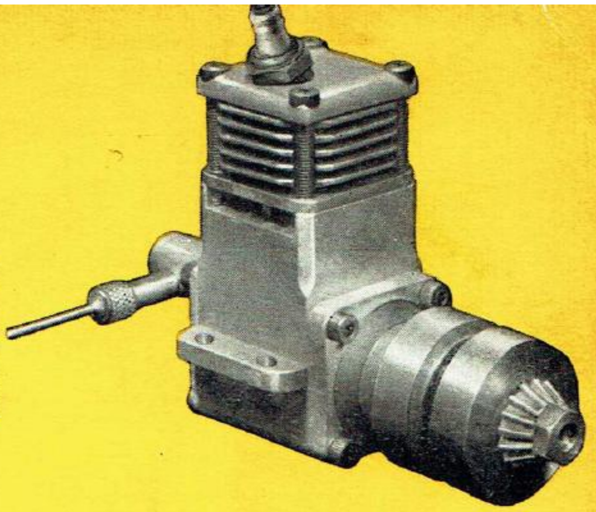
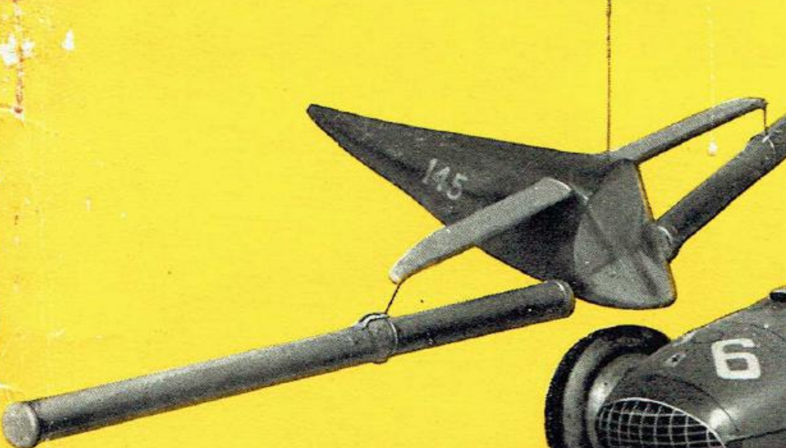
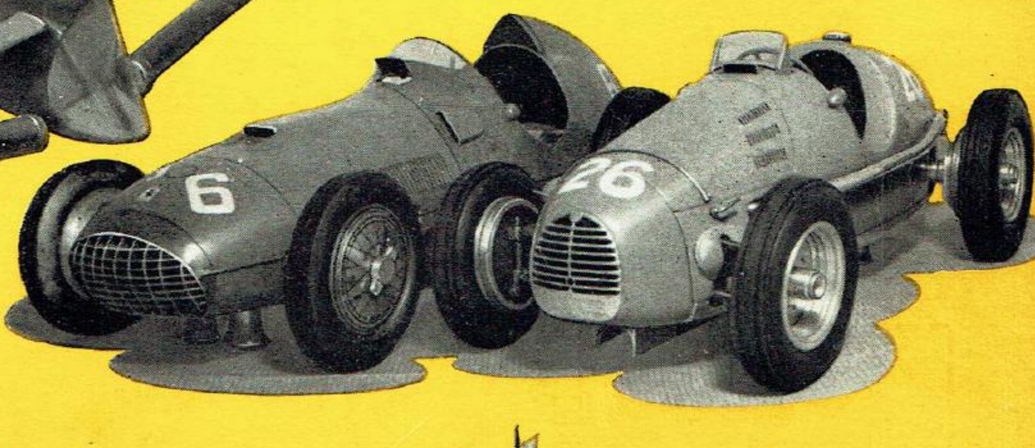
MODEL MAKER







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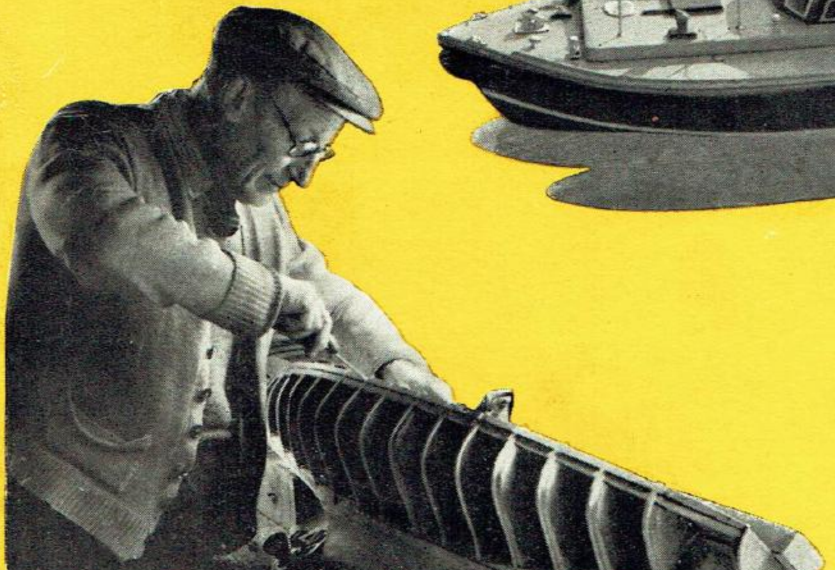

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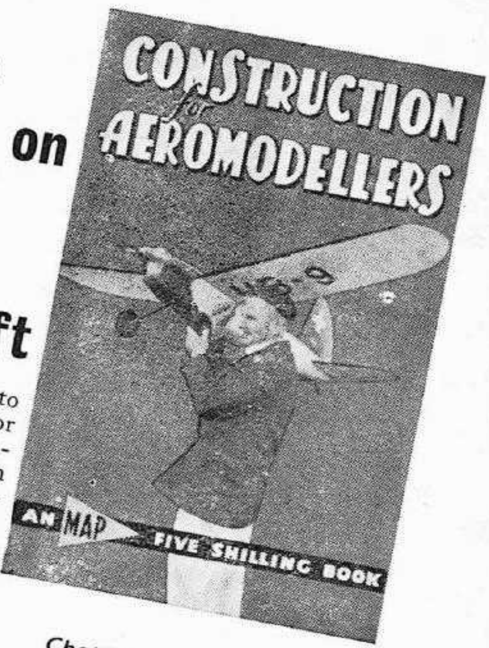

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MODEL MAKER

THE MONTHLY JOURNAL FOR ALL MODEL MAKERS

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Contents

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All Set for Automation?

ONE of the fads of the present day is surely thinking up fancy new words to describe things that we have managed with very nicely thank you for donkey years under quite ordinary names. Foremost in our list of editorial hates comes "productivity" — horrid word for working harder and getting more goods made. Then we have our old friend the unskilled working man disguised as "lower income group"—though in these days of increased productivity he is probably no such thing at all! Now we have thousands of engineers and lots of government officials all worrying about their new bogey word "automation".

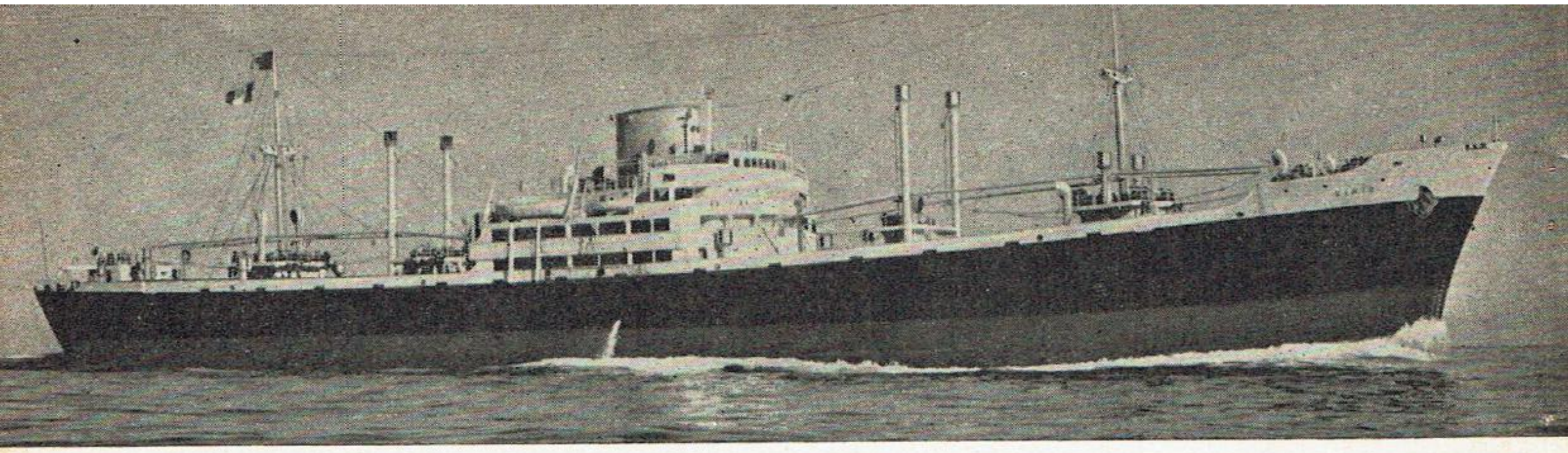
Just what is this automation? Nothing new at all—as nearly every model maker could have told them—just simply and solely making sensible use of improvements in machinery to cut out wearisome repetition work that machines can do much better left to their own devices. We have all of us been making our models with greater or less use of automation for years. Every time we put away our hand-drill and invest in one of the various makes of power drill that plugs into a suitable electric socket, we are embracing a degree of automation. When we extend this purchase with some of the assorted gadgets available and set up a simple form of lathe, we take a step further along the road. If we then decide on the whole hog, and set up a complete lathe in our workshop, then we can claim to have gone all mechanised in the model field. But stay, there are other branches that we can well follow. What about the vacuum cleaner that was given to the wife as a bribe when our model shavings got somewhat overpowering? What about the powered lawnmower, and the powered cultivator that have relieved the garden drudgery and made many more hours available each week for modelling? Yes, automation has been a very good friend already to model makers: let us then give it every encouragement in the larger world of industry, and not be frightened off by the bogey of any new word describing it. It is just another very old friend—"mechanical operation"—that is going to do us all a power of good. It is not going to make unemployment but create new work for some, make possible a shorter working week for many, improve range and quality of goods and ultimately reduce prices all round. And as it takes an ever firmer grip we know that many a twist and contrivance will be the direct result of some model maker's ingenuity.

L.B.S.C. TO WRITE IN M.M.

We are happy to announce that the one and only L.B.S.C. has agreed to write for MODEL MAKER. *First locomotive in the series will be* "MONA" *for* 3½ *in. and* 1¾ *in. gauges—a simple type that should attract an immediate public. This is based on a L.C. & D.R. 0-4-2 radial tank engine that delighted Curly's childhood days. And did we mention these articles will be i* the old original style . . . *August issue will see the start, so pass on the good news.*

ON THE COVER . . .

Top right: "All square" i.c. engine devised by Jim Dean, that also has bore and stroke squared up. *Top left:* "Coot" Peter Holland's latest future model. *Upper centre:* Attractive rail cars that have been earning laurels in the north. *Lower centre:* All balsa effort spotted by our Assistant Editor on his travels of which more appears on page 309. *Bottom left:* Grand Old Man of the East Coast, Charlie Adams atwork on his latest yacht.



PART ONE OF A NEW SERIES COVERING THE BUILDING OF BOTH BOAT AND MACHINERY

M. V. TARANAKI

BY 'TARENTFORD'

TARANAKI—an unusual name to British readers, but as a full-size vessel of some 10,000 tons would no doubt pay a visit to the shores of New Zealand, to that country we go for the name of this new model motor ship. However, this particular design does not represent any known type or size of vessel—rather does it take its layout from several sources, and one of the chief factors which have influenced the design is the need for simplicity because this model is meant for work, and not the glass case. For those who prefer the looks and great amount of detail of a *Queen Mary*, the author can only urge that they give further thought to the matter; the making of some couple of dozen lifeboats and an equal number of ventilators is calculated to dampen the interest of this hobby, especially when the final result is perhaps a collection of details which do not have the appearance of uniformity.

Taranaki has only four boats and a similar number of ventilators—we are talking now of the cowl-type unit which is never really easy to make from the solid—and as these items are the worst you will have to undertake (about two evenings work at the most) there is little fear you will become exasperated with the work and resolve there and then to scrap the whole layout.

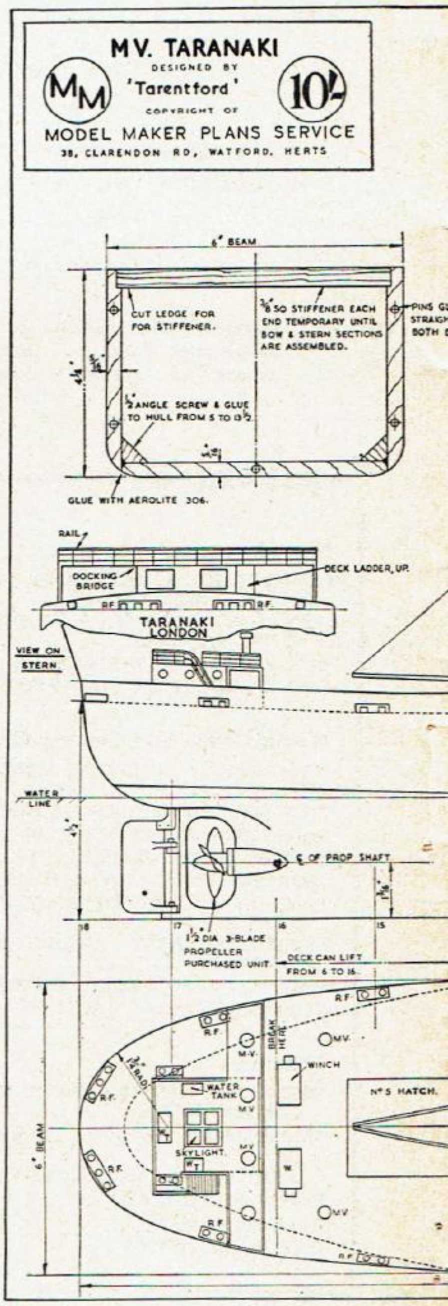
The ship follows rather closely in elevation to the latest Italian standard trampship design, and by courtesy of the constructors—Cantieri Navili Riuniti, of Genoa, the writer is able to reproduce a typical example of one of their ships at sea. The vessel is the *Sirio*—a ship

THIS SERIES WILL COMPRISE, BASICALLY, THREE PARTS, TWO OF WHICH CONCERN THE MODEL ITSELF AND THE THIRD THE STEAM PLANT, ETC., FOR THE MODEL. FOLLOWING THESE, "TARENTFORD" WILL BE DISCUSSING SHIPS' FITTINGS IN A FURTHER THREE ARTICLES, WITH PARTICULAR REFERENCE TO *TARANAKI*.

★ ★ ★

FULLSIZE COPIES OF THE TWO SHEET PLAN, MM/428, ARE AVAILABLE PRICE 10s. POST FREE FROM *MODEL MAKER* PLANS SERVICE, 38 CLARENDON ROAD, WATFORD, HERTS. THESE DRAWINGS INCLUDE FULL DETAILS OF THE STEAM MACHINERY, ETC. READERS INTERESTED IN DRAWINGS OF THE MACHINERY FOR INSTALLATION IN MODELS OTHER THAN *TARANAKI* MAY PURCHASE, IF DESIRED, SHEET 2 OF THE DRAWINGS ONLY, BY ORDERING MM/429 STEAM PLANT FOR *TARANAKI*, PRICE 5s. POST FREE.

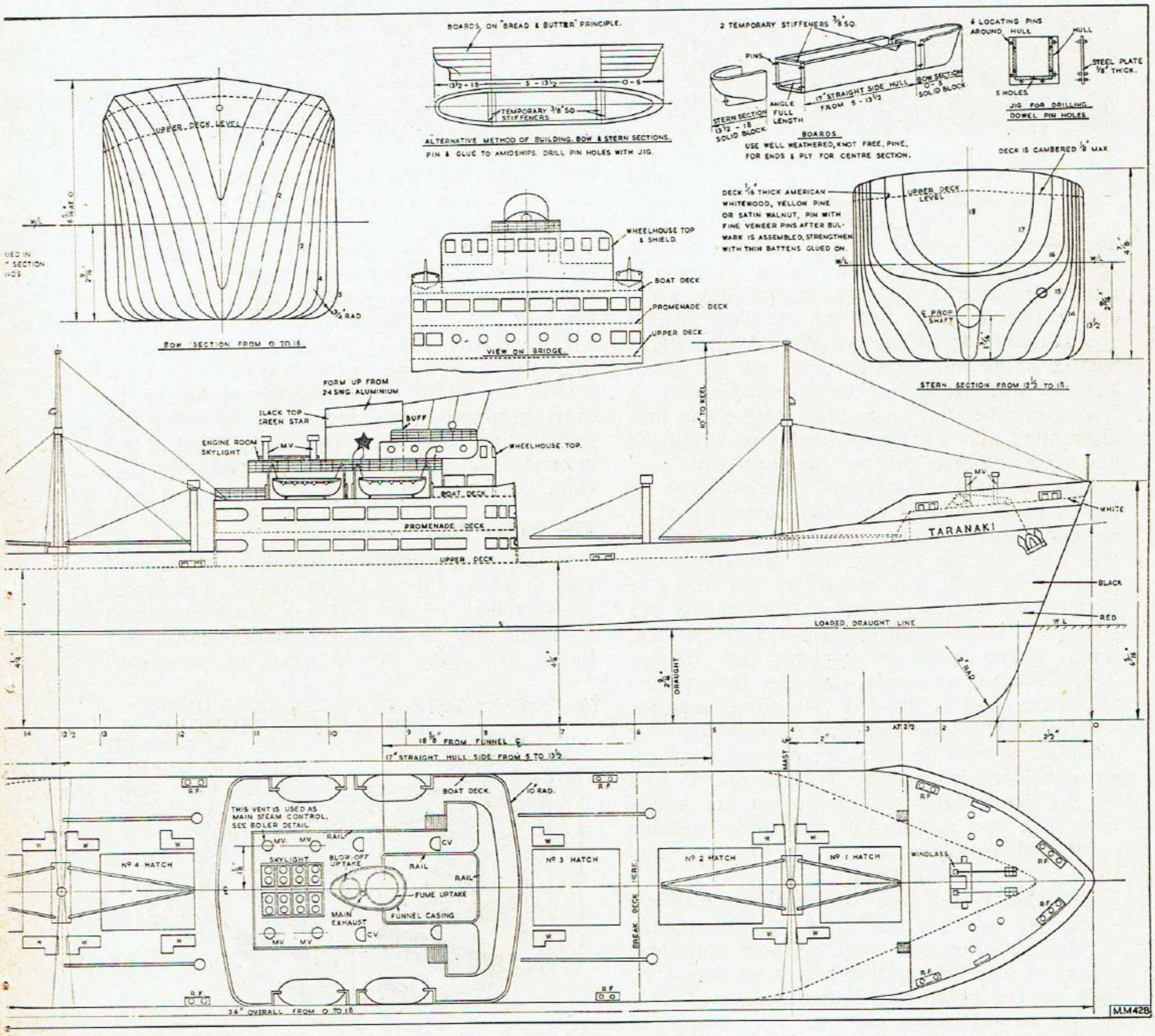
★ ★ ★ **The almost dead beam view of *Sirio*, above, offers quick comparison with the slightly simplified model below**

