MECCANO® Magazine

JANUARY 1970

★ SIMPLE STEAM ENGINE ★
★ APOLLO 12 ★ STAMPS ★
★ DINKY TOYS ★ BATTLE ★

MAP

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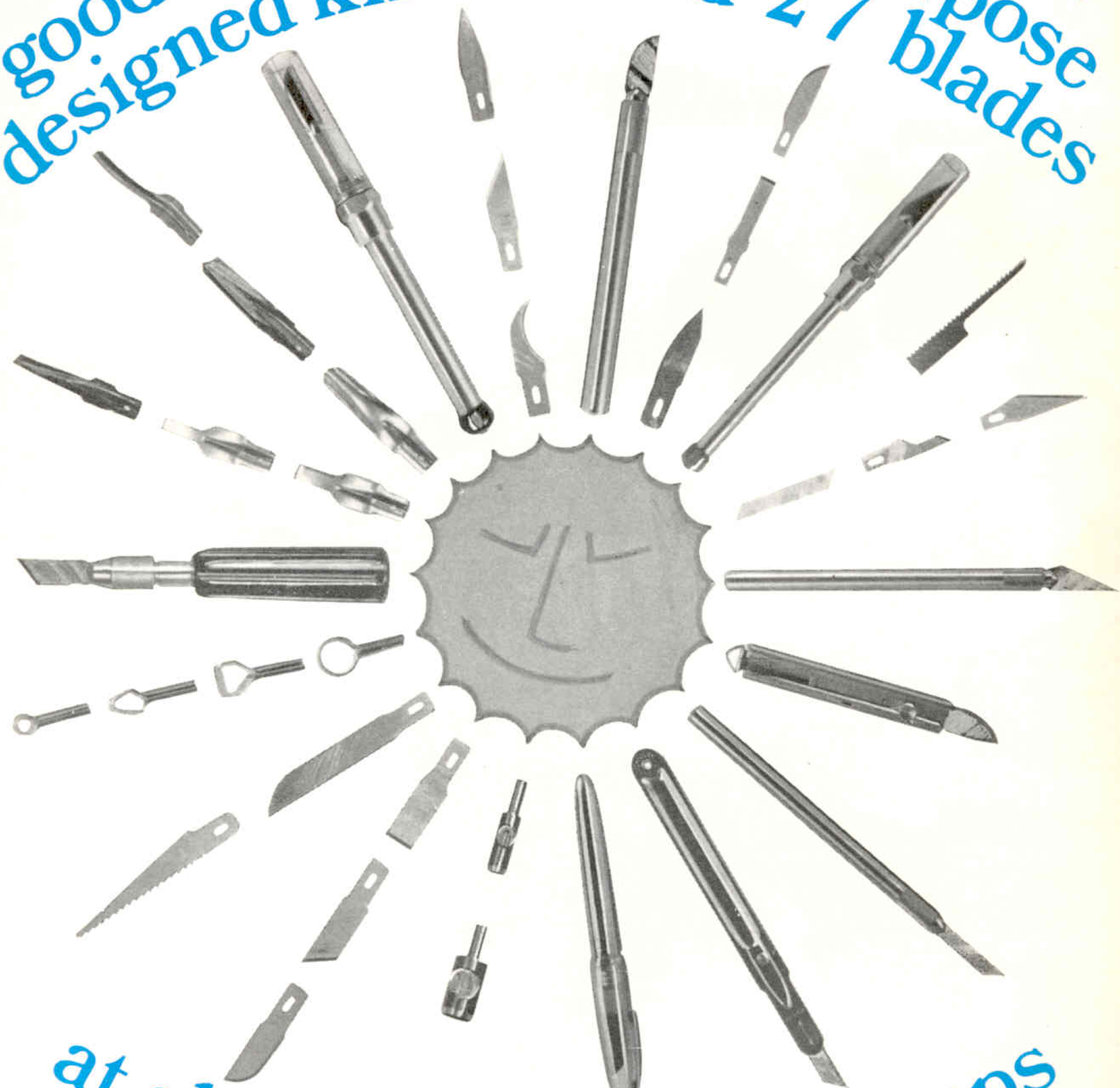

at all good modelling shops

MECCANO® Magazine

JANUARY 1970 VOLUME 55 NUMBER 1

Meccano Magazine, founded 1916.

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MAP **HOBBY MAGAZINE**

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FRONT COVER

The short cold days of winter drastically reduce the amount of time that keen modellers can spend on out-door pursuits such as depicted on this month's cover. Taken during a warm summer's day last July, it shows the editor accompanied by Gordon Blackwell spending an hour or so at the local pondside " messing about with boats ".

For those interested in this particular hobby the model is a 35 in. off-shore model power boat fitted with 5 cc E.D. Viking diesel engine and equipped with Mainstream 4 channel proportional radio equipment.

NEXT MONTH

Certainly one of the most gruelling sporting events in the World is the Tour of Britain Cycle Race. For 14 days, 36 top amateur cyclists from all over the world cycle 1,300 miles around Britain with only a few hours of rest a day. Stephen Goodger describes and illustrates this colourful event in his feature " The Milk Race ", the unofficial title by which it is popularly known.

Other special features include " Oil From the Arctic ", describing how the oil is pumped, and the problems the men at work have to face in these severe conditions. " Microscopy And Its Development ", another interesting science feature by Charles A. Rigby, describing the different types of high powered microscopes, and their many uses. The latest bike to be tested in " On Two Wheels " is the Vespa Primavera, a smart little scooter of 125 ccs.

For Meccano enthusiasts we have the conclusion of the Combine Harvester, construction feature, an interesting model of an elevator loader and the prize winning Meccano Competition entry H.M.S. Cossack. All the regulars with the exception, unfortunately, of "Air News ", are with us as usual.

Advertisements and Subscription Offices: Model & Allied Publications Ltd., 13-35 Bridge Street, Hemel Hempstead, Hertfordshire. Tel.: Hemel Hempstead 2501-2-3.

Second class postage rates paid at New York, N.Y. Registered at the G.P.O. for transmission by Canadian Post. American enquiries regarding subscriptions, news stand sales and advertising should be sent to MECCANO MAGAZINE, Eastern News Distributors Inc., 155 West 15th Street, New York, N.Y. 10011, U.S.A., U.S.A. and Canada direct subscription rates Y5 including index.

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model engineer exhibition 1969-70

31 December '69 — 10 January '70 ★
Seymour Hall, London, W.1

SEE AND ENJOY
There will be a magnificent collection of models of all sorts shapes and sizes covering locomotives, traction engines, steam rollers, ships, yachts, cars, aircraft, in fact anything which can be modelled. These entries will be competing for a wide selection of trophies, cups and other awards as individual entries, in addition this year the emphasis will be very much on the club aspect and not only the governing bodies but some of the larger individual clubs have come together to give a composite exhibit of their efforts.

In the gallery, the popular "Boys' Exhibition" organised by Commander Guffick will be there again—bigger and better. There will be a Meccano Competition and a fine display.

WORKING MODELS
The ever popular live steam exhibit will be operated by the Society of Model and Experimental Engineers and youngsters of all ages, five to seventy, will be able to have a ride behind the steam engine. The S.M.E.E.'s own stand will also, of course, have its usual selection of models operating under compressed air.

COME AND HAVE A RUN
. . . Yes, you can now with your locomotive. A second track will be in operation this year with 2½ (yes, 2½!) in. gauge, 3½ and 5 in. facilities. We are open to accept visits from clubs bringing their locomotives to "put on a show" during the exhibition. Limited time available so make up a party and get a firm date.

HISTORIC MODEL AIRCRAFT COLLECTION
Lt.-Commdr. Greenhaigh's collection of famous model aircraft and power units from the birth of flying to the present day will be on display.

POND FOR LITTLE SHIPS
(about 2 ft. l.o.a. is the limit) where radio-controlled boats will be demonstrated. Why not arrange to bring yours?

MECCANO DISPLAY
In addition to a Meccano Model Class there will be a fascinating array of working Meccano models, including the famous Ferris Wheel (from Vienna's Prater—Remember "The Third Man"?)

ECRA CAR CIRCUIT
(as built for National Championships). All day running, individual, club, inter-club competitions and visitors' races. Both 1/24 and 1/32 scales operating; six-lane track. Prizes for novices and expert alike. Send for detailed day-by-day programme.

WORKSHOP EQUIPMENT
Tools to make things. Lathe accessories, complete lathes, small tools and the like make a strong and popular class. Smaller items will be displayed safely under glass. A special attraction will be a selection of "Duplex" tools and models—mainly from the treasure chest of Ian Bradley, one-half of the famous combination.

CLOCKS
Horological work is one of the most rewarding of home workshop efforts. In recent years we have had excellent support from enthusiasts.

RADIO CONTROLLED CARS in action. An operating area round the pond will be used by electric r/c cars. If you have one bring it along!

STAMP COLLECTORS
Specially franked covers and other items of philatelic interest will be available. A commemorative cover will be available and may be posted from the Exhibition with a special frank.

MODEL TRADE SUPPORT
Once again we welcome members of the model trade who will be displaying their wares and in most cases selling their products. We have Beatties of London, Kennions, Myfords, Historex, Flying Dutchman, Mainstream Productions, Howard Taylor, Arms & Armour Press, Sartglen Eng., Arlington Supplies, Cromar White, Turntable and G.R.P. Marine. In fact there should be somebody to please the enthusiast in every angle of model making. Our own M.A.P. books will be on sale and a number of representative model governing bodies will be exhibiting, including The Society of Model and Experimental Engineers, Society of Model Aeronautical Engineers, International Plastic Model Society, Model Power Boat Association, all of which are National Non-territorial bodies. In addition there will be a number of club features to show what can be done.

SOUVENIR GUIDE
A very special Christmas Extra issue of Model Engineer will be coming out on December 12th. This will be the Exhibition Souvenir Handbook and Guide. It will contain Exhibition Entries, details of Stands, plus articles by experts on all aspects of modelling. On sale everywhere and at the Show. If you cannot come get a copy and it should persuade you. If you expect to come read all about it first.

PARTIES
Many clubs will be organising parties to come. We shall be very happy to welcome them, give them reduced price bookings, also book up party lunches, teas or other meals well in advance. **Single and small number pre-booking tickets are available from these offices at Adult 3s. and Child 2s. Parties of more than ten: Adults 2s. 6d., Child 1s. 6d. Admission at the Pay-box is: Adult 4s., Child 2s. 6d. Any youngster at school is a child. Under five, admission free accompanied by an adult.**

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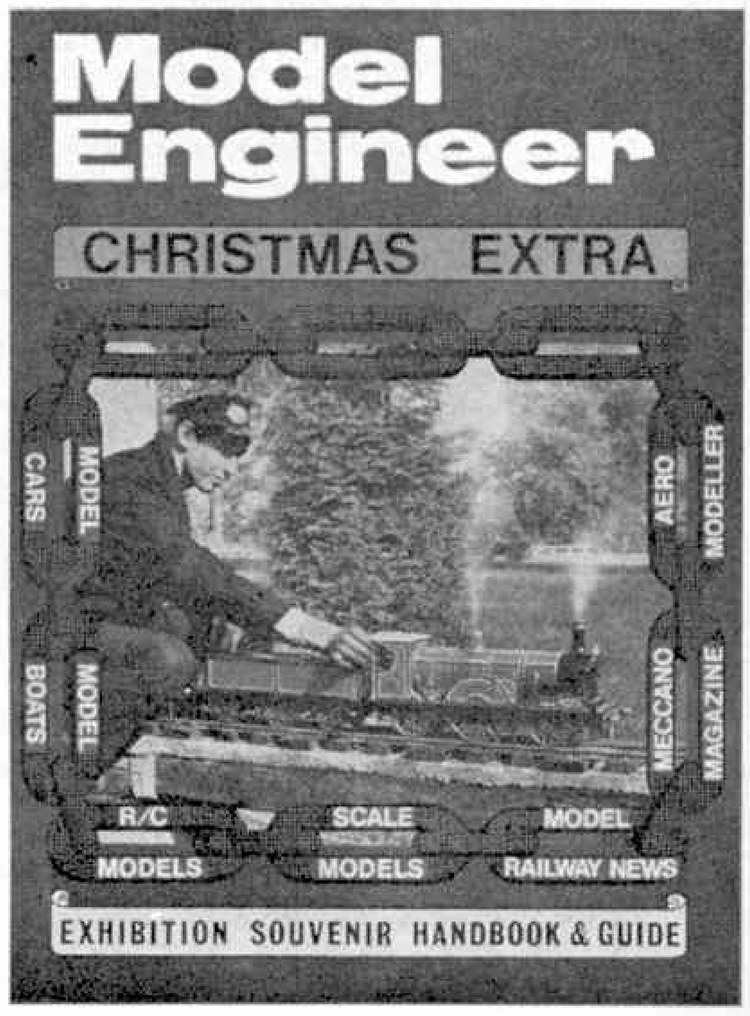

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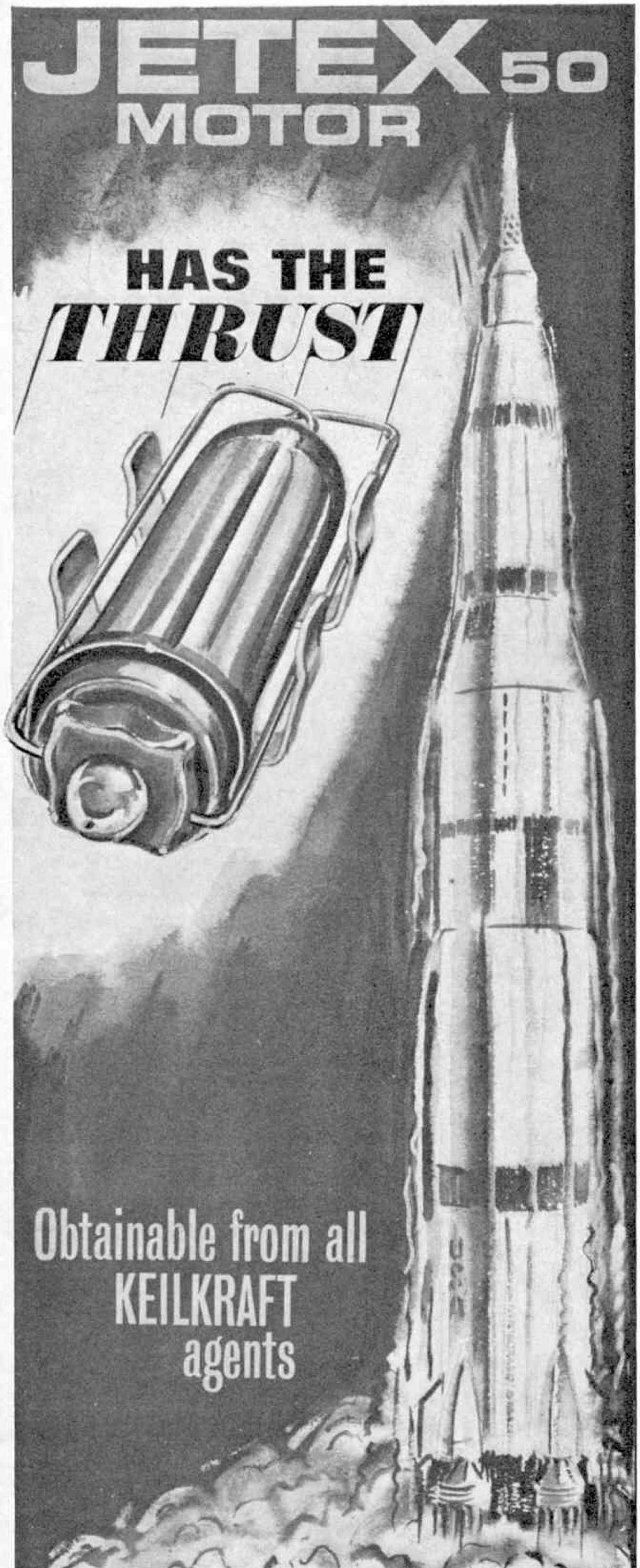

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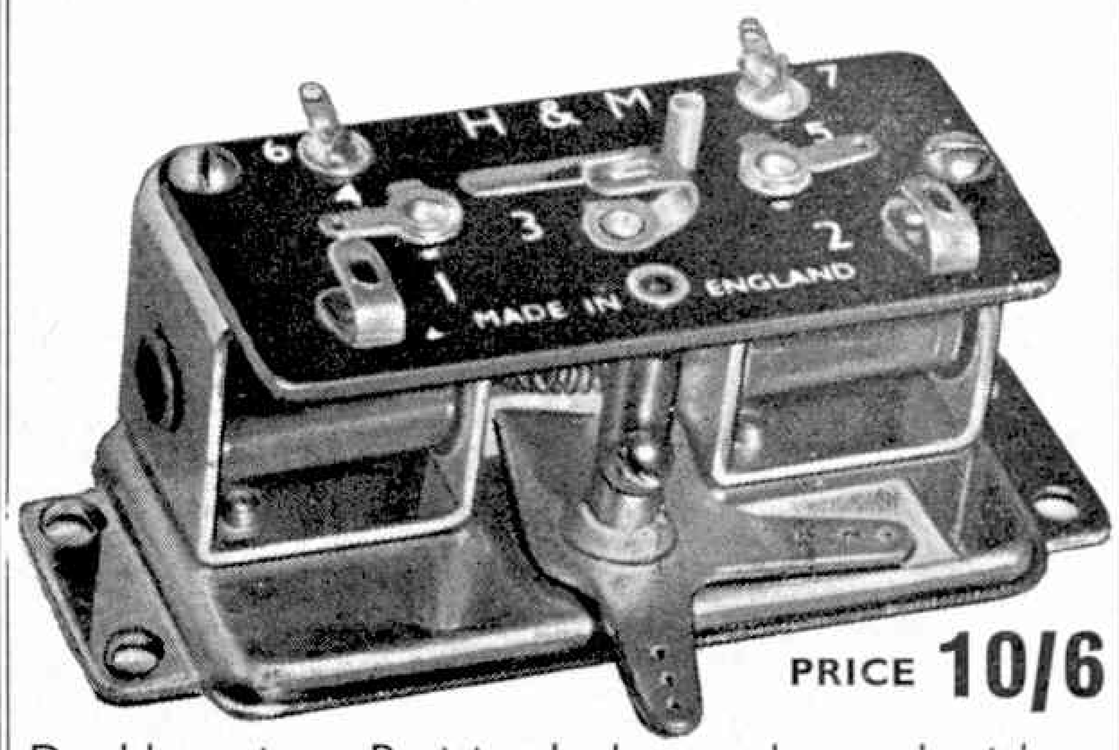

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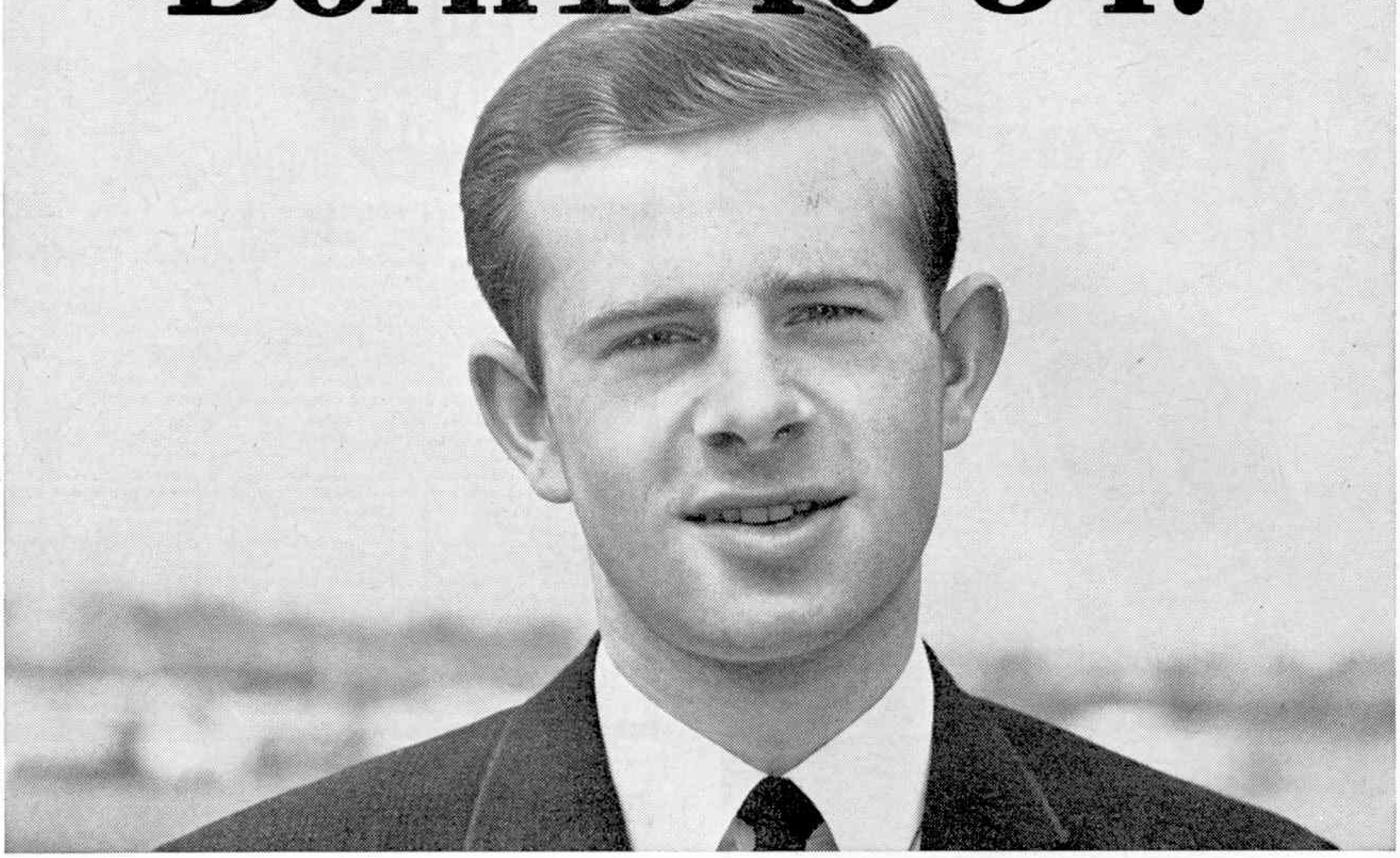

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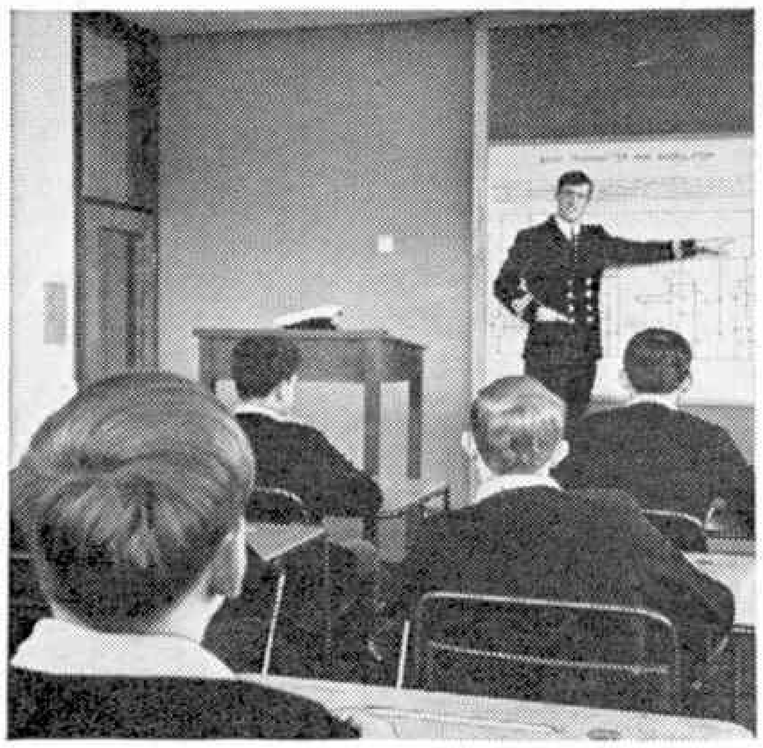

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All that is necessary for you to do to obtain the benefits of this magnificent cover is to complete the forms at the right of this announcement, sending the first part to us together with your remittance of 5/-, which covers you for one year, and handing the second part to your usual magazine supplier. Whenever or not you already have an order in hand for the regular supply of your magazine, this form should still be handed in and your dealer will adjust his requirements according to whether you are a new customer or merely continuing your old arrangement.

This insurance is the prudent thing for every modeller to take out, but it is a sad fact that until now, although the governing bodies of the hobby have offered this cover to their members, something like 90 per cent. of the modellers in the U.K. have never taken up this opportunity and are operating 'without insurance protection'. By joining M.A.P. 'Modellers' Accident Protection' you come into the world's BIGGEST MODEL CLUB. For your initial subscription you obtain a lapel badge for identification and transfers to put on your model.

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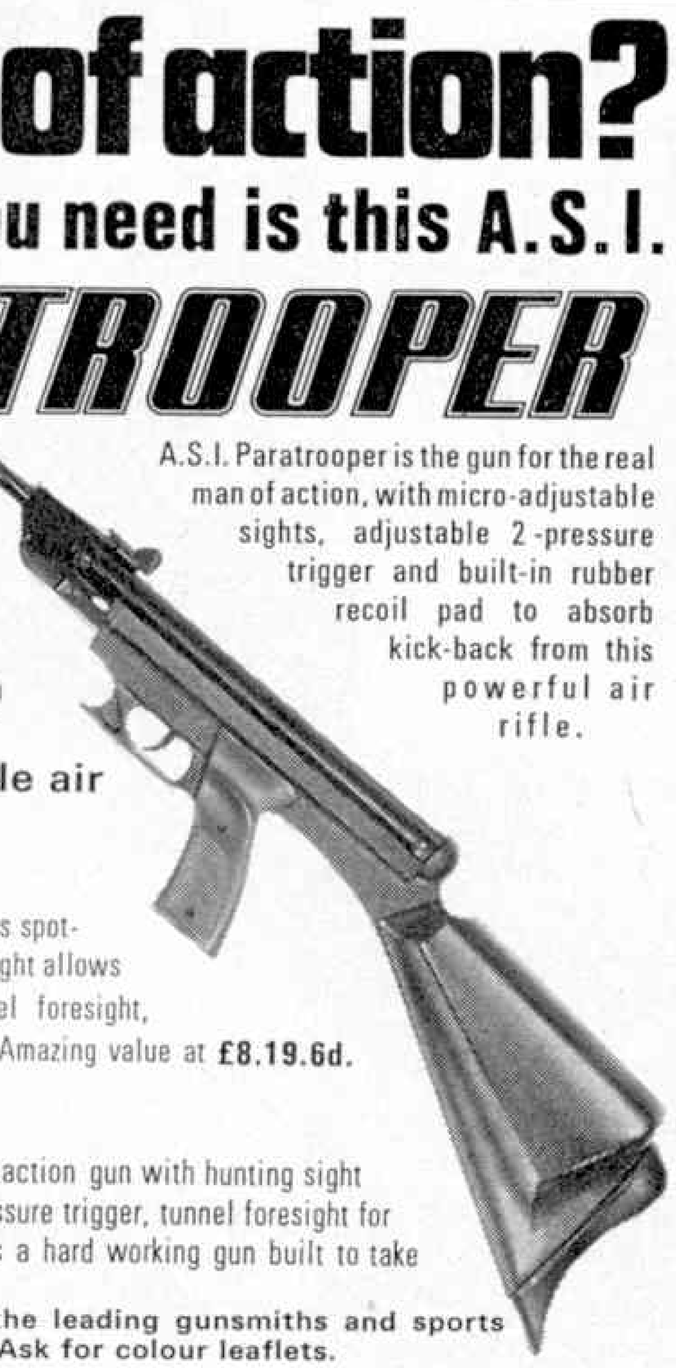

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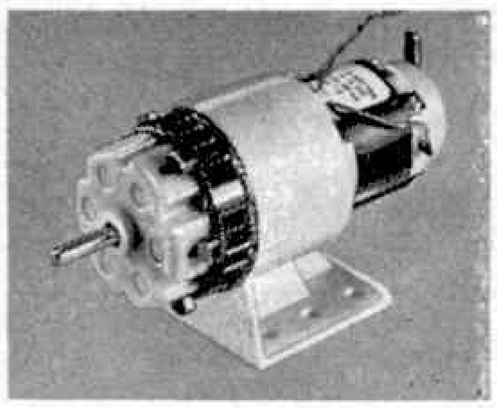
Model Boats/Dec.

on sale 28 November, Price 3s.

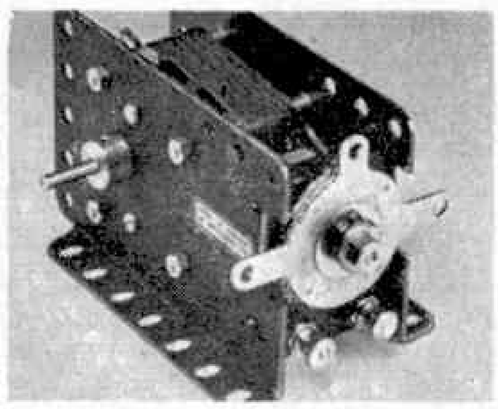
Increased size (additional pages) and a free full-size plan for a 32 in. model corvette are features of December's *Model Boats*. The corvette is electric-powered and suitable for radio control. Other features include the 1969 10-rater Champion *Stroller*, an Admiralty paddle tug, an electronic horn for models, how to build a waterline model of *Queen Elizabeth 2*, and much else besides. A bumper number—make sure of it !

'Add-on' gifts from MECCANO -put them on your Xmas list

Add-on a power unit-get things moving



Power Drive Motor with 6-Ratio Gearbox Copper-graphite brushes have a life of more than 1,000 hours. Works from a 3-12 volts D.C. power supply. **£2.15.11.**



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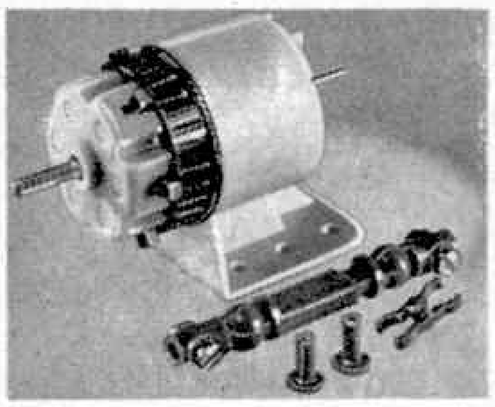
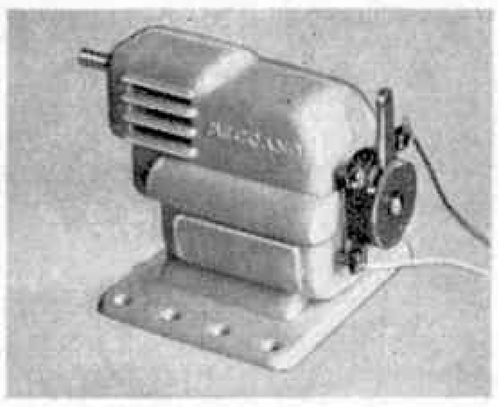


Power Drive 6-Ratio Gearbox with universal coupling Transmission ratios 3:1, 6:1, 12:1, 16:1, 32:1, 60:1. Can be coupled to any motor or other driving source that uses a 5/32" diameter spindle (Standard Meccano Rod size). **£1.16.11.**



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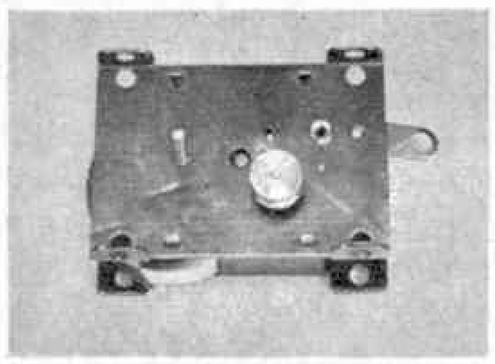

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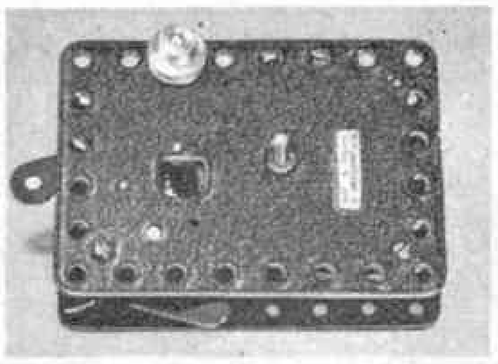

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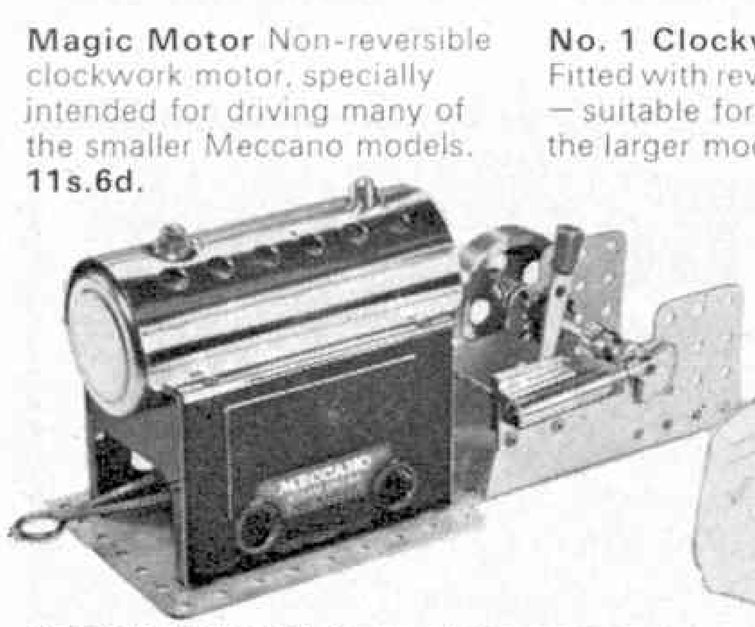

STEAM ENGINE Super-efficient power to drive off gears, chains and pulleys. Works on water heated by methylated spirits burner. Operating reversing lever. **£3.15.0.**

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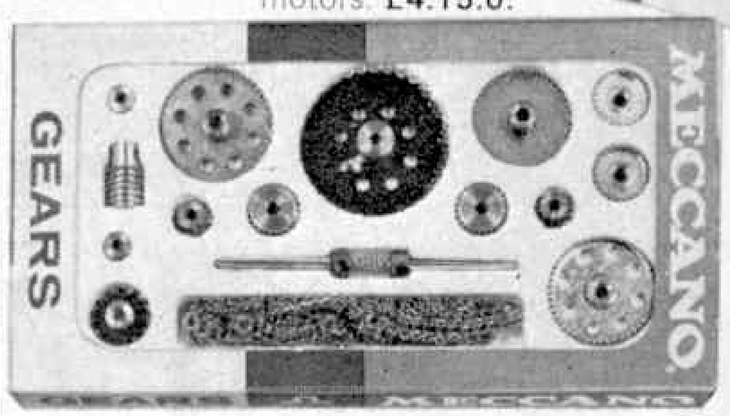

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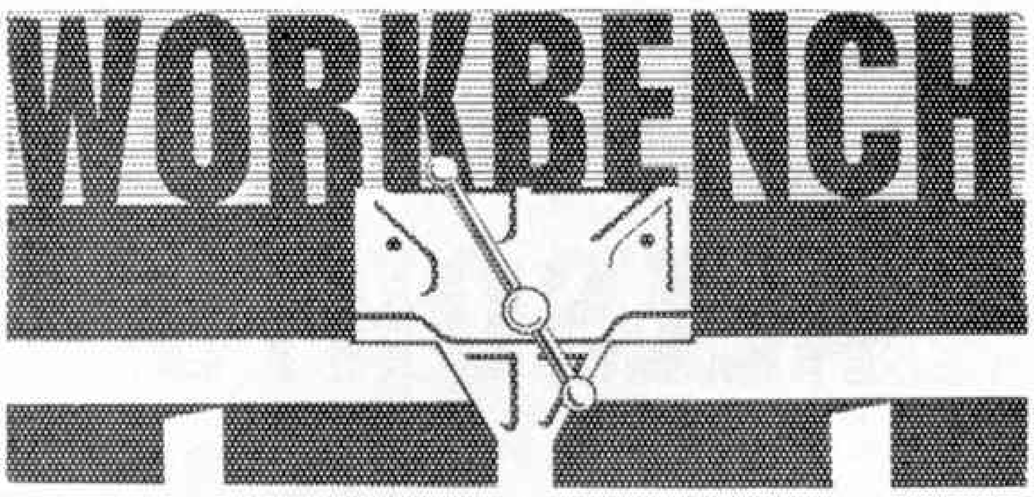


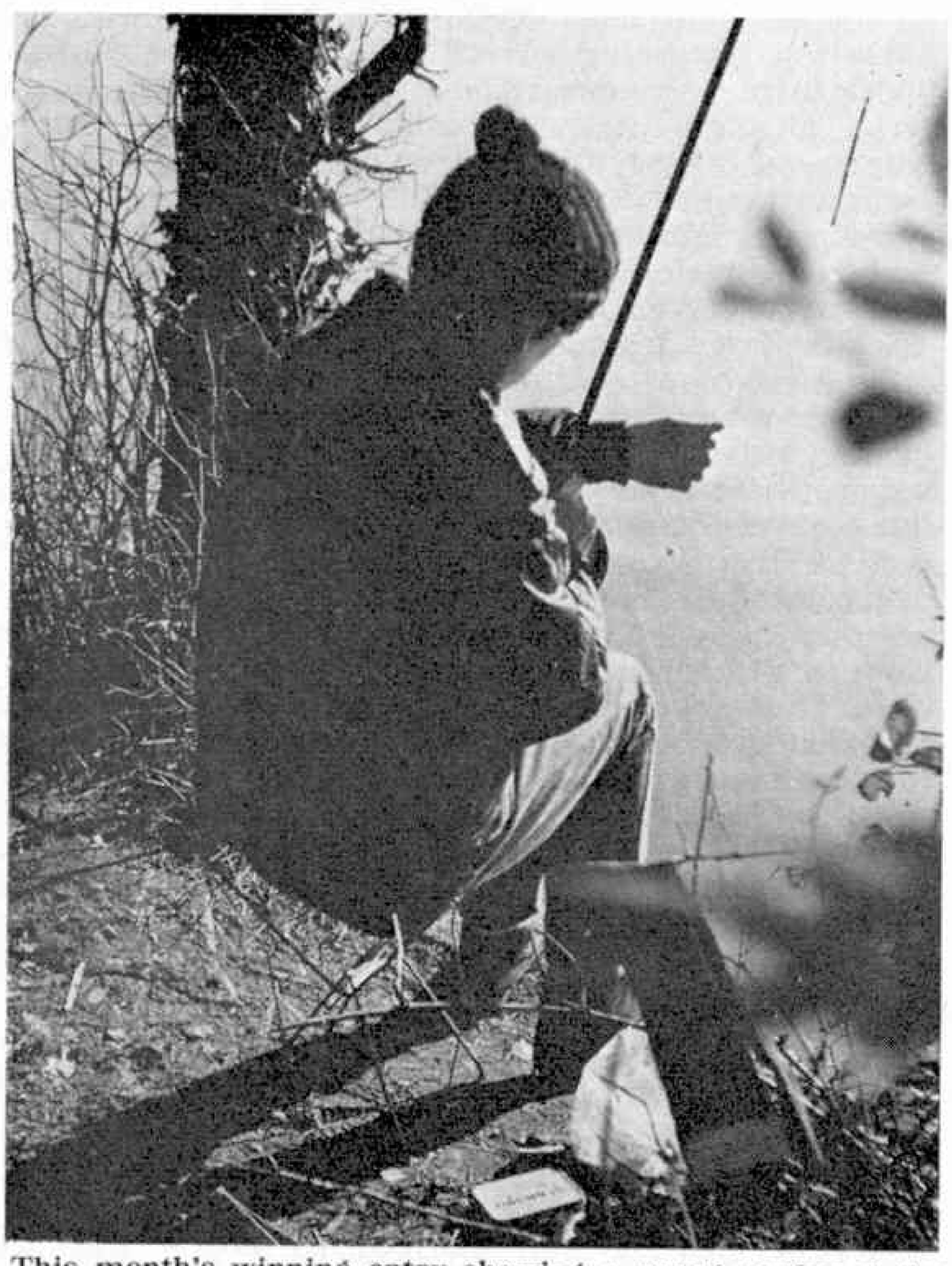
Photography Competition

Readers will no doubt remember that we held over last month's entries, due to the fact that there were none for our "National Trust" section. The worst has happened again this month, and once again we still have no entries for that particular class! We are therefore unable to give away all that lovely money, and will hold it over until next month hoping for the best.

The "Outdoor Activity" section has been well supported, however, and the 1st prizewinner is reproduced on this page, obtaining for the entrant prize money totalling £2.2.0.

We are still anxious to receive entries from readers for both classes, and would remind them that the competition closes on the 29th December.

COMPETITION WINNER
CLASS II



This month's winning entry showing a young angler at the pond side, was taken by M. Howland of Hythe, Kent, and wins him a prize of £2.2.0.

OUR RADIO 4-2 CAR IS COMPLETED!

Illustrated above is one of the many versions of a radio controlled model car it is possible to build as described in the car construction section of our Radio 4-2 series.

This particular model, built by a local enthusiast, started life as a humble Frog Morris 1100 motorised plastic kit. The existing chassis, motor, steering unit and body shell were utilised and Mainstream single channel radio receiver and servo installed. Actual construction took only a few hours, and I think readers will agree that the finished product looks very attractive indeed.

In our February issue of the magazine we will devote a page to provide readers with a selection of detailed close-up shots of the car; just to clarify any points that may cause difficulty!

The free plan included in the centre of this issue, is devoted to the drawings of no less than three simple cars for operation by radio control, and for those of you who intend visiting the Model Engineer Exhibition (details on page 4) the Morris 1100, together with the Radio 4-2 Aircraft 'CRACKER', the balsa built racing car 'CA-CANNY' and the model boat 'CORKER' will be on display on the M.A.P. stand. See you there?

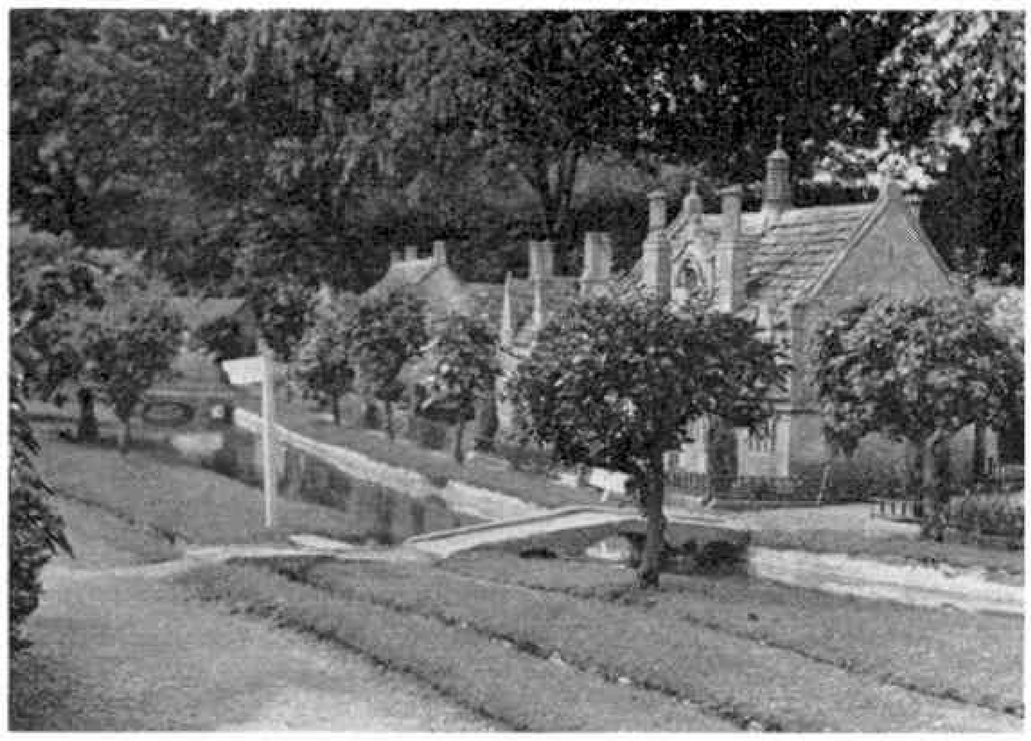
More News on the Coin Club

In the August issue on this page, readers may remember we published details of a newly formed club for Coin Collectors. The minimum age for joining the club was 18 years, but due to a large number of protests from youngsters, this age limit for membership has duly been scrapped, and anyone, previously ineligible, still interested in hearing more of the club's activities, are invited to write to the following address: The International Coin Club, Morley House, 320 Regent Street, London W.1.

Air News

One of the most popular regular features in *Meccano Magazine*, "Air News", will be absent from our pages for this, and possibly the February issue of the magazine. The reason for its non-appearance is due to the illness of contributor John W. R. Taylor.

I know readers will join us in wishing John a rapid and full recovery, and we hope to see his feature in the contents again very soon.



MODEL ALLSORTS

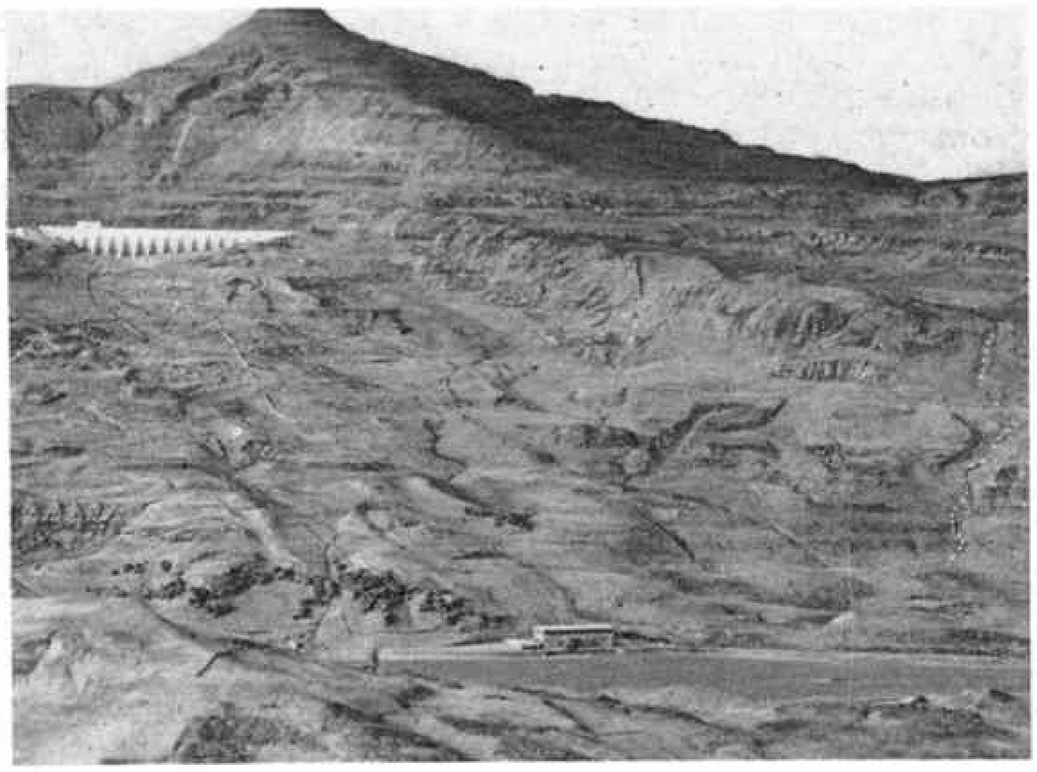
by A. P. Major

MODELS ARE being used for all kinds of purposes every day. If you keep your eyes open you can soon realise how varied these are.

One of the most common uses of a model is by architects to display a planned project, perhaps a new hotel, multi-storey car park, a factory, office block, shopping centre, etc. These help to show what such schemes will look like when built, in addition to the prepared scale plans or maps, the models being a scaled down preview of the real thing, made in hardwood, perspex, or metal. Similarly, local authority and county council town planning departments have models of redevelopment schemes, new houses, roads, schools, sewage disposal farms, parks and playgrounds and so on, which it is proposed to create within their area.

Both architects and large local authorities usually have their models made in one of their own departments by model-makers they employ, one example being the London County Council. Normally these are quite willing to allow anyone interested to inspect them when being constructed, also the finished model is put on display in their offices or somewhere suitable for the public to see it. That is part of the object of having it made in the first place. Smaller local authorities generally employ a professional modelmaker when a complete set of drawings of the scheme are available.

The idea is not new. The ancient Greek, Roman and Egyptian architects used models to show the design of their buildings for approval. In the Middle Ages the builders of the great cathedrals and monasteries knew the value of their previously made models. They were also used in later centuries by the architect who was often also the builder, to explain his design to the customer who was paying to have the building built and also for the architect/builder to instruct his craftsmen and labourers how to work on the building design, a method which still applies today.



Michelangelo created a model of his dome for St. Peter's, Rome. Christopher Wren was told to prepare a giant model of his proposals for St. Paul's Cathedral, a model in which, with the floor removed, it was possible to stand inside and obtain a Gulliver's eye-view of the Lilliputian inside. The model was perfect in every detail but after all his effort the Church of England rejected Wren's original scheme. This made him so angry he afterwards refused to make complete architectural models and instead relied on scale plans and small models of building sections. Fortunately Wren's original model design for St. Paul's still exists.

During the Second World War models were very widely used. Accurate reconstructions were made from aerial photographs using optical instruments, stereoscope, etc. Firstly these were used to brief bomber crews of their objective, carefully incorporating known anti-aircraft gun positions and other dangers. Later such models were used for commando raids and as these assisted the success of such operations scale models were made for large areas of North Africa, Italy and Europe for the same purpose prior to invasion. These models were reproduced in large numbers from one original model, cast in PVC or foam rubber, very light in weight, flexible, easy to carry and remained indestructible but were costly to produce.

Since the War new techniques have been evolved. Topographical models of land areas, photogammetry, are now made by using the Steromat, with electronic scanner and computing devices for drawing contoured maps from photographs, taking only two hours for a task that previously took twenty hours. New ideas for three dimensional models for building construction plans have been devised by the Building Research Centre, Watford.

In addition to architects and local authorities, commercial organisations, such as planning, management and engineering consultants, make models to present their ideas in visual form to customers. A well-known planning engineering and management consultant firm, W. S. Atkins & Partners, Epsom, Surrey, has one of the largest model-making departments in Britain for this purpose. Several years ago the company realised that a model could be of considerable value in presenting its ideas to clients, as well as of use within its own varied departments and in 1962 it set up its own model-making department. One of their first jobs were various models for the Scottish Pulp & Paper Mills,

Fort William, Scotland, one of which was praised by the Royal Fine Arts Commission for the way it presented the scheme. Atkins' models have been used for a planned shops, offices and housing complex in Addis Ababa, Ethiopia, a new refuse disposal incinerator at Basingstoke, Hampshire, and a new civic centre at Bourne Hall, Ewell, Surrey, amongst other projects.

The nationalised industries, gas, water, electricity, steel, coal, etc., also prepare models of their new schemes for public viewing. An example is the Central Electricity Generating Board's model of the 13½ million pound Ffestiniog Power Station on display in the reception office. Briefly, the scheme operates by using the same water over and over again stored high in the mountains until needed, then it drops a thousand feet through underground pipes into a lower reservoir turning four water turbines and generating 360,000 kilowatts of electricity from a standing start, enough for a large city, in less than a minute. Later the 60 million cubic feet of water is pumped back into the upper reservoir by four of the largest centrifugal pumps in Europe. All this can be seen in the detailed model and then the visitor can go on a tour of the real thing.

Models are also widely used for advertising and publicity. In the offices of airlines, shipping lines, travel agents, also on exhibition stands, models of the types of passenger ships, aircraft, railway trains, hydrofoils, and hovercraft used can be seen displayed. B.O.A.C. and B.E.A. both use solid models of their latest aircraft types and cutaway models showing their interior, lighting, seating, etc., perfect in every detail. These models are made by several commercial firms in Britain, who also produce them for foreign airlines, too.

One such firm is Space Models Ltd., of Isleworth, Middlesex, who recently made 3,000 models of the Anglo-French Concorde before the aircraft flew on its maiden flight! Their models are made in Araldite epoxy resin reinforced with glassfibre.

The making of the model began with the aircraft's original plans being scaled down to 1/10, 1/30, 1/48 or 1/72 of their original size. Either lime, a hardwood, or jelutong, a softwood, was used to carve an exact replica of the real aircraft, using the scale plans and photographs to check it for accuracy. From this wood model a mould was made in resin and glassfibre which is immensely strong and can be used hundreds of times to cast models in the same material. Small models of aircraft are generally cast complete, but larger aircraft models are moulded in three or more sections and bonded together with adhesive. The final processes are painting, lettering and polishing. After the main body has been sprayed and is dry the model goes to an artist for the letters, emblems, portholes, landing lights, windows and control surfaces to be painted on.

Cutaway models of aircraft interiors are also produced to show the inside furnishings, such as seats, curtains, carpets, in exact colours and detail. Araldite resin glassfibre is used for the part of the aircraft, while the cutaway section is made of perspex.

Space Models also produce models for television

programmes, such as Century 21's puppet series "Fireball XL5" and "Thunderbirds", including Lady Penelope's pink Rolls Royce actually about the size of a child's pedal car. It also made some of the doll's-house size furniture and a spiral staircase used in cottage scenes in the "Joe 90" puppet series. Most of these models are aproximately one-third life size or even smaller.

Another way in which models are part of advertising is that used by the Crusader Insurance Company. From April to September every year they display "Crusaderville", a model town in a kiosk at Chessington Zoo. Built to the scale of 4 mm. to the foot it shows a section of a small county town, complete with road vehicles, pedestrians, etc. and "incidents" or "accidents" which frequently occur, such as a man stepping off the pavement in front of a motor cyclist who has crashed into a shop window, and which involves insurance. A smaller, portable model town scene with ten "incidents" is also exhibited in shop windows of estate agents and insurance brokers by the same insurance company.

There are numerous miniature model villages and model areas to be found throughout Britain. One of the most famous is that at the Old New Inn, Bourton-on-the-Water, Gloucestershire. It was started in October, 1936, by the landlord of the inn and finished in 1939 with the help of local craftsmen. The model village, made in locally quarried stone, about half an acre in size, is an exact copy of the real village, down to the names of the village shops and accurate chimes of the church clock.

Slightly different is "Pentre Bach" (Little Village), a Welsh model village at Rhyl, North Wales, opened in 1964. Most of the models, made by the staff of the firm which owns it at a scale of ¾ inch to the foot, are copies of existing buildings in North Wales. Wherever possible Welsh materials have been used in its construction, one example being that all the roofing of the village buildings is genuine Welsh slate. An unusual feature is the slate quarry working model, typical of the slate quarries at Nantlle and Blaenau Ffestiniog, complete with cable cars, trucks and splitting sheds.

Our heading photograph shows a realistic section of the Model Village at Bourton-on-the-Water. Left: A model of the Pumped Storage Scheme in North Wales. Photos by George Haines. Above: A Cutaway model of a Boeing 707, showing interior layout. Photo courtesy Space Models Ltd. Right: A model of a suggested complex comprising shops, offices and flats. Photo courtesy W. S. Atkins & Partners.

Mike Rickett outlines the 2nd proposed

MOON LANDING

ON NOVEMBER 14 or 16, a week or so before this issue of Meccano Magazine is due to appear on the bookstalls, America's Apollo 12 mission should have taken off to make only the second manned landing on the Moon. Should conditions not have been favourable, the alternative launching dates for the mission are December 14 or 16—two weeks after this issue of the magazine has been published. Whichever date the Apollo mission directors decide on however—and we have not heard as we go to press—we include information received from Mission Control and the National Aeronautics and Space Administration in Washington D.C., which we unfortunately received too late to include in the December issue.

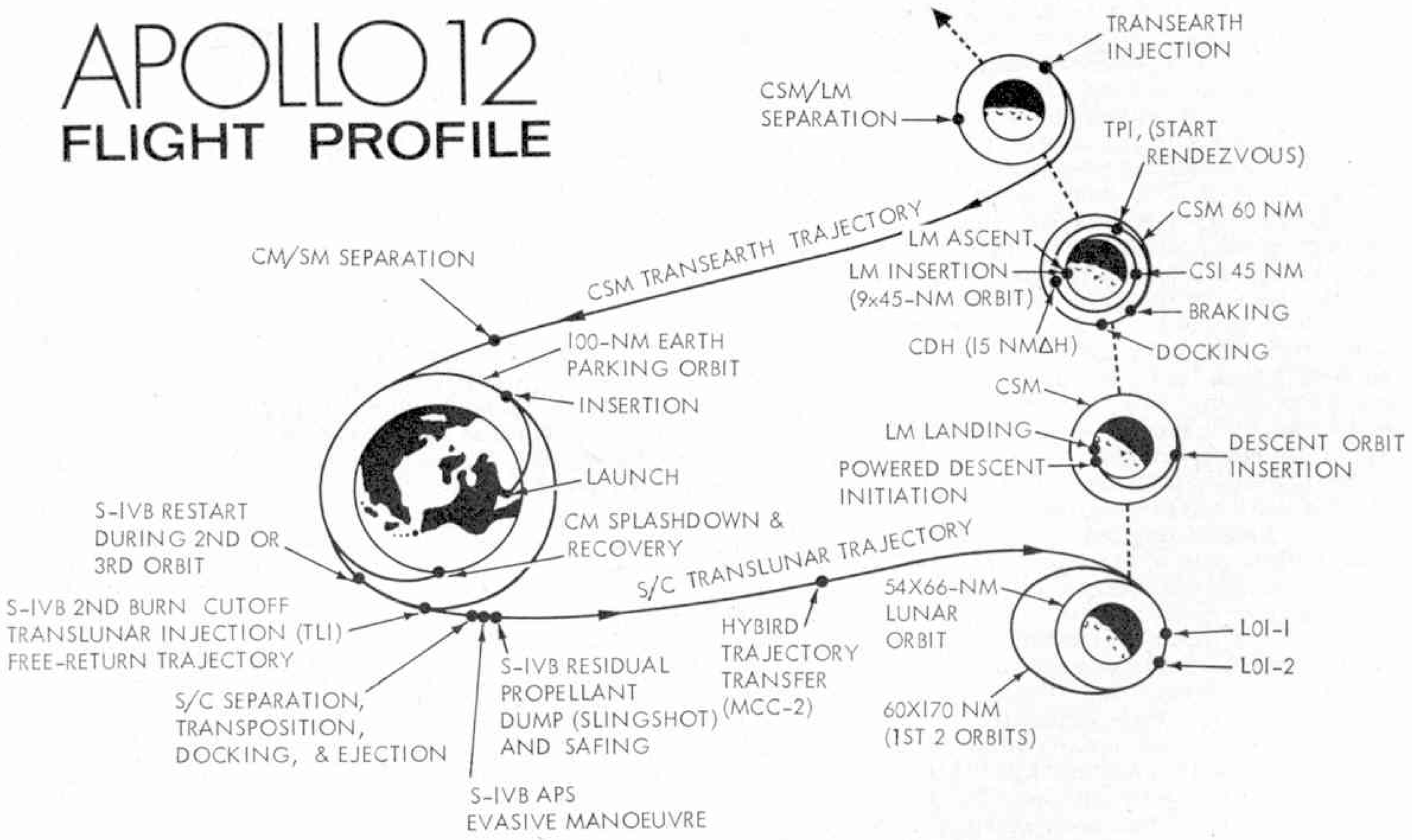
From launch on either of the four dates, the sequence of events would be ignition of the first stage, centre-engine cut-off, outboard engine cut-off, stage 2 ignition, the aft interstage jettison, the launch escape tower jettison, the stage 2 engine cut-off, and the final stage —1VB—ignition, inserting the spacecraft into an orbit 102 or 103 nautical miles up. The total rocket " burn " would be no more than 11½ minutes and there are two opportunities of pushing the craft into a Moon (trans lunar) orbit as it travels round the Earth the second and third time. After the stage 1VB rocket motors have fired to give the spacecraft the " push " it needs to head to the Moon, these are jettisoned, the docking and transposition manoeuvres carried out, and with a course correction at approximately 30 hours the craft is safely on its way.

