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DAVE ROTHWELL

Consulting Editor for Meccano Ltd.
J. D. McHARD

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MAP **HOBBY MAGAZINE**

FRONT COVER

The British Petroleum vessel *British Commodore* in Table Bay, South Africa. This picture taken a few years ago, shows the pre-1958 B.P. colours and at 64,000 tons *British Commodore* is by no means gigantic. See "Leviathans of the Deep" for further tanker information. **Photo: Courtesy of British Petroleum Co. Ltd.**

NEXT MONTH

In the May issue we have an interesting article on Veteran Cars, with the attention focused on the R.A.C. London to Brighton Veteran Run. Meccano models include a Double Fairley Locomotive, this is, of course, the kind of engine that runs on the Welsh Festiniog Narrow Gauge Railway. For the not-so-expert, construction of a Gantry Crane will provide interesting reading. Also included in the Meccano articles are instructions on how to build a striking device for a Meccano Clock. All of the regulars are present, including, Air News, Stamps, Battle and Workbench.

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CONTENTS

WORKBENCH 173
News And Views by the Editor

LEVIATHANS OF THE DEEP 174
The Story of The World's Great Oil Tankers

BASIN WHERE SHIPS ARE BORN 176
Experimental Ship Models Detailed

INTRODUCING THE MAMMOTH MINIATURES 178
Training School for Future Tanker Captains

THERE'S MORE TO COINS THAN MONEY 180
P. J. Leighton Describes One of the Fastest Growing Collection Hobbies

HAVE YOU SEEN 182
The Latest Products, Reviewed

BATTLE 184
Part XII—Infantry Weapons

AIR NEWS 186
John W. R. Taylor on Aviation

MEDALS ON STAMPS 188
Stamps on a Theme by James A. MacKay

SLEEKSTAR 189
A Simple Rubber Powered Aircraft

AMONG THE MODEL BUILDERS 193
Readers' Meccano Ideas

MODEL ENGINEER EXHIBITION SUCCESS 195
Prize Winning Steam Ploughing Engine

THE DINKY WORLD OF JOE 90 196
A New Dinky reviewed by Chris Jelley

MECCANO—FRENCH STYLE 197
Two Simple Models Designed by Meccano France

UNIVERSAL MILLING MACHINE 200
A Meccano Model for the Experienced Enthusiast

AWAY FROM THE SEA IN SHIPS 204
The Man Made Waterways of Britain

TRANSPORT TOPICS 207
A Look Underground

GREAT ENGINEERS 208
No. 15 Sir Frank Whittle

MILITARIA 209
Charles Grant reviews New Battle Gaming Products

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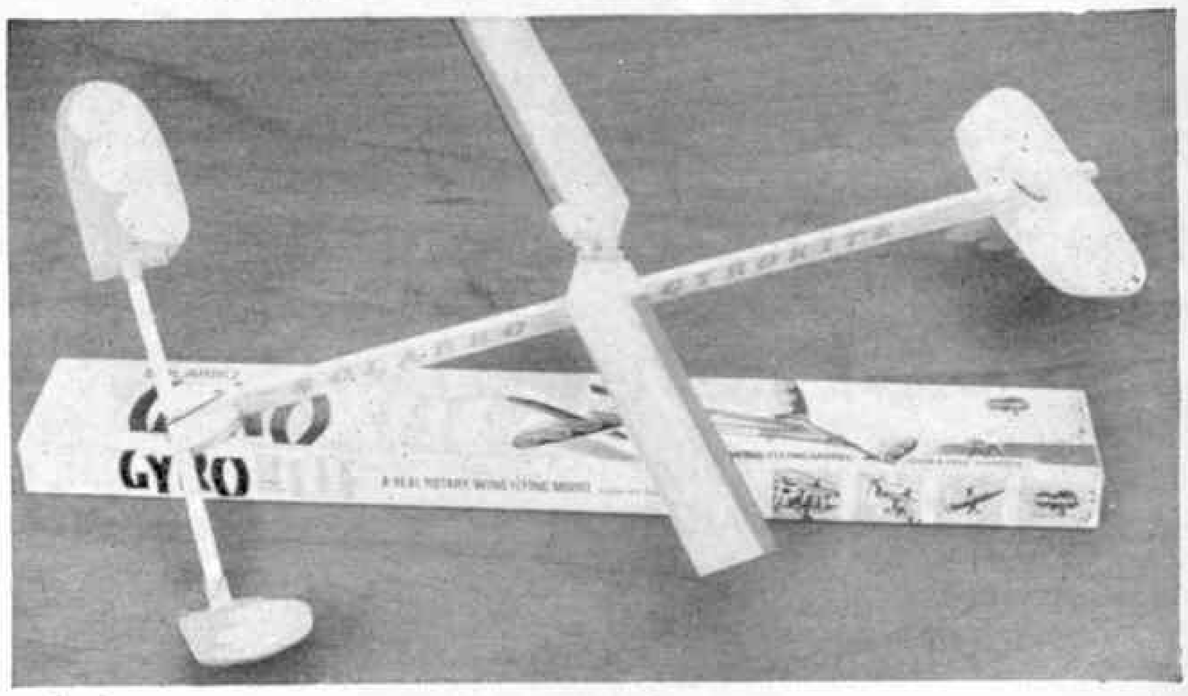

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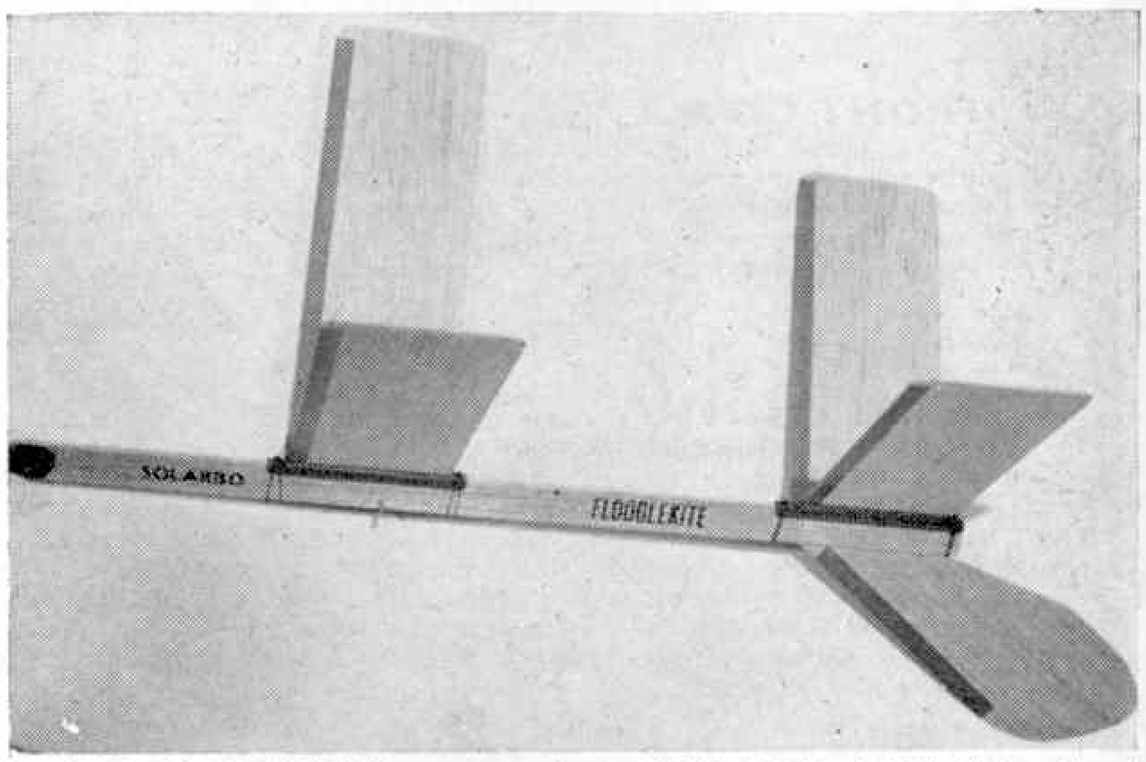

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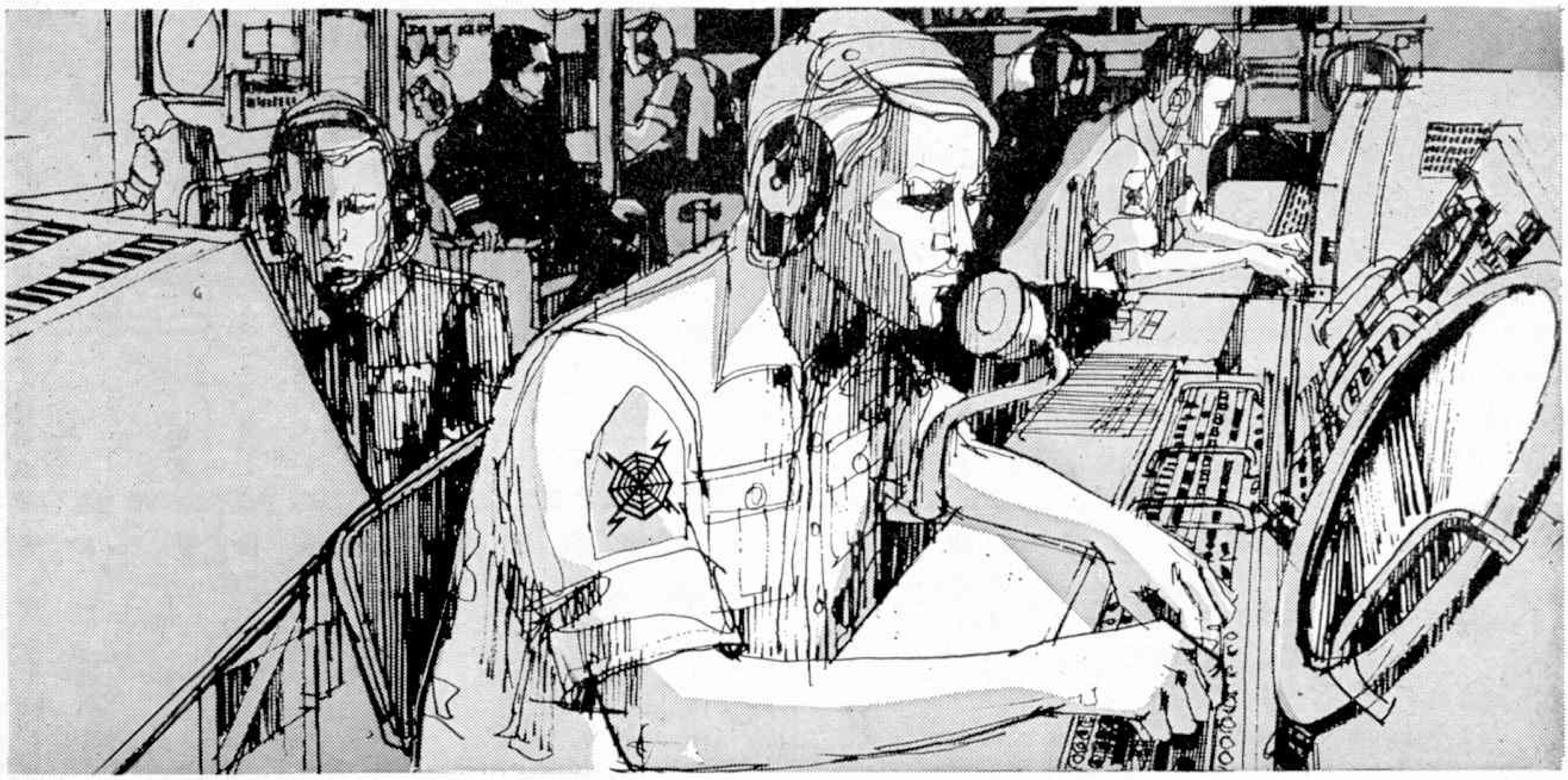

You are looking at the operations room of one of the Navy's new guided missile destroyers.

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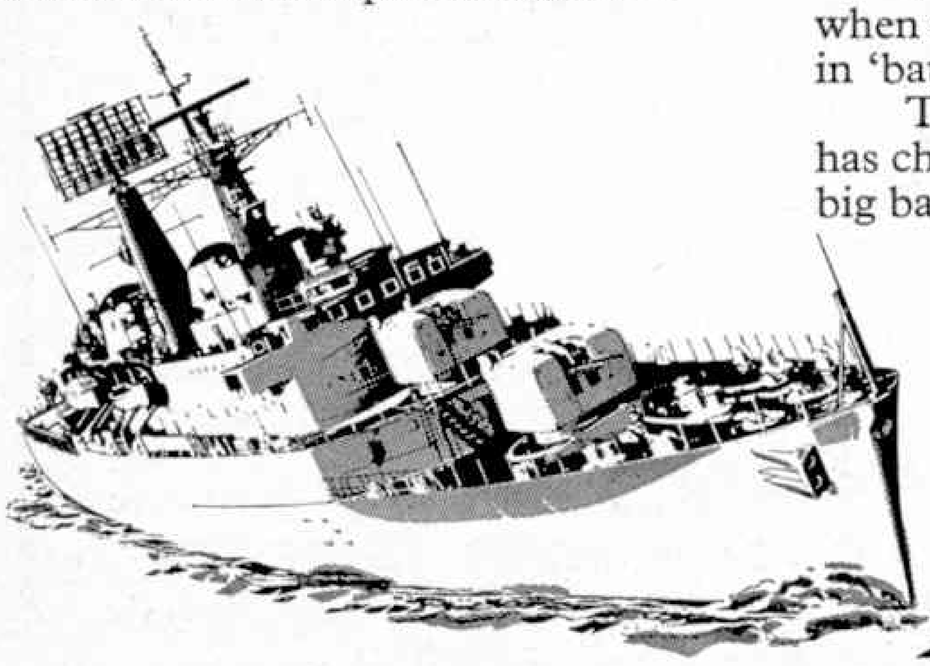

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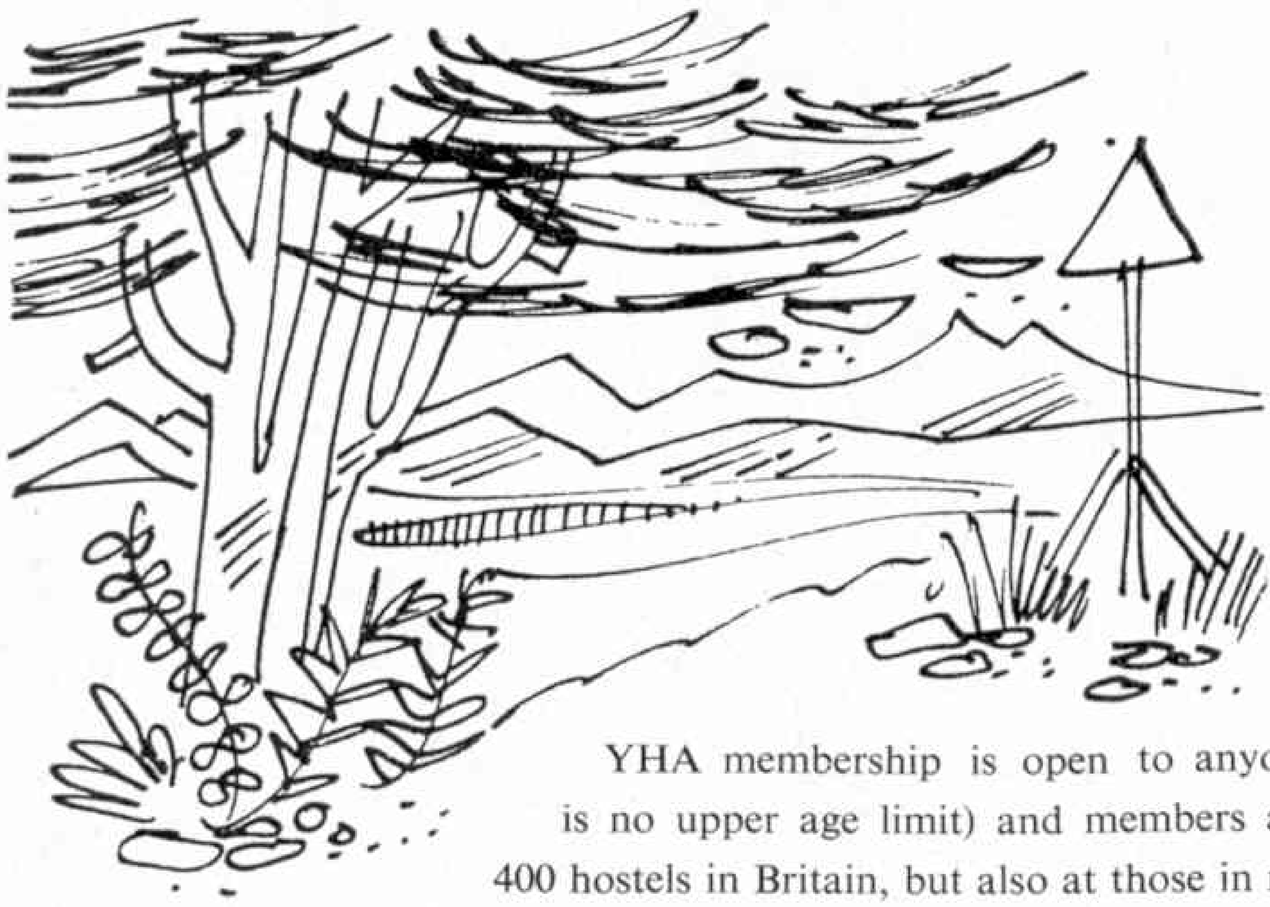

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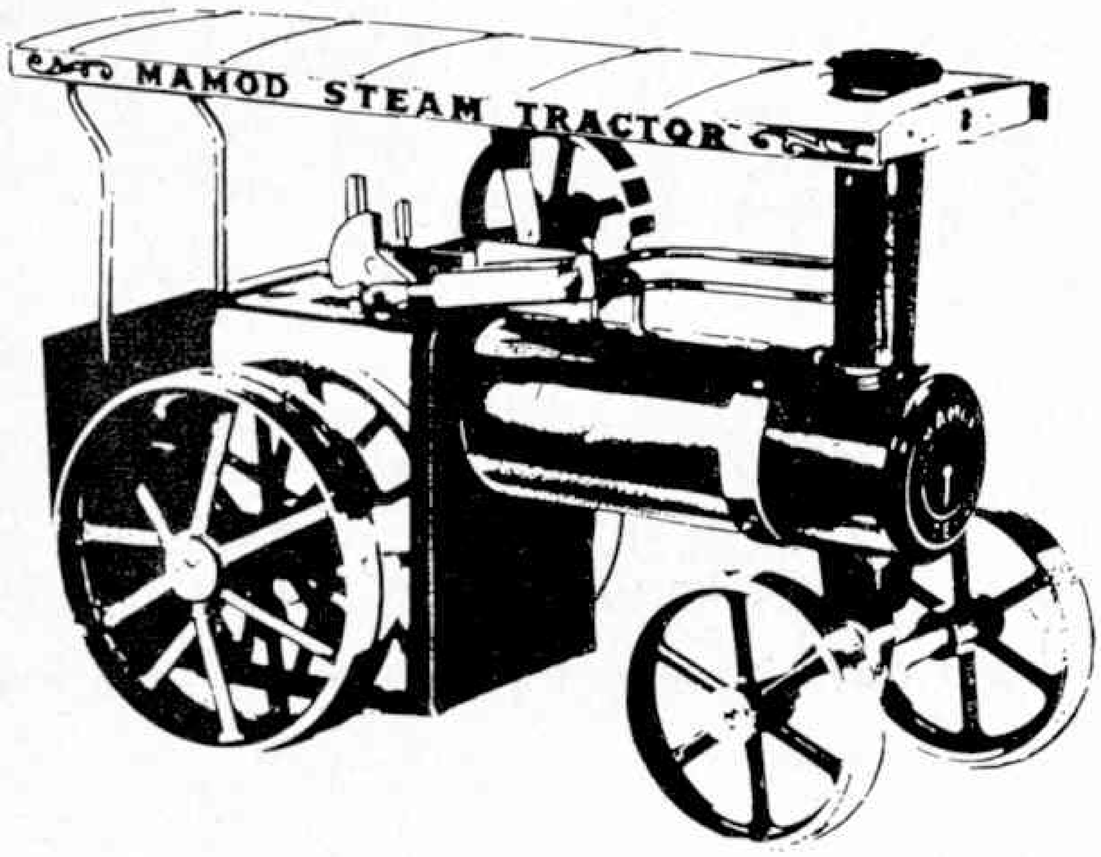

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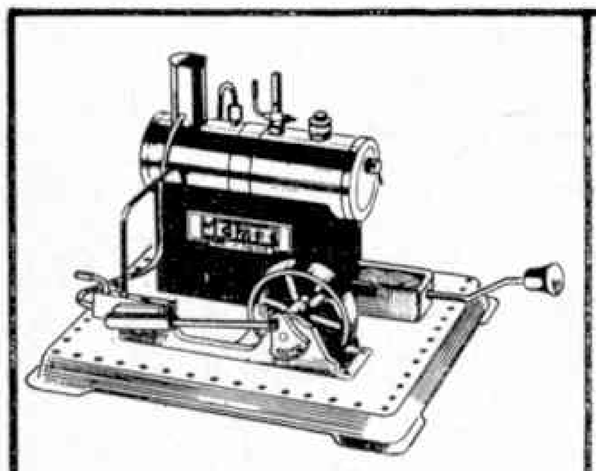

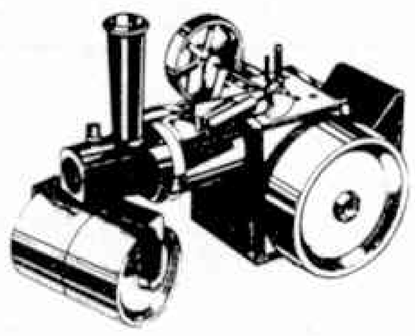

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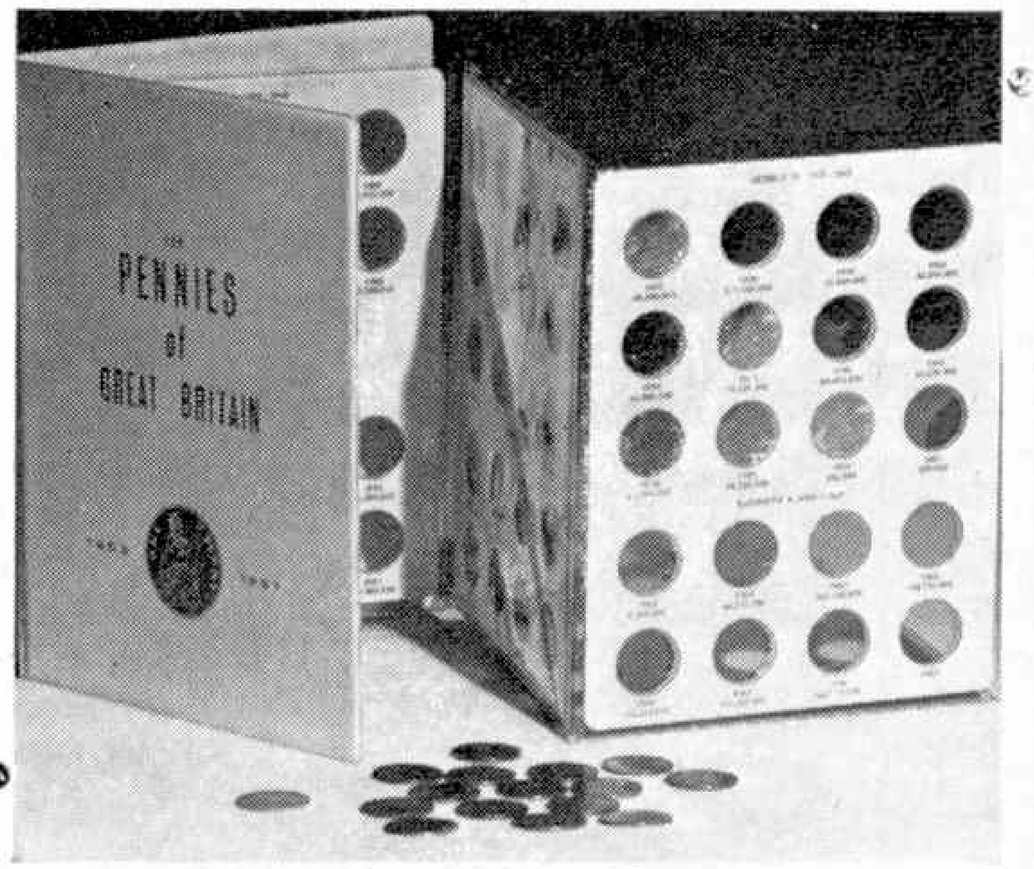

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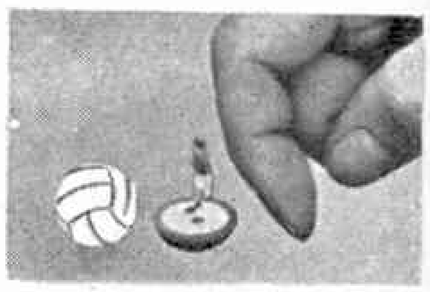

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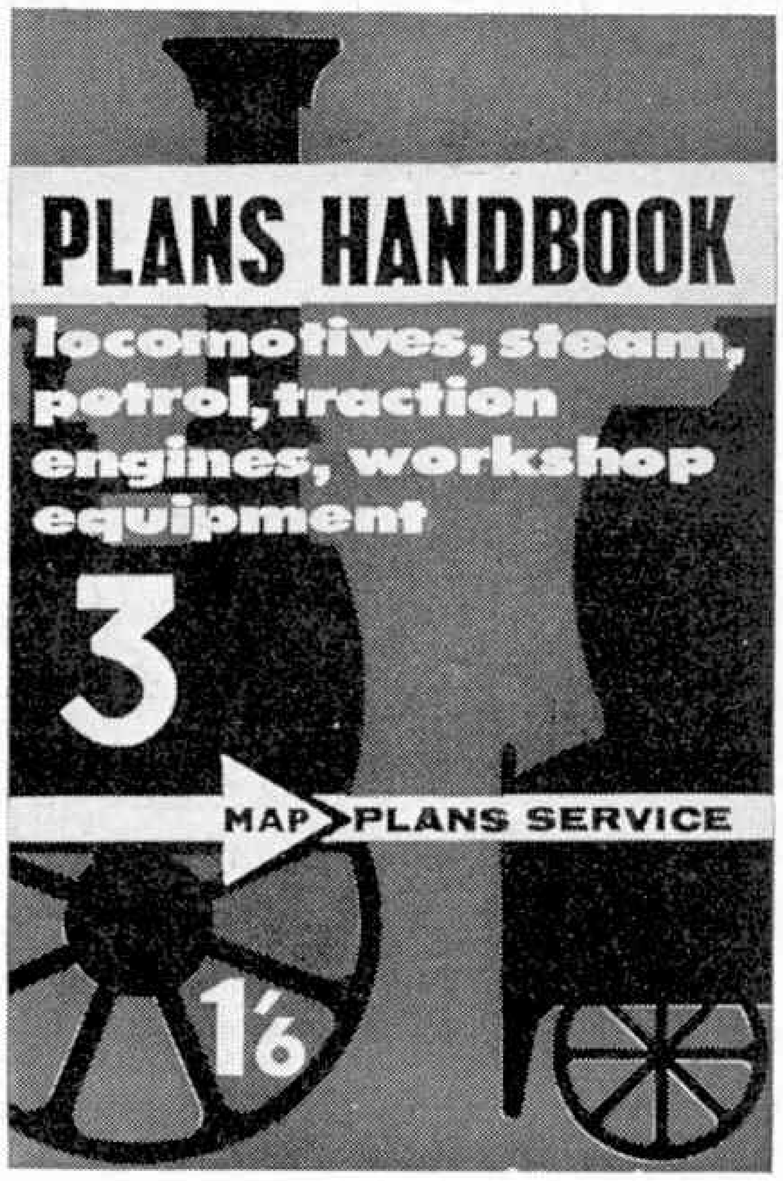

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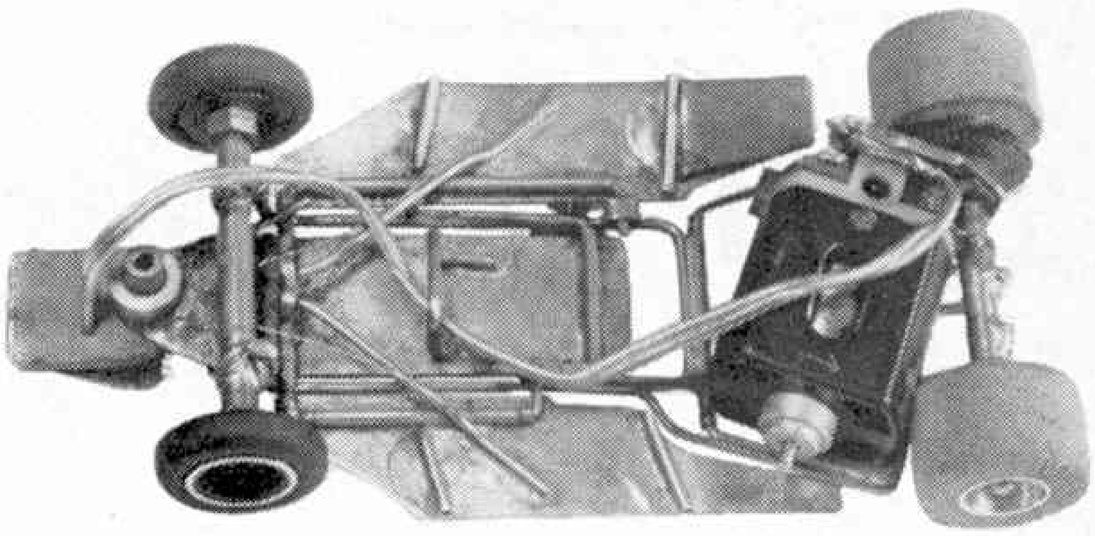
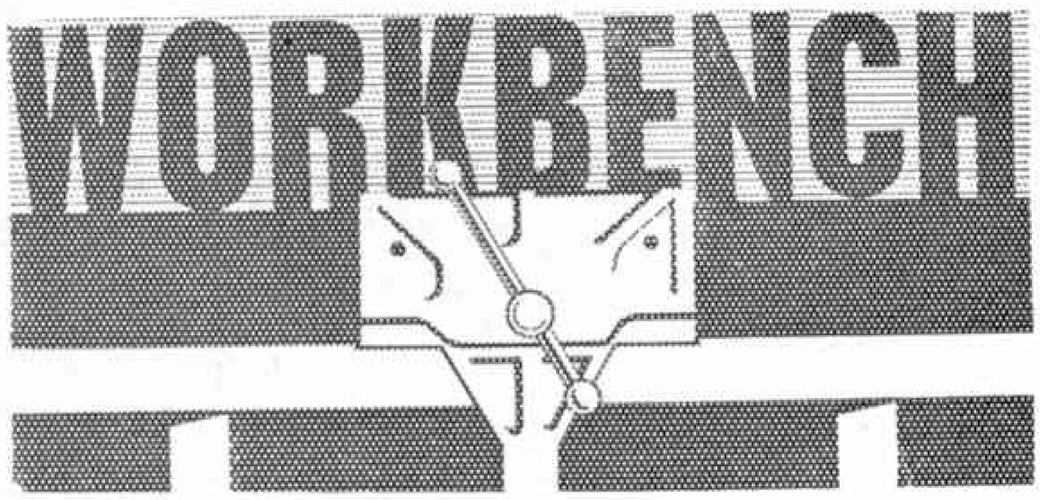


Model Cars for April will carry Prototype Parade plans for the Repco Brabham BT26 by Roger Taylor with one of John Wood's usual highly informative descriptions.

For builders, John Veasey starts a step by step photo feature on chass's construction which everyone can follow—and for 1/32nd scale fans, there's an anglewinder plumber Ford Thunderbird. For plastic modellers there's a modified Monogram Rolls Royce Phantom and we have a big photo report on the recently held Swedish Slot Racing Champion hips together with, of course, many more exciting items, plus, that elusive E.C.R.A. Handbook.

1st FRIDAY MONTHLY **2/6**



Duke of Edinburgh's Award Scheme

In a future issue we will be detailing some aspects of the Duke of Edinburgh's Award Scheme for boys. We would like to incorporate into this some readers' experiences of the scheme. If any readers have taken part in any of the awards (bronze, silver or gold), we would be pleased to hear about them and see some photographs if possible. We cannot promise to publish all that we receive, but an interesting selection will be included. All contributions will be acknowledged, and photographs that are submitted will be returned if requested.

Holiday Winner

The winner of the Model Power Boat Association competition to estimate the total attendance of visitors at the recent Model Engineer Exhibition, was Mr. H. T. Brownless of the Keighby Model Engineering Society. His estimate of 36,219 was the nearest to the actual figure of 36,224. The prize for winning the competition is a free trip to the European Model Power Boat Championships to be held in Bulgaria later this year.

An unusual Model

In the early years of the motor industry various manufacturers used to give away replicas of their full size products as part of their sales promotion schemes. Models in those days were usually of tin-plate construction, often powered by clockwork. During recent years this practice was discontinued, mainly for economic reasons, so it was rather surprising to hear that the largest car producers in the world, General Motors of America, had started to produce models of some of their immense range of cars in model form, purely for advertising purposes. The example sent to us, by courtesy of Opel Cars U.K., is the latest 2 seater Opel G.T. This car incidentally is Opel's answer to our Lotus Elan.

The model is in 1/24th scale, and is superbly detailed throughout, including underside details. Bumpers and wheels are chromed and the tyres soft black plastic. All remaining parts are bright red. The most impressive part is the one-piece body shell which is complete down to the smallest details.

The manufacturer is unfortunately unknown at present and none of the models will be available in this country in the forseeable future which is a pity as they would make admirable show models, or with a bit of work perhaps be turned into slot cars.

General Motors of America's model of the new Opel G.T., the full size version of which will soon be seen on our roads.

Dear Readers,

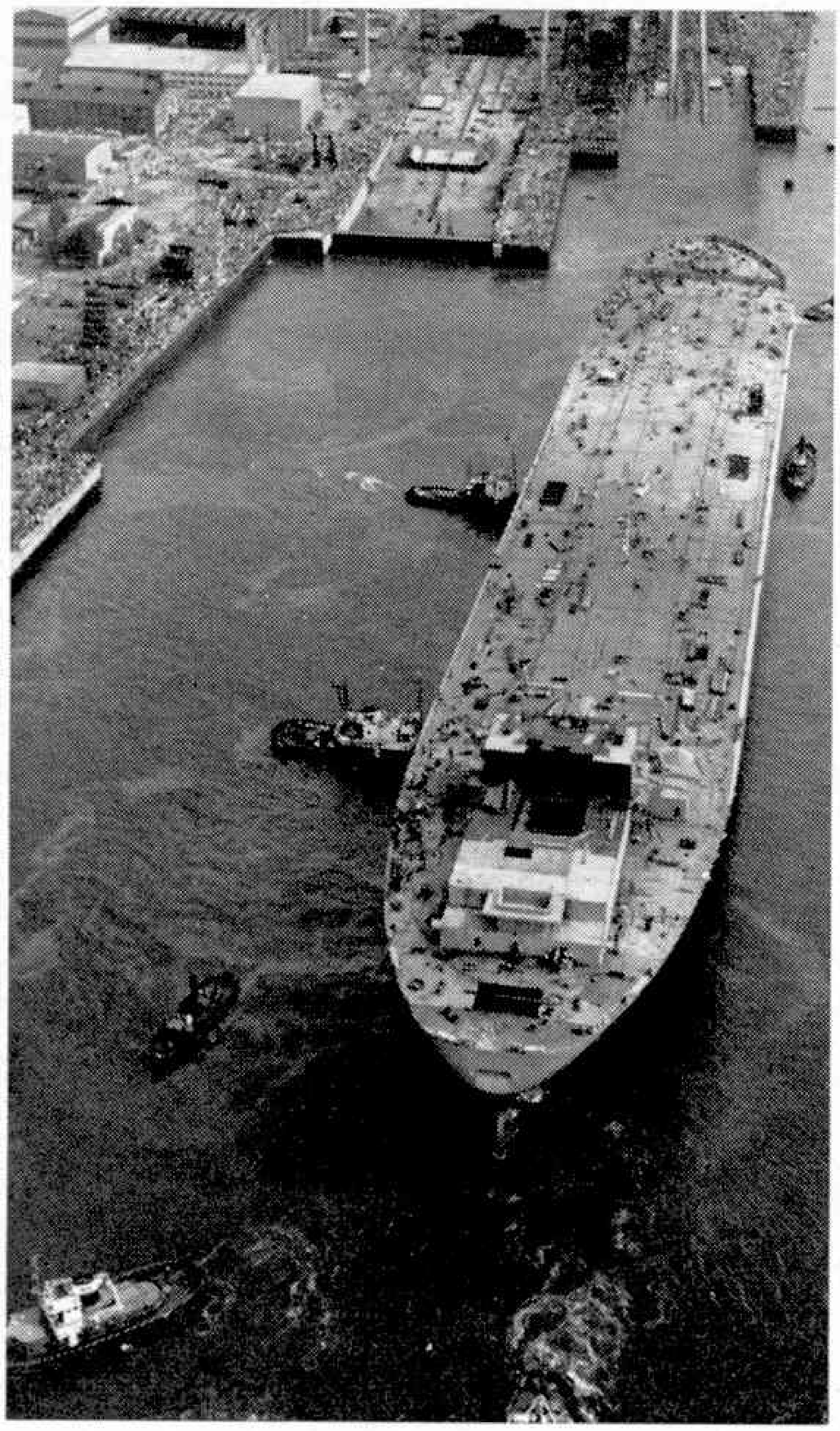
Editorial Change

Writing this at the beginning of February before I leave for Toronto, to take up a position with a Canadian Publishing Company, I would like to jot down a few thoughts. The degree of reader co-operation and participation in the magazine has been very pleasing, and take my word for it MECCANO MAGAZINE is here for good now! I have made many good friends since taking up the Editorship and starting the new MECCANO MAGAZINE some 15 issues ago, and would like to thank all contributors and readers alike for making this task so pleasant. After nearly six years at "Model and Allied Publications" with four years on AEROMODELLER it comes as a bit of an upheaval to change, but that's life—with everything constantly on the move. There will not be any drastic changes in format or contents of MECCANO MAGAZINE—but I am sure the new Editor will add his own ideas as time goes on. Having become well and truly hooked on MECCANO MAGAZINE I look forward to reading it for many years to come, all those thousands of miles away.

The more observant will have already noticed from the contents page, that the new Editor's name is Dave Rothwell. Dave has been a regular contributor to these pages and both Slot Car and Fire Brigade fans will be aware of his features. This is a promotion for Dave who was Assistant Editor of our sister magazine MODEL BOATS for the past year, here at Model and Allied Publications. Dave is 26 years of age, married and an all round model enthusiast not specialising in any particular hobby branch—although slot car racing has occupied most of his time over the past two years. Dave's latest projects include the Electric Round The Pole Model Aircraft Flying, seen at the "Model Engineer Exhibition" and on your T.V.s in "Blue Peter", and a Coffee Table "N" Gauge Model Railway Layout—built for "The Model Railway Club Exhibition" and also seen on "Blue Peter". His other pastimes are motoring and camping.

May I take this opportunity to wish Dave all the best and every success to MECCANO MAGAZINE.

Sincerely,
John Franklin



The birth of a great tanker. The "Esso Mercia" after her launching at Bremen. Weighing 36,000 tons she is the largest vessel of the Esso fleet.

LEVIATHANS OF THE DEEP

The ever increasing world trade in oil, has brought about the development of super tankers to ply between the oilfields and consumer countries. They are now the world's largest transport vessels.

By John Mannering

SHIP LOVERS who delight in statistics; who like to reel off information about vessels of the largest tonnage, the greatest length, the deepest draft, will find a rewarding field in the study of the great oil tankers now in service and the even larger ones planned for the near future.

Without oil, civilization as we know it would grind to a halt, and quickly. Which is why, whenever there is a threat to oil supplies by the closure of the Suez Canal or by strikes, most western countries have to think at once about the possibility of rationing. But when all is going smoothly: the 'buses running, the cars and lorries speeding along the roads, the factories busy, and the central heating humming away in the cellar little thought is given to the great tankers ploughing the oceans to bring oil from the oil fields to the great refineries of Europe and other parts of the world.

In Great Britain two of the largest tanker companies are British Petroleum Ltd., known familiarily as 'BP', and Esso Petroleum Ltd. As long ago as 1896 ships were being constructed for the bulk carrying of oil, and by the 1920s the enormous growth of the motor car had brought about the need for tankers of the 10,000 ton range. This gradually went up until oil tankers of 15,000 to 18,000 tons were being built. They were principally employed in carrying refined products —petrol and diesel oil, from the large refineries of the Middle East and America. Their size was therefore limited by the depth of water or dock accommodation at the ports of delivery.

It soon became apparent that it was more economic to ship vast cargoes of crude oil to a few specially chosen deep water harbours where refineries could be established, and to reship the refined products in moderate size vessels to the oil storage ports.

Hence the development of refineries at Fawley on Southampton Water and on the Isle of Grain in the Thames estuary.

By the late nineteen fifties ships of 35,000 and 40,000 tons had come into being, and the tanker fleet owners saw virtually no limit to the size of the ships they could build, and run economically, if only harbour accommodation was available.

Hence the most recent step in the oil carrying operation has been the establishment of huge crude oil storage depots such as Milford Haven and the one being built in Bantry Bay in south-west Ireland, which will accommodate the vast vessels now coming into commission; and the even larger ones which some think will ultimately be built. Ships of 500,000 or even 1,000,000 tons are envisaged by naval architects; and certainly there appear to be no insurmountable difficulties in the construction or operation of such vessels. Only port facilities, which essentially mean depth of water and room for manoeuvring, are the limiting factors.

But taking our eyes off the future for a moment, let us see what the latest modern tankers actually in use, are really like.

The Esso London, belonging to the Esso Petroleum Co. is 94,247 summer deadweight tons, which is the total weight of cargo, fuel, stores, fresh water, etc., which she can carry on her summer draft as shown by her Plimsoll Mark (see June M.M.).

This gives her a draft of 50 ft. 2 in. Her winter north Atlantic deadweight is 89,895 tons, on a draft of 48 ft. 2 in. Her overall length is 861 feet and her beam 125 ft. It may help to visualise this great ship if one thinks of her length as equal to 13 cricket pitches !

Her engine develops 24,100 shaft h.p. at 105 r p m., giving her a speed of 17.1 knots when loaded. Her two main cables for her port and starboard anchors are each 200 fathoms. She carries 9,865 tons of oil fuel of which she burns 138 tons a day.

She is a big ship by any standard (the Torrey Canyon which was wrecked on the Small rocks off Lands End last year with such disastrous results had a summer

The " Torrey Canyon ", a 60,000 tonner lies wrecked on the Seven Stones reef off Lands End. This disaster provided the World with its biggest oil pollution problem and was also the World's largest single shipwreck.

deadweight of 60,615 and was 810 ft. long).

The British Admiral, owned by the British Petroleum Co. and launched by the Queen in March 1965, was the first 100,000 ton ship built for that company. She has an overall length of 917 ft. and a beam of 128 ft.; her actual tonnage being 111,274 s.dw. She is driven by a single six bladed propeller, 24½ feet in diameter.

Even larger still is the Esso Mercia, built at the A. G. Weser yard at Bremen for Esso Petroleum Ltd., in 1967. Her summer deadweight tonnage is 170,800, on a draft of 59 ft., with an overall length of 1,010 ft. With a speed of 16.6 knots she can carry one ton of oil for 77 miles for 1d.; compared with a 36,000 tonner of 1957 which could carry 1 ton only 34 miles for 1d., indicating the great economy achieved by the larger vessels.

