THE MODEL ENGINEER

Vol. 84 No. 2088

Percival Marshall & Co., Limited
Cordwallis Works, Maidenhead

May 15th, 1941

Smoke Rings

Engineering in Warfare

A NEW body has been set up by the Government under the title of the Engineering Advisory Committee. Its purpose is to consider how the resources of the engineering profession can be best utilised in connection with the war work of Government departments, and generally to examine new ideas or devices in engineering likely to assist the war effort and to advise on problems referred to them in connection with the development of new engineering devices. The Committee appointed is a small but very representative and well-qualified body, and it is to be hoped that this engineering "brains trust" will render valuable service in furthering the engineering side of the war effort. The work of the Committee will not only affect actual military equipment, but the machinery and methods employed in armament production.

* * *

The New Minister for Aircraft Production

THE Rt. Hon. Lt.-Col. J. E. C. Moore Brabazon, M.P., has been appointed Minister of Aircraft Production in place of Lord Beaverbrook. Col. Moore Brabazon was previously Minister of Transport where he gave excellent service. He is well known in the model engineering world for his public and business interest in motoring and aviation, and for his private enthusiasm for everything relating to scale model railways.

* * *

Testing a Railway Bridge

UNDER the signature of "Puffing Billy," a reader writes:—"The story you mention may not be quite so tall after all, as the nature of the test load is not specified. I believe a similar incident actually occurred some years ago in a bridge-builders' yard in Middlesbrough when, in order to obtain a measurement of permanent deflection under sustained load a span was left overnight loaded with sand-bags. There happened to be a particularly heavy fall of dew!"

* * *

A Gift from New Zealand

A SHORT while ago I published an appeal for measuring instruments on behalf of the Ministry of Supply. A number of replies were received from readers at home, but I have been especially pleased to find that my appeal has aroused a patriotic response from New Zealand. This comes from Mr. J. O. S. Miller, of Timaru, who has done more than make an offer. He has sent me two most useful tools in new condition—a Moore and Wright micrometer and a "Mauser" vernier caliper gauge—as a free gift to the Government. He writes :—"About three years ago, while in the old country, I purchased these with the intention of using them in the building of a 3½-in. gauge 'Princess Royal' Pacific loco. So far I have been unable to start the building of the model, and in any case, I feel sure that these tools, which are apparently in short supply, could be put to better use than just hanging in my workshop." Thanks to very careful packing, the tools have arrived in excellent condition, and I have been pleased to be able to pass them on to the Ministry of Supply. I am sure Mr. Miller's gift will be much appreciated and put into good service. He adds :—"I am a member of the Timaru Model Engineering Society. We are a small body, but very keen. All are enthusiastic readers of THE MODEL ENGINEER ; mine comes regularly still, and I have only missed one or two copies since the war began." In acknowledgment of this gift the Area Officer of the Ministry of Supply writes :—"The results already received from your appeal have been excellent, but this exceptionally fine-spirited patriotic effort of Mr. Miller, and from such a distance, excels anything we might have expected and is very much appreciated. I am writing directly to thank him for his kind gift of valuable instruments."

* * *

Centenarian Models

THERE has recently been on view at the National Museum of Wales, at Cardiff, a set of models made 100 years ago, and still in perfect condition. The models are made of wood, the set comprising 12 models containing 579 separate pieces. They illustrate the structure of the earth's crust and show the prevalence of coal seams and mineral veins in certain areas. The wood used in making the models was cut into thin layers to represent the various strata, the layers then being glued together. Despite the elapse of this long period of time the joints have remained intact, a fact which reflects credit not only on the craftsmanship of the maker, Mr. Thomas Sopwith, a geologist and mining engineer, but also on the quality of the glue or other jointing material used.

* * *

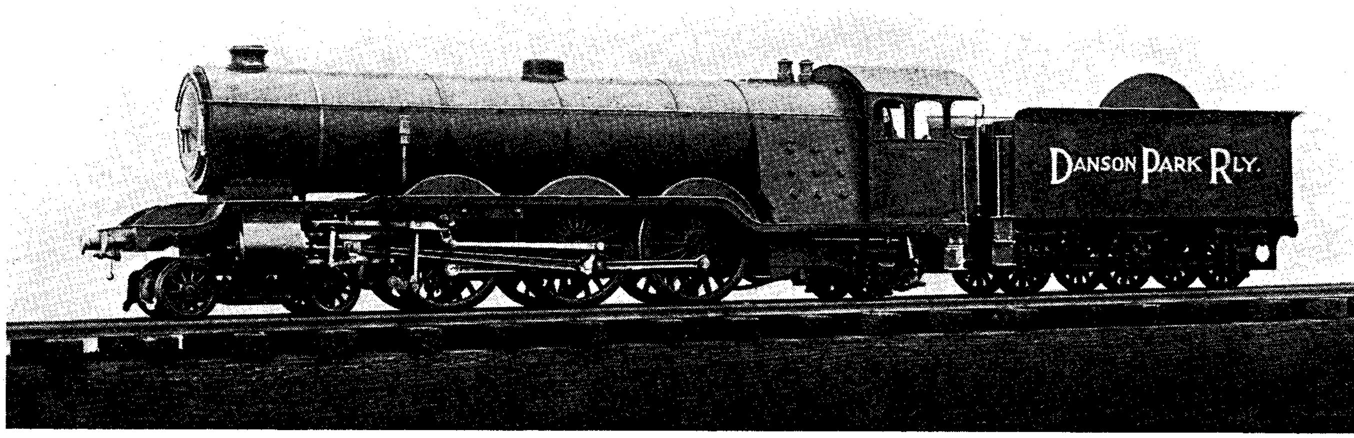
A Long Railway Journey

MR. H. V. STEELE, the Secretary of the Society of Model and Experimental Engineers has calculated that an express train travelling from the sun to the earth at 60 m.p.h. would take 93 million minutes to complete the journey. There is no immediate prospect of seeing such a train arrive, for, as Mr. Steele points out, the journey to be completed this year would have had to begin in the year 1763, at which date the steam locomotive had not been invented. This interesting speculation occurs in a lecture delivered before the Society, and now reproduced in the April issue of their journal under the title of "The Steam Engine in Time and Space." The lecture summarises the development of various types of steam engines since the days of James Watt, and I should like to compliment Mr. Steele on his novel and thoughtful treatment of a subject in which all model engineers are deeply interested. The same issue of the journal reports an excellent lecture on "Automatic Brakes," by Mr. W. Barnard Hart, M.I.Mech.E., the popular Vice-President of the Society.

Percival Marshall

"ONE GOOD TURN DESERVES ANOTHER"

By "L.B.S.C."



A FRIEND who is the head of a big building concern, Mr. R. C. Hammett, did me a good turn some little time ago. Now Mr. Hammett is a real locomotive enthusiast, and although his full-size contractors' locomotives are internal combustion, he owns (and sometimes drives!) a steam roller, and at his home in North Kent, has a stud of 5-in. gauge locomotives and a multiple-gauge continuous track on which to run them. Some time last year, when visiting my workshop, he told me he had also a 2½-in. gauge Pacific bought second-hand, which was reputed to have hauled four adults, but had evidently "gone off colour" a great deal, as it would now hardly pull its own tender. I told him that I was a firm believer in the principle of one good turn deserving another, and if he brought the engine along, I would endeavour to restore it to the *status quo ante*, and perhaps add a bit for luck. In due course the engine arrived.

"Built by the Yard"

When the L. & N.W. eight-coupled goods engines started working through on to the Brighton lines, we used to call them "dachshunds" (and other things) and said their boilers must have been built by the yard. When I saw Mr. Hammett's pacific, I thought the same; she is far and away too long, and out of proportion with it. "Tishy," the L.N.E.R., and "Fernanda," the S.R. type (a "King Arthur" with a trailing truck) are both much shorter "pacifics," only extending as far as the front of the Danson Park engine's cab. The bogie wheelbase is too long, and its rear wheels much too far away from the leading coupled axle; whilst the rear axle under the firebox was in rigid bearings, not even radial boxes or a pony truck, whereas a trailing bogie should have been fitted, to suit the length of the engine. The whole issue reminded me of a 4-6-0 chassis which had been lengthened to take a pacific boiler.

The workmanship on the engine was very good indeed, but whoever built her had made the fatal mistake of thinking that she would never have to come apart any more, and everything was riveted up solid. There were no means of getting the running boards off; they were riveted, with angles, to the full length of the frames. The bogie bolster was riveted to the frames, so were the buffer beams; in fact the whole issue had hardly a screw in it anywhere where rivets could possibly be used. The cylinders, which had studded covers and steam chests, were cast-iron. The valve gear was Walschaert's, with an unusual reversing arrangement, the reverse shaft being underneath, and the lifting arms working upside down, engaging the radius rod by means of a pin in an outsize fork which embraced the link and carried the die block. It was reversed by a lever in the cab, the reversing rod passing under the ashpan, which was fixed. The grate was pivoted at one end, and by pulling out a split pin, the loose end fell down into the ashpan, the residue from the fire effectually blocking the narrow air slot at the front end, instead of falling out as it should have done. The cylinders were supposed to be supplied with oil from a comparatively large drum, located between the frames just ahead of the trailing coupled axle; this had a pipe, with regulating valve, leading to a cross fitting on the steam pipe between the cylinders, and a separate steam pipe, with regulating valve, leading to the drum from a four-way turret on top of the backhead in the cab. This gadget evidently had a permanent reversing gear fitted to it, for the oil had apparently gone into the boiler instead of the cylinders, the latter being bone-dry when I took them down, whilst the boiler was well and truly oiled inside, the water gauge being completely obscured, and oil all over the firebox and tubes.

Missing—One Combustion Chamber

The boiler was not at all bad so far as workmanship was concerned, though the outside joints were riveted and sweated, but it had no combustion chamber, though the barrel was beyond even normal "Pacific" length, and the tubes are somewhere about 16 in. long. This is excessive, and the last five inches or so at the smokebox end are not much use for steam generating purposes. The only consolation is that there is not much heat wasted, the smokebox keeping fairly cool despite the strong blast needed to pull the products of combustion through the overlength tubes. The front of the smokebox was nicely finished off, but the appearance was spoilt by a little pimple of a chimney, ugly in shape, and inadequate in diameter for the size of the firebox. At the footplate end, there was a four-way "manifold" turret with connections for whistle, blower, steam gauge and lubricator. The water gauge was fitted with studded flanges, a nice job, but it had no blow-down valve! The push pin of the whistle valve did not

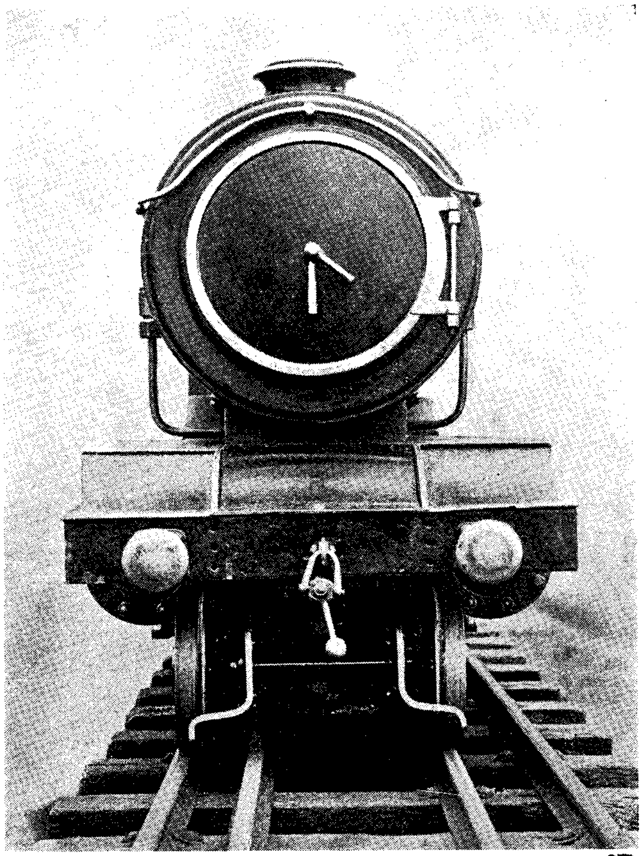


Photo. by] [*C. J. Grose*

Looks as though she has hit something !

even have a knob on the end, whilst the whistle itself was very small, and only emitted a hideous squeak.

The tender was well made, of heavy-gauge brass, and contained a hand pump of " Bill Massive " dimensions, with regulation " hydraulic " square-flanged gland, and square valve-box ; but nary a drop would it pump, for reasons which you will see below. The union connection to the engine was right in the middle, under the drawbar, absolutely inaccessible, and calculated to provoke as copious a flow of railroad Esperanto as the pump should ditto of water. There were other little discrepancies on engine and tender which I need not mention here.

Effects of Too Much Water and Too Little Oil

I tried her on the air pump ; nothing doing, except a half hearted attempt to turn her wheels a few spokes, and a bad blow up the chimney. That told me all I wanted to know. First I took off the alleged lubricator, together with all its valves and pipe connections, and consigned it to the junk pile. Then I made a start on the cylinders. To get at the pipe connections, the rivets had to be cut out of the bogie bolster, and same removed. Then I found that the cross pipes between the cylinders were coupled with union nuts, and big ones at that ; and when I got these undone, which was a job, as there was no room to use a proper spanner, the pipes could not be moved far enough to get the screwed parts away from the cylinders. This meant disconnecting everything between cylinders and motion outside the frames, taking out the cylinder fixing screws, and easing the cylinders away from frames whilst the pipe connections were unscrewed. It is a good job I have more patience than certain parties whose stock of that commodity rapidly becomes exhausted !

When the cylinder covers and steam-chest covers were removed, bores and port faces were found to be in a shocking state ; bone-dry, black, and very badly pitted. The pistons were steel ; one of them was entirely innocent of packing, the other had a few shreds left in the groove, both were a bad fit in the bores, and were also black and pitted. The slide valves were gunmetal, and had ground themselves against the rough surface of the portface. Well, thought I, the only thing to do, is to start all over again as if the cylinders were fresh castings ; and this I did. All the studs had to be removed, this taking some time, as there are plenty of them ; and then I set up the cylinder blocks separately on my milling machine, and milled a full 1/32 in. off the port faces before I got anything like a true and unpitted surface. The ports were altered to " Live Steam " specifications.