Once in orbit round the Moon at a distance of 50 to 60 nautical miles, the Lunar Module separates from the Command Module and makes a descent to a point where the engines " burn " for about twelve minutes in a powered descent. The Lunar Module pilot—Al Bean—and Commander Conrad should land in the scheduled vicinity of Oceanus Procellarum (site 5) located in the western portion of the Moon's front side, 2 degrees and 24 minutes South of the Moon's Equator, and 23 degrees, 18 minutes West of the North-South line, and leaving Commander Gordon—Command Module Pilot—orbiting the Moon. Other sites have been chosen should this prove unsuitable, and one of the objectives of the mission is to take photographs of future exploration sites, and this forms an important part of the mission. Called " Bootstrap Photography," this is done while the lunar module is at low altitude, during its descent.

Landing close to where America's Surveyor 3 soft-landed in April 1967, part of the mission is to observe what the lunar environment has done to a known object that has rested on the Moon's surface for a known time. The astronauts may also be able to inspect and photograph the area around Surveyor to compare it with the 6,315 pictures and other data sent back to Earth by the unmanned landing vehicles, as well as attempt to return parts of the Surveyor to Earth for inspection by scientists under laboratory conditions.

Apollo 12 should land on a site located within

APOLLO 12 FLIGHT PROFILE



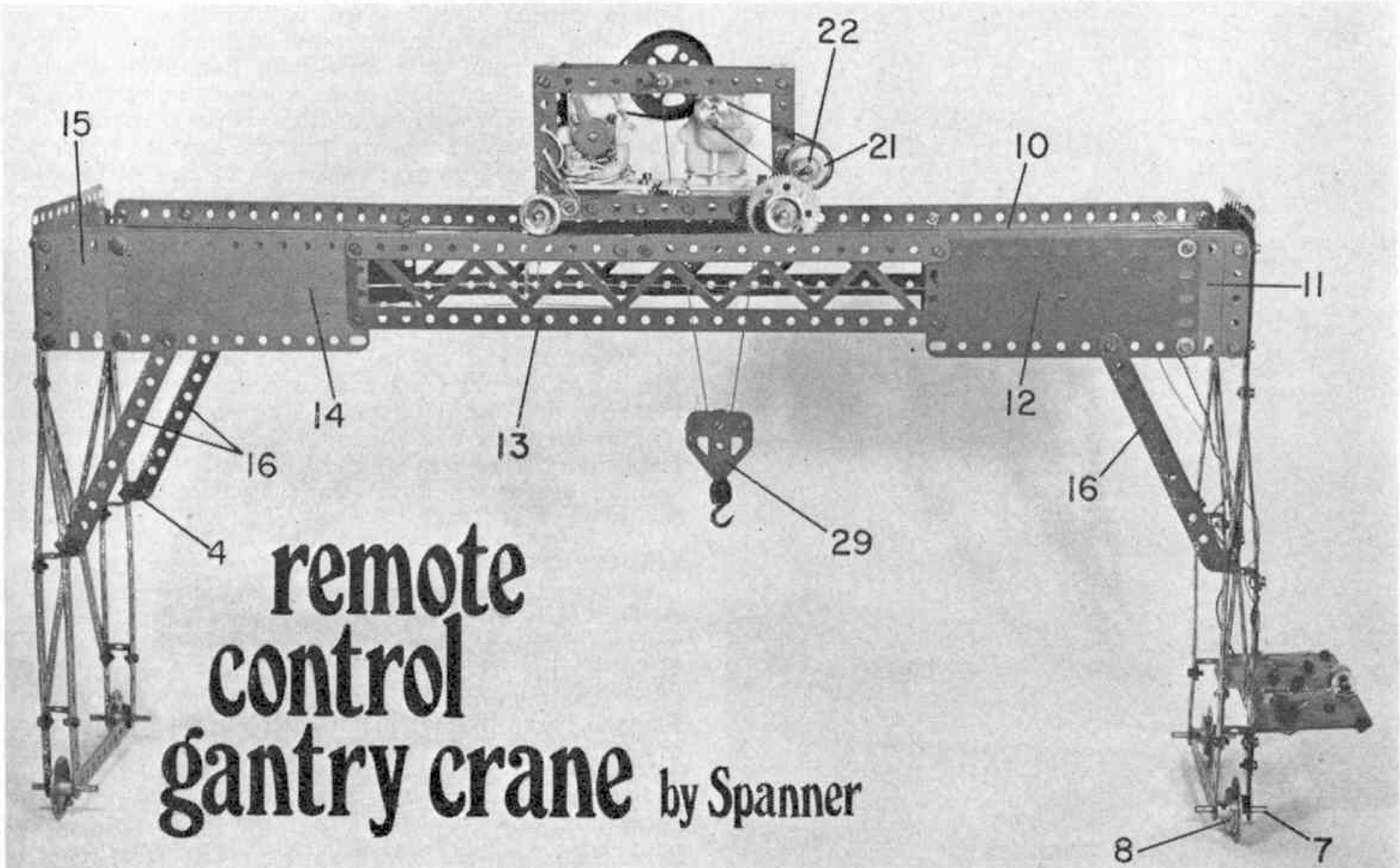
relatively old (Imbrian) mare material, where there are many large subdued craters measuring from 200 to 600 yards in diameter. The number of intermediate size craters—50 to 200 yards in diameter—is fewer than on younger mare material in other sites. This crater distribution is common on many apparently old surfaces, including the Imbrian blanket, which will be investigated on a later Apollo mission.

Like Apollo 11, Commander Conrad will emerge from the Lunar module feet first and this should have happened, at 0600 a.m. Eastern Standard time on the morning of November 19. On Apollo 12 and on all future missions, astronauts will place experiment packages in position, to establish a network of lunar science stations to measure the internal structure of the Moon, and to monitor the solar wind and radiation environment.

This mission is the first occasion that a nuclear electric power system has been used on the Moon. The device, called SNAP-27, is one of a series of atomic batteries developed by the Atomic Energy Commission. Nuclear heaters were used in the seismometer package on Apollo 11 but SNAP-27 on Apollo 12 will mark the first use of a nuclear electrical power system on the Moon. It is designed to provide all the electricity for continuous one-year operation of the NASA Apollo lunar Surface Experiments Package—an array of scientific instruments and supporting sub-systems to be used by the Apollo 12 astronauts on the lunar surface.

The Moon is believed to be relatively undisturbed, geologically speaking, since its formation several billion years ago. Surface samples, together with other data, could yield a wealth of knowledge on the origin of the Earth. For the more scientific minded, the packages left on the Moon will include a seismometer, magetometer, solar wind spectrometer, lunar ionesphere detector, and lunar atmosphere detector.

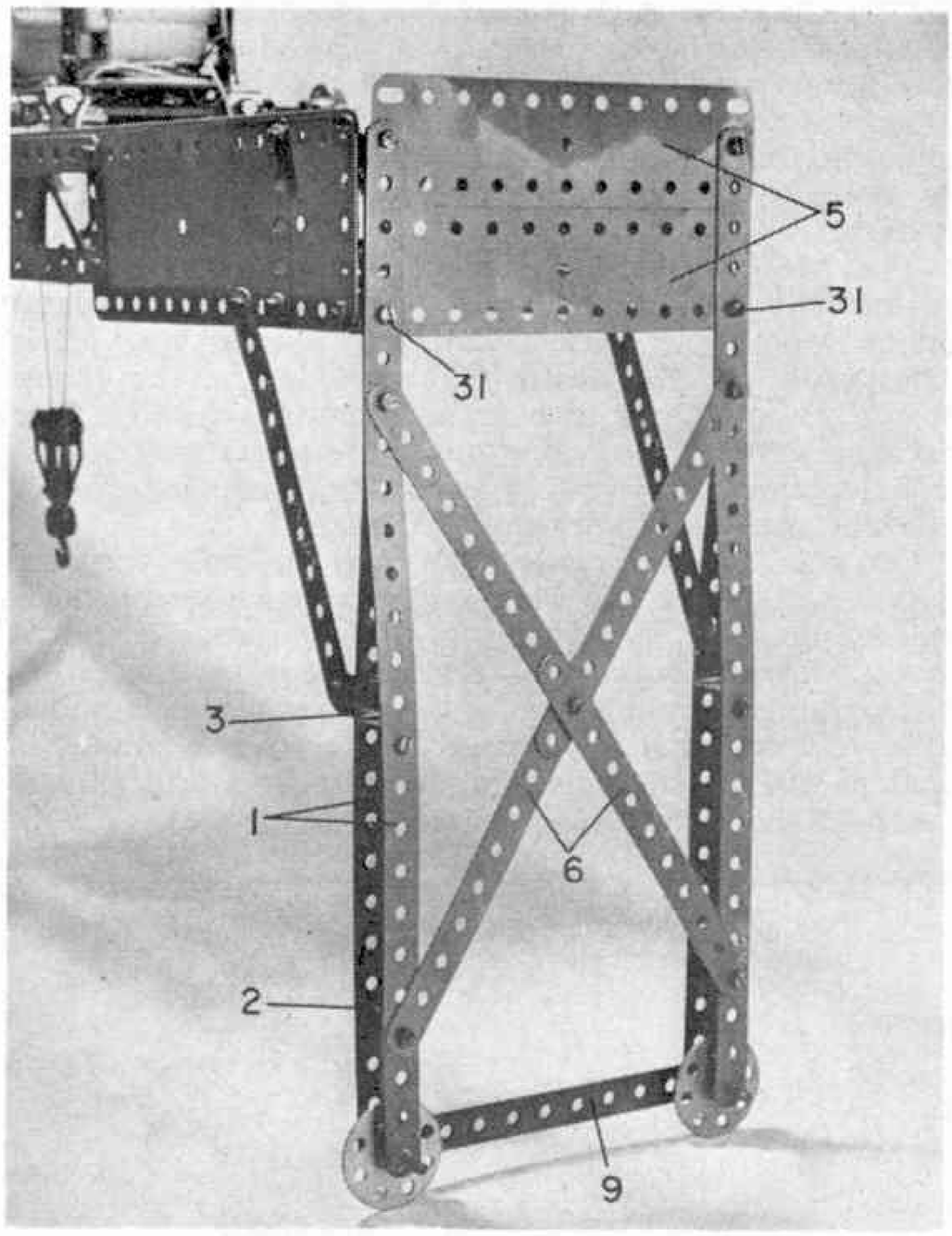
On this mission, astronauts will be able to walk within a radius of half a mile, as against about 25 yards on Apollo 11. It may involve going into a crater to investigate the Surveyor craft. Some very interesting photographs should result, and we hear that it is hoped to have a colour T.V. transmission from the Moon, as well as the normal black and white and still photos taken by the astronauts themselves.



remote control gantry crane by Spanner

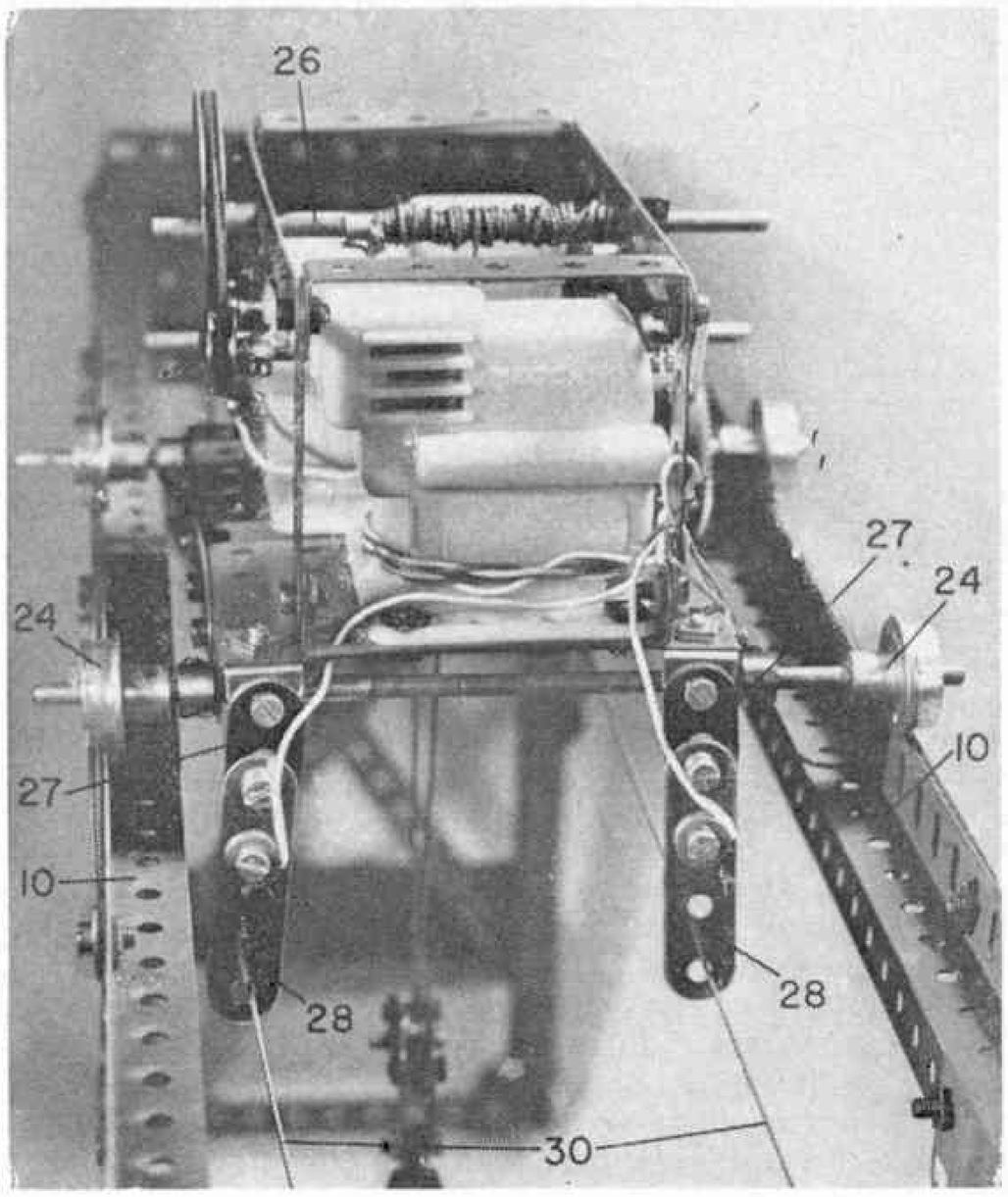
WITH ONLY a slight deviation from my usual route to the office I can pass along the edge of Birkenhead's extensive dock complex and this I like to do whenever I have the time. The sights and sounds of dockland can be fascinating to anybody unconnected with the docks, but, to the Meccano modeller, a dock complex is of particular interest because of the vast amount of machinery found everywhere within it. Much of this machinery is ideal for reproduction in Meccano, although, to be able to find and study individual machines at close quarters you really need to be able to wander round actually among the docks at leisure. I whip along the outskirts in a car, but even then I manage to see enough to whet my appetite. Admittedly, all I can see under such circumstances are cranes, but cranes of all shapes and sizes, types and uses in great profusion, jutting up into the sky and looking for all the world like an army of weird spindly-legged monsters.

Cranes, of course, are one of the mainstays of the Meccano system. They have been built by just about every modeller at some time in his career and we ourselves frequently feature them in Meccano Magazine. In fact, I would say that virtually every type of crane



Above: A close-up view of the basic gantry leg showing the use of bracing strips to improve stability.

Below: An end view of the gantry trolley showing the Strips used as contacts for picking up the current for the two Junior Power Drive Units.



that has ever been made has been presented in model form in these pages—probably several times—but it strikes me that we have not had a fair-sized gantry crane for quite a time. This is a situation which we now remedy with the Remote-controlled Gantry, described here, which is produced from a mixture of standard and electrical parts and is powered by two Power Drive Units, remotely-controlled from a control panel built on to one of the two gantry legs.

Each of these legs consists of two main supports, each built up from two 12½ in. Strips 1 connected together by a Double Bracket 2 and a ½ in. Reversed Angle Bracket 3, the Bolt securing the latter to the inside Strip also fixing an Angle Bracket 4 in place. At the top, the Strips are bolted together, at the same time sandwiching two 5½ × 1½ in. Flexible Plates 5 between them and also fixing an Angle Bracket to the top of each inside Strip. These Angle Brackets are joined by a 5½ in. Strip, then cross bracing for the legs is supplied by two 9½ in. compound strips 6, supplied by 5½ in. Strips overlapped three holes.

Journalled in the lower end holes of each pair of Strips 1 in the main supports of one leg is a 1½ in. Rod 7 carrying a 1 in. Pulley with boss 8 and a 6-hole Wheel Disc, the Rod being held in place by the Pulley and a Spring Clip. Two further 1½ in. Rods are journalled in the main supports of the other leg, each of these carrying only an 8-hole Bush Wheel which holds it in place. The main supports in each leg are themselves connected by a 5½ in. Strip 9 mounted on the Rods as shown. At the top, the legs are connected by the overhead gantry, consisting of two 25 in. compound angle girders 10 bolted between Strips 6, each compound girder being made up of two 12½ in. Angle Girders butt-jointed by a 5½ in. Strip. Bolted to the vertical flange of each compound girder are a 2½ × 2½ in. Plastic Plate 11 overlaid by a 2½ in. Strip, a 5½ × 2½ in. Flexible Plate 12, a 12½ in. Braced Girder 13 overlaid by a 12½ in. Strip, a second 5½ × 2½ in. Flexible Plate 14 and a second 2½ × 2½ in. Plastic Plate 15, this also overlaid by a 2½ in. Strip, as before. The lower corners of Plates 11 and 15 are attached to respective Strips 1 by Angle Brackets, while Plates 12 and 14 are attached to Angle Brackets 4 by 5½ in. Strips 16.

Gantry trolley

Coming to the gantry trolley, a chassis is supplied by two 3½ × 2½ in. Flanged Plates 17 joined together, with a distance of one hole separating them, by two 3½ in. Strips 18, bolted between the flanges. Two 2½ × ½ in. Double Angle Strips are fixed one to each Flanged Plate, four 2½ in. Strips 19 in turn being fixed to the lugs of these Double Angle Strips. At the top, the two Strips at each side are joined by a 5½ in. Strip 20, the securing Bolts also fixing two further 2½ × ½ in. Double Angle Strips between the sides. Bolted to front Strips 19 are two Fishplates, the free holes of which serve as bearings for a 5 in. Rod held in place by a 1 in. Pulley 21 and a Spring Clip. Mounted on the end of the Rod is a ½ in. Pinion 22 which meshes with a 57-teeth Gear Wheel on a 6½ in. Rod 23 held by Collars in the end holes in the flanges of appropriate Flanged Plate 17. Held by Collars in the opposite end holes of the other Flanged Plate 17, is a 6½ in. compound rod, built up from one 2 in. and one 4½ in. Rod joined by a Rod Connector, then ¾ in. Flanged Wheels 24 are secured on both Rods, being spaced to run on the flange edges of compound girders 10.

Bolted to the tops of Flanged Plates 17 in the positions shown are two Junior Power Drive Units, both with ½ in. Pulleys fixed on their output shafts. In the case

of one Unit, the Pulley is connected by a 6 in. Driving Band to Pulley 21, while, in the other case, the pulley is connected by a similar Driving Band to a 2 in. Pulley 25 on a 4½ in. Rod 26 held by a Spring Clip in Strips 20. Attached by Angle Brackets to Flanged Plate 17 at one end of the trolley are two Insulating Fishplates 27, each extended by a 2 in. Strip 28, these Strips later serving as the current collectors for the motors.

The load hook is built up from a Meccano Loaded Hook carried on a ⅜ in. Bolt between the apexes of two Flat Trunnion 29 joined together at the base corners by further ⅜ in. Bolts, but spaced apart by a Spring Clip on the shank of each Bolt. A ½ in. Pulley without boss is mounted loose on a ½ in. Bolt in the centre base holes of the Flat Trunnions, than a length of Cord is tied to the trolley chassis, is passed around this Pulley and finally secured to a Cord Anchoring Spring on Rod 26.

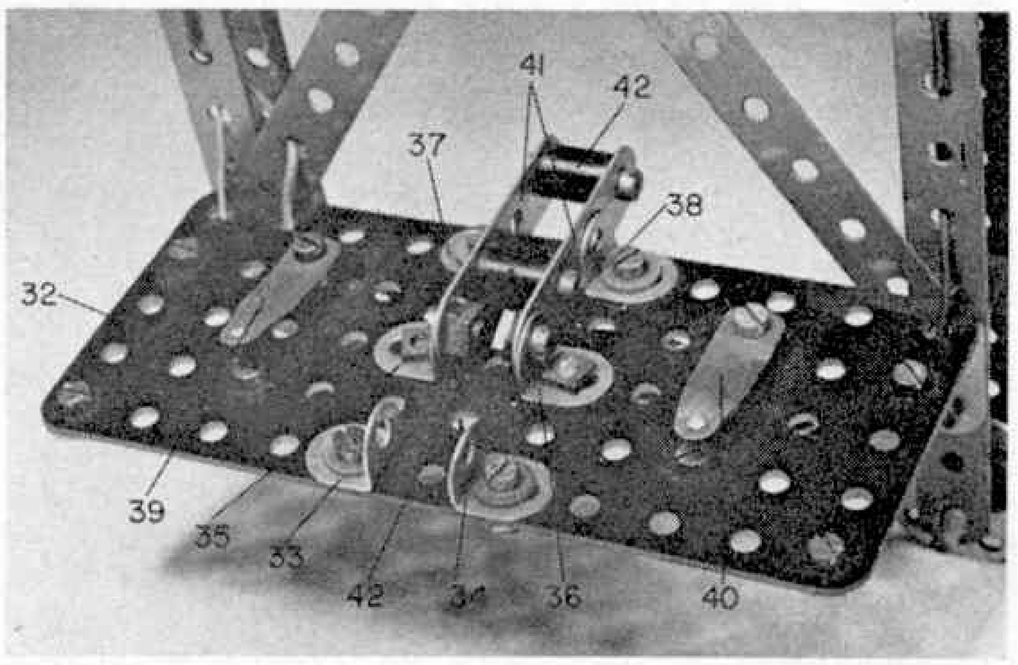
We come now to the electrical side of the model, dealing first with the two conductor lines for the motors. These are supplied by two lengths of non-insulated wire 30 passed through the lower end holes of Strips 28 and fixed taut between two 5½ in. Insulating Strips attached to inside Strips 1 by Angle Brackets held by Bolts 31. Note that one end of each wire is secured directly to its Insulating Strip, while the other end is attached to the remaining Strip by means of a 2½ in. Driving Band. This system ensures that the wires remain taut.

In the case of the remote-control panel, this consists of a 5½ × 2½ in. Insulating Flat Plate 32, edged by two 2½ in. Strips, attached to one of the gantry legs by 1 × 1 in. Angle Brackets. Six ordinary Angle Brackets 33, 34, 35, 36, 37 and 38 are bolted to this Plate, as shown, as also are two 1 in. Wiper Arms 39 and 40, the latter spaced from the Plate by Spring Clips on the shanks of the securing ½ in. Bolts. When pressed down, the tips of the Wiper Arms should each make contact with a terminal supplied by a Bolt, head upwards, fixed to the insulating Plate. Lock-nutted to the two centre Angle Brackets 35 and 36, on the other hand, are two 2 in. Strips 41 connected together by two Insulating Spacers 42. These Strips should engage between the vertical lugs of one or the other pairs of Angle Brackets as the arrangement will later act as a reversing switch.

Wiring

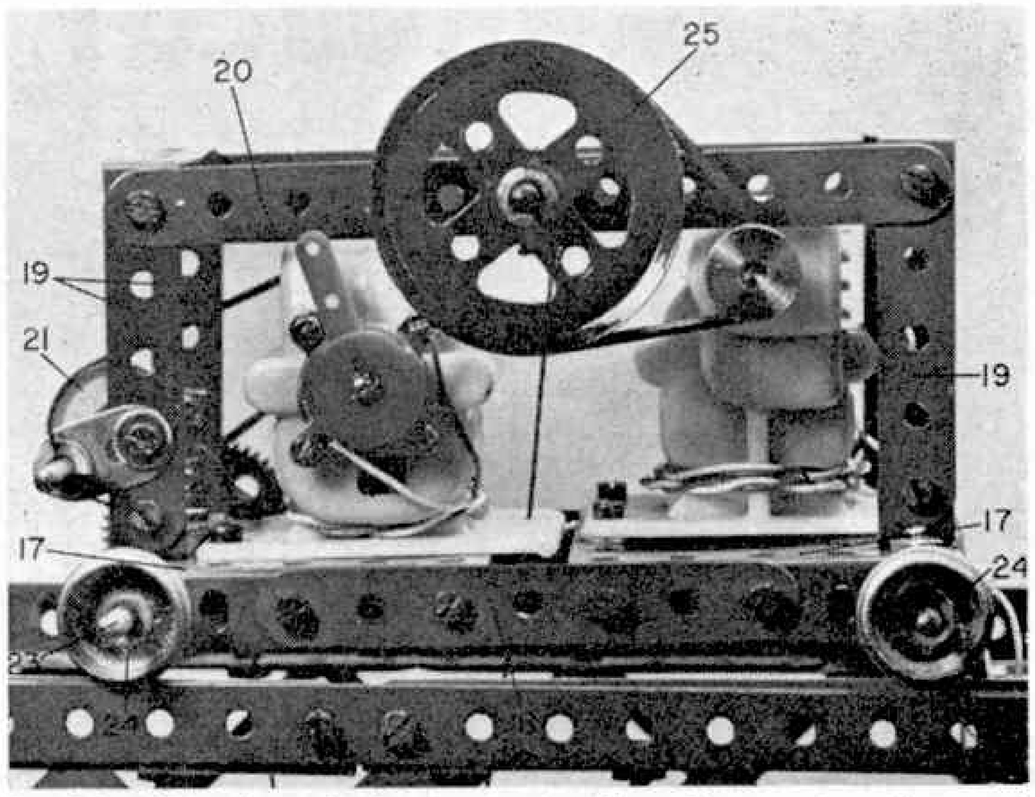
This leaves us with only the wiring to complete, using insulated wire in all cases. With the respective securing Bolts acting as terminals, Angle Bracket 33 in the control panel is connected to Angle Bracket 38, while Angle Bracket 34 is connected to Angle Bracket 37, then Angle Bracket 35 is connected to both Wiper Arms 39 and 40. The terminal Bolt for Wiper Arm 39 is connected to one length of wire 30 in the gantry, the terminal Bolt for Wiper Arm 40 being connected to the other. Angle Bracket 36 is earthed by connecting it to a metal part of the gantry.

In the gantry trolley, one lead from each Junior Power Drive Unit is connected to one or other Strip 28, whereas the other lead is earthed by connecting it to a metal part of the trolley. Where all wires are earthed, of course, care should be taken to ensure that a good electrical contact is made at the earthing point and that the connection is not insulated by any enamel with which the appropriate parts may be painted. It is also important to remember that, as the model itself is used to pass current, the wheels of the gantry trolley must make an electrical contact with the compound angle girders of the gantry on which they run. For this reason, the present plated Angle Girders should be



The simple control panel in close-up. Remember that a power source of only 4½ volts D.C. must be used with the model.

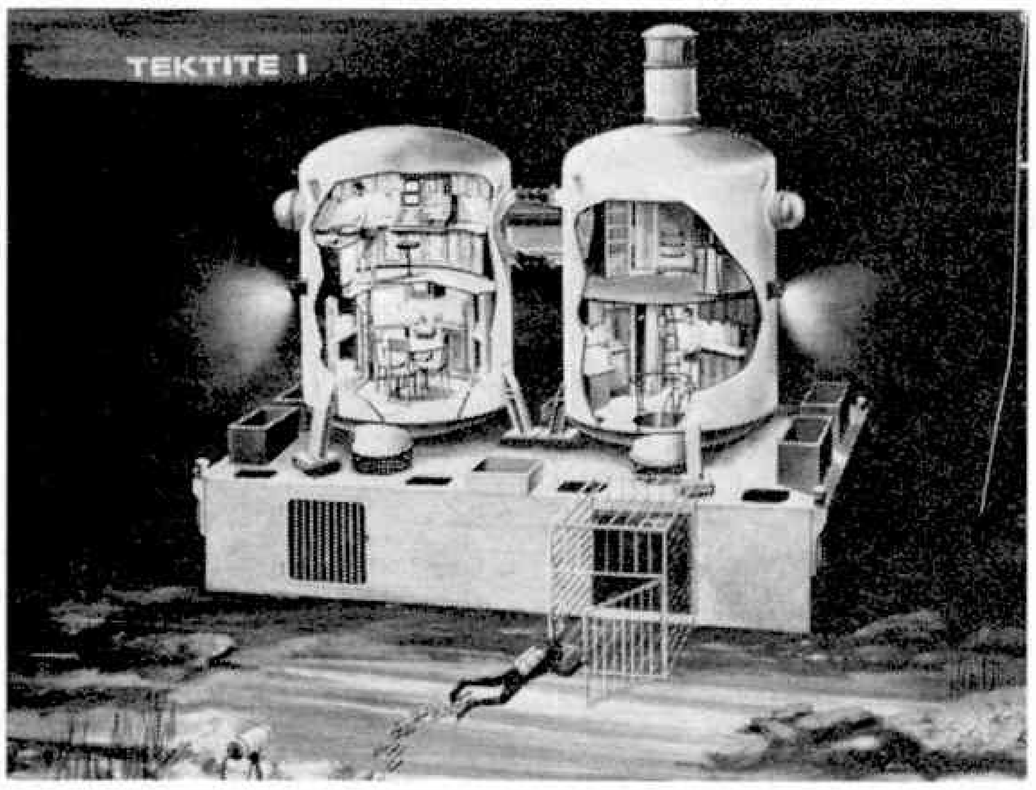
used for the compound girders, or, if the older enamelled Girders are used, the enamel must be removed from the flange edges on which the wheels run. The axles carrying the wheels must also make electrical contact with their supporting Flanged Plates and, of course, Strips 28 must connect properly with Spring Cords 30. With everything operating satisfactorily, the motor switches should be left in one drive position, then the forward and reverse movement of both the gantry trolley and load hook can be successfully controlled from the remote-control panel on the gantry leg. The leads from the power source, by the way, are connected, one to Angle Bracket 33 and the other to Angle Bracket 34.



In this side view of the gantry trolley, the construction and layout of the trolley itself is clearly shown. Note the packing Washers beneath one side of the right-hand Junior Power Drive Unit.

PARTS REQUIRED

10—1	1—16	6—35	2—126a
20—2	1—17	120—37a	2—186
2—3	4—18a	105—37b	4—189
4—6	1—20a	16—38	4—190
4—8	4—20b	4—48a	4—192
2—10	3—22	2—53	1—213
4—11	1—23	1—57c	2—501
22—12	2—23a	4—59	1—510
2—12a	2—24	2—99	2—531
1—14	2—24c	2—111a	2—513
1—15	1—26	8—111c	2—564
1—15a	1—27a	4—125	2—Junior Power Drive Units
			2—lengths non-insulated wire.



TEKTITE 1 UNDERSEA RESEARCH PROJECT

by Charles A. Rigby

BESIDES SPACE exploration, oceanology is also a subject of considerable interest today. Tektite I, a U.S. project, and the name given to the underwater laboratory, began on February 15th, 1969, with four men living for 60 days, on the ocean floor, at a depth of 50 ft. off the island of St. John, in Great Lameshur Bay. St. John, one of the small Virgin Islands lying off Puerto Rico, was chosen for its favourable climate, clear waters and abundant tropical plant and animal life. On the mainland, not far away, was the monitor and control station, and some distance to the north was the base camp, ecological station and the docks.

The project was sponsored by several important U.S. Services, and a large company which was responsible for designing and building the underwater laboratory and other equipment. While the main mission was devoted to marine science, the psychological and biomedical aspects, however, were equally important since the present-day urge is to learn as much as possible about man's capabilities and performance under the sea. The four marine scientists were specialists in fisheries, biology, biological oceanography and marine geology. As they carried out various scientific missions daily, they were continuously observed by specialist medical teams.

The Tektite underwater laboratory consisted of two interconnected vertical cylinders 18 ft. high and 12.5 ft. in diameter, mounted on a base structure. The left side housed the crew quarters in the lower deck, and the 'bridge' or control room was above. The right-hand cylinder was connected to the left by means of a $4\frac{1}{2}$ ft. diameter transfer tunnel running from the bridge to the upper half of the right-hand cylinder, the engine room. The lower half of the right-hand side housed the wet room, which was continually left open to the sea for easy access when entering and leaving. The right-side of this undersea home also supported a 5 ft. high, 2 ft. diameter cupola, an 'observation tower' with 360 deg. visibility.

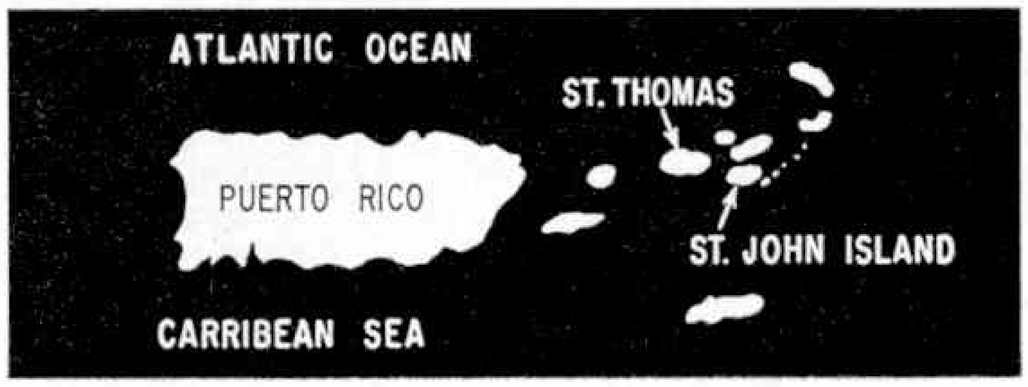
In the crew quarters were a small galley, bunks, a storage for personal gear, and other equipment. An emergency exit hatch and SCUBA equipment were located in the crew quarters. The bridge on the left, above the crew quarters served as (1) The Control Centre and (2) as a laboratory. The engine room contained important equipment for the system, including primary transformers, switch gear, and a large fridge. The wet room housed the SCUBA equipment for use during experiments outside, and an outlet for recharging the SCUBA bottles. In addition, there was a laboratory and a hot shower.

Chief function of the base was to provide a mounting for the cylinders, with adjustable legs, making it possible to compensate for small slopes and irregularities in the sea bed. It also contained 175,000 lb. of ballast required to bring the total emplaced system's weight to net negative buoyancy of 20,000 lb. In addition, it served as a shark cage for the diver's protection. Both the normal and emergency hatches opened into the base with simple cage doors opening out to the sea.

The oxygen partial pressure of Tektite was maintained at the normal sea level value of 158 mm. of mercury with nitrogen as a diluent. For environmental gas supply there were four supply systems, the normal supply being provided by an air compressor. Prior to emplacement, the sea home was sealed and charged with nitrogen to raise the pressure to 36.9 p.s.i. needed in the bottom. During occupation, normal compressed air was introduced at the rate needed to maintain the oxygen partial pressure at the desired level. If at any time contamination occurred in the cabin atmosphere, provision was made for charging and recharging in four hours.

Also, in case of emergency, there were two sets of stand-by bottles each containing a 72-hour supply, one of these being mounted in the Surface Support Facility, and the other in the base. A high pressure compressor was in use for the SCUBA charging system. Additional safety measures included an emergency built-in breathing system, plus walk around bottles in each compartment. The air treatment system was in the engine room, the carbon dioxide being removed by a special process. Humidity and temperature control was achieved by condensing out the excess moisture, and then reheating the air. In addition, the air was passed through charcoal filters to remove odours; the air breathed in being a mixture of 92 per cent nitrogen and 8 per cent oxygen.

Another important part of the system, the Surface Support Facility was mounted on a barge moored near



the shore, on which was a van containing the duty stations for the test director, medical duty officers, and the special observers. The electrical generating equipment, air compressor, purge bottles, and stand-by breathing gas, as well as water supply, were also on the barge. All these were connected to the habitat by umbilicals. This facility also provided a deck decompression chamber, and a personnel transfer capsule for transfer of the crew at the end of the mission, or in case of emergency.

On shore, the communication centre of Tektite, the 'bridge', was connected to the Surface Support Facility by phone, intercomm. and voice sonar, each compartment being equipped with an intercomm. station connecting it with the other compartments as well as the support barge, besides an open microphone and closed circuit TV monitor for observation purposes, also audible and visual alarms. The voice sonar permitted direct communication with crew members while out of the undersea home. In addition, a safety patrol with qualified divers in a small boat stood by at all times. Besides, the Tektite habitat, there were 'five way stations' in the vicinity to serve as places of refuge against sharks, etc.

The main objectives of the mission were to conduct extensive science research on the ocean floor, and to study biomedical responses; and also to observe group and individual behaviour of a 4-man team engaged on a project of fairly long duration, and in relatively hazardous environment. A study was also made on the uses of sonar for fishing and for providing reliable range and bearing, also for diver tracking and navigation.

During the first phase of their undersea stay, the aquanauts made several sorties outside to familiarise themselves with their surroundings, and to perform some of the scientific tasks, including tagging lobsters, taking a census of fish population around their sea home, and geological exploration in the surrounding reefs. The biggest excursion made to a point several hundred yards away lasted almost three hours. During these sorties, a team of safety divers followed their 'bubbles', ready to assist them in case of emergency. When in their habitat, they were constantly observed by closed circuit TV, the only contact with personnel above being at first limited to voice communication.

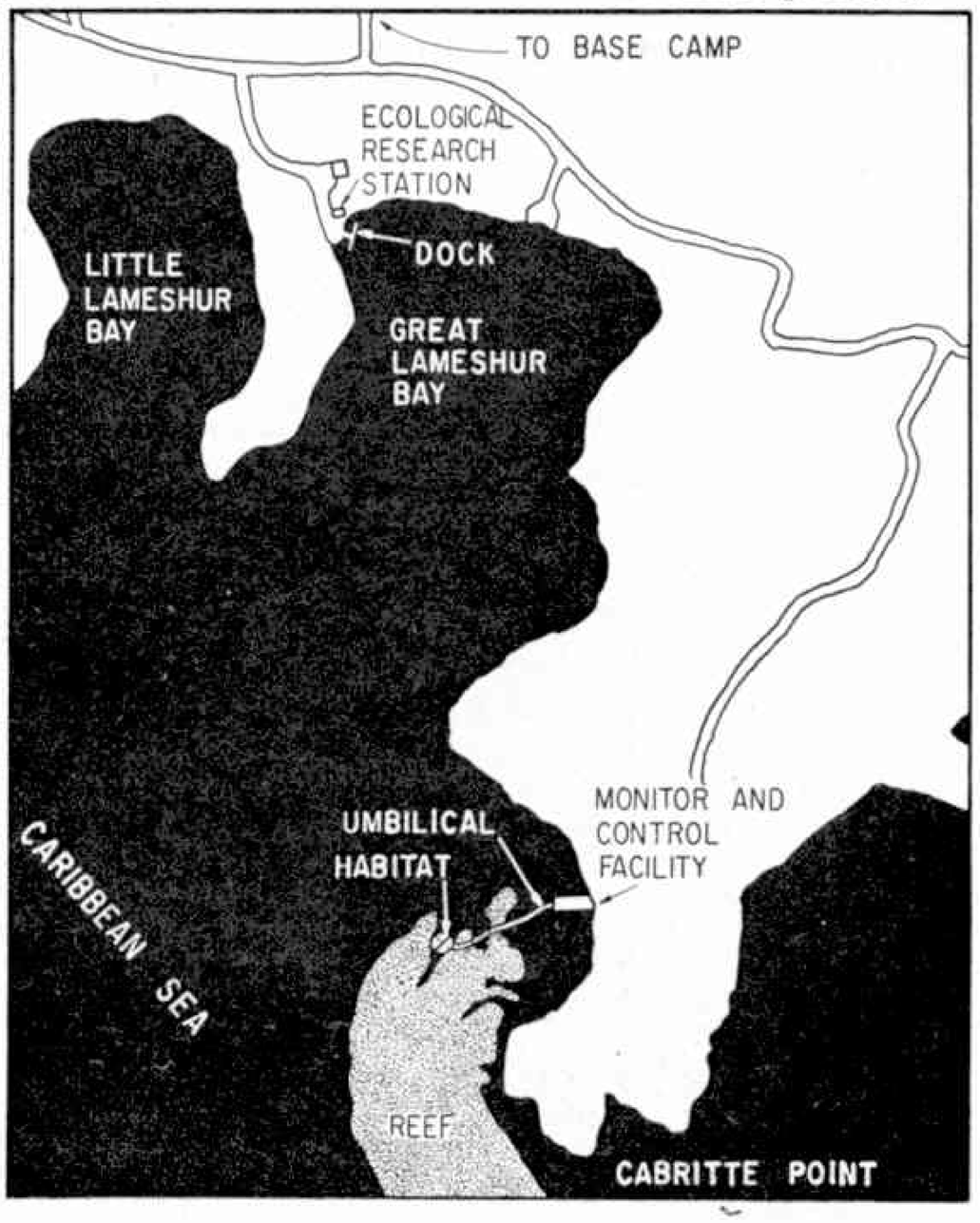
A team of scientists at their post above them monitored every move and sound in the habitat below. At night, electrodes attached to their heads recorded the duration and soundness of their sleep. On the thirteenth day of their stay, one of the worst thunderstorms since 1960 lashed at the Virgin Islands and dumped more than four inches of rain on the operational site, in the National Park on St. John Island. Accompanied by strong winds, the storm temporarily immobilised ground and sea transportation in the area. The only knowledge they had of the raging storm were lightning flashes which they could see through the water. In what may be described as an 'underwater first', they watched in fascination the light streaks from their windows which were hemispherical plexiglass portholes resembling bubbles.

Next day, a green Moray Eel invaded the shark cage, effectively barring the way in and out of their sea home. Unable to venture out without risking an attack from the five-foot intruder, aquanaut John Van Derwalker, and Conrad Mahnken, attempted to drive

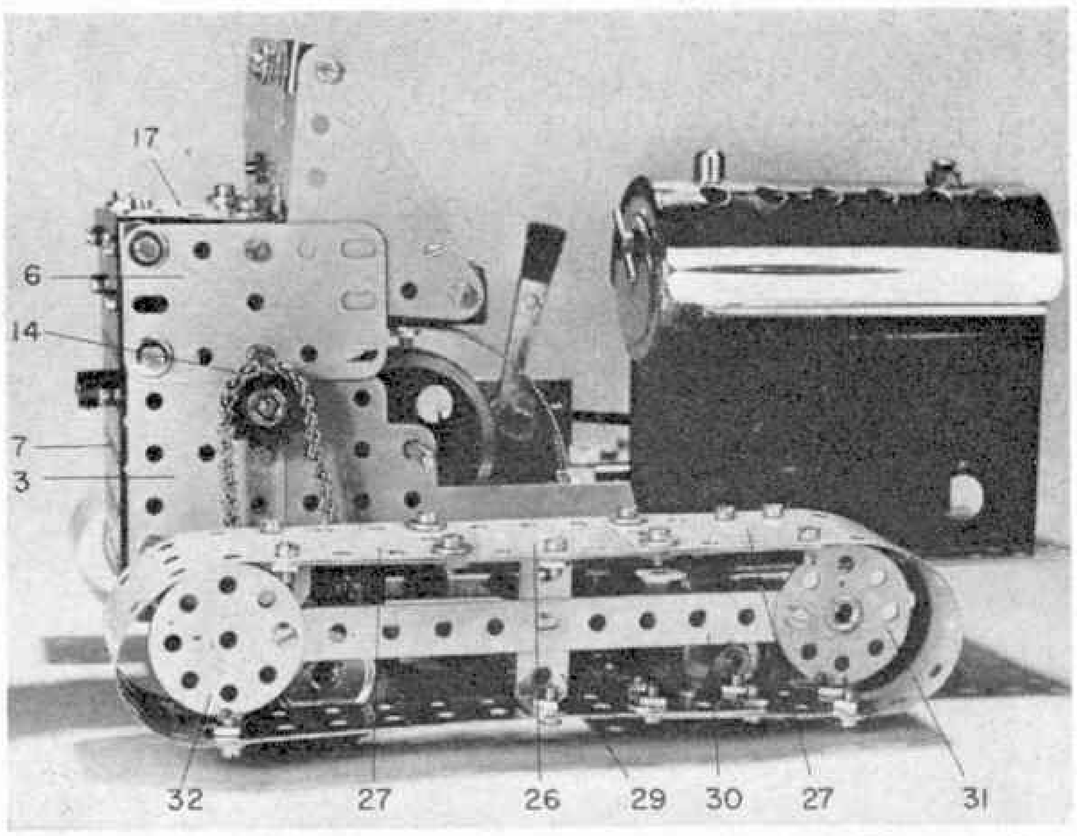
out the eel with a long handled lobster net, when the eel tore through the net with its sharp teeth, Mahnken was forced to kill it with a hand spear.

Later on, they spent four hours a day working on the ocean floor. Most work was done during the day, but often they made night-time excursions. Ed Clifton began collecting sand samples, coral and other sea-bottom sedimentation in his effort to make a detailed geological map of the sea floor. The other aquanauts busied themselves with observing the behaviour of fish, taking the census of species of organisms in the area, and particularly prying into the lives of 'spiny' lobsters. Knowledge of this kind is of value in assuring an adequate commercial supply of the sea food, 'lobster's tail'.

In this way, all three objectives of the 60-day mission, namely the scientific, biomedical, and psychological sides of the work were made possible.



Our heading photograph is an artist's impression of Tektite 1 showing the various compartments. Left: Map of the Virgin Islands showing St. John Island. Above: An interior view of the crew's quarters. Right: A map showing the geographical position of Tektite 1.



The Meccano Steam Engine, if treated with respect, is one of the most exciting power sources for a Meccano model, but it is not one which is often featured in the M.M.

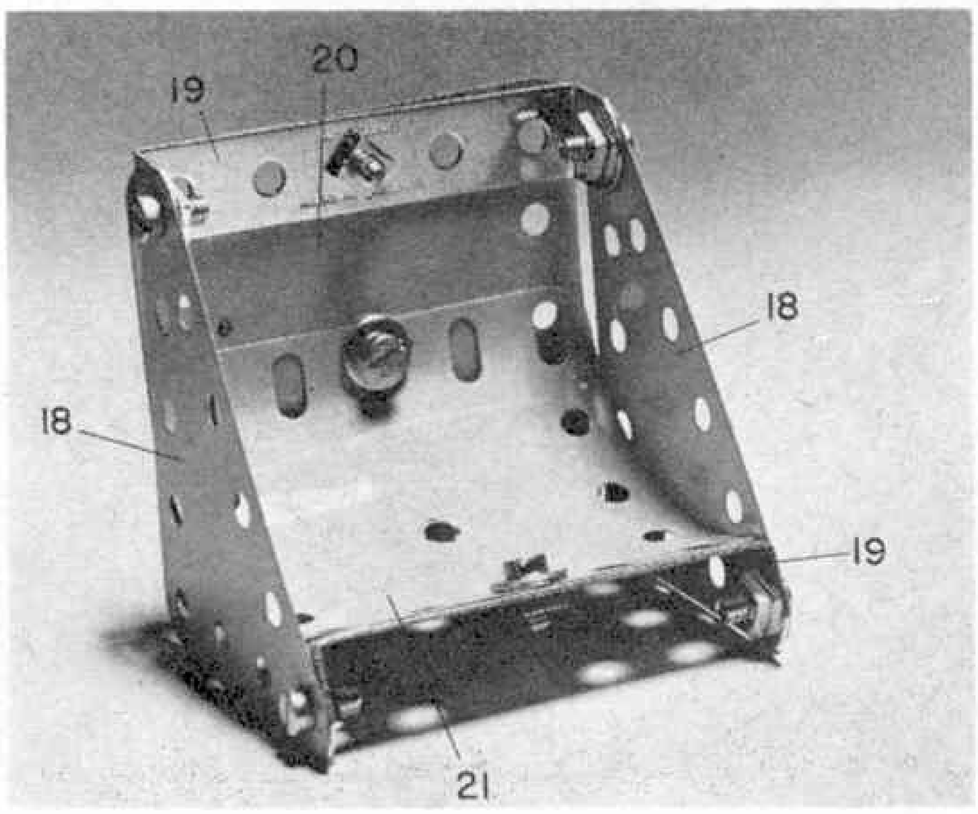
LIVE STEAM TRACTOR

Spanner describes an intriguing model built by R. SMITH

IN THE December issue, Alf Hindmarsh, mourning the passing of steam power in his "Meccano Steam Era" article rightly claimed that Meccano modellers are indeed fortunate—we can enjoy all the fascination of live steam by building models powered by the Meccano Steam Engine. One of the many Steam Engine owners who agrees whole-heartedly with Alf on this subject is Robert Smith of Twickenham, Middlesex, the designer of the splendid steam-powered Tractor described in full here. He has devoted a considerable amount of building time to the Steam Engine and described it, succinctly, as "an excellent source of power."

Excellent, it undoubtedly is, and not only for the power it gives. It also adds tremendous character and atmosphere to any model in which it is fitted—far more, in my opinion, than is supplied by an electric or clockwork power unit. It seems to bring a model almost to life! To see Mr. Smith's Tractor, for example, slowly chugging along with steam hissing from the cylinder exhaust ports and the piston working away like a battering ram is a sight to behold. It just wouldn't be the same if the model moved cleanly and quietly along with no hissings splutterings and following steam clouds!

The driver's seat is easy to build and designed to be wedged in place on the model—not bolted.



The tractor is by no means a complex model. In fact, it was designed as a simple construction intended to be little more than a realistic "carrier" for the Steam Engine rather than a complicated, feature-packed scale reproduction. Nonetheless, it captures the true "feel" of the subject—and this despite running on four ordinary wheels—thanks to a pair of non-operable, but authentic-looking imitation "tracks".

One of the advantages of the Meccano Steam Engine, besides its obvious attraction as a live steam unit, is its large, strong baseplate which enables it to serve virtually as the chassis of its parent model as well as its power unit. In fact, in the Tractor, it supplies not only the chassis, but a fair amount of the body, also!

Before construction proper is begun the piston connecting rod of the engine is *carefully* slipped off its spigot on the driveshaft cam to allow the flywheel, Sprocket Wheel and Pinion to be removed from the driveshaft and replaced by a Collar and a Worm 1. The flywheel is then returned—inside the Engine sideplates—and the piston rod connected, the Collar and flywheel holding the driveshaft in place.

Once these drive modifications have been attended to, the baseplate of the Engine is extended rearwards by a $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flanged Plate 2, secured to the floor of the baseplate, and by two $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plates 3, secured one to each side of the baseplate. The forward Bolt fixing each of these Flexible Plates in place also holds a $1\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip 4 and a Flat Trunnion 5 in position, as shown, then the sides are completed by two further $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plates 6, bolted one to the top of each Plate 3.

At the rear, a $3\frac{1}{2} \times 2\frac{1}{2}$ in. Flanged Plate 7 is bolted to Flanged Plate 2 being spaced from it by one Washer on the shank of each securing Bolt, the Plate also being attached by Angle Brackets to the upper rear corners of Flexible Plates 6. Secured to the inside of Plate 7, in the position shown, is a Double Bent Strip 8, in which a $3\frac{1}{2}$ in. Rod is held by a Collar. The forward end of this Rod is journalled in a $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip 9, bolted to the Engine baseplate, while fixed on the Rod are two $\frac{1}{2}$ in. Pinions 10 and 11, the former engaging with Worm 1 on the Engine driveshaft, and the latter meshing with a $\frac{3}{4}$ in. Contrate Wheel 12 on a 2 in. Rod mounted in the Engine sideplates and in a $1 \times \frac{1}{2}$ in. Double Bracket 13 bolted to the inside of the sideplates. Fixed on the outside end of the Rod is $\frac{3}{4}$ in. Sprocket Wheel 14.

A second $3\frac{1}{2} \times 2\frac{1}{2}$ in. Flanged Plate 15 is now bolted to Flanged Plate 7 through the latter's second row of holes down. Secured to Plate 15 is the upper lug of Double Angle Strip 9 and a Formed Slotted

Strip 16, acting as a flywheel guard, this also being attached to the Engine baseplate by a 1 × 1 in. Angle Bracket. A $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plate 17 is bolted to the upper flange of Flanged Plate 7 and to a $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip fixed between Flexible Plates 6.

Wedged between Plates 6, immediately in front of Plate 17 and resting on Flanged Plate 15, is a removable driver's seat built up from two $2\frac{1}{2} \times 2$ in. Triangular Flexible Plates 18 connected together by two $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strips 19. Bolted to the upper Double Angle Strip is a $2\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plate 20, to the centre of which a $2\frac{1}{2} \times 2\frac{1}{2}$ in. Curved Plate 21 is fixed. The forward edge of this Plate is bolted to lower Double Angle Strip 19.

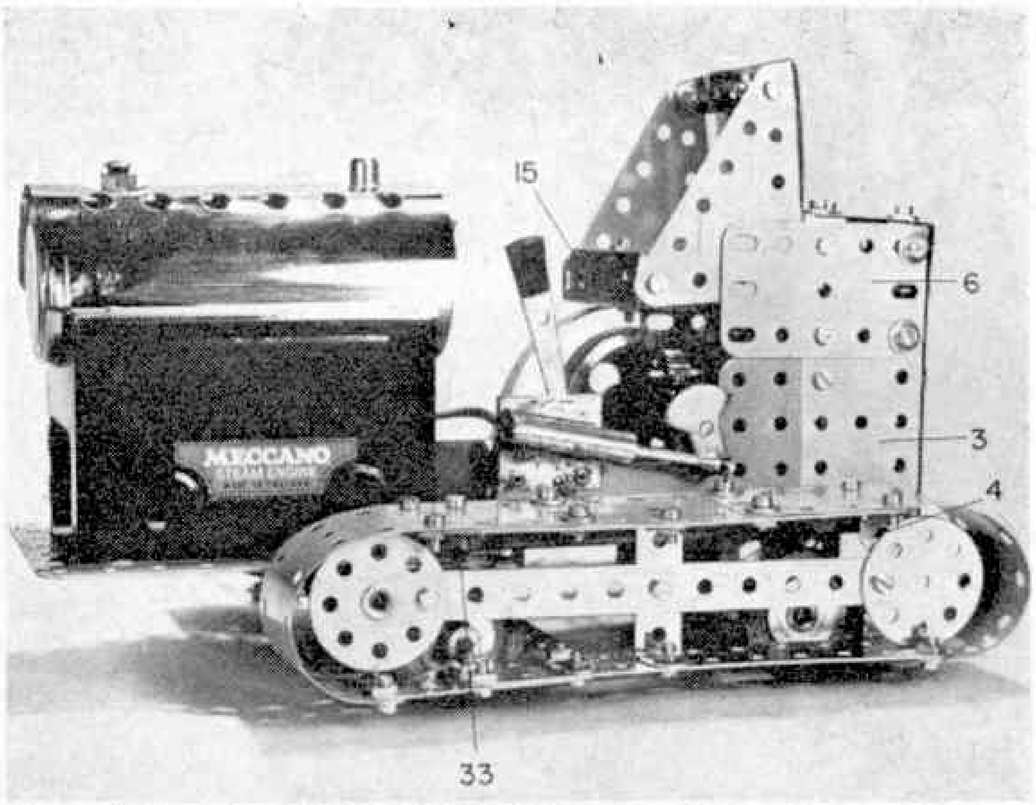
This brings us to the traction system fitted to the model. As already explained, the tracks shown in the photographs are imitation—meant only for effect—as the Tractor, itself, runs on wheels. All four wheels are supplied by 1 in. Pulleys fitted with Motor Tyres, the rear wheels being mounted on a 4 in. Rod held by a Collar and a 1 in. Sprocket Wheel 22 in the apex holes of Flat Trunnions 5. The front wheels on the other hand, are mounted, boss outwards, on a 5 in. Rod 23, journalled in the apex holes of two Trunnions 24 bolted to the underside of the Engine baseplate. Sprocket Wheel 22 is connected by Chain to Sprocket Wheel 14.

Each imitation track is produced from two $5\frac{1}{2}$ in. Strips 25, to which a $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plate 26 and two $5\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plates 27 are bolted, Plates 27 being so arranged that they each project a distance of seven holes beyond the ends of the Strips. These same Plates are curved round and under, as shown, to be joined together by two $6\frac{1}{2}$ in. compound strips 28, built up from $5\frac{1}{2}$ in. Strips extended by $2\frac{1}{2}$ in. Strips. The centre of the outer Strip 25 is connected to the centre of outer compound strip 28 by a $1\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip 29, to which a $5\frac{1}{2}$ in. Strip 30 is bolted at right-angles. An 8-hole Bush Wheel 31 is secured to the forward end of this Strip, while an 8-hole Wheel Disc 32 is secured to the rear end of the same Strip.

When completed, each track is attached to the Tractor towards the front by a $\frac{1}{2}$ in. Reversed Angle Bracket 33 held by the rear Bolt fixing respective Trunnion 24 in place. Towards the rear, the track is bolted to Double Angle Strip 4, both tracks finally being joined together underneath by two $5\frac{1}{2}$ in. Strips 34 bolted between compound strips 28, at the same time extending the ends of forward Strip 34 by Fishplates which serve to secure the compound strips in each pair to each other.

This, then, completes construction of the model, but, before closing, there are one or two things that must be stressed. Firstly, great care must be taken when disconnecting the piston rod of the Steam Engine from the driveshaft at the start of operations to ensure that no damage is done either to the piston rod or the driveshaft-crank spigot. The rod is best disconnected, when fully extended, by pressing the cylinder pivot bolt inwards to bring the cylinder out away from the cylinder block, at which time the rod can quite easily be slipped off its spigot. Excessive force must never be used.

The second important point to remember is that the Steam Engine is a genuine live steam unit, operating at very high temperatures, and it must be treated with great respect. The operating instructions should be followed exactly and, under no circumstances, should the boiler or firebox be handled once the ignited burner is mounted in position, unless you want a painful burn! (I know this from experience!) The boiler should not be allowed to burn completely dry and should never be re-filled with water with the burner alight and in position.



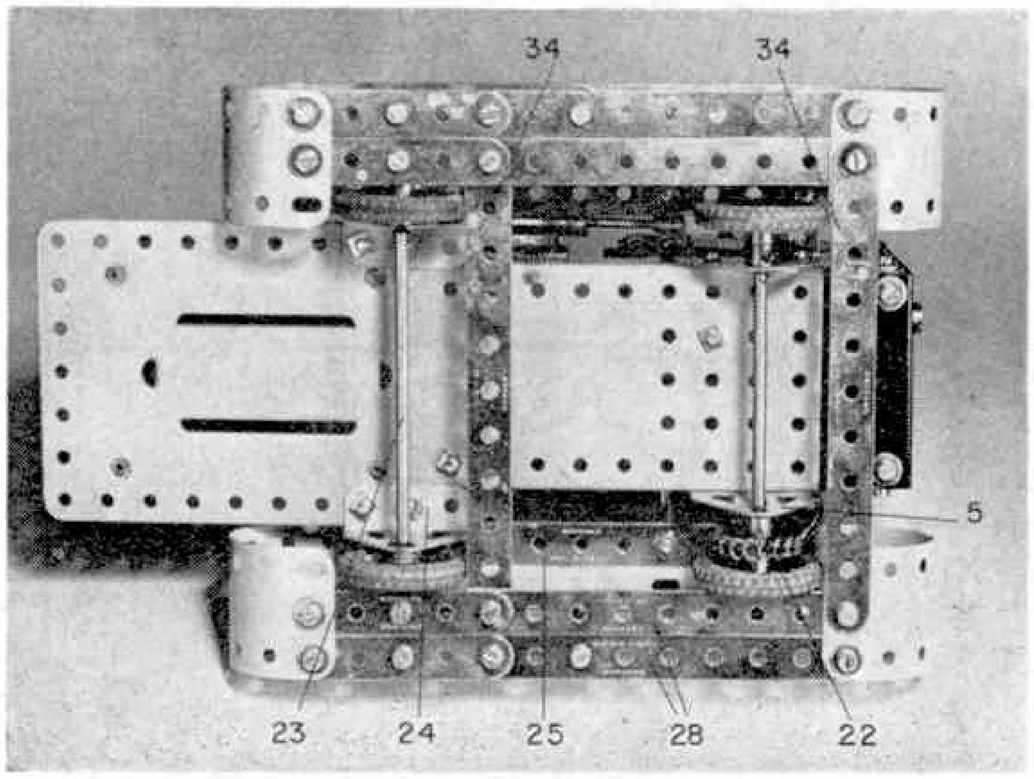
One of the advantages of the Meccano Steam Engine is that the Engine, itself, can serve as a sturdy chassis for a model. In this Steam Tractor, designed and built by R. Smith, it supplies a large part of the body, as well!