Both pilot and master need to be skilled ship handlers to berth such a vessel when it is realized that her length is about one fifth of a mile !

When a crew member leaves the accommodation and bridge section in the stern to go forward he is very soon beyond hailing distance, and it takes him five or six minutes before he is back. For this reason the crew are equipped with small radio sets which keep them in touch with the officers on the bridge. The decks tend to be so vast and featureless that some ships have white lines painted on the decks leading to important positions such as the windlass, mooring bollards, deck winches, etc., to enable the crew to find their way in a thick fog.

Most of the larger tankers are powered with geared steam turbines, although diesel has been adopted for some of the vessels being built. For various reasons, including manoeuvrability and capital cost, it is more efficient to drive the larger tankers by a single screw, at least up to the 220,000, 240,000 ton range. Above that it is thought likely that twin screw may render better service; one of the reasons being that with the increased value of ship and cargo in the great tankers of the future, twin screw give a certain protection against total breakdown at sea.

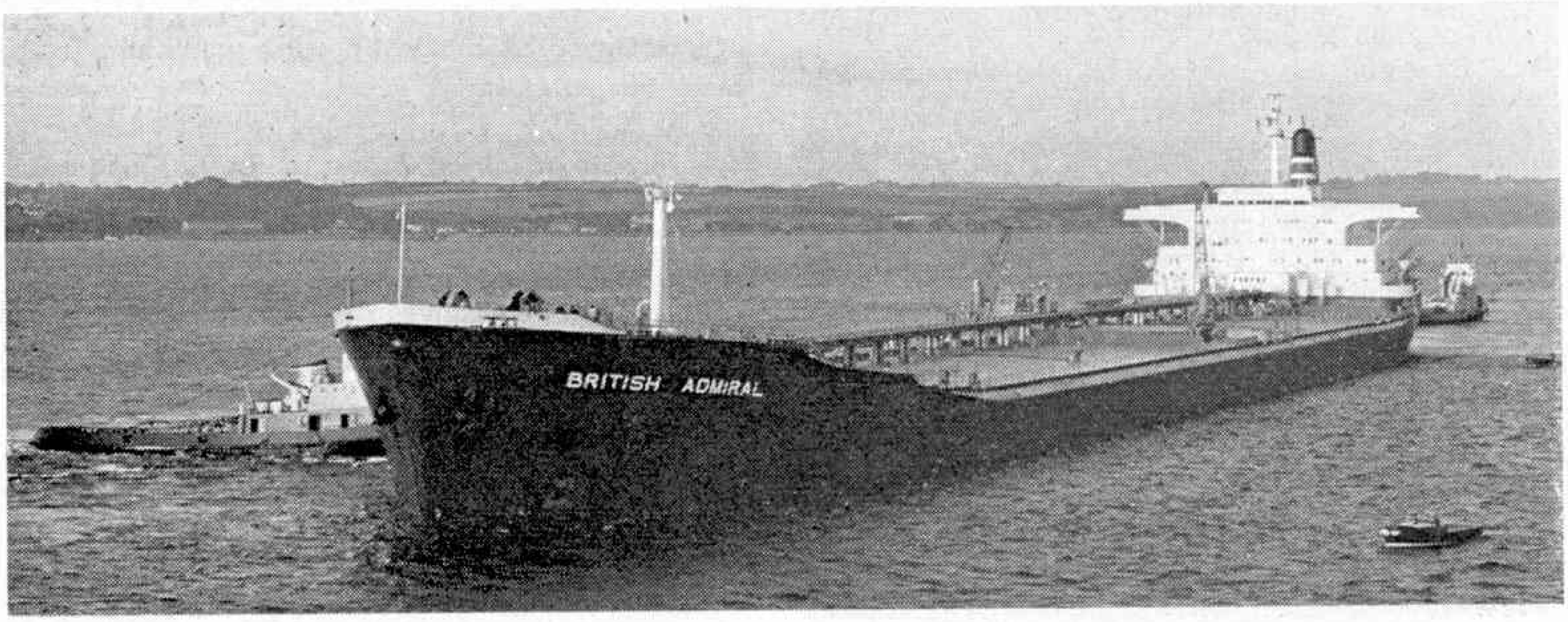
There are several problems peculiar to the very large tankers, including excessive rolling and ' slamming ' when steaming into a head sea in heavy weather. Passive tank type stabilizers will be increasingly used to reduce roll; and another feature which masters have to bear in mind is the very long distance the ships will travel before they can be brought to a standstill, often as much as five miles.

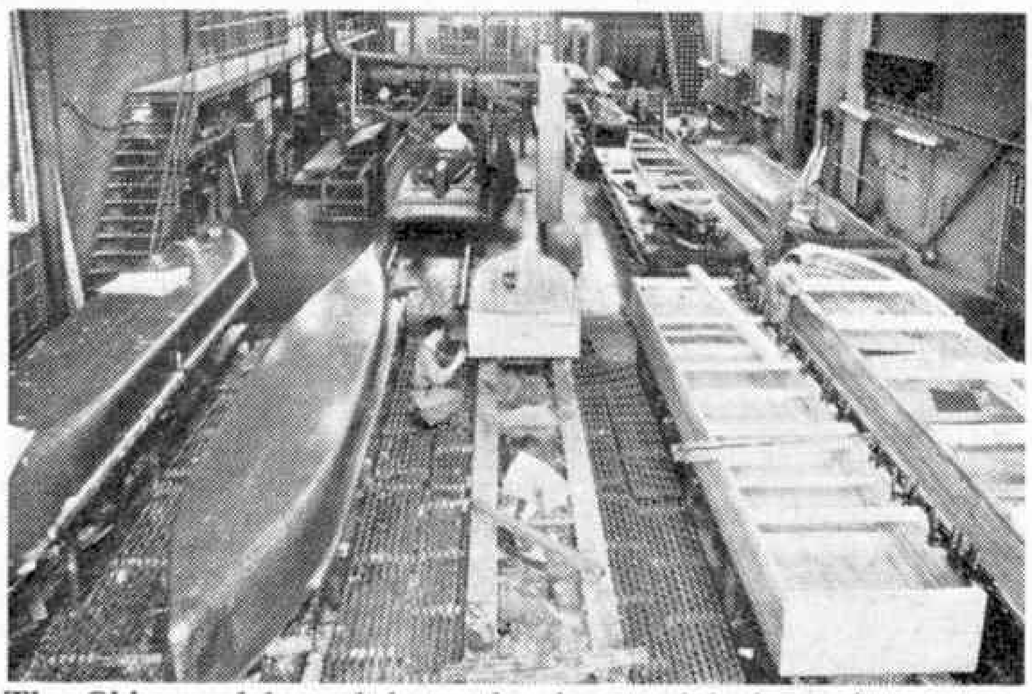
In the quite near future we shall be seeing the very largest ships that can be accepted in the European oil ports. Esso Petroleum have ordered four ships, each of 240,000 tons from the Swan Hunter Group and Harland & Wolff Ltd. They will come into service between August 1969 and November 1970 and will probably ply between the Persian Gulf and Milford Haven or Rotterdam.

These giants of the sea will be 1,143 ft. long with a beam of 170 ft. and a draft of 65 ft. They will be driven by single screws and will probably be at the extreme range suitable for such propulsion. Their speed will be 15.8 knots.

But they will not be the ultimate in tankers. As port facilities are improved even larger ships will be carrying the world's oil, until one day one of our youthful readers, grown to manhood, will be standing on a wind swept headland and will see a huge ship ploughing along the distant horizon, dwarfing every vessel in sight—an oil tanker of 1,000,000 tons !

" British Admiral " B.P. Tanker company's first 100,000 ton oil tanker, arriving at B.P.'s Angle Bay Terminal, at the end of her maiden voyage.





The Ship model workshop, showing models in various stages of assembly. These models have to be extremely well madè to detailed specifications.

BASINS WHERE SHIPS ARE BORN

John Drummond relates the increasingly important role played by models in ensuring that tomorrow's ships will be as seaworthy as science can make them.

IN THE Netherlands town of Wageningen, miles away from the sea, lies the basin where many kinds of ships are ' born ' and tested, as scale models.

This basin is the world-famous Netherlands Ship Model Basin.

The N.S.M.B. was founded as an institute in 1929 by the Netherlands government and four large shipping companies. Although independent, it collaborates closely with the Central Organization for Applied Scientific Research in the Netherlands. It has a Board of six Directors, assisted by an advisory committee. Members of this committee represent the ship owners, the government, the shipbuilding yards, the (Netherlands) Royal Navy, engine builders, and the shipbuilding laboratories of the University of Technology at Delft.

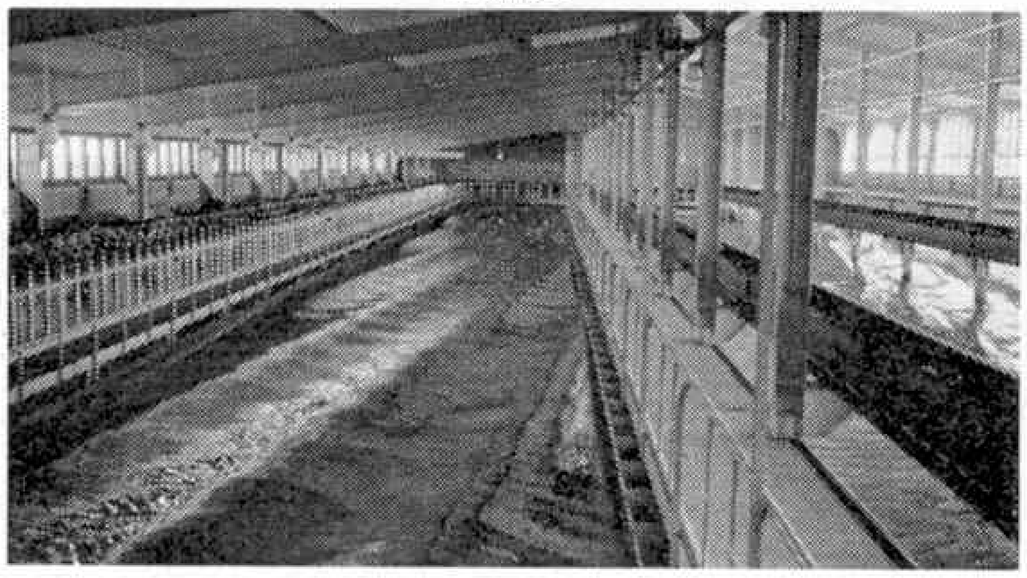
In broad, romantic terms, the functions of the N.S.M.B. determine whether a ship, which shipbuilders or ship-owners are planning to build, will meet the Owners' requirements for speed and be able to withstand anticipated weather and harbour conditions, using scale models to battle against miniature hurricanes and other hazards of sea-travel. But the functions of the N.S.M.B. go much deeper and are more extensive. The president, Professor Dr. ir. W. P. A. Van Lammeren, puts it this way:

" The N.S.M.B. considers contributions to the solution of the following two problems as its main task:

A. Development of optimum forms for ships, propellers, and rudders, or more generally, development of optimum hydrodynamic properties for each type of ship.

B. Increasing the accuracy of all predictions based on experiments in ship model basins."

The results of the wave-making machine movements are evident in this large test tank. Almost any wave formation can be formed.



The word " ship " covers every conceivable type of floating structure, including submarines.

A number of panels, selected from the Advisory Committee, steer the various fields of research, such as propulsion and cavitation, sea keeping, and behaviour in shallow water. Results are published in English in the periodical " International Shipbuilding Progress." The institute employs about 300 people, of whom about 30 are university trained. The international scope of this organisation can be envisaged by the fact that, out of 200 ship models and 150 propeller models made and tested in a year, some 60 per cent. are for foreign nations.

One might be tempted to think: surely everything that could be known about the shape and behaviour of ships and propellers must now be known ? Can there be *anything* left to find out ? Oddly, perhaps, the answer is that the field of vital research tends to grow, rather than to diminish, with every passing month of this scientific era. Today, for instance, scarcely any ship of any importance is built without model tests having been made previously. Clearly it is essential that new ships should have the greatest possible speed for a given deadweight and engine power, and/or that for a certain speed, the least possible power and fuel be consumed.

Clearly, too, this applies more than ever to merchant and passenger vessels in these days of fierce competition, especially from air transport. Every conceivable economy of operation, as well as the safest behaviour in all weather conditions at sea and in harbour, must be sought and achieved where possible, in terms of the most suitable shapes of ships and propellers.

When a shipping company gives a commission to the N.S.M.B., it submits a provisional plan of the ship's hull, from which a ship model is made in laboratory workshops equipped for this work, using wood, paraffin-wax or plastic according to the weight of the model or the kind of testing required. The results of the tests, when completed, are analysed and converted into dimensionless coefficients, then compared with those of comparable ships and with diagrams based on the institute's own research work.

Initially, work at the N.S.M.B. for the first 20 years

was concerned only with tests conducted in still water, in which the most suitable shapes for hulls and propellers were sought—and achieved. This research, still a vital part of the Institute's work, continues. It was a natural progression for the Institute to enlarge its research into the relatively unknown field of how ships and propellers behave in stormy conditions, spurred on by ever-advancing technological knowledge in associated matters, and by world-wide demand for reliable information on how this, or that, hull or propeller shape, would behave under all conditions likely to be met in the course of the ship's lifetime.

Today, to meet this demand, the N.S.M.B. has 8 facilities in which to carry out tests. We are permitted to have a glimpse of the stringent care taken in evaluating test results from the words of Prof. W. P. A. van Lammeren: "A good correlation between trial or service results on the one hand and model tests results on the other hand can only be expected if the conditions for the model tests and those for the full scale ship are mechanically similar. As is well known, mechanical similarity of the conditions requires geometric, kinematic and dynamic similarity as well.

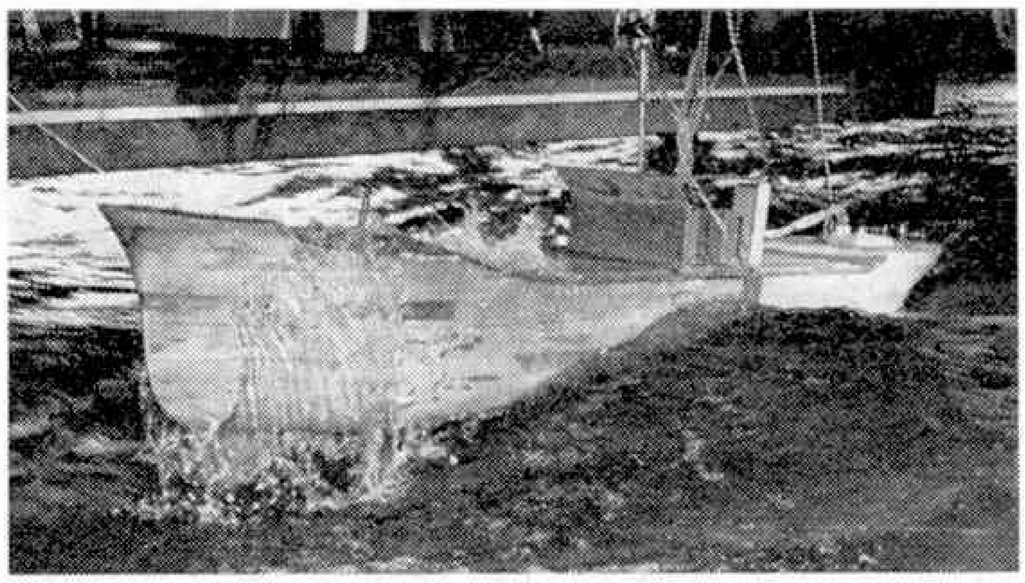
"Geometric similarity does not only apply to the geometrically similar ship and propeller model (also for surface roughness) but also to the waterways as regards depth and width. This condition is of great importance in the research of ships in estuaries, harbour entrances, rivers and canals. Kinematic similarity requires similarity of speeds in each point along the surface of ship and ship model, full scale propeller and propeller model as well as in each point of the surrounding fluid."

But while velocity fields must be completely similar, Professor Van Lammeren points out that dynamic similarity can never be realised because of insuperable technological difficulties, and hence the only alternative —scale effect—is introduced.

The first of the facilities is a deepwater basin, 830 feet × 35 feet × 18 feet. This is used for experiments (hulls and propellers) with models of sea-going ships travelling under ideal conditions (no wind, no waves, practically unlimited depth and width of water). The models, 20-23 feet long, are either towed or are self-propelled at a maximum speed of 30 ft/sec., while flow observations are made where necessary by underwater television.

The second facility is a Shallow Water Basin, 710 feet × 52 feet × 4 feet. This is used to test scale models of vessels for inland navigation such as rivers and canals, and especially the waterways of Europe and America; this facility—the largest in the world—has been found particularly suitable for testing the behaviour of pushed barge fleets, fleets up to 42 barges having been fully investigated, using underwater photography and underwater television. The effect of width of canal or river on ship performance, launching and manoeuvring and other tests involving rudder angle, model heading and yaw angular speed are also carried out in this basin.

A further facility, described as a Cavitation Tunnel with Homogeneous Velocity Field, was built in 1941. This is used to test propellers for cavitation, erosion and noise characteristics. (Cavitation is defined as the formation of cavities in the water around the blades of a propeller, resulting in a loss of propeller efficiency.) This tunnel is now used for fundamental research and testing propeller models with diameters up to 18 inches in a homogeneous velocity field. Maximum velocity is about 40 feet per second, maximum propeller speed 3,000 r.p.m., maximum torque 800 feet lb., maximum thrust 2,600 lb., maximum propeller output 250 h.p.



This model is being tested in heavy seas created by the wave machine.

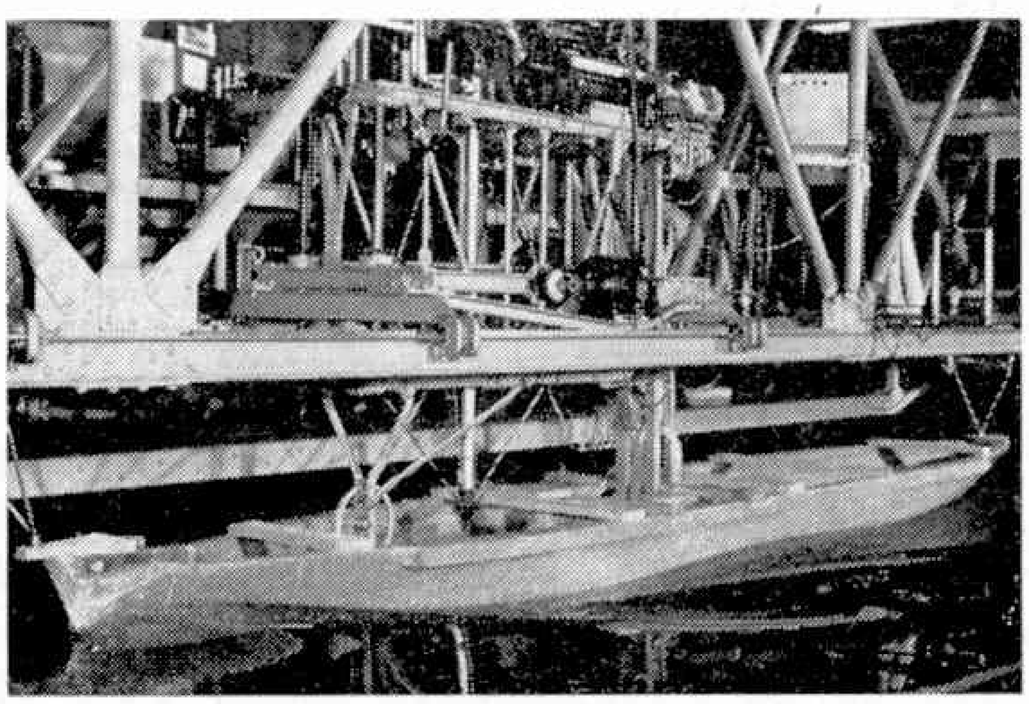
Recently modernised, it is now suitable for testing super-cavitating and contra-rotating propellers. Various other aspects, as, for example, cavitation characteristics in oblique flow, and the effect of turbulence on cavitation inception, can also be studied.

In 1956 a second cavitation tunnel was built, described as a Cavitation Tunnel with a Flow Regulator. In this tunnel propeller models made of brass or aluminium, and having diameters up to 10 inches (representing propellers of single screw ships) are tested under conditions where it is possible to reproduce any arbitary velocity field, as far as the axial components are concerned. Rudder and screw aperture are also imitated.

Commenting upon this facility, Professor van Lammeren says: "In the same year (1956) a new cavitation tunnel was put into operation, where propeller models can be examined in a velocity distribution very similar to that existing behind the actual ship. It turned out that indeed the cavitation phenomena observed showed appreciable difference with what had been observed so far in homogeneous flow."

The utilizing of new types of propellers also needs expert testing. "Screws operating in fixed nozzles or in nozzle rudders, vertical axis propellers, bow thrusters, controllable pitch and contra-rotating propellers, water-ram jets and large hub to diameter ratio propellers with cyclic pitch control"—all clamour for immediate attention. New ship afterbody shapes, developed with the purpose of creating a more uniform flow behind single screw ships, in order to avoid or reduce unsteady propeller forces, cavitation erosion and propeller noise, have likewise to be tested.

Since research and development at the N.S.M.B. clearly pointed to the need to develop specialised



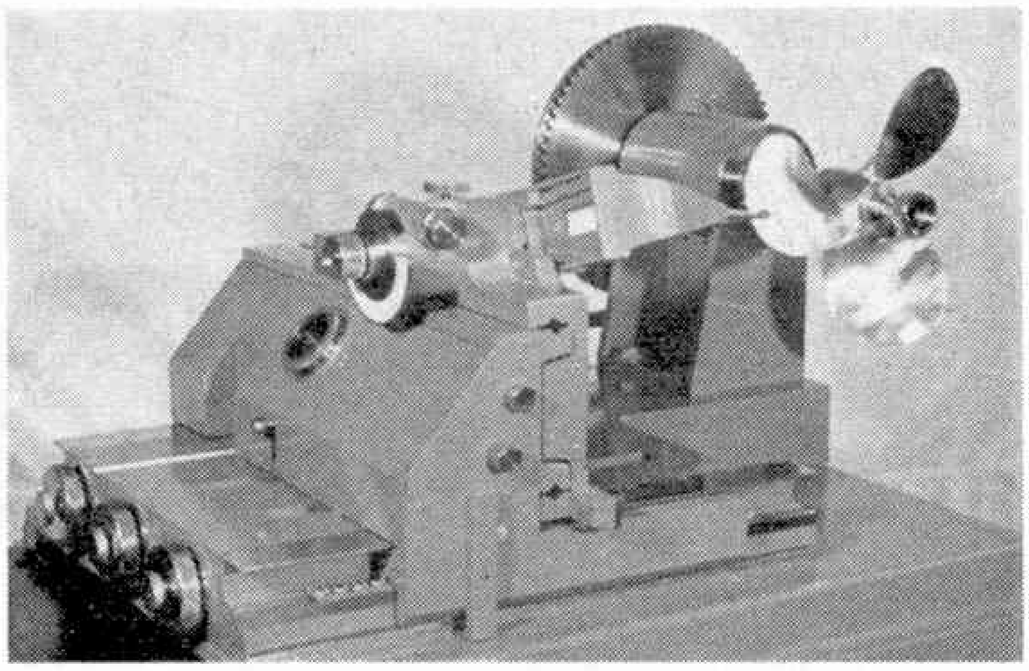
Note the immense amount of equipment needed to record information during tests on these scale models.

facilities for special types of tests, another facility—the Seakeeping Basin—was added in 1957. In this basin (330 feet × 80 feet × 8 feet), self-propelled models using automatic steering are tested in waves created by a snake-type wavemaker, representing regular or irregular, head, following or oblique seas. The six components of motion (rolling, pitching, heaving, yawing, surging and swaying) as well as speed variations and, possibly bending moments in the main section are measured. Speed variations in waves, wave pattern, r.p.m., thrust and torque of the propeller, the effect of accelerations at bow and stern, pressure variations at the bow when slamming, forces and moments working on the ship, as well as other aspects of ship behaviour in all kinds of seas, are also studied, using electronic equipment which records instantaneous values. In that aspect of research which involves accurate knowledge of the energy spectra of the sea, the co-operation of nautical experts and oceanographers is indispensable.

In 1961, a Computer Centre was set up. Its functions are thus described: " The Computer Centre is at the disposal of ship-owners and builders and gives service for calculations in the field of hydrostatic curves, stability, trim, tank capacity, strength, propeller design, launching, fairing of ship lines, table of offsets and shell plating developments. Apart from this service work all calculations for the research and routine work are carried out on this computer." This computer is described as an intermediate sized digital type, with a storage of 10,000 words, each consisting of 26 bits. Its speed is 15,000 additions or subtractions, and 2,000 multiplications, per second.

In December 1967 a second computer was installed. Known as a CDC 3300 of Control Data, it is faster and has greater capacity than the first computer, which it has now replaced.

The ever increasing interest in so many diversified aspects of travel on water, and especially the interest in research on new types of ships such as hydrofoils, hovercraft, high speed submarines, and so on, has brought into existence at the N.S.M.B. two new facilities. These are the High-Speed Tank (730 feet long), which is being used for research in the behaviour of fast vessels, and the Combined Wave and Current Tank (230 feet × 166 feet × 4 feet), which is being used for behaviour research into a variety of structures, such as floating, drilling platforms, off-shore anchoring of tankers to buoys, dredgers in open sea, the manoeuvring and stopping of large tankers in harbour entrances, under every possible combination of wave, current and wind conditions. In this new combined tank, such conditions can be artificially simulated; a special wavemaker creates waves " to order," while a battery of fans creates winds up to hurricane force.



Measuring bench for propeller model design testing.

After the conclusion of a specific commissioned test, the client receives a report containing all the necessary data and plans required for the shape of the hull and the propellers. These details, in turn, enable trial trip speed and service speed which may be expected, to be determined with a high degree of accuracy. Since the results of any commissioned test are the exclusive property of the company commissioning the test, the strictest secrecy is observed at the Institute. It is up to the ship-owners or ship-builders concerned as to whether or not they publish the results of tests on scale models of their own ships.

The fine research work of exceptional practical value being carried out by the far-sighted and progressive N.S.M.B. has stimulated ever-increasing interest among owners and operators of all kinds of ships and ancillary structures. With the Institute's increasing success came —and continues to come—ever increasing requests from governmental sources and private interests for information as to how this, or that structure would behave in a given set of conditions. The behaviour of floating structures such as drilling pontoons, floating pipe lines, platforms for loading and unloading ships at unaccessible coasts, buoy systems for mooring, installations for storing all kinds of materials, and so on, have aroused much interest in official quarters.

Although the N.S.M.B. is primarily concerned with ship behaviour, research and experiment of necessity have had to be initiated into what are called " boundary conditions." These may be said to include the architectural aspects of dams, locks, harbours and so on; for instance, in what form should a new harbour be constructed, or an existing harbour be modified, to make ship behaviour in entering, leaving, tying up, or mooring easier, safer and swifter ? To such problems can be added the more general problem of determining accurately the behaviour of cutters, dredgers, barges, cranes, etc., used in building new dykes and harbours. Such problems are accentuated as ships, such as tankers, get larger and longer. The growth of industries drilling for oil, gas, or sulphur, and which require floating or fixed drilling platforms, add their problems in the matter of ship manoeuvrability.

In all this intensive research work, the task of keeping records up-to-date is never overlooked. Such records, whereby vital comparisons of analysed research results can be accurately made, enables the N.S.M.B. to make suggestions that will improve shape of hull, stern or propeller.

Who pays for all this research ? The institute is a non-profit making body and is self-supporting. The major source of revenue comes from the fees paid for investigations and advices requested by ship-owners, ship-builders and other interested parties; a Research Fund, to which the Netherlands Government contributes annually, meets most of the expense of scientific research, the results of which are published in technical journals in that country and abroad.

It is impossible in terms of increased efficiency and economy of ship and structure operation, in terms of safer travel on water, in terms of swifter and more comfortable travel, to accurately equate the great strides in the improvement of ship behaviour that have been made possible by the work of the N.S.M.B. But it can be pointed out that the quality of hull shape and propulsion since 1932 (when operations actually began) have improved by no less than 25%—a magnificent achievement.

READERS LETTERS

Publication of a readers letter entitles the writer to a small "thank you" gift from the Editor.

DEAR SIR,—I am a collector of miniature car models, produced by Dinky Toys, Lesney Toys and Corgi Toys. Unfortunately here in Poland I cannot buy all of these. So I am very interested in receiving models from someone who can accept in exchange Polish stamps, which I can send in complete sets, unused or used, new issues or old issues.

Marek Skwara.
Kotowice, Okrzei 1/26, Poland.

DEAR MR. BARTON,—I am delighted to learn that you have been following "Battle" and "Militaria" with some degree of approval. Like you, I suppose I am basically a Wargamer, but then "a rose by any other name," etc.

You are, of course, absolutely correct in what you say concerning the mathematical probabilities involved in the use of two dice, and I say that I had used the wrong set of figures—the 'apparent' rather than the 'real'—only when I saw the relevant article in print. Already the editor has the correction for publication in the next instalment of "Battle".

Regarding your point concerning the Churchill tank, I would refer you to Part VI of "Battle" wherein I tried to make the point that widely divergent specifications exist for different periods and, in view of this, I took the figures from "a single, easily obtained source", to wit, 'Colonel Rogers' "Tanks in Battle", adding the rider that "this list may not be acceptable to many a military purist". One has to bear in mind the fact that most readers of "Battle" are pretty well beginners, and if the facts from a relatively simple authority are insufficient, the great thing is that they may well be started on some rewarding research, the end product of which will be rules at once more accurate in detail and more complex in operation.

Certainly, as you say, there must be a limit to the search for realism, otherwise the game becomes bogged down in a mass of paperwork and calculation, and it is my aim to present, if you like, the bare elements of "Battle", leaving the enthusiast to improve or alter as he thinks fit.

Many thanks again for your letter.
Dover, Kent. *Charles Grant.*

DEAR SIR,—I have today received the December issue of Meccano Magazine in which you have included my article, "Some Showman's Tractors"; pages 664/5. Reading through the article and comparing it with a copy of my original script I notice several errors which have crept into the published article; particularly in the photo. captions, which of course are not my original captions (having been compiled by yourselves from my photo. details). One serious error which has crept into the main text of the article deserves, I feel, an ammendment to be published. This error occurs at the end of the last but one paragraph in the published text (page 665), referring to the showman's tractor and I quote—"(which legally must *not* exceed 7¼ tons in weight)". The error of course is the inclusion of the word "not", which has somehow crept into the phrase, giving it the complete opposite meaning!

Another error that has crept into the published text occurs approximately halfway up the same page and refers to the Scammell-Harrison 'Showtrac', and I quote—"which was built from 1946 to 1953": the error here is the omission of the word "circa", which is quite important as I have no exact record as to the precise dating of the final 'Showtrac' to be built.
Plymouth, Devon. *Richard M. Collis.*

DEAR SIR,—You may be interested to hear that I have had the pleasure of riding in the 'Sentinel' Waggon which was pictured in the December issue of the Meccano Magazine. The waggon was built at Shrewsbury in 1934 and went to work for Brown and Son in Chelmsford, later it passed to the Castle Firebrick Company of Buckley, Flints. It has now been restored by Messrs. Brook, Hurst and Marsden of Holmfrith. In 1968 it attended the annual Traction Engine Rally staged by the County of Salop Steam Engine Society at Church Stretton in Shropshire. My father is the organiser of this event.

We own a Ruston Traction Engine which was built in 1918. It was built to W.D. requirements for hay baling, but as the war had ended the engine was sold unused to Mr. C. James of Penyparc, Clifford in Herefordshire. Here it was used for threshing until 1950, soon after this my father purchased it and restored it for preservation.

May I add that I think you are making a grand job of the Meccano Magazine, but let us have more 'steam' articles.
Church Stretton, Salop. *Richard Smith.*

DEAR SIR,—The "Workbench" article on the Electric Aircraft flying at the Model Engineer Exhibition, reminded me of the time fifteen years ago, when, to amuse my sister's two young children, I constructed from Meccano, a pylon with rotating arms, from which I suspended 1/32 in. scale plastic model aircraft that were available then at 1/6d. each—ready constructed! One model I remember well, was Chance-Vought "Cutlass" delta wing fighter, which positively refused to fly straight until the nose was well weighted, while the more conventional type of plane gave hardly any trouble in this respect.

The drive for the rotating arms, was supplied by a Meccano No. 1 Clockwork Motor, and I reversed the usual Meccano principle of gearing down for power, and geared up—to give the rotating arms a 3-1 speed.

The results were startling; for when the arms reached their peak speed, the aircraft, flying in a circle of 7 ft. dia., became *invisible* (they really did) much to the astonishment of the children, who were a bit too young to understand the mechanics of this illusion.

I have often wondered since then, did those tiny planes go through a miniature sound barrier?

Later, I fitted an additional set of arms geared to revolve at a slower speed, and from these I suspended model airliners. With the fighter aircraft (flying in a 'wedge' formation by this time) 'buzzing' them, the children were in raptures with the model, and couldn't visit home often enough. My nephew (he's a married man now) gave me stern instructions *never* to dismantle the model.

But I found that to fly the fighter aircraft successfully in formation, the rear planes had to be suspended at slightly succeeding heights, for, in spite of the planes being only models, the slipstream from the leading plane, caused the rear ones to perform wildly twisting gyrations. This brought home to me, how Meccano can be instrumental in discovering technical drawbacks during the testing of theories.

Finally, in spite of being geared up, the model ran for just under six minutes on one winding of the motor; an astonishingly lengthy run under the circumstances, though I expect the 'flywheel' effect of the rotating arms helped.
London S.E.15. *H. J. Halliday.*

DEAR SIR,—It is once again my pleasant duty to write to you in thanks for your excellent coverage of the Annual General Meeting of the Midlands Meccano Guild which was so kindly attended by yourself, by Mr. D. McHard, Marketing Manager of Meccano Ltd. and our old friend 'Spanner'. Your article in the January edition was very well received by the Guild Members who were all delighted by the attendance of all three Meccano representatives at the Guild's first A.G.M. and are well rewarded by the interest and enthusiasm shown by the visitors.

'Spanner' was kind enough to comment on the high standards of model building displayed at the meeting and mentioned this in a caption on one of the pictures of a Guild model. I would like to make it clear, however, that while 'Spanner' was no doubt personally impressed by the high sandards, the Guild does not limit any of its members on size or scope of models and while some members' models are outstanding, we do not discourage other less ambitious projects. Interest and genuine enthusiasm are the principle requirements for Guild Membership.

I have just seen the Feb. issue of Meccano Magazine which is an absolute knock-out. Everything from the Fire Service features through the wide distribution of Meccano features is absolutely first class.

Above all, I want to thank you for the excellent presentation of Eric Taylor's Giant Level Luffing Crane and for the publicity of the Guild's Building instructions, both in the 'starred' heading of the article itself and for the valuable space in the Workbench editorial. I know that I am expressing the views of the Guild as a whole in my sentiments and of Eric in particular.
Hall Green, Birmingham. *B. N. Love.*

DEAR SIR,—Firstly, thank you very much for your wonderful magazine which is far better than the old one.

I, like Mr. Kennedy (August '68 issue), had just started getting the old magazine when it ceased publication. I was indeed thrilled to see my Meccano magazine back again.

No one, in their letters, ever seems to mention Laurie Bagley—so I will. I always look forward to seeing what has flown from his brush and appears on the cover. Keep up the good work Mr. Bagley.

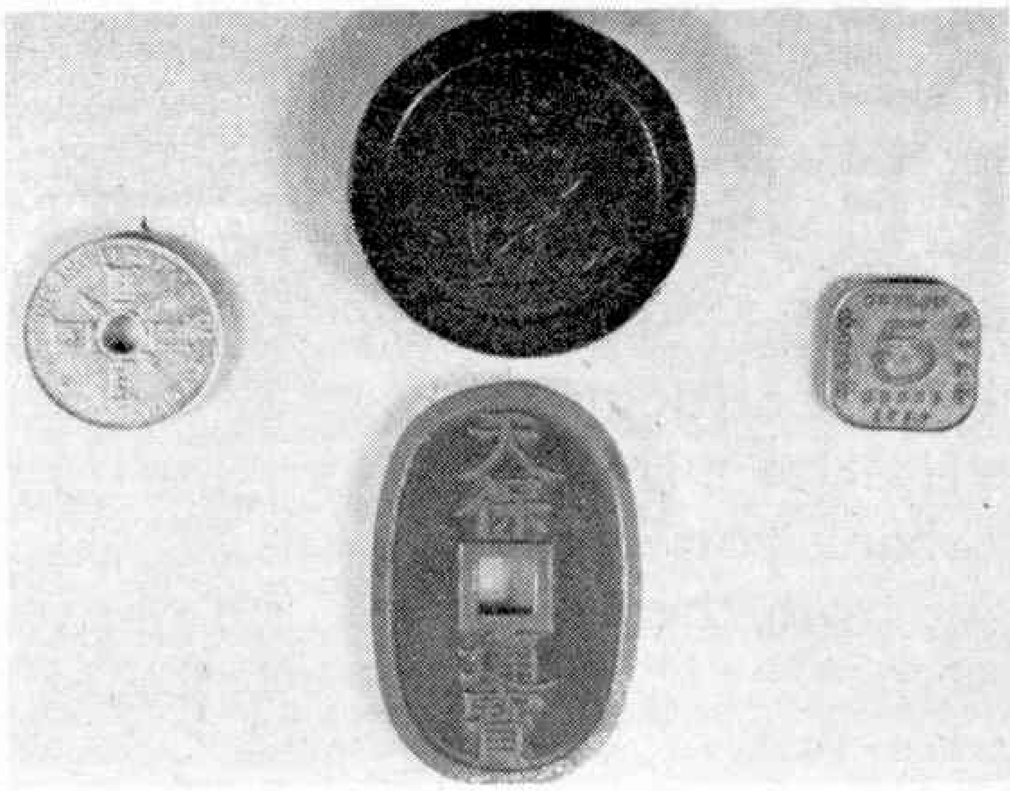
I am very interested in making models of Cabin Cruisers, Launches, Speed Boats, etc., out of solid pieces of Pinus which I shape and hollow out. This Pinus is much easier to obtain than balsa where I live. Other readers might back me on a few articles on this type of modelling once in a while.

In the May '68 issue, there was an article on making tanks out of razor blade dispensers. I made a couple of these and they turned out quite well. Small things like that never go astray on a wet afternoon in the workshop when you are just 'mucking' around.

I think I have had my say, but once again, thank you for the fab magazine—keep it going!

Peter Stevenson.
South Island, New Zealand.

THERE'S MORE TO COINS THAN MONEY



by Philip J. Leighton

WITH PRICES of so many coins in so many series rising month by month, the newcomer to numismatics might be forgiven for thinking, as was often thought in the past, that this is a rich man's hobby. It depends, really, on the way one looks at things. To those who embark on coin-collecting purely as an investment then, as with any other form of investment, to accumulate one must speculate. There is, however, still considerable scope for the non-affluent enthusiast and in point of fact it is frequently the case that the small-spender obtains far more satisfaction from his hobby than he who thinks only in terms of profitable investments.

Few collectors would deny, that a great amount of pleasure can be derived from the acquisition of an uncirculated coin, of whatever nationality or denomination it may be, but when an entire collection must be relegated to the vaults of a Bank, there must surely be something missing. Gone is the opportunity of browsing through a few odd items; of discovering perhaps some unexpected feature, a die variation or misplaced mint-mark, to say nothing of being able to reflect on the story that a particular specimen might be able to relate.

In modern coinage, perhaps, the story angle may not be as strong as in mediaeval or ancient types, but as an example there is pleasure to be gained in building up a complete series of twelve-sided 3d. pieces, a commentary in brass on three decades which came along and will soon be gone. For the most part the dates since 1937 are easily found, and if the one or two exceptions have resulted in rocketing prices, well-circulated examples of even these will eventually come to those who keep their eyes open. The fact that in such conditions they may never pay for that world cruise should not worry the collector for whom the coin is of prime interest. There is pride in possession of any lovely coin, but even a badly worn piece has the same historical significance. This point was brought even more forcibly to mind by a coin that I recently had given to me with the thought that it might be of interest.

The coin in question was in fact a William and Mary Farthing. Condition-wise I doubt whether it would have found its way into the lowest-priced tray in the dirtiest second-hand shop. Badly scarred with details only just discernable, one felt, nevertheless, that it had in its time played a vital part in the lives of many. How many hands had eagerly clasped it since it was first issued in 1694 ? One recalled how William of Orange and Mary Stuart had become joint sovereigns of the country, following the abdication of James II who, a few years previously (1689) had fled to Ireland in an effort to raise an army and re-take the English Throne—an ambition never realised, but one which resulted in a period of political unrest. In this farthing of William and Mary was the unique example of conjoined heads—a form of obverse that has never been repeated on our coins.

Historically interesting, too, regardless of condition must be the familiar 'Cartwheel' pieces, mirroring as they do the revolution in coining processes. Even in the most battered piece we can read the story of Matthew Boulton. If the 'Cartwheel' coinage was his crowning achievement we should not overlook his many other triumphs in the field of engineering. His artistry was indeed unique and his name is assured of a permanent place in the story of numismatics the world over. In his copper coinage, and the many industrial tokens for which he was responsible, we can learn much of the background of the period. Some of his finest work was done at a time when we were politically involved in losing our American colonies. As we look at the date, 1797, and the well-executed bust of George III we can see our emergence into the modern world.

Apart from the tokens of Matthew Boulton, however, which certainly accounted for some of the finest examples of this form of supplementary coinage, any tokens can be well worth the attention of the collector. Produced during periods in our history when the need for small change tended to be overlooked by those responsible for the Regal coinage, virtually every piece can be made to tell a story. From the seventeenth century we have the particularly individual pieces, rather crudely struck perhaps, but entirely representative of their day. In the many towns and villages throughout the country appeared the 'coins' of the Butcher, Baker, Candle-maker or Inn Keeper. Different shapes (round, square, some even heart-shaped) and different sizes, most of them bore the name of the issuer, with his emblem, on the obverse, with the date and 'His Half Penny' on the reverse. A few enquiries in the appropriate quarters will often reveal that descendents of the issuing traders are still in the same line of business today. The changes that may have taken place in the intervening years provide fascinating glimpses of local history. What, for instance, may have become of "Thomas Hutchins" or "Glover" of Hereford who, in 1668, issued his heart-shaped halfpenny? Or who might have followed on in the business of "Joseph Sherwood a Grocer" of Canterbury?

In the field of tokens the seventeenth Century are

possibly the most expensive to buy now-a-days, although by comparison with some of the prices at which recent Regal issues are catalogued they are still quite reasonable, few of them rising above £4-£5 mark in quite good condition.

When we move into the Eighteenth Century, however, we find equally interesting items, many of which still turn up in the 'sixpenny trays' of many dealers. The designs, now, are more elaborate than on the earlier issues and the number of types available seems almost unlimited. Apart from the specific 'Traders' pieces (exchangeable at the points of issue) tokens which had little purpose other than advertising came into their own. Further types seem to have been produced solely for the collector. Nevertheless, most of these have something to commend them, and examples of different series can be brought together to provide a cross-sectional view of our past.

Advancing into the nineteenth Century we find again, that many pieces are easily obtainable, and the artistry employed in the designs is quite frequently better than we see in the official coinage of the country.

