MECCANO® Magazine

MAY 1968

TWO SHILLINGS
AND SIXPENCE

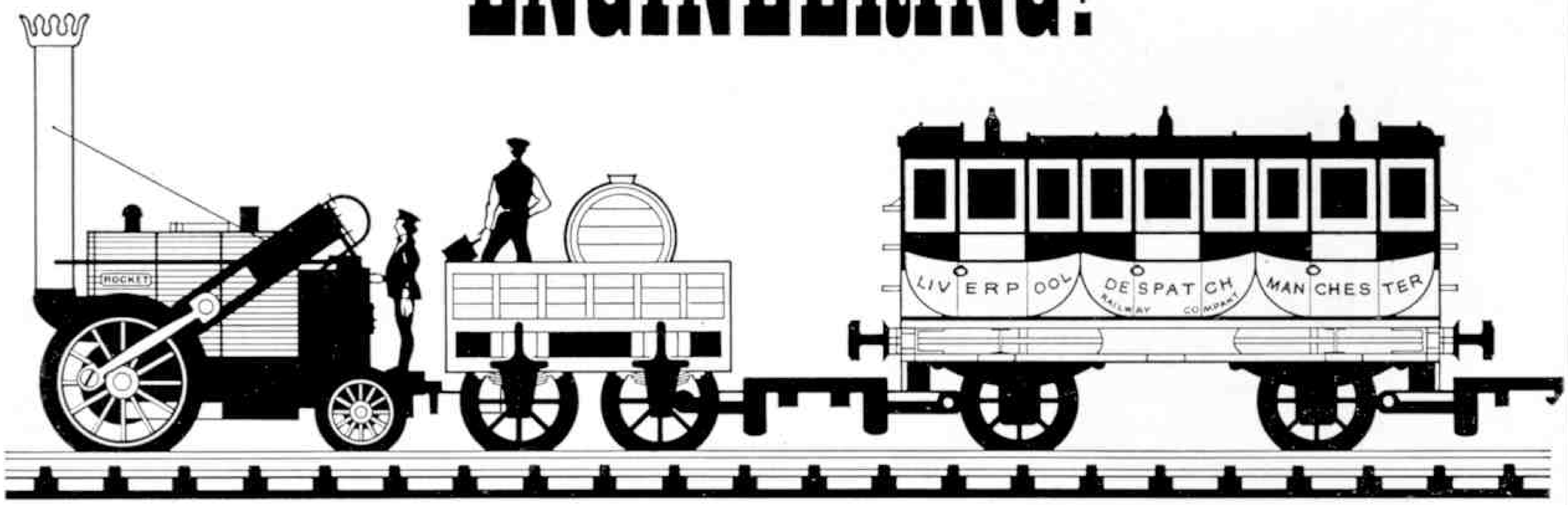
U.S.A. AND CANADA 60 CENTS.

MAP

HOBBY MAGAZINE

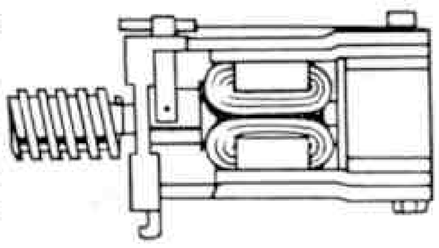
RAILWAYS PLASTICS AEROMODELLING BOATS CARS STAMPS MECCANO SCIENCE

STEPHENSON'S ROCKET IS A TRIUMPH OF MODERN ENGINEERING!

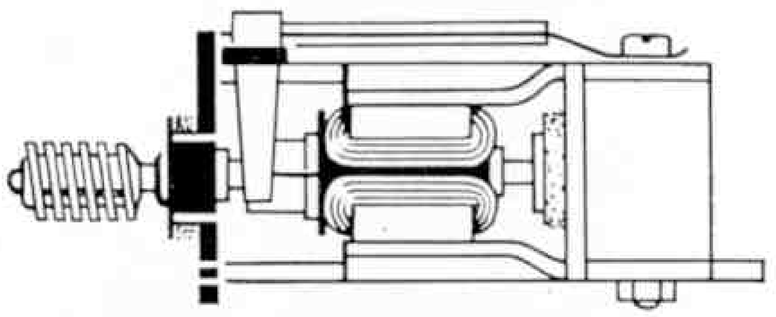


To scale down Stephenson's Rocket with its crew, tender and a Liverpool and Manchester Railway coach and produce them in accurate detail and in their original livery for 49/11d. (recommended retail price) the set is an achievement. To fit the engine with one of the most perfect electric motors and magnadhesion ready for OO gauge running at this price is a triumph for the engineering skill of Tri-ang Hornby craftsmen.

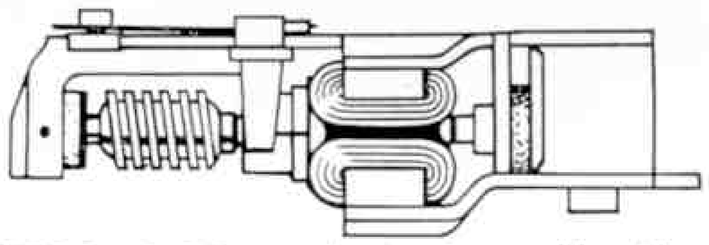
The motor is the 0.1 amp X500 and 3 pole unit with Delrin bearings, a 3/8" armature, 1/16" shaft, Alcomax III magnet and 13 to 1 reduction on its two-start worm drive. Off load speed 20,000 r.p.m. One of three Tri-ang Hornby motors available at 15/8d. each (Recommended retail price).



ALTERNATIVE MOTORS



XO4 3 pole, 0.4 amp. phosphor bronze oil retaining bearings 1/2" armatures, 3/32" shaft, 20 to 1 reduction worm drive, Alcomax magnet, 20,000 r.p.m. off load.



XT60 3 pole, 0.3 amp. phosphor bronze oil retaining bearings 1/2" armature, 3/32" shaft, 26 to 1 reduction worm drive, Alcomax magnet, 15,000 r.p.m. off load.

Tri-ang Regd Trade Mark HORNBY

Made in Britain by Rovex Industries Ltd., Westwood, Margate, Kent.

MECCANO® Magazine

MAY 1968 VOLUME 53 NUMBER 5

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MAP **HOBBY MAGAZINE**

FRONT COVER

Artist Laurie Bagley captures the Spectrum Pursuit Vehicle racing up a hill with the Spectrum Patrol Car just about to close up behind it. Both these exciting television series vehicles, are made as Dinky Toys.

NEXT MONTH

Watch out for the very picturesque, Napoleonic Battle Gaming cover. Charles Grant describes Battle Game rules and model soldier fans will be pleased with a feature on how to build and detail a Napoleonic plastic soldier kit. Meccano models include a really realistic tram for advanced enthusiasts and a simple plastic crane for the novice. Among the Model Builders will have yet more interesting ideas from readers, written up by the ever-popular Spanner. Railway modellers will have a real bonanza with the A.B.C. of Model Railways describing station track layout, while OO gauge Trackside Construction describes the use of reinforced plaster scenic materials. For the young and old railway modeller alike, Two Approaches to Railway Modelling describing the past and present attitudes will be invaluable. Great Engineers, Have you Seen, Dinky Toy News and Book Reviews make this an issue not to be missed.

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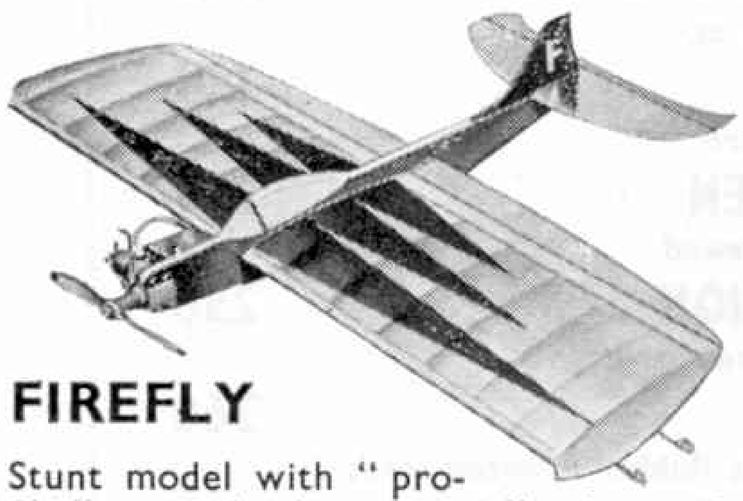
START OFF RIGHT with a KEILKRAFT KIT



FIREFLY

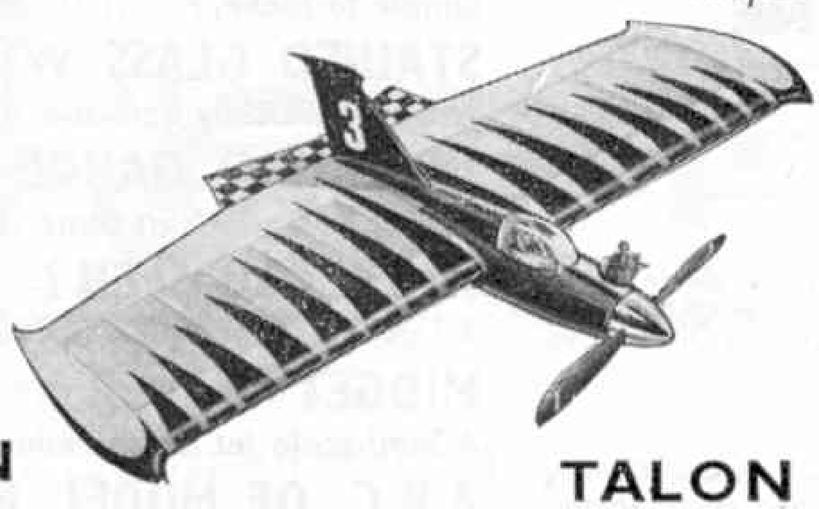
Stunt model with "profile" type fuselage, specially designed for engines under 1 c.c. Kit contains die-cut parts. Wingspan 20 in. **24/3**

DEMON

Class A team racer to S.M.A.E. specification. Kit contains die-cut parts. For engines up to 2.5 c.c. Wingspan 30 in. **44/2**

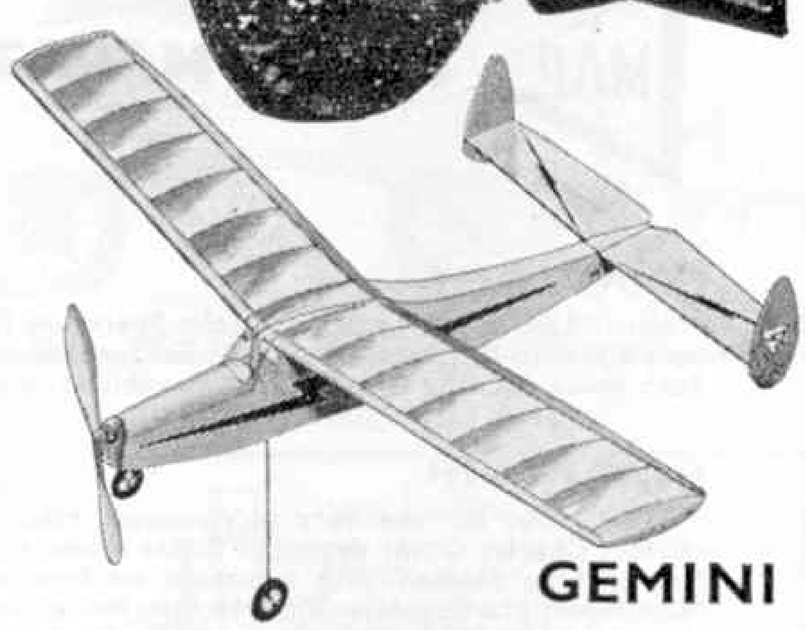
RADIAN

with coupled wing flaps and elevators For .049 motors. Kit contents include die-cut parts, stunt tank, preformed U/C, formed canopy, all hardware. Wingspan 22 in. **25/11**



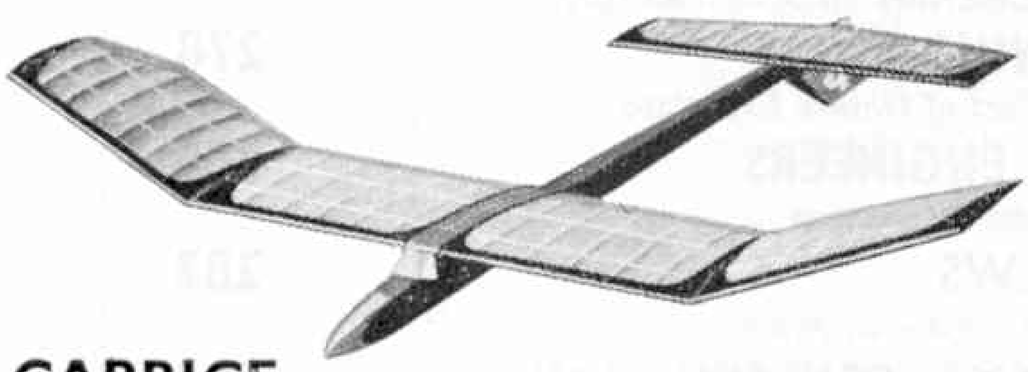
TALON

Combat design of considerable strength. Easy and quick to build. A fully aerobatic model that is great fun to fly. For 2.5 to 3.5 c.c. engines. Wingspan 32 in. **37/3**



GEMINI

Duration model with all fuselage parts, tailplane, and fins in pre-cut, pre-decorated sheet balsa. Wingspan 22 in. **12/6**



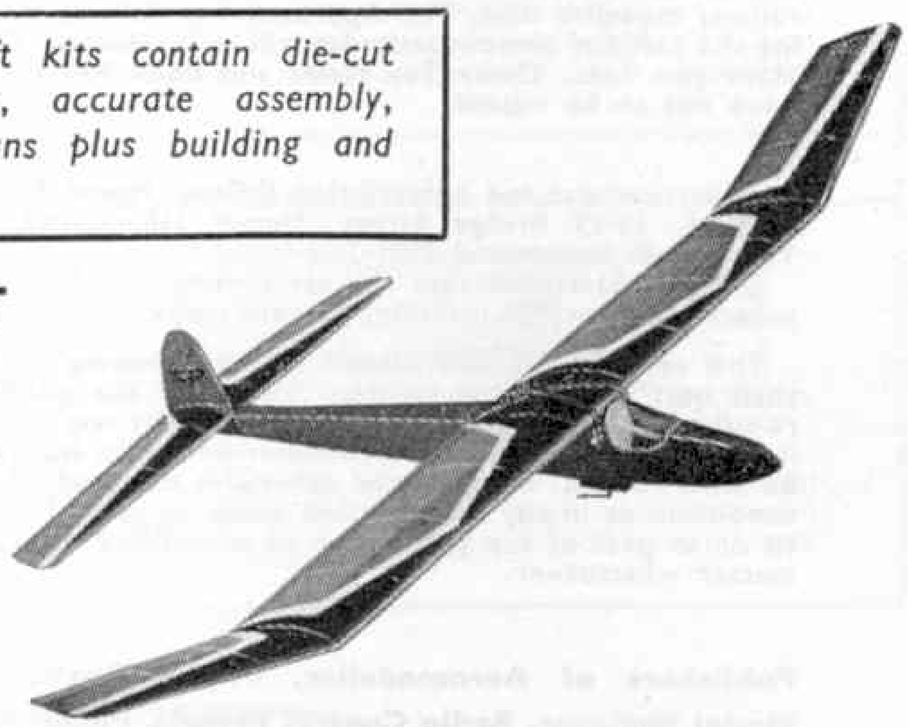
CAPRICE

High performance contest glider. Rugged and straightforward to build. Kit features die-cut parts for speedy assembly. 51 in. wingspan. **23/11**

All these Keilkraft kits contain die-cut parts for speedy, accurate assembly, and full size plans plus building and flying instructions.

CONQUEST

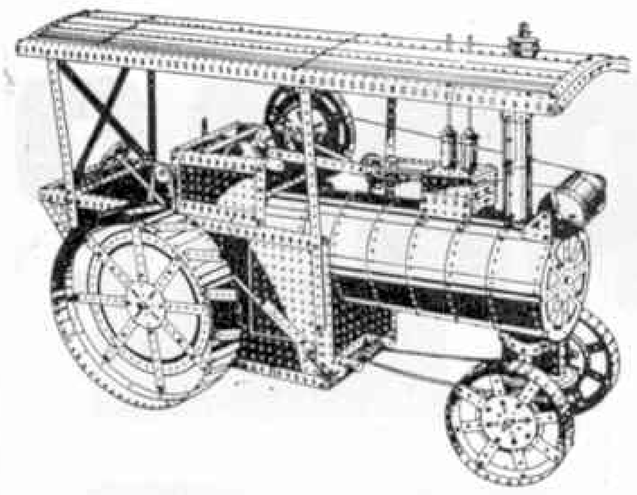
Towline glider for beginners, with a very good performance. Kit contains die-cut parts. Wingspan 30 in. **11/6**



KEILKRAFT

RIGHT from the start!

See this famous range at the local model shop



WHAT'S WHAT IN THE MECCANO LINE

The standard progressive Meccano system consists of ten Main Sets, numbered 1-10 inclusive each with an identifying "theme" name in addition to the number. This theme, e.g. "Highway Vehicles" is obtained from the predominant type of model featured in the Instructions Book for the particular Set and does *not* mean that *only* models of that type can be built with the Set. In fact, the number and variety of models that can be produced is limited only by the imagination of the user. Also included in the standard system is a series of seven Conversion Sets. These are not intended as constructional sets in their own right, but simply contain the necessary extra parts to convert a Meccano main outfit into the next larger one, e.g. Outfit 1 + Conversion Set 1A = Outfit 2. Also available, but not included in the standard progressive system, are several self-contained outfits, such as the Power Drive Set and Gears Set, as well as a number of Motors and additional equipment. The following is a list of all items and Sets currently available, with their U.K. recommended retail prices:

MECCANO SETS

(Complete with illustrated Books of Models)

Set No.		£	s.	d.
	Playset		15	3
1.	Junior Kit	1	2	6
2.	Super Junior	1	15	0
3.	Highway Vehicles	2	5	6
4.	Airport Services	3	8	6
5.	Site Engineering	4	13	6
6.	Ocean Terminal	5	15	0
7.	Mountain Engineer	7	17	6
8.	Breakdown Crew	13	10	0
9.	Master Engineer's Set	22	10	0
10.	Meccano Outfit in 4-Drawer Cabinet	59	10	0
	Meccano Gears Set	1	4	11
	Meccano Mechanisms Set	1	19	11
	Elektrikit	4	7	3

MECCANO CONVERSION SETS

		£	s.	d.
No. 1a	Converts No. 1 into No. 2		12	11
No. 2a	" " 2 " " 3		17	11
No. 3a	" " 3 " " 4	1	9	6
No. 4a	" " 4 " " 5	1	15	0
No. 5a	" " 5 " " 6	1	7	9
No. 6a	" " 6 " " 7	2	5	0
No. 7a	" " 7 " " 8	5	15	9

MECCANO POWER DRIVE SERIES

	£	s.	d.
Junior Power Drive Set	3	19	11
Power Drive Set	6	2	9
Power Drive Unit (6-ratio Gearbox and 6 volt D.C. Motor). Battery operated.	2	9	11
Power Drive Gear Box and Coupling	1	9	11
Power Drive Steam Engine	3	9	11
Reversible 4½ volt D.C. Motor	1	4	6

MECCANO MOTORS, ETC.

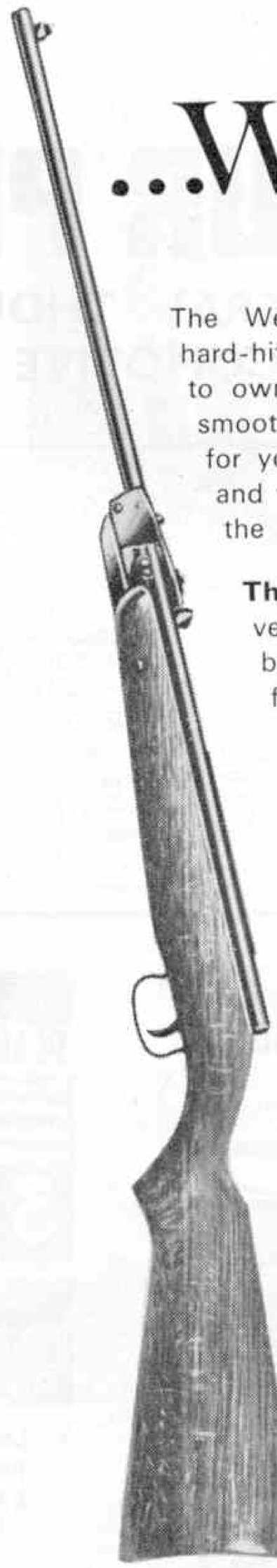
	£	s.	d.
Clockwork, Magic, non-reversing (including key)		9	11
Clockwork No. 1, reversing (including key)	1	7	6
E15R Electric, reversing*	2	19	3
EMEBO Electric Motor (Battery operated)	1	5	9
43901 B Key for No. 1 Clockwork Motor		1	3
43903 S Key for Magic Clockwork Motor			4

* Fitted with T.V. and Radio interference suppressors.

SPARE PARTS

The Meccano range of Spare Parts consists of more than 300 individual items, all of which are available for separate sale. A price list can be had on application.

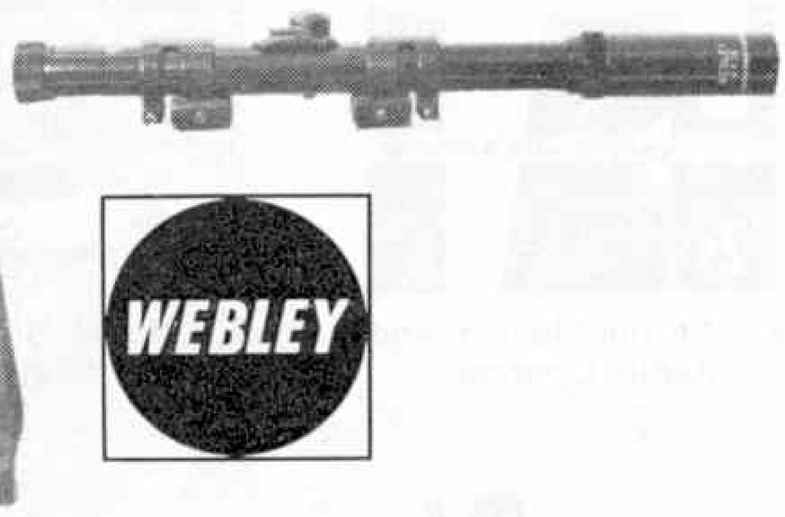
measure the calibre of this gun by its name



...Webley

The Webley Falcon is a precision-built, hard-hitting air rifle which you will be proud to own. It is extremely accurate, with a smooth action, and a superb finish. See it for yourself at your nearest gun stockist and you will see why Webley have been the greatest name in guns since 1790.

The Falcon ·177 or ·22 calibre high velocity precision air rifle. Hand rifled barrel, solid drawn seamless tube for body, solid steel loading lever, click adjustable rearsight, solid pins and keeper screws (not rivets), to facilitate dismantling and reassembly, provision for mainspring to be replaced without use of special tools, fitted with plate for telescopic sight. Velocity: ·177—550 ft. secs. ·22—500 ft. secs. Weight: 6 lb. Overall length: 41½". Barrel length: 17¼".



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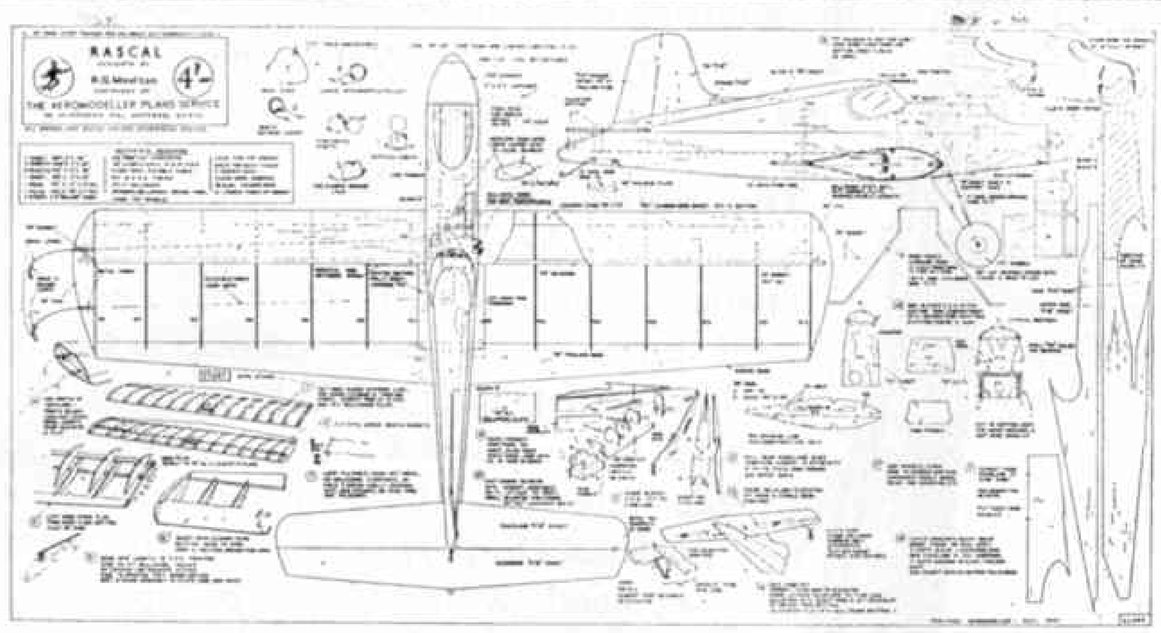

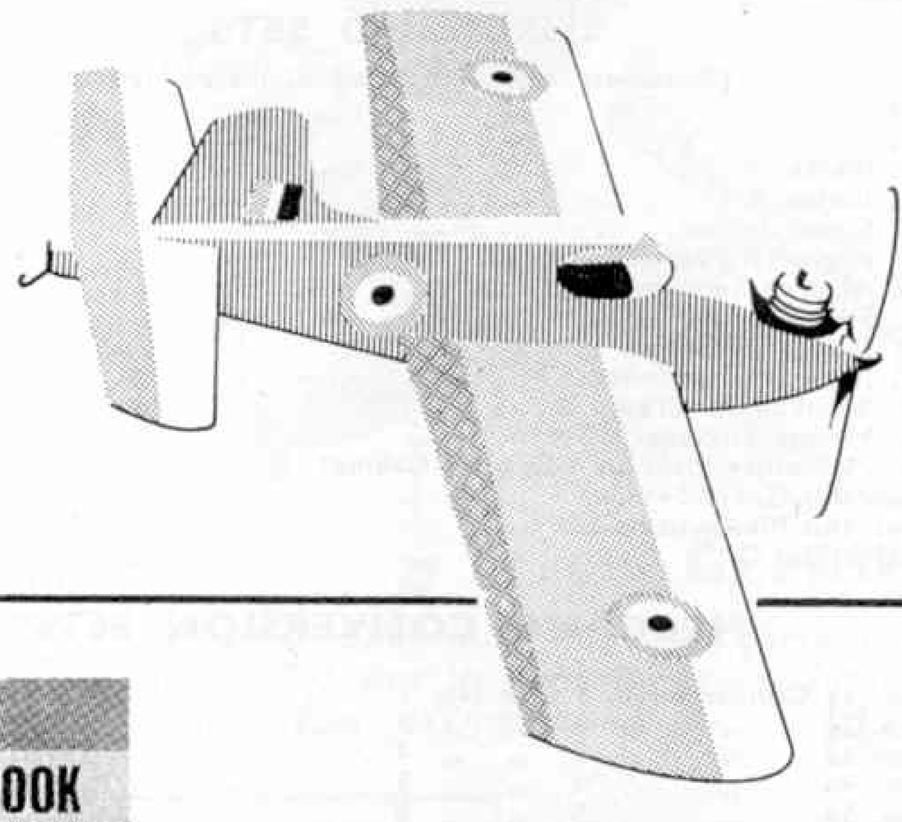

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2. Model Boats, Cars, and Radio Control.

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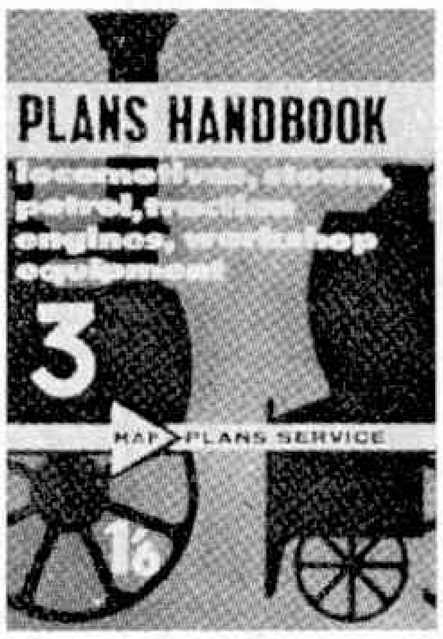


3. Locomotives, steam, petrol, traction engines, workshop equipment.

1/6

THE ABOVE AIRCRAFT AND PLAN ARE TYPICAL OF MANY TO BE FOUND IN THE PLANS HANDBOOKS.

In these three handbooks, we offer you a wide choice of plans for all types of models. Books one and two have articles to help the newcomer and are fully illustrated throughout.

Obtainable from : MODEL AERONAUTICAL PRESS LTD., 13-35 BRIDGE STREET, HEMEL HEMPSTEAD

KINDLY MENTION "MECCANO MAGAZINE" WHEN REPLYING TO ADVERTISEMENTS

WORKBENCH

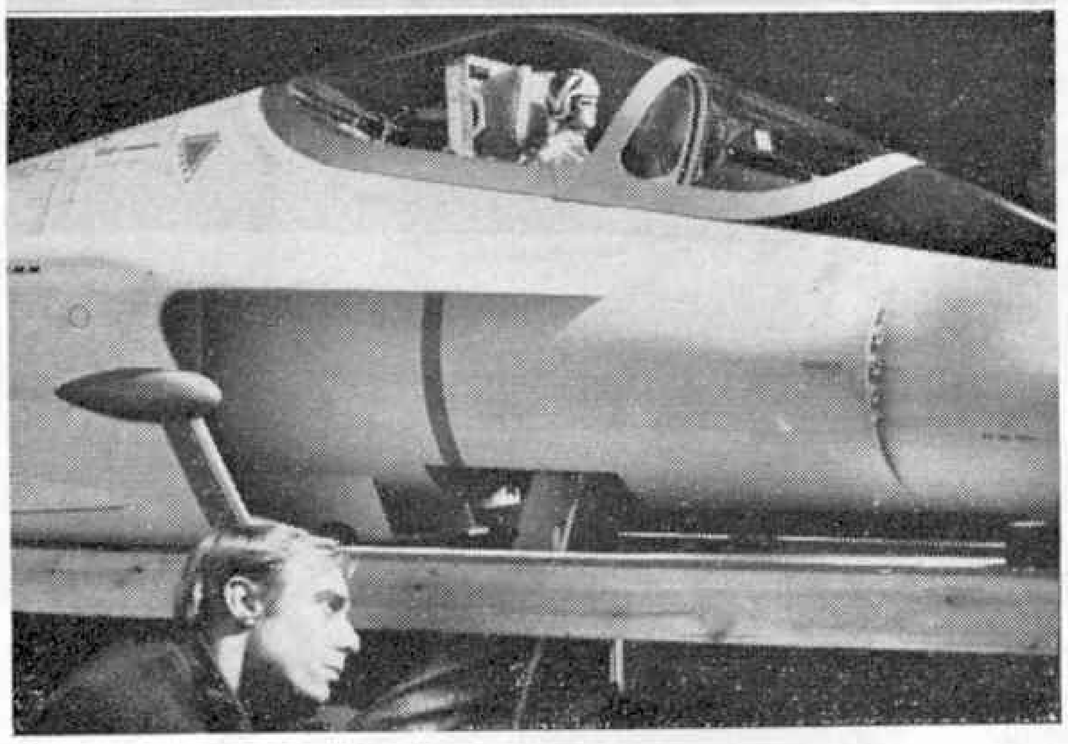
Mr. G. J. Taylor, owner of our local model shop in Hemel Hempstead, poses with a nice array of Meccano Spares in a display case. Every Meccano part is displayed and kept in stock by Taylor & McKenna (Hemel) Ltd.

AFTER SOME 20 floors of models and toys and miles of walking at Brighton and Nuremberg Toyfairs, we still cannot find a novelty to beat the "Toy of the Year" *Johnny Astro* Moon Probe with its fascinating control console and the balloon and basket to land in its destined crater . . . it is harder than it looks! Seen in Germany for the first time were the LGB locomotive and coaches which is the first *commercial* Gauge 1 Outfit we can recall since well before our time. It is electric powered with robust track and can be laid on the lawn in a jiffy. Those with bedroom circuits would have liked the convertible divan —bed one side, "OO" layout complete with scenery on the other.

Every year, Meccano Ltd. prepares a special giant size model for display outside the Max Scheerer Haus at the Nuremberg International Toy Fair. Three years ago it was a 33 ft. high Eiffel Tower, the following year a 13 ft. diameter Vienna Big Wheel and last year an enormous Rocking Horse—symbol of the Nuremberg Fair.

