MECCANO® Magazine

OCTOBER 1971

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MECCANO® Magazine

OCTOBER 1971 VOLUME 56 NUMBER 10

Meccano Magazine, founded 1916

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MAP **HOBBY MAGAZINE**

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FRONT COVER

Paul Hodgson holds his prototype *Clippie* model while his flying partner Tony Wager checks the elevator horn. You too can enjoy flying this simple model—full-size plans in this issue.

NEXT MONTH

Another full-size plan, this time for an electric outboard powered runabout, will be a leading feature, plus something on battle-gaming and the first of a series of articles on photography.

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

Second class postage rates paid at New York, N.Y. Registered at the G.P.O. for transmission by Canadian Post. American enquiries regarding news stand sales should be sent to MECCANO MAGAZINE, Eastern News Distributors Inc., 155 West 15th Street, New York, N.Y. 10011, U.S.A. U.S.A. and Canada direct subscription rates $6 including index.

Publishers of Aeromodeller, Model Boats, Model Cars, Model Engineer, Radio Control Models, Model Railways, Scale Models, Woodworker, Military Modelling.

CONTENTS

MODEL & ALLIED PUBLICATIONS LTD.
13-35 BRIDGE STREET, HEMEL HEMPSTEAD, HERTFORDSHIRE

Announcing the BiC Regd. Trade Mark National Model Making Championship

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

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

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

Where do they go to?

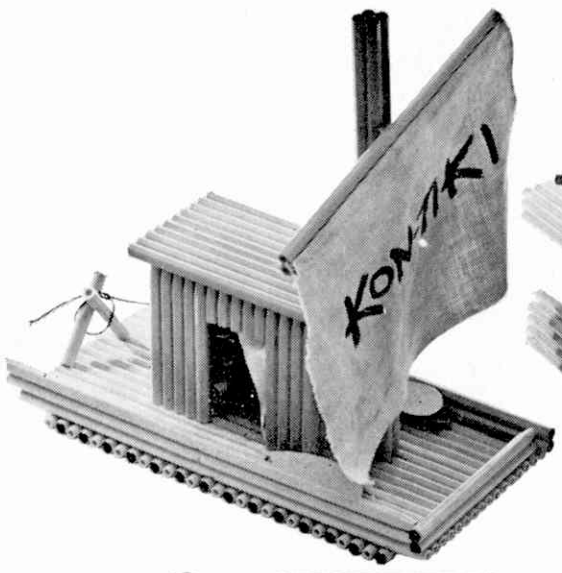
It is human nature to squeeze the last drop of ink from a ballpen or to believe that it may write again after a short rest. This is why you will probably find more than you expect in your own home. In offices and factories you should find them by the hundred.

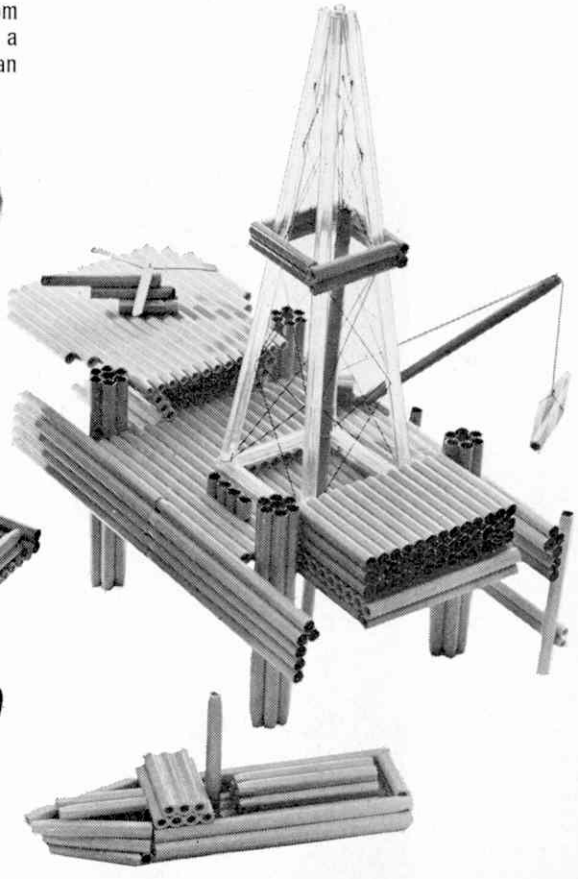
All you have to do . . .

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

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

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





BiC Regd. Trade Mark

the pen they model on

BIC
Regd. Trade Mark

Model Making Competition

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

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

RULES

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

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

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

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

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

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

PRIZES

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

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

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

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

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

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

RESULTS

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

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

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

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

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

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

I understand and abide by the Rules

Name.....
(BLOCK LETTERS PLEASE)

Address.....

.....

.....Age.....

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MM 7

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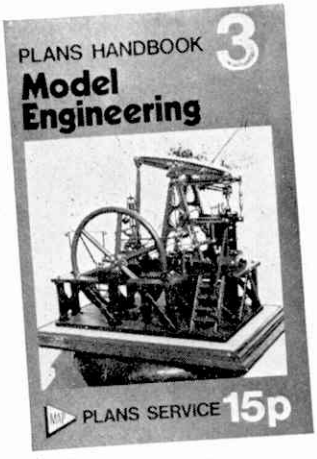
Model Boats & Cars

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



Model Engineering

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

Radio Control Models

A truly *FULL* range of R/C models are described in this 100 page catalogue. There are 128 R/C aircraft all illustrated, including S/C Sports Models and Trainers, Galloping Ghost Models, Competition Aerobatic Models, Multi-Sport and Trainers, Pylon Racers, S/C and M/C Scale Gliders and Soarers. 87 model boats suitable for radio control, plus do-it-yourself R/C systems. Many useful instruction features, like the R/C 'Goof-ups'—an introductory feature for beginners. Fully illustrated current F.A.I. aerobatic schedule.

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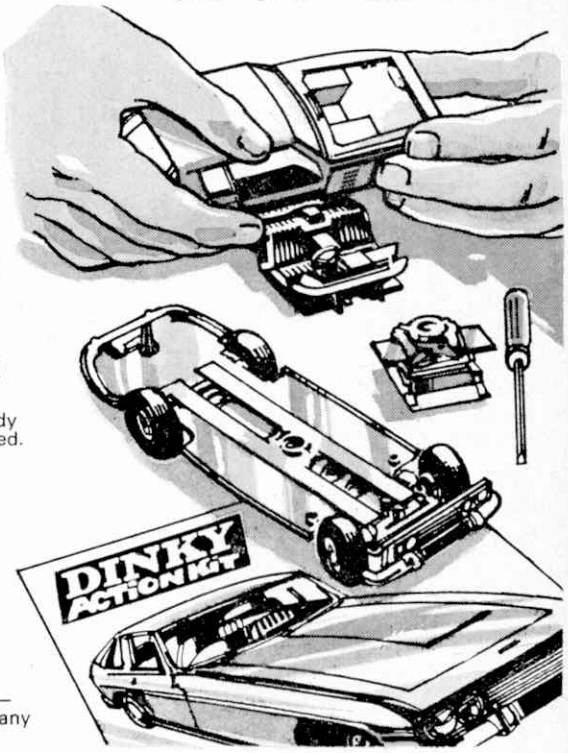

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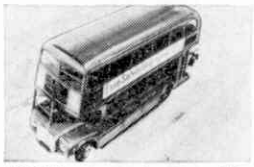

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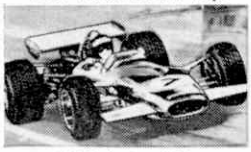

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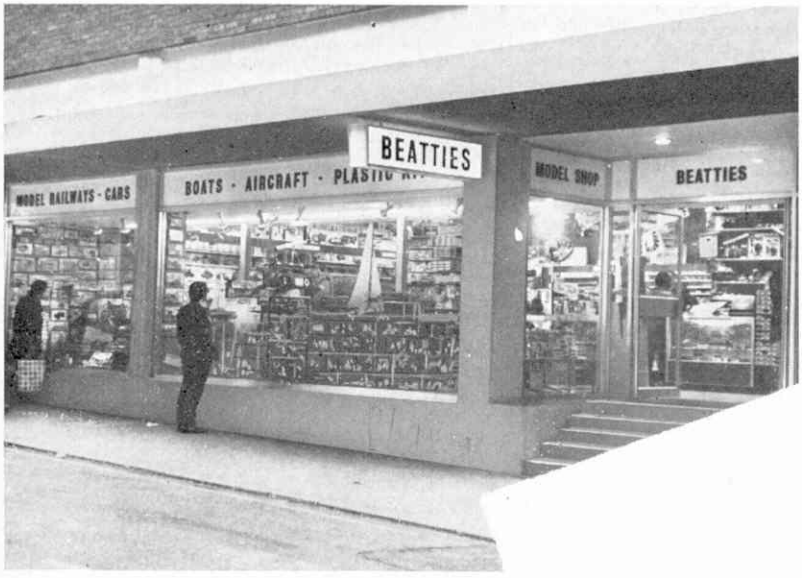

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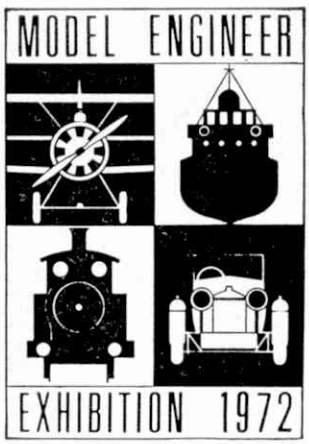


41st GREAT SHOW!

SEYMOUR HALL, LONDON, W.1.

4th January — 15th January 1972

(Not Sunday)

Model Aircraft, Locomotives Boats, Traction Engines Military Models, Crafts

COMPETITORS

Your entries are now invited. Entry Forms on request. £300 in prizes . . . some 30 cups, trophies and other awards. Championship Cups for permanent retention. A win confers " Expert Status! "

ENTRY CLASSES

Examples of every form of modelmaking activity can be entered. Model engineering masterpieces such as locomotives, traction engines, aircraft, boats, cars . . . or simple plastic creations . . . there is a class for you. Classes include Military Models (six classes) and Craft entries (Furniture, glass fibre, etc.).

WHAT WILL BE ON DISPLAY

THE MAIN HALL will be laid out in a completely different manner, offering a grand " open plan " scheme with more room for models, which will be grouped under the gallery balcony and in the centre, with a WINNERS' PODIUM to display class champions. The popular S.M.E.E. PASSENGER RAILWAY enjoys its usual position, but with the added feature of the immense BERKSHIRE 10¼ in. gauge locomotive based on an American Freight Locomotive and destined to operate on Lord Gretton's Stapleford Park Railway. This is nearly 19 ft long and will be on show alongside the track. Another locomotive specially built for Stapleford Park will also be on show at the entrance—The Hon. John Gretton's ROYAL SCOT—a fine scale model embodying many of his own design features.

A FLYING CIRCLE stretching right across the hall from balcony to balcony will be available for electric model aircraft flying. This will be at BALCONY LEVEL and provide splendid and spectacular sport with electric models doing nearly all that more powerful outdoor i.c. engined models do—or so we hope!

TRADE STANDS—fewer in number than before, since " club " and other special stands are in another hall—are tastefully grouped in three units, giving convenient access in the MAIN HALL.

Introduction of a MODEL ENGINEER WORKSHOP manned by the S.M.E.E. last year proved immensely popular and will be increased in size and scope, again with experts from S.M.E.E. in charge and assisted by M.E. consultants. Working models under compressed air will also be on show.

BRIGHTON ROOM will be operating as the CLUBMEN'S CORNER with stands manned by the principal governing model bodies of the country, plus club units demonstrating, and offering combined club " Little exhibitions." Demonstrations of power tools will also be shown. This hall will contain the TRACTION ENGINE entries, and wall showcases of small exhibits.

LECTURE HALL will be arranged as the BATTLEGROUND with four WARGAMES TABLES for regular miniature battles, where clubs will be invited to run wargames of all popular periods, with opportunities for running commentaries. MILITARIA entries will be displayed here.

BOATING MARINA: For the first time we have taken the SMALL SWIMMING POOL to operate as a nearly 100 ft long indoor lake for boating activities. R/C boats will be demonstrated daily. Evenings will be given over to inter-club and individual contests. Pool will also be big enough for some steam powered boats to operate by arrangement.

GALLERIES will provide sitting out space, spectator room and house additional club displays including our favourite BOYS' EXHIBITION. Furniture and craft entries under the auspices of *Woodworker* will be on show.

SOUVENIR GUIDE

Another CHRISTMAS EXTRA issue of *Model Engineer* will be coming out 2nd Friday in December with entries, trade stands, articles galore to assist the visitor and solace the stay-at-home.

PRIZE POOL ALLOCATION

Classes attracting six or more entries will enjoy prizes to value of 1st £5; 2nd £3; 3rd £1. With over 12 entries s £7, 2nd £4; 3rd £2; 4th £1. Classes under six will have 1st & 2nd only, or at discretion of the judges may be combined with other classes.

ENTRIES CLOSING DATE

All entries must be made by October 18th 1971.

Enquiries for Competition Entry Forms, Trade Stands to:

EXHIBITION MANAGER,
M.A.P. Ltd. 13/35 BRIDGE STREET,
HEMEL HEMPSTEAD, HERTS.

ON THE EDITOR'S DESK

Yachting

We have just returned from Fleetwood where the 1971 British Open "A" Class Championship and the International Yachting Monthly Cup races were held. "A" Class yachts are the biggest size of models, round about seven feet long and standing nine feet or so high, out of the water. They weigh an average between 50 and 80 lb. and require two people to handle them, especially in a breeze!

Both the British and the International events saw seven countries represented, and both were won by a Danish boat and her skipper, Kai Ipsen.

Fleetwood has what is certainly the finest yachting lake in Europe and probably the best in the world. It was built under the scheme for public works instituted to provide employment in the depression between the two wars, and has seen many fine regattas. The "A" class regatta lasts a week, and is held in Fleetwood every other year, alternating with Gosport on the South Coast. The lake is 800 yards long and 250 yards wide, and being next to the sea on a narrow peninsula, is noted for its breezes which, on so large a lake, can produce quite a considerable chop.

We took with us the original *Splinter*, the little 12 in. yacht for which full-size plans appeared last month, and slipped it into the water during a lunch-break when there was quite a stiff wind blowing. It was very satisfying to see the relatively tiny model able to lay the same course as bigger boats to windward, and even more so to slack everything off and release the boat from the windward end and get a fine run down the full length of the lake. The model slowed between waves but spurted off as soon as it rose high enough to catch the wind; in the bigger waves at the leeward end of the lake it was quite hard to see it at times, but it sped manfully on to complete the full length, to the surprise of quite a few of the experienced yachtsmen there.

Front wheel drive

The use of front wheel drive for mass-production cars is a relatively recent innovation, dating from the introduction of the Mini in 1959, although it had of course been used in a small way on other cars before that. British Leyland reached a record in July this year when the five millionth f.w.d. transverse-engined car came off the production line, within minutes of the two millionth 11/1300. The total is made up of 2,000,000 110/1300s, 2,600,000 plus Minis, about 80,000 Maxis, and over 300,000 1800s. These figures are practically meaningless to the average person, until you think that a nose-to-tail traffic jam of 1000 cars will stretch around three miles, so that one million cars would make a line nearly 3000 miles long. Going the other way at 60 m.p.g. past this jam you'd have to drive non-stop for 50 hours to reach the end. What's that word? Mind-bending?

Model Railways

Railway enthusiasts among our readers may well have seen the first issue of our new magazine *Model Railways*. This title replaces *Model Railway News*, the oldest magazine for small size railway modelling; the new journal is bigger in page size and quantity and can best be described as "lavish" with super large pictures, colour, etc. Price is 20p per issue and publication on the second Friday of each month.

Mobile Service School

If you cannot get the pupils to the school, then take the school to the pupils. This is what the Rover Company—part of the Socialist Car Division of British Leyland—is doing with a new "Service School on wheels" which is to tour parts of Europe giving on-the-spot training to mechanics servicing the Company's products.

The mobile school has been developed at the Rover Company's plant at Solihull and consists of a long-wheelbase one-ton capacity Land-Rover specially converted for the purpose and completely fitted out with all the equipment necessary to run a series of one-week courses for Rover mechanics employed throughout the British Leyland European distribution network.

The equipment, which ranges from a slide projector to complete engines and gearboxes, will enable the instructors to give a high standard of training to mechanics at their own garages.

The special Land-Rover is painted Leyland blue, the official colour of the British Leyland Motor Corporation.

Sheffield Class Destroyer

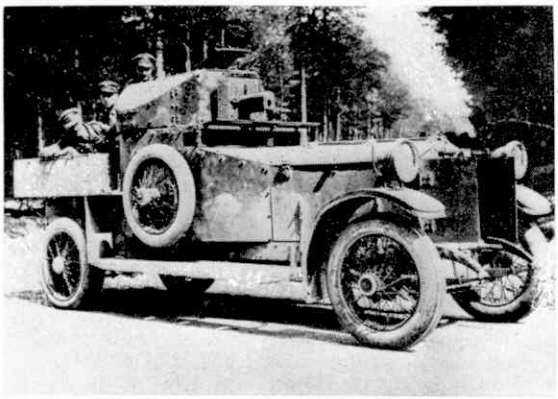
Lord Balniel, the Minister of State for Defence, announced recently that a further Type 42 destroyer has been ordered from Vickers Ltd., Barrow-in-Furness. This is the fourth ship of this class to be ordered.

The announcement was made at the launching by the Queen of H.M.S. *Sheffield*, the first ship of the class, also built at Vickers, Barrow.

Two other ships of this class were ordered some two weeks ago from Cammell Lairds, Birkenhead.

These vessels will have a standard displacement of about 3,500 tons and will be powered by a combination of Tyne gas turbines for cruising and Olympus gas turbines for full power.

The will be armed with the 4.5 inch Mk. 8 gun, anti-submarine torpedo tubes and the new Sea Dart surface-to-air/surface missile system. The ship will also carry the new twin-engined WG 13 Lynx anti-submarine helicopter.



From 'GHOST' to 'FOX'

Jack Wheldon traces the history of the armoured car

WHEN we see veteran cars of the 'nineties, we sometimes wonder at the hardiness of the pioneers who drove them along the rough, unmetalled roads of those days. Merely getting from one town to the next must have been high adventure. Yet it is a fact that long before motor cars had become either reliable or powerful, some daring spirits were trying to adapt them to warfare, by giving them guns and armour!

The U.S. Army claims to have been first in the field, with a group of cars designed by Col. R. D. Davidson of the North Western Military and Naval Academy in 1898. They were steamers, they carried a machine gun over the front wheels, but they were not really armoured. Just a few pieces of steel gave some protection to the machinery, but none to the crew, and for this reason we can't really accept that Col. Davidson built the first armoured car.

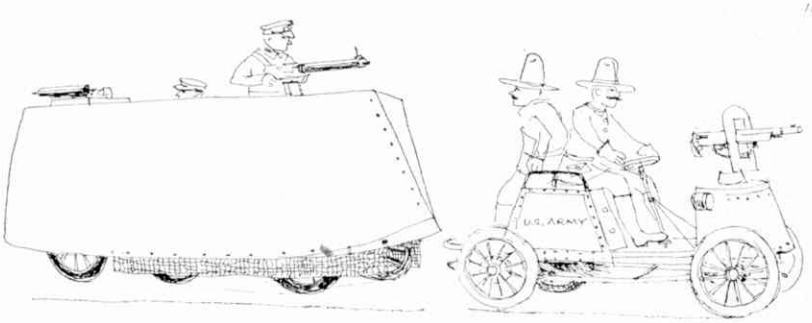
A more likely candidate was Fred Simms, the British engineer who introduced low-tension magneto ignition in 1899. In the same year he collaborated with Messrs. Vickers to produce a quadricycle protected all round by a boat-like steel hull having a pointed ram-nose. The top was open, and machine guns could be raised to fire over the 'gunwale'. Chain mail was hung to protect the tyres. Of course there were difficulties. Vision was inadequate, and the total weight of 6½ tons overburdened the little engine, which was geared down to a maximum of 9 m.p.h. Even so, remembering the primitive brakes of those days, one shudders to think of the Simms War Car going down a long, twisty, steep hill!

Now, this experiment was not taken seriously at the War Office, for two reasons. First, armies have to travel across country, and those early cars had no cross-country performance at all. Secondly, the W.O. had just experienced unpleasantness with an American salesman named E. J. Pennington, who had tried to con them into buying a super-performance "Armoured Mobile Defence System". Pennington was simply trying to cash in on the motor-car boom. He had a strong line of sales talk about a patent "long-mingling spark" that was supposed to make even the tiniest of engines go like a tornado, and he claimed that his air-cooled cylinders of plain steel tubing were much better than the more expensive finned type! He also had a good line in coloured leaflets, and I suppose his aim was to collect as many advance payments as possible before disappearing. He nearly hooked the British Army—rumour had it that Lord Kitchener himself was very interested—but, fortunately, someone dug his toes in, and insisted on details and demonstrations. Pennington then disappeared, and his mysterious workshop was found to contain only a broken-down motor-bike and a lot of coloured pictures.

After these novelties, the armies of Europe and North America saw very few armoured cars for the next 14 years. A few wealthy car-owning officers experimented with steel plate and gun mountings, but the results were underpowered, liable to chassis breakage, and were helpless off the roads. Remember, a square foot of armour only 12 mm. thick weighs 20 lbs.

A new impetus came in 1914. The Royal Naval Air Service was operating inland from the French coast, and was losing too many pilots by forced-landings in German-held territory. So the Admiralty purchased 100 Rolls Royce Silver Ghost chassis, and had them fitted with coupe style armoured bodywork, which some people thought made the classic Rolls Royce lines even more handsome. These cars operated a "land-air rescue" service successfully until trench warfare set in.

Now, the Silver Ghost chassis was strong, and the



Top photo shows the famous Rolls-Royce Silver Ghost armoured car of WW1. Note the coupe type body, radiator flaps in the open position, characteristic RR bonnet, and the bullet-proof jacket on the machine-gun. Weight was four tons and speed 60 m.p.h. Left, author's sketches of two 19th century forerunners of the true armoured car.

Right, the prototype Straussler 4 × 4, the first modern production-made armoured car, built by Alvis to Manfred Weiss' design. Note rear engine and curved armour. Weight was 6 tons, speed nearly 70 m.p.h. Lower right, American armoured car of the '30s, built by Cunningham. Good quality and appearance but poor cross-country performance, outdated by the Weiss-Straussler-Alvis.

strong, reliable R.R. engine gave a good turn of speed even under the load of armour. Cross country performance was still poor—but the first difficulty, establishing reliability, had been overcome. As the cars could not cross trenches, new work was found for them in the dry, open country of the Middle East—and they excelled at long-range raids and reconnaissances under Lawrence of Arabia and the Duke of Westminster. They were excellent at police duties too, and so the Indian Army bought many cars for this purpose. They were given armour by various railway workshops. The Silver Ghost was always a favourite, and one of them, which acquired the interesting name of "Wedding Bells", lasted until 1940. Recently, the name has been bestowed again upon another Silver Ghost preserved at Bovington.

The fame of these desert exploits caused soldiers to think that armoured cars might again prove useful in Europe when trench warfare gave way to mobile warfare, and orders were given for cars to be built on Austin and Peerless small lorry chassis. Both cars had twin machine-gun turrets, and the Austin ran on pneumatic tyres, but the Peerless did a bone-shaking 18 m.p.h. on solid ones. How the gunners could take aim on the move, I can't imagine. The Tank Corps raised a Battalion (the 17th) to use these cars, and their chance arrived in the Autumn of 1918, when open warfare came at last. On November 11th they were operating far ahead, almost on the German frontier.

* * * * * *

So the Armoured Car emerged from World War One as a converted luxury car or light lorry. Its reputation was high, based on successful police work, and on 'independent missions' in open warfare. But its future in this form was not assured, for it would soon prove vulnerable to the new anti-armour weapons—small mines and light anti-tank guns. If it was to survive, it would have to get off the road.

The British and other governments would not see this. They provided money only for new cars based on six-wheel lorry chassis. By doing this, they hoped to use the money in two directions at once:

(*a*) giving the army 'post-war' equipment, and
(*b*) helping the motor trade to develop something with commercial value.

This was a fatal error from the view of National Security, but British politicians were not the only ones who committed this folly. Poland actually purchased armoured cars built on the Ford Model T, and the Red Army's "Bronje Ford 27" was little better. The U.S. Government, by contrast, perhaps with an eye on the British Rolls-Royce Ghosts, thought that only the best would do, and ordered high-class and very elegant hardware built on La Salle and Cunningham chassis. All the same, their cross-country performance was close to zero.