Simple but interesting are the little discs handed out as 'change' by various 'pubs'. These relate to practically every town where a 'pub' stands, or one stood, and are the basis of a field of study in their own right. More than once have I taken such a token to 'mine host' of the house that once issued such an item—and if it can no longer purchase that 'pint of Ale' it can often purchase an intriguing excursion into the past.

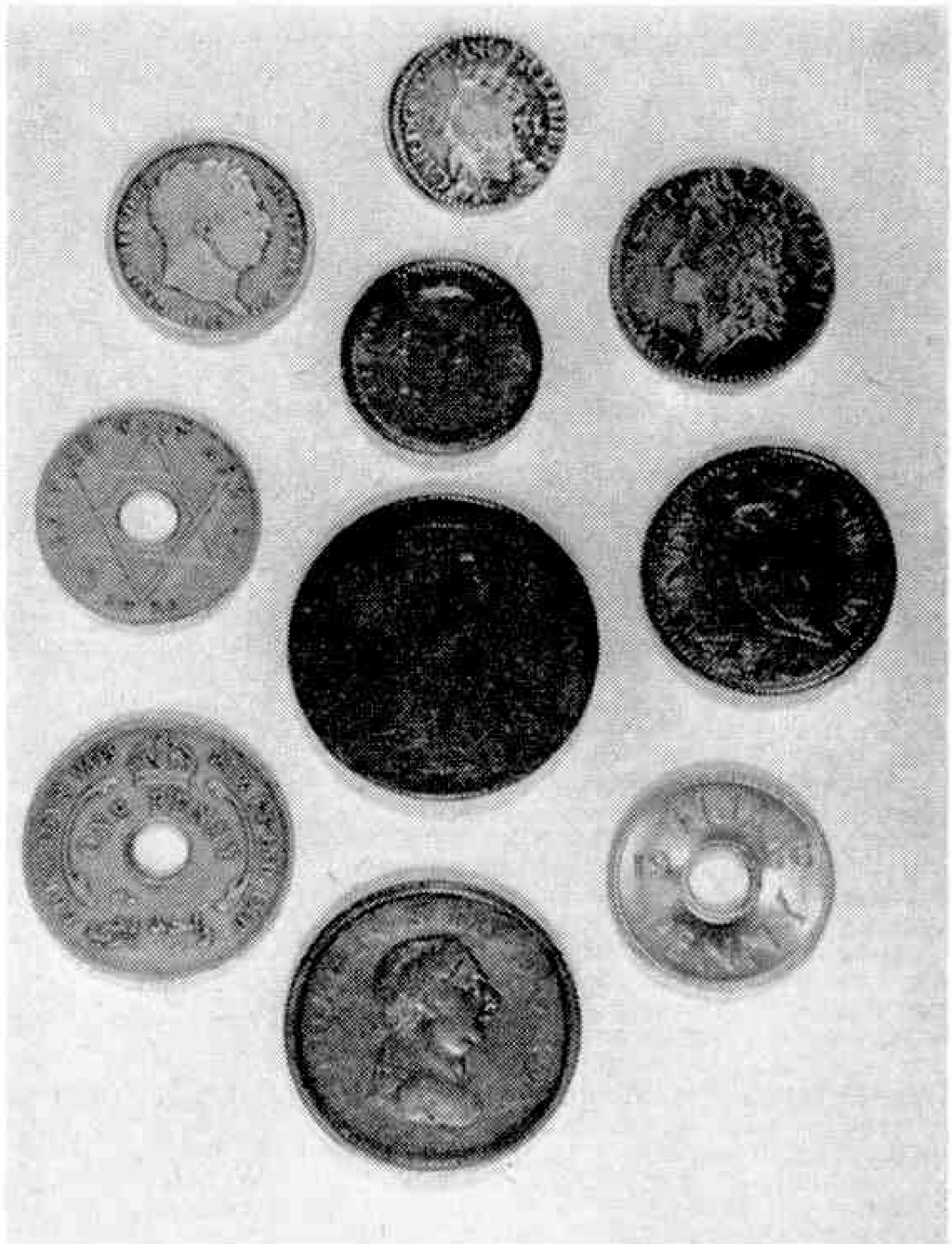
Manufacturers, Marketeers, they are all represented in some form, and doubtless the 'fruit machine' tokens and the plastic transportation issues of our own time will eventually be regarded as miniature mirrors to life in the mid-twentieth Century. A sixpenny token of "Burton Coin Co." obtained at "The Cabin" Inn sometime in the 1960s what story may it tell to future generations of collectors ?

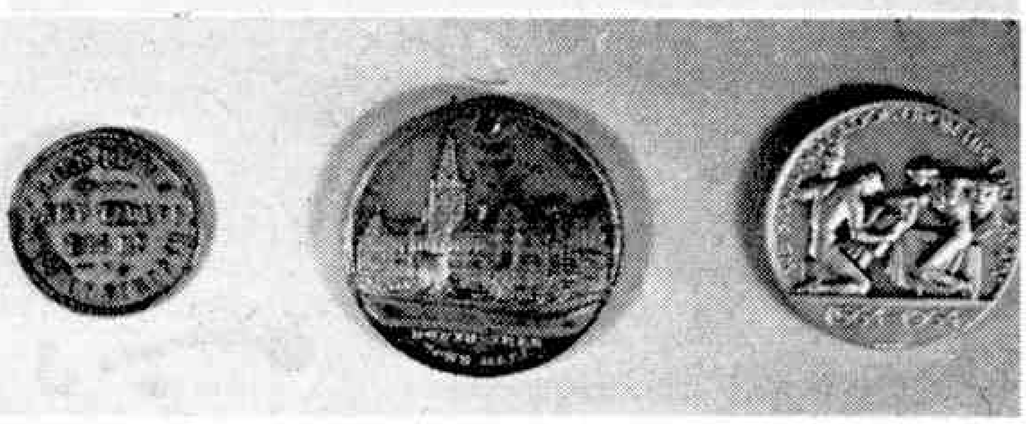
On the borderline of tokens and legal currency are the controversial Puffin pieces of Martin Coles Harman, self-styled King of Lundy Island in 1929. Certainly unique, the Puffin and Half-Puffin (equalling the Penny and Halfpenny) are most attractive coins and are worthwhile additions to any collection. If their list prices continue to rise, they are still relatively inexpensive and for the most part are usually to be found in an extremely fine condition, although some of them had certainly circulated within the Island prior to the Court case which declared them to be illegal and resulted in a fine being imposed on the issuer. In holding one of these pieces one can almost hear the sea striking the coast of this little Kingdom in the Bristol Channel, and a visit to Lundy itself, to learn a little of the story behind the coins seems inevitable.

Token, coins, worn or uncirculated: we have many different phases of history from which to choose, and apart from the commercial aspect condition, certainly, need not be regarded as all-important.

But if I seem now perhaps to be dwelling on our own past, through the medium of well-worn and easily come by coins, this is perhaps because so many collectors make their start on the English series. But from the point of view of interest there is much in the old

Continued on page 183





Above left—left to right: A New Guinea shilling, 'Cartwheel' 2d., Japanese Bronze Coin—Era of Temp and a Ceylon 5 cents.

Top right: A selection of common and inexpensive coins. (British and Colonial—includes 'Gun Money' 6d. and 1/- James II 'Cartwheel' 1d.—Lundy—B. West Africa—Fiji).

Centre right: Tokens and Lundy Island Pieces. George III 1d. in centre. Right—Left to right: Birmingham 'Pub' token, Dunkinfield Medallion, Shakespeare 400 year Medallion.

HAVE YOU SEEN ?

Monogram's Paddy Wagon

The newest plastic kit in **Monogram's** series of " instant fun ' car kits is another Tom Daniel way-out creation—the Paddy Wagon. The body is of old horse-drawn patrol wagon type, but when this is put on a chassis with a fully modified engine, big, fat drag slicks, cycle fenders and custom mag. wheels, it is instantly transformed into a flashy show car. The kit also has a custom " passenger " compartment with tufted upholstery and wood grained seats; plenty of chrome parts, some in authentic ornamental shapes; police station globe tail lights and combined custom and antique cab interior. Altogether a very pleasing model. The kit is packed in a big colourful box, and includes full painting and assembly instructions, plus a big selection of " cooky " transfers.

Monogram's Pie Wagon

Another addition to **Monogram's** line of mad, mod fun cars is the Pie Wagon—yet another of Tom Daniel's way-out, custom-built designs.

This " Cherry Red " model sports many brass and chrome parts, which is enough to make any gourmet's mouth water. The rear door with psychedelic glass opens to give full access to the packed pie-tray. The wild interior contains a long, cherry-topped gear lever and old-time racing car fuel tank. Another amazing feature is the slight suspension on the rear wheels—very authentic.

Its engine is of the Custom Ford type, with custom exhaust system and " T " Brass radiator. The wide drag slicks on mag-spoke wheels add to the Wagon's authenticity. These we think could have been a little fatter at the back, and thinner at the front.

This, as with all Monogram models, fitted together easily and quickly. The finished article is very weird, yet very pleasing. Full assembly instructions are included and a choice of three different types of transfers can be made.

Red Baron by Monogram

The Red Baron strikes again! One of **Monogram's** all-time favourites, the Red Baron, designed by Tom Daniel, is now being introduced as a new bigger model. This model, measuring over 9½ inches long, still contains many of the features enlarged from the original. These include a 1914 Mercedes aircraft engine, fat drag slicks on Iron Cross mag wheels, 12 sweeping exhaust tubes, twin Spandau machine guns, German gas mask cannister fuel tank, detailed interior and a gleaming chrome German spiked helmet of World War II vintage. The kit also contains a miniature skull sporting a spiked helmet plus full assembly and painting instructions.

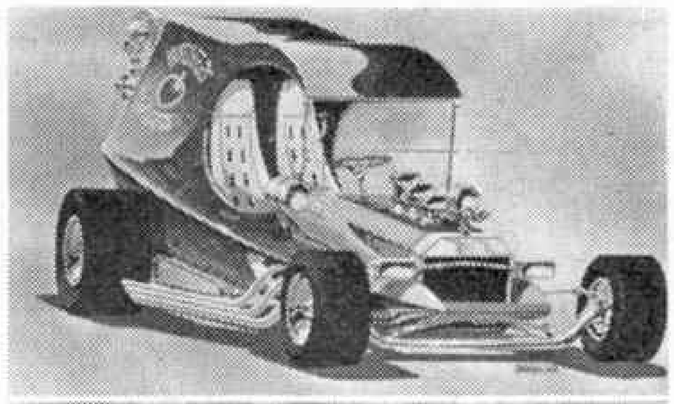
At right: Monogram's Pie Wagon, Paddy Wagon and enlarged Red Baron.

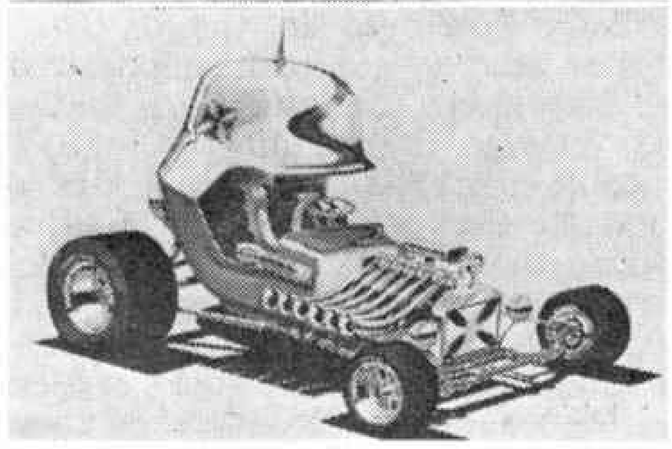
Corgi's American LaFrance

Always an impressive scene at a fire in America, is the arrival of an American LaFrance fire appliance. With its sirens screaming and lights flashing, this 53 ft. long tractor/trailer reaches speeds approaching 60 m.p.h. and carries an escape ladder extending to 100 ft., and ground ladders to reach 208 ft.

The **Corgi** model is fully manned with a driver, 4 firemen and a tillerman, who is mounted high at the very end of the chassis to steer the rear wheels. The open tractor with 8 jewelled lights, rear view mirrors and a host of Chrome fittings can be unhitched from the trailer. The escape can be raised and rotated through 360 degrees. The triple extensions to the escape can also be raised, extending to a height of 17½ in. Half a dozen clip-together ground ladders are stowed under the high escape and massive extending jacks are included to steady the trailer when the main escape is at maximum height.

Corgi also provide mock, dry chemical extinguishers, tool-boxes and fire hose faucets. All in all a very delightful model, which costs only 37s. 6d.



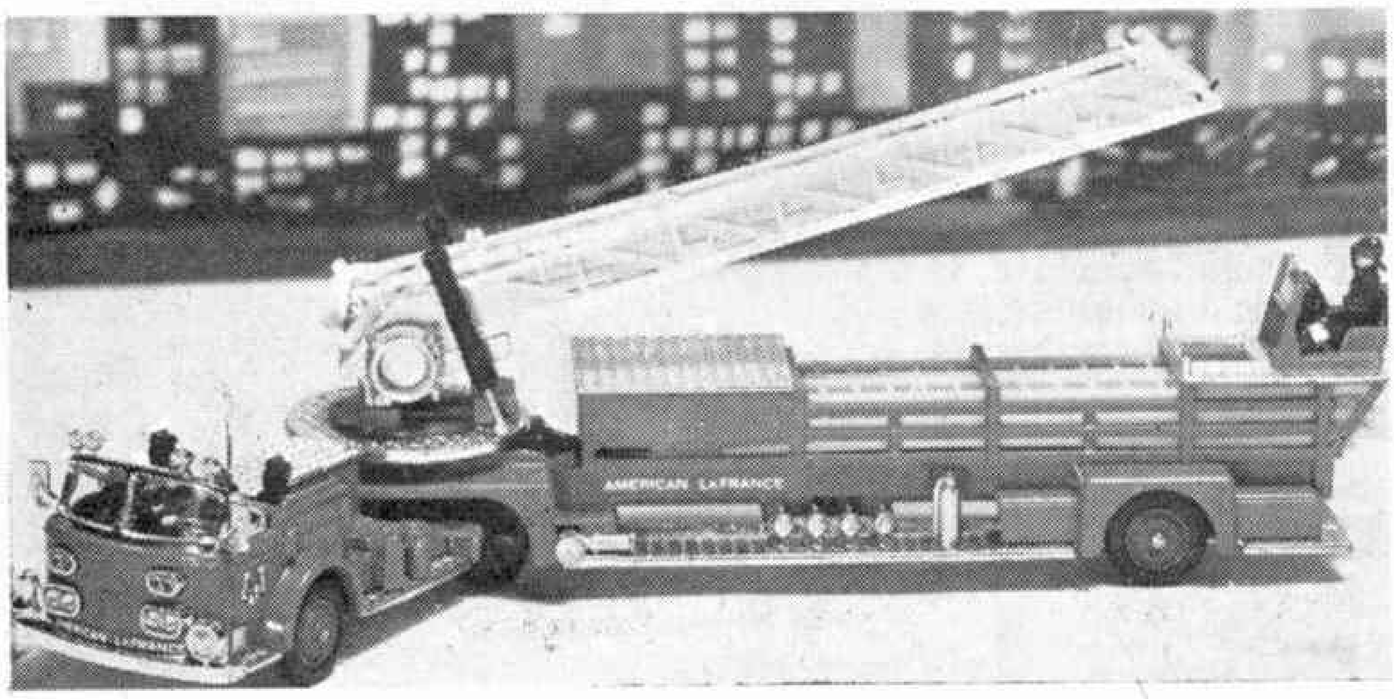


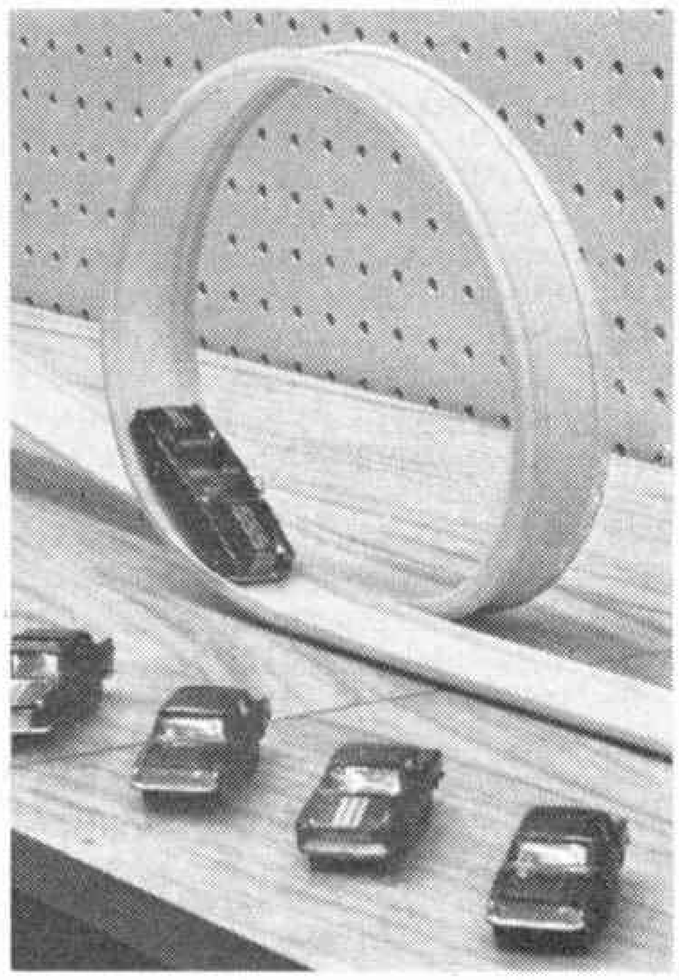
Lone Star Flyers

A completely new type of die-cast model car is being introduced by **Lone Star** Products. Engineered so as to reduce friction to a minimum, these models fly and they not only go faster, but travel far greater distances. Also a plastic track has been provided for the car to run on. This track, which is set up with one end raised, is completely flexible and can be looped to create a dare-devil wall of death. Using two lengths of track, the flyers can be made to leap a gap, or jump from one level to another.

The cars themselves, all scale models, have windows, seats and steering wheels, with opening doors, bonnets and boots. All cars have relief model engines based on the engine of the prototype.

Below: Corgi's American LaFrance fire appliance. It has extending and rotating ladders plus many accessories. At right: Lone Star Flyers zooming down the loop-of-death on the new flexible track.

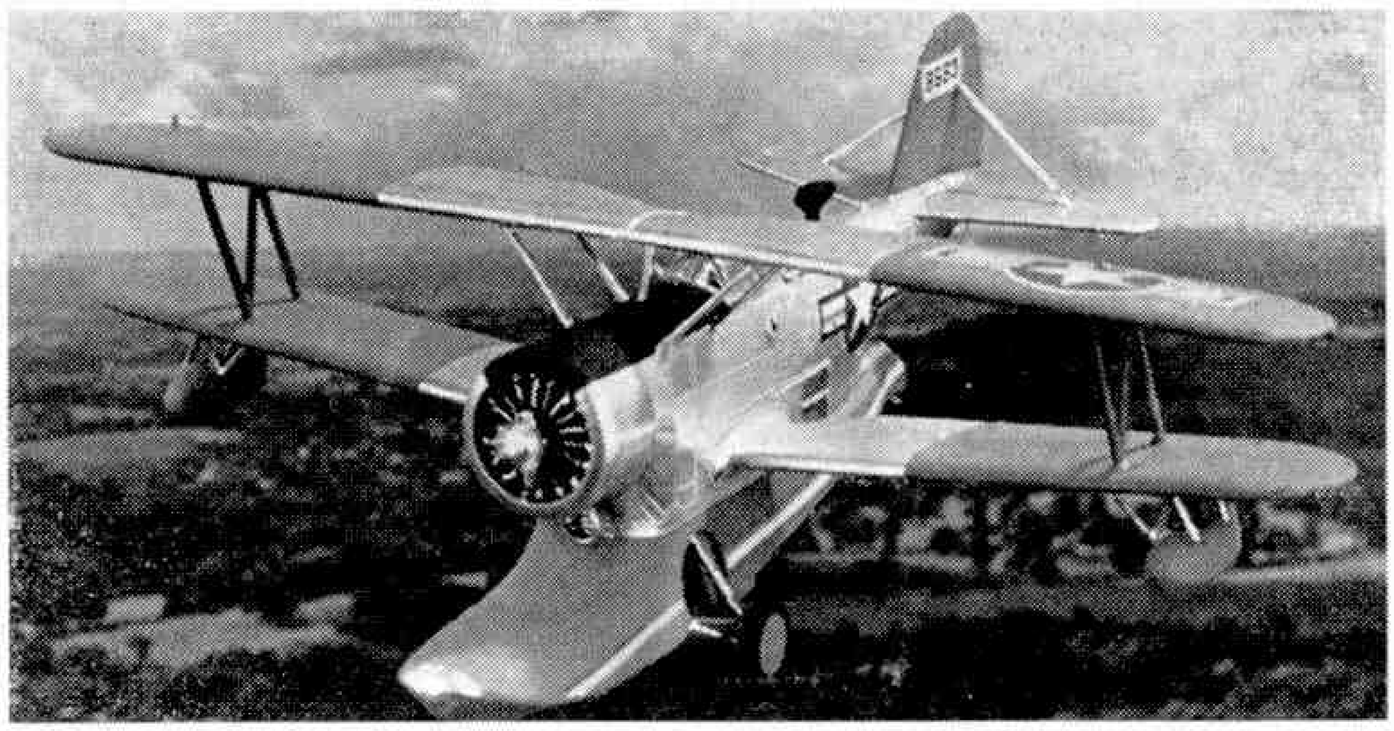


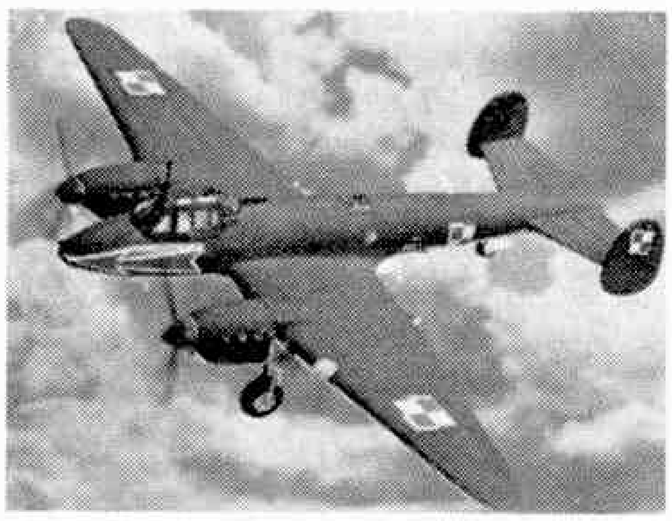


An Airfix Amphibious Aircraft

Another introduction to the **Airfix** Aircraft Series is the Grumman J2F6, known as the "Duck." This, a single-engined biplane, float-plane, first flew in 1955 and subsequently did service on air-sea rescue operations, photo-reconnaissance, target towing and as a light transport. It was also based on U.S. aircraft carriers, and was so fitted with an arrester hook and catapult points. Usually the Duck was unarmed, but on some occasions a flexibly mounted 0.30 in. machine gun was fitted in the rear cockpit and up to 650 lbs of bombs carried.

The kit contains enough parts to assemble a number of variations; these are of course the unarmed, aircraft carrier and armed versions. The extra parts included are a machine gun and mounting, bomb racks, bombs and an arrester hook. The wheeled landing gear can be assembled in either the lowered or retracted position. Transfer and painting instructions for the J2F6 in service during and after the 1939-45 War are included, plus full assembly instructions.





Felt Tip Pen from Eagle

Everyone at one time or another has used a felt tip pen, and we know that after some time the tip gets flattened making it difficult to write with. **Eagle's** new felt tip marker called Koh-i-Dry has been specially designed with an extra strong tip to withstand this rough and constant use.

The Koh-i-Dry marker is available in 6 vivid and permanent colours—black, blue, red, yellow, green and brown—which will mark on virtually any surface in either thick or thin lines. The capillary ink-feed action enables the marker to be used at any angle without the ink in the nib drying up—even when writing upside down !

The colour coded cap, when removed from the tip, fits tightly into the base, and when replaced for a short period reactivates the marker.

We have used this marker extensively both in the office and at home and find it most satisfactory. The Editor finds it specially useful for writing numbers on wings of model aeroplanes, as it gives a solid line, and dries quickly. We think it is very reasonable priced at 3/3d.

The Airfix Russian Pe-2

The Vladimir Petlyakov-designed Pe-2 low altitude dive-bomber, which played an important role during the 1939-45 war on the Eastern Front, has become the subject of the latest addition to the **Airfix Series 2 range of 1 : 72 aircraft** kits.

The Pe-2, which first went into active service in 1941, has two M-105 R engines, each developing 1,100 h.p. giving the aircraft a top speed of 335 m.p.h. and a range of over 1,000 miles. Its armament consisted of a single 7.62 mm. machine gun fixed in the nose, and two 12.7 mm. machine guns, are mounted in the rear cockpit, and the other under the fuselage. The aircraft also carries an inboard bomb load of 2,200 lbs plus bomb racks beneath the wings.

The **Airfix Pe-2 costing 3s. 8d., has** 90 numbered parts. Included with the painting and assembly instructions are transfers for both the satellite air forces and the war-time Red Air Forces.

Above right: The Airfix Grumman J2F6, known as the "Duck." Kit contains parts for a number of variations. Above: The Airfix Russian Pe-2, the full size version of which has a top speed of 335 m.p.h. Right: The Eagle Koh-i-Dry felt tip pen.

COIN COLLECTING

Continued from page 181

and current issues of other nations, that can be blended into a representative collection to form a picture of ways of life different from our own, yet not all that much different.

The story of Australia can be re-told with a few well chosen pieces even if we must, because of their scarcity, leave out the Holey Dollar and the Dump, which came into use following the Proclamation of 1813, whereby the Spanish Dollar, then freely circulating in the New Continent, was to be transformed into two coins (5/- and 1/3d.) by stamping out the centre.

So it is with many different nations: each has its own story—reflected so vividly in the coinage. Czechoslovakia (a brief outline of the coinage has appeared in an earlier 'Cartwheel'). Finland, France, Germany, Russia: representative types can be obtained for very little outlay and there is much to look for. Apart from regular issues some countries have World War II invasion issues; types reflecting the movement of national boundaries or the presence of occupying forces, all history in metal discs.

Egypt is yet another country that possesses a colourful past. Fingering an easily acquired Five Piastres Piece of Farouk one can wander in imagination to the days of the Pharoahs, the birth of the Sphinx, the building of the pyramids, and back to the days when ring money was a form of national currency: "A golden ear-ring of half a shekel" "Two bracelets . . . of ten shekels weight of Gold".

To recapture the romance of the story of Hadrian's Wall we need pay only a modest sum for a reasonable example of that Emperor's coinage, not perhaps the British issues, but we have an era. It can be the same throughout the Roman period. Perhaps with the possible exception of Token types, the Roman issues reflect more easily than any other the events of their time.

Through the libraries there are many facilities for research and this is half the pleasure of collecting, whatever the coin, whatever the condition.

There's a lot more to coins than money.

BATTLE

Part XII—INFANTRY WEAPONS

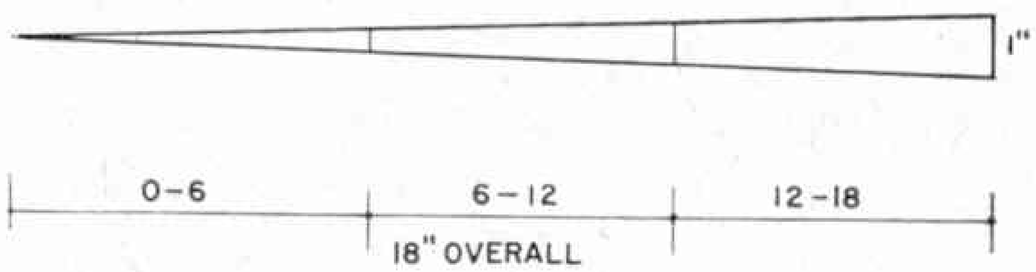
by

Charles Grant

AFTER OUR little excursion into the realm of armoured warfare, we return, as I indicated at the end of Part XI of "Battle", to the footslogging infantryman, without whom, in spite of the incredible sophistication of the weapons of even the period we are concerned with, neither battle nor campaign can be successfully waged.

Way back, in Part IV of "Battle" to be exact, we made a preliminary examination of the weapons of the footsoldier and an attempt was made to divorce them from the unreality with which various entertainment media have invested them—the 'bringing down of a rapidly moving target at several hundred yards range with a pistol' sort of thing. We also took the first step to giving effect to these weapons in our game by listing the maximum effective range of those we proposed to use, taking an average for each main type of weapon, while appreciating that the same sort of weapon in different armies had probably slightly different characteristics and capabilities. Once we have devised a system for assessing the amount of damage these weapons can do as an average, the player can work out the finer details of the different types, if he wants his game to have more refinements than is proper to consider in this context—that of getting off the ground with the elements of the game.

Right then, we begin, not unreasonably I think, with what is even today the mainstay of the infantryman, to wit, his rifle. As with any sort of armament, the greater the distance that his target is from the rifleman, the less—obviously—will be the likelihood of that target being hit, and at the maximum range of the rifle, which we established as being 9 in. (or 300 yards in 'the real thing') the average infantryman is only going to have a pretty slim chance of hitting anything other than a "sitting duck". Pace out, if you like, 300 yards, remembering that your pace is at most 30 in., and listen to your own sounds of surprise when you see just how tiny is the human figure at that distance. The closer you are, naturally, the greater the chances of getting a hit, so, as for artillery armour-piercing fire, we shall subdivide rifle range into three—



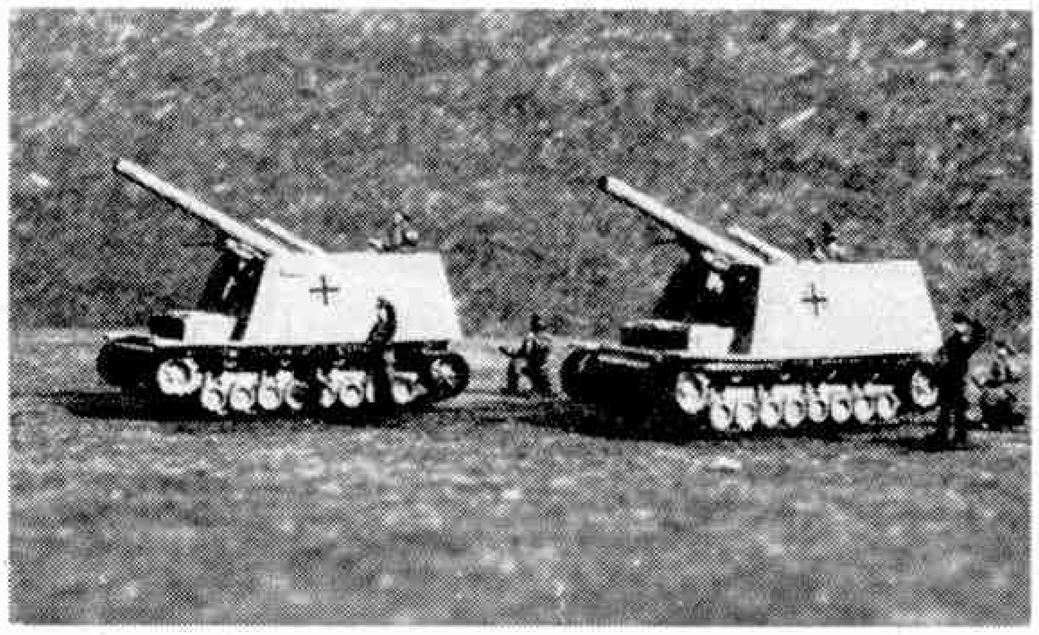
THE "MACHINE GUN CONE"

0 in.-3 in., 3 in.-6 in., and 6 in-9 in., labelling them close, medium and extreme range respectively.

We shall not give our requirements for a hit at these ranges right away as a second factor has to be discussed. Remember that we are dealing with infantrymen who are lurking about and dodging here and there to confuse the opposition, and doubtless being properly trained, are making the maximum use of ground irregularities, buildings, bushes and so on, all of which can be described as 'cover'. This is quite certainly a vital consideration and one which must have a very appreciable effect on the result of rifle fire or indeed of any other infantry weapon. It is going to be a great deal easier to hit an enemy who is standing up in the open with his whole body in full view than the one who is almost totally concealed in a fox-hole or who is crouching behind a wall. Not only does that fraction which is visible present a very small target but much of his anatomy is pretty well 100 per cent safe behind the wall, or whatever he might be using as cover. On the other hand he might be hidden by bushes, a hedge or a fence, although this, while affording a high degree of concealment which makes him a pretty difficult target, does not provide the protection the wall did. This quite simply is the distinction between the two types of cover we have to allow for in drawing up rules for the effectiveness of rifle fire, and for the other weapons we shall be considering later. 'Hard' cover provides not only concealment but protection, 'soft' cover only the former.

Table One (Effect of rifle fire)	Dice throws causing casualties		
Range in inches	In the open	Soft cover	Hard cover
0-3	4, 5, 6	5, 6	6
3-6	5, 6	6	—
6-9	6	—	—

So, for our rules for rifle fire, we must make allowance for the vagaries of the bullet the further it travels, as well as for the effect of both types of cover. In "Battle" we adopt the simplest possible system to assess the effect of infantry firing at infantry. We take each individual soldier firing and throw one dice to determine whether he has hit the enemy infantryman at whom he has fired, the single throw determining both hit and result. This is done, as with an armoured fight, when the 'moving' part of the 'game move' has been completed, the range being taken as it stands at the end of the move. One dice throw is made to represent the amount of fire the rifleman is capable of during this time. No one, after all, is going to waste valuable ammunition by wildly letting off a whole fusillade 'into the blue'—a single, aimed shot is obviously far more likely to produce a satisfactory result. So, in brief, when RED rifleman 'A' fires at BLACK rifleman 'B', whether or not he hits him is determined by comparing the result of the dice throw with the appropriate effect as shown in Table One, this being based on the known probabilities of the results of rifle fire at the various ranges given, and at the same time having regard to the presence or absence of 'hard' or 'soft' cover. Table One gives just this, and the reader will see that effectiveness decreases until the point where, at a range of 6 in.-9 in., it is so extremely unlikely that a man behind any cover would be hit by rifle fire that we can ignore it completely. After all, just think how small the target would be



You can always make your own artillery—Self-propelled guns 'cannibalized' from various Roco models (David Gates collection).

were the man hiding round the corner of a house, from time to time poking his head out to have a 'look-see'. Even were he returning fire from behind the same corner precious little of him would be in sight. It would indeed take some fancy—not to say lucky—shooting to register a hit on such a minute and fleeting target.

So, briefly, when 'A' fires at 'B', a dice is rolled and the range noted. Reference to Table One shows whether the result is a hit. If it is, then 'B' is a casualty and is forthwith removed from the table. Incidentally, as firing is considered to be simultaneous, if the now defunct 'B' was firing back at 'A', player 'B' also rolls a dice to see whether *his* man's rifle shot was successful, and if it is, then 'A' is also whipped smartly off the table. (Moving simultaneously is occasionally the cause of wargame anomalies, but there is a simple way of overcoming them, as we shall see later).

From the rifle we progress to the machine gun which, it may be recalled, we decided was to be the heavier type, the tripod-mounted job in contrast to the lighter and more mobile bipod-mounting (say, the wartime Bren, for instance). The range we allocated to this most useful weapon was 18 in. (being the equivalent of 600 yards) and, as for the rifle, we divide this into three—0 in.-6 in., 6 in.-12 in. and 12 in.-18 in., corresponding to close, medium and extreme range. First of all, though, a little bit of Do-it-yourself work is involved, for this is not just a matter of a single round travelling in a straight line. At 600 yards even a short burst from a machine gun will 'fan out' somewhat, and when the gunner is 'traversing' his weapon, the "spread" will naturally be more.

Table Two (Effect of machine-gun fire)	Dice throws causing casualties		
Range in inches	In the open	Soft cover	Hard cover
0-6	3, 4, 5, 6	4, 5, 6	5, 6
6-12	4, 5, 6	5, 6	6
12-18	5, 6	6	

This traversing operation—may I point out?—does not involve the tremendous sweep through about 80 or 90 degrees one sees often enough on the screen. This in practice would scatter a hail of bullets half across the horizon and would be a complete waste of ammunition, the idea being to maintain a fairly heavy concentration of fire. However, we do have to cater for the spread and this we can best do with the aid of a simple device, cut from thin card, made from wire bent to shape, or best of all cut from a piece of transparent acetate sheet, this being the "Machine Gun Cone" illustrated in the diagram.

This bit of apparatus is obviously 18 in. in length, and if one considers it as a triangle, is 1 in. across at the base, this giving a 'spread' at maximum range of just over the equivalent of 30 yards. This might be a shade more than is desirable for an arc of fire, but it will suffice, as the device would have little use in representing machine gun fire if any narrower. It is divided into the suggested ranges, the lines being drawn in with a felt-tipped pen or with marking ink, using a fine brush. In operation it is simplicity itself, being placed in position with the apex at the muzzle of the M.G. and laid along the line of aim desired—the advantage of its being transparent becomes apparent—all troops covered by it being considered vulnerable. They have to be diced for as possible casualties. Again we have to allow for both types of cover and in Table Two are given the dice throws required to account for any unfortunate types who happen to be included in the Cone, the effect being more lethal as the range closes. If, by the way, an unlucky infantryman becomes a prey to M.G. fire when casualties are assessed, he nevertheless is allowed to have a crack in reply, if in range of the M.G. He might be just lucky enough to put paid to a member of its crew, which would be a good thing. This is due to the proviso that such firing is simultaneous.

This indeed might be a good time to mention the crew of a machine gun. We assume for the purposes of "Battle" that it requires a minimum of two men to operate, so, when one becomes a casualty, the gun is out of action, of course. However, it seems reasonable to allow an ordinary infantryman to be brought in as a substitute, if available, when the N.G. fires as normal. This we take as being a standard Rule, then, not forgetting that the infantryman must get to the M.G. in his normal 3 in. move and until he does so the gun cannot fire. It might be suggested that not every infantryman is capable of operating the M.G., but let's be generous and assume that all our men have that little bit of extra training which makes this possible. After all, we can train our troops just as we like, can't we?

And in our next, we shall round off our consideration of infantry weapons before carrying on with some more action.

A somewhat risky operation!—a tank commander pops up for a breather. Let's hope no enemy sniper is about.

Ground crew members loading 13.5 cm. rockets under the wings of a SAAB 105XT which, in this arctic scenery at Vidsel, also carries two gun pods each housing one 30 mm. cannon.

AIR NEWS

by John W. R. Taylor

RUSSIA'S MINI-CONCORDSKI

WHEN THE Tupolev Tu-144 supersonic airliner flew for the first time on December 31st, 1968, it was inevitable that our newspapers would refer to it as the " Concordski ". With its " ogee " curved delta wing, four engines in two long underwing ducts and drooping nose, it is very much a twin sister of the Anglo-French Concorde.

In size and performance, also, the two pioneer SST's (supersonic transports) are very similar. The Tu-144 is 180 ft. long, with a span of 81 ft. and take-off weight of 330,000 lb., and is intended to carry up to 121 passengers. The Concorde has a length of 193 ft., span of 84 ft., loaded weight of 367,000 lb. and accommodation for 128 passengers.

The turbojets fitted in the Russian aircraft are Kuznetsov NK-144's, each rated at 28,660 lb. thrust or 38,580 lb. with afterburning. Comparable ratings for the Olympus 593's in the Concorde prototype are 32,825 lb. and 37,400 lb. respectively. The Tu-144 is designed to cruise at 1,550 m.p.h. (Mach 2.35, or 2.35 times the speed of sound) for 4,040 miles at a height of 65,000 ft. The slightly larger Concorde will have a maximum cruising speed of 1,450 m.p.h. (Mach 2.2), but will normally fly at 1,350 m.p.h. (Mach 2.05), at which speed it has a maximum range of 4,250 miles.

Being tailless deltas, both types of SST land with their noses high in the air. That is why their nose-cones, forward of the flight deck windows, are drooped during the landing approach, to give pilots an improved forward view. First to fly with a droop-snoot of this kind was the Fairey Delta 2 research aircraft which set up the World's first over-1000-m.p.h. speed record back in 1956.

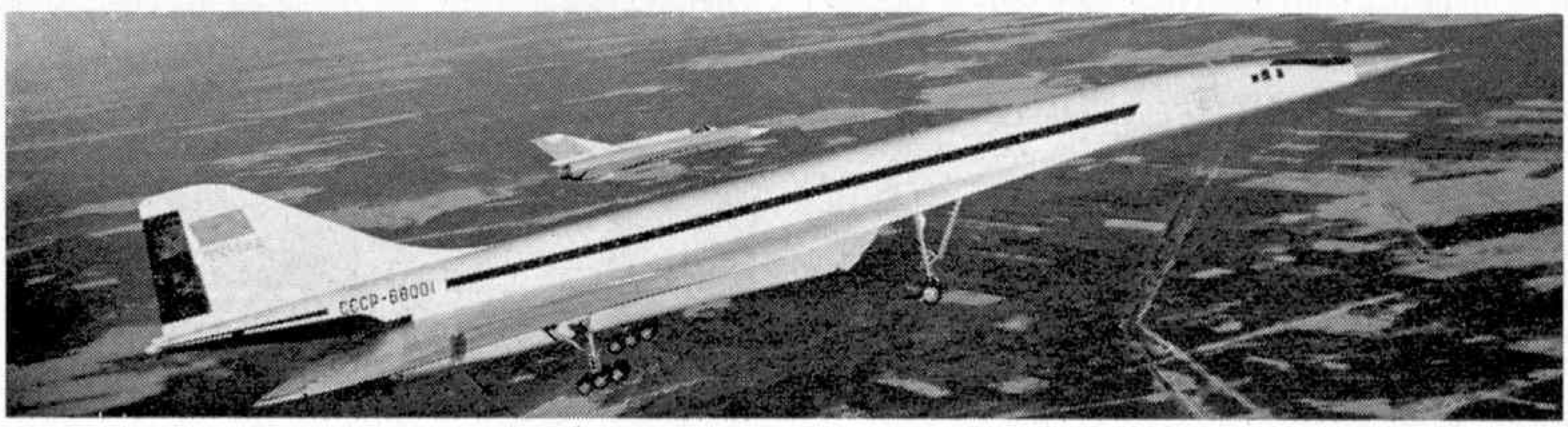
Later, the Delta 2 was modified into the BAC 221, with its original straight delta wing replaced by a small-scale replica of the Concorde's ogee wing. This enabled BAC and Sud-Aviation to study the behaviour of the new-shape wing in high-speed flight long before the full-size airliners were completed.

It was, therefore, no surprise to learn that Andrei Tupolev's design team also fitted an existing aircraft with a small-scale replica of the wing of their SST, for initial flight testing. Their " mini-Concordski " research machine, revealed when photos showed it escorting the Tu-144 during the latter's first flights, is basically a MiG-21 fighter. It was a good choice, as the standard MiG-21 is very much a " pilot's aeroplane ", pleasant and easy to fly, and ought to make a first-class research aircraft.

Cold Weather Fighter

Combat aircraft designed for service in countries like Sweden have to remain operational when the temperature drops well below zero. The little Saab-105XT twin-jet trainer/light attack aircraft showed its capabilities in this respect when Winter came a month earlier than usual in 1968.

