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OCTOBER 1968

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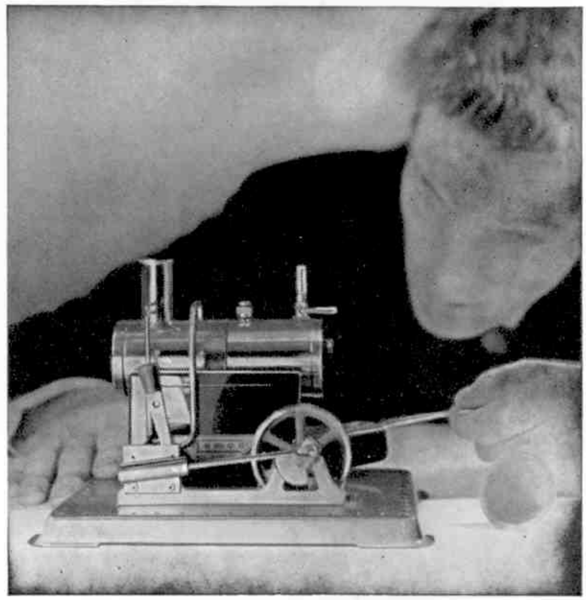

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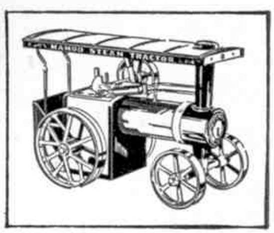

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MECCANO® Magazine

OCTOBER 1968 VOLUME 53 NUMBER 10

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Advertisement Manager
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MAP **HOBBY MAGAZINE**

FRONT COVER

The story behind this Tri-ang-Hornby layout is that it was first designed and constructed for the Model Railway Club Show in 1967. It was later redesigned and used at the Association of Model Railways Clubs in Scotland for their 2nd Annual Exhibition in March of this year. From there, it went to Selfridges for their Easter Promotion, and then to Lewis's of Argyle Street, Glasgow. The layout itself measures 14′ x 6′, and is constructed in two sections each measuring 7′ x 6′. The layout consists of four independently controlled circuits for Railways and four independently controlled circuits for Motorways, together with Through Stations, Terminal Stations, Engine Sheds, Model Land Buildings, Automatic Signals, Tri-ang Scenic Materials and many other interesting Tri-ang-Hornby-Minic accessories.

NEXT MONTH

November Meccano Magazine will have a bright Disneyland Monorail Railway cover. The cover heralds the first part of a complete history on Monorail development, application and future uses by Harry McDougall. Meccano models are again with us in force, and include a "Plastic Aircraft Fairground Roundabout," a "Post Boring Tractor," a "Go Kart" model and "Among the Model Builders." Railway fans need not be disappointed as we have "A.B.C. of Model Railways" whilst "Trackside Construction" describes the construction of a simple commercial kit. For the more scientifically inquisitive readers, we have features on "Weather Satellites," "Sonic Glider Train" and "Great Engineers."

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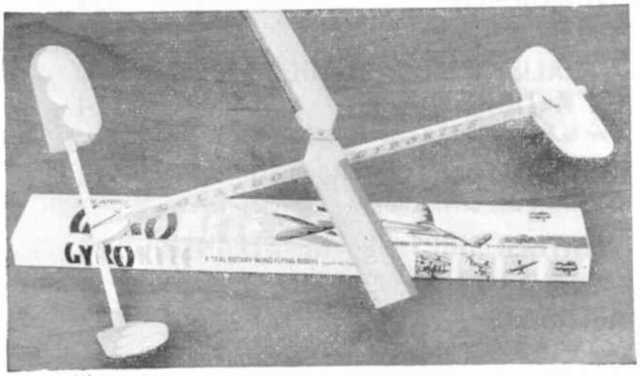
NEW! Solarbo GYROKITE



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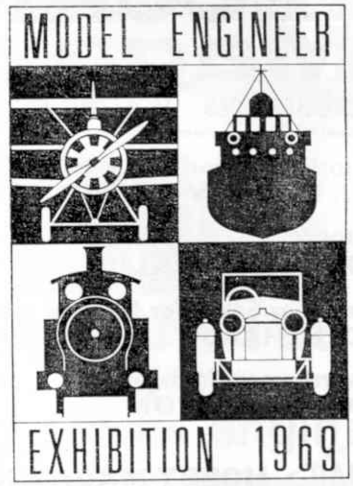

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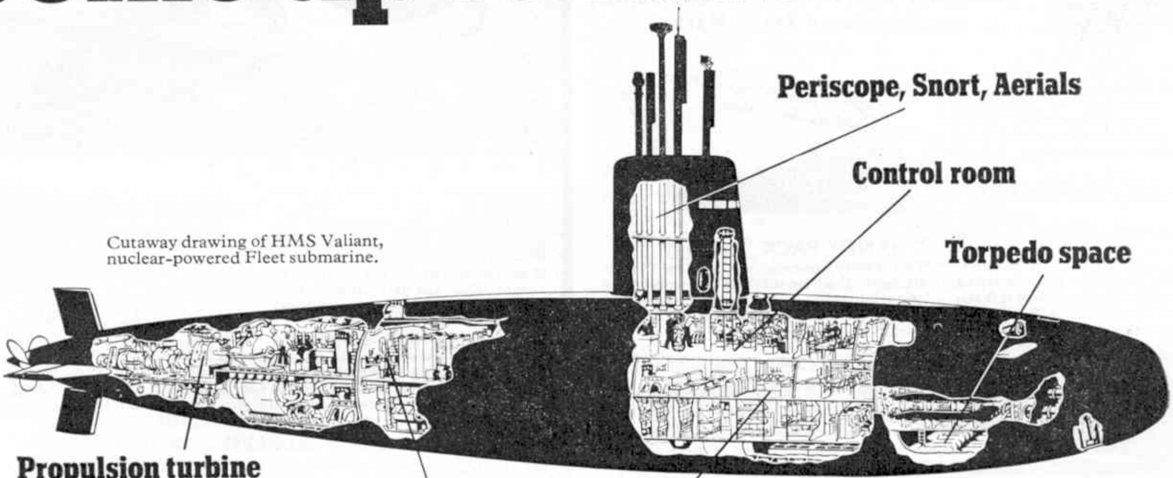

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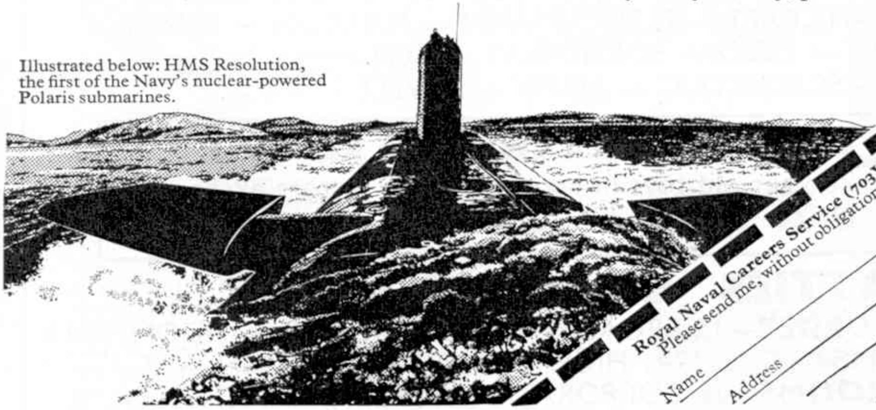
Illustrated below: HMS Resolution, the first of the Navy's nuclear-powered Polaris submarines.



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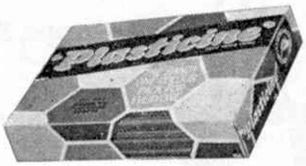

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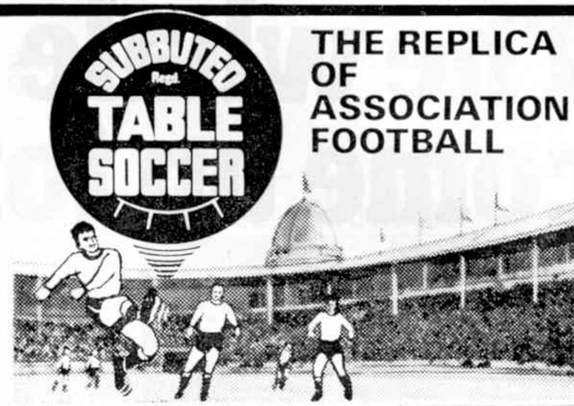

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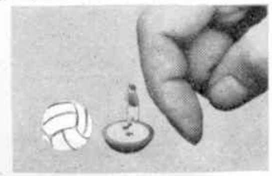

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WORKBENCH

Monogram Modellers' Club

Monogram Models Inc., of 8601 Waukegan Road, Morton Grove, Illinois 60053, U.S.A., have just formed the Monogram Modellers' Club and membership is open to all plastic model builders. The aims of the club are threefold:—To inform members of the latest Monogram kits, to offer guidance on the latest modelling techniques and to bring to the member information designed to increase his enjoyment of model collecting and hobbies in general. Membership for American readers costs 50 cents a year, and it is one dollar for all overseas members, i.e. 8/4d. in Great Britain. Each member gets a membership card, lapel badge and the quarterly news-sheet "Modelers' Quarterly". Your Editor has been made an Honorary Member, No. 5929 and the first newsletter is positively bristling with information. Jack M. Besser, President of "Monogram Models" gives a "Welcome Aboard" message, the latest Monogram kits are described and one is constructed with stage by stage photographs. The three most interesting features to our way of thinking were:—"The Birth of a Model", "Detailing the BF 109 E Messerschmitt", and "Brush Painting". *(Please send membership fees direct to Monogram in the U.S.A., address above, and not to Meccano Magazine. Ed.)*


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Luxury Tractor

The British Leyland Motor Corporation's A.E.C. Mandator V8 tractor must surely be one of the most de-luxe British commercial vehicles yet. The cab has seats that would not seem out of place in an expensive G.T. car and the mate's is reclining. It is also fitted with a luxuriously appointed two bunk sleeper unit on the back of the cab, and clearly shows the determination of the British manufacturers to produce truck cabs up to, and in advance of, the high standard demanded by Continental and European drivers. The machine is powered by a V8 269 h.p. fuel injection diesel engine, which drives through a 10 speed semi-automatic transmission line. Design load for the Mandator is 38/40 tons and with this load the lockable differential, which reduces wheel-spin on slippery surfaces and makes the articulated outfit much more acceptable, is a highly worthwhile optional feature.

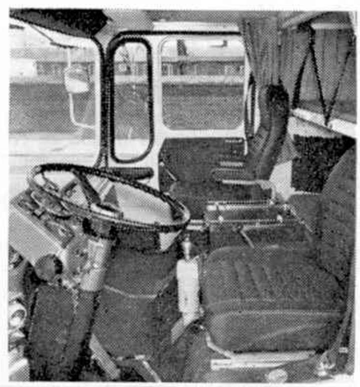
The Great RIKO Competition

The "Great RIKO Competition" will be a free competition launched in conjunction with the issue of the new RIKO catalogue. This, the 1968-69 catalogue, will be available from October 1st at all RIKO model retailers, price of 2/6d. It will also be presented free of charge to all readers of MODEL CARS as an insert in the December issue and to MECCANO MAGAZINE readers as an insert in the January issue. All entrants for the competition will have to obtain an entry form from their model shop or Richard Kohnstam Ltd., and there will be ten basic questions, each having four answers, which will be shown on the entry form. The competitor then selects the answer he considers to be correct and after completing the ten questions, invents a slogan of not more than six words and attaches a RIKO symbol, which will be on the last page of the catalogue. Some of the questions will refer to the text inside the catalogue and this will involve each contestant in reading through the catalogue fairly carefully. The prizes will consist of a HONDA CAR, a HONDA MOPED, a SPORTS BICYCLE, a TAPE RECORDER, four MICROSCOPE SETS, twelve TRANSISTOR RADIOS, one hundred large-scale motorised CAR KITS and one hundred motorised TANK KITS! All in all, a total of 220 prizes and the contest is open from October 1st to May 1st 1969.

London Club

Narrow gauge railway fans in South London, will be pleased to learn that D. Brewer and a group of fellow narrow gauge enthusiasts have decided to form a club. Called the Lewisham and District Narrow Gauge Society they welcome prototype enthusiasts and modellers in all scales. Send a stamped, addressed envelope to L.D.N.G.S., 4 Prior Street, Greenwich, London S.E.10, for full details.

At right, the plush seats and double bunk are just part of the luxurious equipment in the Mandator tractor. Below, the complete tractor which we feel sure will be seen more and more on the roads of the Continent.



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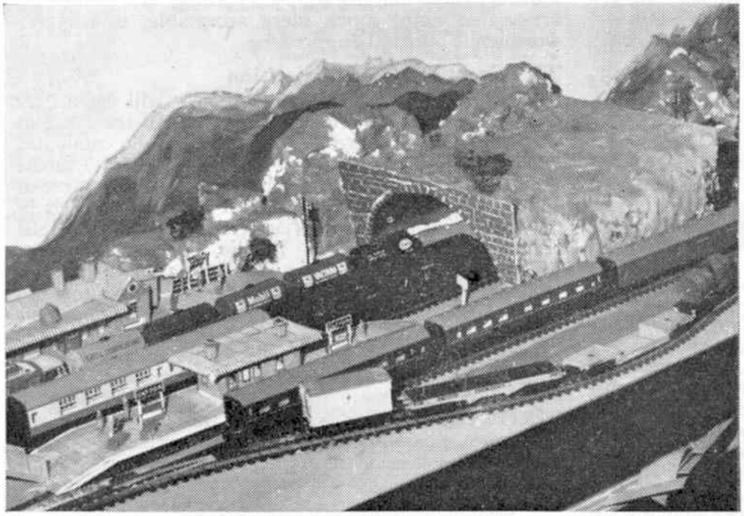

At left: The layout of Gatton station is very realistic, but still simple to construct. Note the tunnel mouth brickwork effect and the painted background to give a depth effect on the wall.

At right: Locomotive E 3001 approaching a bridge after passing through the local station. Note the simple structure that supports the layout, the model people really add realism to this type of layout.

Below right: Locomotive 7032 " Denbigh Castle " with passenger stock passing through Oakham signal box with a 30027 M7 tank locomotive on the quarry branch line.

BUILDING A REALISTIC OO GAUGE LAYOUT ON A TIGHT BUDGET

by D. S. Thomas

THE LAYOUT described here was built as cheaply as possible, a good thing these days when pocket money seems to vanish overnight! The final result looks most realistic and always impresses visitors.

It doesn't take long for the proud owner of a new train set to realise that the carpet is no place for a layout, what with fluff getting into the works and requests to dismantle the track to tidy the room! Not to mention the dangers of treading on the rolling-stock. So the author decided to make a layout that could remain in place. If you are lucky enough to have a spare room, or space in your bedroom, then the location is fixed. Our layout occupies a spare bedroom and we decided that the tracks should be run around the room with space left in the centre for the controller and privileged visitors.

The track must be laid on a baseboard, and for this we made benches along each of the walls. The bench tops are preferably made from insulation board with wooden battens for strengthening purposes, as we can push track pins etc. easily into this material. We pressed into use some chipboard which originally formed darkroom benches, and an old double wardrobe unscrewed to form two halves which, when placed on their sides, formed ready-made benches. The width of the benches should not be more than about 3 feet, to allow access to any part of the layout. The height of the benches is about 2 feet, which allows the controller to sit in comfort and supervise operations.

We then planned the track routes, and from this moment it became more and more interesting. Planning, modelling and making scenery can be even more interesting than operating trains. *See the last seven months of " Trackside Competition " in Meccano Magazine for some simple stations, signal boxes, loco-sheds etc. Back numbers available price 2/6d. each plus 4d. post from the Editorial Office.* Let us have a branch line to a quarry, for example, and a tunnel or two and cuttings. It adds interest if the train disappears from view for a short time during its journey. It is best to plan ahead at this stage, even if we will have to wait for some time for more track, points, etc., so that you won't have to remove a mountain or two to make room for later additions.

We laid the track on the baseboard and altered it here and there until we thought we had the basis of an interesting layout. One bench was occupied by engine sheds, turntable and sidings, one was allocated for a tunnel and station, the third for the quarry branch line and the fourth for another station, a farm and surrounding scenery. We also decided to have mountains along the back of the second and third benches.

The track itself makes two independent loops, with a crossover near the engine sheds. The gap between the benches near the door was bridged over a section of 'river'. This means that access to the room is by crawling under the 'river' or stepping carefully over the bridge! After pencilling-in the positions of the tracks, they were removed and the scenery construction started.

The mountains and cuttings were made from blocks of expanded polystyrene, which is used for packaging many things these days. Egg-boxes are a good substitute. Pieces were broken-off the blocks, leaving a mountainous contour and the blocks then glued to the baseboard, using UHU glue, or similar. When the glue had set, the mountains and cuttings were coated with a runny mixture of Polyfilla, using a palette knife to produce the final contours. The tunnel was made from thin card bent into a half-cylinder between two hardboard tunnel portals, and supported by dowel pins glued and nailed between the portals. The Polyfilla mixture was then applied over the card and allowed to dry.

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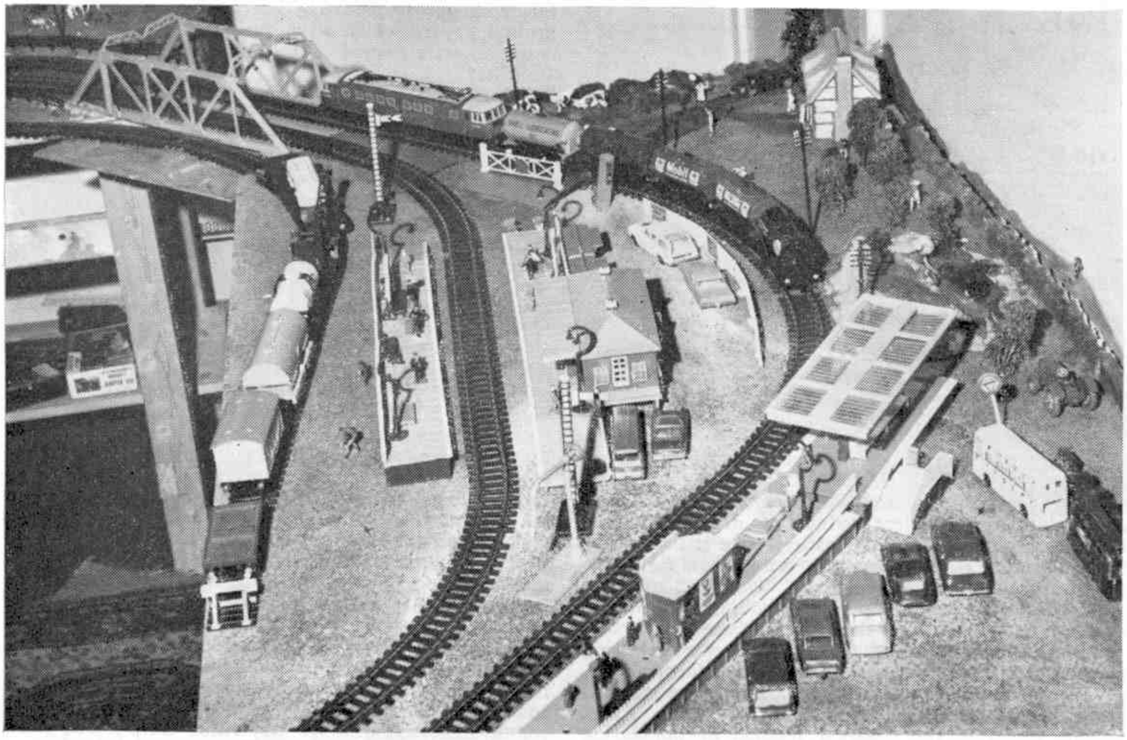


We then started painting the scenery. A flat-finish paint such as Poster Paint or plastic emulsion paint is suitable. Greens, browns and greys are required, but it is cheaper to buy yellow and blue to make green, and white and black to make grey, as we get six colours that way. The scenery is improved if we use the scatter powders that are available in landscape tints, or we can use sawdust and paint over it. We tried two ways of using the scatter powders—one by using the paint liberally and scattering the powder on to the wet paint, and the other by brushing glue over the dried paint and scattering the powders on the glue. We painted the track route and engine shed area in very dark grey scattered with black powder. Roads were made a lighter grey.

To improve the bareness of the landscape, we made trees and bushes from lichen, stuck to twigs found in the garden. The trees were "planted" in Plasticine; another method would be to drill holes in the baseboard and glue the twigs in place, although this makes re-arrangement of the landscape rather more difficult. Hedges were made from foam rubber strips, tearing the tops here and there for a more natural appearance, and stuck to the baseboard, then painted.

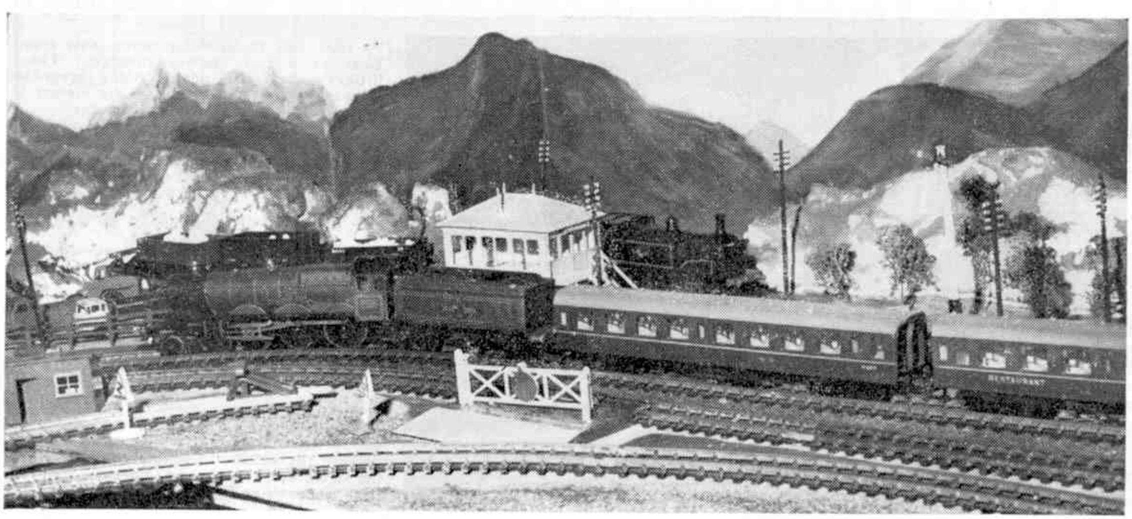


FIG 1

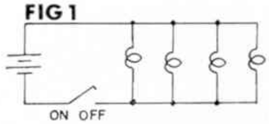


FIG 2

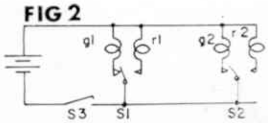
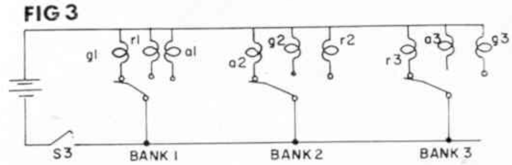


FIG 3



We then laid the track, checking that we had adequate clearance between the two tracks at bends, by running two coaches or locos which have an overhang. When satisfied, the track was pinned at intervals to the baseboard.

We are now ready to add stations, bridges, signal boxes etc. It is much cheaper to assemble these from kits such as Airfix, or to make them from card. The Airfix kits are excellent value for money and the finished result looks most realistic if care is taken over the painting. Humbrol paints were used for these models, using the matt colours. We found that the Airfix kit of telegraph poles, although one of the simplest, added greatly to the realism of the layout.

The next stage is to add life to the scene by having passengers on the platform, and animals, farmers, etc. on the surrounding countryside. There are various proprietary figures on the market, but again Airfix provide probably the cheapest method of populating our layout. These must be painted, but Merit make very life-like figures which are already painted. We used the Triang-Hornby figures for engine crews and sitting passengers in the coaches. An assortment of Matchbox cars, tractors etc. parked near the stations and farms add to the life of the scene.

Although the layout now looks very realistic, a vast improvement is made if we provide a background. We actually painted a landscape scene on the walls. This method has one advantage at least—if you feel like a change of scenery, you just paint over the old one! If you will be photographing your layout, don't forget to paint the sky area sufficiently high to exceed the camera field of view. If you don't feel artistic or confident enough to paint the walls, you can obtain background papers which have various landscapes, village and industrial scenes. Bilteezi and Peco are two suppliers.

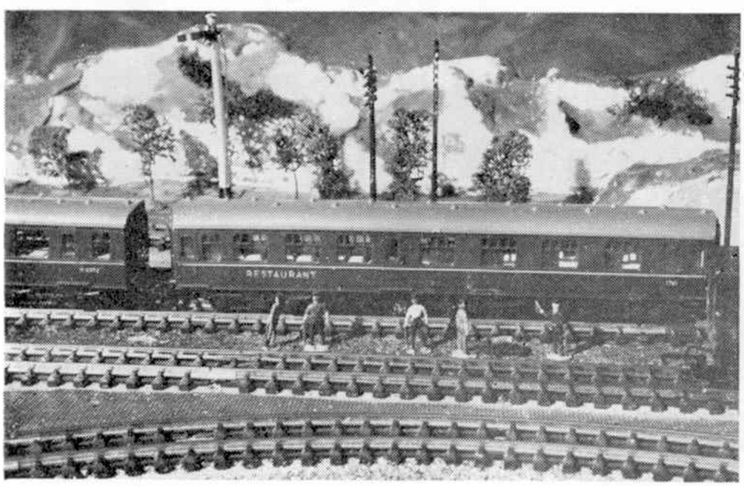
We now have a very lifelike layout, but we can add refinements that will not only lift it out of the ordinary, but will increase our enjoyment in operating the trains. These refinements are lights for the buildings, floodlights for the outside of some of the buildings and colour light signals. Now these are expensive to buy, but if we make them ourselves, it can be economical.

Firstly the lights. For those we used 'grain of wheat' bulbs, so-called because of their shape and small size. These bulbs, in green, amber, red and clear, cost about a shilling each and do not require bulb-holders, as they have their leadout wires extended to about 4 inches. When the bulb has been placed in position in the booking-hall for example, the lead-out wires are secured in position with a couple of spots of glue. The bulbs work from 12 volts, but it is better to run them from 9 or 10 volts, as this will prolong their lives. This means a separate voltage supply from that supplying the track. We use two 4.5 volt batteries connected in series, that is + of one battery to − of the other. You could also use a bell transformer, giving 8 or 10 volts output. Don't forget to take care when using mains electricity, *it can kill*. The bulbs are connected in parallel across the battery or transformer output via an on-off switch, as shown in *figure 1*.

Up to 10 bulbs can be connected in this manner. The wires are run underneath the baseboard, drilling holes for them to come up inside the buildings. To enable us to start night operations, we should add colour light signals. We can either have a red-green system, or red-amber-green. For the red-green system, we need a single-pole double-throw toggle switch for each signal. These switches are obtainable from radio spares shops. *Figure 2* shows how these are connected to operate two signals, g 1 and r 1 being the green and red lamps for the first signal and g 2 and r 2 for the second, s 1 and s 2 being the toggle switches and s 3 the on-off switch.

For a red-amber-green system, we must use a wafer rotary switch, again obtainable from radio spare shops. For three signals we shall need a 3 bank 3-position switch. *Figure 3* shows the connections.

With this circuit, signals 1, 2 and 3 will show green, amber and red respectively with the wafer switch in



At left: The track maintenance crew stand clear as a train passes through. These little touches with people doing everyday railway jobs on the layout, really elevate it from 'toy' to 'model' status.

