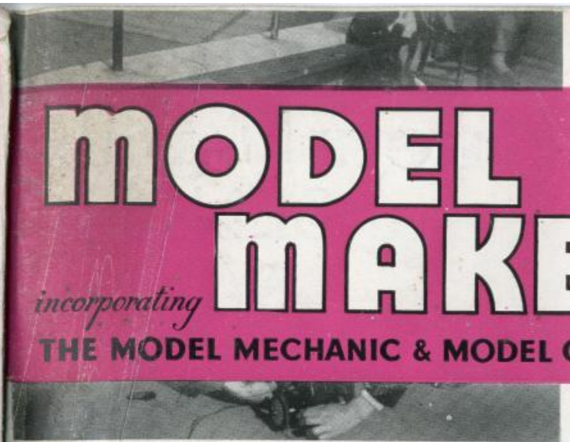

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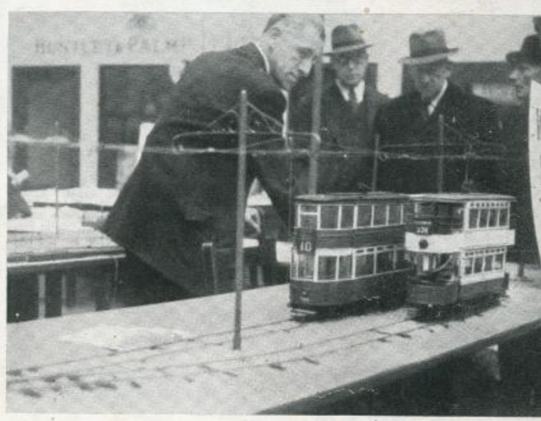

VOLUME 1 NUMBER 6 (New Series) MAY 1951

IN THIS ISSUE : "Festive"—a new Marblehead Yacht by W. J. Daniels : Model Traction Engine Wheels : Streamlining and Model Car Performance : Model Trams in U.S.A. : Embossing Photographs : "Small Fry"—000 Model Railways : On the Right Track for 00 Enthusiasts : Improving the Miniature Railway for 0 Gauge : Model Steam Loco Design for "Live Steamers" : Making Model Buildings : Bridges : Lincoln's Car : 4.5 l. Le Mans Bentley Prototype : Circuit Racing Review : "Santa Maria"—4ft. Sailing Galleon : Model Cars in Germany : Trade Reviews : All Regular Features

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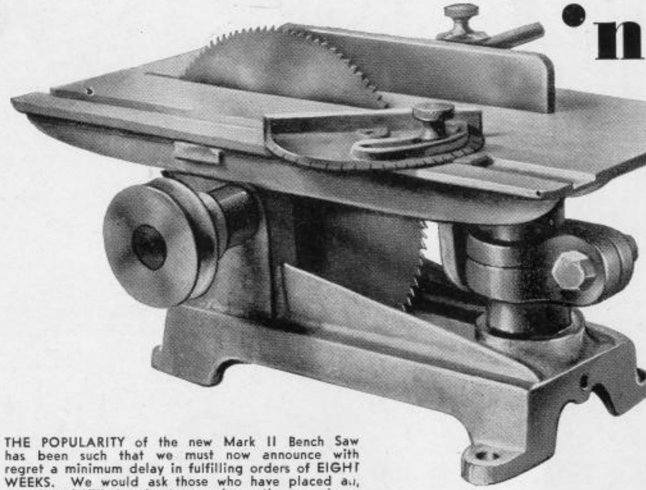

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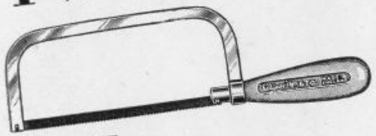

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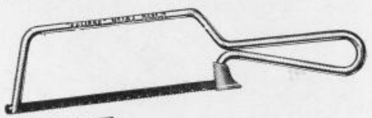

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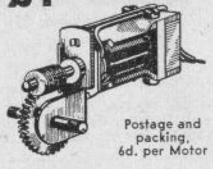

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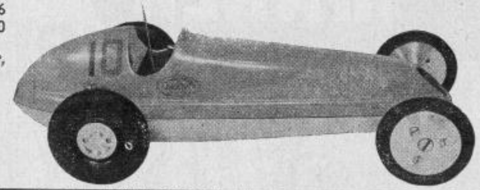

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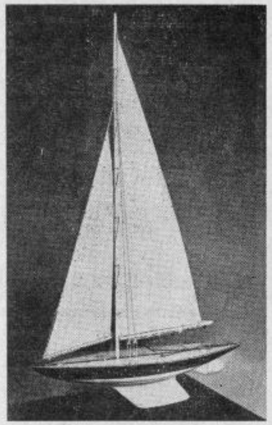

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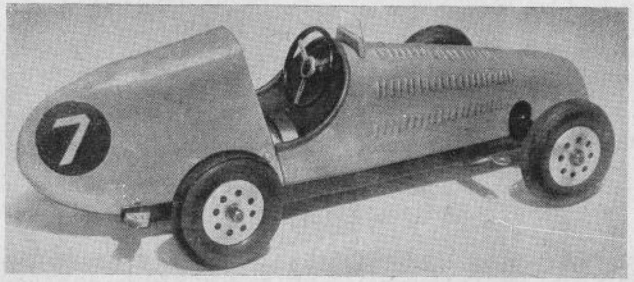

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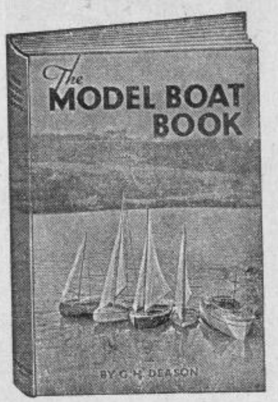

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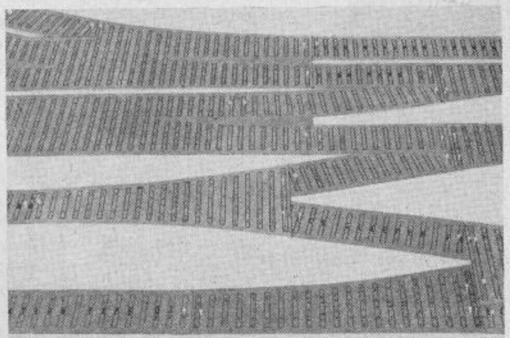

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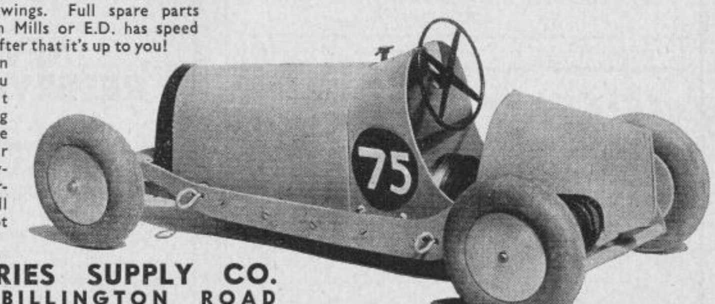

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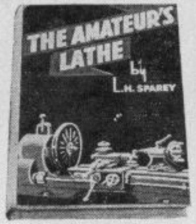

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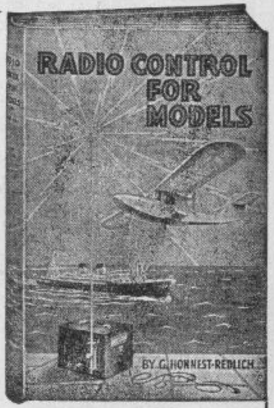

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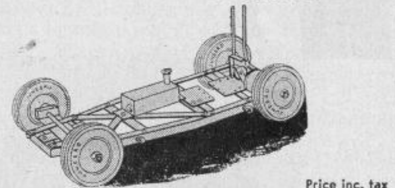

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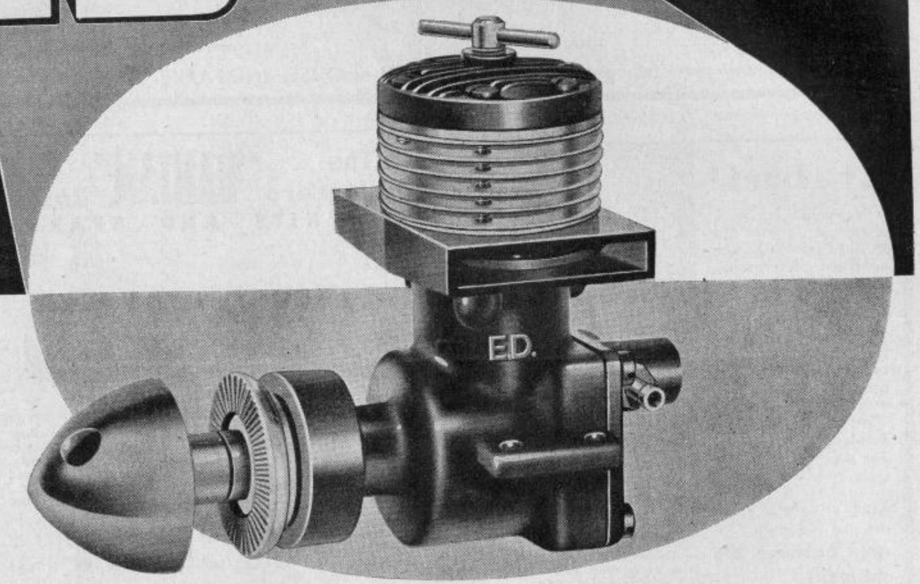

MODEL MAKER

incorporating THE MODEL MECHANIC & MODEL CARS

THE MONTHLY JOURNAL FOR ALL MODEL MAKERS

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Contents

FESTIVAL ACTIVITIES

SPRING is the time of year when club secretaries' thoughts turn towards exhibitions, classes are considered, catalogues produced, and, all being well, successful shows provided which, if they do not exactly make a fortune at any rate add few grey hairs to the treasurers' heads. This Festival Year we may be sure that even more such displays will be available throughout the country to add their quota of entertainment, and to do more than a little in promoting an ever widening interest in model making as the best of all hobbies.

Already a successful Northern Models Exhibition has been held—pictures of some of the more unusual exhibits adorning our cover, together with a layout from The Model Railway Exhibition. These ambitious shows represent the highest class of amateur endeavour, being staged throughout by the clubs, or groups of clubs, concerned, without any backing other than their normal club funds, and such revenue as they may expect from the gate and the sale of trade concessions and advertising. This is pure amateurism at its best and will always enjoy the widest support from right thinking people.

It is a pity that some of the smaller provincial exhibitions have reason to complain of a certain "professionalism" creeping in, whereby winners at the principal shows are entering their winning models to scoop the pool in lesser centres. Such outstanding models certainly merit display in all their glory, but surely the loan section rather than any competitive class is their rightful place, unless there is a "Championship Class" restricted to previous winners. We should welcome comment from our readers on this aspect of exhibitions, both from the organisers and from the point of view of exhibitors.

We, too, are anxious to mark the year 1951 with some suitable awards and propose to offer two Twenty-five Guinea Challenge Cups together with two annual prizes of Five Guineas.

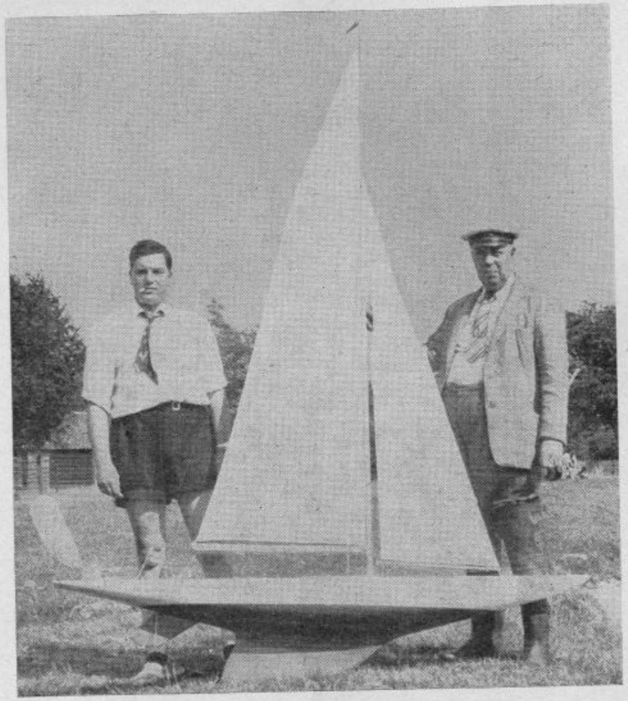
The first of these will be offered for the best model railway layout each year, open to gauges up to 0, the winner being decided on the basis of reality, ingenuity and true scale working. Details will be published in our next issue.

The second cup will be awarded annually together with the cash prize to the model yachting fraternity. The exact details again will be published in our next issue, when we have canvassed the views of the governing body of the sport in the matter.

ON THE COVER . . .

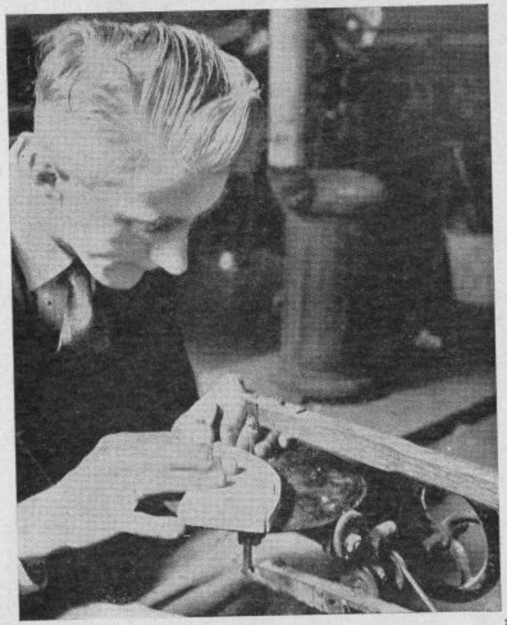
Top right: Miniature ships in bottles adapted for domestic use. Centre left: Mr. W. Stables' steam-driven roundabout which took eight years to build. Centre right: Mr. G. Oakley's 2½in. gauge model tram layout. Bottom left: One-eighth in. to the foot scale working model of the tea clipper "Caliph". All the above from the Northern Models Exhibition. Bottom right: Mr. Bryant's working layout seen at the Model Railway Exhibition.

(Photos: Northern Models Exhibition — Arthur Hamer — Model Railway Exhibition — Model Maker)



FESTIVE

PART I OF A NEW SERIES BY THAT FAMOUS DESIGNER AND SKIPPER W. J. DANIELS, GIVING STEP-BY-STEP INSTRUCTIONS FOR THE BUILDING OF HIS LATEST MARBLEHEAD "FESTIVE" EXCLUSIVELY PRODUCED FOR "MODEL MAKER". THE YACHT IS BEING BUILT IN OUR OWN WORKSHOPS UNDER THE SUPERVISION OF OUR STAFF EXPERT A. G. PALMER WHO WAS RESPONSIBLE FOR OUR SERIES OF SCALE MODEL SAILING CRAFT.



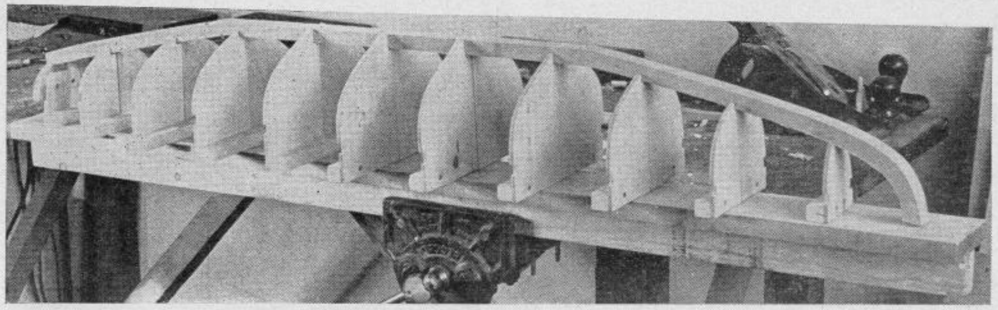
THE Marblehead Model is one of the classes catered for by the Model Yacht Association and is perhaps the most popular for the reason that they are easy to transport, and if correctly designed and built, will give quite as much sport as the larger classes.

The class had its origin in the United States of America, and was started at the town of Marblehead, near Boston, Mass.

The main demands of the class is that they shall not exceed 50 in. deck length and that the actual measured sail area shall not be more than 800 sq. in. There are other slight restrictions with regard to bottoms in sails and the arc at the junction of fin and hull, but as these have been complied within the design we are dealing with, it is not necessary to enumerate them.

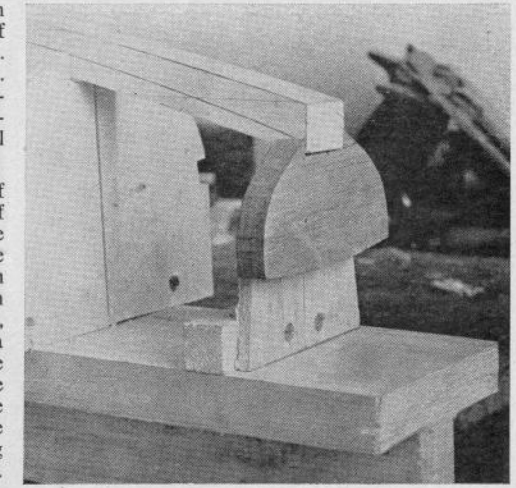
There are several methods of building a model yacht, and as long as the design is strictly adhered to and good workmanship is employed, one method is as good as another, but at these times when materials are very difficult to obtain, we must make use of the best we can get.

The most economical method of building at the present moment is the orthodox method employed in the construction of full-size small yachts, and this is to be described in this article.



A building board must first be made upon which to erect the boat. This should be of two pieces of seasoned timber each of 54 in. in length, and 1 in. thick. One should be 4 in. wide, the other 2 in. They should each be planed dead straight on all surfaces, care being taken to see that they are not winding. If you do not possess a trying plane a saw mill will shoot them for you for a small charge.

A line must now be marked down the centre of each face of the 4 in. piece, and along one edge of the 2 in. piece. The 2 in. piece is then screwed to the centre of the 4 in. piece by drilling holes through the face of the latter of such size that the screws are an easy fit at intervals of 6 in. Place the narrow piece on edge on the face of the wider board and screw it, care being taken to set it central. This will form a T-girder and will be our base for the erection of the model. Lines should now be squared off on the face of the building board at the intervals shown on the drawing, taking care that section No. 6 is in the centre (approx. 29 in. from the stern end of building board). This will leave 2 in. each end beyond the hull.



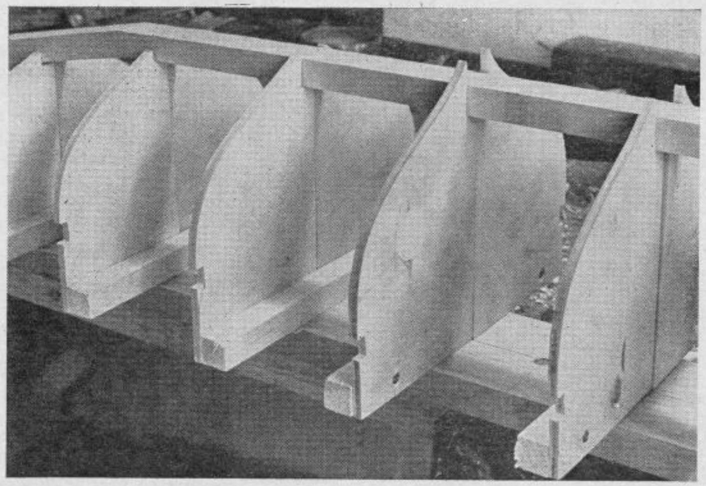
Heading : The author (in cap) with his mate and one of the many world famous International A-Class winners with which his name will always be associated.

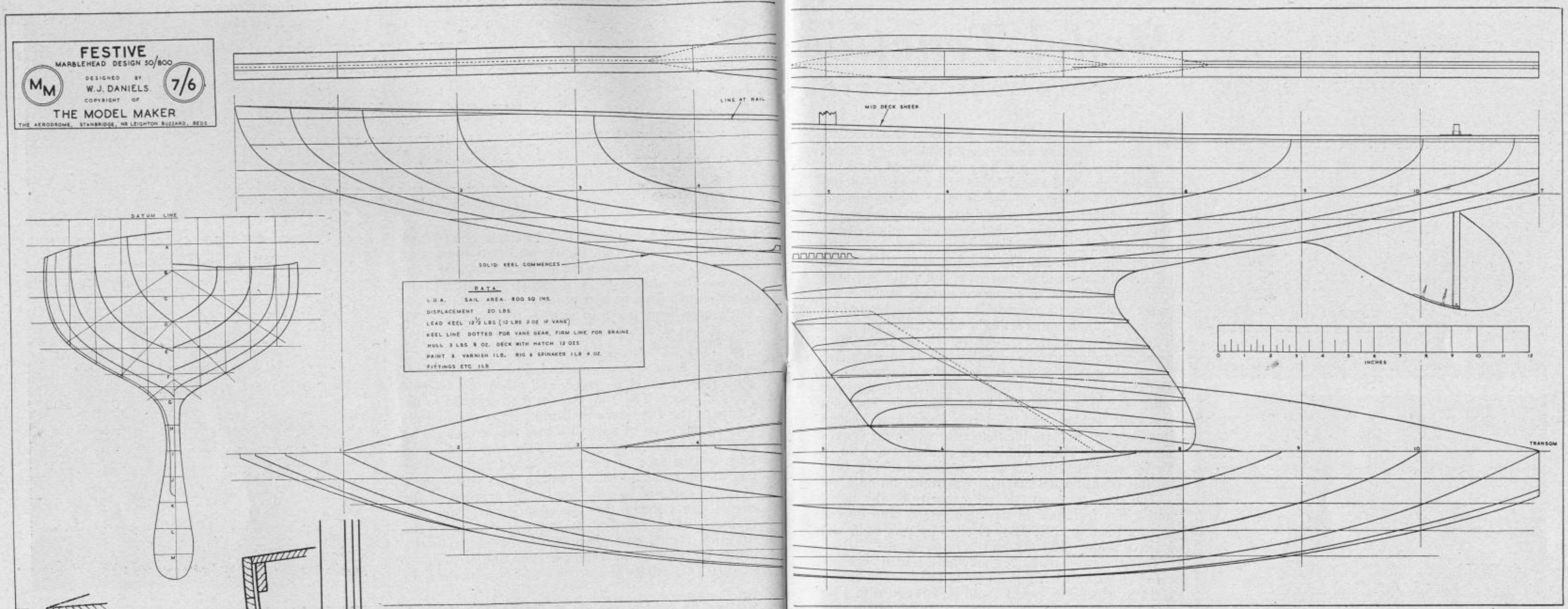
Below left : Cutting out a half mould in pairs on the treadle fretsaw.

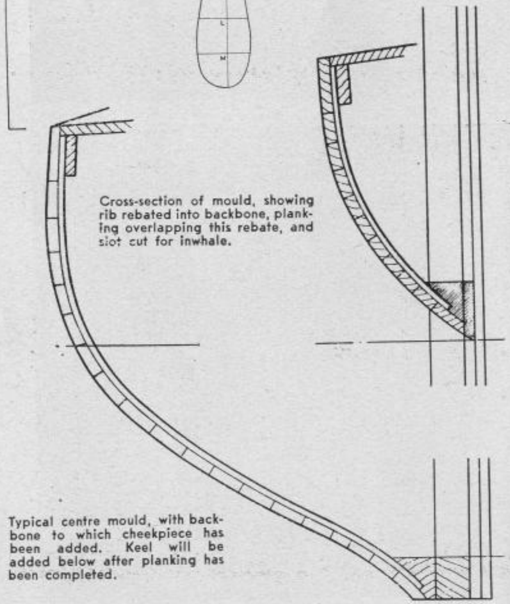
Above, top : T-girder building board in vice w.th moulds erected, and backbone being tried for fit before adding cheek-pieces and carving to shape.

Centre, right : Close-up of transom. Instead of extending this piece to the building board and cutting away later it has been made to size and a temporary tab added.

Bottom, right : Shows how moulds face stern and bow to enable bevel to be cut thereon. Note also the cutting away of slots for the inwhale. Two right-hand moulds have not yet been trimmed to take the backbone cheek-pieces.







Cross-section of mould, showing rib rebated into backbone, planking overlapping this rebate, and slot cut for inwhale.

Typical centre mould, with backbone to which cheekpiece has been added. Keel will be added below after planking has been completed.

A suitable wood that is obtainable at the moment is obechi. This, like any other timber, varies in quality, but as most retailers of this timber cater for the model men, it can be generally relied upon. We first have to make the section moulds or patterns of the shape of the model as shown on the design. These should be made in two halves and screwed together by a cross-piece as illustrated.

The necessity of this is for their easy removal after the boat is planked.

We intend to make the planking $\frac{1}{8}$ in. thick, and the ribs $\frac{1}{16}$ in. It will therefore be necessary to make our moulds $\frac{3}{16}$ in. smaller than shown on the design. The transom will, of course, only be less the thickness of the planking.

All the section moulds should be marked so as to extend them to the datum line.

Carefully mark off the position of the deck on each cross section, mould and recess it to receive the inwhale. This should be cut from a board $\frac{1}{4}$ in. thick to the sheer, as shown.

It will be seen that the inwhale must be set lower than the rail line by the thickness of the deck so that when the latter is fitted it will give the correct freeboard as shown in the design.

Having made the cross-section moulds it is now necessary to prepare the backbone of the model.

This should be marked out as shown and cut from 1 in. board. First mark out the profile down to third waterline below the load water line. Carefully mark the position of the section stations and also the water lines. On your design draw a line parallel to the centre line of boat $\frac{1}{2}$ in. away from it. If on the wood you mark a spot where the $\frac{1}{2}$ in. line crosses each waterline you will find that you can draw a curve through these spots and this will give you the correct level to pare the stern and stem to in order to conform to the design.

The transom will, of course, be left in the boat, and this must be $\frac{1}{2}$ in. thick. It will be reduced by only the thickness of the planking.

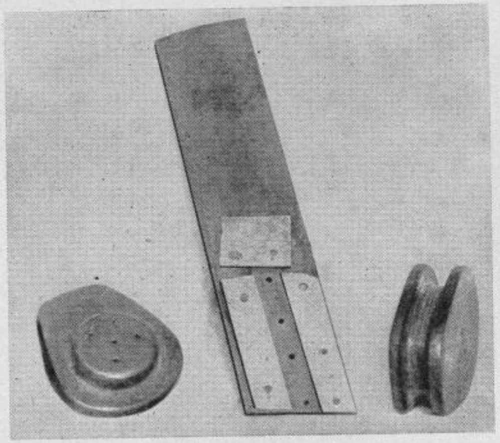
It will be noted that as the inner face of the transom is larger than the extreme end allowance must be made for the bevel if the planking is to seat properly.

It will be seen also that the moulds over which the ribs are to be bent must also be bevelled for the same reason as the transom.

In order to fix the moulds to the building board, cross-pieces must be fitted across the board to attach the moulds. In the case of the forward sections the other face must be over the section position and aft of the largest section the forward face must be fitted.

The cross-pieces must be screwed from the underside of the building board as otherwise it would not be possible to remove the boat when finished. These must be placed aft of the section forward and forward of the section aft. This will then bring the mould into position to allow the bevel to be made. Before erecting, the moulds however, they must be recessed to allow the backbone to take its correct seating, and also for the inwhale let in. Having erected the moulds

(Continued on page 384)

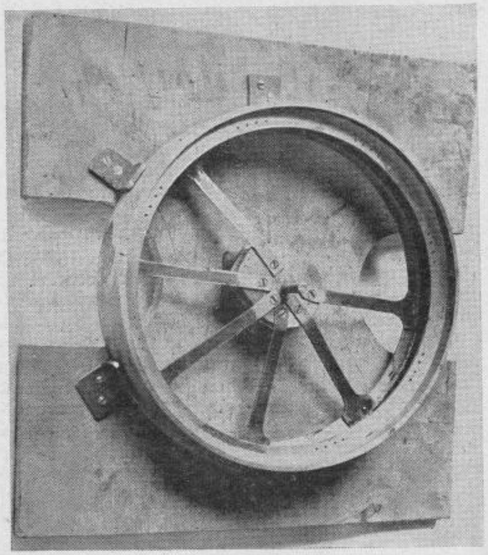


Above: Patterns for hubs and jig for cutting the strakes, which will be seen in place in picture of completed rear wheel on opposite page.

Below: Jig for holding hub concentric. Some of the spokes have already been fixed in place.

Above right: Completed rear wheel with strakes duly fixed. Matchbox gives an idea of final size.

Bottom right: The model begins to take shape. We look forward to publishing further articles on its progress.



Model Traction Engine Wheels

L. J. OLDRIDGE REPORTS PROGRESS ON THE MARSHALL

WHEN I announced at a Model Engineering Society meeting that I intended building a model traction engine I was told by a member, of some experience, that if I could build the wheels I should be able to build the engine. Bearing this in mind I started on the wheels first, and having made a reasonably good job of them I thought a description of the method used may be of interest.

The rims were the first consideration. It is quite usual to build these of cast iron, but I did not wish to use this material as I considered they would easily break—and what a tragedy it would be after spending many hours constructing a wheel and then to let it fall and see a piece broken out of the rim. After much scheming a piece of mild steel $2\frac{1}{2}$ in. wide and $\frac{3}{16}$ in. thick was obtained for the rear wheel rims, and this was rolled by a blacksmith friend into a true circle 9 in. in diameter in a rolling machine. The joint was butt welded, and then two rings were welded into the rims to form the flanges to which the spokes are attached. These rings were made from $\frac{1}{2}$ in. x $\frac{3}{16}$ in. mild steel in the same rolling machine, only on this occasion the material was rolled on edge.

The rims were outside the capacity of my lathe, and I was fortunate in having a friend who offered to turn them for me. They cleaned up very well, and I felt a major difficulty had been overcome.

