting the mechanism.





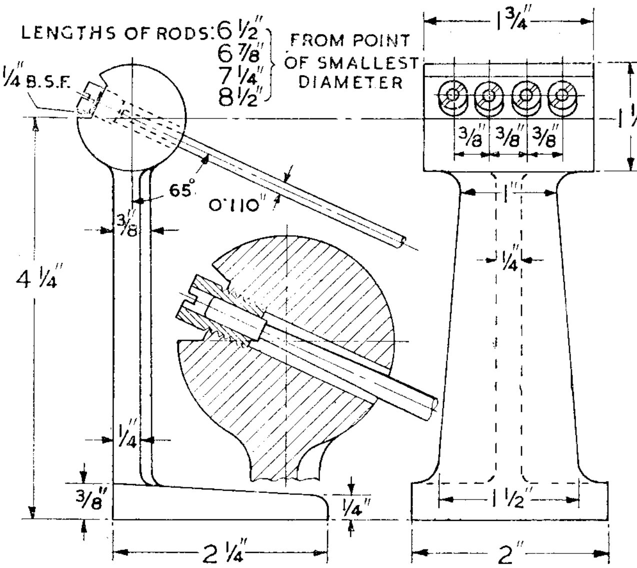




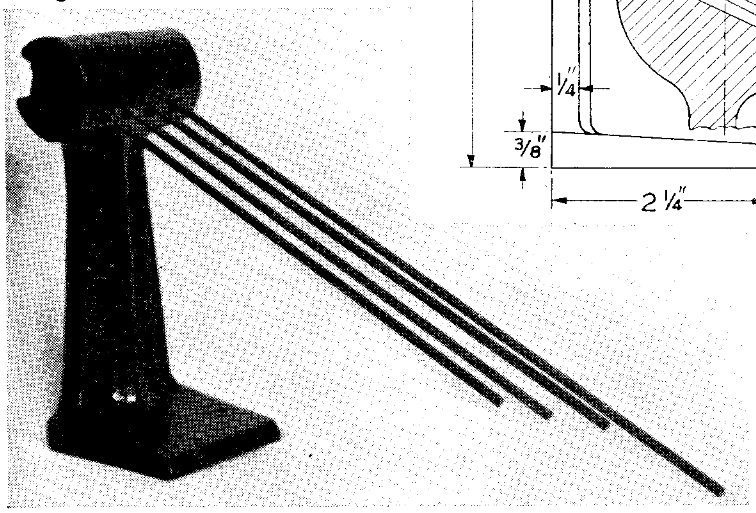


This determines the relative positions of the cam and the pin barrel, which are so arranged that the contact is broken almost immediately after the last hammer has fallen. By this means, the over-run by the momentum of the motor is just sufficient to ensure a clean break of the contacts, and when the latter are shorted by the bell-push, the motor re-starts under no load, enabling it to get up to speed before the first hammer starts to lift. This should be checked by actual trial before the position of the cam is finally fixed by drilling a " dimple " in the hub of the worm wheel to take the point of the cam fixing screw.

Before assembling the hammers on their pivot, the spacing bush is threaded on, and this should locate the hammer tails so that they are central with the pins in the barrel, and also have the minimum end play when the front motion plate is fixed. A rubber or plastic sleeve is slipped over the stud which forms the hammer rest, and the hammers are adjusted, by bending the rods near the root if necessary, so that when at rest, they clear the barrel by a bare two or three thou. The hammer tails should not reach the exact vertical centre line of the barrel, and they are sloped to give front clearance ; this ensures that they fall clear of the pins, without scraping them. All four hammers should have equal lift, the length of the pins being adjusted if necessary to ensure this. As the ratio between the radii of the hammer head and tail is approximately 7 to 1, pins $\frac{1}{8}$ in. long give the hammers a lift of $\frac{7}{8}$ in.



Details of chiming-rods



The cast stand, with set of four chiming-rods

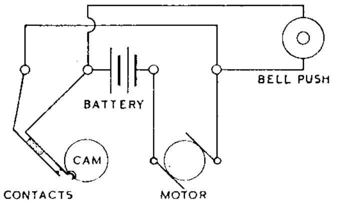
As already mentioned, the return springs may not be found necessary in all cases, depending on how loud a chime is required. An alternative to the springs would be heavier hammer heads, but this is only effective when they move near the vertical part of the arc.

If the skew gear on the motor shaft is made a press fit, care should be taken to provide a support for the other end of the shaft while pressing it on, otherwise there is a tendency to push the shaft endwise through its bearings, with a risk of shifting the armature and commutator, which might be disastrous. As the motor is fitted in a vertical position, the weight of the armature will produce end thrust, which must be supported. I have not found a special thrust bearing necessary, but it is a good idea to interpose a steel washer, preferably case-hardened, between the top bearing and the gear wheel, and adjust the position of the latter so that it rests in contact with the washer when the motor is vertical ; it should not, however, eliminate the end play entirely. The motor bearings do not require oiling, but a little clock oil should be applied to the worm shaft and pin barrel pivots, and a trace of graphite is good for the gear teeth.

When the gearing is fully assembled and the electrical connections made, as shown in the diagram, a trial of the mechanism should be carried out to see that it functions according to plan. It will be clear that, when using a permanent-magnet motor as specified, the polarity of the battery is important ; if it is connected the wrong way round, it will run in the reverse direction and pull up with a jerk when one of the pins strikes the tail of the hammer—probably to its detriment. In the case of a motor with a wound field, such as would be necessary for running on a.c., reversing is only possible by changing over the relative connections of field and armature—elementary, but so often misunderstood ! The " Whirlwind " motor proved capable of driving the mechanism on 3 volts (two U-2 cells or a cycle lamp battery) but to make up for the line resistance, three cells have been employed, which speed up the motion slightly but not excessively. It is most important that the motor should be thoroughly reliable, because if it should stall while the cam contacts are closed, the battery will be run down ; however, the likeliest thing to happen, if the motor is not in perfect order, is that it will fail to start, so that this risk is rather remote. The wiring diagram shows four terminals, which may be mounted on a paxolin strip attached to the mechanism or the case. This feature is optional, but will be found a great convenience when wiring up.

Chiming-rods

In the example shown, these are copied more or less exactly from the set of chimes in a modern eight-day



Wiring diagram

English clock. The stand to hold the rods is a heavy iron casting, and while it might be possible to use a lighter built-up structure, its massiveness has an important influence in transmitting the sound to the wooden case, which acts as a sounding-board or resonator. The foot of the stand is drilled and tapped, and attached to the floor of the case by two 2-B.A. screws, which have large washers on the underside so that they can be pulled up tightly to ensure good contact of the stand, without the heads sinking into the wood.

The rods are mounted in the head of the stand as shown in the enlarged inset section. Each rod is driven tightly into a hollow brass screw, and close to the end of the screw, is necked down to about half its diameter, from which point it tapers up to the full diameter in about $\frac{1}{2}$ in.—say, an included angle of about 5 deg.

The rods are of brass, 0.110 in. diameter, and the lengths, measured from the shoulder of the taper, are as follows : $6\frac{1}{2}$ in., $6\frac{7}{8}$ in., $7\frac{1}{4}$ in. and $8\frac{1}{2}$ in., to produce the notes E, D, C, G, respectively. At present, they are struck in that order, but as already explained, it is quite easy to change the sequence if desired. It is advisable to fit the rods to the hollow screws, or ferrules, before tapering them down, as it is most essential that they should fit tightly, and the same applies to the fit of the screws in the head of the casting. The angle of the rods is largely a matter of convenience in accommodating them in relation to the hammers, but obviously it is desirable that they should line up truly with each other. Note that the tapping holes for the ferrules, which are screwed $\frac{1}{4}$ in. B.S.F., are continued through the head ; it is important that the rods should not touch the sides of the holes under any circumstances.

Some tuning of the rods will probably be necessary, and one need not necessarily be a skilled musician to do this, so long as one is not completely tone-deaf. Comparison with a piano, or a tuning fork, will show whether the rods are sharp or flat, when they are struck with a small improvised mallet such as the head of a plastic knitting needle. It should be remembered that shortening the rods will raise their natural frequency, in other words, their tone, and reducing their diameter at the root of the taper will lower it. Should rods larger in diameter than those specified be used, they will have to be made longer, but not necessarily in the same dimensional proportions. Other metals than brass may be used, and will affect the timbre, or character of the tone, to some extent.

If one does not wish to go to the trouble of making the set of chiming rods, it is possible to obtain them ready-made from dealers in clock materials, such as are found in the vicinity of Clerkenwell, London, E.C.1 ; various sizes and types, for either four or eight notes, and also sets of tuned bells and gongs. are available.

The mechanical unit and the set of chimes are fitted to the case in a suitable position to enable the hammers to fall on the chiming-rods, and as already stated, the stand for the latter must be firmly mounted on the floor of the case. But the mechanism must be prevented, as far as possible, from transmitting sound to the case, and after many attempts at mounting it so as to eliminate resonance, it was found that the best method was to avoid screws or other metal attachments, and simply use four pads of medium hard rubber, cemented to the back of the case, and also the back motion plate, with Bostik. After this was thoroughly set, the individual hammers were adjusted by bending their rods so that, when at rest, they were a bare $\frac{1}{16}$ in. from their respective chiming rods. It may be necessary to bend the rods sideways to line up with the chiming rods, as well. They should strike the rods fairly close up to the head ; if they operate too low down, or insufficient static clearance is allowed, rattling or damping may be caused.

The finish of the mechanical parts may be left to individual taste ; it obviously does not affect efficiency, provided that the basic workmanship is all it should be, but most constructors will like to make it look as nice as possible, even though it may be out of sight under normal working conditions. In the example shown, the working parts have a moderately high finish, either straight from the tool or by application of fine emery-cloth, and the motion plates are " snailed " by the use of a fine dental abrasive disc in the drilling machine. The whole job is a work of utility rather than of art, but it has been interesting to make, and very satisfactory in fulfilling its humble everyday duty.

L.B.S.C.'s "CANTERBURY LAMB"

(*Continued from page* 523)

The complete tank top is then placed in position, and secured by a few $\frac{1}{16}$-in. or 10-B.A. round-headed brass screws run through No 51 holes drilled in the plate, into tapped holes in the pieces of angle attached to the tank sides, front and back, as shown in the section of the complete tender body.

Oddments

The $\frac{1}{8}$-in. pipe leading from the hand pump union to the connection on the drag beam of the engine, is coiled and bent as shown underneath the sectional illustration. One end has a $\frac{1}{4}$-in. $\times$ 40 union nut and cone, and the other a $\frac{1}{4}$-in. $\times$ 26 ditto. When silver-soldering the cones on the pipes, heat up the complete pipe, and quench the lot in the acid pickle. A softened pipe is more flexible than a hard springy one; too stiff a pipe is a frequent cause of derailments.

The beading around the tender top is 3/32 in. half-round wire, soldered on. At the front end it is left long enough to bend around the tops of the 3/32-in. wire handrails, which are screwed into tapped holes in the soleplate. A small collar screwed or soldered on, at the bottom of each, adds to the appearance. Final stage, brake gear and " trimmings."

P.S.

Anybody want to build a $3\frac{1}{2}$-in. or 5-in. gauge *Titfield Thunderbolt*?—don't all speak at once !

Locomotives at the NORTHERN MODELS EXHIBITION

REPORTED BY "NORTHERNER"

THERE were some fine model locomotives at the N.A.M.E. show this year, though, of course, some were not so good. Finish in both paintwork and on the unpainted parts, varied from very good to merely indifferent; but this seems to apply to almost any section of work at any exhibition!

The Cup Winner

I have already alluded in my preliminary report to the model which won the *Evening Chronicle* Cup, and the First Prize in the locomotive section, but after that was written I had the pleasure of a chat with the builder, F. L. Smith, of Bamber Bridge, and elicited from him a few more facts.

It will be recalled that the model was a $3\frac{1}{2}$-in. gauge Pacific of the Eastern Region of the B.R., with an excellent finish, including good lining and lettering. Mr. Smith is a draughtsman, so undoubtedly his training would stand him in good stead there, if not in the actual building. However, the latter was excellently done, too, as the judges evidently agreed.

The locomotive is, basically, "L.B.S.C.'s" *Heilan' Lassie*, with sundry detail and trimmings added after close inspection of photographs of the prototype. She has been steamed several times, and the only trouble has been with the blower, which at first did not do its job properly. The trouble was soon cured, after thought and adjustment, and there has been none since. She steams very well, but owing to shortage of passenger trucks on the club track there has been no opportunity to test her haulage capacity to the full yet.

Mr. Smith has been modelling for about eight years, but this is his first locomotive, on which he has spent between four-and-a-half and five years. Incidentally, it was Very Highly Commended at the "M.E." Exhibition in 1951. The workshop is a small outdoor one, equipped with a $3\frac{3}{8}$ in. "Ideal" lathe, and an old drilling machine of small capacity, though when the locomotive was first being built the latter had not been acquired and all holes had to be drilled in the lathe. A recent purchase of a hand shaper will no doubt be of great help in future work, but, of course, was not used on the locomotive.