At right, above: The 46225 "Duchess of Gloucester" with the 11 a.m. down express passing the 92220 "Evening Star". Note the telegraph poles and lineside fixtures such as fences and gates.

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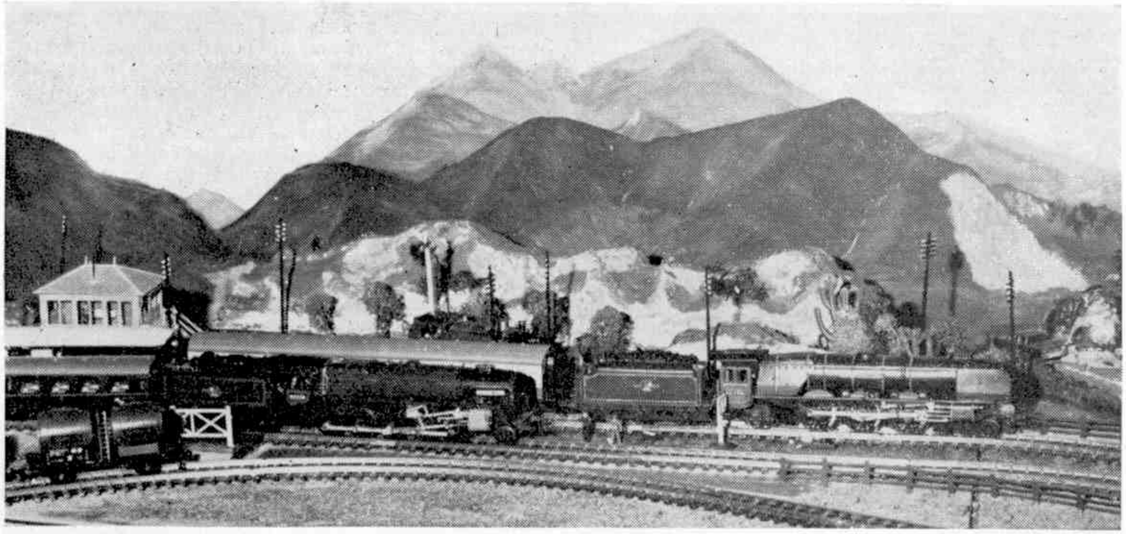
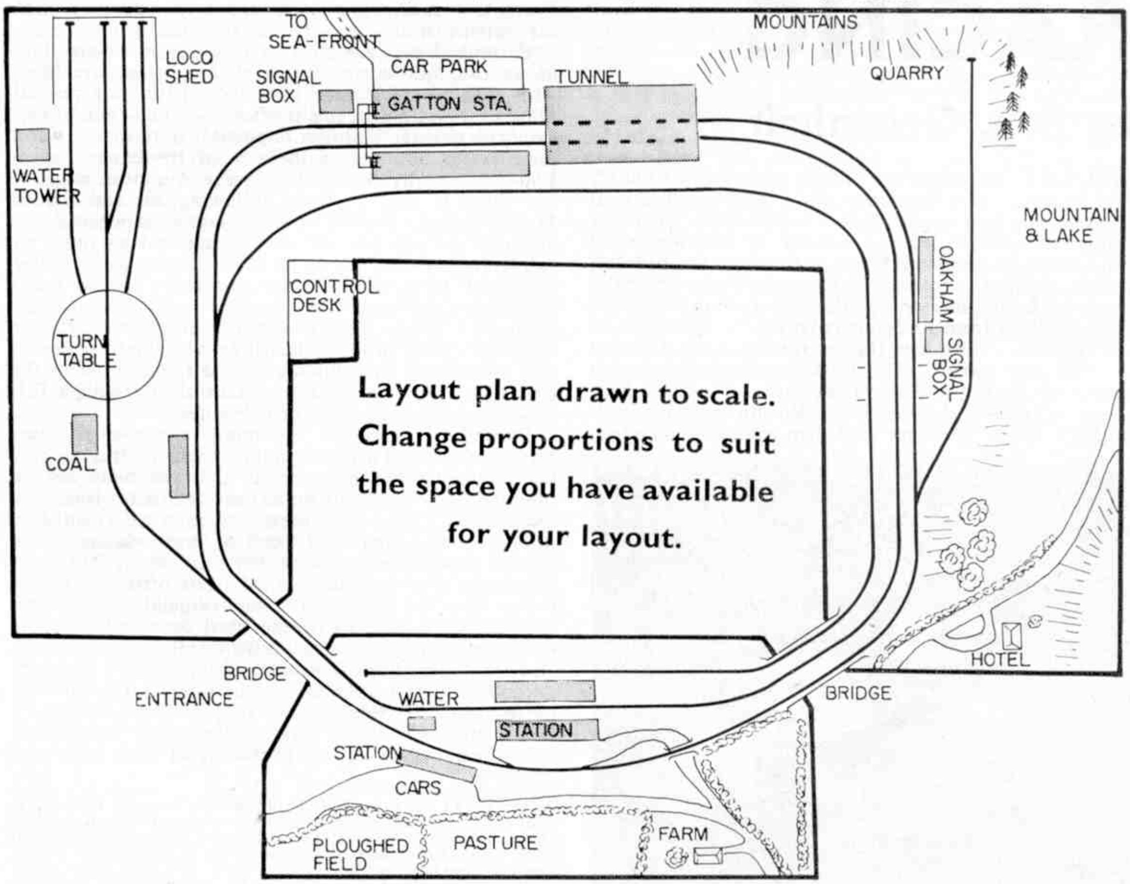


position 1 as shown. As the train passes signal 1, we turn the switch one position and now signal 2 will be green; 3 and 1 being amber and red respectively. Similarly another operation of the switch makes signals 3, 1, 2, turn green, amber and red respectively. Thus a continuous clearway for the train can be signalled or the train may be stopped at any signal.

The final touch for realistic night operations is to have a blue bulb in the room light and we now have a layout that we can be proud of.



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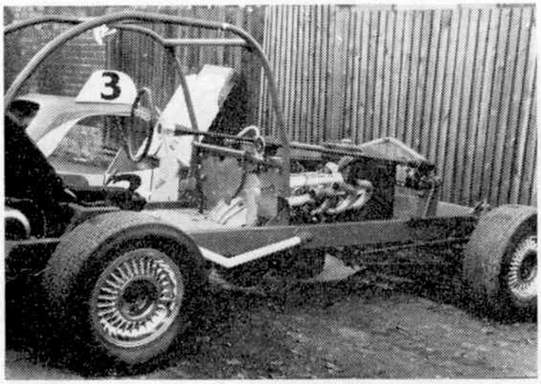

BRITISH STOCK CAR RACING

by B. J. Greenhalf

STOCK CAR racing was introduced into this Country in 1954 from America. Since those early days it has certainly had its critics as a motor sport, but today enjoys an ever increasing number of followers, and can be seen at numerous tracks throughout the country. It has changed considerably from the form originally imported from America, and developed along altogether differing lines from its counterpart on the other side of the Atlantic. Stock Car Racing usually takes place on a small oval circuit. The track is often shared with Speedway Racing and it was at such a Stadium, New Cross in London, that Stock Car Racing made its debut in April 1954. The cars used then were large cumbersome American models and a few unsuitable larger British cars of that era, all heavily armoured for the purpose of disposing of the opposition in any way possible. In fact the only thing noticable about the rules of the 'sport' was the fact that there simply were none. The sporting element did not exist, and the last one running was declared the winner. Unscrupulous promoters of the time even went as far as to pay a little extra bonus to the driver who could cause the most havoc by deliberately wrecking or overturning other cars, so it was not surprising that the general public soon tired of this and the sport went into a rapid decline. However, a few people persevered through the lean years and in 1958 a move to discipline the sport was made by the formation of the first national governing body. Rules and regulations were introduced (and adhered to) and by now significant changes had taken place within the sport itself. Competitors had begun to realise that lighter and more managable cars would win more of the prize money and so started the move away from the "Stock" car previously seen, which was raced in its virtual road going state, to the specialised Stock Car which grace our Raceways today.

These are constructed specifically for short circuit oval racing, and nothing else. There are now three classes of Stock Car Racing—Formula I (also referred to as Seniors), Formula II and Juniors. The latter classes were introduced in an effort to keep the cost of racing within reasonable reach of all pockets, for Formula I racing is now an expensive operation with cars often costing almost £1,000 to build.

Formula I cars are built to a maximum weight limit of 25 cwt, but invariably weigh much less, are fitted with a body which must have started life as a normal saloon car—although this is often "cut and shut" to an extent as to make it almost impossible to recognise—and there is no limit as to the size of the engine fitted. Power is usually provided by large American engines, but there is also a strong following for the British Jaguar engine. Several of these Jaguar exponents rate amongst the top men of F.I. racing and its quite an exhilarating experience to hear the Jaguar cars as they jostle for front places, their distinctive whine heard way above the other cars on the track. In 1961 the Formula I World Final was won by the greatest Jaguar driver of them all, Jock Lloyd (131) whose victory in this great event brought him added fame by being the only man before or since to obtain victory with a F.I. Stock Car powered by a British engine.

Formula II cars are the more potent of the two smaller classes. Their maximum weight limit is 15 cwt, but they do differ in so much that the body can be of any design, often self-built, provided that it is cleanly constructed. They are powered by 1200 c.c. (manufacturer's rating) engines of 1956 or prior vintage, from normal production type cars, but they can be hotted up by almost any possible method, thus often producing power far in excess of their original capabilities. B.M.C. units seem to be the most favoured, and the output of some of these cars must be seen to be believed. Juniors differ from Formula II in several respects. Although their maximum weight limit is the same as the Formula II class, 15 cwt, they, like the Formula I cars, must be fitted with bodies from production saloon cars. One sees a profusion of Fiat 500s and

At the top of the page, Ellis Ford's potent Formula I Stock car with body removed. Note the rollover cage and the steel girder chassis. At left: Power unlimited; Formula I stars George Ansell (375) and Jim Essau (244), attempt to avoid the 'fence bending' exploits of Ron Cayzer (267) and Earl Testo (389) during an action-packed race. *Photo: Hendnesford Hills Raceway.*

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immediate post war Fords, sprinkled with a few old Austin Ruby bodies and some more modern looking Mini bodied cars. Engine wise the limit remains at 1200 c.c. but—and here is the biggest difference—these engines must be pre-1948 vintage, hence drivers are limited to the old side valve engines, mainly of Ford origin. In fact, the Juniors were the first of the smaller classes and during their early years consisted of very "Stock" looking Ford Populars, Anglias and Prefects of the forties. Nevertheless, the mechanical skills induced into these old engines is quite remarkable and they can turn on a fair amount of power—and have a huge following.

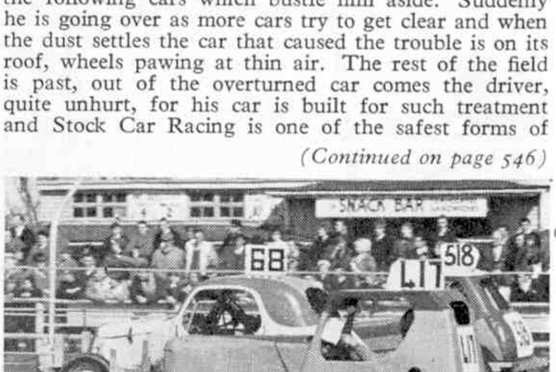
All these classes share certain construction details, in so much that the chassis is often self constructed from boxed steel, all must have internal roll bars (tubular) which 'cage' the driver, the driving seat must be bolted and welded to the main frame, fuel tanks and batteries are inboard, doors and other movable parts must be bolted and welded in place and, of course, no glass anywhere and full safety harness fitted. The armament or bumpering, once so prevalent, is now kept to a minimum and of limited dimensions. Drivers in all classes are graded on a monthly points basis, their gradings depicted by differing roof colours on the cars—White or "C" grade for newcomers, novices or those who have run out of luck; Yellow or "B" graders; Blue or "A" graders and the "Star" men of the sport—those who proudly display the Red roof. One other colour appears and that belongs to the current World Champion of each class and he sports a Gold roof whilst holding the coveted title and always starts with the Redtops during his reign as Champion.

There are only a limited number of places permitted in each grading other than White or "C" grade, so places really have to be fought for. This means that each time a driver appears he is not only looking for prize money, but also points to enable him to either remain in or improve upon his current monthly grading.

Above: It happens to the best. 1967/68 Formula Junior World Champion Andy Webb (763) parks neatly on a fence post as veteran driver Chick Woodroffe (601) drives past, this time to take the chequered flag. *Photo: Alan Ralls.* **At right: Roger Warnes (417) in a typical example of a self-constructed Formula II stock car.** *Photo: Spedeworth Ltd.*

Two facts which are noticably different from other forms of motor racing is that firstly the Redtops, or Star men, always start from the back of the grid, and have to battle their way through the "A," "B" and "C" grades during every meeting to maintain their status. Secondly a driver keeps his own number throughout his racing career. This latter point makes it easy for a driver to have his own fan club, and many do, with ardent and dedicated fans travelling thousands of miles a season to wave banners and help cheer their man home. The cars themselves present a gay sight as they line up on the grid in graded order. Other than the roof, there is a great profusion of gaily painted bodywork. Straight through exhausts and the noise builds up as anything from sixteen to thirty cars take their places. They move off on a rolling lap start, down goes the flag and away they go into the first bend amidst a cresendo of revving engines and a roar of encouragement from the spectators. Who would want to be in the front row position with the knowledge that there are all those cars hurtling along behind you! A white top fails to come out of the bend, skids into the following cars which bustle him aside. Suddenly he is going over as more cars try to get clear and when the dust settles the car that caused the trouble is on its roof, wheels pawing at thin air. The rest of the field is past, out of the overturned car comes the driver, quite unhurt, for his car is built for such treatment and Stock Car Racing is one of the safest forms of

(Continued on page 546)



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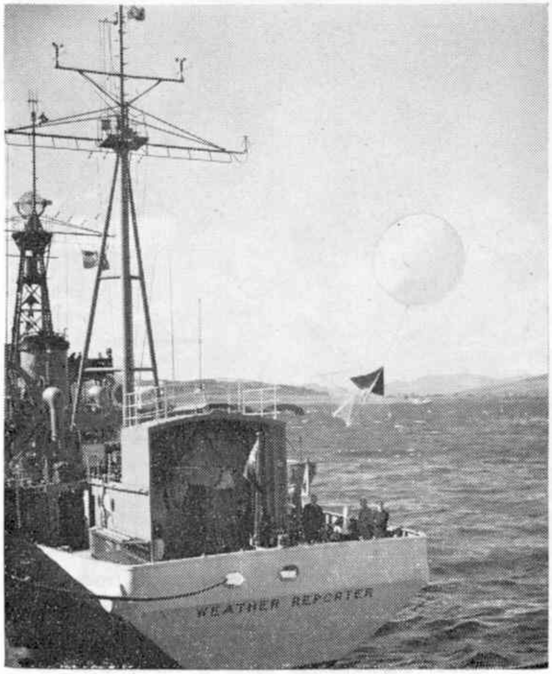
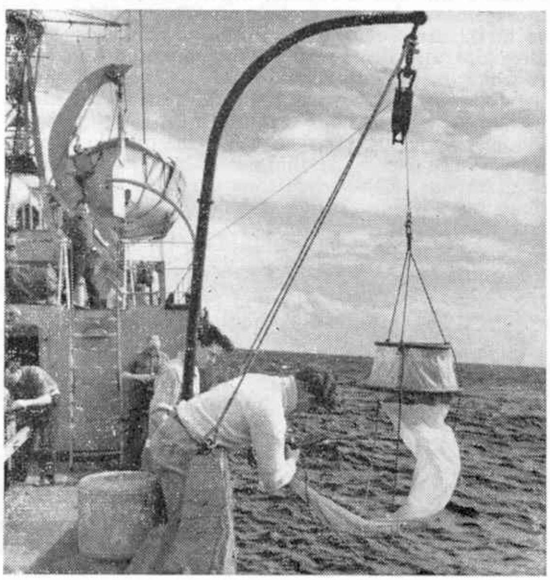


Weather Ships of the Atlantic

by W. H. Owens



LASHED BY merciless gales and pounded by heavy seas, about twenty small ships stationed in the North Atlantic serve the weather forecasting organisations on both sides of the ocean. Their crews—drawn from six maritime nations, including Great Britain—endure some of the hardest climatic conditions outside the polar regions so that forecasters ashore may predict tomorrow's weather with great accuracy.

Much information which day-to-day weather forecasting depends on has to be collected at sea. For a very long time this has been done by voluntary observers serving in merchant ships. The Central Forecasting Office at Bracknell, Berkshire, receives daily surface observations at six-hourly intervals from 500 selected British ships. Less frequent and detailed reports are transmitted by some 250 smaller vessels.

Valuable as these reports are to the forecasters, they only take account of conditions on the ocean surface. Moreover, as the ships are in movement they may not often be just where the meteorologists ashore really need them. These are reasons why the fleet of special weather ships is necessary.

The North Atlantic Weather Stations were set up by international agreement immediately after the Second World War. As a result of the tremendous growth of transatlantic air traffic, much more detailed information about ocean weather conditions was required than could be provided by the observers in moving ships.

During the latter part of the war, aircraft in considerable numbers were flown from the United States and Canada for service in Europe, the Mediterranean and North Africa. At the time, of course, merchant ships could not transmit radio messages which might divulge their positions to enemy submarines. So the Allied Navies formed a chain of weather ships with naval corvettes to safeguard the aircraft on their way across the ocean.

In 1946 an international conference in London agreed to establish thirteen permanent ocean weather stations between Iceland and the Azores. Their number has since been reduced to nine—five in the Eastern Atlantic and four in the Western Atlantic.

Great Britain operates four ships as part of the European fleet of ten at Eastern Atlantic Stations. Two British ships are always at sea, and two off duty at the home base at Greenock on the River Clyde. Other nations which operate weather ships include France, the Netherlands, Norway and Sweden jointly, and the United States which provides all the ships for the Western Atlantic Stations. (Canada mans one of three weather stations in the North Pacific.) The countries having regular transatlantic airline services and which do not provide weather ships make their contributions in cash.

In addition to its meteorological duties, a weather ship "on station" provides emergency air/sea rescue facilities for aircraft and ships, and also navigational assistance for aircraft in flight. Certain oceanographical and other scientific work is carried out too.

Routine surface weather observations are made by the Met. staff aboard at hourly intervals throughout the day and night. These comprise observations of the density, height and type of clouds, wind direction and force, visibility, barometric pressure, air temperature and humidity, and the direction, height and period of sea waves. Twice a day the sea temperature is taken, to a depth of 450 feet, with an instrument called a bathythermograph.

One of the most important jobs of the weather ship meteorologists is to investigate conditions in the upper air. The resulting information has a most important

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bearing on accurate weather forecasting.

For this purpose an apparatus called radio-sonde is dispatched from the ship's deck at regular intervals. The radio-sonde is a miniature radio transmitter which is carried aloft by a large hydrogen-filled balloon. By an ingenious switching system, controlled by a tiny windmill, the transmitter sends out signals of varying frequencies at different levels. These are received aboard the ship and are converted into values of pressure, temperature and humidity.

The transmitter continues to emit its signals up to a height of 60,000 feet or so where, owing to reduced atmospheric pressure, the balloon bursts. The instruments fall into the sea and are lost.

Launching the raido-sonde balloon—it is seven feet in diameter—during a spell of bad weather can be a very difficult and even hazardous task. But the weather ship men take a keen pride in keeping up the programme of day-to-day observations at all times, and in fair weather or foul.

For making observations of winds in the upper atmosphere, the ship's radar equipment tracks a radar target which is attached to the rising balloon. By this means it is possible to calculate both the speed and direction of the wind at different levels.

Results of the surface and upper air observations made aboard weather ships and merchant vessels alike are coded and transmitted direct to the Central Forecasting Office. There, together with a mass of other "raw material" collected at observer stations on land, they are fed into a computer which now plays an important part in scientific weather forecasting.

Radio officers of the weather ships keep in touch with the Air Traffic Control Centre at Prestwick in case they are needed for air/sea rescue emergencies. Fortunately these occur very seldom. Nevertheless, each ship carries full rescue gear and its crew is well prepared for any eventuality. If an aircraft captain should report that his plane is in difficulties, he is guided by navigational aids towards the weather ship where rescue can speedily follow a forced landing.

Direct radio-telephone contact is maintained between weather ships and transatlantic aircraft. Most pilots passing over talk with the ship's radio operator to get the latest news of the weather ahead. Each ship is equipped with a radio beacon and radio direction finders so that the navigator of a passing plane can "fix" his position in relation to the stationary vessel.

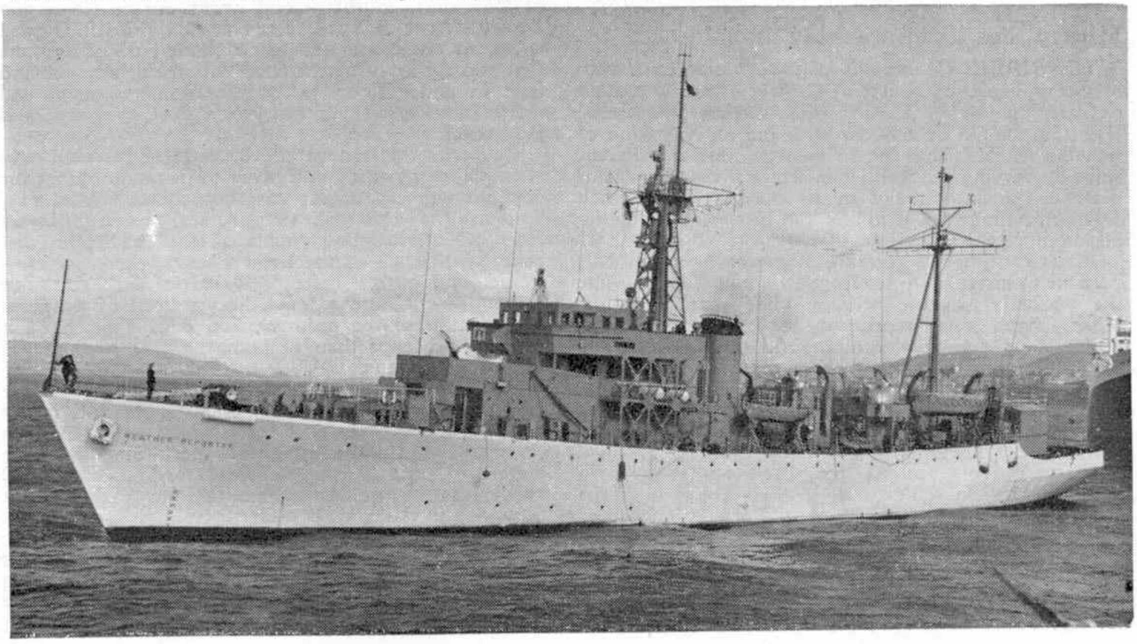
The ocean weather ships take part in scientific activities other than those directly concerned with meteorology. For example, while on passage to and from their stations they may tow an apparatus known as a plankton recorder. Plankton, of course, is the food of many different kinds of edible fish, and so information about its distribution is of great value to such bodies as the Ministry of Agriculture and Fisheries and trawler owners.

While there is always plenty of work around for the fifty or so members of each weather ship's crew, there is time for leisure activities too. Film shows are given regularly, some of the ships have their own concert parties, and all have a library. In fine weather cricket and other deck games are played in the balloon hanger. Bird watching is popular on several ships, and over the years very large numbers of sea birds and migrants have been sighted, including many rare species.

A weather ship is at sea for 24 days at a stretch, followed by 12 to 23 days in harbour. Crews are naturally glad to be relieved and, especially after a bad weather spell, greet the relief ship with delight. As it draws close, a lifeboat is launched to ferry mail to the ship returning to base. Soon the relieved ship is on the move, taking its hard-working crew for a well earned leave ashore—with the hope of good weather in which to enjoy it.

At left, top: Launching a radio-sonde balloon from a British weather ship at the Greenock base in Scotland. The hydrogen filled balloon and radio transmitter reach a height of 60,000 feet.

At left, bottom: A plankton net being checked for fishing conditions near the weather ship. Below: The ship "Weather Reporter" leaving Greenock Dock for her Atlantic Station.



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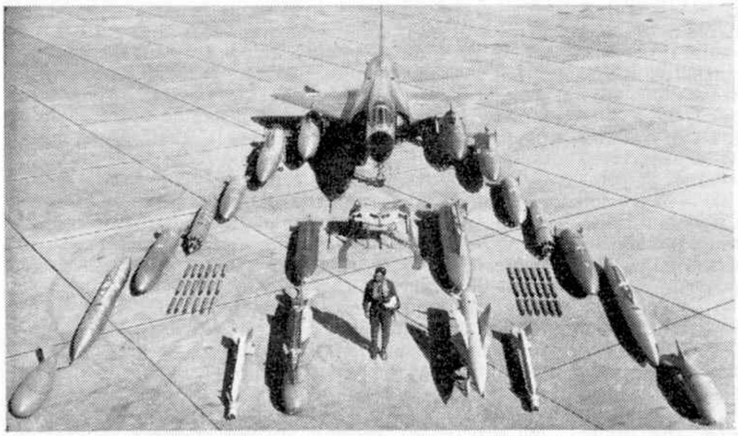

A Mirage III with the awesome range of destructive weapons it can carry. A very versatile aircraft, the Mirage III design has been scaled up to make a bomber version, and the simpler Mirage 5 uses the same basic airframe.

AIR NEWS

Mirage flies like a washing machine

THE SUBHEAD on this page may not seem very complimentary to one of the world's finest combat aircraft, but it is. Anyone who watches commercial television should be familiar with the superior kind of washing machine that can be made to work in different ways by varying the manner in which a plastic selector plate is put into a slot in its casing. The French Dassault Mirage III-E fighter can be flown automatically in much the same way.

In its cockpit is a rotating magazine in which it is possible to insert up to twelve plastic punch-cards—like the washing machine selector plate—one after the other. Each card represents the geographical co-ordinates of a particular place, and equipment in the Mirage is able to compare these coordinates with the position of the aircraft at any moment during its flight. A calculator then tells the pilot the course which he must steer and the distance to the point which the punch-card represents.

Let us imagine, for example, that the pilot wants to fly from the big military air base at Dijon to Paris. Before take-off he will place the "Paris" punch-card into the magazine. As soon as he reaches a speed of 150 knots during take-off, the calculator begins to work and gives him his compass bearing and distance to fly to Paris. When he reaches Paris, he can fly on to, say, Beauvais, by simply putting into the magazine the "Beauvais" card and steering on to the new heading worked out for him by the black boxes.

Even if, half-way between two points, he is ordered by radio to go to a place for which he has no punch-card, this presents no problems. He simply sets on the magazine by means of two knobs the bearing and distance of his new destination from the old one and the calculator will immediately tell him his new heading and distance to go.

The information for this equipment is provided by British Marconi Doppler radar and a TACAN tactical air navigation system. In addition, Cyrano II nose radar can locate an enemy aircraft and guide the Mirage towards it automatically and tell the pilot when to launch his air-to-air missiles. It can also give a radar map of the terrain beneath the aircraft and tell the pilot to pull up into a climb if any obstacle in his path offers a danger of collision.

Fully-equipped, a Mirage III-E costs around £400,000, a sum that would have bought six squadrons of Hurricanes in the second world war or about 300 Sopwith Pups in 1916. Even at that price it is good value, as there are not many single-engined fighters that can fly at twice the speed of sound, take-off and land in under 1,000 yards from rough airstrips and carry such a weight and variety of weapons and electronics.