Finally, when building the model, it is essential that friction is kept to an absolute minimum, otherwise the model may not operate satisfactorily. The Tractor is pretty heavy and the Steam Engine does not have a lot of power left over above that needed to drive the model, therefore, unnecessary friction may result in failure. With careful adjustment and the help of a suitable lubricant, however, a really impressive working model will be your reward.

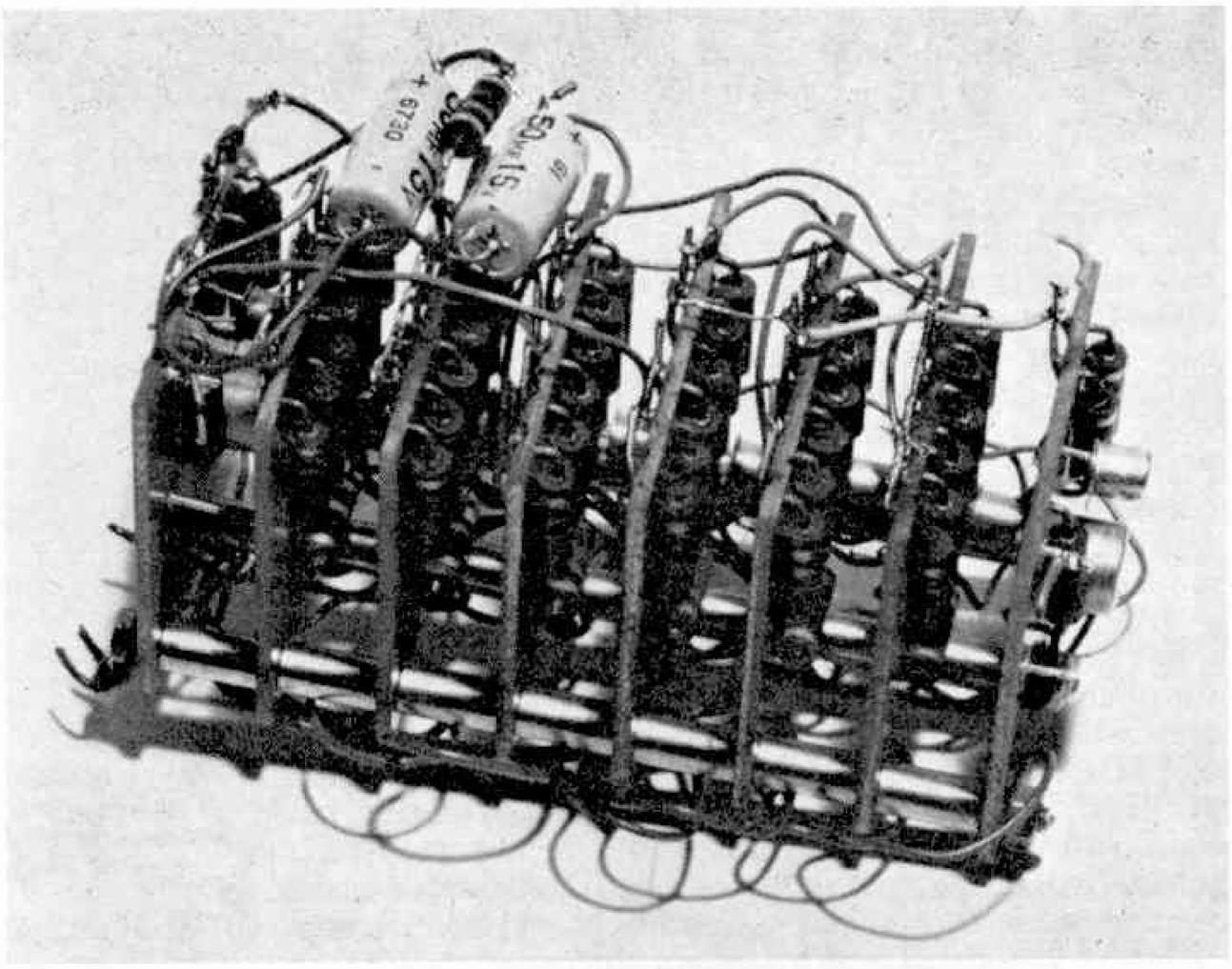
PARTS REQUIRED

12—2	2—24	4—48a	2—126a
4—5	2—24a	1—51	4—142c
2—10	2—26	2—53	7—188
1—11a	1—29	4—59	4—189
2—12	1—32	1—94	1—190
1—12a	89—37a	1—96	1—200
1—15	89—37b	1—96a	1—215
1—15b	32—38	2—125	1—222
1—16	1—45	2—126	1 Meccano Steam Engine
4—22	4—48		

An underside view of the model showing the imitation track bases together with the wheels and axles actually used for traction.



Dr. GREGOR DRUMMOND explains to readers the theory of logic in this feature entitled . . .



THE A.B.C. OF COMPUTERS

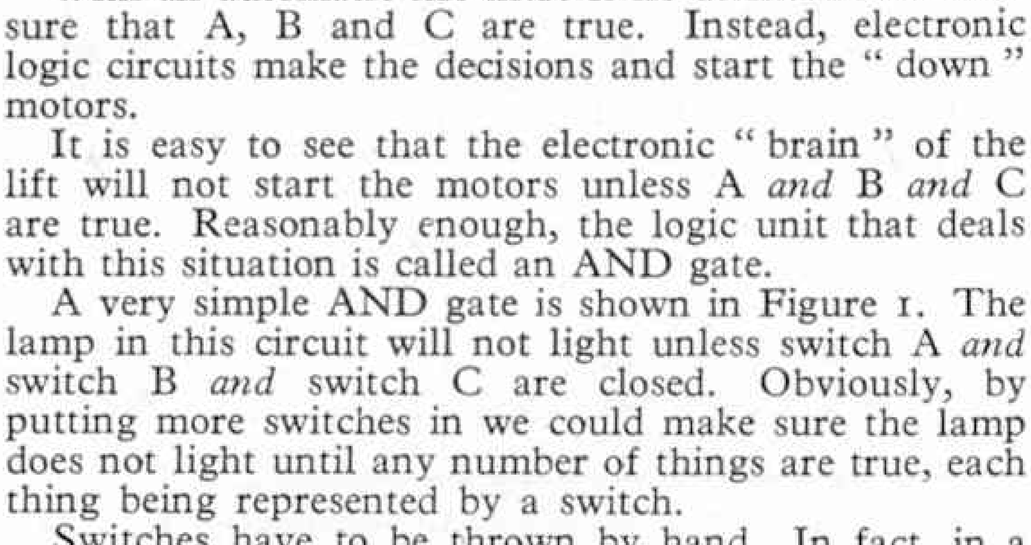
IMAGINE THAT you are halfway up a tall building. You want the lift to come down to you. Three things must be true before this can happen—A, the lift must be above you; B, its doors must be shut and C, the button on your floor must be pressed.

With an automatic lift there is no attendant to make sure that A, B and C are true. Instead, electronic logic circuits make the decisions and start the " down " motors.

It is easy to see that the electronic " brain " of the lift will not start the motors unless A *and* B *and* C are true. Reasonably enough, the logic unit that deals with this situation is called an AND gate.

A very simple AND gate is shown in Figure 1. The lamp in this circuit will not light unless switch A *and* switch B *and* switch C are closed. Obviously, by putting more switches in we could make sure the lamp does not light until any number of things are true, each thing being represented by a switch.

Switches have to be thrown by hand. In fact, in a lift with an attendant this is just what happens. You press the button on the third floor, say. The attendant presses the button to close the doors and then, because an indicator lamp tells him you are down below, he presses a button to start the " down " motors.



With automatic lifts and indeed with almost all applications of electronic logic, transistors, diodes and resistors are used to make decisions and to act like the switches in Figure 1. This is partly because these devices are very speedy and partly because they have no mechanical wear. In a computer switches may have to open and close several thousand times a second. No manual switch could stand up to this for very long!

Then, when the logic is over, when the decisions have been made, the final switch—to turn on the lift motors, say—is usually a relay. In a relay there is a coil of wire near some metal contacts. When a current passes through the coil a magnetic field is produced and the contacts are made to touch, closing the power circuit for driving the motors. In a computer the relay might turn the wheels of a numbering device, like the revolution counter on a tape-recorder.

But logic is not only used for turning motors on and off and for calculating. One very important use is to give an alarm when something goes wrong. For this purpose the logic units are connected at one end to a bell or klaxon (the 'end' that is equivalent to the lift motors) and at the other end, called the 'input' to a detecting device.

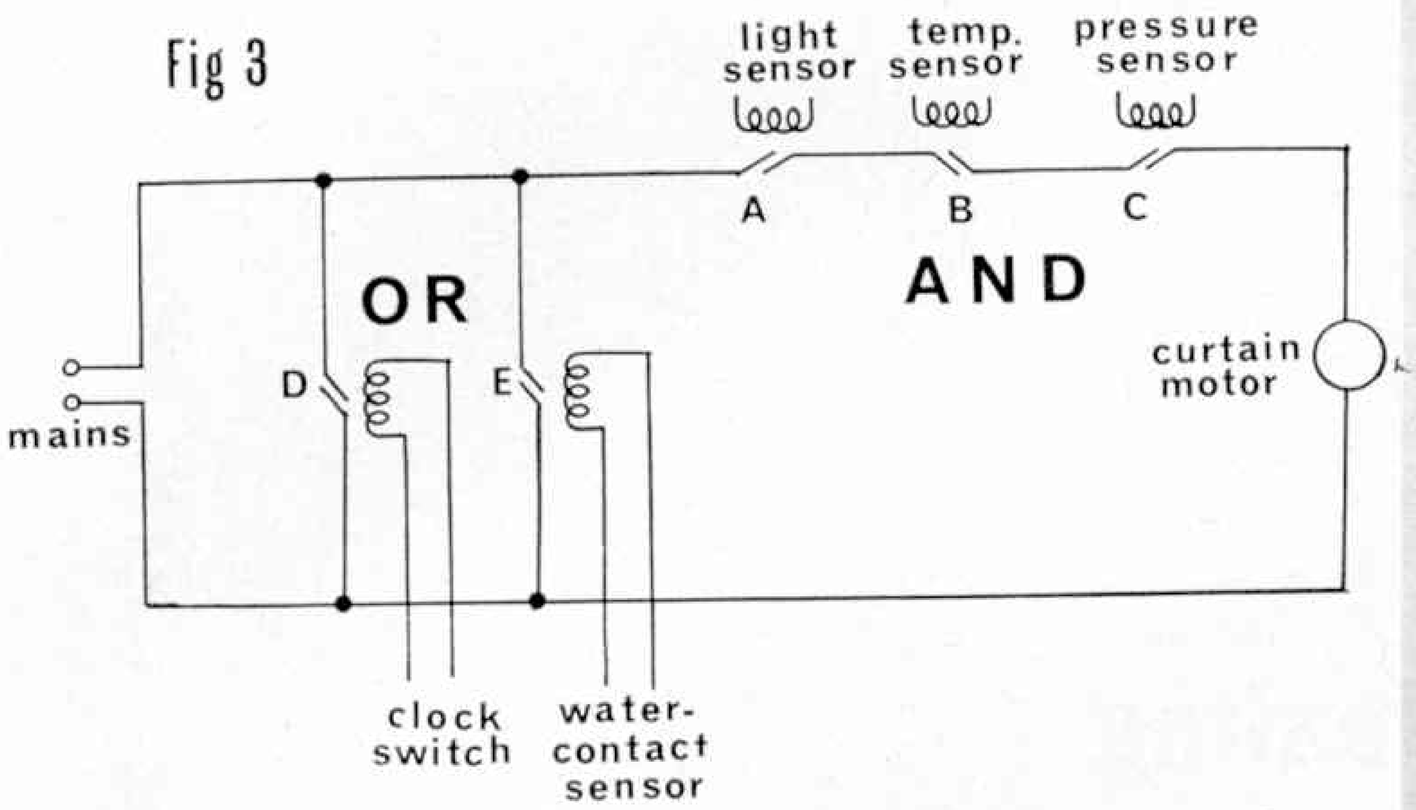
Over the last few decades engineers and scientists have invented input devices for detecting just about anything. There are components that will 'sense' light, sound, temperature, pressure, contact, movement, metal, non-metal and so on. It is these sensing devices which 'tell' the logic units what is happening, which 'state' what is true and what is not true.

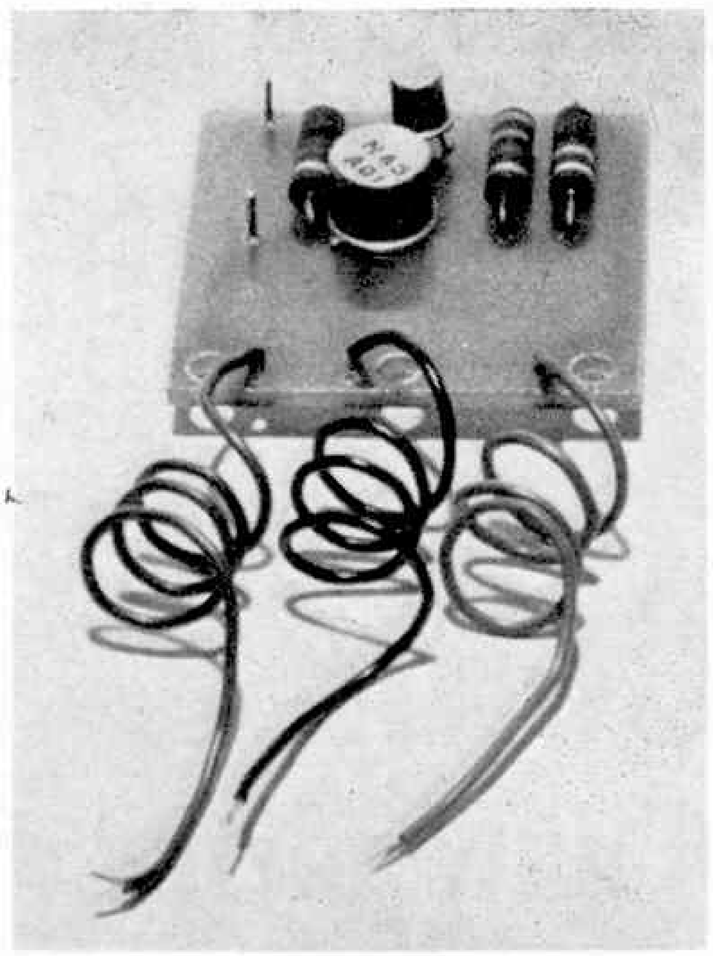
The logic units then decide what to do and issue instructions to the 'output' components; motors, lamps, bells,—'doing' equipment.

Suppose we have a nice aquarium of tropical fish. We would like to be warned by a bell ringing if either A, the water temperature rises too high or B, the water temperature falls too low or C, the water level evaporates below a certain level.

Here we have a situation where something must be done (i.e. the bell wrung) if A *or* B *or* C are true. As

Fig 3





The above photograph shows a simple output unit as referred to in the text.

you may have guessed, the logic unit needed is called an OR gate. With appropriate sensing devices for high and low temperature and for water-contact, we can arrange that relay contacts are closed if either A, B or C is true. And we arrange the three switches as in Figure 2.

Again, by increasing the number of relays we can arrange for any number of conditions to cause the bell to sound. The unit in Figure 2 is sensitive to three different things, so it is called a '3-input OR gate'. In Figure 1 we saw a '3-input AND gate'.

There are five different basic patterns for logic units, but even with just these two we can carry out quite complicated control procedures by combining them. Even rather fantastic ones.

A gardener would like to get up early tomorrow to do some digging. But he is only a *fairly* keen gardener. He does not want to get up early unless it is a nice bright, warm morning. Nor does he want to get up until the milk is delivered, so that he can have some tea before starting work. Even if all these things are true, he thinks it would be silly to get up early if much rain fell in the night, making the soil soggy. To top it all he does not want to get up before seven o'clock anyway.

All this can be very simply arranged with one 3-input AND gate and a 2-input OR gate. For a nice gentle awakening our gardener has an electric motor to open his bedroom curtains. Figure 3 shows how it is done.

A photocell will close the relay contacts at A if the morning is bright. A thermistor will close the contacts at B if the weather is warm. A pressure sensor under the doormat will close the contacts at C when the milk is delivered. So, only when A *and* B *and* C are true can current pass along the top wire of the circuit.

However, the clock switch keeps the contacts at D closed until seven o'clock and this short-circuits the power lines and prevents current passing. Of course, in a practical circuit we would have to do something to prevent the fuses being blown, but that has nothing to do with the logic.

Also, in the garden there is a rain butt with a water-contact sensing device in it. If the sensor is not in air the contacts at E will remain closed and again there will be a short circuit.

So the curtain motor will only be switched on if contacts A *and* B *and* C are closed, but will not be switched on if contacts D *or* E are closed. Our gardener's electronic 'brain' does all this thinking while he peacefully sleeps.

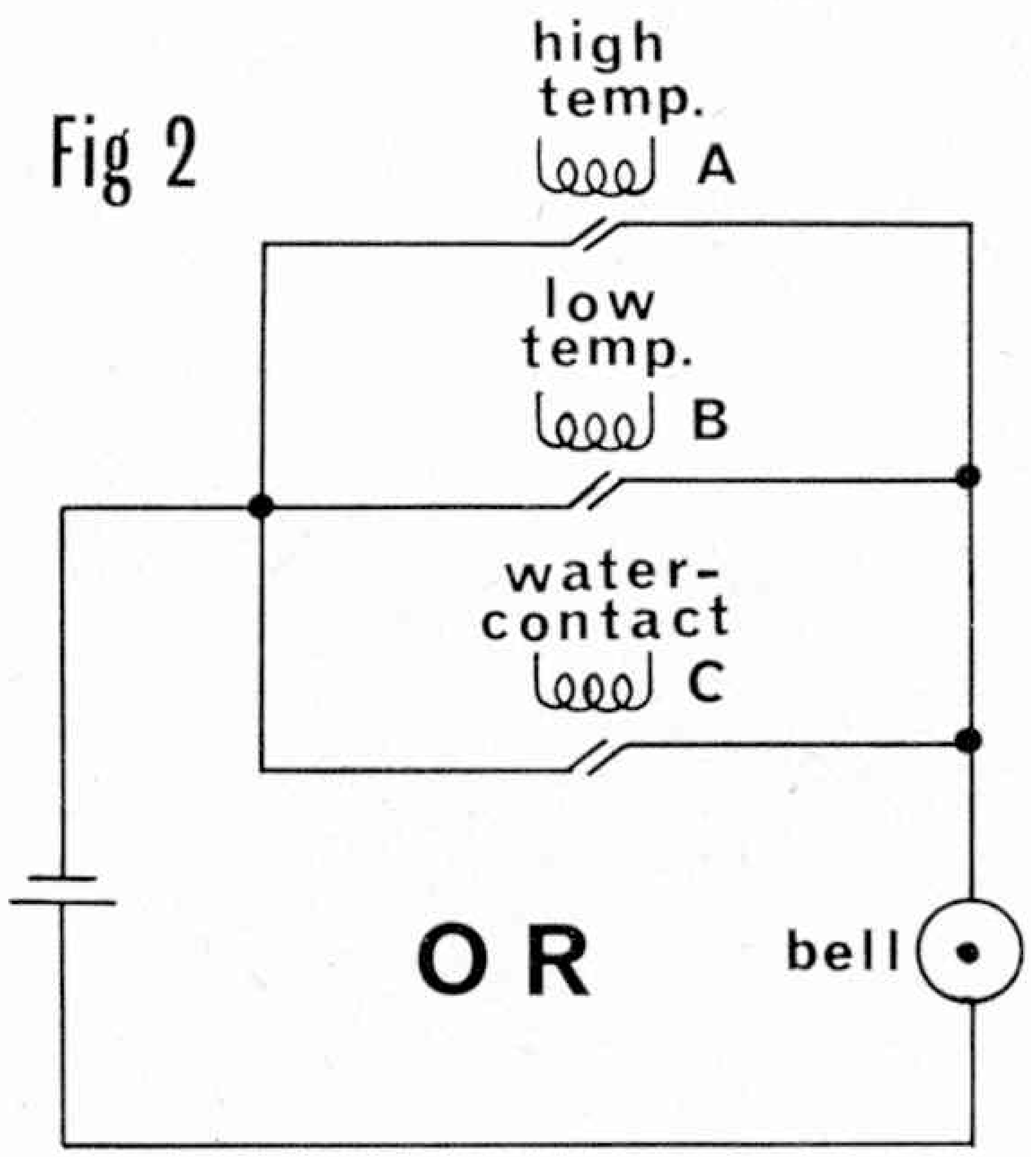
Have you noticed that the contacts at D and E in Figure 3 act differently from A, B, C in Figure 2? With the gate in Figure 2 the contacts had to *close* for something to be done, i.e. the bell ring. In Figure 3 the contacts had to *open* for something to be done, i.e. the motor started.

We could put this another way and say that in Figure 2 the bell rings if either of three things *happen*, whereas in Figure 3 the motor starts if either of two things does *not* happen.

For systems of this second kind the term 'negative logic' is sometimes used and then the unit would be called a NOR gate, which is short for 'not or'. In the same sort of way we can have a NAND unit, which is short for 'not and'.

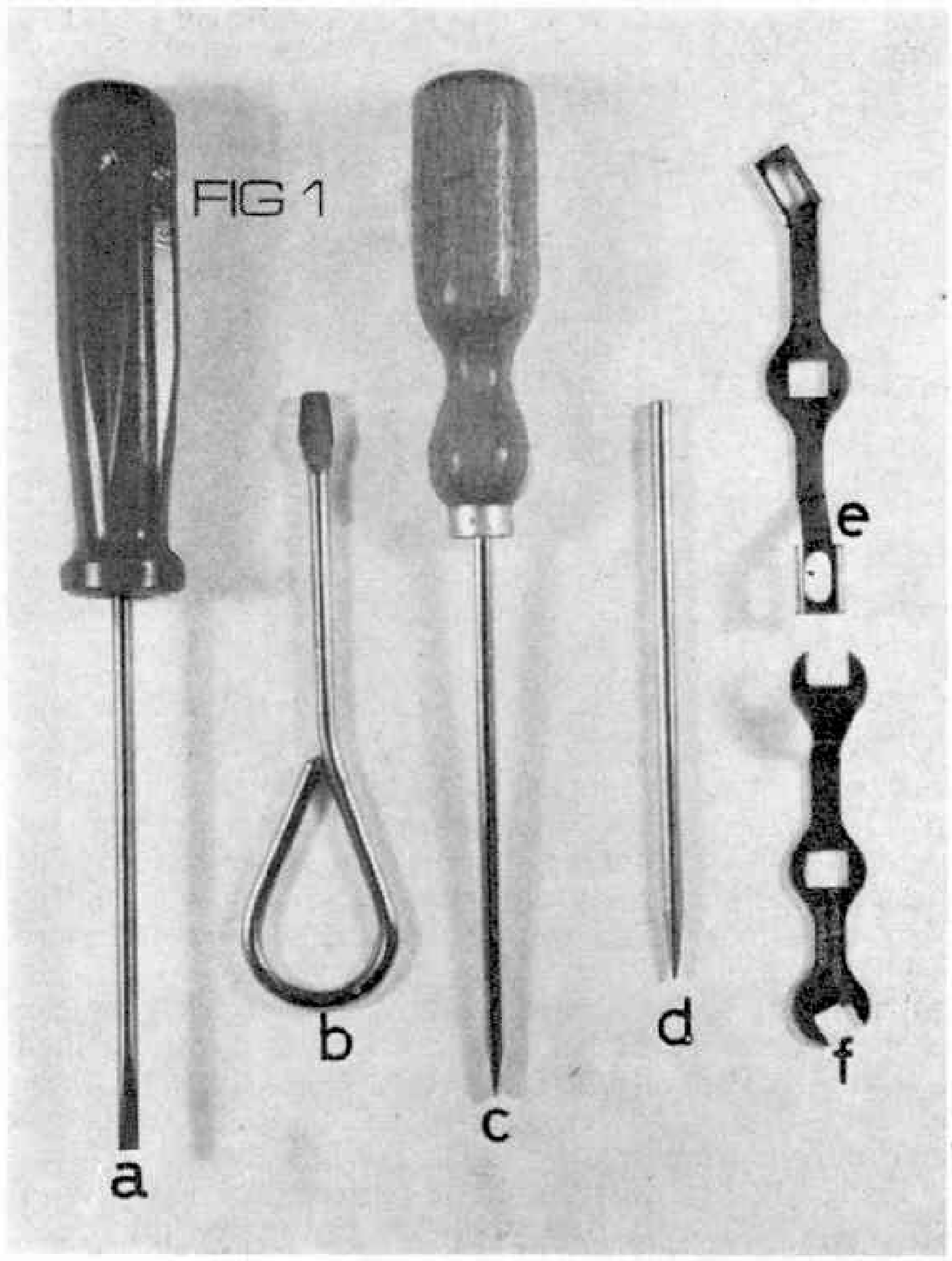
(To be continued)

Fig 2



Meccano Constructors Guide

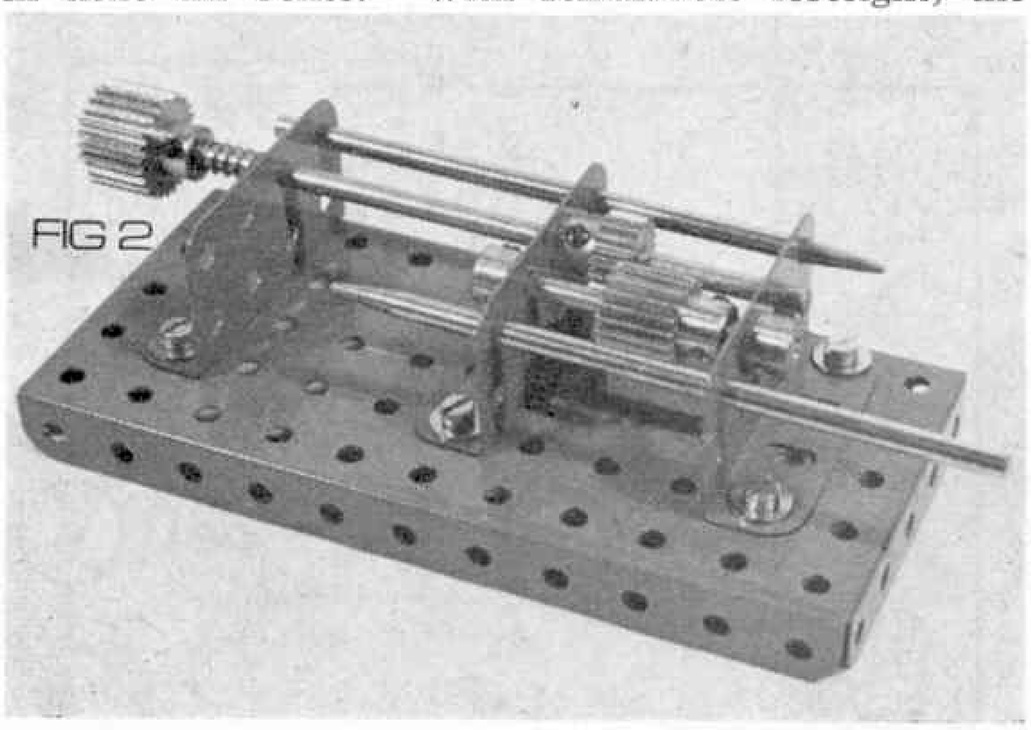
A new series dealing with gadgets and mechanisms that will be useful to Meccano modellers



By B. N. Love

Part 1—Basic Construction

THERE IS no doubt that Meccano Parts make up the most versatile and comprehensive construction system in the world and one which has maintained its lead in a competitive field ever since its inception by Frank Hornby in 1901, when he marketed his first comparatively crude "Mechanics Made Easy" outfits in little tin boxes. With remarkable foresight, the creator of Meccano adopted a standardisation of parts and perforations on which the system has developed over a period of three generations. The greatest appeal in using Meccano stems from the fact that no special tools are required to construct even the most complex and advanced models, the basic items being a screwdriver and a spanner. However, even in the use of simple tools, there is a right and a wrong way of employing them and this opening article of what will be a twelve-part series, gives some hints and guidance for the benefit of all who enjoy this wonderful hobby the world over.



Nuts and Bolts, Part Nos'. 37a and 37b respectively, are the basic fasteners for the whole system and these are manufactured literally by the million in the high speed ultra-modern machines in the Meccano factory at Liverpool and they follow a standard Whitworth pattern of 5/32 in. diameter. They are well made and very strong and, provided that they are not abused, they will continue to serve the constructor, model

Fig. 1 shows the basic Meccano model-building tools: a. is the Super Tool Set Screwdriver; b. is the standard Screwdriver; c. is the long, wooden-handled Screwdriver; d. is the Drift; e is the Box Spanner; f. is the standard Spanner. Fig. 2 shows the Drift at work—aligning holes.

after model for a lifetime. Two simple rules will help both in the long life of the Bolts and the correct construction by making sure that there is always a clean entry for the Bolt in the holes of the Meccano Parts which are being secured together and that the Bolt rotates freely as it is tightened. Any tendency for the Bolt to jam or the Nut to stick on the thread should immediately be checked for cross threading arising from careless application of the Nut. Make sure that the Screwdriver blade has a clean square end which is a snug fit into the slot of the Bolt and never sharpen the blade to a cutting edge. This is very dangerous to the person and wreaks havoc with the carefully machined slots in the boltheads.

One of the most useful additional tools for the Meccano constructor is the Drift which is shown with the other basic tools in Fig. 1. This is Part No. 36c and is manufactured to have a full tolerance on its diameter but is shaped to a blunt point at one end which allows the builder to insert the Drift into an assembly of Strips or Plates to align all of the holes prior to bolting up the pieces to make sure that Axle Rods or further Bolts may be inserted cleanly. Fig. 2 shows some of the applications of the Drift and if this is fitted with a Spring Clip or a Collar, the Drift will remain in place when the model is turned to one side and is almost as good as having a third hand.

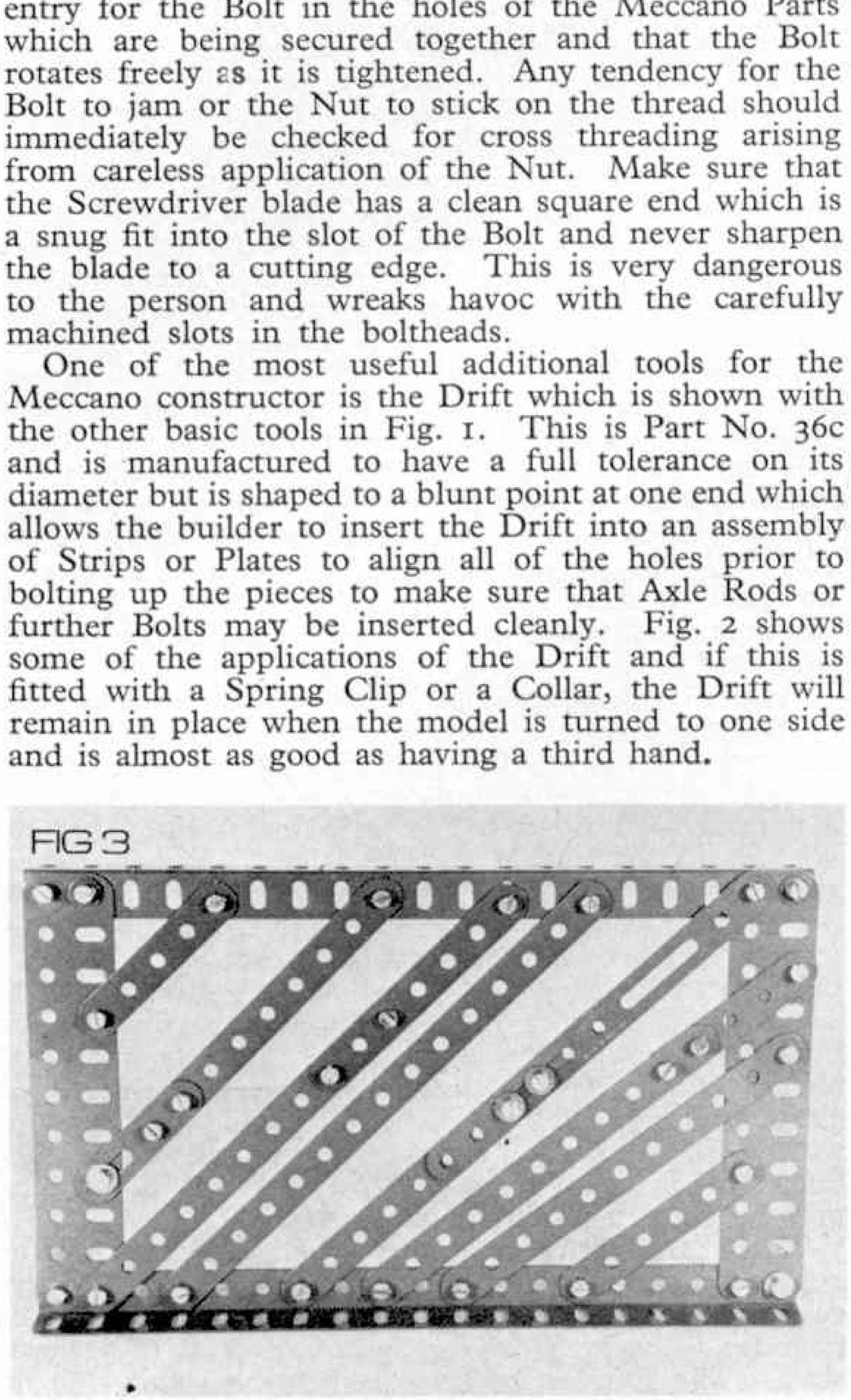


Fig. 3. A demonstration assembly showing how elongated holes in Slotted Strips and other parts enable diagonally-mounted Strips to span inexact distances between anchoring points.

In the simpler models, journals for Axle Rods are quite commonly formed by the holes in Perforated Strips or Plates and two points of support are adequate in such cases. However, where an Axle Rod has to pass through three or more holes in a line, such as often happens in the case of gearboxes, etc., the Drift is invaluable for making sure that all holes are properly aligned. Again, where greater precision or long running operation is required, journals may be provided by Double Arm Cranks, Part No. 62b, or by Bush Wheels, Part No. 24 or 24a, bolted to the Plates or Strips forming the side members of the mechanism. Because Bush Wheels have a peened over lip where the boss is joined, they may be stood off from their respective mountings by inserting a packing Washer on the securing Bolts, as shown in Fig. 5, and then correctly aligned with the Drift which should pass quite cleanly and without binding through both bosses forming a pair of journals.

Meccano Washers themselves, Part No. 38, are a

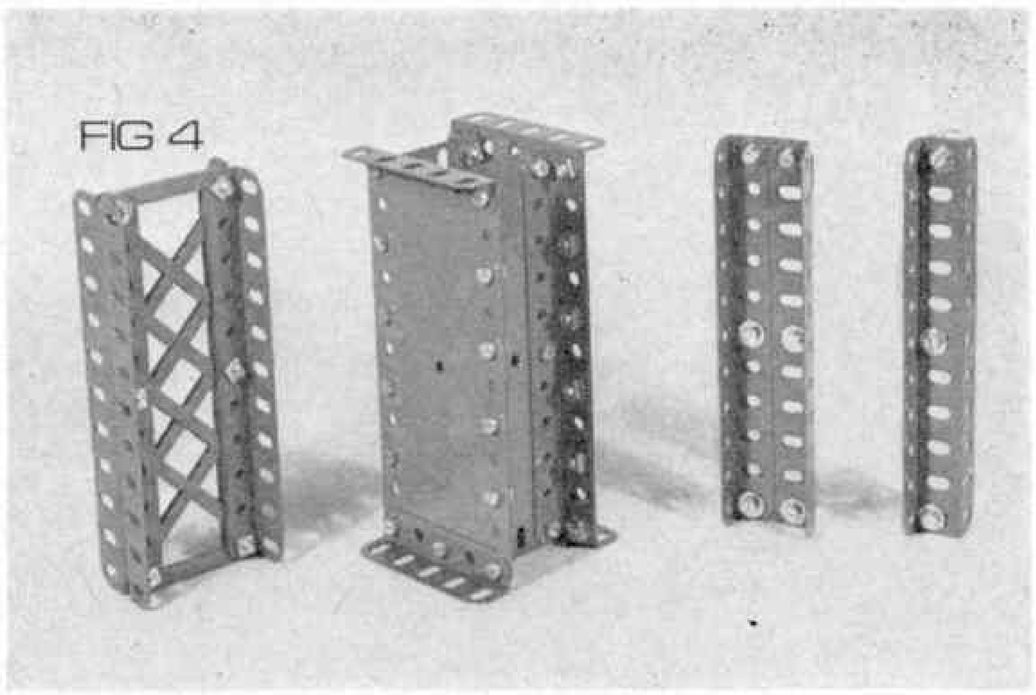
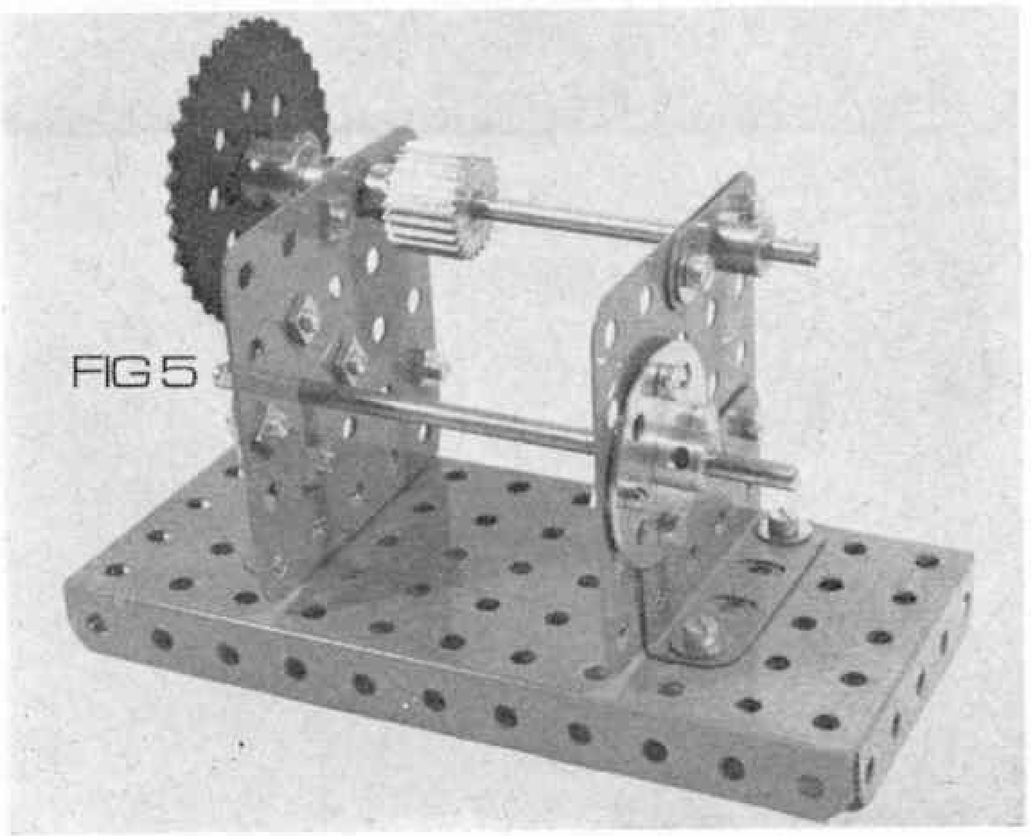


Fig. 4. Some of the many different types of composite girders that can be built up using basic Meccano parts. Just about every type of girder in existence can be reproduced in this way.

most useful if not essential part of the serious constructor's kit as they serve several uses. They may be employed as packing in many applications; they may be placed under the head of a Bolt to protect the enamelled surfaces of Meccano Plates, etc., and to give extra grip from the Bolt in mechanisms subject to vibration. Their most common use, however, is that of providing a smooth running bearing face between the boss of a Gear or Wheel etc., and the journal carrying the Axle Rod. Lubrication of all journals with a tiny spot of light machine oil will assist the smooth running of any model but, if overdone, the process becomes messy and can attract enough dust or fluff to defeat its own object.

If a model is chosen from one of the Meccano construction manuals, the parts list should be checked against available parts and these should be set aside where they are handy and ready for immediate use so that handling or raking over the parts is reduced to a minimum. Bolts and Nuts may be screwed up finger-tight for the early stages of construction until the builder is satisfied that his model is 'coming up

Fig. 5. While the simplest bearings for Meccano Rods are supplied by the holes in Strips and Plates, etc., a stronger, more efficient bearing is supplied by the boss of a suitable part bolted to the Strip or Plate. This picture shows a Double Arm Crank and a Bush Wheel being used in this way.



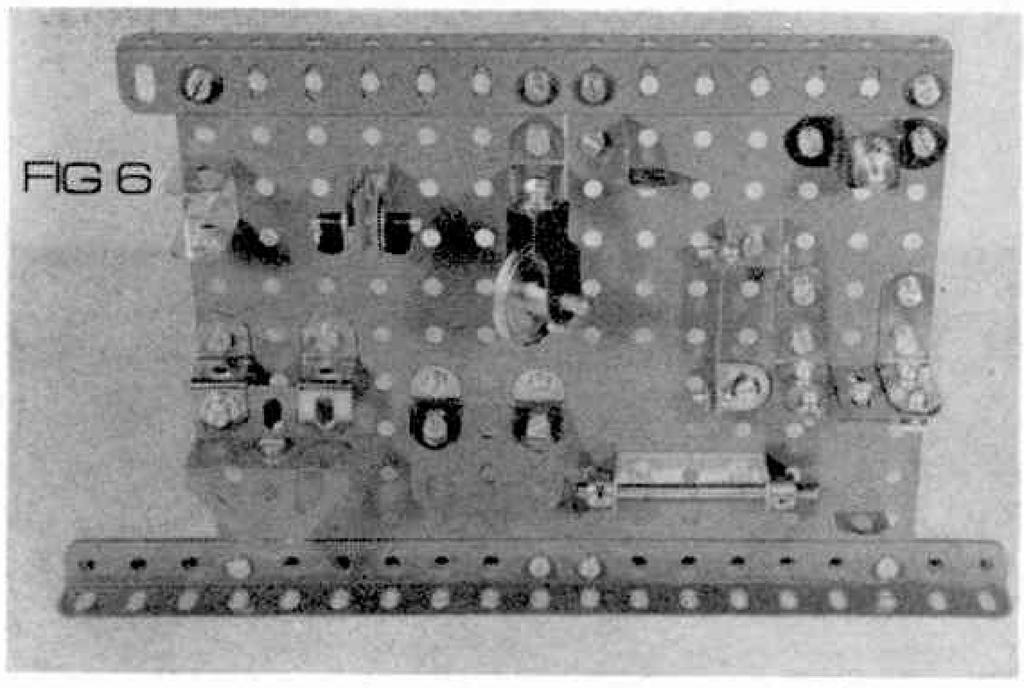


Fig. 6. Some of the many brackets included in the Meccano system with a few examples of the innumerable uses to which they are put.

square'. At this stage, the Nuts should be held quite firmly with the Spanner and the Bolts screwed home firmly with the Screwdriver. Should a really tight grip be required, necessitating a final turn of the Spanner, a Washer should be placed under the Nut to prevent its edges from scoring a circle in the enamel on the Meccano Parts. This enamel is hard wearing but will not stand up to abuses of this kind. On the other hand, a little care in handling and storing the parts can be rewarded with a lifetime of service from your Meccano Outfit.

Every Meccano Manual carries an illustrated list of Meccano Parts, many of which have specialised applications and some of these will be dealt with in a later chapter. Basically, the correct use of Strips, Angle Girders, Plates, Wheels and Axle Rods are most important. Strips are intended principally to act as bracing units or tie rods where they are primarily in tension, i.e. being stretched, but the shorter varieties will carry considerable loads, especially when several thicknesses are combined by means of Nuts and Bolts. Some of the uses of Strips are shown in Fig. 3.

It is a well known engineering principle that the strength of structures relies in many cases on triangulation, it being a fact that a triangle is not readily pushed out of shape, and the range of Perforated Strips is ideal for this purpose. There are occasions, however, particularly where a right-angled structure is required, when the Perforated Strip selected will just not reach across the necessary diagonal and when, in addition, the simple process of bolting on an extra length of Strip is equally unsuccessful. There are two methods available to the constructor to overcome this difficulty. A large range of Meccano Parts, such as Angle Girders, Flat Girders and Flexible Plates, are provided with elongated holes which give considerable latitude in adjusting diagonal constructions, but where this does still not give sufficient scope, special parts known as Slotted Strips, may be used as shown in Fig. 3. Slotted Strips are made in two lengths, Part No. 55, 5½ in. long, and Part No. 55a, 2 in. long, and the slots in these special Strips are also put to good use in models where a sliding Axle Rod mechanism is employed.

Angle Girders combine some of the uses of the Perforated Strip with a part which will stand both compression and tension and this makes any Girder an ideal element in a framework where great strength is required. Laid flat, any strip metal will bend or sag but turned up like a knife edge, it then becomes very rigid in a vertical direction. A Girder always presents at least one of its sections in opposition to its load and will therefore stand up not only to compression and tension but also to bending forces as well. A simple framework of Meccano Angle Girders can be assembled quite quickly to take the weight of a man without showing any signs of stress or damage, although it is not really recommended that the beginner with a small outfit attempts such a venture at the outset! Fig. 4 shows how various forms of girders may be constructed from basic parts.

There are many occasions when the attachment points for various parts of a structure are not directly accessible and for this reason, the Meccano system includes a comprehensive range of brackets in various sizes. The simplest of these is Part No. 12 which is the ½ × ½ in. Angle Bracket having two holes, one of which is slotted so that a useful range of adjustment is available. A simple development of this part is the Double Bracket, Part No. 11 and this is really extended throughout the entire range of the Double Angle Strips which run from 1½ in. up to 5½ in. with fixing lugs of various lengths, also, in some cases. Fig. 6 shows a number of Meccano Brackets and some of the applications for which they are designed. In each case they simulate standard engineering practice, but whereas a welding or riveting process is frequently used in steel structures, the Meccano constructor must rely upon the Nuts and Bolts. It is therefore very important that they are all very securely tightened in any model which is subject to motion or vibration or substantial weight and, again, the use of Washers for extra grip under Boltheads is very strongly recommended. Meccano brackets perform two principle functions, one being to connect Plates, Strips, etc., at various angles and the other to provide simple bearings or journals for Axle Rods. Some of the brackets have

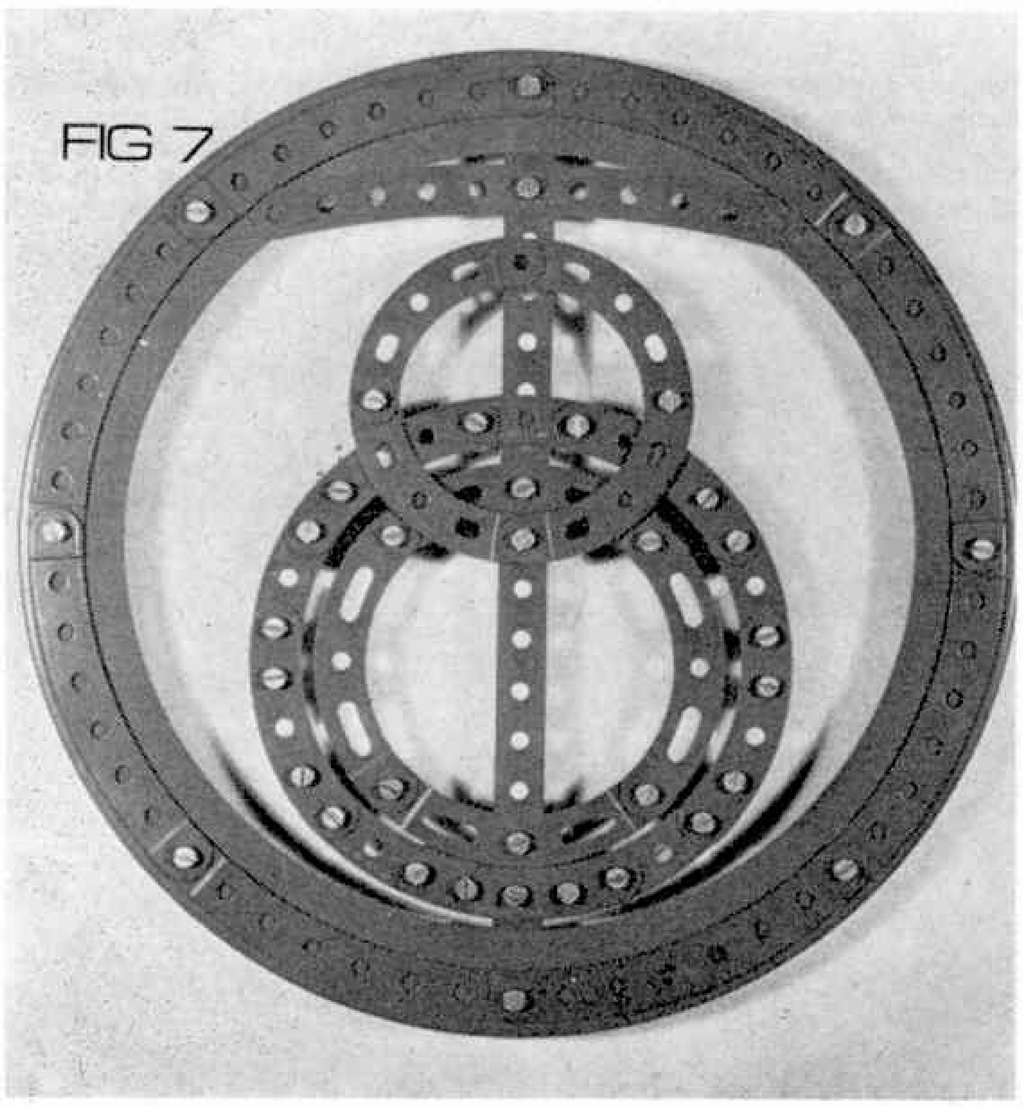
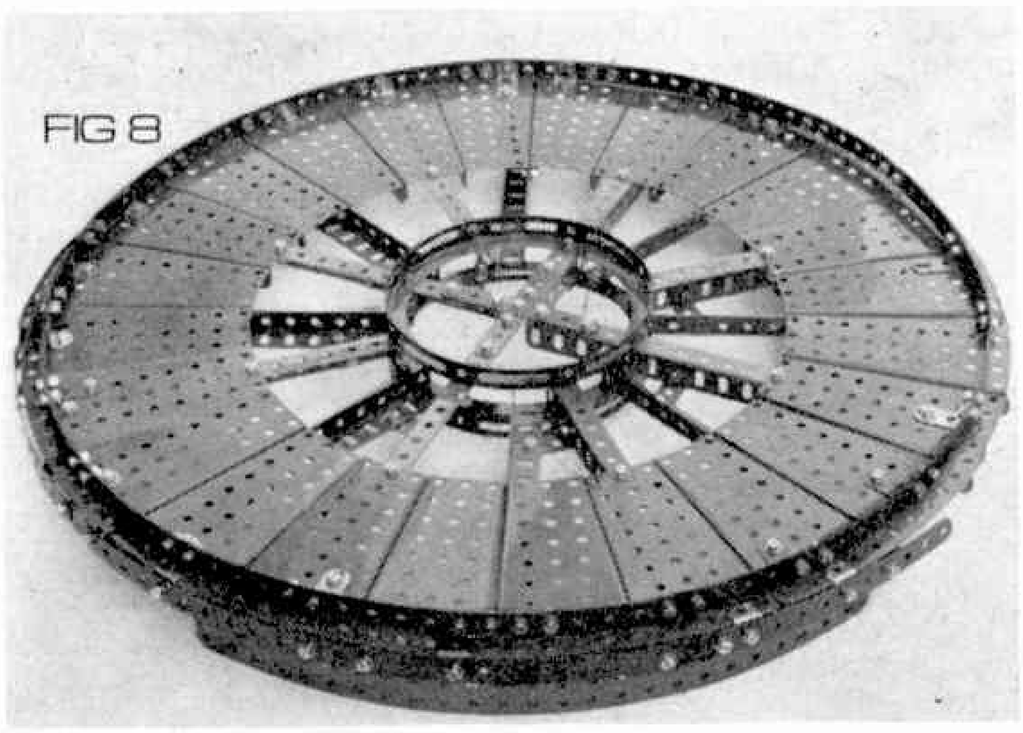


Fig. 7. When bolted together, the various Meccano Curved Strips will make up complete rings of different diameters, as this picture clearly shows. The rings are seen here attached to a 9⅞ in. Flanged Ring to give an idea of size.

elongated holes and they provide for adjustments previously mentioned.

A development of the Perforated Strip is the Curved Strip and there are no less than five different Curved Strips in the Meccano system, ranging from 2½ in. to 5½ in. length and having curvatures varying in radius from 1⅜ in. to 10 in. Three of these are 'stepped' curves which means that the end of each strip is cranked slightly to allow the adjacent strip to bed into it without changing the overall level of a completed circle. Fig. 7 shows the range of Curved Strips arranged as complete circles with the exception of the 10 in. radius Strip which is shown as a separate item at the top of the display. The decorative value of the Curved Strip is evident from the illustration but they may be used structurally of course to form flywheels and formers for cylinders. Part No. 90, the 2½ in. Curved Strip is of interest to clockmakers as it forms a circle having 30 holes and makes a wheel for a 30-peg escapement in conjunction with a pendulum of royal length. The slotted holes in two of the Curved Strips, 89a and 90a add to the versatility of their use. All radii are measured from hole centres.

Fig. 8. The one non-rectangular flanged plate in the Meccano range is the Flanged Sector Plate, Part No. 54. Designed as a small sector of a large circle, twenty-four Plates are required to make up the complete circle.



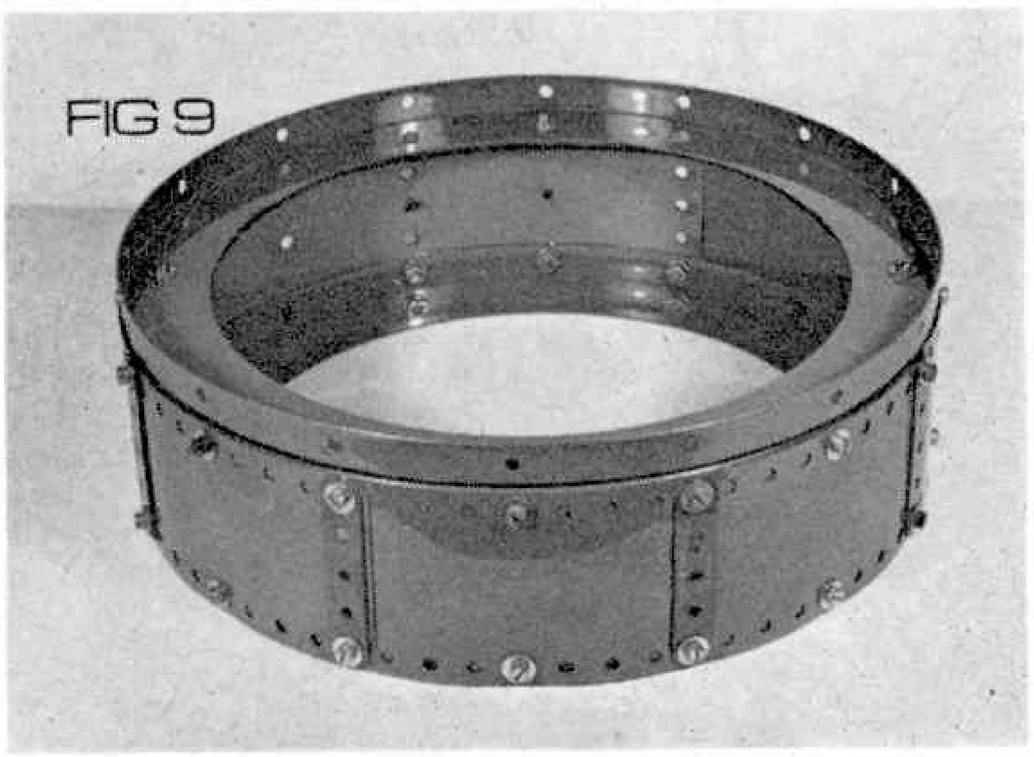
While Strips and Girders form the 'skeleton' of general Meccano structures, Flat Plates and Flanged Plates complement the construction by serving as bases and supplying extra rigidity and large perforated areas for the purposes of providing journals for mechanisms, anchoring points for brackets and Girders and standard spacing for gear meshing, etc. Examples are illustrated in Figs. 2, 5 and 6.

Flanged Plates are produced with flanges to give the same sort of edge rigidity as is found in Angle Girders. They are made in a similar gauge of steel to that used for Perforated Strips up to 5½ in. in length and provide adequate strength for virtually all requirements. Flat Plates are made in a thicker gauge to give them rigidity in a flat plane and they range in size from 1½ in. square up to 5½ × 3½ in. In each case they are fully perforated at standard half inch spacing. Although the majority of the Plates mentioned are of rectangular form, the Sector Plate, Part No. 54 is an exception since it was originally designed to form a sector of quite a large circular platform. This is illustrated in Fig. 8 which shows a complete circle of Sector Plates forming the base for a Giant Dragline. It is interesting to note that this circle is 20 in. in diameter and the outer curved edge formed by the Sector Plates is the same as that formed by the largest Curved Strip which is of 10 in. radius.

The versatility of the Meccano system was considerably extended some 36 years ago when Flexible Plates were introduced—originally in cardboard and fibre, but these being quickly superceded by thin-gauge flexible steel plates which have remained in the system ever since. They are available with a width of 2½ in. and with lengths varying from 1½ in. to 12½ in. Their general applications for filling in large areas on the surface of models and for providing curved surfaces are well known to the Meccano constructor, but their application extends beyond this. They may, for example, be used as very strong webs for large girders (see Fig. 4) by employing several thicknesses of Flexible Plates and, as they are all made with elongated holes at their ends, they allow a considerable amount of latitude in adjustment. They will also make up into cylinders, over a very wide range of diameters and a further advantage in using Flexible Plates is that, when they are formed into cylinders, they possess very rigid properties in the line of the axis of the cylinder. That is to say, if a cylinder is made from Flexible Plates bolted to the flanges of a pair of Circular Girders (Part No. 143), it forms a very strong drum which will form a very stable base for constructions of towers, etc. capable of supporting considerable loads. This follows the well-known mechanical property of sheet metal bent to circular or corrugated forms, Fig. 9 illustrating the use of Flexible Plates for this purpose.

Triangulation has already been mentioned in connection with mechanical rigidity and this is catered for in the Meccano system by a range of Triangular Plates as well as formations of Perforated Strips. These Plates fall into two categories, i.e. rigid and flexible, and the largest in the first category is Part No. 76, 2½ in. Triangular Plate. This is very useful as a journal plate or centre plate and its slotted holes permit meshing of gears in non-standard spacing. Part No. 77 is the 1 in. Triangular Plate which is useful for supplying a mid-point anchorage or journal at half standard spacing because of its equilateral form. Other triangular forms of rigid parts are found in the Trunnions, Part Nos, 126 and 126a, Corner Brackets, Part Nos. 133 and 133a.

Fig. 9. The main use of Meccano Flexible Plates is to fill in large open areas of a model, but they can also be used in the construction of special drums which, when completed, will take tremendous weights. One such drum is shown in this picture.