The new thinking on the subject, so badly needed, came from Europe. First, in 1927 the Germany Army secretly ordered 3 experimental multi-wheel cars, two 8 wheelers and one 10 wheeler, although, of course, the Treaty of Versailles prohibited such vehicles. Money was short, so development was incomplete, and stopped in 1929. The technical problems of multi-wheel drive and steering were great, but independent wheel suspension was achieved. Indeed, the 8-wheel car built by Germany in the late 'thirties was in some ways less sophisticated.

Just as the German army suspended research, an engineer in Hungary named Manfred Weiss took it up. The Weiss car was of monocoque construction: that is, the armoured hull required no chassis, and provided secure attachments for engine, drive and suspension. It had drive to all four wheels, and a system of swing links on the transverse leaf springs gave virtually independent suspension. At maximum wheel deflection, the hull remained level. The engine was at the rear, the car could be driven from either end, disengagement of front wheel drive and engagement of rear

Right, the 8 × 8 Boarhound built by General Motors, U.S.A., to British requirements, was in effect a wheeled tank. Redundant when "position war" evolved, but could it make a comeback?

Left, the 7-ton Daimler 4 × 4 of WWII with fluid flywheel and five pre-selector gears forward or reverse! Speed 50 m.p.h., armament 2 pdr. cannon with co-axial machine gun. Dinky Toy No. 670 represents this vehicle.

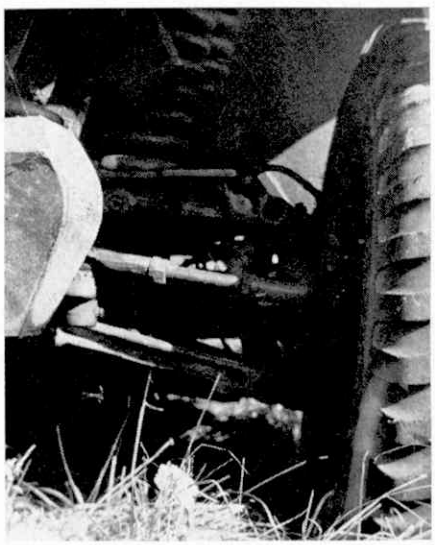
wheel steering was effected by one lever movement. Indeed, there were hosts of sound, workmanlike design-points. Frontal armour was sloped, top speed was 68 m.p.h., the power reserve was great, the vehicle climbed like a cat. . . . This machine, the first production-model cross-country armoured car, appeared in 1932. Weiss' problem was to get it on the market, and this was attempted by a friend, Nicholas Straussler, also a very gifted engineer, who was resident in England.

To cut a long story short, they never really got it off the ground. 'Straussler' cars were used in small numbers by the R.A.F., the Dutch Colonial Forces, Hungary, and Germany. The chief difficulty lay in getting volume production organised. In England, for example, Straussler teamed up with Alvis Ltd., but the chairman of Alvis had just decided that the future of Alvis lay with the aircraft industry, and armoured cars were a sideline. Each car thus took about a month to build.

From 1932 to the eve of World War Two, the Alvis-Straussler was the most advanced 'second generation' armoured car in the world. Then, the nations about to plunge into conflict suddenly saw its advantages—and began to copy its features and improve on them. There were the 4 × 4 Auto-Union, the 8 × 8 Bussing-NAG, the 4 × 4 Guy, 4 × 4 Daimler, 4 × 4 Humber (actually built by Karrier) on the basis of the Guy, and in the U.S.A. the big car building firms were commencing research, although the U.S. Army itself showed small interest in armoured cars. The Ford 6 × 6 'Greyhound' and Chevrolet 4 × 4 'Staghound' were produced to British requirements. All these eve-of-war cars were armed with cannon, and had the latest equipment. Weiss' design suffered from having been first in the field, and played no important part in the war, although its features were to be seen everywhere.

Alongside these high-performance fighting reconnaissance cars, a family of smaller, lighter, 'scout cars' grew up, some turretless, others with small open-topped machine gun turrets. Such were the little Daimler (which took over the nickname "Dingo" from a similar vehicle from Alvis), the Humber Light Recce, the Horch, and the Russian BA 64.

Now, speed was very important to these new generation cars, and they needed pneumatic tyres. But the latter are not bullet proof, and armoured skirts are heavy, and catch on obstacles. The answer was the 'Runflat' tyre; an outer pneumatic case and tube, with an inner solid rubber tyre. The runflat allows a multi-wheel drive vehicle to keep belting along under control even after unkind people have shot holes in the tyres.



Independent front wheel suspension of a Daimler A.C. Note coil springs and wishbones. Used on armoured cars long before their use in sports cars etc.

The German Bussing-NAG 8-wheeler was much admired in the mid-war period and both the G.M.C. 'Boarhound' and the Marmon-Herrington Mark 6 were built in emulation of it. This desire for really big armoured cars showed that high cross country performance and the ability to carry a cannon were creating the possibility of a wheeled tank. A big 8-wheeler weighed 24 tons and carried a 57 mm. cannon. It was in the 1942 medium tank class! If it could be developed, it would offer the immense advantages of long range, longer life between overhauls, fuel economy, silence, speed. And had the mobile war of the early 'forties continued, who knows what might have happened? But after 1942 the trend was towards 'position war', which demanded ever thicker armour, and immense guns, requirements which could not be met by the

Left, British Scout Car, WWII, built by Humber, seen from the rear. Angled hull for maximum protection, open top (no turret) and rear engine.

Right, notice how the front four wheels of the 6 × 6 Saladin turn to different angles for correct geometry in tight manoeuvres.

development of 'Boarhound' types. It was easier to develop tank types. Thus, by 1945 battle tanks were weighing around 50 tons, but armoured cars had levelled out at around 11 tons, and 'Boarhound' types had been dropped. The typical cars of 1945 were the 11 ton A.E.C., the 'Coventry' (a heavier Daimler) and the 'Staghound'. They were armed with 75 mm. guns (tanks were up to 90 mm.), and their armour situation was confused. It was excessively thick for 'bullets and splinters', yet far too thin to keep out any modern anti-tank projectile.

* * * * * *

Both Britain and France produced new armoured cars for the fifties, and both elected to remain in the 11 ton class. Britain produced the 6×6 Alvis Saladin, of conventional layout, armed with a 7.62 mm. gun, capable of 50 m.p.h. on the level, but somewhat underpowered and slow on the hills, and advertising its whereabouts with a penetrating whine which can be heard for miles. The purpose of the big gun was to give it a chance of dealing with tanks, as well as versatility in actions against bandit-type opponents. France produced an 8 wheeler, the EBR 75, with a similar gun and

Scout car development; two versions of the Ferret, one with small open machine-gun turret, the other with anti-tank missile pack.

moderate mobility performance, but with a very neat, low silhouette. The hull is symmetrical, and occupied by crew at both ends, and the engine, a compact unit only 9 in. high, is tucked away under the floor, where it annoys the fitters who have to maintain it. By contrast, the U.S.A. and U.S.S.R. have paid small attention to armoured cars, so the Saladin and EBR. 75 have soldiered on as 'modern' cars for nearly 20 years, and only now is the scene changing again, and 'third generation' cars appearing.

But only, it seems, for Britain. Other countries seem still to be looking to the past. Thus, in the U.S.A. Lockheed are developing their 8-wheeled 'Twister', which undoubtedly has a fantastic obstacle-crossing performance, with walking-beam rear bogie and what-not. But this is at the price of an excessively large vehicle, 10 tons of weight in pre-combat format, a dreadfully complex transmission system, and 3 million dollars. Power relative to weight is actually not very wonderful, and so far it is not amphibious. The Army of West Germany likewise is developing a big 8-wheeler, very reminiscent of World War 2, and very heavy. Its 16 tons soon soak up its 400 b.h.p. It is amphibious, with duplex drive to a built-in water propeller.

The best 11-tonner of its time, the Saladin demonstrates agility at an RAC show in 1964. It has just crossed a 4½ ft gap with scarcely a bump.

In Britain, by contrast, it was decided that as the main roles of the armoured car are reconnaissance, observation and liaison work, it is unwise to pile battle tank characteristics on to it. The recce vehicle's best protection, and usefulness, come from concealment and super-mobility. So the Fighting Vehicle Research and Development Establishment and Daimler Ltd., have produced the 'Fox', which weighs only 5½ tons, is only 6½ feet high, churns out 34 b.h.p. per ton, and can motor really fast. Its main armament is the lightweight 30 mm. Rarden cannon, having a very high performance with all types of ammunition. As the inboard length of the gun is very short, it can be elevated enough to engage low-speed aircraft. Its AP ammunition deals with any light AFV, and soon a special round will do the same to heavy armour. The importance of a high-performance ammunition in the small calibre of 30 mm. cannot be exaggerated; little 'Fox' can stow 96 cannon rounds, 2,600 machine gun rounds, and 2 salvos of smoke, plus personal weapons. In addition, a guided missile pack can be mounted on the turret.

Reconnaissance means navigation plus surveillance plus communications. So 'Fox' has day and night optical aids, a Sperry Navigator, nuclear and bacteriological detection and protection systems, radar—very important for plotting enemy fire positions—and a choice of radio equipment. And the thermally insulated interior has been carefully designed to permit one-man control of all systems, for crew comfort is of vital importance in long-range AFVs. Excesses of heat and

Britain's newest armoured car, Fox, small in size but big in performance, is quiet and unobtrusive but packs quite a wallop. Only 5½ tons, it is capable of well over 60 m.p.h.

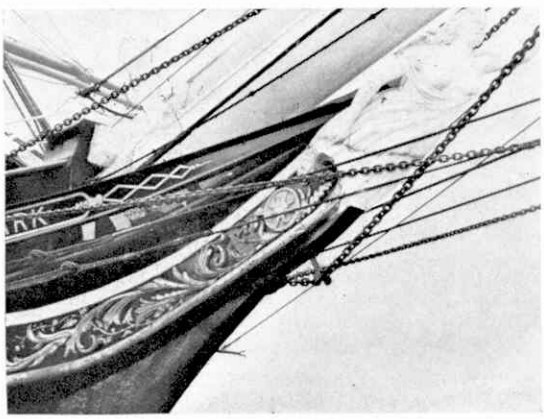
cold, and awkward equipment, can tire a crew and lower their efficiency.

That all this comes in a neat 3-man package weighing only 5½ tons is due to the combined research of Daimler Ltd. and High Duty Alloys Ltd. For 'Fox' is made of—wait for it—the same material that Dinky Toys are made of; the light alloy Mazak. No wonder Dinky Toys will stand a lot of bashing about from their younger owners! But of course Dinky Toys are not expected to be bullet proof, and this is where the research came in. Careful adjustment of chemical balance and heat treatment have given Fox's hull and turret better protection against bullets and splinters than the equivalent weight of steel, and, as this special alloy can be welded, Fox's designers have given its outside a subtle, missile-deflecting mixture of angles and curves. Of course, it is not expected to keep out heavy anti-tank missiles; that is where speed and concealment come in.

But where does the high engine performance come from, when the engine compartment is so small. The answer is—racing competition. The motor is the 4 litre Jaguar XK. Coming through Bovington the other day I saw an armoured car pull on to the road ahead of me. At first glance I thought it was a Ferret with turret equipment, and expected to overtake. To my surprise, it suddenly shot off down the road like a, well, like a Jaguar in a hurry, leaving my Austin 1100 standing. Needless to say, it was a Fox. And Fox can be driven equally fast in reverse!

Anything more? Well, a flotation kit can be clipped on in seconds. Two Foxes can be carried on a Hercules, and both can be parachuted from it. Suspension is independent, with wheel deflection of 11 inches. Brakes are servo caliper disc, and wading doesn't affect them.

Yes, armoured cars have come a long way, and Fox has come furthest of all. Just think what it carries and what it can do, and then think—it weighs only 1 ton more than the improved Silver Ghost of 1920. We can surely congratulate its designers and builders on their achievement.



The Story of

SHIPS' FIGUREHEADS

By A. P. Major

THE first men who ventured on the seas with their primitive craft believed the water contained a male spirit which could protect or destroy them. To please "him" a young girl used to be sacrificed before a voyage and her head placed on a pole in the bows. Later carved figures in the shape of gods and symbolic creatures were fixed on the bows and were meant to frighten enemies. Another purpose in the days of oared galleys was to use the solid carving as above-water rams. When driven with force against an enemy ship they could make it heel over. From these beginnings was developed the figurehead.

The war galleys of ancient Greece and Rome had the ram fashioned as the head of a charging beast, a ram, boar, even an elephant. The peaceful Phoenician traders symbolised their ship as a swift horse, using a carved horse's head and neck. The Northmen of the Middle Ages likened the heads to those of snakes and dragons. In the 11th century Danish raiders had figures of lions, bulls, dolphins, etc. Sweyn's ship of 1004 had the head of a dragon as the figurehead while the stern post was carved as its tail. William the Conqueror's personal ship had a lion's head on the bows while at the stern there was a figure of a boy blowing a trumpet and pointing with an outstretched hand. Henry V's ship *Holigost* had two of the royal devices, a carving of a swan and antelope. Three of Elizabeth I's ships were the *Mary Rose* with a unicorn, *Swiftsure* with a tiger and *Repulse* a lion figurehead. During the Stuart period St George alone or slaying a dragon was popular. After the Restoration of Charles II figureheads on both naval and merchant ships became very intricately carved and elaborate. The *St. Michael* of 1669 showed Jupiter in a chariot being drawn by a two-headed eagle. The *Royal Anne* of 1704 had an ox, a woman and several Cupids on each side of a large carved shield of the Royal Arms, the latter supported by four Cupids while two female figures and more Cupids were carved underneath. The original figurehead of Nelson's *Victory* in 1765 had several dozen figures and animals upon it, but in the ship's overhaul in 1802–3 this was changed to a simple "device" of the crowned Royal Arms with a pair of Cupids, legs standing on both feet, as supporters. Incidentally, the figurehead on the *Victory* today is not the one which saw battle at Trafalgar. In 1814–15 the *Victory* was given a new figurehead very similar to the other mentioned, except the Cupids have their legs crossed.

The cost of carving these intricate figureheads was so high that in August, 1796, the Board of Admiralty

The original figurehead of the *Cutty Sark* is restored and displayed below decks. That on the bow (opposite) is a modern copy.

issued instructions forbidding the use of so much carved work. After this naval figureheads became much simpler with a main figure or device and two or several secondary supporting figures.

When men-of-war and merchant vessels changed from sail to steam there was at first no change in figureheads because the form of the ship was not altered. When warships were armoured the figurehead was retained, but when the straight-stemmed ironclads came into service the use of the figurehead was impossible. An Admiralty order of 1894 abolished figureheads for large naval vessels, but the small ships kept them a little longer. The sloops of the *Odin* and *Espiegle* class of 1901 are believed to be the last to have them, and surprisingly some of these served, complete with figureheads, in the 1914 War. Examples of naval figureheads are preserved in most of the naval dockyards, the Maritime Museum, Greenwich, and elsewhere.

Some of the finest samples of the figurehead carver's art were used on commercial vessels large and small during the 18th and 19th centuries, the figurehead representing the ship's "spirit" and symbolic of her name. One famous example is the 7-foot "Nannie" on the tea clipper *Cutty Sark* at Greenwich, inside the vessel there also being a collection of other commercial ship figureheads. Another collection is at Trescoe, on the Scilly Isles, from ships wrecked there, but they are also to be found elsewhere, as inn and antique shop signs, on walls near harbours, in private gardens, sometimes on piers. There is a fine one of a woman holding a rose from the wooden barque *Roseau* broken up in 1897, on the Prince of Wales Pier, Dover, for instance.

Elm was the timber first used but the constant wetting by the sea and drying soon made the figurehead wood soft and pulpy, so oak was generally used later.

There were facts about carving figureheads that had to be taken into consideration for a design. Protruding ears were liable to be damaged easily on a jutting figurehead and it was more difficult to carve an accurate likeness of an ear than of hair. Figureheads of men, women, sirens, mermaids, etc., usually have long flowing hair that covers the ears for these reasons. Similarly, because individual fingers could be broken off, hands were carved "solid" or with the hand clenched holding a flower, a spear, fold of the clothing, etc. Figureheads with protruding arms had them so they could be screwed off and on, which was done during bad weather or prior to docking for unloading. The shape of the figurehead was also governed by the requirement of the traditional wide shoulder and bust section which tapered back to blend with the bow of the vessel. It also had to be designed so that there were no areas which could retain water.

The eyes and the heads also seem to be carved in unnatural positions, but there was a reason for this, too. The figurehead was supposed to help the ship "find" a good passage, so the eyes were always carved to look continually at the horizon, with the neck outstretched and head turned to one side to give the impression of straining movement, the hair and clothing featured as being blown by the wind.

It might be thought that with the disappearance of the ships that carried them there would be no demand for figureheads. But down in Cornwall, at St. Just-in-Roseland, near Truro, Mr. Charles Moore, one of the only two figurehead carvers in Britain, still produces them. His interest in figureheads goes back over forty

years when as a young man he admired them as an almost forgotten art form quite different from sculpture. He began to collect photographs, books, records and anything about them and now has one of the finest collections on the subject, covering over 1,200 different figureheads and ships' carvings.

After the last War Mr. Moore sold his firm in London which manufactured ships' clocks and barometers under the trade name of "Celeste" and decided to escape from the "rat race" by moving to Cornwall, where he bought a small boat hire business, but still continued his interest in figureheads. Some years ago he tried to purchase a figurehead, but on being quoted £100 decided to attempt to make one himself. From a block of wood he carved a composite example of various styles and when finished placed it in his garden. This aroused interest locally which reached the local newspapers and from there he was interviewed on radio and television. He received enquiries for other figureheads from places as far apart as Germany, Holland and the U.S.A., and decided to carve these. After this his skill became so well-known that he received commissions for special replica figureheads from retired ship's captains, naval and maritime museums, antique shops and collectors of items connected with the sea who could not afford or anyway obtain the real thing. The

Part of the Long John Silver collection aboard the *Cutty Sark*.

figureheads he has carved include the "Nannie" from the *Cutty Sark*, the face-masked female from H.M.S. *Espiegle*, the last British warship to carry one and commissioned by a retired naval officer who served on her, a "mermaid" for a Bermuda yacht, the figurehead from the 1865 British clipper *Sally* for an antique shop, the 7-foot figurehead of the U.S. frigate *Chesapeake* ordered by an American maritime museum, also those of H.M.S. *Ganges*, *Foudroyant*, *Shannon*, and *Implacable*.

Another important commission was for a figurehead of Britannia which now ornaments the restaurant of that name aboard the Cunard Company's *Queen Elizabeth II*, and given to the ship as a goodwill gesture by Lloyds. He also makes replicas of existing figureheads so the owners have a copy in case the original decays beyond repair, though part of Mr. Moore's work now includes restoring decayed or weather-worn original figureheads.

Before beginning the actual carving of a replica figurehead Mr. Moore studies drawings and photographs of the original, noting any peculiarities in the design. Then he prepares scale drawings in detail of the front and side. Following these if he cannot see or visit the original he makes a plasticine likeness of the figurehead to assist him during the carving. This plasticine likeness and a photograph of the figurehead is then set up in his workshop immediately behind the floor column holding the wood to be carved. At first Mr. Moore tried various timbers but found it difficult to obtain large enough solid blocks or logs to carve the whole figure. He overcame this by purchasing Quebec Yellow Pine as boards.

The use of this type of material allows a method of working differing from conventional sculpture and wood carving using a solid mass. The front view drawing is divided vertically into 1 in. or 1¼ in. widths, according to the thickness of the boards being used. By extending the contour planes on to the side view drawing, the appropriate shape of each individual portion can be gauged. After the shape of each portion is transferred, the shapes are cut, using a jigsaw attachment in a portable electric drill. After cutting the pieces are glued together to form a laminated solid approximately the shape required. This also has the advantage that any knots or disfigurements in the wood can be placed in positions where they will not show or affect the carving. From now on carving proceeds in the normal way, using an adze, then gouges and a mallet and chisels. It is then sanded down and five coats of paint applied, the painting and gilding being done by Mr. Moore's wife. The replica is painted accurately in the colours of the original figurehead when these are known.

The time taken by Mr. Moore to plan and carve a figurehead depends on whether all the design details required are easily available, as research is time consuming, but takes an average three to five weeks. Also some figureheads are simple in design, whereas others have more difficult characteristics to reproduce.

Several years ago, as a variation from replicas of original figureheads, Mr. Moore, for his own amusement, completed a small bust figurehead of the late Sir Winston Churchill, which is now mounted above one of his carving studios. Examination of this shows it deliberately flouts the usual figurehead convention by having ears.

Mr. Moore feels that the time is ripe for a revival of figureheads and that there is no reason why a variation of them cannot be used on yachts and similar craft, which are bare and monotonously alike, based on their name, the owner's name etc. In fact, one Norwegian shipping line has revived the custom and has a beautifully created figurehead on the bow of each of their vessels.

Above, Work proceeding on the Churchill bust figurehead. Note photo and plasticine likeness for reference; the timber laminations can also be seen. Right, A front view of figurehead from corvette *Scylia*, launched at Sheerness in 1856, broken up in 1882. Now preserved in a public garden at Sheerness, Kent.

MECCANO SUMMER SHOW

History of Meccano exhibited at Hurstpierpoint

Entrance to the Meccano Exhibition held at Hurstpierpoint, Sussex on Saturday, 3rd July. The chap with his back to the camera (extreme left) is Mr. Peter Matthews, organiser of the Exhibition and Curator of the Meccano Museum in Hurstpierpoint. The large model on display outside the marquee is "Mr. Louie", a North Sea Gas Drilling Rig which was built by Meccano Triang Ltd. several years ago and renovated by members of the Holy Trinity Meccano Club specially for the Show.

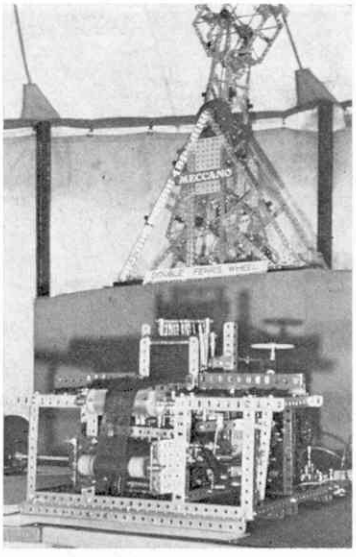
ON SATURDAY, 3rd July (writes Spanner) the Meccano Museum, in association with the Holy Trinity Meccano Club, held a magnificent exhibition of Meccano history at Hurstpierpoint, near Brighton, Sussex. Organised by Mr. Peter Matthews, Curator of the Meccano Museum, the show was mounted in a marquee and represented one of the attractions of the St. Lawrence Fair held at Hurstpierpoint on that day. I was one of several hundred people who visited the Exhibition and I do not hesitate to say that it was a deeply impressive show, as well as being absolutely unique in that it illustrated the entire, varied history of the Meccano product with rare literature and models built with equipment from the relevant periods. My congratulations go to everyone involved in the Exhibition and my particular thanks go to Mr. Matthews himself, for providing me with the following report on the displays. My only regret is that I was unable to spend more time there, personally, but I trust the hard-working exhibitors appreciated that the long return journey to Liverpool required an early start.

"The Exhibition." writes Mr. Matthews, "was entitled 'Seventy Years of Meccano 1901–1971' and was arranged in seven periods starting with the 'Victorian Age 1901–1907'. This period was illustrated by several of the original 'Mechanics Made Easy' outfits, with instructions booklets of the time and also a copy of the first patent taken out by Mr. Frank Hornby, the inventor of Meccano, in 1901.