Countries that cannot afford the III-E, or need only a simple, easier-to-fly and easier-to-maintain fighter for daylight use, can in any case buy the new Mirage 5. This has the same basic airframe and 13,670 lb. thrust Atar 9C afterburning engine as the III-E, but dispense with much of the latter's heavy, expensive electronic equipment. Instead, it carries an extra 110 gallons of fuel and a much heavier load of weapons. The picture of the prototype, on page 533, shows it carrying no fewer than 14 bombs, with a total weight of nearly four tons.

Even this is only part of the Mirage story. There are tandem two-seat models for training and others with camera-carrying nose for reconnaissance. All can carry a liquid-propellent rocket pack built into the bottom of their fuselage to speed take-off, climb and acceleration in combat, enabling them to reach a height of 75,000 ft. in seven minutes.

When the French Air Force wanted a supersonic vehicle for its newly-perfected atomic bomb, Dassault simply scaled up the Mirage III design from a wing span of 27 ft. to 38 ft. 10½ in., fitted a pair of Atar engines side-by-side in the rear fuselage, and the result

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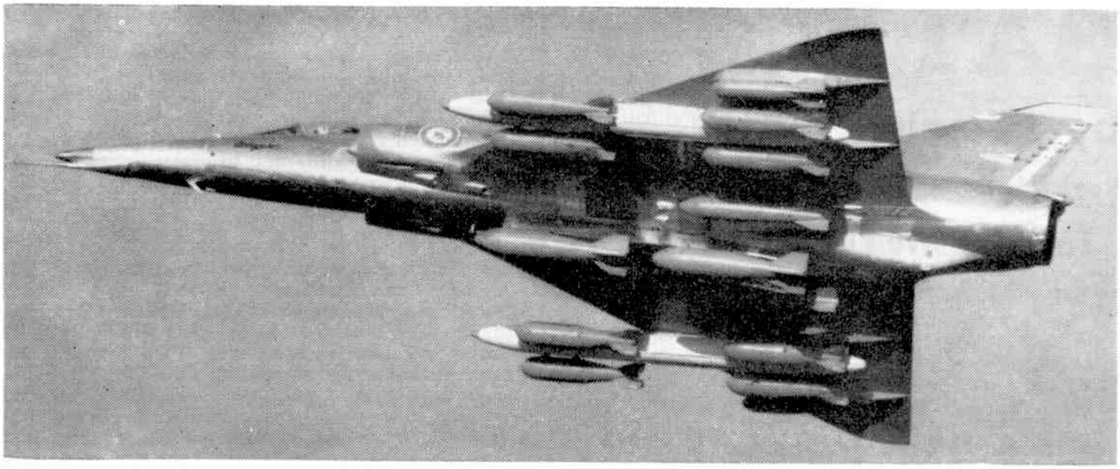


The less expensive and easier to maintain Mirage Mk 5 with a full combat load on board.

was the Mirage IV. To meet the need for a formidable new fighter for the seventies, they have fitted sweptback wings and a tailplane in place of the Mirage III's usual delta wing, to produce the Super Mirage F1. Even the swing-wing Mirage G and vertical take-off Mirage III-V bear an obvious family likeness to the standard fighters.

About 1,000 Mirage III's and 5's had been ordered by mid-1968. Of these over 600 had been completed, including licence production in Australia and Switzerland. Added to the Caravelle airliner, Magister trainer, Alouette helicopters and, now, the Jaguar and Concorde, these fine machines have re-established the French aircraft industry as one of the best in the world.

How loud is loud ?

Some years ago an American air force general indicated the power of the B-52 Stratofortress bomber by stating proudly that the noise from its eight jet-engines was as great as that which would be produced if all the people on earth talked at once.

The airliners are more sensitive about noise, as they are faced with the constant problem of persuading the public that it is worth tolerating the sound of jet-engines to obtain the kind of services they have to offer. To support their claims, they produced some interesting statistics recently.

It appears that measurements taken in London showed the beat music in a discotheque, at 98 decibels, was more noisy than living in a house backing on to a railway track, more noisy than a heavy lorry only 25 ft. away, more noisy than the traffic's roar in one of London's busiest streets, and not much less noisy than living under the final approaches at London Airport, where 104 decibels were recorded.

Minimum aeroplanes

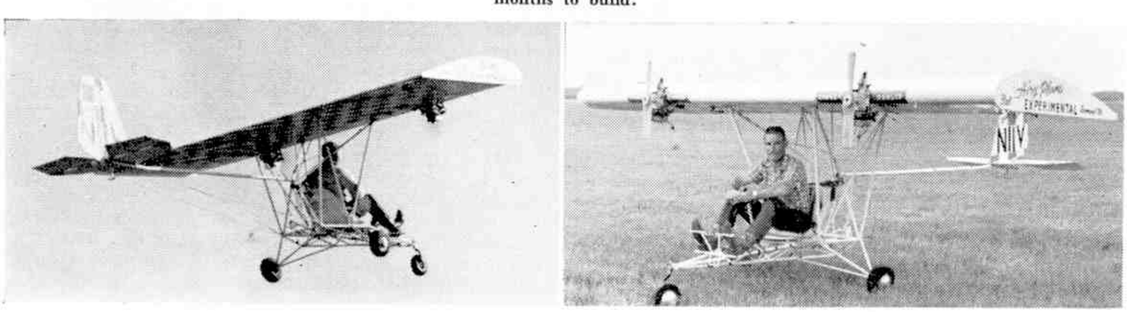
Latest craze among America's amateur designer/pilots is to build what are called "minimum aeroplanes". The idea is to produce the simplest possible welded steel-tube structure that will support a wing, tail unit and power plant and get itself airborne. The results look very like the stick-and-string contraptions flown by Curtiss and Santos-Dumont sixty years ago.

The current record for minimum-isation probably goes to Wilbur Stain of Diamond, Missouri, whose Airy-Plane is shown in the illustration below. It consists basically of an L-shape open-girder assembly of steel tubing, carying the wing, seat, controls and landing gear. A single tube, wire-braced to the central structure, carries the tail unit.

As the aircraft has an empty weight of only 175 lb., a high-lift wing only 14 ft. in span is sufficient to lift it. Propulsion is provided by a pair of 10 hp West Bend chain-saw engines, driving 24-in. diameter propellers.

The Airy-Plane may not be fast or handsome, but it took only three months to build, at a cost of about £210, and must be fun to fly.

The most minimum-minimum aircraft yet! Built by Wilbur Stain in the U.S.A., it only spans 14 ft., and took three months to build.



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BATTLE

by Charles Grant

Part VI —The Defensive Powei of Armour

WHEN AN armour-piercing shot hits a tank, or any other vehicle for that matter, what happens is dependent on a great variety of factors, of which the most readily apparent are—the calibre of the gun which fired; the range involved; the type of shot; the angle at which the target is hit and the thickness of the metal skin. The last, as we know, can range from the immensely strong and thick frontal armour of a 'Tiger' tank, which will obviously take a considerable wallop before being even dented, right down the scale to an unarmoured truck which, for practically any type of armour-piercing shot, is pretty much of a pushover. Now all the factors specified above will be taken into consideration, but first we have to deal with the last we mentioned—the armour value of the target vehicle.

The most cursory glance at the specifications for any fighting vehicle shows at once that there are many varying thicknesses of armour to be met with on any one tank, and different 'marks' of the same one may vary quite considerably in the armour of some particular section thereof. Almost invariably the front of a tank is more heavily protected than the remainder—theoretically, this is the aspect most usually turned towards the enemy, and it might provide a boost to the morale of the crew and dissuade them from turning their backs to the foe! Here and there it will be found that the manufacturer's idea of what was deemed adequate protection was found insufficient by the fighting men and additional armour plates were bolted on to a tank. This was seen in a number of World War II A.F.V.'s —heavy plates fixed to the sides, overlapping the tracks, always a vulnerable feature of a tank, where a shot might easily immobilise, if not necessarily destroy. The turret, too, being a high priority target, was also heavily armoured, although again the emphasis was normally on the frontal aspect. Roof armour of both chassis and turret were naturally lighter than that of both front and sides.

If we established a set of rules making immediate allowance for all the enormous number of armour variations to be found on even the limited number of tanks we are going to use in "Battle" the result would be too complex by far—we should have to draw up a set of tables as complicated as any volume of logarithms and, if we added the additional factor of the inclination of the armoured plates one to the other, we should be quite hopelessly bogged down. Nevertheless, as I hope the reader will be patient enough to learn as time goes on, we shall indeed have rules which will give reasonably appropriate effect to the particular point of a tank struck by a shell and to the angle at which it hits.

It is an extraordinary thing that, even with such a recent period of military history as World War II, we still get varying and often conflicting statements of fact relating to actual constructional details of such things as tanks, etc. One rather expects this when doing research on earlier periods, the Napoleonic Wars and so on, but with so much data available, it is a little surprising when two different and seemingly reliable sources give apparently different figures for—to quote an example—maximum armour thickness of a Panther tank. The numerous modifications of this vehicle might explain this away, so might varying types produced by different firms to requirements not always the same. Still, not to worry, what we are primarily concerned with is the *relative* defensive strengths of the A.F.V.'s we are using and if we can say, if only approximately, how the defensive power of the Panther compared with that of the Sherman, how the latter compared with the armoured half-track, and so on, we are pretty well home and dry.

Perhaps if I give one set of comparative values from a single, easily obtained source, the basis of what we are trying to achieve can be found. This is from a very readable book—if not the most technically detailed—"Tanks in Battle", by Colonel H. C. B. Rogers. What in fact we need is a *defensive value* for all the tanks and other vehicles appearing in our game. Some, such as the jeep or the truck, will have next to nothing in this connection, others, like the Churchill and the Panther, will have very large ones. Here it is then as given in an appendix to the book to which I have referred.

Tank	Nationality	Maximum Armour Thickness
Panther	Ger.	120 mm.
Churchill	Br.	100 mm.
PzKw. IV	Ger.	85 mm.
Sherman	U.S.	76 mm.
T.34	Russ.	75 mm.

This list may not indeed be acceptable to many a military purist, but I give it as printed. It seems that the figures refer to the greatest thickness of armour for each type in use towards the end of World War II but, in any case, it provides a good basis for comparison.

It will be seen that I have included the German tank —the PzKw IV—whose details were omitted from the previous article on tank speeds, etc. The decision to bring in the Mark IV was prompted by the thought that the Panther—the Mark V—which I had originally intended to be the sole German representative, was far stronger defensively than the tanks of other nationalities. This would have resulted in a very unequal fight were it included in future battles against the smaller fry. It would be pretty unfair to a battlegamer with possibly an American army using Shermans to pit him against a German one with the terrible Panthers. Hence the details of the Mark IV, for which the Sherman was a reasonable match. We can give a few details concerning the PzKw IV to bring it into line. We shall employ the one armed with the long-barrelled 75 mm. gun, whose speed was similar to that of the Sherman and which can consequently be converted to battlegame table moves of 12 in. on roads and 6 in. across country.

Taking the foregoing list further down the scale we come to the more lightly armoured types, the self-propelled guns, the half-tracks and armoured cars, and last of all the jeeps, trucks and other soft-skinned vehicles. Once again we give—this time from a number of sources—the maximum armour thickness as a guide to their defensive capabilities.

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Vehicle	Nationality	Maximum Armour Thickness
Sturmgeschutz III (S.P. gun)	Ger.	50 mm.
Sdkfz 234 (Heavy armoured car)	Ger.	30 mm.
A.E.C. Armoured car (heavy)	Br.	30 mm.
Sdkfz 231 (Light armoured car)	Ger.	14.5 mm.
Humber Armoured Car (Light)	Br.	15 mm.
Sdkfz 251 (Half Track)	Ger.	12 mm.

Together with the previous list, this should be enough to be going on with, and we conclude with the ordinarily unarmoured truck or jeep whose defensive value, with next to no protection, is relatively about nil.

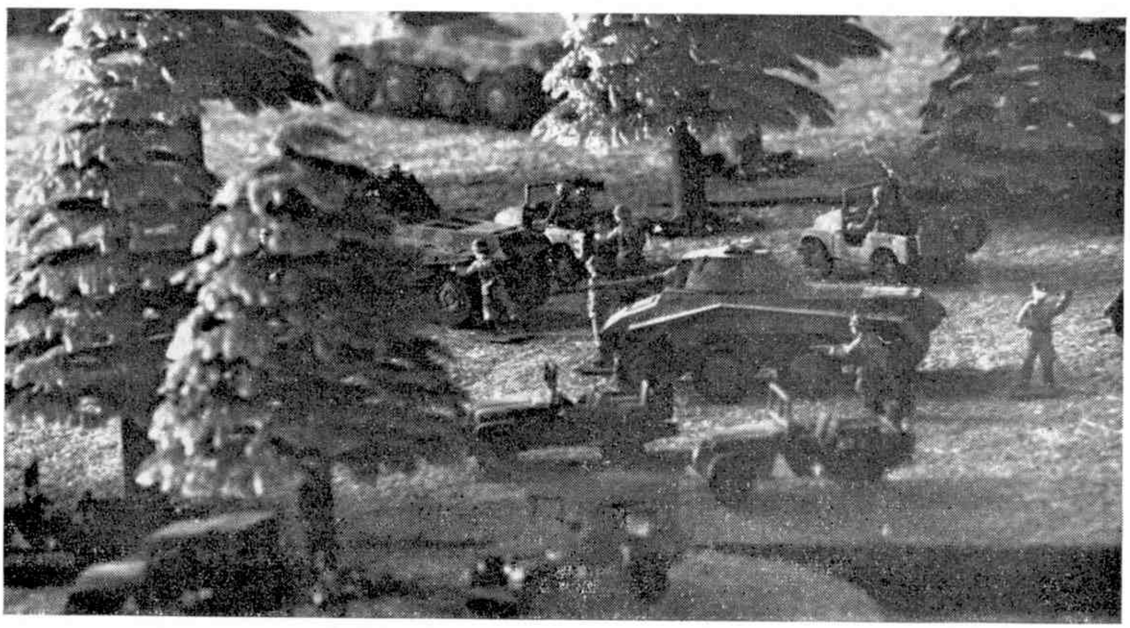
Now, from all this wealth of data we can work out a table of comparison values to indicate the defensive power of the vehicles used in " Battle ". Let me elaborate just a little on what we are aiming to do, and this applies initially to a tank versus tank battle, or at least an engagement between a gun firing armour-piercing shot and some kind of vehicle, more or less protected by armour. The process is simple—the gun fires at the target, the first problem being to hit it. If this is successful and the shell makes contact, the result—in the simplest sense—is determined by the difference between the penetrative capability of the shell and the toughness of the defensive armour. We have then to work out a rule which has two variables—the Defence Value of the target and the Strike Value of the gun. The result of this calculation—plus certain other factors—will determine whether the shell penetrates or merely glances off, causing little or no damage. Obviously one of the lighter A.T. guns is going to have no effect on the massive armour of a Tiger, and conversely, an 88 mm. or 17-pounder will make mincemeat of a lightly protected armoured car.

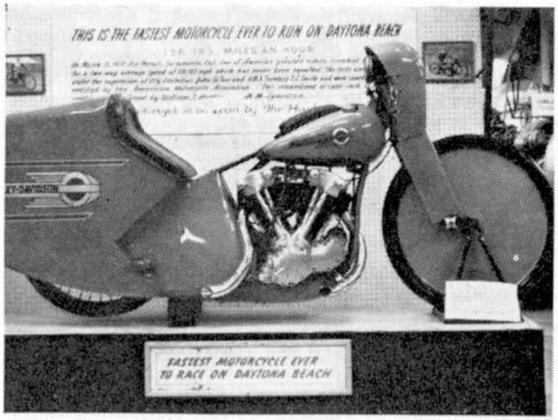
The scale of defensive values we lay down will be based then on the maximum thickness of armour for each vehicle. I shall have to ask the reader to accept the values given as being the products of some considerable research together with the experience gained from many games on the table. Let it suffice to say that the theoretical side is governed by research into the capabilities of various types of shell and the ability of armour to resist attack, these things being regularly tested on army proving grounds. Nothing is certain, though, and, as we shall see, the element of chance is far from being absent.

Enough preamble, however, and we conclude with our actual table of Defence Values, concerning which there will be further discussion in the next issue.

Vehicle	Defence Value
Panther	18
Churchill	15
T.34	14
PzKw IV	14
Sturmgeschutz III	13
Heavy armoured car	12
Half-track	11
Light armoured car	10
Truck or Jeep	6

Ill-met by moonlight! A recce, group of scout cars and armoured cars taking up a position in a wood.





Above, left: The fastest motorcycle ever to run at Daytona Beach, ridden by Joe Petrali. This Harley-Davidson recorded 136.183 m.p.h. Above: This sign reveals the great origins of high speed machinery that raced at Daytona.

The DAYTONA MUSEUM OF SPEED

by Harry McDougall

THE NAME of the car was Bluebird and in the 1930s it was the most famous in the world. It had three speeds and could do 175 mph in low gear. The engine alone cost £20,000 and each of the tyres, built to last only seven minutes, were worth £500.

I saw the car recently in the Museum of Speed at Daytona Beach, Florida. It is just one of dozens of exhibits relating to man's desire to get from A to B in the shortest possible time.

In September 1935 at Daytona, Sir Malcolm Campbell drove Bluebird along the beach at a two-way average speed of 276.82 mph and a top speed of 330 mph. The record is probably destined to remain forever; no other car in its class has ever even approached it.

Nowadays jet-powered cars dominate the field but Bluebird used a Rolls Royce 2500 hp supercharged V-12 engine driving two wheels in the conventional manner. The car was only three feet high at the cockpit and the driver sat a mere eighteen inches above the ground.

Bluebird has pride of place in the museum but stock cars, motorcycles, boats and any other piece of machinery that can move fast is apt to find a home there.

In the days before the Daytona International Speedway was built, the beach was a great favourite for attacks on speed records. In the 1930s, sportsmen came from all over the world to take advantage of the flat, hard-packed sand. Every summer, new attacks were made on existing speed records providing exciting spectacles for holidaymakers.

Daytona's initial claim to fame was staked around the turn of the century. In that pre-asphalt period, when most roads were little more than rutted, unpaved dirt tracks, Daytona offered a smooth surface that was long enough to permit even the fastest cars to accelerate, make a timed run, then slow down.

As early as 1907 a Stanley Steamer—one of the vehicles that in the early days competed with cars powered by internal combustion engines—reached a speed of 190 mph on the beach. But the performance almost resulted in tragedy.

The car was driven by Fred Marriott, a famous USA driver of the era, and it made a nine-mile run before disaster struck. The front wheels hit a rough spot and the car flew through the air. When it crashed back onto the hard sand it was demolished. Fortunately the driver survived, and the remains of the car are now displayed in the museum.

The walls of the museum are covered with photographs of the record-breaking events and of the sportsmen to whom Daytona Beach was Mecca. One of these was Joe Petrali.

On March 13, 1937, Petrali rode a fully-streamlined Harley Davidson motorcycle—one of the precursors of those now used in international competitions—to a world's record. His two-way average speed was 136.183 mph. The motorcycle, in almost mint condition, is displayed in the museum alongside Bluebird.

Attacks on absolute speed records have always been expensive; wealthy sponsors are essential. But stock cars and drag racers are within the means of thousands of people.

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Both types of cars are represented in the museum.

The Green Monster, first dragster to achieve 150 mph in a quarter mile from a standing start, is a prize exhibit. It was built by Walter and Art Arfons, is 20 feet long, weighs two tons and has a ground clearance of only two inches.

The 1450 hp V-12 Allison aircraft engine drives both front and rear wheels through a clutch that was taken from a 50-ton Army truck.

There is no transmission and no radiator. Fourteen gallons of water circulate through the chassis frame tubes for cooling.

At the opposite end of the scale is the tiny Blendzall Special—a go-kart driven by a modified outboard engine which burns alcohol and peaks at over 10,000 rpm. *The go-kart reached speeds of 150 mph with ease.*

Speedboats are also represented in the museum. Miss America VIII, which twice won the Harmsworth Trophy, is the prize exhibit. Each of its two engines drove a single propeller. At racing speeds the boat was steered by throttles alone.

The mahogany hull was hand-built. Miss America VIII was one of the ancestors of the famous PT boats used by the US Navy in World War II. Pictures of the latter are exhibited on the museum to show the family resemblance between the hulls.

Another famous speedboat on display—Tempo VII—was used by a Canadian bandleader, Guy Lombardo, who for many years competed in US races. It is the boat in which he had one of his narrowest escapes. That was in 1948 when he swerved to avoid a collision. Tempo VII overturned but Lombardo sustained no more serious injury than a broken arm.

The boat set a world record of more than 118 mph on the Salton Sea, California but achieved unofficial speeds of more than 125 mph. It was claimed to be the first 3-point hull ever built and its design revolutionized speedboat racing.

When any attack is made on a speed record the vehicle gets most of the publicity. But it is the power plant that makes high speeds possible.

The museum has a collection of more than a dozen engines that illustrate their development from the earliest days up to the present. Included are an Austro-Daimler, an Isotta-Fraschini, a Rolls-Royce, a Liberty, two Packards, an Allison and a Duesenburg.

One of the exhibits is a German Maybach engine built originally to power the Zeppelin airships of World War I and later converted for use in boats.

The advent of the jet airplane and the man-carrying rocket has changed the concept of speed. In the museum, a section of the fuselage of one of the earliest US jet aircraft—a Lockheed Shooting Star—represents the new era, and several early missiles are displayed. But the museum is mainly interesting as a repository of so many relics of the early days of speed on land.

Not all attempts on speed records are successful. Many optimistic drivers of all kinds of vehicles have visited Daytona to try their luck and have presented the museum with the products of their endeavours before returning home to try again. So the museum has built up a collection of items, including a number of motorcycles, which never became world-renowned but which made good showings. They are now exhibited in excellent company.

Adjoining the main exhibit area is a room in which scores of trophies are displayed. All were gained in contests in which speed was the quest.

The museum has files holding hundreds of pictures of automobile, boat and airplane speed record attempts—particularly those which have been staged in the Daytona Beach area—as well as a fine collection of old automobile magazines and clippings.

Since the opening of the Daytona International Speedway, the beach has not been used for racing. But every year a Parade of Antique Cars is held to commemorate the times when it was a proving ground and race track for car manufacturers.

The Ormond Garage at Ormond Beach, which is part of the Daytona Beach Resort Area, has been designated as an historic site. It was there that many racing drivers, including Sir Henry Segrave, tuned their cars before taking them out onto the beach.

Some vintage Fords driving through Daytona during the Annual Vintage Parade, held to commemorate the times when it was a proving ground for car manufacturers.

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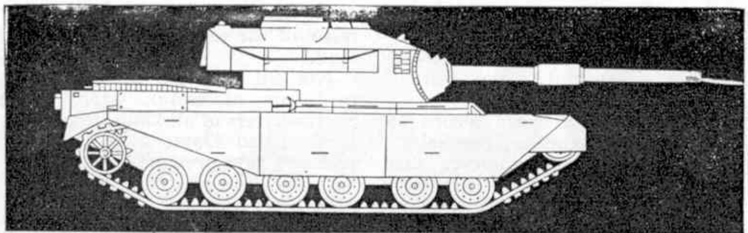


MILITARIA A REVIEW BY CHARLES GRANT

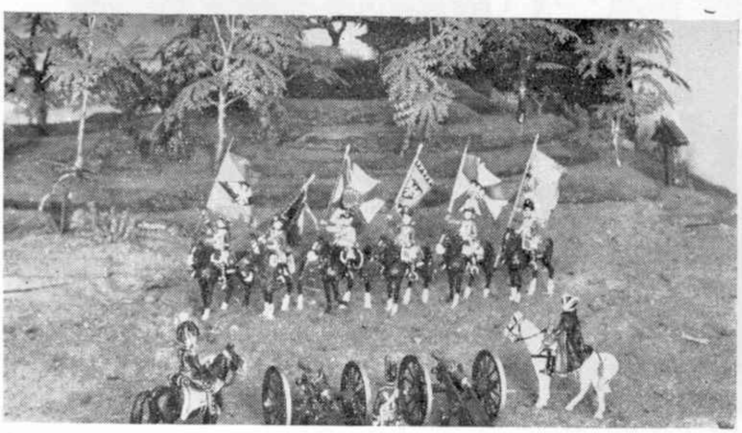
SINCE FIRST producing his 54 mm figures (**ROSE MINIATURES,** 45 Sunborne Road, London S.E.7), Mr Russell Gamage has moved right into the front rank of craftsmen figure manufacturers, and his latest figures are, if anything, even better than their predecessors, good though they were. His range is wide—Ancient Egypt and Greece, mediaeval, 18th Century and, of course, the ubiquitous Napoleonic. Illustrated are Romans and Napoleonic Marshals, all from his latest list. What I find particularly attractive about Rose Figures is the absolute perfection of finish, each moulded detail being clean and sharp, while their natural positioning makes them unique in the field. For my own part I admit to a weakness for the very colourful series—"Egypt of the Pharaohs" —which includes Nefertiti and her attendants—they are first rate. Prices for single foot figures—untaking a substantial chunk of this) and £1 (Purchase Tax regrettably taking a substantial chunk of this) and they are—for the keen collector, worth every penny. I recommend them without reservation.

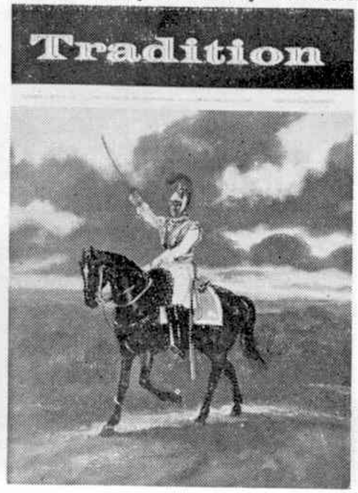
A mouth-watering list (for the military enthusiasts, of course) is to hand from **K. G. WYNN,** 42 Esher Drive, a bookseller catering largely for the military "buff". Old books and new, regimental histories, field training manuals, and rare works are all included, plus lists of sets of cigarette cards, military prints and paintings, in fact, everything for the devotee is here. Prices are reasonable and a card puts you on the mailing list.

My contacts keep telling me that clubs of battlegame enthusiasts are springing up all over the country, and obviously one of the most active is the **WARGAMERS' CLUB, of 16 M.U., R.A.F.,** Stafford, some of whose members we show taking part in a most exciting looking recent refight of the Battle of Quatre Bras (1815), the encounter leading up to Waterloo. It can be seen that this was a major sort of undertaking, and indeed something like 3,500 miniature soldiers—all converted Airfix—were engaged. It is on record that the result was a decisive victory for the Allies, who drove off the French by the end of the day (Some 250 boxes of Airfix figures were converted to make the armies engaged—what a tremendous argument for persuading the firm that it is high time it got round to producing Napoleonic figures!)

Although it could be called a 'house' magazine, **"TRADITION",** Journal of the International Society of Military Collectors, published six times a year by NORMAN NEWTON LTD., 44 Dover Street, London W.1, is a veritable mine of information for the military collector, historian and battlegamer. The Editor, Lt. Col. J. B. R. Nicholson, has, throughout the three or four years of the journal's existence, maintained a consistently high standard of content, both text and illustrations being of the very best quality. Uniform plates, both black and white and in colour, are a speciality and the artists responsible are among the best in this line. The latest issue, whose cover we show, contains articles on the Standards and Colours of the King's German Legion by W. Y. Carman, whose name is internationally known as an authority on uniforms, on British Artillery in Egypt, 1882, and Louis XIV's Army in Canada, all lavishly and accurately illustrated, plus magnificent coloured plates of Austro-Hungarian infantry of Napoleon's time. Finally, for the battlegamer, there is the latest article in the continuing story, not of Peyton Place, but of a series on Eighteenth Century type battlegames. Modesty alone precludes my naming the author, but I am at liberty to divulge that they are the product of many a painful hour of military research. 'Nuff said. Each issue of "Tradition" costs 13/6, but the annual subscription works out at a little less per copy—sounds rather a lot, but it is really very well worth the money.