Patterns were made for the hubs, and it was decided to make each hub in three pieces. The centre piece to which the spokes could be screwed with $\frac{1}{8}$ in. countersunk screws, and a piece to fit on either side of the centre portion. This would serve the purpose of covering the screws used to hold the spokes in position. The spaces between the spokes, it was thought, could be filled up with soft solder, but more of this later.

The spokes, sixteen for each wheel, were cut from mild steel plate by a hammer and chisel and then filed up in groups of five or six clamped in the vice using one master spoke as a template. This proved to be quite a tedious job, but did not take half as long as was at first estimated.

A jig to hold the hubs concentric with the rims whilst assembling was the next consideration. A piece of 5-ply, roughly 1 ft. square, formed the base, and two half-moon shaped pieces were cut out from either side to facilitate riveting the spokes. A 9 in. dia. circle was scribed on the wood, and pieces of 1 in. angle iron 1 in. long were screwed with countersunk woodscrews so that the wheel rim was a good fit in the circle so formed. In the centre of the board a piece of $\frac{1}{4}$ in. mild steel rod was fastened and over this the centre portion of the hub was fitted, a piece of packing being put on first so that the hub assumed its correct position in relation to the rims.

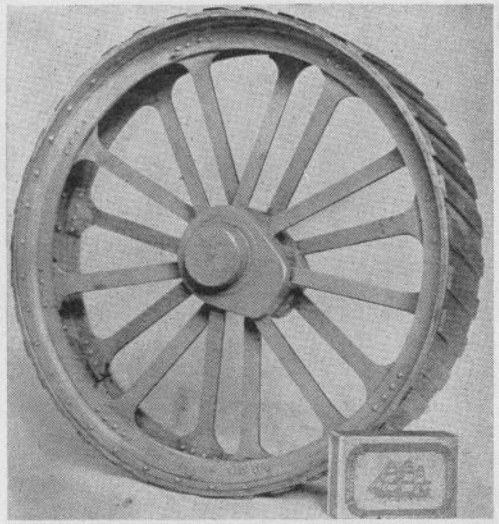
The rivet holes in the wheel flanges were drilled and then the work of assembling could commence. Owing to the pear-shaped hub it will be appreciated that the spokes varied in length, and because of this it was decided it would be best to cut each spoke to the correct length individually, and also to bend them in the same way. Each spoke was bent at the "T" end to the correct angle, and then at the hub end; the hub end of the spoke was then "tinned". When this was done a $\frac{1}{8}$ in. hole was drilled and countersunk in the hub end and after drilling and tapping a hole in the hub the spoke was fastened with a $\frac{1}{8}$ in. countersunk screw. It was then fastened to the rim by one rivet, the hole in the spoke being drilled with the spoke in position. A piece of wood, it was found, could be jammed between the other flange, and the spoke to keep it in position whilst the drilling operation was tackled. These operations were repeated until all the spokes were in position. The wheel was spun on a piece of $\frac{1}{2}$ in. axle and found to revolve fairly truly. The remaining rivet holes were then drilled and the rivets inserted.

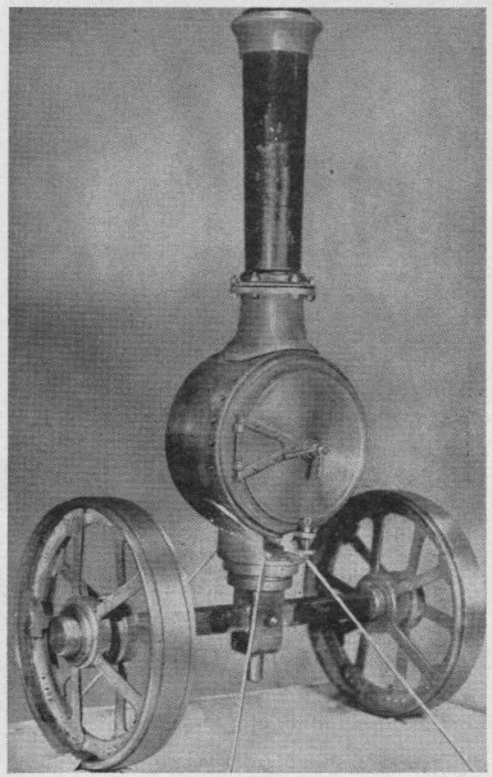
The two outer portions of the hub were now bolted to the centre portion by a bolt and nut which had been treated with blacklead, the bolt and nut being screwed up really tight. The hub was then heated with a blowlamp and with the aid of a soldering iron and some patience the spaces between the spokes were filled up with soft solder, and the whole hub sweated up together. The bolt was then removed and the wheel taken to my friend with the big lathe for the axle hole to be truly bored to $\frac{1}{2}$ in. dia., this "taking out" any slight error which may have occurred in building. At the same time recesses for the hub caps were turned in the hubs.

The strakes were the next consideration. First the wheel had to be divided into 38 divisions, there being 38 strakes to each wheel. A 9 in. dia. circle was drawn on a piece of stiff paper and this circle divided into 36. A second circle was then drawn and setting the dividers at slightly less than the divisions for the first circle, by trial and error, the correct distance for 38 divisions was found. A third circle was then drawn and this neatly divided into 38 divisions. The wheel was then laid exactly on the circle and the divisions on the circle were transferred to the wheel. A gauge was set at the correct angle for the strakes and lines scribed for each strake.

The strakes were cut from $\frac{3}{8}$ in. x $\frac{1}{16}$ in. mild steel, a jig being used for this purpose. The same jig was

(Continued on page 366)

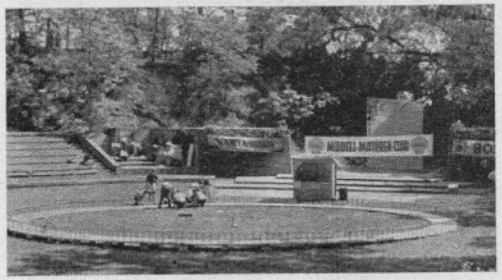




(Above) A line up of German enthusiasts at Stuttgart with their varied assortment of winged and wheeled models, some of which are shown on the right. (Below) A picturesque setting for the track, and two views of a simple friction driven model with cast baseplate.

Photos by courtesy of "Mechanikus"

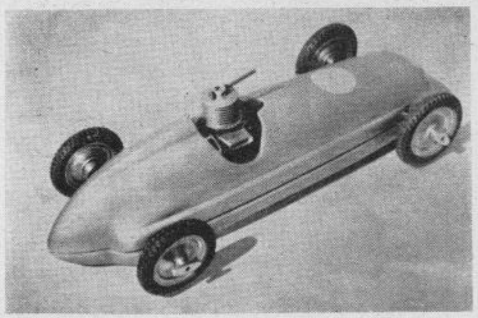
Model Cars in Germany

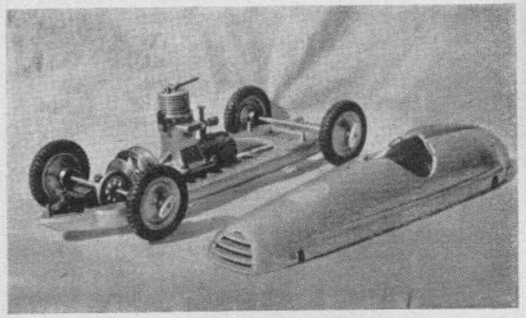


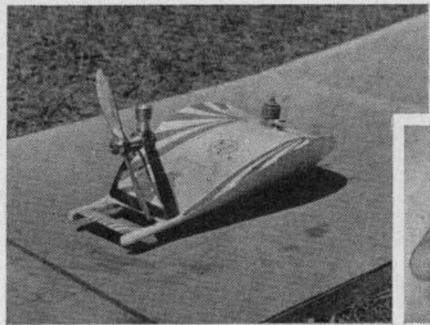
AMONGST the pleasures of everyday life in an editorial office is the frequent surprise packet which turns up in the morning mail; these often take the form of a collection of snapshots or a news letter from unexpected quarters of the globe, and all too often they tell only part of a story, leaving us very anxious to learn more, but prevented by time and distance from doing so.

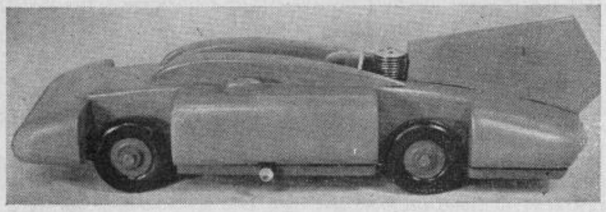
One such collection of pictures came to hand the other day from the Modell Motoren Club of Stuttgart, and it is evident from a study of these prints that they certainly have a catholic taste in models and, what fun it must be! We confess that in most cases the details given are very meagre, even after the services of one versed in technical German had been sought, so we must let the pictures speak for themselves!

Taking the track shots first, they certainly have a cosy little set-up in picturesque surroundings, and the line-up of members and their models shows a startling diversity of "Creatures Great and Small", either with wheels, wings or both! Amongst the more orthodox car models are two realistic looking saloons, five more normal racing models, and a number of very streamlined record cars, including a replica of the highly streamlined Auto Union of pre-war days. This latter model is a truly remarkable effort, being powered with a V8 cylinder engine of no less than 60 c.c., a detailed description of which we shall publish next month. In the centre is a powered model of a lorry and trailer, and there are three examples of that hybrid vehicle, the "Aerocar", which to judge from the German hobby paper *Mechanikus* has a strong following over there. All apparently run together, irrespective of mode of drive.







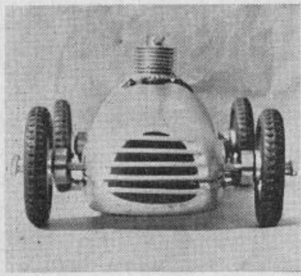


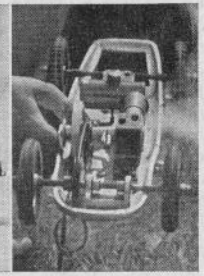
(Above) Models of all shapes and sizes! That on the left has airscrew drive at the rear, a driven axle and brief shoulder wings! (Below) Another simple model, this time with belt drive, a front view of the friction driver, and details of the handsome Buick built by Siegfried Richler.

Photos by courtesy of "Mechanikus"

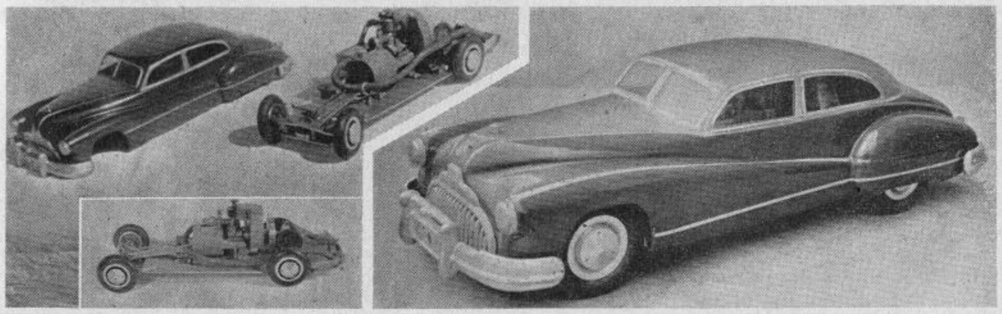
Turning to the individual pictures, the little racer with the immodest amount of engine showing from the cockpit has a neat cast alloy chassis, no visible means of suspension, and the spring-loaded friction drive so beloved of the Continental fraternity.

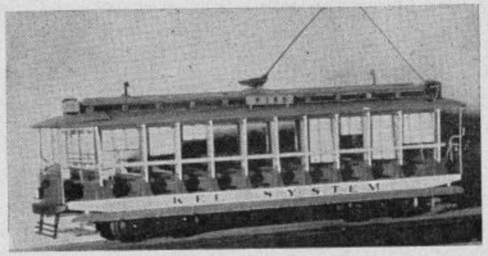
The Bluebird-like record contender with the vast stabilising fin is mainly built in solid chunks of balsa, and has wooden wheels with "rubber sandwich" tyres. The compression-ignition motor is so small in relation to the rest of the vehicle as to be unobtrusive, and if fitted with a crash hat and goggles would hardly look out of place! The model being "run-up" follows the Italian practice, having a cast frame, large diameter flywheel and leather belt drive. Finally, there is the quaint twin-engined airfoil section "rennwagen" which boasts a pusher airscrew at the rear and a glowplug motor out in front, presumably driving one of the axles! There's a tip here for some folk who are troubled with wheel spin! What effect the "shoulder wings" have, we would not know, but there seems at least an even chance of the contrivance becoming airborne sooner or later! Amusing, and no more of an anachronism than a spur-geared "tear-drop"!





Finally (see below) comes the fine model of an eight-cylinder Buick, built by Siegfried Richler. This charming little car is powered by a 2 c.c. Art diesel, with cooling by fan and duct, the drive once more being by friction on the rear axle. The bodywork is of aluminium, windows are of Plexiglass, and all bright parts are plated. Readers will agree, we think, that this is a really attractive model of a modern saloon, and we should like to see more of this kind of work in this country.

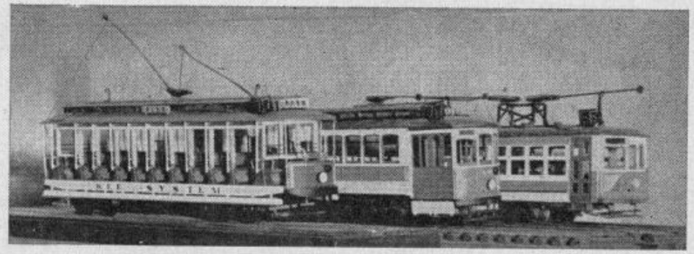




Model Trams in U.S.A.

OUR RECENT ARTICLE ON TRAMWAY MODELLING IN THIS COUNTRY HAS BROUGHT US THIS INTERESTING CONTRIBUTION ON "AMERICAN TRACTION" FROM TWO ENTHUSIASTIC MODELLERS, FROM WHICH IT WILL BE SEEN THAT EVEN IN THAT LAND OF PLENTY STREETCAR MODELLERS HAVE ONLY A LIMITED SELECTION OF MATERIAL AVAILABLE TO THEM.

BY
P. S. HEDENE
&
BILL KEE



AMERICAN street car modelling (there is little or no distinction between Canadian and U.S.A. in trolley matters) may be best explained by giving a brief history of the full-sized street cars.

The best known and probably the first successful electric railway in America started in Richmond, Virginia, in 1888, and with it, each and every city and town in the country decided that a street car system was a necessity.

Equipment for the first lines was usually one or two converted horse cars, while constructional standards were of the poorest, for finances seldom permitted better. There was little interchange of equipment between companies with the result that such fundamentals as gauge and clearances standards were determined by the whim of the operator, equipment available on the horse or cable operated system to be electrified, or by conditions of the franchise. Restrictive clauses of the local franchises were often the result of pressure on the city councils, by other promoters, local residents, and the steam railroads (the latter quickly recognised street cars as potentially capable competition). The non-standard gauge requirement was designed primarily to prevent the interchange of equipment (especially freight) with other companies, this stipulation resulting in the common use of 3 ft. 6 in., 4 ft. 3 in., 5 ft., 5 ft. 2 in., and 5 ft. 3 in., and other gauges to a lesser extent. To overcome the gauge handicap, many an inter-urban line was built to the same gauge as the street cars in one of the major cities along its route, otherwise special gauge track had to be built in the cities for the exclusive use of the inter-urbans.

Equipment was built by operating companies, local car building firms, or by such nationally known manufacturers as Brill or St. Louis. Most of the equipment was ordered to meet local requirements and moreover, it was subsequently altered in company shops to the extent that it is practically impossible to point to any American streetcar and say more than that it is typical of any one company.

Rolling stock falls into about four distinct eras. The first era comprised the early years when cars were usually four-wheeled converted horse or cable cars. The second (or "Golden") era, was from about 1900 to the first world war, when large double-trucked two-men cars were designed. This was the era of the special car, when summer, winter, sightseeing, open, convertible, semi-convertible and even funeral cars were seen in any city worthy of its name. The third era lasted until about 1930, with an emphasis on reduced operating costs. The Birney Safety Car was typical of this time of lightweight one-man cars. The final era extends to the present day, during which time the PCC car, with its automatic acceleration was developed. Now in many communities there is a growing demand that these last cars be replaced by a more modern transport system.

Concurrent with the development of the streetcar was that of the inter-urban which frequently started as a streetcar line extension beyond a city. Thus the first inter-urbans were usually streetcars. The differing needs of inter-urban service (more speed for the longer runs, better appointments and interior furnishings) soon brought out cars specifically designed for the service which were a compromise between the admittedly superior characteristics of steam railroad cars and the limitations imposed by running over streetcar lines in cities, with short radius curves and limited clearances.

However, the inter-urban developed rapidly from 1900 to about 1915 when it too, had its "Golden Era" with a great variety of special and fancy cars. This period was followed by a time of lightweights and one-man operation, but not to the extent experienced by the city cars. And with the exception of one or two rather special experimental developments nothing was even attempted in the way of an inter-urban equivalent to the city PCC car.

It can readily be seen that American traction (a term used to denote both city and inter-urban electric railways) modelling has many special problems caused by the wide variety of prototype equipment, plus the individual preferences of the modellers. Since traction modellers are apparently more individualistic than other modellers, there is too little demand for any one traction model or item to warrant commercial manufacture of any but a few of the most common prototypes and accessories.

However, there are half a dozen or so firms producing traction models and accessories, one of the biggest being Wm. Walthers Inc. Walthers' kits cover a wide selection of prototypes (mainly inter-urbans), by offering several basic body kits with a wider variety of sides, roofs and trucks. Both '0' gauge and 'MO' are well covered, and prices vary from about 30/- for a body kit (wooden structure, diecast ends), plus 15/- for the sides kit (printed card sides, windows, sash, etc.), to £7/10/- for a power car kit, in '0' gauge. 'HO' kits are a little cheaper, the power car kits costing £6/10/-. These prices are comparable with other kits on the market, depending on whether they are plastic, diecast, or wood and card. Made up models are more expensive, for instance, Wagner Car Co. advertise an '0' gauge PCC car at £20. But it must be stressed again that all these kits cover only a very small percentage of the original prototypes, and that they are mainly inter-urban models.

Thus, basically, the traction modeller must either make most, if not all, of his components or compromise by altering his car to the extent that he may use commercial parts or kits that are available. If his prototype is other than standard gauge, he has the added problem of wheels and axles. There is also the ever present problem of trying to power a car with a motor that is at least small enough to be inconspicuous. However, the motor problem has improved since 1945 and it is now possible in '0' gauge to secure motors which may be mounted in the trucks, following full-size practice if not appearance. '0' gauge power trucks including motor, may be obtained for £6, while 'HO' are a little cheaper. Motors alone, either AC or DC, cost between £2 and £3.

Traction modelling, like most other railroad modelling in America, is almost entirely confined to two scales 'HO' (3.5 mm. to the foot), and '0' ($\frac{1}{4}$ in. or $\frac{17}{64}$ in. to the foot). Which is the more popular is debatable, but both have their adherents. Some modellers are only streetcar, more are only inter-urban, but the majority model both: frequently in conjunction with other types of railroads.

Rolling stock is modelled after many roads and many pieces of equipment. Cars are built of wood, bristol board, metal, plastic and combinations of the materials, and of course, each material has its good and bad points. Power is distributed to the cars usually from overhead trolley wire, sometimes from third rail and sometimes by the two-rail method. Overhead wiring follows general American practice with a scale 20 ft. height for city cars and from 20 ft. to 22 ft. for inter-urbans and heavy railroad electrics. Usually 20 or 22 s.w.g. wire of spring bronze is the material used, and it carries the current which is grounded out through the truck wheel and into the rail.

Summarising, one may say that traction modellers are one of the largest groups of individualists in railroad modelling. Each has his own preferred traction company, car, and building material, and of course each knows that he has selected the very best!

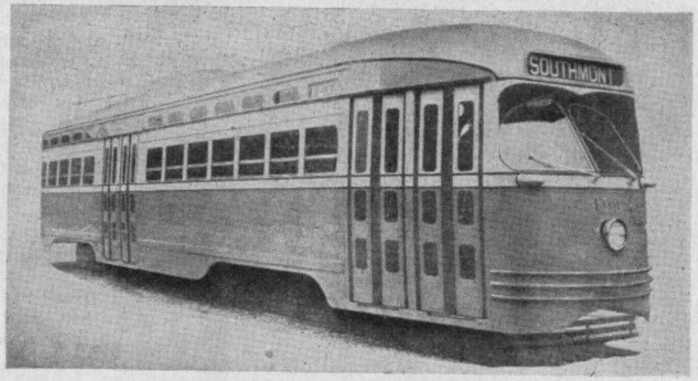
But all have their fun and relaxation.

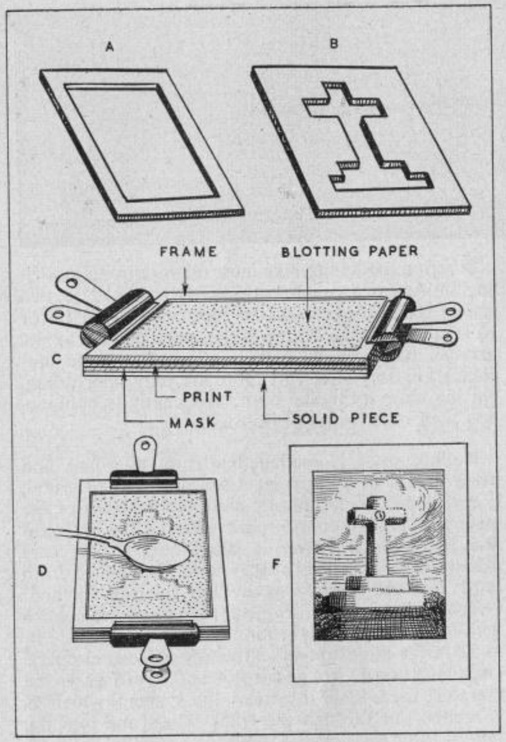
Top left is shown a model of an early type city streetcar built to a scale of ¼in. to 1ft. (0 gauge) by Bill Kee.

Top right. Three more models from Bill Kee's collection depicting streetcar progress over a number of years. That on the right is an early P.C.C. car. It is evident that our American friends achieve a very high standard of construction even in a field not so fully catered for by kit manufacturers. These models are all '0' gauge.

Right. A typical example of the modern American P.C.C. streetcar. This one being built by the St. Louis Car Co.

Photos by Bill Kee and the St. Louis Car Co.





Embossing Photographs

THE completing of photographic prints with their surfaces in relief was a method of picture-finish that received considerable attention from camera devotees some thirty to forty years ago. Despite its age, however, a description of how the embossing was done will doubtless be of interest, as any present-day amateur can carry out the work — and some very charming effects are obtainable.

All prints will not emboss satisfactorily, those full of fine details or of a too small general size are not suited to the process, but bold pictures with one or two clearly defined items respond to the treatment extremely well.

Accessories required for the embossing are a little tissue paper, two medium-sized clips of the "Bulldog" variety, a rectangular frame of $\frac{1}{8}$ in. wood as (A) a shade smaller than the print being dealt with, another rectangle of wood (this time solid) and some $\frac{1}{8}$ in. cardboard.

Taking the tissue paper it is first put over the print, being held by a clip, and a tracing is made of the main items to be brought out in relief. This must be done with an extremely light line to eliminate any danger of leaving a groove on the picture. The tissue is now removed and the outline, or outlines, darkened in with a fairly black pencil. A suitably-sized piece of the cardboard is next cut, and placing the tissue over it (again using a clip) the tracing is transferred to it either by pressing over the lines or by shading the back of the tissue and tracing over the outline with a point of some sort.

Having completed the tracing, the card inside the outlines is cut out using a sharp-pointed knife for the purpose, this being better than a razor blade for the negotiating of curves, etc. Make the edges clean and cut well into any angled corners there may be. Fig B shows how the card mask will appear, a village cross in this case being made to stand out.

The print is now prepared for treatment. This is done by pasting it on to a rectangle of thick white blotting paper using a flour paste of medium consistency, being neither too thick nor too watery. Unfortunately most blotting papers at the present time are rather thin but a satisfactory thickness can be obtained by pasting two or even three layers together.

Both the back of the print and the surface (or surfaces) of the blotting paper are coated with the adhesive, it being well rubbed in with the finger. The blotting paper must receive special attention for here the aim is to get the paste right into the fibres so that when the pad dries it will be almost as hard as cardboard.

Print and pad are now brought together, and after a preliminary smoothing over to make sure that there is good even contact they are placed under a light but well distributed weight for about a quarter of an hour. At the end of this time it will be found that the print and its backing have become just nicely damp throughout, and pliant, but in no sense wet. A little practice will soon show the state for which to aim, but it is helpful to bear in mind that the combined pad formed by the print and paper should have the feel in stiffness and pliability of good oil linoleum.

Everything is now clipped together as (C), the print going face down on the mask, the frame above and the solid piece below. The sandwich so formed is fairly thick, and the clips must be of sufficient size to grip everything well.

Work on the actual embossing is effected with a variety of round-surfaced tools. Such things as spoons or bone tooth brush-handles do perfectly well. Starting with a very light circular motion the areas that lie within the mask openings are first pressed gently downwards, but as the motion of the instruments begins to take effect the edges of the image in question can be made rather more pronounced by a little harder rubbing—the position of the edges being easily detected with the tool being used.

(*Continued on page* 366)

EDMONTON at Croydon

Reported for "Model Maker" by W. S. WARNE

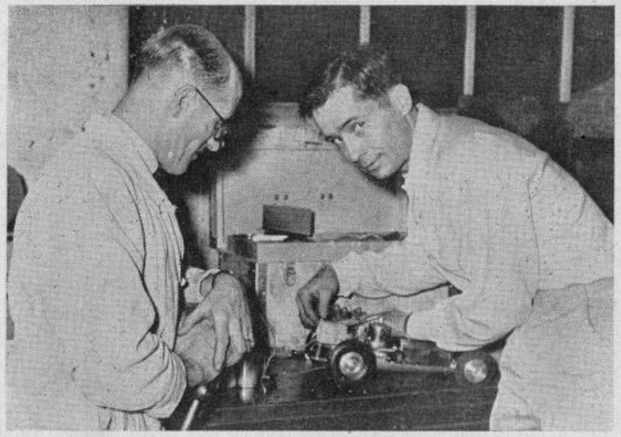


Photo : "Croydon Times"

Jack Pickard watches Joe Shelton prepare for his 120 m.p.h. run.

EDMONTON CLUB held their first competition meeting of the season at Hubert Dee's garage, London Road, Croydon, on Saturday, March 17. Upwards of 40 competitors entertained over 1,000 spectators. Messrs. Dee's had gone to town with the arrangements, providing a massive safety wall topped by a 6 ft. cage in which Arthur English would have been proud to perform!

Joe Shelton, of Tennesse, U.S.A., a new Edmonton member, showed the way with his IIg Dooling proto., knocking up 120 m.p.h. on the 52 ft. track to win the handsome Dee's Trophy, and a replica, presented by Messrs. Dee's to the Edmonton Club for annual competition. Len Mainwaring with a handicap speed of 102.13 m.p.h. won the Dooling car presented by the writer, and G. Young with a handicap speed of 100.9 m.p.h. secured a case of fuel presented by Messrs. Flash Petroleum Ltd.

L. Tillett won the nomination trophy, a fine cup, presented by Arthur Poyser, for keeps, being only .02 m.p.h. off his nominated speed. Messrs. Harris and Hurn having motored up from Bristol to compete were presented with a case of fuel to see them through their long journey home!

Joe Shelton deserved the luck to draw No. 1 on the track for the 10 c.c.'s, as the track soon became very slippery owing to the high humidity of the day, coupled with the glass smooth floor. All the 10 c.c.'s really required the impossible—a track clean for each man, to do justice to their speed. The lower down on the draw the worse off they were, and the writer's car covered three laps with the wheels locked against compressions when switched off. The 120 m.p.h. of Joe's car was confirmed by a request run after the competition, when he again turned in a time of 7.5 secs for the $\frac{1}{4}$. Ernie Jackson, get those record certificates ready for Edmonton's new track!

Jack Pickard, our energetic secretary, had the misfortune to get his Dooling up to its highest yet in practice, and then break a con.-rod in the first heat, a very unusual mishap to a Dooling.

George Thornton on the public address earned praise from a number of people and (an idea for other clubs), during the track cleaning he moved over to the spectators with the mike and invited questions, which were broadcast and then answered. This produced some very intelligent questions and interested a lot of people.

All the Edmonton members gave high praise to the directors of Messrs. Dee's for the wonderful provision made for their comfort and enjoyment. The date for the next competition for the Dee's Trophy will be announced shortly; with nearly 12 months' notice no one will be able to say "I wish I had known!"

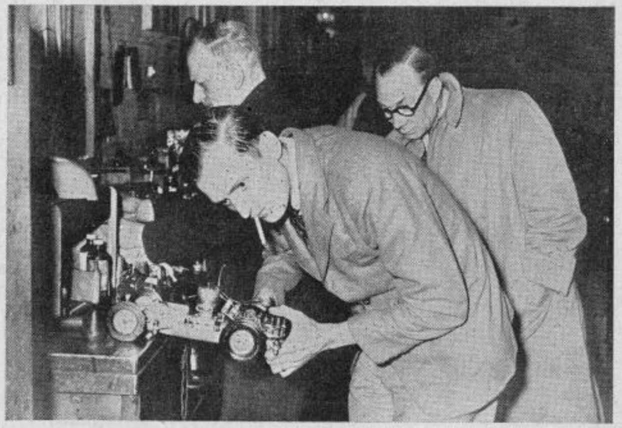
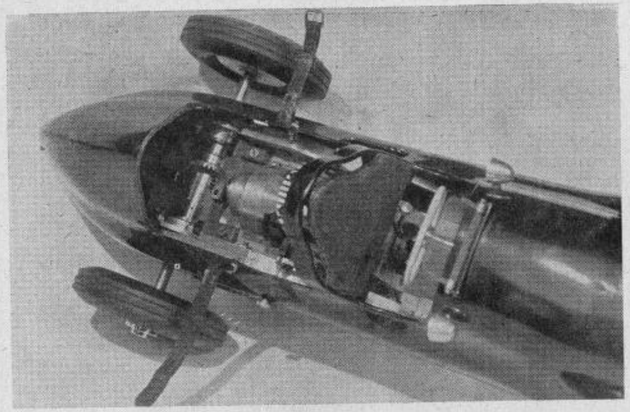


Photo : "Croydon Times"

Competitor G. Newbold turns his engine over compression before starting-up.

