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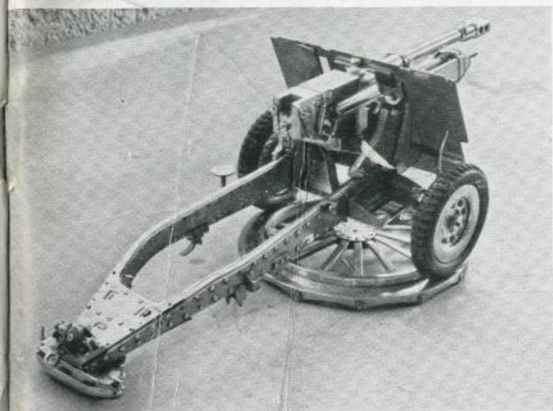

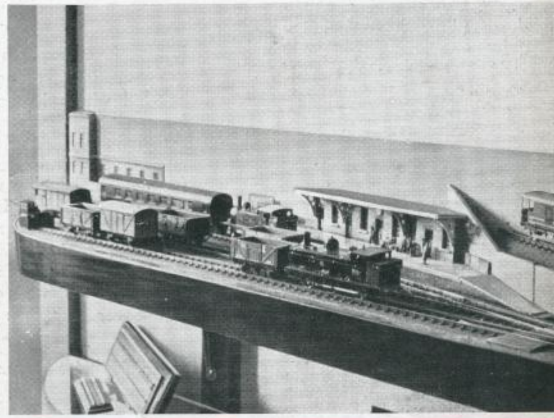

VOLUME I NUMBER 10 (New Series) SEPTEMBER 1951

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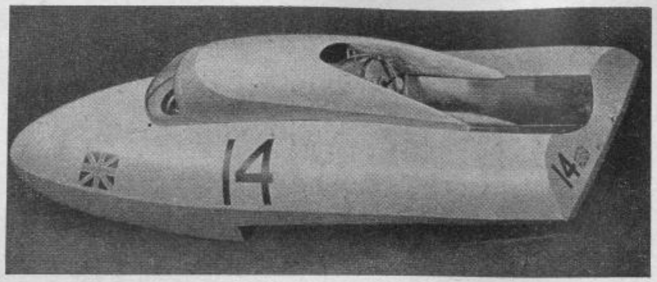

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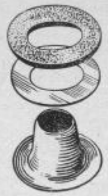

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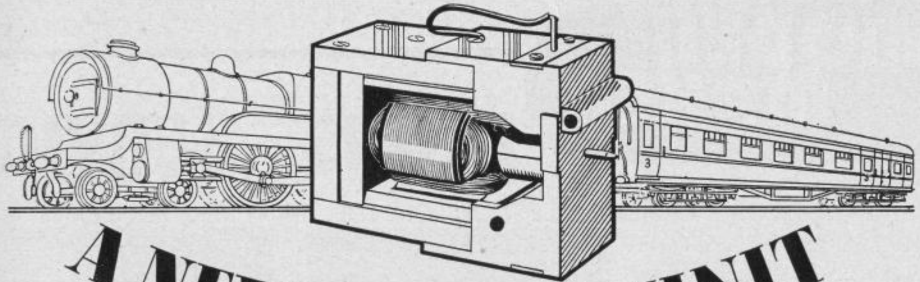

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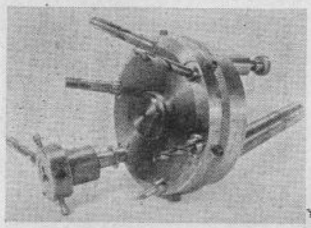

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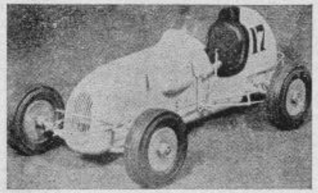

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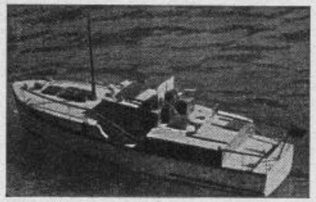

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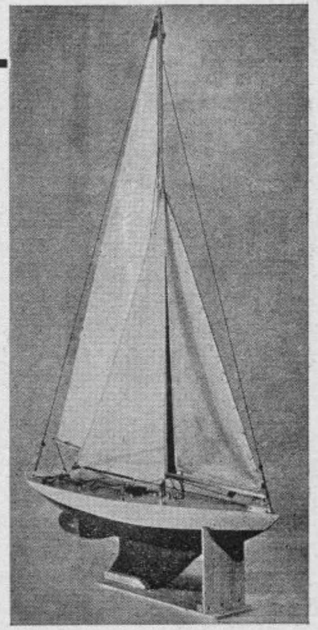

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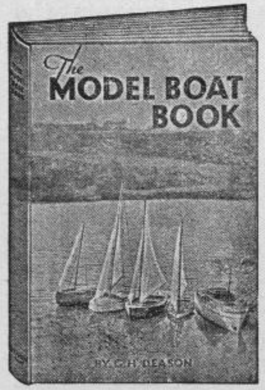

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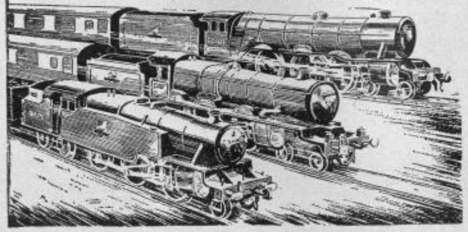

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THE MONTHLY JOURNAL FOR ALL MODEL MAKERS

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Contents

"The Days are Drawing in"

AT any moment now someone will be making the brilliantly original comment that the days are drawing in. This to our mind is as much the herald of our winter season as the first cuckoo announces the arrival of spring. To some it is a harbinger of doom, suggesting the snowing up of outdoor layouts, the end of summer sailing days, and the regretful packing away of the power boat which ought to have won the club championship for another period of hibernation.

But to many more it means carpet slippers before the fire, renewed activity on the 00 gauge layout, or a long delayed start on some ambitious project that has been brewing up for many months while essential work in the garden took seasonal precedence. Those with cold workshops may be giving an anticipatory shiver, and making a note to lay in some more of that chilblain cream, others with power in hand to heat their electric fire will be rubbing their hands gleefully.

Which makes us wonder why do model makers so often endure winter hardships in ill-heated workshops —often nearly as ill-lighted, when for a comparatively small outlay of time and money they can pursue their hobby in comfort? Like the man whose bench is always in a muddle, who is going to clear it up one of these days when he has time, we fear it is really a matter of putting off what seems less important than the job of the moment. But is this old tradition of taking our pleasures sadly quite such a good or necessary thing? If power is laid on to supply a lathe it can only be a matter of an hour's work to fit another point for a fire.

Again, what of those unfortunates who have managed to turn out such splendid work on their kitchen tables, disguised dining room workshop-cabinets and the like? Can they not bestir themselves during the last few weeks of outdoor weather to knock up a real workshop of their own in the garden. In spite of rising prices everywhere it is still possible to get a stout little portable shed large enough for the amateur's needs at a fairly modest figure—particularly as deferred payments are available, which can be regarded as no more than rent. Such a little shed, say 10 ft. x 8 ft. can be erected in a few weekend hours with the help of a clubmate or neighbour, and will enlarge enormously its proud owner's scope, or serve as the home for a really ambitious layout established on a permanent basis.

We should be very interested to hear from readers with workshop or layout problems and how they have tackled them.

ON THE COVER . . .

Top right: Tudor style Doll's House from the Northern Exhibition. Centre left: Model 25-pounder Gun from B.A.O.R. Centre right: Moor Junior with his "Big Little 'Un" at Shelsley. Bottom left: One of the scale model boats seen at Wicksteed Park Regatta. Bottom right: Part of the Peco layout at Seaton.

Above : L. S. Pinder of Maiden silhouetted by a cloud of spray as he launches his Douglas Cup winner "Rednip" which recorded 62.6 m.p.h. in the 10 c.c. class

Heading, right : shows the elegant Rescue Squad manned by Sea Rangers, who contributed a pleasant touch of feminine charm along with considerable nautical skill to the Laughing Mater meeting.

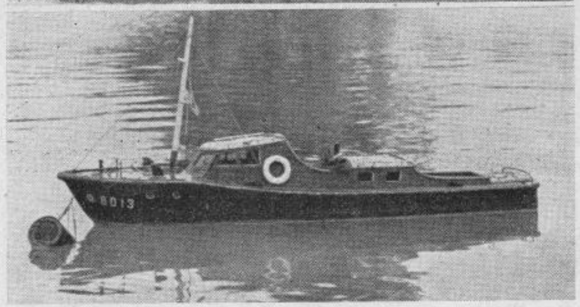
Below : Moored in peaceful waters at the south end of the lake whilst the hydroplanes did their stuff was this fine ocean yacht "Lady Marion" powered by a 2 c.c. E.D. diesel unit. It was built by K. Brownridge of Bedford. The lower picture shows an attractive R.A.F. launch, which did not however appear to take part in the contest.

Recent Powerboat, Steering & Radio Control Contests

Wicksteed Regatta

IN spite of unpleasant weather conditions from a spectator's point of view some excellent racing was seen, and humidity must have suited some of the engines for J. Innocent put up a new record over 1,000 yards in the Newman Lowke Cup, clocking 38.3 secs. to achieve a speed of 53.406 m.p.h. with his *Betty*.

Betty also took the Timpson Trophy for 500 yds. at 57.136 m.p.h., giving the visiting Victoria Club another two trophies for the clubroom. Our old friend Mr. Pinder, who has achieved some distinction with his experimental model cars, showed that he has all his old skill in the powerboat department by winning the 10 c.c. Douglas Cup over 300 yds. at 62.6 m.p.h. G. Lines won the Paten Cup for 15 c.c. boats over 500 yds. at 58.108 m.p.h., with his *Sparky*, which continues to put up convincing performances.



A number of attractive craft were out for the steering competition, in which the Whitworth Cup fell to K. Brownridge of Bedford with *Wye*, scoring 6 pts. out of a maximum of 15.

Interesting details of attendance are: 82 visitors for lunch—140 for tea. Ten clubs competed, putting in 19 boats for the Locc event. Visitors included Mr. Mitchell from Runcorn with *Beta II* and *Gamma II*, and Mr. Cockman of the Victoria Club with *Ifit*, which, however, developed trouble with steam coils on its first run. However, club mate *Innocent* more than showed the club flag, in breaking last year's record over 1,000 yds. set up by Mr. Williams.

For those who have not sampled the joys of Wicksteed Park may we urge them to "have a go". There are an infinite variety of reasonably priced amusements to keep the younger element out of mischief, including pony rides, miniature railway and refreshments, so this can be a trouble-free family occasion.

Radio Control in the Thames Valley

(Reported by Bill Warne)

IT may appear that an enthusiast in model car racing and model aircraft has no business reporting on a model boat meet; however, as the accent was on radio control I make no excuses. Laughing Water, which is a natural pool situated on the Rochester road not far from Gravesend, was crowded with spectators when the Thames Valley Radio Control Club held a meeting on Sunday, July 15th.

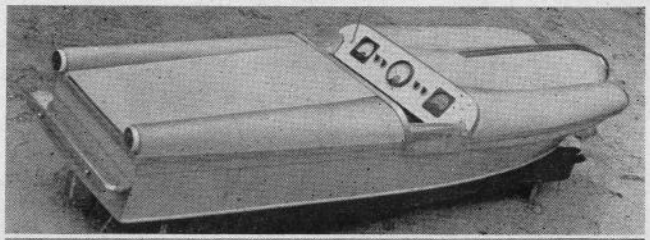
Mr. Riser's *Queen Mary* performed well, with his freelance effort, unnamed, resembling a Mercury car in appearance, built of ply and obechi, driven by a 24-volt motor, running it close.

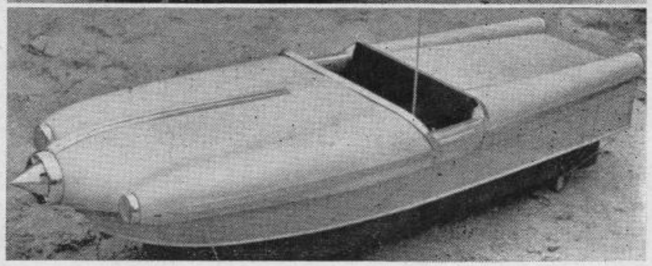
Mr. A. E. Bugg made a good showing with *Daffodil*, and Mr. Parfit's *Obedience* was certainly well named. This model has a clockwork actuator and a light system to give visual sign of any disobedience.

Practically all the radio apparatus on view was personally made or adapted. It was noticed that a number of the members used a table tennis ball on a line as "marker buoys" for rescue operations in event of a sinking.

Squads of Sea Rangers sold programmes and manned (hardly the correct word) two dinghies for possible rescue operations.

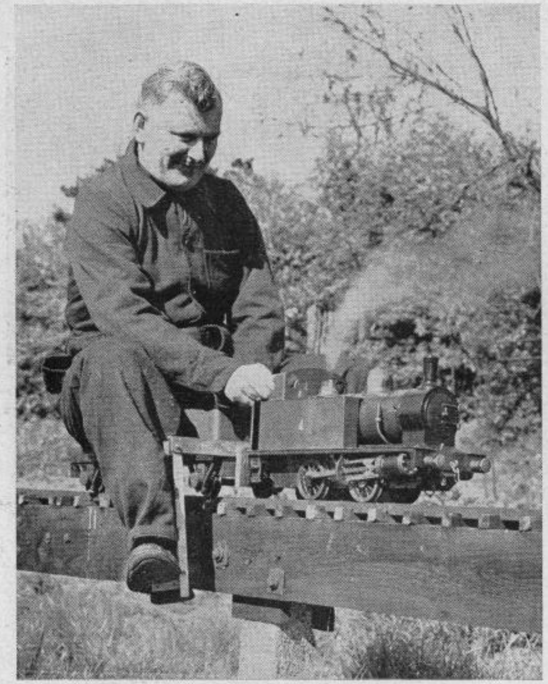
Finishing with an undercover note to Jerry Cann, Messrs. Gascoigne and Sullivan were noted in the vicinity and rumour of a joint effort in the R/C boat direction was heard.





Centre : Enthusiasts starting up their hydroplane during the Wicksteed Regatta. The craft is shaped just right for a good knee grip! R. Riser's unnamed boat, that surely could only be called "Mercury", resembling as it does this ultra modern car. Early car manufacturers went to boat builders for inspiration—this represents the full turn of the circle.

Model Maker Photo Contest



Readers have been a little shy in submitting quality pictures for our monthly Photo Contest, but we are happy to offer here a first selection of worthwhile entries. To remind those who have not yet submitted photos we reprint the classes below—and will welcome a bumper post.

Best of the month prize goes to Mr. Bennett for his workshop interior, which apart from being an excellent photograph catches the higgeldy-piggeldy atmosphere of the average kitchen table model-maker, who in this instance evidently divides his attention between boats and cars.

We also like Mr. A. Smith's high speed soldering bit as a good piece of close-up work. Apart from which the tool was made up from old radio junk, and may be featured as a constructional article in a future issue.

Mr. Dyer's passenger carrying tanker also conveys the happy spirit of an enjoyable run on the club track, and must be considered a close runner-up to the month's winner.

The finely detailed boat by Mr. Morgan is only 30 in. long, and is built with watch-precision—the builder is a watchmaker—and took ten years' spare time to finish. Alas, it was badly damaged by his small daughters and he has no heart to spend the necessary time repairing it !

The small track layout picture submitted by the Ickenham and Dist. S.M.E. is interesting in that it provides evidence of four separate branches of modelmaking — railways, bridges, architecture and buses.

Finally, there is Mr. Hamer's yacht picture, taken at the Northern Models Exhibition, and a good example of picture taking under difficulties, where it would not have been possible to remove the subject to a more neutral background.

Remember this monthly contest is primarily to encourage good photography amongst our readers, who should not therefore be too diffident regarding the quality of the models portrayed.

Section 1. Passenger carrying locomotive by Norman Dyer, Kenton.

Right : Section V. Close-up of High Speed Soldering Bit by A. Smith, Saltford, Nr. Bristol.

Section VI. Workshop Interior by A. W. Bennett, E. Farleigh, Nr. Maidstone.

CLASSES & BRIEF PARTICULARS OF "MODEL MAKER'S" PHOTO CONTEST

Section I.—Model Railways, including individual models, scenic layouts, lineside buildings, of any gauge, indoor or outdoor.

Section II.—Model Sailing Craft, individual models, sailing pictures, regattas, or exhibition models.

Section III.—Model Powered Craft, speedboats, scale ships, working or exhibition models.

Section IV.—Model Cars, scale models, racing cars, indoor or outdoor pictures.

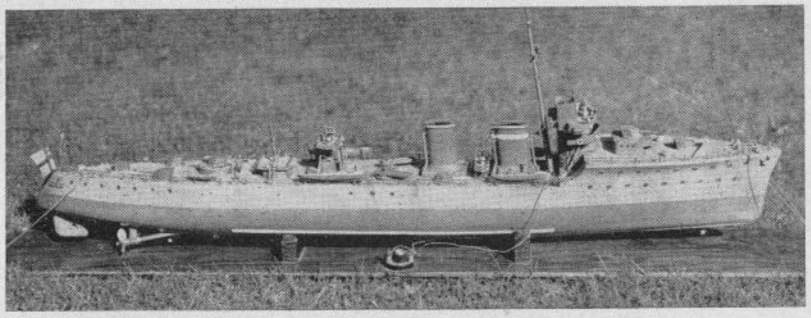
Section V.—Close-up section showing detail work on any class of model or home workshop set-up.

Section VI.—Workshop interiors, showing work in progress on a model, or home workshop in use, with model maker at work.

All pictures used paid for at 10/6, with best of the month at £1/1/-. Five 10/6 prizes monthly plus £1/1/- prize.

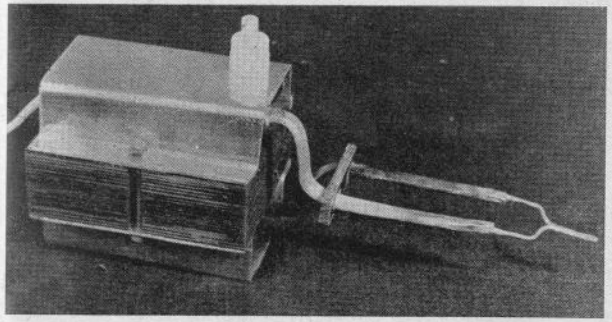
Each month's winner goes into final with further prizes of £5/5/-, £3/3/-, and £1/10/- for "pictures of the year", plus consolations of 10/6 for three next best.

(*See April, 1951, for full particulars.*)

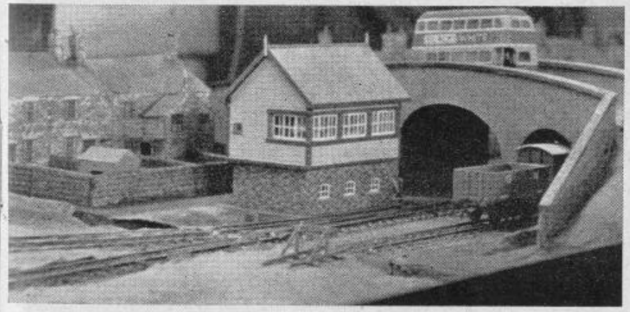


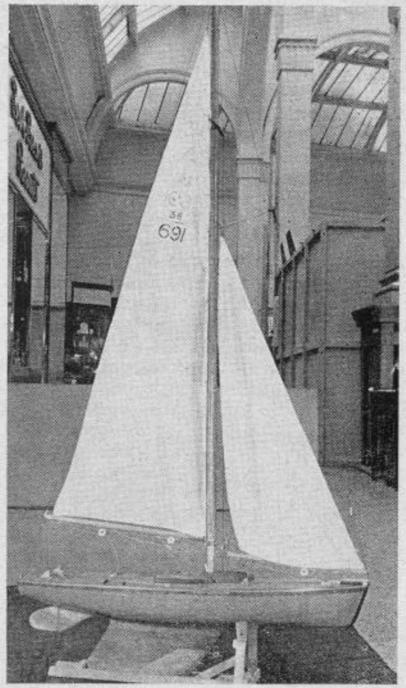
Left : Section III. Powered Scale Model by L. H. Morgan, Winchester.

Right : Section I. 00 Gauge Layout by Ickenham & Dist. S.M.E., Hayes, Middx.



Right : Section II. Model Sailing Craft. 36 in. Rest. Yacht by F. Hamer, Manchester.





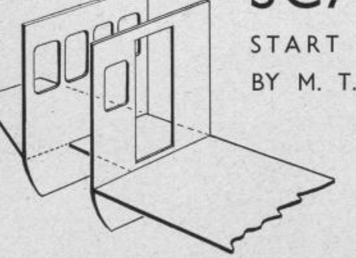
SCALE MODEL BUSES

START BUILDING A FLEET THIS AUTUMN

BY M. T. DEVE

FIG. 1

BULKHEAD & FLOOR ASSEMBLY

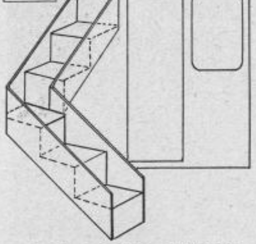


THIS is really a sub-division of that interesting hobby of making scale model road vehicles, and the article should come in especially useful to readers with 4 mm. scale model railways. It is a hobby that I can recommend to anybody with a reasonable knowledge of model making, and it is a real satisfaction to see a completed vehicle in front of you, that you have fashioned from mere pieces of card and wood. It is also very cheap, an average bus can be made for about sixpence. There is a vast range of prototypes to choose from, and they carry practically every colour of the rainbow.

The one I have chosen is a Midland "Red" double-deck FEDD type bus. It is an interesting little model as it has a front entrance and is fairly easy to make. To start off with it is necessary to obtain a few photographs of the bus, and a drawing or blueprint, which the owning company will usually supply. The first job is to fashion the bottom floor from fairly thick card. The spaces for the wheels and steps should also be cut out now. To this is fitted the front bulkhead, which is cut from slightly thinner card, and you should make sure that they are flush with each other before they set. This is most important, as this first assembly forms the framework for the whole vehicle. Next the second bulkhead is fitted; this is cut from the same material as the first bulkhead and is the same width (see Fig. 1).

The seats occupy our attention next. A bus of this type has fifty-six seats and that means twenty-eight double seats each 1/5 in. x 1/5 in. x 2/5 in. altogether. For the lower saloon twelve double seats are required and two single ones face towards the centre over the wheel arches. The rest of the seats are put on one side and kept for the upper deck.

FIG. 2



STAIRS & SECOND BULKHEAD

Stairs always mean difficulty for the beginner, and I think that the best thing to do is make your stairs of two flights at right angles to each other and not worry about curved ones. For this take two pieces of paper about $\frac{1}{4}$ in. wide and fold them concertina fashion. Glue them together at right angles, trim to the right length and fit them in place (see Fig. 2).

Having completed the model this far, the next thing to do is to cut out the glazing for the windows from celluloid and glue in place. Cut the driver's seat from cardboard and glue it in place by means of a card bracket.

I have decided to deal with wheels and axle boxes in this section, so that the chassis may be finished. I am assuming that most readers will not have a lathe and will not be able to turn their wheels, and I think the next best method is casting in lead. For the pattern obtain four $\frac{1}{2}$ in. dia. wheels and make the mould out of plaster of paris in a wooden frame. Do not forget to grease the wheels before putting them in the plaster. Should you be able to buy new wheels, of course, all the better, but I find them difficult to obtain in any great quantity.

For the axle boxes take several odd pieces of balsa wood and make two boxes. Each box should allow plenty of clearance for the wheels and the small amount of sideplay for the axle. The axle itself should be either a metal rod or a matchstick sandpapered perfectly round. I have developed a most efficient way of spring for the wheels. In fact one of my buses will heel over about 15 deg. from normal without the wheels leaving the ground. This was achieved in this way. I glued a small block of wood to the lower floor about halfway between the axles. To this I glued a piece of bone, such as is used to stiffen shirt collars. An axlebox was fitted to each end of this (see Fig. 3).

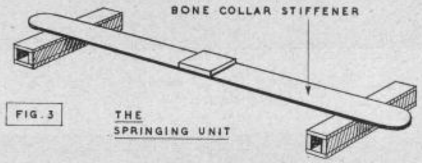
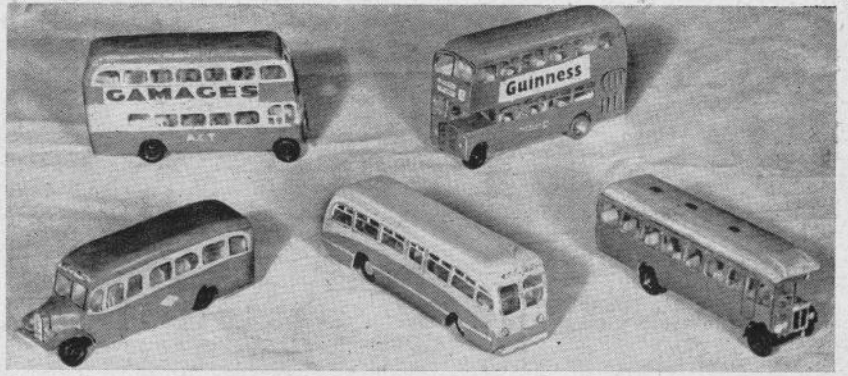


FIG. 3 THE SPRINGING UNIT

On the next piece of work depends the whole appearance of the completed model — that is the cutting out of the sides. The most difficult part is the forming of the sweeping curves on the corners. The Modelcraft plans suggest the method of side laminations, that is three layers are used. They are knitted together and so give plenty of bulk to be smoothed off. It is difficult, however, for beginners to get the measurements quite correct, and I would suggest that for your first model you ignore the curves at the back of the bus—it will probably not be noticed.

To start the cutting out of the sides first equip yourself with a sharp razor blade and some post



Some of the author's fleet of buses, which offer a wide variety of types, both single and double decker, pre-war models and the latest streamlined coaches.

cards or similar material. Draw out the sides and ends, taking measurements from your blueprint. For this vehicle you will require nearside, offside, front, back, cab front and windscreen and car nearside wall. For the glazing thin celluloid is the best and it should be glued to the sides along part of one side only, to allow it to expand freely and not take the side into a buckle, which would ruin the whole model.

Your sides being finished you can now fix them on to the basic assembly. Glue the offside first and make sure it is perfectly square before the glue dries. Now add any cab fiittings you wish such as steering wheel, dashboard, etc., and fix the back, once more ascertaining that it is square with the offside. You should have fifteen seats left over from the first stage and they should now be glued to the upper floor. This should stop short about $\frac{3}{8}$ in. from the front if you wish to fix a moveable destination blind. This should be cut from dry tissue paper, if it is damp the ink will run. Write any place names you want, and glue each end to a thin wooden roller. These should stretch the full width of the bus and run in small card bearings, which are glued to the front. The blind is moved by rotating one of the rollers, and an opening flap in the off side gives access to the mechanism. If you are doubtful about this see Fig. 4. Now take the cab front and side and fit them in place. Last of all comes the near side which is glued in place, so completing the second stage.

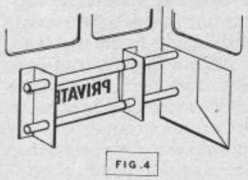


FIG. 4 THE BLIND MECHANISM

Your bus is now gradually taking shape, and you must give it a roof. Pine is the ideal wood, but it is difficult to shape, so I advise balsa. This is easy to shape, as it is soft and you can buy it in sheets of the right thickness, $\frac{1}{4}$ in. When you have shaped the roof you can glue it in position, and if the sides have been assembled squarely it will sit on top without any movement. While you are working in wood the bonnet should be shaped and fitted in place. First cut the radiator, either from wood or from several layers of card. If you like fiddly work you can cover it with silver paper. I have done this to several of my buses and it looks most effective. Headlights can be cut from wood and covered with silver paper and the mudguards are made from card and rolled on a round pencil. Mirrors give an air of completeness and they can be made from strips of wood and card. Lastly, the step is glued in place and the model is ready for varnishing.

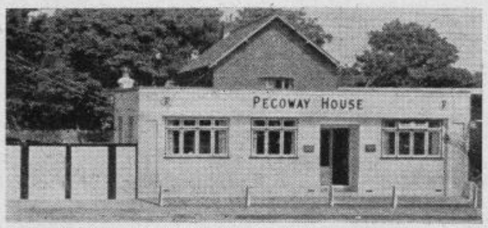
Use shellac as a varnish. It is undoubtedly the best for this type of work. The colour for this model, by the way, is brown inside and red outside. The roof is painted silver or aluminium. There now remains one thing, the lining. This is done with an easy flowing paint and is applied either with a small brush or a mapping pen. If you use the latter only dip the extreme point of the pen in the paint and wipe the nib clean after every stroke. The name is treated similarly, and if you like you can shade it black. The model is now finished, and if you have taken reasonable care you will be proud of it.

