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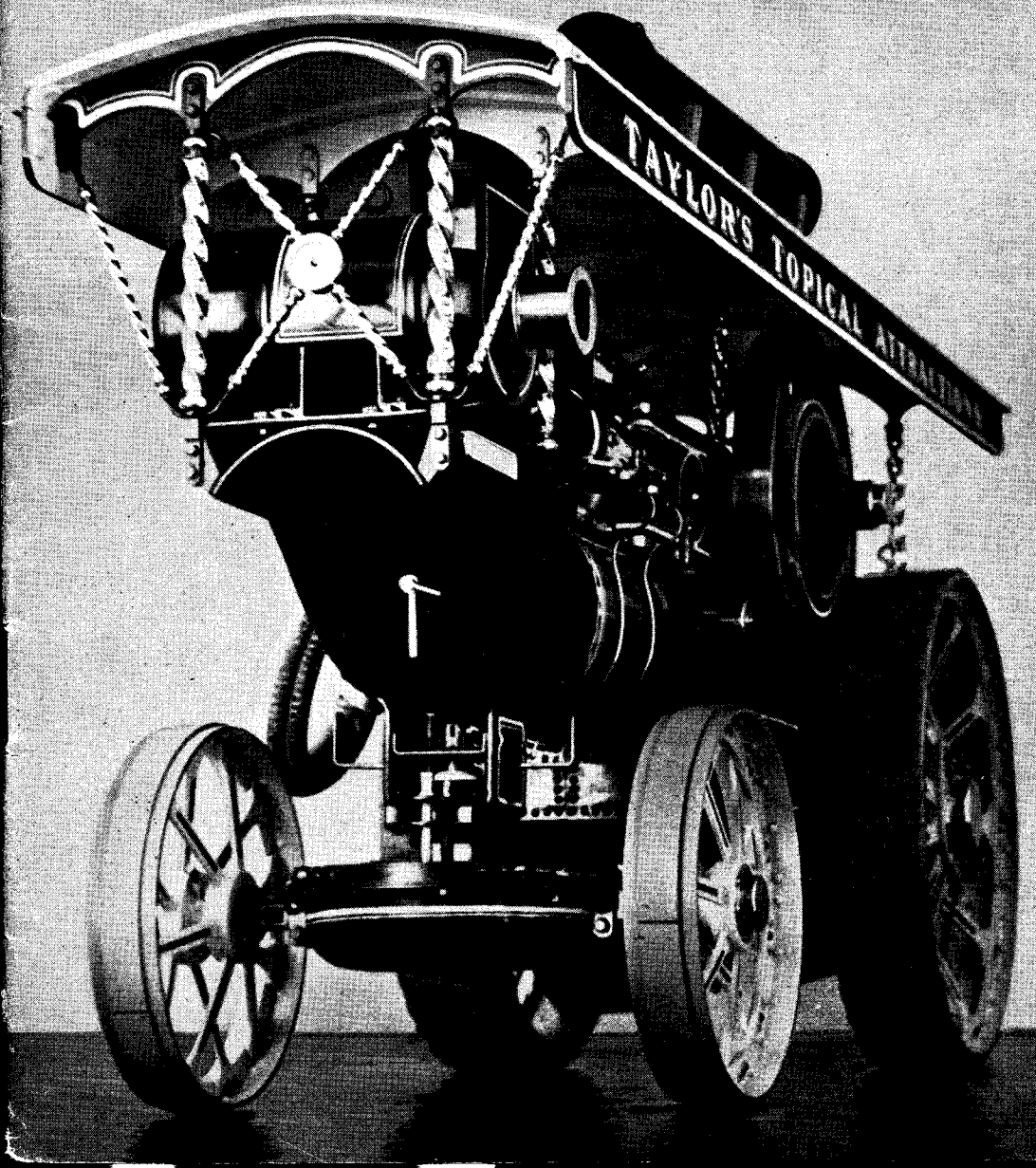
THE MODEL ENGINEER



The MODEL ENGINEER

PERCIVAL MARSHALL & CO. LTD., 23, GREAT QUEEN ST., LONDON, W.C.2

4TH DECEMBER 1952 VOL. 107 NO. 2689

SMOKE RINGS

Our Cover Picture

● THIS WEEK'S photograph presents a striking view of the splendid 1½-in. scale showman's engine built by Mr. G. C. Taylor, of Earley, Berks, and exhibited at the recent "M.E." Exhibition where it was awarded a silver medal. Not for some years has a locomotive or a traction engine scored such high marks as this one, the percentage being no less than 97.4. It was built to Fowler drawings and specification, but some slight modifications were made, hence the model is not a scale replica of any particular engine. The drawing used for all general dimensions is of an A5 compound, a number of which were made for South Africa and had a different-from-normal gear-change that was considered unsuitable for a working model; so the standard design of gear-change, as used in Britain, was adopted, the detail information being obtained from illustrations in a Fowler catalogue dated 1910.

Mr. Taylor, who is a member of the Reading S.M.E.E., had no previous knowledge of road locomotives prior to starting this job, and he says he still has "an awful lot to learn"! This fine engine is the *first* model he has ever made, and several special tools and appliances had to be constructed, including a sensitive drilling machine and lathe accessories.

The style of finish is based on Mrs. Deakin's *Supreme* which had all bright parts chromium-plated. On the model, *all* bright parts, including the crankshaft, connecting-rods, etc., are stainless steel, excepting the twisted pillars, nameplates, manhole edging ring and the gears.

Axle springing, road gear compensation, differential locking and winding-drum all work, and are true to prototype, so far as is known.

The only casting, for which pattern and core-boxes were made, is the cylinder-block; this is steam-jacketed and has inclined valve faces with parallelogram slide valves. All other parts were either cut from the solid or fabricated; a few screws and rivets below 3/32 in. dia. were purchased.

The generator is free-lance and gives an output of 80 watts at 14 volts when running at 4,100 r.p.m.

The model has required ten years of spare-time work and research, and we think the result is more than justified! We have seen it once or twice during that period and noted the slow but steady progress, always admiring the craftsmanship evident at all stages.

Just as it Happens!

● FROM A recent edition of *Merseyside Express*, the bright little house-journal of the Merseyside Model Railway Society, we repeat the following pathetic domestic story:

"The better half recently discovered that the manufacturers of a proprietary brand of porridge oats were including a real photograph of a British railway train in every packet. In a spirit of co-operation it was decreed that *we* should collect the set of 50 photographs... At one packet per week plus 10 per cent. for swaps, that's—er... Any bids for 30 cwt. of nice thick porridge?"

"Old Faithful" Resumes Duty

● REFERRING TO our "Smoke Ring" headed "Old Faithful" in THE MODEL ENGINEER for October 23rd last, Mr. G. Hingley, of Pedmore, Stourbridge, has written to us, not only to identify the engine, but—much more to the point!—to inform us that the old engine is *working* again. The engine turns out to be the grand old Watt engine belonging to the Harts Hill Iron Company, a subsidiary of N. Hingley & Son Ltd., Netherton, Dudley.

Mr. Hingley tells us that the broken beam has been replaced, and he adds: "While I have no direct knowledge of this engine, I have many times admired a similar one at the Netherton works. This is claimed to be older than the Harts Hill one; the engineer says he can tell by the valves! Anyway, this engine was bought second-hand well over 100 years ago; it was there when my grandfather started there, and my father is still an employee. The engine is genuine and is known only as 'The Big Engine'; it drives the main rolling mill. I forget the odd details, but the single cylinder is somewhere about 6 ft. bore by 9 ft. stroke, and turns over nicely on only 50 or 60 lb. It was going to be replaced by a large electric motor last summer, but the Harts Hill beam breaking postponed the exchange—thank heaven!"

So, it looks as though the older of these two old engines may soon have to give way to that electric motor; but "Old Faithful" at Harts Hill may run for some years yet. In fact, we think that if she were given the chance, she would outlast the electric motor!

A Brighton Revival

● TO CELEBRATE the centenary of Brighton station and the old L.B. & S.C.R., the Railway Correspondence and Travel Society organised three interesting Sunday excursions during October. We took part in the first one and enjoyed it immensely. The programme was as follows: A 9-car Pullman express, hauled by an L.B. & S.C.R. express passenger steam locomotive to Brighton in 60 minutes; a tour of Brighton Works and Motive Power Depot, and a trip from Brighton to Kemp Town and back; a return run to London in the Pullman train, hauled by the same engine as on the outward run, and again on a 60-minute schedule, completed the trip. The weather was at its very best for the time of year.

The only ex-L.B.S.C.R. express passenger steam locomotives now available are five of the original six Atlantics of Class H2, built in 1911, and one of these, now No. 32426, *Beachy Head*, was chosen for the main-line runs. She did very well by reaching Brighton in 58¼ min. actual time, including about 3 min. lost through a bad signal check at South Croydon. On the return run, a bad check occurred passed Star Lane signalbox, for track repairs, we were nearly stopped by signals at Selhurst, and another check caused slow running from New Wandsworth through Clapham Junction. In spite of all this, however, the stop at Victoria was made in exactly 60 minutes from Brighton.

On the Kemp Town branch (closed to passenger traffic since 1933) a two-coach autotrain unit was hauled, in each direction, by 0-6-0 tank No. 32626, old No. 72, *Fenchurch*, the oldest of the Stroudley "Terriers" now at work; she is 82 years old, but does not look it and did not show any sign of it!

In the works, several standard 2-6-4 tank engines were under construction and a great deal of repair work was in hand and curiously enough, the majority of the locomotives concerned were of L.B.S.C.R. origin. The machine tool equipment in the shops includes a number of new, modern automatic tools, which seems to indicate that the threatened demise of the factory has been postponed.

The Motive Power Depot contained examples of ancient and modern types of locomotives, the newer types, of course, predominating. Much modernisation has taken place here during recent years, considerable ingenuity having been applied to bringing the old depot right into line with present-day requirements; locomotives of all types can be serviced conveniently and expeditiously.

All the arrangements in connection with the days events were carried through admirably, and everybody concerned must be warmly congratulated. Perhaps the most exciting moment of the day was when 32426 attained 85 m.p.h near Harley, on the outward run.

An Amos Barber Memorial

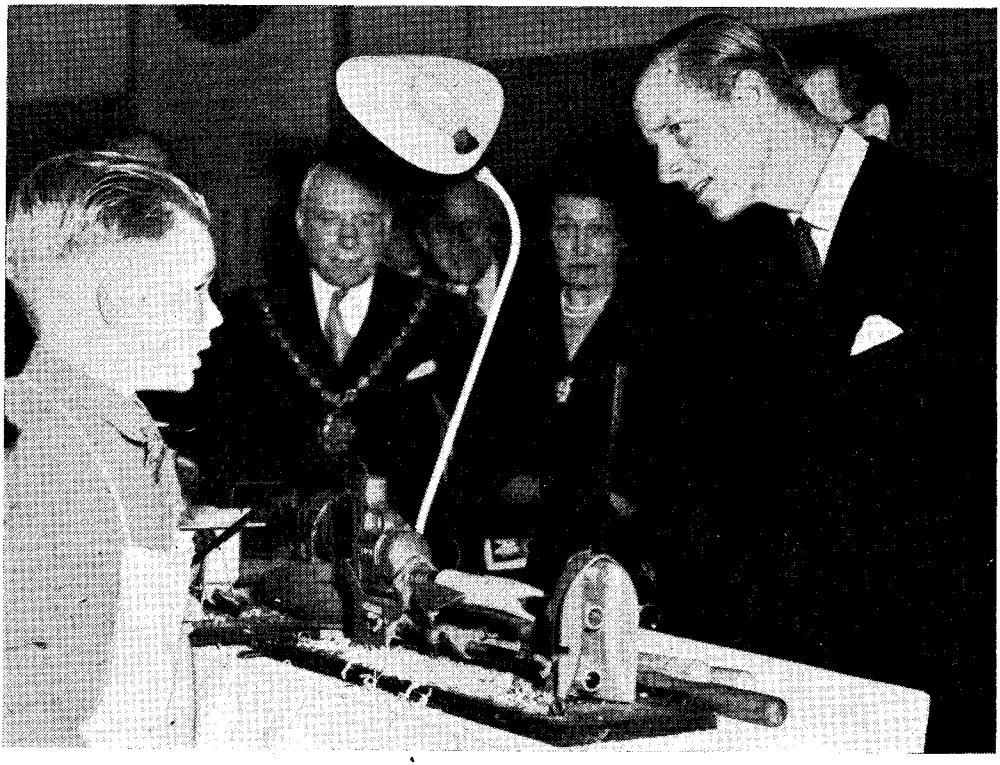
● IN A recent letter from Dr. T. Fletcher, of Colne, he refers to the death of Mr. Amos Barber, one of the best known model engineers in the North Midlands, who founded the Bradford and District Model Engineers' Society in 1908, and became its first president, in which honorable capacity he served for at least 23 years. His death, at the age of 77 years, reported in our issue for November 20th, occurred by a coincidence on the very day his father celebrated his 100th birthday. Mr. Barber was a most prolific and versatile worker, whose models included mill engines of all types, traction engines, ordnance, i.c. engines, ships and machine tools. The latest of his productions was a Corliss-valved mill engine, which was shown at the Northern Federation Models Exhibition early this year. In all cases, his models were of outstanding workmanship and finish, and he won awards at many exhibitions in all parts of the country.

Some years ago we visited Mr. Barber at his home in Bradford and were very much impressed with the simplicity of the equipment with which he produced these excellent models. His wife was his devoted helper, and as keen as himself on model engineering. Dr. Fletcher, whose own contributions to model engineering are noteworthy, and who was associated with Mr. Barber for many years in the Bradford society, has taken up with this, and other societies in the locality, a scheme for instituting an Amos Barber Memorial Trophy to keep alive the memory of "a fine gentleman and a remarkable craftsman," and "to be an inspiration in humility and greatness to all who follow on." We need hardly add that we concur wholeheartedly with these sentiments.

PRACTICAL DEMONSTRATIONS

at the "M.E." Exhibition

THE demonstration stand at this year's Exhibition was more interesting and instructive than ever. The "M.E." Workshop had transferred its M.L.7 lathe to the hall, and this, with a few other machine tools, enabled Mr. Message to demonstrate a number of machining operations, greatly to the enlightenment of the visitors.



H.R.H. the Duke of Edinburgh discusses a wood-turning problem with Derek Martin

Wood turning is becoming a very popular hardy annual at our Exhibitions, and this year's demonstration was no exception. Mr. Pain, and Derek Martin, his 14-year-old assistant, had a very busy time showing how easy it is to create beautiful things in wood, but when the offer was made for visitors themselves to "have a go," the subtle difficulties became more apparent. However, many visitors came forward and tried their hand, and went away highly pleased with the wooden bowls and other things they had been able to produce—in many cases to their great surprise.

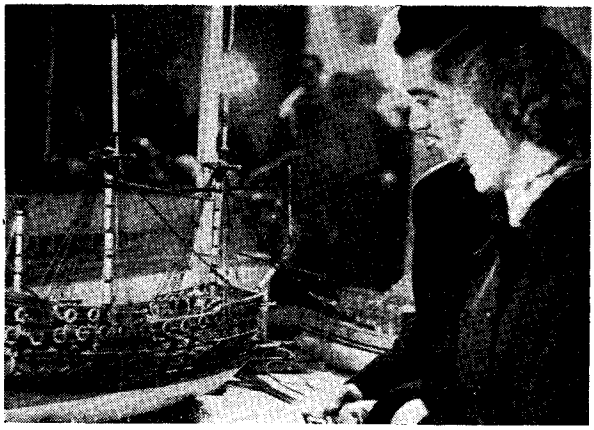
The boiler brazing section was a great attraction to the locomotive enthusiasts, and, in fact, to all who were interested in steam, and to many who were not. Mr. C. Kennion, assisted on occasion by Brigadier Richards, who was in charge of the demonstrations as a whole, had a very busy time showing how brazing is done, and in explaining why things had gone wrong with the attempts of some of the visitors. This was a particularly useful display, as in boiler making, more than in most things, to see the job done is worth far more than pages of print.

The model aeroplane section staged a very interesting demonstration of constructional processes, and made clear to many visitors how such strong and rigid structures could be made from what seemed very flimsy materials.

The smithy interested not only model makers, but everyone who was interested in craftsmanship and the creation of things of beauty from rather unpromising material. To watch leaves, flowers and scrollwork being produced from bar and strip metal is a revelation.