A 10 c.c. Racer from the West Country

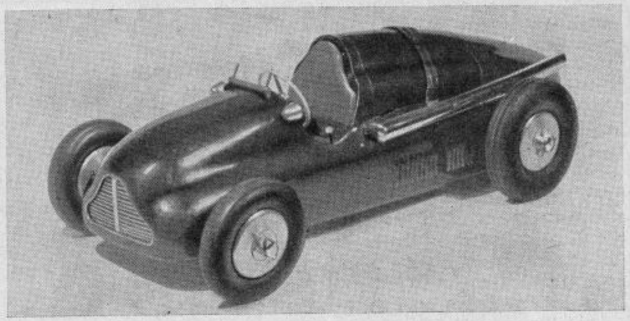
Designed and built by G. V. WALSHAW



(Left) This view shows the open bevel drive arrangement and steady bearing for the propeller shaft. (Below) The car has a distinctive appearance, and is beautifully finished in dark green cellulose.

Model Maker Photos.

(Opposite page) A rear three-quarter view showing the graceful lines of the tail and the large 'working' exhaust pipe. The 10 c.c. engine fits snugly beneath the tail fairing. Note the well finished instrument panel.



ALTHOUGH there are probably more active model car builders to the square mile in the Midlands and the South, the West Country has, from the earliest days of the hobby, been the home of a hard working coterie of enthusiasts who are, by reasons of geography, fairly widely separated, but who manage to get together frequently to keep the hobby very much alive. The majority of these West Countrymen have favoured the good-looking scale type of model, and some really fine efforts have been produced. Although distances forbid very frequent journeys to the open meetings of clubs in the East and North, they usually manage to give a good account of themselves when they do appear.

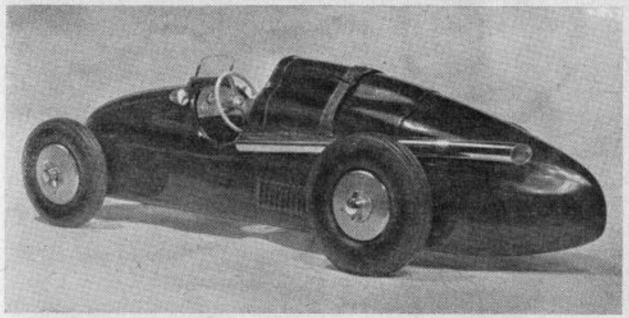
One such enthusiast is G. V. Walshaw, of Lytchett Minster, Dorset, who has been working in conjunction with H. C. Baigent to produce a neat little kit-car described recently in *Model Maker*. He is equally interested in rail-track and cable racing models and when paying a visit to *Model Maker* a few weeks ago, brought with him a really fine example of the latter type of car. We were most impressed with this model, and after inspecting and photographing it, we asked the builder to give a description of its construction for the benefit of our readers.

The origin of the model goes back two and a half years when, like many others, G. V. Walshaw was disappointed to see so many records and club awards going to engines and cars of transatlantic make! It was decided there and then to "have a go" and see what a home-constructed engine could do if tackled in the right spirit. It was to be a combined effort, a friend doing the calculations and paper-work, and machining to be done in the Lytchett Minster workshop.

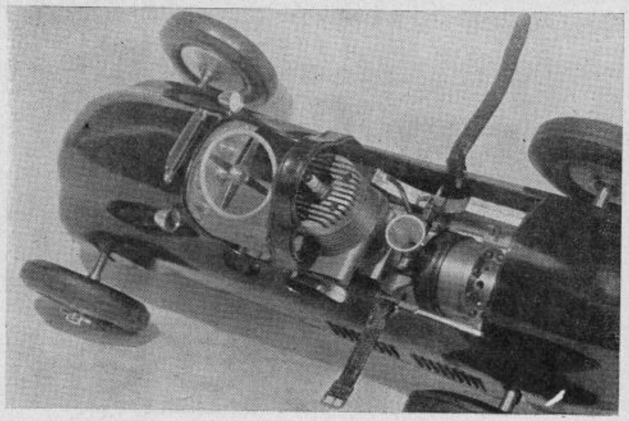
The first engine was "carved" from the solid, from a piece of round bar, crankcase and cylinder being in one, with a steel liner and detachable cylinder head fitted. The piston was machined from dural bar and lots of fancy lightening work carried out inside it. The connecting rod was also cut from dural and has a $\frac{1}{4}$ in. dia. big end. Crankshaft induction was used, the shaft itself being of mild steel, $\frac{7}{16}$ in. dia., with as large a hole as was deemed safe to assist the passage of mixture. Piston, con-rod and crankshaft were carefully balanced, and the whole job proved quite satisfactory, though no performance figures were given for it, the builder merely admitting that "it ran".

A start was made almost immediately on engine No. 2, but this time design was influenced by aesthetic considerations, and in the interest mainly of good looks, patterns were made for the crankcase and cylinder barrel. The same crankshaft, con-rod and piston were retained, however, having proved their worth in the original unit. No. 2 engine was bench-tested with both glow-plug and electric ignition, and ran quite well on both, 12,000 r.p.m. coming up easily with the former, and 15,200 r.p.m. when spark-ignited.

There was evidently some way to go yet, however, before the engine could compete at all favourably with the hot-stuff Americans, so further modifications were discussed, with a view to putting unit number three in hand. Chief amongst these was an increase in the size of the transfer port and also an increase in crankshaft diameter, plus ballraces, these latter not having appeared in previous specifications, somewhat surprisingly. Bore and stroke were decided as $\frac{15}{16}$ in. x $\frac{7}{8}$ in. A cast iron liner was made, and a new $\frac{1}{2}$ in. dia. crankshaft turned from the solid in special steel, and having the maximum cross-section induction passage. Two substantial ballraces were fitted to carry the shaft. The same cylinder head and two-ring piston were brought into service again, but in the interests of better balance and smoothing-out the engine, the contact breaker was transferred to the forward end. Up-to-date this engine, which is the one shown in the car, has not run with electric ignition, but using the glow-plug 17,500 r.p.m. is regularly reached, proving the value of the development work.



Now for the car. A demonstration at a local function necessitated a rush-job during the existence of engine No. 2, so this unit was built into a chassis with wooden bodywork and drove Z.N. wheels through spur gears, which being the only ones on hand, naturally turned out to be the wrong ones, giving too high a ratio and difficulties in starting and getting away. When engine No. 3 proved to be so much of an improvement on its predecessors, it was deemed worthy of a new car to house it, so the present handsome vehicle was commenced forthwith, and clutch drive was to feature in the specification, using a clutch of Henri Baigent's design, employing two shoes operating on the drum through an expanding ring.



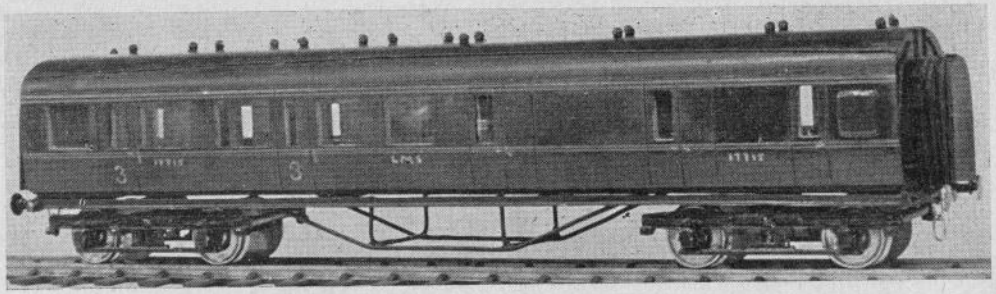
The bodywork is designed on the lines of a modern "500" racer, and a wooden block was first carved to shape upon which the aluminium shell was beaten out. The engine is mounted amidships in a heavy $1\frac{1}{2}$ in. x $\frac{3}{16}$ in. dural chassis frame of "L" section, and this brings the unit nicely under the highest point of the headrest fairing where it is entirely unobtrusive. A short coupled drive shaft with a massive steady bearing terminates in open bevel drive giving a 1.5 : 1 ratio, and the rear axle runs in self-aligning ballraces, the housings for which are bolted rigidly inside the frames. Divided-axle I.F.S. is employed at the front end, and the Z.N. air-cored racing wheels retained from car No. 1.

The finish of the body is really good, having been obtained by several coats of cellulose priming and final coats of "racing green" of an attractive dark shade. Although the car is of truly functional type, the detail-work is first class: a dashboard in mottled aluminium carries an array of instruments realistically executed, and a well made four-spoked steering wheel with white plastic rim, similar to those which the builder is marketing for other constructors. An upholstered seat-back, twin rear view mirror and a full-length plated exhaust pipe complete the details, the latter being easily detachable in case the engine takes a dislike to it, a point which remains to be proved.

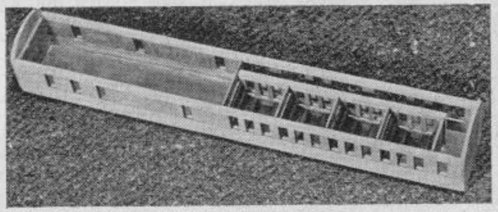
Altogether this is a thoroughly pleasing model, and a worthy winner of a Diploma in the "M.E." Exhibition in August, 1950.

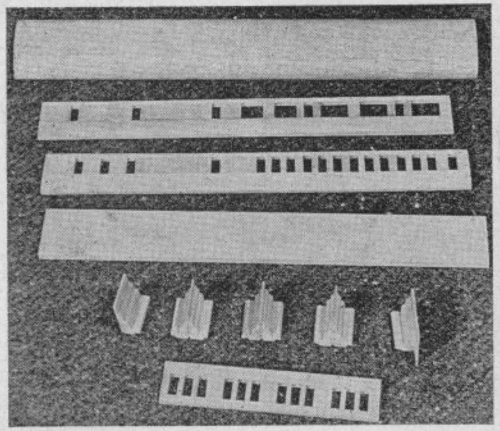
An All Wood Brake Composite

MODEL MAKER ADDS ANOTHER COACH TO ITS STOCK



CONTINUING our policy of reviewing as many different types of model railway stock as possible, we have obtained a C.C.W. coach kit, of an L.M.S. 57 ft. corridor brake composite. Of the last two coach kits reviewed, one was a Graham Farish Pullman, and the other was the Gem L.M.S. 57 ft. corridor compartment coach. Actually the first-mentioned was not a kit, being already made up, but the latter, it may be remembered, was a wood and card kit. The C.C.W. is all wood, apart from the Celastoid windows, and requires surfacing and painting.





For those who are not familiar with the C.C.W. system, it may be described briefly as follows. A series of standard wooden sections are available, which are designed to fit together either with tongue and groove or half lap joints. The tongue and grooves are used on the coach sides, and Celastoid windows, in various standard sizes, are available which will fit into the grooves. The system of building up coach sides is, therefore, rendered comparatively simple. The top and bottom stiles of the sides are grooved and are each available in one standard size only, in 10 in. lengths, window panels of a set depth, tongued to suit the stiles, are obtainable in lengths from 1 mm. to 19 mm., and standard depth window glasses in lengths from 4 mm. to 20 mm. Thus it will be seen that combinations of these various sizes can be made up to suit any type of coach. Similarly, the compartment walls with windows may be made up to suit any type, while the compartment partitions are available in two sizes, to suit either corridor or compartment coaches. Coach ends, accurately machined, are available either flat or bowed, and there are three types of roof, flat, standard or clerestory. Seats are made in five lengths from 5 mm. to 29 mm.

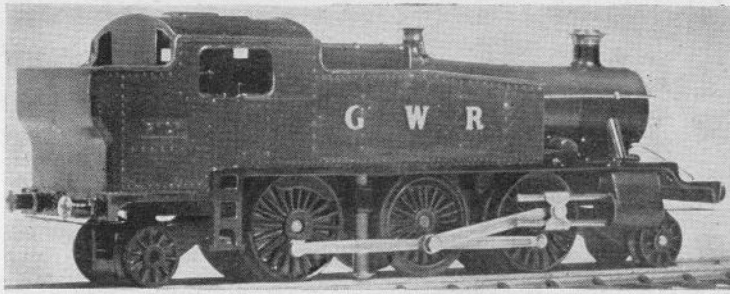
Data sheets have been produced in conjunction with the "Skinley" range of blueprints, and show the sizes of panels and windows to use, and also give a plan view of the interior layouts.

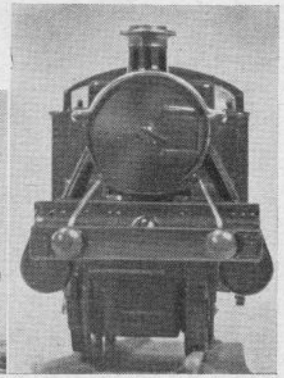
All the separate pieces of wood may be obtained from local stockists, but to save time and trouble C.C.W. have assembled the necessary pieces into kit form, covering a number of the more popular types of coach. These kits are available with or without body interiors, and in either 00 or 0 gauge.

The wood used appears to be mainly cedarwood, and, where necessary, L.N.E.R. teak finish coaches, which when polished gives a beautiful finish. Otherwise, a fair amount of grain filling is required, but a leaflet is in preparation by the makers to cover this aspect of their construction.

A Diecast Tanker Model

MODEL MAKER BUILDS THE NEW FORMO KIT





IN marked contrast to last month's article describing the building of a Royal Scot loco kit which called for a fair degree of skill in its construction, this month I am dealing with a kit which for sheer simplicity and ease of assembly could not reasonably be bettered. This does not imply that the one kit is better than the other, as one caters for the type of modeller who takes pride in having "made it all meself", and who has the patience to watch his model progress over a number of evenings' work, whilst the other is intended for anyone who wants an efficient accurate model which can be assembled ready to run, with a minimum of skill, in a few hours, and which is obtainable at low cost.

I must say that for completeness both in the kit itself and the instruction booklet with it, ease of assembly, ingenuity of design, packing and all-round standard of finish, I don't think I have ever experienced another kit to even compare with this. To top it all the extremely low cost is really heartening to see in these times of ever-rising prices.

At first sight there are three versions, one complete but unpainted, the other two complete with the body enamelled in either B.R. or G.W.R. colours, with transfers. On further investigation however, it appears that a loco kit without motor or gearbox can also be obtained for around 30/-. There is a complete spares service which covers every item included in the kit, and a price list is attached to the instruction leaflets.

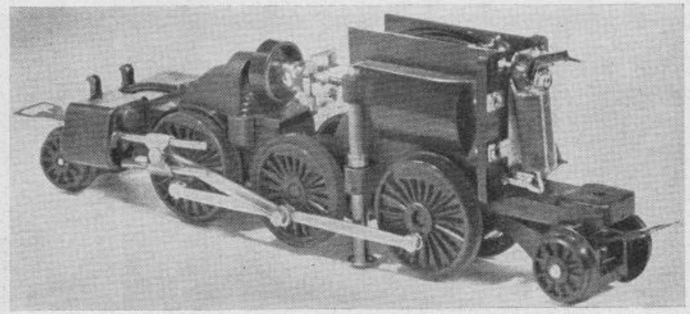
Construction of the kit is quick and simple, and if a painted body kit is obtained, may be accomplished in under two hours plus the time taken for transfers to dry. Apart from the time-saving qualities of its enamelled bodies the better finish obtained is well worth the extra cost.

The body is excellently die cast in alloy, as are the steam chests, ponies and chassis mainframes. Wheels and motor casing are moulded in plastic, and sundry other items are of copper and steel, etc.

The powerful motor has an ingenious commutator gear which eliminates the need for the usual brushes and the subsequent replacement of same. The current pick-ups consist of two sprung arms bearing directly on to the rails. The gearbox is simple to assemble, and the plastic clutch housing is incorporated in the unit, being moulded integrally with one of the drive pinions. The remainder of the clutch components are fixtures on the motor driving shaft. It is a centrifugal type clutch and there are no adjustments of any kind to make.

We have not so far, unfortunately, had an opportunity of thoroughly testing the pulling properties of this loco, but a tryout on a short length of track showed that the clutch gave a smooth get-away and a slow stop, and that the maker's claim of 4½ oz. hauling power would appear to be well justified.

Altogether a sound investment.



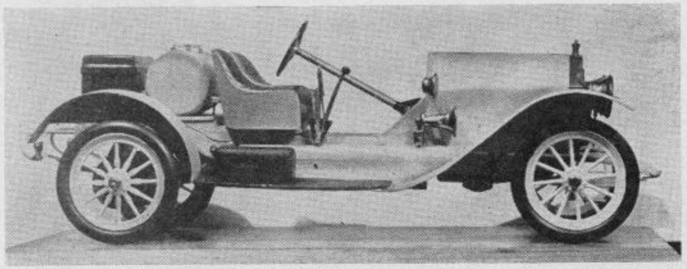
Heading shows side and head-on views of the finished Prairie Tanker. On the right : interesting motion and power unit : note "car-type" clutch.

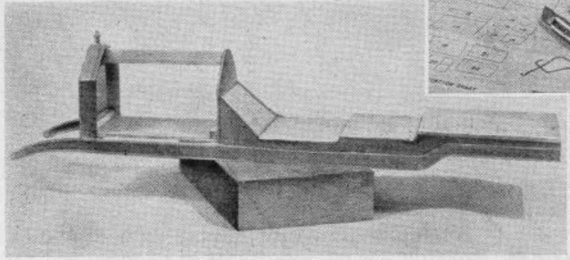
An Eighteenth Scale Stutz "Bearcat"

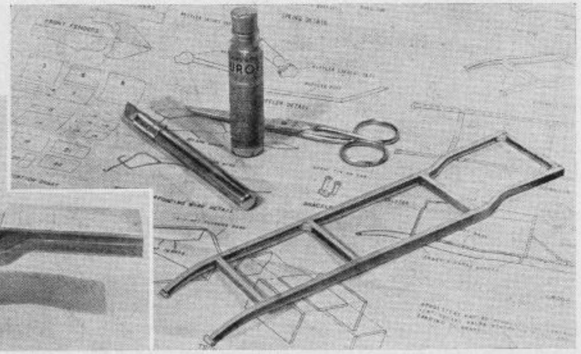
BUILDING AN AMERICAN KIT

by G. H. DEASON

Model Maker Photos.







(Left) The 'Bearcat' almost completed, in its bright yellow and brown colour scheme, but still lacking pedals and instruments. Note the reinforced rear wheel spokes. (Right) The chassis frame and first stage of assembly.

"SO you're going to build that Stutz Bearcat", said the Production Bloke with ominous heartiness. "That'll be fine for the April issue!" You'd think, wouldn't you that an Ed. might reasonably be expected to say what goes in and what doesn't, but you can't argue with Production Blokes, because they get you out of jams now and then . . . as for instance when you *must* have a fourth picture on a page that can't possibly contain more than three, and the paper goes to Press "any moment now". They know all the fiddles. Still, I *had* looked forward to a couple of months of quiet evening enjoyment, building the "Bearcat", ever since the kit arrived as a gift from my good friends the Scranton Model Centre, Pennsylvania. Worse was to follow: "I've arranged" said the P.B. happily, "to have the finished job on the cover . . . it'll tie up nicely with . . . etc, etc." (Now I understand why they are referred to as Layout Men.) The cover, you must know, is an extremely forward item in the production schedule, and this latest bombshell meant that instead of having two months' quiet fun I had four days' hard labour in front of me. As it turned out, however, it *was* fun, all the same.

I had looked forward to building up this little model for two reasons. Firstly, experience with other "Old Timer" series kits generally led me to expect an unusually high standard of material, and meticulous attention to the details of the period, which makes them a real pleasure to work on. Secondly, and more especially, the old "Bearcat" was an early love of mine, dating from the days of 1922, when a small "barnstorming" outfit, complete with an ancient Avro and a couple of lighthearted ex-R.F.C. pilots, settled in my home district. Sports cars were rare birds in those far-off days, particularly in our remote district, and their mode of transport was none other than a 1914 Bearcat, bucket seats, bolster tank and all. It went straight to my adolescent heart, and it wasn't long before I scraped acquaintance with its owner, scrounged rides and eventually (proud moment) drove the palpitating monster myself. Small wonder then, that having reached that age when anything which telescopes the years and calls up the ghosts of youth is A Good Thing, I feel very tenderly towards the old Bearcat. Apart from that, the car itself was a notable one, being much more closely akin to the Continental speed models of the day than most other American roadsters, sportsters or raceabouts. It is recorded that the 1911 prototype was built, entirely by hand, in five weeks, entered in the 500 mile International Sweepstakes at Indianapolis, and covered itself with glory by averaging $68\frac{1}{4}$ m.p.h. for the distance, including thirteen stops for tyres and fuel. I don't know how many came to this country; probably very few, for nine people out of ten have never heard of the type or, worse still, imagine it to be some exotic American eatable related to a Hamburger. It wasn't, in fact, until the late twenties that the name Stutz became familiar over here, when the "Black Hawk" caused us pangs of envy, and incidentally had the sauce to harry the Bentleys more than somewhat at Le Mans.

But to return to what an American journal recently referred to as Grandpappy's Hot Rod!

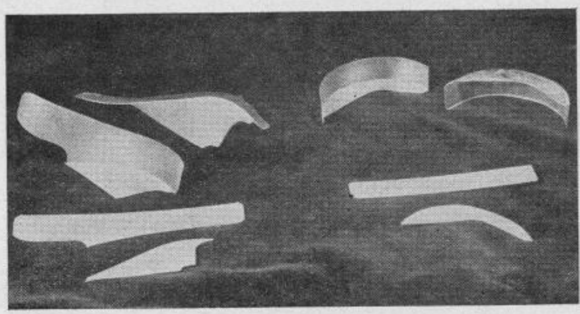
The Scranton-produced kit is very complete and a positive invitation to sit down and get cracking. (I confess to being one of those decadent types who prefer to do my modelling in an armchair before the fire in preference to getting my knees cold in a draughty workshop.) The drawings are clear and amply sprinkled with detail sketches, and construction follows generally on "big brother's" lines. There is, for a start, a real chassis frame. This is made of $\frac{1}{16}$ in. plywood with four cross bracings, and the channel section obtained by capping top and bottom edges with card strip. With plenty of cement and several coats of dope a very realistic frame results. The front spring anchorages are pieces of $\frac{1}{8}$ in. dowel.

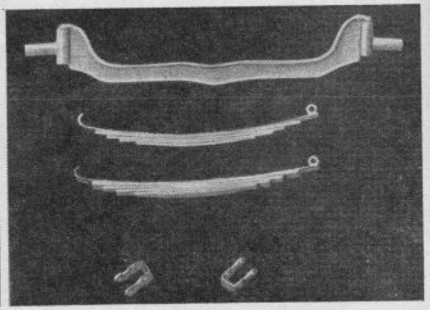
The next stage is the dashboard, radiator and bonnet assembly. The radiator is a lovely little plastic moulding which almost guarantees the success of the model from the start. I decided to replace the card bonnet with metal and elected to make this at the office between spells of pen-pushing, as a "relaxation". . . . I cut the 35g. aluminium sheet to the card template, and set about making it fit—some two hours later Assistant Editor Cull could bear it no longer, said "Gimme the thing, do", threw it away and started again, with a fresh piece. Late the same evening a bonnet materialised, which fitted where it touched, and I must admit that it touched a lot oftener than mine did. Rubber bands and cement did the rest, and a good night's sleep more or less restored my moral fibre. Body sides of $\frac{1}{16}$ in. ply, seat stretchers, seats, rear decking and cockpit floor followed, and the trunk and petrol tank went like a charm.

The wings were to be tinplate and these were tackled next, before the effect of the night's sleep wore off. I needn't have worried, for everything went according to plan, and any gaps in the edge-to-edge joints of the wings and valances were pusillanimously filled in with solder, using a good big iron, and filed up clean.

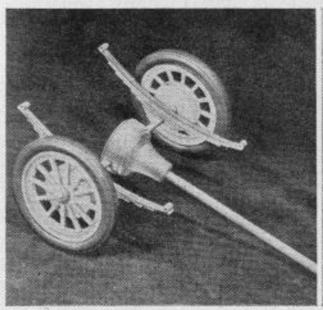
The road springs and shackles were mostly an exercise in scissor work, but the main leaves were in brass, with the appropriate shackle eyes made from short lengths of 18 s.w.g. brass tube soldered in place. The lower leaves of Bristol board were then

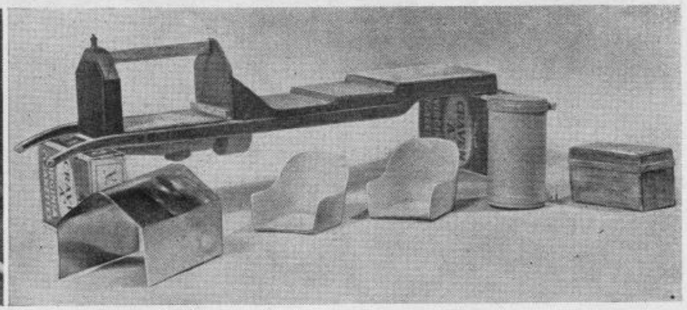
(Left) The wings, made up in tinplate to the original card patterns, shown below. (Right) The "I" section front axle beam, springs and shackles.

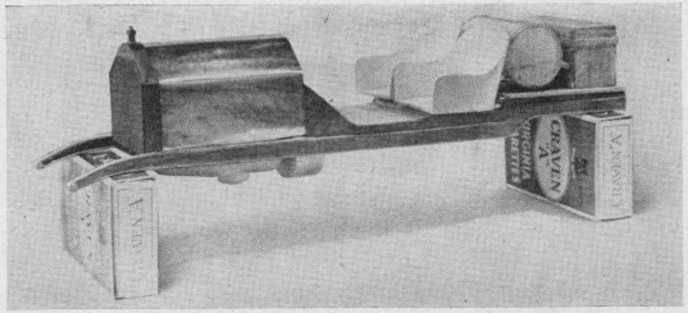




(Left) The rear axle assembly, with springs, differential casing and brake drums, before painting. (Right) Chassis with engine sump and flywheel added, and bonnet, seats, fuel tank and trunk ready for assembly.







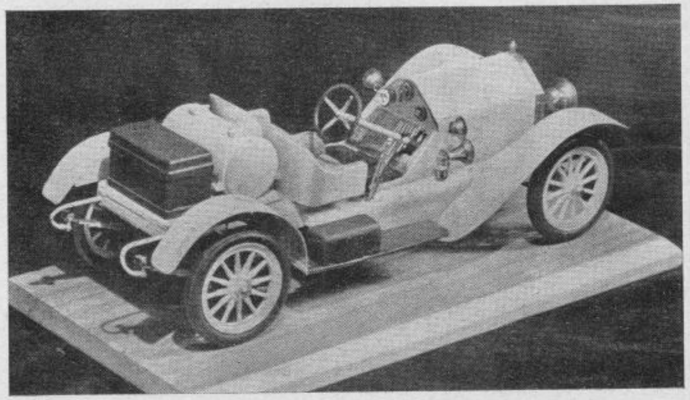
(Left) The chassis on its 'building trestles' (advt.!) and (below), the finished model.

glued in place after the correct set had been put in the master leaves. Rear spring hangers were made from 18 s.w.g. brass wire, with short lengths of tube soldered to their extremities.

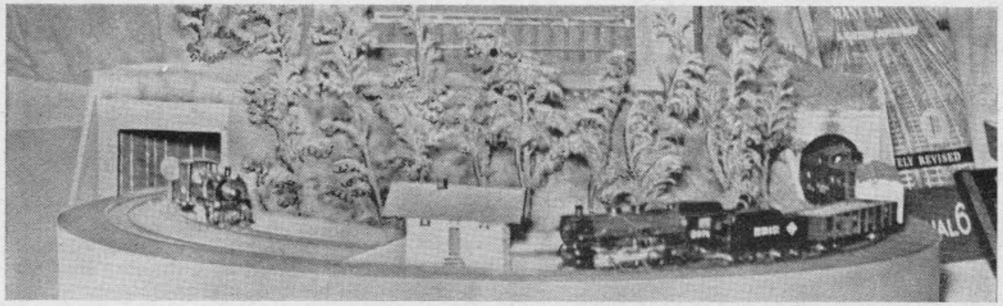
Crankcase, sump and flywheel are of hardwood, and the propeller shaft of $\frac{1}{8}$ in. dowel, let into the wooden axle casing, together with the half-shafts of the same material. This assembly was mated to the rear springs, and the detail work tackled with some cheerfulness, beginning with the handbrake, gear lever and quadrant. The handbrake is of brass, with a length of tube soldered in place to form the hand-grip and a long dressmaker's pin passed through, bent over at the tip, and soldered to the shaft to form the ratchet release. The quadrant was cut and bent from thin brass sheet, and the gear lever made up with a blob of solder for the knob. The steering column is again $\frac{1}{8}$ in. dowel, with a baseplate and supporting web of card. Before fitting the column an aluminium footplate was fitted, scribed with diagonal markings. The starting handle is of tin plate with a $\frac{1}{16}$ in. dowel grip. Lamp brackets and cross bracing are of 20 s.w.g. piano wire, bent to shape and pressed flat into a piece of soft balsa for soldering, which greatly simplified correct alignment.

Before any of these details were fitted to the car, the wings were added, with valances and wire stays, and the whole job given an undercoat and two coats of vivid yellow dope, whilst crankcase and sump were painted aluminium and the flywheel matt black. Next came the wheels, brake drums, axles and finally the neat plastic hub caps supplied in the kit. The wheel and axle assemblies, together with all other details were painted before fitting.