Trolley buses make impressive models, especially if you can rig up overhead wires on your layout. Single deck trolley buses seem to be on the way in, so plenty of choice is assured. It is quite easy to fit the trolley arms. Two holes are drilled in the roof and two fairly short pieces of dowel put in. These have a small piece of wood left on the top and the trolley arms are hinged to this with wire. A rubber band is slipped over each arm to act as a spring (see Fig. 5). It should be quite easy to fit an electrotor in and you can then have the pleasure of actually seeing your model move.

FIG. 5 TROLLEY ARM

D. J. LAIDLAW - DICKSON VISITS PECOWAY HOUSE & DISCOVERS

THE MODEL RAILWAY AS FURNITURE



Pecoway House stands with its door invitingly open.

WHEN we discussed Pecoway specialities with their inventor and proprietor S. C. Pritchard at the Model Railway Exhibition earlier in the year, we were quick to take up his proffered invitation to visit him at Pecoway House, which has the very special summer advantage of being with fifty yards of some of Devon's more attractive sea coast at Seaton. Choosing that pleasant heat wave, which may by now be little more than a memory, we spent a very enjoyable weekend looking over his distribution centre, the famous Peco Technical Advice Bureau Headquarters, and admiring S.C.P.'s own precision 3½ mm. layout and its delightful details. Though, as he reminded us, the cobbler's children are always worst shod, and we must not under any circumstances expect that it would ever be finished!

It must be a real pleasure to work in the surroundings of Pecoway House, which as our illustration shows, is a bungalow building in the modern style. The larger building in the background forms the main store and is stocked from the company's factory at nearby Sidmouth. Pecoway House itself serves the dual purpose of housing the administrative part of the business, the Technical Bureau with its own test layout ,and another little layout along one wall of the entrance hall.

This layout so impressed us that it forms the title of this article—The Model Railway as Furniture. Originally it was designed and laid out to form part of a moving display on the Peco stand at the Model Railway Exhibition, demonstrating the Peco Simplex Auto Coupler. After the exhibition it turned up again just about the time the office was being decorated and furnished. Nothing could have been simpler than its installation along one wall of the entrance hall—and there it might well have served its original purpose without change in status. But the bright thought occurred of making it not only functional but decorative. A neat cabinet with drop flap like those designed to house one of the larger radiogram outfits was built in under one end, and glass shelves added under the layout to complete this piece of built-in furniture. In many homes it might be more popular to fit wooden shelves in lieu of glass, and house one's model library below. The cupboards beneath the cabinet serve to retain the rolling stock when not in use.

The overall dimensions are approx. 10 ft. long by about 14 in. deep. This could be modified to fit a modern lounge fireplace recess, or take up part of a facing wall.

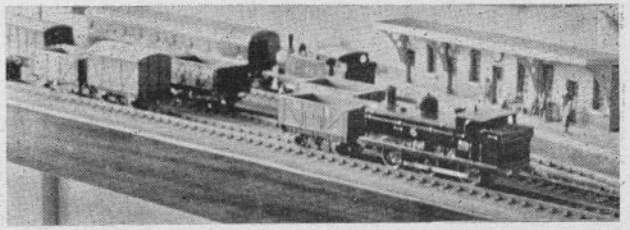
Our close-up pictures of the layout show Pecoway Station, with a tanker busily shunting goods trucks. The other picture portrays the "blind" tunnel mouth that ends the layout over the operating cabinet. The loco peeping out is of special interest as it was built up from a Marks & Spencer's plastic casting which has passed through the magic hands of F. J. Roche. No alteration was made to the basic casting, which is incidentally slightly short on scale, but the whole has been painted up and suitable detail added to make a very useful addition to any enthusiast's rolling stock—and all for a few shillings only, plus, of course, a lot of "know how".

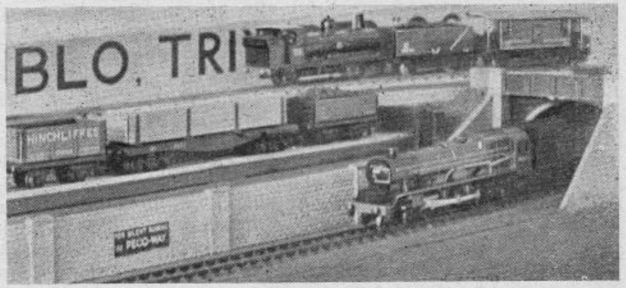
For normal private use the would-be imitator of this model railway furniture, would probably make certain changes. The high level lines for example are there purely for show purposes and do not form part of the working layout. By keeping them at approx. the same level two more lengths of track could be brought into operation.

Those who fancy the appearance of the dummy tunnel may be interested to know that Peco are now making a special tunnel mouth set for scale layouts. This comprises tunnel mouth and two abutments—available in two degrees of slope—and is made up of plaster finished in the most realistic stonework we have yet seen.

After enjoying the operation of this little layout which the Peco Simplex Auto-Coupler system makes so realistic in operation, it was something of a change to go into the Peco Technical Bureau, where their "civil engineer" was just putting the finishing touches to the series of test tracks encircling the room.

In spite of this addition the room is still capable of its normal function of handling model railway queries from correspondents throughout the world. We are prepared quite unblushingly to lift the idea of this layout for our own office. Briefly, it utilises a shelf extending about 10 in. from the wall, running round the four sides of the room, and placed at a level of about 4 ft. 6 in. from the ground. Thus normal office desks, filing boxes, correspondence files and work tables can be placed beneath it without one in any way interfering with the efficiency of the other. Two walls are broken by doors, but a hinged "drawbridge" type of flap can be lifted and replaced in about twenty seconds to permit entry.





Above: Two close-up pictures of Pecoway Station with much shunting in progress, and the Marspen Express coming out of the dummy tunnel.

Only improvement we would have suggested is to install either peepholes or warning lights to prevent impetuous entry.

On the shelf there is room for two tracks of 00 or similar size and a further test track forTT. The special deep section Peco-rail is used by virtue of its universal adaptability to all types of rolling stock. As many readers will know, part of the Peco service consists of their Technical Advice Bureau which answers queries. The staff do not claim to be all-knowing and much of their work is to test all the more popular commercial products, and find out practically the answers to posers which could be glibly disposed of "theoretically" without providing any real solution.

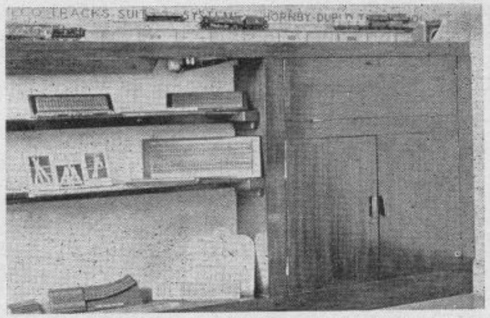
Model railway enthusiasts are cordially invited to take any rolling stock they may wish to test for a trial run on this track, which suits all standards in 16.5 mm. gauge and TT 12 mm. gauge. This is a genuine offer and should encourage the small gauge modeller to take his holiday in some part of glorious Devon within reach of Pecoway House.

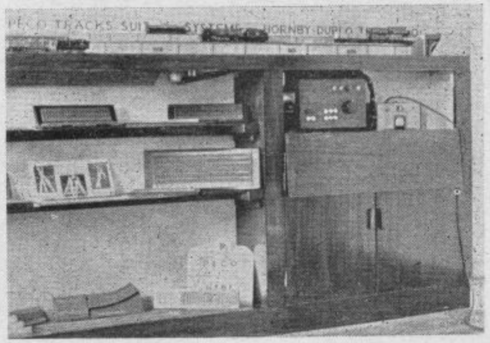
After an interlude on the beach with our host, when we were inveigled into spending some part of our leisure in making up track in the comfort of a deck chair, we repaired to his home where his own layout was in operation.

This we venture to say will rank amongst the most attractive bijou layouts in the country if he can ever bring himself to say: "It's finished!" This, like that at the office, is no more than 10 ft. overall length, but about 2 ft. wide. Everything is in 3½ mm. precision scale, with some really remarkable station buildings. These were made for him as periodic gifts by a friend unfortunately killed in the war, and represent the highest degree of scale finish likely to be seen. They include signal box, platform and parcels office, with finely detailed items such as miniature packing cases, hoists, handtrucks and the like.

One end of this layout contains a crafty turntable concealed in a scenic hill, approached via a tunnel. Trains can disappear within, be uncoupled mechanically, and return later in quite a different make-up, as though from the opposite direction. In addition locomotives can be bypassed into sheds whence they can again reappear fresh for more duty.

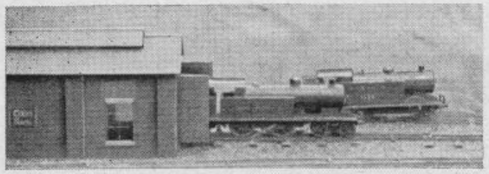
Below: Some idea of the layout as "furniture". The cabinet is shown in the closed and open positions. Instead of books trade samples are displayed upon the shelves in this instance.





The Kessex Railways

PART III OF E. L. KILLICK'S LAYOUT



REFERENCE to the plan of the site to be used for the railways (in Part II), will show that it is a plot of land approx. twice as long as it is wide, and with a frontage facing west south west.

The house, garage, offices and other buildings are all in the western half of the ground. Another house is situated on the north western boundary, and although it is not part of the same property it has an indirect connection, and until recently had a joint interest in the rented ground at the rear. For this reason it is included in the plan and map.

The "spare" ground at the rear, forming the eastern half of the site is the property of the local Liberal Club. At one time this was used as allotments, but at present is completely overgrown, and is to be brought under cultivation at a later date.

The ground falls from the front (west) to the rear (east), and to a lesser degree from north to south. A ditch runs across the ground dividing the cultivated part from the "spare" ground. Another ditch runs down the south boundary for about three-quarters of the length, carrying surface water from the western boundary.

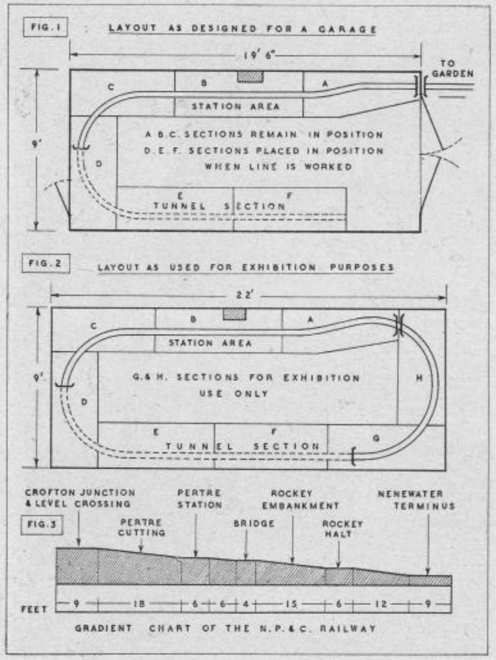


FIG. 1 LAYOUT AS DESIGNED FOR A GARAGE

FIG. 2 LAYOUT AS USED FOR EXHIBITION PURPOSES

FIG. 3 GRADIENT CHART OF THE N.P. & C. RAILWAY

The first thing to be settled was just where it would be possible and practical to build a line. Of equal importance was to decide where it was *impossible* to build, either because of natural obstructions or because of flower and vegetable beds. As a matter of fact I think one could almost make a point of ruling out "impossible" sections *before anything else*, as it comes hard on one when a good plan has to be altered because it would be passing through a bed of bulbs which, under no circumstances could be disturbed!

It was very apparent that the spare ground was only suitable for $3\frac{1}{2}$ in. or 5 in. gauge lines. Of the rest of the ground it was decided (and most fortunately agreed by all concerned!) that the garage would provide the ideal for an indoor section to house the locos and stock. From there at 2 in. high it could be taken up the side of the drive to the front boundary at which point it would be at or slightly below ground level. Continuing along the front and down the northern side to the house, a slight down grade would maintain ground level. From the back corner of the house, to and along the ditch, the line would again be raised from 2-3 ft. above ground level.

An additional route was possible from the north, by the back corner of the house, to the south, via a raised piece of ground and a lawn.

Now, as you may remember, the general idea was to have a double road main line, connected to the mainland, but of private ownership, together with a small independent single line branch.

The route from north to south via the lawn was a "ready-made" site for the branch line, while the long run from garage to rear of house via the front gave just what was wanted for the main line. The only problem left was where the connection to the mainland should be made—garage end or the other end. At first it was decided that the terminus of the main line should be in the garage, and through connection at the opposite end of the line. Later, however, this was completely reversed to enable the garage section to be built as portable section for exhibition and display work. Had this been the terminus it would not have given the continuous run required for display purposes. As a through terminal it would be possible to connect the "tunnel" section to the approach roads of the terminal to give continuous running (Figs. 1 and 2).

The next stage was the preparation of a map of the "island" which had to correspond as nearly as possible to the plan of the ground, at the same time having a fair resemblance to a map. Comparison of the two will show how the house and outbuildings are represented by high ground and hills. One ditch gives a river and the other a canal.

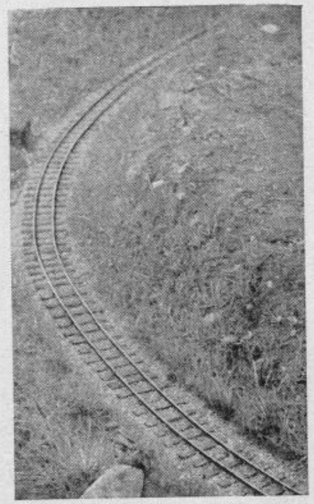
During wet weather the path from the front gate to the garage produces another river (being occasional it is, of course, a "bourne"), and this river goes underground to join the canal. This underground part of the river is a drain from the front of the garage to the ditch.

The drive being lower than the ground each side of it, produced Drivin Valley, while the spare ground is represented as plains and marshes (a very damp and boggy corner). Most of the names of towns, villages, rivers, etc., are derived from the surroundings, such as Garaville (garage), Offiston (offices), Pertre (pear tree), River Dyker (ditch), Libovian (Liberal).

The first surveys taken were only sufficient to give a general idea, and did not produce figures for gradients, etc. A more exact survey was therefore taken of the proposed branch line, and it was found that the total fell from Frofton Junction to Nenewater Station would be about 18 in. The total distance from end to end of the branch being approx. 90 ft. a continuous gradient of 1 in 60 would give this fall. However, the site of Pertre Station, Rockey Halt, Nenewater Station, and from Crofton Junction to the Pertre cutting, was required level. This left only 50 ft. to be graded and so 1 in 35 was necessary to give the required fall. Although this gradient is very severe, only two or three coach trains will work this line, and should not give any trouble on the graded section. A diagram of the gradients is shown in Fig. 3.

Unfortunately, as soon as the levels had been pegged there started a spell of very wet weather and actual construction work was considerably delayed. As soon as the weather improved the work was started and pushed ahead at good speed. Pictures in the last chapter show the Pertre cutting well under way. Further photos will be given later, together with a full report on the construction of the branch, and these photos will show the rapid strides made.

In spite of the bad weather time was not wasted, and attention was turned to the garage section. This as you will recall was to be one terminal of the "Island" line combined with a through station to the mainland via an undersea tunnel. It was also to be portable for exhibition work.



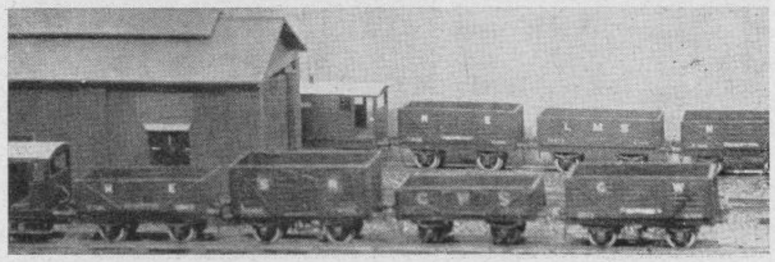
Part of the Kessex Railways layout in the garden. Natural features have been utilised to provide track problems exactly after fullsize practice.

The general layout of this section is to be as shown in Fig. 1 for normal operation of the line, and it would terminate in the "tunnel", but when on exhibition the line would be continued to join the approach line to the terminal, thus giving continuous running (Fig. 2).

The station was planned to fit three sections of baseboard fixed to three ex-Government wooden folding bed frames, giving a working height of 2 ft. This is rather low when standing to operate, but for exhibition purpose it is found necessary to sit down, and this gives an ideal height for this.

As the garage was still to be used as such the tunnel section will have to be removed when the line is not in use.

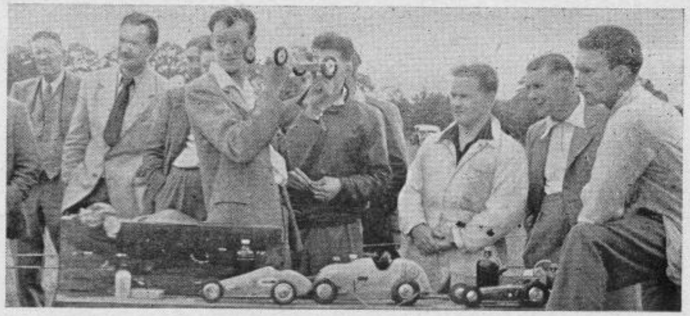
First reports of the construction work of the branch line are now to hand and will be dealt with in full detail in the next chapter.



Top left and right: The sheds and some of the rolling stock of the Kessex Railways.
(Photos are by the author)

M.G. TROPHY MEETING AT EATON BRAY

Left: A group of competitors in the 10 c.c. class, including Joe Shelton (in peaked cap), present 10 c.c. Record Holder, and on his right, E. E. U. Rogers, of the Surrey Club.



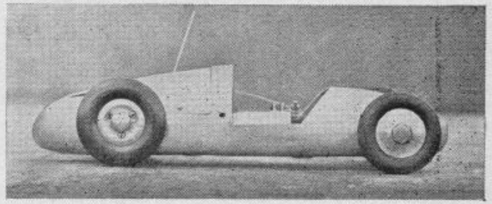
Right: Competitors in the pits, watching an interesting run in progress. John Oliver is holding the card, whilst B. W. Harris in white overalls, weighs up the chances of a West Country win. Below are Ken Davies's neat 2.5 c.c. Rhiando Trimax and the Oliver experimental twin.

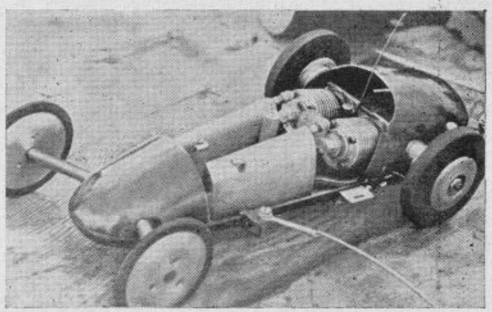
THE M.G. Trophy was to have been combined this year with the Austin Trophy, the two competitions to be run concurrently on the Eaton Bray Track on July 22nd. On this occasion, however, the weather was not co-operative, and with the first round of the 2.5 c.c. class half run, a thunderstorm swept the track, and the long period of sheltering from torrential rain was enlivened by brisk discussion of the usual variety. By the time the track dried out all hope of running the big class had vanished, but the M.G. Trophy continued, followed by a 5 c.c. competition and a short scratch event for the "tens".

As in previous years the M.G. event called for a flying start and standing start run over a $\frac{1}{4}$ mile, and instead of a handicap for the smaller engines, the officially recognised 1.5 c.c. class ran as a separate category, rather surprisingly contested by only two entrants, L. H. Strickland of the Northampton club and A. F. Weaver of North London M.E. Society, the former with a fast little motor powered with a 1.49 c.c. Albon, and the latter with his fine miniature 350 h.p. Sunbeam with a 1 c.c. engine, which has been running "on the rail". The latter car was actually on the line when the deluge fell, and did not run again during the later part of the day.

L. H. Strickland however, put in an excellent run which is claimed as a class record for the $\frac{1}{4}$ mile in 17.8 seconds, representing 50.56 m.p.h.

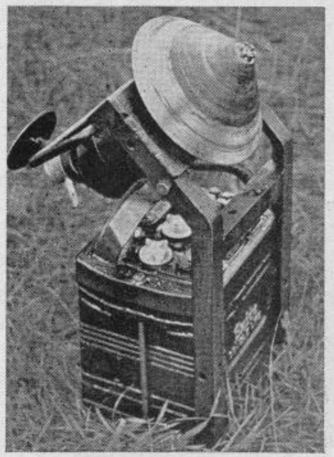
The 2.5 c.c. entries were an interesting mixture of scale and purely functional models, both types showing astonishing speed. Harry Howlett's Oliver Tiger clocked 69.5 m.p.h. K. Crow of Nottingham, with another Oliver engined car of his own construction, promptly lifted the speed to over 74 m.p.h. B. W. Harris from Bristol was unlucky, his car running below form, and then Alec Snelling, after some difficulty in getting his super-streamlined car going on the still damp track, clocked 11.43 seconds, fractionally under 79 m.p.h. The only other competitor to come anywhere near this was J. R. Parker, a previous trophy holder, with a run of just under 70 m.p.h.

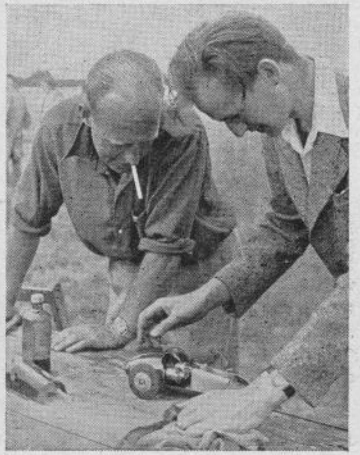




The standing start runs proved the real reliability of these modern babies, and some fine times were put in. Harry Howlett's Oliver Tiger, Ken Davis's Trimax and John Parker's Oliver Special misbehaved, but K. Crow and O. Mead were excellent, though not fast enough to beat Alec Snelling, whose brilliant time of 15 seconds gave him the M.G. Trophy with nearly two seconds to spare over K. Crow's Oliver Special.

Cyril Catchpole's 5 c.c. B.R.M. Dooling won the 5 c.c. event, at 115.23 m.p.h., and an interesting newcomer was John Oliver's 5 c.c. "Double Oliver" twin, which went extremely well for an experimental design.





M.G. TROPHY

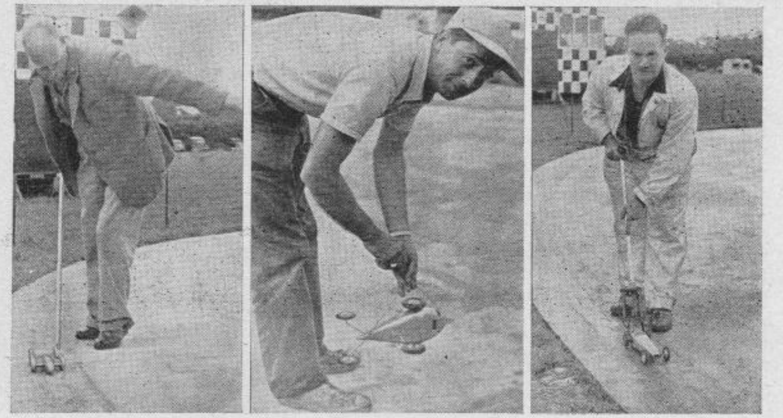
Entrant	Car	Engine
A. F. Snelling	Own	Oliver
K. Crow	Own	Oliver
O. Mead	Own	Oliver
J. D. Parker	B.R.M.	Elfin
B. W. Harris	Own	Own
L. H. Strickland	Own	Albon
H. Howlett	Busy Alfa	Oliver
H. Howlett	Oliver Tiger	Oliver
K. Davis	Trimax	Elfin
J. R. Parker	Own	Oliver
A. F. Weaver	Sunbeam	Own
E. V. Snelling	Own	Own
J. Dean	Oliver	Oliver

Left: This interesting electric starter with conical friction wheel giving a varying drive ratio was brought along by J. Dean.

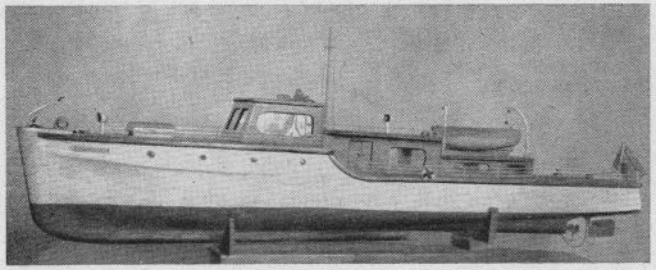
Left: Alec Snelling, winner of the M.G. Trophy, discusses the new 5 c.c twin with John Oliver, last year's winner.

RESULTS

c.c.	Time Flying	Time Standing	Total Time
2.5	11.43	15.00	26.43
2.5	12.13	16.15	28.28
2.5	14.21	17.75	31.96
2.5	14.33	19.80	34.13
2.5	15.23	19.40	34.63
1.49	17.80	22.70	40.50
2.5	15.00	26.65	41.65
2.5	12.89	56s.	68.89
2.5	16.64	95.32	112.00
2.5	12.95	39.00	—
1.0			
2.5			
2.5			



Left to Right: Alec Snelling gives his streamliner the winning push; Joe Shelton with his 5 c.c. Borden Special, and B. W. Harris of the Bristol Club with his beautifully constructed 2.5 c.c. job in the M.G. Trophy.



Tabletop Model Photography

BY R. FREEMAN

IT is obvious from the photographs appearing in this paper from time to time, that many model makers are also keen photographers. This fact is further emphasised by the photographic competition at present running, and in which many will be interested.

There is a very fascinating branch of photography known as Table Top, which enables very realistic photographs of certain types of models to be obtained, and with care the resulting print can be very true to life.

With care, it is possible to arrange a model in natural surroundings which will give the effect of realism, and the photographs appearing with this article will explain exactly what I mean.

Print No. 1 is a straight photograph of a model cabin cruiser 39 in. long, taken on a stand. Print No. 2 is the same model used in a table top scene which has been built up to represent a boat at sea.

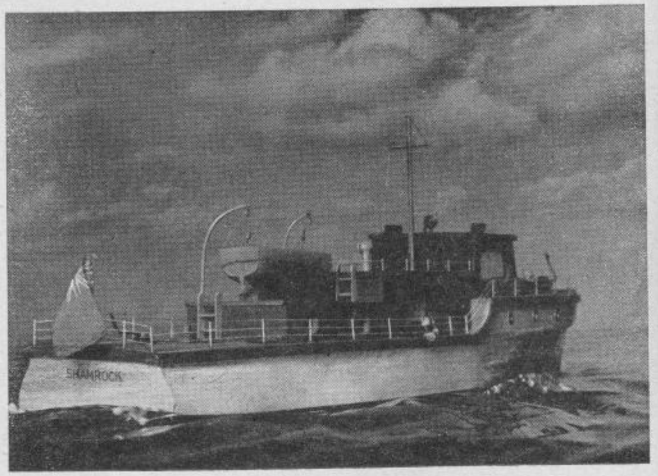
To obtain this effect, the boat was placed on a table and supported in an upright position. The table was covered with a dark cloth over which was spread sheets of green cellophane to represent water. An opening was cut in the paper to allow it to completely surround the hull at the correct waterline. The edges of the cellophane along the hull were turned outwards and shaving lather applied to them with a brush, to give the effect of foam.

On the far side of the table a white sheet was hung to cut out all detail in the background and the exposure made. The resulting negative showed the boat at sea with a completely blank sky. An enlargement of this negative was made, exposing only the lower half of the negative containing the boat, the upper half of the print being shaded by means of a card. The negative was then changed and another inserted with a good cloud study. This was printed on to the upper half of the same print by shading the lower half in the manner already described. The print was then developed in the usual way with the result as shown.

Double printing requires a certain amount of practice to obtain good results, and great care has to be taken to avoid a hard line appearing where the two images join together. To do this, the card used for shading must be kept moving, otherwise this is impossible. Another method of obtaining the same result is the use of a backcloth suitably painted.

Briefly, no special apparatus is necessary, but a camera with a focusing screen is an advantage and in the case of double printing, an enlarger essential, but double printing is only one method of obtaining the required effect. The set should be worked out in detail and everything included must be to scale whilst perspective must receive careful attention otherwise the result will be ruined.

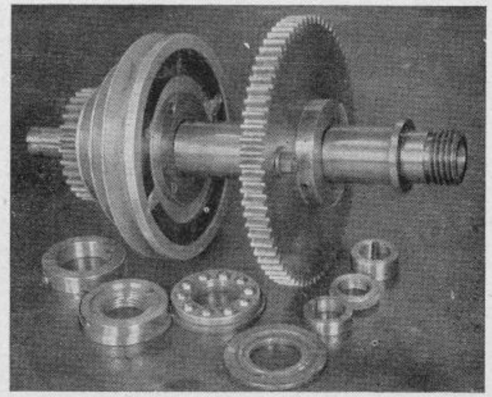
The photographs illustrated were taken with a Zeiss Ikoflex twin lens reflex, focal length of lens 8 cm., and Print No. 2 details are: exposure 75 secs. at f22, boat lit by window 4 ft. to the left of the subject on a dull afternoon in February; film Panatomic X.