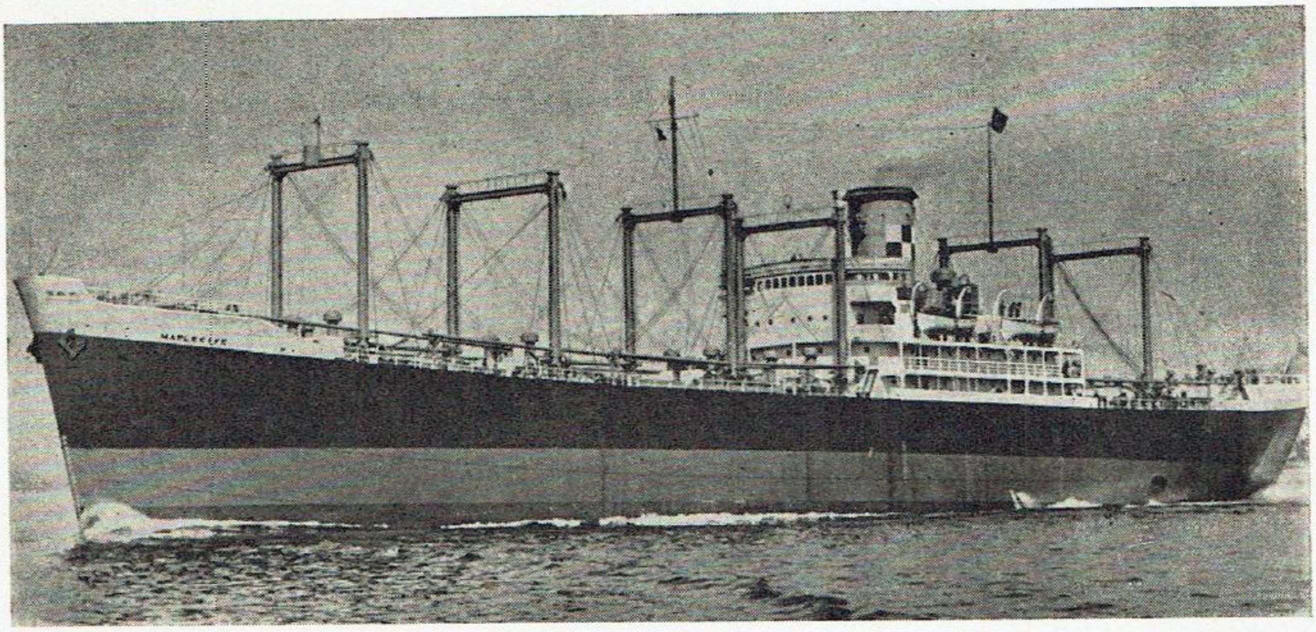


of some 11,000 tons, about 444 feet long and 62 feet beam, and the illustration reveals the remarkable good looks which will also reappear very well in the actual model.

The full-size plan reproduced here shows the lines of *Taranaki*, and readers will quickly notice the modifications to the prototype which have been carried out in an effort to simplify the design and make it more adaptable for pondside conditions. No matter how careful one is when running a boat of this nature, things are forever being broken or bent, so the rigging has been reduced and much of the deck gear eliminated. On the other hand the finished model will not have that unfinished look when she first makes her maiden trip on your local pond, but if there are some readers who wish to include further detail, well go ahead but do keep in mind the question of weight.

For real work do not have much deck gear aboard—remember some vessels can give the impression they will make excellent models but the result is always a little disappointing. For instance, look at the ship illustrated on the next page. The Canadian Pacific Steamship Company have some really fine ships in their line, but imagine trying to model all that





deck gear of the *Maplecove;* you would need major replacements after every trip.

So *Taranaki* has been designed for work and simplicity—in fact the most awkward detail which requires some care because it naturally becomes the focus of the ship, is the centre island. The full-size drawings which are available from the MODEL MAKER Plans Service show this construction, and though it has the appearance of being complicated, a few simple bending operations with some thin aluminium and a series of simple wood blocks will soon complete this part of your ship.

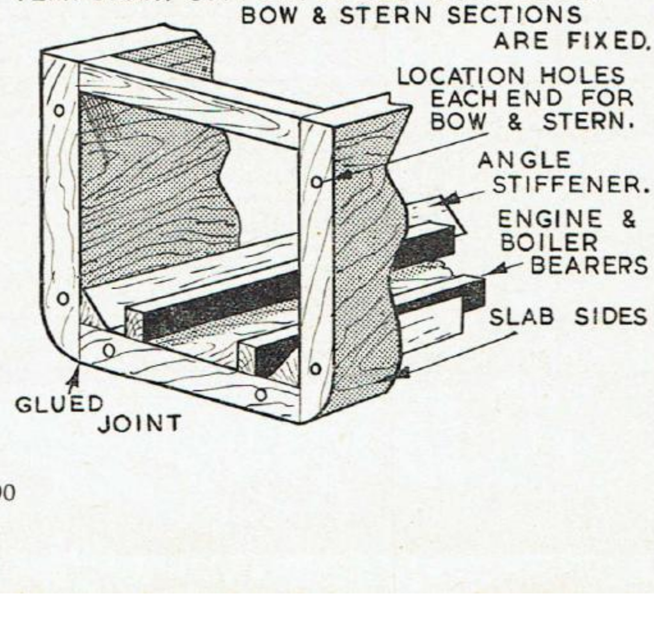
Now for the dimensions. *Taranaki* is 36 inches long; some of you may have visions of an enormous amount of work on a hull of this size, but the author must stress that the larger the hull the easier is the task of building it, within reason of course, and this size is not too difficult to transport to the local pond. The beam is 6 inches and draught 2 9/16ths and to really simplify the arrangement, the hull is divided into three separate sections. The long centre portion is what we call slab sided—the sides are perfectly vertical so considerable carving is eliminated, and on the plans full-size hull curves are added to enable you to line out and make suitable cardboard templates to ensure the bow and stern sections are correct.

Two methods of hull construction are shown —the slab sides are built-up from three planks as sketched opposite and the bow and stern either carved from solid pieces of wood or built on the bread and butter principle. Our skilled readers may care to undertake hull plating, but as this is not really work for the tyro reader making his first model, this idea was not included on the main drawings. Each section is jig drilled to ensure it fits the mating part correctly, and the author would stress that there is nothing complicated in this—it really is the only satisfactory way to carry out the task. A simple jig drills the dowel holes and when each part is pushed home and glued, they will not at some future date part company.

You can build this hull without having to exert pressure in an endeavour to make the joints hold together, and as a matter of interest, use Aerolite No. 306 glue for this ship.

The Power Plant

It will come something of a shock to some of you to know that a steam engine and boiler are specified for *Taranaki*—a steam engine in a motor ship is certainly remarkable, but for those who may not possess the necessary



facilities for making this type of plant, they can fall back on electric traction to push her through the water. The boiler is mounted in the centre of the hull with uptakes for the burner, exhaust and safety valve passing up through the funnel. Incidentally the latter is not circular but assumes the modern profile which resembles a pear.

A fuel tank is mounted forward of the boiler with access for filling through a hatch cover. Both boiler and tank are a "permanent fixture", though readers are advised to take them out for cleaning after every trip.

The steam engine is, of course, aft, and takes the form of a simple oscillating type driving a single screw. This layout is really rock bottom simplicity and keeps down the weight —a gear box is installed to reduce the engine revolutions to a convenient speed because *Taranaki* is not meant to plough through the waters of the lake at a scale 40 knots or even more.

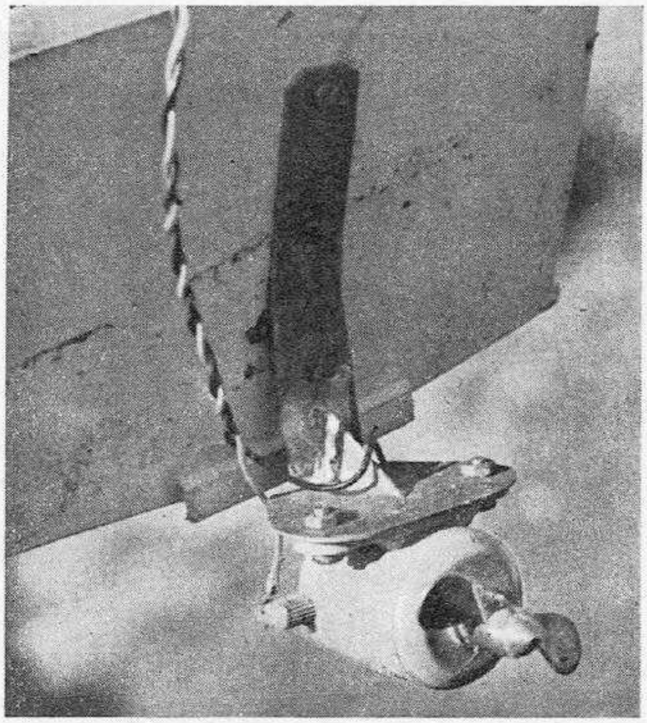
Back to the decks again. These look much better if they are cambered slightly, and thin wood or aluminium sheet will allow you to do this easily without introducing very great complications. Around the wheel house top, the boat deck and the poop deck, there appear some sections of railing, and this is both out of the way and also is not in great quantities to cause inconvenience, so it should not get broken very easily. You can add further ladders if you wish, but these rival rails in damaging at what appears the slightest touch.

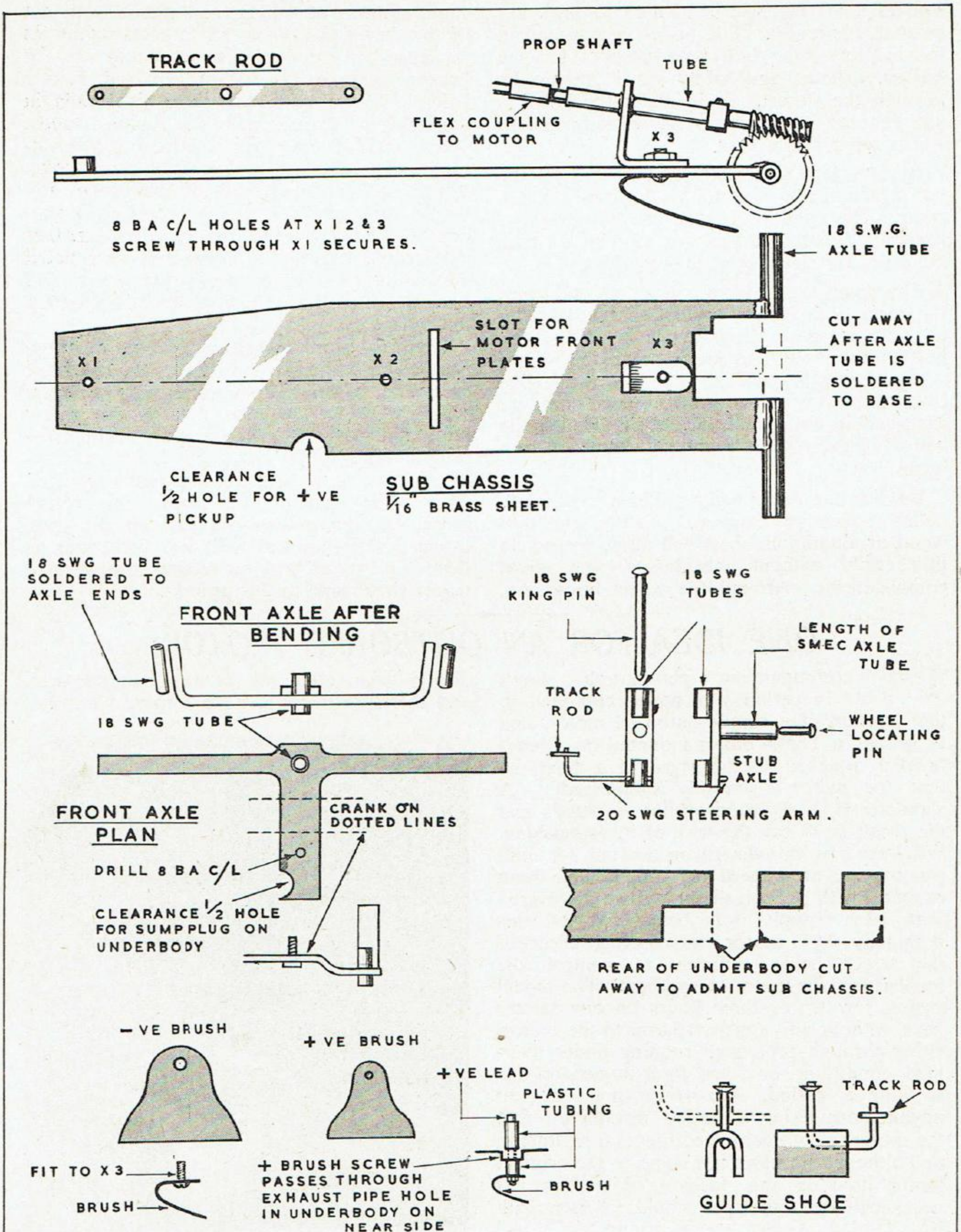
The main steam valve is in reality a mushroom vent—it takes the form of a screw down fitting and is situated aft of the funnel and within easy reach when you require to shut down. Similarly the rudder tiller—another remarkable fitting on a motor ship—is situated underneath the poop deck; the latter will naturally lift off to allow access when setting the rudder.

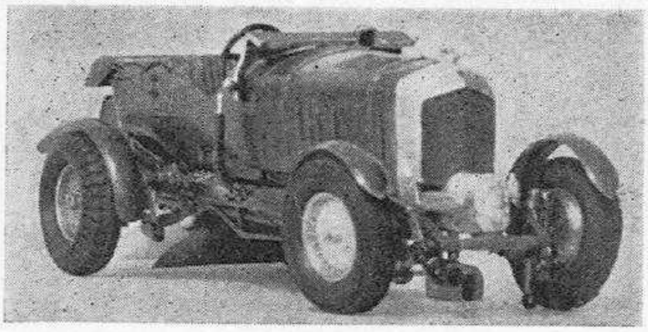
One final word regarding the hull construction. The domestic bath makes an ideal test tank cum floating dock, and with a ready supply of water available, it takes only a few minutes to try all the parts and so adjust the trim to the draught line. The latter incidentally is shown on the prints, so make repeated trials when installing the plant, tank, centre island and poop deck—in fact all the deck fittings. Painting we shall deal with later as there is plenty of work for readers to undertake before they come to this process.

ONE IDEA FOR AN OUTBOARD MOTOR!

THE accompanying photograph shows what is certainly a novel approach to the question of a simple outboard motor, and is, in fact, a Taplin motor mounted on a brass bracket attached to the stern of a boat, so that the motor is entirely submerged. A standard E.D. $1\frac{1}{4}$ in. propeller is fitted, and the result is, to say the least of it, astonishing. When we saw this device on test the 3 ft. hull was moving at a speed that might have been expected with a .5 c.c. diesel and we discovered that 12 v. supply was being fed to this nominally $4\frac{1}{2}$ v. motor, the cooling effect of the water being sufficient to control the tendency of the motor to overheat. The model cruises for two or three hours on one battery pack without any apparent harm to the motor, either through prolonged running under overload conditions, or from total immersion for so long a period. We would point out to anyone considering a similar installation that the motor is not guaranteed for such treatment, and although no harm has come to the original motor used in this fashion, this does not necessarily mean that you would get away with it! The one we saw was being run by Colonel Taplin who, after all, is the manufacturer, and therefore likely to have a spare handy!




TRACK ROD
PROP SHAFT
TUBE
FLEX COUPLING TO MOTOR
X 3
8 B A C/L HOLES AT X 1 2 & 3
SCREW THROUGH X1 SECURES.
18 S.W.G. AXLE TUBE
SLOT FOR MOTOR FRONT PLATES
X 1
X 2
X 3
CUT AWAY AFTER AXLE TUBE IS SOLDERED TO BASE.
CLEARANCE ½ HOLE FOR + VE PICKUP
SUB CHASSIS
1/16" BRASS SHEET.
18 SWG TUBE SOLDERED TO AXLE ENDS
FRONT AXLE AFTER BENDING
18 SWG TUBE
FRONT AXLE PLAN
CRANK ON DOTTED LINES
DRILL 8 BA C/L
CLEARANCE ½ HOLE FOR SUMP PLUG ON UNDERBODY
18 SWG KING PIN
18 SWG TUBES
LENGTH OF SMEC AXLE TUBE
TRACK ROD
WHEEL LOCATING PIN
STUB AXLE
20 SWG STEERING ARM.
REAR OF UNDERBODY CUT AWAY TO ADMIT SUB CHASSIS.
– VE BRUSH
+ VE BRUSH
+ VE LEAD
PLASTIC TUBING
FIT TO X 3
BRUSH
+ BRUSH SCREW PASSES THROUGH EXHAUST PIPE HOLE IN UNDERBODY ON NEAR SIDE
BRUSH
TRACK ROD
GUIDE SHOE



Vintage Bentley
for Electric Rail Racing

G. H. DEASON HAS A NOVEL APROACH USING A PLASTIC KIT FOR THE MODEL

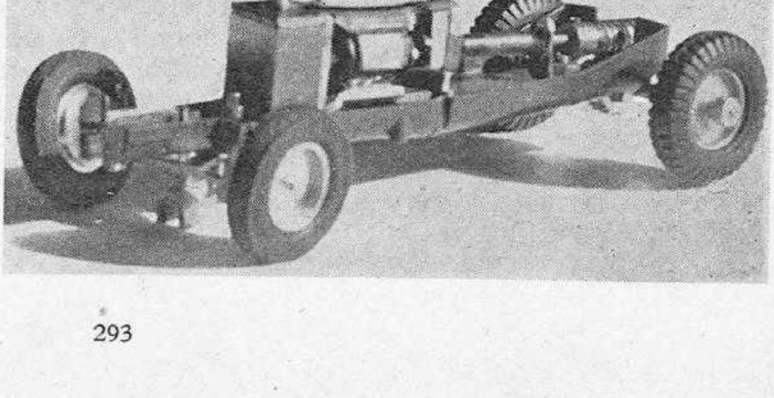
STUDYING the "Southport Formula" carefully, I came to the sad conclusion that so far as a true-scale 1/32 scale model of a modern G.P. car is concerned, to fit the track requirements there just ain't no sich animal.