Tank filler caps were punched from thick card, with wire tommy bars cemented to them, and the tank secured to the rear decking by brass straps and household pins. The trunk, painted dark brown, is mounted behind the tank, and the seat upholstery tackled. This should have been a "proper job", but time didn't permit, so after several attempts with the stuff dentists clap in your mouth to make a pattern for your bridgework, a compromise was reached with strips of $\frac{1}{8}$ in. square balsa, and a resolution made to do the job properly later. The seats were cemented in place, Klaxon horn and cowl lamps drilled and fitted on short lengths of wire, and tool box added to the running board, when in came the aforementioned P.B., still beaming happily, and demanding finished prints! Pedals, instruments, exhaust system and a second toolbox were still missing, but the Bearcat by now bore a strong resemblance to the old thunderbucket which won my allegiance more than a quarter of a century ago, so after a few quick dabs with gold paint to zip up the "brass work" we clapped her in front of a camera, pressed the button, and sent her on her way to become a front page glamour girl. (See last month's cover.)



Instruments, consisting of speedometer, switch and ammeter, and the very "period" foot pedals, were made to complete the job, which took, from the true model maker's point of view, a disgracefully short time from start to finish, and there are a number of details which will be a mute reproach to me until I get down to tidying them up. Nevertheless, in her brave yellow and brown paint she is a very pleasant little ornament, and something of a challenge to start from scratch to build one of her British contemporaries, a nice line in T.T. Sunbeams, for example . . . purple paint and all!



" Small Fry "

IF it can be said of a display where every single item aroused both interest and envy that any one class of exhibit "stole the show" then we must award that distinction at The Model Railway Exhibition to the tiny 000 layouts and models. Of particular interest to would-be constructors in either 000 (2 mm.) or TT (1/10th in.) scales is the news that PECO are now able to provide scale F.B. nickel silver rail and the special Peco-tied sleeper strips in the appropriate sizes. Supplementary Platelayers' Manual instructional sheets are being prepared, together with details of standards used.

Our heading picture shows the simple but effective demonstration of this new Peco track, with two locos of American origin and a small goods train running at approximately scale speeds. As yet no British manufacturer has ventured to tackle the problem of locomotives and rolling stock of this size.

The more ambitious builder cannot fail to be attracted by R. G. W. "Matchbox" Bryant's impressive Highland railway layout in 000, which is also illustrated. The series of curves winding in to narrow necks which will be noted are designed for an amusing purpose—the whole layout takes down and is packed into a series of music cases! If therefore, any reader should encounter a group of rather oily fingered musicians apparently en route for the Albert Hall it may well be the Inversnecky Railway on tour!

Extensive rolling stock all faithfully follows a typical Highland Railway design, and the whole layout is built to portray an imaginary highland branch line —indeed it is so true to detail that it may well be based on an authentic section, as detailed drawings decorating the stand would suggest.

But what is truly amazing, and should encourage the most cramped modeller, is that most of the layout, rolling stock and other details was painstakingly made in a series of boarding houses, which it has been the builder's lot to occupy during the past few years. The old belief that genius can only thrive in a garret might well be modified to include boarding house model makers.

Everything under Control

ONE great thing about the Model Railway hobby is that it offers limitless prospects for the future, and yet is packed with the thrills of achievement as you go along.

To begin with, the mere fact of having trains running under their own power and obeying the movements of the controller, is a thrill in itself.

The beginner—and for that matter the old hand—should never be afraid of indulging in a bit of "aimless running" now and then, for the sheer pleasure of seeing the trains in motion.

Perhaps "aimless running" is hardly the right term, because even when you are not running to time-table, there is always such a thing as making the trains behave in a realistic manner as regards starting, stopping, and speed. For example, if more constructors remembered that 60 m.p.h. in full-size is about equivalent to 14 in. per second in 00 gauge, we should see less of non-fitted mineral trains careering gaily along at a scale speed of 90-100 m.p.h.

Watch your trains as they go past some stationary object such as a signal post, and you will soon develop a scale sense in the matter of speed without resorting to actual measurement or timing. While on this subject we may remark that an express travelling at 80 m.p.h. or so is very difficult to represent on a small model. One has no assistance from the "roar" of the train or the beat of the loco ("scale noise" is very difficult to represent accurately), and although there are, of course, devices on the market which enable electric engines to emit puffs of actual smoke as they go along, one cannot expect the long stream of smoke and steam associated with a real train in full blast.

Another thing is that our average "point of view" on a small railway is approximately equal to that of seeing a real railway from a hillside a mile or so away. And at *that* distance even mile-a-minute speeds appear as a crawl.

There is thus everything to be gained by keeping the speed down and in making our model trains glide along smoothly and gracefully. Gentle starting and stopping, gradual acceleration and deceleration and an even speed while running, particularly at the lower controller settings, all these virtues make for realistic and convincing running, and it is worth a bit of practice to acquire them. It is of little use to spend much time and trouble in laying down good track work, in designing and making convincing scenery, and in buying or making accurate scale models of locos and coaches, unless we are prepared also to spend some time and thought on how to make our trains behave as they should.

To secure this obedient behaviour we shall need to comply with the following requirements:—

1. Loco mechs. must run freely.
2. There must be perfect collection contact.
3. There must be no tight spots on the track.
4. Rolling stock must run freely.
5. The controller must be of a design to give sensitive and continuously graded control.
6. The operator must cultivate a fine feel.

A regards loco mechs., granted that bearings are adequately (but sparingly) lubricated, the most important factor is the commutator brush gear. Brushes must be of the correct grade of material, they must be properly bedded to the commutator face, they must be clean and free in their holders and, above all, they must bear on the commutator with the correct pressure, neither too much nor too little.

It goes without saying that there must not be any binding due to bent outside valve gear or to coupled driving wheels having slipped out of correct quartering.

Collection contact implies more than a clean, bright surface to the "supply" and the "return" rails. There must be good soldered bonding across all joints—except, of course, where gaps are intentionally provided for sectionalising purposes—and the treads of the tyres on all wheels used for "pick-up" or "return" of current must be bright and clean.

Over-oiling of axles causes the wheels to throw oil out to the tyre. This picks up dust from the rail face and—apart from causing bumpy running—forms a beautiful insulating compound just where maximum contact is essential. Moral one: don't over-oil. Moral two: flick over the track with a duster before beginning of each session. If there is a tight spot on the track caused by gauge being too narrow, or by incorrect clearances at frogs and check rails, smooth running may be affected.

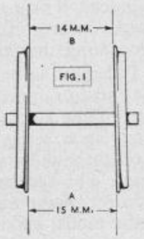
If you get a bind and track clearances are O.K. according to gauge, go over your locos and stock with a caliper gauge and check the back-to-back measurements.

For BRMSB "scale" wheels in 00 gauge the back-to-back should be 14.5 mm.

It is as well to make this check at four points (i.e. every 90 deg.) particularly on loco driving wheels, which may either have been mounted badly when first pressed on to their axles, or may subsequently have become bent by an accidental fall.

Fig. 1 shows how this affects running. When the broad clearance at (a) comes round, the flange will tend to bind on the running rails and the narrow clearance at (b) will tend to pinch in the check rails at points. If a loco proceeds in a series of jerks corresponding to the wheel revolutions, it is most probable that this is the cause.

So that binding may be due either to the rails or checks being out of gauge, or to the wheels being out of gauge—or both!



Pair of wheels that has been bent or wrongly mounted, causing jerky running. At A flanges will bind on curves or where track is slightly under gauge. At B backs of wheels will bind on check rails at points.

On the Right Track

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

The necessity for free running rolling stock will be apparent from the foregoing. Ensure, however, that bogies are free to swing, as binding here will cause a drag and, in extreme cases, a derailment on curves and points.

Refinement in controller design is well worth insisting upon and paying for.

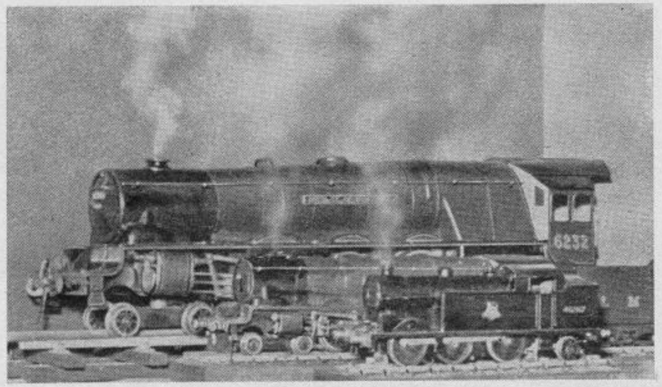
Trains, particularly steam ones, do not start off with jet propelled velocity. Even a multiple unit electric does not accelerate at much more than a mile an hour per sec.

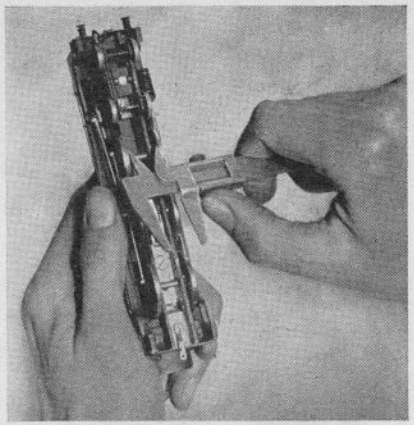
Similarly, in the matter of stopping. Most 00 gauge electric mechanisms are of the worm drive persuasion and have no over-run. They are virtually "dead beat" and come to an abrupt skid-stop the moment current is cut off.

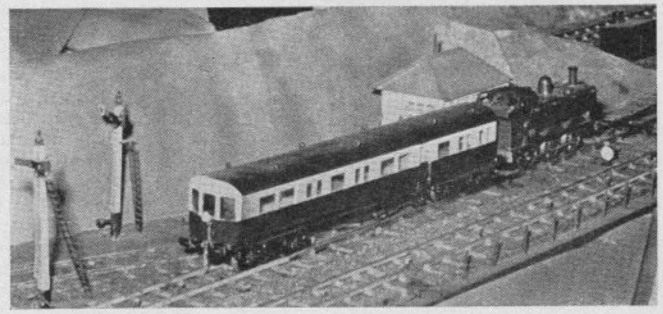
Flywheel-fitted mechanisms certainly tend to smooth out these impulsive and unrailway-like movements, but the real answer is to fit a resistance which gives a finely graded control from a crawl to flat out.

The Kirdon people—among others—make a particularly fine resistance of this type, and if this is fitted with a handle of the kind used for trams (minus the "dead-man" of course!) a highly sensitive control is secured over the entire speed range. Such a resistance can be connected in series with any existing controller, the handle or knob of which is merely left permanently at the full "ON" position.

In a previous article we suggested that the beginner would be well advised to make a start with a good proprietary set of trains. In this way he can rapidly get a trackway laid down and come to the matter of operating the trains. Having now acquired some skill in the sensitive handling of the controller and having formed some idea of the requirements of the moving train in terms of track layout, he will be in a better position to judge how to spend his money and time to the best advantage when it comes to designing and laying down his own permanent-way. Of this, more anon!



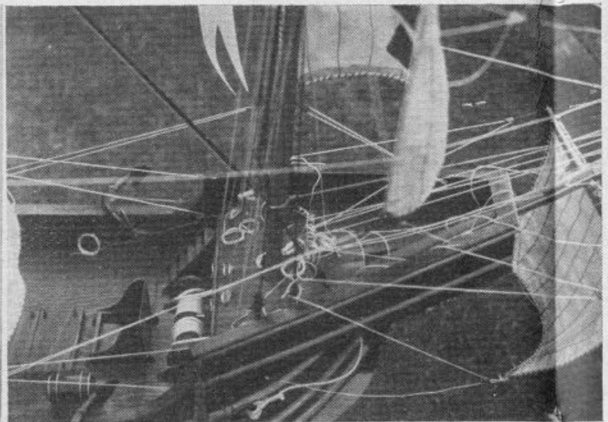


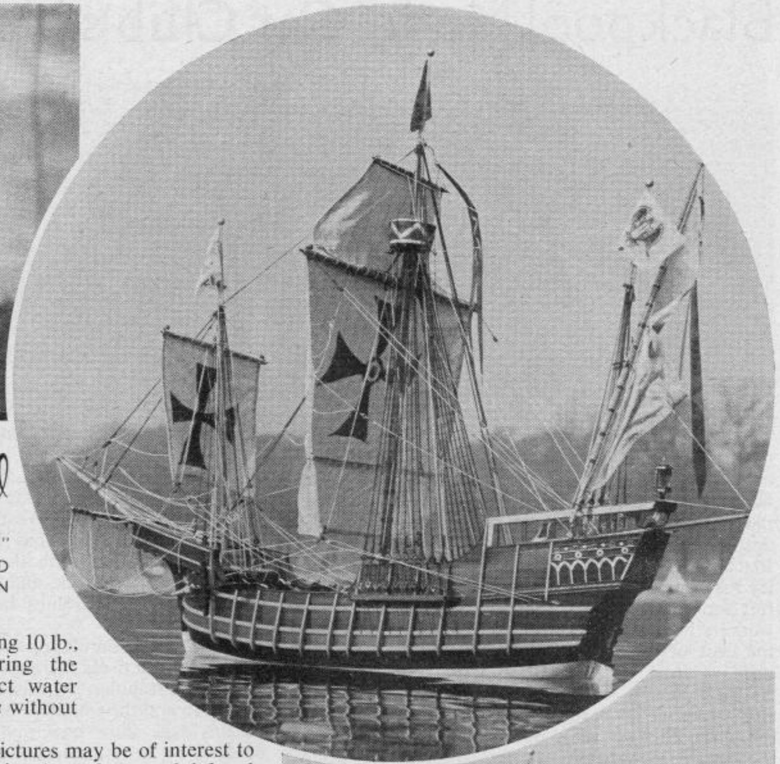


Above: The Kirdon Smoke Unit in full blast at The Model Railway Exhibition. This very useful addition to electrically operated steam trains gives another touch of versimilitude to the model layout.

Centre: Underneath view of loco, showing use of inside calipers to measure back to back dimensions between driving wheels—which in 00 should be 14.5 mm.

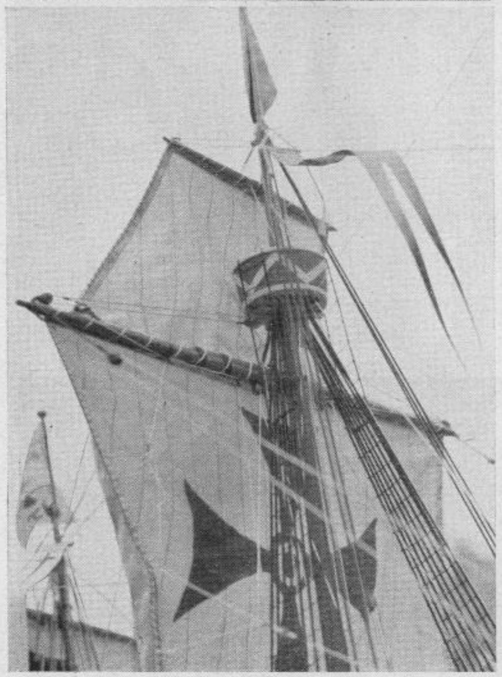
Below: Part of Mr. Michael Salmon's layout shown at The Model Railway Exhibition. Do not despair if your space is limited—the whole of this layout and rolling stock was made in a caravan with a workshop no larger than a small card table!





Columbus on the Round Pond

BEING THE MAIDEN VOYAGE OF CHRISTOPHER COLUMBUS'S FLAGSHIP "SANTA MARIA" AS BUILT IN RON AARON'S LONDON SHIPYARD IN THE YEAR MCMLI AND PHOTOGRAPHED BY ED STOFFEL OFFICIAL PHOTOGRAPHER TO THIS TWENTIETH CENTURY MODEL VERSION OF THE WORLD'S MOST EPOCH MAKING VOYAGE OF DISCOVERY.



FEW ship models can have enjoyed a greater following than Columbus's flagship *Santa Maria* — but almost inevitably they have been replicas for show rather than work. Picture the scene, therefore, when Ron Aaron's *sailing* model appeared for its trials at The Round Pond one Sunday afternoon in March!

Construction of the model commenced on November 4th, 1950, and the finishing touches were added on February 15th, 1951. In just over four months the builder had completed a really outstanding model of approx. 4 ft. length over-all. To assist him in his work five photographs of the South Kensington Science Museum model were obtained together with a hull drawing, while the small Modelcraft plan was also of assistance in scaling up to the size selected.

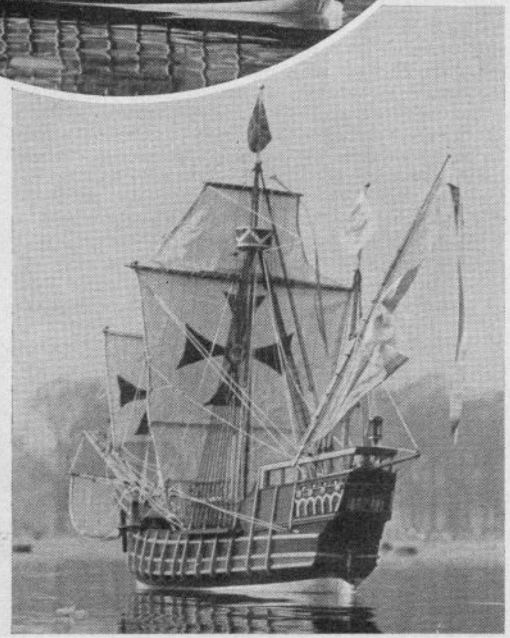
As might be expected, a ship model rigged in the authentic 15th century style provided sailing problems of its own. Early difficulties were experienced in sailing a straight course, particularly as no form of automatic rudder steering had been provided. The scale rudder, depicted in lower right-hand picture, is fixed as it was considered unlikely to be effective on account of its small size, and the builder, in any case, wished to experiment with sailing a straight course by trim alone.

Every effort has been made to adhere to scale features throughout. The lower part of the mainsail for example was attached to the upper part in the original craft in such a way that a pull on one rope would separate it from the upper sail in the event of encountering a sudden squall. This feature is faithfully copied in the model.

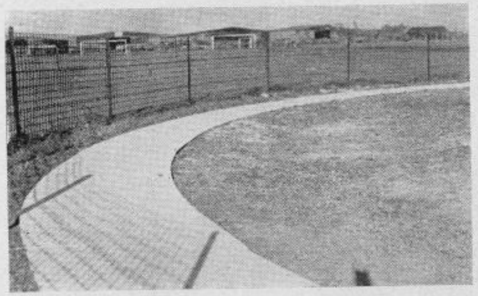
Only departure from scale is in the provision of a detachable lead keel, weighing 10 lb., which is necessary to bring the model down to the correct water line. Weight of *Santa Maria* without the keel is nearly 5 lb.

Some description of the pictures may be of interest to readers. Proceeding clockwise from bottom left-hand corner, the first illustration depicts a close-up of the crow's nest and rigging of the mainmast. The crosses on the sails were painted on using a tin of very old lacquer from which most of the solvent had evaporated. This prevented running of the paint at the edges. Next we see the builder adjusting the model, as it stands supported in its cradle. The lead keel can be clearly seen. Then we have some detail of the network of ropes in the fore-part of the ship; note anchor capstans, with open fireplace immediately behind. A dinghy remains to be added on the port side. The ship's lantern is illustrated approx. full-size, which gives some idea of the scale of the complete model. Low angle gives a realistic appearance to the side view of the *Santa Maria*. The curved "waterline", peculiar to the full-size ship, is shown to advantage. Last comes what is probably the most pleasing view of all, taken from the rear.

Much still remains to be done with this ambitious model, but the summer months should find most of the sailing problems solved, while such details as members of the crew in period costumes will complete the illusion of reality. Should any of our readers feel the urge to go and do likewise Ron Aaron will be happy to provide further information if they will write c/o *Model Maker*.



Blackpool Model Car Club's New Home



Photos by courtesy of Blackpool and Fylde Model Car Club

ENTHUSIASTS of the model car racing persuasion in the North West will recall that for over 12 months the Blackpool and Fylde Club, which used to operate on a track at the Castle Gardens Hotel, were without a home. Happily, it takes more than the loss of a track to daunt a really keen group, and despite temporary setbacks the club applied to the Blackpool Corporation for a plot of land at the Stanley Park aerodrome site. The application was successful; and in May of last year an enthusiastic band of workers made a start on the new track construction, the cost of which was borne entirely by the club itself.

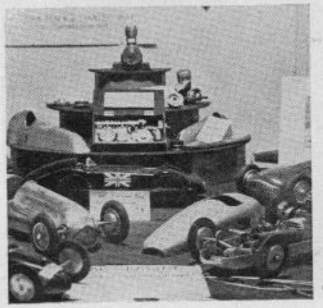
The Corporation stipulated a six months probationary period in case of complaints from the local populace, but everything went according to plan, and the track is now firmly established. A further application was then made to the authorities for permission to erect a hut for the storage of equipment and for housing the electrical timing apparatus, the latter having been made for the club by member E. Sharples, with advice from F. G. Buck, who has been of considerable assistance to the club in this respect.

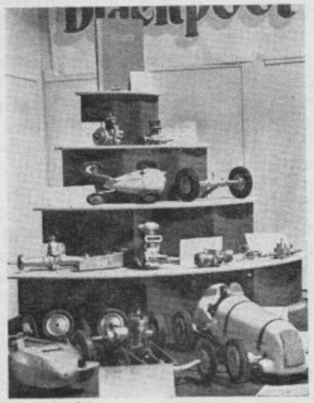
Further developments include the use of a public address system for open meetings, and the erection of a stout permanent fencing, 100 ft. square, to form an enclosure for the pit area for the use of members and visiting clubs. The public will have an excellent view of the proceedings from the safe distance of the perimeter. After this work has been carried out the Blackpool and Fylde M.C.C. is still in a thriving financial position and ready to keep the model car flag flying in the North West.

The official opening has been arranged for July 8th, in conjunction with the Corporation's Festival of Britain Sports Week, and a warm welcome awaits entrants from other clubs in the Midlands and the North.

By way of stimulating interest locally, the club had an attractively arranged stand at the recent Hobbies Exhibition organised by the Blackpool Rotary Club and the Chamber of Trade. The illustrations on this page show how well this kind of thing can be done by an enthusiastic club. The Hon. Secretary is C. Hedges, of 13 Birchway, Layton, Blackpool, and our correspondent and Track Secretary is J. Bibby, of 5 Leopold Grove, Blackpool. Those who wish to combine a spot of racing with a sniff of the famous Blackpool sea breezes should write for further particulars of the opening meeting forthwith.

(Above) A section of the new track. (Above r. and below) The well presented exhibition stand, with J. Bibby in charge.

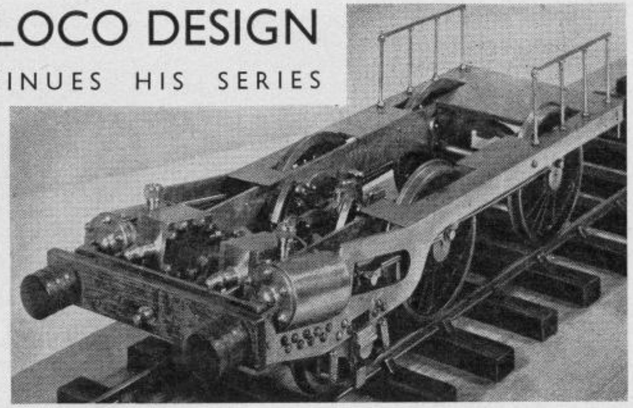




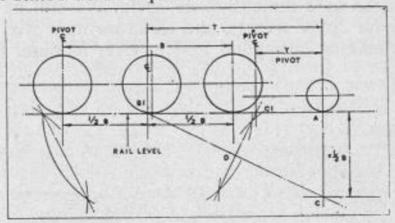
MODEL STEAM LOCO DESIGN

K. N. HARRIS CONTINUES HIS SERIES

This article is Part IV of a design series started in "The Model Mechanic", April, 1950, and continued in July and August issues. Copies of these issues are available, price 2/- each, from our offices should new readers desire the earlier parts, to which passing reference is made in this instalment.



THE next point in order of development of our design is to settle the longitudinal location of the pivots of the leading and trailing pony carriages. There is a very simple geometrical construction for this which is shown in Diagram II. This is the graphical solution of what is known as Baldry's rule which stated as an equation is



$$Y = \frac{1}{2}\left(T - \frac{\frac{1}{2}B^2}{T}\right)$$

T = Centre of rigid wheelbase to centre of pony axle.
Y = Pivot radius.
B = Rigid wheelbase.

Construction

Drop a perpendicular bisecting the *rigid* wheelbase. Project the CL of the leading wheelbase vertically downwards and on the downward projection mark off a point C distant from A = $\frac{1}{2}$ B. Join B_1 and C, bisect and project a line through the point of bisection D, at right angles to B_1 C to intersect RL at C_1. From Point C_1 erect a vertical line. This line is the required axle centre for the Pivot.

In our case the actual length on the pony frames for front and rear carrying trucks, i.e. from axle to pivot centres is 7 in. for the front and 6½ in. for the rear; as a matter of structural convenience it is easier to make two frames identical, and in actual practice, if we compromise and make both frames with 6¾ in. centres it will make no difference whatever to smooth running round curves.

By setting the trailing wheels 1 in. further towards the rear, both pivot centres would come out at 7 in., but the matter is one of no serious importance.

We have now settled the main layout of what may be described as the "vehicle" portion of the chassis. Of course, we have to work out details of many things, springing for one, but this can come later.

Up to now, we have perhaps had a lot of not very exciting drudgery, though I can assure readers that this is all very necessary if they aspire really to do their own designing, not to do it by halves.

Anyhow, to those who have persevered thus far, I can say that from now on they will begin to find ample scope for the exercise of their imagination and ingenuity in working out details. As you progress you will find that designing becomes more and more involved. Do not misunderstand this. I do not mean that it becomes more difficult, but that more and more, each feature has to be considered not in isolation, but in its bearing on, and relation to, other features, which may either affect it or be affected by it.

This blending and harmonizing of individual units may be likened to the blending of a good brand of whiskey (or tea if you prefer it that way!) and its skilful execution largely comprises the art of design to which I have previously referred.

I mentioned earlier that it is, within reason, desirable to use as long a connecting rod as possible; there are two reasons for this, both connected with an inescapable law of geometry, angularity and its consequences. This question of angularity is either not understood by certain would-be instructors on model loco matters, or if it is, is conveniently ignored.

Diagram III illustrates what is meant by "angularity" and its effects.

(A) Shows the case of a connecting rod having its centres at a distance apart equal to three strokes.
(B) Shows a rod with this dimension equal to two strokes.
(C) Shows a "Scotch" or slide crank, which in effect is equivalent to a connecting rod of infinite length.

It will be noted that in the case of (A) with the crank at 90 deg., or half-way round, the piston has completed 54 per cent of its travel. In case (B) with similar crank conditions the piston has completed

57 per cent of its travel; whilst in case (C) piston travel and crank travel are both 50 per cent, and are always coincident in relative position.

Once again, you don't need to have been a Senior Wrangler to deduce from the foregoing that the shorter the connecting rod, the greater is this undesirable discrepancy.

Diagram IV shows the forces acting on the crosshead, and again it does not need any very marked degree of intelligence to realise that the greater the angle "Theta" the greater the resultant load on the crosshead, leading, of course, to increased friction and wear. I think from the foregoing it will be quite obvious why as long a connecting rod as circumstances will allow is highly desirable. We shall find in our own case that we can comfortably accommodate a rod of 9 in. centres equal to 3.4 strokes. Centres equal to three strokes should be regarded as a minimum or very close to it.

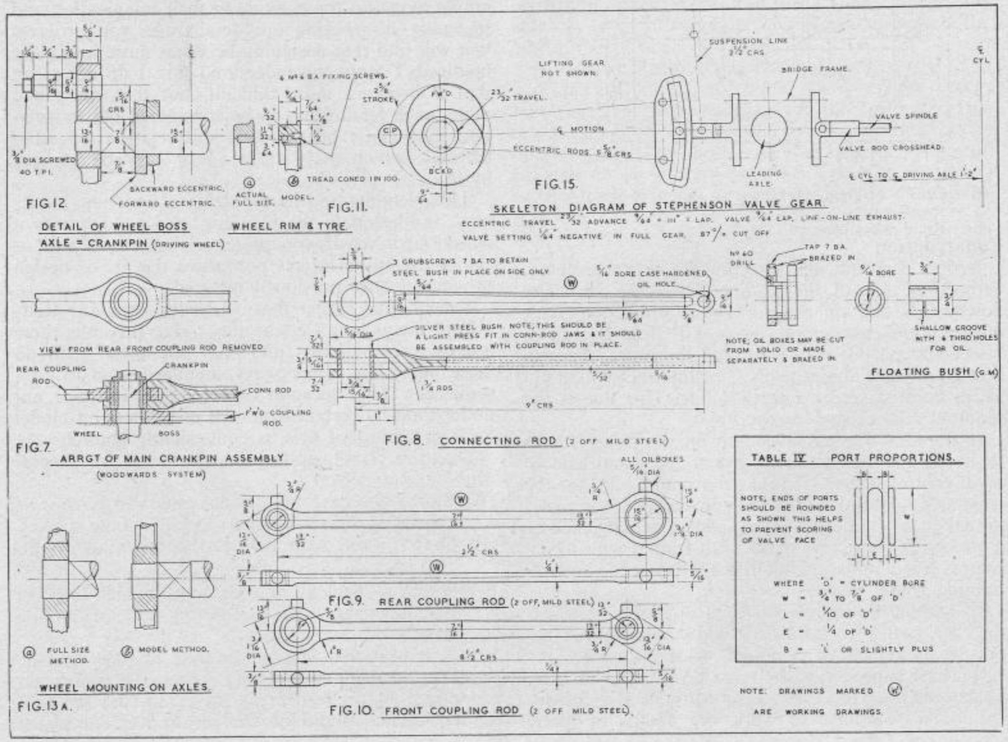
We shall be meeting angularity again when we come to Valve Gears, where its effects can be most troublesome unless they are understood and allowed for.