The 1968 model was of a Tower Crane as used on nearly all modern building sites. Although, perhaps not offering as much colour and movement as the earlier giants, it was, certainly, the most challenging from an engineering standpoint. The 25 ft. high structure used only standard Meccano parts, and demanded no little ingenuity in devising means of transporting the model from England and erecting it on site. This job had to be completed in a minimum time, for, in addition to the crane, the rest of the company's products had to be laid out, and the big indoor exhibition prepared. The Meccano Crane needed a real crane to lift it into place and hold the upper sections whilst the pre-built lower parts of the tower were bolted in position. The cost of hiring one of these mobile cranes, even for one day, is quite staggering.

On completion, the 16 ft. long jib stood over 22 ft. from the ground and swung through an arc of 65 degrees before automatically reversing to return to its original position. A silhouette Volkswagen with the words "Dinky Toys" on the sides was attached to the crane hook and the cradle above it travelled the length of the jib, raising and lowering the Volkswagen as it did so! The whole model, driven by two electric motors, weighed over 3½ cwt.—and that's a lot of Meccano!



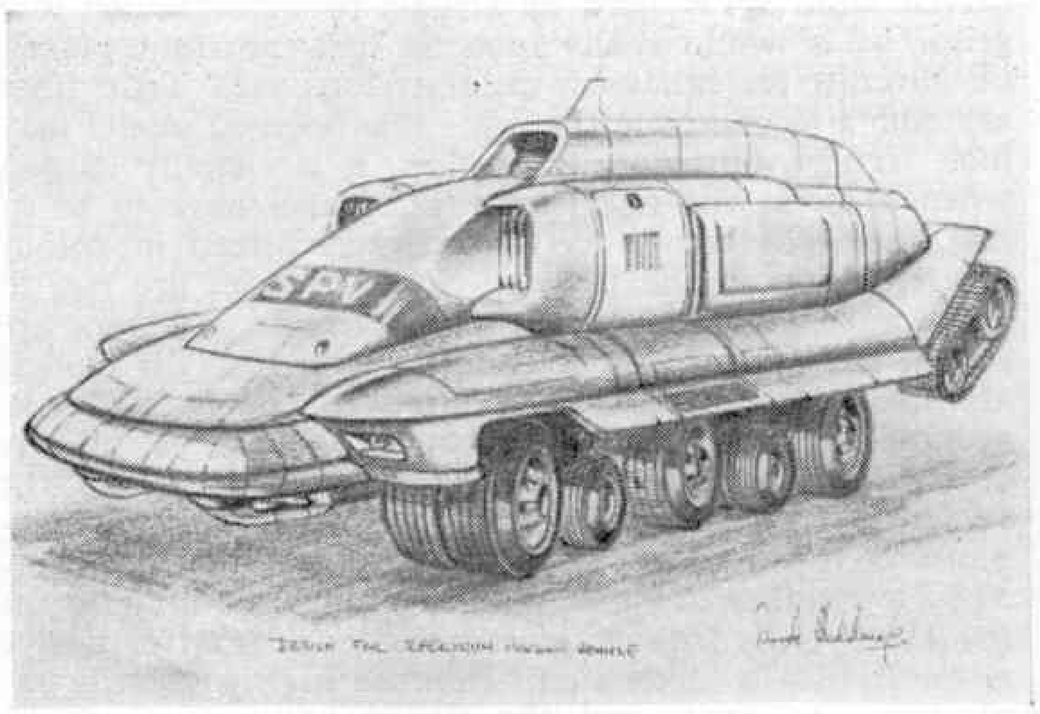
Above, top to bottom. The Spectrum Helicopter used for air transport and armed with high explosive rocket projectiles. Next, the Spectrum Patrol Car which has a top speed of 180 m.p.h. and is used for high speed chases. The aircraft is a general use model, note those realistic panel lines and futuristic look. Above "Melody Angel" being operated on, underneath control in cockpit of Angel Aircraft. Right, note the very realistic wig and false eyes. The lips of this puppet move to match the spoken words which are played during filming sequences. Movement is obtained by the use of a solenoid to actuate an electric lip-moving mechanism.

DIRECT FROM CAPTAIN SCARLET AND THE MYSTERONS

AS SO many readers watch television these days, and the Captain Scarlet series is so popular, we decided to find out just how the programme is produced. The technical aspects of production are highly creative and unusual, so read on for the "low down." For those who have not watched the exciting series on television, Captain Scarlet and the Spectrum organisation defend the earth against the attacks of the Mysterons—an alien race from another planet, determined to destroy the earth, after an unprovoked and accidental attack on their city complex by a Spectrum Space Probe.

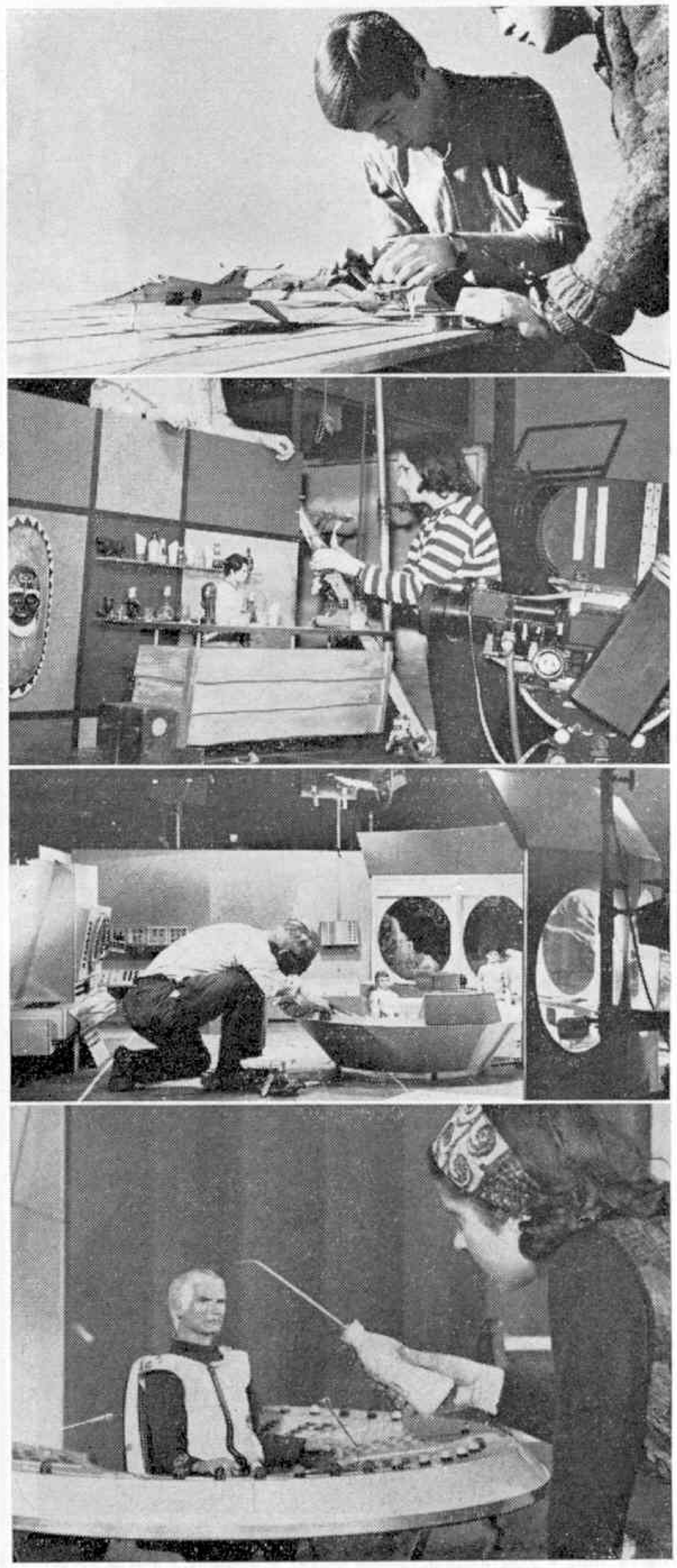
Produced by Reg Hill, the series, whose Executive Producer is Gerry Anderson, is made by *Century 21* at Slough, Bucks, and we were fortunate to be able to visit the studios, see the models, puppets and advanced filming methods used to bring this series to your screens. This is by no means the first venture of *Century 21* into puppet films, they also produced: Four Feather Falls, Supercar, Fireball XL-5, Stingray and the recent Thunderbirds series. Captain Scarlet is unique, as it is the first series where the puppets have human proportions, whereas the Thunderbirds were caricature puppets and had enlarged heads.

Gerry and Sylvia Anderson created the Captain Scarlet theme from which the other departments designed the characters and vehicles. After the scripts

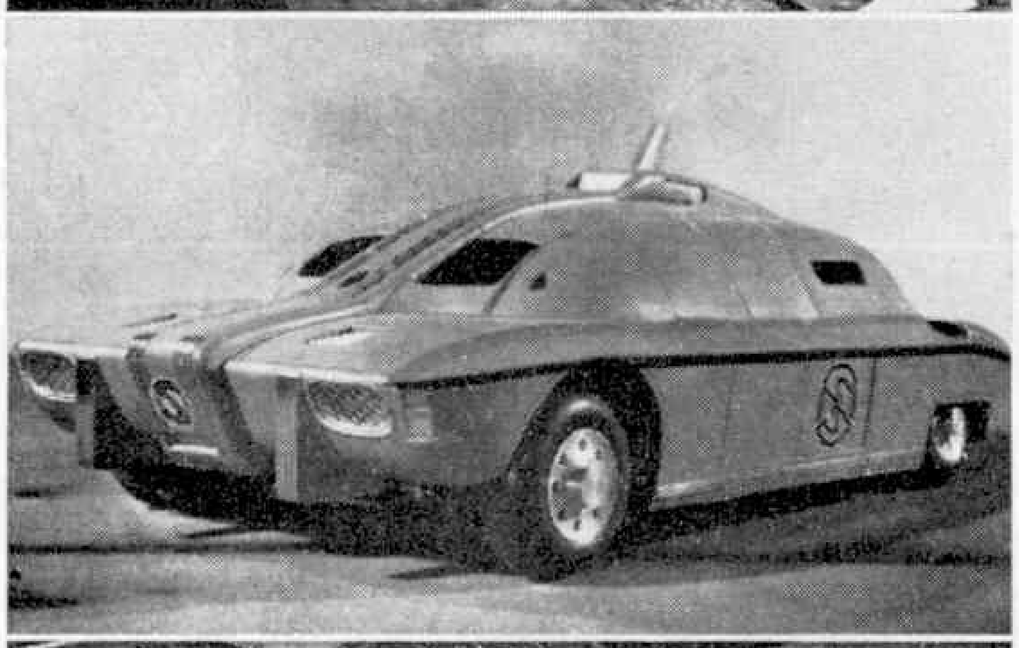


are written, the Special Effects Department decide on the type of background to match the script and which vehicles are to be used. Derek Meddings, Supervising Special Effects Director, created the famous Spectrum Pursuit Vehicle as a pencil sketch, from which three-view model-making drawings were made to enable the Model Making Department to construct a whole range of S.P.Vs. ranging from 1/48 to 1/12 scale, the 1/12 scale model being 24 inches long. Ray Brown, well known for his control line stunt and radio-controlled model flying, heads this department, where every imaginable material is used for model construction. Most are carved from hardwood and balsa with rubber or nylon wheels. When models are required, of the same size, female moulds are formed and fibre glass duplicates reproduced. Whenever possible, commercial parts are used in their construction, i.e. rockets, wheels, etc., from plastic kits and keen modellers may be able to spot these.

Constructing and painting the basic model is only half the job, as they still look like models and *not* like a full-size machine—as is needed for the television series. The Special Effects Department add an array of extra items and dirty the model up for realism. This dirtying-up procedure is in itself a very skilled operation. Paint is applied with an airbrush (a small air-



Top left, the original sketch by Derek Meddings from which the Spectrum Pursuit Vehicle was created. Top right, Special Effects Assistants Alan Berry (on left) and Harvey Walgate, wiring up Jetex fuses in Angel aircraft. Next, Bridge Puppeteer Peter Johns and Floor Puppeteer Rowena White, make a final check on puppets' attitudes prior to a take. Next, Electrician Reg Ives wiring up a console on set prior to shooting. Above, Floor Puppeteer Rowena White, dusting out Colonel White's wires prior to a take. On the left, we see Wardrobe Mistress Iris Ritchins fitting a dummy puppet with a costume.



Above top, a real actress stands in for a puppet when a close-up shot of hands or feet is needed; actors never stand-in for whole puppets. Next, the Spectrum Maximum Security Vehicle, a completely missile-proof and massively constructed vehicle with a cruising speed of 150 m.p.h. Above, a typical Set, seen just before a film take. At right, top, Special Effects Director Shaun Cook inspects a model set immediately after an explosion. Bottom, Puppet Workshop Supervision—Tim Cooksey dressing puppet's hair prior to a stage call. The detail incorporated in these faces is quite fantastic, even the hair, parting, etc., has to be exactly right. Note how the odd heads are stored.

driven hand spray used by artists) to simulate dirt and grime as it would really look, in just the right places, i.e. aircraft jet exhausts, cannon slots, etc. Trim lines are added to complete the job. The finished model may look scruffy, but more important, it is visually correct when seen on the television. They also have to be of just the right colour as the series is filmed in colour for television in the U.S.A. Some vehicles are run in a slot with a guide pin on their underside and some are pulled along to obtain movement. Six to eight models are made each week, in addition to the many background buildings and landscapes. Smoke is usually created with Jetex fuel pellets concealed inside the vehicle in a flameproof tube. Those tremendous explosions you see each week are a speciality of *Century 21*; the tongues of flame leap high into the air and the model explodes into fragments as Petrol Gel explosive is electronically detonated. Because highly volatile explosives are used, and the flammable nature of the background materials, all of the Visual Effects Team are required to have had fire-fighting experience; fire extinguishers and protective clothing are the order of the day when a large model is being exploded. Talking of large, the biggest model ever used by *Century 21* was an 8 ft. long car in Fireball XL-5, some model!

There are two types of puppet, the wire operated marionette and the glove puppet, either being used as film circumstances dictate. All of the Captain Scarlet puppets have human proportions and most are one-third life size, large enough to incorporate plenty of detail. Very skilled model makers create the puppets' faces, which are first moulded in plasticine or clay to the exact shape required, allowing a chin shape that lends itself to easy soft movement of the soft, leather lower face. A rubber female casting is then made from the plasticine head and next a final male fibre glass mould which is painted and rubbed down until the final facial effect is obtained. A whole wardrobe of puppets is kept in stock, the "stars" along with many standard puppets, which are used regularly for background work, by changing the facial appearance and adding glasses, hats, etc., so you will not recognise one from a previous episode. As many as 12 very thin high tensile steel wires are used to control the marionette puppets, operated by two puppeteers standing on an overhead gantry with a closed circuit transistorised television attached to the film camera so the puppeteers can see what they are doing, just as the camera sees it, and not in reverse as they see it from above. The high tensile steel wires are matched to the background by spraying them with colour paint to blend with buildings, landscapes, and it's very seldom these are visible on television. Each puppet has a solenoid in its chest which activates an electric mechanism to move its leather lips by picking up the electronic impulses from the sound track recording, which is made before the film and is played back while the filming takes place; this is how the correct mouth movements to match the sound are obtained. Making the dressings for the puppets is no mean task, with wigs costing as much as £60 each, and eyes constructed in exactly the same way as human false eyes, shoes made from real leather and suits of exactly the right shape and size, creasing in just the right places. If a costume is damaged during filming, another has to be made to an exact colour match, as you can't have Captain Scarlet's suit changing colours if you are watching the series on a colour television!

The background sets are just as involved and difficult to produce. These nearly all have to be to the common one-third scale (except for large buildings, etc.) and everything has to be hand-made. Toy tea-sets

for example may be of nearly the right size, but they do not look real enough to the film camera's critical eye. They also have to construct all the tables, chairs, control panels, radio sets, and glasses to one-third scale.

Unfortunately, not every movement or part can be fulfilled by a puppet and real hands and feet occasionally have to stand in for the puppets. This raises another problem—clothing; this has to be scaled up exactly from the puppet as in the final film both puppet and actor will be the same size, so every button, badge and crease has to be exactly right.

With several sets being worked at once, filming proceeds at a rapid rate, even though each 30-minute episode takes approximately 150 hours to produce, and costs an astronomical amount of money! A new series is well under way, and this promises to be just as exciting as Captain Scarlet. Finally, we would like to thank *Century 21* for their co-operation which enabled us to produce this feature.

INTRODUCTION TO BATTLE

By Charles Grant

THE BRAKES shrieked madly in protest as the three-tonner roared round the bend and slewed to a halt in a cloud of choking dust. From its rear men spewed out onto the road and flung themselves into the shallow ditches on either side. There they lay, clutching their weapons and waiting . . . about them the air was still, and even the sky was empty, the customary drone of aircraft for the moment absent. They were conscious only of the muted boom of a far-off barrage —more felt through the ground than actually heard. The captain slowly raised his head and peered along the road, hardly daring to breathe as he tried to pierce the haze with shaded eyes—could that be a ruined house by the roadside in the middle distance? What did it hide? Was it empty or did the enemy lurk behind its shattered walls? The answer was almost immediate—a blaze of fire from the ruins, a fiendish howl overhead and a shattering explosion from the road behind. A cloud of dust blanketed everything and the men coughed and choked, but it was true then—there *was* a Mark IV in the ruins—as the recce had suggested—and it had to be destroyed. The captain looked over his section—ten riflemen and a bazooka team—and mentally measured the distance along the road. As his mind raced to solve the problem of approach a second shell burst in blinding red and yellow fire in the field to his right. There was little time to waste, what was to be done?

What would you do ?

Yes, indeed, what was to be done, and what would *you* have done in the commander's place? How would *you* have coped?

If you think you could have done so, it is the easiest thing in the world to find out—in miniature, that is—with the aid of a few model soldiers and some miniature fighting vehicles, guided by a little knowledge of how fast your little men can get about in relation to, say, the speed of a tank; how far a bazooka shell will travel and, if it hits its target, how effective it will be. All these factors and many more which seem quite obvious, together with others not so apparent, can be worked out and assessed in the form of rules for a game which, for want of a better title, we might call "BATTLE." This game has been played for many years in all sorts of conditions and, in an attempt to reproduce the strategy and tactics of any period you like to name—Ancient Greek, Roman, mediaeval, and Napoleonic—metal or plastic soldiers have marched and countermarched on a multitude of tabletop battlefields (or, let's face it, it could be the floor, which gives a heap more room!). All over the world all sorts of people, of every shape and size, young and old alike, have tried to prove that they could have done a great deal better than Alexander the Great, Caesar, The Black Prince, Wellington or Montgomery—to name but a few.

The beginning

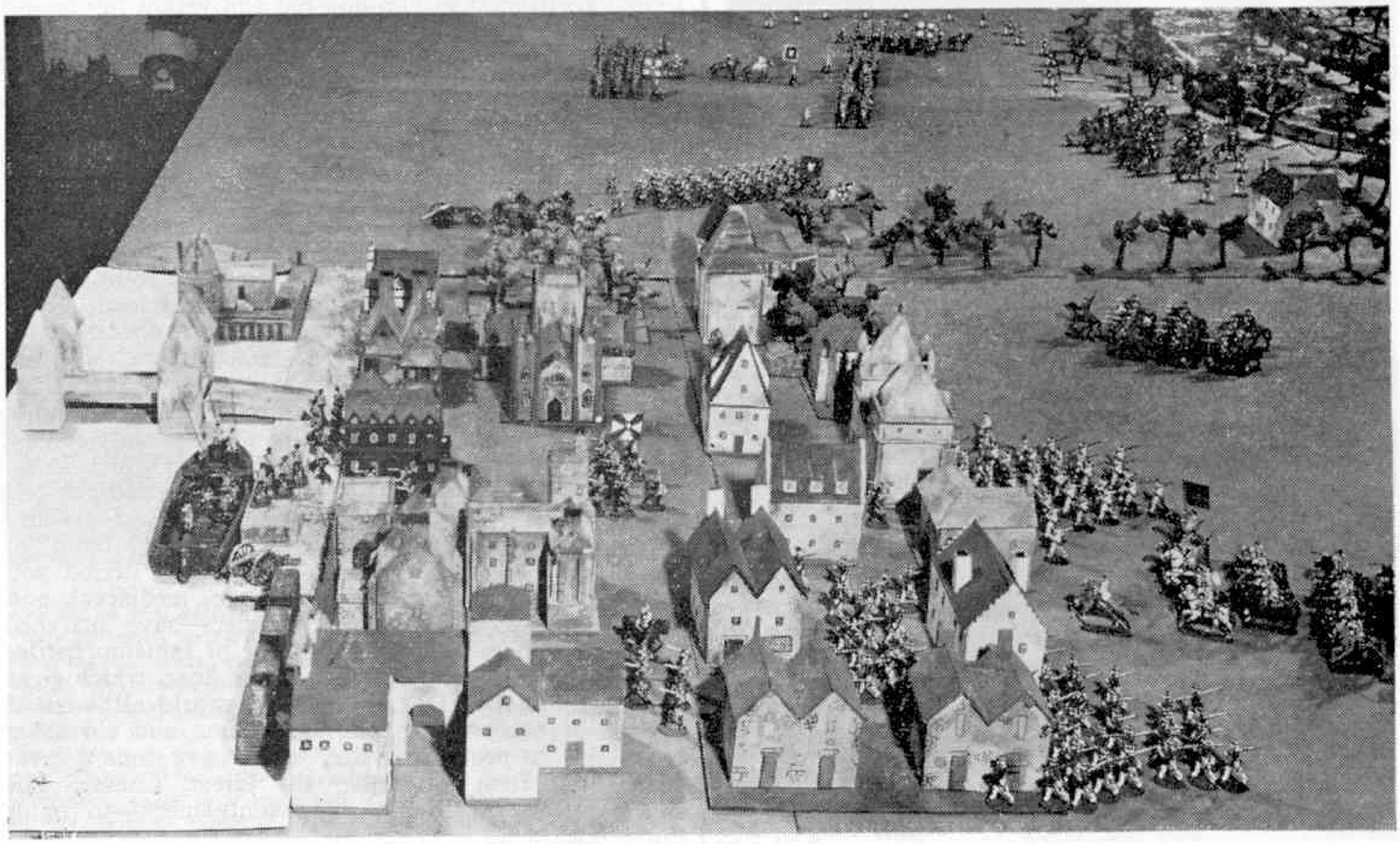
We must walk before we can run, however, and in the beginning at least we are not going to be quite so ambitious as to try to emulate these illustrious characters. After all, few great commanders started out by controlling large armies—even Napoleon began his military career as a humble lieutenant of artillery and Montgomery had to do his two years, or whatever it was, at the Royal Military College, Sandhurst. The idea is then to start off in a much more modest way (we hope that promotion will be fairly rapid, though, and that ere long we shall be directing the movements of forces rather greater than those with which we initially take the field) and first of all to assemble a body of troops to find out what they can do. Here will come a judicious mixture of a little research and practical experience—trial and error, if you like—and with a set of battle rules at our elbow we can "have a go" at some sort of enemy who will doubtless spring up from somewhere to threaten us with fire and sword—in a manner of speaking, that is.

Planning the game

First of all, it might be as well to devote a word or two to what we are planning and it might be a good thing to be clear about this. Briefly, the Battlegame—and quite definitely the operative word is "game"—is simply an extension of many other games which have come down through history, the sort of game I mean being those like chess and draughts, where two players set out to defeat each other by skill and guile, not unmixed in many cases with a little luck here and there. Both these games I mention are in a way—if I might be so bold—elementary forms of Battlegame. You have your powerful pieces—bishops, rooks and so on—which might represent heavy weapons such as tanks and artillery, and the lowly pawn taking the place of the infantryman. In draughts you have the ordinary pieces and the "kings" having the same sort of relationship. Our game—at least I hope it is going to be "our" game—is one based on the movement rates and capabilities of different types of soldiers and their weapons in a particular period of military history. The player is going to direct and manoeuvre these men as he would in an attempt to carry out some military task. We—the battlegamers—have a great advantage in that we can draw up our own set of rules for our game—and no two players will ever completely see eye to eye in this matter, as they—the rules—depend very considerably on the inclinations and set-up of the individual player, chiefly whether he has loads of time at his disposal and has a private battle area—i.e. a table—or whether at some crucial moment of the game the rattle of teacups and saucers coupled with fragrant odours from the kitchen indicate that—for the general good (no pun really intended)—troops and equipment should be rapidly whipped off the dining table and returned to their quarters (boxes or shelves) until battle can be resumed at some future date. (This can be more than frustrating to a commander just about to carry out some complicated and devastating manoeuvre calculated to end in the utter discomfiture of his opponent!)

What we are going to do then is to draw up a set of rules for our battlegame, assemble an army—a small one to begin with—and set about devising some kind of battlegame wherein two or more players can simulate the excitement, the stress and the strain of directing a battle in miniature.

The primary consideration is to determine in which period we are to set our game. Now this hobby—and it has a tremendous number of enthusiasts—has the great virtue that one can set one's game in any of a dozen historical epochs and still have enormous fun and excitement. All sorts of different eras have their ardent supporters—everyone has his particular favourite—but I think that, for a variety of reasons, we shall stick to fairly modern times. By this I mean something round about the end of World War II, say, 1944-45.



At the foot of opposite page we have a typical village layout as used in a Table Top Battle with troops positioned as they would be in a real battle. The buildings, etc., are not fixed as they would be on a railway layout, nor is there a great deal of scenic work, as different Battles have different layouts.

Charles Grant and his son study a wall map in the picture above. With the help of historical reports and area maps, many Battles that helped to shape our modern history can be reconstructed and refought in the light of new knowledge and the way you would have directed the Battle.

This is primarily because weapons and vehicles of those years are so well known and documented that it is an easy undertaking to draw up scales of speed, armament, range of guns and so on. So there we are, about to create rules for a 1944-45 battlegame and with one exception are ready to get cracking.

Soldiers; type and scale

The exception is that we are as yet without the necessary troops and we have to decide on what type of miniature soldiers we shall employ. Here we have a pretty wide choice—of size, material and cost—and it's up to the individual battlegamer to make his own decision here. It would be reasonable, however, to give one or two pointers to guide his choice, and if he doesn't agree, fair enough, that's his privilege. The first question is one of size. Broadly speaking there are three—first, what is called "standard" size—that of the ordinary toy soldier—this being, for a man on foot, 54 mm. (we are obviously not going to have to bother with "horsed" cavalry). This—roughly $2\frac{1}{2}$ in. in height—is generally speaking considered to be rather too large for our purpose, particularly as we have to get vehicles, tanks, guns and so on in a similar scale, and even without such things, a group of soldiers of this size would take up far too much room on the battle area we hope to use. An intermediate size is 30 mm. —the infantryman then being about $1\frac{1}{4}$ in. tall—and finally there is the 20 mm. scale, the man on foot being about $\frac{3}{4}$ in. in height. Now, these scales, particularly the last, are regrettably by no means constant, different manufacturers having pretty elastic ideas about what constitutes, say, a 20 mm. figure, and you might find that figures from two different makes vary appreciably in height and bulk. Not to worry, though, after all, men do come in different sizes.

Personally I have no tremendous brief for either the 20 mm. or the 30 mm. figures (or for the 54 mm. for that matter) but for many reasons—the principal one being that if one is to have even a small number of vehicles involved in the game, then a field gun or tank in anything bigger than the 20 mm. scale is going to be far too large to fit in with what we hope to achieve and will go far towards creating all sorts of anomalies and complications which could well foul things up generally.

Let us suppose then that we have chosen to operate in the 20 mm. scale. The troops therefore will probably be plastic—they are easily and inexpensively obtained, although metal soldiers in this scale are also available. The latter usually cost a little more and are more prone to accidental destruction (after all, you can drop a plastic figure onto the floor with impunity, but do the same with a metal figure and it will be retrieved almost certainly minus a head, a stand or some other vital part of its miniature anatomy.

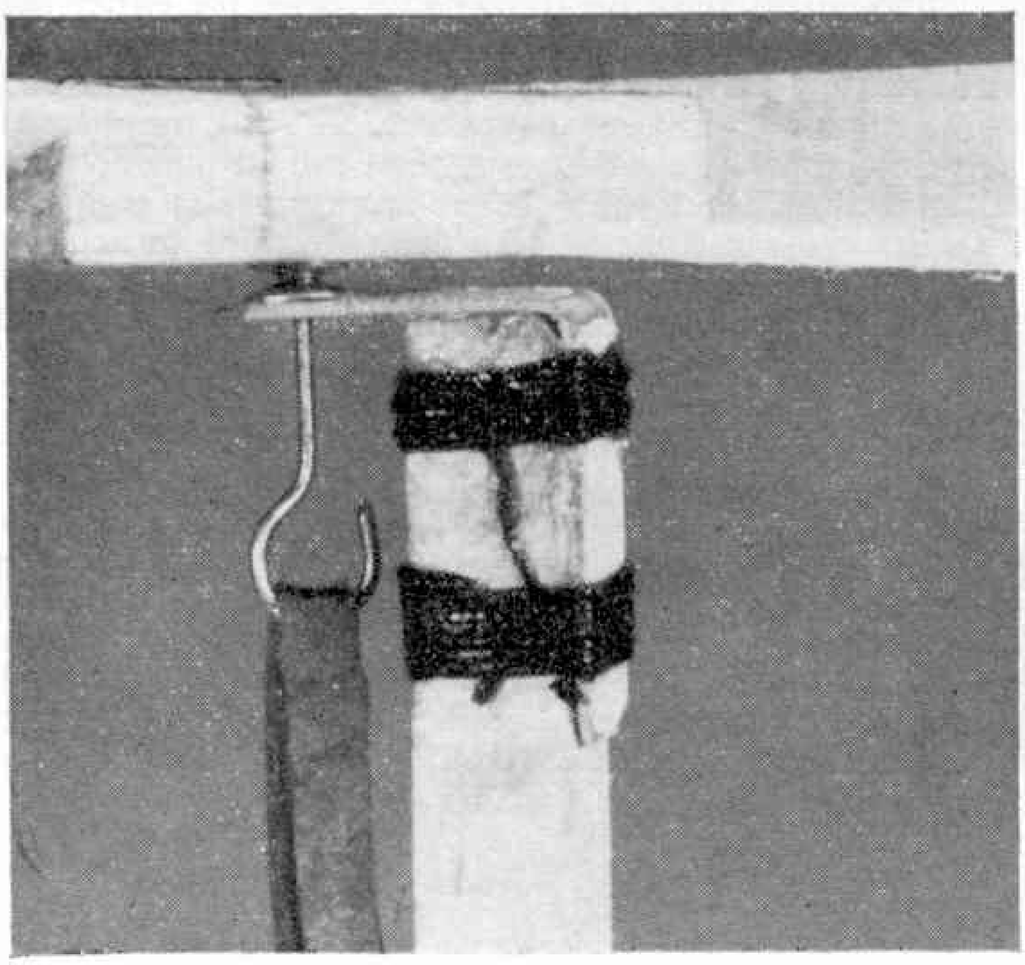
MINI-COPTER

A 13¾ in. long rubber powered helicopter of simple balsa construction. This model is not a novelty, it really does fly and hover just like a real 'copter. Full-size plans available from Meccano Magazine office, price 2s. 6d. each.

WORKING MODEL helicopters are unusual—and often tricky—but in Mini Copter we have adopted a very simple, basic layout, avoiding all the complications of flapping rotor hinges, torque compensations and other bits of mechanical trickery which are usually necessary for stability. Also we have kept the construction simple.

One most important point, is to choose your grade of balsa as detailed on the plan, using *very light* $\frac{1}{16}$ in. sheet, and a light grade for the $\frac{1}{4} \times \frac{1}{8}$ in. balsa strip. A successful performance with Mini Copter depends a lot on keeping weight down to a minimum.

Start by building the basic frame which consists of the motor stick and the "triangle" formed by the $\frac{1}{4} \times \frac{1}{8}$ strips. This should be built flat over the plan. The plan is reproduced exactly one half size, so you need to scale the side view up twice (reproduced) size, or obtain a full size plan **(available from Meccano Magazine office, 13-35 Bridge Street, Hemel Hempstead, Herts.; price 2s. 6d.).**



When this frame has set, remove from the plan and cover one side only with lightweight tissue. Do not water shrink or dope this tissue. Just get it taut and free from wrinkles when you apply it.

Now cut the two sides, pieces A, B, C and D—all from the very light $\frac{1}{16}$ in. sheet you have selected; and two pieces of $\frac{1}{4} \times \frac{1}{8}$ strip $3\frac{1}{2}$ in. long. Mark the position of the sides on the motor stick, cement the $\frac{1}{4} \times \frac{1}{8}$ strips either side of the motor stick and cement the sides onto these strips. Hold in place with pins, as necessary, and then cement in pieces A, B, C and D between the sides to complete the fuselage assembly.

Cut the top bearing from 20 gauge dural or similar hard, light metal (springy brass strip would do). Pierce this to take the prop. shaft and then bend at right angles. Bind in place to the top end of the motor stick and then coat the binding with cement.

Bend the skid mount from 22 gauge wire to the shape shown and bind and cement to the bottom of the motor stick. Cut the two skids from $\frac{1}{4} \times \frac{1}{8}$ strip and bind to the wire mount.