This is not to say that the thing can't be fiddled; compromise has always played a large part in model car racing anyway. But for my first "Southport" job, I decided on a sports car, vintage for preference, and a quick look at the Gowland and Gowland $4\frac{1}{2}$ litre Bentley mouldings settled my choice. Plenty of room for the mech. in its natural position, and ground-clearance galore!

A sub-chassis is cut and filed from 1/16 in. brass, drilled as shown in the sketch to take the motor fixing screws and prop shaft bracket screws, and cut away to clear the motor end-plate, positive lead and driven gear. Before cutting the latter, a length of 16 s.w.g. brass tube is securely soldered across the rear edge to form the axle bearing, and the centre part of the tube cut away together with the chassis to ensure accurate alignment of both sides. The motor itself is packed up under the front lug, giving a slightly-inclined drive-line. The drive is coupled up with a short polythene sleeve over motor shaft and worm-gear shaft. A length of brass tube soldered into the bracket forms a centre bearing, and a short piece of shaft left protruding behind the worm gear runs in a steady bearing in the front of the Bentley's rear petrol tank. It is necessary to cut away the lower back portion of the plastic under-tray to admit the sub-chassis, and the various fixing-screws pass through this tray to hold the assembly together. The front screw also secures the front axle, and the rear bracket screw fixes the negative pick-up brush. The positive pick-up is fixed with a screw passing up through the front hole provided for the exhaust system, with polythene sleeving insulating it above and below the chassis.

The front axle and steering construction can be seen more easily in the sketches than described in words. 1/16 in. brass is used for the axle, and the stub axles swivel on 19 s.w.g. pins in brass tube soldered to the turned-up axle ends and to the stub back-plates. The wheels are S.M.E.C., and short lengths of S.M.E.C., axle are sweated into the stub-plates. The guide shoe pivots in a short length of tube soldered to the centre of the front axle, the upper end of the tube passing up through a hole drilled in the supercharger casing, with a cup washer soldered to the wire shaft and concealed by the addition of the top half of the casing. The shoe pivot shaft is in effect a wide "U," the rear leg of which engages a hole in the centre of the track-rod.

It is necessary to cut away the floor and a small part of the front seats, also to cut clearance notches in the instrument board to clear the motor brushes. The existing stubs for the plastic wheels are also cut off, and various items of the original steering gear omitted. The front wings do not permit full movement of the wheels, and must be either repositioned or discarded, but otherwise, the model can be a really handsome little detailed replica. The mouldings are already in the correct shade of green, so only detail painting is required to complete the model.



Above: **The neat plastic body of the "old school" Bentley suffers hardly at all from the addition of rail guide and contacts.** *On the right:* **Different as ever, G.H.D. puts the engine in the proper place and instals a suitable prop shaft! Fancy no one thinking of this aspect yet in electric rail racing circles!**

RE-RIGGING AN OLD YACHT

By A. ASTON

In circle a contemporary shot is given of the cutter in its 1922 heyday — ladies' fashions of that day can perhaps be glimpsed. Larger picture shows the yacht restored to a place of honour in the household, and doing extra duty as an ornament in between sailing occasions

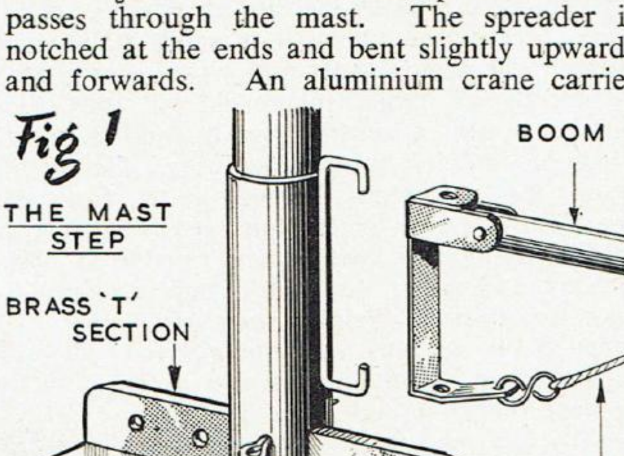
THE following description of the re-rigging of an old model yacht hull may tempt others to do likewise ! Such old hulls are to be found in many an attic. The resulting boat, besides making a very attractive ornament, has made several adventurous open sea voyages which would never have been risked with an expensive "bought" boat.

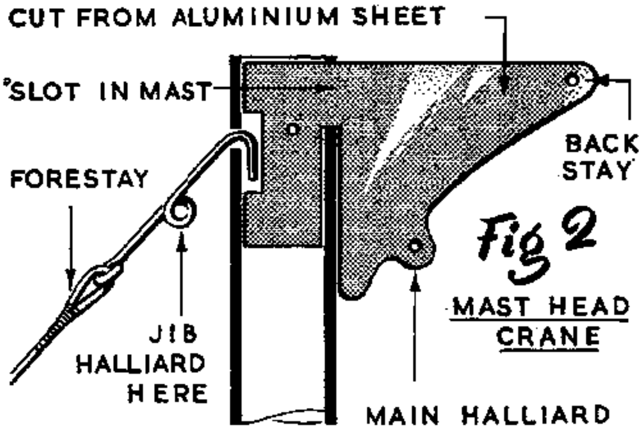
It was decided to alter this 1922 "Hamley's" gaff topsail cutter, whose mast and sails had long been missing, to modern Bermudan rig with Braine steering. The work was tackled in the following order: The old paint was first stripped off with "Nitromors", the waterline being retained with pencilled dots. The hull and deck were glasspapered smooth. It was decided to shift the mast position $2\frac{1}{2}$ in. aft, to give the boat a better appearance when sloop rigged. A rectangular hatchway $3\frac{1}{2}$ in. x $2\frac{1}{2}$ in. was carefully cut 1 in. aft of the chosen mast position. A $\frac{3}{8}$ in. wide hatch coaming was cut, in one piece, from resin bonded mahogany ply and screwed to the deck with well countersunk brass screws.

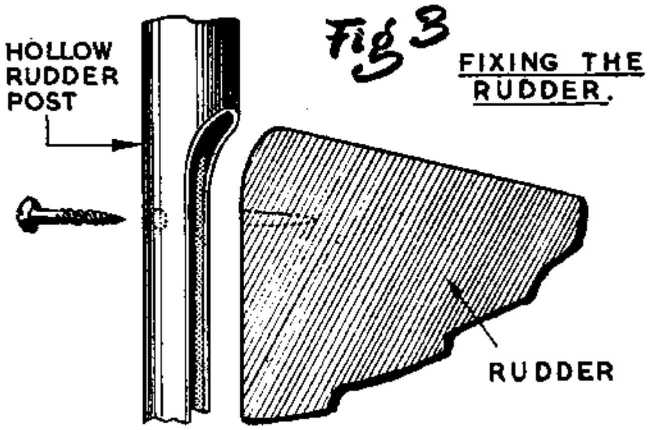
Next, $\frac{3}{8}$ in. half round birch beading bulwarks, merging into shaped, 3/16 in. thick mahogany pieces at bow and stern, were copper pinned into position. For Braine steering, the original inclined tiller and rack rudder had, of course, to be scrapped entirely. The after edge of the keel was cut to a pleasing curve. A vertical brass rudder tube was fitted just forward of the old rudder tube. The latter was knocked out; and replaced by a suitable length of dowel rod, cut off flush with deck and hull after being carefully fitted and glued into position.

The mast was stepped on deck, the latter being thick and strong. The mast socket (made from an old camera tripod tube) and the adjustable step, were made as shown in Fig. 1. The combined gooseneck and kicking strap attachment were easily bent up from stainless steel sheet; and can be sprung on and off the brass wire pivots soldered to the mast socket (see Fig. 1). The aluminium mast was made 32 in.—slightly less than one-and-a-half times the 22 in. waterline length of the boat. The 14 in. x 5/16 in. O.D. topmast fits inside the 20 in. x $\frac{3}{8}$ in. O.D. lower mast, and rests on the $\frac{1}{8}$ in. solid aluminium spreader, which passes through the mast. The spreader is notched at the ends and bent slightly upwards and forwards. An aluminium crane carries

Fig 1







the preventer backstay clear of the mainsail roach, and also carries the main halliard block (see Fig. 2). The main boom is $\frac{1}{4}$ in. aluminium tube, wood plugged at the ends.

All the remaining deck fittings, stemhead and backstay fittings, shroud plates, sheet horses, and the jib rack were made from brass curtain rail, sawn, filed and drilled to shape. This was a most entertaining job ! A small hacksaw, needle files and drills were all that was needed. The Braine steering quadrant was cut from brass sheet and soldered to a $\frac{3}{8}$ in. length of brass tube, slotted to grip the hollow, 5/16 in. O.D. rudder tube to which it is bolted. The mahogany rudder was attached to the rudder tube as shown in Fig. 3. It was made thick and un-tapered so that the smallest rudder angle would have steering effect.

When completed, all fittings, together with a number of assorted *brass* screw eyes, washers, small woodscrews, nuts and bolts and two brass split pins for the mast step were sent to be chromium plated. The plated eyes, screwed through the plated washers, make smart gunwale eyes and leads for the steering lines.

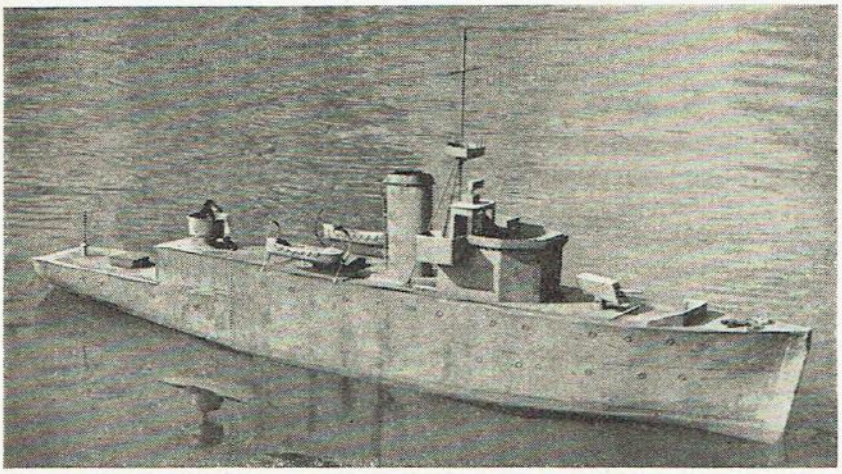
Next, a block of $\frac{1}{2}$ in. balsa was carefully cut to a good push fit in the hatchway. It was then glued to a block of Chilean Laurel—an excellent light-weight wood—and the latter planed to a rounded coach-house roof shape. A small mahogany companion hatch was let into this roof; also two perspex skylights, mounted over black-painted cavities. A "samson post" of wood, with a stainless steel wire bar, plugged the original mast hole.

The bulwarks were stained mahogany. The whole boat was then given several coats of varnish. The hull was finished in primrose and green Valspar, and the deck and bulwarks left varnished. Each coat was well rubbed down with No. 400 "wet and dry" paper. The small rigging screws, being beyond the writer's capacity, were the only "bought" fittings; lanyards would serve equally well. The standing rigging is all of .017 stainless steel wire, attached to strong stainless steel wire eyes passing through the mast. The running rigging and jacklines are all of braided fishing line.

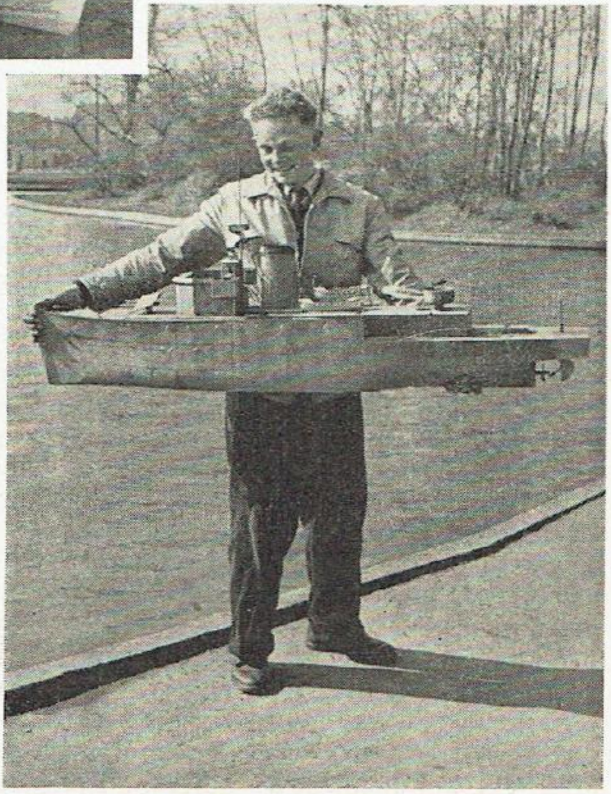
Experimental suits of sails were home-made and tried out. Jibs of various sizes were tried with the one mainsail. When a good balance had been achieved, which, incidentally, involved a large jib, three suits of sails were made up by a model yacht sail-maker, and a genoa as well. The three jib booms were made from the same $\frac{1}{2}$ in. tube as the main boom. Finally, all spars were well treated with banana oil, which has proved very effective in resisting the effects of salt water.

Now a few words as to sailing: On the beach pools, a spinnaker is an unnecessary encumbrance. On the open sea, always sail close hauled if at all possible; the boat will not then sail too fast to be easily overtaken. The boat described, with her large jib, is a very steady sailer, and has often made very long cruises parallel to the beach; and a very pretty picture she looks with genoa set ! The genoa is cut with the same dimensions as the No. 1 jib, except that it has a large overlap over the mainsail.

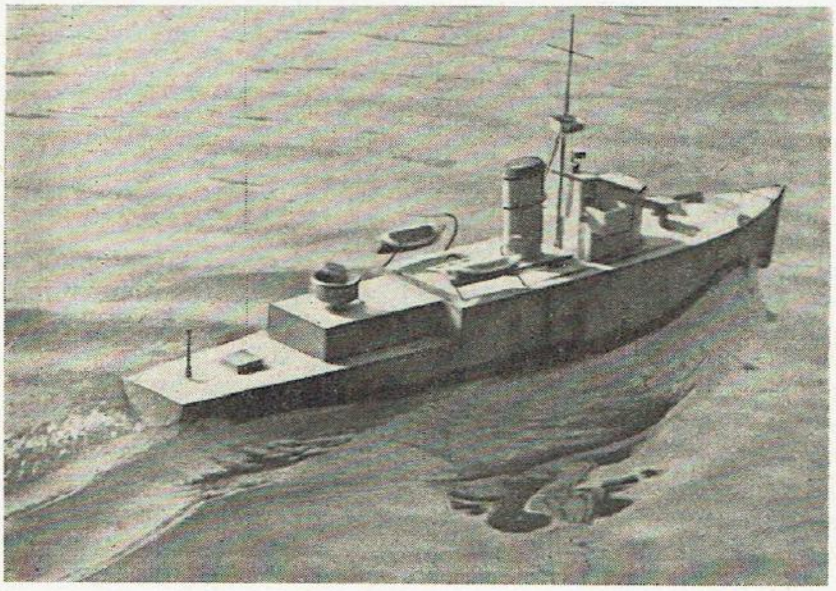
Very great fun has been enjoyed with a carefully adjusted beating guy, the boat sailing out to sea and then returning. The guy, an adjustable cord with a light elastic section, gradually pulls the main boom to windward, causing the boat to tack. BUT—a final word —DON'T swim after your boat if she fails to guy; it isn't just worth the risk ! As the writer has found, she will eventually guy and return ! Besides —a neat nameplate, with the owner's address, is screwed to the deck !

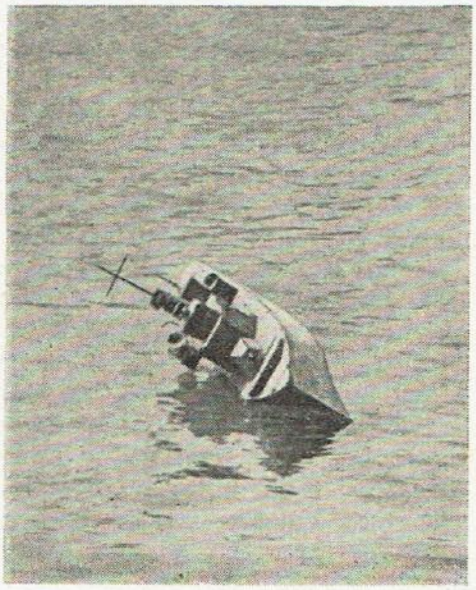


AN INTERESTING ALL-METAL MINESWEEPER



The 5-ft. semi-scale *Algerine* class minesweeper in the accompanying pictures is particularly interesting from the construction and performance angle, since it is built entirely from dried milk tins and achieves a remarkably high speed for its small power. Owner John Barden (right) acquired the hull in a very early stage of building and with the aid of a pair of tin-snips and a large soldering iron produced the result shown; the procedure was to solder the tin frames to a tin keel and then solder on the plating, deck, etc. A small overlap on the plates gives strength and scale appearance, and the finished hull is rugged and weatherproof—as witness the fact that it spent the whole winter out of doors and was untouched before being photographed. The power unit is a Mills 1.3 diesel (previously a 1 c.c. Bee had been fitted) driving a home-made propeller of about 2 in. diameter and 5 in. pitch through a 2 : 1 reduction, the gears being pre-war brass Meccano parts, running with nothing but a little grease surrounding them. The model is extremely fast—as fast as it could be without appearing grossly out of scale. At the revs reached the engine burns the castor oil in the fuel, producing smoke which is ducted through to the funnel. The 60 in. x 10 in. boat weighs 14½ lb. when empty, and carries three housebricks (minimum) to bring the running weight to nearer 30 lb. The penalty of failing to secure this ballast is shown lower right ! ! Other interesting points are the after gun turret (part of a coffee percolator) and its guns (extendable curtain spring slid over brass tube) and the ships' boats (converted Woolworths). Despite the lack of small detail, the model looks very much the part when afloat.

