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AUGUST 1970

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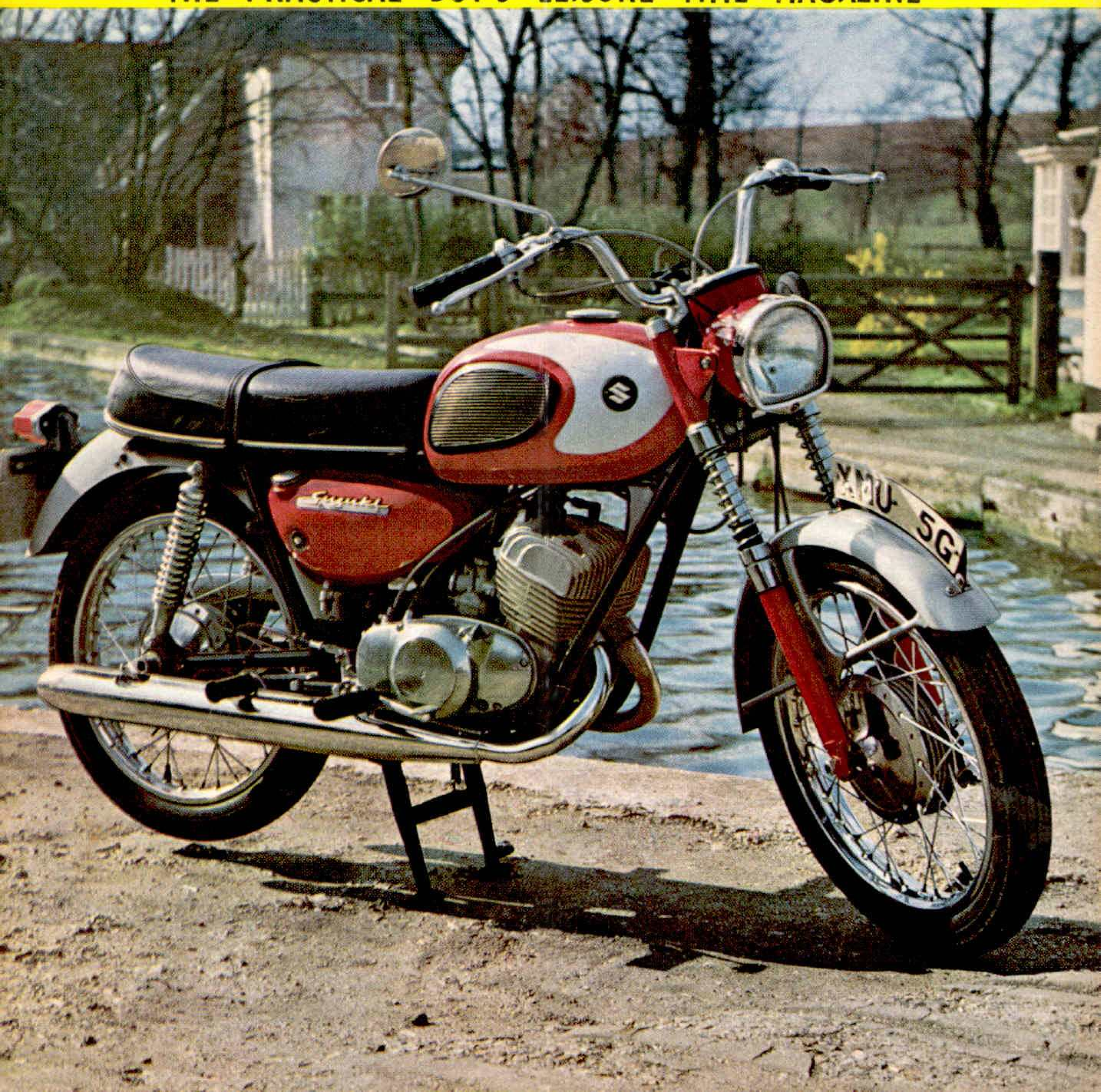

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AUGUST 1970 VOLUME 55 NUMBER 8

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FRONT COVER

Our subject on the cover of this month's issue is of the last motorcycle to be reviewed in the present "On Two Wheels" series. It's by far the fastest machine we've tested to date with a top speed of almost 90 miles per hour, and its full title is the *Suzuki T200 X-5 Invader*, an impressive title for a very impressive bike. Full details and additional photo's appear on page 442.

NEXT MONTH

Late last year a group of young students set off on a fantastic adventure in an old Land-Rover to cross the Sahara Desert. A member of the expedition describes both the fun and inevitable set-backs they encountered in a feature written especially for Meccano readers, entitled "Across the Sahara".

Still on an adventurous theme, although of a rather different nature, we present an interesting article describing the "Tall Ships" race which starts from Plymouth at the end of July, when a collection of tall-masted sailing ships will set sail for Tenerife.

Also in the issue will appear the third and final feature in the popular series, "A Short History of Tank Development", and in a similar vein. "Battle" and "Militaria".

Also included are all the regulars such as "Air News", "Great Engineers" and Stamps, plus of course a comprehensive selection on Meccano features.

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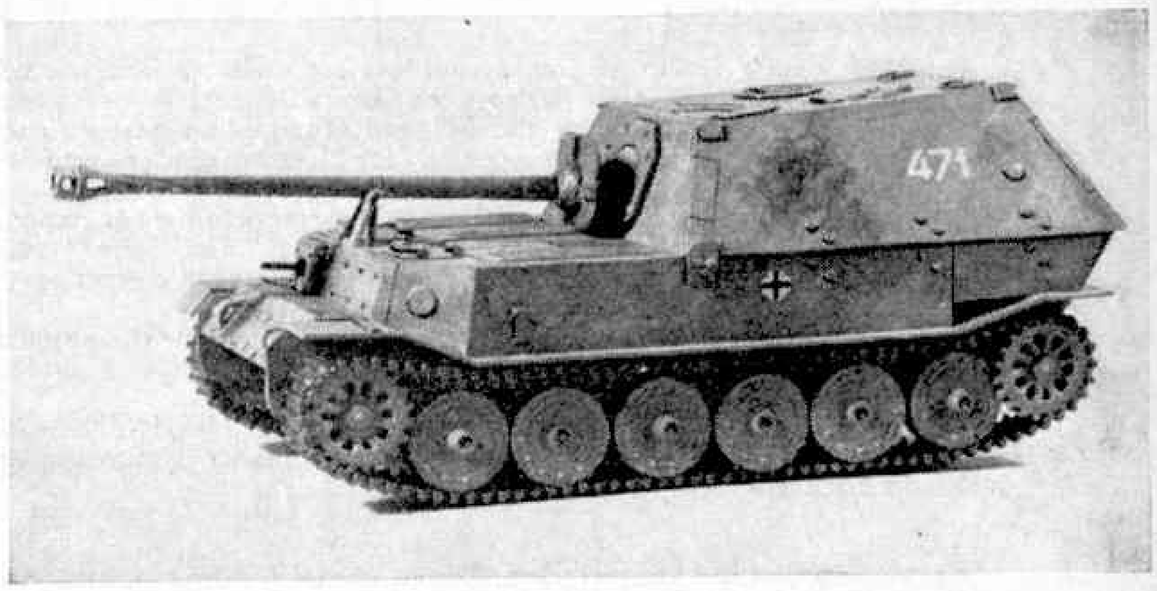

Armoured Fighting Vehicle modelling in plastic card is introduced with a Porsche 'Elefant' to 1/76th scale. Made from flat sheet patterns, reproduced full size in SCALE MODELS the *Panzerjager Tiger* forms an easy introduction to this developing model technique. Waterline ship models in detail; the famous Breguet XIV biplane drawn in 1/72nd scale superplans with loads of extra photo-gen; Model Soldier making described by the National expert Peter Wilcox, and reviews of latest books, kits and accessories form the main features of August issue. Supporting items are on military markings plus new decalomania for authentic model decor.

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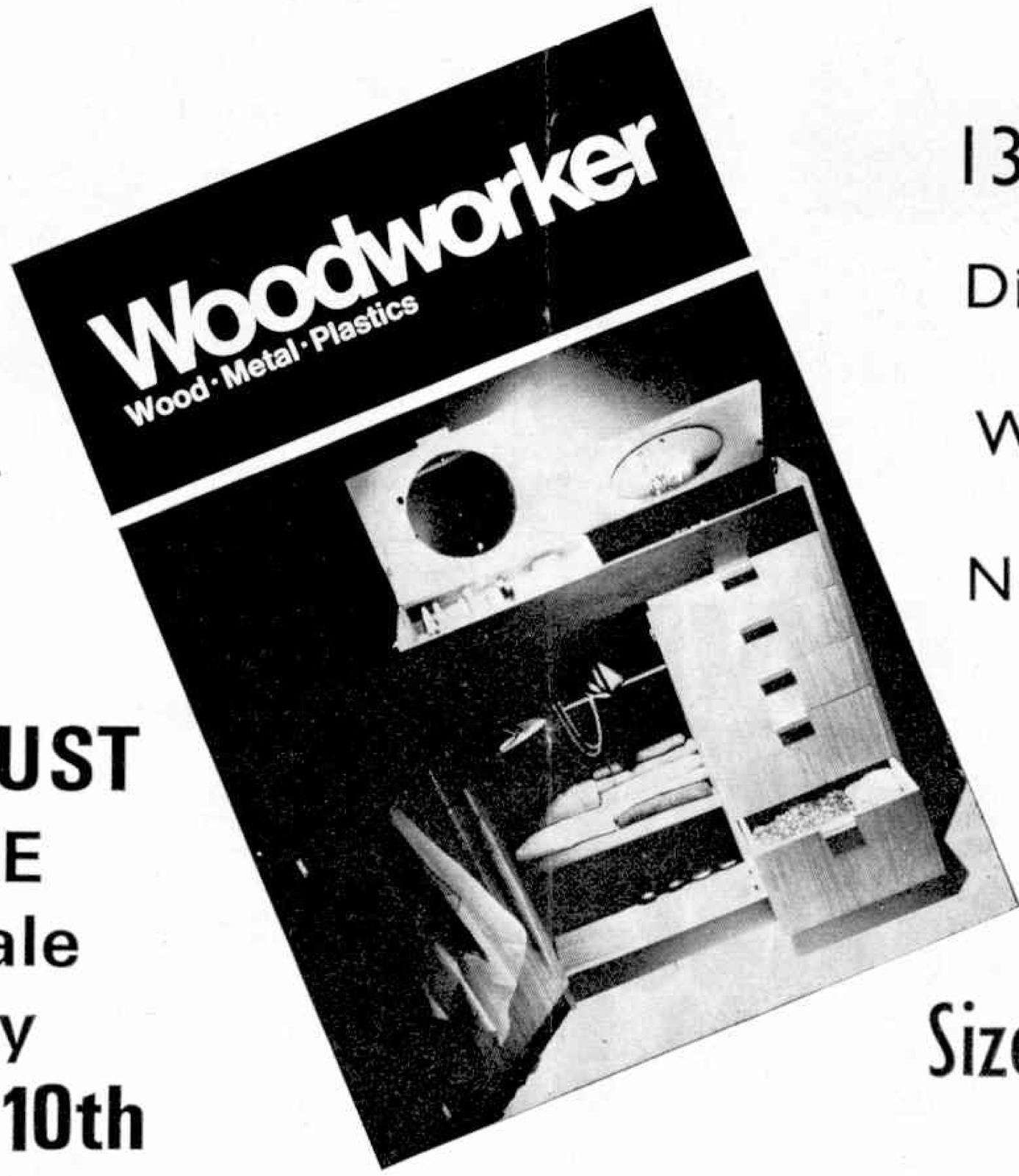

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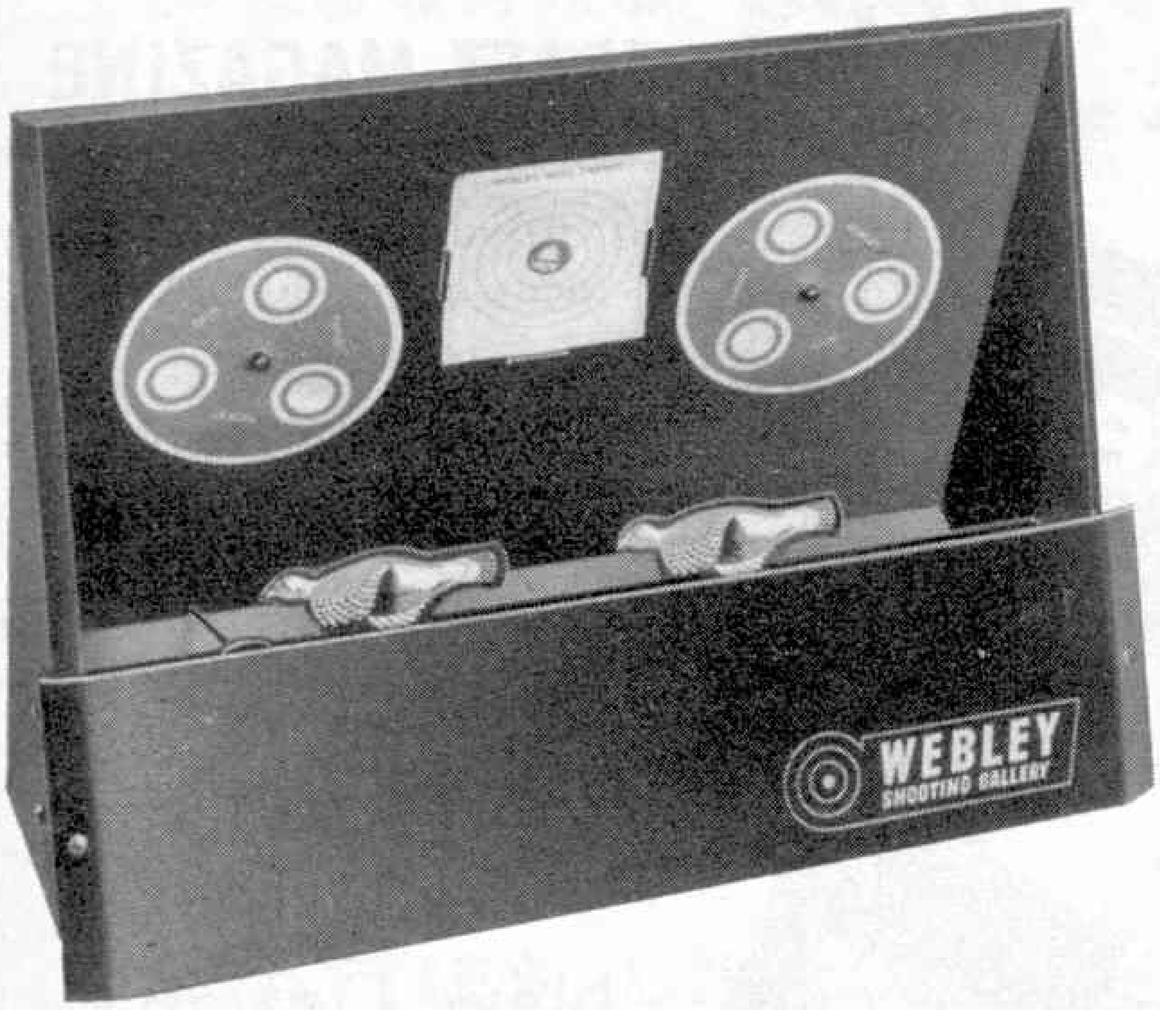

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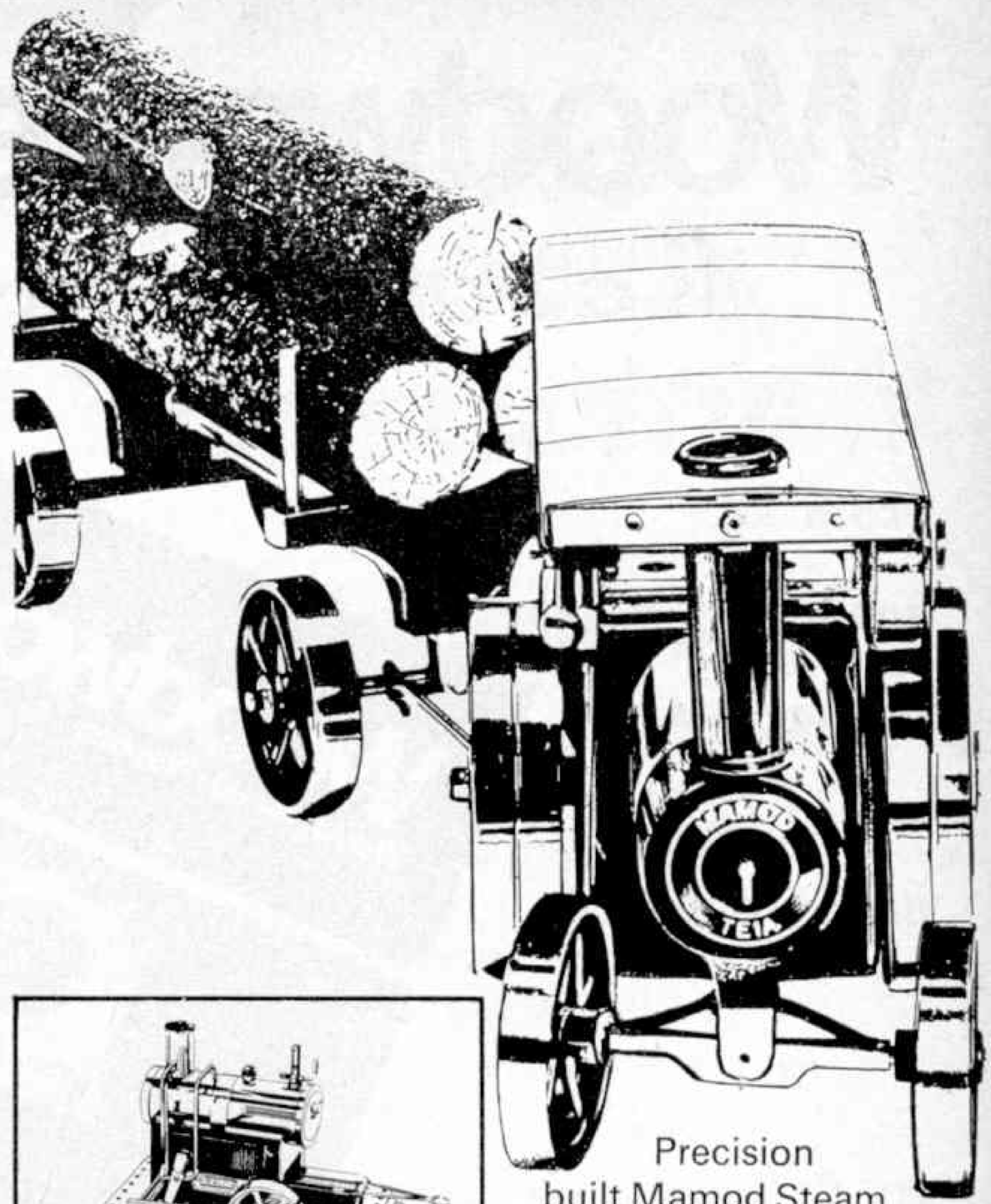

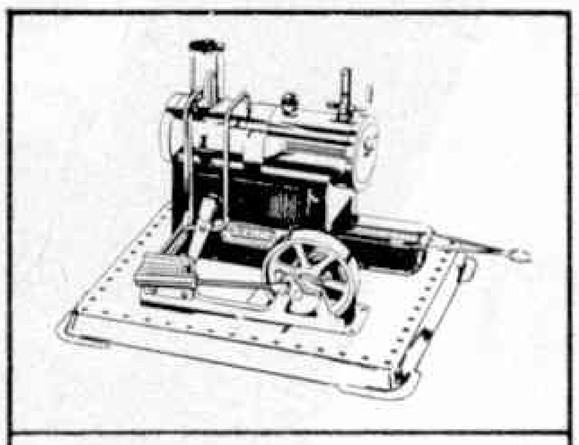

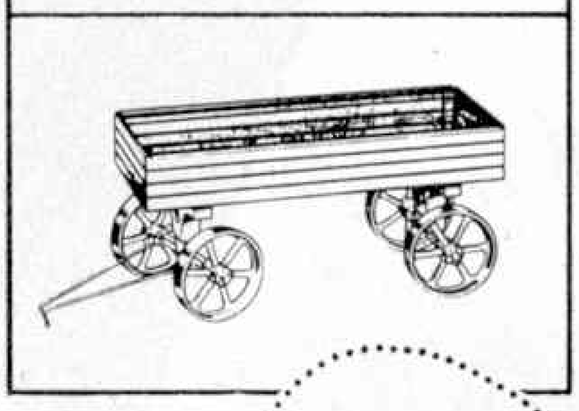

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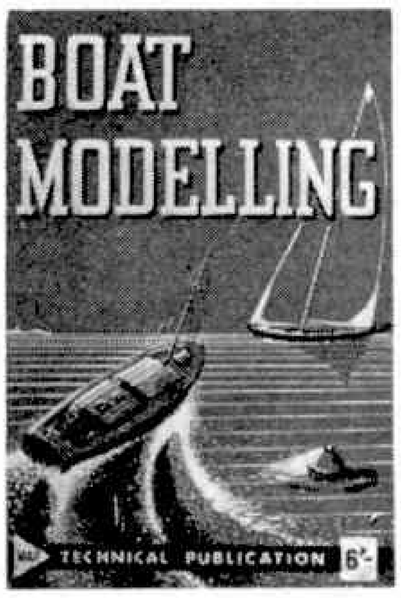
14 BOAT MODELLING



A comprehensive book for the not-so-expert modeller covering every aspect of model boat work from construction through to sailing. Author Vic Smeed provides a wealth of practical assistance. Chapters include: Tools and materials, hard chine hulls, round bilge hulls; superstructure fittings, finishing; I.C. engines, electric motors, hydroplanes and special models; operations; radio control.

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30 WORKSHOP HINTS & TIPS

A 'must to be beside every enthusiast's lathe! Workshop mysteries are revealed, there are quick tips and easy dodges to show that there is sometimes some easier way . . . thoroughly recommended.

9¾ x 7½ in. 60 pages. Two-colour card cover. 106 line drawings. **5/-**

133 AEROMODELLER ANNUAL 1969/70

Laurie Bagley cover, R/C scale model Whirlwind in bright yellow livery. To tie in with this Dieter Schlueter's fine article on Model Helicopter Technology. John Burkham, of U.S.A., adds comments. Articles include Tubular Fuselages from Balsa; Contest Model Performance Prediction; Beginners Only Please; Facts About Propellers; Glider Construction Suggestions; Navy Carrier Event and What It's All About; Fuel Control. Fifty model planes — all scaled and with main dimensions shown — from the year's best, most interesting, curious, screwball, intriguing, different designs.

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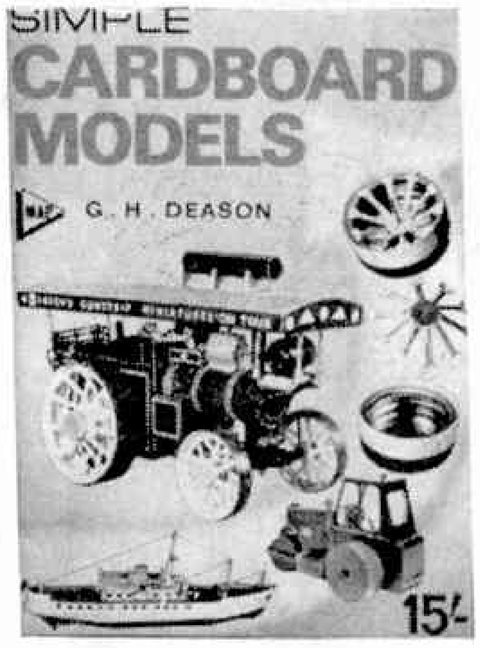

132 SIMPLE CARDBOARD MODELS

This magnificently-illustrated book deals with working models of Rollers, Road Engines, Ships, Cars, Tracklaying Vehicles, Rail and Tramway models and other working models, including models of R.M.S. *Scillonian* and the *Ruston Bucyrus Excavator.*

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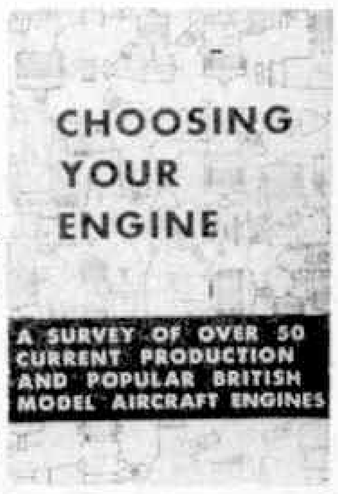

A. M. Staff
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21 SIMPLE ELECTRIC CAR RACING

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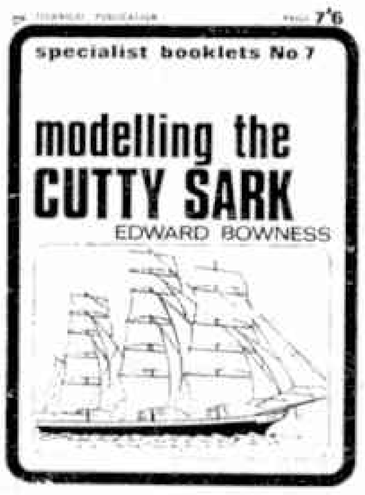
17 MODELLING THE CUTTY SARK

Covers building a 1/48 in.-1 ft. scale static model and includes all necessary drawings, together with many photographs and detailed instructions, plus notes on the ship herself.

58 pages, size 9¾ x 7½ in., printed on good qualiiy paper with stout cover. **7/6**



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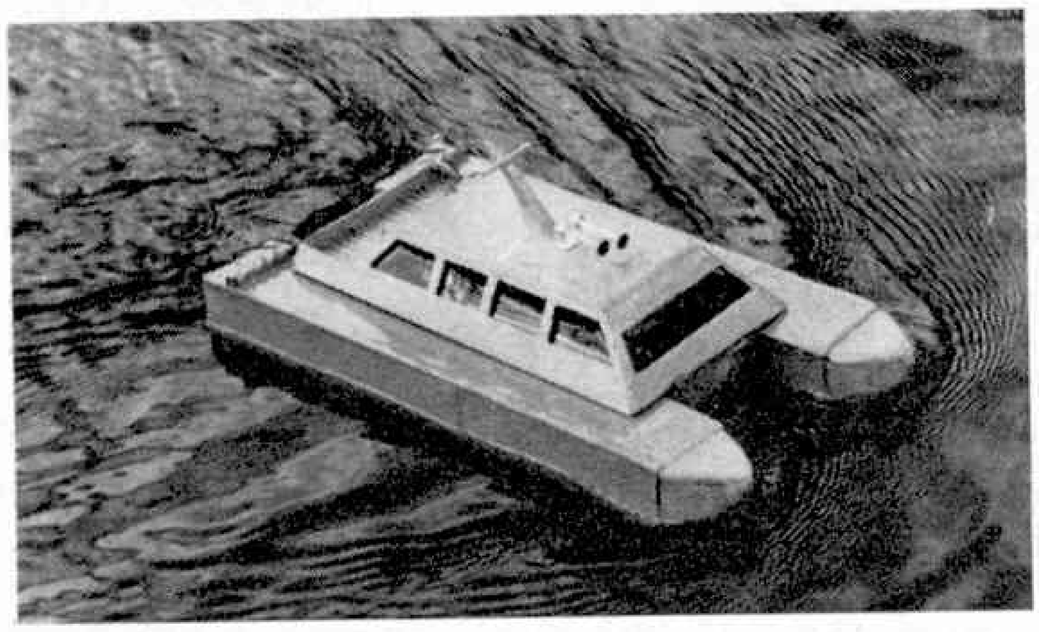
Readers' Models

I firmly believe that the finest modellers are those who can use their imagination and adapt existing parts to suit their own requirements. The two young modellers whose work is shown on this page this month have both created their own models; the catamaran is completely "home-made" as it were, being both designed and built by Master Lawrence Alderman, of Stevenage, Herts. The car was tackled in rather a different manner; it started life as a standard "Frog" Morris 1100 plastic kit, the kind we used for our Radio 4-2 series in fact, and was extensively modified by Master Kevin Saunders, of Southampton into a Morris 1300 GT.

Returning for a while to the catamaran; this was completely built from balsa and measures 13½ inches in length, by 7½ inches in width. Power to the electric motor is supplied by 4—1½ volt dry cells and propulsion is by water screw. The whole of the cabin section is easily removed for access to the "works" and features tinted blue windows, a mast, air-horns, lifebelt and the on/off switch.



Seen in action on our local pond is Lawrence Alderman's splendid little catamaran. Lawrence both designed and built the model which has an impressive turn of speed.

We tested the model on the local pond and found it to be very stable and capable of a reasonable performance. Overall appearance is very attractive in varnished balsa with the twin hulls finished in medium blue. Congratulations Lawrence on a very fine model !

Believe it or not this super Morris 1300 GT started life as a Morris 1100 kit produced by 'Frog'. Plenty of patience and skill were used by its constructor Kevin Saunders.

The much-modified car as I said earlier, started life as a De-Luxe Morris 1100 and a fair amount of work was needed to convert it into the latest design to emerge from the B.M.C. stable. Kevin widened the radiator grille and fitted it with matt-black mesh, made a vinyl roof, altered the wheels to make them into the new-style G.T. type and finally sprayed the bodywork in red, adding a hand painted black stripe down each side. The finished result is very impressive and there can be no doubt as to the skills of Kevin as a plastic kit conversion expert !

Polaroid Film

In the June issue of the Mag' I included on this page a review of the new Polaroid Black & White camera and gave the price of film as 17/3d. I am now informed that Polaroid have reduced the price to 14/6d., a worthwhile saving don't you think ?

COMPETITION RESULT

The response to our "Spot-the-number-of-Dinkys" on the cover of last month's magazine was overwhelming. No less than 50 cards arrived just after the issue appeared on the bookstalls and at the time of writing this they are still pouring in! The first correct entry was submitted by F. G. Worsnop. of The Plain, Boars Hill, Oxford, who estimated that 88 models were used to form our unusual cover.

A free year's subscription commencing with our September issue is the prize, and congratulations to Master Worsnop!

Have You Seen ?

During the recent weeks we've received a tremendous amount of new products from manufacturers all over the world. In particular plastic kits are being introduced in great quantities by companies such as Airfix, Frog, Monogram and Revell.

To keep our readers up-to-date on the latest developments in both kit and other fields, our Have-You-Seen feature has been extended to no less than 4½ pages in this issue.

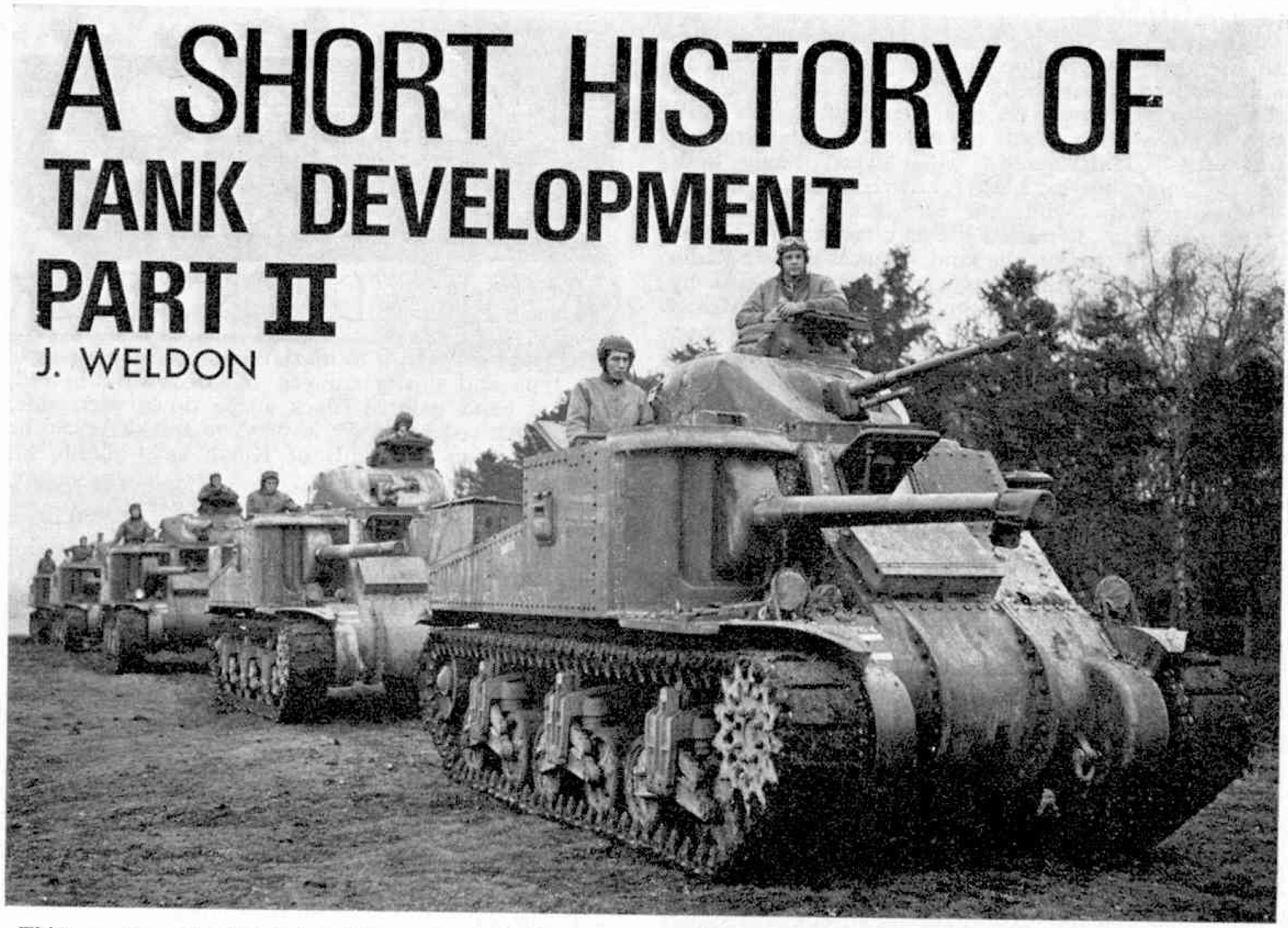
NEW COMPETITION

Starting next month for an indefinite run will be a new competition for all Meccano Magazine readers.

All you have to do is to identify correctly the silhouettes of a number of Dinky Toy models and as prizes we will be giving away no less than 50 Dinky Toys per month! More news in the September issue.

A SHORT HISTORY OF TANK DEVELOPMENT PART II

J. WELDON



This was the American M3, known as the 'Lee' (American turret) or 'Grant' (British turret). Comparison with the Soviet T34/85 shows it as an inferior machine in that its silhouette is higher; the main armament is not in the turret; construction is by riveting, not cast or welded.

The struggle for survival

LAST MONTH I DESCRIBED the tremendous variety of mechanised armour that passed under the name 'tanks' in the 20 year period between the World Wars. In 7 main varieties this Heinz-like assemblage of war-cars entered the great struggle for survival in 1939 . . .but they did not all emerge at the other end in 1945. In this instalment, I shall describe how first one type, then another, failed the test of war—and which ones in the end proved to be the dominators.

Now we must point out that tanks were used in several wars before 1939, and that the chief lesson to be drawn from them, was that they could not be relied on to show a quick profit. The Japanese used tanks against the Chinese in the 'thirties, but found only that small numbers of tanks used without an overall plan in a vast country, had very little effect on the profit-and-loss of a campaign that looked like lasting for ever.

In the late 'thirties a Civil War broke out in Spain. Both sides—the Fascists and the Communists—we might call them—used small numbers of tanks, usually to support infantry in frontal attacks and were rather disappointed, because the tanks were mostly small, thin-skinned 'commercials' which were not always able to cross the enemy's defence positions, and were never available in really large numbers.

Then, co-inciding with the outbreak of World War Two came a savage Russian attack upon Finland, and as was the case when the Russians smashed down Hungary and Czechoslovakia, the Red Army didn't waste time handling penny-packets of tanks—they were sent in in hordes. Stalin had only recently re-directed the Red Army's use of tanks. They were to lead and support infantry, but in a new way. Only a small area was to be attacked at one time, and it was to be simply overwhelmed by vast numbers of tanks and men. Actually, the British first demonstrated this

method of attack in 1918, against some particularly strong German positions at Hamel. It seemed a good method if plenty of tanks could be massed together—a series of tremendous short-arm jabs that would soon have the enemy shattered and collapsing, which is exactly what happened at Hamel. But a real big bully's method, as used by Russia against a little opponent like Finland. However, the clever Finns had constructed a deep belt of defences across the strip of land separating them from Russia, so to the Red Army's dismay, and since 1918, anti-tank guns had come a long way, their losses in trying to force these defences were immense ! There were so many Russians that they gradually wore the Finns away, of course, but they were quite glad to have peace talks instead of finishing off the Finns—because that might leave them in turn too weak to face Germany ! However, there was no sure lesson for the future here, because the tanks used were of older types, based on the Vickers or Christie designs. The new general-purpose tanks, T34 and KV1, were not yet ready. Indeed, the Finnish experience may only have confirmed Stalin in his belief that tank design was hopelessly on the wrong tracks until his ' reforms ' of 1937.

Then, Germany went to war, also with small and thin-skinned tanks. In 1939 her most numerous tank was the Panzer 1; in '40, the Panzer 2. Both were descended from the Vickers 6 Ton commercial of 1930. But the way they were used, for indirect attack on nerve-centres, resulted not in loss, but in immense profit ! They caused the swift collapse of Poland and France and the hurried retreat of the British force. It seemed as if Light Tanks were the ones to win wars cheaply !

So Britain, the USA and the USSR promptly renewed their interest in them, although Germany was actually ending their production ! The USSR kept building them until 1943, as did Britain; the USA kept producing new designs right through the war, although an American ' light tank ' such as the ' Chaffee ' of 1944 was very much like a ' medium ' of 1939 !

With regard to the larger tanks, the British army chiefs were flurried. They had been planning to rely heavily on slow, thickly armoured infantry tanks—but the fast German machines seemed to run rings round them. So after Dunkirk, priorities were switched right over; 78 per cent of tank production was to be ' fast tanks '. The Russians watched this war in the West—and did not alter their huge building programme of T34 and KV general purpose tanks. The Americans seemed unsure. They had a very good fast medium tank chassis—but their British adviser General Pratt told them the fighting top was poor. So they made it simpler, and gave it more armour and a bigger gun—and the results were the Grant and Sherman general-purpose tanks, not in the same league as the T34, but still very strong. The Germans, not knowing of these future dangers, went ahead with their fast, thin skinned 3s and 4s.