Building a Lathe

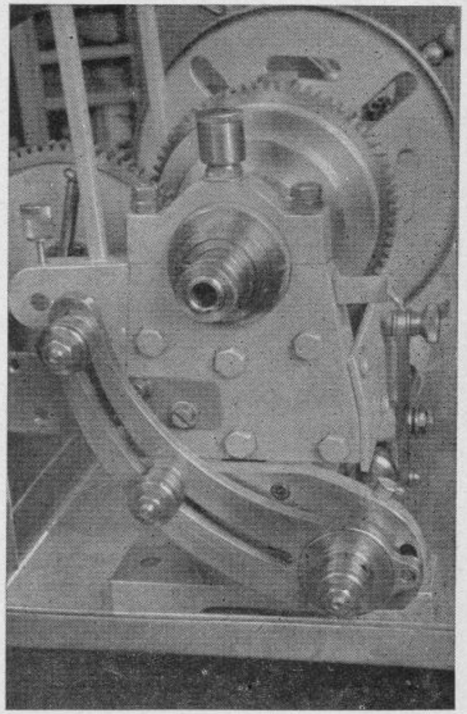
PART III. LEADSCREW CLUTCH, CHANGEWHEEL & BACK GEAR, LINING UP

BY J. A. MURRELL



Mandrel detail, showing aluminium pulley, mandrel in silver steel, and bull wheel in place. Thrust race and bearings are in foreground.

Close-up of back gear detail, showing back gear bracket in position. Note banjo plate and other details covered in previous instalments.



Leadscrew and Clutch

THE leadscrew was turned from a piece of mild steel $17\frac{1}{4}$ in. long, $11\frac{1}{4}$ in. of left hand 8 t.p.i. square thread was cut. The handwheel end was drilled and tapped 2 B.A. as shown and the other end was filed away for half its diameter to form a $\frac{1}{8}$ in. step for the clutch dog.

The leadscrew nut was cut next and this was made from a length of 2 in. brass which was hacksawed out to the shape shown. A $\frac{1}{16}$ in. boss, 1 in. dia., is left on the front of the nut. This makes the nut wider and also holds the chip guard. The handwheel was an aluminium casting turned, knurled and graduated 125 divisions and fitted to a steel sleeve as shown. The bearing brackets were made next, the rear one being fitted with a bronze bush to take the thrust.

The rear bearing was bolted to the bed by one 2 B.A. screw and the leadscrew lined up by using a clock from the top of the bed. The nut was screwed on and the holes drilled and tapped for the bearings. After firmly fixing the bearings, the nut was brought up to the saddle and the position of the $\frac{5}{16}$ in. dia. hole marked off. The saddle was removed and the hole drilled and tapped $\frac{5}{16}$ in. B.S.F.

After replacing the saddle and firmly tightening the bolt, it was found that the saddle moved freely and smoothly along the bed.

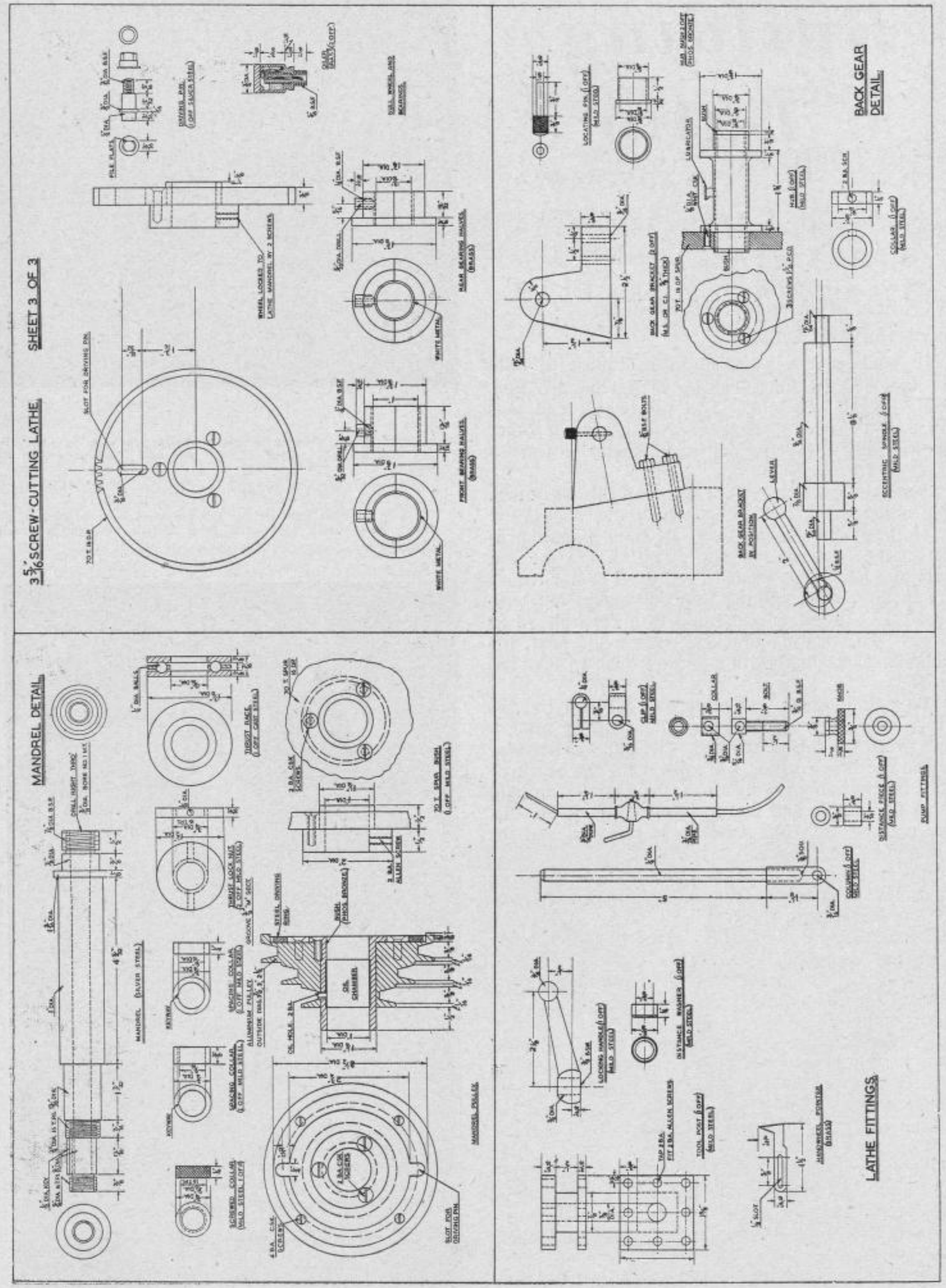
The clutch gear was made next, the sleeve being made first as shown. The dog was fixed by a 2 B.A. Allen screw. The lever and pivot pin were made and fitted and then the stub shaft turned.

Changewheel Gear Arrangement

The banjo plate was cut from $\frac{1}{4}$ in. mild steel plate to the dimensions shown. Next the bearing plate from $\frac{3}{8}$ in. mild steel, and then the steel and bronze bushes. The steel bush is pressed into the bearing plate; the banjo is a sliding fit on the outer portion.

The bronze bush is bored to suit the stub shaft and turned to a press fit into the steel bush. A $\frac{1}{4}$ in. Whitworth bolt is fitted through the slot in the bearing plate and screwed to the banjo to act as a locking bolt.

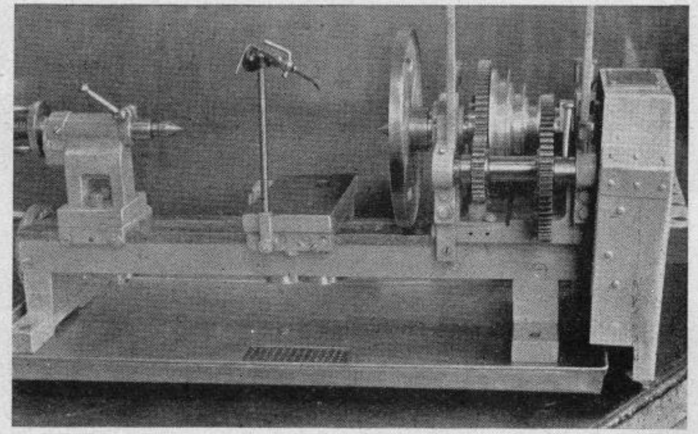
The changewheel studs were tackled next and con-



sist of a steel bolt and bush with a bronze bush fitted with a 1/8 in. dia. key.

When assembled the bolt and steel bush are held in position on the banjo by tightening the 1/4 in. B.S.F. nut, while the bronze bush is a running fit.

Three distance collars 1/4 in. thick were made to suit the bronze bushes and the stub shaft, and this completed the changewheel assembly.



The completed lathe, which displays its extreme simplicity of construction, combined with professional standards of finish. Note the neat pump in position.

Mandrel Detail

The mandrel is turned from a length of 1¼ in. dia. silver steel, to the dimensions shown. A 1/8 in. dia. key is fitted to the 9/16 in. dia. portion. Two spacing collars and a screwed collar were also fitted to this portion.

Two thrust nuts are fitted and a collar 1/4 in. thick fitted with a 2 B.A. Allen screw, bored to suit the 1 in. dia. portion. A ball thrust is fitted and this was turned from mild steel and case hardened, the ball carriage being of brass.

The ball wheel is a 70-tooth, 16 d.p. spur, and was fitted to a bush by three 2 B.A. csk. screws. The bush is locked to the mandrel by two 2 B.A. screws. The cone pulley is a home-made casting turned to sizes shown. A bronze or brass bush fitted and held in position by three 2 B.A. csk. screws. A steel driving ring was cut from 1/8 in. mild steel plate and fitted inside the pulley as shown, two slots being cut in the ring for the driving pin to engage. The 30T spur is fitted to the rear end of the cone as shown.

The bearings were turned from a stub of 2 in. dia. brass, halved and sweated together. The halves were then white metalled, held in jig in the 4-jaw and bored to size. A piece of 1/4 in. dia. brass is fitted to each top half and this fits into the 1/4 in. dia. hole in the bearing caps, this preventing the bearings from rotating. Oilways were cut in the bearings. Two wick oilers were turned from scrap ends of brass to complete the headstock fittings.

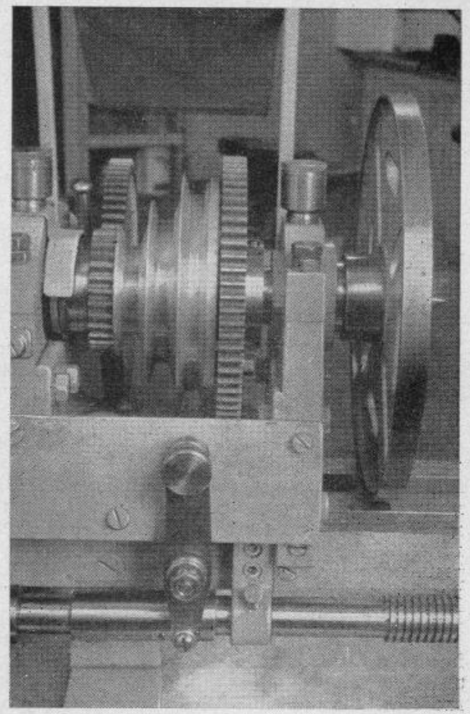
Back Gear

Two back gear brackets were made as shown and bolted to the headstock. The eccentric spindle was turned next and then the hub. The gears are fitted to the hub flanges as shown and the hub is fitted with two bronze bushes.

A collar holds the hub in position. The lever position was marked off when the back gears were meshed.

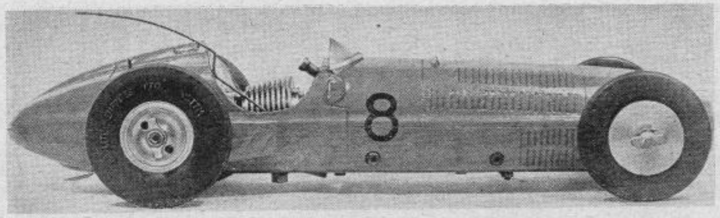
The rear bracket is fitted with a 1/8 in. dia. locating pin, a 1/8 in. dia. hole being drilled through the eccentric spindle when the gears are meshed.

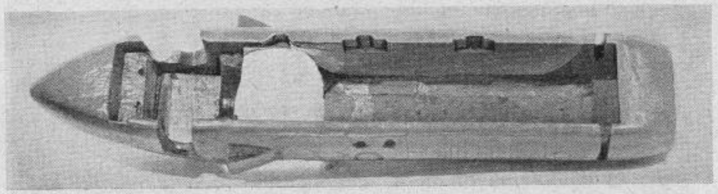
(*Continued on page* 634)



Another view of the mandrel, pulley and gearing.

PART II OF KEN PROCTER'S KITCHEN TABLE B.R.M.





Left : Side view of the little B.R.M. in completed form, and an underside view of the all-balsa bodywork, which is neatly secured to the chassis with Allen screws. The car can normally be operated without removing the body. Opposite page : Rear and front shots show the clean lines which help to make the car a potential contest winner. It will be noted that streamlined front wheels are fitted in this view. Note also the Perspex and fuse-wire radiator grille.

I NEXT made the front axle from one length of 12 s.w.g. steel wire, using a gas ring flame to heat the material and two pairs of pliers to produce the necessary bends. The front axle was mounted in position by clamping the centre U-shaped bend between a small 12 s.w.g. aluminium plate and the bottom of the chassis, using two 6 B.A. steel nuts and bolts passing through both. The body was again tried on the chassis and the front axle clearance slots adjusted until satisfactory. I then drilled 6 B.A. clearance holes at the appropriate points on the body coinciding with the actual panel fixings on the real car, replaced the body on the chassis and marked through the hole positions on to the latter, utilising a thin scriber for the purpose.

Having once again removed the body, the centre of each of the scribed circles was popped and 6 B.A. clearance holes drilled. I then took four 6 B.A. steel Symmonds type anchor nuts, two for each side and using 6 B.A. screws clamped these in position, the near side ones being on the inside and the offside ones on the outside of the chassis, since the latter would otherwise have fouled the fuel tank position. Holes were then drilled through the chassis valances, using the small anchor nut holes as jigs and the anchor nuts riveted in position using small lengths of iron wire. The 6 B.A. bolts were then removed.

The bodywork was again slotted to clear the two outer mounted anchor nuts, and the 6 B.A. clearance holes opened out very carefully to a depth and diameter corresponding to the head of the 6 B.A. Allen screws. The two offside Allen screws had to be shortened so that the length was such that when in position the threaded portion did not protrude inside the chassis otherwise the fuel tank might have been punctured.

In accordance with my usual practice, I made the fuel tank of tinplate taken from a discarded cocoa tin. The main envelope was first developed, cut out, and bent, then soldered down the seam. The ends were then made and suitably flanged, and the pipework members made from $\frac{1}{8}$ in. bore thin walled brass tube, suitably annealed for bending, and each member scarfed at the end which entered the tank. All holes were then drilled in one flange and the envelope, this flange and the pipes then being sweated in position. The tank was then thoroughly cleaned out, and the final flange sweated in position. This procedure is very important; *never* drill holes into a tank and fit pipes as the final operation, otherwise a recurrently blocked fuel jet will occur with accompanying annoyances. I always use a "buttress" type mount since this gives rigidity in all three directions, and I am pleased to see that several club mates have followed suit. The mount is sweated in position midway along the innermost wall of the tank, and the whole fixed in position by two 6 B.A. bolts and nuts, one of which also part-served to hold the forward tether bracket.

The tether brackets were made from 16 s.w.g. duralumin, being developed, cut out and drilled for both fixings and tether eyes, then annealed by heating until soap blackened on the surface, quenched and very carefully bent to shape. The second fixing hole for the front one was drilled, whilst the rear one is held in position by the rearmost pair of engine unit fixing bolts.

A fuel valve was lined up with the outlet and having slotted the valance and also drilled the bottom of the chassis, was fixed in position by means of the 2 B.A. screw fitment. Once again the body was modified to accommodate the projection and wire on-off lever, which in turn was suitably bent to give maximum angular travel. An 18 s.w.g. wire clip was fitted to retain the lever in the "on" position during runs.

The "works" department was now, except for refinements, almost complete, but one major provision had yet to be provided, namely the cooling of the engine. I therefore noted the position of the cylinder cooling fins, then completely stripped the chassis, and drilled two $\frac{1}{16}$ in. holes $\frac{13}{16}$ in. apart at right angles to the main axis and about $\frac{1}{2}$ in. ahead of the cylinder head. By drilling holes between these extremes a slot was produced, and this was then "dished" out behind the slot and beneath the chassis to a depth of $\frac{3}{16}$ in. using the ball peine of a hammer, thus forming a cooling scoop.

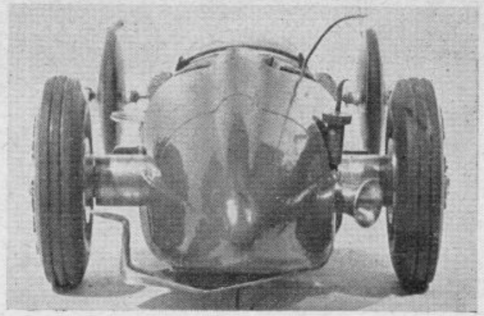
The chassis was now re-erected, complete with flexible fuel connections, and where necessary star washers, the final operation being the soldering of washers on to the front axle for the two 2 in. dia. solid rubber Kielcraft wheels to butt against, and the use of mild steel wheel clips to retain these in position, with the advantage of being readily removable for wheel change purposes.

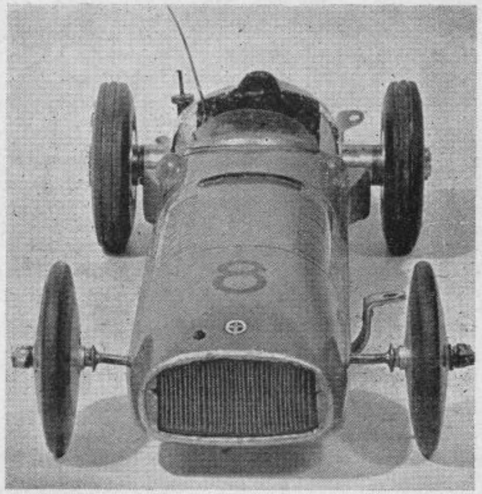
The detail work on the body was now tackled, and since the B.R.M. concerned is the Bourne type, it requires two ventilators to communicate with the driver's cockpit, these in the model being carved from end-on balsa, and actually functioned. I fitted a bulkhead across the back of the cockpit which saddled over the engine and chamfered the sides and also beneath the scuttle to give a reasonable width of cockpit edge. Hollow radius strut covers were then carved and inlaid into the body at the appropriate place just ahead of the rear axle, and on each side. I then gave the body about six coats of banana oil, rubbing down the exterior between coats until the desired finish was obtained, and at this stage, the panel junctions were scribed in, though a very fine jeweller's saw would have been a better instrument for the purpose.

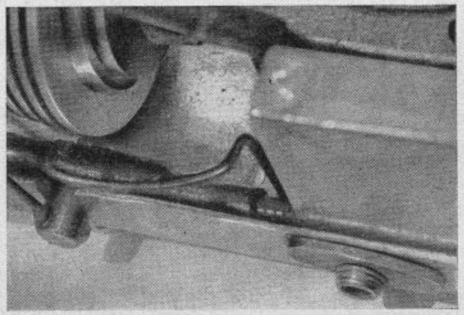
The windscreen frame was made from tinplate, in two pieces, sweated together with space between to take the sheet celluloid screen, and two pins soldered on to provide fixings to body. This left the radiator grille, or rather I had left it until this stage in desperation, with its three dozen odd vertical bars! My final solution took the form of a $\frac{1}{16}$ in. thick "Perspex" former, which just fitted into the recess at the front of the bonnet. I lightly nicked with a fine fretsaw the edge of this "former" or more exactly retainer, at the aforementioned three dozen points top and bottom, and wound light fuse wire round so that the vertical "wind" was always at the front of the grille, and the cross return at the back. With "nicks" of the correct width and depth, the fuse wire bites into position, but this was supplemented by a touch of balsa cement at each nick. When dry, or set, I cut through each of the cross return links top and bottom on the rear face, thus leaving the vertical bars at the front, which were immediately "varnished" with clear fuelproof dope.

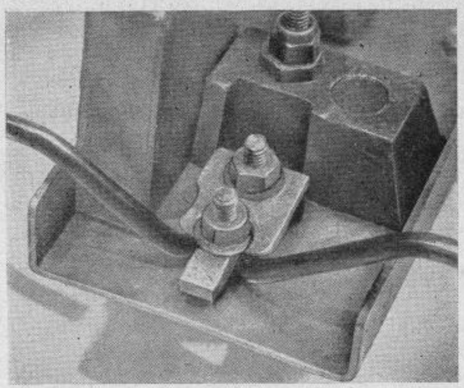
I silver painted the inner parts of the balsa portion of the grille and also the inside of the driver's cockpit, excepting a black portion representing the padding behind the driver's seat, and finished the exterior mid-green, one or two coats being applied with rubbing down between. I understand that there is no such colour as British Racing Green, any shade of green being equally applicable in full-size practice!

Following a close scrutiny of the photographic evidence I surmised that the B.R.M. badge was a four-pointed silver star on a red, white and blue roundel base and, since the scale diameters of the latter were so small, I decided that they could not be successfully hand painted on to the body. The immediate solution appeared to be hand painting









Above : A close-up showing the fuel cut-off valve and the anchorage for a body holding screw, and a view of the bent wire front axle with its clamping bracket. Immediately behind is the forward ballast weight.

on thin rice paper, then gumming this to the bodywork, a method which I have successfully carried out in the past for such badges as that of the Austin. However, I finally remembered wartime R.A.F. roundels with the narrow white band, and on inspection found that the $\frac{3}{8}$ in. size transfers with the outer blue cut to the same width as the white was just the right scale outer diameter. Using a pair of needle-pointed compass dividers, and centre of the red as centre, I scribed the blue roundel to the correct width, and placing the whole in lukewarm water, allowed the outer excess to separate and "slid off" the remainder into position on the bonnet.

When dry, a silver star was painted on, using a very fine brush.

The final stage on the body was to press the radiator grille in position and fuelproof the whole, inside and out with Hamilton's "Pax" fuel proofer.

On erecting the car, the all-black appearance of the front wheels was very harsh, so in order to disguise these the centres were silver painted on both sides to the appropriate diameter. The standard Tiger hubs were also a trifle small for scale rear wheels, so here again the effective diameter was increased by the silver paint on the tyre surface with the desired effect. This additional paintwork was then fuel-proofed.

Knowing how lively these small rear wheel drive cars can be I fitted a 16 s.w.g. piano wire tail skid as shown in the drawing and later, due to the fact that the finished car was extremely light and therefore even livelier than anticipated, fitted lead weights to improve stability. The first lead weight was $\frac{1}{2}$ in. square by 1 in. in length, held in a transverse position just aft of the front axle by a 6 B.A. steel bolt and Simmonds nut, whilst the second was $\frac{3}{8}$ in. x $\frac{3}{8}$ in. and $2\frac{1}{4}$ in. long, mounted lengthwise, terminating just in front of the cooling air scoop, and fixed by means of two 6 B.A. steel bolts and Simmonds nuts. Thus, the front weight countered the reactionary torque, whilst the heavier weight was where most needed for efficient traction that is, principally over the rear axle.

I always favoured piano wire bridles with a relatively short distance to the apex (and fitted with a link to increase the length to the 2 ft. then specified by the M.C.A.) in view of experiences in the early days with "Bowden" cable bridles, and as the M.C.A. requirement has now been revised to 9 in., will describe the manner in which the bridle was fitted to the latter requirement.

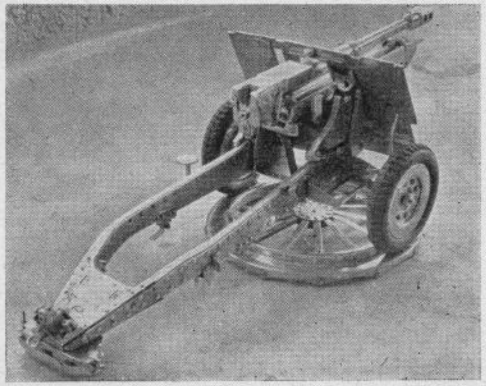
Firstly, as is well known, when the bridle is correct, a car will lie with main axis horizontal, and axles vertical, when suspended from the apex. Obviously then, the apex must satisfy two conditions, firstly it must be on a line passing through the longitudinal centre of balance, at right angles to the car main centre line and distant 9 in. from it; and secondly, with the car on a level plane, must be on a horizontal line passing through the centre of gravity, again at right angles to the centre line.

The centre of balance was found by use of a knife edge at right angles to the chassis centre line, the car being moved backwards and forwards until it balanced see-saw fashion on the knife edge. I then placed a set square on the appropriate side flange of the chassis, with right angle at the previously determined point and measured the 9 in. from the centre line, later bending a piece of soft wire until, when fitted to both tether brackets, the apex coincided with this mark.

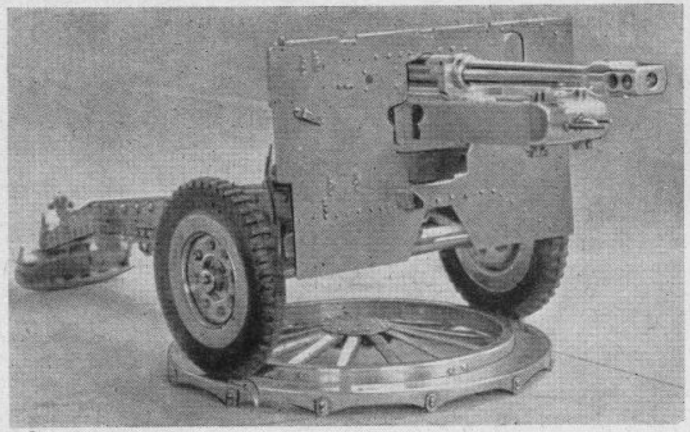
This mock-up was then put to the suspension test and found to be satisfactory, though in some instances it may be necessary slightly to move the apex or to raise or lower the front tether bracket to achieve perfection.

The actual bridle was then made from 18 s.w.g. piano wire, using the soft wire mock-up as a pattern, each end of the bridle being bent, using round-nosed pliers, to form open loops of about $\frac{1}{16}$ in. dia., which when slipped on to the appropriate tether brackets are closed by sliding a 6 B.A. washer into position.

(Continued on page 638)



A Model 25 Pounder from B.A.O.R.



Although still uncompleted these two illustrations serve to give an impression of the detail work that is going into the 25-pounder. As the actual full-size gun is readily available for checking there is no reason why this should not be a superbly detailed model. We look forward to publishing pictures of the completed gun in due course.

MODEL engineering, both as a recreational pursuit and as an aid to advancement in the specialised units of the army, is more popular than is generally realised. A recent visit to a R.E.M.E. unit in the Ruhr brought to light a really magnificent achievement.

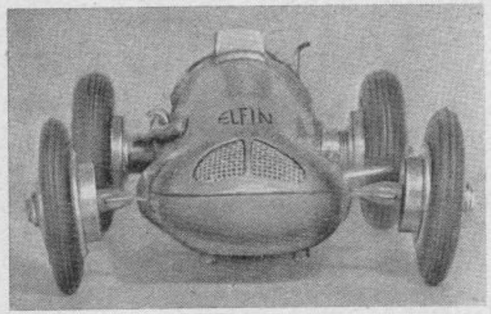
A group of National Servicemen, under the direction of a senior N.C.O. have built an accurate scale model of the famous 25 pounder field gun. All drawings were made from the gun itself, thus gun fitting was automatically a part of the job, and stripping down a full-size 25 pounder is no mean effort.

All parts were carefully measured and drawings produced to a scale of one-twelfth full-size. The entire gun is built from scrap brass, and perhaps the biggest problem of all was the provision of the many and varied sizes in rivets. Some of these are slightly "oversize", but only a very experienced "Gunner" will ever spot which.

The most intriguing part of the model is the breech block; this is fully detailed and each performs its proper function. A gentle pull on the tiny L.B.M. and the breech block slips down to expose the chamber in the appropriate manner. Even the familiar, and to all gunners, musical metallic "click" as the extractors of full-size guns come back, is there. The dial sight is a masterpiece, and worthy of any instrument mechanic.

Full recoil mechanism is fitted, and it seems a great pity that so much fine detail is hidden away in the recoil cylinder, never to see the light of day.

The photograph shows the gun in an unfinished state, but a general idea of the detail is quite obvious.



