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AUGUST 1971

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MECCANO® Magazine

AUGUST 1971 VOLUME 56 NUMBER 18

Meccano Magazine, founded 1816

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Managing Editor
V. E. SMEED

Consulting Editor for MECCANO-Tri-ang LTD.
J. D. McHARD

Advertising Manager
ROLAND SUTTON

MAP **HOBBY MAGAZINE**

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MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS

FRONT COVER

Electric cars on test in Greece; the 707s etc. are in Olympic Airways livery.

NEXT MONTH

Full-size plans for a simple sailing model for the school holidays, report on sailing the HiBall, the world's most ancient dog, and village stocks are among September issue's features.

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Announcing the BiC National Model Making Championship

Regd. Trade Mark

If you have a few used ball pens and a creative mind . . . prove it!

Even when they are the world's finest ballpens, as Bic undoubtedly are, they have to run out of ink sometime! For years a further use has been sought for those empty barrels, destined after gallant service to end their days in sideboard or office desk, side by side with less worthy writing instruments.

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Because Bic Crystals write first time every time there are far more sold in the U.K. than any other model. In fact, each year a Bic Crystal is sold for every man, woman and child in the Country with a few million more for good luck.

Where do they go to?

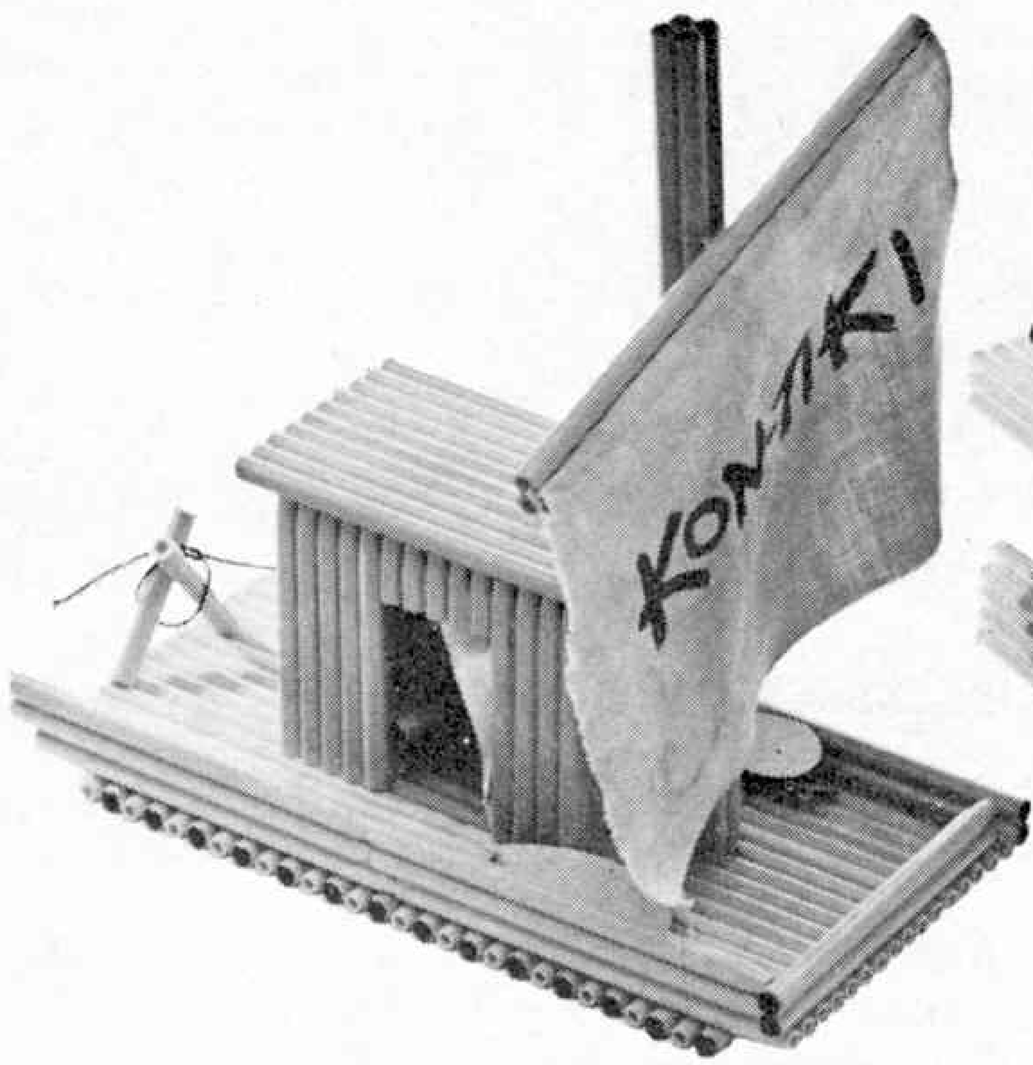
It is human nature to squeeze the last drop of ink from a ballpen or to believe that it may write again after a short rest. This is why you will probably find more than you expect in your own home. In offices and factories you should find them by the hundred.

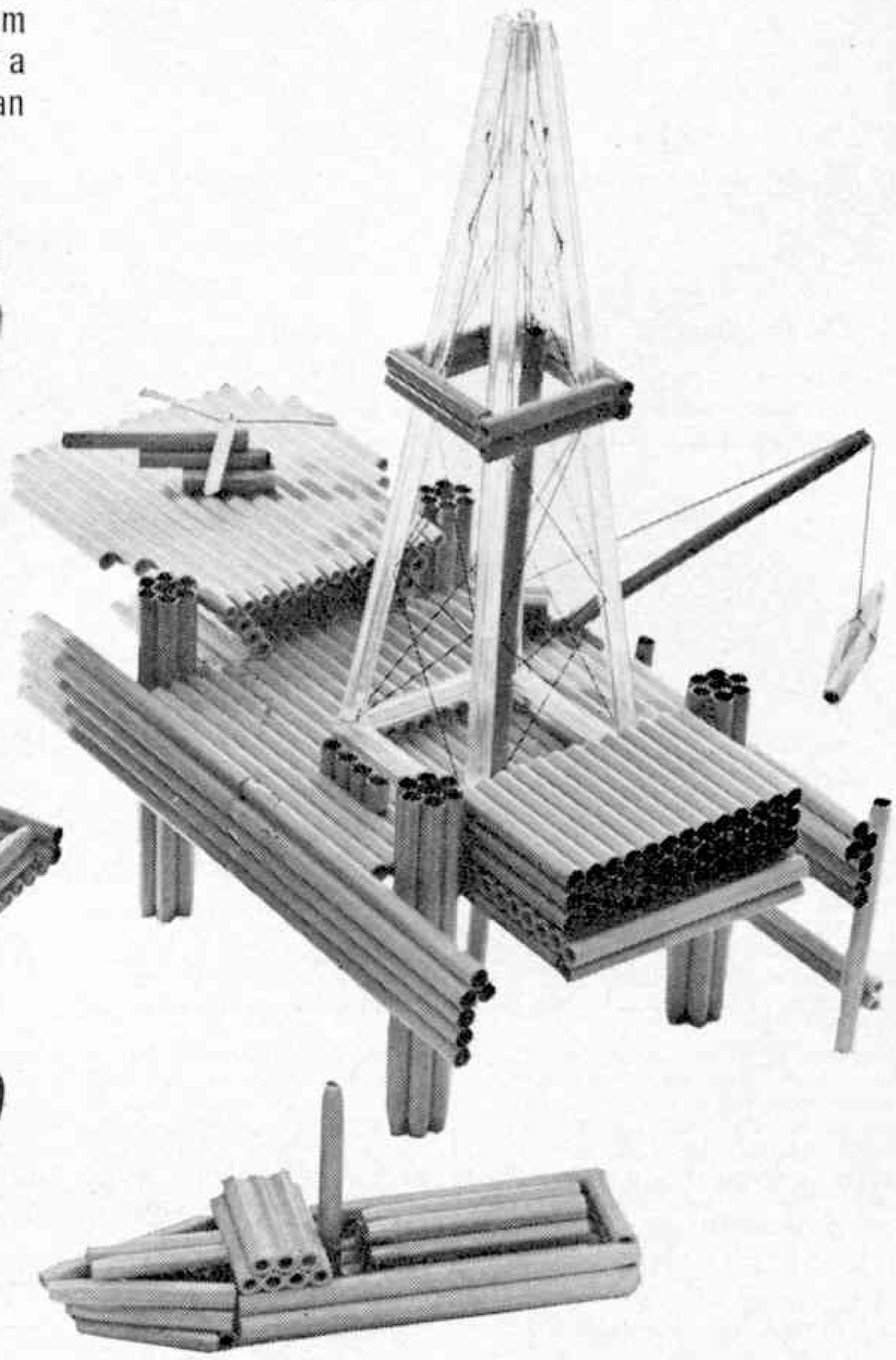
All you have to do . . .

. . . is to start collecting used Bic Crystal medium and fine ballpens now so that you may complete a suitable model and enter the competition.

There will be cash prizes for the best models every three months, both senior and junior and finally the best modeller overall at the end of the year will be awarded a further cash prize of £250 and the handsome Bic championship trophy.

Take your time, read the rules overleaf, then send your model with coupon.





BiC

Regd. Trade Mark

the pen they model on

BIC

Regd. Trade Mark

Model Making Competition

Start collecting your pens now but–
one word of warning–

make sure they are genuine Bic Crystal Medium or Fine Point ballpens carrying the Bic Registered Trade Mark because only these are eligible

RULES

1 The participants of the Bic Model Making Competition will be judged on their originality and technical model-making expertise.

2 The competition will be divided into two parts:
Junior: Participants, either sex, under the age of 16 at time of entry. Within this group no heat or flame technique for moulding may be used, but any other form of adhesion may be utilized.
Senior: Participants, either sex, over 16. Within this group, any form of adhesion is accepted. Heat to bend or shape the pens may be used.

3 Entries for the competition must be accompanied by the official entry form below.

4 Any number of BIC Ballpen barrels may be used. All models must be constructed utilising any part of BIC Crystal Fine (Yellow) and Medium (Transparent) ballpens.

5 BIC Crystal barrels may be cut to shape or size, but each barrel must clearly show the Registered trade name BIC (as imprinted on the barrel). Where models are moulded by heat, there must be at least 10 parts where the BIC Registered trade mark is clearly shown.

6 Accessories other than BIC parts may be used *only* to make the model functional or to infer final design, i.e., wheels, transfers, cotton, string, paper, etc.

PRIZES

7 Prizes will be awarded to competitors who, in the opinion of the panel of judges, produce the most creative, unusual or skilful entry for each quarterly competition.

8 **Quarterly prizes will be awarded as follows:**
Senior section—first prize £25.
second prize £15.
third prize £10.
10 consolation prizes of £5 each.
Junior section—first prize £15.
second prize £10.
third prize £5.
10 consolation prizes of £2 each.

9 Models winning any of the three prizes in either Junior or Senior levels of any of the quarterly competitions will automatically be entered in the BIC National Championship Competition and the individual competitor whose model is selected by the judges to be of greatest merit will receive an additional cash prize of £250 together with the 1971 BIC Model-Making Trophy.

10 **Entrants should send their models to:**
The BIC Model-Making Competition,
c/o Montague House, 23 Woodside Road,
Amersham, Bucks.
Should a model be considered delicate for conventional postage, then a photograph (colour or black and white) may be despatched beforehand. This will be used for preliminary judgement. Entry forms should be clearly attached to each model or photograph entered.

11 No responsibility can be taken for the damage in transportation of any model received. Judges will, however, take into account such unfortunate circumstances and the model will still be eligible for participation within the contest.

12 Should participants require a model returned, then return postage must be included by way of enclosing the appropriate stamps.

RESULTS

13 The 1971 competition will be held during 3-monthly periods and results will be announced during August 1971, November 1971, February 1972.

14 Participants should ensure that their models are despatched to arrive by 1st June (for August judging), 1st September (for November judging) and 1st December (for February judging).

15 Any model received after this date will not be eligible for the relevant Quarter but will qualify for the next Quarter's competition.

16 Any prize winning model will become the property of Biro-Bic Ltd., and may be used in any way they think fit.

17 Employees, relatives or direct associates of Biro-Bic Ltd., Model and Allied Publications Ltd., as well as their advertising agents will not be eligible for this competition.

18 The decision of the Judges is final and no correspondence can be entered into in relation to prizes awarded or decisions made.

I understand and abide by the Rules

Name.....
(BLOCK LETTERS PLEASE)

Address.....

.....

..... Age.....

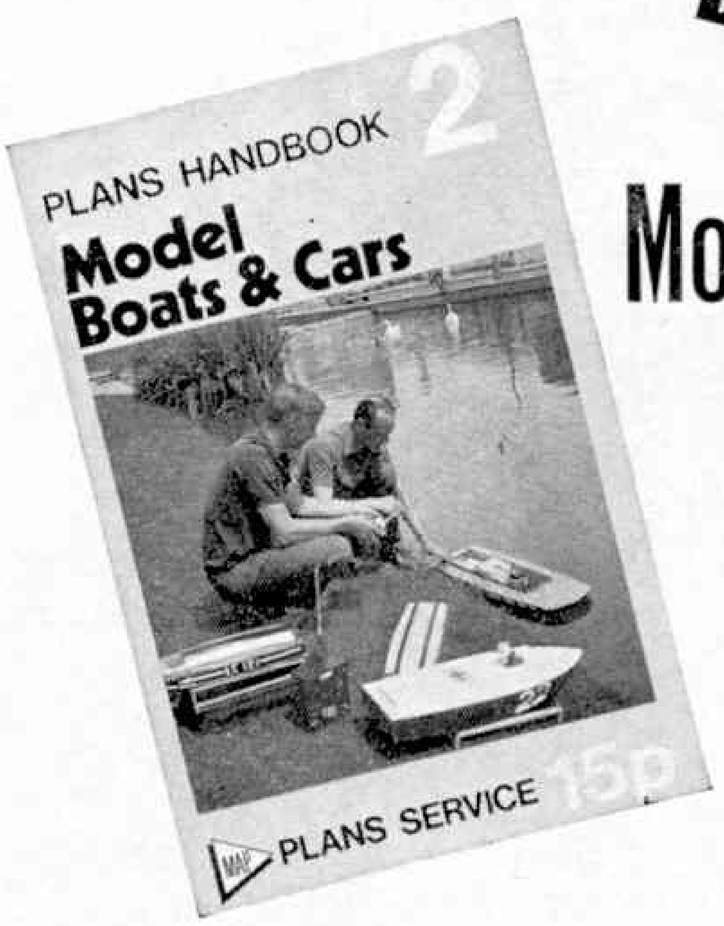
WHERE DID YOU COLLECT YOUR BIC PENS? .....

MM 5

NEW! PLAN HANDBOOKS

Aeromodelling

128 pages featuring hundreds of working model aircraft, illustrated almost entirely by photographic reproductions of the actual models, plus span, brief description and graded for ease of construction. Also selected engine list with tabulated data; index to illustrated plans, a list of vintage unorthodox novel plans, many other classifications, useful articles, order forms. Also good selection of trade advertisements.



Model Boats & Cars

96 pages of plans of scale and semi-scale ships, tugs, lifeboats, submarines, paddle steamers, period ships, racing yachts, hovercraft, cabin cruisers, mostly illustrated, fully described, and classed for ease of building. Working model cars and usual vehicles are included and the very range of scale car drawings, racing cars ancient and modern. Index of drawings; useful articles on building; waterline plans; trade advertisements.

Model Engineering

96 pages of working model drawings for steam locomotives, traction engines, steam engines, petrol engines, workshop equipment from LBSC, Westbury, Evans, Maskelyne, Bradley, Hughes. Plus useful model engineering information, screwcutting tables, standard threads, letter and number drills, wire and sheet metal gauges, miscellaneous information.

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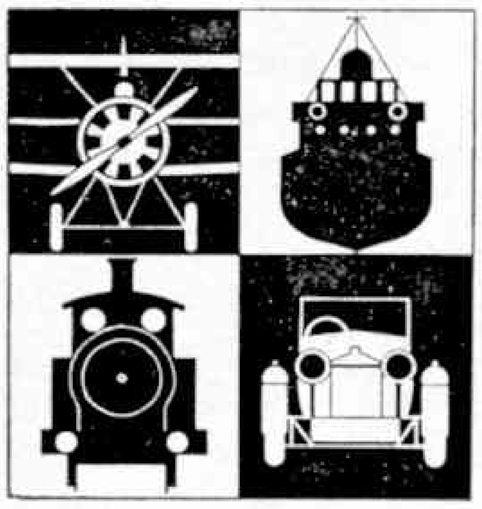

41st Great Show!

MODEL ENGINEER EXHIBITION

SEYMOUR HALL, LONDON, W1

January 4th—January 15th 1972

ENTRIES
Entry forms are being prepared. You still have six months to get your entries to exhibition standards. May we hope that you will be supporting us with your very best! Classes for every kind of model . . .

Over twenty trophies, over £300 in prizes, plus the pleasure of displaying your efforts and seeing those of other people.

Details from the Exhibition Manager.

Another better than ever show at the Seymour Hall! Exciting new features for this **41st EXHIBITION** include – for the first time ever – indoor **MARINA** – a pool 98ft. long by 29ft. wide for demonstrations of radio controlled boats; competition racing in the evenings; and some fine steam powered boats in operation. **HUGE FLYING CIRCLE**! We are elevating our electric flying circle to give full width of the hall between balconies – enabling models to fly a diameter of over 40 feet! We believe electric-powered models can loop, wing-over, fly inverted – in fact, go through the book – come and watch us (and our enthusiastic club helpers) try out new techniques. **BIGGER & BETTER DEMONSTRATIONS**! Model Engineer Consultants and Silver Medallists will be assisting at the S.M.E.E. Workshop ready to show you how . . . Ever-popular **S.M.E.E. PASSENGER TRACK** in operation, plus enormous surprise item on show . . . The Bryanston Room will be devoted to club stands, demonstrations, and provide a visitors' Clubroom. This room will also house the **TRACTION ENGINES.** New! Lecture Hall will be **BATTLEGROUND** – where three **BATTLEGAMES** will be taking place with running commentaries, plus **MILITARIA** display. Upstairs regular **CINEMA SHOW.**

If you feel you can help in any of these projects, get in touch at once. Big contest classes will have improved stewarding; all small models and entries under glass. Write in for further particulars.

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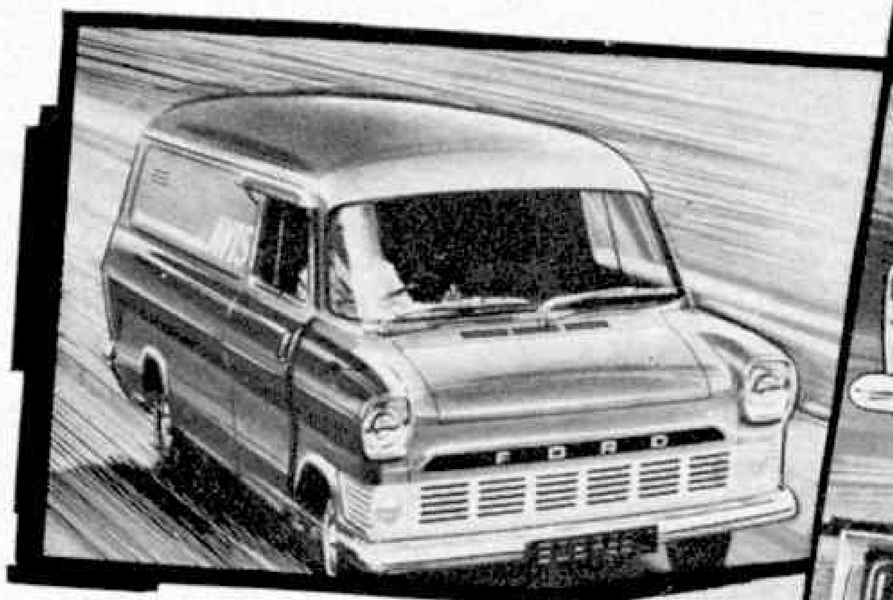

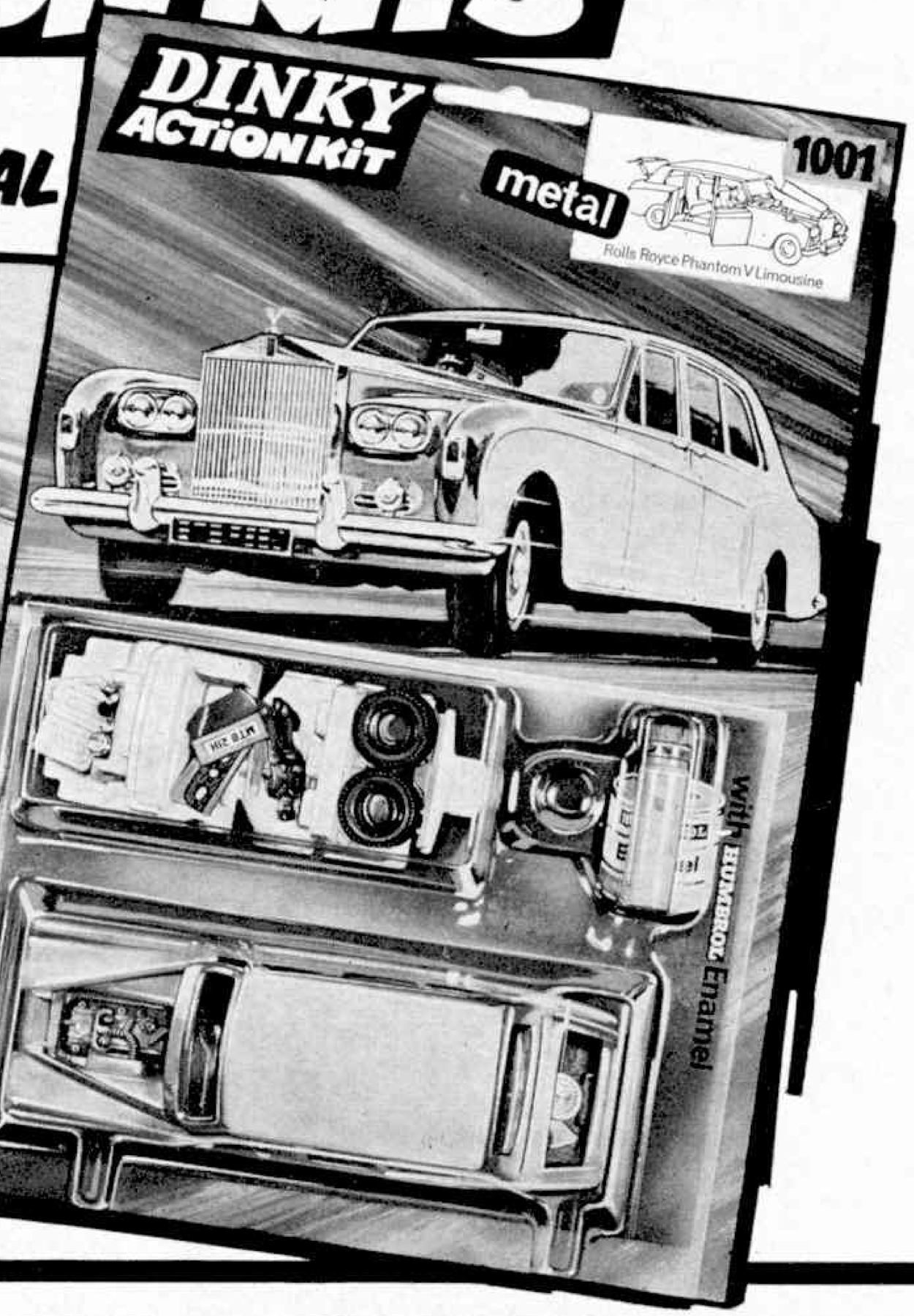

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You can finish the models to your own liking. A phial of HUMBROL Enamel has been supplied although you can paint your models any colour. See the kits at your toyshop NOW!

Model Railways

THE BIGGER Model Railway News

£250 in prizes!

Locomotives · Layouts · Trade

August 26th–September 4th EXHIBITION

CENTRAL HALL · WESTMINSTER · LONDON · S.W.1

ANNOUNCING . . .

MODEL RAILWAYS, the new bigger, better Model Railway News, makes its bow to the public with the issue dated September and appearing in August. This issue will be in the new popular A4 size, that is 11¾ ins. deep by 8¼ ins. wide. This will give us more opportunity for bigger and clearer half-tone illustrations and bigger drawings of layout and more drawings of locomotives and rolling-stock.

We shall continue our policy of an all colour cover and add to it in the shape of some spot colour, that is to say a second colour, on some of the inside pages and where we get a really lovely picture we will try and manage an inside picture or page of colour pictures to really do justice to beautiful layouts or beautiful models.

We are happy to announce that Roy Dock has rejoined the team and will be editing MODEL RAILWAYS he is renewing his acquaintance with all levels of the model railway world and will, we are confident, recruit a great team of expert contributors.

OUR EXHIBITION . . .

The new MODEL RAILWAYS comes at the traditional beginning of the model railway season and we had an opportunity of taking Central Hall, Westminster, over the Bank holiday period, so, for the first time, we are sponsoring an exhibition devoted to the smaller gauge of Model Railways. This differs from previous exhibitions in that it is at the beginning of the modelling season rather than the end. It lasts for nine days, which includes two Saturdays and a Bank holiday Monday so that we feel there should be a great opportunity for enthusiasts to visit us for many in London, perhaps on holiday, who would not otherwise have had the opportunity.

NEW STYLE . . .

We are making one or two changes in the traditional presentation. The trade stands will be placed in the usual manner round the edge of the hall, but instead of having high walls screening off the central layouts these will be presented in what we can only call an open-plan form. We hope this will do more than justice to the trade displays and also enable some comparison to be made between one layout and another.

PROPRIETARY LAYOUTS . . .

We are endeavouring to present in addition to home-built layouts some idea of what can be achieved using nothing but proprietary equipment. This is the sort of layout that can be seen at Nuremberg, Paris, Milan or other of the great European Toy Fairs each year but which strangely enough are never available for the public to see unless they are in the trade. Another feature we hope to introduce will be an opportunity for members of the public to operate a layout on display. Here numbers must be limited but there will be a chance for everyone visiting the show to try and obtain some idea of the feel of a big layout and we hope go home enthused to achieve the same himself.

GRAND LAYOUT COMPETITION . . .

We are offering prizes of:

First Prize—£50. Second Prize—£30. Third Prize—£20

for the best club or individual layout. The layouts displayed will be limited to 200 sq. ft. which gives a maximum size of about 16 × 12 ft. Gauges eligible will be O gauge, OO gauge, or N gauge and their fine scale equivalents.

How to enter is simple—a club or an individual has only to drop us a line and send us a photograph of the layout; if possible a rough sketch/plan and a note of dimensions and special features. We will visit layouts which seem likely to be of interest and make our choice from them. A great deal depends on how well you describe your layout in the first place so while not asking for modesty we do ask for accuracy.

A condition of winning this competition is that the first three layouts shall be available for display at our exhibition. We would be responsible for collecting the layouts and returning them after the exhibition and keeping them insured during that period. If the layout owner wishes, and is able, to demonstrate his layout during the exhibition with whatever team is deemed necessary so to do then expenses will be paid for this purpose. Alternatively, we shall be happy to provide reasonably skilled club operatives who would operate the layout or would alternatively assist the original owner. As a final encouragement the layout will be described in pictures in MODEL RAILWAYS at a future date and editorial fees for this will also be paid to the builder.

OTHER COMPETITIONS . . .

There will also be additional competitions for O gauge, OO and N gauges.

First Prize—£10. Second Prize—£7. Third Prize—£5

in each of these classes provided entry is not less than twelve models, should it exceed twelve then we would divide into additional classes, if less than six entered in any class then the prize rate would be halved. Classes will be open for entirely scratch built locomotives, locomotives built from any kit sets available and for best finished model. Additional classes will cover rolling stock as passenger coaches, ancient or modern, goods wagons of all sorts, including private owners' wagons, with special prize for the most original design. There will also be prizes for line-side features, low relief buildings and station buildings, wholly original or based on kit material with naturally the emphasis towards original work in cases of equal merit. There are no entry fees for any of the competitions. Entry forms are available on demand.

SOUVENIR HANDBOOK & GUIDE . . .

The first of the new MODEL RAILWAYS comes out on August 13th and will contain a special Exhibition Souvenir Handbook and Guide Supplement.

ADMISSION . . .

Hours of Opening—

The exhibition will be open on the 26th August 1971 at 10 a.m. and will continue through daily to 9 p.m. except Sundays, when it will be closed, and will finish on Saturday, September 4th at 7 p.m.

It will be open on the two Saturdays and on the Bank holiday Monday all day.

Prices of Admission:—

Price of admission at the door will be 25p adult, 15p child. A child is regarded as anyone still at school. Children under 5 who have not started school and are accompanied will not be charged.

Reduced admission charges for pre-booking as under:—

Single and small number pre-booking tickets available from these offices. Adult 22½p, Child 12½p. Parties of more than 10: Adult 20p, Child 10p. Teachers i/c parties free—one per 10 in party.

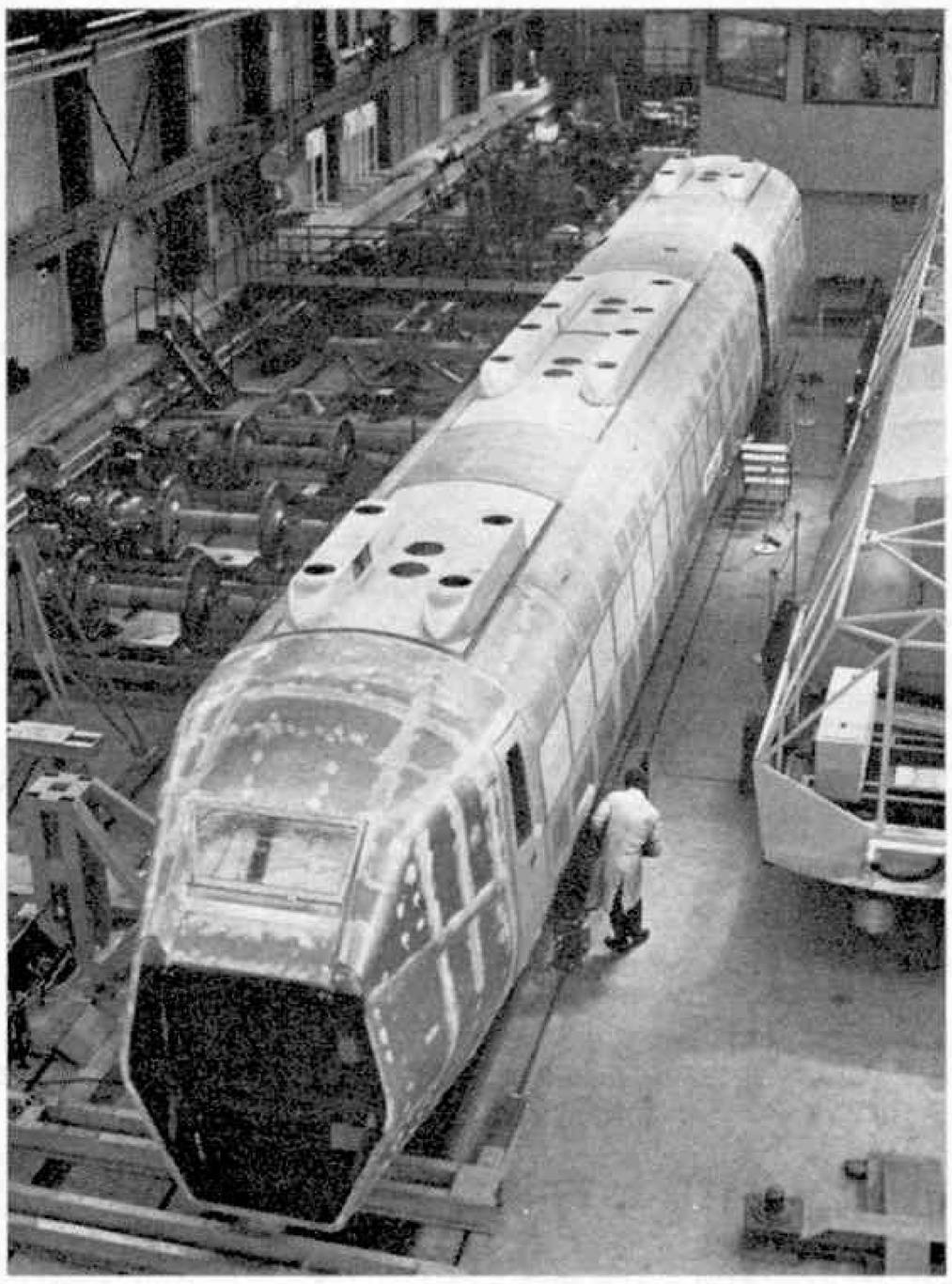
A combined family ticket can also be bought in advance.

Enquiries to Exhibition Organiser **MODEL & ALLIED PUBLICATIONS LTD.** 13/35 BRIDGE ST. HEMEL HEMPSTEAD

ON THE EDITOR'S DESK

Tests are due later this year on the APT-E, the new 155 m.p.h. train revealed a couple of weeks or so ago at the advanced projects laboratory of BR at Derby. What is surprising about this is that 150 m.p.h. speeds are envisaged in normal passenger service on existing routes with little or no alteration to the track or signalling system.

The secret of the four-car train is light weight and a new suspension system, plus two power/driving cars each with five 300 h.p. gas turbine engines, but the core is the suspension. Research into oscillation etc. has enabled bogies to be designed that produce a super-smooth ride; the bogies are in effect self-steering, and the APT will be able to take curves half as fast again as conventional trains, without the wheel flanges coming into contact with the rails. A coach tilting mechanism is incorporated to " bank " the coaches on curves, and there is a hydro-pneumatic self levelling vertical feature which gives a very soft and smooth ride.



Aerodynamic requirements place the driver on the centre-line and the cab layout will permit later installation of track-to-train control equipment, already in an advanced stage in the laboratory.

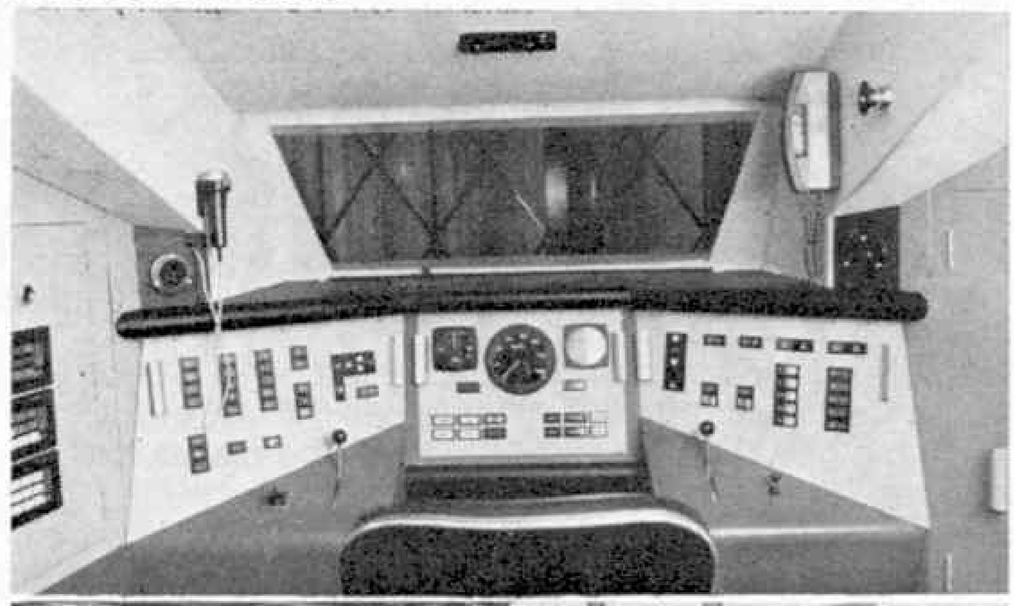
Some idea of what this new development will do to journey times, when it comes into service in the mid-seventies, can be obtained from computer calculations which show that the London-Edinburgh run, now 5 hrs. 45 mins. at its fastest, will fall to 4 hrs. at 125 m.p.h. and later to 3 hrs. 40 mins. when the potential top speed is realised.

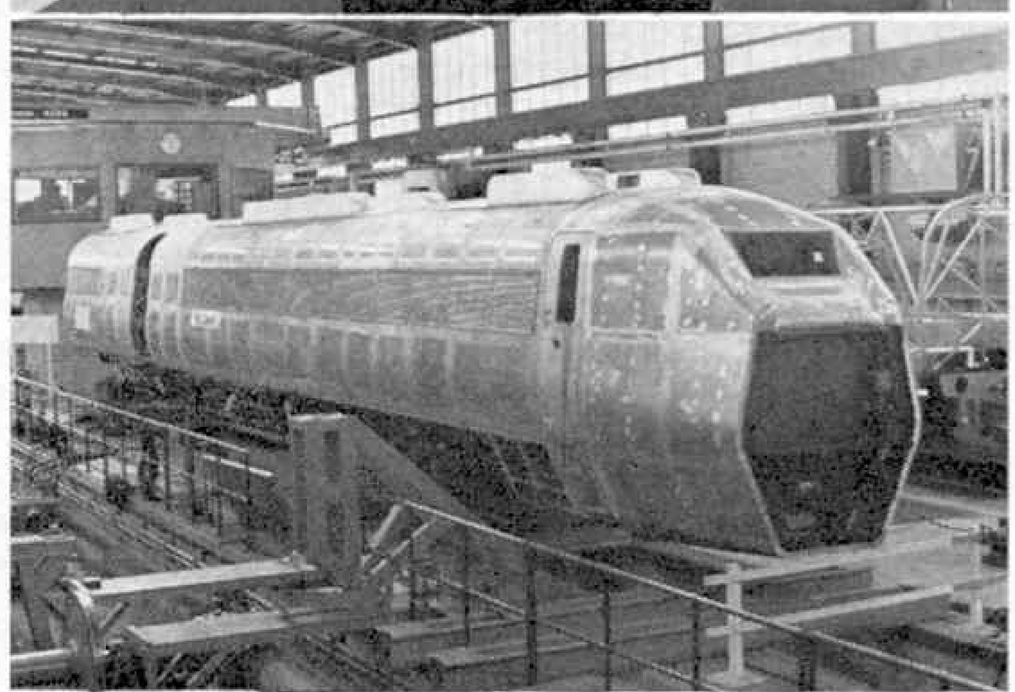
A commercial train would have five cars between the two power cars and would include quite extensive catering facilities. Double-glazing and air conditioning will be features.

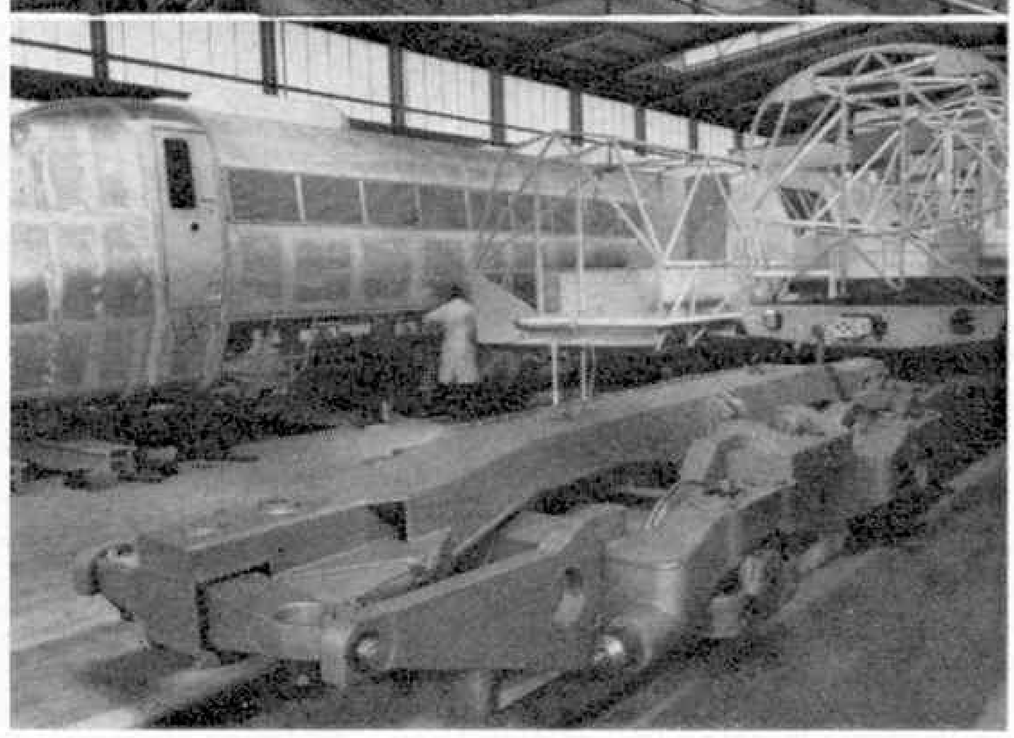
How do you stop in existing signalling distances? Hydro-kinetic brakes are fitted—like turbines on the axles; fluid is fed in and the churning effect does the trick.