The rotor hub is a $1\frac{1}{4}$ in. length of $\frac{1}{2} \times \frac{1}{4}$ balsa. File or saw-cut slots at an angle in each end, as shown in the detail sketch. Open out these slots to $\frac{1}{16}$ in., if necessary, with a small flat file. Pierce a hole through the centre of the hub.

Cut two rotor blades to the shape shown from $\frac{1}{16}$ in. sheet balsa and cement into the slots in each end of the hub. This completes the rotor. The rotor is mounted in position on the prop. shaft with a bead between the hub and the bearing. Bend over the top of the prop. shaft and turn back into the hub to secure. Coat with a skin of cement to hold in place.

Take a 1 in. length of $\frac{3}{32}$ hardwood dowel. Pierce a $\frac{1}{16}$ in. hole at an angle near the bottom of the motor stick and cement the dowel into this hole. The dowel anchors one end of the rubber motor.

To finish the fuselage, sand down the sides lightly, if necessary and add the acetate sheet "glazing"—one piece on each side and one between parts A and D at the front. The fuselage is open at the top and bottom near the motor stick to pass the rubber motor. Finally, cut a 2 in. circle from acetate sheet and cement to the end of the tail strut.

To fly properly the model needs to balance at the motor stick position. This may mean having to add a little ballast weight to the front, but you can check this when flight testing.

A single loop of $\frac{1}{4}$ in. rubber will be adequate power. Wind on about a hundred turns and see if the model will lift and rise. If not, try more turns—but most probably you will need a little more power. If the model rises and tilts backwards, you will need to add some ballast weight to the nose. If the model tips forward, you may need a little weight at the rear end to balance. Slight out-of-balance will not matter very much.

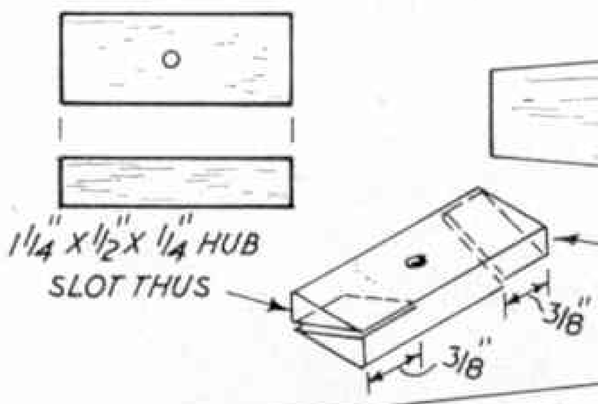
The ideal is to try to fly on the *minimum* power necessary—i.e., the smallest section of rubber for the motor. This will not only give you the longest flights, but almost true hovering for part of the power run. It will also reduce the rate at which the fuselage rotates in the opposite direction to the rotor. A drop of thin oil on the bead and bearing will also help reduce rotation of the fuselage by reducing friction. Another way of reducing the rate of rotation of the fuselage is to cut down the length of the rotors (which is another way of adjusting the model to fly on a relatively weak motor).

Mini Copter is best flown indoors—or outdoors only in dead still air. With the best size of motor—which you can only determine by experiment—you can get quite reasonably long semi-hovering flights between floor and ceiling level.

The motor stick top end at left clearly illustrates the alloy bearing bracket, cup washer bearing, and propeller shaft that passes through and back into the motor blade hub.

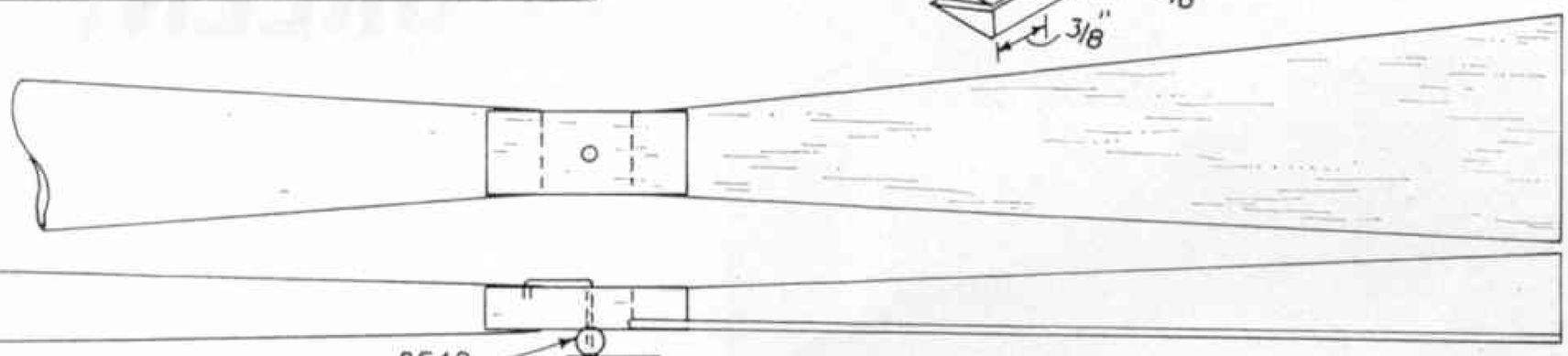
MINI-COPTER

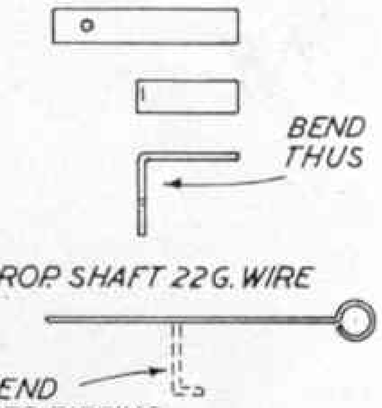
A 13.3/4" LONG RUBBER POWERED HELICOPTER OF SIMPLE CONSTRUCTION.
COPYRIGHT OF MECCANO MAGAZINE PLANS SERVICE, 13/35 BRIDGE STREET, HEMEL HEMPSTEAD, HERTS.

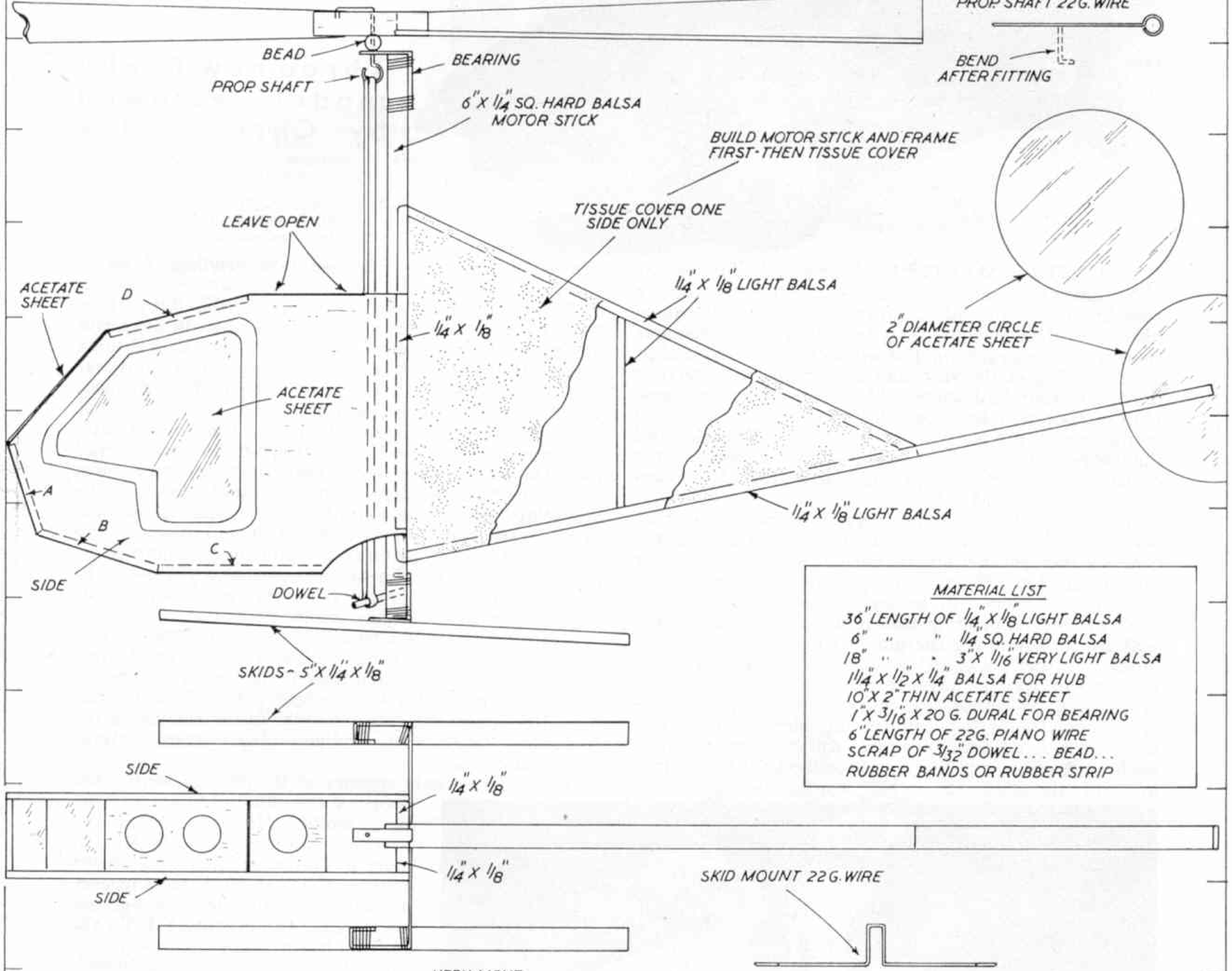


ROTOR BLADE - CUT TWO FROM 1/16" SHEET

CEMENT ROTOR BLADES INTO HUB SLOTS

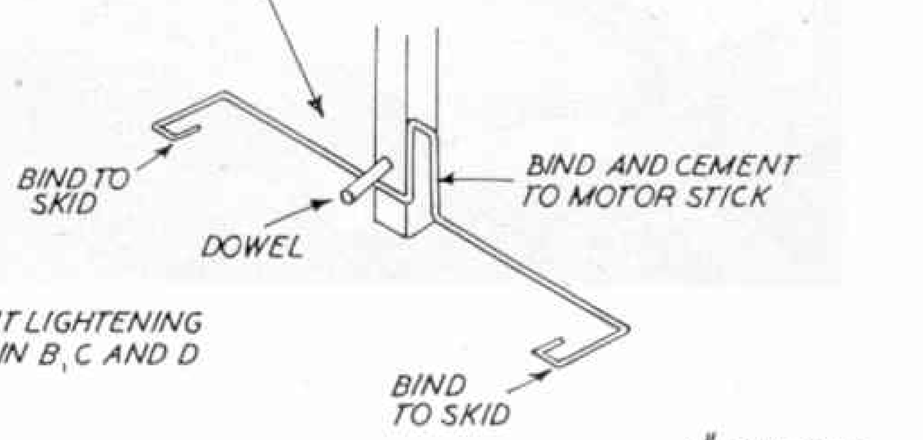


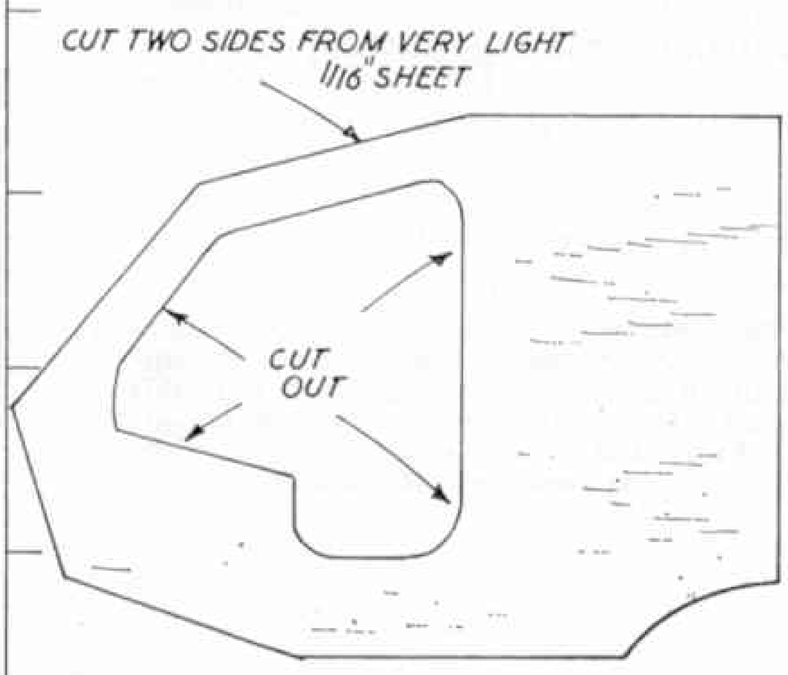


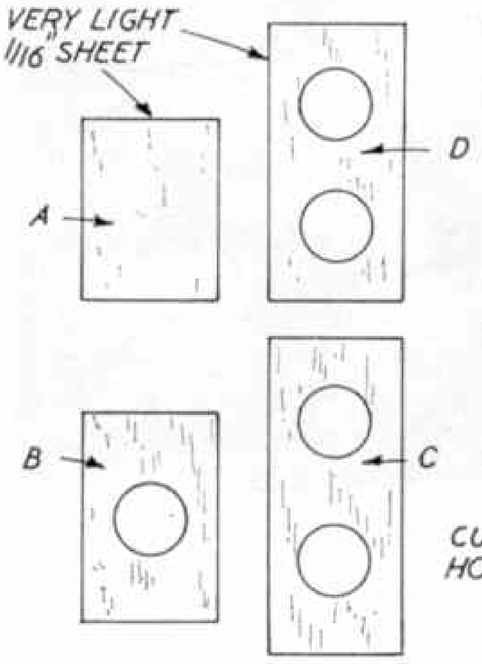


MATERIAL LIST

36" LENGTH OF 1/4" X 1/8" LIGHT BALSA
6" " " 1/4" SQ. HARD BALSA
18" " " 3" X 1/16" VERY LIGHT BALSA
1 1/4" X 1/2" X 1/4" BALSA FOR HUB
10" X 2" THIN ACETATE SHEET
1" X 3/16" X 20 G. DURAL FOR BEARING
6" LENGTH OF 22G. PIANO WIRE
SCRAP OF 3/32" DOWEL . . . BEAD . . .
RUBBER BANDS OR RUBBER STRIP







CUT OUT LIGHTENING HOLES IN B, C AND D

1" SQUARES

MEC 103

SPECTRUM IS GREEN!

Three new Dinky models reviewed by Chris Jelley

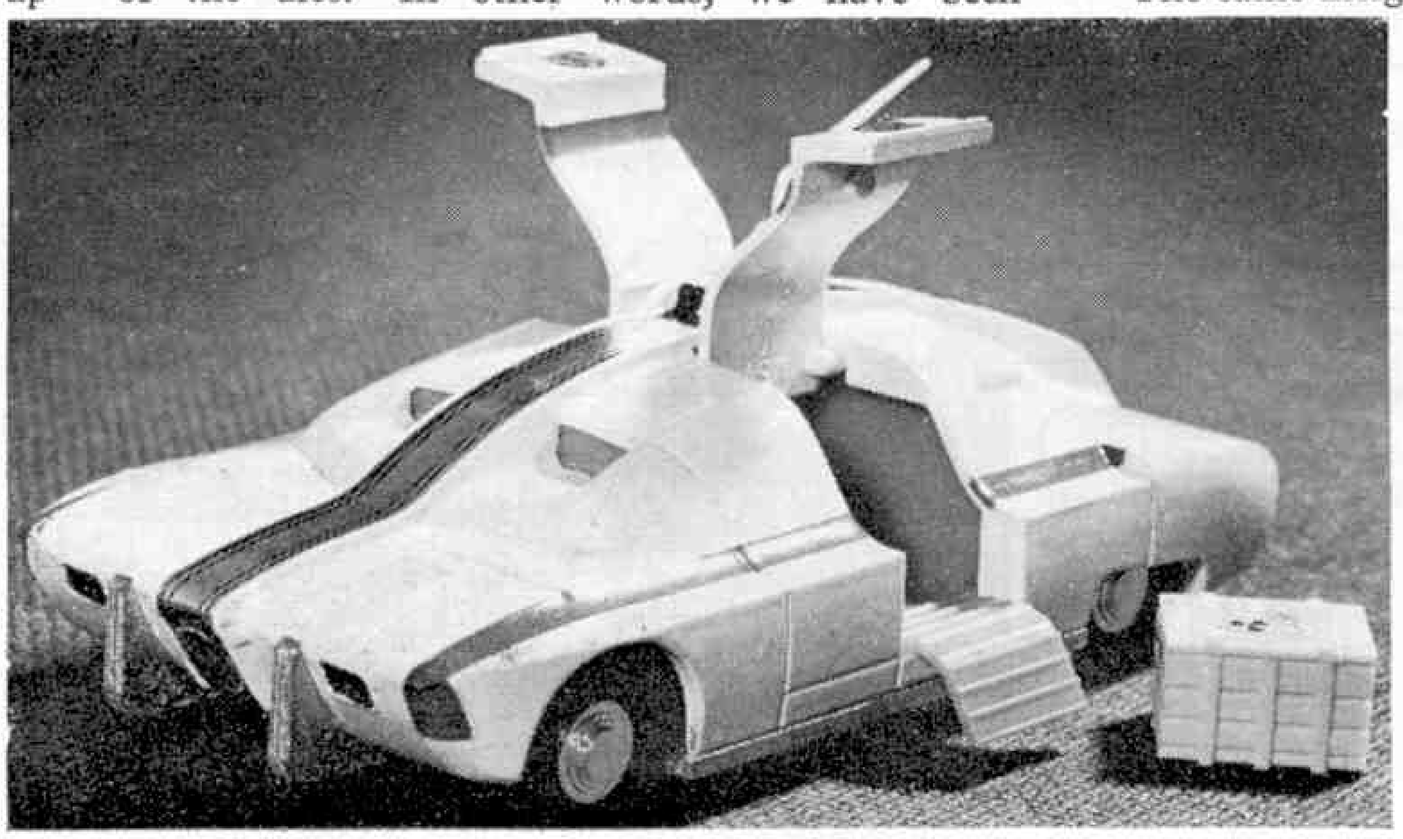
MINIATURE MYSTERONS beware ! The Spectrum organisation, in model form, is becoming very highly mobile, thanks to two new pieces of equipment from Dinky Toys. Yes, following the tremendous success of the *Spectrum Pursuit Vehicle*, introduced at the beginning of the year, and in response to numerous requests from collectors, Meccano have produced Dinky models of the two other road vehicles featured in the gripping television series " Captain Scarlet and the Mysterons." The vehicles in question?—the *Spectrum Patrol Car* (S.P.C.) and the *Maximum Security Vehicle* (M.S.V.).

Strictly speaking it is not correct for me to say that Meccano " have " produced the models because, at the time of writing, neither of them have actually gone into production. When you read this, however, one, if not both, of them will be on sale and I felt that the news of their impending release was so hot that it was well worth " jumping the gun " a little. This in itself raises a rather awkward problem, though. As I am writing this well in advance of the models going into production, I cannot, of course, photograph a production model. The accompanying pictures, therefore, show two hand-built samples which were specially made up from test castings prior to the final " cleaning-up " of the dies. In other words, we have been allowed a sort of preview—a rare privilege I might add !

To get down to business, the *Spectrum Patrol Car*, No. 103 is a solid, strong and tremendously attractive model, aerodynamically shaped to suggest lightning speed. It cannot, of course, be compared to any car in real life, because it is taken from a T.V. fictional series set in the future, and it certainly looks futuristic —long, low and streamlined with a little fin built into the rear of the roof and swept-back radio aerial mounted on the front of the roof. It incorporates most of the features we have come to expect from Dinky including suspension, windows (dark-tinted in this case), seats and full interior fittings, but most important of all, it features a fantastic mechanism reproducing a screaming turbo-jet engine noise as the model is pushed along. None of your puny little " click-click-click " engine sounds here !

Overall finish is in a beautiful deep red gloss—almost scarlet—with contrasting yellow interior and white base. Transferred on each door is the Spectrum organisation's insignia of a black-edged gold " S " superimposed on concentric rings making up the colours of the spectrum, i.e., violet, indigo, blue, green, yellow, orange and red.

The same insignia appears on the front as well as the doors of the other " Captain Scarlet " model, No. 105 Maximum Security Vehicle. The M.S.V. is more a Transport than a passenger vehicle, used, as its name suggests, for carrying valuable or dangerous loads. Like the existing S.P.V., the M.S.V. has a shape all its own; a shape that cannot be called beautiful and yet is ruggedly appealing.



Two views of the brand new Dinky Maximum Security Vehicle from " Captain Scarlet." Like the S.P.C., this model is a rough, pre-production sample built so that we can show it to you while the news is still " hot."

Straight from " Captain Scarlet and the Mysterons," Dinky Toy No. 103 Spectrum Patrol Car. This particular model, photographed under make-shift conditions, is a special hand-built sample made-up from pre-production test castings to enable us to give readers some idea of what it looks like. The finished production model will of course be much improved.

Another new Dinky Toy, just released, is this Michigan 180-111 Tractor Dozer, No. 976. Packed with action features, it will make an excellent addition to any model collection.

Power unleashed! The real-life Michigan Tractor Dozer in action cutting a deep trench through hard-packed earth.

Strong and solidly built, the Dinky is fitted with two upward-opening side hatches which give access to the cargo hold. With the hatches open, two loading ramps, one each side, can be hinged down to reveal a little crate labelled " Radioactive " and meant to represent a crate of radioactive isotopes—all very scientific ! Cast into the roof, between the doors, is a small fin into the top of which a swept-back radio aerial is fitted. Although such a comparatively small item, this aerial succeeds in increasing the model's high-speed look.

Fitted with four-wheel suspension, the model is finished predominantly in white except for a red base and a metallic silver stripe running right down the centre from its nose, along the roof, to its tail. In addition, a red stripe runs the length of the model at each side, while the cargo hold and loading ramps are also red in colour.

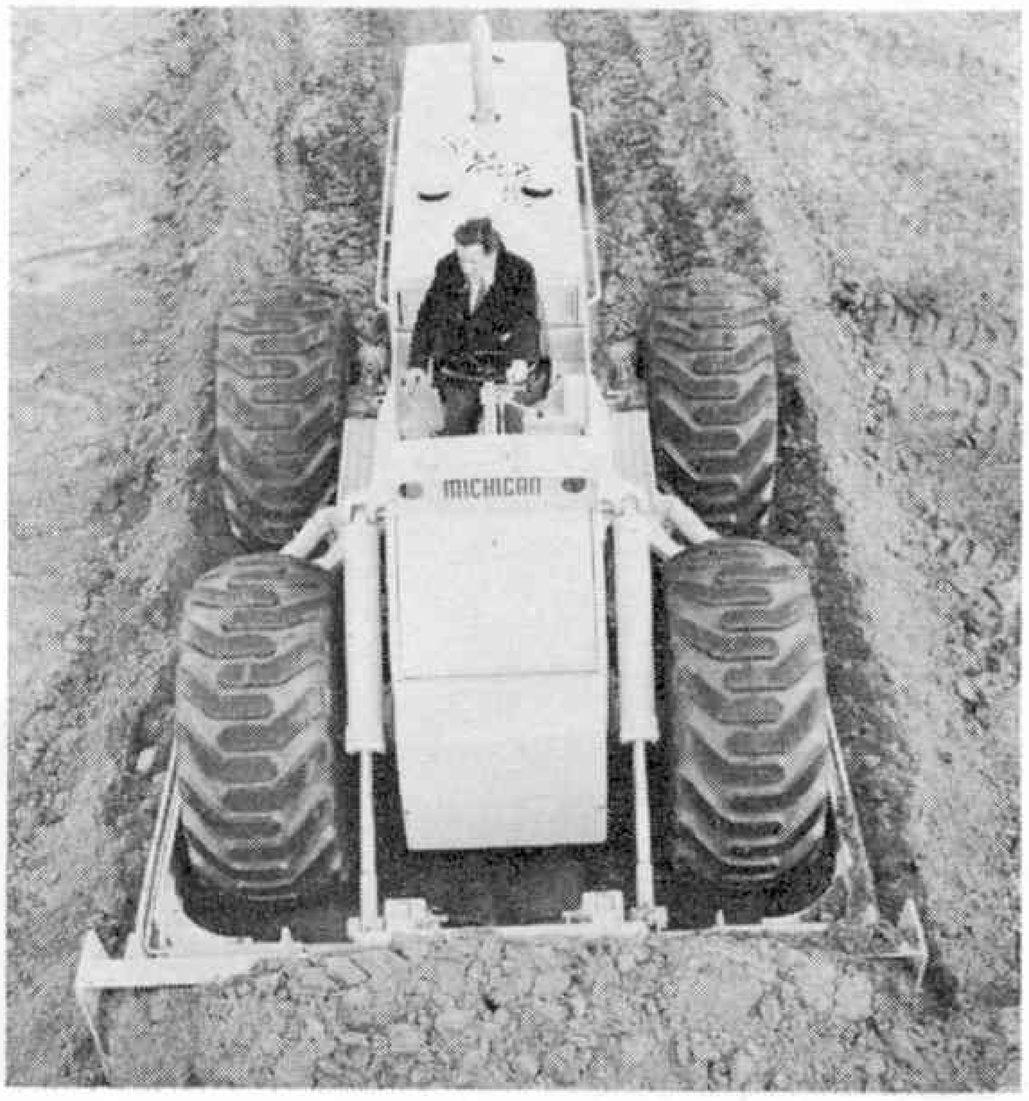
Just space now to look at another new model—this time one which *has* started to come off the production line at the time of writing—No. 976 Michigan 180-111 Tractor Dozer. Packed with play-value, it is based not on a fictional prototype, but on a piece of heavy earth-moving plant manufactured in this country by Clark Equipment Limited of Camberley, Surrey. This company, you will be interested to learn, is backing Britain in no uncertain manner—as much as 80 per cent of its output is exported!

" Tractor Dozer," the title chosen by the manufacturers, is a very apt description for the full-size machine, because it *is* a sort of cross between a giant tractor and a bulldozer. A spokesman for Clark Equipment told me that it would normally be used on heavy-duty earth-moving jobs as well as for stock-piling and reclaiming materials such as coal, iron ore, etc. He added that it is also used extensively by contractors engaged on road and dam construction or, indeed, on almost any big civil engineering job.

Sales figures for the real-life vehicle show that it has proved highly popular with civil engineering firms all over the world and I am sure that the Dinky version will prove equally as popular in the model world. It certainly reproduces all the major features of the original including various working movements. For example, it is equipped with a bulldozer blade, " controlled by imitation hydraulic arms, which can not only be raised with its mounting arms, but which also has a variable working angle. The blade, in other words, can be tilted on the end of its mounting.

Also fitted is a working steering system connected to the rear axle and controlled from a steering wheel in the cab. The cab, itself, is fully glazed and so, to allow access to the steering wheel, it is removable. Behind the wheel is a little bucket seat for the driver. This, together with the bulldozer blade and road wheels, is red as also are two groups of inspection panels along each side of the engine cowling. Each group can be removed as a unit to reveal a well-detailed representation of an enormous engine in an aluminium finish.

The body and cab of the model are finished in yellow while the large tyres are, of course, black. An aluminium-coloured air-cleaner and exhaust pipe project out of the top of the engine cowling and the final touch is given by the name " Michigan " transferred in black lettering on each side, just above the inspection panels. If you are interested in constructional plant or models of any sort, then this Dinky Toy is a " must."



The Liverpool Lion

by Mike Rickett

SHE WAS first discovered in 1929, driving an ancient chain pump in Princes Graving or "drydock" on Liverpool's waterfront. She was obviously very old and also very dilapidated, with no nameplate, trailing wheels or coupling rods, and was lying on trestles. A search in the records showed that she had been used for pumping water out of docks since 1859, when she was first acquired, along with three other locomotives by the "Mersey Dock Committee." There she lay, forgotten and unwanted, until 1927 when Mr. Charles Reed saw the locomotive on visiting the docks and requested permission to photograph her. The Mersey Docks and Harbour Board—as it had become, investigated, and on finding the old locomotive still working, hurriedly decided to scrap her and install a more modern electrically driven pump. Shortly afterwards, the engine was withdrawn from service and moved outside the pumping shed prior to being sold for scrap.

Were it not for one of those strange twists of fate, that might easily have been the end of the story. She was not, however, destined to end her days under a scrap dealer's torch, for research had identified her as No. 57 of the Liverpool and Manchester Railway, built by Todd, Kitson and Laird of Leeds in 1838—almost 90 years before!

With the wholehearted assistance of the Liverpool Engineering Society, who finally bought her, the engine was saved the indignities of the scrap heap, and when Sir Henry Fowler, Chief Mechanical Engineer of the London, Midland and Scottish Railway Company heard about the old locomotive, he persuaded the railway company to recondition it and place it on permanent view in Liverpool's Lime Street Station. There she stood, mounted on a plinth, until the outbreak of war in 1939 when she was moved for safekeeping to the paint shop in Crewe Works—never to move back to Lime Street again.

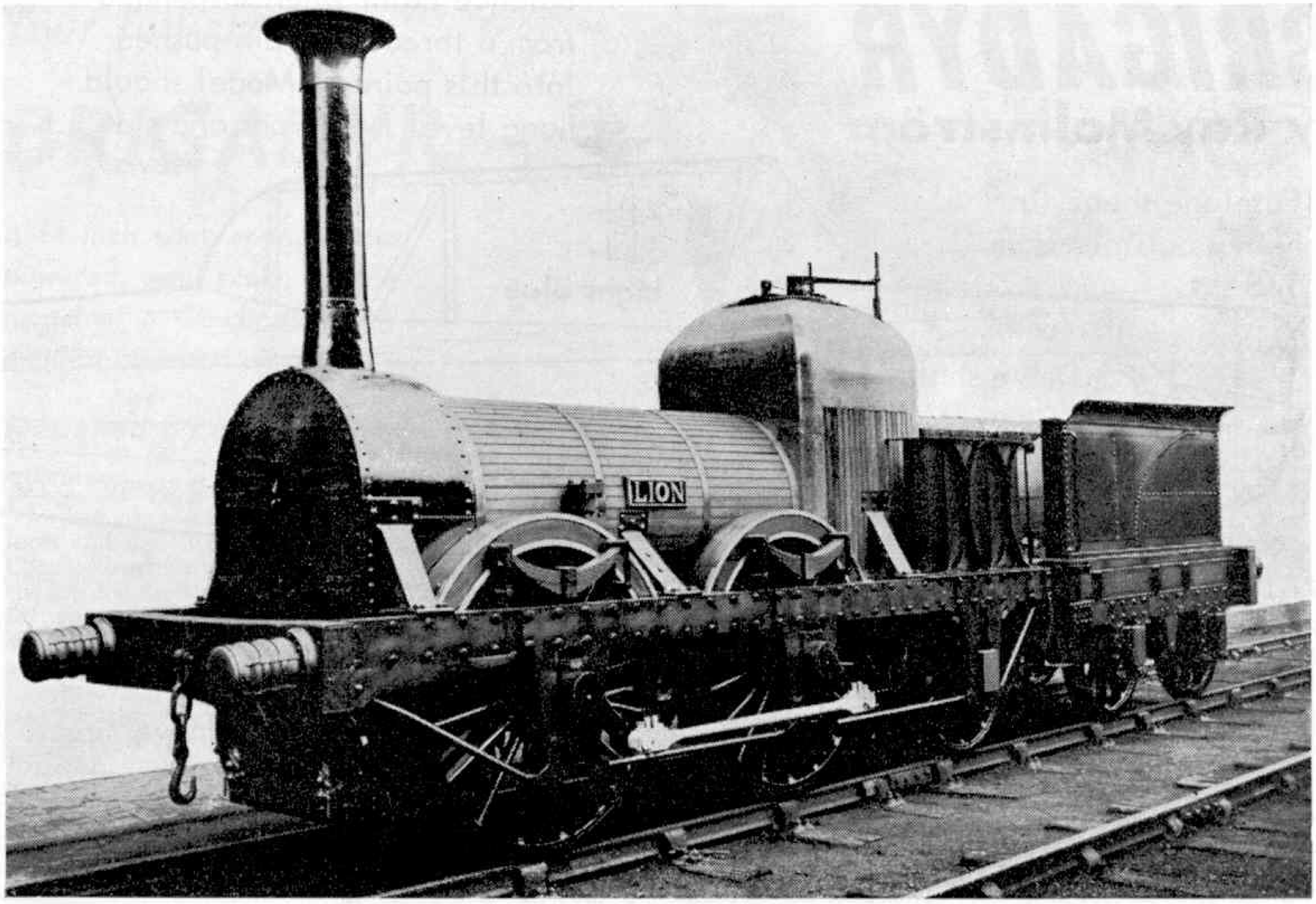
Lion, as she was christened in those far-off days of 1838, was one of the original locomotives of the Liverpool and Manchester Railway, with all the features characteristic of the time. The tall chimney with flared out top, outside frames and cranks and "haystack" firebox, are all very typical of the engines used on the early railways. Controls were mounted at the back of the firebox, and the footplate crew, you will notice, were given scant protection against the weather. This, however, was accepted practice of the time and contrasts strangely with the cabs of today's high-speed electric locomotives, where drivers are provided with sprung seats, full heating, cooking facilities, and anti-misting devices.