Coming back directly to our immediate problem before we can settle the length of our connecting rod, we must settle certain main features of our cylinder assembly and details of our crosshead. (This is an excellent example of the interplay of one feature on another just referred to.) We have already settled our stroke at $2\frac{5}{8}$ in. We have now to settle the length of our cylinder body, and the amount of space taken up by its back cover and gland, and by the crosshead, plus reasonable clearance allowance.

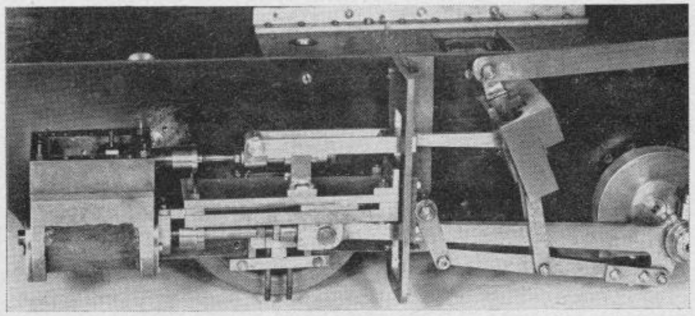
Let us deal first with the cylinder body. This must be long enough to accommodate

(1) The full stroke of the piston.
(2) The piston itself.
(3) Working clearance at each end for the piston.
(4) Spigots for the cylinder covers.

(1) We know ($2\frac{5}{8}$ in.); (2) should be wider than a "scale" dimension would indicate (we can do this with a free-lance job where it might not be feasible with a prototype model without departing too much from outside dimensions). Piston should be wide enough to take three rings $\frac{3}{32}$ in. wide with "lands" or dividing flanges, $\frac{1}{8}$ in. wide which would make this dimension $2\frac{5}{32}$ in. Clearance should be kept down to a minimum, and with good workmanship and careful erecting this may be as little as $\frac{3}{64}$ in. each end. This brings us to a dimension of $3\frac{1}{2}$ in. We still have to allow for cover spigots, and these we may give $\frac{1}{8}$ in. each, making our cylinder $3\frac{3}{4}$ in. over its outer faces.



Heading overleaf shows chassis of Crewe type 2-4-0 under construction by Mr. D. H. Harris.



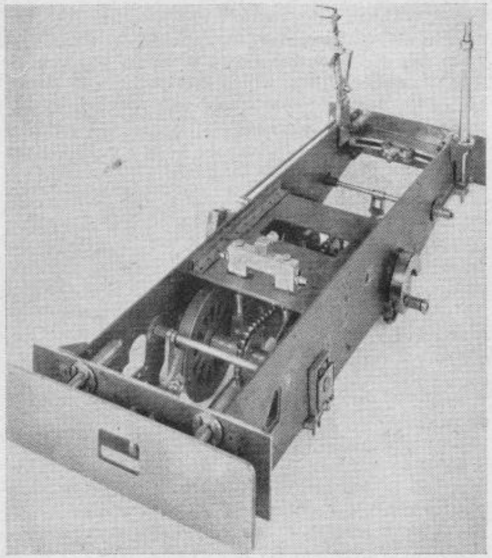
On the right: Close-up of valve gear (Greenly gear) 0-4-0 tank engine in $3\frac{1}{2}$in. gauge.

Below right: Chassis of $1\frac{3}{4}$in. scale $3\frac{1}{2}$in. gauge contractors' 0-4-0 loco. Note wide buffing plate. Fitting over centre crosshead is twin pump delivery.

Fig. 3 illustrates cylinder and piston in part section. We are left with the back cover containing the stuffing box and gland and carrying the front end of the slide bars, and with the crosshead before we can finally settle the greatest length of our connecting rod.

Fig. 4 is a detail of the cylinder cover, etc., and Fig. 5 of the crosshead. It is desirable that stuffing boxes should be ample capacity in the lengthways direction. Here it is convenient to mention an important constructional matter in the same connection. The neck ring in the cover should be a really good fit on the piston rod and of a length equal to the piston rod diameter, whilst the actual gland should also be a close sliding fit on the rod with a total length of not less than one and a half or preferably two diameters; it should also be a good fit in the stuffing box; needless to say neck ring (which preferably should be a separate renewable bush of hard G.M. or Phosphor Bronze) stuffing box and gland must always be truly concentric. Unless these conditions are observed you will never be able to maintain steamtight conditions for any length of time, and you will engender needless friction and wear. One other constructional point, small but important, faces of neck ring and gland should be flat, not bevelled as is so usual, bevelling leads to local compression of the packing, friction and wear. Full sized locomotives use various forms of metallic gland packings which do not lend themselves well to reproduction in miniature in such a way as to give efficient results. For tightening the glands I strongly recommend a form of construction used successfully and very widely in small power steam engines, such as launch and steam car engines, which is shown in Fig. 4. This is simple to adjust and completely eliminates any risk of putting side or twisting strains on the gland. For packing, strands of "Palmetto" twist are excellent, as also is an asbestos-metallic loose fibre packing marketed before the war by Messrs. Bassett Lowke, and possibly available again now, I believe, under the name of "Sealite".

Turning to the crosshead, where, as in our case, the crosshead and guide bars run past the forward portion of the coupling rod, it is obvious that the width must be kept down, and the two bar form is quite the best for the purpose.



In full-size practice, piston rods are generally cottered to the crosshead, usually with a taper fit between rod and bore of crosshead; there is nothing against adopting this practice in model work if you are sufficiently skilled, but it is a troublesome job and the slots for the cotter in crosshead boss and rod end are very fiddling things to make satisfactorily. Furthermore, there are no means of adjusting the length between piston and crosshead centre. It is all very well to say that if work is accurate, there will be no need for adjustments. With the most skilled work and the greatest care, minor errors *do* creep in; sometimes they cancel each other out, at others they pile up and call for adjustment somewhere.

In view of these facts, I strongly advocate a screwed piston rod end and threaded boss to crosshead, with a thin locknut on the piston rod. Fig. 5 shows this arrangement. In making the crossheads great care must be exercised to ensure that the threaded portion for the piston rod end is truly parallel in *both* planes with the crosshead slippers, otherwise you will never get things running true and free; this is a most important point and one well worth taking great care to ensure accuracy. The crosshead shown embodies separate G.M. slippers, a desirable, but not absolutely necessary refinement. The crosshead is of the box type to take an eye-ended connecting rod, the wrist-pin is fixed in the crosshead and the connecting rod turns on it. Both wrist-pin and eye of connecting rod are thoroughly case hardened. They must be a first class running fit. This form of construction, too, is adopted in steam car practice and is found to give more satisfactory results and longer wear-free life than any other.

Fig. 6 shows the assembly of 3-4 and 5 with the crosshead and piston on forward dead centre, and from this we find that our connecting rod can be 9 in. between centres, which gives a ratio to stroke of 3.4 to 1—quite reasonable and satisfactory.

Following modern practice all connecting rod and coupling rod bearings are of the bush non-adjustable type.

For the connecting rod big end I have adopted the Woodward form, which gives increased bearing surface and somewhat simplifies the making of the coupling rods which are in two entirely separate sections. This is detailed together with the adjacent ends of the coupling rods in Fig. 7. The use of the floating type of bush in the construction tends towards reduced friction, and the general form of construction relieves the already highly stressed crankpin of most of the driving stresses to the rear coupled axle.

Figs. 8, 9 and 10 give full dimensioned details of connecting rod and coupling rods and these can be regarded as the first actual working drawings; to a purist, somewhat out of sequence, but arising naturally from the course we are following with the design.

We must now consider our wheels, axles and crankpins in detail, for tied up intimately with these is the distance between cylinder centres. We will start with the actual rim section.

Fig. 11 shows at (a) the section of a full-size wheel rim and tyre, and at (b) the proposed section for use on the model.

Note particularly the form of the flange. This question of wheel rim section is one over which a large proportion of model loco builders fall down badly. The sort of thing all too common is indicated in the sketch where there is no indication of the tyre, which shows on a very large proportion of British locos, no "arris" at the outer edge of the tread, an excess of coning on the tread, an excess of depth to the flange, with a completely wrong contour. I strongly recommend separate steel tyres for all driving and coupled wheels, made from a good quality of mild steel; they are a definite help to adhesion, as mild steel on mild steel has a higher co-efficient of friction than cast iron on mild steel. If used they should be shrink fitted and an allowance of .001 in. oversize of centre per inch of diameter will be about right. The rim will require only quite a moderate degree of heat to allow the centre to drop in quite freely. With an engine of this type where there is no crankshaft there is ample room for as long bearings as may be required, so there is no need to have recourse to coning the spokes to make room for axleboxes extended outwards.

The main crankpin should not be less than the equivalent of 6 in. dia. on the portion taken hold by connecting rod, and should have an increased dia. next to the wheel for the coupling rod (front portion) to work upon, say equivalent $6\frac{1}{2}$ in. dia., 7 in. dia.

The length of these portions should be around the scale equivalent of 6 in. and 4 in. respectively, whilst the wheel boss should be about the scale equivalent of $7\frac{1}{2}$ in. thickness.

Fig. 12 is a section through wheel boss and crankpin, dimensioned to suit our model on the proportions stated above.

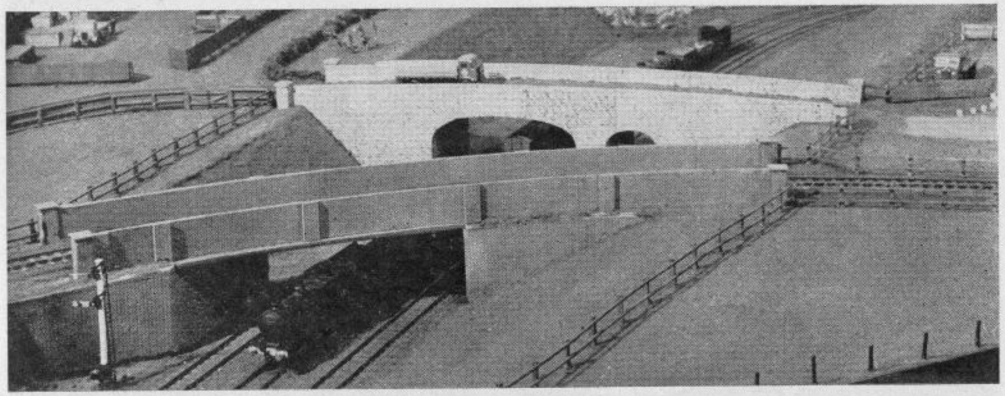
The crankpin is a force fit in the wheel boss, and an allowance of about .005 in. ($\frac{1}{2}$ thou.) plus, is about right for a force fit of this size; don't think if $\frac{1}{2}$ thou. is good $1\frac{1}{2}$ thou. would be better or you are likely to split your wheel boss!

Wheels too, are a force fit on axles, and here we depart somewhat from standard full-size practice. Fig. 13 shows what this is, at (a) and at (b) the method best followed in model work; *note*, in all this type of work good radii must be left at shoulders and sharp corners avoided, otherwise you are asking for trouble with breakages; whilst not so serious as in full-size practice this is none-the-less likely to lead to trouble if disregarded. Don't forget to radius the edge of your holes to clear!

For a modern type of engine like this, journals of driving axles should be made the scale equivalent of 9 in. to 10 in. dia., say $\frac{7}{8}$ in. dia., and about the same width. Fig. 13 appeared in the August issue of *The Model Mechanic* and was wrongly numbered by me, hence 13A on Sheet III, which shows the driving axle assembly (frames shown dotted) dimensioned to show distance apart of cylinders, which must, of course equal horizontal distance apart of connecting rod centre lines.

We have now reached the stage where the main features of our chassis and motion are settled, such matters as details of hornblocks and stays, axleboxes and springing, etc., structure and mounting of pony trucks all have to be settled yet, but they do not in any way affect the main theme of design, and we can return to them in due course.

[*Next section commences Cylinder and Valve Gear Design.*]



Above: Two simple bridges from Mr. E. Rankine Grey's professional layout in Bournemouth. Stone arch road bridge in background, and steel and brick rail bridge in foreground were made up from odd hardboard, balsa, plywood with Anorma and Modelcraft paper.
(Photo from "A Study of The Model Railway.)

BRIDGES

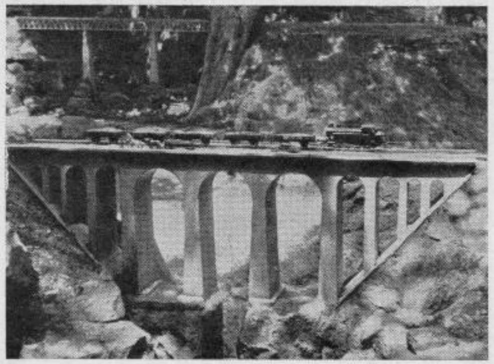
PT. I BY R. H. WARRING

TO most people a bridge is just a bridge. The fact that many appear to follow a similar pattern is merely incidental, but to a model maker it is both interesting and instructive to classify the various bridges according to "type". Bridges are, in fact an interesting subject to model—either as definite scale models of existing bridges or models of bridge "types". A knowledge of these basic types, too, is useful when bridge models have to be constructed as part of a scenic layout associated with a model railway system, for example.

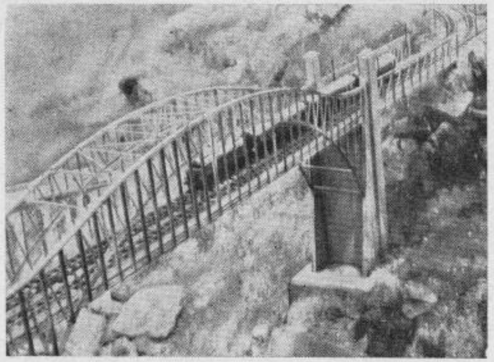
The best known bridge "types" are the *suspension* and *cantilever*, since most of the more famous of the world's bridges fall into these categories. The very first bridges were undoubtedly trees felled across a river or stream, followed by the built-up bridge made by laying stones across a series of stepping stones. This eventually became a more elaborate affair with two end stones and a larger stone laid between them, raising the "footway" well clear of the water level. Simple wooden bridges of this type were also in widespread use by the early middle ages.

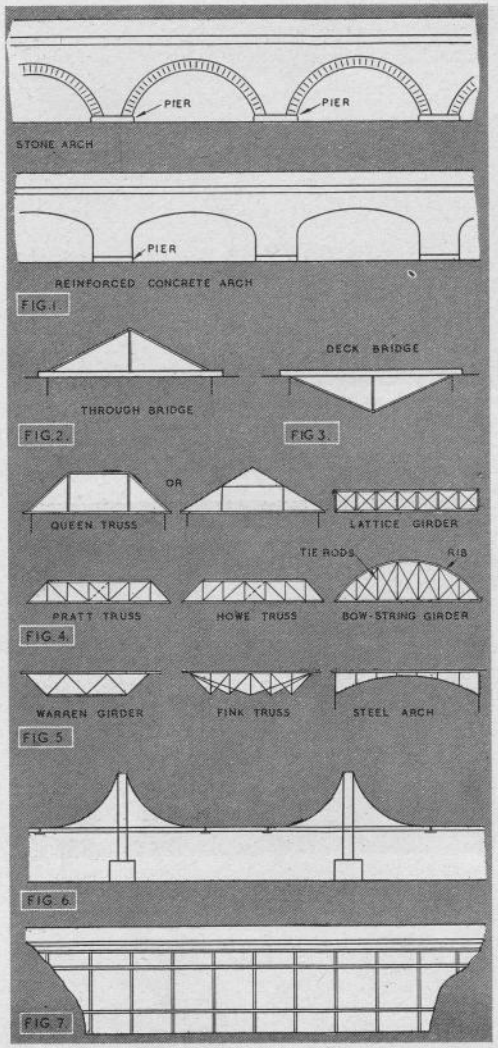
The first major development in bridge design was the introduction of the *arched bridge*, primarily intended to use ordinary building materials such as bricks, but also duplicated in wood. There are numerous stone arch bridges in use today and the principle is still used in modern construction, although the material employed is now usually reinforced concrete (Fig. 1). Arch bridges, in fact, are a definite "type". The first plain concrete arch bridge was built in 1869 to carry the aqueduct of the Paris waterworks.

Steel, however, is the main bridge material of modern times, although very recently use has been



Above and below: Interesting examples of 0 gauge bridges from a continental model railway club's garden layout. A further lattice girder bridge will be noted in the distant background of the upper picture.





made of light alloys of the duralumin type in construction. It was steel which first made possible the use of very large spans. A single span width of nearly a mile, as in the proposed Narrows Bridge, would have been unheard of some thirty years ago, even though large span steel bridges had then been in use for a century. Such is the speed of progress.

Of the basic forms of steel girder bridges, the "through" bridge (Fig. 2), and the "deck" bridge (Fig. 3) are typical. In the "through" bridge the girders rise on each side of the roadway; in the "deck" bridge the roadway runs above the girders. Each is a rigid structure which is supported on piers at each end.

Taking the "through" bridge first there are a number of possible girder arrangements which can be used to secure a rigid structure. A number of these are shown in Fig. 4. The first is a very elementary variation of the original diagram, called a queen-post truss, and suitable for very small bridges, but slightly longer than a simple king-post truss could safely carry. For larger spans a more elaborate system has to be employed, such as a lattice girder of N- or K-truss. The latter is widely used. Another form is the parabolic or bow-string girder, employing a curved rib or beam as a load-carrying member, braced to the horizontal tension member.

Dick bridges can take a similar form and some typical examples are shown in Fig. 5. The arched truss is particularly favoured for moderate spans.

Cantilever bridges are built on the principle that two projecting arms, suitably fixed and counterbalanced, can carry a centre span resting on them (Fig. 6). Joining up a series of such units a long bridge can be completed which is balanced throughout its length. The Forth Bridge is an excellent example of this type of construction. Another, larger, is the Quebec Bridge, over the St. Lawrence River in Canada.

One other basic type of fixed bridge may be mentioned—the *trestle* bridge. Here the roadway is carried simply on a series of trestles built up to the correct height, simpler and less expensive than most other forms of bridge, particularly where a considerable length has to be bridged. Main disadvantages are that the trestle bridge is not particularly attractive in appearance and also it is largely impracticable to rig across rivers or water (Fig. 7).

OUTSTANDING BRIDGES (1928-1950)

Name	Type	Material	Traffic	Largest Span (feet)	Height (feet)	Weight (tons)	Built
GOETHALS, NEW JERSEY	Cantilever	Steel	Road	672	—	—	1928
OUTERBRIDGE, NEW JERSEY	Cantilever	Steel	Road	750	—	—	1928
MARBLE CANYON, U.S.A.	—	Steel	Road	616	—	—	1928
NEWCASTLE-GATESHEAD	Arch	Steel	Road	531	—	—	1928
SNAKE RIVER, U.S.A.	Cantilever	Steel	Road	700	—	—	1928
ROYAL TWEED	Arch	Reinforced Concrete	Road	361½	—	—	1928
WEARMOUTH	Arch	Steel	Road	375	—	—	1929
COLOGNE	Suspension	Steel	Road	1,033	—	—	1929
DUSSELDORF	Steel Arch	Steel	Road	666	—	12,500	1929
AMBASSADOR, DETROIT	Suspension	Steel	—	1,850	—	—	1929
KHARTOUM-OMDURMAN	Warren - Girder	Steel	Road	304	36	—	1929
KILL VAN KULL	Arch	Steel	Road & Rail	1,652	37½	—	1930
MONTREAL HARBOUR	Cantilever	Steel	Road	1,937	162	—	1930
SYDNEY HARBOUR	Arch	Steel	Road & Rail	1,650	60	51,000	1931
GEORGE WASHINGTON	Suspension	Steel	Road	3,500	—	—	1931
SEATTLE, U.S.A.	Cantilever	Steel	—	800	—	—	1931
CAVAILLON, FRANCE	Suspension	Steel	—	1,000	—	—	1932
DANUBE	—	Steel	Road & Rail	528	—	20,000	—
BOONEVILLE, U.S.A.	Lift Span	Steel	Rail	408	—	—	1932
NEW JERSEY HIGH LEVEL	—	Steel	Road	550	—	—	1932
TRANEBERGSSUND, SWEDEN	Arch	Reinforced Concrete	—	594	—	—	1934
NEW ORLEANS, U.S.A.	Cantilever	Steel	Road & Rail	730	—	—	1935
KING ALEXANDER, BELGRADE	—	Steel	—	804	—	—	1935
LA ROCHE GAYON	Arch	Reinforced Concrete	—	528	—	—	1935
BIRCHENOUGH, S. RHODESIA	Arch	Steel	—	1,080	—	1,650	1935
ST. LAWRENCE	Suspension	Steel	Road	1,059	—	—	1935
LITTLE BELT, DENMARK	Cantilever	Steel	Road & Rail	721½	—	—	1935
GOLDEN GATE, U.S.A.	Suspension	Steel	Road	4,200	—	—	1936
NIAGARA FALLS	Deck Truss	Steel	Road	500	—	—	1936
MISSISSIPPI, U.S.A.	Arch	Steel	Road	562½	—	2,640	1936
ST. CHARLES, MISSOURI	Cantilever	Steel	Rail	629	—	—	1936
SAN FRANCISCO - OAKLAND	Suspension & Cantilever	Steel	Road	2,310	—	—	1936
QUEBEC, CANADA	Suspension	Steel	Road	1,059	—	—	1936
TRIBOROUGH, NEW YORK	Suspension	Steel	—	1,380	—	—	1936
STORSTROM, DENMARK	Arch	Steel	Road & Rail	447	—	—	1937
KING GEORGE VI	Lattice Girder	Steel	Rail	336	—	3,400	1937
LION'S GATE, CANADA	Suspension	Steel	—	1,150	—	—	1938
FINDHORN RIVER, SCOTLAND	Arch	Steel	—	470	—	—	1938
BLUEWATER, CANADA	Cantilever	Steel	—	871	—	—	1938
OTTO BEIT, RHODESIA	Suspension	Steel	Road	1,050	—	1,060	1939
BRONX - WHITTESENE	Suspension	Steel	—	2,300	—	—	1939
ESLA RIVER, SPAIN	Arch	Reinforced Concrete	Rail	672	—	—	1940
NEUILLY, FRANCE	Arch	Steel	Road	269	—	—	1940

History & Development of Model Yachts

PART II

BERNARD REEVE M.S.N.R., GIVES DETAILS OF SOME INTERNATIONAL EVENTS AND A SUMMARY OF THE USUAL CLASSES

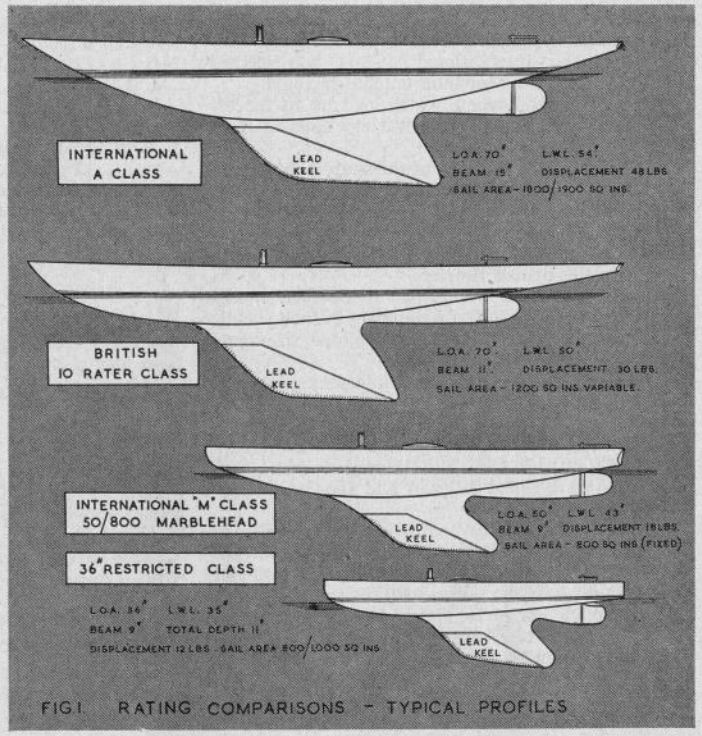


FIG. I. RATING COMPARISONS - TYPICAL PROFILES

As model yachting became more popular so more clubs were formed, and with increasing membership designers and builders began to apply more scientific principles to the design of their craft.

Interest in international events began to awaken and in 1922 Mr. W. J. Daniels, the well-known designer and builder of model yachts, issued a single-handed challenge to the model yachtsmen of America. Ho took his boat *Endeavour* to the States to meet the American defender, Mr. Bull's *Polka Dot*.

Mr. Daniels' model put up a strenuous fight but was eventually beaten.

So much interest was aroused that the proprietors of *Yachting Monthly* put up a 100 guinea challenge cup for future races, and a special formula was evolved for these contests by the then editor Major B. Heckstall Smith. Thus international model yacht races could be said to be successfully launched.

The next year, 1924, a challenge was received from The Royal Danish Yacht Club, and in order to find the most suitable defender for the cup a series of eliminating contests were held between club members in this country which resulted in Mr. Daniels being chosen. A new boat owned by Mr. Scott Freeman named *Invader* was entered skippered by Mr. Daniels who this time was successful.

1924 saw another win for Mr. Scott Freeman with Mr. Daniels once more acting as skipper, this time with another new boat called *Crusader*. In 1925 the States sent a challenge, a boat called *Slipper*, but *Crusader* proved to be the better craft. By his third win Mr. Freeman won the cup outright.

The proprietors of *Yachting Monthly* very generously put up another 100 guinea challenge cup which, in 1931, was made over by a deed of gift to the Model Yachting Association who nominated a Committee of Control chosen to represent International Model Yacht Racing and to decide the conditions under which the cup would be competed for.

Returning to the yearly competitions we find in 1926 entries from America, Denmark and France. Captain F. N. Lazell won for Great Britain with *Defiance*.

1927 saw entrants from America, France, Germany and Sweden. On this occasion the winner of the selection race in England was Mr. R. Jurd with *Gertrude*. This was the most exciting of all the international races to date as, after a terrific struggle *Gertrude* managed to beat the American boat *Bostonia II* by one point only.

It was during this event that the International Model Yacht Racing Association (I.M.Y.R.A.) was formed and the "International A Class" was selected as the principal class for international racing.

So much for the events which lead up to the establishment of model yacht racing upon a firm footing.

Today the governing body of the sport is the Model Yachting Association (M.Y.A.) to which all clubs must affiliate.

Formed in 1911 its objects are to promote, organise, control and encourage the sport of model yachting within the British Empire.

The M.Y.A. keep a register of all class model yachts, and issue registration numbers to such yachts, these numbers being of a predetermined size must be stencilled upon the main sail.

They draw up the rules governing racing and the measurement of yachts; organise National Regattas and International Regattas.

The principal classes recognised by the M.Y.A. are as follows: A Class, 12 metres, 6 metres, 10 Rater M (Marblehead 50/800) and the 36 in. (Restricted) Class.

Fig. 1 is a comparative drawing showing typical profile of the four most popular classes. These profiles are not put forward as specific designs, but merely to illustrate the salient features and differences of each model. The metre classes have been omitted, the 12's because they closely approximate to the A Class and are chiefly used by Scottish Clubs, the 6's because their numbers are rather small.

They are, however, included in the undermentioned description of each class which gives the chief characteristics of each model. Rating formulae of the "A" and metre classes are somewhat complex and are too lengthy to be included in this article. Those of my readers who desire precise information should write to the M.Y.A. Publicity Secretary, Mr. C. V. Hooper, 4 Freke Road, Battersea, S.W.11, for booklets dealing with the subject, price 1/6 each. Rating rules for the other classes being more simple can be quoted almost in their entirety.

I have set out below a table showing the various racing classes of model yachts as now recognised by the M.Y.A. Maximum and minimum measurements are given where applicable as for example in the "A" and Metre classes, where any difference in measurement is taken care of in the rating formula.

Classes	L.O.A. inches	L.W.L. inches	Beam inches	Displacement (Weight) lb.	Sail Area sq. in.
Intl. A	70	49 to 51	15 to 17	48 to 52	1800/1900
Intl. 6m	56	38	11	22 to 24	1100
10 Rater	70	50	11	27 to 30	1200
Intl. M	max. 50	47 to 50	9 to 10	16 to 20	800 max.
36in. Res.	max. 36	34 to 36	max. 9	max. 12	800/1000

As already mentioned the M.Y.A. keep a Register of all yachts owned by members of affiliated clubs, and at the end of 1950 these numbers were:—

International "A" Class — 617. International I.Y.R.U. 6 Metre — 609. International I.Y.R.U. 12 Metre — 270. British 10 Rater — 1134. International "M" Class — 382. British 36 in. — 660.

Let me elaborate on the bare statistics given above.

1. The International "A" Class

This is the largest class and its weight usually calls for two men to handle and transport it. Its rating rule is a complex one and too lengthy for quoting in full, but as I have stated earlier full details are available from the M.Y.A. Publicity Secretary.

The formula is as follows:—

$$\frac{L + \sqrt{S} + L\sqrt{S}}{12\sqrt[3]{D}} = \text{Rating}$$

Where L = Load Water Line in inches plus half any excess in Quarter Beam Measurement.

$\sqrt{S}$ = The square root of the total Sail Area in square inches measured in accordance with the International Yacht Racing (I.Y.R.U.) regulations

D = The cube root of the displacement of the model in cubic inches, in full racing trim with the largest suit of sails, including spinnaker or other running sail.

There are many limits and penalties which space prevents quoting as already stated.

2. The International I.Y.R.U. 6 Metre Class

These are scale models of full-sized craft at a scale of 1.2/3 inches to the foot. Lighter than the "A" Class but excellent sailers. A typical example would be:—

L.O.A. 60 in., L.W.L. 40 in., Beam 10 in., Weight 26/29 lb., Sail area 1,100 sq. in. variable).

They are rated under the I.Y.R.U. Rule which again is a complex one. The formula is as under:—

$$\frac{L + 2d + \sqrt{S} - F}{2.37} = \text{Rating}$$

Where:—

L = Length in linear inches. d Girth difference in linear in. $\sqrt{S}$ = Sail Area in sq. inches. F. Freeboard in linear inches.