A Freelance Grand Prix

Model for 2·5 c.c. Engines

AN ELEGANT BUT FAST DESIGN BASED ON THE ELFIN ENGINE

Jack Green, well known North East speed-man, produced this efficient looking little free-lance model in answer to an appeal for more 2.5 c.c. jobs in the Sunderland Club.

BY JACK GREEN

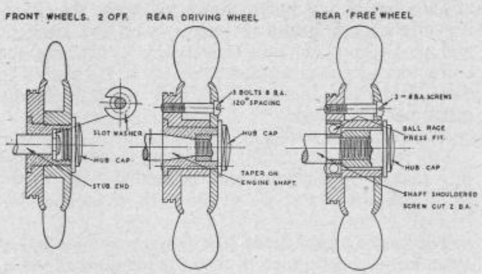
THE 2.5 c.c. Elfin engined "Grand Prix" racing car described is actually my fourth, though, since the other three were all built with the help of club mates, it is the first that I have constructed entirely by myself.

Having to resort to the help of clubmates was a necessity, since I did not then possess a lathe. Whilst truly thankful for service rendered, I resolved to obtain a lathe at the earliest opportunity.

On counting my coppers I decided that the largest lathe I could afford was one of the 1⅝ in. centres, which I subsequently purchased in 1948. At this time I was too busily engaged in tuning and racing my existing cars to contemplate a fourth, but after a considerable period of inactivity in building I decided to support the plea for more competition in the 2.5 c.c. class, made by our Car Secretary, Ken Procter.

Shortly before Christmas, 1950, I purchased one of the new Elfin 2.5 c.c. diesel engines, and almost immediately had to re-enlist the use of Jack Cooke's workshop which had in the past had more than its fair share of my presence, in order to turn a new rear cover, screwcut to suit the Elfin crankcase to carry the offside rear wheel, since my lathe was not fitted for screwcutting.

I then bought a pair of Roadway Models 2 in. dia. solid tyres for the rear wheels, and a pair of MS



"knife" edge tyres for the front wheels, the latter being more bulbous than normal knife edges, thus giving a better appearance. The original wheel centres were in each instance discarded, and new hubs and discs commenced on my own lathe.

The material used was principally aluminium, the now standard arrangement of clamping the tyres between suitable discs being carried out, with slight variations as indicated in the accompanying sketches.

The front wheels are, of course, both free to rotate about the steel axle end stubs, the latter being turned on the lathe, slotted to suit the spring steel front axle, and then sweated and pinned in position so as to give a degree of "toe-in".

The rear wheels were similar excepting that the offside one was fitted with a pressed-in ballrace as a free wheel, whilst the nearside one was taper-bored to suit the Elfin crankshaft as the driver.

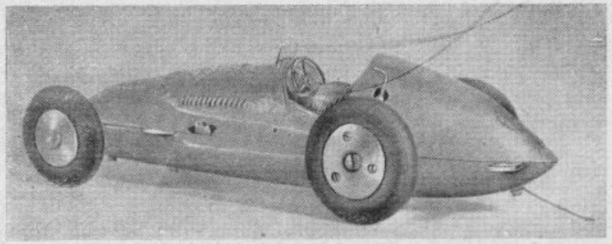
The inner discs in every instance were turned complete with dummy brake drums, and the general appearance further improved by fitting steel hub caps.

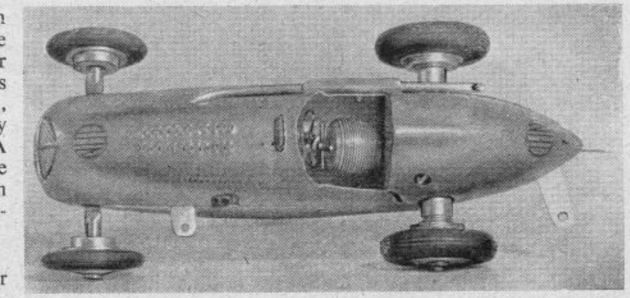
Having satisfied myself with the wheel and axle arrangement I turned my attention to the bodywork, and decided to make it in the form of an underpan chassis with removable top.

Now while I am in general, scale minded, I have never actually constructed a true-to-scale model, preferring to produce my own freelance editions of Grand Prix cars usually combining features from several actual prototypes.

My method of panel beating is simply to anneal the sheet aluminium, in this case 20 gauge, for the top, and 16 gauge for the underpan, and to "bash" away, using an egg-shaped mallet and suitably recessed hard wooden block, until the material forms the required shape. It may seem strange that I never carve a forming block, but it is surprising how the eye and mind can produce in perspective the shape one wants, and I believe in fully utilising this gift in all my model making, be it ships, aeroplanes or cars!

The car I visualised in this instance was similar





The Green Special, shown in side view and plan, has pleasing modern lines, and the joint between the halves of the bodywork is unobtrusive. The tank filler can be seen on the near side.

to the Alfa Romeo Type 158, and I completed the underpan and top portion in two consecutive evenings. I fitted the top with a flat strip horizontal crossbar near the front to engage in slotted lugs attached to each side of the underpan, and so shaped as to keep the top fully registered with the pan when home. A bent piano wire clip is also fitted at the rearmost point of the underpan, which when the top is manipulated into position firmly holds the whole in place.

The front axle is mounted on a rubber block and held in postion by two 6 B.A. steel bolts and nuts, whilst the engine unit is mounted on two heavy gauge aluminium bearers suitably bent and transverse across the underpan.

The fuel tank is wedge shaped, and the top of the car cut away so that it can be filled from the outside. Further portions were neatly cut away to allow the venturi to protrude and also the needle valve control.

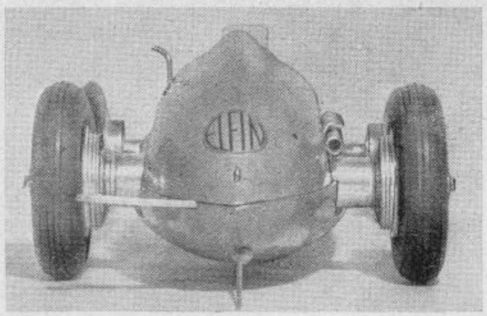
I fitted all the usual accessories, namely facia panel with lined-in instruments, three-quarter steering wheel with corded rim, celluloid windscreen, exhaust pipe and shield, and rear-view mirrors, the bulges for the latter being formed by quick manipulations with a pair of pliers.

The louvres were punched, using a tool made from a discarded screwdriver blade, and I may say that no small amount of courage was needed to commence this operation.

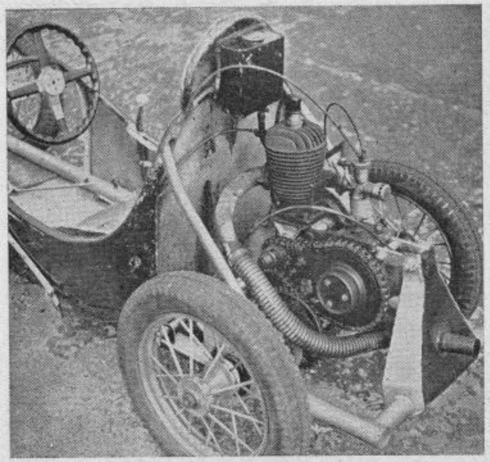
The car was now complete except for painting, and for this process it was fully dismantled. Four coats of metallic light green were applied with rubbing down between, which gave an excellent degree of finish without having to resort to initial filling. The whole was then fuel proofed and re-erected.

I have not as yet had the opportunity of letting the car show its paces, but even if it does not prove to be a record breaker, I have derived a great amount of joy from building it on my own "kitchen table" bench and using my own lathe.

In closing, I would once again like to acknowledge the help I was given by fellow clubmates initially, without which I could never have made a real start in this interesting sport.



Seen from the rear the car looks robust and well streamlined, and the builder has made a neat job of his panel beating without the use of special equipment. Drive is on the near rear wheel only, a special crankcase cover being made to fit the Elfin to carry the free-running wheel.



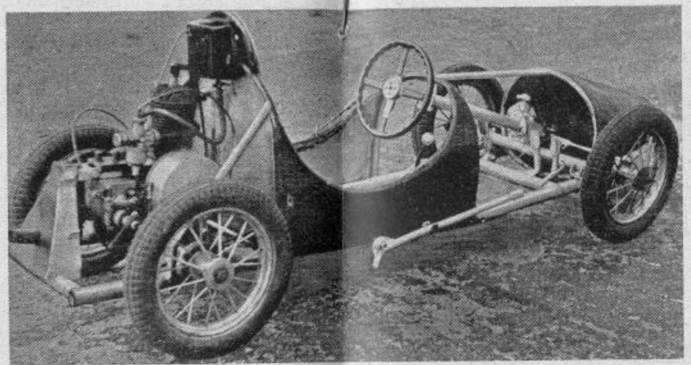
BIG LITTLE 'UNS

G. H. DEASON ENTHUSES OVER JACK MOOR'S AMAZING LITTLE "BOY RACER" WASP GRUB

THE miniature passenger carrying model racing car is not a new idea, and from time to time some very convincing "miniatures" have been built, mainly by motor-minded parents for their offspring. Probably the best known of these was the little G.P. Bugatti, originally constructed at the Molsheim works as a "one-off" job for young Roland Bugatti, and later produced in limited quantity at the urgent demand of Le Patron's customers. The little Bugatti was electrically propelled, and although having a very moderate performance, was an extremely good looking replica of the real thing. A few of these now "vintage" models still exist in this country.

The model I am about to discuss, however, falls in a more serious category. The name of E. J. Moor immediately evokes memories of a succession of stark and ferocious sprint cars, invariably with black bonnets and black and yellow striped tails, streaking up the classic sprint courses to the crackle of a highly tuned twin or single. E.J. has been doing this for so long as to earn from John Bolster the happy title of "The Senior Specialist," and his cars have always been "Wasps". Some have been extremely successful, others less so, but none have been dull, and although over a period of twenty-eight years the Shelsley Walsh record has eluded him, he can probably claim the most sensational blow-up the famous hill has ever seen, when at a pre-war meeting parts of his engine actually flew over the tree tops!

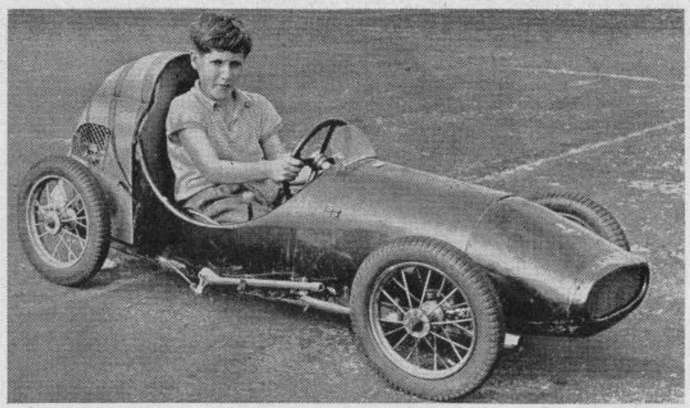
At the Jubilee Shelsley meeting on June 23rd, a new "Wasp" (or more correctly, a Wasp "Grub") made its bow on the hill, when a 147 c.c. version of the illustrious family made a demonstration run in the hands of young Nicholas Moor, in the very creditable time of 134 seconds. Being at Silverstone instead of Shelsley I missed this interesting performance, so I was delighted to find the little car at the M.M.E.C. meeting at Silverstone the following week-end, and whilst its youthful driver was briskly lapping the Club circuit between races, I hastened to contact Jack Moor with a view to getting the low-down. I certainly got it! We retrieved Nicholas, who by this time had departed on a test run in the direction of Club Corner and run out of fuel, and took some photographs. E.J. then said "Have a go yourself", and waving aside my suggestion that I wouldn't fit in very well, removed the bonnet, explained the technique of sitting with one's feet over the scuttle hoop, passed on a few sketchy instructions about the controls and pushed me off, to weave in and out of the racing machinery in the paddock and out into open country. The immediate impression is that this machine is no toy. Its acceleration is brisk, the note of the unsilenced motor is hearty, and the steering positive and accurate, as one would expect with such a builder. The gears go in like a racer, and the maximum speed is something over 40 m.p.h., which with an almost total lack of suspension certainly feels like it, the more so since one's posterior is about three inches above the concrete!



Above left: The "works" of the 150 c.c. racer, showing the fabricated rear engine mount and the arrangement of the transmission. The rear axle is ex-invalid carriage, hence the large unused sprocket to be seen on the axle itself. A contracting band brake at present fitted is to be replaced with something more powerful.

Left: The Wasp 150 with covers removed, showing further details of the chassis and controls. The writer drove with his legs draped over the scuttle hoop! The gear lever is in the cockpit, the lever on the off-side being a ratchet starter. Below: Nicholas Moor at the wheel of his car, which he handles like a veteran.

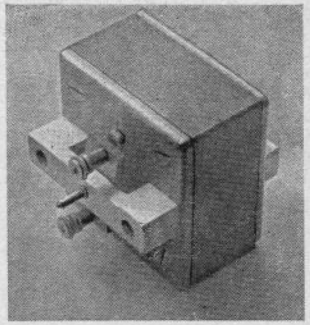
Constructionally the smallest Wasp is built on the lines of a modern 500; 14 gauge $1\frac{1}{2}$ in. dia. tube is used for the chassis, with welded in cross members and light gauge tubular framing for the bodywork. Welded up to the rear cross member is a triangular fabricated plate which forms the rearward mounting for the gearbox bearers, which in turn are attached to the crankcase bolts of the Villiers engine at the forward end. The engine is further supported by stout engine plates welded to another cross member. The engine itself is a veteran 147 c.c. Villiers with fixed head and single exhaust port, driving the solid rear axle through an Albion 3-speed gearbox which is controlled by a short rigid lever working in a quadrant inside the cockpit. A lever and cable starter is fitted on the offside, coupled up to the old kickstarter shaft, but as is generally the way with such devices, this was not in use, and the good old push of racing practice is generally resorted to. Fuel is fed to the Villiers carburetter from a small gravity tank behind the headrest. The driver is separated from the engine department by a "fireproof bulkhead" which forms his back rest, and a sheet steel floor passes beneath the parallel side members. Foot controls are normally placed, the clutch and accelerator pedals operating via Bowden cables. Braking is on the rear axle only and a handbrake is positioned outside the body on the nearside.



The central steering column and box are relics of a Reliant delivery tricycle, and divided trackrods pass from the drop arm to the steering arms. The front axle immediately strikes a chord in the memory as being of G.N. ancestry, and indeed proved to be a shortened edition from the original G.N. Wasp. The steering swivel bushes are shorter than normal, and coil springs are fitted above these, over the king pins, to give some degree of front suspension. The wheels are ex-Government surplus, of stout welded construction with radial spokes, carrying 14 x $2\frac{1}{2}$ in. tyres, and are believed to have been made for wheeling stretchers on the Normandy beaches.

The bodywork is simple, and the radiator grille is made from an old Spitfire oil radiator, whilst the tail started life as a Spitfire propeller spinner! Needless to say the traditional Wasp markings are used in the colour scheme.

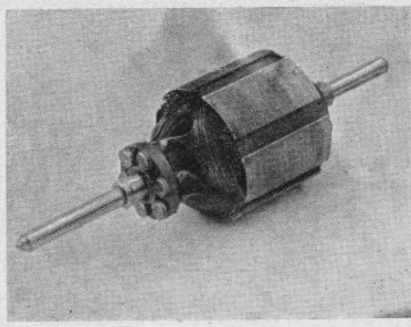
The all-up weight is a trifle under $1\frac{1}{2}$ cwt. which accounts for the fact that the performance is at least as brisk as that of the motor-cycle from which the engine originated, even supposing that the "Senior Specialist" has resisted the urge to apply his wizardry! Young Nicholas handles the car with confidence and skill, and in fact he could hardly have a more suitable training machine. I am surprised that more miniature racing cars on these lines have not been built, for they possess considerable possibilities for a "nursery class" as in the sailing world. In Italy and Spain such classes are already in existence, and meetings have been held at Monza for cars of under 125 c.c. These cars were very beautifully built and finished, have wheels carrying 3.50 x 10 tyres, and 5 ft. 8 in. wheelbases. The very successful Lambretta engines are used, the drivers' age being limited to 18. When shall we see something like it in this country? And why a maximum age limit? After my brief acquaintance with the Wasp, I'm all for having a go myself!



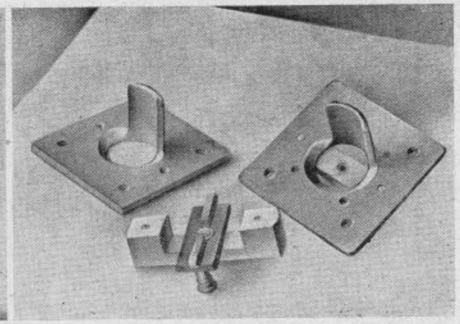
I. The completed motor.

AN ELECTRIC BOAT MOTOR

A SPECIALLY COMMISSIONED DESIGN BY H.J.J WHO IS A LEADING EXPERT ON FRACTIONAL H/P MOTORS



9. The armature ready for assembling.



3. The finished polepieces.

THE motor forming the subject of this article has as its main features low current consumption, high efficiency, simplicity of construction and considerable power output. A permanent magnet is used for the field and this makes reversal easy. The magnet forms the basis of the design and the dimensions of the parts are determined by the magnet available. The following description takes this point into account.

The Magnet

Fig. 1 shows the completed motor. The magnet is of the type used on small loudspeakers and in this instance is 3 in. square by $1\frac{1}{8}$ in. long. Other magnets, circular or square, can be used equally well so long as the sizes of armature and poles are altered to agree with the different dimensions.

Magnets of the kind shown in the figure are magnetised so that one of the faces has N., and the other S., polarity. One pole of the motor field must therefore be attached to one face and one pole to the other. This produces the proper field distribution as Fig. 2 shows. A compromise is needed in settling the sizes. The larger the armature, the greater the torque developed, but the nearer do the poles approach the magnet and that reduces the field. The minimum spacing is about one-eighth of the inside size of the magnet, so the distance G in Fig. 2 should not be less than $\frac{1}{4}$ in. for a magnet of 2 in. inside size. The thickness of the poles should be about one-third that of the magnet wall as a minimum. These two requirements limit the armature diameter to rather less than $1\frac{1}{8}$ in. in the present case.

Polepieces

These are made from the two end plates of the magnet, and a short length of 1 in. dia gas barrel. Fig. 3 shows the general form. The size of gas pipe is given as the nominal bore; the outside diameter is $1\frac{11}{32}$ in. A $1\frac{1}{2}$ in. length can be faced and a small spigot formed on each end, the length being equal to the thickness of the end plate. Four $\frac{5}{16}$ in. holes are then drilled and the piece divided by saw cuts, shown dotted in Fig. 4. The two end plates are then bored to fit the spigots and the poles brazed into place. Soft solder will give ample hold if the fit is good and only light cuts are taken when machining.

The plates are next mounted in the 4-jaw chuck and bored to $1\frac{1}{16}$ in. dia., faced to length and the inner side of the plate also faced. All this should be done at one setting. When both are machined, the inner corner of the hole should be filed to a generous bevel to reduce magnetic leakage; the width of each pole reduced to $\frac{3}{4}$ in. and all corners well rounded. When finished the free end of the polepiece should be $\frac{5}{32}$ in. from the other end plate. Finally, each pole is strapped by the bore to a brass mandrel and the outer side of each plate faced up. This part of the work must be accurately done or the bearings will not line up. One of the centre holes of the mandrel should be drilled $\frac{1}{8}$ in. dia about $\frac{1}{2}$ in. deep. The use of this hole, and the reason for a brass mandrel will appear later.

The Armature

Usual practice is to build an armature from laminations. This is very advisable where high speeds are involved, but at 1,500 to 2,000 r.p.m. a solid armature can be used without introducing serious losses; it is much easier to make as well.

The armature of this motor is a $1\frac{1}{4}$ in. length of $1\frac{1}{8}$ in .dia. mild steel. Fig. 5 gives the sizes. The blank is faced, turned .01 in. oversize and drilled and reamed $\frac{3}{16}$ in. dia. Finally, a $\frac{3}{4}$ in. dia. circle is scribed on the end with a fine pointed tool. The circle is divided into six and the chuck, with the piece still in the jaws, is transferred to the drilling machine and the six $\frac{1}{4}$ in. dia. holes drilled. It can then be faced up at the back end and the slots cut. After this, all sharp corners and burrs should be removed from the holes and slots.

Armature Spindle

This is a $3\frac{1}{2}$ in. length of $\frac{3}{16}$ in. silver steel.. The ends are turned to 60 deg. conical points and two light knurls are cut $\frac{3}{4}$ in. apart as can be seen in Fig. 6. One knurl is eased down with a fine file until the armature will just push over it; the second provides a driving fit. When the armature is in place, hollow centres are used to hold the spindle while the journals are turned, the oil slingers cut and the outside of the armature finished to size. Bearings and armature are then perfectly true.

The Commutator

This is of the disc type, $\frac{9}{16}$ in. dia. turned from a piece of hard fibre or catalin. Fig. 7 gives details of this and of the six studs. Notice that the fibre is countersunk to take the heads of the studs. These are screwed tightly into place and faced true after the armature is finished. No fixing is needed if the commutator is a good tight fit on the shaft, but if it has to be pinned, the studs must be in line with the slots of the armature.

Bearing Brackets

Aluminium bar is used for the brackets, though a casting completely covering the hole in the end plate would be an improvement for marine use as the motor would then be waterproof for all practical purposes. One of the brackets can be seen in Fig. 3 with the brush holder in position. Each bracket is bored $\frac{3}{16}$ in. and fitted with a bronze bush, the brush holder being friction tight on a $\frac{5}{16}$ in. spigot left on one bush. The brackets are held in place by two 4 B.A. screws, the holes being spotted as follows. A piece of $\frac{1}{8}$ in. silver steel is inserted in the hole in the end of the brass mandrel previously mentioned. The polepiece is clamped to the mandrel and the bearing bracket slid on to the projecting $\frac{1}{8}$ in. pin. The centre line of the bearing and of the armature tunnel must then coincide. The bracket can then be clamped in place, the end plate spotted, drilled and tapped for the fixing screws.

Brush Gear

This is simple; a $1\frac{1}{2}$ in. length of $\frac{1}{2}$ in. x $\frac{3}{16}$ in. bakelite bored $\frac{5}{16}$ in. for the bearing spigot and with two 6 B.A. holes $\frac{3}{16}$ in. from the centre for the terminals. The brushes are of $\frac{3}{16}$ in. x .021 in. spring bronze, bent to the form shown in Fig. 8.

The ends touching the commutator have a piece of silver soft soldered to them—a short length of $\frac{1}{16}$ in. dia. wire can be flattened for the purpose. Copper can be used instead of silver, but brass will not work well against the brass studs. The corners of the brushes should be rounded to prevent catching on the commutator studs.

The top bend of the brushes must be finished after the terminal screws are in place and pressure adjustment made when the motor is assembled.

Armature Winding

A good deal of latitude is possible in the winding for the armature. The total number of turns will depend on the voltage, the speed and the strength of the magnet. For any one armature the turns have to be increased if the voltage is increased, reduced if the speed is to be increased or if a stronger magnet is used. In general the diameter of the wire will need increasing when the voltage is reduced, but the aim should be always to use wire that will just fill the slots. Standard tables showing the number of turns that can be wound in a given area are not of much value for the present work because of the practical impossibility of producing an even winding. The armature shown in Fig. 9 has 70 turns per coil of 30 s.w.g. wire, and is intended to work from 8 volts. Other windings to suit various conditions are given below.

Volts	Turns	Gauge	Speed
4	40	24	1500
6	55	26	1500
6	30	22	3000
8	70	30	1500
8	40	24	3000
10	85	38	1500
12	95	32	1500

The turns are those of one coil, the total will be six times larger.

With a six slot armature the best winding pattern is the double triangle in which a set of coils is wound in slots 1 and 3; 3 and 5; 5 and 1, followed by a second set in slots 2 and 4; 4 and 6; 6 and 2. If this pattern is followed the projection of the wire beyond the armature will be about half the diameter of the armature.

Insulation

Before winding any wire, insulate the armature. Two washers of fibre or strong card should be cut to fit the ends of the armature and register with the

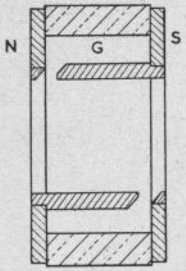


FIG 2

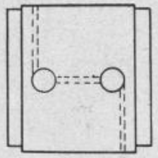


FIG 4

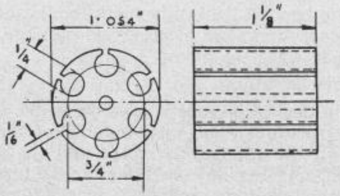


FIG 5

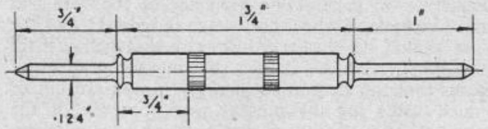


FIG 6

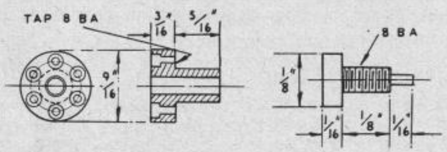


FIG 7

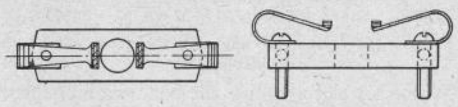


FIG 8

FIGURE TITLES

2. How the fields are arranged
4. Method of cutting the polepieces
5. Details of the armature
6. The motor spindle
7. The commutator
8. Brush holder and brushes

slots. The slots themselves can be lined with thick brown paper left slightly wide so that it overlaps beyond the washers at the ends and long enough to leave about $\frac{1}{4}$ in. projecting beyond the top of the slot. Fold this projection down on to the armature and then spread the ends slightly beyond the end washers. The shaft can be insulated with a short length of systoflex.

Start the winding by making a knot in the end of the wire, and be sure to make a similar knot in the starting end of each coil. Wind all coils in the same direction and keep the same end of the armature to the same side. These points settled, wind the specified turns into slots 1 and 3, using a thin strip of wood with a rounded edge to work the wire into place. When the coil is finished twist the ends together temporarily and, remembering the knot, wind the same number of turns into slots 3 and 5. Repeat for slots 5 and 1; 2 and 4; 4 and 6; 6 and 2.

When all coils are wound, test for insulation from the armature and if this proves satisfactory, pair up the ends. Take the end of coil 1 (slot 3) and join it to the start of coil 4 (slot 2); the end of that coil (slot 4) to the start of coil 2 (slot 3) and so on. It is most important that the start of one coil be joined to the finish of the earlier one. The paired ends should be twisted together, bared and tinned with solder. They are then ready for joining to the commutator.

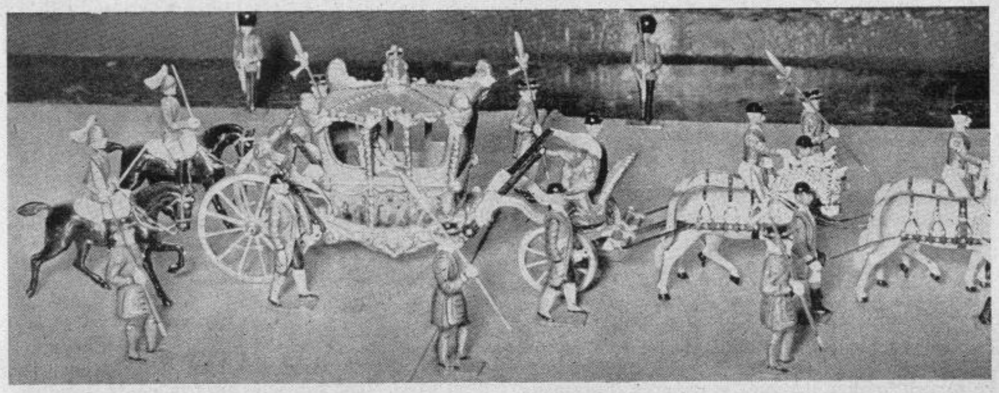
This is done by setting the armature so that slots 1 and 3 are equally spaced from the edges of a polepiece. In this position one commutator stud will be in the centre of the polepiece. Join the pair of wires containing the start of coil 1 to this stud and continue in order round the commutator.

Trim the slot linings to length and fold them over the wire into the slot. Then push a piece of fibre or card into the slot to hold everything in place. Bind the wires to the commutator with a few turns of thread and then varnish the whole winding. Shellac or other spirit varnish is suitable, but not cellulose.