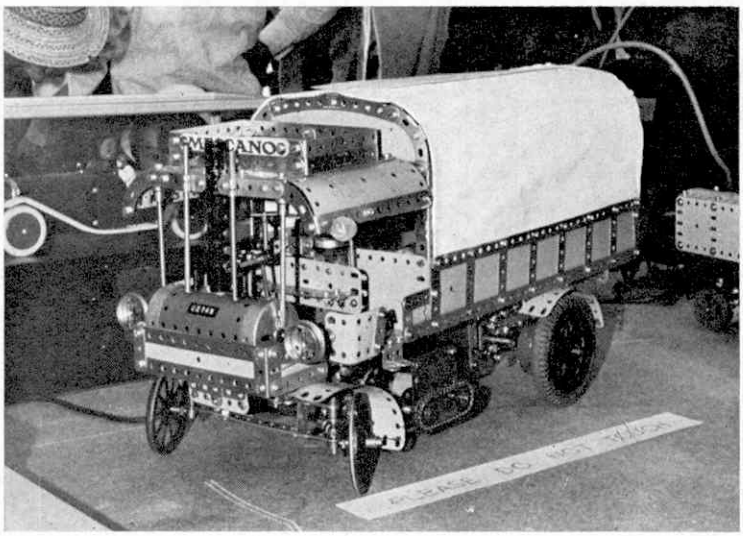
"Next came the 'Nickel Period 1907–1926' and this was presented by Mr. L. R. Dougal M.B.E., M.T.A.I. with a fine display that included, among other things, a working model of an L.C.C. tram and trolley reversing gear, the Eiffel Tower built from instructions included in a 1914 manual, a No. 6 Outfit in Nickel and a beautifully-finished chiming Granddaughter Clock. After Nickel came the 'First Red-and-Green Period 1926–1934', this being illustrated by a 1928 Meccano Dealer's Cabinet, shown together with a Double-cylinder Stationary Steam Engine built from a Super Model Leaflet of the period.

"The 'Blue-and-Gold Period 1926–1934' came next and here, again a Dealer's Display Cabinet was shown, together with a model Platform Scales, a Bi-plane and an 8a Outfit, all in correct blue and gold-coloured parts. This was followed by the 'Second Red-and-Green Period 1945–1964' which showed many Dealer Display Models, plus an eight-foot long working model of the old Runcorn Transporter Bridge and the Motor Cycle Engine from the current No. 10 Set.

"Outfits, alone, were used to illustrate the 'Yellow, Silver and Black Period 1964–1970', but the 'Space Age Period 1970, to date' offered great scope for model-building, especially in the electronics field and, in fact, a display was arranged which showed some of the possibilities of these new parts and outfits. This display consisted of a Conveyor constructed by connecting together several standard models from the new Instructions Manuals with very slight alterations. The Conveyor was 3 ft. long with a Power Press (Electronic Model 5.16) at the beginning and a Sorter (Electronic Model 6.17) in the middle. This latter was connected to a Bell (Model E.11 in the 4EL Manual) and a Photo Cell at the end, the Cell



A close-up view of the Power Loom which was exhibited and demonstrated by George Clark. Based on an industrial Loom used for weaving wire gauze, the model worked well throughout the entire opening hours of the Exhibition



One of the star attractions of the Exhibition was this remotely-controlled Steam Wagon designed and built by Mr. Tony Homden. A single "joy stick" control lever gave forward, reverse and full steering movements.

controlling an Impulse Counter (Model E.31 in the 4EL Manual). The combined production operated as follows:

"Blocks of wood, both large and small, were fed into the Press, which operated and then released the blocks on to the moving conveyor belt. As they moved along, the larger blocks would break the light beam to the Sorter which would then reject them, at the same time ringing the Bell. The small blocks, on the other hand, would pass under the Sorter light beam and continue down the belt until interupting the light beam controlling the Impulse Counter. This caused the Counter to operate, thus indicating the number of correctly-sized blocks leaving the conveyor belt.

"In addition to the progressive historical periods, Jim Gamble very kindly travelled down to Hurstpierpoint from Nottingham for the show and gave a display of ancillary products from Meccano's pre-war years. These included two Motor Cars Nos. 1 and 2, built from Motor Car Constructor Outfits of the 1930's and an OO and Special Aeroplane produced from other special Outfits in his collection, as well as an early Crystal Set, a Speedboat and a Mechanised Army Model.

"The Hurstpierpoint-based Holy Trinity Meccano Club was also well represented, with Bert Halliday showing his Meccano Cup and the prize-winning Miniature Traction Engine featured in the M.M. last year, as well as a Meccanograph designing machine. Tony Homden was putting his remote-controlled, electrically-driven Steam Lorry through its paces—creating a tremendous amount of interest at the same time! This model is an original and has an automatic centrifugal gear-change in addition to an effective braking system and steering operated by a 3-12 volt Motor with Gearbox. All movements are controlled from a single, remotely-situated 'joy-stick' lever which, when moved to the left or right, causes the lorry to steer in these directions and, when moved backwards or forwards, causes the Lorry to drive forward or in reverse

"Frank Palin brought along his Giant Dragline Excavator, built from a pre-war Super Model Leaflet in immaculate red-and-green parts, while George Clark (a new member) demonstrated a very neat Power Loom. The idea for George's model came from an industrial loom used for weaving wire gauze and the fact that the model worked well throughout the whole Exhibition is a credit to his constructional ability.

"Thanks must be given to all members of the H.T.M.C. who helped behind the scenes and especially to our President, Mr. Stuart H. Wilson, for being Club Photographer for the day. Special thanks also go to Michael Martin who so kindly sat at the pay desk all day. A small entrance charge was made to the Exhibition, the proceeds from this being donated to the Save the Children Fund".

The Meccano Museum

Many readers will be puzzled by the mention above of the Meccano Museum and will no doubt be wondering what it is. To clarify the situation, therefore, I should explain that it is a large and comprehensive collection of Meccano equipment and literature, dating from the very first days of the product, which has been collated by the Curator of the Museum, Mr. Peter Matthews, and which is at present displayed in a special extension built on to his home at 7 Trinity Road, Hurstpierpoint, Sussex.

Over the years, of course, Meccano has undergone many changes and improvements. A vast amount of literature has been published, parts have been withdrawn and introduced, packaging designs have been altered and so on, all this combining into a long and varied history of a world-famous company. Much of this history is already represented in Mr. Matthew's Museum, although the final aim of the Museum is to assemble a complete and permanent collection of all products from the Meccano factory in Liverpool from 1901 up to the present day. The collection is growing continuously and has moved to larger premises three times already. It is due for another move at this moment.

The Museum is open for all to see, although at the present time visits can be accepted by appointment only as Mr. Matthew's own full-time job requires his time during working hours. However, when larger premises have been acquired, it is hoped to have a retired member of the Holy Trinity Meccano Club on duty permanently throughout the day which will make the Museum available on a "drop-in" basis.

It must be stressed that the Meccano Museum is a non-profit making venture, supported entirely by private means. It has no official connection with Meccano Tri-ang Ltd., although the Company does show great interest in it and helps materially whenever possible. Its survival therefore depends on the hard work of its Curator and the help and generosity of enthusiasts. It can never receive too much assistance and so, if any reader has any Meccano Sets, parts or literature, Hornby Trains, Dinky Toys, Meccano Magazines, or anything connected with Meccano Ltd. that he has no further use for (the older the better), please let the Curator know at the above address. Mr. Matthews will also be pleased to hear from anybody wishing to visit the Museum and will be delighted to make the necessary arrangements.

Research for Perfect Packaging

By Trevor Holloway

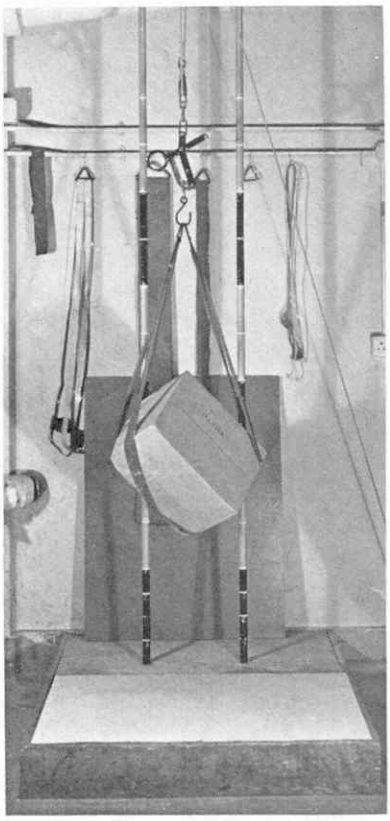
PACKAGING is of vital importance to almost every industry, particularly when products are exported to countries overseas. The quest for perfect packaging bristles with problems and comparatively few firms can afford the time and money to conduct their own long-term research.

Fortunately, there is at Leatherhead, Surrey, one of the finest packaging research centres in the world, equipped to investigate almost every conceivable packaging problem for firms large or small. Hundreds of problems are dealt with every year and very seldom indeed is the team of scientific investigators at Leatherhead unable to find a satisfactory solution.

The work of the Pira Laboratories is known and respected the world over. The name 'Pira' is an abbreviation of the centre's full title—The Research Association for the Paper and Board, Printing and Packaging Industries.

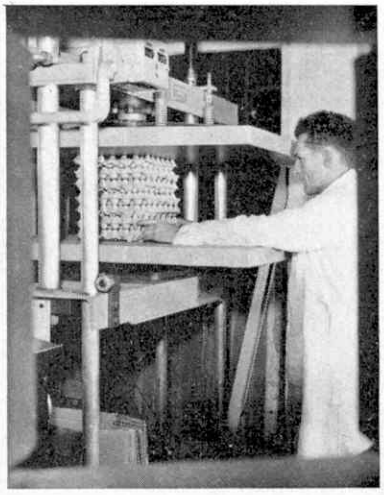
Pira's Packaging Division has been humorously likened to a cross between a chamber of torture and a battle school for postmen! Packages and packaging materials are subjected to almost every kind of ill-treatment it is possible to imagine. They are dropped, crushed, battered, shaken, frozen, attacked by moulds and insects and generally given the roughest of rough treatment. All in a good cause, of course, for having established a package's faults and weaknesses, the back-room boys at Pira set to work to find the remedies.

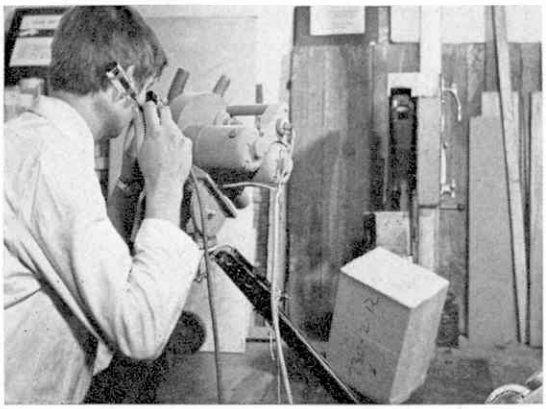
Unlike the majority of laboratories, the Pira laboratory can be quite a noisy place at times with a succession of thuds, bumps and bangs. The Inclined Plane Impact Tester is partly to blame. This is a device in the nature of a 25 ft. long incline down which travels a flat trolley on rails. A package is placed on the trolley at the top of the incline and then sent headlong down the slope to crash into a solidly-built wooden buffer. The effect on the package is much the same as would befall it aboard a carelessly-shunted goods train.

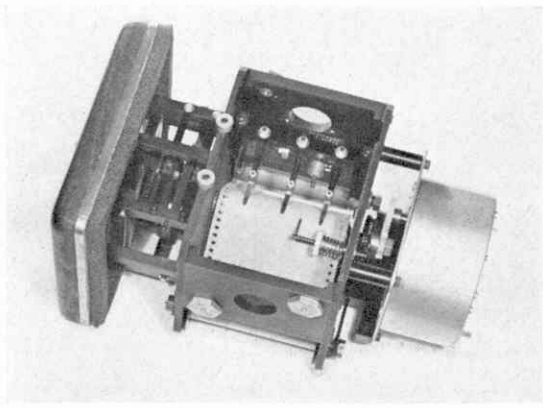


Right, the sling-type drop test. Below, left to right, a metal container about to undergo the heavyweight drop test, the compression test, where apparatus stimulates the crushing effects a pack experiences when stacked, and an adhesive expert sniffs at a jar of glue.

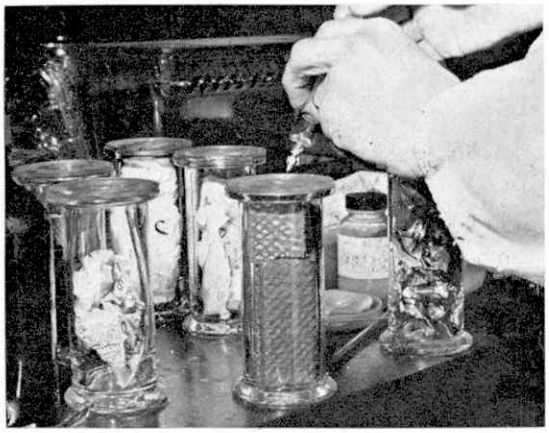
Another 'culprit' is the Heavy-weight Drop-Tester, affectionately referred to by the staff as the 'Hangman's Drop'! It is much used for testing metal containers, such as oil drums. The drum is hoisted to a pre-determined height and a quick-release catch is operated which allows the drum to crash to the ground. A scientific 'inquest' is then held and details noted as to where and why the container suffered damage.







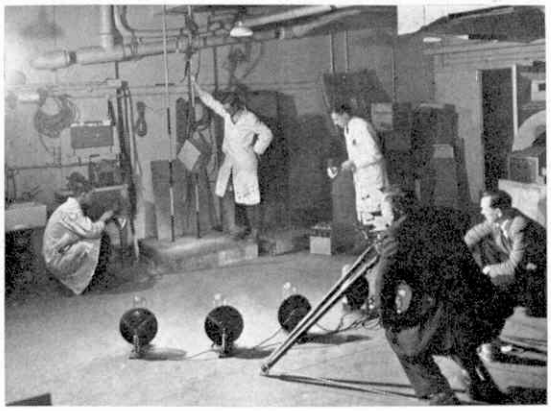
Above, high-speed photography can be used for studying the effect of drops on packed goods, since it provides a permanent record of motions which cannot be followed with the naked eye or assessed in any other way. Above, right, the drop recorder is placed inside a package to record the number and severity of shocks received whilst the package is in transit.



Above, gas chromatography—testing samples of odorous packaging materials and products.

Below, left, the Biological Laboratory. This laboratory is concerned with preventing damage to packages and their contents by mould and insect attack.

Below, right, a camera team prepares to take a high speed film of a box being dropped.

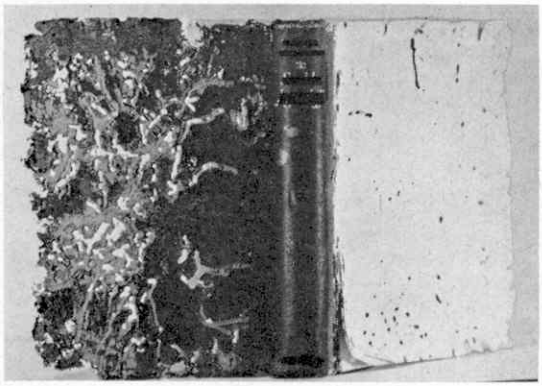


There is also a sling-type Drop Tester for smaller and lighter types of packages. Packages are raised a few feet from the ground and allowed to drop at various angles on to a bed of solid concrete. For test purposes, the container may be filled with flour or sand of the same weight the case is intended to contain. The pack may survive, or its seams may burst. Sometimes a camera team takes a high-speed film of the drop in order that the actual condition of the container at the time of impact may be studied.

The sound of a regular succession of 'thuds' will guide you to a strange looking piece of apparatus known as the Drum Tester. This is a revolving metal drum about 7 ft. in diameter, not unlike the old-time tread-mill and electrically driven. Inside the drum are a number of wooden baffles, all set at differing angles.

The package to be tested is placed within, the drum set in motion and the 'torture' begins. The angles of the baffles are such that the case or carton slithers from one baffle to the next as the drum rotates, falling heavily on its corners and sides until eventually it becomes very much the worse for wear. After being removed from the drum, the package is carefully examined to determine where, if any, its weakest spots are.

One of Pira's most ingenious testing instruments is the Drop Recorder. A knowledge of the drop hazards to which packs are subjected in transit is often necessary to improve or reduce costs of packaging. The Recorder is packed inside the package and sent off on a typical journey. En route the sensitive instrument records the time and date of each drop, also the height and the edge or side on which the container fell. This information



Left, this book made a tasty meal for some book-worms.

Right, insects are kept in the laboratories for test purposes. Here a cockroach is seen sampling material which has been treated with insecticide.

is recorded on a paper roll by means of three pens and provides Pira's scientists with a detailed record of the container's journey from start to finish.

A carton standing on its own may be quite strong enough to protect its contents. But in a warehouse, or in transit, cartons may be stacked perhaps ten or a dozen high. It is essential for a firm to know if their packs can withstand compression resulting from high stacking. Pira's Compression Tester will determine the maximum degree of compression a carton can stand.

Rough handling is by no means the only way by which the contents of a package can be damaged. Manufacturers of foodstuffs in particular must be on their guard to ensure that their products do not become tainted by odours given off by the packaging materials. The odour could come from cardboard, paper liners, pasted flaps, printing ink, and so on.

Sample packing materials are sent to Pira for testing. They are placed in air-tight jars so that any smell they give off can be collected. Samples of air from these sealed containers are then injected into the laboratory's gas chromatography apparatus which will very soon pin-point the source of harmful odour.

Goods stored in damp places, or shipped to countries where humid conditions prevail, are liable to attack by moulds. These are microscopic plants and by their growth they can stain and weaken a package, or cause an objectional musty odour which eventually taints the contents of a package.

A wide range of moulds is therefore cultivated at the Laboratory and introduced to packaging materials so that their action, likes and dislikes, may be constantly studied. From such data the scientist gains information for seeking methods of checking growth, either by chemical means or by establishing what materials are naturally most mould-resisting.

Comparatively few people realise what a vast number of moulds exist. The Laboratory has over 25 large volumes cataloguing moulds that have been identified during the past 80 years or so.

Numerous types of British and foreign insects are bred in the Laboratory and their habits and appetites closely studied. By allowing the insects to attack various packaging materials, Pira's scientists can ascertain which materials are most vulnerable. They can then set to work to find the best deterrents and how to employ them most effectively. The common cockroach is an arch-villain when it comes to attacking packaging materials.

Adhesives—gums, glues and pastes of various types—play a vital part in packaging. They have presented Pira with some very 'sticky' problems too, at times! They can cause discoloration of packing materials, their odours may taint foodstuffs, and adhesives which are perfectly satisfactory in temperate climates may fail completely under, say, African or Indian conditions. As will be appreciated, it is a very serious matter if labels of medical products, foodstuffs or chemicals come adrift. Pira is equipped to test all kinds of adhesives under stress and strain and under all kinds of atmospheric and climatic conditions.

After completing their tests, Pira sends the firm concerned a detailed report of their findings, together with suggestions as to how best any troubles could be rectified. Incidently, Pira sometimes has to report that a package, or a packaging material, is *too* good for its job and that a less robust and cheaper article would prove entirely satisfactory!

Automatic Ticket Machine

(*Continued from page* 504)

remainder of the roll from being pulled out.

Once everything is operating successfully, the body of the model can be enclosed. Two $5\frac{1}{2} \times 2\frac{1}{2}$ in. Flat Plates 49 are bolted to Angle Girders 29 to complete the top, while each side is supplied by a $7\frac{1}{2} \times 6\frac{1}{2}$ in. compound strip plate 50, built up from three $7\frac{1}{2} \times 2\frac{1}{2}$ in. Strip Plates. Note, however, that, to enable the sides to be easily removed, the compound plates are fixed by Threaded Bosses on the shanks of Bolts fixed by Nuts Angle Girders 6 and 26.

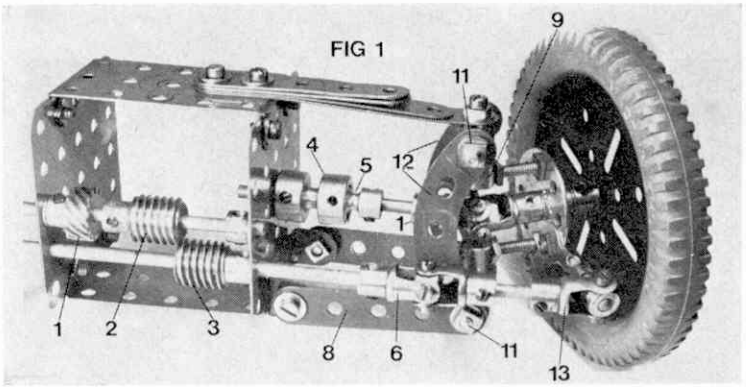
After building the model, a certain amount of adjustment will be necessary to ensure that one ticket only is issued during one operation of the Motor, but other than this, no particular problems should be experienced.

POCKET MECCANO COMPETITION

There is just under a month to go before the closing date of the "Make a Model" Pocket Meccano Competition. Anyone up to 15 years old can enter—just buy one of the new Pocket Meccano Sets at only 39p and make an original model from the parts in the Set. Full details are with each Set; closing date is September 30 and there are some fine prizes.

AMONG THE MODEL-BUILDERS

with 'Spanner'



A Front-Wheel Drive Mechanism, designed and built by Brian Edwards of Kempston, Bedford, which includes wishbone suspension and rack steering. The required differential has been omitted to aid description.

Front-Wheel Drive

In the course of our day-to-day correspondence with modellers we are often asked to supply details of particular Meccano mechanisms to meet individual model-building requirements and, over a period of time, these requests obviously enable us to see which mechanisms tend to be more useful than others. One of the most frequently requested items is a good Front-wheel Drive system, and therefore I am pleased to feature here just such a mechanism, in the sure knowledge that it will be of value to a large number of readers. Full credit for its design goes to Mr. Brian Edwards of Kempston, Bedford and my thanks go to Bert Love for the accompanying photographs of Brian's unit and the following description of it. The unit, incidentally, is of special interest in that it incorporates an effective wishbone suspension system as well as rack steering.

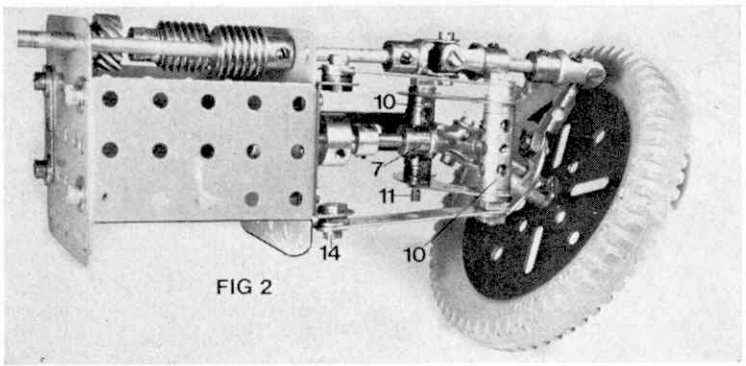
Dealing with the suspension first, the "wishbone" is formed from two 2½ in. Strips 8 which are secured to a 1½ × ½ in. Double Angle Strip on the 2½ × 2½ in. Flat Plate forming part of the central drive box. The Strips are pivoted fairly tightly by lock-nutted Bolts. Overhead cantilever springing is supplied by a series of Strips of various lengths, sandwiched to make a leaf spring 16, bolted to the upper part of the central drive box, while kingpin bearings are provided by a pair of Couplings 10 which are carried on Threaded Pins attached to both ends of two 2½ in. Stepped Curved Strips 12. The Threaded Pins are clamped inside the Couplings by Grub Screws, but are carefully adjusted by packing with Washers to keep the central transverse tapped bores in the Couplings free from binding.

Outside lock-nuts are provided on the lower Threaded Pin to clamp two 2½ in. Strips 8 fairly tightly to Curved Strips 12, with the aid of a Washer, to effectively simulate shock absorbers. The overhead leaf spring is secured to the central tapped bore of the upper Coupling by a standard Bolt, firmly secured by a lock-nut and Washer.

The two kingpins 9 are provided by Rod Sockets which have most of their shanks screwed into the central tapped bores of the Couplings, but with sufficient slack to permit steering angle movement. An 8-hole Bush Wheel forms the wheel hub, this being locked to the kingpin Rod Sockets by two ¾ in. Bolts, each fitted with two lock-nuts. A Rod and Strip Connector, extended by a 1 in. Rod, is bolted to the Bush Wheel, as shown, to form the steering arm, which is pivoted in a Swivel Bearing 13.