The prototype 105XT was at Vidsel, in North Sweden, last October when the snow came. It had already completed weapon trials in which full salvoes of twelve heavy rockets and full magazines of cannon ammunition had been fired at a speed of 560 m.p.h. After the rockets had exploded on target, the aircraft was deliberately flown through the smoke to prove that the gases would have no effect on the smooth running



At top right: The Fairey Rotodyne built some 10 years ago, set up a speed record of 190 m.p.h. Right centre: A scale model of the TU 144 in a wind tunnel.

of its 2,850 lb. thrust General Electric J85-17B engines.

When the temperature dropped suddenly to −15°C by day and −25°C by night, Saab engineers decided to carry out one more test. The 105XT was left parked out in the open with loaded guns. Next morning the engines were started by using the aircraft's own battery, after which an air firing test was made, with complete success.

Canadian Pacific Go—Gay

Ten to fifteen years ago, Canadian Pacific was regarded as simply a railway company with an airline, some ships and some trucks. Today, it is a vast organisation, with many different interests, and has recently adopted a new public " image " to reflect this change.

Canadian Pacific Airlines, for example, has become CP Air; and, like all other Canadian Pacific vehicles, buildings and publications, its aircraft carry on their tail-fin a new symbol. This is described as " a portion of a square to represent stability, a segment of a circle to suggest global activities and a triangle to denote motion and movement."

The complete new paint-scheme is very vivid indeed on CG-CPU, the first of CP Air's fleet of seven twin-jet Boeing 737-217 airliners. The strips running down from the top of the flight deck to beneath the rear fuselage on each side, and the triangle on the tail, are red. The top of the fuselage and most of the tail-fin are orange, this being the basic colour for the CP Air symbol.

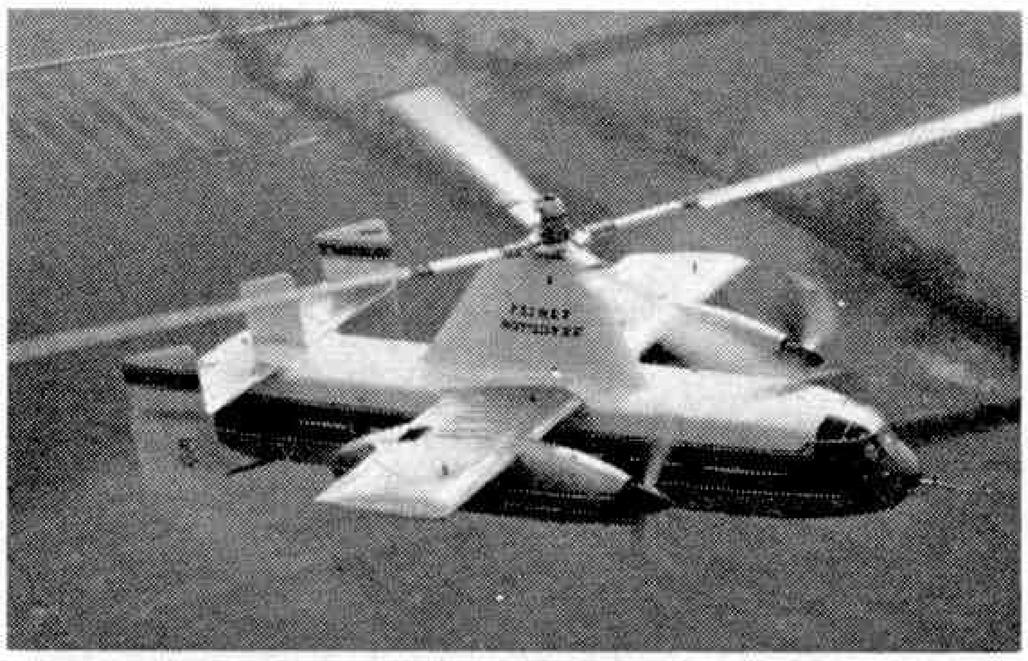
The colour of the symbol is red for CP Rail vehicles, blue for CP Transport, green for CP Ships, grey for CP Hotels and yellow ochre for CP Telecommunications.

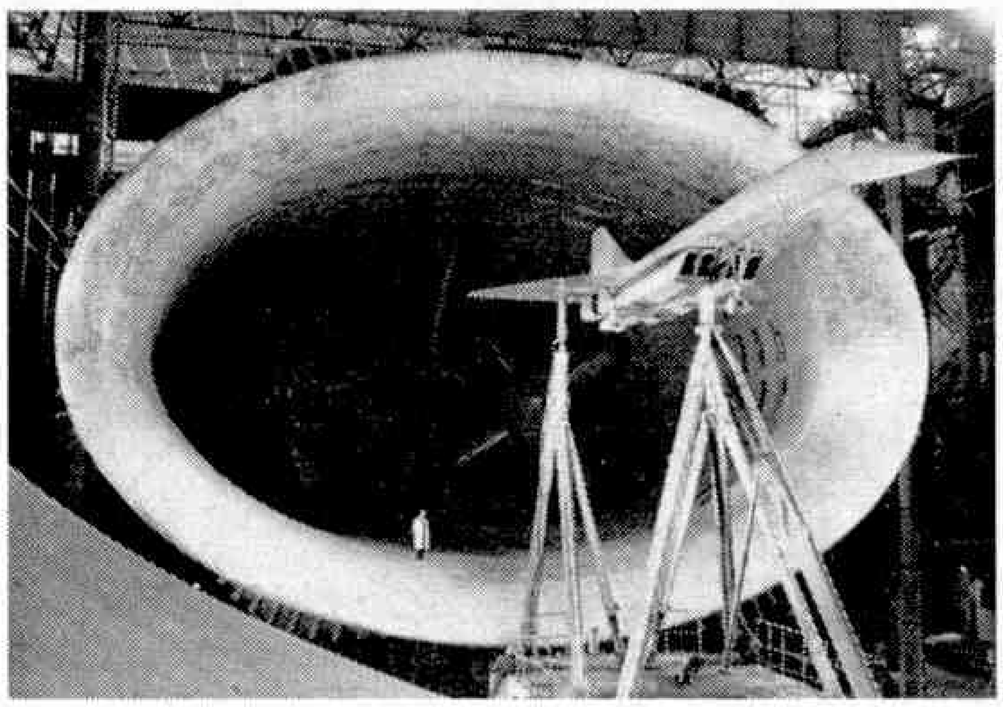
It may be some time before the new paint-schemes become a familiar sight in the U.K., as they are being applied to existing ships and aircraft only when the craft undergo their annual drydocking and overhaul respectively. Eventually, however, CP Air's DC8- will add a bright splash of colour to the British airport scene, and we may one day reach the stage where fashion-conscious ladies will choose to travel by the airline whose livery matches best their new clothes.

300 m.p.h. Chopper

Ten years ago, on January 5th, 1959, a rotorcraft named the Fairey Rotodyne set up a speed record of 190.0 m.p.h. over a 100-km. circuit which has never been beaten. Like so many other fine British aircraft, it was soon scrapped by the government, not because it didn't work but to save money. And, again true to form, it has been left to foreign aircraft companies to realise the potential of a British idea and turn it into profit-making reality.

The Rotodyne was what is known as a compound helicopter or convertiplane. It took off, landed and



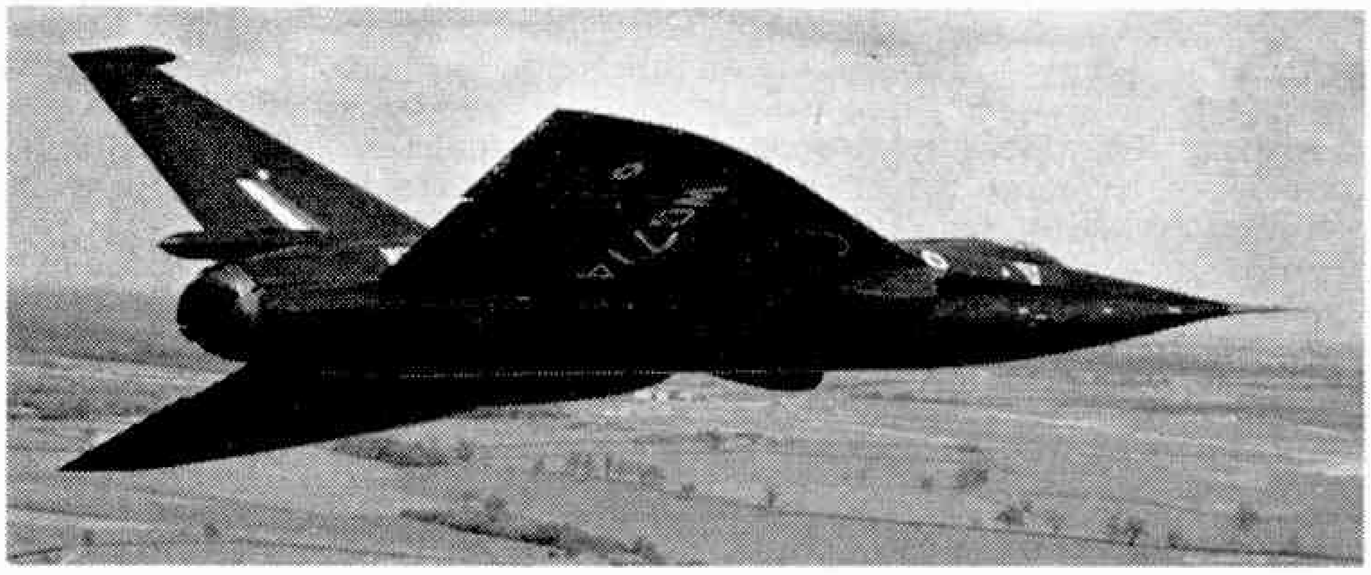


hovered like a helicopter, using the power from its wing-mounted engines to drive the main rotor. In cruising flight, it was able to " convert " to an autogyro configuration, with the main rotor windmilling freely in the airflow and all the power of the engines being used to drive conventional propellers. Added to the fact that it had fixed-wings to off-load the rotor in flight, this enabled it to cruise at much higher speeds than an ordinary helicopter.

Sikorsky have adopted the same principle for their new S-65 compound design. Intended for military and civil transport, rescue and surveillance duties, this helicopter would be powered by three 5,000-h.p. turboshaft engines, two in underwing nacelles and one inside the main rotor fairing. All three engines would be able to drive the main and tail rotors for take-off and landing, and the propellers in forward flight. Top speed is estimated at nearly 300 m.p.h., with a cruising speed of 265 m.p.h.

If ordered now, the compound S-65 could be flying within three years. Up to 86 passengers would be carried for 260 miles by the civil version.

At left: The TU 144 in flight with wheels down (usual for early flights of large aircraft). Escort is a modified Mig 21 with a scaled down TU 144 wing.



At right: The BAC 221 delta research aircraft, was re-designed and re-built from the former Fairey Delta 2. This was to study the ogee wing shape as used on the Concorde.

Medals on Stamps

by James A. Mackay

THE RECENT news that an American pilot was awarded no fewer than nineteen medals for gallantry during a six months' tour of duty in Vietnam reminds me that although the United States has been generous in the issue of medals none of them has yet appeared on a postage stamp. The nearest to this, I suppose, is the stamp released by the Arab sheikhdom of Ajman in memory of the late President Kennedy and showing him being decorated with the Navy Cross for bravery in the Pacific theatre of operations during the Second World War. Another unusual stamp was that issued by Belgium in 1957 and showing General Patton decorating Brigadier General McAuliffe with the D.S.C. after his successful defence of Bastogne during the Battle of the Bulge.

Although Britain is much more conservative when it comes to awarding medals, no fewer than four of her orders and medals have appeared on stamps. In fact the earliest stamp in this theme was a large brown stamp from the Australian state of Victoria which, appropriately enough, showed the Victoria Cross. This stamp was valid for a pennyworth of postage but sold for 1s., the premium going to a Boer War charity fund in 1900. Since its inception in 1856 only 1,347 Victoria Crosses have been won, the most recent having been awarded to Rambahadur Limbu in the North Borneo campaign.

In 1941 King George VI created two new gallantry awards—the George Cross and the George Medal, intended primarily for civilians and members of the armed forces in actions where purely military honours would not normally be granted. Of the George Cross the best known award was that made to the island fortress of Malta on 15th April 1942, " to honour her brave people . . . to bear witness to a heroism and devotion that will long be glorious in history." The citation for this award was reproduced on the 3d. definitive stamp of 1956, while numerous Maltese stamps from 1946 onwards have incorporated a George Cross in their design. Special sets commemorating the award were issued in 1957, 1958, 1959 and 1961, while a handsome series of three large-sized stamps appeared in 1967 to mark the 25th anniversary of the award.

Two orders of chivalry have appeared on Commonwealth stamps. The colonial omnibus design for the Silver Jubilee of King George V depicted the collar and badge of the Order of the Garter, while the Indian Jubilee stamps featured the Most Exalted Order of the Star of India. The Order of the Garter, founded in 1348, is one of the oldest in existence—as well as one of the most exclusive, being confined to 26 Knights. The Star of India was instituted in 1861 and has been in abeyance since India became independent in 1947.

France and her colonies have contributed several fine medals on stamps. In 1952 a stamp showed the premier award, the Medaille Militaire, to celebrate its centenary. Both the 1852 and 1952 versions of the decoration were featured. Algeria and twelve colonial territories each issued a stamp for the same occasion. The 150th anniversary of the Academic Palms was marked in 1959 by a stamp showing this unusual decoration which consists of a palm wreath suspended from a violet ribbon. France and Algeria issued stamps in 1954 to mark the 150th anniversary of the first award of the Legion d'Honneur. The common design of the stamps showed Napoleon holding the first investiture in 1804. More recently a 40c. stamp has appeared to celebrate the golden jubilee of the Croix de Guerre instituted in 1915 and awarded in large numbers in both World Wars.

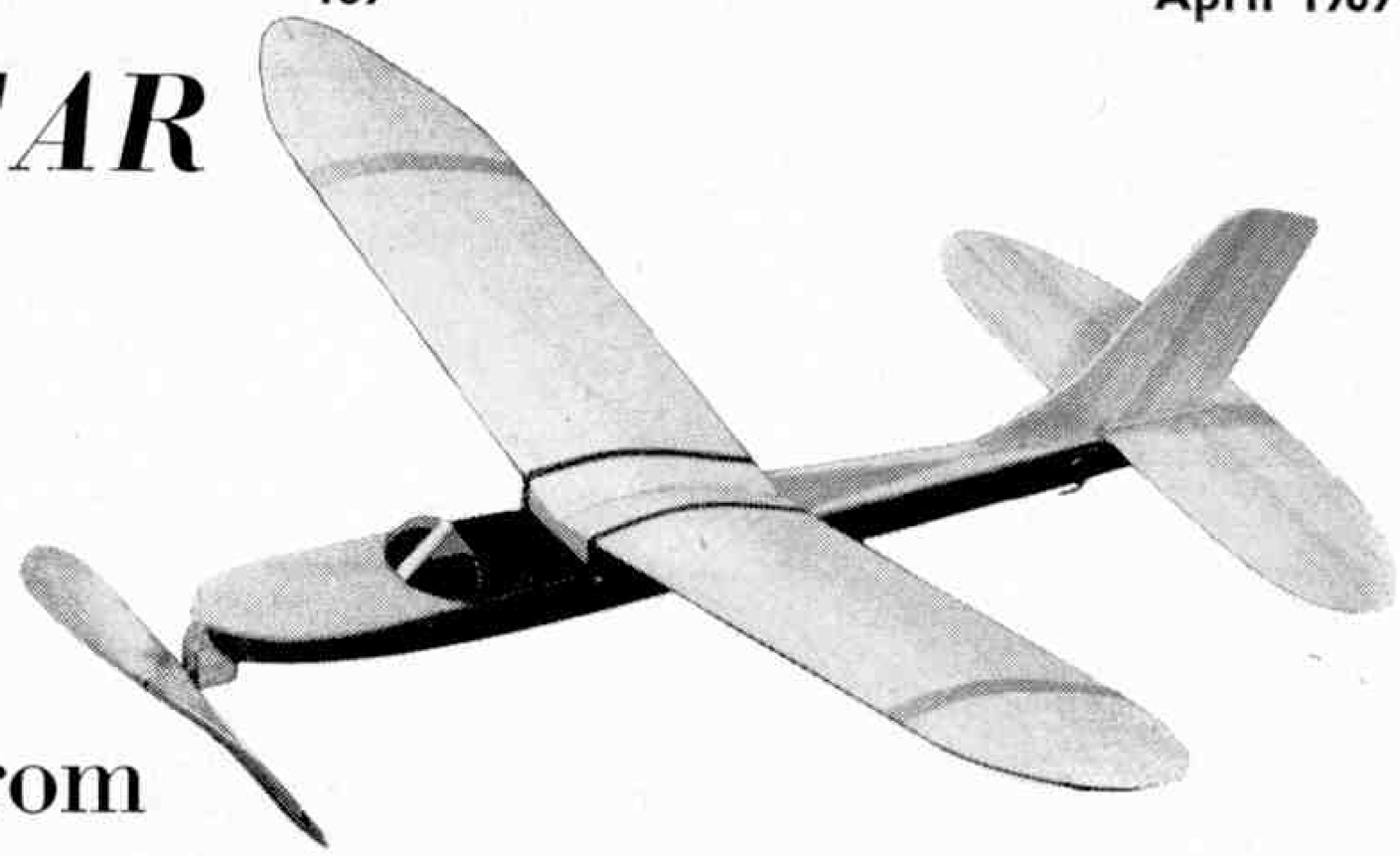
Mongolia issued a set of stamps in 1946 to mark the silver jubilee of independence and showed the 25th Anniversary and Victory Medals. North Korea produced a set of five stamps in 1950 featuring the Order of Merit, while the following year saw two stamps depicting the Order of Li Sun-sin and the Military Medal. Poland has featured a number of her medals on stamps; the Cross of Independence (1933), the Partisans' Cross and Grunwald Cross (1958), the Cross of the Silesian Insurgents (1961). Poland's highest award, the Virtuti Militari Cross, has appeared on several stamps. It was awarded to the city of Warsaw and this was recognised on the 55g. stamp issued by the government exiled in London during the war. It also appeared on stamps issued in 1958 and 1965.

The 150th anniversary of the Military Order of William was marked in 1965 by a handsome 1 guilder stamp released by Holland. Founded by King William I in 1815, it was awarded " for most conspicuous acts of bravery in the presence of the enemy." In 1968 Turkey issued two stamps in honour of the Independence Medal. But pride of place in the medal stakes must go to Russia which has issued no fewer than 59 stamps since 1943, depicting the numerous orders, medals and decorations of the Soviet Union. These range from the Order of Victory, a five-pointed platinum star studded with diamonds and rubies, awarded to generals whose success on the scale of one or several fronts has resulted in a radical change in the situation in favour of the Red Army. At the other end of the scale is the Medal of Valour which carries with its a pension of 10 roubles a month and free travel on the tramcars.

SLEEKSTAR

An easy to build rubber powered, all balsa free flight model

by Ray Malmstrom



MAYBE YOU found that last model aeroplane you built a bit on the difficult side. Well restore your confidence with SLEEKSTAR. This little job really is easy to build, so go on spoil yourself, build Sleekstar and have some flying fun.

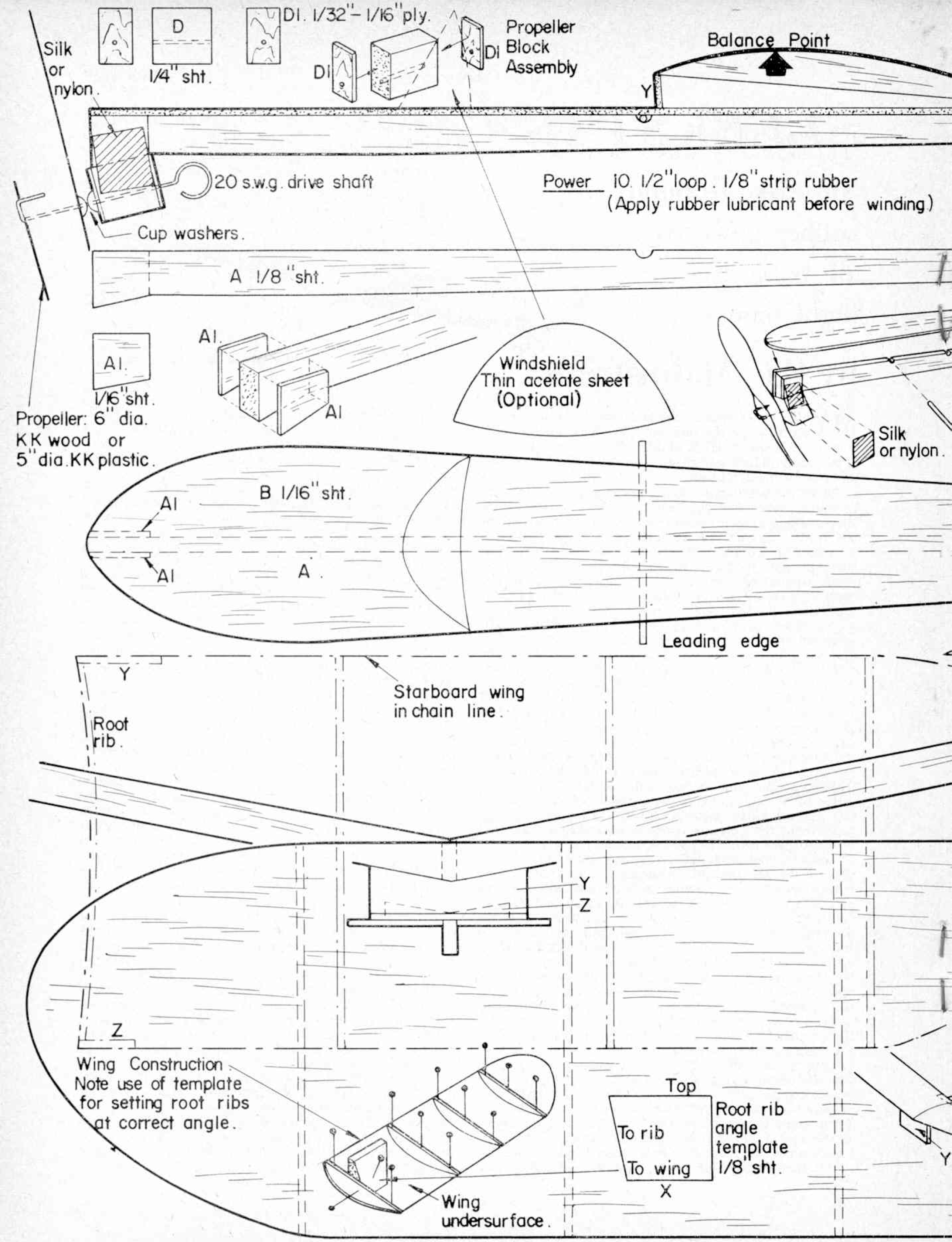
Trace the parts onto tracing paper and transfer them to balsa sheet. Cut the fuselage shape A from $\frac{1}{8}$ in. sheet, taking care to accurately cut the angled part at the front. Cut out $\frac{1}{16}$ in. side pieces A1 and cement to front of fuselage shape as shown on plan. Cut fuselage top B from $\frac{1}{16}$ in. sheet (medium grade balsa should be used for your entire model by the way). Cement fuselage shape A underneath fuselage top. Bend the rear rubber motor hook from 20 s.w.g. wire, cement in place, and hold firmly with a small piece of silk or nylon, well cemented over the wire. Cut the tailplane and fin from $\frac{1}{32}$ in. sheet. Note the small cuts in the rear edges of the fin and tailplane. These cuts will make adjustments of the fin or tailplane much easier later on. Cement two strips of $\frac{1}{16}$ in. sq. balsa under the tailplane as shown, and then cement it to the rear end of fuselage top B. Check that the tailplane is at right angles to the bottom of the fuselage. Cement fin and fin strake (c) to fuselage top and tailplane. Make sure it is perfectly upright. Reinforce the join between fin and tailplane with strips of $\frac{1}{16}$ in. sq. Cut two lengths of $\frac{1}{16}$ in. dowel rod (or carefully sandpaper round two matches) and, push them through the cut-outs on fuselage shape A. Cement them firmly to the underside of fuselage top B.

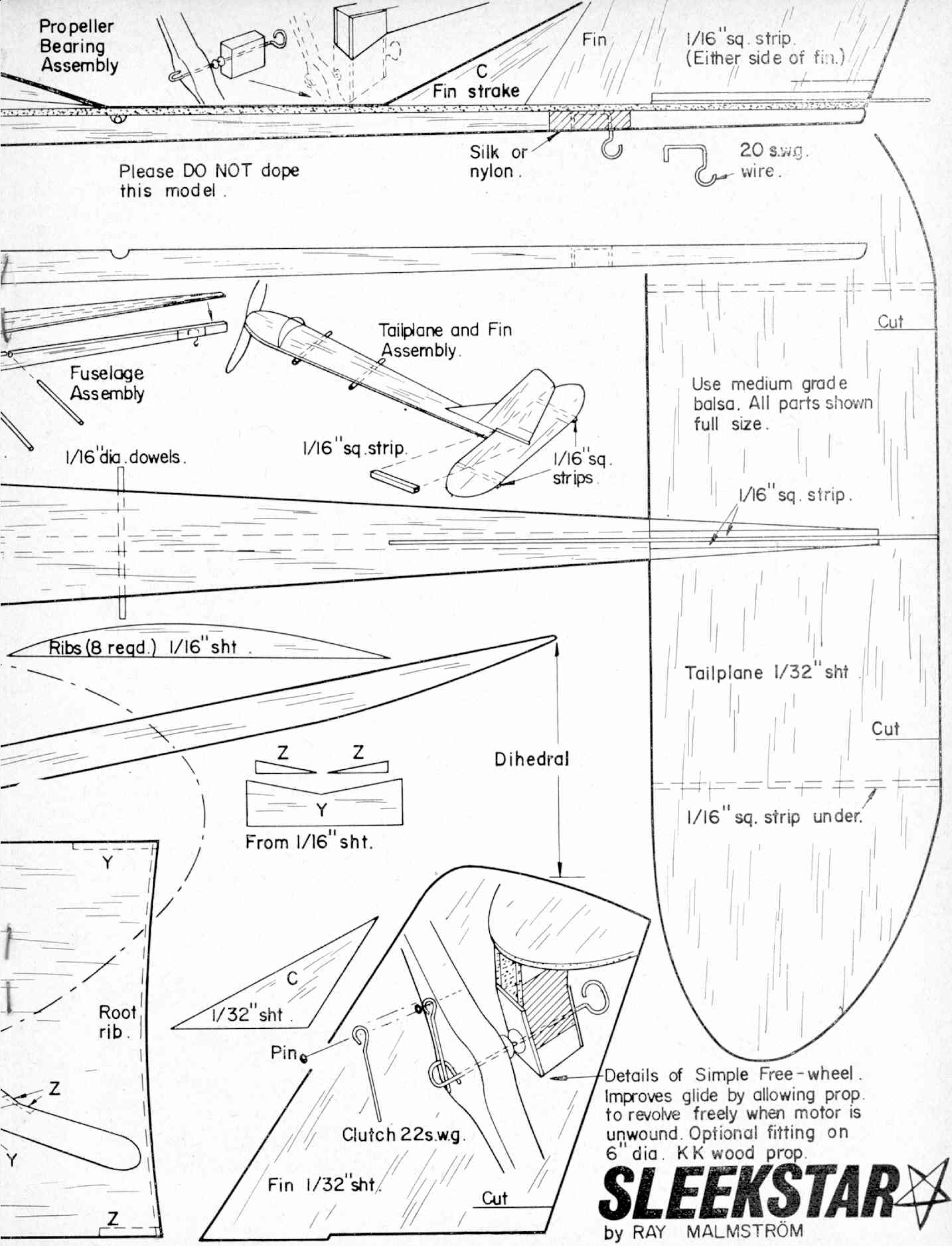
Now to the propeller block assembly, please take time over this and drill the parts accurately. Your reward will be a really smooth and accurately running propeller. Cut block D from $\frac{1}{4}$ in. sheet, and drill to take a 20 s.w.g. wire propeller drive shaft. Cut two pieces (D1) from $\frac{1}{32}$ or $\frac{1}{16}$ plywood, drill holes as shown and cement them to front and rear of block D, lining up all the holes. Form a hook in a $2\frac{1}{2}$ in. approx. length of 20 s.w.g. wire. Insert the wire from the rear of block D, making sure it turns very easily. Slip onto the wire two cup washers, and then the propeller. Bend the end of the wire into a 'U' shape so that it engages the propeller. Our own Sleekstar has a 6 in. dia. KK wooden propeller. Alternatively, you can use a KK 5 in. dia. plastic propeller. The wooden prop. gives a slightly better flying performance, and can be fitted with a simple free-wheel device (see plan). Both types of propeller can be purchased from your model shop. Then cement the completed propeller block assembly to the angled portion at the front of fuselage shape A. Check that the propeller shaft when viewed from the top is neither pointing to right or left. Reinforce the join on either side with two small squares of nylon, silk, or thin liner. Cut the windshield from thin acetate sheet and cement in place.

Now for the wing. This is easily made in two parts, and these are then cemented together. Trace the wing panels from the plan, transfer to $\frac{1}{32}$ sheet and cut out. Curving the wing panels cement the ribs in place, holding with modelling pins as shown. Take care with the end (or root) ribs. These have to be set at an angle. Use the wing root template (x) cut from $\frac{1}{8}$ in. sheet in the way shown on the plan. When the ribs are set remove all pins and the template. Cement the two wing panels together and check for equal dihedral (upward tilt of the wing panels from centre to tip). Check also by looking along the wing panels from the tip for warps. If the wing is twisted, just twist out the warp and hold the wing panel in the steam from a kettle for about a minute. Mind your fingers! Remove from the steam, still holding in the correct position for another two minutes. The wing panel should then be true and warp free. Remember warps in your wing can prevent your model from flying. Add incidence piece Y to the front centre part of the wing, and support pieces Z to the centre rear. The wing is now complete and can be mounted on the top of the fuselage, and held by two 2 in. rubber bands looped over the dowel rods and the top of the wing. Now get a 21 in. length of $\frac{1}{8}$ in. strip rubber and tie it to form a $10\frac{1}{2}$ in. loop. Lubricate this loop with rubber lubricant (Humbrol rubber lubricant in 1/- tubes is excellent). Slip the rubber loop over the hook on the propeller drive shaft and the rear hook. Sleekstar is now complete. By the way, on no account dope your model.

Before test flying, it is essential to balance your model. Push a pin tied to a length of thread into the balance point marked on the plan. The model should hang level. If it does not the wing can be moved a little forwards or backwards to obtain correct balance.

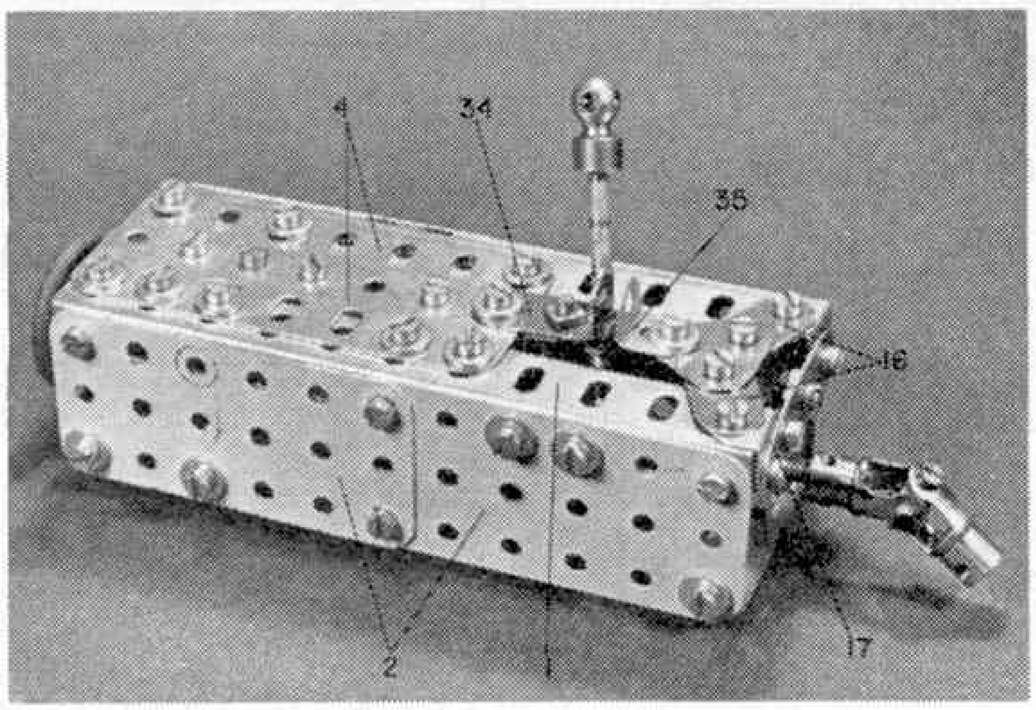
Test glide over long grass on a calm day. From a shoulder high launch Sleekstar should glide straight and land about 20-25 feet in front of you. If it turns, bend the rear edge of the fin in the opposite direction to the turn. Only a slight amount of bending will be necessary. If the model dives bend up the rear edge of the tailplane about $\frac{1}{16}$-$\frac{3}{32}$ in. and vice versa if it stalls. You can now wind up the propeller about 150 turns. Sleekstar should climb away from your hand cruise for a short distance and then glide into land. You can gradually increase the number of turns to about 350 when Sleekstar will really turn in some exciting flights, and give you lots of fun.


Silk or nylon.
D
1/4" sht.
D1. 1/32"–1/16" ply.
D1
D1
Propeller Block Assembly
Balance Point
Y
20 s.w.g. drive shaft
Power 10. 1/2" loop . 1/8" strip rubber
(Apply rubber lubricant before winding)
Cup washers.
A 1/8" sht.
A1.
1/16" sht.
Propeller: 6" dia. KK wood or 5" dia. KK plastic.
A1.
A1
Windshield
Thin acetate sheet
(Optional)
Silk or nylon.
B 1/16" sht.
A1
A1
A.
Leading edge
Y
Starboard wing in chain line.
Root rib.
Y
Z
Z
Wing Construction
Note use of template for setting root ribs at correct angle.
Wing undersurface.
Top
To rib
To wing
X
Root rib angle template 1/8" sht.
Y



SLEEKSTAR

by RAY MALMSTRÖM



A compact 3-Speed and Reverse Gearbox with authentic "H" gate-change, designed and built by Mr. Phil Ashworth of Kirk Ella, Hull. As far as we can trace, this is the most successful "H" gate-change unit we have ever featured in Meccano Magazine.

AMONG THE MODEL BUILDERS

with Spanner

Gateschange success

PERHAPS THE best way—if not the only way—I have of sensing the feelings of Meccano model-builders is through the large amount of mail I receive. While pressure of work sometimes prevents me from answering letters, I can assure you that I do read them when they come in and, over a period, these letters tend to give me a good idea of the general concensus of opinion on matters relating to the hobby. In this way, it has become obvious that there is considerable demand among advanced vehicle builders for what is often described as a "proper" gate-change gearbox, i.e., a gearbox with a change lever working in a "gate" that allows the lever to be moved in an accepted sequence such as the popular "H" pattern.

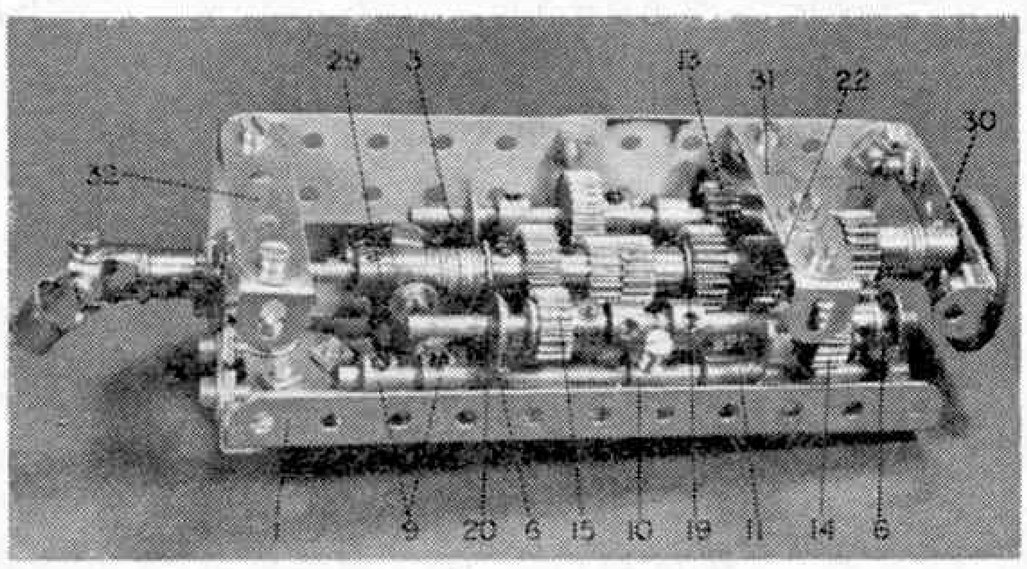
In view of the high number of gearboxes we have featured in the M.M. over the years, this demand may come as a surprise to some readers, but the fact remains that, as far as I can trace, we have never presented a really satisfactory gate-change example. (If any of you Old Hands can prove me wrong, mind you, I'm more than ready to stand corrected!) Now, however, thanks to the skill of Mr. Phil Ashworth of Kirk Ella, Hull in Yorkshire, we are able to change the whole situation. Mr. Ashworth has supplied me with a superb 3-speed and reverse unit incorporating an "H" gate that works beautifully and, in addition to this, the whole thing is so compact that it can be included in almost any even medium-sized model, let alone a large construction.

As the accompanying photographs show, the framework is built up from two $5\frac{1}{2}$ in. Angle Girders 1, to each of which two $3 \times 1\frac{1}{2}$ in. Flat Plates 2 are bolted, at the same time fixing a shaped $1\frac{1}{2}$ in. Wiper Arm 3 (Elektrikit Part No. 532) to the inside of the vertical flange of each Girder. The horizontal flanges of Girders 1 are then connected by two overlapping $3\frac{1}{2}$ in. Flat Girders 4, the securing Bolts also fixing a $2\frac{1}{2} \times 1$ in. Double Angle Strip 5 to the underside of one of the Angle Girders and two 1×1 in. Angle Brackets 6, their free lugs 3 in. apart, to the other Girder. Note that Washers are added to the securing Bolts, not only because the Bolts pass through the elongated holes of Flat Girders 4, but also to prevent the shanks of the Bolts projecting too far into the interior of the gearbox.

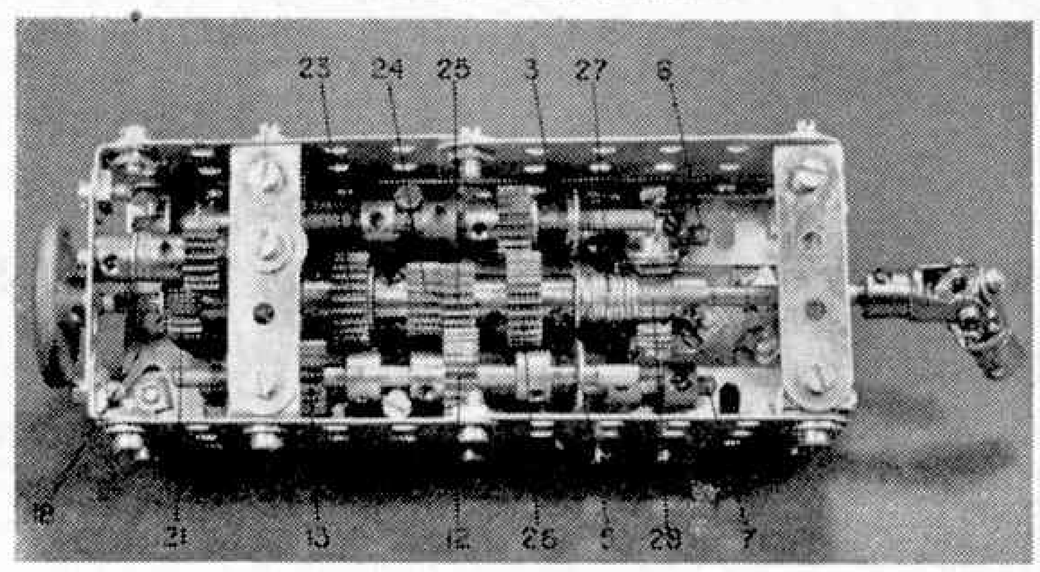
Now journalled in the inside holes in the lugs of Double Angle Strip 5 is a 4 in. Rod 7, a $4\frac{1}{2}$ in. Rod 8 being journalled in the corresponding holes in Angle Brackets 6. Both Rods are free to slide in their bearings and both carry two Collars 9 outside the lugs, as well as a further Collar 10 and a Pawl with boss 11 inside the lugs. A $\frac{3}{8}$ in. Bolt is screwed into one tapped bore of each Collar 10.

The head of the Bolt fixed in Collar 10 on Rod 7 engages between a Collar and a $\frac{3}{4}$ in. Pinion 12 on a $3\frac{1}{2}$ in. Rod journalled in the lugs of Double Angle Strip 5 to form one of the sliding layshafts, Pawl 11 making contact with the sideplates of the gearbox so as to hold the Bolt in position. Also mounted on the

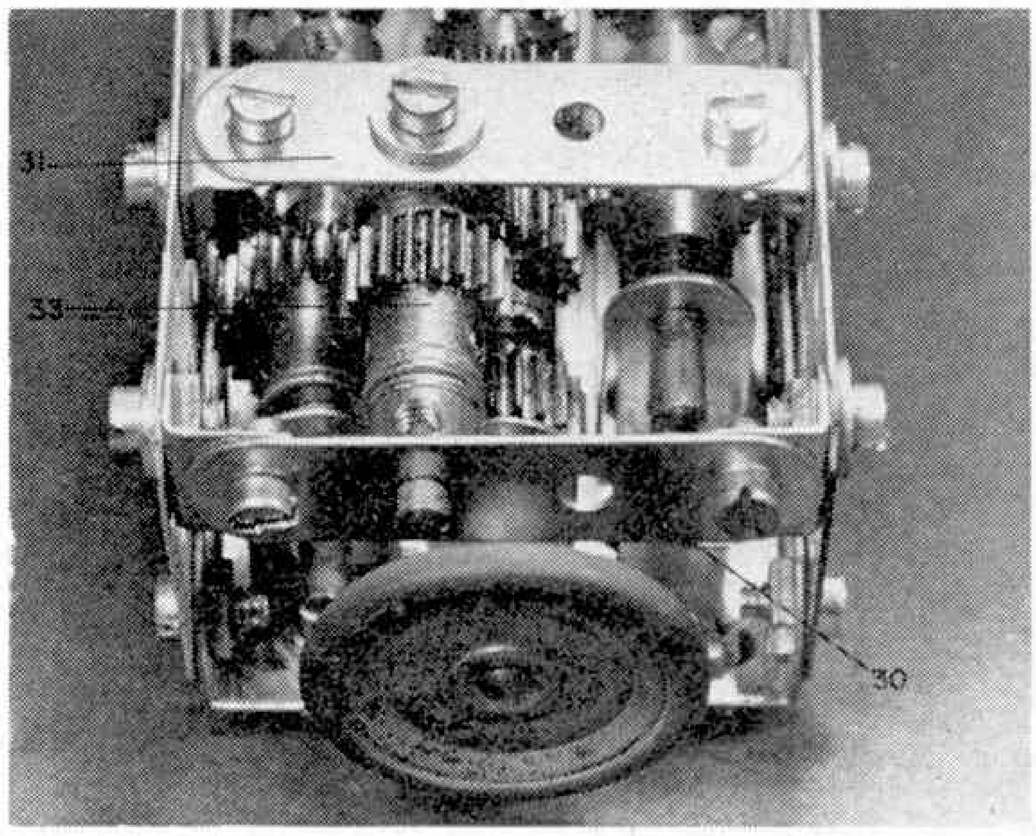
In this view of the Gearbox, one of the sideplates has been removed to show the layout of the layshafts and the layshaft-control rods.