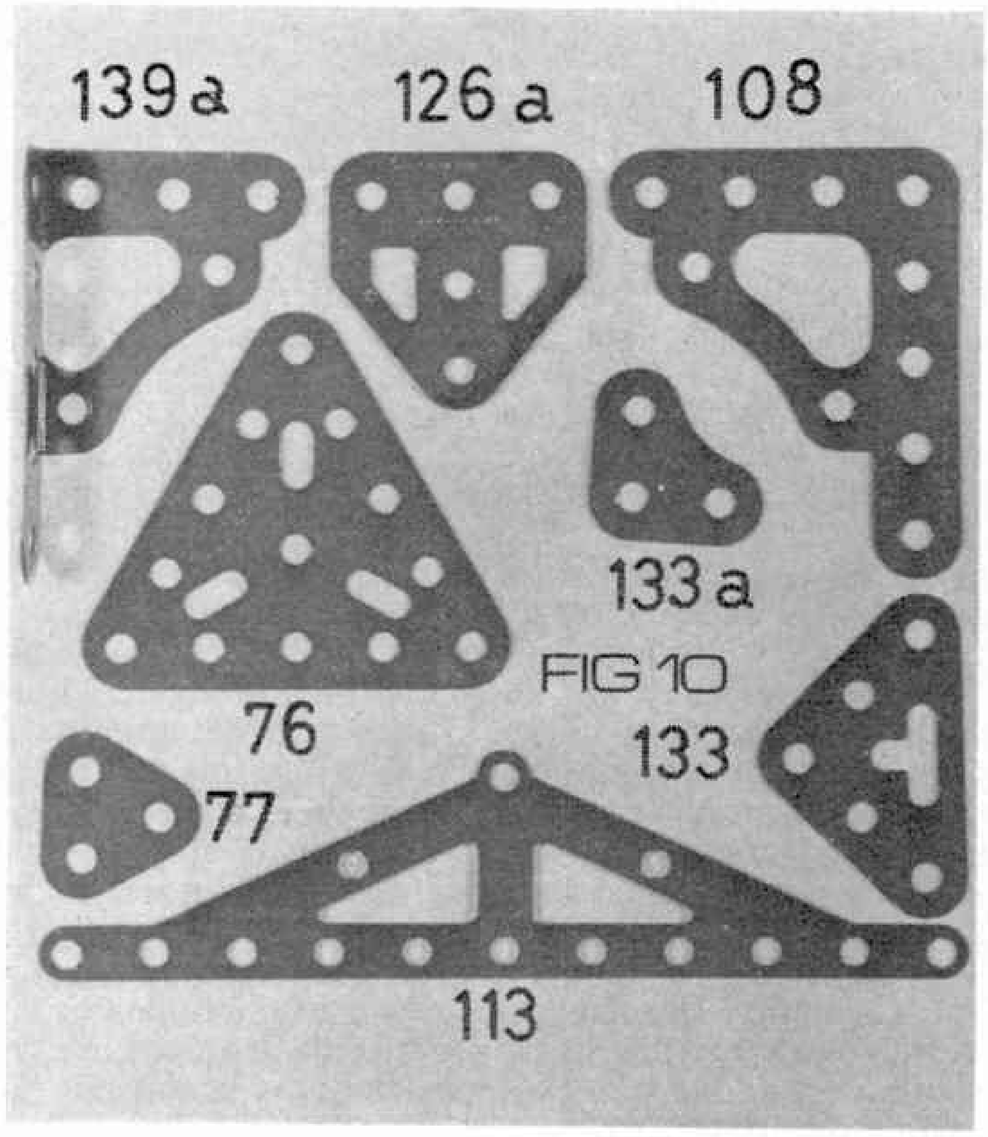
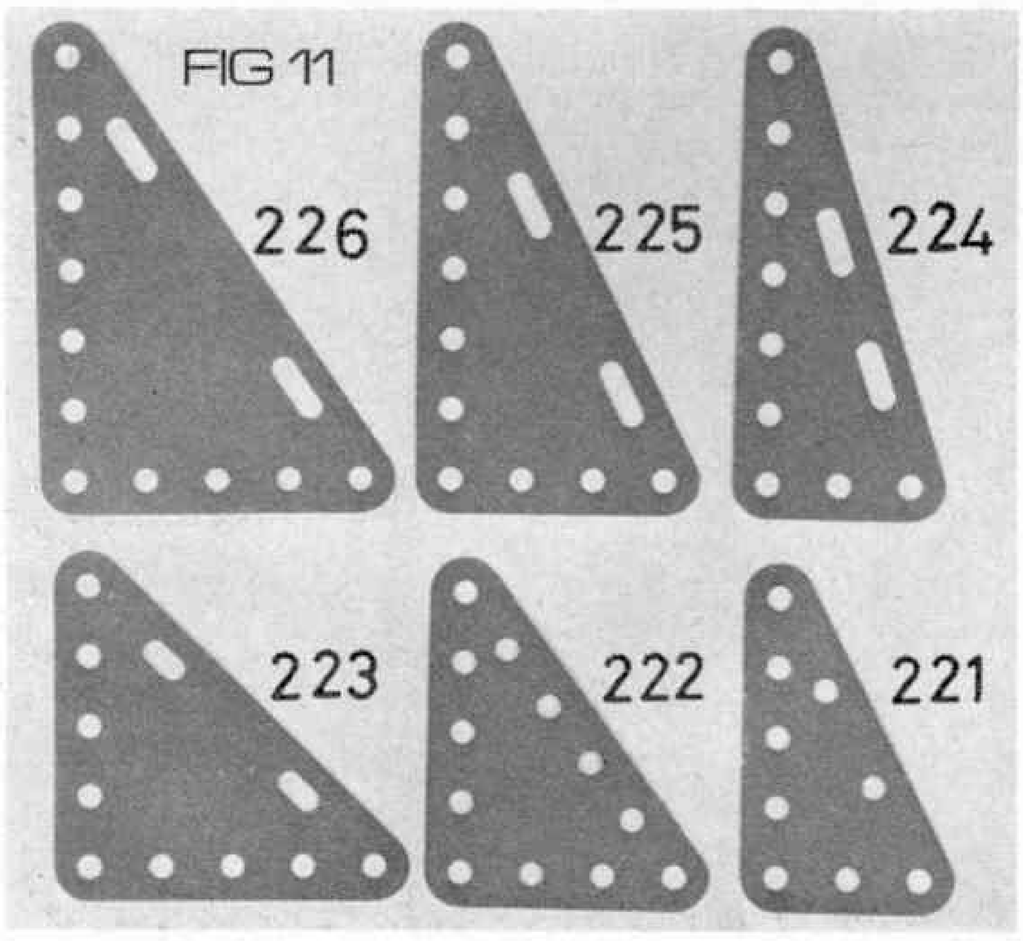


Fig. 10 and Fig. 11 show examples of the many types of triangular-shaped parts contained in the Meccano system. Because of their shape, triangular parts will withstand a great deal of pressure.

Corner Gusset, Part No. 108, Flanged Brackets, Part Nos. 139 and 139a and the Girder Frame, Part No. 113. The above are illustrated in Fig. 10.

As a complement to the Flexible Plates, a series of Triangular Flexible Plates was introduced into the system in the 1950's which extended the versatility of the system still further. Used in single layers, the Triangular Flexible Plates are principally used for filling appropriate shapes as a surface covering but if several thicknesses are bolted together and used in conjunction with Angle Girders they provide extremely strong corner structures. Again, by overlapping a pair of Triangular Plates, after reversing one of them, a rectangular plate is formed and as there are six different sizes available, an extension of the range of rectangular Flexible Plates is immediately available.



Some of the Triangular Flexible Plates have slots to facilitate adjustments and these are illustrated in Fig. 11.

Actually, a type of Flexible Plate was in use in the Meccano system almost sixty years ago and is still with us to-day. This is the Braced Girder which has featured extensively in Meccano models and structures since their first appearances in the early Manuals of Instructions and the Meccano Magazine. It has both structural and decorative properties and is shown in Fig. 4 as the bracing web of a deep 'H' girder, where several Braced Girders (reversed to give the 'crossover' appearance) are used.

A Meccano illustrated price list shows Part Nos. listed up to 234f but so many parts of a similar type are listed as a,b,c,d,e, etc., that there are well over 250 parts in the system. The objects of this first part of the series for Meccano Constructors has been to review the basic parts with which the builder should acquaint himself before tackling the more ambitious models. A fuller development of the system will be dealt with in these pages over the next 11 months, during which time a number of topics will be covered in subsequent articles. Part II next month will deal extensively with gearing and transmission in general and will be fully illustrated, as will be the rest of the articles throughout the series.

New Book for Dinky Toy Collectors

Price 5/-

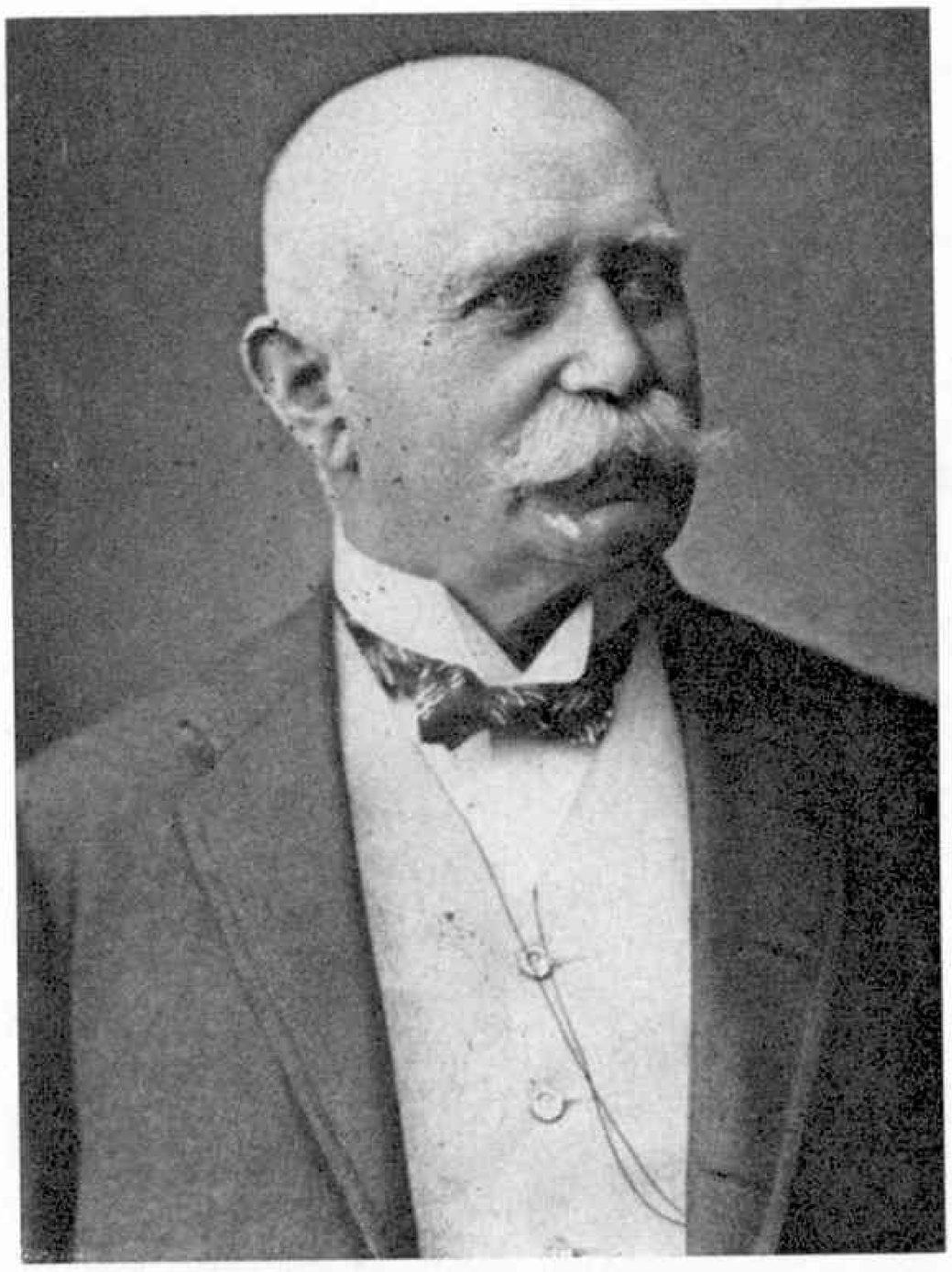
All serious Dinky Toy collectors, worthy of the name, will have heard of the book "History of British Dinky Toys 1934-64" by Cecil Gibson. The book is invaluable to collectors, and is limited only in that it deals exclusively with what can be described as "ground vehicles"—cars, lorries, buses, etc. This is perfectly understandable considering the number of models which fall under the heading, but it does mean that the growing band of die-cast aircraft collectors as well as the old waterline ship series collectors do not have anything like the same detailed information to draw on as the vehicle collectors. I should say, "did not", because the aircraft men are now well and truly catered for with the publication of a 16-page foolscap-size, stereotyped booklet entitled "The Dimmock-Jackson Checklist of Dinky Toys Aircraft".

Produced by Alan Dimmock and Leslie Jackson, this booklet contains a wealth of information on every known Dinky aircraft save the two latest examples which were released after the booklet had been finished. It identifies each model, gives its year of introduction and a concise description of its salient features. A great deal of effort must have gone into the preparation of the booklet which is being made available at its cost price of 5/-. It is produced purely as a service to collectors and is entirely non-profit-making: hence the low price. It can be obtained from either Mr. A Dimmock, 2 Wynter Road, Southampton, SO2 5NY or Mr. L. Jackson, 369 Lower Broughton Road, Salford 7, Lancs M7 9HR, and it's well worth the price.

GREAT ENGINEERS No. 23

COUNT FERDINAND VON ZEPPELIN (1838-1917)

by A. W. Neal



IT IS easy to see why, when man began to make determined efforts to fly, so much attention was paid to lighter-than-air vehicles. Aerodynamics were virtually unknown, for there was no real need for them. The balloon had been in existence for centuries and it appeared that this approach to getting about in the air would always be safer than heavier-than-air craft. Hot air as a lifting agent gave way to gas inflation, and from that point it was but a short step to the power-driven ship of the air. Then came a further step in advancement—the dirigible—the succeeding designs of which became larger and larger and more intricate. These enormous envelopes became known as 'Zeppelins', after their first builder Count Ferdinand von Zeppelin.

This German Count was born at Constance, Baden, in 1838. He was a soldier by profession, and he served in the Federal army during the American Civil War, and while in America he acquired a taste for ballooning. He saw active service in the Austrian War of 1866 and the France-Germany War of 1870. After he retired from the army he devoted himself to aeronautics.

His dream was an airship of unprecedented size by which the awaiting airways of the world could be opened up, and he set about raising funds to build it. On Lake Constance he constructed a vast floating hangar, which, by cables, always had its door end facing against the wind. In this, work on the ship was began in 1892, and two years later the first 'Zeppelin' was ready for trials. It took the form of a 420 feet long, 38 feet diameter, 24 sided prism with tapered ends. The 'Meccano-like' framework was of aluminium for lightness. It had 17 compartments, each containing a gas-bag. Over all was a linen and silk covering. Underneath the cigar-shaped hull were hung two cars carrying a 16 horse-power engine in each and accommodation for the crew. The first attempt to get the ship into the air was not at all successful, and some damage was suffered. But the second attempt was better and a speed of 20 miles per hour was reached. It became apparent that there were fundamental errors in design. The framework was not strong enough, the gas-bags were not tight and the engines under powered. One report states the ship was wrecked in landing. Five years later the Count had another ship completed, and this made two successful flights. Unfortunately it was completely destroyed by a windstorm in January, 1906. Following these and other set-backs the Count's faith in his dream began to wain, but his Government urged him to continue with his experiments. By the end of 1906 Zeppelin III took to the air, and from that time onward his ships made steady progress.

Zeppelin may have had at the back of his mind, although he did not say so, that the dirigible, in addition to purely commercial work, would figure in plans for war. Indeed, this did transpire. During the 1914-18 war the Germans used dirigibles for patrol work over the North Sea, and sent them on raids over France and Britain. They did much damage, but their morale effect was much greater. The defenders, however, worked out new techniques to combat this hazard. These leviathans of the skies proved to be vulnerable to incendiary shelling and attacks by aeroplanes, quite apart from adverse weather conditions. So, after learning the hard way, they were withdrawn from the war scene. By this time Zeppelin was dead.

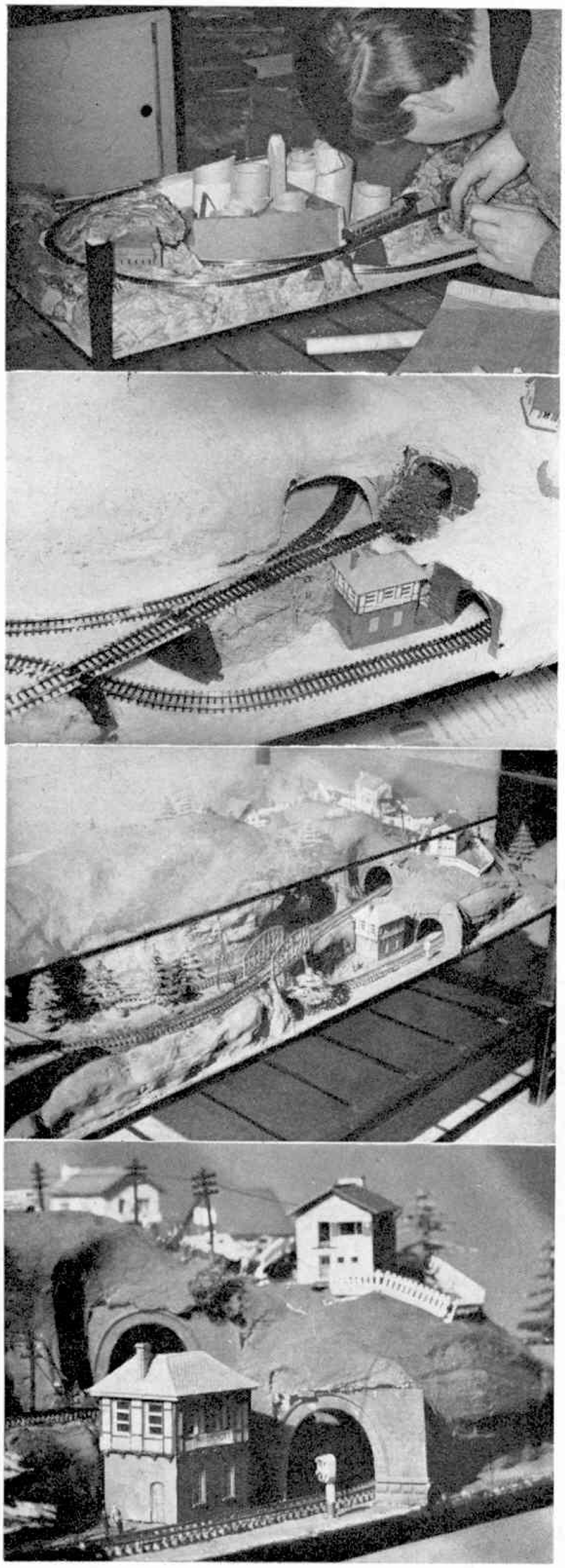
After the 1914-18 war ended various leading countries took up building dirigibles, making many spectacular developments, flights and calamities. Their vulnerability to weather and other agencies was never overcome, so the wheel of fortune turned a complete circle and no more were made, and the heavier-than-air craft gained the ascendancy.

One sees in Zeppelin that great self-impelling urge that is inseparable from all inventors. It is hard to believe he was fifty-four before he finished his first design for a rigid airship. Fortunately he did not see the demise of this brain-child. He died at Charlottenburg on March 8, 1917, aged 79.

BUILDING AN 'N' GAUGE LAYOUT

CONCLUSION

SCENERY



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THIS IS the last instalment of our layout building series, and we are going to talk about the last thing to be tackled when constructing a model railway—the scenery. Once, not so many years ago, the construction of hills, valleys and scenic effects generally was a very hit-and-miss and somewhat messy business. Papier Mache was a popular substance to use for hills and cuttings and, although it is undoubtedly cheap and there is nothing to stop anyone from still using it, there are much more modern and satisfactory methods available today. Perhaps the best known is Mod Roc, a plaster reinforced fabric which you can buy from your local model shop. We have described how to use Mod Roc before, but a recap will not come amiss, and the photographs on this page will speak for themselves.

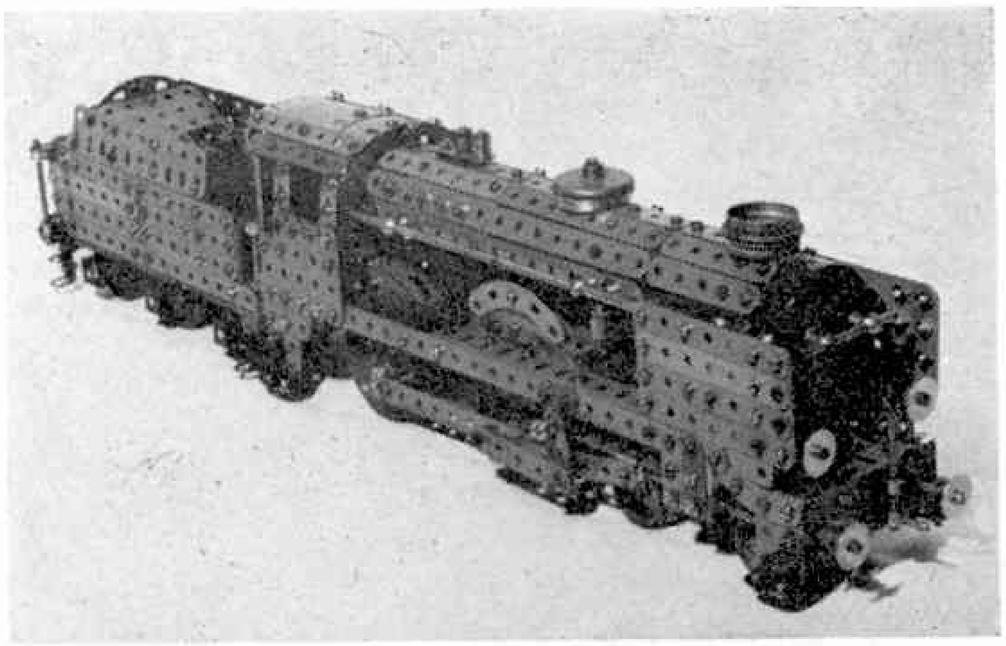
When one reads the instructions on the Mod Roc packet—how the material is wetted in a bowl of water, and then smoothed into any shape required—it is sometimes very tempting to rush for the nearest water tap, fill a bowl, and let artistic talents run riot. But wait ! Mod Roc, ingenious as it is, will not support itself. Our hills must have a foundation; something must hold the Mod Roc covering in approximately the right shape. Our first photograph shows a motley collection of old cardboard tubes and bits of screwed up newspaper standing in a heap in the middle of a small N gauge layout constructed in the *Meccano Magazine* office some while ago. Modern art ? Well, perhaps it would pass for such, but in fact it is only the foundation for a small mountain ! The second picture shows what the mountain looked like *after* the layer of Mod Roc fabric had been applied and carefully smoothed to the shape we wanted. (You've no idea how satisfying this is to do if you've never done it.) When the Mod Roc has dried out it is really very strong, and very very white. Looks like a snow scene, and so attractive in its way one feels loathe to paint it. A model railway locked in perpetual wintertime is probably not a good idea, though, so paint our hills and mountains we must. We have found that most sorts of paint are satisfactory for using on Mod Roc, although you may need to apply quite a lot as the material is hygroscopic (ask Dad or look in a dictionary!)

Pictures 3 and 4 show the general effect after painting. Mix plenty of yellow with green for grass—real grass is not quite so green as you may think. Picture 4 shows a rather untidy " edge " of Mod Roc overlapping one of the tunnel mouths. It needs tidying up, but we did not even notice it until we saw it in the photograph.

Model scenery is a big subject, and to try to cover it in one article would be hopeless, so we will elaborate on further aspects some other time in *Meccano Magazine*. In the meantime, if any of you have a go, please let us know how you get on. We can still learn a trick or two, and would very much like to see photographs of your efforts.

MECCANO CONTEST '70

by Spanner



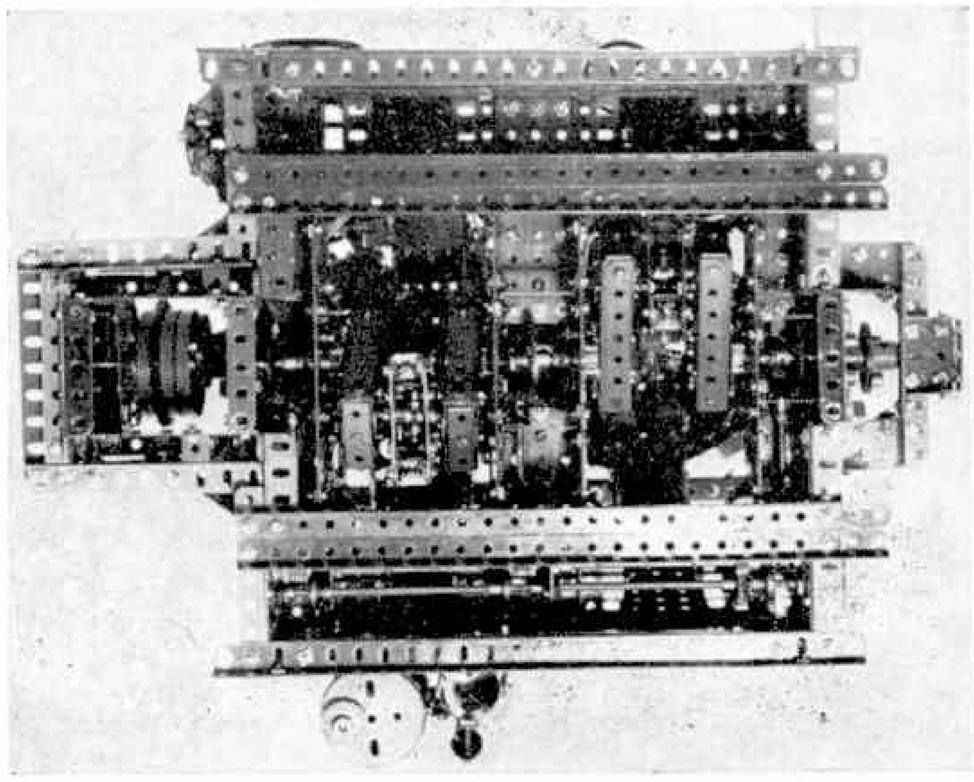
Railway locomotives, especially steam locomotives, are great favourites in all "open" model-building competitions, and at least one manages to carry off a prize of some sort. Last year's contest was no exception as Stanley Jones will verify. Mr. Jones produced this interesting model, pictured above, and won for himself £1. 1. 0. The model is particularly noteable for its use of Strips in place of Flexible Plates, which makes the Locomotive rather reminiscent of pre-war models, when Flexible Plates did not exist.

NOW THAT the dark nights are at their longest in the Northern Hemisphere, you Meccano modellers will be well advanced with your building, but there's no need to keep your masterpieces to yourself ! Let Meccano Limited see just what you've been producing —and give yourself the chance of winning a valuable cash prize into the bargain. How ?—By entering this winter's Meccano model-building competition, now open !

Open to all

As in past competitions "Contest '70" 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 quantity of parts which may be used or the number of entries which may be submitted, although no one will be awarded more than one prize. 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 your own, unaided work and must be built of standard Meccano parts.* Non-Meccano parts will only be acceptable—and that at the discretion of the judges—either when completely unavoidable, as in the case of designing machines pens, etc., or when used as unnecessary "extras" such as fire engine hosepipes, locomotive nameplates and so on.

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, the 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 if you don't own a big stock of Meccano. The Contest closes on April 30 for competitors in the U.K. and Ireland and three weeks later, on May 21, for overseas competitors.



In every country throughout the world, Meccano enthusiasts are constantly reeling off varied and interesting Meccano models. Holland particularly, is the home of many ingenious modellers. One such Dutch enthusiast is Mr. H. Groen of Badhoeve Dorp, who gained £1. 0. 0. prize in section B of last year's contest. His model was based on a 2-cylinder Compound Steam Engine, and incorporated just about everything to be found on the original engine. Our picture, right, is an underside view showing the complexity of the built-up cranks.

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 and 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; ten prizes of 10s. 6d. Section B, 1st £7.7.0; 2nd £5.5.0; 3rd £3.3.0; ten 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 the sketch prepared for you. It is also advisable to include a short description of the main features of the model with your entry, mentioning any points of interest 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 according to the section for which you qualify, and forward to "Contest '70", 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 stamped addressed envelope or, in the case of overseas entries, 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.

Good luck !

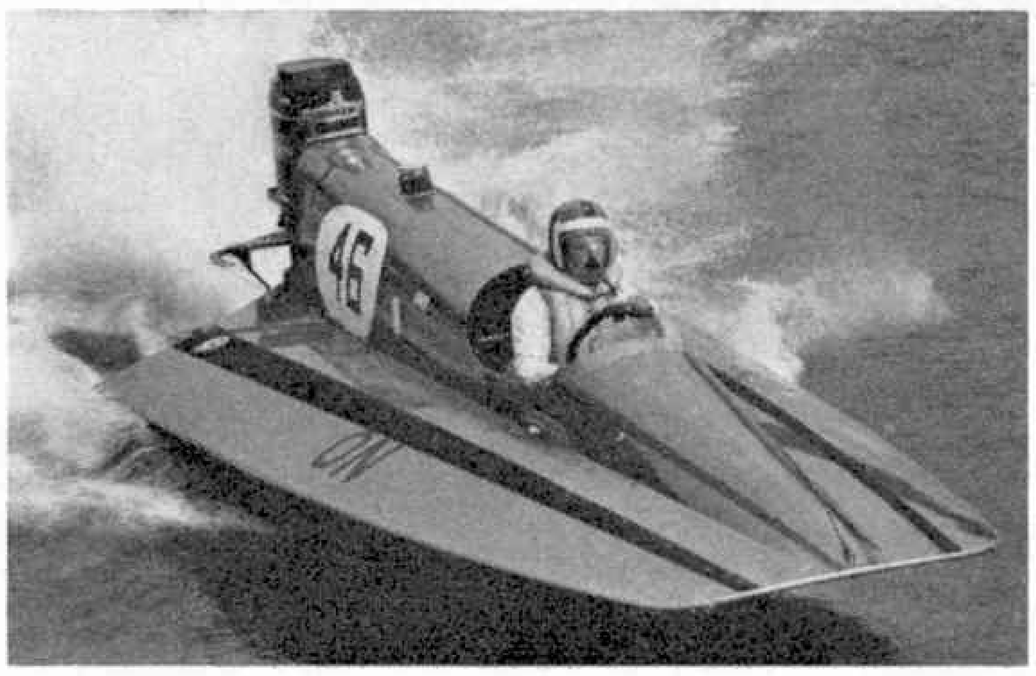
BIG names in outboards

R. H. WARRING

THE OUTBOARD motor is still regarded by some people as only being suitable for powering dinghies and small runabouts, in fact nothing could be further from the truth! The outboard motor offers a complete power-pack for boats, with production models ranging in size from a little under 1 horsepower to approximately 125 horsepower. The latter with a little 'tweaking' can develop 150 horsepower or better and represent a serious threat to much larger inboard engines for offshore racing. Given a suitable hull you can increase power—and speed—simply by adding another engine. The offshore racing enthusiasts at present favour three outboards mounted together, which on a 27 ft. hull gives the same sort of speed that would demand nearly twice the power with an inboard installation; mainly because of the saving which can be realised in overall weight. And it makes for a cheaper installation. Already the Americans are trying four, and even five, outboards mounted side by side on a suitable strengthened transom, rivalling the 70 m.p.h. plus achieved by the very fastest inboard offshore racers.

Of course, when you come to the big stuff you are no longer talking about a portable unit which you can readily lift onto or off the transom of a boat. The heart of the unit is a near-2 litre engine (a vee-four or a straight-six), enclosed in a massive cowling surmounting a bulky drive shaft casing and underwater unit. The whole lot weighs over two hundredweight—so you need a hoist to lift it—but it is still only half the weight of an inboard or inboard-outboard unit of the same power. It's a far cry from the dinghy-size outboard which you can easily carry in one hand (and some even fold in half for compact stowage in the boot of a car); or from the original Evinrude outboard of 1909 which developed ½ horsepower and weighed 62 pounds (and, incidentally, cost 62 dollars or 'a dollar a pound').

Mercury, Evinrude and Johnson are the big names in outboards—Evinrude and Johnson being indentical units in different 'packaging'. Crysler is another big name coming to the fore, but not yet in the racing field. They took over the American West Bend models and completely redesigned and modernised the range. British successes have been sadly lacking, with one or two notable exceptions.



Our heading photograph shows an ocean racer powered by four *Mercury* Outboards. Left: Outboards such as this can reach speeds of over 90 m.p.h.

British Seagull have continued to enjoy a world-wide reputation for the reliability of their low-power, low-cost 'workhorse' outboards since they introduced their first lightweight single-cylinder model in 1933. British Anzani have also continued to produce low powered models since the early 1930's, and also achieved successes with their 250 cc and 350 cc racing outboards until the American models virtually took over this field. They also took over the Perkins range in 1955 (which was originally the American Oliver), but again that could not stand up to American competition and simply faded from the scene.

It is not surprising that the Americans do dominate the outboard motor production field, particularly in the larger sizes, for their industry is based on something like sixty years of continual development, and large sales. They have the know-how, tooling and the capital investment behind them—plus huge world-wide sales.

It all really started when an American student, Cameron B. Waterman, hit on the idea of coupling a petrol engine to an underwater propeller via a vertical drive shaft and bevel gear drive in an integral unit which could be fastened to the stern of a small boat. This was tooled up for production as the Waterman 'Porto', first appearing at the New York Boat Show in 1906. It sold twenty-five that year, but was so successful that production rose to three thousand in the next two years, and six thousand by 1909. In fact, the Waterman 'Porto' continued to be manufactured until 1924.

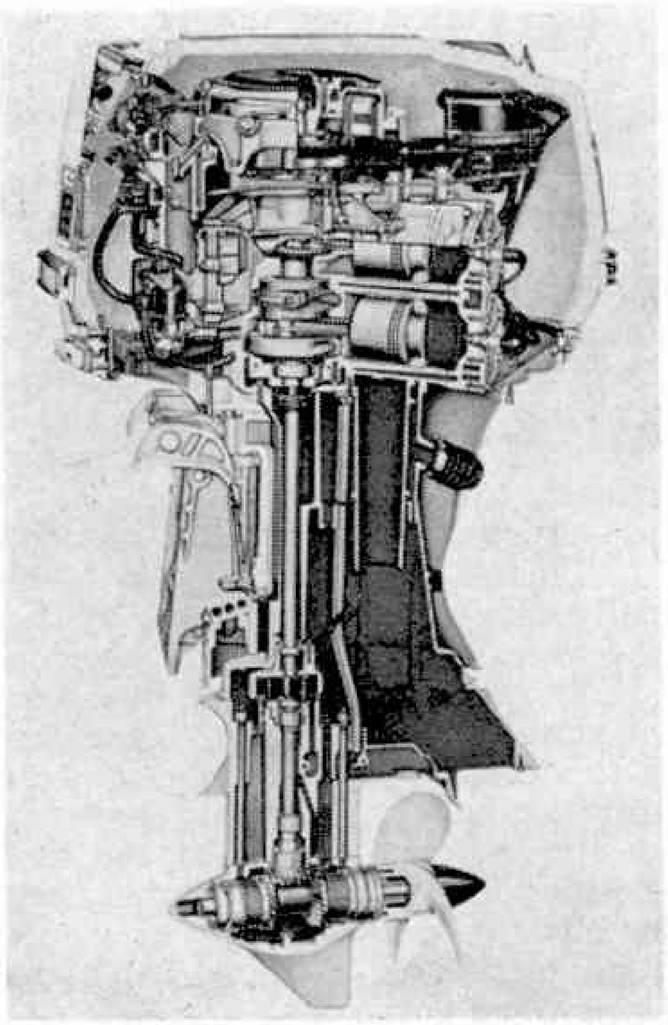
In 1909 Ole Evinrude appeared on the scene, setting up a firm to market his own design of outboard with certain refinements over the 'Porto'. One noticeable difference was that the Evinrude outboard located the cylinder horizontally (as do all modern outboards) whereas the 'Porto' has a vertical cylinder, calling for additional gearing to drive the vertical downshaft. At any rate, Evinrude was soon producing his outboard in thousands, and selling internationally, particularly to Scandinavia.

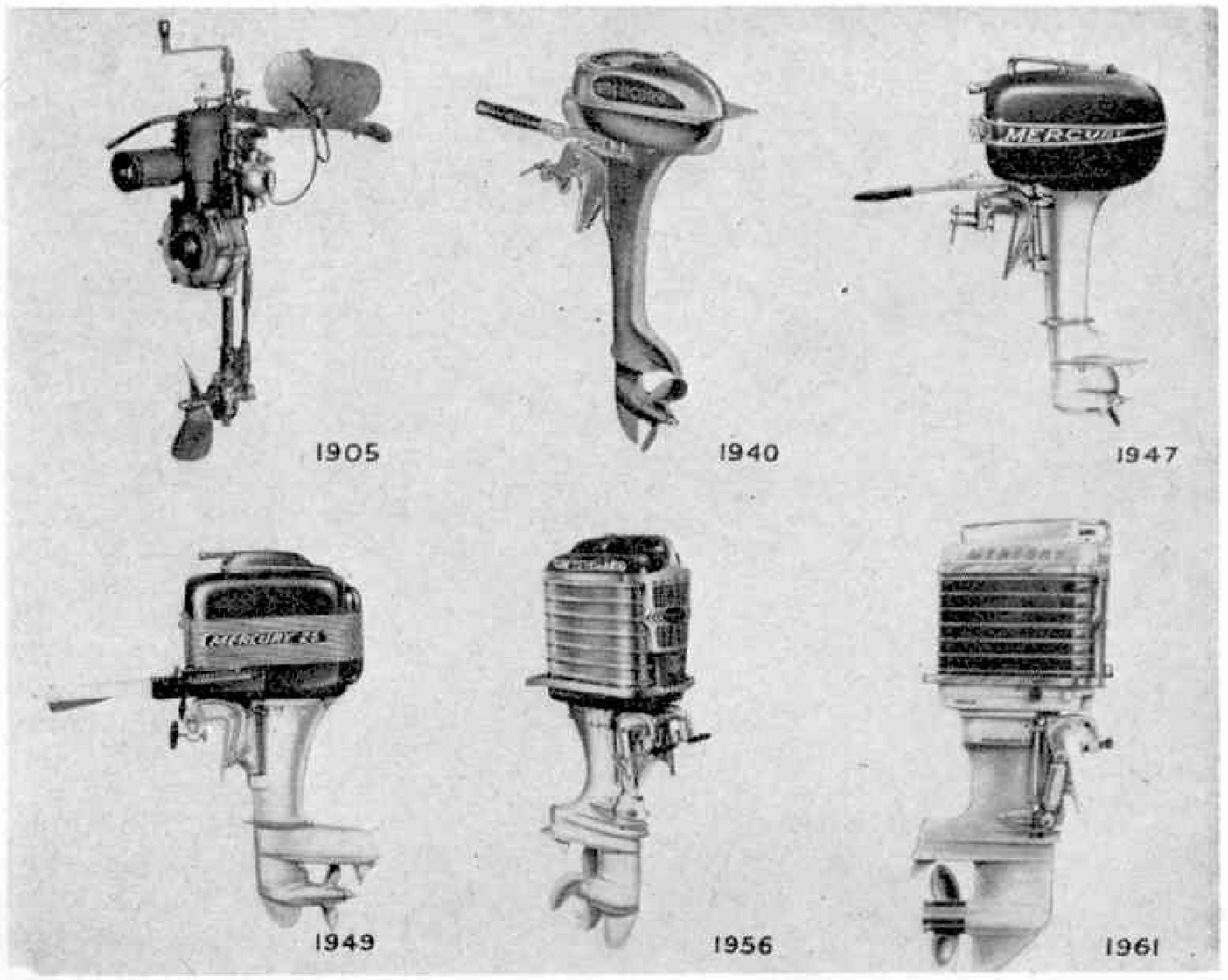
For various reasons, Evinrude sold out his business in 1914, the new company continuing to produce 'Evinrude' models. In 1921 Evinrude himself was back again—first trying to buy back his old company and, when that did not succeed, starting up on his own again with 'Elto' outboards. After a shaky start, 'Eltos' were eventually outselling 'Evinrudes', although there was very little difference between the various models. Finally, in 1928, Elto and Evinrude

A far cry from the World of racing, the versatile outboard is shown here powering a small Dingy.

Seen below is a selection of *Mercury* outboards covering a period of nearly 60 years.

A cutaway drawing of the *Johnson* Sea-Horse outboard.





The outboard powered boat has rapidly become a firm favourite with the increasingly popular sport of water ski-ing.

merged as Outboard Marine, manufacturing only Evinrude outboards

Meantime three brothers, Lou, Harry and Clarence Johnson, had started the Johnson Motor Company to produce outboards in 1921. First year's production was 3,000 motors, rising to 7,000 the following year. Their real success came when they introduced the twin-cylinder outboard—a 6 horsepower model in 1925—from which type they continued to develop bigger and more powerful outboards, and capture virtually all the speed records for outboard powered boats. By the end of 1929, of the thirty-nine records established by outboard boats, twenty-six were made by Johnson motors (and of the remaining thirteen, twelve were in classes in which Johnson did not make motors). Then, just as they were at their crest, the Johnson Company was hit by the depression of the early 1930's and eventually merged with Outboard Marine in 1936. From that time on Evinrude/Johnson models have continued to be produced as twin, identical ranges; and in post-war years when models were up-to-date in design, older models continued in production under the Gale name.

The 'Mercury' outboard was a very much later starter. A brilliant engineer, Carl Keikhaefer, took over a defunct factory in Wisconsin in 1939 and found, amongst the 'assets' a large number of completed outboards. These had been ordered by a mail-order firm, but rejected by them because their performance was unsatisfactory. Rather than junk the lot, Keikhaefer decided to strip and rebuild this unwanted stock—properly. So successful was he that not only did the original firm take back the outboards, but placed several more bulk orders for the same model that year. Next year he was selling still more to the same customer—and several more mail-order firms, all under different brand names. Good business, maybe—but not the best way to establish a reputation for 'Mercury'. So in 1940 Keikhaefer decided to go it alone with the 'Mercury' range—and from that time on never looked back. In a few years Mercury's dominated the racing and record field.

Very few firms other than Johnson, Evinrude and Mercury make big outboards. In America, Crysler make a range up to 105 horsepower; McCulloch models up to 75 horsepower; and Fisher-Pierce a 55 horsepower model. Carniti of Italy—along with Mercury probably the most popular type for outboard racing in Europe—make a range of models up to 55 horsepower and a limited number of larger racing motors. In Sweden, Crescent Marine and Penta also make models up to this size. No British-made models are currently in production above a size of 5 horsepower.

Yet strangely enough in the very early days from just before World War I up until about 1930 outboard manufacture thrived in this country, there was a considerable interest in outboard racing and some excellent high-powered outboards produced by British manufacturers for the sporting enthusiast, capable of performing with the best of foreign competition. But there were just not enough customers to make 'big motor' production a commercial proposition in this country at the time. When there was—starting in the 1950's—it was too late. The American manufacturers virtually dominated the world markets.

Practically all modern outboards have one thing in common. They are all two-strokes. There are the few four-stroke models which appear from time to time, with the attraction of greater fuel economy and somewhat smoother running—but they generally lack revs and are usually more troublesome in the long run. Outboard motors are one field where the two-stroke has reigned supreme for over sixty years, and it is unlikely that the four-stroke outboard will ever make its mark.

But the two-stroke engine is greedy on fuel. You can reckon on a fuel consumption of about one-tenth of a gallon per hour per horsepower. That means a 125 horsepower outboard is going to gobble up over 12 gallons per hour at full throttle. A four-stroke *would* be more economical—and a diesel even better. Scott (McCulloch) did introduce a 15 horsepower diesel outboard in 1963 but, like the four-strokes, it never made the grade and remains forgotten.

There is one other approach to economy, though. The electric outboard. There's one horrible snag, however. Even with a really efficient electric motor, by the time it has driven the necessary shafting and gearing it will need about 1200 watts of electrical input to produce 1 horsepower at the propeller shaft. Thus for an electric outboard to develop just *one* horsepower, powered by a 12 volt car battery, it would have to draw 100 amps from the battery! Think of the size and weight—to say nothing of the cost—of the battery for a 100 horsepower electric outboard! Electric outboards have been in production since the early 1950's—but all are very low-powered units.

On warm summer days what could be nicer than a fast run across the bay in a speedboat?

Barry Orr

invites you to build a working

SIMPLE STEAM ENGINE

THE SIMPLE steam unit illustrated, can be made entirely without the use of a lathe or any special tools. A Valtock blowlamp, or similar, a file and a junior hacksaw are the main tools needed and no previous experience in steam is required.

An oscillating steam engine is the simplest form of steam power that gives any sort of decent power and this little puffer pushes out more than sufficient power to drive a number of models. The cost, including a bought boiler, is well under thirty shillings.

Construction

Before making a start on your own engine, study our illustrations and read the instructions until a good idea is gained of the general layout.

The heart of the engine is the cylinder unit and this is made from a 1½ in. length of thick-wall brass tubing with an inside diameter of ⅜ in. The piston is made from a short length of brass rod, ⅜ in. in diameter. Buy about four inches of both these items longer than you require, to give a good grip when "lapping" them in. As bought, the rod will be a very tight fit in the tube. Using a little patience and lots of "Brasso" they will soon become a good sliding fit.

Saw the cylinder to length and then saw off a ⅜ in. length of the rod for the piston. The piston should be drilled to a depth of about ⅛ in. in one end to locate the connecting rod (made from silver steel rod or any suitable piece of scrap axle). One end of the cylinder is plugged with a ⅛ in. length of the rod, which is soldered in place later.

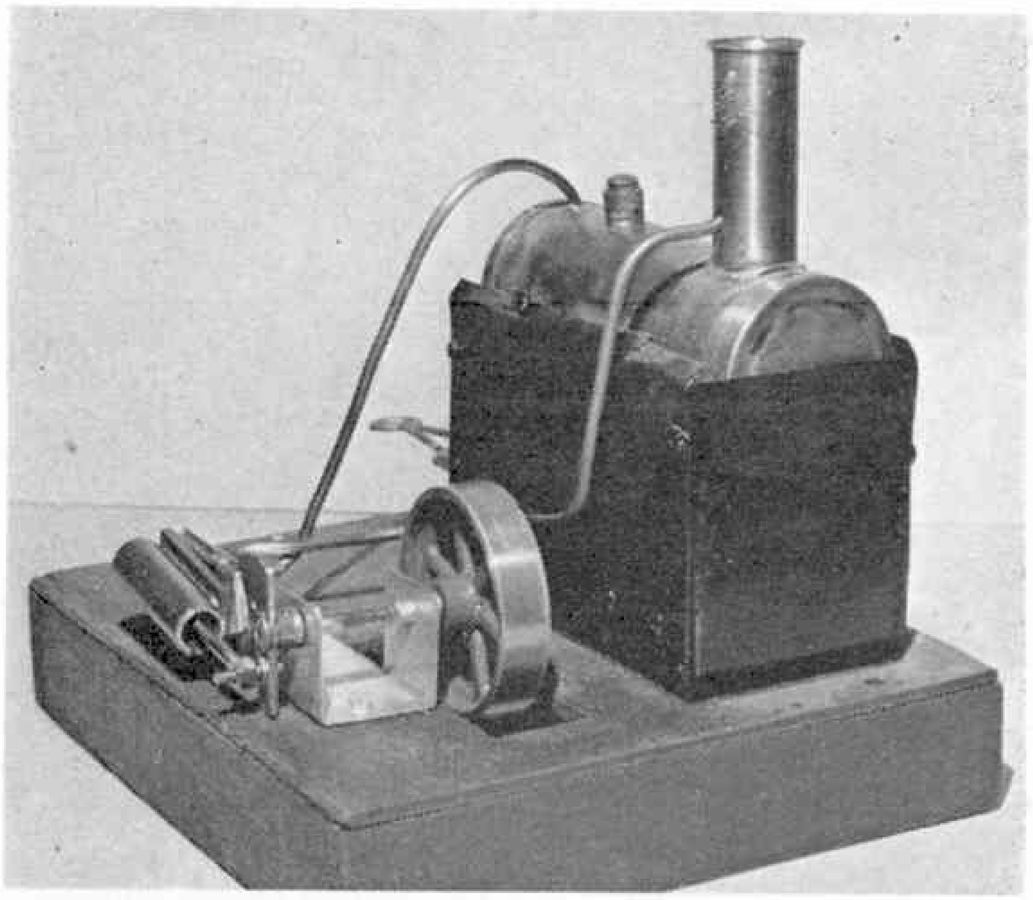
Two pieces of ⅛ in. thick brass measuring 1⅜ in. by ½ in. are required to make the standard and valve plates. Take the standard first. This is drilled 7/64 in. in the diagonal centre to take the pivot pin on which the cylinder oscillates. The cylinder is now soldered to the standard and this is made a lot easier if wire is used to bind it in position during the soldering. The cylinder should be located approximately an ⅛ in. in from one end of the standard. Insert the cylinder plug and saw the head off a 6 BA bolt (about 1½ in. long) and locate in centre hole. Bind the lot together and solder, ensuring a good run of solder along the full length of the cylinder where it makes contact with the standard.

Next drill a 7/64 in. hole through the standard so that it emerges at the very top of the cylinder, just inside the end plug. This is the steam port.

The valve plate has a hole drilled in the centre of the diagonals, to just clear the pivot pin soldered to the standard. Do not drill the steam and exhaust ports at this stage.

The engine bracket is bent up from tin, that from an old tin tray being ideal. The drawing gives the dimensions.

The valve plate should now be soldered to the bracket and the assembly allowed to cool before drilling out the centre hole through the tin of the bracket. The



The completed steam engine, constructed without the need for special tools.

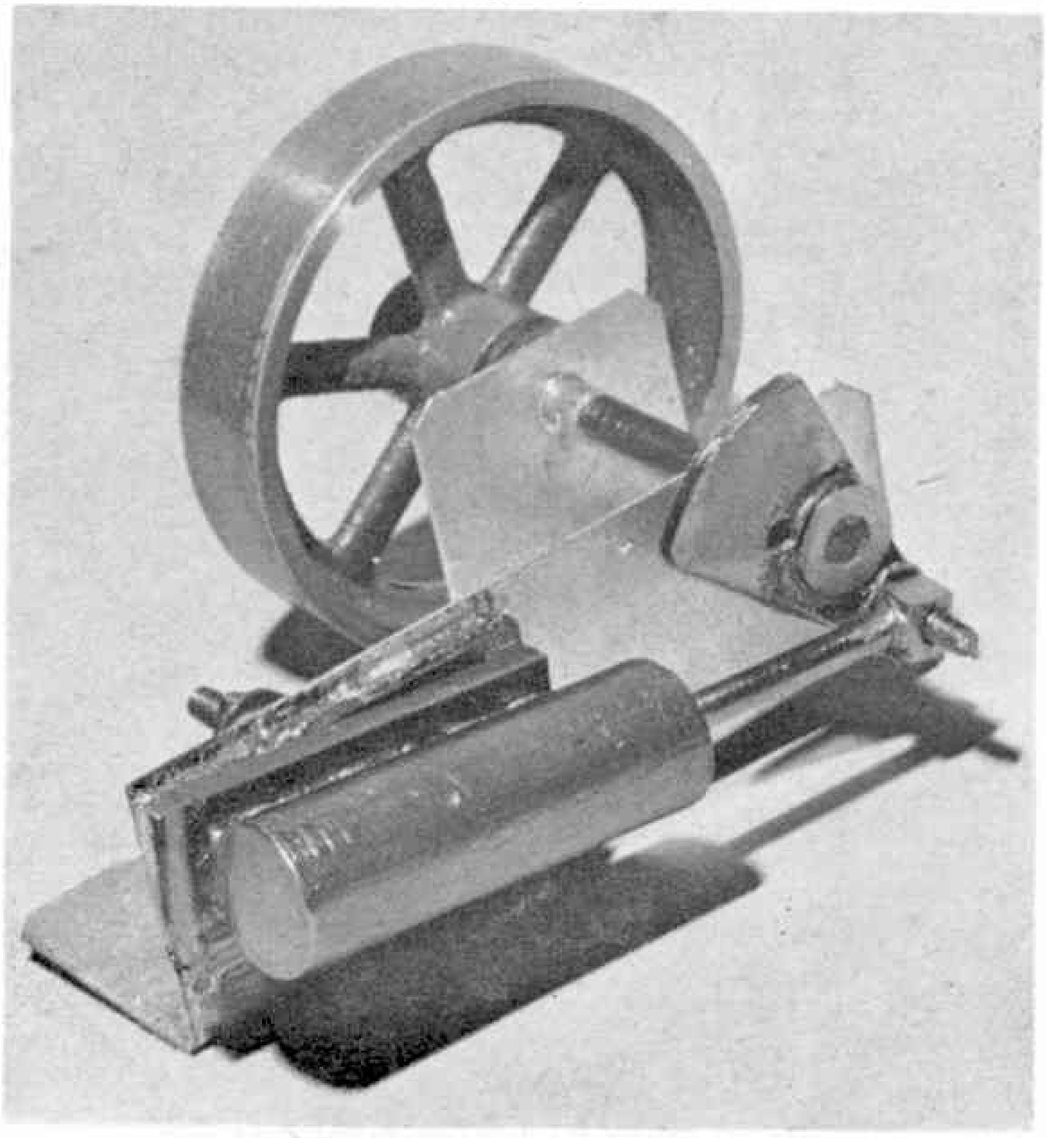
bearing holes should be drilled to take the flywheel shaft. These should be drilled at the same height from the bottom of the bracket, as the pivot hole in the valve plate.

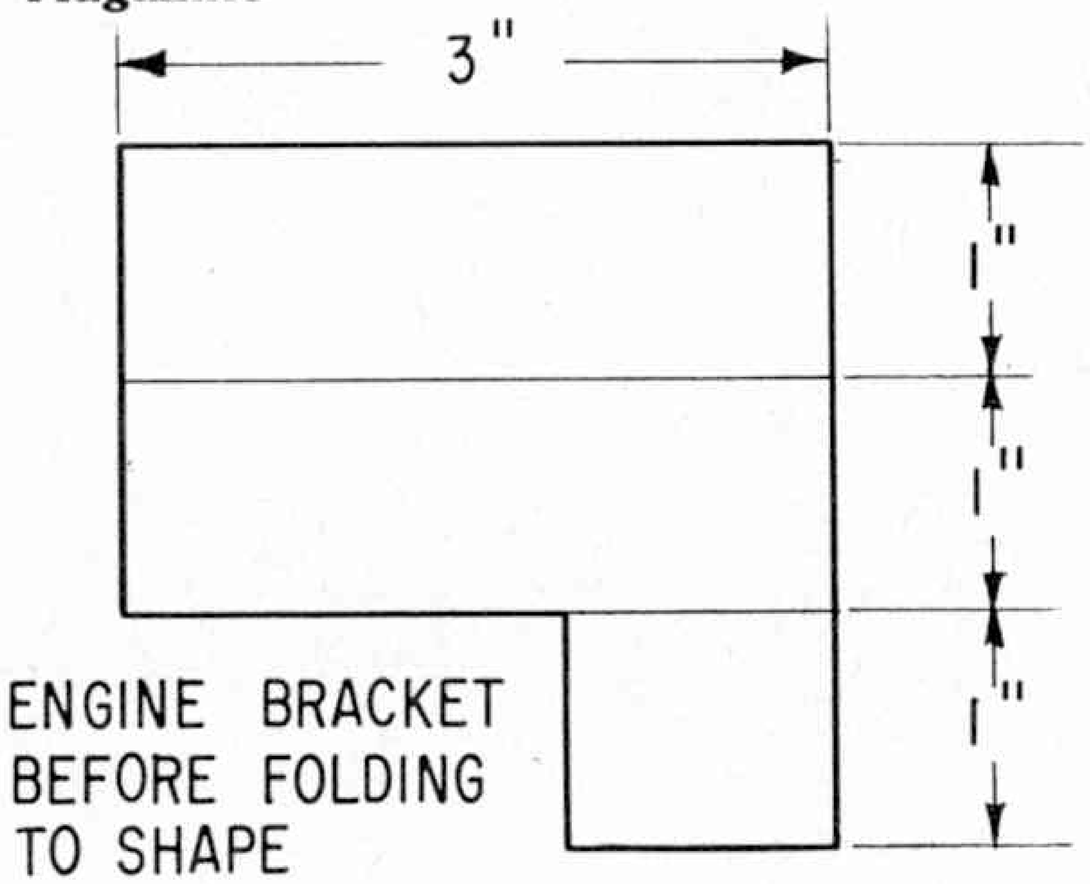
Now the piston. Saw the connecting rod to the correct length (see drawing) and file the big-end from a small piece of scrap brass and solder in place. Note that the distance between the end of the piston and the centre of the hole in the big-end should be 1½ in. It is a good plan to drill the end of the big-end slightly to take the connecting rod.

Base

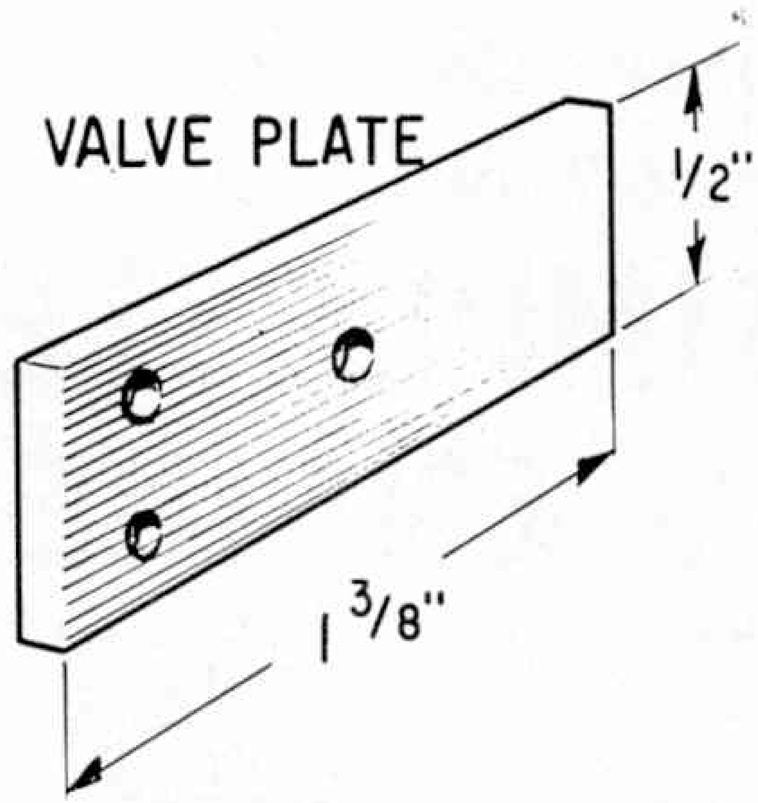
A simple base should now be made from a piece of plywood and two end pieces (see drawing). A slot

A close-up view of the flywheel and piston, showing its simplicity.