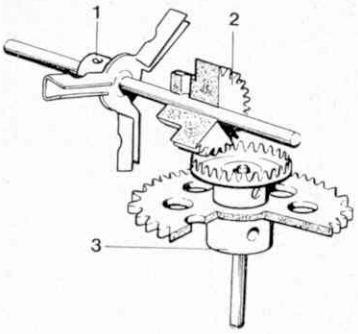
To ensure flexibility when the suspension moves, the steering track rod requires a flexible joint, provided in this case by a Universal Coupling 6 which is fixed to the Swivel Bearing by a further 1 in. Rod. Secured in the other side of the Universal Coupling is a 5 in. Rod 15, carrying a Worm Gear 3. This Worm does not rotate, but serves, instead, as the steering rack. Drive to this rack comes from another Worm 2, mounted on a Rod above it, this Rod being turned by means of a ½ in. Helical Gear 1, which is itself turned under operating conditions by a 1½ in. Helical Gear mounted on the steering column. Worm 2 must of course make contact with Worm 3 in order for the steering to operate successfully.

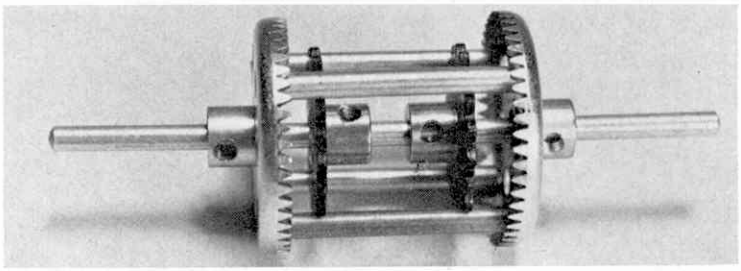
Coming to the drive system, this would be taken initially to a differential mechanism mounted in the central drive box. The customary Meccano differential would be perfectly adequate here, and as this mechanism has been frequently described in the M.M., it has been omitted from the demonstration unit



An underside view of the Front-wheel Drive Mechanism showing the layout of the kingpin bearings.

A simple, although unorthodox idea suggested by Bob Hauton of Lincoln for obtaining a 12:1 reduction ratio for clock hands by using a 3-way Rod Connector meshing with a 36-teeth Sprocket Wheel is sketched below. On the right is another simple idea from this modeller, an interesting Intermittent Motion Mechanism.

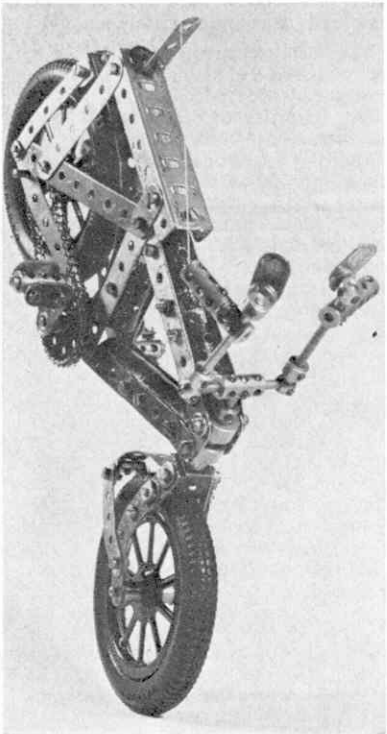




illustrated so as not to complicate matters unnecessarily. Mounted on each output shaft of the differential is a Socket Coupling 4, forming the first part of a flexible drive which is taken up by a Handrail Coupling 5, its head fitted with the special Keyway Bolt to make a neat fit in the slot of the Socket Coupling and thus allow a positive drive with adequate flexibility. A 1 in. Rod passes the drive on to a Universal Coupling 7, critically positioned so that its central spider is in axial alignment with the kingpin bearings above and below. Finally, a further 1 in. Rod passes through the boss of the Bush Wheel to link the Universal Coupling with the road wheel. The following parts list applies to a full two-sided unit, but does not include the differential or drive shafts, the latter depending on the assembly of the differential.

PARTS REQUIRED

2—3	2—24	1—59	2—136a
2—4	2—32	4—63	4—140
8—5	32—37a	2—72	2—142b
2—15	16—37b	4—90a	2—165
1—16	64—38	4—111	2—171
4—18b	2—48	4—111c	4—179
2—19b	2—51	8—115	1—211a
			2—212



A rather unusual, but descriptive view of a first-class Bicycle designed and built by 13-year old Neil Pluck of Woolston, Christchurch, New Zealand.

Useful Hints

Next, we move on to two or three quick hints, supplied by Mr. Bob Hauton of Lincoln. First in line is an Intermittent Drive System using a 3-way Rod Connector with boss, engaging with the teeth of an 18-teeth or 36-teeth Sprocket Wheel at right angles. Bob points out, in fact, that by using a 36-teeth Sprocket, it is possible to make a simple—if unorthodox—12:1 ratio for clock hands, as shown in the accompanying sketch. The Rod Connector 1 is fixed, along with a 25-teeth Pinion 2, on the driven Rod of the clock. In mesh with the Pinion is a $\frac{3}{4}$ in. Contrate Wheel secured on the minute hand Rod, this Rod also carrying a loose 36-teeth Sprocket Wheel 3, to the boss of which the hour hand would be fixed. The Rod Connector engages with the teeth of this Sprocket.

Bob's second idea will be of interest to Meccanograph builders. Four of the Large-toothed Quadrants introduced last year, he says, can be bolted to the $9\frac{7}{8}$ in. Flanged Ring, which in turn can be secured to a suitable wood table to make an ideal design table for Meccanograph models. A really positive drive can then be fed to the table through the large Quadrant Pinion.

Suggestion No. 3 takes the form of another Intermittent Drive Unit, but one with a wide variety of uses over a wide area of operation. Any number of Rods from one to eighteen can be mounted on the teeth of two 1 in. Sprocket Wheels, being held in place by "capping" the ends of the Rods with $1\frac{1}{2}$ in. Contrate Wheels, as shown in the photograph. All the Rods must, of course, be of a similar length, but theoretically this length can by anything from 1 in. upwards!

Push Bike from New Zealand

Last of all, this month, I would like to draw attention to the very good Bicycle model illustrated in our remaining photograph. This was designed and built by 13 year-old Neil Pluck of Woolston, Christchurch, New Zealand, who managed to complete it in a total of approximately 10 hours building time. An enthusiastic member of the Christchurch Meccano Club, Neil entered the Bike in a recent Club competiclubtion and succeeded in carrying off top marks with it.

The rather unusual view of the model in the illustration, by the way, was chosen by the photographer to show off its realistic proportions and sturdy construction to the best advantage. It shows well the amount of detail that has been incorporated in the model and I would particularly like to congratulate Neil on the main framework. There is a tendency, when building a bike frame in Meccano, to use only Strips which obviously leaves an unrealistic gap between the two sides of the frame. Neil has overcome the problem extremely well by enclosing the space with Sleeve Pieces and I think everyone will agree that they make all the difference. Well done, Neil!

More unusual stamp subjects by James A. Mackay

BASEBALL ON STAMPS

ONE of the surest ways of upsetting an American is to tell him that baseball is derived from the old English game of rounders. Baseball, he is bound to reply, is an all-American game. How could such a great American institution, the country's national game, possibly have anything to do with a foreign nation? In 1908 the Spalding Commission, headed by a United States senator, investigated the origins of the game and came to the unanimous conclusion that it had been solely devised by Abner Doubleday of Cooperstown, New York in 1839. Doubleday, who later fought at Gettysburg and became a general, was an instructor at a military academy in the 1830s. At Cooperstown he laid out the first baseball field and organised a game played by cadets at the academy.

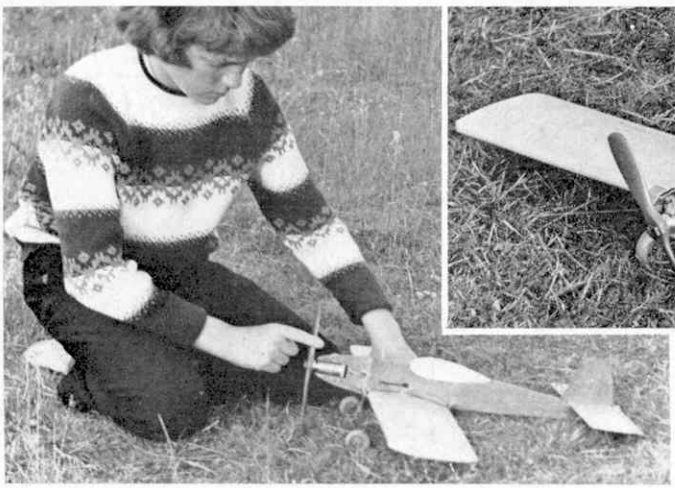
In 1919 the Cooperstown village council acquired the site of the original field and dedicated it as a permanent memorial under the name of Doubleday Field. Plans for a museum of baseball were then promoted and on June 12th 1939 the National Baseball Museum and Hall of Fame was inaugurated at Cooperstown, to coincide with the centenary of the game. To celebrate the event the United States issued a 3 cents stamp showing a sand-lot baseball game played by the cadets, with the buildings of Cooperstown in the background. Crossed bats, ball and catcher's mitt were featured in a panel on the left-hand side.

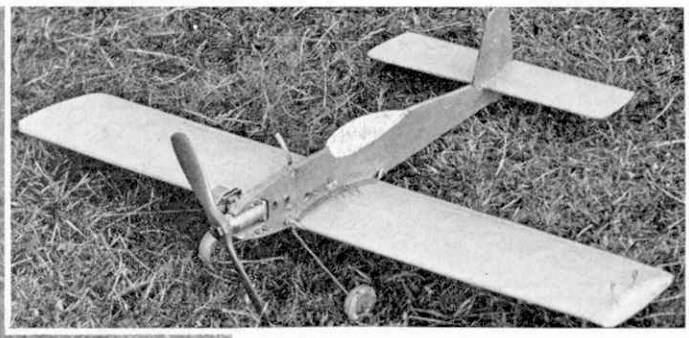
In the centenary year of baseball, however, serious scholastic research was carried out by Robert Henderson of the New York Public Library and proved beyond a shadow of doubt that the game was derived from English rounders, and, in fact, was in existence under the name of baseball long before Doubleday "invented" it. The name has been traced back in English literature to the early 18th century. In *Northanger Abbey*, written by Jane Austen about 1798, the heroine, Catherine, is described as having a preference for cricket, baseball and other boyish pursuits. An alphabet book, first published in 1744 and running to many editions in both Britain and America, illustrated the letter B with a baseball scene showing batter and pitcher and two bases. The *Boys Own Book*, published in England in 1828, devotes an entire chapter to rounders and its variations and includes a detailed description of a game which has an uncanny resemblance to modern baseball.

Subsequent research showed that Doubleday was a cadet at West Point in 1839 and could not possibly have been at Cooperstown at that time. Doubleday did not become an instructor at Cooperstown till 1842 at the earliest, and eye-witness accounts of the game he played indicate that it had little resemblance to modern baseball. It now seems certain that the honour for inventing the game should be given to Philadelphia where a form of baseball was being played as early as 1833. Ball games of various kinds were played in different parts of the United States, but the first real attempt to provide a set of rules occurred in 1845 when the Knickerbocker Club of New York drew up a code for baseball. This was the basis for the game as it is known today. Nevertheless Doubleday and Cooperstown are still regarded as the man and place which come first in baseball annals.

The game is played between two teams of nine players, involving the throwing, batting and catching of a ball on a field on which are placed four bases. The players run from base to base in order to score runs. The American baseball season runs from March to early October and is a highly professional business. Professionalism began about 1865, with players accepting money to play in games. The first fully professional team, from Cincinnati, made a tour of the United States in 1869 and was undefeated in every game played. The centenary of professional baseball was marked by a 6 cents stamp issued in September 1969 and showing a batter about to strike the ball.

Baseball has spread to other countries, primarily in Canada and Latin America, but also to Australia, Tunisia, Japan and China, and many of them have also issued baseball stamps. In fact the first stamp to feature this sport was released by Nicaragua two years before the United States. In 1949 Nicaragua issued long sets marking the World Amateur Baseball Championships held in Managua. Baseball stamps were issued by Japan in 1948 and by Cuba in 1957 and 1967. Latest in this theme is a set of three from China to mark the beginning of the Pacific Region Competition of the 1971 World Little League Series held in Formosa. Baseball is a very popular sport in Formosa. The stamps feature pitcher, players and batter from the Golden Dragons team of Taichung, who won the Little League World Series championship in 1969. The stamps, in denominations of 1, 2.50 and 4 dollars, were released on July 29th, the opening day of the championship.





Full-size Plans for CLIPPIE

28in. Control-Line Sport Model and Stunt Trainer

Remove magazine centre pages, cut out page 497 and tape together to obtain complete plan.

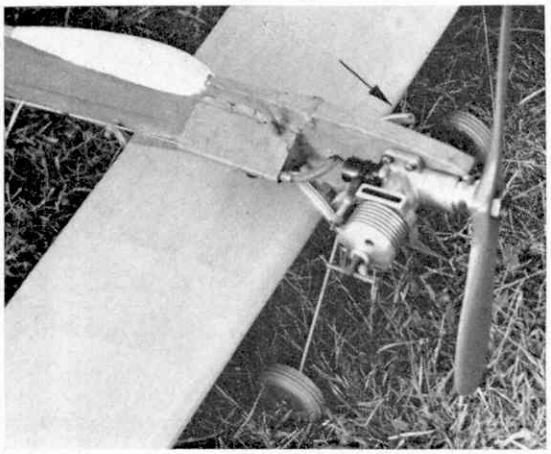
THIS model is intended to be a suitable trainer for someone wanting a fairly lively but safe design as a step towards learning to stunt. With a 1½ cc engine and an elevator twice the width shown on the drawing, it will perform the simpler manoeuvres quite easily, but for a start it is wise to use the elevator as shown until you can fly the model and are used to its speed; it is quite fast!

The original was built by 12-year old Paul Hodgson and turned out very successfully. He was unlucky on the first flight, when after nine or ten laps the "up" line broke and the model immediately nose-dived straight in. Worse, it picked the only grass-less spot in the flying circle and landed on hard, gravelly ground. Despite this, there was no major damage except for split tissue on the wing.

Most beginners start with a small and underpowered model which can be hard to fly because there is a tendency for the model to slide inwards towards the pilot if it gets much above level flight. Then, if the whole model is a rigid unit, damage is quite normal. With *Clippie*, the model is big enough to pull on the lines, especially with a 1½ cc engine, and this means that if it zooms higher than intended, it will still stay out with reasonably tight lines, enabling the pilot to continue to control it.

The profile fuselage offers the minimum drag, which means higher speed and hence more G force to hold the model out, and it will also flex in a crash, reducing the chance of damage. The wing is detachable, secured with rubber bands, so that it will fly off in a crash, which again helps to reduce the chances of damage. In other words, although this model is bigger and has a tissue-covered wing, it will cope with a lot more rough handling than a smaller model, as well as being easier to fly.

Cost to build is relatively light, and the procedure is simple. A little patience and care in cutting and assembly will pay off in a better and stronger model, so don't rush it!



Arrow shows fuel feed tube which for Super Fury engine passes through fuselage to bottom of needle body. Unclipped here to show clearly. With this engine, the model is pretty fast!

Construction:

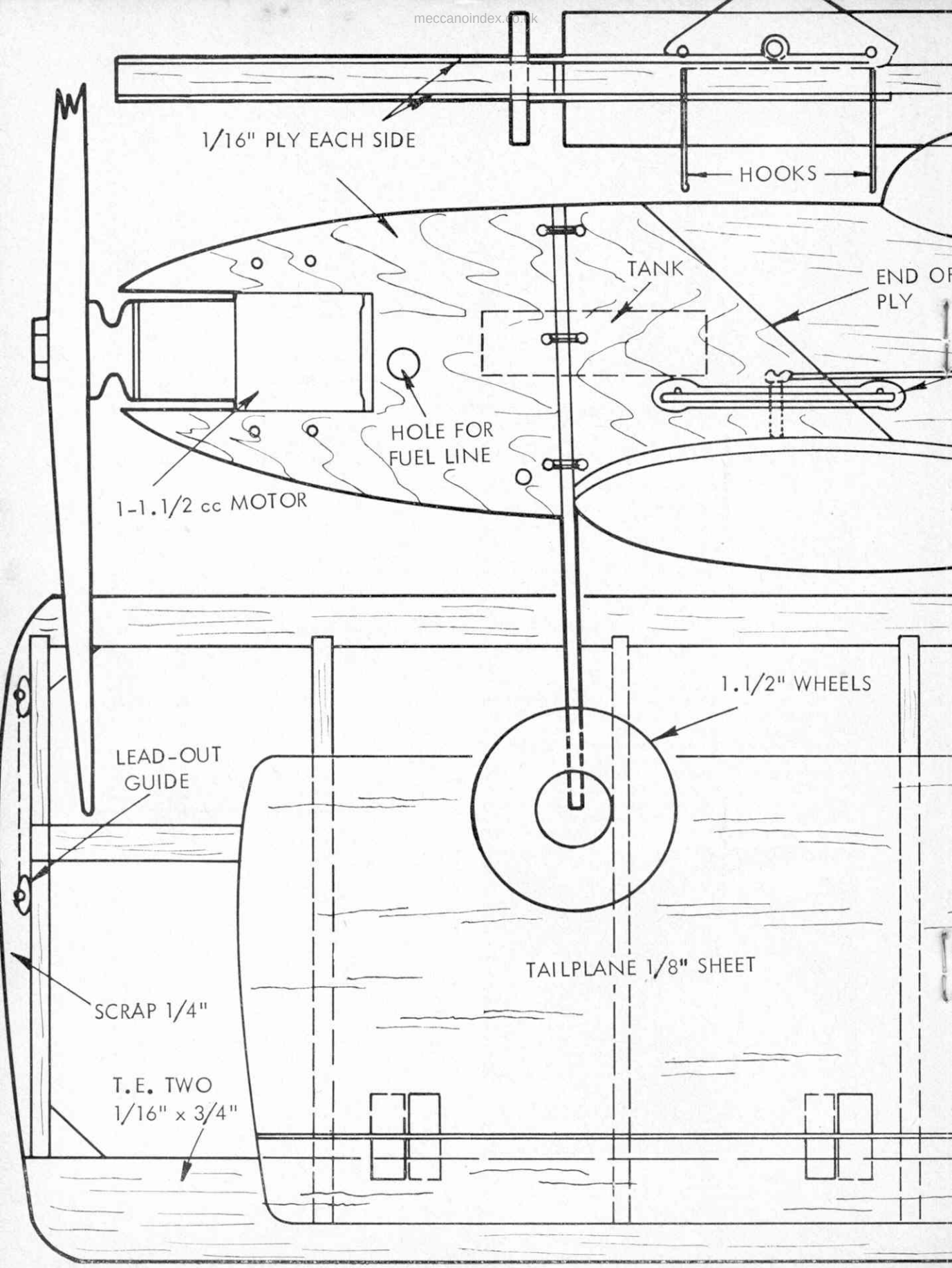
You will need:

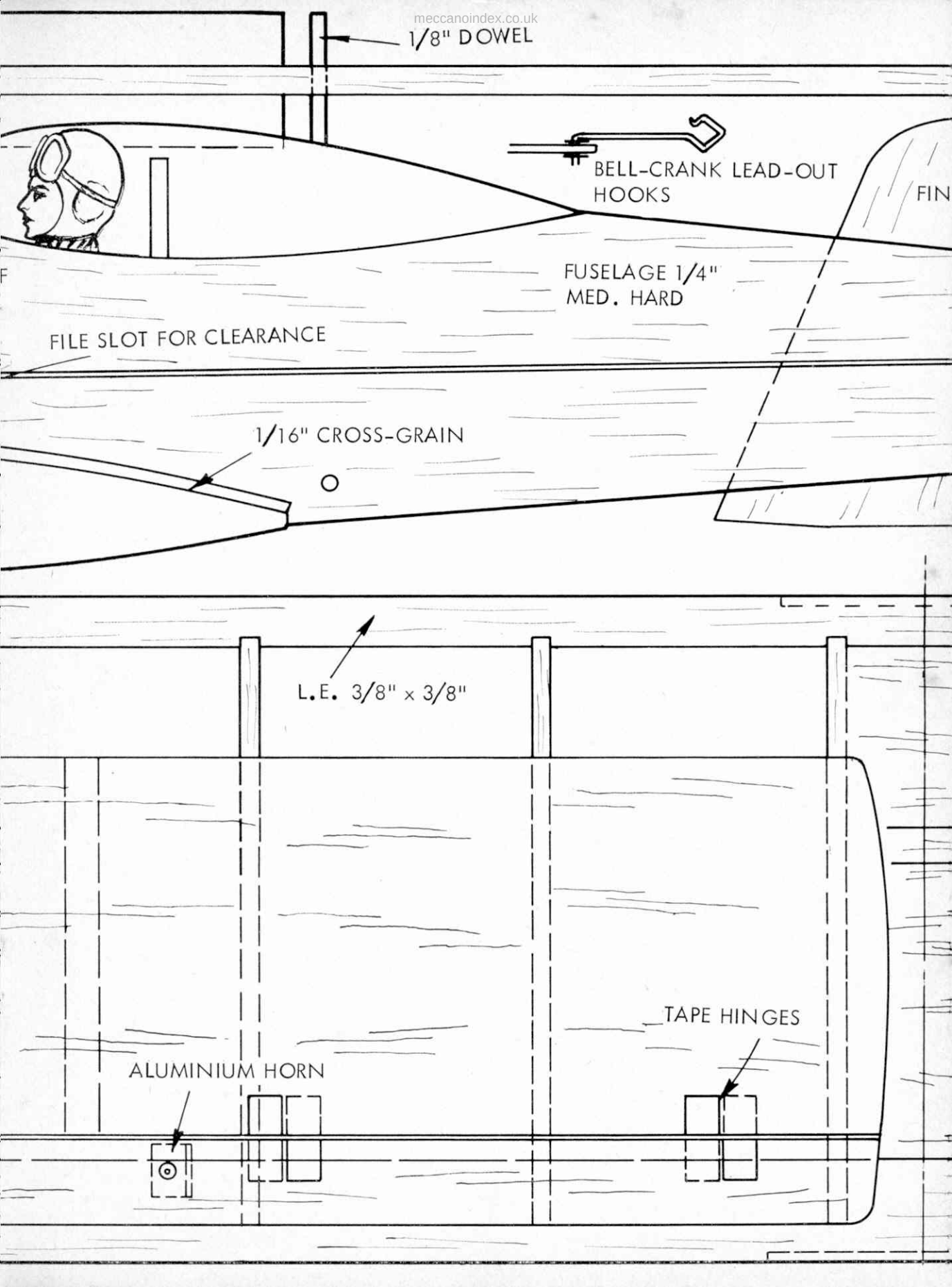
1 sheet—$\frac{1}{8}$ × 4 × 36 in. med. balsa
1 sheet—$\frac{1}{16}$ × 3 × 36 in. med. balsa
1 sheet—$\frac{1}{4}$ × 3 × 36 in. med. balsa
1 strip—$\frac{3}{8}$ × $\frac{1}{2}$ × 36 in. med. balsa
2 strips—$\frac{1}{8}$ × $\frac{1}{4}$ × 36 in. hard balsa
1 length—18 swg piano wire
14-15 ins.—14 swg piano wire

A piece of $\frac{1}{16}$ in. ply about 5 × 6 ins.

Two stubs of $\frac{1}{8}$ in. dowel, a few inches of tape or nylon ribbon, a bell-crank and elevator horn, a pair of 1½ in. wheels, a little thread, and a couple of small bolts and nuts, plus cement, tissue, dope, etc.

Trace the fuselage side view on to kitchen paper and transfer to the $\frac{1}{4}$ in. balsa, either by turning the paper over and going over the lines from the back, or by pin-pricking through and then joining the pin-pricks with a pencil or ball-point pen. Cut out with a modelling knife or fretsaw—the balsa should be hard enough to make cutting with a knife fairly hard work, but not





impossible. Take care to get the wing and tailplane seat areas squarely cut.

Now trace off the nose area on to $\frac{1}{16}$ in. ply twice and cut out. Be sure that the cut-out for the engine will fit the motor you intend to use. If you want to use a radial mounted engine, cut the nose off square $1\frac{1}{2}$ ins. back from the tips drawn; later mount a circle of $\frac{1}{8}$ in. ply on the nose and reinforce behind it with scraps of block balsa.

Cement the ply pieces thoroughly and place one each side of the nose, lining up accurately, then place on a flat surface with a weight on top (a couple of heavy books will do) and leave to dry for at least twelve hours.

Trace the outline of the tailplane, elevator, and fin on to $\frac{1}{8}$ in. balsa and cut out. The remainder of the sheet can then be used for wing ribs, except for a scrap for the sub-fin. Trace the rib pattern carefully and cut out; the best method is to cut it from ply and use this as a template to cut around for all the other ribs. If preferred, you can draw the ribs round the template and cut to the drawn lines. Twelve full ribs are needed, plus two reduced by $\frac{1}{16}$ in. top and bottom. Pin the twelve together with long pins from each end and sand the resulting block so that all ribs are identical and all notches and the ends line up.