An underside view of the Gearbox showing the layout of the input and output shafts. Note the use of Washers 27 for extended packing purposes.



In this close-up view of the input end of Mr. Ashworth's mechanism, the position of the free-running reverse Pinion is clearly shown.



Rod are a ½ in. Pinion 13 and a second Collar, the latter acting as a stop. The head of the ⅜ in. Bolt secured in Collar 10 on Rod 8 engages between two Collars on a 4 in. Rod journalled in Angle Brackets 6. Acting as the other layshaft, this Rod carries, in addition to the Collars, a Washer, a ¾ in. Pinion 14, a ½ in. Pinion 15 and two further Washers. Corresponding Pawl 11 again makes contact with the sideplates to hold the ⅜ in. Bolt in place.

Returning to the framework, two Angle Brackets, together with two Fishplates 16, are bolted one to each Angle Girder 1, then the Angle Brackets are joined by a 2 in. Strip 17, to which two further Fishplates are bolted, using their elongated holes. The free ends of these Fishplates are brought together so that their holes coincide, then three 1 × 1 in. Angle Brackets 18, 19 and 20 are bolted to the underside of Flat Girders 4 in the positions shown.

Journalled in Angle Brackets 18 and 19 is the input shaft, supplied by a 3½ in. Rod carrying, between the lugs of the Brackets, two ½ in. Pinions 21 and 22 and a ¾ in. Pinion 23. Fixed on the Rod outside the Bracket is another ½ in. Pinion 24, the Rod passing only partway into its bore. Free in the remaining part of the bore is the output shaft—another 3½ in. Rod, journalled in Angle Bracket 20 and the Fishplates bolted to Strip 17. Mounted on this Rod are a ½ in. Pinion 25, a ¾ in. Pinion 26, nine Washers 27 and a loose Collar 28, held in place by a fixed Collar. A Large Fork Piece 29 is fixed to Collar 28, a Washer and Nut on the shank of each securing Bolt preventing the Bolts from fouling the output shaft. Secured in the boss of this Fork Piece is a 2 in. Rod serving as the gear-change lever and carrying the spider from a Universal Coupling immediately above the Fork Piece, whereas a Handrail Coupling is fixed on the end of the Rod. Tight in opposite bores of the spider are two of the special shouldered screws included in the Universal Coupling and these should engage neatly between Collars 9 on Rods 7 and 8. A Universal Coupling is fixed on the end of the shaft, while a 1 in. Pulley with Rubber Ring is fixed on the end of the input shaft.

Coming back again, to the framework, Flat Plates 2 are joined, as shown, by three 2 in. Strips 30, 31 and 32, attached by Angle Brackets. Journalled in Strip 30 and in an Angle Bracket bolted to Strip 31 is a 1½ in. Rod on which are fixed, in order, a Collar, three Washers, a ½ in. Pinion 33 and two more Washers. Pinion 33 is in constant mesh with Pinion 21.

Finally, the "gate" is produced from a 1 × ½ in. Angle Bracket 34 and a ½ × ½ in. Angle Bracket 35. The former is bolted to Flat Girders 4 and strengthened by an Angle Bracket bolted to Angle Bracket 20, while the latter is bolted to a 1 in. Triangular Plate fixed to Fishplates 16.

In operation, when the gear lever is taken to the upper left position, layshaft 8 is moved forward to bring Pinion 14 into mesh with Pinion 33, Pinions 15 and 26 being in constant mesh, thus giving reverse gear. Movement of the gear lever to the lower left position disenages Pinions 14 and 23, but engages Pinion 14 with Pinion 22 to give first gear. Second gear is obtained by moving the lever to the upper right position in the gate to bring Pinion 12 into mesh with both Pinion 24 and Pinion 25. Top gear is found in the lower right position when Pinion 13 meshes with Pinion 23 at the same time as Pinion 12 meshes with Pinion 25.

Before finishing, I should mention that, under normal circumstances, ½ in. Pinions will not mesh with ¾ in. Pinions owing to the standard ½ in. spacing of the holes in Meccano Strips and Plates, etc. On this occasion, however, Phil Ashworth has overome the problem by making use of the elongated holes in Angle Girders 1 and Flat Girders 4, thus allowing the Double Angle Strips and Angle Brackets forming the bearings for the parallel Rods to be positioned that much closer together. Wiper Arms 3, by the way act as friction pads to hold Rods 7 and 8 in position—a very clever idea!

PARTS REQUIRED

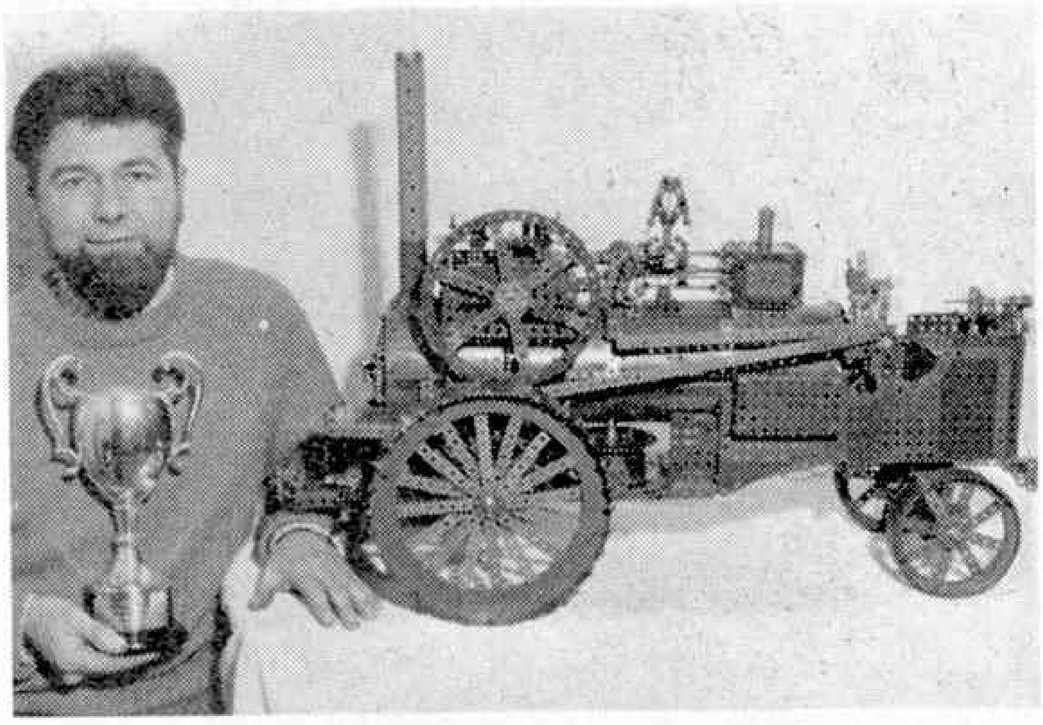
4—6	3—16	38—38	1—116
2—9	1—17	1—46	1—136a
4—10	1—18a	13—39	1—140
10—12	1—22	4—73	2—147a
5—12a	4—25	1—77	1—155
1—12b	7—26	2—103d	1—532
1—15a	50—37a	2—111c	1—Universal Coupling "spider"
2—15b	50—37b		

New Meccano Club

It now gives me very great pleasure to report the introduction of a brand new Meccano Club out in Lancashire, at Poulton-le-Fylde. Formed in November last year, the new Organisation has chosen the name "The Carleton Meccano Club" with, as its adult Leader, Mr. Arnold Heathcote of 31 Blackpool Road, Carleton, Poulton-le-Fylde. Founder members include Paul and Phillip Bamber, Peter Hallam and David Heathcote, all of Poulton-le-Fylde, plus Christopher Birkett of Thornton Cleveleys.

On December 3, the Club held its second meeting at which Philip Bamber showed a 4-wheel Drive Mechanism he had built. Mr. Heathcote on the other hand, demonstrated a morse practice oscillator and also gave a talk on the Army heliograph, once used by the British Army for signalling in Morse Code. Such diversification of interest is a very good thing, as was mentioned in the Meccano Magazine Handbook, given free with the December issue of the M.M. It certainly helps to foster interest in the activities of a Club and allows members to obtain the fullest enjoyment from their own Organisation.

The Carleton Meccano Club now hold meetings very regularly and anyone in the area interested in joining should contact the Leader at the address given above.



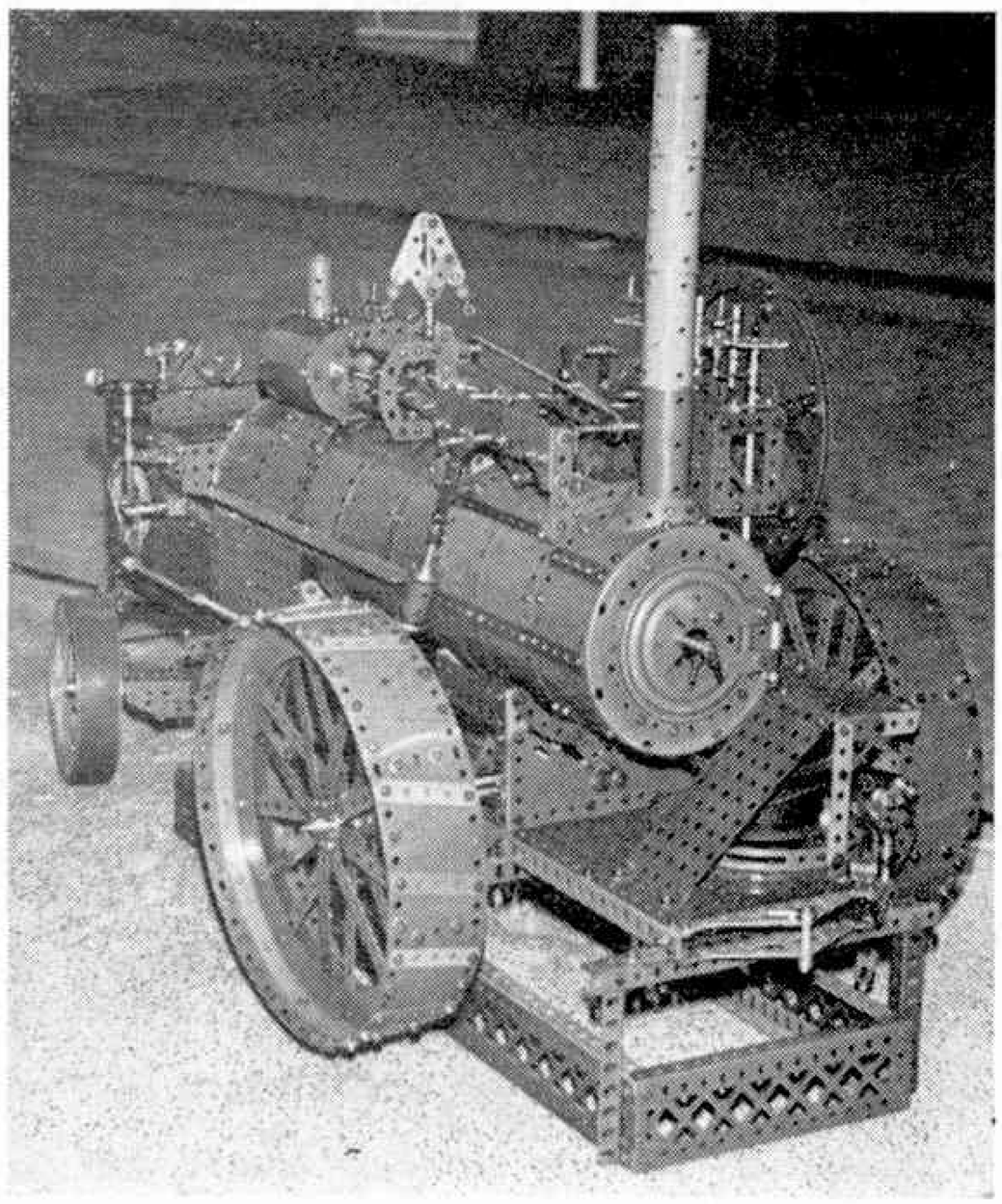
At left: Alf Hindmarsh poses with his Steam Ploughing Engine and the "Meccano Cup" he won at the "Model Engineer Exhibition". He has every right to look pleased as the competition was very close.

MODEL ENGINEER EXHIBITION SUCCESS

Steam ploughing engine wins the Meccano Cup for a Lincoln reader.

Reported by Spanner.

ALL OF us with Meccano Magazine wish to extend our heartiest congratulations to Mr. Alf Hindmarsh of Lincoln who won the Cup for the most outstanding model entered in the Meccano model-building competition at the 38th Model Engineering Exhibition held in London from December 31 to January 11. This is the first time that Meccano has been included in the Exhibition, therefore Mr. Hindmarsh is the first person in history to win a Cup, specially donated by Meccano Ltd., for his model-building skill.



This view of the Steam Ploughing Engine shows Alf's neat Boiler/Chimney Stack joint with a flexible Gusset Plate. Note the very neat appearance of the model as a whole.

Alf Hindmarsh gained the trophy, despite the presence of perhaps technically superior models, for a variety of reasons, most important of which was the originality of the subject on which the model was based. We took the photographs reproduced here, but I wrote to Alf, asking for some background information on the model. His reply was so interesting that I felt it (or the relevant parts of it) should be printed for the interest of other readers.

"Now to the Plough," he says. "It is the first large free-lance model I've ever built, and took all of five months to complete. I had served my "apprenticeship" on the pre-war super models, so wanted to build something ambitious. Steam has always fascinated me and, during the years, Meccano enthusiasts and Meccano themselves have built some superb traction engines. I wanted to tackle something different but in the same vein. Then I remembered an excellent article that appeared on page 16, January, 1963 Meccano Magazine on "Ploughing by Steam," with a very unusual photograph of a twin drum Ploughing Engine. This is the Fowler No. 414 built in 1867. Later methods of ploughing by steam use "sister" engines, one each side of the field and in certain areas, these can still be seen in use. Last year, for example, I saw a pair working the land just outside Nottingham.

"However, my model is different in as much as it is a single engine, the cable passing from one of the drums round a "dolly" and back again to the other drum. On it was carried the balance plough with a man riding it.

"The illustration in the M.M. was the base I used to build the model, and I also found the book "A Century of Traction Engines" very useful for detail work. The model posed its own problems, because the engine is very unorthodox in as much as the crankshaft and flywheel are at the smoke-box end and the cylinder and valve chest at the other. Mainwheels are at the back, because the engine went from site to site, smoke box trailing. Problem No. 1 was where to start, and I decided to build the boiler, starting with the smoke box door and chimney. The boiler is of the "locomotive" type because of the length needed for the cable drums. The door opens on hinges, and I used a Ball Race flange, Slotted Strips, Rod and Strip Connectors and Handrail Supports, to give the heavy appearance of this unit. Small Threaded Pins were utilised for the locking clamps.

"I had noticed that on none of the steam traction engines I'd seen, was there a good joint between the boiler and chimney stack. I found, however, that the comparatively new Flexible Gusset Plates, suitably formed, made an ideal joint. just large enough to take a 1½ in. Pulley Wheel with small Driving Band. You were good enough to publicise this idea in Among the Model-Builders last year. This formed the base for the large chimney stack, for which I used cylinders. I presume the chimney on the original was large to reduce fire risk.

"The boiler was built in stages, butting the Strip Plates and using Circular Girders at every joint. I found these gave a well-formed appearance to the model. At intervals I used 2 in. flexible brass Strips from the Elektrikit to give the brass bound appearance—a

Top right: This close up shows the Winding Drum complete with stained string to simulate greased cable and well constructed link gear. Centre: The Valve Gear works well and is a piece of very good engineering design.

" pinch " from Jim Gamble of Nottingham ! I had to remember to add the necessary external parts required as I knew that, if I made the boiler too long, I would be in difficulties getting inside it. A point to remember is the model ended up about 3 feet long.

" Next to come was the crank-shaft, valve eccentrics and flywheel—difficult tasks as I had to build up the crankcase on a curved surface. I overcame this eventually by using Curved Strips attached to Angle Brackets, and $5\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strips to form a base. Flat Girders were used for the crankcase and gearbox sides, and Double Arm Cranks were very necessary as bearings. The transmission shaft is vertical, paralleled by the shafts to each cable drum. Bevel gearing was used for the transmission drive, and a Power Drive Unit was concealed between the drums under the boiler. This enabled me to connect the transmission drive to the crank-shaft, and also connect the cable drum drives. These are operated by hand, allowing the drum to feed in cable, and the other drum to release it. I found that Bell Cranks fitted with suitable Pinions could be swung in position and would remain in mesh in one direction, and swing away, when the engine was reversed. At one stage I realised that the drums would feed cable in on the inside, so I had to squeeze in an extra Pinion to counteract this, and reverse the movement. This was so the cable cleared the massive main wheels.

" These are two large Flanged Rings, fitted with sixteen spokes Bush Wheels and Flexible Plates for the rims. On one side I fitted a spur gear differential, and the other a hand-operated drum brake.

" Next came the Stephenson link motion which operates the valve mechanism, after I had fitted the cylinder valve chest and cross head guides. To simulate the inspection and servicing doors, on the valve chest, I found the $1\frac{1}{2} \times 1\frac{1}{2}$ in. Flat Plates very useful. I put the Bolts inside, with the Nuts on the outside.

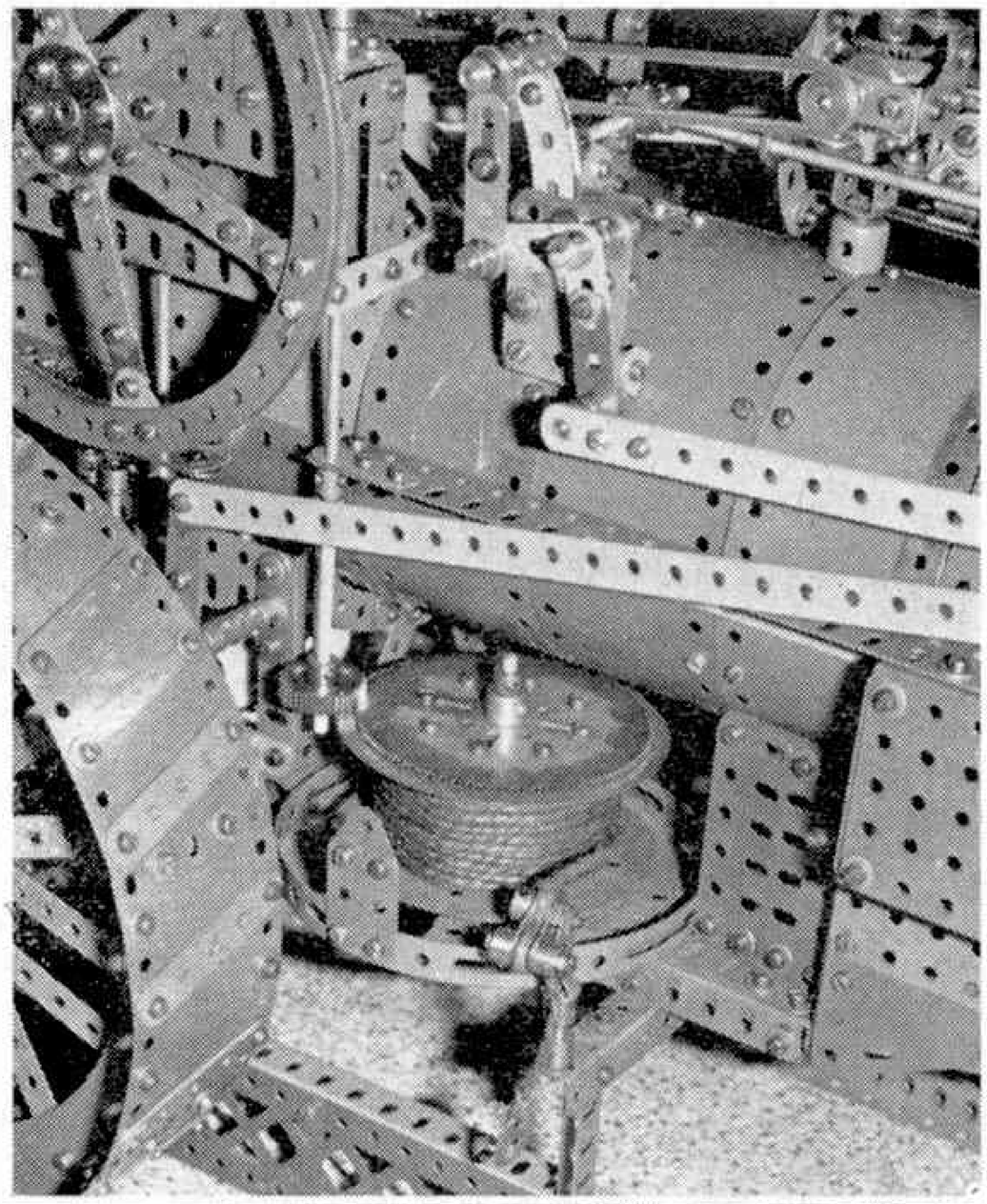
" The governor, using small loaded hooks as the weights, was another problem because it had to be sandwiched in between the cross head guides and valve shaft. This was overcome by using a Chimney Adaptor and suitable bevel gearing. Belt drive was used between the crank-shaft and governor pulley.

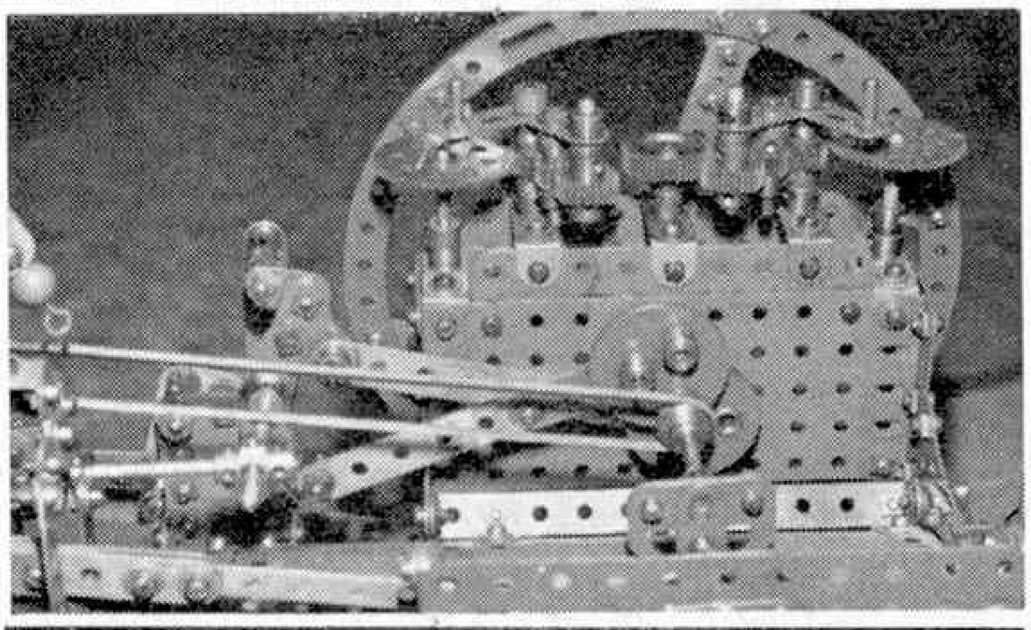
" Levers controlling the link mechanism and main wheel-drive were added, then the bulkhead was fitted with all the features, such as steam pressure gauge, water gauge, operating lever, valves, fire box, doors and steam pipes. The cab was completed with coal bunker and tool box.

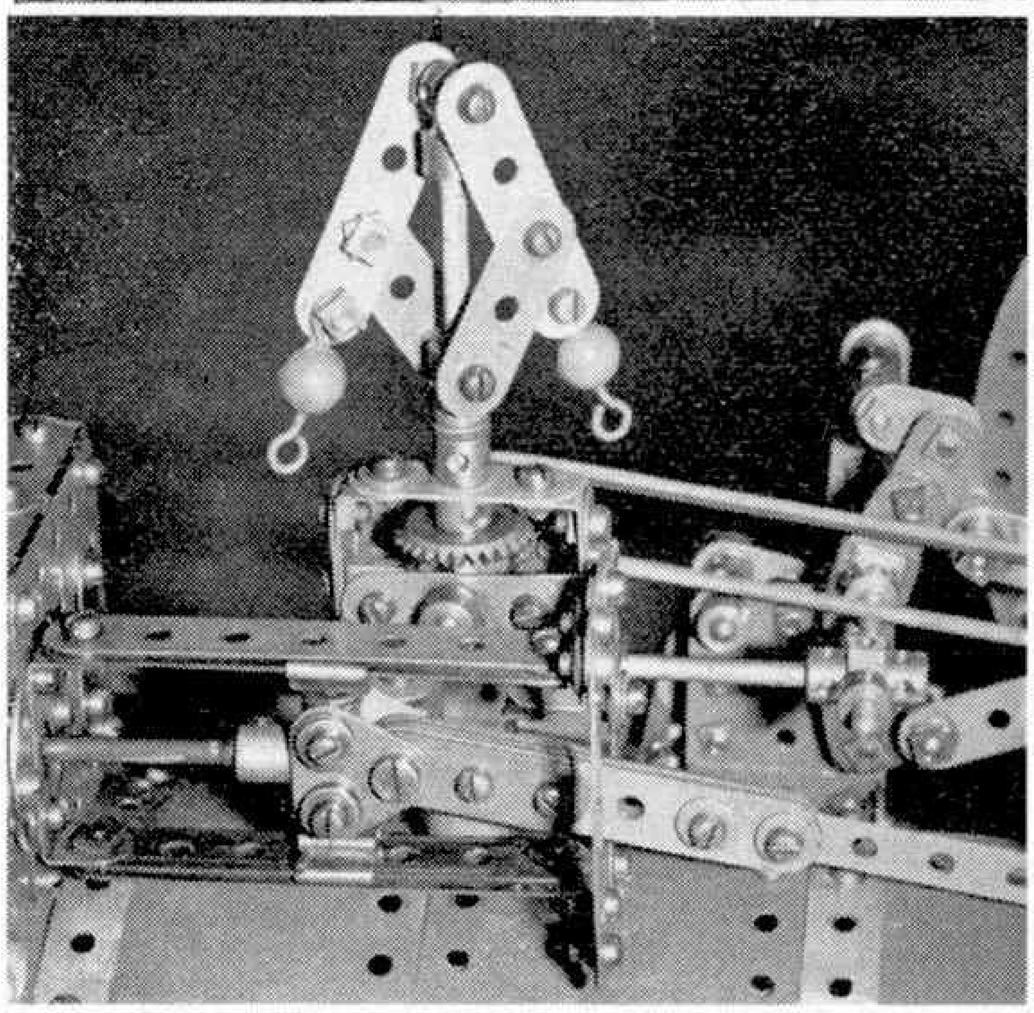
" After this, the front steering was set up, using worm drive, through bevel gearing to the chains which operated the movement of the wheels. Here I used Circular Girders once more, suitably spoked. The front wheels were fitted with a form of gimbal mounting to give the three-point suspension needed for rough, uneven conditions.

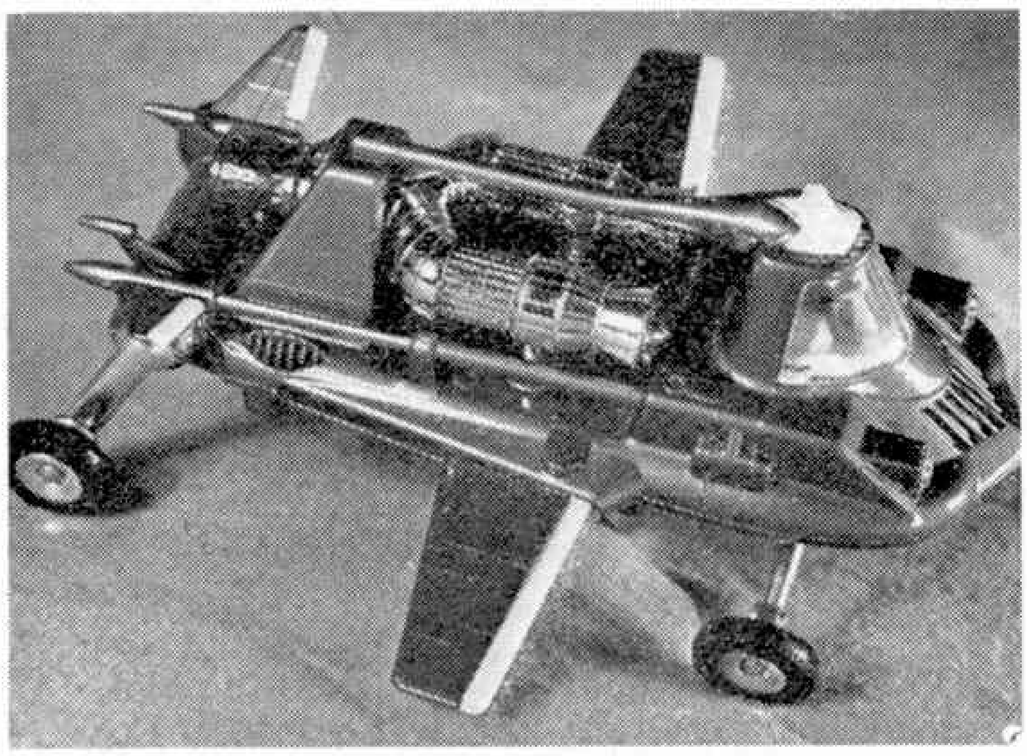
" At last it was nearing completion, and I could begin to fit the details which enhance a model, such as the lamps, water pipe, arrestor chains on the front wheels to prevent oversteering, and I wound the drums with cable. This consisted of heavy string, stained with blue/black ink, and greased with black boot polish. A distinctly messy business, it took me twenty minutes to get my hands clean again ! "

At right: The Speed Governor is belt driven. Again note the neat construction and flush boiler plate joins. All of the model was thought up with the aid of just one photograph.









THE DINKY WORLD OF JOE 90 by Chris Jelley

FANTASY AND smash television hits—that seems to be the result of the inventive genius of Gerry Anderson and his back-up generation, Century 21.

Think of world famous T.V. puppet series "Thunderbirds" or the equally famous "Captain Scarlet and the Mysterons" and you are thinking of the work of Gerry Anderson. He has revolutionised puppetry with his detailed stories, his lavish sets and his futuristic outlook, but perhaps more important, his past successes have not drained him of ideas. On the contrary, he has now produced yet another equally clever, drama-packed show, "Joe 90," currently running on commercial television.

In a nutshell, "Joe 90" depicts the work of the World Intelligence Network—W.I.N. for short. Star of the show is top secret agent Joe McClaine, code-named Joe 90 who, within the context of the show, is the adopted son of Mary and Ian McClaine, the latter a Professor of Electronics. Professor McClaine has developed a complex electronic brain capable of transferring the knowledge, personality and skills of any chosen individual to Joe, and it is by taking over somebody's "life" in this way that Joe is able to perform his tasks. Once he has absorbed the desired knowledge, Joe is able to tune into it, when necessary, by donning a pair of special glasses into which electrodes are built. Without the glasses, he is his normal self.

Anyone who has seen the T.V. Show will know that it bristles with fantastic machinery, equipment and vehicles, the most interesting example of the last being Joe's car itself.

According to Century 21, this was hand-built by Professor McClaine and designed for efficiency rather than appearance. Powered by fully-exposed twin turbine aero-engines, the car travels not only on land but also flies at some 300 m.p.h., and can take to the water where it had a speed of 70 knots. Land speed is 200 m.p.h.

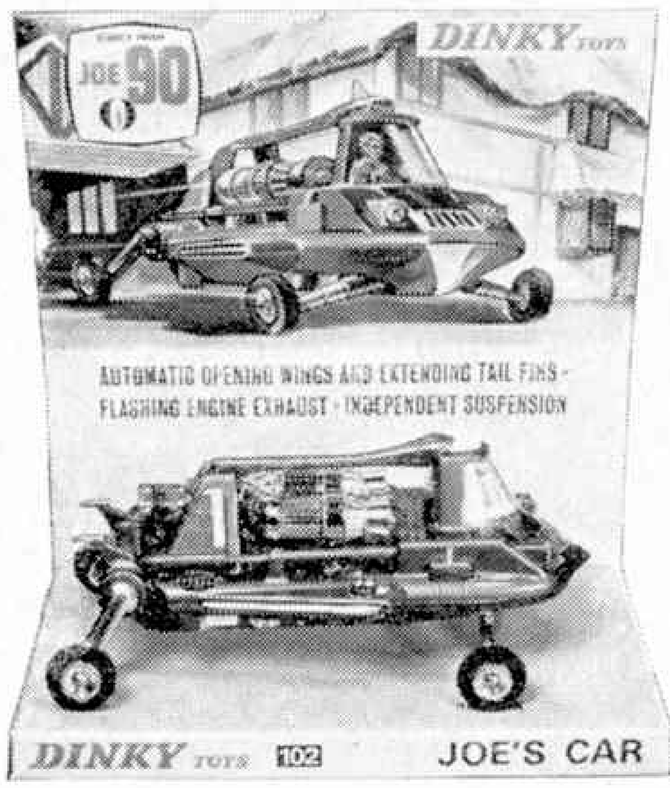
Century 21 might describe Joe's Car as being designed more for efficiency than appearance, but I personally think that its appearance is far more intriguing than any car model to be seen today. Rugged, functional and, above all, entirely different, it has the added attractions of extending wings and a pair of fold-up fins on telescopic trailing arms. For road and sea travel, the wings retract into the body.

The success of Gerry Anderson's previous series "Thunderbirds" and "Captain Scarlet" was matched by the success of Dinky Toys models of vehicles appearing in the two series. In the first case we had FAB 1 and Thunderbird 2 with Thunderbird 4 while, in the second case, we had the S.P.V., the S.P.C. and the M.S.V. Now with a new series on the screens, Dinky have not been slow in upholding their reputation. As I write this, in fact, just beginning to come of the Binns Rd. production lines is a fabulous model of—wait for it—Joe's Car ! (As if you hadn't guessed !)

"Fabulous" is the word I used here and "fabulous" is the word I meant. I was quite honestly captivated by this brand new Dinky. It is, as far as I can tell, an exact reproduction of the T.V. original in general detail, with the same rugged appearance and twin turbine engines as well as the long undercarriage legs, the correct fluting, struts and "projections," and the enclosed cabin—complete with a miniature Joe at the controls ! Features don't stop here, however. Admittedly, when the model is taken out of its box it is dressed for road travel, but, if a little button built into the left-hand side of the body is pressed, two wings shoot out of the sides and, at the same time, the fins on their extending rods shoot rearwards.

It's all very fascinating, but there's even more to come. The simulated turbines, with a bright plated finish, feed into a single exhaust chamber that, at first glance, appear to have a rather dull red aft-section. However, if a small switch in the underside of the model is moved, this aft section lights up and, after a few seconds, suddenly begins to flash, thus simulating a realistic engine exhaust. The light is powered by a Vidor V16 or equivalent battery which fits into a cavity in the base. Because of the danger of deterioration, the battery is not sold with the model, but is readily obtainable from any electrical suppliers.

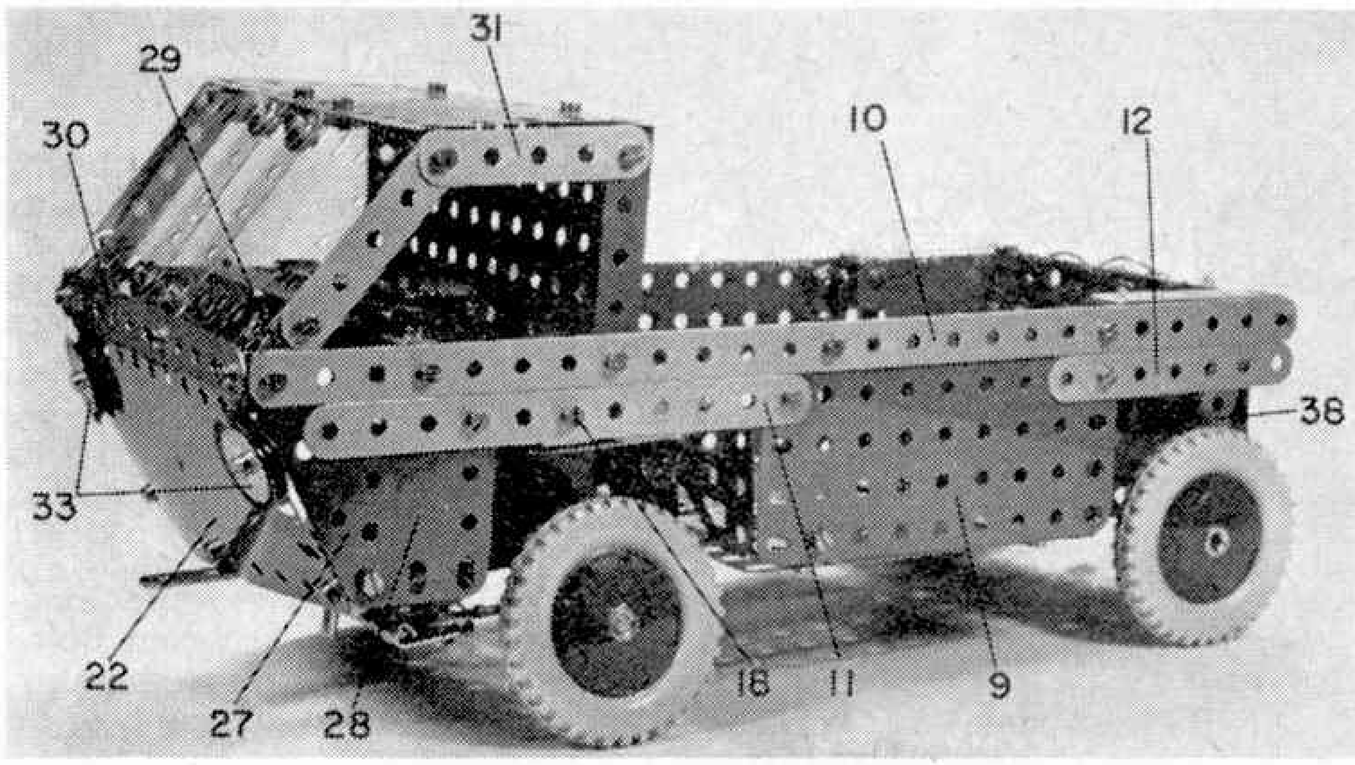
Marketed under Sales No. 102, Joe's Car is finished in a metallic blue-green colour with white leading edges to the wings and fins and plated undercarriage legs which, incidentally, are all sprung. Jewelled headlamps just give the final touch to a really great Dinky Toy.



Dinky Toy No. 102 Joe's Car, is based on one of the vehicles in the highly popular television series "Joe 90". Joe's Car is sold complete with a special display platform, but, because of storage deterioration, the battery for the flashing engine exhaust is not included.

MECCANO FRENCH STYLE

Spanner looks at two outfit models made by the French Meccano-Tri-ang Company



AMPHIBIOUS TRUCK AND GRASS-CUTTING TRACTOR

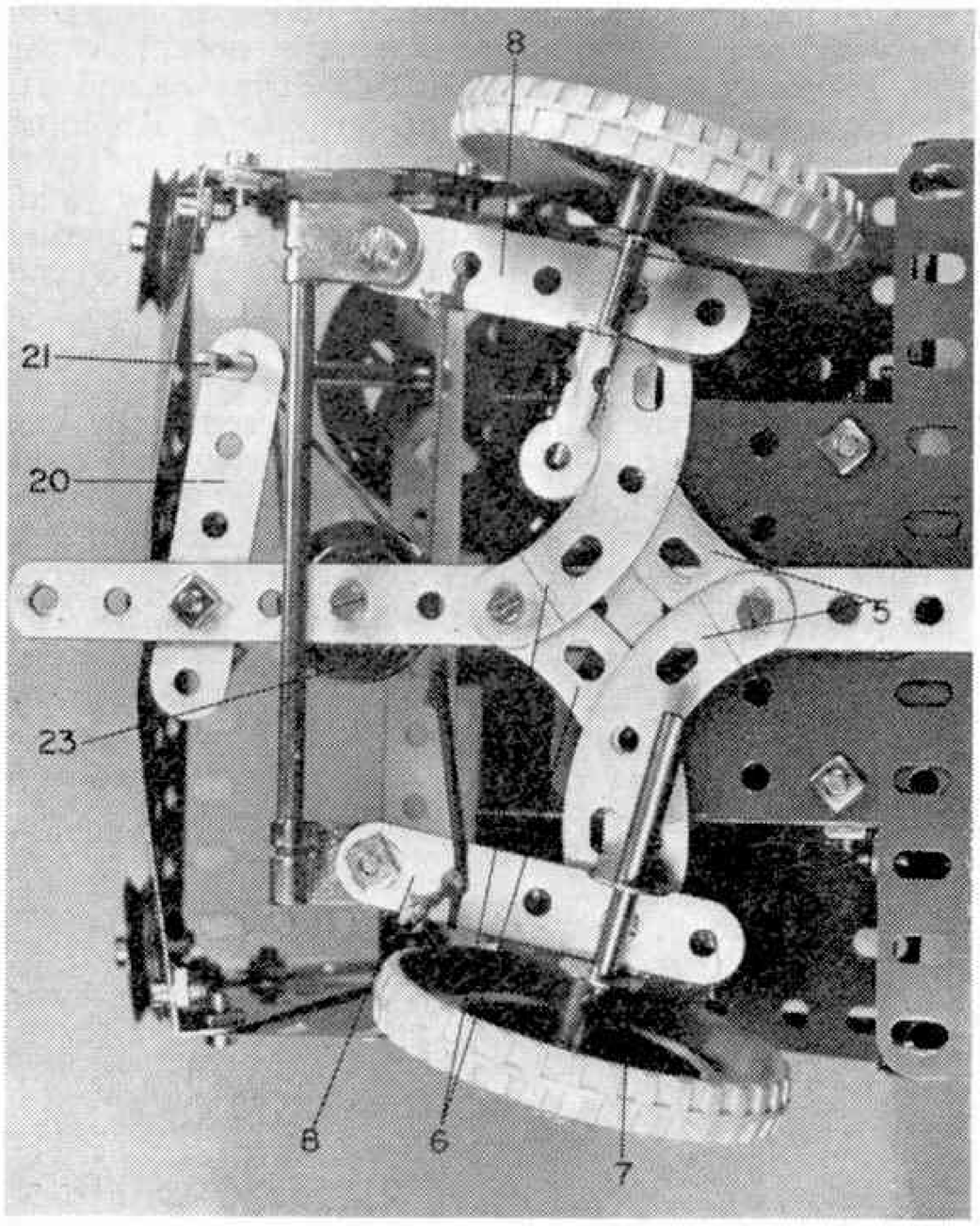
SOME TWO or three months ago, we featured in these pages a biplane model that had been built by our French associate company, Meccano-Tri-ang, based in Paris. The biplane, however, was not the only model sent over to us from France. On the contrary, several examples were sent, two of which are described in the following article. The first, built with Outfit No. 4, is based, fairly accurately, on an amphibious truck in service with the French army, while the second, I understand, represents a grass-cutting tractor for use on golf courses. A rotor blade beneath the tractor performs the actual cutting operation.