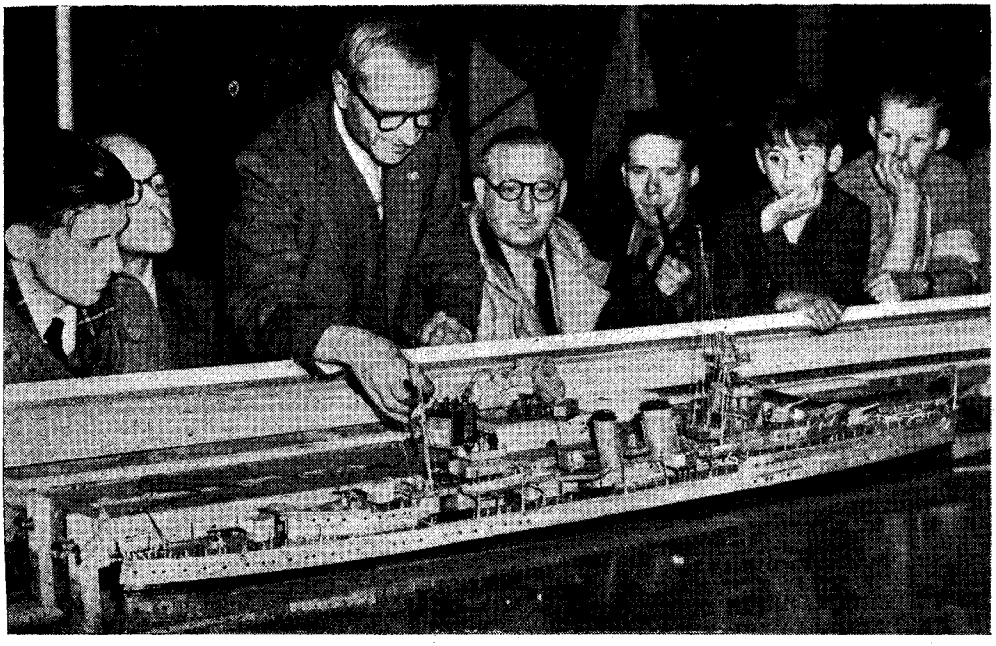
A rather unusual feature this year was the demonstration of violin making by Mr. Clifford Hoing. This is a highly skilled job and one which is somewhat of a mystery to most people, and the demonstration was accordingly greatly enjoyed and appreciated.

In the maritime section, Mr. Collins had a very busy time rigging his model of the *Prince* of 1670. The model is to the scale of 1/6 in. = 1 ft., and at this scale it is possible to include practically every detail of the rigging. Visitors to the Exhibition showed themselves greatly interested, and Mr. Collins was very much occupied in answering all the queries. Mr. F. C. Chapman, whose articles in our companion magazine *Model Ships and Power Boats* on "Naval Architecture for Models" are arousing a considerable amount of interest, had a small tank and in it the model of the midship portion of a ship to demonstrate the principles of buoyancy and stability and all the various considerations that go to make up a successful working model It was intended that Mr. Chapman should show a number of diagrams which he had prepared to illustrate these principles, but owing to limitations of space it was found impossible to display these satisfactorily. However, the tank and model aroused great interest, and many visitors were considerably helped by the lucid explanations Mr. Chapman was able to give. In addition, Mr. Chapman demonstrated his method of hull construction with strakes of tinplate built up on a wooden former. With this method it is possible to build a hull sufficiently light and strong for a working model, and at the same time to keep it strictly to scale dimensions. Mr. Chapman was actually building the hull of an ocean-going salvage tug, the lines of which he gives in the articles already mentioned.



Visitors admiring Mr. Collins's model of the "Prince"

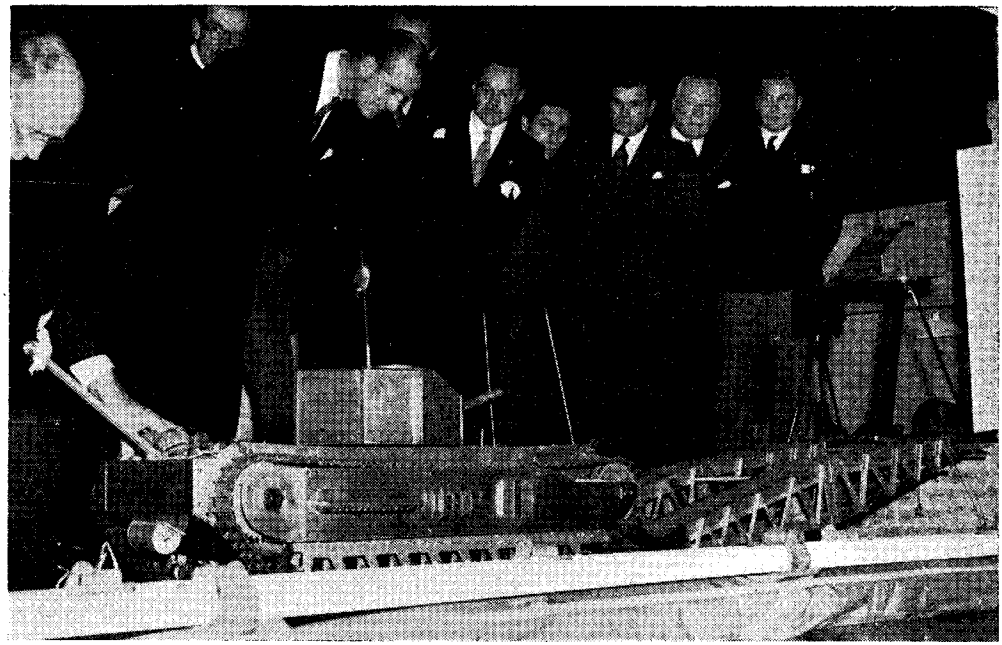
Mr. Wurr was working on the hull of a model Thames sailing barge. The deck was not planked, but all the deck beams and hatch coamings were in place, and the model looked very attractive. Mr. Wurr is an expert on the subject of the spritsail barge, and was able to enlighten a large



Mr. Norman Ough with one of his radio-controlled models

number of visitors on the various points raised. Mr. Brittain, and his assistant, Mr. Beesley, were building a wooden hull of the orthodox type. It was properly ribbed and planked, and as it grew under his hands from the bare keel with stem and sternpost, it was very fascinating to watch its progress at its different stages. It looked a picture when the frames were all erected with a few stringers to hold them in place, and the process of planking was very interesting to watch. To one with a little experience, this is the easiest way to build a hull, and many who saw the process at the Exhibition went away with the determination to "have a go." This is all to the good, as a model built in this way is certain to have smoother and better lines than one carved from the solid, or built bread-and-butter fashion.

Other demonstrations included Mr. Draper showing how ship models should be painted, Mr. Turpin explaining points in foundry practice, and Mr. Hayes building cameras.



The Churchill tank lays its own bridge

The Marine Tank

The demonstrations of radio-controlled models which took place on the tank were an ever-popular centre of attraction, and despite the difficulties of manoeuvring the models in a limited space, were in all cases highly successful. Although radio control has passed the stage in which it was regarded as a scientific miracle, interest in it has certainly not declined ; on the contrary, improved development has very much increased the variety of operations to which it can successfully be applied, and thereby enhanced its popularity.

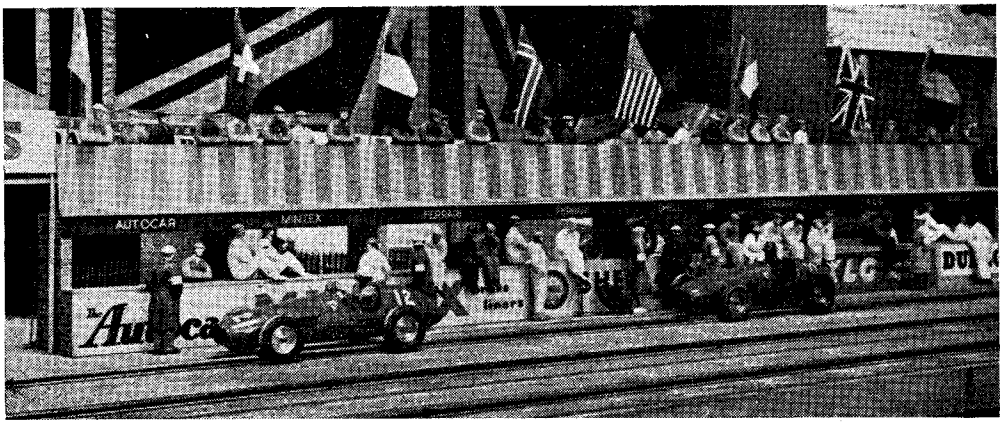
There would, undoubtedly, have been much greater scope for these demonstrations, had it been possible to allot more space for the manipulation of both marine craft and land vehicles, but one of the major problems in planning the "M.E." Exhibition is always how to find space enough to do justice to the many attractions, all of which have an equal claim to representation. The different methods of dealing with this problem, which have been tried out at previous exhibitions, all have their own particular merits and limitations, and improvements can only be made on the basis of experience. Unlike the usual forms of popular entertainment, which can be rehearsed and developed beforehand, the element of the unexpected always crops up at this exhibition, and must be allowed for in so far as this is possible.

One of the points which might perhaps be made more of at these demonstrations is the fact that they are staged by amateurs, and moreover, are the result of amateur enterprise and research. In a few cases, we have encountered comparisons between these models and some of the elaborate models produced by professional research engineers, usually at great expense (to the taxpayer!) Even on this basis, however, the amateur-built radio control apparatus, in which "surplus" components and many other improvised odds and ends figure very largely, works very well indeed.

One of the demonstrators this year was Mr. Sommerhof, whose model motor torpedo boat, built under his supervision by a class of schoolboys, proved capable of performing a wide variety of operations under radio control. These included the firing of torpedoes, dropping of

depth charges, running flags up to the masthead, and flashing signals in Morse code, in addition to the normal manoeuvring of the vessel. The demonstrator not only had everything well under control, but also displayed able showmanship in putting it over, especially on the very few occasions when things did not go *quite* according to plan!

Mr. Norman Ough showed two of his superb models of naval vessels, one of which was under radio control, and this answered perfectly to the signals, even though with boats of this length, lay across the river, trench, or other gap, its weight being supported by a pair of temporary shear-legs and guy wires. On manoeuvring into the required position—in this case against a sea wall—the front end of the bridge was lowered to rest firmly on the top of the wall, which called for careful "inching" movement of the tank itself. At the completion of this operation, the shear-legs were jettisoned, and the rear end of the bridge lowered to the ground and completely detached from the tank. The latter then moved



A scene at the pits on the model racing car track

the space limitations were a great handicap. This was not so serious in the case of the smaller boat demonstrated by Messrs. Ripmax, and others. Great excitement was caused by the balloon-bursting contests staged by these boats, Another craft which very much amused the public, though *not* radio-controlled, was the scale model "racing four," whose robot oarsmen, in their meticulously correct technique, might set a good example to many human crews—but not, we hope, in the employment of a little electric motor under the coaming!

The Model Tank

The radio-controlled model Churchill tank, by Mr. Tamplin, of Chichester, which featured in the opening ceremony at last year's Exhibition, has been very much improved in detail, and its already wide range of operations still further increased. This year it demonstrated the very difficult and complicated evolution of laying its own bridge, in the manner achieved by its prototype during the latter stages of the European offensive in the late war. It will readily be appreciated that quite apart from the matter of radio control, the mechanical apparatus required to do this without external manual aid, must be highly ingenious. Its development, in the case of the model, was all the more remarkable in view of the fact that this gear is still on the secret list, and apart from a few photographs, no details of it have been made public.

Mr. Tamplin's tank went into action with the bridge rigged in position on the front, ready to forward over the bridge, at the same time swinging its turret into action and firing its gun; it needed little imagination to picture the entire operation taking place in batte, and under heavy enemy fire. But there was a surprise ending to the story, for as the tank left the bridge, on the top of the wall, it ran on to a "booby trap" in the form of a land mine which had been thoughtfully laid for its reception. Happily, however, there were "no casualties"—and the next demonstration came on according to schedule!

The Racing Car Track

In view of the fact that this track was a bold experiment on a scale never before attempted, it is hardly surprising that a few teething troubles were encountered in getting it to work properly. Few of the visitors who watched the track demonstrations, however, were dissatisfied with the spectacle presented; indeed, in more than one case the opinion was expressed that even as a purely static display, the track would have justified its existence. With its scenic effects, groups of spectators at strategic points, the mechanics, pit staff, and, last but not least, the team of Formula 2 scale model cars in correct national colours, it presented an atmosphere of realism which was appreciated by all who had experience of full-size racing tracks.

The cars, propelled by 1½ c.c. compression-ignition engines, were fitted with centrifugal clutches, so that they could be held under "starter's orders" with engine running, and

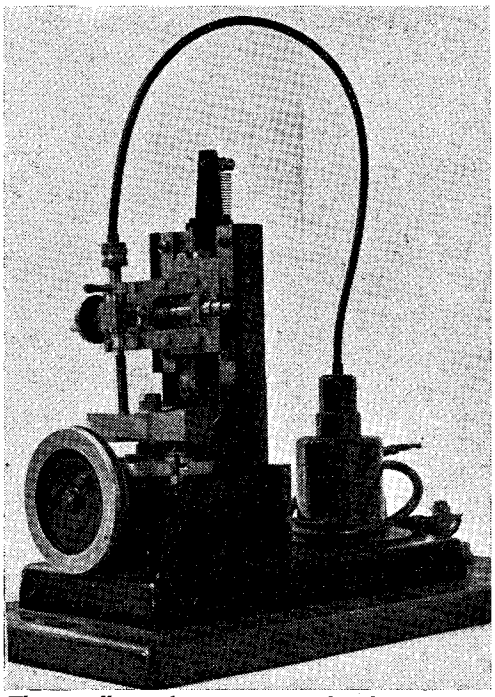
simultaneously released by a mechanical device. After traversing a straight section, the cars climbed a long gradient, with a flat top and a corresponding down grade. At full speed, they swung round a left-hand bend, and then into a right-hand hairpin, returning over the hill, and by way of another right-hand hairpin to the starting line. The timing of laps showed that in many cases, average scale speeds of over 140 m.p.h. were attained, and in some of the races, cars raced " neck and neck " for several exciting laps.

Many realistic " thrills and spills " occurred, and on one occasion a car made a spectacular capsize, crashing through a barrier and knocking down a number of spectators in a manner which made one very glad that they *were* scale models ! While one would not claim that the development of the track is 100 per cent. perfect, and there are many details were improvements are indicated, valuable experience has been gained, and many visitors will undoubtedly look forward to seeing it in action again at next year's Exhibition.

TOOLS AND EQUIPMENT

by Edgar T. Westbury

BEFORE leaving the competition exhibits, mention must be made of the experimental machine for cutting marine propeller patterns, by Mr. Toogood, of Sudbury. This is in a very different category to other exhibits in this section, and it might be questioned whether it should properly be classed among tools and workshop appliances., or as an experimental model. It is, however, a machine tool to all intents and purposes, designed for a specialised but important purpose, presumably capable of carrying it out satisfactorily.



The propeller pitch-generating machine by Mr. C. H. Toogood

The machine embodies a pedestal enclosing the housing and bearing of a vertical work spindle, with a horizontal faceplate, and a vertical column with slides having vertical and cross movements, the whole of this asembly being comparable to the machine tool usually known as a " vertical mill," as extensively used for handling heavy faceplate work. Beyond this, however, the resemblance ceases, as the work table is not power-driven, but operated through worm gearing by a handwheel, which is also geared to a rack on the vertical slide. The respective ratios of the table and vertical-slide gearing are presumably variable, by the use of change wheels or some similar means, to deal with propellers of different pitch dimensions.

A vertical milling spindle on the cross-slide of the machine has a cutter at its lower extremity, for the purposes of shaping the blade of the propeller pattern, which is made in wood. This is driven by a flexible shaft from a motor having a vertical spindle, mounted adjacent to the machine.

While the idea of this machine is basically sound, and might with advantage be applied to the practical solution of difficulties in the accurate shaping of model propellers (its use need not be confined to wood patterns, as it could also be adapted to work directly on the metal propeller) there are several details in its design which are open to criticism. In the first place, the bearing of the work spindle appears to be hardly adequate, as there was evidence of side shake and general lack of rigidity. This objection applies even more seriously to the cutter spindle, the bearing of which appeared much too short, and the overhang of the cutter excessive ; here again, play was apparent. The method of driving this spindle through a flexible shaft, though not entirely impracticable, is not the most efficient, as it would have been quite simple to use a direct belt or geared drive to a spindle arranged in this way. The constructor is, however, to be

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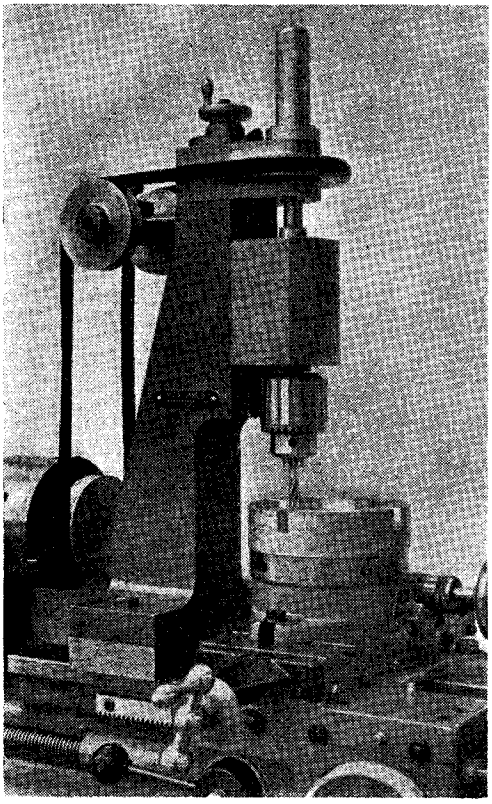
commended for his originality in introducing a form of machine tool which may give model marine plant designers food for thought.