The blocks were next chucked truly in my Milnes lathe, by means of a Keats vee-angle-plate attached to the face-plate ; a plug in the tailstock, which fitted the cylinder bore, being used to locate them. They were rebored with a single-point boring tool of the usual pattern. As with the port faces, over 1/32 in. had to be taken out before a true surface was obtained ; this brought the cylinders to within about 1/64 in. of 1-in. bore, and as I had no suitable reamer of the exact size, the bores were left as finished by the tool. A finish which is practically as good as a reamed finish, can be obtained with a suitable tool and a very fine final cut.

About three years ago, Mr. Sturla, the Waltham Cross foundryman, cast for me some sticks of a hard bronze piston metal of his own composition ; and having some left, the new pistons were made of this. They were turned to my usual clearance, mounted on new rustless steel rods, and

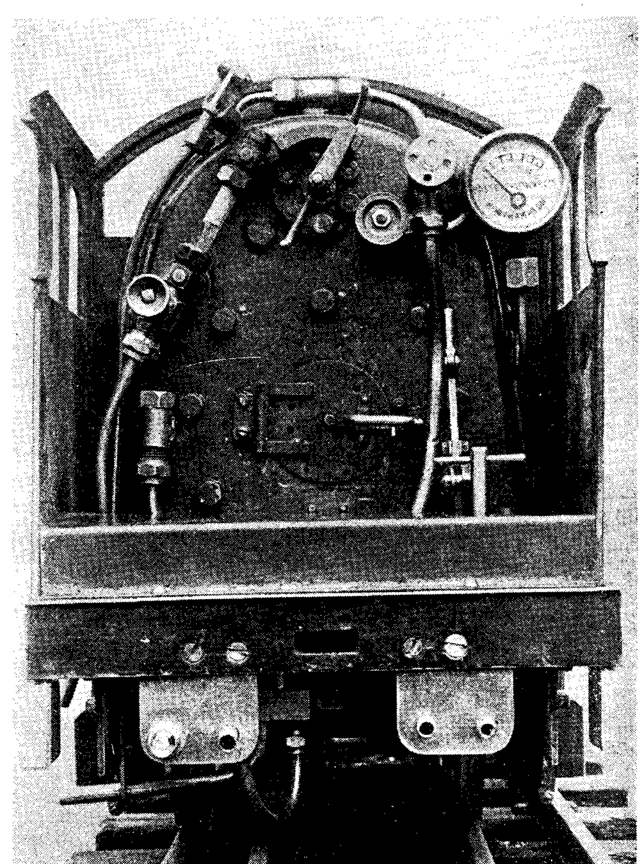


Photo. by] [*C. J. Grose*

Back end after alterations—note tiny injector.

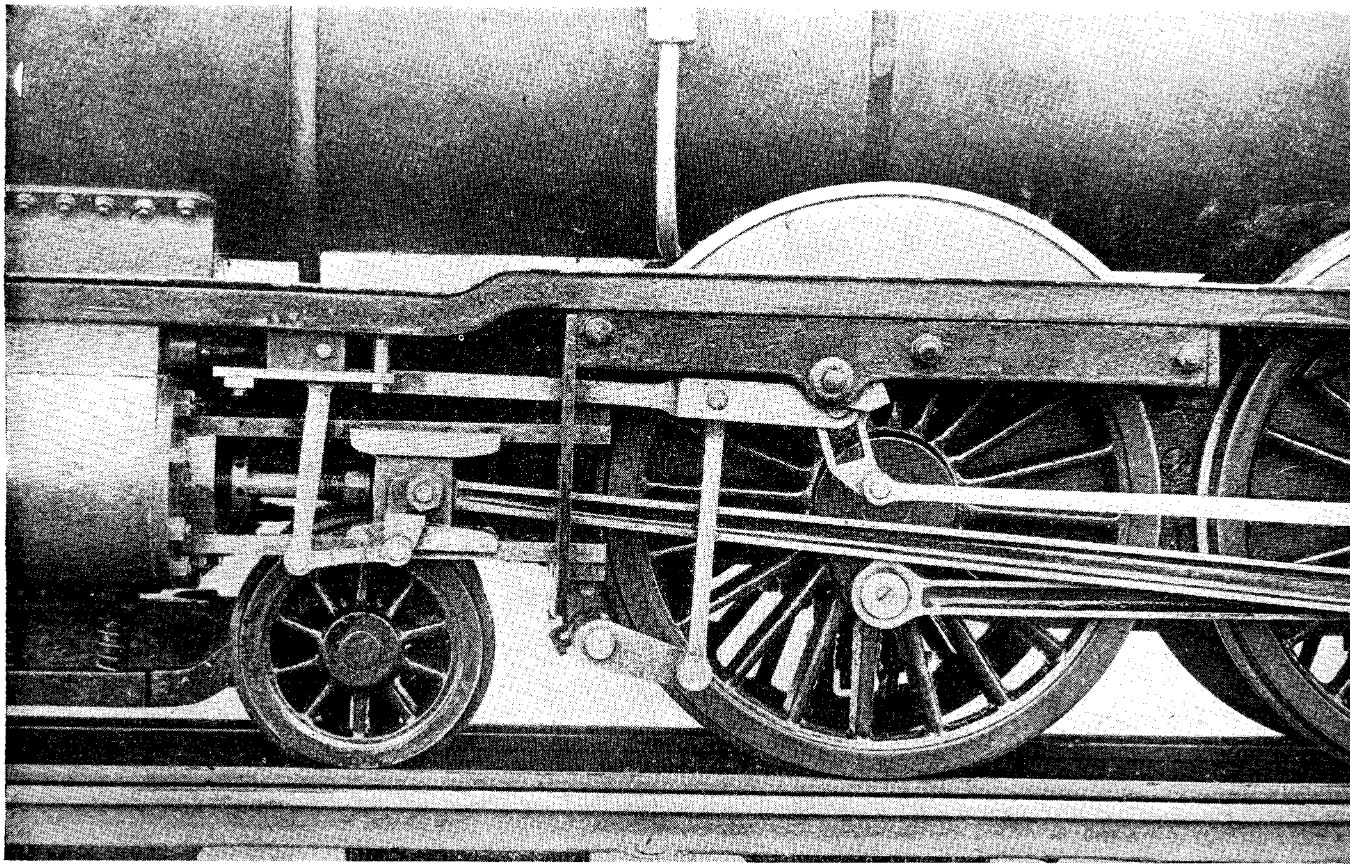


Photo. by **The " works " in normal running position.** [*C. J. Grose*

furnished with braided packing " rings " of graphited yarn. The valves were of the same kind of material, which works perfectly in conjunction with cast-iron. The cylinders were then reassembled, the joints being made with 1/64-in. Hallite jointing, and a nobby job it was, making the gaskets. After replacing the umpteen studs in each cylinder flange and portface, the holes for same had to be punched separately in the gaskets, and the blessed job took a month of Sundays, as the old saying has it. I used a plier-type saddler's punch for the job; and when through, I sympathised with our old ticket-collectors on the barrier at London Bridge between 12.30 and 1 p.m. on Thursday afternoons, when the " Early Closing " cheap excursions were running! Incidentally, if I am spared, I hope to tell you some footplate yarns about these trains. The cylinders were then re-erected, and this job didn't take quite so long as dismantling, as I had " got the run " of it, but they took ever so much longer than on one of my own engines. Certain adjustments were then made to the valve-gear, and the valves were set with the gear in running position, the die blocks being at the position in the links shown in the close-up photo.

Oil Supplies Ensured

A mechanical lubricator, with a ram 3/32-in. diameter and 3/16 in. stroke, was made and fitted between the frames, just behind the front axle of the bogie. The ratchet-wheel has 35 teeth, and the lever is operated by a 13-gauge cycle spoke from an eccentric mounted on the leading coupled axle. This lubricator feeds into the bottom of a crosspiece on the steam pipe between the cylinders, via the usual check valve, and holds enough oil for a three-mile run.

There is a feed pump, 5/16 in. bore and $\frac{1}{2}$ in. stroke, between the first and second coupled axles, but like the tender pump, it had retired from active service. On taking them both out, I found that they were fitted with wing valves; and the wings were sealed tight in the valve boxes by deposit from the water. They were knocked out, the valve boxes rebored and reseated, and rustless steel ball-valves fitted in place of the wing valves. This restored the pumps to full efficiency. A screwdown bypass valve was made and fitted, with an accessible handle (*see* cab photo) and the feed and bypass pipes refitted in my " standard " positions.

The Boiler Gets a " Birthday Treat "

The inside of the boiler was a mass of oily slime. I use " Gresolvent " paste to clean my hands, and thought it might get some of the grease out of the boiler, so I washed it out with a strong solution of that commodity in hot water. It certainly shifted a lot! Then I spied the can of scouring powder my fair lady uses for cleaning, so mixed up some of that with water, and had another go. Out came some more! Finally, after a boil-out with washing soda, the inside became reasonably clean, so I turned attention to the fittings.

The four-way manifold was scrapped (it was full of oil) and a tee fitted in its place, the whistle valve having a lever handle fitted to push the pin; also the " squeaker " was replaced by a respectable whistle. The other end of the tee was connected to the blower-valve, the steam-gauge syphon being fitted to a new elbow screwed into the side of the wrapper. The water-gauge was cleaned out, and furnished

(*Continued on page* 388)

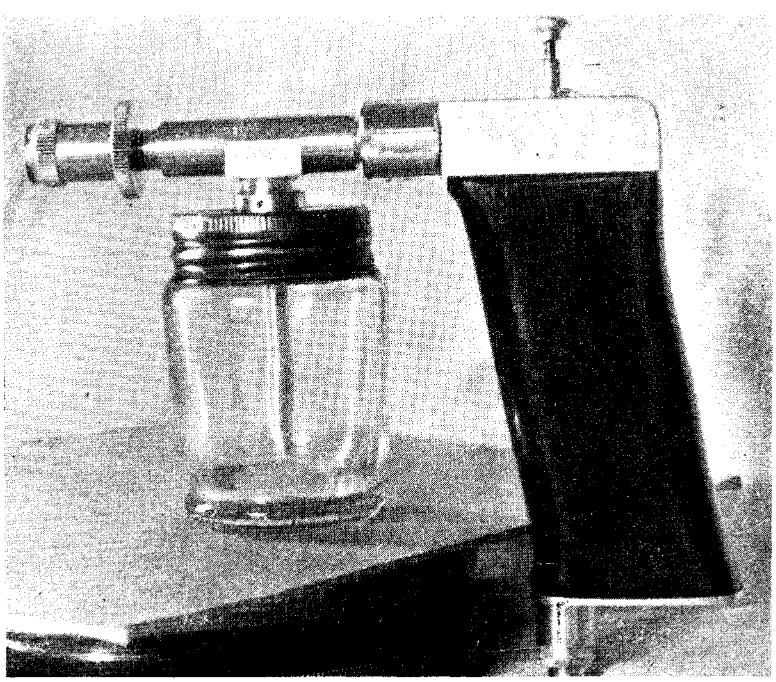
Notes on Using the "M.E." PAINT GUN

By Ian Bradley

SOME time ago I was faced with some rather tricky little painting jobs on small model components, including those of the "M.E." Road Roller which I described recently. It seemed to me that this work called for the use of a spray gun, and remembering that such a device had been described some years ago in THE MODEL ENGINEER I decided to look up the subject and construct it. The results have been so successful that I have thought it worth while to record my experiences with the gun and give a few hints on how to use it to the best advantage.

For the benefit of new readers, a sectional drawing of the gun, together with an explanation of its working, is reproduced here ; both are from the pen of the designer, Mr. E. T. Westbury, and are taken from his article "A Spray Pistol for Painting Models," published in the issue of this paper for Nov. 2, 1933. In this article, Mr. Westbury states :—

"The injector, as employed for pumping fluids, is, of course, the basis of all sprayers of this type, but at the same time there are some very important differences in their respective methods of operation. For instance, an injector pure and simple is required to have a high efficiency in terms of the output of fluid raised, compared to the expenditure of the working fluid. This is achieved by so arranging the jet and passages as to reduce friction and eddying to the very minimum. In an atomising sprayer, on the other hand, only a very small quantity of fluid is required to be raised, but it must be finely pulverised and mixed with the working fluid. To this end, the jet and passages are so designed as to promote friction, and also that the lifting efficiency is somewhat under control.



"Referring to the general arrangement, it will be noted that the working fluid (compressed air) is supplied by way of the pipe (6), which passes up through the hollow stock (12), and is arranged to be connected to a flexible air line. A thumb button (10) at the top end of this pipe operates a ball-valve which serves the purpose of a stop-cock. The air is discharged through the air pipe (3) and the air jet (11) through the aperture in the combining cone (9). As the air emerges from the air jet, it expands and practically fills the orifice in the cone, thus producing a partial vacuum in the annular space between the air jet and the mixing tube (7). This is communicated to the fluid contained in a reservoir attached to (7), causing it to rise into the mixing chamber, and be discharged with the air at the combining cone (9). At the same time it becomes mixed with the air and mechanically atomised.

"By varying the distance between the air jet (11) and the nozzle of the cone (9), which can readily be done by running the latter backwards or forwards on its thread, and locking in place with the lock-out (8), it is clear that the lifting effect can be controlled, and with it the degree of atomisation, within very wide limits. In practice, it is possible to obtain anything from a very fine 'fog' to almost a solid stream. The effect also varies with the pressure of air employed, so that thick fluid can be quite effectively sprayed by using a high pressure, which provides not only increased lifting power, but also greater mechanical pulverising effect. For still wider range of control, as for dealing with large or small surfaces, it is recommended that two or three sizes of air jets and combining cones should be employed."