Initial tests will be on a roller test rig and then on the 13 miles special test stretch between Melton Junction (Leics.) and Edwalton (Notts), part of the former Nottingham-Kettering main line.

Photos show the first power car being fitted out, the cab mock-up for instrumentation and control lay-out, and one of the special bogies.







Will electrically-driven vehicles shortly be given an important role in our road transport system? The idea isn't new, but it is being examined more urgently today than ever before, and intensive efforts are being made to overcome the practical difficulties arising from this revolutionary suggestion.

A Future for the Electric Car?

By Arthur Nettleton

NOWADAYS, with traffic noise and city air pollution reaching intolerable proportions, the possibility of replacing petrol-driven vehicles with a quiet and fumeless mode of transport is especially inviting. The electric car meets these requirements, and engineers and scientists are pushing ahead with research to make the change practical and economic.

The electrically-driven car is really nothing new, and the present efforts for its development as a modern means of travel can be truly described as a *revival*.

Electric cars were on the road before petrol-engined ones, and a battery-driven racing car held the world's land-speed record (nearly 66 m.p.h.) in 1899.

Electric broughams were still being made just before World War II, and even today the cleanliness and convenience of electrically propelled drays makes them ideal for milk deliveries.

So why not adapt this kind or power unit to road vehicles in general? The electric car is silent and emits no fumes—qualities of special importance in these days, when attempts are being made to minimise traffic noise and control the exhaust gases which pollute our city streets.

Yet the battery-run car is not without drawbacks. Chief among these is its short range. Such a car can travel only 40 miles or so before the batteries require recharging.

The plain fact is that electricity is difficult to store, and that the batteries needed to propel a car of normal size are heavy, as well as needing eight hours of recharging after each 40 mile journey.

Further, the electric car is comparatively slow, its maximum speed being around 40 m.p.h. Nor can it accelerate like a petrol-driven one. Traffic experts fear that congestion would be aggravated if many slow-off-the-mark vehicles were allowed to cruise along our city streets.

Increasing the number or size of the batteries to give the cars the same performance as piston-powered ones would raise the weight of the vehicles to an impracticable point.

Yet advocates of the electric car are not despondent. They are trying out different ways of providing the electrical energy with lighter but longer-life batteries.

One innovation is a battery which, its developers claim, will store fifteen times as much energy as the lead-acid ones of the same size at present in use. This new-style battery produces power by a combination of sodium and sulphur—two cheap and plentiful elements.

A battery system of this type, suitable for a car, weighs about 300 lb., but from this weight must be deducted the savings which can be effected elsewhere in the vehicle.

Electric cars, for instance, do not need a transmission system or a fuel tank. The exhaust pipe, carburettor, and fuel pump are other unnecessary items.

There are a number of problems associated with the sodium-sulphur battery, however. It must be kept at a high temperature, and one difficulty is how to insulate it so that it stays at this heat.

Another problem arises from the fact that if sodium comes into contact with water, as it might well do in a crash, highly inflammable hydrogen gas results.

A more promising type of battery has been undergoing development in the U.S.A. This new power source, known as an air battery, uses zinc as a fuel, and introduces a new principle into the production of electric current.

Air is pumped at pressure onto zinc plates and acts as an oxydising agent. The oxygen in the air then combines with the metal in an electro-thermal action that induces an electric current.

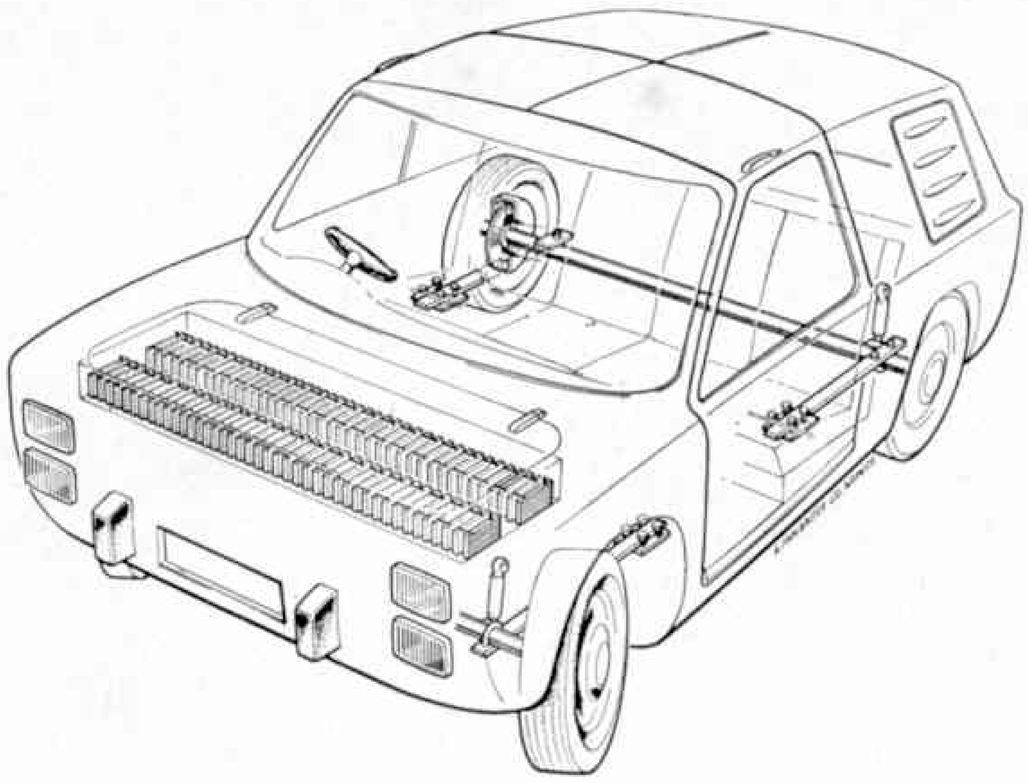
Recharging is effected by applying a current of reverse potential, which restores the cell to its original condition.

Despite the pumping action which the cell has to power in order to work, it operates at about 80 per-cent efficiency. Its big advantage is its lightness and cheapness compared with the lead-acid battery.

A $1\frac{3}{4}$-ton vehicle driven by lead-acid batteries weighing 850 lb. has a 40-mile range. But with zinc-air batteries the same vehicle would cover 150-200 miles

Heading photo, opposite, a most promising British entrant in the electric car field, the Enfield 800. It is claimed to have an 80-mile cruising range, and a top speed of 40 m.p.h. Its lead-acid batteries can be recharged overnight by plugging into the domestic supply.

Right, known as the Carter Coaster, this electric car is propelled by motors which look like the conventional brake drums, and which eliminate the need for transmission gear and an axle differential.



before re-charging became necessary. And an experimental car powered in this way has attained 75 m.p.h. and its acceleration has been good.

Here again, however, there are problems to be overcome. The cost of such a car would at present be about three times that of petrol-driven one, and only mass production would enable the price to be reduced sufficiently to compete in price.

Still more recent research has concentrated on a lithium-chloride battery, which is reported to generate twice as much power as sodium-sulphur and zinc-air batteries. Other experiments are being undertaken to see whether fuel cells like those used to power space-flights can be adapted to cars. At present such cells are bulky and costly, but smaller and cheaper ones may eventually be produced.

And it isn't only conventional cars that figure in the research. Small, enclosed runabouts powered by batteries are envisaged as a means of reducing traffic congestion in cities.

The most startling idea of this kind comes from Philadelphia, Pennsylvania. It foresees a revolutionary transport system using as many as 200,000 electric cars, these being hired for the day, or for a particular trip between a conventional transport terminus and the hirer's destination.

The cars would accommodate two adults and two children, and would have a cruising range of only 20 miles. Their maximum speed would be less than 40 m.p.h., and they would be restricted to the city's central business area.

The Electricity Council founded by the British Government in 1957, to promote an efficient and co-ordinated electricity supply system in England and Wales, has also been taking a close look at the electric car as a viable vehicle for town use.

Three types of battery-propelled vehicle have been studied and tested. One is a bicycle or tricycle for one person, capable of carrying about 50 lb. of luggage. The other two are cars—a two-seater and a four-seater—with a top speed of 40 m.p.h. and a range of 40 miles on one battery charge.

The designers of electrically driven city runabouts have produced prototypes which occupy the minimum amount of road-space, but which incorporate novel transmission systems.

One such car has a battery mounted over each axle, giving the vehicle four driving-wheels instead of the two normal with cars driven by an internal-combustion engine.

Electric vans, lorries, and buses are another idea. Japan has already developed a 2¼-ton Yuasa Battery Car which can be used as either a delivery wagon or a bus.

An improved type of battery enables recharging to be completed in only 3–4 hours, against 6–8 hours for ordinary batteries.

Some authorities believe that the biggest break-through in electrically-driven vehicles will come through heavy ones, rather than via small runabouts. They have in mind a battery-driven heavy vehicle fitted with a gas turbine to drive a battery-charging generator. Large lorries and public service vehicles

Electronic car—View of the prototype "Amitron" electronic car recently displayed in the United States. Case in left foreground contains one of two newly developed long-life, light-weight lithium batteries that will power the car. Their combined power is equal to that of the 45 conventional automotive batteries shown in background.

An electrically driven runabout designed and produced by Scottish Aviation. Such vehicles are being recommended for shopping trips and other comparatively short runs.

(say some experts) will prove a better bet.

A type of passenger car using the same principle is being designed, too. It uses a hybrid system—a small turbine power generator charging a small battery, which in turn provides current to run an electric motor geared to the road wheels.

A problem which will have to be solved before the electric car becomes an attractive commercial proposition concerns speed control. This can be effected most conveniently by employing resistances which vary the voltage applied to the drive motors.

Unfortunately, at low speeds a significant amount of energy is dissipated through the resistances, and the loss considerably reduces the range of the vehicle if a substantial part of the journey at such speeds. The answer seems to be the thrysister, a device which does not waste current, but which does increase the cost of the car.

An electronic car which has been undergoing development in America has an original feature to extend its range without re-charging. Energy normally lost in slowing down and stopping the vehicle is used to recharge the batteries. This can increase the range by as much as 25 per-cent.

The power unit consists of two lithium batteries, and they are much smaller and lighter than batteries used in other electric cars. Each of these batteries weighs 75 lb. and measures 13 in. wide, 12½ in. high, and 23½ in. long, and stores ten times as much energy as the conventional lead-acid automotive batteries of the same size.

Lithium is the lightest metal known and is plentiful. The electronic system also includes two 25 lb. nickel cadmium bipolar batteries which are re-charged from the lithium batteries while the car is cruising. The energy output enables the vehicle to accelerate from a standing start to 50 m.p.h. in twenty seconds.

The car is not meant to replace but to supplement conventional cars for city driving. It is barely seven feet long, less than six feet wide, and four feet high. Yet it seats three persons, or its air-filled seats can be deflated and lowered to floor level, creating an enlarged goods area when there are no passengers.

The vehicle has no doors, a "clamshell-type" opening, hinged at the rear, allowing the entire roof to swing back on counterbalanced hinges. Large bumpers at the front and rear are of rubber-vinyl, and return to their original shape after absorbing impacts.

How long will it be before battery-driven vehicles are commonplace—if ever they are? The question involves so many points that a conclusive answer is impossible at the moment.

The abolition of obnoxious exhaust gases from petrol-driven vehicles is going ahead rapidly, and one of the benefits of the electric car is thus being removed. But experiments and tests are continuing, partly because world supplies of petroleum oil are not inexhaustible.

Road safety comes into the matter, too. It has been seriously suggested that the silent horseless carriage or lorry might, by its very silence, be a danger to the unwary.

It is even said that the electric car may have to be fitted with some continuous audible warning to announce its approach and prevent accidents!

CAR OUTLINE COMPETITION

LAST month's competition was the last in the present series; next month there will be something a little different for all you competition fans to try your hands at.

The car featured as a silhouette in July was the Dino Ferrari, No. 216, and the lucky 50 winners are:

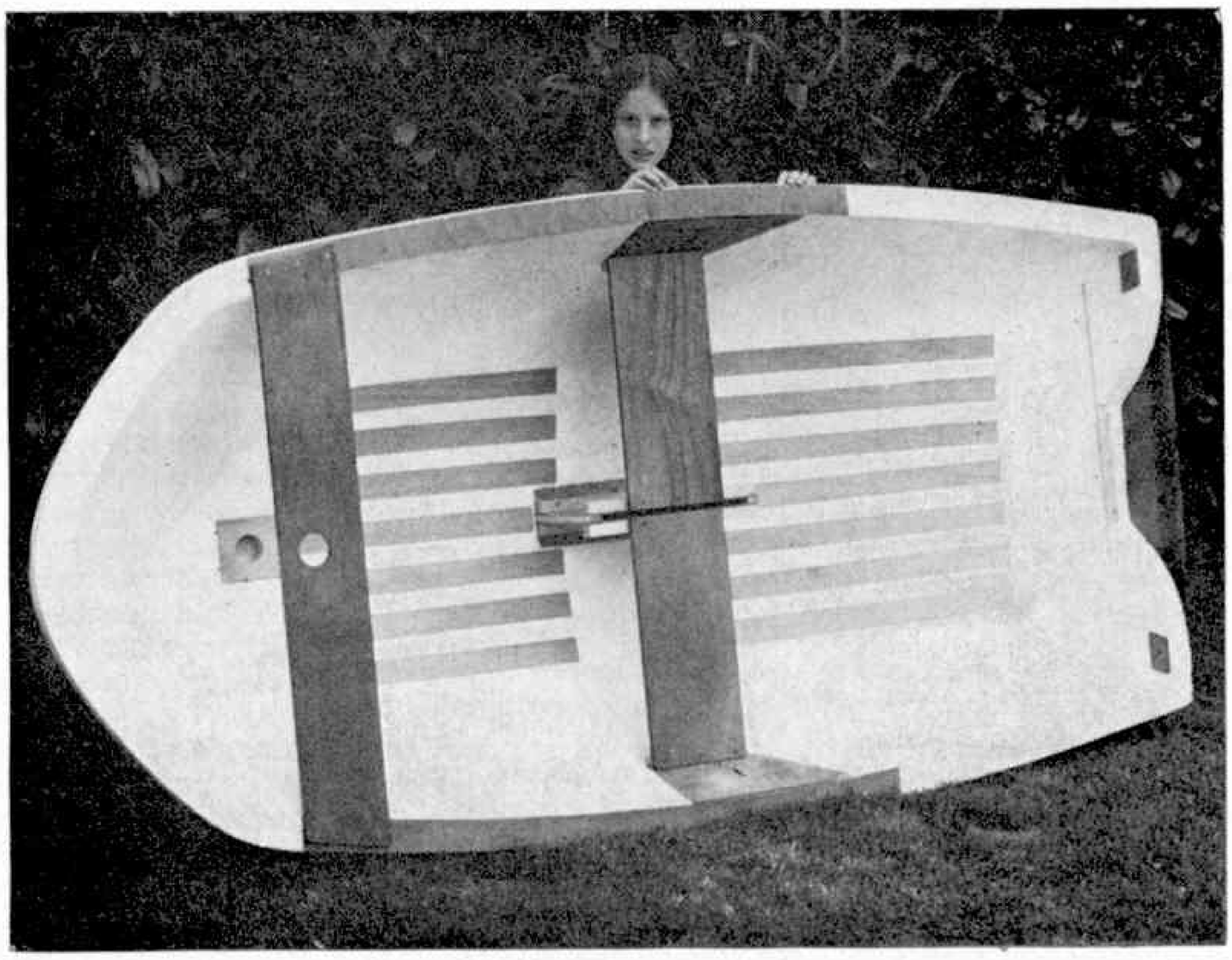
T. Baldwin, Nr. Honiton, Devon. A. Barlow, Eastwood, Nottingham and M. Barlow, Eastwood, Nottingham. M. Belcher, Reading, Berks. P. Burgess, Nr. Calne, Wilts. A. M. Cookson, Blackpool, Lancs. N. Cullum, Woodbridge, Suffolk. S. Cummings, Horsham, Sussex. E. Dales, Yorkshire. C. J. Davies, Guisborough, Yorkshire. C. Denton, Christchurch, Hants. N. Dixon, Folkestone, Kent. G. Dowle, Sidmouth, Devon. A. J. Drake, Cambridge. A. Favell, Birmingham. M. Gilbert, Newark, Notts. M. Guest, Devon. G. Henwood, Wallingford, Berks. D. J. Iveson and P. B. Iveson, Annan, Dumfriesshire. R. Levy, Manchester. K. I. Marchant, Gravesend, Kent. E. C. Marven, Huntingdon. W. Newdick, Ipswich, Suffolk. M. North, London, SE3 8RW. P. Northway, Dunfermline, Fife. R. P. Oglethorpe, Upminster, Essex. N. R. Owens, Cranleigh, Surrey. R. J. Peat, Aldershot, Hants. P. Pickersgill, Wokingham, Berks. I. Pizzey, London, SW16 2BT. M. V. Prior, Malvern, Worcs. T. Ralphs, Coldfield, Warks. R. M. Redmond, Belfast, N.I. D. B. Reed, Hemel Hempstead. S. Reed, Stanmore, Middlesex. P. S. Reynolds, Burton-on-Trent. S. Salmon, Winchester, Hants. A. Sartain, Melksham, Wilts. P. Sims, Southampton, Hants. D. Sorrell, Chelmsford, Essex. M. Stamp, Reading, Berks. D. A. Stewart, Annan, Dumfriesshire. M. Strohm, Southend-on-Sea. I. Thomson, Ruislip, Middlesex. G. Tozer, Torquay, Devon. M. Tully, Blaydon-upon-Tyne. W. J. Vevers, Musselburgh, Mid Lothian. G. Walkden, Manchester. P. Wensley, Bridgwater, Somerset.

Fifty Dino Ferrari models are on their way, with our compliments to all the keen winners. Our thanks also to all the hundreds of entrants who have tried their luck during this series of competitions—we have given away 500 assorted Dinky Toy models, so if your entry didn't win one of them, well, bad luck; perhaps you'll do better in the next competition!

Building a Simple Sailing Dinghy

Meccano Magazine tries its hand with the very inexpensive

HiBALL



EVER looked enviously at people enjoying themselves dinghy sailing? And looked at the boat price tags—£130, £150, £190, and so on? Even a second-hand one is likely to be £65 or more, and then, unless you can join a club, you need a trailer etc. If the outlay wasn't quite so high, a lot more people who'd like to get afloat would be sampling the delights of sailing in their own boats.

We believe that Richmond Marine Ltd. have come up with a very happy answer to this situation. Their Skipper boats, and particularly the Minisail, are widely known and well thought of; their latest product is going to make their name known to a tremendous number of people for whom a boat up till now has been just a day-dream. The name of the product is HiBALL, and Meccano Magazine has one to evaluate.

Firstly, the price. As an outboard boat, the cost is £15.99. As a rowing boat it is £17.99. In the version in which we are interested, sailing, the complete device costs £29.99, if you collect from one of the firm's distribution points. Not unreasonably, a charge is made for delivery.

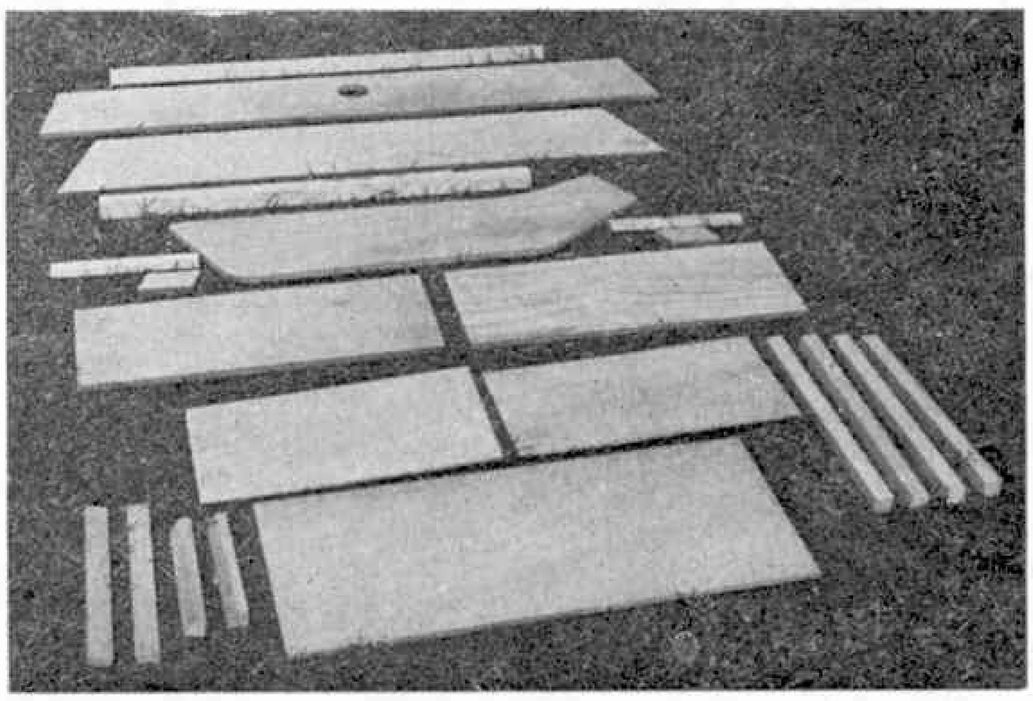
What do you get for your £29.99? Well, it's a kit, but the work involved, apart from painting, can be done in an evening, and if you wished, you could be actually sailing three hours after you got the kit home. This would be hasty and unwise, because it is obviously best to paint or varnish everything, but it does indicate the amount of work and the completeness of what is supplied.

The hull, 8 ft. long and 4 ft. beam, is actually a one-piece moulding in high density expanded polystyrene. As such it is fairly soft, but given one coat of emulsion paint and reasonable care in handling, you could reasonably expect at least two full season's sailing before it became too tatty. If it is given a tough skin and fitted with a few strips of ply at strategic points, it will last for years.

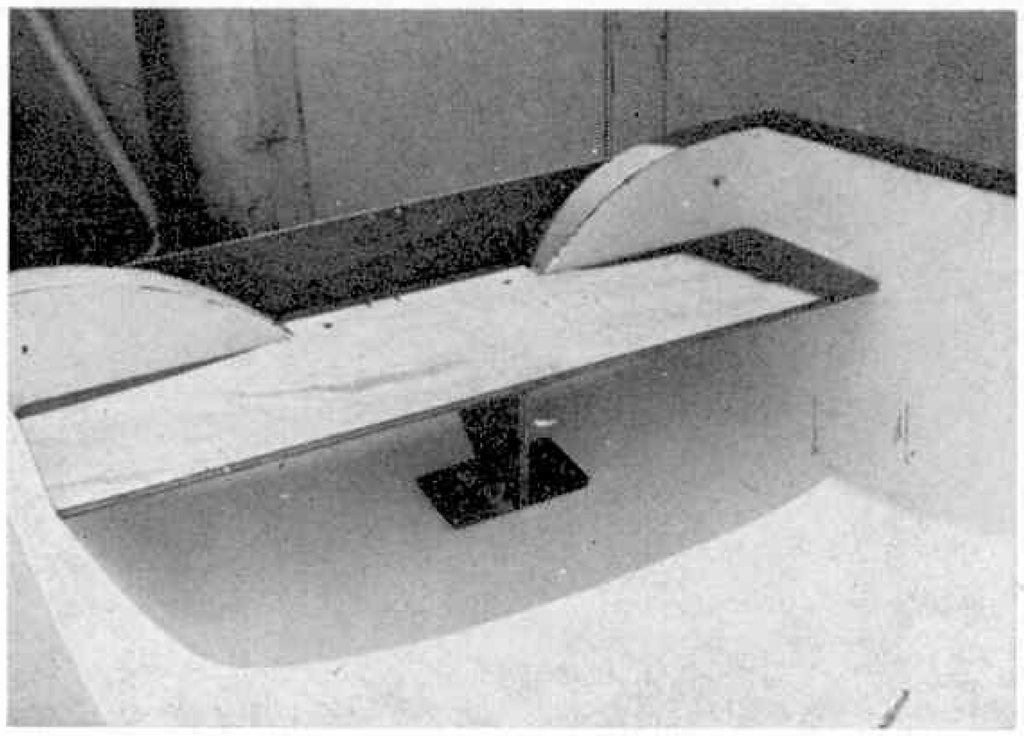
Wood and marine ply inserts are moulded into the hull at key points, and besides the hull you get a centre thwart with dagger board and casing, a 13 ft. aluminium mast and a 6 ft. boom, a mast support thwart, transom stiffener, rudder, tiller, finished proofed nylon sail, mainsheet, adhesive, screws, bolts etc. and all necessary metal or nylon fittings, plus assembly instructions. You do not get paint or varnish.

A special pack of a gallon of a special resin called Isoplan, plus glass scrim to give the hull a thick, tough skin, costs an additional £6.11 and though this sounds expensive, it is recommended. Any emulsion paint (followed by gloss paint if you wish) will provide a reasonable surface for use, but the Isoplan is specially developed for polystyrene hulls and really makes a robust surface. Other optional extras are a kicking strap kit (to hold the boom down), a rear thwart (seat), and a pack providing gunwale trim, rubbing strips for the three little skegs beneath the hull, and duckboards for the interior, but none of these is essential.

Weight of the hull is 30 lbs., and adding the rest of the woodwork plus the skin would bring this up to perhaps 45–50 lbs., so that it is ridiculously easy to lift the boat in and out of the water, and also up on to a car roof



Above, Twelve-year-old Michele supports the hull for a photograph. Wood strips on floor are non-standard but otherwise everything is as supplied. Right, wood parts come all pre-shaped and need only sanding and varnishing.



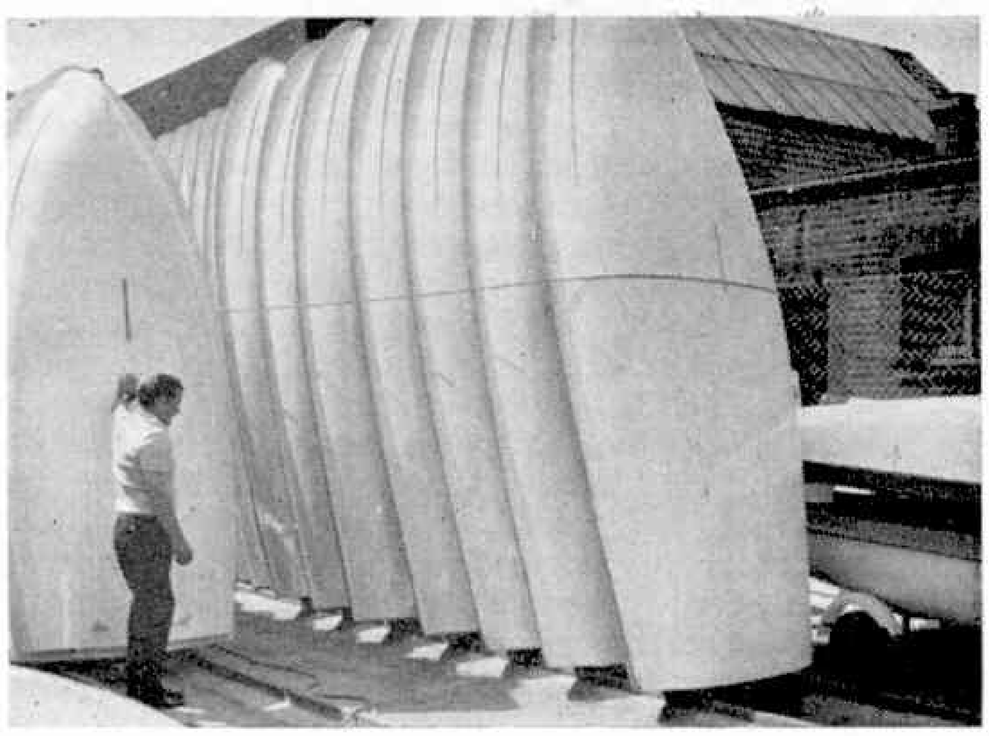
The stern thwart is an optional extra, mostly for the outboard or rowing version. This is a built-up sample in Skipper Boats' yard and is simply emulsion painted.

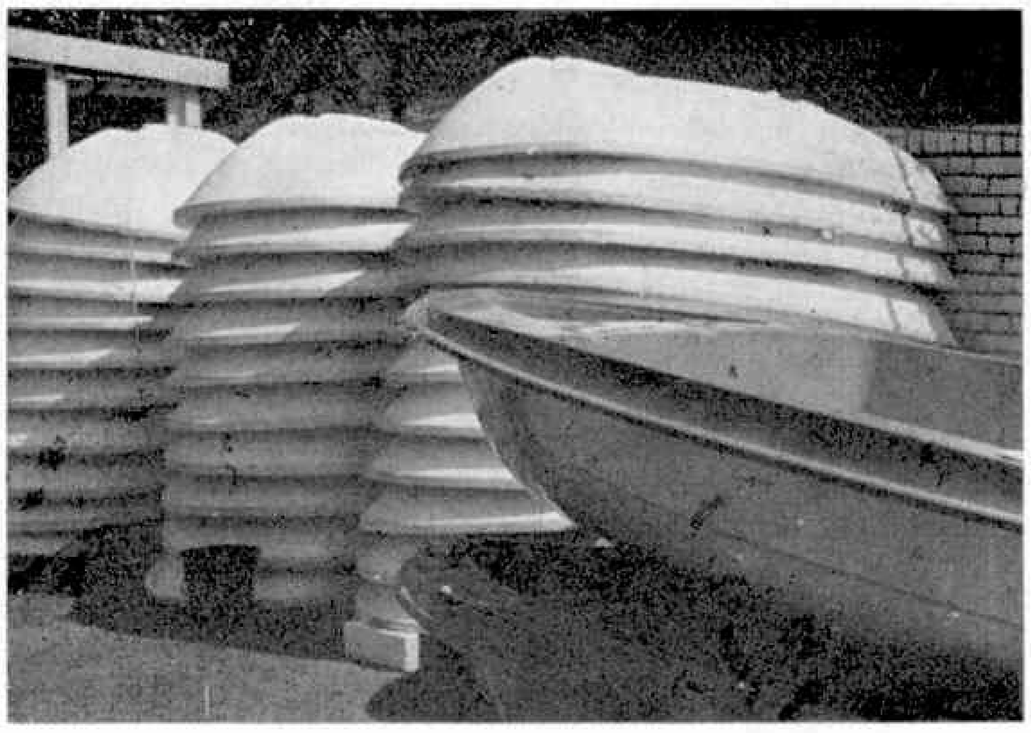
rack; any saloon or estate car will carry it without noticing. The boat is weatherproof and can live in the garden between outings.

At the moment we have not had ours afloat—we will cover sailing it next month—but from experience we are sure that it will be fun. The design is by Peter Milne, who was responsible among other boats for the famous *Fireball*, so we are also sure that performance will be as high as can be expected from this type of craft. We like the safety aspect; it will float filled with water, and will support 700 lbs., so provided the owner handles it with common sense, it is ultra-safe. Some simple do's and don'ts will be coming up with the sailing trials, but in the meantime, here's our assembly procedure.

As with any kit, the first step is to read the instructions and identify all the parts. All the ply pieces are band-sawn and a few minutes with a plane or Surform and glass-paper sees all sharp edges chamfered or rounded off. Apart from appearance, this avoids the chance of future splinters and enables the varnish to seal more effectively. Varnish all the wood bits before assembly, using ordinary varnish, not polyurethane, which has a bad effect on polystyrene.

While the varnish is drying, work can go on on the hull. This is covered with little faintly raised rings left by the blow-out holes in the mould, and they can be gently sanded smooth with fine wet-or-dry paper. There was a small crushed area on the forward skeg of our hull, and we cleaned this up and stuck on a piece of expanded polystyrene, sanding it to fair in when dry. For all work on the boat, Cascamite One-Shot resin glue is recommended, as it does not affect polystyrene and is one of the best glues for amateur boat work. A quantity is supplied with the kit, but if you run out it is easily available through ironmongers, etc.

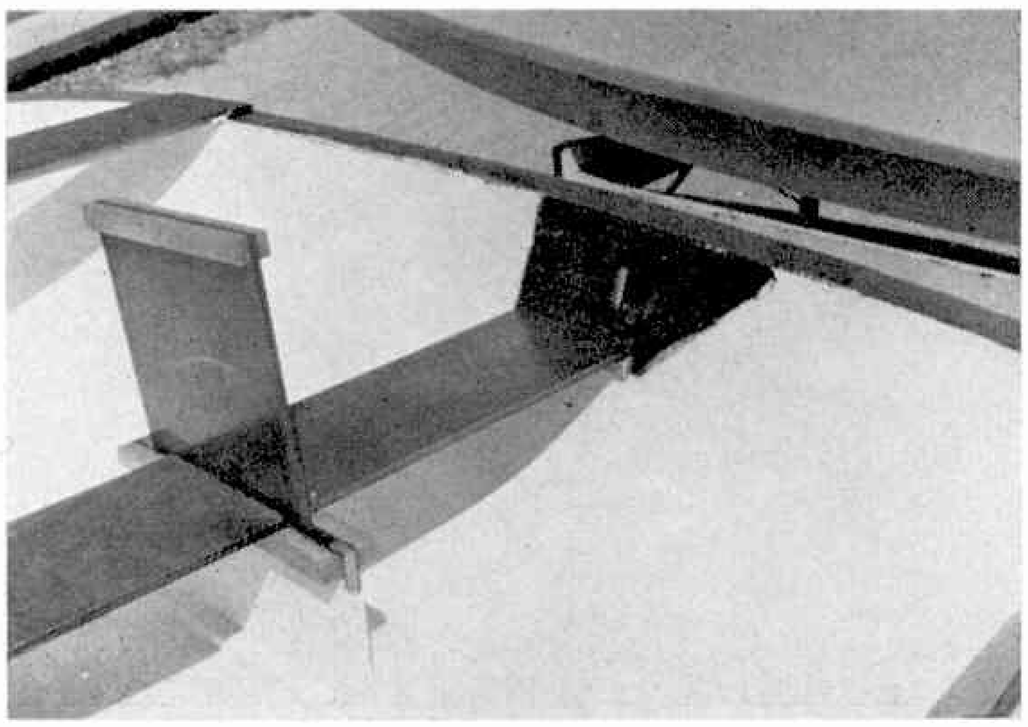




On the left, glass-fibre Skipper 12 and 14s awaiting delivery or collection by lucky owners. Right, HiBall hulls; the machine that makes them blows out one every fifteen minutes. Weight in bare form is a mere 30 lbs.

We sawed 1 in. wide strips from a piece of 1/8 in. marine ply and stuck these on the three skegs, and inside the boat stuck down 2 in. wide strips of the same ply to protect the floor (see photo). All these pieces would later be covered by the skin, but they provide local surface reinforcement and reduce the chances of damage to the most vulnerable areas. The panel of ply was 30 in. square and cost 20 p, incidentally, but offcuts from a timber yard would cost even less. Cascamite glues these in place; we used house bricks to hold them in contact. Apart from protection of the floor, the internal strips help make it non-slip, which is important in a boat.

The first wood assembly is the dagger box which is



The dagger plate is simply pulled up or pushed down through its box; its job is to reduce leeway when sailing, and you have to remember to pull it up when heading into shallow water!

glued (again with Cascamite) and screwed (screws supplied) together following the directions. A plate is moulded into the hull floor and the slot for the dagger board is cut in it, but it is necessary to cut through the polystyrene to complete the slot. This can be done with a very sharp knife, an unmounted hacksaw blade, or an old bread-knife. The dagger box is then glued and screwed to the mounting exactly over the slot; it is a good idea to slide the dagger board through before screwing to ensure that it passes cleanly through. The inside faces of the ply box sides should be thoroughly varnished, two or three coats, before assembly.

Two shaped supports are glued and screwed to the outer ends of the centre thwart halves, and the inner ends are then glued and screwed to the upper dagger blocks. The outer supports are glued and screwed to plates moulded in the hull sides, ensuring that the halves of the thwart line up tidily. We planed a bevel on the outer ends of the ply halves to get a nice fit. The dagger board simply has two strips of wood glued and screwed to its top edge.

At this stage the hull can be painted or " skinned ", or the woodwork can be finished first. The bow thwart has a stiffener glued and screwed to it, and is then simply glued and screwed on top of strips moulded in the gunwale, making absolutely sure that the mast hole in the thwart is directly above the hole in the wood step moulded in the floor of the hull, otherwise the mast would lean out of true.

The ply transom is glued and screwed to the stern, a wood cross-member being moulded in the hull to receive the screws. It is also secured by two bolts through the top corners to two ply patches inboard. As supplied, this transom will take a $1\frac{1}{2}$ h.p. outboard motor, but for anything larger a sturdier transom is needed; the makers would advise on this.

Apart from fittings, that's it. Up to this stage, ours had taken 8 hours work, including varnishing everything, rubbing the spots off the hull (this took about an hour but was well worth it) and cutting and fitting the non-standard ply floor strips etc.

Covering the hull with the Isoplan pack adds another three or four hours work, most of it in getting the glass netting smoothly on the exterior. The resin is rather like very thick emulsion paint and is painted on quite thickly. Because of the hull shape, particularly the skegs, we found it best to cut the scrim into pieces rather than try to do it all in two large panels. The material is pressed into the wet resin and allowed to cure overnight, then a second thick coat is applied. Any small bumps etc. can be sanded away after the first coat (it is quite tricky getting the glass scrim absolutely flat all over) and this ensures a reasonably smooth finish after the second coat.

The interior has two coats of resin without the glass, and is quite quick to do. As the resin dries matt, this helps to provide a non-slip finish inside, but most people would like a glossy exterior, and this can be achieved with one or two coats of gloss paint. All bright varnish work (thwarts, rudder, dagger board etc.) should be sanded smooth and given at least a second coat.

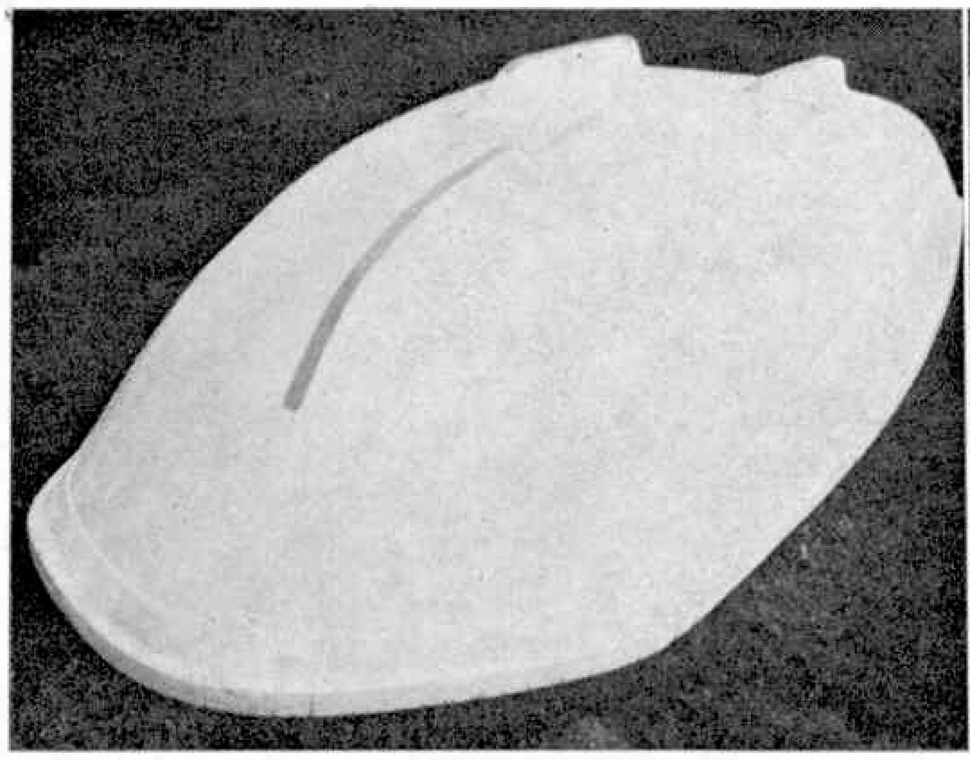
Fittings are simple. The rudder is hung on pintles bolted through the transom and rudder, with a removable pintle pin. A hole drilled through this pin at the top and a length of twine secured to an eye on the transom would be an insurance against dropping it in the water. The tiller bolts to the rudder; a pivoted extension held by a single bolt to its inner end seems a refinement worth making. An eye is screwed to the tiller where it crosses the transom and traps the eyed end of the mainsheet (supplied with the eye ready spliced in).