Trade Section

As usual, the most comprehensive display of general tools and equipment was staged by Messrs. Buck and Ryan, Ltd., whose stand was fully stocked with hand and machine tools of every kind for the amateur or professional craftsman. Most of these call for no detailed description, as they are well known to all readers.



A new vertical milling attachment for the lathe, by Messrs. Buck & Ryan Ltd.

Mention may, however, be made of the array of lathes, which included those of all well-known makers, and also some not quite so familiar to readers of THE MODEL ENGINEER, such as the Murad "Cadet" lathe, intended mainly as a light industrial or tool-room lathe, but not without appeal to the amateur craftsman.

A Vertical Milling Fixture

An interesting lathe attachment, shown for the first time on this stand, was the vertical milling fixture designed to mount on the lathe bed, the drive being taken from a pulley on the mandrel nose, *via* jockey pulleys to the vertical spindle. The latter is equipped with vertical feed movement, and thus with work mounted on the cross-slide of the lathe, it is possible to manipulate cutter operations in three dimensions. It was shown in conjunction with a worm-geared rotary table, which provided yet another range of movement. This device resembles, in its general principles, the Abwood milling attachment, which was produced some thirty years ago, but differs from it considerably in detail design.

Other general tool displays were featured by Messrs. S. Tyzack & Son Ltd., including the well-known "Zyto" lathes and accessories; also Precision Model Engineering Co., of Liverpool, who demonstrated the "E.W." convertible lathe, as seen in showcase displays at previous "M.E." Exhibitions. The latter firm, it may be observed, are new to the exhibitions; they show great promise of attaining a popular place in the model supply trade, and made many friends by their willingness to discuss matters of mutual interest, but it may be that in trying to make their display include every aspect of model work, they failed to focus sufficient attention on their really noteworthy exhibits in this highly important section.

A Hive of Industry

The Myford stand was again not only a centre of interest, but also a veritable hive of industry, with both wood and metal working machines humming away continuously to good purpose. In the last two or three years, the accent of the Myford display has been on the development of the woodworking side, and the design of metal working lathes appeared to be somewhat less progressive; but this year there is no doubt that development in this direction has been equally well maintained. The introduction of the "Super 7" lathe, based on the popular M.L.7, but improved in many important features, was one of the surprises of the exhibition. I do not propose to describe it in detail here, as it would take too much space in what is intended to be a general exhibition review, but it is hoped that a complete description will shortly be available for publication.

A Sturdy Lathe

Other features of interest in lathes and machine tools included the Granville "Senior" lathe featured by Burnett Machine Tool Co. Ltd., of Hull, which has recently been the subject of a review in THE MODEL ENGINEER. The demonstrations which took place on this stand gave evidence of the sturdiness and work capacity of this machine. On the stand of Victa Engineering Co. Ltd. of Maidenhead, demonstrations were given of the Hobson 3½ in. and 5 in. lathes, which strike a new note in small lathe design by being the first to introduce all-geared, totally-enclosed and oil-bath lubricated headstocks in these sizes. The Eagle surface-grinder and the Warwick bench milling machine were also featured on this stand.

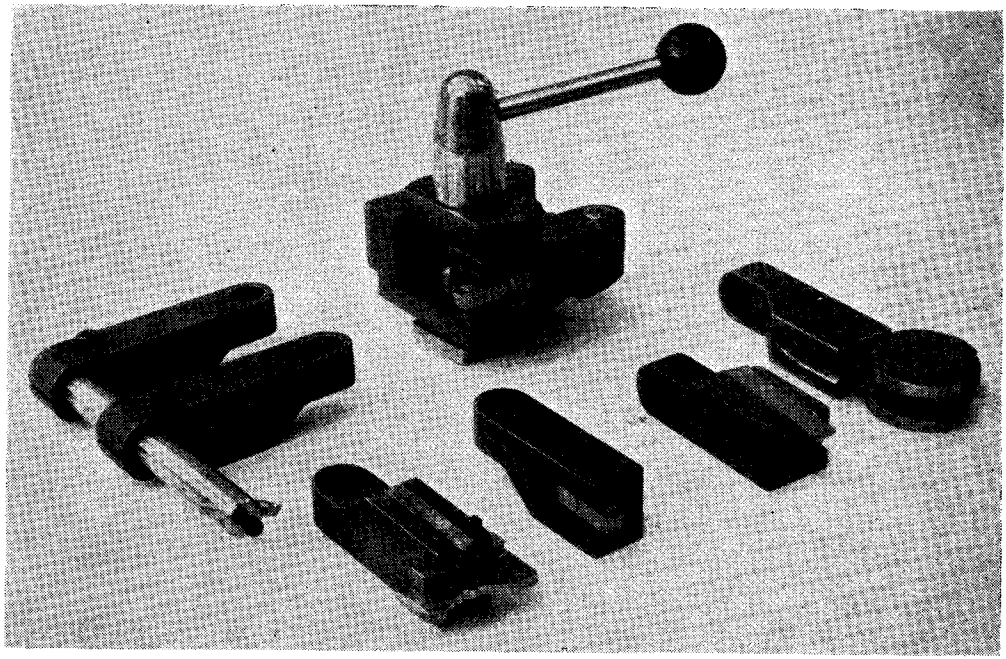
Spiral Saws, Ltd. of Slough, demonstrated the versatility of this new tool, which is applicable equally to hand or machine use. The miniature bandsaw machine designed specially for using this saw, but adaptable also to using the more

orthodox form of blade, is capable of working efficiently in a very wide range of materials, from foam rubber to window glass. Black and Decker, Ltd., of Slough, gave equally convincing demonstrations of the very wide range of work which can be dealt with at production rates by the range of Handy-Utility electric tools and accessories. On the Burnerd stand, the principle attraction, apart from the well-known range of chucks bearing this name, was the new interchangeable toolpost, which enables an unlimited range of tools to be instantly located to precision limits.

Messrs. Donald Ross and Partners, Ltd., of London N.W.1. demonstrated their well-known portable electric soldering and welding appliances, also a range of ingenious clamping and jigging appliances for welding operations.

The products of Mr. E. W. Cowell, of Watford, which were featured on the Sample Display stand, included castings and parts for constructing ⅜-in. drilling machines for belt or motorised drive, a 6 in. hand shaping machine, and a 2½-in. collet-type lathe. The castings appear to be of excellent quality, and can be obtained either in the rough, or with main machining operations completed. Another sample display was that of the range of castings by Mr. W. H. Haselgrove, of Petts Wood, which included those of the "M.E." drilling machine, universal swivelling vice, and jig saw attachment, also the "Duplex" back toolpost and the "Turpin" Universal dividing head.

Although not a tool in the commonly accepted sense, the "Quickdraw" drawing device is a very useful appliance which deserves a brief notice. It comprises a folding drawing board, fitted with a pantograph controlling a template of transparent material, which gives squares, principal angles, and measurements, enabling quick and accurate drawings to be made in any location.



The new Burnerd patent toolpost, as made to fit the Myford M.L.7 lathe, with holders for various types of tools

Materials

Materials for model engineering appear to be somewhat easier to obtain, to judge by the displays seen on the stands of supply firms; at any rate, it is good to see that the pessimistic forecasts of those who threatened an almost complete shut-down of model supplies through restrictions of raw materials, have not been realised. Messrs. H. Rollet & Co. Ltd. showed a wide variety of non-ferrous stock bar, sheet and tubing, and a useful selection of similar material was featured by the S.C. Metal Sale and Servicing Co. Other materials, both ferrous and non-ferrous, were available on the stands of Kennion Bros. (Hertford) Ltd., and Dick Simmonds & Co. of Erith, who also featured castings in galore for all types of locomotives, traction engines, etc. What with these, and the castings exhibited on the Sample Display stand by W. K. Waugh, of Glasgow, there is every evidence that model workshops are unlikely to close down or work "short time" for quite a long time to come yet.

A REVIEW OF THE EXHIBITION

by W. R. Dunn

THE 27th "M.E." Exhibition ended by fully maintaining the dignity conferred upon it by the presence of H.R.H. the Duke of Edinburgh, whose graceful and complimentary speech was the prologue to his opening the exhibition officially. Everyone was delighted, especially the enthusiasts, to know that we had interested H.R. Highness, which was so obvious by the time he spent inspecting the craftsmanship before him, for he stayed much over his scheduled time. Indeed, visitors were so intrigued by such a huge assembly of excellent work in the competition section, that they must have informed all their friends, with the result that the attendance this year has surpassed all previous occasions. Moreover, the hallkeeper informed me that on Saturday, October 25th, the attendance at the show exceeded that of any other exhibition *of any kind that has ever been held* at the New Horticultural Hall. So much for the popularity of model engineering, which is accredited as the *most* fascinating of hobbies.

The competition models this year, as far as workmanship is concerned, certainly displayed an improvement over last year, for I noticed but few models which bore the mark of poor finish; but I wish I could say as much in praise of fidelity to scale. It is most disappointing to contemplate the many examples of excellent workmanship, which have been totally "let down" by an awful lack of conception of how the thing ought to be. To illustrate my remarks here, before touching on other examples later, I would refer the reader to Photograph No. 1, which is a glaring example of a model in which the workmanship was of the highest order, yet fantastic for fidelity, seeing that the maker described it as "a scale model of a saloon motor car," and to which, no judge could ever accord any distinction, as such.

The competition stands, themselves, were unfortunately insufficient in area to accommodate all the models to the best advantage for the seeing public, so that cramping was unavoidable. One day, we may, perhaps, look forward to having the two halls running at the same time with a combined ticket of admission or single for either hall if desired. I would like to see the New Hall containing all the engineering models, steam and sailing ships, with demonstrations of radio-control, steam track and workshop methods, with appropriate trade stands, whilst in the Old Hall the enthusiasts could enjoy their model motor-car racing and aircraft of every sort, and include all their appropriate trade stands.

This appears to me the only way to get over the present congestion, and give more room to competition stands which, after all, are the *raison d'etre* of the show. Another reason is that model engineers *are not* interested in model aircraft, and most likely, vice versa.

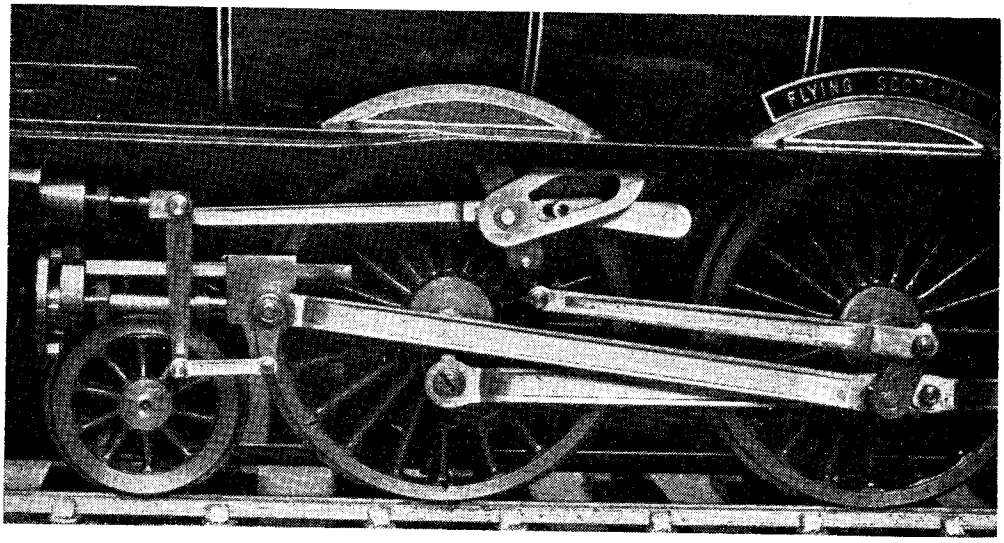
What is now becoming one of the most popular interest, is the demonstration area where all kinds of model construction is shown at work. It was rather patent to note that the boiler brazing demonstration appeared to excite the most interest, whilst model shipbuilding construction came a good second. A formidable rush of spectators to the area was apparent whenever a demonstration was announced.

Imagine this "full scale" with its front wheel clearance!

The Radio Control Association has made remarkable advances since last year. The raised platform and the water tank were besieged by interested visitors at the stated times of demonstrations. Mr. Tamplin's radio-controlled "Churchill" tank was exemplary of what can be done by radio-control. On the water tank, even sailing yachts were shown controlled by radio in trimming of the sails to suit the wind, together with the rudder; so now model yachts can do tacking, like the full-size yachts, for racing. Some of the other types of model craft had as many as 22 controls of various sorts; some war vessels were shown firing guns, dropping depth charges, mine sweeping, using searchlights, morse signalling, running pennants up and down, lowering and raising anchors, operating fog-horns, etc. as well as the main control of driving and steering the boats. There appears to be unlimited scope in this interest.

Then there was the elaborate show put on by Mr. Rex Hays, representing a model Grand Prix Racing Track, reminiscent of Silverstone, with some 300 scale figures of mechanics, pit personnel, flag marshals, and spectators. This proved a very pleasing diversion for those interested in model car racing, for on every occasion that a car was heard starting up, visitors flocked to the track with such eagerness that once or twice the barriers were broken, necessitating stopping the demonstration. Breakdowns with the cars caused some disappointment; they were chiefly due to the extreme sharpness of the curves. A scale 300 miles an hour is a bit of a wrench on the small cars taking a sharp curve, to say nothing for the poor driver, who was often thrown out!

One of the main attractions was the performance put up by the track committee of the S.M.E.E. which maintained its popularity as usual. This always has a wide following of enthusiasts. Coal-fired steam locomotives of every type were adding their quota of interest to the many new visitors who had not previously seen what a wonderful show a small locomotive will put up, especially in hauling power. Additionally, this year the coaling and steam raising of the engines could be watched by visitors at the well-arranged stand where all operations could be followed with ease, to acquire instruction in firing.



"Realism" spoilt by screwheads and too thin tyres on drivers

What I consider contributed in no small degree to the success of the exhibition was the fact that it was held in late October instead of August. As I have formerly advocated, autumn is the start of the model engineering season, whereas August is usually when most model engineers are away on their annual seaside or other holiday, *for which enthusiasts, the exhibition was at the outset, mainly staged.*

In this connection, I would like to say that the most unfortunate thing that happened to our show was the babel that ensued when hoards of school children in parties were let loose by their charges, when often one of the latter was heard to say to the children on arrival, "go around where you like and meet me in the foyer at such a time p.m." What happened then was a mad scramble around the trade stands to commandeer all the catalogues and pamphlets that could be picked up, quite indifferent to any interest that was conveyed; and, of course, the stewards had much difficulty in restraining the boys from touching the exhibits for sake of touching; few of them even understood or took the slightest interest in the competition models, which is only to be expected in view of the fact that some of the boys were still carrying their school books, such as *Tales for the Chicks*. I heard many disparaging remarks from visitors on the matter, who all agreed that the Schoolboys' Exhibition more appropriately catered for these intruders, while some were

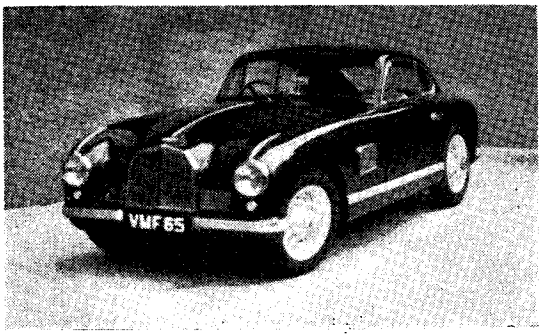
indignant that the status and tranquility of our show should be thus assailed. The "Model Engineer" Exhibition is a technicians' and a craftsmen's exhibition, and no one wishes it to degenerate into a commercial or showman's fairground.

Reviewing some of the models, I would first say that the cup-winning models, *outside the ship models*, were not up to the same standard that we have had in the past, I am thinking of Mr. G. Smith's eighteen-cylinder radial petrol engine of the 1930 Exhibition, and also Mr. S. J. Ward's beautiful quadruple expansion marine engine of 1938; we have not had anything to compete with these elaborate models in recent years, so it is up to competitors to refer to back numbers of THE MODEL ENGINEER for the earlier championship awards, if they wish to raise a higher standard of engineering craftsmanship. In saying this, I am not deriding the cup-winners, nor the general high standard of work, but only pointing out that it was obvious to anyone that there was no particular job in the show that stood out as a certain cup-winner. The 10¼-in. gauge "Royal Scot" locomotive was certainly an ambitious job of work, but what failed it most was the missing third cylinder which, of course, in a model of these dimensions for a "Royal Scot" class locomotive, was rather unforgivable, together with many other shortcomings.

It occurs to me that if one wants a standard of efficiency to work to in model making, those who inspected Eng.-Com. W. T. Barker's triple expansion marine engine, seen on the S.M.E.E. stand, have in this an ideal in every respect, for it was the most beautiful piece of work in the show, but, of course, not exhibited for competition. In fact, the show put up by the S.M.E.E. on their stand with many models running on compressed air, was certainly one of the highlights of the whole exhibition and great credit is due to them for putting up such a feast of mechanical interest for the benefit of visitors.