In case these few notes should prove a stimulus to the construction of further paint guns, a few remarks on manufacture may be helpful. The designer intended the gun to be made up in brass, but, for those who happen to possess it and can spare the material, light alloy makes a nice job, with the added advantage that the finished gun is light to handle. For those who do not happen to have any light alloy, my advice is, stick to brass. There is simply no hope whatever of buying any aluminium alloy at present.

Now there is nothing in the actual machining of the components which can be called difficult; but two points need a little attention if the best results are to be obtained.

(1) The air jet (11) and combining cone (9) must be carefully machined to ensure concentricity, otherwise the gun's action will be "lumpy."

(2) The air valve must be well made, or the gun will "weep," particularly when thin paints are being used.

Apart from these two points, the rest is straightforward, but the work calls for neat craftsmanship, and any temptation to "rush" the construction, in order to see how the gun performs, should be firmly resisted.

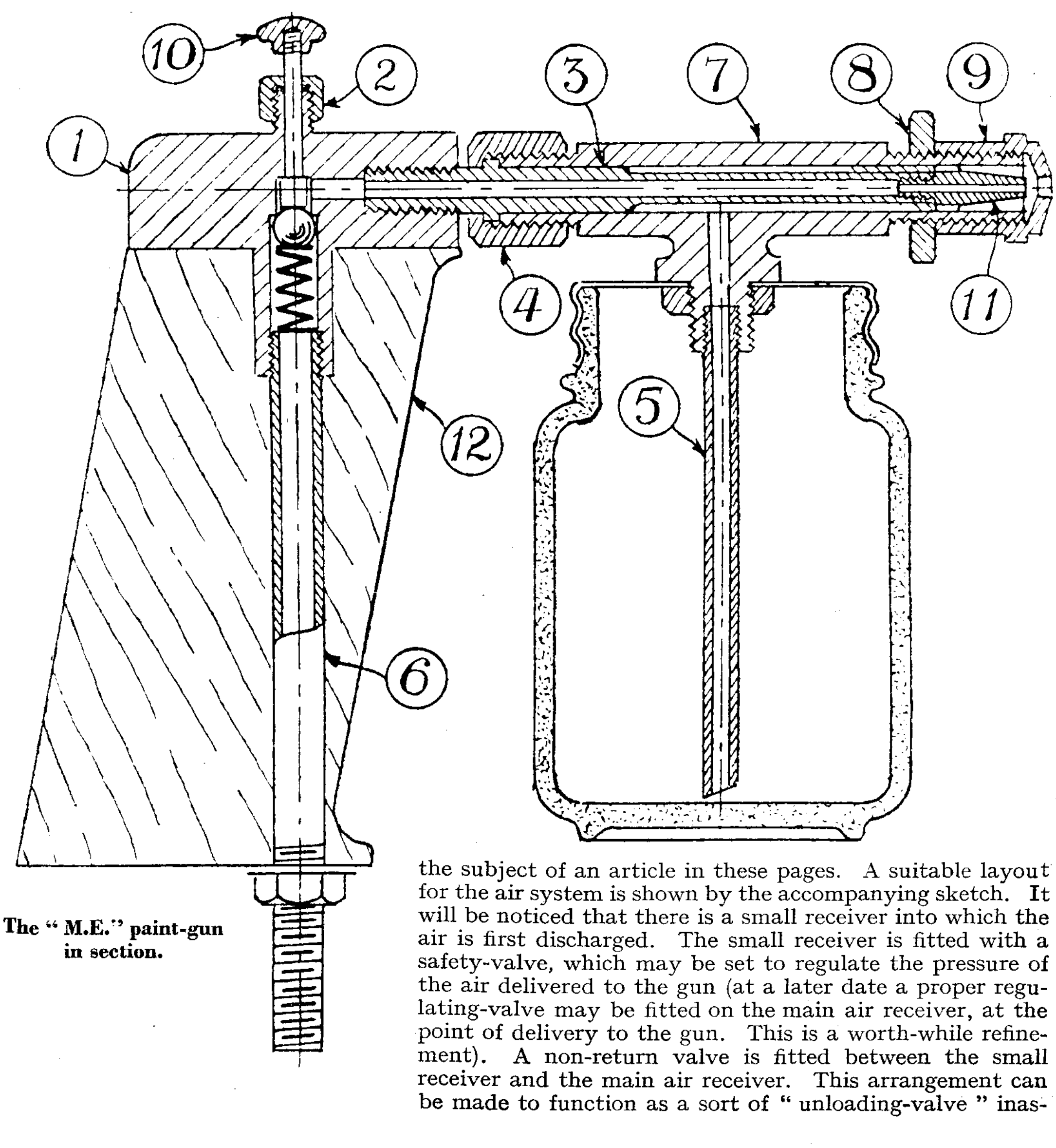
I have no precise information as to the number of people who built up the "M.E." paint gun, but it seems that the interest shown in it was quite considerable.

Classes of Paint Suitable for Use with the Gun

From experience, I have found that the gun will handle any paint, but, in the case of cellulose, it is advisable to see that the paint is not too thick, since this condition promotes a tendency to "orange-peeling." Paintwork drying in this condition takes a lot of rubbing down. In the case of enamels, the "orange peel" condition does not manifest itself, as the slow setting qualities of the material allows the surface to "flatten out" before drying. At the same time, no paint should be used in a "treacly" condition, as trouble in the form of "runs" is sure to be met with, due to a surplus of paint being sprayed on. This is particularly noticeable in the case of vertical surfaces. For this reason, large surfaces should be painted in a horizontal position, and an object having a complex construction should be so placed for painting that its major surfaces lie horizontally.

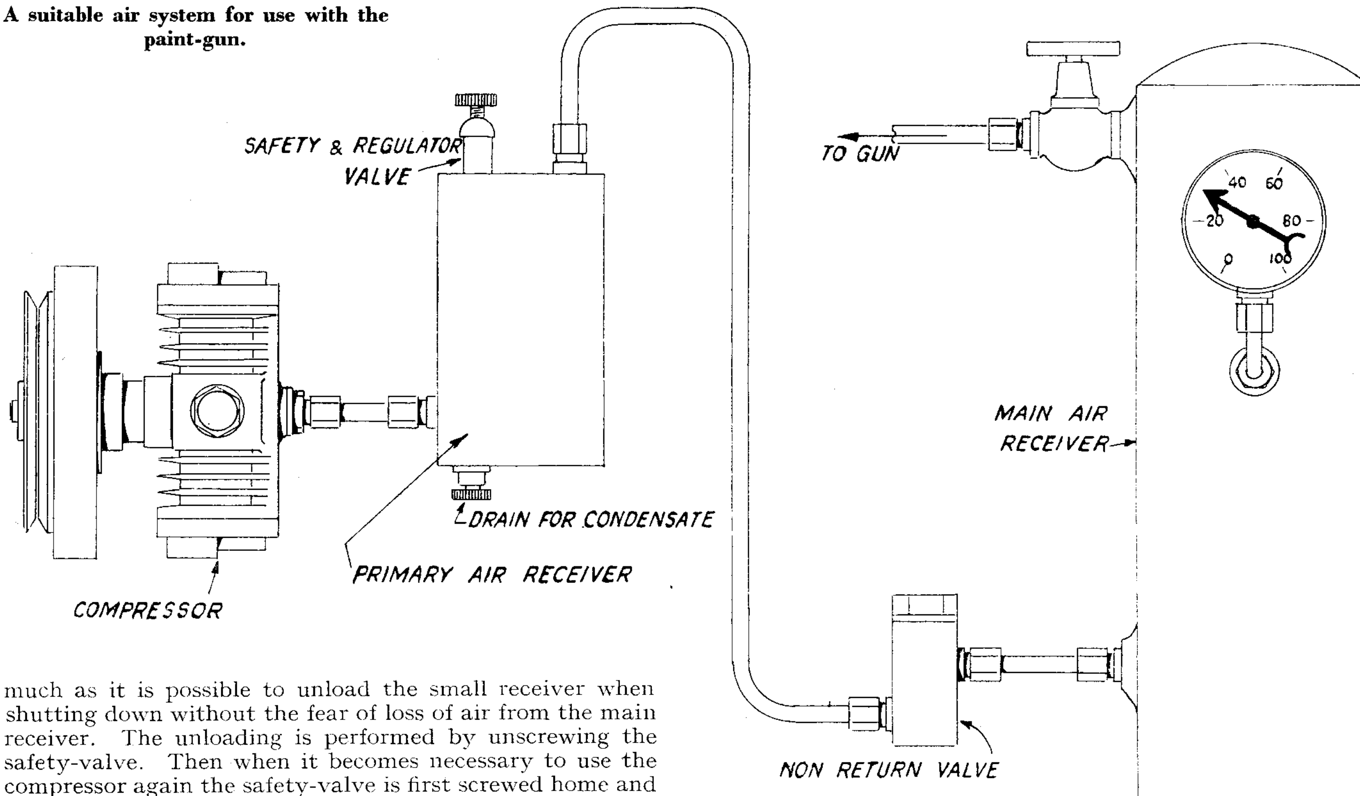
Air Supply

It is possible to use a foot pump with the gun, but the amount of air required is more than human endeavour can supply for protracted periods. A power-driven compressor is, therefore, advisable. Experience has shown that the gun, when used under normal conditions of service, requires about one cu. ft. of air per minute at about 50 lb. pressure. In my own case, this demand is just about met by the redesigned "Eureka" compressor, which has recently been the subject of an article in these pages. A suitable layout for the air system is shown by the accompanying sketch. It will be noticed that there is a small receiver into which the air is first discharged. The small receiver is fitted with a safety-valve, which may be set to regulate the pressure of the air delivered to the gun (at a later date a proper regulating-valve may be fitted on the main air receiver, at the point of delivery to the gun. This is a worth-while refinement). A non-return valve is fitted between the small receiver and the main air receiver. This arrangement can be made to function as a sort of "unloading-valve" inas-



The "M.E." paint-gun in section.

A suitable air system for use with the paint-gun.



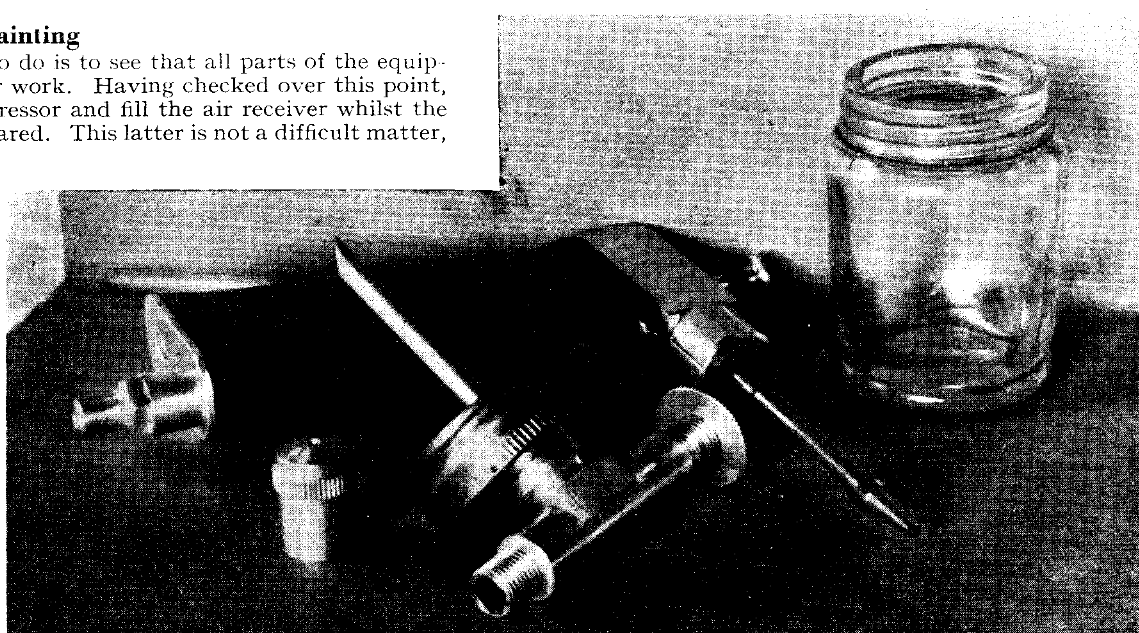
much as it is possible to unload the small receiver when shutting down without the fear of loss of air from the main receiver. The unloading is performed by unscrewing the safety-valve. Then when it becomes necessary to use the compressor again the safety-valve is first screwed home and then finally adjusted to the correct working pressure.

In addition, the small air receiver acts as a trap for the condensate which is inseparable from any compressed air system. The condensate may be drawn off by a bleed-valve situated at the lower end of the small receiver. It need hardly be stressed that dry air is a *sine qua non* for satisfactory painting. Therefore, if, in addition to the provision of a small primary receiver, the air is delivered to the bottom of the main receiver and drawn off from the top, no fear need be entertained that anything but dry air will be supplied to the paint gun.

Procedure for Painting

The first thing to do is to see that all parts of the equipment are ready for work. Having checked over this point, start up the compressor and fill the air receiver whilst the paint is being prepared. This latter is not a difficult matter, and little guidance on the subject can be given, except to stress the remarks made previously on the subject of paint consistency, and to add that the correct thickness will come by experience. It is a good plan, therefore, to experiment on non-important details before embarking on something requiring an exceptional finish. It is advisable to wear rubber gloves, as they provide complete protection against paint on the fingers.

An item of equipment that will be found of real value, particularly when small articles have to be painted, is some



The paint-gun as stripped down for cleaning.

form of rotary table on which the items may be placed. The rotating portion should be made good and heavy, so that, once started in motion, it will keep going at a slow rate for at least one revolution. I use a turntable which was originally made for some experimental wireless gear. The top of the table by itself has not much weight, so an old engine flywheel is superimposed to give the necessary extra weight when occasion calls for it.

To return to the procedure once again: When the paint is ready, the air line should be connected to the gun, and the paint reservoir filled. When applying paint, I find it best to use the gun in a series of short bursts, as this seems to make for economy in paint: a continuous discharge probably results in 50 per cent. of the paint missing the target altogether, due to the great degree of atomisation which the gun provides.