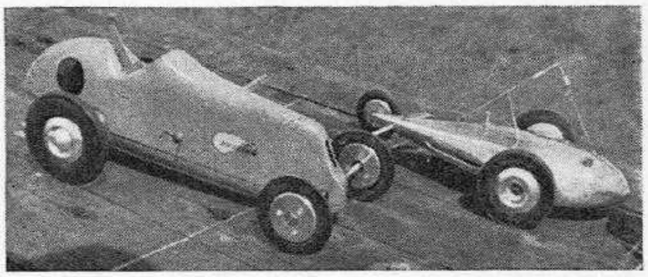




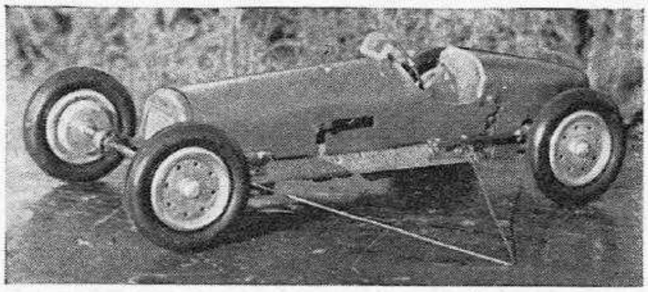
Overalls, yes. I would like to say a word or two on clothing. A white boiler type suit is not only cheap, but easy to obtain, they save clothes from oil and fuel stains. Fuel, once it gets on clothing, is almost impossible to remove. The full length type coat is very useful, but it cannot save the bottoms of trouser legs from splashes.

If you run one or two cars, it is a very good idea to keep and complete a notebook recording all speeds, times and modifications carried out, and what is more important, the result of those modifications for future reference. Never try to run more than three cars at any one meeting; two are usually sufficient for any one competitor.

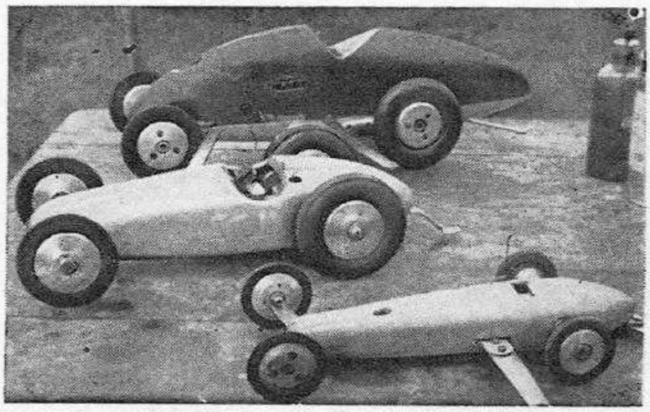
So far I have tried to clear up one or two small points and to offer a few suggestions on a very old theme. Next month comes the real point in question, the cost, and one or two ideas about a cheap car.



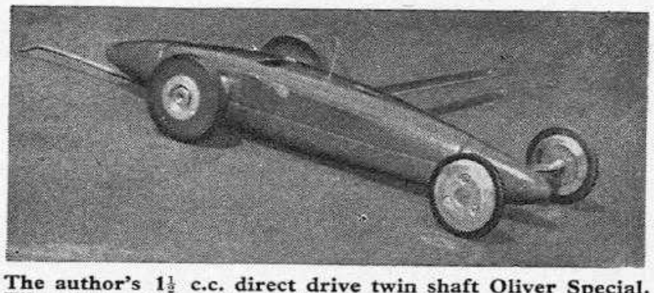
Jim Dean's 5 c.c. F.W.D. Bordon and R.W.D. 10 c.c. Dooling. Very fast—but not for the beginner!



Six years old and still going strong—L. A. Manwaring's E.T.A.-engined "kitchen table" job

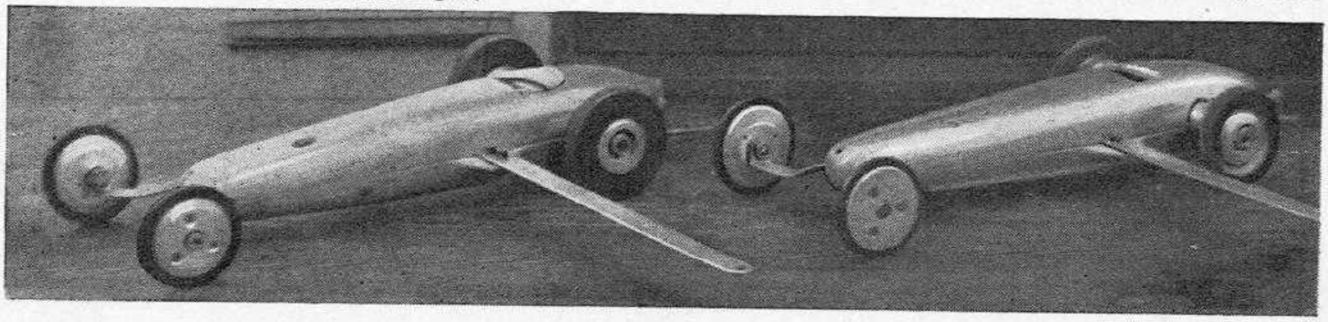


Tom Prest's very fast team of cars—10 c.c. Dooling, 5 c.c Z.N. Dooling and 2.5 c.c. Oliver BU



The author's $1\frac{1}{2}$ c.c. direct drive twin shaft Oliver Special. Fibreglass body and pan. Fibreglass is now very definitely in the picture for models as well as in full-size practice

The author's two "Bottoms Up" Oliver Specials that earned him a place in the 1954 British team (one time class record holder at 74.19 m.p.h.)



Sorceress

A LIGHTWEIGHT 10-RATER

BY

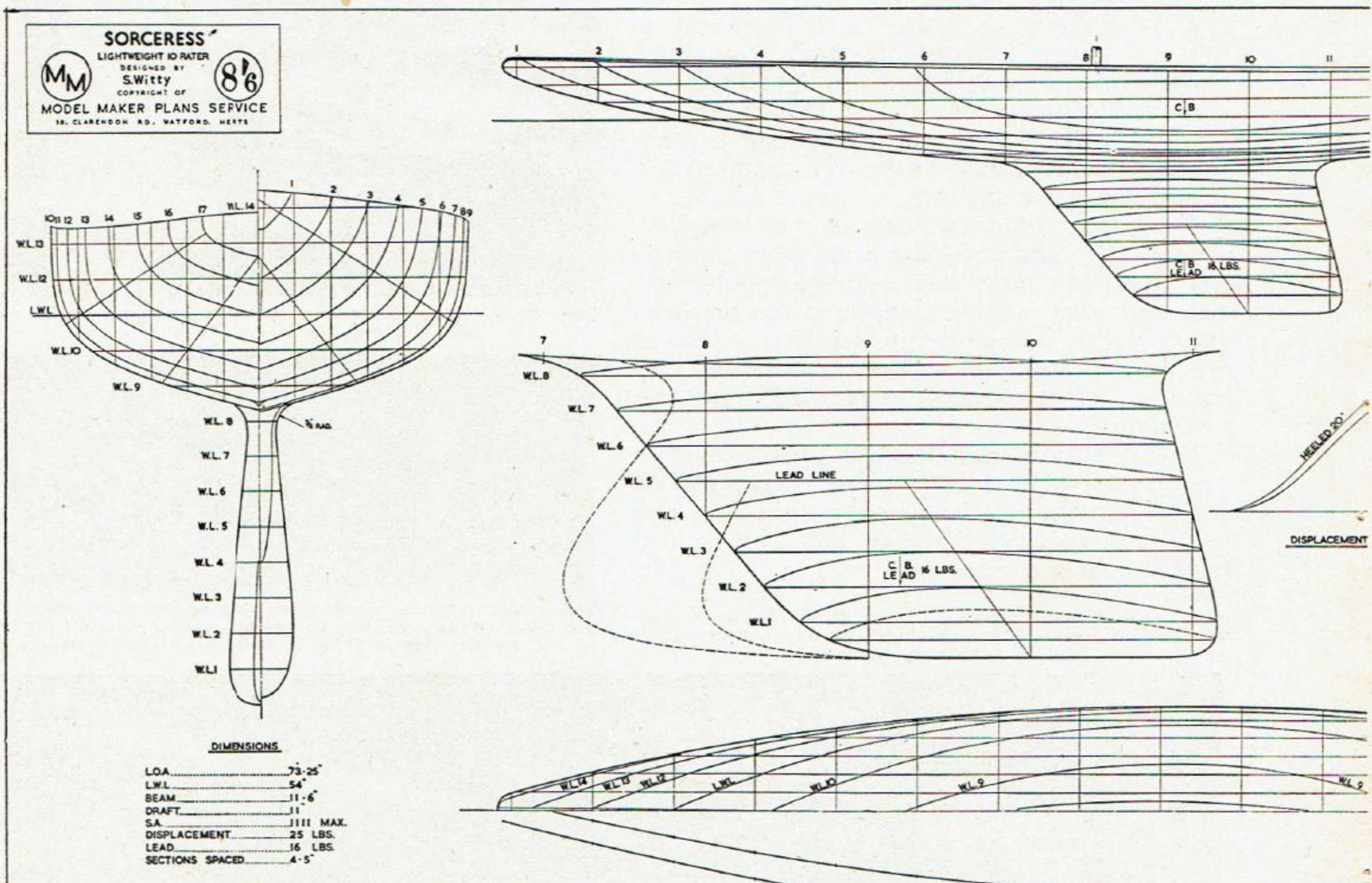
S. WITTY

AFTER more than six decades of model ten-raters one might think that designs would be more standardised at the present time than they are, but with beam varying from 16 in. to $9\frac{1}{4}$ in., and displacement from 20 to 35 lb., this can hardly be said to be the case. In the design shown however, all dimensions are average, with the possible exception of the hull draft which has been reduced to the minimum.

Dynamic and static balance have been combined in a manner which makes for both speed and ease of handling.

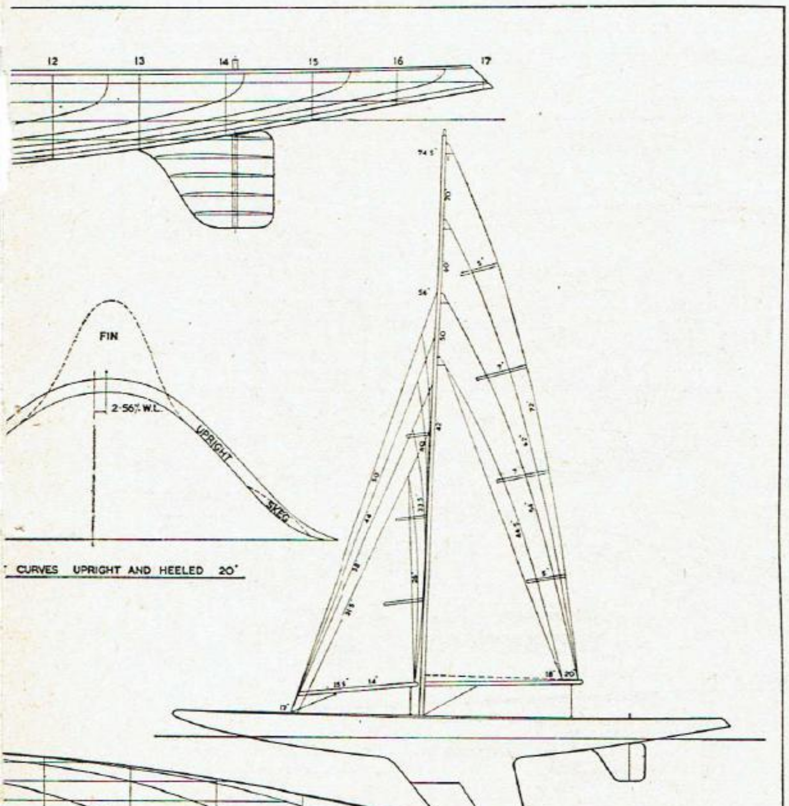
Much has been said on the subject of static hull balance, but little on the real problem of dynamic balance which becomes increasingly important as the speed rises. It has been apparent for some time that even a perfectly designed metacentroid can become totally unbalanced while under way, if the disposition of the appendages is incorrect.

The key to dynamic balance in a fin keel yacht is in designing the fin root, skeg and rudder to approach as near as possible that position normally occupied by a full keel. To demonstrate this, it is a definite fact that if the skeg and rudder on a normal fin keel yacht are moved forward, the sail plan has to be moved aft to compensate. In fact, a good method of estimating the dynamic balance of a



model is by checking the distance of the mast position from the C of B. The nearer the mast position to the C of B, the better the balance. This is not to say dynamic balance is a criterion for fast sailing, but it gives a hull which can be sailed to the maximum under varying wind conditions without having to adjust the mast position or resort to pinching. Neither is metacentric balance, or the perfect balancing of the in hull wedges, a necessity; such extreme hulls as *"Triplane"* and *"Revenge"* disprove this. The thing to aim at is a reasonable combination of the two types of balance. In this design the fin root is placed in a neutral position while the skeg and rudder is mounted inboard to balance the slight tendency of the bow to turn windward. It should be noted that while these forces balance each other around the C of B, they are in fact both of positive pressure acting on the *LEEWARD* side of the hull.

The fin is of normal type, but is unusual in having the root perfectly centralised, a point which is not practicable on a symmetrical hull due to difficulty in placing the position of the lead. Flipper fins do save a certain amount of root interference drag but are difficult to balance out dynamically. Also due to the centre of area being much lower than is normal, considerable stability is lost, and as the fin has to be made rather deeper to compensate for this, there is no real saving in wetted area.



The fin sections are kept as fine and sharp as possible, since it is definite that the blunt-nosed aerofoil sections sometimes used have no part in hydrodynamics, and create much resistance, particularly at the higher speeds. It seems actually that these sections are used because designers of more or less symmetrical hulls find difficulty in accommodating the ballast in a reasonable position rather than for any merit of their own.

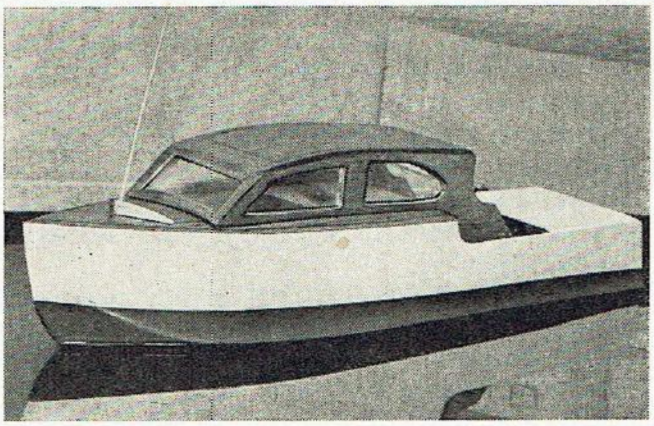
Sixteen pounds of lead are carried, which should leave ample room for the weight of the hull. If, however, an extra pound of ballast can be incorporated, the leadline should be increased by $\frac{3}{8}$ in.

The peak of the displacement curve lies approximately $1\frac{1}{4}$ in. aft of the mid-section, giving a forward length to the bow water-line of $28\frac{1}{4}$ in., making the waterline length equivalent to that of a symmetrical hull of $56\frac{1}{2}$ in.

While this particular hull has a fairly long sailing length, I have never regarded this as essential to heavy weather performance, in fact short sharp bows and cut-away sterns seem to fare much better in these conditions. In this respect it is interesting to examine photographs of racing yachts taken during actual competition: they seldom appear to be sailing on a full wave length. Apart from having a reasonably shallow hull section the most important thing, to ensure a good planing performance, seems to be ease of reverse turn in the profile of the undersurface.

The sailplan has an aspect ratio of 3.5, which is about the highest practicable. Apart from the usual considerations it must be remembered that the mast becomes thicker in proportion as the sail width decreases. I don't think the normal sail arrangements can be much improved, and we've tried most things, including revolving streamlined masts and a ten-tenths rig, with a double luff sail.

Full-size copies of the accompanying drawing, which gives full size body plan and fin lines with half size sheer and waterline plans, are available price 8/6d. post free from *MODEL MAKER* Plans Service, 38 Clarendon Road, Watford, Herts.



Audrey VII

14 in. SEMI-SCALE CABIN CRUISER

BY R. BARTON

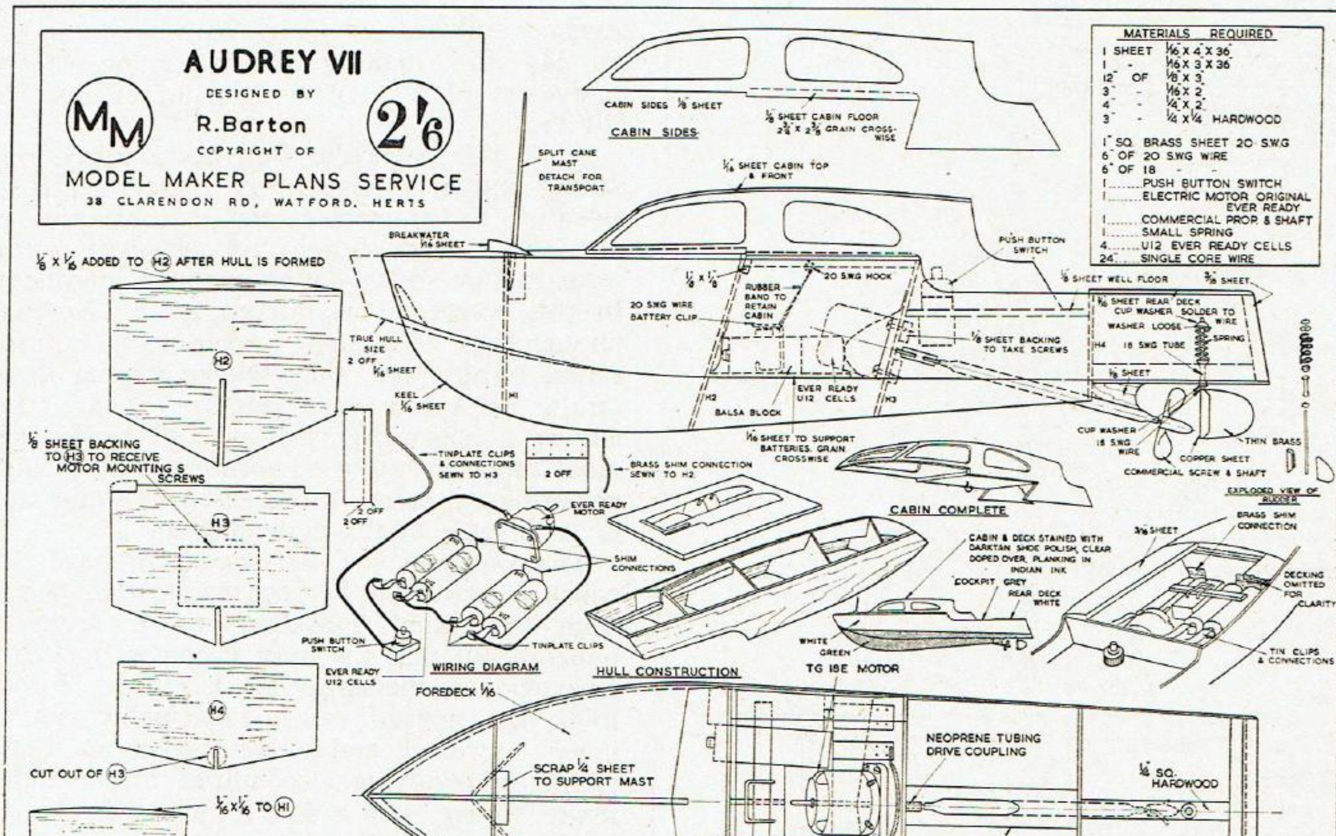
CUT two hull sides from 1/16 in. sheet medium balsa, cut formers H1, 2, 3, 4 from 1/16 sheet, mark positions of formers on hull sides (insides), cement H2 and 3 in the respective positions, putting hull upside down on a flat board using a square across the stern as shown in the sketch. When dry, add H4 and 2 in that order, finally the 3/16 in. sheet stern, then join bows.