Diverting to some of the competition models again, we still appear to find imperfections in many, in spite of the fact that so much has been said in the past about cheese-head and countersunk screws being used in prominent places. Surely, if one is sufficiently capable of making the locomotive shown in Photograph No. 2, it should be just as easy to follow prototype construction, instead of using ugly screwdriver methods as seen in the leading wheel crankpin. And why not a L.N.E.R. crosshead and double slide-bars as in the original, instead of the one shown? This is quite inexcusable in a 2½-in. gauge locomotive, declared by the maker to be a "scale" model. Locomotive wheels in many cases are still offenders in regard to correct conformity. Unless wheels are machined with the precise tyre recess, and 20 deg. tread angle with the outer edge bevel, and the spokes and wheel bosses carefully filed to shape, the whole character of a locomotive wheel is lost. "Railwayism" in a model locomotive cannot be captured unless these points are studied; and, of course, "scale" particularly in details, is the *sine qua non* for a model that aspires to anything like distinction. Traction engines had similar faults; in some instances, operating levers were out of all proportion to the scale of the job, and far too large, and even the pitch of the gearing made too coarse. Let us hope that the best of the prize-winning models will be an inspiration to those who have failed to acquire that *scale* accomplishment sufficient to bring them an award this year.

An Ambitious Scale Model Sports Car



AT the recently-concluded Earls Court Motor Exhibition, a very beautiful scale model of a DB2 Aston-Martin sports saloon was shown in a glass case on that manufacturer's stand. It was loaned by the well-known racing driver, R. R. C. Walker, who has a DB2 of his own and for whom this model was made by Henri Baigent, the well-known Bournemouth model engineer.

The model is to ⅛th-scale and is so beautifully detailed and finished that outwardly it seems to be a non-working exhibition model. The body is panelled in hand-beaten aluminium, all woodwork is satin walnut and the upholstery is pigskin. The dashboard carries tiny instruments, even the ignition key is there and the front wheels are suspended independently, the back wheels on swing axles.

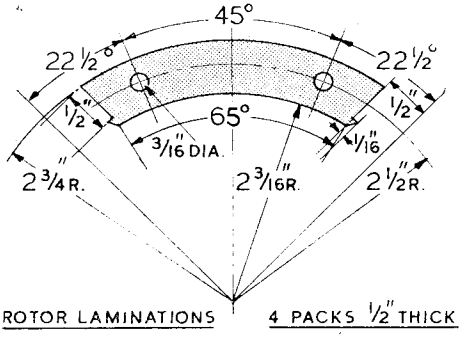
In fact, this is a working model, to which radio control of throttle and steering will eventually be applied. It is driven by a front-mounted three-cylinder in-line two-stroke petrol engine, which has coil-ignition and is cooled by water carried in the tubular chassis and pumped through a forward radiator. Wire wheels with centre-lock hubs and spokes of 70-ton h.t. wire carry tyres moulded by Baigent specially for this model. The drive goes *via* a centrifugal clutch to a back axle geared 32 to 1 to provide a scale cruising speed of 80 m.p.h. The model is based on the famous competition DB2 Aston-Martin, VMF 65. The engine is started by a handle inserted at the rear, and a plunger at each end of the model enables it to make back-and-fore runs between two walls—W. BODDY.

A Magneto for the "Busy Bee"

An entirely new design for a flywheel magneto-generator, suitable for all types of small power engines

by Edgar T. Westbury

WE come now to a stage in the construction where the work is perhaps a good deal less interesting than the straightforward machining and fitting of the main structural parts. I refer to the cutting out of the rotor and stator laminations, which some constructors find rather tedious, and may, therefore, be inclined to devote



ROTOR LAMINATIONS 4 PACKS ½" THICK

less care to than other operations ; but rough or inaccurate work should not be permitted to pass, as errors in the shape or location of pole surfaces may seriously affect the efficiency of the magneto.

I have already observed that ordinary commercial sheet-iron or mild-steel is quite suitable for these laminations, and if one is lucky enough to have access to the scrap heap of a sheet metal works, there will be no difficulty in picking up enough offcuts of a suitable gauge of material. Slight rust or mill scale on the surface is no objection. Theoretically, the thinner the laminations the better, but there are mechanical objections to working very thin material, and I have found that anything between about 24- and 20-gauge (say, 0.020 in. to 0.030 in.) gives good results. The material should be as flat as possible, and well annealed either before or after cutting to shape.

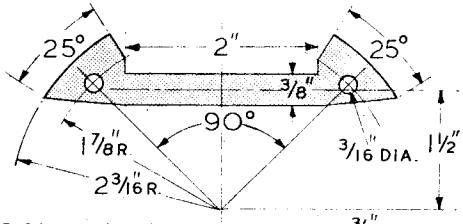
The entire set of laminations, therefore, can be made from a pack of 5½ in. diameter discs, 25 in number for 24-gauge and 17 for 20-gauge, by cutting out an annular ring for the four sets of rotor poles and using the inner disc for the stators, which, incidentally, are of less thickness, and do not require so many pieces in the pack.

Rotor Laminations

The most efficient way of cutting these out is by trepanning, and tools for this purpose are available, but I have not found the commercial "tank cutter" type of tool very convenient, except possibly for cutting out the sheets one at a time. I prefer to mount the complete pack on the lathe faceplate, and use a parting tool, suitably ground to give adequate side clearance. Assuming that square pieces about 6 in. diameter are used, they can be securely attached to the faceplate by bolts at the four corners, well clear of the outer circle ; a piece of wood or thick card is advisable as a backing, to avoid risk of digging into the faceplate as the tool comes through. The lathe should be run slowly on back gear, and plenty of lubricant, preferably soluble oil or suds, applied to the tool.

Before starting to take a cut—the inner circle, of course, should be cut out first—the circles should be marked out to check dimensions, and the centre-line of the bolting holes also marked. By using indexing gear, such as with a 40-tooth change wheel, counting every fifth tooth, the exact positions of the bolting holes can be marked, and they may even be drilled at the same setting if a drilling spindle is available. This will greatly facilitate accuracy and uniformity in the sets of pole-pieces.

The inner circle may now be trepanned out, cutting slightly inside the lines to allow a little for finishing the pole surfaces after assembly. As each sheet is penetrated, it will fall out, giving more working clearance for the tool on the inside, so that the tendency to jamming, which is often the bugbear of trepanning operations, is very much reduced. The outer circle is then dealt with in the same way, but in this case working exactly to the stated dimensions, so that the ring is a neat push fit in the flywheel rim, as can easily be checked when the first sheet is cut out. Remove



H.T. STATOR LAMINATIONS 1 PACK 3/8" THICK

the burrs carefully from all the pieces, and using the flywheel as an aligning jig, stack them in place and mark out for cutting the gaps between the poles ; if the magnets are available, they can be used as templates to ensure exact gap dimensions.

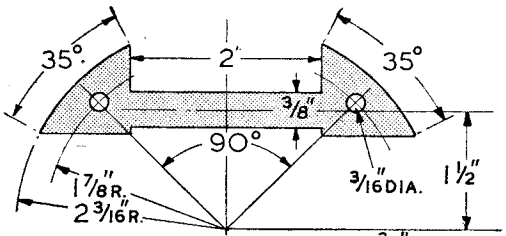
If the marking-out and drilling of the holes is done as advised above, it should be possible to make all the laminations interchangeable, but as a matter of discretion, it is perhaps better to make identification marks on them before separating the poles, in case individual pieces should get

Continued from page 674, "*M.E.*" *November* 20, 1952.

mixed up. The best way to do this is to clamp the set of rings together by temporary screws through three or four of the holes, and with a small saw or a three-cornered file, make distinct cuts on the outside of the ring, marking the poles *obliquely* thus : *I — II — III — IIII.* This will not only identify the four pole packs but also the locations of individual pieces in each pack ; if any piece is out of its proper place, it will make a break in the continuity of the numbering marks.

In cutting out the gaps, it is essential that they should be kept on the tight side, so that no spaces are left when the magnets are fitted. The small projection on the inner edge of the gap is for the purpose of keeping the magnet hard up against the inside of the flywheel rim. This, of course, is ensured by centrifugal force when the engine is running, but in the absence of a retaining device, there is a risk of a magnet becoming loose and falling inwards when it is stationary.

Should magnets of different shape and size to those specified be obtained, they will be quite satisfactory if they are of the correct material,



L.T. STATOR LAMINATIONS 1 PACK 3/8" THICK

similar cross-sectional area, and properly arranged. The angular length of the pole-pieces—namely, 65 deg.—should be maintained by modifying the length of the projections on the pole tips if necessary to compensate for any variation in the length of the magneto. In order to obtain maximum efficiency, it is recommended that the magnets should be assembled in the inert state and magnetised *in situ* after all machining and fitting is completed. A fixture to enable this operation to be carried out in a standard two-pole magnetiser, as used by magneto repair specialists, will be described later.

When the set of magnets and pole-pieces has been assembled, and the cheek plate is put on to hold them in, it will probably be found that there is some discrepancy in thickness between the packs of laminations and the magnets. Test this by screwing the cheek plate down *lightly* and noting any tendency for it to distort, which would indicate that the magnets are " proud " of the laminations. Alternatively, it may be possible to clamp down hard on the latter, while a gap is left over the magnets ; this can be checked by feeler gauges. In either case, the difference can be made up by paper of the required thickness ; a little shellac or oil varnish may be used to hold the paper in position during assembly.

When the screws securing the assembly are fully tightened—the countersinking of the holes in the cheek plate should be deep enough to sink them in flush with the surface—a centre-punch may be used to throw up a burr into the end of the screw slots, and key them against any tendency to loosen. Finally, the flywheel should be mounted on its mandrel between centres, and the pole faces carefully skimmed—again using slow speed and plenty of lubricant—to ensure that they are exactly concentric.

Stator Laminations

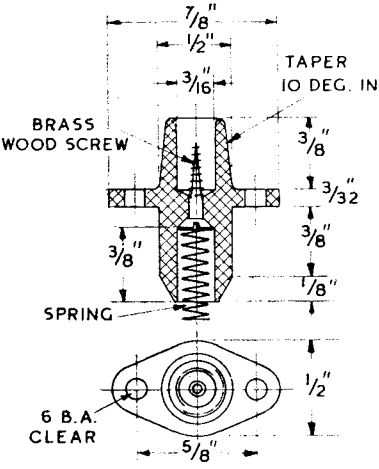
In view of the fact that these are located on the backplate by the screws in the bosses, it is clear that the positions of the fixing holes are of vital importance, and other essential dimensions are related from these points. It is advisable, therefore, that marking-out operations should commence by setting out these holes from a centre-point outside the piece, striking arcs at $1\frac{7}{8}$ in. radius and intersecting them with radial lines at 90 deg. If the two packs are made from the inner circles produced in the previous operation, it will not be possible to work from the centre, as a certain amount of metal has inevitably been lost in the cut, and the discs would not clean up on the pole faces if this was done ; it is thus necessary to work from a point beyond the disc centre in each case. It will however, facilitate matters if centre-lines at right-angles are first scribed across the face of the disc, as these can be used as a guide in ensuring symmetry and correct geometry in the marking-out.

Queries are often received from readers who encounter difficulties in setting out exact angles, and who seem to imagine that expensive instruments are necessary for this work. I would, however, assure them that although this may apply in some cases, a job of this nature can be done quite well with the aid of a cheap protractor of tin or celluloid, which can still be obtained for a few pence at any stationers, or at one of the philanthropic institutions which our American friends describe as " Five-and-tens." These instruments may not be marvels of precision, but they are accurate enough for most marking-out jobs in the home workshop, and I use them quite a lot myself. As a matter of fact, anyone who has really mastered the elements of plane geometry could do this job without a protractor at all, but it would take a good deal longer.

Having marked out the positions of the locating holes, and the radius of the pole faces ($2\frac{3}{16}$ in.), the rest of the marking-out is fairly simple. It will be noted that the h.t. and l.t. stator laminations differ only in the angular length of the pole faces, for reasons which have already been explained. The angles embraced by these faces, 25 and 35 deg. respectively, should be adhered to as closely as possible. At a distance of $1\frac{1}{2}$ in. from the centre point, a line is marked to show the centre of the yoke, which is $\frac{3}{8}$ in. wide by 2 in. long.

When cutting out these laminations, it is advisable to drill the holes in the set of discs, using the marked one as a jig in all cases, and clamp them all together with four 2-B.A. bolts. Much of the cutting can be done with a hacksaw, but where this is not possible, I recommend drilling a row of holes and joining them up with an Abrafile or a spiral saw. The use of a hammer and chisel is best avoided, as it is almost bound to stretch and distort the metal, making it very

difficult to produce a compact flat pack ; and the same applies, in some measure, to the use of shears. While the pack is still clamped together, it may be filed up on the outside ; it is advisable to leave about $\frac{1}{16}$ in. machining allowance on the pole faces, but the rest of the surfaces may be finished exactly to size. Mark the pack to ensure identification of the individual pieces,



H.T. TERMINAL 1 OFF EBONITE

as before ; they can then be separated, and all the burrs removed from the edges.

If the coils are to be wound directly on the cores—a method which is quite convenient for the constructor who does the entire job himself, the pack may be permanently assembled, preferably with one or two iron rivets through the yoke, to keep it together when the screws are removed. These should be filed flush with the surface, and the sharp corners of the yoke taken off. It is also a good idea to varnish the individual laminations and assemble them while still tacky, to help keep the pack in a solid piece under all conditions.

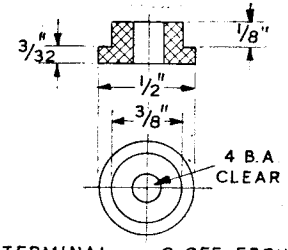
The two stator packs should now be fixed in place on the backplate for machining the pole faces. In the assembly drawing, 2-B.A. screws are shown for securing them ; these are quite satisfactory for this purpose, but a more positive location can be obtained by using studs, having a plain central portion which is a dowel fit in the holes of the pack. The backplate is now mounted on a concentric spigot held in the lathe chuck, and the pole faces carefully machined to size, that is, 0.020 in. less over the diameter than the internal size of the rotor pole faces, so that the radial air gap, or running clearance, is 0.010 in.

If the coils are to be separately wound, the stator packs cannot be made in one piece, and, therefore, after they have been located on the backplate and machined, they must be taken off, separated, and each piece cut through with a fine saw about $\frac{1}{4}$ in. from the end of the yoke, the cuts being made at alternate ends so that they are interleaved in the same manner as transformer stampings. This procedure is not necessary for the l.t. stator, which can quite easily be wound on the yoke, even by hand if necessary ; but it is possible that the ignition coils may be obtainable as a separate item, ready wound, less core, in which case it is necessary to assemble the stator packs in this way. Before dealing in detail with the windings, however, the other mechanical parts of the magneto can be produced ready for assembly.

H.T. Terminal

This is specified as being made in ebonite, an excellent insulator having a rubber base, which is most likely to be available. There are several other materials equally good or even better for this purpose, including certain grades of bakelite compositions, but unless one is well versed in the science of insulation it is easy to go wrong with these. Do not use vulcanised fibre, which is excellent stuff for many purposes, but not for holding back some 8 to 10 thousand volts ! Its chief disadvantage is its liability to absorb moisture, which is fatal for high-voltage work.

The insulator is machined to the dimensions shown, and finished to a high polish—the best method with ebonite is to use plenty of soapy water as a lubricant, with a keen tool having plenty of top rake, and polish it with its own shavings. Do not use oil, which will not only discolour the surface, but also cause the material to perish, in time. The conductor is formed by a brass wood screw, about $\frac{3}{8}$ in. × 1-gauge, screwed in a tightly-fitting hole from the underside. A small coil spring, preferably brass, is fitted below this, the top turn being opened out so that it grips inside the lower socket. The dimensions of the upper socket are arranged to take a $\frac{3}{16}$ in. V.I.R. or P.V.C. high tension lead, which is simply screwed in so that the wood screw penetrates the stranded core, and expands the covering to grip the socket.



L.T. TERMINAL 2 OFF EBONITE

L.T. Terminal

The actual conductor is a 4-B.A. brass screw, inserted from the inside, and insulated by two bushes as seen in the assembly drawing. As these only deal with low voltage, there is a much wider choice of insulating material, but it should be mechanically strong enough to take the clamping pressure. Vulcanised fibre is quite suitable here. The terminal screw is fitted with plain washers each end and double-nutted outside, ordinary hexagon full nuts being preferable to anything in the nature of special or "fancy" terminal nuts.

(To be continued)

A Shopping Bag with Retractable Undercarriage

by "Base Circle"

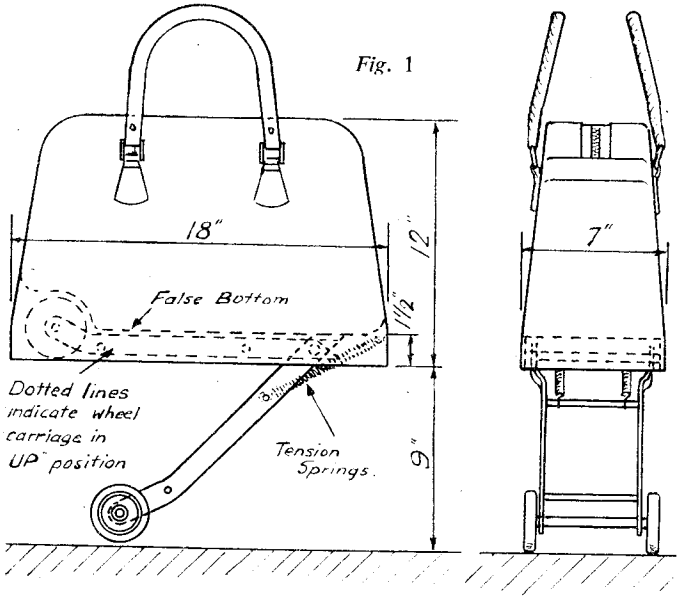


Fig. 1

ABOUT this time of the year it is probably quite a good idea to produce in the workshop something which will be useful to the lady of the house, and which will help to justify the continued existence of the said workshop, which to her is responsible not only for a great deal of dirt and untidiness, but also for the prolonged absences of her better half from the family circle.