Do not be tempted to try and get a lot of paint on at one hit. If you do, " runs " will be caused; should they occur, do not hesitate, get a clean rag and wipe them off, then paint again; and do not put so much on this time.

I would stress the necessity of providing some form of bracket or clip, which will hold the gun firmly when it is desired to put it down during the actual paint operations. A paint gun with about 20 feet of air line simply will not " stay put " if it is just laid on the bench, and its falling about will be even more spectacular when you trip over the air line, as you are bound to do sooner or later.

Procedure After Painting

First empty the paint reservoir, returning surplus paint to storage, and fill the reservoir with a small quantity of thinners. Then open up the spray adjustment, so that the gun can discharge violently. Release the thinners in the reservoir in one long burst. This will effectively wash all paint from the interior of the gun, which should now be disconnected from the air line and stripped down to the extent shown in the illustration. There is no need to strip further, as all parts in or around which the paint can lodge are now readily accessible, and may be further cleaned off by a rag damped with thinners. Now dry off all parts, including paint reservoir; re-assemble gun, and place in rack.

The need for cleanliness cannot be too strongly urged; it is the key-note of the whole process. If the work is dirty, and the paint gun fouled by previous painting, it is useless to expect good results. The work *must* be free from all grease, and the gun must be clean or it will not discharge evenly.

Some operators use grease to mask work which does not require painting, but it is questionable whether its use is advisable, for grease is readily soluble in thinners, and it will be clear, therefore, that there is a very real danger of a mixture of paint and grease forming at the joint of the masking. I should certainly not advise the use of grease for this purpose when especially important work is to be done.

It will be noticed that I have confined most of my remarks to the technique of cellulose painting. This is for the reason that, strange as it may seem, cellulose paint requires more careful treatment than any other.

The question of the correct undercoats to apply is one which is rather outside the scope of these few remarks. It is assumed that if important work is to be done, paint made by a reputable maker will be selected. In which case, the maker's advice, given willingly, on the matter should be sought. Moreover, they spend a great deal of money on research into such problems. So when the manufacturer's advice is obtained, his recommendations should be adhered to.

One Good Turn Deserves Another

(*Continued from page* 384)

with a screwdown valve having a long stem, so that it was very easy to blow down the gauge when the engine was running. The firehole door, which was of the flap-down pattern and suffered from the usual complaint, viz., jamming with coal and dust in the hinge, was removed and refitted as a swing door, with a wire extension on the handle. The firehole, by the way, is circular, and too small for easy firing on the road; you can't " pop any in the back corners." I then made a weeny injector only 11/16 in. long, and fitted it under the trailing end, putting the steam-valve over the blower-valve. It has an internal pipe leading to the dome; and the delivery clack can be seen under the water-gauge. The overflow pipe comes out under the step. Both clacks on the side of the boiler leaked badly, so they were taken off, rebored, reseated, and fitted with new valves. A new connection was made for the hand pump, and the pipes bracketed up as shown in the cab photo., to the usual " Live Steam " spacing, so that any tender can be used with any engine built to my specifications.

The ugly chimney was taken off, the hole in the top of the smokebox enlarged, and a new Southern pattern chimney of larger diameter, plus liner to match, fitted in place. The tender was re-piped to suit the new water connections on the engine, the valve for regulating the injector feed being in the form of a brake-handle, for convenience in operation when running (*see* full-length photo.). The trailing wheels on the engine were taken out, and the axleboxes bored to allow about $\frac{1}{4}$ in. side play on the trailing axle. No guard irons nor steps were on the engine when it came to me, so I fitted a pair of Drummond pattern guard irons on the bogie, and steps on both engine and tender. There were screwholes in the buffer beam which indicated that Great Eastern type guard irons had originally been fitted, but had been knocked off by collision or derailment; but the only time they ever could have been over the rails was on a straight line.

" Oh, What a Difference in the Morning ! "

I tried the engine on my road one evening when it was getting dark, but found she would not keep the track, owing to some defect in the bogie springing. The springs were therefore replaced by new ones, and the side play increased. She has a sliding block in the centre-piece, similar to a full-size " Adams." The next time I got up steam, everything went like marriage bells. After a preliminary warming-up run light, I took my seat on the flat car, and away we went for $1\frac{1}{2}$ miles, only stopping to pick up the shovel, which I dropped, as it would not rest on the tender, owing to the high division plate. I cut this off afterwards ! She blew off most of the time, the water level being maintained with the bypass well open; the injector worked perfectly, needing no regulation whatever on the run, and having no appreciable effect on the steam pressure. In due course, Mr. Hammett came over to collect her, bringing three friends (all " loco. fans," two of them building " Maisies ") and his son; and for two glorious hours we forgot all about Messrs. Hitler & Co. and all their works. The engine behaved like a perfect lady, no matter who was driving her, hauled three passengers on two cars at a high speed with a crack of throttle, and the valve-gear in the position shown in picture (radius rod hardly moving !) safety-valves sizzling all the time. She starts readily in that position under full load, owing to the way I set her valves; and if the lever is inadvertently dropped into full gear she nearly blows the chimney off !

*A CAPSTAN ATTACHMENT for Small Lathes

A device for the expeditious and accurate quantity production of small turned parts in the home workshop

By " Ned "

Stop Indexing Pinion

APOLOGIES have already been made for the design of the gear which rotates the stops ; the only excuse for its existence is that it is capable of performing its allotted function just as effectively as a properly designed and cut bevel gear. It will readily be appreciated that, apart from low transmission efficiency, quite a considerable backlash in the meshing of the gears can be tolerated, since it is only necessary to turn the individual stops into such a position that they abut against some part of the head of the fixed stop screw. There is, of course, no objection to the use of a proper bevel gear by those who have the facilities for providing one ; the crude but effective substitute is intended for those who have not.

As will be seen in Fig. 12, the pinion resembles a small chain-sprocket wheel, and can be produced by methods which would equally be applicable to such a wheel. In turning the blank, it is advisable to make the disc diameter sufficiently large to enable the tooth spaces to be formed by drilling—say, not less than 1½ in. It may, if desired, be built up by brazing or welding a disc of ⅛-in. sheet metal to a suitable boss—in fact, riveting is good enough if it is properly done ; but in this case it may be advisable to leave the boss as large in diameter as possible, to ensure the disc being seated firmly and truly. Note that the permissible diameter of the boss is limited by the clearance under the capstan slide plate. The bore of the pinion, outside of boss, and one face of disc should be machined at one setting, after which it is advisable to mount the blank on a ¼-in. mandrel to machine the other face. At this stage, both sides of the disc should be left parallel, the tapering off towards the edges being carried out after cutting the teeth.

The latter operation is carried out by first indexing out twelve divisions on a 1¼-in. circle, by any means which will ensure reasonable accuracy, and drilling small pilot holes, afterwards opening them out with a drill and reamer to 3/16 in. dia. Replace the blank on the mandrel and turn down the edge to 1 7/16 in. dia., which will just break into the holes. It is now necessary to form the edges of the teeth by machining or filing, the latter being quite good enough in the present case, and capable of being carried out easily and accurately with the aid of a simple filing jig. This consists of a steel " button," 7/16 in. dia. over the flange, and shouldered down to 3/16 in. to fit the holes in the disc. A centre hole is drilled and tapped for a fixing screw, by means of which it is clamped to the blank, with a thick washer, also 7/16 in. outside diameter, on the other side. Both the button and the washer should be case-hardened, and the device is used by applying it to each of the holes in turn, and filing the edges of the teeth away until they coincide with the contour of the flanges on either side. Finally, the pinion is again mounted on the mandrel and the outside edges of the teeth thinned down to about 1/16 in. wide at the tip.

It may be mentioned that this method of forming teeth is applicable also to small chain sprockets, and if care is exercised in the indexing of the holes, will result in quite a sound and accurate job.

Fig. 12 also shows the bearing block for the index shaft, which is made from a piece of ½-in. square material, preferably brass. It will be noted that this must screw intothe underside of the slide plate so that its faces are square with the edges of the latter when it is tightened up ; this may necessitate the use of a thin washer under the shoulder. If more convenient, however, it is permissible to use round material, and drill the cross hole after it is fitted ; the two flat sides may then be formed by mounting the block on a mandrel and facing them in the lathe. In either case, it is advisable to mark off the position for the cross hole while the block is in position, and by means of a scribing block, produce centre lines, in both planes, on the rear slide cross-bar also, so that their alignment with the hole in the block is assured. It will be advisable to remove the rear cross-bars of both the capstan slide and the frame for drilling the holes for the index shaft. After the hole in the former has been drilled to ¼ in. reamer size, to coincide with the marked position, it may be clamped to the other cross-bar, with short ½-in. dowels in the slide bar holes, and the latter also drilled, a ¼-in. reamer being then passed right through both bars. In this way, true alignment of the three holes through which the index shaft passes should be beyond question, at any point of the slide travel.

A detail which was inadvertently omitted from the

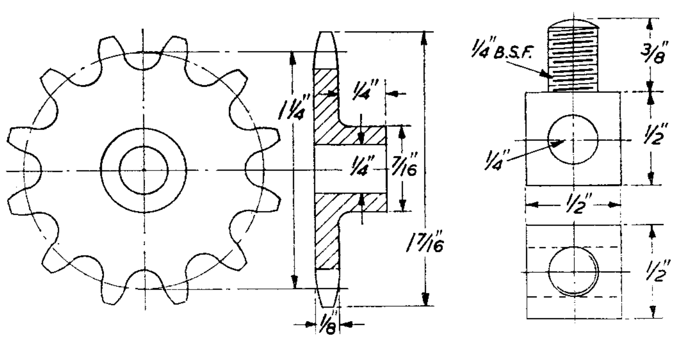


Fig. 12. Stop indexing pinion and bearing block (1 off each).

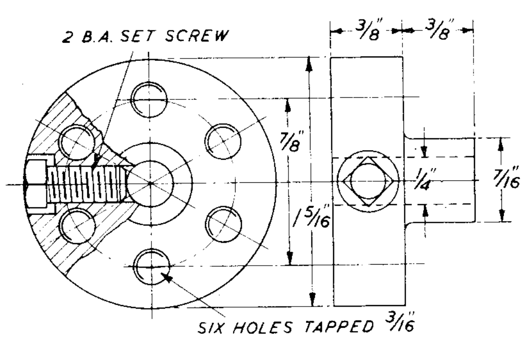


Fig. 13. Rotating stop holder (1 off).

* *Concluded from page* 348, "*M.E.*," *May* 1, 1941.

drawing of the capstan slide plate was the slot through which the indexing pinion passes to engage the holes in the underside of the capstan head. The position of this slot will, however, be obvious ; it is 1½ in. long by 3/16 in. wide, and may be formed by drilling a row of holes and filing out the metal between them. Just as easy, and usually more satisfactory a method, is to clamp the plate to an angle plate on the lathe cross slide and finish the slot, after preliminary drilling of a row of holes, by means of a 3/16-in. end-mill.

The indexing pinion should be securely pinned to its shaft—grub-screwing is not good enough, as there is always a possibility of the grub-screw loosening and upsetting the sequence of the stops ; being in a position which is not reaily accessible while the attachment is in use, it would be necessary to dismantle it to put matters right, and thereby valuable time might be wasted. A plain collar (not shown in detail drawings) is also pinned to the shaft behind the bearing block to ensure its endwise location.

Rotating Stop Holder

This consists of a steel or cast-iron collar having six axial holes to take the stop screws, and is shown in detail in Fig. 13. Its machining calls for no special comment, as all

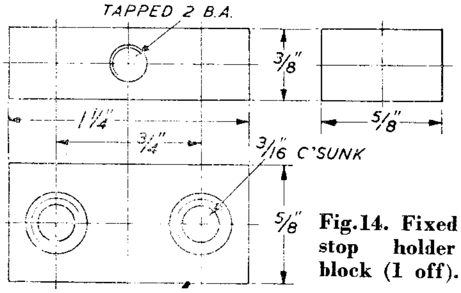


Fig.14. Fixed stop holder block (1 off).

operations are quite simple, and the drilling calls only for normal care. Any available long screws may be used for the stops, and although the general arrangement drawings show hexagon-headed screws, cheese heads are quite permissible, and may be found easier to manipulate. The lock-nuts must, however, be sufficiently small in diameter to enable them to be operated on by an ordinary spanner, and for this reason it may be found necessary to make special nuts, or to open out some of a smaller original size. The cross hole in the holder is tapped by a screw, by means of which the holder is clamped to the shaft, and it is most important that this screw should be capable of being firmly tightened up. A headless grub-screw is not suitable, and a projecting head would foul the lathe bed so as to prevent rotation of the holder. It will be seen that a square-headed screw, sunk in a counterbore so as to lie flush with the surface of the holder, is specified in the detail drawing, but an alternative which will occur to many readers is an Allen set-screw with an internal square or hexagon ; this may be made ¼ in. dia., but in view of the small amount of room between the axial holes, great care will be necessary to avoid breaking into them when drilling and tapping the cross hole.

The exact length of the stop shaft is immaterial, but it should not be less than about 10 in. long, and may with advantage be made 12 in. long, if the spare length does not get in the way of other workshop equipment. In the writer's case, a rather crowded layout makes it desirable to avoid excessive length. A substantial flat should be filed or machined on the shaft for a length of 4 in. at the tail end to form a seating for the stop holder screw.

The fixed stop holder-block consists of a rectangular block of metal attached to the top of the rear slide frame cross-bar, to hold the fixed stop screw in alignment with the particular indexing stop which happens to be in use. A screw stop is not, strictly speaking, a necessity here, but it will be found an added convenience, and is just as easy to fit as any other. In this case, a cheese-headed screw is not suitable, and the head of the screw used should be carefully faced off flat, so as to form a true abutment for the moving stop. The fixed stop must in all circumstances project from the holder block not less than the difference between the longest and shortest stops in the indexing holder. If the work which is being dealt with necessitates greater differences in the position of tools than is normally accommodated by the stops, it is possible to make further adjustment of the tool holders in their sockets ; in extreme cases, it may be found advisable to employ extension holders. This expedient should not be adopted unless it is absolutely necessary, however, because it adversely affects the rigidity of the cutting tools ; but in ordinary practice, the need for it only occurs rarely.