Cement keel in position and ¼ in. sheet facings to take prop shaft. The bottom of the hull can now be covered. Next cement ¼ in. square hardwood in position to take rudder assembly, the ⅛ in. sheet backing to take motor fixing screws and floor to battery compartment, also the ⅛ in. × 1/16 in. to top of H2, the 1/16 in. square to H1, and scrap block to take mast.

Fit motor and prop shaft assembly, ensure that motor and shaft are in so as not to lose power.

Sew brass and tinplate connections in position. Solder connecting wire to inside tinplate connections as shown, then cement over the sewing, place batteries in position. (Place in

(*Continued on page* 303)



TEST YOUR NERVES

CEPHEUS SHOWS HOW THE MODEL MAKER CAN PROVIDE A STALL AT HIS LOCAL FÊTE

THIS sideshow may not be strictly model engineering, but younger readers will find it most amusing, and easy to build.

It also has a practical side, in that the organisers of local fetes and shows—even model exhibitions—are often glad of an extra money-making sideshow such as this. Operated by one of the younger members, it can provide an attraction on the "recruiting stand" for the local Model Society.

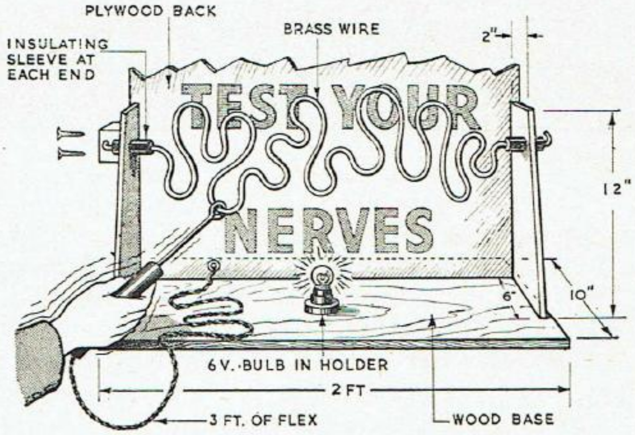
The principle is obvious from the drawing. The luckless person under test has to pass the ring along the full length of the bent wire without making contact with it. Should contact occur, a light glows and a loud buzzer frightens the already shaky operator.

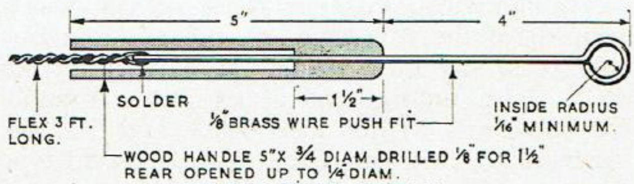
Now to the construction. The base, side pieces, and back are all of plywood or thin board, glued and screwed together with corner fillets where necessary. Sizes are not at all critical and can be altered to suit material in hand. Leave sufficient room at the back for mounting a switch, a buzzer, and terminals.

The wire across the front is of $\frac{1}{8}$in. diam. soft brass, and may be twisted to any fancy shape so long as the ring can be threaded along it. Before being bent the wire should be rubbed bright with emery cloth to ensure good electrical contact. The single flex leading to the wire is soldered in position.

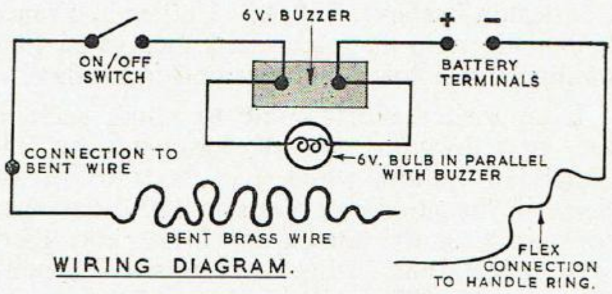
Small bore rubber tube, or, less neat, insulating tape, makes the insulating sleeves at either end. The ring is also of $\frac{1}{8}$ in. soft, clean brass wire. Its size is governed by the abilities of those likely to be using it. The single flex is soldered to the ring wire and pushed back inside the handle with sufficient glue to hold it tight (see drawing).

After the simple wiring up, and a spot of showman's painting—as lurid as you please—it is ready for use. An accumulator is a better source of current supply than dry batteries.





HANDLE RING DETAIL



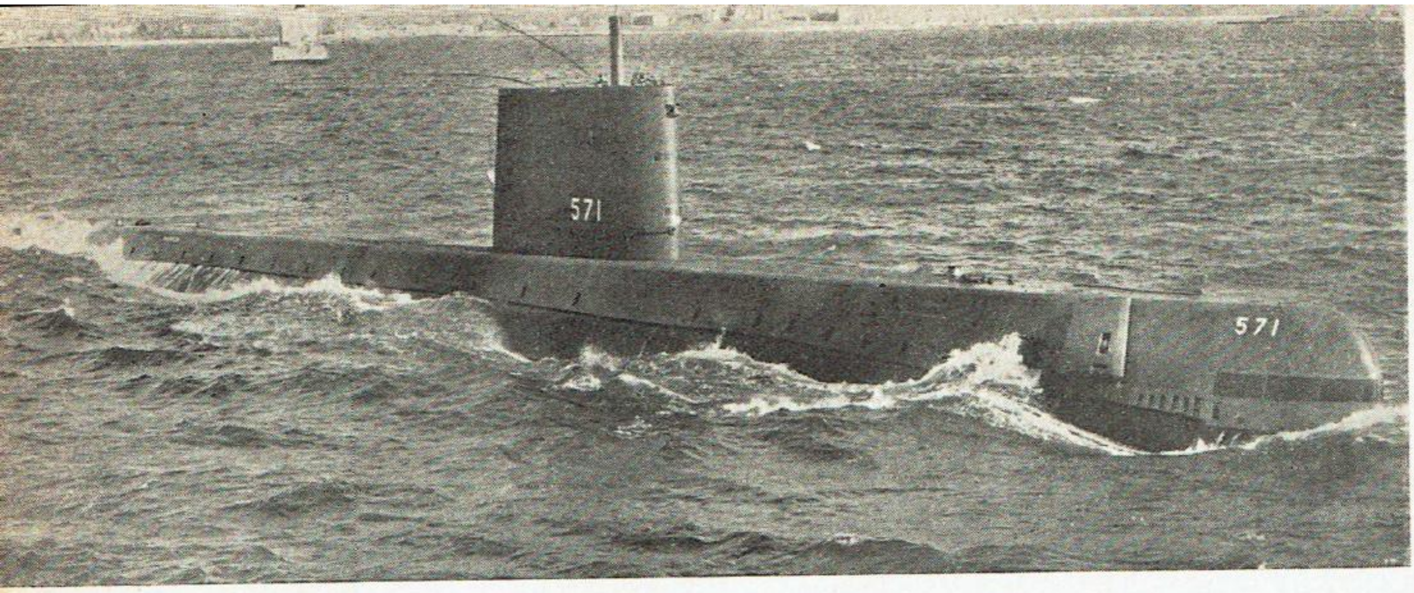
WIRING DIAGRAM.

AUDREY VII (*Continued from page 302*)

same order as on plan, or the result will be a motor in reverse!) Now the retaining block can be cemented in position, complete with 20 s.w.g. clip, the foredeck can now be covered, the $\frac{1}{8}$ in. square support and the two 3/16 in. deck pieces which are then shaped to the contour of the deck, make the $\frac{1}{8}$ in. cockpit floor, fit the switch, wire as diagram and cement in position.

Drill the $\frac{1}{4}$ in. square hardwood to take 18 s.w.g. tubing, fit a short piece into the hole and bell each end by turning a drill in reverse on it. Fit the rudder, placing the cup washer, spring, flat washer and finally another cup washer which is soldered whilst the spring is compressed; this will then retain the rudder in any set position. The rear deck can now be covered.

Cut out two cabin sides of $\frac{1}{8}$ in. sheet to template on plan. Add windows to inside, cement them together, using the cabin floor as a spacer, then cover with 1/16 in. sheet. Fit front of cabin to fit foredeck, after completion of hull.



NAUTILUS

WORLD'S FIRST ATOMIC-POWERED SUBMARINE

Described by **CHRISTIAN TAVARD**

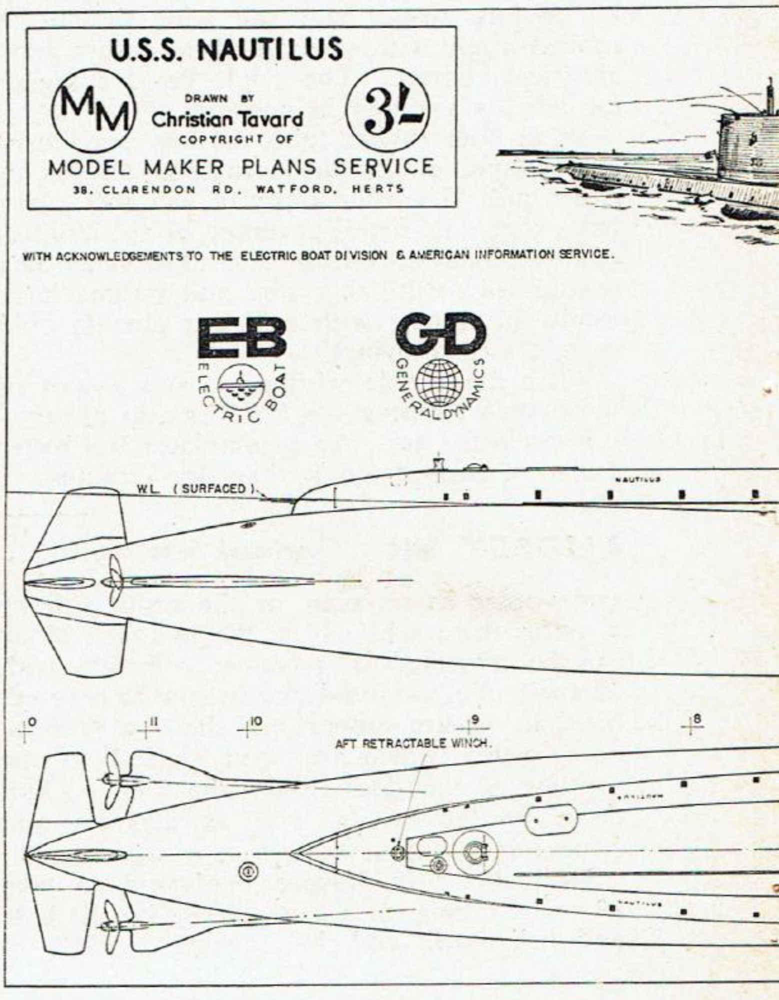
THE fiftieth anniversary of the death of Jules Verne, famous French author of what we now call "science-fiction" and creator of the submarine *Nautilus* in his novel "Twenty Thousand Leagues under the Sea", coincides with the opening of a new era of technical advancement. Foremost of these new marvels must be the first atomic-powered submarine *U.S.S. Nautilus—S.S.N. 571.*

Though Jules Verne may be regarded as a prophet of the submarine by the uninitiated—that is to say most of us—he can sustain no such claim amongst naval experts. Actually his book was written after 1865, and in 1864, during the American Civil War, a David type "submersible torpedo" the *Hundley* torpedoed the steam corvette *Houstatonic* outside Charleston harbour, U.S.A. Earlier in France (1863) the navy had launched the 149 ft. long *Plonguer,* a colossal submarine for its day!

Even earlier efforts come to mind, such as the first *Nautilus* of all, designed by the American Fulton, which had its trials in the Seine in the middle of Paris in 1800, and then took part in the attack on Brest; and there was also that other American Busnell's *Tortoise* in 1775, which also claimed to be the first boat to be driven by a propeller.

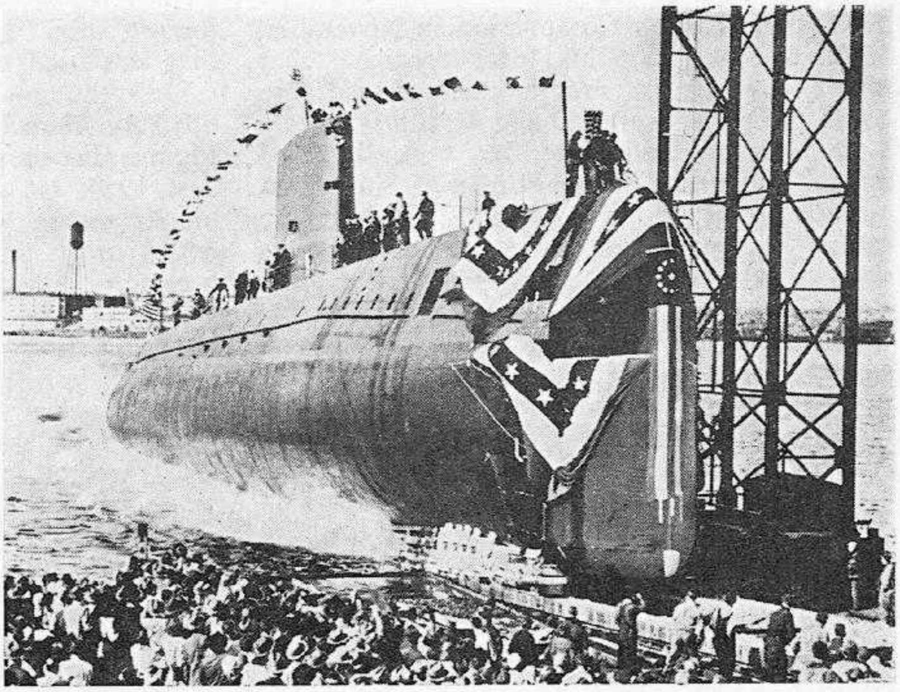
The story of the first atomic submarine is a true romance extending over some ten years. Its promoter is Vice-Admiral H. G. Rickover, who also bears the nickname "Mr. Zirconium" —why we shall soon see.

In 1946 while reading a work of Dr. Phil Abelson, and a secret report from the General Electric Company, Rickover thought of making use of atomic energy for the propulsion of a submarine. This presented problems not to be found in surface craft, and was indeed the most difficult application that could be considered. H. G. Rickover was then a naval captain, his World War II rank.

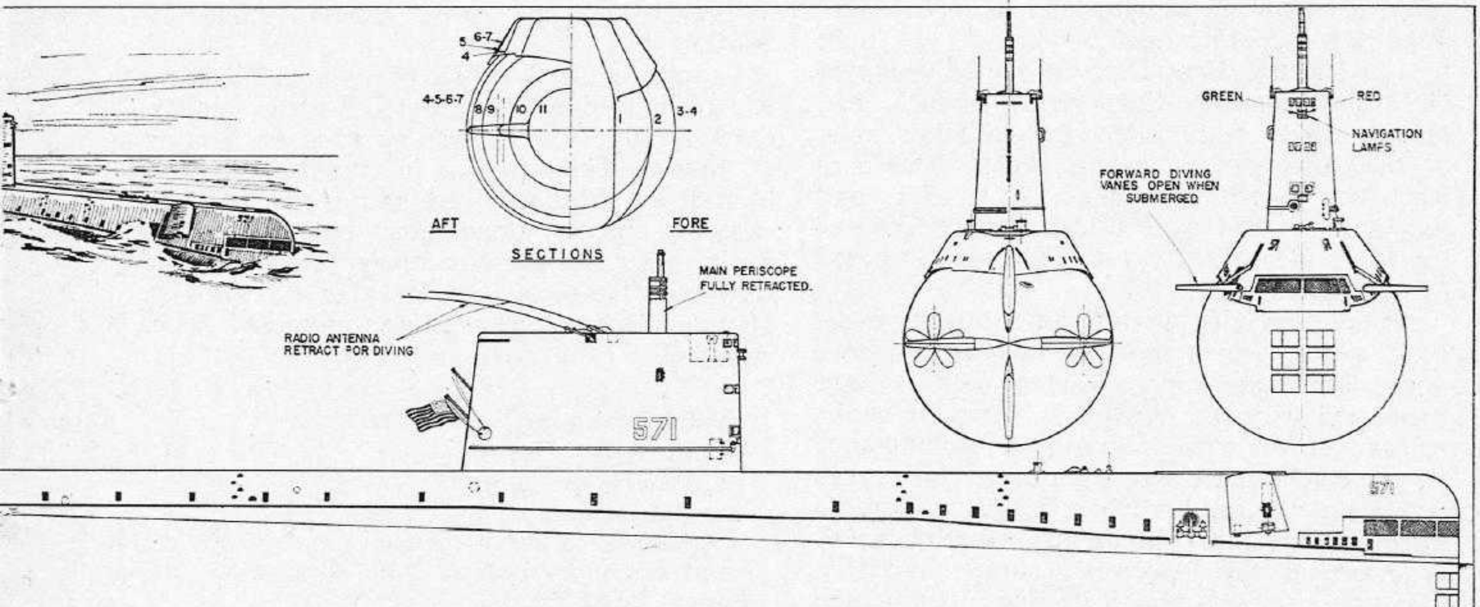


He was the son of a little Polish Jew tailor, and was born in White Russia in 1900. In 1904 his father emigrated to Chicago, and and his family followed two years later. H. G. R. had a hard youth there, and tried his hand at a variety of jobs to pay for his schooling. He was thus enabled to enter the Naval Academy at Annapolis, from which he was duly passed out as a naval officer.