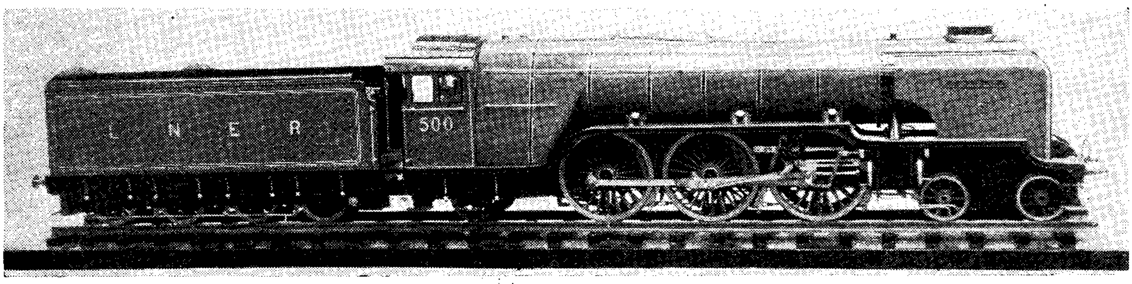
A point of interest is in the leaf-springs of trailing wheels and tender. Each leaf consists of two thicknesses of the strip steel used for binding packing cases, made more flexible by having the centres of the leaves drilled away to make in effect a slot.

Painting was done by hand, with a draughtsman's pen used for the lining.

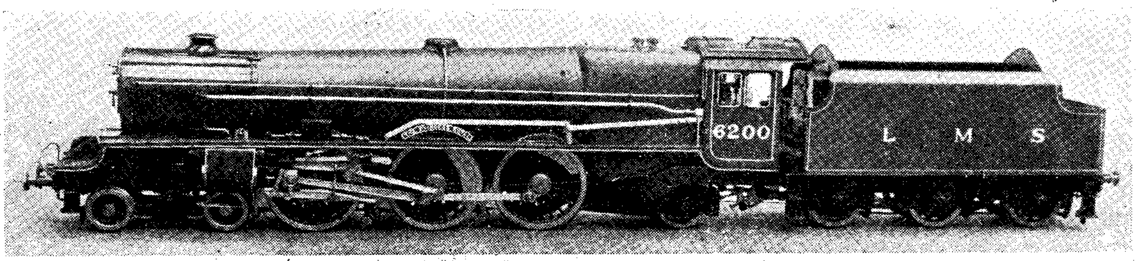
A "Princess Royal"

Another Pacific was awarded the Second Prize; this was the imposing *Princess Royal* built by V. Beswick of Manchester. In this case the paintwork was not so good as Mr. Smith's, having a dull finish and no lining, and the numbers on the cab-sides were not so well executed.

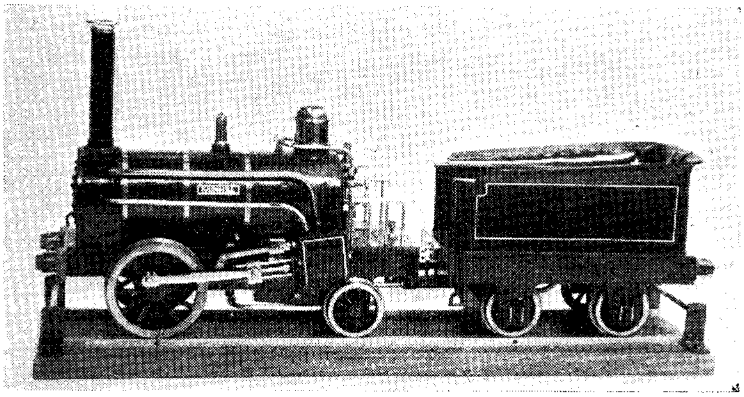
Finish of the motion work and the bright parts generally was good, however. In particular, the riveting was excellent, with tiny rivets (four thousand of them!) in neat rows; in fact, I thought that it was better than on the cup-winner, whose rivets were rather larger and not so numerous. This is a small point, ad-



This excellent $3\frac{1}{2}$-in. gauge "Pacific" won the cup and the first prize in the Locomotive Section for F. L. Smith



V. Beswick, of Manchester, was the winner of the second prize with his "Princess Royal," which had four cylinders and was equipped with vacuum brakes



Third prize winner was J. W. Moon with his nicely-finished " Rainhill "

mittedly, but it does help the " real " appearance greatly.

Boiler lagging was very neatly done, and the cab was well fitted, even including the tip-up seats for the driver and fireman. The tender was unusually complete in detail, especially at the footplate end, and it had a working water pick-up and a water-gauge worked by float. Those chaps who build locomotives for trackwork only may turn up their noses at such fittings—may even term them " useless "—but they do make a lot of difference between merely a " small locomotive " and a *model* locomotive. And if the latter works as well as the former, then surely it is a *better* locomotive. It will gain more marks when being judged in competition, other things being equal !

Mr. Beswick told me that the building of the engine was started as long ago as 1941, though she was only finished recently. During this time, however, work was not continuous, and three " O "-gauge steamers have been built as well. His previous model was a Great Northern Atlantic. The workshop equipment includes a 3-in. lathe, a $\frac{3}{8}$-in. drilling-machine, oxyacetylene equipment, and a small milling-machine.

The photographs of the two Pacific locomotives were taken by Arthur Hamer of Whitefield.

An " Old Timer "

Since *Rainhill* was first designed by " L.B.S.C.," one has seen many models of her at many shows. At Manchester a good example was exhibited by J. W. Moon, of Middlesbrough, who was awarded Third Prize in the class. Here again the finish was good, though the paint could have been smoother. The dome, safety-valve, and footplate rails were of brass, highly polished, and the copper pipe-work was similarly finished. As for the wheels and motion-work, the finish was high enough to be pleasing, but not so high as to be unrealistic.

One point I have not seen on other *Rainhills* was that the big-ends of the connecting-rods were finished off to represent the strap-and-cotter type, and though the deception was obvious at close range, it made a difference from a little distance.

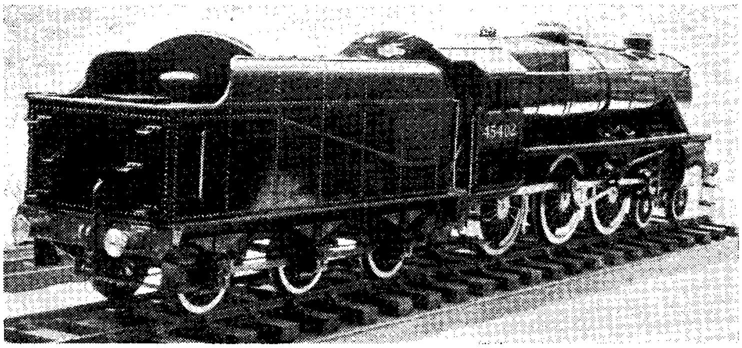
The buffers were of wood, and the painting was done in black and crimson, with a cream line on the tender.

Detail—and Lack of It

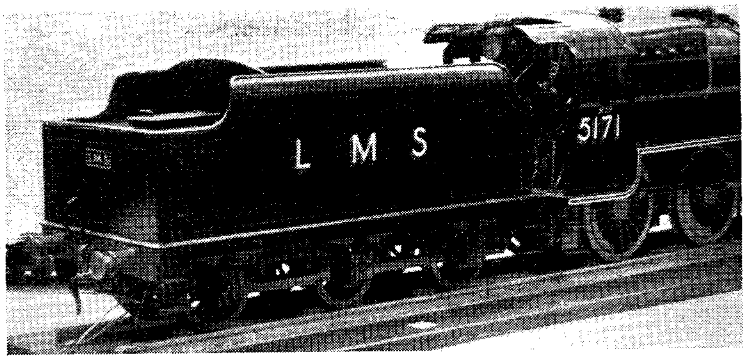
My next two photographs show how some time spent in adding detail will embellish a model greatly. Both these engines were built to the same basic design by " L.B.S.C." of a $3\frac{1}{2}$-in. gauge Class 5 L.M.S. mixed traffic locomotive, yet how much more like the big sister is the one compared with the other.

The more detailed engine was built by A. F. Stevenson, of Prestwich, and the other by W. F. Jackson, of Rochdale. The former's paintwork might be termed average, but it was better than the latter's. Mr. Stevenson's lettering (or rather numbering) was also better, and Mr. Jackson had used very garish red and yellow lining.

(*Continued on page* 531)



This L.M.S. Class 5 engine, by A. F. Stevenson, of Prestwich, was Highly commended at Manchester



Compare the bare and unfinished appearance of this tender with that in the preceding photograph. Detail does *count* !

READERS' LETTERS

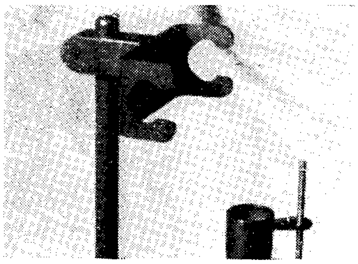
Letters of general interest on all subjects relating to model engineering are welcomed. A nom-de-plume may be used if desired, but the name and address of the sender must accompany the letter. The Managing Editor does not accept responsibility for the views expressed by correspondents.

WORKSHOP BUNSEN BURNER

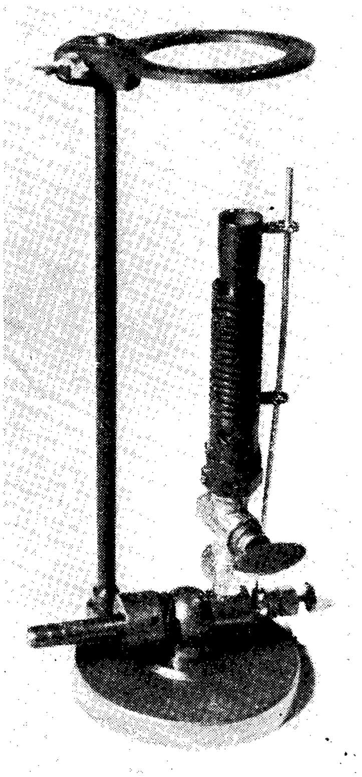
DEAR SIR,—With reference to "Ned's" article on a workshop Bunsen burner, I would like to point out an error in the detail drawing of the swivel bolt.

Even working to B.S. limits for oversize holes, it is neither possible to put a $\frac{3}{8}$-in. nut over a $\frac{3}{8}$-in. shank nor fit a $\frac{7}{16}$-in. shaft in a $\frac{3}{8}$-in hole. The cross hole in the bolt should obviously be $\frac{7}{16}$ in. diameter.

Working to available materials, I have made one of these burners, but it will be seen that my burner has a slightly "different" look about it. The barrel stock being $\frac{1}{8}$ in. larger than drawing, I decided to fin the barrel rather than turn it down. One may weave fancy theories about keeping cool and preventing "blow-back," or call it just plain "bull." The air sleeve was cut from the same hex. as the gas-jet, and is an easy push-fit without slitting. The cock was a double female having a union connection. Circular nuts were used to lock the swivel head. The style of iron holder was chosen, as it can retain unbalanced objects, and the risk of accident is reduced. The method of holding is by split clamp with stud and wing-nut.



The modified rest for soldering-bit



Mr. Clawson's modified Bunsen burner, with ring stand

The spherical turning tool, as can be seen from the photograph, has a fine adjustment, the nut being retained by means of a groove in its neck holding in the split plate on the end of the body, otherwise it is generally as per "Duplex."

The photographs are by courtesy of Derek Vincent.

Yours faithfully,

East Ham. A. E. CLAWSON.

STROBOSCOPIC SPEED MEASUREMENT

DEAR SIR,—I have read with interest the letters in "Ours" on fluorescent lighting and stroboscopic effects with rotating machinery.

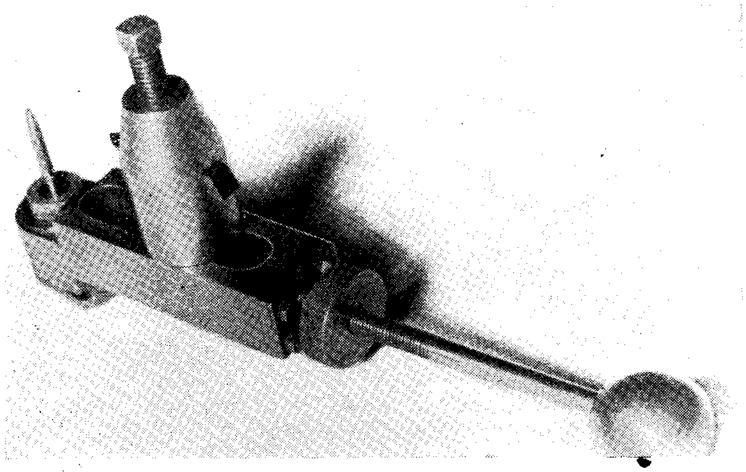
Not one of the correspondents made any mention of the fact that this effect can be used to indicate r.p.m. and is used for that purpose by the gramophone connoisseur to ensure that his turntable is rotating at the exact speed.

The following formula I have taken from *The Wireless World* diary, and it gives the number of segments "usually black and white" for a required speed.

$$\frac{\textit{Supply Frequency} \times 120}{\textit{Speed (in r.p.m.)}} = \frac{\textit{Black}}{\textit{Segments}}$$

If required, the speed can be found by substituting segments for r.p.m.

Thus it will be seen that any article driven at its synchronous speed will appear to stand still, but if driven faster, the article will appear to revolve faster and faster in a clockwise direction until the illusion



The spherical turning-tool

is lost and the movement becomes a blur. This refers to an article revolving in a clockwise direction; if it is driven at a slower speed it will appear to reverse, until as the movement gets slower and slower, individual parts can be distinguished.

The most important thing to remember is that this effect cannot be observed with d.c. illumination, but only when illuminated by light from an alternating current supply.

From the above formula, I have just worked out that a 4-jaw chuck must rotate at 2,100 r.p.m. or very near that speed for this effect to be observed, when at this speed the chuck jaws will appear to be standing still.

The higher the r.p.m., the least segments you require, and vice versa; you can try this by taking a small hand drill and holding it so that you are looking at the teeth of the large gear; now rotate this wheel with a light from a.c. mains shining on it, first slowly and gradually speeding up. You will see the teeth moving slowly in a direction the reverse of actual movement; increase speed slowly and they will appear to stand still. Increase still further and they will move with the direction of turning and further increase in speed will result in a blur. Any light driven by a.c. mains will give this effect, not only fluorescent light.