Tool Holders and Cutting Tools

This attachment may be employed in conjunction with ordinary capstan tool holders, so long as these are furnished with ½-in. diameter parallel shanks to fit the sockets, and in other respects adapted to suit the size of the lathe and the work being handled. For those who are unfamiliar with the design of capstan tool holders, it may be mentioned that all the standard types are described and illustrated in the handbook, "Capstan and Turret Lathes," which is obtainable from THE MODEL ENGINEER Publishing Dept., price 2s. 2½d., post free. It is, however, possible to simplify many of these fittings in adapting them to the requirements of model work, without destroying their general utility, and should this capstan attachment prove to be popular among readers, so that there is a general demand for tools to suit, it is proposed to follow up this article with one dealing with the construction of appropriate holders for cutting tools, also tap and die holders, steadies, and other devices likely to be essential or helpful in carrying out normal production work.

Wrinkles

Rubber and ebonite may be ground on an emery wheel if French chalk is liberally used to stop clogging. Too fine a grade wheel is not satisfactory.

For turning papier machê, use such tools and speed as that used for cast iron, and *not* metal turning tools used at wood-turning speed, nor wood turning tools at the latter speed.

Fine metal-cutting saws should be mounted so that they cut on the "pull" stroke—the "Japanese" fashion—rather than on the "push," or forward stroke. Many broken saws will be thereby saved.

High speed bearings can be satisfactorily lubricated with a mixture of castor oil and sulphur ; in the proportion of 13 of the former to one of the latter. This lubricant is satisfactory where no pressure exists on the journal.

For packing superheated steam-pipe joints, thin copper foil is far to be preferred to the usual red or white lead paint, being less likely to be pressed out as the flanges are tightened.

When it is desired to drill into a hard cast iron casting, heat it to redness and place a lump of sulphur on the spot to be drilled ; it will soften locally during cooling off.

To prevent rust deposit when working on bright iron or "tin-plate," wash the hands frequently in soda water, also rub pieces on the work, with a little water.—F.C.

The CENTENARY of the ELECTRIC CLOCK

By Waring S. Sholl, A.M.I.E.E.

As The Model Engineer has probably done more than any other practical journal to encourage electric clock making, it might be of interest to follow the development of this device since its original appearance one hundred years ago.

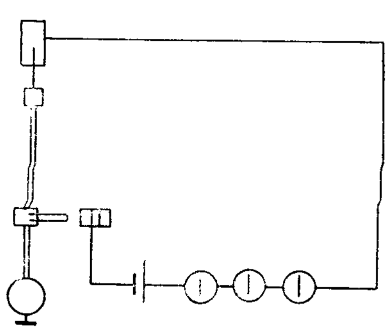
Quite recently the writer, during a visit to Edinburgh, made a call at No. 21, Hanover Street, and read the attached

> **WORKSHOP OF**
>
> **ALEXANDER BAIN**
>
> Electric Clock and Telegraph Inventor
>
> Born 1810 Died 1877

inscription engraved on a simple stone tablet marking the modest workshop of the man who gave the world its first idea of a practical electric clock. Bain also invented a teleprinter, the high-speed chemical recording telegraph and the punched paper sender.

The writer, at the time of his visit, was fortunate in meeting Mr. Alexander Steuart, himself the inventor of a notable and original electric clock, who has made an exhaustive study of Bain's life-work.

Bain's invention suffered from certain faults, largely due to the, then, lack of manufacturing facilities and electrical materials and supplies also, the fact that electricity was at that time far from being an "exact science." Today, it seems hard to grasp that Michael Faraday's momentous discovery of magnetic induction had only been made known ten years before the publication of Bain's first patent in 1841. Despite the rather drastic criticisms passed on Bain's work—in the light of latter-day knowledge

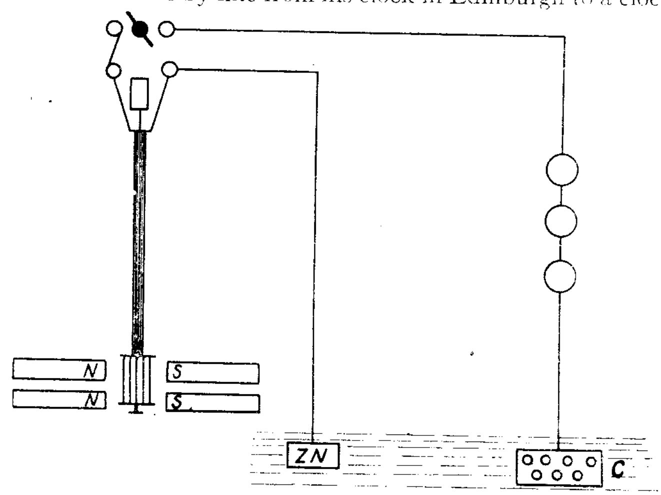


1841.—Bain's first—contact—pendulum.

be it understood—the fact remains that he was the first to produce impulse, or "slave" dials connected in series, and even series-parallel, driven by a master clock at predetermined intervals.

It is of interest to note that Bain's first invention was not of the "all-electric" type. The master clock here was of the spring-driven variety with a seconds-beat pendulum. The pendulum-rod was provided with a contact which completed an electric circuit, a gold stud set in a stationary insulating block. This passed the current from an "earth battery," i.e. a zinc and carbon couple imbedded in moist earth, through impulse dials of both the plain electromagnetic and also the polarised type.

Bain's first idea was to *distribute* uniform time throughout a building and in this he certainly did establish himself as the pioneer of the system which still survives at the present day. In fact, he went so far, in 1846, as to transmit time by line from his clock in Edinburgh to a clock



1843.—Bain's second—electric—moving coil pendulum, with "earth" battery.

in Glasgow. His next invention took the form of an electric pendulum which reversed the existing order of things in that the *pendulum drove the clock*. In fact, he was probably the first, or "tied" with the first, in demonstrating the possibility of the "tail wagging the dog." This pendulum had, as a "bob," a wound coil oscillating between two pairs of permanent magnets with consequent poles, the coil being energised from the "earth battery" through a tumbler contact tripped by the swing of the pendulum.

The coil was of rather heavy gauge wire and consequently took an unduly heavy current from the all-too-meagre "earth battery." Alexander Steuart has suggested that the troubles which attended this invention, *viz.*, pitting and burning of contacts, and the contingent unreliability of functioning, were due to Bain having to cover his copper wire with cotton by hand. Hence the unduly large gauge of wire, the low resistance and the troubles which necessarily followed in its train.

Bain's third effort reversed the previous order of things in that he adopted fixed coils and a permanent magnet "bob" of radial form which described an arc as the poles alternately entered or withdrew from the open coils.

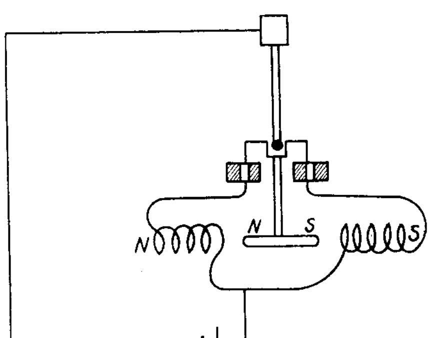
Here the contacts were of the reversing type, the switch arm being moved to and fro by a peg attached to the pendulum-rod. This added further complication and increased the load on the under-powered pendulum.

The large number of inventions, by other experimenters, which followed, were chiefly of the "Heath Robinson" order. The inventors, or rather "perpetrators," of these freaks appear to have had little or no conception of an even passably "free" pendulum. Practically all were under the impression that an electric impulse at frequent and uniform intervals was necessary to energise the pendulum. In Bain's pioneer effort this *was* necessary, as he had to provide for feeding the impulse dials at predetermined and uniform intervals. His followers appear to have blindly followed his lead while contenting themselves with the "simple" or self-contained unit type intended to move one pair of hands and to indicate on one dial only. Consequently, these experimenters "mixed" the idea of the unit clock with that of remote control—and with disastrous results.

Hard on the heels of Bain came Hipp, of Würtemberg, whose electric pendulum was of such outstanding merit that certain adaptations of it are used at the present day. Hipp originated a system which made a comparatively infrequent contact for energising the electro-magnetic pendulum instead of creating an impulse at every or every other swing. In fact, the pendulum "helps itself," in a highly economical manner to the exact current required. This is done by a pallet pivoted to the pendulum-rod and arranged to trail over a notched block fixed to the end of a contact spring. While the pendulum is describing a satisfactory arc by its accumulated momentum and the escapement is being driven regularly, the pallet sweeps over the notch without depressing the spring or engaging the contact beneath it.

When, however, the swing of the pendulum decreases unduly, the pallet "hangs up" in the notch, momentarily, which forces the spring down and closes circuit through the windings of the electro-magnet fixed below the pendulum and the battery. As the pendulum has a soft iron armature, which swings clear of the upper pole of the magnet, it receives an impulse which restores the momentum. The sequence is repeated so long as the clock continues to work.

This design has the added advantage of indicating, by more frequent contacting, when the battery is in need of recharging. Moreover, the "braking" of the pendulum

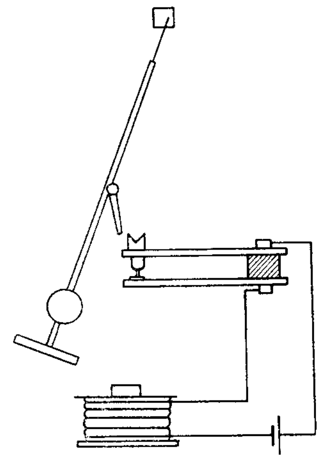


1843.—Bain's third pendulum; fixed coils, permanent magnet "Bob."

is comparatively slight and the contacts are sound and substantial, and capable of being cleaned without stopping the clock.

Space will not permit an adequate description of the fine achievement of Alexander Steuart, but a brief reference is given here to the salient points of his clock. Here the pendulum and movement are never actually connected mechanically, electrically, or magnetically. The movement *drives the pendulum*, the pendulum controls the movement and the usual escapement is not fitted. A motor of the "electricity meter" type supplies the power which raises a gravity arm. This, in descending, drives the pendulum with a constant force. The motor also drives the clock hands and makes contact for driving "slave" dials, where required.

The gravity arm acts on the pendulum and is then arrested by a stop; electric power passes to the motor while the arm and stop are in contact. Current is interrupted when the motion of the motor raises the gravity arm. The motor speed is governed by the time of contact, but the motion of the motor is maintained between the



1842.—Hipp's pallet and notch system.

periods of contact by a reduced current and by kinetic energy. The pendulum performs no work, and has no contacts to make or break. Its losses are merely those of air friction, the friction of pendulum and gravity-arm suspensions and the impact of pendulum and arm. The clock has the advantage, among others, of absolute silence

The arrival of the Hope-Jones Gravity Arm system, with its reliability, accuracy and obvious commercial possibilities, gave the electric clock a new lease of life. Due to the encouragement of the inventor of this "Synchronome" system, large numbers of MODEL ENGINEER readers have made highly successful clocks, from parts supplied, in their own workshops.

But now the mains-driven "clock," i.e. a synchronous motor-geared and calibrated to indicate seconds, minutes and hours, threatens to put an end to further developments in the pendulum-type of clock. Those enthusiasts, with a liking for the fine work of Tompion and Graham, and such clocks as Wells, Rye, Guildford and Big Ben will share with the writer the satisfaction that these had their day before "progress," so-called, put the master-craftsman and the individualist out of business.

For the Bookshelf

Drawing and Development for Practical Welding, by F. W. Sykes (London: Pitmans) price, 4s. 0d. nett.

The process of welding, so important in practical engineering to-day, has been the subject of several treatises published in recent years; but hitherto, the student has had little to help him in the preliminary considerations of the subject, more especially those applying to that part of the work which is undertaken in the drawing office. This new handbook fills a long-felt want, and deals very fully and concisely with the subject, aided by numerous drawings and sketches in the text.

★The Story of the Model Motor Yacht "ANTHEA"

By **R. H. Morrell**

ON looking through the previous articles, I find that I have not yet described the fitting of the batteries and switchgear, so this shall be the next consideration.

Batteries, Wiring and Switchgear

As the motors are arranged to work at 8 V, it was necessary to use two batteries connected in series for each motor. Each pair of batteries is then connected to its motor, one motor having its polarity opposite to the other so that they run in opposite directions. It will be remembered that their arrangement in the hull requires this. The four batteries stand vertically in a wooden tray and the tray is screwed to the floor of the hull at the forward end of the engine-room.

It is important to use wiring of the correct type in fitting a low-powered installation, as otherwise considerable efficiency will be lost. When purchasing wire, tell the electrician that it is to carry current from torch batteries, so that you may be served with the correct type.

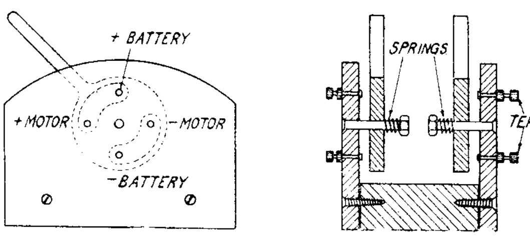


Fig. 24. Diagram of switchgear to fit in funnel.

The question of switches provided something of a problem. A separate switch for each motor was necessary, and yet I wanted to be able to operate both simultaneously when required; furthermore, I did not want to "clutter-up" the decks and so spoil the realistic appearance of the model. The switches had also to be capable of reversing the polarity of the motors when required, so that the model could go "astern" when desired.

After some consideration, I decided that the switchgear must be inside the funnel, as it would then be accessible and yet out of sight from normal angles of vision. I therefore evolved switchgear as illustrated in Fig. 24. This permits the switching on of both motors simultaneously, as the closeness of the switch-levers permits them both being pushed at the same time. When pushed forward they give "ahead" and when pulled back "astern." "Half-speed," ahead or astern can be obtained by operating only one of the switches.

Thin vulcanite sheet is the material used for construction of the switchgear.