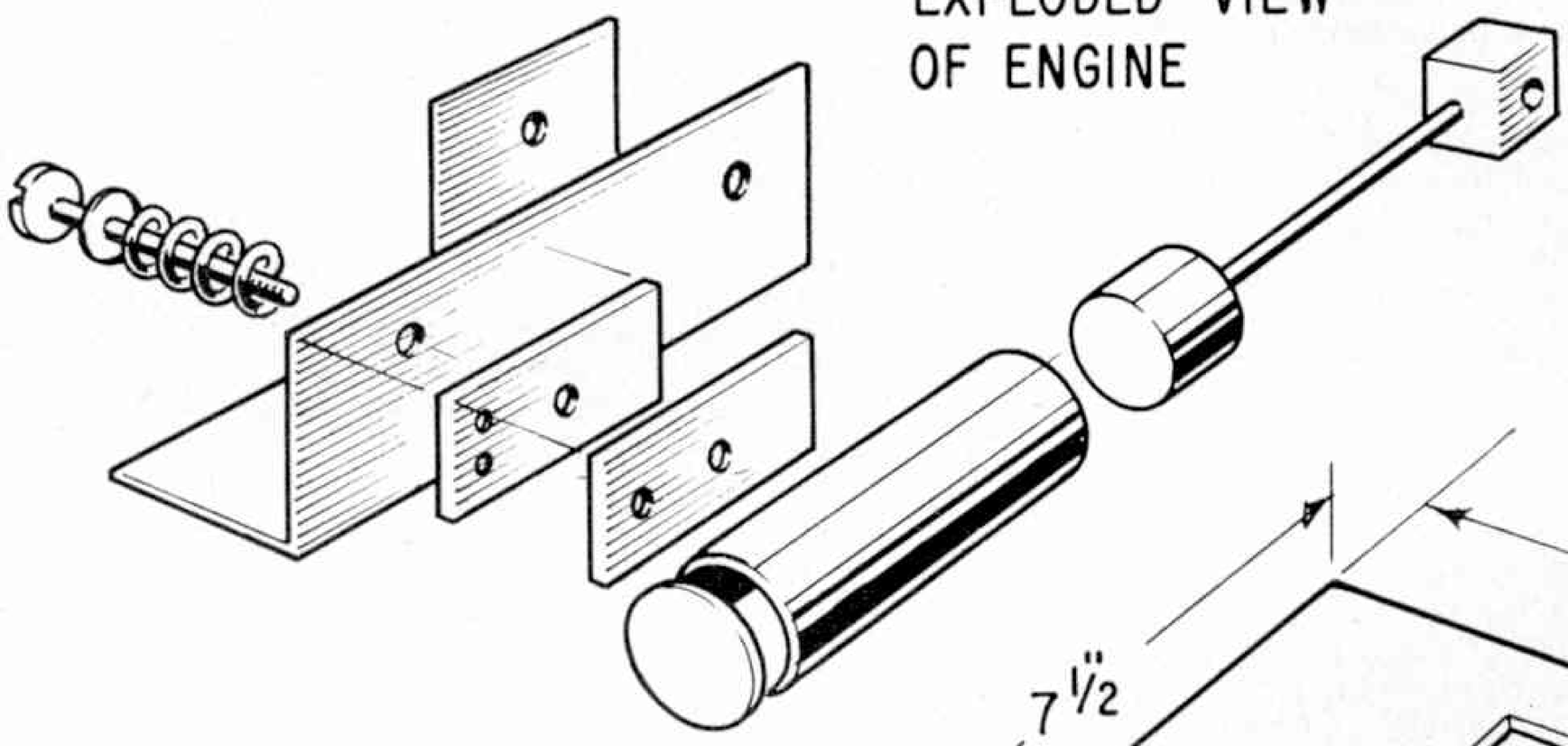


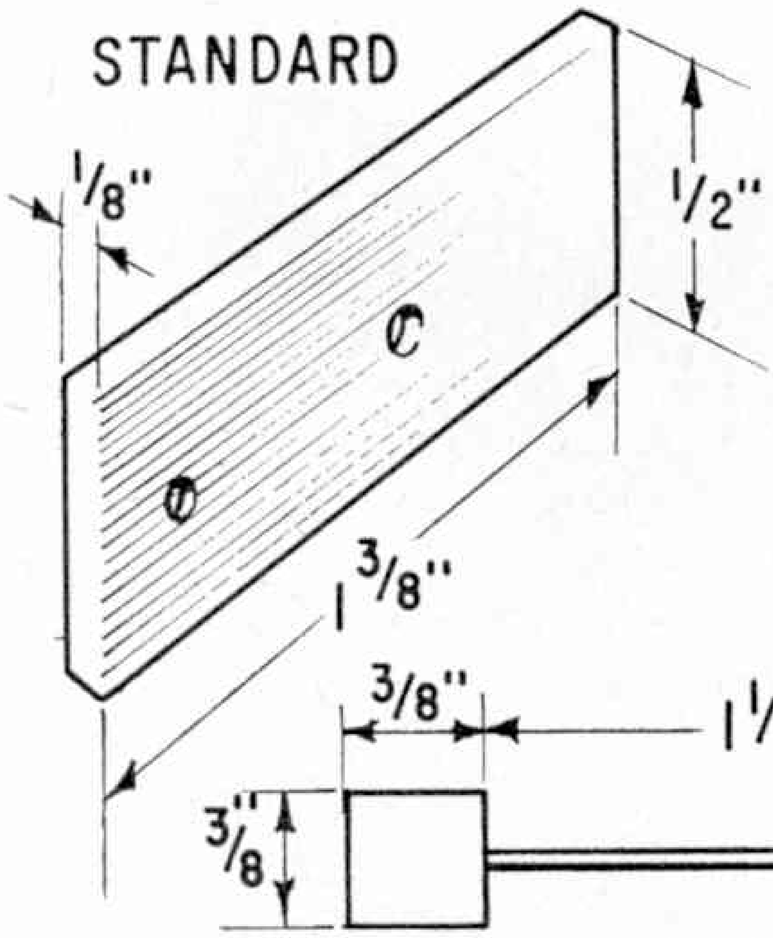


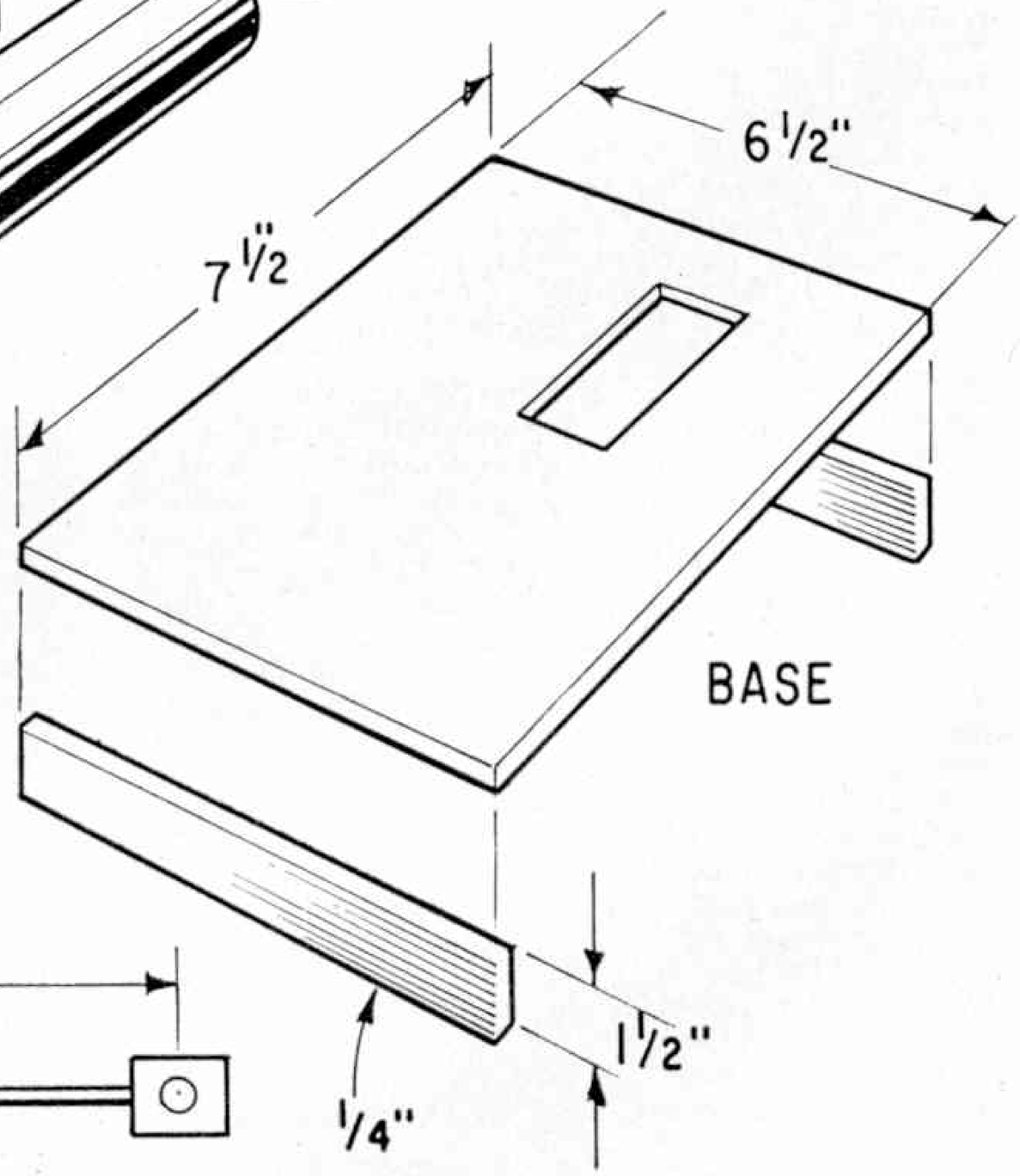
ENGINE BRACKET BEFORE FOLDING TO SHAPE



EXPLODED VIEW OF ENGINE







PISTON CONNECTING ROD AND BIG END

measuring 3 in. by 1 in. should be sawn out to clear the flywheel. Mount the engine bracket on the base, using wood screws.

A 2½ in. length of axle is now fitted in the bearing holes and the flywheel secured. The flywheel can be a Meccano artillery wheel or one of the Mamod range. The crank can be cut and filed from scrap brass or, as in the original, may be made from an old stripped Meccano gear, sawn to segment shape to provide a balance weight for smooth running. The crank pin (a 6 BA bolt) is located $\frac{5}{16}$ in. from the centre.

Locating steam and exhaust ports

While the majority of dimensions given so far have only been given as a rough guide, the following simple instructions should be followed closely.

Using nail varnish or shellac as marking fluid, paint the surface of the valve plate and allow to dry before assembling the engine. The cylinder unit is kept in place by a light spring, held by a washer and nut on the engine bracket side. The nut should only be tightened sufficiently to ensure a firm but not tight fit between the standard and the valve plate. With the engine assembled turn over the flywheel a few dozen times by hand. Now strip the engine and you will find that the hole (steam port) in the standard has left a curving mark on the nail varnish on the valve plate. The steam and exhaust ports are located at the ends of this mark, the outsides of the 7/64 in. holes forming the outer curve. Drill these holes 7/64 in. and re-assemble the engine to ensure that, with the crank first in the vertical top position and then in the vertical bottom position, the steam and exhaust ports coincide with the steam port in the standard.

Boiler

It is not recommended that the beginner to steam attempts to make his own boiler. Messrs. Mamod Ltd., make a range of extremely efficient boilers, complete with safety valves and it was the smallest of these that was used in the original. The boiler housing is made up from tin and bolted together with Meccano nuts and bolts. Do not forget to punch out sufficient air holes along the bottom to allow the engine to breath. The square opening at one end is cut out to allow free entrance for the burner (once again, this may be bought or folded up from tin and stuffed with asbestos wool).

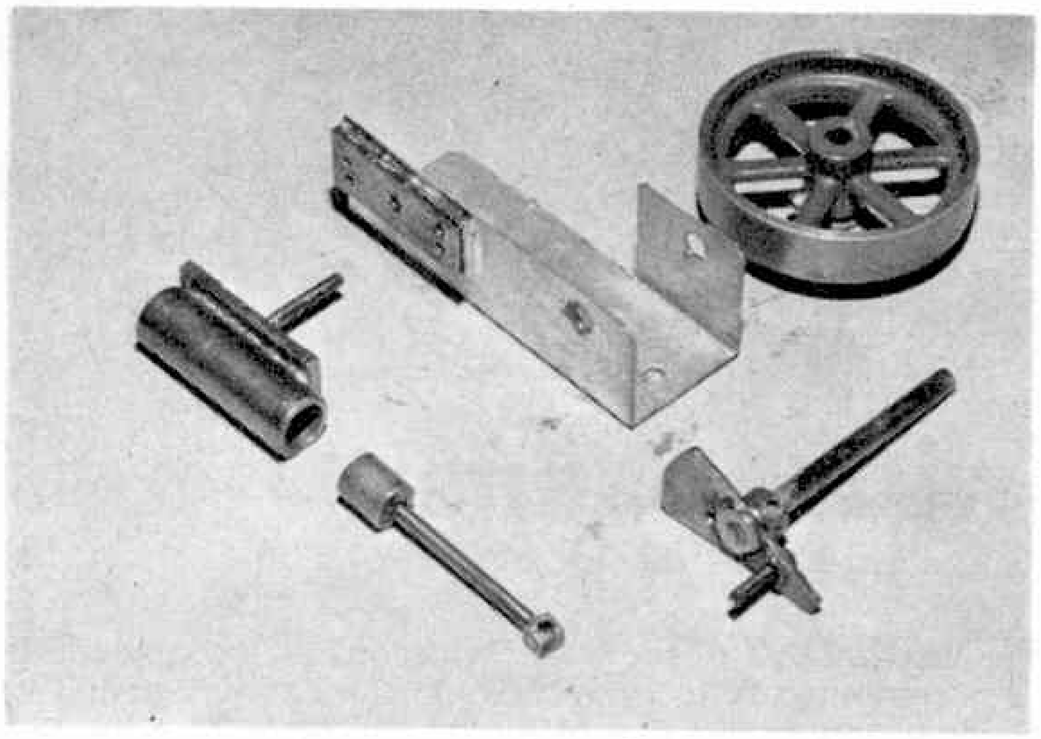
The boiler sits on two simple curved brackets but before locating the boiler, screw the housing to the base with wood-screws.

After removing the safety valve from the boiler, solder the steam pipe in place and bend it round to line up with the ports in the engine bracket. When soldering the steam and exhaust pipes to the valve plate, remove the cylinder unit and bolt the valve plate to the bracket to ensure that it remains in its exact position should the solder holding it melt when the pipes are being soldered.

Hook up the other port to the chimney and the end is in sight!

Important

Do not fool around with a steam engine. If carefully run and commonsense is used, there is no danger. Here are a few important points for safety of operation. Ensure that the boiler is always between half and three-quarters full with water before firing. When filling the burner with methylated spirits, do not spill any. If this happens, wipe it up before lighting the burner.



An exploded view of the piston assembly showing the five main parts.

Steam engines love oil so apply liberally to all moving parts, particularly the cylinder bore.

All set? Light the fire and sit back and await the sizzling sound that precedes the first burst into life! Turn the engine over by hand a few times to clear away any condensed water that may be in the pipes or cylinder. Then let her rip!

Driving models

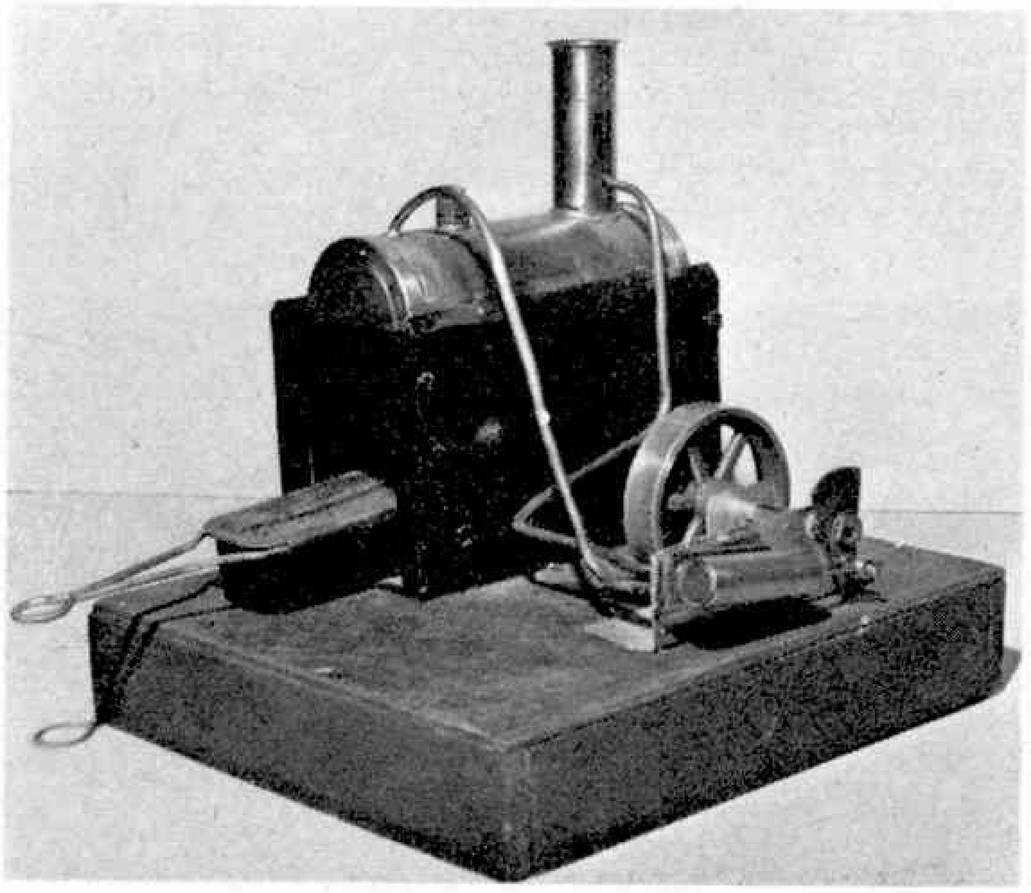
While the Mamod flywheels all have pulleys built in, if a Meccano wheel is used it will be necessary to add a small pulley.

All materials, brass, steam tubing, etc. may be obtained from most plumbers suppliers for a few shillings.

Difficulties ?

If the little puffer does not spring into life soon after steam up, check the following points. Are the steam and exhaust pipes clear of dirt, solder, etc. ? Do the ports coincide with the steam port in the standard? If not then make another valve plate, or reverse the old one and start the timing operation again. Ensure that the spring holding the cylinder unit to the valve plate is not too tight.

A rear view of the completed unit in full working order.



AMONG THE MODEL BUILDERS

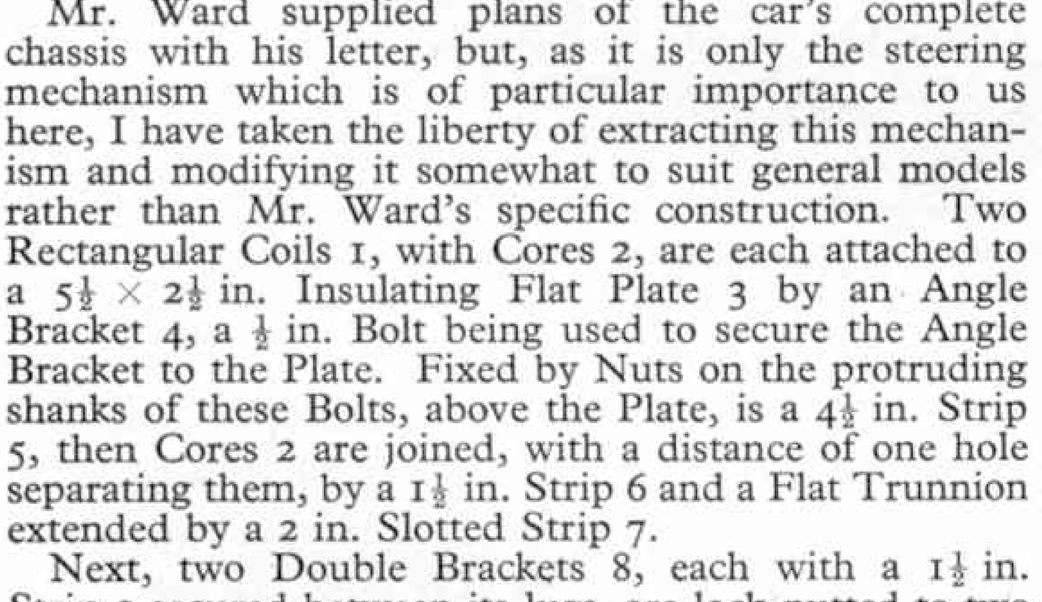
with Spanner

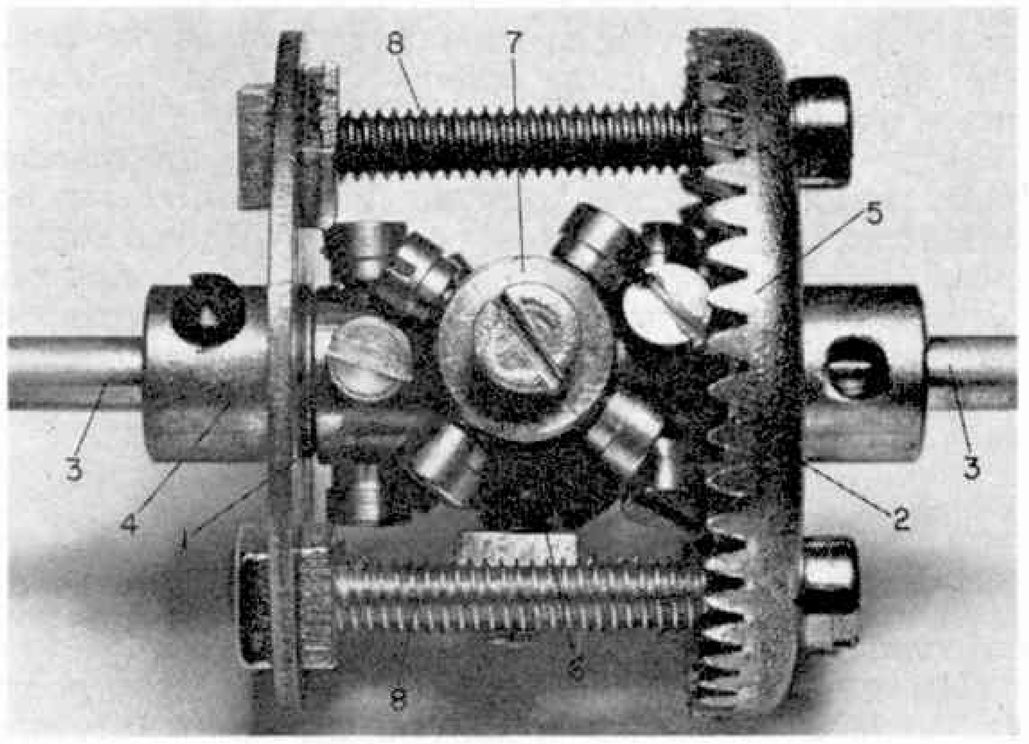
EVERY DAY of the week, without fail, a considerable amount of Meccano correspondence from modellers appears on my desk. All of it is carefully read and much of it contains some very useful ideas, but it is particularly interesting to find over a period of time that we have a hard-core of " regulars ": M.M. readers who write fairly frequently and often with more than the usual amount of suggestions to offer. Naturally enough, these modellers are mentioned regularly in the magazine—not because of favouritism, but simply because of their ideas—and we begin this month with a suggested mechanism from one of the regulars, Mr. Timothy Ward of Bristol.

In his last letter to me Mr. Ward writes, " I have noticed in the Meccano Magazine from time to time articles dealing with remote-controlled models, but these have all used a motor of some sort for steering. As I cannot afford to use motors for small jobs like this (if I did, I would need six or seven motors !), I have worked out a simple method using Elektrikit Coils, which I incorporated in a small remote-controlled car."

Mr. Ward supplied plans of the car's complete chassis with his letter, but, as it is only the steering mechanism which is of particular importance to us here, I have taken the liberty of extracting this mechanism and modifying it somewhat to suit general models rather than Mr. Ward's specific construction. Two Rectangular Coils 1, with Cores 2, are each attached to a $5\frac{1}{2} \times 2\frac{1}{2}$ in. Insulating Flat Plate 3 by an Angle Bracket 4, a $\frac{1}{2}$ in. Bolt being used to secure the Angle Bracket to the Plate. Fixed by Nuts on the protruding shanks of these Bolts, above the Plate, is a $4\frac{1}{2}$ in. Strip 5, then Cores 2 are joined, with a distance of one hole separating them, by a $1\frac{1}{2}$ in. Strip 6 and a Flat Trunnion extended by a 2 in. Slotted Strip 7.

Next, two Double Brackets 8, each with a $1\frac{1}{2}$ in. Strip 9 secured between its lugs, are lock-nutted to two Double Bent Strips 10 which are in turn bolted to Insulating Plate 3. Lock-nutted between the ends of Strips 9 is a $5\frac{1}{2}$ in. Strip 11, then Slotted Strip 7 is





pivotally attached to the centre of this Strip by a Pivot Bolt, a Collar on the shank of the Bolt spacing the two Strips apart. Lastly, two 1 in. Rods, each carrying a 1 in. Pulley with Motor Tyre 12, are held by Collars in Double Brackets 8.

A simple control panel for the mechanism can be built up from an Insulating Plate, to which two Wiper Arms 13 and 14 are bolted. When each Wiper is depressed it should make contact with a Contact Stud 15, or ordinary bolthead, this Stud being wired direct to its opposite number. Each Wiper should be connected to one or other of the free terminals of Coils 1, while another lead is taken from Strip 5 to a terminal 16 on the control panel. A second terminal 17 is added to the control panel, this being wired to one Contact Stud 15. The power source required to operate the mechanism is 15-volt A.C. and it should be connected to terminals 16 and 17.

PARTS REQUIRED

BASIC MECHANISM		CONTROL PANEL	
1—5	1—45	18—37a	2—111c
1—2a	3—59	2—38	1—511
5—62	4—111a	2—111a	2—231
2—11	2—142c		
2—12	1—147b		
2—18a	1—510		
2—22	2—520		
23—37a	2—526		
13—37b	1—534		

Small differential

Moving away from Mr. Ward's remote steering gear, we have a small and very compact differential mechanism suggested by Mr. Bob Hauton of Lincoln—another enthusiast whose ideas have been featured in these pages before now. Differentials, of course, are anything but new to Meccano, yet this particular example is completely different to the normal type of unit in that is uses Universal Coupling " spiders " (Part No. 140y) in place of the usual gearing. This, I know, sounds most unorthodox, but, says Mr. Hauton, " Surprisingly enough, it works very smoothly ". I must add, though, that the example illustrated, which I built up from Mr. Hauton's original sketches, tended to catch slightly, but it was assembled rather hurriedly for photography and so I am sure that, with a little careful adjustment, and lubrication, it can be made to work quite satisfactorily.

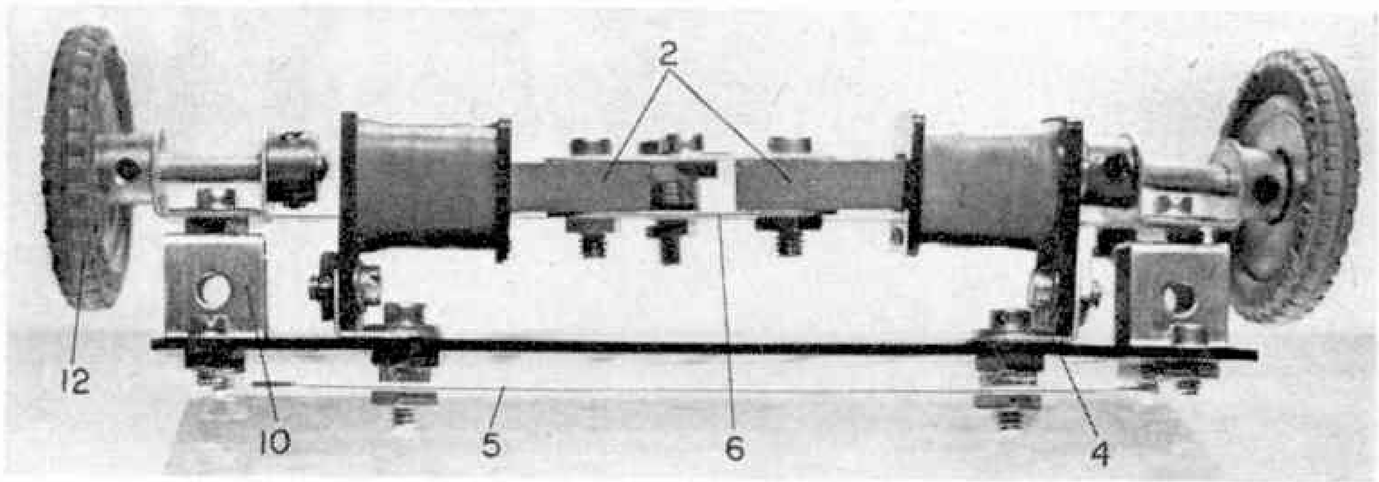
Construction is much easier than the usual type of Meccano differential. Two Universal Coupling spiders 1 and 2 are fixed one on the end of each Rod 3 serving as the respective half shaft, the Rod projecting a

Our heading photo shows a small Differential utilising Universal Coupling "Spiders."

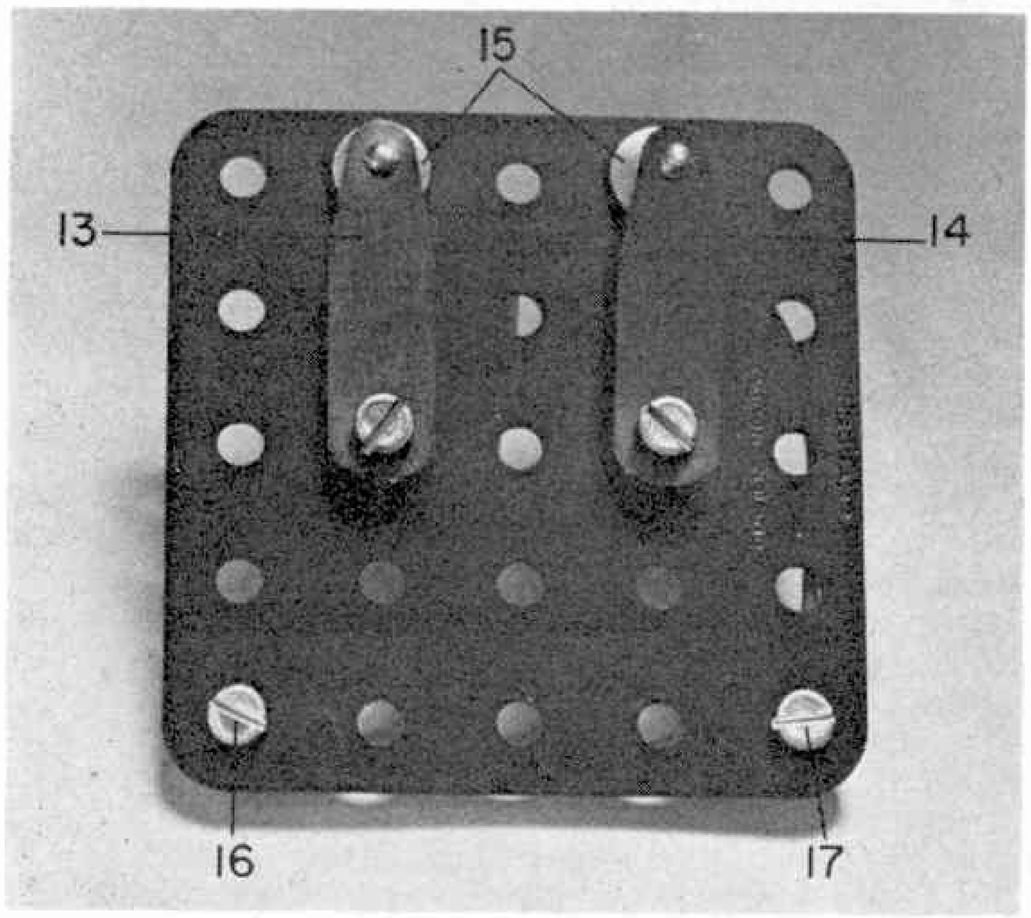
Below left: An interesting remote-controlled steering unit. Right: A front view of the inverted Steering Unit.

Below: This simple control panel controls the Steering Unit very successfully.

Bottom right: A detailed working model of a Mobile Rotary Drilling Rig.



distance of about $\frac{1}{16}$ in. through the spider. One Rod 3 is journalled, free, in the boss of an 8-hole Wheel Disc 4, while the other Rod is similarly journalled in the boss of a $1\frac{1}{2}$ in. Contrate Wheel 5, a spacing Washer being mounted between the Contrate and spider. Note that the special shouldered bolts supplied with each spider must be screwed tight into all four of its tapped bores. The protruding ends of Rods 3 are then inserted into the transverse smooth bores of a Handrail Support 6, the shank of which carries a Nut. Screwed tight into the tapped bores of the Handrail Coupling



are a $\frac{1}{2}$ in. and a $\frac{3}{8}$ in. Bolt, each carrying another Universal Coupling spider 7, complete with shouldered bolts. These spiders must turn absolutely freely on their Bolts, the head of the shouldered Bolts engaging between the heads of the shouldered bolts in spiders 1 and 2 as they do so. Bush Wheels 4 is connected to Contrate Wheel 5 by three or more $1\frac{1}{8}$ in. Bolts 8, the Nut on the shank of Handrail Support 6 locating between two of them (in adjacent holes) to hold the Support in position. The following Parts List applies to the unit as illustrated.

PARTS REQUIRED			
2—16	10—37a	1—111c	4—140y
1—24	1—38	3—111d	
1—28	1—111a	1—136	

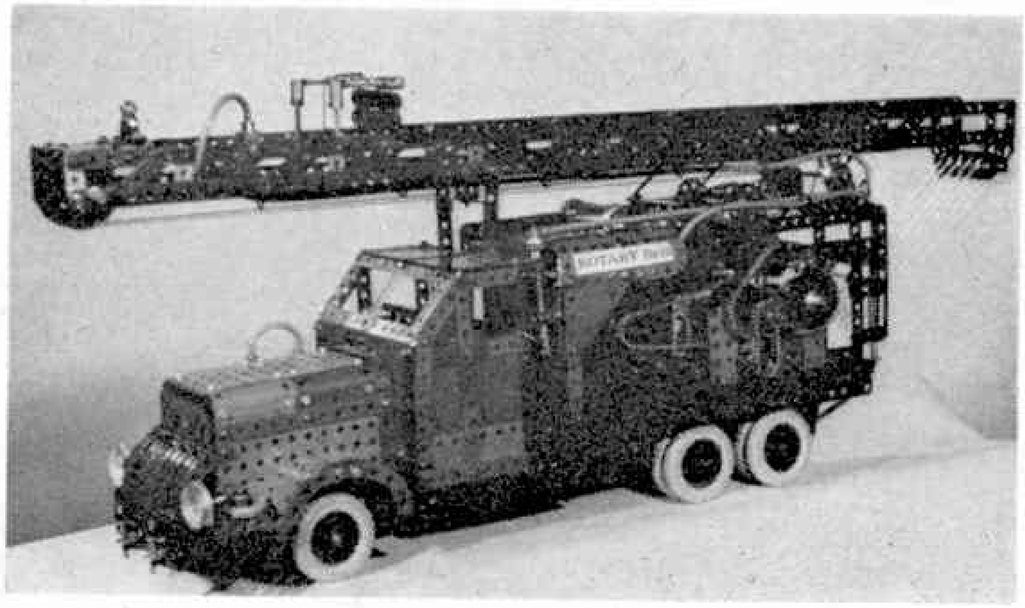
South African Model

I would like to finish this month by drawing attention to the splendid Mobile Drilling Rig model, illustrated here, which is the work of Mr. Les Thompson of Uitenhage, Eastern Cape, South Africa. In a recent letter to me Les says, "After much persuasion by my friends to build a working model for our town's annual Hobbies Exhibition, I got started on this Rotary Drilling Machine and, after more than fifty hours spare time I finally managed to complete it.

"It performs most of the operations of its lifesize original, the only pieces of machinery that do not operate being the water pump and compressor unit. A 220-volt electric motor drives a four movement gearbox mounted behind the cab, the four movements consisting of, raising and lowering of the tower, raising and lowering of the workmen's platform on the tower, block and tackle system for raising and lowering drilling rods out of the ground and finally the turning of the rotary drill. A further three-speed gearbox is incorporated to control the rotary drill, the three speeds on the lifesize machine being used for drilling through different rock formations. Also mounted on the truck is an imitation compressor unit and water pump, and I have fitted a few lights to the model. It looks very realistic at night.

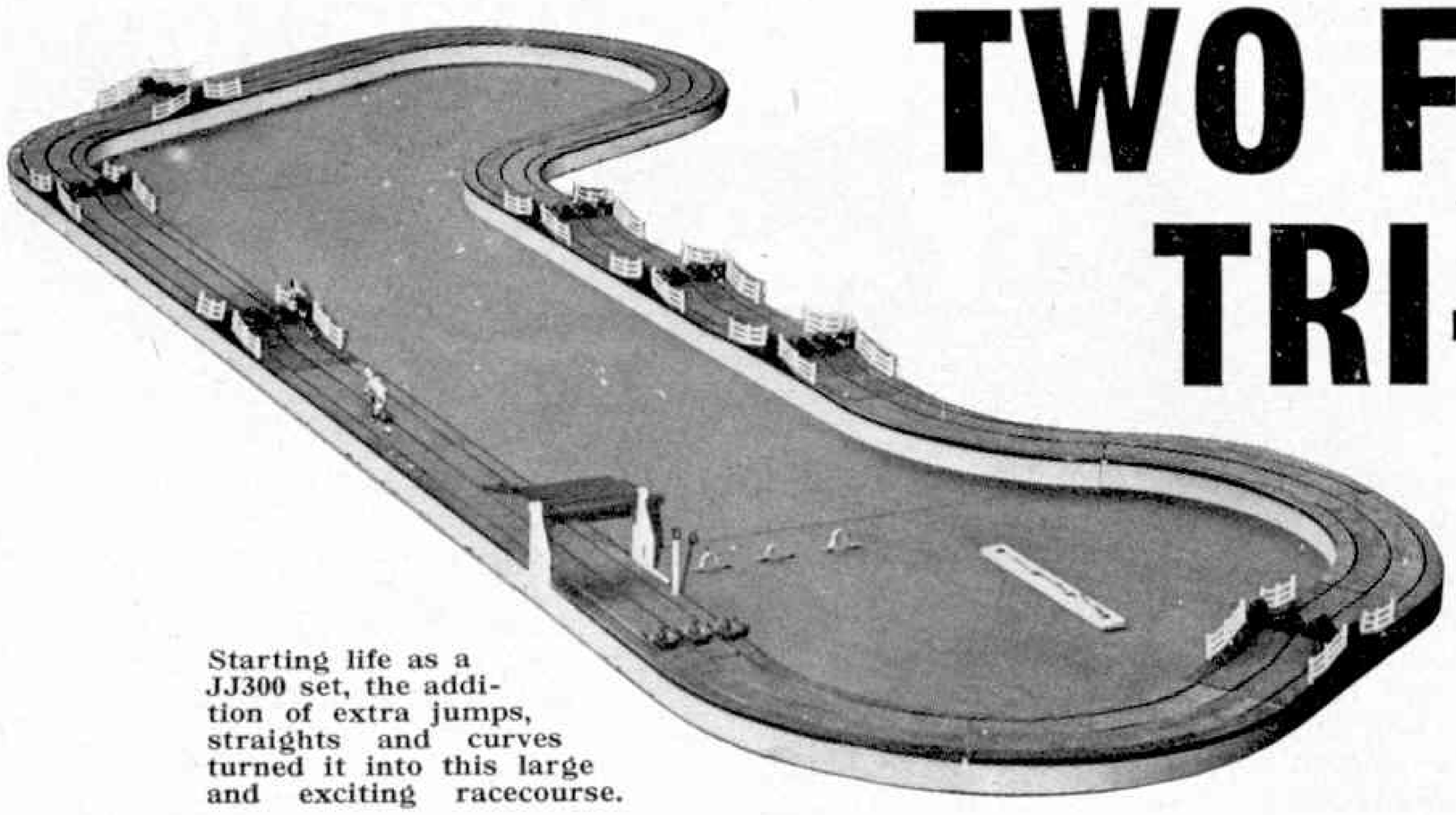
"The drilling rods are 27 in. in length and reach up to the platform where they are connected to the 'Kelly,' swivel and travelling block and then up to the crown block. In the actual machine the drilling rods are screwed into each other but my rods are connected by couplings. I have also laid a few pieces of plastic piping for show purposes as they look quite realistic. The model stands 35 in. high with the tower erected and when ready for travelling it is 34 in. long and 12 in. high (almost to scale). The truck itself is of rigid construction but there is no steering, differential and gearbox as I had to use nearly all my gears on the drilling machinery. Altogether 42 gears were used which include the Sprocket Wheels. To lift the tower a massive block and tackle system which consisted of 13 pulleys was used. It takes 31 seconds to raise to full height."

Les finishes by saying that he got most of his ideas from a drilling machine which was working a few miles outside his home town. This is interesting because it proves just how important it is for a "freelance" modeller to keep his eyes open if he hopes to discover new subjects to work on. Ideas can be all around us if we only take the trouble to see them.



TWO FROM TRI-ANG

Meccano staff look at two new games



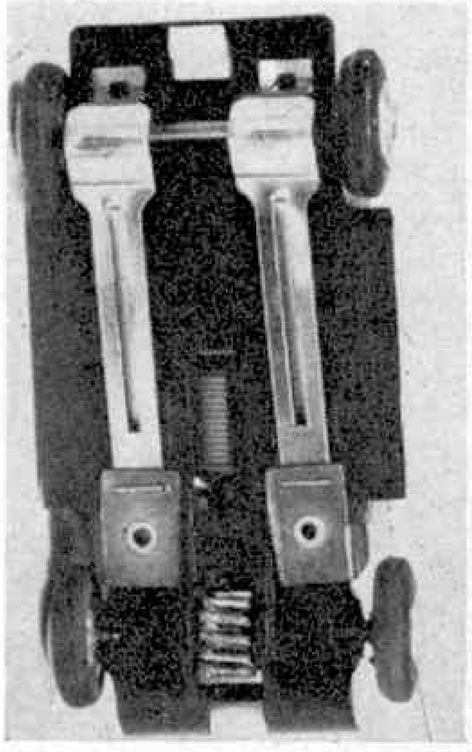
Starting life as a JJ300 set, the addition of extra jumps, straights and curves turned it into this large and exciting racecourse.

Out just in time for Christmas are two new toy games from Tri-ang, and to do them full justice would have been rather difficult in our "Have You Seen?" column, so we are devoting these two pages to give readers a better opportunity to see them in detail.

The first (and we think the more exciting of the two) is an Electrically operated horse racing set, a brand new idea with some unusual and interesting "twists" resulting in very exciting and sometimes hilarious racing! However more of that later.

The second game, also very new and different, is best described as a "Race to the Moon" and involves firing model rockets to a model of the moon situated up to 15 ft. away from the landing pad! Good judgement and an "eye" for shooting being the prime requirements of this one.

However back to the horse racing system, and a close look at exactly what the game involves.



Above left: This underside view of one of the "cars" shows the replaceable pick-ups.

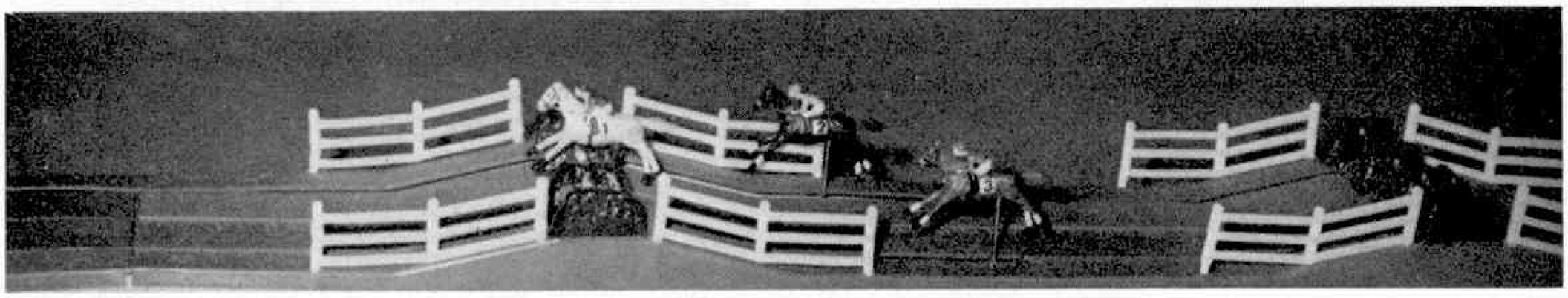
Above right: The cars are fitted with rubber tyres for silent running, and grip to enable them to negotiate the jumps. Only the horse is visible of course on the actual layout.

Below: Two jumps are shown clearly in this photograph, and serve to illustrate the very realistic appearance of this remarkable game.

Jump Jockey

WE SAID earlier that the game was brand new and indeed it is. Its nearest relation we would describe as Slot Car Racing, although as will be seen from the photographs, there is a hint of electric trains lurking in the background somewhere!

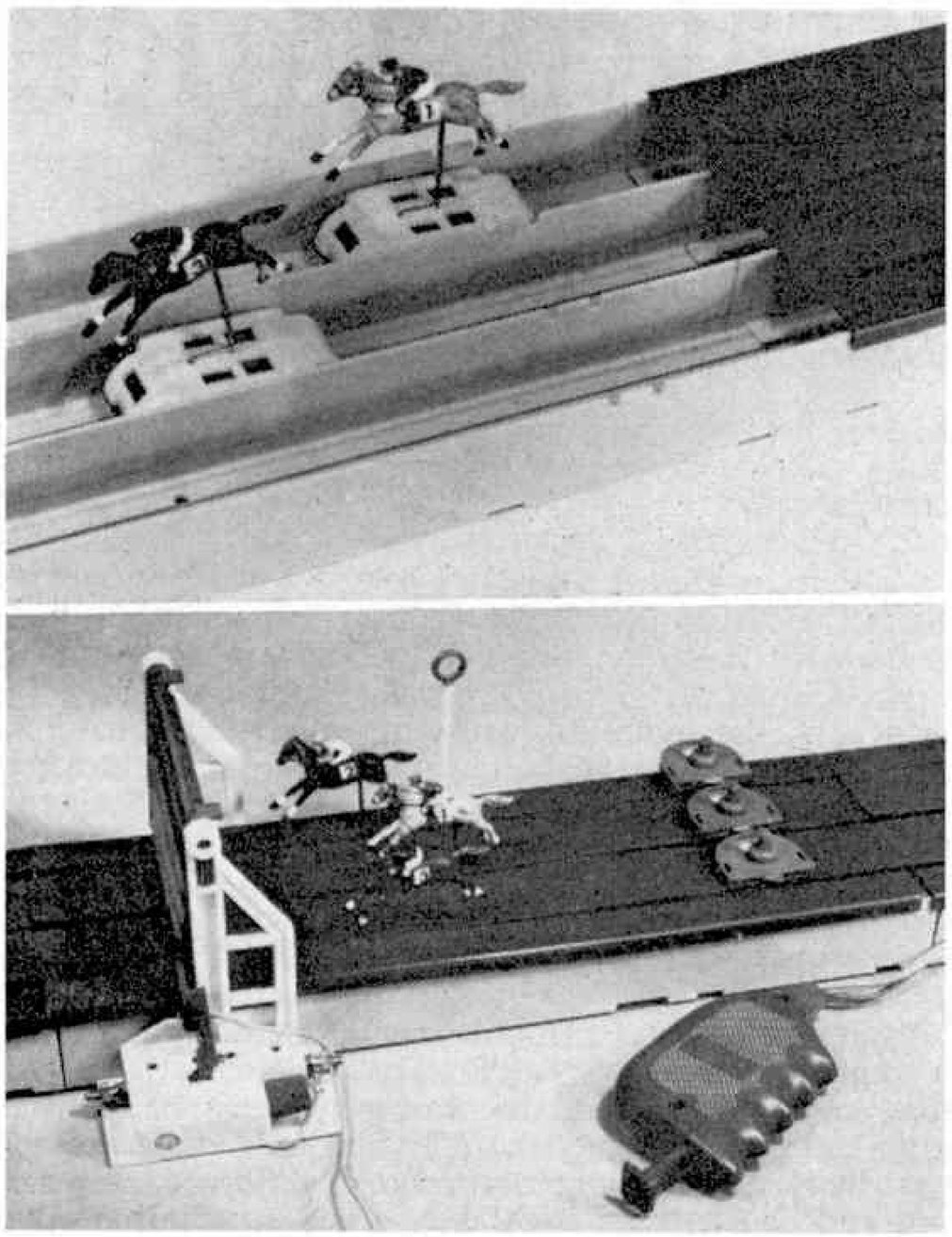
Basically the game entails racing horses around a race course, with hazards in the form of "jumps" situated at various parts of the course. It isn't until you reach a jump that the *real* skill in operation comes into its own. Racing down the straights and around the bends in the course is reasonably easy providing that the slot-car type hand controllers are not depressed to their fullest extent. If you should, in the excitement of a close race (and it's easily done, as we found out) press the controller button hard down, the horse comes to a sudden halt and sets off again at full speed, *backwards*! We would point out here the controllers don't control speed, only direction. Once mastered, travelling on the open field is fairly straightforward, but until you arrive at one of the "jumps" your troubles have not even started. As soon as your horse reaches the nearside of a jump, it instantly refuses by stopping and backing away. The method needed to successfully cross a jump, is to press the controller button hard down just as the horse reaches it, and releasing the



button to its former position when the jump has successfully been negotiated. If you don't of course upon reaching the level track at the other side, the horse will immediately stop, reverse, and set off over the jump once again.

It all may sound rather complicated at first but once mastered successful leaps without fault can be achieved. This of course isn't an end to the novelty of the game by any means. Strict concentration is required all the time you are racing, one false move and you are in real trouble! Many competitors loose concentration when a second horse is challenging close behind, causing their horse to refuse a jump. Often this situation rapidly spreads throughout the field, causing complete chaos!

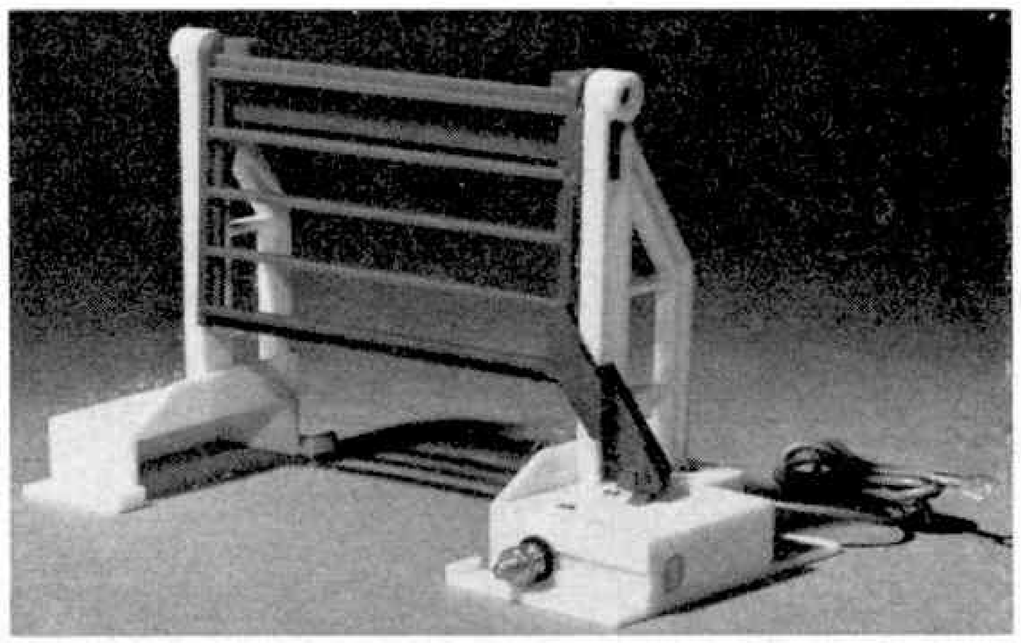
There then, is what "Jump Jockey" is all about. But possibly as interesting as the racing itself is the cunning design behind the game which causes the spectacular results. The secret lies in the electrical wiring of both the track and the hand controllers; the horses themselves are completely free from tricks of any sort!



Upper: With the "grass" section removed the horse units are seen each running in its own enclosed track.

Lower: The starting gate automatically cuts off the current supply when in the "down" position. At far left are seen the simple "6 lap" recording parts; foolproof in operation.

Polarity of the circuit is reversed on all of the jump sections, which means that under normal conditions an electric motor running clockwise on the straight will run anti-clockwise on all the jumps. To change the polarity on the jumps is where the hand controller comes into effect. Pushing the button right to the bottom of its travel, reverses the polarity on a jump, thus making it conform with the rest of the circuit. Once on the other side of the jump, the button must



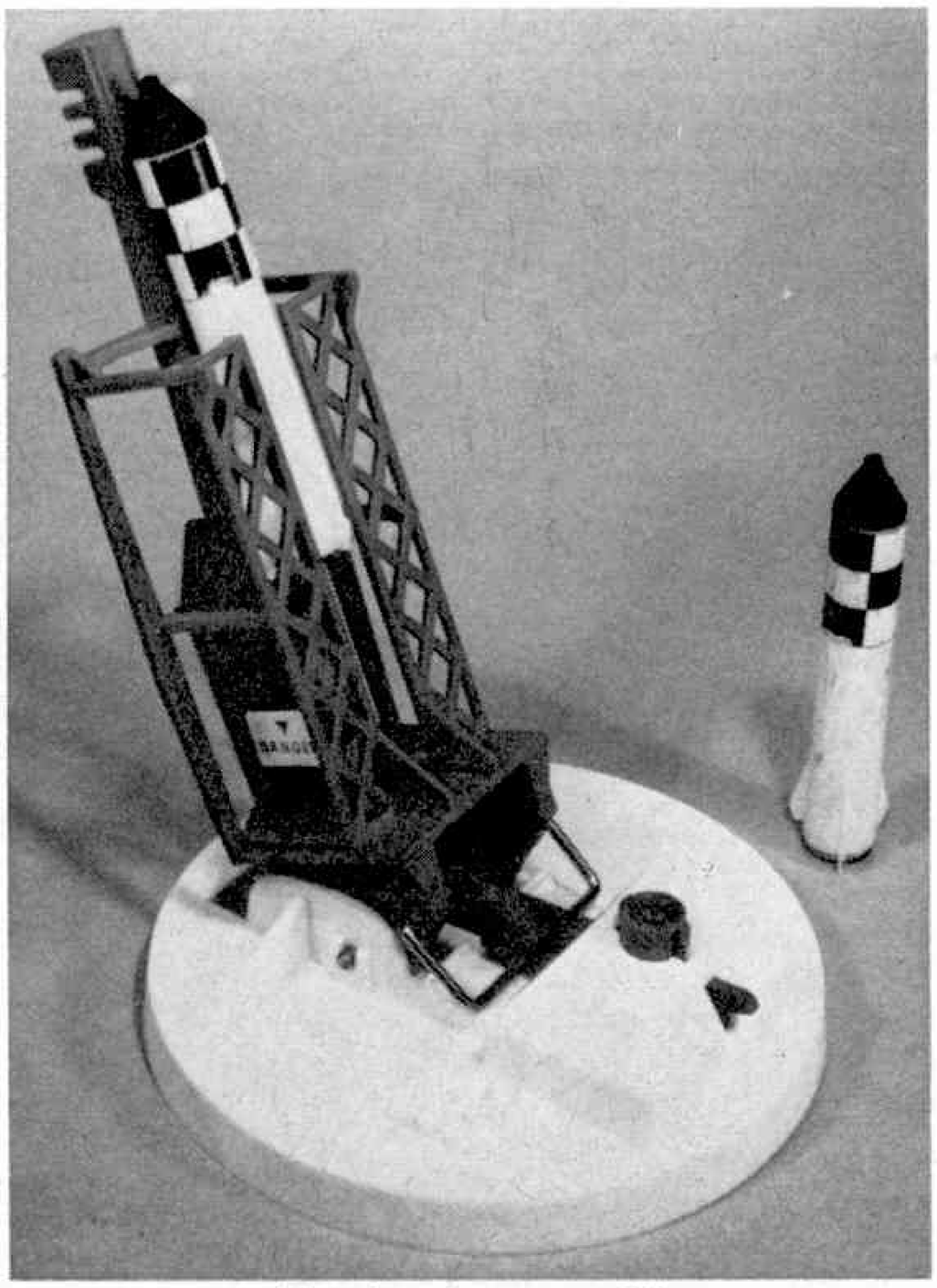
A close-up view of the starting gate, included in the outfits.

be released to change the polarity back to its original, otherwise the motor will run in reverse. Got it?

Jump Jockey is available in no less than four sets all building up into an oval shape; JJ100 contains 1 jump and 7 ft. 5 in. of track, costing £7.7.0; JJ200 contains 2 jumps and 9 ft. 5 in. of track, costing £8.19.6; JJ300 contains 3 jumps and 11 ft. 5 in. of track, and the fourth and largest set, JJ500 contains 5 jumps and 15 ft. 5 in. of track. All the sets contain a starting gate, fences for the jumps, lap recorders, hand controllers (3) and 3 motorised horses.

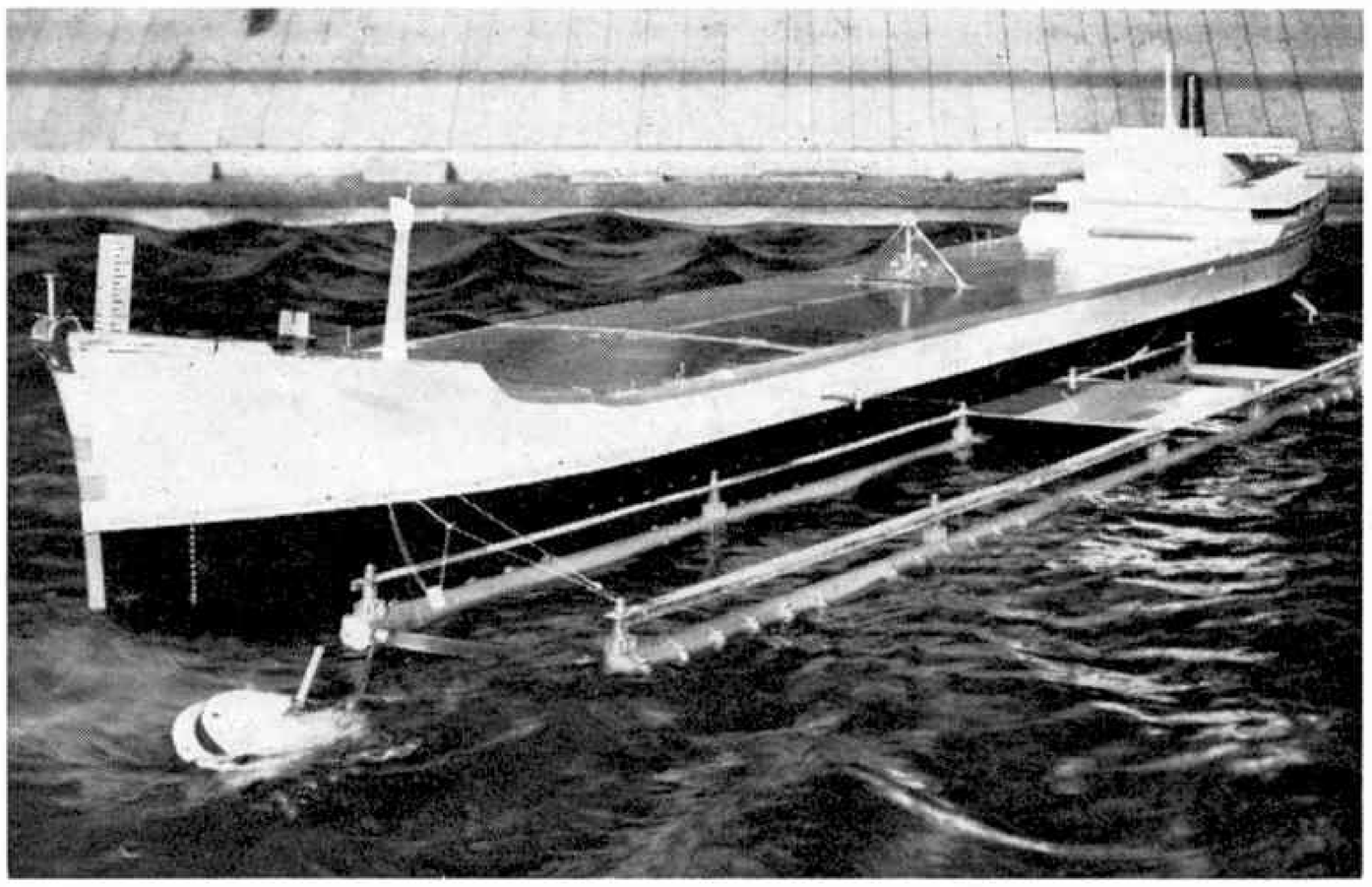
We predict that "Jump Jockey" is going to be a big success in the new year, and is without a doubt one of the most exciting games to appear for a long time.

All ready for "blast off". One of the pair of rocket launchers included in the Luna-cy set, with one of the spare rockets standing by.



(Continued on page 54)

Trevor Holloway describes the vital work of . . .



The HYDRAULICS RESEARCH STATION

WATER CAN be man's greatest friend, or his most ruthless enemy. Left to its own devices it can destroy or it can build up. It is a restless, unpredictable force, always on the move, rushing down from mountain tops to the sea and dashing in and out with every tide. Every drop of rain that falls changes the earth in some way; every group of drops carries off some soil to the sea, and every wave that breaks places a strain on our harbours and coastlines.

In a civilised world such as ours, it is vital that water should be the servant of man, not his master. Spearhead in man's effort to curb the lawlessness of this mighty natural force is the new-type scientist—the waterways engineer. As the world's population grows and people begin to move into new and more difficult areas, the work of these "wet nurses" will become increasingly important.