Trusting that I have raised a few interesting points and given you something to think over, I will wish "Ours" the best of luck.

Yours faithfully,
Aldeburgh E. C. WRIGHT.

EARLY STEAMBOAT ENGINES

DEAR SIR,—I was much interested in Mr. Ronald Clark's article on "East Anglia's First Steamboats," and should like to add my appreciation to that of Mr. E. J. Howlett in the issue of the March 12th.

Mr. Clark's references in his letter to Fig. 1 give some food for thought, and also have a bearing on the recent discussion on "free-lance" work. I entirely agree with him that the finish of my model Hypocycloidal Engine is not as the original. I believe Mr. Clark went to considerable lengths to obtain this effect on his model, and also to show the original method of manufacture, which I obviously have not.

But after all, one builds a model for one's own satisfaction as much as anything, and personally I like to see a certain amount of gleaming steel in the moving parts of an engine. (Incidentally, I think the number of moving parts exposed to view in period engines is one of their chief attractions).

The gaps in the bottom of the "masonry" would never be met with in practice, of course. Their object is merely to give effect to a small bag of silica gel crystals concealed in the hollow base. These absorb any moisture in the air in the glass case, and I have certainly had no trouble with rust.

Yours faithfully,
Wanstead. F. L. FOLKARD.

SMALL STEAM PLANTS

DEAR SIR,—Mr. Tucker's beautiful Savery engine has produced a most interesting discussion on launch machinery. One firm, the Liquid Fuel Engineering Co., of Poole, has not been mentioned. I was once concerned with a 27 ft. boat built by this company, and it was a very neat and rather unusual job.

The engines were compound, 2½ in. and 5 in. bore, horizontal with piston valves, link motion and an enclosed bronze crank case. The boiler was similar to the old Thornycroft "Speedy" type, with copper tubes secured by unions, bronze drums and a vaporising paraffin burner; the pressure was 250 lb./sq. in. A keel condenser was used, but there was no air pump until I made and fitted a Kingdon type. The machining was very successful. The Lune Valley Engineering Company of Lancaster also made some interesting sets, but they lacked the "scale model" appeal. Their machinery was functional and probably successful, but not pretty.

It is strange that nobody has mentioned that a fairly complete description of a fast Simpson-Strickland launch with a four-crank quadruple set was given in THE MODEL ENGINEER during, I think, the first half of 1902. I have the volume, but cannot lay hands on it at the moment, but if anyone is interested, the photographs and drawings illustrating that article will well repay the trouble of turning up the files.

Finally, I possess a Simpson Strickland two-crank quadruple, Kingdon's patent. The h.p. cylinder is 1¾ in., l.p. 5 in. bore. I started to overhaul it in 1939, but since then I have not possessed a workshop and my tools are packed away in grease. However, I look forward to the day when I can instal it in a launch again.

Yours faithfully,
Stoneclough. W. MELVILLE.

Locomotives at the NORTHERN MODELS EXHIBITION

(*Continued from page* 529)

In addition, the former had added rows of rivets, which although somewhat overscale in size, added greatly to the appearance, as did several fittings which did not appear on Mr. Jackson's engine. But perhaps one of the most effective additions to No. 45402 was the neat lagging on boiler and firebox, which was missing on No. 5171. As a result, one could see that the firebox outer wrapper had had some rough handling, and the stay-heads were ugly.

Now I have no knowledge of how well these two locomotives perform on the track; so far as I know, No. 5171 may be as good as No. 45402, or even better, in this respect. But in competition work, a good appearance may make all the difference between an award and none !

As it happens, Mr. Stevenson was Highly Commended by the judges, and Mr. Jackson was not, which would seem to add point to my remarks !

There were, of course, many other locomotive models at the exhibition, but in the space left I can only deal briefly with one or two of them.

G. H. Broadbent, of Stalybridge, had built *Pamela*, "L.B.S.C.'s" "Southern Pacific" rebuild. This was a nicely-finished engine, both in the mechanical detail and in the paintwork—in fact, the latter was better than average. But surely in tapered rods, the fluting should taper, too, to leave an equal web at each side ? And there were two big countersunk screws holding each name-plate on, and more of the same on the front footplate. Moreover, for my choice, those Southern pattern wheels are horribly ugly, though that, of course, is not the builder's fault !

First in the unfinished locomotives section was a 3½-in. gauge L.N.E.R. Pacific chassis, by E. Hinchliffe of Rochdale. This had a nice clean finish, and I look forward to seeing the finished engine at some future exhibition. She should be worth it !

"POCKET" WORKSHOPS

By Terry Aspin

TO make this little lathe serviceable again, it was deemed that the acquisition of a suitable chuck was a matter of first importance and, in this matter, I had to guide me the experience of having already used the type of chuck usually supplied for $1\frac{5}{8}$-in. lathes. Apart from being screwed to fit a smaller mandrel nose, my old Adept chuck had really passed the stage when, it could be relied upon to hold anything securely, and thus it was decided to attempt the production of one from scratch.

As a beginning, a pattern was made in wood for the body, the design to follow as closely as possible, but to half-scale, the lines of a six-inch Burnerd already in my possession. There was no complication here, two pieces of wood being employed, one about seven-eighths of-an-inch and the other half-an-inch thick and these were first cut to shape on the treadle jig-saw; two discs large enough to allow for final turning up in the pattern stage and a further margin of, roughly, $\frac{1}{4}$-in. above the ultimate machined diameter of the chuck. Such an allowance being ample for shrinkage in casting, too.

The hazy nature of the dimensions given so far in this description of the chuck are frankly admitted. Allowance for shrinkage and machining can certainly be worked out to a high degree of accuracy and, were I a manufacturer, I would be inclined to pay very strict attention to this matter if only for the sake of economy. But for the purpose of producing one or two articles at home, as I am sure my readers will agree, the importance lies in *ample* allowance to avoid wastage and disappointment.

The finished measurements are given in the sketch and shown also is the manner in which the chuck body is hollow at the back. To arrive at this, the thicker wooden disc had four segments sawn out of it to leave, what I would describe as, an enclosed cross and, to cut the "draught" angle at the same time, the table of the jig-saw was tilted a few degrees. The arms of the cross were intended, in the casting, to accommodate the adjusting screws and their thrust blocks, and they were made $\frac{1}{4}$ in. wide. The "cross" then formed the back of the pattern and the plain disc the front, and all that remained was for the two to be fastened together with pins and glue and the outer diameter skimmed off in the lathe leaving a draught angle increasing from back to front (Figs. 3 and 4).

I found the moulding and casting not too difficult and, in spite of the fact that the pattern was designed to "leave its own" rather deep cores, (and due to this, my first pouring resulted in a blow-out) my second attempt produced a sound casting. This, without more ado than sawing off the runner and removing the adhering sand with a wire brush, was transferred to the "machine shop" (about four strides up the garage !) and mounted on the $3\frac{1}{2}$-in. lathe.

After turning and boring the casting, the face of the chuck-to-be was grooved with concentric rings spaced a quarter of-an-inch apart. Chuck and work was then transferred bodily to a dividing attachment mounted on the vertical-slide and the four radial holes drilled (to take the actuating screws) to within an eighth-of-an-inch of breaking through to the centre bore. Following that, the whole bag of tricks was moved round through an angle of 90 deg. on the cross-slide table for the cutting of the jaw slides.

The actual milling was carried out, first with a commercial $\frac{3}{16}$-in. end-mill and then, to form the T-slots, if such they can be called, a home-made cutter was used. It was made quite roughly as in Fig. 5, from a piece of $\frac{5}{16}$-in. silver-steel and, in use, it formed the slots as clean as a whistle in one cut right through.

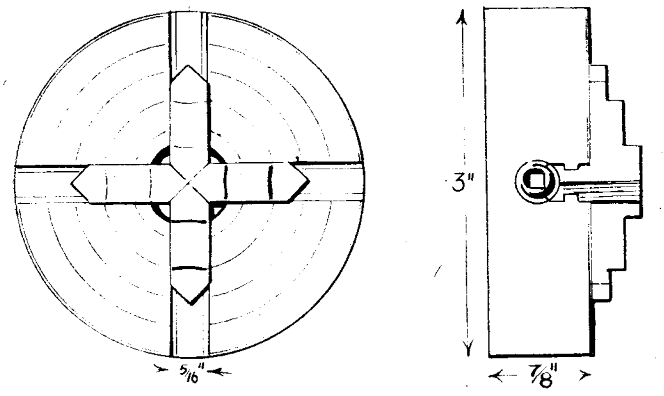


Fig. 3. Principal measurements of the four-jaw chuck

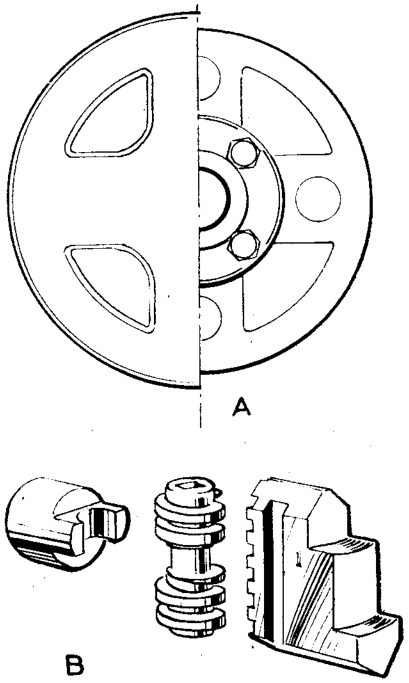
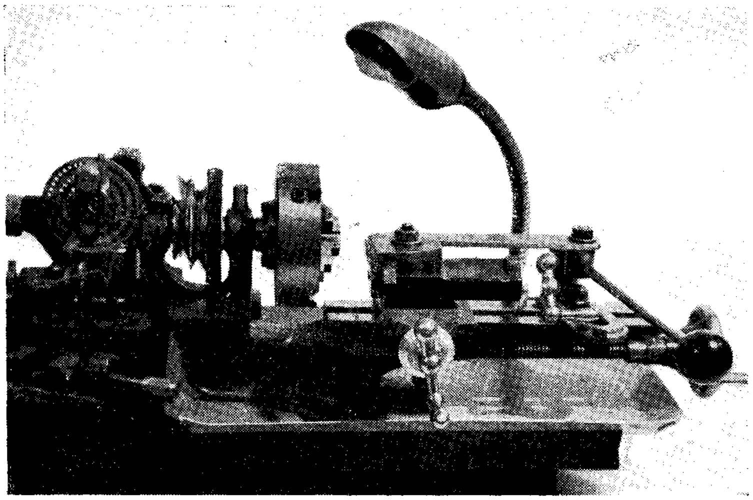


Fig. 4. (A) Reverse side of chuck. Pattern on left, finished chuck on right, showing position of thrust-blocks and back plate fitted. (B) Exploded sketch of jaw assembly

Concluded from page 477, *April* 16, 1953.



Adept No. 1, with stroking device in position

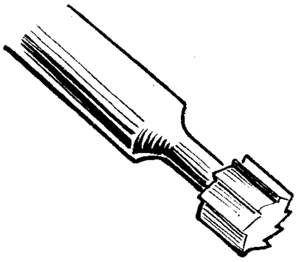
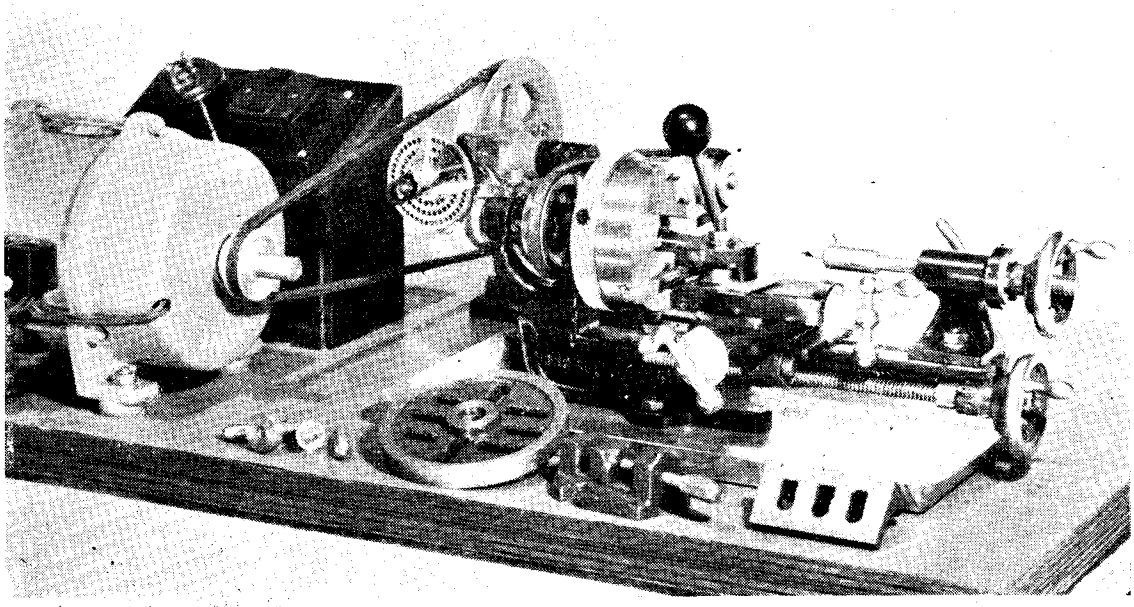