Rudder

The rudder-post consists of a piece of brass tube which was a good fit in the rudder tube already fitted to the ship. It extends from just above the deck right down to the rudder pintle and both its ends are plugged, pieces of brass rod being sweated in.

The blade was cut from mahogany $\frac{1}{4}$ in. thick, and the centre line was then scribed around its edge. The thickness of the rudder was reduced at its rear edge to about $\frac{1}{8}$ in. and all the edges carefully rounded off to give the rudder a streamline form. A groove was now cut down the front edge of the rudder to allow the rudder-post to bed down in it. The rudder-post was then drilled and countersunk so that three fine brass screws could be used to secure it to the rudder blade, as shown in Fig. 25.

Painting and Varnishing the Hull

Before proceeding with the other deck-fittings, the painting of the hull was next tackled.

The priming paint already applied was well rubbed down, and for this purpose "wet or dry" abrasive paper, used wet, is the best thing, as it avoids "picking up" the paint.

After well rubbing down, a further coat of white lead paint was applied and this also was rubbed down when thoroughly dry and hard.

The model was to be finished white, with emerald green underbody, and it was now necesasry to mark in the waterline, which was the line of demarcation of the colours. To obtain this line, the model was "chocked up" on the top of the bench with small wooden wedges so that she was on a level, and a pencil was then supported in a gauge, and the gauge pushed slowly and steadily along the bench around the boat, so that the pencil marked in the waterline.

It is difficult to paint exactly up to a line without going over it, and as nothing looks worse than a wavy waterline, it is work taking some trouble to avoid this. If long strips of paper are cut $\frac{1}{4}$ in. wide, these may be stuck around the hull immediately above the waterline and it is then easy to paint right up to the paper, as it does not matter if some paint goes on to the paper, which is later removed.

Two coats of green paint were given the hull, each being well rubbed down with finest glass-paper when hard. Then followed a coat of best yacht varnish, and when this was quite hard the paper strips were well soaked with water and then peeled off, leaving a perfectly clean, even water-line. Similar strips were then stuck below the water-line to protect the green paint whilst the top-sides were being painted.

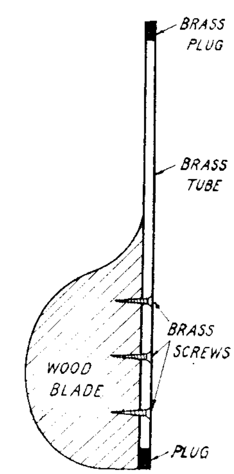


Fig. 25. Construction of rudder.

When painting the top-sides, it is preferable to use enamel rather than white paint and varnish, as the latter produces a yellowish white. I find Robialac synthetic finish very satisfactory, and it has the great advantage of being obtainable in small-size tins. Two coats of this were given, each being well rubbed down with fine wet glass-paper and a final coat was then given.

After the paper-masking strips had been removed, the hull looked very nice and well repaid the trouble taken.

As already mentioned, the deckhouses were all finished separately, and the decks were now given final coats of varnish, and the model began to look "something like a ship!"

Masts

In my opinion, many good models have the fault of excessively heavy masts which detracts greatly from their realism. I strongly advise readers to stick closely to scale, and whilst this may in some cases produce spars which are not very robust, there is no great danger of breakage if the spars are easily removable for transport. The mast

*Concluded from page 237, "M.E.," March 20, 1941.

tubes already described readily solve the problem. One other point—do make proper masts—dowel rod is most unsuitable and can be relied upon to warp badly !

Either yellow pine or spruce is best for masts, and when wood of the correct thickness has been obtained, draw out the mast on it, allowing the proper taper, and then cut just outside the lines. This produces a spar of the correct taper, but square in section. The corners are then planed off, making the spar octagonal, and by rotating it in one hand and holding glass-paper around it with the other a circular mast is quickly produced.

Stanchions and Rails

Rail stanchions are a problem to many modellers and unless they are made to give straight, level rails, the result is very unsightly and mars a model's appearance.

Whilst, with patience, nice stanchions can be turned up from heavy brass wire, the turning of long, slender parts calls for some experience, and the easiest method is to employ fine split-pins. If these are bent on a jig they will all be identical and will produce nice even rails.

Fig. 26 shows a simple jig for two-ball stanchions, made from a piece of wood and two very fine nails (panel pins), with their heads nipped off. A split-pin is put on the jig and pliers are used to squeeze it around the nails so that the balls are properly formed. This will be found a quick and efficient method.

Holes for the stanchions are marked out at the correct spacing around the deck-edge by means of dividers. The holes are now drilled very slightly under-size for the stanchions, so that they are a " drive-in " fit and will remain secure.

The rails consist of fine, stranded brass wire (fine picture wire), and when the stanchions are in place, this is threaded through. Each ball is then touched with the soldering iron, and nice strong deck rails result.

When completed, the rails and stanchions were carefully painted with aluminium paint, which gives them a correct galvanised appearance.

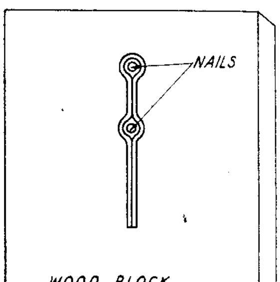


Fig. 26. Simple jig for making rail stanchions.

Boats

Anthea has a motor launch and a lifeboat, and I think it will suffice if I describe the making of the latter. It was made from a small block of yellow pine, which was first squared up. The plan view of the boat was then marked out on the top face of the wood, and the elevation similarly marked on the side. The block was first cut to the elevation shape and afterwards to the plan shape and it was then simple to carve and glass-paper the hull to shape. In making small boats I find it best to ignore the stem and keel when carving the hull, and these are put on separately later.

The thickness of the sides was then shown on top of the hull by a line drawn around inside the boat's edge. The inside was now hollowed out with a spoon-gouge, care being taken to keep to the marked line. At the stern it is best to go right out through the wood and a transom is afterwards cut from thin wood and glued into place. This method greatly simplifies the hollowing-out process, which would otherwise be difficult in so small a model.

The inside was finished with glass-paper, and then a very fine piece of wood (in this case 1/10 in. × 1/16 in.) was fastened around the inside of the hull at the right height to support the seats. Fine brass pins were used to secure this, and their ends were nipped off outside the hull and filed flush with the boat's side.

The seats were cut from mahogany 1/16 in. thick and were stained and varnished before being glued in place with Pear-drop cement.

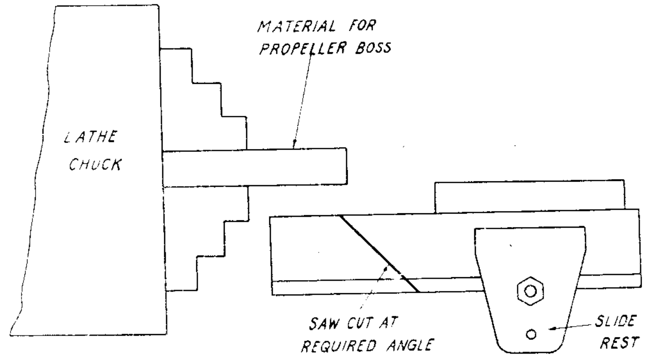


Fig. 27. Set-up for cutting slots in propeller boss.

The stem and keel were cut in one piece from 1/16 in. mahogany and secured in position with brass pins and Pear-drop cement.

This keel and stem piece is rather fragile until glued into position and requires careful handling if breakage is to be avoided. The boat was then painted white, with a brown top-strake. The motor-launch is finished in clear varnish.

The anchors are the stockless type and were sawn and filed to shape from some solid duralumin which I happened to have handy. As they are non-working, the lightness of this material is an advantage.

A three-bladed propeller of $1\frac{3}{4}$-in. dia. is used and several of different pitches will eventually be made so that the most suitable can be determined by experiment. As a commencement I decided to make one of 3-pitch and I will describe its construction.

The shape of the blade was drawn and roughly cut out in sheet brass and it was used as a pattern to produce the other two blades. The three blades were then temporaril soldered together and filed to exact shape before being separated again. This ensured their all being exactly alike

To prepare the boss, a piece of brass rod was mounted in the lathe chuck and turned to the correct maximum diameter. Slots were then cut in this with a hacksaw to receive the blades, and, by using the three jaws of the chuck as a guide, it was easy to get them spaced equidistantly.

The major problem is to get the saw-cuts at the correct angle, and I achieved this by marking out the correct root angle of the blades on a piece of wood and making a saw-cut with my hacksaw along this line. This saw-cut then formed a guide for the hacksaw, and by clamping the piece of wood in the lathe slide-rest, it was easy to correctly cut the slots in the propeller boss. Fig. 27 should make the arrangement clear.

The blades were soldered into the slots and after they had been carefully bent to correct shape the propeller was ready for use.

I think I have now described *Anthea's* construction fairly comprehensively and I can assure readers that her building has been a great source of pleasure and relaxation to me. If any reader has been even vaguely contemplating building a ship model, I most strongly advise him to make a start and thus to open for himself a realm of new interest and constant pleasure.

Unfortunately, it has not yet been possible to give *Anthea* her maiden voyage, but I hope, at some later date, to be able to describe this and to give details of the results of the proposed experiments with different propellers.

★ Improving the Two-Stroke

"VALVES for the VALVELESS!"

A discussion of the pros and cons of equipping two-stroke engines with valve-gearing

By Edgar T. Westbury

Rotary Valves

POETS are wont to bewail the fact that roses have thorns, and engineers can confirm and amplify the practical significance of this statement by attesting that there are nasty snags attached to every attractive proposition. It often happens that a scheme which is well-nigh perfect from the theoretical point of view, defies all attempts at practical solution, or at least introduces so many new problems that its realisation falls very far short of what it should be. To a great extent, this applies to the use of rotary valves in internal combustion engines; although their theoretical advantages have been known ever since the introduction of this form of prime mover, the few examples of rotary-valve engines which have been developed have nearly always proved to be disappointing in some important practical aspect. The realist may be

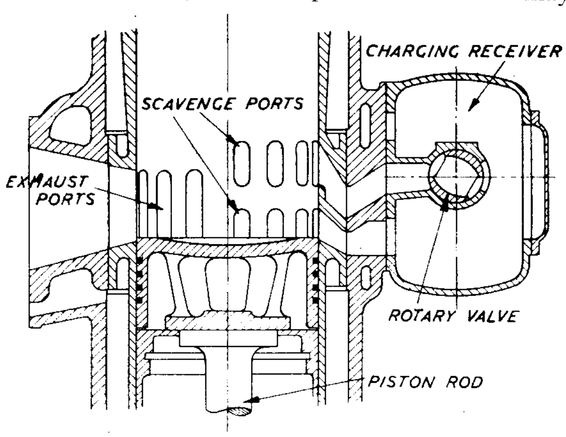


Fig. 62. Rotary scavenge valve of Sulzer oil engine.

inclined to argue from this that rotary valves are fundamentally unsound, and not worthy of serious consideration by practical engineers; but this does not necessarily follow, and there are so many instances of failure being turned into success by patient research and development that it is logical to hope that the complete success of the rotary-valve engine may only be a question of time.

In an article dealing with modern developments in engine design, published about three years ago in THE MODEL ENGINEER, I described some of the latest attempts to re-introduce rotary valves, and although the engines referred to were of the four-stroke type, it is more than likely that their ultimate success, if and when it arrives, will have far-reaching effects on the progress of two-stroke design also. In fact, I have first-hand knowledge that one of the types of valves referred to, namely, that developed by Mr. F. M. Aspin, has been applied experimentally to two-stroke engines with very promising results. I have also been personally associated with experiments in the employment of a particular form of rotary valve which embodies all the theoretical virtues, and eliminates most of the vices, of its type. But, apart from these instances of advanced practice, the fact should not be lost sight of that certain forms of rotary valves have long been used successfully in two-stroke engines, in connection with the charging and scavenging functions, in which conditions are admittedly much less exacting, but advantages no less substantial, at least in theory. On the practical side, it is sufficient to say that there is clear proof in most of these cases that the extra complication has been well worth while.

Let us consider the particular advantages of rotary valves in relation to their limitations and defects, bearing in mind that all factors in the problem are dependent upon arrangement and design, and perhaps even to a greater extent upon construction and material. The outstanding theoretical advantages of the rotary valve are that it can be adapted to control one, two or more separate functions, in any designed sequence of timing, and that it provides positive port opening and closing at any speed. It can, in most cases, be of fairly simple mechanical design, and the speed at which it may be run is theoretically unlimited. On the other side of the picture, it is (at least if run in contact with, or proximity to, the combustion flame) very difficult to cool and lubricate properly, and even more difficult to maintain with running clearance sufficiently fine to prevent pressure leakage. In the event of the slightest distortion of either the valve or its housing, excessive friction or binding will take place, unless this is provided for by extra running clearance, at the expense of gas-tightness, or by some form of compensating device. A rotary valve, if arranged to control two or three different functions, with large port openings, may have to be made with a large surface area, so that its rubbing speed or friction area is excessive.

Apart from the experiments referred to above, which have not yet arrived at the stage of commercial production,

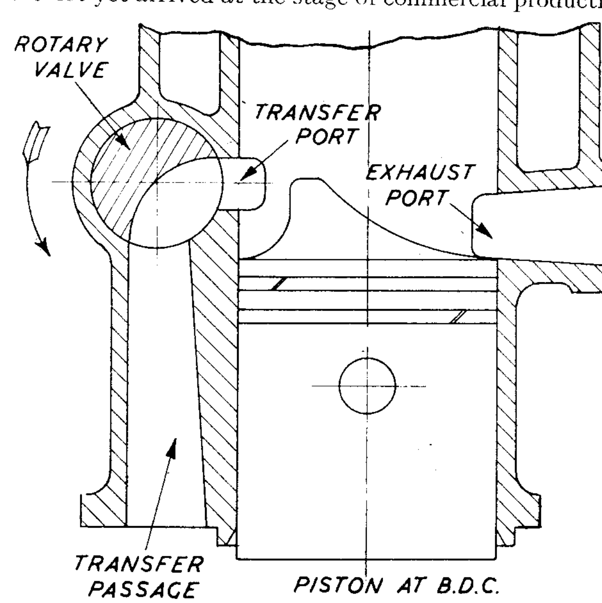


Fig. 63. A simple form of rotary transfer valve applied to crankcase compression engines.