Well, here's one suggestion. The shopping bag shown in Fig. 1 will be found to be quite a boon to the harassed housewife on her shopping expeditions. It is quite handy to carry when empty or lightly loaded, but when the week-end supplies are being laid in and it seems to weigh about half a ton, then it will be found to be a welcome relief to let down the wheels and trundle the load home with practically no effort!

There are, of course, wheeled carriers for this purpose on the market but there are obvious objections to them, and they do not appear to have caught on to any great extent. They are

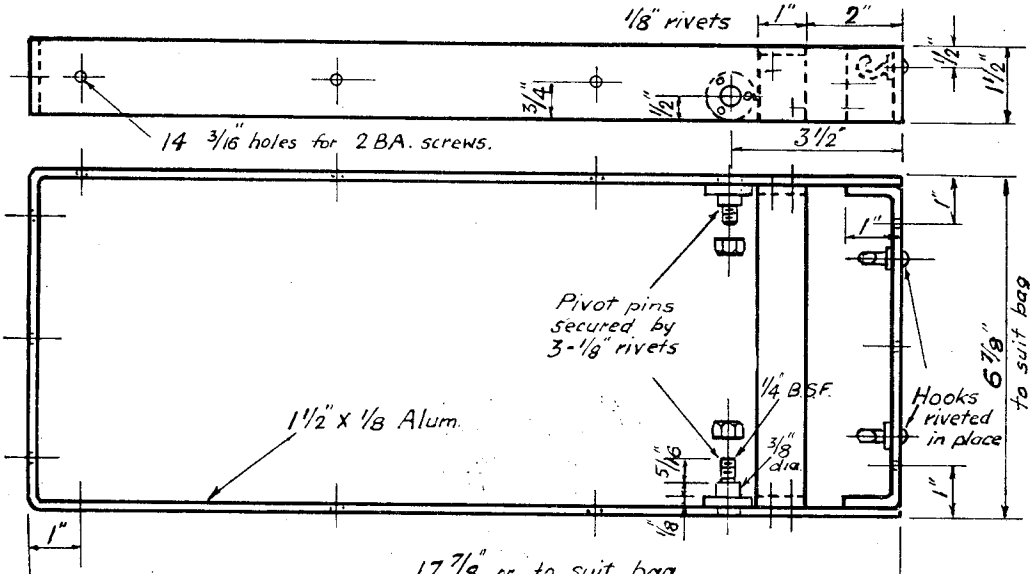


Fig. 2. *The chassis*

clumsy things to cart about when empty and they are most inconvenient for bus or tram travel. It would appear, too, that their use is regarded by the ladies as to some extent an admission of old age or infirmity!

The bag to be described, on the other hand, looks like an ordinary shopping bag and can be used as such until the need for the wheels arises. It is similar to the canvas or leather bags which have become so popular of late years—indeed, an ordinary bag could quite well be adapted to our purpose. As will be seen, the bottom of the bag is raised 1½ in. to allow for the mechanism, and is curved up at one end to clear the wheels when in the "up" position. A good strong bag should be used, whether it is specially made or adapted. It is not necessary to go into the details of bag making; very probably the lady of the house will know all about that part of the job herself. If not, it is not a job that would give any capable mechanic much bother.

Anyway, we will assume that we have made or converted a suitable bag. The next thing to do is to make a chassis as in Fig. 2 to fit into the recess at the bottom. For the sake of lightness, this is mainly of aluminium, but certain parts such as the cross-piece at the end, which takes the pull of the spring, and the piece which acts as a stop for the wheel carrier when the wheels are down, are better made in steel. Before the cross-pieces are riveted in place it will, of course, be necessary to thread the wheel carrier over the pivot pins.

The wheel carrier shown in Fig. 3 is built up from two lengths of 1 in. by ⅛ in. steel strip fastened together by two aluminium distance-pieces. The strips are easily bent to the required shape by heating to a bright red and hammering at the outside of the bend to stretch the metal, which should be flat down on an anvil or any suitable flat metal surface. Any attempt to bend flat strip like this on edge by hammering on the edge of the strip usually results in buckling the metal. The carrier pivots on the hinge-pin in the chassis, and is held either in the "up" or "down" position by strong tensions springs. The ends of the side members are shaped to stop against the cross-piece on the chassis. The rubber-tyred wheels can be obtained at any of the large stores. They are riveted to the $\frac{5}{16}$-in. steel axle, which runs in bronze bushes. These bushes can be driven into the side members, but would be all the better for a touch of solder (soft or silver) to make them additionally secure.

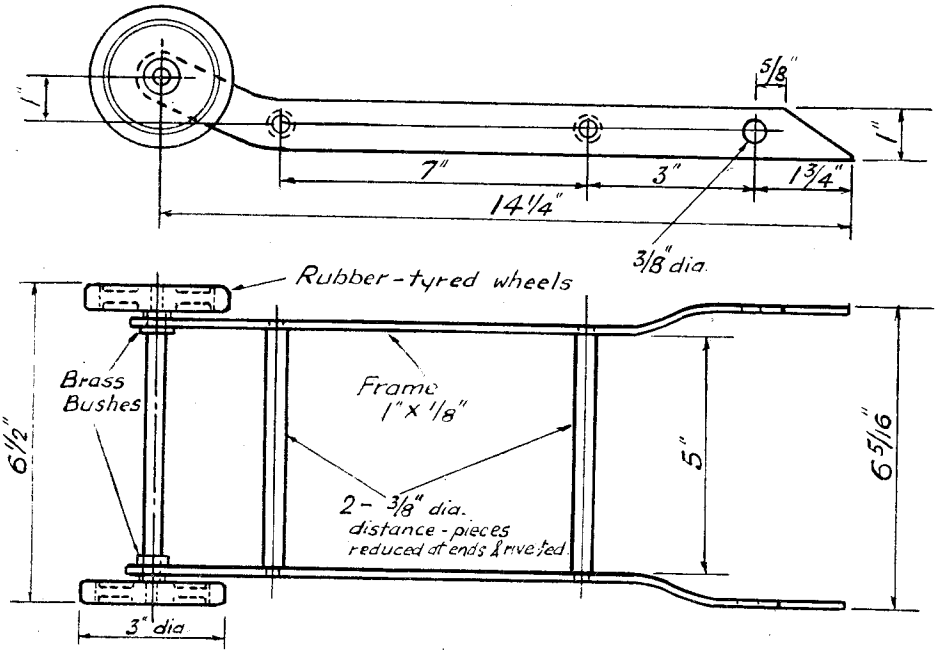


Fig. 3. Details of the wheel carrier

Finally, the whole contraption is secured firmly in the recess in the bottom of the bag either with rivets or preferably with 2-B.A. screws and nuts. With a little adjustment here and there, the gadget will be found to work quite smoothly, the wheels staying up out of the way when not wanted and, when down, giving a nice well-sprung effect.

No attempt has been made to go into great detail regarding the construction as, obviously, the dimensions will be modified to suit the bag being used, and possibly to suit material which may be available.

The essential thing is to see that the mechanism is strong enough to do its job, and at the same time not unduly heavy.

A HOME-MADE IMMERSION HEATER

by D. May

REQUIRING a suitable alternative to the kitchen fire back-boiler as a means of providing the domestic hot water supply during the summer months, and also at such times as precious coal was being burned in other rooms during the winter, the writer decided to install either an electric immersion-type or a gas-fired circulating heater in connection with the existing hot water system.

Enquiries revealed that the installation of an electric immersion heater would cost something in the region of £20, whilst its gas counterpart would be an even more expensive proposition.

It was, therefore, decided to make and install an electric heater at home, as this, although an expensive item to buy, appeared to be of very simple construction and quite capable of successful home manufacture.

The hot water storage arrangements of the existing system consisted of a 25-gallon rectangular galvanised tank, and this was the point where it was intended to carry out the water heating.

It was realised that initially, and also having in mind future replacements, a good deal of time and trouble would be saved by the use of a standard type, easily replaceable heater element rather than a home-made one, and so various available types of elements were considered.

The long round pencil-type of reflector fire element was selected as appearing to be the most suitable, and the following method, illustrated in the accompanying diagrams, was devised for its application.

First, the element—a 1 kW component of ½ in diameter and ten inches in length—was modified (see Fig. 1) by unwinding a few turns of wire from one end to form a lead-in of about 2½ in., and by passing a length of 11 in. of heavy gauge nickel-chrome wire through the centre of the element to connect, by means of a nut and bolt, with the opposite end of the element. This left two leads projecting from one end of the element so that connection to the mains could then be made at one end only. The projecting leads were suitably insulated with ceramic insulating beads. (It might be thought that the same effect could be obtained by unwinding a number of turns of wire from the distant end of the element and passing this itself through the centre of the element, but this, in fact, would not be satisfactory, as the element wire itself would overheat and burn out at the tepmerature which it would attain inside the element, and the heavy

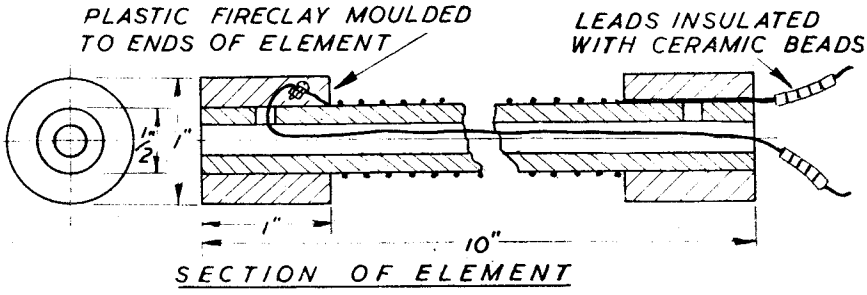


Fig. 1

nickel-chrome wire is necessary to stand up to this duty.) The ends of the element former were modified by moulding on, with the fingers, two collars of plastic fireclay, which was then rolled, and smoothed with a wet knife to the shape and size shown in the diagram. The fireclay was used to cover and hold in place the two ends of the element wire.

Next, a 1 ft. length of 1 in. bore solid-drawn copper tube was obtained and prepared by making six equally spaced cuts down the tube for a distance of 1 in. and by bending back one set of three of the "tongues" thus formed at right-angles at a point ½ in. from their ends. The remaining set of three "tongues" were bent back at right-angles over their whole length and cut off. Each of the lugs thus formed was hammered flat and drilled to enable a standard two-pin five amp. socket outlet to be bolted on the end of the tube (see Fig. 2),the other end of the tube was sealed by soldering into it a 1 in. diameter copper disc.

A ¾ in. diameter B.S.P. flange was then filed out to fit snugly over the copper tube and soldered thereon at a point so as to leave the junction box fixing-lug faces standing ½ in. clear of the flange face (see Fig. 3). It should be noted that this joint requires to be silver-soldered or, better still, brazed, as the different expansion of the iron flange and the copper tube raises stresses at this point when heating or cooling. A suitable alternative would be to make the flange of copper, in which case soft-soldering would be suitable, but in this design it was intended to use only such components as were

readily and cheaply available, and the iron pipe flange is a standard pipe fitting.

After turning off the supply cock and draining off all the water from the hot water system by means of the drain cock provided at the lowest point, a hole, to suit the outside diameter of

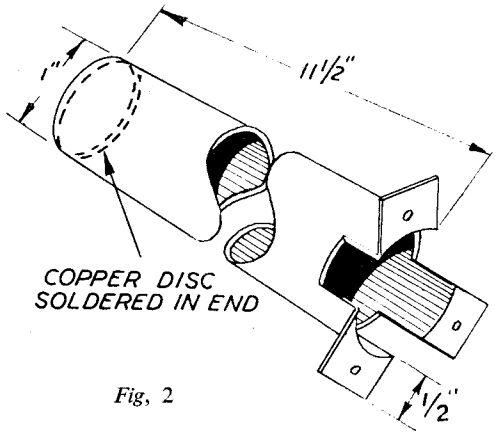


Fig. 2

the flange tube, was cut in the hot water tank at a point one-fifth of the way down from the top.

The copper tube was then passed into this hole and the flange bolted up through suitable holes drilled in the tank. The joint between the flange and the tank was made watertight by a gasket cut from rubber sheet.

Having allowed the fireclay ends to set and become thoroughly dry in the oven, the element was then passed right into the tube, the socket outlet was bolted on to the end of the tube, and used as a junction box for the purpose of connecting the element leads to the mains, via a suitable switch. One lug of the tube was connected by heavy copper wire to the nearest earth point, in this case the rising water main (see Fig. 3).

After refiling the system with water, and examining the heater for leaks (fortunately there were none), the apparatus was switched on, and it was found that a reasonable supply of hot water was available in one hour from starting.

The heater has now been in use for eighteen months and has given no trouble. It has been found that the 1 kW element will provide all the domestic hot water needed for a family of four, with reasonably economical use. A thermostat, to cut off the supply at a certain temperature, has not been found necessary, as the normal daily use, in conjunction with the low loading of the element, prevents the system overheating, boiling, etc., but it has been found desirable to install a small indicator lamp in parallel with the heater to prevent its being accidentally left on overnight.

From cold, the heater will produce a deep hot bath in three to four hours, depending upon the temperature of the cold water supply, and the water in the cylinder, which has since been lagged with felt and newspaper, will remain piping hot overnight.

For the guidance of anyone wishing to copy this arrangement for themselves, it should be noted that only the water above the heater in the storage cylinder or tank is heated, consequently the position of the heater unit is important. The higher the heater is placed the sooner will hot water be available after switching on, but the less will be the amount of hot water available at one draught. In the case here described, the position of the heater was chosen to give a storage of about five gallons of hot water, which is enough for a bath. It could have been placed lower down so that sufficient hot water was stored for two baths, but this would have meant waiting twice as long for the necessary temperature to be reached after switching on, or alternatively, the use of a suitable wire to give a 2 kW loading for the element. The existing arrangement was considered to be the most likely to be both satisfactory in use and economical in running, and experience has shown that this is so.

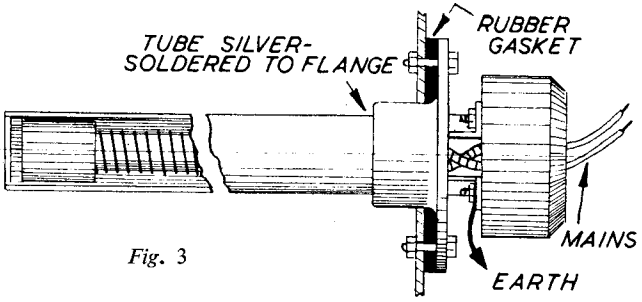


Fig. 3

The "M.E." Speed Boat Competition

Once more we remind all model power boat enthusiasts that this competition is again open to all constructors of model speed boats in classes "A," "B" and "C," for 30 c.c., 15 c.c., and 10 c.c. respectively or steam plants of comparable sizes and weights. All boats must be constructed by the competitors, including both hull and engine, though some latitude is allowed for minor parts such as coils, batteries, etc., obtained ready-made. Runs made at any time during the season are eligible, so long as they have been properly timed and witnessed, and in the case of runs made at M.P.B.A. regattas which have been reported in THE MODEL ENGINEER, the officially observed figures will be accepted. Entry forms for the competition are obtainable from this office, and all entries must be received by December 21st.