Fig. 5. Home-made cutter for forming the T-slots

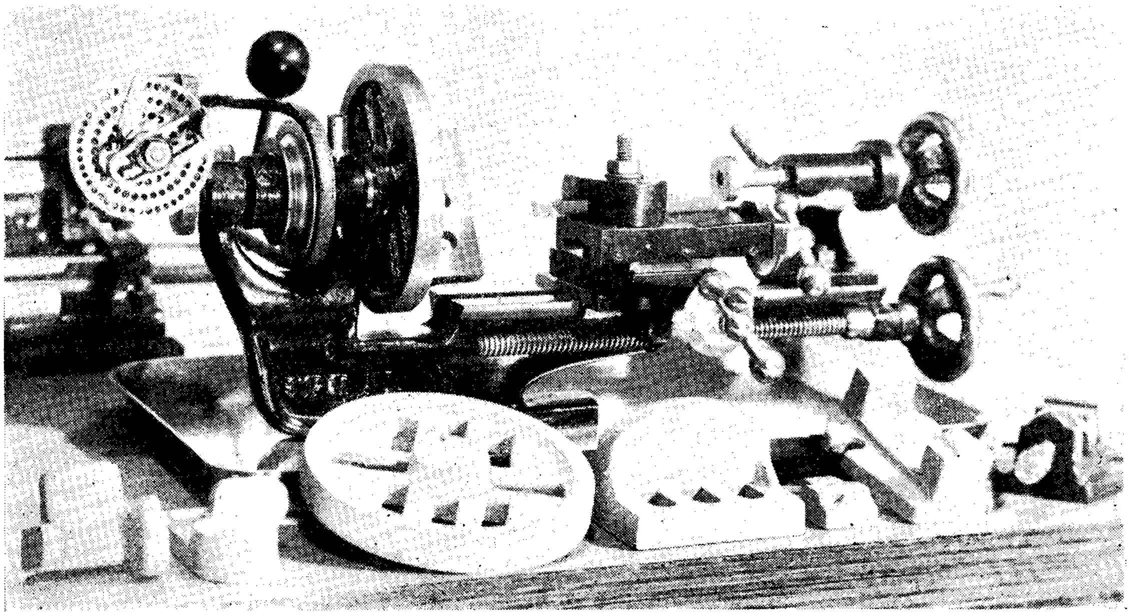
But I recognise the mistake of using a dividing attachment for this job. It could, undoubtedly, have been better performed with the work mounted directly upon the face of the vertical-slide, the dividing being accomplished by means of a square used in conjunction with the bed of the lathe. Likewise it would appear desirable to leave an excess of metal in the centre of the casting to be cleaned out afterwards. I found that, on breaking into the centre bore, the cutters were apt to " climb," thereby causing a slight curve to be formed at the end of each slot. For the actual fault there appears to be no remedy when milling in a light lathe but, if the last eighth-of-an-inch or so of metal were waste, there would be no harm done and the damaged portion could be removed when the job was completed.

The adjusting-screws were a simple turning and screw-cutting job. The outer end of each was drilled and an internal square formed by means of a home-made drift of silver-steel, hardened and tempered. Each screw was provided with a waist in the centre of its length so that it could be located by its thrust block pressed in from the back through a $\frac{3}{8}$-in. hole, bored for the purpose, in each arm of the " cross."

Perhaps the most tedious part of the whole operation was the provision of the section of internal thread being each of the jaws. This job was carried out by a fly-cutting-cum-screw-cutting method. The jaws were held, one at a time, in a vice mounted on the vertical-slide. A specially made small boring bar was provided with a cutter of the correct form for the threads set to cut a diameter equal to the outside measurement of the screws. Now, using the screw-cutting mechanism of the lathe in the usual way, the saddle carrying the work was traversed across the revolving tool and the



The complete layout. (No. 2)



Adept (No. 2) with a collection of patterns used in the modifications

feed provided, only a thou. at a time, by means of the cross-slide handle until the required depth was obtained.

Jaws, screws and thrust blocks were all given a thorough case-hardening, using Casenit, and a key provided to suit.

Only in the matter of securing to the back-plate does this chuck differ materially from the one from which it was copied. The latter is screwed right through the body, the countersunk heads showing at the front, while mine is secured by means of four small studs from the back.

A Sister

Shortly after being put again into service my re-built Adept was seen by my brother during a visit. The outcome of this was that my workshop witnessed the arrival of yet another Super Adept lathe (this time brand new from the makers) which was to be provided with a countershaft and trimmings similar to my own.

In this case the bare lathe only was obtained and, as will be seen from the photographs, a fairly comprehensive range of equipment has been added to it. All parts have been patterned and cast at home and include faceplate, angle-plate, machine vice and dividing attachment. These items were duplicated so that both lathes are now similarly equipped. The exception is the four-jaw chuck. I have not yet got round to the duplication of that.

I made the faceplate much larger and heavier than that supplied by the makers and, of course, the enlarged bearings and mandrel nose will easily take it.

The miniature machine vice, designed for mounting on the saddle to enable small milling operations to be carried out, has been found to be very useful even in a shop where a couple of larger vices are available. It can also be fitted to the top-slide of the Adept in place of the tool holder and, when this in turn is secured to an angle-plate it gives the movements of a vertical slide.

The Dividing Attachment

My brother has no other machine tools at all, and my object was to provide accessories of a nature as generally useful as possible. Thus, although I toyed with the idea of fitting either (or both) back gear or some sort of screw-cutting mechanism, I finally decided on providing a dividing-head to mount upon the extended spindle. This, like the other items, was produced in duplicate; one for each lathe, and the same parts were machined at one setting, thus getting almost "into production" so to speak!

The principle employed is that of the worm and worm-wheel; the former in steel and the latter in bronze of my own casting, giving a reduction of forty-to-one. Many of the components, due to their small size, I found convenient to machine on the small lathe itself. The parts of the quadrants, as an example, which were machined on the faceplate thereof, would have slipped through the centre hole of the larger lathe.

Each has one division-plate only and that is provided with three circles of holes, 21, 32 and 45. These enable 29 divisions to be obtained between 1 and 50 inclusive and also split the circle into any number of degrees down to 0.2 of a degree. Most of the numbers unobtainable are those which would require a plate with the same number of holes in any case. I refer to numbers such as 11, 13, 17, 19 and so on.

No modification to the lathe itself was necessary, the attachment being retained in position by means of the adjusting-screw on the back bearing. To enable this to be tightened down hard, a shim was inserted in the split, and, for convenience a stud, washer and nut was substituted for the existing cheese-headed screw. The whole contrivance remains in position while the lathe is working, and engagement is effected, when required, by slacking two nuts; allowing the worm to fall into mesh with the wheel on the mandrel; when the nuts are again tightened and the divider is ready for use.

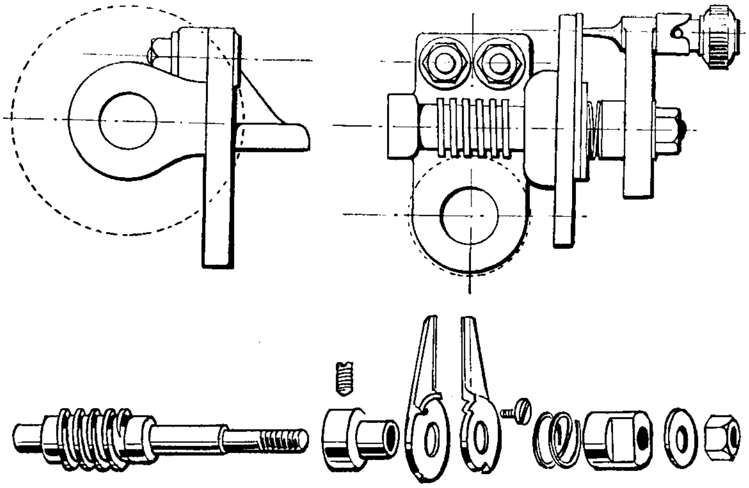


Fig. 6. General layout of dividing attachment with exploded view of worm assembly, less division plate and arm

Two castings are employed. The first bolted to the lathe as already described, forming a support for the second upon which all the components are carried, and to cast them, aluminium, brass or iron could be used. I chose the first, mainly for ease of machining.

Fig. 6 shows the layout which carries no claim to originality. The important thing is to eliminate backlash. For assembly the worm passes right through the larger boss on the casting, where it is secured in place by a well-fitting brass bush—itself retained by a grub-screw. No end-play is permitted in the worm if the bush is pressed up firmly before the grub-screw is tightened.

Only a portion of the bush is housed in the casting, the remainder being turned down to locate the division-plate (whose rotation is prevented by a countersunk screw into the boss casting) and the quadrant with its spring. The last is provided with the object of retaining the quadrant in any desired position by friction but, in practice, I find it advisable to hold one of the blades with my thumb while the arm is rotated.

The arm is slotted to permit adjustment in length upon its own boss, which in turn is provided with flats to fit the slot, and the whole is held firm by a nut and washer, locking the arm to the boss, and the same to a shoulder turned on the worm itself.

A Hand Stroking Device

More recently, my own Adept has been called upon to perform quite a wide variety of jobs. Not the least formidable among them was the cutting of a toothed blank from which a couple of ratchet wheels were to be turned. When first I tackled the work I imagined that it was going to be simply a case of winding the saddle to and fro while gripping a suitably-ground tool on its side in the tool-holder.

The answer was a lever feed to the saddle and, in one of the photographs, the lathe is shown with this attachment, for which necessity supplied the maternal instinct, in place.

For the soleplate I utilised the base of a hand-rest originally supplied with the lathe and it suited its new duty admirably. In particular, by virtue of its slot, which allows a very wide adjustment regarding its position on the lathe bed in relation to the saddle.

Half-inch round, mild-steel rod provides the fulcrum-pin for the end of the lever. It was turned down as shown for about an inch to provide a working fit in the boss of the soleplate normally occupied by the stem of the T-rest. The remaining portion was drilled crosswise with a ¼-in. hole to take the actuating lever; a length of ¼-in. mild-steel, taper-pinned, to prevent the latter twisting.

Provision for varying the length of the stroke is made at the point where the connecting-arm is anchored to the lever. It is made adjustable and the nut which retains the arm also serves to clamp the pin in any required position. An exploded view of this component, along with a layout of the complete attachment, is shown in Fig. 7. The arm itself is merely a slightly tapered strip of ⅛ in. flat mild-steel with a ⅜-in. hole at the wider end; a working fit for the collar of the adjustable pin, and a ¼-in. hole at the other end to engage with a stud substituted for the holding-down bolt of the top-slide. This latter consists of a one-inch length of ¼-in. mild-steel threaded half way up ¼-in. Whit. with a nut run up to the threaded portion. It then resembles a set-screw having a short spigot projecting through the head.

Disengaging

It will be seen that, leaving the soleplate in position, the device can be disengaged simply by lifting the fulcrum-pin out of its socket and the arm clear of its stud, and that it can be brought into use again with equal facility. It can also be used for turning small parts held in the chuck, and provides a nice, sensitive feed and a speedy withdrawal of the tool. To use it, it is, of course, necessary to disconnect the lead-screw.

The pretty, black plastic knob completes the picture.

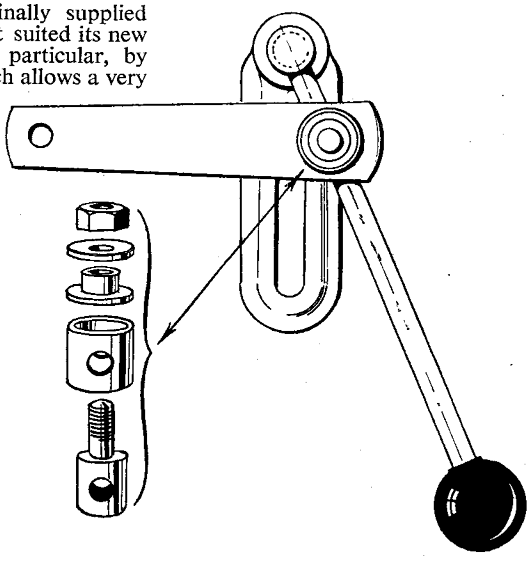


Fig. 7. The hand-stroking device, with an exploded view of the adjustable-pin

Talking about Steam—

NO. 17. THE FOWLER "BIG LION" ROAD LOCOMOTIVE

By W. J. HUGHES

READERS will remember that when discussing the "Big Lion" cylinders, I gave photographs of Mr. R. S. Jaques's fabricated cylinders for his $2\frac{1}{4}$-in. scale engine. At the recent Northern Models Exhibition at Manchester, I had the pleasure of meeting Mr. Jaques again, and seeing a few more parts of the locomotive. So out came the camera, and the results are given herewith. Two of the photographs show the motion bracket, with two of the slide-bars fitted. In the prototype, this bracket is cast, but Mr. Jaques likes to fabricate, as we have already seen, and his bracket is built up from steel and brazed. A nice job, too !

The slide-bars are separate pieces bolted on, of course, the lower one being in the form of a trough, into which, incidentally, Mr. Jaques has fitted a facing of cast-iron to give better wear. At the top of the bracket is an oil-box, from which syphons carry oil through pipes to the upper bars.

Two bronze bushes are fitted to take the valve-slides, and a bearing for the weigh-shaft is incorporated in the lower part of the bracket. The small boss at the side of the oil-box takes the lower end of a bracket which supports the regulator-rod.

Another photograph shows the eccentrics and eccentric straps assembled, and a further photograph shows them taken apart. They are a very close copy of the prototype, the eccentrics being made in two halves, fastened together and bored out to take the shaft. The four eccentrics are then turned from the solid, so to speak.