In his first atomic submarine project Rickover had the help of Admiral Mills, assistant-chief of the U.S. Bureau of Ships. The Admiral put him in charge of a group of officers studying nuclear physics at the



These two pictures of the U.S.N. *Nautilus* give some impression of her stark lines. A recent newsreel film has now given more details of her appearance, which bear out the accuracy of our contributor's drawing



U.S. atom base at Oak Ridge. At the request of the Atomic Energy Commission in November, 1946, Rickover and his team predicted that within 8 years the first atomic-powered ship could be put in service, and within 15 years a whole fleet. Unhappily, they were disowned by the directorate of the Bureau of Ships, and even Admiral Mills, who had obtained the initial encouragement for Rickover and his team, disclaimed any responsibility for their claims on behalf of the naval department.

On January 1st, 1947, Captain Mumma (now Admiral and Director of Naval Construction, U.S.N.), Rickover's principal opponent, replaced him in charge of the Bureau of Ships' Atomic Energy Division.

The years following passed for Rickover in a constant struggle to overcome the hostility and the prejudice of opponents of the project, as well as problems from naval, financial, political, and scientific aspects. Finally, on April 25th, 1950, Admiral Forrest P. Sherwood, chief of naval operations, recommended to Congress that an atomic-powered submarine be built. This motion was passed and the project put in hand.

Construction of the ship and its motor were handled as separate items. The hull was built by the Electric Boat Division (Subdivision of General Dynamics Corporation) which had already been responsible for building most of the American submarine fleet. The contract was signed on August 21st, 1951, and the keel was laid by President Harry Truman on June 14th, 1952, at the Groton Shipyard (Connecticut).

At the beginning of this same year an event took place, which no one seems to have appreciated the importance of, nor to have connected with the *Nautilus*. We refer to the salvage of the *Flying Enterprise*, commanded by the celebrated Captain Carlsen. Her cargo was a state secret, for it was largely comprised of zirconium and columbium, essential metals required in the American atomic industry. The first named is practically inoxydisable and inert, and used for the manufacture of sundry atomic motor pipework. Its loss would have led to a hold-up and great loss of time in the making of the first atomic motor. The latter metal—columbium—stands up to extremely high temperatures, and is used for turbine blades in aero engines. The amount carried on *Flying Enterprise* was enough for three months' U.S.A. production. In spite of this hold up Mark I—first atomic reactor constructed by Westinghouse—entered into service on May 31st, 1953. This motor was not used for the ship. It was the second—Mark II—that was used to equip *Nautilus*.

Once the motor was installed S.S.N. 571 was officially launched by the President's wife, Mamie Eisenhower, at 11.57 hours on January 21st, 1954. It was commissioned by the U.S.N. on September 30th, 1954. *Nautilus* made her first trip on January 17th, 1955. On this occasion, her commander Captain Eugene Parkes Wilkinson set off at eleven in the morning, and twenty-six minutes later flashed a message destined to become historic: "Under way on nuclear power", transmitted by Quartermaster 1st class Lyle Royle. The first dive took place on January 20th, 1955, to the south-west of Long Island; and was followed by a dive to maximum depth (125 fathoms) on February 27th, 1955. Her first real cruise took place last summer. Totally submerged *Nautilus* can travel 1,300 miles, that is to say from New London to San Juan (Porto Rico).

As announced by Vice-Admiral Rickover: "This performance multiplies by ten the longest distance that has previously been achieved by a submarine completely immersed." Average speed attained was 16 knots.

In spite of the hostility of so many, Captain Rickover received the reward of his obstinacy. On July 7th, 1952, he was awarded the Legion of Merit. Then just as he reached the age limit at the third application, in spite of certain superior officers' opposition, but backed by a big American press campaign, and with the recommendation of President Ike Eisenhower, Hyman George Rickover was promoted Vice-Admiral.

Technical Particulars

Length overall: 300 ft.
Waterline beam: 28 ft.
Draught on surface: 25 ft 7 in.
Total height to top of conning tower: 47 ft. 7 in.
Displacement on surface: 2,900 tons.
Power: 3,600 h.p.
Motors: Nuclear reaction steam producers driving turbines.
Fuel capacity: Weight of Uranium U235 22¼ lb. ! !
Other power plant: Diesel auxiliaries.
Maximum speed on surface: 35 knots.
Maximum speed submerged: 20 knots.
Radius of action in 50 days: 30,000 miles.
Fuel consumption at full power: 7 oz. U235 per day.
Maximum depth of dive: 125 fathoms.
Total cost (primarily for nuclear reactors) approx. £2,000,000.
Crew: 2 officers, 82 p.o.s. and ratings.

STARTING ON THE RIGHT TACK

AN INTRODUCTION TO MODEL YACHT RACING
PART FOUR—THE STEERING GEAR (Continued)

BY D. A. MACDONALD

We can now begin to build up the bar or body of the vane gear, with its self-tacking mechanism. A simple arrangement for the bar is shown in Fig. 1. The block A is fashioned from square section material. The most commonly used material is aluminium alloy, which has the advantage of lightness, but suffers from three disadvantages, viz:—(i) it cannot be soldered except by the use of special techniques; (ii) it is soft, and drillings are apt to wear; and (iii) it corrodes easily especially when in contact with brass or other copper alloys. Perspex is used occasionally; this overcomes the corrosion difficulty but is even softer than aluminium, and rather difficult to work. The author prefers brass, the weight being maintained by drilling out as much surplus metal as possible.

The block A is drilled at B to fit over the top portion of the rotor. This and all other drillings of the bar should be done with a bench drill or lathe to ensure accurate alignment of all parts. When the hole B has been drilled, it is temporarily plugged with a tight fitting rod, and hole C (for the friction clamp) is drilled, at right angles to B, and overlapped the hole B by about ⅓rd of its diameter. A suitable diameter for hole E (and for the clamp), would be ¼ in. Two brass rods D and E, ⅛ in. diameter, are fixed into the bar as shown. They can be silver-soldered (if the bar is of brass), but it would in any case be preferable to thread them (5 B.A.) and screw them into tapped holes in the bar, so that they could be removed and replaced at any time if bent or broken. The tops of these rods are also threaded 5 B.A. to receive a nut. These rods form bearings for the two arms of the self-tacking mechanism.

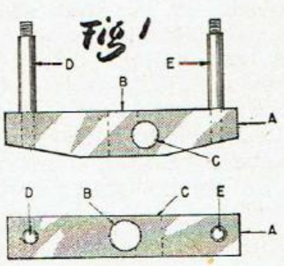
A simple form of friction clamp is shown in Fig II. It consists of a piece of ¼ in. diameter rod A, into which is silver-soldered a threaded rod B. The "bite" taken out at C is achieved by inserting the rod into place in the bar, and drilling through the rotor hole (B in Fig. I). The length of A is slightly less than the width of the bar so that when the large washer D is placed in position and the knurled nut E is screwed up tight, the rotor is firmly gripped in the bar.

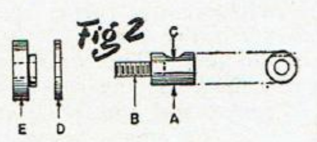
Fig. III shows an improved form of clamp which is well worth the extra effort involved in making it. The clamping rod A is now split into two halves, and drilled to move freely on the threaded rod B. The latter is silver-soldered into the cap C (same material as A) which has a large disc soldered to it to act as a flange. A locating pin D fits into a pinhole in the bar so that the screwed rod does not turn when the clamp is inserted into the bar. The total lengths of A and C (less flange) are slightly less than the width of the bar. The washer E and nut F are used as before to clamp the rotor in the bar.

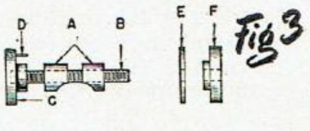
The self-tacking system comprises two arms, one carrying the vane feather and the other carrying the balance weight. These arms are made of extruded brass strip ¼ in. wide by 16 s.w.g. Fig. IV shows the counter-weight arm and details of the weight. The strip A is slotted at B to carry the 6 B.A. fixing screw of the weight. At C, three holes are tapped 5 B.A. to receive the machine screw D. The choice of three positions provides a coarse control of vane angle when the self-tacking gear is in use. A tube E (⅛ in. internal diameter) is silver-soldered into the brass strip as shown. Care should be taken in this operation to ensure that the strip is not unduly annealed by the use of excessive heat for soldering. If a low temperature silver-solder (such as "Easy flo") is used, this trouble should not arise. This tube should fit nicely over the appropriate rod (D in Fig. 1). The tube for this arm could be ⅝ in. long, with 3/16 in. of this length below the arm. The weight F is made of brass rod (½ in. diameter) with a screwed rod silver- soldered into the centre. It is secured in the desired position in the slot B by the washer and nut G.

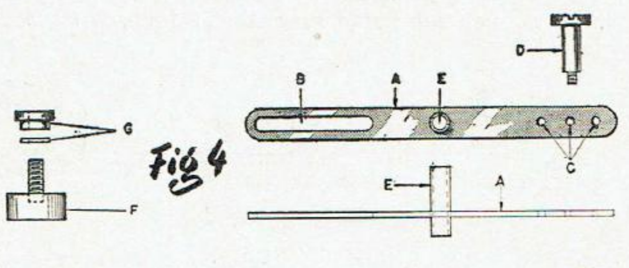
The vane-carrying arm is shown in Fig. V. The strip A carries a tube B of the same length and diameter as that in Fig. IV but this time, ⅜ in. of the tube is below the strip A. This ensures that the vane arm when in position will ride above the weight arm. The inner end of the arm has a block C silver-soldered in position. This block is drilled and tapped to house the adjusting screw D, which acts as a fine control on the vane angle. The inner part of the strip is slotted at E to accommodate the pin (D in Fig. IV). It is important that this slot is carefully made, so that the pin moves freely along its length, but without excess play. The outer or feather end of this arm is fitted with two discs (F) silvered-soldered in position and drilled through the centre to receive the fixing screws G. If desired only one disc need be soldered to the arm, the other being free to allow for the use of varying thickness of feather.

To complete the self-tacking apparatus, a latch is required. This can be in the form of a slider (see Fig. VI). The slider is made of thin sheet brass,









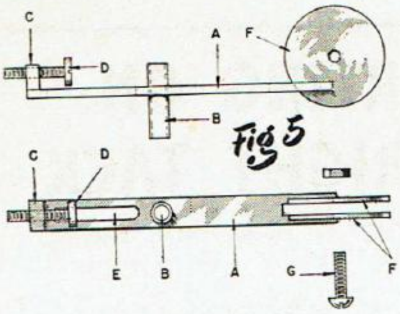


Fig 5

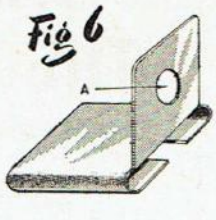


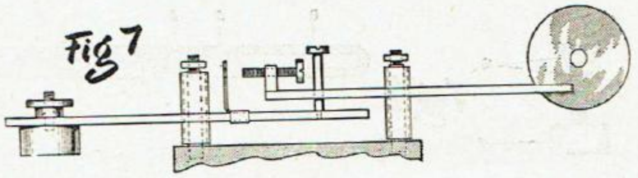
Fig 6

to fit on the weight arm (Fig. IV), where it is placed between the rod E and the pinholes C. The hole A in the latch (Fig. VI) is dimensioned and positioned to engage with the end of the fine control screw on the vane carrying arm (see Fig. VI). The assembly of the self-tacking mechanism on the bar is shown in Fig. VII. The simplicity of this gear will now be apparent. The vane angle is set as near as possible by selection of the fixing hole for the pin, with the fine control at mid-position. The exact setting is then done by the fine control which will be found invaluable for quick adjustments during racing. The sliding hatch is positive and accurate, and can be so used that the self-tacker is held to one side only, as a form of gye-ing device.

I have avoided laying down set dimensions for the main parts, since the design can obviously be made to suit craft of all normal racing classes. It is recommended that the constructor makes up his own dimensioned working drawings from the foregoing illustrations, and arranges his dimensions to suit his own requirements. As a rough guide, the bar length overall should be from $1\frac{3}{4}$ in. to $2\frac{1}{2}$ in., and the cross section from $\frac{3}{8}$ in. square to $\frac{1}{2}$ in. square. By reducing the diameter of the top of the rotor and of the clamp (Figs. II and III) to 3/16 in., a still smaller cross section could be adopted for the smaller craft. It is advisable, however, not to make the outer ends of the self-tacking arms too short, for two reasons. One is that a small feather, and correspondingly small balance weight on a long arm can be as effective as a large feather and corresponding weight on a short arm. Therefore, lengthening the arms will reduce the overall weight of the gear. Secondly if the weight of the inner portions of the arms (with the added weight of the latch and angle adjustments) is not appreciably less than the weight of feather and balance-weight, it will reduce the "toggle" action of the gear so that the arms will tend to return to a centre position when the yacht is upright. This trouble is very common with self-tacking gears, and causes very erratic performance when sailing. It is essential that the self-tacking gear should maintain the full vane angle for which it is adjusted at very small angles of heel, and this feature should be checked carefully when the gear is made up.

It is also inadvisable to try making the arms too long, as they are liable to distortion caused by wind

Fig 7



pressure on the feather. This must be perfectly upright, otherwise the yacht will not sail the same on both tacks. One essential accessory to the gear is a slow-acting gye. It is advisable for this to be designed so that it can be brought into action quickly on either tack when required, and also set for the desired speed of action. Many commonly used arrangements fail on either or both of the above counts. The arrangement to be described is one of the few that really work well. Fig. VIII shows the bar of the gear and part of the weight arm, viewed from above. A light cross-bar A mounted on a slider B is attached to the weight arm. The slider is similar to that of Fig. VI, the cross-bar and nut being silver-soldered to the top of the slider. A screw D with a large head is used to clamp

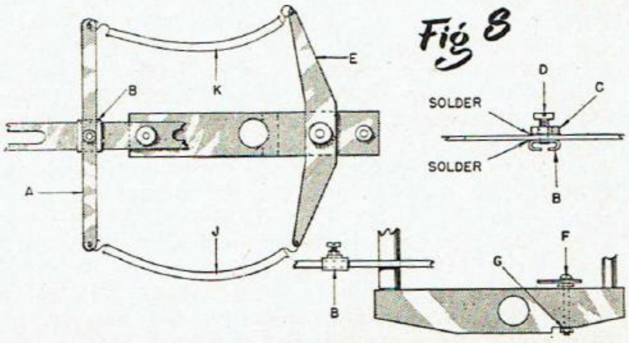


Fig 8

the slider and cross-bar in any desired position along the weight arm. A rocker arm E is secured to the bar which is tapped to receive the 6 B.A. screw F. A locknut G and spring washer H provide a friction grip which enables the rocker arm to be set at any desired angle. Two light springs or rubber bands are hooked between the cross-bar and rocker arm as shown. Now if the cross-bar A is locked in such

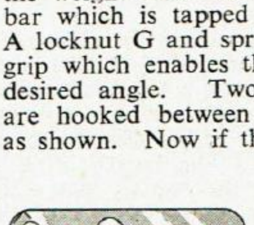


Fig 11

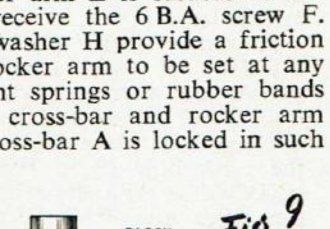
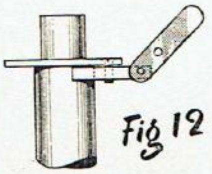


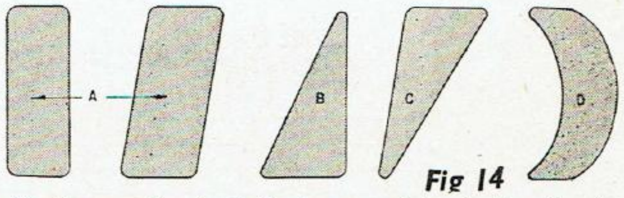
Fig 9

Fig 10

a position that both springs are just inoperative with the self-tacking arms open to their sailing angle and the rocker arm in mid position, the yacht will sail full-and-bye on both tacks. Turning the rocker arm will slacken one spring and tighten the other to any desired extent. It is thus possible to apply a gye of the required speed on either tack by one simple movement. This device will be found most effective in racing particularly in variable winds when the "sailing" tack is liable to change at any moment. The cross-bar A can be of brass $\frac{1}{8}$ in. × 22 s.w.g. the rocker arm being 3/16 in. wide at the centre and $\frac{1}{8}$ in. wide at the ends, and 20 s.w.g. thick.

It is a great convenience to be able to latch the bar amidships (i.e. in line with the rotor arm) when the self-tacker is in use. To do this, a small block, shaped as at Fig. IX is attached to the rotor by a countersunk 8 B.A. screw as shown in Fig. X. The





width (W) of the block is the same as the width of the vane bar (Fig. I). It is shaped as shown to fit snugly against the main column of the rotor and protrudes beyond the circular plate. The protruding end is drilled through horizontally to take a long rivet for securing the latch (Fig. XI). This latch is made of two side plates (A) of 3/16 in. x 18 s.w.g. brass with a spacer bar B silver-soldered in position. The fixing holes C enable it to be riveted to the block (Fig. IX). The complete latch assembly is shown in Fig. XII, fixed to the rotor.

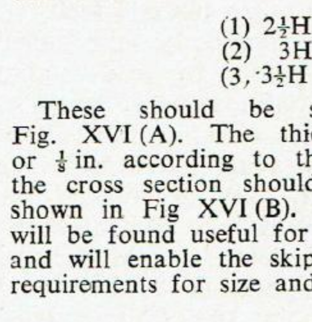
It is customary to provide some means of limiting the range of movement of the tiller. There are two reasons for this. One is that the linkage pin can stick at the end of the slot in the tiller arm, and it is therefore advisable to stop the movement of the tiller before this occurs. The other reason is that rudder deflection beyond a certain angle does not materially increase the turning power of the rudder, and merely increases drag. The maximum useful rudder deflection varies between 22 and 27 degrees according to the characteristics of the rudder. Some steering gears are fitted with stops in the form of a pinrack or similar device which enables the limit of movement of the tiller to be varied. In the author's experience, a pair of fixed stops will prove adequate, and these should be positioned to allow a maximum deflection of 25 degrees for a yacht with a deep rudder well inboard, to 30 degrees for one with a small rudder very far aft. These stops may be made in a number of ways. One neat solution is to cut the barrel portion of a turnbuckle in two halves (see Fig. XIII) and screw these to the deck (preferably into a deckbeam).