At left: "Captured Colours being paraded" from "Charge! Or how to play War Games" by Brigadier P. Young and Lt. Col. J. Lawford. Below: No. 26 of "Tradition", journal of the International Society of Military Collectors.





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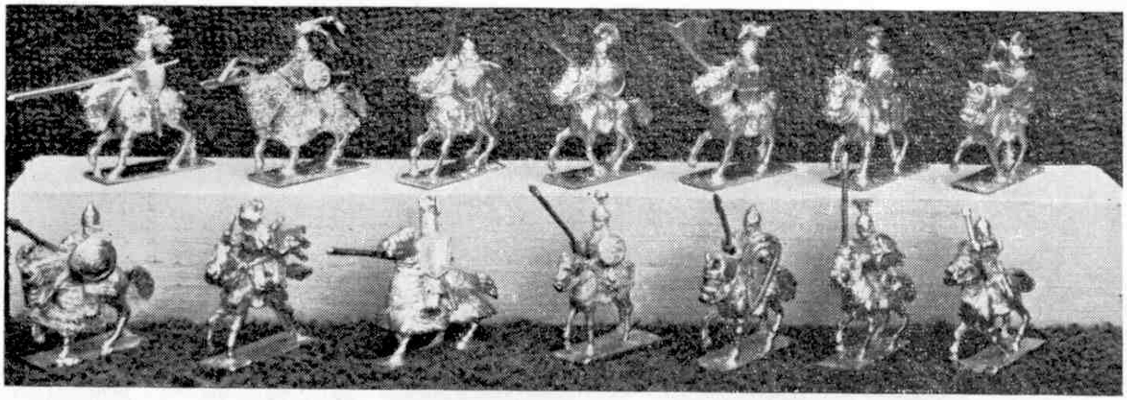
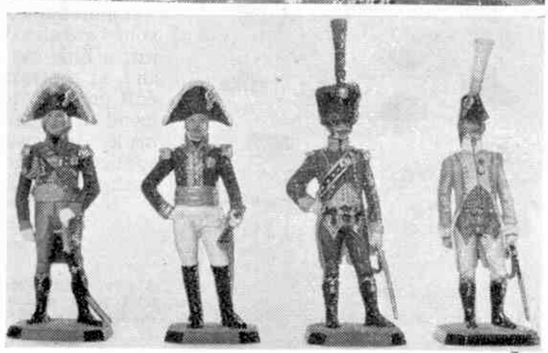


MINIATURE FIGURINES, of 5 Northam Road, Southampton, advertise as "The Model Soldier Manufacturers run by Wargamers for Wargamers" and this claim has a high degree of validity. The firm specialises in the 20 mm figure for battlegamers and almost every conceivable period of military history, from the Ancient World right up to the Eighteenth Century and Napoleonic times is covered. Illustrated is a selection of the firm's latest 'S' line, or special figures, a praiseworthy and successful attempt to combine the high quality of the 'collector' miniature with the lower cost of the battlegame soldier. As we show, the 'S' figures are so far predominantly 'ancient' and mediaeval, and these armoured horsemen have a grim and solid look about them, appearing ready to charge home upon a terrified adversary. It might be that they are really more like 25 mm. than 20 mm, but even so, the mediaeval 'destrier' was a massive brute—he had to be to carry that tremendous weight of man and armour. Miniature Figurines have another point in their favour—an important one—they are about the most inexpensive metal figures on the market. 'Specials' are 3/- each (all cavalry types at the moment), the ordinary range generally 9d. each for infantry and 2/- for cavalry—all unpainted, of course. Very reasonable, I think.

Above: Miniature Figurines—a goodly selection of recent 'S' types, ancient and mediaeval cavalrymen. Below: The Wargamers' Club of No. 16 M.U. R.A.F. Stafford in action—a refight of the famous Battle of Quatre Bras, 1815.

It has already received a notice in this magazine, but I hope I may be permitted briefly to comment on **"CHARGE! OR HOW TO PLAY WAR GAMES"** by Brigadier Peter Young and Lt. Colonel J. Lawford (published by Morgan Grampian Books, London at 55/-).

Below: Rose Miniatures—Soldiers of Ancient Rome and French Marshals and Staff Officers from the firm's latest list.



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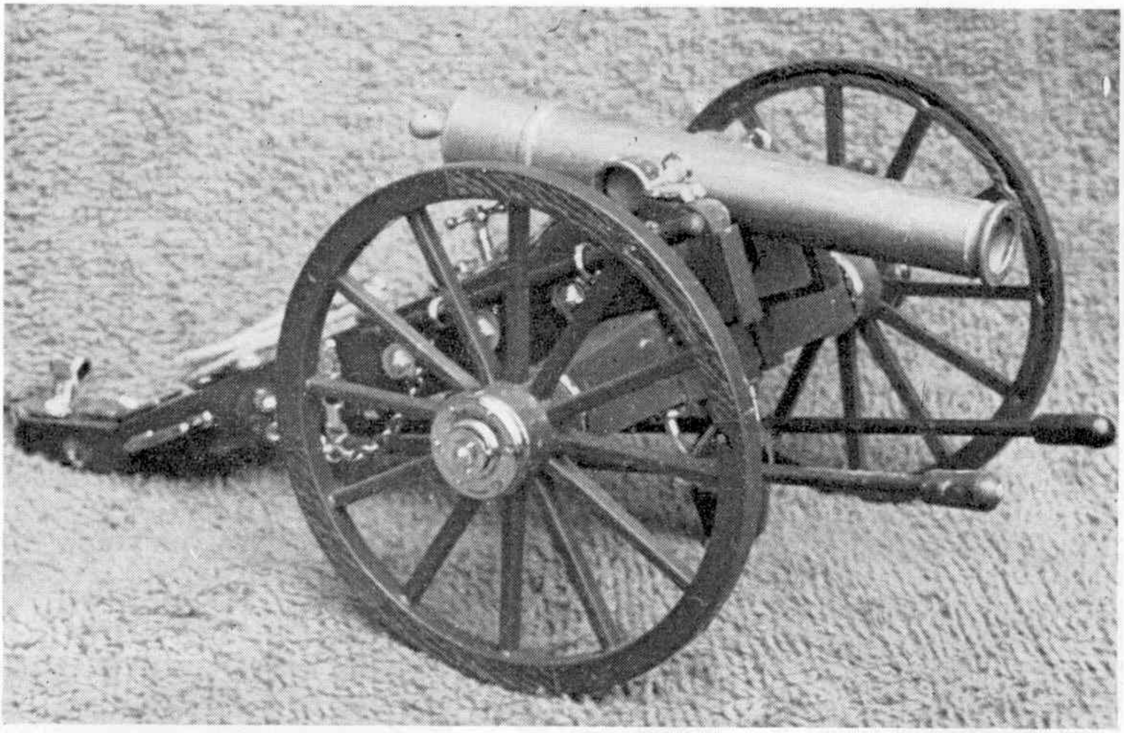

For the battlegamer, above all the one interested in the horse-and-musket period of warfare, this is really a 'must' and it is quite the most readable volume on the subject yet published. It breathes the lively enthusiasm and good humour of the authors, and one can simply read it, without necessarily taking in the technicalities of the rules set down so well—it's as readable as that. Diagrams are many and explicit and the photographs magnificent. I have a special and personal interest in the one we reproduce—"Captured colours being paraded", three of the said colours formerly belonging to certain of my own regiments. They were captured in a somewhat unfortunate encounter some two years ago with the senior of the two authors, Brigadier Young. I hasten to add that five or six colours, captured from him in the same campaign, now ornament the military museum in my capital city!

The American Civil War field piece by **PALMER PLASTICS** Inc. (imported by **RICHARD KOHNSTAM**) makes up, as can be seen, into a pretty impressive model, with considerable detail. The instruction sheet, however, lacks clarity and, as a personal thing, I was not too happy with the bright gold 'metalized fittings'. They are just a little too dazzling for realism and, in contrast, the barrel is a flat, dull grey, in no way simulating the metal of which it is supposed to be made. However, a little 'flatting' applied to the fittings and some work on the barrel to make it less matt and all should be well. The price—18/11—I thought a little steep, though.

Above: The Palmer Plastics Civil War field piece makes up into an impressive model. At left: The latest Minitanks booklet, very interesting indeed.

The latest list from **MINITANKS** (U.K. distributors—Model Hobby Products Ltd., Ackroyd Place, Halifax, Yorks.)—is a very full one and illustrates a number of new items, including a magnificent U.S. Armoured Recovery Vehicle, a British Saladin armoured car (particularly good value at 3/-) and German utility and amphibious cars. MINITANKS certainly provide the widest possible range of tanks and other military vehicles for the battlegamer specialising in the World War II period and later. Despite inevitable price increases of late, they are not terribly expensive, and some of the larger pieces, such as the U.S. Bridge Layer, the Armoured Tank Transporter, and so on are really excellent models. There is one sad omission, though, one that I really cannot understand, and that is the German '88'. I know there is a MINITANKS version on a tank chassis—the 'Grille' type—but it seems that very few of these were actually brought into service. Still, since the firm has brought out the 8-ton half-track prime mover, maybe it will be followed by a towed version of this famous gun. We can but hope.

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SCALE DIMENSION CALCULATOR

THIS LITTLE gadget has been designed to give instant readings for scale dimensions in inches corresponding to full size dimensions in feet and inches for a whole variety of different standard scales. You do not have to work anything out—just insert the appropriate slide in the body and read off the scale dimensions required direct.

The basic parts are made from balsa, and comprise one body plus one slide for every scale you want to work on—1/96th, 1/72nd, 1/48th, and so on. The scales are the only tricky parts, so these are reproduced full size on the plan ready for cutting out and cementing to the balsa parts.

Details of the body assembly are shown in Fig. 1. Parts required are—one piece $11\frac{1}{2}$ in. × $1\frac{3}{4}$ in. cut from hard $\frac{3}{16}$ in. sheet balsa; two pieces 11 in. × $\frac{1}{2}$ in. cut from hard $\frac{1}{8}$ in. sheet balsa; two pieces 11 in. × $\frac{5}{16}$ in. cut from hard $\frac{1}{8}$ in. sheet balsa; one piece $1\frac{3}{4}$ in. × $\frac{1}{2}$ in. × $\frac{1}{4}$ in. balsa.

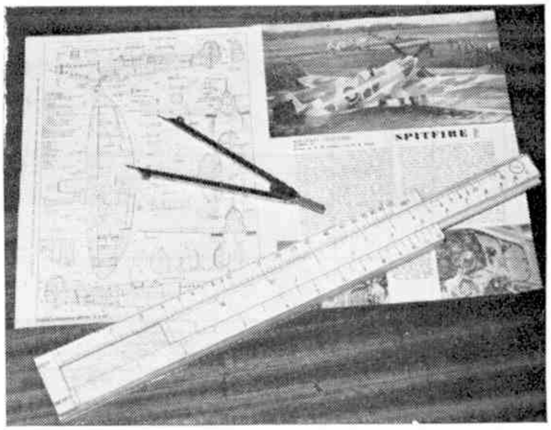
It is very important that these parts be cut accurately—i.e. the four strip peices must be exactly parallel—otherwise it will be difficult to read the scales accurately. Assemble by cementing all the parts onto the base piece, as shown in Fig. 1.

A slide is made quite simply by cementing a $11\frac{1}{2}$ in. × $\frac{3}{4}$ in. × $\frac{1}{8}$ in. strip exactly over the centre of a $11\frac{1}{2}$ in. × $1\frac{1}{8}$ in. × $\frac{1}{8}$ in. piece, as shown in Fig. 2.

Cut out the paper scales for the body and the slides from the full size plan. The body scale is cut in one [-shaped piece and cemented in place. If you find it easier to cut the two body scales separately, make sure that they line up in exactly the same position as drawn on the plan.

Each slide scale is cut out separately and cemented to its balsa slide, positioned exactly level with the balsa edge at the left hand end. Now check that when a slide is inserted in the body and pushed right home the vertical line on the slide scale lines up *exactly* with the 'I' on the top and bottom body scales.

The calculator is used as follows. The top scale on the body refers to full size dimensions in feet.



With the appropriate slide in position, the equivalent of any dimensions (i.e. its corresponding position on the top body scale) can be read as a scale dimension *in inches* immediately underneath the full size dimension. The range of full size dimensions covered is from 1 foot to 100 feet, so this should cover most requirements. For dimensions larger than 100 feet, either work to 1/10th the size and multiply the answer by ten; or find the scale dimension in stages for 100 feet + the remaining dimension.

The lower body scale is for full size dimensions in *inches*. Again the scale dimension is read off on the *slide* scale which comes adjacent (i.e. the bottom slide scale), against the actual full size inches. This time the scale dimension is given in *thousandths* of an inch.

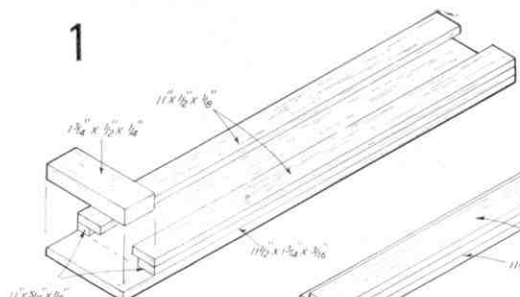
Remember, be sure to insert the appropriate slide for obtaining scale dimensions in the scale you want. The six scales given cover most common scales, but for others not included the following notes apply.

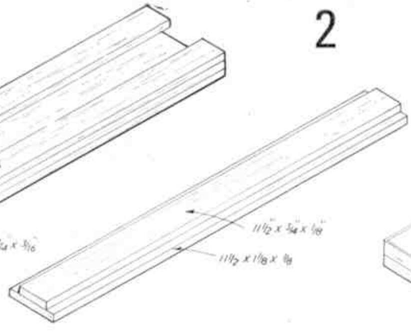
OO gauge—which is 4 mm to the foot or approximately 1/76th scale. This is so near 1/72nd scale that you can use the 1/72nd scale slide.

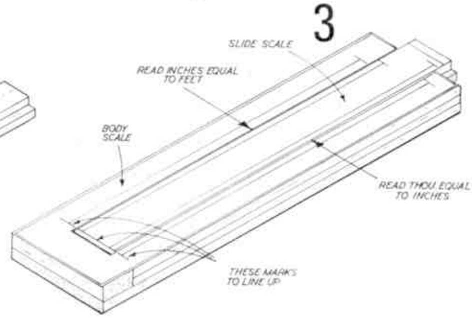
1/24th scale—a popular slot car scale. Use the 1/48th scale slide and multiply the scale dimensions obtained by 2.

1/100th scale—sometimes used for waterline ship models, etc. This is so near 1/96th that you can use the 1/96th scale slide.

1/200th scale—also used for ship models. Use the 1/96th scale slide and divide the scale dimensions obtained by 2.







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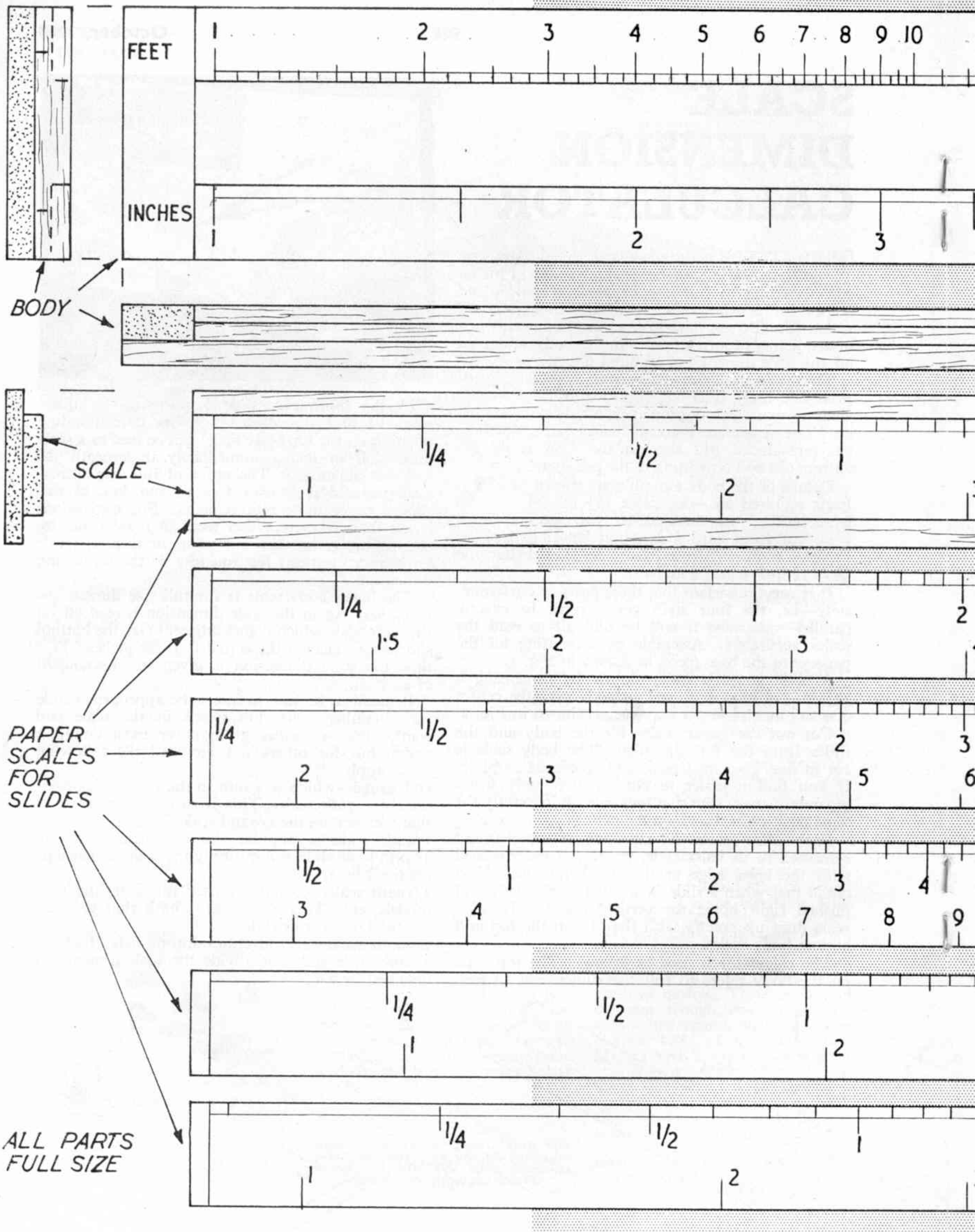

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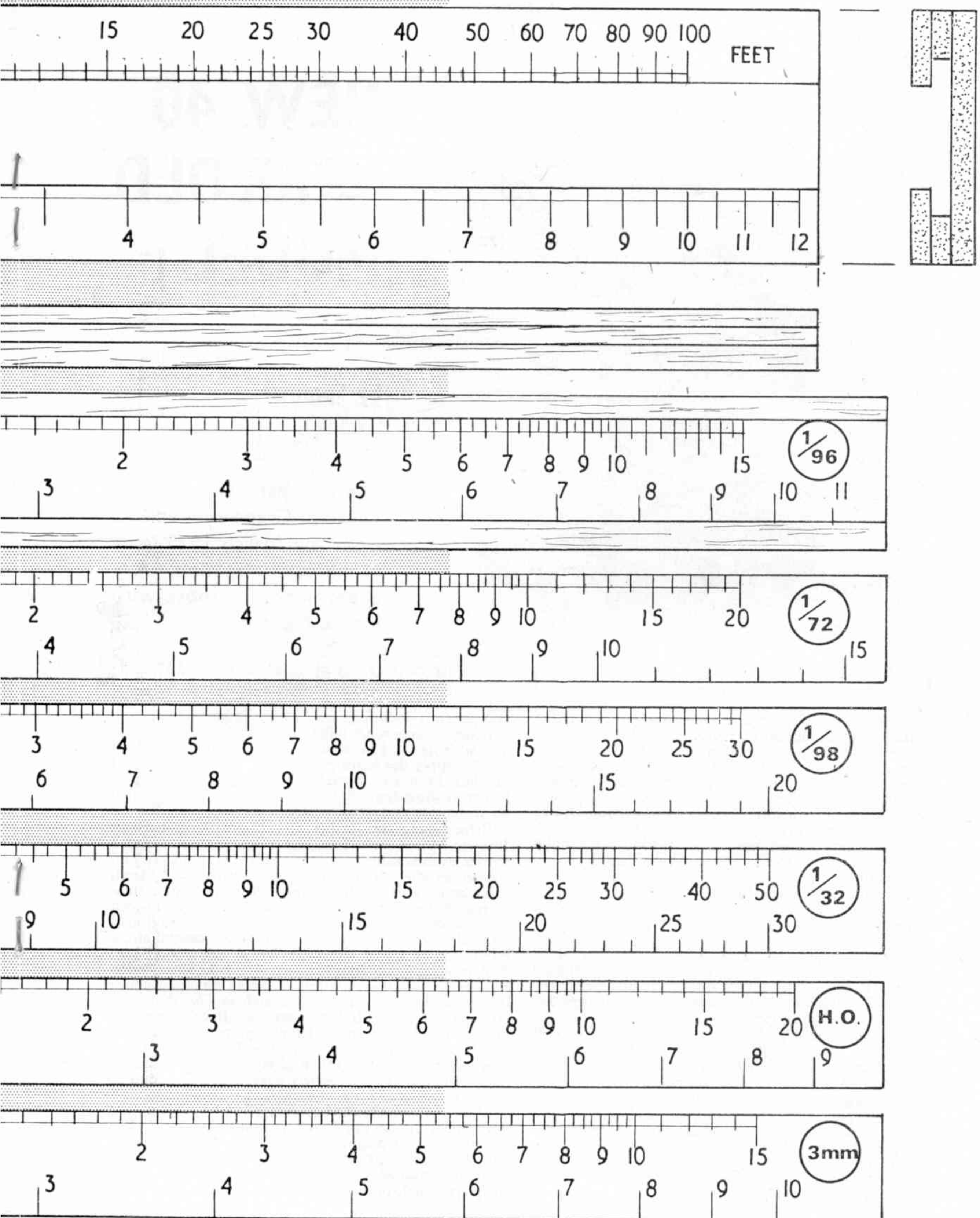

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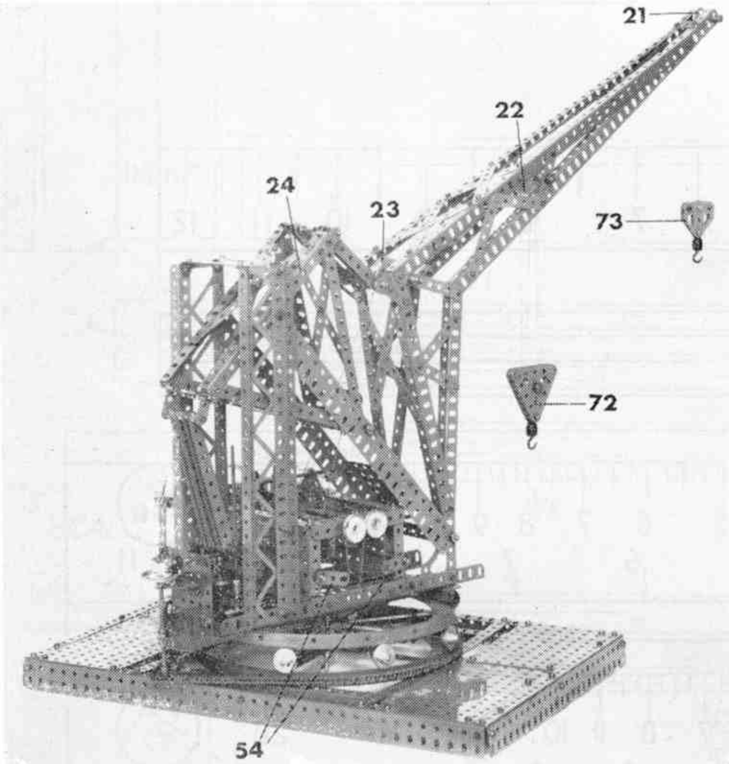

NEW 40 YEAR OLD MODEL

by Spanner

The final part of a giant Pontoon Crane rebuilt from the March 1925 issue of Meccano Magazine. A Supermodel for those with lots of Meccano.

IN MECCANO Magazine last month we began describing this extremely interesting advanced model by detailing construction of the pontoon and general superstructure. Before continuing with the building instructions this month, however, I would like to give a brief resume of the reasons why the model is so special.

Irrespective of its intriguing appearance and completely realistic movements, its main claim to fame is the fact that it is a reproduction of a model which was first featured in the March 1925 issue of the M.M., later appearing in pre-war Super Model Leaflet No. 28. This alone says a good deal for the continued reliability of the Meccano system; a reliability which is further attested to by the fact that the model is an almost scale reproduction of a crane that existed in real-life. This was "Crane Lighter No. 4"—an enormous floating crane owned by the British Admiralty. The dimensions of the pontoon alone were 242 ft. long by 86½ ft. wide, while the crane as a whole was capable of lifting a load of 250 tons to a height of 77½ ft. above the sea, to then deposit it anywhere within 100 ft. radius from the crane. Even by modern standards, these figures are impressive, as I am sure you will agree.

The Meccano model reproduces all the actions of the original crane, and, talking of the model, it is time now to continue with the building instructions.

Motor and gear arrangements

In this model, two distinct gear arrangements are included, the main gearbox controlling the two load hooks, and a secondary unit controlling the swivelling motion of the superstructure as well as the vertical movement of the jib. The main box is constructed from two 9½ in. Angle Girders joined at one end by a 5½ × 3½ in. Flat Plate 32. A 5½ × 2½ in. Flanged Plate 33 is bolted to the other end of each Girder, then the lower flanges of these Plates are joined through their first and seventh holes by two 4½ in. Angle Girders 34. The upper flanges are joined by a similar Angle Girder 35 and a 4½ × ½ in. Double Angle Strip 36, both of which supply the bearings for two 5 in. Rods each held in place by a 1 in. fixed Pulley 37 at one end and a Collar at the other. A ⅞ in. Bevel Gear 38 is mounted on the inside end of each Rod.

Before going any further, the sideplates of an E15R Electric Motor, bolted to Flat Plate 32, are extended two holes forward by 3 × 1½ in. Flat Plates 39. A ½ in. Pinion on the Motor output shaft drives a 57-teeth Gear 40 on a 2½ in. Rod journalled in the Motor sideplates. A ½ in. Pinion on the centre of this Rod in turn drives a second 57-teeth Gear 41 on a 3½ in. Rod held by Collars in Flat Plates 39. Mounted on one end of the latter Rod is a ¾ in. Sprocket Wheel 42, a ½ × ½ in. Pinion being mounted on its opposite end. This Pinion meshes with another 57-teeth Gear 43 mounted above it on a second 3½ in. Rod *free to slide in Flat Plates* 39. Also fixed on this Rod are two ⅞ in. Bevel Gears 44, outside the Plates, and a Crank 45, trapped between two Collars inside the Plates. The Bevels must be so positioned that, when the Rod is slid in its bearings, one or another of the Bevels engage with appropriate Bevel 38.