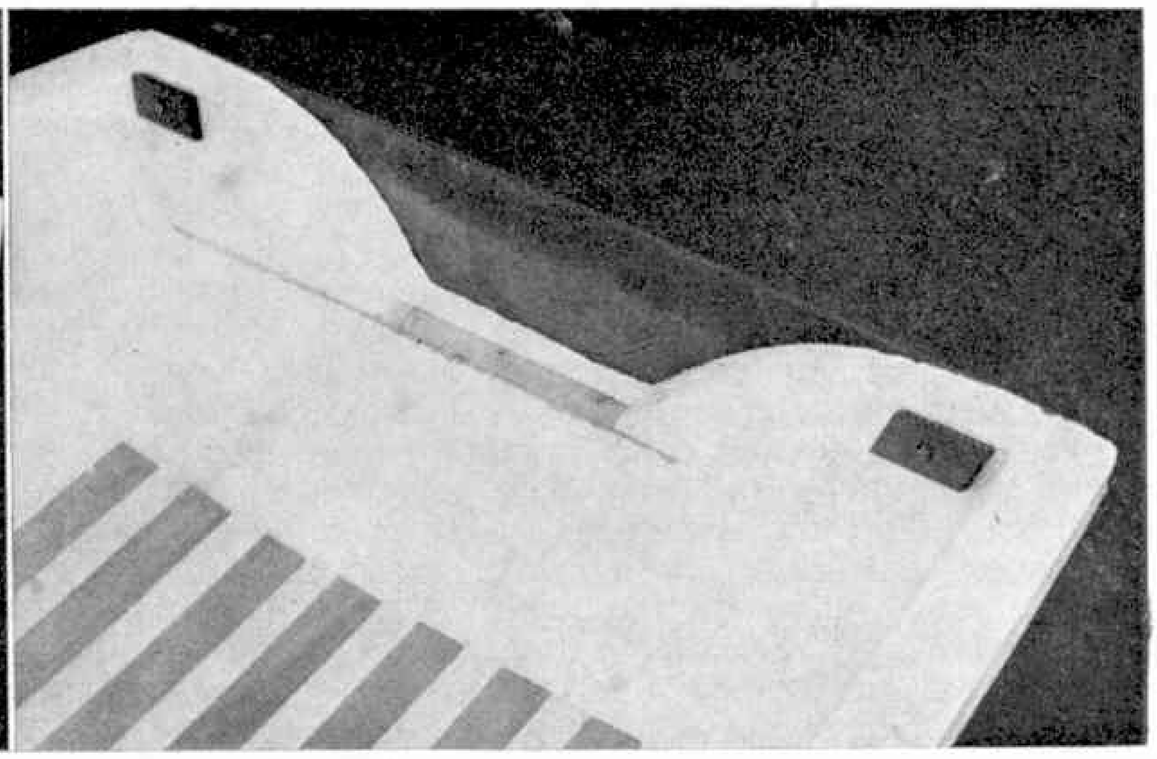
Two small holes are drilled in the top of the mast for self-tapping screws holding an eye for the mainsail halliard; a cork in each end of the mast and that is finished. The boom has a nylon crotch (gooseneck) at one end and a plug at the other, plus a clew fitting which clamps on and which takes the clew eye of the sail and has an eye beneath for the sheet.

Rigging is simplicity itself. The sail has a pocket luff (a large hem up the fore edge) and the mast is slid into this and the halliard passed through the eye; the mast can then be slid into place in the boat. The boom is placed against the mast and tough tapes in the sail tack (front corner) passed round the boom and round the mast. An eyelet in the sail clew (rear corner) is screwed into the clew fitting, the halliard hauled tight and made off round the thwart, and the rudder shipped and you're away.

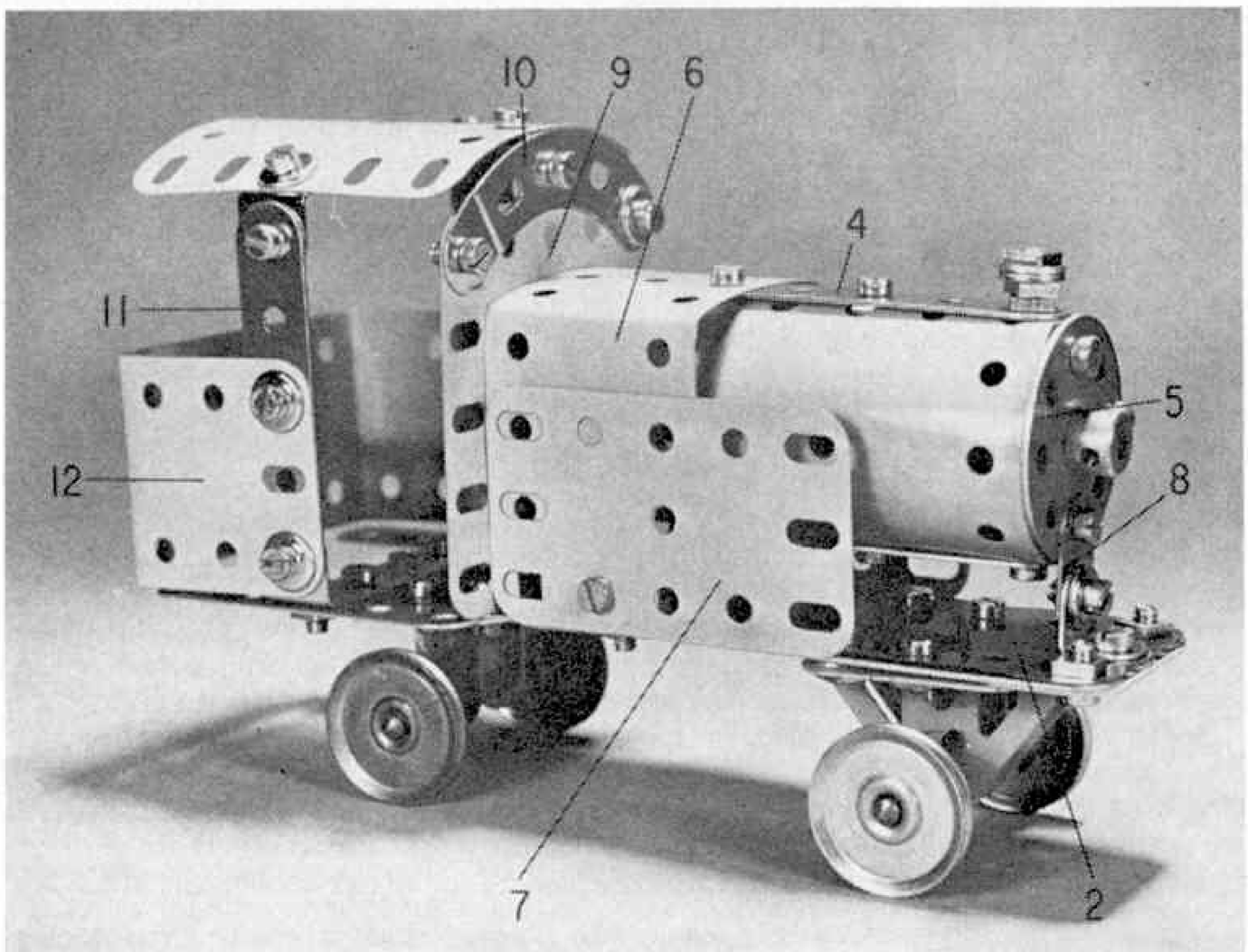
Skipper Boats say " instant boat—just add wind and water " and this is as near as one could get to that with a kit. To make a long lasting and nice job of it means no more than a week-end and a couple of evenings, and only that long because you have to wait for things to dry.

Look out for our sailing report next month.





Attractive shape of the hull is obvious at left as are the three ply strips we glued on the skegs. Pictured before applying the Isoplan covering. At right, transom of our hull. Note moulded in timber strip for receiving the screws and two ply patches which take the two bolts.



Old, but Interesting

SPANNER rebuilds three simple models from early Meccano Magazines.

MECCANO Magazine, believe it or not, is one of the oldest-established magazines in the world. Except for a short, six-months break in 1967, it has been published non-stop since 1916, which makes it 55 years old—and there are not many publications of any sort that can boast a history as long as that!

Reading back through early issues of the Magazine—particularly those published before the last war—is a fascinating pastime. Those early writers were often dealing with subjects which, to them at the time, were in their infancy and yet which we, today, regard as commonplace. Subjects covering advanced engineering, flying and even electricity were comparatively undeveloped by modern standards and, of course, space travel was in the realms of science fiction! Despite all this, however, it is amazing how accurate the writers were in there predictions of how things would develop in the future—which proves that the M.M.'s reputation as an authoratative journal was well-deserved.

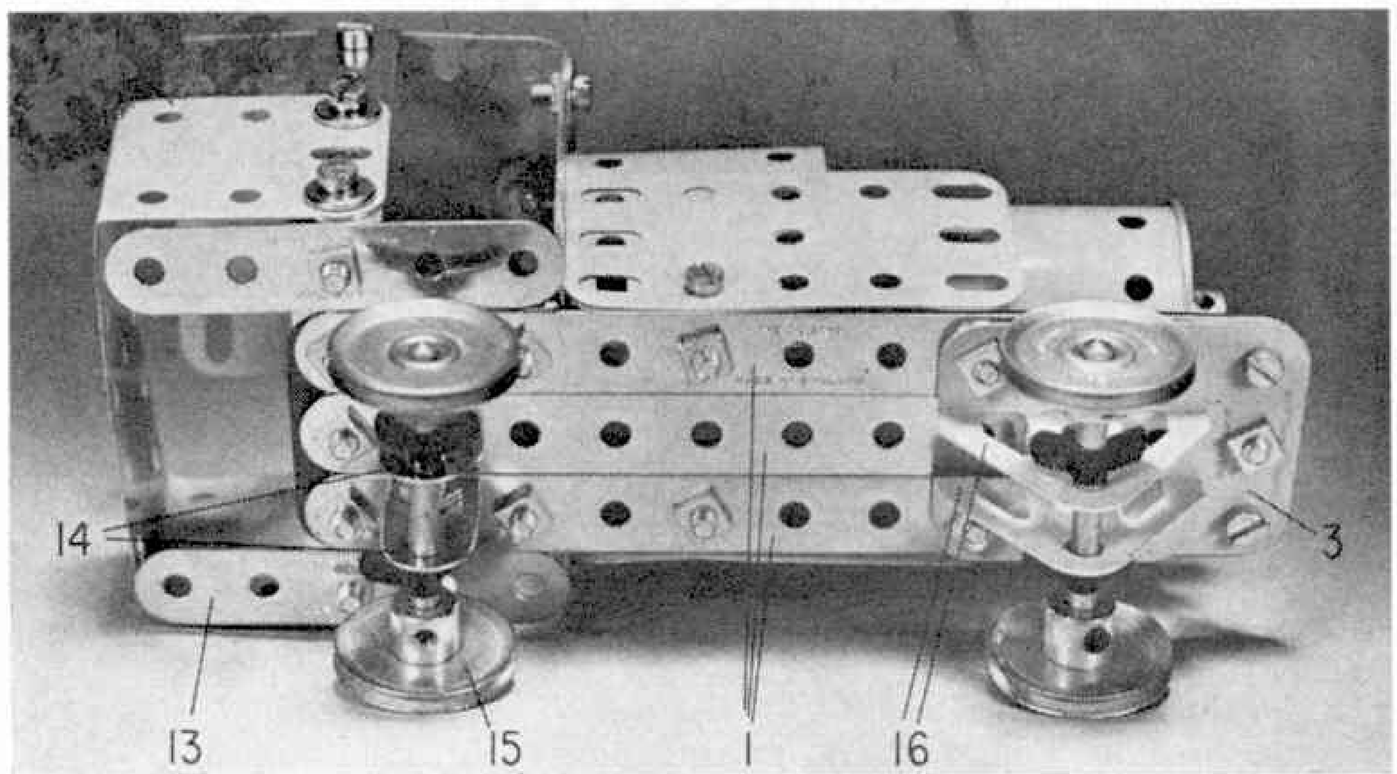
One of the things which would not come as a surprise to the Meccano historian is the fact that the vast majority of Meccano models featured in those early Magazines can be re-built, using the Meccano equipment of today. The modern parts are fully interchangeable with pre-war parts and, in fact, most of today's standard parts are identical in design to the originals. To prove the point, we feature here three models which we have re-built from instructions published in pre-war M.M.s. We have actually made some slight alterations to bring in one or two parts which have been introduced since the Magazines were published, but these changes are not essential and the models could be produced exactly as they originally appeared, using current parts.

Tank Locomotive

First in line is a little Tank Locomotive re-built from the January 1938 M.M. which, although simple, nonetheless makes an appealing reproduction of the old-time "puffer"!

The engine frame consists of three $5\frac{1}{2}$ in. Strips 1, overlaid by a $5\frac{1}{2} \times 1\frac{1}{2}$ in. Plastic Plate 2 and connected together at the forward end by a Flat Trunnion 3. Attached to the frame is the boiler, this being built up from two $2\frac{1}{2} \times 2\frac{1}{2}$ in. Curved Plates, further curved to shape and joined together, the connections being overlaid by $2\frac{1}{2}$ in. Strips 4. Note that the forward end securing Bolts in each case also fix two Angle Brackets in position and note that the upper Bolt is a $\frac{3}{8}$ in. Bolt, shank pointing upwards. Mounted on the shank of this Bolt are two Nuts, two Washers and another Nut, all representing the chimney, while an 8-hole Bush Wheel 5 is bolted to the spare lugs of the Angle Brackets to enclose the end of the boiler.

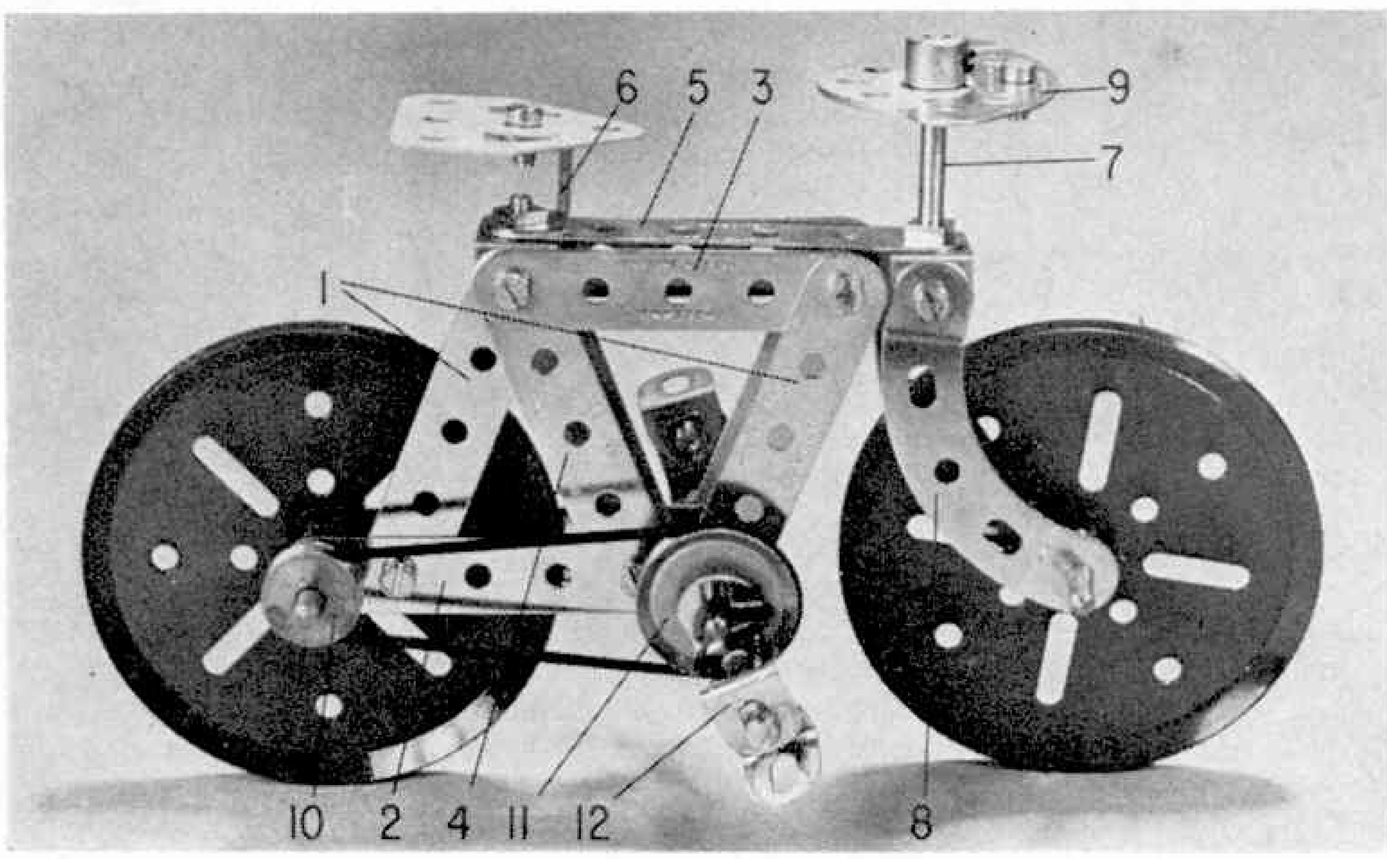
At the other end of the boiler, the upper rear connecting Bolt also



The "timeless" nature of Meccano is made clear by this enchanting little Tank Locomotive. Rebuilt with current parts, it was first featured in the January 1938 edition of Meccano Magazine! Left is an underside view of the model, showing construction of the frame and bogies.

fixes a $5\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plate 6 in position, this being curved to shape to represent the firebox section. The ends of the Plate are bolted, along with two $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plates 7, to two Angle Brackets secured to the engine frame. The front end of the boiler is attached to the frame by a Fishplate 8, secured to an Angle Bracket.

Also attached to the frame by Angle Brackets, immediately behind the firebox, is a $2\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plate 9, a $2\frac{1}{2}$ in. Stepped Curved Strip 10 being bolted to the upper edge of this Plate. Secured by an Angle Bracket to the centre of this Strip is another $2\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plate, gently curved to form the cab roof, side stays being provided by two $2\frac{1}{2}$ in. Strips 11, attached to the roof by Obtuse Angle Brackets. The lower ends of these Strips are secured to the lugs of a $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip bolted to the rear end of the frame, the securing Bolts helping to hold a shaped



$5\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plate 12 in position to form the back of the cab. Two further $2\frac{1}{2}$ in. Strips 13 are bolted through the remaining holes in the base of the Double Angle Strip to help enclose the floor of the cab.

Last of all, the two bogies are added. The rear bogie consists simply of two Angle Brackets bolted to the underside of the frame through its second holes, the spare lugs of these Brackets being extended by Fishplates 14. Held by Spring Clips in the circular holes in the Fishplates is a 2 in. Rod, on the ends of which two 1 in. Pulleys 15 are fixed.

Two 1 in. Pulleys also serve as the front wheels, these being mounted on another 2 in. Rod held by Spring Clips in the apex holes of two Trunnions 16 bolted towards the front underside of the engine frame. A Washer is mounted on the shank of each rearmost securing Bolt to space the Trunnion from the frame.

PARTS REQUIRED

3—2	4—22	11—38	1—126a
6—5	1—24	1—48a	2—188
3—10	4—35	1—90a	2—189
12—12	42—37a	1—111c	2—190
2—17	41—37b	2—126	1—194d
			2—200

Bicycle

Also re-built from the January 1938 issue of the M.M. is the charming little Bicycle, illustrated here.

The mainframe consists of two similar sides, each built up from $2\frac{1}{2}$ in. Strips 1, connected together at their lower ends by a 3 in. Strip 2, this Strip projecting one hole rearwards. Note that at this stage the forward end of Strip 2 is not bolted to Strip 1, but is left clear, as a 2 in. Rod, on which the driving crank will be mounted, will later be journalled in the end holes of these Strips. The crossbar at the upper ends of Strips 1 is supplied by another $2\frac{1}{2}$ in. Strip 3, the rear securing Bolt also holding a further $2\frac{1}{2}$ in. Strip 4, diagonally positioned to provide cross-bracing, its lower end being bolted through the second hole in Strip 2.

The two sides of the mainframe are connected by a Double Bracket, to the back of which a 3 in. Strip 5 and another Double Bracket 6 are bolted, the latter by one of its lugs. Strip 5 forms the top of the crossbar and it does, of course, protrude one hole forward past the end of the mainframe. Pivotally attached to the protruding end of the Strip by a Long Threaded Pin 7 is yet another Double Bracket, to the lugs of which two $2\frac{1}{2}$ in. Stepped Curved Strips 8 are bolted to serve as the front forks. Another $2\frac{1}{2}$ in. Stepped Curved Strip 9 serves as the handle bars, this being bolted to an 8-hole Bush Wheel mounted on the end of the Long Threaded Pin. The seat is a Flat Trunnion bolted to the spare lug of Double Bracket 6.

Both wheels are supplied by 3 in. Pulleys. The rear wheel is fixed on a 2 in. Rod mounted in the protruding end holes of Strips 2 and held in place by a Collar and a $\frac{1}{2}$ in. fixed Pulley 10, the latter on the right-hand end of the Rod. The front wheel is fixed on a $1\frac{1}{2}$ in. Rod mounted in the end holes of Stepped Curved Strips 8.

The pedals and crank assembly can now be added. The earlier-mentioned 2 in. Rod is mounted in the forward end holes of Strips 2 and in the lower end holes of forwards Strips 1, being held in place on the right by a 1 in. Fixed Pulley 11. A Reversed Angle Bracket 12 is added to the left-hand end of the Rod, which is then secured by a Spring Clip. Note that the arms of the Spring Clip must be positioned downwards over the central lug of the Reversed Angle Bracket to prevent it from

Comparatively few parts are needed to build this charming Bicycle, also re-built from the January 1938 M.M.

turning freely on the Rod. Another Reversed Angle Bracket is similarly held by a Spring Clip on the other end of the Rod, against Pulley 11, the pedals finally being provided by two Angle Brackets bolted one to the spare lug of each Reversed Angle Bracket. The Reversed Angle Brackets must, of course, point in opposite directions in relation to each other. Pulley 11 is connected to Pulley 10 by a 6 in. Driving Band.

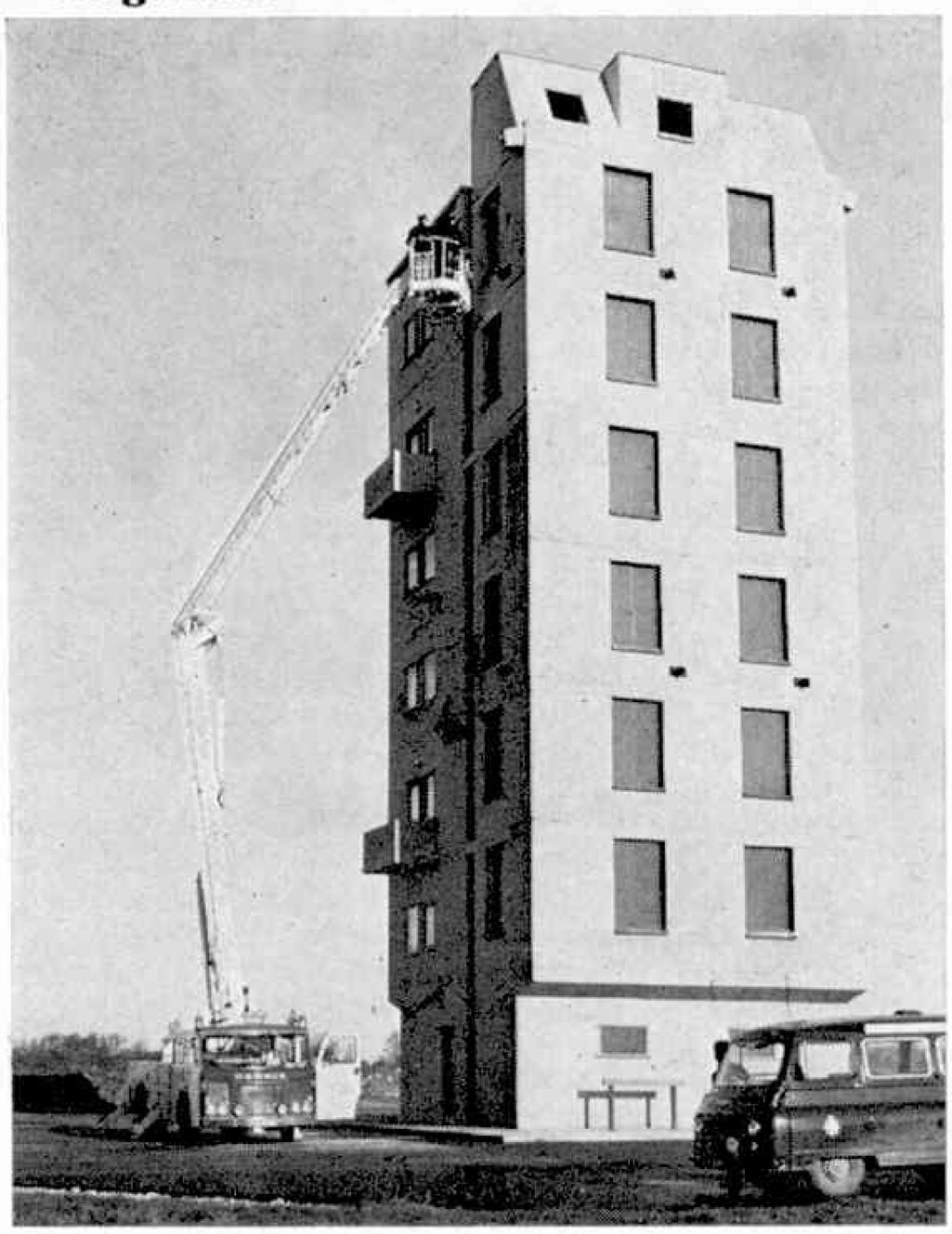
PARTS REQUIRED

8—5	2—17	1—23a	3—90a
3—4	1—18a	1—24	1—115a
2—11	2—19b	5—35	2—125
2—12	1—22	22—37a	1—126a
		20—37b	1—186

Bucking Bronco

Perhaps the most novel of all these models is our third and final re-built offering—a Bucking Bronco which originally appeared in the December 1938 issue. With a Magic Motor to give it life, the horse kicks up its hind legs and tries to get rid of its rider, who, fortu-

(*please turn to page* 401)



THE FIRE SERVICE TECHNICAL COLLEGE

A recently introduced training facility at Moreton-in-Marsh. By Edward G. Hodgkins

WE ARE living in a rapidly progressing community, continually using new and more sophisticated materials, machines and techniques. Fire may strike any of us at any time and every new development can mean new problems for the Fire Service. In order that the Service may keep abreast of this progress, a Technical College for the training of Middle Rank Officers has been opened on the site of a war-time R.A.F. airfield at Moreton-in-Marsh.

Specialist training in fire-fighting techniques has been given here since 1959, when large numbers of R.A.F. reservists were brought here for instruction. Later, the facilities at Moreton were used to train officers and men of the Auxiliary Fire Service and certain Territorial Army Units. Emergency training over a very wide field was being developed for all ranks of the Fire Service, and prior to 1967 weekend courses were being run at Moreton. On 14th June, 1966, Mr. Roy Jenkins, then Secretary of State for the Home Office, announced the establishment of the Technical College on this site. Mr. Jenkins told the House of Commons that building work would start within a matter of months and would proceed as quickly as possible to provide accommodation for 470 students. The estimated capital cost would be of the order of £4 million.

The construction was divided into three phases in order of importance, and the first part, now complete, includes 11 study bedroom blocks providing individual accommodation for the 470 students and 32 instructors; 43 staff houses, and the fire-ground buildings. These training buildings are thought to be the most advanced in the world and simulate a wide variety of modern factory and domestic buildings. The eight-floor drill tower incorporates several kinds of windows, balconies and roofs while the basement has a smoke and heat generating room and sewers. Other buildings simulate a garage and petrol station, a fish and chip shop, office and warehouse accommodation, and many other typical areas. A special building for breathing apparatus training incorporates ships' holds, a search room and crawling galleries, all of which can be filled with smoke. Lecture rooms and changing rooms are also in the same building. Oil tanks and various electrical installations are dotted around the college grounds while a central control tower overlooks the whole fire area.

Phase 2 in the building work is now well in hand and will provide new administration and class-room accommodation and a mess-building to seat 600. A simulated 3,000 ton ship is also being built, with a cabin complex, in a dock with quay-side buildings. Phase 3 will include motor workshops and garages, a sports hall and playing fields.

Administration of the Technical College is under the direction of the Fire Service College Board headed by the Deputy Under Secretary of State at the Home Office, Mr. F. L. T. Graham-Harrison, C.B. The College Staff is directed by the Commandant, Mr. H. Judge, supported by a Deputy Commandant, Mr. G. Taylor, a Director of Studies and an established staff of

Top picture shows a snorkel hydraulic platform at the drill tower. On the left, foam jets in action on a burning oil tank.

46 uniformed and 16 civil tutors. The administration is headed by the Secretary who is ably assisted by a large professional and ancillary staff.

Mr. Judge, who was formerly one of H.M. Inspectors of Fire Services, and, before that, Chief Fire Officer of the West Riding of Yorkshire, told me of some of the problems facing the Service today. On farms, thirty years ago, a farm fire would involve a hay-stack or a barn or sometimes the farm-house itself. The biggest problem would be a shortage of water. Now sophisticated electrical milking machinery or tractors and

storage tanks of diesel fuel are present. (Nearly two thirds of the diesel oil in the country is used on farms.) Chemical fertilisers react in different ways when involved in a fire. Fire Officers must have a knowledge of all these hazards.

Perhaps closer to us all, on the roads—Mr. Judge surprised me by saying that over 900 different hazardous materials are regularly being transported by road. Every one of these materials will react in a certain way in the event of fire or accident and must be handled correctly to bring it under control. It is also the fireman's unhappy job to rescue accident victims trapped in their vehicles. The College provides theoretical and practical training for such cases.

Building materials are continually changing. Buildings themselves are getting taller. A multi-storey building presents special problems, not only in rescue, but in controlling the spread of the fire. Air conditioning ducts provide easy routes for the spread of smoke and fire. Therefore a Fire Officer must know where and how to shut off the air-conditioning. Modern materials within the building might emit toxic fumes in a fire, so breathing apparatus may be necessary. Only a well trained Officer can decide how to handle these circumstances.

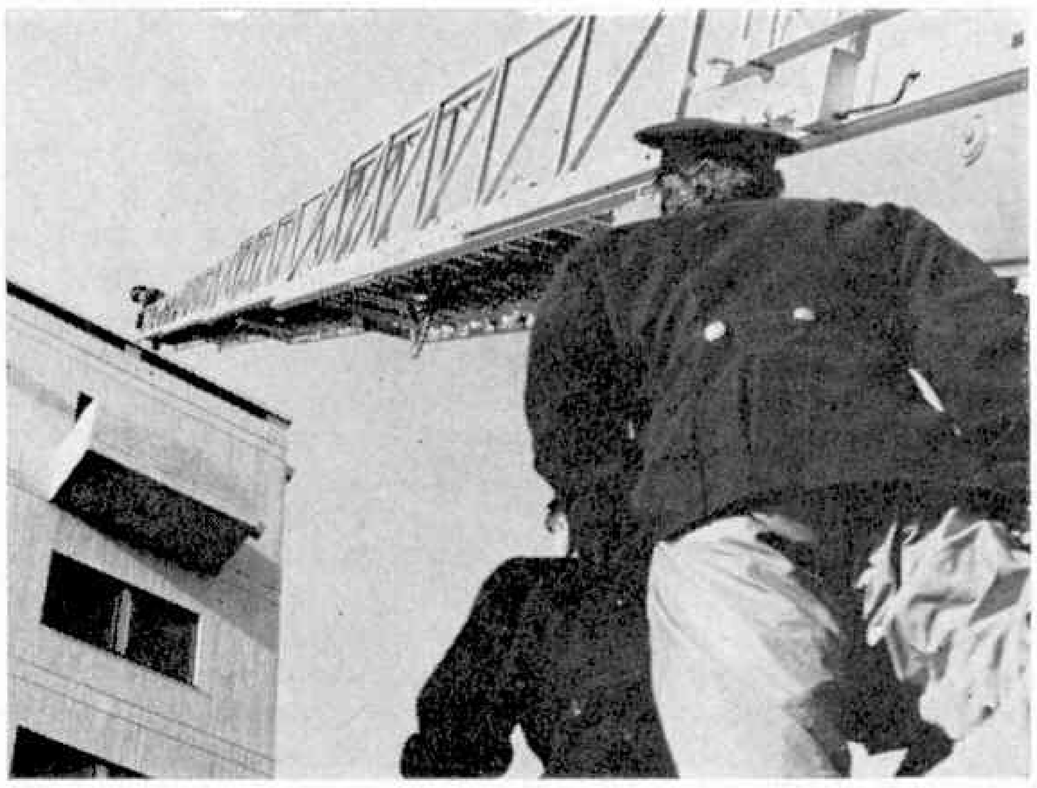
Mr. Judge then turned his attention to industry. He told me that some modern plants may be so huge, with

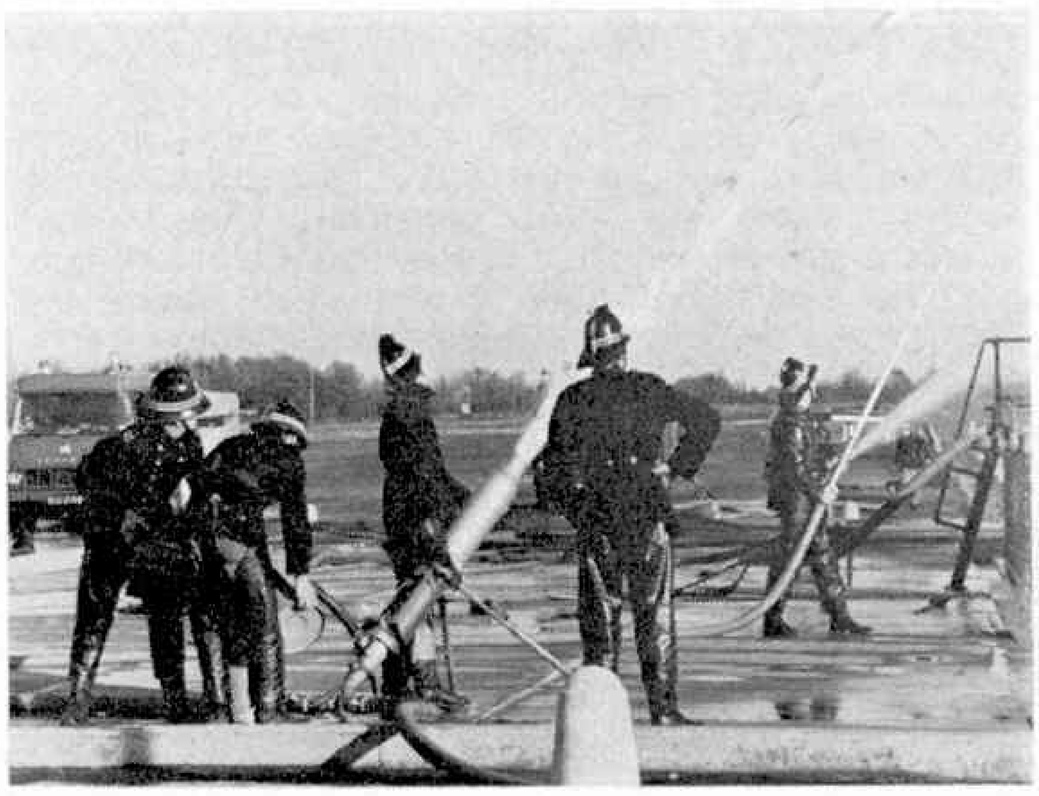
Above, the " snorkel " hydraulic platform.

Left, foam jets being used to extinguish a spectacular blaze in an oil tank.

Below, quick way up to the top of an 80 ft. tower—by turntable ladder which shoots up!

Bottom, foam jet practice.





A 100 ft. turntable ladder at the drill tower. In the background can be seen the control tower and some of the other fireground buildings.

such a narrow margin of safety, that they are run by computer. It will then be necessary for the fire Service to know what materials are involved, as well as have some knowledge of the computer and how it exercises control. I was staggered to learn just how complex these problems are.

In order to be able to tackle the wide variety of fires that occur, recruits to the Fire Service must not only be physically able to do the job, they must also have attained a reasonably high standard of education, and have the mental ability to absorb the technical training they will receive in the Service. An Officer must also be able to control and direct his men and will he receive the necessary leadership training at Moreton.

One of the most important tasks for today's Fire Brigade is Fire Prevention. Each Brigade has a Fire Prevention Officer whose full-time job is to give advice to industry and the public in making their premises or their work less vulnerable to fire. This Officer and his men are frequently unpopular but they are well qualified in their work and their advice should never be ignored. The College ensures that they know what they are talking about.

Advancement courses of up to a year are provided at Moreton to train men for promotion to sub-Officer and Station Officer, and also to bring Station Officers of long standing into touch with the latest developments in their work. I watched some of these men undergoing practical exercises on the fire-ground and was very impressed by their discipline and efficiency. A large oil-tank was the most spectacular. This was ignited and a column of black smoke rose hundreds of feet into the air. A group of fire appliances sped across the fire-ground and foam jets were directed at the blaze. Within minutes it was out.

The 8-storey drill tower was being used for demonstration and practice with a Snorkel hydraulic platform capable of rising to 80 ft. and a 100 ft. turntable ladder. To me, the Snorkel looked very stable and safe, but the ladder was somewhat unnerving. The man at the top climbs into position when the ladder is telescoped down to about 30 ft. He attaches himself by a safety harness and then the operator on the vehicle shoots him into space—to the full extension in a matter of seconds!

I saw demonstrations of automatic extinguishing equipment in the transformer house. Also, how not to direct a water jet onto a high voltage grid—the power will run back down the water jet and could electrocute the operator. In a class-room a small group of men were being shown how to operate their breathing apparatus before being subjected to the smoke-filled search room. Throughout the exercises, a training group Officer was on duty in the control tower to keep an eye on things, to operate the two-way radio for communications practice and to call for immediate assistance in the rare event of an accident. I also saw the automatic equipment situated in the control tower for recording temperature and chemical contents of smoke etc. in the simulated fires.

This unique Technical College will ensure that loss of life and property will be kept to a minimum as our way of life progresses, thanks to the far-sightedness of the Home Office and to the dedication of the College Staff.

TALL LADY (*continued from opposite page*)

tore off the greater part of his nose.

One day, April 6th 1930, however, will never be forgotten in the history of the Eiffel Tower, for on that day the Tower was sold! Only three people knew about this, the pair who sold it, and the one who ' bought ' it. The " salesmen " were Count Victor Lustig and his " Private Secretary ", Dapper Dan Collins. Lustig, the most successful confidence trickster of all time, had seen a news item that the Tower was in urgent need of major repairs, and the French Government were considering a suggestion that it would be cheaper to pull it down.

From other sources, Lustig obtained some forged government credentials and sent out invitations to five wealthy businessmen to meet him at the Crillon Hotel. There, the dramatic news that the government were going to sell the Tower was broken, and then the men were taken on a tour of the Tower, with Lustig pointing out how valuable the iron and steel would be. At the end he asked for their sealed bids to be sent to him by the following week, at the same time reminding them that what they had heard was in the strictest confidence and a state secret.

The sealed bids duly arrived, and the ' successful ' applicant was a certain Andre Poisson. A final meeting was arranged, the documents signed and sealed, and Poisson handed over a cheque for £300,000, together with a ' cash consideration ' for the hard working government official. Within an hour, with the cheque cashed, Lustig and Collins were on a fast train heading for Austria.

Poor Poisson soon realised he had been duped, but calling the police would have made him the laughing stock of Paris. In fact, the whole affair was not made public until seventeen years later, when Lustig, on his deathbed, told of the most daring confidence trick of the century.

THE TALL LADY OF PARIS

BY P. M. SMITH

TAKE 7,300 tons of steel, in 15,000 separate metal sections, held together by 2,500,000 rivets, and you have the Eiffel Tower. Its creator, Alexandre Gustave Eiffel, used over 5,000 sheets of paper, each a yard square, to design this masterpiece of engineering. It took two years, two months and two days to build, despite the belief of many that it would immediately collapse. Nor did everybody like it at first, nicknaming it the 'Giraffe', but when the invading Germans talked of pulling it down, there was a great outcry from the whole French nation.

It is supported by four huge masonry piers, sunk over thirty feet into the ground, each having a surface area of thirty one square yards. Structurally, it is a brilliant engineering feat of lightness and strength, such that the pressure per square inch it exerts on the ground is no greater than the pressure per square inch of a chair with an average man sitting in it.

First erected as a temporary structure for the 1889 Paris Exhibition, it stands at the north west end of the Champ de Mars, overlooking the River Seine, and facing the Palais de Chaillot. The first visitor to climb the Eiffel Tower was the Prince of Wales, later Edward VII, with his family, on June 10th 1889. Today it is the most popular tourist attraction in Europe, with an average of four thousand visitors a day.

There are three floors open to the public; the first, at 57 metres, has a restaurant, bar and tearoom, the second, at 115 metres, has similar facilities, and the top floor, 274 metres high, has a circular glazed gallery from which visitors can see over fifty miles on a fine day. At the very top is an important television transmitter centre, and a revolving light signal for aircraft, visible for almost a hundred miles.

A full time staff of over two hundred people are employed to look after the Tower, including the painters, who use thirty five tons of paint each year to keep the Tower's paintwork looking spick and span. To add to their difficulties, during a gale, the 984 foot Tower sways three inches, though in a 'strong wind' it only sways one and three quarter inches.