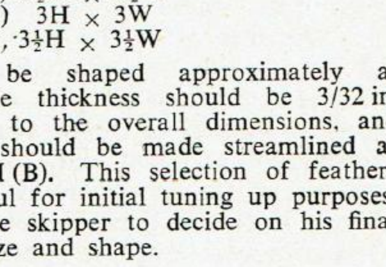
Feathers for vane gears vary widely in size and shape. The requirements for a feather should be adequate but not excessive turning force (this subject will be dealt with later) light weight, and sufficient rigidity to avoid distortion under wind pressure. The shapes commonly used fall into the following categories (see Fig. XIV):—(1) Rectangle or parallelogram (A), (2) Triangle (B), (3) Inverted Triangle (C) and (4) Crescent (D).

The rectangular shape (A) obviously gives the largest area for given overall dimensions, and for this reason is commonly used when there are limitations of space. It does not, however, give the best driving force for a given weight. It has reasonable rigidity. The triangular shape (B) is very rigid, and normally requires no strut to support it. The most effective portion is at the base, and in sheltered water the lack of area at the top can be a disadvantage. In such conditions the inverted triangle C is often used; this needs an adequate strut to mount it rigidly. If this is done it gives a good driving force for a given area, but the strut loses marks on the score of weight. The crescent form D is the most widely used. It is rigid, the area is concentrated beyond the end of the arm giving maximum drive for the area; and it is quite rigid, requiring only a light strut. It answers all the requirements for lightness, rigidity and power, and is therefore recommended for all normal purposes. A light strut in the form of Fig. XV made of 24 s.w.g. brass can be used, this replaces one of the discs at the end of the feather arm of the self-tacking gear, and is fixed to the feather by 10 B.A. screws, nuts and washers, or by eyelets. The optimum size of feather can be determined only by trial and error as it depends on so many circumstances. However, it is necessary to start somewhere, so the beginner is recommended to make three feathers for preliminary trials with the yacht. The dimensions can be based on those of the rudder. Assuming this to be of approximately rectangular shape, of height H and width W, mark out three rectangular sheets of balsa to the following dimensions:—

(1) $2\frac{1}{2}H \times 2\frac{1}{2}W$
(2) $3H \times 3W$
(3) $3\frac{1}{2}H \times 3\frac{1}{2}W$

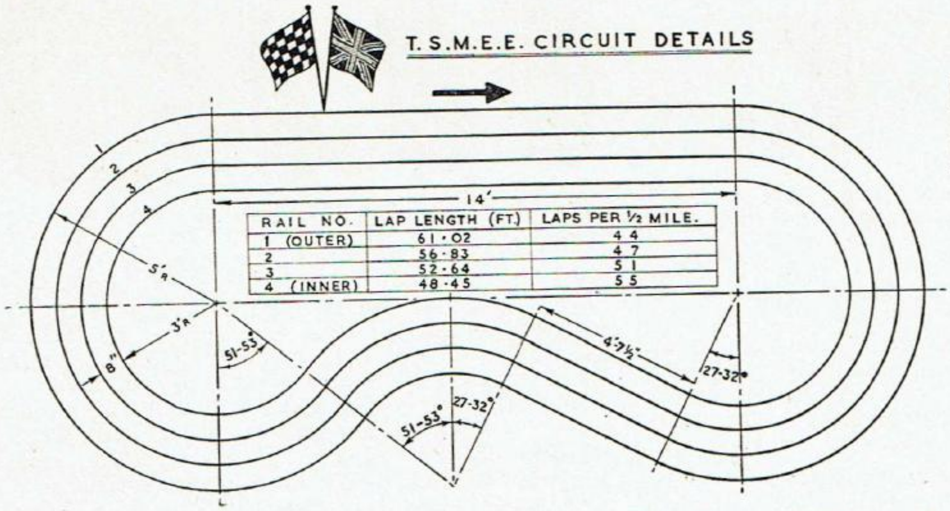
These should be shaped approximately as Fig. XVI (A). The thickness should be 3/32 in. or $\frac{1}{8}$ in. according to the overall dimensions, and the cross section should be made streamlined as shown in Fig XVI (B). This selection of feathers will be found useful for initial tuning up purposes, and will enable the skipper to decide on his final requirements for size and shape.





"SUNGA MARUTHAM"

The attractive model boat featured on our cover is a scale model of a Singalese customs launch built by John I. Thornycroft Ltd., the model being the work of M. Purday of Herne Bay. Overall length is 36 in. and construction is entirely of balsa, with the exception of deck and engine mount. Powered by an old type E.D. Mk.2 with home built water cooling head, etc., the model is equipped with an entirely home built radio installation with optional progressive rudder obtained on the pulse system. A smart maroon and royal blue colour scheme make this one of the nicest launch type models we have seen for some time.



RAIL NO.	LAP LENGTH (FT)	LAPS PER ½ MILE.
1 (OUTER)	61·02	44
2	56·83	47
3	52·64	51
4 (INNER)	48·45	55

KEN PROCTER REPORTS ON THE 1956 NOVOCASTRIAN GRAND PRIX

RAIL RACING IN THE NORTH

WHILST idly turning over the pages of back numbers of MODEL MAKER, I was rather surprised to see that the report of the first "Novocastrian Grand Prix" appeared in the 1953 February issue (an excellent issue for model car enthusiasts of all branches) and as I cannot recall any reports of model rail car racing in this part of the country since that date, though many have taken place, I feel that the most recent event should be chronicled lest the impression be gained by readers that activity in this field is confined to the South.

It is difficult to imagine a more unusual setting for model rail car racing than inside the portals of a Town Hall, but, in view of the success of the first meeting held in Gateshead Town Hall, the Tyneside Society of Model and Experimental Engineers had no hesitation in selecting this venue for the 1956 Novocastrian Grand Prix.

Invitations were accordingly extended to all the interested clubs within reasonable travelling distance with the satisfying result that, on the day, entrants arrived from Corbridge, Gateshead, Middlesbrough, Northallerton, Stagshaw, Sunderland, and, of course, Newcastle. Apologies for absence were also received from our Scottish friends who were effectively snowed-up and their fast 0.75 c.c. engined cars were greatly missed.

'Flu was responsible for the absence of one or two other well-known contenders, but over 16 cars were present and from these, four four-car teams were selected to represent the Stagshavians, Northallertonians, Teesiders and Tyne/Wearsiders respectively.

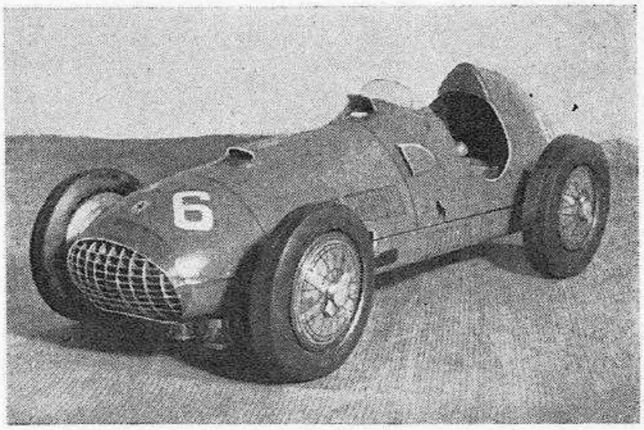
The event was run in accordance with M.C.A. Rail Racing Rules, each heat being of 50 laps or approximately ½-mile. A new electronic timer had just been completed which recorded the number of laps completed on each track on separate dials and showed a red light over the appropriate dial when the distance was completed.

A heat is deemed completed when the winning car crosses over the finishing line (as in full scale practice) the remaining places then being determined by the number of laps completed by each of the cars still running at that time. Points awarded per heat:—First Place 5, Second 4, Third 3, Fourth 2. If a car completes one lap or more, but is not still running at the finish—1 point (equivalent of starting money) and a bonus point is awarded for a finish, excluding a win, by a car with engine of 1 c.c. or under.

Klaxon horn warnings were given at intervals of 2 minutes, 1 minute and 30 seconds before the starting gate was released at the start of a heat and a further 30 seconds were then allowed for late starters.

Unfortunately, the Gremlins chose to deal with the electronic timer first and though the contacts on the baseboard for each rail had functioned perfectly during testing and practice, it was found that inadvertent operation was taking place, probably due to the combination of general track vibration and the vibrations of the contact strips themselves (these have now been re-designed to prevent this phenomenon). For this reason, it was agreed to abandon the timer and resort to hand operated counters and the organisers also decided to award points for the first and second places only which, I am afraid, had the adverse effect of widening the gap between the good and the mediocre teams.

Ferrari 4½ litre 1951/52 built by Ken Procter—this was one of the original rail cars running in the North and still looks a formidable entry



Sixteen heats of four cars were run off in all, every car running four times and against different opposition each time. The draw for running rails was made in such a manner that no advantage went to any one team. All the cars were allocated numbers which were stuck on the cars by means of adhesive backing and assisted identification by the owners and spectators alike.

Many exciting duels took place in the ensuing heats with cars racing neck and neck, or should I say, bonnet to bonnet, whilst the Gremlins, undismayed by being foiled of their first objective, applied themselves gleefully so that fuel valves mysteriously stuck in the off position when fuel was required and vice versa when attempting to stop engines, flywheels or starter pulleys slipped round uselessly on shafts during the starting period, fuel dried up with cars within sight of the finishing line, and compression disappeared at vital moments.

However, these trials and tribulations together with the general excitement were enjoyed by spectators and contestants alike, and the Stagshavians "did a Mercedes-Benz" relentlessly beating down the opposition whilst at the same time going on to a well deserved and popular win with 43 points in all. Teeside (assisted by one Stagshavian) were runners up with 41 points, and the Northallertonians and Tyne/Wearsiders trailed somewhat with 13 and 8 points respectively having had perhaps more than their fair share of Gremlinitis; indeed the latter team was reduced to three cars before the start of the first heat!

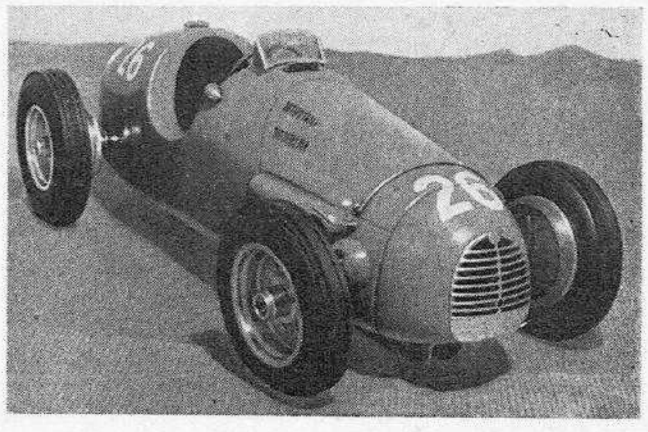
Whilst we believe that teamwork is the forte of rail racing, credit must be given to Reg Fordingham for winning the fastest heat at an average speed of 37 m.p.h. The consistency of the event is shown by the fact that the average winning speed was 31 m.p.h.

Prototypes represented included Alta, Alfa-Romeo, B.R.M., Connaught, Cooper, Cooper-Bristol, Ferrari, Gordini, Maserati, Mercedes-Benz, Novi-Governor Special and Vanwall, and though the general standard was very high, I think it will be agreed that Len Dobbin's as yet incomplete 2 litre Gordini (Manzon's Car 1952) is outstanding. I have included photographs of this car in its present condition, and hope, at a later date, to give a more complete description. The Gordini is based on the Prototype Parade in MODEL MAKER dated December, 1952, and in the meantime I will merely mention the fully detailed front suspension and Ackermann steering, the rear view mirrors which actually contain miniature convex mirrors, the beautifully detailed radiator grille with hand engraved Gordini Badge, and the special type bonnet clips. The wheels and hubs have been prepared for wire spoking and scale type treaded tyres will be fitted later.

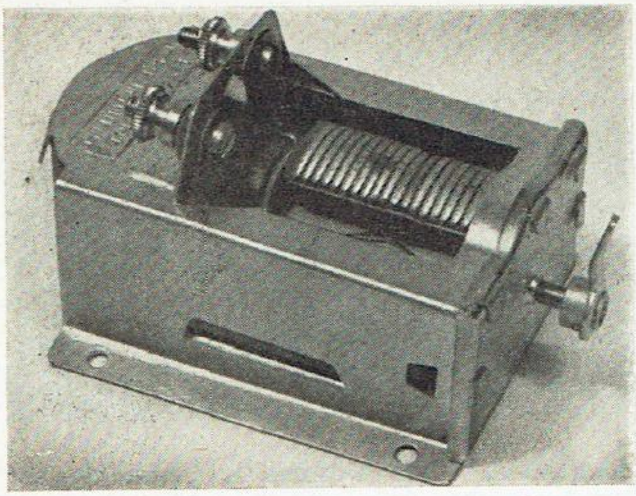
The meeting was highly successful thanks to the efforts made by the organisers and officials (and, of course, the co-operation of the contestants) namely Messrs. Duerden, Davies, le Lamb, Hall, Lindsley, Charlton (2), Buck, Brough and Dobbin, the latter two also participating in the car racing.

Immediately following the completion of the event, contestants were invited to Mr. M. J. Atkinson's premises where an excellent and most welcome tea was served by Mesdames Atkinson and Lindsley which was greatly appreciated by all.

The track, as the diagram shows, is still in its original form, but efforts are to be made in the near future to incorporate a fly-over in order to attain distance equality on all the rails.



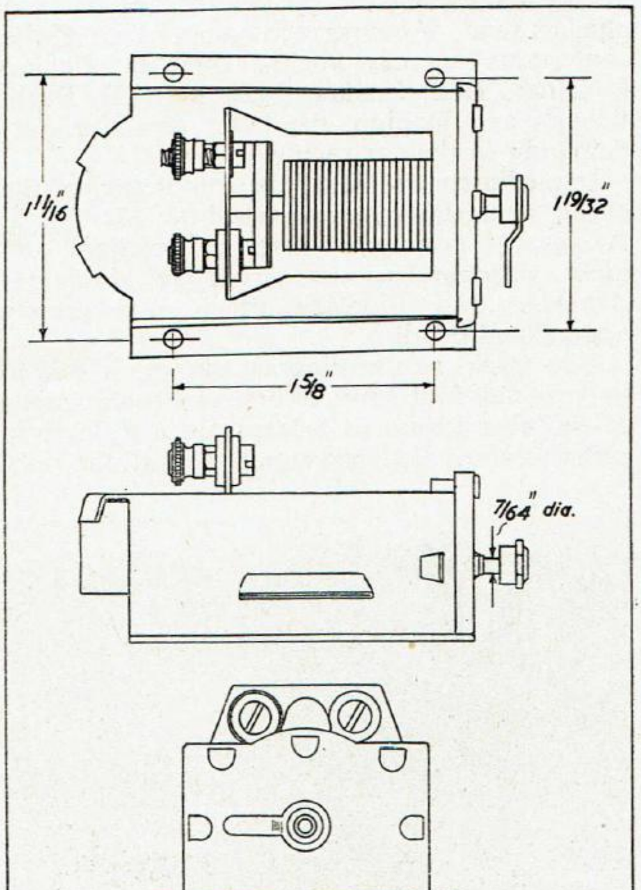
Gordini 1952 by Len Dobbin, based on Manzon's car. A number of delightful refinements are being added in the near future



MODEL MAKER MOTOR TEST

Bassett-Lowke No. 1461

BY R. H. WARRING & E. J. HOOK



THE No. 1461 is the smallest and cheapest of the range of three Bassett-Lowke motors which, whilst employing the same sort of basic layout is very much more toy-like in construction. The main design difference is that a disc type commutator is used with metal leaf brushes and arcing is rather prevalent, particularly at low speeds. The brushes are mounted on a bracket formed by turning up a section of the 23 s.w.g. brass casing and, although small stiffening ridges are impressed in, the assembly is prone to distortion if the motor is dropped or roughly handled. Thus, as happened in this particular case, some little time was spent in adjusting the brush pressure (by bending the mount) in an endeavour to get satisfactory running.

Current readings obtained over the range of speeds all showed a tendency to variation although, by comparison, the speed held on any particular load was reasonably steady. Undoubtedly, therefore, this type of brush gear does give varying contact resistance but some definite improvements in this respect were realised by lubricating with a contact oil (see separate report).

Torque readings obtained on test were consistent and despite the general feeling that the motor was not giving a particularly good performance, subsequent analysis of the data obtained showed that the power output was quite good and the overall efficiency high—both figures, in fact, far better than initial examination of the motor would suggest,

Bassett-Lowke's quote the design voltage for the No. 1461 as 4½ to 6, with a current consumption of .6 amps and a speed of 2,000 to 2,500 r.p.m. The latter figures obviously refer to the recommended operating range under load.

Our tests were conducted on a nominal 6 volts supply—actual voltage being 5.9 volts on no load (free running) and 5.7 volts stalled. Free running speed was found to be 4,300 r.p.m. in an anti-clockwise direction and 4,000 r.p.m. clockwise. The motor set-up is symmetrical and thus performance should be the same in either direction. Test data were obtained with anti-clockwise rotation.

As the graphs show, peak power output occurs at 2,500 r.p.m., with a current consumption of .8 amps and an overall efficiency of about 23 per cent. The best operating speed would appear to be 3,000 r.p.m., at which speed the power output is still within a few per cent. of the peak, overall efficiency is approaching its peak figure and current consumption is reduced to .6 amps. Operating at a speed much below 2,500 r.p.m. current requirements tend to become excessive and efficiency drops off very rapidly. Hence for low operating speeds this is definitely a motor which would pay for the fitting of reduction gearing.

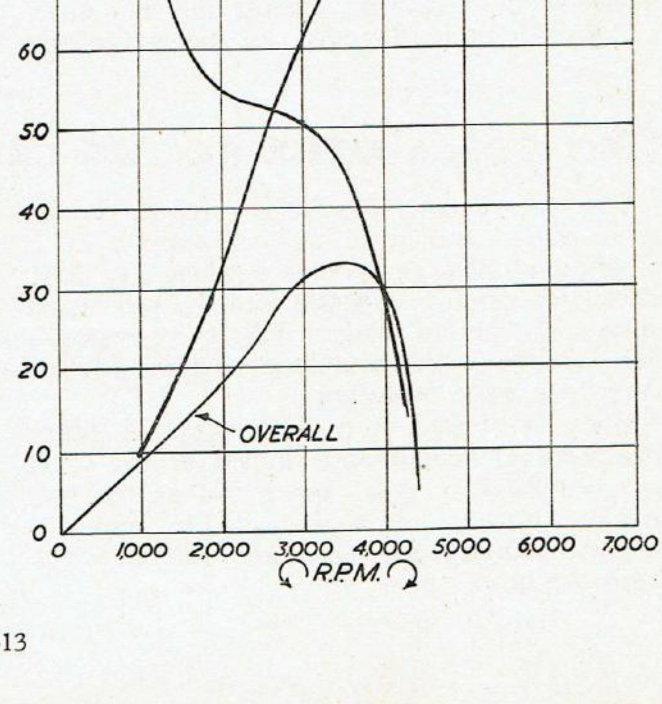
The shape of the current curve, as drawn, is an average over a rather higher "scatter" than is usually obtained on such tests. The shape of the torque curve was more clearly defined although it should be borne in mind that the vertical scale on the graph is quite large and this curve does, in fact, approximate to a straight line consistent with a straight line current curve. Theoretically torque is directly proportional to current on motors of this type and so the torque curves and current curves tend to follow the same pattern. In this case, no apparent reflexing of the torque curve was found, as occurs with the current curve, although it was not possible to measure torque values right up to the free running speed on account of the extremely low values concerned. All measurements were, in fact, made with the eddy current dynamometer. Torque available over the range 3,500 to free running may, in actual fact, be somewhat less than that indicated by the graph. The shape of the mechanical efficiency curve would appear to indicate high iron losses and increasing frictional resistance with increasing speed, the curve tending to fall off more rapidly than usual at the higher end of the speed range.