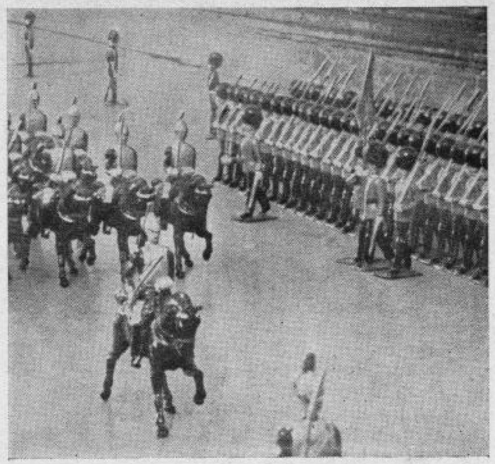
Assembling the Motor

Remove all loose swarf from the poles and magnet—this must be thoroughly done—place the poles roughly in position on the magnet and insert, but do not tighten the fixing screws. Now insert the brass mandrel previously made, into the bore and gently tap the end plates into place with a mallet. The clamping screws can now be tightened and the mandrel should then be free enough to be twisted out. This part of the work needs care because there is only .004 in. clearance between the armature and the poles.

Next assemble the rear bearing bracket with the fixing screws only lightly tightened. Insert the armature and then the bracket carrying the brush gear. The armature should turn without catching. If it does not, the bearings may be slightly out of line or the armature may be rubbing on the poles. Adjust as necessary and then tighten the fixing screws of both brackets. (*Continued on page* 638)

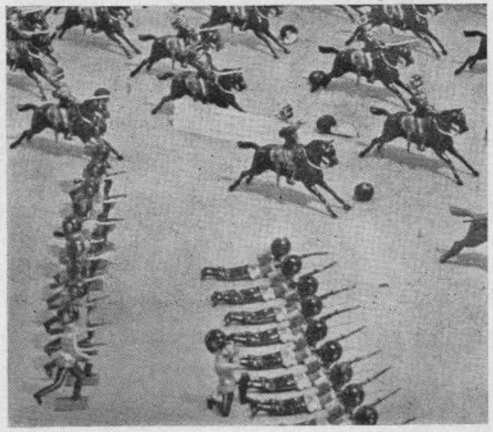


CAPTAIN LIGHTBODY'S
Model Army



The illustrations do far less than justice to the meticulous care which has gone to the presentation of Captain Lightbody's Model Army. The heading picture portrays part of the Royal Procession, with full Sovereign's Escort of Household Cavalry, some one-hundred and twenty strong.

At first glance this might appear to be merely the careful assembly of a suitable number of ordinary lead figures: which of course it would be, if such authentic figures were obtainable. In a long chat with the worthy Captain he pointed out that almost without exception the normal commercial figures are woefully wrong in essenial particulars, crudely finished, and certainly not obtainable in the variety he requires. His winter activities then are divded nto two main parts: the acquisition and alteration of "other ranks" where such adaption or alteration is fairly straightforward, and the preparation and casting of special figures to replace breakages.



The processional figures represent several hundreds of hours work amounting to at least fifty per cent. of each figure—and are still far behind his own ideal of perfection, as they are mainly the efforts of the past two winters after the destruction by fire of some 12,000 soldiers he was exhibiting at Dreamland, Margate.

The bottom picture shows part of his most imaginative conception—the Charge of the Light Brigade in the Crimean War. Here representatives of all the regiments taking part or supporting the action are portrayed in their appropriate uniforms. To provide these details he has amassed a magnificent collection of books, old engravings, and even the humble cigarette card set. Note the spent cannon balls appearing in the picture. These Captain Lightbody assured us are scale size—and indicate one of the less desirable hazards of the romantic old-time warfare.

RON WARRING'S MODEL WINDMILL SERIES PT. IV

A Model Smock Mill

ONE of the prettiest of all the windmill types, the smock mill is particularly attractive as a modelling subject. Smock mills are one of the later of the basic types and most featured either spring or patent sails and a faintail mounted on the rotating cap or cupola. In layout a smock mill is very similar to a tower mill, the main difference being that the body of the mill is generally octagonal and of wooden construction.

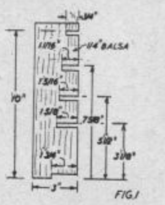
For the purpose of the model the windshaft can be powered by a small electric motor, if desired. The cap, sails, fantail, motors, etc., are built as one assembly which fits into the body of the mill and can be rotated to align the sails, as required. Two major points on which the model differs from full scale practice is that the cap, on a full size mill is mounted on a series of pivoted rollers or a track, whereas in the model we have pivoted the cap by means of a central shaft running in holes in the floors of the tower or body; also the fantail is completely dummy and not connected or geared to drive the cap to align the windshaft as in full scale practice.

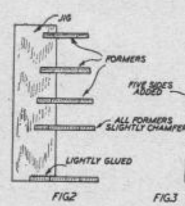
It is convenient to start with the main structure first—the body of tower. This is octagonal in section and is built up from eight tapering sides cut from thin sheet wood—$\frac{1}{16}$ in. or $\frac{3}{32}$ in. — pinned and/or glued to octagonal formers or floors. The lower former acts as the base of the mill. Cut each former accurately to shape and size as given on the plan. This is reproduced one-third actual size. The top former or dust floor is cut out as indicated to provide clearance for the electric motor drive if the sails are to be powered. The second and third formers from the top, the bin floor and stone floor, respectively, are drilled with $\frac{3}{8}$ in. clearance holes at their exact centre.

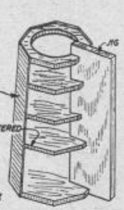
When the eight identical sides are cut out, score across with a sharp point, as indicated, to represent boarding. Also cut out three window panels in four of the sides only. Frames for these windows can be built up on small rectangles of thin celluloid, with small wood strips glued in place as shown, when each completed frame can be glued in place from the inside.

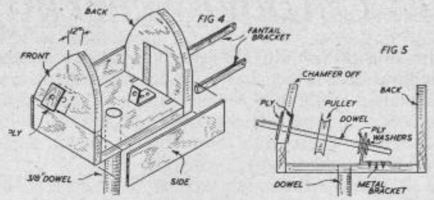
The tower should be assembled with three adjacent sides omitted. These are added later after the cap has been mounted and there is no further need to obtain access to the interior. To assist in accurate alignment of the sides and formers a simple jig should be cut from $\frac{1}{4}$ in. sheet balsa, as shown in Fig. 1. Each former or floor is slipped in place on the jig and five sides added (Figs. 2 and 3). The jig can be removed when this assembly is set.

The cap is made as shown in Fig. 4. This is a straightforward assembly, the main point to watch being to get the correct angle of rake on the top part of the front face. The lower edge of this piece must be chamfered off at 12 deg. before cementing in place. The two ends and floor are cut from $\frac{1}{4}$ in. sheet balsa. The two sides are from $\frac{1}{16}$ in. material, either ply or soft wood. Sides and back and front are scored before assembly and a door opening is cut out of the back.





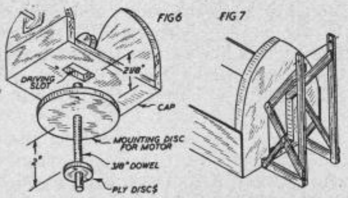




The windshaft assembly should be added at this stage. The windshaft itself is a length of $\frac{3}{16}$ in. dowel supported in ply bearing faces glued either side of the front face and at the rear in a small metal bracket (Fig. 5). Locating washers or collars should be glued to the shaft to limit fore and aft movement.

The cap is mounted on a $5\frac{1}{4}$ in. length of $\frac{3}{8}$ in. dia. dowel, securely cemented in a hole drilled in the floor. $2\frac{1}{4}$ in. below the level of the floor is glued a $\frac{1}{4}$ in. ply disc to take the motor. The whole assembly runs in the holes in the bin and stone floors in the tower with a suitable collar of $\frac{1}{4}$ in. ply glued to the $\frac{3}{8}$ in. dowel just above the stone floor to locate the assembly at the correct height (see plan). This main assembly is shown in Fig. 6.

The small electric motor is mounted on the ply disc glued to the vertical dowel. A wedge shaped ramp can be used to line the motor up with the windshaft and the two can be connected with a loose belt running over a small wood pulley glued to the windshaft. The belt should slip fairly readily so that the sails are driven only at a modest speed. Alternatively, a better arrangement would be to arrange a worm drive between motor and windshaft with a 40:1 reduction. The motor can be adjusted for position by raising the mounting disc as required. Details of the power unit do, in fact, depend on the type and size of motor being used and a simple direct link up should be obvious. Similarly with regard to



the leads to the motor. Since the whole cap, and with it the motor, is free to rotate, electrical contact could be made by means of a simple pair of rubbing contacts on the underside of the mounting disc.

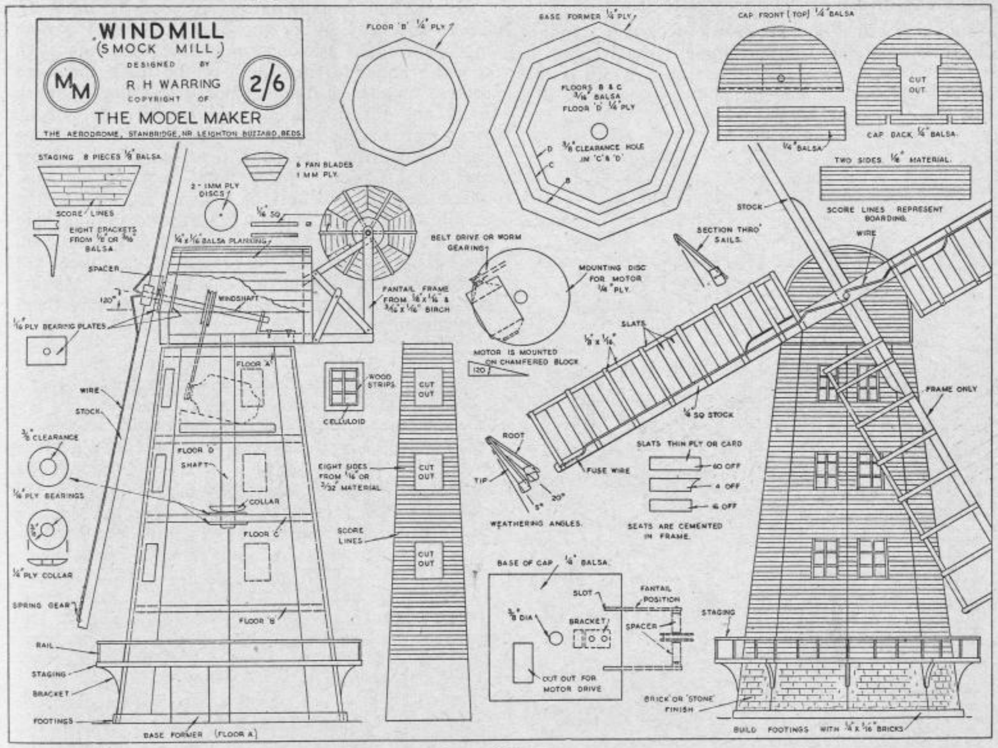
The cap itself may now be completed by cementing the two $\frac{1}{4}$ in. x $\frac{1}{16}$ in. outriggers for the fantail in the slots in the floor and building up the rest of the fantail framework (Fig. 7). When this is complete the roof of the cap can be planked in with strips of $\frac{1}{4}$ in. x $\frac{1}{16}$ in. balsa, trimmed off, sanded smooth and covered with paper.

The fantail wheel is built up as shown in Fig. 8. The six small vanes are cut from 1 mm. ply, scored to represent joint lines and each one is then cemented to a short length of $\frac{1}{16}$ in. square hardwood. Each of these hardwood pieces have the ends trimmed off to an angle of 30 deg. on one face so that when sandwiched between the two small 1 mm. ply hub discs and glued the fantail blades have a pitch angle of 30 deg. The complete fan is mounted on a wire spindle between the upright posts of the framework and centralised with suitable spacers, e.g. small lengths of metal or rolled paper tubing.

The sails should be constructed next. These are of the spring type, but on account of the very small size of the individual slats are not made working, i.e. the slats are glued in place and not separately hinged to open and shut as in full size spring sails.

For each pair of sails two 12 in. lengths of $\frac{1}{4}$ in. square hardwood are required for the stock. These are glued together overlapping 6 in. at the centre, as

(Continued on page 640)



Authentic Model Bricklaying

BY A. M. COLBRIDGE

BUILDING with miniature bricks is by no means new, but small scale construction with scale bricks is something which few modellers attempt. The work is, in many respects, tedious, but where the time spent in construction is of secondary consideration there are many instances where scale brickbuilding may be justified.

Fortunately there are a number of stock sizes of strip wood which can be cut to length to make excellent "bricks". These then have the advantage that they can be assembled with ordinary glue or cement for an easy, permanent bond. Making the individual bricks from strip wood in this manner the bricks may be coloured as required by dropping into a can of dye of the appropriate shade.

Full size bricks are produced to certain standard dimensions. Length, for example, is held to $8\frac{3}{4}$ in. with a tolerance of $\frac{1}{8}$ in. either way. Width is one half of the length ($4\frac{3}{16}$ in. plus or minus $\frac{1}{16}$ in.), whilst depth varies from 2 in. to $2\frac{7}{8}$ in. according to type (Fig. 1).

These figures reduced to scale dimensions in $\frac{1}{8}$, 1/12th, $\frac{1}{16}$ scale, etc., are summarised in the table. A "standard" model brick would average out to have a length equal to twice the width, and a thickness of one-half of the width. Corresponding sizes of stripwood appropriate to the various scales are then summarised in Fig. 2. The length "L" of the scale brick would then be twice the largest (width) dimension in each case.

It is thus only a matter of selecting the appropriate size of stripwood for the scale concerned and parting off to scale length. Using balsa wood, a sharp razor blade is all that will be necessary, and a very simple jig could be arranged to ensure that each brick length is cut off accurately. A fine saw would be better for parting off harder woods.

With a sufficient number of bricks prepared and dyed construction can then commence on the style required. Some typical bonds are shown in Fig. 3. A wall consisting of a single brick width is laid so that the brick joints do not fall in a vertical line in adjacent layers or courses. This type of bond is known as stretching and is the simplest of the lot to tackle. Half bricks complete the ends, as shown.

Bricks laid lengthwise on are called stretchers. Those laid head on are known as headers. Combining headers and stretchers in wall construction with a width equal to the length of the brick there are quite a number of different bonds to follow. English bond and Flemish bond, for example, are typical. Note that if these further half bricks, only this time parted lengthwise, are used to get uniformity. These are called closers. Most bonds are of the type where the full thickness of the wall is equal to the length of a brick and two further examples are shown in Fig. 4. There are other types and, in fact, there is no reason why full scale practice should not be followed throughout for scale brickwork. Making the model bricks is an easy task—assembling them a fascinating one.

Scale	Scale Length	Scale Width	Scale Thickness I	Scale Thickness II	Strip Size
$\frac{1}{8}$	1	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{1}{2} \times \frac{1}{4}$
1/12	$\frac{11}{16}$ ($\frac{3}{4}$)	$\frac{11}{32}$ ($\frac{3}{8}$)	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{3}{8} \times \frac{3}{16}$
$\frac{1}{16}$	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{1}{4} \times \frac{1}{8}$
1/24	$\frac{3}{8}$	$\frac{3}{16}$	$\frac{3}{32}$	$\frac{1}{8}$	$\frac{3}{16} \times \frac{3}{32}$
1/36	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{16}$	$\frac{3}{32}$	$\frac{1}{8} \times \frac{1}{16}$
1/72	$\frac{1}{8}$	$\frac{1}{16}$	$\frac{1}{32}$	—	$\frac{1}{16} \times \frac{1}{32}$

All dimensions in inches.

FIG. 3

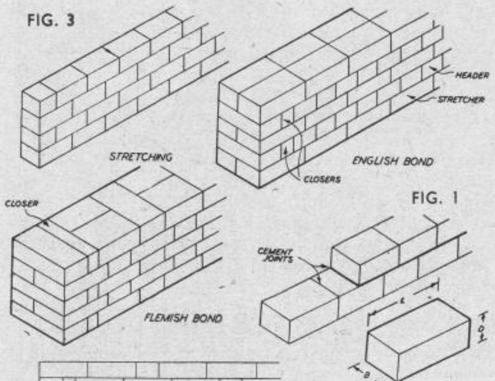


FIG. 1

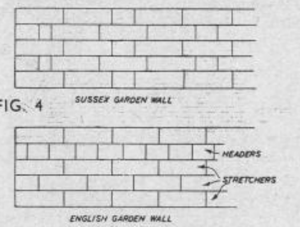


FIG. 4

Fig. 1 : General proportions of standard bricks.

Fig. 2 : Suitable strip-wood sizes to cut into bricks.

Fig. 3 : Typical bonds in common use.

Fig. 4 : The so-called garden wall bonds.

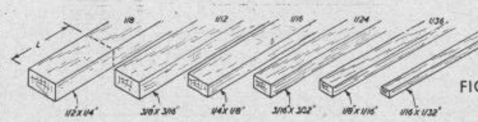
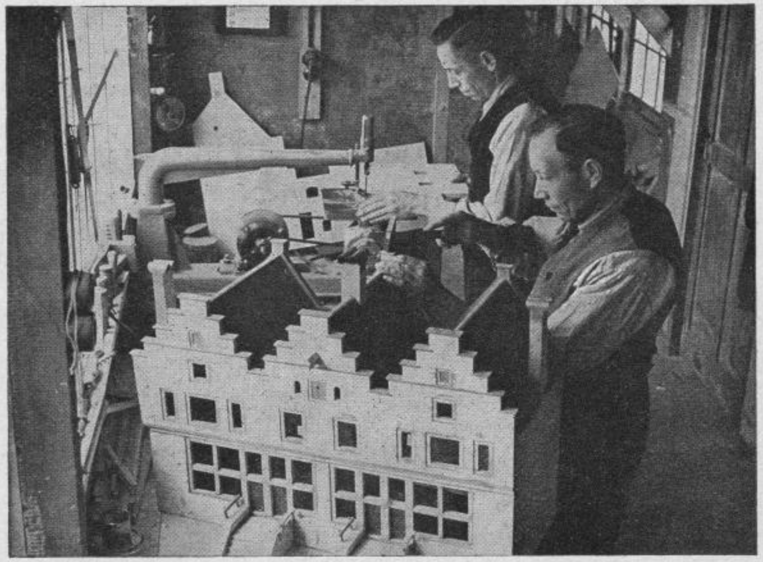


FIG. 2



This illustration of commercial modelmakers at work shows how the problem is tackled in Holland.

(Photos by courtesy of Handig Bekeken)

THIS MONTH VICTOR SUTTON DESCRIBES A SIMPLE MODEL BASED ON A CARDBOARD BOX IN HIS SERIES ON

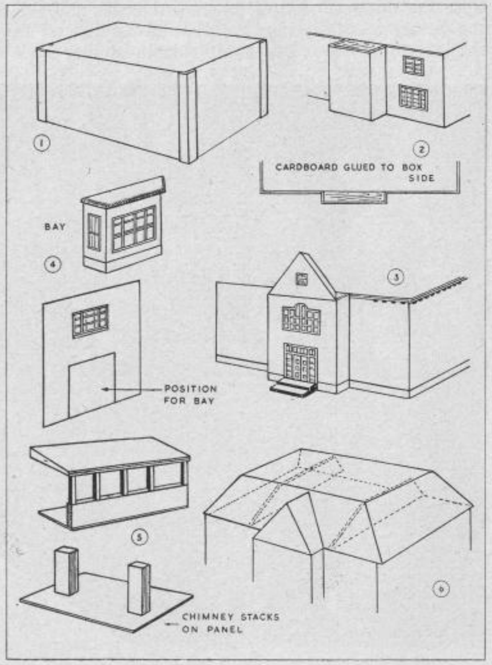
MAKING MODEL BUILDINGS

IN making model buildings and also instructing in Night-school I have often found the stumbling block to so many enthusiasts to getting started on a building is a sort of fear that they cannot get the initial shape right. With this in view I have written this article around an ordinary strong cardboard box which you can pick up from the chemist shop or grocer. After all, a model house is a glorified box but the box does give the wary worker some heart to "have a go".

First of all, choose your box. The one shown in No. 1 sketch is about the right size for a well-shaped house. All you need to do is to strengthen it up. Note the strips of card up the corners. This type of box was chosen to represent a typical type of country house. Strengthen the top with a good strong piece of cardboard as we shall be building on to this.

Note that the main door is a projection and this we build up separately. The facing walls on both sides are cut from $\frac{1}{16}$ in. photographic cardboard which cuts well and gives a realistic bevel to the window edges. Cut these and fit them leaving the centre space for the doorway and central windows. Paint in blue backgrounds on thin card to go behind the windows and put on before fixing the wall sections. You will now have the main base of the box as the wall, the windows on thin card and the outside wall in $\frac{1}{16}$ in. cardboard.

One side of the photographic card is often of a



matted type surface and this looks very real if used as the outside wall.

Now draw out the shape for the front projecting part and allow this to extend by $\frac{3}{8}$ in. This can be made on layers of cardboard or sheet wood. Wood is best and then the shape of the gable can be incorporated and this alone will save the intricate cardboard cutting which is so difficult in this type of construction. Note particularly the style of the top window which is distinctive. Door and the surrounding small windows can all be fitted and painted before assembly which is a great advantage. Also fit the two steps and the ledge over the door. Fix these through with small pins and do not rely on just sticking them. Glue this section on and then apply the deep cement footings we see on all houses. Make this $\frac{1}{4}$ in. deep and bring it round and up to the front door. This will serve a second purpose because it will bind the structure in and save it from bending.

The second side has an imposing bay which will add realism and dignity to any model. Design this side on cardboard leaving the space for the bay. Top window is the same as on the front but can be a little larger.

For simple instruction I have shown the bay window section built up and ready for fixing. First, a wood "Key" is made and this prevents all chance of it buckling out of shape. It also allows you to carry out a little interior decoration in the bay itself. Note the flat roof with a downward bevel and this can be done with $\frac{1}{4}$ in. obechi wood sanded off to shape. Treat the other short side in similar style or change the bays and windows as you wish. Finish off all round with the deep footing at the base.

Choose your own style for the back of the building and do not make it too complicated. Projecting doors and other parts are best made in a unit and fitted on. The addition of a loggia would improve it and this is shown in separate sketch.

Most buildings of this type have a fairly ornamental finish just along the top and this can be done with a strip of cardboard $\frac{1}{2}$ in. deep and another $\frac{1}{4}$ in. deep as shown. Along the top one is fitted little sections of cardboard or you can do this by cutting little bits out of obechi wood. This has the added advantage of binding up the top sections and preventing them coming apart at any time.

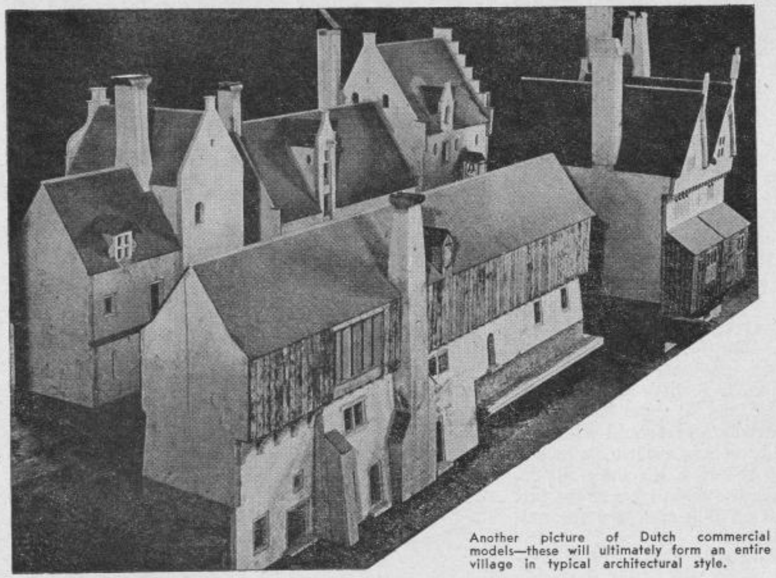
Before we go any further I must confess that chimney pots are always lost at exhibitions. With this system we shall save them because I suggest that they are made complete, fitted to the flat roof of the box and then the roof is slipped over the top.

In designing the roof first get over the slope of the gable. Take the slope of the main roof and build the cardboard gable top to rest back to this when in position. For the base of roof make a panel of stiff card or plywood to fit right over the building extending by $\frac{1}{2}$ in. all round. The whole roof section can now be made up as shown with plenty of supports to save it from caving in. With this system you can work on the most difficult roof section in the flat stage. Put your card sections on and join up the corners with a strengthening strip inside at the joint. Tops of chimney sets will have a strip of card round about $\frac{1}{4}$ in. deep as they are of the modern type.

Gutters can be made from thin tin bent to shape and gutter pipes from sticks of solder as this bends easily.

Window frames would look well in poster shade in Vandyke brown with all the doors in dark green. Loggia could be in light brown.

Edges as shown around windows could be touched up in red brick shade as this is so often used on such buildings. Better effects can be obtained by lining the windows as shown in small sketch with Indian ink. This picks them out and makes them more distinctive although not too prominent.



Another picture of Dutch commercial models—these will ultimately form an entire village in typical architectural style.

Improving the Miniature Railway Layout

H. A. ROBINSON DISCUSSES CLOCKWORK MAINTENANCE

CLOCKWORK as a model railway motive force is a far more temperamental agent than either steam or electricity. Every user of this form of energy will know this, for one day a locomotive so powered will romp away with a train and on the next be quite sluggish and come to a stop short of its usual run.

Everything seems to affect clockwork—from temperature to oil content, and even the presence or otherwise of dust, yet curiously taking it by and large, there is no bit of model machinery that receives less servicing than this. A clockwork engine is bought and often, sad to relate, just run and run till the spring goes, or some faster moving bearing, through sheer dryness, grinds itself out.

Yet being temperamental the clockwork mechanism, like its human counterpart, will respond to little attentions which would seemingly have no effect on its coarser brother ,and so it is quite worth studying such with a view to getting the best out of this very handy form of energy translator.

In looking after clockwork the first consideration is that of lubrication. Despite a strange notion in some quarters to the contrary, spring motors *do* require a lubricant and the questions that arise are how much or how little should be put on, by what methods can it be applied and at what intervals—also what oils can be safely used?

A clockwork motor should never be run bone dry, but on the other hand neither should it be flooded with lubricants—as can other items of machinery. Spring mechanisms are notorious for picking up dust and this is greatly encouraged if all the parts are damp with oil. Here, if anywhere, the place for any lubricant is *exactly* where it is wanted, that is on the teeth of the spurs, ends of spindles, etc. It is not wanted right along the spindles and on the sides of the wheels.

This, then, suggests that with a clockwork mechanism a considerable nicety in lubricating is required—which is definitely the case. A simple way to apply oil is from the end of a sliver of wood which has been cut to a fine point. Dipped in the lubricant a drop is retained on the end which can then be placed at the desired point. If this method does not appeal then a "watch oiler" can be bought which is a perfect instrument for precision oiling, and some model firms turn out miniature oil cans which are capable of depositing drops with the utmost accuracy.

A not too thin oil is required for spindle ends and spurs. Thin oils run off and dry up quickly, but thicker varieties remain as a fine film for a reasonable length of time. On the whole it is better to purchase one of the model mechanism oils that are on the market and which are correctly balanced for the purpose. The oil to use for springs will be dealt with in a moment.

For treating the bearings, the motor must be held on its side, and drops of oil deposited where the spindles enter the case. The sideways position still retained, the spindles are given a few revolutions which draw the lubricant in and the thinnest skin of this in the right place is sufficient to give all the ease of running that is necessary.

Spur wheels must be oiled with the mechanism in an upright position. The merest trace of lubricant is sufficient and application is made evenly to the cogs all round—not just at one place, hoping that it will work in later. After completing the job, mop up any unwanted oil with a piece of cloth round a matchstick.

Now with regard to springs. Again we find the idea quite popularly held that they do not require oil. But this is entirely erroneous. A moment's thought will show that a spring unwinds by a slipping action of one coil over another. This action should be smooth and effortless right through to the end of the running, when all the tied-up power is expended. A dry spring, although highly polished, does not allow of this easy slipping, a fact which can be noted when it is nearly run out. All the power seems exhausted, and then suddenly it picks up again for a few seconds. This is because the coils have freed themselves after being slightly bound. With a well lubricated spring the output of energy continues evenly to the very end.

Springs, therefore, must be oiled, but the lubricant used should be treated with graphite, and this is sold as "graphited oil". It is introduced between the coils when the spring is slack and then run in by successive windings and releasings.

Once treated, a mechanism should retain its films of oil for a good time, but a lot depends on the working conditions. Thus continual running in a very hot room will cause a quicker drying out than if the temperature is normal.

In servicing spring motors, next to oiling comes the question of periodic cleaning. Like clocks these motors need a good clean out every so often if full efficiency is to be maintained and long life to be assured, for apart from dust, minute specks of actual metal collect from various parts and in the aggregate these can do a big lot of harm. Also a gumminess which can come about by repeated oilings without intermediate cleanings must be guarded against.

Cleaning is effected by removing the mechanism from the locomotive and submerging it completely in petrol or benzine. While in this the spring must be wound and allowed to run out several times. The black colour which the spirit assumes during this process is ample proof of how efficiently dirt is being taken away.