Lion has an 0-4-2 wheel arrangement with frames of the outside type, made from two iron plates with wood between. Her whistle gives a thin querulous note appropriate for her age, and she is provided with horsehair filled buffers. The engine has outside cylinders, 11 in. diameter by 20 in. stroke, and when used for pumping water in Liverpool's docks, the driving wheels acted as flywheels.

Her history goes back from the old Liverpool and Manchester Railway to the Grand Junction Railway—its successor—when she became No. 36 and then No. 116 when in the ownership of the London and North Western Railway in 1857. Between then and May 1859 she was used for pulling ballast trains before being sold to the Mersey Docks for £400.

Since the L.M.S. reconditioned her, *Lion* has made quite a name for herself as a film star, and has appeared in the "Lady of the Lamp," "Victoria the

At left, the huge ventilation shaft, still in position at Crown Street, which is now in use as a coal yard. Below, the tunnel from Crown Street, Liverpool, once the terminus of the Liverpool and Manchester Railway, which "Lion" was built for in 1838. Opposite, the "Lion," preserved in the form she will enter the new museum at Liverpool.



Great," and that memorable film—" The Titfield Thunderbolt." Apart from film-making, her retirement has been studded with other activities, and in 1930 thousands of people saw her pulling a replica Liverpool and Manchester Railway train around Wavertree Playground in Liverpool on the occasion of that railway's centenary. She also appeared pulling a replica train during the Festival of Britain celebrations in 1951, when she visited Exchange Station, Liverpool.

In the " Lady of the Lamp," *Lion* and train appeared for only a short time, showing the film version of the return of Florence Nightingale from the Crimea to her home town. Her appearance in the Ealing Studios film, " The Titfield Thunderbolt," was, however, as a star, for in this film, which tells of a rural community fighting to keep its branch line working after it had been closed by the authorities, the old engine travels an actual distance of over 1,500 miles under her own steam.

Efforts by the local residents, which included the Rev. Weech—a highly enthusiastic if somewhat eccentric vicar—played by George Relph, centred on taking the ancient *Thunderbolt*, played by the *Lion*, out of a local museum and putting it into commission with even more eccentric rolling stock consisting of an old coach body mounted on a well wagon, in order to maintain the train service. Naturally, the local bus company become depressed about this state of affairs and the villainous characters in its employ managed to create opposition, even to the extent of sending a steam roller into battle against the sturdy *Thunderbolt*. Both *Thunderbolt* and the local residents win the day in the end and the fictitious line is preserved along Tal-y-Llyn lines.

Located on the nine-mile long Camerton to Limpley Stoke branch line near Bath, closed some years ago due to the coal from nearby Camerton Colliery becoming exhausted, the film involved a great many sequences showing *Lion* under steam. This same line, in fact, was the location of another famous railway film called " The Ghost Train," starring Jack Hulbert and filmed at Monckton Coombe Station.

During the making of " Titfield Thunderbolt," *Lion* was driven by a regular B.R. driver, Sydney Mitchell, who is reported to have been so proud of her that he refused to admit that there was anything the old engine was incapable of. *Lion* did indeed pull a load of 60 tons throughout the 1,500 miles estimated to have been travelled during the shooting of the film, so perhaps he had a point! One rather irritating habit she acquired was the frequent blowing off of her safety valves during the shooting, which deafened everyone. The director of the film was once quoted as saying that *Lion* felt like driving a Rolls Royce, moving very smoothly and gently, and " breathing " as she travelled along, instead of the more violent movement and harsher exhaust of more modern locomotives. Rather like an old lady—sedate and slow, but very elegant.

After an absence of 27 years, *Lion* is once again back in Liverpool where her remarkable career started 129 years ago, for she is destined to enter the new transport section of the Liverpool Museum when it opens. Her travels up and down the country—as far as Euston Station for the Centenary Celebrations of the London and Birmingham Railway in 1938—have finally come to an end, and after 40 years she has again found her way to a shed in Liverpool's Dock Estate, where it is intended to store her for the time being.

BRIGADYR

by Ray Malmström

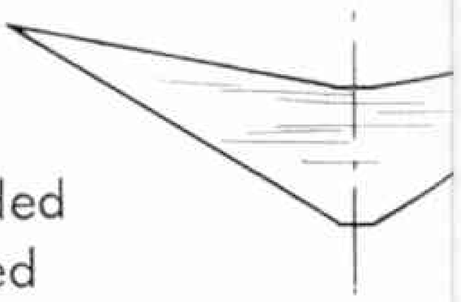
Front

Rear

2 of each required

Cut wing struts from 1/16 sht. Chamfer ends to fit sandpaper edges

Balance point when suspended from a thread and pin pushed into this point. Model should hang level from front and side views.



Fuselage shape (in heavy outline) from 1/8 sht.

Light blue

Black

Red

Drive shaft 20 s.w.g.

Tape

Red

K.K. commercial 5" dia. plastic prop cut to 4.1/4" dia.

Black

Struts cut-out

Side pieces (2) 1/8 sht.

Propeller detail

Remove tips. Sand round

Tailplane leading e

Razor crack assist out.

Red

Fin 1/16 sht.

Oil pastel

Wing

Sellotape

Decoration detail

Soft rag

Wing le

Red

Lightly score along

Remove sellotape

Do not dope any part of this model

Cut wing from sheet

Tightly fitting elec. tubing or blob of cement

Bend undercarriage wire to this shape 20 s.w.g. wire

Turn wing over, put cement in crack and raise one

Greaseproof paper

wing panel 2.1/2" as shown. Pin other panel to board.

Power: 7.1/2" loop 1/8 strip. A 12" loop 1/8 strip can be used for longer flights. (max. turns 600)

Wheels from 1/4 sht

Your full-size plan

BRIGADYR

A 14 inch wing span, rubber powered, semi scale, profile model of a Czechoslovakian maid-of-all-work aircraft.

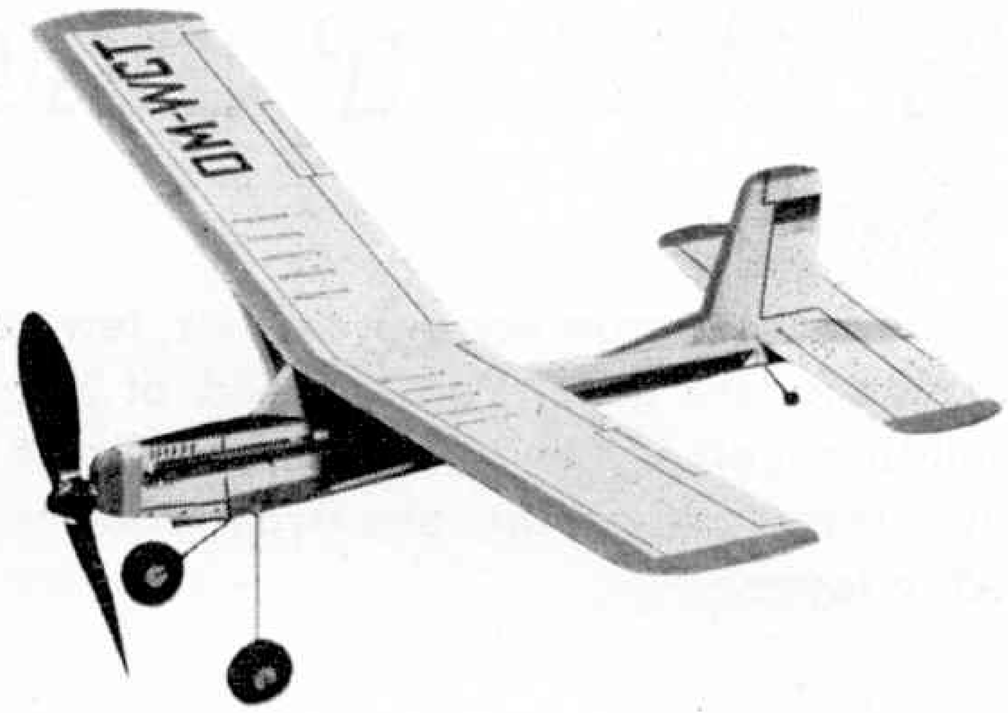
Designed by Ray Malmström

NOT VERY many full-size aeroplanes these days lend themselves to easy reproduction in model form and still fly " off-the-drawing board." The little Czechoslovakian *Brigadyr*, however, proved to be just the job for the simple-to-build profile model we present for your delight, this month. The real *Brigadyr* is indeed a maid-of-all-work being employed extensively as an agricultural aircraft, and also equipping the Czechslovakian Air Force for observation, photography and parachute duties.

The plan and easy-build sketches of our 14 in. span *Brigadyr* supply all the information you will need to build a " full-of-fly ability " model; but before we go on to the all-important flying notes, one or two points may assist your construction. A sharp pointed knife, or a razor blade cracked in two to give a sharp point, will assist in cutting accurately the fuselage shape. See plan. Note direction of grain for nose pieces and fin. Use medium grade balsa throughout. Retain the undercarriage and rear hook wire with pieces of this tape. Cement well and rub the cement into the material and allow to dry completely. Check when assembling the wing and tailplane to the fuselage that they are true and not twisted. Decoration of the parts should be done as soon as they are cut from the sheet, and before assembly. We invented a new method of colour application on this model, which avoids heavy dopes or paints, and results in a bright, colourful finish. Possibly in your art periods at school you have used a new form of pastels that are really oil colours in stick form. These are ideal for decorating your little *Brigadyr*. Simply mask off the area to be coloured with Sellotape (wing tips and leading edges, tailplane tips, fin leading edge, nose pieces and lower part of fuselage on this particular model). Rub on the oil-colour pastel fairly thickly with a soft rag, gently smooth out the colour to get a very pleasing solid-colour effect. It looks good and adds no weight to your model. Try this new method (applicable to all small sheet models), it really works. You can obtain a small box of oil-colours in stick form (one manufacturer calls these oil colour sticks " Cray-Pas Crayons ") from your local art dealers. They are great for painting colourful pictures with too! Elevator lines are easily put in with a ruler and ball-point pen.

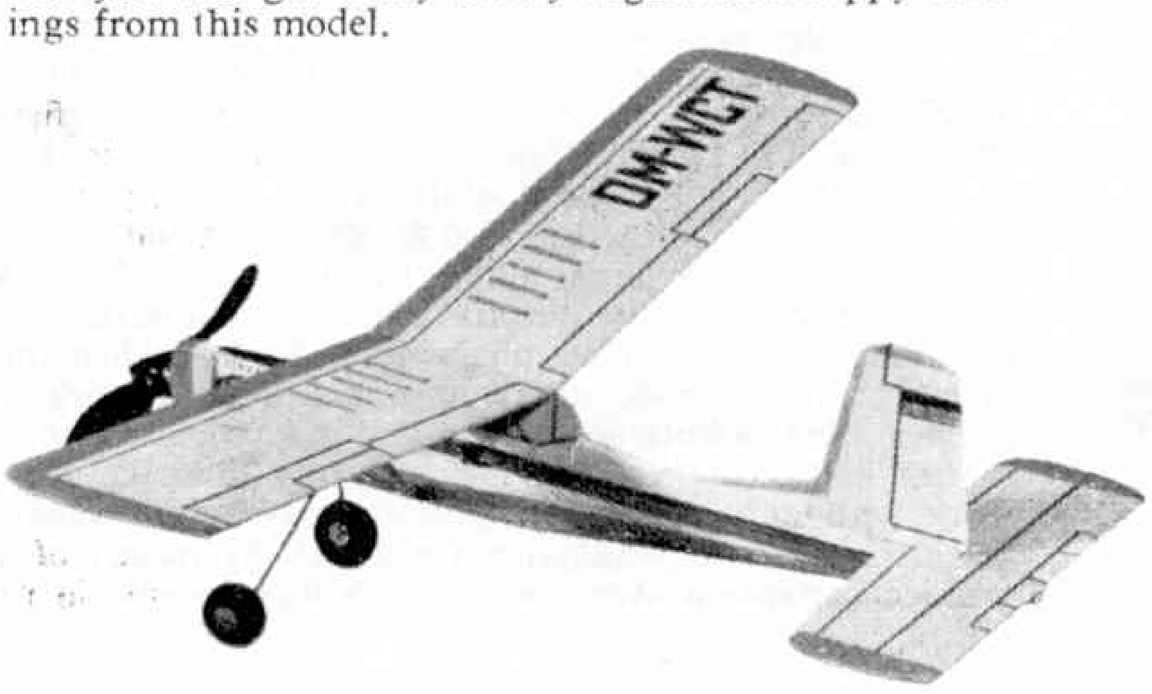
Plan Instructions

The full-size constructional plans on pages 260 and 281 should be removed from the magazine (joined) by undoing the binding staples, removing pages 261-'80, and then replacing them. Page 281 shows assembly in easy-to-follow sketch form.



Flying notes

Install the rubber motor (one loop 7½ in. long, ⅛ in. strip rubber) after having put rubber lubricant (6d. a tube from your hobby shop) on the rubber. Balance the model carefully as indicated on the plan. You may need to add a small quantity of plasticine to the nose or tail to obtain correct balance. Choose a calm day for your first flight, and carry them out over long grass. Point the nose of your model into any breeze that may be blowing and launch it gently with nose pointing slightly downwards. Never throw the model. Your *Brigadyr* launched from shoulder height should glide straight down and land about 20 feet away. If the model climbs steeply, falls back on the tail, and then dives (stalls), add a little more weight to the nose. If it dives, remove some nose-weight or bend up the rear edges of the tailplane a very little (1/32 in. to 1/16 in. will be enough). Make sure the glide is straight. If the model turns sharply to left or right, check that the wings are not warped. If they are, breath gently on them, twisting out the warp. If there are no warps and the model continues to turn sharply, bend the rear edge of the fin in the opposite direction to the turn. Once the model glides satisfactorily you can try a " power-on " flight. Wind the propeller about 150-200 turns and launch gently, releasing the propeller first. Your *Brigadyr* should climb away, turning slowly to the left. When the power runs out, it should glide in to a smooth landing. With each successful flight you can increase the turns up to a maximum of about 320. Remember to rub some lubricant on the motor after every two or three flights. Stalls, dives or excessive turning under power can be corrected in the same way as we mentioned above for gliding tests. Build and balance your *Brigadyr* according to the plans and these notes, and you will get many steady flights and happy landings from this model.



A GIANT FROM THE PAST

No dock was large enough for her, few harbours could accommodate her. Years ahead of her time in size, building methods and engines, the Great Eastern had a chequered career until she proved herself as an ocean cable layer.

by John Mannering

SEEN AGAINST the background of scientific and mechanical achievement of the period and the development of contemporary shipping, the steam ship *Great Eastern*, launching in January 1858, was, and has remained, the most outstanding vessel of all time.

She was the brainchild of that famous Victorian engineer, Isambard Kingdom Brunel (see February *Meccano Magazine*), who built the Great Western Railway to Bristol, the Clifton suspension bridge, the atmospheric railway along the south coast of Devon, as well as numerous bridges, canals, dock, ships and tunnels.

Everything which came from the fertile brain of the "Little Giant" was larger than life; and in the creation of the *Great Eastern* he attained immortal fame.

She was indeed a great ship by any standards. Built on the Isle of Dogs beside the murky waters of the Thames, she was a vessel of almost unbelievable superlatives.

Six hundred and ninety-two feet long, with a displacement of 22,500 tons, she was five times larger than any ship in existence, and it was almost 50 years before a bigger vessel was built.

She had two sets of engines, one to drive the 58 ft. paddle-wheels and one to turn the 24 ft. propellor, the largest which any ship has ever carried. Total h.p. was 11,000. To fire her ten boilers she could carry 15,000 tons of coal; for it was Brunel's idea that she should be able to engage in the far eastern trade by making round trips from Great Britain to Trincomalee in Ceylon where she would load goods brought to her by a fleet of cargo ships serving Australia and the Orient.

In the event the financial difficulties which beset her from the start deflected the board of directors from this purpose, and she was early engaged in the fashionable and, it was hoped, lucrative Atlantic passenger service, for which she was not designed.

Over 2,000 men were employed in building the hull, which had several novel features. She was the first ship to be built without ribs, and she had a double skin of iron plates, 3 ft. apart, with strong bracing in between, from her bottom up to 6 ft. above the water line.

Transverse and longitudinal bulkheads divided the space between the two skins into 16 compartments, rendering the ship almost unsinkable. In fact when she hit an uncharted rock off the approach to New York in August 1862, a hole 80 ft. long and 9 ft. wide was torn in her bottom skin. But she was able to make New York with only a slight list to starboard. The repair of this huge rent, while she was afloat, by means of a wooden cofferdam over 100 ft. long, was an epic in itself.

Over three million 1 in. rivets were used in her construction; and part of the price of her building was the employment of young boys, three to each riveting gang, who worked between the hulls amid the din of hundreds of hammers, 12 hours a day for six days a week. At the close of 1857, after six years' incessant labour, the huge vessel was ready for launching. She had become almost a permanent feature of the Thames-side scene.

Efforts to launch her were protracted over an agonising 12 weeks, during which, at successive suitable high tides, hydraulic rams, tugs and winches inched her down the 300 feet between the building cradles and the water's edge. She went broadside down an incline of 1 in 12, and was the heaviest object that man had ever attempted to move.

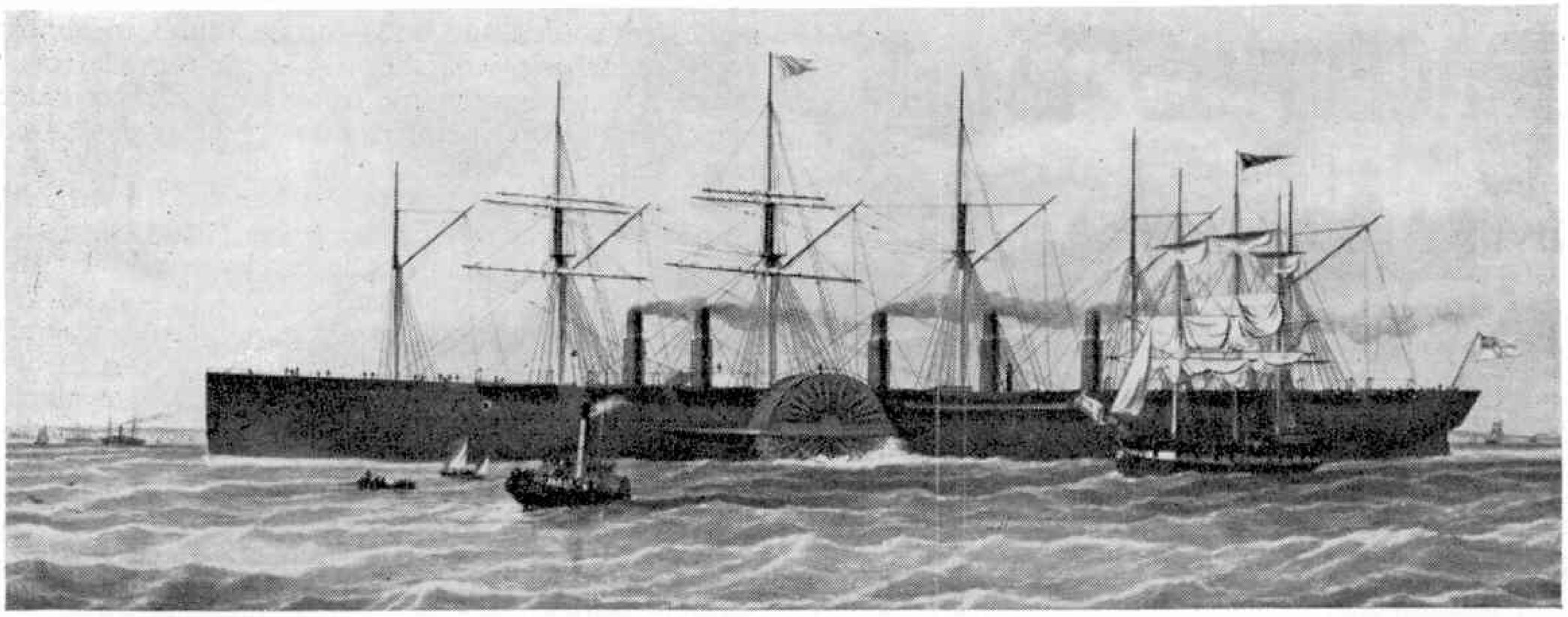
The work of stepping and rigging her six masts, named after the days of the week from Monday to Saturday, erecting the five funnels and completing her fitting out was finished in August 1859. The lavishness and comfort of her accommodation, in typical Victorian style of red plush, polished woods, mirrors and marble, excelled anything seen afloat before; but although originally designed to carry 4,000 passengers, sufficient funds were only forthcoming to furnish 300 first-class staterooms.

Her readiness for sea was celebrated by a banquet on board, but Brunel, exhausted by his labours, was too ill to attend.

She left the Thames Estuary on September 7th, 1859, on her maiden voyage, bound for Holyhead and New York. Within a few hours she was in desperate trouble. She came out of the Thames estuary and made the turn into the Channel at 12 knots, considerably in excess of any speed hitherto attained by a steam vessel. But as she passed Hastings an explosion occurred in the forward funnel, blowing a hole in her decks and side, completely wrecking the magnificent saloon and killing several stokers. The cause of the explosion was the closure (by whom, no one ever discovered) of an escape cock in the water jacketing system round the funnel casing.

The ship limped into the anchorage under Portland Bill and the voyage was abandoned. The news of the accident, when told to Brunel, already suffering from a stroke, killed him.

After spending the winter at Holyhead, during which sightseers helped to alleviate her financial troubles, it was decided to run the ship from Southampton Water, and on June 16th, 1860, she actually sailed for New York carrying 43 passengers and a crew of over 400, including three doctors. The voyage took 12 days,



The " Great Eastern " off Margate on her maiden voyage from the Thames. A few hours afterwards she was severely damaged by an explosion in the forward funnel. Reproduced from the collection of Liverpool Museum by permission of the Liverpool Libraries Museums and Arts Committee.

being accomplished without further accident. She was lionised on the American coast and ran a few short excursions and was thrown open as a show piece in different ports.

With varying success, but always in financial difficulties, the *Great Eastern* continued in the Atlantic service until 1864.

On one occasion she embarked over 3,000 men, women and children on a trooping voyage to Quebec, and it was not until the 1914/18 war that a ship again carried so many people. Her worst experience was in 1861 when she ran into winds of hurricane force some 300 miles west of Ireland. A heavy beam sea set the ship rolling grotesquely and both her paddle wheels were completely smashed and broken away at the hubs. Then the rudder post sheered, allowing the huge rudder to swing to and fro as the ship rolled, causing it to hit the propeller blades so that the screw had to be stopped. The ship lay helpless. The lifeboats broke their lashings, swinging about so dangerously that they had to be cut adrift. The grand saloon was in a state of chaos, with furniture crashing from side to side; very little food was served and passengers and crew were in a dire plight. Eventually H. E. Towle, an American engineer on passage home from Europe, persuaded Captain Walker to allow him to endeavour to secure the rudder post by means of tightly gripping chains.

This proved successful, the propellor could be used once more, and the crippled ship turned tail and ran back to Cork and thence to Milford Haven. It cost £60,000 to repair all the damage done by the gale.

In 1865 the directors of the great ship company came to an agreement with the American cable enthusiast Cyrus Field to allow the *Great Eastern* to be used in an attempt to lay the first telegraph cable across the Atlantic, for a fee or £50,000 if successful; or if the attempt failed there was to be no charge.

The cable was stowed in three huge containers occupying the space taken by the saloon, cabins and holds.

At the first attempt the cable broke and the end was lost in mid-Atlantic. The position was buoyed, the indomitable Field returned to England, raised more cash, stowed away a million pounds' worth of new cable and started a fresh attempt to put down on the sea bed a physical communication link between the Old World and the New.

Laying the cable at six knots, the *Great Eastern* headed once more into the grey Atlantic. No difficulties arose and only July 26th, 1866, the end of the cable was carried ashore at Hearts Content, Newfoundland.

Captain Anderson accomplished the further incredible feat of steaming back to mid ocean, finding the buoy left the previous year marking the position of the lost cable; dragged with grapnels in water three miles deep and succeeded in bringing it up to the surface. The end was buoyed and the Great Eastern went back to England for more cable to complete a second link across the Atlantic.

The great ship had found her purpose. In the following years she laid a French cable from Brest to Miquelon Is. off Newfoundland, and laid the Bombay-Aden section of the all-British cable from Great Britain to India. One might say that this work alone justified her building. For she did little after this, beyond being a show boat for the Liverpool Industrial & Maritime Exhibition, and going to Dublin and Clydeside advertising tea!

In 1889 she was broken up at Liverpool. Inside her double bottom the skeletons of a man and a boy lost during her building came to light.

The *Great Eastern* was dramatic to the last.

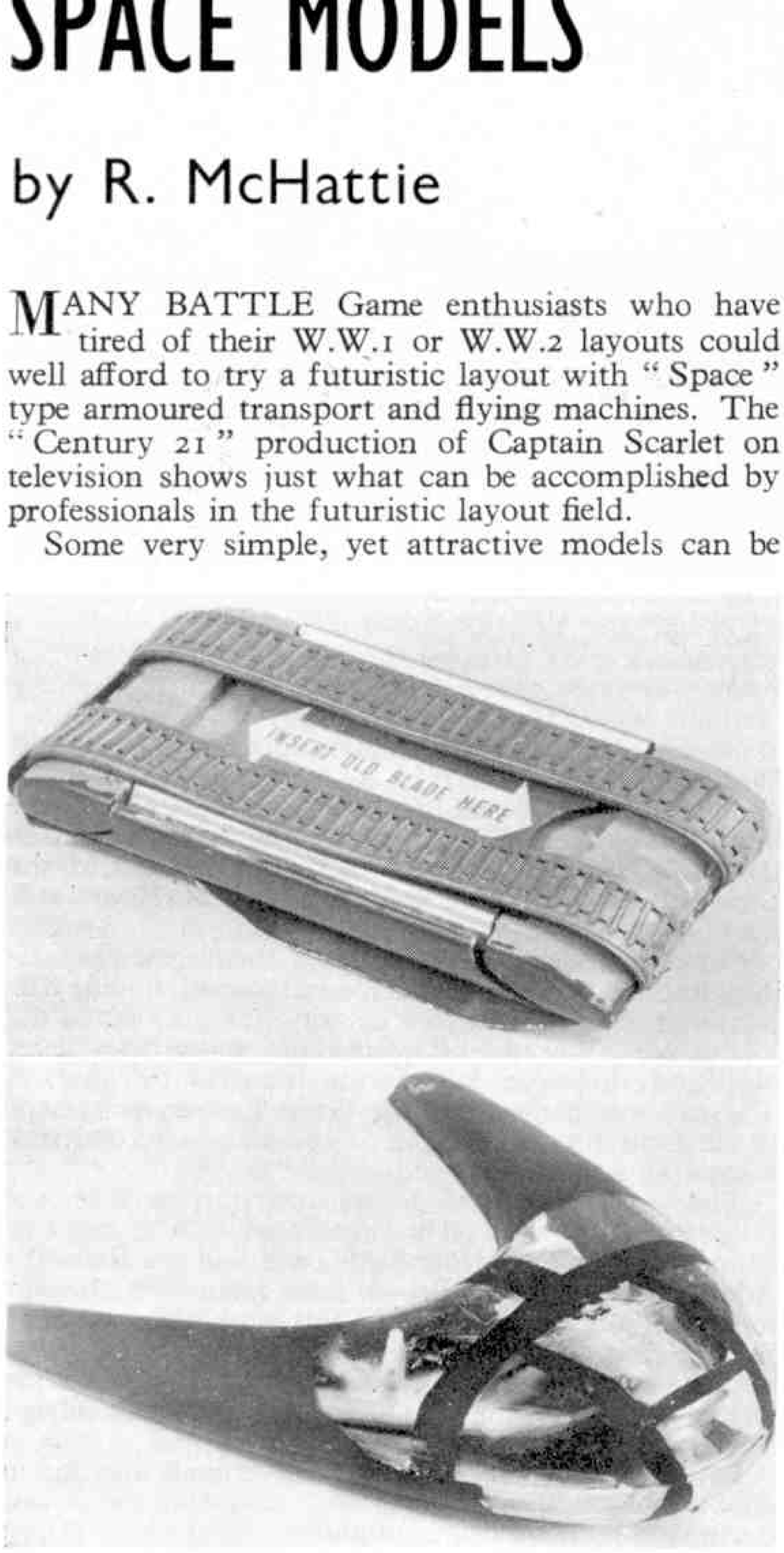
SPACE MODELS

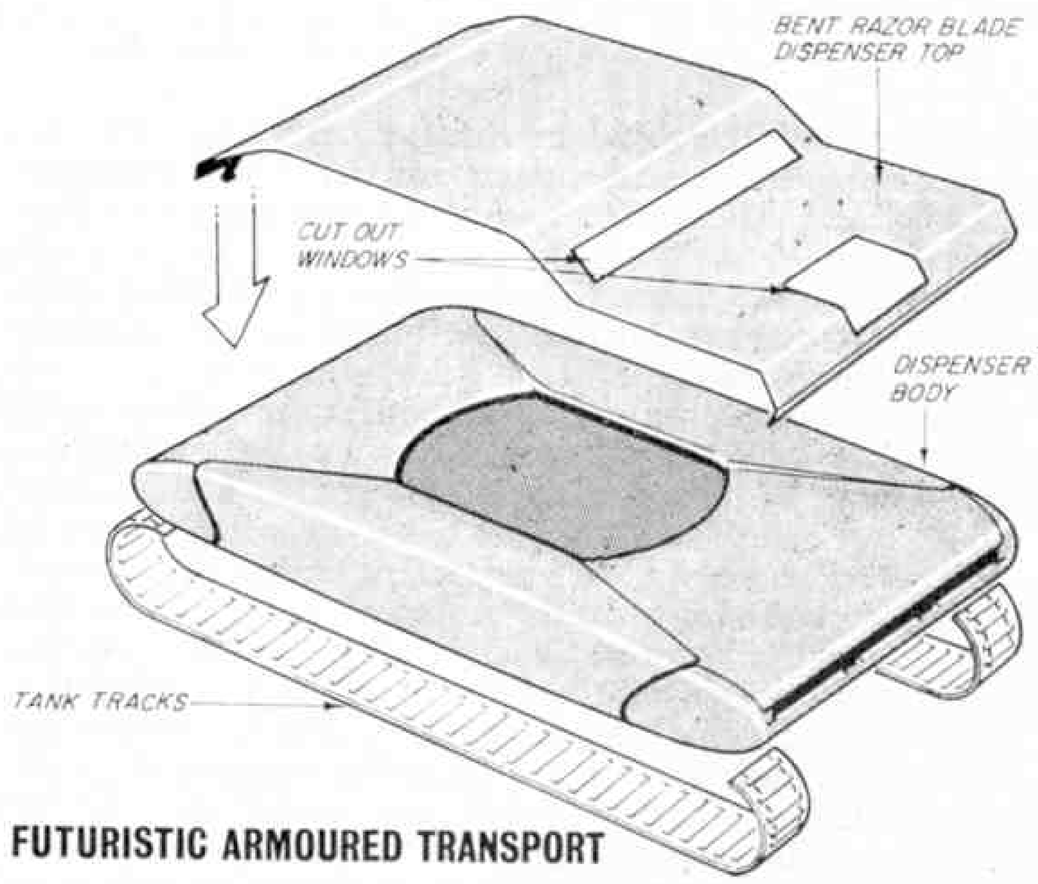
by R. McHattie

MANY BATTLE Game enthusiasts who have tired of their W.W.1 or W.W.2 layouts could well afford to try a futuristic layout with "Space" type armoured transport and flying machines. The "Century 21" production of Captain Scarlet on television shows just what can be accomplished by professionals in the futuristic layout field.

Some very simple, yet attractive models can be made from odds and ends—to be found in almost every modeller's workshop. The first model constructed was a hover tank, using a metal razor blade dispenser. When painted matt black, this looked most realistic. By shaping the top of a blade dispenser, as illustrated below, it can be turned into a hood to fit perfectly on the body. Also tank tracks can be added and guns, etc., from old plastic models, give an air of realism.