In 1930, a bronze bust of Eiffel, by the sculptor Bourdelle, was placed at the foot of the Northern tower, and since 1958 the Tower has been floodlit each evening.

Despite the magnificent fifty mile view from the top, some people who have gone there haven't gone to admire the scenery. To date, over four hundred people have committed suicide by jumping from the Tower. Because of certain religious beliefs, many have jumped from the East side, so that they would die facing East. Suicides are now so common that they are no longer front page news, usually rating only a small paragraph in the newspapers. Despite special safety precautions, the suicides continue, but, as one of the patrol men has said, "Apart from three observation platforms, there are 1,700 steps to climb to the top. How can we guard every one of them? If a man wants to jump, he'll find a way."

Some who have plunged to their death have not been attempting suicide. Johann Reichen, for example, was convinced that his flying wings would turn him into a human aircraft when he jumped from the top in 1912, and a similar fate awaited a parachute inventor a year later.

Surprisingly, three people have jumped from the Tower and survived. Upset by his poor school reports, fourteen year old Prosper Gold decided to end everything. He jumped from the second platform, to land on the first with a few broken ribs as his only injuries.

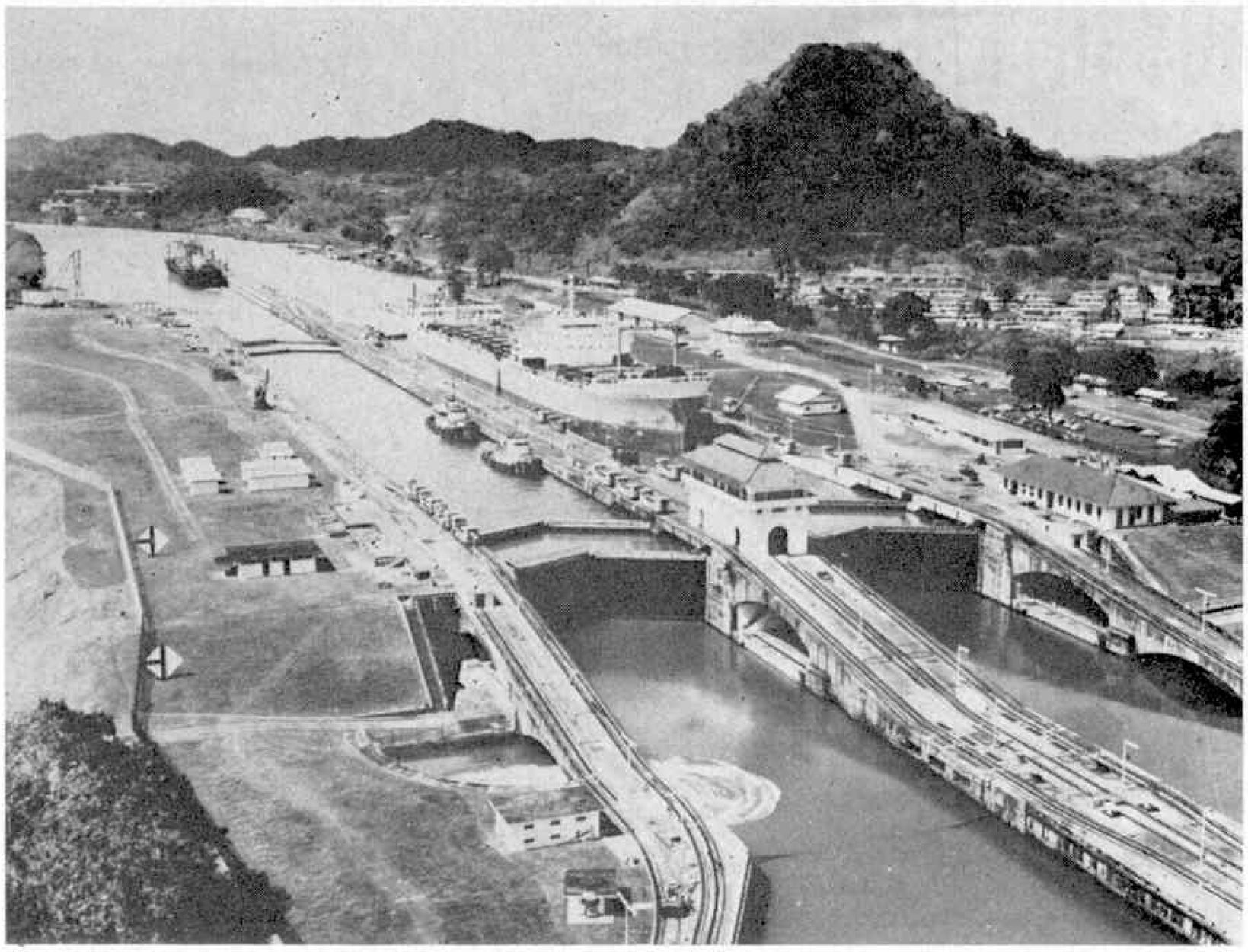
When Annette Negen's boyfriend deserted her, she too jumped, but never reached the ground. She hung with her foot trapped between two girders for almost half an hour before firemen released her. Although she lost one leg, she made an otherwise complete recovery.

Luckier still was a seventeen year old girl from Normandy, who decided that she couldn't go through with her proposed marriage. When she jumped, she landed on top of a passing car. In hospital she was reunited with her fiance, and later they married as they had originally planned.

A happier event takes place every year in July, when Monsieur and Madame Jaques Malarme visit the Tower to drink champagne at the top. Over twenty years ago, Jaques went to the platform intent on committing suicide. When he got there, he saw a girl, obviously intent on doing the same thing. He managed to prevent her going over the top, and then told her his own story. Within a week they were married, and every year since then they have toasted each other with champagne, on the top floor on their wedding anniversary.

But it's not only people who come hurtling down to ground level. All sorts of missiles are dropped from the observation platforms, and the Tower authorities hold special insurance policies for claims for damages from people struck by such objects. Even small objects can cause a great deal of damage. A lump of sugar, for example, was travelling so fast when it reached ground level that when it hit a passing Frenchman it

(*continued opposite*)



CUTTING the PANAMA CANAL

By E. V. Malone

FOR 400 years the idea of cutting the narrow isthmus to join the Caribbean Sea with the Pacific Ocean had tantalised the minds of men.

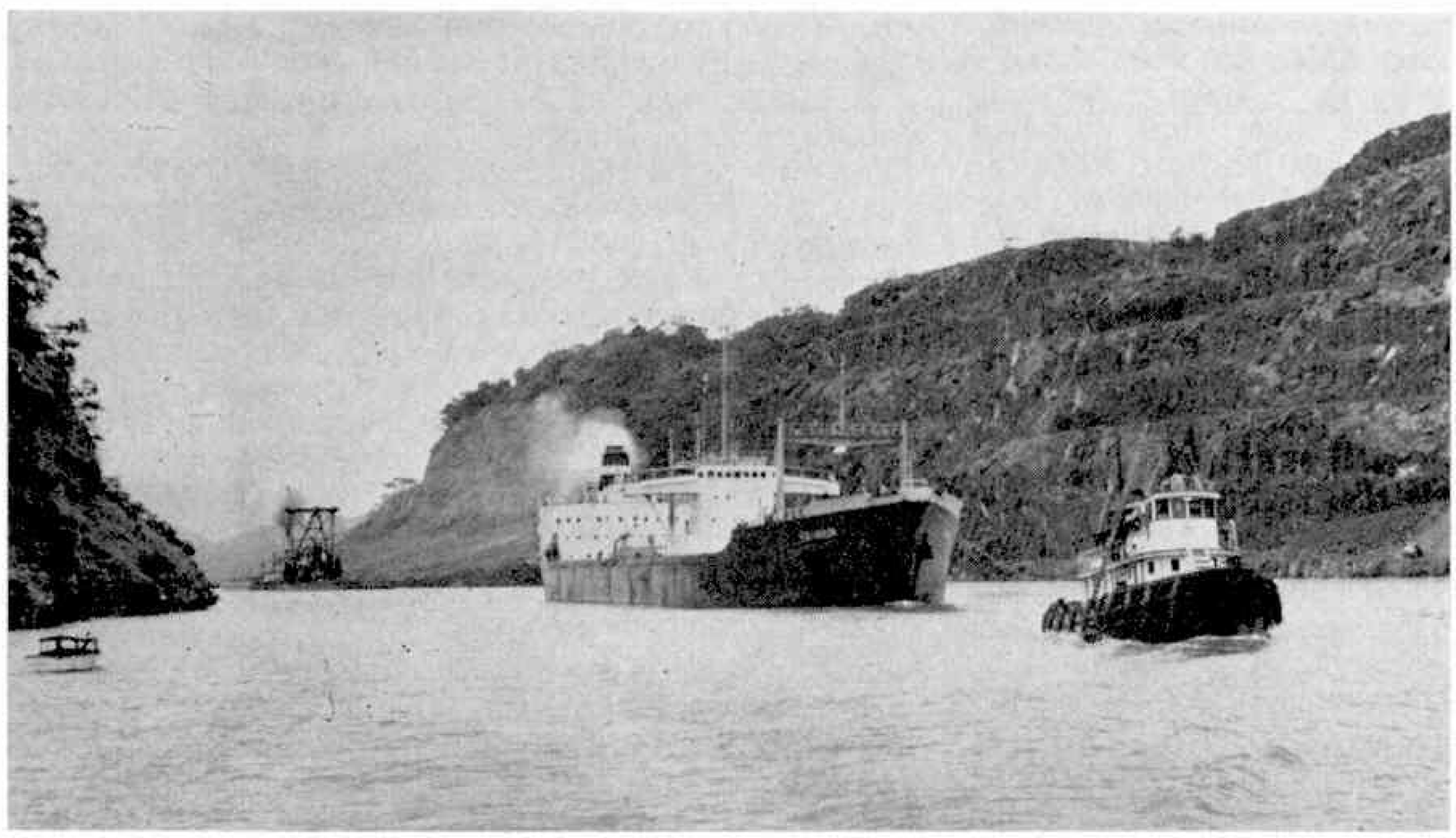
First on the modern scene was the renowned French engineer, Ferdinand de Lesseps, the successful builder of the Suez Canal. Although past the age of 70, he founded a company in 1879; the estimated cost of the project was twenty-six million pounds.

In addition to the magnitude of the task, de Lesseps was confronted with two great difficulties—firstly, the region through which the proposed canal was to run was fever-infested; and, secondly, the River Chagres rose so much during the rainy season that it became an ungovernable raging torrent.

Eventually work was started and the fight was on. Men pitted their puny strength against sheer, solid matter, swamps, torrents, heat, pests and disease. Ever present were the great problems of water-control, continual land-sliding and earth disposal.

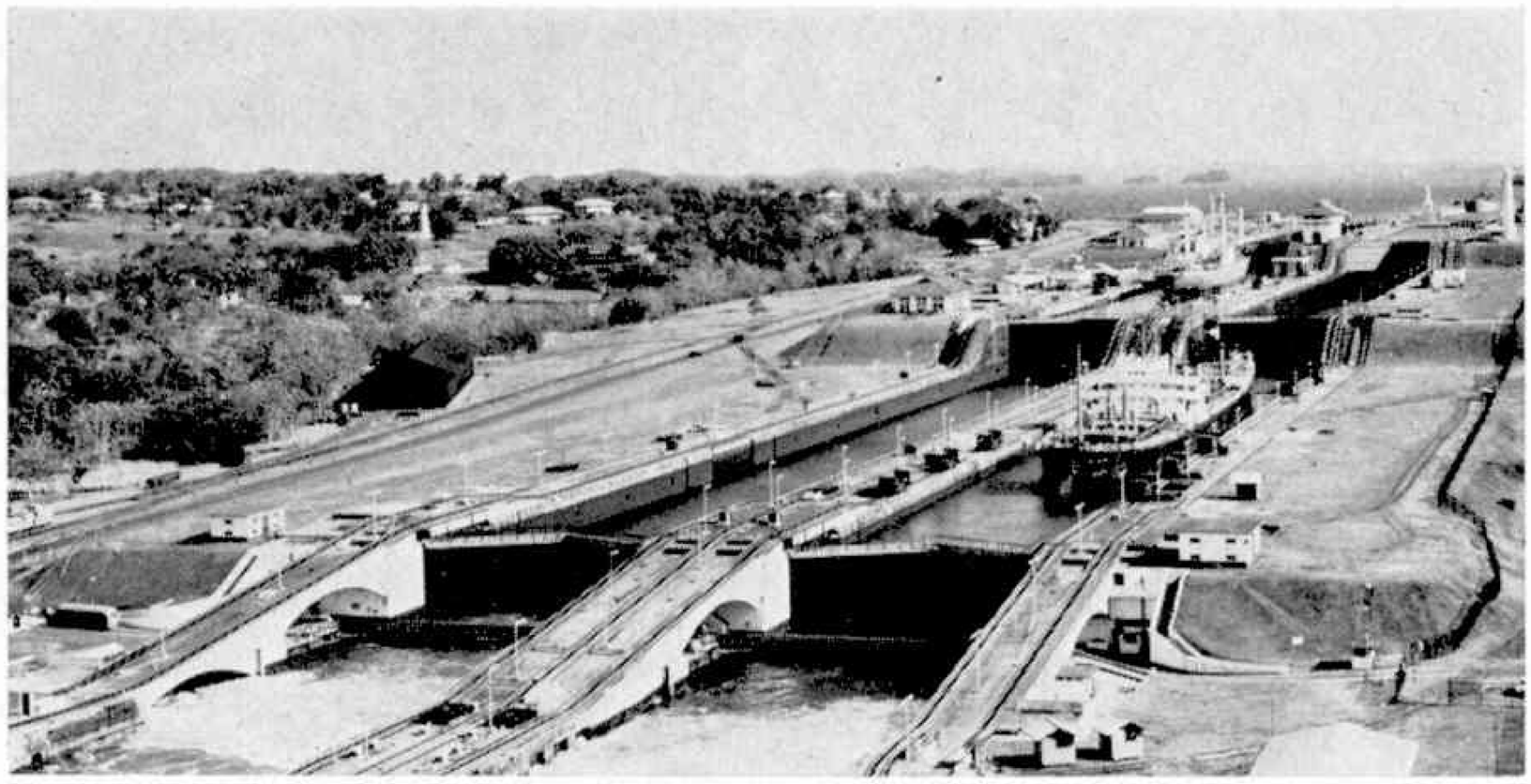
For nine long years the struggle continued and during each of them the deadly mosquitoes claimed their toll relentlessly. Finally, the project was abandoned; 16,000 men had died of malaria and yellow fever, the cost had soared to sixty million pounds, and many people who had invested their savings in the enterprise were ruined.

Next to take up the challenge of Panama was the government of the United States. Using largely military personnel and doubtless profiting from the



Presenting a tight fit in the Southbound lane of Pedro Miguel Locks (Pacific side) is the *San Juan Prospector*. The *Prospector's* 106.4-foot beam makes it one of the largest ships ever to transit the canal, which has 110-foot-wide lock chambers.

Gaillard Cut, named after the engineer in charge of its excavation, is one of the three major construction feats that made the Panama Canal possible. Over 168 million cubic yards of earth and rock were removed in its construction. The ship in transit is being assisted by a tug, a common occurrence with large commercial ships, as it passed between Gold Hill and Contractors Hill.



Aerial view of Gatun locks with ships transiting both North and South. Water from locks is spilling into the ocean from higher levels in the foreground.

experiences of the French, the Americans tackled the project with characteristic resolution, vision and attention to detail.

In 1904 a strip of territory ten miles wide was purchased from the State of Panama. The gong sounded for the second great contest to begin.

Preliminary steps were to drain the land and spray petroleum on any remaining stagnant water to kill the mosquito larvae. While this was being done, mosquito-proof huts, hospitals, schools, and amusements were being assembled, transported and installed. In short, no need of the vast army of workmen who were to spend anything up to ten years on the isthmus was overlooked.

The Americans were surprised to find much of the equipment abandoned by the French was still in a fair condition and able to be used. With the mosquitoes under control, there were no serious outbreaks of disease and the morale of the workers remained high.

The main section of the canal was cut at 85 feet above sea-level, meaning that ships would have to be raised and lowered at each end by a chain of locks.

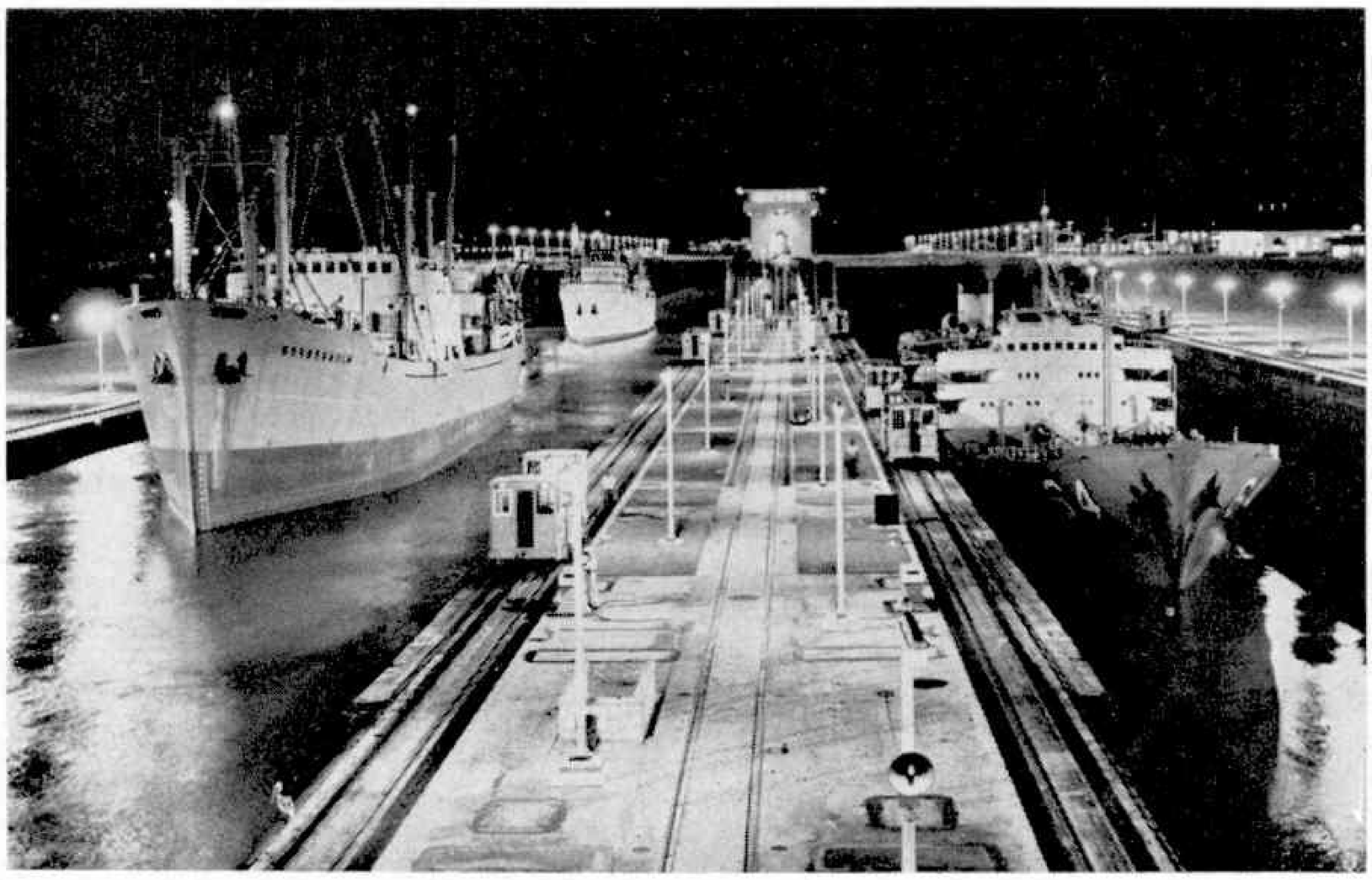
Eventually there were three sets of locks which were named Miraflores, Pedro Miguel and Gatun. Each is 1,000 feet long, 110 feet wide and between 47 and 85 feet deep. Their huge gates, which are hollow and made of steel, can be opened or closed in two minutes. A lock takes fifteen minutes to fill or empty.

Another great accomplishment was the erection of a great dam, the Gatun. This was built across the River Chagres to form a huge lake at canal level.

Ships were hauled through the locks by four or six electric locomotives, generally two in front and two behind.

The completed canal, about fifty miles long, involved the excavation of approximately 240,000,000 cubic yards, and cost $366,650,000 dollars (more than one hundred million pounds at to-day's rate).

Despite this fabulous cost, the canal has been a great financial success because every year thousands of ships pass through it, and naturally, each has to pay dues. Shipowners do this willingly, however, for the alternative is a long and perilous trip around Cape Horn. As an example of the mileage saved, San Francisco has been brought nearer to Liverpool by 5,600 miles.



The sun falls each day, but the operation of the Canal fails to ease up at all when night comes. A 24-hour operation, an average of 35 ships transit the Canal daily. Three vessels are shown as they pass through Miraflores Locks, South-bound.

OLYMPIC STAMPS

By

James A. Mackay

THE Olympic Games is not only the world's premier sporting event, but one which can trace its ancestry back to the ancient games held at Olympia in Greece. The ancient games began in 776 B.C. and had religious and political significance as well as being a great gathering of people and athletes from all over the Greek world. During the games wars and friction between the petty states were suspended and people forgot their differences in a spirit of friendly sporting rivalry. The last games of the ancient series was held in 393 A.D. Thus the Olympic Games spanned an unbroken period of more than a thousand years.

The ancient site of the games was gradually excavated during the last two decades of the nineteenth century and focused world interest on the event. A French sportsman, Baron Pierre de Coubertin (1863–1937), had the idea of reviving the games and in 1894 addressed a circular to all the governing bodies of sport in which he pointed out the educational value of sport to modern peoples, if practised in accordance with the ancient Greek ideals. Coubertin became first president of the International Olympic Committee and plans were made for the first of the modern games, held in Athens in 1896. Coubertin has been portrayed on the stamps issued by many countries in honour of the Olympic Games in recent years.

To mark the first modern games Greece issued a series of twelve stamps, in denominations from 1 lepton to 10 drachmae. The stamps reproduced scenes from the ancient games, based on classical statues and urns, and depicted views of the Acropolis and Parthenon on the higher values. This set, with a relatively high face value, was severely censured by collectors at the time, but it is now an expensive set highly prized by philatelists. Greece also held an Olympic Games ten years later and issued a set of stamps on that occasion also. Nevertheless it was established that the official games would be held at four-yearly intervals on the same principle as the ancient series, and to hold them in a different venue each year. Subsequent games were held in Paris (1900), St Louis (1904) and London (1908), none of which was celebrated by stamps or even postmarks. But the fifth games, held at Stockholm in 1912, resulted in several commemorative postcards and postmarks.

The First World War intervened to prevent further games being held and it was not until 1920 that they could be revived. Antwerp was the venue for the games that year and Belgium issued a set of three stamps in honour of the occasion.

This precedent was followed by France (1924) which issued a set of four stamps depicting athletes and the Olympic stadium in Paris. Holland issued eight stamps with charity premiums for the Amsterdam games in 1928, and Portugal issued stamps to raise funds for its Olympic team. Uruguay, which won the football event in the games of 1924 and 1928, issued sets of stamps on both occasions to celebrate their victory.

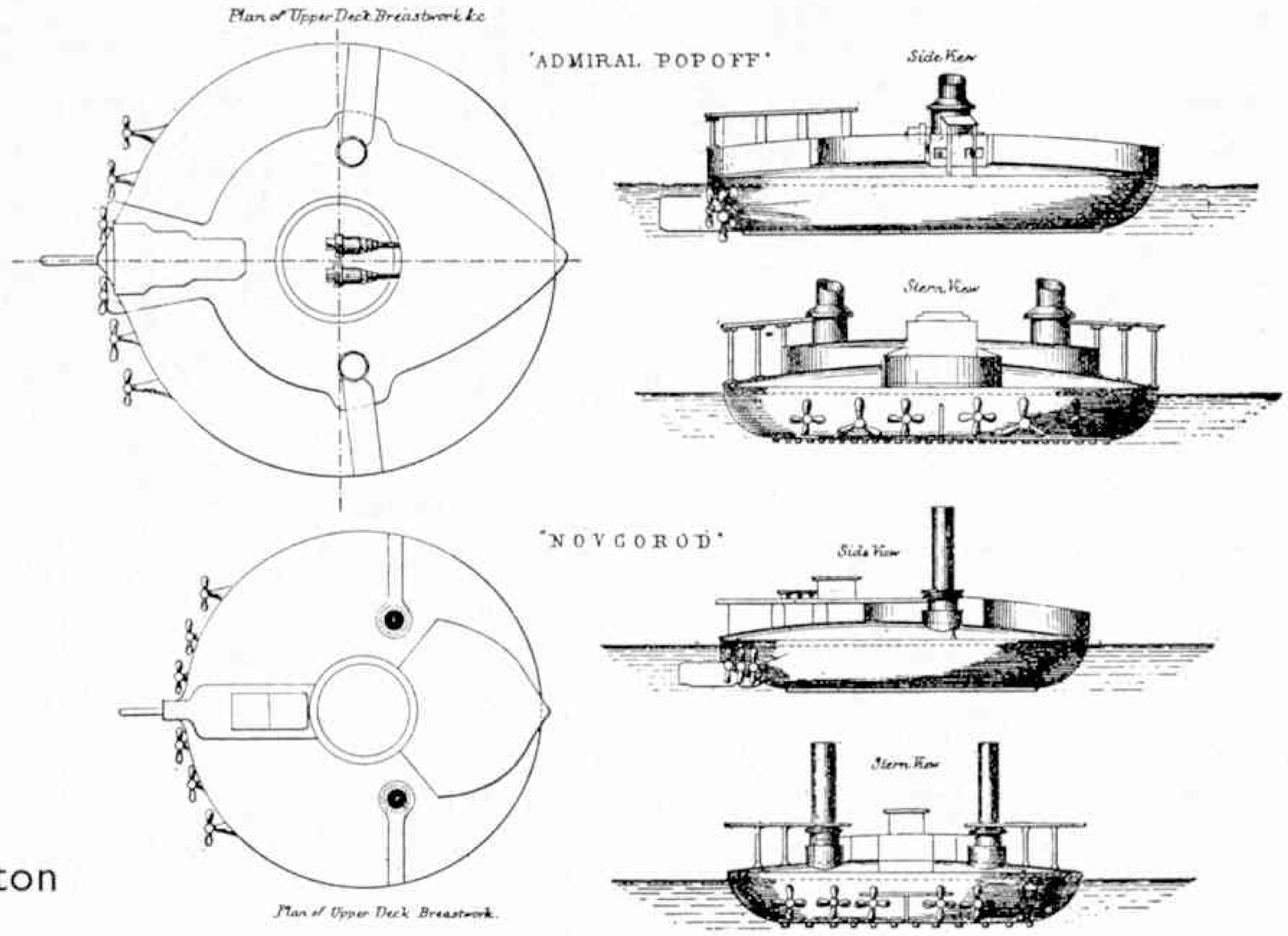
The 1932 games was held in the United States and for the first time a stamp was issued to mark the corresponding Winter Olympics, held at Lake Placid. The summer games were commemorated by a further two American stamps depicting a sprinter and a discus thrower respectively. For the 1936 games the venue was Berlin and Hitler used the event as a show-piece for Nazi Germany. Stamps were issued for both winter and summer games, as well as a miniature sheet and commemorative postal stationery. The next Olympics were to have been held in Helsinki, Finland, in 1940, but the Second World War intervened and prevented the games taking place. The abortive 1940 games are remembered, however, by the slogan postmarks used in 1939 by Finland to advertise the forthcoming event.

Three years elapsed after the war before the games could be revived. This time they were held in London in 1948 and for the occasion Britain issued four stamps and a commemorative air letter, bearing symbolic designs. For the winter games at St Moritz both Switzerland and Austria issued Olympic stamps. This is a trend which has escalated rapidly ever since, so that it is now customary for many countries to issue stamps for the Olympic Games—including quite a few whose athletes, if they exist, are conspicuous by their absence from the event! Further Olympic Games were held in Helsinki (1952), Melbourne (1956), Rome (1960), Tokyo (1964) and Mexico (1968), and on each occasion the number of commemorative stamps has steadily increased.

The 1972 winter games are to be held at Sapporo and the summer games at Munich, and already several countries, including the host countries, Japan and Germany, have issued special stamps in honour of the events. Illustrated here is the miniature sheet which West Germany issued on June 25th as a compliment to the Japanese Winter Olympics. No doubt Japan will return the compliment and issue stamps to publicise the summer games in Germany.

The "Popoff"

Introducing the Popoffskas, circular Russian warships, with full-size plans for a semi-scale model by A. J. Morton



A COMPLETELY circular ship may sound a strange idea, but when the Russians built two back in 1875, it was taken very seriously in naval circles (sorry!) and a naval expert M.P. actually visited Russia specifically to see them.

The two ships were built as coastal defence vessels, virtually to be used as floating forts but capable of moving under their own steam as necessary. The first of the two was the *Novgorod*, 101ft. diameter and almost 2,500 tons, with two 28 ton (11 in.) guns. This was followed by the larger *Admiral Popoff*, 121 ft. diameter, over 3,500 tons, with two 40 ton guns and four smaller ones. The draught of this ship was 14 ft. and she carried a crew of 120.

Apparently the design showed no particular advantages, or rather its disadvantages outweighed its good points, since no further development took place, and the ships thus remain as outstanding oddities, even in the atmosphere of peculiar designs which surrounded the arrival of ironclad warships.

The drawing overleaf shows how to make a working semi-scale model of these unusual vessels, using a circular biscuit tin or something similar as a basis. That used on the original was just under 8 in. diameter and about $3\frac{5}{8}$ in. deep.

Most of the work takes place on the lid, so we can dispose of the base by outlining the motor installation. Instead of the six propellers of the original we can reasonably use two, and if these are connected to the motor by pulley drive, line-up and construction are simplified. Before piercing the tin for the shafts, you may like to put equivalent ballast in the tin to check its waterline, although as the contemporary illustrations above show, there was very little freeboard and you will probably have to fit permanent ballast in the tin anyway.

A tinplate motor mount was used on the original model, but a wood one could be made, just soldering a couple of tinplate tags to the tin's bottom to secure it. A Mabuchi 15 or 25, or Orbit 105/205, or similar motor, will give adequate power. Use brass stern tubes, so that they can be soldered into the tin, though epoxy could be used with aluminium tubes. If you use $1\frac{1}{4}$ in. propellers and $\frac{3}{4}$ in. pulleys on their shafts, with a $\frac{3}{8}$ or $\frac{1}{2}$ in. pulley on the motor, good battery life and reasonable scale speed should be obtained. Solder or epoxy a bracket to support the inboard ends of the prop tubes, reasonably lined up with the motor, and use ordinary thin rubber bands as driving belts.

Most of the superstructure is $\frac{1}{16}$ in. sheet balsa, card, wire, and odds and ends. It is advisable to use epoxy resin to glue anything to the tin lid itself, though metal parts such as handrail stanchions and davits are obviously better soldered in place. Holes can be punched for these with a suitable nail, supporting the tin underneath where you're tapping with a block of hard wood. It is best to solder everything in place before starting on the wood work.

Fit the coffee jar lid to the centre and surround it with a strip of card. Glue the bottom decks in place. Make up the four separate deckhouses, two of which glue to the centre circle, and paint the sides, draw on the windows etc., before gluing in place. Add the top decks, which should just lap over the centre circle, and paint before attaching the details to them.

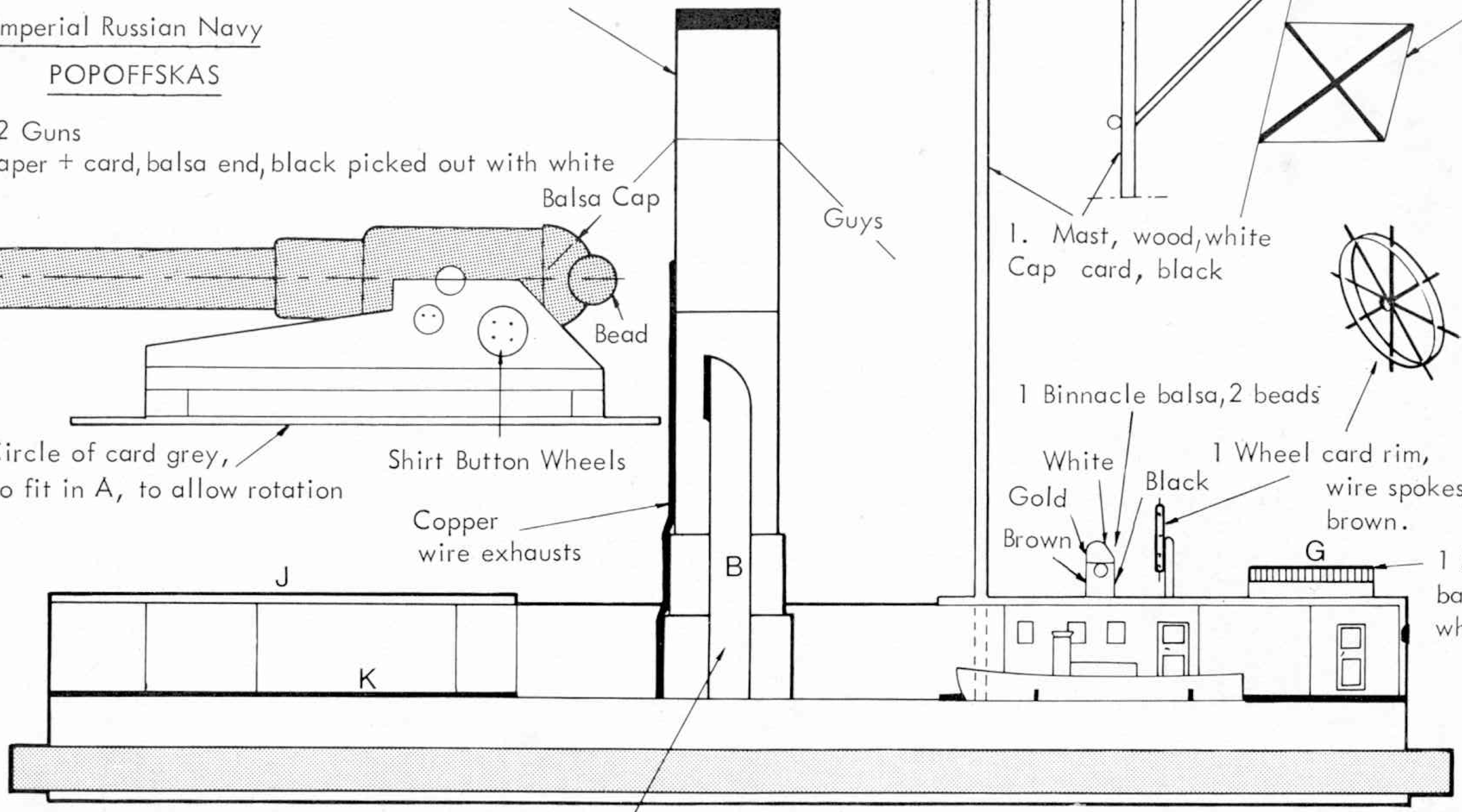
Suggestions for making the various bits and bobs are included on the drawing but their final appearance depends on your ingenuity and particularly how well you pick out the small details with paint. Run a strip of foam plastic draught-stop round the edge for a rubbing strip and you will be surprised how attractive and colourful a model results. You're bound to have a lot of questions asked at the pondside when you go to sail this most unusual vessel!