Movement of the Rod is controlled by a 5 in. Rod 46 fixed in the boss of Crank 45 and journalled in two Trunnions bolted one to the upper flange of each Flanged Plate 33, Collars acting as stops for the Rod. Pivotally attached to one of these Collars is a 5½ in. Strip 47 which is lock-nutted to a Double Bent Strip

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attached to a $5\frac{1}{2}$ in. Angle Girder. This, in turn, is bolted to Flanged Plate 33 and attached to one of the $9\frac{1}{2}$ in. Girders by a $2\frac{1}{2}$ in. Strip 48. A similar Strip is attached to a second $5\frac{1}{2}$ in. Angle Girder 49 bolted to the other Plate 33.

Sprocket Wheel 42 is now connected by Chain to a $1\frac{1}{2}$ in. Sprocket fixed on a 5 in. Rod 50 held by Collars in Flanged Plates 33. A $\frac{1}{2} \times \frac{3}{4}$ in. Pinion mounted on the Rod meshes with a 57-teeth Gear 51 on an $11\frac{1}{2}$ in. Rod 52 free to slide in Plates 33 but being prevented from moving too far in one direction by a $\frac{1}{2}$ in. Pinion 53 outside the Plates.

Journalled in the end flanges of each Plate 33 is an 8 in. Rod held in place by a Crank 54 and a Collar. A Coupling, carrying a $2\frac{1}{2}$ in. Rod 55 in its longitudinal bore, is mounted transversely on the end of the Rod nearest the Motor, then the complete gearbox is fixed in position in the model by bolting Girders 34 to Girders 9.

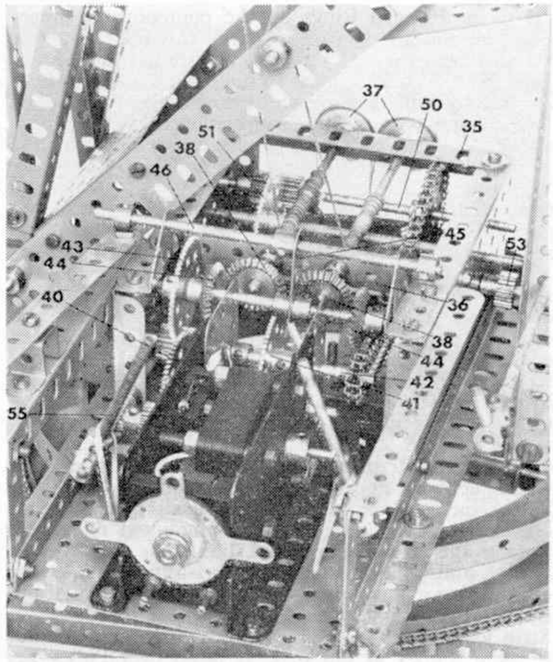
Next, two $3\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strips 56, a distance of two holes separating them, are bolted between rear Girders 10, two and five holes respectively from their lower ends. Journalled in the centre holes of these Double Angle Strips is a 2 in. Rod carrying a Coupling and a $1\frac{1}{2}$ in. Contrate Wheel 57 between the Strips and held in place by a Collar above the upper Strip and a 1 in. Gear 58 beneath the lower Strip. The Rod, incidentally, passes free through one of the Coupling's end transverse bores, its longitudinal bore providing one bearing for a $3\frac{1}{2}$ in. Rod, the other end of which is mounted in nearby Flanged Plate 33. Fixed on this Rod are two $\frac{1}{2}$ in. Pinions 59 and 60, the former in constant mesh with Contrate 57 and the latter meshing with Pinion 53 when Rod 52 is moved towards the jib. Movement of Rod 52 is controlled by a 1 in. Rod fixed in a Coupling 61 which is in turn fixed on an 8 in. Rod journalled in inner Girders 10. A Crank 62 on this Rod is pivotally connected to a loose Collar mounted between two fixed Collars on Rod 52.

Returning to 1 in. Gear 58, this is in constant mesh with a further two 1 in. Gears 63 positioned one each side of it on Adaptors for Screwed Rods 64 mounted in lower Double Angle Strip 56. Fixed in each Adaptor is a 5 in. Screwed Rod mounted in upper Double Angle Strip 56 and in a 1×1 in. Angle Bracket bolted to appropriate Angle Girder 10. Each Rod is also screwed through one transverse tapped bore of a Short Coupling 65, mounted on the end of a $1\frac{1}{2}$ in. Rod passed through the end holes of Strips 28, the Strips being spaced by Collars and Washers as before.

A $4\frac{1}{2} \times 2\frac{1}{2}$ in. Flat Plate 66 is now bolted to the ends of Girders 9, as shown. Attached to this Plate by a $2\frac{1}{2}$ in. Angle Girder is a $2\frac{1}{2} \times 2\frac{1}{2}$ in. Flat Plate which helps to support Rod 52 and to which a Flat Trunnion 67 is attached by a $1\frac{1}{2}$ in. Angle Girder. A $3\frac{1}{2}$ in. Rod carrying a $1\frac{1}{2}$ in. Contrate 68 and a 1 in. Sprocket Wheel 69 is journalled in the apex hole of the Flat Trunnion and in Plate 66, being held in place by a Collar. Contrate 68 meshes with a $\frac{1}{2}$ in. Pinion 70, fixed on the end of Rod 52, when the Rod is moved away from the jib towards the rear.

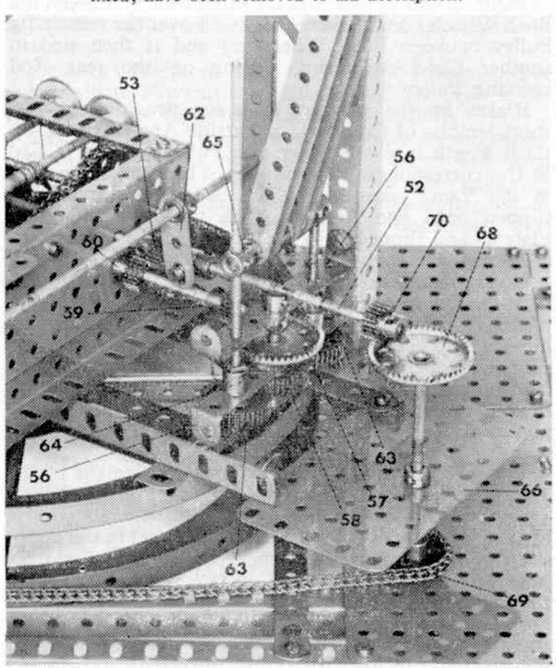
Roller race

Before the superstructure of the Crane can be mounted on the pontoon, a roller race to facilitate the swivelling movement must be produced. This is built up from a Face Plate 71 to which eight radiating $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strips are bolted. Held by a Collar and a Spring Clip in the lugs of each one of these is a 5 in. Rod on the end of which a $\frac{3}{4}$ in. Flanged Wheel is fixed. The finished race is then mounted between



A close-up view of the main gearbox including the E15R Electric Motor which drives all the movements of the model.

In this close-up view of the secondary gearbox, left-hand Girders 10, like Flat Trunnion 67 and the Plate to which it is fixed, have been removed to aid description.



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the $9\frac{7}{8}$ in. Flanged Rings on the pontoon and superstructure and a 3 in. Rod is passed through the centre holes of Strips 6 and 7 as well as through the boss of Face Plate 71. Being loose in the boss, the Rod is held in place by Collars above and below Strips 6 and 7.

With the superstructure in position on the pontoon, a length of Sprocket Chain is passed round the circumference of the lower Flanged Ring and round Sprocket Wheel 69. The Chain must be as tight as possible so that, when the Sprocket rotates, the Chain tends to grip the Flanged Ring causing the Sprocket to travel round the Chain thus rotating the Crane.

All that now remains to be built are the pulley blocks, two of which are included in the model. The larger, numbered 72, consists of three $2\frac{1}{2}$ in. Triangular Plates connected together at the corners by $\frac{1}{2}$ in. Bolts, Washers on the shanks of the Bolts spacing the Plates sufficiently far apart to allow two 1 in. loose Pulleys to be mounted between them on a central 1 in. Rod held in place by Collars. A Loaded Hook is secured on the lower Bolt, as can be seen. The smaller pulley block, numbered 73, is built up from two Flat Trunnions separated by a Collar at each upper corner and with a $\frac{1}{2}$ in. loose Pulley mounted on a $\frac{1}{2}$ in. Bolt fixed in the upper centre hole. A Loaded Hook is mounted on a Bolt fixed to the apex of the Flat Trunnions.

Both pulley blocks work independently of each other, each having its own operating Cord. In the case of the smaller block, a length of Cord is tied to the $1\frac{1}{2}$ in. Strip joining the ends of Girders 17, is passed round the $\frac{1}{2}$ in. Pulley in block 73, is taken over Pulley 21, is brought down the jib and is finally taken over one of the Pulleys between Bush Wheels 23 to be attached to a Cord Anchoring Spring fixed on the front Rod carrying Pulley 37. A second length of Cord is tied to one Bush Wheel 22 in the jib, is passed round one of the Pulleys in block 72, is brought up and around one of the Pulleys between Bush Wheels 22, is taken down and round the other Pulley in the block and is again brought up and passed over the other Pulley between the Bush Wheels. From there it is taken over the remaining Pulley between Bush Wheels 23 and is then tied to another Cord Anchoring Spring on the rear Rod carrying Pulley 37.

Brakes for the winding Rods are provided by two short lengths of Cord tied to outside Angle Girder 34. Each length is passed over one Pulley 37 and is tied to the corresponding Crank 54. The brakes are held in the "on" position by an elastic band which is slipped onto one Rod 55, then taken beneath Flat Plate 32 and slipped onto the other Rod 55. The Rods, of course, act as the brake levers.

Owing to the drive mechanism built into this model it is possible to operate one of the main gearbox movements at the same time as one of the secondary box movements, although both movements of any one box cannot be operated simultaneously. The main gearbox controls the pulley blocks, movement of Strip 47 bringing one or the other Bevel Gear 44 in mesh with corresponding Bevel Gear 38, thus turning the respective winding Rod.

In the case of the secondary box, movement of the 1 in. Rod in Coupling 61 in one direction brings Pinion 53 into mesh with Pinion 60, setting the jib control linkage into motion. Movement of the Rod in the opposite direction, however, disengages Pinions 59 and 60, but engages Pinion 70 with Contrate Wheel 68 to bring the swivelling mechanism into action. Note that in both gearboxes the gearing must be so arranged that there is a neutral period between movements. All movements, incidentally, are reversed by simply reversing the Motor.

BRITISH STOCK CAR RACING—*Continued*

motor sport. The rest of the cars battle on like this for twenty laps, and slowly the red topped men avoid the abandoned cars, pass slower drivers, and pick their way to the front—although not every time. Men like Ellis Ford (3), Andy Webb (763) and Trevor Frost (68) all at the top of their chosen sport whose cars are groomed to perfection, a credit to them and to Stock Car Racing.

Stock Car Racing's biggest night is that of the respective World Final for each class. Preliminaries for this event take place during each season, when selected meetings at differing venues count, on a points basis, for entry to the big night. Often, as in the Football Association Cup competition, fancied men fall in early rounds and many lesser known faces can find themselves in a position to have a crack for the title. When the big night arrives, drivers not only have to face competition from their own country, but also entrants from France, Belgium, Holland, South Africa and other countries. Many of our drivers compete regularly at overseas meetings, and 1967 saw the triumphant return of F.II driver Tony May (364) from Holland complete with the European Championship Trophy, the first time that a British driver has won a major foreign award. Whichever the class raced, the technique remains the same. The prime object is to win, and this is done by skill of man and machine and nothing else. Slower cars can legitimately be pushed or spun off, but deliberate charging or fencing is not allowed and such an action would result in the offender receiving dire penalties for such behaviour. Tactics vary according to driver and racing surface, be it shale or tarmac. Gearing, back axle ratios and the type of tyres fitted all have to be carefully considered. Star graded Formula I driver Geoff Harrison (127) is a past master of the calculated tail slide, taking the same line both in and out of the bends with unbelievable precision for lap after lap. Veteran Junior driver Chick Woodroffe (601) whose car seems glued to a tight inside line all through a race and young Todd Sweeney (531) whose rapid rise to F.II fame has been his uncanny ability to "read the track" well in advance.

Remember that all these incidents take place on a track of which the majority are less than 440 yards per lap, and bounded on the outside by a three strand wire fence supported by railway-line type uprights at regular intervals and on the inside by oil drum sized markers. These only add to the hazards of getting round the track for twenty or so laps, with all the other drivers breathing down your exhaust pipe, at speeds which average 45-50 m.p.h.

Stock Car Racing has, for some time, suffered from its dubious early days and is still regarded by the "purists" as something of a circus act. However such days are well and truly past and whatever the thoughts are on Stock Car Racing, the skill of driver and ingenuity of construction of the cars cannot be denied. It's a fast, skilful and entertaining sport, which combines speed with spectacle, and can be seen at Stadiums all over the Country, during a season which lasts from November to February and includes such famous circuits as Cadwell Park in Lincolnshire and Brands Hatch in Kent.

Readers can obtain details of their nearest Stock Car track and details of all fixtures from: The British Stock Car Racing Supporters Association, 2, Enfield Court, Ruthall Close, Abdon Avenue, Selly Oak, Birmingham, 29.

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Great Engineers No. 9

S. Z. de Ferranti
(1846-1930)
by A. W. Neal

SABASTIAN ZIANI DE FERRANTI was born in Liverpool and his family were distinguished in the fields of music and painting. As a child he frequented Lime House Railway Station, and railway locomotives captivated him. At the age of ten he was asking for 'a book on Compound steam', and 'as a great favour' a model steam fire-engine. When only thirteen years of age, he attended St. Augustine's College, Ramsgate; here, he displayed advanced thinking, and the head-master wisely set aside a room for him to experiment in. Soon a friendly electrician in Canterbury taught him to use the lathe and he was writing home for such a machine-tool. He left Ramsgate and sold his dynamo during 1881. This was the time when Edison, in America, had started a power station to light consumers' houses with his carbon filament lamp. In England the Swan incandescent lamp was lighting the Savoy Theatre, London, and electric lighting was obviously coming to stay.

1881 was also the year that Ferranti took up employment with Siemen's at Charlton. On this he said "A most fortunate place which is as good for me as if I was spending piles of money on experiments". In the course of his duties he met Alfred Thompson, an engineer, and they joined hands on a dynamo project. Ferranti, had by then, finished his improved dynamo and arc lamp which he had worked up whilst at school. The Ferranti machine was found to be similar to that designed by Sir William Thomson (later Lord Kelvin), and they agreed to combine the two inventions. Then came along Francis Ince, a wealthy London lawyer, and this resulted in the formation of a company to be known as Ferranti, Thompson and Ince Ltd., to manufacture the Thomson-Ferranti machine. The Hammond Electric Light and Power Supply Company Limited obtained the sole sales rights, and at this time Ferranti was hardly 18 years old.

After about a year, both companies went into voluntary liquidation, and Ferranti bought back his patent and commenced business on his own account. He went ahead with the manufacture of the dynamo, with electric meters, transformers, fuse gear, oil-break switches and so on. It was at this time that he built his first 10,000-volt transformers.

In 1883 the Grosvenor Art Gallery in New Bond Street, London, installed electric lighting, and it seems this source of electric supply was extended to neighbouring premises. The result was the formation of Sir Coutts Lindsay and Co. Ltd., and the construction of a generating station with Gaulard and Gibbs transformers. Technical troubles arose and Ferranti was consulted, and, in 1866, he became engineer to the company—at 21 years of age! The reforms he brought about lead to some litigation. The little company formed the London Electric Supply Corporation Ltd., and then went to Deptford to build a new power station with Ferranti as its engineer and electrician. The project was a very large one at that period—Ferranti did not believe in small electric light works supplying a limited area, but in mass production of electricity supplying a wide area. The supply from Deptford was settled by Ferranti at 10,000 volts, a decision that drew considerable criticism at a time when 2,000 was regarded with doubts. "Engineer" reported: 'The new electrical machinery is so enormous as compared with anything in existence, that it may be deemed a perfectly novel creation, a monument to the confidence reposed by the directors in their engineer Mr. S. Z. de Ferranti.' During the course of these works there were many problems to overcome and new techniques to develop, but all was well in the end and a regular supply of electricity was made available in February 1891.

Colonel Crompton, the direct current advocate, gave full credit to Ferranti (and alternating current), for the part he played in developing electric supply.

In 1890, the Grosvenor Gallery power station, being used as a kind of substation, was burnt out with disastrous results. Probably some of the engineers of the day agreed that it was those high voltages that Ferranti would work to, that brought this about. But contemporary reports suggest otherwise. In 1891 Ferranti, then twenty-seven years of age, severed his connection with the Company.

We have seen that Ferranti was operating a manufacturing business after the Ferranti, Thompson & Ince Limited business closed down. This second business was named S. Z. de Ferranti, and there were partners in it. While retaining his interest in this, Ferranti embarked upon his great pioneering work at Grosvenor Gallery and Deptford.

In 1890 the business known as S. Z. de Ferranti was turned into a limited liability company with a factory at Charterhouse Square, London, making electric supply equipment and steam engines. Then, in 1896-7, all work was transferred to Hollingwood. In 1905 the title became Ferranti Limited.

He spent Christmas 1929 in Switzerland and died on the 13th January, 1930 at Zurich.

One could lay stress on the extreme youth of Dr. Ferranti when he did his great pioneering work. Of course, his was an exceptional case, but it can be held up as a shining example of youthful accomplishment.

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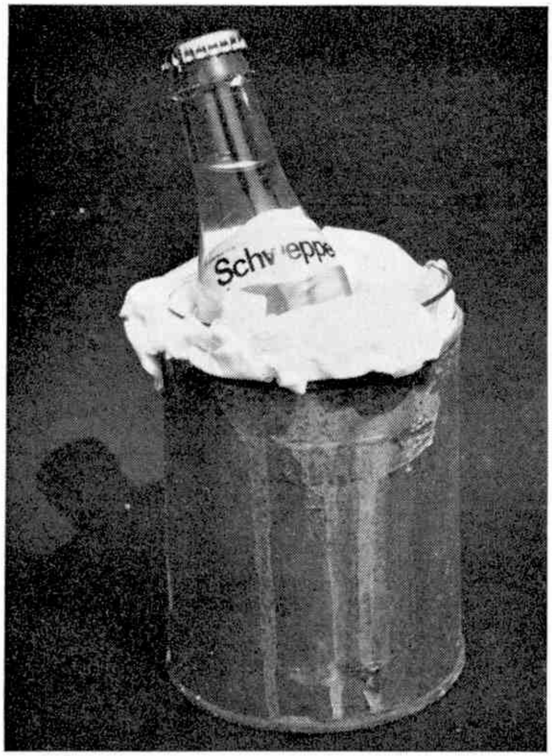

SIMPLE HOME CHEMISTRY

Producing Low Temperatures

by Boffin

A LOWERING of temperature is produced when a liquid is allowed to evaporate into a gas, or when certain chemicals are dissolved in water. The former method is the principle of the domestic refrigerator; the latter the principle behind the working of chemical freezers which you can readily make to cool drinks, or produce ice when no refrigerator is available.

If you have ever filled a gas lighter from a butane cartridge you will have experienced the freezing effect of evaporation. The butane in the cartridge is in liquid form (a liquid gas) and under pressure. Pressing the nozzle into the base of the lighter releases a simple ball valve allowing the liquid gas to escape into the lighter body. The lighter body and cartridge case both get appreciably cooler and near completion of filling, when surplus butane overspills to turn into gas the cooling becomes very marked, often causing frost to appear on the lighter body and cartridge. Allow the butane to go on overspilling and your fingers are in danger of becoming frozen into the cartridge !

Evaporative cooling is applied to simple coolers comprising a porous vessel partly filled with water, or with hollow walls which are water filled. Water seeping through the pores and evaporating off cools the water remaining inside, so that anything inside the container is kept cool. For 'emergency' cooling of a drink on a hot day, wrap the bottle or can around with a water soaked towel held in place with rubber bands. In a short while the temperature of the drink will fall by several degrees.

Chemical freezers work on an entirely different principle. When some solids are dissolved in water the molecules gain a greater freedom of motion and they obtain the energy to achieve this by absorbing heat from the water. In other words, the simple act of dissolving the chemical in water lowers the temperature of the resulting solution.

All we need for our simple freezer is a suitable container which can be insulated to help it retain its low temperature. Wrapping a towel around the outside to form an insulating blanket is one way. Another is to place the container in another larger container with a layer of cotton wool separating the two, as shown in the diagram. The inner container is then half filled with cold water, to which the chemical is added and stirred until it dissolves. Anything placed in the solution—such as a bottle of 'Coke-'—will then be cooled down to the temperature of the 'freezing' solution.

There are quite a number of chemicals we can use to produce 'freezing' solutions, although not all of them will produce a low enough temperature actually to freeze water. Remember, in each case the formula involves a solid substance which is simply added to the water inside the container and stirred until it dissolves, continuing to add as much of the solid as will dissolve. Do not add more solid than necessary (i.e. more than will dissolve) as this is only waste. Approximate proportions (i.e. the maximum amount of solid which will dissolve) are given in each case.

Formula A—sodium thiosulphate.

Sodium thiosulphate is a common chemical (better known as 'hypo', used for photographic work. This will dissolve in almost equal proportions in water (e.g. a cupful of water will dissolve up to a cupful of 'hypo'). Add the hypo a little at a time and stir rapidly. Continue adding more 'hypo' and stirring until all has been dissolved. The temperature of the original water will drop by as much as 10 to 15 degrees C, or below the freezing point of plain water, if you

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start with very cold water.

Note that although you will use up quite a bit of 'hypo' with this formula the solution can be saved and used for photographic fixing baths, provided it has not got dirty.

Formula B—ammonium chloride

This is a more economical 'freezing' mixture for you only need up to one third the amount of ammonium chloride in proportion to the amount of water. The temperature realised should be about the same as that with 'hypo'—another true 'freezing' mixture, provided you start with really cold water.

Formula C—ammonium nitrate

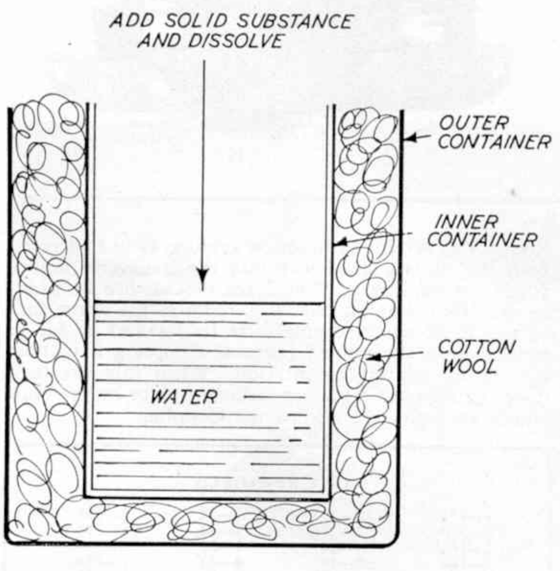
This chemical will dissolve in water up to about equal proportions but will not give a temperature quite as low as with the two previous formulas. It should, however, reach freezing point or slightly below.

Formula D—equal parts of ammonium chloride and potassium nitrate. This will produce a lower temperature than any of the above formulas.

Formula E—1 part ordinary salt mixed with 3 parts crushed ice. This is by far the most economic freezing mixture, and also produces the lowest temperature of all (well below freezing point). You do, however, need ice to start with. All the other formulas produce 'cooling' or 'freezing' mixtures starting with chemicals and water at ordinary room temperature.

Incidentally, with some chemicals the very reverse effect applies. When dissolved in water these chemicals produce a considerable *rise* in temperature of the solution. These can, therefore, be used as chemical heaters rather than freezers.

One such chemical is calcium oxide. Dissolve this in water and the resulting solution will get very hot—it may even boil. The same thing happens when a strong acid or strong alkali is added to water and stirred. Heating solutions like this are toxic or poisonous, so do not use them like freezing mixtures for changing the temperature of anything you may be considering drinking or eating.



A diagrammatic representation of a simple home made freezer. Note the cotton wool layer.

AUTOMOBILE OLDIE

A No. 3 Outfit Model by Spanner

WHILE IT is possible to produce all sorts of true scale models with Meccano, builders would soon be hard pressed finding new things to make if they were limited to scale reproductions only. To get the most out of the system you need a bit of licence or, in other words, you need to be able to make models which, although recognisable as particular types of thing, are not based on specific prototypes. You might, for example, build a model of a crane, rather than a model of a specific make of crane, or a car rather than a particular car—and this is precisely what our model-builder has done. He has produced the simple model featured here which is roughly based on a coupé of the type popular in the 1920s. It can be built with the parts contained in Outfit No. 3.

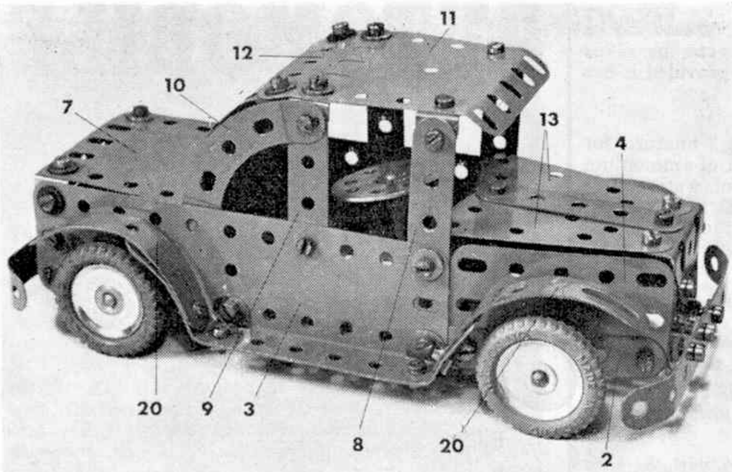
The chassis consists of a $5\frac{1}{2} \times 2\frac{1}{2}$ in. Flanged Plate 1, to each side flange of which a bent $5\frac{1}{2}$ in. Strip 2 is bolted, the securing Bolts helping to fix a $5\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plate 3 in place. Strip 2 projects a distance of five holes past the end of Plate 1, a $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plate 4 being secured to the projecting section.

At the front, the lower corners of Plates 4 at each side are joined by a Flat Trunnion 5, attached by Angle Brackets, while at the rear, Plates 3 are joined by two $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strips held by Bolts 6. The Bolts securing the upper Double Angle Strip in position also hold in place two Angle Brackets to which a shaped $4\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plate 7 will later be fixed. Before this is done, however, two $2\frac{1}{2}$ in. Strips 8 and 9 are bolted, as shown, to each Plate 3. Attached to the upper end of each of these is an Angle Bracket, the securing Bolt in the case of Strip 9 also fixing a $2\frac{1}{2}$ in. Stepped Curved Strip 10 in place. Bolted to the Angle Brackets is a shaped $2\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plate 11, extended one hole by a $2\frac{1}{2} \times 1\frac{1}{2}$ in. Plastic Plate 12.

Plate 7 is now fixed in position, one end being attached to Plate 12, the other end being bolted to the earlier-mentioned Angle Brackets.

The bonnet is built up from two $2\frac{1}{2} \times 1\frac{1}{2}$ in. Triangular Flexible Plates 13, overlayed down the centre by a $2\frac{1}{2}$ in. Strip, all three items being bolted to a Trunnion 14. This, in turn, is bolted to Flat Trunnion 5. Both the front and the rear bumpers are supplied by two shaped $2\frac{1}{2}$ in. Strips 15, bolted together and fixed on $\frac{3}{8}$ in. Bolts held by Nuts in Flat Trunnion 5 and Plate 1. An imitation steering wheel is represented by an 8-hole Bush Wheel fixed on a 2 in. Rod held by a Spring Clip in Flanged Plate 1 and in a $\frac{1}{2}$ in. Reversed Angle Bracket 16, bolted to the underside of the Plate.