Take the $\frac{3}{8} \times \frac{1}{2}$ in. strip and lay on the plan in the position of the leading edge and mark the rib positions and the wing centre line. Turn it end for end, align the centre line, and mark the other half with its rib positions. Cut off the surplus at one end, leaving you with a leading edge just under 28 in. long, and cut or file slots on the $\frac{1}{2}$ in. face at each rib position. Each slot should be $\frac{1}{8}$ in. wide and $\frac{1}{16}$ in. deep, and at right-angles to the strip, or the ribs will lean out of true.

Now mark out on the $\frac{1}{16}$ in. balsa two strips $\frac{3}{4}$ in. wide and 28 in. long. Cut out using a straight-edge or steel rule. Pin one piece in the trailing edge position on the plan, then cement and pin (with one vertical pin) half the ribs to it. Before the cement is dry, run cement into half the leading edge slots and position the l.e. on the front ends of the ribs. They will be cocked up in the air, so block the l.e. up with matchboxes or something similar; make sure it is parallel with the t.e., which means an equal height at each end. Pinch the

finger and thumb over the l.e. and feel that each rib is central, then skew a pin through each into the l.e. and leave to dry thoroughly.

When dry, remove all pins then pin the "other half" with the t.e. over the l.e. on the plan (this simplifies rib spacing) and add the remaining ribs, again pinning and blocking. When this is dry, cement in the $\frac{1}{8} \times \frac{1}{4}$ in. spars top and bottom and check that the wing is flat and unwarped. Again whey dry, sand along the top surface of the $\frac{1}{16} \times \frac{3}{4}$ in. t.e. strip until the second strip will sit down fairly, then cement rib ends and first strip and pin second strip in place. Again pin down to the building board and check for warps.

Sand the tailplane and elevator, and secure together with narrow tape or nylon ribbon. Four pairs of tapes are needed, and each pair is cemented side by side as shown, but with one tape over and one under the tailplane. When dry, "bend" the tapes so that they are vertical across the edge of the tailplane, pin the elevator in place, and bend the tapes and cement to the elevator. If you haven't done it before, to make it clear, the tape stuck under the tailplane is stuck on top of the elevator, and vice versa. Keep the tapes in the crack between the two surfaces free of cement and dope, to ensure free movement.

Sand the fuselage edges etc. and accurately mark the engine mounting holes, dowel holes, and the position of the undercarriage and bell-crank slot. Drill holes and cut out slot. Make wing seat from 1 in. wide strips of $\frac{1}{16}$ in. balsa, grain the short way, ensuring that the seat is square to the fuselage.

Bend the undercarriage from 14 swg. piano wire, bending the square U first then bending the legs out and finally the axles. Use a heavy pair of pliers and/or a small vice. Slide in place on the fuselage and bore the holes for the binding with a fine bradawl or a fine drill if you have one. Sew several turns of strong thread between each pair of holes and knot off, then rub cement into the thread.

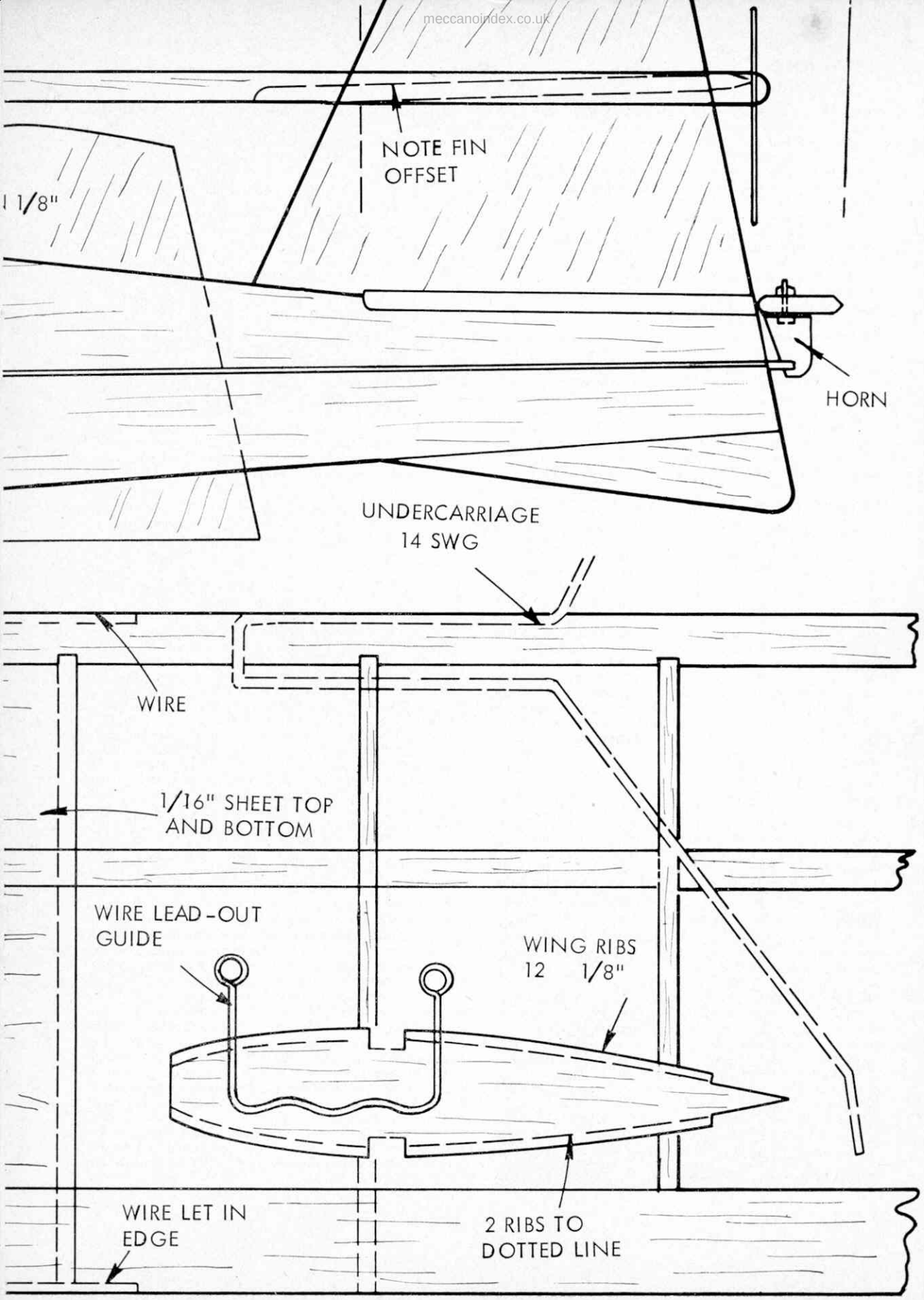
Cement in the two short dowels for the wing retaining bands, then firmly cement the tailplane in place, making certain that it is square to the fuselage from above and from ahead. Leave to dry thoroughly, before cementing the fin and sub-fin in place. Note the angle of the fin, which will tend to turn the model out of the flight circle and thus help keep the lines tight.

Sheet the wing centre-section with $\frac{1}{16}$ in. sheet top and bottom (grain the short way) and cement on two pieces of $\frac{1}{4}$ in. sheet to each tip rib, plus gussets in the tip corners. A wire line guide is needed on the inside (port) wing tip; this can be cemented in before adding the $\frac{1}{4}$ in. sheet or it can be pushed through and the guide eyes bent in situ after covering. Carve and sand the leading edge to shape, then sand the entire wing to produce a smooth framework for covering. Cut a little groove and cement a piece of wire on the l.e. and t.e. in the centre, to prevent the rubber bands cutting into the balsa.

Use heavyweight Modelspan to cover the wing, attaching it with tissue cement, tissue paste, P.V.A. glue, or Gripfix. Only two panels are needed, one top and one bottom. Smooth them evenly in place and allow the adhesive to dry. Lightly dampen the tissue with water to shrink it, and when dry apply two coats of clear dope.

The fuselage and tail are best tissue-covered, using lightweight tissue doped on. If preferred, they can be painted with two or three coats of sanding sealer, sanded well, and colour doped and/or fuel-proofed.

A commercial fibre bell-crank can be bought, or one made from $\frac{1}{16}$ in. ply or thin Paxolin or even Formica. The line hooks are bent from 18 g. wire and are best



secured by a soldered washer above and below the crank; it is difficult to bend the wire back underneath and still get free movement. The crank pivots on a 6BA bolt (nuts can be used above and below it to position it accurately) and the bolt is then secured with a blob of epoxy resin top and bottom, on the starboard side of the fuselage. Make sure it can swing freely without catching on the slot; file clearance if necessary.

Bend the elevator horn from a piece of aluminium etc. or make a ply horn and cement it in a slot cut in the elevator. The pushrod is 18g wire and should be bent to length so that when the bell-crank is central, so is the elevator. Soldered washers are again the best way of securing the ends. Aim for completely free movement of the whole system.

The wheels are also best retained by soldered washers each side; 1½ in. rubber balloon wheels are recommended for easier operation on the average grassed area.

Bolt the motor in place and mount a control-line tank on the starboard side of the nose, keeping the pick-up point as nearly level to the engine's spraybar as possible and the tank close to the engine and clear of the bell-crank. On the prototype model, the tank was just a shade above the engine centre line due to the E.D. Super Fury's rear intake position. This also necessitated bring the neoprene fuel line through the fuselage, as seen in the photos. Secure the wing in place by strong rubber bands stretched diagonally between the dowels (i.e. making a cross under the wing). It should be firm but capable of being knocked off in a crash.

The model should balance roughly on the front line position and a little ballast should be added to the nose if the balance point is more than say ¼ in. behind this line. Use a line length of 30-35 ft. for a 1 cc engine and about 40 ft. for 1½ cc, and use a propeller about 7 × 5 or 7 × 6 as recommended by the engine manufacturers.

Test fly on a windless day and keep away from electricity pylons. Lightweight Laystrate steel lines would be normal, but even if you use fishing twine, on a damp day, electricity pylons can be very dangerous.

Always start the model from the point of the circle when it is tail to wind, which means that for the first half-lap the breeze will help hold the lines tight while the model accelerates. Take off the ground if possible, but if hand-launching is unavoidable, the pilot should hold his arm out straight, pointing at the model, with the elevator neutral. Lots of crashes are caused by over-correction from hand-launches—or picking up the control handle upside down, so make sure that "up" really is "up" before signalling release!

DOWN TO EARTH (*continued from page* 501)

rotary hoes have come on to the market in the last twenty years which really mince the ground to bits by brute strength. They all need a tractor which has a power-take-off shaft to power them, and a great deal of power they consume, too. 'L' shaped hoe feet are driven to flail down into the ground to cut it and throw it against a breaker shield. The more stubborn the soil, the faster and harder the powered hoes can be driven to make sure the tilth is obtained on time. As is only to be expected, these machines produce results at the expense of ..... expense. A new set of hoe blades which could wear out after as little as one hard week's work, costs around £20. Rotary hoes require thorough maintenance and cannot cover the areas of ground in a day that the discs or rolls might be expected to.

Look out at the land

If one knows what to watch for, there is plenty of interest in seeing what sort of cultivations are going on in your locality. An expert tractor driver always makes a point of drawing his furrows down a field so straight that 'a bullet could be fired down it'. This is the mark of the good ploughman—along with good furrow slicing and turning, of course. Often a ploughman will set his furrows so that the lines run to the road—and his work has to stand the inspection of passers-by. If the field slopes away to one side, however, he may well set his plough lines to run up-and-down to assist drainage. In the autumn one can see drivers in difficulty working heavy land—perhaps using two tractors in tandem on a specially tricky spot. In the spring you will see plenty of tractors working longer and longer overtime as the sowing season comes to hand.

Knowing the countryside starts with knowing the soil. I never regretted the months I spent as a young man on contract driving. Left to myself miles from anywhere with a tractor and plough or other tackle, I rode my tractor—heaving with power, turning that part of the scenery from green to brown, grey or red. I found soils of all colours and textures. For company I had a thermos flask, lunch tin—and the ubiquitous flight of swooping gulls following my furrow. When I got expert enough to dare my plough lines to the roadside and could pilot the tractor over to the horizon as straight as a die, leaving the earth steaming from being turned and taking the fresh colour of the day's work, I got a satisfaction from the land that is hard to describe. When my work grew to be good enough to earn a few words of gruff appreciation from other country-men I knew I was starting to understand the soil. And the men of the soil.

PADEMELONS (*from opposite page*)

pretty colouring. This pademelon is a favourite pet with people, who like to have wallabies about their grounds.

The famous 19th century naturalist, John Gould, advocated: "that pademelons might be easily naturalised in England where, if in sufficient numbers in suitable forests and estates of the nobility and gentry, the novelty of these animals could not fail to appeal apart from being highly esteemed for the table."

This didn't take place, however, but some White-throated or Parma Pademelons were taken to New Zealand.

These kangaroos were introduced to Kawou Island in Hauraki Gulf off the North Island of New Zealand, thirty miles north of Auckland, in the 1870's. This was arranged by Sir George Grey, once Governor of South Australia, and subsequently Lieutenant-Governor and then Premier of New Zealand.

These pademelons thrive in their new home; in fact, within twenty years . . . "they were so numerous that they could be shot by the hundred by sporting parties without any real dangers of being wiped out."

But it was not so in their homeland, for in Australia they were ruthlessly hunted down to extinction.

In 1966 Dr. W. D. L. Ride, Director of the Western Australian Museum was examining skins of wallabies from New Zealand, when he decided that they belonged to the extinct Parma Pademelon. Subsequent investigation by zoologists of the New Zealand Department of Scientific and Industrial Research finally led to conclusive identification.

Since then the various zoos of Sydney, Adelaide and Perth, as well as the Healesville Sanctuary in Victoria, have all obtained members of the "back from extinction" perky pademelon family.

The perky PADEMELONS of Australia

Frank Madigan describes the various species of wallaby found "down under"

'PADEMELON' is a corruption of an aboriginal name for the kangaroo used by a tribe living near Sydney in the early days of settlement. These days, however, this term is given only to the perky small wallabies dwelling in the scrubland of Australia.

Strangely enough, the first and second members of the fifty different species of kangaroos found in Australia to be sighted by Europeans were pademelons.

The Dutch navigator, Francois Pelsaert, when wrecked on the Abrolhos Island off Western Australia in 1629, was the first European to record seeing a kangaroo. He reported: "a species of cats which are very strange creatures. Below the belly the female carries a pouch".

This animal was a Dama Pademelon, which is a most attractive animal, and is readily kept in captivity. Those who have kept them as pets have been amused at the habit they have of resting with their tails forward between their legs.

In 1658 a published account of the Dutchman Samuel Volckersen of his visit to Rottnest Island (Western Australia) recorded: "I saw two seals and a wild cat resembling a civet-cat, but with browner hair".

The "wild cat" was actually the short-tailed Pademelon or Scrub Wallaby, named later in 1830 by the French naturalists, Quoy and Gaimard, as the "Setonis Brachyurus". Naturally, the local aboriginal name for the Rottnest wallaby, the "Quokka" is more popular.

The Quokka make mazes of definite runways through coarse grass and dense undergrowth. So short are their ears and hind-legs that they may easily be mistaken for large rats as they move along, so it is not surprising that Willem de Vlaming of the second Dutch Expedition in 1696 mistook this marsupial for a rat, and named the island, Rottnest (rottes nest), or nest of rats.

Of all the Pademelons, the Quokka is most rat-like, because its tail is so short, being barely twice the length of its head; also, the short foot is only inches long. It has short, rounded ears, too, which hardly project above its fur. Like the rest of the kangaroo family, they are herbivorous feeders.

The Rottnest colony, however, as well as eating a large variety of ground vegetation, eat the leaves of wattle trees, which grow up to 15 feet tall. Pursuing this food, Quokkas have been found browsing in these trees at least five feet from the ground.

The joey when born is very tiny, about three quarters of an inch long, and it weighs less than one-sixtieth of an ounce. When the Duke of Edinburgh was shown a joey in the pouch during his visit to Western Australia in 1954 he remarked: "Better close the pouch, or it will catch cold."

At least one species of pademelons is found in each State of Australia.

The Red-necked Pademelon was the favourite food of the earliest settlers of New South Wales for, according to Gould, "the flesh being tender, well-flavoured, and more like that of the hare than any other European animal he could compare it with."

Like all pademelons the Red-necked Pademelon lives in thick scrub or dense undergrowth of forests, in which their tunnel-like runways can be seen. Although on occasions they can be found in the tangle of grasses, ferns and bushes of swamp country, they are generally discovered in the forests.

Of the seven different types, the Red-necked, Quokka, Tasmanian or Red-bellied, Dama, Southern Red-legged, Cape York and White-throated or Parma, the Tasmanian Pademelon is the least attractive.

The reason for this is that its colour is greyish-brown to sooty-brown, edged with rufous, and its fur never seems to be sleek or well groomed.

Michael Sharland, the author of "Tasmanian Wild Life", says: "The creature is more like a large untidy rat, the least presentable of the animals that comprise the kindred of the kangaroo".

Strangely enough, the other insular pademelon, the Flinders Island Pademelon, is of an elegant build and

(*Continued at foot of opposite page*)

Tough tools that get DOWN TO EARTH

By RICHARD LEE

SOIL. . . . Soil is important—a basic requirement of all life! Nor is it dull stuff to deal with, as some folk might think!

Men who understand soil and how to work it are always telling of the challenges and satisfaction they get in preparing the ground for crops—getting it done in time for the proper season and doing it in spite of delays and sudden difficulties which come overnight if the weather changes for the worse.

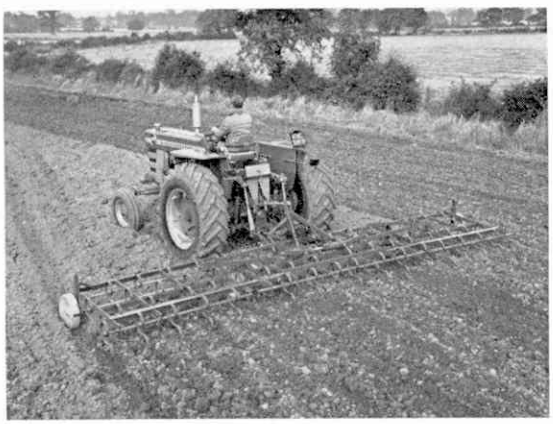
A contract tractor driver working on tillage has to find the answers to the local problems himself—there may be no-one within miles to even talk to. Yet in the course of a year he might easily turn over a *million tons* of soil! Machines that handle the land in such quantities may be the 'plain Janes' of the range of farm implements, but they are tough and hardwearing—like the men who use them.

Working the land on tillage jobs falls into two main types of work:

1. Ploughing ground for the purpose of burying the grass, weeds, stubbles or other remains of the previous crop. This job is to wipe 'the slate clean' and also breaks up the land to aereate the soil particles and organisms that live there to help it keep 'sweet' and in condition as living soil.

2. To work the ploughed or fallowed ground into a suitable state for planting the seeds or seedlings of the next crop. This means that the top few inches of the soil must be broken down into a level crumb structure, with no remaining lumps, which will make a tilth in which the next crop will grow to its best advantage. Again different crops require different qualities in the tilth or 'seed-bed' to ensure the best chance of success.

Top, a Ransomes TS89 four-furrow plough for use with four-wheel drive tractors. Centre, a 105 h.p. Massey-Ferguson 1100 tractor and the 24 ft. model MF37 spring tine cultivator. Bottom, Track-Marshall 70C crawler-tractor with Ransomes four-furrow plough, good on compacted ground.



Ploughing and Ground Busting

The modern ploughs work on the same age-old principles of driving a share point into the ground and turn the rising earth slice on to its side by means of a curved mouldboard. But modern improvements and more powerful tractors have enabled ploughs to be built bigger to draw multiple plough bodies and so turn up to six furrows at a time. Ploughing depends on a neat equation of physics. It depends on the 'grip' that the tractor wheels can gain in the existing ground conditions (the traction co-efficient), the pulling power of the tractor itself, and the resistance of the plough that is being used. This depends on its size and the opposition which the land affords to it, which varies according to the 'stiffness' of the soil. Stiff soils, like clay, are called 'heavy' land. This is why the weather is important—a tractor set up to pull a six furrow plough on rubber tyres may do so in low gear on a fine day, but rain will turn the land slippery and the next day the tractor wheels would simply spin around uselessly. No farmer can afford to own the full variety of ploughs and tractors which are made to cope with the wide variety in conditions which land can offer.

In the same way a spell of nice weather may dry the land just enough to enable a tractor to plough at a faster speed than the previous day—due to the wheels gripping just that little bit better.

Ploughs vary in design from ones which dig only a shallow furrow to single furrow monsters called deep-diggers or 'Prairie Busters'.

Some ploughs are built with a second, duplicated but opposite, body which can swing over at the end of a run.

These are called reversible ploughs and enable a ploughman to start ploughing on one side of a field and work his way steadily across it. Normal non-reversible ploughs only throw the earth to the right-hand side and so the ploughman must plough a field in strips, going round and round each 'land' that he sets out. To do a whole field in one single 'land' which starts down the middle of the field would entail too much wasted time running 'empty' at each end on the 'headlands' in order to dig into the next furrow to be turned. Have a special look at a ploughman at work in the country and you will see what I mean.

Finally, on a few occasions when the farmer does not wish to bury the material on top, but simply wants to liven up the soil, he may use a 'Chisel Plough'. These are simply in the shape of chisel-pointed steel hooks which tear through the land to break up the sub-soil pan and assist drainage.

Tilling for Tilth

This is the job that demands speed. The reason is because the ploughed ground is reduced to a tilth for sowing at the last possible moment before the new seeds are planted. If the tilth was to be prepared weeks in advance, the field would be full of growing weeds by the time the new crop seeds were sown, and they would never grow into a proper crop against the weed competition. Breaking the soil down into tilth at the same time, of course, kills all the weeds that have started growing on or below the surface. The crops themselves smother the natural weed growth if they get off to a good start and cover the ground first.

Bad weather that holds up tilth preparation holds up sowing. In this country it is a known fact that delay in getting crops sown on time result in lower crop yields. As a lot of money is invested in every field that is sown to a crop, the farmer is always anxious to see his crop at least gets the best chance at the beginning. There will be hazards enough to face long before the crop is grown, sold and the cash is back in the bank again!

The tools that are used to make the seed bed vary a great deal. Most popular, perhaps, are the 'discs'. These are usually in the form of four units or frames which each carry 8–10 steel discs. The discs are made of fantastically tough steel and rotate as they are drawn over the ground, cutting into the soil and breaking it into a loose friable mixture. The discs are so arranged that they can be angled to achieve greater breaking power. Again the greater they are angled, the more power that is needed to pull them. A farmer may decide to put the discs over a field two or three times until he is satisfied with the tilth. For all the hard work that these unglamorous machines do, breakages are extremely rare and a set of good discs may last a farmer for a lifetime.

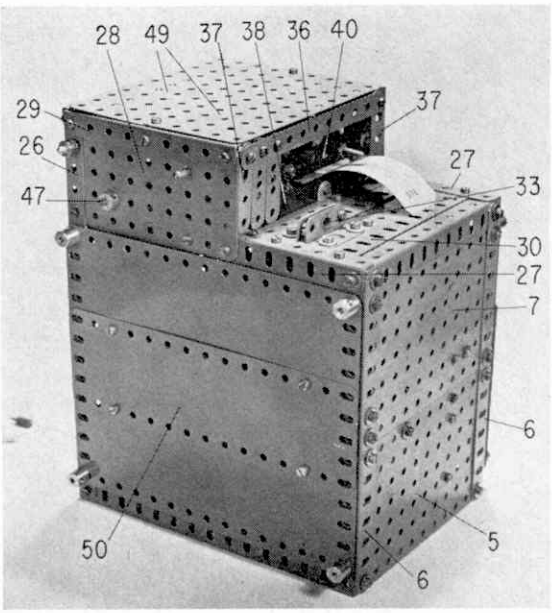
Some discs are slightly modified whereby the leading set of discs has a crimped or botched edge to further assist cutting and avoid clogging if the soil is sticky and tends to pick up on to the machine instead of falling away cleanly. Discs were invented with the first tractors—no horse could pull such a back-breaking implement—and are a farm 'maid-of-all-work'. They need the minimum of maintenance and often lie patiently in a field corner for weeks until the farmer suddenly wants them in a hurry. Usually they can be relied upon to go straight into action after a two minute grease-up and cut down yet a few more thousand of tons of soil without complaint!