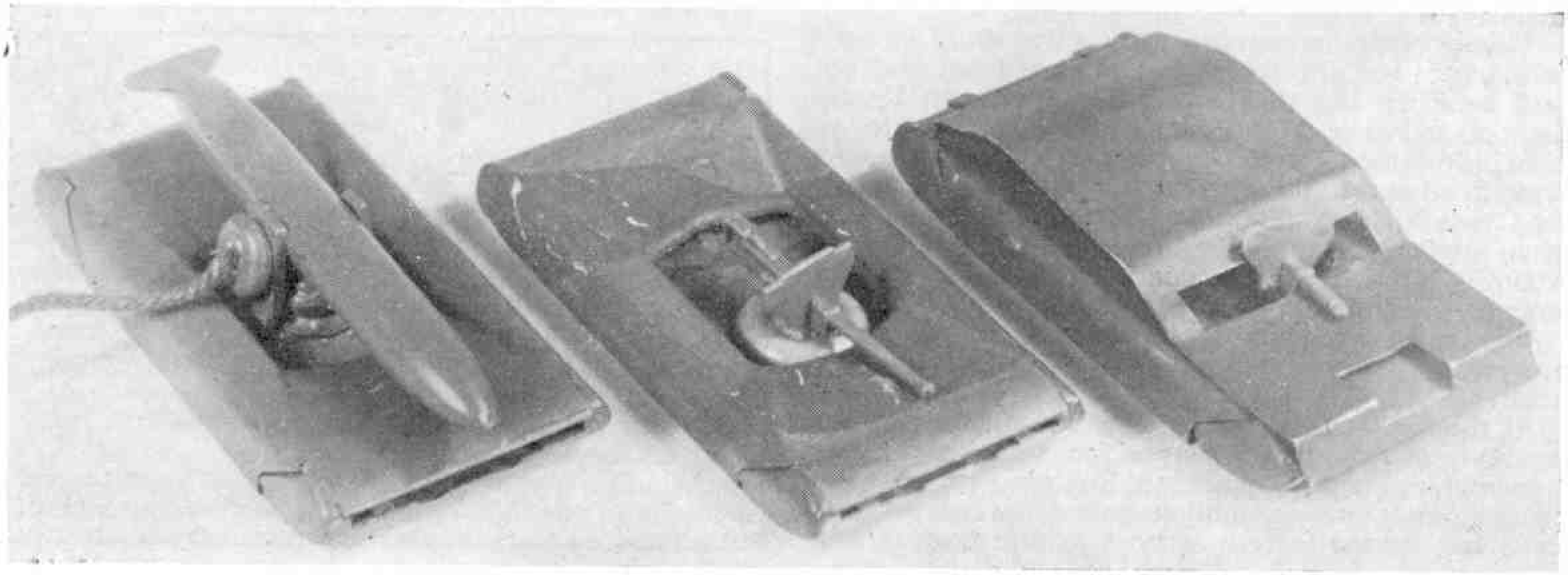
By cementing two transparent plastic aircraft stand bases together, and adding seats, controls, pilots and other parts, a very realistic jet plane-hovercraft can be constructed. Paint the hovercraft matt black, leaving the window areas clear to simulate glass. These models are to just the correct scale to match OO/HO combat figures and you can now simulate a space invasion from Mars, landing on your railway layout.





FUTURISTIC ARMOURED TRANSPORT

How about these for jet-age models? The futuristic-type tanks are slightly modified razor blade dispensers with toy tank tracks added. Fuel tanks and guns from old plastic models add interest. The flying machine is just two old transparent plastic aircraft stand bases, cemented together.



STAINED GLASS WINDOWS ON STAMPS

by James A. Mackay

THE PAST two years have witnessed a tremendous spate of stamps devoted to Art in its many forms. Most of these stamps have reproduced paintings or sculpture and there is a feeling among collectors that this subject has been rather overdone. One art form, however, which has so far attracted comparatively few stamps is the stained glass window and, as this is a theme with attractive prospects, I would suggest that now is the time to begin forming a collection of such stamps.

The earliest stamps in this subject were issued by the Netherlands in 1931 to raise funds for the rebuilding of Sint Janskerke in Gouda and, more especially, for the restoration of the famous stained glass windows in that church. These windows, constructed by the brothers Dirk and Waiter Crabeth towards the end of the 16th century, were of extraordinary range and completeness. The two stamps not only depict the windows but also show a glazier repairing a detail.

Ten years elapsed before neighbouring Belgium released a set of stamps in aid of the restoration of Orval Abbey and depicted a stained glass window, showing a monk at prayer, on the 50c. and 1.75fr. denominations. Germany issued four stamps in 1948 to celebrate the 700th anniversary of Cologne Cathedral and chose details from the stained glass windows for the two lowest values. The 6pf. stamp portrayed one of the Frankish kings, while the 12pf. depicted the Three Wise Men. The stamps bore a small premium in aid of the fund for the repair of bomb damage sustained by the cathedral as a result of the war. Three years later Germany issued another set, this time commemorating the 700th anniversary of St. Mary's Church in Lubeck. The two large-sized stamps featured one of the magnificent triptychs, or windows in three panels, which date from the 14th century.

In 1961 the erstwhile Belgian territory of Ruanda-Urundi had a set of stamps to raise funds for the completion of Usumbura Cathedral and two of them, the 1.50fr. and 6.50fr., depicted stained glass windows in the cathedral.

During the past five years France has come to the fore with several attractive stamps featuring various stained glass windows in full original colour. The first of these stamps appeared in March 1963 and showed a window from the Church of St. Foy in Conches. The window depicted fishermen on the Sea of Galilee. The following November a window from Chartres Cathedral was chosen as the subject of a 95c. stamp. The stamp reproduces a detail from the celebrated La Belle Verriere, a window dedicated to the fur trade. The 800th anniversary of Notre Dame Cathedral in Paris was celebrated in 1964 by a 60c. stamp showing the great roundel portraying the Madonna and Child. The eighth centenary of Sens Cathedral was marked the following year in the same fashion. This time the subject was a diamond-shaped stained glass window featuring a knight on horseback. The Baptism of Judas, shown on a stained glass window in Sainte Chapelle, Paris, was depicted on a 1fr. stamp in October 1966 while smiths at work, from a window in the Church of St. Madeleine at Troyes, were featured on a French stamp issued last October.

No identifiable stained glass windows have yet appeared on stamps of the British Commonwealth. The nearest thing to this is a Canadian stamp of 1938 which shows the interior of the Memorial Chamber in the Parliament Buildings, Ottawa. In the background can be seen a stained glass window, although the details are not clear.

An opportunity to depict a stained glass window was lost when Britain released a half-crown stamp in 1965 to mark the ninth centenary of Westminster Abbey. The stamp shows the richly ornamented fan-vaulting, but the window at the far end has been left blank. One of the designs turned down by the Postmaster General featured the stained glass portrait of the Abbey's founder, King Edward the Confessor. One of Gibraltar's Christmas stamps, issued last year, showed a stylised stained glass window.

Austria issued a stamp in 1964 to publicise a Romanesque Art Exhibition and featured a stained glass window showing St. Mary Magdalene. Last year a stamp was released in honour of St. Leopold, patron saint of Austria, and a portrait of him, from a stained glass window, was chosen.

Not all stained glass windows decorate churches and cathedrals. Last year a memorial window to the late Dag Hammarskjold was installed in the lobby of the United Nations Secretariat building in New York. The entire window was depicted in a miniature sheet of six different 6c. stamps. One stamp, featuring the detail entitled "Kiss of Peace," was also printed in normal sheet form. The window was designed by the French artist, Marc Chagall, and donated by him jointly with members of the UN Secretariat.

Many Nazi concentration camps have been preserved as memorials in East Germany which issued three stamps recently featuring the stained glass triptych from the Museum of Anti-Fascism in Sachsenhausen, one of the notorious death camps of World War II. The left-hand portion shows a family group symbolising the illegal struggle against fascism; the central portion symbolises the liberation of the camp by the Russians; and the right-hand portion represents partisans in action. The outer windows are inscribed with anti-fascist slogans while the central window bears the word "Peace" in twelve languages.

HORNBY "O" GAUGE TRAINS—YESTERDAY AND TODAY

by P. E. Randall

BACK IN the 'thirties, in the golden days of my boyhood, every issue of the *Meccano Magazine* carried at least three articles, in addition to advertising material, on Hornby "O" gauge trains. This continued right through the War, but a decline set in during the late 'forties, with a corresponding increase in articles on Hornby-Dublo trains.

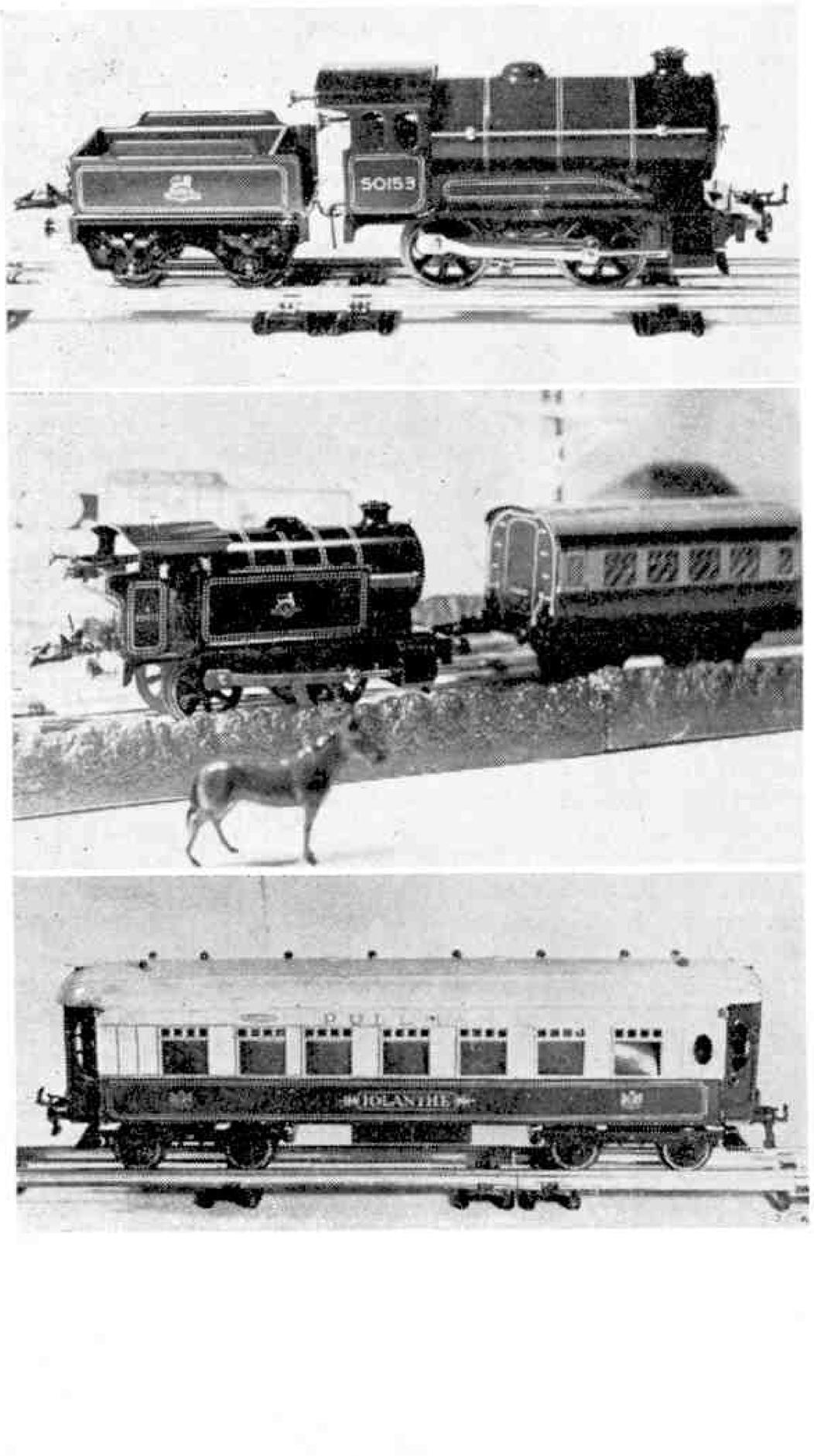
The range of the trains themselves probably reached its zenith shortly before the War, but only a small part of it reappeared at the end of hostilities. This soon started to shrink, first bogie stock disappearing (yes, it was available for a short time after the War) and then accessories dropped out of the catalogue, one by one. A slight flicker of new interest seemed to appear with the introduction of the No. 50 series of rolling stock, but then the rot really set in, and now the only available items, except for old stock, are the smallest No. 20 sets.

Strangely enough, during these years of the decline in availability of "O" gauge, there has grown an increasing interest in it, on the part of middle-aged men, like myself, who knew the trains in their past glories. For the most part, these enthusiasts are collectors, but operators can also be found among those who are fortunate enough to have a fair-sized room available.

Just why do mature men drool over toys which in most cases do not even resemble real trains? In my own case, I suppose it is pure nostalgia, recalling the thrill of seeing, coveting and eventually owning the trains during boyhood. They have, too, a certain charm of their own, with their rich colours and sturdy construction, and I believe that there is real beauty in the pre-1931 locomotives with their large domes and handsome outlines.

Hornby trains were born just after World War One, and those of the early 'twenties were bolted together like Meccano. The range extended rapidly in the late 'twenties, until by 1931 a comprehensive layout could be assembled. In that year, major changes were made and the old large-domed locomotives disappeared. At the same time, rolling stock items were fitted with automatic couplings and a new type of base. Some enthusiasts, then and now, think that these were retrograde steps. Just before the War, too, most of the locomotives could be obtained with electric motors instead of clockwork. Not a great number of the electric items are still in use, due, no doubt in part, to the fact that they would interfere with television.

Some collectors, today, are willing to collect any Hornby item and a few rich ones are hoping, one day, to possess every item. Others, more modestly, aspire only to a representative selection. Personally, I have decided to specialise, due to cost and to the fact that I want a working layout. Post-war track is still available but it is of the flat type, that is, without banked sleepers. This means that the larger pre-war locomotives and bogie stock cannot be used, so I am concentrating on acquiring all the pre-war and post-war four-wheel locomotives and rolling stock. In any case, in my view, one should not mix Hornby trains and scale models. The pride of the pre-war range were the Pacific *Princess Elizabeth* and the range of No. 2 special scale model 4-4-0 locomotives. Excellent though these were, I always considered them out of place alongside the rest of the Hornby range, and they are mainly sought today by scale model enthusiasts. Frankly, scale model railways in any gauge have always bored me as I want toys that look like toys! My final layout will also bear no resemblance to a model railway and will consist of a very large oval with plenty of storage sidings to take whole trains. I do intend, however, to add accessories and line-side effects. This also presents a problem, because although model cars, commercial vehicles, etc., are available in plenty, they are all much too near to scale models and would look out of place on the layout. I am seeking a source of tinplate cars and lorries which match my trains.



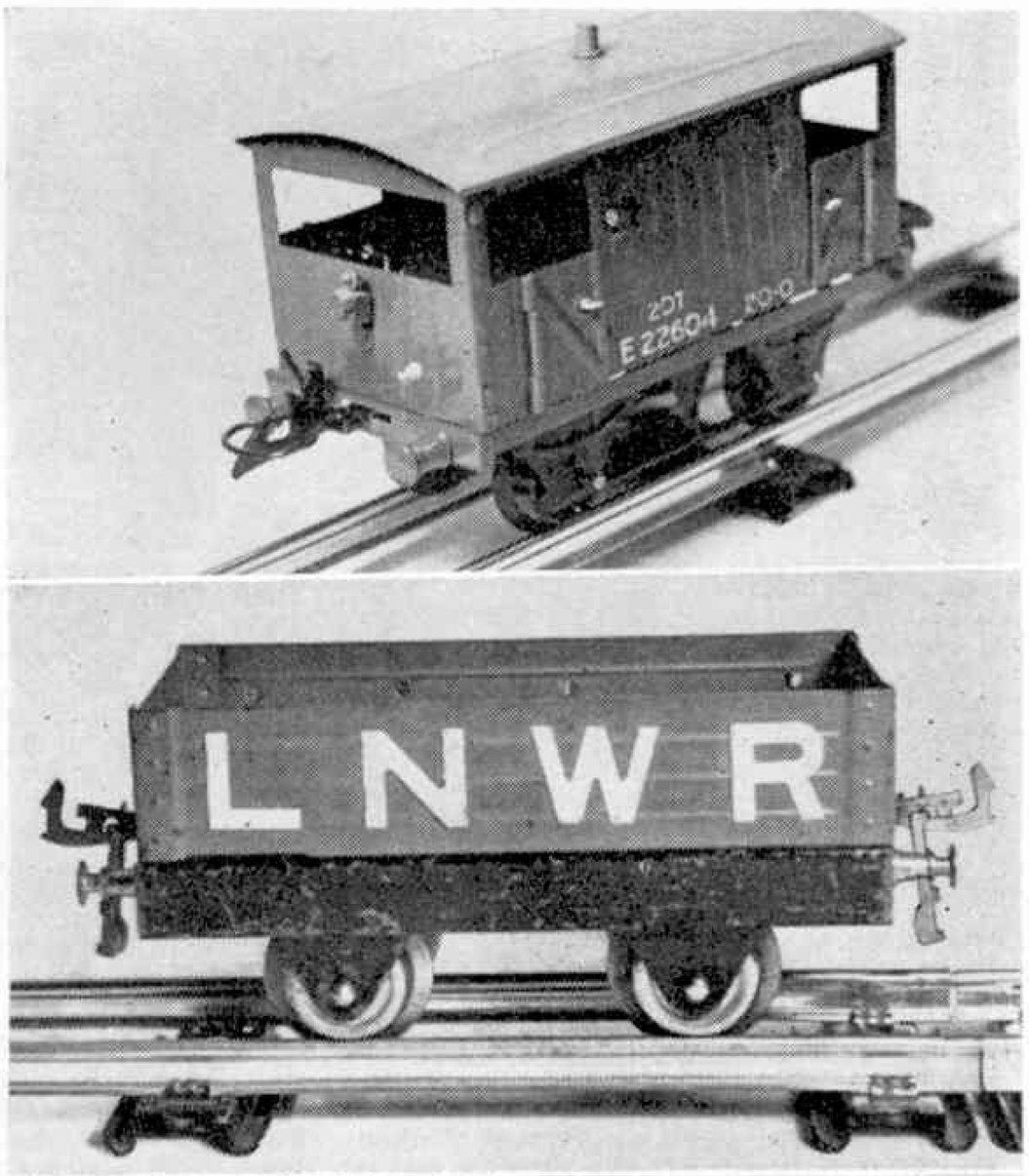
At left, top to bottom. The final guise of the largest post-war tender locomotive No. 51 in B.R. green as 50513. This locomotive, first introduced in 1931 as No. 1, carried no less than eleven different liveries in its lifetime. Next, a rural scene on the author's layout. The locomotive is the last of the Hornby tanks, No. 40 in B.R. black as 82011. This locomotive was the pre-war M3 tank originally produced without outside cylinders or coupling rods. The most luxurious Pullman ever produced by Hornby, No. 2 special of 1930 vintage (Peter Gomm collection).

The big problem for collectors is, of course, that of supply. At the time of writing, new items are still to be found in some shops; for instance, track and No. 50 wagons are fairly common and the rarer find is still possible in remote village shops. Most of the locomotives have been snapped up long ago, however. One hears rumours, but I have only myself seen one case of new pre-war items being found in shops recently. A small shop near by home unearthed three No. 1 tenders of about 1927 vintage and a watchman's hut and put them in the window during the summer of 1961. Like every collector, however, I dream of finding a brand new No. 1 special tank locomotive on a shelf behind a village sweet shop, and, who knows, it just might happen!

Sources of second-hand items include jumble sales, junk shops, private sales of collections of old toys, and, of course, fellow collectors and dealers. Most collections of old toys, although cheap, are in very poor condition, but it is sometimes worth buying a load of junk to get just one rare item. Dealers and fellow collectors selling surplus items have rationalised the whole business and they issue lists describing exactly the identity and condition of each piece. Hence a goods brake van can be vintage bolted and raised lettered type; pre-1931 with large or small couplings; post-1931 with automatic couplings and the revised type base; post-war pre-1953; or the latest type No. 50. This tells the buyer exactly what is for sale, but condition is not so easy to specify. Most vendors specify "mint," "good condition," etc., but their meaning of these terms may not be that of the purchaser. The only safe thing is to see the item before buying, even if this involves a journey from London to Scotland! (Non-collectors should note here that all collectors are mad anyway!) As to prices, these vary exceedingly and fairly recent items could almost be regarded as investments. For example, a No. 501 locomotive in L.N.E.R. green could have been bought, new, for a little over 35s. in 1953. Kept in unused condition it would fetch between £4 and £5 today and some dealers would ask a lot more. The best advice I can give to would-be collectors is to send for as many lists as you can and compare prices. By doing this I have now a fair idea of who are the honest fellow-collectors, and who are the wide boys.

A very interesting side-line is the seeking of errors and one-off items. As in stamp collecting, if one found a genuine Hornby item finished in a style not mentioned in any catalogue, it would be very valuable indeed. Again, one hears rumours, but the only things I have seen with my own eyes have been wagons finished in the style of Commonwealth railways, and some bearing unusual advertising material, and the only error I ever saw advertised was a No. 3 locomotive without a name.

This, then, is the picture of the Hornby "O" gauge scene today, and it is very different from that of the 'thirties, when they were merely children's toys. I wonder if Frank Hornby ever dreamt that in 1968, professional men would drive over a hundred miles to pay £10 for a No. 1 tank locomotive that could be bought once for 12s. 6d. in any toy shop.



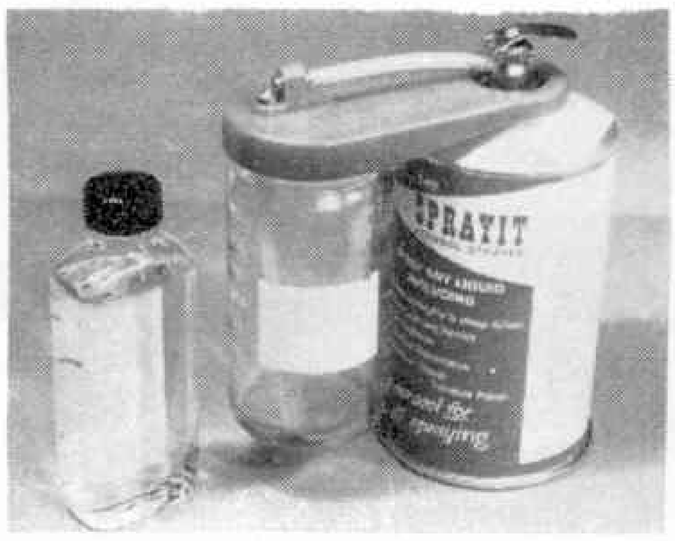
At right, top to bottom. A post-war Goods Brake Van showing side and tail lamps. Next, an early wagon of about 1921 of the bolted together and raised metal lettering type (Peter Gomm collection). The L.M.S. is a Goods Brake Van of about 1929, early type base and ornate lettering (Peter Gomm collection). The locomotive is a 4-4-4 Tank of about 1925 vintage with brass dome and coat of arms on cab. Probably the most handsome engine ever made by Hornby (Peter Gomm collection). Lastly, pre-war and post-war M1 Pullman. Post-war right.

HAVE YOU SEEN ??

David Hewson Ltd., "Sprayit," Aerosol spray. Price 19s. 11d.

Not just another Aerosol spray can, the *Sprayit* is an *Aerosol*-powered spray gun, and is ideal for spray painting both large and small models. The Aerosol can is connected to a jar containing the liquid to be sprayed, so that when the Aerosol lever is pressed, it draws the paint up a tube from the container jar and sprays it in the Arcton 1 gas propellant. The Arcton 12 propellant is completely safe and it is designed to operate at room temperature (about 70 deg. F). It has all the advantages of a conventional Aerosol with the added advantage that one unit will spray a whole range of liquids. The 12 oz. capacity Aerosol supplied with the unit will spray over a pint of light liquid or about 12 oz. of paint or lacquer. The 22 oz. replacement, which is fitted in seconds, enables double this quantity to be sprayed.

We tested ours with 50 per cent thinned Humbrol matt enamel on a tank kit and it produced a very even surface. It did not cope too well with fine detail work, and tended to cover smaller panel lines, etc., over. For the larger plastics, model aircraft and boats it is just about ideal, but please make sure you do all your spraying in a well-ventilated room as paint fumes can be harmful if continually inhaled. You should also remember to thin most brushing paints 25 to 50 per cent for spray application, using the recommended thinners to match the paint in use. Dad could also use your *Sprayit*, as it is recommended for spraying window-cleaning fluids, polishes, and garden insecticides. Replacement Aerosol cans cost 9s. 6d. and 13s. respectively for the 12 oz. and 22 oz. capacities. Spare graduated container jars are also available with lids for keeping thinned paint in, at 1s. 6d. each.



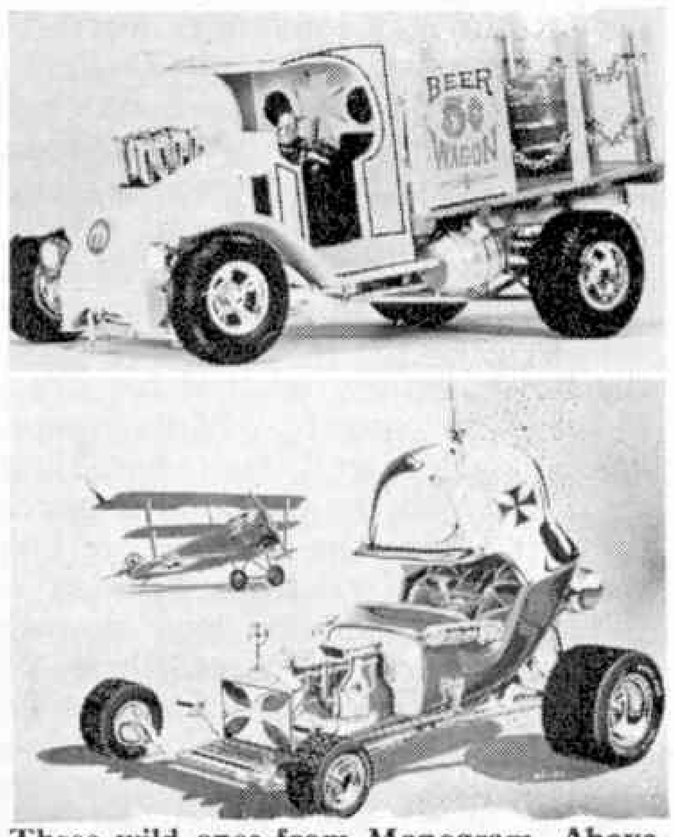
At left, the spray aerosol, a very handy piece of equipment for your workshop. Below, Revell's JU-88 makes up into a very nice 1/72 scale model.

Revell "Junkers JU-88." Price 9s. 3d.

Developed during 1936 as a medium bomber, the Junkers JU-88 became an all-purpose aircraft. Germany's fighters —Focke Wulfs and Messerschmitts—were its glamour planes, but the real support of the Luftwaffe was the JU-88. This rather elegant 65 ft. 10½ in. wingspan aircraft had a top speed of 273 m.p.h. and was oddly enough designed originally by an American and Englishman, before World War Two. Of the 15,000 JU-88s built during the war, 6,000 were bomber versions. This total production exceeded the total number of all other German bombers produced during World War Two. The Revell 1/72 scale kit of this aircraft depicts an actual plane on exhibition at the Air Force Museum, Wright-Patterson A.F.B., Ohio, U.S.A. You can build the model as a bomber or reconnaissance model, and it has such features as: removable cowlings, two detailed engines, two-position undercarriage, movable wheels and propellors, clear canopy, three crew figures, three view drawing, four 550 lb. bombs and bomb racks for bomber version, and 11 in. wingspan. Easy to construct with only 48 components, it builds up into a very pleasing model.

Monogram's "Beer Wagon," "Red Baron" and "Boot Hill Express" Price 29s. 6d. each

The "Boot Hill Express" is a 1/24 scale, show car model and a real eye-catcher, as nearly half of the kit parts are "chrome" plated. Moulded in startling orange-coloured plastic, all parts are very clean and right up to Monogram's high standard of production. This must be one of the fastest hearses ever built (this is a joke car and not a real funeral car), and the model comes complete with a white skeleton driver wearing a ten-gallon hat! None the less way out are Monogram's Beer Wagon and Red Baron models. The Red Baron features a giant-sized Kaiser helmet complete with a spike on top, as a roof. Powered by a 1914 in-line six-cylinder Mercedes Benz aircraft engine. It is based on a model "T" Ford body, the super wide drag tyres have deep dish Iron Cross design magnesium alloy wheels. To complete the



Three wild ones from Monogram. Above, the beer wagon and Red Baron machine both with decidedly germanic style. Below, the Boot Hill Express, a dragging hearse.

German look two Spandau machine guns are mounted on the windscreen and the model has the usual chrome glitter. By far the wildest plastic from Monogram is the Beer Wagon kit. Built around a 1923 Bulldog Mack truck, complete with chaindrive and all the latest drag racing accessories, it is a highly detailed 1/24 scale truck carrying seven beer barrels. Moulded in brilliant yellow plastic, over 50 per cent of the parts are chromed, including the chains to retain the barrels on the truck. Once again, Monogram have gone to a lot of trouble to import an American/German air about the model. All three kits are good fun to build and will attract loads of attention; but don't take them too seriously, will you? Available soon in G.B.

Above, the Airfix Little Nellie autogyro. An action-packed kit that actually fires plastic missiles, as used in the James Bond film. At right, the Airfix Angels' Interceptor as flown by the Angels in the Captain Scarlet series.

Minitrix "N gauge Coach." Price 15/-

This new addition to the Minitrix range will be particularly popular with Southern enthusiasts, as it is finished in that region's green livery. The coach itself is based on a British Railways standard design, and the quality of the plastic mouldings is very high indeed. All detail is sharp and clear, including even such tiny objects as door hinges, and the grey roof is well supplied with ventilators and plumbing. The windows are all fully glazed, and the lettering on the coach side is quite legible. A broad yellow band runs along the top of the first-class windows, in the modern manner and, combined with the green and grey body colour, gives the whole vehicle an attractive and colourful look. The bogies are interesting in that they represent the new B.R. "B4" type of coil spring bogie—we have not seen these in model form from any other manufacturer, although they are fast becoming an everyday sight on British Railways. The wheels of the coach are of metal, with insulated centres, and run very freely indeed. The slightest push will send the coach on a very long journey—the rolling resistance must be very small. A very good buy in N gauge, particularly for S.R. fans.

Below and at right, the new Minitrix N gauge coach based on a British Railways standard design. Note the B.R. B4 bogies.

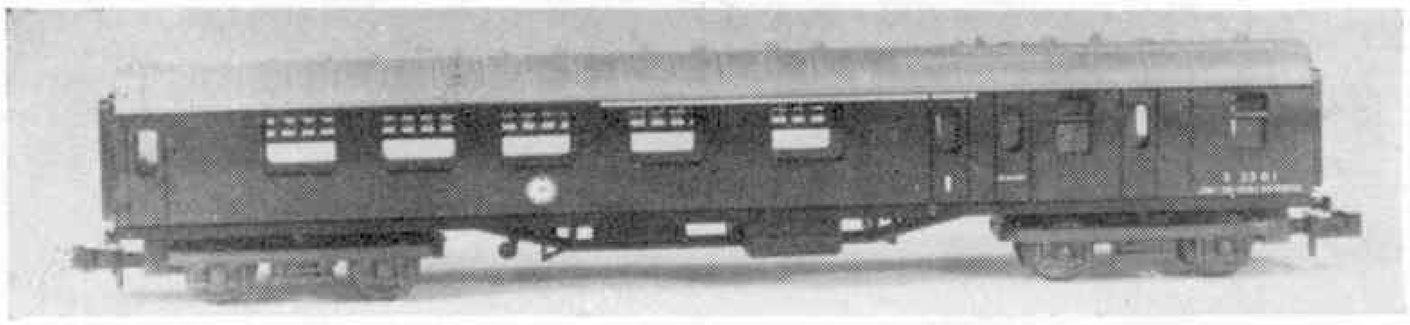
Airfix "Angel Interceptor." Price 3s. 6d.

This is a really different aircraft, not in fact a model of any real aircraft at all, but a super scale model of the Captain Scarlet television series Angel Interceptor. The menacing Interceptor is built from 23 white moulded polystyrene components and assembly only takes a few hours. Ours went together qutie well, though a lot of filler had to be used to fair-in adjoining sections for a continual smooth line. When painted and with all the transfers added it looks really smart; refer to our Captain Scarlet feature for a picture of the television model. The real Angel aircraft used for the television series have a fictional top speed of 3,000 m.p.h. and they are clamped onto Cloud Base runway in a "V" formation for automatic release on take-off orders. The little Airfix model makes up into a very neat replica of the real model and is well worth its 3s. 6d. price tag.

Airfix WA-116 "Little Nellie" Autogyro. Price 5s.

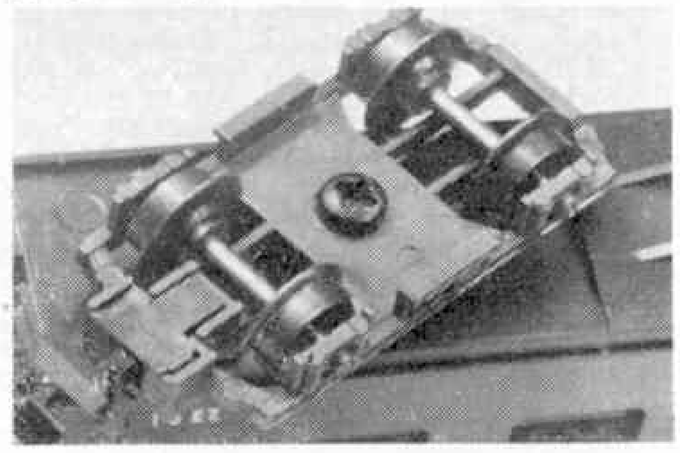
Little Nellie, the midget autogyro featured in the James Bond film "You Only Live Twice," is the latest 007 gimmick to be introduced by Airfix in construction kit form. Very well detailed, this 1/24 scale kit has more than 100 moulded polystyrene parts that can be used to make either the standard WA-116 aircraft or the exotically equipped James Bond version, which was heavily armed for the film sequences flown by Wing Commander Wallis over the volcanoes of the East China Sea and Japan. Guns, flame/smoke throwers, rockets and missile projectors (that actually fire plastic worth its 5s. price tag, and so unusual. missiles), are some of the extras on the James Bond version of this kit. Our kit went together well and the spring release missile mechanism is very clever. The fin and all the side flash transfers are included in the kit, which is well worth its 5s. price tag, and so unusual.