3. The International I.Y.R.U. 12 Metre Class

This class is also rated under the I.Y.R.U. Rule and they are scale models of the full-sized boats built down to a scale of 1 in. = 1 ft. As shown in the table above there are only 260 registered with the M.Y.A., but a typical example would measure 70 in. overall, 48 L.W.L., 11½ in. beam, displacement 40 lb., with a sail area of 1,800 sq. in.

4. The 10 Rater

This is one of the oldest classes (1887) and the rating formula is a simple one being $\frac{L \times SA}{6{,}000}$ where L equals the length on the water line and SA the sail area; referring to table above we get the equation 50 x 1,200 ÷ 6,000 = 10, i.e. a ten rater. There are no restrictions as to Centre-boards, Bilge-boards, or Lee-boards and Bulb Keels. There is no limit to height of Rig, or Fore Triangle hoist above deck. Batten limits for mainsail are restricted to four, the upper and lower ones must not exceed 5 in. in length, and the intermediate ones 7 in.

There are no restrictions as to materials or weight of spars, and bent masts, rotating or bi-pod masts are allowed.

This briefly sets out the salient points of the 10 Rater rating rule.

5. The "M" Class (50/800 Marblehead)

This class is steadily gaining popularity in this country. Originally designed at Marblehead in the U.S.A., this model gives a certain amount of scope or latitude to the designer as the rating formula is: Hull not to exceed 50 in. in length; Sail Area not to exceed a total area of 800 sq. in., thus 50/800. The following are prohibited:—

Movable Keels	Bilge Boards
Metal Fin Keels	Bowsprits
Centre Boards	Overhanging Rudders
Lee Boards	Movable Ballast.

Sail battens are limited to four and must not exceed 4 in. in length. Apart from these restrictions the rest of the rating rules closely follow those of the 10 Rater Class.

6. The 36 in. (Restricted) Class

This is the smallest class registered by the M.Y.A., and is for use on restricted waters or for juvenile use. Nevertheless it is a fine model and in spite of its size is capable of putting up a really excellent performance.

Its method of measurement was proposed by Mr. Stansfield Hicks some thirty years ago, and was known as the "Cuboid Rule". This rule is one of the simplest of all rating formula: the dimensions shall not exceed a length overall—including bowsprit if fitted—of 36 in. Beam 9 in.; Depth 11 in.; and total weight in full racing trim, including the largest suit of sails, spars, spinnaker and rudder, 12 lb. As will be seen this rule allows great freedom of design and although a forward transom is prohibited the modern 36 in. hull is usually designed so that the L.W.L. is approximately the same length as the overall length; reference to Fig. 1 will show a boat of this type.

Distinguishing Marks on Sails

The M.Y.A. allot a Registered Number to all models registered and this, together with a Class Mark, must be stencilled on both sides of the main sail in black. The position shall be mid-way between luff and leach at about two-thirds of the height from boom to peak. Owing to the transparency of the sail the marks shall be at different heights to avoid showing upon each other.

In I.Y.R.U. and International A and M Classes the Registered Number must be preceded by the distinguishing National Letter "K", but the 10 Rater and 36 in. Class do not carry this letter.

These class letters and numbers are of a predetermined size and the M.Y.A. have stipulated in their regulations that these sizes shall be as follows:—

Class Marks	Height	Width of each item	Thickness	Spaced
A. 10R. 6M M	1in.	¾in.	¼in.	¼in. between item
Registered Numbers				
A. 10R. 6M	3in.	2in.	½in.	½in. between figures
M	2½in.	1¾in.	⅜in.	½in. between figures
36in. Class 1½in. high for number; ¾in. high for class mark.				

Example:

A	6m	12m	M	10r	36in
K.620	K.610	K.280	K.380	1150	700

The bar dividing the letters and numbers to be ⅛ in. thick.

Selecting a Model

My advice to the prospective model yachtsman is to join a progressive club and learn all you can by "crewing" or acting as mate to an experienced skipper, before actually buying or building a model.

You will find that practically all model yachtsmen are only too willing to do all they can to help a new member and even the raw novice will gain much valuable experience in watching a skipper and mate in action. When you have learned the rudiments of model yachting and handling ask a fellow member to take you on as mate not for an important competition but during a tuning-up trial. Keep your eyes and ears open, do as you are told quickly and without question, and you will soon be welcome to the "crewing pool".

When practical experience has been gained it is time to think about acquiring a boat of your own. I suggest you put yourself in the hands of one of your club mates and take advantage of his knowledge and experience in helping you to select a suitable craft.

If your club caters for the 36 in. class you should consider acquiring one of these boats for a start. If you want something a little heavier there is the M 50/800 or the 10 rater, but do not buy a boat which, as a class, is not raced by your club. Personally, I consider the I.Y.R.U. classes and the "A" International quite unsuitable for the beginner. True they are magnificent craft and are a joy to handle, but they are for the experienced man so keep off them for the present.

There is nothing against a second-hand boat provided she is sound and has no vices. You will get an awful kick out of repainting the hull and overhauling the gear during the winter, so don't worry about appearances if the model has a reputation for good sailing. To buy a boat with a wrung keel or other built-in fault will soon disgust you with the sport for such a craft can never perform satisfactorily, hence my advice to put yourself in the hands of a fellow club man and really heed his advice. Chromium plate and glossy enamel does not make a sailer out of a dud hull.

Building Your Boat

If you are a man of average skill and can use simple wood working tools there is no reason why you should not build your own model. Select one of the lighter classes for a first effort and buy a design from the board of a designer of repute. There are not many such designers but their boats can sail. Daniels, Littlejohn and Tansley can be relied upon to produce first class designs, to mention but three of our leading men.

(Part III will cover some of the author's own ideas on future design and thoughts on radio control for model yachts.)

Improving the Miniature Railway Layout

H. A. ROBINSON DISCUSSES STRENGTH AND CONTINUES CLOCKWORK TRAIN CONTROL

Make it Strong!

A STRUCTURE is said to be rigid when it does not "give" or "sag" no matter from what angle it is pressed. This state of rigidity should be aimed at in models, woodwork articles (e.g. cupboards, stools, etc.), and indeed in all other constructional efforts.

In the main, rigidity is not given by increasing the number of nails, screws and bolts used, but by following certain very definite laws of strength, which when once grasped can be applied to all structures from a pen rack to a greenhouse.

Rigidity also is not given by having the various parts thick and heavy, for it is only the outer "skin" of any member that is doing the work of supporting, holding, or whatever is its job.

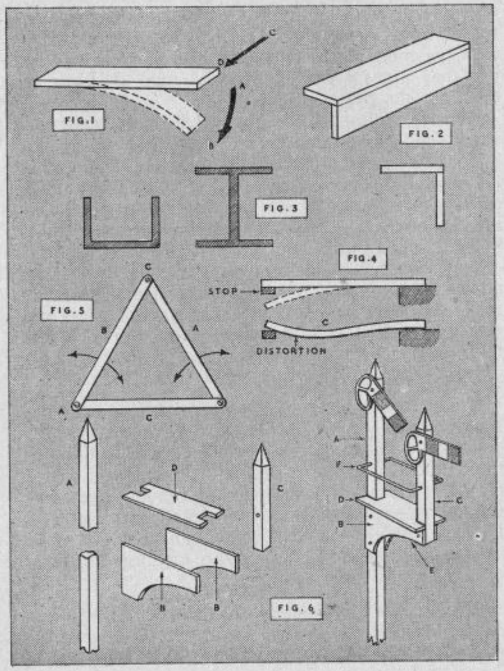
Thus a hollow cylinder is just as strong as if solid throughout, and a girder that is built up of an upright and two perpendicular plates is as rigid as a solid piece of material of the same dimensions—in fact more so.

To explain just why this is would take too long here; it is sufficient to say that careful experiments have shown that a certain amount of the metal in most regularly shaped and solidly cast articles is lying idle, that is, taking no stress or strain. This surplus material may be doing definite harm as it has weight, which has to be supported somehow, and this imposes unnecessary work on other and more useful parts.

In very small structures it is often easier, and takes less time to put in a solid part rather than build up a lighter, but scientific one, hence solid members are often employed in models when their use would be inexcusable in bigger work.

But to get to the laws of strength. In the main they are very simple, falling under two headings: (1) Those which, if applied, stop bending, and (2) Those which stop turning.

All members in a structure either tend to bend or turn, and so clearly should this idea be appreciated that testing everything for "bend" or "turn" should become instinctive; also the remedies for these troubles should become very clear as time goes on. Both tendencies can be checked by putting in another (generally very simple) member or fastener, *just at the right place*. It is the instinctive knowing of the "right place" that shows the born engineer. However, much can be learnt by persons not so naturally talented.



First, take bending. A thin piece of wood or metal tends to bend about one "axis" but not about the other. The sketch (Fig. 1) makes this clear; bending would take place with this slat of material as per the arrow AB but not as CD.

Now every two pieces like this can be made to give a rigid bar by using one to counteract the bending tendency of the other, which is done if they are secured as Fig. 2 edge to edge. A member so built, within reasonable length will not bend vertically or from side to side, as each part would be trying to do so against the rigid axis of the other, and the composite member is as strong as a solid strip of similar dimensions.

In actual engineering, further developments of the principle which give greater or lesser degrees of strength from various directions, are given by the sections as Fig. 3 which are standard for girders.

If, therefore, any member in your work bends, try and insert a piece edgeways along the faulty member and the trouble will go.

Bending, if the piece in question is not too long, may be prevented by a "stop" of some sort, as far from the point of bending as possible (as Fig. 4), but this may give distortion as 4c. The only scientific way to counteract bending is by the edge piece. Please remember this.

Now with regard to turning and twisting. This is the tendency of any member, or set of parts, to rotate about a fixed point. Again this can be prevented by placing a "stop" as far from the point of rotation as possible, as this means that the stop will not have to do so much work and so can be of lighter construction, also it will be more efficient in eliminating the unwanted movement. It is really the same principle as the lever, the effort necessary to prevent or cause turning being steadily less the further from the point of rotation it is applied. To test this, try the time-honoured experiment of closing a door pressing only a few inches from the hinges. It will be found almost impossible, but easy when you press on the handle, 3 ft. further out.

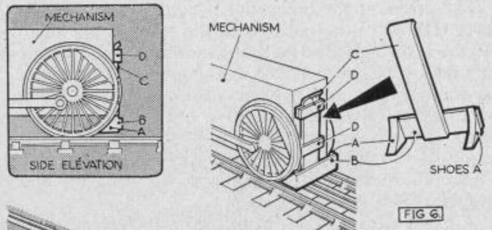
The triangle is a good example of this principle (Fig. 5). It is the most rigid structure known. Any pair of members alone would tend to turn as shown, a and b about A, b and c about B. When all are linked up, however, C checks the turn of a and b (and is as far from A, the centre of rotation, as possible) b checks a and c, and a checks b and c. Result —absolute rigidity.

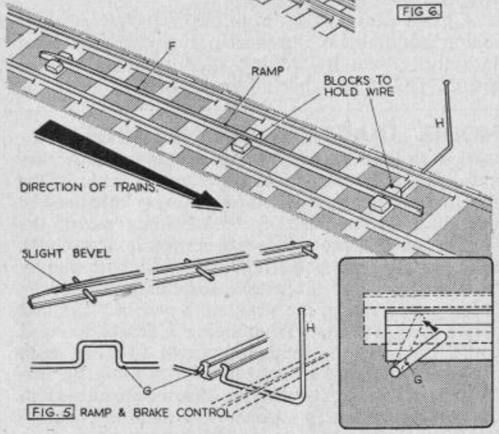
Hence, therefore, if some part of your work tends to rotate, find the point about which it seems to turn, then going straight out from this point (as the spoke of a wheel) find some part of the turning section as far away as possible from this centre and secure it in some way to a definitely firm part.

Or rigidity might be obtained by linking the moving part with some section that was tending to rotate in the opposite direction. And here again is where the true art of engineering comes in, the linking and balancing up of the various tendencies, so that they counteract one another.

Consider the signal gantry (see Fig. 6) which was built by the writer to demonstrate how quite thin pieces of card and very few fasteners could be employed to make a rigid structure if put together scientifically. A is the main post—it could have been hollow or lattice. B is two thin pieces of card which by themselves bend from side to side even when the short post C is put in (and held by one pin), but this is checked by the horizontal piece D. A small pin pushed through to B keeps it from rising.

All is now rigid except the post C which rotates about the one pin E. This rotation is stopped, however, by the wire rail F. The finished article can be pressed in any direction without the slightest sign of bending or turning, and so by following these elementary rules becomes, with the simplest of material, a perfectly rigid structure.





Clockwork Train Control *(Continued)*

A second method of clockwork train control is shown in Fig. 5. Here we have a ramp located between the rails which lifted engages with a bar under the locomotive, that in its turn presses two small brake shoes against the rear wheels. This is a good method for the ramp can readily be operated from a distance and as little or as much retardation as required can be brought into play — a full stop being produced if desired.

Furthermore with the lowering of the ramp the train automatically starts again.

This sort of control is rather harder to fit up and the method by which the shoe arrangement can be put on a locomotive depends greatly on the size and shape of its mechanism. A simple brake, however, is shown in Fig. 6. The shoes (A) are soldered to the arm (B) which in turn is fastened to the upright (C). By two bands (D) on the back of the "mech" this fitting is hung so that the shoes come up on the bottom arc of the rear drivers and the crossbar (B) only about $\frac{1}{16}$ in. above rail level. The whole brake must slip readily up and down in the bands (D).

Now for the ramp. This is a length of rail (F) anything up to 18 in. long. It is bored at three points to take the cranks (G) and bevelled off along its upper edge for about 8 in. at the end at which the trains will enter.

The crank at the other end is continuous with the lever (H), and it is by this that the ramp is operated. As the lever is moved over the cranks rotate and the rail rises—the inset sketch making the action clear. By the bevelling and its general design the ramp will be found to give more positive braking the further along it the train proceeds, which is exactly what is required—a steadily increasing brake application. The rail's most positive action is up near to, and over the lever crank.

A usual wire is taken from (H) to the lever-frame, and a little latitude and resilience can be introduced into the system by putting a coil spring into the length. This means that no matter how violently the ramp is brought up there can be no jerky stop. The right strength of spring is important however, and this has to be found by trial and error. If anything it should err on the too strong side, for if too weak it will make the ramp only partially operative.

The cranks themselves are secured to the sleepers with small strips of wood or metal taken over them and pinned down, a groove being made to take the wire. This method of fixing it will be found makes quite a satisfactory bearing.

If more convenient the lever (H) can be turned down instead of up, and taken through a hole in the baseboard, the connections to the lever-frame then being on the underside.

MODEL TRACTION ENGINE WHEELS

(*Continued from page* 335)

used to drill all the holes for the rivets in the strakes and afterwards these holes were countersunk. In the full size wheel a rivet is left out in every other strake and the hole is utilised for the holding pin of the spuds, and this practice was followed in the model. It was found that each strake had to be bent slightly to fit the curve of the wheel, and this was done by holding each end of the strake in a pair of pliers and giving a slight twist. After doing a few I found I could give just the right amount of twist on each occasion. The strakes were held in position by two toolmaker's clamps whilst the holes were drilled in the wheel for the rivets which hold them in position. Riveting the strakes into position was a long and tedious job, and I was glad when it was done.

The hub caps were a simple job and were turned out of mild steel. The wheel was given a good wash in hot water to get rid of any traces of "flux" used in the soldering operation and after cleaning up it was ready for the coat of priming paint; $\frac{1}{16}$ in. rivets were used throughout, and although this is rather under scale the finished wheel looks very realistic.

The front wheels were completed in a very similar manner. The rim in this case was a mild steel forging, the "T" portion and the tyre being turned from the solid.

Mr. F. G. Bettles, of Taunton, a famous maker of traction engines, gave me much useful advice on the method of building, and I am extremely grateful to him. Now remains the very many other bits and pieces which go to the making of a traction engine, and when time permits it will be full steam ahead again on this, which to my mind, is the most fascinating of models.

EMBOSSING PHOTOGRAPHS

(*Continued from page* 340)

The art lies in gentle but confidently applied pressure to the pulpy mass and later in giving certain parts, as ridges in stone, noses in portraits, folds in dresses, rather more prominence, always bearing in mind the general rule that highlights should stand out but shadowed areas lie further back.

While the general embossing is done pressing down on the solid piece below, final touches can be given with advantage with this removed, and the print and mask held in the hand, working from the back, but at the same time inspecting the front continually to see the effect. Held thus, very marked ridges can be given strong relief by pressing heavily on the back with a blunt instrument or even the finger nail, if the face of the print is supported by the flat of another finger to prevent the paper breaking through.

When at length the relief is completed the print, still clamped in the frame, is put on one side to dry. As the moisture leaves it will be found that the blotting paper stiffens, and when complete drying has taken place it, together with the print, will become as hard as a papier-mache mask, and the relief will be permanent.

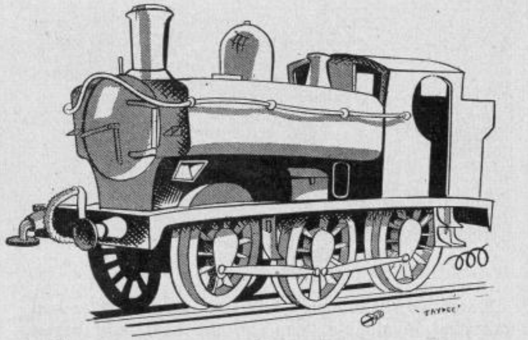
Final drying having taken place (and not before), the print is carefully trimmed and then mounted on a suitable rectangle of card running the adhesive round the outer lip only. A glue, and not a mountant should be used. The picture is now finished and viewed, particularly in a side light, some striking effects can be obtained.

It is interesting to note that sets for embossing prints came out just after world war No. 1, consisting of special tools, prepared paste, frame and clips, with full instructions on how to "make every photograph stereoscopic by a simple and reliable method of embossing at a minimum cost". The sets were marketed at 10/6 and 5/6, and went by the name of the "Releefoto Process".

In the Beginning

BY A. J. EDMUNDS

Our article on making a "Royal Scot" has produced this lighthearted contribution on the struggles of a novice railway modeller. Nevertheless our author who is a professional electrical engineer manages to provide no little practical assistance to others in a similar position without his special knowledge.



" . . . a parody of a locomotive . . . "

AFTER some years of making flying model aircraft it suddenly became a major domestic problem to accommodate an inquisitive small son and the current fragile model in the same house.

Small son could not be persuaded to take any interest in aeroplanes, so the inevitable happened and model making ceased. Now this state of affairs could not be tolerated, and much thought led to the conclusion that railway modelling might be a fair compromise.

Of course, many very logical arguments were put forward to enlist wifely sympathy for this new project; no more balsa dust, no more horrible smells of diesel fuel, etc.; but no doubt it was transparently obvious that two small boys wanted to play trains.

A start was made on a small kit to build a locomotive, the grotesque and lovable G.W.R. 57XX Pannier Tank. Fortunately, soldering had formed part of my regular occupation, so the thing went together all right, but what an appalling number of things I did not know about railway engines, and brass filings were even less popular than balsa dust.

Should the loco operate on two-rail, or three-rail system? That it should be electrically powered was a foregone conclusion since electricity is my trade.

I had by now discovered that the loco body was 4 mm. to 1 ft. scale, and therefore 00 gauge, such finer points as to whether it should run on 16.5 mm. or 18 mm. track were not appreciated at that time, so by chance it was fitted up for 16.5 mm. two-rail.

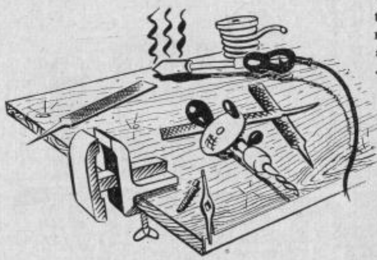
The great day came when 57XX could be test run on a few lengths of ready-made track. It ran, as no loco ever ran before, uncertainly, jerkily, cheered on and occasionally pushed by small son, but it ran, and enthusiasm knew no bounds. From now on we were railway modellers.

Of course, 57XX was then barely a parody of a locomotive, no part of it was painted, its connecting rods either clanked dismally or bound up tight, the ancient and decrepit motor that powered it made enough noise to drown all conversation, and its six wheels could not all be persuaded to touch the track at the same time. But such minor troubles were gaily written off as incidental.

The superstructure, which really looked quite good, was tenderly packed away, and a new set of frames produced to make the wheels behave. The most careful marking out seemed inadequate, so a drilling jig for frames and connecting rods was the first job. Here an engineer friend with a workshop, helped considerably, and soon 57XX stood squarely on six wheels and possessed connecting rods that moved sweetly.

Then came the question of a motor, cash being short and motors expensive. That noble institution "swop", beloved of model makers, solved the problem, and a Zenith 004 was exchanged for a "diesel" aero-motor. More very careful cutting and filing of our precious main-frames, and at last a "mechanism" (horrible term) that ran silently, smoothly, and with surprising power. This time our track tests were much more impressive, but not perfect by a long way. We were about to learn of the intricacies of "pick-ups". These had so far been pieces of phosphor bronze wire rubbing on the rails, but, oh! how they squeaked! Occasionally, too, they failed to contact properly at a certain speed; this was found to be due to the resonance set up in the spring wire, and was cured by short pieces of rubber sleeving slipped over the wire. Of course, it was later discovered that hard nickel silver wire pressing on the wheel treads did not resonate or squeak, but at that stage we learned everything the hard way.

" . . . it ran, as no loco ever ran before, uncertainly, jerkily, cheered on and occasionally pushed by a small son . . . "



". . . our total equipment, was, and still is . . ."

Later we remembered how the *Aeromodeller* had provided invaluable "gen" in the past, and began furiously to study sundry publications on railway modelling. Naturally, we found that we had done nearly everything wrong—that our beloved 57XX was only very approximately a scale model, and that generally we were only feeble imitations of railway modellers. However, we had a respectable loco that would work, and we had made it, so who cared?

It will have been obvious throughout this account that we had no proper workshop, but it may be interesting to describe what we had. Our total equipment was, and still is, a 36 in. by 24 in. drawing-board, a small clip-on vice, drill brace, drills, taps, files, and soldering equipment.

The workshop any corner of any room in the house where we might reasonably hope to work in peace.

The next snag we found was that bare brass cannot be successfully painted with cellulose paints, but Mr. J. H. Ahern provided an answer, lightly varnish first. Another answer, not available to everyone, is to have the structure electro-tinned. Brush painting is not easy, but it can be done with a relatively slow drying paint and a really soft brush. The result does not compare with spraying, of course, but most railway engines are not so immaculate that perfection is necessarily realism.

Now we mentioned earlier, a certain ancient motor, in fairness to its maker, it was ancient and had obviously suffered much use and abuse in the past. But it remained in the junk box a silent reproach and a challenge. After all, if the intricate electrical devices which bring our daily bread could be mastered surely one small motor could be persuaded to behave.

Dismantling and checking over brought encouragement. The armature, commutator and spindle were sound; the bearings and brush gear were hopeless.

The bearings consisted of 4 B.A. brass screws with recessed ends to take the conical ends of the spindle. Said recessed ends were worn to curious shapes and offered large bearing areas to create friction.

A search of the junk box produced steel grub-screws (from radio knobs), with ready-made recesses in their ends. Carefully polished with a pointed piece of hardwood and carborundum paste they made excellent bearings, and the armature ran smoothly without shake and with much less friction.

The original brushes consisted of rolled-up copper gauze soldered to brass arms, and they seemed to cause very considerable friction. As a first step the spring pressure was drastically reduced and this at first appeared successful, but it was later found that the motor would not run really fast. After much thought it was decided that the brushes were "floating" above a certain speed, due to the commutator not being truly round. This lack of roundness could not be cured by skimming as the commutator was a fabricated one, not a moulding.

The only remedy appeared to be to restore the brush pressure, but to use brushes of less area and different material in order to reduce friction.

Various ideas were tried, but all failed for one reason or another. Copper blocks caused whistling noises, carbon brushes worked well, but were too difficult to fix to the brass arms.

Then one day the domestic sewing machine motor needed new brushes and the old ones provided the answer; they were apparently electrolytic graphite, but much more important the outer ends were heavily copper plated and could consequently be soldered to the brass arms. These old brushes were filed to the required size, soldered in place, and soon our ancient motor was decrepit no longer. It hummed joyfully, and showed every sign of beginning a new lease of life.

Perhaps these adventures and mistakes of a beginner will cause the experts to snort indignantly that they should be discreetly hidden, but perhaps some other beginners will find solace in reading of someone else's troubles and even a little help in solving their own problems.

A NOVEL METHOD OF BODY BUILDING

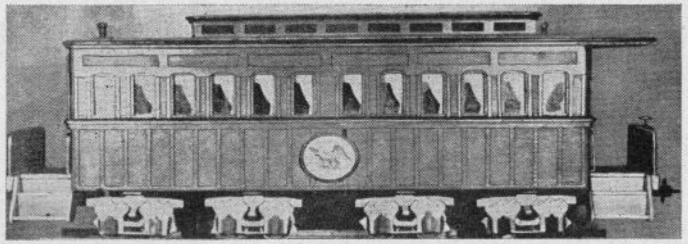
continued from page 372

the surface of the body already has a liberal coating of solder.

The final stage is to fill in any dents with ordinary metal stopper obtainable at most garages. I use grey Belco metal putty. This has an acetate base so one must not use any oil paint over this when finishing. Also, when using Belco, only use it in thin layers as it tends to sink when drying and consequently will be able to dry quite quickly if done thinly. If there is a big dent to be filled in, apply several layers of Belco. This is, in itself, best lightly rubbed down with fine wet emery so as to leave no scratches, and give a perfectly smooth finish ready for painting.

Now, you fellows, let's see some metal bodies! It is far easier and much more satisfactory than hollowing out the centre of your wooden ones, and stronger too. It won't warp or crack, and is easily repaired should it come by any rough treatment.

Lincoln's Car



PRESIDENT Lincoln's special railway carriage — or car, as the American's term their rolling stock — had a most unfortunate history. Started in 1863, it was eventually completed in February 1865. The President was expected to make his first trip in the car on April 14th of that year, but on that very day he was assassinated. As it was, the first trip it made was to take his remains from Washington, D.C., to Springfield. Subsequent to that it was bought by the Union Pacific Railroad and used as a business car for their directors—the first business car to run on any railroad.

Unfortunately, it proved too cumbersome, and was eventually sold in the early seventies to a Colorado railway company. Later it was bought back again and converted into a construction outfit wagon. Retired in the late nineties it was on exhibition at the Chicago World's Fair in 1903, from whence it was installed in a park in Minneapolis as a relic. It was finally destroyed by fire in 1905.

Design and construction of the Lincoln car was in the hands of B. P. Lamason, superintendent of the car department, United States Military Railroad, at Alexandria, Va. Framing was similar to that of cars on the Pennsylvania Railroad at the time. It was 42 ft. long inside, and had a raised roof with circular ends. The interior was divided into three compartments—drawing room, state room and parlour, with luxurious appointments.

The outside of the car was painted chocolate brown with a white upper deck. On each of the panels on the upper deck was painted a coat of arms from one of the different States in the Union. An oval panel on the side was painted with the U.S. arms.

As the picture shows the car was mounted on four bogies, but this was something of an afterthought. The original design called for two bogies and the car was almost completed in this form before it was decided that four bogies would give smoother running. Wheels were of cast iron, 33 in. in diameter, each bogie being 4 ft. 10 in. long.

Armchair Draughtsman

HAVE you ever tried to illustrate by means of rough diagrams, a complicated piece of gadgetry to a disbelieving friend, and found that he couldn't make head or tail of your weird squiggles? Or have you ever, when taking dimensions and sketches from a prototype longed for a board and tee-square that would go in your pocket? Or ever discovered how cosy is that nice deep armchair by the fireside when you have to leave it to do some drawing? If so, some at least of your troubles may be cured by a new and very ingenious instrument marketed by "The Quickdraw Co.", which solves all these problems.

Basically, the "Quickdraw" comprises a "Perspex" template attached to, what is, in effect, a pantograph of similar material, mounted on a light board contained in a folder. The pantograph, mounted at the top left hand corner of the board, ensures that horizontal or vertical lines, etc., may be drawn parallel with one another, no matter what position the template occupies. The template is precision cut to produce angles of 30 deg., 45 deg., and 60 deg. in addition to the horizontals and verticals.

The folder is backed with rexine, and the cover includes a large pocket on the inside, in which spare paper, notes, etc., may be kept. The maximum drawing size is 13 in. x 10 in., and the folder measures 14 in. square overall.

Constructing a 5 c.c. RACING ENGINE Pt. II

Continued from last month by
G. M. BARRY

Part No. B5/9. Gudgeon Pin

The gudgeon pin is made from mild steel, cyanide hardened. Chuck a piece of round bar, .218 in. dia., in 3-jaw, leaving .7 in. length out. Turn this to .1875 in. dia. and finish to dead size and a very high polish with smooth file and emery. Chamfer end .025 in. at 45 deg., and drill .062 in. dia., .650 in. deep. Part off—reverse in chuck, and face off other end to make pin .6 in. long. Chamfer same as other end. Pin may now be taper reamed, from either end—so that tapers meet at middle. This is not strictly necessary, but gives the greatest strength for the least weight. Cyanide harden, .010 in. to .015 in. deep. This completes gudgeon pin.

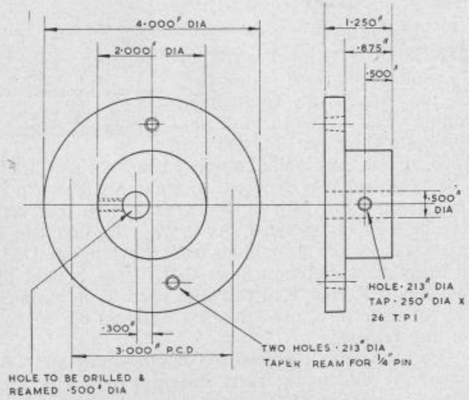
Part No. B5/8. Rotary Valve

The rotary valve I propose to use, is a combination of rotary disc and shaft type. Apart from one doubtful feature, necessary to the design, I am of the opinion that it will offer some improvement over the more normal types. The doubtful feature is, of course, the size of shaft necessary to accommodate the inlet passage. However, I offer it as a possible improvement, and one which may easily be replaced by the normal disc type, if thought desirable.