VICE CLAMPS FOR ROUND WORK

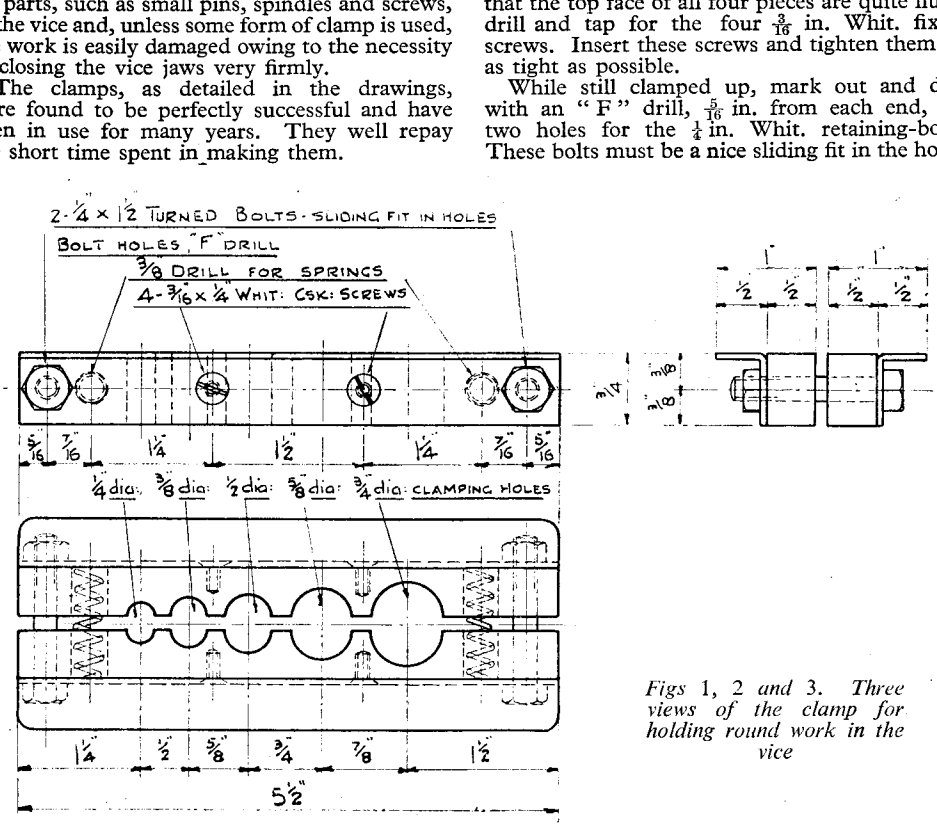
by R. B. Fuller, S.M.E.E.

IT frequently becomes necessary to hold round parts, such as small pins, spindles and screws, in the vice and, unless some form of clamp is used, the work is easily damaged owing to the necessity of closing the vice jaws very firmly.

The clamps, as detailed in the drawings, were found to be perfectly successful and have been in use for many years. They well repay the short time spent in making them.

angles and the two main pieces together, ensuring that the top face of all four pieces are quite flush, drill and tap for the four $\frac{5}{16}$ in. Whit. fixing screws. Insert these screws and tighten them up as tight as possible.

While still clamped up, mark out and drill with an "F" drill, $\frac{5}{16}$ in. from each end, the two holes for the $\frac{1}{4}$ in. Whit. retaining-bolts. These bolts must be a nice sliding fit in the holes.



Figs 1, 2 *and* 3. *Three views of the clamp for holding round work in the vice*

The size shown can, of course, be altered to suit requirements, but the set detailed will be found to cover most cases for small model and clock work. The drawings are self-explanatory but the following description will no doubt be of help.

Figs. 1, 2 and 3 give the side and end views and plan. For the angle flanges that keep the fixture on the vice jaws, cut two pieces of mild-steel strip $\frac{1}{16}$ in. thick, $1\frac{1}{4}$ in. wide and $5\frac{1}{2}$ in. long; mark out and bend over in the vice to form two angles $\frac{3}{4}$ in. by $\frac{1}{2}$ in. by $5\frac{1}{2}$ in. long.

For the main blocks, two pieces of mild-steel are required, $\frac{3}{4}$ in. by $\frac{1}{2}$ in. by $5\frac{1}{2}$ in. long. On the $\frac{3}{4}$ in. face of one, mark out the centre-line, clamp the two pieces firmly together and $\frac{3}{4}$ in. from each end drill a $\frac{3}{8}$ in. hole right through the two pieces. Slip a short piece of $\frac{3}{8}$ in. rod in each hole to register them together.

On the inside of the $\frac{3}{4}$ in. leg of each angle-piece, mark out, drill and countersink two $\frac{3}{16}$ in. holes 2 in. from each end. Now firmly clamp these

Unclamp and remove the two registering dowels, and in their place fit two compression springs, $\frac{3}{8}$ in. by $1\frac{1}{4}$ in., free in holes. These should be strong enough to separate the two halves about $\frac{1}{8}$ in. when the vice jaws are released.

Now fit the two retaining-bolts, locking the nuts with $\frac{1}{16}$ in. split-pins, to give about $\frac{1}{8}$ in. of end freedom. Test for freedom in the vice.

Clamp the whole up tightly and mark out for the holes to take the split bushes, drill these on the joint of the clamp to the sizes given, remove all burrs.

A typical detail is given of the split bushes in Fig. 4. The bushes are turned from any odd pieces of mild-steel, brass or fibre. The shank being the same diameter as the clamping hole for which it is being made, the top flange is $\frac{1}{8}$ in. larger than the shank and $\frac{1}{16}$ in. thick. Drill each bush to any size within its capacity as required, and saw through vertically on one side. A further set should be made and tapped to take all sizes of screws. As each bush is made,

carefully and distinctly mark the size on each.

When set for turning these bushes, it is as well to make a number of spares which will only require drilling as required when they are needed, and soon a complete set will be available. Bushes made from ordinary beech dowel rod are very useful for holding polished work. The sizes of the clamping holes shown on the drawing will take bushes to accommodate all sizes of work from nothing to $\frac{11}{16}$ in. in diameter

A very useful additional fitting which should be made for each size of bush, is a slotting guide (see Fig. 5) for sawing the slots in the heads of screws. No size is given as they can be made from any scrap piece of flat mild-steel about $\frac{1}{8}$ in. thick. The centre hole should be drilled a good fit on the shank of the bush. As they would only be used for slotting odd screws, it is scarcely necessary to harden the guide slots, although this method of slotting has been found to be much quicker than setting-up for milling each screw singly.

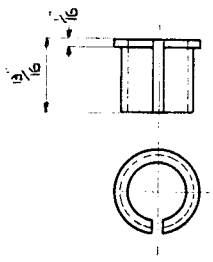


Fig. 4. Typical bush with plain or taper bore

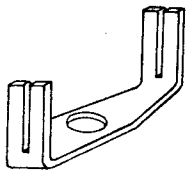


Fig. 5. Saw guide for slotting screw heads

A Farmyard from Scrap Materials

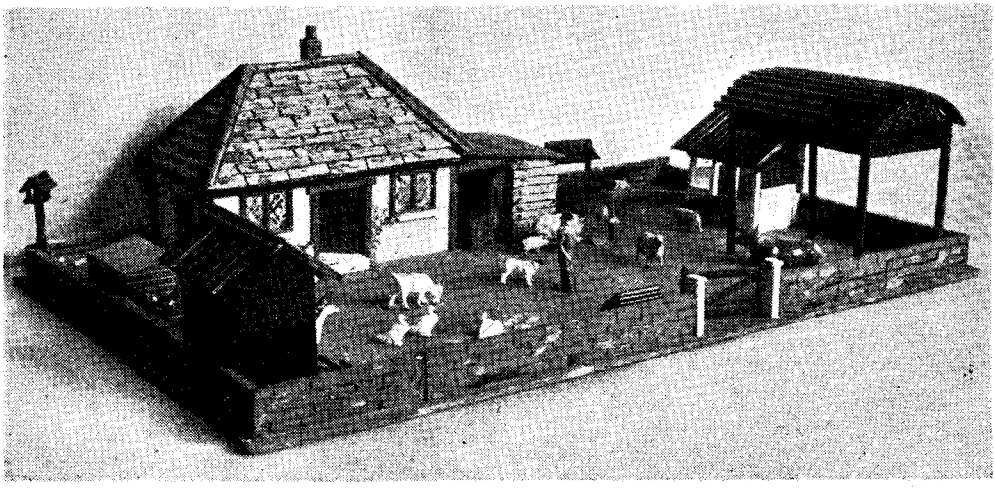
by W. J. Hughes

THERE are some models which, whilst they do not come within the range of "model engineering," still appeal very much to the eye, especially when one considers the materials which have been used and the time and thought put into them.

Such is this tiny model farm, built by Mr. J. A. Pickering for the delight of his small daughter. It is made from all kinds of odds and ends—hardboard, fibre-board, cardboard, corrugated card, strips of balsa and three-ply, and so on. The painting was also done with "left-overs" of paint from the bottom of tins, so that the total actual cost was very little.

A detailed description is not necessary, as the photograph speaks for itself, but readers with small offspring (or nephews or nieces), might well consider the joy that such an offering would bring on a birthday or Christmas morning. The chief point to consider, of course, is that for one's own satisfaction the model should be built to a scale down to the animals and human figures as decorations!

[Messrs. Percival Marshall & Co. Ltd. issue a number of prints of miniature buildings (all to 4 mm. scale), drawn by J. H. Ahern, which would help readers to make similar models to the one described above.—ED., "M.E."]



In this model farm the buildings include poultry-houses, dove-cote, cottage, pig-sty, barn and well

"L.B.S.C.'s" Lobby Chat

Another Look Backwards

SOME correspondence has reached your humble servant regarding the letter from Mr. C. M. Keiller, published in October 16th issue, asking if I would clear up the matter in a lobby chat, especially the reference to *Ayesha's* cylinders. Well, as I have said before, I'm always ready to oblige ; and as the " principal actors in the play " have all passed to the land beyond Jordan, there is now no harm in telling the full story. First of all, I know Mr. Keiller personally, though I haven't seen him for some years ; he is a locomotive builder of wonderful skill, profound knowledge, and unimpeachable integrity. If he says that he did a certain thing, it is good enough for Curly—but in the instance mentioned, it was apparently a question of what the old saw calls " great minds thinking alike ! "

I have known of the advantage of superheated steam over the wash-day variety, ever since childhood days ; I believe I mentioned how it was accidentally discovered, in a previous reminiscence, but for new readers' benefit, it will bear repetition. I had a little tin *Ajax* locomotive, which did most of its running on the footpath in the street, much to the detriment of its thin brass wheel flanges. It had two brass oscillating cylinders, the steam blocks of which were connected by a cross pipe soldered into them ; and to prevent the solder melting, a tin partition was fixed across the frame, just ahead of the pipe, to protect the latter from the flame of the lamp. One day, the engine suddenly developed an unexpected liveliness, going far better than ever it did before, and no drops of water were shed from the open cylinder exhausts on to the flagstones. That evening, when cleaning down, I found that the tin partition plate had fallen out somewhere, being conspicuous by its absence ; and the cross-pipe bore evidence of having been well hotted up, though the mass of the steam blocks at each side had prevented any solder melting.

Working Overtime

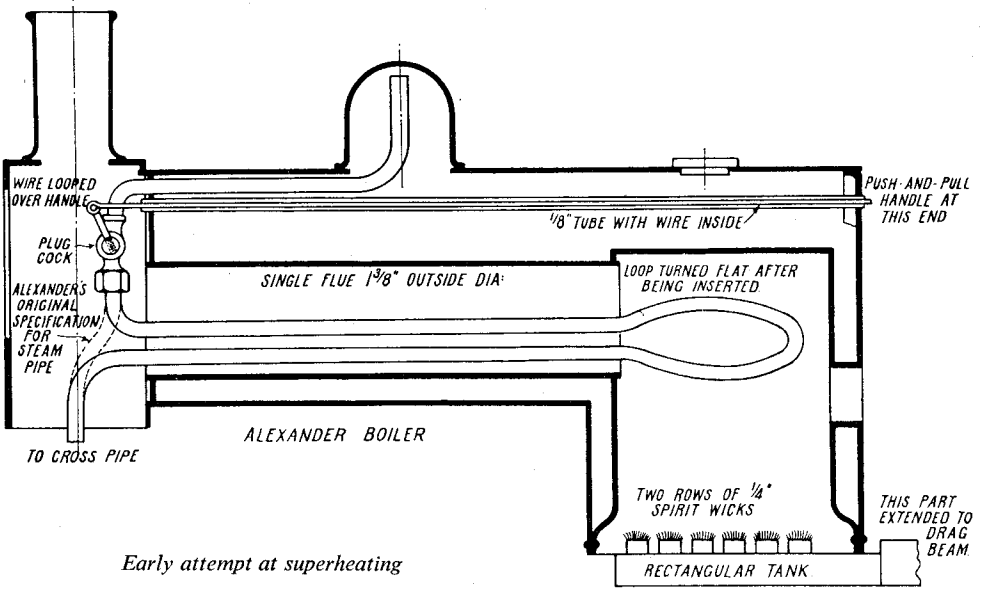
I didn't connect this with the improved performance at the moment, but put in a fresh bit of tin, to protect the pipe. Next time I got up steam, the little toy showed no signs of her previous burst of extra efficiency, and that set the grey matter under young Curly's golden mop working overtime. I could never rest until I had " found things out "—and still can't ! Anyway, to see what happened, I took out the partition plate again ; and lo-and-behold ! the engine was as lively as a kitten once more, and no " spitting on the pavement " either, so I decided that the reason was the heating of the cross pipe, which dried the steam, and also vaporised any drops of water that primed over from the little tin boiler, But I soon discovered that the sewing-machine oil that I had been using for cylinders, dried up, and caused the pistons to squeak. The driver of the Borough Council steam-roller came to my aid at this juncture, and gave me some of the thick green oil which he used for the " Aveling & Porter." Incidentally, children get hold of some quaint notions, and I always thought that the reason for the " A. & P." " trademark " on the pivot block of the steam-roller, the rearing horse of Kent, was because horses of those days were scared stiff of any vehicle which hadn't another horse in front ; and whenever they saw a steam-roller or traction engine, they promptly emulated the " trade-mark " ! Other times, other manners ; once, when caught in a traffic block in the East end of London with my gasoline buggy, on a very cold day, I saw a horse putting its head as close as possible to the smokebox of a Foden steam wagon beside which it was standing !

Developments

Having once discovered the advantage of hot dry steam, it is hardly necessary to add that I utilised my experience wherever possible, taking the steam pipes of my toy locomotives through the lamp flames, if convenient to do so without melting any soldered joints. In this connection, I think I can claim to have fitted a firetube superheater long before Mr. Keiller's quoted example, though I didn't call it a superheater ; in fact, I didn't think I'd done anything clever or original, but merely exercised a bit of common sense. I mentioned in a previous reminiscence, that I built one of " Bro. Iron-wire " Alexander's engines, as described in his book *Model Engine Construction*, published in 1894. Although his specifications would give modern locomotive builders a fit—e.g. driving axles of $\frac{1}{8}$ in. diameter iron wire, running in plain drilled holes in frames of 20-gauge sheet brass on a locomotive of $2\frac{7}{8}$ in. gauge ! !—his principles were quite sound, his valve-setting correct, with lap and lead on the valves, and he specified locomotive-type boilers with a large number of small spirit wicks, to simulate a fire. These boilers had high-crowned fireboxes, and a large single flue. The steam pipe started up in the dome, and emerged through the smokebox tubeplate, where it was connected to a plug cock which served as a regulator, the handle being operated by a wire passing through a tube soldered into the boiler, something like a hollow stay. From the cock, the pipe went straight down to the cross pipe connecting the steam chests of the outside cylinders. The footplate end of the operating wire was furnished with a push-and-pull handle.

When I made my boiler, it occurred to me that it would be a good idea if I could take the steam pipe through the lamp flame, instead of direct to the cross pipe ; and to that end, thought of mounting my plug cock on the backhead, and running the pipe through the firehole, and along the single flue. I had previously adopted the

backhead-cock idea on a " pot " boiler, running the pipe along to the cylinders just below the boiler bottom. Then the grey matter stirred again, and I thought, what a chump I am, to be sure ! Why not run the pipe back from the cock in the smokebox, along the flue, loop it over the lamp flames, and take it back through the flue again, turning it down in the smokebox, to connect with the cross pipe. I'd get twice the amount of pipe, to dry out the steam. This was done ; I bought a union cock at Archbutt's optician's shop in Westminster Bridge Road, for sixpence, to use as a regulator, and filed up the bottom tee from a scrap bit of brass. Couldn't afford to spend much, as I was earning 2s. 2d. (two shillings and twopence—don't faint !) per day as an engine cleaner, at the time. Anyway, the engine was eventually finished, and did more than " Bro. Iron-wire " ever claimed, probably due to my steam-heating loop. I had arranged for a hit-and-miss form of lubrication, by fitting a couple of " dope cups " (tallow and cylinder oil lubricators) like those on the Brighton engines, and naturally I could always get a drop of oil from the running-sheds. Had it not been for that, my poor soft brass cylinders would have soon gone to glory.



Early attempt at superheating

What Led to the " Battle "

In due course, Mr. Fred Smithies brought out his water-tube boiler ; and many extravagant claims were made for it—not all by Mr. Smithies, I hasten to add—but it never appealed to me, because it seemed to be only a toy " pot " boiler put into a casing. Moreover, it could hardly have been called an efficient job, as far as fuel economy was concerned, for the " heating surface " of the casing was far greater than that of the actual boiler ! Two-thirds of the heat generated by the lamp, was wasted through the casing, unless same was asbestos-lined. However, the steam pipe was taken back through the casing, and looped over the flame, and thus the boiler fed hot steam to the cylinders. In my own experiments, I stuck to the proper locomotive type ; and when I found that it was possible to use several small tubes instead of one large one, and make a coal fire burn in a weeny firebox, I was quite happy and contented. As I couldn't put a steam-drying loop in a little tube, it was obviously necessary to provide a larger one ; and as the loop could not be made small enough to push into even a larger tube without kinking the pipe, I bent the ends over, filed them flush, and brazed them to form a spearhead.