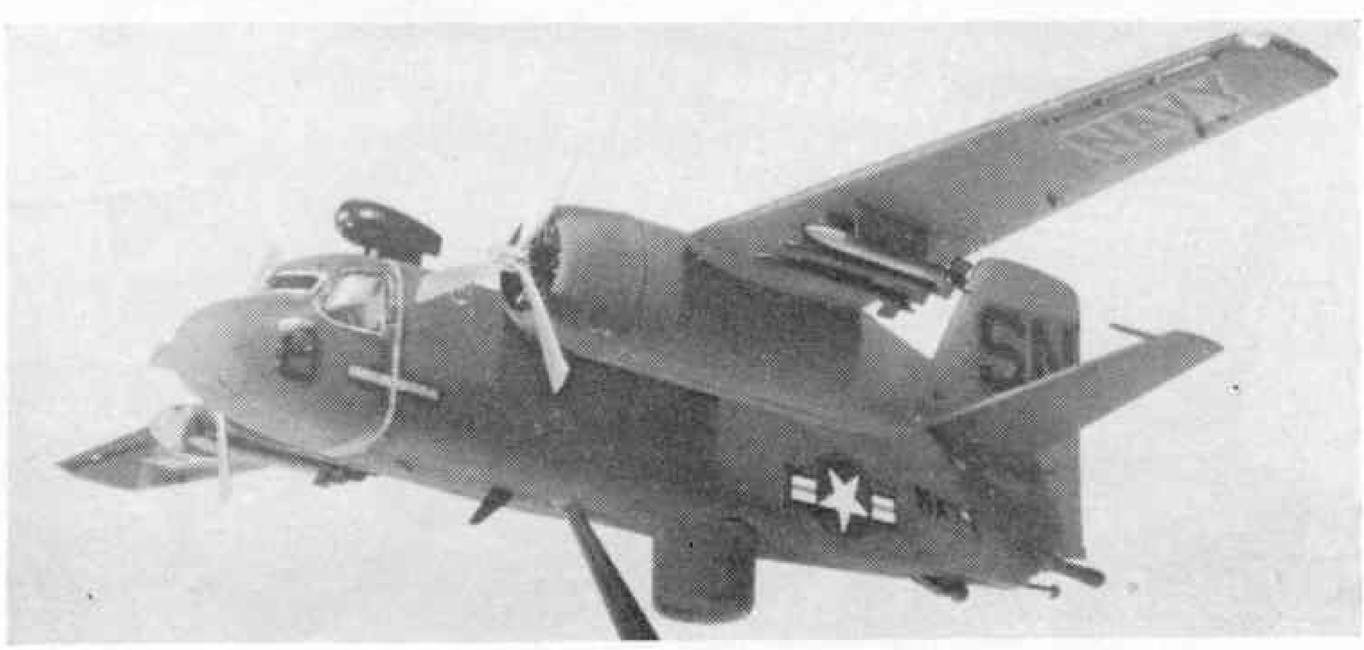
At foot of page, Aurora Grumman Tracker. A very easy to build model with 36 parts. 15¼ in. wingspan.

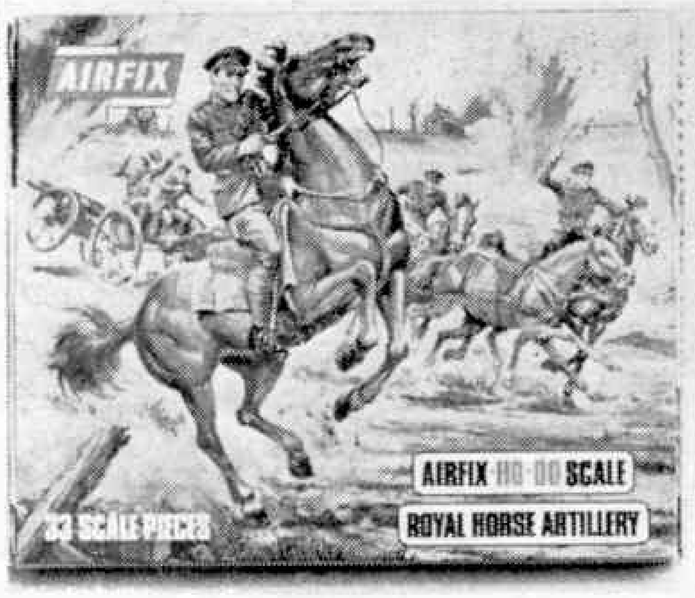


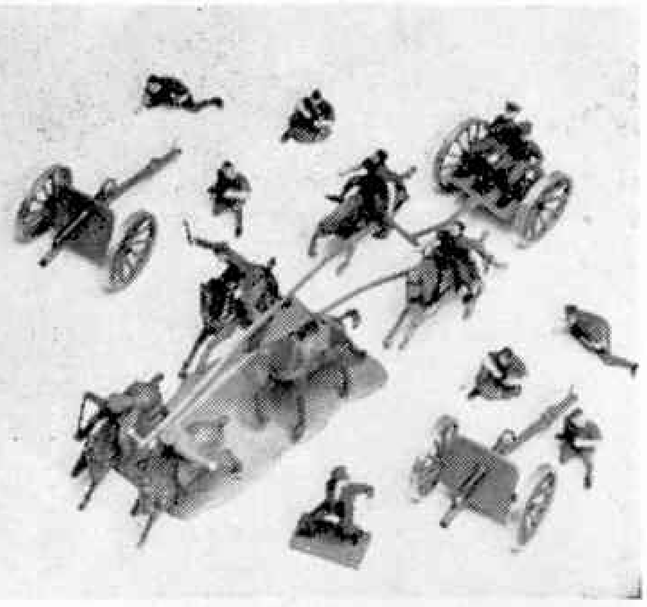
Aurora "Grumman S2F Tracker." Price 12/6

Another very easy-to-build model, with 36 parts, is the Aurora "Tracker." This aircraft is the latest carrier-based 'plane to be operated by the U.S. Navy for Anti-Submarine Warfare. With its two Wright radial engines, it cruises at 150 mph, suitably slow to "stay with" a submarine. Four moving components are provided in the kit; the propellers, Sonar dome and M.A.D. gear (Magnetic Airborne Detection). Unfortunately, the landing gear components are not included, and the kit, when placed on the stand supplied, has to be exhibited "clean." The windows need careful positioning to avoid cement being smeared on them, but the kit in general is easy to construct. The wingspan is 15¼ inches.









Airfix OO/HO Scale Figure Sets. Commandos and Royal Horse Artillery. Price 2s. 6d. each

The Commandos set contains 36 figures, two ladders and a two-part canoe. Moulded in olive green polythene, each figure comes complete on a base and they only have to be washed in detergent before painting. Contact type adhesive has to be used to glue them to anything as plastic cement will not adhere to polythene. These figures in action poses are just the right size for railway layouts or table top battles. The Royal Horse Artillery outfit includes 14 figures, six horses, two cannons and a limber, all in 33 scale pieces, all very cleanly moulded.

Humbrol Authentic Camouflage Colour Packs. 9/6 per pack

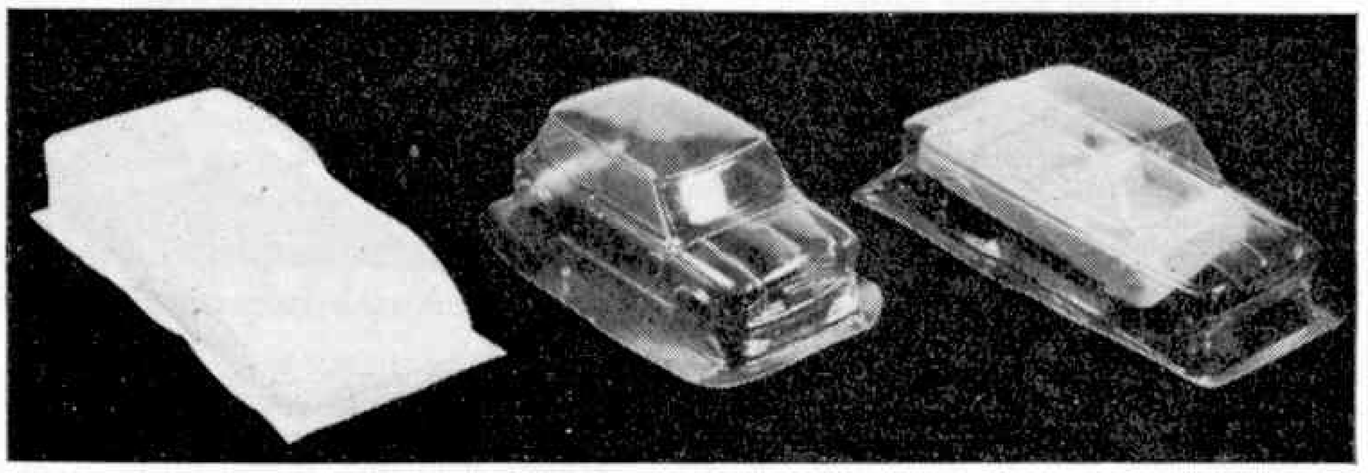
Aeromodellers and wargamers who are sticklers for accuracy will be delighted with the latest range of enamels from Humbrol. Each kit of six tinlets contains authentic camouflage colours for a particular subject. Humbrol have put a great deal of research into the production of these colours, and the shades are identical to the original. The finish is matt, of course, and the paint will dry in three minutes without showing any brush marks. Even very fine surface detail remains unobliterated, as the paint covers in a thin film. Kits are obtainable for the following (six tinlets in each kit): 1, R.A.F. (European); 2, Luftwaffe; 3, U.S.A.F.; 4, Fleet Air Arm; 5, R.A.F. (Overseas); 6, French Air Force; 7, Italian Air Force; 8, Japanese Air Force; 9, U.S.A.F. (Vietnam); 10, Military Vehicles; 11, Military Uniforms; 12, W. War 1 Aircraft.

At right, Trix Express Pacific Locomotive, based on an ex-Bavarian State Railway prototype, runs smoothly and pulls well. Below, six tinlets of paint as contained in the new Humbrol camouflage packs. Twelve packs are available.

Clear Vacuum-formed Car Bodies in 1/24 scale, by Atkinson's Model Car Centre, Swansea. Price 5/- each.

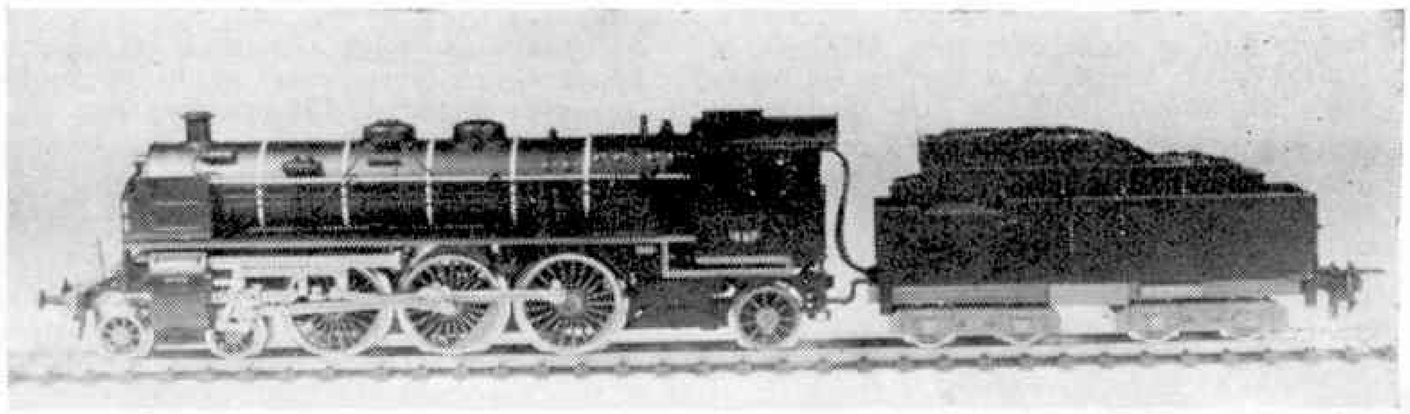
The photograph shows the latest three cars in the Atkinson's range of vacuum-formed body shells for 1/24 scale. They are the Chaparral 2F, the Mini Cooper "S" and the Hillman Imp. Using these shells is a popular and inexpensive method of building your own racer, and they represent very good value for money. The mouldings are sharp and clean and extremely well detailed.

At left, Airfix HO/OO Royal Horse Artillery 33-piece scale figure set. Good value for 2/6d. Below, three of the new "blob" body shells produced by Atkinsons, Model Car Centre, Swansea.



Trix Express Pacific Locomotive. Price £10 18s. 0d.

It is always nice to see new examples of Continental locomotives, and this Trix Pacific, which Messrs. Atkinsons of Swansea have sent us, is no exception to the rule. Modelled on an ex-Bavarian State Railways prototype, this engine is very much better looking (to English eyes) than the usual run of Germanic monsters. Its lines are clean, and the long boiler is not hidden from view with the usual clutter of "gubbins." The whole model is of die-cast metal, and is very heavy, so adhesion is good. The livery is satin black, with red wheels and valve gear and silver boiler bands. The wheels themselves have "see-through" spokes, and the driving wheels are rubber-tyred to aid adhesion. The valve gear is fully working, the various rods being bright metal with red fluting. Current is collected via the wheels of the eight-wheeled bogie tender. The raised details on the body casting of both locomotive and tender are very clear and sharp, but the handrails are free-standing ones of plated wire—much better than cast-on rails. The locomotive runs smoothly and pulls well, as we have come to expect from this manufacturer, and indeed from all Continental model locomotives.

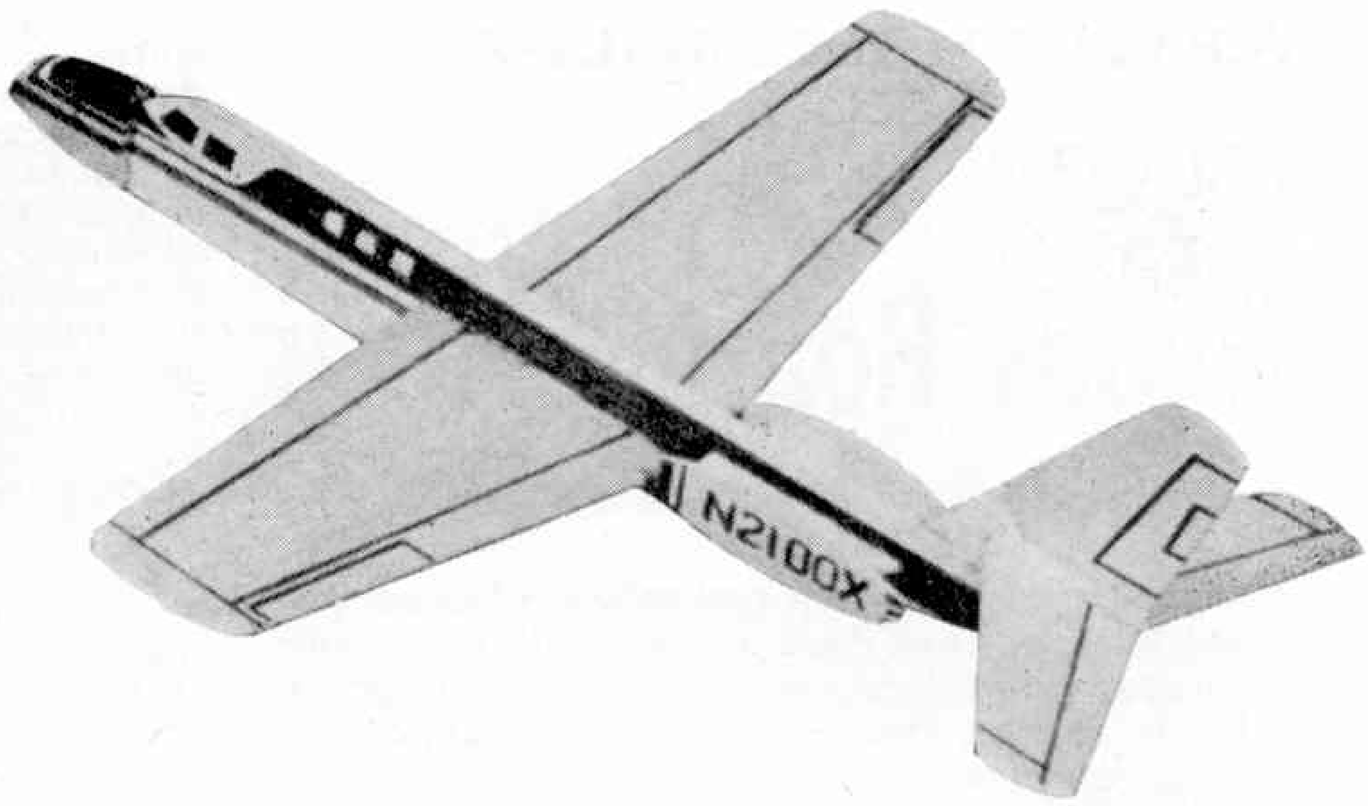


Bib Home Electrician's Kit. Manufactured by Multicore Solders Ltd. Price

This very useful kit includes wire stripper and cutter, small screwdriver, insulating tape, 5 and 15 amp. fuse wire, three flex-shorteners, and match-melting solder. All fit very neatly into a plastic folding wallet, which keeps everything tidy, and handy for immediate use. The wire stripper and cutter is a particularly useful tool, which will successfully strip a variety of different types of flex; it will also *split* extruded flex—a useful point. One of the great advantages of this kit is its portability; it would be very useful for last minute electrical repairs at, say, a model railway exhibition. The solder supplied needs no soldering iron, as a match will melt it. The solder contains its own flux, and enough is supplied in the kit for about 80 average joints.

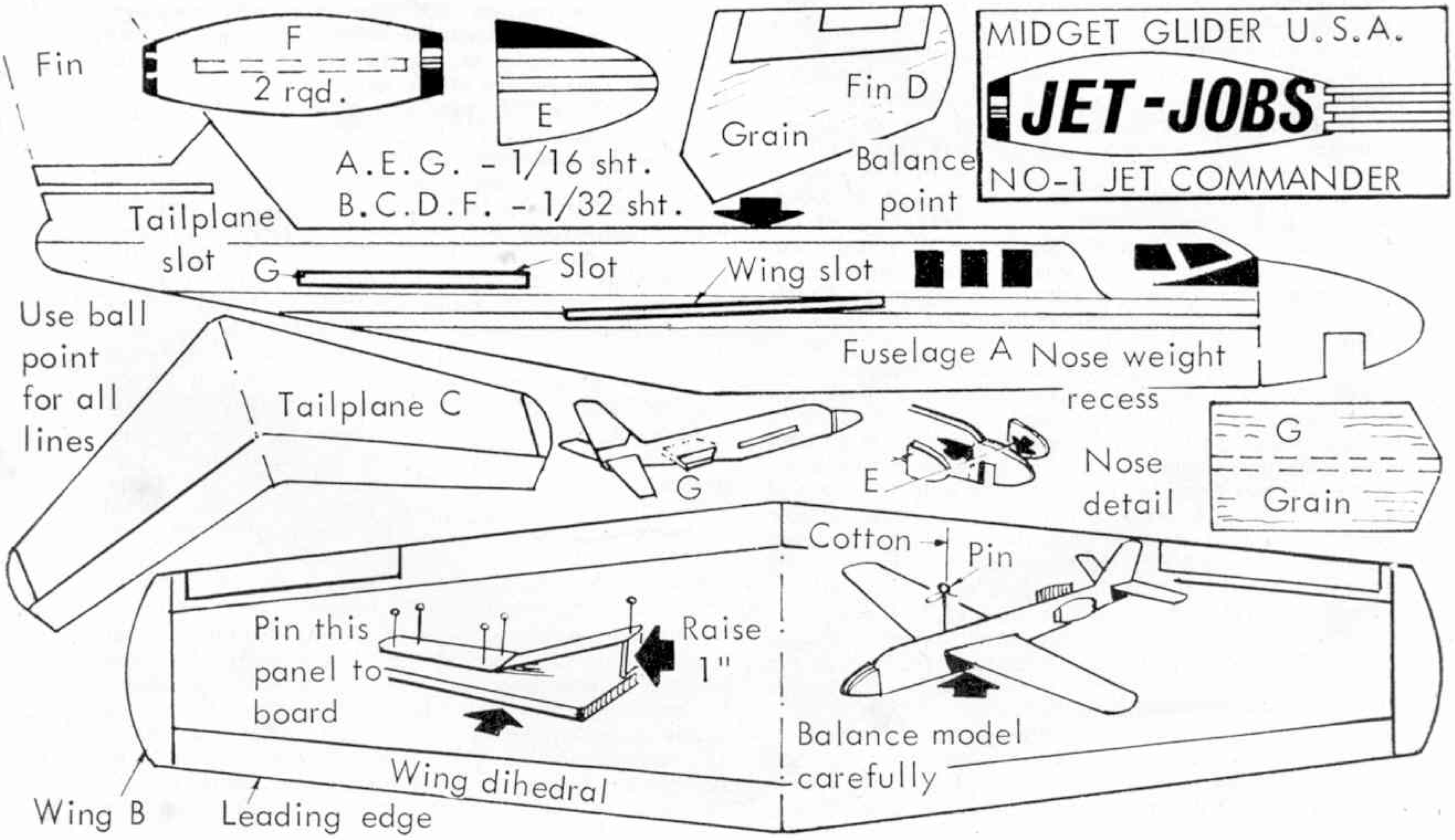
FULL-SIZE MIDGET GLIDER PLAN

The first in a series of simple balsa profile gliders by Meccano Magazine's regular model designer Ray Malmström



No. 1. Jet Commander

THE JET Commander is an American high-speed, executive, jet aeroplane, with handsome lines. It is very fast, cruising at Mach 0.8 (nearly the speed of sound). Our little model is also a fine flier. Start by tracing the parts onto sheet balsa and carefully cutting out. Add the markings and decoration with a ball-point pen. Assemble the parts together, using balsa cement, as shown in the small sketches. When completed, balance the model by pushing a tiny piece of lead or used cement tube into the recess in the nose. Suspend the model as shown, and adjust the amount of nose-weight until the model hangs level. You can now try a test flight. Choose a dead calm day, or preferably a large room or hall. Holding the model beneath the wing, launch smoothly with the nose pointing slightly downwards. If your Jet Commander dives, bend up the rear edges of the tailplane slightly, or remove a little nose-weight. If it climbs steeply and then dives (stalls) add a little more nose-weight. If it turns sharply to right or left, bend up the front edge of the wing near the tip, on the inside of the turn. You will be surprised how much you can learn about a model aeroplane from this "jet-job"!



A.B.C. OF MODEL RAILWAYS

PART FIVE

Goods Rolling Stock

Freight train working on real railways is a complicated business, and there are many different types of wagons and vans, each designed for specific jobs, in use on British Rail. In this article, we introduce some of the more common types of goods rolling stock, and pass on a few hints on operation to the model railway enthusiast.

GOODS TRAINS are very popular with model railway enthusiasts. This is probably because of the tremendous variety of goods rolling stock that is available from the proprietary model railway firms, and the fact that goods trains are more interesting to operate than passenger trains. Let's consider, for a start, the most common types of goods wagons to be seen on our railways.

Until very recently, the standard British open wagon was a four-wheeler, without anything in the way of continuous brakes whatsoever. The various wagons in a goods train were "loose-coupled"; that is to say, they were simply coupled together by loose three-link "chains," and when the couplings were pulled tight, the buffers of adjoining wagons did not touch. Most *Meccano Magazine* readers will have heard such a train slowing down for a signal; the distinctive "clink, clink" of the wagon buffers meeting is now becoming a thing of the past, as more and more goods trains are being fully fitted with the continuous brake, in the same manner as passenger rolling stock (see ABC of Model Railways for March). Because of the absence of continuous brakes on the wagons, these loose-coupled freight trains always had a brake van at the rear. This vehicle combined the duties of guard's van and extra "brake"; the guard himself operated a mechanical screw-brake, which worked upon the wheels of his van only, and helped the locomotive to bring the train to rest. In order to increase the braking efficiency, goods brake vans were always very heavily weighted, with concrete ballast under the floor, and most such vans weighed 20 tons. They make fascinating models, and several types are available in OO scale. Almost always of planked wooden construction, a balcony was provided for the guard either at one end of the vehicle or, more often, at both. The interior contained a coke stove to keep the guard alive on cold winter nights, as steam heating could not be provided from the locomotive in the normal manner, as all the wagons in between were not "piped." Today, the familiar goods brake is fast becoming obsolete; freight trains will soon all have continuous brakes, and the guard will ride in comfort in the rear cab of the train's diesel or electric locomotive.

Perhaps the most common type of wagon to be seen is the open mineral type. Usually seen carrying coal, these wagons are now usually of the all-steel type (very rusty) but some of the old wooden-bodied ones are still seen from time to time. Normally without continuous brakes, there were thousands of these old vehicles creaking around the country until very recent years. Although crude in some respects, they had the advantage of being very easy to repair. If one of the boards of a side became damaged, it was a very simple matter to replace it with another—that can't be done with a steel wagon! Before the war, many large firms owned their own wagons, which were painted in colourful and distinctive liveries. These "Private Owner" wagons make enchanting models; Trix make a good range, and the Peco wagon kits are well known.

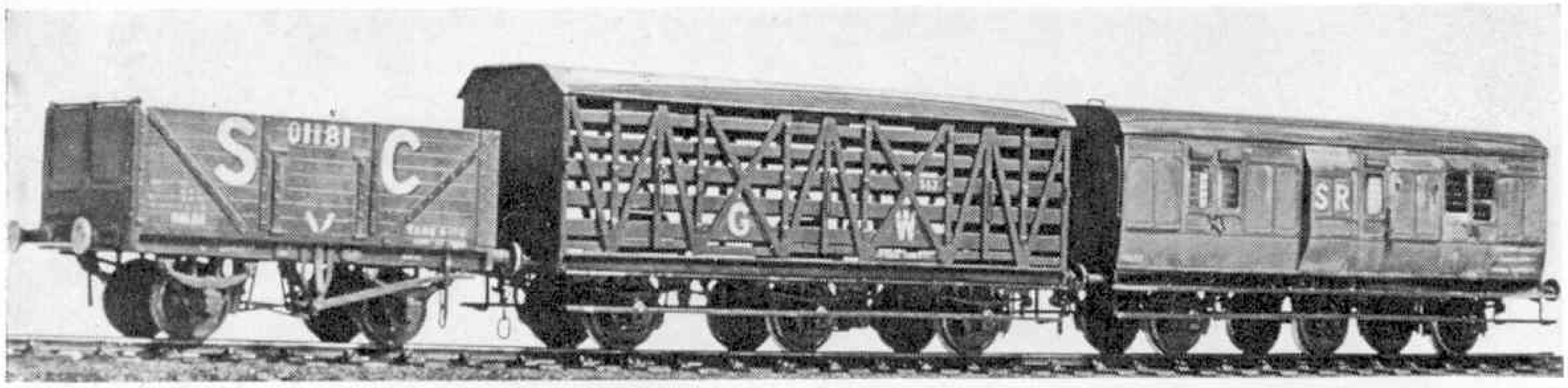
The covered van is probably the next most common type. These were also usually four-wheelers, but often had longer wheelbases than their open counterparts, as they were more often required to run in passenger trains, and consequently had to be able to travel safely at higher speeds. Only vans fitted with continuous brakes, of course, could run with passenger stock. Since Nationalisation in 1948, unbraked stock has been painted grey, while "fitted" vehicles are brown. If you are running a "mixed" branch-line train on your model railway, with a few goods vehicles attached to a passenger train, always be careful to see that your coaches are coupled next to the engine, and the "unbraked" wagons are tacked on to the rear. This is essential in actual practice, of course, as if the unbraked wagons were *between* the locomotive and carriages, the coaches would not be coupled to the continuous brake.

There are very many varieties of closed van. Some are specially adapted for carrying fish, others are insulated for perishable goods, a few are actually refrigerated (for transport of fish fingers, etc.), and some have special suspension for carrying very fragile loads. Cattle-trucks also come into the closed van category, and so do horse boxes. The latter two types nearly always run in complete trains of the same type of vehicle, in conjunction with farm sales, race meetings, etc. However, this need not worry the model railway enthusiast too much as, on the average small layout, a train of four or five of the same type of wagon looks most impressive, and quite as long as a real 20-wagon train appears.

Oil and petrol tank wagons are also usually four-wheeled, although some giant bogie ones have recently entered service with British Rail. They are nearly always brightly coloured, and a complete train of them looks most attractive. Unfortunately, they are really out of place in the ordinary "general" goods yard, as they need specialist unloading equipment and storage tanks. How about a model oil depot? It's not often done. One thing to remember; never run a tank wagon next to a steam locomotive if you can avoid it; it's a fire risk, and is frowned upon in real railway practice.

Many *Meccano Magazine* readers will be aware that the pattern of freight operation has changed a good deal on British Rail in the past year or two. The Freightliners, with their huge silver containers carried on massive bogie wagons, have revolutionised long hauls, and an excellent model of one is available from Tri-ang. Most Freightliner trains do not have a container on every wagon; there are gaps every so often.

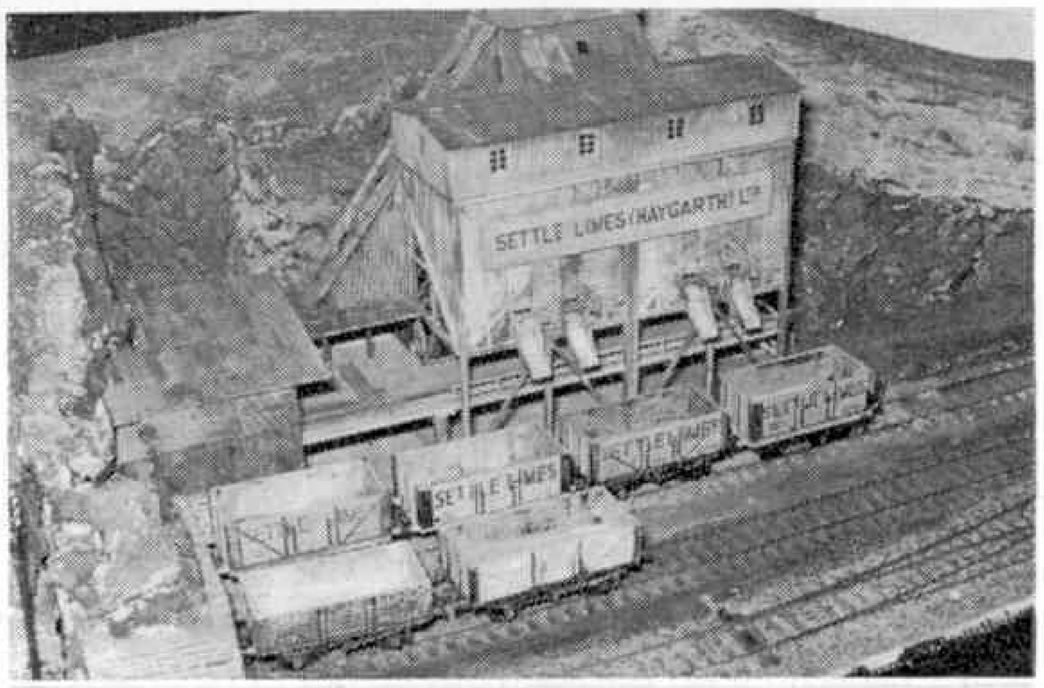
Another feature of modern freight operation is car traffic. This is of two kinds. Firstly, there are trains like the long ones carrying Fords from that company's Liverpool plant, which can be seen every day racing south along Midland Region metals. These, of course, are new cars being delivered the fast way. The other type of car trains are the holiday trains, carrying both cars and their owners who just can't face the long drive

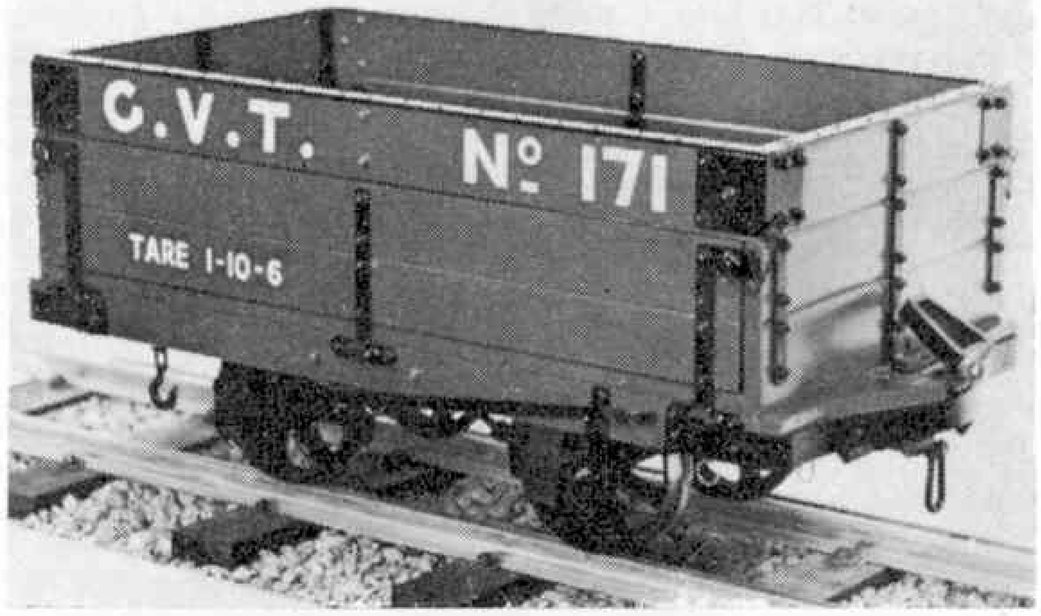


The short train depicted above includes three very different types of freight vehicle. The wagon on the left of the picture is a typical wooden-bodied " Private Owner " mineral wagon, followed by a six-wheeled slatted-slided milk van. The Southern Railway vehicle at the end is really designed to run in passenger trains, carrying milk, newspapers, etc. On the right is a model lime plant, complete with " Private Owners."