Came the invasion of Russia ! Hitler had overreached himself at last. The panzer armies had some great successes, ' paralysing ' much larger Russian forces, but they were too small for the job, and the much vaster Russian resources began to wear them down. And when the T34 and KV were first met at Borissov on 2nd July 1941, the panzer leaders saw at once that they needed a stronger tank—fast ! To add to their troubles, Hitler's over-reaching caused the war to become more static, which favoured heavily armed and armoured tanks. The T34 and KV showed that

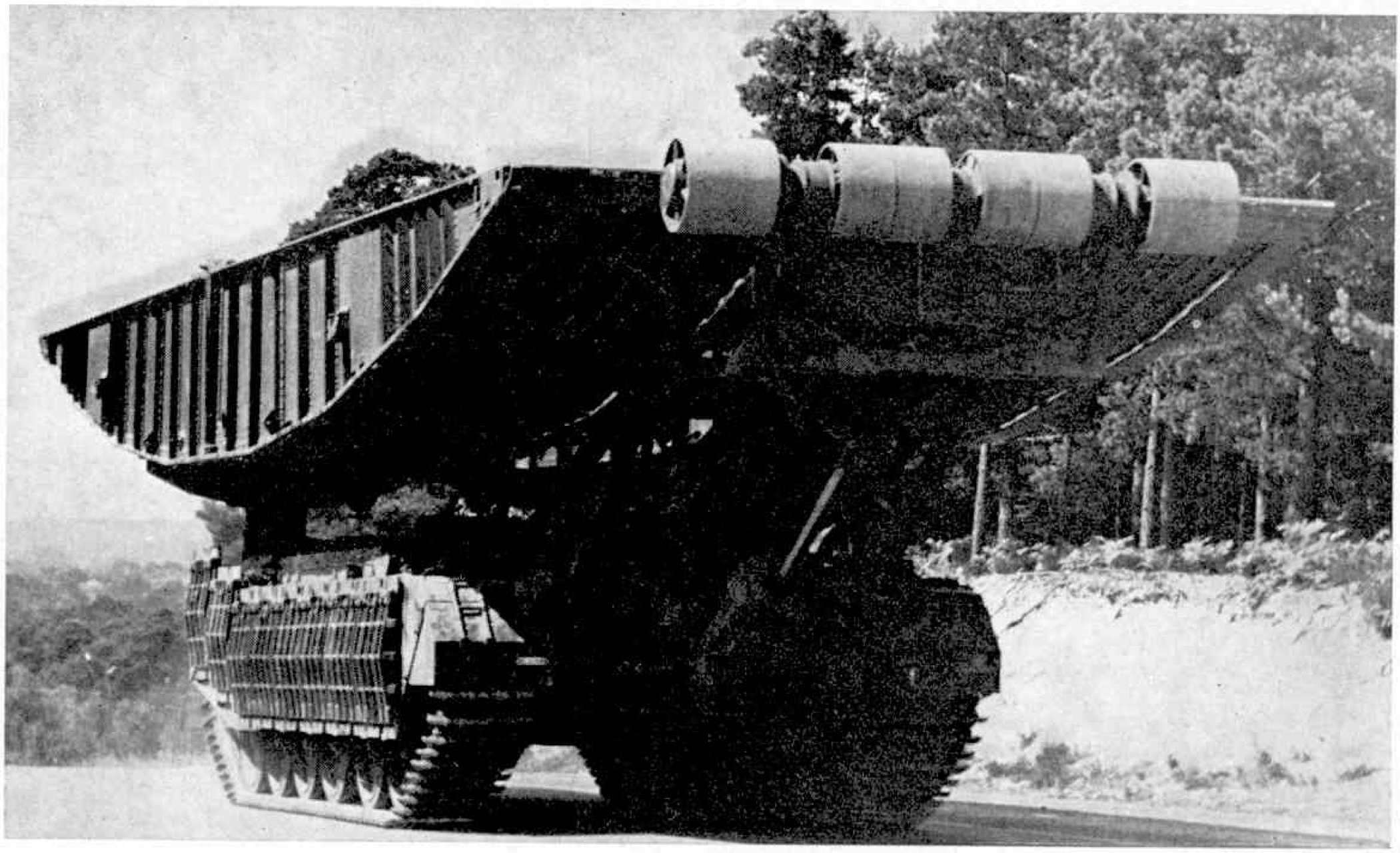
Upper: The " Comet " of 1945—the last of its type. It has grown very like the General Purpose Tank, but is still inferior to the T34/85.

Lower: U.S. Army M26 " Pershing " of 1945. This was the first Western tank built to rival the Soviet T.34 to enter active service. Note the close resemblance to the T34/85, but note also *cast* frontal armour and more sophisticated commander's cupola.

every tank had to be tough enough to take on any kind of combat job.

As soon as the effect of the T34 was known in the West, attempts were made to copy it. The Germans began design of the ' Panther ', and Hitler ordered a re-hashing of the pre-war heavy designs, which resulted in the ' Tiger ', which might be described as a tougher version of the Russian KV.

The Bristol Cruiser Tanks (left, A10; right, A9). Both are based upon the inter-war period Vickers designs, surviving in service until 1941. Note sub-turrets on the A9. These were a popular feature on many nations' tanks before 1939. War experience showed them to be excessively vulnerable, and some units used them as storage space. These tanks were said to " bounce like a pea on a drum ".



The Centurion Bridgelayer, which took 110 seconds to position. Although a post-war machine, it serves to illustrate the type of specialist armour evolved during World War 2 by the 79th Armoured Division, under Lt. Gen. Hobart. The tank is approaching—although this is not clear! Note the bridge plates hung on the tank sides.

The British top command began to quarrel among themselves as to the best course of action. Montgomery favoured a general-purpose tank, but the chief of the Royal Armoured Corps wanted to continue with improved 'infantry' and 'cruiser' tanks. As a result, all three types were developed, which resulted in some wasted effort. The 'Churchill' infantry tank was built in great numbers, but had to be given a lot of extra armour, and bigger guns, and eventually it became dreadfully slow. The fast cruiser tanks were given the same treatment, until by 1945 the 'Comet' was something like the T34 had been in 1940—but not quite so well armoured. The general-purpose tank wanted by Montgomery did not appear until 1945—it was designated A41, but will be more familiar to M.M. readers as the famous Centurion. It was too late to fight the Germans, but it has seen a lot of service over the last 25 years and it is still a good tank. It was the first one designed by the Fighting Vehicle Research and Development Establishment, with help from Vickers, and it had all the basic features of the T34 plus good old fashioned British quality, which gave its armour amazing protective power, and its armament a high degree of accuracy—the gun stays on target no matter how the tank lurches about. However, it was a bit slow.

The Americans kept their Sherman in production, and their copy of the T34 likewise appeared in 1945—just in time to fight. It was the M26 'Pershing', also a very good tank, but one which has not stood the test of time like the Centurion.

What of Germany? Thanks to Hitler's madness, tank design fell into confusion. Hitler demanded even more gigantic ones and plans went ahead to build monsters weighing nearly 200 tons! There was even a project for one weighing 1500 tons, powered by 4 U-boat diesel engines. Hitler monkeyed with the 'Panther' development, as a result of which it came out very heavy and unreliable. All this wasted effort meant that the Germans had to rely heavily on the Panzer 4, as the British relied on their cruisers and the Americans on their Shermans. The Russians were the ones who called the tune. All they had to do was put a bigger gun on the KV and T34, and build a 'streamlined' armoured case for the former—which was then renamed JS, or Josef Stalin. Their basic production was never changed—they continued to churn out their pair of winners by the thousand.

As for Italy and Japan—their rather inferior machines simply disappeared, and no one ever wanted to copy them, or regretted their departure. Italian tankmen used to call their M13 medium tank 'The Self-Propelled Coffin'.

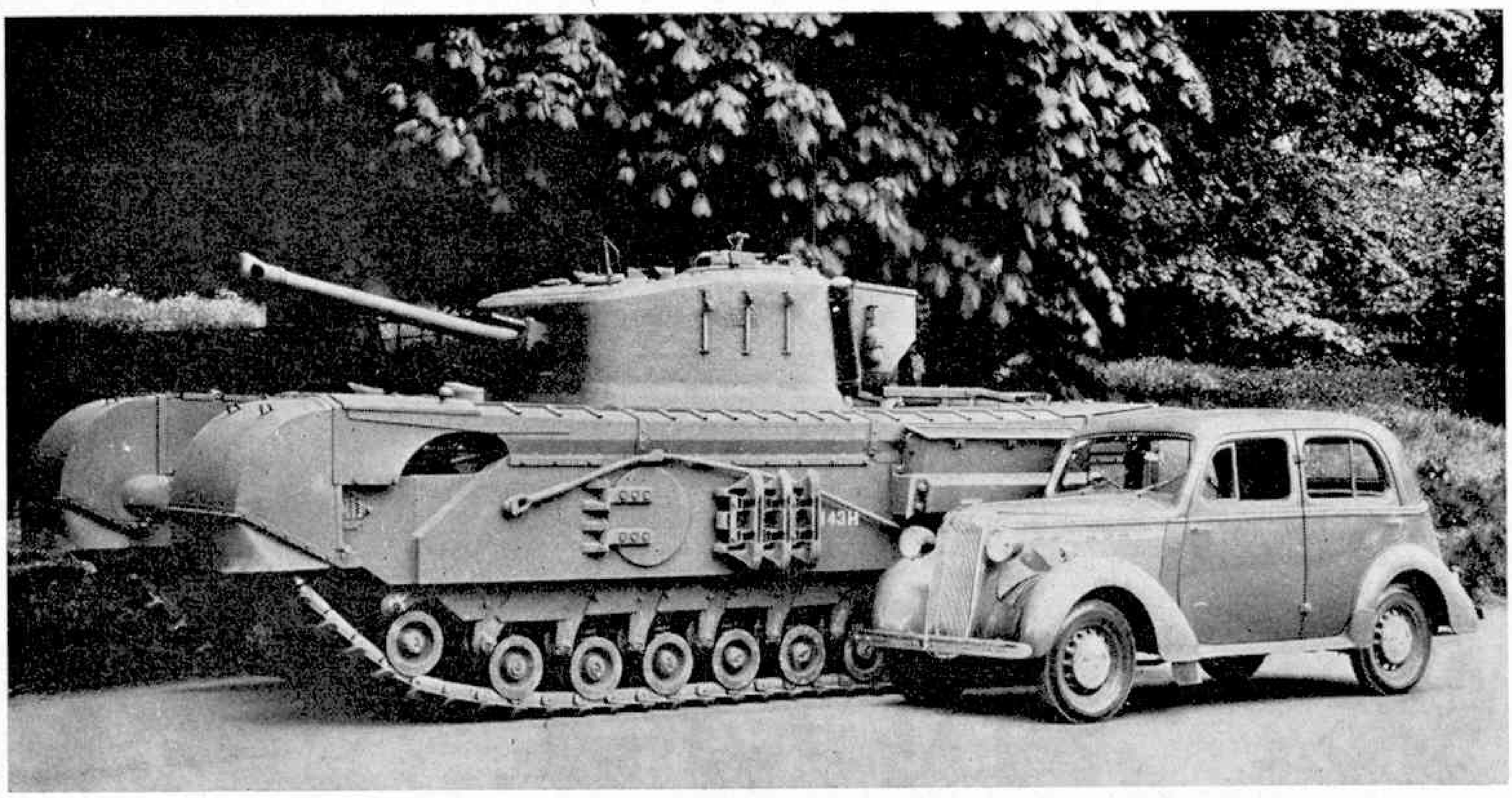
At this point we might try a summary.

i. *Slow infantry-escorts.* The French ones disappeared in 1940. The Germans used the hulls of those they captured to provide gun carriages. The British Matilda lasted until 1941.

ii. *Slow Heavy Assault tanks.* The French ones disappeared in 1940. The British kept their Churchill going until 1945. Various experimental machines were built but not put in service. Hitler, however, took up this type when everyone else was dropping it, and so dropped the German panzer forces in the mire.

iii. *Fast Light Tanks.* These were very useful for 'mobile' war at first, and helped to collapse several large armies, but proved too weak in a long struggle against really powerful giant nations. They disappeared, their chassis being used as gun carriages. Only the USA kept producing new designs—but no one really wanted them.

iv. *Fast thin-skinned Medium Tanks.* These had their heyday in the swirling tank battles of the 'mobile



The British Infantry Tank, Churchill 7, which was thickly armoured but very slow, and with a small gun (75 mm.) for the time (1944). Note the heavy tracks and small wheels, unsuited to speed.

war' period up to 1941. After that year, the war slowed down, and they were shown up as under-armoured and under-gunned. The best of them—the Panzer 4, and the British Cromwell/Comet series held on until 1945, being given thicker armour and bigger guns whenever possible. The poorer ones, such as the Italian and Japanese ones, the Panzer 3 and the British Vickers, vanished; destroyed or scrapped.

v. *General-Purpose Tanks.* The American Sherman remained in service until after 1945, but was reckoned inferior to the T34 and the Panther. The T34 was the best basic model. The Josef Stalin was now developed as a big-gun tank to support the T34. The Germans did something of this sort with the Tiger and Panther, but hadn't enough tanks to carry such a system out properly. The British and Americans did not catch on to this trend until after 1945. During the last years of the war, they supported the leading tanks with ground-attack aircraft. The Panther ended its career with Germany's defeat, of course, but a similar tank they had built in France, the A.R.L. of 1944, remained in service in liberated France for a while.

vi. *Amphibians and Airbornes.* After Japan's invasion of South East Asia, no Power built special swimming tanks, although quite a few amphibious load-carrying vehicles were developed.

In Germany, Hitler ordered that some tanks be made water-proof so that they could cross rivers by running over their beds, completely under the water. In the West, an invention of Mr. Straussler, a tank designer who associated with Alvis motors, was taken up. His idea was to give the tank a temporary 'ship's hull' of waterproof canvas. This was a large structure—and in the water, the tank hung at the bottom of it like a heavy keel, having twin screws driven by power take-off, so that it could make good speed and steer in the water. It worked splendidly for the liberation of France in 1944, and is still used.

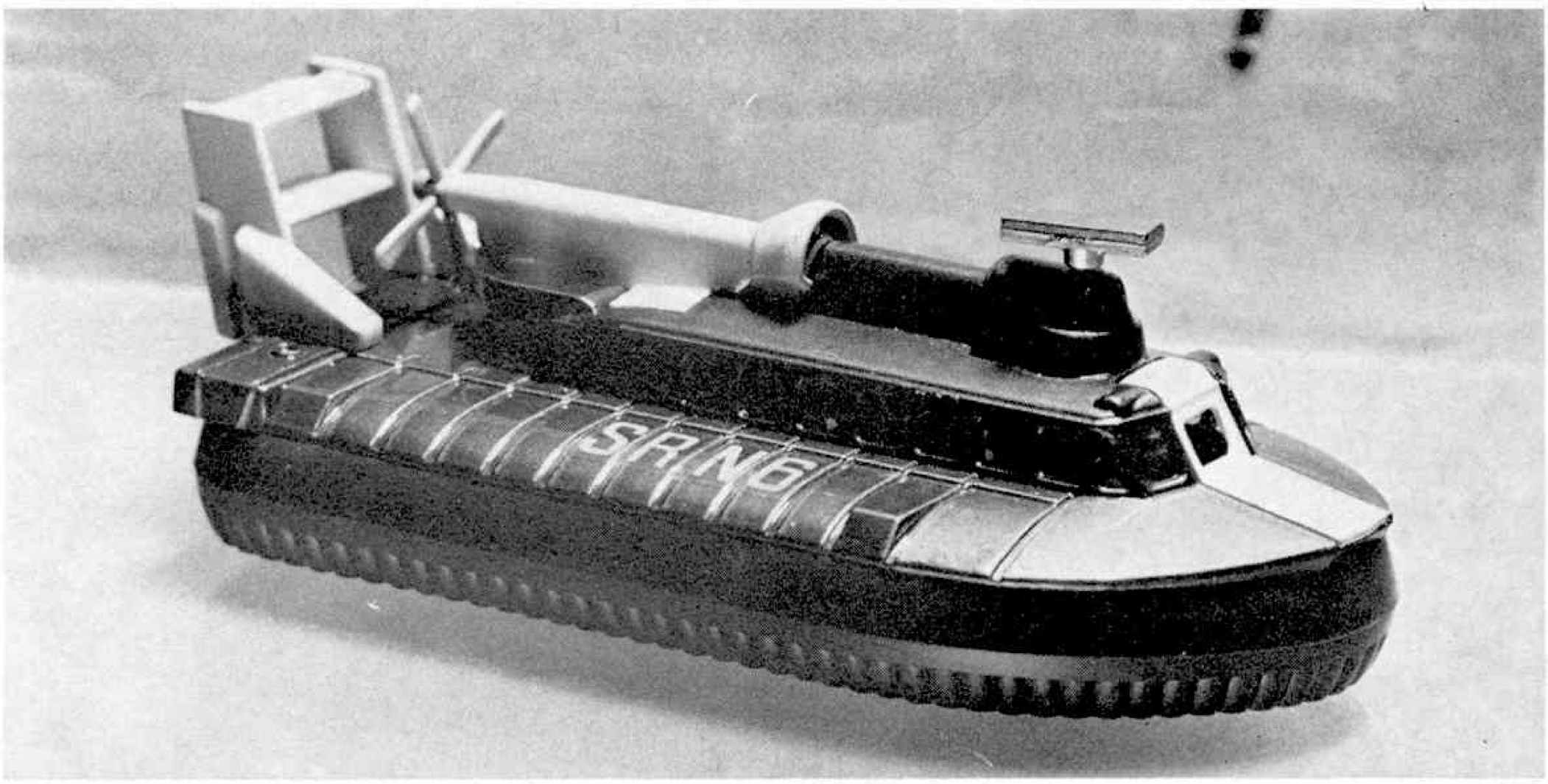
Airborne tanks were not developed. In the West, it seemed that the army chiefs were suspicious of their novelty. So many promising looking tank ideas had fallen by the wayside in the test of war, that they were not willing to back this line. Christie continued to advocate them, but died disappointed in 1944. On D-day 1944, a few glider-borne tanks were dropped in the rearward parts of the German defences, but they landed in the area of a Panzer Division and were knocked about. The work Christie had suggested, of 'paralysis' deep in enemy territory, was never tried.

Funnies. These were mostly a British speciality, and were due largely to Generals Martel and Hobart of the Royal Armoured Corps. Martel was an engineer and Hobart an enthusiast of mobile war. Both were keen to provide all that a mechanised army could need to prevent it being stopped by obstacles. So the 79th Armoured Division under Hobart was given the job of creating all manner of highly specialised armoured vehicles; mine-sweepers, engineers' demolition tanks, bridge-layers of several types, flame-throwers, search-lights, recovery vehicles, etc., which it did upon the chassis of standard tanks. They were a peculiar looking lot and were nicknamed 'funnies', but their usefulness was immense—in saving time, which in war time meant saving life and materials. These inventions were taken up by other armies, but it is probably true that the British armoured forces still give this question more attention than do those of other nations.

So the war ended, and of the host of tank varieties that took the field in 1939, only the general-purpose tank and its big-gun brother in support survived. Slow infantry tanks, nippy thin-skinned tanks, super-heavy slow assault tanks, all vanished.

The best general-purpose tanks were the Russian T34 and the British Centurion—both of which had been thoroughly worked out in detail by engineers in State research teams. . . . No doubt this research cost an awful lot of money, but for both nations, it proved a sound investment.

For, as I shall describe next month, these tank-types were to become the principal armoured champions of East and West during the coming Nuclear Age, until armoured forces learned to change and adapt themselves to the tactical nuclear weapon.

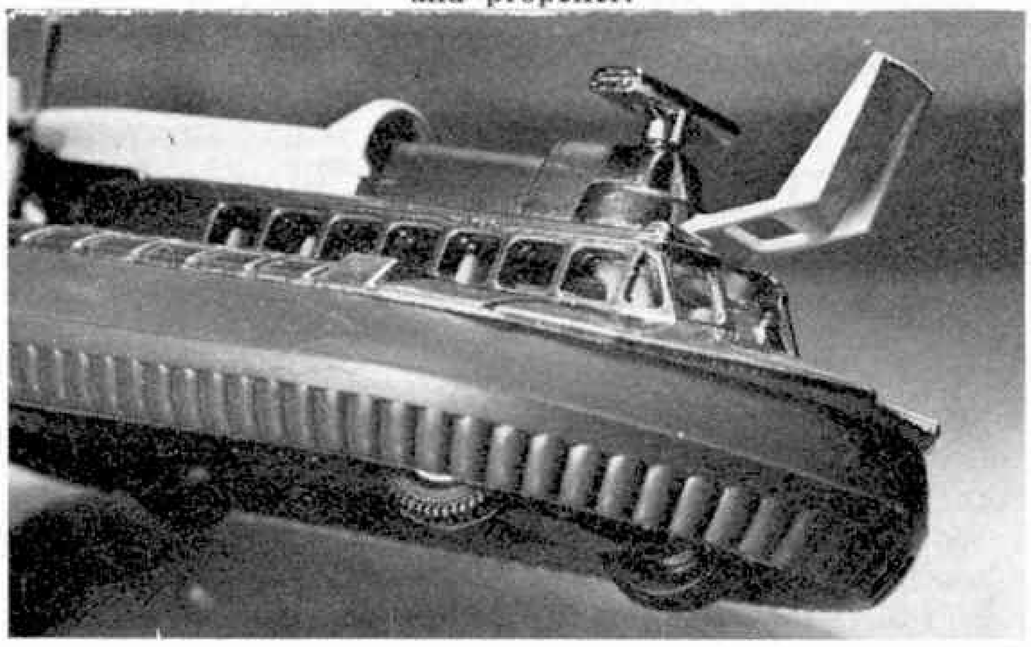


DINKY TOY NEWS

by Alan Jones

'CART BEFORE THE HORSE'

Heading photograph: A rather unusual prototype to reproduce, but the new Dinky Toy S.R. N6 Hovercraft, No. 290, will prove popular with both young and old, alike.
Below: An unusual view of the forward end of the Hovercraft showing the opening cabin door and the wheels which not only provide mobility, but also drive the radar scanner and propeller.



TELEVISION VIEWERS THE NATION OVER, especially the younger ones, will already know Parsley, the loveable lion in the popular B.B.C. T.V. Watch with Mother series, "The Herbs" and also in the more recent series, "The Adventures of Parsley". Well, Dinky have just released a miniature model of Parsley's Car, straight from the new series and, although there may appear to be nothing particularly unusual in this, the new model, in fact, makes die-cast modelling history. It proves that the cart can come before the horse!

To explain what I'm talking about, always in the past, the Dinky type of toy has been modelled on something already in existence, be it a real car or a specially-designed "model" for a television programme, but never before, as far as we know, has the "original" been based on the miniature reproduction —until now. On this occasion, Meccano Tri-ang are unashamedly tickled to admit that Filmfair, the maker of the T.V. series, based their Parsley's Car on a Dinky Toy—and not the other way round! When

planning the present television series, Filmfair were anxious to provide the star of the show, Parsley, with suitable transport and, as they were already in touch with Meccano Tri-ang, they hit on the idea of using a car which was already modelled by Dinky, namely the 1913 (Bull-Nose) Morris Oxford. A large-scale model of the Bull-Nose is now a regular performer in the highly popular T.V. show—using, as a matter of interest, quite a lot of Meccano constructional pieces in its " works ". That's co-operation at its best !

Dinky's small-scale version of Parsley's Car, No. 477, released to coincide with the show, is aimed at the younger collector and I have no doubt that it will prove to be a big hit with them. Finished in the correct colour-scheme of fluorescent green body, with yellow folded hood, on a gleaming black chassis, with black mudguards and opening boot lid, plus an extremely attractive and authentic-looking " brass plated " radiator-grille, windscreen surround and old fashioned-type head and side lamps, the model comes complete with a really captivating Parsley sitting innocently behind the steering wheel. His pop-on head swivels, while the expression on his face would melt the hardest heart. (You've got to see his expression to believe it. It really is delightful.)

Play-value is further increased by a set of easy-to-cut-out, stand-up cardboard figures of Parsley's friends which are cleverly incorporated in the display platform packed with the model. Of course, it has not been feasible to include everybody who appears in the show, but all the main characters are present : Dill the dog, Bayleaf the gardener and Tarragon the dragon, with the Law represented by Constable Knapweed—virtually a complete T.V. show in one !

Incidentally, you might like to know that Michael Bond, the author of Parsley, is also the author of the world-famous stories of Paddington the Bear, which have been translated into no less than eight different languages. Ivor Wood, the director of the series, was one of the team responsible for the highly-successful " Magic Roundabout " programme. His enchanting puppets are easily recognisable by the own unique and outstanding characters. With a team like that behind him, Parsley cannot fail to be a success.

Dinky Hovercraft

And speaking of success, to get anywhere in this highly competitive modern world of toys, die-cast model manufacturers must keep abreast of events in the full-size world of transport, and nobody could ever accuse Dinky Toys of lagging behind in this respect. Most innovations in real-life have been mirrored, in miniature, in the Dinky range; now they have released yet another model which proves their ability to keep bang up to date—an S.R. N6 Hovercraft, Sales No. 290.

In real life, the S.R. N6 is powered by a Bristol Siddeley " Marine Gnome " Gas Turbine which has a maximum continuous rating of 900 S.H.P. (Shaft Horse Power) and is fitted with 4 ft. hover skirts. Despite weighing as much as 8.9 tons, it provides an extremely comfortable ride for 38 passengers, and is capable of cruising at 40 knots in 4-5 ft. seas. In calmer conditions, a maximum speed of 56 knots can be attained—and this with a full payload. Overall length is 48 ft. 6 in. and the height, when the craft is hovering, is 18 ft. 4 in. Cabin floor space is a spacious 166 square feet.

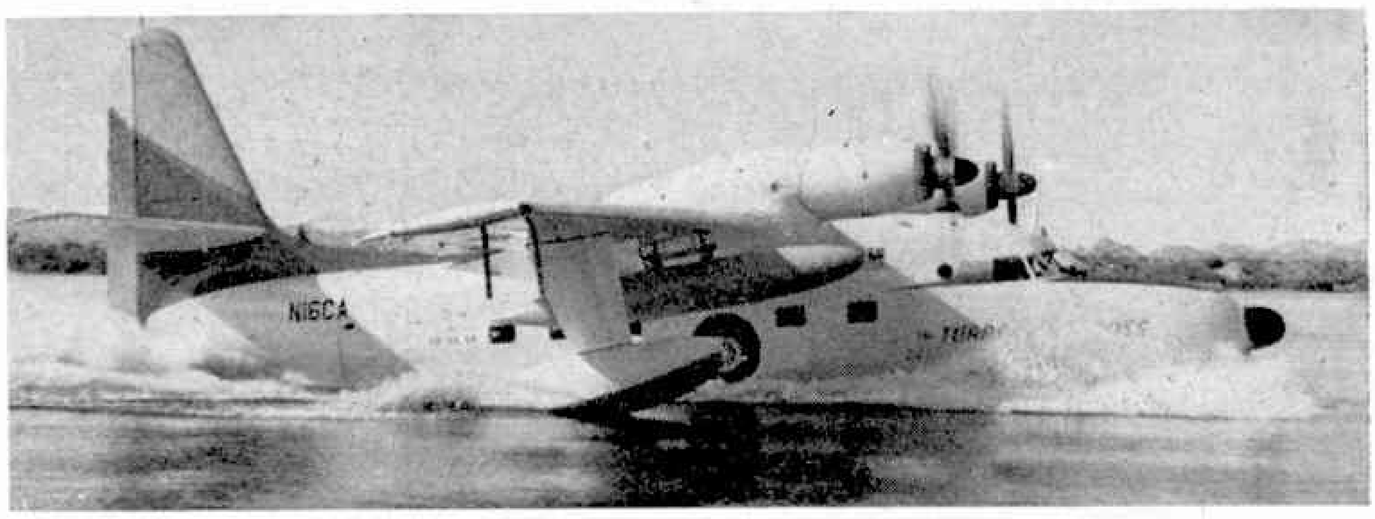
Being a truly amphibious, highly-manoeuvrable and compact in size, the Hovercraft can operate from relatively unsophisticated terminals above the high water mark. Due to its extreme versatility, it can also play a number of roles, other that the obvious public/commercial transport use to which it is put. For instance, if it were fitted with water pumps and monitors, it would be particularly useful in rivers and harbours and, because of its amphibious capabilities, it has immense potential as a military vehicle, particularly in beach assault and coastal patrol roles.

An unusual machine in its own right, you may think that the S.R. N6 Hovercraft is a strange prototype to reproduce in die-cast form, but it none-the-less makes an excellent Dinky, packed with play-value. Features include a highly-accurate body casting complete with cabin and superstructure, a revolving propeller at the rear and a radar scanner on top of the superstructure. As on the original, an opening door in the front of the body gives access to the cabin, which is itself glazed and fitted out with full seating, while, secured round the lower section of the body, is a " hover Skirt " moulded in soft P.V.C. Although not designed as such on the full-size machine, this latter item serves as a very effective protective bumper on the model.

As must be expected with such a small model, the new Dinky does not actually hover, but mobility is achieved by the inclusion of wheels in the baseplate, these almost completely hidden from view by the hover skirt. A geared linkage from the front axle provides the drive for the revolving propeller and radar scanner so that, when the model is pushed along, the prop and scanner spin realistically around. The effect is marvellous.

Whereas Parsley's Car is aimed at the youngster, the Hovercraft will appeal to young and old, alike, therefore it looks like both of these new releases will turn out true Dinky winners. They deserve to be !

The new Dinky Toy model which proves that the cart can come before the horse —No. 477 Parsley's Car, straight from the B.B.C. Television series, " The Adventures of Parsley." The cut-out figures of Parsley's friends are included with the model.



Conway Turbo Albatross re-equipped with Dart turboprop engines taken from a retired Viscount 700.

AIR NEWS

by John W. R. Taylor

Britain's enemy flies Canberras

On May 1 this year, No. 7 Squadron of the Royal Air Force reformed as one of the most unusual units in the country. Based at St. Mawgan in Cornwall, home of the Nimrod and Shackleton maritime reconnaissance aircraft of Strike Command, it will spend its time operating as the 'enemy' of all three services, to test the efficiency of the guns, fighter aircraft and surface-to-air missiles that defend us.

This probably sounds a lot more dangerous and exciting than it really is. The people who fire the weapons will not aim at the Squadron's Canberras, but at targets towed anything up to nine miles behind the aircraft. Some of these will be of the familiar canvas "sleeve" type. Others will be Rushton targets fitted with infra-red flares to attract air-to-air homing missiles, reflectors which produce the same radar echo as a large bomber, and miss-distance recorders to show whether shells or missiles fired at the targets would have come close enough to destroy a full-size aeroplane.

Less than a fortnight after No. 7 Squadron began its new job as Strike Command's Target Facilities Flight, the Canberra celebrated its 21st "birthday". The prototype was flown for the first time on May 13, 1949 and the B.Mk.2 version entered service as the R.A.F.'s first jet-bomber two years later. Nearly 1,400 Canberras of all types were eventually built, including more than 450 produced in Australia and under licence in America as Martin B-57s.

So far, this fine British aircraft has earned £135 million in royalties and exports to 16 countries, and ex-R.A.F. Canberras continue to be in great demand overseas. In fact, British Aircraft Corporation announced the latest multi-million-pound contract, from the Argentine Air Force, exactly 21 years to the day after the prototype flew. To mark the anniversary, an Argentinian B.Mk.62 bomber was put through its paces at BAC's Warton Aerodrome by Wing Commander "Roly" Beaumont, who also made that first-ever flight in 1949. The cockpits of the two aircraft must have looked quite different, as the Argentinian machines are completely refurbished with the latest equipment, including a Doppler self-contained navigation system and automatic pilot.

Three export Canberra B Mk 2's destined for (furthest from the camera) Venezuela, Peru and (nearest the camera) West Germany.

Albatross with a difference

Canberras are not the only aircraft that are getting a face-lift nowadays to give them a new lease of life. Several companies in America are being kept busy modernising vintage types such as the Beechcraft 18, de Havilland Heron and Douglas DC-3, by exchanging their original piston-engines for turboprops.

Latest conversion of this kind is Grumman Albatross N16CA, illustrated . . . which has been fitted with two Rolls-Royce Dart turboprops taken from a retired Viscount 700 airliner. It was produced by Conroy Aircraft Corporation of Santa Barbara, California, whose earlier conversions have included a Dart-engined DC-3 and an oversize version of the Canadair CL-44 "swing-tail" transport with the fuselage enlarged to 14 ft. 9 in. wide and 11 ft. 5 in. deep for carrying bulky freight.

The Turbo Albatross, which flew for the first time on February 25 this year, has the cockpit instruments of a Viscount as well as the engines. With 400 aircraft of this basic type still in worldwide service, Conroy hope to do good business with conversions at a cost of around £150,000 a time.

British Navaid for Air Shuttle

News that Eastern Airlines have decided to fit the British Decca Omnitrac to jets used on their Air Shuttle flights between Washington, Newark, New York and Boston represents a major breakthrough for this British navigation system. It is the first such installation on any American airline fleet and follows a three-year evaluation of earlier Decca equipment on an Eastern DC-9.

Air traffic control has become an immense problem in the U.S.A., where so many aircraft fly into and out of the big airports that they often have to queue up for a half-hour or more, wasting time and fuel. Pilots on the Air Shuttle normally fly along a radial, or "spoke", from one VOR radio navigational beacon to the next. Quite apart from the extra distance covered by such dog-leg courses, traffic tends to slow down because aircraft on the same or intersecting courses must be kept well apart as they pass over the same radio beacon.

With Omnitrac, a computer on the aircraft processes radio signals and plots the machine's position continuously on a moving map in the cockpit. A line drawn on the map tells the pilot exactly where he is and where he is heading. In addition, the computer

can be linked to the automatic pilot, so that the aircraft flies along a narrowly-defined corridor direct from one airport to another, instead of threading its way between beacons. This is expected to reduce flying times on the Air Shuttle by an average of 10 per cent and to pave the way for future operations by STOL (short take-off and landing) aircraft into city centres.

Space Shuttle

The top picture on this page shows a shuttle aircraft of a very different type to those which carry commuters between New York and Boston. Known simply as a manned space shuttle booster, it is being designed by General Dynamics under an $8 million contract awarded by NASA on May 12 to this company and North American Rockwell.

By the mid-seventies both the U.S.A. and Russia expect to have space stations in permanent orbit around the Earth. It would be wasteful to use giant rockets like the Apollo Saturn V to put up all the men, supplies and equipment needed to keep such stations operational, as the rocket would always burn up in the atmosphere after putting its payload into orbit. So NASA asked the American aircraft industry to submit design studies for recoverable shuttle-craft able to do the job again and again without any wastage of boosters.

This aircraft, designed by General Dynamics, is one of the answers. Nearly 260 ft. long, with a wing span of 142 ft., it would be launched vertically with North American's orbital 'plane mounted piggyback on top. Its twelve 400,000 lb. thrust rocket engines would give it a high enough speed to boost the smaller machine into orbit, en route to a space station. Once the two had separated, it would re-enter the atmosphere and use four turbofan engines to cruise to an airfield where it would make a normal landing, ready for the next mission.

Saved by a Cork

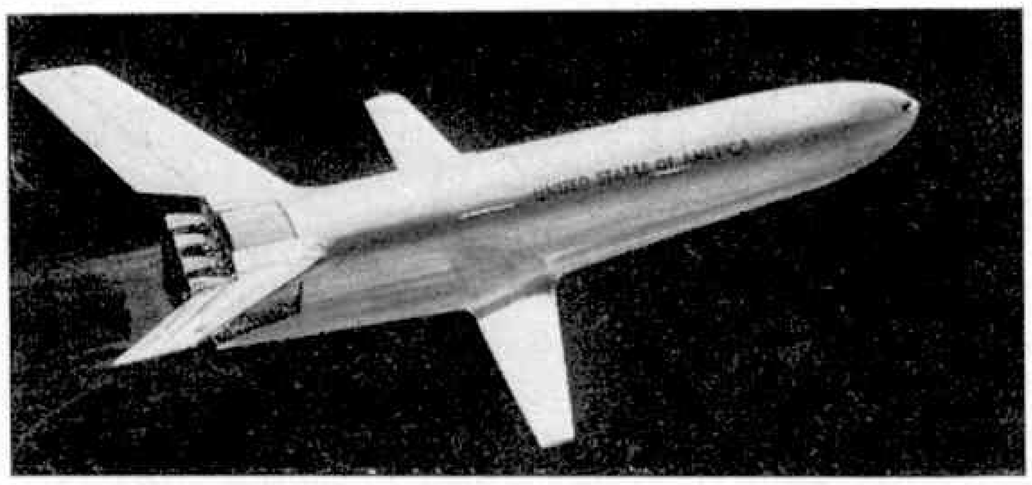
In Vietnam recently, a $1½ million Boeing-Vertol CH-47C Chinook helicopter was saved by a two-cent cork. Hit by enemy fire, the chopper's number two engine was knocked out and another round pierced the forward transmission. Although a bullet smashed through the windscreen, narowly missing the pilot's head, he managed to get the aircraft down safely.

The enemy was close, and the only way to save the Chinook was to fly it out on one engine, if the damaged transmission would continue to function. A frantic search on the ground in the gathering darkness produced a wine-bottle cork, which was whittled down to fit the hole in the transmission casing. The helicopter then struggled off the ground with a crewmember holding the cork in place. Happy to say, all arrived safely on one engine and a cork !

From Vanguard to Merchantman

Shown in front of BEA's new £6½ million Cargocentre Europe at London Heathrow Airport is one of the airline's Merchantman freight-planes. Eventually there will be about 14 of them, converted by Aviation Traders at Southend, or by BEA themselves, from the Vanguard turboprop airliners that have given such excellent service for nearly ten years.

The biggest job in the Merchantman conversion is to instal a hydraulically-operated freight door, 11 ft. 7 in. long by 6 ft. 8 in. deep, in the fuselage forward of the wing on the port side. Each door is built, complete with its frame, before the aircraft in which it is to be fitted is withdrawn from passenger service. As a result, the aircraft is on the ground, losing money, only long enough for installation of the door assembly, a new strengthened floor and a mechanised cargo handling system.



This aircraft, designed by General Dynamics, would be launched vertically. At the end of its mission it would re-enter the atmosphere and, using turbo-fan engines, cruise to an airfield to make a normal landing.

A merchantman can carry more than 19 tons of cargo, which can be pre-packed on eleven 9 ft. by 7 ft. 4 in. pallets for quick loading and unloading. The first few aircraft put into service by BEA have proved so successful that the airline may well buy and convert some of the Vanguards now being retired by Air Canada.

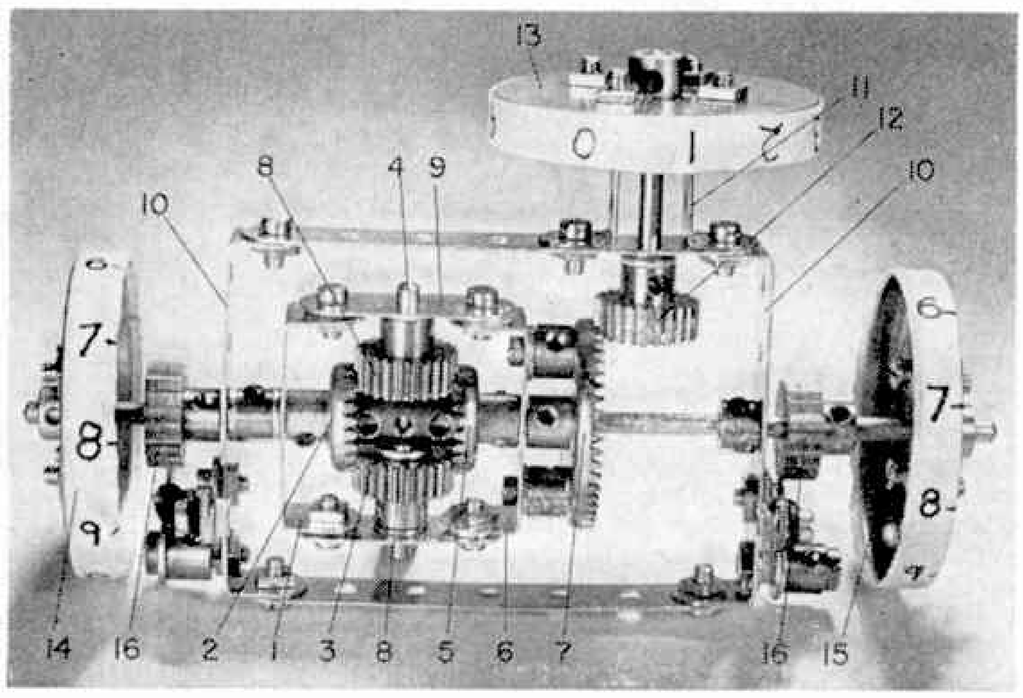
Skyvan aids Apollo 14

Every week seems to bring some new story of unusual jobs being done by Short Skyvan STOL transports from Belfast. The latest concerns one of these little aircraft used for ultra-short-haul scheduled freight services in the New York area by Del/Air of Wilmington, Delaware.

It seems that operators of other types of aircraft had tried unsuccessfully to load a main communications antenna for the Apollo 14 spacecraft, which its manufacturer, RCA, had to ship to the Cape Kennedy spaceflight centre in Florida. The crate containing the antenna was 15 ft. long and 6 ft. wide, with a weight of 1,800 lb., and required very careful handling. The would-be loaders had decided reluctantly that nothing less than a four-engined DC-6 with cargo doors could possibly take the crate.

But the Skyvan was able to transport the antenna in what was described as a " very routine " job, lasting only five hours from pick-up at Moorestown, New Jersey, to delivery at Cape Kennedy, 820 miles away. With many of the space programme sub-contractors located within 100 miles of Del/Air's home base, it now seems certain that the Skyvan will play an even larger part in getting Apollo 14 to the Moon later this year.