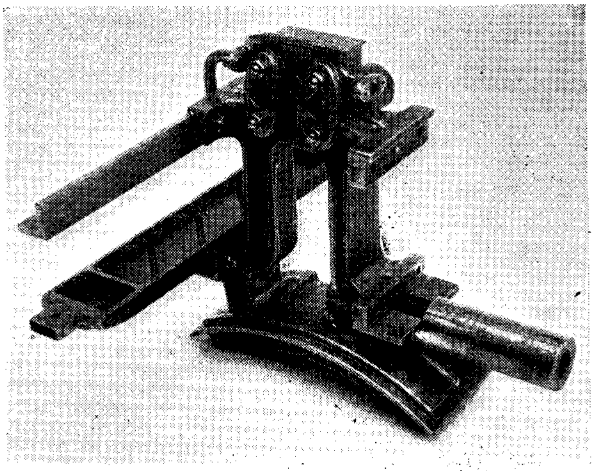
Between the two pairs of eccentrics is a squared boss, through which two holes are drilled, one at each side of the bored hole. Two bolts pass through these holes, and are secured by tapered cotters, one of which may be seen to the right of the photograph. Thus the two halves are held together. The eccentric straps are turned from cast-iron, and are fastened together by means of turned bolts, nutted and lock-nutted, and drilled for a split-pin. A flat filed on the head of each bolt bears on a corresponding shoulder on the strap, thus being prevented turning.

Mr. Jaques's boiler is well on the way to completion, and he told me that at the next Northern Exhibition he hopes to be able to show me this, with all the motion work assembed on it.

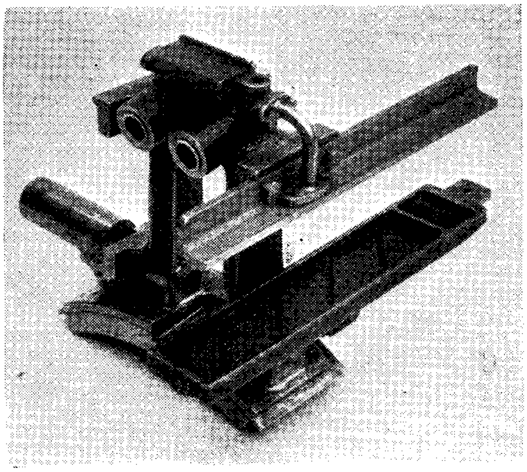
When discussing the cylinders also, I mentioned that though it *was* possible to make pukka castings for the "Big Lion" cylinders, with all the passages cored (as done by Mr. Taylor in his engine), the average model engineer would not have the necessary knowledge of foundry practice to make the patterns and core-boxes.

The cylinder block (shown in a photograph) is made in this way, and another picture shows the core-boxes and a set of cores to do the job. These were made by Mr. L. Tatlock, of Bolton, and were also seen at Manchester. This gentleman is *not* a pattern-maker or moulder by profession, as one might imagine, but a textile engineer in business on his own account. (I understand he is also an inventor of some merit, but that is by the way.)

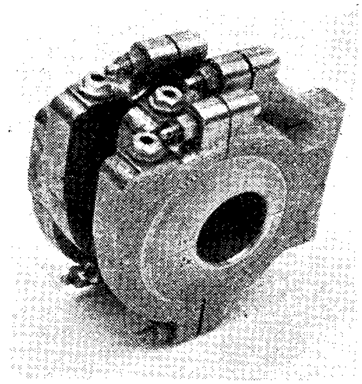
This display will perhaps make the amateur realise I was not talking through my hat ! The items are, respectively, as follows:—Core-boxes: (*a*) cylinder back, (*b*) underside of cylinder, (*c*) valve-chest, (*d*) cylinder front, (*e*) steam cavity in underside of cylinder, (*f*) cylinder bores, (*g*) cavity in upper valve-chest or dome. Patterns are (*h*) cylinder covers and



Cylinder side of the fabricated motion bracket and slide-bars



Another view of Mr. Jaques' excellent handiwork



Mr. Jaques' eccentrics and straps are very close copies of the prototype

(*j*) cylinder sides (the pattern for the other side of the cylinder is on the other side of this pattern). The middle line of various odd-looking shapes are, in pairs, the halves for moulding the cores for the various steam-ways.

On the board in the front of the display is a set of the cores in sand, all baked and ready for assembly, and the whole assembly is seen, nearly off the picture, just behind the cylinder casting. Incidentally, when all the cores are made, it takes a week to build them together, since the assembly must be baked each time a separate piece is attached. And the patterns and boxes, says Mr. Tatlock, took much longer to make than the cylinders did to machine !

So there we are—a fine achievement carried out in grand style. If the rest of this engine matches up —and why not ?—it should certainly be a winner.

Incidentally, talking about the Northern Exhibition, I was very pleased to meet there several old friends and acquaintances, and to make several new ones. To name them all would take up too much valuable space, but it is good to meet them on common ground, to chat with them on, usually, the subject of steam, and to receive helpful suggestions and (in many cases) expert knowledge.

Drawings of the " Big Lion "

One or two of these people asked when I would be producing detail drawings of the " Big Lion " ; this is a point that sometimes is asked by correspondents also. The answer is, of course, that I cannot say. Such drawings take a very long time to prepare, as anyone will know who has tried to do it, and at the present time I have more than enough to do, as mentioned recently in an Allchin article.

It can only be said, then, that detail drawings *will* be done " in due course." Meantime, the more experienced worker who is anxious to get on with the job, will be able to sort out most of the detail he will require from the general arrangement blueprint, as Stan Green has done. And, thanks to Stan himself, he will be saved a great deal of trouble in doing so by the drawings which have appeared in the last few instalments of this series. He should also have acquired much knowledge from these articles, and from my book.

As for the tyro who wants to build the locomotive, he would be advised seriously to put the thought aside for the time being. Later on, by all means, when detail drawings *are* available, but meantime let him gain experience in the use of his workshop tools and in the reading of drawings. To build the Allchin would provide an excellent introduction to the Fowler, I would suggest.

More Photographs

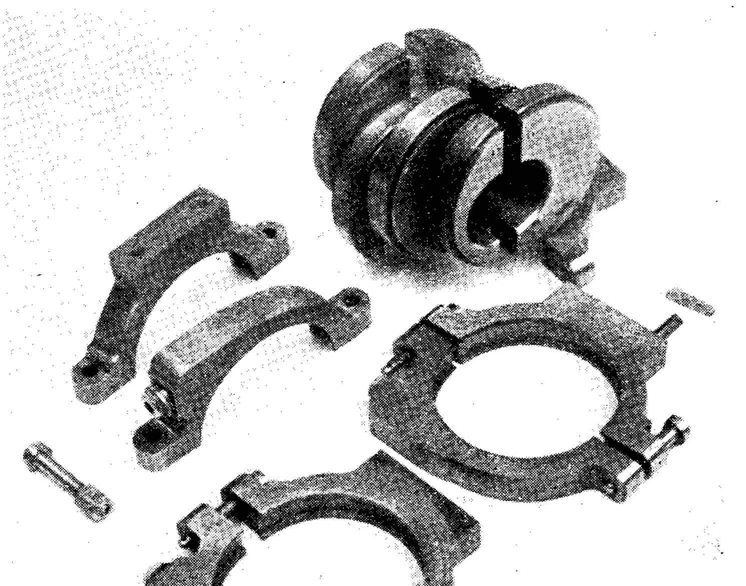
The pictures of Mr. Jaques's motion-bracket and slide-bars give a useful idea of these parts as viewed from above, and here are two more pictures from my albums to help.

About eighteen months ago, I was informed by Mr. W. H. Johnson, of Barnby Dun in Yorkshire, that a few miles away from his home, at Thorne, there were several traction-engines, and he and I spent several hours examining them and, on my part, exposing several rolls of film on them.

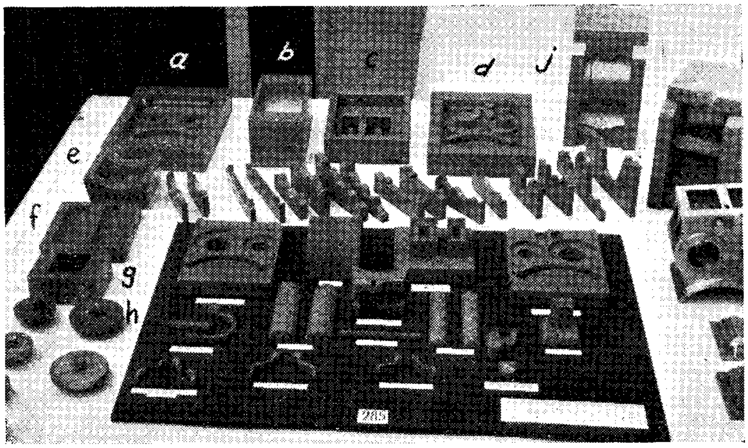
Among the engines was a Fowler 8 h.p. compound traction-engine, which, though differing in detail from a road locomotive, was substantially the same in appearance, especially as to the engine and motion. The two photographs are of parts of this engine, which, by the way, was No. 14898.

As will be seen, the engine was in a very dirty condition, but the cylinder-cover with its slide-bar brackets, and the slide-bars themselves, are well shown ; the lower bar is, of course, of trough section, like Mr. Jaques's, though it should be stated that on some engines Fowlers used angle-section bars below as well as above.

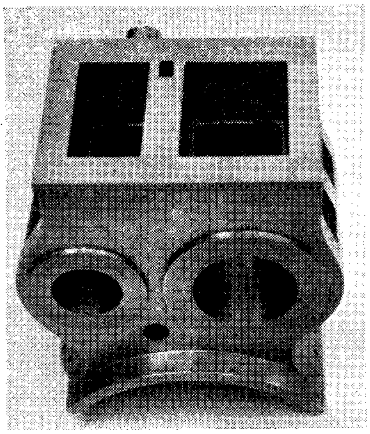
Note that the trough section, strong in itself, is further stiffened

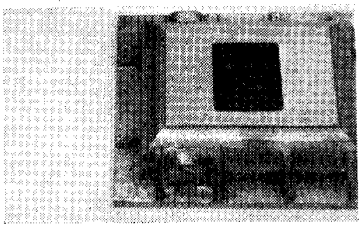


Eccentrics and straps dismantled to show correct method of construction by a rib on its underside, by which it is bolted to the motion-bracket. It should be realised that in a four-shaft engine, which the Fowler was, when the locomotive is travelling forwards, the crankshaft rotates in the opposite direction to the wheels. Thus all the vertical thrust on the crosshead, in both the forward and backward strokes of the piston, is in



Set of core-boxes and cores necessary to produce the correctly cored-out cylinders made by Mr. Tatlock





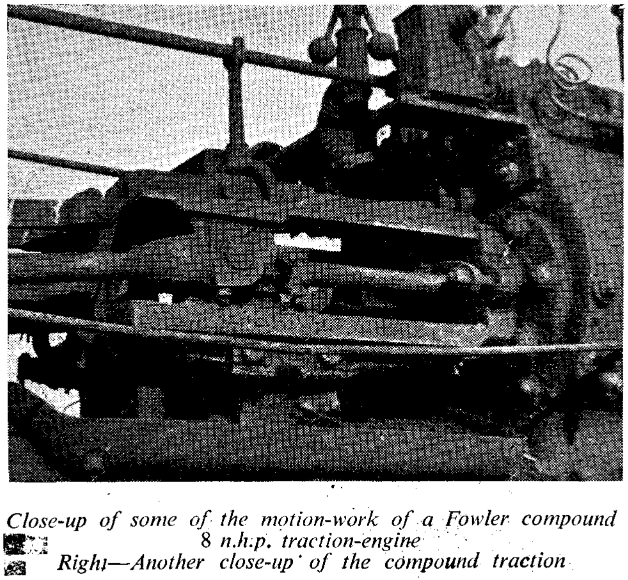
Fowler cylinders to $1\frac{1}{2}$-in. scale, with all steam-passages cored out, by Mr. L. Tatlock. The port-faces are inclined forwards, as in the prototype, but not inwards as well

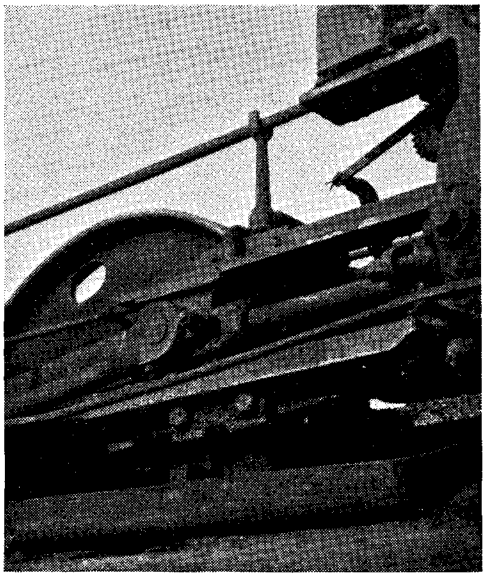
a *downwards* direction, which explains the more substantial lower slide-bar, partly to resist the thrust and partly to give a larger wearing surface, as well as to provide, so to speak, an oil bath.

You will also notice the oil-box above, with the oil-pipe to the upper slide-bar, the shapely little-end of the connecting-rod, and the crutch or stay supporting the regulator-rod. A tray is placed beneath the motion to catch oil-drips ; pipes are fitted to carry the waste away below the boiler.

One of these may be seen in the next photograph (by the Press Photograph Agency of Sheffield), which is reproduced from my book, and a union—of a different type—for another is seen in a previous photograph.