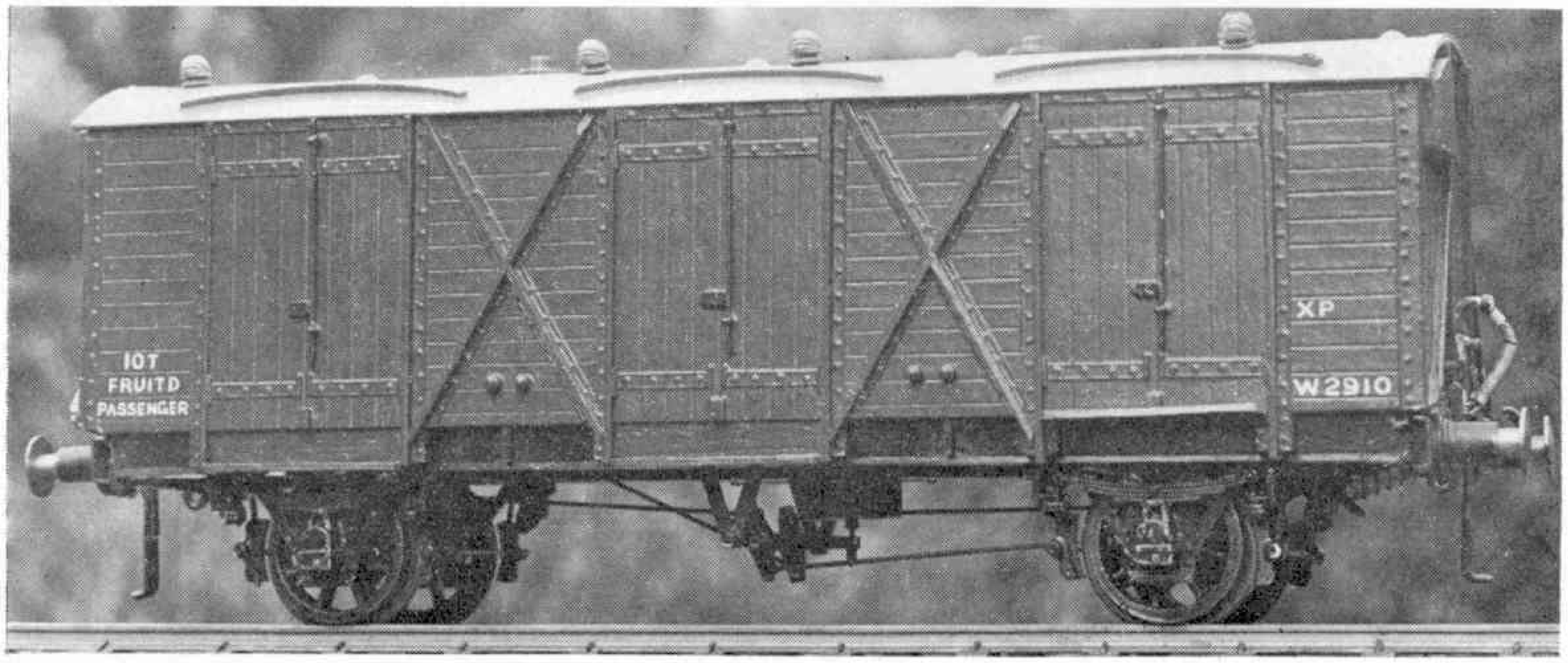
from, say, London to Scotland (who can blame them?). These people just relax in the comfort of a railway carriage, while their car rides on a railway wagon at the rear of the train, probably faster than it has ever been on the road! Such trains are easily represented in model form; a couple of main-line coaches, with two bogie " flats " with cars should look quite impressive.

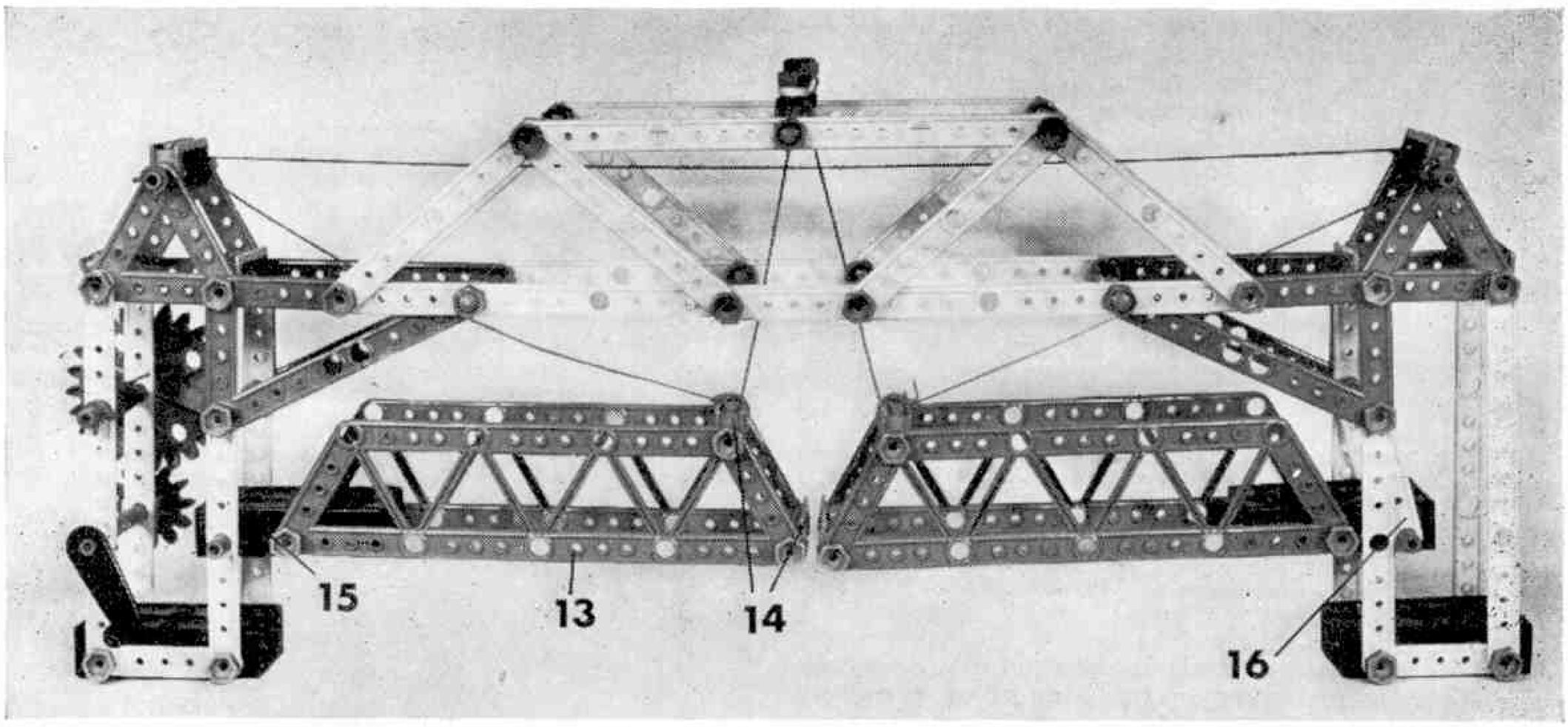
Probably the most interesting goods trains from the modeller's point of view are the " pick-up freights." These trains are becoming less common now that short distance traffic is more often going by road. As the name implies, the pick-up goods train stops at most stations on its route, and either picks up wagons from the goods yard or drops off a couple. This involves quite a bit of shunting at every stop, and the train gets longer as the journey proceeds. All this must be done, of course, without interfering with main-line traffic.





On the right is an unusual model of an unusual open wagon. It belonged to the narrow-gauge Glyn Valley Tramway, in North Wales, and was used for carrying granite from the quarries down to the canal at Chirk. The combined central buffer and coupling is usual narrow-gauge practice. The long-wheelbase van below is typical of a vehicle designed for specialist traffic; it is an ex-Great Western Fruit Van. Th " XP " on the side means that the van is suitable for running in Express Passenger trains.



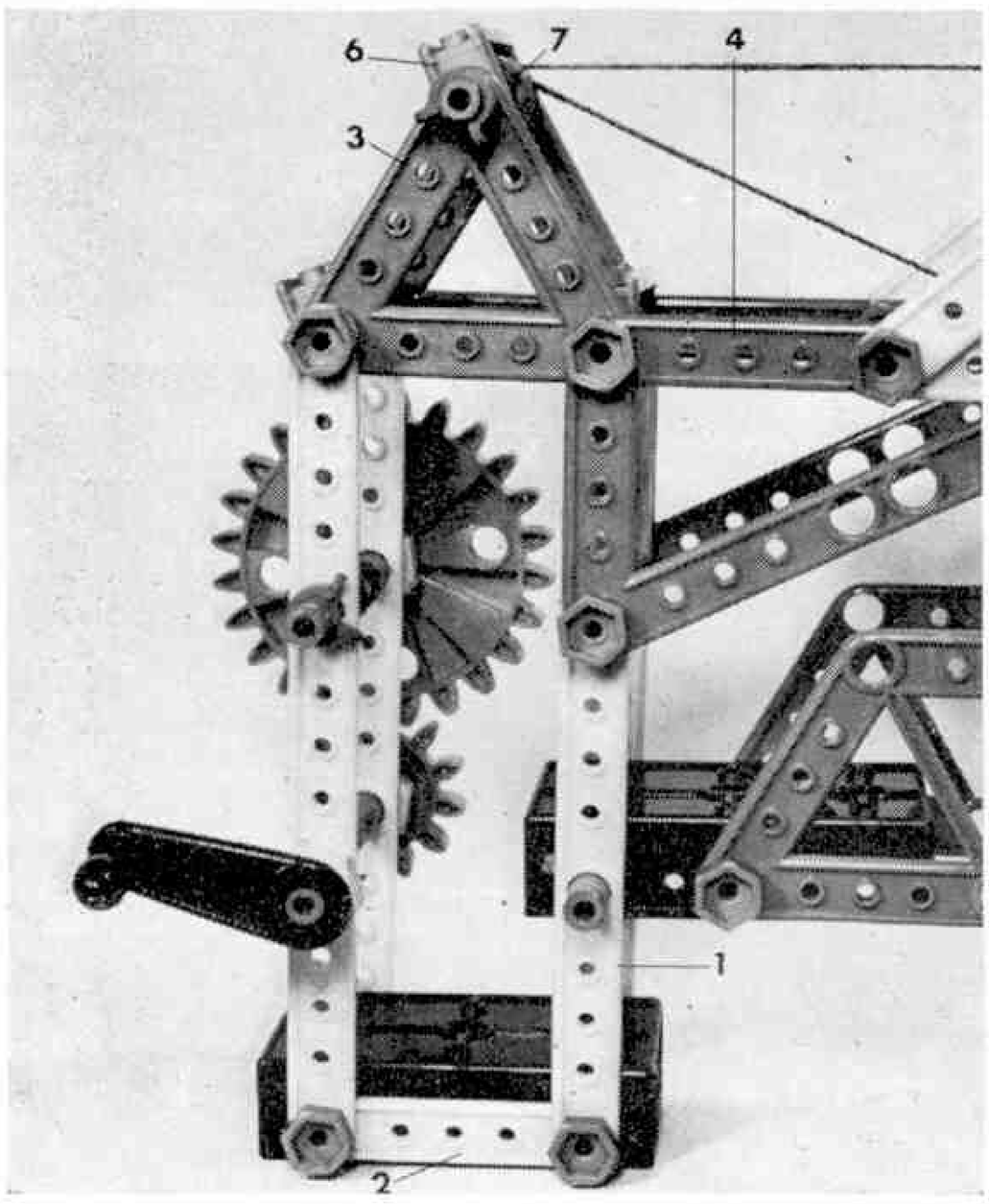


BUILD A BASCULE BRIDGE

by Spanner

A working model that can be built from a Plastic Meccano Set C. Study the operation of a real lifting arm bridge in miniature, easy to construct and operate

BRIDGES—DO you ever think about them? I must admit that I don't often do so and I doubt if many other people do so, either. We tend to take them for granted, yet ever since man learned to travel, bridges have been one of the most essential constructions in existence. You can build as many roads and railways as you like to make travel quick and easy, but unless you have bridges to carry them over natural obstacles such as rivers, gorges, etc., those roads and railways would never take you very far.



Bridges, therefore, are very necessary, particularly in these days of high-speed, long-distance transportation. They are also typical engineering structures and, as such, make excellent subjects for Meccano modellers. In fact, we have featured innumerable bridges of all types in *Meccano Magazine* over the years, but these have all been built with standard metal Meccano—never with the junior Plastic system. I thought it was about time this situation was rectified and so I present the working Bascule Bridge described below. A Bascule Bridge, incidentally, is one which has lifting arms or "bascules" and the example illustrated here can be built with Plastic Meccano Set C.

One of the many good things about Plastic Meccano is that, with it, it is possible to build good, big models which are nonetheless very simple in design and use comparatively few parts. Our bridge is no exception. Two towers are each built up from four 4-hole Strips 1, bolted two to each side of a Base. Note, however, that each pair of Strips is spaced from the Base by a 2-hole Strip 2. Fixed to the top of each pair of Strips is a 2-hole Triangular Girder 3, the inner securing Bolt also holding a 3-hole Triangular Girder 4 in position as well as a Double Angle Strip 5, the latter joining the sides of the tower. A similar Double Angle Strip is held by the outer securing Bolts.

Held by Axle Clips in the apex holes of Triangular Girders 3 is a $4\frac{1}{2}$ in. Axle carrying a Double Angle Strip 6 and, in the case of one of the towers, two Pulley Wheels 7. Only one Pulley Wheel 8 is carried on the Axle in the other tower.

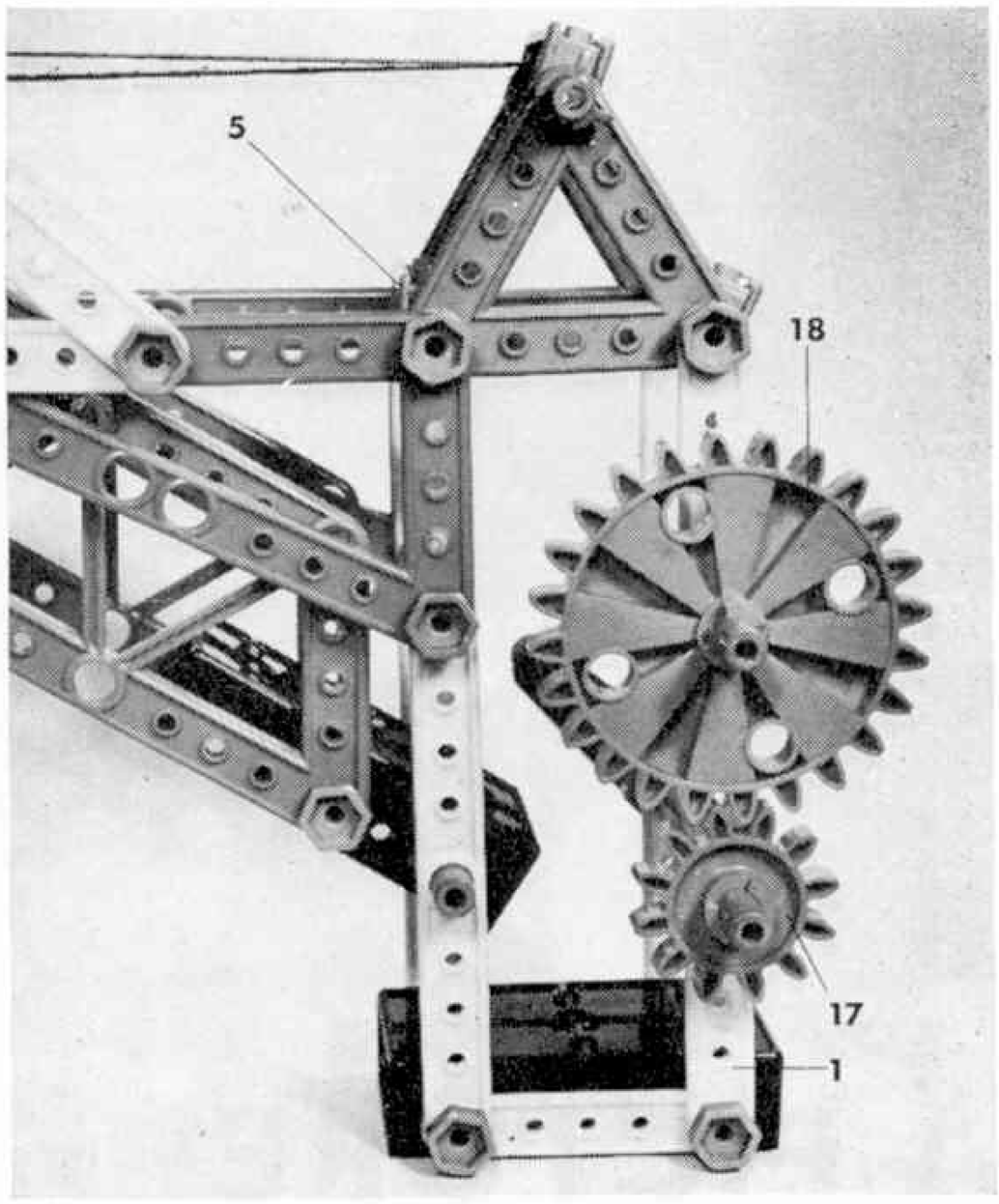
PARTS REQUIRED:

8—2-hole Strips	3—Pulley Wheels
8—3-hole Strips	8—Axle Clips
8—4-hole Strips	4—4½ in. Axles
6—5-hole Strips	4—2-hole Triangular Girders
4—Bases	2—6 in. Axles
49—Bolts	1—Handle
4—1 in. Bolts	1—24-teeth Gear Wheel
51—Nuts	1—12-teeth Gear Wheel
2—Angle Brackets	4—Bridge Girders
10—Double Angle Strips	4—3-hole Triangular Girders

Two special braced girders are now each built up from two 5-hole Strips 9, overlapped two holes and connected to a third 5-hole Strip 10 by four 3-hole Strips 11, positioned as shown in the accompanying pictures. The braced girders are then used to join the towers by being bolted between 3-hole Triangular Girders 4, the braced girders themselves being joined by a 3-hole compound strip 12, obtained from two 2-hole Strips and attached to Strips 10 by Angle Brackets.

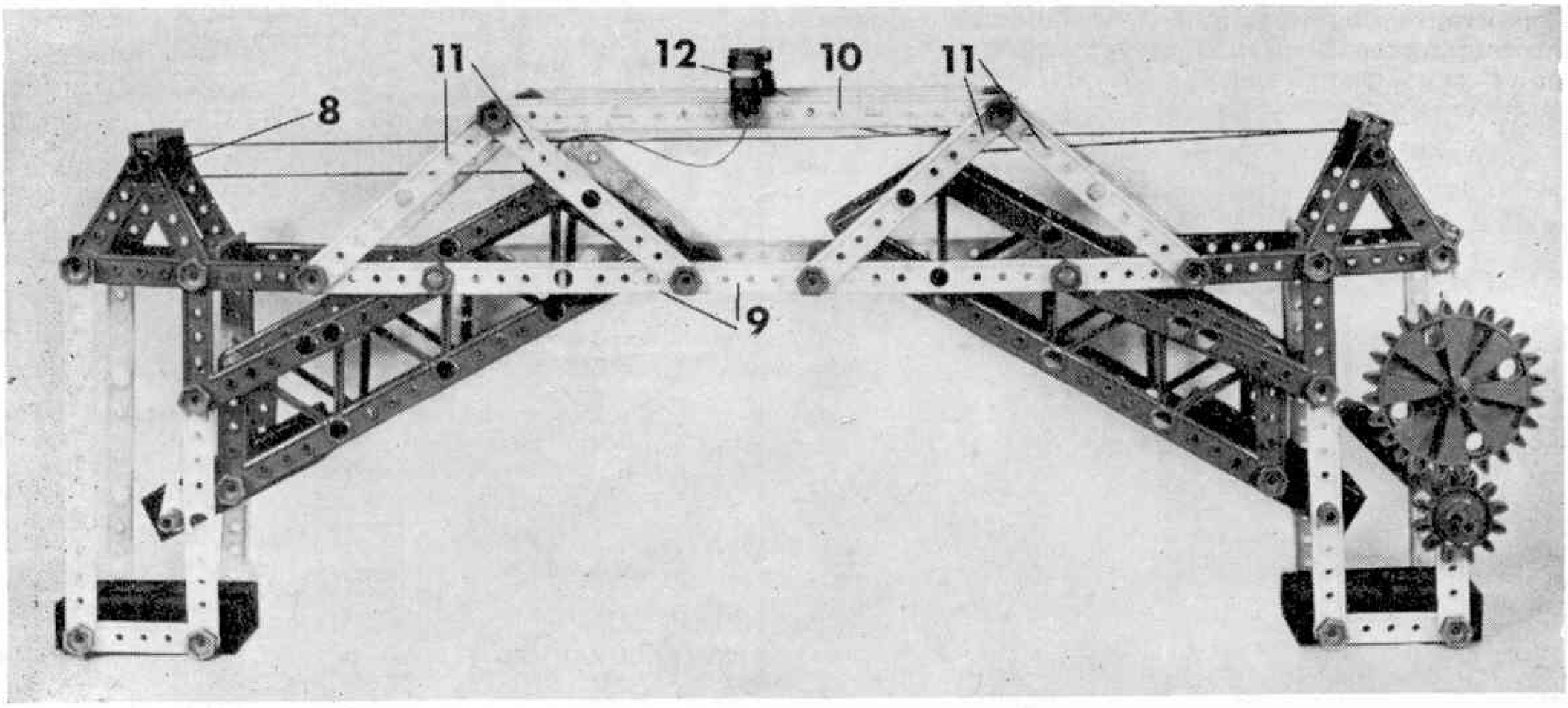
Next we come to the bascules or lifting arms, both of which are similarly and very easily built: two Bridge Girders 13, joined at one end by two Double Angle Strips 14, are bolted to a Base 15—that's all! The actual fitting of the bascules to the main structure, however, requires a little more concentration as the method used differs slightly between the two towers. In one a 4½ in. Axle, held by Axle Clips in Base 15, is journalled in the second holes in inner Strips 1, but, in the other, a similar 4½ in. Axle is journalled in two 2-hole Strips 16 bolted to inner Strips 1. This is to bring the pivot point of the latter bascule backwards a little so that a small gap is left between the bascules, when in the lowered position, to prevent them locking together. Lengths of cord tied to upper Double Angle Strips 14 and compound strip 12 prevent the bascules from dropping past the horizontal lowered position.

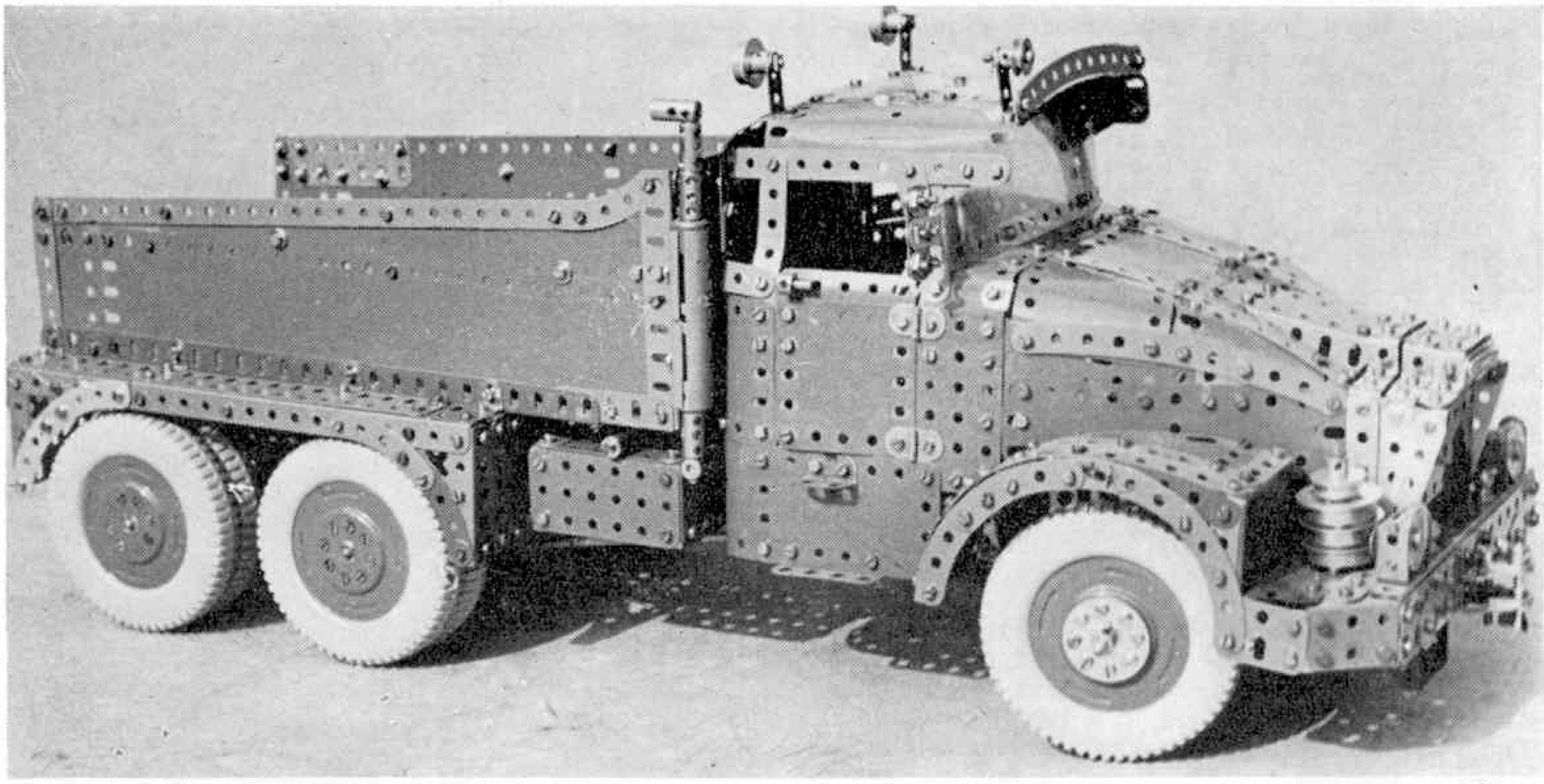
Finally, we have the operating mechanism for the bascules which, again, is very simple. A 6 in. Axle carrying a 12-teeth Gear Wheel 17 and a Handle is mounted in outer Strips 1 of one of the towers. Gear Wheel 17 engages with a 24-teeth Gear Wheel 18 on another 6 in. Axle also mounted in outer Strips 1. Attached to this latter Axle are two lengths of cord, both of which pass over Pulleys 7 and one being tied directly to upper Double Angle Strip 14 in the nearest bascule. The other cord is taken the full length of the bridge and is passed around Pulley Wheel 8 before being tied to the upper Double Angle Strip in the remaining bascule. It is important to remember, by the way, that, if both sections of the bridge are to open together, the lengths of the cords must be such that both cords tighten at exactly the same time, not one before the other.



The two close-up views of the " control " tower show its simple but adequate construction. Note the Gear Wheels used to transfer the drive from the Handle axle to the winding drum axle.

Below, and at top of opposite page. This model Bridge has lifting bascules or arms controlled by a Handle built into one of the towers. You can construct this with Plastic Meccano Set C.

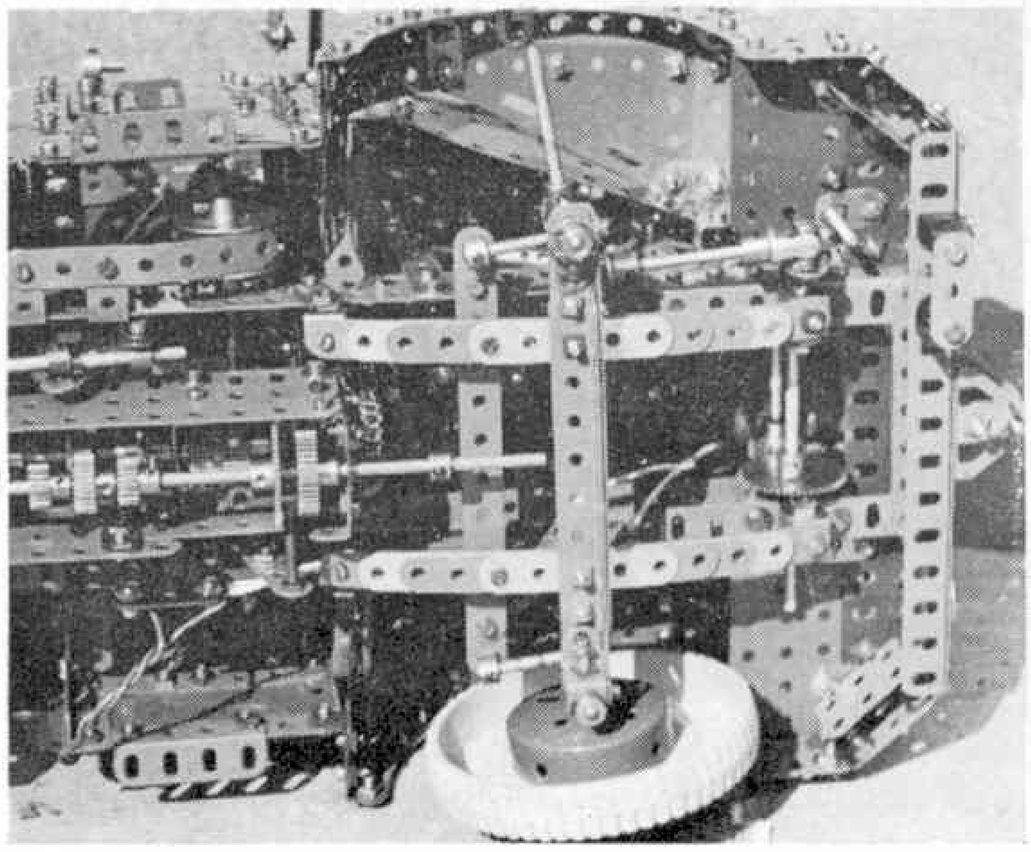




A PICTURE OF POWER

Meccano Magazine reader P. W. BRADLEY describes the main features of his self-designed model, based on the Scammel "Contractor" heavy tractor.

MAN HAS a disturbing habit of biting off more than he can chew, and I had this thought very much in mind when I set myself the task of reproducing in Meccano one of the most powerful vehicles on Britain's roads today. It was, I knew, an ambitious project. The very complexity of the prototype would require the use of an enormous number as well as variety of parts and, of course, any detailed model of a complicated vehicle must automatically be complicated itself. Yet, in spite of this, the model had to be "driven" realistically by quite young children and so over-complexity of the mechanical features had to be avoided. Comparative simplicity, in fact, was essential—despite intricate mechanisms such as constant-mesh gearbox with "gate" change and Bowden cable-operated brakes



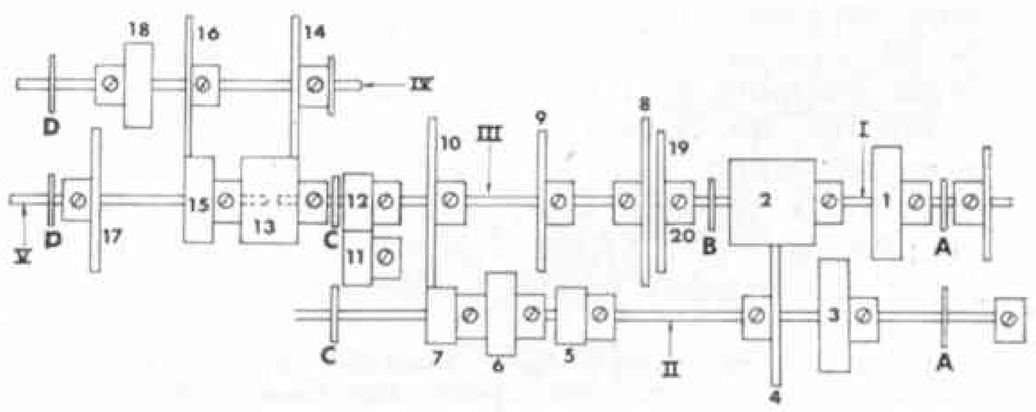


DIAGRAM OF GEARBOX
(8 Forward, 2 Reverse Speeds)

Nos. ON DIAGRAM	PART No.	SHAFTS
19	24	I (not sliding) Journalled A and B.
6,15,18	25	II (sliding) Journalled A and C.
13	25a	III (not sliding) Journalled C and in Wheel Disc bolted to Gear 8 and running on Shaft 1.
2	25b	
5,7,11,12	26	
4,9,14,16,17	27	IV (sliding) Journalled C and D.
8,10	27a	V (not sliding) Journalled D and in bore of Pinion 13 on Shaft III.
1,3	31	
20	59	

A, B, C and D represent bearings in which Shafts are journalled.