Removed from the bath, the spirit will evaporate at once, leaving the motor beautifully bright, but unhealthily dry. Cleaning, therefore must be followed at once with the oil treatment. Just how often to do this cleaning is again one of those things which depend on the operating conditions, but one authority on the matter in his textbook states emphatically that motors that are in pretty continual service should be taken out, bathed and re-oiled every six months.

Comparative tests on the effects of correct cleaning and oiling show that mechanisms so treated will haul heavier loads, have higher turns of speed and have a considerable extra footage added to their run. Sticky and too dry motors come to a stop a distance before the potential power in the motor is completely run out—the distance being proportional to the amount of friction set up. A lubricated motor will use every bit of the power. As well as producing added strength and ease of running, regular lubrication will also give longer life to a motor and reduce the chance of breakdowns.

There are other measures, too, that help longevity and a failure-clear record, and these should be practised by anyone wishing to get the very best out of this form of power.

Springs are extremely sensitive to temperature and for this reason should never be subjected to too sudden changes. Extreme cold is a real danger and running a motor in the open when there are several degrees of frost is asking for a snapped spring—particularly if the mechanism has just come from a warm room. Too high temperatures can also be harmful, but it is the shrinkage and brittle tension caused by a low thermometer that can really bring trouble. This question of temperature assumes most importance when a line is part in the garden and part indoors. A tightly wound spring passing out into really cold air is then in great danger. Some "railway rooms" the writer has known can be very cold in winter, but although a consistent cold makes a spring brittle, it is the sudden drop in temperature that has to be guarded against.

For long life, never allow an engine to be pushed by its train (or otherwise) after the spring has run right out. This does harm at the middle and too much of this sort of thing may snap the coil from its mooring on the centre spindle. Always too, leave mechanisms fully unwound when the running for the day is over as this helps to preserve the resilience.

Another set of factors that come into the picture when considering getting the best out of spring motors lie in the *quality* of the winding operation. There is more in this than might first appear. Always turn the key steadily, never with a jabbing action. Too forceful and snappily uneven winding, while looking very businesslike can impose great strain on the spring and other parts. Winding too, should always be stopped a little before the spring is tightly coiled. Vigorous winding suddenly jerked to a stop by the spring having reached its ultimate wrapping capacity is definitely harmful.

Apart from the strain imposed on the spring and its anchorage, this kind of thing quickly "spreads" the key and causes early slipping on the squared spindle. And by the way, the keys should always be pushed tightly home before starting to turn, to further guard against slip and spread. Once a key starts to slip there is nothing to do but to square off the spindle again and purchase a key of smaller bore.

Learning the number of turns necessary to bring the spring of any engine up to the correct and safe degree of tension is a very good thing, as one can then turn with certainty to practically the end of the wind without having to "feel" one's way through quite a number of the final revolutions. When new from the manufacturer, run a mechanism in by only giving half winds for at least the first twenty or thirty runs. Many a spring has been snapped at once by a too tight first winding.

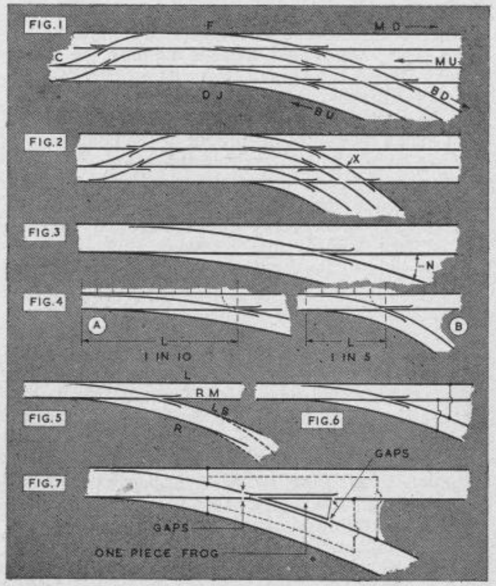
Here, then, we have some of the major points to note in getting the best out of a clockwork motor. Electricity is greatly winning the day—indeed some would say it had won the day—but clockwork is not to be despised as a means of model train propulsion. It is excellent for end-to-end runs, especially if these conform roughly to the capacity of the spring. No extra track fittings are required as with electric traction and unlike the steam engine it is always ready for immediate use. Modern spring motors are fine bits of work and treated with respect the wrapped spring and its chain of spurs can be a very faithful friend.

CONTRIBUTORS are welcome! You need not have a famous name, you need not have a fully equipped workshop—just as long as you have something of interest to our readers we shall be pleased to hear from you. Good photographs are our lifeblood, but your diagrams can be mere sketches—we will re-draw them for publication. Not more than 1200 words for a first article. We will acknowledge all articles submitted—and be pleased to give advice on likely articles, even if not suitable as at first submitted.

On the Right Track

A REGULAR FEATURE OF INTEREST TO 00 GAUGE FANS BY R. WATKINS-PITCHFORD

THIS MONTH THE AUTHOR GIVES SOME POINTERS ON POINTS



A LAYOUT without points is pointless. However, it is one thing to decide that points are required and quite another thing to know how and where to include them in the layout to best advantage. There is a grammar in these things, and a point in the wrong place can alter the meaning of a layout as surely as it can that of a sentence. Moreover, there is a special technique in the placing of points to the best advantage on a model railway and this technique must be mastered—partly by observation of the other fellow's layout, and partly by trial and error on our own.

What may be all very well in full-sized railways may, for one reason or another, be quite impracticable on a model layout; you have only to recall that in 00 gauge it takes some 70 ft. of track to represent only a mile of prototype to see why this is so. This does not mean that full-sized practice may be cheerfully ignored in every particular; but it does mean that in scaling down a real railway the model maker is entitled to a certain "poetic licence". For example, in full-sized practice, a point (usually called a "lead" or a "crossing") is, more often than not, designed for the location in which it is to be used—it is not just picked out of a box and dumped in one piece on the site as is done in "tinplate" practice. For commercially-made train sets, points of uniform curvatures are the invariable rule (although with some sets there may be a choice of two radii). The reason is, of course, that these points complete with their hand levers and/or electric setting motors, cost several thousand pounds in tools before they can be made at all and the separate set of jigs and presses would be required for each different radius of point.

Also, commercially-made sets are usually designed for use on a table top or other strictly limited space. This implies curves of a sharp radius (12 to 15 in. in 00 gauge) and, in the interests of making regular geometrical layouts (such as ovals) the radius of the curved part of a point is made to match that of the curved rail section. The entire layout thus takes on that stereotyped appearance so characteristic of the "toy" railway and this is emphasised by the breakneck speeds at which operators—not excluding professional demonstrators—hurl their trains into and out of curves.

Consider Fig. 1 for example. This represents a double junction at DJ and a cross-over at C. We will assume that the branch lines BD and BU are equal in importance to the main lines MD and MU—that is to say that both sets are required to handle fast moving traffic. Now from Main Down to Branch Down implies taking a facing point at F, and if this is to be done at any speed above a crawl, the curve must be made very gradual.

The cross-over at C, however, would only be used for setting back (e.g. for breakdown trains in the event of a derailment at the junctions, or to give access to a lay by). It is a trailing cross-over and as such could afford to be of a relatively sharp radius, because it would never be used by fast running traffic.

Here is a case then, where full-sized practice would employ points of different radii, each suited to the requirements of the case, and where, if we imitated such a formation in track of commercially-made types, we should have to employ the same radius of point throughout, securing an effect somewhat after the manner of Fig. 2. Note, incidentally, that the angle of the acute-angle crossing unit at x must match the radius of turnout of the point.

If we were to build up this formation from rail sections, as is done in real practice, we could, of course, imitate the prototype by having points of different angles according to situation and, indeed, this is often done by model makers. But we must not lose sight of the fact that a point of acute angle will occupy a greater length than one that is obtuse —and length generally is the one thing in short supply!

Moreover, if we were to vary the angle of each point according to its position and application on the layout, there would be a fair amount of calculation and drawing board work to do. Some like this; others don't.

For most model makers then, it will suffice to build all points to the same radius or angle, but to make this radius very much larger than is feasible in ready-made "table railways". It is a matter of compromise again, we must not have too small a radius, because the running will be jerky and unreal. Equally we must not have too large a radius, because our points will be unduly lengthy and we shall restrict the amount of "layout" that we can get into our baseboard. The Peco people keep to a standard of 3 ft. radius, which is pretty well the ideal compromise, and their well-known Foundation Point Plans are drawn to this radius.

Actually, although it is convenient to refer to points in terms of the radius of the turnout, this is not strictly accurate. The ruling factor is the angle made by the two rails at the nose of the crossing (N, Fig. 3) likewise called the "frog of the point."

This angle may be expressed in degrees, or it may be identified like a gradient as 1 in 6, or 1 in 8. In American practice, the point is referred to simply as a No. 6 or a No. 8 point, and this is understood to refer to the frog angle and, this angle being given, the remainder of the point is designed around it. Fig. 4 shows at A an acute angle (e.g. 1 in 10) and at B a more obtuse angle (e.g. 1 in 5) from which it will be seen that the more acute the angle—or, in other words, the more gradual the turnout—the longer the lead L and, therefore, the more space occupied on the baseboard by this point.

It we contemplate running locos with long coupled wheelbases, this question of point angle needs watching. Usually a 1 in 6 frog will be found to be a useful compromise in 00 gauge work, but if Pacific are going to be used and not unduly slowed down, this should be regarded as a minimum figure and 1 in 6½, 7, or even 8, should be used.

Taken all round, therefore, it is perhaps a good plan to standardise on one angle of frog for ordinary turnouts, remembering that the radius of the curve immediately following the turnout can easily be made less than that of the point itself if desired (see dotted lines, Fig. 5).

One of the advantages of adopting a standardised angle is that it permits the use of one-piece frogs. The Peco people offer a one-piece frog of 10 deg. to be used in conjunction with a turnout radius of 3 ft. This, like other products from the same stable, does much to simplify the home construction of track. Being machined or cast from solid metal, it ensures not only the correct angle at the crossing nose, but also correct spacing of the wings and depth of throat.

There is, of course, no insuperable difficulty in making a crossing nose from filed rail sections, or in making wings by bending out the ends of the switch rails or, indeed, in finding the correct place for the nose in the throat so formed (usually by trial and error!) but it is convenient, particularly in the early days of track making, to have this ready done "beyond a peradventure".

It is, of course, necessary in buying a one-piece frog to select the type which complies with the wheel standards we are using, e.g. Scale 00 (B.R.M.S.B.), Hornby Dublo, Trix Twin, etc., special frogs being available for each standard.

Apart from the convenience of having the frog (crossing nose) and wing rails all correctly set in relation to each other, there is also the matter of electrical connections to be considered. For example, a point such as that shown in Fig. 6 would not be suitable for two-rail running, because this depends upon complete insulation between each pair of running rails. As will be seen, the left-hand branch rail LB joins up with the right-hand main rail RM and this would cause a short circuit. One way to avoid this is by leaving a small air gap or, in other words, by isolating the frog. There must only be a short section isolated, otherwise the loco collector shoes would be unable to span the dead section and the train would come to an abrupt stop.

In practice there would be some difficulty in fixing down rigidly and precisely a small assembly such as the isolated frog shown in Fig. 6, but if the frog and its wing rails are all in one piece of metal, it becomes an easier matter to locate it accurately and firmly to the other rails in the point. However, if an all-metal one-piece frog is used, it will not do for the switch rails and frog to be in contact, because if the flange of a passing wheel touched the open switch blade, it would cause a short circuit. But again, we can avoid this possibility by leaving a small gap between the switch rails and the frog and the complete assembly becomes as in Fig. 7.

There are, of course, many ways of wiring up points, depending upon whether you are using two-rail, three-rail, stud contact, or twin running, and also upon whether you wish the setting of the point to switch in or out various parts of the track way. But this must be the subject of another chat.

The Steam Horse Problem Solved?

AN INTERESTING REPLY TO THE POSER BY P. R. WICKHAM

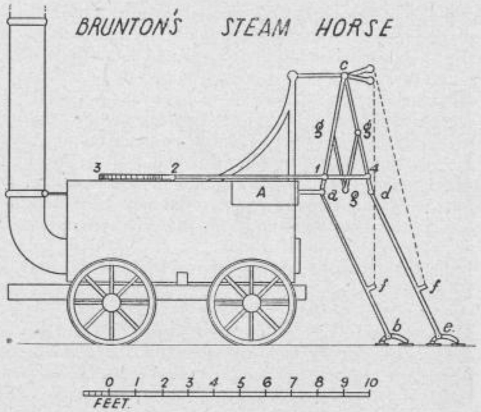
MR. COLBRIDGE'S article in the July *Model Maker* sent me straight to the bookshelf for my copy of *Wood's Treatise on Railroads*, and therein, I believe, lies the solution to the problem set by Brunton's patent sketch. Nicholas Wood (coal viewer at Killingworth Colliery and one of the judges at the Rainhill Trials, where Stephenson's "Rocket" finally established practically all the salient features of the locomotive as we now know it) published his famous "Treatise" first in 1825. My own copy is of the second edition dated 1832 and including the very valuable detailed account of the Rainhill Trials.

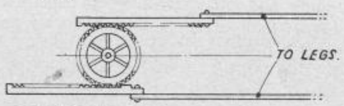
Wood gives a full description of Brunton's patent, of which the following is a practically verbatim copy, and an engraving of the Elevation of which I append a tracing.

"In 1813, Mr. Brunton . . . also obtained a patent for a mode of accomplishing the loco-motion of the engine without the aid of the adhesion of the wheels upon the rail. . . .

"The boiler was . . . cylindrical, with a tube passing through it to contain the fuel. The cylinder *A* was placed on one side of the boiler; the piston rod projected out behind horizontally, and was attached to the leg *ab* (at *a*) and to the reciprocating lever *ac*, which is fixed at *c*. At the lower extremity of the leg *ab*, feet were attached (by a joint at *b*). These feet . . . were furnished with short prongs, which prevented them from slipping, and were sufficiently broad to prevent their injuring the road.

"On inspecting the drawing, it will be seen that when the piston-rod is projected out from the cylinder, it will tend to push the end of the lever (or leg *a*) from it, in a direction parallel to the line of the cylinder; but as the leg *ab is* prevented from moving backwards by the end *b* being firmly fixed upon the ground, the reaction is thrown upon the carriage, and a progressive motion given to it, and this will be continued to the end of the stroke. Upon the reciprocating line *ac* is fixed (at 1) a rod 1.2.3., sliding horizontally backwards and forwards upon the top of the boiler. From 2 to 3 it is furnished with teeth, which work into a cogwheel lying horizontally; on the opposite side of this cogwheel another sliding rack is fixed, similar to 1.2.3. which, as the cogwheel is turned round by the sliding rack 2.3., is also moved backwards and forwards. The end of this sliding rod is fixed upon the reciprocating level *dc* of the leg *de* at 4. When, therefore, the sliding rack shown





CONJECTURAL PLAN OF RACKS. (NOT TO SCALE)

in the drawing is moved forward in the direction 3.2.1., the opposite rod 4. is (by the progressive motion of the engine) moved in the contrary direction, and the leg *de* is thereby drawn towards the engine; and when the piston-rod is at the furthest extremity of the stroke, the leg *de* will be brought close to the engine. The piston is then made to return in the opposite direction, moving with it the leg *ab* and also the sliding rack 1.2.3. The sliding rack acting on the toothed wheel, causes the other sliding rod to move in the contrary direction and with it the leg *de*. Whenever therefore, the piston is at the extremity of the stroke, and one of the legs is no longer of use to propel the engine forward, the other (immediately on the motion of the piston being changed) is ready in its turn to act as a Fulcrum, or abutment, for the action of the moving power. . . .

"The feet are raised from the ground, during the return of the legs toward the engine, by straps of leather or rope fastened to the legs at *ff*, and passing over friction sheeves (moveable in one direction only) by rachet and catch worked by the action of the engine."

(I have slightly amended the somewhat erratic punctuation of the original and added brackets here and there, in an attempt at greater clarity.)

Now, if we compare the above with the copy of the patent drawing in the July issue, we find that the essential factor missing from the latter is the rack-and-pinion arrangement on the boiler, which imparts motion to the second leg. I have not seen the *original* patent drawing, but it seems more than likely that there is, in fact, no fundamental error in it, but that it has been misinterpreted by successive copyists. The racks and pinion being in a horizontal plane ,only the reverse (or plain) side of one rack shows in a side elevation and would certainly be mistaken for a plain side if not explained by accompany-text, as in the "Treatise". I have appended to the elevation, a plan of this arrangement to clarify it still further. This is frankly conjectural as to its details, but cannot be very far out. Some form of guide brackets to keep the slides in line and in contact with the pinion would obviously be essential, but as they are not shown in the engraving, I have not ventured to detail them.

This description, while solving the main problem, leaves two smaller problems of its own. One is the purpose of the links g, which Wood omits to refer to. Presumably they are merely provided to steady the motion of the legs, but they hardly seem to be necessary and in any case it is difficult to see how they could be fitted as the legs are on opposite sides of the engine and not, therefore, in line with each other. The second problem is the exact working of the gear for lifting the feet on the return stroke. Here, the description is rather ambiguous and I frankly cannot make very much of it.

What emerges from all this, is that modelling the loco would be a rather more difficult task than at first appears. Certainly the rack-and-pinion arrangement would call for careful work, but it would be a most interesting experiment. The original, if not a practical success certainly did work. Wood quotes a letter from Brunton describing experiments with the engine, which gives, incidentally, the only scanty dimensions I have been able to trace; ". . . the boiler was . . . 5 ft. 6 in. long, 3 ft. dia.; the step was 26 in. long, the piston-rod having a stroke of 24 in.; the weight of the whole 45 cwt." The letter goes on to mention speeds of 2½ m.p.h., at which speed the engine could lift a weight of 812 lb. attached to it by a chain, ". . . thus making the whole power equal to 896 lb. at 2½ m.p.h., equal to six horses nearly." I very much like that 'nearly'!

If there is any moral in all this, it is surely that one must use infinite care in interpreting old engineering drawings. Having spent a good deal of time in recent years, in studying early locomotive history with a view to preparing true scale drawings, I have had several severe lessons on this score myself. Often one seems to hold in one's hands all the threads need to solve a problem save one. That is at present my position with regard to the exact form of valve-gear used by Stephensons on their earliest inside cylinder engines, the "Planet" and the later four-coupled engines. One day, I trust, the vital clue will come into my possession and the whole thing will seem as simple as the works of the "steam-horse" do when one knows the secret. It is all as fascinating as any detective story—indeed a good deal more fascinating than many!

MODEL SIGNAL OPERATION

(*Continued from page 625*)

ampere turns. The only cure is to increase the coil C.S.A. and use a bigger core C.S.A. It happens the other way round, of course, but the rub is in that bigger coil. Regarding magnetic materials, laminations are unnecessary with D.C. although for the very best magnetic materials laminated stock may be the only source. Generally, black mild steel is quite good, bright stock is sometimes all right, but when free cutting as is usual the little globules of lead or sulphide can sometimes cause a much reduced real magnetic C.S.A. Both are quite usable, but do not be surprised if some pieces are much better than others, due, it is believed, to quicker saturation caused by some trace and otherwise harmless impurity. A test which usually works is to use a small piece of the stock on a big permanent magnet—to saturate it: the magnet must be good—and testing its lifting power. This will permit any residual to be assessed by trying it immediately after without the magnet. Returning to the coil, the same bobbin when wound with different gauges of wire with the same type of insulation will wind to nearly the same external diameter for the same ampere turns of each, which is useful when rewinding for a different voltage. The effective ampere turns alter slightly, however, and it can't be pushed too far, such as trying to wind an equivalent 16 gauge coil in place of 33.

(7) To work very light signals such as 00 gauge should be a normal relay bobbin, and "works" should be good enough. It is suggested that a second hand 100 ohm. Post Office type be obtained and tried. A really well balanced 00 signal could be worked with it easily, and so 12 volts 100 ohms should be ample for something less well balanced. Examination of a P.O. relay will show all the points made above clearly and are marked in the Figure (2). For very light jobs such as this the extra friction of the plunger type makes it much less advantageous. This type begins to be useful owing to reduced relative friction and more even pull at about 12 volts 50 ohms, being far the best at 12 volts 25 ohms

(8) As regards A.C. the first suggestion is—don't. It will be found cheaper to group and use a selenium bridge rectifier for a D.C. supply as heavy current rectifiers are relatively cheaper than any other system. Half-wave rectification is quite good, but the tyro may find hum and overheating unless the relays or solenoids are mechanically or electrically "slugged", that is sluggish in response to current changes.

(9) To come down to the original issue in a very practical form, why are relays so expensive? Could some trade firm mass produce say, coils, which are easy on a machine and a complete horror by hand, leaving the modellers to fit cores, etc., to his own requirements? Incidentally, one further practical point, neat windings pay off owing to the area effect mentioned earlier, and results are more reproducible.

Signal Operation

BY D. F. T. ROBERTS

THE writer of the article in your July issue on Signal Operation has, I believe, given your readers a rather erroneous picture of the power requirements of model railway signals. As there seems to me to be a distinct tendency in the model railway world generally to use very makeshift electrical equipment in a rather incorrect way, resulting in a heavy expenditure which puts off newcomers like myself. (In fairness, the writer is an intending modeller still very much in the design stage, but has devoted considerable time to electrical control systems, and at work has had much to do with small automatic electrical gear.) If one signal requires a power suitable for three locos, or even one, then something is very wrong. The fact that the requirement is intermittent

A well made 24 watt (12 volt 2 ampere) solenoid should be capable of operating a signal by lifting a section of the track relative to the signal arm, and 6 watts should be enough to operate a well made 00 gauge point. The quadrupling of the wattage itself suggests that all is not well; if 6 watts will do, why use 24? The use of Ohm's law suggests D.C., but even if A.C. were intended, the D.C. resistance is still too low. It will be assumed that D.C. is to be used. The leading points in solenoid design are:

(1) The magnetic circuit must be "closed". This means that the magnetism should be able to travel entirely through magnetic material—mainly soft iron or mild steel, although silver steel could be used for pins or pivots if indispensable to both sides of the working gap.

(2) Adequate magnetic circuit. This means that core, yoke and armature should be of adequate cross sectional area, pivots and pins should be of a size to commensurate with this C.S.A., and that air gaps at them should be as small as possible; a normal free turning two thou. does not cause bad losses.

(3) The longer the core, and hence the yoke, for the same driving force in ampere turns, the weaker the magnetism owing to the longer magnetic circuit; but, and a very big but, the bigger the coil cross section the less the magnetism induced for the same ampere turns. This means that the length/diameter ratio of the coil must be a compromise, good values lying between 2 and 4 to 1.

(4) Generally, as is well known, the mechanical force exerted decreases proportionally to the square of the working gap distance. This causes, as the article shows, a big difference between the pull in and lock on currents. The cure is fairly obvious with a nearly fully balanced system such as a signal could be, being the use of the greatest possible leverage with the smallest gap. Eventually, the force

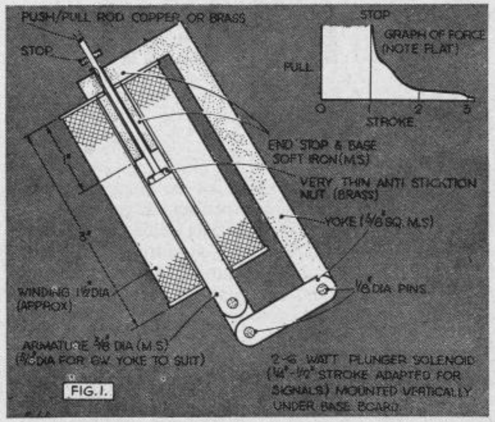


FIG. 1.

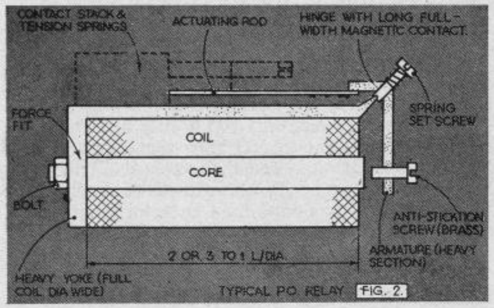


FIG. 2.

required is too great, but an idea of this can be obtained by considering the power available. The one danger here is that a residual magnetism, that is, any tendency of the core, etc., to retain a slight magnetism when the current is off may itself cause locking on. The cure is a piece of thin paper, a tiny brass stud, very thin coppering or tinning or any non-magnetism material on one of the poles of the gap. A few thou. only should be used, or the greatest pull part of the stroke will be lost.

(5) The best way of wangling the inverse square law is the use of a plunger working against a core stop, as shown in Fig. 1. The resulting improved force curve is shown. It is not difficult to make if all the foregoing and following points are kept to. In fact the mechanism is nothing to the bind of coil-winding.

(6) The magnetic force is proportional to the ampere turns, or of more use here, milliamps times thousands of turns. This is providing the coils used are the same shape and size, and the magnetic material is not saturated. All highly magnetic materials suffer from saturation, which results in a rapidly decreasing gain in magnetism above a certain drive in

(*Continued on page 624*)

TEST BENCH

A REGULAR TRADE FEATURE ON ITEMS OF INTEREST TO READERS

Juneero Engraving Tool

There are quite a number of de luxe engraving tools on the market which perform a multitude of functions, but this simple tool follows the usual Juneero practice of providing at a most moderate figure (12/6) a simple instrument capable of the one simple operation, which should certainly please a lot of people who really only need it for that purpose.

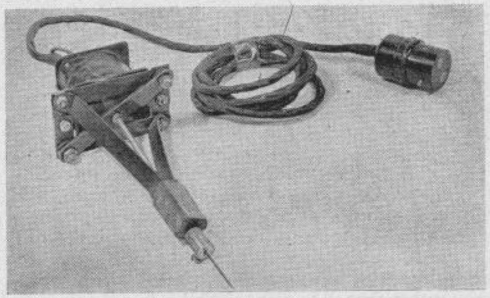
It comes neatly boxed, completely assembled and ready for use, with 4 ft. of flex for attachment to the nearest point. A plug-in socket is not provided as this will vary according to district and whether to be plugged into lighting or power circuits. It is equally suitable for all A.C. voltages 200-250.

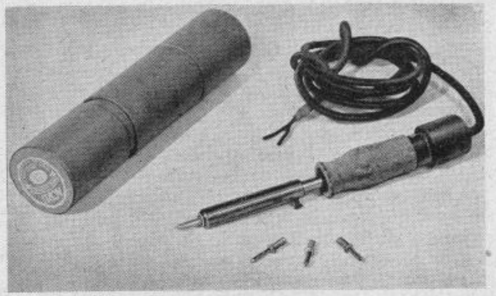
A nice firm grip can be taken about the handle which fits naturally into a writing position. The actual engraving point is made from a gramophone needle, so that at the first sign of blunting it is a simple matter to renew it. Our first test was the rather ordinary one of scribing names on tools. Naturally enough it cannot be expected to make a big impression on steel, but with brass and other softer metals it could be used to print neatly and clearly. We tried a running hand and managed a passable signature after a few tries.

Other uses are many. It makes a useful addition to the model rolling stock builder's kit for lining out metal plates, when it should be used against a straight edge. After a little practice really professional looking work can be done. Finally, the ornamental worker may find it serves for engraving brass trays and the like with traditional patterns.

The Acru Wood Engraver

This is the sort of tool wise exhibition organisers should include in their prize lists: it would meet with a ready welcome from winners, and add distinction to the award table, in its elegant pigskin





case. Those who cannot win one will just have to put their 28/6 on the counter and buy one for themselves for it is too good to miss.

It is a multi-purpose tool that does not seem essential to the model maker's tool chest, until he acquires one: then he wonders how he managed so long without it. A set of four tools are provided with the handle and flex. Numbers 2, 3, and 4 are sharp pointed and suitable for wood, leather, velvet or cork burning, for lettering, design effects, or simply cleaning up rough chiselling in inaccessible places. No. 1 bit is rounded, and most useful for forming plastics and sealing cellophane.

Those who do any of their own bookbinding will find the bits useful for foil embossing. By their means elegant hand-lettered titles in suitably coloured foils can be professionally embossed on spine or front of bound volumes.

Finally, for those who would like a delicate little soldering iron, a further copper bit can be obtained for 1/9d. which will enable radio work, or any of those intricate jobs where too much heat loosens earlier joints to be conveniently accomplished.

Posters for 4 mm. Trackside Hoardings

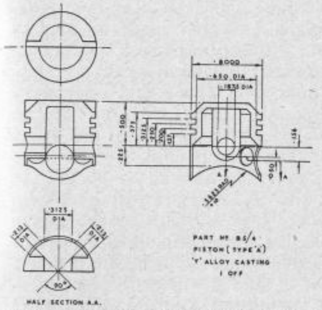
Our illustration can hardly do justice to these new Wills posters produced in full colours from the advertiser's original drawings for ERG (Bournemouth) Ltd.