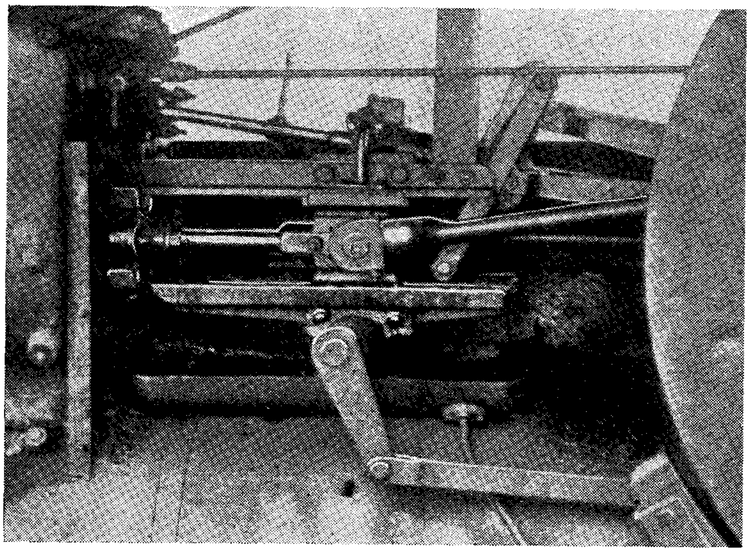
This picture also shows the mechanical lubricator fitted to the compound traction. An old showman's driver told me that for very many years Fowlers refused to fit mechanical lubricators, claiming (and rightly) that their own type of lubricator did the job adequately. Nevertheless, many owners *did* fit





Close-up of some of the motion-work of a Fowler compound 8 n.h.p. traction-engine

Right—Another close-up of the compound traction



Low-pressure side of "Big Lion" No 9292 "Lord Kitchener," which has now been scrapped

the mechanical type after taking delivery, and my photographs show a typical example, the lubricator being driven from a clip attached to the H.P. valve-rod.

My last photograph was taken of the same engine, and its detail should be useful to a modeller, especially if studied in conjunction with the general arrangement drawing (October 16th, 1952). This engine had only two speeds, like the majority of traction-engines, but the arrangement of these is very similar to the slow and fast speeds of the three-speed engine.

It will be recalled that in the latter, the third (extra-fast) speed gears are carried outside the hornplate. The slow speed is outside the hornplate on the offside—that is, on the left of the photograph—with the pinion sliding on four splines machined on the crankshaft. The fork by which it is engaged or disengaged slides in a bracket cast on the cap of the bearing.

One difference will be noted from the drawing, however. In the latter, the end of the operating-lever has a slotted hole for the pin on the fork; in the photograph it is connected to the pin by a separate short link.

In the fast speed, the pinion is keyed to the crankshaft, and it is the spur-wheel which slides on splines machined on the second shaft. Here again, a short link is interposed between the pin and the lever. The interlocking bar between the two levers, to prevent both speeds being engaged simultaneously, is also seen.

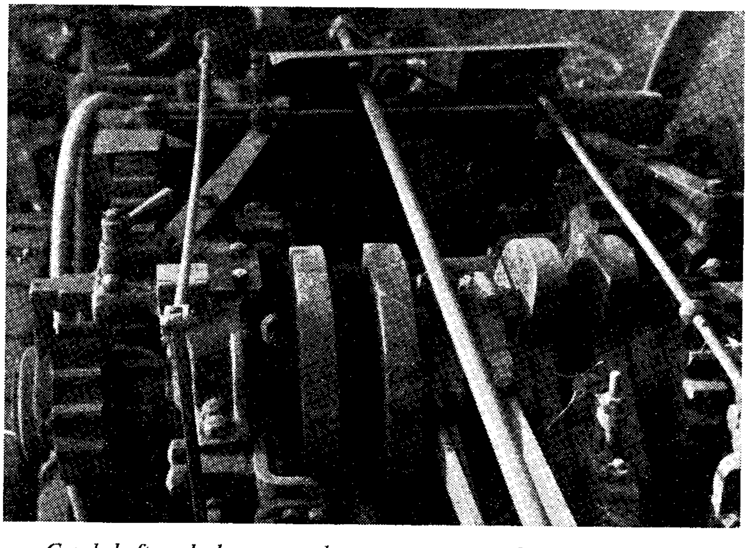
The button and rod to the left of the photograph operate the drain-cocks, and the central control is, of course, the regulator; again the lever is different from that shown in the drawing. On the right is the rod which operates the simpling-valve, and a curved plate has been fitted to this particular engine to prevent oil-splashes.

Note also the pump eccentric between H.P. crank and bearing; the separate balance weights secured by straps, and in the right foreground the details of the big-end.

Showman's Fittings

Those readers who have been waiting patiently for the drawings of the showman's fittings for the "Big Lion" will be glad to know that by the time this article is published the first sheet of drawings should be ready, and obtainable from the publishers of THE MODEL ENGINEER. It will include the canopy and dynamo platform, and the differences to the smokebox and rear of tender.

The second sheet will deal with the crane, and will be published later. I shall be discussing the showman's fittings in the next article, all being well.



Crankshaft and change-speed arrangements on the 8 n.h.p. Fowler

PLASTIC WOOD SUBSTITUTE

Quite by accident I found that a mixture of sawdust and Durofix made an excellent substitute for commercial plastic wood. It is, too, far more economical because you make the quantity needed at the time, whereas, invariably, when you go to your tube or tin of commercial plastic wood, it has become hard.

Another point is that you can make the consistency such that the application becomes much easier, because after a time the commercial article becomes difficult to apply, possibly owing to a degree of vaporisation of the binder.—P.G.T.

MAKING GREASE CUPS

BY "DUPLEX"

GREASE cups provide a convenient means of supplying lubricant to some types of shaft bearings, where the speed of rotation is comparatively slow and there is, perhaps, more than the usual clearance between the bearing surfaces. Thick grease is not generally necessary for this purpose, for a thin grease, such as Vacuum Mobilgrease No. 2, will cling more closely to the shaft and will be retained better within the bearing.

These small neat fittings can be easily made in the workshop, and will provide a simple exercise in lathe work for the beginner. In work of this kind, where several operations have to be carried out on the same length of material, the sequence of operations should be planned so that, right up to the finish, the work can be securely mounted in the lathe or gripped in the bench vice without damaging any screw threads or machined surfaces. It should, perhaps, be mentioned that, where gripping the threads in the chuck jaws cannot be avoided, the threads can be protected from damage either by wrapping a strand or copper wire in the thread grooves or by holding the parts in a short length of brass or aluminium tubing, split to allow of contraction.

It so happened that a batch of grease cups was required recently for a piece of apparatus being made in the workshop and, to save expense and delay, these were quickly machined from stock Duralumin. Commercial grease cups usually have a hexagon formed on the body to provide a spanner grip for screwing the fitting into place ; but, as this does not necessarily improve the appearance and certainly adds greatly to the work of machining, it was decided to omit the hexagonal portion and, instead, to cut a screwdriver slot in the upper end.

In work of this kind it generally saves time if the parts are made in pairs, by using short lengths of material and carrying out each stage of the machining on either end in turn.

The machining sequences on the body portion are illustrated in the operational drawing, Fig. 3. Time will be saved if the readings of the cross-slide index are noted when machining the first part with a right-hand knife tool, as these can be repeated for sizing the remaining parts. In the same way, reference to the leadscrew index will enable a uniform length to be maintained on the shouldered portions of the work-pieces.

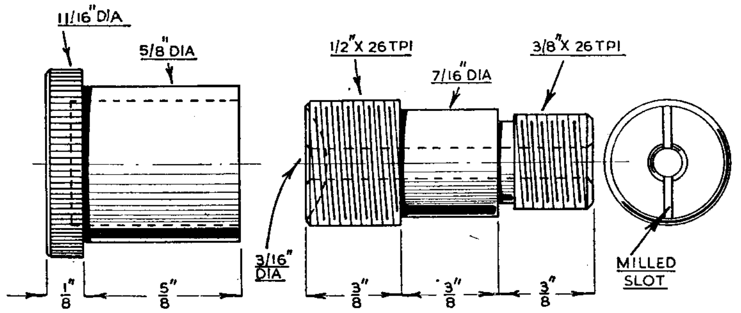


Fig. 2. Showing the dimensions of the lubricator body and cup

The nominal diameters given, ½ in. and ⅜ in., are best reduced by about 3 thousandths of an inch, as this will give easier threading and the soft material will be set up by the die to form a full thread ; moreover, ½ in. dia. rod can then be used. Next, drill the body axially, from the tailstock and countersink the mouth of the hole.

The threads on the two different diameters can be machined by screwcutting or by means of a die mounted in the tailstock dieholder. The standard brass thread dies required have a thread of Whitworth form with a constant pitch of 26 t.p.i. for all diameters. Put the ⅜ in. die and the ½ in. guide collet in the dieholder, and cut the smaller thread up to the shoulder ; then change to the ½ in. die and cut the second thread for the full distance.

Before removing the work from the chuck, it should be marked with a centre punch opposite to No. 1 jaw, so that, on remounting the rod in the same position, it will run truly. The unwanted portion of the ½ in. dia. threads is then removed by reducing the diameter to 7/16 in., and the end of the work is chamfered

Next, the body, after being parted off to length, is reversed in the chuck for chamfering the end and countersinking the bore.

To form the screwdriver slot, a small diameter milling cutter is mounted on an arbor and gripped to run truly in the chuck.

As described in a previous article, and illustrated in Fig. 3 (6), the body can be held in an L-shaped bar, gripped in the lathe toolpost and drilled at centre height ; but, here, it is advisable to secure the body in place with a nut. The slotting was actually carried out by screwing the body into a piece of bar, tapped ½ in. × 26 t.p.i., which was found in the scrap box. Another method is to grip a short length of square rod in the toolpost and to drill and tap it axially, but the end of the rod should be counter-drilled to allow the work to seat against its ½ in. diameter shoulder. After centring the work to the cutter, the slot is milled to depth, but does not extend as far as the screw threads. However,

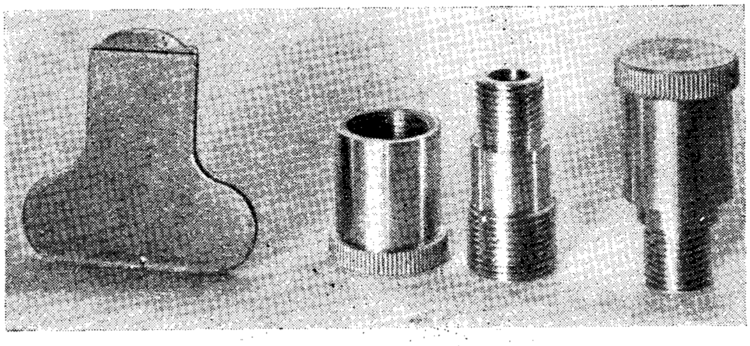


Fig. 1. Two finished grease cups and the special key

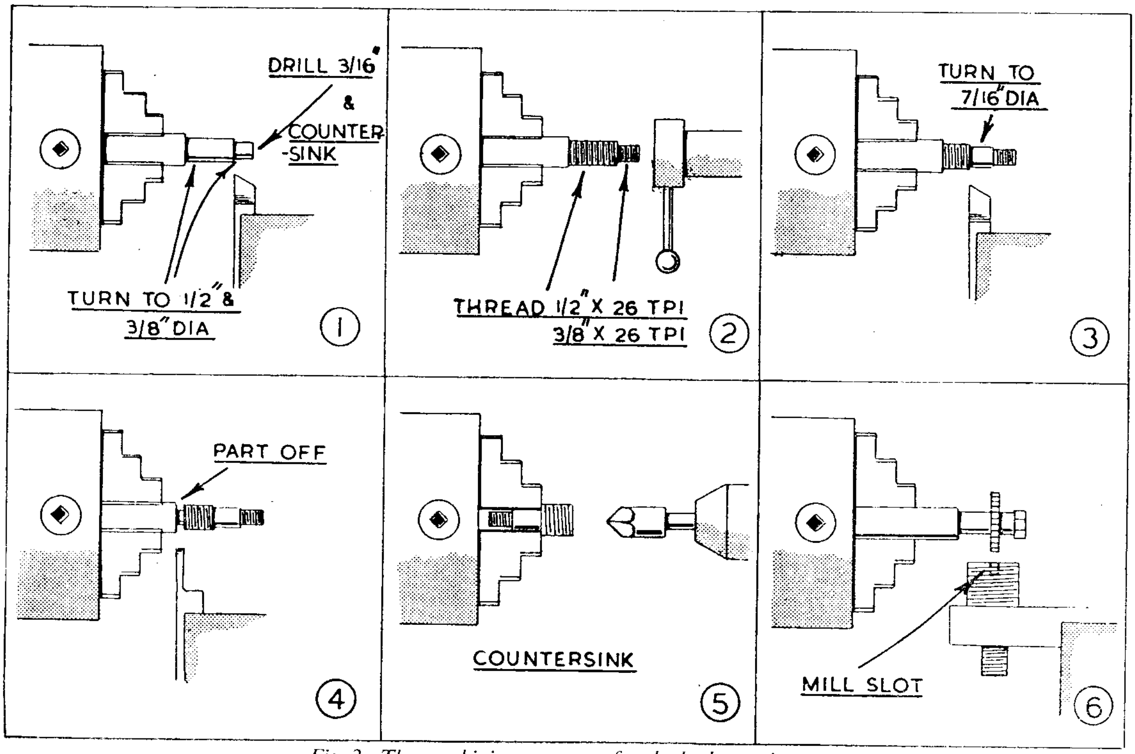


Fig. 3. The machining sequence for the body portion

if exception is not taken to cutting into the screw threads, or if the end of the body is deeply chamfered, time and trouble will be saved by cutting the slot with a hacksaw.