This stage was reached some time before the " Battle of the Boilers " broke out in the correspondence columns of this journal. I lay low and said nothing about what I had found out, either on boilers, cylinders, valve gear and setting, etc., until the continued advocation of the water-tube boiler, pinhole ports, no-lap-and-lead ideas (" expansion of steam in little cylinders is all rubbish," said one writer) made me just about boil over and start priming, in a manner of speaking. The rest of that tale is well known to older readers of this journal. When challenged, I proved all my contentions, as mentioned in my answer to Mr. A. L. Lee. Our worthy friend Mr. Keiller may have started experimenting as early as I did, for all I know ; but the first locomotive of his that I ever saw at the Caxton Hall, if memory serves me rightly, was a spirit-fired job with an eight-burner lamp. I cannot recall at the moment what type of engine it was. On a subsequent occasion, I saw his 4-4-0 coal-fired engine, running on the circular track, but it wasn't pulling passengers then, and I chaffed him about the 5/64 in. blast nozzle, which I thought would tend to cause back-

pressure, as it was smaller than I had found necessary for a locomotive of similar size.

The Facts About "Ayesha's" Cylinders

Anyone reading Mr. Keiller's reference to *Ayesha's* cylinders might easily jump to the conclusion that they were Greenly-designed ; in fact, this was openly stated in a club journal, so I had better make it quite clear that such is not the case. Prior to the "Battle of the Boilers," I started to build two 2½-in. gauge L.B. & S.C.R. locomotives, a 4-4-2 tender engine and a 4-6-2 tank engine ; and as W. H. Jubb Ltd. had just come on to the market with a loud splashing and terrific flourish of trumpets, I purchased two sets of "best gunmetal" cylinder castings from their London agents, Messrs. Bond, of Euston Road. Alas ! when I started to machine them, they proved to be soft spongy brass, and utterly useless. I complained to Jubbs, who replied in a letter that might have been dictated by an Indian babu, to the effect that they used the castings themselves, and there was nothing wrong with them. I then complained to the then advertisement manager of this journal, the late Mr. Alf Dawson, showing him the castings and pointing out that they were decidedly *not* "best gunmetal" as advertised. If there was one thing that honest lad from Huddersfield detested more than another, it was "catchpenny" advertising, and he promptly descended on the junk merchants like a wagonload of bricks, with the result that I received some replacement castings from Sheffield in—hold your breath—German silver, above all things ! Meantime, seeing Mr. Greenly's name in the Jubb catalogue as "consulting engineer," etc., I wrote to him and "shot the whole works," as they say over the pond. In reply, Mr. Greenly sent me a long letter, saying that he had since broken off business relations with Jubb's, and gave me full details of how, why, and where. Jubb was a Yorkshireman and Greenly a Lancastrian—the "War of the Roses" was an also-ran, according to the letter ! Mr. Greenly also advised me to complain to the MODEL ENGINEER, but I'd already done so.

The Real Stuff

While living at Norbury, I made the acquaintance of a Croydon foundryman who at that time was in business just at the back of East Croydon station. He was interested in little locomotives, and when I mentioned about the dud castings, he said that if I made a pattern, he would cast my cylinders in the real stuff, as he did quite a lot of small fine work for teleprinter firms and others needing similar castings. I did, and he did—and grand metal it was, too, the castings being very clean. Now, in course of further correspondence with Mr. Greenly, the latter stated that he had a new design for cylinders with a circular steam chest, and wanted somebody to market castings for them ; could I put him on to any likely foundryman ? He wasn't having anything more to do with Jubb's, naturally. Anyway, to cut a long story short, I put him on to my Croydon friend, who agreed to make castings of the Greenly cylinders ; but there was a wasp in the jampot—what about patterns ? Mr. Greenly couldn't supply them. To assist my friend, I stepped into the breach, and made sets of metal patterns for the circular type, and several other types as well, and the foundryman got busy. Mr. Greenly wanted to show the cylinders on Bond's stand at the 1922 Exhibition, and the foundryman also wanted to show how much better his castings were than Jubb's ; so, out of friendship, I machined up a set of the circular type, to Mr. Greenly's drawings, and as the chassis of the Atlantic engine was well under way, I put the cylinders on it, attached a cycle pump, lent it to Bonds, who put it on their stand, and operated the wheels by working the pump.

Not so Good!

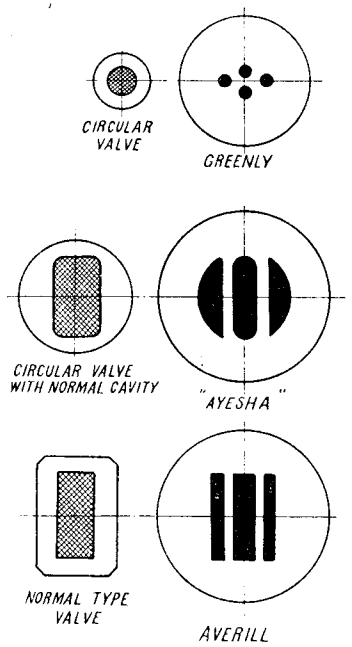
When I put the boiler on the Atlantic chassis, I soon found trouble. Mr. Greenly maintained that his pinhole ports and no-lap-and-lead ideas were all right, and cited the performance of the pump-operated chassis to prove it ; but running with the wheels jacked up, under a few pounds of air, is a different proposition to pulling a heavy load continuously on the track. The engine behaved exactly the same as the 0-6-0 (which I referred to in a previous reminiscence) did, before I altered the ports and valve gear to full-size principles. That was no good to me ; so I took off the whole bag of tricks, bored out the steam chest, got my friend to cast a fresh pair of cylinders, bored them much bigger than the Greenly specification, cut moon-shaped ports, and supplied circular slide-valves with proper lap and exhaust-clearance. The valve-gear was altered for longer travel, early admission and exhaust, and the performance of the engine was improved out of all recognition. It was in that condition that she "astonished the natives" at the Caxton Hall, and at the following "M.E." Exhibition.

When I informed Mr. Greenly of the improvements made, he wouldn't believe it, saying that his cylinder design couldn't be improved upon. Later on, he saw the engine doing the job at the show ; said that it was just a fluke, and would fall to pieces in a week. *It is hardly likely that he would have said that, if the cylinders had been made to his design* ! Rather, he would have promptly claimed all the credit for the locomotive's performance. *Ayesha* is still running—it's a long week !—with the same cylinders. Just before the war, I can't recollect the exact date now, I put a reamer through the bores, to true them up after umpteen years of wear, and made new pistons. She has had two new trailing axleboxes, and a new boiler. This was fitted long before the war, as the original boiler was made in a great hurry, only the firebox being brazed, the rest riveted and soldered. When I made it 30 years ago, I hadn't the appliances which I now have. It began to leak at the soldered joints, so I made a new one, with Sifbronzed joints and silver-soldered tubes, in seventeen hour's work, including fittings and erection. The old girl is pretty badly worn now, but still does the job, hauling three adults quite well at a good speed around my road ; but she is a bit heavier on coal than she used to be, owing to the worn valve gear. I'll have to give her a "birthday treat" soon, as she absolutely refuses to fall to pieces !

Credit Where Due

There is one more point to clear up. A couple of correspondents refer to the phrase in Mr. Keiller's letter: "Mr. Greenly's all-circular cylinders," whilst your humble servant always refers to the cylinders with a circular steam-chest, as the Averill pattern; and they ask why this is so. The late Mr. T. W. Averill of Alcester, was the pioneer of the "big haul" in the "inch-scale" size; and descriptions and photographs of his engines, with full particulars of their haulage capacity, appeared in the earlier days of this journal. I got into communication with Mr. Averill, as an interested engineman (he had many driver and fireman friends at the local shed of the G.W.R.) and many letters passed between us on the subject of locomotives, both full-size and weeny. Long before Mr. Greenly ever got out a design for a circular steam chest, Mr. Averill told me that he had designed one for easy machining, as it could be turned entirely on the lathe, and only needed round holes in the frames. His design included a large oblong inspection opening underneath, closed by a studded cover. This enabled the valves to be set by sight.

Mr. Greenly's version of the same idea first appeared, if memory serves me rightly, on a commercially-made Midland 4-4-0 with outside cylinders—a simple variation of the then new Johnson compound—in 3¼-in. gauge. The later version, referred to by Mr. Keiller, was much inferior to the original Averill design. The steam-chest had no inspection opening, and the hole through it was bored eccentrically to the flange, giving a very small portface to the cylinders. Soon after this design appeared, Mr. Averill wrote to me and commented very adversely on the faults which were apparent; and in my reply, I suggested that he should design a 2½-in. gauge set, on the lines of his original. He said that if I would give him the bore and stroke required, he would; so I suggested ⅞-in. bore and 1¼-in. stroke. Mr. Averill duly got out the design, and it appeared as a separate article, complete with drawings, in this journal; I forget the exact date, but it was before 1928. I made patterns, and my Croydon friend cast a set, which I machined up and fitted to a Great Eastern type Atlantic, a sister to *Ayesha* named *Bluebell*. She is still on the job; at this minute, she stands on a shelf alongside old *Ancient Lights*, close to where I am sitting, and takes her turn on my little railway. George Kennion had the patterns afterwards, and marketed the castings. In the drawings of a 2½-in. gauge Atlantic which I made about 20 years ago for a contemporary journal, full details of these cylinders were given, with acknowledgments to Mr. Averill. *Bluebell* has Stephenson link motion of my own design. Well, I hope the above makes everything perfectly clear; the reproduced drawings will show the steam-drying loop fitted to the Alexander boiler, and the difference in the port and valve arrangements of the Greenly cylinders compared with those on *Ayesha*, and those originally designed by Mr. Averill.



Comparison of ports and valves

New York S.M.E. 1953 Exhibition

We learn from Mr. Clark H. Pool, Jr., that the annual exhibition of the New York Society of Model Engineers will be held from February 11th to 23rd, 1953, at Lackawanna Terminal, Hoboken, New Jersey. It will be open 5.30 p.m. to 10 p.m. on weekdays, and 1 p.m. to 10 p.m. on Saturdays, Sundays and holidays. This will be the twenty-fourth annual exhibition to be held by the society, which we think is an excellent record. All model builders are invited to display their best work, including railroad models, live steamers, sail and power boats, race-cars, aircraft, structures, etc., regardless of scale. In addition to a "Certificate of Merit," the builders of prize-winning models will receive cash awards.

All models entered will be adequately protected by insurance while they are in the society's quarters. Further information and entry forms are available from the society at Lackawanna Terminal, Hoboken, New Jersey.

A Near Relation

by T. H. Walker

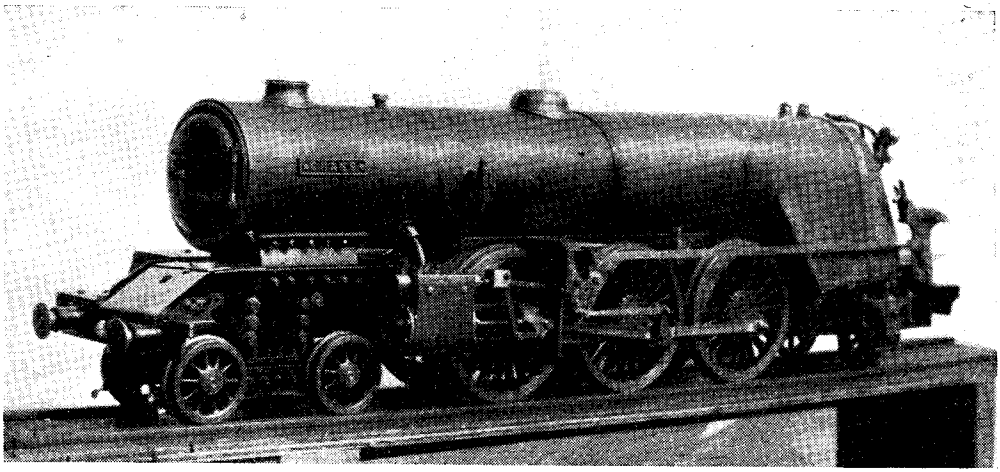
" Chang," a near relation to " Hielan' Lassie," on test on the Wigan society's track, with the author driving

I HAVE felt an urge since my schooldays to build locomotives, but it was not until some nine years ago, that I was able to realise my ambition. I built up a small workshop, Myford lathe, hand-shaper, etc., but I had no particular ideas as to what type of locomotive to start on. Not then being a reader of THE MODEL ENGINEER, I did not know of " L.B.S.C.," and was led into purchasing a commercial set of *Flying Scotsman* parts in 2½-in. gauge. Soon afterwards I joined the Wigan & District Model Engineering Society, and began to assimulate knowledge as to what constituted a " small locomotive " builder as against a " model engineer," but I carried on until the 2½-in. *Flying Scotsman* was finished. This did not perform too well, although eventually I made and fitted two cylinders and motion parts as per " L.B.S.C." with definitely improved results.

By this time, the " bug " had really got hold of me, and when *Hielan' Lassie* made her bow, I tackled the building of one with real gusto. That was six years ago, and my effort has been track tested, and found quite up to expectations. However, I had my own preferences on several points, and incorporated them in my locomotive. Plain chimney with single blast pipe, plain dome, slipper crossheads with twin slidebars, plungers between engine dragbeam and tender, will be evident in the photographs, but basically the engine is to " words and music," and oh boy ! can she steam ! She (or he) has been named *Chang* from a character in *Lost Horizon* (not that there is any apparent similarity, but the name just appealed to me, and seemed apt).

I would like to express my appreciation of " L.B.S.C.'s " weekly articles, in the " M.E.," and also of help given by fellow members of the Wigan & District Model Engineering Society.

There is certainly nothing " toyshop " in the



Nearing completion and ready for bench tests

way the locomotive performs. In the action photograph the engine was obviously priming, but this was during the early tests, and the trouble has now been overcome.

For the Bookshelf

" Maisie." by " L.B.S.C." (London : Percival Marshall & Co. Ltd.) 133 pages, size 6 in. by 9 in. Fully illustrated. Price 12s. 6d.

For several years, it has been the intention of the publishers to reprint a number of those ever-popular serial articles of " L.B.S.C." in book form. For nearly thirty years, those serial articles have been a regular feature each week in THE MODEL ENGINEER, practically without a break. It can be said in all truth that no other articles written on the subject of small locomotive construction have achieved such world-wide popularity. The style of writing and presentation has aroused enthusiasm wherever the hobby is practiced and the English language is understood ; the precise instructions given have enabled many a raw novice to build a small locomotive that will give absolute satisfaction and arouse the desire to proceed to something more elaborate. The author who hides himself behind the initials " L.B.S.C." has built up an enormous following, spread all over the world, and his writings, his " words and music " as he calls them, are eagerly sought after and read with avidity by thousands of enthusiasts ; the advice and instruction given have led, not only to his various locomotives being built in almost astronomical numbers, but also to societies, clubs and associations being formed in many parts of Britain, Africa, Australia and America, specifically for the purpose of building and running these small locomotives.

The demand for reprints of the " words and music " has been simply phenomenal, but until now, little or nothing has been possible in the way of satisfying it. Now, however, a start has been made in the form of this book on *Maisie*, the well-known 3½-in. gauge Great Northern Railway Ivatt Atlantic locomotive, one of the most popular of all " L.B.S.C.'s " creations. The book contains the whole of the original serial article, revised and brought up to date where necessary, and reproductions of all the detail drawings. They are, of course, arranged in progressive order from the start to the completion of the engine and tender. Nothing is missing, and the whole story proceeds smoothly along in the author's inimitable style.

The book is obtainable through all booksellers, or direct from the publishers ; also from the British Book Centre, 122 East 55th Street, New York, 22, and the British Book Service (Canada) Ltd., Kingswood House, 1068, Broadview Avenue, Toronto.

Making a Small Hacksaw Frame

THE small Eclipse hacksaw frames, taking the corresponding Junior blades, will be familiar to most readers as a most useful tool for all kinds of light work. These Junior blades are fitted with fixing pins at either end, $5\frac{3}{4}$ in. apart.

When cutting thin sheet metal, it may at times be found that the wavy form of setting given to the saw teeth is liable to cause the blade to follow a serpentine path as it travels to and fro; that is to say, the blade is being guided by the line of the teeth as viewed from above. The reason for this would seem to be that the distance between the points of set may be considerably greater than the thickness of the material being cut. However, when each alternate tooth is set in opposite directions, in a blade having 32 teeth to the inch, there is usually no difficulty in sawing thin sheet material or in starting the saw accurately to a line.

Nevertheless, the manufacturers, who know best, have produced this blade and it is, perhaps, the most suitable for all-round use.

It so happens that, recently, we have been using several sizes of the wide range of Eclipse jig-saw blades with excellent results, but as the pin centres of these blades are 6 in. apart, they cannot, properly, be used in the Junior frame unless a special adapter is fitted.

Even when an adapter is used, it may not be possible to turn the blade into the horizontal position, as may be required for some work. To overcome these difficulties, it was decided to build a frame to take the jig-saw blades, and also to make provision for mounting the blade either vertically or horizontally. To save having to bend or braze the material, the frame was built up by screwing the parts together.

A start can be made with the two hangers, parts *A* and *B*. These are made from $\frac{3}{8}$ in. square, mild-steel filed flat and square, and the work should be accurately marked-out before being machined. After the two upper ends have been drilled and then tapped 1 B.A., the rear hanger is tapped 2 B.A. for the handle shaft. Next, this part is cross-drilled and tapped 6 B.A. for the blade fork-screw.