Amphibious Truck

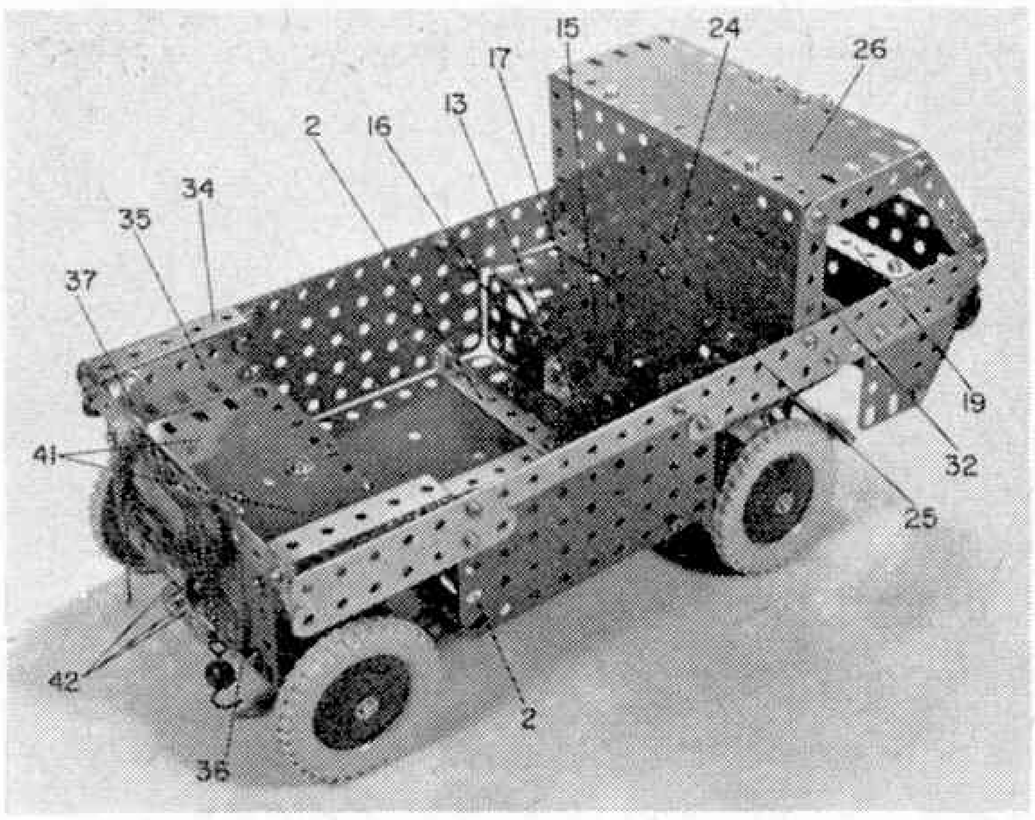
No chassis, as such, is included in this model, but a strong " floor " is built up round a 12½ in. Strip 1, to which two 5½ in. Strips 2 are bolted. Fixed to Strips 2 are two 4½ × 2½ in. Flexible Plates 3, while two Semi-circular Plates 4 are bolted to the top of Strip 1, the securing Bolt passing through the tenth hole of the Strip and also fixing in place two 2½ in. Stepped Curved Strips 5, arranged as shown. Another two 2½ in. Stepped Curved Strips 6 are then bolted to Strip 1 in such a way that the ends of each pair of Curved Strips 5 and 6 coincide with each other. A Double Bracket 7 is lock-nutted to these ends, the securing ⅜ in. Bolt also fixing a 2½ in. Strip 8 between the lugs of the Double Bracket. A right-angled Rod and Strip Connecter is, in turn, lock-nutted to the forward end of this Strip, then the Connecters at each side are joined by a 4 in. Rod, as can be seen in the accompanying pictures.

Before the steering can be completed, however, the major part of the body should be attended to. Attached by Angle Brackets to each Flexible Plate 3 is a 4½ × 2½ in. Flat Plate 9, to which a 12½ in. Strip 10, a 5½ in. Strip 11 and a 3½ in. Strip 12 are bolted. A 2½ × ½ in. Double Angle Strip 13 is, in due course, bolted to Semi-circular Plates 4. Fixed to one lug of this Double Angle Strip is a 2½ × 1½ in. Flanged Plate 14, while, fixed to the other lug, is a 2½ × 1½ in. compound flexible plate 15, obtained from two 2½ × 1½ in. Triangular Flexible Plates. Attached to the rear flange of Plate 14 is a Flat Trunnion, a similar Flat Trunnion 16 being attached to compound plate 15 by an Angle Bracket. Each wheel arch is then completed by a 2½ × 1½ in. Plastic Plate 17 bolted to a 2½ × ½ in. Double Angle Strip fixed to Strip 11 by Bolt 18.

Strips 10 are now joined through their fourth holes by a 5½ in. Strip 19, attached by Angle Brackets. Journalled in this Strip and in a 2½ in. Strip 20, bolted, along with an Obtuse Angle Bracket, to Strip 1, is a 3½ in. Rod 21, acting as the steering column and held in place by a 2 in. Pulley above Strip 19 and a Spring Clip beneath the same Strip. A 5½ × 2½ in. Flexible Plate 22 will later be fixed to the Obtuse Angle Bracket, but first a 1 in. Pulley 23 is fixed by a ⅜ in. Bolt to Strip 1 and a Cord Anchoring Spring is mounted on Rod 21 towards its lower end. A length of Cord is then tied to one Strip 8, is passed round Pulley 23 and wrapped several times round Rod 21. It is then passed through the eye of the Cord Anchoring Spring



A close-up view of the steering mechanism included in the Amphibious Truck. Note the use made of Stepped Curved Strips.



In this rear view of the Amphibious Truck, the fairly simple layout of the body section is clearly shown. The truck is built from a No. 4 Outfit.

and knotted, after which it is again taken round Pulley 23 and finally tied to a 2½ in. Driving Band secured to remaining Strip 8. Two 2 in. Rods, each carrying a 2½ in. Road Wheel, are journalled one in each Double Bracket 7 where they are held in place, one by a Rod Connecter and the other by a Rod and Strip Connecter. If the steering mechanism has been successfully completed, the Road Wheels should change direction when the steering wheel is turned.

Next, a 5½ × 2½ in. Flanged Plate 24 is bolted between Strips 10, as shown. Bolted to the back of this Plate is a 2½ × 2½ in. Flexible Plate, to which a 5½ in. Strip 25 is fixed, while a 5½ × 2½ in. Flexible Plate 26 is bolted to the upper side flange of Plate 24 to form the cab roof.

Plate 22 can now be fixed to the earlier-mentioned Obtuse Angle Bracket, the Plate also being fixed by an Angle Bracket at each of its lower corners to a 2½ × 1½ in. Triangular Flexible Plate 27 and a 2½ × 1½ in. Flexible Plate 28, overlapped one set of holes. At the top, Plates 27 and 28 are bolted to Strips 10 and 11, the securing Bolt at the end of Strip 10 also holding in place a Fishplate 29 and an Angle Bracket. These Angle Brackets at each side are connected by a 5½ in. Strip 30, whereas a 2½ in. Strip, extended by another 2½ in. Strip 31, is bolted to Fishplate 29. The free end of Strip 31 is bolted to each flange of Plate 24.

Inside the cab, a seat is provided by a 5½ × 1½ in. Flexible Plate 32, bolted to the lower side flange of Plate 24, while the windscreen is represented by one 2½ × 1½ in. and two 2½ × 2½ in. Transparent Plastic Plates attached to Plate 26 by two Obtuse Angle Brackets and to Strip 30 by one Obtuse Angle Bracket. Headlamps are provided by two 1 in. Pulleys without boss, each overlayed by a ¾ in. Washer 33 and bolted direct to Plate 22 in the positions shown.

Turning to the back section of the model, a ½ in. Reversed Angle Bracket is bolted to the upper rear corner of each Flat Plate 9. A 2½ × ½ in. Double Angle Strip 34 is fixed to the centre of this Bracket, while a 2½ × 2½ in. Flexible Plate 35 is secured to the Bracket's free lug. The rear lugs of Double Angle Strips 34 are joined by a 5½ in. Strip, to which two 2½ × 2½ in. Flexible Plates 36, overlapped one hole, are bolted. Secured to each of these Plates and to corresponding Plate 35 is a Trunnion 37, the side securing Bolt helping to fix a 2½ in. Strip 38 in place. Note that Strip 38 is angled and projects a distance of one hole below Plate 35.

Now secured by Bolt 39 to Strip 1 is a 1½ × ½ in. Double Angle Strip, the Bolt passing through one lug of the Double Angle Strip. Fixed to the back of the Double Angle Strip is a 5½ × 1½ in. Flexible Plate, the securing Bolt also fixing a 2½ × ½ in. Double Angle Strip 40 across the top of the smaller Double Angle Strip. The rear lug of Double Angle Strip 40 is bolted to Plates 36, while, bolted to the top of the Double Angle Strip are two 2½ × 2½ in. Plastic Plates 41. An imitation propeller at the rear is represented by three Fishplates 42 mounted on top of a ½ in. Pulley without boss and all bolted to Flexible Plates 36.

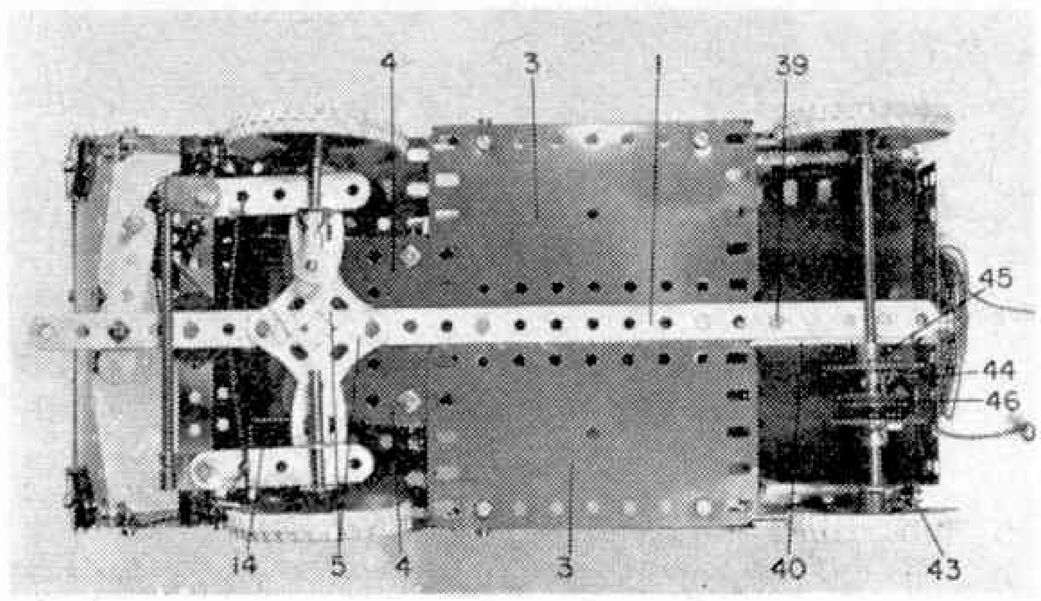
Finally, the rear axle is added. A 1½ in. Rod is fixed part way into the boss of an 8-hole Bush Wheel 43, to which a 1 × ½ in. Double Bracket 44 is bolted. A second 8-hole Bush Wheel 45 is bolted to the other lug of the Double Bracket. Journalled loose in the boss of this second Bush Wheel and in the remaining bore of Bush Wheel 43 is a 4 in. Rod carrying a 1 in. fixed Pulley 46, located between the lugs of Double Bracket 44. The completed axle is journalled in the lower end holes of Strips 38 where it is held in place by 2½ in. Road Wheels. An imitation cable is represented by a length of Cord, coiled and tied as shown to the back of the model. A Hook is tied to one end of the Cord.

PARTS REQUIRED

3—1	1—20a	1—51	2—189
8—2	2—22	1—52	5—190
2—3	2—22a	2—53a	2—191
7—5	1—23	1—57c	2—192
5—10	2—24	4—90a	1—193
2—11	1—35	1—111a	2—193a
1—11a	94—37a	5—111c	2—194
9—12	84—37b	2—125	2—194a
3—12c	7—38	2—126	1—212
2—15b	2—38d	2—126a	2—212a
1—16	1—40	1—176	1—213
2—17	1—48	4—187	2—214
1—18a	6—48a	2—188	4—221

Grass-cutting Tractor

Construction of this model which is built with Outfit 3, is perfectly straightforward. A 7 in. compound strip 1, obtained from a 5½ in. Strip extended by a 2½ in. Strip, is fixed to the lower side flange of a 5½ × 2½ in. Flanged Plate 2, to the back of which a Flat Trunnion is secured. Bolted across strip 1 is a 5½ in. Strip 3, this in turn being connected to Plate 2 by two 2½ in. Strips 4, the securing Bolts helping to fix two Trunnions 5 in place, as shown.



An underside view of the model showing construction of the chassis, including the front and rear axles.

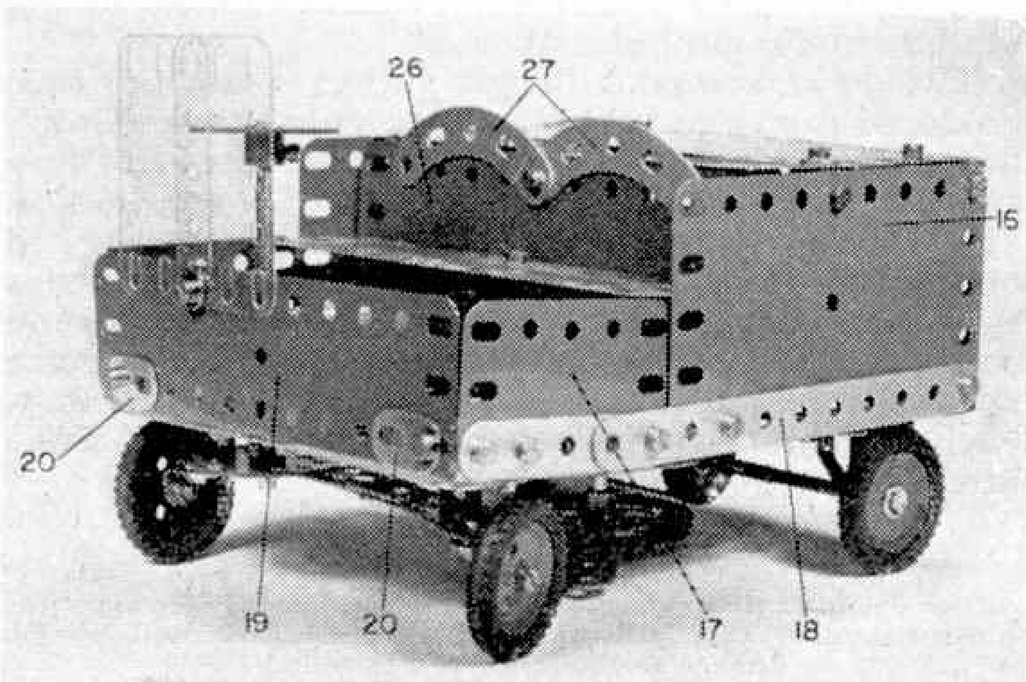
The compact appearance of the Grass-cutting Tractor is evident from this illustration. Despite its simplicity, the model's steering system works extremely well.

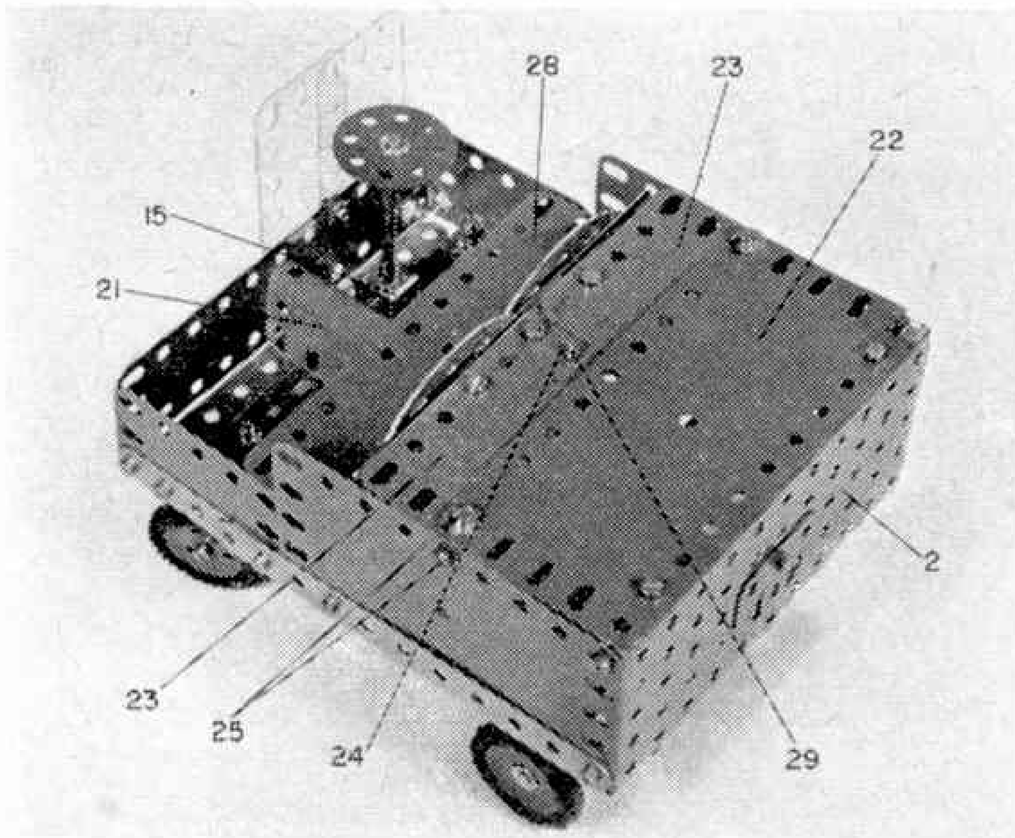
Bolted through the first and second holes at the opposite end of strip 1 are two further 5½ in. Strips 6 and 7. Fixed to Strip 7 are two ½ in. Reversed Angle Brackets 8, the fixing Bolts at the same time holding two 2½ × 2½ in. Plastic Plates 9 in position. Lock-nutted to the free lug of each Reversed Angle Bracket are an Angle Bracket 10 and a Fishplate 11, the two tightly fixed together by the locking Nuts. Lock-nutted, in turn, between the Fishplates at each side is a 4½ in. compound strip 12, built up from two 2½ in. Strips overlapped one hole, while, mounted free on a ⅜ in. Bolt fixed by Nuts in each Angle Bracket 10, is a 1 in. Pulley without boss, 13, fitted with a Motor Tyre. Compound strip 12 is attached by Cord to one point only of an 8-hole Bush Wheel 14, mounted on a 3½ in. Rod forming the steering column. This Rod is journalled in Strip 7 and in a Double Bracket 15, attached by an Angle Bracket to Strip 6. A Spring Clip above the Double Bracket holds the Rod in place while a second 8-hole Bush Wheel fixed on the upper end of the Rod serves as the steering wheel.

Each side of the model is now very easily built up from one 4½ × 2½ in. Flexible Plate 16 and one 2½ × 1½ in. Flexible Plate 17, both overlayed along their lower edges by a 7 in. compound strip 18. Plate 16, with the strip, is bolted to the end flange of Plate 2, whereas Plate 17, also with the strip, is attached by an Angle Bracket to the end of strip 7. The front of the model is enclosed by a 5½ × 2½ in. Flexible Plate 19, attached to the sides by Angle Brackets, then a windscreen is supplied by two 2½ × 1½ in. Transparent Plastic Plates bolted to Plate 19. Two Fishplates 20 represent headlamps, while a "transmission tunnel" is supplied by a "U"-section Curved Plate 21 bolted to a Double Bracket which is, in turn, bolted to compound strip 1.

Coming to the top of the body, this is enclosed by a 5½ × 3½ in. compound flexible plate consisting of a 5½ × 2½ in. Flexible Plate 22, extended by two 2½ × 2½ in. Flexible Plates 23 joined by a Semi-circular Plate 24. Plate 22 is bolted to the upper flange of Flanged Plate 2 as well as being attached, together with Plates 23, to Plates 16 by Angle Brackets held by Bolts 25. Fixed by one of its lugs to the front edge of Semi-circular Plate 24 is a 2½ × ½ in. Double Angle Strip, to the front of which a 5½ × 2½ in. Flexible Plate 26 is bolted, the securing Bolt also holding two 2½ in. Stepped Curved Strips 27 in position, as shown.

These two views of the Tractor show construction of the chassis and cutting rotor with its drive system. Note the simple steering arrangement. This model is built from a No. 3 Outfit.



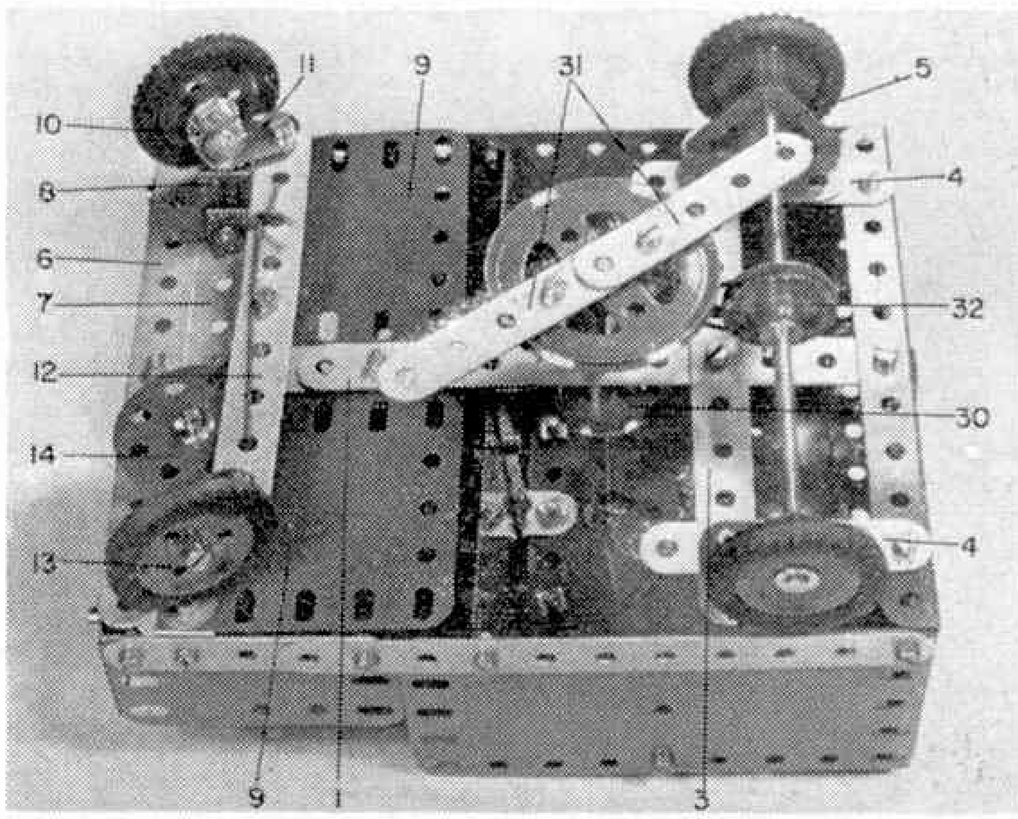


A 5½ × 1½ in. Flexible Plate 28 is bolted to an Angle Bracket secured to the centre of Plate 26 to act as the seat.

Last of all we come to the cutting rotor and its drive system. A 4 in. Rod 29 is journalled in Semi-circular Plate 24 and compound strip 1 where it is held by a Cord Anchoring Spring and Spring Clip beneath the Plate and a 1 in. fixed Pulley 30 above the strip. Fixed on the lower end of the Rod is a 2 in. Pulley, to which two 2½ in. Strips 31 are bolted to represent the cutting blades. A 2½ in. Driving Band is then slipped over the Rod above the 2 in. Pulley and taken to a 1 in. Pulley 32 fixed on the rear axle. This, by the way, is held by 1 in. Pulleys with Motor Tyres in Trunnions 5 and consists of a 3½ in. and a 2 in. Rod joined by a Rod Connecter. Note that the cutting rotor should be so positioned on Rod 29 that it lies as close as possible to the ground without actually touching it.

PARTS REQUIRED

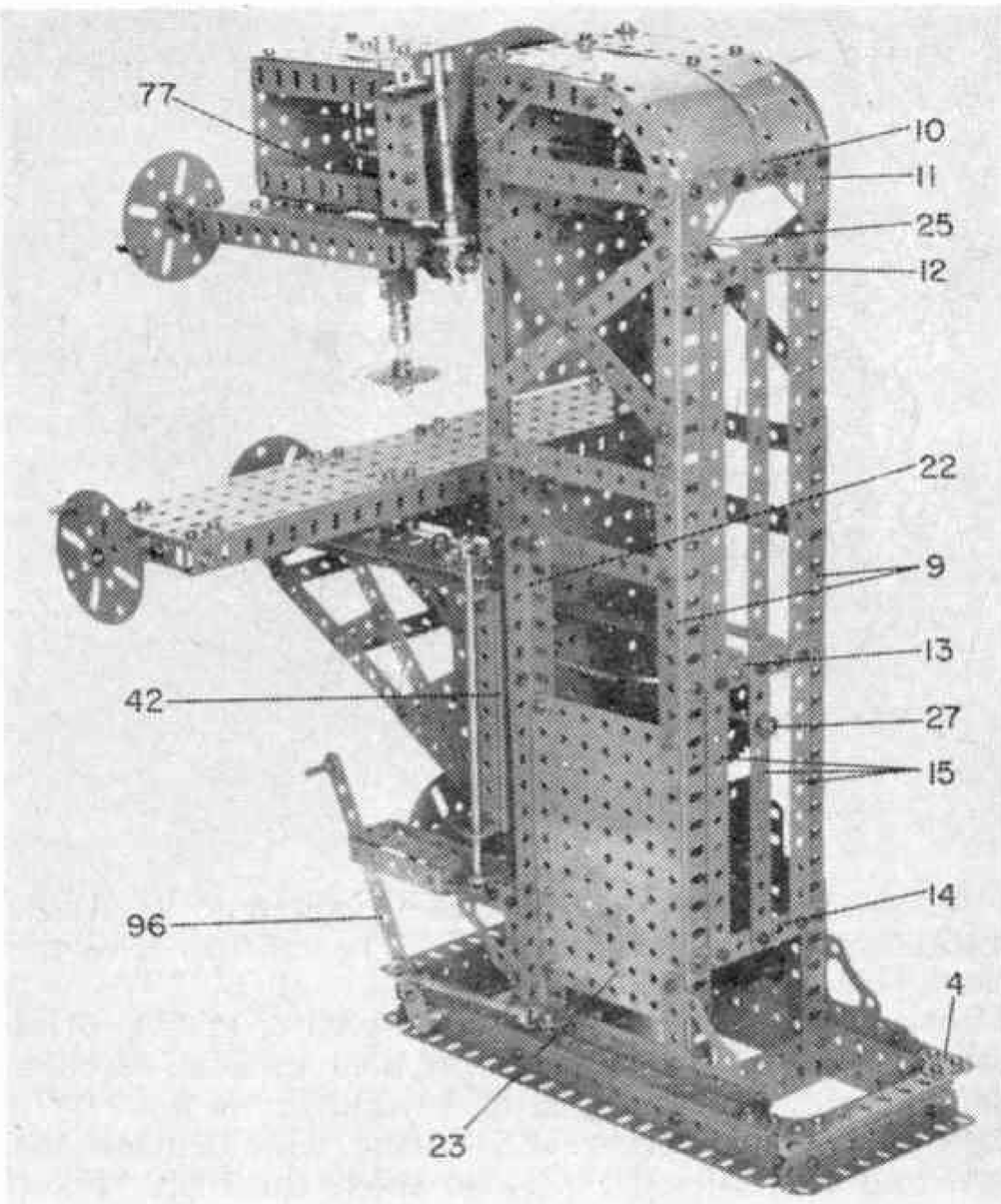
6—2	4—22	1—52	2—189
9—5	2—22a	2—90a	2—190
4—10	2—24	2—125	2—191
2—11	2—35	2—126	2—192
10—12	58—37a	1—126a	2—193
1—15b	54—37b	2—142c	2—194a
2—16	7—38	1—176	1—213
1—17	1—40	1—186	1—214
1—20a	1—48a	2—188	



UNIVERSAL MILLING MACHINE

by Spanner

An intriguing model for the mechanically-minded Meccano model enthusiast.



A rear general view of the Universal Milling Machine in which the open construction of the column is clearly shown. This is a fully working model and best constructed by the more experienced Meccano enthusiast.

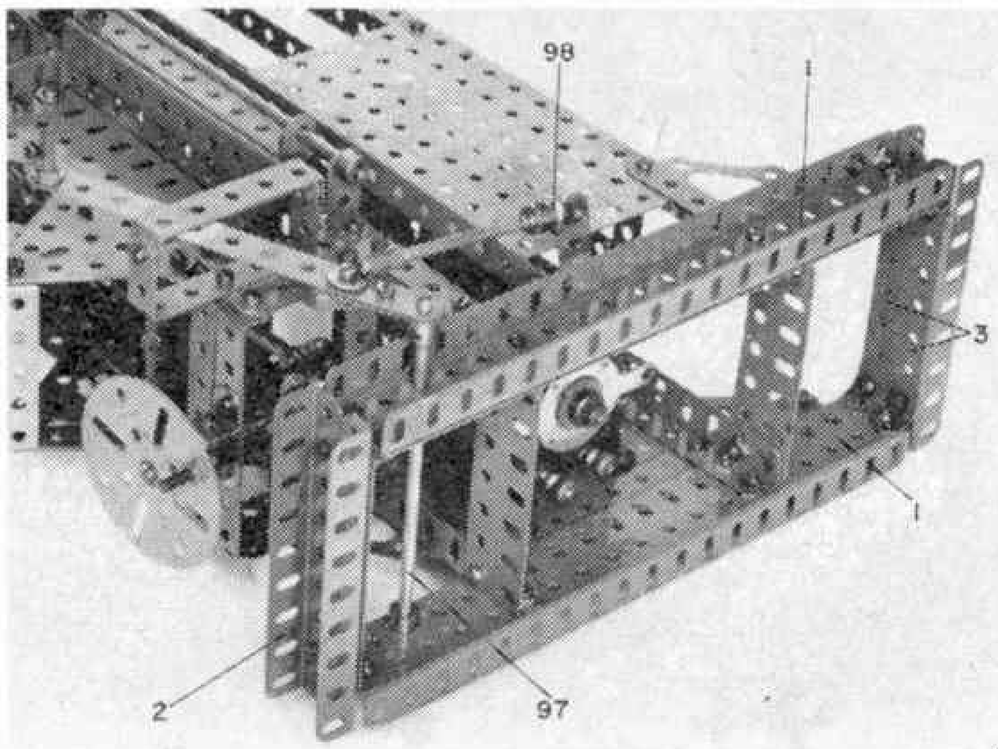
ALL OF us have our own personal likes and dislikes connected with virtually everything we do and Meccano modelling is certainly no exception. I have often claimed—rightly, I think—that the most popular subjects for Meccano modellers are road vehicles, cranes and bridges, but these are not the only well-liked subjects. On the contrary, there is another highly-popular category which unfortunately tends to receive rather less publicity than the first three and this is, quite simply, machinery.

Machine models, in fact, have a very wide following, perhaps because there is something deeply satisfying in producing a Meccano version of something, such as a lathe or bench drill, that reproduces most of the movements of the original, although the finished model need not actually perform the *work* of the prototype. In this article, we feature one of the best examples of this type of model I have seen. Based on a Universal Milling Machine and powered by an E15R Electric Motor is incorporates a driven spindle in a universal head that can be swung to any position in one plane without affecting the drive, as well as including a worktable with fully-adjustable height-, traverse- and cross-feeds.

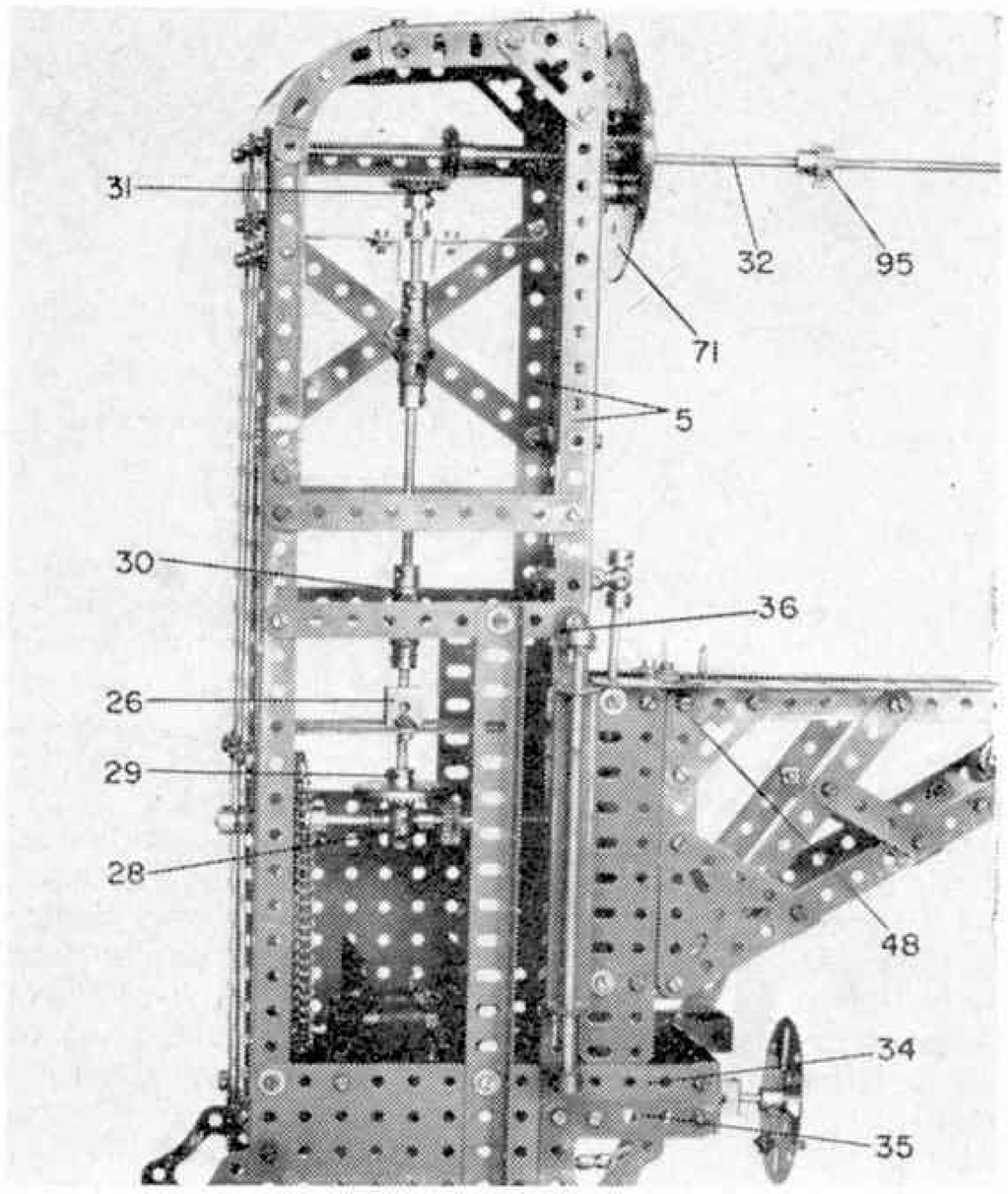
Construction is not really so complicated as it may appear from the accompanying pictures. The base of the Machine is built up from two $9\frac{1}{2} \times 1 \times \frac{1}{2}$ in. channel girders 1, each obtained from two $9\frac{1}{2}$ in. Angle Girders joined flange to flange by a $9\frac{1}{2}$ in. Flat Girder. Two $4\frac{1}{2} \times 1 \times \frac{1}{2}$ in. channel girders 2 are then each produced from two $4\frac{1}{2}$ in. Angle Girders joined, in this case, by a $3\frac{1}{2}$ in. Flat Girder, the securing Bolts also holding in place two $4\frac{1}{2} \times 2\frac{1}{2}$ in. Double Angle Strips 3 which are used to connect girders 1 to girders 2. In addition, one girder 2 is secured to girders 1 by two 1 in. Corner Brackets 4 bolted as shown between the upper flanges of the girders.

In the case of the main body or column of the model, it is best to build this up separately and attach it to the base when completed. Two $18\frac{1}{2}$ in. Angle Girders 5 are joined together at the top by a $3\frac{1}{2}$ in. Angle Girder 6 and, at the bottom, by a $3\frac{1}{2}$ in. Flat Girder, two $5\frac{1}{2} \times 3\frac{1}{2}$ in. Flat Plates 7 and 8 also being bolted to the Girders in the positions shown.

Two 17 in. compound angle girders 9 are next each produced from one $12\frac{1}{2}$ in and one $5\frac{1}{2}$ in. Angle Girder, the compound girders being joined at the top by a $3\frac{1}{2}$ in. Strip 10, strengthened by $1\frac{1}{2}$ in. Corner Brackets 11. Further $3\frac{1}{2}$ in. Strips 12, 13 and 14 are bolted between girders 9 in the positions shown, these Strips themselves being joined by three $12\frac{1}{2}$ in. compound strips 15, the lower ends of girders 9 being connected by a $3\frac{1}{2}$ in. Flat Girder as in the case of Girders 5. Each compound strip 15 consists of a $7\frac{1}{2}$ in. Strip extended by a $5\frac{1}{2}$ in. Strip.



An underside view of the base of the model showing the construction of the built-up channel girders as well as the linkage to the E15R Motor switch.



A close-up view of the column showing the drive to the universal head which, along with the table and its saddle, have been removed for this picture.

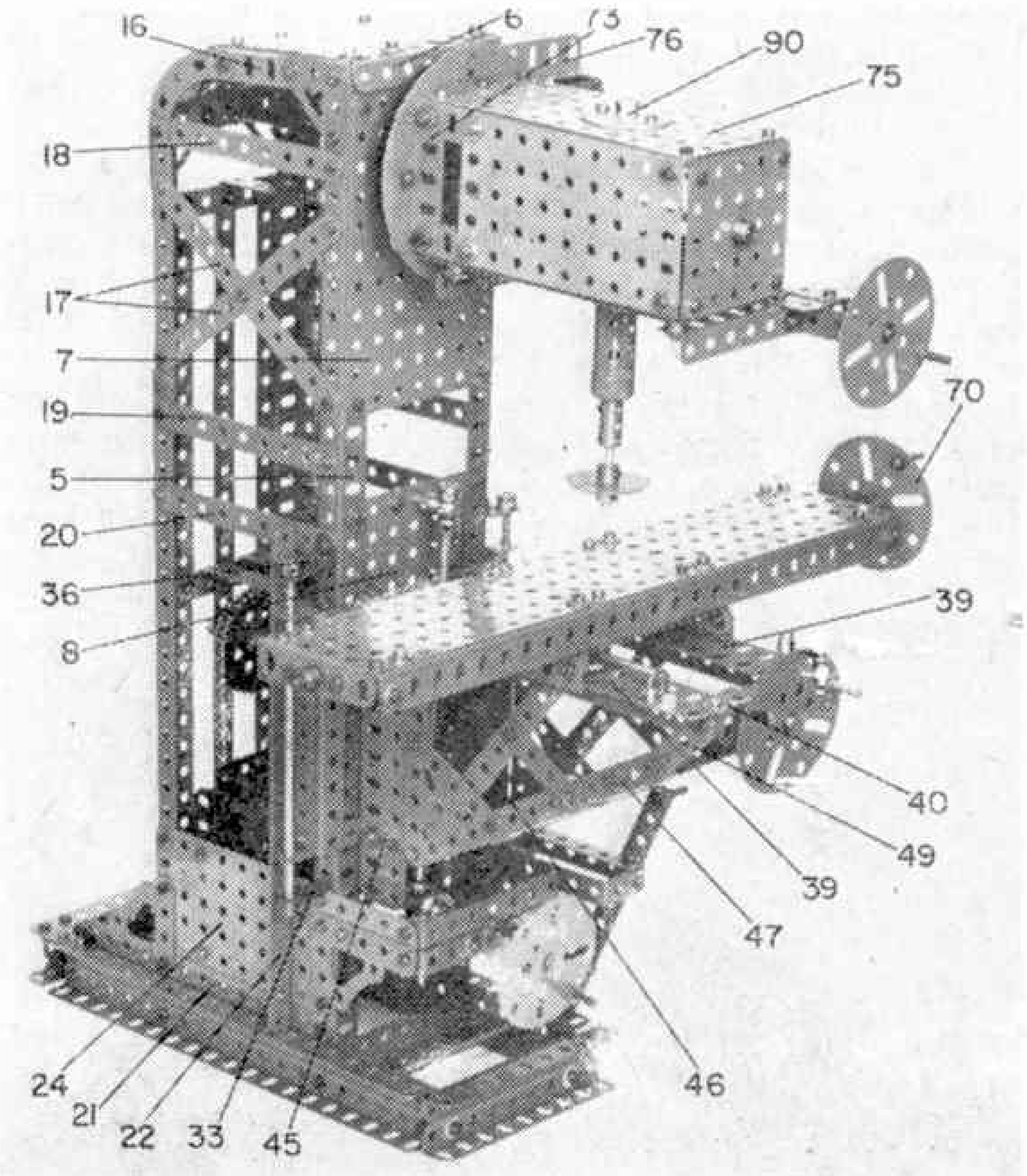
Girders 5 are now secured to compound girders 9 by a 3 in. Angle Girder 16, extended by a 2½ in. Stepped Curved Strip, two crossed 5½ in. Strips 17 and four 4½ in. Strips 18, 19, 20 and 21. Strips 20 and 21 are joined by a 9½ in. Angle Girder 22 which, at one side, is connected to girder 9 by a 5½ × 3½ in. Flat Plate 23 and, at the other side, is connected to corresponding girder 9 by a 3½ × 2½ in. Flat Plate 24. A 4½ × ½ in. Double Angle Strip 25 is bolted between Strip 12 and Flat Plate 7, while two similar Double Angle Strips are bolted between Strip 13 and Flat Plate 8. A Double Bent Strip 26 is fixed to the centre of the latter Double Angle Strips.

An E15R Electric Motor is now bolted to Flat Plate 24 and a ¾ in. Sprocket Wheel on its output shaft is connected by Chain to a 2 in. Sprocket Wheel on a 5 in. Rod 27 held by Collars in centre compound strip 15 and Flat Plate 8. Also mounted on the Rod are a ¾ in. Pinion and a Coupling 28, the latter loose on the Rod but held in position by Collars. Note that the Rod passes through the centre transverse bore of the Coupling. Journalled in the longitudinal bore of the Coupling and in Double Bent Strip 26 is a 2½ in. Rod that carries a 1½ in. Contrate Wheel 29 towards its lower end and a Universal Coupling 30 at its upper end. Fixed in this Universal Coupling is a 3 in. Rod, on the other end of which a second Universal Coupling is secured. The other side of this Universal is mounted on a 2 in. Rod held by Collars in Double Angle Strip 25 and in a Double Bent Strip bolted to the underside of the Double Angle Strip. A ⅞ in. Bevel Gear 31, fixed on the upper end of the Rod, engages with a second in. Bevel Gear on an 11½ in. Rod 32 journalled in Strip 10 and Flat Plate 7. This Rod will later transfer the drive to the universal milling head.