I have specified mild steel, case hardened, as the material. This is rather heavy and I would much prefer to use dural but, until I have done some test running, I am not willing to recommend a light alloy. So let it be steel. I again made a simple jig for this job, and I think it worth while to go to this trouble, unless one is a very skilled machinist, or has other ideas on how to do it.

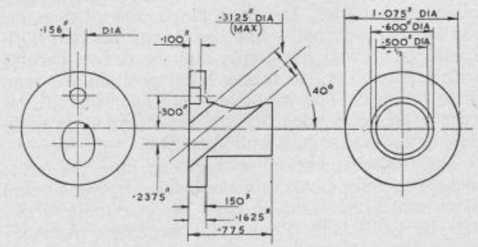
Chuck a piece of 1.125 in. dia. bar in 3-jaw, leaving 1.0 in. out. Turn to 1.075 in. dia. for about .800 in. long. Turn to .500 in. dia. for .6125 in. long, turn .025 in. thick shoulder, .600 in. dia., and face off back of disc Polish to super finish, especially on shaft and shoulder, using emery. Part off .775 in. long. Chuck by shaft, using packing to avoid marking shaft. Face off disc to .150 in. thickness, and get as good a finish as possible. Remove from chuck, and scribe two centre lines lightly across face, at about 90 deg. to each other. From this centre mark off, along one of the lines, .2375 in. Very carefully centre pop. The piece is now ready for drilling the inlet port, and the simple jig to be described should be made for this operation.

Obtain a piece of mild steel (or brass or dural) bar about 1 in. square and 2 in. long. Clamp this to topslide of lathe, with topslide set at 0 deg., with long side of bar parallel with axis of lathe, and centre of bar approx. on centre line of lathe. (I should have mentioned that end of bar should be fairly true and



SKETCH OF CRANKSHAFT JIG (ALUM ALLOY)

flat.) Put .5 in. dia. drill in chuck, and drill bar about .7 in. deep, very carefully, to keep hole to size. Remove topslide complete with bar, from lathe, and drill .213 in. dia. hole in top of bar about .25 in. from end of bar, to break through into .5 in. dia. hole. Tap cross-hole .25 in. dia. B.S.F., and fit with grub or set screw, preferably of brass, to avoid marking shaft. Replace topslide at 0 deg. Put valve in hole in bar, and position, so that scribed line is on lathe centre height. Check by centre in head stock or by scribing block on bed ways. Clamp valve by clamping screw. Swing topslide through 50 deg. and clamp in position. By cross traversing, position piece so that centre pop is true with lathe centre. Chuck a .3125 in. dia. (or slightly smaller) end mill, and carefully mill right through valve and block. If you have marked out and set up correctly, the port will be correct, but if not, it's more than likely that you will scrap the piece. So it's well worth while making sure of every setting before starting to cut. Remove valve from bar, examine, and if correct to drawing, remove burrs from hole and polish with fine emery. If not



PART Nº B5/8 ROTARY VALVE (TYPE A) DURAL OR STEEL

correct, you can either start again, or decide to use a normal disc type! This is, to me, one of the trickiest jobs in the whole construction, so do take time and pains. I found it fairly simple, but maybe I was just lucky! I need hardly add that the block can, in future, be used as true jig, if any more valves have to be made, by reversing the block, and starting milling or drilling through hole where mill broke through. This eliminates the necessity for marking off the valve blank.

All that remains to be done is to make provision for the drive. For this use the crankshaft jig on the faceplate. Position jig with taper pins and clamp. Put valve in hole and position so that centre line on face is on lathe centre line, and with port passage away from centre. Check position by cross-traversing. Chuck a .156 in. dia. end mill in tail stock chuck, and mill hole .1 in. deep in valve face. Polish face, remove from chuck, and valve is complete, except for hardening. If this setting up has been correctly done port and drive pin socket will be in line, at 180 deg. to each other. Any discrepancy will vary inlet timing of engine.

(*Part III of this series will appear in the June issue.*)

Readers' Letters

Dear Sir,

May I refer you to the vice clam mould described on p. 159 of the February issue, and suggest that some readers who make this useful accessory will have the same trouble as I had, viz. the cooled clam refuses to come out of the mould, even when Part B is completely removed.

In theory the clam is slid out longitudinally—but in fact it won't budge—the thicker the clam the greater the difficulty.

My cure was to fix one retaining piece, with a pair of bifurcated rivets and the other with a pair of small screws having counter-sunk heads—the heads absolutely flush with the surround—all four heads of course, inwards—and tails on the outside of the mould. On removing Part B and the retaining piece from its pair of screws the clam comes away clearly and only wants the ends trimming up.

Incidentally, Part B is quite satisfactorily held in place by an encircling piece of soft wire—the clamp is unnecessary.

Also incidentally, it is less tedious to sit the mould vertically on a smoothed-over chunk of Pyruma cement, slightly built up to hold it securely. This serves to seal the lower end and it is not necessary to spend extra time on getting the components levelled off to obviate leaks, nor drill and tap holes.

In the same way, I use a smear of Bostick to seal Part B. I cast four clams without renewing the Bostick or disturbing the cement "floor"—in quick succession.

The new series of the *Model Maker* is great value.

J. W. G. BROOKER.

Dear Sir,

Whilst reading my copy of the *Model Maker,* I came across a name that had a familiar ring, and after much speculation it occurred to me that C.W. was the chap who hadn't written to the Editor lately!

Firstly, I thoroughly approve of the change to include all forms of modelling. It may eventually guide model "carers" back to the paths of righteousness from which they have strayed too far.

Mr. Boddy tempted the fire with his fingers and was gently frizzled, but I feel that between him and the Editor exists the right attitude to the hobby!

When an opporunity occurs I should like to put on record some of the following points.

1. Model car builders must eventually get into step with other branches of model making. That is—to strive for accurate representation and spirit of the subject. This is apparent in other branches. The model train fraternity are now finding electricity the most expedient form of power, and are producing really first rate engines and stock, etc. Electricity is really more consistent with scale as regard model cars.

2. Battery Electric Cars. To my mind this is a very important form as regards Scale Model - Scale Speed. The difficulties mentioned in your Ed. Comment are, after all, only spurs for achievement. Today motors are smaller and accumulators and batteries are available to assist progress.

Battery electric models can be built and worked almost to scale down to smallest visible detail. The model is self-contained, self-sufficient. Costs are more near to funds available to the small boy—whom we must not forget! In practice, an electrically driven scale model will achieve a cruising speed of, say, about 40-50 m.p.h.—before any wizardry is applied. The run is longer than clockwork and automatics can be applied ad lib. The all-out speed attitude is comparable to an orgy from which we must break free to gain the greater pleasures of restraint!

3. *Grouse.* The best model car available on the market today is the Schuco, made in Germany, and priced 3/6 in 1938 (now 26/- odd). Ten years of British progress! Second is the "Mighty Midget" electric racer. Cannot some forceful argument be put to manufacturers at least to try to better this? Production models are the foundation of all branches of sports and hobbies. Cannot they challenge the success of gauge 00 products?

I think that good power driven scale models, complete with wire wheels if necessary, could be produced and would sell at about 21/-.

Why should a car with one body and four wheels be any more difficult than a railway engine, not to mention complexity of accessories? We are truly censured by commercial models built in the past (Citroens, etc.). Yours sincerely,

Hounslow, Middx. C. WOODLAND.

A novel method of Body Building

BY G. B. McSTEA

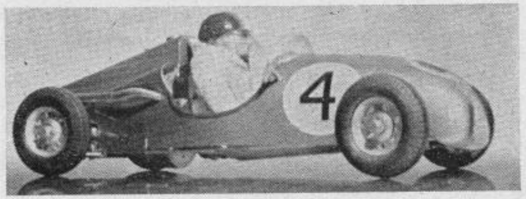


Photo by Leslie H. Buckland

On the left is an example of body-building by the very unusual method described below. The model is, of course, the popular Cooper 500, and the body lines have been well carried out. We hope to describe the model itself in our June issue.

READERS may like to know of a simple method of constructing bodies for all types of model cars, regardless of the number and type of curves which give the modern racers their pleasing lines. Metal bodies are long-lasting, impervious to fuel from messy engines, and generally most efficacious all round. I, myself a most unsuccessful panel beater, have developed the following simple, effective and easy way out of the difficulty.

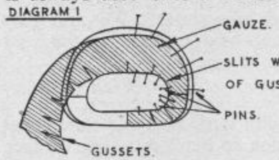
First of all, having selected the car you wish to make, carve out of solid balsa an exact replica of the body $\frac{1}{16}$ in. smaller than the body-to-be. Now let into the wood brass formers $\frac{3}{16}$ in. to $\frac{1}{4}$ in. wide, approx. 40g. so that they become flush with the surface, and placed into desired positions to act as strengtheners for the body. These strengtheners can be placed in such positions as to conform to the actual shape of the panels of real cars, or as in the fashion of the modeller's favourite of two-piece bodies, i.e. upper body and underpan. We now have an outline in thin brass strips of the body over a wooden former. The brass strips are now lightly tinned with solder.

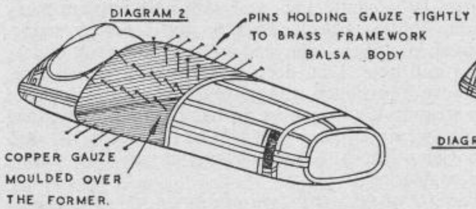
The third stage is to procure from the ironmongers or any chemical laboratory equipment manufacturers, sheets of thin woven copper gauze. This gauze is usually supplied in sheets 8 in. square, but can be obtained in larger sheets if specially ordered. The copper gauze can be found in most laboratories and is always used over a Bunsen tripod. The gauze is now firmly stretched over the wooden body and pinned down with ordinary household pins, gusseting neatly where necessary in order to keep the gauze well down on to the former. Don't be frightened to use too many pins for it is essential not to have the gauze lifting from the surface of the former in any place, otherwise the finished body will not be true. Note must be taken that in a two-piece body the straight edges of gauze must meet neatly along the edges of a brass strip, thus giving no nasty gaps between the upper and underpan in the finished body. The model now will be completely covered in gauze, and with all the pins sticking out of it will resemble either a pin cushion or a hedgehog!

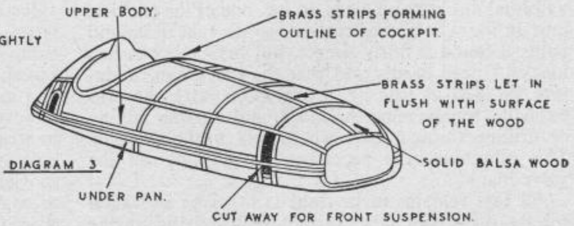
The fourth stage is to run solder all over the surface of the gauze, thus filling the mesh with solder. This is best done with the aid of Baker's fluid and an electric iron, or, if you have one, a spirit lamp. It will be found at this stage that the pins are well and truly soldered to the gauze. To undo this, heat each pin with a soldering iron and withdraw the pin by a smooth pulling action with a pair of pliers as soon as the solder start to melt at the base of the pin. When the last pin has been removed, the two halves or panels can be eased off the wooden former. The brass strips will have been soldered to the gauze, giving it the strength and rigidity which the body will need for fixing to your car chassis. With the aid of a file and fine emery, rub off any surplus blobs of solder until a reasonably good surface presents itself.

This is the stage now for putting on any body louvres. I find the most satisfactory method is to cut from brass a rough outline of a louvre and shape each one independently by use of a file. These are next soldered to the body, this being very simple as

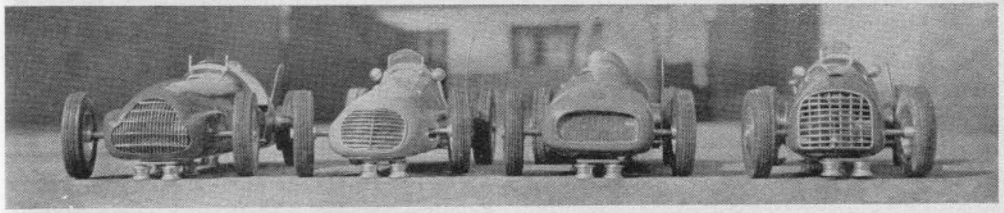
Cont. on page 368







CIRCUIT RACING REVIEW

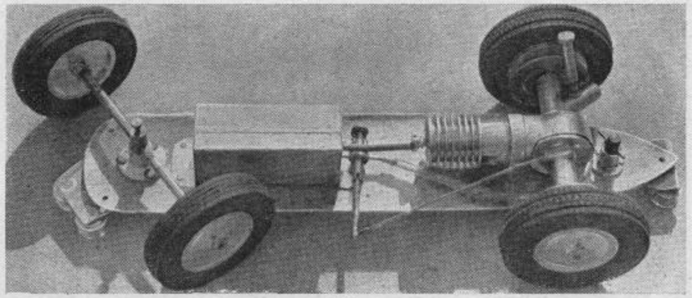


THINGS are beginning to move nicely in the direction of real racing for the model car enthusiast. The 22nd of April sees the first official "private view" of the Meteor Club's scheme at Newcastle-under-Lymne, when four cars should take the road together on the circuit of which we published a plan view last month. Guests at this interesting ceremony will probably include P. D. MacDiarmid of the Chiltern Club, Henri Baigent and G. V. Walshaw from the Deep South, and Co-Editor G. H. Deason of *Model Maker*.

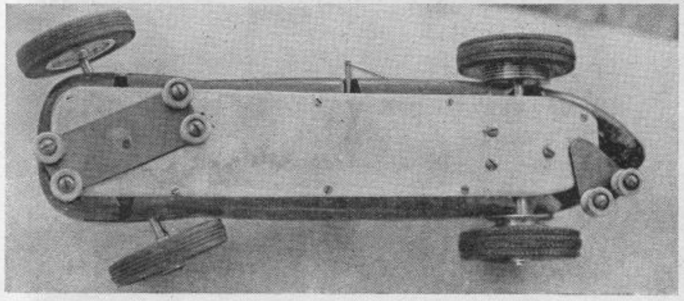
Actually a preliminary canter has already taken place, all four rails being tried in sequence by one car, Gerry Buck's 2.5 c.c. E.R.A. which would be the equivalent of Denis Poore doing a few fast laps of the Brand's Hatch road circuit on the 3.8 litre Alfa! In fact Gerry describes it as a really soul shaking experience, and enthusiasm has been redoubled. In a letter just to hand he says that the track sections went together without a hitch, and dismantling and storing away the complete layout after racing is no trouble at all.

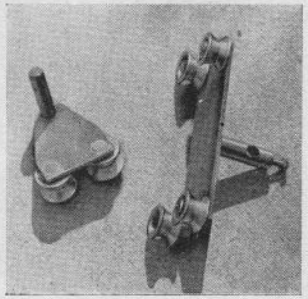
The running proved 100 per cent perfect, apart from one mild mishap when, due to the excessive speed of the E.R.A., the rear-end pulleys "spread", allowing the car to slew sideways with the front end still firmly guided by the rail. That, of course, happens to the best drivers from time to time, but it's just too bad on the chap about to overtake! However, F.G.B. is quite definitely of the opinion that 2.5 c.c. engines are far too powerful for this size of circuit, as his E.R.A., whilst negotiating the straights like an arrow, looked ridiculous on the bends, which it navigated as though they weren't there! Heaven knows, he says, what "G's" the unfortunate driver had to absorb!

Talking about drivers, incidentally, brings us to a point worth raising. If we are to achieve something approaching realism, should miniature drivers be compulsory? They would certainly add immeasurably to the spectacle of the little cars tearing round the circuit, and to reply to the critics who will undoubtedly say this is "kid-stuff", we would point to



(Above) A well chosen quartette ready for the circuit. (Right and below) Some of the parts being produced commercially by H. C. Baigent.





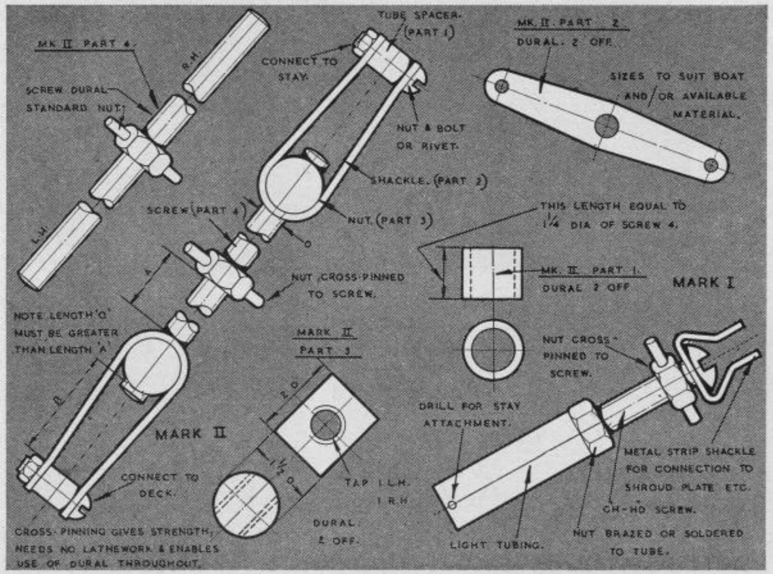
that serious minded body of men, the control line model aircraft brigade, who have made scale-sized pilots compulsory in the various team racing classes, with no damage to their dignity and much improvement to the appearance of their models. We certainly plump for drivers every time, if only because we have long wanted to model John Bolster's well-known moustache in miniature! As a matter of fact, for those who doubt their ability to model the human form, at least one firm (The Model Shop, of 3 Ridley Place, Newcastle-on-Tyne) are offering "plastic" pilots in scales to suit team racing aircraft, and they are prepared to supply these for model cars in $\frac{1}{8}$ and 1/12th scale unpainted for 3/0$\frac{1}{2}$ and 2/5 respectively, the figures being suitably clad in overalls, helmets and goggles.

This brings us to other and more essential components for the use of circuit racers. H. C. Baigent has just sent us photographs and details of the fittings he is producing for the "standard" rail circuits, which will enable many people to get going sooner than they would normally be able to do so. The track attachments illustrated comprise the two pulley plates assembled as shown, two pillars for fixing to the tray, rivets, etc. The roller pins are brazed into the 16g. steel plates, the rollers themselves being secured by 4 B.A. screws with shake-proof washers. The $\frac{5}{16}$ in. upright swivel pin on the front plate is drilled to take a $\frac{3}{16}$ in. dia. axle, at the correct height for wheels of not less than 2$\frac{3}{8}$ in. dia. The price of these attachments complete is 32/6. A complete 1.5 c.c. engine unit, with clutches, tyres and wheels, as shown in the chassis picture, is also to be available, or if you prefer to buy your car off the peg and ready to race, the price of a complete Grand Prix job, as shown in the line-up of models, is £15.

Rumours reach us of proposed road circuits as far apart as Eastbourne and Dundee, and keenly interested enquiries have come in from Italy, where not unnaturally this form of sport has a very strong appeal. You can hardly wonder that the Italians can't resist those Alfas, Maseratis and Ferraris!

Accompanying the photographs came a letter from H. C. Baigent taking us to task for our query in "Rail Track Developments" as to whether a car would tend to swing about on a long fast straight. He asks whether, when we drive a car fast down a straight road, it swings about or follows the steering! (*H.C.B. has been driven down a straight road in the Editorial coupé so he should know!*—ED.) Actually the answer to this one has already been provided by the Meteor Club experiment, when no instability was reported at speeds of around 40 m.p.h. On entering a curve after a fast straight we are also assured that, provided the fixings are correctly carried out and properly spaced, all will be well, and Gerry Buck tells us that one of the most delightful features of this form of racing is the realistic change of engine note on the bends, which certainly do slow the cars appreciably without any outside or inside aids!

. . . Notes on Turnbuckles



MK. I

This design is very crude and weak if soldered, but quite sound if brazed.

Advantages: Few tools are required and NO taps or dies.

MK. II

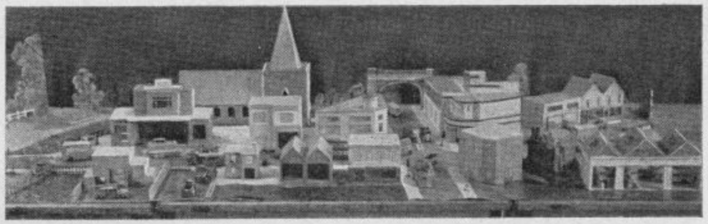
May be made entirely from duralumin or other light alloy. Needs NO lathe or drill; only simple hand tools. Appearance is improved if a streamlined cover is fitted. This also lessens drag. Used with success on 50 in. sharpie.

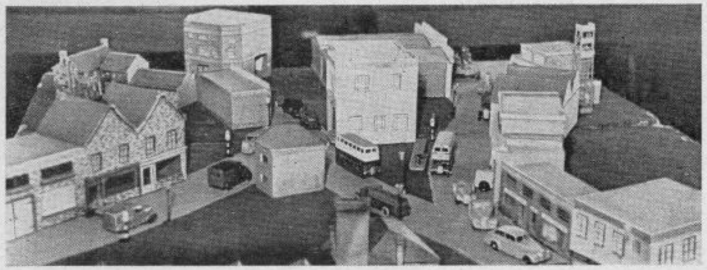
GENERAL

Normal types of turnbuckles have the disadvantage that they require drilling through the length of the body. This is difficult using only a hand brace. The above designs are far easier to produce using only hand tools.

Making Model Buildings

VICTOR SUTTON ON PASTES & GLUES





Two aspects of a model village scene constructed entirely of cardboard buildings. Traffic is composed of solid models made up from kits. This is displayed in a temporary setting only for exhibition purposes.

ALL model makers have their own ideas on the use of this or that glue, but some simple hints for the newcomer to this field may be helpful.

As one progresses in making model buildings and the suggested scenic layouts he will run across the problem of sticking various types of materials together. If in any doubt it is a good plan to look around the local handicraft shop and ask to see various types of glues and adhesives. In my own shop I have "Mendine" in three different packs, all selling at 7d. Before serving any customer I find out what they require. In the lid of each pack one will find listed quite 15 articles to be stuck with this. However you start and whatever you make you will learn by experience.

I am a great believer in "Croid" and some of my fire model scenery has knocked around exhibitions for well over 25 years and is still intact.

Large surfaces to be covered with brick paper can be done with a small mixing of "Tap-water" paste. This is normally used for house wall paper and sold in packets at about 10d. Mix it well and according to instructions. Avoid any bumps and keep balance of it in a tin—the mice like it very much in powder form.

Most models have to last many years. Cardboard sections should therefore have good wide flaps to give a sound hold in vital parts.

Dryad liquid glue is sold in tins and tubes, and can be used both for cardboard and wood joints. It needs no preparation and is convenient for working in groups. You may have difficulty in getting this unless you live near a good class handicraft shop.

I like Le Page's liquid glue which is clean, strong, and ideal when preparing a surface for sawdust to be sprinkled on.

Casein glue is obtained in powder form. Mixed with cold water, it is used for sawdust mixtures, but does not mix so well with the water as Casco glue. It is waterproof and is very hard when set.

Casco glue is obtained in powder form, and when prepared by mixing with cold water, is a good strong, waterproof glue. This is very useful for mixtures, used in the making of trees, etc., and for general purposes.

Seccotine is chiefly used for cardboard models as it is very sticky and sets quickly.

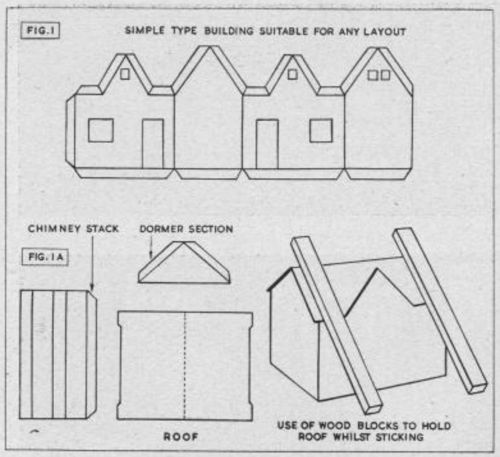
Durofix is a cellulose cement and is useful for mixtures with a base of plastic wood.

Higgins vegetable glue is like paste. It is very strong and suitable for sticking paper, wood veneer and cloth for tiny mats and carpets.

Some office pastes with a dextrine base can be used for small parts of buildings on which miniature paper is used. Such pastes as "Dex" and "Grip-fix" are clean and, kept shut in aluminium tin containers are always ready for use.

Just as you must have the right paste, then so must you have the right cardboard. Some cardboard is absorbent, and the paste will just dry in and leave the paper surface in bumps. Generally speaking, the best plan is to cover the building paper with paste and not the cardboard. A little practice and you will get used to fixing the papers.

One may also find a good use for "Butterfly" brand ever-ready gum bottle. This has a spreader with a slit opening which allows just enough gum at a time to run along the edge of small work where you want to be neat. The 3 oz. bottle costs 1/6, but is most economical in use.



For fixing a quartering batten to the baseboard one cannot really do better than mixing up some Scotch glue. Failing this one can use the 1/- jars of Kirkor or Acrabond as both of these are very strong for light woodwork.

In all uses of adhesives on models do at all times prevent them from over-running. Once they have gone over to another part of the model and you have to clean it off it is certain that you will pull off the surface of the cardboard, and thus leave a rough patch which it will be hard to cover up later. If the gum runs over, wipe off quickly with a slightly damp rag.

When adding narrow strip-wood to the cardboard model as you would with ledges and so on, glue the beading first and not the cardboard where the beading is to fit. It will over-run on the building but not on the strip. If it should you can wipe it off before fitting.

Storage of models is always a problem and many come apart if there is a little dampness. For this reason it is wise to consider the adhesive question thoroughly.

Commercial gumstrip is made in sizes up to 2 in. and obtainable from stationers. In capable hands this can be used to quite good advantage in large model buildings, especially in making domed roofs, fitting in the large lights in railway stations. Strips down the inside of the building where you have fitted the window material will prevent this coming apart after the model is complete. It can also be cut into narrower strips for small parts. Store in a dry place as it tends to stick if left in a damp atmosphere.

Strawboard, if you have to use it, can be given a coat of light artist's size before pasting on papers. This prevents the paste soaking in. There are times when one has to use strawboard to give added strength to the model.

BUILDING WITHOUT BRICKS . . . .

TO those modellers who contemplate making buildings from the "Bilteezi" series of cards, the following hints, gained from personal experience, may prove helpful. The tools required are:—

A straight-edge, small square, pair of really sharp scissors, sharp pointed knife for scoring, a pane of glass 10 in. x 6in. for a base to build on and when joining two or more buildings, and a piece of No. 0 glasspaper for fitting floors.

As the cards are very accurately printed the work must be correspondingly acçurate if a nicely finished job is expected.

Care should be taken in scoring along the marked lines and depth of cut is important. Too deep a cut makes a flimsy building while one too shallow makes bending difficult and produces bulging walls. A little practice on a piece of waste card will show the degree of pressure needed for best results.

A quick drying balsa cement is recommended in preference to glue or paste which are slow. Gum should not be used as it curls the card. I find that sharp scissors do not turn the card edges, but a knife may be used by those who prefer it. It is, however, more difficult to follow a line with a knife.

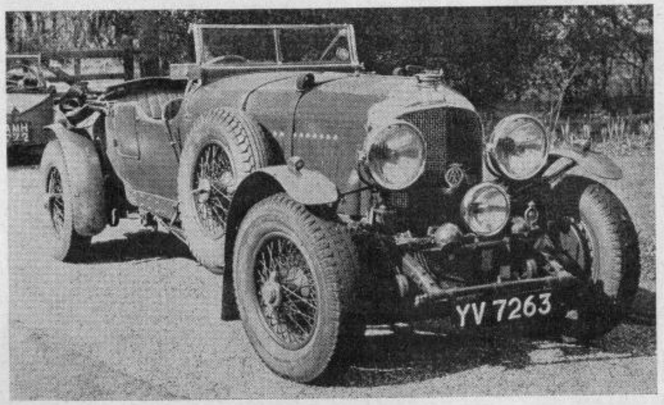
One of the not-so-easy jobs is fitting the floor. The makers recommend card $\frac{1}{32}$ in. thick for this, but if $\frac{1}{16}$ in. card is available it makes a better and firmer job. In cutting floors to the templates provided, remember always to cut to the outside edge of the black line or the floor will be too small.

After various attempts I found that it is best to fit floors next after the walls are erected, as this squares the building for the roof, and my method is this. Slip the floor between the walls above the bottom then cement round the walls below and just above the bottom edges, stand the shed on the glass and while pressing the walls gently but firmly down, push the floor into position. A little pressure round the bottom completes the operation.

Needless to say, the floor must be dead flat.

Though not absolutely necessary, it is helpful to stiffen the chimney stacks by sticking a piece of card bent at right angles by the edges of the angle to wall and stack. This should extend from $\frac{1}{8}$ in. below top of stack to floor, and will strengthen the wall too. Testing with a straight edge is advised to avoid stack from leaning in or out, and causing roof fitting trouble. The stiffener should be fitted before bending the stack to shape and will greatly assist this operation.

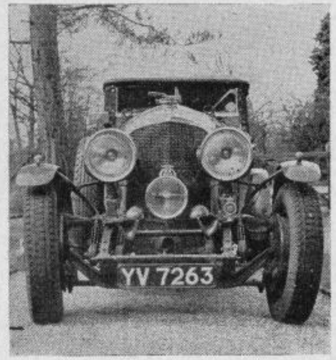
When fixing the roof great care should be taken to see that the ridge is high enough. It is quite easy to press this down too low without noticing it and difficulty in fitting gables will result. Bending gutters is rather a ticklish job. I always hold these between two straight edges and bend as required.