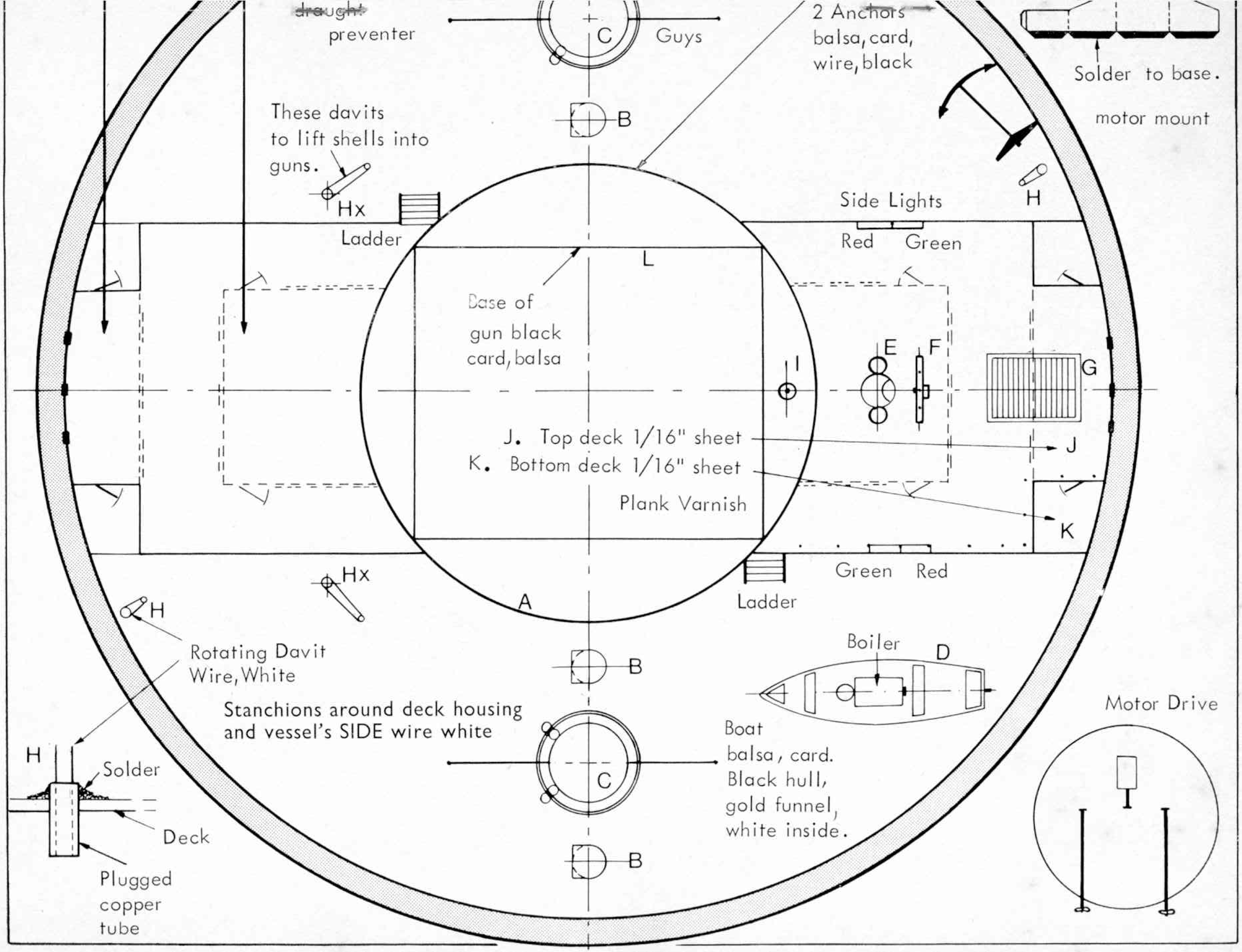
'The Popoff'

Imperial Russian Navy

POPOFFSKAS

2 Guns
paper + card, balsa end, black picked out with white



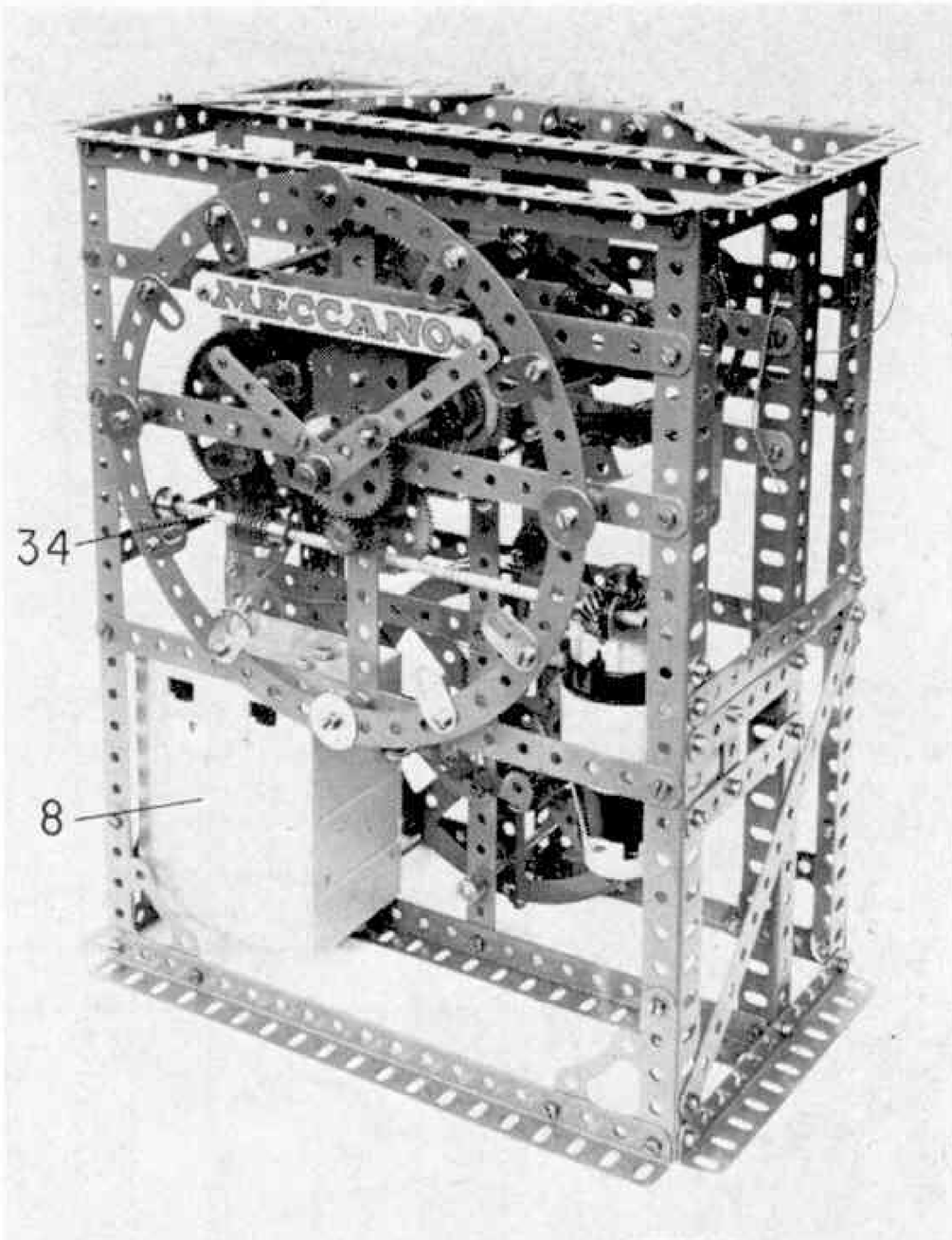

draught preventer
C
Guys
2 Anchors balsa, card, wire, black
Solder to base.
motor mount
These davits to lift shells into guns.
B
Hx
Ladder
Side Lights
Red
Green
H
L
Base of gun black card, balsa
I
E
F
G
J. Top deck 1/16" sheet
J
K. Bottom deck 1/16" sheet
Plank Varnish
K
Green
Red
Hx
A
Ladder
H
Rotating Davit Wire, White
Boiler
D
B
Stanchions around deck housing and vessel's SIDE wire white
Boat balsa, card. Black hull, gold funnel, white inside.
Motor Drive
H
Solder
C
Deck
B
Plugged copper tube

A Self-Winding Balance Wheel Clock

entirely in Meccano

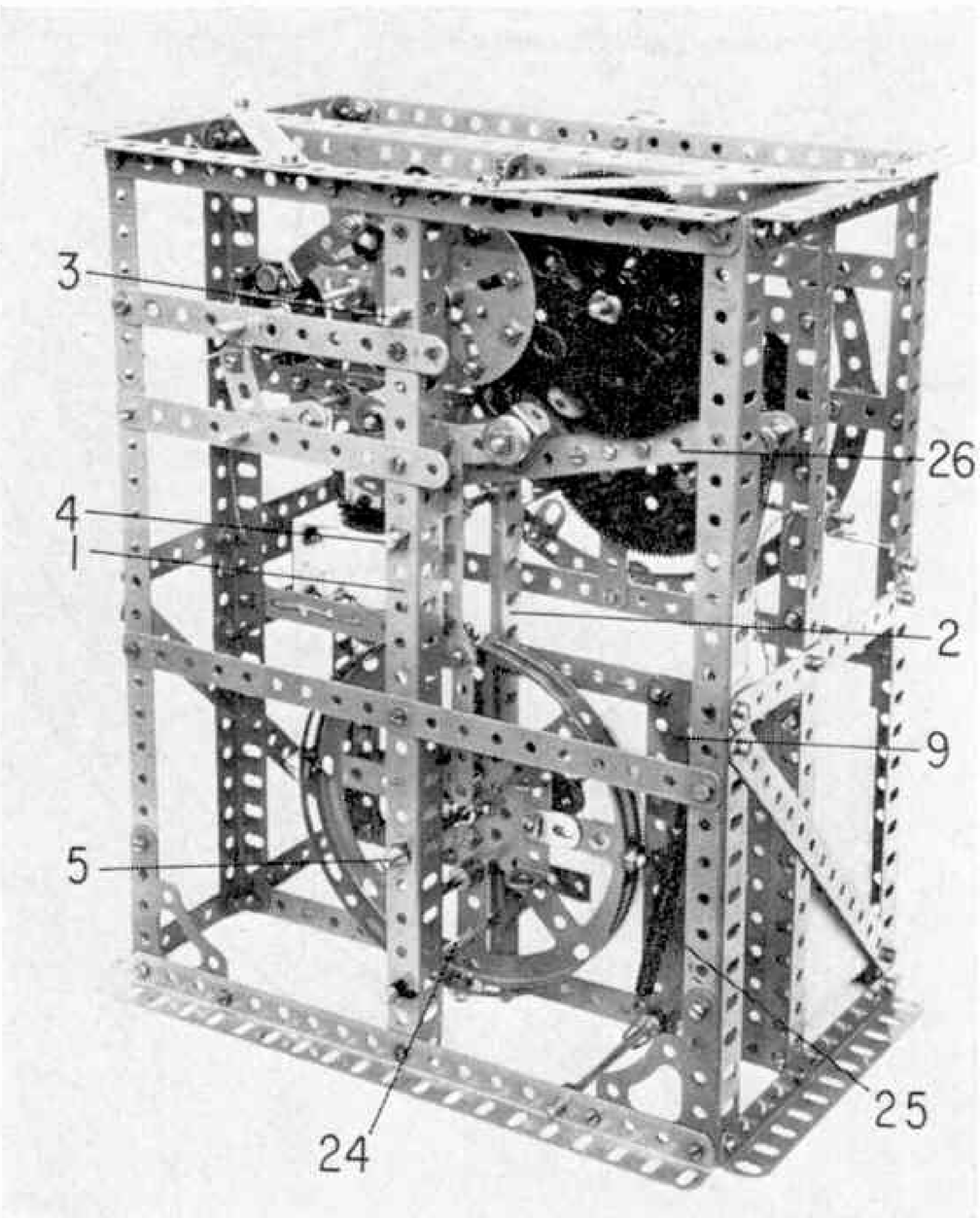
By Ron Fail, introduced by 'Spanner'

EXAMPLES of clock building in Meccano over the past five years have shown staggering advancement under the clever hands of such veteran time-piece constructors as Pat Briggs, Leslie Dougal and Ron Fail. Once again I am very pleased to be able to present a fine example of Ron's work in which he pulls off another " First " in Meccano Magazine by creating, probably for the first time, a clock with the hairspring movement of a pocket watch entirely in standard Meccano parts! As Ron says, his clock will work in any position being entirely independent of gravity so it will even work out in space. With the aid of Bert Love's photographs the clock is not difficult to build and is, of course, a complete timepiece.



Main Frame

A rectangular framework as shown in Figs. 1 and 2 is built up from 5½ in., 9½ in., and 12½ in. Perforated Strips and Angle Girders. The general construction is clear from the photographs. The Escapement is mounted between the 12½ in. Angle Girders 1 and 2 by means of Electrical Pivot Bolts 3, 4 and 5 on the rear Girder 1 and a corresponding set of Pivot Bolts on the inner Girder 2. The top Pivot Bolt is covered by the Double Bent Strip 7, see Fig. 3, and forms the rear journal for Axle Rod 56. The second Pivot Bolt on the inside Girder is also in line with shaft 61 carried in a 1 in. Reversed Angle Bracket mounted immediately below the Pivot Bolt. Fig. 4, which shows the hairspring arrangement, also shows the bottom Pivot Bolt in the centre hole of the Flat Trunnion 6. Battery Box 8 is bolted to the 5½ in. × 2½ in. Flat Plate 9.



Escapement

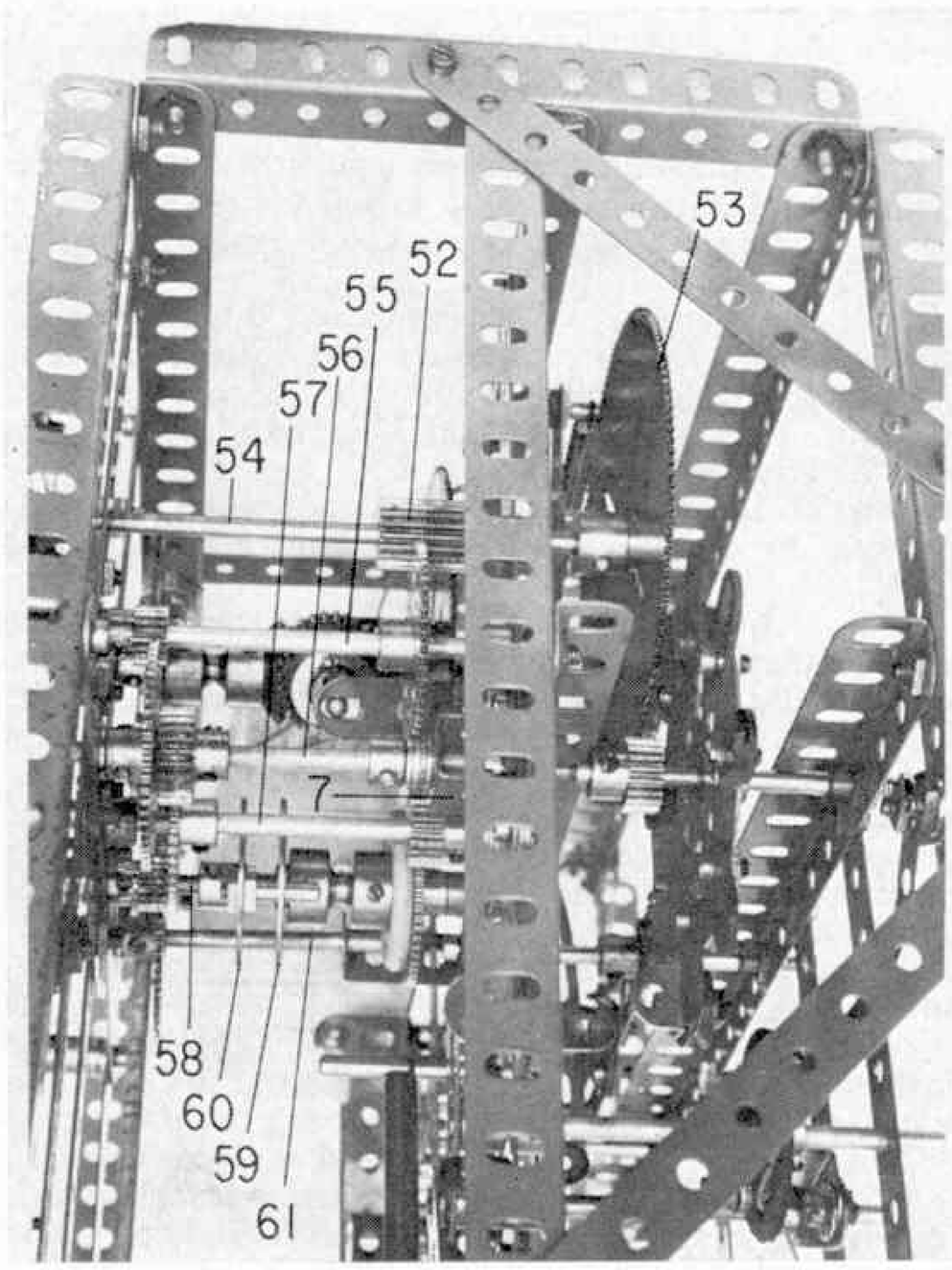
A rear view of the complete escapement, removed from the clock, is shown in Fig. 5. The escapement wheel consists of a Faceplate 10 fitted with eight Fishplates. (Electrical Insulating Fishplates can be used to give quieter running). The Faceplate is secured to a 2 in. Pivot Rod together with a ½ in. Pinion in front.

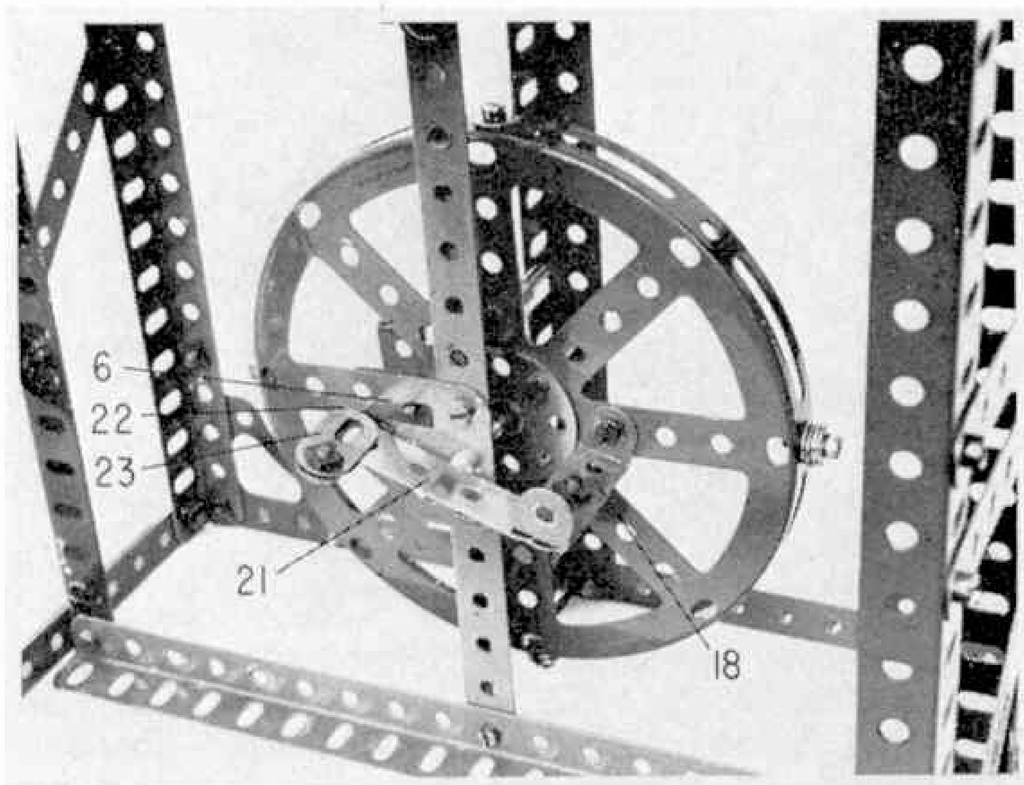
The lever is built up from a 3 in. Strip 11, with a 2½ in. Curved Strip 12 at the top and a 1 in. Triangular Plate 13 at the bottom. Two 2½ in. Narrow Strips are bolted to the Triangular Plate, leaving a slot between the Strips in which fits an Adaptor for Screwed Rod 16 on the balance wheel. The pallets consist of ½ × ½ in. Angle Brackets 14 bolted through their elongated holes to the Curved Strip. The bolts also hold ½ in. metal Pulleys 15 which serve to balance the lever, the completed lever being mounted on a 2 in. Pivot Rod by means of a Double Arm Crank.

The balance wheel is a Hub Disc also mounted on a 2 in. Pivot Rod by means of a Bush Wheel. Adaptors

Above, Fig. 1. A general frontal view of the Author's Self-Winding Balance Wheel Clock. When correctly adjusted, it will operate successfully in any position.

Left, Fig. 2. Assembly of the main framework of the model is evident from this rear view of the Clock. Note the positions of the balance wheel escapement.





Left, Fig. 3. A top view of the model showing the main gearing arrangement.

Above, Fig. 4. A close-up view of the balance wheel showing the hairspring arrangement. Note the Washers stacked on the balance wheel for timing regulation.

for Screwed Rod 16 and 17 are bolted to the Hub Disc, the upper one engaging in the slot in the lever, and the lower one acting as a balance weight. A $1\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip 18 is bolted to the front of the Hub Disc and again is balanced by attaching a second Double Angle Strip 19 and Fishplate 20 to the back of the Hub Disc. Balancing and timing weights, each consisting of a $\frac{3}{8}$ in. Bolt and three Washers, are attached to the top, bottom and each side of the balance wheel.

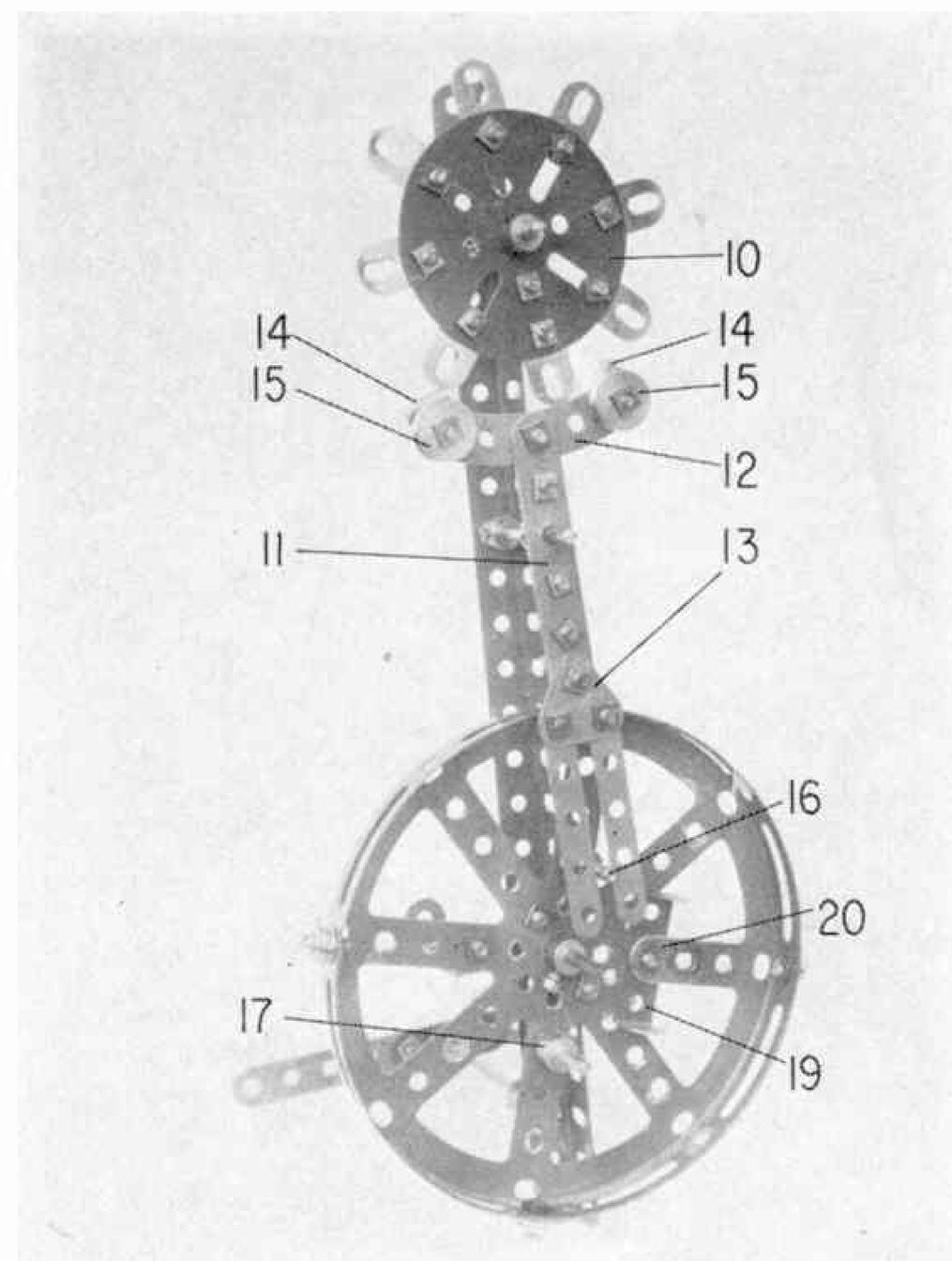
Perhaps the most important part of the Clock is the hairspring which consists simply of a 2 in. Electrical Flexible Strip 21. A $1 \times \frac{1}{2}$ in. Angle Bracket 22 is bolted to Flat Trunnion 6 and one end of the Flexible Strip is clamped to it by means of Fishplate 23. The other end of the Flexible Strip is similarly clamped to Double Angle Strip 18. The various parts should be adjusted so that the Flexible Strip is straight and symmetrical, passing through the axis of the balance wheel and just clear of the head of the Pivot Bolt. While fitting the hairspring and, later, when adjusting the balance weights, the balance wheel should be locked by passing a Rod 24 through it and through Girders 1 and 2.

Winding Gear

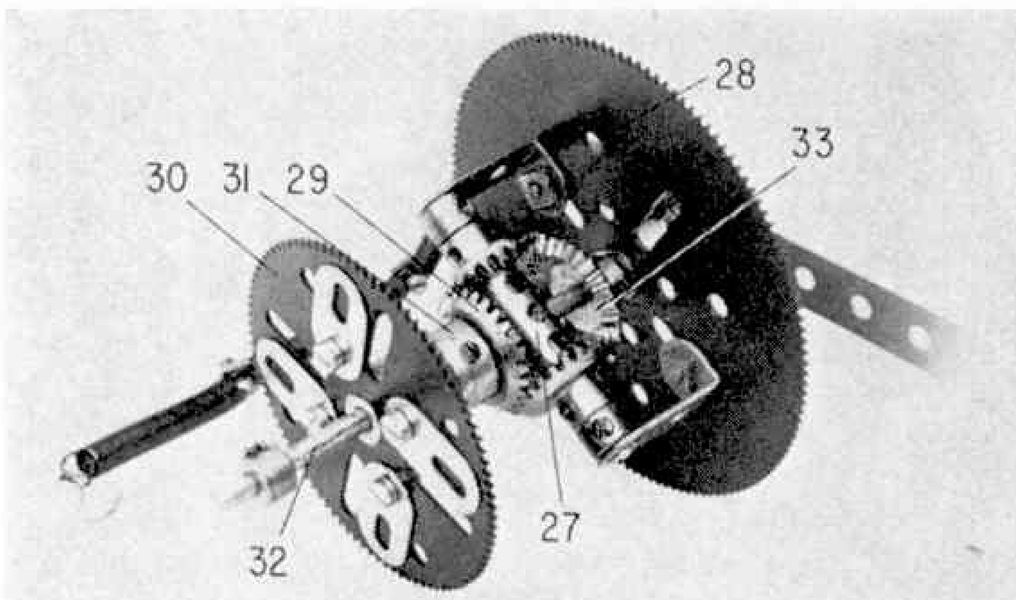
The clock is driven by three Tension Springs 25 bolted together in series and attached to lever 26 by a Pivot Bolt. This spring is automatically re-tensioned at frequent intervals.

Maintaining the drive to the clock during the re-tensioning is done through the differential mechanism shown in Fig. 6. The carrier consists of Coupling 27 with two $\frac{7}{8}$ in. Bevel Gears free to rotate on 1 in. Rods fixed in the longitudinal bore of the Coupling, and located by Collars. The carrier is connected to $3\frac{1}{2}$ in. Gear 28 by $1 \times \frac{1}{2}$ in. Angle Brackets. Bevel Gear 29 is connected to $2\frac{1}{2}$ in. Gear 30 by Socket Coupling 31 and this unit, as well as the complete carrier (including Gear 28), is free to rotate on 4 in. Rod 32. Bevel Gear 33 is fixed to this Rod.

Lever 26 is built up from a $3\frac{1}{2}$ in. Strip, a $5\frac{1}{2}$ in. Strip and a Double Arm Crank overlapped so that seven holes project in one direction and five in the other. The lever is fixed to Rod 32 and the spring attached to the short end. The long end operates the switchgear.



Right, Fig. 5. The full escapement mechanism as it appears removed from the model.



Left, Fig. 6. The differential winding gear, shown here removed from the model.

The winding mechanism is driven by a Motor with 6-speed Gearbox via a pair of ½ in. Helical Gears, an 8 in. Rod 34 and a Worm engaging with Gear 31. Rod 34 is journalled in a pair of 1 in. Reversed Angle Brackets bolted to the main frame. The Fishplates bolted to Gear 31 are intended to reduce noise due to " ringing " of the Gear.

The lower end of the main spring is hooked on to a 3½ in. Rod in the base girders of the main frame. The spring is not vertical, its inclination helping to keep the driving torque constant.

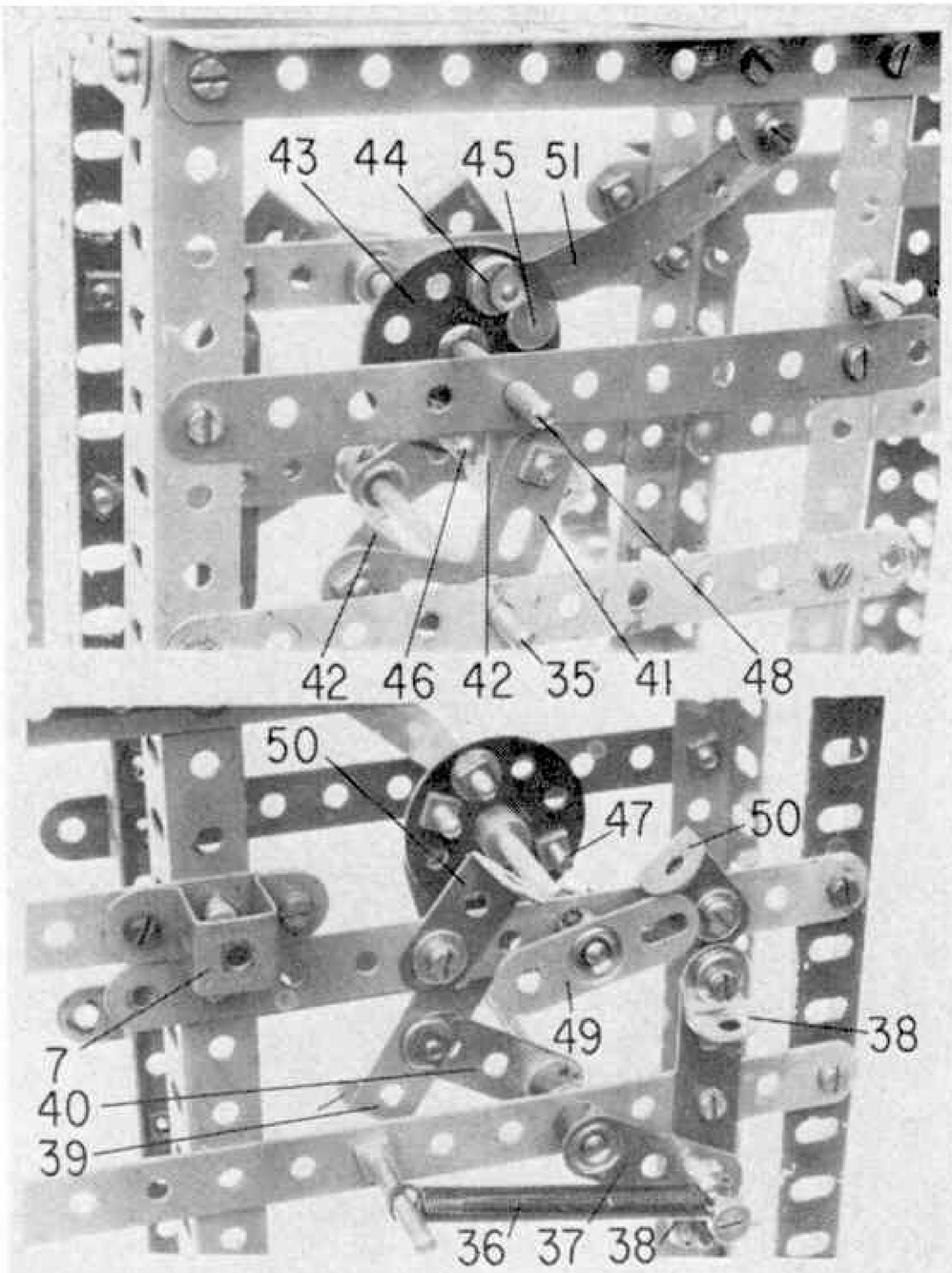
Switch Gear

The first part of this mechanism is assembled on 3½ in. Rod 35, as shown in Figs. 7 and 8. One end of Tension Spring 36 is attached to Crank 37 by a Pivot Bolt and the other end to a Long Threaded Pin on the main frame. A 2½ in. Strip is bolted to the main frame and carries a pair of ½ × ½ in. Angle Brackets 38 which limit the movement of the Crank. A 1½ × ½ in. Double Angle Strip 39 is bolted to a second Crank 40, also fixed on Rod 35. The switchgear is operated by a lever 26 pushing alternately against the ends of the Double Angle Strip. Finally, a Bell Crank 41, with a ½ × ½ in. Angle Bracket 42 on each arm, is fixed to Rod 35.

The switch consists of an Insulating Bush Wheel 43 fitted with two Contact Studs 44 and 45 and, opposite these, a Threaded Pin 46 and (for balance) a ⅜ in. Bolt 47. This unit is fixed on 3½ in. Rod 48 together with a Double Arm Crank 49. 1 × ½ in. Angle Brackets 50 limit the movement of the switch, which is operated by Angle Brackets 42 pushing Threaded Pin 46.

A 2 in. radius Wiper Arm 51 is fitted to the main frame by a Fishplate and is adjusted so that it slides from one Contact Stud to the other as the switch operates. The Wiper Arm must be in electrical contact with the main frame.

One of the Motor leads is connected directly to the Battery Box, the other to Contact Stud 45. The remaining Battery Box terminal is connected to the main Frame.



Main Gear Train

Collars are required to locate some of the Rods and Washers used to ensure proper meshing of the Gears and these are generally not mentioned in the following description. A ½ × ¾ in. Pinion 52 and a 3½ in. Gear 53 are fixed on Rod 54. The 3½ in. Gear meshes with a ½ in. Pinion on the escapement wheel Pivot Rod. The ½ in. Pinion 52 meshes with the differential carrier Gear 28 and also with a 57-teeth Gear on a 3½ in. Rod 55, this Rod also carrying a 7/16 in. Pinion which drives a 60-teeth Gear on a 3 in. Rod 56. Also fixed on this Rod is a ¾ in. Pinion which meshes with a 50-teeth Gear on a 3½ in. Rod 57, this latter Rod also carrying a ½ in. Pinion which drives a 57-teeth Gear, free to rotate on the minute hand 4½ in. Rod 58, located by a Collar fixed behind it.

A friction clutch, enabling the hands to be set, is arranged as follows. A Bush Wheel 59 is connected to a 1 in. Pulley with Rubber Ring by a Socket Coupling. Bush Wheel 60 is fitted with a pair of threaded Pins and fixed to Rod 58. A Compression Spring between the two Bush Wheels presses the Rubber Ring against the 57-teeth Gear. A 7/16 in. Pinion is fixed to Rod 58 in front of Bush Wheel 60 and drives a 60-teeth Gear on 3 in. Rod 61. The minute hand is a 3½ in. Narrow Strip bolted to a Crank fixed on the front of Rod 58. The hour hand is a 2½ in. Narrow Strip bolted to a 57-teeth Gear which is free to rotate on Rod 58. Washers are used to space the hands and the 57-teeth Gear carrying the hour hand is driven by a ½ in. Pinion on the front end of Rod 61. The clock dial is a 7½ in. Circular Strip, embellished with ¾ in. Washers and Fishplates, and attached to the main frame by four Threaded Bosses spaced with Washers.

Adjusting the Timekeeping

Since it is impossible to make small precise changes to the hairspring, the Clock is regulated by altering the number and position of Washers bolted to the rim of the balance wheel. This is the usual practice for precision watches and clocks. The four sets of three Washers already mentioned in the description of the

Left top, Fig. 7. A close-up view of the switch gear as seen from the back of the Clock. Bottom, Fig. 8. Another view of the switch gear as seen from the front.

escapement should provide a reasonable starting point. Removing Washers will cause the clock to run faster while the addition of Washers will slow it down. If necessary, Electrical Thin Washers will provide a fine adjustment.

It is also desirable to retain good timekeeping regardless of the position of the Clock, and this can be achieved as follows. Suppose the Clock is found to run faster when upside down than when it is right-way up. This will be corrected by transferring one or more washers from the top of the balance wheel to the bottom. Similarly if it runs faster when lying on its left side than on its right side, washers should be transferred from the left side of the balance wheel to the right.

When correctly built and adjusted, the Clock will keep very good time—in any position!

PARTS REQUIRED

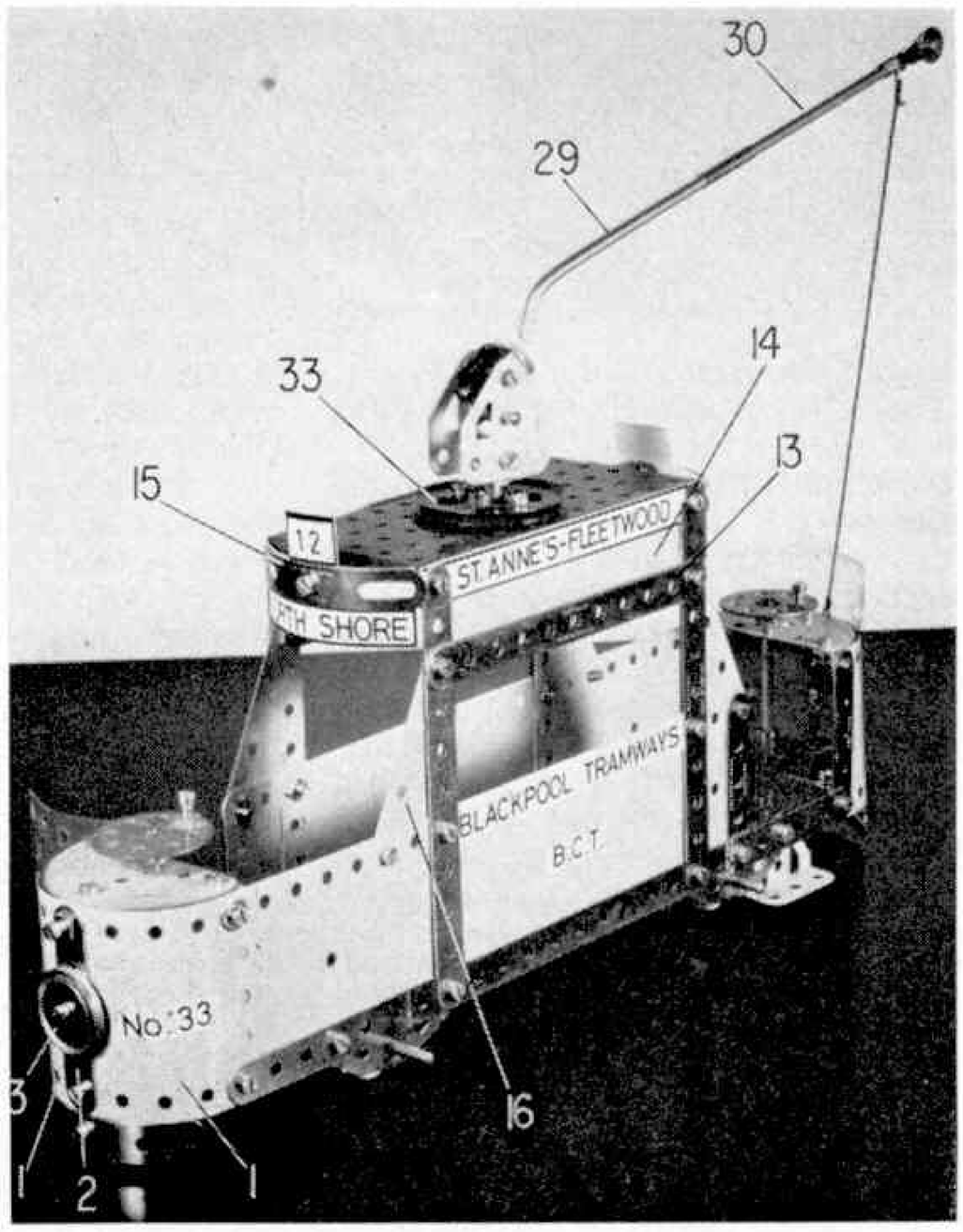
5—1a	1—22	3—48	1—126a
3—1b	2—23b	1—57d	1—128
7—2	3—24	12—59	1—145
3—3	1—25	3—62	2—147b
1—4	3—26	3—62b	1—155
1—5	1—26b	1—63	2—171
2—6a	2—26c	4—64	2—173a
8—8	1—27	1—70	2—211a
6—8a	3—27a	1—73	3—235
4—9	2—27b	1—77	1—235b
24—10	1—27c	1—90	1—514
6—12	2—27d	4—108	1—530
4—12b	4—30	1—109	1—533
1—13a	1—32	16—111c	2—544
2—15a	133—37	2—115	6—545
1—15b	60—38	1—115a	3—549
5—16	4—38d	1—118	1—Motor with 6 speed Gearbox
2—16b	4—43	1—120b	
2—18b	1—45	3—124	1—Battery Box

. . . and for owners of a No. 4 set, Bert Love describes a

SEASIDE TRAM

M.M. readers will have had a chance to admire the excellent Bondi Tram built by Colin Campbell which was published in the April Magazine. Such a tram, however, may be beyond the scope of many younger readers, but those younger readers may take heart in seeing that a perfectly satisfactory and realistic tramcar can be built from one of the smaller standard Meccano Sets. The Seaside Tram featured here is built with the No. 4 Set only, and yet it captures much of the atmosphere of its subject. Construction is quite straightforward and aims at utilising nearly all the parts in the Set, with the utmost economy in employing each Nut and Bolt to the full extent.

The only features which require careful modelling are the round ends to the driver's compartments and these should be tackled first. One end is made from a pair of $2\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plates 1 secured together by overlaying their slotted holes in the middle with a $2\frac{1}{2}$ in. Strip 2. The centre Bolt is $\frac{3}{8}$ in. and carries a $\frac{3}{4}$ in. Washer and a 1 in. loose Pulley 3, forming the headlamp. The upper Bolt is also $\frac{3}{8}$ in., but carries a lock-nut to allow the Bolt shank to protrude outside the tram body so that the loop of the trolley arm cord can be secured to it. The upper Bolt traps a $2\frac{1}{2} \times 1\frac{1}{2}$ in. Transparent Plastic Plate in place to serve as the windscreen and also carries an Angle Bracket inside, to which a $2\frac{1}{2}$ in. Semi-circular Plate 4 is later attached.

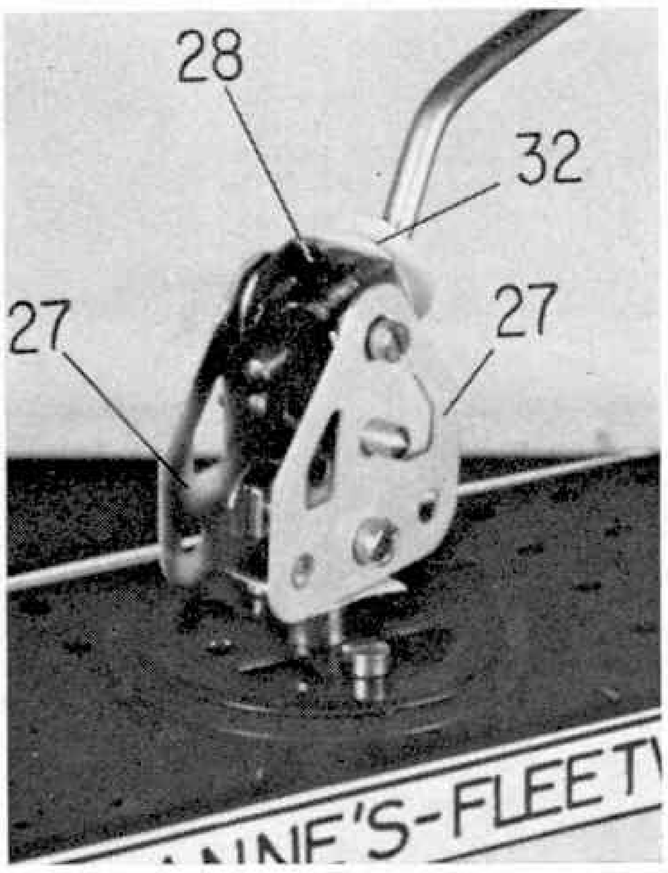


Meccano Set No. 4 contains all the parts needed to build this delightful model of a Seaside Tram, designed and built by B. N. Love.