They are available in a set of five sheets—one only of which we reproduce—each containing six different posters. Our picture is exactly full-size, and indicates

(*Continued on page 638*)

Constructing a 5 c.c. RACING ENGINE Part VI

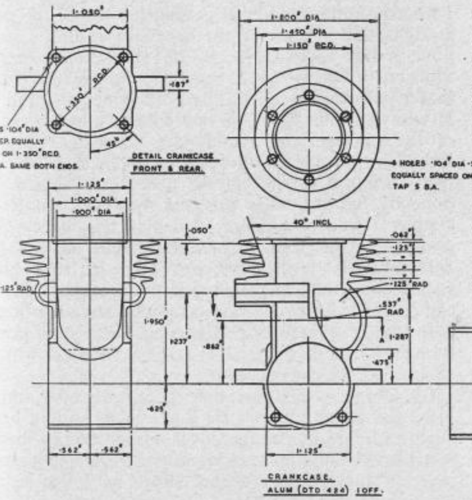
CONCLUDING THIS SERIES OF ARTICLES BY G. M. BARRY



Piston

THIS is to be made from a casting, and I am inclined to say that it must be a die casting. I cannot conceive that any other method could give the desired result. Of course, I could be wrong! But I specify a die casting, with a good "stalk" left on the head, for chucking purposes.

Hold the casting in the 4-jaw by the "stalk", and set to run as truly as possible. Turn for whole length to .800 in. dia. —1, or to suit your particular liner. Piston should be just a nice smooth fit when dry. Turn the two ring grooves, using a narrow parting tool and part off piston from "stalk". Hold lightly in 3-jaw and face head, getting a good finish. Piston may now be placed on a surface plate, head down and marked off for gudgeon pin and port holes. I think this is a very tedious method, and I made a simple jig to do the job. It is merely a 1.500 in. length of 1.500 dia. bar, bored out, .800 in. plus for about 1.00 in. deep. It is marked off and cross drilled for the gudgeon pin holes and drilled for the port holes. That is to say the gudgeon holes are .500 in. in from blank end, the two small port holes .606 in., and the large one .656 in. from blank end, and at 90 deg. to gudgeon pin holes. In operation the piston is pushed into jig and turned until gudgeon pin bosses are in same plane as holes. Gudgeon holes are drilled through, and a pin inserted to hold piston while front holes are drilled. Piston is then removed, gudgeon holes reamed and all burrs, etc., removed. If a little care is taken in making and using the jig, no trouble at all will be experienced, and what is normally a tedious job becomes fairly easy. This completes the piston.

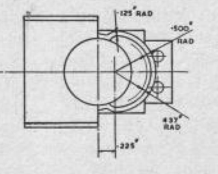


Crankcase and Cylinder

THIS is made from an aluminium alloy casting. The only point to watch is getting the bore truly at 90 deg. to the crankshaft. If you have a good angle plate this is fairly easy, and I think it's worth while getting one if you are without. I machined my first engine entirely in a 4-jaw chuck, so it can be done, but I would not advocate it! I will assume, however, that you have an angle plate.

The first job is to mark off the casting. I think the best stuff for this operation is whitewash. Give the casting a coat and leave it to dry. Then find the centres over the two crankcase faces, the top of the cylinder and the crankcase bottom. Centre pop lightly. Set up crankcase on side, and on surface plate, and adjust with packings until scribing point passes through all four marks and then scribe through them, right around casting. Find axial centre point on holding-down flanges and mark them. Set up casting in surface plate again, so that marks on flanges and cylinder and bottom crankcase marks are in line, and again scribe right round casting. This completes initial marking off. (I would again stress that I consider this unnecessary, if you are reasonably sure of your "eye" when setting up. If not, it does perhaps make things easier. As I am not a machinist myself, it may be that I cannot appreciate the finer points of the craft. However, that's by the way!)

Put centre in headstock and 4-jaw chuck on spindle nose. Set casting with one of the crankcase centre pops on centre, opening out chuck to let it enter, and bring up back centre, in tailstock, to other centre pop on front of casting. This more or less clamps casting between the two centres. Now carefully close up jaws of chuck to clamp casting, using paper between casting and jaws to ascertain when contact



is being made. You will make contact on the top-bottom and edges of the holding flange. Carefully tighten up chuck, making checks to ensure that casting has not moved. When tight, remove tailstock and centre, take chuck off spindle, remove headstock centre and then replace chuck. This method ensures a fine amount of accuracy for boring crankcase, and is the best I know. If your headstock centre is not sufficiently long to come through the chuck, you can either make one up, or rely on sighting the back centre pop through hollow mandrel. I think it better to make a centre, as there is that much spare material in casting, and if the centre pops are out of line to any extent, you may find that one wall of the crankcase at the rear is dangerously thin. Besides, it looks bad!

Having set casting up, drill and bore right through to 1.00 in. dia. Free off front of crankcase until it measures .562 in. front scribed centre line, finishing with as fine a cut as you can, and then bare 1.125 in. dia. for 1.00 in. deep, again with a fine finish cut. (It is better not to bore right through to 1.125 in. dia., in case you bore a little taper, a fault found in a lot of lathes.) Remove casting from chuck, chuck from lathe and using 3-jaw, chuck a piece of 1.250 in. dia. steel bar, and turn a 1.125 in. dia. spigot on it .1875 in. long. Finish with a very smooth file, until the finished bore of the casting is a nice push fit. Now face off other side of crankcase to .562 in. from centre line, and finish bore to 1.125 in. dia. These two diameters, at front and back of crankcase are, of course, to fit your front and rear covers, so, if there is any discrepancy in these, bore the crankcase to fit. After all, my drawings don't really matter, so long as your engine goes together! The thing which does matter, is to get a good finish on these machined faces, as on these depend, to a large extent, the running of the engine and its performance. The housings should be a nice push fit into crankcase.

Remove casting from mandrel, and remove chuck from lathe, replacing with faceplate and headstock centre. Put angle plate on faceplate and lightly clamp casting to angle plate, using a paper packing on faces of casting to prevent marking, and adjust until centre pop in bottom of casting is true with headstock centre. Bring up tailstock centre to cylinder top centre pop, and being careful to check during clamping, finally clamp casting to angle plate, and angle plate to face plate. (It would be obvious that only a small bolt should be used to clamp to angle plate, and that it should be as near the bottom of crankcase as possible because the boring tool has to clear the clamping bolt.) With all finally tightened up, remove tailstock, take faceplate and casting off lathe, and remove headstock centre. (This latter is not strictly necessary, but, on replacing faceplate and casting, it's nice to look through mandrel, and see centre pop running true. On the other hand, it's equally unpleasant to see it isn't!)

Now drill and bore cylinder, right through to crankcase, to .900 in. dia., or until your liner is a nice push fit, and bore the 1.40 in. dia. and .062 in. deep recess, after the cylinder has been faced off to correct length. Incidentally, the cylinder liner is not a shrink fit, and is liable to distort if so made. The cylinder fins can be turned while crankcase is set up but I prefer to leave these until later. Remove crankcase from angle plate, etc., and place on surface plate, upside down. Set scribing block to .713 in. height and scribe centre line across exhaust stub. Scribe two more lines, one above and one below centre line, each spaced .125 in. from it. Set up crankcase on topslide and vertical slide, and using lathe centre as a guide, set up until exhaust stack centre line is on centre height, and at 90 deg. to lathe axis. Check this by cross traversing. Clamp crankcase in position. It is as well to make a plug to fit into crankcase for this clamping, to save distortion, though this should not occur if care is taken. It is, however, better to take a little extra precaution, than to bewail the spoiling of a job to which a lot of work and time has been devoted. Now either mill or drill and mill exhaust port. I use a ¼ in. dia. endmill and feed in about .025 in., cross traverse for extent of port—then feed in and back to original point—continuing this process for full depth of port. On completion, remove crankcase from lathe and using bent scriber, scribe a line in cylinder bore, opposite exhaust port, .663 in. from top of cylinder, as a guide to position of top of transfer passage.

You may remember that, at the commencement of these articles, I stated that I did not know how to machine the transfer passage? Well, that is true still. I have not succeeded, at least in any way which can be described on paper, in obtaining the shape which I consider most desirable, as shown in the drawing. The only way to do it is to use various shaped cutters, rotary files, etc., and do it by hand. I find the difficulty lies in getting the top of the port straight, and yet having the necessary radius. I have gone so far as to make, or try to make, a special tool, but it was no great success. I trust, therefore, that I will not be too hastily condemned if I fail to give any specific "gen" on how to arrive at the shape of the passage, but merely say "transfer passage should be formed by the careful application of correctly shaped rotary cutting tools, and should be done by hand". It is possible, however, to use a simpler shape of passage, which is reasonably efficient and which can be machined quite easily. Incidentally, this is the type used in the earlier engine, so I can assure you that it does work quite well. It can be made in two forms (a) communicating direct with the crankcase and (b) using the piston ports, though I have not tried (b) I see no reason why it should not be successful.

(a) Obtain a .750 in. dia. woodruff cutter, on a ¼ in. dia. shank about 4 in. long. This should have slight radii ground on the edges, about .062 in. being suitable. Hold this in 3-jaw chuck. Set up crankcase on topslide or vertical slide, on lathe centre

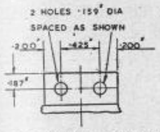
height, which can be checked by trying cutting in cylinder bore. When correctly set, clamp in position, and advance lathe carriage until cutter (near-side) coincides with line scribed for top of transfer passage. This can be seen through exhaust port. Advance work, by cross traverse until cutter is touching cylinder wall, then start cutter revolving and advance .025 in. Traverse carriage toward headstock until cutter runs out. Repeat this operation until transfer passage is of sufficient depth, about .125 in.

(b) Is exactly the same as above except that cutter does not run out, but is stopped at the correct distance down the bore, 1.475 in.

Having completed the above, remove crankcase from lathe, and finish off by drilling and tapping where necessary, all holes. Holding down flanges must be marked off and drilled individually. For cylinder head holes, insert liner, put on cylinder head, being careful to position it properly, and spot holes through head. Remove head and liner, and drill holes .104 in. dia. x .500 in. deep. Tap 5 B.A.

Next put on front housing, get as square as you can and spot holes through it. Remove and drill .104 in. dia. x .250 in. deep. Tap 5 B.A. Repeat on rear, using rear housing for spotting holes.

Chuck a piece of 1.00 in. mild steel and turn to .900 in. dia., a good push fit for cylinder bore. Put cylinder on mandrel and using a narrow tool ground to about 12 deg. or 13 deg. included angle and nicely radiused on end, turn fins. A little care makes the job quite easy.

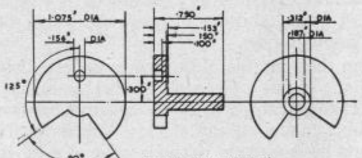


SCRAP VIEW HOLD DOWN LUGS.
SAME BOTH SIDES.

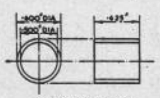
Assembly and Initial Running

This, I think (and hope), completes the engine, apart from assembly and initial running. I feel that enough has been written about these matters to justify the omission here of any specific directions. I would only stress the need for absolute cleanliness and some care. If a part won't fit, don't make it. Find out why and correct whatever is wrong. I never use any packings or jointing compounds, and if the machining is done properly, these should not be necessary.

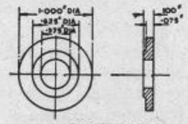
Assemble crankshaft and bearings in front housing and fit flywheel. See that everything is free, but with no end-play, other than about .005 in. Assemble piston and rings, and fit con-rod, gudgeon pins, etc. Insert into liner and then fit liner into crankcase (correct way round!) and put on cylinder head, but not too tight. Being sure that piston is right way round, fit crankcase front, entering crankpin into big end. Insert rotary valve pin, and fit crankcase rear, making sure that pin is in its driving hole. If everything now feels nice and free, set up in lathe, and motor over for two hours, applying plenty of oil, and frequently checking for tightening up. If o.k. remove, dismantle, wash thoroughly and examine for high spots, etc. If o.k. rebuild, and this time make everything tight. Fit glowplug, mounting engine on head in vice. Rig up tank, etc. Fit carb. and try to start it. I daren't say how long it took me to start my first engine. If it won't start, check plug, which can be seen through port. The usual trouble is lack of compression, in a piston ring engine, and unless rings are properly made and fitted and nicely headed in, they can cause a lot of heartache. However, if everything is right, I think you'll find starting not too bad. Use methanol-castor oil 2-2.5/1 for initial running, and don't let the engine run flat out, free, until it's nicely run in. Run in on a 9 or 9 x 8 propeller. When run in engine should do about 17,000 r.p.m. running light. You can then start to "tune" it, by experimenting with various plugs, fuels, etc., and modifying timing, balancing valve and reducing friction as much as possible. As made timing is exhaust 65 deg. before and after bottom centre, transfer 55 deg. before and after. Rotary valve, opens 55 deg. after bottom centre, closes 55 deg. after top centre. Inlet and exhaust period may be increased to as much as 70 deg. and 75 deg. respectively, though much depends on the individual engine, fuel and compression ratio so *festina lente*, or it's better to do nothing than to do it wrong!



ROTARY VALVE (TYPE B)
DURAL OR STEEL.
1 OFF.



ROTARY VALVE BUSH.
PHOSPHOR BRONZE.
1 OFF.

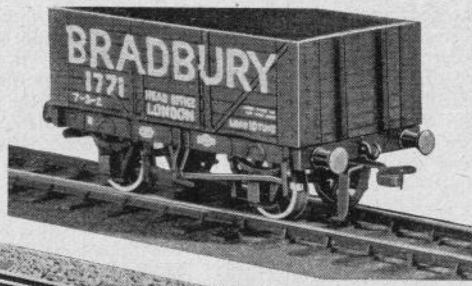


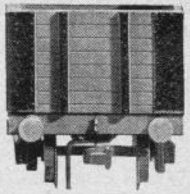
FLYWHEEL WASHER.
DURAL.
1 OFF.

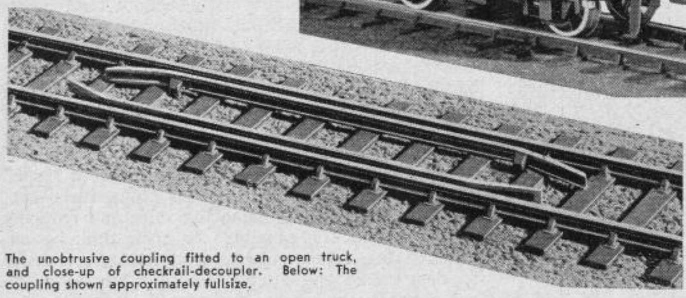
Earlier in these articles I mentioned the possibility of the rotary valve not being too successful, so I have made drawings of a normal disc type and housing which may be used in preference, or in case! I don't think any detailed description is called for, as there is nothing special about the bits. Only the old heart-cry—Careful Workmanship! In conclusion, I sincerely hope that anyone who may build the engine is amply repaid and offer my apologies in advance for any errors of omission and comission.

I am willing to assist anyone in difficulty, if I can, but would stress the fact that I dislike letter writing as much as writing articles and that, as Runyon has so aptly put it, is more than somewhat.

Try these AUTOMATIC COUPLINGS







The unobtrusive coupling fitted to an open truck, and close-up of checkrail-decoupler. Below: The coupling shown approximately fullsize.

NOTHING detracts more from the realistic operation of a miniature railway layout than to see a large hand descending from the heavens to uncouple wagons and even lift rolling stock bodily to a new location. Such maneouvres should be unnecessary and are certainly as undesirable as would be the sight of scene shifters at work between scenes of some popular play.

From the time the old tinplate model railway grew up to the status of a scale model enthusiasts have been experimenting with devices to couple up and de-couple model rolling stock. The more usual expedients have already been covered in articles in our columns and we are now happy to present the Peco-Simplex Auto-Coupler system which is taking an ever growing hold on model railway operators who insist on realism.

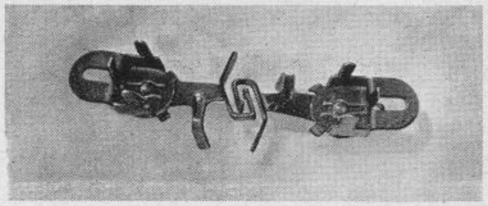
This consists basically of the coupling which can be used with any normal make of rolling stock, and will connect with vehicles still retaining their conventional couplings. The makers' extensive fitting leaflet deals with minor modifications of the principal varieties of coach and wagon on the British market, as well as American HO rolling stock and locomotives.

In addition there is the mechanical ramp used for fly-shunting, which is made to resemble check rails, thus presenting a railway-like appearance without detracting from the realism of the track. We have also seen it disguised as a boarded crossover when used adjacent to platforms and goods yards. There is also a second de-coupling method embodying a concealed permanent or electro magnetic device. This is particularly suitable for releasing stationary vehicles.

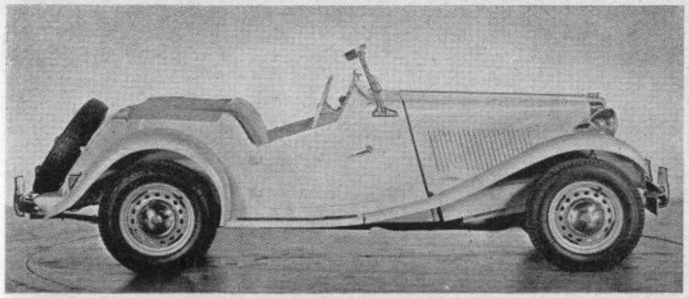
The whole beauty of the device is that anything up to a half-hour or more of complicated shunting devices can be operated from the control panel without ever putting a hand near the layout. Our experience is that operations can continue until we have got ourselves into such a state that only manual operation will untangle us. The expert can carry on indefinitely with a series of precise and realistic movements, with everything moving sweetly and quietly to its conclusion. That indeed is, to our mind, one of the particular delights of the system that everything does move so quietly and sweetly, with a definitely scale-like click as wagons are shunted one on to another.

The illustrations will show how unobtrusive this fitting is. When coupled up it is almost invisible and allows a near-scale gap between wagons or coaches. The detail picture of the actual coupling before installation is approx. full-size. The three little prongs sticking up from the coupling are normally pushed up through slots cut in the floor of the wagon and then bent over. In the case of covered vans made from the solid the two side prongs are bent over at right angles, the rear prong cut off, and attachment made through the back portion and alongside the prongs with round-headed brass wood screws. But, these and sundry other alternative methods are, as we said, fully dealt with in the instruction leaflet.

Anyway, for a very few shillings Doubting Thomases can acquire a pair of couplings and a de-coupling unit from their local model shop and spend a pleasant evening trying it out for themselves.



PROTOTYPE PARADE NO. 34



The TD Series M.G. MIDGET

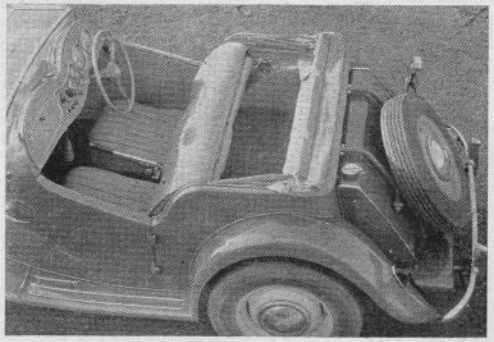
BY G. H. DEASON

NOT so very many years ago the motorist who wished to own a sports car had to pay heavily for the privilege, either in cash, or in the sacrifices he was prepared to make in comfort, reliability and convenience. No single manufacturer can claim to have done so much as the M.G. Car Co. Ltd., to bring practical sports motoring within the reach of the man in the street; so much so that to the entirely uninitiated, almost all sports cars are M.G.'s! Since 1923 this fascinating firm has produced a continuous stream of sporting machines (how well I remember glueing my nose against the old Queen Street showroom window to devour the first bull-nosed example, and driving one in an obscure sand race meeting the same year!) and the affection in which each succeeding model has been held by owners is repeatedly demonstrated by the howls of reproach and lament which greet the dropping of an old favourite and the announcement of an improved one!

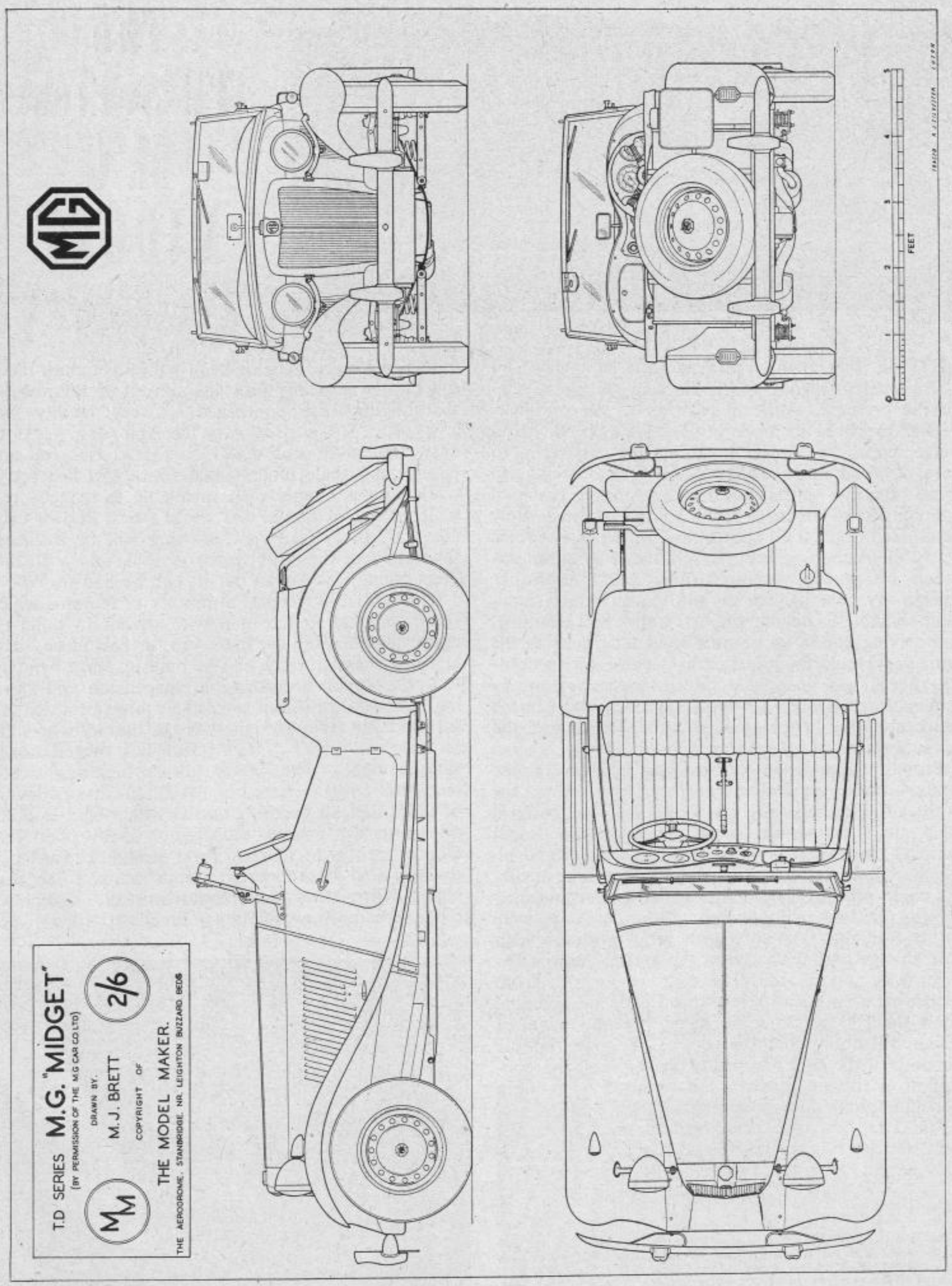
Probably the most outstanding change in the famous M.G. succession came in 1936, when the overhead camshaft engines gave way to pushrod o.h.v. units, based, as before, on a touring design built by the parent organisation. A quieter and altogether more refined car resulted, which nevertheless could produce just as fine a road performance as before. In four cylinder guise these new cars were the first on the T-series, which were produced with little change until 1950, when the entirely new T.D.-series was announced. The cries of anguish from conservative enthusiasts resounded even in America, where the T.C. was much beloved, but no student of design will doubt that the new car is an admirable blending of the best features of the old and the conception of the small sports car required by modern road conditions and modern markets.

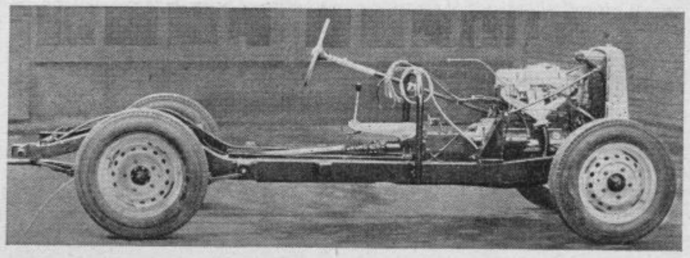
The T.D. has, of course, made a great name for itself, and for this reason, plus the fact that the M.G. folks have always been sympathetically disposed to model makers, it is being dealt with this month much more fully than any previous subject of P.P., so far as drawings are concerned. Every facility was granted to *Model Maker* by the Abingdon works to draw the car in true detail, so that those keen and painstaking scale model builders may at last set to work with authentic plans available to make a real scale model of one of the world's best known cars. The customary four-view drawing will be available separately at the usual price of 2/6, and a further sheet giving full chassis details can be had for 5/-.

The M.G. Midget has a number of features which should appeal to the man who wishes to build an exact model on big car lines. In the first place, there is a real chassis, which can be built up stage by stage to house engine transmission, suspension and steering, and would in itself form the subject of a delightful model in its own right, for the builder who likes to see the "works". The frame has rugged boxed side members, with tubular cross bracings, which lends itself to fabricated construction, and is devoid of those delicate tapering curves which tend to complicate earlier frames. Suspension is by plain half elliptic springs at the rear, and straightforward coil springs, and wishbones at the front, and the new wheels with their perforated discs are distinctive without being too daunting. Finally, the bodywork



Above: A handsome side view of the Series TD M.G. showing the new pattern whels and the graceful sweep of the simple and conventional wings. Right: The driving compartment, facia panel, and the clear luggage space normally concealed by a tonneau cover are seen here.





Right: A production chassis from the assembly line, with pipe lines and cable harness ready for coupling up.

Below: Detail pictures showing from left to right the front suspension unit with coil spring and triangulated swinging member, the offside of the engine with carburetters and air cleaner, and the half-elliptic rear spring and the differential casing.

lends itself admirably to metal construction, being composed of simple panels with a minimum of double curvature, this being limited to the scuttle deflectors and the wings, which should be a nice exercise in amateur "tin bashing". There is plenty of external and cockpit detail, and with its plain but imposing plated radiator the complete car is a most satisfying sight.

Harking back to the wheels for a moment, readers will note that in the lower photograph on page 631 the car is shown with an earlier type of wheel, having an unperforated disc with a dished centre portion. These have now been superseded by the drilled variety seen in the other pictures, but some model builders may find it more convenient to use the early pattern, as being somewhat simpler, and at the same time quite authentic. If so, they should note that the discs outside the plated hub cap are painted in a contrasting colour to the bodywork.

The catalogued colour schemes for the bodywork are as follows: black, with red, beige or green upholstery, red with red or beige, almond green with beige, ivory with red or green, and clipper blue with beige. Upholstery in all cases is in leather.

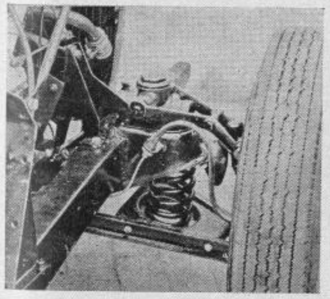
The instrument panel is in leather cloth finish, with chromed beading round the centre panel and glove box door, and speedometer and revolution counter have 5 in. dials. The three steering wheel spokes are of twin chromed flexible bar type, and a miniature M.G. octagon is carried in the centre of the boss. The plastic rim is 16½ in. in diameter.

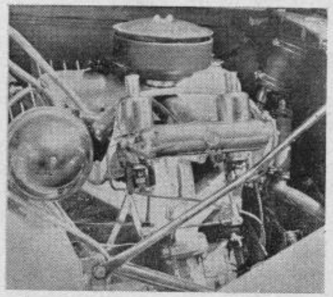
The hood and tourneau cover are fawn duck, and the space behind the seats is left clear for luggage, which rests on a flat platform. The wheels carry 15 x 5.50 Dunlop tyres, the competition version being fitted with 6.00 in. rear tyres, when provision is made for carrying two spares behind the petrol tank. Twin stop-tail lamps are fitted to the rear wings, and as an extra the cars can be supplied fitted with a chromium badge bar and spot light.