The Cargocentre Europe, as seen from a B.E.A. Helicopter.



Generally regarded as a motor chassis mechanism, the common differential can be put to other uses—such as to form the simple Adding Machine shown here !

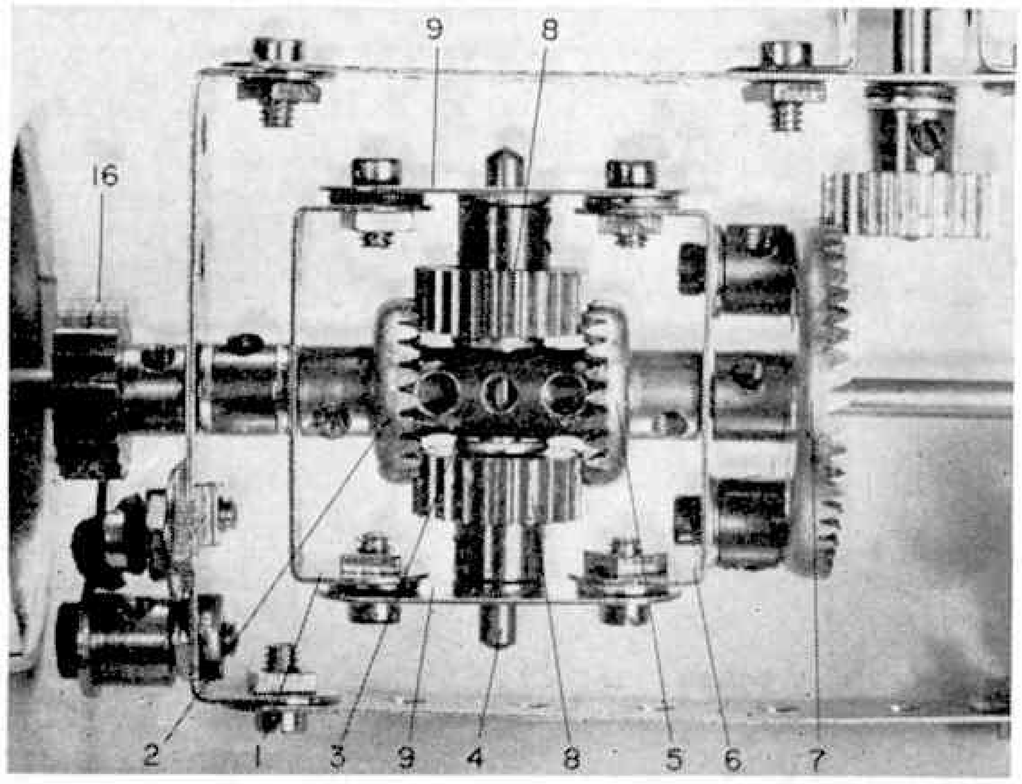
AMONG THE MODEL BUILDERS

with 'Spanner'

SIMPLE ADDING MACHINE

WORKING ON THE ASSOCIATION of ideas principle, if I was to say, "Differential", I feel quite sure that just about every Meccano modeller in earshot would answer, "Motor Chassis", and this would be perfectly understandable. The differential, after all, is generally looked on as being a motor chassis mechanism. Such is not its *only* use, however, and in fact, Bob Hauton of Lincoln has put a standard differential to an entirely different and, I might add, an extremely novel use—as a simple Adding Machine. This is described below, and the amazing thing about it is that the diff. is not just a component part of a complicated machine—it is, itself, practically the whole machine !

Construction varies little from a typical Meccano differential. A 2½ in. Rod, fitted with a 1½ × ½ in. Double Angle Strip 1 and a fixed ¾ in. Contrate Wheel 2, is inserted, free, part-way into the longitudinal bore of a Coupling 3, in the centre transverse bore of which a 2 in. Rod 4 is secured. Mounted, free, in the remaining part of the longitudinal bore of the Coupling is a 4 in. Rod, this also being fitted with a fixed ¾ in. Contrate Wheel 5 and a 1½ × ½ in. Double Angle Strip 6. Attached to this Double Angle Strip, but spaced from it by a Washer and a Collar on the shank of each securing ½ in. Bolt, is a 1½ in. Contrate Wheel 7. Mounted loose, one on each end of Rod 4, are two ¾ in. Pinions 8, each being spaced from Coupling 3 by a Washer, and both meshing with Contrates 2 and 5. Another Washer spaces each Pinion from a 1½ in. Strip 9 bolted between the nearby lugs of Double Angle Strips 1 and 6, but spaced from the lugs by a Washer on the shank of each securing Bolt.



A close-up view of the actual differential mechanism included in the Adding Machine, showing its straightforward construction.

The complete assembly is now held by Collars in a simple framework supplied by two 2½ × ½ in. Double Angle Strips 10, connected by two 3½ in. Strips, one of the securing Bolts helping to fix a Double Bent Strip 11 to one of the 3½ in. Strips. Journalled in this Double Bent Strip and in the 3½ in. Strip is a 2 in. Rod held in place by a Collar and a ¾ in. Pinion 12, the latter spaced from the Strip by two Washers. Fixed on the outside end of the Rod is an 8-hole Bush Wheel, to which a Wheel Flange 13 is bolted. Another two Bush Wheel/Wheel Flange arrangements 14 and 15 are also mounted, one on the 2½ in. Rod and one on the 4 in. Rod, both these Rods first being fitted with a Ratchet Wheel 16. Engaging with each of these Ratchets is a Pawl on a Pivot Bolt held by Nuts in respective Double Angle Strip 10. The Pawl is held against the Ratchet by a 2½ in. Driving Band, looped over a Bolt fixed in the free hole of a Fishplate bolted to the Double Angle Strip.

All that now remains to be done is to stick strips of tape or paper to the flange of each Wheel Flange 13, 14 and 15 and to mark them up with numbers. (I marked my examples from 0 to 9.) The sum of any two correspondingly-placed numbers on Wheel Flanges 14 and 15 should be shown on Wheel Flange 13, there-

fore Wheel Flange 13 should be marked last and the best way of calibrating it is to first set Flanges 14 and 15 at "O" and to mark "O" on Flange 13. Then, holding Flange 14 stationary, all the time, turn Flange 15 to "1" and mark "1" on Flange 13, then turn Flange 15 to "2" and mark "2" and so on, until all the numbers have been dealt with. When the machine is being used only one Wheel Flange 14 or 15 should be moved at a time, the other being held stationary while this is being done.

The machine is, of course, extremely basic in design, but it is nonetheless ideal for youngsters, keeping them amused for hours—if Mr. Hauton's two children are anything to go by. Consequently, it should appeal particularly to harassed parents!

PARTS REQUIRED

2—3	3—24	25—37b	1—63
2—6a	3—25	9—38	2—64
1—15b	1—28	1—45	1—63
2—17	2—29	2—48a	3—137
2—10	31—37a	5—59	2—147c
			2—148
			2—186

Two Quickies

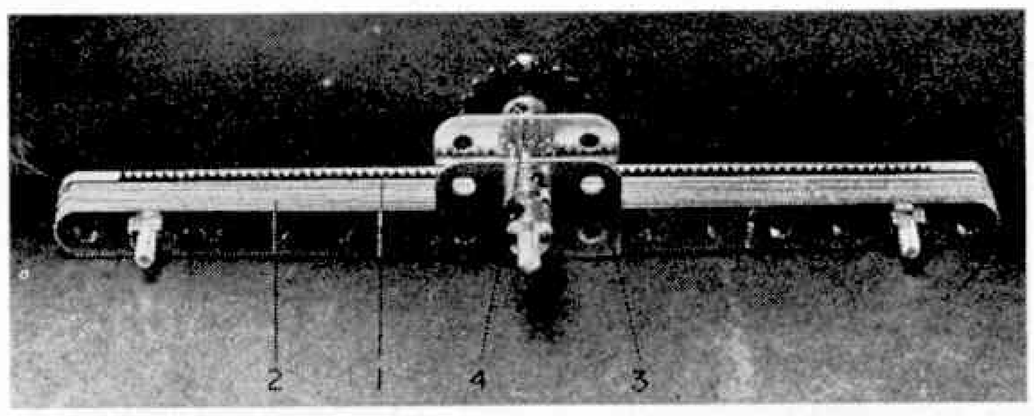
Moving on quickly, now, Pat Lewis of Formby, Lancs, has supplied me with a couple of small, but very efficient mechanisms which could prove particularly useful under appropriate circumstances—a Rack and Pinion Unit and a Safety Clutch. The former is extremely robust and ideal for heavy-duty use, consisting of a Rack Strip 1 packed between the second and third Strips in a "block" of ten $7\frac{1}{2}$ in. Strips 2, firmly bolted together. Sliding on this block is a Channel Bearing 3, in the upper centre hole of which a $2\frac{1}{2}$ in. Rod is journalled, this Rod carrying a $\frac{7}{16}$ in. Pinion 4 between the flanges of the Bearing to engage with the teeth of the Rack Strip. The Pinion is secured by a 7/64 in. Grub Screw. In the demonstration unit illustrated, the Rod is held in place by a 1 in. Sprocket Wheel and a Collar, the Sprocket receiving the movement drive, but under operating conditions, the drive would, of course, depend on the requirements of the parent model.

PARTS REQUIRED

10—1b	1—26c	1—59	1—110a
1—16a	2—37a	1—96	2—111
			1—160

In the case of the Safety Clutch, a demonstration mounting is built up from a $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flanged Plate, to the flanges of which two Flat Trunnions are bolted. Journalled in the apex holes of these Flat Trunnions is a 3 in. Rod, held in place by Collars and carrying a 57-teeth Gear Wheel 1, a Socket Coupling 2, a Cord Anchoring Spring 3 and another Collar 4. Gear Wheel 1 is free on the Rod, but is fixed in one end of the Socket Coupling, while the Cord Anchoring Spring is positioned in the other end of the Socket Coupling, being arranged so that the "eye" of the Spring projects into the large slot in that end of the Coupling. Collar 4 is positioned against the Cord Anchoring Spring to hold it in place on the Rod. A $\frac{1}{2}$ in. Pinion 5 is fixed on the end of the Rod to transmit the drive, Gear Wheel 1 serving as the input point.

With the mechanism built up, its operation becomes



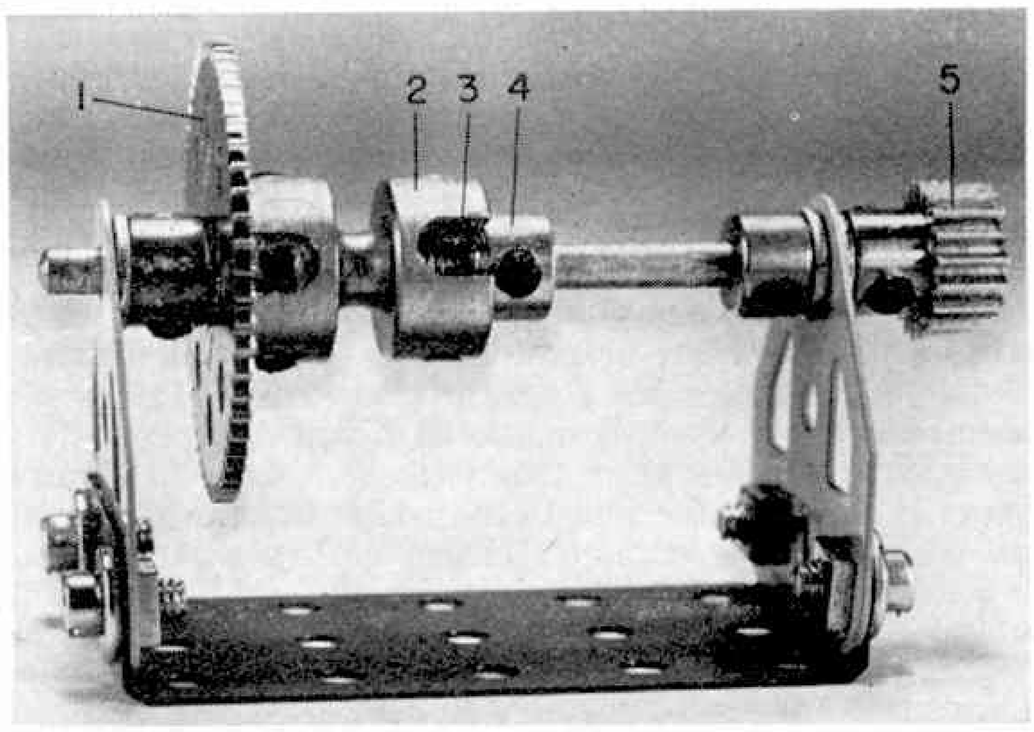
A positive-acting Rack and Pinion mechanism ideal for heavy-duty work, designed by Pat Lewis of Formby, Lancs.

evident. When a Cord Anchoring Spring on a Rod is turned in one direction, its coils will tend to tighten on the Rod, gripping the Rod hard to prevent slip, but when it is turned in the opposite direction, the coils will tend to unwind, loosening the Spring's grip on the Rod and allowing it to slip. Applying this to the mechanism, when Gear Wheel 1 is turned, the Slot in Socket Coupling 2 catches the eye of Cord Anchoring Spring 3, causing the Rod to turn. Provided the movement is in the appropriate direction, therefore, the spring will tend to unwind, and slip, when sufficient friction is placed on the Rod, thus acting as a safety device to prevent damage from unloading. It is important to remember, though, that the movement must be in the right direction, as, if in the wrong direction, the Spring will tend to tighten on the Rod, preventing the "clutch" from slipping. This does away with the safety clutch characteristics, but instead turns the unit into a form of ratchet mechanism which will grip when turned in one direction and slip when turned in the other. Whether used as a clutch or a ratchet, however, the friction required to cause slip is fairly substantial, therefore, the mechanism can be used with reasonably heavy loads before slip will occur. Another useful point is that the mechanism is reversible, i.e., Gear Wheel 1 can be used either for input or output purposes, making the mechanism an extremely versatile unit, indeed.

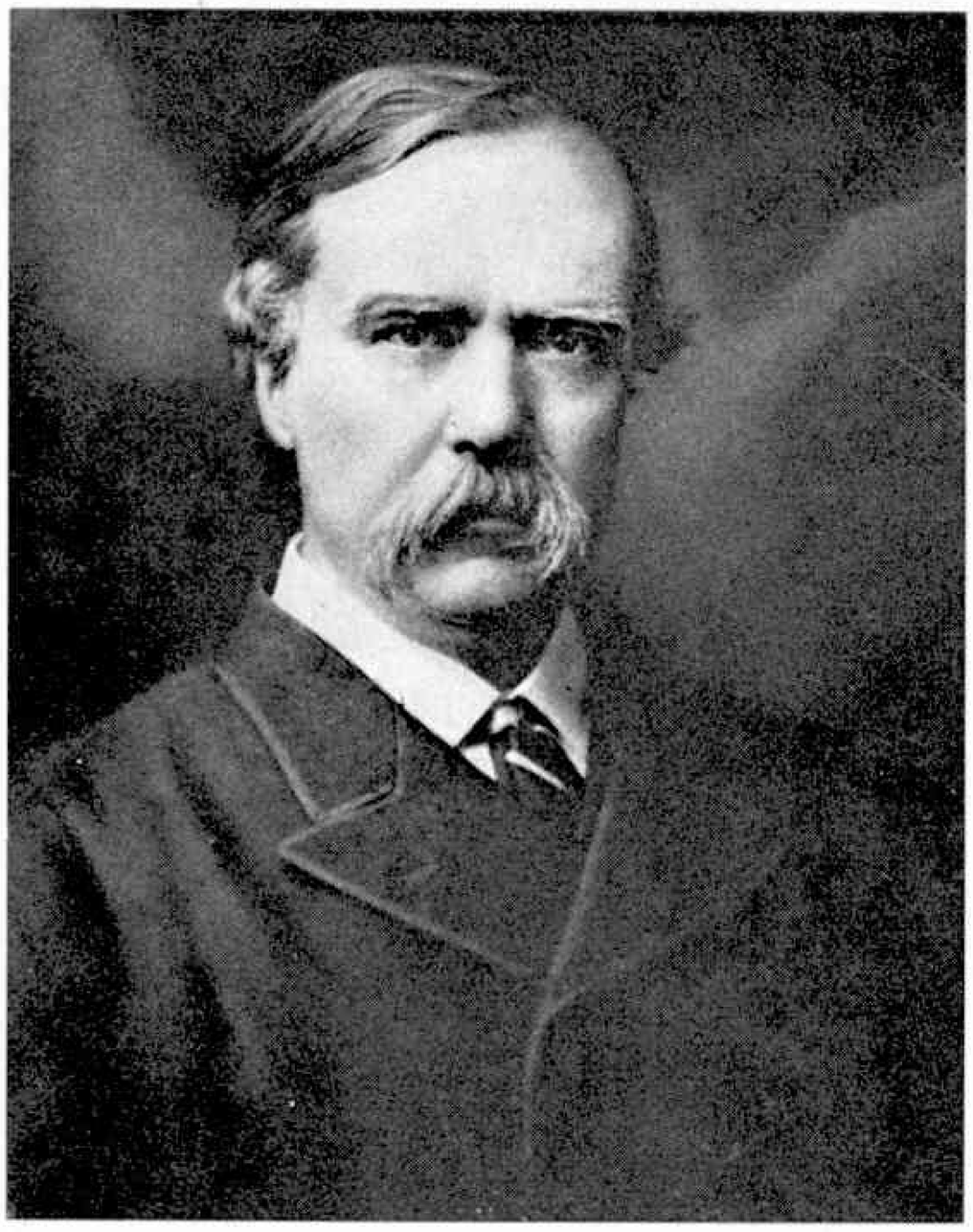
continued on page 466

PARTS REQUIRED

1—16a	4—37a	1—51	1—171
1—26	4—37b	3—59	1—176
1—27a	7—38	2—126a	



Another of Pat Lewis's ideas—and one which we believe to be completely new—is this Safety Clutch which will also double-up as a ratchet-type mechanism.



GREAT ENGINEERS No. 31

SIR CHARLES TILSTON BRIGHT

(1832—1888)

by A. W. NEAL

THE NAME OF CHARLES TILSTON BRIGHT has passed into history as one of the foremost developers in the field of telegraphy. Born in Wanstead, Essex, he was the youngest son of Brailsford Bright. He was sent to Merchant Taylors School where he displayed a Classic rather than a Mathematic turn of mind, but he did however show an early interest in electricity.

In 1847 the Electric Telegraph Company was formed, and soon brothers Edward and Charles (16 and 15 years old respectively) took employment with that concern. Charles first duty was working telegraph instruments in a railway signalling box and he was fortunate enough to be under the watchful eye of Fothergill Cooke, the well known inventor in the telegraph sphere. Within twelve months they had devised a method of locating telegraphic faults from a distance, the details of which were entered into a joint inventions album against the time when they had money to take out patents.

In 1851 Charles left the "Electric" Company and became Assistant Engineer to the British Telegraph Company for important works in developing their telegraph system. In the same year Edward took a post with the Magnetic Telegraph Company, eventually becoming Manager. It was during this period that the brothers took out legal coverage for their fault locating system referred to. The patent covered no less than twenty-four separate inventions of a telegraphic nature. Soon after this the English and Irish Telegraph Company came into being, and Edward accepted its managership. In 1852 Charles, then scarcely twenty years of age, became Engineer-in-Chief of the business. As such he was heavily burdened with the completion of an immense telegraph system of over-head and under-ground lines throughout the United Kingdom. With the assistance of his brother, Charles devised new apparatus to meet the needs of various difficulties hitherto not apparent.

In 1853 Charles supervised the laying of a submarine cable between Denaghadee, in Ireland, and Portpatrick, in Scotland, probably the first of its kind in deep water, although it was not the first link between the two countries. This enterprise was a prelude to a much more spectacular undertaking, a telegraphic link between England and America. The distance involved was some 2,200 miles and with sea depths as much as three miles. The brothers, having available their company's telegraphic system, were able to determine the practicability of such a scheme by linking existing cables between London and Dublin in such a way that messages could be transmitted through 2,000 miles of cable. Other preliminary work, like soundings of the sea bed, were furnished by various experts. After considerable negotiations on both sides of the ocean the Atlantic Telegraph Company was formed, and it seems natural that Charles was appointed Engineer-in-Chief. Apart from his participation in the actual design of the cable and the weighty responsibility involved, he was also responsible for the selection and adaption of ships, cable paying-out machinery, programming, staffing, and inspection of equipment during its manufacture. He, of course, had the backing of a highly skilled and specialized team, and that of Professor Thompson (afterwards Lord Kelvin).

There is no space here to re-tell the exciting story of the laying of the first Atlantic Cable other than saying that it was achieved. But it was an unhappy cable and breathed its last on October 20th, 1858 after conveying 732 messages. After this set back the scheme was just kept alive, and Charles (by this time Sir Charles) busied himself with various telegraphic matters, a line to India being one.

In 1865 another attempt to cross the Atlantic by wire was made. It proved unsuccessful. The following year, however, a line was successfully laid, and soon others followed. Sir Charles was consulted, when not Chief Engineer, on many of these projects. He was also concerned in various capacities with many important submarine cable and over-head lines of telegraphy in foreign party.

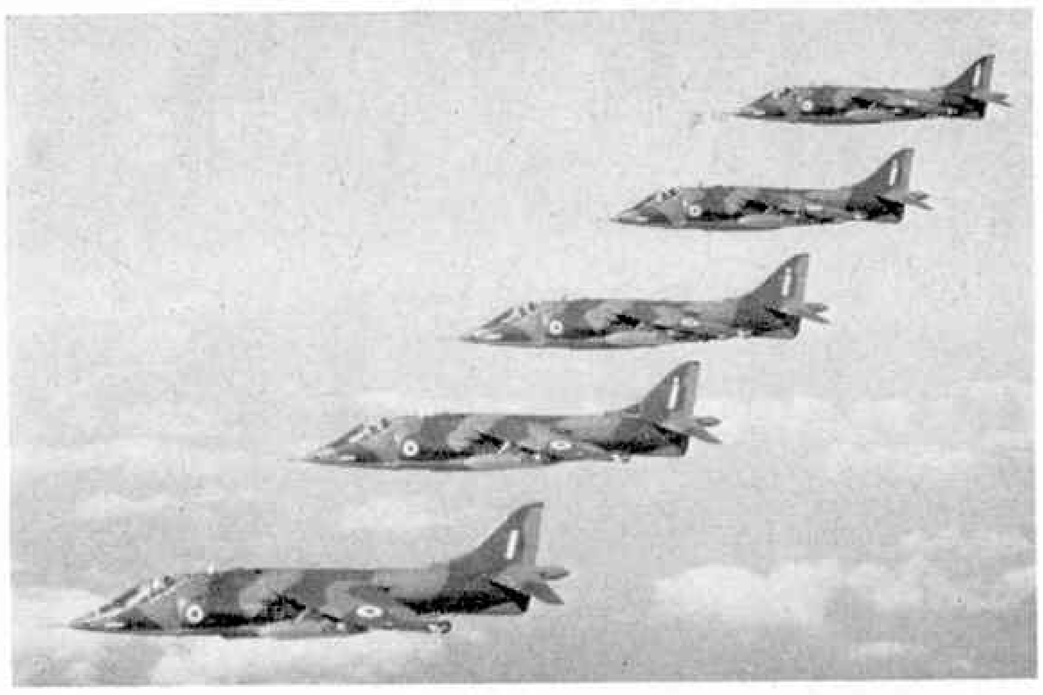
During the latter part of his life he was active in the fields of mining, electric light and power, but his principal claim to fame rests with this part in the development of submarine telegraphs.

His lesser inventions include fire alarm systems, printing telegraph, arc lamps and dynamo machines. He became Member of Parliament for Greenwich, a Captain in the Volunteer movement, President of the Society of Telegraph Engineers (now the Institution of Electrical Engineers), and a member of numerous official committees.

Obviously a man of intense determination, patience and energy, he died on 8th June, 1888 a comparatively poor man.

TRANSPORT TOPICS

by Mike Rickett



A REVITALISED PROGRAMME to attract new business on Inter-City routes—that's British Rail's formula for the Eastern Region, announced in the new timetable.

The new timetable marks a big step forward in Eastern Region's bid for an even larger share of the inter-city travel market. Times are to be cut on the fastest trains by 15 minutes bringing Newcastle and London to just over 3½ hours. With schedules built for the businessman, other services on Eastern's prestige East Coast Main Line will have up to 13 minutes clipped off the journey between Newcastle, Darlington, and King's Cross.

Inter-City will provide faster and more frequent services between most major cities and for instance, there will be a train between Leeds and London almost every half hour, the fastest doing the 185¾ mile journey in 3 hours 36 minutes.

More modern coaches with air brakes, electric train heating, double glazed windows and other new equipment are being introduced and, by early May, a major civil and signal engineering programme will have been completed. For the Bradford businessman the early morning train to King's Cross will be 10 minutes faster and there will be accelerations, too, on Sheffield services to London.

Inter-City sleepers are enjoying a boom in business and later departure times on some trains should make them even more attractive. The crack "Aberdonian" will leave King's Cross 15 minutes later, call additionally at Peterborough but will still retain its present arrival time in Aberdeen. The 19.10 Newcastle-Bristol sleeper will have a 20 minute later departure and the 22.45 Newcastle-King's Cross sleeper has also been retimed to leave 10 minutes later. A recent innovation for sleeping car passengers is a "Nightcap" service. Previously, only the traditional early morning tea and biscuits were brought to passengers, but now they can order a pre-bedtime snack; tea, coffee, sandwiches, biscuits or even a whisky and soda.

A new morning train from Sheffield at 07.40 via Wakefield, Leeds and Carlisle to Glasgow will provide a useful additional link for the Inter-City traveller. Also to Scotland, the 08.40 Leeds-Edinburgh via the East Coast route will save seven minutes on the journey giving better connections at Edinburgh for Glasgow and arriving 45 minutes earlier, Dundee 27 and Aberdeen 76 minutes earlier. In the southbound direction the 17.10 Edinburgh-Leeds has been accelerated by no less than 24 minutes.

The West Country holiday resorts come closer to the diverse industrial centres of the North East with new and intensified services. The almost hourly expresses will have a general speed-up of 15 minutes, but one of them, the 12.05 Newcastle-Paignton via York, Sheffield, Derby, Birmingham and Bristol will have 40 minutes sliced from its journey time. And for West Riding passengers to the South West, the "Cornishman" will be accelerated by 10 minutes to Penzance.

The morning train from Newcastle to Manchester and Liverpool will leave at 07.50, an hour earlier than at present, allowing the businessman more time at his destination. Additional calls at Durham, Huddersfield and Stalybridge have been introduced.

A rather different exercise took place recently when ten Harrier fighters of the Royal Air Force's No. 1 Squadron took part in an operational work-up during a successful exercise in Cyprus. Deployment to the Mediterranean meant it was the largest number of Hawker Siddeley Harriers—the world's first operational V/STOL aircraft—to go abroad at one time.

During the ten day exercise the revolutionary Harrier GR MK.'s were based at Royal Air Force Akrotiri and demonstrated their unique multirole capability. The squadron's home base is at Royal Air Force Wittering, Northants.

Seventy seven single seat GR MK.1's and thirteen two seat T. MK.2 Harriers are on order for the Royal Air Force. Harriers are also in production for the United States Marine Corps.

Whilst talking on air topics, readers might be interested to know that the latest version of the Hawker Siddeley Trident—the high capacity three—is making good flight test progress. By the end of January 45 flights, totalling more than 70 hours, had been made in the certification programme.

With the installation of a Rolls Royce RB 162 boost engine, the next development phase of the Trident Three will begin shortly. First flights with the additional engine operating are expected in May. The RB 162 supplements the power of the three Rolls Royce Spey engines for take off and initial climb, and the fourth engine is shut down for cruise.

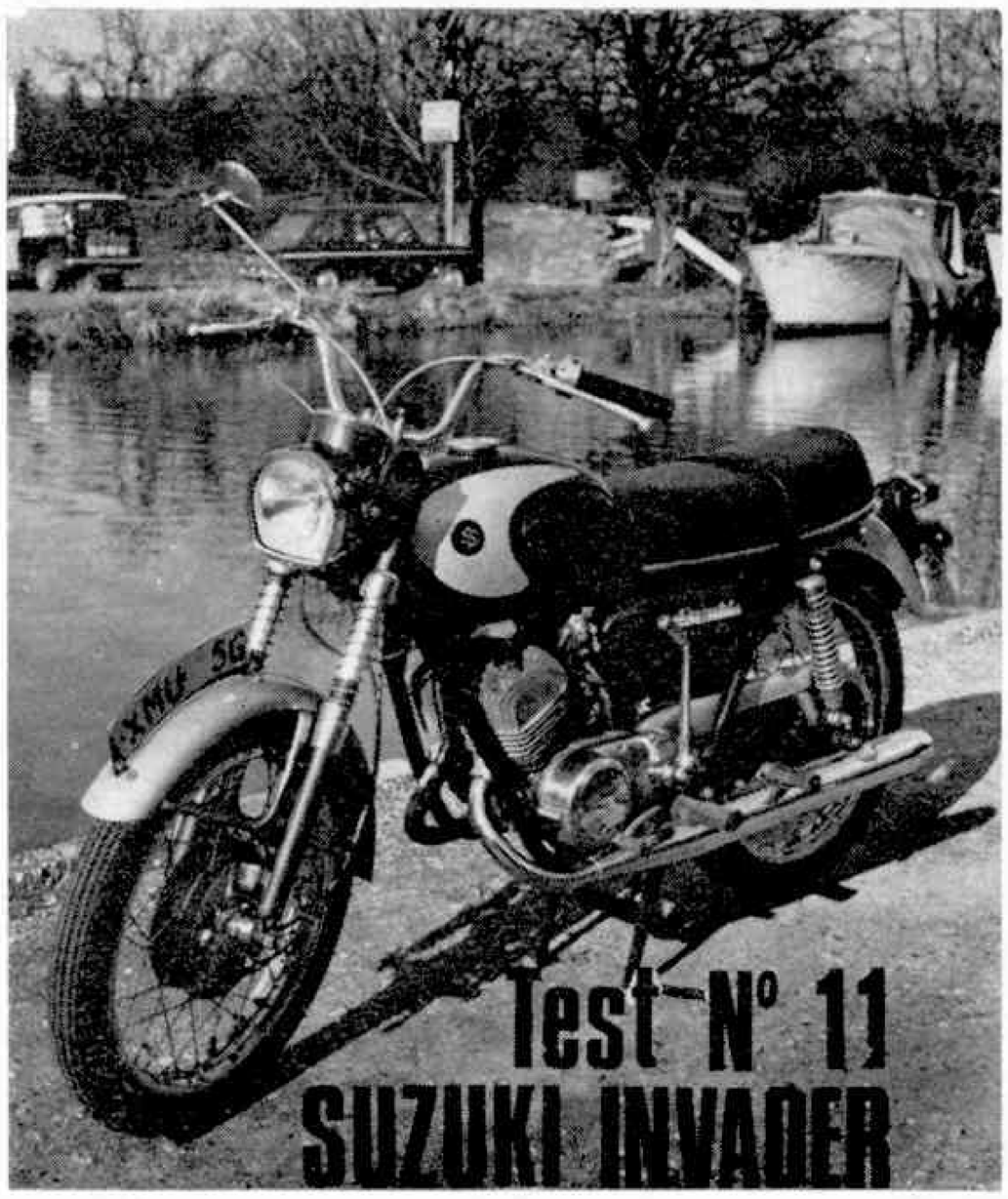
Since its maiden flight in December, piloted by Mr. J. Cunningham, Executive Director and Chief Test Pilot at Hawker Siddeley Aviation, Hatfield, the Trident Three and its complex test instrumentation have had a high serviceability record.

Early programme targets, designed to establish the boundaries of the operation envelope, have all been achieved, including the clearance of the design speed and mach number limits. True mach numbers in the range of 0.95-0.96 (about 40 m.p.h. below the speed of sound) have been achieved on several flights. Handling characteristics at these high speeds have been good, and included in the test programme has been a series of fully automatic landings.

First deliveries of the aircraft, 26 of which are on order for B.E.A., will be in early 1971.

ON TWO WHEELS

A high performance lightweight twin from Japan . . .



Terrific performance with looks to match are the main characteristics of the Invader.

This report will be the last in the present series and takes us round almost to a complete twelve month cycle. We hope that our reports have proved of value to the readers who were contemplating a two wheeler as a means of transport, and perhaps it has even persuaded a few to look deeper into the possibilities of this, the cheapest and for many the most enjoyable means of powered travel.

In our reports we have covered all types of two wheeled transport, from the humble moped, through scooters and onto motorcycles, catering in fact for all tastes. Our first review back in September 1969 was of a lightweight Lambretta scooter, loaned to us by Lambretta Concessionaires, and our report this month, although of a Suzuki motorcycle, came from the same firm, which takes us back to where we came in.

FOR THE YOUNGSTER FORTUNATE enough to own a Suzuki " Invader ", we can see a bit of trouble in store. Not, we hasten to add from the machine but from Dad, whom we feel sure will be very unwilling to part with it once he has had a ride. You will have probably gathered that we were very favourably impressed with this lightweight, and you would be right !

Neatly installed in one unit are the speedometer and rev. counter. The ignition switch can be seen on the left side of the headlamp.

With an engine capacity of only 196 c.c.'s this bike can produce some shattering performance figures, putting it well ahead of most sports cars. Its top speed is almost 90 miles per hour which means that cruising at the legal limit of 70 m.p.h. can be comfortably maintained even with a pillion passenger, indefinitely.

Trying to find its most appealing point proves very difficult. It has an attractive appearance, enhanced by plenty of polished aluminium and chrome. It also has the smooth vibration free ride that only a twin can give, and thirdly it has the blood-tingling howl which is this type of engine's most endearing characteristic. You can take your pick !

We tested the " Invader " when the winter's weather was at its worst. We left it out in the snow and rain which tests cold-starts to the limit, but a prod of the kickstart with full choke always had it ticking over at most on the third attempt. Because it is a twin it is a beauty to kick over, only 90 odd c.c.'s at a time have to be dealt with, thus dispensing with the need for a hefty swing. The fact that it has two carburettors must account largely for its ease of starting (in warmer weather one prod was enough).

Being a high performance machine, careful use of the engine revs available and selection of the right gear is important. These being properly selected the machine howls off down the road, but made a mess of it will creep away making the rider think the brakes are still on.

Roadholding is superb, with braking to match and the gearbox is a delight to use. (Naturally there is a neutral warning lamp in the headlight). Pillion passengers can be carried without any recognisable difference in performance, although whilst on the subject of pillion we found the dual seat a little on the short side.

Controls are simple, kept to a minimum and well laid out. Clutch lever, horn (a nice loud one for a change !) and dip switch on the left and front brake and throttle on the right. The lights are controlled by the ignition key in the headlamp cowl and are excellent. It was very comforting to find a large rear lamp especially when riding in dark country lanes. Parking lights can be left on and the ignition key removed, but rather annoyingly when the machine is being ridden only dipped or main beams can be operated, as turned to the " side lights " position the ignition is immediately cut.

The Bodywork

The Japanese seem to have a knack for producing attractive looking machines, and the Invader is no exception. Plenty of chrome, bright paintwork and highly polished aluminium add up to a sparkling overall look. The fuel tank, oil tank, toolbox and headlamps are metallic red; the frame black and the mudguards silver.

The shock absorbers, handlebars and twin silencers are heavily chromed and the wheels, engine, etc., polished alloy.

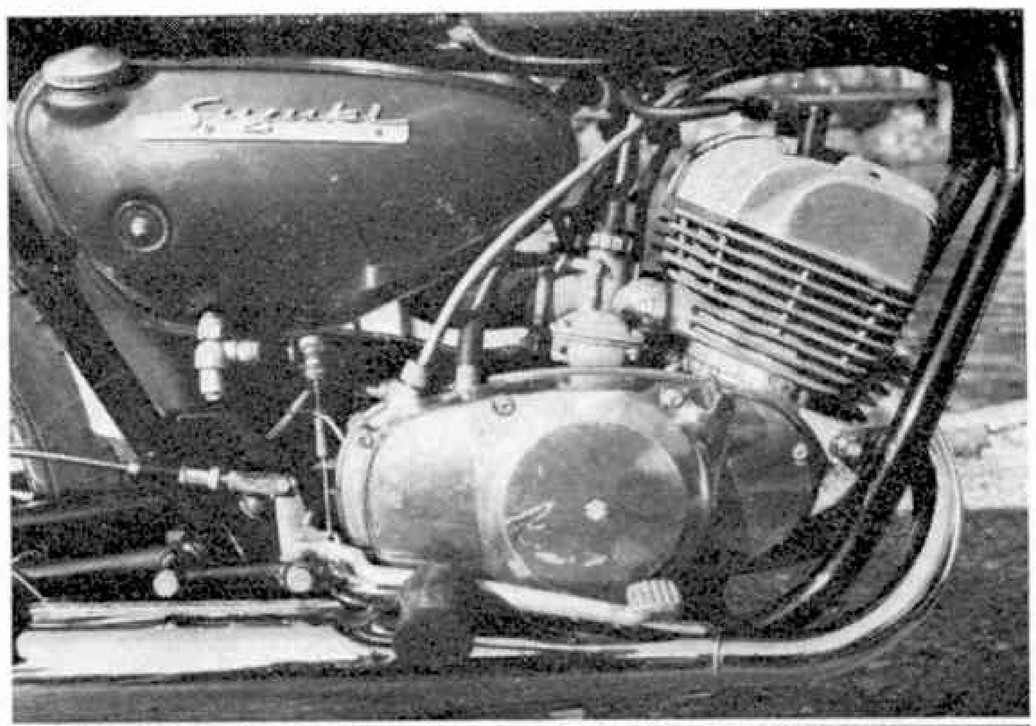
The headlamp unit houses a combined speedometer (with milage recorder) and an engine revolution counter. Both are easily seen behind the raked handlebars. Also in the headlamp unit is of course the ignition switch, neutral indicator lamp and main beam indicator lamp.

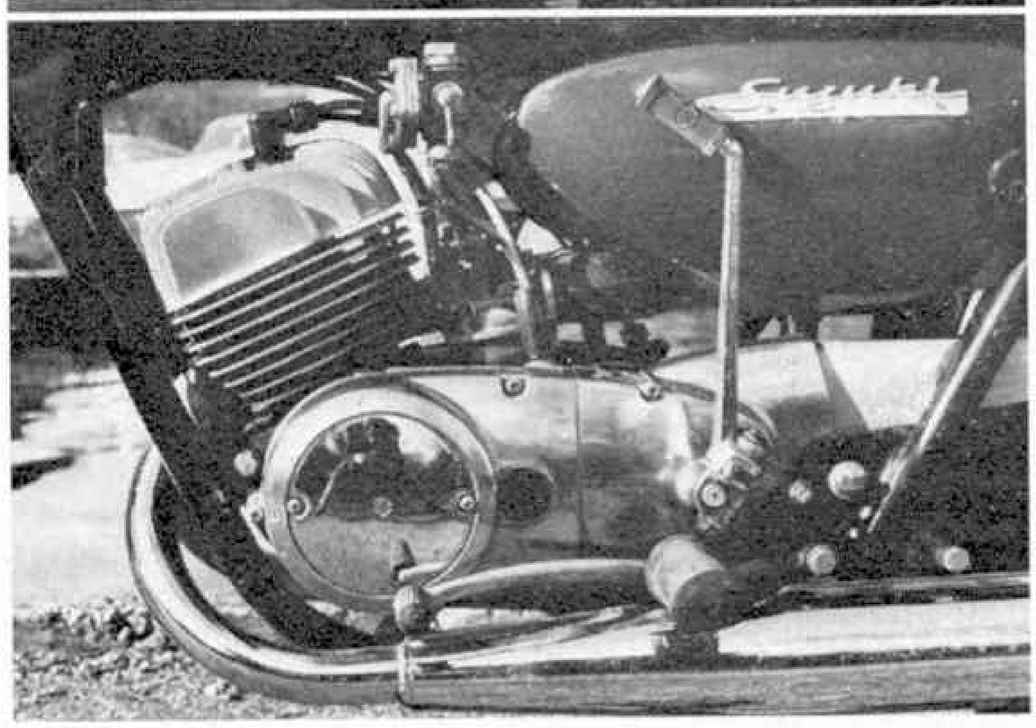
The Engine

With a capacity of under 200 c.c.'s this two stroke twin develops an alarming amount of power. It is quiet, vibration free and gives the impression of being unburstable. It will purr quietly at 20 miles per hour in top gear without fuss, and at the other end soar up to almost 90, revving up to 8,000 r.p.m. and giving the rider an exhilarating thump in the back on the way !