Having got so far, there should be no difficulty in machining the cups from ⅝ in. dia. duralumin rod, by following the operational drawing, Fig. 4, and again working to the readings of the cross-slide index. Knurling has been described recently, but there is one point not brought out in the drawing: the knurling will usually have a more regular pattern throughout its length if the advancing edges of the knurls are allowed to finish in a groove turned in the work. For this purpose, the parting tool is entered for only a short distance at the point where the final parting-off takes place.

If, when tapping the cup, the work tends to turn in the chuck, do not risk straining the chuck jaws by excessive tightening, but mark the rod for future reference with a centre punch and finish the threading with the work gripped in the bench vice.¶

Where the screwdriver slot has been milled in the way described, it is advisable to use a key of corresponding shape to screw the body into place. The key illustrated in Fig. 1 is made from a strip of mild-steel, ⅛ in. in thickness, and the end is filed to fit closely in the body slot; in addition, the tip of the key is rounded to conform to the curvature of the slot. Increased turning pressure can be exerted by drilling the key to take a tommy bar, or an adjustable spanner can be applied to the end of the key.

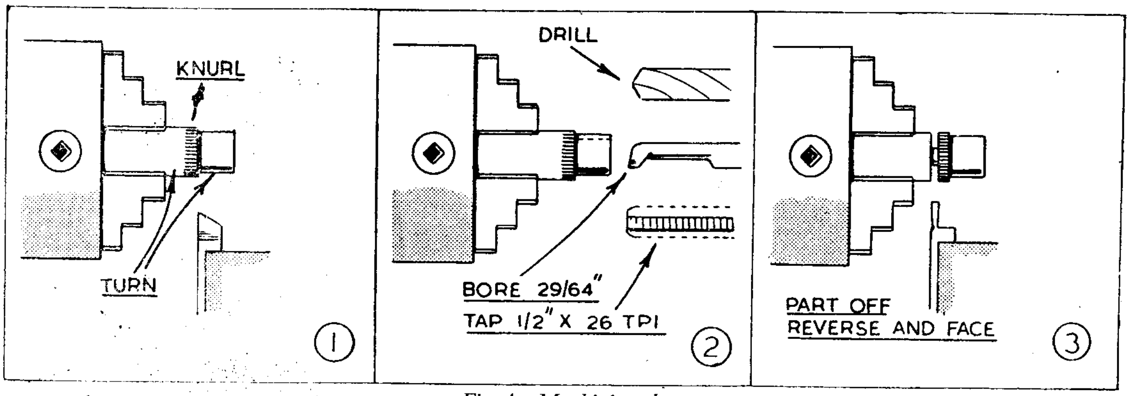


Fig. 4. Machining the cup

TWIN SISTERS

by J. I. AUSTEN-WALTON

IN connection with recommendations I have already made with regard to the use of "Silbralloy" for the brazing of boilers, I have a certain duty and responsibility to my readers. I therefore approached Messrs. Johnson, Matthey & Co. Ltd., the makers of Silbralloy, Easy-flo, and other special alloys for further guidance on the subject. With their permission I quote from their letter to me, dated March 3rd: "The makers are not conscious ever of having warned prospective users of Silbralloy that this material should not be used on pressure vessels, always assuming that copper is the material of construction and the joints are designed with the regular close fit and suitable degree of overlap which are customary in good brazing-engineering practice.

"Properly-made joints in suitably prepared assemblies should not fail at any working pressure for which the vessel could be considered 'safe' on the basis of its design and the gauge of material used.

"In our view, there is no more suitable means of heating for Silbralloy brazing than the oxy-acetylene torch—again provided that it is used with reasonable skill. Evidently, no brazing material should be overheated if good results are to be obtained. However, the effect of melting Silbralloy under workshop conditions is to convert part of the phosphorus contained in the alloy to phosphorus pentoxide, which combines with the oxide produced on the work, making a fusible slag. It is for this reason that Silbralloy may be used on copper without a conventional flux.

"One of the effects of 'consuming' some of the phosphorus is to make the Silbralloy remaining in the joint more ductile than the original material used.

"It is felt that some users might benefit from more practice in the use of the oxy-acetylene torch and from a closer study of the subject, as, for instance, from the book *Industrial Brazing*, published by Iliffe & Sons Ltd., London, 1953. In that volume, design for brazing, the effects of stress distribution and the characteristics of phosphorus-bearing brazing alloys are discussed in some detail.

"It will be evident to you as one skilled in the art of brazing that the lesser skilled are ill-advised to attempt to get the results which they would achieve with a material like Easy-flo when they try Silbralloy. The brazing alloys high in silver are so comparatively easy to use that the operator has to make the grossest errors either in design or performance of the act of brazing if he is to get bad results. That is the benefit one derives from the use of a comparatively costly material containing a large percentage of silver. On the other hand, it is a great mistake to suppose that satisfactory results cannot be obtained with materials of lower quality, provided the user has first of all acquired a working knowledge of his subject and the necessary manual skill to substitute for the ease of application evident in the higher quality alloys."

It is hoped that this official view of the matter will produce peace of mind in anybody who had perhaps entertained doubts in the matter. When you stop to think about it, if you do not feel that you have sufficient skill or knowledge to build even a simple boiler, such as the one I have described, then you have no right to construct something that will subject you and perhaps onlookers, to possible danger or injury.

A Further Step

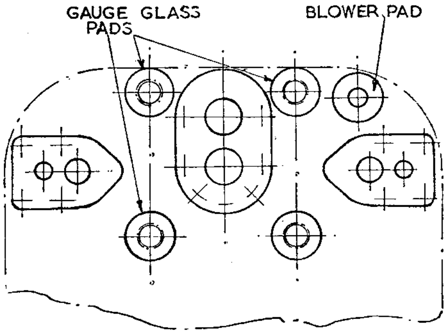
The most cautious operators might like to take one step further and use another material, so far not mentioned in these notes; this is Silfos, a material similar to Silbralloy but having a higher silver content, and greater ductility. It is more expensive than Silbralloy and that was my reason for not including it before; to my mind, it is rather like putting a 6 in. nail in the wall for hanging up a calender—but there you are.

Here are some actual figures of strengths and qualities of metals now under considerations :—

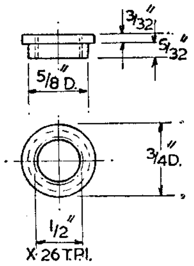
Copper. Tensile strength 12 tons (approx.). Elongation per cent. 25 per cent. soft condition; 8 per cent. hard condition.

Silbralloy. Tensile strength 35 tons. Elongation per cent. 5 per cent. cast condition.

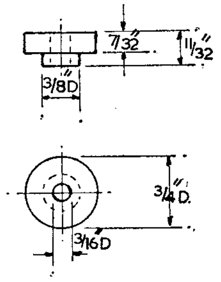
Silfos. Tensile strength 45 tons. Elongation per cent. 10 per cent. cast condition.



Arrangement of pads for backhead fittings

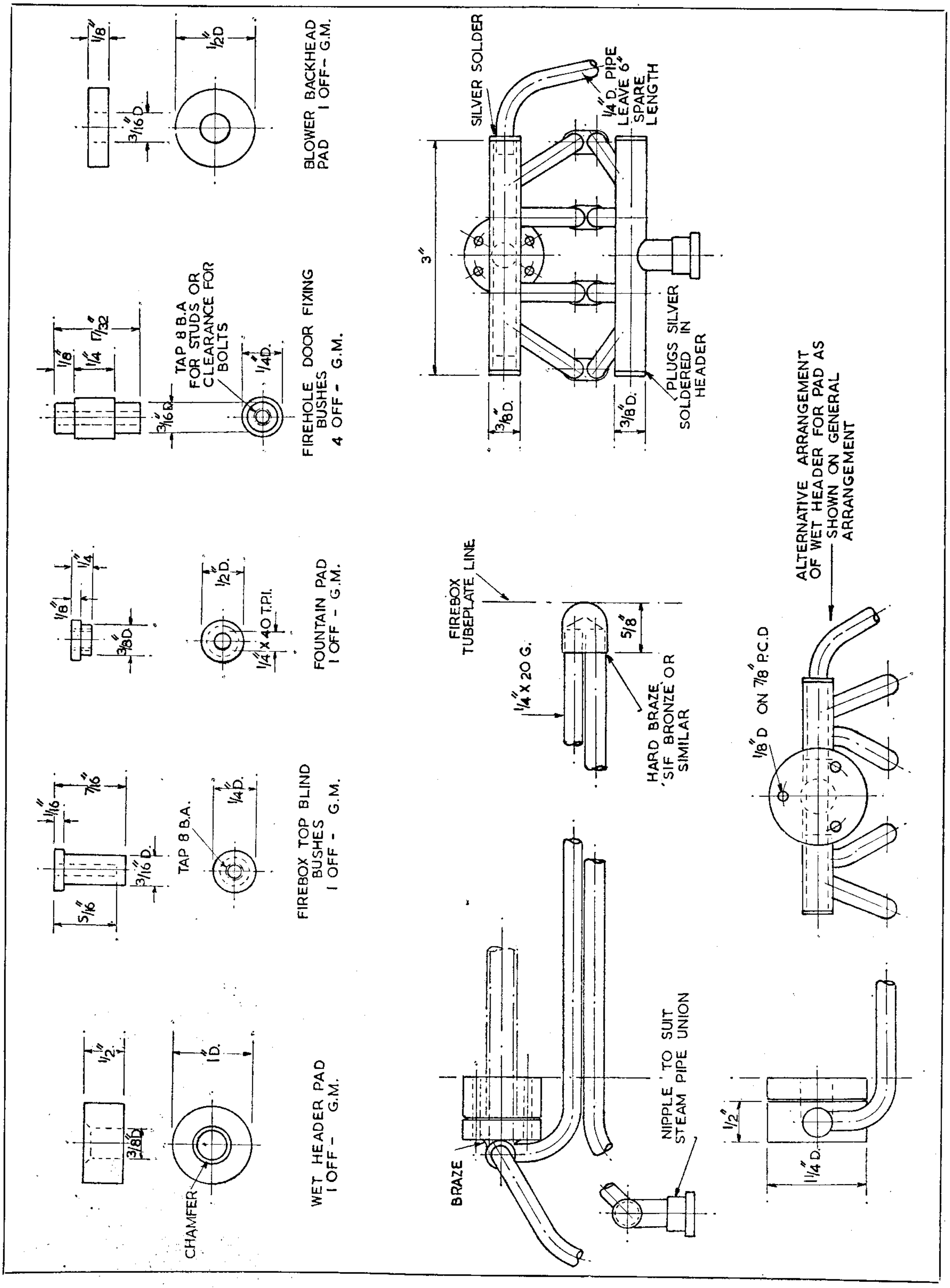


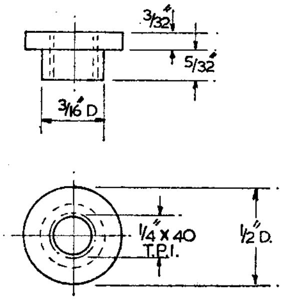
SAFETY VALVE BUSHES
2 OFF – IN G.M.



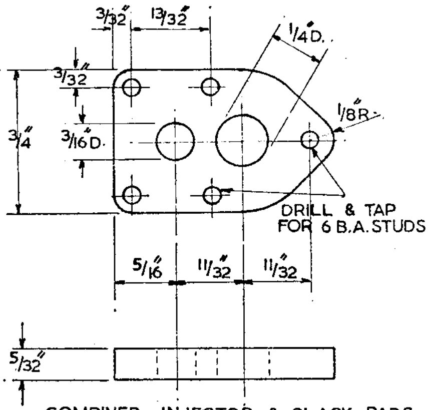
BLOWER PAD (FRONT)
1 OFF - G.M.

Continued from page 457, *April* 9, 1953.


BLOWER BACKHEAD PAD
1 OFF - G.M.
TAP 8 B.A FOR STUDS OR CLEARANCE FOR BOLTS
FIREHOLE DOOR FIXING BUSHES
4 OFF - G.M.
1/4" X 40 T.P.I.
FOUNTAIN PAD
1 OFF - G.M.
TAP 8 B.A.
FIREBOX TOP BLIND BUSHES
1 OFF - G.M.
CHAMFER
WET HEADER PAD
1 OFF - G.M.
SILVER SOLDER
1/4" D. PIPE LEAVE 6" SPARE LENGTH
PLUGS SILVER SOLDERED IN HEADER
FIREBOX TUBEPLATE LINE
1/4" X 20 G.
HARD BRAZE 'SIF BRONZE' OR SIMILAR
ALTERNATIVE ARRANGEMENT OF WET HEADER FOR PAD AS SHOWN ON GENERAL ARRANGEMENT
1/8" D ON 7/8" P.C.D
BRAZE
NIPPLE TO SUIT STEAM PIPE UNION



GAUGE GLASS PAD
4 OFF – G.M.



COMBINED INJECTOR & CLACK PADS
2 OFF – G.M. OR BRONZE
2 OFF BLANK COVERS 3/16" THICK

Easy-flo. Tensile strength 30 tons. Elongation per cent. 35 per cent.

Further, independent examination of the problem shows that the boiler as described and brazed with Silbralloy, gave a safety factor of 4, which is more than enough for anyone.

More Boiler Parts

Here are a number of small parts that still have to be made before you can say that the boiler is completely finished ; some of these parts are bushes. First, the safety-valve bushes which need no special comment. Then there are two blind bushes, one of which goes between the safety-valves, whilst the remaining one takes up a position offset to the centre-line of the outer firebox wrapper, as shown quite clearly on the drawing. It takes the whistle which, I might add, consists of exactly the same number of parts as the full-size whistle. This is steam fed, not from the blind bush (obviously) but from the whistle-valve in the cab ; there is a small pipe that leads from the valve to a side-entry on the whistle fitting. If properly made, this fitting will produce a true note, but probably above the normal audible range.