All the wheels are obtained from 1 in. Pulleys fitted with Motor Tyres and mounted in pairs on two $3\frac{1}{2}$ in. Rods forming the axles. The rear axle is journalled in



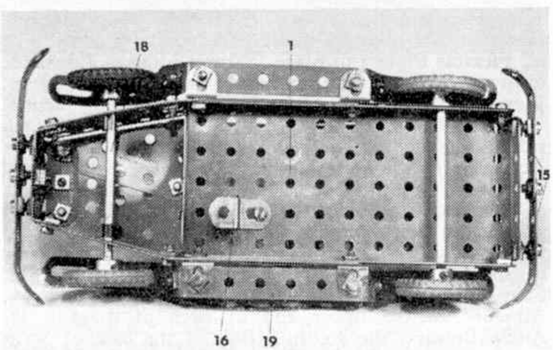
A simple model roughly based on a coupe of the type popular in the 1920's, built with Meccano outfit No. 3.

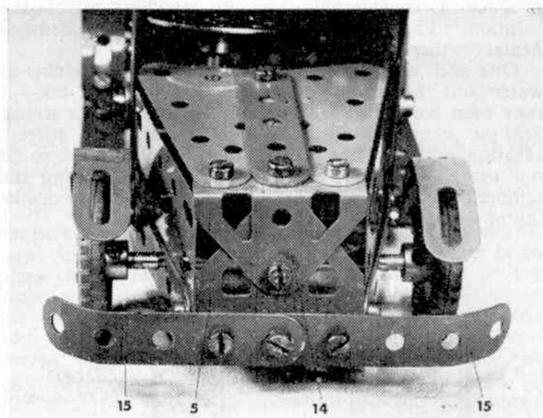
Below left: Underside view of the model showing the layout of the chassis and axles. Below: The front of the model in close-up. Note the use of trunnions to serve as a radiator-grille.

PARTS REQUIRED

4—2	1—24	2—90a	2—189
9—5	2—35	4—111a	1—190
2—11	57—37a	1—125	1—191
10—12	46—37b	1—126	1—194
2—16	10—38	1—126a	4—215
1—17	1—48a	4—142a	2—221
4—22	1—52	2—188	

the side flanges of Plate 1, while the front axle 18 is held by Spring Clips is Strips 2. Two running boards are next each supplied by a $5\frac{1}{2}$ in. Strip 19, with its ends bent upward, attached to the side of the model by Angle Brackets. Finally a Formed Slotted Strip 20 is bolted to each of these bent ends to represent a mudguard and the model is finished.





AMONG THE MODEL BUILDERS—cont.

Also attached to Coupling 6, this time by two 1 in. Screwed Rods in the end transverse tapped bores is another Coupling 8, Nuts again preventing the $1\frac{1}{2}$ in. Rod from being fouled. Fixed tight in the centre transverse bore of this Coupling is a second $1\frac{1}{2}$ in. Rod which is passed free into the "spider" of a Swivel Bearing 9 mounted on the end of a 4 in. Rod journalled in Flanged Plate 1 and Double Angle Strip 2. Finally, a third $1\frac{1}{2}$ in. Rod is passed through the appropriate hole in the $5\frac{1}{2} \times 2\frac{1}{2}$ in. Flanged Plate and is fixed in the boss of Large Fork Piece 7.

When building this unit, you may have difficulty fixing Coupling 8 to Coupling 6 with the Screwed Rods. The system to follow, therefore, is to first screw both the Rods a good way into the transverse tapped bores of Coupling 8. Two Nuts should then be added to each Rod, leaving plenty of room at the lower ends of the Rods which should next be screwed as far as possible into the tapped bores of Coupling 6 without fouling the central $1\frac{1}{2}$ in. Rod. When this has been done the Screwed Rods are locked in place by the Nuts which are tightened against the Coupling.

PARTS REQUIRED

1—10	20—37a	1—52	2—111
2—15b	12—37b	1—53	1—116
1—16a	4—38	1—59	2—116a
3—18a	2—48	4—63	1—126a
1—27	1—48b	2—82	1—165

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ENERGY CONVERSION

by Chris Jelley

Three Meccano models to illustrate how energy is changed in form as it goes through a sequence of operations.

"ENERGY CONVERSION"—a term used to describe the transformation of one type of energy into another. A battery, for example, is a source of electrical energy (obtained from the reaction between the chemicals contained in the battery), yet, if you connect a battery to an electric motor, the output shaft of the motor imparts, not electrical energy, but mechanical energy. You have, in other words, converted electrical energy into mechanical energy, the motor acting as the "Energy Conversion Unit".

Besides the electric motor, another common Energy Conversion Unit is the dynamo or generator, which changes the mechanical energy used to drive it into electrical energy at its output. It is worth mentioning here, by the way, that any permanent-field electric motor incorporating a commutator and operating from Direct Current will also serve as a dynamo if the usual sequence of operations is reversed. (In basic terms, a permanent-field motor is one containing a permanent magnet.) Normally, an electric current is applied to the terminals of such a motor to drive it, but if it is driven, say, mechanically by revolving its output shaft, then the motor actually *generates* electrical pressure which can be tapped at the terminals.

Featured in this article are three simple Meccano models in which an electric motor is used to serve as a dynamo in this way at the same time acting as an Energy Conversion Unit to derive electrical energy from a variety of quite different energy sources. In the following text the motors are referred to as dynamos for descriptive purposes.

All three models are extremely easy to build, the first (figure 1) consisting of little more than a $5\frac{1}{2} \times 2\frac{1}{2}$ in. Flanged Plate 1, to the top of which a Power Drive Unit 2 is bolted and to one end flange of which a $2\frac{1}{2} \times 2\frac{1}{2}$ in. Insulating Flate Plate 3 (Elektrikit Part No. 511) is fixed. Attached to this Flat Plate are two Lamp Holders with lamps 4, the upper secured by $\frac{1}{2}$ in. Bolts and the lower by $\frac{3}{8}$ in. Bolts. Note that a Fishplate is used to connect each $\frac{1}{2}$ in. Bolt to the adjacent $\frac{3}{8}$ in. Bolt behind the Plate before the securing Nuts are fitted. A Washer is added to each $\frac{1}{2}$ in. Bolt, then the leads from the Power Drive Unit are connected to the same Bolts, to be held in place by Terminal Nuts 5 (Elektrikit Part No. 542). Finally, a handle built up from a Crank to which a Long Threaded

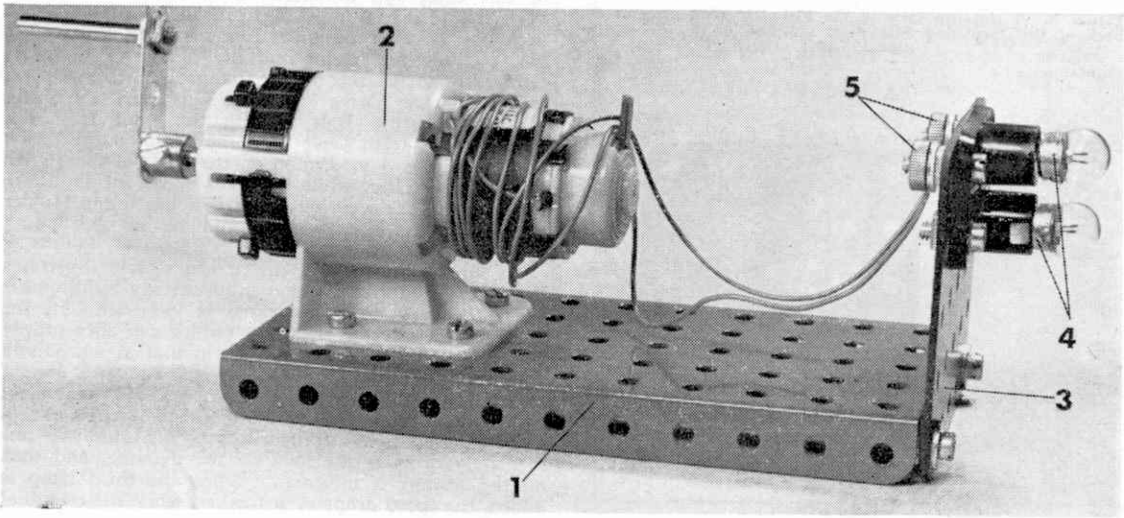

Figure 1. This basic form of Energy Conversion Unit consists of a hand-driven dynamo powering two lamps. A Meccano Power Drive Unit serves as the dynamo.

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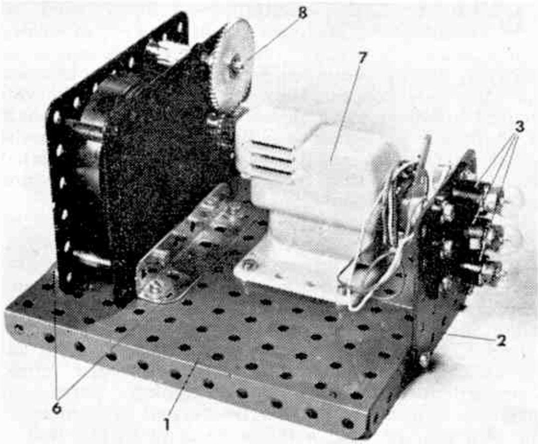
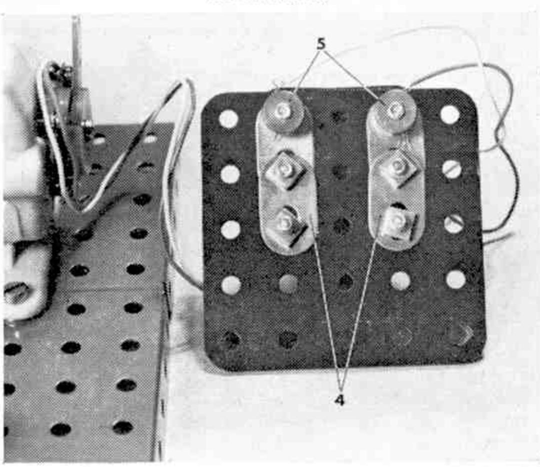


Figure 2. A more-complicated Energy Conversion Unit in which a Meccano No. 1 Clockwork Motor is used to drive a dynamo which in turn generates electricity to power the lamps shown. The dynamo is provided by a Junior Power Drive Unit.

Figure 3. A close-up view of the Fishplate connectors at the back of the Insulating Flat Plate attached to the clockwork-driven model.



Pin is bolted, is mounted on the shaft of the P.D.U. which, incidentally, should be switched "on" and be set on the 12 : 1 or 16 : 1 ratio.

It must be stressed, here, that in this model or, indeed, in all three models, Elektrikit Lamps should not be used as their resistance is too high. The best results will be obtained from a low-voltage lamp (2.5v. or 3.5v.) with a current rating of 0.1 amps. These are easily obtained from any electrical supplier.

Let us now look at the operation of the model. When the handle is turned manually, the physical energy expended in turning it is converted into electrical energy by the dynamo. When this electrical energy is applied to the resistance of the lamps, however, it is converted into heat energy which is, in turn, converted to light energy, provided the electrical energy generated by the dynamo is sufficient to overcome the resistance of the lamps. At the light energy stage, of course, the lamps light up, but they will not do so if there is not enough electrical energy to heat the lamp filament sufficiently to produce light.

You may be wondering why two lamps are included in the model. This, in fact, has been done to illustrate another point involved in Energy Conversion Units of the type at which we are looking. One lamp requires a specific amount of current to illuminate it, this current placing a particular load or "demand" on the dynamo. Two identical lamps require twice the current, resulting in a proportional increase in the load on the dynamo. The dynamo, in turn, requires an increase in energy to drive it. To put it simply, therefore, the dynamo is harder to turn when the second lamp is screwed into place.

This increase in the input energy required is perhaps not too noticeable in our hand-driven model, but it becomes very obvious in our other two mechanically-driven examples. The first of these, illustrated in figures 2 and 3, consists of a dynamo driven by a Meccano No. 1 Clockwork Motor and powering, not two, but three lamps.

Construction, again, is simple. Two 5½ × 2½ in. Flanged Plates 1, placed side by side, are bolted together with a 2½ × 2½ in. Insulating Flat Plate 2 being secured across their end flanges at one end and a 3 in. Strip at the other end. Attached to the Flat Plate are three Lamp Holders 3, the securing Bolts again being connected by Fishplates, two at each side in this case, and numbered 4 in figure 2. Also, a Washer and Terminal Nut 5 are added, as before, to each Bolt holding the upper Lamp Holder in place. A No. 1 Clockwork Motor is fixed, by two 3½ in. Angle Girders 6, to the top of the Flanged Plates as also is a Junior Power Drive Unit 7, a Washer on the shank of each securing Bolt spacing the Unit from the Plates. A 50-teeth Gear 8 on the Motor output shaft engages with a ¾ in. Pinion on the shaft of the Junior Power Drive Unit, while the leads of the J.P.D.U. are connected to the securing Bolts of upper Lamp Holder 3. The J.P.D.U. switch should be in the "on" position.

As already mentioned, this model clearly illustrates the increase in the dynamo input energy requirement when the load on the dynamo is increased. If, for instance, the Clockwork Motor (which can only supply a fixed amount of energy) is set in motion when only one lamp is in place, the Motor will run at a certain speed, while the dynamo will generate sufficient electricity to light the lamp. If the second lamp is added, however, the speed of the Clockwork Motor will immediately drop as the load on the dynamo, and thus on the Motor, is increased. When the third lamp is added, the speed drops even further, while the electrical

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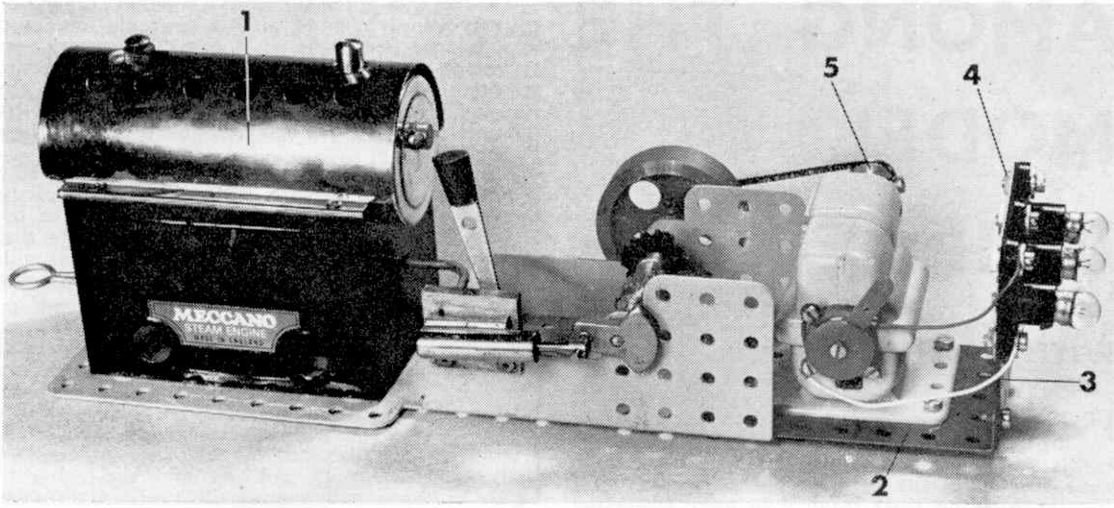

Figure 4. Numerous conversions of energy are illustrated by this particular model in which a Meccano Steam Engine is used to drive a dynamo, supplied by a Junior Power Drive Unit.

energy generated by the dynamo is insufficient to pass through the heat energy stage into light energy. In other words, it is insufficient to light the lamps.

Before passing onto our third and final model, it is interesting to follow all the energy conversions performed by this model. When the Clockwork Motor is wound up, the physical energy expended in winding it is "stored" in the Motor spring in the form of *potential* mechanical energy until the Motor is set in motion, at which time it actually gives mechanical energy. The dynamo then converts this energy into electrical energy which is subsequently converted by the lamps into heat energy, this, under the right conditions, changing to light energy.

You will see from the above that there are quite a number of complicated changes taking place during the operation of one simple little model and, believe it or not, even more changes occur with our equally-simple final model! Illustrated in figure 4, this is a steam-driven dynamo connected to a bank of three lamps and it is built as follows: the baseplate of a Meccano Steam Engine 1 is extended five holes by a $3\frac{1}{2} \times 2\frac{1}{2}$ in. Flanged Plate 2, the securing Bolts helping to fix a Junior Power Drive Unit to the top of the Plate. Bolted to the end flange of Plate 2 is a $2\frac{1}{2} \times 2\frac{1}{2}$ in. Insulating Flat Plate 3, to which three Lamp Holders are secured. The upper terminals of these Lamp Holders are connected together, this time by a $2\frac{1}{2}$ in. Strip 4, as also are their lower terminals, the J.P.D.U. leads being connected to the terminals of the nearest Lamp Holder. A $\frac{1}{2}$ in. Pulley with Boss 5 is mounted on the shaft of the J.P.D.U. and is connected by a Driving Band to the small pulley incorporated in the flywheel casting of the steam engine.

This model is much the same as the above clockwork-powered example, except that, here, the Steam Engine drives the dynamo to power the lamps. The work done is similar and, as with the other model, the more lamps which are in use, the slower the Engine will run owing to the increased load. If the work done is similar, however, the number of energy conversions occurring is definitely higher.

To begin with, the burning methylated spirit in the Steam Engine burner creates heat energy. The action of the heat on the water in the Engine's boiler makes steam, which is stored as pressure energy, and so the heat energy has been converted into pressure energy. The steam pressure in the boiler drives the piston and thus the flywheel shaft of the Engine—a mechanical action—therefore the pressure energy has now changed into mechanical energy. From here, the energy changes are similar to our second model—the dynamo converts the mechanical energy into electrical energy which is in turn changed by the lamps into heat energy and then finally into light energy.

All in all, Energy Conversion is a fascinating subject and these simple Meccano models clearly illustrate the progress of such Conversion through a given set of operations.

PARTS REQUIRED

(Hand-driven Model)

2—10	1—52	1—511
10—37a	1—62	2—542
8—37b	2—111c	2—539
4—38	1—115a	2—2.5 v. or 3.5 v., 0.1 amp. lamps

1—Power Drive Unit

PARTS REQUIRED

(Clockwork-driven Model)

1—4	1—27	2—52	2—542
2—9c	24—37a	2—111a	3—539
4—10	18—37b	4—111c	3—2.5 v. or 3.5 v.,
1—25	10—38	1—511	0.1 amp. lamps

1—No. 1 Clockwork Motor. 1—Junior Power DriveU nit.

PARTS REQUIRED

(Steam-powered Model)

2—5	8—37b	1—511
1—23a	6—38	3—539
14—37a	1—53	3—2.5 v. or 3.5 v., 0.1 amp. lamps

1—Meccano Steam Engine. 1—Junior Power Driven Unit.

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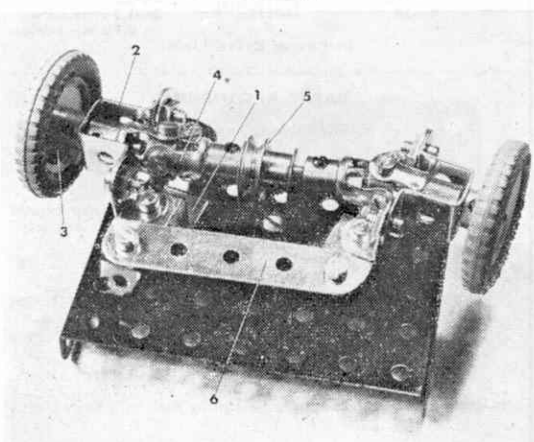
AMONG THE MODEL BUILDERS

with Spanner

IT IS generally assumed that Meccano front wheel drive mechanisms are only suitable for fairly large models and, under normal circumstances this is quite true. The complexity of an F.W.D. system is such that the Meccano parts required to make a working reproduction result in a good-sized mechanism which, of course, needs a good-sized model to accommodate it. However, it is certainly possible to produce a simple front wheel drive system for small models which, although not based on a real-life mechanism, nonetheless operates perfectly successfully. M.M. reader James Grady of Dundee, Scotland has in fact sent me details of just such a system he has designed and which you will find featured here.

Construction is pretty obvious from the accompanying photograph. The mounting, which might vary in a model, is supplied here by a 3½ × 2½ in. Flanged Plate to which two Double Bent Strips 1 are lock-nutted. Attached at right-angles to each of these Double Bent Strips by Angle Brackets is another Double Bent Strip 2, in the centre of which a 1 in. Rod is held by a 1 in. fixed Pulley with Motor Tyre 3. One end of a Universal Coupling 4 is mounted on the inside end of the Rod.

Below: Suggested by James Grady of Dundee, Scotland, this simple, belt-driven Front Wheel Drive system is ideal for small models. At right: A multiple Drive Mechanism rebuilt from the pre-war Meccano Standard Mechanisms Manual. It is based on a type "frequently employed in multiple drilling machines and similar apparatus . . ."



The free ends of the Universal Couplings at each side are now joined by a 1½ in. Rod centrally journalled in a Stepped Bent Strip 5. A ½ in. Pulley with boss is fixed on the Rod between the lugs of the Bent Strip, as shown, then two Fishplates are bolted one to the rear lug of each Double Bent Strip 1. To complete the unit, a 2½ in. Strip 6 is lock-nutted between these Fishplates.

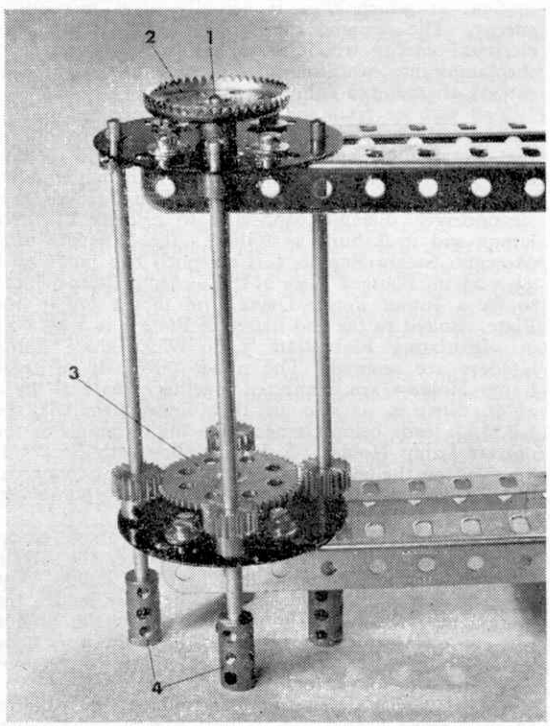
I leave the last word on the subject to James, only adding that I heartily agree with him. "Many of the smaller set users," he says, "will I think, like the idea of being able to make a front wheel drive that steers and can be fitted with 1 in. Pulley Wheels with Tyres and can be driven from a Magic Motor, using a Driving Band and a ½ in. Pulley".

PARTS REQUIRED

1—5	2—22	4—45
2—10	1—23a	1—53
4—12	17—37a	2—140
1—18a	13—37b	2—142c
2—18b	1—44	

Pre-war mechanisms

Changing the subject, now, I have been looking through a file copy of the old Meccano Standard Mechanisms Manual which was published before the last war. I don't know if many readers have seen this rare publication but it contains a wealth of mechanisms of tremendous variety, the great majority of which are just as applicable today as they were thirty or so years ago. For interest's sake I have re-built a couple of the items shown and I think you will agree that their age in no way limits their present usefulness.



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Item No. 1 is a Multiple Drive Mechanism reminiscent of a type which, according to the original manual, " . . . is frequently employed in multiple drilling machines and similar apparatus where several shafts are required to rotate at a uniform speed and in the same direction." The unit is really very simple, consisting of little more than five Rods journalled in two Face Plates and carrying various Pinions or Gears. The input shaft 1, free in the bosses of the Face Plates, has a $1\frac{1}{2}$ in. Contrate Wheel 2 and a 57-teeth Gear 3 fixed to it. This Gear is in constant mesh with four $\frac{1}{2}$ in. Pinions fixed one on each of four countershafts, held by Collars in the outside circular holes of the Face Plates, while Couplings 4, mounted on the lower ends of the countershafts, are used to carry the drilling bits. The Face Plates are of course secured to the body of the machine in which the mechanism is fitted, the drive being transferred via a Pinion to Contrate Wheel 2.

In operation, the length of the Rods and the method of mounting the Face Plates depends entirely on the "parent" model, but, for demonstration purposes, I have used one 5 in. and four $5\frac{1}{2}$ in. Rods, and have mounted the Face Plates in a framework of Angle Girders. The following Parts List applies to the unit as illustrated.

PARTS REQUIRED

2—6a	4—26	8—38
4—9	1—27a	4—59
2—9a	1—28	4—63
2—14a	20—37a	2—109
1—15	20—37b	

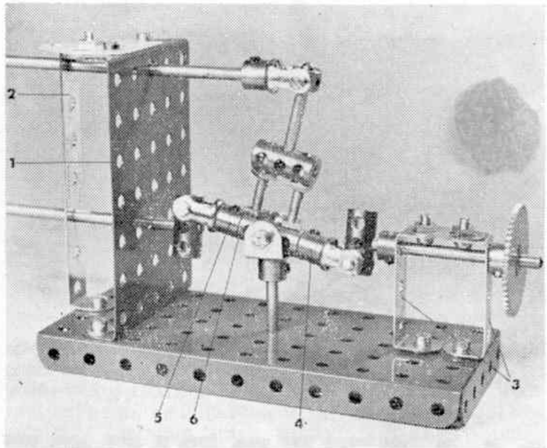
Swashplate

Item No. 2 from the Standard Mechanisms Manual is a Swashplate Unit. This is a mechanism which acts as a sort of cam to give a reciprocating (back-and-forth) motion to a rod, but it is unlike the normal cam in that the motion is in a direction parallel to the revolving input shaft of the mechanism. As you know, the reciprocating movement resulting from a normal cam is at right-angles to the input shaft.

The mounting shown in the original Manual and reproduced here consists of a $5\frac{1}{2} \times 2\frac{1}{2}$ in. Flanged Plate to which are bolted a $3\frac{1}{2} \times 2\frac{1}{2}$ in. Flanged Plate 1, a $3\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip 2 and two $1\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strips 3, the last spaced from the larger Flanged Plate by one Washer in each case. The tops of Flanged Plate 1 and Double Angle Strip 2 are joined by a Flat Trunnion, while a Fishplate connects the upper lugs of Double Angle Strips 3.

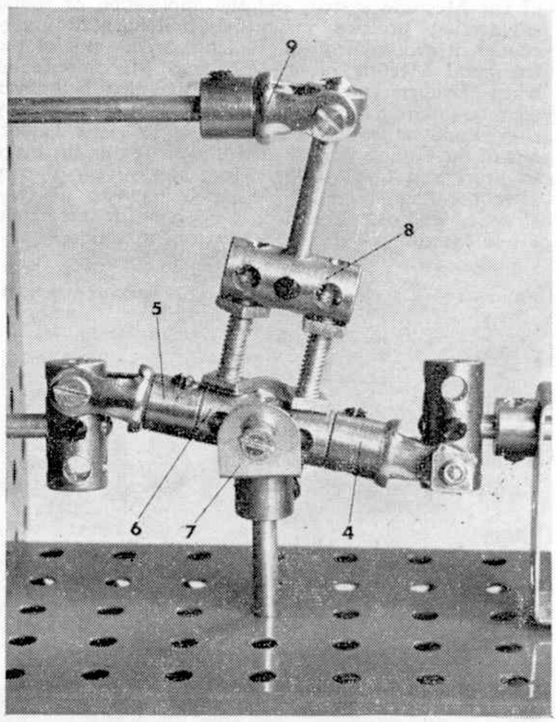
Held by a 50-teeth Gear and a Collar in Double Angle Strips 3 is a $2\frac{1}{2}$ in. Rod, serving as the input shaft. On the inner end of this a Coupling is fixed, the Rod passing through its centre transverse bore, while a Small Fork Piece 4 is pivotally attached to one end of the Coupling by a lock-nutted $\frac{3}{4}$ in. Bolt. Another similar Coupling/Small Fork Piece arrangement 5 is mounted on the end of a 4 in. Rod journalled in Flanged Plate 1 and Double Angle Strip 2, then the two Small Fork Pieces are joined by a $1\frac{1}{2}$ in. Rod on which a Coupling 6 is *loosely* mounted. A Large Fork Piece 7 is attached to the centre of this Coupling, the securing Bolts being prevented from fouling the $1\frac{1}{2}$ in. Rod by a Nut on the shank of each.