To carry out the next operation of slotting the ends for the saw blade forks, *G* and *K*, the two hangers can be gripped in a machine vice attached to the lathe vertical slide, and an end-mill, mounted in the mandrel chuck, is used to machine both slots at the same time. It is advisable to form the slots a little under width so that, later, the blade forks can be filed to a close, sliding fit. The slotting operation can usually be more easily carried out in the shaping machine and, by using a parting tool, the slots are readily cut to size and a good finish is given to the work.

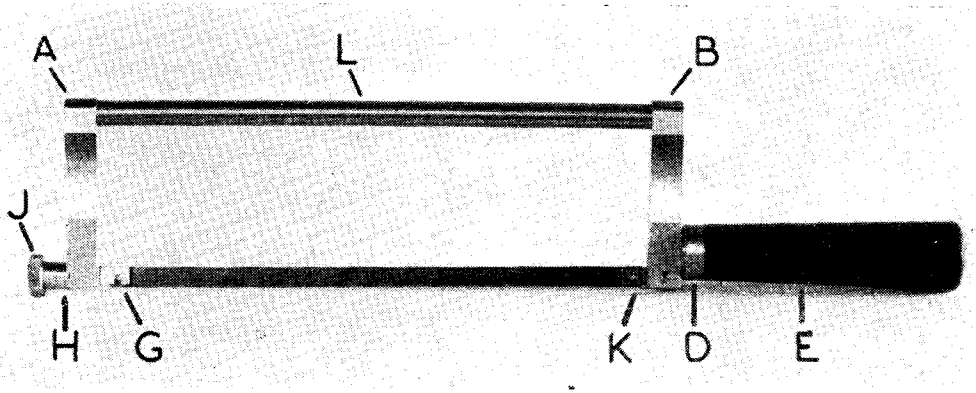


Fig. 1. The finished saw frame. "A"—the front hanger; "B"—the rear hanger; "D"—the handle ferrule; "E"—the plastic handle; "G"—the front blade fork; "H"—the fork collar; "J"—the tensioning nut; "K"—the rear blade fork; "L"—the frame back

The notch in part (*A*) to receive the tenon of the fork collar (*H*) is either machined in the shaper or formed with a file.

It will be seen that, to give a more finished appearance, the side faces of the two hangers have been machined with a hollow curve, but this can quite well be omitted. However, as the machining operation employed will also serve for other work, it may, perhaps, be described in a future article. To finish the hangers, their upper ends are rounded by filing and then polished.

The frame back (*L*) can now be made and fitted. It is, however, advisable to make the rod, in the first instance, slightly over-length, for when the two hangers have been screwed firmly in place, one shoulder of the rod may have to be faced back in order to bring the parts into exact alignment. When the assembled frame is placed on the surface plate, it should lie quite flat and without rocking.

A moulded, plastic handle of just the right size was found in the oddments box; but, failing this, a handle can be turned from a rod

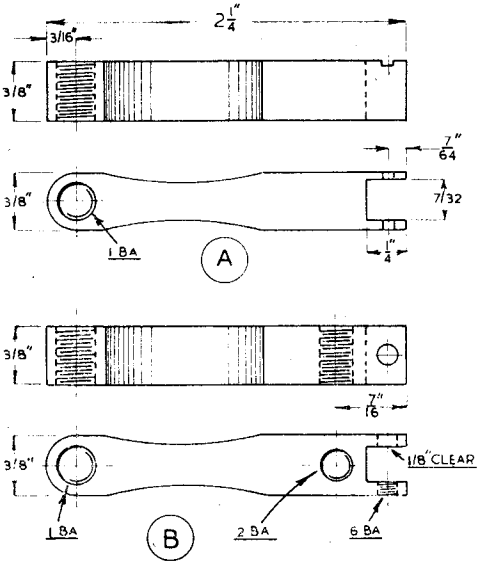


Fig. 2. The front and rear hangers

of plastic material, or a polished, wooden handle will serve equally well.

The handle shaft (*C*) is screwed tightly into the rear hanger and hardly needs cross-pinning. The steel ferrule (*D*) was made to fit the handle used ; but, in any case, this fitting will give the finished frame a more workmanlike appearance.

The bevelled nut (*F*) fits into a recess in the handle and can usually be tightened by twisting the handle, but to make certain of this, a screw-driver slot should be added.

The two small forks carrying the saw blade are made from ¼ in. square, mild-steel, and they should be filed to a close sliding fit in the hangers when the blade is mounted either vertically or horizontally in the frame. It should be noted that, in order to maintain the strength of the parts, the inclined slots for the blade pins extend upwards

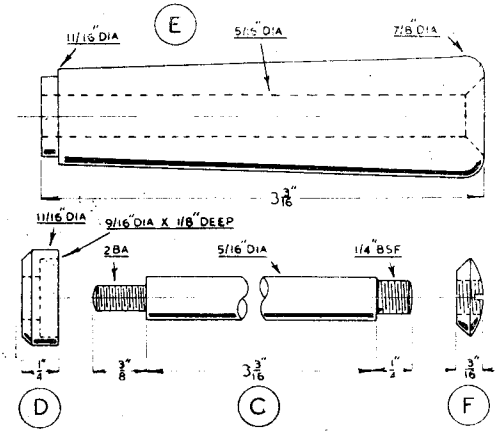


Fig. 3. The handle and its parts

only as far as the centre-line of the forks. When making the two forks, it is best to start with a single piece of material of ample length. The inclined slots are first formed by cross-drilling and filing. Next, the rod is gripped at centre height in the lathe toolpost, and is set to lie exactly parallel with the chuck face. A circular

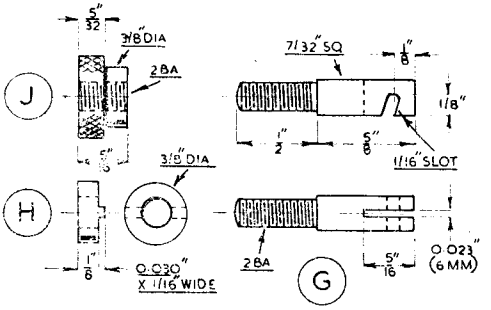


Fig. 4. Components of the front blade fork

slitting-saw, of the same thickness as the hacksaw blade is mounted on an arbor held in the chuck, and the blade slots are, in turn, cut to the finished depth.

After the rear fork has been cross-drilled in two directions at right-angles to one another for the fixing screw, both forks can be cut off to length.

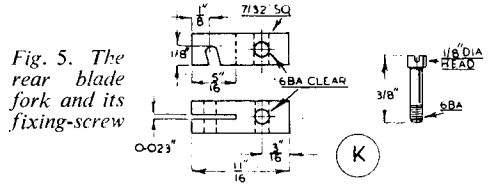


Fig. 5. The rear blade fork and its fixing-screw

The front fork is now centred in the four-jaw chuck and its end, after being shouldered down, is threaded 2 B.A. with the aid of the tailstock dieholder.

The machining of the tensioning nut (*J*) requires no description, but the fork collar (*H*) should have its tenon machined or filed accurately

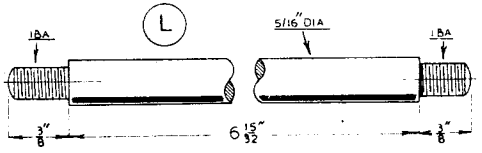


Fig. 6. The rod forming the frame back

to size, so that it will remain in place after being pressed into the hanger between the vice jaws.

The finished parts can now be assembled and, if the frame has been correctly made, the saw blade will lie exactly parallel with the frame back, and, in addition, changing the position of the blade in the frame will present no difficulty.

PRACTICAL LETTERS

Small Flash Boilers

DEAR SIR,—I have read with some interest Mr. Ward's article under the above heading, and having had exactly the same thoughts some two or three years ago in connection with firing a Cornish type boiler with gas, it occurs to me that he may be interested in the practical efforts that followed.

The boiler is a Cornish Trentham type, 4 in. diameter × 14 in. long with 2 in. diameter furnace tube having five ½ in. diameter cross-tubes in the back half. The primary heating surface is approximately 103 sq. in. It is brick set with the correct flues.

I had been firing this with a Bunsen type gas burner mounted centrally in the furnace front plate which gave an evaporation of approximately 2.3 lb. per hr. at 35 lb. per sq. in. gauge. This ran a small ½ in. bore × ¾ in. D.A. slide-valve engine for hours, but when I finished and connected up a pumping set of ¾ in. × ¾ in. stroke (80 per cent. cut-off) the pressure gauge "wilted" and the boiler could not "cope."

At this stage, thoughts turned to ways and means of raising more heat from the fuel burnt, as it was obvious that the boiler efficiency was a lot worse than it should have been. Radiation was the first thought, a gas-fire element was obtained and carefully cut down to suit the burner.

This element glowed to a bright orange and looked good, but the results were most disheartening.

The evaporation certainly improved, but only to about 3 lb. per hr., as the pumping set could only be run at slow speed if boiler pressure was to be held.

The burner consumed 20-25 cu. ft. hr. town gas. The evaporation figures given are not exactly to the best laboratory limits admittedly, but are taken from my rough notes at the time of the tests, and give a guide to results.

The "radiant" idea was abandoned, and a "sprayer" ("all same" oil burner in effect) type gas burner made up with a mushroom head having four holes drilled radially at about 30 deg. to which "plain" gas was fed—no air mixture.

Having four pea-light jets about 9 in. long when out of the boiler I thought that these would impinge on the flue tube and "conduct" the heat. I had overlooked the fact that it would not induce its own draught like the bunsen burner.

An I.D. fan was made up, and the burner then got down to work making a noise like a VI. By adjusting the fan speed and gas supply, a beautiful blue mass of flame filled the furnace tube and the evaporation went up to 5 lb. per hr. at 45 lb. per sq. in. with no trouble at all. The gas consumption remaining the same. I have not yet had a full evaporation test with this burner, but I feel sure that it will be well over the 5 lb. per hr. obtained with normal firing as above.

In my experience, as related. it appears that whilst there is a case for the radiation principle, the conduction gave the real results, but I am going to try combining the two.

I have no experience of flash steam boilers, but suggest that Mr. Ward will find that the first one or two "spiders" in his furnace tube will take on a radiant glow whilst any that follow will not glow at all. My radiant burner set-up needed very careful adjustment to keep the whole element hot. If the flame deviated, black spots developed.

I would suggest that "Pyruma" fire cement might be suitable for the elements. It can be obtained from most builder's merchants, but is rather expensive, I believe.

I don't think I have been very helpful, but I shall be very interested in the results obtained by Mr. Ward, and look forward to another artiele from him in due course, and hope to "infringe his copyright" if he is successful.

Yours faithfully,

Sydenham. W. E. BROCK.

DEAR SIR,—The following remarks may be of general interest in connection with Mr. Philip Ward's article on small flash boilers in the September 25th issue.

The star shape he requires can be moulded out of "furnace plastic," a material somewhat like fireclay, used in almost all boilers where a curved or pattern surface has to be formed, in a combustion chamber or furnace. This material is water-mixed and set up by hand; once fired, it is permanent.

To get the small amounts required for model work from one of the regular suppliers would result in at least a sackful being supplied. It is, therefore, suggested that those interested look in the 'phone book for a firebrick or boiler contractor in their vicinity, take their boiler, etc. along to show the foreman, and see if he will not give you enough and to spare for the job.

In a general way, boilermakers and boiler shops are very interested in models and model makers, and the bits of tubing and odds and ends can be obtained better, quicker and cheaper from such small shops than from the larger suppliers, who just cannot make enough on these little deals to be worth the trouble.

Further on flash boilers, we have been getting down to the subject in sizes of 85 h.p. and 1,500 pounds sq. in. and find a very practical way is to wind at least four layers of tubing, each layer in opposite direction to the preceding one, to counteract the twisting on expansion, using the outer layers for the cold water and taking steam from the inner layer. As regards efficiency of flash boilers, the only big power station boilers being built now, are nothing but flash boilers, even if they are 100,000 and more horsepower. They have usually but one little water drum and the rest is all tube, with plenty of "furnace plastic" on the water wall tubes. Pressures are up to 2,500 pounds and temperatures up to 1,100 deg.

Fowlers Mechanical Engineers Handbook, 1944 edition (published in England), on page 191, has some real information on surface com-

bustion, and having seen some of these burners operating here, the results are amazing.

I would be interested to know if anybody ever made any model boilers on these lines, and the results obtained.

Yours very truly,
San Mateo, California. G. ROSEKILLY.

DEAR SIR,—I was very interested in Mr. Ward's article on increasing the efficiency of small flash steam boilers, by increasing the amount of radiant heat available (issue of September 25th).

In the course of experimental work on which I was engaged some time ago, I was faced with a similar problem. (Not connected with boilers, but the conditions were rather similar.)

We experimented on similar lines to Mr. Ward ; but it was found that wire radiants were to be preferred to clays

Our radiants were coils, plaited coils, or just tangles of Brightray wire (as used for electric fires, etc.). These became incandescent, and very greatly increased the radiant heat available. Even a few pieces of stainless-steel swarf would serve. The exact nature of the radiant to suit a given boiler would have to be found experimentally, of course. Some sort of a simple clay former may be required, or stainless-steel could be used.

Incidentally, asbestos, as suggested by Mr. Ward, will almost certainly disintegrate. Asbestos is merely fireproof, it is not a very satisfactory refractory.

For purely experimental purposes, clays can be made from the fireproof cement sold in a putty-like form for mending fireplaces. This is moulded in a wooden mould, and, if the shape is such that, when set, the clay cannot be withdrawn from the mould, the whole is *slowly* fired, to first scorch, and finally burn away, the wood. I have used this method with fair results to make clays for bowl-type gas-fires of obsolete type ; but I add the warning that about 40 per cent. scrap is to be expected.

Yours faithfully,
Lancaster. W. S. CARTER.

Parting Tools

DEAR SIR,—As your correspondent Mr. R. M. Longden-Thurgood says in his letter in your issue of October 16th, it is true that the general impression is that " parting-off " is much more satisfactory when done by a tool in a toolpost at the rear of a lathe cross-slide instead of the front. The reason this should be so is that usually the rear toolpost is of reasonably robust construction and is rigidly bolted direct to the cross-slide. Furthermore, this leaves the front position free for using other tools operating on the same work-piece.

In actual fact, " parting-off " should be no more difficult at the front than at the rear, provided there is adequate tool support. This condition is, however, not met by the design of many compound tool rests and that is why we ourselves mount our 4-way toolpost direct on to the cross-slide in place of the compound slide assembly, which is quickly detachable. For anyone requiring it, we can supply a cross-slide for our " Little John " lathe having a sturdy rear toolpost for parting-off or other operations and the standard compound slide assembly at the front, which latter can, when required, be quickly exchanged by our heavy type 4-way toolpost. This arrangement enables a much larger and substantial 4-way toolpost to be used than is possible on the face of the top-slide.

Yours faithfully,
p.p. Raglan Engineering Co. (Nottingham) Ltd.,
(BERNARD J. WADKIN, M.I.Mech.E.)
Managing Director.

Hot Air Engines

DEAR SIR,—Knowing that many of " ours " are interest in the above subject, I know of one that can be got at scrap price. It is a Robinson, power cylinder, 6 to 7 in. bore and stroke; I put it at $\frac{1}{4}$ to $\frac{1}{2}$ h.p. It seems in fair order, but piston stuck after years of lying up after electric light was fitted in the hall, in which the engine used to drive a fan. The displacing cylinder is at right-angles to the power cylinder, and it appears to be cooled by means of laminated plates in the engine base. It has two gas taps, one small one appears to be to warm up the castings before a start is made. I intended to buy it, but it is too large for me. It must weigh two to three cwt. at least, and it will require a set of $\frac{1}{2}$-ton blocks to lower it, unless taken to pieces *in situ*. I shall be pleased to put any one interested in the way of seeing this engine.

Yours faithfully,
Weston-super-Mare. R. F. M. WOODFORDE.

Steam Ploughing

DEAR SIR,—I have read with great interest, all items on the subject of the traction engine and steam road locomotion generally, and find the subject most absorbing.

With regard to steam ploughing, and the photograph reproduced in the issue of November 13th, there has recently been a revival of interest in this type of cultivation in Lincolnshire, and engines have been busy ploughing or dragging at several places in the county this autumn. In one case, a pair of Fowler's, which stood idle for the past nine years, were sold to a farmer, retubed and steamed for the 40-mile journey from South to North Lincolnshire where they immediately went to work with a drag, tearing up the hard stubble fields. These are Nos. 15332/3.

Another pair, Nos. 15154/5, have also changed hands, and during November they, too, made the journey from South Lincs to their new home just west of Lincoln City. They will be deep cultivating next year.

During the last six months, it has been my pleasure to seek out any engines still in existence in this district, and I now have a list of some 40 traction engines which have escaped the scrap dealer's cutter. These are mostly agricultural types. There is a scarcity of road locomotives and the five-ton tractors are very few indeed, only four having been observed, all Fosters. One of these is converted into a roller and works in the Boston district. This is No. 14511, and was originally a showman's tractor.

Yours faithfully,
Lincoln. D. H. YARNELL.