The Gearbox

The foot operated gearbox is a delight to use, smooth, quick and positive. It is fitted with no less than *five* speeds all close together ratio-wise and this accounts much for the impressive acceleration up to 70 m.p.h. Neutral takes a bit of delicate footwork to find, especially when, as on our test model, the green neutral light also stayed on when in 2nd gear !





The above pictures show the power unit of this eye catching twin. Note the stylish kickstart and highly polished parts.

Summary

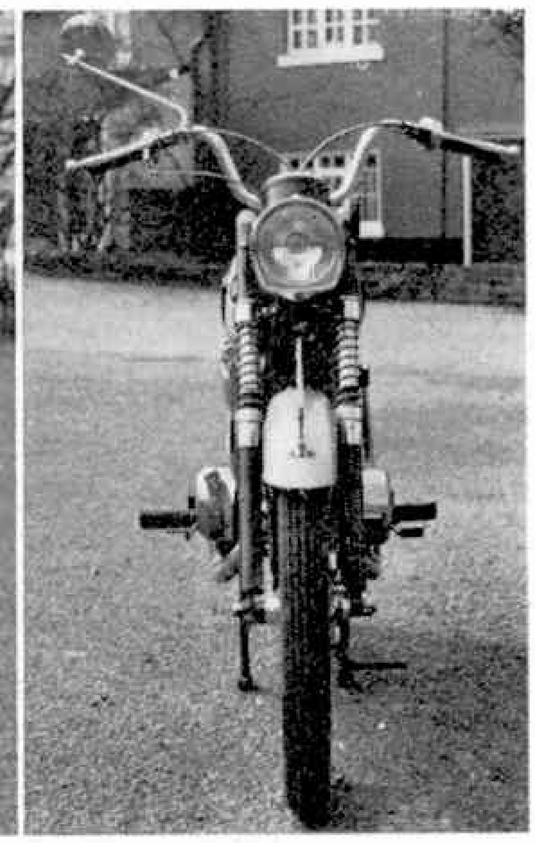
The Suzuki Invader is a superb machine in many respects, and in our opinion ideal for the type of person who enjoys riding for the sheer pleasure of it. It is ideal (believe it or not !) for the young learner rider; easy to start; very forgiving and very sure footed.

The fact that it is below 200 c.c.'s means cheap insurance and running costs and its high cruising speed and comfort will enable long journeys to be made.

It's a splendid machine in all respects, and for the money (wait for it) £230, very good value.

FOR THE TECHNICALLY MINDED

Cubic capacity	**196 c.c.'s**
Maximum power	**23 b.h.p.**
Consumption (per gal.)	**75 miles**
Weight	**269 lbs.**
Gear ratio	**1st—2.77:1**
	2nd—1.72:1
	3rd—1.32:1
	4th—1.09:1
	5th—0.92:1
Tyres	**2.75-18 in.**
Lubrication	**Separate oil through " Posi-Force " lubrication**
Common dimensions	**Length 75.8 in., Width, 30 in., Height, 40.6 in., Wheelbase, 49.4 in.**
Available colours	**Red; Blue; Black**



LITERARY FIGURES ON STAMPS

by James A. Mackay

THE BICENTENARY OF THE BIRTH of the poet William Wordsworth and the centenary of the death of the novelist Charles Dickens are being celebrated in Britain this year with numerous exhibitions, recitals, special editions of their works and a shoal of new biographies. Philatelists are not being left out in the cold since both these literary figures are the subject of commemorative stamps released this year.

It is perhaps invidious to compare Wordsworth with Dickens and relate their popularity to the numbers of stamps issued for each of them, but the fact remains that the British Post Office has issued four stamps for Dickens (all five-pennies at that, and therefore commonly seen on ordinary correspondence) whereas poor Wordsworth has to be content with a single 1s. 6d. which, perpaying the airmail rate overseas, will be seen in India and America rather than in Britain.

William Wordsworth was born at Cockermouth, Cumberland, on April 7th 1770. He was educated at Hawkshead Grammar School and St. John's College, Cambridge, where he took his bachelor's degree in 1791. Before he was thirty he was well known as a poet and had published *Lyrical Ballads*. He was later associated with Coleridge, Southey, De Quincey and others who became known as the Lakes School of Poets. A number of Wordsworth's poems describe the beauties of the English lakes and surrounding district. In 1813 he was appointed Distributor of Stamps (the revenue, not postal kind) for Westmorland at a salary of £500 (worth about £5,000 in today's currency). He held this post till 1842 when he resigned in favour of his son. In the same year he became Poet Laureate, an office which he held till his death on April 23rd 1850. He is buried at Grasmere in the Lake District and it is a typical scene in the Grasmere neighbourhood which appears on the Wordsworth stamp.

Charles Dickens was born in Portsea in 1812, the son of John Dickens, a Navy clerk. When he was still a small boy his family moved to Chatham and then to London. Young Dickens had a chequered childhood, largely on account of his father's fecklessness and eventual bankruptcy. Charles was sent out to work in a blacking factory at the age of eight and earned six shillings a week labelling bottles. A windfall, in the form of a small legacy, enabled him to leave work and attend a grammar school. As a teenager he served as a lawyer's apprentice and later as a law reporter. He learned shorthand and graduated into Fleet Street journalism. He developed shrewd powers of observation and possessed a true gift for journalism; these qualities combined to make his novels masterpieces of enduring popularity.

Some of his novels are semi-autobiographical, *David Copperfield* in particular being based on his own boyhood. Other novels were used by Dickens to satirise and attack the social evils of his day. In *Oliver Twist* he attacks the workhouse system and the parochial poor laws, in *Martin Chuzzlewit* it was the nursing profession, in the form of Sairey Gamp, which was criticised, while *Nicholas Nickleby* showed up the malpractices of private schools such as the aptly named

Dotheboys Hall. Even the light-hearted *Pickwick Papers* satirised the so-called "crim con" lawsuits—divorce, breach of promise and scandal—in which his experience as a law reporter came in useful. Dickens died suddenly on June 9th 1870 at the age of 58 and is now buried in Poets Corner, Westminster Abbey.

Dickens was the subject of a Russian stamp, released in 1962 to mark the 150th anniversary of his birth. This novelist, the best known and most popular of all English novelists, is widely respected all over the world and this helps to explain why a number of Commonwealth countries have issued stamps this year in his memory. Sets of four stamps each have been issued by Antigua, Botswana, British Virgin Islands, Cayman Islands, St. Helena, St. Kitts-Nevis, St. Lucia and the Turks and Caicos Islands. In addition the British protected sheikhdom of Dubai has released four Dickens stamps. The majority of these stamps bear portraits of Dickens, with characters from his novels depicted in the background. His birthplace in Portsea appears on a stamp of St. Kitts-Nevis, while a series of different portraits of Dickens are shown on the Dubai set.

The four British stamps reproduce well-known illustrations from the novels: Mr. Pickwick and Sam Weller by "Phiz" (Hablot Browne), David Copperfield with Mr. and Mrs. Micawber, also by "Phiz", David Copperfield and his aunt, Miss Trotwood, by the same artist, and Oliver asking for more, by George Cruikshank from *Oliver Twist*.

HAVE YOU SEEN ?

Revell Kits

Recently arrived from the plastic-kit producing company of Revell Ltd. are a host of new models of cars and ships.

Unfortunately they arrived rather too late for them all to be included in this month's issue, but by a bit of fast talking we managed to persuade our kit reviewer to assemble one of the cars for inclusion here, with a brief mention of others in the range.

The cars in question (there are four in the present range) are all to 1/32nd scale, and are all of American sports jobs. The most interesting feature of them all, and one which will delight the more heavy-handed is that no cement is needed to assemble them, they just snap together in fact. This snap together system works extremely well, and from outward appearance it's just impossible to tell that no cement was used in construction.

However, back to the cars: The four we received are 1, Javelin SST, 2, Corvette Sting Ray, 3, AMX "390", 4, Barracuda Formula " S ". They are moulded in bright colours and although painting is not really required they do tend to lose that " plastic " look if they are either coloured or clear varnished.

Each kit contains only 20 or so parts and takes only a matter of minutes to assemble. They look very attractive when completed, each kit containing chromium and clear parts as well as the basic body colouring. Black soft-plastic tyres are included and each kit contains comprehensive instructions/diagrams.

For the young enthusiast we would consider them to be an ideal introduction into the kit construction world, and reasonably priced at 11/9d.

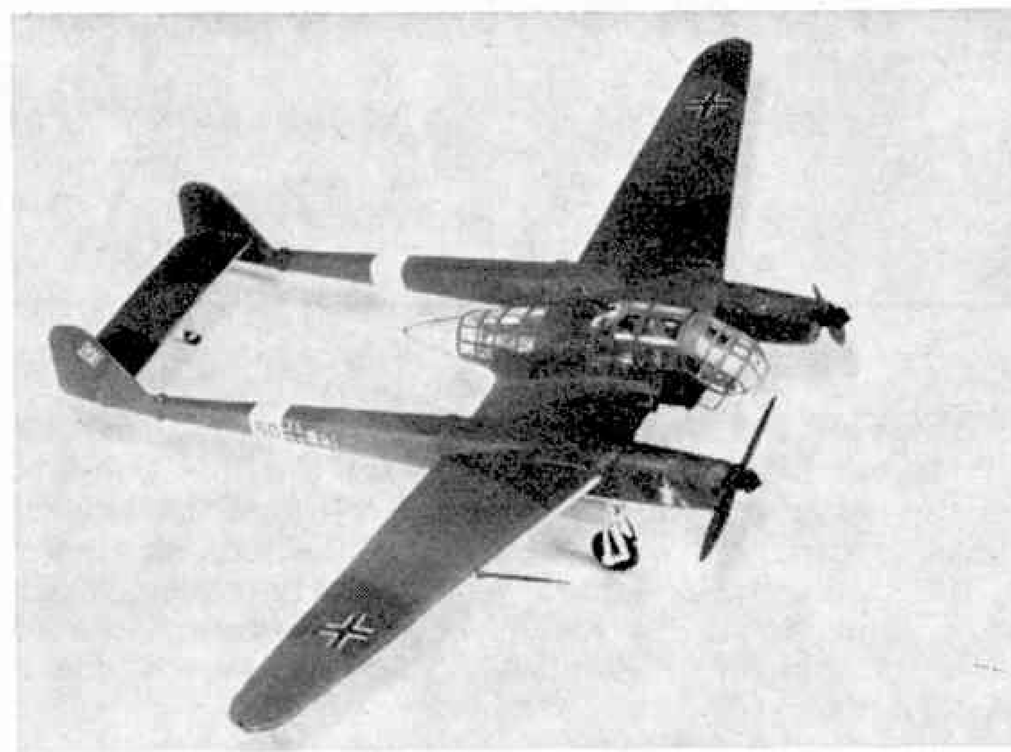
Airfix Focke Wulf 189

The latest series 2 aircraft kit released from Airfix is the famous German FOCKE WULF 189, which was used with great success by the Luftwaffe in World War 2.

The kit contains nearly 80 parts moulded in both grey and transparent polystyrene. No difficulty was found when assembling the model, though cement must be used carefully when fitting the nacelle transparencies. Alternative rear-gun and undercarriage positions are provided, together with a matt transfer sheet, very good value at only 4/3d., the F.W. 189 is available from all model shops.

Airfix Ford Escort

Another new Airfix kit, this time a car, is the popular family saloon, the FORD ESCORT. Moulded to $\frac{1}{32}$ scale in nearly 80 parts of white polystyrene, the kit is finely detailed.



The new Airfix Focke Wulf 189 kit built up into an attractive model.

Full interior is included, together with a driver, and the bonnet is detachable to reveal a fully detailed engine, complete with cooling fan, chassis detail is also well moulded and captures the look of the original.

A model that should keep many of you occupied for quite a few hours, the ESCORT retails at a mere 4/3d.

Excellent value at a mere 4/3d. is the Airfix Ford Escort.

Revell Jolly Green Giant

Revell's latest helicopter kit is of the famous SIKORSKY HH-3E, nicknamed the JOLLY GREEN GIANT by its pilots. The Revell kit builds up very easily into quite a big model and is well detailed.

There are about 34 parts moulded in forest green and the transparent parts are beautifully clear.

There are many moving parts including revolving wheels and rotors, steerable nose wheel and operating rear access ramp. Very good model of a contemporary helicopter, the Revell kit costs 9/9d.

Revell N.A. OV-IOA Bronco

Another 1/72 scale model by Revell brought out at the same time as the " Jolly Green Giant " is the North American OV-IOA BRONCO.

Continued on page 462

BUILDING A MODEL RAILWAY

Part II

Wiring, operation and introduction to scenery

ELECTRICAL WIRING FOR a Tri-ang Hornby layout just could not be simpler. The negative and positive wires from the controller-transformers are joined to the track with the track connectors, as shown in the photographs—there is absolutely no soldering to be done, as the wires have push-in connectors to the track " spade ' 'assembly. The picture will make this clear.

Converting points to remote controlled operation is equally simple, and our picture shows just how the connections are made betwen the un-controlled transformer outlets, the operating lever, and the point solenoid. All Tri-ang Hornby points are designed to be converted to electric operation if required. The solenoid unit simply clips into place and connects to the original hand lever. In this way, points can be " electrified " when required, and the cost of doing so can be spread over a long period. On our layout we only electrified the crossover on the far side of the layout to the controllers—this saved leaning over the layout. Points thus automated work with a satisfying " snap ", and several lever quadrants arranged in a bank look very much like a real lever frame !

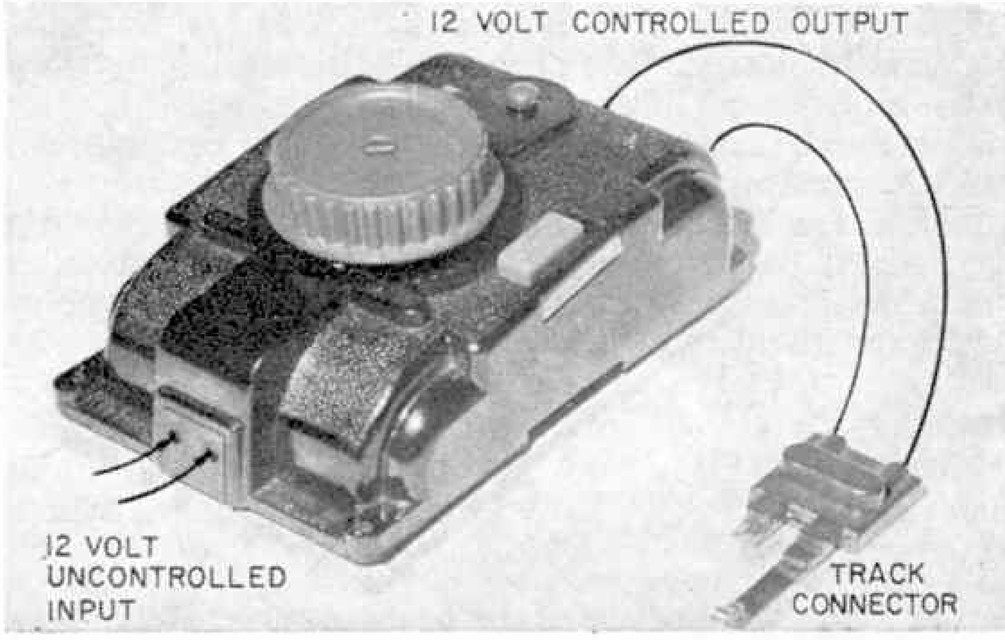
Although we decided to keep all scenic effects on our layout as simple as possible, readers who saw the pictures in last month's article will agree (we hope!) that the latest pictures show a considerable improvement in realism as interest. This has been achieved by two methods—by painting roads on to the basic green baseboard in grey paint, and by adding various items in the way of buildings, fences, trees, etc. As a site for our passenger station, we used the side of the baseboard opposite to the " goods yard complex ". The station platforms and buildings are from the Tri-ang Hornby range. They represent a modern style of structure, and look very attractive with their " glazed " canopies. Photograph 4 shows an aerial view of the station, with passenger and goods trains passing. This picture was taken before we added any trees, but the " roads " had been painted in. Note the white lines in the " car park " outside the station—these were merely strips of white paper stuck down. The cars are from the Lesney " Matchbox " series.

Photograph 5 shows a tree we " planted " in the station forecourt. It is one of Britain's realistic plastic products—these sort of things really relieve the essential bareness of a simple layout.

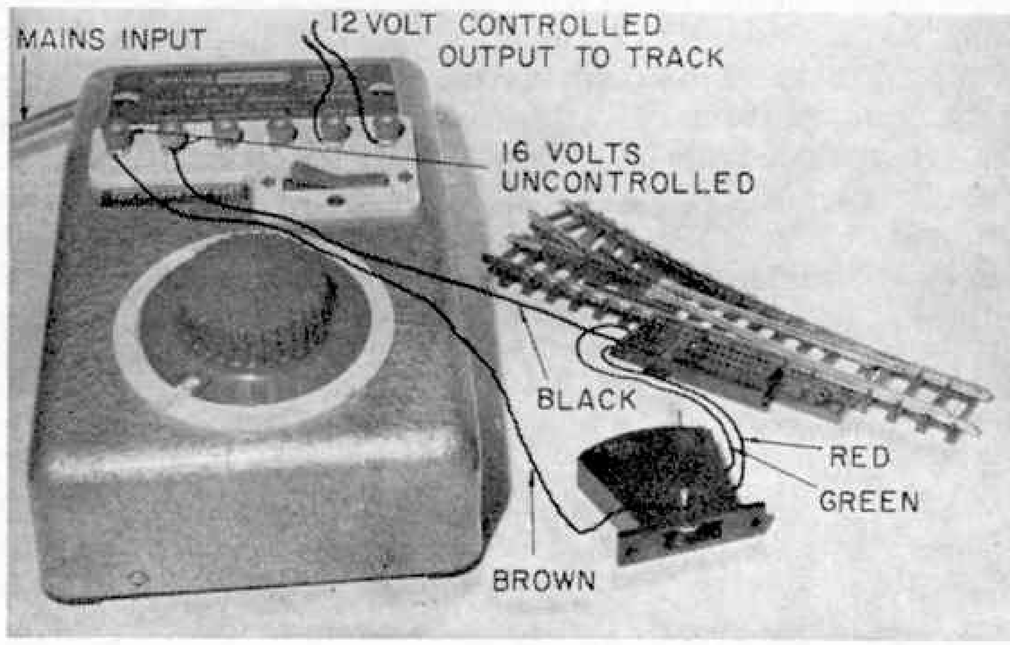
Photograph 6 was taken across the main lines, looking towards the " inner " goods yard. The scene is simply set: a little plastic fencing, a Tri-ang platelayers hut, and Lesney commercial vehicles. The grey-painted goods yard " ground " separates it from the rest of the layout. In the far distance, an express can be seen approaching, and an incoming goods train is just backing its brake van into the siding on the extreme right. Realistic as it is, this scene is entirely built up from cheap commercial items.

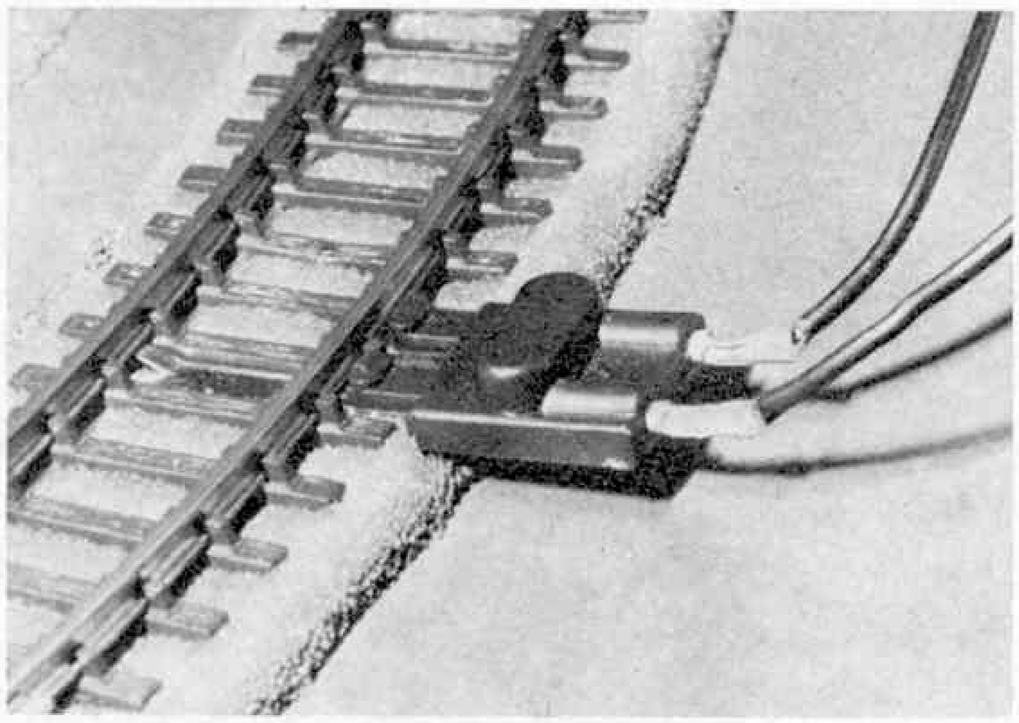
Photograph 7 shows exactly the same scene from " the air ". Raising the viewpoint immediately proves that this is our model railway, and a lot of the realism of that low-level shot is lost. The painted confines of the goods yard itself are now apparent, and the fences and accessories show up clearly. The left-hand siding is mainly used for fuel storage, and a rail tanker

The " sceond " controller has no built-in transformer—the " 12 volt uncontrolled input " comes from the main transformer-controller.



The main transformer-controller. The 16 volt uncontrolled output is wired to point lever and point motor as shown.





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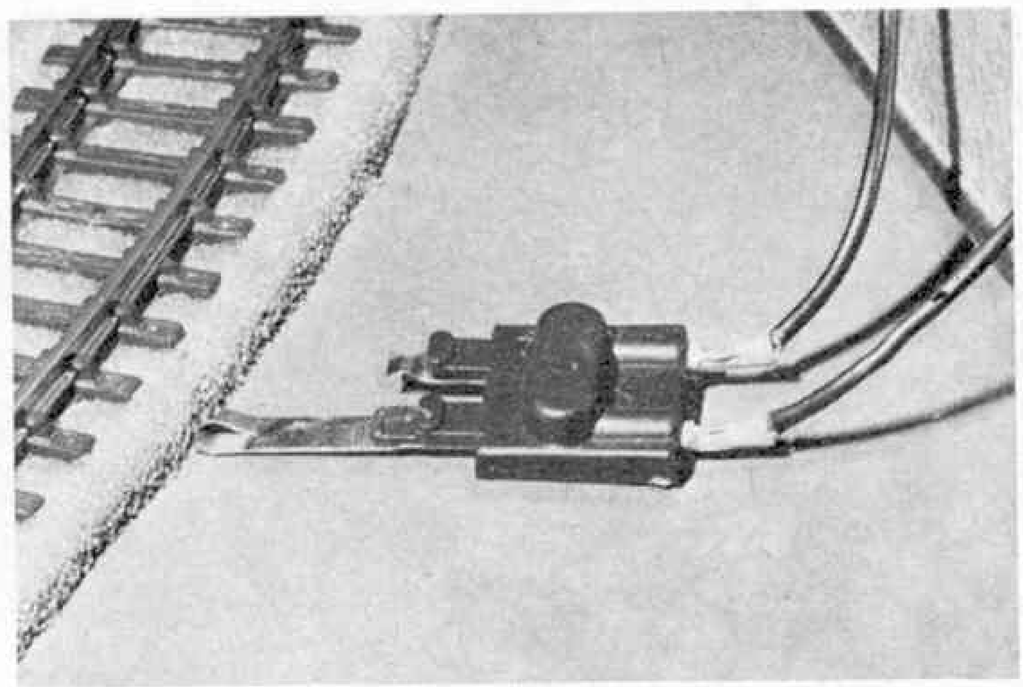

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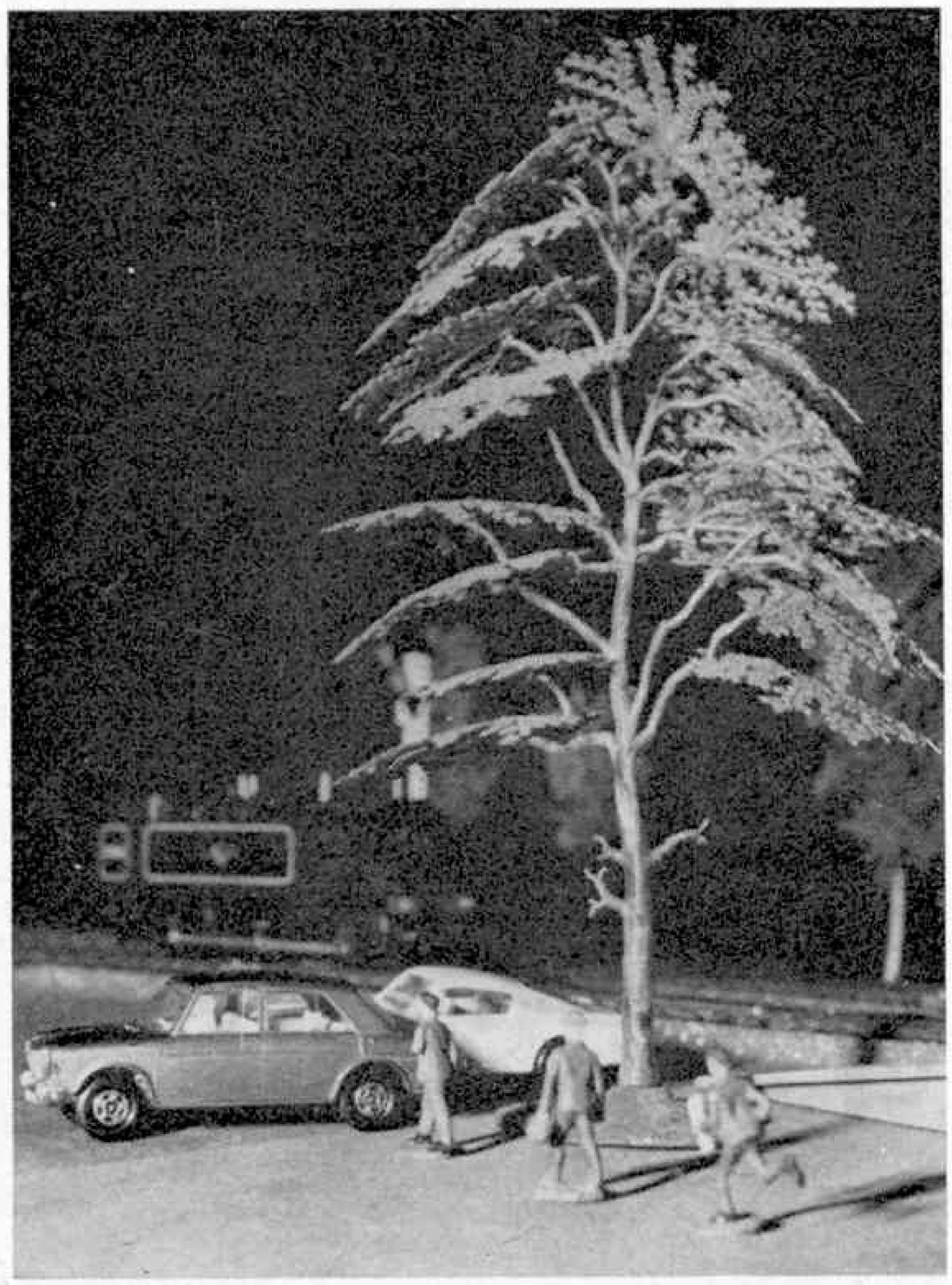

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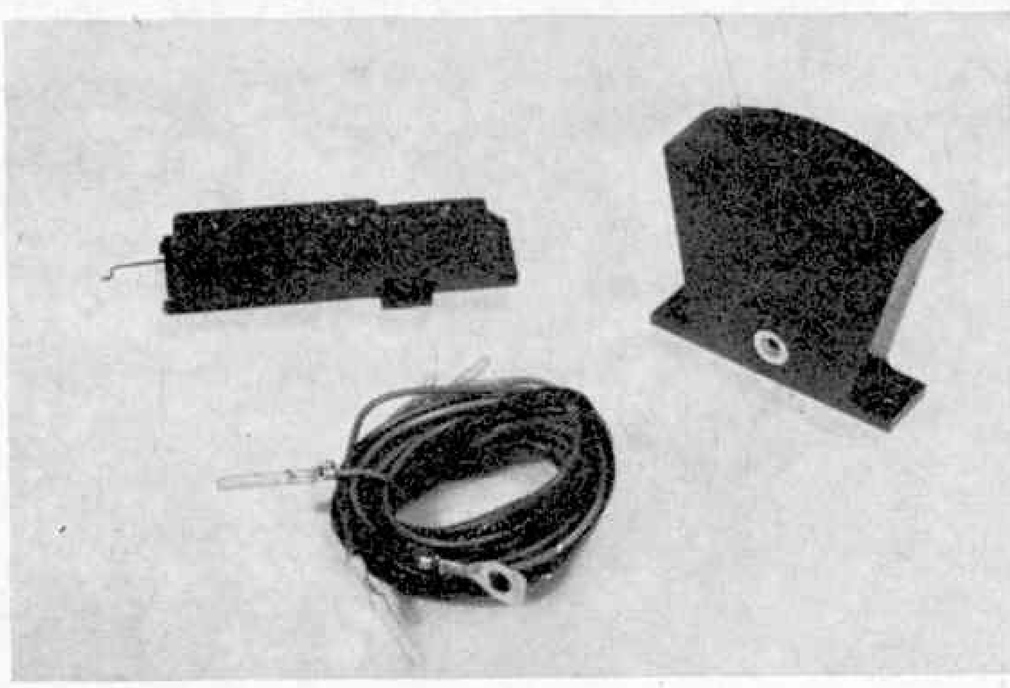

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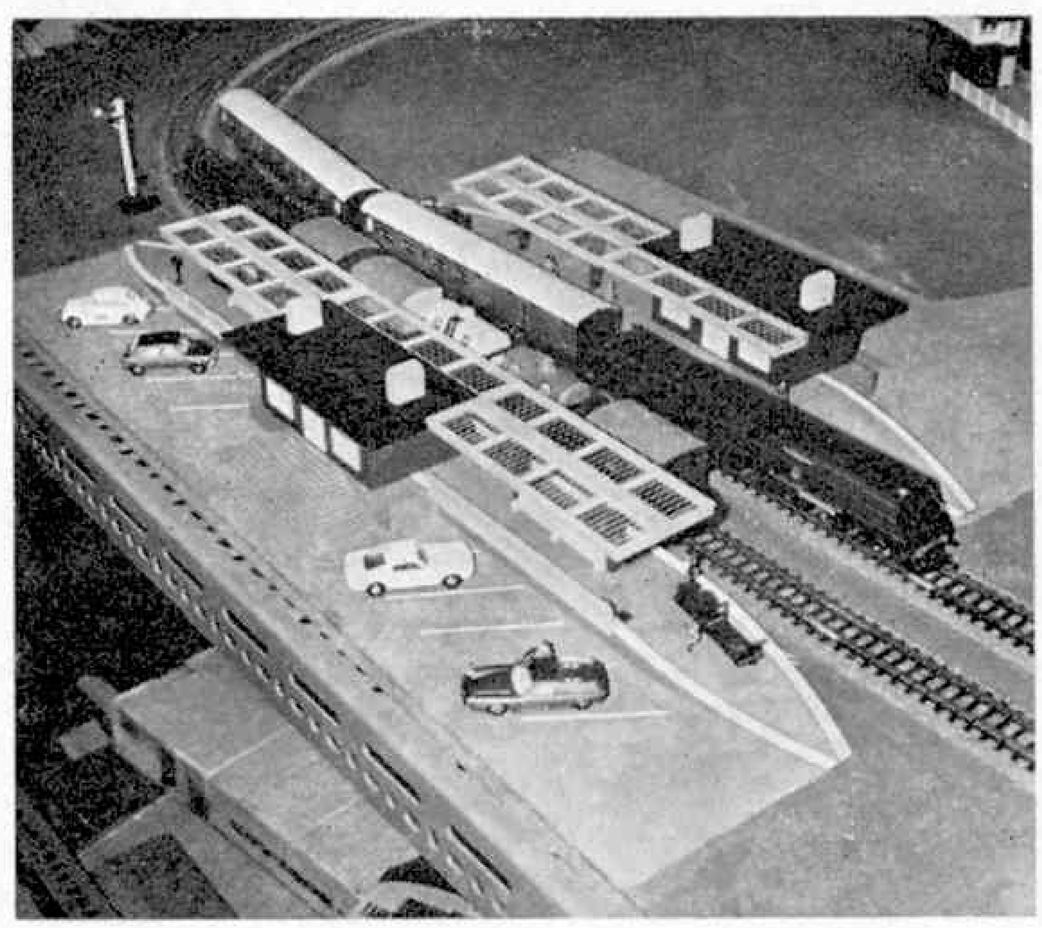
is standing next to the elevated fuel tanks. An interesting shunting movement is taking place in the inner goods yard. The mixed freight train has just arrived from the bottom of the picture, travelling on the inner track (trains, like cars, drive on the left). It has just pulled up beyond the yard entrance points, and backed into the yard. The brake van and U.D. milk tank are required to go on to a further destination, so they have been uncoupled and left in the short siding. The remaining vehicles of the goods train will soon be backed into the middle siding. While all this is going on, a diesel-hauled express is about to pass on the main line.

We come down to ground level again on Photograph 8, once again in the inner goods yard, but looking in the opposite direction. The little 0-6-0 " Jinty " is still shunting, and the uncoupling ramp can be seen right in front of it. These ramps are very cunningly designed and, although they are completely " remote " in their

1: The track power connector in position, and (2) withdrawn.
3: Point motor, actuating lever, and wire connections.
4: View of the main station " from the air," showing the very realistic appearance of the Tri-ang Hornby station buildings. Note the car park !
5: Britain's plastic tree " growing " in the station car park.