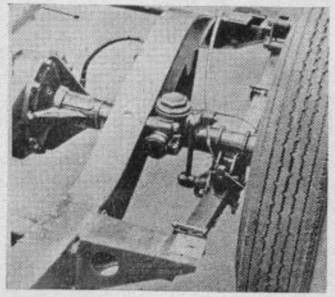
So far as competition work is concerned the new T.D.'s are beginning to appear as regularly as their predecessors, and the works are prepared to supply tuned engines in various degrees of potency, to give the would-be sports-racing and trials driver a basic car of considerable promise.

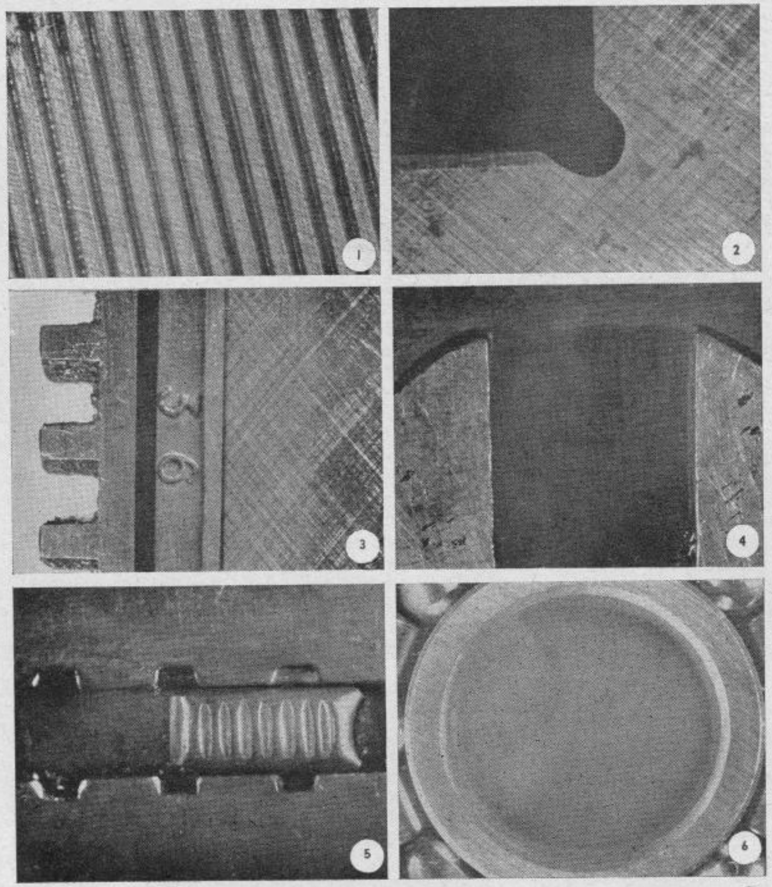
The introduction of fully detailed plans is very much in the nature of an experiment, undertaken at the request of a number of readers, and I should make it clear at this stage that *Model Maker* will not be dealing so fully with all the cars described in "Prototype Parade", since such treatment involves a great deal of preparatory work and the wholehearted co-operation of the factory concerned. Nor, in most cases, is it possible to provide similar drawings of racing cars already in existence, since the opportunity to dissect the machinery fully enough to ensure really accurate detail and eliminate guesswork is rarely available. We hope, however, as time goes on, to add to this range, if the demand would appear to warrant it.

Model Maker will be most interested to hear from any readers who tackle the T.D. Midget as a fully detailed model, and will be pleased to assist with advice and information wherever possible.









Another Selection of Oddities

Once again our readers are invited to try their skill at identifying a set of Oddities. For the benefit of those new to this test, all the six illustrations are of tools, gadgets or instruments likely to be found in the average model-makers' workshop. The only thing is that they have been pictured from unusual angles, have been enlarged to greater than lifesize, or otherwise disguised from the more obvious. No picture has been interfered with in any way—they are straight photographs. When you have exhausted your powers of discovery turn to page 640 for the answers. We should be pleased to receive suitable Oddity contributions from our readers—the harder the better, and please do not fail to supply solutions!

BUILDING A LATHE

(*Continued from page* 601)

Lining Up

After fitting the back gear the headstock was complete and was then lined up. A test piece was turned up to fit the mandrel and the headstock set parallel to the surface and edge of the bed.

The latter operation being a simple job of adjusting the set screws in the lugs of the headstock.

The tailstock was lined up in a similar manner after which the $\frac{1}{4}$ in. dowel rod and second $\frac{5}{16}$ in. dia. Allen screw were fitted.

The lathe comes well within professional limits, a copy of an official lathe test certificate being used as a guide.

Lathe Fittings

Now the odds and ends were tackled. The toolpost first, this being built up from a piece of $\frac{3}{8}$ in. plate and $\frac{1}{4}$ in. plate brazed together. A $\frac{1}{2}$ in. end mill was used to cut the slots.

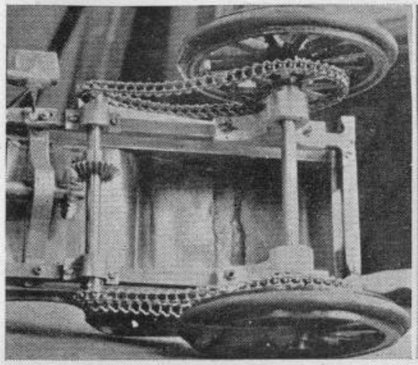
The pump fittings were made from scrap ends and fitted as shown. The pump itself was described in the April issue of the *Model Maker*.

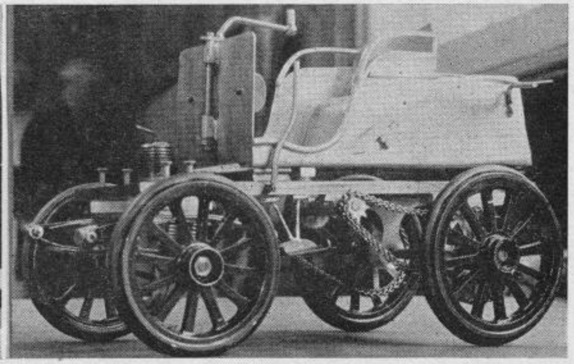
A small adjustable pointer was made for the leadscrew handwheel. The pointer is fitted to the end of the bed with two $\frac{1}{8}$ in. dia. Whitworth screws.

Centres were turned from scrap ends of cast steel.

The faceplate was made from an old one which was on the scrap heap. The thread was recut to suit the mandrel nose, and the plate turned down to fit the lathe. While on this job, a $\frac{7}{8}$ in. dia. B.S.F. tap was made from the stub end of the silver steel. A $\frac{7}{8}$ in. dia. plug gauge was also made. These can now be used when making back plates, etc.

Several accessories have yet to be made and it is hoped to tackle these in the near future.





S. C. PALMER GIVES FURTHER DETAILS OF THE CONSTRUCTION OF HIS MODEL

1894 PANHARD

DURING a talk with Mr. Kedgley, the designer and constructor of our figure '8' rail track he put forward the idea that it would be something new if we could construct some old timers for use on our track. This suggestion appealed to me very much so I started thinking of a model which could be built largely from scrap though I knew from the start that it would not be absolutely to scale (due to its use on the track) but as near as I could possibly make it.

A number of books were obtained from the library and others were obtained by pestering various friends, but these did not produce what I wanted—however, I was told that at the Science Museum, Kensington, there were a few of the original cars, so at the first opportunity a visit was paid. Now although a Londoner and over 50 years of age I am ashamed to admit that I had not been inside this building which contains a wealth of information and I would say to any first timer—particularly in the loco section that an hour or two spent there would pay a handsome dividend.

There were about six old timers there and it did not take me long to decide on the Panhard, the reason being it really did look an old timer, the construction seemed to be within my limited capabilities, and there was plenty of room for the engine. Having gazed at the exhibit for some time, and taken several notes I found the gentleman in charge of this section who was good enough to let me behind the barrier in order to take some measurements, and it was during our conversation that the real piece of information was obtained—if I filled up a form and left 2/- a 10 in. x 8 in. photograph would be sent me in seven days. This arrived on the due date and although only a side view, it was a perfect picture—all rivets, bolts, etc., could be seen without using a glass.

A start was soon made on the model, the size being exactly that of the photograph — the chassis was made of $\frac{1}{4}$ in. mild steel and welded—small body packing pieces (curved) were next silver soldered in place and then the engine was installed — at the moment this is an Allbon .5 c.c. fitted with a two-shoe clutch, the driving plate being supported by a ball-race fitted to a cross member and ends there with 1:1 ratio gears to the shaft to which are fitted the chain sprockets—these were made from mild steel and the teeth filed to take a Meccano chain—the sprockets on the rear wheels were Meccano with the centres filed away to represent the spokes, and the original boss was removed and a stronger one silver soldered in place. Then came the question of those wheels—I worked on these for nearly a month—they are made from solid dural bar and the biggest error in the model is of course the rear wheels—I had no material of the necessary size and refused to pay the high price asked for a piece of scrap, but a member of our club came to my assistance with the nearest thing I could get, on condition that I sawed off a lump myself. The wheels having been turned with the hubs and recess for the tyres, the spokes were marked out and a start was made with a fretsaw to remove some unwanted metal. This proved very slow and having tried most of my other tools the job was eventually done by drilling a number of holes and finished by filing. The inner rim was then cleaned up by putting the wheels in the chuck and with a small endmill in a drilling spindle the wheel was rotated slowly by hand. The tyres are electric light cable, with the wire taken through a hole in the rim and soldered. The body, which is made of brass proved quite a simple job and so did the other fittings. Since this photograph was taken most of the other bits and pieces have been made, but the rear brake will necessitate another visit to the museum.

Although a novice I have already made four rail cars 2 to 5 c.c. and 1 to 10 c.c. cars together with two engines from the solid, but this old timer has interested me more than any.

The Grading System

G. H. DEASON CONSIDERS THIS CONTROVERSIAL SYSTEM FROM EXPERT AND NOVICE ANGLES

WHEN in the infancy of model car racing we ran a competition, there were two simple classes, "fives" and "tens", and sometimes the fives went faster than the tens and sometimes they didn't. There were seldom any handicaps, everybody who persuaded his car to run went home quite pleased with himself, and a good time was had by all. There were, it is true, a fair percentage of foreign engines in use, but they were not notably superior to those made in the home workshop, and hardly anyone had even seen a Hornet, let alone a McCoy or a Dooling.

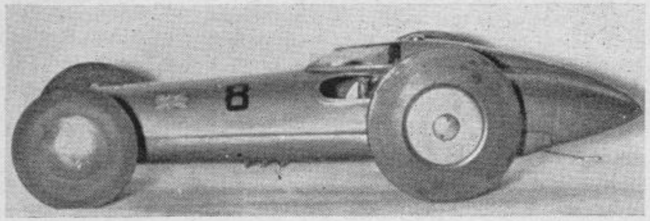
As was inevitable, however, events didn't stand still. Competitions became fiercer affairs, speeds rose fantastically, the "Alone I dunnit" brigade bickered with the "buy it off the peg" fraternity, and the modest man with his modest model began to feel life was growing tedious as an eternal "also ran". It wasn't, he said, that he wanted to get his hooks on the silverware, but it *would* be rather nice if he could see a faint glimmer of a chance of getting into the award list once in a while, even if the award was only a cardboard medal. "Just", as one enthusistic "rabbit" once rather pathetically put it to me, "to show the wife *something* for all these weekends away from home!"

Handicapping systems came and went, club organisers tried the expedient of excluding foreign engines entirely, to the detriment of their entries, and the Open and British categories were established for record breaking and used by some clubs as the basis for ordinary competitions. The latter system gave satisfaction to the top liners who built their own engines, and the handicaps enable heterogeneous collections of models to run together in a single event, the outcome depending largely on the guessing capabilities of the committees, without providing any real glow of satisfaction to anyone except the scratch man, who could always boast that he was so good that he was beaten before he started! Other alternatives were the nominated speed event and the consistency competition, the guesswork being transferred to the competitor in the first instance, the second being a rather tepid affair lacking the element of excitement. Things were getting into a groove, and something had to be done about it, so the Model Car Association came along with its Grading System, as a palliative if not a panacea for all ills. The system was discussed towards the end of 1950, and has been in operation in a number of club contests during the present season. For the benefit of those who may not be familiar with its working, cars are not only divided into capacity classes, but into subdivisions of their classes according to their performance, there being four grades in the 10 c.c. class, three in the 5 c.c. and 2.5 c.c. classes, and two only for the 1.5 c.c. Thus the 10 c.c. Grade A is a somewhat rarified sphere graced by those cars whose speed exceeds 110 m.p.h., Grade D by comparison being a nursery floor game for the under 80's. To avoid relegation to the Third Division in the 5 c.c. class you must exceed a mile a minute and 35 m.p.h. is the deadline for the smallest class. A new and untried model qualifies with its best run in the particular competition in which it makes its debut. If a model fails to record a time in three consecutive Open meetings it may, at the option of the owner, be downgraded.

Like most other devices for squaring things up, the Grading System is a compromise. It certainly, on the face of it, offers hope to the "rabbit" and broadens the distribution of the prize list. It also makes for considerable complication in running an event, and appears to place the onus of knowing all about the competing cars on the already harassed organisers. These latter disadvantages are outweighed by the chances of everybody "having a go", but the fact stands out a mile that to make the Grading System a workable success, everybody concerned *must* play the game by it. It must be a "gentleman's agreement", taken in the spirit in which it is meant, otherwise it lends itself to abuse, and the development of practices which may lead to its being dropped by the clubs. Obviously the man who is after prizes above all else can ensure that his model goes no faster than is necessary to keep him at the top of a low grade, whilst one might even visualise the competitor who exercised his option to be downgraded after three "no runs", having committed the tactical error of getting his mixture right by mistake too early in the season! This, however, is to take the darkest view of things and although I know that there are a number of influential model car folk who feel that the scheme is unworkable, I personally hope and believe that such is not the case, and that the Grading System in its present form or modified in the light of experience may yet become generally accepted, and play a useful part in the future of the hobby. The only people who can ensure its success are the competitors themselves and it is in their own interests to do so.

MAN & HIS MODELS

Jack Parker



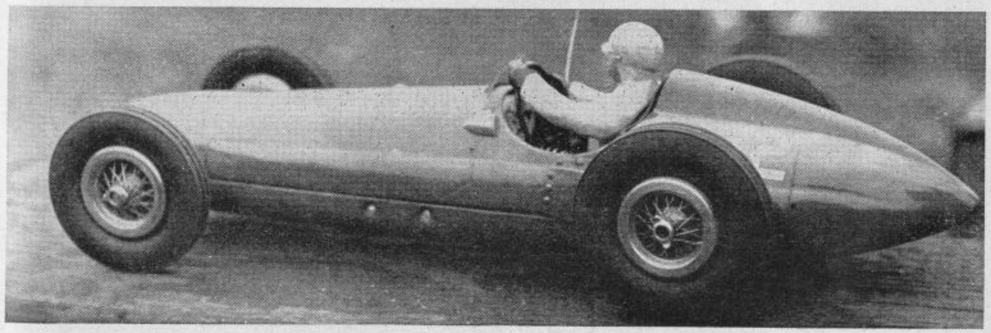
Left: J. R. Parker with his successful Parker '500', shown in more detail above. Below: The beautifully constructed little B.R.M., with wire wheels and scale driver.

JOHN PARKER of Stafford, came into prominence in model car racing as the winner of the M.G. Trophy in 1949 with a 2.5 c.c. E.D. engined car of his own design. This was far from being his first model, however, and his career in this line goes back to 1929, when he souped up a clockwork P.2 Alfa Romeo, fitted a triple spring motor, and ran it on a fencing school floor in Cannes, on the end of a string, to the consternation of a French fencing master. The P.2, which did 20 m.p.h., was followed by a variety of clockwork and rubber jobs, but John's heart was in the real thing in those days, his personal transport including from time to time a Brescia Bugatti, a blown 2.3 G.P. car of the same make, a T.T. Rep. Frazer Nash, an 18/80 M.G. Tiger and a Bond; not the three-wheeled Villiers engined variety, but a formidable sports car of that name built in Brighouse, Yorks.

After the war, "high speed scrap" being a prohibitive price for a married man, John turned to his old interest as a second string and produced a whole series of models, mostly good looking free-lance cars with plenty of "atmosphere" and plenty of urge too. Concentrating on the 2.5 c.c. class he achieved 55 m.p.h. when most other folks were content with 40. Engines used included E.D., Elfin, E.T.A., and home built units, one of the latter being a 10 c.c. c.i. twin which achieved 75 m.p.h. Last season saw a fine free-lance Grand Prix type car from the Parker "works", fitted with wire wheels and powered with a very breathed-upon Conqueror 10, of which not a great deal has been heard in competition so far, and a 2.5 c.c. Cooper 500, built, we suspect, to please John Junior. Finally came the very pleasing 2.5 c.c. B.R.M. which we illustrate here, the motive power of which is once again an Elfin, geared to the rear axle, and once more wire wheels figure in the specification, not to mention the driver.

On the stocks at present (perhaps complete by now) is yet another 2.5 c.c. job, this time an out-and-out speed model, and side by side with these are a couple of rail track racers for use on the Meteor circuit.

Just to show that he isn't biassed, John produced a really magnificent 1/12th scale doll's house in charming half-timbered style in 1948 and, to the same scale, a fascinating articulated furniture van, powered by a 2 c.c. E.D. engine, driving a 32:1 reduction gear, which circulates on his lawn at a sedate 2 m.p.h.!



TEST BENCH (Continued from page 626)

the variety of shapes, both upright and landscape, that are available.

They are printed on heavy grade single sided white art paper so that some care is needed in fixing them in place on station hoardings and the like. We found on test that the best effect is gained if the back is lightly sandpapered with an old worn out piece of glasspaper to reduce the paper thickness to wafer thinness at the edges. This should be done when the posters have been roughly trimmed to size, with about $\frac{1}{16}$ in. excess border. The thinned paper can be finally cut out dead to size with a razor blade. If this is not done then an "un-scale" thickness to the poster will be noted by the critical.

Price of the set of posters is 1/10½d. including purchase tax.

ELECTRIC BOAT MOTOR (Continued from page 612)

Because of the strong field the armature will move in a series of jerks when turned. This does not indicate a defect. Adjust the brushes, oil the bearings and the motor is ready for a trial. Running may be much better in one direction than the other at first. This can be cured by rotating the brushes.

Performance

Tests of the motor shown, supplied with 8 volts, gave the following results:—

Current on load	1.4 amps.
Speed	1,700 r.p.m.
Power	7 ft. lb.

The efficiency is therefore nearly 10 per cent, a very good figure for so small a machine.

If low current consumption is of first importance the armature may be wound with more turns. For example, the winding given in the table for 12 volts may be used with a 6 volt supply, or a 6 volt winding can be supplied from 4 volts. This will reduce the current consumption and, unfortunately, the power as well. Conversely, the power output can be increased by using a higher voltage than that given for a particular winding, but there is then danger of overheating. For short periods—5 to 10 minutes—the motor can be run on twice its rated voltage, and this period can be increased if a fan is fitted to draw air through the armature.

Used as a dynamo and driven at about 2,300 r.p.m. the machine will light four normal 3.5 flashlamp bulbs.

KITCHEN TABLE B.R.M. (Continued from page 604)

A further refinement was the fitting by soldering of a wire bridge near the apex, thus forming in effect an eye through which the actual tether line link is threaded.

My B.R.M. was now complete and in this form raced throughout the 1950 season. Whereas it did not prove to be a record breaker it did gain a total of four placings in nine Open Meetings, and furthermore retained for me the N.E. Region Championship. It therefore did fulfil every objective I had set out to achieve and what was more important to me, gained a reputation for easy starting only equalled by its predecessor.

For those interested in actual speeds, apart from one exceptionally high spirited practice run at slightly over 14 seconds for the quarter mile, the car is slow by latest standards, never having exceeded 60 m.p.h. in actual racing. This speed is, however, now an asset; illustrated by the fact that in two Open Meetings already attended this year, the B.R.M. has won the 2.5 c.c. Grade III award twice!

It has therefore, I hope, been shown that a kitchen table prototype car can be successful under the old racing system, and even more so in view of the present M.C.A. grading scheme.

During the respite between the seasons my unit was returned to Olivers and the track altered to be true scale, the rather unsightly threaded portions of the driving axle, which then protruded through the hubs, being disguised by the fitting of "knock-off" hubs made from $\frac{5}{32}$ in. thick duralumin.

The two ventilators were then united, the rear view mirrors fitted, and the louvres impressed by means of a broad screwdriver blade to bring the "Bourne" model in line as far as possible with its racing successors.

I said, or wrote, earlier, that the publication of the *Model Maker* drawings afforded me my first opportunity of checking the accuracy of my own drawings against an officially approved source, though I suspect that even the former do not tell the full story of the louvres! However, regular readers will now be able to make their own comparisons.

One very noticeable point is, of course, the larger radiator grille on the Bourne model, but this cannot be regarded as an error, the actual overall dimensions being in agreement to a most remarkable extent.

There appear to be only two real errors: firstly, the panel joint at the scuttle should recede towards the tail, whilst I, after much deliberation, made it vertical; and secondly, the windscreen should have a V-shaped frontage, not a circular frontage as on my model. The car should also be painted a metallic light green hue instead of my mid-green version.

Readers are reminded that reduced scale plans of the "Kitchen Table" B.R.M. designed and built by Ken Proctor appeared with the first instalment of this article in our August issue. Full-sized working plans of this simple but successful little contest model can be obtained from this office, price 2/6, post free.

DOPE & CASTOR

By JERRY CANN

THE Exhibition season is on us once again, and although this certainly does not mean the end of outdoor track racing by any means, it marks the closing stages. Apart from the annual M.E. Exhibition, an increasing number of clubs are including model car sections amongst their varied activities, the latest one being the Staines and District Society of Model Engineers and Craftsmen. They are staging a two-day show on September 28th and 29th, in the Staines Town Hall, and it is hoped that both the Edmonton and Surrey Clubs will be in support to keep the model car section lively. Entry form can be had from R. E. Slade, of 166 Kingston Road, Staines, Middlesex.

As mentioned in our last issue, the Blackpool and Fylde Club's opening meeting was just too late to be reported with other club events, but the affair proved most successful. Held at Stanley Park, on the aerodrome site, the proceedings were opened by the Mayor of Blackpool, Councillor Joseph Hill, who wished the Club every success. The Sunderland contingent arrived on Saturday, proving once again that they must be one of the keenest clubs in the country. Racing opened with a demonstration by each class of car, represented by Ken Proctor (2.5 c.c.), L. Haslem of Bolton (5 c.c.), and Gerry Buck with 10 c.c. Topsy.

The inevitable problem of lack of time limited runs to one only, not surprising as the visiting clubs included Altrincham, Bolton, Derby, English Electric and Napiers, Guisley, Hooton, Meteor, Osset and Sunderland, excellent support for an opening "do". At the conclusion of the meeting Jack Greatrix of Hooton, successfully attacked the 5 c.c. mile with a run at 68.44 m.p.h.

It is interesting to learn that the grading system was operated for this meeting, but in view of criticism from any visiting members and the organising club's own experience of it, the club feels that they would prefer to consider some other method of approach for future competitions. (See our Editorial on this subject on page 636.) Personally I had great hopes for the scheme when it was announced by the M.C.A., and feel that it may yet find its feet, but that it has its drawbacks was plainly indicated by a bunch of well-known speed men to whom I chatted t'other day. On asking innocently for their opinion, I was promptly answered by a concerted motion reminiscent of a chain being pulled in a downward direction! Odd!

Reverting for the moment from club affairs to personalities, I think that many southern enthusiasts will be sorry to hear that ill-health has caused the temporary retirement from active racing of that fine craftsman, Cyril Field of Reading, whose models are

" . . . Personally I always use 40 per cent Nitro . . . "

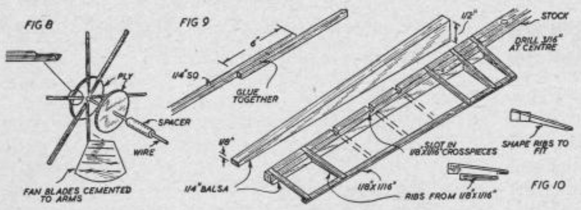
always such a joy to behold. He is the present holder of the Sutton Trophy for the finest home-constructed 5 c.c. job, and hopes that he may be able to defend his title to it this year on September 23rd at Eaton Bray, even if a more strenuous programme is denied him.

On the up-grade, however, I was delighted to meet Mrs. Gascoigne at the M.G. Meeting, now fully recovered from the serious illness which has kept her away from track meetings for the last twelve months. Club meetings are as mucht made up of friendly contacts as the actual racing, and the absence of regular competitors is soon noticed and felt.

The weather which spoilt the Austin Trophy on July 22nd failed to stop the exuberant Tiddlers in the M.G. Trophy, and Alec Snelling's Oliver Streamliner was in brilliant form. Alec is always completely imperturbable, and his standing-start ¼-mile was a wonderful effort in a quarter of a minute dead, on a track which was alternately wet and dry, and far from ideal.

The scale fans will have their chance at Eaton Bray on September 23rd, when the Russell and Sutton Trophies are contested, the former on Conc- points plus speed, the latter on workmanship only and limited to cars up to 5 c.c. The Jaguar Trophy will be run for at the same time on a class handicap basis.

Gerry Buck has taken to a new form of tuning with his usual enthusiasm. As a sideline from i.c. engines his latest passion is musical boxes, a vast and wonderful exampel of which he produced to enliven the lunch-time session of a recent Meteor meeting. Not only does he make them go, but is now producing his own variations and can make an 1870 version of "The Last Rose of Summer" sound like Duke Ellington on the top of his form!



shown in Fig. 9. On these stocks the frame of $\frac{1}{8}$ in. x $\frac{1}{16}$ in. hardwood is laid out and glued.

Sails of this type generally have a pronounced weather or twist from root to tip. The simplest method of construction is to tackle one sail at a time and support the stock away from the plan with a jigging piece tapered to give the correct weathering angles (Fig. 10). File slots in the stock where each $\frac{1}{8}$ in. x $\frac{1}{16}$ in. cross piece comes, cut twelve of these cross pieces to $1\frac{3}{8}$ in. length and glue in place, also chamfering and glueing to the trailing edge member which is held flat on the plan (Fig. 10). When set, remove from the plan and add the small ribs to the underside, as shown in Fig. 10, trimming each rib to shape, as required. These are also made from $\frac{1}{8}$ in. x $\frac{1}{16}$ in. material.

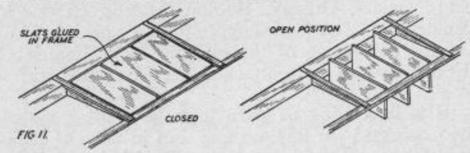
When all four sails have been completed in this manner the slats can be cut from very thin ply or wood, or even card. These are glued between the frames, as in Fig. 11. When operating these slats are closed, when not working, fully open. Choose the position accordingly. For instance, in the "powered" model, fit the slats in the closed position. In a non-powered or static model probably open slats would be better.

The two stocks are then joined together at the centre, and exactly at right angles, and then mounted on the windshaft. The stocks can be morticed, or simply glued one against the other. Either is representative of full scale practice. Fit a suitable spacer between the back of the inner stock and the bearing face on the cap so that the sails clear the mill when rotating. Then glue permanently to the windshaft.

The final detail consists of glueing a length of wire along the top of each stock to represent the spring gear. A small coil of fuse wire at each tip represents the spring. The hub end of the wire should be cranked and bent in to come against the extreme front of the windshaft.

Having checked the whole assembly, and the sails for free rotation, the remaining three sides can be added to the tower or body. Eight staging pieces should then be cut from $\frac{1}{8}$ in. material, scored to represent planking and then cemented around the body $1\frac{1}{2}$ in. from ground level. Add the bracket support under each corner and build up a suitable rail around the stage to complete this assembly.

Little then remains to be done other than to clean up the tower assembly, as necessary, and then paint the whole model. Flat white can be used throughout for tower, cap, faintail, sails (frames and slats). The floor of the staging can be left natural wood or stained to represent ageing. The roof of the cap could be painted black of dark brown to add a point of contrast. The bottom of the tower below the staging would be brick or stone in full scale practice and so some additional treatment is suggested here. Two alternative methods are very successful. The first is to cover this portion of the tower with brick paper and then "age" by staining with a wood dye. Another method is to paint this portion with a thin paste of plaster of paris, coloured light or medium stone. This will give a most realistic surface. The "footings" of brick shown on the plan is optional. It could best be added by $\frac{1}{2}$ in. x $\frac{1}{4}$ in. x $\frac{1}{8}$ in. wood blocks glued around the base.



ODDITIES SOLUTIONS . . . .

1. A smooth file. 2. One of the steps on the front of a 3 in. self-centring chuck. 3. Inner portion of one jaw of a 3 in. self-centring chuck. 4. The end of a spanner for $\frac{1}{4}$ in. Whitworth bolt-head. 5. The slot in the head of a ratchet screwdriver. 6. A ballrace for $\frac{1}{4}$ in. shaft.

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