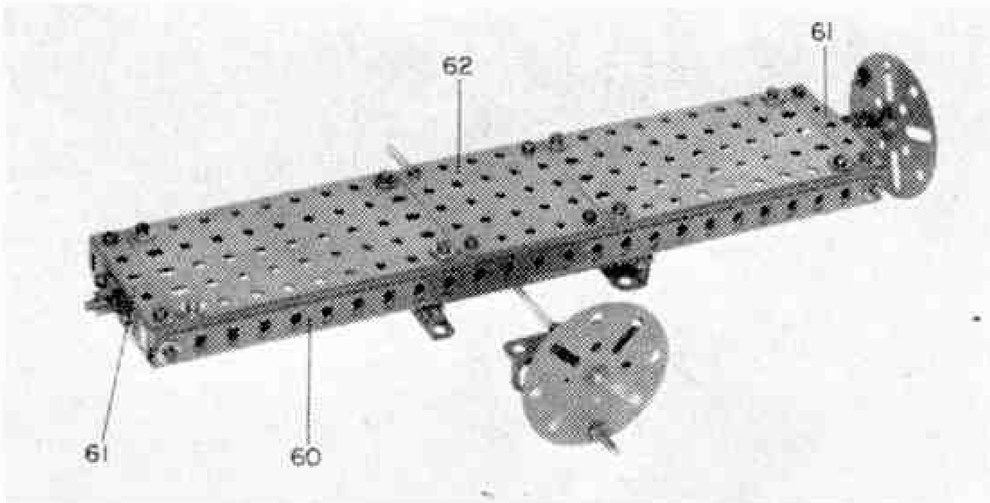
A 1 × ½ in. Angle Bracket 33, overlayed by a 2½ in. Flat Girder 34 and a Corner Gusset 35, are now bolted to Angle Girders 5 at each side, a second 1 × ½ in. Angle Bracket 36 being bolted further up the same Girders. Flat Girders 34 are joined by two 3½ × ½ in. Double Angle Strips 37, a Washer being added to each securing Bolt for spacing purposes. At one side, the securing Bolt helps to hold in place as shown a 2½ × 1 in. Double Angle Strip, between the lugs of which two 2½ × ½ in. Double Angle Strips 38 are bolted in such a way that they form a " gate " for the start/stop lever, to be fitted later.

In producing the vertically-moving section or " bed " of the model two T-section girders 39, each built up from two 7½ in. Angle Girders bolted " back to back," are joined at one end by a 2½ in. Angle Girder 40 and at the other end by a 2½ × 1½ in. Double Angle Strip fixed to the back of a 4½ × ½ in. Double Angle Strip 41. Bolted to each lug of the latter Double Angle Strip are two 4½ in. Angle Girders 42, arranged to form a U-section girder, the securing Bolt also fixing another 4½ × ½ in. Double Angle Strip 43 to the back of the U-section girder.

Fixed between the lower ends of the U-section girders at each side is a further 4½ × ½ in. Double Angle Strip 44, to which another 2½ × 1½ in. Double Angle Strip is secured. A 2½ × 1½ in. Flanged Plate is bolted between the lugs of this last Double Angle Strip, the securing Bolts at each side also holding in place a 5½ in. Flat Girder 45, a 2½ in. Triangular Plate, a 5½ in. Strip 46 and a 6½ in. compound strip 47, obtained from one 5½ in. and one 2½ in. Strip. The Triangular Plate is extended upwards by a 2½ in. Strip which is bolted, along with a 1½ in. Corner Bracket 48, to T-section girders 39. Flat Girder 45 and Strip 46 are also bolted direct to the girder, while compound strip 47 is extended by a 2 in. Slotted Strip 49 fixed to the end of the girder. A 2 in. Strip is fixed between Strips 46 and 47 for bracing purposes, then strips 47 at each side are joined by three 2½ × ½ in. Double Angle Strips. A Threaded Crank 50 is bolted to the top of the 2½ × 1½ in. Flanged Plate mentioned above.



Machine models have a very wide following among Meccano hobbyists. This particular example is a Universal Milling Machine which performs nearly all the actions of its full-size counterpart.



A view of the worktable and saddle as they appear when removed from the model.

The assembly can now be mounted on the main body of the machine which is simply done by positioning U-section girders 42 on Girders 5 so that the lugs of each Double Angle Strips 43 fall in line with the protruding lugs of Angle Brackets 33 and 36. A 6½ in. Rod 51 acting as a slide is then slipped right through all these lugs, to be held in place by Collars.

Movement of the bed is controlled by a handwheel (built-up from a Face Plate 52 to which a Threaded Pin is fixed), mounted on a 3 in. Rod held by a Collar in lower Double Angle Strip 37 and a Double Bent Strip bolted to this Double Angle Strip. A ⅞ in. Bevel Gear 53 is also fixed on the Rod, the inside end of which is inserted, loose, part way into the longitudinal bore of a Coupling. Loose in the centre transverse bore of the same Coupling is a 6 in. Screwed Rod 54 extended, via a Threaded Coupling 55, by a 2½ in. Rod free to turn, but held by Collars in the head of a Handrail Coupling 56 on a 1 in. Rod fixed in the boss of a Double Arm Crank bolted to Flat Plate 8. A Nut locked against Threaded Coupling 55 holds the Screwed Rod in place in the Coupling. *Note that the Screwed Rod passes through the boss of Threaded Crank* 50.

Fixed on the Screwed Rod just above the Coupling is another ⅞ in. Bevel Gear 57, meshing with Bevel 53, then the Rod is held by a Collar in a 3½ × ½ in. Double Angle Strip 58, secured between Flat Girders 34 with Washers on the shanks of the securing Bolts again being used as spacers. A couple of "stops" for this section of the model are supplied by 1 × ½ in. Reversed Angle Brackets 59 bolted to Flat Plate 8 so that they project one each side of the Screwed Rod.

Coming now to the worktable and the "saddle" on which it is mounted, two U-section Girders, each produced from two 12½ in. Angle Girders 60, are connected by two 2½ in. Angle Girders 61, one at each end, two 4½ × 2½ in. Flat Plates and a 2½ × 2½ in. Flat Plate 62, the last centrally placed.

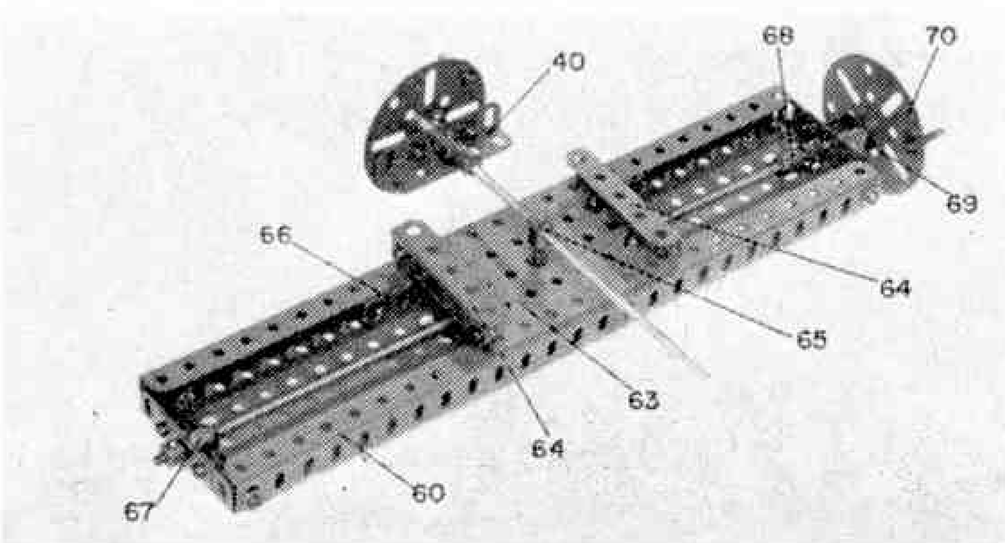
A Threaded Boss is now locked by a Nut on the end of a 1 in. Screwed Rod, care being taken to ensure that the Rod does not foul the transverse bores of the Boss. The Screwed Rod is then fixed by Nuts in a 3½ × 2½ in. Flanged Plate 63, to each flange of which a 2½ in. Angle Girder 64 is secured, Washers on the shanks of the securing Bolts spacing the Girders a short distance from the flanges. Note that the Threaded Boss is situated above the Flanged Plate and should not be confused with a second Threaded Boss 65 now locked by a Nut on the lower end of the Screwed Rod, care again being taken to ensure that the transverse bores are not fouled.

Two 3½ in. Angle Girders are fixed to Flanged Plate 63, through the second row of holes from each side, the horizontal flanges of the Girders pointing inwards. Bolted to the back of the vertical flange of each of these Girders is a 5½ in. Angle Girder 66 and note that use is made of the elongated holes in this latter Girder, thus enabling a gap to be left between its horizontal flange and the top of Flanged Plate 63. Sliding in this gap are the horizontal flanges of lower Girders 60 to give table traverse movement. Screw control for the movement is again included, this time being supplied by an 11½ in. Screwed Rod passed through the transverse bore of the upper Threaded Boss, previously mentioned, and extended, at one end, by an Adaptor for Screwed Rod 67 and, at the other end, by a 1½ in. Rod fixed in a Threaded Coupling 68. The Adaptor is held by a Collar in a 1½ in. Strip bolted to one Angle Girder 61, while the 1½ in. Rod is journalled in a Double Bent Strip 69 and a second 1½ in. Strip bolted to other Angle Girder 61. Incidentally, the 1½ in. Strips are necessary as they are used to cover the elongated holes in Girders 61 which themselves allow the height of the Strips to be adjusted. A handwheel, supplied by a Face Plate 70 and Threaded Pin, is mounted on the end of the Rod.

The "saddle," supplied by Flanged Plate 63 and Angle Girders 64 is slid on to T-section girders 39, after which stops are provided by four Angle Brackets bolted to the girders. Movement is controlled by a Face Plate with Threaded Pin fixed on a 1 in. Rod connected by a Threaded Coupling to a 6 in. Screwed Rod passed through the transverse bore of Threaded Boss 65 and journalled in an Angle Bracket fixed to a 3½ in. Strip bolted between T-girders 39. The 1 in. Rod is journalled in a 1½ in. Strip bolted to Angle Girder 40.

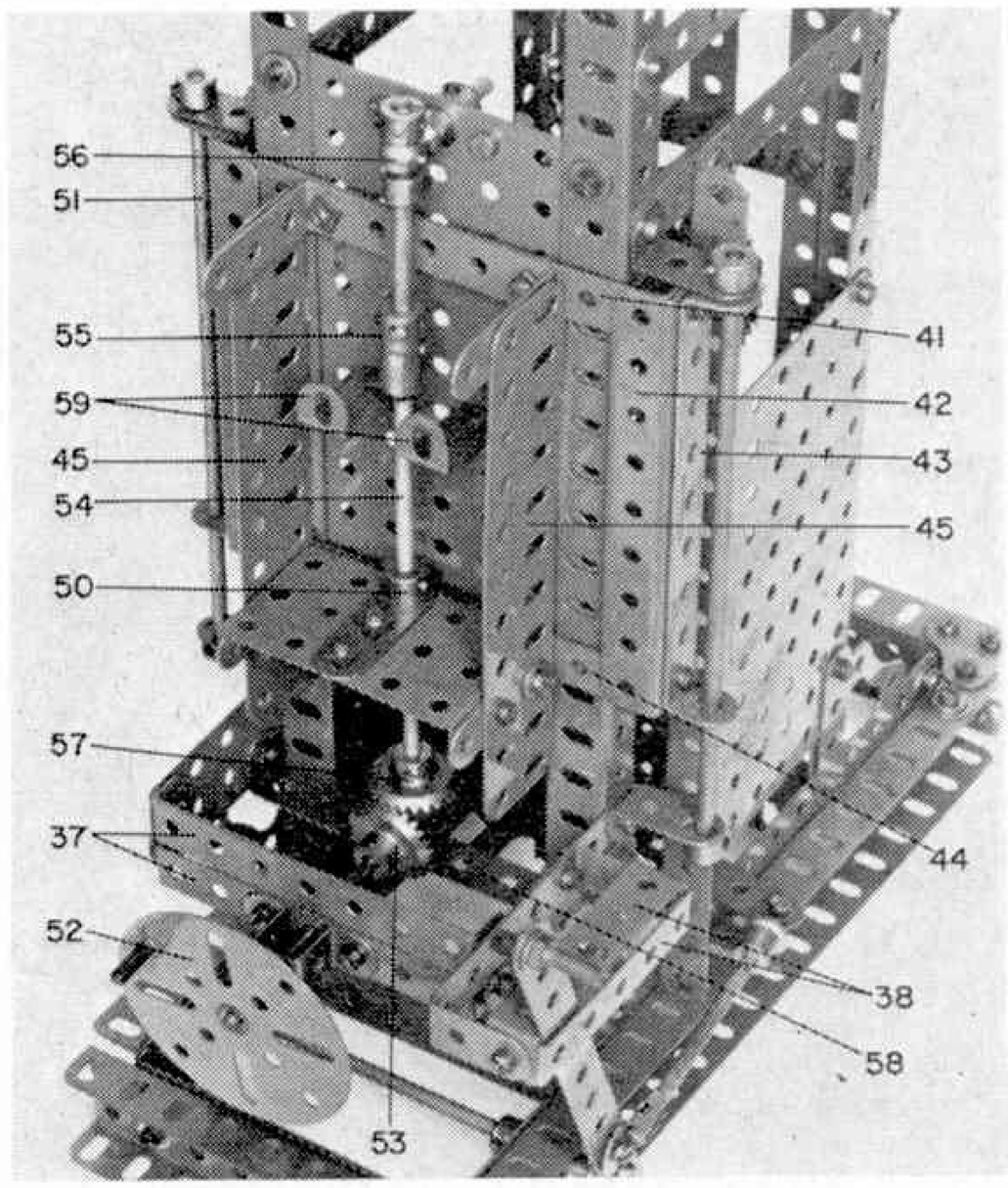
We come at last to the universal head, with which particular care should be taken. First, however, a Wheel Flange and a 3½ in. Gear Wheel 71 are tightly fixed by two ¾ in. Bolts to Flat Plate 7, but are spaced from the Plate by two Collars on the shank of the securing Bolts. Note that Rod 32 projects, free, through the boss of Gear 71 and that the flange of the Wheel Flange points outwards. The head, itself, is built up from a 4 in. Circular Plate 72, to one side of which a 2½ × 2½ in. Flat Plate is bolted. Fixed to the other side of the Circular Plate are two 2½ in. Angle Girders 73, to each of which two 5½ in. Angle Girders 74 are bolted, one to each end. The ends of the two upper Girders 74 are joined by a 2½ in. Angle Girder, the securing Bolts helping to fix a 5½ × 2½ in. Flat Plate 75 to the same Girders. A 3 in. Angle Girder 76 is bolted to the inside end of the Plate, projecting three holes sideways, as shown.

The ends of lower Girders 74 are also joined by a 2½ in. Angle Girder 77 only, this time, ⅜ in. Bolts are used as they not only help to fix another 5½ × 2½ in. Flat Plate 78 to lower Girder 74, but also secure a 3½ in.



In this underside view of the worktable and saddle, the method of obtaining traverse- and cross-feed is clearly shown.

A close-up view of the drive for adjusting the height of the bed. The bed, itself, has been removed to aid description.



Angle Girder 79 in position, this Girder being separated from the Plate by three Washers on the shank of each Bolt. A second, similarly-spaced 3½ in. Angle Girder 80 is fixed half an inch from the other end of Plate 78, both Girders projecting a distance of two holes past the Plate. These projecting sections are connected by a 5½ in. Flat Girder and a 5½ in. Angle Girder 81. Bolted between earlier-mentioned 2½ in. Girders is a 2½ × 2½ in. Flat Plate 82.

At one side Girders 74 are joined by a 4½ × 2½ in. Flat Plate, while Girders 74 at the opposite side are joined by a 2½ in. Strip, to which a Girder Bracket 83 is bolted. This Girder Bracket is extended by a 1½ in. Flat Girder, to which a second Girder Bracket 84 is bolted at right angles. Fixed to this Girder Bracket are two 1 × 1 in. Angle Brackets, in which is mounted a 3½ in. Rod, carrying a Worm Gear 85 and a ¾ in. Contrate Wheel 86. The lower end of the Rod is inserted, free, part-way into the longitudinal bore of a Coupling 87, in the centre transverse bore of which an 8 in. Rod 88, free to turn in the bore, is held by a Collar and a ¾ in. Pinion. The Pinion meshes with Contrate 86, while the Rod, itself, is journalled in Angle Girders 79 and 80 and in a 1 × ½ in. Reversed Angle Bracket 89 bolted to Girder 79. A Face Plate carrying a Threaded Pin is fixed on the end of Rod 88 to serve as yet another handwheel.

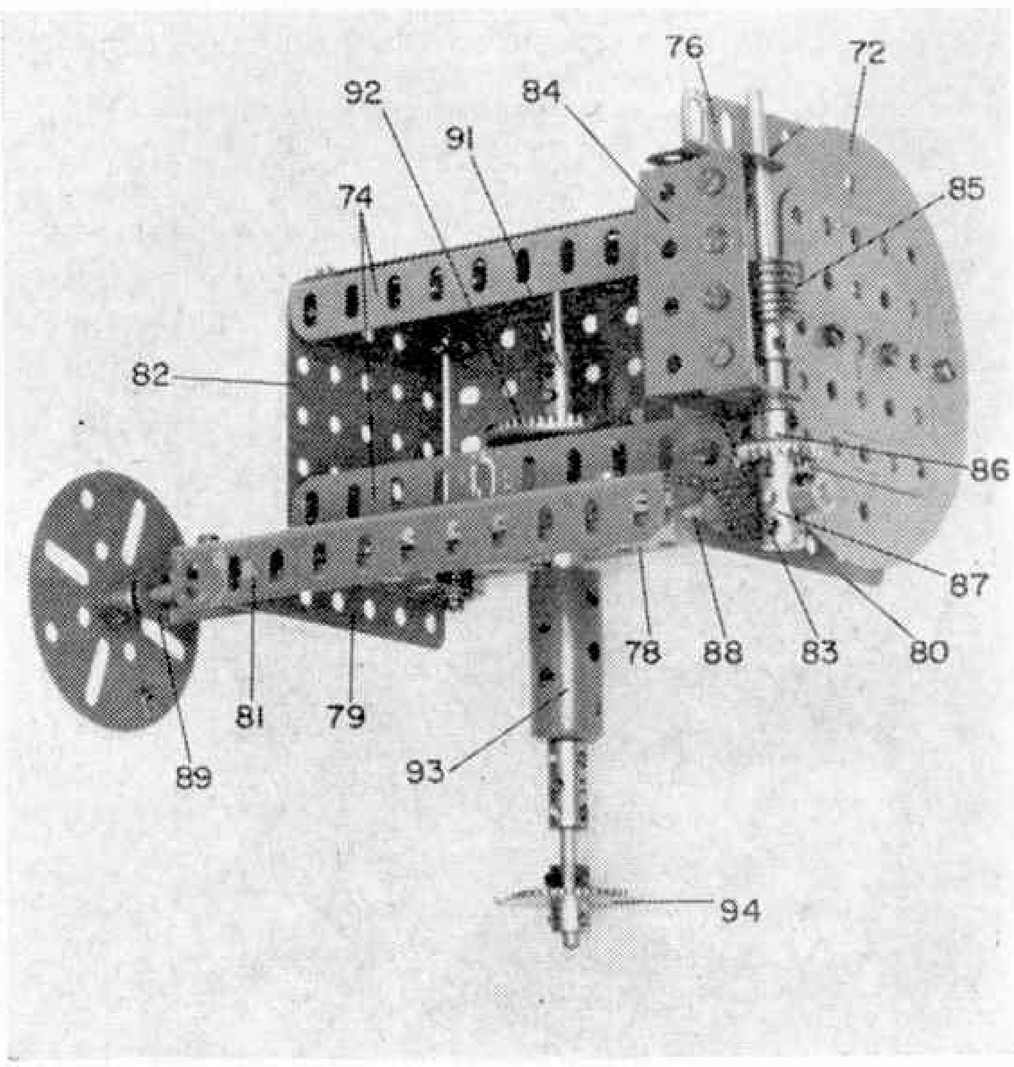
A ½ in. Rod is now fixed in the boss of an 8-hole Bush Wheel 90, bolted to the top of Flat Plate 75, then a Coupling 91 is secured to the end of this Rod in such a position that its centre transverse bore remains clear and coincides exactly with the centre holes in Circular Plate 72 and Flat Plate 82. Loose in the lower part of the longitudinal bore of the Coupling is a 5 in. Rod on which a 1½ in. Contrate Wheel 92 is fixed, the Rod being journalled free in the boss of another 8-hole Bush Wheel bolted to the underside of Flat Plate 78 and held in place by a Collar above the Plate. Also mounted lower down the Rod are a Sleeve Piece 93, carrying two Chimney Adaptors, a Coupling, a Collar and a 50-teeth Gear Wheel 94, the last representing the milling tool. The finished head is then mounted, along with a ¾ in. Pinion 95, on Rod 32 which passes through the centre of Circular Plate 72, the central transverse bore of Coupling 91 and the centre hole of Flat Plate 82, after which a Collar is added to the Rod to hold the unit in place. Pinion 95 meshes with Contrate 92, while Worm 85 engages with Gear Wheel 71.

Last, but by no means least, a stop/start lever for the Motor is supplied by a 5½ in. Strip 96, inserted in the gap between Double Angle Strips 38 and bolted to a Crank mounted on a 5 in. Rod 97 held by Collars in channel girders 1. Lock-nutted through the third hole of the Strip is a Rod and Strip Connecter that carries a 3 in. Rod, on the opposite end of which an end Bearing 98 is fixed. Pivotally attached to this End Bearing is a 2½ in. Strip which is bolted tightly to the centre arm of the Motor switch.

PARTS REQUIRED

3—1b	2—16	3—52a	4—103d
12—2	3—16a	1—53	2—103f
8—2a	2—16b	4—53c	1—103h
3—3	1—17	2—55a	4—108
7—5	3—18a	28—59	4—109
2—6	2—18b	1—62	2—111
3—6a	2—24	1—62a	6—111c
2—7a	3—25	1—62b	5—115
6—8	1—27b	5—63	3—124
6—8a	2—28	2—63c	6—133
4—8b	1—29	2—64	2—133a
10—9	4—30	2—70	1—136a
8—9a	1—32	3—72	1—137
4—9b	304—37a	2—76	2—140
3—9c	280—37b	1—78	1—146a
9—9d	80—38	2—59a	2—161
7—12	4—45	1—82	1—163
2—12a	1—46	2—90a	2—164
4—12b	2—47	1—94	1—166
1—13	5—48a	1—95	1—137a
1—13a	7—48b	1—96a	1—189
2—14	7—48c	3—103	1—192
2—15	1—51	2—103a	1—212

1—E15R Electric Motor.



The universal milling head removed from the model. Note that, when in place, Contrate 92 meshes with Pinion 95 on Rod 32.

Climbing uphill, a typical pleasure-boat rises up one of the locks at Beeston, Cheshire.

AWAY FROM THE SEA IN SHIPS

by Chris Jelley

THROUGHOUT HISTORY Britain has been famed as a great seafaring nation. For centuries, intrepid adventurers have sailed fearlessly from her shores to travel vast distances across the mighty oceans of the world—oceans that can be as cruel and deadly as they can be calm and friendly.

Deep down, every Briton probably has a subconscious wish to follow his national tradition by taking to the high seas, but the fact remains that there are millions of us who will simply never have the slightest opportunity to do so. There are also those more timid souls (and I count myself among them) who are inclined to feel that the high seas are perhaps just a little too deep, wet and unsteady ! You might believe that the closest we could get to the water-borne life is a rowing boat on the park lake one summer's afternoon—but you would be utterly wrong! In actual fact we could travel by boat for thousands of miles in reasonable comfort and perfect safety. How? By taking, not to the high seas, but to the inland waterways of Britain—a vast network of canals and navigable rivers running the length and breadth of the country.

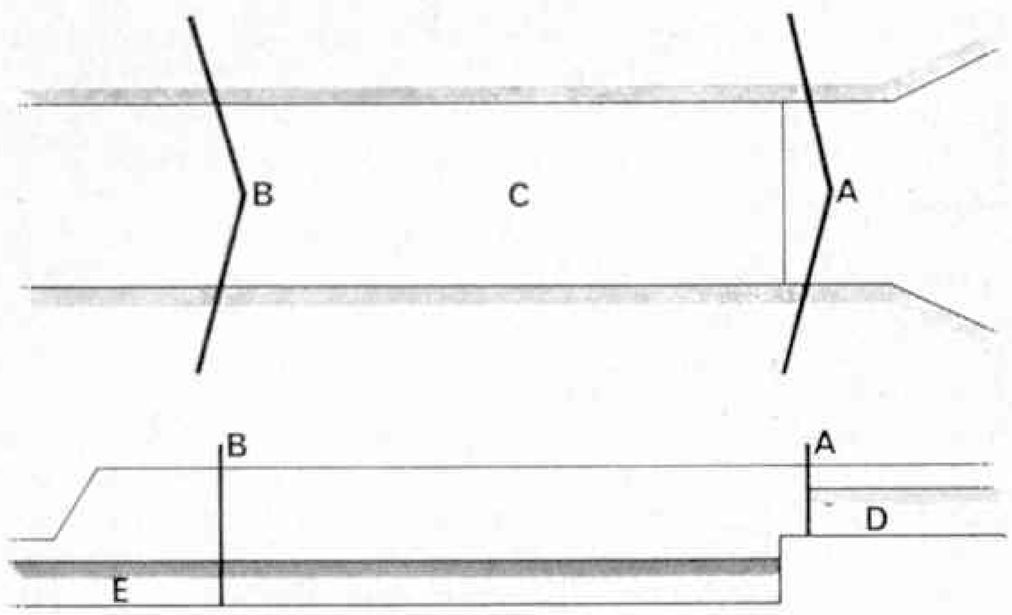
England alone has more than 1,300 miles of canals, not wide, generally speaking, and not deep, but on which it is possible to travel from east to west and north to south, besides to most places in between. Interesting names like the Grand Union, Gloucester and Sharpness, Peak Forest, Erewash, Worcester and Birmingham, Shropshire Union, Kennet and Avon are just a few of the many titles found in the canal world—a world managed by the extremely helpful British Waterways Board.

Wales, too, has her canals including one running to Llangollen in the North which is one of the most beautiful routes anywhere in the British Isles. Scotland, of course, has the famous Caledonian Canal running from Inverness on the east coast to Fort William in the West. This also passes through some magnificent scenery, but neither it, nor the Llangollen Canal can really be called exceptions. On the contrary, most canals are delightfully picturesque.

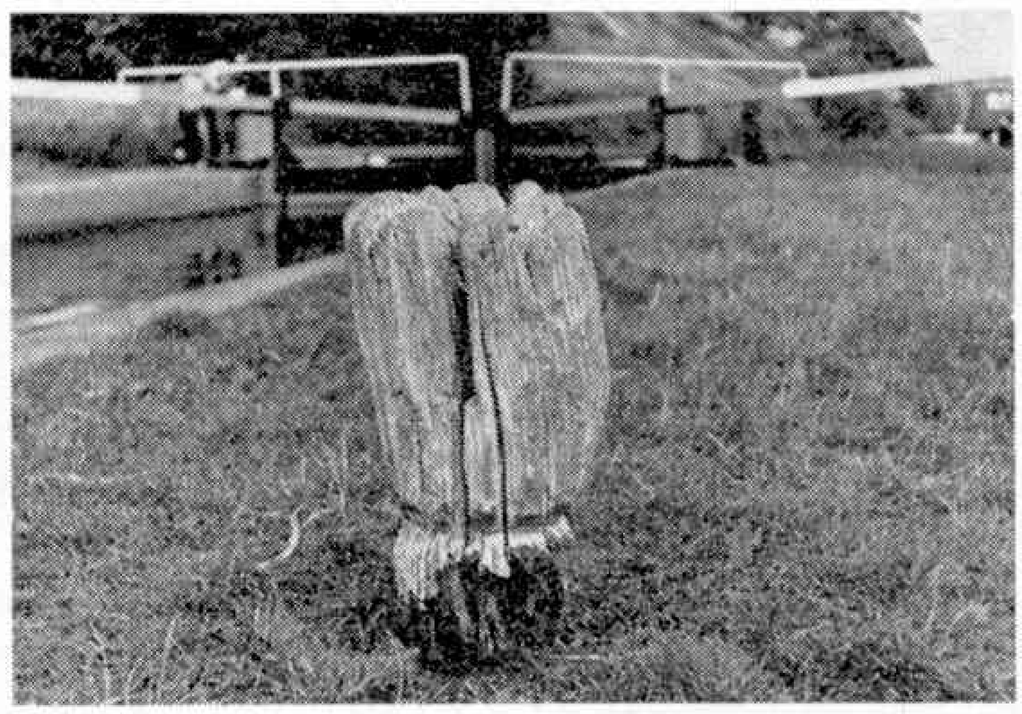
Some people, I know, look on our inland waterways as dirty, rubbish-choked ditches—ugly eye-sores that should be filled in—and unfortunately some short stretches of several canals (usually where they run through equally ugly and dirty cities) do live up to this description. It is a matter of fact, however, that the great majority of almost any canal you care to name is situated in the lush British countryside. In other words, for every ugly mile of canal, there are many, many beautiful miles which isn't too difficult to believe when you realise that far more of Britain consists of open countryside than built-up areas.

Canal water is rarely clear and, because of this, many people look at it with suspicion, incorrectly thinking it stagnant and dangerous. While the water is certainly not up to drinking standard, it is muddy for a simple and very good reason. For most of their length, canals are basically trenches dug in the earth and filled with water. You will know from experience, however, that when water is poured into an ordinary earthen trench, it quickly soaks into the ground and

Monument to a bye-gone era when canal traffic was horse-drawn, a line of stables on the banks of the Shropshire Union Canal at Bunbury in Cheshire. Once used to house barge-horses, these stables are now the workshops of a pleasure-boat hire company.



A greatly simplified diagram showing the layout of a typical canal lock. The water in the lock chamber is shown on a level with the water in the lower stretch of canal, at which time the lower gates of the lock could be opened. Key: A—upper lock gates; B—lower lock gates; C—lock chamber; D—upper canal level; E—lower canal level.



Worn, cracked and rotting, but still standing after more than 150 years of use, an original bollard at the edge of one of the locks on the Shropshire Union Canal.

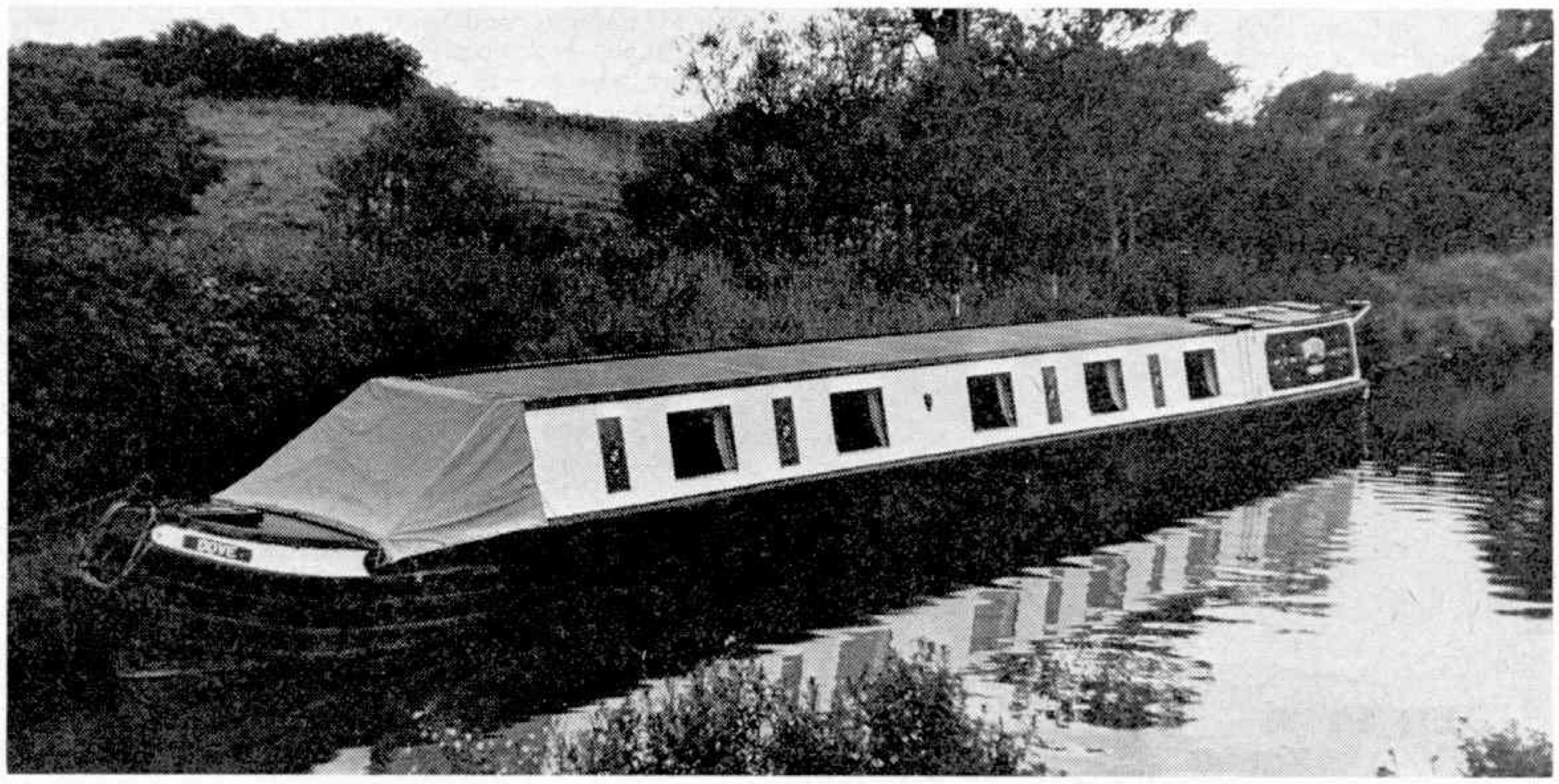
disappears. To prevent this, canal trenches are lined with a substance known as "puddle-clay" and consisting of a mixture of well-tempered clay and sand, reduced to a semi-fluid state and made waterproof by constant working about with a spade or mixer. Puddle-clay is usually applied in three or more layers to a thickness of about 3 ft. and topped with a layer of common soil.

As boats pass along the canal, the agitation in the water caused by their revolving propellers stirs up the layer of soil, spreading it throughout the water. This muddy "mist" takes a long time to settle, but it definitely will settle if the canal is left undisturbed for a good length of time. The result is reasonably clear and certainly non-stagnant water.

Virtually every craft using our inland waterways today is engine-powered and most are either hired or privately-owned cabin cruisers used for pleasure trips and holidays. It has not always been like this. When the canals first came into being more than 200 years ago, they were widely used by commercial cargo barges, all of which were horse-drawn. In fact, all our canals even today have a "tow-path" running alongside them for their entire length, this path being used by the specially-trained towing horses which were harnessed to the barges by long ropes. The tow rope, incidentally, was the only connection between the horse and the barge. It was used purely for towing and in no way to control the horse which, if properly trained, knew exactly what to do on a command from the barge.

Canal barges were of course specially designed and built for the waterways they travelled. As the canals were generally narrow, so also were the boats, the average "narrow boat" having a width or beam of only 6 ft. 10 in. To be able to pay their way, however, they had to be able to carry a good-sized cargo and so, as they could not be built wide, they were built long—70 ft. from bow to stern. Then, again, the barges were

Working canal barges are becoming rare sights on our inland waterways, but a narrow boat can be converted into a "palatial" pleasure cruiser. This picture shows a typical converted barge with a long cabin built over the normally empty cargo space.



constantly on the move travelling all over the country, therefore the "bargee" and his family had to live on board. Consequently, living accommodation was added at the stern, this being made as small and compact as possible to avoid wasting valuable cargo space.

A bargee would spend his whole working life on the canals and, as his family grew, things could get pretty cramped on board. Yet his living quarters could not be increased as his livelihood depended on the amount of cargo he could carry, and the length of the boat could not be increased owing to the difficulty of navigating the bends in the canals and, more particularly, to the short length of the locks encountered up and down the various canals.

Locks—these are the things that really made canals possible. They did away with the dangers of currents, shallows, rapids and waterfalls. They made it possible for them to climb hills and cross watersheds. In short, they set them apart from rivers which were previously the only form of inland waterway. Believe it or not, you can travel all over the country by canal and yet at no time when you are actually cruising along will you be going either up hill or down hill. In spite of this, you can travel along a canal, such as the Leeds and Liverpool, and climb hundreds of feet in the course of your journey. How? By "locking".

A lock, in effect, is a large tank, usually brick-lined, sunk into the ground where a canal must change height. At each end of the tank is a large water-tight gate or pair of gates, one opening out on to the lower stretch of canal and the other on to the higher stretch. A mechanism is provided at each end, one to enable water to be let into the lock from the higher end, and the other to let water out from the lower end.

Assuming a boat wishes to pass from the lower level of the canal to the upper level, water is let out of the lock until the level of water in it equals that of the lower stretch of canal. The lower gate can then be opened and the boat floated in. The gate is shut and water is introduced into the lock from the upper stretch of canal. This causes the water level in the lock to rise until, when it equals that in the upper stretch of canal, the top gate can be opened and the boat floated out. By reversing the process, a boat can pass from the higher to the lower stretch, but the entire stretch, itself, is perfectly level between any two locks, be they close together or miles apart.

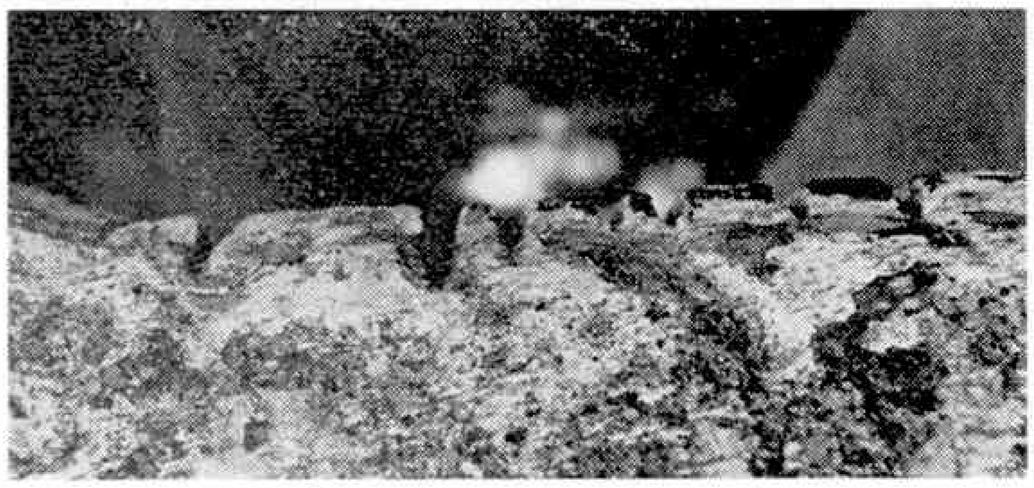
Britain's first fully man-made canal, running from Worsley to Manchester, was built by the famous engineer and one-time millwright James Brindley. Forming the first part of what was to become the Bridgewater Canal, it was financed and owned by Francis Egerton, the third Duke of Bridgewater and was constructed specifically to carry coal from the Duke's mines at Worsley to what was then the small town of Manchester—a town which suffered tremendous hardships in winter owing to the shortage of fuel and the high cost of what little there was available. Not only was this canal a fantastic feat of engineering for the time, but it was and still is unique in that it began miles underground—right in the heart of the mine workings so that the coal could be loaded at its source !

When the canal reached Manchester, it opened up endless possibilities for the town and so proved canals to be viable propositions that the Duke of Bridgewater had Brindley continue his "navigation" to meet the River Mersey at Runcorn, Cheshire. To do this, he had to lift the canal above the lowlands on either side of the River Irwell near Manchester and across the river itself, the former at the top of a 900 yard long man-made embankment and the latter with Britain's first navigable aqueduct. This was the Barton Aqueduct, across which the first boats of coal passed on 17th July, 1761. It was a great day for Brindley, his revolutionary plans for the embankment and aqueduct having earlier been ridiculed by most experts as being almost literally "castles in the air".

After the Bridgewater came the Grand Junction Canal (now known as the Trent and Mersey) joining the Trent and Mersey Rivers. It dispelled any lingering doubts as to the enormous superiority of canals over any existing form of inland travel and, in the next 50 years, almost the entire canal system of Britain was constructed—more than 4,000 miles of waterway. The superiority was, in fact, indisputable. Canals were, of course, built before the railway so, until the canal, the only forms of travel were by foot, horse and stagecoach. The first was "out" for long distances, while the remaining two were forced to use roads which, at best, were deeply rutted from start to finish and, at worst, were little more than rivers of mud. Travel for any distance on these roads was a long nightmarish experience and the cost of transporting goods on them were tremendous. Canals changed all this. Travel on them was as fast, and was luxurious by comparison, but, more important still, the huge quantities of raw materials and industrial goods that could be carried revolutionised industry. It is no exaggeration to say that the canal system completely opened up the interior of the country and made possible Britain's full-scale industrial revolution.

Since the turn of the century, owing to our vast railway network and improved road system, however, our canals have been increasingly forsaken by the commercial concerns which used them and whose dues paid for their upkeep. Many stretches were becoming derelict, but, as commercial traffic decreased, so pleasure traffic increased until, today, there is an unprecedented boom in canal cruising. With the present trend for "Holidays in Britain" resulting from the small overseas travel allowance we are permitted, more and more people are discovering the relaxation and enjoyment that can be had floating gently through the very heart of Britain. Thanks to the support of these people and the efforts of the Inland Waterways Association, the government only last year announced its intention to keep open our canals and encourage their use as a nationwide holiday playground. They made a wise decision.

Footnote: Information about any of the British Waterways Board's waterways and activities will be provided, on request, by The General Manager, British Waterways Board, Melbury House, Melbury Terrace, London, N.W.1.



A cast-iron rubbing strip on the corner of a stone canal bridge deeply scored by the action of countless tow-ropes over the years.

TRANSPORT TOPICS by

Mike Rickett

READERS MAY remember the competition I announced in the February issue concerning the two rather intriguing vintage cars shown in our illustrations. I was pleasantly surprised at the response —and some of the answers! The winner however was M. J. Bolan of West Wickham, who correctly described the two vintage vehicles as an 1898 Stephens, which in fact was a 2-cylinder 8 h.p. car with a dog cart body, and a Talbot of 1904 vintage, with a 4-cylinder 12/16 h.p. engine and a tourer body. My prize of a Dinky Toy 1913 Bullnose Morris Oxford has therefore been sent to him. My congratulations to Mr. Bolan.

How many of you, I wonder, have taken the opportunity of visiting the latest section of the Victoria Line to be officially opened to the public. Operating between King's Cross, Euston and Warren Street, this new stage added to the existing six stations served by the Victoria Line and it will also provide interchange with British Railways main line services and other Underground lines. Due to open very shortly at the time of writing, is the third stage of this mammoth undertaking, between Warren Street, Oxford Circus, Green Park and Victoria.