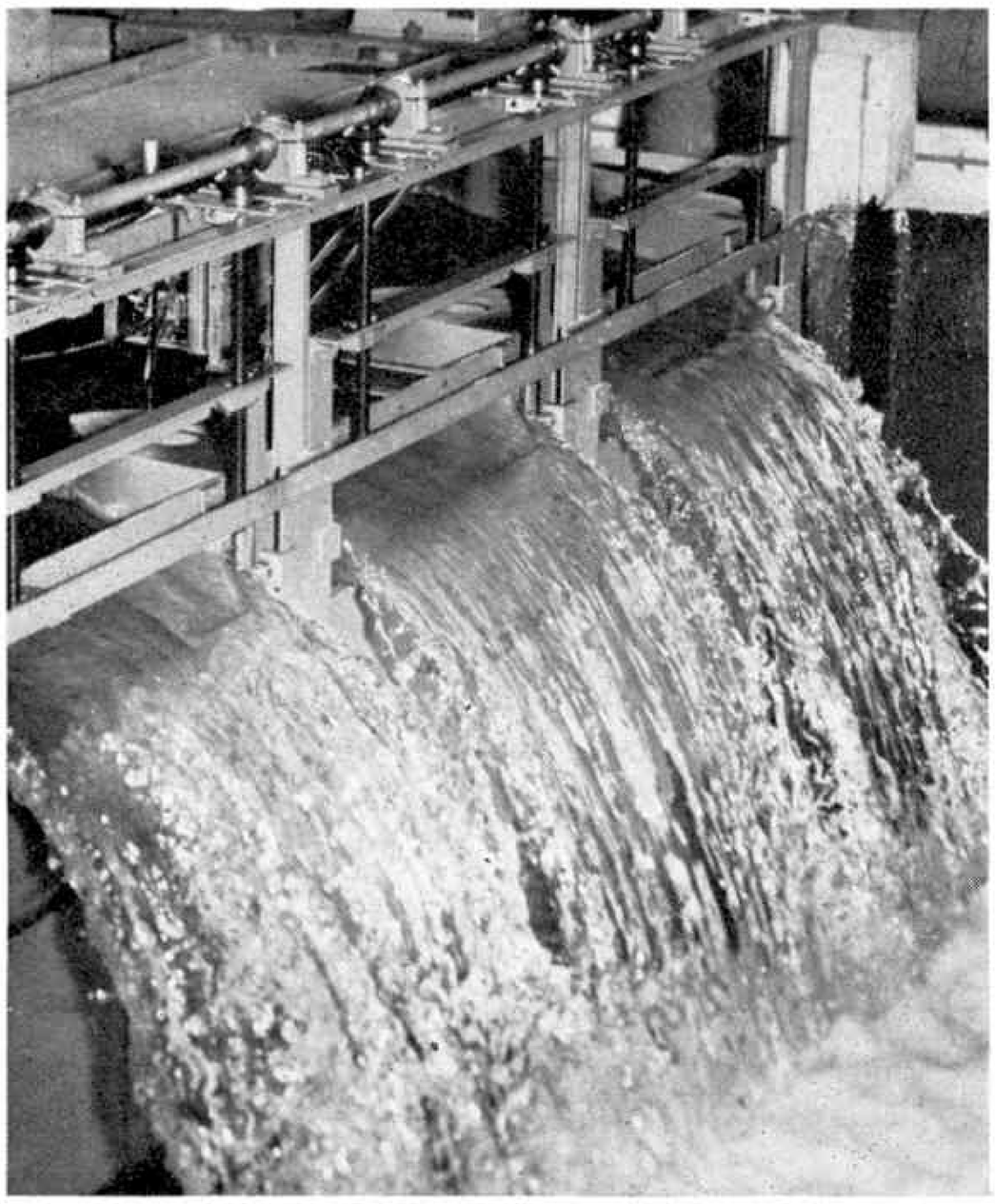
In Britain, the headquarters of those modern scientists is the Hydraulics Research Station at Wallingford, in Berkshire. Its function is to study the behaviour of water flowing in "open channel" conditions and, in particular, the hydraulic problems encountered in civil engineering. It covers the natural course of water after precipitation on the earth's surface, through drainage into streams and down to the sea. It includes the investigation of problems associated with the training and control of rivers and estuaries, the development of harbours and ports, and the prevention of coast erosion.

Even the non-scientific layman would find a visit to the Laboratory a fascinating experience, for the main research tool of the waterways engineer is the large-scale working model. We still don't know exactly what happens when water currents of different temperature and density mix with each other in an estuary or river; or how sand and other sediments are transported by water; or exactly how wave action changes the shape of a coastline.

Thus, the waterways engineer has to construct a miniature replica of the river, harbour or coast he is investigating, and test its reaction to various stimuli before the scheme is put into full-scale practice. The interesting thing about all these models is that they really *work*. Every detail of the study area is reproduced on a small scale, including winds, tides, floods and droughts.

Requests for advice come from all over the world, and as many as 150 projects may be investigated in a year. The investigations are undertaken mainly for consulting engineers, engineering contractors, industrial

Above: This model tanker and floating jetty are undergoing tests to resolve the problem of mooring when vessels are too large to go into port. Below: Modern servo-control techniques permit whole cycles of tides to be reproduced by the apparatus.

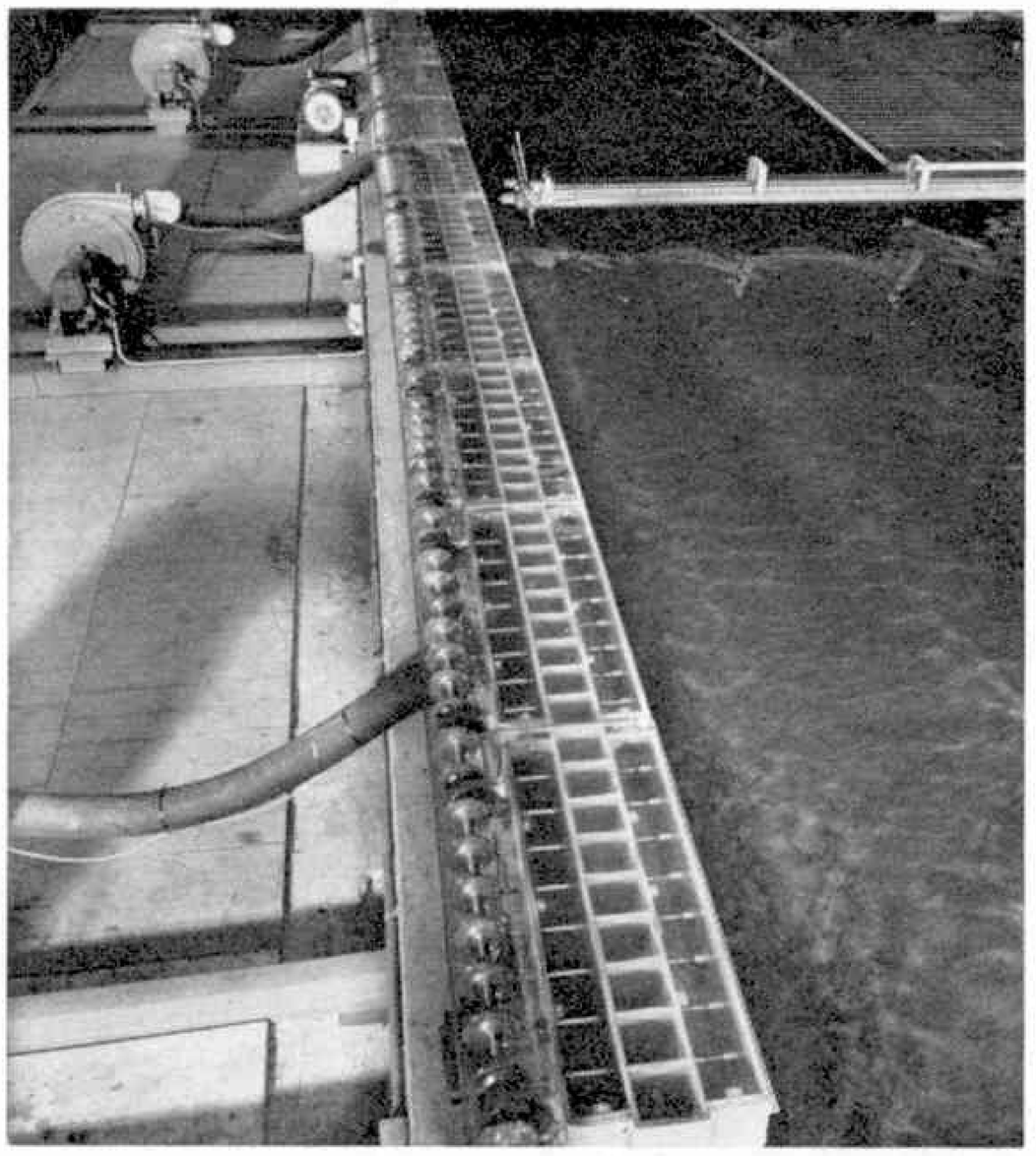


concerns, port and harbour trusts and other public bodies including Government departments.

The main experimental hall at the Station has been specially designed to house the hydraulic models; it has a floor area of 170,000 sq. ft. interrupted only by eight columns which support the roof. Overhead gantries permit access to any part of the model, and there is provision for photographing models through apertures in the ceiling. The floor consists of consolidated earth loosely stabilised so that it can easily be excavated for the construction of models.

The Station has four large basins for studying wave disturbance problems, for testing harbour designs, for investigating the effects of waves on beaches, and for research into sea defences. All four basins are equipped to produce tides and tidal currents, as well as waves; their total area is about 42,000 sq. ft.

Flumes, channels and tanks are indispensable to the research worker in hydraulics, and these are provided in quantity at the Station. The flumes range in length from 12 ft. to 400 ft. and in width from 2 ft. to 12 ft. Four channels are provided with wave-making machinery, one being totally enclosed and fitted with an extractor fan so that wind can be simulated and structures can be tested in the face of random wind-generated waves.

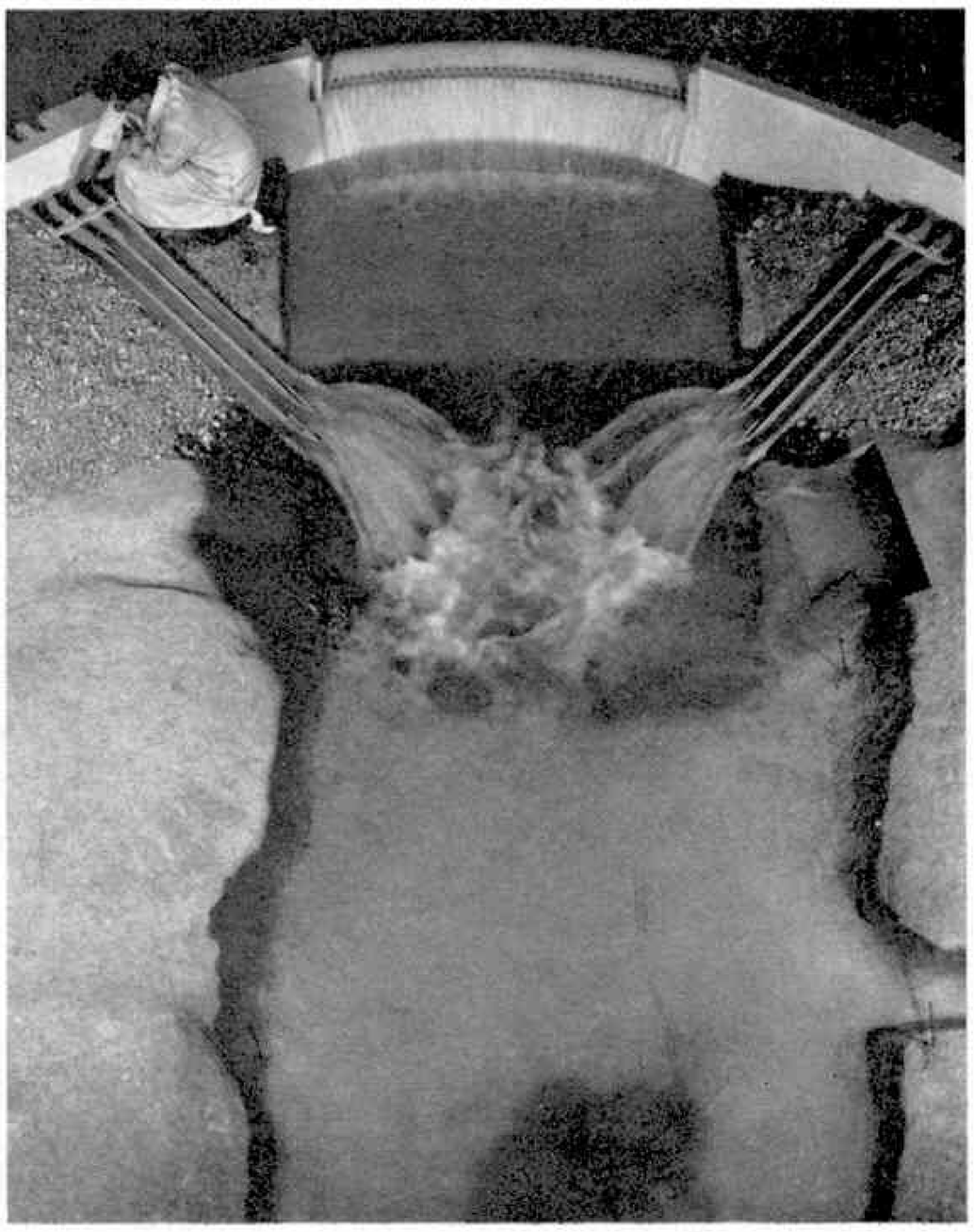


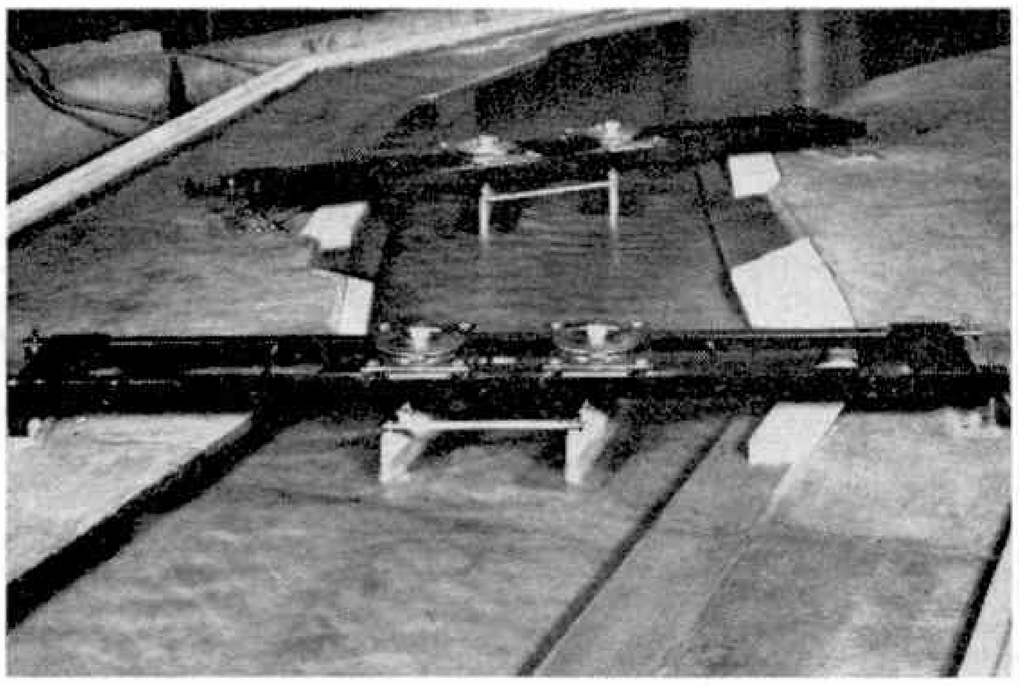
Above: This pneumatic wave-maker is capable of producing waves over a wide range of angles to the shore. Left: An experiment in an area of graded sand at the Station to study how the meander pattern of rivers is governed by the quantity of sediment and water in transit. Below: This model was used to test and develop works for minimising scour of the river bed.

In the lower reaches of rivers, where gradients are normally slight, the likelihood of flooding is greater than in the upper reaches. The various ways by which flooding can be reduced—by deepening, widening or straightening channels, by improving weirs and bridges and constructing flood relief embankments and channels—provide the station with further model investigations. In such models, both the river channel and the flood plains bordering it are reproduced.

Many of the Station's major investigations relate to estuaries in which shoaling, the movement of sediment and the instability of low-water channels have presented serious problems of navigation. Such investigations are normally made with the aid of large-scale models equipped with servo-controlled mechanisms for reproducing tides through full neap to spring cycles. In recent times, increasing use has been made of radioactive and fluorescent tracers for the study of sediment transport.

On the coast, the Station is confronted with two main types of investigation—those dealing solely with wave motion and the forces imposed by waves, and those concerned with the movement of sand and shingle. In the first group are studies of the performance of sea walls and breakwaters, and sometimes the behaviour of moored ships under wave action. In the second group are studies of coastal erosion, the formation of sand-bars, and the shoaling of dredged channels.





Above: A 1/60 model used to determine the best alignment for the piers of two bridges to be built over the River Exe in Devon. Below: This model was built to find ways of maintaining a deepened channel across the bar at the entrance of an estuary.

An urgent problem being investigated at the moment relates to the River Plate, in South America. This is actually the silt-laden estuary, of the Rivers Parana and Uruguay, which is only 10 ft. deep in places. Ships calling at Buenos Aires and wishing to enter the River Parana, in Argentina, cannot do so directly but have to make a detour of 100 miles. Furthermore, in some cases ships can be only partly loaded owing to the shallow depth of water. Such conditions have existed for the past fifty years, and constant dredging is necessary.

A model measuring 180 ft. long and 52 ft. wide has been built having a horizontal scale of 1 : 4000 and a vertical scale of 1 : 120. It represents a distance of 120 miles from the head of the delta to a line seaward of Buenos Aires. Winds are reproduced as well as tides and fresh-water flow. Already the model has indicted three possible new routes which would cut the present detour mileage by three-quarters or more.

Another project being investigated concerns the future of the town of Telok Anson, in Malaysia. This lies on a spur of the land that is rapidly being eroded at its neck by the tidal River Perak. The town of 30,000 people is in danger of being cut in two if the erosion is not halted.

The Hydraulics Research Station has built a model and carried out exhaustive research which has shown that the answer would be simply to erect light barriers in the river to deflect the flow away from the bank. The positions for these barriers have been precisely determined.

One of the most interesting models is of the Van Der Kloof Dam which the South Africans are planning to put across the Orange River to provide hydro-electric power and water for irrigation. The problem here was that the river valley at the site is very narrow and that spillways from the dam would tend to discharge at the same point and very soon dig a deep hole in the soft shale of the river bed.

With the aid of the model, engineers found that by adding an extra discharge spillway further downstream —and by slightly curving the chutes on the dam itself —they could cut the scouring action of the water to a minimum.

In New Zealand, the principal port on the west coast of North Island is Taranaki. There, they have long had trouble with silting caused by waves which blow in from the west and carry large amounts of sand around the end of the harbour breakwater. Acting on studies of a model, the Wallingford experts have been able to advise Taranaki to add a 1,200 ft. extension to the existing breakwater and to build a new lee breakwater in the harbour itself. The port authorities can now go ahead, confident that a long-standing trouble will be eradicated.

Oil tankers are now built so large they are unable to berth at many of the jetties at refineries and supply depots. One of the leading oil companies asked the Station to investigate the problem. One possible solution is to moor these super-tankers to a floating buoy-and-jetty assembly positioned off-shore, and to take on or discharge oil from there.

The Station has constructed a model of a 100,000 ton tanker and a 1 : 80 model of a 550 ft. long floating tubular steel jetty having single-point mooring. The mooring buoy, scaled to the equivalent of 36 ft. diameter, is moored to the bed with a chain assembly. The model tanker and jetty have been subjected to tests simulating waves, winds and currents. Research is still continuing and it is hoped the final design for the jetty will go a long way to solving one of the most urgent problems of super-tanker operation.

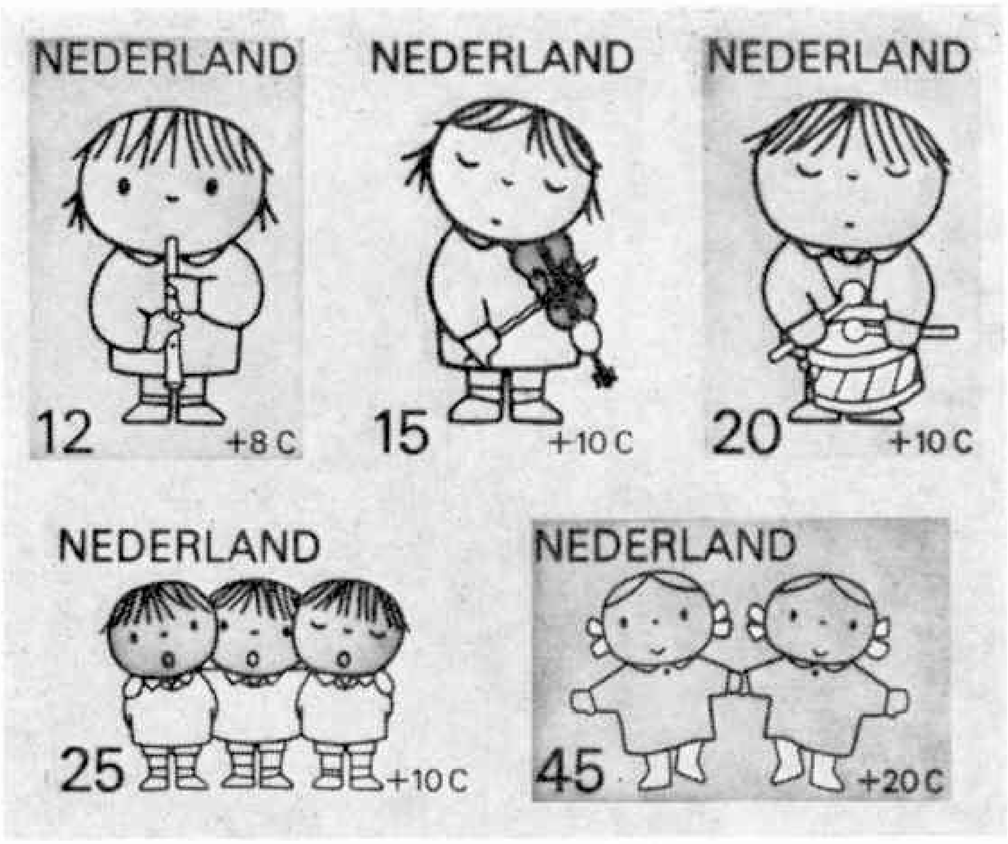
There is no doubt that research of this kind will become increasingly important. The models make it possible for engineers and designers to take important decisions, secure in the knowledge that they are going about things in the right way.

What is happening, in fact, is that the waterways engineers are using water to dilute the problems caused by it!

This model of Hong Kong Harbour was constructed to determine the effect on the tidal streams of proposed reclamation schemes.

CHILD'S PLAY ON STAMPS

by James A. Mackay



ABOUT THIS time of year several countries issue sets of stamps bearing premiums above the postage rate, in aid of charity. Most popular of these, and deservedly so, are the so-called Child Welfare issues. Switzerland was the first country to issue annual Child Welfare stamps. These "Pro Juventute" issues, named on account of their Latin inscription, made their first appearance in 1913 when a single 5 centimes stamp depicting the Matterhorn and the female figure of Helvetia (Switzerland) was sold for 10 centimes, the premium being given to Children's Benevolent Societies.

There was no stamp the following year, but from 1915 onwards every December a set of gaily coloured stamps has appeared, sold at a premium for the children. The subjects have varied over the years; many of the earlier issues depicted the arms and provincial costumes of the cantons, but more recently flowers and insects have been chosen while last year wild birds of Switzerland were shown. One stamp in the series bears a portrait. Usually a famous Swiss is portrayed and occasionally these have been connected with children, such as J. H. Pestalozzi, founder of the orphan schools (1927) or Johanna Speyri, creator of *Heidi* (1951). Last year Anker's "Portrait of a Girl" was reproduced.

Other countries which have regularly issued children's stamps for many years are the Netherlands, whose first Child Welfare set appeared in 1924, and Luxembourg which has issued them since 1926. These have had a strong thematic appeal, showing children at work and play. Some sets have laid emphasis on sick children, such as the series of 1931 which showed a mentally defective boy, a deaf mute, a blind girl and a sick child. Others have tried to set a good example—like the stamps of the 1954 series showing a girl brushing her teeth, or a traffic warden escorting children at a road crossing. The Dutch stamps have had girls skipping, girls on stilts, boys on roller skates, boys playing Cowboys and Indians, and even a very tiny baby boy pulling himself up on the bars of his playpen. The Dutch series of 1962 showed children doing such household chores as cooking, watering flowers, feeding chickens and running errands.

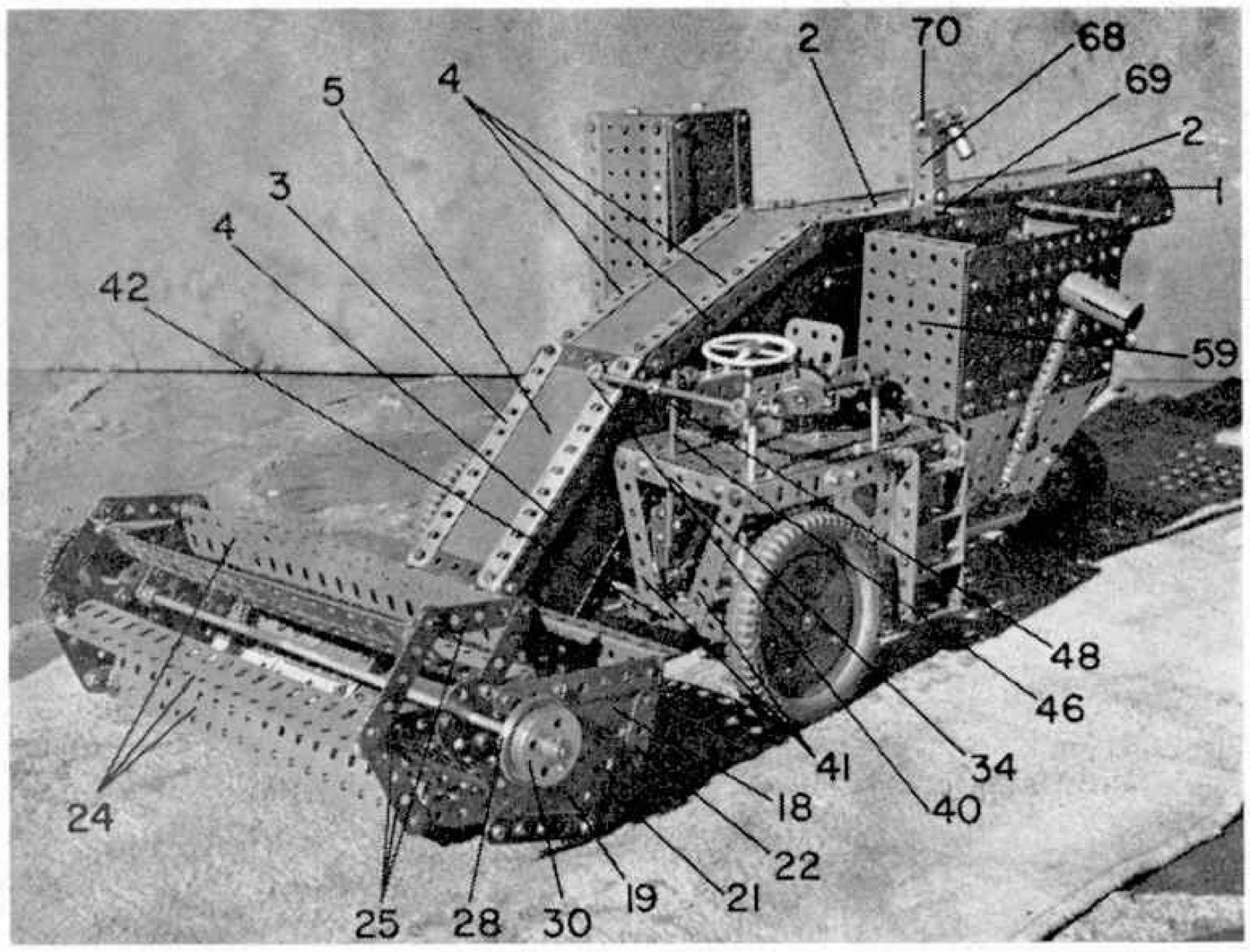
In recent years the idea of Child Welfare stamps has spread to the other countries in the Netherlands Union. Both the Netherlands Antilles and Surinam (Dutch Guiana) have been producing interesting stamps in this theme for some time now. With the exception of the 1967 series the Child Welfare stamps of the Antilles have depicted children at work and play, while the series of 1963 was actually designed by school-children themselves. The set of 1967 featured fairy tales and folklore.

Surinam, which first issued Child Welfare stamps in 1931, has also concentrated on children's activities on its stamps. The children of the different races which inhabit Guiana have been a favourite subject for these stamps, but in the past few years games and pastimes have been depicted. The series of 1966 showed children playing games connected with different public holidays, the 1967 set features stilt-walking, kite-flying, marbles and a game known as "dibs", while last year's set included tug-of-war and hopscotch.

All three countries of the Netherlands Union have featured children at play in their respective sets issued last month. The stamps of Holland and the Antilles have a musical flavour this year. Holland's five stamps show children playing recorder, violin and drums, singers and dancers; the Antilles (Dutch West Indies) show boys playing the guitar and the marimula (a local instrument) and girls playing the flute and the piano. Bars of music form the background to this series. Surinam's quintet depicts boys and girls taking part in the Konferjari Games, held every August in honour of the Queen's birthday. Actually the date celebrates the birthday of the late Queen Wilhelmina; Queen Juliana's birthday, in April, is too early in the year to be suitable. The stamps feature a pillow fight, eating contest (!), climbing the pole, the sack race and the obstacle race.

The only Commonwealth country which regularly issues Child Welfare stamps is New Zealand whose annual Health issues have appeared since 1929. The premium on these stamps goes to provide health and holiday camps for children. This year's series, featured boys and girls playing cricket—a sport now receiving the philatelic recognition which was so long overdue.

The first part of the construction of a first-rate model by M.M. reader **Clive Robins.**

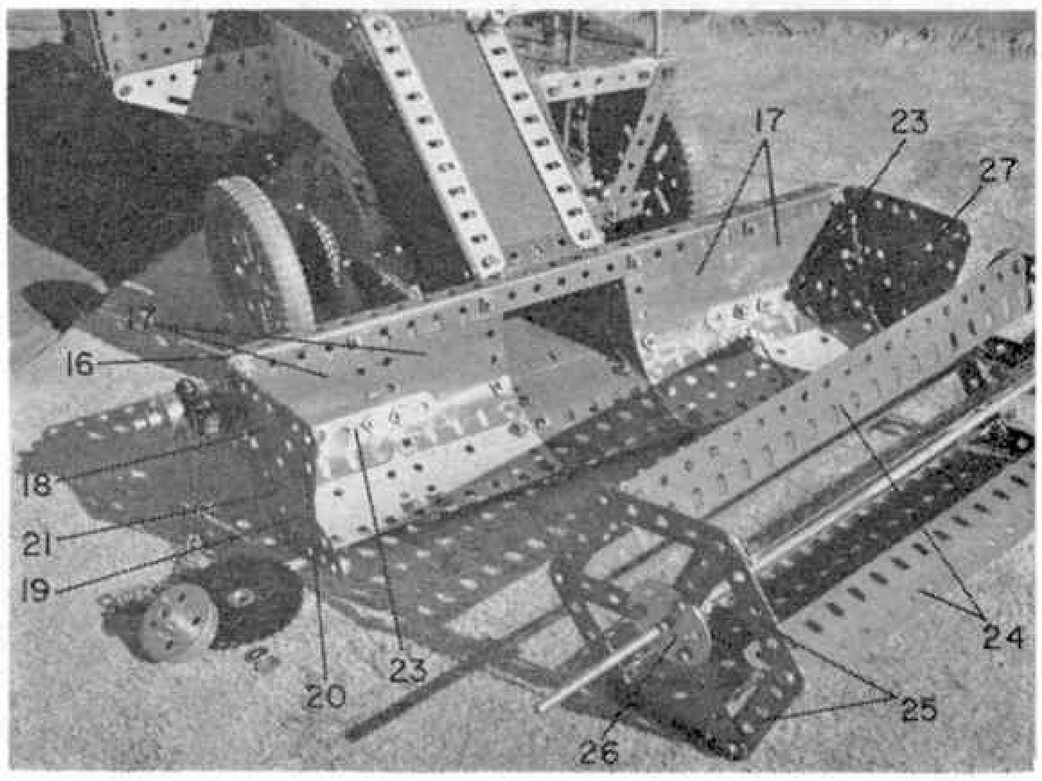


Clive describes for readers how to build a . . . .

COMBINE HARVESTER

OF ALL the agricultural equipment in use today, one of the most important to farmers—and most interesting—is the combine harvester; a self-propelled machine that cuts wheat, and other cereals, threshes it to separate the grain, collects the grain, disposes of the unwanted chaff and ejects the useful straw in a steady stream on the ground behind it—almost a factory in itself!

Combine harvesters make excellent subjects for Meccano models yet, perhaps because of their complex appearance, they do not often appear. Leaflet No. 13 in the series of Special Model Leaflets for Outfit No. 10 does feature a first-class example, but, this seems to be the only one available and it is based on the now rather uncommon type which requires a second man to bag the grain. Most harvesters tday collect the grain in a large hopper which can be emptied directly into a lorry driven alongside the harvester as it is moving. This means that nothing has to stop and, as it also does away with the need for the second man, or "bagger", it is considerably more efficient in overall operation. Described here is a model based on this latter type of harvester and it can be built with really very little difficulty.



A central body is produced from two 12½ in. Angle Girders 1 connected together by suitable Strips or Girders and two 5½ × 2½ in. Flexible Plates 2, then the construction is extended forwards and downwards, as shown, by 5½ in. Angle Girders 3 overlaid by 5½ in. Strips 4 and joined by a 12½ × 2½ in. Strip Plate 5 as well as by 2½ in. Strips. The body sides are added, these being supplied by various Strips, Plates, Flexible Plates, Triangular Plates, Girders and Strips, etc., depending on what parts the individual builder has available, and the sides are joined where necessary by Double Angle Strips. Note that one of these Double Angle Strips is used to connect two Semi-circular

Above: This superbly detailed and realistic model of a Combine Harvester was designed and built by the author, Clive Robins of South Africa. Left: A close-up view of the Cutter-guard with the cutter removed. Note the hexagonal construction at the end of the sail assembly.

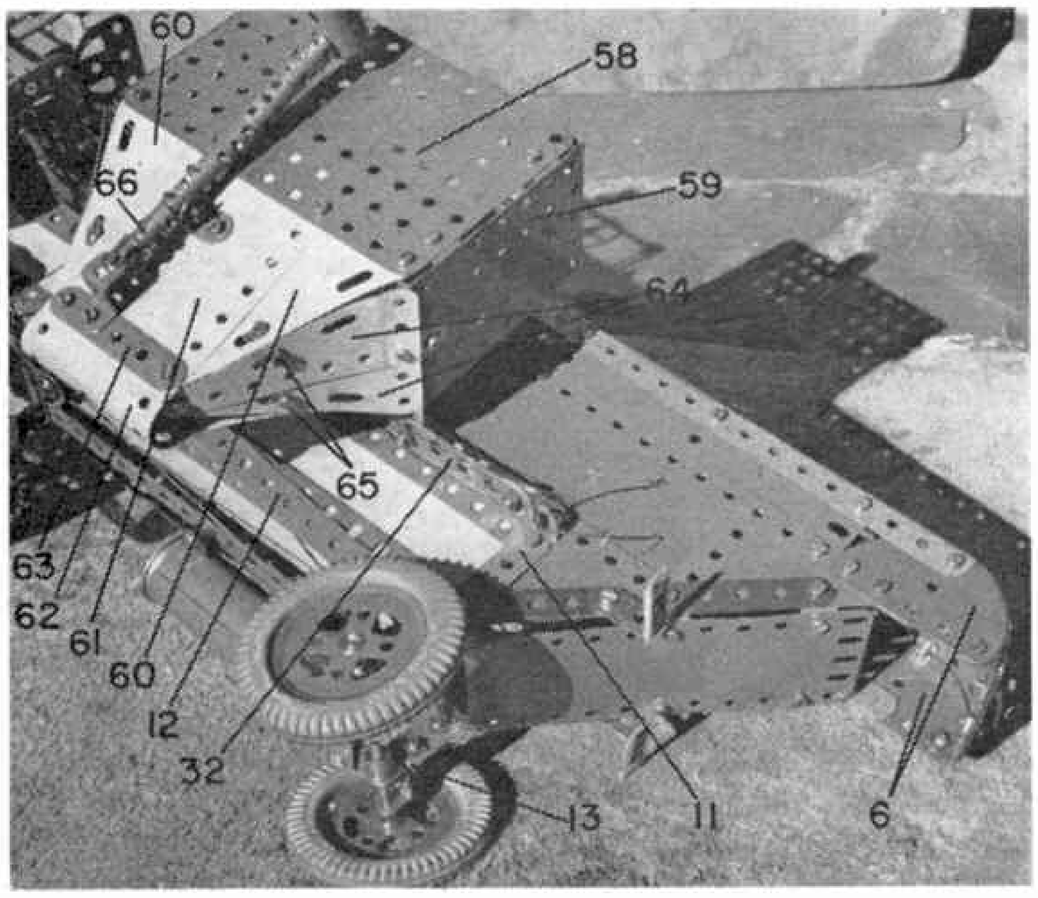
Plates 6, forming the upper rear corner of each body side. Bolted between this Strip and the ends of Girders 1 is a $2\frac{1}{2} \times 2\frac{1}{2}$ in. Curved Plate enclosing the straw outlet chute.

When completed, the central body is mounted on a chassis built-up from two $12\frac{1}{2}$ in. Angle Girders 7 secured to each other by three $2\frac{1}{2}$ in. Strips fixed in the fourth, sixth and twenty-second holes respectively, counting from the cab end. A $2\frac{1}{2} \times 1\frac{1}{2}$ in. Double Angle Strip 8 is bolted to the Girders through their seventh hole, the lugs pointing downwards to form the bearing for a $4\frac{1}{2}$ in. Rod on which a 57-teeth Gear Wheel 9 is mounted. In mesh with this Gear is a $\frac{1}{2}$ in. Pinion on the output shaft of a Power Drive Unit bolted to Girders 7. Also bolted to these Girders are two Corner Gussets 10 joined by a $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip, the Corner Gussets later forming the bearings for the front axle.

Two $3\frac{1}{2}$ in. Strips 11 are next secured to the rear ends of Girders 7 as well as to the central body, these Strips extending two holes below the Girders. Bracing Strips are provided by two $5\frac{1}{2}$ in. Strips 12 bolted between Strips 11 and Girders 7, using the second holes from the lower end of the Strips as, fixed to each Strip though its end hole is an Angle Bracket 13. Lock-nutted to this Angle Bracket is a Double Bracket to which a $1\frac{1}{2}$ in. Strip 14 is fixed. Lock-nutted between Strips 14 at each side is a $3\frac{1}{2}$ in. Strip 15, while mounted in the lugs of each Double Bracket, is a $1\frac{1}{2}$ in. Rod held in place by a Collar and a 2 in. Pulley fitted with a Motor Tyre.

At the front of the model the cutter shield is built up on a $12\frac{1}{2}$ in. Angle Girder 16 attached by Obtuse Angle Brackets to the ends of the Girders forming the central body chute. Bolted to the vertical flange of the Girder are four $2\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plates 17, each curved to shape and extended three holes by another similar plate. Note that the entrance to the body chute is left clear. Each end plate of the shield is supplied by a $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plate 18, a $2\frac{1}{2} \times 2$ in. Triangular Flexible Plate 19, a $2\frac{1}{2} \times 1\frac{1}{2}$ in. Triangular Flexible Plate 20 and a Semi-circular Plate 21, Plate 18 being edged by a $3\frac{1}{2}$ in. Strip and Plate 19 by a $2\frac{1}{2}$ in. Strip. Semi-circular Plate 21 is secured to Plate 18 by a $1\frac{1}{2}$ in. Strip 22, the complete end plate being connected to the back of the shield by Angle Brackets, at the same time securing a $3\frac{1}{2}$ in. Strip 23 to nearby Plates 17. Bolted between the end plates is a $12\frac{1}{2}$ in. Strip to which the lower ends of the Plates forming the back of the shield are secured.

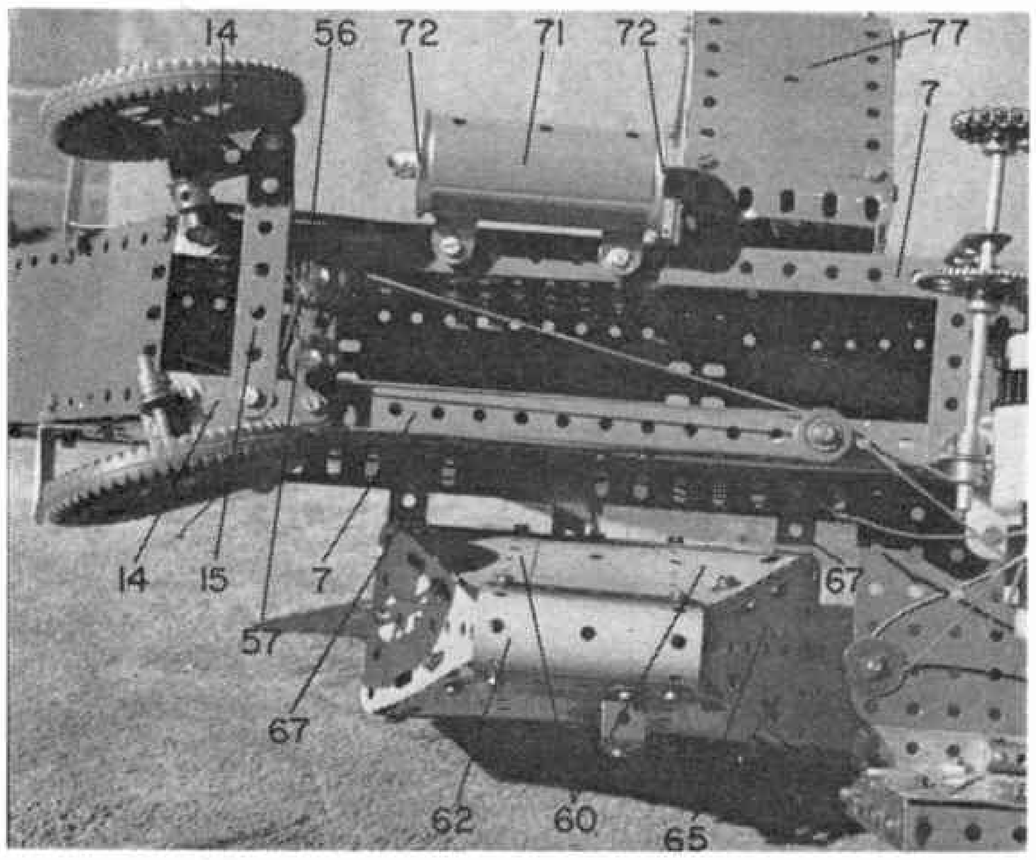
Carried between the end plates of the cutter shield is the revolving bladed cylinder, or "sails", which pushes the wheat into the machine. On the model this is produced from six $9\frac{1}{2}$ in. Flat Girders 24 attached by Angle Brackets to a hexagon built-up from six $2\frac{1}{2}$ in. Strips 25 attached by three 2 in. Strips to a 6-hole Wheel Disc 26. Secured to the inside of one of the 2 in. Strips in each arrangement is a Crank, the boss of which coincides with the centre of the Wheel Disc. The completed drum is fixed on a $13\frac{1}{2}$ in. compound Rod journalled in holes 27 in Triangular Flexible Plates 20 and held in place by a $1\frac{1}{2}$ in. Pulley 28 and a 2 in. Sprocket Wheel 29 each spaced from the end plate by two Washers. Two $1\frac{1}{8}$ in. Flanged Wheels 30 are also mounted one on each end of the Rod as shown. The compound rod consists of one 8 in. and one $6\frac{1}{2}$ in. Rod joined by a Rod Connector.



Before the transmission to the sails can be fitted, the driving cab should be built. The floor of the cab is a $5\frac{1}{2} \times 3\frac{1}{2}$ in. Flat Plate 31 bolted to a $12\frac{1}{2}$ in. Angle Girder 32 fixed to the side of the central body section. The outer side of the Plate is edged by a $5\frac{1}{2}$ in. Angle Girder 33 while a $3\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip 34 is fixed by Angle Brackets to the front end of the Plate. Bolted to Angle Girder 33 is a Corner Gusset 35 and two $3\frac{1}{2} \times 1\frac{1}{2}$ in. Triangular Flexible Plates 36, the securing Bolts in the latter case also fixing a $1\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip 37 in place. Fixed to the lugs of this Double Angle Strip is an access ladder supplied by two $3\frac{1}{2}$ in. Strips joined by several more $1\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strips. The seat is supplied by a flat Trunnion 38 bolted to an ordinary Trunnion which is in turn bolted to a Double Bent Strip fixed to Plate 31.

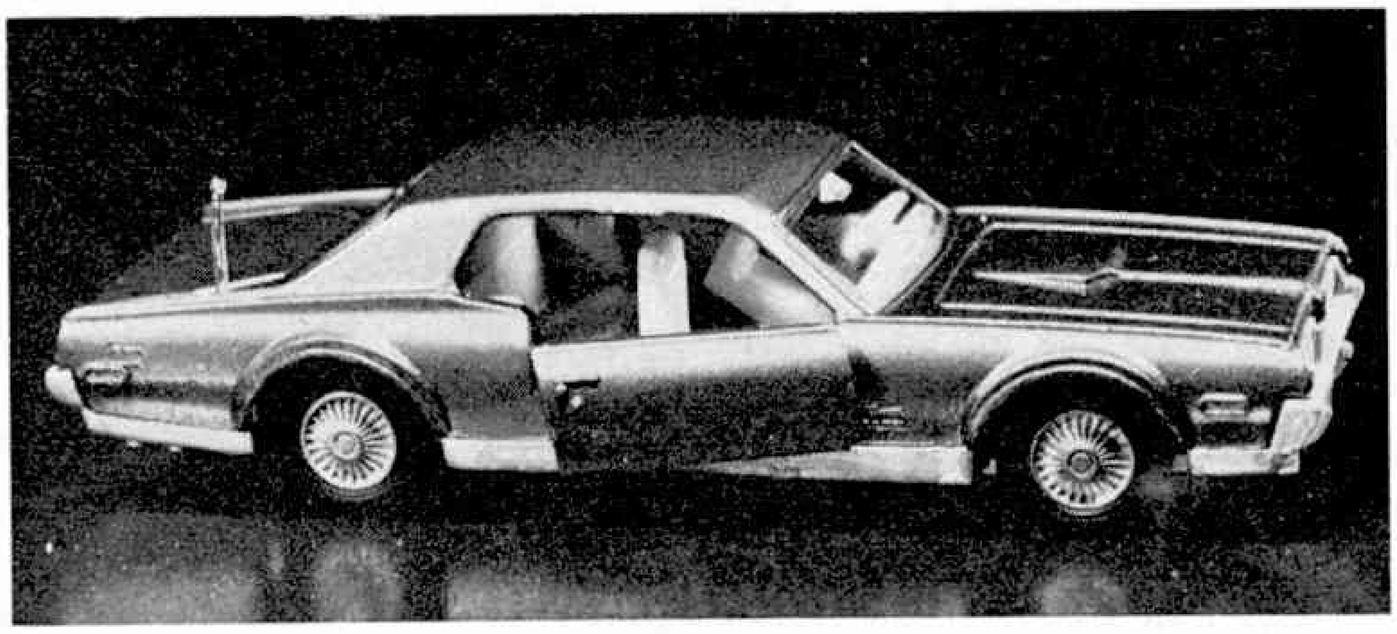
Secured to the underside of Angle Girder 33 are two Couplings in each of which a 2 in. Rod 39 is held. A Short Coupling fixed on the upper ends of one of these Rods is connected by a 3 in. compound rod to an ordinary Coupling on the other Rod to represent one of the handrails. The other, front, handrail is a 4 in. Rod also held in the Coupling and in a Short Coupling 40 fixed to the appropriate Angle Girder in the central body section.

(Concluded next month)



Above right: The rear body section and grain hopper. The body can be filled in by any suitable parts which the builder has available. Right: In this underside view of the rear of the model, construction of the simple steering gear is clearly shown.

DINKY TOY NEWS



BIG COUNTRY—BIG CARS

says Chris Jelley

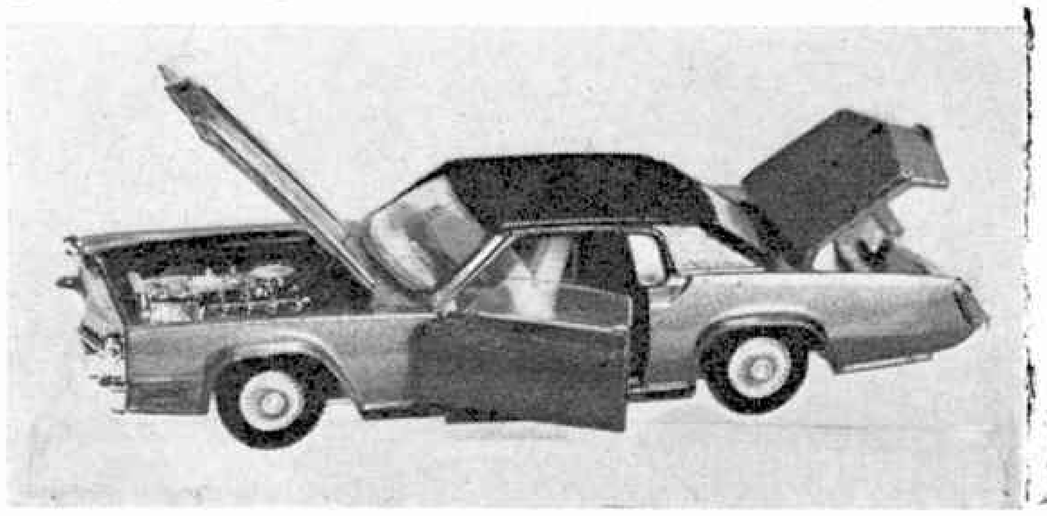
ONCE KNOWN universally as the land of opportunity, the United States of America can now claim another equally outstanding title—" the land of the automobile " ! America is certainly the most car-conscious country in the world. It produces more cars than any other country and Americans buy more cars than any other nationality. It is estimated, in fact, that there is one car for every 2½ people in the U.S. as compared to one car for every 5 people in Great Britain. The population of America is over 203 million which means that there are something in excess of 81 million cars driving about over there. That's one enormous quantity, but after all, they have a lot more room for them than we have !

Meccano Limited, recognising America's position as the world's largest car manufacturer, have always included a reasonable number of American car models in the Dinky Toy range. These, however, because of the American's habit of bringing in new car styles very regularly, tend to become out-of-date after a time and need replacing with more modern types. At the moment, only two car models (as opposed to models based on other types of vehicles) fall into the American category, so now Meccano have just produced a further two examples to bring the number up—the Ford Mercury Cougar, No. 174, and the Cadillac Eldorado, No. 175.

Basically speaking, the most obvious difference between British and American cars is the size. American cars are usually much larger than British cars, and, naturally, this is reflected in the new models. Both qualify as " big ", the Cougar, at $4\frac{13}{16}$ in. being no less than one inch longer than the Dinky Triumph 1300, for instance—and the Cadillac is some three quarters of an inch longer than the Cougar ! Like their full-size counterparts, both models are fast-travellers, thanks to low-friction " Speedwheels ", and both are packed with action features, which of course is only to be expected in a modern Dinky Toy. The same features are not all fitted to both models, but those which are common to the two are opening doors, windows, steering wheel, number plates and full interior seating, the backs of the front seats tipping forward to allow access to the rear. In addition to these, the Cougar is fitted with a retractable radio aerial in the right-hand rear wing which is raised and lowered by means of a sliding button in the model's baseplate, just behind the rear axle. Sliding the button to the right raises the aerial and to the left, lowers it. It's simple, but extremely effective.

Additional features sported by the Cadillac are an opening boot or " trunk " as the Americans call it, and an opening bonnet, the latter referred to across the Atlantic as a " hood ". There is also another feature, though, and one which must not be overlooked because it gives the Cadillac Eldorado a place in die-cast modelling history—an interior bonnet lifter ! This is something quite new to modelling of the Dinky Toy type or even, as far as I am aware, to modelling generally. It comes in the form of a small peg projecting through the dashboard in front of the driving seat. When the peg is pressed it pushes against the bonnet's specially-designed hinge and lifts the bonnet open—and fully open at that ! Quite frankly, I do not know how the backroom boys at Binns Road manage to think up all these new ideas.

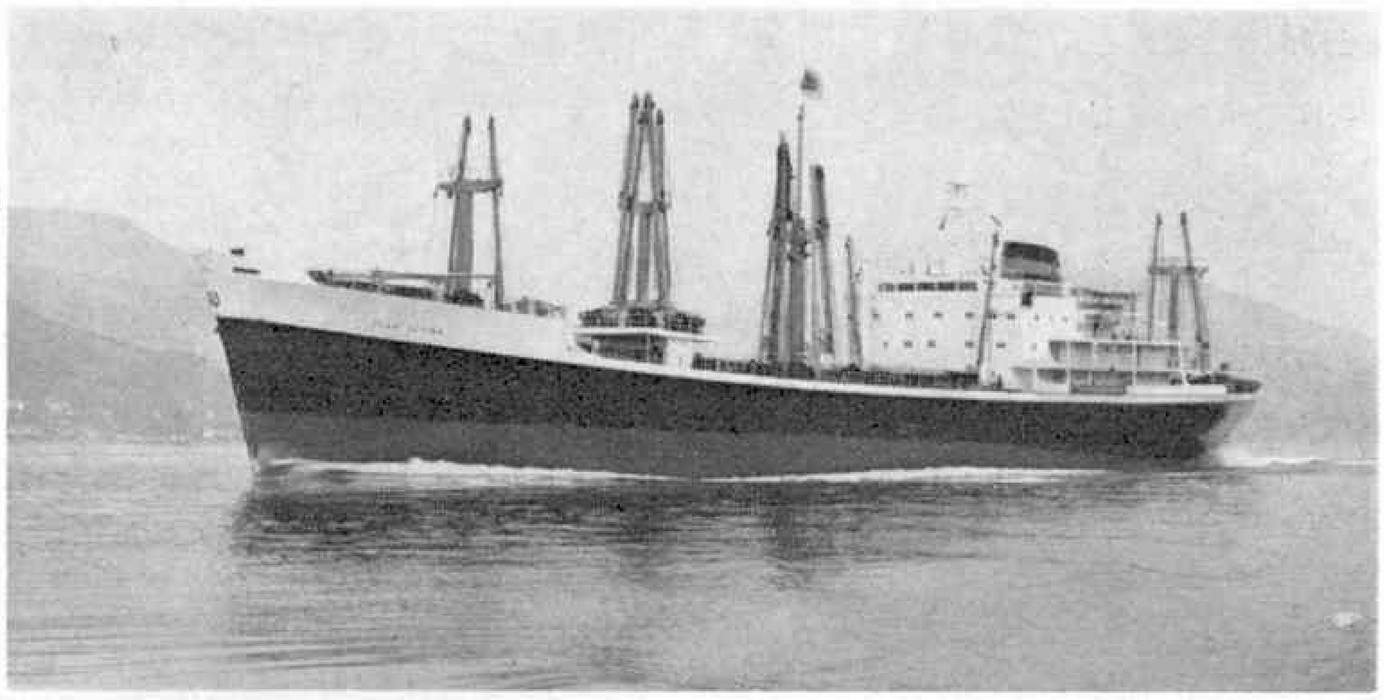
Colour finish on the Cougar before me is in blue with silver base and deep yellow interior moulding, while the Cadillac is in a rich purple, also with a silver base and deep yellow interior. The roof, however, is finished in a special matt black paint which, when dry, has a slightly roughened surface to represent the original car's fabric roof. The effect is amazingly realistic.



Heading photograph: Dinky Toy No 174 Ford Mercury Cougar. Left: The new Cadillac Eldorado from Dinky, Sales No. 175.

TRANSPORT TOPICS

by Mike Rickett



IT HAS often been stressed that trade is this nation's lifeblood. Without it, our prosperity would dwindle and our influence in the world gradually fade. Trade built us an Empire and a Commonwealth and was responsible for Britain's vast merchant fleet of ships travelling to every corner of the world.

Britain's shipping companies, in consequence, are now many and varied, and since most have fascinating histories, I include the story of one such line this month. Although not the oldest by any means, Clan Line is certainly among the larger companies and its ships have been a familiar sight in Glasgow, London and Liverpool for over ninety years.

Founded by William Cayzer and Captain William Irvine in 1878, the Company at first owned only two ships, " Jalawar " and " North Star," but within a year of operations had placed orders for six steamers, the first of which—" Clan Alpine "—was launched in 1879, so beginning the long and famous series of ships named after Scottish Clans. Although Captain Irvine died within a year of the Company being formed, a fortnightly service between Liverpool and India was soon established and over the next five years, a total of 22 ships were built. At the time Clan Line began business, there was no shipping service from Scotland or the North of England to South Africa, and realising that the Indian service could be maintained with fewer ships, Mr. Cayzer decided to enter the South African trade. " Clan Lamont " inaugurated the service in 1881, arriving at Cape Town on October 8.

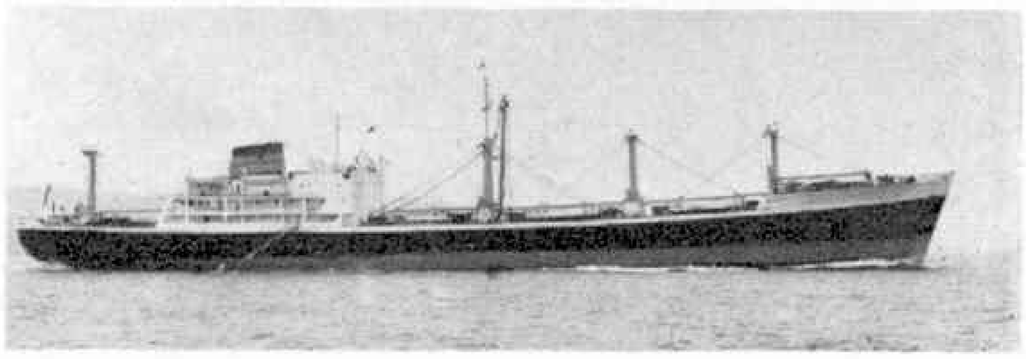
A period of expansion saw the Company build a further nine steamers, start a new service between Liverpool and Colombo, Madras and Calcutta, and in 1883 " Clan Lamont " was chartered to carry pilgrims between India and Jeddah. In the same year, an extension was made to the Indian service to include the Malabar Coast and Chittagong, while ships from the U.K. sailed from London and the east coast as well as west coast ports. Passenger carrying had never been ignored and indeed a number of ships were specially equipped for passengers, but as the trade side of Clan Line's business increased, passengers began to be regarded as less important.

In 1896, " Clan Macdonald "—first of the much discussed turret ships—joined the fleet. Their peculiar design at first raised doubts in the minds of many seamen, but the class eventually proved extremely seaworthy. A phenomenal period of expansion was halted by the advent of the First World War, when the Company had a total of 56 steamers in its fleet, totalling over a quarter of a million tons. Twenty-eight had been sunk by 1918, but all were replaced during the war by faster, more modern vessels. In 1918 however, Clan Line also gained control of the Scottish Shire and Houston Lines, which gave them increased rights on the Australian and South African routes, and also with South America.

Ship after ship became laid up in the disastrous trade recession of the thirties, when the carriage of world trade became so severely reduced. When it ended, a fresh period of modernisation had to be started, and this included the building of a number of refrigerated ships for the homeward South African and Australian routes. Again, war interrupted the work and by 1945, thirty-six of the total fleet of fifty-eight had been lost through enemy action. During the war however, Clan Line ships were among those in the first convoy through the Mediterranean to reach besieged Malta, and on June 5, 1944, " Clan Lamont " sailed with 1,400 troops on board for the initial assault on the Normandy beaches.