Hollow Stays

The double-ended hollow stays are for the firebox, as already described ; simple bushes for gauge glasses and blower are also given, leaving only the odd-shaped parts that carry the two injector-clack fittings and the regulator pad. For the injector pads, select some pieces of bronze or gunmetal of the thickness given, but increase the number to four instead of two. The extra two parts will form the base portions of the fittings themselves to be completed later, but this procedure will enable you to drill and tap two parts together, marking them accordingly ; the outer plates so prepared in advance, will have clearing holes, not tapped holes.

The central pad for the regulator will also be made in two parts and for the same reason ; there will be separate details of the actual fittings in due course.

The Ashpan

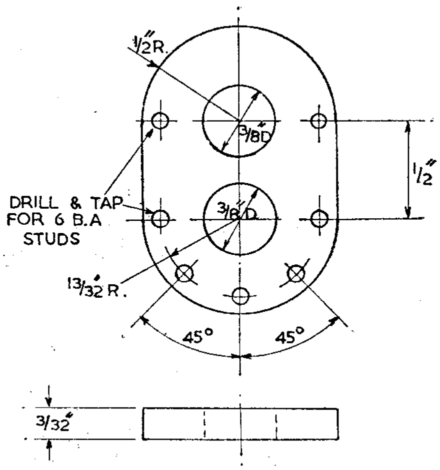
This can be a bit of a teaser in the matter of getting just the shape required ; mine was. The important thing is to find sufficient clearance and air space in and around it. The main obstacle is the trailing axle (as it always is !) and the horn-cheeks that take up so much of the valuable room. My advice is to try out the two bent side sections before joining up the whole unit ; conditions may vary slightly from locomotive to locomotive, according to how exactly you have followed the instructions given.

My own ashpan was made up from stainless-steel sheet, *welded* at all the joint edges with a fine strip of the same material cut from the remaining sheet. I did this because I was not quite sure of the steel specification being used—just something that happened to be in the junk box. For the best response to welding, it should have been what is known as F.D.P., which is both malleable and weldable, and maybe it *was.* The job turned out quite well, however, and I was careful to take full note of its eventual shape.

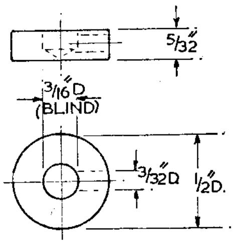
The ashpan unit when made, bolts directly to the two side sections of the foundation ring, in which should be drilled and tapped the necessary four holes ; these should be blind, of course.

How it Works

You will notice that, in the end view the ashpan provides a sort of ledge to accommodate the grate, which should be free to slide in and out when the ashpan is bolted up tight to the underside of the firebox. When the boiler is in position in the frames, it should be possible to slide the grate back through the open stretcher that comes hard up to the backhead face, by putting the pricker through the firehole door and hooking it back as far as it will go. This has the effect of leaving a wide gap at the front of the firebars, through which the



REGULATOR PAD
1 OFF – G.M. OR BRONZE
1 OFF BLANK COVER 3/16" THICK



BLOWER PAD CONNECTION
1 OFF – G.M.

embers will fall into the ashpan and so away. This is one of the quickest and neatest ways of dumping a fire in a hurry.

Owing to the slope of the grate, the firebars when released, will fall back to the closed position where they need no locking or other security device to hold them. Vibration or movement on the track will not cause them to move back at all.

The Grate

The extreme simplicity of this will more than make up for the difficulties of the ashpan, and consists of the necessary number of strips and spacers, just as shown on the drawing. Owing to its simple shape, it is reversible, end for end, should the bars begin to show signs of burning in one particular place. This reminds me of a trouble I had when *Centaur* was first run. The ashpan was very shallow, due to the large wheels and the consequent high axle level. The sweep of the ashpan over the axle produced a state of affairs where the bottom of the fire bars was only about $\frac{3}{8}$ in. above the sweep. On the very first run, there was a distinct tendency for the fire to get rather dead after the first hour's running, and on removing the bars, it was noticed that, at that very point, severe burning had taken place, and at one place in the centre the bars had almost scaled away.

Later, I made up a hopper ashpan in stainless-steel and all steaming troubles disappeared. The lesson to be learned is that the draught conditions inside the ashpan, can be quite critical, both from the point of view of inside obstruction, and actual air entry positions and areas. This is where working dampers can be so useful and informative. Unfortunately, when I came to work out a system to suit this locomotive, I met my first major defeat ; there simply did not seem to be any way in which I could incorporate the linkage required. Perhaps some super-enthusiast will get down to it one day, and present us with a scheme.

Firehole Door

I have come to like this type of fitting very much ; it is not, in this case, intended to be a slavish copy of that fitted to the prototype, but is designed to serve it utilitarian purpose and still retain a sensible and well balanced appearance. Due to the extensive pipe system that will have to run from the backhead, the swinging oven-door type would be quite out of the question. One of the advantages of the oven door is its ability to stay in intermediate positions, often necessary when excessive blowing-off takes place. It allows a certain amount of cold air to enter the firebox and so effect some degree of cooling down. Looking at it critically, the method is slightly brutal in that cold air *must* play right across the box, and on to the tubeplate. On anything other than a copper firebox, this might be disastrous and cause expanded tubes to leak in the tubeplate, but with silver-soldered or brazed tubes being more or less universally used these days, no trouble is encountered.

The Swinging Type

Our firehole door is still of the swinging type and also capable of staying in any desired position, from shut to fully open, but it swings down instead of out. In addition to this, the door itself is fitted with an internal baffle so that when the door is shut, a small amount of air is allowed to enter through the row of holes in the door proper and is deflected downwards via the baffle and more or less wafted across the top of the fire, just where we want it. Even when the door is " broken " slightly, there is still a tendency for the incoming air to be broken up from a direct stream, and a direct impingement on the tubeplate is less likely to occur.

Making the door should be simple enough, and stainless-steel is the ideal material from which to make it. There is not a very great heat problem here, not as much as one would expect, and I dare say an all-brass door would serve the purpose equally well. I have used silver-solder for joining up firehole doors for quite a long time, and never had a failure yet.

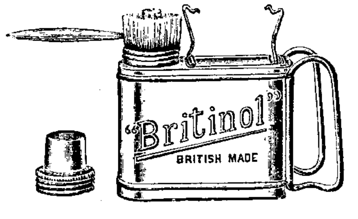
Some locomotive operators like to add a simple refinement in the form of a variable air control in place of the four permanent holes shown on the drawing. My own is to the drawings, but a slide of some sort could be added if you wish to have such a feature, and you should be able to plan this little extra yourself.

(To be continued)

" BRITINOL " SOLDERING ACCESSORIES

IT is now many years since the Britinol products were first introduced, but although they represent one of the earliest attempts to simplify soldering for the amateur, they are by no means out of date at the present day. Many readers will remember the original Britinol paste solder, a combination of solder and flux on a principle which is now very widely used in industrial soldering processes ; also the Britinol pocket blowlamp, which, for several years during and after the war, was not available, but is now again in production. This ingenious little device burns methylated spirit (alcohol) and is self-blowing, but eliminates the need for a pressure vessel or pump, as it embodies a simple vaporising burner working at atmospheric pressure. It is flat and compact, small enough to carry in the pocket, and can be lit with a match. A cap is provided to seal the burner against leakage when not in use ; the handle folds flat against the container, and it is supplied either with or without a folding rest for carrying a soldering bit.

A companion to the blowlamp is the Britinol telescopic soldering iron, specially designed for use on the supports of the blowlamp, and having an adjustable shank



" *Britinol* " *self-blowing pocket spirit lamp*

which can be extended from 5 in. to 12 in. length. Despite the present-day tendency to high prices, the Britinol products are still relatively inexpensive, and can be obtained either separately or in complete outfits which contain all that is necessary for soldering operations either with the aid of the soldering iron, or the direct heat of the blowlamp flame.

Other Britinol products include the original paste solder, consisting of a standard tin-lead alloy in finely powdered form, combined with a non-acid flux, and also cored solder in the form of hollow wires containing the same flux. All the above can be obtained from tool dealers and ironmongers everywhere in Great Britain.

QUERIES AND REPLIES

"THE M.E." FREE ADVICE SERVICE. Queries from readers on matters connected with model engineering are replied to by post as promptly as possible. If considered of general interest the query and reply may also be published on this page. The following rules must, however, be complied with:

(1) Queries must be of a practical nature on subjects within the scope of this journal.
(2) Only queries which admit of a reasonably brief reply can be dealt with.
(3) Queries should not be sent under the same cover as any other communication.
(4) Queries involving the buying, selling, or valuation of models or equipment, or hypothetical queries such as examination questions, cannot be answered.
(5) A stamped addressed envelope must accompany each query.
(6) Envelopes must be marked "Query" and be addressed to THE MODEL ENGINEER, 19-20, Noel Street, London, W.1.

Installing Steam Plant in Model Tug

I have a d.a.s.v. twin-cylinder steam engine and centre-flue boiler, and wish to install this in a tug. I would appreciate your advice on the following points.

(a) The boiler is approximately 10½ in. long × 5 in. diameter; centre-flue 1⅞ in. internal diameter; engine cylinder ¾ in. bore × ¾ in. stroke. Would this engine be capable of driving a 4 ft. model tug?

(b) Will it be necessary to fit an engine-driven pump for water-feed, and if so, what bore and stroke would you advise, also at what position on the boiler end should the check valve be fitted?

(c) I presume, with an engine-driven pump, that a by-pass valve should be fitted; could you tell me where this should go?

(d) Could you suggest a book which would clarify such matters, as most books seem to assume a considerable knowledge of steam-plants on the parts of the reader?

E.W.B. (Peterborough).

(a) The plant specified should be of ample power for driving a 4 ft. model tug. As a matter of fact, the boiler should be capable of steaming a larger engine, but it is an advantage to have plenty of steam capacity in hand.

(b) The centre-flue type of boiler has a fair reserve of water and would steam for 15-20 minutes on one filling of water, but it is always an advantage to fit an engine-driven pump so as to keep up a continuous supply of water. There is no definite basis for the calculation of the capacity of the feed pump, as an engine may be arranged to run at either high or low speed while using about the same quantity of steam. We suggest that a direct-driven feed pump of ¼ in. bore × ⅜ in. stroke would supply enough water for the maximum requirements of the engine, and if this is found to be excessive, the stroke of the pump can be reduced, or a by-pass valve used to spill the excess water back to the tank. The position for the feed check-valve is largely a matter of convenience. Generally speaking, it is fitted on the endplate at the most readily accessible end of the boiler, and well below water level.

(c) The bypass-valve may be fitted anywhere in the delivery line from the feed pump to the boiler feed check.

(d) The only book which we publish at present on the application of steam plants to model boats is *Model Steamers and Motor Boats*, price 3s. 6d.

Converting a Rheostat

I have in my possession one rheostat with markings 6/2 amps and 15 ohms, which is used to operate on a 50-volt supply. It comprises eight porcelain formers. each 8 in. long, wound with about 20 ft. of thick resistance wire (about 16-gauge).

Each coil is tapped at six points, and leads are taken to contact studs on an insulated plate, over which passes the current brushes.

I would like to convert this into a dimmer for stage lights, comprising six 100-watt lamps at 200 volts a.c. Could you please tell me the size of wire to use, and the name of a manufacturer?

P.H. (Blackpool).

It will be necessary to use wire sufficiently heavy to carry 3 amps without becoming excessively heated. The question arises whether your resistance formers are large enough to provide for adequate wire spacing to carry this current.

No. 22-gauge "Brightray" wire will be a suitable size for the current capacity, and we suggest that 100 ft. of this will produce a suitable resistance for dimming six 100-watt lamps, with the latter connected in parallel. "Brightray" is a proprietary name for an alloy of 80 per cent. nickel and 20 per cent. chrome, and this wire is manufactured by London Electric Wire Co. & Smiths Ltd., 24, Queen Anne's Gate, London, S.W.1.

We are rather inclined to doubt whether a rheostat with six tappings is a really suitable type for dimming stage lights, as it would not give gradual increase or decrease. The usual form of stage dimmer does not use tappings, but has a sliding contact moving over the coils of the resistance and making contact at each turn, thereby giving a much more gradual regulation of current.

Stationary Engine Boiler

Where can I obtain drawings for a spirit- or gas-fired boiler suitable for running a Stuart No. 10 stationary engine? If no drawings are available, please suggest a suitable size of boiler.

Is there a practical method of testing whether the finished boiler will withstand the required pressure, or is there a firm which would undertake to test the boiler?

R.F.W. (Shepperton).

We understand that Messrs. Stuart Turner Ltd., Henley-on-Thames, can supply either a suitable boiler or materials and drawings for constructing one. Alternatively, the design for the "M.E." steam generator would be suitable for this purpose. Full detailed drawings for this are available from our publishing department, price 6s. for set of two sheets. (Ref. No. M.4.)

The gauge of copper to be used in the construction of a boiler will depend to a great extent on its design, and in the case of a water-tube boiler, with comparatively small steam or water capacity, it is practicable to use a smaller gauge than in a boiler of large water capacity. In any case, much will depend on the design and method of staying the boiler. It is quite a simple matter to test a boiler by hydraulic pressure, the only fittings required being a force pump and a pressure gauge. The type of pump used for hand feeding a small boiler is quite suitable.

The boiler should be completely filled with water, and in the event of any leakage or failure, no expansion will take place, and the pressure will simply drop to zero on the gauge.

If you are a member of a model engineering society, you will probably find that facilities for boiler testing are available, but we do not know of any firm that would undertake to test a home-made boiler.