At this stage the curved form of the tram ends may be carefully shaped by bending the flat Flexible Plates gently but firmly, using a springing action of the hands rather than any attempt to make a sharp bend in one go. Such latter action will produce creases, or ugly bends instead of a smooth curve. The second tram end is fashioned in a similar manner, but the owner of the No. 4 Set will be obliged to use Part Nos. 199 and 200. Both of these are $2\frac{1}{2}$ in. square Flexible Plates, but the 199 has a sharp-radius bend, which must be eased out, while the No. 200 has a gentle bend which is not far off that required in the final form. When the two ends have been satisfactorily shaped, the side portions of the tram body may be assembled to them. The rounded ends of the tram will assume their final shape when tightly bolted up to the side frames.

Side Frames

Both side frames of the model are similarly built up from a $4\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plate 5, bolted to the left-hand side Plate 1 in one of the curved end assemblies, the two Plates being overlapped two holes. The upper securing Bolt also holds an Angle Bracket in place, this Bracket later being attached to Semi-circular Plate 4, while the lower securing Bolt holds a $12\frac{1}{2}$ in. Strip 6 outside the Plates and another



A close-up view of the insulated trolley pole, swivel and tensioning device. If a motor is used to drive the Tram, an insulated flexible wire should be connected to Double Bracket 28 and fed through the roof to be linked to one of the motor terminals.

Angle Bracket inside the Plates. The latter Angle Bracket will later hold the Driver's platform.

Bolted to Strip 6 in the positions shown are two $2\frac{1}{2}$ in. Stepped Curved Strips 7 and 8, the forward securing Bolt in the case of Strip 8 also fixing a Trunnion 9 in place to serve as the access step. The innermost securing Bolts in both cases fix a $5\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plate 10 and two $5\frac{1}{2}$ in. Strips 11 and 12 in position, Strips 11 and 12 being further connected through their third holes from the top by a $5\frac{1}{2}$ in. Strip 13 and a $5\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plate 14. A $5\frac{1}{2} \times 2\frac{1}{2}$ in. Flanged Plate is bolted to the top of the Strips to serve as the roof, two formed Slotted Strips 15 being attached by Reversed Angle Brackets, one to each end flange of the Plate.

The sides are completed by a $2\frac{1}{2} \times 1\frac{1}{2}$ in. Triangular Flexible Plate 16, bolted between the upper edge of Plate 5 and nearby Strip 11, and a $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plate 17, edged by a $2\frac{1}{2}$ in. Strip 18, bolted to Strips 6 and 12. Plate 17 is extended upwards by another $2\frac{1}{2} \times 1\frac{1}{2}$ in. Triangular Flexible Plate 19, as shown, then the end of $12\frac{1}{2}$ in. Strip 6 is bolted to the right-hand Plate 1 in the other curved end assembly of the Tram, at the same time fixing a strengthening $2\frac{1}{2}$ in. Strip 20 to the edge of the Plate and two Angle Brackets inside the Plate, one at top and bottom. The gap between Strips 20 and 17, of course, serves as the passenger entrance.

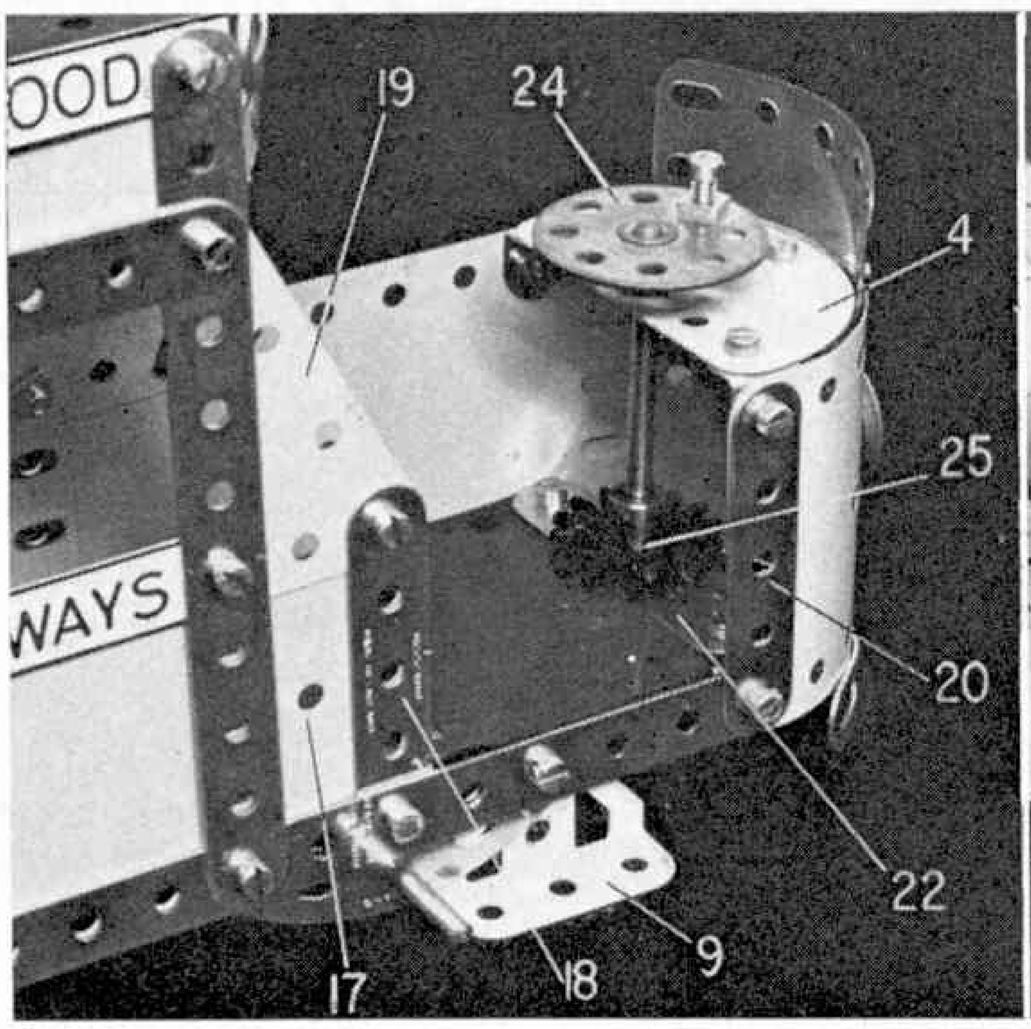
Greater rigidity is now given to the tram ends by cross bracings in the driver's compartments. Underfoot, the driver's platform at each end consists of a $2\frac{1}{2} \times 2\frac{1}{2}$ in. Plastic Plate 21 held in place by a transverse $2\frac{1}{2}$ in. Strip 22 bolted to the Angle Brackets which are already assembled in the side frames. At windscreen height, the bracing is supplied Semi-circular Plates, secured at three points to the Angle Brackets fitted to the curved ends internally during the initial construction. At this stage, patience is required to adjust the curved ends to preserve their final shape and upright presentation. The Semi-circular Plates also trap the Transparent Plastic Plates, forming the windscreens, inside the curved plates to give a smooth curve to the screen.

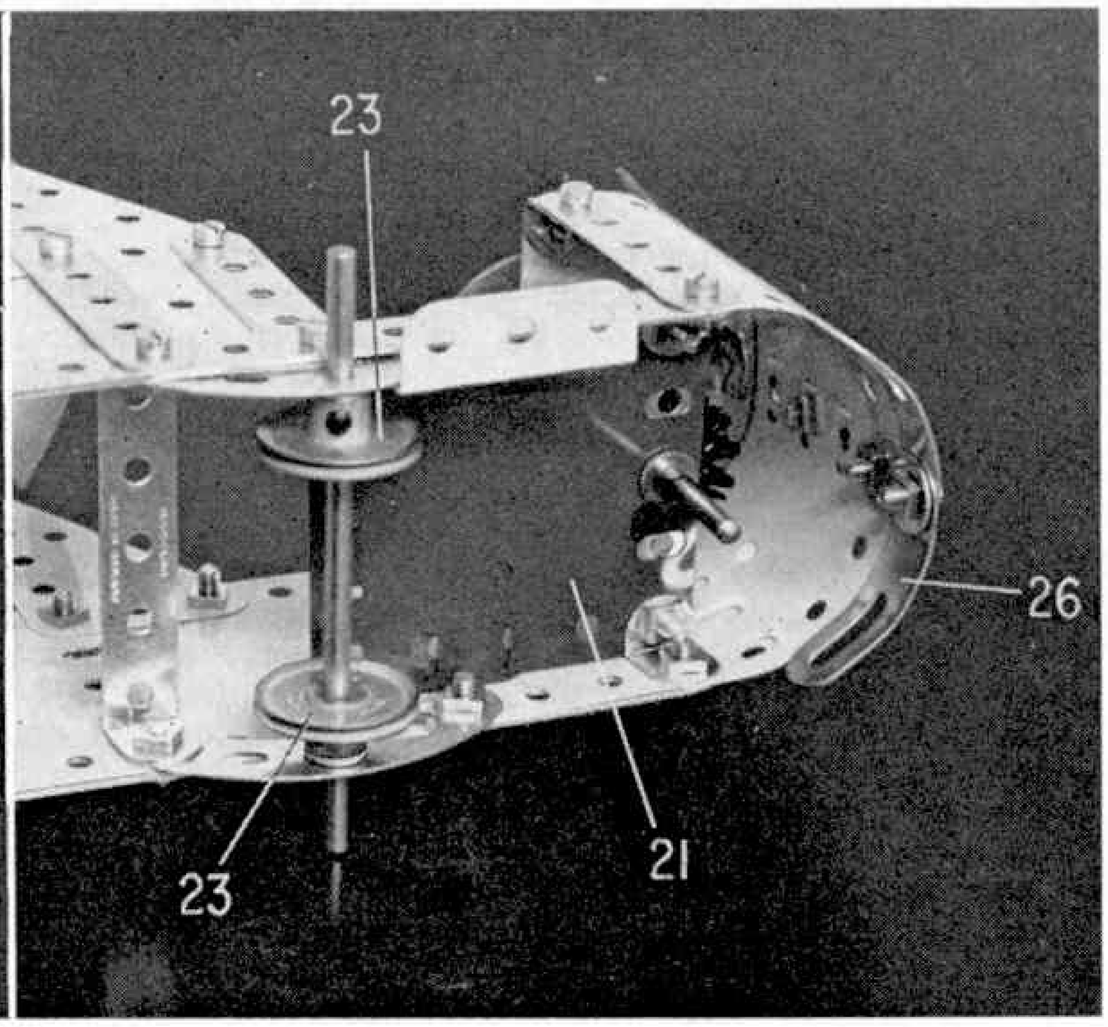
This completes the main structures and it only remains to add the working parts and minor embellishments. Two 4 in. Axle Rods, journalled in stepped Curved Strips 7 and 8, are each fitted with two 1 in. fixed Pulleys 23, forming the tram wheels, each Pulley boss pointing outwards and being spaced by a Washer from the Curved Strips forming the wheel bearings. The driver's hand-wheels are made from Bush Wheels 24, carrying lock-nutted $\frac{3}{8}$ in. Bolts as handles, and these are mounted on 3 in. Rods journalled in Semi-circular Plates 4 and $2\frac{1}{2}$ in. Strips 22 in the driver's compartment. A Multi-purpose Gear 25 is secured in place from below by a Spring Clip and Washer, careful adjustment of which will cause the Multi-purpose Gears to click like the ratchet brake of a genuine tramcar! Two Formed Slotted Strips 26 are secured one at each end of the tram by Fishplates to provide collision fenders.

Working Trolley Arm

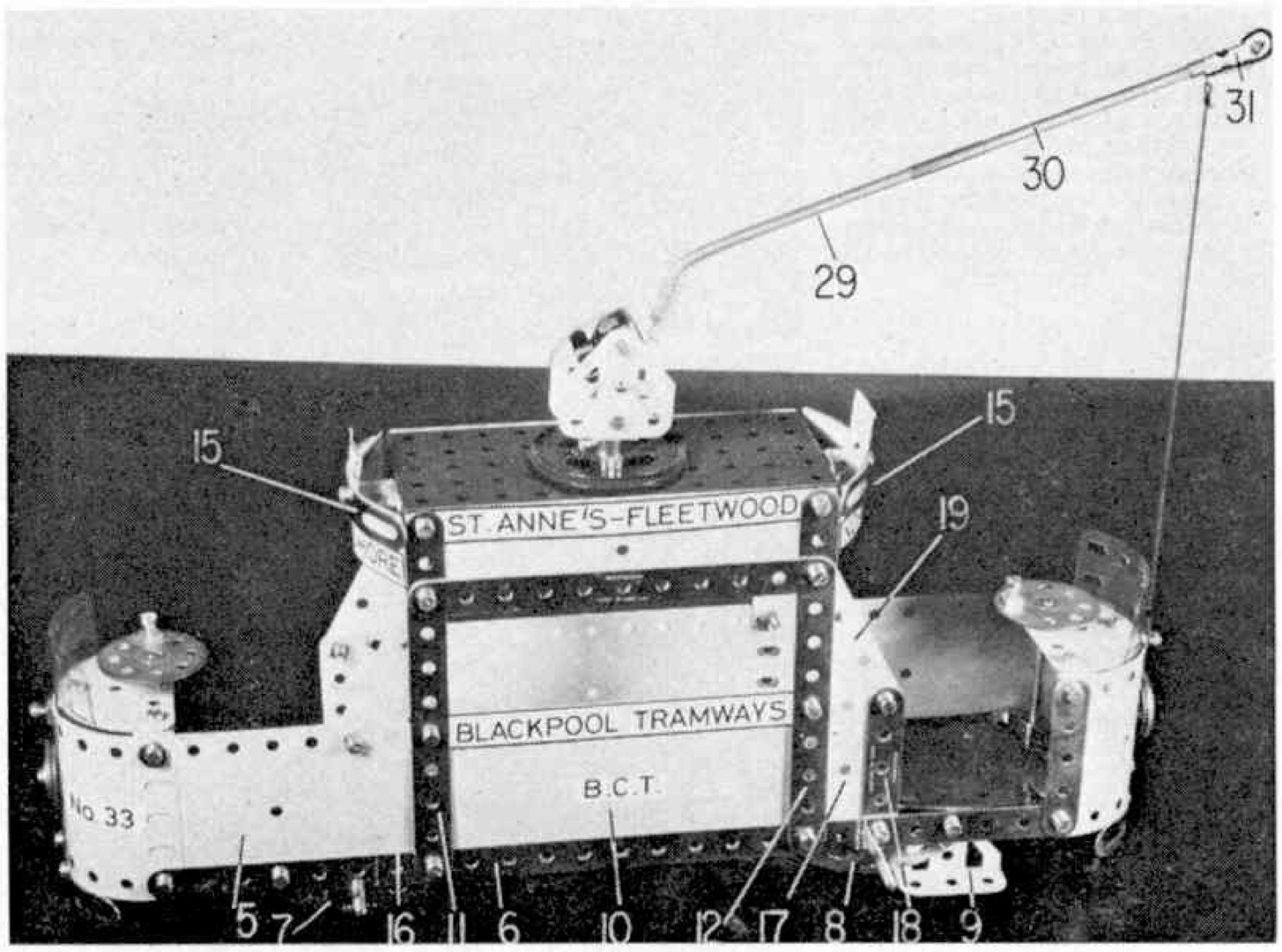
An insulated sprung trolley pole is included in this model and is made up as follows: two Flat Trunnions 27 are bolted very firmly through their centre base holes to a Double

Below, left, a close-up view of one of the driver's compartments showing the imitation "ratchet" brake supplied by a Multi-purpose Gear. Below, right, an underside view of the driver's compartment, showing the wheel arrangement. If a motor is employed, one lead is connected to the tram frame and the other to the trolley arm.





The smooth lines of the driver's compartment are evident from this general view of Mr. Love's Tram.



Bracket, a second Double Bracket 28 being loosely bolted to the apexes of the Trunnions. Held by a Spring Clip inside Double Bracket 28 is a Crank Handle 29 forming the lower end of the trolley pole, the Spring Clip being firmly, but carefully placed to wedge inside the Double Bracket where it will trap the Crank Handle and also prevent the Nuts holding the Double Bracket Bolts from unscrewing. A 1 in. Rod is passed through the centre of the Flat Trunnion and held by another Spring Clip, inside, then a 2½ in. Driving Band is folded over the Rod to form the tensioning device for the trolley arm. The open end loops of the Band are slipped on to the end of the trolley arm with an extra twist to give a fine adjustment of tension after which they are secured in place by a further Spring Clip.

To complete the trolley arm, a Rod Connector is added to the Crank Handle and extended by a 4 in. Rod 30, on the other end of which an Anchoring Spring for Cord and a Rod & Strip Connector 31 are mounted. The 'slipper' contact for the overhead wire is made from a Washer, sandwiched between two Nuts bolted through the hole of the Connector. An 8 in. length of Meccano Cord is tied to the Anchoring Spring and a loop made in the lower end to pass over one or the other protruding bolthead at each end of the tram body when the car is in motion. A ½ in. Plastic Pulley 32, slipped over the Crank Handle, simulates an insulator, but, to achieve true insulation between the trolley arm and the tram body, a plastic stud, provided in the Set for securing parts in the box, is used as a swivel pin and is passed through the lower Double Bracket and into the boss of a 2 in. Pulley 33 bolted to the tram roof. By cutting a small cardboard washer and placing this between the Double Bracket and the boss of the Pulley, complete insulation is achieved.

Power Running

If the modeller wishes to run his tram in an authentic manner he may do so by fitting the Meccano 3–12 volt Motor with 6-ratio Gearbox. This should be mounted vertically in the middle of the tram so that the driving spindle protrudes slightly below the body. Two 2½ in. Double Angle Strips, additional to the Outfit, would be required to secure the motor in place, or a 2½ × 1½ in. Flanged Plate spaced by Washers from the tram side will suffice. Drive to one of the axles would be by ½ in. fixed Pulleys and a 6 in. Driving Band. (Readers who have access to the March 1969 edition of M.M. will find an alternative drive arrangement suitable for this model described therein.)

Having exhausted the parts in his Outfit, how can the young modeller run his tram? A simple solution is as follows. Get permission to lay out a couple of yards of ordinary kitchen aluminium foil on the floor or table (a hardboard surface is ideal). By getting a friend to hold an overhead bare wire at one end of the table while the modeller keeps the other end taut, a 6–12 volt battery connected to the overhead wire and to the kitchen foil, respectively, will drive the tram quite successfully, the tram making its own path across the aluminium foil. WARNING. While this method is perfectly safe for battery operation it is not recommended for a transformer supply, where mains voltages are involved, unless the operator is quite competent and confident about insulation requirements!

PARTS LIST

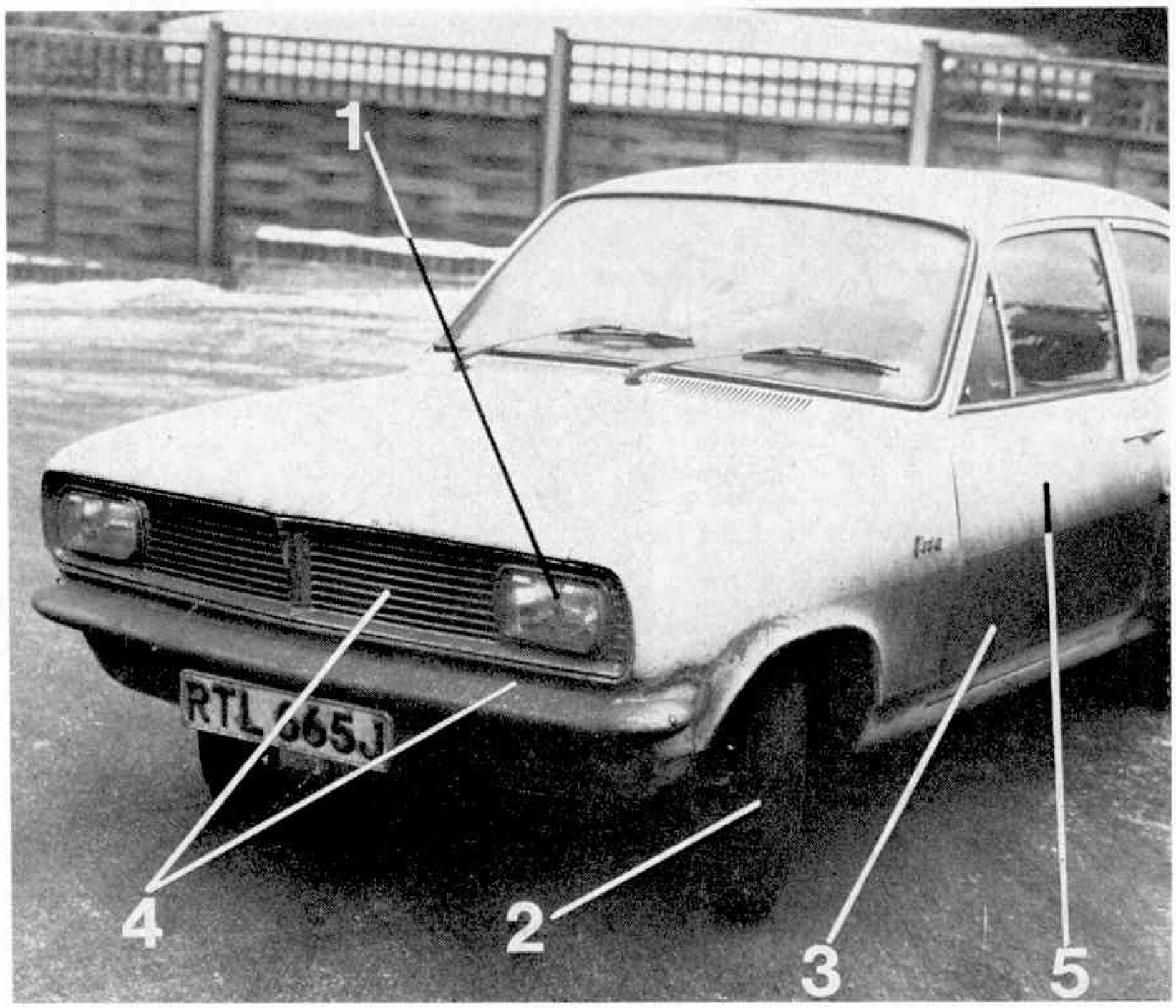
2—1	4—22	2—48a	2—190	4—221
6—2	2—22a	1—52	2—191	
8—5	1—23	4—90a	2—192	
2—10	2—24	6—111c	2—193	N.B. The Grub Screws provided in the outfit are used for all wheels so that the Set Screws may be used for assembly.
2—11	2—27f	2—125	2—194a	
10—12	5—35	2—126	1—199	
2—15b	74—37a	2—126a	1—200	
3—16	62—37b	1—176	1—212	
1—18b	10—38	1—186	1—213	
1—19s	2—38d	2—188	2—214	
1—20a	8—40	2—189	4—215	

BACKROOM POLICEMEN (*continued from page* 399)

clues as to the identity of the suspected vehicle.

When the vehicle is found the scientist can do much to prove conclusively that it was the one concerned in in the accident. Samples of paint from the vehicle will be examined to see if the build up and type are identical to that already at the laboratory and the vehicle itself will be examined for traces of the accident. If the victim was a pedestrian, fibres from the clothing will be found attached to the suspect vehicle whereas if it has been in collision with another car, paint from that vehicle will be found on the suspect car. All of these points give the scientist the chance to give a positive report from which there is no escape.

It is in these minor cases that the work of the Forensic expert is of greatest value, for only by the suppression of these, that make up the large part of our crime figures, can we attain a crime-free society.



Showing the points that, in the event of a non stop accident, can lead to the identity of the car. Headlamp glasses can be built up from pieces at the scene and left on the car—tyre treads can be identified—paint and even mud and dirt can be identified in the laboratory.

Forensic science is not only of value in solving major crimes says Peter Wilkes. Here he describes the normal work of

BACKROOM POLICEMEN

MANY people, when the word " crime " is mentioned, visualise Scotland Yard's top detectives hurrying to the scene of a murder, after having alerted the forces of the Forensic Science Laboratories to hold themselves in readiness to help solve this one major crime.

Yet this image could not be further from the truth, because, for each serious crime that engages the attentions of top detectives, thousands of minor ones are investigated, not even by members of the C.I.D. but by those uniformed constables familiar to us under other circumstances. During any working day in a ' police ' laboratory, the callers will be just these policemen visiting for help in a case which will never come to the attention of the general public nor warrant more than perhaps a paragraph in the newspaper that serves the area concerned.

Every policeman, whether he be the head of C.I.D. or the local ' country bobby ' patrolling on motor cycle, is taught, from his first days in the force, the ' law of contact ', and it is this that sends him hurrying to the laboratory for assistance. This law says that no person can come into contact with a substance without traces being transferred to that person or traces from the person to the substance.

Often, of course, such traces are so minute as to be invisible, even to a trained policeman making a search of the scene of a crime, but, equally, small particles are found at such scenes and provide substantial evidence against the criminal.

In the case of a break-in offence, where a thief enters premises through, for example, a window that he has forced open, the police may find, caught on a rough edge of the window frame, a fractional piece of material, but in the hands of the Forensic chemist it can tell an interesting story, and, when the suspect is found, may prove to be identical with clothing worn by him.

Usually the purpose of a felonious entry is to force a safe containing money and valuables, and in such instances, the chemist can be of valuable assistance to the investigators.

Whether a safe be ' blown ' open with explosives or the back or sides ripped off with tools, the ballast that is used by the manufacturers to pack between the inner and outer walls as fire protection, will spill and find its way onto both the clothing and footwear of the criminal, and so provide positive evidence against them.

Mr. C. R. M. Cuthbert, who served at the Metropolitan Police Laboratory, quotes a case which is a classical example of the help a Forensic chemist can give in such a case.

Police in an area near London were experiencing cases of safe breaking but, despite extensive enquiries, were unable to find those responsible. In connection with another matter two suits of clothing came into their possession and were sent to the Forensic Science laboratory for examination by a chemist.

His findings came as a considerable surprise to the detectives investigating the cases of safe breaking, for the suits bore material that had obviously come from safe ballast. Examples of the ballast from four of the attacked safes were sent to the chemist who found that they contained mahogany sawdust, elm sawdust, oak sawdust, pine sawdust, iron filings and alum.

Particles of every one of these were found in the two suits that had been examined. Although the owners of the suits denied being responsible, when it was discovered that they were out of work but had been spending lavishly, the police charged them with the offences.

The only evidence presented at court was that the two men had plenty of money at a time when they were unemployed, and the evidence of the chemist.

A learned judge had no hesitation in deciding that only one explanation could be placed on this circumstantial evidence and both were convicted and sent to prison.

Even the smallest of small threads can tell the scientist enough to solve a case. When detectives were called to a hotel where a jewel box had been forced open and expensive rings, belonging to a guest, had been stolen, it was obvious to them that a duplicate key had been used by the thief. The jewel box had black marks inside it and, attached to the fastener, a minute piece of red thread.

The scientist was able to tell the investigators that the thread had come from uniforms worn by the hotel porters, and that the black mark in the box had been caused by hands covered in coal. Enquires soon revealed which porter was responsible for taking coal to the hotel rooms, and he, when confronted with the evidence, confessed and produced the stolen property.

Another type of case which rarely makes newspaper headlines but which puts much reliance on Forensic assistance is fowl stealing, which is particularly prevalent in rural areas.

Often the police visit the home of a suspect and recover poultry identical to that stolen, only for him to give an explanation as to his possession of the birds that, while highly unlikely, could be true.

Under these circumstances the crops of the poultry are sent to the laboratory not only with some of their feed, but with samples of the type of vegetation on which they are kept. It is the vegetation that gives the necessary identification for, if seeds or growth of a kind peculiar to their habitation is found in the crop, then it is easy for the court to accept positive identification of the origin of the birds.

Cases of fowl stealing, more than any others, conform to the 'law of contact'. Often, to get the poultry, the thief will have to negotiate fences and wire and, in most cases, some small fibres will be left on these. Soil and vegetation will adhere to his boots and clothing, and if he is using a motor vehicle, will be transferred to it. Feathers from the birds will almost certainly be left in the car or van and, no matter how carefully he later cleans it, at least some trace of these will be found by a thorough search made by a trained policeman.

In the examination of vegetations, the chemist can give considerable help to the investigator. He will be able to differentiate between wheat husks, river vegetation, pine needles and the various other types of seed that make up a rural landscape and, by comparison with examples from that area, go a long way towards putting the suspect at the scene of the crime.

In this age of the motor car more and more accidents are happening on our roads and many are the cases where, for a variety of reasons, the motorist, after being involved in an accident, drives away in the hopes of concealing his identity. Usually this is done where the

Forensic Science for cases of Fowl Stealing.
Showing " Law of Contact ".

At the Scene.
Feathers—feeding matter of birds.
tyre marks—fibres of clothing on fences etc.
footprints.

At the home of suspect.
Feathers—remains of birds—clothing—footwear.—details of vegetation and soil.

On Suspect's Vehicle.
Tyre marks—make and condition to compare with those at scene.
Feathers—soil—vegetation—blood inside vehicle.

Forensic Science at Road Accidents.
Showing " Law of Contact ".

On the injured person.
Material from the vehicle.
Paint—glass—mud and dirt and also grease.

On the vehicles involved.
Material transferred from person and other vehicle.
Fibres from clothing—blood-stains.
Glass—paint—hairs etc.

Found at Scene
Broken parts from vehicles.
Paint—grease—mud—tyre and skid marks.

driver has been consuming alcohol and attempts to avoid the penalty for his act.

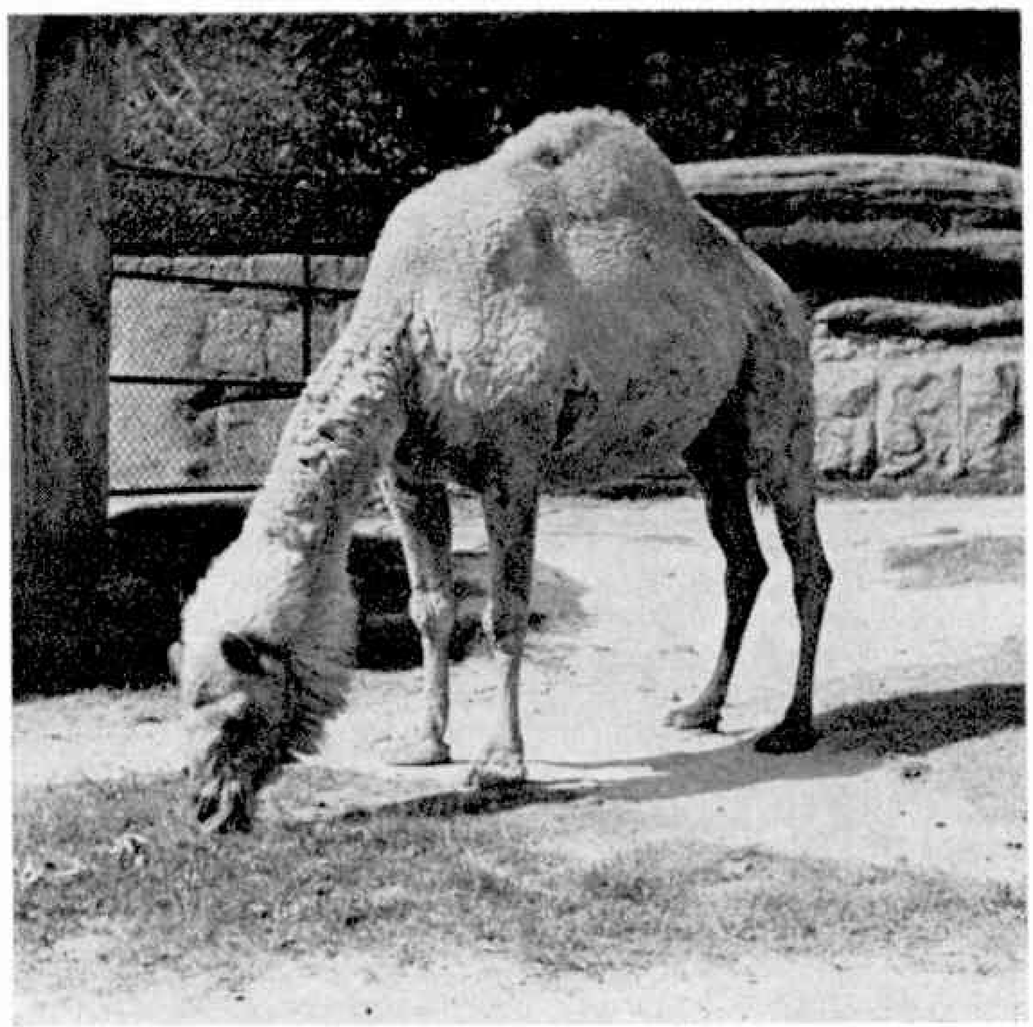
In all cases, even where the victim is a pedestrian, damage will be caused to the offending vehicle, and traces of it will be found both at the scene and on the clothing of the victim. Broken glass from headlights may be found, together with pieces of paintwork that have cracked and chipped off the car involved, and these will immediately be sent to the laboratory.

Here the chemist will subject the paint to a microscopic examination and other tests, from which he is able to determine the actual number of layers of coats of paint that have been applied to the vehicle and, from only minute findings of paint, he is often able to tell the police, not only the colour of the car, but the make that uses that particular paint. Glass from the headlamps can often be built up by the scientist and give further

(*continued on page* 397)

A familiar scene to everyone—a Policeman on traffic duty, yet this same man may well, within a matter of hours, find himself dealing with an incident which brings into operation the aids of forensic science.

The Cantankerous Camels of Australia



It may be a surprise to you to learn that camels played a big part in Australia's past. Frank Madigan explains.

THE TRUTH of the saying that 'history has been made by three animals—man, horse, and camel' has amply been proven in different countries. Certainly, the 'ships of the desert' did as much as any of these three to open up Australia's outback in the early days of settlement.

Camels first arrived in Australia in the 'Calcutta' at Hobart in December, 1840. They were landed and exhibited by J. Ardlie in Melbourne in January, 1841. Then they were overlanded to Sydney, sold to the Government for £225 ($550–00), and placed on public display in Sydney Domain.

Nine camels were shipped from the Canary Islands in 1846, and one of them proved to be the ideal beast of burden to an explorer, J. A. Horrocks, as he traversed the trackless wasteland of the outback of Australia. This poor beast, however, stumbled and accidentaly shot his master at Lake Dutton in South Australia in September in the year 1846.

By 1860 the camel was recognised as the ideal exploration beast for such a waterless interior, when Sir Henry Barkly, Governor of Victoria, imported 25 riding and baggage camels from Peshawar, West Pakistan, to be used in the Burke and Wills Expedition.

Dost Mahomet, an Afghan camel-driver, accompanied them, and he was the first of nearly 400 Afghans who came to Australia with camel trains.

Although the Expedition ended disastrously, to Sir Thomas Elder of South Australia the Afghan and his camels proved their superiority over horses for outback work. Elder imported 120 baggage and riding camels from India.

Some experienced bushmen had their doubts about the camel at first, because to them it was an ugly, shaggy, awkward, stiff-legged, goose-necked, hump-backed beast, with a split upper lip, pop-eyes, loosely hung jaws and, to a horse-lover, a stupid, sad expression seemed to be always on its too-small face.

More important than looks was its disposition. It was morose, sullen, and often had fits of anger. No wonder some bushmen at first thought it was sheer madness to trade the horse for such a cantankerous animal as the camel.

But their doubts dissolved in amazement when they discovered that the two and three day long thirst, which killed their hardiest horses, was only the beginning of a dry stage for camels.

It is recorded that on one occasion, some forty-two camels travelling with the Elder surveying party covered 600 miles in 23 days without a drink.

Then the explorers shattered the bushmen's doubts completely when they told their tales.

Peter Egerton Warburton, with the aid of camels, won through to the North-West coastline of Australia from Alice Springs in the centre of Australia in 1873.

Ernest Giles, in 1875, covered 220 waterless miles in only eight days. After a drink his camels then travelled a further 324 miles in 17 days with only one bucketful each of water on the twelfth day. In 1891 David Lindsay's camel carried him for twenty days on six gallons of water.

"What about fodder?" asked the bushmen. Well, the camels ate the "top feed" or desert acacia, which, for most of the time, is too woody and drought-hardened for horses to eat at all. In fact, they throve on such a diet as the desert had to offer them—mainly saltbush, mulga, she-oak, parakeelia etc.

The Afghans with their camels in the outback soon successfully combated the high freight charges of the old bullock and horse teams. Camels could carry in 12 days loads which took the bullock trains five weeks to move. Their carrying, however, was all done on the back of the swaying camel. The Ghans possessed the knack of loading the pack camel; some of their loads even included bore casing and grand pianos.

The Australian teamsters quickly learnt to handle camel-drawn waggons and camel teams for sinking dams and other outback tasks. This way they won back a fair share of the transport business of the outback.

There are two types of camels; the Arabian camel with one hump, and the Bactrian camel with two humps on its back. The two-humped camel is sometimes wrongly called the dromedary.

The dromedary is the racing or riding one hump camel, a swift breed of the Arabian camel, called the dromedary to distinguish it from the slow plodding pack camel.

The hump is the camel's outstanding feature. This hump is a skin-covered lump of fibrous, connective tissue and fat, and not a curve in the backbone. It weighs about 80 lbs., about 1/15th of a normal camels total weight.

Like other hairy animals, the camel stores food as fat inside its body, most of it inside the hump; in fact, when the camel becomes starved, the hump becomes less. The fat inside the hump is then used for energy.

The hump is not used to store water, however.

The camel is a mighty drinker and one has been

known to drink 30 gallons in ten minutes, and a herd of camels in Western Australia are reputed to have emptied a 4,000 gallon dam in one mighty drinking session.

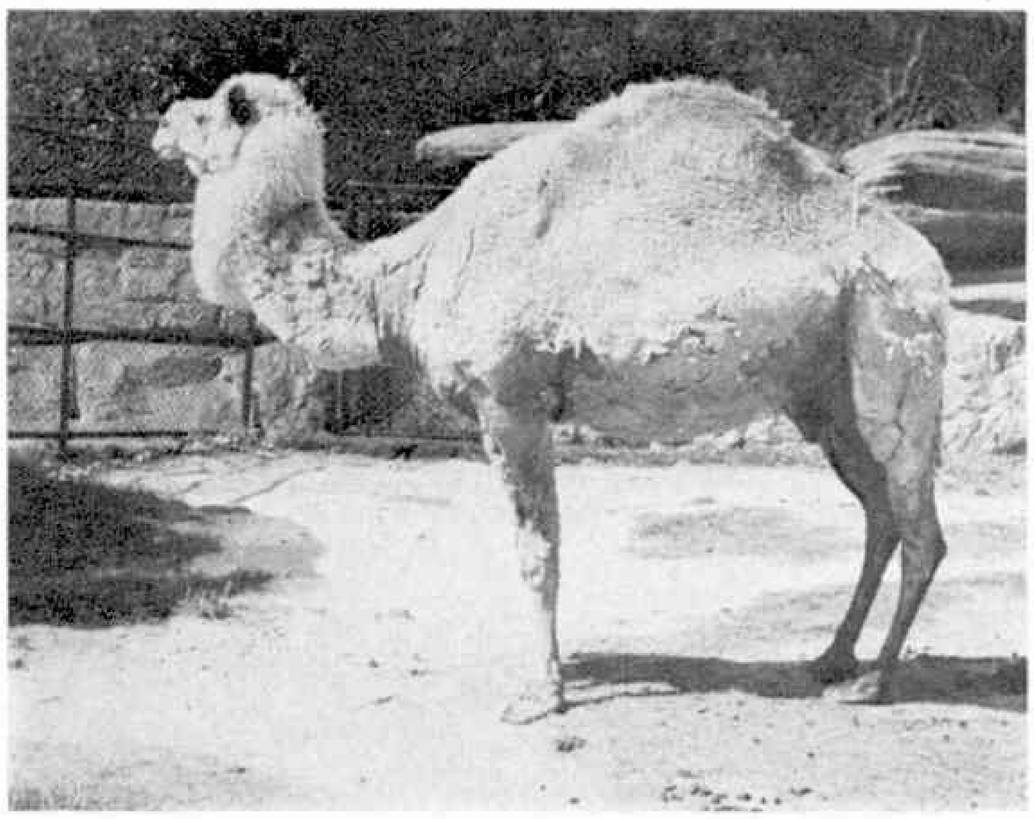
The secret of the camel's ability to do without water is, as one authority puts it: " Most animals keep cool by evaporating water from their skins, but the camel does practically no sweating. His body temperature can go up eleven degrees with no apparent harm. So he simply keeps most of the water he drinks instead of sweating it out. "

The camel's small face, compared with its body, is well suited to desert conditions. Its eyes are protected by overhanging lids and by long lashes, which shield them from the fierce sun. Its nostrils can be closed up tight against the driving sands of sand-storms.

To prevent the camel's two-toed feet from sinking into the soft sand, they are broadly cushioned. And horny pads on its chest and knees protect the rest of its body from the sand when it is kneeling.

As a beast of burden the camel is supreme, for it can carry up to a thousand pounds, although the usual burden is 600 pounds. It moves slowly, about two and a half miles per hour, but will average 25 miles per day.

With modern means of travel by aeroplane or helicopter, the cantankerous camel has now outlived its usefulness, but such was its effect on the building of this nation that many people think that at least there could be a statue erected in Canberra commemorating this fact.