Five new ships were built to replace the disastrous war losses, and twenty-six war-time ships were bought from the government. A further nine new ships were also built between 1946 and 1949, and since the company had begun to cater for passenger accommodation in 1948, a total of fourteen ships were provided with facilities for twelve passengers each.

Bringing the story really up-to-date, Clan Line entered air transport with Hunting Transport Group, and this resultant Company—Hunting-Clan Air Transport—eventually became merged with British United Airways. Talks with the Union Castle Line began in 1955 and as a result of these, the British and Commonwealth Shipping Co. was formed. Since then a high degree of automation has been achieved, and has been included on all ships since " Clan Macgillivray " was introduced in 1962.



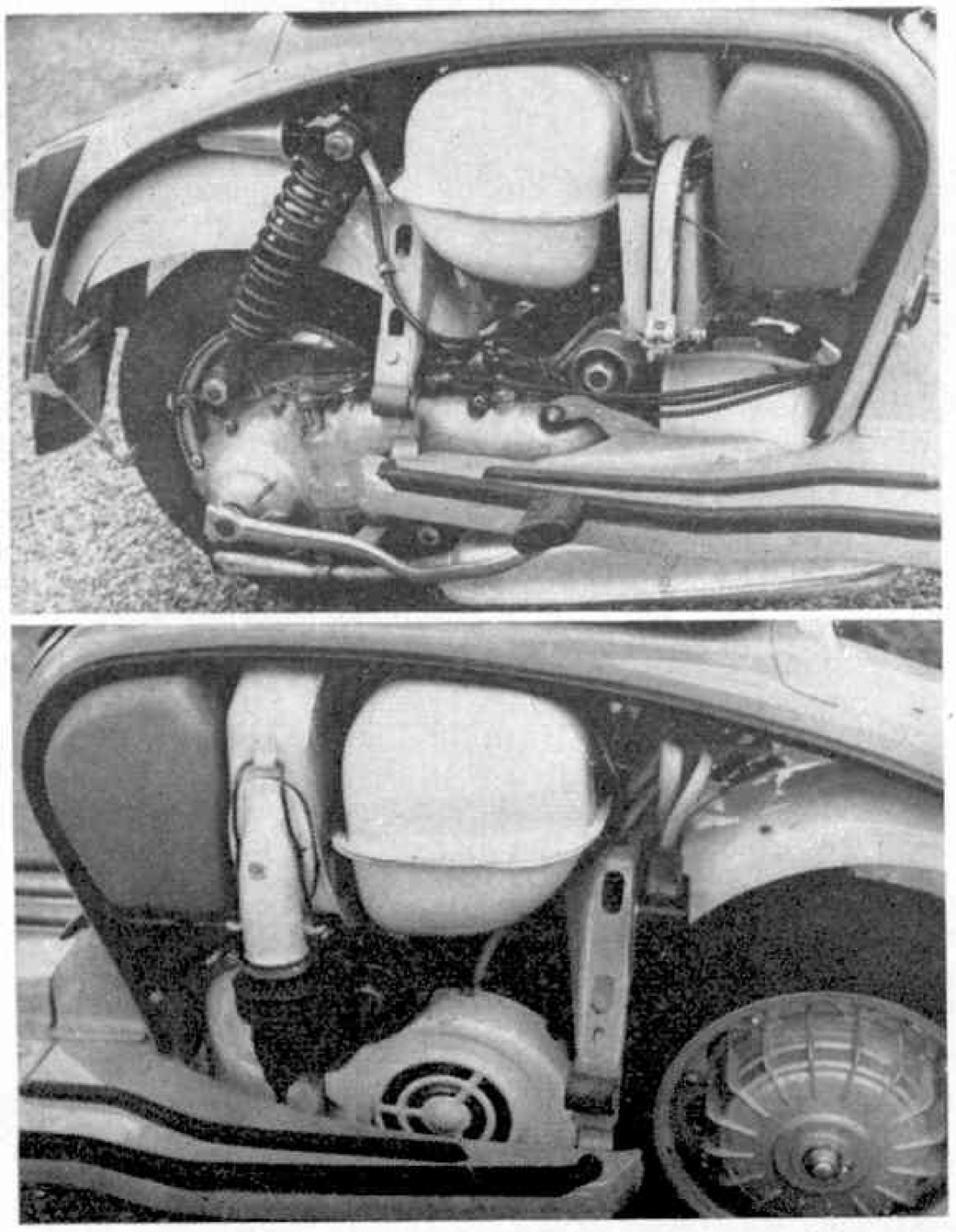
Our heading photograph shows the Clan Alpine, and right the Clan Macgillivray.

ON TWO WHEELS

Meccano Staff test Scooters Mopeds and Motorcycles

THE MOST common criticism aimed at motor scooters concerns their performance, or so we have found, especially when comparisons are made with motorcycles of similar engine capacity and price range, etc. Speeds in excess of 60 m.p.h. have been practically unheard of in the scooter world until recently, and what might be termed "vivid acceleration", just an enthusiasts dream.

This situation has happily been rectified and proof of this takes the form of Lambretta's new Grand Prix 200. It beats the 60 m.p.h. barrier by almost 10 miles an hour; and its acceleration through the gears more than justifies its title.



Clearly seen in the upper photograph is the long kickstarter and slim silencer, the latter tucked away under the pillion footboard. The lower photograph shows the easy access to the rear wheel with the side panel removed.

The Grand Prix 200 (and its sister machine the Grand Prix 150) were, as with the "Luna Line" of Lambrettas, designed by Italian car bodywork specialist Bertone, but unlike the Luna Line, the Grand Prix series are by comparison rather more conservative, and in fact bear a very strong resemblance to the familiar SX and LI series, now discontinued.

The general lines of these machines are simple and attractive, and an overall sensible appearance as regards design is conveyed to the onlooker. Switches and various controls are neatly arranged; simple and without exception easy to operate. The handlebars, incorporating the powerful headlamp unit are completely enclosed, both on top and underneath, hiding the various cables and wiring. The left-hand controls the clutch lever and gear selector (4 speed and very easy to use), and the right, the front brake lever. The centrally mounted speedometer and mileage recorder is easy to read, both during the day, and at night when it is illuminated by a small bulb. On the inside edge of the handlebars immediately behind the speedo unit is the ignition switch. Five positions controlling both lights (main beam and parking), and the ignition itself. Lighting on the Grand Prix machine is above reproach, being both powerful and having a wide spread, although at low speeds in a high gear they tend to fluctuate rapidly when on main or dipped beam from bright to dim, being powered directly from the magneto.

The Engine

Being completely panelled in, motor scooter engine units are very much "out of sight, out of mind," and very often fail to get the required attention they need. Removal of the side panels (achieved by releasing a couple of cunningly concealed spring clips) reveals the power-house of the Grand Prix 200, and is clearly evident in our photographs.

In common with all the scooter breed it is a two stroke, and a powerfully willing one to boot! The long kickstart started it more often than not at first prod, and even on the coldest morning a bit of choke always produced the desired effect on at most the third attempt. At idle the unit "pop-pops" quietly, a situation which changes to an impressive head-turning roar when the throttle is opened.

Cooling for the unit is provided by a ducted fan system driven from the crankshaft, the usual scooter method in fact, and one which is perfectly satisfactory.

The Gearbox

As we mentioned earlier the gearbox is a four speed one, and is controlled from the handlebars. Providing the necessary cables are properly adjusted, this method is very easy from the operational point of view, and on the Grand Prix is simplicity itself. The positioning of the gears are clearly marked on the handlebars, should the situation ever arise when the rider is at a complete loss! Very swift changes can be made, changes that are in fact as quickly executed as a motor cycle foot operated type, a comment made by all our test riders.

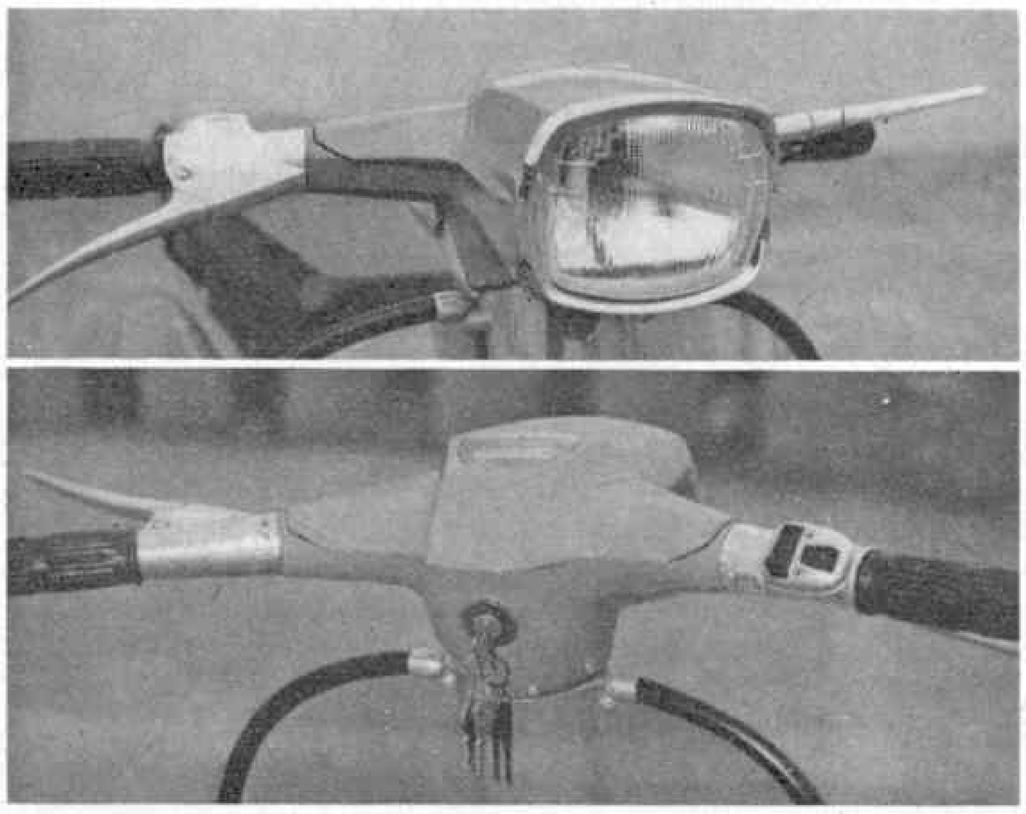
The gearbox unit itself was superb, being both silent and smooth in its operation.

The Bodywork

Simplicity is the order of the day here as far as the all metal panelling is concerned. There are no awkward corners or sharp edges evident and the overall effect created is of a sensibly designed machine.

Under the dual seat (very comfortable and quite long enough for two) is the fuel tank which holds just under two gallons. Immediately in front of the seat is located a useful tool box-cum-small luggage space which can be locked to keep its contents safe. Below this are the two small controls for the petrol supply, on/off/reserve and the choke. Running down each side panel are matt black decorative stripes, broken approximately ⅓rd of the way towards the rear, to accept dummy intake grills. The large rear lamp unit contains a brakelight and is finished with a matt black plastic surround which matches the horn unit at the opposite end of the scooter. The legshields are raked back slightly and provide adequate protection against the elements from the knees down.

Above: The front wheel has ventilation slots to cool the disc brake, and like the rear wheel is easily removed from the machine. Below: Altogether a very attractive scooter. Only the racing stripes give a hint that here is something special!



Upper: The elegant and exective headlamp unit gives a powerful beam on both main and dipped positions. Lower: Note the neat control unit on the right handlebar, and the ignition switch in the centre.

Summary

For the enthusiast with long journeys at the back of his mind and £243 (£203 . 19 . 6 for the Grand Prix 150) to spare, this machine would take a bit of beating and is certainly worthy of serious consideration.

Without exception, our four test riders were impressed with the looks and terrific performance of this, the largest engine capacity scooter on the market. The horn was constantly criticised for its poor output, especially on such a quick machine, as indeed was the front (disc) brake which was rather below the standard we would expect from a system generally accepted to be more efficient than a drum brake. Apart from the above mentioned faults we had nothing but praise for the Grand Prix 200, and it was with genuine regret that we returned it to the distributors.

FOR THE TECHNICALLY MINDED

	Grand Prix 150	*Grand Prix 200*
Cubic capacity	148 ccs	198 ccs
Maximum power	9.27 bhp	11.74 bhp
Consumption (per gal.)	86 miles	70 miles
Weight	264 lb.	271 lb.
Gear ratios	1st 15.33 : 1	1st 13.05 : 1
	2nd 10.71 : 1	2nd 9.13 : 1
	3rd 7.97 : 1	3rd 6.79 : 1
	4th 5.65 : 1	4th 5.22 : 1
Tyres	3.50 × 10	3.50 × 10
Lubrication	Petroil mixture 2% oil	

Common dimensions: length 70.8 in., width 26.8 in., height 39.8 in., seat height 30.39 in., wheelbase 50.8 in.
Available colours: GP 200 yellow, red; GP 150 red, turquoise, white, white/red, white/blue.

BATTLE

by

Charles Grant

PART XXI

MAINLY ABOUT MINES

BEFORE CARRYING on with some more 'action' (in the next Part we shall be having a go at a rather more general engagement than those previously described) we have to complete our examination of the Infantry Headquarters Company, whose composition was set out in Part XX, by noting certain rules governing weaponry we have not already touched upon. These affect the support elements on the HQ Company, and being few in number may be dealt with briefly.

Certain of the HQ components have been covered already—rules for mortar and heavy machine gun fire, as well as for the anti-tank section have already been formulated—and we are left basically with the Assualt Pioneer Section, the six men and the N.C.O. comprising it. A fair amount of what we can say about this section falls really into the realm of strategy rather than of tactics, particularly in the type of battles we have in mind at present—that of not greater extent than, say, battalion level. As such, more will be said in this respect when we proceed to games in which maps are used. Take the laying of mines, for example. On a table top with a battle in progress, there would be little point in giving one's engineers the job of laying a minefield. The enemy would see what was going on and would therefore avoid the mined area like the plague (even if 'visibility' was such as to prevent his 'seeing' officially it would be too much to ask him to turn a blind eye to such an important operation.) Ideally then mines would have to be in position and their position noted on a map before any troops actually were placed in position on the wargame table. Indeed, this is far more likely to be the case, minefields being strictly defensive, and it would be likely that the first evidence of their existence would be when a leading tank 'went up' when entering a mined area. Unless, of course, detecting apparatus had not previously been employed.

Even so, just in the event of a player's wishing suddenly to discourage an opponent's incursion into his line in some particular spot, we shall give the rules for the tabletop operation. We can either—according to the whim of the player—ignore the question of supply, or can stipulate that each engineer section has so many mines, or, better still, can mine a certain particular area with the available supply.

Basically, a mine-laying team will generally consist of two men—one digging the necessary hole and the other placing, and activating or fusing the device. The question which will immediately be asked is just how long this is going to take, and the obvious answer is that it depends on just what sort of ground is involved—is it hard or soft? It is a comparatively easy matter to do the job if the team is working in the soft soil of a ploughed field but a vastly different kettle of fish if rough or stony ground is involved, and even more so if the mines are being laid in metalled roads. We could, if required, make some allowance for the difference in the speed of the process caused by such circumstances, but it seems better at present to take

an average and use this as a general rule. I do this also because, as will be generally found, laying a minefield is a job which comes more often into the more strategic type of wargame, in which one can draw out considerable mined areas at leisure. The actual positioning of the mines themselves is a pretty complicated matter. They are not just strewn about in any old way but have to be placed in proper geometrical patterns.

One further point is the question of the type of mine. It is hardly necessary to point out that there was an enormous variety of these devices, although only two main categories need concern us—the anti-personnel mine and the anti-tank one, the latter naturally being very much heavier and more powerful than the former. At the moment we shall consider only the anti-tank variety, as this is the one more likely to be used on the wargame table during a game. All sorts of calculations could be made and tables set out giving times and areas but I think that all this would be out of place in the present context, so, to postulate a simple rule, we shall say that an engineer team of two men can sow an area of one square inch—on the table, naturally—with mines in five moves. This is without doubt a tremendous generalisation, but it will be found to be workable (not forgetting that the two men are half the engineer component of the section—I'm not including those with flame-throwers).

Once laid, if discovered by the enemy, it will take a great deal longer to neutralise the mines in the field. It was a comparatively easy matter to lay them, but to locate, uncover and de-activate them is patently a much more deliberate matter. (At this stage we shan't discuss the 'flail' type of tank, such as the Churchill—that's a highly specialised sort of thing). So again we generalise, and enact that the two-man section—one of whom would be equipped with mine detector—could clear the same area—one square inch—in 20 moves. I re-emphasise, if I may, that this is an arbitrary sort of time, determined upon with an eye on the practical application to the wargame.

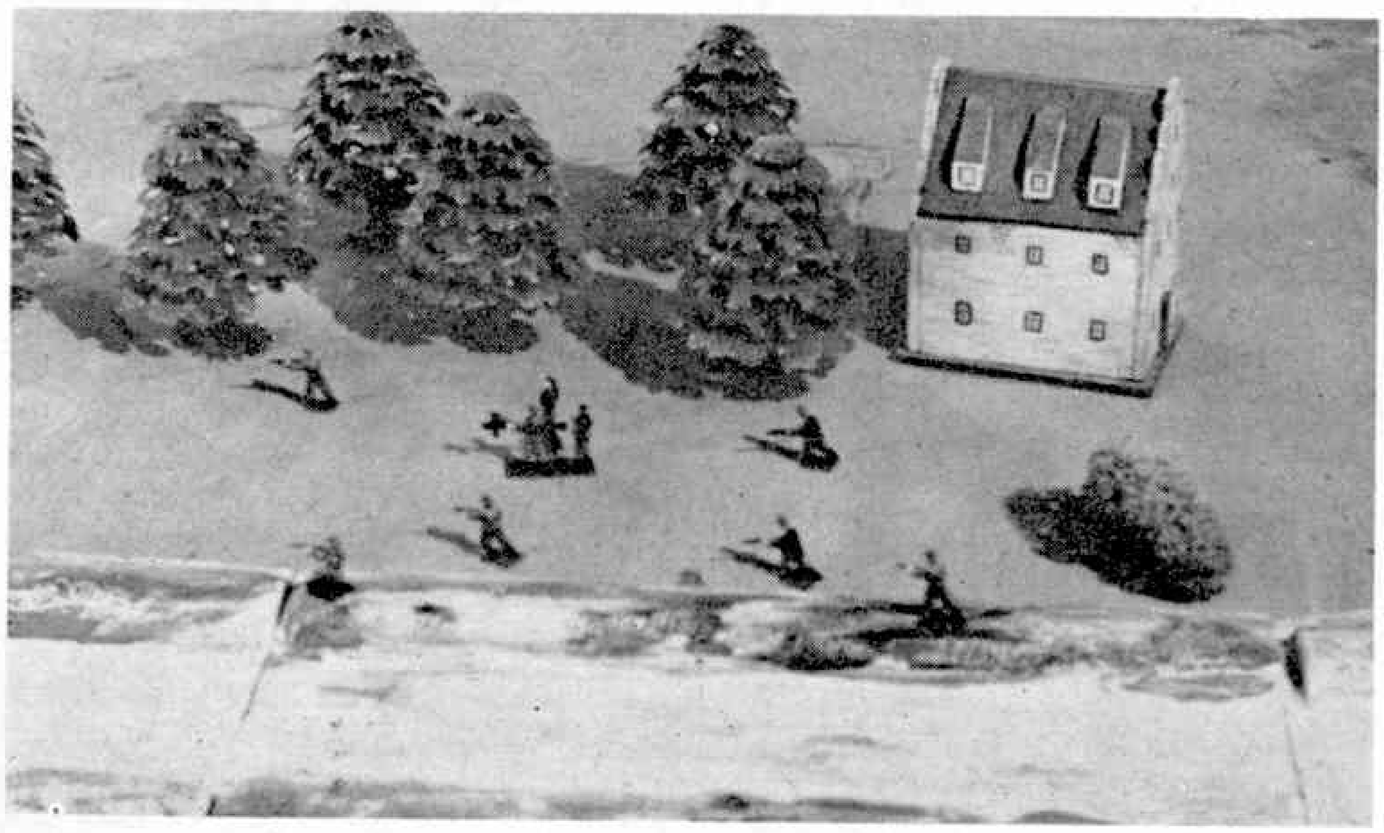
As we are concerned at present solely with anti-tank mines, the question of their being triggered-off by men passing over them does not arise, as it would take the weight of a vehicle to do this, and we have now to decide just what the effect of this would be. The explosion of one mine by itself would rarely be sufficient to destroy a tank, it seems, although it would make a considerable mess of anything lighter. Even so, even one would be enough to immobilise a tank, by blowing off or damaging a track, for example, and if it were unlucky enough to have two explode under it, it might well have to be written-off. We reflect this in writing our rule for this contingency, thus:

As soon as a vehicle enters a mined area, dice will be thrown by the opposing player (the chap who laid the mines)—If the throw is 6—the tank is destroyed. If the throw is 4 or 5—it is immobilised. Throws of 1, 2 or 3 have no effect. For convenience we can lump together all other vehicles, as follows: On entering a mined area—5 or 6 will destroy. 3 and 4 will immobilise. 1 and 2 have no effect.

Of course, should there be a no-effect throw, the tank or other vehicle can proceed—if the 'general' wishes, although he would be unwise to do so, as, on each subsequent move within the minefield, dice throws, as above, will be made, and the further the progress into the mined area, the greater become the risks of destruction or at least immobilisation. Better to wait until the mines have been cleared.

A few words should suffice to take care of the final weapon in the armoury of the engineer section, the man-pack flame thrower, a fearsome thing, although very limited in use. We have already decided on its range and what we want to know now is its effect on tanks and other vehicles. This, contrary to what might have been thought, is not all that enormous. It appears that a spray of petrol or something similar had to be applied before the actual flame, but this is only theory. In practice, a tank—and its occupants—had to be very unlucky if a single jet of flame from a man-carried projector did any real damage at all—let alone send it up in smoke. Actually, this weapon was better employed in clearing houses, bunkers and so on rather than against armoured fighting vehicles. Still, we must have a rule to cover the off-chance, and it is that—with the flame thrower within range, a dice throw of '6' is required to destroy a tank, nothing else is sufficient. It should not really be necessary to stipulate the effect of 'flame' on soft-skinned vehicles—the fuel carried by the man-pack device being severely limited and it would hardly in ordinary circumstances be thus wasted. In fact we might reasonably legislate that not more than three 'squirts' can be made by a flame-thrower. A good reason, therefore, for husbanding the supply. (If, as a special case, it *was* found necessary to use it on a soft-skinned target, the result would be vastly different—a dice throw of 3, 4, 5 or 6 would be enough to do the job of destroying any truck or similar vehicle).

Heading photo: Without a doubt, any move in a battle holds a great deal of risk. In fact as soon as someone moves from cover, there is a great possibility that he will be 'cut-down'. One such desperate move is shown here: tanks and infantry 'rushing' a narrow bridge.



Right: A small band of infantry in open order, advance along a river bank.

Space X Miniatures

Many of today's toys are so produced that in some way they either educate the child or help him to use his imagination. One such toy is the SPACE X Interspace Miniatures Super Set 1, produced by Rovex Industries of Tri-ang. The set, which contains 15 miniature space vehicles, six astronauts and a simulated moon surface, is not a game as such, but is purely of play value. With this set you can perform every stage of a complete space programme—from launching the rockets to actually occupying a planet—all for the modest price of 55/-. Each of the vehicles has an authentic or working feature, such as missile launchers, engine simulations, various moving parts, free running wheels, etc., and include a forklift, tractor, mobile missile launcher, prospector, mobile headquarters, explorer, helicopter and various interpace rockets.

If you only want a few of these vehicles, then they can easily be obtained separately for the very modest price of 2/11d. per craft. There is also, at the moment, three major models, available from 12/11d. These are the Nuclear Pulse, the Mobile launcher, and the Moon Base Headquarters.

The Nuclear Pulse is a space exploration vehicle, with wingtip rotars, two of which can be launched by a simple spring mechanism, for further exploration. A defensive projectile launcher is another feature, this unit being housed under a transparent cover when not in use. The complete unit is yellow with blue trimmings, two blue rotars and two chromium. The projectile is silver. The price of the model, complete with 3 golden astronauts, is 12/11d.

The mobile Launcher is comprised of 13 parts that slot together to form a realistic copy of the type of launcher that was used in the Apollo programme. The gantry incorporates an adjustable crane for lowering the Flight Capsule onto the top of the rocket. The rocket itself is constructed in 3 stages and the whole assembly is mounted on a moveable platform. The recommended price for this is 12/11d.

The Moon Base Headquarters is a reproduction of what might be used to house our future astronauts on the moon. They will have the benefit of a rest room, play room and a work room, with an additional module for storing transport. All these "rooms" are well detailed with all the necessary equipment, beds, furniture computors, benches, cupboards, etc. Six astronauts occupy the base, which retails at 14/11d.

Above: The impressive range of Space X Miniatures complete with simulated moon surface. Above right: Two of the three hilarious new products from Merit. Overpage: The action packed auctioneering game from Tri-ang.

HAVE YOU SEEN ?

Three from Merit

The first of three, from Merit Toys and Games, is a three-in-one box containing Draughts, Nine Men's Morris, and Tic-Tac-Toe. All three games are played on one board. Draughts on one side and the other two, on the reverse side using the same counters every time.

As we are certain everyone knows how to play draughts, there is no need for any explanation of this, but, the other two games not being so well-known, will require a little attention.

Firstly, Nine Men's Morris which is played on the circles and adjoining lines. This is a game for two players, each with nine draughtsmen, either white or black. Each player in turn, places a piece on a circle on the board, the object being to form rows of three.

Every time a player completes a row of three he may remove from the board any of his opponent's men that are not a part of a row of three. When a player has played all his pieces, he may then begin to move those already on the board to form a row of three. A point to make here is, that any row can be broken and remade any number of times. The game finishes when a player has only two pieces left, the other player being the winner.

Tic-Tac-Toe is played on the 9 squares in the centre of the board. This game is easily explained by saying that it is "Naughts and Crosses" played with draughts.

These three simple games, using a strong cardboard and thick plastic draughts, are sure to bring many hours of enjoyment to the owner, and for only 10/11d., this box-of-fun is pretty good value for money.

The second in the trio from Merit is an hilarious action game called Tic Tac Twist. This game, for two or four players, has four different ways of playing, each one equally as much fun as the other. It consists of a large polythene sheet on which are printed red and yellow squares, circles and diamond shapes, but it is only the 9 large squares that really concerns the game.

The basic principle of Tic Tac Twist is exactly the same as Tic-Tac-Toe, but it is not played with draughts or naughts and crosses, it is played with your hands and feet! Some of the positions you get into are really funny.

Tic Tac Twist is an ideal game for parties, or as

something to cheer you up on a rainy day. Its recommended retail price is 8/11d.

Last but not least from Merit is this box of party tricks, containing 21 practical jokes—some old and some new. The old ones, familiar to most of us practical jokers, are such tricks as the lighted cigarette, the nail through the finger, the set of protruding teeth, the ink blob and the plate lifter, all still able to raise a laugh. But it was the new ones that caused the most laughters, or should we say screams, as was the case with the packet of chewing-gum, inside which was a large black spider who jumped onto your hand when you took a stick of gum. Other good laughs came from the spoon with a hole in it, the bar of chocolate that squirted water, the rubber pencil that bent when you started to write, the rubber coat hook and the various horrible insects. Sickening sights came from the long slimy tongue, the white scar and the yellow-headed boils—very effective. The most 'real looking' tricks were the rubber chips and the rubber chocolate biscuit.

All the tricks are good fun, but be careful who you try them on, they could offend someone. The price of this box-of-tricks is 27/11d., which we think is a bit expensive. Still, if you buy it you can have a good laugh at the expense of others.

What am I bid ?

Another interesting game, this time from Tri-ang, is 'What Am I Bid ?' an auctioneering game with a difference. The game contains an auctioneer's mallet, an Object Card stand, Universal Bank Notes totalling £100,000, a pack of 48 Object Cards consisting of 16 objects in 4 collector's categories, four "Rarity" cards, ten collectors price guides. Incidentally, each object has 3 cards representing the "good", the "poor" and the "fake" specimen.

The object of the game is to end up holding the highest collection value in your hand. This is achieved by trying to become a collector of "good" things in one field, the only snag is that you don't know whether the object being sold is the "good", the "poor" or the "fake" specimen.

After dealing with the preliminary operations; that

is electing an auctioneer, giving out the set amount of money and shuffling the Object Cards, play begins by the auctioneer placing an Object Card on the stand with the picture facing the players. The players then start to bid, in minimum steps of £25, and the article is sold, obviously to the highest bidder. The auctioneer then hands the card, face down, to the buyer so that it is only these two people that know what category the object lies in.

If a player manages to buy the "good" specimen of three objects, he is immediately entitled to declare himself a collector and the game stops. The collector doubles the value of all the "good" objects he holds in his collection category. Each player then totts up the value of his objects and then the money they still have added to the total. The player holding the highest total value is the winner of that auction.

This game involves a great deal of skill and is rather hard to grasp first-time-round, but after a few auctions you should get a hang of it, and that is when the excitement starts. "What Am I Bid ?" costs £1 17s. 6d., which is pretty reasonable for what you get out of it.

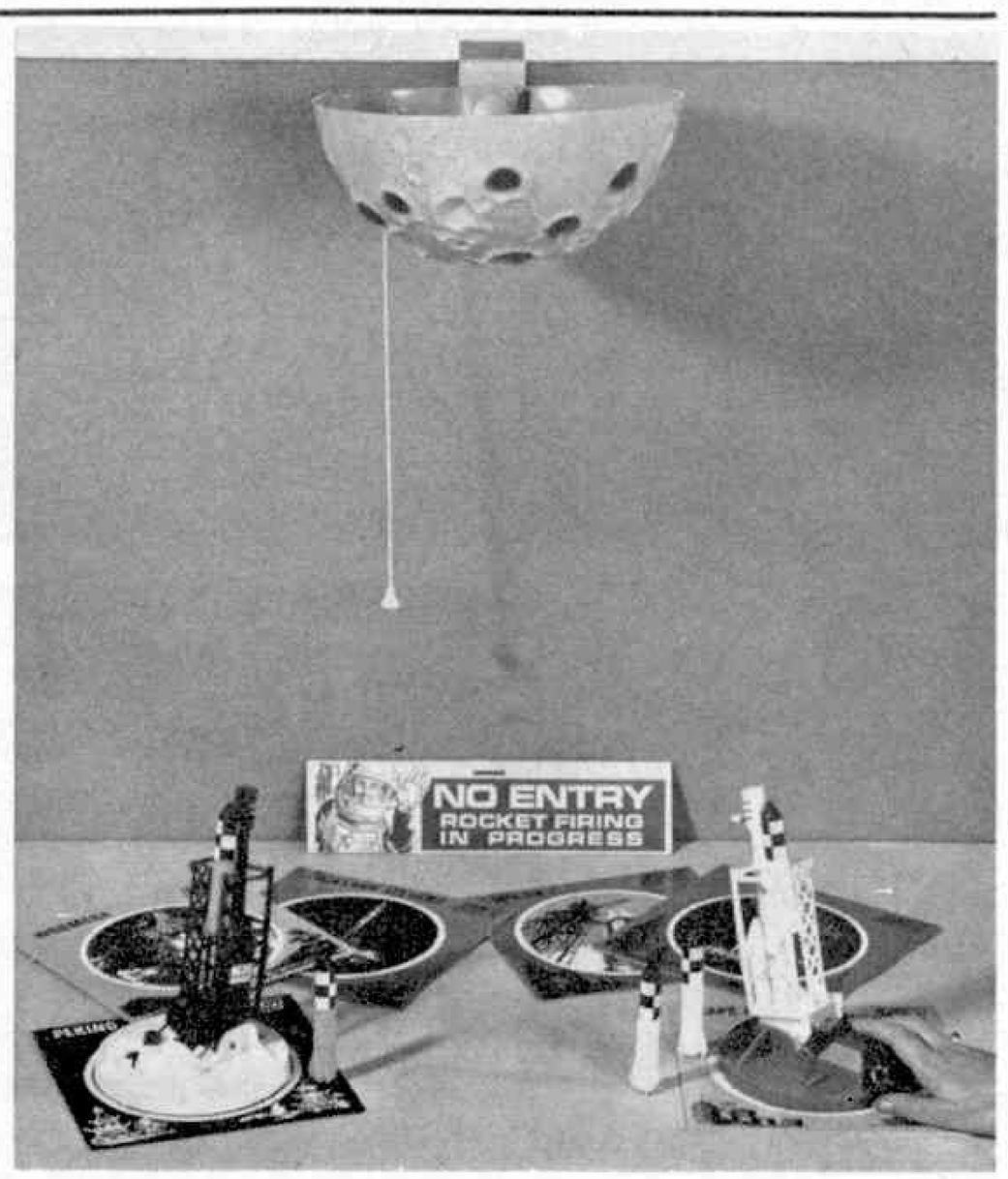
TWO FROM TRI-ANG—Continued from page 39

Luna-cy

The second new game from Tri-ang is yet another one requiring skill and patience, and once again one which causes excitement, although whereas Jump Jockey is a family game, Luna-cy is more suited to the younger members of the family.

The purpose of the game is to fire rockets from launching pads and get them to "land" inside the moon. To direct the rockets on target involves careful variation of the angle of the launching pad. The "moon" is in fact bowl shaped so the rockets can drop inside. A bracket included in the set allows this to be clipped to the top of a door, and a cord attached to the moon when pulled tips the rockets out onto the floor. A small card with the words "No Entry, rocket firing in progress" is supplied and hung outside the door to warn Mum and Dad of the danger inside!

The set contains 2 launching pads, 6 rockets, a well detailed model "moon" and various cards showing full colour pictures of various famous launching sites situated around the world. The price is £3.19.11 and without a doubt excellent value for money.



The complete Luna-cy outfit showing how the game is set up. Great skill and persistence is needed for the game, which is sure to give hours of fun to the youngsters.

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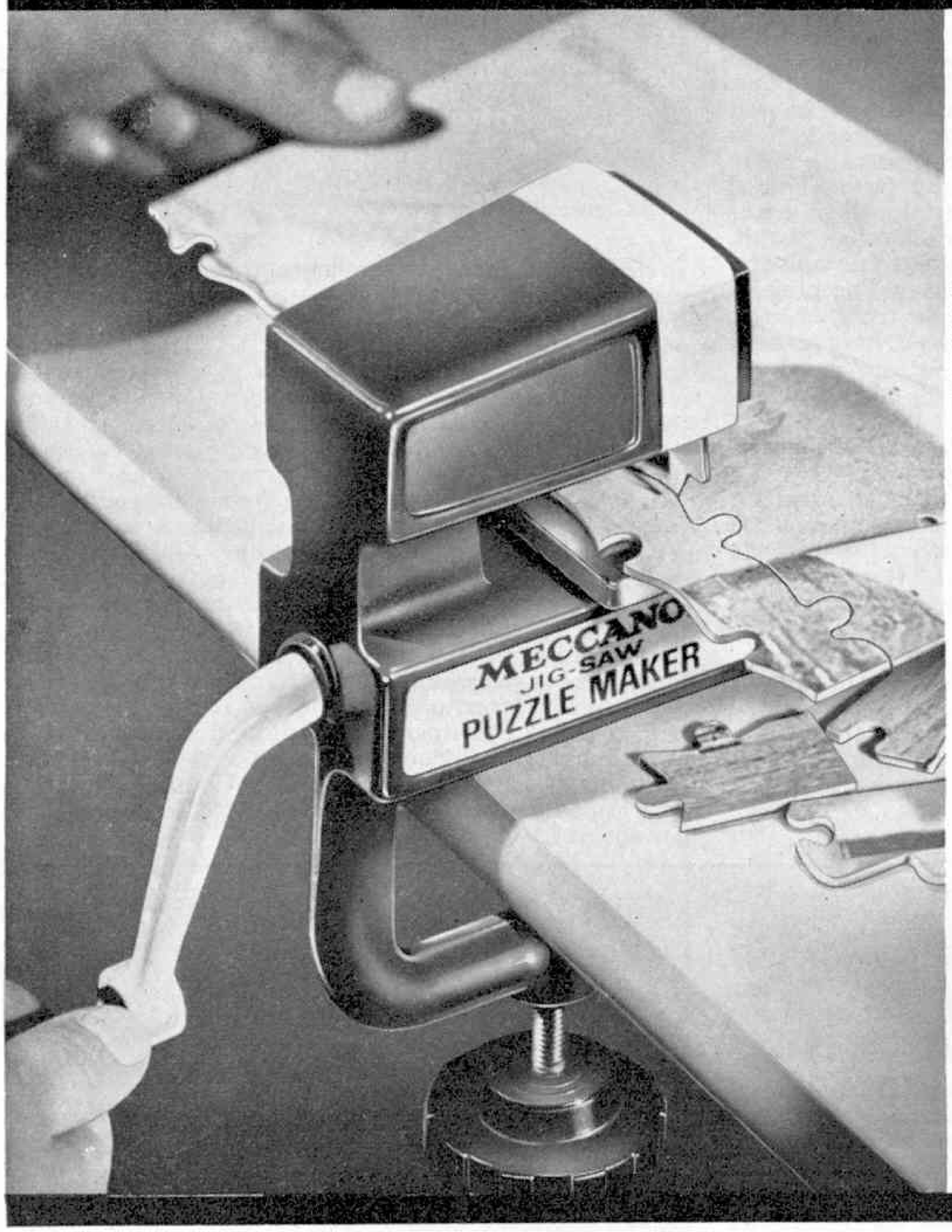

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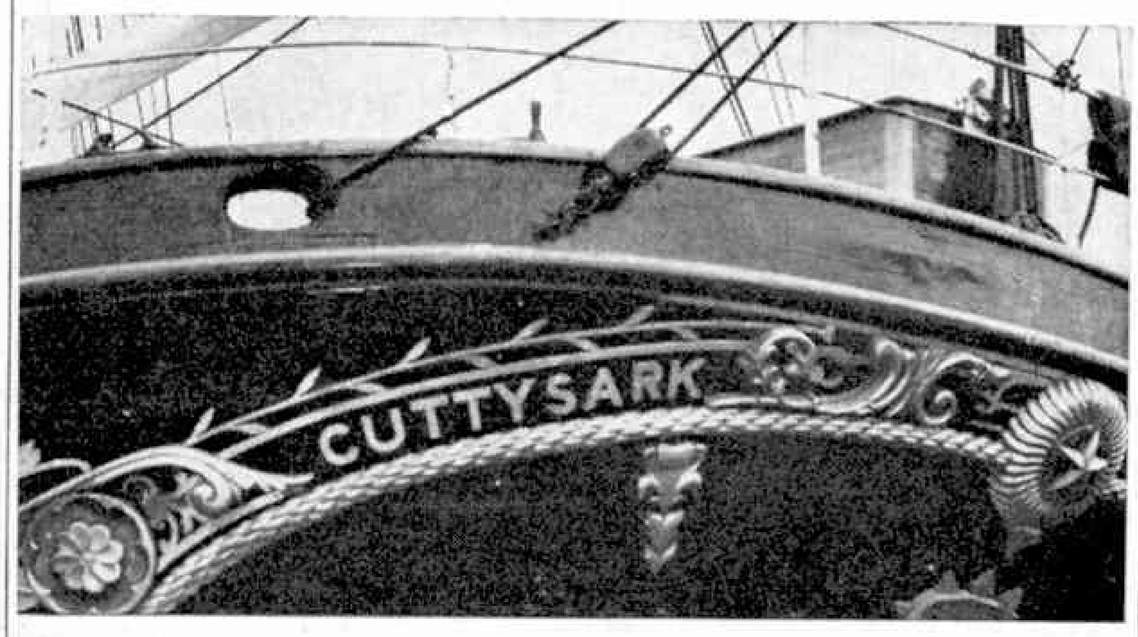

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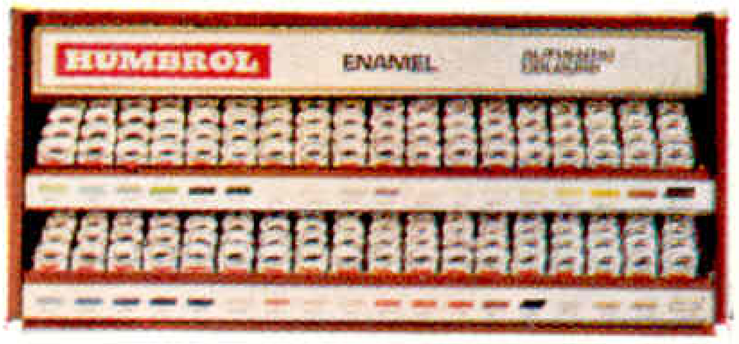

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Another super Dinky with all the authentic details, and an airfoil stabiliser for extra road holding.

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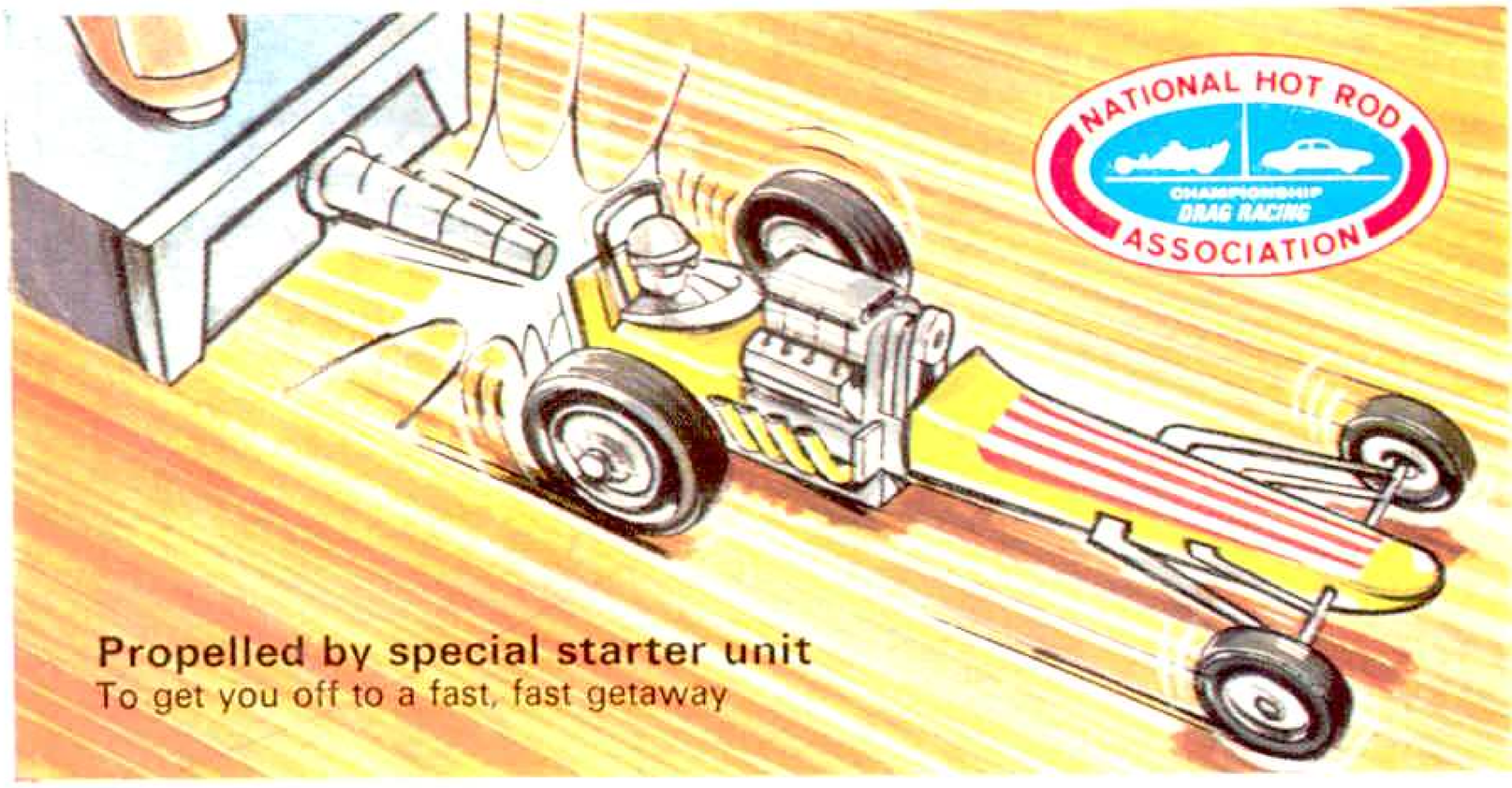

Propelled by special starter unit
To get you off to a fast, fast getaway

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the tough, all-action models

CA'CANNY MK II

A Prototype electric car for radio control by MECCANO® STAFF Magazine

This model, although looking complicated, is quite easy to build. Most of the parts are numbered to make building easier, so a little time spent studying the plan will make it seem simple.

Commence by cutting the base, B.1., from 1/4"sheet. Glue the 1/16"ply motor plate & front axle bolt supports in place. Trace the sides B.2., B.3., onto 1/8" sheet, not forgetting to make the two sides opposite, by marking former & plate positions on the inside or outside as noted on the plan. After marking the two sides, cut away the hatch side's. Now epoxy the 16gauge metal to the 1/8"ply axle plates. Place the sides back to back, & sand until the same. Epoxy the two plates into position, & clamp. While these are drying, cut out all other pieces also the ply wing struts & end plates. While the sides are still clamped drill the

Base B.1. 1/4"sheet
Front axle position
B.7.
B8.
Position of sides & formers shown in chain dot lines
B.10
B4.
B.5.
B.2.
B.6.
1/16"ply motor base. Mark holes & screw or bolt in place when gears are lined up & move freely
1/4"
3/4"
3/8"
5/16"
Bend here
Make axle pivot from tinplate, fold down centre & epoxy. When dry bend to shape as per front view.
1/16"ply glued to bottom
1.1/2"
Front view of nearside wheel axle
Brass axle block, use pins from 13amp plug. cut head & tail off, drill hole for axle. Epoxy to pivot, When dry, drill through pivot & epoxy axle & tube in place
Tube stop
6BA bolt or 14guage wire
5/32"
Cut out to clear drive gear
B.7.
B.9.
B.10.

Wing strut.
2 off 1/16"ply

1/8"sheet back
1/4"sq
Wing strut position
Rear axle plates.
1/8"ply
16gauge brass or dural
1/16"sheet

1/4"sheet
Ply strut
1/8"x1/4"
Section A

B.7. 1/4"sheet
B.8.
B.9.
B.10.
1/8"sheet

3. 3/8"
3/8"
3/4"
1.1/2"
3/4"
3/4"
3/8"
3"
Axle from 3/8"sq beech

2"
1"
Track rod from Plastic sheet or 1/16"ply

Plastic
A
Acetate
Soft block
1/8"x1/4" to here
1/8"sheet
B.13.
B.12.
1/4"sq
1/16"sheet
A
TWO GEARS HAVE 6:1 ratio
60 tooth gear
4.5v flat battery
Motor
10 tooth gear
Servo
Rx
Rx battery
Soft block
B.4.
B.5.
B.9.
B.1.
2"front wheel
2.1/4"rear wheels
Drive switch

Rear hatch
Battery
1/8"sq

Hatch
Seat back
1/8"x1/4"
B.10. outside
B.6. inside
outside

B.6.
Slots for sides

B.13.
B.9. on B2.
B8. on B3.

Chamfer
B.5.
B.4.
B.12.
B.13.
All formers 1/8"sheet

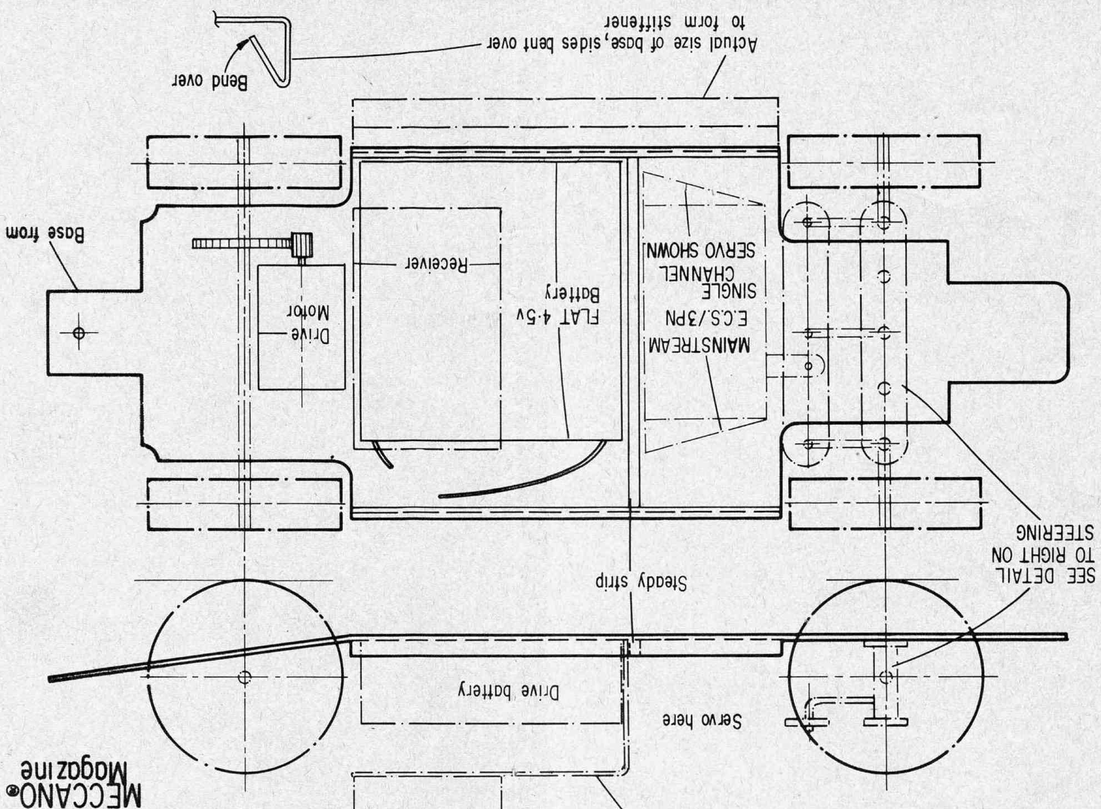
B.12.
B2. B3 from 1/8"sheet

B.11.
Servo battery
Wing
Clamp
Cockpit
Top sheet cut away for clarity
Servo
1/16"ply servo mounting plate
Receiver
B.13
B.6.
1/8"x1/4"
14swg axle
Gears 6:1 ratio
Top hatch 1/8"sheet

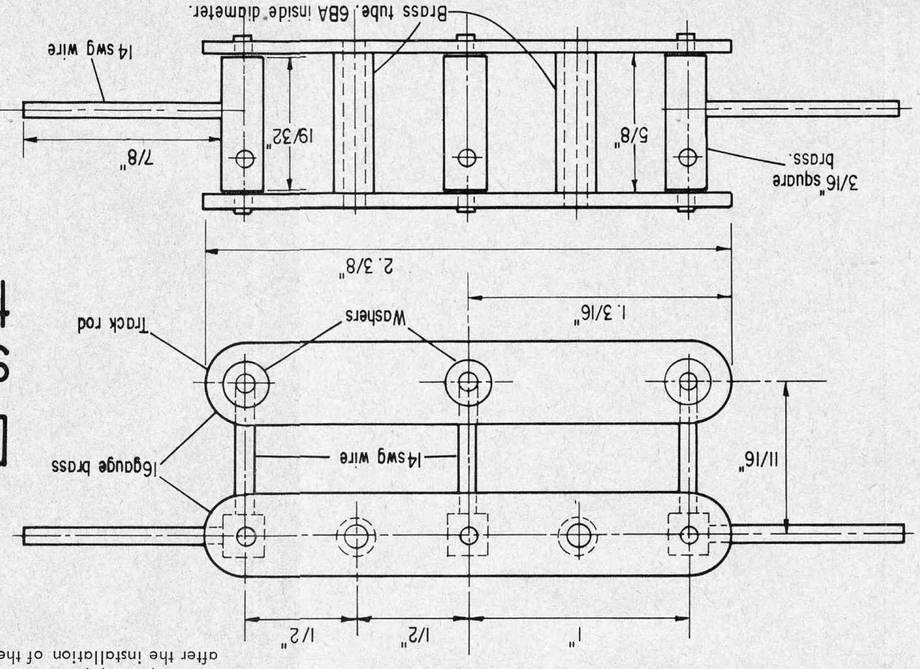
Section
Wing 3/16"sheet
End plate

TOYOTA 2000 GT

a radio control version from the 1/16th scale OTAKI kit, by MECCANO Magazine Staff.

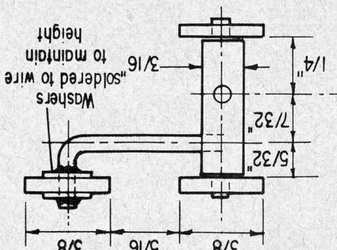


The chassis in this kit could not be modified for radio, so a complete new base was made. The plan is almost self explanatory, but a few points will make some things clear. Note that the base has two stiffener rails down each side, made simply by folding over the extension shown at the bottom of the chassis. The chassis was made from tinplate and is adequately strong enough when screwed to the plastic body. If a heavier gauge of metal is used, then only an 'L' shape at each side should be sufficient. The steering gear is perhaps the most difficult - NOTE THAT IT IS DRAWN TWICE SIZE - after cutting the brass strips, clamp together and file to shape, and drill the holes.



NOTE

Drawing of steering is twice full size



The 3/16" sq. brass pieces should be drilled as shown, to take 14 swg wire. Great care should be taken here and accurate drilling pays off. When all are drilled, cut the wire to length and bend to shape, and either solder, braze, or epoxy in place. Cut the brass or copper tubes to exact length and when the pivot pieces are dry, assemble the complete steering gear to make sure it works correctly.

After filing as required to get a smooth movement, solder the lower three washers in place on the links, and after placing the track rod in position, solder the top washers in place. Bolt the whole assembly on to the base, and offer up the servo to be used to find the correct pick up point. The model can now be completed normally after the installation of the rest of the radio equipment.

MORRIS 1100

A simple conversion to single channel radio by MECCANO Magazine STAFF

The adaption of this motorised FROG kit to radio control is a very simple one, and is mainly concerned with omitting several parts. The parts not required are as follows:-

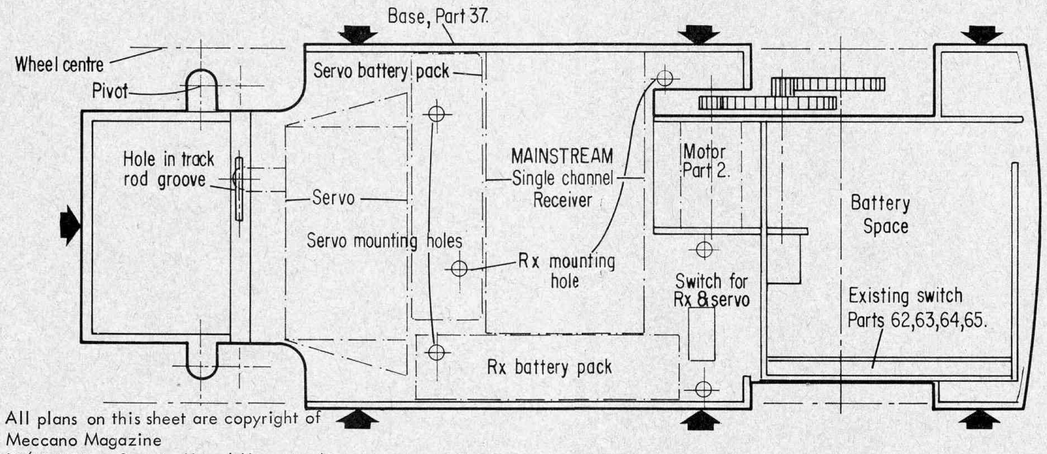
9, 10, 12-15, 18, 25-29, 41-43, 46

Commence building the Morris as per the building instructions included in the set up to para. 7. Before locating part 21 (the steering rack) cut the slot in the steering rack groove as shown on the plan. Next remove the steering support and file off flush with base. Now file away the teeth on the rack and assemble steering rack with stub axles in place. Adjust axles so that they are straight. Place servo in position so that the servo arm is over the rack (the Mainstream servo is ideal for this model) making sure that there is enough room for full servo travel. Mark the rack so that mark is in line with the hole in the servo arm. Drill the rack so that a 10 BA bolt is a nice sliding fit. Not too stiff and not too much play. Line up servo again to make sure that all is correct.

On the original, MECCANO angle brackets were used to mount the servo with the slots on to the base so that the servo could be adjusted to allow slight alterations in its position to make the car run in a straight line. When the angles have been bolted to the servo, position the servo as before and mark the position of the slots on the base. Drill the holes as per the plan, so that they line up with the slots.

Mount the servo temporarily and assemble and fix the steering gear permanently. Now place your receiver in a position similar to that on the plan. If your receiver is smaller than shown then you can move it around to make even more room for the receiver and Servo batteries. The mounting for the receiver was also MECCANO parts. The 3" long strips were used one at one side and one at the other. A little room was left at the top so that a small piece of soft wood or some foam could be inserted before the nuts were tightened down.

DRAWING BELOW SHOWS GENERAL LAYOUT OF RADIO GEAR & BASIC ALTERATIONS TO STANDARD KIT



The last fixture is the receiver and Servo switch. The one used here was a tight fit, so if a small switch can be found this will be preferable. Cut the slots for the switch push, place in position and mark holes. Drill out holes and mount switch. Wire up all the parts together and make sure that all is working before screwing everything down. The battery positions are as shown on the plan.

The battery packs were not secured permanently to allow easy change of batteries when they run down. The Servo batteries were placed in between the Servo and Receiver and a length of tape passed over to hold in place. The Receiver batteries were held in place in the same manner and the loose wires were taped down so that they would not fall into the motor drive gears or the steering.

The fixing of the body to the base can be achieved in this way. Put the body in place around the base and mark and drill a small hole through the side of the body so that the hole goes into the flange at the side of the base. Drill four holes into the base as shown by the arrows on the plan. Use small self tapping screws and if you wish you can sink the screws into the body slightly by drilling a hole the size of the screw head.

Now that the body and base are firmly fixed, you can go on to finish your car as per the kit instructions. One final comment, a nice finishing touch would be a 12" long piano wire aerial for the radio receiver. Drill or burn a small hole wherever you want the aerial and epoxy in place. Solder the aerial wire from the Receiver to the end of this wire aerial and you will extend the range slightly, not forgetting to reduce the length at the wire from the Rx by the length of the piano wire aerial length.

The length of the aerial, however constructed, must always remain the same as originally supplied with the receiver as bought.

CA'CANNY - Cont:-

holes for the axle. Make the front axle and epoxy and bolt in place. Next make the axle pivots from tinplate, or thicker metal if you wish. Epoxy the axle blocks to the pivots, followed by the 14 s.w.g. axles and the tubes. When these are dry, mount them onto the axle cross-piece. Glue the two sides in place, together with B.4, 5, 6. Glue the $\frac{1}{8}$" x $\frac{1}{4}$" uprights in place, also the $\frac{1}{4}$" sq. cross-pieces at the rear. Glue B.7 and B.11 in place, together with B.10. When dry, glue B.8 and B.9 in place. Push the rear axle through the body, and slip on the large gear, screw in position over the hole made for the gear. Clamp the axle with the gear located in the middle of the hole, offer the motor up to the gear and when the gears are meshing and turning freely, mark and drill the holes in the motor base. Screw into position and return to the front axle. Now glue the 1/16" ply wing struts in place and clamp. Also glue the small pieces of 1/16" sheet in front of these.

Next glue the $\frac{1}{8}$" x $\frac{1}{4}$" strips to the hatch sides, followed by the small block pieces on the forward stub wings – while this is drying glue the $\frac{1}{8}$" sheet back in place.

Pin the hatch sides to the main body and glue the cross-pieces B.12 and B.13 in place, also the $\frac{1}{8}$" x $\frac{1}{4}$" piece at the front. Return to the back at the body and cut out a hole for the drive switch.