* *Continued from page* 357, "*M.E.*," *May* 1, 1941.

I am unable to call to mind any example of the successful use of a rotary valve in the combustion head of a two-stroke engine, for controlling either the transfer or exhaust functions. Most of the successful applications of rotary valves, as mentioned above, are in positions where they encounter neither the maximum pressures or temperatures, and can therefore be kept adequately cooled and lubricated.

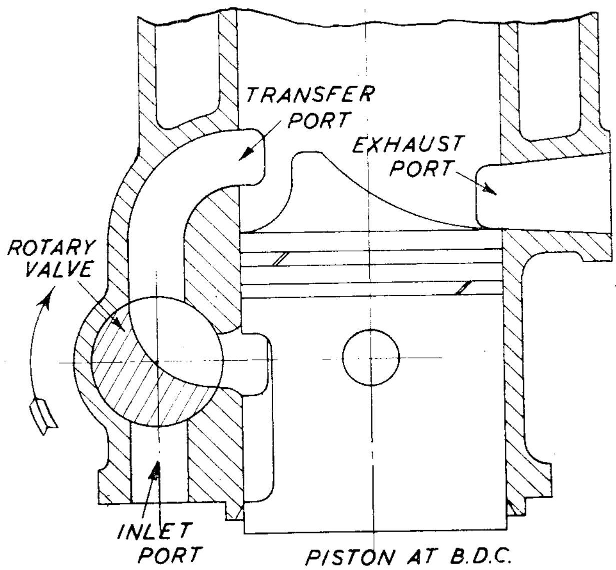


Fig. 64. The use of a single rotary valve to control both admission and transfer.

Rotary Transfer Valves

In large engines, the most successful application of the rotary valve is in controlling the scavenging of the cylinder; as such engines are generally charged by means of a blower, rather than by crankcase compression, the term "transfer valve" is not generally used, though the port controlled corresponds essentially to the transfer port of an ordinary two-stroke engine. The well-known Swiss firm of Sulzer Bros. were pioneers in the use of rotary valves for this purpose, and have employed them very successfully in engines of very large power, mostly for marine propulsion. In one example, illustrated in Fig. 62, the engine is charged by means of a low-pressure reciprocating blower, which delivers air to a large receiver lying along the full length of the bank of cylinders. Admission to the individual cylinders is by means of two sets of ports, the lower of which is controlled by the piston in the usual way; but the upper ports are controlled by means of a cylindrical rotary valve located in the centre of the receiver. This valve, which is driven by gearing at the end of the receiver, is double-ported and thus only requires to run at half engine speed. It opens the upper ports only after the lower ports are open, and thus allows the scavenging period to be prolonged for the more complete charging (or supercharging, if desired) of the cylinder, in the same manner as the poppet valve described and illustrated in Fig. 59 (May 1st issue).

A somewhat similar method has been employed in smaller engines in connection with crankcase compression. In this case (see Fig. 63) only one port, or set of ports, is employed, and the valve, which runs at engine speed, has a crescent-shaped port designed to control an adequately sized passage, with the minimum restriction or wire-drawing. It would be quite possible to make the valve double-ported and run it at half engine speed, but since, in this case, the valve would have to be much larger in order to obtain the same timing, with ports of the same area, its peripheral rubbing speed would be little, if any, lower, and the advantage gained would be small.

It will be realised that a rotary valve in this position need not be perfectly gas-tight, since its main object is to retard or delay the beginning of the transfer period, rather than to completely isolate the passage against any considerable difference of pressure. In any engine having an abnormally high transfer port, the design of the piston deflector is important, and it is generally necessary to make it high enough to prevent any direct blowing across from the transfer to exhaust at B.D.C.

A rotary transfer valve of this type was used experimentally for bench and track tests on a well-known type of British motor-cycle some years ago, but so far as I am aware, no results were published, and I do not think the scheme was ever adopted in the commercial production of the firm's machines. Another example of a somewhat similar valve was employed on a very promising two-stroke aircraft engine which was introduced shortly before the last war; the cylinders were in this case charged by means of a Roots blower, and the valve was found effective in reducing wastage of mixture, and enabling a higher volumetric efficiency of the working cylinder to be attained than was otherwise possible. The career of this engine was. I believe, cut short by the death of its designer.

In a slightly modified arrangement of the rotary valve, it is possible to use it also to control the admission of mixture to the crankcase, as shown in Fig. 64. The transfer passage is in this case arranged to communicate with the crankcase through a port in the piston, and the rotary valve is situated at the lower, instead of the upper, bend. The inlet port is situated below the transfer passage,

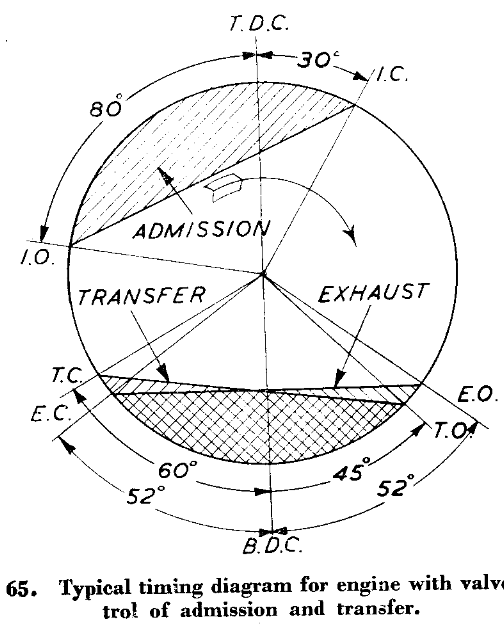


Fig. 65. Typical timing diagram for engine with valve control of admission and transfer.

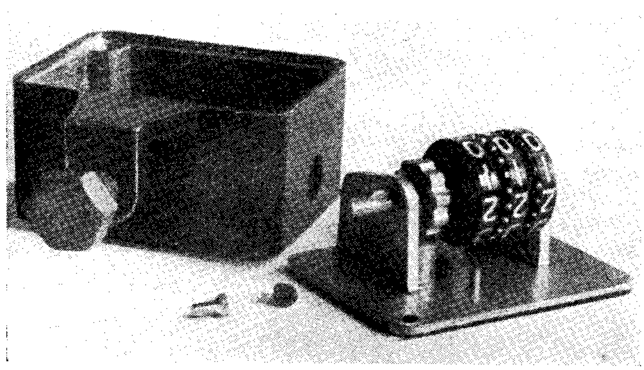
and the valve thus puts the inlet and transfer ports alternately in communication with the crankcase. It is important that the ported piston shall not interfere with the passage of mixture either way, and thus the port in the skirt must be made deeper than usual, and the bridge which is left to stiffen the lower edge of the skirt must be shallower than the port in the cylinder wall. Gas-tightness of the rotary valve is, in this case, of greater importance

(Continued on next page)

BARGAINS for EXPERIMENTERS

MODEL engineers are always on the look-out for odd items of mechanical and electrical equipment which can be adapted to serve purposes other than those for which they were designed, or even pulled to pieces to provide useful constructional material such as springs, gears, screws and contacts. In the past many of our advertisers have recognised and catered for this demand, and we have frequently been able to call the attention of our readers to bargains in these oddments, which have been snapped up as promptly as the proverbial hot cakes.

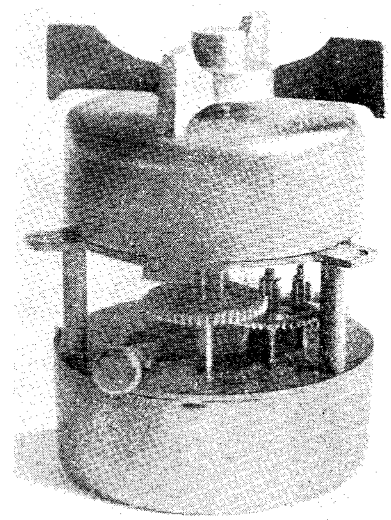
Messrs. Gamages, who can nearly always be relied upon to provide something of interest in this respect, have recently submitted to us two items which appear to be capable of adaptation for use in a wide variety of model engineering capacities. The first of these is a counter mechanism of very robust design, having a die-cast motion frame and detachable casing, with a clamp by means of which it can be attached to a machine or other structure. It has a rotary motion, and reads up to a maximum of 999, repeating continuously and, of course, indefinitely. The drive is by means of a shaft with a raised spline, which may be coupled up as required by means of a piece of tube with a keyway or slot in the end. The counter is directly applicable to such purposes as the measurement of speed in all types of model engines, number of strokes of small presses or other production machines, counting turns on coil winding machines, and so on. It is sufficiently robust to stand up to hard usage and vibration, and the casing, which could, if necessary, be made air- or water-tight, affords adequate protection from dust or oil. This item is sold at 2s. 6d.



The counter mechanism removed from its case.

The second item is a powerful compound geared clockwork motor which, it is stated, was originally made for use in connection with time switches. It embodies a powerful spring enclosed in a brass barrel with a large external winding key (detachable by unscrewing) and a train of gearing by which power is transmitted to an enclosed high-speed fan. The latter is presumably intended to act as a speed governor, rather than to displace air, and it can be started and stopped by means of a lever. When fully wound, the mechanism will run for 12 hours at a fairly constant speed, and, of course, could be kept running practically continuously by periodical attention. Among the uses for such a piece of apparatus which immediately occur to us may be mentioned: the control of display apparatus or signalling gear which follows a constant sequence, including the switching on and off of lamps or small electric motors; providing a "time lag" in the actuation of either mechanical or electrical apparatus; or by suitable modification of the gearing, it may be used as a clockwork motor for propelling boats or other models. The price of this item is 5s.

Messrs. Gamages also have for disposal a limited number of small unspillable 4-volt accumulators, of a size suitable for boat propulsion, ignition and many other model purposes. These are of the glass-wool filled type, and weigh about 13 oz. dry. While the present stock lasts, they are being sold at 2s. 6d. each, which represents excellent value in view of their high quality of construction and wide utility.



Compound-geared clockwork motor, showing winding key and stop button.

"Valves for the Valveless"

(Continued from previous page)

than when it is employed for controlling only the transfer of mixture.

In cases where a valve having a single port, or set of ports, is used to control more than one function, it is clear that the relative timing of the stationary ports must be adjusted by their relative angular location around the walls of the valve housing. A typical timing diagram for a combined admission-and-transfer rotary valve is shown in Fig. 65. The exhaust valve is controlled by the piston in the usual way, and thus it opens and closes symmetrically about B.D.C. (unless the engine is *desaxe*); but the transfer and admission periods can be timed as desired by adjusting the angular relationship of the respective ports. It is not claimed that the timing shown is that best suited for racing performance, but it represents a logical distribution of the various periods, and would therefore be a fairly safe and sound basis for experiments with this form of valve gear.

(To be continued)

Letters

A Stroudley Model

DEAR SIR,—I was extremely interested in the letter from Mr. Wm. E. Briggs, published in your May 1st issue. Years ago, when on a visit to Brighton Locomotive Works, I heard rumours concerning a large model of a " Gladstone " class engine, which was supposed to have been under construction in the works during Mr. Stroudley's term of office. In spite of many enquiries, however, I was unable to obtain any further information, except that what few parts that had been made had " been disposed of."

At the time, I thought that there was some confusion of ideas, and that the rumoured model was none other than Dr. Bradbury Winter's masterpiece, the $\frac{3}{4}$-in. scale *Como* ; yet the available evidence did not seem quite to fit in with this notion.

From Mr. Brigg's description of the spring he illustrates, it seems quite clear that Stroudley's model was being built to the scale of $1\frac{1}{2}$ in. to the foot, i.e., exactly to the original working drawings. What a magnificent job it would have been ! Is it possible that any of the other finished details are available ? And, if so, could not something be done towards having the model completed ? I, for one, would be only too glad of the chance to do something to help, out of my reverance for Stroudley, the master.

This may be quite a forlorn hope, and I suppose we must content ourselves with the thought that, after all, and thanks to the Stephenson Locomotive Society, we still have the *Gladstone* herself preserved. But she is so far away from her proper home !

Yours faithfully,

Berks. " JACK."

Renewing Batteries

DEAR SIR,—We think that our experiences of renewing old batteries, chiefly of the car type (which we use for our model railway layout), might be of interest to your readers.

First, we empty out the old acid, which is bottled to be filtered and corrected later, and put the battery in a moderately warm oven (in the case of glass cells, it is advisable to warm it up with them in it). Within a few minutes, the sealing pitch will be soft enough to part with a knife. Where the batteries have lead connecting bridges between cells, unless all the cells are taken out at the same time, these will have to be cut. If the plates stick when being removed, it is safe generally, to coax them by the gentle action of a screwdriver ! The hard pitch top will now have to be parted, preferably at the positive terminal, as these are generally the useless plates, and the two sets drawn apart, the wood separators being carefully kept intact. The negatives are generally found to be in good condition, but if they have a thick white deposit (unless this can be scraped off), they are useless, and another cell must be opened for better ones. If the positive plates have not already fallen out in small pieces, they will probably have a thick curtain of snowy-white sulphate crystals closely adhering to them. This can be scraped off, and provided the plates are otherwise good, they can be used again. If, as is generally the case, the positive plates have disintegrated, negative ones from another cell can be used. In this case, one of the plates of the set that is going to serve as the positive will have to be taken off with its length of bridge. The plates having been washed and cleaned in distilled or, at a pinch rain-water, they can be reassembled, putting the wood spacers in from the middle plates outwards. If two sets of negatives are being used, it is advisable not to pitch in the top yet, and for the average sized car battery, put on a low charge till full, with the corrected acid. The plates can then be lifted out at will, and be examined, meanwhile, the lead formers of the positive plates will have turned brown, the pucking changing rather slower. It is important at this stage to keep an eye on the gravity of the acid.