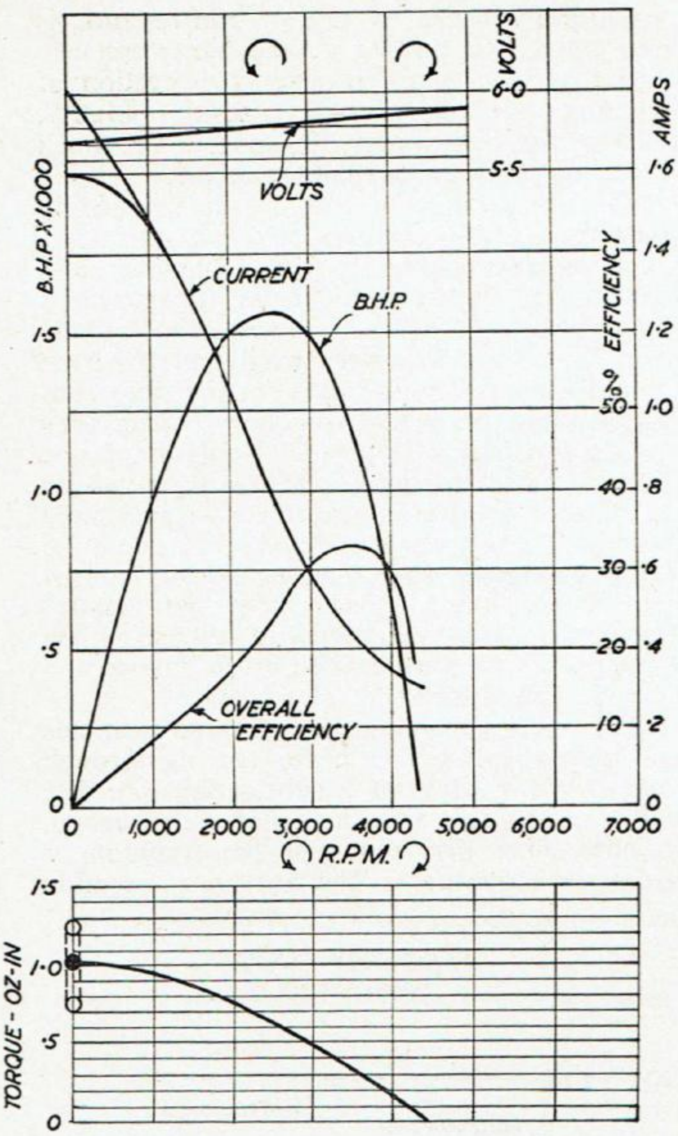
Constructionally, the main feature of the No. 1461 is its simplicity—we were tempted to say crudity, but in view of the good efficiency of the motor, this is hardly fair. The frame or casing consists of 23 s.w.g. hard brass bent into the form of a top hat section and quite elaborately tooled to produce tags and cut-outs for tagging to the brass end cover (of similar gauge), locating the permanent magnet and holding the brushes, The back bearing is formed by a turned down tab with the hole swaged to give an improved bearing surface. The other bearing is pierced in the end cover, similarly swaged.

The cobalt steel horseshoe magnet forming the field is simply slid in place and locked by turning down the two end tabs. As supplied the magnet was quite loose, but this slack is readily taken up by adjusting the tabs. If it is withdrawn. it will be found that the magnet is marked with a red dot on one pole, presumably as an assembly guide. Actually it does not matter which way round the magnet is assembled, as far as overall performance is concerned, and putting it back the other way round would simply reverse the direction of rotation for a given terminal polarity. Geometrically, however, the magnet fits much better one way round than the other.

The armature is a fairly long unit extending back beyond the effective field pole positions. It is approximately 15/16 in. diameter and consists of twenty laminations or stampings assembled on a .109 in. dia. shaft (fractionally over 12 s.w.g.). It is very well insulated from the windings with fibre packing and fibre end-plates whilst the actual volume of copper used on the windings is quite small—only about one half of the actual space available for windings is utilised. Total armature resistance measured through the brushes was found to be about 3.6 ohms (average), this being reasonably consistent turning over slowly from the "static" position. Hence variations in current when running can be attributed to brush bounce and varying contact pressure with speed.

The commutator consists of three segments of fairly thick section brass, tagging through and over the edges of a substantial fibre disc mounted on the armature shaft. A second, thinner, fibre disc separates the commutator from the armature. The armature assembly





is located by means of short piece of sleeving over the shaft bearing against the end cover and in the other direction by the end of the shaft fouling the horseshoe magnet. Normally the shaft is floated away from this end by the spring pressure of the brushes.

Brushes consist of phosphor bronze strips cantilevered from the turned up section of the casing forming the brush holder. The brushes are mounted with 6 BA brass screws and terminal nuts, one brush being electrically connected to the frame and the other insulated from it by means of fibre washers each side (the fixing screw passing through an oversize hole and insulated from it by means of a piece of sleeving over the thread. There is therefore little danger of shorting this brush to earth, even if slackened off and re-positioned in adjusting brush tension. The insulated terminal is, however, rather too near the frame for comfort when attaching crocodile clips or temporary leads, although this apparent danger should not be present when permanent leads are attached, provided they are disconnected from the battery whilst being fixed. Connection to the motor can, of course, equally well be made to the insulated terminal and to any part of the frame, ignoring the second terminal.

Summarising, not a bad little motor at all, in spite of its general appearance. With a maximum b.h.p. slightly in excess of .0015 this is up to the standard expected of this size and type. The efficiency is also good, so that this power is obtained without excessive current drain. It is, however, particularly greedy for current at lower speeds and in practical installations it would pay to operate at speeds not below 2,500 r.p.m. Having metal brushes, this is a motor in which performance can definitely be improved by lubricating the brushes with an accepted contact oil or a very thin coating of light machine oil. The former is much to be preferred.

TIPO CORSA JETEX RACING CARS *(Continued from page 316)*

For the benefit of those anxious to try their hand—and since an operating area is of only secondary importance when any 30 ft. stretch of smooth concrete will do we expect quite a number of readers will be interested—here are basic constructional details (choose your own near prototype!):—

Body fabricated from $1\frac{1}{4}$ in. dia. 24 gauge steel tubing, heated and shaped at the front to give $1\frac{1}{2}$ in. x $\frac{3}{4}$ in. space for power unit and cockpit cut out; a piece of $\frac{1}{2}$ in. tubing is cut at an angle and welded or soldered on to form the head rest.

The axles are made up from 4 B.A. rod and fitted with self-locking nuts, the wheels are made up out of 15/16 in. dural bar with imitation brake drums or disc brakes.

The Jetex 200 Power Unit fits snugly into the body and an augmenter tube runs through to the rear of the car.

The finished car is very simple, compact and strong, and every part can be quickly replaced.

Performance—so far accurate figures in M.P.H. are not available, but in several straight away runs the results were better than expectations.

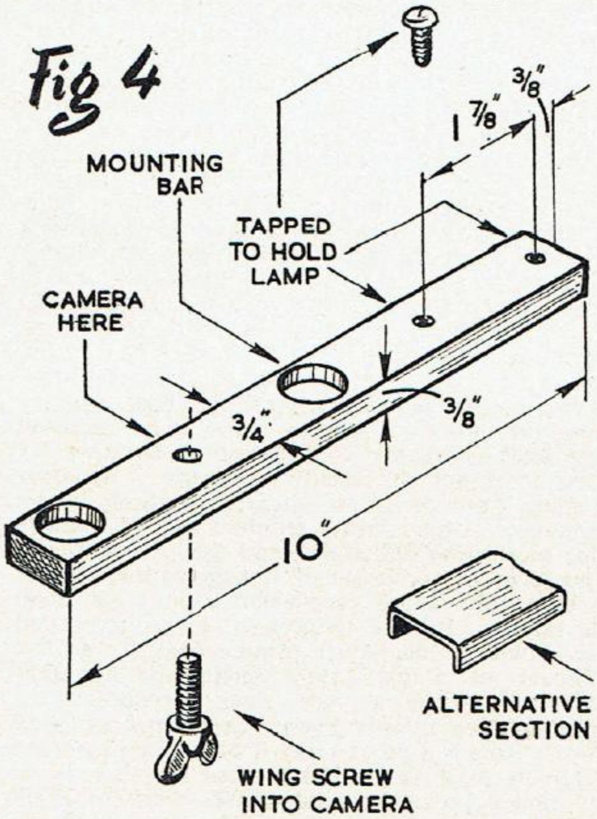
at the appropriate spacing. Alternatively, a bar can be made by turning 16- or 18-gauge sheet metal over a piece of suitable rectangular stock. The camera should then fit in the channel, and the lamp be attached at the other end through bolts and distance pieces.

It is advantageous to drill and tap the solid bar for the camera and flash outfit to balance nicely on a tripod, if one is used; with a channel bar, this could be arranged by brazing or soldering on a ¼ in. Whit. nut.

Clips for securing the Perspex guard can be made from springy brass, or from mild steel, casehardened.

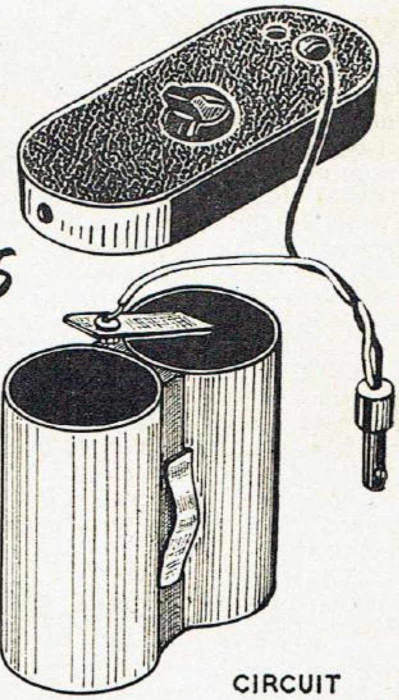
The inside of the reflector is polished, first with fine abrasive cloth if the surface is at all uneven, then with liquid polish.

Fig 4



The circuit is made as shown in Fig. 5 The strip on the top of the battery is drilled for one wire to be attached by a screw and nut; the other wire is secured in the same way to the lid of the lamp; for neatness, both wires can pass through a hole in the lid.

Fig 5



CIRCUIT

With a 6-volt car bulb in the adaptor, the outfit can be tested with the switch on the lamp, before a Stellaflash bulb is fitted, and the fitting plugged into the camera. The switch must not, of course, be operated with the Stellaflash bulb in place—except in the case of photographing on the open-flash principle.

Exposure Procedure

In general, an aperture of F.8 should be used, and an exposure of 1/25 sec., with the lens set at the appropriate distance for the subject. Too short an exposure—1/50 or 1/100 sec., for example —despite text-book data—is likely to result in failure.

In a poor light, excellent results can be obtained with the camera on a tripod, using 1/10, 1/5, ½-sec. exposure. For cameras without a flash-synchronised shutter, the procedure is—set up on a tripod, open the shutter, provide the flash, close the shutter. Thus, it is practicable to take photographs in total darkness.

TUCKER'S TOPICAL TALKS *(Continued from page 322)*

In the course of more than fifty years' experience of yachts and models, I have never seen a yacht that could be sailed a good full and by pointing much higher than 4 points (45°) off the true wind. If pinched much closer, her speed was materially decreased, and excessive leeway usually resulted through lack of speed through the water.

In the April number of this magazine, there was an article by Mr. Guy Blogg, giving an ingenious explanation of "Rhythmic Rolling" when running. Now most yachts roll when running by the lee in a heavy wind, but by no means every yacht rolls when not by the lee. In fact, it is only comparatively few yachts that do so, and when they suffer from this fault, the cause can usually be ascribed to the design lacking sufficient natural stability, or, in other words, a weak section which encourages a pendulum motion of the heavy ballast keel. In a full-sized cruiser, which has part of her ballast inside, the usual cure is to "wing out" part of the inside ballast to damp down this pendulum rolling.

This, of course, is impossible in a model yacht, and I have in mind a well-known A-Class boat, which is a notable offender in this respect, although she is very fast and has frequently figured in the prize lists. The craft in question is fitted with a vane gear which carries the balance weight on an unusually long arm, and no elastic centreing line is fitted. In consequence, as the boat rolls down wind, the balance weight swings wildly from side to side, sawing the helm from port to starboard and back again. This, in turn, causes the boat to yaw frantically, and if the yacht's opponent is on the course, a foul naturally occurs. The result is a succession of re-sails, no matter whether this yacht starts from weather or lee berth. Usually by about the fourth or fifth re-sail, the opponent, in his endeavours to keep clear of her, puts his boat so far up to windward, or down to leeward that the offending boat is left to make her serpentine way down the lake alone, while her opponent is on the shore re-trimming.

Tucker's Topical Talks

TUNING UP & TRUE COURSES

At this time of the year, many new yachts are being launched, or in course of tuning up. Most new yachts, like new cars, suffer from "teething troubles," and rarely does a new boat reveal her true form right away.

Last season (1955) I was consulted by an owner, whose new A-Class had been built from one of my designs. I gathered she was not on her correct fore-and-aft trim, and as she was nowhere near London, asked the owner to send me her Rating Certificate for inspection. From this, I found that not only was the boat badly by the stern, but bore no resemblance to the design. The L.O.A. was about 1 in. wrong, the displacement several pounds too heavy, and every possible dimension differed from the lines. If one adds the midships freeboard to the draught, one gets the depth of hull from gunwale to bottom of keel. She measured $\frac{7}{8}$ in. more than the design. Moreover, the port and starboard Q.B. Lengths differed by almost $\frac{3}{4}$ in. I did my best to help the owner to make something of her, but obviously the case was hopeless and I ought to have told him to scrap her right away. As a result, she raced all season as a "Tucker" design, and was no credit. I am glad to say that she has now been done away with. As a result of his experiences with this boat, the owner decided against having another "Tucker" boat, and produced lines by another designer, but strangely enough though he changed his designer (who was in no way responsible for his 1955 yacht), he has not changed his builder. So, whether the 1956 boat will be an improvement on the 1955 one, remains to be seen.

From the above, it might be inferred that I suggest bad and unsuccessful boats are invariably due to poor building. This is far from being the case. What I am trying to impress is that yachts must have both sides alike, or they will perform differently on the two tacks. Also one must be sure the yacht is true to design before blaming the designer.

On the other hand, even the best designers do not always turn out winning designs. The designer can ensure balance, and take pains to eliminate all features liable to cause steering vices. He can also make the boat easy to drive. However, in addition, he has to select the dimensions and type that give the best results in the class. It is here, and in the distribution of displacement, that the difference lies between an ordinary reliable boat and an outstanding performer.

To reach top flight, a yacht has to be built perfectly to a first-class design, and in this connection, please do not forget that sister craft from the same lines and moulds often differ in performance for no apparent reason. Undoubtedly, the best heavyweight A-Class to date is "Moonraker," but she has eight or nine sisters, some of them excellent yachts, yet none is quite her equal, even if we allow for Mr. Peter West's excellent handling.

Some boats handle more easily than others, but the last word always lies with the skipper. Ultimate success comes from a good design, well built and equipped, well tuned, and well sailed. Many models do not attain their best form for several seasons. There may be many reasons for this. Possibly some slight alteration is required, such as a minor variation in the sail plan, an amendment to fin, skeg or rudder, etc. These things can only be discovered by experiment. Likewise, the skipper has to know his craft before he gets the utmost out of her.

The old hands know this, but the novice often expects too much at first from a new boat. Far too often, brand new yachts are entered for National Championships and other important races. Very occasionally, a really expert skipper manages to do well with a new, untried boat, but generally speaking, the practice of entering an untuned yacht in a major event is greatly to be deprecated.

However, let us assume our new craft is well built and true to design. The owner is naturally anxious to get her into the water for a trial spin, and the less experienced often leave measurement until they have got the yacht sailing reasonably well. I venture to suggest that this is the wrong way to go about things, and the first step should be to get the Club Measurer to check the salient measurements, such as L.W.L., fore-and-aft trim, displacement, etc., since if these require correction, it is pure waste of time to sail the boat and try to tune her up, until matters have been adjusted and he craft is on her correct line of flotation.

When it comes to actual tuning-up, it is often astonishing how small an alteration entirely alters performance. Many initial troubles of new models are due to steering difficulties, and though experience is a guide in the selection of linkage ratios, feather sizes, etc., only actual experiment can decide these points finally. In this connection, I was interested in the article in the April Model Maker by Mr. A. Wilcock on "Vane Feather Angles and Apparent Wind." He gives a very clear explanation of the phenomenon usually known as "Apparent Wind at Ship." This is a point which I have often intended to refer to in these "Talks," since it misleads so many model yachtsmen and causes them to think their boats are pointing far higher to windward than they actually are.

I notice, however, that there is an apparent discrepancy between Mr. Wilcock's remarks on pointing to windward and leeway, and my own mention of the same subject in my "Talk" in the same number of the magazine.

Mr. Wilcock stated: **"The course taken for a close beat is 45°, the axis of the boat, however, is probably about 30°, the reason for making a 45° course being the leeway made."**

My own remarks were: **"Even the most weatherly craft makes at least $\frac{1}{2}$ point of leeway. Hence, if the boat is pointing 4 points off the wind, the course made good will be $4\frac{1}{2}$ points off."**

Now the angle of leeway made depends not only on the amount of lateral plane and L.W.L. length, but also on speed through the water and the angle of heel at which the boat is sailed. The more expert skipper sails his boat in such a way that she does not heel to excessive angles, since excessive heel decreases the effective lateral plane as well as reducing its efficacy per square inch.

(*Continued on page* 321)