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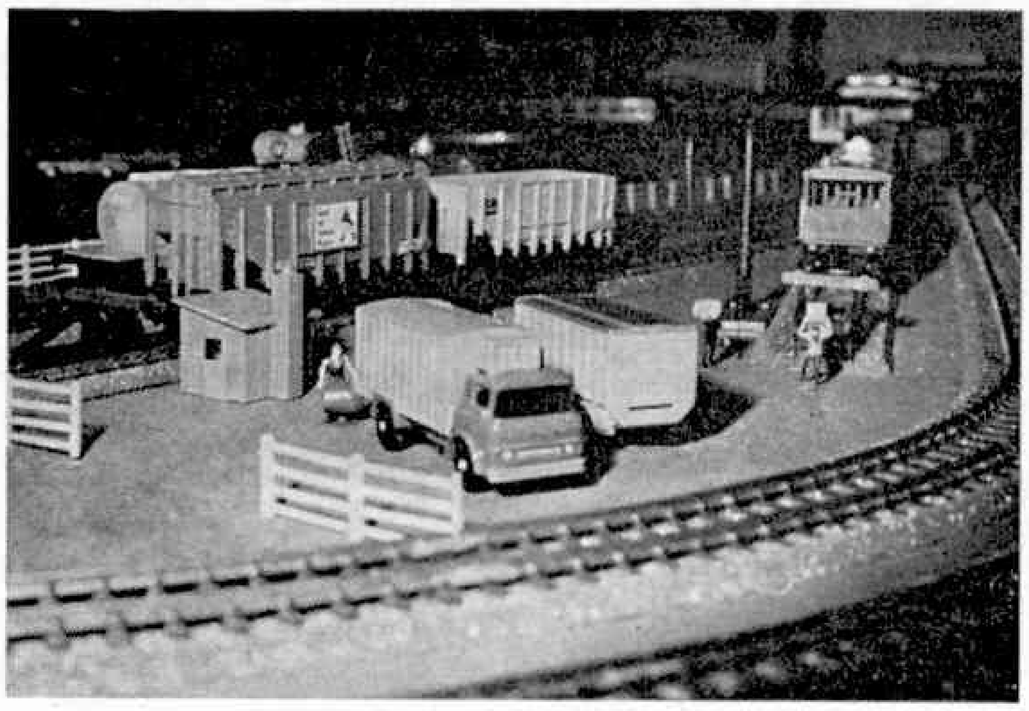

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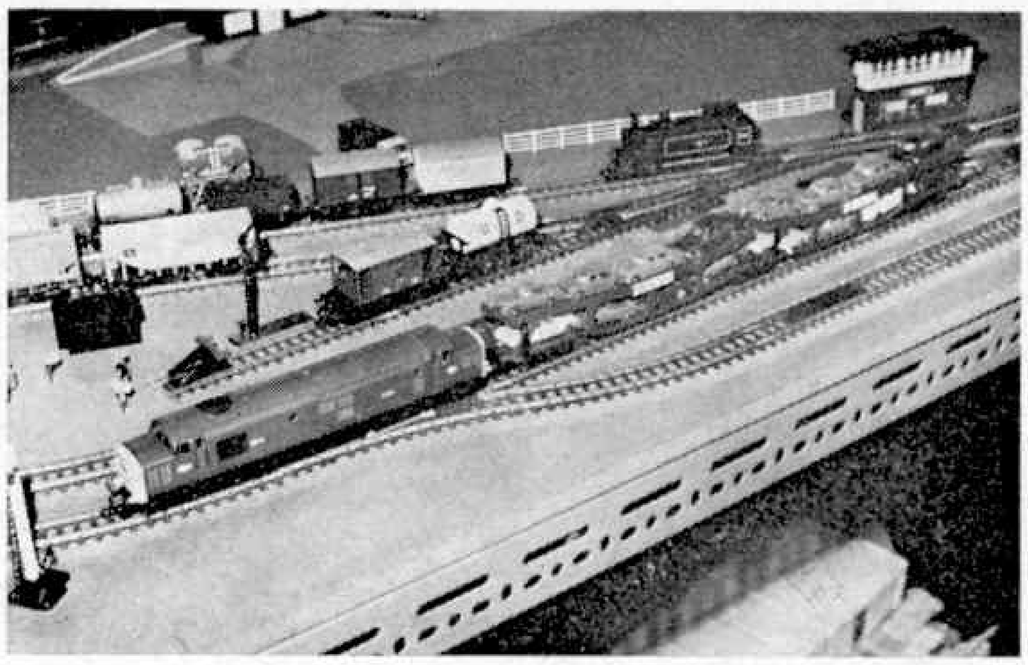

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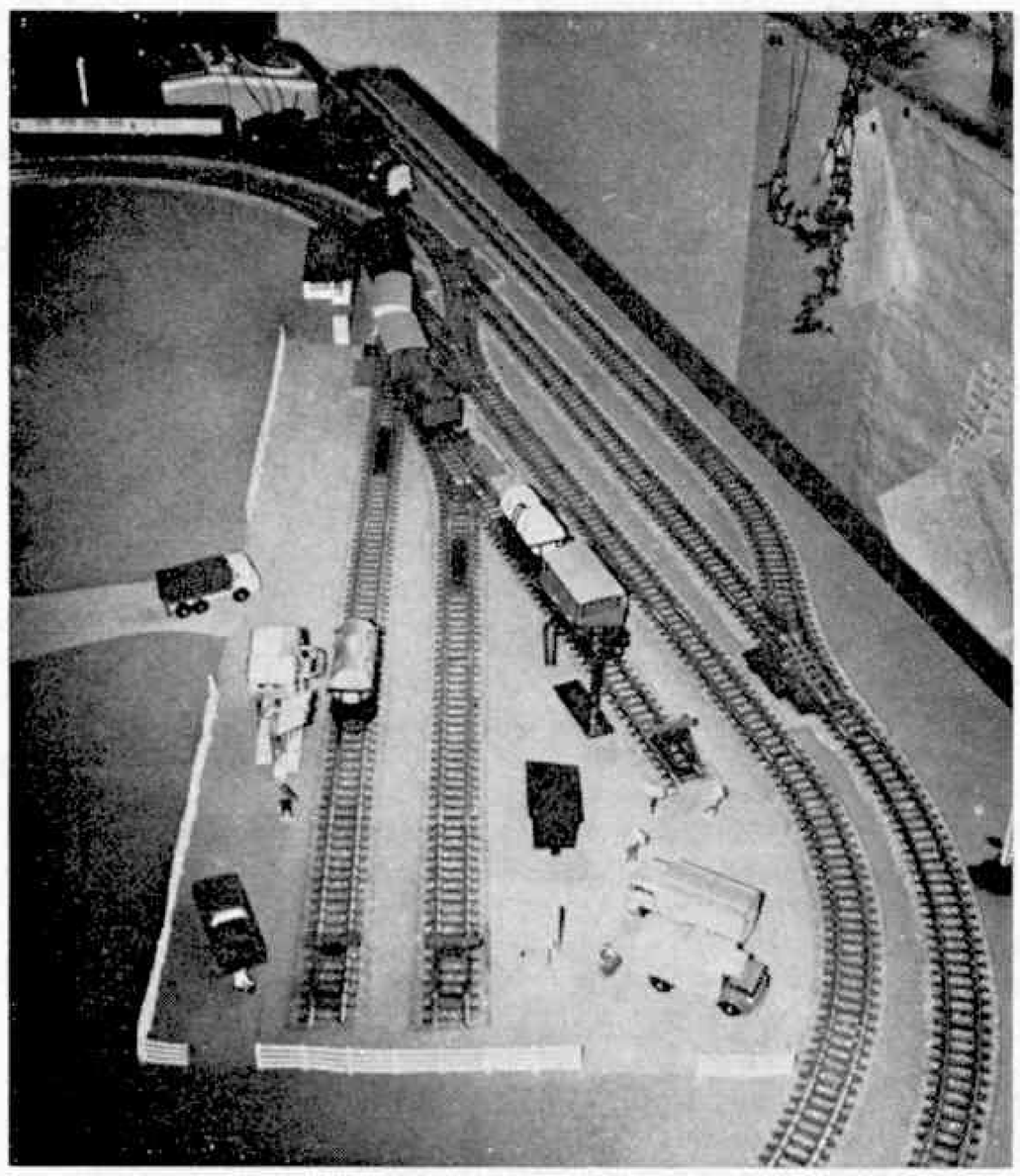

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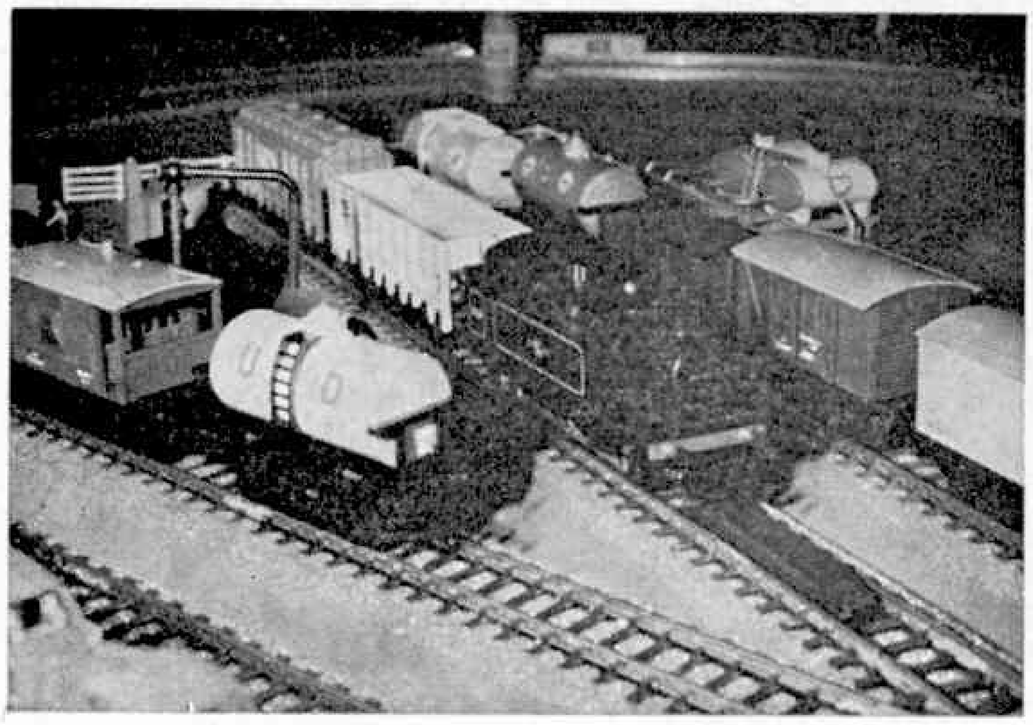
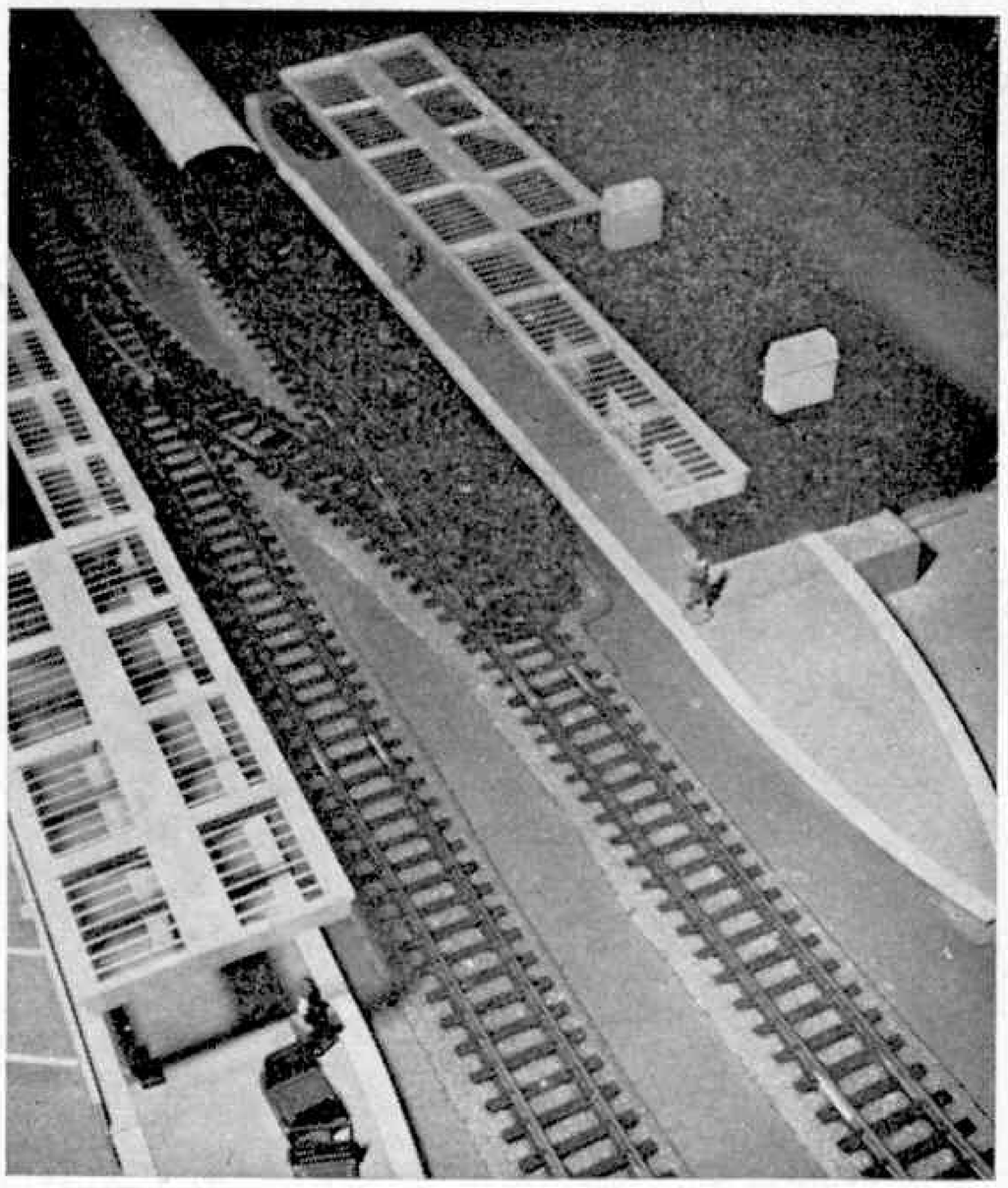


operation, no electricity is needed to make them work. If a train is pulled over the ramp, no uncoupling will take place, because the couplings are locked together when under tension, and they just push the spring-loaded ramp down. If a coupling is stopped over the ramp, however, and the engine just backed off a little, the couplings unlock, the ramp pushed them up and, hey presto ! Uncoupled.

Although plenty is going on in the goods yard, the main line is not idle. A double deck articulated car train is just passing, in the charge of D6830—an easy load for such a big locomotive. Only the glimpse of the station in the background gives away just how small the layout really is. (Photograph 9.)

Photograph 10 takes us back to the station again. The picture gives a good idea of the very detailed canopies. The express passing through is hauled by the Tri-ang Hornby Southern Railway Bulleid Pacific. The cross-over it is negotiating is the one we electrified with point motors for ease of operation.



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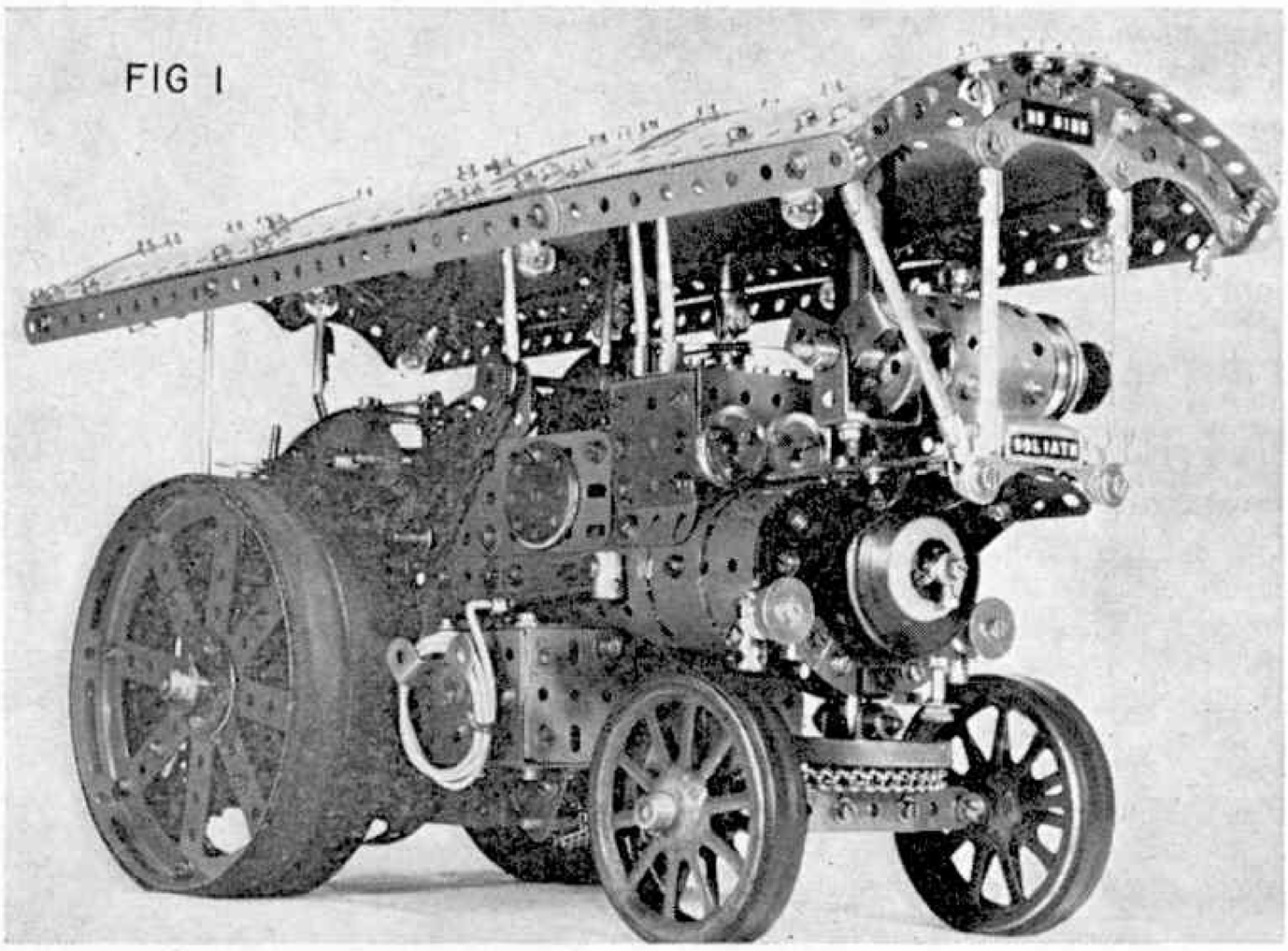


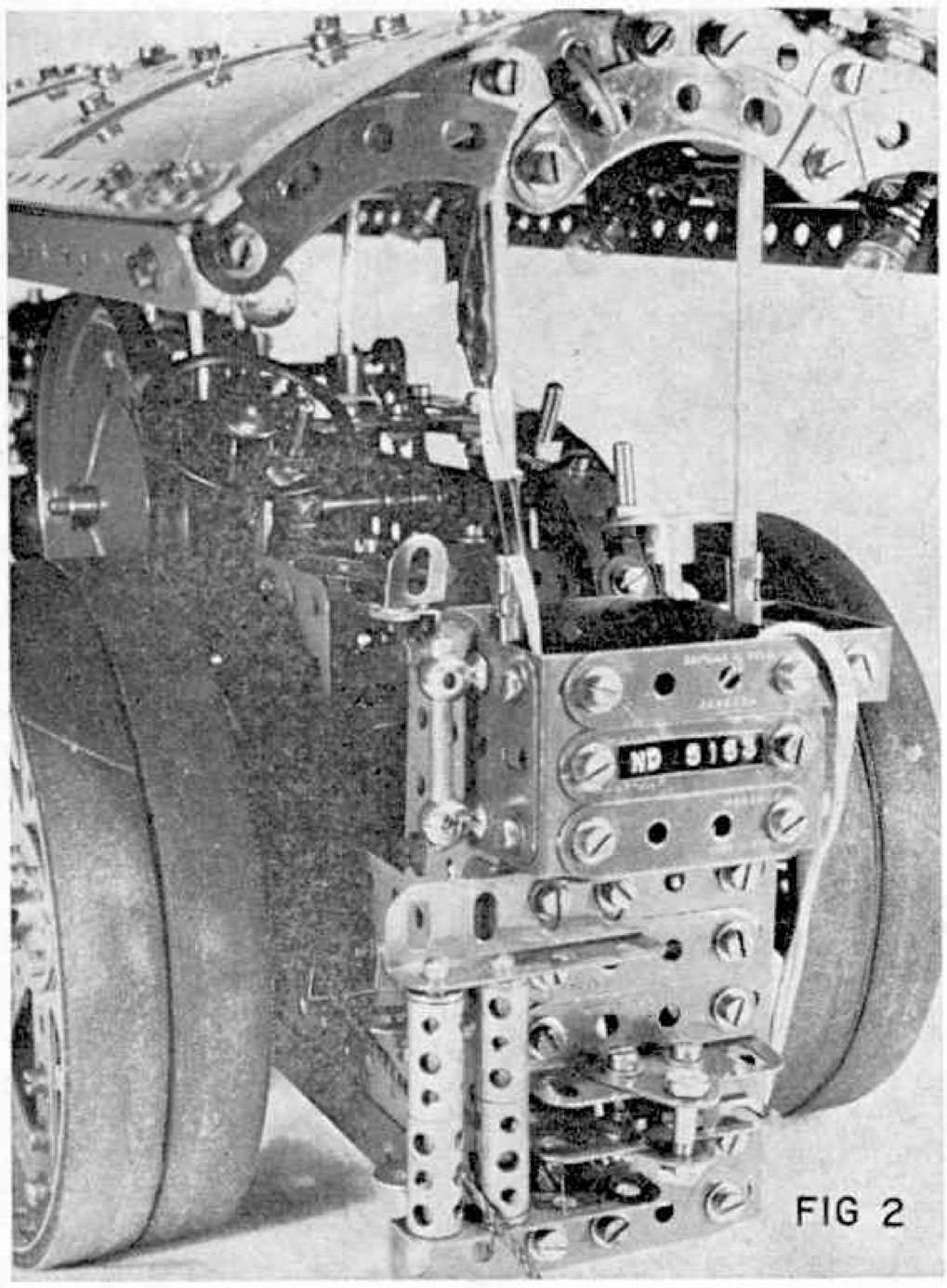
MECCANO CONSTRUCTORS GUIDE

by B. N. LOVE

Part 8: Traction Engine details and mechanisms

JUDGING BY THE roaring success of Traction Engine Rallies held all over the country and the high prices paid for derelict engines which are subsequently restored to their former glory with loving care by devoted enthusiasts, the popularity of these ancient juggernauts seems eternal. As a Meccano modelling subject, the Traction Engine has never really lost its popularity and was familiar as a Super Model Leaflet more than forty years ago. Those readers who can go back that far in time, or who have copies of the original Leaflet, will be able to make comparisons with a very recent model shown in Fig. 1. The basic dimensions of the original model produced a pleasing scale, but there were several drawbacks in the original design. A number of experienced constructors have given a great deal of thought to the improvements required and they are featured in this part of the Guide.

Fig. 2: Rear proportions of a Traction Engine are as important as those at the front. The slim coal compartment tow-bar and Winch Roller brackets complement the Boiler diameter. on which the scaling is based.



The Meccano Boiler, Part No. 162, sets a suitable scale for a model, but it is important to ensure that the tail-end of the engine has the same narrow proportions if the overall width of the model is to be kept in similar proportions to the prototype. Due to the width of the early Meccano Electric Motors, the fire-box ends of traction engines tended to be far too wide, but the introduction of the slim combined motor and 6-speed gearbox units enables the constructor to improve the appearance at the rear in a striking fashion, as shown in Fig. 2. Bearing in mind that space is required for a winch drum on one side of the rear axle and a heavy differential gear on the other, the driver's compartment must be reduced to an overall width of 2 in. for good proportions.

At this stage it is probably as well to affirm that the Meccano modeller is not working in the same sphere, or with the same materials, as the scale modeller and he should certainly not attempt to follow scale in a slavish fashion—a sure road to frustration and disappointment. If an appropriate scale to the half-inch spacing of Meccano parts presents itself, so much the better, but general appearance with satisfactory proportions is a reasonable aim.

Terminology for traction engines is a study of its own, but basically there are three types, as follows:

(a) Agricultural Engines—usually fitted with all-metal wheels and tyres, "spuds" being available for fitting to perforations in the rim of the rear wheels for extra grip. These engines were commonly single-cylinder machines with no canopies and included ploughing engines and other special-purpose farming engines.

(b) Road Locomotives—usually fitted with heavy solid rubber shod wheels of broad face at the rear, and of compound (twin-cylinder) engine type. A rear canopy was fitted for the protection of the driver.

Used for heavy haulage on well-made roads and frequently fitted with two gears only, reverse being operated by steam valves.

(c) Showman's Engines—usually compound engines as in (b), but frequently fitted with an extra top gear for fast, light running. Canopy covering full length of engine, plus dynamo on extended bracket. Winching and derricking gear was normally fitted and the decoration was always very artistic and ornate.

The latter category gives, perhaps, the greatest scope to the Meccano enthusiast and Fig. 3 shows some of the extra features which can add realism to a showman's engine. The boiler is, again, Part No. 162, but in the model shown, it is clad in $2\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plates secured by Narrow Strips which extend its length into the firebox region. The cantilever dynamo bracket is made from $2\frac{1}{2} \times 1\frac{1}{2}$ in. Triangular Plates supporting a pair of $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plates which form the dynamo platform. A pair of tweezers is indispensable for boiler work as a long reach inside is required to secure the Boiler End, dynamo bracket, etc. with internal Nuts. Care and patience at this stage will, however, produce the desired effect. Fig. 3 shows a dynamo at the front driving a " field exciter " at the rear of the chimney. The exciter, in turn, feeds back a regulated current to the field coils of the main dynamo, thus reducing the size of the dynamo to manageable proportions, while enabling it to cope with a wide range of electrical loads in driving the various items of fairground electrical equipment. Brass Wheel Discs form the body of the field exciter, while $1\frac{1}{2}$ in. Pulleys and large Flanged Wheels form the end casings and bearings.

Chimney details are achieved by Sleeve Pieces, small

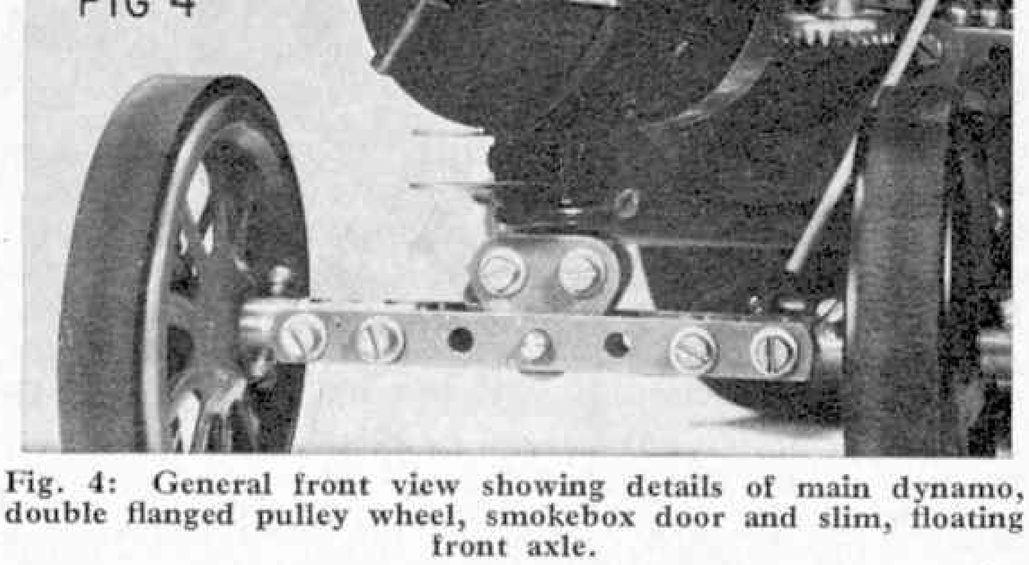


Fig. 4: General front view showing details of main dynamo, double flanged pulley wheel, smokebox door and slim, floating front axle.

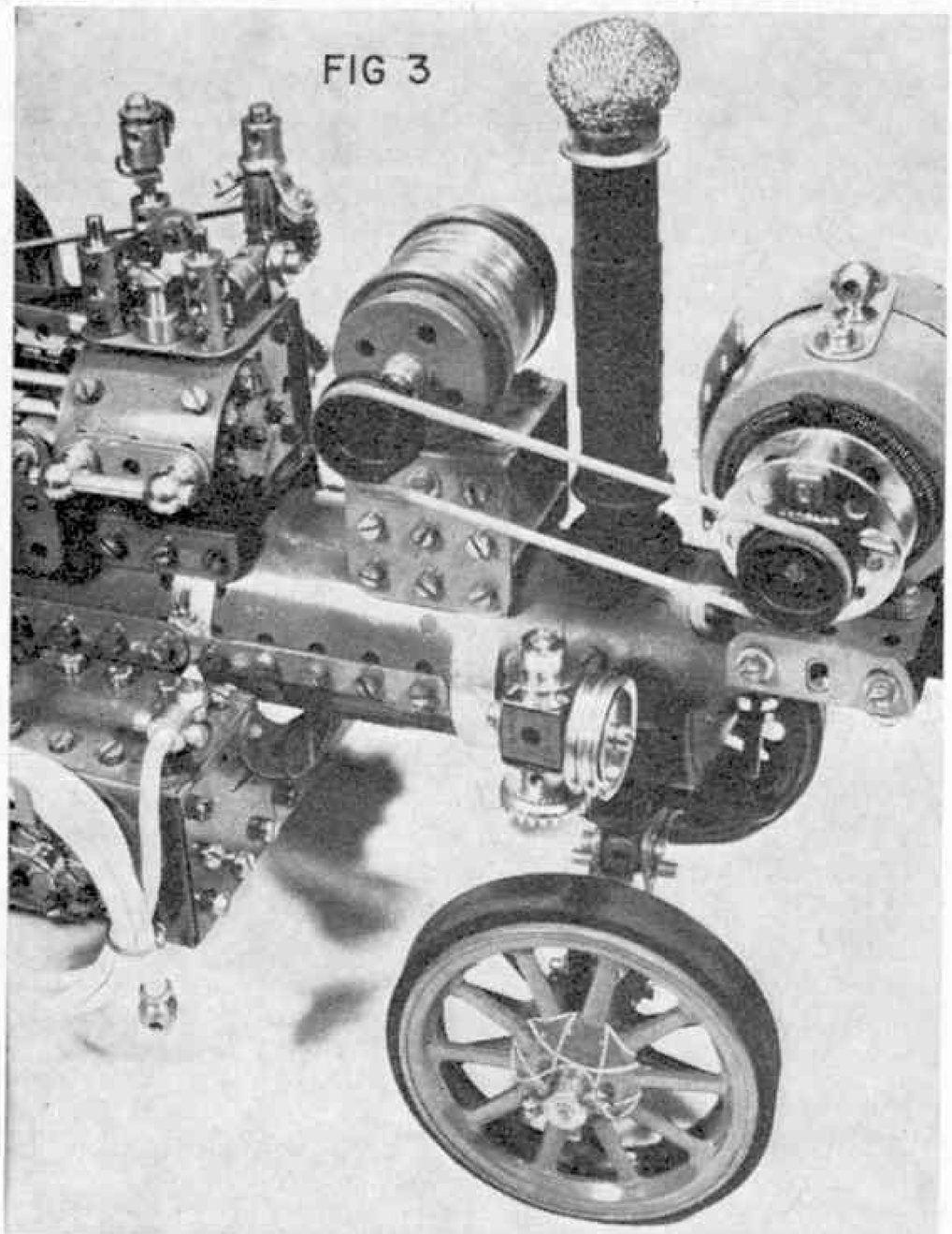


Fig. 3. Forward end of a Showman's Loco showing Cantilever Dynamo bracket protruding over the smokebox. The machine mounted behind the chimney is a " field exciter " which feeds current back to the main dynamo in the prototype. Note steam chest details, water hose, ornamental lamp, twin front wheels and chimney spark arrestor.

Flanged Wheels, Chimney Adaptors and a $\frac{3}{4}$ in. Dinky Toy tyre which gives a smooth moulding to the boiler contour. The chimney is locked in postition by a Screwed Rod running from the upper Flanged Wheel to the inside of the boiler, the final touch of realism being added by a spark arrestor—an unmodified kettle scourer !—which is held in place by a Washer and Nut at the end of the Screwed Rod, the open weave of the kettle scourer being amenable to penetration by tweezers. Water pick-up hose is by courtesy of spring curtain wire, (plastic covered) which enters a Handrail Coupling on top of the water tank and admits a Handrail Support at the " business end " as a filter. Oil lamps are provided by 1 in. loose Pulleys, small Contrates and fixed $\frac{1}{2}$ in. Pulleys secured to three $\frac{1}{2}$ in. Double Brackets. A right-angled Rod and Strip Connector bolted to the back of the lamp carries a 1 in. Rod which drops into a Handrail Support fitted to either side of the Boiler.

Fig. 4 shows further details at the front end of the model, the smoke-box door being a Conical Disc, Part No. 187a, locked on from inside the boiler by a $\frac{1}{2}$ in. Bolt which is first secured to the Boiler End by a lock-nut. The Collar, carrying a short Threaded Pin, is secured by the outside Nut, and the Hinge, Part No. 114, is sandwiched between the Disc and Boiler End at the same time.

Construction of the dynamo begins with the attachment of a $\frac{1}{2}$ in. Bolt in one rim hole of a pair of Boiler Ends by means of lock-nuts. Two $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plates or Plastic Plates are then secured inside the Boiler Ends by a $1\frac{1}{2}$ in. Strip (see Fig. 3) at the top of the dynamo, a Handrail Support, with a Washer packed below the Strip, completing this section. The instrument board is a $1\frac{1}{2} \times 1\frac{1}{2}$ in. Flat Plate carrying three

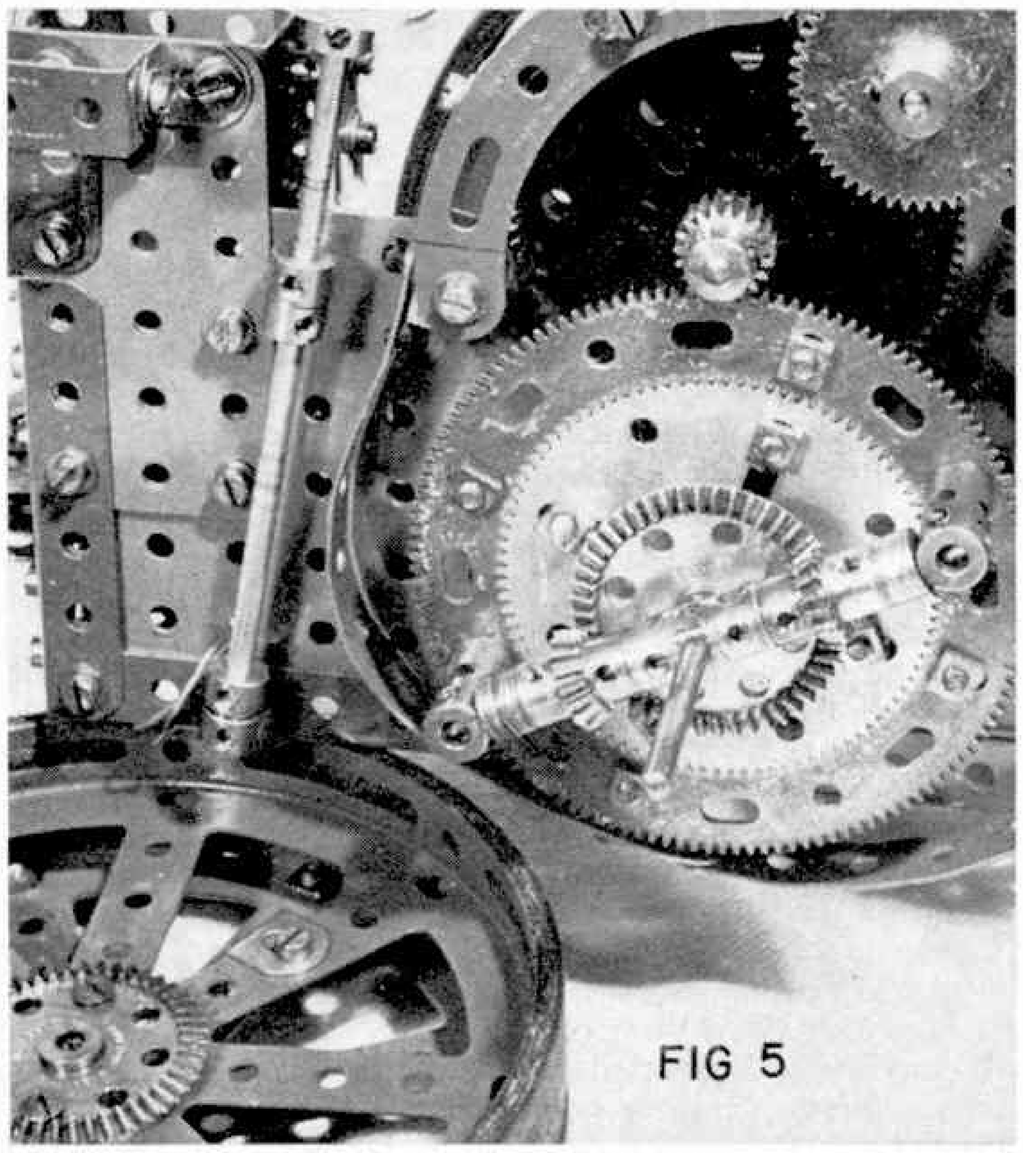


Fig. 5: The all-important differential gear which allows the traction engine to steer and perform winch operations.

Collars on ½ in. Bolts which secure the internal Flexible Plates at the front of the dynamo. A heat reflector plate, of similar construction, is attached with standard Bolts to the rear of the dynamo, embellishments at either side of the dynamo being supplied by brass Wheel Discs. Tension Springs, etc. are held in place

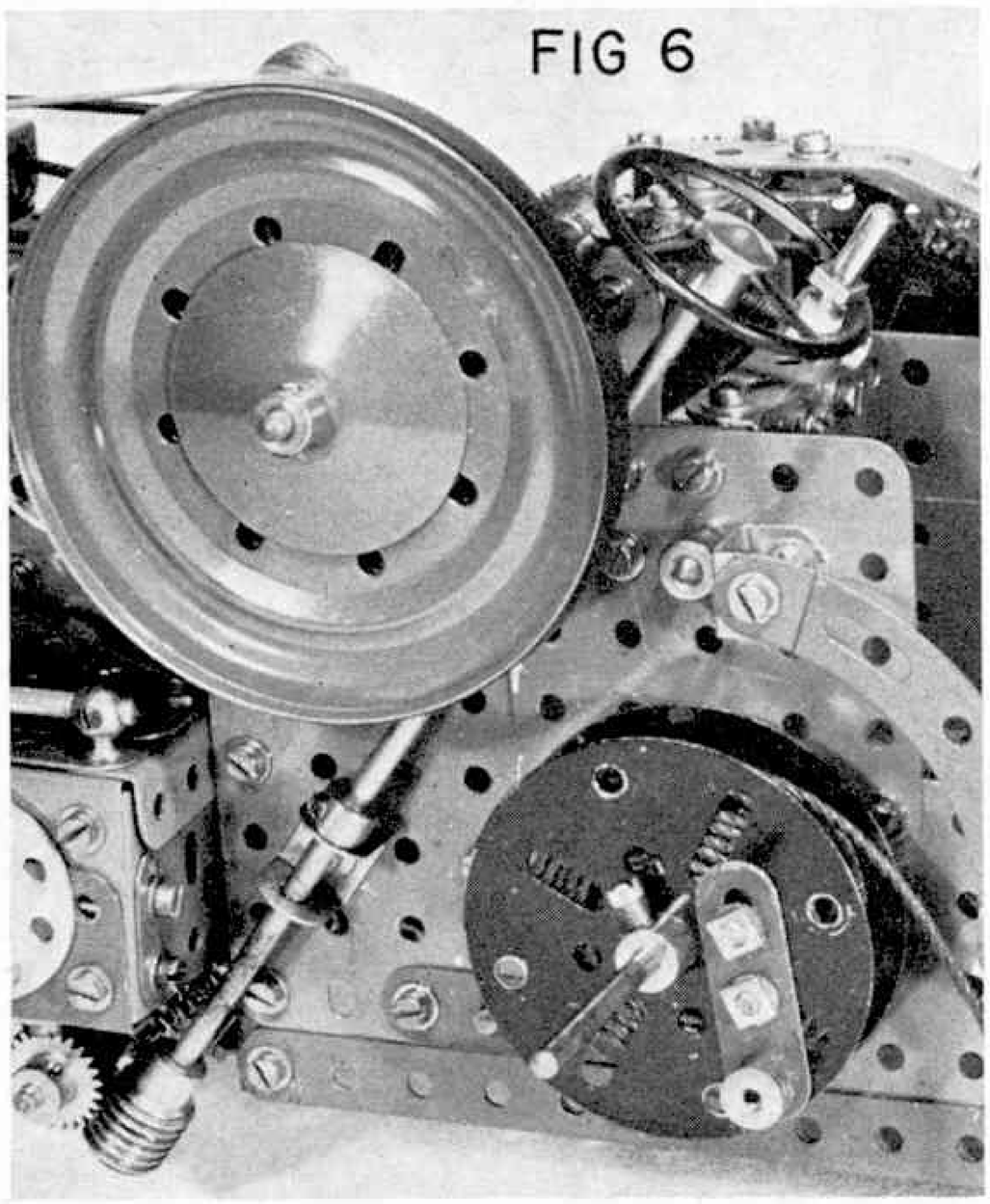


Fig. 6: The winch side of the rear axle. Note the Threaded Crank bolted to the winch drum. This forms the locking point for the drive pin passing through the rear wheel boss.

by Screwed Rods passing through the dynamo case from side to side. The central shaft must be free to spin, as this carries the drive by belt from the Flywheel.

A double flange dynamo pulley is made as follows: the dynamo shaft carries a Rod Socket, Part No. 179, to which a ¾ in. Washer and Chimney Adaptor are locked by a Threaded Boss. The outside ¾ in. Washer is then bolted to the other end of the Threaded Boss to complete the pulley.

Front axle mounting is important and it is a mistake to use a ball race at this point or to use a fixed swivel which will not allow the front axle to " float ". It must be able to ride over bumps without tilting the engine. Fig. 4 gives one solution with double thickness of Narrow Strips bolted to Couplings to form independent axle journals. If double wheels are used to improve the appearance and rugged qualities of the front end of the traction engine, they must be locked to stub axles which must be free to revolve independently if the model is to steer properly. Collars fitted with 7/64 in. Grub Screws, Part No. 69c, are fixed to the inside ends of the stub axles running in the Couplings. The axle pivot is

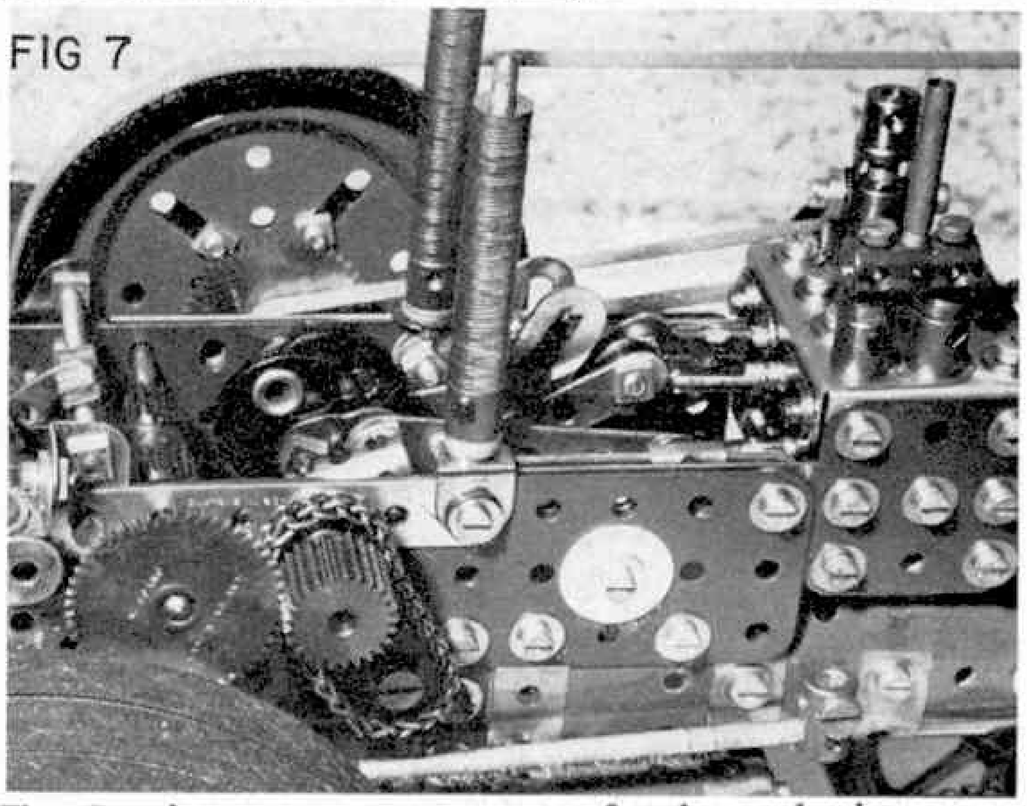


Fig. 7: A compact arrangement of valve and piston connecting rods. Note the Slotted Strips simulating reversing slides. These oscillate in opposition to the valve gear with great realism.

provided by a pair of 1 in. Triangular Plates bolted to a Coupling carried on a Long Threaded Pin which passes up through the Double Bent Strip and is secured inside the boiler with a Collar. The Double Bent Strip is bolted directly to the boiler and carries a ½ in. Double Bracket fitted with a Single Bent Strip, Part No. 102, as a towing bracket. Several ¾ in. Washers give the necessary height adjustment and swivelling pad.