OLD BUT INTERESTING

(*continued from page* 381)

nately, is an expert horseman and never meets with disaster.

A base is supplied by a $5\frac{1}{2} \times 2\frac{1}{2}$ in. Flanged Plate 1, to which two $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strips 2 are bolted in the positions shown. To one lug of the rear Double Angle Strip, a Reversed Angle Bracket 3, and a Fishplate 4, are bolted, which together form bearings for a 2 in. Rod, held in place by a Bush Wheel 5, and a 1 in. Pulley 6, the latter being connected by a Driving Band to the output pulley of a Magic Motor, also bolted to the baseplate.

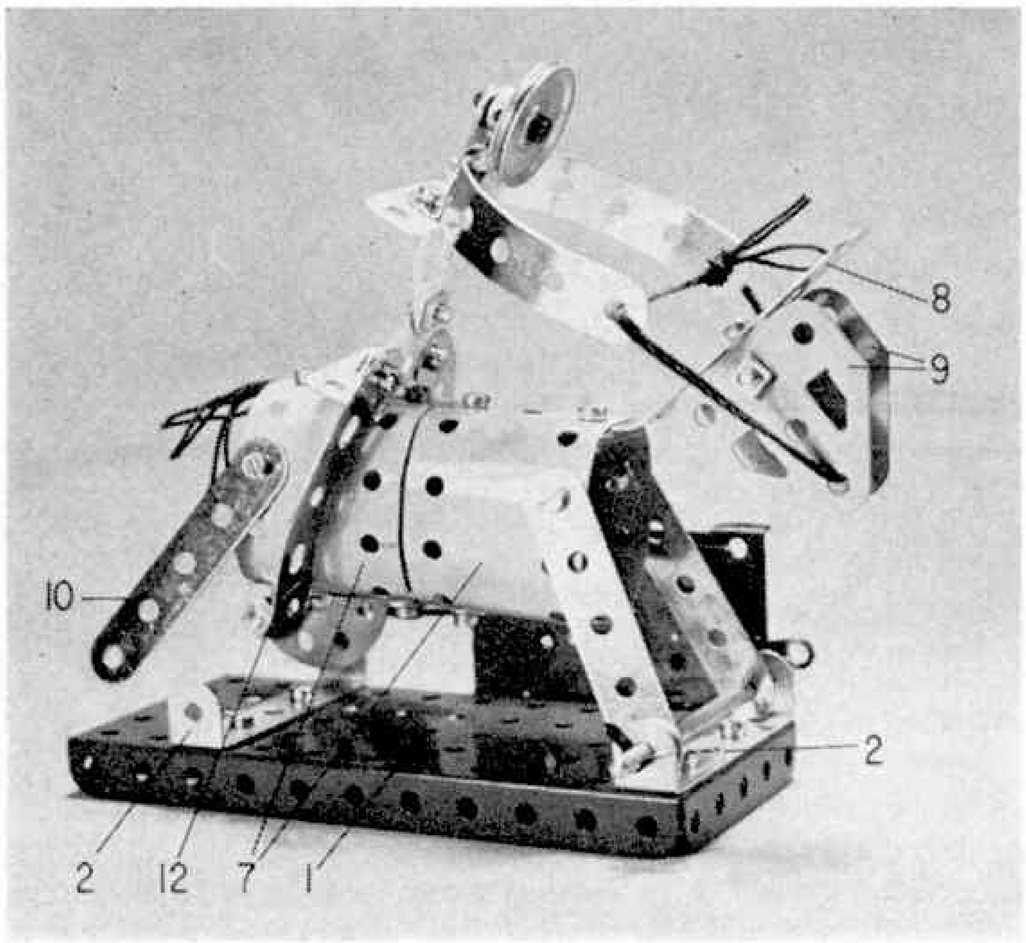
The horse's body is built up from two $5\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plates 7, curved to form oval cylinders and connected together by a Fishplate and a $5\frac{1}{2}$ in. Strip 8. The Strip is bent upward and to it are fastened two angle Brackets that in turn carry Flat Trunnions 9, which together make a respectable representation of a horse's head. One of the animal's rear legs, which are made from two $2\frac{1}{2}$ in Strips 10, is bolted tightly to the body, while the other is lock-nutted in place. The lower end of this latter " leg " is also lock-nutted to Bush Wheel 5, using a $\frac{3}{8}$ in. Bolt.

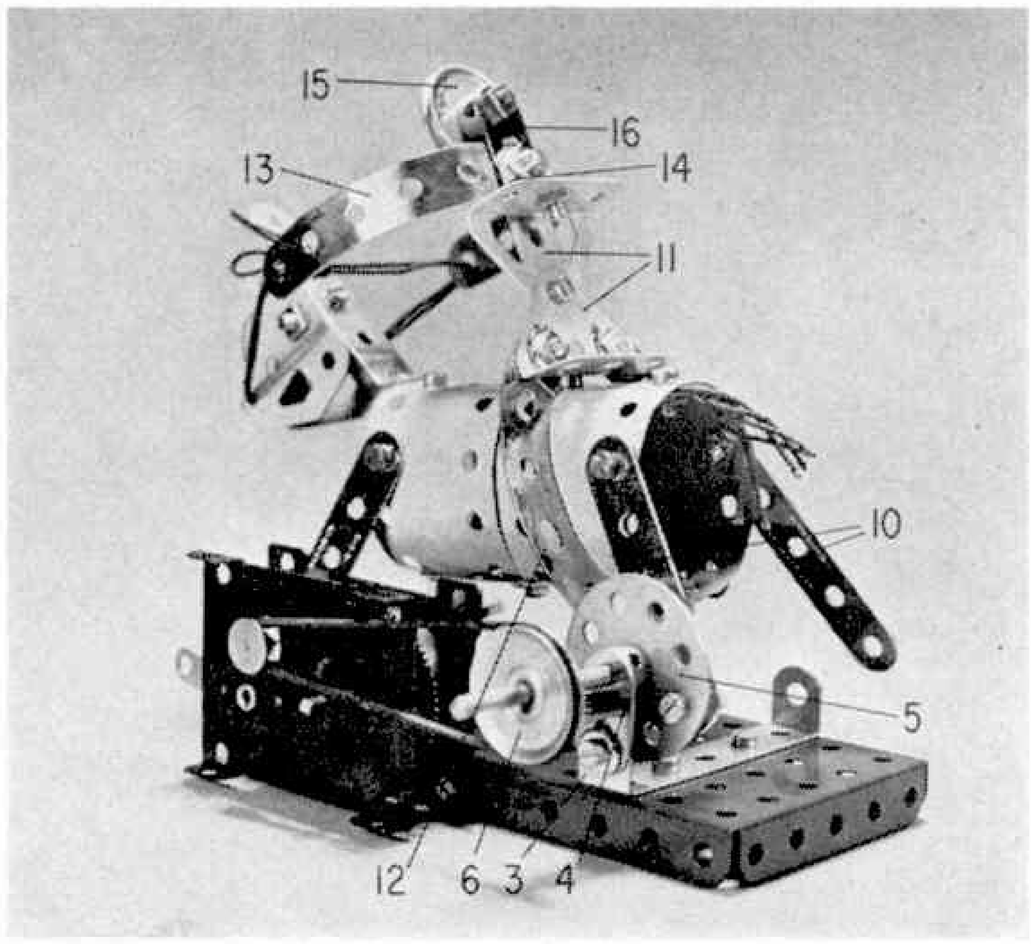
Coming to the rider, or " bronco buster " as they were called, his body consists of two Trunnions 11, joined at their apexes, while his legs are provided by two $2\frac{1}{2}$ in. Stepped Curved Strips 12, which are adjusted so that, while they prevent the rider from falling off his horse, they allow him freedom to wobble about. A $5\frac{1}{2}$ in. Strip 13, bent to shape and attached to the body by an Angle Bracket 14, serves as his arms, with his head being provided by a 1 in. Pulley 15, fixed to a Fishplate 16 by a $\frac{1}{2}$ in. Bolt.

The model is completed by reins and a tail for the horse, both provided by Meccano Cord and arranged as shown in the accompanying photograph.

PARTS REQUIRED

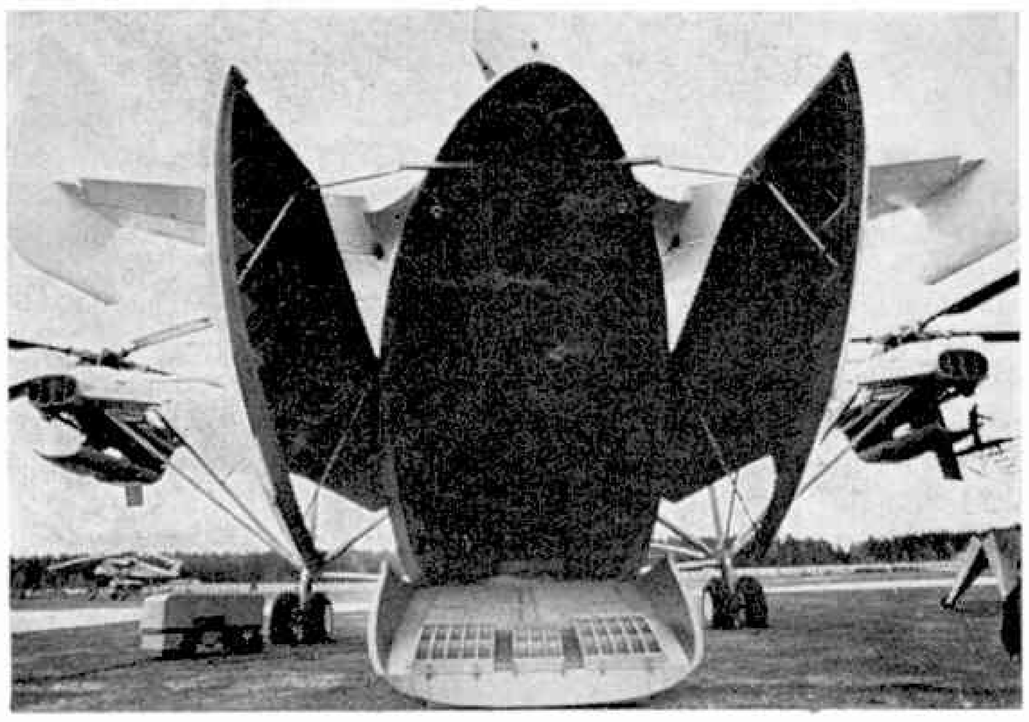
2—2	2—22	1—40	1—125
4—5	1—24	2—48a	2—126
3—10	2—35	1—52	2—126a
3—12	29—37a	2—90a	1—186a
1—16	24—37b	1—111a	2—189
1—17	4—38	3—111c	1—Magic Motor





AIR NEWS

By JOHN W. R. TAYLOR



Mil's Last Masterpiece

When the Russians first described the sort of loads that their latest helicopter could carry, the facts seemed hard to believe. Referring to the aircraft simply as the " V–12 ", they claimed that it had taken off from an airfield near Moscow on February 22, 1969, and climbed at a rate of more than 600 feet a minute to a height of 9,682 ft., carrying a payload of 68,410 lb.—more than 30 tons. Yet this was only the start. . . . .

On August 6 the same pilot, V. Kolochenko, easily beat his earlier record by lifting 88,636 lb. (nearly 40 tons) to a height of 7,398 ft. in the V–12. This meant that the new Soviet helicopter could carry a load greater in weight than two Sikorsky CH–53D Sea Stallions—the biggest helicopters flying outside Russia—complete with fuel and maximum payload. Clearly it was quite a giant.

Two rather poor pictures of the V–12, minus its rotors, appeared in the aviation press. Then, when Russia's leading helicopter designer, Mikhail Mil, died on January 31, 1970, the Moscow news agency *Tass* released a photograph showing him with a model of the V–12, or Mi–12. It proved to be his last design, embodying components from the earlier Mi–6 and Mi–10 which had themselves been far larger than any other helicopters in the world.

At the time this *Air News* is being written, the V–12 has just made its first public appearance outside Russia, at the 29th International Air and Space Exhibition in Paris. So now we know much more about it. As expected, its dynamic components consist of two complete five-blade rotors and twin-turbine power plants almost identical with those fitted to the "single-rotor" Mi–6 and Mi–10. This makes good sense. The rotor system of a helicopter is always the most difficult part of the aircraft to perfect, and it meant that the V–12 could use from the start components that had already been well tested in everyday use.

It appears that Mil designed the V–12 to an official military specification calling for a vertical take-off aircraft that could embark the kind of giant cargoes carried by an Antonov An–22 turboprop freighter and carry them from forward airfields to front-line combat areas. The requirement was for a tandem-rotor helicopter, like the American Boeing CH–47 Chinook but very much larger. Mil preferred side-by-side rotors, obtained permission to switch to such a layout, and the result was the prototype V–12.

When the rotors are turning the " span " from tip to tip is 240 ft, which is about 45 ft. more than the

Four photos of the V12 " Jumbo " helicopter from Fotokhronika Tass. The enormous cargo hold is 14 ft. wide and 14 ft. high.

wing span of a Boeing 747 Jumbo-jet. The fuselage is 121 ft. long, with most of the interior laid out as a cargo-hold 14 ft. wide and 14 ft. high. Entry to the hold is via a "straight-in " loading ramp, between two huge clam-shell doors which form the rear of the fuselage when closed.

The V–12 carries a crew of six and has a maximum take-off weight of 240,000 lb. The two pairs of 6,500 h.p. Soloviev D-25 turboshaft engines give it a cruising speed of 150 m.p.h. and are linked by cross-shafting through the tapered wings and across the top of the fuselage. This ensures that the rotors are always synchronised as they turn in opposite directions, and that both rotors will continue to turn even after the failure of one or both engines on either side.

As in other Mil helicopters, fuel is carried in cylindrical tanks mounted on each side of the main cabin. An unusual feature is that a second " flight deck " is provided inside the nose, below the main flight deck, to ensure a better downward view while the aircraft is taking off, landing or hovering near the ground.

In Paris, the V–12 was demonstrated as a commercial transport in the markings of the Soviet airline Aeroflot. There seems little doubt that it will play an equally important role in the future transport operations of the Soviet armed forces, and it is a sobering thought that no Western nation has a vertical take-off transport remotely approaching the capability of the V–12 even on the drawing board, let alone in the air.

Heathrow's 25 Years

During a period when the daily newspapers, radio and TV are spending so much time arguing the merits of Foulness as London's third airport, Heathrow's 25th " birthday " slipped by almost unnoticed. This is a pity, because London's number one airport has established itself as one of the finest, safest terminals in the world in its first quarter-century—after a truly depressing " baptism " on May 31, 1946.

When the Minister of Civil Aviation of that time, Lord Winster, declared Heathrow officially open for business it was pouring with rain. Many of those present could remember the pre-war days when the central area had been The Fairey Aviation Company's Great West Aerodrome. Carefree flying displays and garden parties had been held there, always it seemed on lovely sunny days. During the Battle of Britain, it had become a satellite for Northolt, operating Hurricane fighters built a few miles away in Kingston upon Thames, Weybridge, and Langley.

The military aircraft had gone long ago. In June 1944 work had begun to convert the Great West Aerodrome into a huge base for R.A.F. transport operations, close to London. The need for such a base had ended with the war, and it had been decided to adopt Heathrow instead as London's new airport for the coming jet age, retaining the original R.A.F.-pattern two sets of triangular runways.

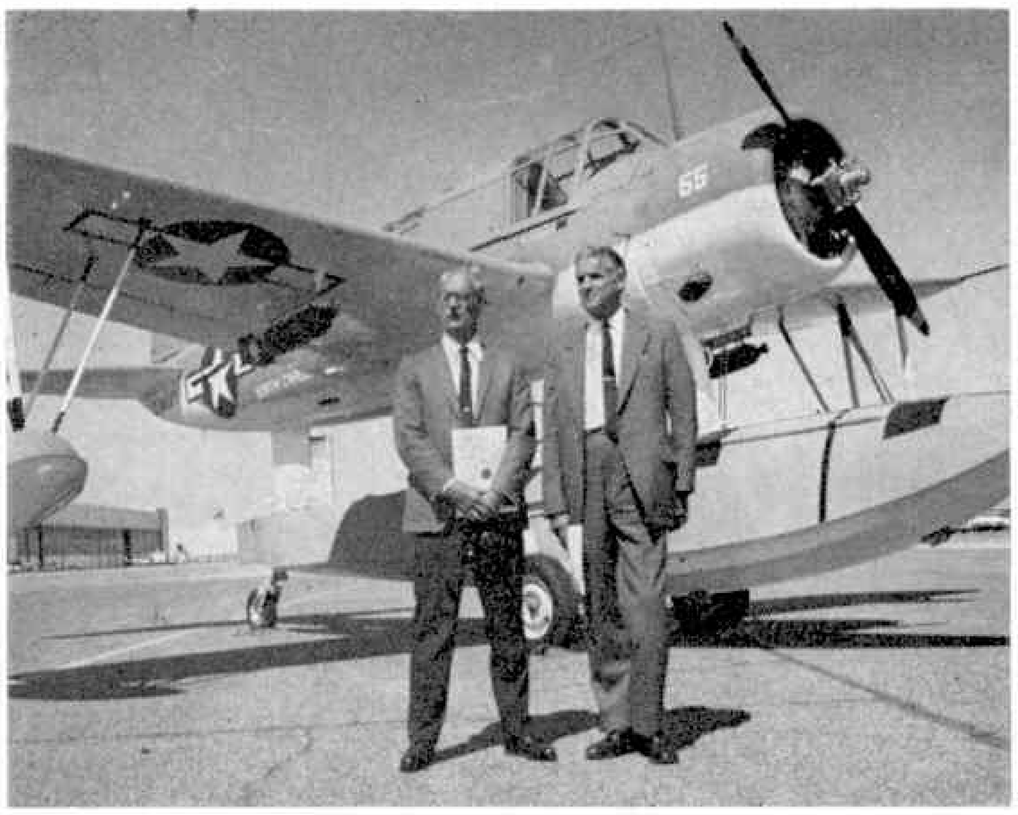
Nothing was quite ready by the official opening date—at least by modern standards. The only brick building was a temporary red-brick control tower on the North side of the airport. Airline companies had their offices in caravans. Terminal facilities for passengers consisted of a row of large brown tents which had been " made comfortable with floors of clinker and sand covered with coconut matting ". At least, they might have been comfortable but for the rain. As it was, when passengers began to alight from the first Constellation airliner of Pan American on the afternoon of May 31, one of them took a look at the circus-like tents and asked jokingly " Gee, where are the elephants ? ". A few seconds later he slipped at the bottom of the steps and sat down in the mud.

By 1951, Heathrow exceeded the number of passengers passing annually through neighbouring Northolt. In 1953, it handled one million passengers for the first time; today the total is more than 17½ million a year. Whatever happens at Foulness, it is safe to predict that Heathrow will still be London's number one airport after another 25 years, when supersonic VTOL airliners will be leaving quietly for every corner of the world.

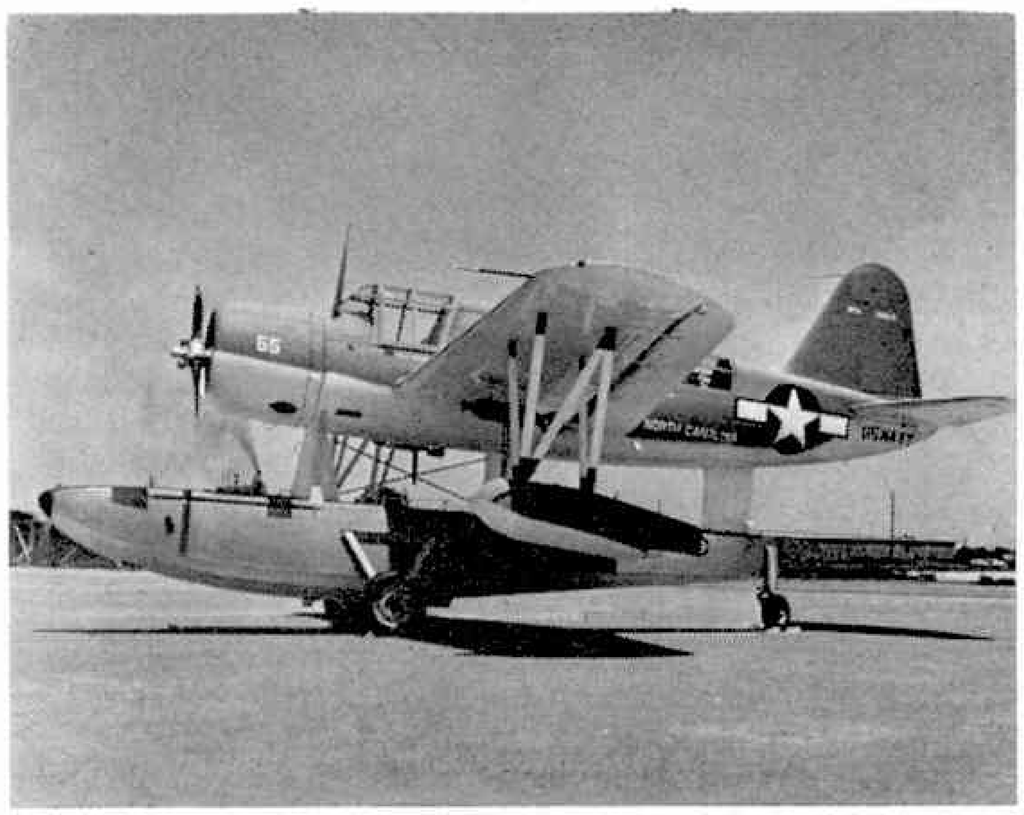
Kingfisher Reborn

A few months ago, I told you about the wartime OS2U-2 Kingfisher floatplane that had been retrieved from a hillside in British Columbia, and was being rebuilt by retired employees of Vought Aeronautics Company who had worked on the original production models.

As shown in the photographs on this page, the Kingfisher has now been restored to its former " show-



Thirty years ago these two men were sitting in the seats of the OS2U *Kingfisher* when it crashed into a British Columbia mountain in a dense fog flying at 90 knots. They walked away from the badly-wrecked Navy plane and saw it again restored to display condition at Vought Aeronautics Company plant in Dallas Texas. On the left is Stanley S. Goddard, radioman-gunner who was in the rear cockpit when it crashed, and Mac J. Roebuck, pilot. Retired Vought men rebuilt the plane over a period of 12 months.



Buffeted by flying snow from rotor blasts, chilled Royal Canadian Air Force helicopter crewmen pick up the wrecked U.S. Navy *Kingfisher* from a foot of snow at the 1,500-foot level on Mt. Buxton, Calvert Island, B.C. in 1964. The plane had laid on the mountainside for 22 years before being salvaged.

room finish " and was scheduled to be installed officially on board the battleship U.S.S. *North Carolina* on June 25 this year, at Wilmington, N.C., where the ship is preserved as a memorial.

Bulldogs for Malaysia

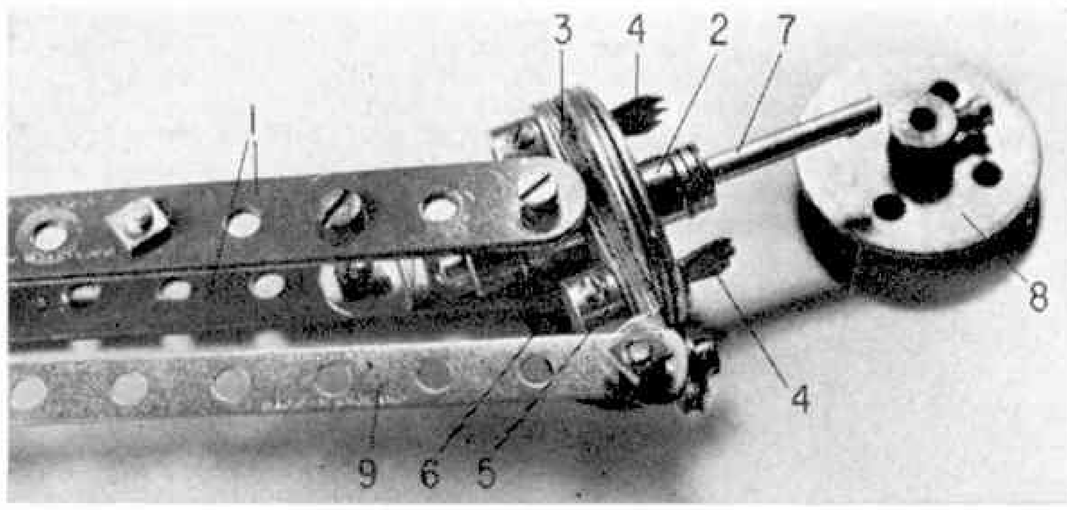
Latest country to choose Britain's Bulldog as its new primary trainer is Malaysia, which has ordered 15 for the Royal Malaysian Air Force. This is excellent news for Scottish Aviation, which took over Bulldog production when the Beagle company went out of business. Sweden decided that it preferred this aircraft to any of the competitors and confirmed its order for 58, with an option on 45 more. Kenya also transferred its order for five Bulldogs from Beagle to Scottish Aviation, but Zambia decided to have eight Italian Siai-Marchetti SF. 260s instead of the Bulldogs it had originally ordered.

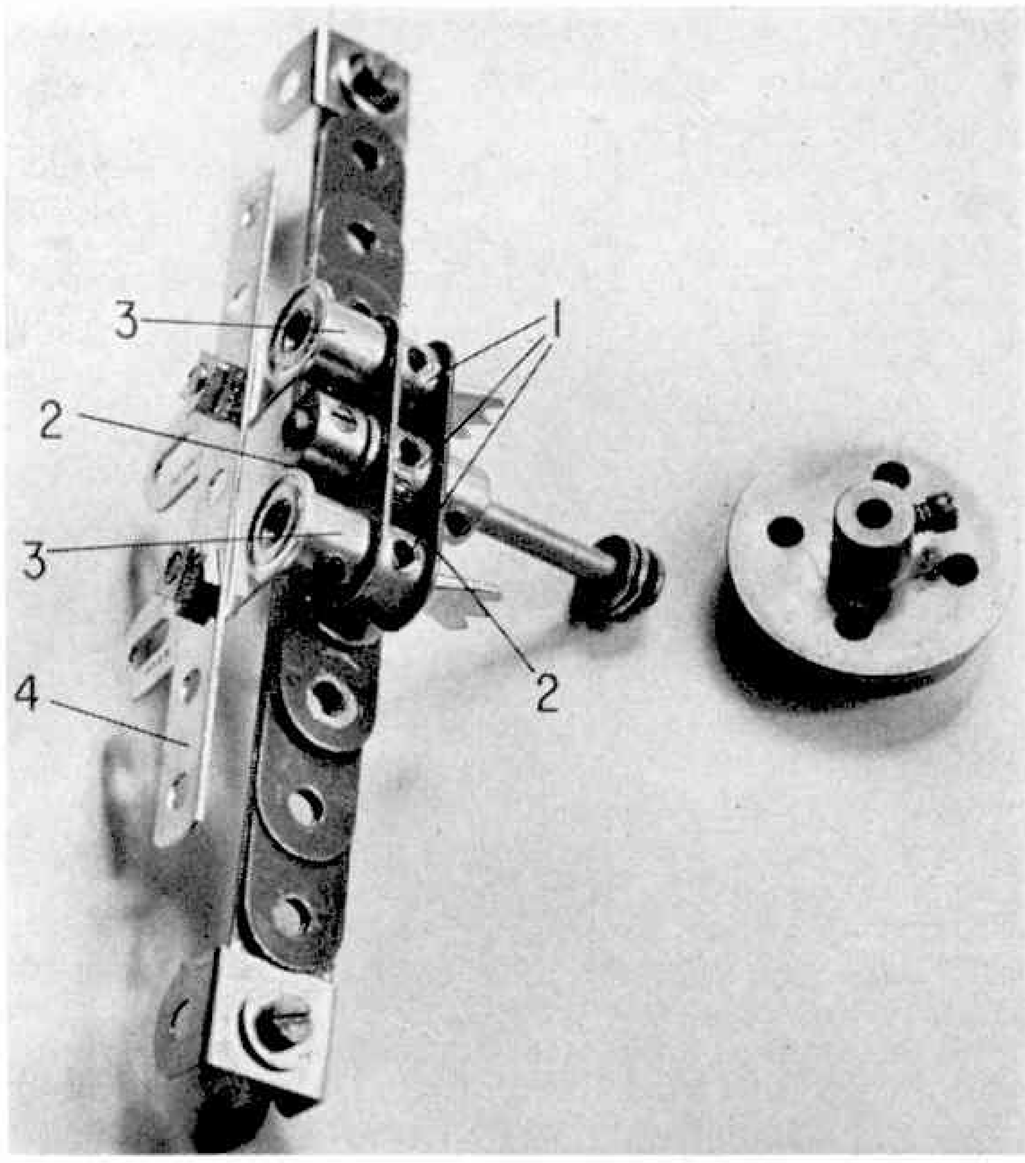
Now Scottish Aviation have more than made up for the one lost contract, and the list of customers will probably grow rapidly once deliveries of production aircraft begin this summer. The original prototype Bulldog, converted from a Pup, was followed by a second prototype, built by Scottish Aviation and stressed for unrestricted aerobatics, on February 14, 1971. Photographs of this attractive little aeroplane appeared in our last issue.

AMONG THE MODEL-BUILDERS

WITH 'SPANNER'

Below, an Internal Expanding Front Wheel Brake Mechanism suitable for use with 1½ in. or larger wheels, designed by Mr. James Grady of Dundee, Scotland. Right, a similar-sized Rear Brake Mechanism from the same enthusiast.





Internal Expanding Brake

" What! " you might be thinking, "Have they gone mad, featuring another Expanding Brake, here, when they included one only a couple of issues back! "

It's true, we did feature a Brake a few issues ago—in May to be exact—but I make no apologies for apparently repeating myself, now. There is a very good reason for it, as will become clear from the following comments of our old friend, Mr. James Grady of Dundee. " In the May issue of the M.M., " he says, " You show an Internal Expanding Brake, but as this can only be used with 3 in. wheels, I got cracking in defence of the lads with 1½ in. and 2 in. wheels. " The result was the interesting mechanisms illustrated here, these being a front and rear brake which can be used with different wheel sizes.

Dealing first with the front brake, the cross-member carrying the hub is provided by two pairs of two 5½ in. Strips 1, connected by two Double Brackets bolted through the third holes from the ends of the Strips. The bearing for the stub axle is built up from an 8-hole Bush Wheel 2, two 8-hole Wheel Discs, three 2 in. Strips 3 and a Double Arm Crank, all mounted on top of each other and connected together, not by Bolts, but by two Centre Forks 4, each secured by a Collar 5. A Washer is carried between the head of each Centre Fork and the Bush Wheel. The assembly is pivotally attached to the

Figs. 1 and 2 show an extremely compact Free-wheel Unit designed by Mr. Clive Hine of Stratford-upon-Avon, Warks.

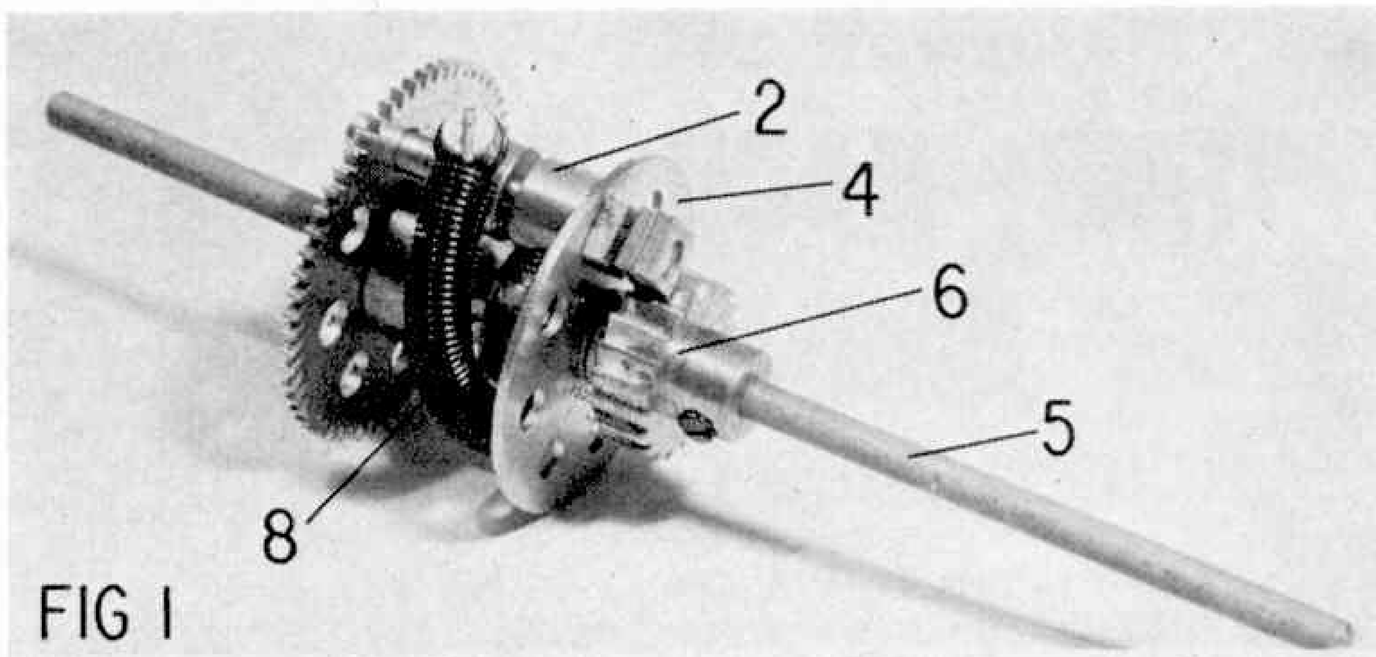


FIG 1

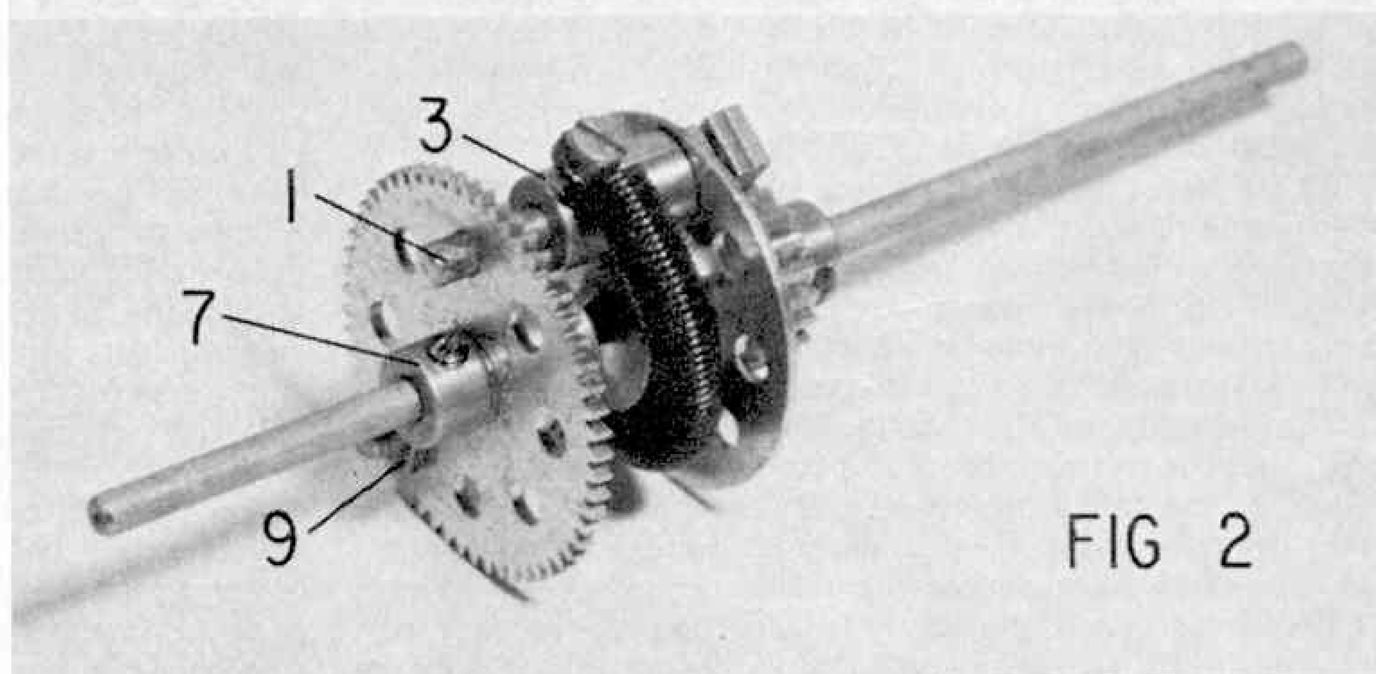


FIG 2

ends of Strips 1 by means of two Bolts, passed through the end holes in the Strips, fitted with Nuts and then screwed into the threaded holes in the boss of the Double Arm Crank.

Collars 5 must be so arranged on the Centre Forks that, when the points of the Forks are vertical, the threaded bores of the Collars are also vertical. Tightly screwed into the upper bore of each Collar is a Pivot Bolt, fitted with a Compression Spring, the two Bolts being linked by a 1½ in. Strip 6. The chosen brake control linkage would be connected to this Strip. A 2½ in. Rod 7, held by a Collar in the hub, serves as the stub axle, while the brake drum is a 1⅛ in. Flanged Wheel 8, fixed on the Rod, but spaced from the boss of Bush Wheel 2 by three Washers. The flange of the Wheel, of course, fits over the heads of the Fork Pieces which serve as the brake shoes, connecting with the rim when they are revolved by means of Strip 7. The track rod, supplied by a 5½ in. Narrow Strip 9, is lock-nutted to an Angle Bracket bolted to the ends of Strips 3.

In the case of Mr. Grady's rear brake, three ⅜ in. Bolts, shanks pointing downwards, are held by Nuts in the leaf spring of the parent model, care being taken to ensure that the Nuts are lined up parallel to the edge of the Spring. Using their threaded holes, three Collars 1 are screwed onto the protruding shanks of these Bolts, these also being carefully lined up. Two 1½ in. Strips 2 are then positioned, one each side of the Collars, being held in place by two Centre Forks passed through the two end Collars and secured by two Cranks 3. These Cranks are linked by a Narrow Strip 4, to which the activating linkage would be connected.

The rear axle is journalled in the centre Collar, being held in place by further Collars, the brake drum—again supplied by a 1⅛ in. Flanged Wheel—also being fixed on this axle with its flange over the heads of the Centre Forks. The Flanged Wheel is spaced from the axle securing Collar by three Washers, as before. The following parts lists apply to the Brake units, only, and do not include the sample chassis sections to which they are fixed.

PARTS REQUIRED

(Front Brake)		(Rear Brake)	
3—6	6—38	2—6a	5—59
1—6a	2—59	1—20	2—62
1—16a	1—62b	7—37a	2—65
1—20	2—65	2—37b	3—111c
1—24	2—120b	5—38	1—235b
2—24a	2—147b		

Ratchet Mechanism

To finish with, this month, we have a sturdy Ratchet Mechanism produced by Clive Hine of Stratford-upon-Avon and described for us by Bert Love of Birmingham. Clive designed the unit deliberately small and compact to fit inside the vertical tubular column of a heavy Paratrooper fairground model he was building. The weight of the revolving superstructure of the model naturally imparted considerable momentum during operation, therefore the drive had to permit the machine to continue running after the motor had been stopped, otherwise the momentum would have set up unwanted stress, or even damaged the gear train. A free-wheel mechanism was thus an important requirement.

" Construction ", writes Bert, " Is simple, but elegant, with reliability and tensioning adjustment. A Bush Wheel is fitted by its boss into one end of a Socket Coupling, a 57-teeth Gear being fitted into its other end to form a solid unit which is free to spin on a Rod. A Long Threaded Pin 1 is passed through a hole in the Bush Wheel and fitted with two Collars 2 and 3. The Pin is free to revolve, but is held in place by Collar 2 which is fitted with a standard Bolt to limit rotation of the Pin during the ratchet action. A pair of Nuts 4, locked together to form a square, are fixed on the Threaded end of the Pin to serve as a pawl, thus removing the need for a Meccano Pawl. The Nuts, however, must be very firmly locked to each other and to the Pin.

The main drive shaft 5 passing through the assembly carries a Ratchet Wheel 6 which is fixed in position by two Grub Screws and spaced from the Bush Wheel by three Washers. A Collar 7, spaced from the 57-teeth Gear by one Washer, holds the assembly in place at the other side.

Adjustment is achieved by first slackening Collars 2 and 3 on the Threaded Pin to allow lock-nuts 4 to sit fairly in the teeth of the Ratchet Wheel. The Bolt in Collar 2 is then set up to bear against the Socket Coupling, after which a Tension Spring 8 is attached to Collar 3, as shown, this being passed under the Socket Coupling to be fixed to the 57-teeth Gear

(*continued on page* 408)

Have you got a "FRUIT MACHINE" MIND?