Next, sheet the top of the body from B.4 back to B.3, followed by the $\frac{1}{8}$" x $\frac{1}{4}$" cross-piece at the back of the hatch. Next, glue the seat back in place. The $\frac{1}{8}$" x $\frac{1}{4}$" x $\frac{1}{8}$" sq. pieces can now be glued in place in the side panniers. Cut the top sheet where shown and remove the hatch. Sheet the bottom of the cockpit and cut tops of the panniers from $\frac{1}{8}$" sheet, with the grain running front to rear. Put the hatch back in place and cut and fit the $\frac{1}{4}$" sheet to rear hatch. When it fits properly glue the $\frac{1}{8}$" square in place on the underside, making sure that they give a good tight fit to the body. Glue the nose back in place and then the rear wing. Check that it is square. Remove the rear hatch and glue the crash supports in place. These are made from scrap plastic sprue, found in plastic kits. Trim to round section and then hold over a gentle heat and bend to a "U" shape. Trim the ends and make a small hole at the back at the top, and together with the straight back piece, glue to the hatch. Now shape the whole body to the rounded sections as shown. Fit and glue the ends plates on the rear wing. The installation of the radio gear should be quite straightforward. The only problem might be the servo position. If the position shown on the plan is adhered to, then no trouble should be encountered. The drive battery can be held in place by screwing or glueing two small hooks into the hatch and using a strong rubber band. Pack the other batteries with foam, also the receiver. Connect all the wiring and you are all ready to go.

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13/35 Bridge Street, Hemel Hempstead,
HERTFORDSHIRE, ENGLAND.

Base B.1. 1/4" sheet

Front axle position

B.4. B.5. B.7. B.8. B.2.

Position of side
shown in chain

1/4" 1/4" 3/4" 3/8"

5/16"

1/4"

3/8"

Bend here

Make axle pivot fr
down centre & epo
bend to shape as p

1/16" ply glued
to bottom

1.1/2"

Front view of
nearside wheel
axle

6BA bolt
or 14guage wire

Tube stop

1/4"

3/4"

5/16"

5/32"

Brass axle
from 13am
head & tai
for axle. E
When dry,
& epoxy ax

B.7. B.9.

3. 3/8"

3/8"

3/4" 1.1/2" 3/4"

3/4"

3/8"

2"

Track rod from Plastic sheet
or 1/16 ply

3"

1/8" sheet

Axle from 3/8" sq beech

B.12.

Servo

Rx

Soft block

B4. B.5. B.9.

B.1.

2" front wheel

CA'

Position of sides & formers shown in chain dot lines

B.10

1/16" ply motor base. Mark holes & screw or bolt in place when gears are lined up & move freely

B.2.

B.6.

Make axle pivot from tinplate, fold down centre & epoxy. When dry bend to shape as per front view.

Brass axle block, use pins from 13amp plug. cut head & tail off, drill hole for axle. Epoxy to pivot, When dry, drill through pivot & epoxy axle & tube in place

3/4"

5/32"

Cut out to clear drive gear

This mod
are numb
make it s

Commen
plate &
sheet, not
positions
sides, cut
axle plat
plates int
also the p

B.9.

B.10.

1/4" sheet

Ply strut

1/8" x 1/4"

2"

1"

rod from Plastic sheet 1/16" ply

Section A

Plastic

1/8" x 1/4" to here

A

Soft block

Acetate

B.13.

1/4 sq

1/16" sheet

A

TWO GEARS HAVE 6:1 ratio

4·5v flat battery

Rx battery

Rx

60 tooth gear

Motor

10 tooth gear

B.9.

B.1.

2.1/4" rear wheels

CA'CANNY MK II

A Prototype electric car for radio control by MECCANO® STAFF Magazine

This model, although looking complicated, is quite easy to build. Most of the parts are numbered to make building easier, so a little time spent studying the plan will make it seem simple.

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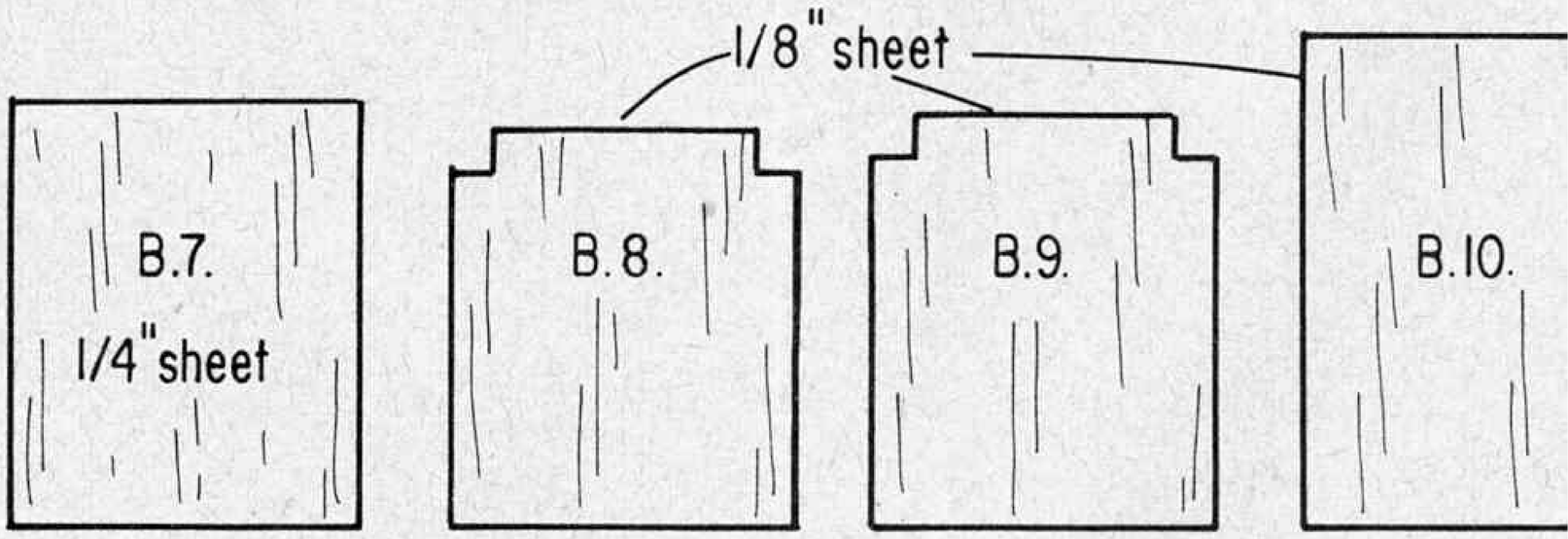
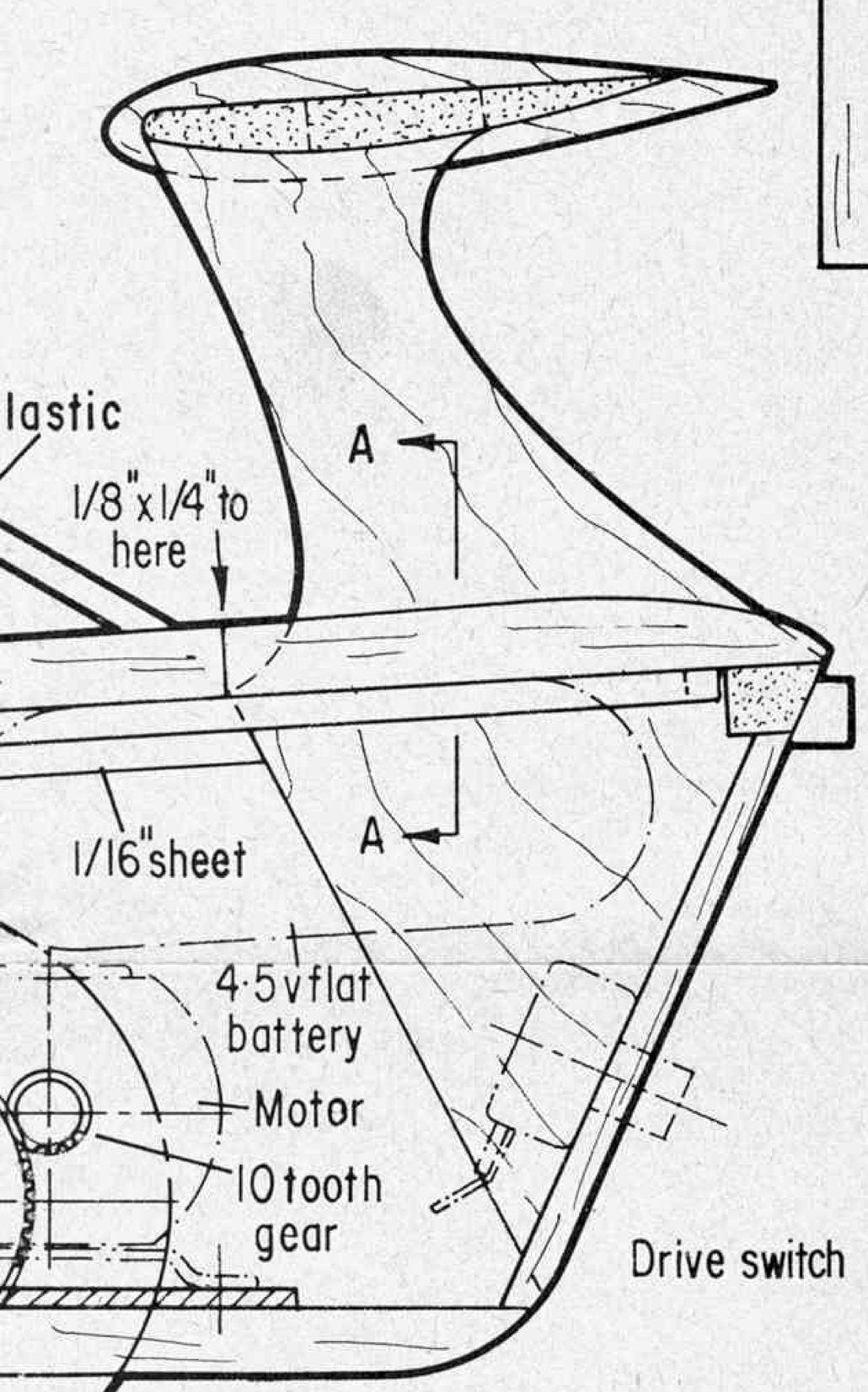
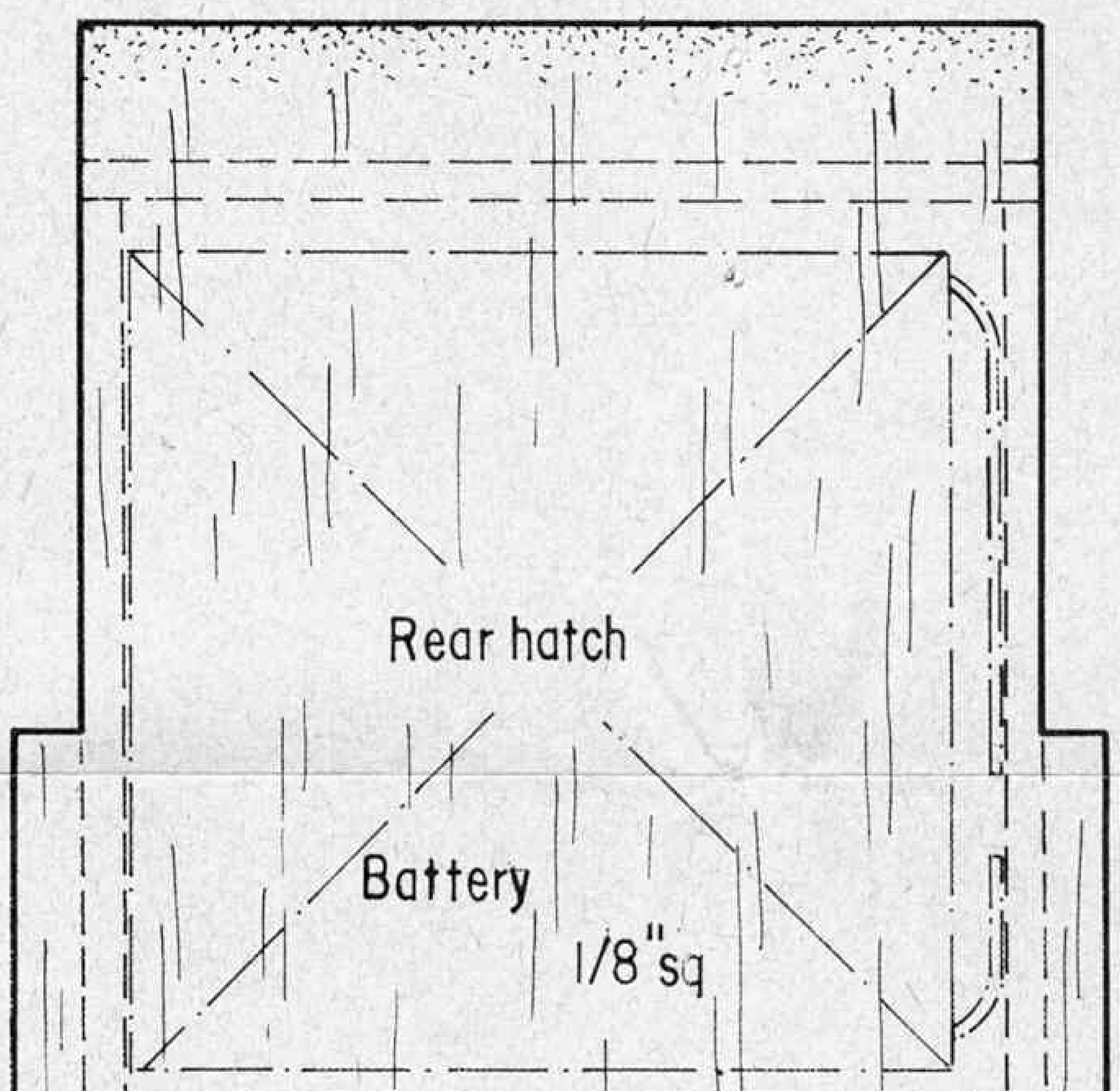
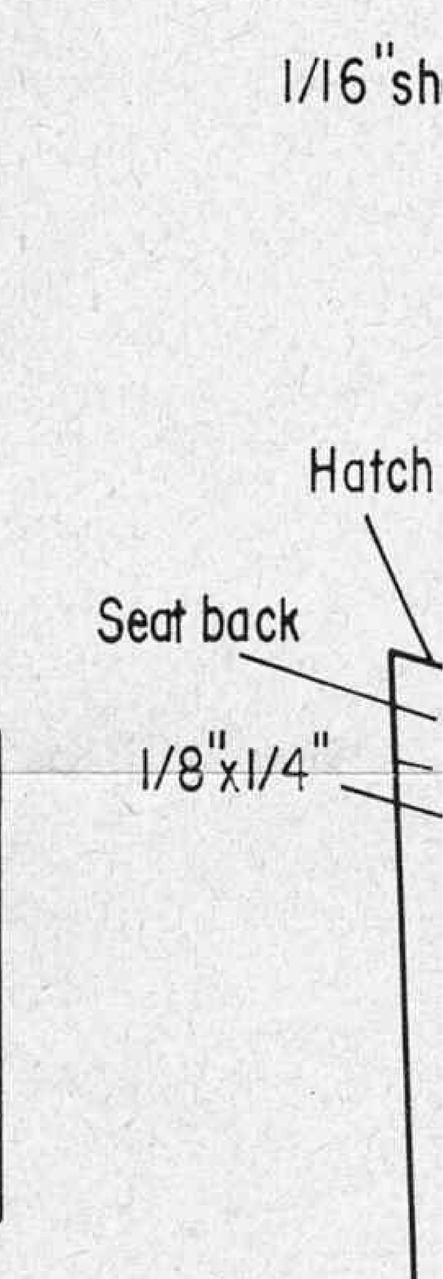
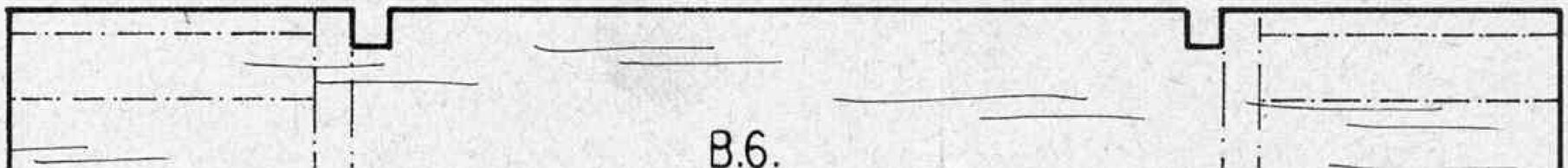








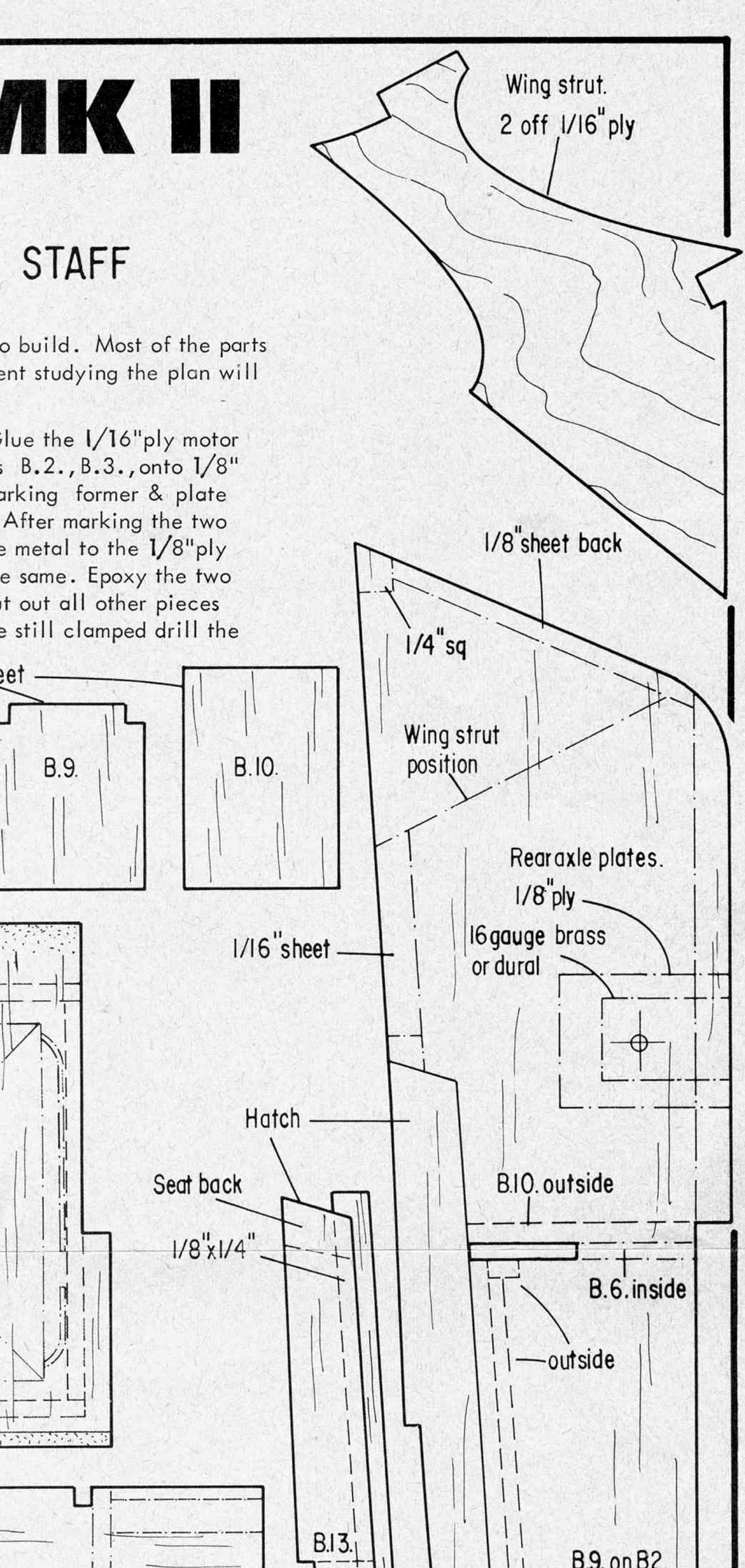


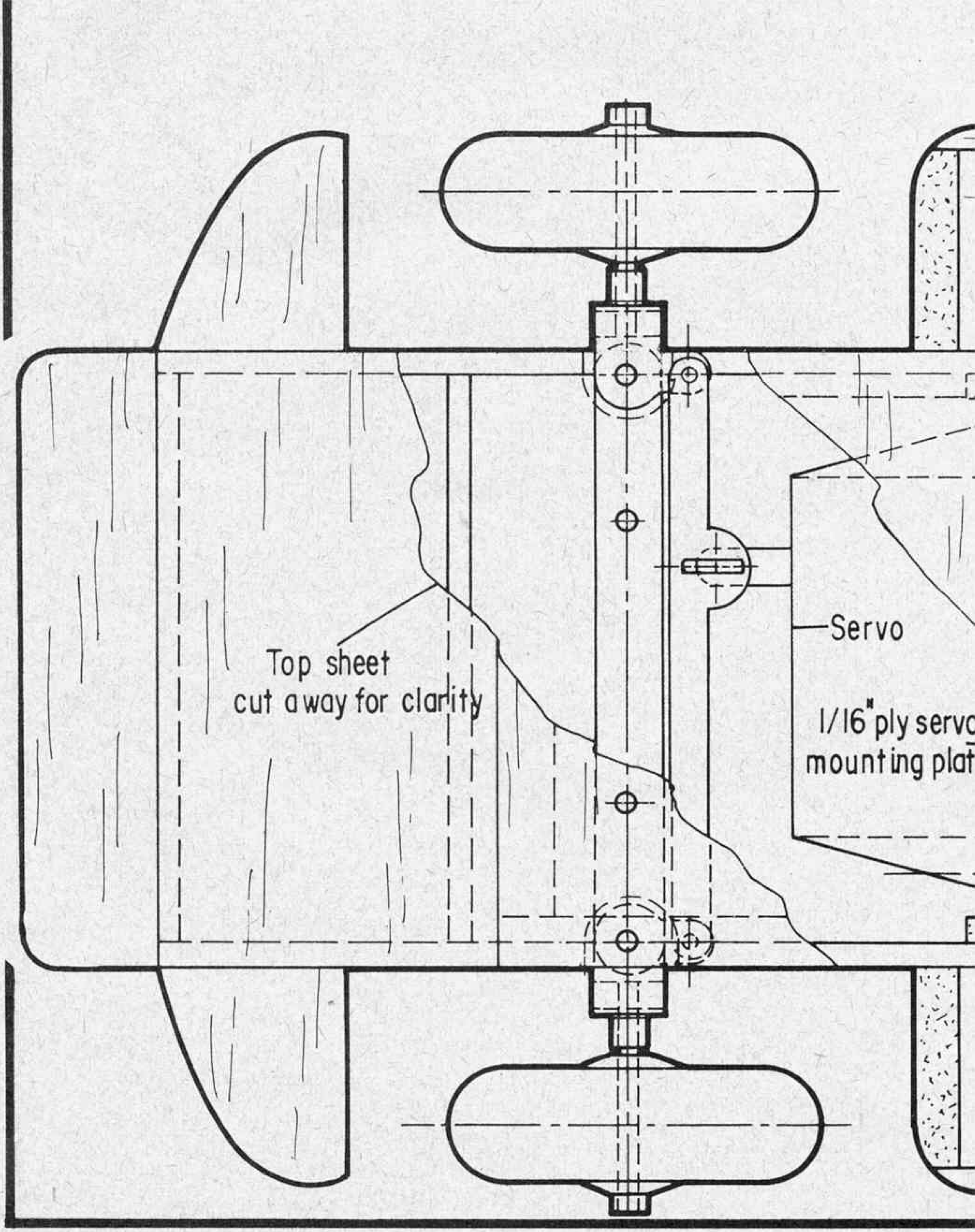
MK II

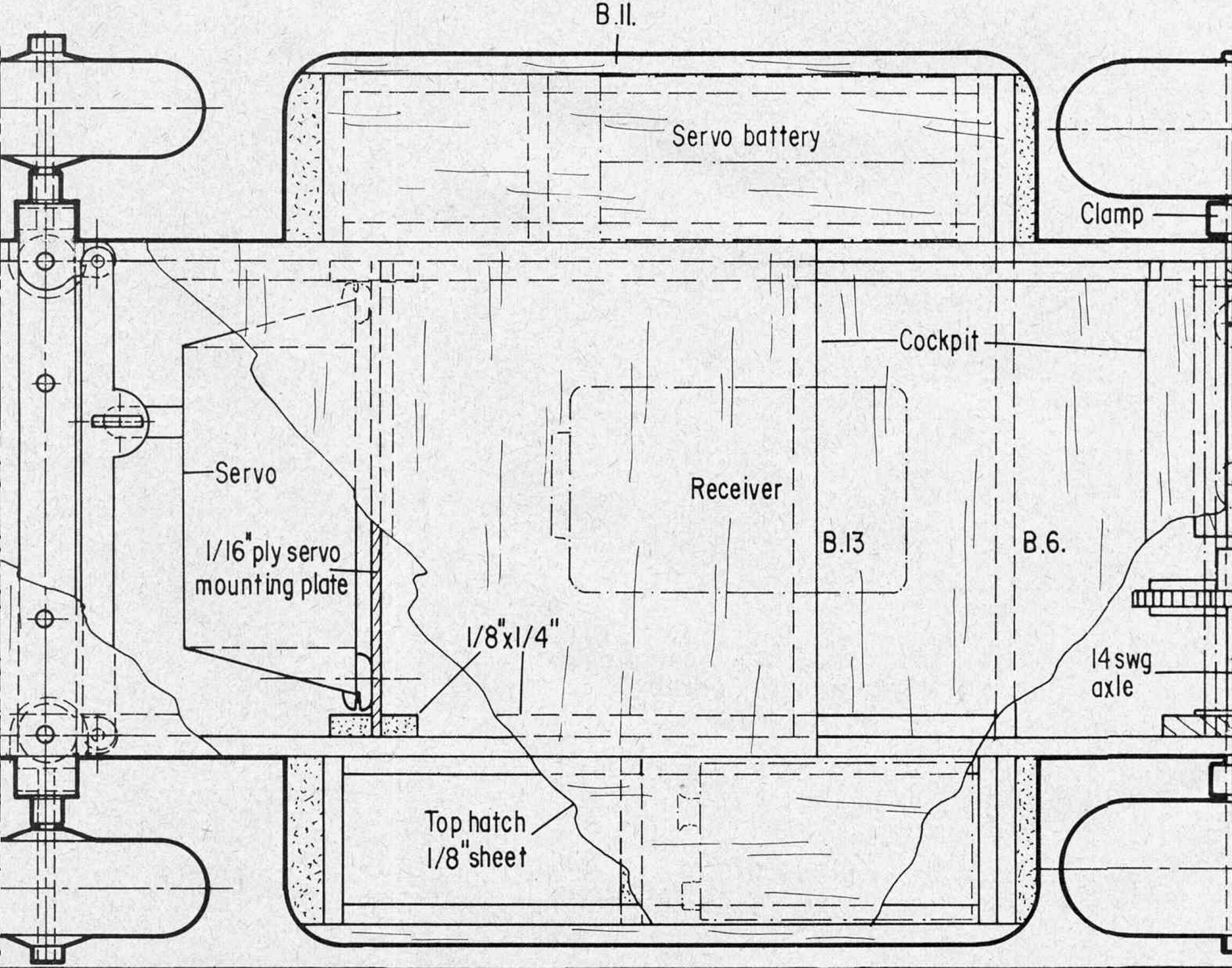
STAFF

o build. Most of the parts
ent studying the plan will

Glue the 1/16"ply motor
s B.2., B.3., onto 1/8"
arking former & plate
After marking the two
e metal to the 1/8"ply
e same. Epoxy the two
t out all other pieces
e still clamped drill the




Top sheet
cut away for clarity
Servo
1/16" ply servo
mounting plat


B.11.
Servo battery
Clamp
Cockpit
Servo
1/16" ply servo mounting plate
Receiver
B.13
B.6.
1/8"x1/4"
14 swg axle
Top hatch 1/8" sheet

B.6.

Slots for sides

Wing

Clamp

Chamfer

Cockpit

B.12.

B.13.

B.6.

14 swg axle

Gears 6:1 ratio

Section

B.6.

Slots for sides

Chamfer

B.5.

B.4.

B.12.

B.13.

All formers
1/8" sheet

Wing 3/16" sheet

B.13.

B.9. on B2.

B.8. on B3.

B.12.

B2. B3
from 1/8" sheet

End plate

The 3/16" sq. brass pieces should be drilled as shown, to take 14 swg wire. Great care should be taken here and accurate

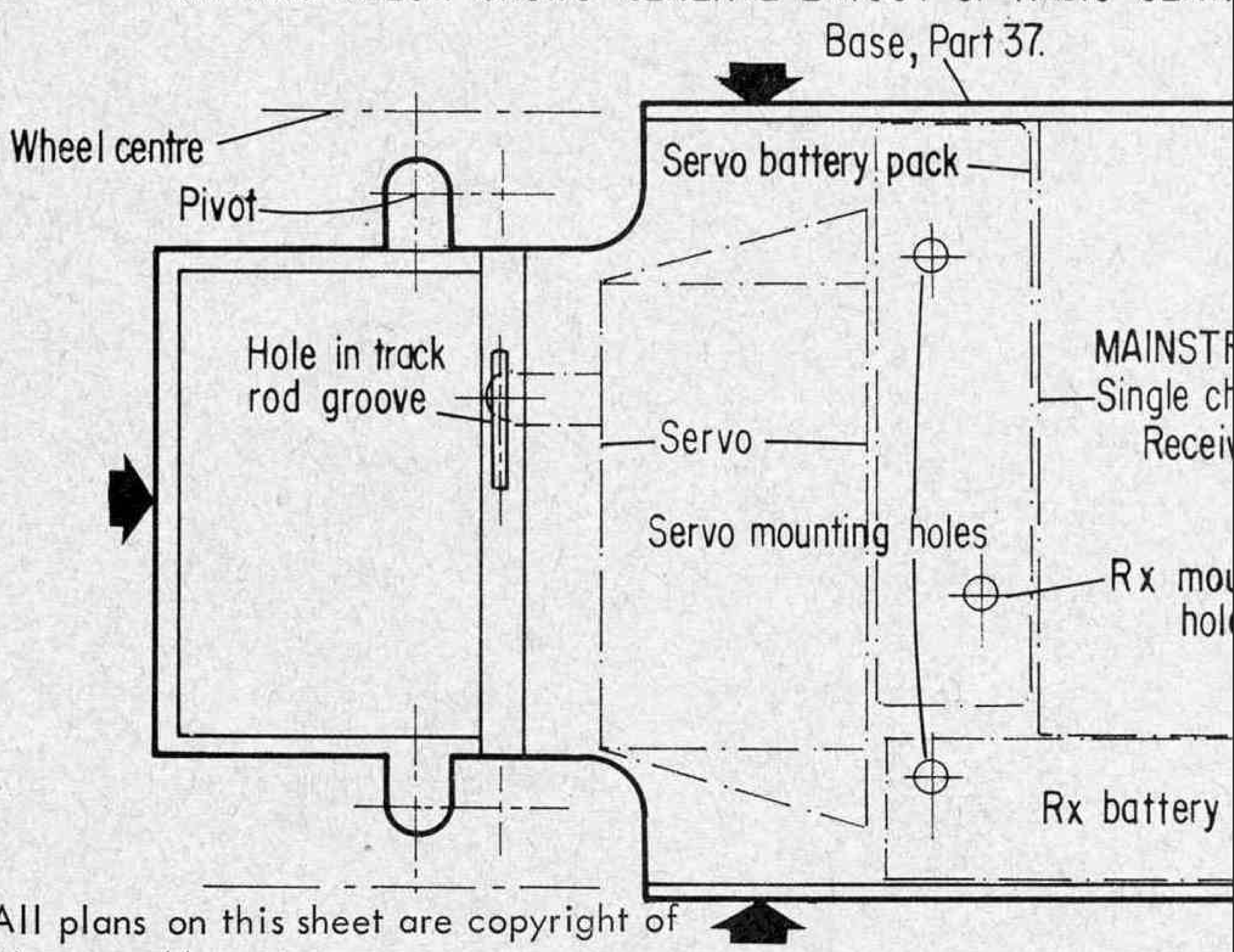
The adaption of this motorised FROG kit to radio control is a very simple one, and is mainly concerned with omitting several parts. The parts not required are as follows:-

9, 10, 12-15, 18, 25-29, 41-43, 46

Commence building the Morris as per the building instructions included in the set up to para. 7. Before locating part 21 (the steeri rack) cut the slot in the steering rack groove as shown on the plan. Next remove the steering support and file off flush with base. Now file away the teeth on the rack and assemble steering rack with stub axles in place. Adjust axles so that they are straight. Place servo in position so that the servo arm is over the rack (the Mainstream servo is ideal for this model) making sure that there is enough room for full servo travel. Mark the rack so that mark is in line with the hole in the servo arm. Drill the rack so that a 10 BA bolt is a nice sliding fit. Not too stiff and not too much play. Line up servo again to make sure that all is correct.

On the original, MECCANO angle brackets were used to mount the servo with the slots on to the base so that the servo could be adjusted to allow slight alterations in its position to

DRAWING BELOW SHOWS GENERAL LAYOUT OF RADIO GEAR



All plans on this sheet are copyright of Meccano Magazine
13/35 Bridge Street, Hemel Hempstead,
HERTFORDSHIRE, ENGLAND.

The chassis in this kit could not be modified for radio, so

The 3/16" sq. brass pieces sho
14 swg wire. Great care shou

MORRIS 1100

A simple conversion to single channel radio

by

MECCANO Magazine STAFF

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concerned with omitting several
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25-29, 41-43, 46
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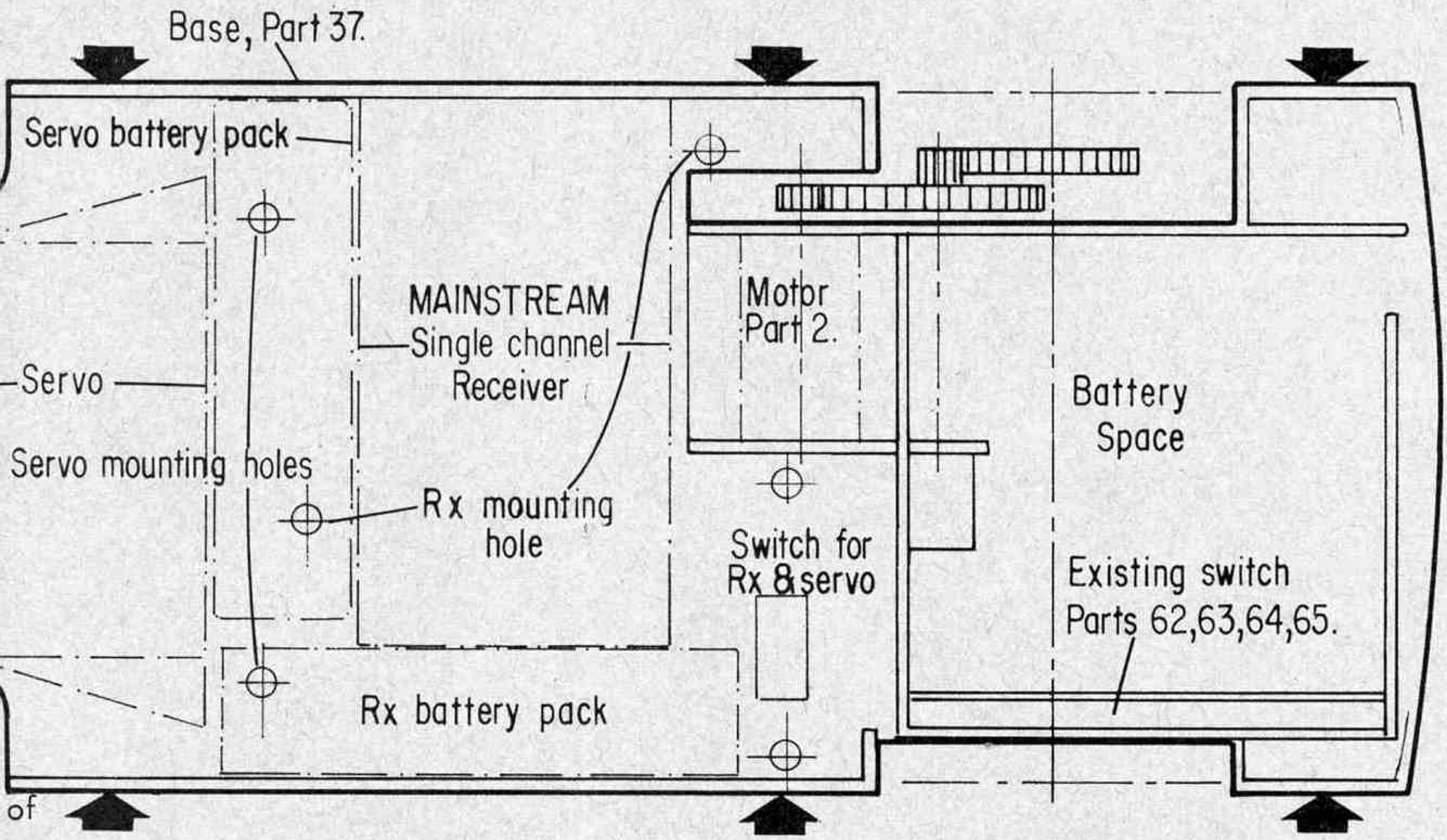
sure that there is enough room
so that mark is in line with
rack so that a 10 BA bolt is a nice
much play. Line up servo again to

ginal, MECCANO angle brackets
e slots on to the base so that the
ght alterations in its position to

make the car run in a straight line. When the angles have been bolted to the servo, position the servo as before and mark the position of the slots on the base. Drill the holes as per the plan, so that they line up with the slots.

Mount the servo temporarily and assemble and fix the steering gear permanently. Now place your receiver in a position similar to that on the plan. If your receiver is smaller than shown then you can move it around to make even more room for the receiver and Servo

GENERAL LAYOUT OF RADIO GEAR & BASIC ALTERATIONS TO STANDARD KIT



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The chassis in th

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S 1100

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AFF

n the angles have been
before and mark the position
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ssemble andfix the steering
iver in a position similar to
ller than shown then you can
or the receiver and Servo

batteries. The mounting for the receiver was also MECCANO parts. The 3" long strips were used one at one side and one at the other. A little room was left at the top so that a small piece of soft wood or some foam could be inserted before the nuts were tightened down.

The last fixture is the receiver and Servo switch. The one used here was a tight fit, so if a small switch can be found this will be preferable. Cut the slots for the switch push, place in position and mark holes. Drill out holes and mount switch. Wire up all the parts together and make sure that all is working before screwing everything down. The battery positions are as shown on the plan.

The battery packs were not secured permanently to allow easy changeof batteries when they run down. The Servo batteries were placed in between the Servo and Receiver and a length of tape passed over to hold in place. The Receiver batteries were held in place in the same manner and the loose wires were taped down so that they would not fall into the motor drive gears or the steering.

The fixing of the body to the base can be achieved in this way. Put the body in place around the base and mark and drill a small hole through the side of the body so that the hole goes into the flange at the side of the base. Drill four holes into the base as shown by the arrows on the plan. Use small self tapping screws and if you wish you can sink the screws into the body slightly by drilling a hole the size of the screw head.

Now that the body and base are firmly fixed, you can go on to finish your car as per the kit instructions. One final comment, a nice finishing touch would be a 12" long piano wire aerial for the radio receiver. Drill or burn a small hole wherever you want the aerial and epoxy in place. Solder the aerial wire from the Receiver to the end of this wire aerial and you will extend the range slightly, not forgetting to reduce the length at the wire from the Rx by the length of the piano wire aerial length.

The length of the aerial, however constructed, must always remain the same as originally supplied with the receiver as bought.

CCANO parts.
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CA'CANNY - Cont:-

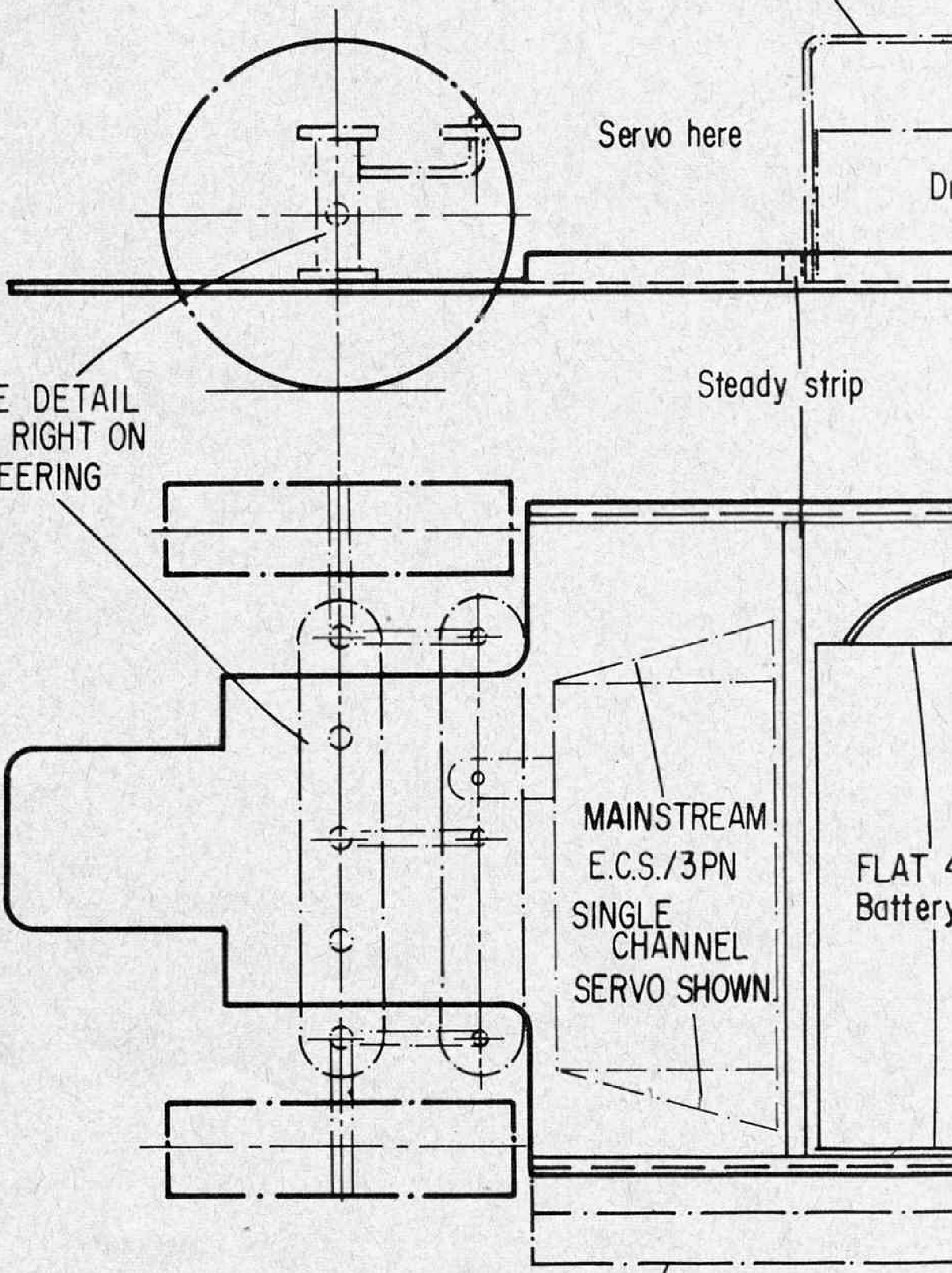
holes for the axle. Make the front axle and epoxy and bolt in place. Next make the axle pivots from tinplate, or thicker metal if you wish. Epoxy the axle blocks to the pivots, followed by the 14 s.w.g. axles and the tubes. When these are dry, mount them onto the axle cross-piece. Glue the two sides in place, together with B.4, 5, 6. Glue the $\frac{1}{8}$" x $\frac{1}{4}$" uprights in place, also the $\frac{1}{4}$" sq. cross–pieces at the rear. Glue B.7 and B.11 in place, together with B.10. When dry, glue B.8 and B.9 in place. Push the rear axle through the body, and slip on the large gear, screw in position over the hole made for the gear. Clamp the axle with the gear located in the middle of the hole, offer the motor up to the gear and when the gears are meshing and turning freely, mark and drill the holes in the motor base. Screw into position and return to the front axle. Now glue the 1/16" ply wing struts in place and clamp. Also glue the small pieces of 1/16" sheet in front of these.

Next glue the $\frac{1}{8}$" x $\frac{1}{4}$" strips to the hatch sides, followed by the small block pieces on the forward stub wings – while this is drying glue the $\frac{1}{8}$" sheet back in place.

Pin the hatch sides to the main body and glue the cross-pieces B.12 and B.13 in place, also the $\frac{1}{8}$" x $\frac{1}{4}$" piece at the front. Return to the back at the body and cut out a hole for the drive switch.

Next, sheet the top of the body from B.4 back to B.3, followed by the $\frac{1}{8}$" x $\frac{1}{4}$" cross-piece at the back of the hatch. Next, glue the seat back in place. The $\frac{1}{8}$" x $\frac{1}{4}$" x $\frac{1}{8}$" sq. pieces can now be glued in place in the side panniers. Cut the top sheet where shown and remove the hatch. Sheet the bottom of the cockpit and cut tops of the panniers from $\frac{1}{8}$" sheet, with the grain running front to rear. Put the hatch back in place and cut and fit the $\frac{1}{4}$" sheet to rear hatch. When it fits properly glue the $\frac{1}{8}$" square in place on the underside, making sure that they give a good tight fit to the body. Glue the nose back in place and then the rear wing. Check that it is square. Remove the rear hatch and glue the crash supports in place. These are made from scrap plastic sprue, found in plastic kits. Trim to round section and then hold over a gentle heat and bend to a "U" shape. Trim the ends and make a small hole at the back at the top, and together with the straight back piece, glue to the hatch. Now shape the whole body to the rounded sections as shown. Fit and glue the ends plates on the rear wing. The installation of the radio gear should be quite straightforward. The only problem might be the servo position. If the position shown on the plan is adhered to, then no trouble should be encountered. The drive battery can be held in place by screwing or glueing two small hooks into the hatch and using a strong rubber band. Pack the other batteries with foam, also the receiver. Connect all the wiring and you are all ready to go.

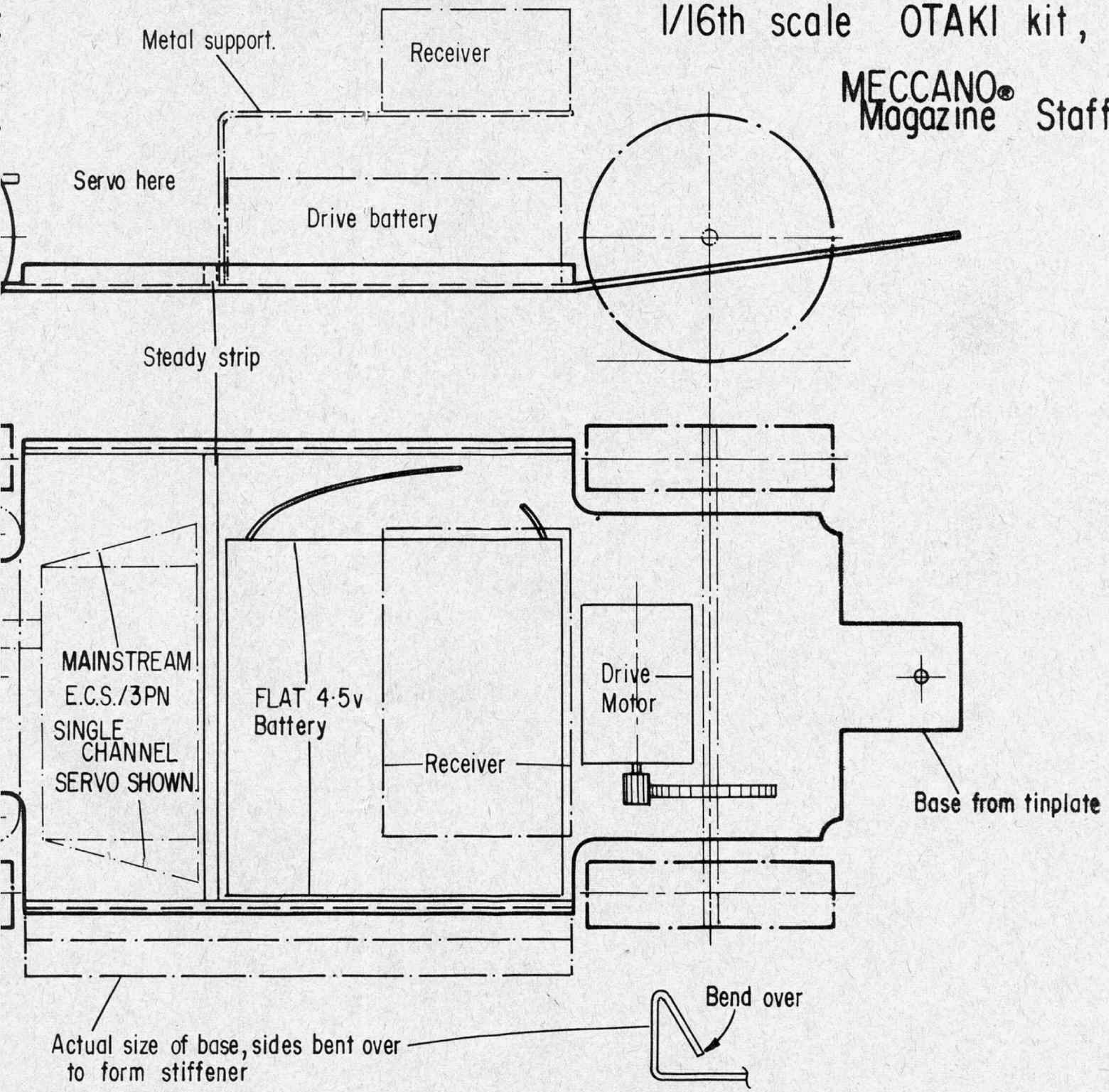
TOYOTA 200


Metal support.
Servo here
SEE DETAIL
TO RIGHT ON
STEERING
Steady strip
MAINSTREAM
E.C.S./3PN
SINGLE
CHANNEL
SERVO SHOWN
FLAT
Battery
Actual size of base, sides b
to form stiffener

A 2000 GT

a radio control version from
1/16th scale OTAKI kit, b

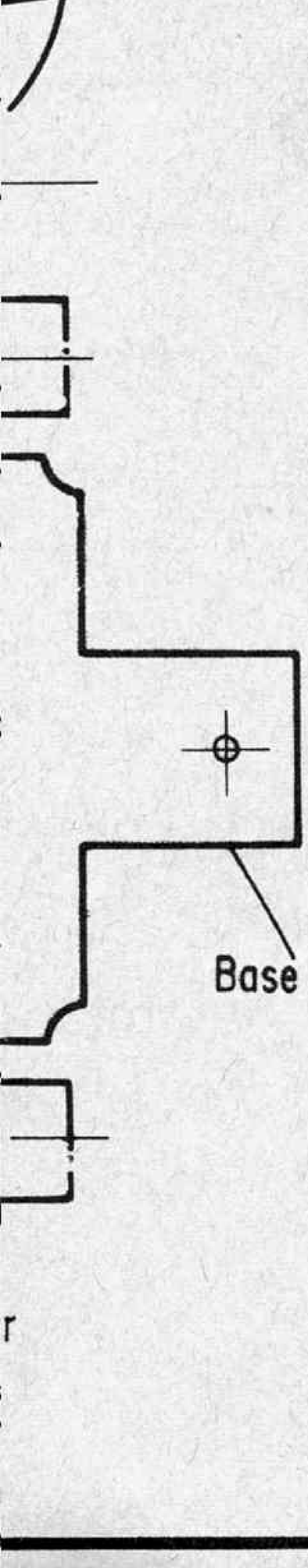
MECCANO® Magazine Staff.

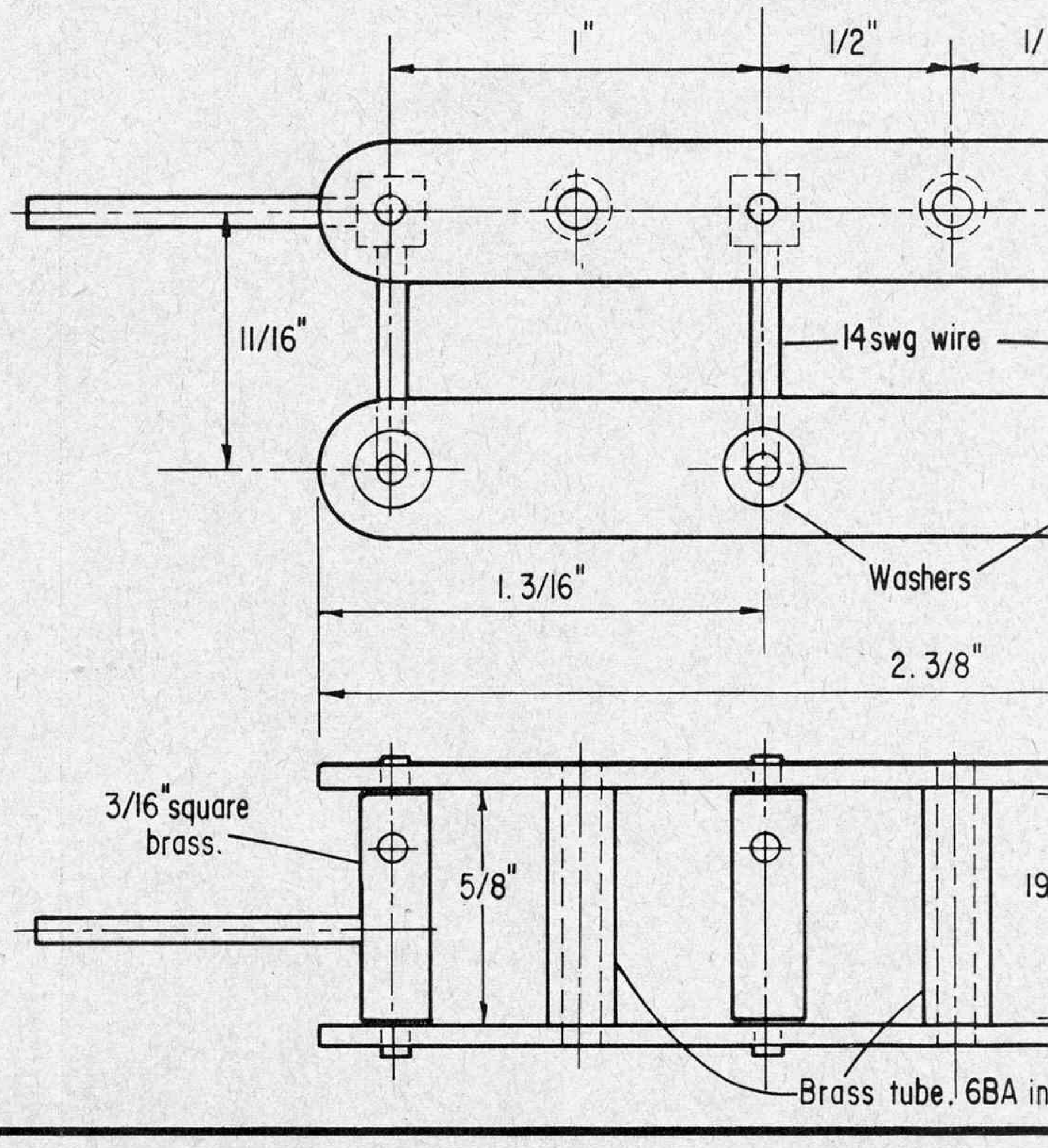


control version from the
cale OTAKI kit, by

MECCANO® Magazine Staff.

The chassis in this kit could not be modified for radi
a complete new base was made. The plan is almost self exp
atory, but a few points will make some things clear er. No
that the base has two stiffener rails down each side, made si
by folding over the extension shown at the bottom of the cha
The chassis was made from tinplate and is adequately strong
enough when screwed to the plastic body. If a heavier gau
of metal is used, then only an 'L' shape at each side should
sufficient. The steering gear is perhaps the most difficult -
NOTE THAT IT IS DRAWN TWICE SIZE - after cutting the b
strips, clamp together and file to shape, and drill the holes.





· be modified for radio, so
plan is almost self explan-
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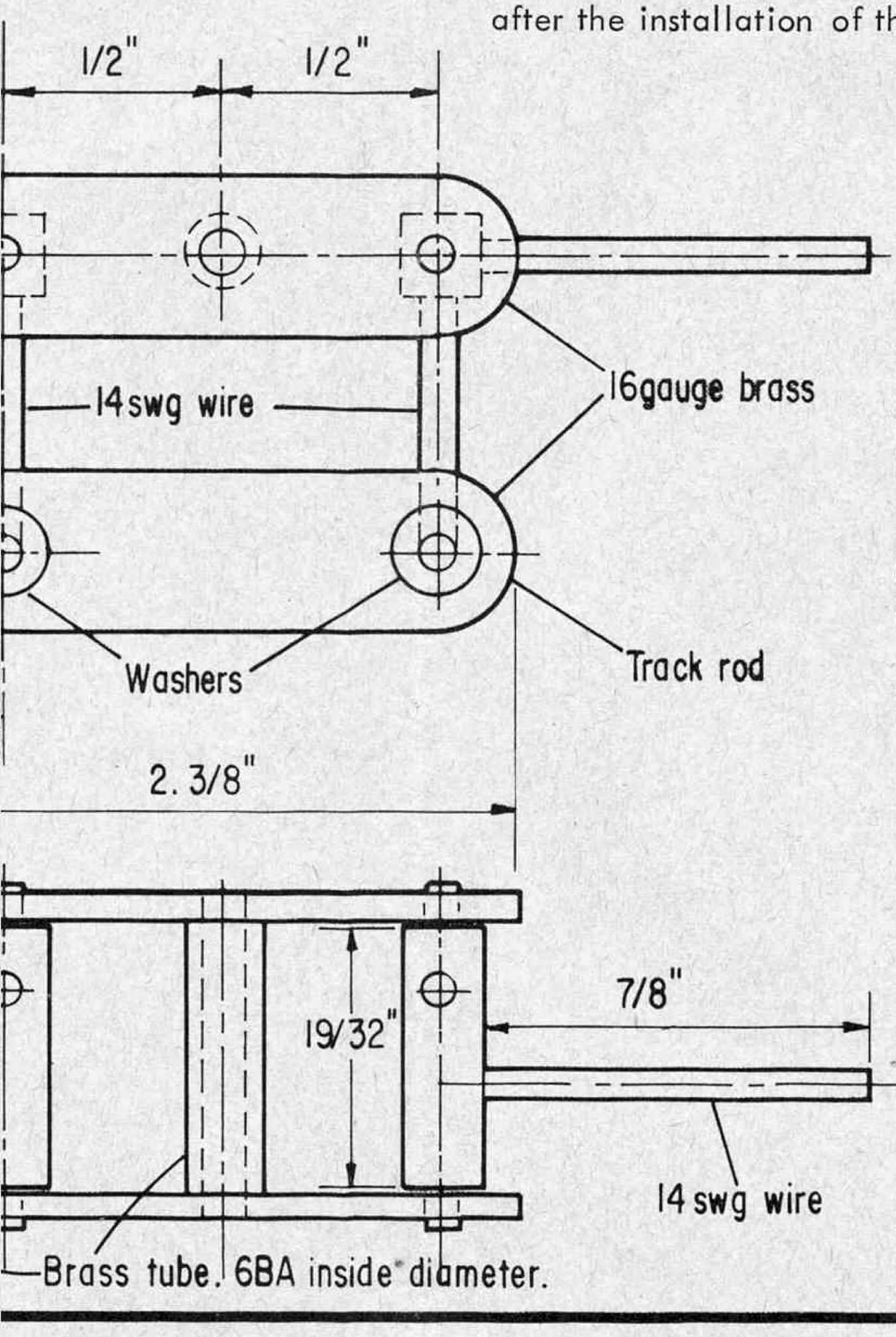
the bottom of the chassis.
is adequately strong
dy. If a heavier gauge
ıe at each side should be
ıps the most difficult -
E - after cutting the brass
, and drill the holes.

The 3/16" sq. brass pieces should be drilled as shown, to take 14 swg wire. Great care should be taken here and accurate drilling pays off. When all are drilled, cut the wire to length and bend to shape, and either solder, braze, or epoxy in place. Cut the brass or copper tubes to exact length and when the pivot pieces are dry, assemble the complete steering gear to make sure it works correctly.

After filing as required to get a smooth movement, solder the lower three washers in place on the links, and after placing the track rod in position, solder the top washers in place. Bolt the whole assembly on to the base, and offer up the servo to be used to find the correct pick up point. The model can now be completed normally after the installation of the rest of the radio equipment.



NOTE

Drawing of steering is twice full size