Fig. 1 shows alternative axle arrangements, retaining the " spud " pan as a carry-over from solid-wheel days by certain manufacturers. A 2 in. Sprocket Wheel receives the chain steering, but, again, the front axle is free to pivot universally. Prototype road locomotives had a short, but heavy transverse leaf spring across the front axle to smooth the ride and to give some stability to the front end of the engine.

As in any vehicle, change of direction always means a change in speed between the back wheels as one has to cover a greater turning circle than the other, particularly on sharp turns. The traction engine is no exception and an excellent differential gear, suitable to the scale under discussion, is shown in Fig. 5. It needs careful assembly, adjustment and packing with selected Washers, including electrical Thin brass Washers, but, when driven by the combined motor and gearbox unit, it is very effective indeed. Basically, a

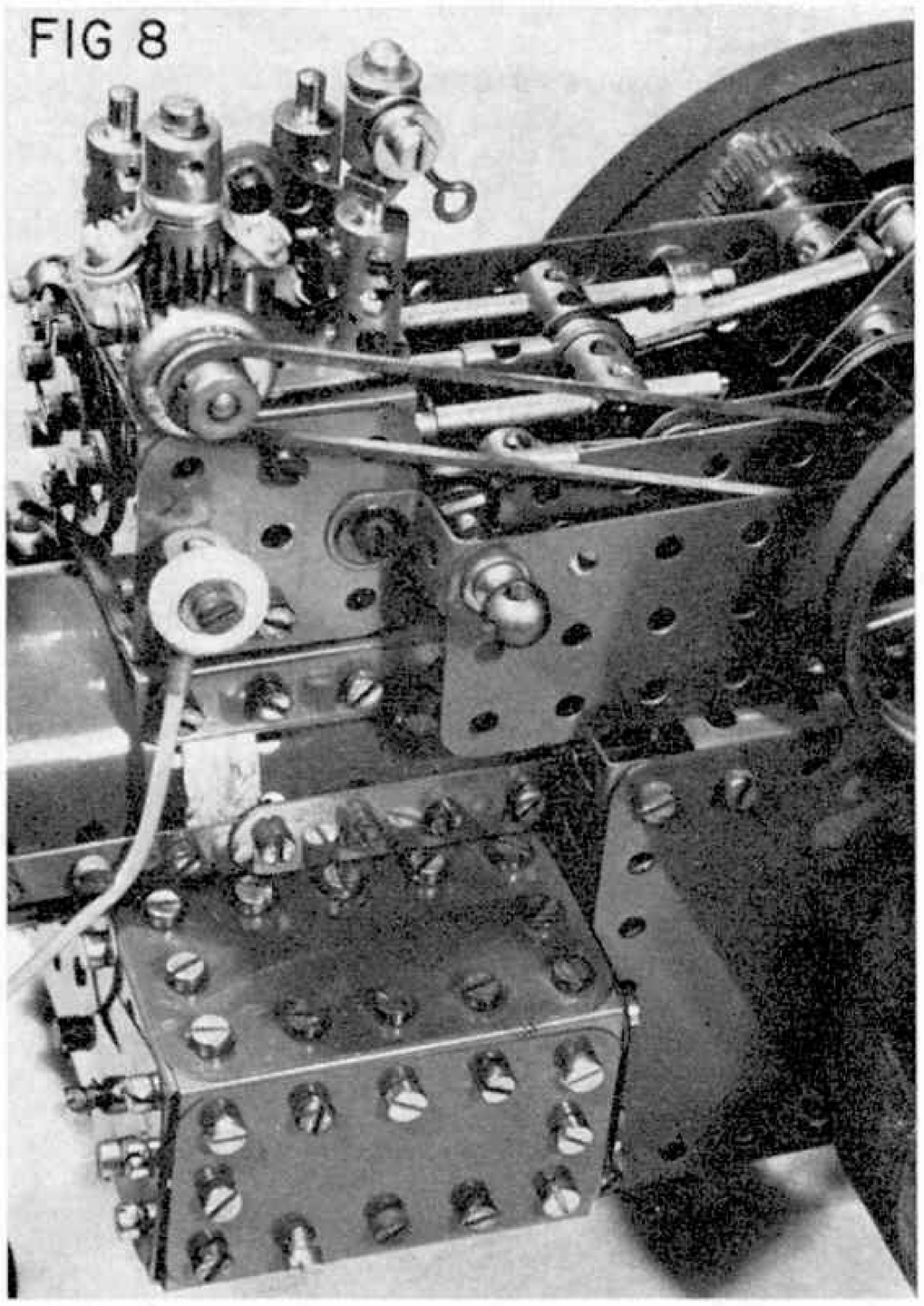


Fig. 8: A single-cylinder engine with double cross-head slide and eccentric valve. Note the belt drive to the boss of the contrate governor gear and bleed valve on the side of the steam chest made from a Dinky Toy tyre, electrical Thin Washer, Short Coupling and Spring Cord.

differential gear must be capable of passing on the transmission to both rear wheels at all times when the vehicle is in motion, despite differences in speed between the wheels. The 3½ in. Gear Ring shown in Fig. 5 has the advantage of peripheral holes which will accept the Threaded Couplings shown and will also allow the Gear Ring to be bolted to a 2½ in. Gear Wheel, which, of course, centres the Gear Ring accurately. The Threaded Couplings hold fixed stub axles on which ½ in. Bevel Gears are free to rotate. The central Coupling is free to spin on the rear axle which passes right through the model, the Coupling maintaining alignment of the stub axles and centralising the radial distance of the small Bevels. Care and patience in critical Washer spacing pays dividends at this stage.

The 1½ in. Bevel Gear lying between the Coupling and the 2½ in. Gear Wheel must also be critically spaced with packing Washers so that it meshes cleanly with the small Bevels without binding. The large Bevel is then locked firmly to the rear axle with double Set Screws, while the outer 1½ in. Bevel Gear is bolted directly to the Hub Disc forming the inner part of the rear wheel, its boss projecting through the large hole in the centre. Again, critical packing Washers are placed on the rear axle prior to putting the rear wheel in place, where it is held in position by a Collar at the outside end of the rear axle. This second large Bevel carries no Set Screws as it receives its motion directly from the differential gears. The near side of the rear axle carries a winch drum made from Face Plates locked to the rear axle and this means that the winch is always turning if the back axle is in motion. A Threaded Crank, Fig. 6, bolted to the winch drum, receives a long Bolt passing right through the rear near-side wheel which is withdrawn when winching operation take place. When in place, the Bolt couples the winch drum to the wheel for travelling.

Also illustrated in Fig. 6 is the steering column and worm drive steering mechanism, and the flywheel, the latter made from a pair of Ball Thrust Race Flanged Discs. Careful assembly of these Discs on a Bush Wheel or Gear Wheel incorporated in the main gearing will ensure the concentric running which is essential for trouble-free dynamo drive. Once set up accurately, the dynamo drive will run continuously, belts being supplied by elastic, thin leather or P.V.C. strip.

Valve gear and piston rod motion present quite a challenge in the confined spaces available in models of the type described here, but Fig. 7 shows a very compact assembly embodying two eccentrics and a crank in a very confined space—a feat which requires the art of the experienced constructor. Fig. 8 shows a simpler motion with single crank, double cross-slide and single eccentric.

Steam chests can be moulded from small Flexible Plates, Threaded Bosses being a great asset inside the chest, where they become versatile "nuts" to which external Bolts, Threaded Pins, etc. can be easily attached. Steam whistles, etc. are easily modelled from Threaded Bosses, Contact Screws, Washers and small Wire

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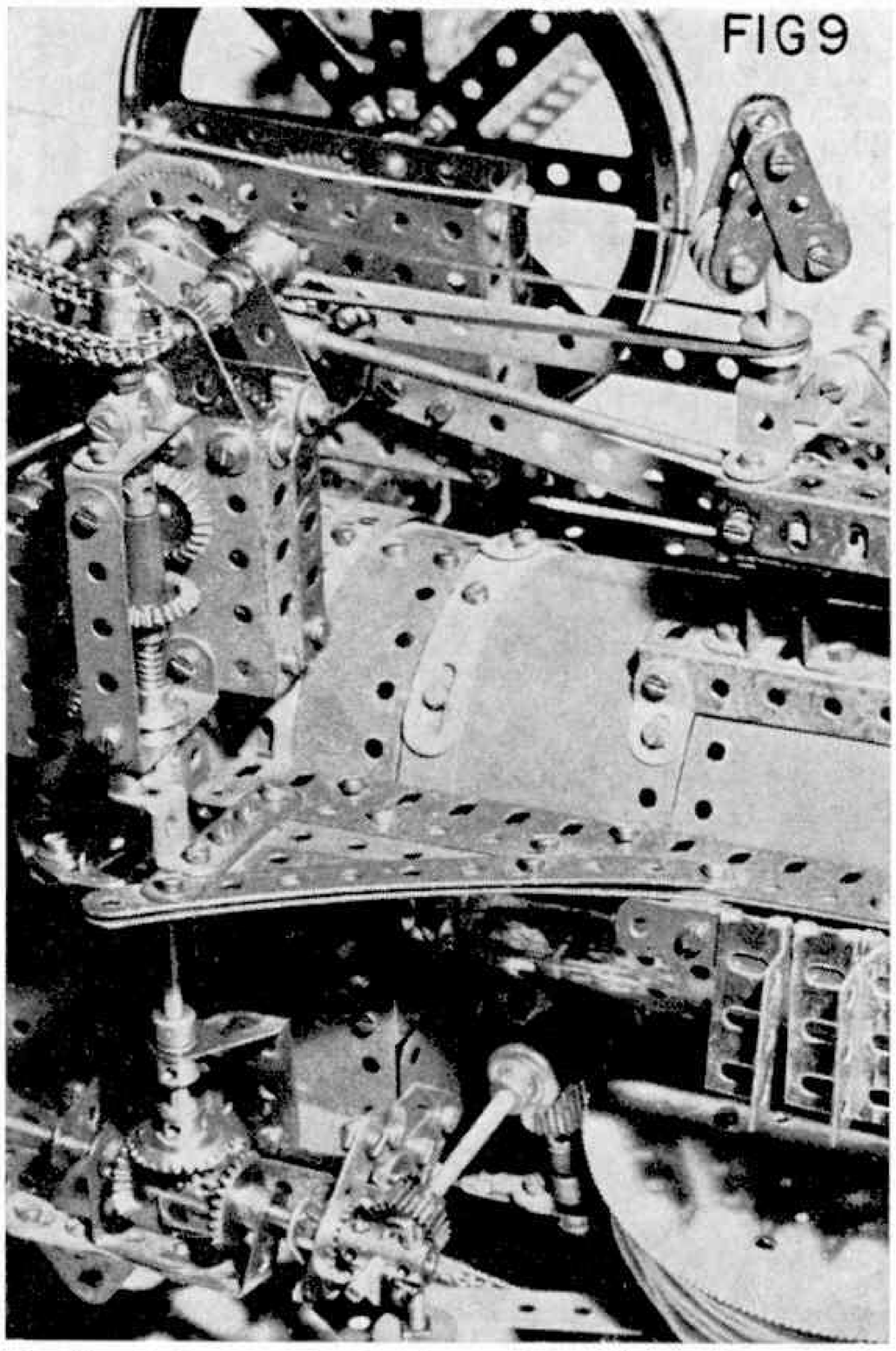


Fig. 9: A larger scale traction engine with ample room for valve gear and pistons. Note power take-off for ploughing winch via screw-operated spring-loaded clutch.

THE TALLEST LADY IN THE WORLD

Arthur Nettleton describes the design and construction of the world's largest and most famous statue . . .

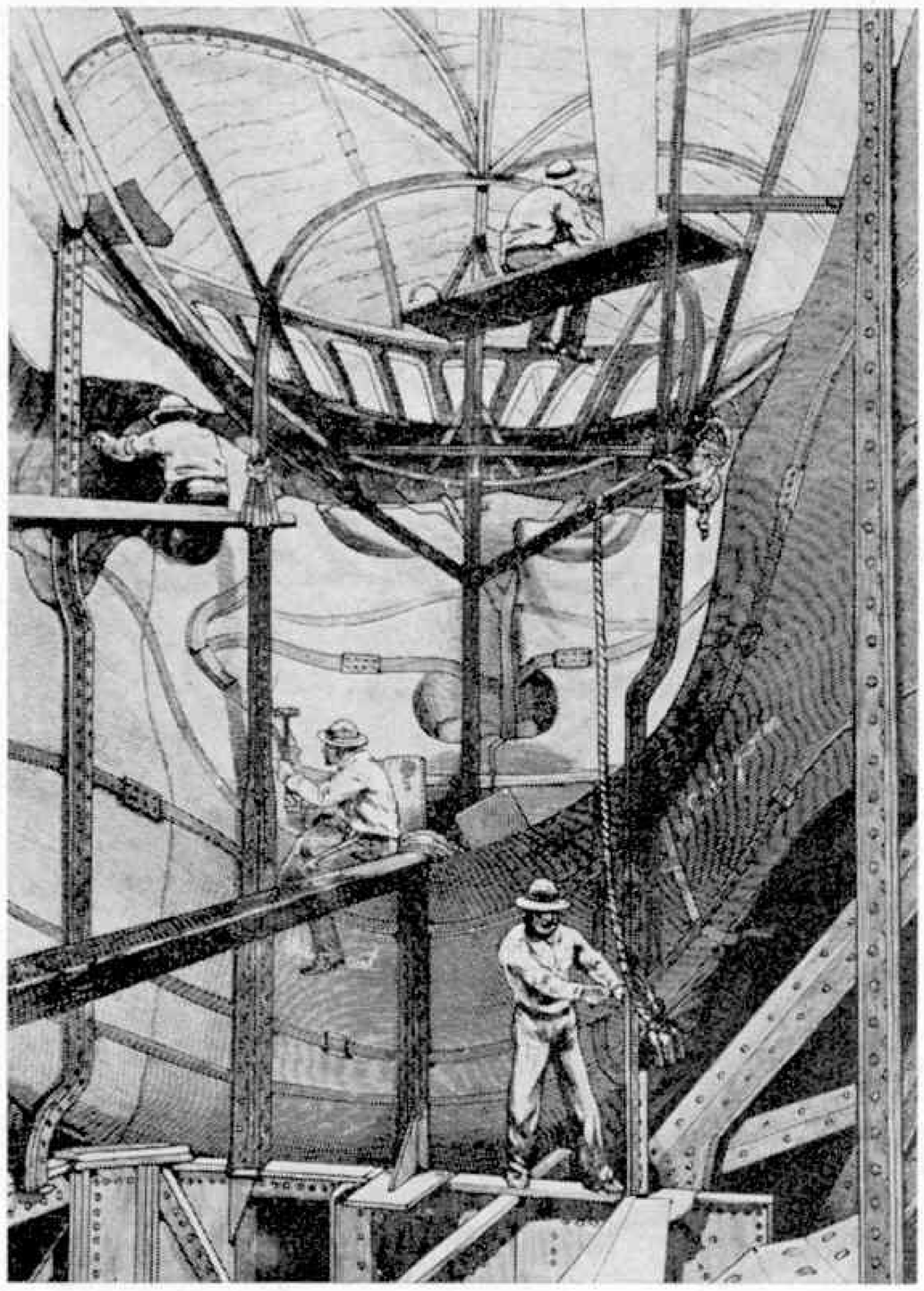
France provided the statue symbolical of Liberty, and it was built in Paris before being dismantled and conveyed to New York, where a site and pedestal were being provided by the U.S.A.

SHE'S JUST OVER 150 FT. TALL, her arms are 42 ft. long, and her mouth 3 ft. wide ! Her hands measure 16 ft. 5 in., and her index finger has a length of 8 ft., with a 13 in. nail. She weighs about 225 tons and contains 40 tons of copper. She was " born " in pieces and put together in stages spread over a period of ten years.

You've guessed correctly. She is the Statue of Liberty, also known as the Lady with a Light, standing on a small island in the shipping lane outside New York harbour. Yet the idea for such a monument did not originate in the U.S.A. It was inspired in France, its purpose being to symbolise the achievement of both countries in supressing intolerance and abolishing oppression. The statue has greeted millions of refugees fleeing from persecution, as well as giving a welcome to immigrants entering the U.S.A. in search of a higher standard of living and perhaps wealth and fame.

When the construction of this monument was decided upon, France and America agreed to share the cost. France offered to provide the actual statue, while America arranged to give it a suitable setting and build the plinth and pedestal. Various events were organised throughout France to raise the £50,000 needed from that country while experts dealt with the other practical aspects of the enterprise. A young sculptor in Alsace, Frederick Auguste Bartholdi, was commissioned to design the statue, and Gustave Eiffel, creator of the Eiffel Tower, was engaged to supervise the siting and erection of the figure. Its construction in Paris began with the production of a number of scale models cast in plaster by Bartholdi. It is sometimes said that his mother acted as the sitter, though other authorities believe that the statue was modelled after Jeanne Bayeux, a French needlewoman who later married Bartholdi. The selected figure was then enlarged to four times its original size. This bigger model was next divided into more than 300 sections, and moulds were fashioned from them to indicate how the copper casing of the statue was to be shaped.

The enlarging process continued, and was carried out with geometrical precision, some sections requiring as many as 9,000 separate measurements to ensure absolute exactitude. Full size wooden moulds were now built from these measurements, and the work continued by shaping copper sheeting (less than one-eighth of an inch thick) on the moulds, using mallets and small hammers wielded by expert panel-beaters. Such a thin shell, however, lacked rigidity, and to remedy the failing, each piece of sheeting was reinforced with iron bars bent in conformity with the curves. Copper bands fastened the sheets to the curved iron bars. As the immense statue came into being in sections, some of them were put on public display. The arm holding



The interior of the statue is braced with iron, and the size of the figure is revealed by the height of the workmen seen in this drawing.

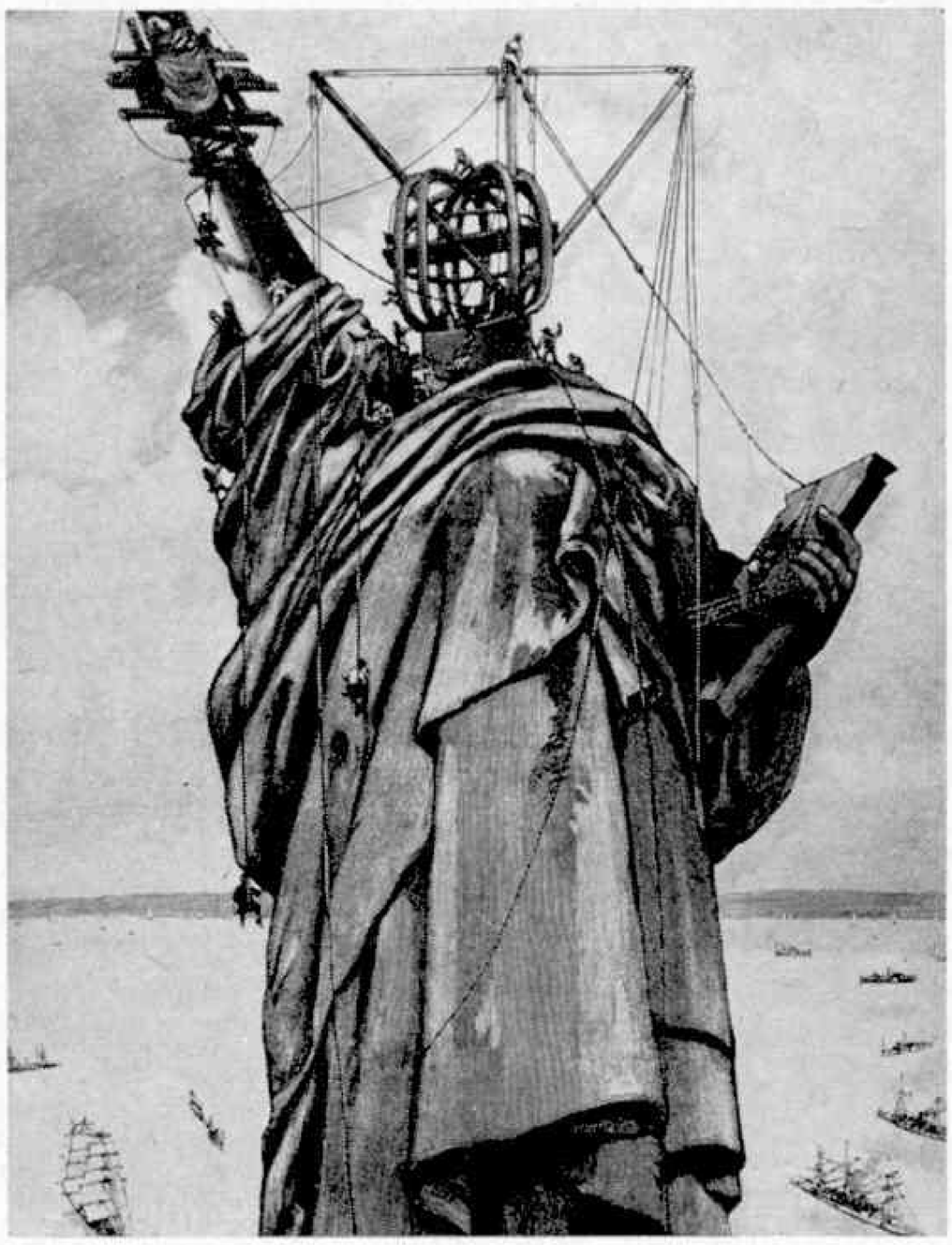
the torch was exhibited at the time of the 1878 World's Fair in Paris, and the head of "Miss Liberty", as the figure was often called, was also displayed in the French capital. Americans, too, were enabled to see the torch arm, for it was shown in Philadelphia and New York before being returned to Paris, where the whole set of components were collected for a trial construction of the statue.

This preliminary erection was deemed necessary to prove that the parts would fit together properly when the monument was built in America. The trial also enabled the rivet holes to be drilled more conveniently than in the cramped conditions of Bedloe's Island, the site selected for the colossus. The public exhibition of the components was intended also to arouse more general interest in the whole project—particularly in America, where for some reason it did not at first attract much attention.

Acquiring Bedloe's Island cost the U.S. Government only £1,000, but much more money had to be spent on the foundations of the statue. A base of solid concrete, tapering from 91 ft. square at ground level to 66 ft. square at a height of 65 ft., was provided. The attractive pedestal existing today serves not only as a lofty setting for the statue, but also includes a balcony commanding New York, thus giving visitors an excellent panoramic view of the city. When the results of the trial assembly in Paris—a job carried out within scaffolding specially designed by Gustave Eiffel—were seen to be satisfactory, the statue was dismantled and shipped to New York.

The cargo's bulk and odd shape called for 214 crates, and loading took 17 days. The actual voyage occupied 17 days, and delays in the construction of the pedestal prevented "Liberty Belle" from being officially introduced to the American nation until nearly a year later. The chief cause of the delay was that Bedloe's Island could accommodate no more than 60 workmen at a time, and that hitherto untried techniques had to be used to raise the 225-ton figure in the limited area. The tides created additional problems. Each section had to be lifted to the required height by rope and tackle, and held in its exact position until it was secured with rivets. To facilitate the task Eiffel built a framework like the one used in Paris, and to safeguard the completed statue in all kinds of weather he engineered it in such a way that the wind pressure on each copper sheet was transmitted to vertical steel columns extending 60 ft. into the massive pedestal. Again, Eiffel had the individual sheets anchored to the framework in such a way that none hangs from the one above it or rests on the one below. To prevent the metal skeleton from corroding, it is insulated from the copper with asbestos strips and has a shellac covering.

Eiffel's genius as a constructional engineer is demonstrated by the fact that the monument still shows no evidence of becoming unsafe or endangering the 300,000 visitors attracted to it each year. A circular stairway inside the statue enables them to reach the head and ascend still further to the balcony encircling the torch. The dedication ceremony took place on October 28, 1886, and was attended by many distinguished Frenchmen and Americans. They included the President of the French Republic—and of course Gustave Eiffel himself, whose engineering talent had made the project possible, despite the fact that it was an entirely new conception in the world of engineering



Rope-and tackle methods were used to build the Statue in America, after a trial erection in Paris.

and its construction had to be " played by ear." There was no similar enterprise to which he could turn for examination and help. His Eiffel Tower, though a remarkable structure, presented different problems. For one thing the Paris landmark was not subjected to corrosion by salt in the atmosphere, as the Statue of Liberty has been continually for nearly 100 years.

Sceptics who forecast that a structure of this type could not be built on Bedloe's Island were confounded. Their discomfiture was tempered by the further belief that, whilst Eiffel had conquered the erection snags, the statue would crumble before long, unless it was constantly repaired at considerable expense. Naturally, the monument does need attention from time to time, and its maintenance calls for the employment of a regular team of workmen. But no major repairs have been needed or are expected to become necessary in the near future. There are, however, a number of points about the statue not usually known. On the base is a four-line verse expressing the symbolic purpose of the figure :

Give me your tired, your poor,
Your huddled masses yearning to breathe free.
The wretched refuse of your teeming shore.
Send these, the homeless, tempest-tossed, to me.

Broken shackles at the feet of the Lady with the Light emphasise that she represents the generations who have fled from tyranny and received a welcome in in the U.S.A. To stress American interest in human freedom still more, the left-hand of the figure holds a tablet inscribed " July 4, 1776," the date of the Declaration of Independence which established the American ideal that " all men are created equal."

Providing illumination for this impressive statue has brought a number of problems, and the electric lighting installation has been altered several times. The present torch is scientifically calculated to have 2,500 times the effect of full moonlight. The illumination comes from ten 1000-watt incandescent lamps and six 400-watt mercury lamps. Floodlighting the figure calls for nearly one-hundred 1000-watt incandescent lamps and sixteen 400-watt mercury lamps, the latter bathing the monument in an attractive bluish tinge.

Soon after the unveiling of the statue, the torch began to serve as a beacon for shipping approaching New York Harbour. Consequently the lighting of the

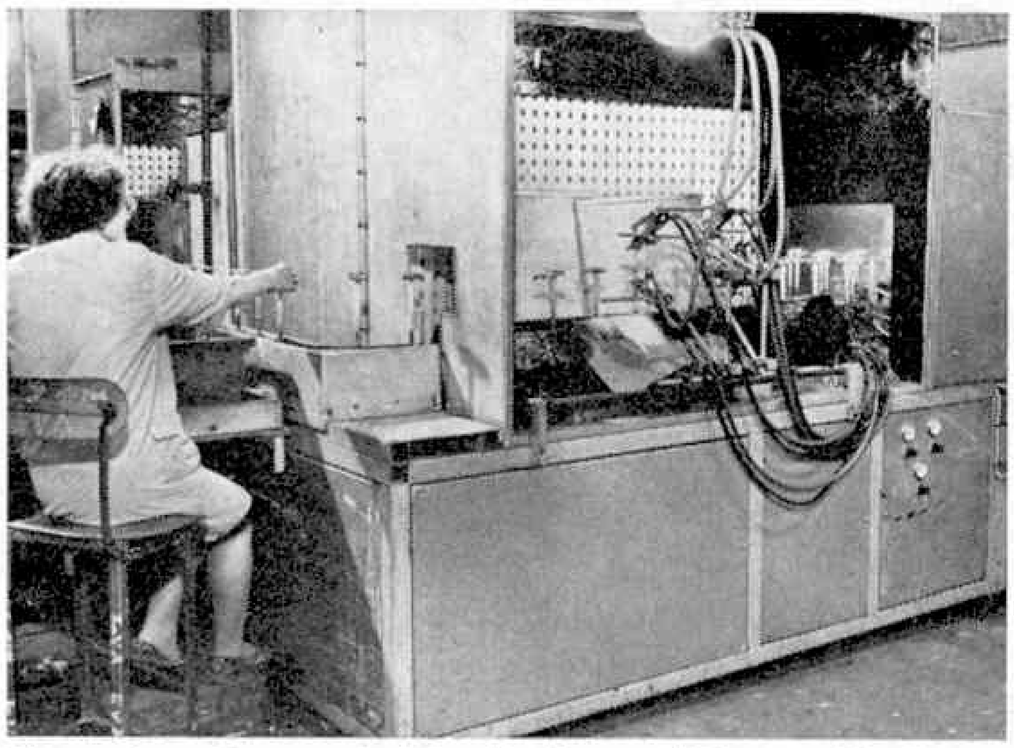
Bedloe's Island, the site of the Statue of Liberty, was renamed Liberty Island in 1956, to recognise its symbolic significance.

The outstretched arm of the Tallest Lady contains a stairway leading to the balcony round the torch, so that visitors can climb to that viewpoint overlooking New York.

" flame " was regarded as a responsibility of the U.S. lighthouse service and was officially recognised as such. However, the duty became less important when alternative and better arrangements were made for illuminating the waterway. Today the torch is kept alight during the night more for effect than as a guide-mark.

" Uncle Sam's Lady "—still another nickname given to the statue—has received several honours in her 84 years. Some have been conferred comparatively recently. In October, 1924, the statue was the subject of a Presidential Proclamation declaring it a National Monument and thereby giving it legal protection as an historic structure. Only 14 years ago an idea to make the monument's symbolic purpose still more evident was put before Congress. A proposal to re-name Bedloe's Island " Liberty Island " was wholeheartedly approved.

An astonishing aspect of the history of this famous monument is that it could have become British property ! Before offering it to America, France proposed to present it to the U.K. as a tribute to Britain's interest in the Suez Canal. The idea was to erect the statue at the southern entrance to the man-made waterway. The British Government turned down the gesture, mainly because the purchase of a site and the provision of a pedestal promised to be too costly. Not so long ago there was a proposal to erect a sister statue—a second Liberty Belle to stand on a site looking westward from Britain to the U.S.A., commemorating the lasting friendship between the United Kingdom and America in war and peace. So far, however, this engaging suggestion has not developed further. It seems unlikely that the Lady with the Torch outside New York will shortly have a rival on the European side of the Atlantic.



The automatic spraying booth of one of the combined spray machines and ovens. The spray-guns operate only as each casting passes through the "line of fire."

Many readers have written to us recently requesting a descriptive feature on how Dinky Toys are made. To answer many of the questions concerning die-cast models Chris Jelley presents part 2 of . . .

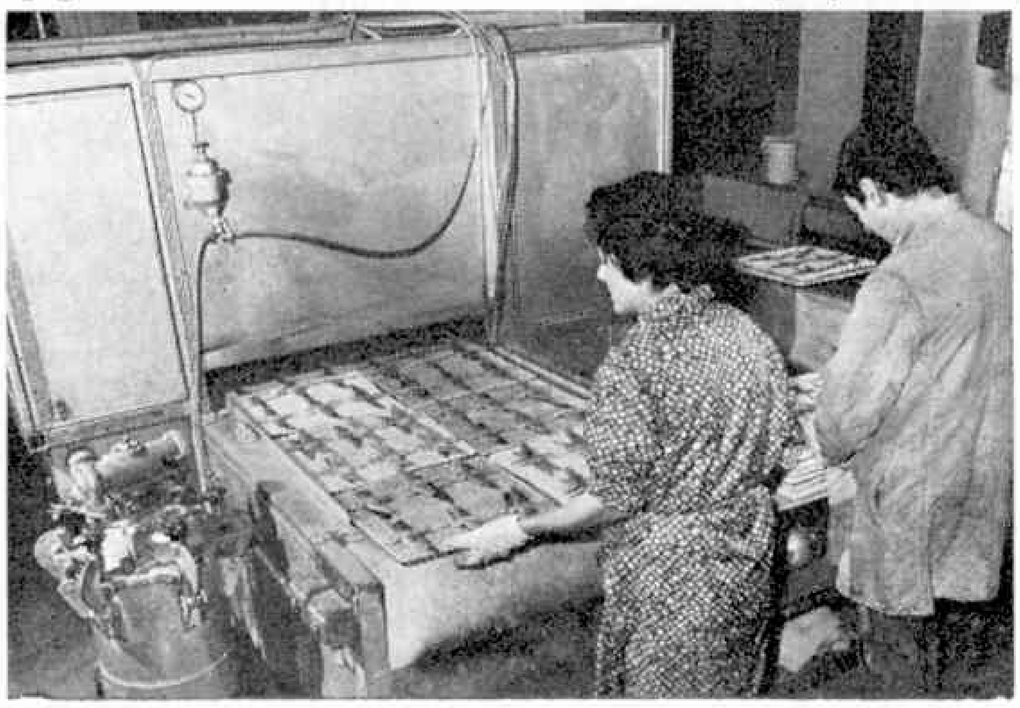
MODELS BY THE MILLION

Spraying

All Dinky Toy castings are stove enamelled to give them the hard and immensely tough finish that is essential for long wear. Even in the Paint Shop automatic machinery, in the form of combined automatic spray booths and ovens, is used to the full. Each casting is mounted on one of an endless chain of spigots which carries it to a spray booth in which several compressed-air spray guns are set at predetermined angles. When it enters the spray booth, the spigot, with its casting, begins revolving, not stopping until it has passed the spray guns which, incidentally, operate only as the spigot passes them. This interrupted spray, coupled with the revolving motion of the spigot, ensures an even, all-over coat of paint with the minimum possible wastage. From the spray booth the spigot carries the casting straight into a drying stove or oven from which it emerges a few minutes later completely dry and ready to go on to the next process.

Some castings, however, require two coats of enamel, in which case they are either sent through the machine a second time or are dealt with on another machine incorporating two spray booths as well as an oven. In this machine the revolving spigot and interrupted-spray system is used as before, but the casting passes, wet, from the first booth directly into the second booth and then into the oven. Whenever possible this system of "wet spraying" is always used in preference to the two-run system where second coats are needed, as the time saved is considerable.

Placed on wire trays, castings unsuitable for mounting on spigots enter one of the automatic flat-bed spray machines.



Because of their design, it is inevitable that some of the die-cast components in any Dinky will not be suitable for mounting on the spigots of the spray machines. Such parts as doors, for example, are therefore laid flat on wire trays which are then run through a different type of combined spray machine and oven. In this machine the automatic spray guns, suitably angled, are mobile, moving constantly backwards and forwards on rails above the trays, spraying the parts continuously as they pass beneath them. Immediately after the spray booth is the oven from which the trays of parts again emerge dry.

After leaving their appropriate ovens, components requiring no further attention now go into store to await assembly. This does not apply to all, however, as there are parts which could require a good deal of additional paintwork. The main body casting, for instance, might well need its head and tail lamps spraying, or perhaps a different colour added to the roof, etc. Additional paint jobs of this nature are carried out on the Masking Line, made up of a number of separate miniature spraying stations spread down the length of a conveyor belt, each equipped with a hand-operated spray gun and an exhaust vent to carry away fumes. Each station handles a particular operation which is performed with the help of an extremely accurate "mask", specially designed and made for the particular job, which covers the entire casting except the part to be sprayed.

With the Masking Line behind them, the castings go into the final drying oven through which they slowly move on a metal conveyor while they are heated to a temperature of about 200°F. The trip through takes something like forty minutes, but it ensures that the castings are completely dry and ready for the Assembly Lines when they finally appear.

Plastic parts

While production and spraying of the castings takes place in the appropriate Departments, the non-cast

items are prepared elsewhere in the factory, the Plastics Department handling the moulded items, the Machine Shop the turned items and the Press Shop the pressed items. The machined and pressed components have already been mentioned, but the processes used in the manufacture of the plastic parts are also well worth looking at.

Plastic production is carried out on two types of machines, Injection Moulding and Vacuum Forming, both of which are again fully automatic. The Injection Moulding Machines are similar in operation to the Die-casting Machines, described earlier, except that the raw material used is a granulated plastic of one sort or another, depending on the particular job on hand, instead of metal. The raw material is fed into a hopper on the machine and from there it passes into a heating chamber where it is liquified. As before, the moulding die is in two sections, one fixed and the other on a movable platen. The die closes, the molten plastic is injected under pressure and allowed to solidify, then the die opens and the moulding is automatically ejected. The cycle of operations takes a little longer than with the die-casting machines, as the plastic takes longer than the Mazak to fully solidify, but the costs involved are considerably less.

Unlike the granulated plastic for the Injection Moulding Machines, the raw material for a Vacuum Forming Machine comes in the form of a roll of long, thin plastic strip. This strip is fed into one end of the Vacuum Forming Machine and over a heating element which softens it to an extremely pliable state. While still in this condition, it passes over an inverted mould, from which the air is suddenly withdrawn to cause a vacuum. This sucks the soft plastic down into the mould and, once there, it solidifies in the shape of the mould. The moulding is then stamped out of the raw material strip, the air is blown back and the finished moulding is ejected into a collection container.

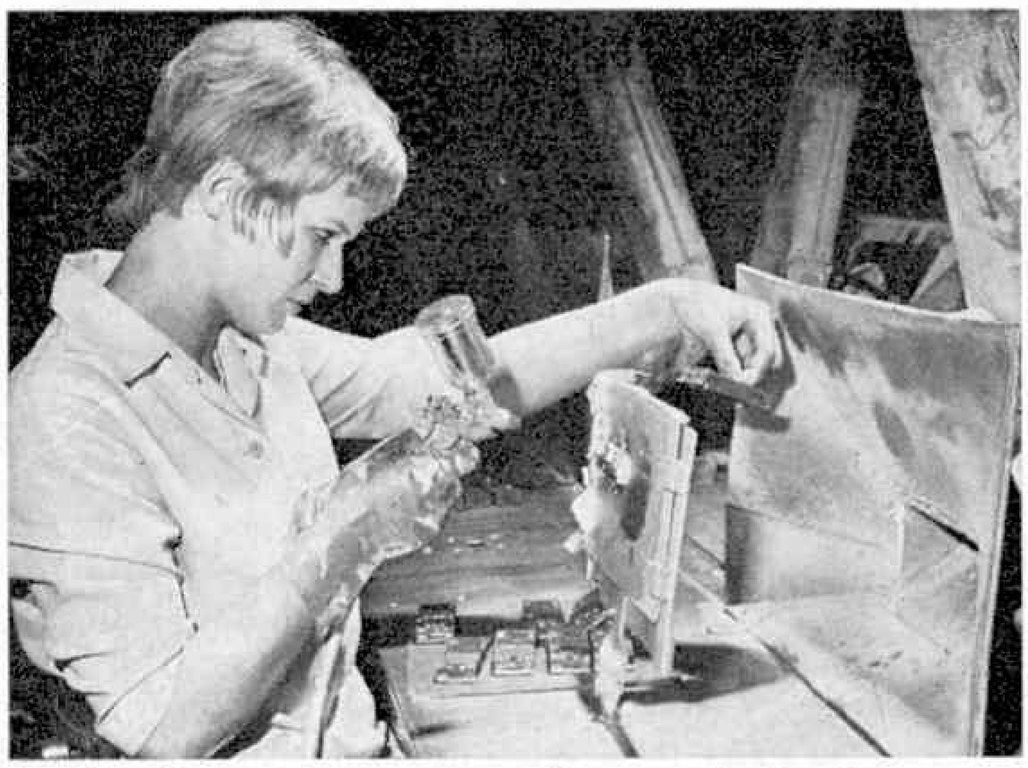
What is turned out on the Vacuum Forming Machines ?—Simple seat mouldings, mainly, as the more complicated seats as well as the window, steering wheel and other mouldings, are produced on the Injection Moulding Machines.

Plating

More and more, these days, parts of Dinky Toys are being plated, rather than painted, and this work is carried out in the Plating Department using Electrolysis. This, briefly, is a process whereby an electric current is passed between two electrodes (anode and cathode) immersed in a suitable chemical solution. As the current passes, metal is transferred from one electrode to the other, building up on the latter in the form of a fine coating or " plate ".

Dinky castings to be plated are first barrelled and checked as usual, but, instead of being phosphated, they travel to the Plating Department where they are placed in large 30 inch-long hexagonal perspex barrels, liberally sprinkled with holes. These drums are immersed in an electrolytic cleaning fluid, which of course immediately fills the drums through the holes and covers the castings. They are revolved for a short time to ensure that the castings are thoroughly cleaned, then the drums, with the castings, are transferred to the Plating Tanks and again revolved, this time in a saturated zinc solution, for half an hour. During this time, the electro-plating takes place, the castings themselves serving as the cathode, while the anode is provided by a number of zinc balls.