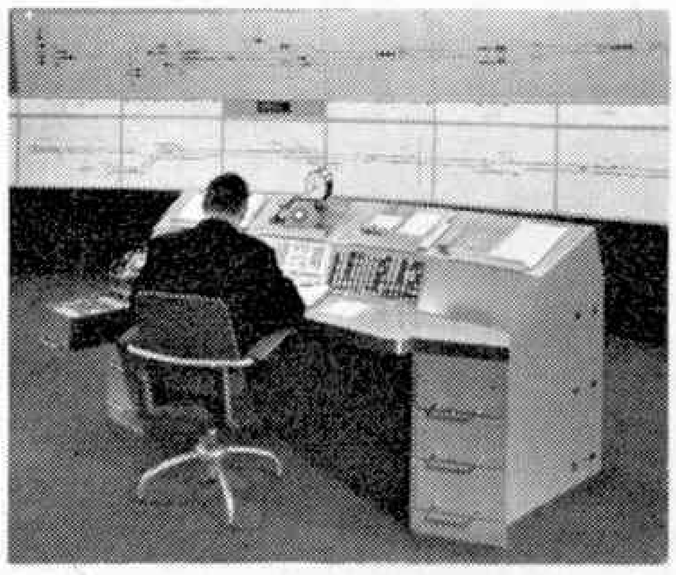
Already used by some 44 million Underground passengers every year, King's Cross will have interchange with B.R., St. Pancras, and the Piccadilly, Northern (City Branch), Metropolitan and Circle lines. The sub-surface ticket hall for the Piccadilly and Northern lines has been enlarged and the new twin escalators lead to the Victoria Line platforms. An outer ring passage-way has been built round part of the enlarged ticket hall to improve interchange with the main line stations and to reduce congestion in the ticket hall itself.

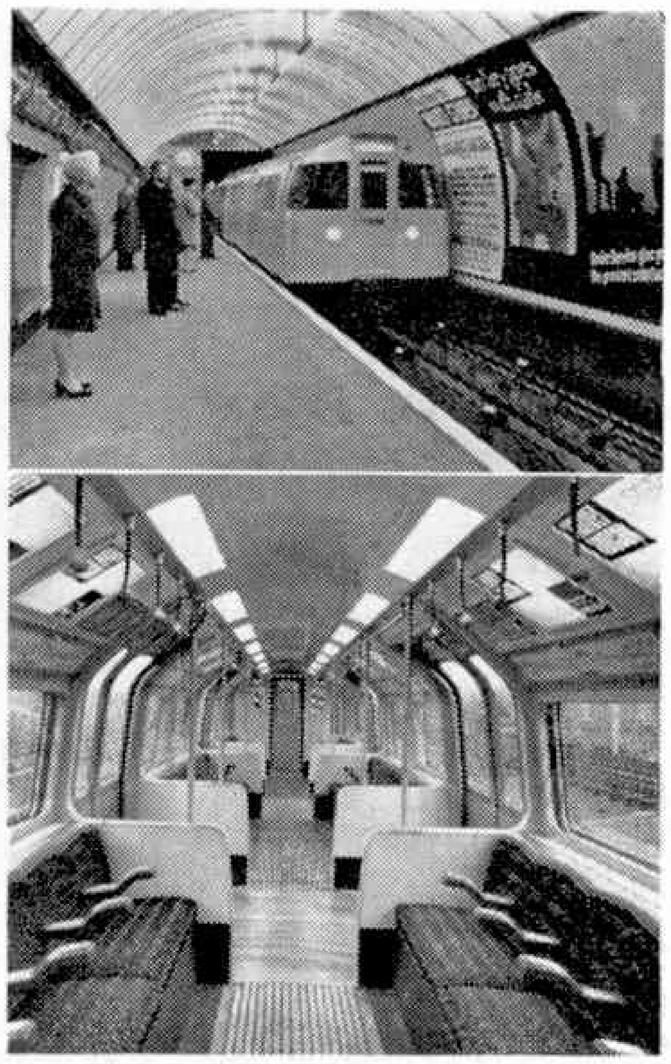
At Euston, a new ticket hall is connected by escalators with the rebuilt main line station above, and four pairs of new escalators serve the Northern and Victoria Line trains, which will run every four minutes between Walthamstow and Warren Street. At most times, including Saturdays and Sundays, trains will run at six, or seven and a half minute intervals, between Warren Street and Seven Sisters, with alternate trains going to Walthamstow.

Incidentally, trains on the Victoria Line are automatically driven, and automatic fare collection involving entry and exit through electronic gates is being installed at stations, making the line one of the most highly automated railways in the world.

Improvements of one sort or another are not however restricted to London Transport, for the Western Region of British Rail have more big improvements in passenger services—including the fastest, most frequent trains ever between London and the West Country—planned for the Western's new 1969/70 timetable to be introduced on May 5.

The speed-up of West of England trains will include the first 3½ hour schedule between London and Plymouth, and the first 5 hour 35 minute schedule between London and Penzance. Many trains on the London-Bristol and London-South Wales routes will be accelerated by 5 to 15 minutes and additional trains will run between London and South Wales and on the London-Gloucester/Cheltenham route.





Above: View of the Coboury Street Control room, showing controls and geographical wall diagrams. Above right: A train on the new Victoria Line entering a station. Right: Interior view of a Victoria Line train. Below: The new Mersey Tunnel under construction.

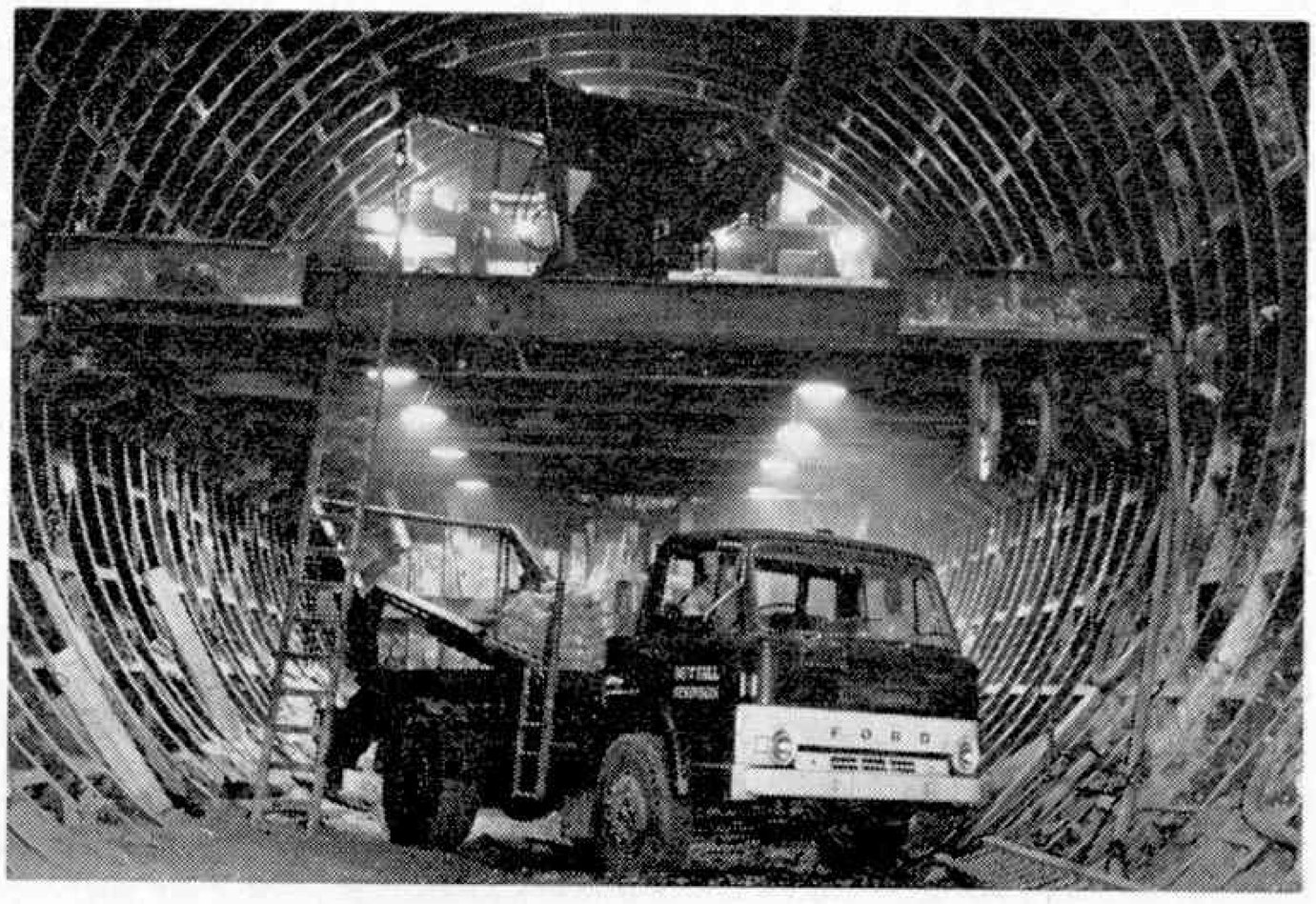
A supplement of 10/- on single journeys and £1 on return journeys will be charged for travel on all morning and early afternoon trains between London and the West of England on summer Saturdays from June 14 to September 6, inclusive. The supplement will include 3s. reservation fee and is intended to guarantee a reserved seat so that all passengers can be certain of a comfortable journey on these popular holiday services. I hear that advance booking is strongly recommended!

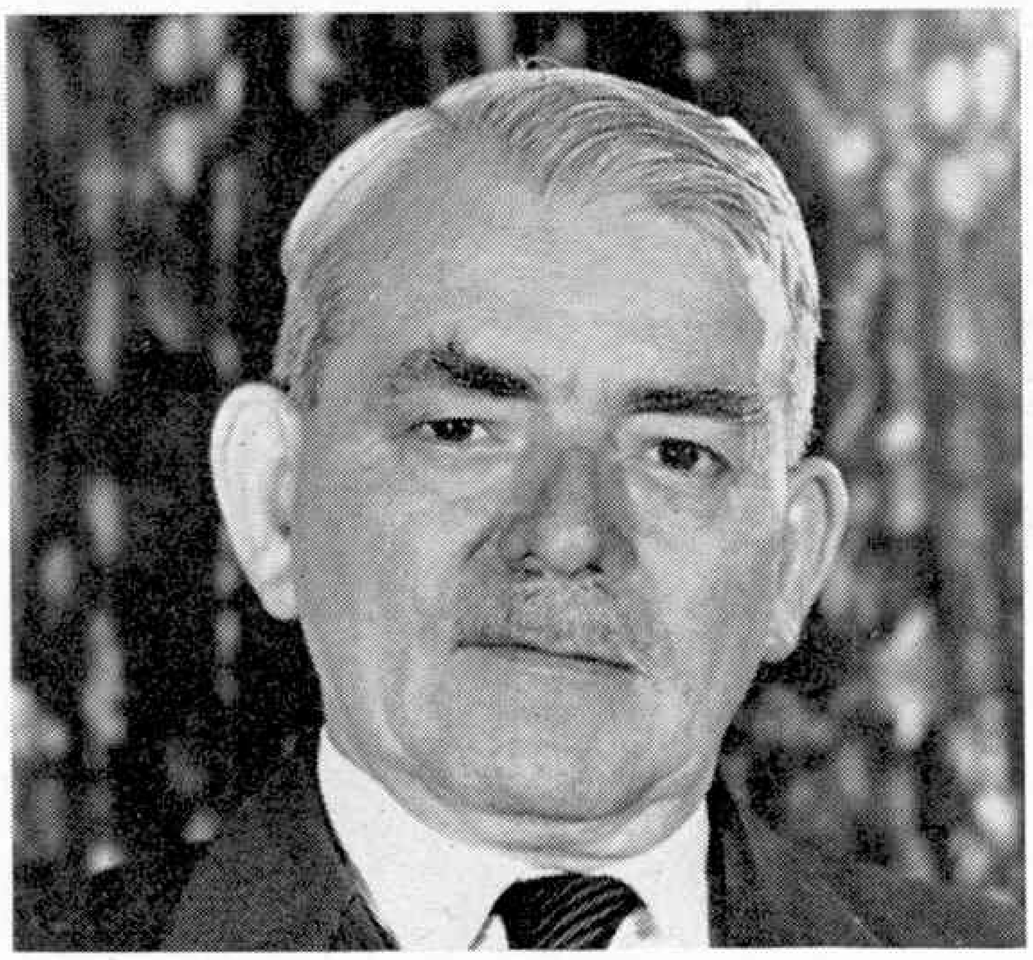
One of B.R.'s most successful services however are the Motorail trains, which are expected to be even more popular this year due to the continued curb on the overseas travel allowance and the rising cost of motoring. The trains running to Scotland enable motorists and their families to avoid the long tiring drive over Shap and Beattock, or if they are visiting the West Country, the frustrating traffic jams on the notorious Exeter by-pass. Each train carries a restaurant car serving meals and drinks and a first class compartment is provided for the sole use of the motorist and his family. An example of the service are the trains to Sterling from Newton-le-Willows, Lancs., which leave at 08.55 hours each Wednesday, Thursday and Saturday, from 17th May to 13th September, arriving at 13.35 hours. The return journey leaves at 16.30 hours arriving at Newton-le-Willows at 21.00 hours.

One of our illustrations shows a scene taken in the new Mersey Tunnel now under construction, sister to the existing Queensway tunnel, one of the longest underwater tunnels in Britain. This is the second to be built under the River Mersey, and it will have two lanes only unlike the existing tunnel which has four. It will be nearly 7,400 ft. in length and will have an internal diameter of 31 ft. 7 in.

One of the features of the construction is the giant "mole" that is being used to enlarge the pilot tunnel to its final diameter. Built in America, this machine has been successfully used to form a number of similar tunnels for the Mangla Dam project in West Pakistan. Its greatest advantage is the speed of excavation, as compared to explosives.

In essence, the "mole" is a self-propelled jumbo, 48 ft. long, with a cutting head mounted in the front. When the head is revolved, by electric motors, the soil is picked up by a series of buckets or scoops mounted round the periphery and then discharged by a series of conveyors to the rear where it is piled up some 250 yards behind.





GREAT ENGINEERS. No. 15

SIR FRANK WHITTLE

by A. W. Neal

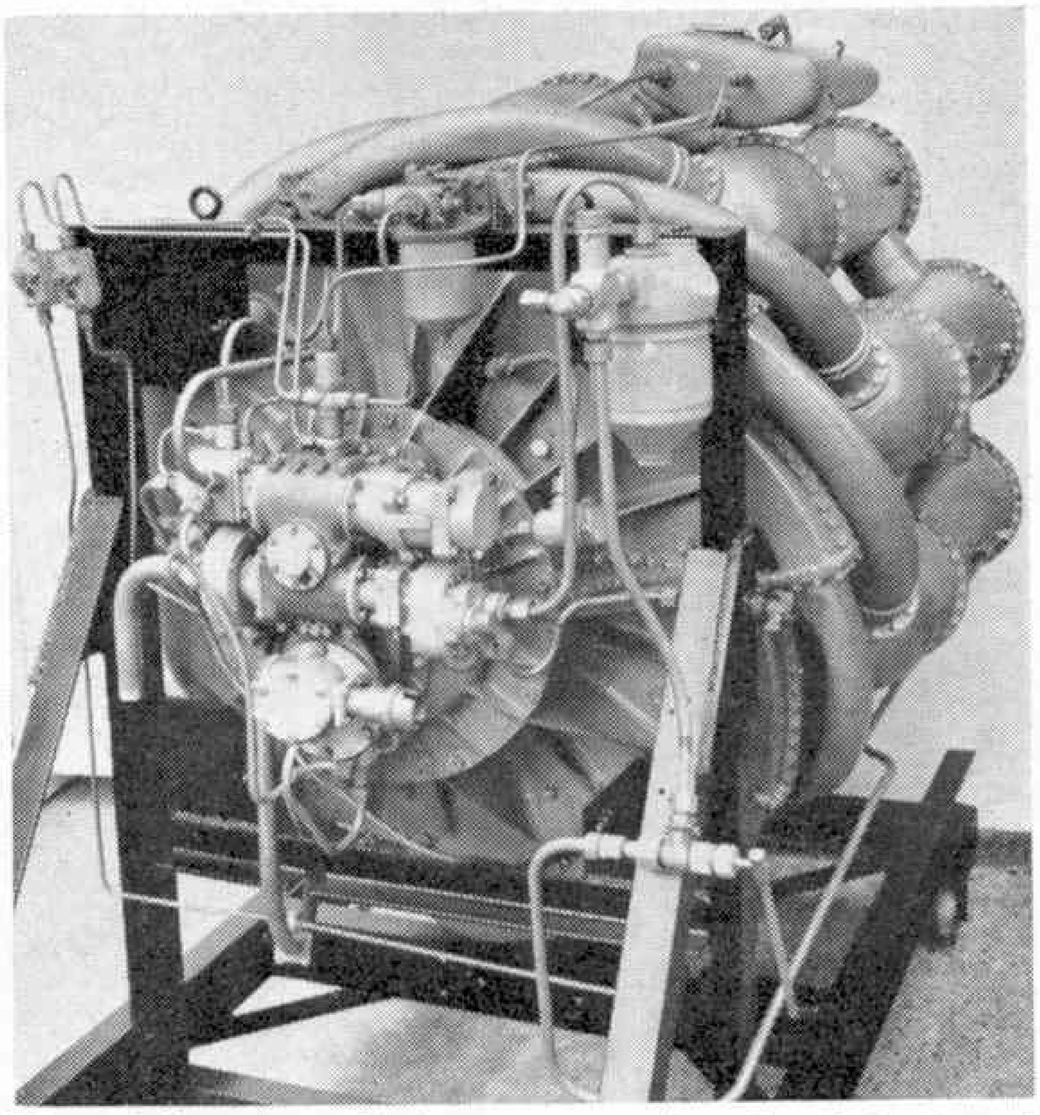
EVERYBODY WANTS to see their most cherished dreams come true, and that is precisely what happened in the case of Frank Whittle (later Sir Frank Whittle). He was born in 1907 and educated at Leamington College. He joined the Royal Air Force as an apprentice, and later became a cadet at the RAF College at Cranwell. In 1928, while still at the college, Frank Whittle wrote his memorable thesis on jet propulsion which shaped his eventual career. Nothing immediately resulted from this, but he did take out his first patent on this now very important subject.

On leaving Cranwell in 1928 he was posted as a fighter pilot, then becoming a flying instructor, and later, a float-plane and catapult pilot. But his interest in jet propulsion still continued, which led to him joining the Officers Course for Engineering at Henlow. From there he proceeded to Cambridge where, in 1936, he gained 1st class honours in the Mechanical Science Tripos. In 1935 he was again active in the jet field and, with the help of some of his friends, he succeeded in forming Power Jets Limited for the purpose of research and exploitation of the jet engine. To enable him to do this he was placed on the special Duty List of the RAF. He was then only 30 years of age.

A contract was placed with The British Thomson-Houston Co., Ltd., for an experimental aircraft engine comprising a single-stage compressor coupled to a single-stage turbine. The difficulties confronting Sir Frank and his team were enormous, there having been so little attempted in this field before. The excessive heat generated within the engine was but one of the many difficulties to overcome, but with Whittle's great persistence and ingenuity, the technical difficulties were overcome. The first test for this engine took place in April 1937, and two years later it became obvious that the Whittle gas turbine could be successfully applied to flight.

The first flight, truly an historic occasion, was made on 15th May 1941 by P. E. G. Sayers, Gloster Aircraft Company's chief test pilot. It lasted seventeen minutes, and a speed of 370 miles per hour was reached. Then followed a long series of exhaustive trials and numerous alterations until a stage was reached which marked the beginning of a new era in aviation. Such has been the evolution of mechanical flight, with the well-established piston engine being superseded throughout the world by the gas turbine as a prime mover.

It should, however, be noted that Sayers' was not the first flight by a form of jet aircraft. A German Heinkel He 178 flew on 27th August 1939, but the flight lasted only a few minutes.

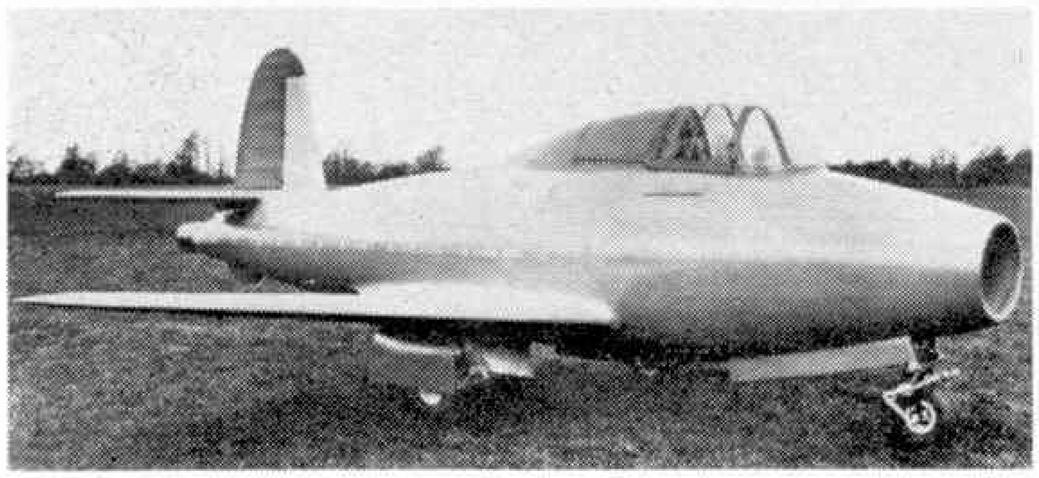


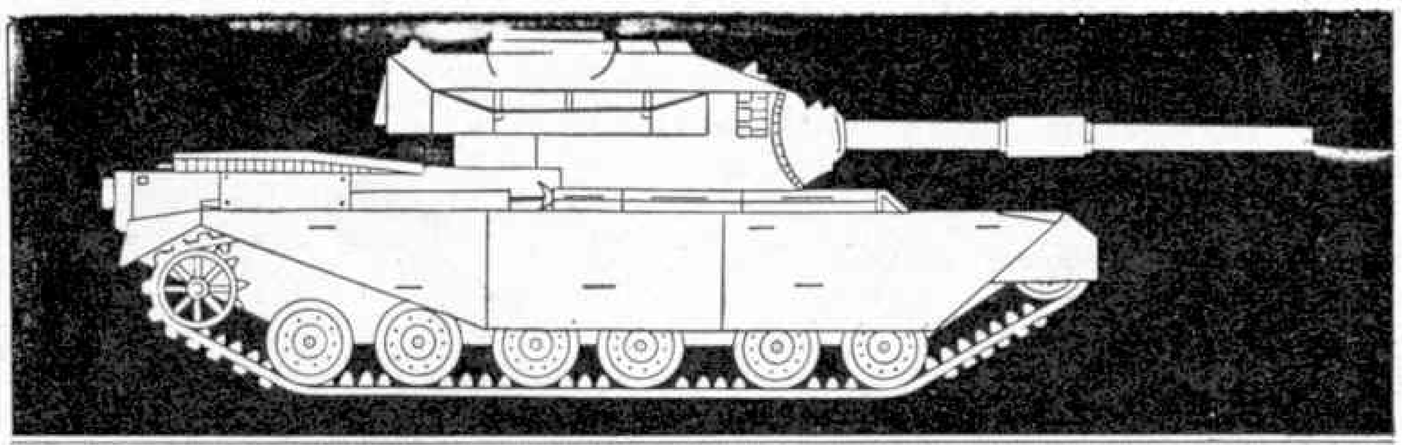
Recognition of Sir Frank's efforts has come from universities and scientific bodies all over the world. He is rightly styled the father of the jet engine in much the same way as George Stephenson is acknowledged as the father of the railways.

Sir Frank, now living in Devon, holds the rank of Air Commodore in the Royal Air Force (retired) and is at present a consulting engineer.

Young people with ambitions for leadership in engineering, or for that matter in industry generally, could do not better than to take a leaf from Sir Frank's book and to be inspired by his enthusiasm and fixity of purpose.

Above right: The original Whittle gas turbine.
Below: The E28/39 aircraft, flying test bed for the turbine.



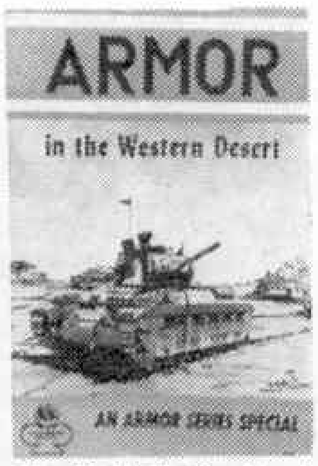


MILITARIA

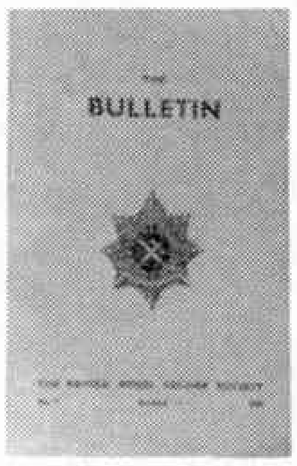
A REVIEW BY CHARLES GRANT

THE **ARMOUR SERIES** by Aero Publishers Inc., of Fullbrook, California, are worth honourable mention. They are available from the importers—**W. E. HERSANT LTD.**, 228 Archway Road, Highgate, London N.6 and those I have to hand are Nos. 4 ("Sturmartillerie"—German S.P. guns and flak tanks), 5 ("Strassen Panzer"—German scout cars)), 7 ("Halbettenfahrzeuge"—Half-track vehicles) and 8 ("Armor In The Western Desert"). All are most informative books, packed with action photographs and coloured drawings of the vehicles in question, the latter the very graphic and characteristic products of Uwe Feist, the text being by Walter Spielberger. These books cost in the neighbourhood of 24/- each, and while at first glance this appears rather high, nevertheless, on reflection, they must be considered to be excellent value, although it is rather a pity they could not have been 'hard-backed', but then, doubtless the cost would have been pro-

hibitive. However, the books are filled—with useful information and the photographs of the various types dealt with are remarkable for their number and variety—they seem to have been culled from every known source, and some pretty unknown as well. General information is lavishly supplied, schemas of technical specifications alternating with snippets of information in the very comprehensive captions to the photographs. I cannot speak too highly of the coloured sketches, both those of the diagrammatic type—for want of a better description—and those showing scenes of violent action. They are first-rate—all worthy of individual framing. They'd look splendid round the walls of a wargame room—if one is lucky enough to have such a luxury. I particularly liked one in the "Sturmartillerie" volume—a terrific scene of a German S.P. gun—a "Wespe"—moving into action over a snowbound terrain in the Russian campaign of 1914—this being a really remarkable bit of painting, looking like something straight from the gallery of the Imperial War Museum in London.



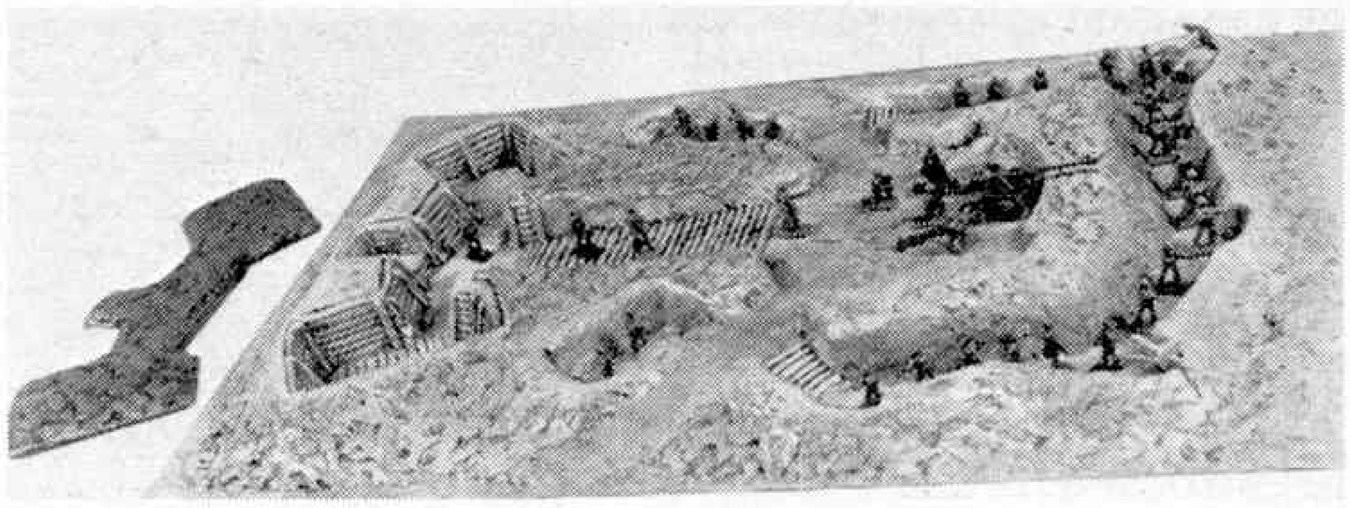
The latest issues of the "Bulletin" of the British Model Soldier Society and "Bayonet", journal of the Horse and Musket Society, provide their usual interesting contrast. In its own line the former is the most senior publication in the country and, as such, has a faintly venerable air, its format not having changed in twenty years or so. Emphasis nowadays seems to be on uniform details although considerable space is devoted to reviews of new books and figures—a most useful section, this. Articles on the 'technical' side of the model soldier hobby are not terribly frequent, probably due to the fact that with so much good stuff coming from the craftsmen manufacturers, there is less inclination for the individual to make his own possibly less expert miniatures. However, the "Bulletin" is pretty essential reading for the collector and the annual sub. of 25/-, which gives membership of the Society as well as the publication, is extremely reasonable, particularly if one lives near or in London and can get to the monthly meetings at the Caxton Hall (third Friday of every month). The October 1968 issue contains articles ranging from "Yeomanry Guidons and Drum Banners", through "The French Foreign Legion" to "Lead Can Be Fun", a first-rate exception to the general rule I mentioned about the infrequency of "Technical" articles. Aspiring members should apply to the Hon. Sec., 6 Hiliary Gardens, Stanmore, Middlesex.



The Horse and Musket Society is, as the name implies, devoted to the art of war in miniature for the period of the eighteenth century and up to about the middle of the 19th. As a partly duplicated publication it lacks the professional appearance of the "Bulletin" but it is second to none in the vital quality of enthusiasm. Its 32 pages—in a printed cover—are published by Hamish Fraser, of 27 Ramsgate Road, Margate, Kent, a most enterprising young man whose magazine deserves to succeed and probably will. The latest number contains a couple of really excellent black and white plates of French 18th Century uniforms, plus articles on Napoleonic infantry, Bavarian infantry uniforms of 1870 and a description of an American Civil War battle—Gaines Mill, 1862—refought as a wargame. Annual subscription to the Society is the same as that for the British Model Soldiers Society—25/-.

It's a source of great satisfaction to me these days that what is generally called the "Seven Years War" period—what it really amounts to is about the third quarter of the Eighteenth Century—is becoming more and more popular among wargamers. I've always considered it is far more worthy of attention than, say, the Napoleonic era. It was a time of change and innovation in warfare and you can run the gamut from big set-piece battles to hectic forest skirmishing with redskins in North America (the French-Indian Wars, of course). Anyway, MINIATURE FIGURINES (5 Northam Road, Southampton) have come out with an extensive line of 20 mm. metal figures for the Seven Years' War, which might induce a few people to 'have a go'. These figures are not all of the same quality but they do have one advantage over some previous types put out by the firm—they all have nice, square bases, in contrast to the old, narrow type many had originally. This could cause wholesale catastrophe to a line of figures, if the end one was inadvertently pushed over. As can be seen, the new figures include some unusual ones—Austrian and other continental irregular troops—as well as the more generally known infantry and grenadiers. Also included are Highlanders of the Jacobite Rising of 1745—the "Bonnie Prince Charlie" time—but I'm not too keen on them. Claymores are rather clumsy, although they could be filed down, and the designer

Trumpeter, Hussar Regiment No. 10



" Bellona " diorama—7.5 anti-tank strong point, showing detachable roof. Could be used as an all-round defensive position with slight adaptation.

didn't have much idea of the size of the " belted plaid " the clansmen wore —the kilt and plaid all in one piece—it was a most voluminous garment. Nor do I fancy the chances of a man wielding a " Lochaber Axe "—an eight-foot long halberd sort of thing, with an axe blade and a large hook at the business end—nasty !—and clutching a targe (or shield) at the same time. All the other figures are of a good standard, though, and at 1/- each are as good as can be obtained now. Incidentally, also for a shilling in stamps, the firm will supply a catalogue and list of figures.

Two excellent sets of uniform cards are published by Olive Productions Ltd. (they can be obtained from THE GARRISON, 198 Northolt Road, South Harrow, Middlesex) and they are widely different in subject matter, one relating to " The Hussars of Frederick the Great " and the other to " Soldiers of the British Colonial Wars ". The cards —six in each set— are considerably larger than the ordinary postcard, and the figure illustrated is round about 6½ in. in height, thus giving the purchaser a good chance—particularly with the rather ' fiddley ' details of the hussar uniforms—of getting good results with his painting. Very complete instructions for this are given on the back of the cards, and although understandably the hussars are the more colourful types, let no one despise the British troops. Although they had entered the khaki era, there was still the occasional bit of colour left here and there. The price of the cards is reasonable—6/- per set. I hope to see more from the same source ere long.

Yet another piece of battlefield equipment comes this month from MERBERLEN (Badgers End, Hawthorn Hill, Bracknell, Berks.) in fact one of their larger items—those they term " dioramas ", this one being a ' 7.5 anti-tank strong point ', which we illustrate. It is—the manufacturers say—based on plans in " Bildheft Renzeitlicher Stellungshan "—sounds great, doesn't it ? —and it is a very detailed anti-tank gun emplacement, plus associated dug-outs and trench system. This piece of terrain is, I feel, just as suitable for World War I and World War II wargames, but I have a strong feeling that it will see a great deal of service on some vastly different battlefields and in some very diverse periods of warfare. It provides, in fact, an all round defensive system, and it does not take much imagination to garrison it with all sorts of different troops—from Romans to American Civil War men, and indeed anything else you like to name. It is as good as any of the other dioramas produced in the Bellona series—well up to the ' Redan ' piece of last year and the price is not at all bad for what it is—considering that in area it measures 16½ in. by 10½ in. —being about 11/3 (plus postage). My own opinion is that it is well worth the cost.

At long last—after what has seemed an age spent in waiting for their arrival —the AIRFIX " Ancient Britons " proved to be just a little disappointing, possibly I expected too much. On examination, though, some of the figures are excellent, and as detailed as many of the previous Airfix figures. But—first of all—the points against. The Airfix people seem to do their historical homework, but only to a point, when they stop. For instance, the chariots in the new set are the correct open-fronted type with the semi-circular interwoven sides; they have no mythical scythe blades sticking out from the hubs, but why the heavy solid wooden wheels? All archaeological research makes it quite certain that the wheels were of the light, spoked type (there is a good reconstruction of one in one of Leonard Cottrell's books, I think it is " The Great Invasion "). Even so, I have to admit that the made-up chariot, team and crew look pretty good—the warrior with long-horned helmet looks magnificent, the detail of moulding being extremely fine. I'm not sure, however, just how safe the driver must feel, sitting, as he is, on the front edge of the chariot floor with his legs swinging! I think it a pity, too, that those figures carrying a shield are moulded with figure and shield in one piece—gives a sort of ' cramped ' look to the warrior. It would have been better, as in the Roman set, to have used separate shields which could plug into position on the arm—they look so much more effective. On the other side of the coin, there is no question but that the detail of modelling is of a very high order—the warrior on the chariot already mentioned, the standard bearer and the chief with winged helmet, for example, they're just great! Usually, I base to a considerable extent my opinion of a box of Airfix figures on how many are what I call ' fightable '. I ignore the wounded, or chaps crouching or kneeling, I don't reckon them to be much good in wargames. The Ancient Britons come out of this test pretty well with, in addition to the two chariots, about 20 men able to take the field in an upright position against the Romans, or a ' friendly ' fight against some other tribe ! All this—for just over half-a-crown—really needs no comment on good value for money.

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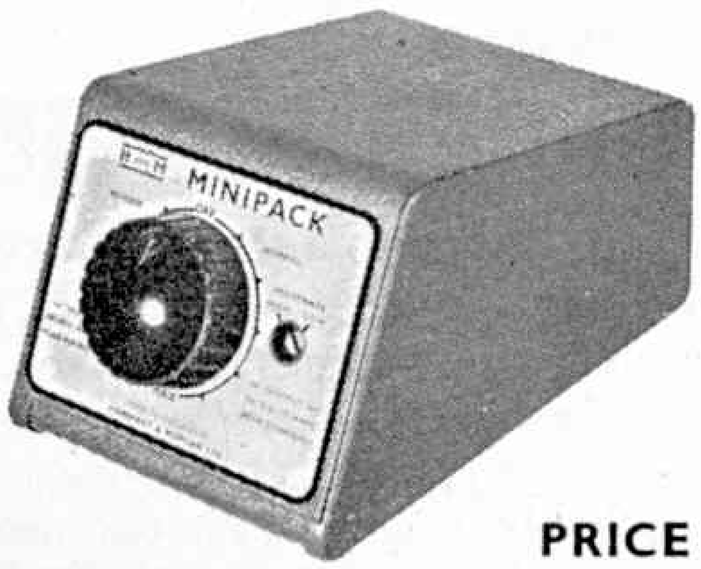

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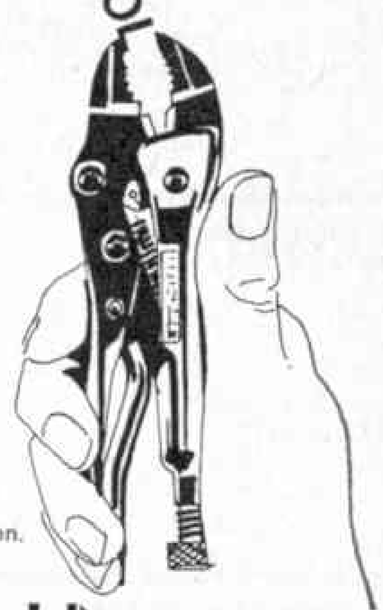

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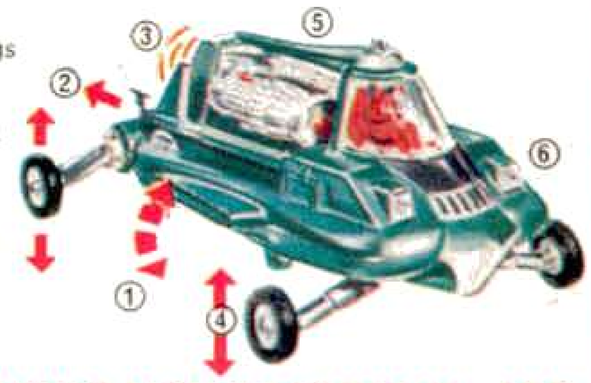

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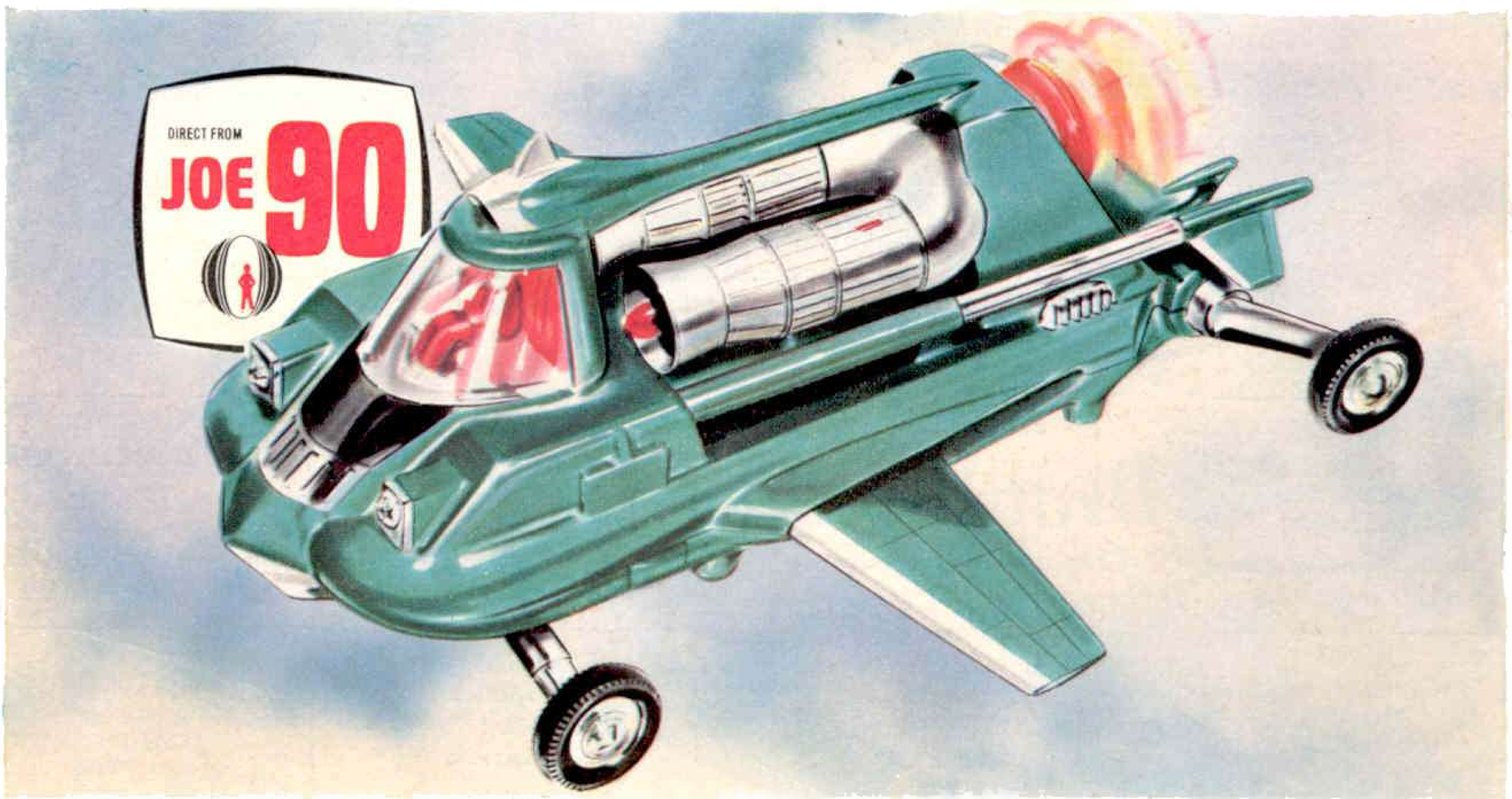

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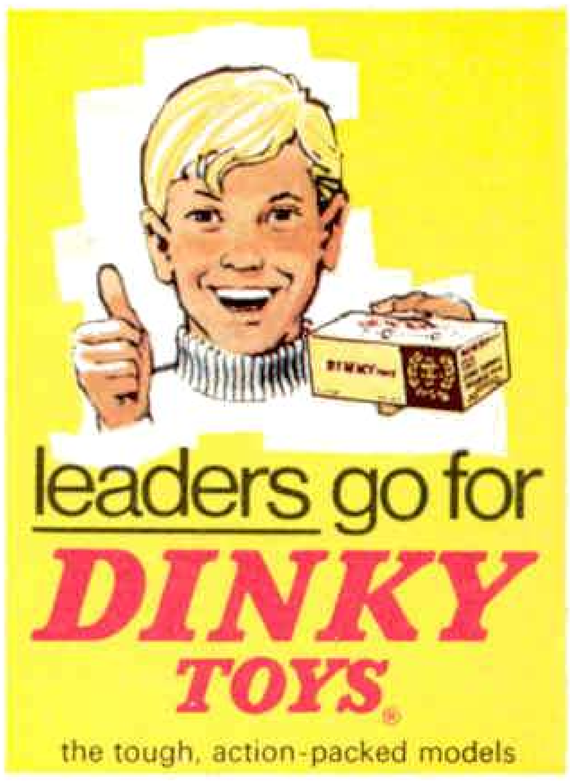
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