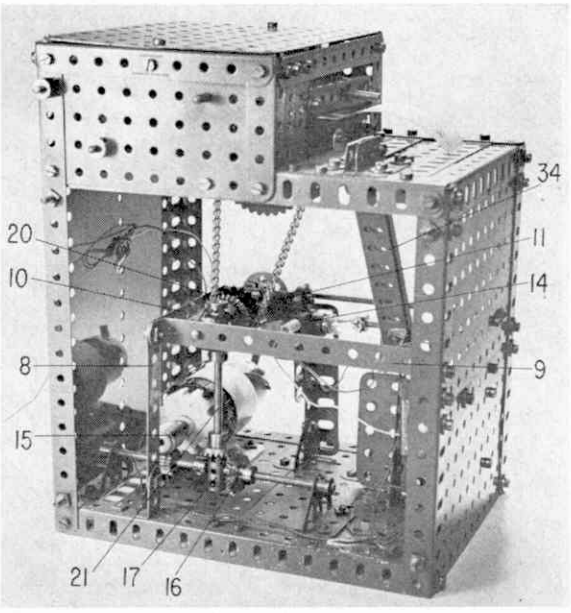
Two other common tools are the spring-tine cultivators and the Cambridge ridged rollers. Each in their own way breaks down the soil lumps according to weather conditions. If the soil lumps break up under pressure to 'powder', the rollers are very effective. If the lumps simply get smaller and even harder under the squashing treatment, the spring tine cultivator will do a better job as the spring-steel points or 'tines' vibrate their way through the ground, with a shaking and teasing action.

Many farmers now rely on sheer power to break up the soil surface into a good seed-bed tilth. Powered

(*please turn to page 498*)

Top, a rotary cultivator from Ransomes Sims & Jefferies Ltd. Centre, a 90 h.p. Massey-Ferguson 1080 tractor with 12 ft. model MF52 tandem disc harrows. Bottom, disc harrows preparing a bed; International Harvester Co. Ltd.





Automatic Ticket Machine

An "electronic" Model described by 'Spanner'

IT IS difficult to realise that not more than 40 years ago, the cigarette or chocolate machine was an extremely novel sight indeed and considered a symptom of our developing technological society. Nowadays, of course, these machines are as common as bus stops and sell virtually everything from chewing gum to hot meals!

Such commonplace objects may not appear very outstanding to the ordinary man-in-the-street, but to the Meccano enthusiast, they make challenging subjects for Meccano models. Featured here, for example, is a Ticket-issuing Machine which, although not a particularly complex piece of equipment, nonetheless illustrates some very interesting operations. It also illustrates the great value of the new Electronic Control Set, making use of the components in this Set to achieve operations simply, where mechanical control would be considerably more complicated. It is, as a matter of interest, the first ever "electronic" model to be featured in full in Meccano Magazine.

As far as construction is concerned, a rectangular base is first built up from two 7½ in. Angle Girders 1, connected together by three 5½ in. Angle Girders 2, a 5½ × 3½ in. Flat Plate 3 and a 5½ × 2½ in. Flat Plate 4. Attached to front Girder 2 is another 5½ × 3½ in. Flat Plate 5, the ends overlaid by 7½ in. Angle Girders 6, a further 5½ × 3½ in. Flat Plate 7 being bolted to Girders 6 above Plate 50. The upper ends of the Girders are connected by a 5½ in. Angle Girder, as shown.

Before proceeding any further with the framework, the electronic and drive sides of the model should be fitted while there is still plenty of room available. A 1 × ½ in. Angle Bracket, fixed by its short lug to left-hand Girder 1 (viewed from the front), is extended six holes upward by a 3½ in. Strip 8. The upper end of this Strip is connected to left-hand Girder 6 by a 5½ × ½ in. Double Angle Strip 9, the securing Bolt also holding a horizontal 3½ in. Strip 10 in place. The free end of this Strip is attached by an Angle Bracket to a 1½ in. Corner Bracket 11 which is, in turn, attached by a 1½ in. Angle Girder to a 2½ in. Flat Girder, secured to a 3½ in. Angle Girder 12, the Flat Girder projecting one hole above the top of the Angle Girder. The lower end of the Angle Girder is secured to a Trunnion, bolted to Flat Plate 4, while the upper end of the Flat Girder is secured by Nuts to a 4½ in. Screwed Rod 13, held by further Nuts in Flat Plate 7. Note that the Bolts fixing the 1½ in. Angle Girder to the Flat Girder also fix an Electronic Set Lamp Holder 14 to the opposite side of the Flat Girder.

A 3–12 volt Motor with Gearbox, set in the 16:1 ratio, is next bolted to Flat Plate 4, in the position shown. A Worm Gear 15 fixed on the output shaft of this unit meshes with a ½ in. Pinion on a 5½ in. Rod held by Collars in two Trunnions, one bolted to rear Girder 2 and the other to Flat Plate 3. Also carried on the Rod is a fixed ⅞ in. Bevel Gear 16, a loose Coupling 17 and a Collar, the Rod passing through the centre transverse bore of the Coupling and the Collar serving as a "stop" to hold the Coupling in place.

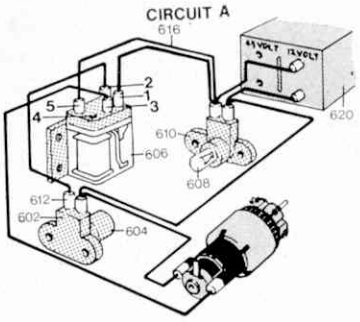
Now journalled in the upper centre hole in Corner Bracket 11 and in the corresponding hole in Double Angle Strip 9 is a 3½ in. Rod held in place by an electrical 1 in. Bush Wheel 18 and a Collar and carrying a 1 in. Sprocket Wheel 19, a ⅞ in. Bevel Gear 20, a Coupling and another Collar. As before, the Coupling is free, with the Rod passing through its centre transverse bore and the Collar holding it in place. Journalled, free, in the longitudinal bores of this Coupling and Coupling 17 is a 2½ in. Rod 21, on which two further ⅞ in. Bevel Gears are fixed, these Bevels meshing with Bevels 16 and 20.

Bolted to Flat Plate 3, in the position shown, is a Trunnion, ex-

Opposite, this Automatic Ticket Machine is the first Meccano model featured in the M.M. to make use of the Electronic Control Set. In the right-hand photo the sides are removed to show drive and electronic systems.

tended five holes upward by a 3½ in. Strip 22. Free to slide in the upper end hole in this Strip and in the corresponding hole in Angle Girder 12 is a 3½ in. Rod 23 carrying a Collar and two Compression Springs between the Strip and Girder and two more Collars, approximately 3/5 in. separating them, on the other side of the Girder. The Collar and Compression Springs should be arranged so that the Springs tend to force the Rod towards the front of the model, the centre Collar acting as a "stop" to prevent the Rod from projecting more than ½ in. beyond Strip 22. The final Collar serves as the snatch point for a Threaded Pin fixed in the face of Bush Wheel 18. As the Bush Wheel revolves, the Pin catches on the Collar, drawing Rod 23 inwards a short distance, the Compression Springs returning it to its normal position when the Pin comes free.

Bolted to the inside of Plates 5 and 7, exactly opposite Lamp Holder 14, is the Photo Cell from the Electronic Set 24, this being fitted with the Hood to cut out excess light. The Relay 25 is also bolted to the inside of Plate 5 in a suitable position and a Lamp is of course fitted to Lamp Holder 14.



Wiring

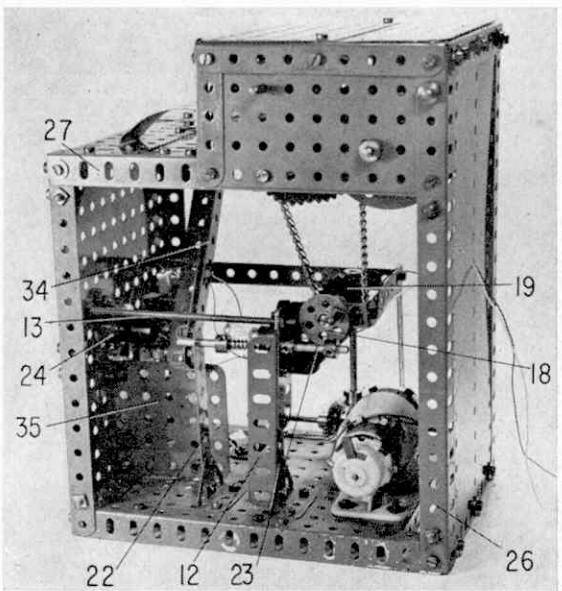
It is advisable to wire up the model at this stage while the components can be easily reached. Using the Miniature Plugs contained in the Electronic Set, one Motor lead is connected to the lower terminal of the Photo Cell, this terminal also being connected to the upper terminal of the Lamp Holder. The lower terminal of the Lamp Holder is connected to sockets 1 and 5 of the Relay, while socket No. 2 of the Relay is connected to the upper terminal of the Photo Cell. The other Motor lead is connected to socket No. 2 of the Relay and, finally, the leads from the power source—which must give 12 volts D.C.—are connected to the two terminals of the Lamp Holder. This layout is Circuit A in the Electronic Set Booklet.

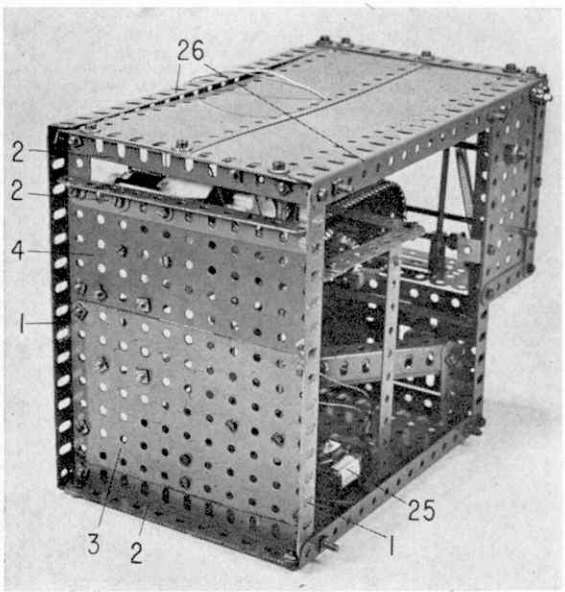
Framework and Ticket Section

Construction of the framework of the model can now continue. Bolted to the rear corners of the base are two 9½ in. Angle Girders 26, these being connected through their fifth holes to the top of Angle Girders 6 by two 7½ in. Angle Girders 27, the securing Bolts helping to hold a 4½ × 2½ in. Flat Plate 28 in position at each side, as shown. The forward edge of this Plate is overlaid by a 2½ in. Strip, while a 4½ in. Angle Girder 29 is bolted to the top edge of the Plate. The upper ends of Girders 26 are connected by a 5½ in. Angle Girder, the space between this Girder and rear Girder 2 being enclosed by two 9½ × 2½ in. Strip Plates completing the back of the model.

Towards the front of the model Girders 27 are connected by a 5½ in. Flat Girder 30, a 5½ in. Angle Girder 31 and a 5½ in. Strip 32, a space being left between the Flat and Angle Girders. Part of this space is enclosed by a 3 in. Flat Girder bolted to Flat Girder 30, the remainder of the space being edged by two 1½ in. Angle Girders 33 forming the entrance slot for the operating coin. A ⅜ in. Bolt is secured through the inner end holes of the vertical flanges of these Girders to act as an improved guide. Immediately below the Girders a channel guide for the coin is supplied by two 5½ in. Angle Girders 34, placed one inside the other and secured together through their

Below, another view of the machine with the sides removed, and an underside view showing construction of the base.





elongated holes, with full advantage being taken of the elongated holes to leave a narrow space between the vertical flanges of the Girders wide enough to receive the coin.

The upper ends of the Girders are bolted to a 2 in. Slotted Strip, attached by an Obtuse Angle Bracket to the underside of left-hand Girder 27 through its second hole. The Girders are angled downwards to deposit the coins in the right-hand forward corner of the model, in a compartment bordered by Strip 22, with its Trunnion, and by a $2\frac{1}{2} \times 2\frac{1}{2}$ in. Flat Plate 35, attached to Flat Plate 5 by a $2\frac{1}{2}$ in. Angle Girder.

Up at the top of the model, a $5\frac{1}{2}$ in. Strip 36 is attached by Angle Brackets to the upper forward corners of Flat Plates 28, the securing Bolts also holding two 2 in. Slotted Strips 37 in place, one at each end of Strip 36. Two 2 in. Strips are also bolted to Strip 36, adjacent to left-hand Strip 37, then a $3\frac{1}{2}$ in. Rack Strip 38, backed by a $2\frac{1}{2}$ in. Angle Girder 39, is attached by further Angle Brackets to Strip 32. Another $3\frac{1}{2}$ in. Rack Strip 40, positioned free above the first Rack Strip, is secured through its end holes to two Threaded Couplings, each fixed on the end of a $3\frac{1}{2}$ in. Rod. The other end of this Rod is fixed in the longitudinal bore of an ordinary Coupling 41, mounted on a $6\frac{1}{2}$ in. Rod held by Collars in the second holes of Angle Girders 26. Also mounted on the Rod is a Crank 42, to the end of which a Tension Spring is fixed, the other end of this Spring being stretched and attached to nearby Angle Girder 27. The action of the Spring raises Rack Strip 40 away from Rack Strip 38.

Preventing the Rack Strip from rising too far, however, is another $6\frac{1}{2}$ in. Rod held by Collars in the third holes from the front in the second row of holes down from the tops of Flat Plates 28. Fixed on this Rod is a 1 in. Pulley with Motor Tyre 43, immediately below which—and touching it—are two $1\frac{1}{2}$ in. Sprocket Wheels 44 mounted face to face on a 5 in. Rod journalled in the inner lugs of two Double Brackets bolted one to each Angle Girder 27. Also mounted on the Rod is a 2 in. Sprocket Wheel 45 which is connected by Chain to Sprocket Wheel 19.

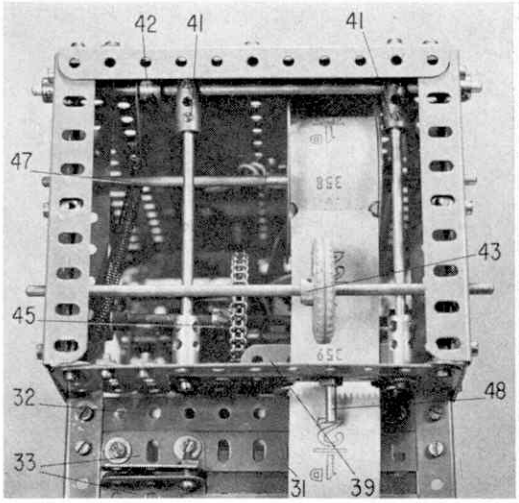
A $1\frac{1}{4}$ in. wide roll of perforated "tear-off" tickets, each ticket $2\frac{1}{2}$ in. long (obtainable from most good stationery suppliers), is mounted between two Face Plates 46 on a final $6\frac{1}{2}$ in. Rod 47 held by Collars in Flat Plates 28. The end of the roll is threaded between Pulley with Motor Tyre 43 and Sprocket Wheels 44 and is brought out between the teeth of the two Rack Strips. With the power and Motor switched on, when a suitable coin is inserted in the "slot", it runs down the guide formed by Angle Girders 34 until stopped by Rod 23, at which point it should break the beam of light falling on the Photo Cell. This sets the Motor working to push the end of the ticket roll out between the Rack Strips until, after one ticket has been issued, the Threaded Pin in Bush Wheel 18 catches on the inner Collar on Rod 23, moving the Rod inward to release the coin. The coin drops into its "box", restoring the light beam to the Photo Cell which stops the Motor. The ticket can then be ripped off after pressing down Rack Strip 40 on to Rack Strip 38 with the aid of a Threaded Pin 48 fixed in Rack Strip 40 to prevent the

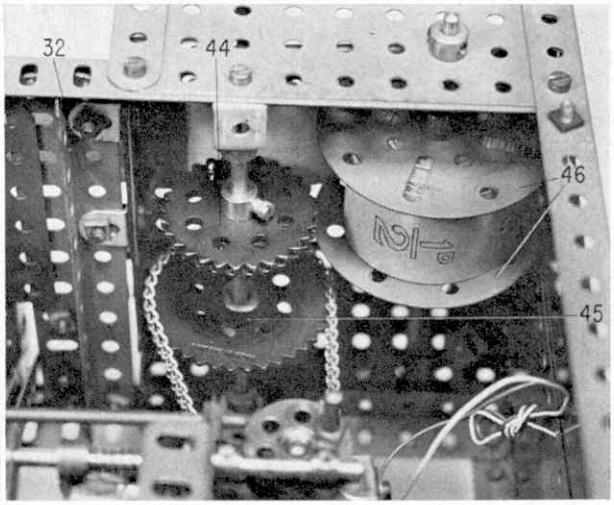
(*Please turn to page* 489)

PARTS REQUIRED

2—2	4—16	5—63	2—115
4—3	1—16a	2—63c	2—120b
2—6	1—22	10—64	4—126
6—8b	1—26	3—70	1—133
8—9	4—30	1—72	1—142c
1—9b	1—32	1—80b	6—195
2—9d	121—37a	1—94	2—196
3—9f	120—37b	1—95	1—518
2—11	44—38	2—95a	1—602
6—12	1—43	1—96	1—604
1—12a	1—48d	1—103	1—606
1—12b	3—52a	1—103e	1—608
1—12c	2—53a	1—103f	1—610
3—14	2—55a	2—109	11—612
1—15	18—59	2—110	2 yds—616
1—15a	1—62	12—111c	1—3–12v. DC Motor with Gearbox
			1—Roll of $2\frac{1}{2} \times 1\frac{1}{4}$ Tickets

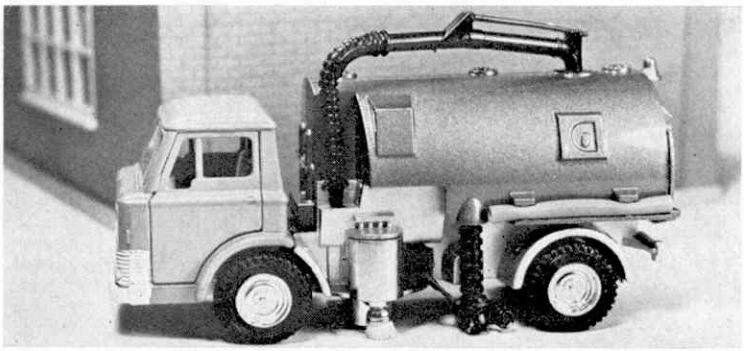
Below left, a close-up view of the top of the model with the upper Plates removed to show the ticket-roll layout. The tickets on our model were marked in "old" pence, but current tickets can be obtained from most good stationary suppliers. Below right, another view of the ticket issuing equipment, as seen from below. Note the two $1\frac{1}{4}$ in. Sprocket Wheels 44, mounted face to face, which actually push the tickets out.





TWO of the BEST

Latest Dinky Toy News from Frank Lomax



"PLAY-VALUE" is undoubtedly one of the most frequently-used phrases in the toy-making industry. It is not a phrase that I personally like, but, nonetheless, it is perfectly correct English and, when used with another phrase, it is certainly highly descriptive. Take the expression "packed with play-value", for example, and you not only have a phrase that tells a prospective toy-purchaser a great deal about his buy, you also have the perfect description for the latest two Dinky Toys to be released by Meccano Tri-ang at the time of writing! The models in question? —No. 451 Johnston Road Sweeper and No. 254 Police Patrol Range Rover.

Both these models, to my mind, are really excellent, both from the scale-modeller's point of view and, thanks to the high play-value, from the point of view of the great majority of people who buy toys to use as toys. Both are exact reproductions of the real-life vehicles on which they are based, which is what interests the scale modeller, and both have their fair share of working action features, which is what particularly appeals to toy buyers.

Dinky's Johnston Road Sweeper, with its solid, compact body, chock-full of interesting, detailed features is certainly, in my opinion, one of the best models of its kind on the market! The sturdy Ford D800 chassis is supported on large, heavy-duty tyres and the spacious cab, fitted with opening doors, windows, and realistic moulded interior, is neatly rounded off with jewelled headlamps and number plates up front.

These features, however, account for only a small proportion of the model's attributes. The really captivating items are yet to come! Mounted behind the cab, and representing the major part of the model, is a large, cylindrical water-cum-refuse tank fitted with a simulated swivelling suction pipe which, when not in use, is secured in a recess close to the body. A short length of removable extension pipe is also provided which fits tidily away on a small ledge running along the side of the tank. A smaller, stationary suction pump with an imitation vacuum cleaner attachment is also incorporated into the model, greatly adding to its authenticity.

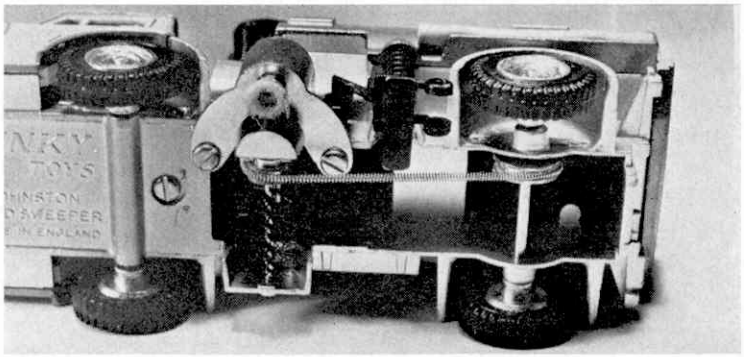
In real life, the approach of a Road Sweeper is usually heralded by the "swishing" sound of stiff, mechanical sweeping brushes scraping away at the road's surface in an attempt to remove the dirt beaten in by passing vehicles. A circular brush, vertically-mounted at the "nearside" of the main body, works at the gutters, while a cylindrically-shaped brush, mounted horizontally beneath the Sweeper, battles with the road surface. Believe it or not, these brushes are reproduced on the Dinky—and they really work, operated by means of a small pulley arrangement driven by the rear wheels. When the model is pushed along, the brushes sweep away the dust.

The cab is finished externally in an orange gloss with cream interior, while the tank is green, and the simulated suction pumps are in black plastic. Produced to a scale of 1:42 and with an overall length of 142 mm, the Johnson Road Sweeper is a really tremendous model and should capture a good deal of attention from a wide variety of collectors.

Police Patrol Car

Another recent Dinky Toy announcement from Meccano Tri-ang will be of particular interest to collectors of model police vehicles. A new Police Patrol Car is being introduced in the form of a specially-finished Range Rover, enamelled in a white gloss with bright-plated baseplate and radiator-grille and equipped with a "Police" sign, imitation blue light and radio aerial on the roof and an orange fluorescent stripe on the sides and back. Identified by Sales No. 254, this model will make a very handsome partner for the other police vehicles in the range, being based on a big, powerful, 4-wheel drive estate car as much at home across country as on paved roadways. What could be better for chasing the wanted criminal on the run!

As with the standard Dinky Range Rover and the Fire Chief's Range Rover, both introduced quite re-



Chock-full of interesting, detailed features, Dinky's Johnston Road Sweeper, Sales No. 451, should capture a good deal of attention from a wide variety of collectors.

cently, the new Police Patrol Range Rover is fitted with Speedwheels, opening bonnet covering a detailed engine, opening doors and an opening two-part tailgate. Windows are of course included, as well as a steering wheel and full, pale-blue seating, the backs of the front seats hingeing forwards. This year's number plates are carried at front and rear.

Most people are attracted by police vehicles and I honestly feel that no model Police Force, if it wants to stem the rising crime wave, can afford to be without this new Dinky!