When plating is finished, the drums are removed from the Plating Tanks and thoroughly swilled with water. The castings are in turn removed from the



An attractive operator prepares to spray the headlamps and bumper of a model at a station along the Masking Line.

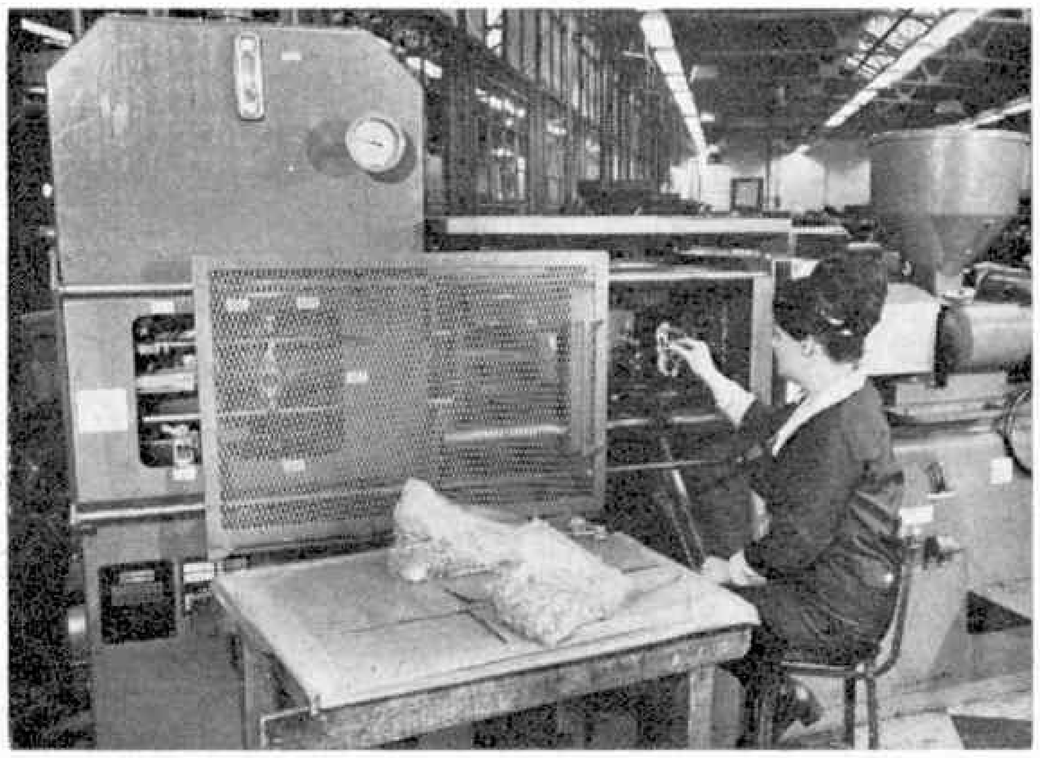
drums and immersed for 30 seconds in a chemical solution, known as a passivator, which seals the plating to give the really bright finish typical of the process, then they are again thoroughly swilled with water. Next, they are dipped in a cold water lacquer to preserve the finish and are finally dried ready for assembly in a centrifuge machine which works on the same principle as a domestic spin-dryer. Cold water lacquer, by the way, is simply lacquer diluted in cold water.

Assembly of the models cannot of course begin until sufficient quantities of all the individual components have been made. As the various parts are produced therefore, they go into store until the necessary quantities of all the parts have been built up, and only then do they go to the Assembly Lines.

Assembly

Assembly is a fascinating process to watch and it is interesting to see that the methods followed are very similar to those used for full-size cars in real-life. The work is carried out on genuine Assembly Lines, each Line—and there are many—consisting of a tremendously long work table, down the entire length (some 100-ft. or so) of which runs a conveyor belt. On either side of the belt, at intervals, are " stations " where a particular operation is carried out, these stations being equipped with suitable machinery for the particular jobs to be done. The main castings start off from the

One of the many Injection Moulding Machines in the Plastics Department on which such things as seat and window mouldings are produced.



Finished Dinky Toy Spitfires being inspected and tested at the end of one of the Assembly Lines.

top end of the Line and, at each station, a specific component is added or a special operation carried out. Wheels and axles are fitted to bases; bonnets, boots and interiors, etc., are fitted to bodies; bases are mated to bodies, and so on. The toy, in short, gradually takes shape as the castings progress down the line.

Before the end is reached, not only assembly is completed, but the models are also closely inspected and tested, then boxed and the boxes themselves wrapped in packs of four or six, ready for selling. These " outers ", as the packs are called, are passed through to the Stockroom, from where they are supplied as orders for them are received. The Stockroom itself covers a huge area and is a collector's paradise likely at any time to contain hundreds of thousands, if not millions, of pounds worth of Dinky Toys and other Meccano products.

Contrary to many people's vague impressions, the Meccano works in Liverpool is not a sort of legendry toyland inhabited by old red-coated gentlemen with long white beards, patiently turning out individual toys to order. Instead, it is a typical up-to-date in dustrial concern making full use of modern mass-production techniques. We have seen here, for instance, the tremendous amount of work and equipment; the advanced methods and the large numbers of people involved in making a new Dinky Toy and, of course, all the preparation work is the same for any model, no matter how many examples are required. Naturally enough, complete production costs vary from model to model, depending on individual complexity, but it is safe to say that anything from £10,000 to £15,000 must be spent before even one model can be made. Unless you have an awful lot of money to spend, therefore, do not expect Meccano to be able to make a " one-off " model specially for you!

BATTLE by Charles Grant

PART XVIII—MORE ABOUT TERRAIN

IN CONSIDERING THE SECOND of the terrain features we listed in Part XXVII—the wood—we concern ourselves initially with its composition, which, not surprisingly, is ' trees ', in varying number, and we now have to decide on how to make the said trees and the best manner in which they may be used to indicate a forest, wood or copse. The individual tree may be acquired in two ways, the first, by constructing it oneself, the second, by purchasing same. Let us deal with the first, then.

Now, I'm not going to say that what will be produced bears any accurate relationship to any known botanical species, but it is most assuredly identifiable with that growth comprising trunk, branches and foliage, and it is made in this way. The first requirement is four or five lengths of wire—they need not be enormously thick, but should be sufficiently strong to maintain any shape they may be bent to assume, and at the same time pliable enough not to make the tree-making a hand-lacerating job. The lengths of wire—bearing in mind that we are dealing with a scale where the average man is less than an inch in height—should be about five or six—not more than seven inches—long. They can vary a little among themselves. These wires are twisted together for something like a half of their total length, leaving about ½ in. free (untwisted, that is) at one end and something like 3 in. at the other. If the process is a little hard on the fingers a pair of pliers—or two pairs, really, are better, twisting in different directions, and will make the job much more easy. The shorter loose ends are splayed out as flat as possible—they represent the ' roots '—and at the other, the longer ends are bent about irregularly, and they of course will be the branches.

So far, so good, we have at least the ' skeleton ' of a tree. For added security and firmness, a length of Sellotape can be twisted around the trunk, although this is not really necessary. The ' trunk ' and ' branches ' are now covered with a thin layer of plastic wood—a messy job, I find, but an essential one

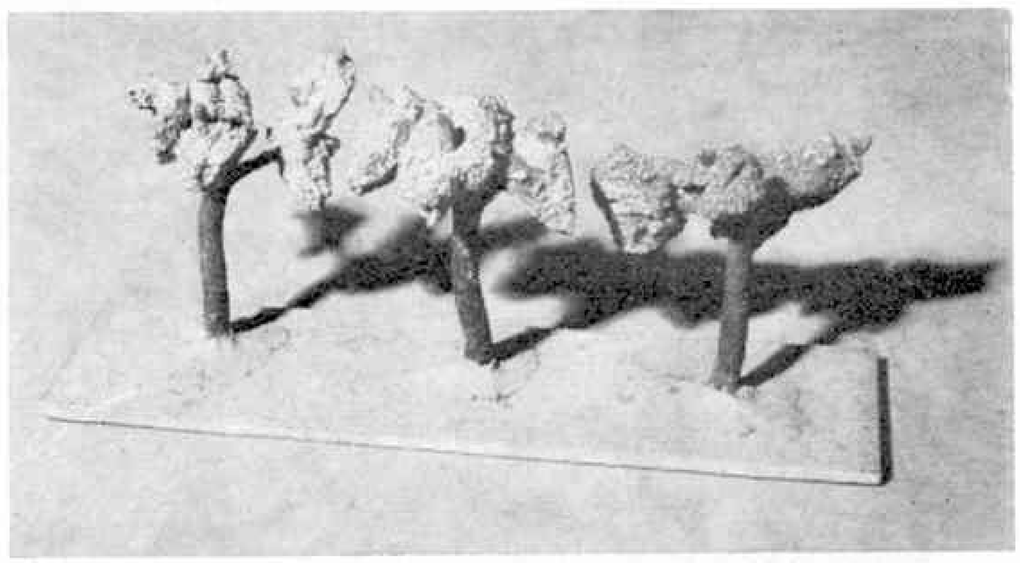
—and when the result has thoroughly dried, one gets to work on the foliage. This is done by begging, borrowing or just committing plain domestic theft to acquire an old rubber sponge. This is fiercely attacked and torn into small pieces of different sizes, but round about an inch thick generally is about right. The pieces are now soaked in liquid glue—the office stuff in a bottle is fine—and when well and truly permeated with the liquid (again a trifle messy) the piece of sponge is attached to a branch of the tree to represent the foliage. If the branch can be poked through a hole in the 'foliage', so much the better. It will adhere more securely, and looks better. The tree is then fixed to a base, and this can be just what the individual wishes—a small piece of hardboard, or a thick card are both perfectly adequate, although I have used myself a square of plywood. One can usually pick up 'offcuts' at the local hobbies shop. Fixing to the base—hardboard or plywood—is done by covering the wire 'roots' with plastic wood and pressing this onto the base, moulding it to give it a better appearance.

One can have one tree on a single base, or a number placed together on a multiple one, but I would offer one word of warning. It is unwise to take a square or rectangular base and cover it thickly with trees—although the results will be effective from a purely scenic point of view. The snag will arise in a wargame when it becomes necessary to move, for example, a section of infantry through the area—fingers get caught in the 'trees', troops fall over and can be extricated only with difficulty (plus curses) and the entire wood might be swept into the air as a branch gets caught on a sleeve or cuff, and tempers fray easily when such mishaps take place. It is far better to have the trees arranged in rows—two, three or four trees per row, or possibly more. To make the wood is then dead easy, one simply arranging as many rows of trees as may be necessary to form the desired circumference, with single trees placed here and there within just to show that it *is*, in fact, a complete wood. It is not necessary to place a lot of trees inside the circumference, as the same will happen as did with the wood on a complete base. As we shall see, rules for movement through wooded areas are just as easy to operate—in fact easier—in such a wood as I have described than in something which is a solid mass of foliage, branches and goodness knows what else.

Now, for the wargamer who does not wish to make his own trees, the problem has an easy solution, of course. He just goes out and buys them. There are several firms who produce most suitable trees for wargame purposes. The old and famous concern of Britains Ltd. has some extremely fine and realistic examples in plastic—they are built up branch by branch and look really fine, but they are, in my view, much too large for use in our scale, being rather more appropriate to the 54 mm. size of figure. They come rather expensive as well. Probably the best, although even in these days they cannot be said to be cheap, are those by the firm of Merit Ltd. They consist of three species, the alder—my own favourite, as readers of "Battle" will have seen already—the poplar, and the fir. Rocco (Minitanks) also make fir trees. The Merit trees are of softish plastic and can be bashed about without much risk of damage. Treatment of these commercially produced trees is exactly as for the home-made ones, although, as they are light, a simple card will suffice for the base. The photographs show the differences in base material, and also the arrangement of two on the same base.

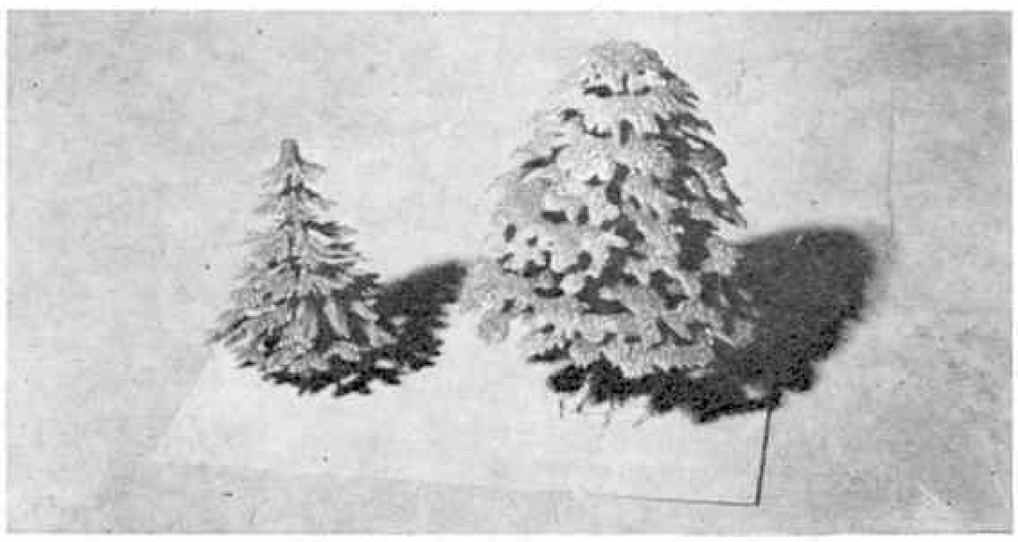
Third, and last, of the terrain features for consideration is the river. Again, it will be no secret to readers that I prefer the commercially produced article—in point of fact the Bellona river sections, or to be more accurate, the 'stream' sections. They are nearly 1½ in. wide—the actual stream part, that is—and as this, in our scale, is equivalent to 50 yards, I feel that this is normally sufficient to provide the obstacle we have to consider in our rules. True, one can make the most realistic rivers—I have done so myself, in the past—by using lengths of hardboard, angled at the end in some cases so that when joined up the resulting river can 'meander' a bit. 'Banks' can be provided by using plaster of Paris and the river course can be painted in appropriate colours—blue/green and so on—while a highly realistic appearance can be achieved by sticking crumpled cellophane sheet along the course of the stream. Indeed this can be done first, before the 'banks' are constructed, and these can be brought over the cellophane to assist in keeping it in place as it does tend to come away pretty easily. The plaster 'banks' are painted in suitable colours, green of various shades, etc. If desired, the presence of a ford can be shown by painting tracks leading down towards the river or by otherwise indicating the presence of shallow water. When fighting a wargame involving river crossings it is obviously of the greatest moment to seek out and locate as early as possible the points where a crossing may be made in safety. Incidentally, the Bellona stream sections can be purchased in straight lengths and curves and are by no means expensive. This is not intended as a plug, but it simply happens to be the case.

This is the procedure for producing or obtaining the terrain features we deemed as being of sufficient importance to warrant rules governing their presence on the wargame table. In Part XXIX we shall consider the application of these rules.



Home made trees—of an indeterminate species—mounted on a plywood base.

A commercially produced pair—an alder and a fir—on a card base.



Chris Jelley (Spanner) presents Bert Halliday with the Model Engineer Exhibition Meccano Cup at the 6th Meeting of the Midlands Meccano Guild at Stratford-on-Avon, March 1970.

6TH MEETING OF THE MIDLANDS MECCANO GUILD

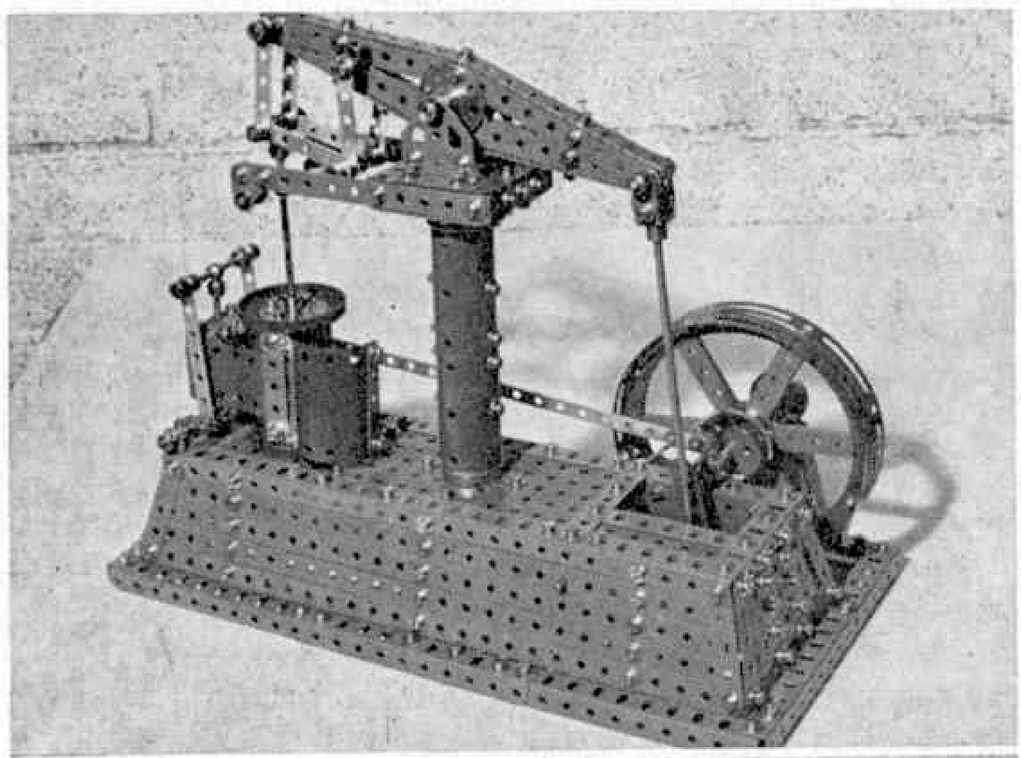
Report and photographs by Bert Love

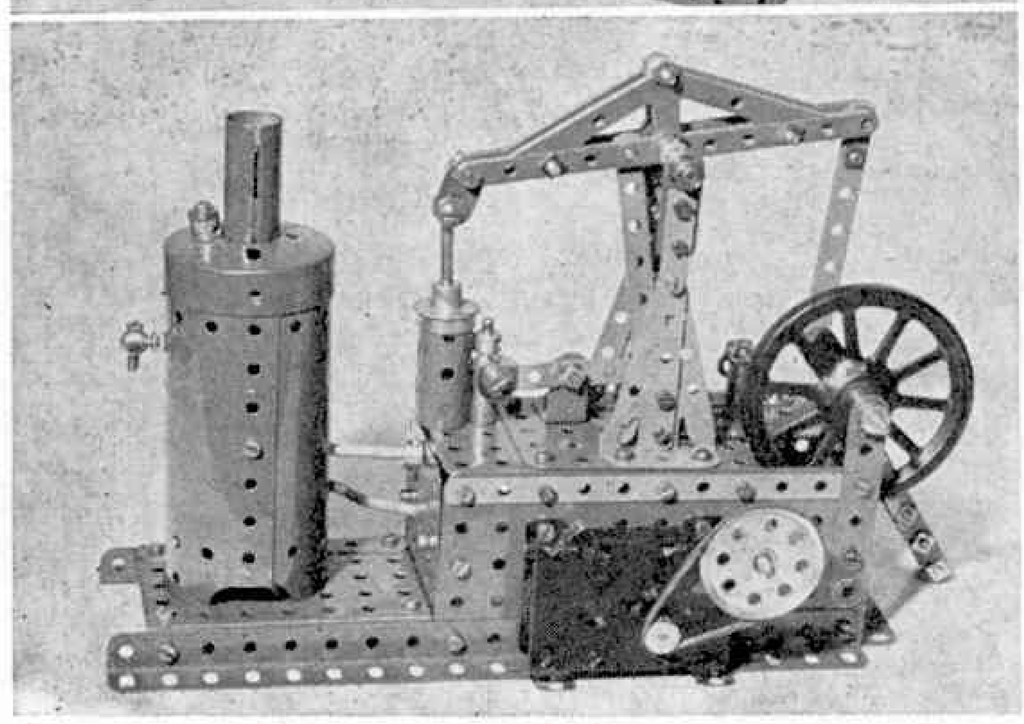
ALL ROADS LED to Shakespeare country on March 21st last, when members from the four corners of the U.K. travelled to Stratford-on-Avon for the 6th Meeting of the Midlands Meccano Guild. Doors opened at 1.30 p.m. and the hall soon became a hive of activity as members erected yet another superb display of outstanding Meccano models. The Meeting, proper, opened at 2 p.m. and on this occasion the Guild was honoured with a visit from Doug McHard, Marketing Manager of Meccano Triang Ltd., Dave Rothwell, Editor of Meccano Magazine, and "Spanner", himself. Presentations were made to Guild prize-winners of various competitions and Doug McHard then demonstrated the range of New Meccano Sets and Parts which are now on sale to the public.

After a vote of thanks to the guests, the Secretary introduced the first speaker, Phil Ashworth of Hull, who demonstrated a sophisticated "One-armed Bandit", or Meccano Fruit Machine. Although electrically-driven and programmed for appropriate pay-outs which kept the model within the limits of amusement rather than gambling, the general appearance was similar in scale and function to the genuine article and operated from a penny-in-the-slot feed with the usual starting lever at the right-hand side. The penny-operated mechanical and electrical switches, which set the machine in motion, and the spinning wheels were brought to a stop by programmed wheel dogs engaging the spokes of Hub Discs from which the fruit wheels were formed.

An element of random wheel spin was built in so that winning combinations could not be predicted and an ingenious mechanism interpreted the "pay-out" sum (in the modest range of a Penny, Twopence or Threepence) according to various winning combinations, and a further mechanism delivered the appropriate amount in the Jackpot chute.

Large models were displayed by several members, including an L.N.E.R. Railway Breakdown Crane by Phil Bradley of Epsom. This spanned some six feet of built-up track and was complete with match trucks and jib wagon. Prototype details were faithfully





Upper left: A simple, but effective Beam Engine by Jim Gamble with link motion, water pump and working governor driven by a Magic Motor. A good example of simplicity coupled with realism of appearance and motion.

Left: A fine "museum" model Beam Engine by David Whitmore with Stephenson's parallel link motion accurately reproduced with eccentric water pump. Note careful and realistic construction of engine base and plinth.

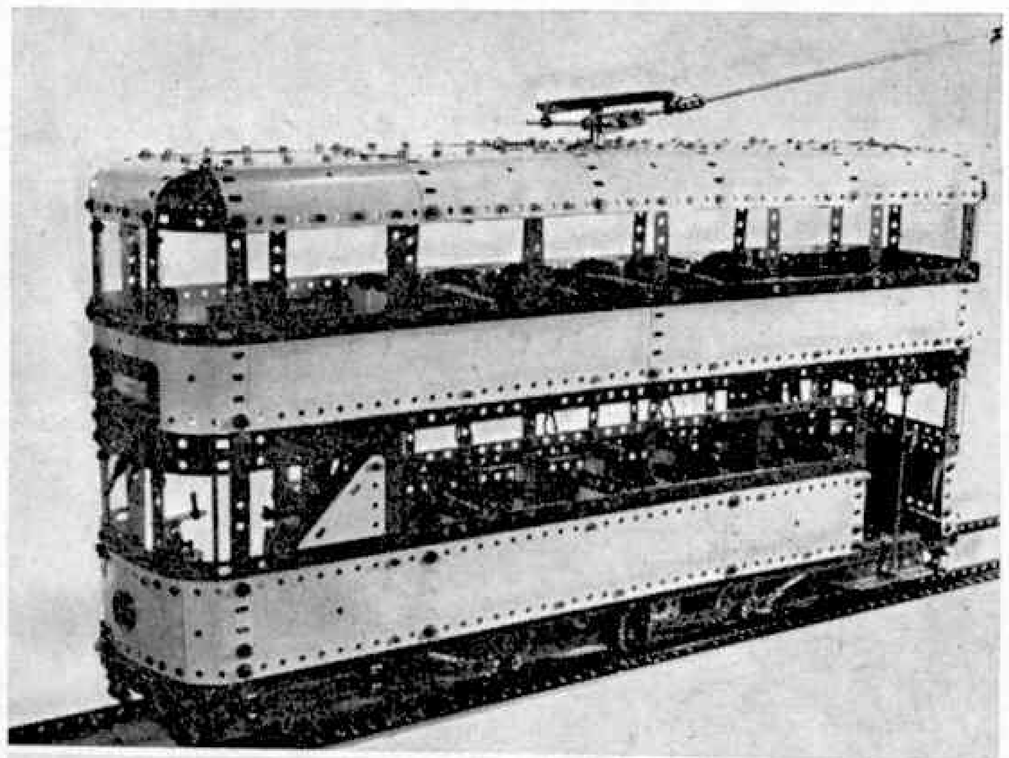
modelled and, despite its size and heavy jib, it was fully powered by the Meccano Steam Engine of current manufacture. Bob Faulkner of Abingdon showed a magnificent Giant Block-setting Crane of very rugged proportions with excellent tower bracing, centralised gearing and independent travelling bogies. Eric Jenkins brought a very neat model of the Gironde Giant Floating Crane, featured as a photographic article in a pre-War M.M. Eric's interpretation was some five feet high, with elegant design of jib, machinery house and pontoon tower, all mechanisms being very compactly assembled.

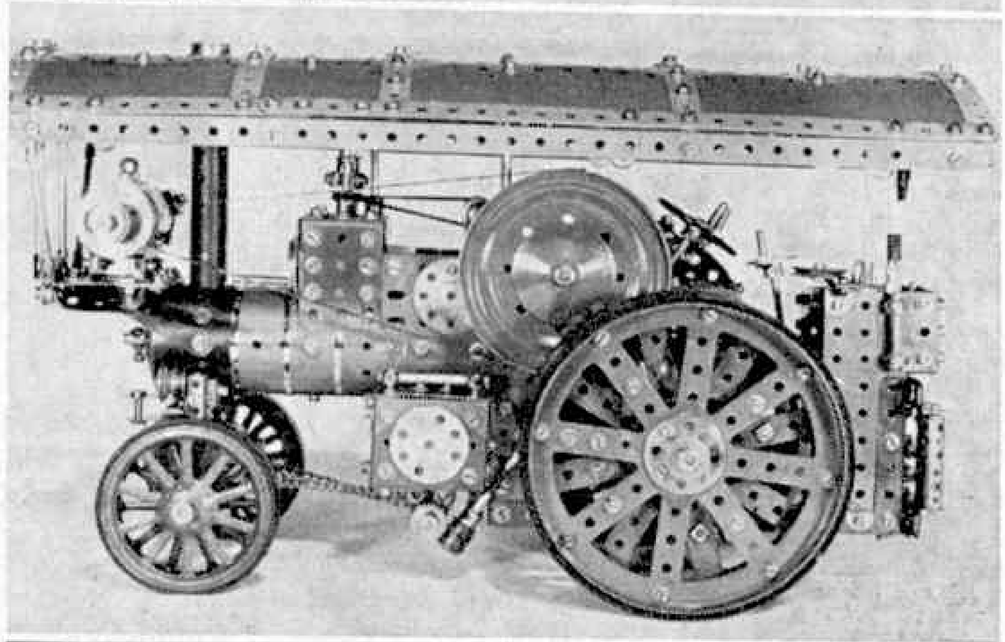
Alf Hindmarsh built a large scale model of the American Civil War 4-4-0 wood-burning locomotive, the " General ". In view of the elaborate ornamentation of steam dome, bell, giant headlamp, balloon funnel and long cowcatcher of the original, the model showed excellent shape and proportions. Ernie Chandler also built a large, early locomotive, the famous 19th Century " Lion " with external coupled drivers and tall smoke stack. Both locomotives were plinth-mounted and powered for demonstration purposes by Meccano electric motors.

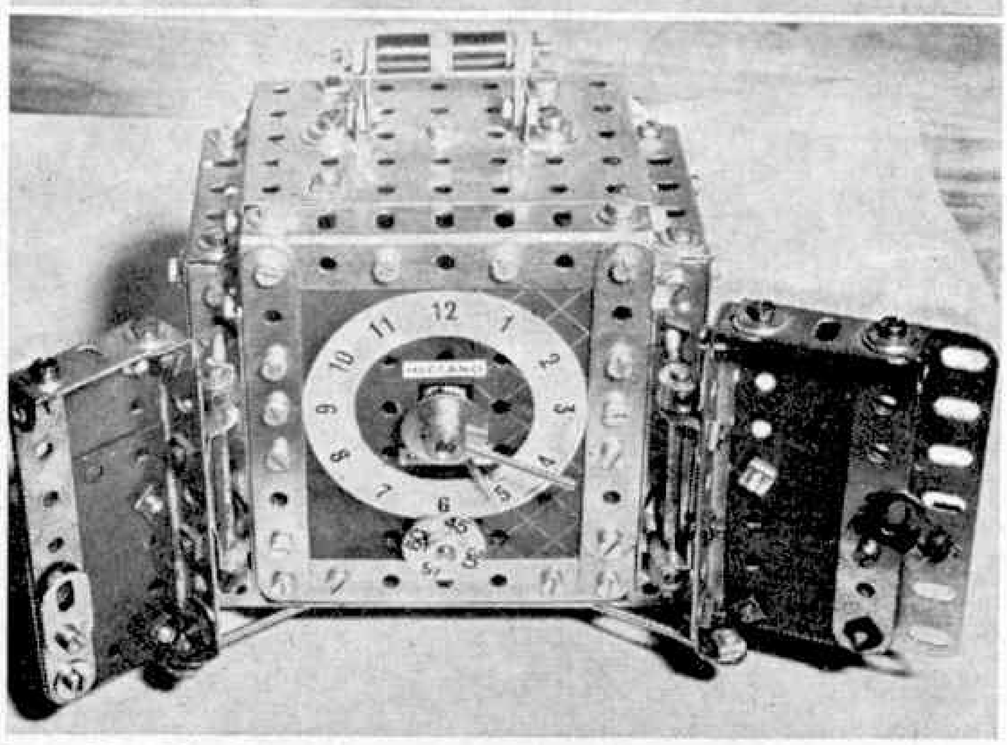
The most colourful of the larger models was a working Showman's Roundabout with 24 gallopers fitted with authentic rise and fall motion in correct phase, by Clive Hine. All motions were driven from the central support via crown wheel mechanisms including the simulated steam engine drive and a " steam " organ with animated musicians whose arms were worked by triggered solenoids. Over 100 low-voltage coloured lamps illuminated the model and the final touch of realism was added by tape-recorded music, piped into the Roundabout.

Among the smaller models, Jim Gamble and David Whitmore produced some very fine steam engines including " museum " types of beam engines. These were beautifully modelled with a keen eye to detail and realism, choice of Meccano parts and colour matching, giving a very high standard of finish. Other locomotives were also featured by Ralph Clark of Bath and Brian Edwards of Bedford. Clocks ranged from miniature travelling clocks of jeweller's standards to grandfather clocks with anti-friction movements running for several days on one winding, the former by Leslie Dougal and the latter by Pat Briggs. Stephen Lacey completed a novel 19th Century Ploughing Engine having its winding drum *surrounding* the boiler and this was complete with a multi-share cable plough.

Dennis Perkins and Phil Ashworth showed a pair of well-made Showman's Road Locomotives which were very finely detailed and complete with working differentials, cable winches and flywheel drive to the forward dynamo, plus fully-illuminated canopies. Power Drive Units were fitted in both, giving good scale speeds to the motions. Esmond Roden showed a set of ancient and modern tramcars to a substantial scale, including " Toastrack " passenger trailers for the early Dutch model, a blend of Meccano colours through several decades providing excellent livery for his models. Six-wheeler lorry chassis with transmissions and gearing as per prototype were displayed by Paul Brecknell and by Gerald Hutton, the latter one of the Guild's two totally blind members. A number of other items were brought by various Guild members, including some interesting gearboxes, novelty models and mechanisms ranging from those using the very latest Meccano parts, to parts from Mechanics Made Easy at the beginning of the Century. Many vintage items of literature and obsolete parts were also displayed.





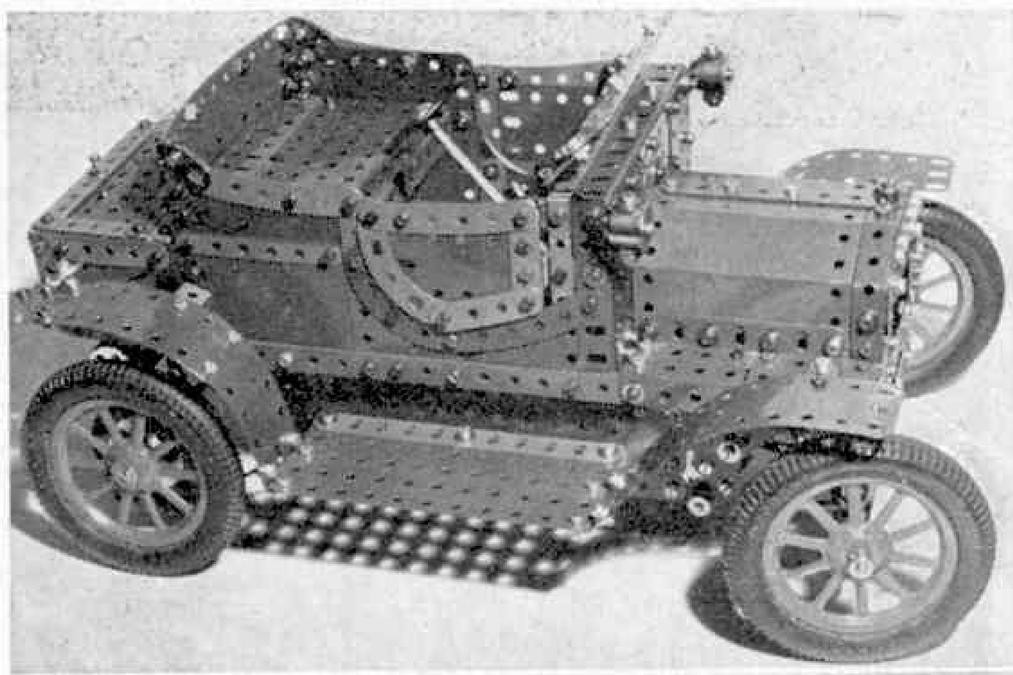


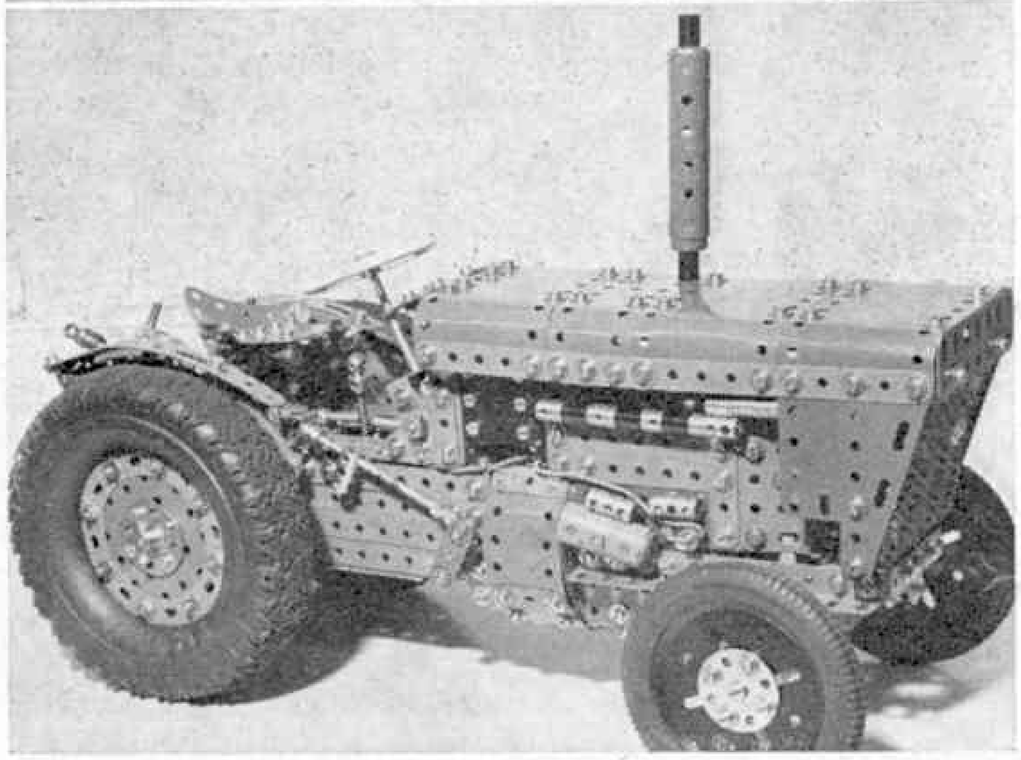
Top: Double-decker Tram by Esmond Roden based on Liverpool Tramways. Drive is by E15R Motor via overhead trolley pole. Working destination blinds, magnetic brakes, foot gong, reversing key and collision safety guards are included.

Centre: Showman's Road Locomotive by Dennis Perkins. Differential, working winch, gears, valve motion, steering and dynamo drive are among the working features.

Lower: An immaculate Travelling Clock by Leslie Dougal. The movement, including synchronised mains motor, is built entirely from Meccano parts.

A highlight of the Meeting was the projection of a 16 mm. film, kindly brought along by Doug McHard, c. unique collection of Meccano mechanisms and models on permanent display at a museum in Eindhoven, Holland. The film, which was in colour, showed the development of basic mechanics and mechanisms from elementary pulleys and gears up through differentials and epicyclic arrangements to sophisticated





machines of a scientific nature built to very advanced standards—all components, with the exception of some electronic control equipment, being constructed from current Meccano parts.

The meeting concluded with free-roaming by the members among the model-builders to soak up the details on display and to exchange comments and ideas. Refreshments were served at several periods during the afternoon and evening by a band of volunteer wives who manned (womanned?!) the kitchen with great efficiency. They were warmly thanked both by the Official Guests and by the Officers of the Guild on behalf of the Membership. By 8 p.m., many of the models were dismantled into manageable sections for stowage into cars, ready for the long journeys home for many. All agreed that, once again, the Midlands Meccano Guild Meeting was a great success.

Guild Photographs and Supermodels

Meccano enthusiasts often write to the Secretary of the Guild asking if photographs and details of models made by Guild members are available. Lists have now been prepared, which include most of the models displayed at the Guild's past six meetings. Details of photographs available and supermodel instructions are contained in a Guild list which may be obtained from the Secretary, B. N. Love, 61 Southam Road, Hall Green, Birmingham 28. Interested readers should include a stamped addressed envelope; overseas readers should include an International Reply Coupon.

Above: A 1905 Brushmobile car by Eric Jenkins with excellent detail and working mechanisms throughout. Great pains have been taken with bodywork to simulate prototype form accuracy.

Left: Rugged modern Tractor by David Whitmore fitted with powerful forward and reverse gears and beautifully detailed throughout.

HAVE YOU SEEN ? *Continued from 445*

Several of the 40 parts provide extensive armament including rockets and bombs. Drop tanks are also featured though these can be left off if desired. The pieces which make up the cockpit transparencies are crystal clear, through these can be seen a fully detailed interior.

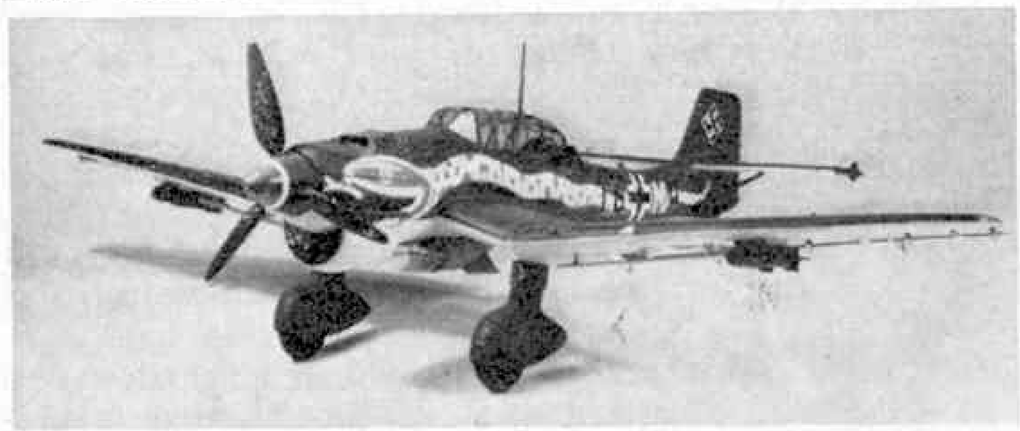
A model of an interesting and an unusual aeroplane, well worth its modest price of 9/9d.