PROTOTYPE PARADE No. 30

This magnificent 4½ litre Bentley, owned by A. G. F. Oldworth was one of the works team in 1928/9, and represents a stirring period in British motor-racing.

Model Maker Photos

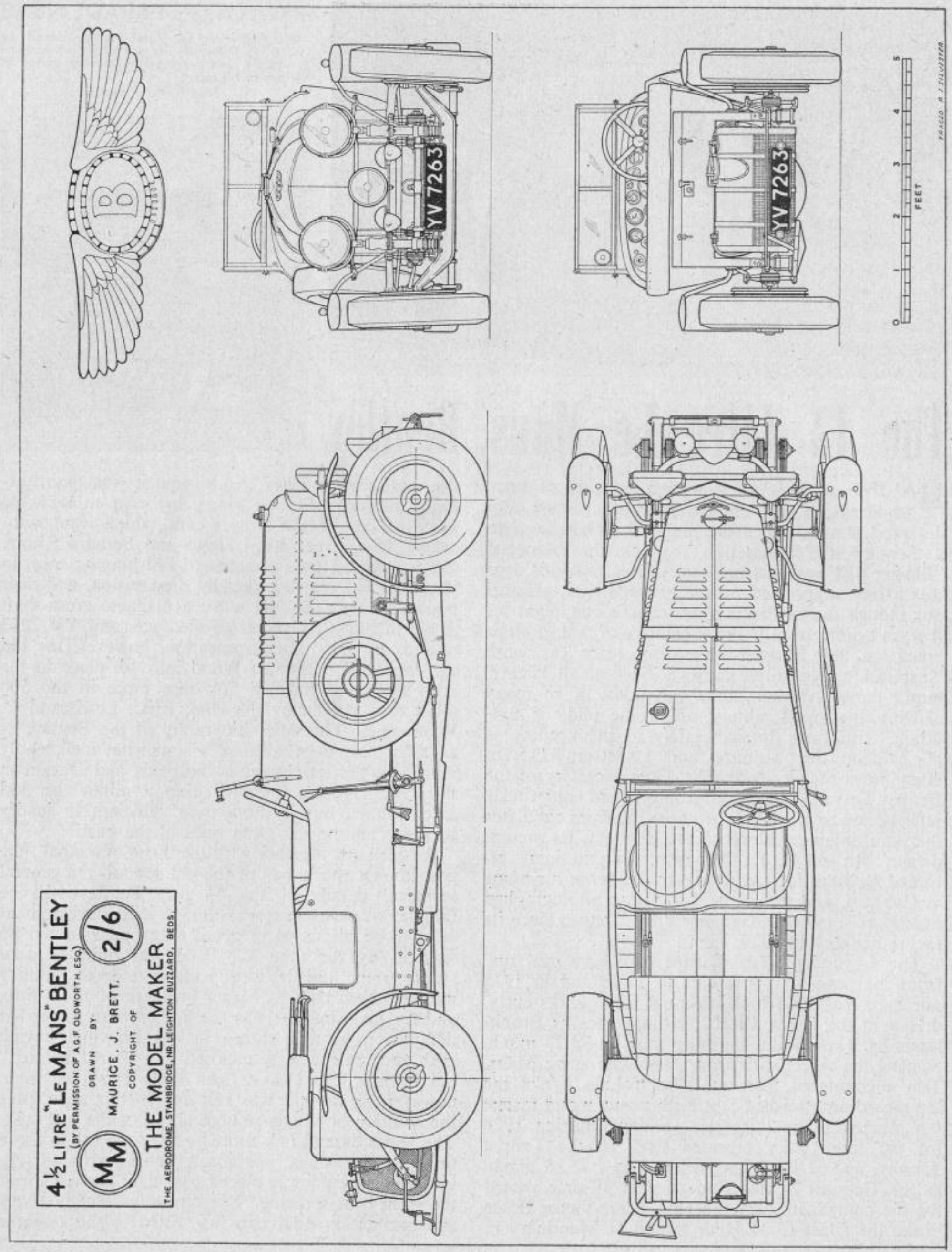


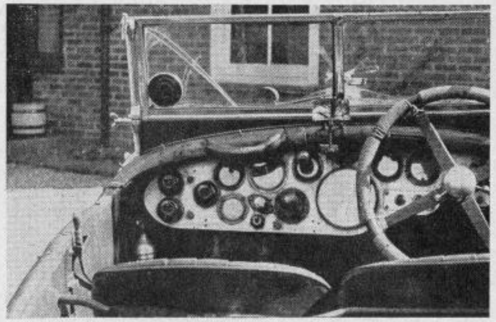
The 4½ Litre Le Mans Bentley

HAVING recently dealt with a number of sleek moderns, it was felt that another vintage type deserved a turn. When the choice had narrowed to a Bentley ,the temptation to pick the immortal "Blower 4½" was well nigh irresistible, but this urge was firmly suppressed on the grounds that, glamorous though the ex-Birkin short chassis car might be, it wasn't quite so fully representative of that glorious breed as, say a dyed-in-the-wool team car, with "inspiration by natural causes". Now of all historic motor cars, no other make can boast of so many existing specimens, almost all in the pink of condition, with their dossiers safely in the keeping of the Mother Club, so once more I sent an S.O.S. to High Priest Stanley Sedgwick, Hon. Secretary of the Bentley Drivers' Club, who promptly and courteously referred me to YV 7263, in whose oil pipes circulates the pure untainted blood of the Bentleys. Its present owner, Mr. A. G. F. Oldworth, unhesitatingly afforded facilities for measuring up the car at his home at Cobham, and the car is drawn and photographed exactly as it exists today, very little changed since its racing hey-day in 1929.

The 4-cylinder o.h.c. 4½ litre Bentleys "grew up" from the popular 3 litre cars in 1927, and in 1928 our hero YV 7263 first appeared as a works entry, driven in the Essex Club's six-hour race at Brooklands by Tim Birkin, finishing third at 72.27 m.p.h. Sharing the wheel with Jean Chassagne at Le Mans, Tim encountered fearsome tyre trouble, broke the lap record and finished 5th. Fifth position and fastest lap seemed to be this car's speciality during 1928 for the same story repeated itself in the Tourist Trophy, and at Boulogne, where Tim's 73.16 m.p.h. in the Georges Boillot Cup was an all-time record for the course. In 1929 the Hon. Mrs. Victor Bruce broke the Class C 24 Hour record at Montlhèry in the same car, at 89.57 m.p.h., and it was then hurriedly prepared for Le Mans, in order to take the place of one of the blower cars, which were withdrawn. It's drivers, Lord Howe and Bernard Rubin, did not regard their chances of finishing as rosy, in view of the somewhat sketchy preparation, and their pessimism was justified when a magneto cross-shaft broke in the early stages of the race, and YV 7263 retired. By way of compensation, however, the old car carried B. Harcourt Wood into 4th place in the Irish G.P. and finished 5th once more in the 500 miles race, driven by the Hon. Brian Lewis and C. W. Fiennes. This brief biography of the Bentley as a "team" car concludes on a somewhat melancholy note with the retirement of Williams and Durant in the 1930 "Double Twelve" after a minor fire and axle trouble, but is more than sufficient to justify its place among the great ones of the past.

As perhaps, together with the 30/98 Vauxhall, the best known sports car of the old school, the general technical details of the 4½ litre Bentley will be familiar to most readers, although if its development were to be discussed in detail many pages could be written. By the time YV 7263 was built, a more sturdy frame and the large wide shouldered radiator marked these cars as bigger brothers of the 3-litre, and for Le Mans in 1928 the bodies were somewhat different from that shown in our drawing, having tank and spare wheels enclosed in a short "manxed" tail fairing. The classic open body is shown here, however, as the car was restored to this style, plus the addition of a luggage boot ahead of the fuel tank. The wings extend in a more generous arc than those fitted for Le Mans, and the third central headlamp is replaced by a lower placed pass-light carried above the front cross-bracing. The typically Bentley lever-and-cam-action filler caps are fitted to the radiator





and fuel tank, and another reminder of its racing days is the wheel adjuster for the brakes in the driving compartment floor. Other interesting external features for the modeller are the double Hartford shock absorbers, two pairs ahead of the front axle, and a pair before and behind the rear axle, and the trussing of the chassis side members, rather reminiscent of a railway coach! An external filler for the scuttle oil tank projects on the near side of the scuttle top, and the two-panel windscreen folds forward. The Rudge hub caps are of the offset ear variety, and these, in fact, form the *motif* of the Bentley Drivers' Club, so they should be correct in the model I hope you are going to make!

There are no valances below the frame, and the exhaust system is visible from the near side, terminating in the massive fan-tail, which used to be sprayed heartily with a fire extinguisher during refilling operations!

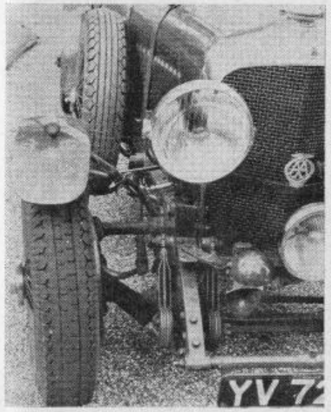
The dashboard is a most satisfying sight, with an array of instruments that wouldn't shame a fighter aircraft, all of which had to be read and memorised by the well disciplined team drivers in days gone by. The large revolution counter is centrally mounted, and reads to 6,000 r.p.m. though for practical purposes the needle is "in the red" between 3,500 and 4,000.

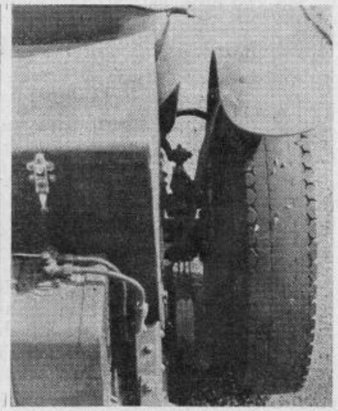
In addition to pressure and temperature gauges, speedometer, clock and ammeter, the instrument panel carries the air pump for the fuel system on the left of the rev. counter, and an array of switches for the lighting and dual magnetos. The large spring spoked wheel is corded, and has centrally mounted ball-ended controls for ignition and throttle, under a domed cover. A leather grab handle is fitted to the scuttle beading, the gear lever works in a gate on the driver's right, inside the body, with the handbrake external. An interesting feature is the brake linkage, which passes through the rear passenger compartment.

The Bentley is, perhaps, hardly an ideal subject for a powered model, as the thought of so majestic a vehicle either popping or screeching along under the urge of a small two-stroke, is distressing to a degree. If, however, anyone can manage a four-cylinder four-stroke, even with side valves, what better car could you find for it?

I have recently found that a surprising number of people collect these drawings purely from enthusiasm for the cars themselves, and with no model making project in view. It is also apparent, from correspondence received, that some readers would prefer very much more detail in these drawings, which would enable them to built super-scale models with accurate dummy engines, transmission, steering details and driving controls. At the moment the demand does not justify the immense amount of work entailed in treating every car described in this way, but the provision of super-detailed drawings of a limited number of popular types is still under review.

(Above) A general view of the instrument panel. (Below left) Details of the front wing mounting, duplicated double-Hartford shock-absorbers and horn mounting. (Centre) Rear view, showing steel-strapped fuel tank with large filler, and (Right) Close-up, of fuel lines and rear shock-absorbers, set on either side of the axle casing.
Model Maker Photos





Streamlining and Model Car Performance

by A. M. COLBRIDGE

MODEL car performance can be analysed in a similar manner to the standard method of simple performance calculations for full-size automobiles. Here speed is a function of the brake horse power available and the total resistance of the vehicle. The total resistance of the vehicle is the sum of the air drag or air resistance, and varies both with speed and the degree of streamlining achieved. Rolling resistance is generally assumed to remain constant at all speeds. The two basic formulae are then:—

(i) ...... Total resistance = rolling resistance + air drag

i.e. R (lb.) = $Q + CV^2$

where R = total resistance (in lb.)

Q = rolling resistance (in lb.)

C = streamline coefficient (non-dimensional)

V = speed in m.p.h.

(ii) ...... B.H.P. = $\frac{1.47\ VR}{550}$

Of the two resistance components, air drag is by far the greater of the two, particularly as speed is increased. Hence streamlining, or the value of 'C', is of some importance. Here it must be noted that the coefficient 'C' is an *overall* streamline coefficient, embracing both the shape and cross section of the body. In aircraft practice, drag or resistance is expressed as a drag coefficient times the cross sectional area of that body, times the square of the speed (the latter in ft./sec., usually). This is not convenient for car practice since cross sectional area is not readily defined, for one thing, and measurement of cross sectional area is difficult. For example, does the definition of cross sectional area include the projected area of the wheels, or not?

The two formulae may be summarised:—

Car practice: air drag = CV^2

Aircraft practice: air drag = KAV^2

where C = streamline coefficient

K = drag coefficient

A = cross sectional area (sq. ft.)

V = speed in m.p.h.

V = speed in ft./sec. (usually)

The car streamline coefficient, 'C', will be seen to equal 'KA', if the speeds are corrected to the same scale.

In model car work, of course, there is also the drag of the cable to be considered. This, unfortunately, is not capable of simple analysis, for it will vary with both the length and diameter of the cable, and also the speed. The fact that one end of

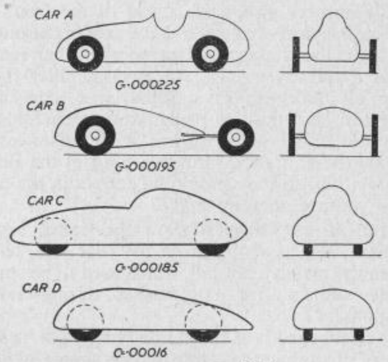


FIG. 1.

the cable is tethered whilst the other is moving with the speed of the car means that no part of the cable has the same velocity.

It has been found that the simplest way to treat cable drag is in terms of horse power absorbed at various speeds, rather than attempt to include it in the general resistance formula. The resistance formula then remains unaltered, and lends itself to simple analysis, whilst the 'power' formula (formula (ii)) becomes:—

B.H.P. of engine — B.H.P. absorbed by cable = $\frac{1.47\ VR}{550}$

TABLE I — AIR DRAG (LB.)

CAR	50 mph	60 mph	70 mph	80 mph	90 mph	100 mph	110 mph	120 mph	130 mph	140 mph	150 mph
A	.5625	.81	1.1	1.44	1.825	2.75	2.72	3.24	3.80	4.40	5.07
B	.4575	.70	.955	1.75	1.58	1.95	2.36	2.80	3.30	3.52	4.40
C	.4625	.667	.907	1.185	1.50	1.85	2.24	2.66	3.13	3.67	4.16
D	.40	.575	.785	1.025	1.30	1.60	1.94	2.30	2.70	3.14	3.60

AIR DRAG = CVXCV

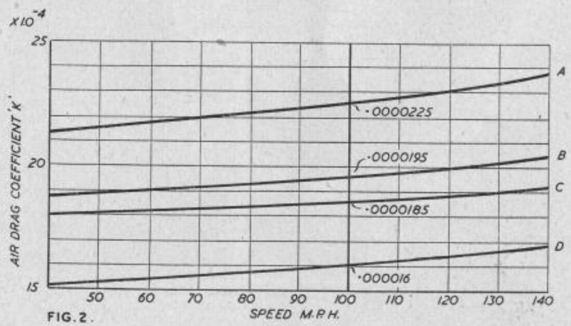


FIG. 2.

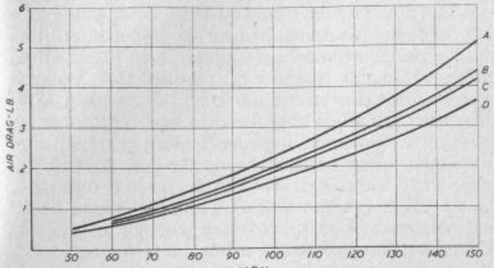


FIG. 3.

Fig. 5 gives typical values for B.H.P. absorbed by a cable representative of normal practice at various speeds.

To fully appreciate the value of streamlining we need typical 'C' coefficient values for different body shapes. These we have obtained for four different layouts, as described in Fig. 1. Drag figures for all are Continental in origin and were determined under similar conditions. The types represent, in effect, an orthodox race car, a McCoy type streamliner, and two streamlined variants with the wheels partially enclosed within the body. Enclosing the wheels in this manner results in a very definite saving in air drag, as the figures show.

All four cars are reduced to a similar width. Type A then has an overall length of 3.8 times this width; type B and type D a length of four times the width; and type C a length of five times the width. The drag figures have been reduced to streamline coefficient values for a nominal cross section of 10 sq. in. which would appear fairly representative of the larger car sizes.

Taking a similar cross section, the air drag coefficient of .0002 sometimes used for model car analysis is somewhat more flattering than these test figures for normal proto layout. A 'C' value of .0002, in fact, would appear to represent a good degree of

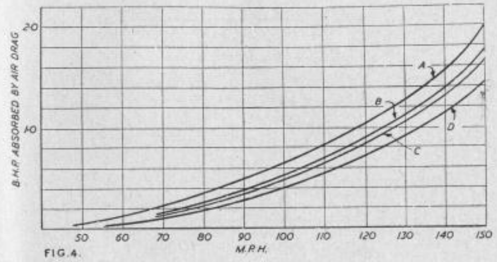


FIG. 4.

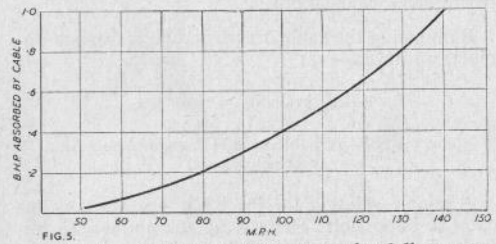


FIG. 5.

streamlining, equivalent, almost, to the full streamliner of type B.

As far as the original test figures are concerned, these were all quoted for air resistant coefficient (i.e. the 'K' of the KAV^2 or 'aircraft' formula) and were given as increasing in value slightly with increasing speed (Fig. 2). The values we have assumed for standard calculations are applicable to 100 m.p.h., and the error involved in assuming these applicable to other speeds would appear to be low. There is a certain doubt, in fact, that drag coefficient figures do rise as markedly as shown on the graph with increasing speeds.

Given these average of 'standard' figures we can then carry out a number of interesting calculations comparing the respective performances of the car types A, B, C and D. The streamline coefficients employed are as follows:—

Type A ...... C = .000225

Type B ...... C = .000195

Type C ...... C = .000185

Type D ...... C = .00016

Air resistance figures for various speeds can then be calculated. These are given in Table I for speeds of from 50 to 150 m.p.h. and illustrated in Fig. 3. The divergence at the higher speeds is noteworthy. This, of course, was only to be expected for the greater the speed the more streamlining pays off. The air drag of car D, for example, is the same at 140 m.p.h. as that of car A at just under 120 m.p.h.

These figures are of interest, but they do not mean very much on their own. A better comparison is afforded by calculating the brake horse power absorbed by each of the four car types at different speeds. This has been done in Table II and is shown in Fig. 4.

TABLE II — B.H.P. ABSORBED BY AIR DRAG

CAR	50 mph	60 mph	70 mph	80 mph	90 mph	100 mph	110 mph	120 mph	130 mph	140 mph	150 mph
A	.075	.130	.706	.308	.44	.60	.80	1.04	1.22	1.65	2.02
B	.065	.112	.178	.268	.38	.52	.695	.90	1.06	1.43	1.76
C	.062	.107	.170	.254	.36	.494	.66	.85	1.01	1.355	1.67
D	.0535	.092	.147	.220	.313	.4275	.57	.74	.57	1.175	1.445

B.H.P. = 1.47VR ÷ 550

These curves, of course, follow the same trend as the air drag since b.h.p. absorbed is a simple function of the resistance to motion. We can, however, use these b.h.p. figures directly to make some sample performance calculations.

Eliminating the cable drag from the resistance formula, we have:—

$$\text{B.H.P. available} = \frac{1.47\ \text{VR}}{550}$$

where B.H.P. available = B.H.P. engine — B.H.P. absorbed by cable

A simple solution for the b.h.p. absorbed by the cable is impossible. There is no straightforward formula, for example, which will give cable drag as so many lb. at given speeds, and also take into account the line length and line diameter. To simplify performance comparisons between the four car types under discussion we can assume that they are all operated on the same cable which has the drag values given by Fig. 5. These have been turned into power absorbed so that at any speed the actual b.h.p. available can readily be determined. The nominal or maximum b.h.p. available (no line drag) is simply the operating b.h.p. of the engine. For convenience, the cable drag figures have been rounded off, as under:—

Speed m.p.h.	*B.H.P. assumed absorbed by cable*
70	.15
80	.20
90	.30
100	.40
110	.50
120	.65
130	.80
140	1.00

We can then find the maximum performance of each of the car types by means of a few simple calculations and a graphical solution (Fig. 6) knowing the maximum b.h.p. available to start with. We shall assume this latter figure to be 1.5.

Sample calculations are then made for each car at speeds around the estimated maximum, as summarised in Table III, the object of these being simply to determine the b.h.p. required for these speeds. All the results are then plotted on a graph as in Fig. 6. This graph represents the b.h.p. required for various speeds. Since the maximum b.h.p. available is 1.5 then where this line cuts the calculated performance curves, the corresponding speeds given represent the maximum speed of each particular car. As will be seen, these vary from 114 m.p.h. for the orthodox car to 121 m.p.h. for type D with streamlined body and enclosed wheels. Provided enough calculated points are obtained to get a fair curve for each car, this method represents a very accurate method of determining maximum (theoretical) speed, and is certainly one of the easiest to apply.

The gain in maximum speed realised by the full streamlining of type D is not, perhaps, as great as might at first be visualised. There is the possibility, in practice, that the gain may be even less, for to get adequate track the cross sectional area may be correspondingly greater and the true 'C' value somewhat higher.

Summarising the comparative results, we have:—

Cars proportioned as Fig. 1.

Same engine (1.5 b.h.p.) operating on same cable.

	Maximum speed m.p.h.	*Percentage increase*
Car A	114	—
Car B	117	2.6
Car C	118	3.5
Car D	121	6.1

TABLE III — PERFORMANCE CALCULATIONS

Speed m.p.h.	Rolling Resist'ce Q (lb.)	Air Resist'ce CVXCV (lb.)	Total Resist'ce (lb.)	B.H.P. Required	Cable Drag B.H.P. Absorbed	Total B.H.P. Required
CAR A						
100	.25	2.25	2.5	.67	.4	1.07
110	.25	2.72	2.97	.573	.5	1.373
120	.25	3.24	3.49	1.12	.65	1.77
CAR B						
110	.25	2.36	2.61	.77	.5	1.27
120	.25	2.8	3.05	.98	.65	1.63
CAR C						
110	.25	2.24	2.49	.73	.5	1.73
120	.25	2.66	2.91	.935	.65	1.585
CAR D						
110	.25	1.94	2.19	.643	.5	1.143
120	.25	2.3	2.55	.82	.65	1.47
130	.25	2.7	2.95	1.075	.8	1.825

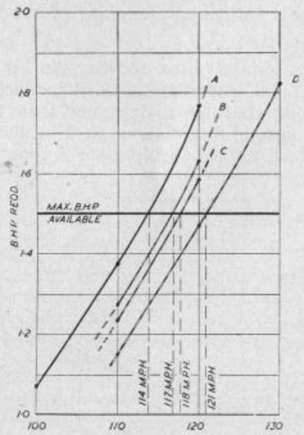
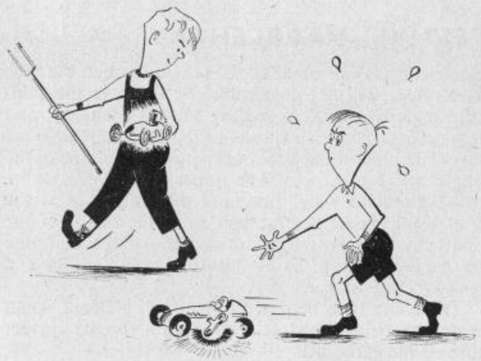


FIG. 6.

DOPE & CASTOR

By JERRY CANN



" Huh — kid stuff ! "

WELL, as I was saying when we were cut off—printers are no respecters of persons, but they might have let me finish the sentence—it may seem a trifle premature to be working out a scheme for recording the finishing order of four cars racing together before four cars *have* raced together, but planning these things in advance is half the fun.

Another entertaining problem which awaits the circuit racing fraternity is the question of gradients and climbing ability. Sooner or later, probably sooner, track constructors are going to introduce hills. I have been told on good authority that even the 0.75 c.c. cars will climb a gradient of 1 in 4, albeit, I imagine, with some clutch slip and reduction of speed. Keen types will soon be considering varying their overall gear ratios to suit their course. All quite in accord with big scale practice.

The Offenhauser model competition which *Model Maker* is running in conjunction with Metro Goldwyn Meyer's film "To Please a Lady" is attracting any amount of interest, and a spate of "Offies" seems likely to result. In this connection, a very generous offer comes from E. A. Tasker, of 247 Derington Road, Tooting, S.W.17, who has a limited supply of bevel gears, of $1\frac{1}{2}$: 1 and 1 : 1 ratio, which he is prepared to give to modellers free, if they will send ninepence for postage and packing. These gears, of which we have examined a sample, are of $\frac{1}{4}$ in. bore, but impecunious constructors shouldn't have any difficulty in adapting them to the Offie's $\frac{3}{16}$ in. axle.

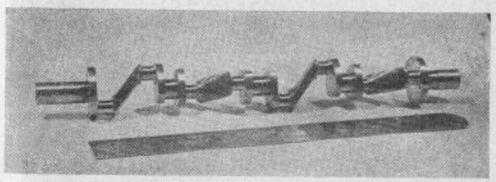
L. A. Manwaring has been at it again, as you see. His latest cartoon was lying on my table when a well known hundred-plus cable racing enthusiast rang me up recently. At the conclusion of our chat I mentioned the latest rail track developments "Tchah! Kid Stuff!" said our friend in disgust. Like little Audrey, I laughed and laughed!

Congratulations to Joe Shelton on his fine run at the Croydon meeting recently. The speed, quoted on two runs as 120 m.p.h. is a magnificent effort, particularly on a small diameter improvised track, with a surface that wasn't ideal for wheelgrip. The Hubert Dee's show bids fair to become an annual fixture.

Another rail racing project has just been announced, which reached the office too late for mention in "Circuit Racing Review" this month. In fact, an entirely new club has been formed, under the title of the "Eight Model Car Club" whose Hon. Secretary is L. C. Strong, of 70 Raleigh Drive, Whetstone. He tells me that a new track has been constructed by S. Kedgley, designer and constructor of the original "Nordromo" track, which many readers probably saw at the North London M.E. Society's exhibition last September.

This new layout is built in 26 sections, gives 120 ft. to the lap, covers a floor space of 40 ft. x 20 ft., and is of figure eight plan, with a flyover crossing. Hence the title of the club! The track is fully portable and is designed to take four cars, primarily limited to 1 c.c., although 1.5 c.c. cars could, if necessary, be accommodated. At the time of writing, I don't know which type of guide rail is being used, but at a guess would expect it to be of Z-section, similar to that used on the original Nordromo arrangement. The turns at each end are banked. There should by now be quite a number of cars ready to run in the N.L.M.E. Society's car section, so some good racing should result.

The initial meeting is to be held this month, and an official opening meeting is planned for June, when anyone interested will be welcome. Watch this page for the date, which I shall hope to have in time for the June issue.



The photograph at the bottom of this page should interest all model engineers, and scale car fanciers in particular. It is the completed eight-throw crankshaft made by Henri Baigent for his 16 c.c. 8-cylinder Alfa Romeo engine, of which an earlier picture was published in the February number. The rule, in case you can't see it clearly enough is a 6 in. one! This kind of work isn't within the compass of many of us, but it might act as a spur!

The Pioneer Club's nominated time event on Easter Saturday was won by George Thornton's 2.5 c.c. Talbot. The course included a stop and re-start after seven laps, and the Talbot's times of 53.6, 52.6, and 54.5 seconds compare astonishingly well with his estimated time of 54 seconds. H. G. Bassom's 10 c.c. car was second, and C. W. Field's Alfa third.

FESTIVE MARBLEHEAD (*Continued from page 333*)

the backbone can be finished. It will be seen that the 1 in. piece will not give sufficient width in the midship region to make a seating for the planking, and it is necessary to glue cheeks to the backbone to effect this. The plan of the backbone shows the shape of the upper and lower faces. The upper is at a level 2½ in. below the load water line, and the smaller is at the 3 in. level. These are marked as at the inside of the planking. It is best to mark out the shape and glue on before cutting, as if cut first you will have a feather edge at each end.

These can then be pared down with a chisel, small templates being fitted at each section for the correct turn of the garboard.

The recess or rebate to receive the ends of the planks is made by first scoring with a gauge a line ⅛ in. off centre along the stem and stern piece on each side. You can now cut the rebate to form a recess for the plank ends using a piece of the planking to get the correct depth. The bearding line is the point of first contact of the inside of planking.

It will be noticed that a tab has been left at the stemhead to fasten it to the building board, and this can be held wih a screw, care being taken to get it dead on centre line. In order to hold the moulds in correct position on the backbone small pieces of wood must be tacked on to keep them upright.

The moulds are fixed to the building board by first screwing to the cross-pieces. The backbone can then be placed in position and fixed at stemhead and also glued into the recess in transom, the rebate will, of course, be flush with the inner edge (as sketch).

Our ribs will be of two thicknesses of timber, $\frac{1}{32}$ in. thick, and ¼ in. wide.

These must be let into the backbone so as to come flush with the seating for the planking. Take two strips that will cover the circumference of the mould to just above the inwhale and after applying glue to the contact surfaces, fasten them with a copper pin. They are then pulled tight and trimmed where necessary to the mould by means of copper pins driven first through small pieces of thick cardboard. This will enable the pins to be removed after the glue has set. In order that the glue shall not attach the rib to the mould it is necessary to cover the latter with strips of tissue paper under each rib. This is easily glass-papered off if it adheres to the rib.

The boat is now at the stage known as "in frame", and our next instalment will deal with planking and fitting of the deck.

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