Action Kit News

Police vehicle enthusiasts are certainly being treated favourably by Meccano Tri-ang this month. Apart from the Police Patrol Range Rover, the Liverpool toy factory has ex-

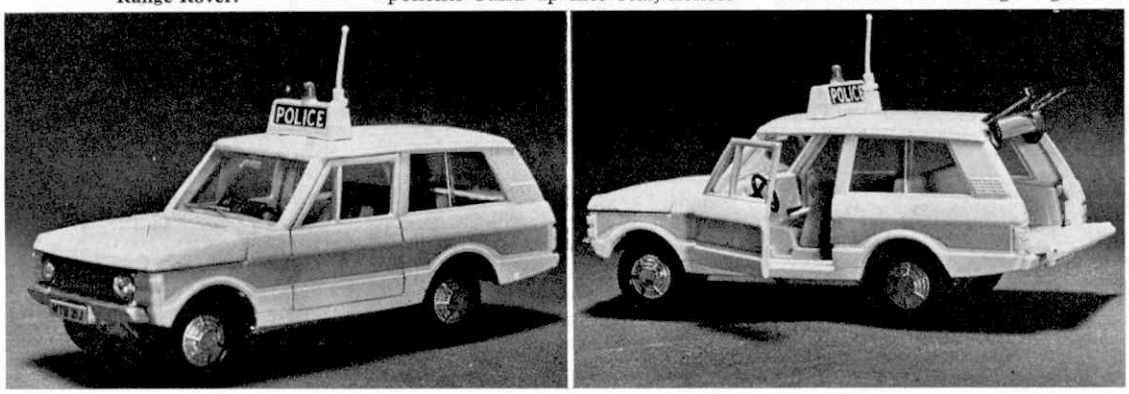
Dinky's new Police Patrol Range Rover, Sales No. 254—a 'must' for the Police vehicle connoisseur. In addition to its attractive finish it has all the working features of Dinky's standard Range Rover.

A treat for Police vehicle enthusiasts! The new Dinky Action Kit No. 1004, the Ford Escort Police Car.

panded its Dinky Action Kit range with the release of a Ford Escort Police Car No. 1004—a feature-packed model destined to attract a lot of attention from the Do-It-Yourself enthusiasts.

Contained in a transparent "blister" pack, all the components are in knock-down, unpainted form, finished to high standards, with the metal parts pre-bonderised in preparation for painting, and it comes complete with all the necessary wheels, axles, tyres, jewelled headlights, plus plastic interiors moulded in effective colours. Also, with this particular model, "Police" transfers and number plates are supplied making the completed model an authentic replica of the real crime-buster.

In my opinion, the main advantage of the Action Kits, apart from the pleasure of watching the components build up into real, honest-to-goodness Dinky Toys, is that *you* can decide upon the colours of the completed vehicles. So, with a little imagination and, of course, some extra paint, you can create your own unique Dinky Toys. In this case, for example, one could collect enough Ford Escort Police Car Action Kits for an individually-liveried model crime fighting force!



LAMP VEHICLE (*from page* 513)

on the outside of the Strip at each end.

Journalled in the forward corner holes of Semi-circular Plates 21 is a $3\frac{1}{2}$ in. Rod 32, carrying a Cord Anchoring Spring and held in place by Spring Clips spaced by Washers. Note that these Spring Clips are so positioned that they press against Fishplates 20 which in turn prevents the Spring Clips from turning when the Rod is turned, this arrangement thus serving as a first class brake for the Rod. A short length of Cord is attached to the Anchoring Spring and is wound several times round the Rod, its other end being tied to a $1\frac{1}{2}$ in. Rod 33 journalled in the free end holes of Strips 24, then a 2 in. Pulley 34, fitted with a $\frac{3}{8}$ in. Bolt, is fixed on the end of Rod 32 to serve as a handwheel. The unit thus far completed can now be mounted on the body by means of a $1\frac{1}{2}$ in. Rod fixed in the boss of the 3 in. Pulley, but revolving freely in the boss of 3 in. Pulley 7. One or more Washers should be mounted on the Rod between the bosses of the two Pulleys to allow Pulley 34 to clear the body when the snorkel is swivelled.

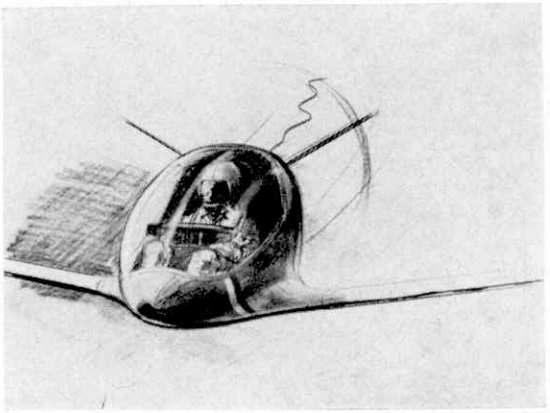
Snorkel Platform

Last of all, the snorkel platform can be built up and fixed in position. The platform itself consists of a $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flanged Plate, to the flanges of which two $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plates 35 are bolted. Attached by Obtuse Angle Brackets to these Plates is a $2\frac{1}{2} \times 2\frac{1}{2}$ in. Curved Plate, serving as the front of the Platform, with a safety bar at the back being supplied by a $3\frac{1}{2}$ in. Rod 36 held in place by Spring Clips. Two $2\frac{1}{2}$ in. Strips 37, connected by a $2\frac{1}{2}$ in. Double Angle Strip, are lock-nutted through the upper centre holes of Plates 35, the Double Angle Strip finally being bolted to the Double Bracket joining the forward ends of Strips 26. If required, the platform can be balanced to the correct attitude by additional Nuts and Bolts screwed to the Platform in appropriate positions.

PARTS REQUIRED

4—1	2—18a	1—52	2—190
6—2	2—19b	2—53a	2—191
2—3	1—20a	2—54	2—192
9—5	2—22	3—90a	1—200
3—10	2—24	5—111c	2—193a
1—11	8—35	2—125	2—194
1—11a	128—37a	2—126	2—194a
10—12	107—37b	2—126a	1—200
4—12c	11—38	1—176	2—214
2—15b	1—40	4—187	4—215
2—16	5—48a	2—188	4—221
2—17	1—51	2—189	

AIR NEWS



by John W. R. Taylor

Jim Bede's Micro

When Jim Bede named his latest aeroplane the "Micro" he was not kidding. Imagine the smallest possible fuselage that will house a man, flying controls, a small piston-engine and a fuel tank. Add a pair of tiny low-set wings, a Vee-tail, retractable tricycle undercarriage and a pusher propeller. That's the Micro, an aeroplane that weighs a mere 210 lb. empty and takes off at a maximum loaded weight of 450 lb., including the pilot, ten gallons of fuel and a little personal baggage.

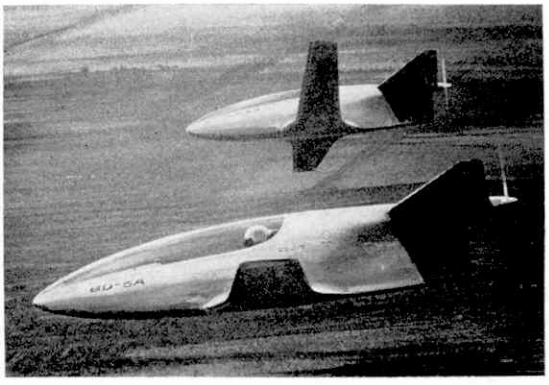
Nobody but Jim Bede would dare to design such a sporty little machine, and there will certainly not be much of a queue of test pilots eager to take it up for the first flight when the prototype is completed this year. Cradled in a seat of the kind fitted in high-performance sports cars, the pilot will feel as if he is wearing the aeroplane rather than controlling it normally. Yet that is what he will do, for despite its tiny size and unorthodox shape, the Micro is in most respects a fairly conventional aircraft. All its bits and pieces are in the "right places", except perhaps for the pusher propeller. Even that will not seem unusual for pilots accustomed to flying jets, as most of the smaller ones have their "push" in the tail.

Like Mr Bede's earlier designs, the Micro has a simple, ingenious structure. The fuselage consists of a glass-fibre shell around an aluminium framework; the wings are made of aluminium and are removable. Only the bare minimum of essential instruments will be fitted, as nobody would wish to fly this kind of aircraft in anything but fair weather. In any case, a larger panel would block the pilot's forward view, which promises to be quite outstanding as a result of making the whole top part of the front fuselage transparent.

The ailerons and elevators, which also serve as rudders, are supplemented by split flaps and specially-designed spoilers. To save weight and avoid complications, the undercarriage is retracted manually by the pilot after take-off, by means of a small lever in the cockpit. Tall pilots will have no problem getting into the cabin, and the rudder pedals are so designed that they can be operated by anyone from a real "shortie" to a 6 ft. 6 in. "giant". Provided, of course, that the latter is not wide as well as tall, because the maximum permissible weight for the pilot is 16½ stone!

Length of the BD-5A version of the Micro is 13 ft. 3 in. and wing span 13 ft. 5 in. It is powered by a 32 h.p. air-cooled twin-cylinder two-stroke engine, driving the propeller through belts and a manual clutch which enables the pilot to disengage the engine and allow the prop to "free-wheel".

Bearing in mind that the engine is less than half as powerful as that fitted in the average family car, it is staggering to learn that the Micro is expected to have a maximum speed of 215 m.p.h. and be able to cruise up to



The Granger Archaeopteryx pictured at Old Warden (Photo by Air Portraits)

650 miles at 205 m.p.h. on those ten gallons of petrol. Take-off and landing distances are estimated to be no more than 450 ft. and stalling speed should be a gentle 57 m.p.h. with flaps down.

Clearly, despite its appearance, Jim Bede does not intend the Micro to be difficult to fly, or expensive. There are not many cars that offer 65 miles to the gallon of fuel, and he plans to make available complete assembly drawings, kits of materials, engine, propeller and instruments, so that anyone can build a Micro at home for around £750. Would-be pilots who consider the BD-5A a trifle "hot" can go for the BD-5B with wing span extended to 19 ft. 6 in. and a 28 h.p. engine, giving a top speed of 180 m.p.h. On the other hand, the venturesome can fit a 70 h.p. engine to the BD-5A and fly at 270 m.p.h.

Spaceman Puts the Clock Back

About two years ago, in July 1969, U.S. astronaut Neil Armstrong became the first man on the Moon. Before he went there he had been a test pilot with the National Aeronautics and Space Administration, and had flown many of the fastest aeroplanes ever built. But he had never had an opportunity to sample one of the slowest, and oldest, still in existence until he paid a visit to the famous Shuttleworth Collection of historical aeroplanes at Old Warden, Bedfordshire, during a recent visit to England.

After inspecting treasures like the Comet racer which won the great England–Australia Air Race in 1934, a still-flyable Blériot monoplane of 1909, fighters of both World Wars and some of the *Magnificent Men* replicas, Mr Armstrong came to the collection's Avro 504K biplane. No aeroplane in history is more justly famous, or ever performed greater service as a trainer. Within minutes, the spaceman was dressed in overalls, helmet and goggles, enjoying some *real* flying in the 504K, with Air Cdre. Allen Wheeler, Aviation Trustee of the Shuttleworth Collection, in the rear cockpit. From 25,000 m.p.h. in space to 80 m.p.h. in the Avro must have made quite a change.

What's an Archaeopteryx?

Most people know what pterodactyls were, and why some of the tailless aeroplanes built in Britain in the 'twenties and 'thirties were named after them. But what was an archaeopteryx? The answer is the oldest known kind of bird, whose fossil remains have been found near Solnhofen in Bavaria. Unlike pterodactyls, which were reptiles with membrane wings, the archaeopteryx had feathered wings and a long birdlike tail. So, when two brothers named R. F. T. and R. J. T. Granger built a small single-seat aeroplane at Attenborough, Notts, in the late 'twenties, with a pterodactyl-type wing but retaining a normal fin and rudder, they decided to call it Archaeopteryx.

Registered G-ABXL and powered by a 32 h.p. Bristol Cherub engine, the aircraft flew for the first time at Hucknall in October 1930 and performed so well that it became a familiar sight at air displays. The control surfaces at the tips of its 27 ft. 6 in. sweptback wings operated together to replace the usual elevators, and differentially as ailerons. Maximum speed proved to be 95 m.p.h. and cruising speed 75 m.p.h.

Main problem encountered with the Archaeopteryx in those pre-war days was that the engine sometimes proved rough or unreliable. It still does, as the Shuttleworth people discovered when they rebuilt the little aircraft and flew it for the (second) "first time" on May 19 this year. As the photograph on this page was taken at a subsequent Shuttleworth display, such minor troubles are clearly not preventing the Archaeopteryx from again showing its paces after more than 30 years of storage.

Echelon Five

Back in the 'thirties the U.S. Army and Navy loved to publish photographs of their racy-looking fighter biplanes flying in tight formation. Such pictures are less familiar in a jet age, so it brought back exciting memories when the accompanying photograph of part of U.S. Navy Attack Squadron 25 arrived in my post.

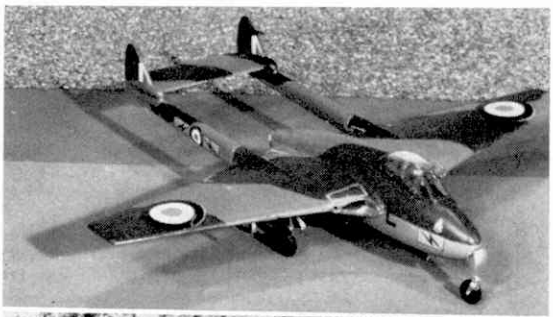
Taken by Lt. J. D. Bell of VA-25, it shows five Vought A-7E Corsair IIs putting in some final carefree formation practice near their base at Naval Air Station Lemoore, California, before deploying overseas to Vietnam. The closeness and immaculate alignment of the formation pays silent tribute to the handling qualities of these formidable attack aircraft, which have Rolls-Royce Spey turbofan engines built by Allison in the States.

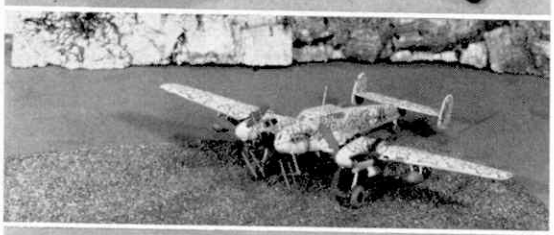
Superb formation flying by A-7E Corsair II aircraft from Attack Squadron 25 of the Naval Air Station Lemoore in California.

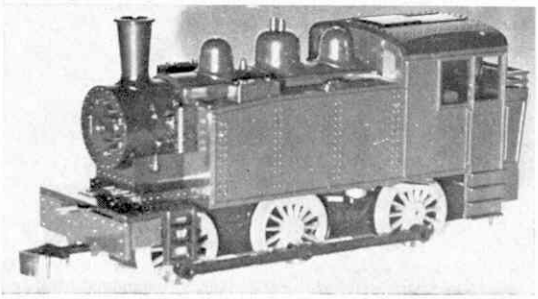
Have You Seen?

THREE new aircraft kits from Frog are the de Havilland Vampire FB Mk. 5 or Mk. 50, the Messerschmitt Bf 110G and the McDonnell Douglas A-4 Skyhawk, all of which are in 1/72nd scale. The de Havilland Vampire can be built as either an FB. Mk. 5 or FB Mk. 50 version. One or two of the pieces fit rather poorly and the surface detail is practically non-existent, but on the other hand the transfers are excellent, as is the artwork on the back of the instructions. The instructions are in the usual multi-lingual symbols and the plane can be finished in colours for either No. 502 Sqn. Royal Auxiliary Air Force based at R.A.F. Aldergrove, N. Ireland, or the 3rd Sqn. of the F15 (Fighter) Wing Royal Swedish Air Force.

The Messerschmitt Bf 110G and the McDonnell Douglas A-4 Skyhawk suffer from the same shortcomings as the Vampire, these being a lack of detail on the surface and some rather badly fitting parts. The Me 110G can be built as either a night-fighter of NUG4 or as a daylight operational aircraft from Nachtjagdgeshwader 200 serving on the Russian Front in 1944. The Skyhawk can be built as an A-4H of the Israeli Air Force or an A-4K of 75 Sqn. Royal New Zealand Air Force. All three of these are fairly accurate when completed and are moulded in a grey plastic. The prices are as follows: de Havilland Vampire 20p, Messerschmitt 110G 37p, and the A-4 Skyhawk 47p.







Also new from Rovex-Tri-ang Limited is a battery powered steam type 0-6-0 locomotive RV262 in the Big-Big Train series. The engine is powered by four HP.11 or C batteries and the controls consist of two levers, one either side, which are for stopping and starting and forward and reverse. The locomotive sells at a price of £2.65p.

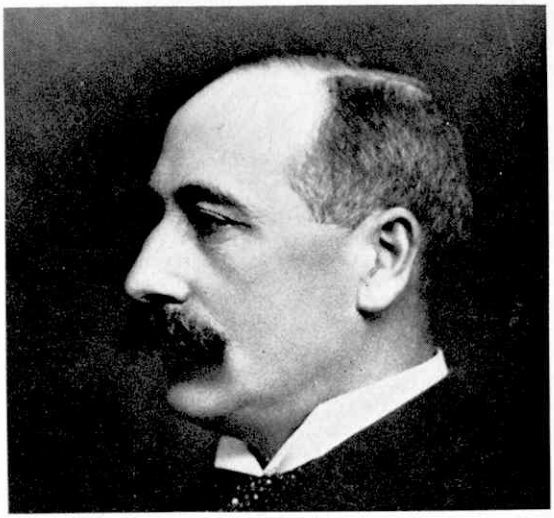
Mainstream/Power Play Productions Limited, based at Hallam Street, Cheshire, have brought out a follow-up to their PP1 Hovercar, the PP2. The propeller is driven by an electric motor running off two HP pencell batteries, controlled by an on-off switch under the body shell. The body is moulded in expanded Polystyrene which produces a very light model, strong enough for normal handling. At a price of £1.30 this might be a rather expensive plaything for a child, but operation is quite good fun and if movable stabilisers were fitted to control it, it would help.

The latest ¼ scale bike from Revell is the Kawasaki Drag Bike Mach 111 (U.K. price £3.20). The kit is of the usual Revell standard, but the beginner must have a certain knowledge of bikes. The kit need not be painted as it comes in the correct colours, including chrome parts.

George Jackson Churchward

One of the best-known of all the Great Western Railway's engineers and the man responsible for many of the unique features of what was probably the most controversial of all the 'Big Four' Railways in the hey-day of steam locomotives

by RICHARD ANGOVE



STORIES of the Great Western have a particular appeal to the railway enthusiast. The mere mention of it projects to his mind a King or Castle, white exhaust blasting from its copper-rimmed chimney, speeding westwards.

In addition to Paddington they set out from Liverpool and Birkenhead, Shrewsbury and Wolverhampton, carrying long destination boards stretching almost the length of their chocolate and cream liveried carriages, which, to the returning exile, displayed the magic words, "Wolverhampton – Birmingham – Bristol – Plymouth and Penzance".

They sped through the Staffordshire countryside, the wooded vales of Herefordshire and steamed in the shadow of the Wrekin through historic Shropshire, bound, as always, for the west country.

Isambard Kingdom Brunel

Headed by Isambard Kingdom Brunel, the G.W.R., in addition to its many other unique features, must surely have been the railway with the most impressive list of colourfully-named administrators.

Thousands of middle-aged railway enthusiasts still remember "Felix J. C. Pole" footing the company's notices throughout the system which, in those days, was synonymous with speed and safety.

The early adoption of electrically-operated automatic train control in the early 1920s made possible the subsequent proud claim that some of their named expresses were the fastest then running, as indeed they were.

To complete the 77 miles from Swindon to London in the scheduled 67 minutes necessitated exceeding 90 mph. This was regularly done in the 1930s and, as part of the Cheltenham Flyer's daily run, stood for many years as the unchallenged fastest start-to-stop run on any railway.

George Jackson Churchward is another famous name; it was he who contributed substantially to the establishment of that well-remembered G.W.R. locomotive outline.

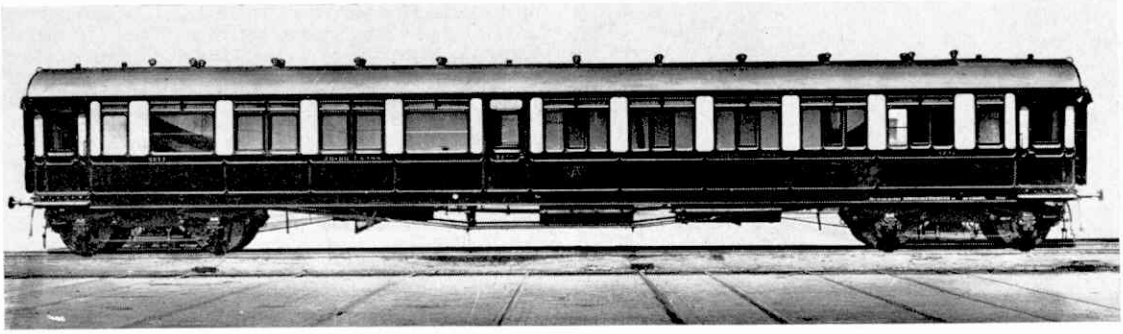
Even before succeeding William Dean as chief mechanical engineer in 1902 he was closely involved in locomotive development in charge of the drawing office, and his first 4-6-0 engines appeared soon after.

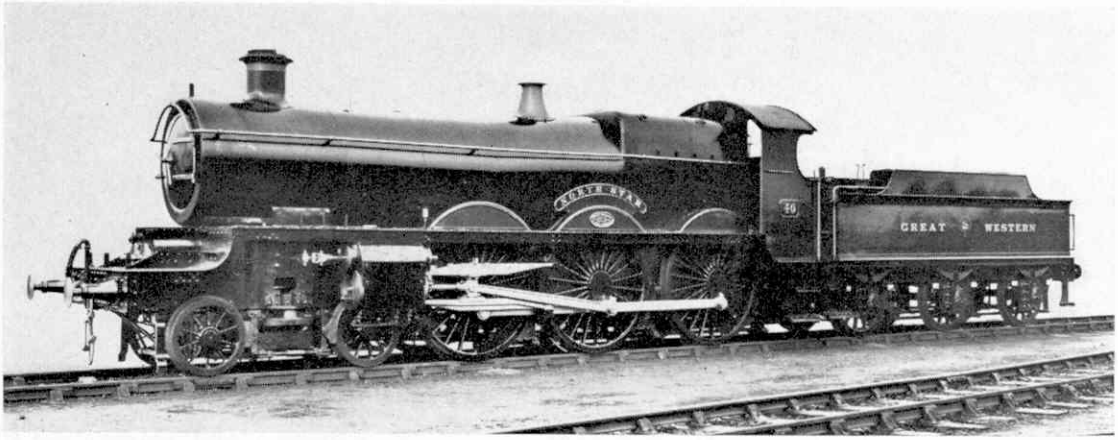
Perhaps because of their romantic nature, railway lovers, especially steam enthusiasts, regarded these Swindon-built engines as something special, especially those living on the Great Western and associated lines where they seemed to be an integral part of daily life.

There was a look of powerful grace and dignity about them, and the impressive exhaust blast which followed that silent creep forward as they strained on their drawbar to start a heavy express left no mistake in anyone's mind that here was power, power with character, power with a personality, power you could see and hear.

Diesel supporters will defend their complex and expensive assembly of technical gadgetry radiating a rattling cacophony from within its tinny carcass. Maybe it is theoretically more efficient, even more powerful, but, as the popular advertising caption says, "It does not show." Steam locomotives demonstrated their power daily by blasting their way through the greenery of our undulating countryside. Maintained to perfection, these majestic machines epitomised everything the steam-lover idolised.

Below, a Dreadnought coach of 1905, a type which created tremendous interest.





With a name like Churchward, where better to start this short sketch of his life than at the picturesque anglican sanctuary of Stoke Gabriel on the wooded banks of the Dart? Here can be found records of Churchwards dating from the 15th century.

An inscribed window refers to their yeoman-seat of Hill Farm, home of the family until recent years. The name appears frequently in the notes on the church. Four of the six bells carry it and a tower clock and other improvements have been donated by the family there throughout the ages.

Technical Aptitude

Born at Stoke Gabriel in the mid-19th century, George was educated at the Totnes Grammar School, from which, at the age of 16, he joined the South Devon Railway as a probationer-engineer and started work at the Newton Abbot sheds.

He obviously showed great technical aptitude for almost immediately following the absorption of the South Devon by the G.W.R. in 1876, he was transferred to Swindon's drawing office. Rapid promotion followed and by the end of the 1880s he was Dean's chief assistant.

From these early days, signs of his engineering genius began to emerge and, as a direct result, Great Western locomotives retained many of his innovations until Dieselisation.

These technical achievements, which are beyond the scope of this article, are covered in many other published works, but it is relevant to mention here that his influence extended to almost every sphere of Swindon's activities.