(Text continued on page 550)



Also rebuilt from the pre-war Standard Mechanisms Manual, this Swasplate Unit serves as a type of cam to convert rotary motion into reciprocating motion which acts in a line parallel to the input shaft.

A close-up view of the Couplings and Fork Pieces, etc., making up the conversion section of the Swashplate Unit.



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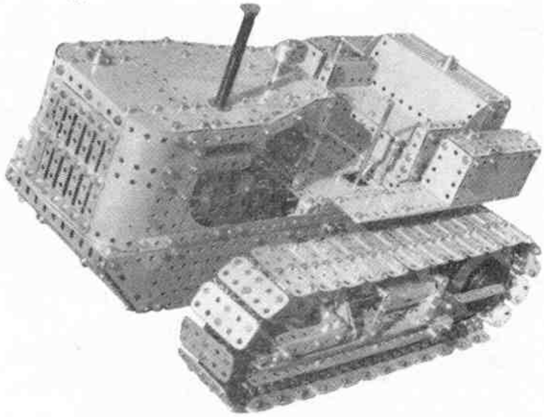


MASTERPIECE

Although its complexity prevents us from giving detailed building instructions, we just had to show you this marvellous Heavy-duty Crawler Tractor built by ERIC TAYLOR of Nuneaton, Warwickshire. BERT LOVE of Birmingham took the photographs and supplied the following general description based on Eric's original notes

ILLUSTRATED IN the accompanying pictures is a model Crawler Tractor that serves as an outstanding example of the combination of the versatility of the Meccano system and the application of sound engineering practice in model building. Strangely enough it evolved from a challenge arising out of the Inaugural Meeting of the Midlands Meccano Guild when Members voiced the opinion that they had never seen a published Meccano model which had really rugged and satisfactory caterpillar tracks. Eric Taylor, one of the Guild's leading modellers, took this challenge to heart and finished the design stages very shortly after the first meeting. He proceeded with its construction and completed it in good time for the second Guild Meeting where it proved a star attraction.

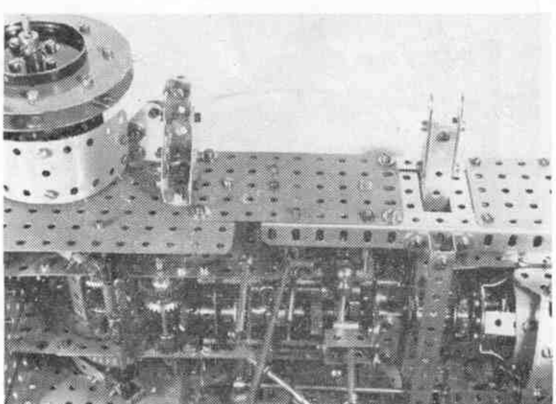
The type of crawler represented is found wherever large civil engineering works, road building or heavy pulling and pushing jobs are required and is a true "Maid of All Work" for the site engineer. Equipped with an angled dozing blade, the full-sized tractor sweeps all before it and the model illustrated was designed and fitted for such an attachment, the "U" frame pivots being provided at the rear of the track frames and the control gear in a 'tank' conveniently placed to the right hand side of the driving seat. Design of the model is not based on one particular type although the general outlines are similar to those of a famous American caterpillar tractor. The model weighs over 30 lb., but is adequately powered at all speeds by a single Power Drive Unit, running from a 12 volt D.C. supply, the motor being mounted in the appropriate place, i.e., inside the engine housing.

Particular attention has been given to main frame rigidity and the accurate alignment of transmission bearings in order to reduce friction to a minimum. To this end the main 'hull' of the model follows the design of the largest British-made crawler tractor as do the three-point suspension arrangements of the track frames. These completely relieve the hull of torsional stresses which would otherwise cause bearing misalignment and related friction over uneven ground. The final drive and steering arrangement is also of British design, having been developed in wartime for tank production, and was selected for the model owing to its simplicity, reliability and compactness.

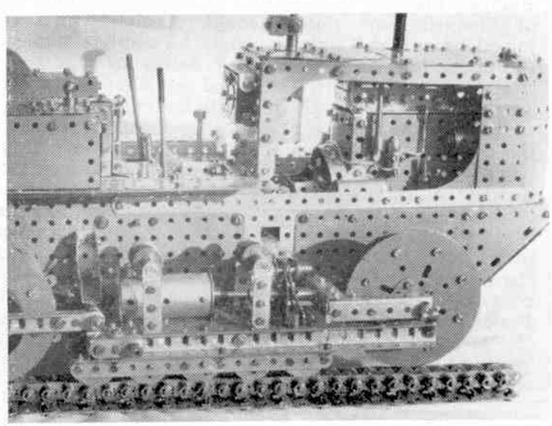
The "Engine" simulates a fan-assisted, water-cooled 6-cylinder diesel unit of approximately 150 B.H.P. with electric starter motor. The cylinder block is fitted with fuel pump, centrifugal governor and injectors on its right hand side. Above this is the exhaust manifold built up from fibre Elektrikit Strips or Fishplates surmounted by an Elektrikit Magnet Holder which conveys the exhaust fumes up the 'pipe' of Elektrikit Insulating Spacers to the rain flap at the top of the pipe. Similar detail is built onto the far side of the engine where fuel lines are run in transparent plastic-covered wire to simulate the prototype. Starter motor, generator, water pump and fan are also included.

In accordance with modern design, the bonnet tapers towards the driver so that the leading portion of each track and a large portion of the angled dozing blade are clearly visible in his line of vision. The taper finishes at the width of the instrument panel which

An upper view of the "hull" showing the gearbox and transmission to the driving shaft.



In this side view of the model, construction of the track frame is clearly shown.



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carries the all important, water temperature, oil pressure and ampmeter gauges. The tapered end of the bonnet also covers a large vertical cylindrical centrifugal air filter, the intake for which is situated above the rear of the bonnet to be as free from ground dust as possible. The radiator filler cap is offset to one side so that the driver may inspect the water level by standing on the offside track. From this position the driver may also inspect the dipstick and oil filling cap.

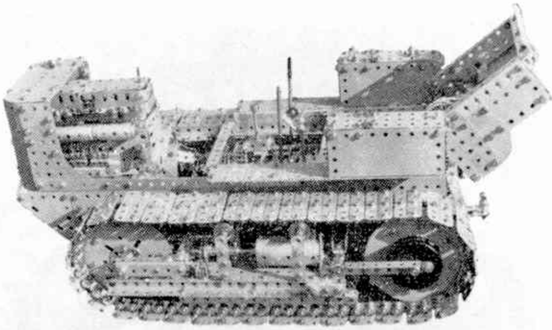
A heavy duty Single Dry Plate pedal-controlled clutch is provided and incorporates an automatic brake which eliminates 'spin' and permits the quick and easy changing of gears. A roller type of release bearing, shown at the rear of the clutch bell housing, is provided to take up operational pressure and a small ball race inside the clutch prevents friction between the clutch shaft and the engine main crankshaft when the clutch is disengaged. A similar thrust bearing is provided at the forward end of the crank shaft to take up the thrust when operating the clutch. With the Power Drive Unit set on the 16 : 1 gear ratio, a designed clutch speed of 360 r.p.m. is obtained and this is variable, by operation of the electrical speed controller, right down to 'tick-over' revs without stalling, thanks to the thrust bearings which also greatly reduce power losses when the drive is being taken up by the clutch.

The four-speed gear box, of orthodox Meccano design, is fitted with a four-position gate change for selection of ratios only. Forward and reverse are selected by an independent gear lever, situated conveniently at the driver's left hand so that he can reverse the tractor in any of the four speeds—a very useful time-saving function when the machine is making swift return movements from bull-dozing runs. The reversing gear consists of a sliding shaft carrying 1 in. and ½ in. Pinions which either mesh respectively with a 1 in. Pinion or two ½ in. Pinions in "series" the lower of these ½ in. Pinions being the gear which operates directly on to the differential crown wheel. The differential half shafts are fitted with supplementary reduction boxes each half shaft also being fitted with a rubber-shod brake disc around which an external contracting brake strap is fitted to effect track steering. Each band brake is linked to a steering stick at either side of the driver and brake tension is adjustable by screw from below the crawler. A 'kick-proof' locking device is fitted to the left hand brake to lock the left hand track when the tractor is parked on a gradient.

Placing the brakes in this part of the transmission reduces proportionately the torque required from the differential and the retardation required from the brakes for steering purposes.

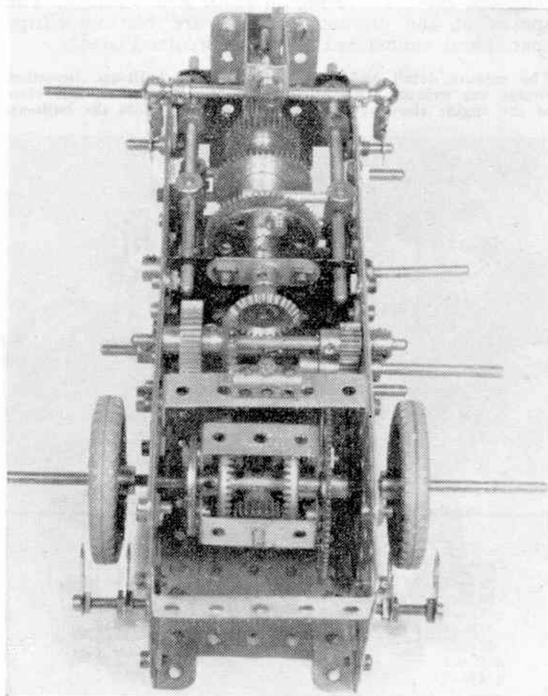
Final drive to the rear track Sprockets is via a 9 : 1 reduction from the differential, positive spur gearing relieving any final axle torque. These track Sprockets are journalled on dead axles, braced at their extremities against track tension and recoil by brace links incorporated in the dust covers on the outer face of each Sprocket. This arrangement prevents sprocket shaft deflection with resultant misalignment of track links and related components.

To ensure that the drive (and idler) Sprockets are not unduly loaded by tractor weight, they are mounted to clear the surface of the ground and the main frames carrying the tractor weight are carried on a series of track rollers, of which there are five on each side of the model, set up in heavy bearings. Each of the front



idler Sprockets is maintained in tension against the track by sliding yokes in which they are journalled, the yokes being attached to spring-loaded 'hydraulic' tension cylinders mounted inside the track frames. These cylinders maintain track tension and absorb undue track pressures arising from sharp rocks and similar obstacles. Each track frame is pivoted at its rear end on a strongly-braced axle mounted immediately in front of its respective drive Sprocket.

It is important to arrange for the crawler to ride over uneven ground while keeping the hull as steady as possible. This is done by arranging for each track frame to pivot in such a way that a rise in one track will cause a drop in the other of the same magnitude so that the hull remains upright when travelling over 'average' rough ground. In the prototype, a very heavy axle is journalled through the hull and is fitted at each end with opposing cranks, linked to the track frames. A rise in one track frame will therefore cause a proportionate fall in the other, and vice versa. Eric Taylor produced a solution in his model by fitting a compensating beam, made from Angle Girders, right



A close-up view of the gearbox and differential removed from the model. Note the rubber-tyred brake discs. Above: A general view of the Tractor with the bonnet removed and the driver's seat hinged rearwards.

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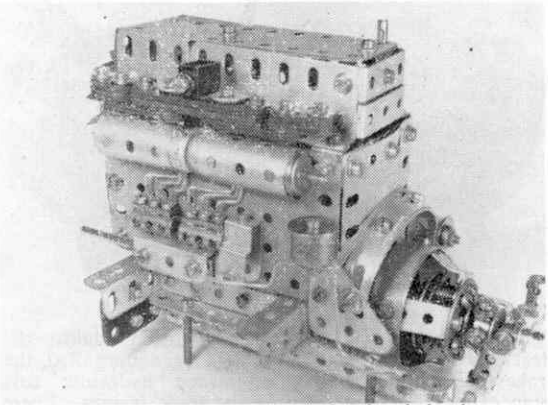
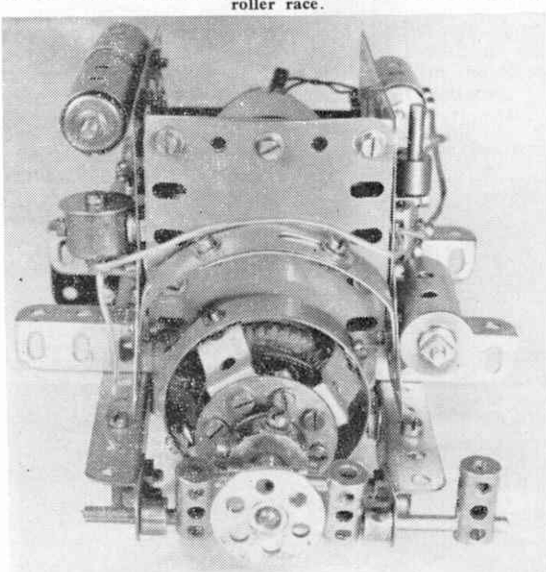


through the hull of the tractor, pivoting it in the centre of the hull, just below the flexible coupling shown in the transmission. At either end of the beam, flexible links connect it to the track frames so that a see-saw effect is produced which provides adequate and realistic compensation in the model.

In order to maintain 'centre point' steering in a crawler tractor which is towing, it is important that the drawbar be pivoted under the tractor at the theoretical centre of weight, thus allowing the tractor to be steered about the centre of 'drag.' In the model, the drawbar pivots just forward of the compensating beam and can either be left in free pivot when towing or locked into any of the holes in the radial frame at the rear of the tractor.

The tracks are made from Flat Girders, with Strips over their elongated holes, each track link being hinged by Fishplates supported against Double Brackets bolted to the Flat Girders. One-inch bolts act as hinge pins and these are locked in place with Collars. The spokes of the driving Sprocket are Narrow Strips spaced and sandwiched between Circular Plates.

The minute detail and proportions of the built-up, imitation engine are evident from picture above. Below: an end view of the engine showing the clutch assembly. Note the built-up roller race.



TWO DOG POWER CARRIAGE

Spanner describes a delightful little model accurately based on a Dog Carriage used in the early 19th century.

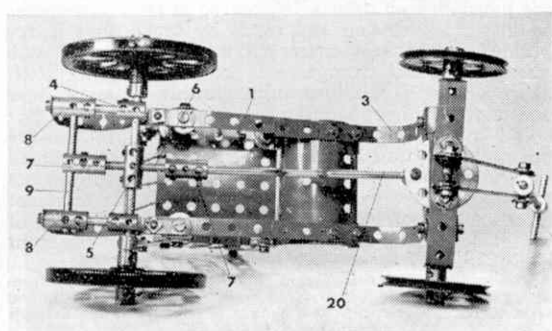
YOU'VE HEARD of horseless carriages—the original name for the motor car—and you'll certainly know something about horse-drawn carriages, but did you know that there used to be such things as dog carriages ? These were usually small, light-weight vehicles drawn, as the name suggests, by large dogs. Prior to 1840 they were not uncommon sights in Britain and I understand that even today they can occasionally be seen in out-of-the-way places in some Continental countries such as Belgium and Switzerland.

As far as we are concerned dog carriages are now part of our history, but we at least have the advantage of being able to re-create history in model form, thanks to Meccano. Illustrated on this page is a simple model based on an early dog carriage preserved in Guildford Museum, Surrey.

Construction is quite straightforward. Two combined chassis members and springs are each built up from a 4½ in. Narrow Strip 1 to each end of which another, shaped, 4½ in. Narrow Strip is bolted. Of these, Strip 2 at the front overlaps Strip 1 four holes, while Strip 3 at the rear overlaps Strip 1 only two holes.

A split rear axle is next built up from two 2 in. Rods, each fixed in one transverse bore of a Short Coupling 4 and joined together by an ordinary Coupling 5. Note that these Rods must not foul the centre transverse bore of the Coupling as, fixed in this, is a 2 in. Rod 6 on each end of which another Coupling 7 is mounted. Two Threaded Couplings 8 are then secured one each on the ends of two 1 in. Rods fixed in the longitudinal bores of Short Couplings 4, the Threaded Couplings being joined by a 2½ in. Rod 9 fixed in rear Coupling 7. Strips 3 are bolted to Threaded Coupling 8 as shown. The rear road wheels are free-running 3 in. Spoked Wheels held on the rear axle by Collars.

In the case of the front axle assembly, two Double Brackets 10 are joined by a 2½ in. Strip to the centre of which an 8-hole Bush Wheel 11, boss uppermost, is bolted. Loose in the boss of this Bush Wheel is a 1½ in. Rod held in place by a Collar above the Bush Wheel and a Double Arm Crank spaced by two Washers below it. Bolted to the underside of this Double Arm



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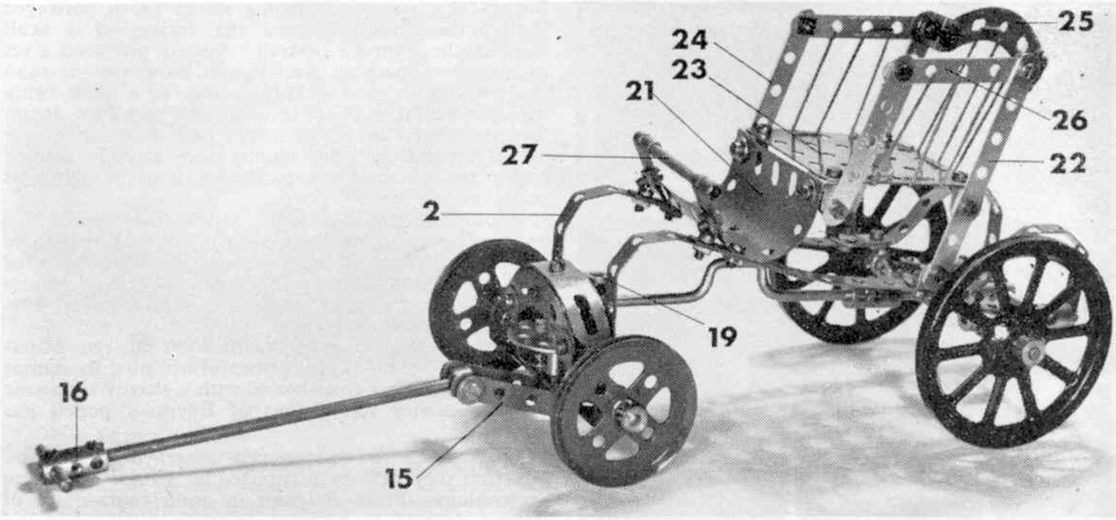
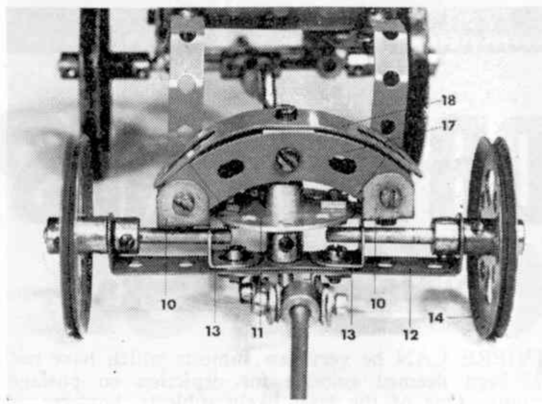


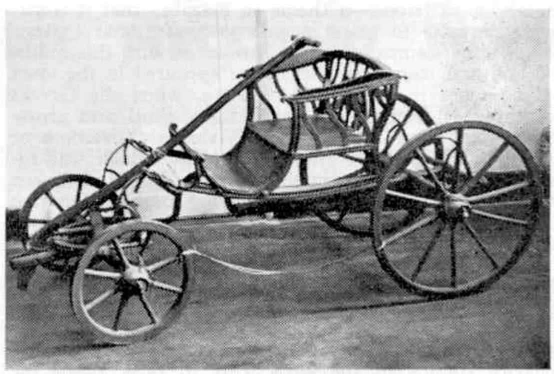
Crank is a 3½ × ½ in. Double Angle Strip 12, the securing Bolts also holding two Angle Brackets 13 in place at the top of the Crank and a further two in place beneath the Crank

Journalled in the free lugs of the upper Angle Brackets and the lugs of the Double Angle Strip are two 2 in. Rods each carrying a free-running 2 in. Pulley 14 and held in place by Collars. Bolted to the free lugs of the lower Angle Brackets are two 2 in. Narrow Strips 15, the free ends of which are joined by two Bolts screwed into a Collar, at the same time fixing a 5½ in. Rod in the Collar. A Coupling 16 carrying a transversely-mounted 1½ in. Rod is mounted on the end of this 5½ in. Rod, then the lugs of Double Brackets 10 are joined by two 2½ in. Stepped Curved Strips 17, the securing Bolts in one case also fixing the whole unit to the ends of Strips 2. The centres of Strips 17 are connected by a Double Bracket to which a Formed Slotted Strip 18 is bolted. A vertically-mounted Threaded Coupling 19 is then fixed to the upper face of Bush Wheel 11 and a Crank Shaft 20 (Part No. 134), mounted in its centre transverse bore, is secured in the longitudinal bore of front Coupling 7.

Bodywork

Coming now to the body, this is really highly simple consisting of little more than a seat with a foot-board. A 2½ × 2½ in. Curved Plate 21 is bolted to Strips 1 as also are two 3½ in. Narrow Strips 22. The Narrow Strips are connected to the Curved Plate by a 2½ × 2½ in. Flat Plate 23, attached by Angle Brackets, two 2½ in. Narrow Strips 24 in turn being attached to the Flat Plate also by Angle Brackets. Angle Brackets are again used to fix a 2½ in. Stepped Curved Strip 25 between the upper ends of Narrow Strips 22, the securing Bolts at the same time helping to fix a further two 2½ in. Narrow Strips 26 between Strips 22 and 24. Meccano Cord threaded between Strips 25 and 26 and Flat Plate 23 completes the seat, while the whole model is finished by adding a footrest to Curved Plate 21. This consists of a 2 in. Rod 27 mounted in right-angled Rod and Strip Connectors bolted to the Curved Plate.





Bottom right: The real Dog Carriage as it appears on show in Guildford Museum. It was used by a small girl round about 1825 and was drawn by two large dogs.

PARTS REQUIRED

1—5	2—18b	1—48b	3—90a
2—11	2—19a	10—59	1—134
15—12	2—20a	1—62b	1—200
1—14a	1—24	3—63	2—212a
3—16a	42—37a	3—63c	1—215
4—17	46—37b	2—63d	6—235
2—18a	8—38	1—72	2—235b
			6—235d

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DRY BONES

by James A. Mackay

THERE CAN be very few subjects which have not been deemed suitable for depiction on postage stamps. One of the least likely subjects, however, is skulls or skeletons—a theme so macabre that it comes as a surprise to many people to realise that quite a number of stamps have been produced with this motif.

The first stamps in this theme appeared in the town of Chimara in the spring of 1914, when the Greeks captured it from the Albanians. A skull and cross-bones was flanked by the Greek slogan "Freedom or Death". The Black Hand movement, which was responsible for the assassination of the King and Queen of Serbia in 1903 and the slaying of the Austrian Archduke Franz Ferdinand at Sarajevo in 1914, used a rubber stamp showing a skull, with the slogan "Union or Death", but so far as I am aware no labels, far less stamps, with this grisly emblem were printed.

The republic of Ukraine, which maintained its independence between 1918 and 1923, issued a set of charity stamps in the latter year to raise funds for famine relief. The 10 + 10 kopecks stamp showed the spectre of famine as a shrouded skeleton, while the 90 + 30k. stamp showed Death wrestling with a peasant. The spectre of death was depicted above Majdanek concentration camp on a memorial stamp issued by Poland in 1946.

The late unlamented Adolf Hitler was connected with death, symbolised by a skull on two interesting items. The first was a British Intelligence propaganda forgery of the Nazi 6 pfennig stamp which portrayed Hitler; the forgery showed the outline of a skull through the Führer's portrait. Austria produced a set of stamps to mark an Anti-Fascist Exhibition in 1946 and one stamp showed Hitler's face as a mask being lifted to reveal a grinning skull behind. This design was considered to be in rather bad taste for it was never released, but the stamps were actually printed and a few of them eventually got into the hands of collectors.

Another propaganda series which made use of this gory theme was issued by Ghana in 1962 when Kwame Nkrumah played host to an assembly in Accra dedicated to "The World Without the Bomb". The 6d. stamp showed an atomic cloud burst with a skull clearly outlined in the mushroom cloud.

Recently the postal administration of the Mutawakelite Kingdom of the Yemen overprinted its stamps with the skull and cross-bones, with a charity surcharge to raise money for victims of Egyptian poison gas attacks.

Apart from the propaganda aspect of skulls and skeletons they have been depicted on stamps honouring archaeology. From Belgium in 1966 came a set of stamps devoted to national scientific institutions and the 1 franc stamp, honouring the Royal Institute of Natural Sciences, featured the fossilised skeleton of an iguanodon.

East Africa is the cradle of human civilisation, a fact which has been signalised by a stamp released by Tanzania. In 1959 Dr. L. S. B. Leakey and his wife made a remarkable discovery while carrying out archaeological excavations in the Olduvai Gorge. Mrs. Leakey found the upper jaw and the palate and other bones of a new kind of fossil man. In the ensuing months a considerable number of fragments were unearthed, enabling the reconstruction of the skull to be carried out. The remains appeared to be those of a young man of sixteen years of age and are remarkable for their size. The teeth, especially the molars, are enormous and show that their owner lived mainly on vegetables and nuts, competing with the giant baboons of the time.

This new anthropoid, the link between modern man and the apemen of southern Africa, has been named Nutcracker Man, or more scientifically *Zinjanthropus boisei*. The remains are of the Lower Pleistocene Age, approximately 600,000 years old, and thus the oldest tool-making man known.

Twenty-five years earlier Dr. Leaky discovered fragments of an ape near Lake Victoria which he named Proconsul. An almost complete jaw was found in 1942 and six years later Mrs. Leakey discovered an unbroken skull. The precious skull, insured for £5,000, was flown to England clutched in Mrs. Leakey's lap, for Professor W. E. Le Gros Clark to study at Oxford. This, the earliest ape skull known from any part of the world, was depicted on an East African stamp issued in 1967.

Two stamps which might be included in this theme were issued by Britain and the United States in 1964 to mark the 400th anniversary of the birth of William Shakespeare. Britain's 2/6 stamp, designed by Robin and Christopher Ironside, showed Hamlet contemplating the skull of Yorick, the court jester, in the famous graveyard scene: "Alas! poor Yorick. I knew him, Horatio; a fellow of infinite jest, of most excellent fancy." The American Shakespeare stamp portrayed the immortal bard himself. At his elbow lay a skull, but whether he used it to gain inspiration or merely as a paperweight is not signified.