Pitching-up is, perhaps, the trickiest operation, and after a lot of wasted time, trouble, pitch, and gas, we find it easiest to put the plates in with the thread of the filler in place, and fill up all the large gaps with plastic pitch made by either heating slowly in an oven, or by heating over a gas-ring, and letting it slowly cool ; and then when all the holes are filled, a gas jet (the gas " match " on many gas ovens does very well) is played on the pitch to smooth it down. If it flows into any small cracks, it will most likely fill them without going through, and even if it does, it will not do any harm, although it should be avoided ; then more pitch can be melted in to level off the top.

Yours truly,

J. WILKES and

Berkhamsted. D. L. TURNER.

Flash Steam Speed-boat Engines

DEAR SIR,—The comments of Mr. E. T. Westbury in the 27th March issue of THE MODEL ENGINEER on the design of my hydroplane *Deanna* are very welcome. I agree that it is important to know what factors influence a designer to pursue a particular policy of design, so I will explain my reasons for choosing the opposed piston type of power unit. In the first place, I must explain that my knowledge of speedboat matters is very small indeed, and my practical experience of same is nil, although years ago I used to " spectate " at, and thoroughly enjoy, the London regattas. From that time, and right up to the outbreak of the present spot of bother (the War, not the boat), my sole hobby has been tuning and racing swiftish motor-cycles. In that sphere, one of the primary aims of the designer is to obtain engine balance that is as near perfection as possible. So much so, that as a racing unit, the single-cylinder engine, with its terrific out of balance forces, is very surely being relegated to the background, whilst the multi-cylinder unit is taking its place. I do not wish to convey the impression that lack of balance is the only reason, however, as the impossibility of successfully supercharging a single-cylinder unit is also one of the main causes. However, a multi-cylinder unit without supercharger, compared with a single of the same capacity, shows a marked superiority in smooth running, greater acceleration, a higher rate of revs., and usually a greater power output, despite the lower volumetric efficiency of the smaller cylinders.

Now, as I have no small engine experience, when I designed the engine for *Deanna*, I " scaled down " as it were my larger engine experience, and endeavoured to obtain perfect balance, without sacrificing single-cylinder volumetric efficiency. An ordinary horizontally-opposed flat-twin would not, to my way of thinking, meet the case, as the necessary offset cylinders would produce a horizontal couple. Another disadvantage is the necessity for two separate sets of valve-gear, with added complication and assumed lower efficiency. One advantage common to both types of engine is the low centre of gravity. Whether, to quote Mr. Westbury, " the advantages of correct dynamic balance in a small engine outweight the loss of efficiency caused by the transmission gears " remains to be seen. There appear to be no figures to prove this, and I, in my ignorance, shall we say, assumed that it was so. The design of the gear train and bearings, and the adjustment of the whole assembly, must, of course, be absolutely "just so." Utilising the lowest gear-wheel for the propeller drive certainly means that the propeller-shaft meets the water at a smaller angle, and thus with less resistance, so that some small proportion of the gear losses may be regained.

Regarding the valve gear, I originally designed a pair of semi-rotating disc valves, but scrapped the idea when I realised how simple it would be to work poppet valves off a cam on each crankshaft.

Having read Mr. Westbury's experience of an engine running roughly with ball-races in the main bearings, I am undecided whether to carry on with ball-bearings or to revert back to my original design, in which plain bronze bearings are used.

As will be seen from the foregoing, I am breaking what is, to me, new ground, but I can see no reason why this engine should not run quite well. To this end, I shall employ bench testing, as I also believe that one can learn a lot more about an engine running on the bench, and what is very important indeed, one can keep other factors, i.e., fuel pressure, draughts, revs. per minute, etc., constant, whilst testing and altering individual components. Furthermore, when every fractional increase in power output is recorded on a dial, a great deal of guesswork is eliminated, and one can ascertain progress.

Burners

I agree with Mr. Westbury that a large radius uni-directional burner tube would be the next best to a straight tube, but I fail to see how one can be installed in a boat the beam of which is only 13 inches. Even a complete circle of 5 in. radius would leave very little room to spare, and then there is the difficulty of getting thin-walled tube bent to this radius. Nevertheless, I should like to try it, and I should also like to try about four straight ten-inch tubes, with four separate jets. I know it is tempting the fates, but I must admit that I was rather intrigued by the silent, almost invisible flame that kept the vapourising tube red-hot all the time. I note Mr. Westbury's reference to the practice of designers of full-size boilers, and as I have endeavoured to apply full-size engine practice to a small engine, perhaps it would be more consistent if I did the same with the boiler. I shall certainly try again at a later date, as the subject interests me greatly.

Finally, I would hasten to assure Mr. Westbury that his criticism is very welcome and is of great interest.

Yours faithfully,

Glasgow. K. R. H. ROSE.

Pump Problems

DEAR SIR,—Further to Mr. Turpin's pump problem, it is possible Mr. Ivison has not noticed that both rams are sealed at the ends, and that the drawing shows the outfit in mid stroke; therefore, when at the extreme, there is very little wasted space, and suction should commence almost immediately on the outward stroke. These problems are of great interest, and if the trouble can be located, I trust Mr. Turpin will tell us all about it. I have had personal experience with a Davey pump with HP and LP cylinders, 54 in. and 104 in. diameter, respectively, working against a head of 360 lb., delivering 150,000 G.P.H., which was designed on practically identical lines, i.e., a common delivery, although the rams were vertical, side by side.

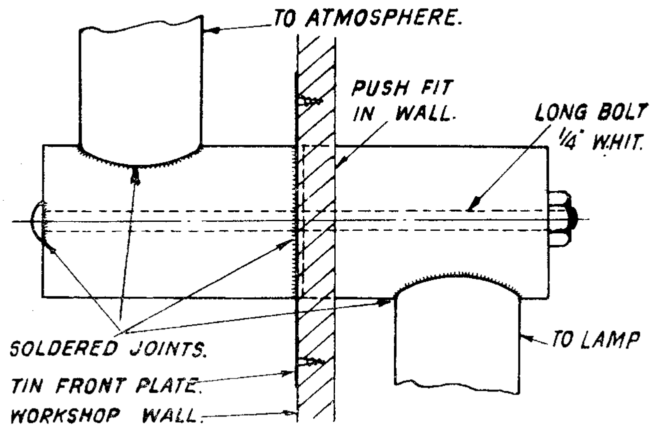
However, I note Mr. Ivison suggests, as I do, an air chamber, and should like to know if this has been tried out.

Yours truly,

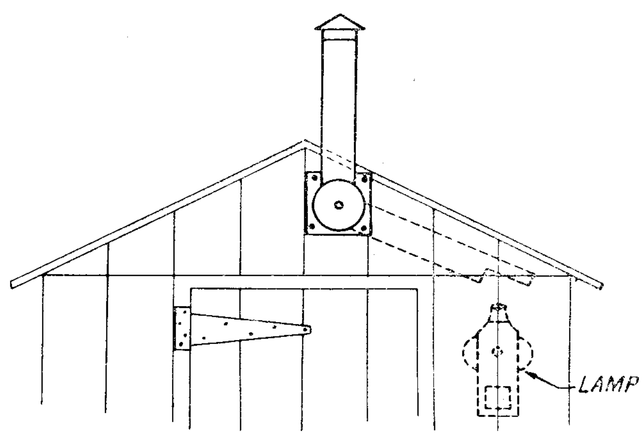
"PUMPING ENGINEER."

Rust Prevention

DEAR SIR,—This device was designed to counteract rusting troubles, caused by condensation from a paraffin lamp of the type shown. The tubing was made from light



Details of the fittings.



End elevation of workshop.

sheet metal, with riveted joints in the hot zone and soldered joints in cooler parts. It has been a decided improvement, as the workshop does not get so unpleasantly hot. Dimensions are of little use, as these will have to be altered to meet individual requirements.

Yours faithfully,

Stafford. D. PUTMAN, Jnr.

Stirrup Pump Spray Jets

DEAR SIR,—Having made a spray jet for hand-pump as described on p. 178 of your last volume, I found a difficulty in inducing it to spray. Having a No. 1 screw-extractor, which has a sharp 6-start left-hand thread of about ½ in. pitch, the point of which just enters a 1/16th in. hole, I drove this from the back into the small hole of the slide, thus lining it with six spiral ridges. This did the trick. Incidentally, I found the packed groove gave trouble, but leaving it unpacked and making a ground fit of the slide proved quite satisfactory.

Yours faithfully,

Godalming. R. W. BUTTEMER.

Letters

That Spring Problem

DEAR SIR,—Recently, in "Smoke Rings" you gave a problem about a wound clock spring being dissolved in acid, the question being—Where does the energy go to?

Many years ago, while at school, the physics master put this question to us, saying that it had actually been set in an examination while he was at Cambridge. His explanation was as follows: The spring is wound up and secured with an acid-resisting wire and immersed in the acid until completely dissolved away. If the temperature of the solution is now taken, it will be found to be much greater than that normally resulting from the action of an acid on metal, thus proving that the energy contained in the spring has been transformed into heat. Presumably the molecules of the metal being under tension impart their agitation to the molecules of the solution, causing a rise in temperature.

Yours faithfully,

Alwoodley. J. S. ELEY.

Clubs

The Harrow Model Engineering Society

Until further notice, meetings will be held every Sunday afternoon, from about 2.30, at Kenton Grange. Members of other Clubs, and other visitors, will be welcomed, and are requested to bring their models with them.

Hon. Sec., A. D. POLE, 13, Churchfield Close, North Harrow, Middlesex.

The Islington Model Engineering Society

Meetings of the above society were resumed on 4th May, and will be held every fortnight at Unity Hall, Upper Street, London, N.1, at 10.30 a.m. Will contributors to the "Bulletin" please note that the Editor's address is now, Miss M. Godfrey, Flat C, 5, Lisson Grove, N.W.1. New members are always welcome and full particulars may be had from Hon. Sec., F. H. BRIGGS, 37, Blandford Street, Baker Street, London, W.1.

Edinburgh Society of Model Engineers

The "Parts in Progress" meeting, scheduled for Saturday, May 31st, will conclude the present session of talks, etc., and during the summer months the Workshop and Club Room at 1A, Ramsay Lane, Castle Hill, will continue to be open on Saturdays at 3 p.m., and on Tuesdays at 8 p.m.

Hon. Sec., H. V. PRESCOTT, 8, Russell Place, Edinburgh 5.

The West Midlands Model Engineering Society (Wolverhampton Branch)

The next meeting of the above Society will be held at the Red Lion Hotel, Snow Hill, Wolverhampton, on Wednesday, May 21st, at 7.30 p.m. prompt.

We are holding an exhibition of models at Messrs. James Beatties' Stores, in Whitsuntide week, commencing Tuesday, June 3rd, the proceeds to be given to the Soldiers' Comforts Fund. Will members and friends wishing to loan their models for this event please communicate with me by May 21st, and oblige.

Hon. Sec., F. J. WEDGE, 13, Holly Grove, Penn Fields, Wolverhampton.

Norwich and District Society of Model Engineers

At the general meeting of the above Society held on Thursday, May 1st, Mr. Benson entertained with a talk on the "Life of the Peasants in the French Alps." This was well supported with photographs projected with the episcope.

The next meeting will be held on Thursday, May 15th, at 7.30 p.m., when Mr. Wyatt will talk on "Rocket Ships."

Hon. Sec., J. POWELL, 29, Spinney Road, Thorpe, Norwich.

Sutton District Model Railway and Engineering Club

This club's financial year which ended 31st March, 1941, and the balance sheet duly prepared, showed a very satisfactory and sound position. Subscriptions came in fully up to expectation and cash is again available for investment until such time as needed for club expenditure. No progress can be reported at the club's freehold site towards the erection of club-house and outdoor track, but this cannot be expected under present conditions, and the conservative financial policy decided upon by the club committee for the time being. Meetings are held in the morning on the first Sunday of each month at 9, Stanley Road, Sutton, and in spite of long working hours, Home Guard duty, etc., the members make a real effort to attend and keep in touch with service members, also. Some very useful friends have joined the club recently. When the time comes and visible signs are shown, both indoor and outdoor, that club operations are once more in full swing, the committee have knowledge that many in the district are prepared to join, and a large increase in membership is expected—may that be soon. Hon. Secretary, P. G. JOHNSTON, 9, Stanley Road, Sutton, Surrey.

The West Midlands Model Engineering Society

The annual general meeting of the above Society was held on Monday evening, the 7th April, 1941, with quite a good number of members turning up.

Our President, The Rt. Hon. The Earl of Dudley, M.C., was re-elected, together with Vice-presidents, Mr. Percival Marshall, Mr. W. E. Willetts, and Mr. H. B. Tucker; our present Chairman, Mr. J. Hughes, was re-elected for a further term of office, as was Mr. S. E. Nunn, in honorary capacity of Secretary and Treasurer. The war emergency committee was re-elected *en bloc*, with addition of two Wolverhampton representatives, Mr. Wedge and Mr. Storr. The Wolverhampton section under the Secretaryship of Mr. Wedge is progressing very well indeed.

The meeting was a very cordial one, and although much could not be reported of the last year, we all realised it was due to present conditions and hope that in the near future better days will arrive. Many of our members are helping in the war effort with their model engineering experience and in various other ways.

The pool and track are in very good condition.

Our meetings in future are to be held on the first Monday in every month, at headquarters, commencing at 7.30 p.m.

Hon. Sec., S. E. NUNN, Sun Street, Quarry Bank, Brierley Hill, Staffs.

NOTICES

The Editor invites correspondence and original contributions on all small power engineering and electrical subjects. Matter intended for publication should be clearly written, and should invariably bear the sender's name and address.

Readers desiring to see the Editor personally can only do so by making an appointment in advance.

All subscriptions and correspondence relating to sales of the paper and books to be addressed to Percival Marshall and Co. Ltd., Cordwallis Works, Cordwallis Road, Maidenhead, Berks. Annual Subscription, £1 10s., post free, to all parts of the world.

All correspondence relating to advertisements to be addressed to THE ADVERTISEMENT MANAGER, "The Model Engineer," Cordwallis Works, Cordwallis Road, Maidenhead, Berks.