By Richard Lee

"IF I could only THINK of something . . . ." We have all said this at one time or another. But when we most need a new idea to solve an immediate problem or to make a bit of money, it seems our minds insist on becoming as blank as a wall! It is very frustrating—why don't new ideas arise on demand if we are as inventive as we are supposed to be?

There is no doubt that some people inherit a certain 'idea-capacity'. To these people ideas arise spontaneously. There are many historical family trees of people who have a special inventive capacity. Whether the capacity is biological or simply the result of being brought up with a successful attitude to problems is a debatable point and too complex to tackle now. However, there is nothing at all to prevent any person—however dull in imagination—from having ideas of their own, providing that they first understand how an idea is made up and born within the brain.

The first mistake that most people make when they are furiously racking their brains for a sudden nifty notion is to believe that they will—simply by trying—conjure up something which is ENTIRELY ORIGINAL. This is a complete fallacy. No invention was ever born like that. Every idea ever produced by a crackpot to a genius was made up of parts of information which they had already acquired in some way. The process by which an idea comes about is by fact-linkage within the mind.

To explain this it is quite convenient to assume that the mind is like a one-arm bandit or fruit machine which you can gamble on at fairgrounds. Everybody knows lots and lots of facts on different subjects. These facts are like the fruit symbols on the revolving drums of the fruit machine—and in very much the same way they are continually revolving within the subconscious mind for examination.

The fruit symbols on the machine are its store of memories—in the case of the machine it is limited entirely, of course, to the subject of fruit or bells or whatever the symbols represent.

The next thing to do is to prime the mind with a neat way of expressing your problem. One can do this by a methodical analysis of the circumstances—for instance you may not need more money if you can find a way of achieving your ends by spending less—or even by seeking an answer that does not involve money at all, for your end product is what is required most usually and your 'need' of money is to obtain a certain thing that leads you to your goal. When you have expressed your problem to yourself in a neat manner—and perhaps found more than one way of doing so—you have really only identified your 'pay off' combinations like a fruit machine declares; three plums pays eight times, a strawberry with any other pays only two times and so on.

With the fruit machine you are now ready to insert a coin and try your luck—but your mind is more generous than any fruit machine. You don't have to pay it anything. With a fruit machine you only get one chance when you pull the handle. Your mind will work away silently on your problem for weeks on end if you want it to. The nature of the mind is to search for information that is asked of it and it will do this in the subconscious state quite automatically until it provides you with the best answer that it can.

If you haven't got the answer to your problem after a week of sleepless nights it is likely that you will have to mentally pull down the set-up that you have instructed your mind with. The reason why the answer has eluded you is quite simple. It simply means that you are lacking the data to complete. Your mind is like a fruit machine which is seeking a three-plum solution when one of its cylinders has no plums on it at all! You cannot make an apple pie without apples, pastry and an oven. With the mind, too, there is the additional problem that some of your data may be incorrect. You are in for a 'second-stage' research to ascertain factual accuracy and also to acquire more new facts before you get your final solution.

The true inventor recognises these mental symptoms and then gets down to hard work to put them right. It is his attitude which causes his thought to proceed along progressive paths—he realises the futility of racking and cudgelling his mind . . . . he will get nowhere that way.

Ideas can be made up by fact-linkage which utilises from two to ten separate ingredients. Until you are expert at inventing it is best to leave the ten-part ideas to the clever folk. In any case the two-part ideas are often the most successful commercially. This is because they are more easily understood and accepted by other people about you. They don't have many 'ifs' in their context and the natural attitude of every critic is to say sarcastically: "IF so and so were done, it would be fine, but it ISN'T, you see, old boy."

The way fact-linkage comes about is illustrated in two of the most famous ideas in history. 'Eureka' Archimedes solved the problem of specific gravity by watching his arms float in his bath water—his mind was primed with the problem of discovering whether base metals had been inserted into the State Jewels and his knowledge of physics was sufficient to connect the realisation that came before him in the example of his bath water to see at once that he had a solution in his grasp. Newton is reputed to have discovered the Law of Gravity when an apple fell onto his head. Again he was a well informed man who could relate an obvious experience with other facts he already knew. It is probable that both of these scientists would have eventually come to the same ideas even without the practical examples chancing to befall them; however, chance data can often be instrumental in forming a new idea.

It isn't only egg-heads who get good ideas, however. In fact many intellectual people are prevented from much opportunity in the ideas business simply because their minds are too full of technical and specialised subject data. In their subjects the obvious linkages have already been made by other people and their outside interests do not provide them with facts which link in to their special subjects at all. People who get the most ideas are semi-technical people who explore a number of different subjects. They relate facts between one subject and another, combine physics with chemistry or art with mathematics and construct an idea which nobody ever thought of before.

The idea jackpot is the inventor's pot of gold, under the rainbow's end. It is as well to appreciate that very few ideas actually bring in money by themselves. Even a very good idea is notoriously difficult to sell—indeed it may well be impossible to give it away. Inventors who spend a lot of time and money taking out patents on their personal ideas could often save themselves the time and

money by not bothering with patent procedures. Often if they were to reveal their idea from the rooftops and give it to the world they would find no-one would adopt it. People are funny that way. A good commercial idea, even if it is patented, may well still be pinched by foreign countries or copied with a slight modification which renders the alteration slightly better and itself benefits from a further patent.

A good case in point is the person who invented the reflecting " cats' eyes " studs which are put in roads to help night drivers. The inventor of this device could find no firm to take up manufacture. In the end he only made a success of his invention by starting his own factory and selling his cats' eye studs to councils himself. They were so simple, so cheap, and saved so many lives. In the end he became a millionaire, but his money came more from his diligence and business sense than from his idea. Inventors have a history of often dying poor; the financial jackpot from a good idea is exceedingly hard to obtain. For all this, many people have a desire to produce a good idea that will benefit the world and themselves. It would be better to be the proud donor of a useful idea and know that one's life has been spent to at least some good purpose, than to be a brilliant inventor dying embittered because someone else had profited as the immediate result.

The good inventor must be a philosopher. He realises that his ideas arise from the bits of information he already holds. Often he got these bits as a result of other people's work. He learns to instruct his mind with his requirements simply and then leaves the old fruit to sort themselves out. If he comes up with a ' lemon ' then he has another free go. If he finds his facts make up three plums in a row he may find he has developed a peach of a new idea. It could be a real pip and bring the jackpot, but often it is just the start of a whole lot of new work.

Quite often the best results for the individual lie in small everyday ideas. Ideas which improve your way of life, your job, your house and garden have an immediate market—you. Ideas are do-it-yourself. Many people can work wonders with their own environment if they apply their minds to their own surroundings and have the effort to see them through to a finished result. The inventor who is a dreamer is a creature of fiction; in real life ideas always require a lot of hard work to back them up—and if you don't have the interest to back up your own ideas it is not surprising to find other people who have no time for them either.

Everybody is capable of producing ideas. It is useless waiting around for somebody else to find your solutions—some will come by and by in this way—a fantastic medical discovery may even save your life, but it is not likely that you will pay the inventor much even for that. Invention is a two-way business and satisfying in itself. Never think you are too unimaginative to produce a good idea, or believe that your education has been too poor. One day you could be sitting in the bath or standing in an orchard or simply saying: " Why don't they make . . . . "

When you say " Why don't *they* " just say it again like this: " Why don't I . . . ?"

Meteorites reveal Life elsewhere in the Universe

says Douglas Greene

THE STRONGEST evidence yet of life elsewhere in the Universe comes from the examination of a meteorite picked up in a field in Southern Australia. Scientists examining it have found the piece of rock from space to contain the amino-acids which are necessary for making protein—and thus of all terrestial organisms. And this is just another aspect of the way in which examination of the objects which bombard Earth from space pays off.

Missiles from space bombard the earth at the rate of a million an hour. These particles vary in size but most of them are tiny. In all less than 2,000 meteorites have been found where they landed on our planet.

This century's two really big meteorite falls both took place in Russia, one in Siberia in 1908 and the other at Vladivostock in 1947. The next big attack by pieces of rock from space is due in 1986. Fears are that this time a meteorite of gigantic size may strike at some centre of civilisation. An American expert, Dr. F. L. Whipple, has pointed out that if a big meteorite hits Los Angeles, the city would be completely wiped out.

One of the most recent heavenly bodies to race towards our planet flashed out of space to land on Earth near Vladivostock just over twenty years ago. It weighed some 300 tons, but the terrific impact of coming into contact with the air surrounding the Earth shattered the huge missile into hundreds of fragments.

Most meteorites are extremely small, rather like tiny grains of sand. But some at the time of their impact on earth weigh many tons. It is calculated that in 3000 years these space missiles have added about one million tons to the weight of our planet. These balls—mostly of iron and stone—first glimpsed more than 100 miles above the earth, race about the sky at incredible speeds. Many descend earthwards at up to 10,000 miles an hour, but the air we breathe saves us from destruction. Our atmosphere is many times tougher than the thickest armour plate.

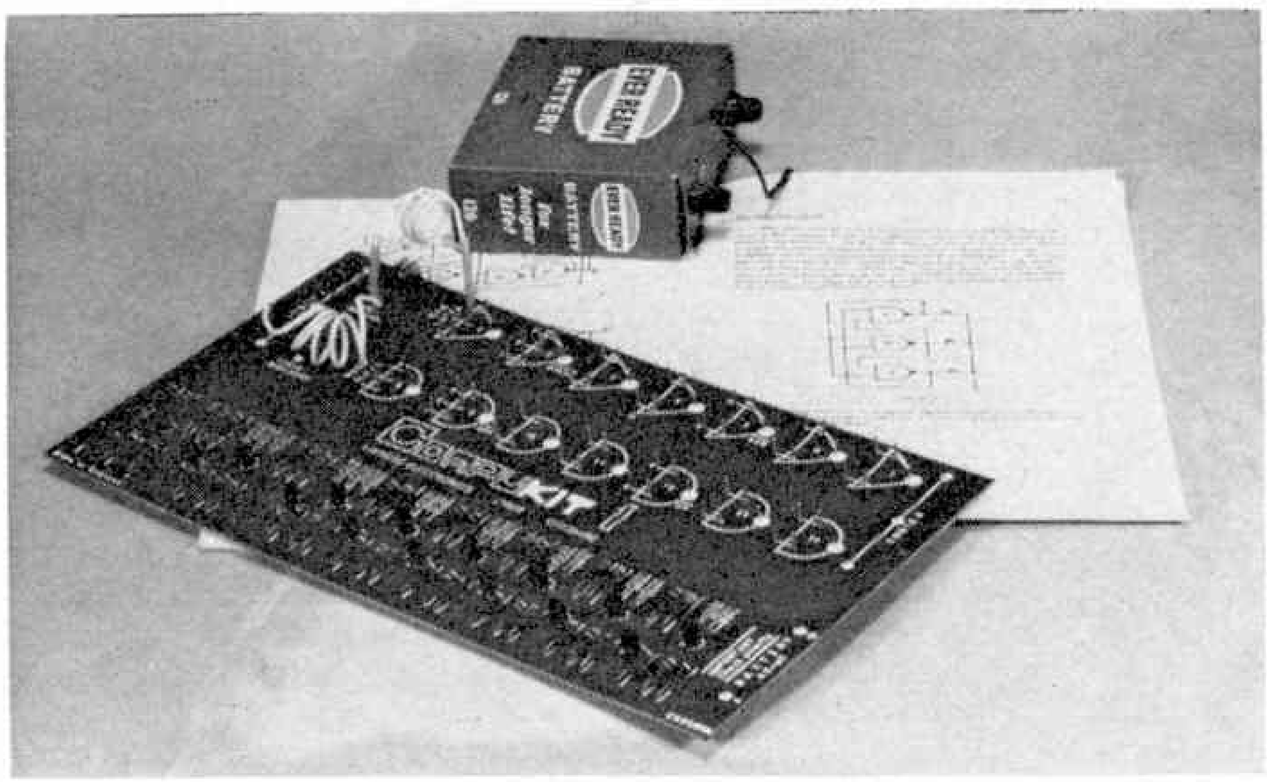
It is nothing short of amazing that the earth's millions of inhabitants escape death and injury from this daily bombardment by space missiles. Yet in 200 years only one person has been discovered who was hit by a meteorite. She was an Alabama lady who happened to be standing close to where a meteorite landed. She suffered shock and injury but claimed the eight inch projectile as a souvenir.

Scientists believe that once a very big missile did strike the Earth. It must have been an object of great dimensions. It is thought that it crashed into our planet with such force that it left the Earth permanently tilted on its axis.

In addition to the 2000 meteorite landings which have been plotted, scientists know that millions more have landed. Most of them are buried in the earth, some miles below the surface. Others lie unrecognised in remote and inaccessible parts of the globe.

One of the greatest dents in the earth is in the Arizona desert where a huge meteorite landed. The cavity it caused is 600 feet deep and averages four fifths of a mile across. In Central Australia thirteen meteorite craters lie within an area of half a square mile. Other meteorite pits lie in the Arabian desert and in other lonely places. Actually on the average only about five of these missiles are observed falling each year.

It has been the detailed examinations over the years that have revealed the secrets of the recovered meteorites. Some have been found to contain iron and nickel as well as hitherto unknown minerals and alloys. Diamonds, gold and even traces of platinum have been found in them. The latest discoveries by NASA scientists, leading to a stronger belief that life in some form exists in space, are only part of the new wonders of the Universe being opened up to man.



Have You Seen?

A do-it-yourself computer and a batch of new books

WE LIVE in a world in which the computer plays an ever-increasing part, but how many of us have the foggiest idea of how a computer works? Naturally a high proportion of older science and maths. students have some knowledge of the subject, but the vast majority know only that it involves transistors and things.

One answer to this lack of knowledge is the Compukit, by Limrose Electronics, Lymm, Cheshire, which is a relatively simple kit for making what is in fact an educational computer. The No. 1. kit includes a printed circuit board, 16 transistors, 16 diodes, 42 resistors, terminal pins, bulbs, clips, patch leads etc., and assembly takes only an hour, provided you can solder. Making up the patch leads takes about the same time. An instruction book makes it all very simple and straightforward, and test procedure is given.

Once it is working, you need to read carefully the explanatory notes in the instruction book, which are comprehensive and cover digital computer principles, binary arithmetic, logic, Boolean algebra, and a whole host of other related matters. It is not exactly light reading, but to understand how a computer works it is necessary to absorb the information, which is not difficult when you settle to it.

The Compukit 1 builds into seven NAND and seven NOR gates, two of each having three inputs and the others two each. Gate operation can be grasped by following the step-by-step experiments in the instructions. Further notes lead on to a logical comparator circuit, decimal to binary conversion, anti-coincidence circuit, binary addition and subtraction, polyflops, and so on. There is even a section on constructing an electronic clock on the equipment.

It will be clear that this device is not a toy but serious educational equipment. Our sample was handed over to a group of young computer experts who had a lot of fun with it and confirmed that it was completely correct in principles, so that apart from one or two spelling errors in the notes (e.g. "excercise" for "exercise" and "lightening" for "lightning") we cannot criticise the product. Schools would find it a most useful teaching aid and for individuals it is a true do-it-yourself method of putting oneself in the picture with regard to one important aspect of modern technology.

Price, incidentally, is in the region of £10.50.

Books Received

Quite a few books have come in for review recently, a fairly mixed bag at that.

"The Observer's Book of Aircraft", 20th edition, describes 185 of the latest aircraft with 335 photos and silhouettes with dimensions, details, and notes on all of them. No need to recommend this fine pocket guide, which is marvellous value at 45p. Accompanying it (there are 42 books in the series!) was "The Observer's Book of Flags", 4th edition, with over 400 flags in colour and a mass of useful relevant information. The colours are perhaps not quite true in all cases, and whoever spelt "Yacht" as "Yatch" deserves a rocket, but it is a fine reference book on the subject. Also 45p, both published by Frederick Warne & Co. Ltd.

David & Charles have produced "Shipbuilders of the Thames and Medway" by Philip Banbury, 336 pages at £4.20 (£3.75 before 1/2/72). This is a remarkable study of all the yards on these rivers from Tudor times to date, with histories of each and in many cases, where records allow, complete lists of all vessels built. Not many illustrations, but masses of fascinating facts.

"German Secret Weapons of World War II" by I. V. Hogg is an 80-page publication by Arms & Armour Press at £1.50. It covers rockets, homing and guidance devices, proximity fuses, radar, fire control, and target detection gadgets, artillery, etc., and includes brief notes of scores of items with drawings or photographs of many of them. Some of the devices seem almost science-fiction. Fascinating.

Back to earlier wars—"Uniforms of Marlborough's War's" from Charles Knight & Co. Ltd. seems a little expensive at £1.25 for a 32 page book, though 8 pages are in full colour and the hard binding is attractive. There are 40 drawings in all and it will be a must for wargamers of the period.

"British Infantry Colours" from Almark runs to 56 pages, 6 in colour, and costs £1.00 in paperback or

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AMONG THE MODEL-BUILDERS

(*continued from page* 405)

by a Nut and Bolt 9. If additional tension is required, the Spring may be anchored farther round the Gear Wheel. A Pinion drive to the 57-teeth Gear is then arranged from the motor or gearbox, this Pinion passing on the drive, via the assembly, to the main shaft 5 and hence to the revolving superstructure of the parent model to which the mechanism is fitted."

PARTS REQUIRED

1—24	1—43
1—27a	3—59
3—37a	1—115a
2—37b	1—148
4—38	1—171

£1.50 hard bound with dust jacket. Lots of detailed information for military enthusiasts handily assembled and easy to look up.

From Patrick Stephens Ltd. are two facsimile reprints of Great Western books, " The ' King ' of Railway locomotives ", first published in 1928, and " Twixt Rail and Sea ", 1927. Both were aimed originally at boys, and the style of writing rather reflects this. The first deals with the King class locomotive, with lots of drawings and photographs, and the second with docks owned by the G.W.R., notably those in South Wales. Both books suffer a little in the reproduction of illustrations, but railway enthusiasts and collectors will not find this a drawback. Price is £1.50 each; both run to 152 pages.

Another Great Western reprint comes from David & Charles, titled " G.W.R. Engines ", and reprints the engine books of 1911, 1928, and 1946, with some pages from that of 1938. Reproduction of photos and drawings is excellent and the book is thoroughly recommended. Originally, each book cost 1/-; this one costs £1.75 and extends to 244 pages.

From the same publishers is " LMS Steam " by O. S. Nock, 270 pages at £3.15. A companion to the same author's " Southern Steam " and " LNER Steam ", it tells the story of the LMS Railway from around its formation by merger in 1923 to 1948, and is a book that railway fans will find irresistible.

Yet more railway books from David & Charles include " Talyllyn Adventure ", a re-issue of " Railway Adventure " (1951) and " Talyllyn Century " (1965) which cover the story of the very first railway preservation scheme, and between them form an account of the first 25 years of the preserved Talyllyn Railway. 290 pages at £2.50, and very readable.

" The Aberford Railway " by Graham S. Hudson sounds as though it's another Welsh one, but in fact it is the Yorkshire coalfields that the railway served and this book is as much about the Garforth Collieries and the industry in the area around as about the railway. Same publisher, 184 pages, £2.50.

For their next titles we move to Ireland—" The Runaway Train, Armagh 1889 " by J. R. L. Currie, which is a detailed examination of one of the worst train accidents ever, when 80 people, many of them children, were killed on a Sunday School outing in what is known as a " runaway collision ". 148 pages, £1.75.

" Railway History in Pictures—Ireland, Volume 2 " by Alan McCutcheon is large format, 112 pages, with scores of well-reproduced photographs of locomotives, bridges, railway buildings, etc, price £2.75, yet again from D & C. Another collector's book, this volume covering the 20th century, it is comprehensive and perceptive in its treatment of the various systems in Ireland.

To Italy now (also D & C—what a remarkable output this firm has) with " Italian Railways ", one of the Railway Histories of the World series. This is one by P. M. Kalla-Bishop, 208 pages, not quite so many photographic plates as usual, but quite a work of art in compressing the history of the country's railway systems into one volume. Its appeal will be mainly with students of Continental railways, though it cannot fail to interest all railway lovers.

Finally, D & C. have reprinted W. J. Hughes " A Century of Traction Engines ", which originally appeared in 1959, as a massive 262 page paperback at £1.25. Prolifically illustrated, and by an acknowledged expert in the subject, the relatively modest price will ensure that road engine fans who have not yet got this book on their shelves can rectify the omission speedily.

KEILKRAFT Handbook

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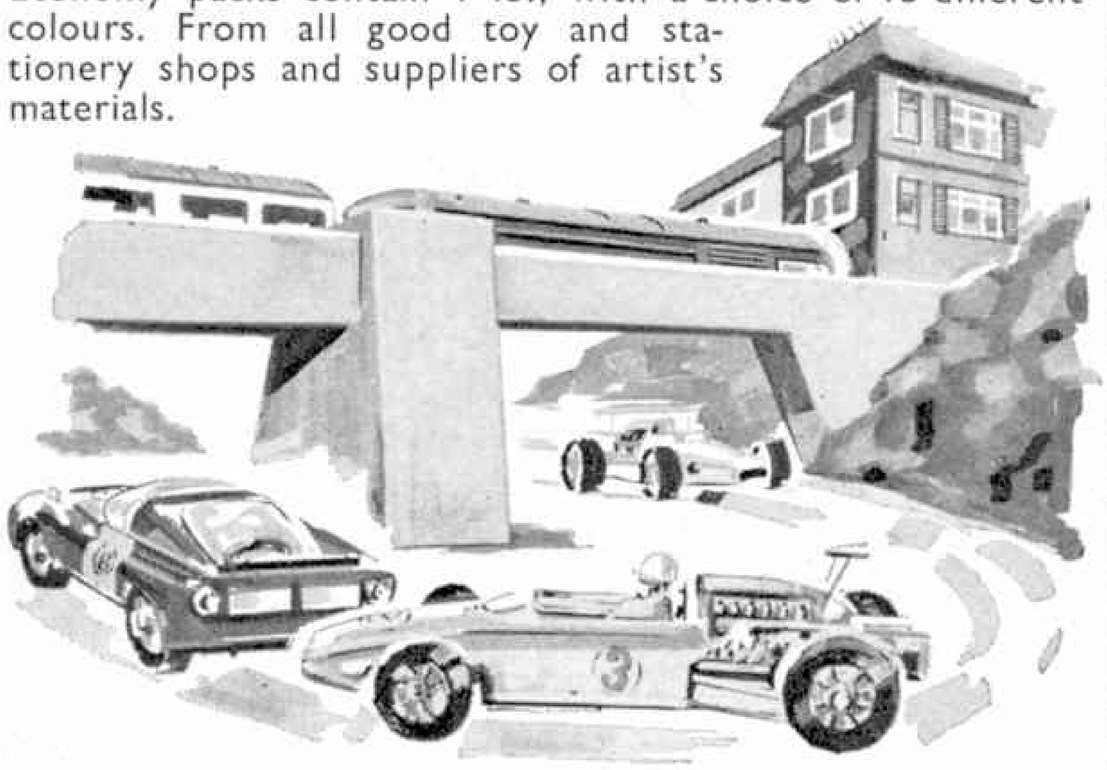

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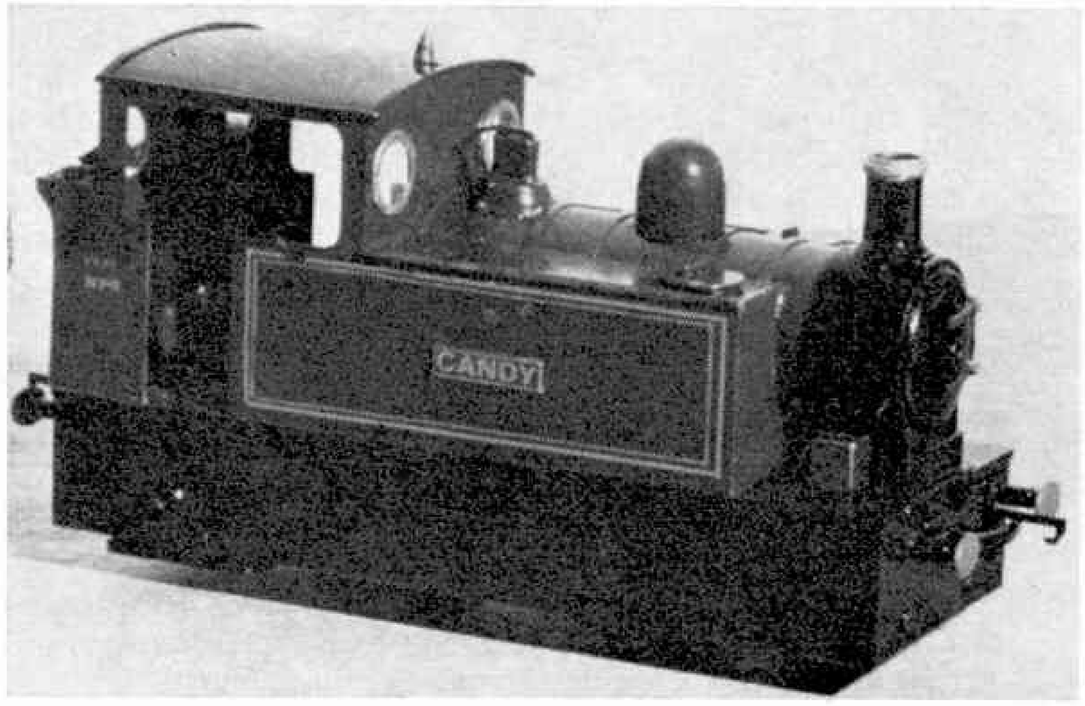

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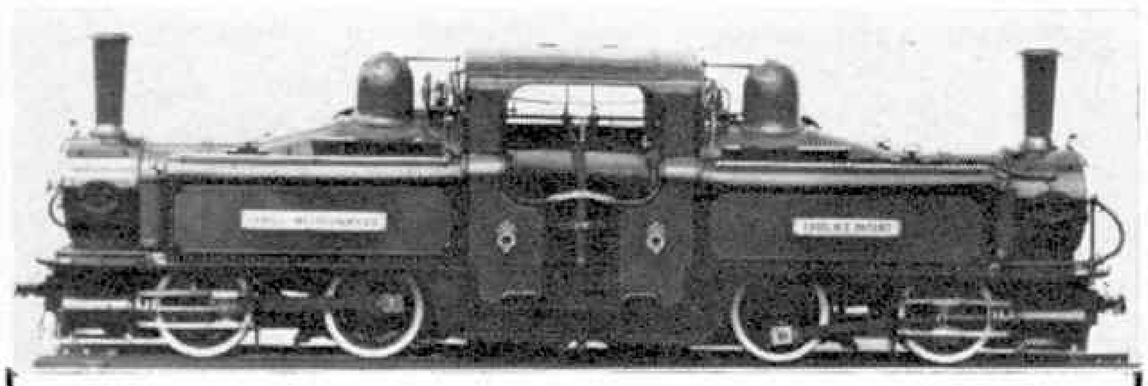

There are reports on the recent model engineering exhibitions at Harrow and Stockport and on the opening of the new track extension of the North London Society of Model Engineers. E. H. Jeynes talks about hydraulic rams and other interesting articles include J. Bamford on his experiences with Flash Steam hydroplanes and John de Bank on his model Fairlie double-boiler locomotive—a scale model of one of the Ffestiniog engines.

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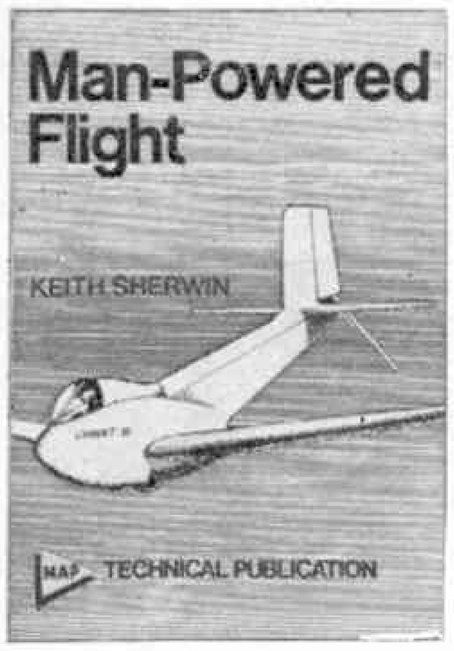

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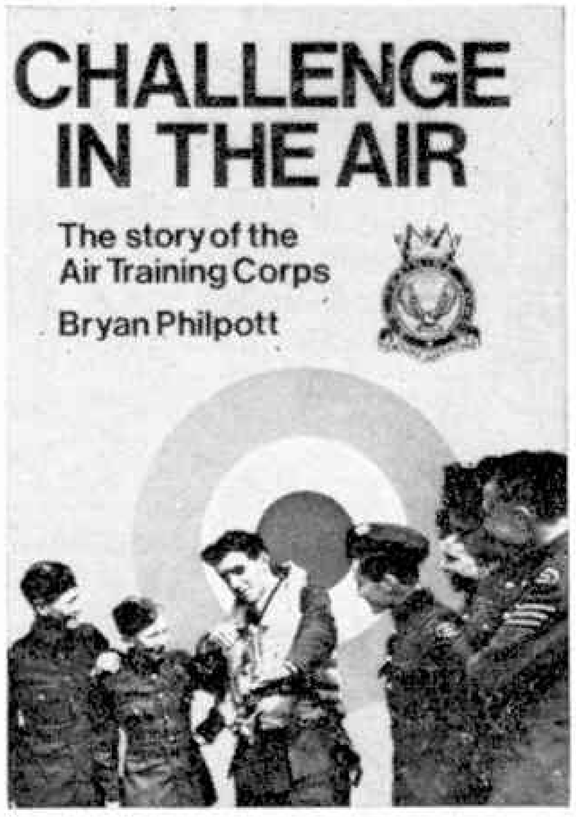

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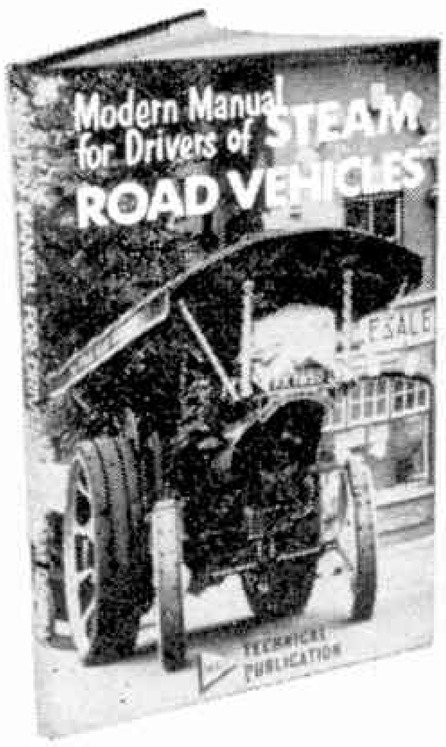

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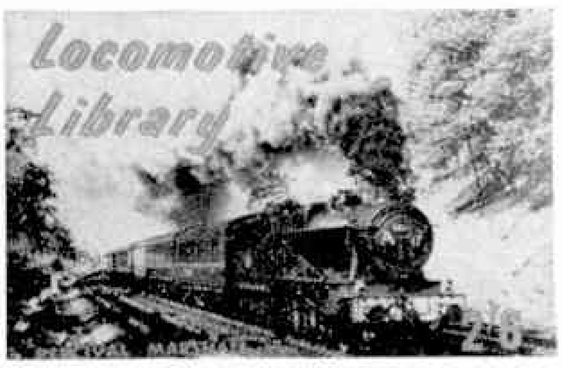

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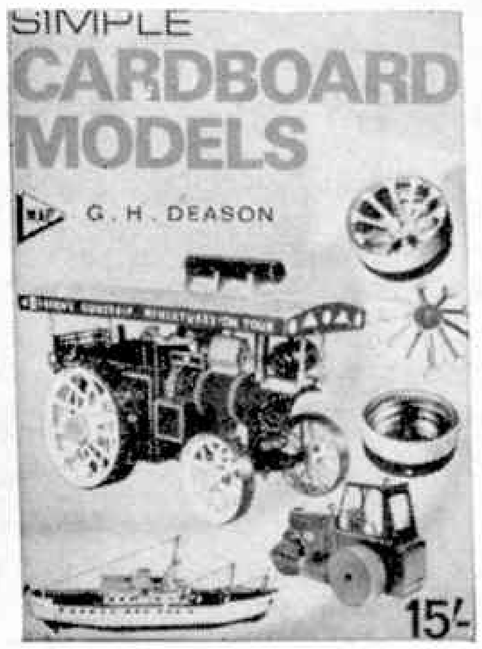

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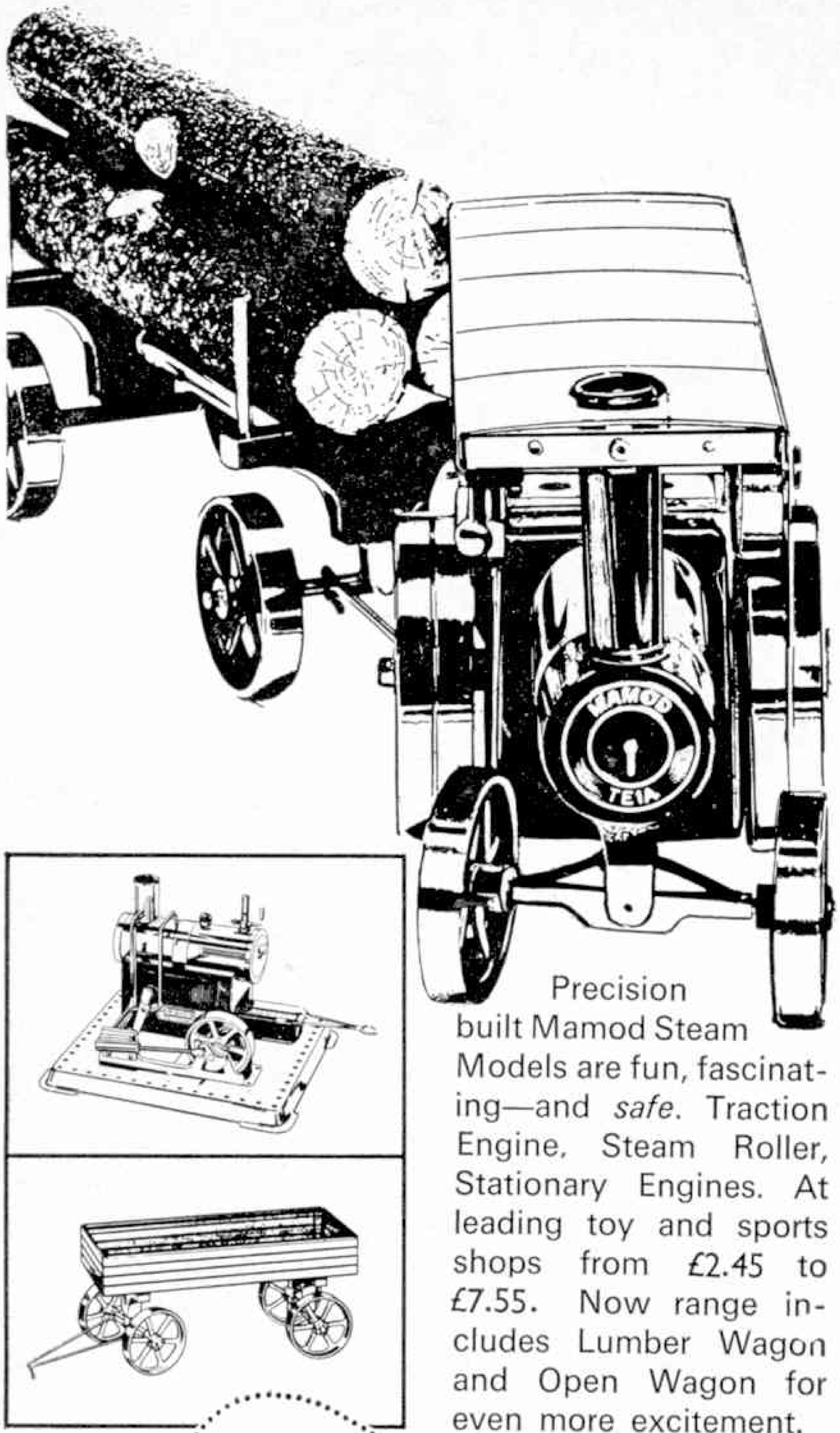

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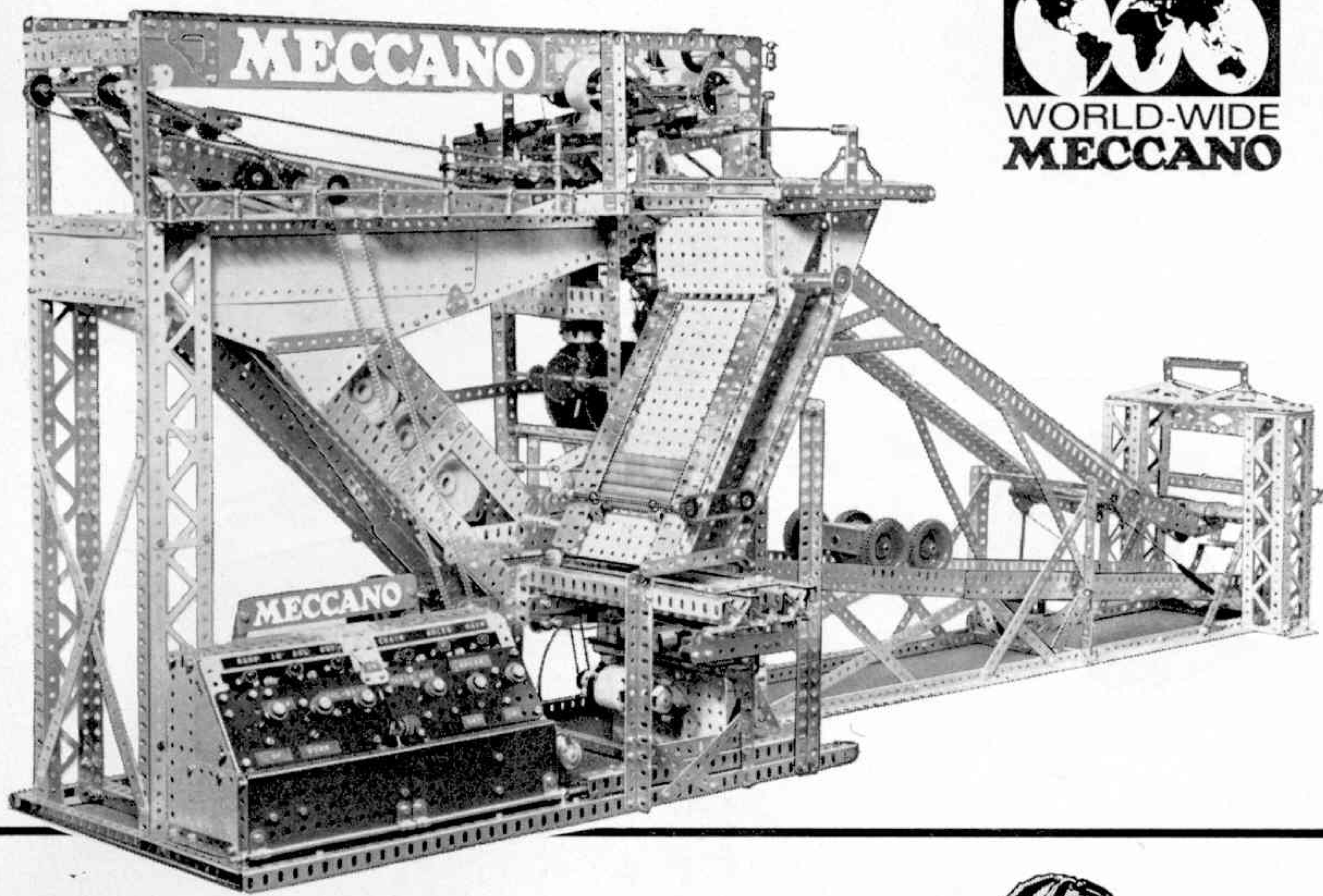

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MECCANO

Italian model-making genius Giuseppe Servetti has done it again! This time he has built from metal Meccano parts a model 'factory' that automatically assembles and then dismantles Plastic Meccano trolleys in a continuous cycle.

It works like this.

At the top of the model are two magazine hoppers and a conveyor. Wheels are fed into one of the hoppers and axles into the other. Chassis are placed on the conveyor. These parts are then progressed down to the assembly section at the right of the control panel. Here the wheels and chassis are held in position whilst the axles are shunted into place.

The complete trolleys are then taken away from the assembly section along a conveyor ramp. At the end of this ramp the trolley interrupts a light beam directed on a Meccano photo-electric cell. This in turn switches on a motor-driven escalator which carries the completed trolley to the top of the factory.

When they reach the top the dismantling process starts. The axles are pushed out, the wheels and the axles fall into their respective hoppers, the chassis are re-cycled to the assembly section—and at the same time another trolley is being built.

Power for all movements comes from several Meccano 3-12 volt D.C. motors and is transmitted through chain and sprocket drives and compound gearing. The control panel is programmed to operate multiple Meccano relay banks which control the sequence of operations.

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