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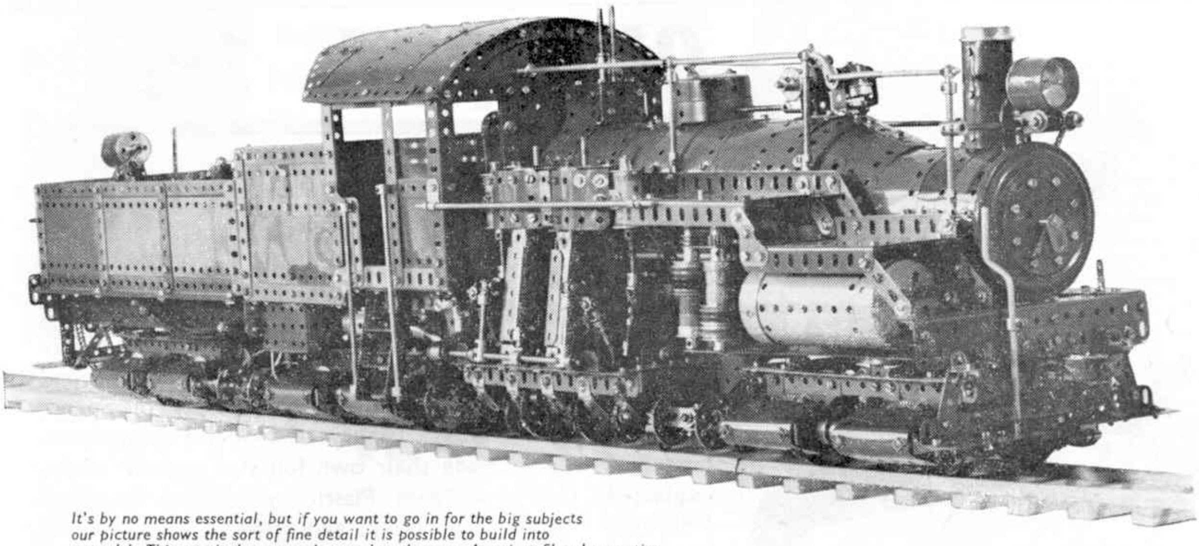

It's by no means essential, but if you want to go in for the big subjects our picture shows the sort of fine detail it is possible to build into a model. This particular example was based on an American Shay Locomotive and it gained first prize in Section B of our last competition for R.H. Groen of Amsterdam, Holland.

Meccano Contest 1968-9

CASH PRIZES FOR YOUR MECCANO MODEL!

When the old Meccano Magazine ceased publication last year, Meccano Limited were forced to abandon the model-building competition they were running at the time. This, however, did not mean that the Contests which, over the years, had become part of the Meccano tradition were being abandoned for all time—definitely not! Now that the new Meccano Mag. is well and truly here, in fact, we are delighted to announce the start of yet another contest in which valuable cash prizes are offered to the builders of Meccano models which the judges, taking all things into consideration, feel to be most worthy of success.

ALL COMERS WELCOME

As usual, the competition is open to every owner of a Meccano Set living anywhere in the world and no limit, maximum or minimum, is set either on the number of entries which may be submitted or the quantity of parts which may be used. Any kind of model is eligible for entry unless taken direct from a Meccano manual, and all will be judged on their individual merits. *The only stipulations are that the model or models must be built entirely of standard Meccano Parts and must be your own unaided work.*

Prizes will be awarded for what the judges consider to be the best-built models with particular attention being given to those in which the more unusual parts are put to good use, as well as, of course, to originality of subject. Remember, too, that a small well-built model stands just as much chance of success as a large, unstable example, so don't be put off entering the contest just because you don't own a big stock of Meccano. The competition closes on January 31, 1969, for competitors in the U.K. and Ireland and two weeks later, on February 14, for overseas competitors.

Entries will be divided into two sections, A and B. Section A is for competitors under 14 years of age on the closing date and Section B for competitors aged 14 or over on that date. Prizes in these sections are as follows: Section A, 1st. £5.5.0; 2nd. £3.3.0; 3rd. £2.2.0; 10 prizes of 10s.6d. Section B, 1st. £7.7.0; 2nd. £5.5.0; 3rd. £3.3.0; 10 prizes of £1.1.0.

HOW TO ENTER

Once you have built the model, obtain a good photograph of it, or, failing this, a reasonably detailed sketch. If you are not an artist yourself, it is quite permissible to have a friend prepare the sketch. It is also advisable to include a short description of the main features of the model with your entry, mentioning any points of interest that you would like brought to the attention of the judges. *Under no circumstances, however, must the actual model be sent.*

In entering the Contest, write your name and address on the back of *each* photograph or drawing, together with the letter A. or B. depending on the Section for which you qualify, and forward to **Model-building Contest, Meccano Magazine, Binns Road, Liverpool 13.**

Prize-winning entries become the property of Meccano Limited but unsuccessful attempts will be returned if accompanied by a suitable stamp-addressed envelope or, in the case of overseas entries, a self-addressed envelope and the appropriate International Reply Coupons. Note that entries can be accepted only on the understanding that Meccano Magazine will not be held responsible for any entry damaged or lost and that the judges' decisions are final. No correspondence relating to unsuccessful entries can be considered.

OUT OCT. 1st

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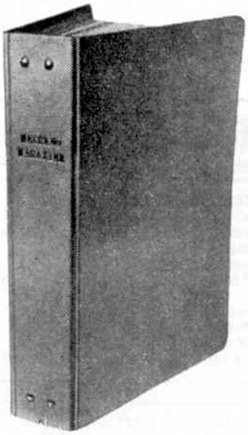

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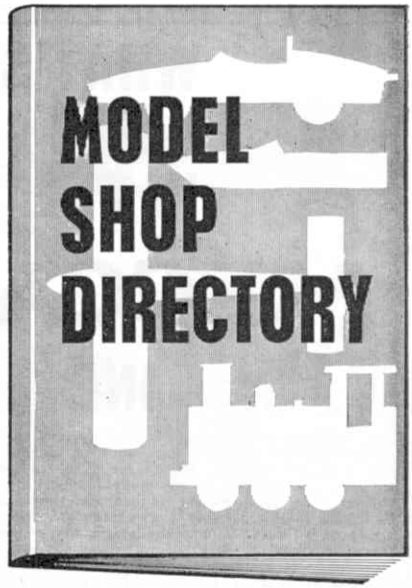

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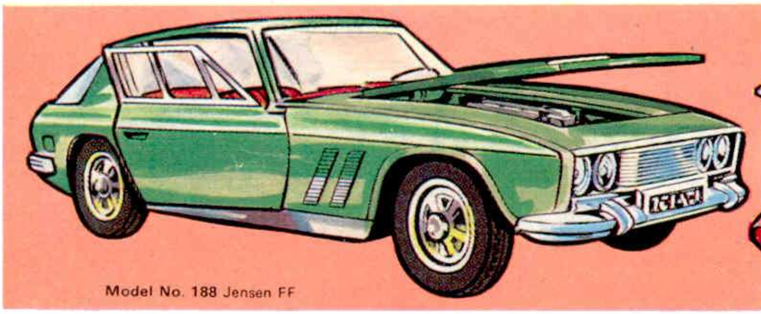
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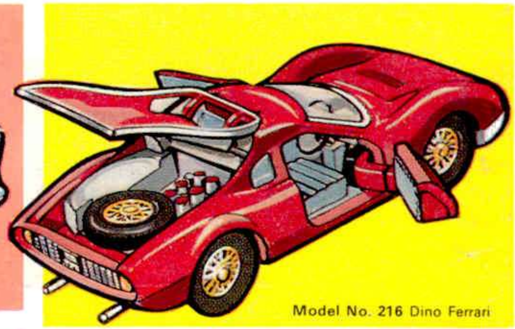
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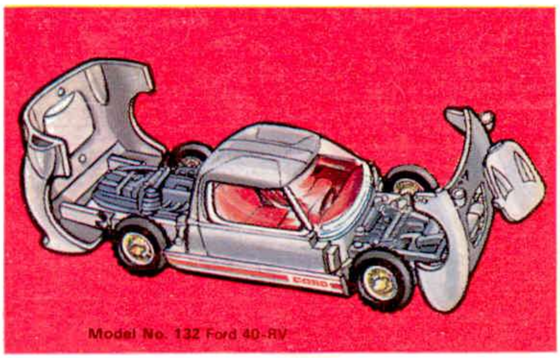
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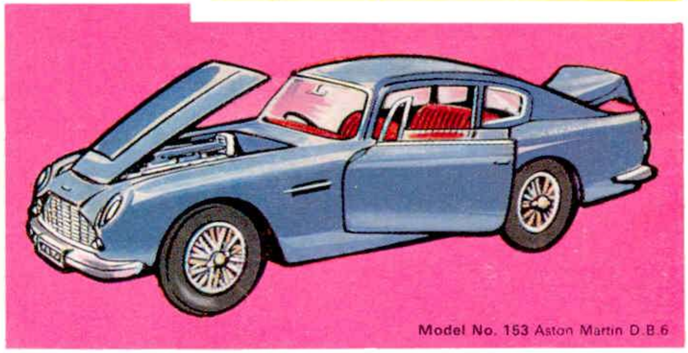
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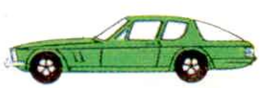

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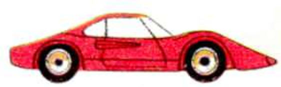

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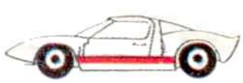

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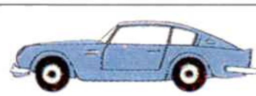

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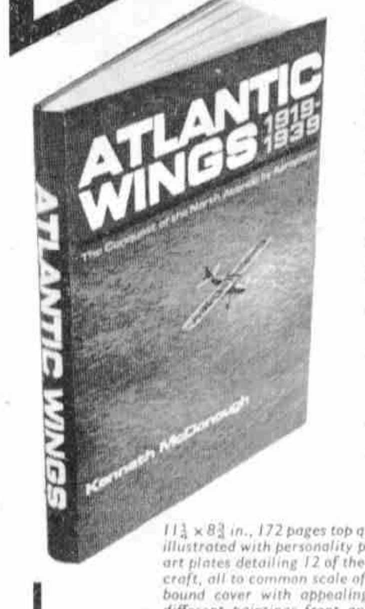

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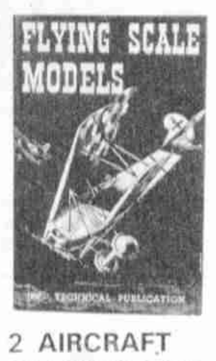

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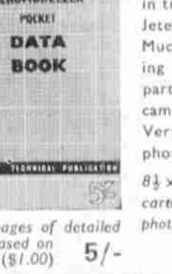

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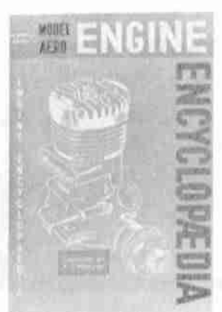

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114 AEROMODELLER ANNUAL 1968/9

This year's Annual is the 21st and our 'coming-of-age' edition brings no less than 47 of the world's most interesting model designs ranging from an actual size indoor flyer to world champs winner. 'Milestone' features include George Aldrich on Secrets of Speed, engine tuning and fuels; Theory of Model Flight; Aeromodellers who've made their own full-size aircraft; Noise explained; The new Foam Plastic techniques, by Erich Heimann; How to use Epoxy, and how to keep control line tension. Designs include Coupe d'Hiver, Wakefield, A/2, F.A.I. and ½A Power, Open Rubber, Chuck Glider, Hydro, Team Race, Stunt, R/C Multi, Sport, Scale, Tailless. Full cover colour by Lauri Bagley portrays 'Breezy' – a home-built light aircraft built by aeromodellers.

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RADIO CONTROL

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60 RADIO CONTROL MANUAL

Angled to appeal to all practical exponents of modern R/C flying, both single channel, multi, scale, pylon racer or any of the other now numerous divisions of the hobby. For the first time an attempt has been made to tabulate equipment and model kit data in a form that quickly shows what will go with which, covering every piece of equipment.

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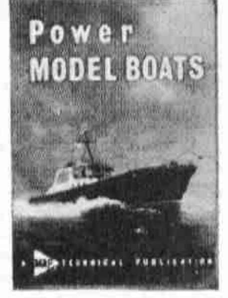

Guides the enthusiast happily through the pitfalls of his progress. Within its covers will be found a wealth of information on all forms of hull construction, materials in common use, suitable tools; the different types of motor and their best employment; simple approach to radio control, boat fittings, couplings, shafts and propellers, superstructure, painting and finishing; unorthodox models, including submarines; and a valuable selection of 'Do's and Don'ts'.

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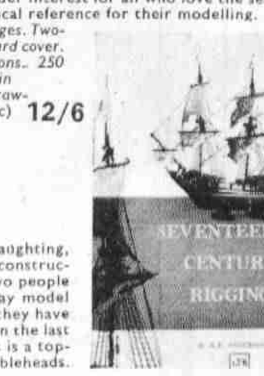

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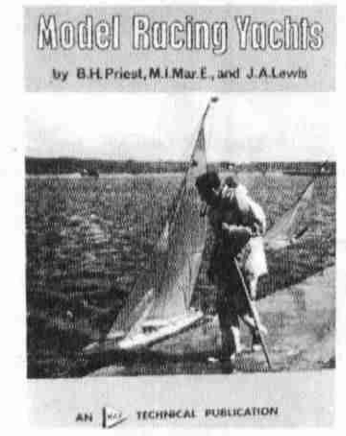
Priest and Lewis



This magnificent new work covering up-to-date design, draughting, tuning, handling and racing of model yachts, with notes on construction and fittings, vane gear, etc. There are probably no two people better qualified to write a book on the arts of present-day model yachting than Dick Priest and John Lewis. Between them they have designed the majority of the top boats in important races in the last few years: both are outstanding 'A' class designers. Lewis is a top-line 10-rater architect, and Priest especially strong on Marbleheads. Thus the three main classes are completely covered by their combined experience.

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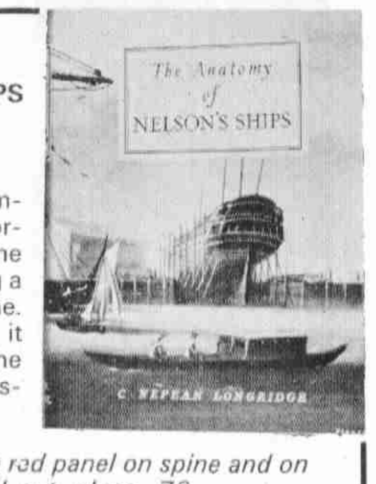
9 THE ANATOMY OF NELSON'S SHIPS

C. Nepean Longridge



A fantastic tour-de-force embracing the most complete information ever for the benefit of the ship modeller intent on building a wooden ship of Nelson's time. Its very completeness makes it also of special interest to the naval historian. Drawings, illustrations, plans are all superb.

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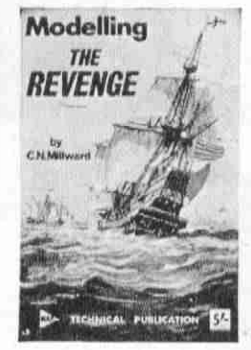
MODEL BOATS

11 MODELLING THE REVENGE



Detailed description of an Elizabethan ship-of-war and how to model it.
Part I: The Hull, covers first stages, fitting and painting.
Part II: Deals with Rigging, including masts and spars, standing rigging, running rigging, sails, finishing touches. Guns, deck details and many other details well illustrated. Working drawings by the author also available.

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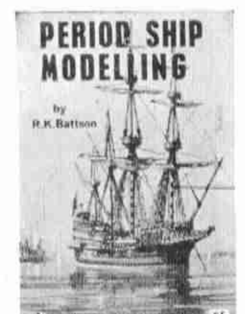
18 PERIOD SHIP MODELLING



Constructional notes with 65 diagrams on the making of an Elizabethan Galleon. Seven chapters cover: Introduction, Hull, Masts, Spars and their Fittings, Standing Rigging, Running Rigging, Sails and their Gear, Finishing and General Notes. Plans available in our Plans Service.

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14 BOAT MODELLING

Vic Smeed

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In successive editions nearly 30,000 model boat builders have been introduced to the hobby via this little book.

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P. Thorne

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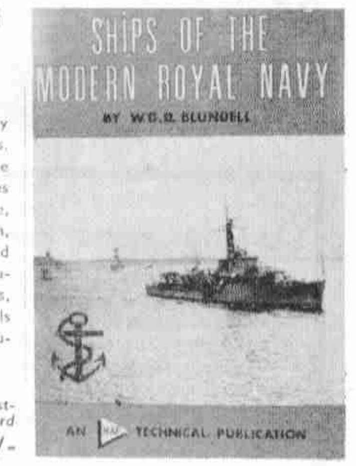
103 SHIPS OF THE MODERN ROYAL NAVY



This book covers the ships of the present-day Navy in photographs, drawings, and words. Nearly 100 photographs, the majority full-page of ships and details of ships, accompany 20 pages of plans – Ton, Triumph, Battle, Salisbury, Eagle, Bulwark, Tide, Forth, Range, County, Manxman, Daring, Bar, Mull, Reliant, Ham, Ford, Agile and Tiger – with descriptive text, plus several tabulated pages listing and detailing all other ships, to provide a comprehensive survey of the vessels in current use. For all ship-lovers, naval enthusiasts, and model builders.

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The history and vicissitudes of this famous concern and the men who ran it and the development of the numerous Leiston engines, from the earliest types to the end of steam. Technical descriptions are leavened by stories and anecdotes of engines, designers and the old family proprietors, and of the interesting trials and experiments which took place.

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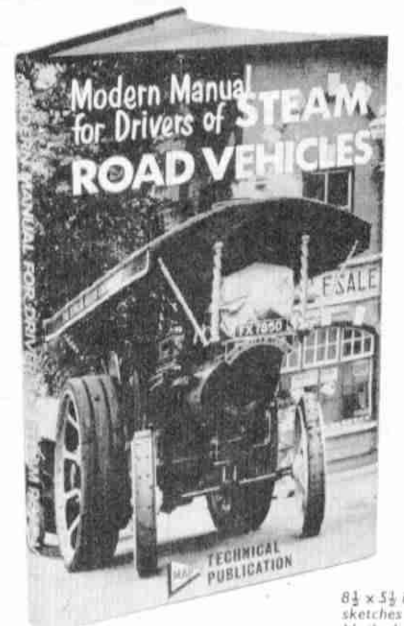

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A 'must' for every steam road vehicle enthusiast, be it traction engine, steam wagon, ploughing machine or any other fascinating variant . . . it embodies all that could be gleaned from surviving professionals on the subject of driving, maintaining, servicing and operating all classes of steam road vehicles. It is no technical tome but a completely practical work written from the novice's point of view by a non-engineering author, who has nevertheless had the benefit of the advice of a number of real experts. For those who drive, would like to drive, or are content to watch others at work, this is a book to read and enjoy . . .

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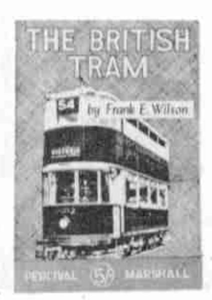

'Travel at Midday – Twopence all the Way' was a pre-war slogan of the trams, and author Frank Wilson takes the reader from the very beginning with horse-drawn trams, through their heyday when Austin Sevens were alleged to get stuck in the rails and carried on to the depot, until their eventual eclipse in modern times. Chapters cover History, General Features, Lines, the Car itself, how it worked, and the passing of an era.

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RAILWAYS

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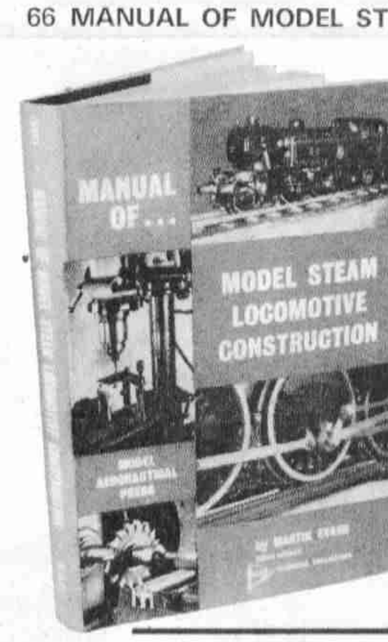
Martin Evans



Acclaimed all over the world, this is earning a reputation as the standard work on the subject. Author for many years, Technical Editor and now editing *Model Engineer*, has not only a 'full-size' steam background, but very many years of practical modelling, plus an intimate knowledge through readers' correspondence of the things that the amateur would like to know. For armchair pleasure, or as a definite investment to save its cost many times over!

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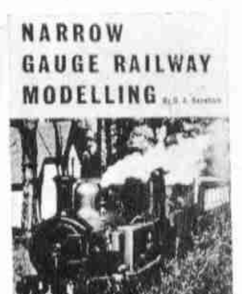
D. A. Boreham



Narrow gauge railways make most attractive models, either as the basis of a complete layout or as a 'feeder' line to a standard gauge layout, adding depth and imagination to proprietary units. The book is practical and authoritative, written by an acknowledged expert. Matters covered include trackwork, wheels, rolling-stock bodies, metal work with useful tips on sources of information, exhibition layouts plus excellent drawings.

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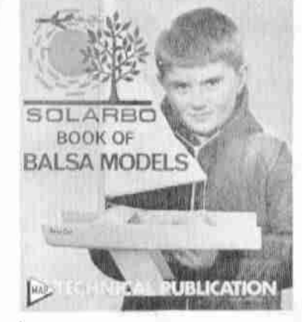

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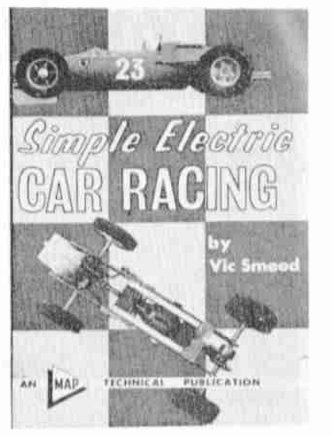

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V. E. Smeed

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Cecil Gibson

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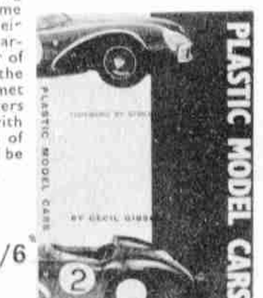

22 PLASTIC MODEL CARS

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MODEL CARS

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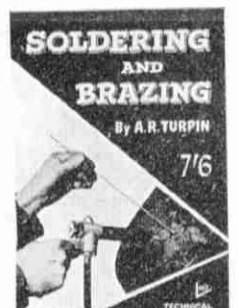

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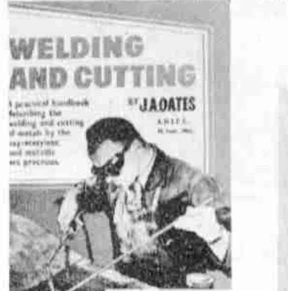

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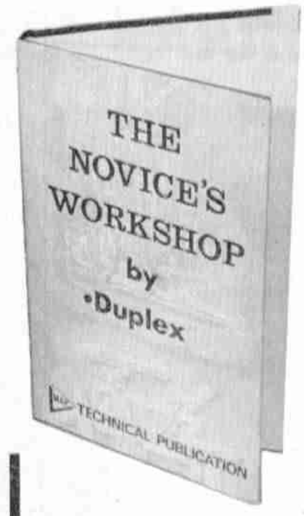

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Duplex, now known to be Ian Bradley and Norman Hallows in partnership, enjoys a high reputation amongst model and light engineers for wide knowledge of the subject and a happy knack of explaining quite involved operations in a clear and logical manner. This work, which originally appeared as a series of articles in *Model Engineer*, is designed to assist and instruct the newcomer to the craft in the all-important matters of planning and layout of the home workshop, the selection of handtools, their correct use, and, finally, shows the reader how to apply his newly-developed skill to the making of additional items for his workshop. The book then goes on to deal with the selection, installation, maintenance, and practical uses of machine tools. Primarily for beginners this is a book which even the most experienced worker will find abounding in useful hints and tips.

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LATHEWORK

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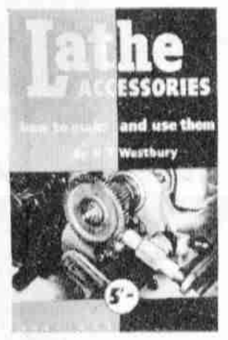

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How to make and use a wide variety of useful accessories, many of which cannot be bought, or only somewhat expensively. Selection includes devices for centring work, chucking accessories; toolholders and cutter bars; dividing appliances; simple milling attachments; steadying appliances; various forms of cutters; aids to screwcutting; and other miscellaneous accessories. Saves its cost many times over in next to no time.

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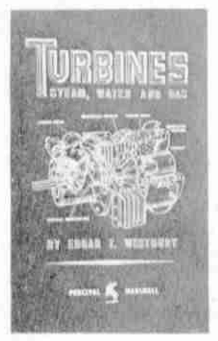

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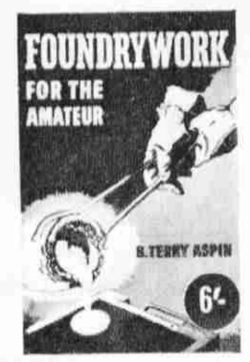

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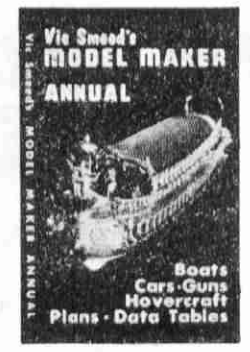

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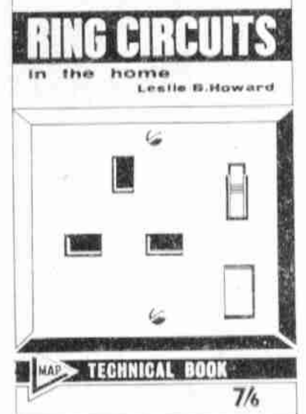

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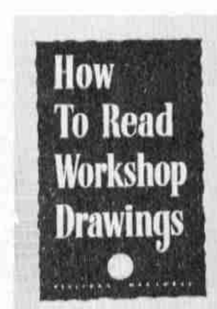

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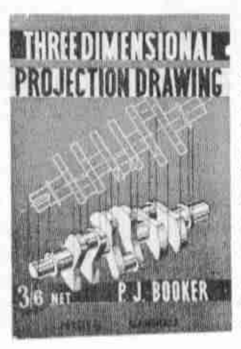

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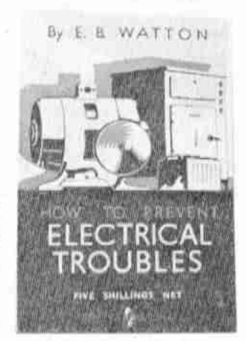

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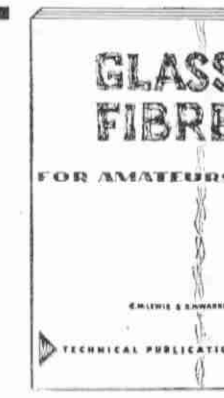

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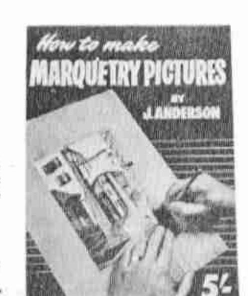

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