Two new ones from Revell. In the background the OV-10A Bronco and in the foreground the Jolly Green Giant.

Revell Junkers JU 87B " Stuka "

Truly one of the best aircraft kits this year (if not the biggest !) must be Revell's $\frac{1}{32}$ scale JUNKERS JU 87 " Stuka ".

The amount of intricate detail on the model is staggering. Two sliding canopies reveal a fully detailed cockpit interior, which is complete to the wooden floor boards !



The highly detailed new Revell Stuka costs only 18/6d. and builds up into a splendid model.

The detailed engine can be viewed by detaching the removable top and bottom engine cowls, both propeller and wheels revolve. Attractive decals include a red and white snake which runs the entire length of the fuselage.

Tremendous value at only 18/6d.

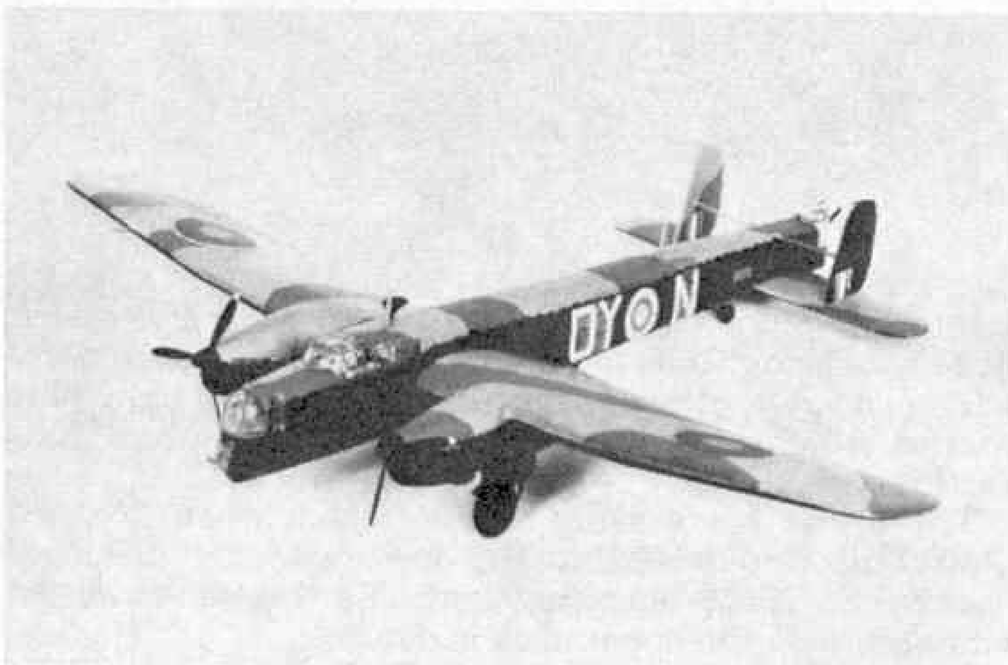
Frog A. W. Whitley Mks V and V11

One of the most famous early bombers of World War 2 has long been awaited by R.A.F. aircraft fans. Moulded in white the model can either be assembled as a Mk V of Bomber Command or a Mk V11 of Coastal Command. Alternative decals and parts are provided for this purpose.

Nice detailing includes crystal clear cockpit transparencies and choice of undercarriage positions are

provided.

Good value for a big model at just 17/6d.



Frog North American Super Sabre F-100D

The N.A. SUPER SABRE F-100D is the latest American Jet kit by Frog. The model is moulded in silver grey plastic and is fairly easy to assemble. The undercarriage can be assembled in either raised or lowered positions and optional decals provide either French or Danish Air Force markings.

The completed model looks most formidable with all its rockets and drop tanks and kit costs just 8/6d.

Lastly don't forget to put some weight in the nose when making the model otherwise it won't stand up properly.

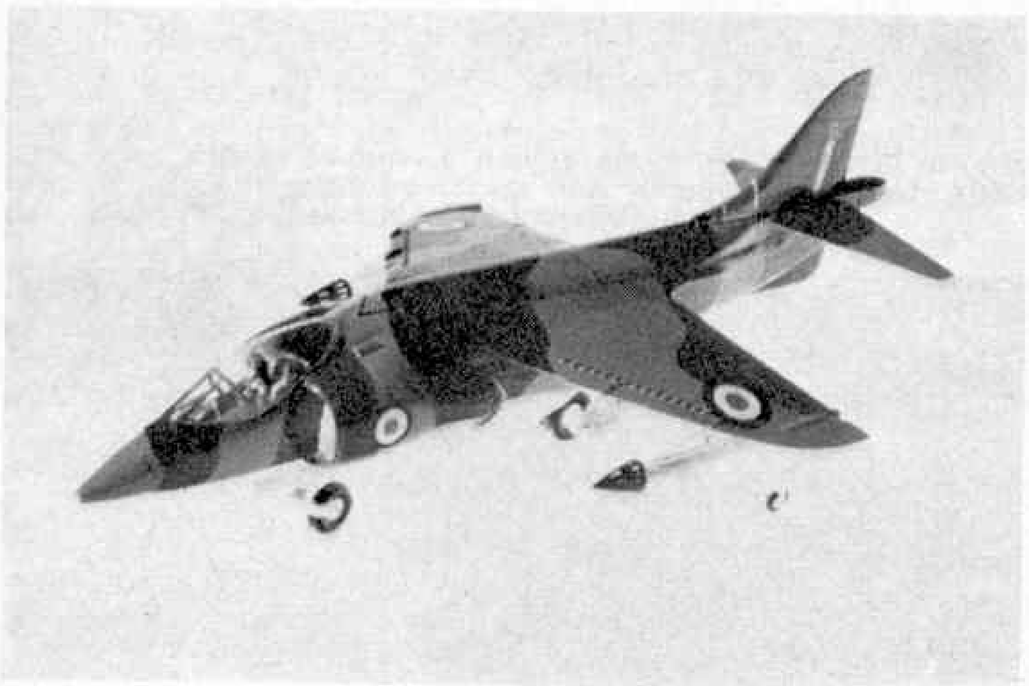
Frog Hawker Siddeley H.S. Harrier

Following hot on the heels of Airfix, Frog have also brought out a 1/72 scale kit of the unique Hawker Siddeley Harrier " Jump Jet ".

Containing over 90 parts moulded in white, the kit provided alternative bombloads and decals.

The model is easy to assemble and makes up into a most attractive and well detailed replica.

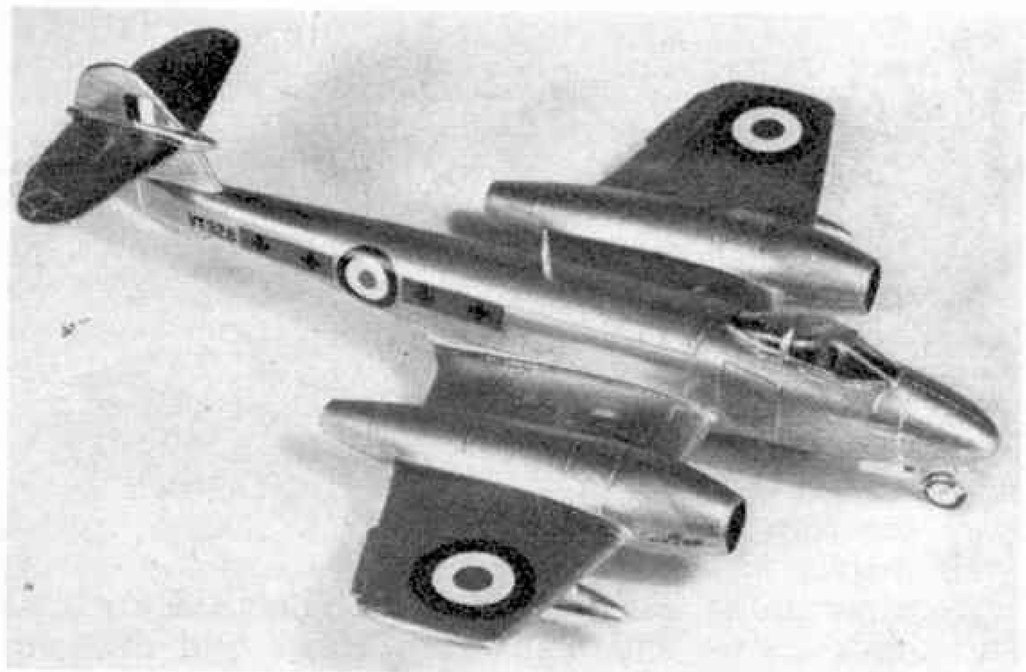
At 8/6d. it costs nearly twice that of the Airfix model and in our opinion is rather expensive.



Frog Gloster Meteor Mk 1V

Frog have released a kit of the first English Jet to see service, the Gloster Meteor.

The kit has all the features expected of a Frog 1/72 scale model, alternative decals and undercarriage positions. The decals provide markings for either Dutch or English Air Force. The kit is easy to make, but like the Sabre, make sure you have put some weight in the nose. Nothing looks worse than a tricycle wheeled aeroplane resting on its tail ! Very good value at a mere 4/9d.



Monogram Snoopy

Snoopy, that lovable " PEANUTS " character is often swearing to " get " the Red Baron !

Monogram have decided to help him out by supplying a Sopwith Camel. This fun kit has nearly 40 parts and snaps together in about 10 minutes, no glue or paints are required.

Ideal for the younger modeller is the simple " snap-together " Snoopy model from Monogram.

The model is motorised and the propeller spins round realistically running on only one Pen Cell battery. The prop is stopped and started by a mere flick with a finger.

A very good little model ideal for a younger brother and sister to make. Price to be announced.

Revell U.S.S. North Carolina

The latest Revell 1/565 scale ship kit is the U.S.S. "North Carolina", a famous American Battleship of the Second World War.

There are over 64 parts moulded in light grey, which

go together quite easily into a well detailed replica. The ship's cranes and main guns rotate and the gun barrels elevate up or down. The model even has two miniature seaplanes on catapults !

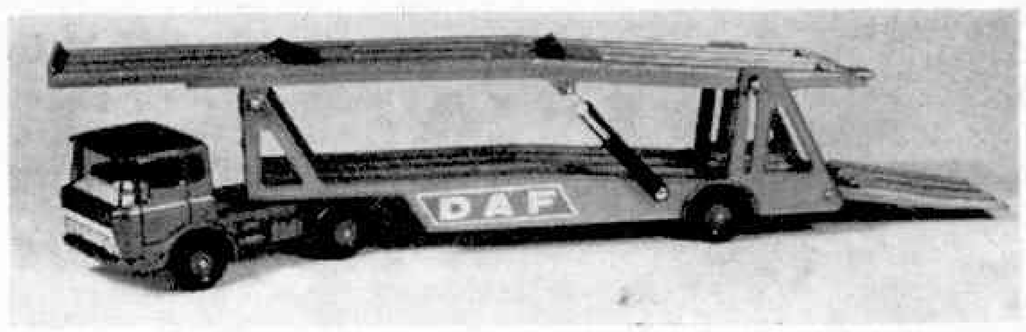
An extremely good model of a famous ship. The Revell kit retails at 14/6d.

Matchbox Fire Engine

From Matchbox this month comes the latest die-cast superfast model, a Merryweather Fire Engine. The model is nicely finished in bright red metallic paint and features a removable ladder, twin blue flashing lights, blue tinted windows (do Fire Engines have blue tinted windows ?) and London Fire Service transfers on each side. The radiator, headlights, front bumper and hose reels, etc. are finished in medium grey and the model is fitted with Superfast wheels. These wheels look rather out of place being chromed with recessed areas picked out in black. They are far better suited to sports car models than a vehicle such as a Fire Engine ! However, overall the model is very pleasing and well up to the usual high standard of Matchbox toys. Price 2/9d.

Matchbox Car Transporter

Also new from Matchbox comes this King-Size model of a Dutch "DAF" car transporter which has room to carry five Matchbox cars. Although well finished in metallic blue and metallic gold it does lack somewhat in general appearance. The wheels are rather dated, reminiscent of earlier models, and the cab unit has only single wheels instead of the authentic double wheels used on the full sized version at its rear.



The cab cannot be detached from the trailer which is rather a pity. One of the good points of articulated models is being able to remove the cab section.

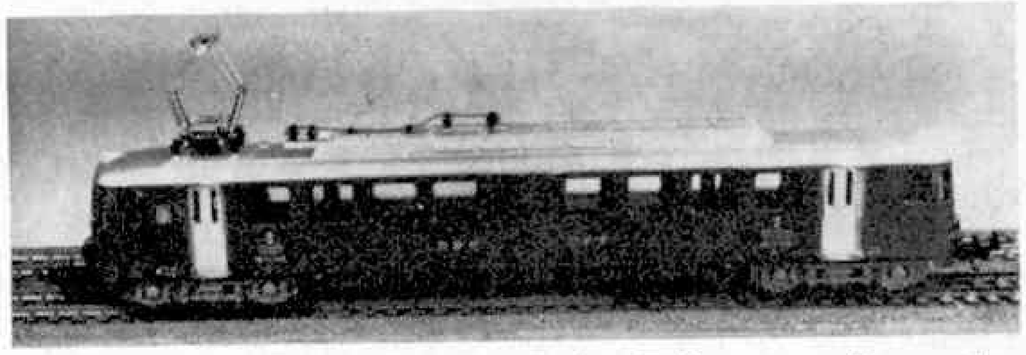
The cab is a pleasing metallic blue with a light blue interior which is well detailed. The wheels are a contrasting bright red.

The trailer has a ramp section which when dropped allows the upper deck to be lowered for "driving" models on. Twin operating hydraulic booms are fitted which work as the upper deck is moved.

All-in-all a reasonable model, modestly priced at 12/6d.

LIMA Swiss Railways Electric Railcar HO gauge

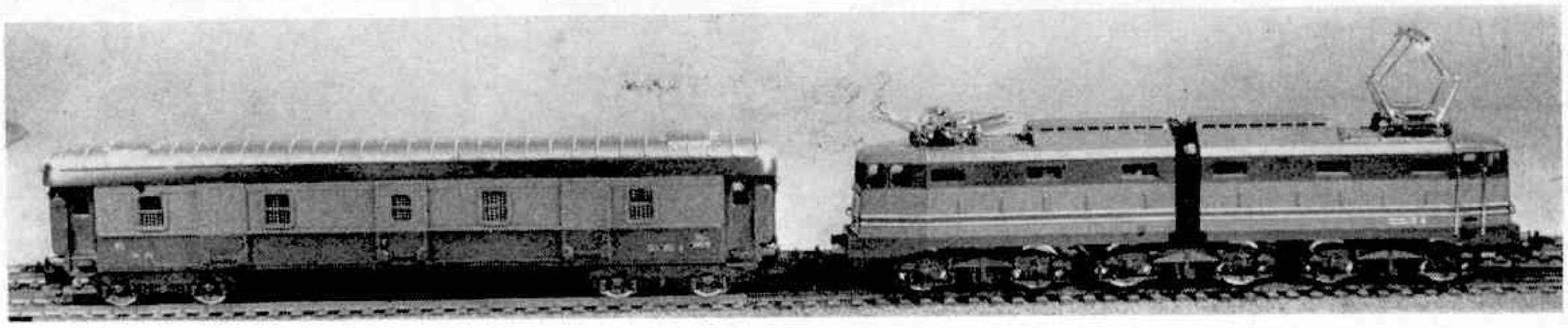
Lima is Italy's popular line in HO model railways, and its products combine typically Continental craftsmanship and smooth running qualities with prices which are considerably lower than most other European models. Richard Kohnstam Ltd. have sent us several examples from the Lima stable, the first of which is the Swiss Railways electric motor coach illustrated. There is really no English equivalent to this vehicle, which is a typically Swiss railcar—modern in appearance, with flush sides and large windows. The prototype is of lightweight construction, and can run in "multiple unit" with other vehicles.

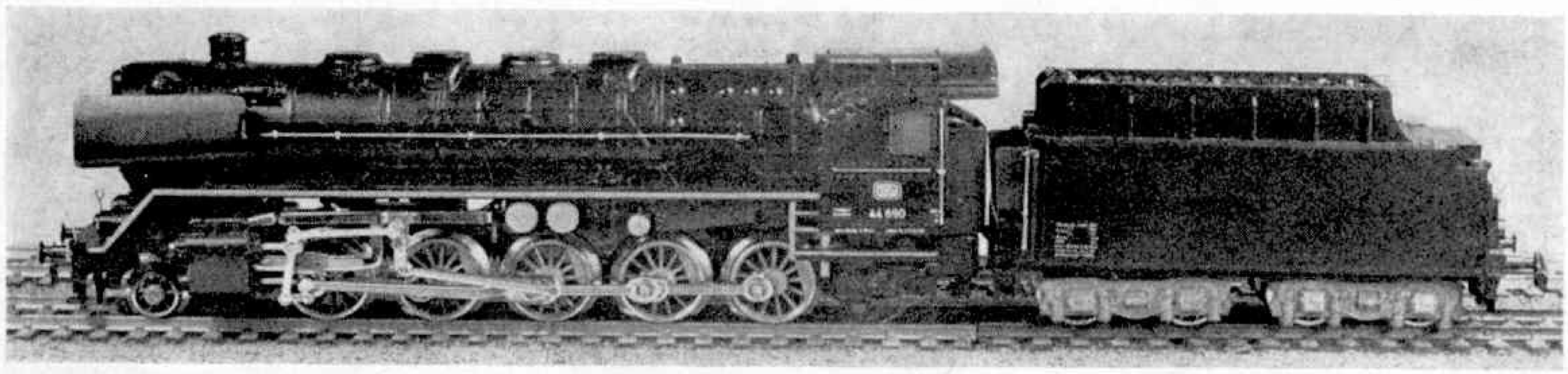


The pantograph on this Lima Swiss Railcar actually works. Detailing on the model is superb.

The model is of moulded plastic construction, and the colour scheme is olive green, with silver roof and grey bogies and undergear. Both axles of the motor bogie are driven, and current (12 volts dc) is collected from the wheels on the two-rail principle. The pantograph works, and is a very interesting assembly. As with most foreign models, detail extends to the *underneath* as well, and the lettering on the coach sides is clear and readable. Price 96/6d.

Shown below is the Lima Italian Locomotive with its coach. Both pantographs operate and the loco is hinged in the middle for negotiating tight curves.





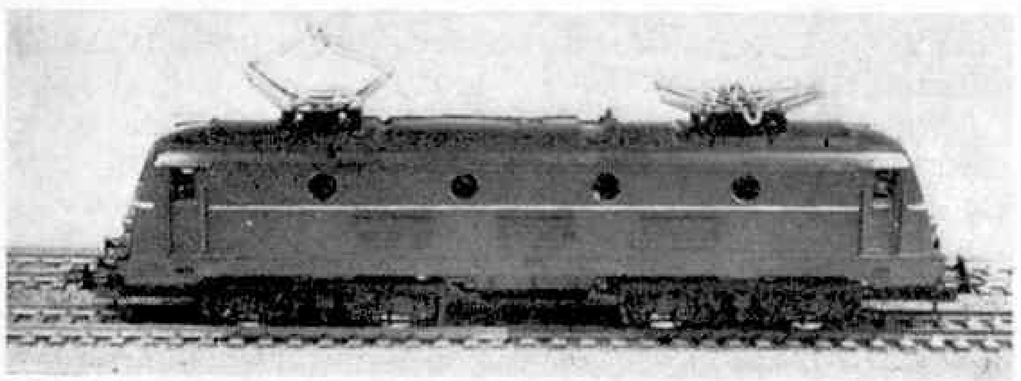
The magnificent Hamo German 2-10-0 locomotive unit must be one of the finest models available. Detailing has to be seen to be believed.

LIMA Articulated Electric Locomotive HO gauge

Seen coupled to the bogie luggage van in our photograph is the Lima Italian Railways electric locomotive E.645.080. Without doubt this is a fascinating beast. It runs on three close-set bogies, and the locomotive body articulates in the middle. Only one bogie is in fact powered on the model. Moulding is of fine quality, and the livery is the same as for the luggage van already described—dark brown and khaki. Two sprung pantographs are fitted. Price 96/6d.

LIMA Italian Railways Bogie Luggage Van HO gauge

This van is also to Lima's very high standards of moulding and finish, and it is painted in the Italian Railways' livery of brown and khaki. The barred windows are particularly nice, as are the rather complicated bogie sides with their fine detail. Price 18/11d.



The Lima Belgium Bo-Bo Electric loco. Once again the pantographs are fully sprung and operational. Detailing is excellent as on all other Lima models.

LIMA Belgian Railways Bo-Bo- Eelectric Locomotive HO gauge

This model represents the typical small Belgian electric engine, of the sort that greets the visitor at Ostend. Rather plain in general outline, its appearance is enlivened by the circular portholes in the sides and the silver strip along the length of the body. Dark green and black is the livery. The model is powered by the tried and tested Lima motor, and good pulling and quiet running are the order of the day. Two pantographs are fitted, and the roof moulding is very finely detailed, with hatches, cables, etc. Price 76/-.

HAMO German 2-10-0 Steam Locomotive Type 44 HO gauge

Hamo is the two-rail version of the famous Marklin stud contact range, and this locomotive is typically Marklin in quality and superb performance. The locomotive body is a massive metal diecasting (only the tender body and bogie side frames are in plastic) and this imparts weight to the model, and goes a long way in supplying its enormous powers of haulage. Tractive effort is also obtained from the all-axle drive —driving wheels are connected by spur gears—and the coupled wheelbase is ingeniously articulated so that flanges appear on all wheels. Motion rods are very cleverly slotted, to compensate for the articulation. Other extras include working lights and synchronised smoke.

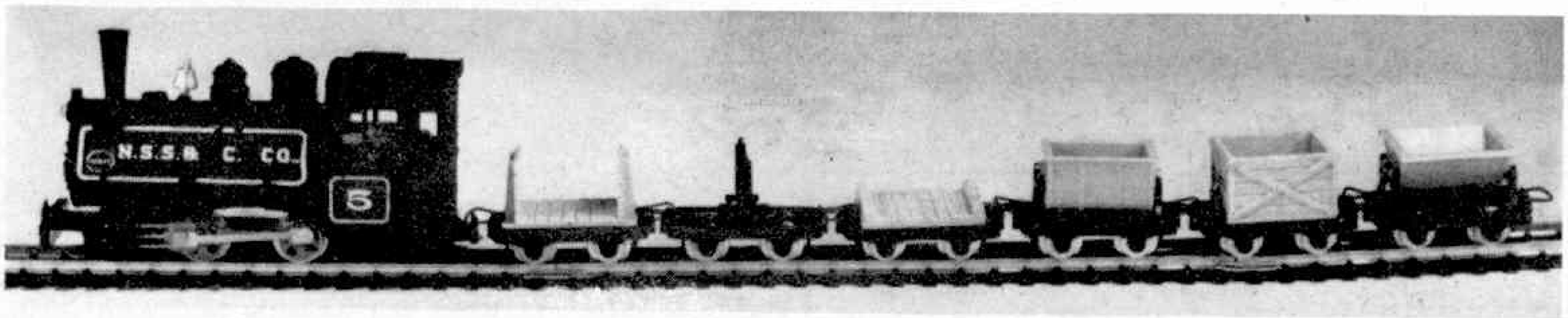
This is a very beautiful model, but we feel the price at £19 10 will be too high for most enthusiasts.

LIMA Bogie Tank Wagon " SHELL " HO gauge

Although this vehicle is naturally based on a Continental prototype, it is very like a modern British tank wagon, and would look quite at home on a British layout. Colour scheme is yellow and black with red lettering. Price 13/11d.

MINITRAINS Narrow Gauge 0-4-0T and wagons. HO scale on N gauge

One of the results of the introduction of N gauge has been to make things a lot easier for narrow gauge enthusiasts. There are many narow gauge locomotives available to run on 9 mm. gauge, and in our opinion one of the best is the little Minitrains 0-4-0 tank which is illustrated. Finished in a realistic matt black, with white lining and lettering, the model represents a typical American-built four coupled 2 ft. gauge saddle tank, the like of which have seen service all over the world. The model certainly would be quite at home on a " British " layout, and the Welsh Highland, Ashover, Lynton and Barnstaple and other railways ran American engines—the Festiniog still does. The model is only 2½ inches long ! The typical narrow gauge rolling stock seen in the picture is also by Minitrains, and comes packed in boxes of six identical vehicles. Price of the locomotive is 52/6d.



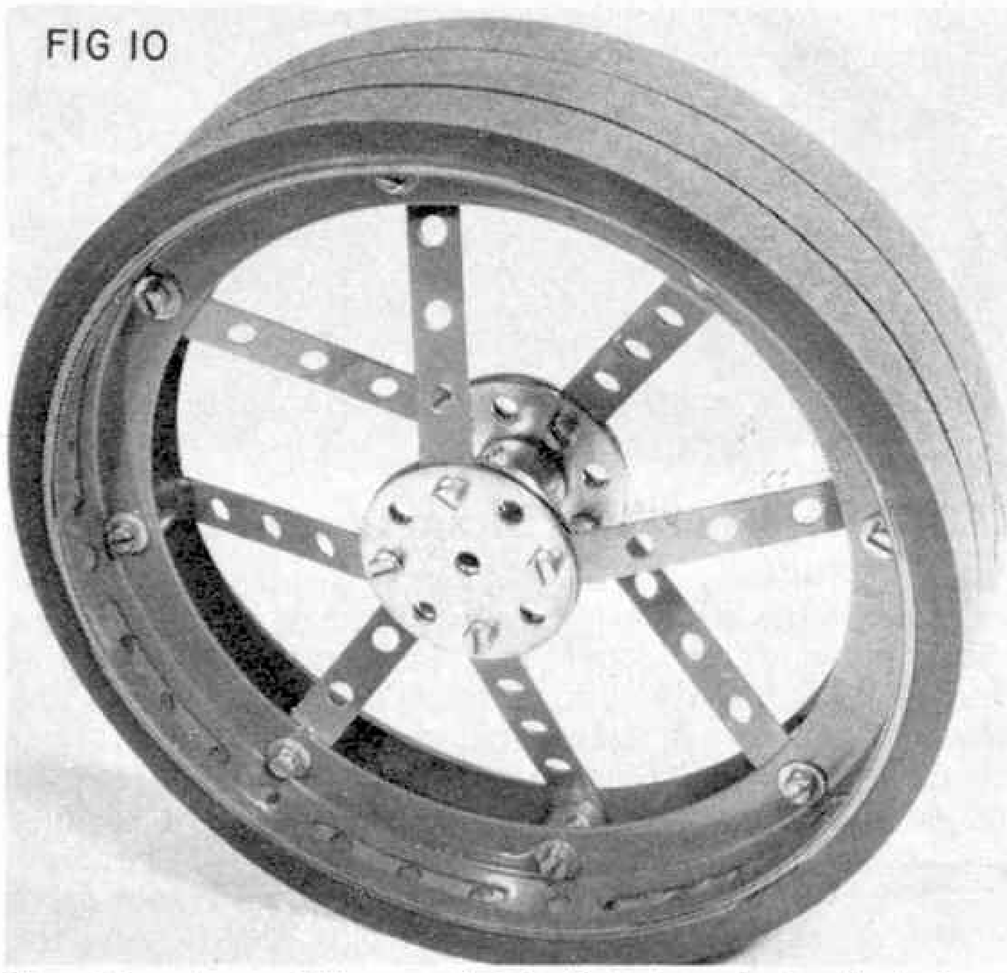


Fig. 10: A partially-completed dished spoked wheel for a traction engine using 2½ in. Narrow Strips for spokes. Eight-hole Wheel Discs are used to "sandwich" the spokes.

Fig. 11: A completed 16-spoke dished wheel for a Showman's Road Locomotive. The outer rim of the wheel is made from 5½ × 1½ in. Flexible or Plastic Plates trapped by rubber tyres or bands.

CONSTRUCTORS GUIDE *Continued from 452*

Hooks, while governors made from Small Fork Pieces can be authentically driven by Contrate gearing, the boss of the Contrate acting as its own pulley. Gear drives are very simple in traction engines, a sliding gear rod carrying two or three change speed gears or Pinions on horizontal bearings to mesh with the crankshaft gear, as shown in Fig. 7. In some cases, as in Fig. 9, auxiliary gearing is required from the main motion to drive a ploughing winch drum, giving the modeller excellent scope to extend the mechanisms.

Wheel construction is a problem with realism in mind. Hub Discs are commonly used and, when staggered by Reversed Angle Brackets as shown in Fig. 1, a fair likeness is achieved. However, spoked and dished wheels can be neatly assembled from Circular Girders and Narrow Strips, as shown in Figs. 10 and 11. No Bolts protrude through the rims, Plastic or Flexible 1½ in. Plates being used for the rim construction. These Plates are simply held in place by the elastic properties of Meccano heavy-duty Driving Bands placed on in layers, or by the use of commercial rubber rings, or vacuum cleaner driving belts. As a last resort, black fabric insulating tape can be wound on to make very effective-looking traction engine "tyres". Agricultural engines can be left, with advantage, with the "bare" look.

Many enthusiasts prefer to model on a larger scale, using the 9 in. Flanged Ring, Part No. 167b, as a standard for their rear wheels as this size gives easier scope for detail work. As an alternative, however, satisfactory wheels for this larger scale can be based on rings of 4½ in. Curved Strips, as shown in Fig. 12, and these have the advantage of multiple perforations for spoke attachments, etc. Hub details can then be built in to give the detailed finish.

One thing is certain: provided care is taken with construction and attention is paid to detail, traction engines can be built with great success in the medium of Meccano.

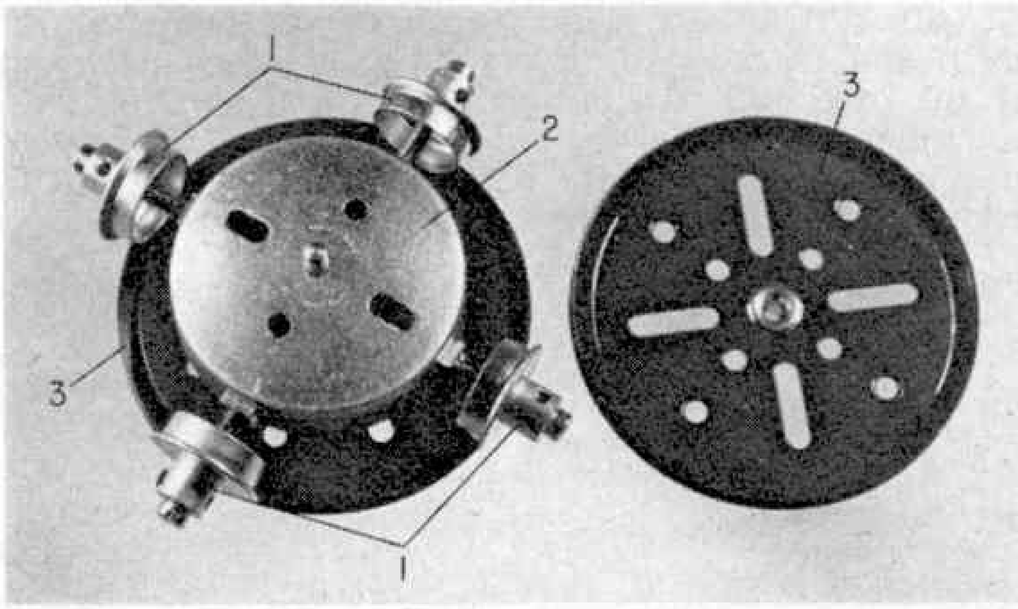
AMONG THE MODEL BUILDERS *Continued from page 439*

Simple Roller Race

As a parting shot, this month, I leave you with yet another simple Roller Race (we've had quite a lot of them, recently!) this particular example coming from Mr. G. Relins of Leamington Spa, Warwickshire. Free-running ¾ in. Flanged Wheels 1 are mounted, boss outwards, on 1⅛ in. Bolts locked by Nuts in the flange of a Boiler End 2. The Flanged Wheels run on the lips of two 3 in. Pulleys 3, the whole unit being centralised by a Rod journalled in the bosses of the Pulleys and passed through the centre hole in the Boiler End. As I say, it's simple, but useful for larger models.

PARTS REQUIRED

1—18a	4—20b	4—111d
2—19b	8—37a	1—162a



This simple Roller Race, suitable for larger models, was designed by Mr. G. Relins of Leamington Spa, Warwickshire.

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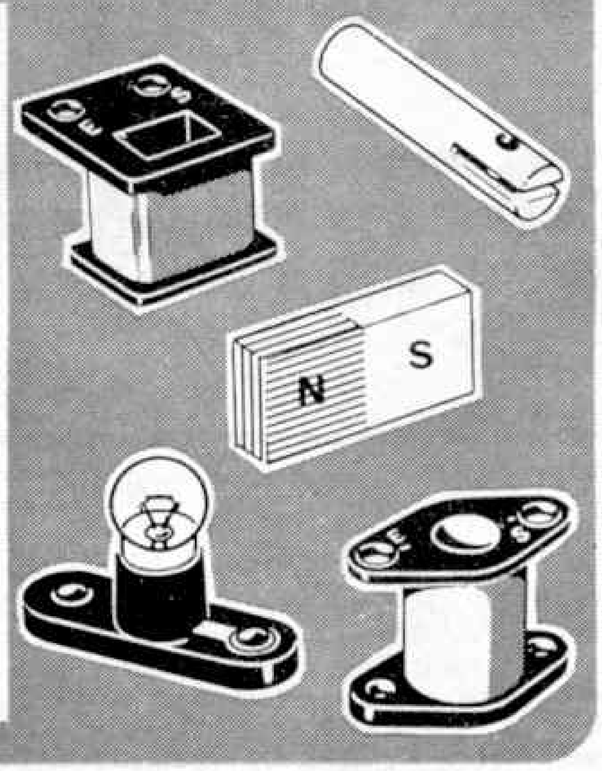

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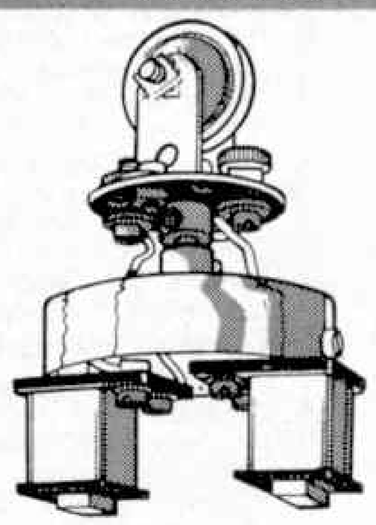

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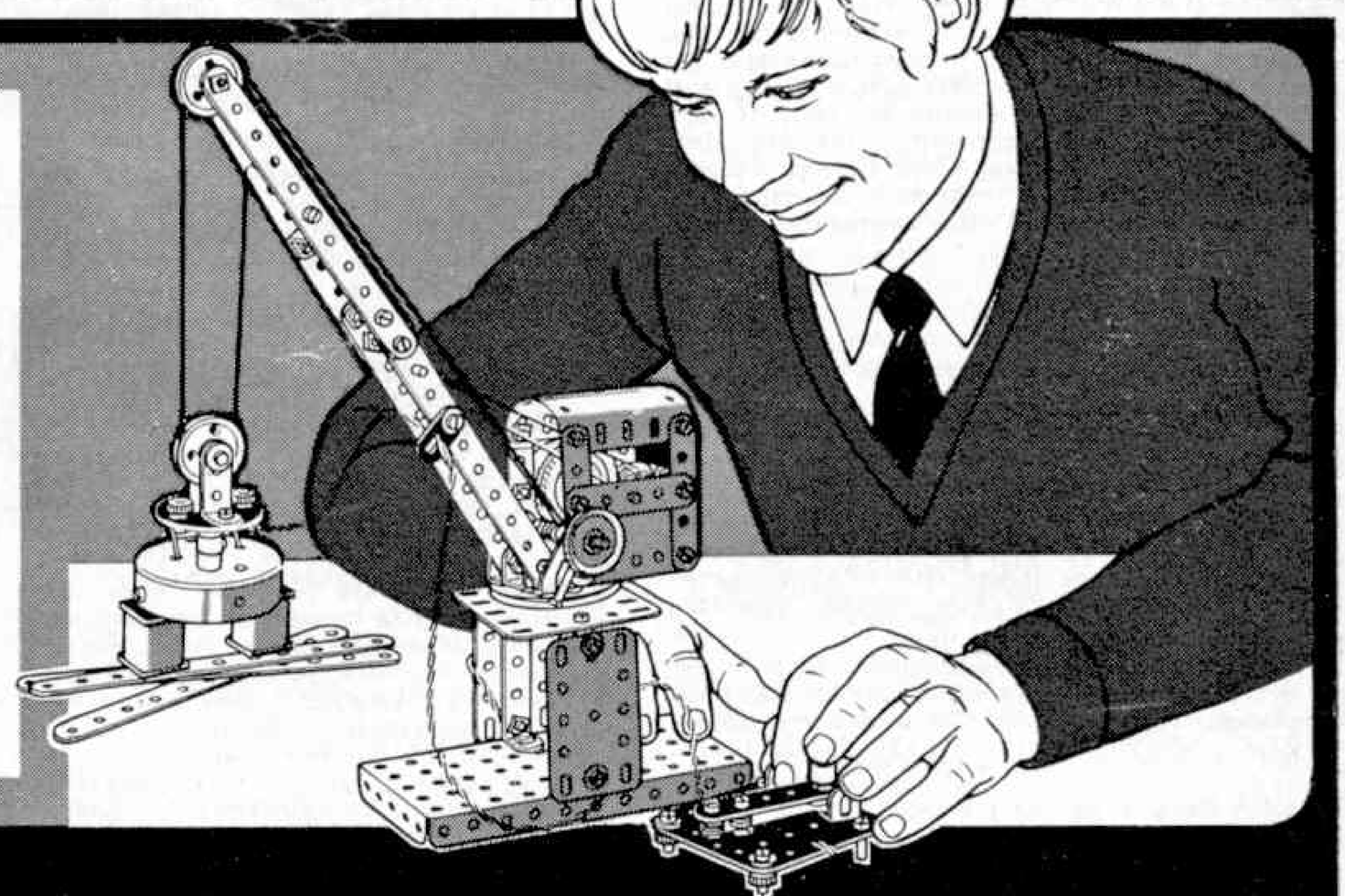

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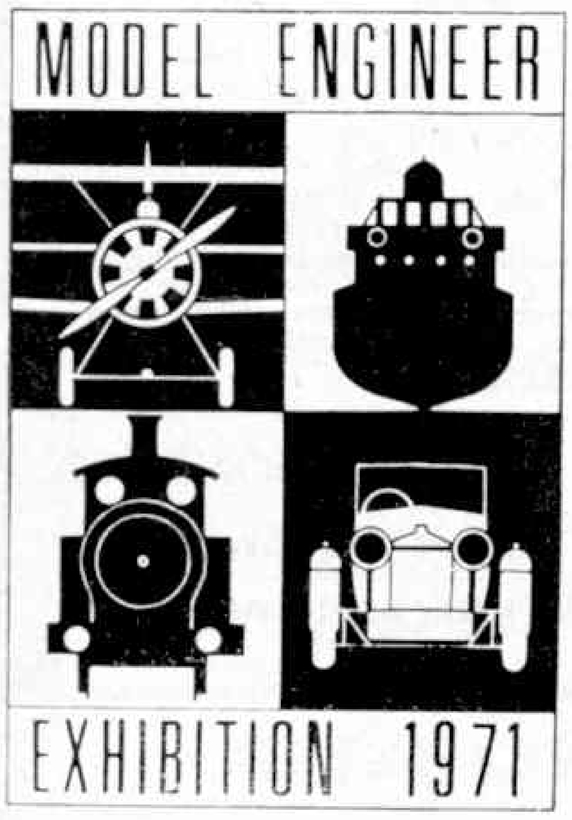

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