He caused a sensation with the introduction of "70-footer" coaches, the longest ever used in Britain. The G.W.R's advantage, inherited from its original broad-gauge planning, facilitated their practicability. Excessive overlap on curves prevented their general adoption by other companies. Here was an improved type of rolling stock giving the G.W.R. improved prestige over the others which, in their great advertising campaigns of the 1920s–30s, they exploited to the full.

Colour classification to indicate locomotive weights permitted over certain routes, better springing, braking and lubrication for all types of stock were only a few of the improvements adopted during his period of office as chief mechanical engineer, a post which he held until his retirement in 1921.

First Mayor

A sense of discipline and strength of character seem to be the personal features most remembered by his contemporaries. One ex-colleague remarked that he was outspoken to directors and staff alike. Known by all ranks at Swindon, he would visit various offices and workshops and discuss problems with the "men on the job".

Despite his bachelor existence and unusual devotion to duty, he found time for social activities and public work, and when the "old" and "new" towns of Swindon were combined in 1900 he was elected first Mayor of the newly-formed borough.

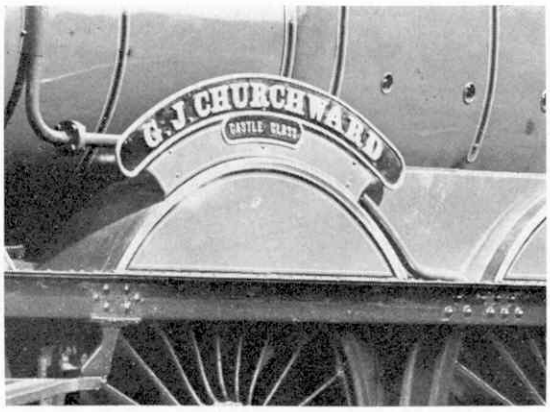
He was a keen gardener and, although he moved from Devon at an early age, he never lost his youthful interest in the traditional country sports and pastimes.

He retired to a house near the great Swindon works and was tragically killed by a train on a foggy day in 1933. A four-cylinder "Castle" class locomotive was named after him in 1948.

Standing beneath a Pullman coach, almost in the centre of the Transport Museum at Clapham, the nameplate of that locomotive can still be seen, appropriately near that of "North Star".

"North Star", originally designed as a 4-4-2 in 1906, was one of his first engines. It was converted to a 4-6-0 in 1909 and a Castle class in 1920. It retained its original frame which, by the time it ended its working life in 1957, had covered 2,110,396 miles.

These facts, recorded on a plaque accompanying the nameplate, are a fitting tribute to Churchward.



Above, 'Star' Class locomotive 'North Star' after conversion to 4-6-0 but prior to renumbering 4000. Right, nameplate from 7017.

LAMP INSPECTION VEHICLE

'Spanner' describes an interesting model designed and built by M.M. reader Brian Turpin

NOBODY living in a town or city these days could fail to notice how much the street lighting systems of this country have improved in recent years. The comparatively sparse, rather feeble lights of a few years ago have now given way in most places to veritable forests of modern, high-density lights which go a long way towards turning night into day!

As street lamps have improved however, so also have the inspection vehicles used to service and repair them. The once common sight of a wagon apparently loaded with a pile of rickety scaffolding is now disappearing, to be replaced by the far more versatile and efficient "snorkel"—a vehicle with a pivoted platform on the end of a hydraulically-controlled, jointed arm which can be rapidly raised and lowered throughout a wide area of operations.

Snorkel-type lamp inspection vehicles are quite fascinating to watch and, for this reason, I am particularly pleased to feature here a Meccano model based on such a vehicle. Designed and built by Mr. Brian Turpin of Hove, Sussex, from the contents of a No. 5 Meccano Set plus extra Nuts and Bolts, it makes a very interesting model which will give hours of enjoyment.

Chassis and Main Body

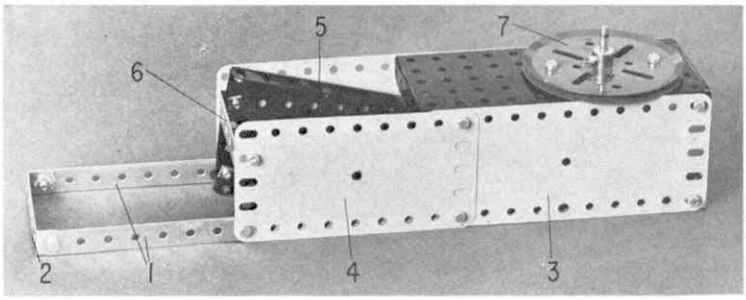
The chassis consists of two 12½ in. Strips 1 connected at each end by a 2½ × ½ in. Double Angle Strip 2, the Bolts securing the rear Double Angle Strip also helping to fix a 5½ × 2½ in. Flexible Plate 3 in place at each side. This Plate is extended 7 holes forward by a 4½ × 2½ in. Flexible Plate 4, the securing Bolts in this case holding a Flanged Sector Plate 5 in place at each side. This Sector Plate is arranged with its wider end facing forward and one side level with Strip 1, then the Plates at each side are connected by another 2½ × ½ in. Double Angle Strip 6, as shown. Note that the lugs of the Double Angle Strip are positioned between the Flanged Sector Plates and the Flexible Plates.

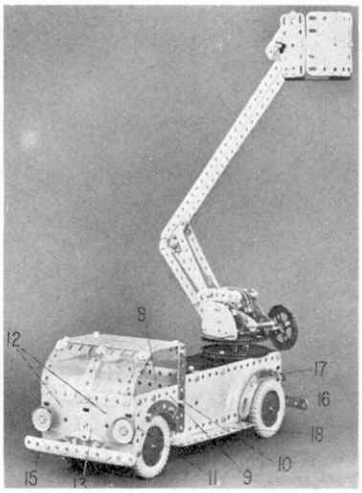
Now fixed to the upper edges of Flexible Plates 3 and 4 is a 5½ × 2½ in. Flanged Plate, to the top of which a 3 in. Pulley 7, boss uppermost, is bolted. The hole in the boss of the Pulley coincides with the centre 4th hole from the rear of the Flanged Plate.

Drivers Cab

Leaving the rest of the body until later, the cab is next built up from a 4½ × 2½ in. Flat Plate 8, to which two overlapping 2½ × 1½ in. Transparent Plastic Plates are bolted to form the rear windows. Attached to each end of the Flat Plate by a centrally-positioned Angle Bracket is a 2½ × 1½ in. Triangular Flexible Plate 9, overlaid by a 3½ in. Strip 10. Plate 9 is extended forward by another 2½ × 1½ in. Triangular Flexible Plate 11, longer side vertical, the two Plates being further connected by a 2½ in. Stepped Curved Strip, as shown.

The cab thus far built is secured at this stage to Double Angle Strip 6, then the front is added. This consists of a windscreen, supplied by two overlapping 2½ × 2½ in. Transparent Plastic Plates, bolted to two overlapping 2½ × 2½ in. Flexible Plates 12, the slotted holes of the former being at the top and bottom, and the slotted holes of the latter being at the sides. The lower edges of the Flexible Plates are secured to forward Double Angle Strip 2, the securing Bolts also holding a 2½ in. Stepped Curved Strip 13 and two ½ in. Reversed Angle Brackets in place. A 5½ in. Strip 14 is bolted to the front lugs of these Reversed Angle Brackets to serve as a bumper, while a Fishplate, overlapping the Curved Strip, is bolted to the centre of the Flexible Plates to complete the radiator-grille. Two 1 in. Pulleys are secured by ⅜ in. Bolts to the centre outside edges of the Flexible Plate to represent headlamps, the lower corners of the Plates then being attached by Angle Brackets to the lower corners of Triangular Flexible Plates 11. The upper corners of the Plates are also attached to each other by further Angle Brackets, then the roof is added, this being supplied by a 4½ × 2½ in. Flat Plate attached to Strips 10 by Angle Brackets and to the windscreen by Obtuse Angle Brackets.

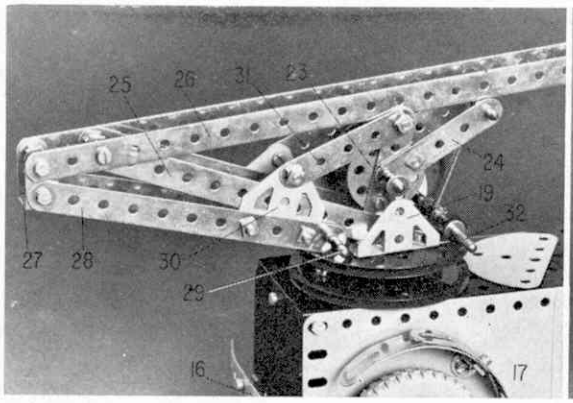


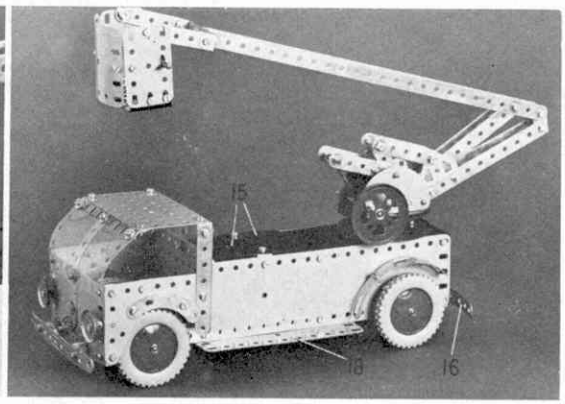


Body Finishing

At this stage the body can be completed. The top centres of Flexible Plates 4 at each side are connected by a 2½ × ½ in. Double Angle Strip, to the top of which two overlapping 2½ × 2½ in. Plastic Plates 15 are bolted, effectively enclosing the top of the body. At the back of the body two 2½ × 1½ in. Plastic Plates are secured between the rear flange of the 5½ × 2½ in. Flanged Plate and rear Double Angle Strip 2. Note, however, that the Plates are fixed to the Double Angle Strip by Nuts locked on ⅜ in. Bolts on which a 5½ in. Strip 16 is also held by Nuts away from the body to serve as the rear bumper. The ends of both the rear and front bumpers are of course curved slightly to increase realism.

Built with a No. 5 Meccano Set, plus extra Nuts and Bolts, this Lamp Inspection Vehicle was designed and produced by Mr. Brian Turpin of Hove, Sussex.





Two rear mudguards are each supplied by two overlapping Formed Slotted Strips 17 attached to an Angle Bracket secured through the centre hole in Flexible Plate 3. If, however, the older type of Plate without the central hole is used, the Formed Strips can be attached to Angle Brackets bolted to the edges of the Plate. A running board at each side is provided by a $5\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plate 18 bolted to the lower flange of Flanged Sector Plate 5, the rear Bolt at each side also holding a $2\frac{1}{2}$ in. Strip as a cross-strut. Finally, the wheels are supplied by $2\frac{1}{2}$ in. Road Wheels fixed on 4 in. Rods journalled in the chassis.

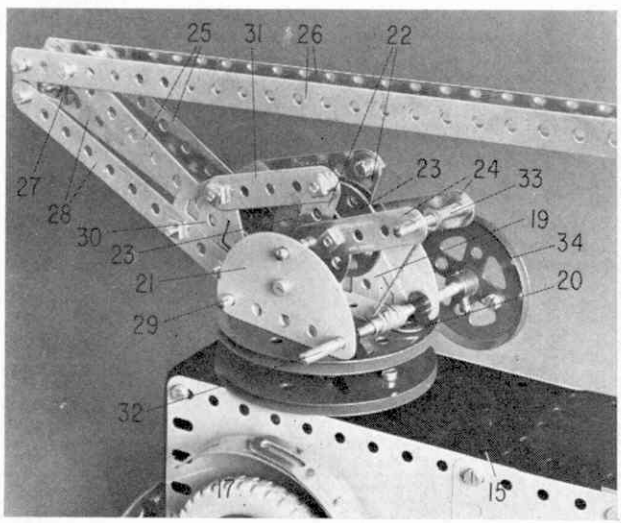
Turntable and Main Bearing

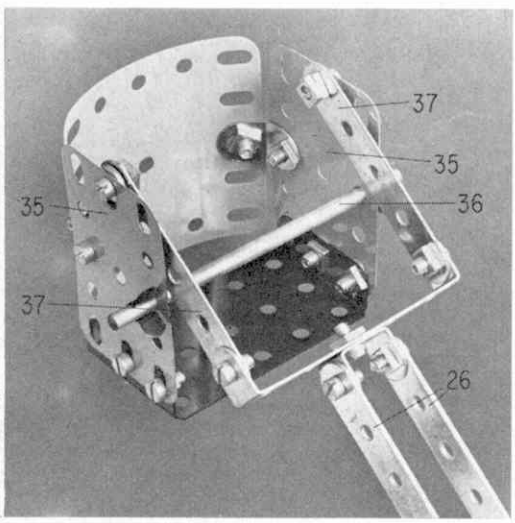
Coming to the turntable, two Trunnions 19, flanges towards each other, are fixed to a 3 in. Pulley, the boss of which points downwards. One securing Bolt in each case also holds a Fishplate 20 through its slotted hole, the Fishplate extending towards the Pulley rim, then a Semi-circular Plate 21 is secured through its centre hole to the vertical flange of each Trunnion.

Next, two $2\frac{1}{2}$ in. Strips 22 are each fixed by one Bolt to two 8-hole Bush Wheels 23, the centre holes of the Strips coinciding with the centre holes of the Bush Wheels, then the Bush Wheels are centrally mounted, with bosses together, on a 2 in. Rod. Two further $2\frac{1}{2}$ in. Strips 24 are mounted with their end holes on the Rod, each of these Strips also being secured by one Bolt to the appropriate Bush Wheel. Note, however, that an *extra* Nut is carried on the Bolt as a spacer between the Strip and the Bush Wheel and note also that the Bolt is head innermost, with its shank passing through the hole in the Bush Wheel nearest to Strip 22 on the Fishplate side. The 2 in. Rod is held by Spring Clips and Washers in the top holes of Semi-circular Plates 21.

Lock-nutted to the lower end holes of Strips 22 on the sides away from the Bush Wheels are two $5\frac{1}{2}$ in. Strips 25, the other ends of which are lock-nutted through the third holes of two $12\frac{1}{2}$ in. Strips 26, the $5\frac{1}{2}$ in. Strips on the inside. The upper ends of these $12\frac{1}{2}$ in. Strips are connected together by a Double Bracket, while lock-nutted to the lower ends is a $1 \times \frac{1}{2}$ in. Double Bracket 27. Tightly fixed to the remaining holes in the lugs of this Double Bracket are two more $5\frac{1}{2}$ in. Strips 28, the lower end holes in these Strips serving as journals for a 2 in. Rod 29 held in place by Spring Clips, the ends of the Rod also passing through the rear end holes in Semi-circular Plates 21. Bolted to each Strip through its second and fourth hole is a Flat Trunnion 30, a $2\frac{1}{2}$ in. Strip 31 being lock-nutted between the apex hole of this Trunnion and the upper end of nearby Strip 22. In the latter case the locking Nuts must be positioned

(*Please turn to page* 506)





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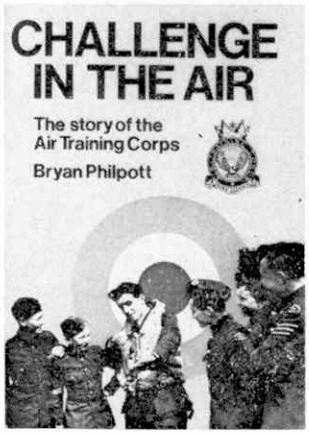

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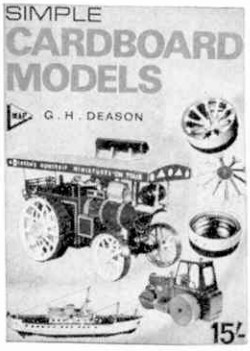

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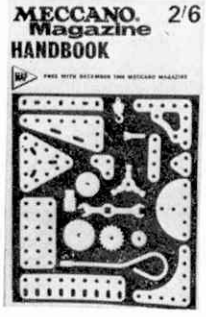

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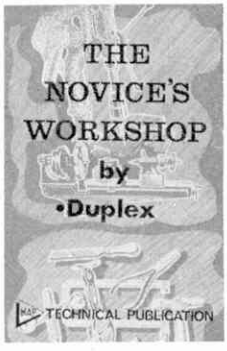

This work, which originally appeared as a series of articles in *Model Engineer*, is designed to assist and instruct the newcomer to the craft in the all-important matters of planning and layout of the home workshop, the selection of hand-tools, their correct use; and, finally, shows the reader how to apply his newly-developed skill to the making of additional items for his workshop. The book then goes on to deal with the selection, installation, maintenance, and practical uses of machine tools. Primarily for beginners this is a book which even the most experienced worker will find abounding in useful hints and tips.

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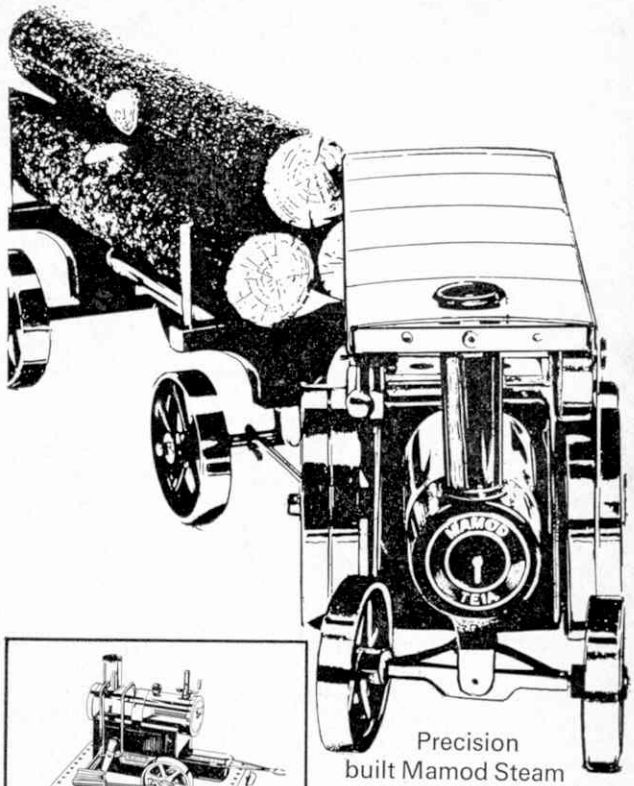

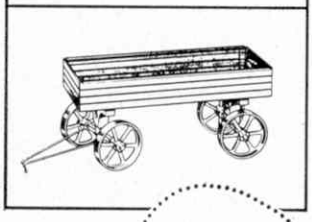

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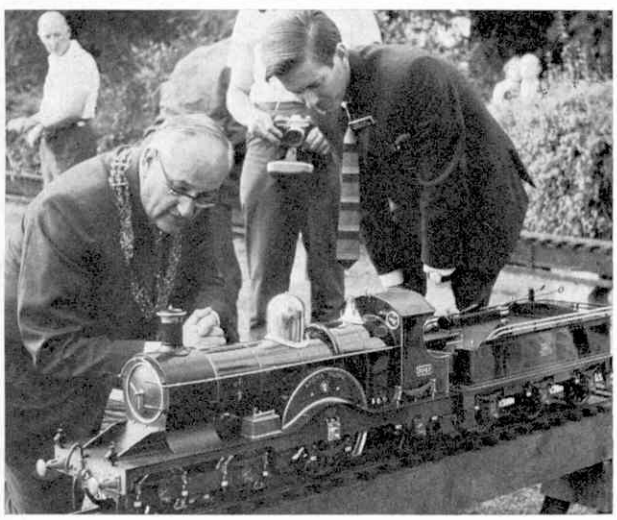

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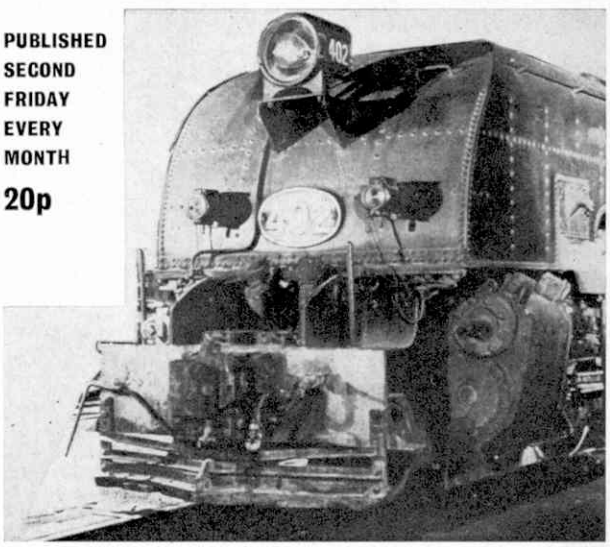

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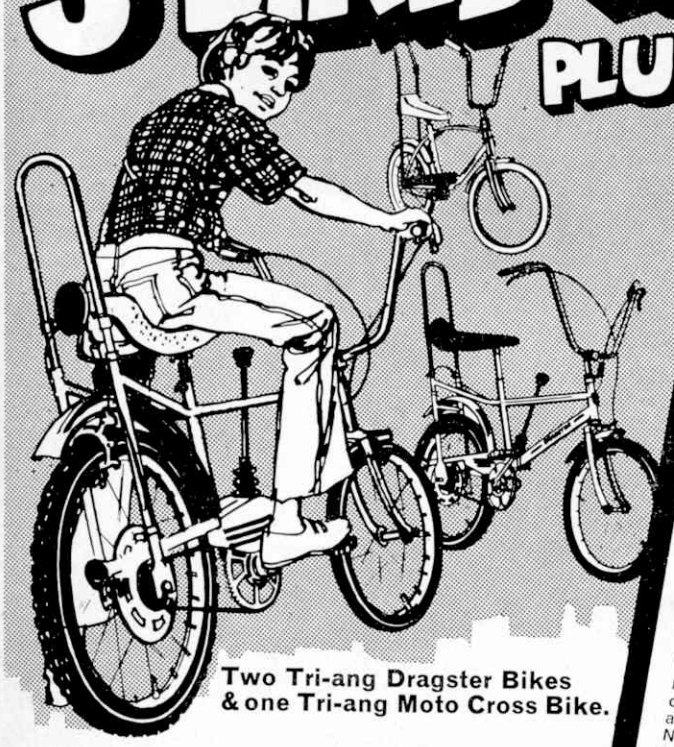

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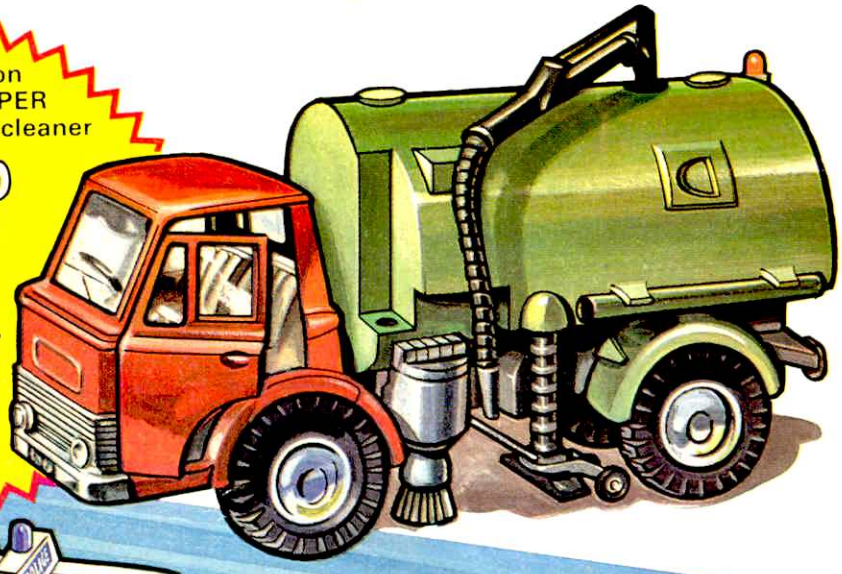

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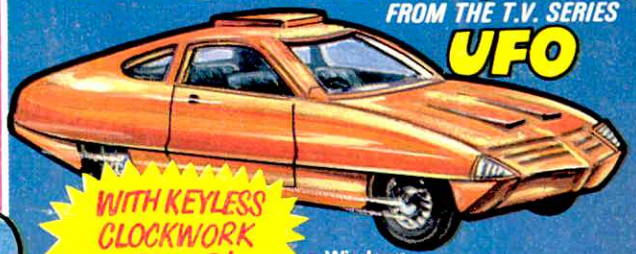

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