SUMMARY OF GEAR RATIOS

PRIMARY DRIVE
(Shaft I to III via II)

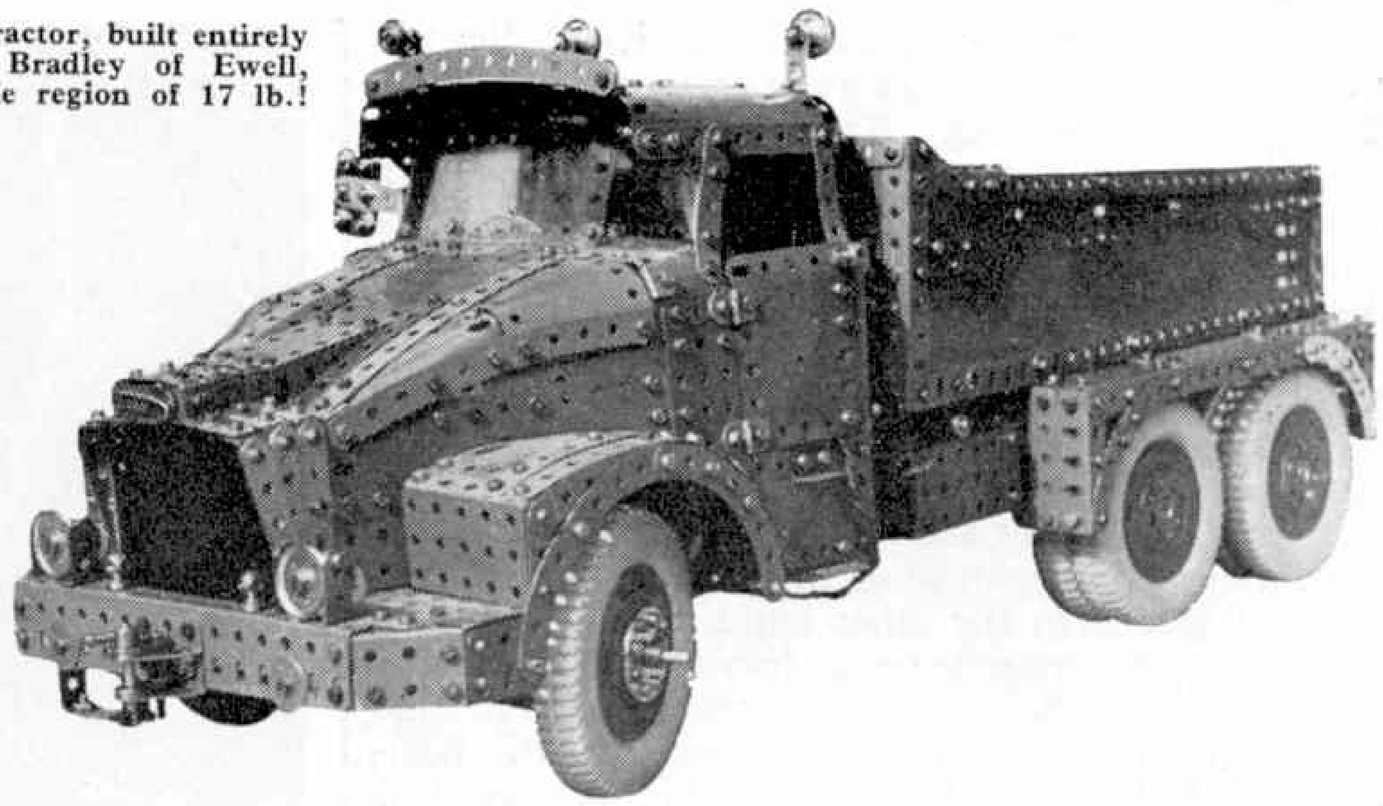
Position of Shaft	Gears in mesh	Direction and ratio
1 (rearmost)	2,4,7,11,12	2:1 reverse
2 (as drawn)	2,4,7,10	6:1 forward
3	2,4,6,9	4:1 forward
4	1,3,6,9	2:1 forward
5 (foremost)	1,3,5,8	3:1 forward

SECONDARY DRIVE
(Shaft III to V via IV)

Position of shaft	Gears in mesh	Ratio
Rearmost	13,14,17,18	4:1
Foremost (as drawn)	13,14,15,16	1:1

OVERALL RATIOS—Forward: 24, 16, 12, 8, 6, 4, 3 and 2:1. Reverse: 8 and 2:1.

A Scammell " Contractor " heavy haulage tractor, built entirely from current Meccano parts by P. W. Bradley of Ewell, Epsom, Surrey. It weighs something in the region of 17 lb.!



being perfectly feasible in Meccano.

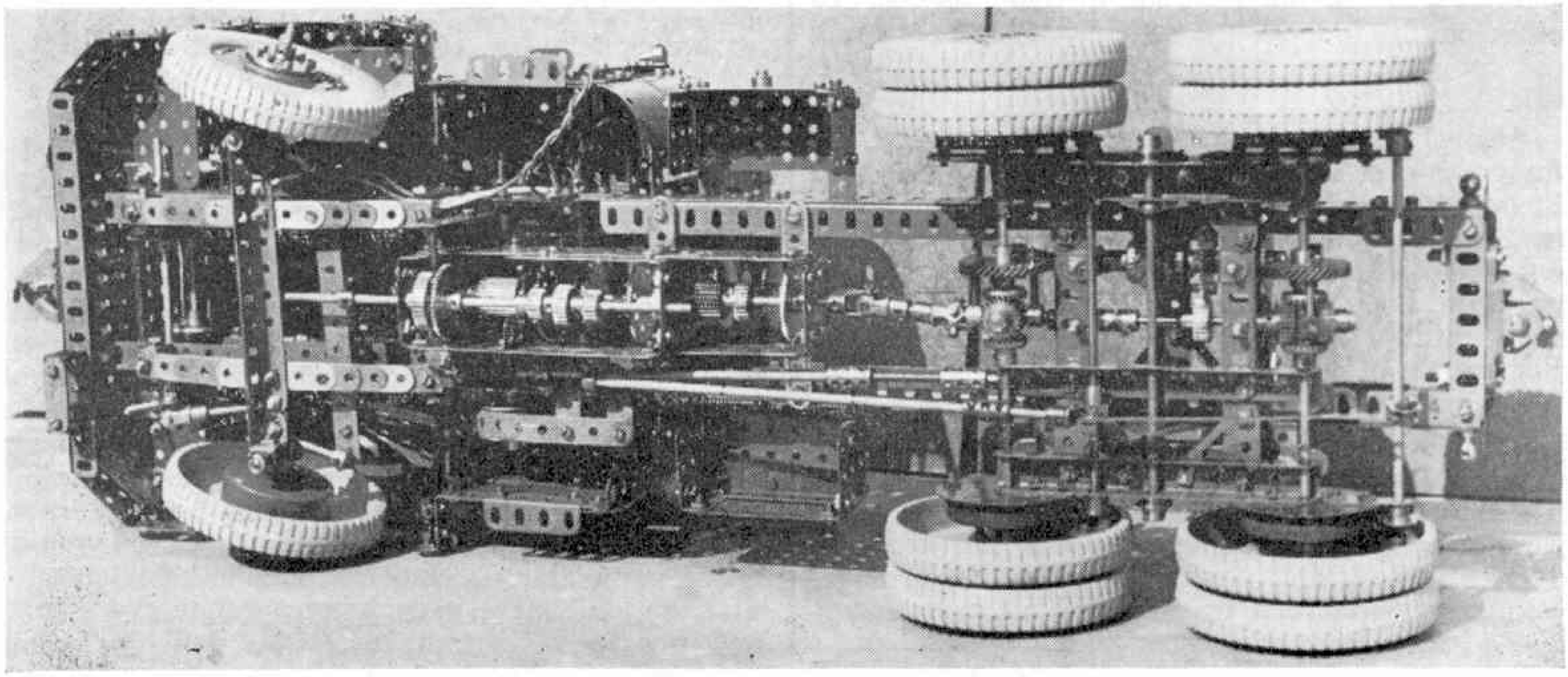
Problems, I felt sure, would arise, but nothing ventured, nothing gained, so I started work. Surprisingly, problems were few and easily overcome and, in due course, the working Scammell " Contractor " shown in the accompanying photographs took shape, was improved and was finally completed.

Two 26½ in. compound channel girders, with a 1 × ½ in. cross-section, serve as the mainframe side-members. Several cross-members keep them rigidly connected, one being a particularly heavy-duty example to take the drawbar coupling. The steering gear is shown in one of the photographs, from which it can be seen that the Couplings carrying the stub axles have the steering " king pin " rods passed through their central transverse bores. Carried in the inner end transverse bores of the same Couplings are short rods to which a compound strip, forming the track rod, is pivotally connected, as shown. Consequently, the distance betwen these pivots is half an inch less (¼ in. each side) than the distance between the king pins, thus giving correct Ackermann steering, where the angle of the inner wheel exceeds that of the outer wheel, when cornering, to an extent proportional to the turning circle.

Ackermann steering in this Meccano form first appeared in the M.M. in 1928, and in the ensuing 40 years I have used it many times. The same effect can, in theory, be achieved by securing Cranks to the king pin rods at an appropriate angle, but in a heavy model there is always a risk of their slipping. The 40-year-old idea used here, however, is absolutely positive.

In Meccano models of motor vehicles, it is usual to gear the steering column to the horizontal (drop-arm) Rod by means of contrate, bevel, helical or worm gearing. While all these methods are perfectly adequate in most cases, it is true to say that the realism of the final steering ratio can leave something to be desired. With any of the first three examples, one turn or less of the steering wheel moves the road wheels from lock to lock. In the case of worm drive, too many turns are necessary and the drive, as you will know, is completely irreversible, resulting in no " steering feel." Realistic driving in the Scammell was insisted upon from the beginning and it was achieved by first using a ½ in. Pinion and a 50-teeth Contrate Wheel, as shown. From the Rod carrying the Contrate, the movement is transferred to the drop-arm shaft below by 3 : 1 ratio gearing using a ½ in. Pinion and a 57-teeth Gear Wheel. The final steering ratio is perfectly acceptable.

Below, an underside view of the Scammell showing the steering gear, gearbox, three differentials and other details. At left, a close-up view of the front suspension and steering gear. Note that one road wheel has been removed to show the stub axle.



Motive power is supplied by an E15R Electric Motor connected to the gearbox by worm and chain drives, as can be seen. The gearbox arrangement itself is shown in the accompanying drawing and, as on the prototype, incorporates eight forward and two reverse speeds. I must admit, though, that the design is not wholly original, being a development of a four-speed box featured in the November 1951 M.M., and it has certain disadvantages. One is that the second and third ratios in the primary box are out of sequence and another, always very difficult to overcome, is that the reverse ratio is the same as top forward gear instead of being equivalent to first forward gear. On the other hand, this design does give a smooth progression of forward ratios, and is certainly not difficult to make, particularly in that it does not demand extreme accuracy in the positioning of the Gear Wheels and Pinions on their Rods.

In some ways the hind bogie was the most interesting part of the model as it includes—like the original—a third (inter-axle) differential mechanism which can be locked from the cab. All three differentials are built up in the usual way from ¾ in. Pinions and ¾ in. Contrate Wheels, as described in the Motor Chassis article in last month's issue. The inter-axle unit, however, is built onto a drilled 50-teeth Gear and is offset 1 in. towards one side of the lorry so that the input shaft carrying its driving ¾ in. Pinion is central. Its two output shafts carry ½ in. Helical Gears which engage drilled 1½ in. Helical Gears onto which the main axle differentials are built.

The above-mentioned locking mechanism for the inter-axle differential necessitated the fitting of a 50-teeth Gear Wheel to its rear output shaft in addition to the 1½ in. Helical Gear. The input shaft alongside this 50-teeth Gear is extended rearwards by a Keyway Rod to which a ¾ in. Pinion is Key-bolted. This Pinion is free to slide on the Rod, being controlled by a built-up fork actuated through rodding from the cab, and when in mesh with the Gear, it causes the differential planetary Pinions and one output shaft to rotate as one. In other words, it locks the differential, transforming the complete unit into a normal straight-through axle.

Also of interest is the brake gear acting on the four rear wheels. Each shoe consists of several 3 in. Stepped Curved Strips bolted together and acting on the inner surface of the rim of the corresponding 4¼ in. Road Wheel. This gives a much more powerful braking effect than is possible with the usual "small area" brake shoes acting in Wheel Flanges.

Finally, some of those enthusiasts who have enjoyed the Meccano hobby since the Twenties say that the system is "not what it used to be." I do not share this view, even though certain pre-war parts are inevitably mourned. For instance, the differential lock and powerful brakes of this model would not have been feasible without parts introduced in comparatively recent years.

LIGHTNING

By E. R. Yarham

Did you know that lightning travels at a speed of 72,000,000 miles an hour, or that the air inside a stroke of lightning may be heated as high as 30,000 degrees? If not, read on.

HERE'S WHY it's no use trying to get away from a "Streak of Greased Lightning," and why there is really no need to bother. The average flash of lightning is two miles long, but takes only one ten-thousandth of a second to travel that distance. This works out to a speed of 72,000,000 m.p.h.; this and many other things are among the findings of a team of South African scientists who made a study of lightning.

Not much hope of outdistancing a lightning flash, then, even if one did get the wind up. Actually there is no need for this, because the average risk works out at one in four million. If you would like to get a clearer idea of the odds of being struck, sit down and make a stroke of a pencil every second, one for a lightning flash. Keep it up for 24

hours a day—and at the end of six weeks you would still be busy. In fact, it would take you seven weeks, all but two days.

Mention of the team of South African scientists is a reminder that more research is going on at the present time into thunderstorms and their attendant phenomenon, lightning, than ever before. There are two reasons for this: lightning interferes with radio, particularly in long-distance communications, and it also causes serious trouble to electrical power undertakings. In a small, highly industrialised and heavily populated country like Britain, these derangements are particularly serious, and British scientists have pioneered two electrical methods of recording flashes. These are now being used in many parts of the world.

Census of lightning flashes are being made in Britain from Scotland down to the south of England from many stations. Similar stations exist abroad in places so widely separated as Ghana and Singapore, Nigeria and the Falklands. In the Italian Alps a lightning observatory has been set up largely financed by power companies, which have suffered serious disruption of services as the result of thunder storms. The World Meteorological Organization is also interested in this research and has encouraged the establishment of observation stations.

In Britain the Thunderstorms Census Organization has been at work for getting on for half a century, since 1924, and has 3,000 observers scattered throughout the country. Some are officials, such as meteorologists, lighthouse keepers, and so on, but the majority (nine out of ten) are amateurs in every walk of life. A number of these have been observing almost from the year the organisation was set up, and the Census receives about 25,000 records annually. Storms in Britain normally reach their peak during the six weeks after the summer solstice; June and July account for one-fifth each of the year's total; May and August for about one-seventh each.

As for other parts of the world, the polar regions are luckier than most latitudes because thunderstorms are unknown there. Take Java, as a contrast. In that island thunder is heard almost daily, at any hour of the day and night. Indeed, the peasants in the fields look up wonderingly if they do not hear rumbling somewhere in the heavens. Parts of South America are almost as bad and South Africa gets up to 100 storms a year. Up-country Nigeria is reckoned to get more lightning than any other territory on earth. A few years back a party of British scienists went there to carry out research relating to the speed, intensity, and other characteristics of lightning.

Lightning is, of course, always being produced somewhere or other in the world. The late Dr. C. E. P. Brooks, of the British Meteorological Office, reckoned that 1,800 storms are in progress at any moment of time. Another estimate is that there occur 6,000 flashes every second, of which 50, perhaps, strike the earth. In this connection it ought to be remembered that storms vary. In some the electrical discharge is from cloud to cloud, in which case electrical installations on the ground are not disturbed, but in others the discharge is from cloud to ground, a different matter.

The study of lightning is a highly scientific task. What happens when a stroke of lightning links the clouds and the earth? To reduce it to fundamentals, Professor Loeb of the University of California, once stated: When a cloud has reached a certain potential, which is built up by raindrops carried up into the heart of a thunder cloud—and which may be hundreds of millions of volts—a cosmic ray particle ionises the air and initiates a "streamer," a path of ions like a fine filament joining cloud to earth.

Along this path the potential wave or "return stroke" of the main lightning flash passes from earth to cloud. This stroke makes a channel, seldom more than an inch in width, but the air inside may be heated to as high as 30,000 degrees. Inevitably it expands explosively, giving rise to thunder. A flash lasts an infinitesimal length of time, a mere 100 millionth or so of a second. It is the persistence of the image on the retina which makes it appear to last longer.

A flash of lightning is probably the greatest concentration of power in nature, and one hard to conceive. One flash was measured by electrical engineers and was estimated to be 1,500 million volts. A flash observed in Illinois, United States, opened up a fissure in the ground 40 ft. long and a foot wide. The bottom was found to be 150 ft. Another time in a southern English county, a flash fused instantaneously and completely two thick wire nails on the top of a post. If done mechanically it would have called for the employment of 5,000 h.p. over a second of time. The lightning did it in not more than 10 millionths of a second.

During a sharp storm, a freak lightning "strike" did extraordinary damage in a Forestry Commission woodland in East Anglia. A Corsican pine was struck, and at the base of the tree was a crater 9 ft. long and 3 ft. across exposing the roots. The earth was disturbed for a distance of nearly 30 ft. from the tree as though the discharge had run along the roots. Other trees were also scarred by lightning and another hole in the ground was found 150 yards from the centre of the incident.

Medical men say four factors are concerned in death from lightning: the direct effect of a current of enormous voltage (1,000 million volts upwards); burning by the flash; what has been described as the "sledge-hammer" effect arising from the intense disturbance of the air in the immediate vicinity of the flash; and the decompression-compression force of the air displaced around the flash.

It is this effect of the blast which is responsible for the victim of lightning who is found without a stitch of clothing—the clothes having been ripped off by the force of the blast. The blast alone, however, may be responsible for death by causing laceration of the lungs.

GREAT ENGINEERS No. 4

ROBERT STEPHENSON

(1803-1859)

by A. W. Neal

ROBERT STEPHENSON was the son of George Stephenson whose feats were described in last month's Great Engineers Series. He received his early education in the village school at Long Benton, and later attended a private school in Newcastle, staying there until he reached the age of 16. He made extensive use of the Newcastle library, taking home books to inform his father and himself about many technical matters. After leaving school he became an apprentice to colliery viewing and between times assisted with the survey of the then proposed Liverpool and Manchester Railway, but his apprenticeship was prematurely curtailed when he entered the University of Edinburgh. In 1823 Robert took part in the management of his father's Firth Street Works, and in the following year went to Venezuela to work on a number of mining projects. When he returned to England, he set about improving the basic locomotive. We have already referred to the celebrated *Rocket* engine and the Rainhill trials in the article on George Stephenson, and Robert's connections with these brought him great fame.

This was at the beginning of the railway era and Robert was appointed engineer-in-chief to the proposed London/Birmingham Railway, engineer to the Warrington/Newton Railway, and that of the line between Leicester and Swannington.

The Leicester and Swannington Railway route ran near " Snibston," where Robert's geological knowledge led him to believe coal seams existed, and after much anxiety and many difficulties, a colliery was opened there.

Much of the London and Birmingham Railway was surveyed by Robert and, after considerable opposition had been overcome, Royal assent to the scheme was obtained in 1833. It then only took five years to construct and open 112 miles of track with eight tunnels!

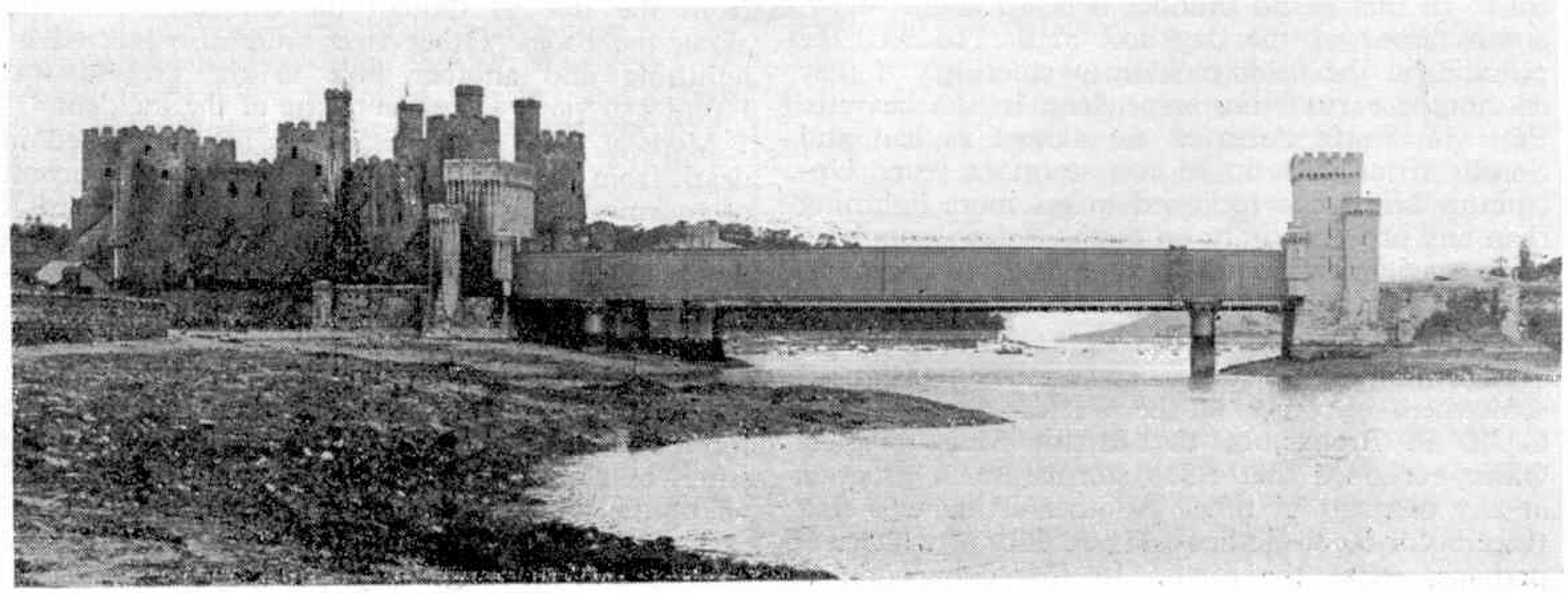
Various other opportunities came the Stephensons' way. In the period 1839-1840 some 321 miles of railway were put down by George Stephenson with Robert taking an active part. Among these projects were the Birmingham and Derby, the Sheffield and Rotherham, the Midland, the York and North Midland, and the Chester and Crewe. Their advice was also sought in France, Switzerland, Italy and elsewhere.

This was the time when railway building escalated into a mania which thrust Robert into a prominent professional position. Never before was there such a need for bridges, and his name will always be identified with many of the most notable. He carried the railway line over a 45 arch viaduct to the river Dee, which was spanned by an iron bridge. Then there was the Conway Tubular Bridge, The Britannia Tubular Bridge over the Menai Strights, the Royal Border Bridge at Berwick-upon-Tweed and the High Level Bridge at Newcastle upon Tyne; but these do not complete the whole list. The drawings of the last mentioned structure were prepared by T. E. Harrison under the direction of Robert, and he publicly acknowledged the value of the services which had been rendered by Harrison in this undertaking. Perhaps his greatest structure is the Victoria Bridge over the St. Lawrence at Montreal. But things did not, by any means, go smoothly, as in May 1847 a grave accident occurred to the Dee Bridge which partially collapsed with a great loss of life.

In the same year he was elected to the House of Commons as the member for Whitby, and when Parliament was dissolved in 1852 he was re-elected to the same seat.

He continued his activities right up to the time of his death in 1859, and was buried by the side of Telford, another Great Engineer, in Westminster Abbey.

One of Robert Stephenson's more decorative bridges, the Conway Tubular Bridge at Conway, North Wales. Photograph by courtesy of British Railways.



Wing mount from 1/8 sht

/16 sht.

Red

Black
Red
Yellow

Cut

Tape

20 s.w.g.

Thin card

Form hook in 20 s.w.g. wire.

Cut brass bush to length

Cut off prop tips. Three straight cuts, then sand tips round.

Insert wire through bush. Slip on a cup washer and prop. Finally bend wire to engage blade.

Assembly Stage 1

Assembly Stage 2

ar
ok
tail

Cut fuselage from sheet

1.1/4"

edge

blade
ted, thus
s cutting

Cut

Cut

All control lines in ball pen.

ading edge

Cement prop bush assembly in nose slot and side pieces.

Assembly Stage 3.

'V' cut

Cuts

Add tailplane and then fin. Note cuts

Wing mount

underside of centre line.

Wing centre line

Tape

Form under carriage wire and cement in place

Wing construction and dihedral detail.

1/2"

Strut positions

Install lubricated rubber motor

Cement wing and struts firmly in place

Assembly Stage 4.

AIR NEWS

by John W. R. Taylor

Who invented the Swing-wing ?

SINCE THE Americans first announced that they intended to fit variable-geometry wings to the F-111 combat aircraft, many different designers have been credited with the invention of the " swing-wing." Some people claim that Dr. Barnes Wallis was first, with his Swallow project, and even go so far as to imply that the United States copied his ideas unfairly. Counter-claims have been made for the American Bell X-5 research aircraft, which flew with a swing-wing in June 1951; but this in turn is sometimes referred to as a copy of the war-time Messerschmitt P.1101, which was taken to America in a partially completed state.

In fact, none of these designs was first. The earliest aeroplane with a swing-wing flew several years before anyone had built a jet-engine that worked, and had a top speed of only 113 m.p.h. It was, however, quite a revolutionary machine, with a tail-less swept-wing lay-out and tandem-wheel undercarriage of the kind that has been re-invented since World War II.

This pioneer swing-wing monoplane, the Westland-Hill Pterodactyl IV, was a three-seat research aircraft powered by a 120 h.p. Gipsy engine. The earlier Pterodactyl I had proved the claim of its designer, Professor G. T. R. Hill, that this rather frightening layout offered excellent stability and control in flight. The more advanced Mark IV version was intended to test the design further before Westland built a Pterodactyl fighter on similar lines.

The awesome appearance of the Pterodactyl IV is shown in the upper photograph on this page, although it should be pointed out that the teeth and talons were non-standard *décor* added for the benefit of visitors to the 1932 R.A.F. Pageant at Hendon. The pilot's flying controls were conventional, operating wingtip elevons and end-plate rudders which worked independently but could be moved together to act as air-brakes.

Less apparent from photographs is that the wings could be swept forward or back in the air or on the ground for trimming, to make possible a wide CG range at all speeds. To permit this, the wings were hinged on a ball-joint at the rear spar. The operating gear consisted simply of a large turnbuckle connecting the front spars at their roots.

It was all rather primitive, and the maximum variation in sweep was only $4\frac{3}{4}$ degrees, but the swing-wing helped to make the Pterodactyl IV surprisingly manoeuvrable. Once pilots had learned to trust it, they did not hesitate to perform aerobatics. The first to attempt a spin, successfully, was Flt. Lt. G. H. Stainforth, soon after he had raised the world speed record beyond 400 m.p.h. for the first time in the far more beautiful Supermarine S.6B Schneider Trophy seaplane.

Westland went on to build a two-seat fighter version of Professor Hill's design, as the Pterodactyl V, with a 650 h.p. Rolls-Royce Goshawk engine. It was a little faster than its conventional contemporary, the Hawker Demon biplane fighter, but the Air Ministry did not consider the improvement sufficient to justify the continued development of such an unorthodox design. So it was a descendant of the Supermarine S.6B, the Spitfire, and not a Pterodactyl which eventually confronted the *Luftwaffe* in the Battle of Britain.

Data (Pterodactyl IV): Span 44 ft. 4 in.; length 19 ft. 6 in.; height 7 ft. 6 in.; wing area 259 sq. ft.; loaded weight 2,100 lb.; maximum speed 113 m.p.h.; service ceiling 17,000 ft.

Cool, man, real cool . . .

Anyone who wandered by accident into the U.S. Air Force Climatic Laboratory, inside a huge hangar at Eglin Air Force Base, Florida, would think he had entered the strange world of science fiction. The first sight to greet him might well be the B-52 Stratofortress bomber illustrated on this page, covered with snow and with icicles hanging from it like a weird Beatle haircut. But he would not have long to work out where he was. The temperature outside might be a sizzling 95 degrees Fahrenheit, but inside the hangar a man could freeze to death in a few minutes unless properly clothed.

The Laboratory is used to discover whether the U.S.A.F.'s latest aircraft, jet-engines, missiles, motor vehicles and components are good enough to withstand the worst kinds of weather they might encounter in service throughout the world. Equipment in the hangar can produce icing, snowstorms, dust and sandstorms, torrential rain, fog, sleet, high humidity, salt-water spray and temperatures as high as 170 degrees Fahrenheit or as low as minus 105 degrees.

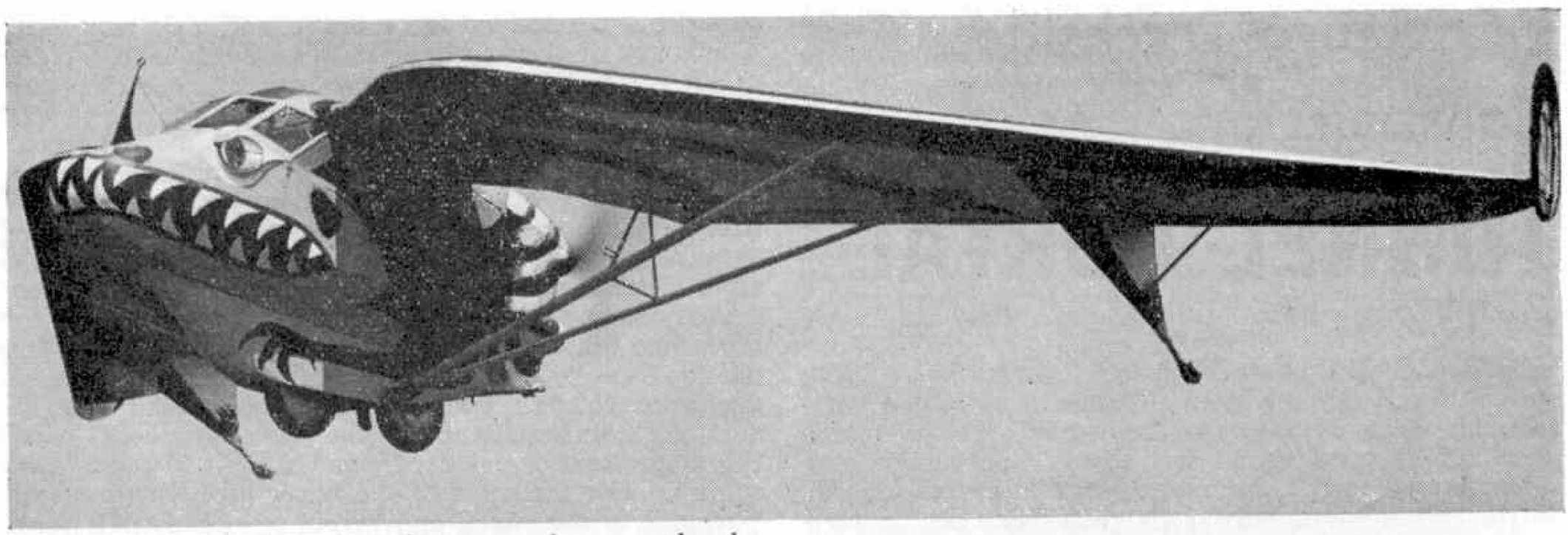
During the twenty years since it was built, more than 270 aircraft of all types, nearly 100 different aero-engines, 70 rockets and their ground equipment, and some 1,500 other items have been subjected to this climatic testing. Extremes of temperature can be supplemented by winds of up to hurricane force. There are two altitude chambers able to simulate atmospheric conditions at any height up to 250,000 ft., and temperatures up to 300 degrees Fahrenheit. In the jungle room, humidity, heat, rainfall and even fungi can be produced to order, and there is a pit which can be flooded with water for checking life rafts and survival equipment.

It sounds quite a place for summer holidays and winter sports if the U.S.A.F. ever runs out of aeroplanes and missiles to test!

Cops in 'copters

Law-breakers in Lakewood, California, will need to brush up their aircraft recognition if they want to escape detection in future, as the local police are now using three Hughes Model 300 light helicopters to work with ground patrols by day and night.

Purchase of the helicopters follows an 18-month experiment in six cities served by the Los Angeles County Sheriff's Department, under the code-name Project Sky Knight. During this time, it was proved that policemen patrolling overhead could reach the scene of any crime within seconds, giving the law-



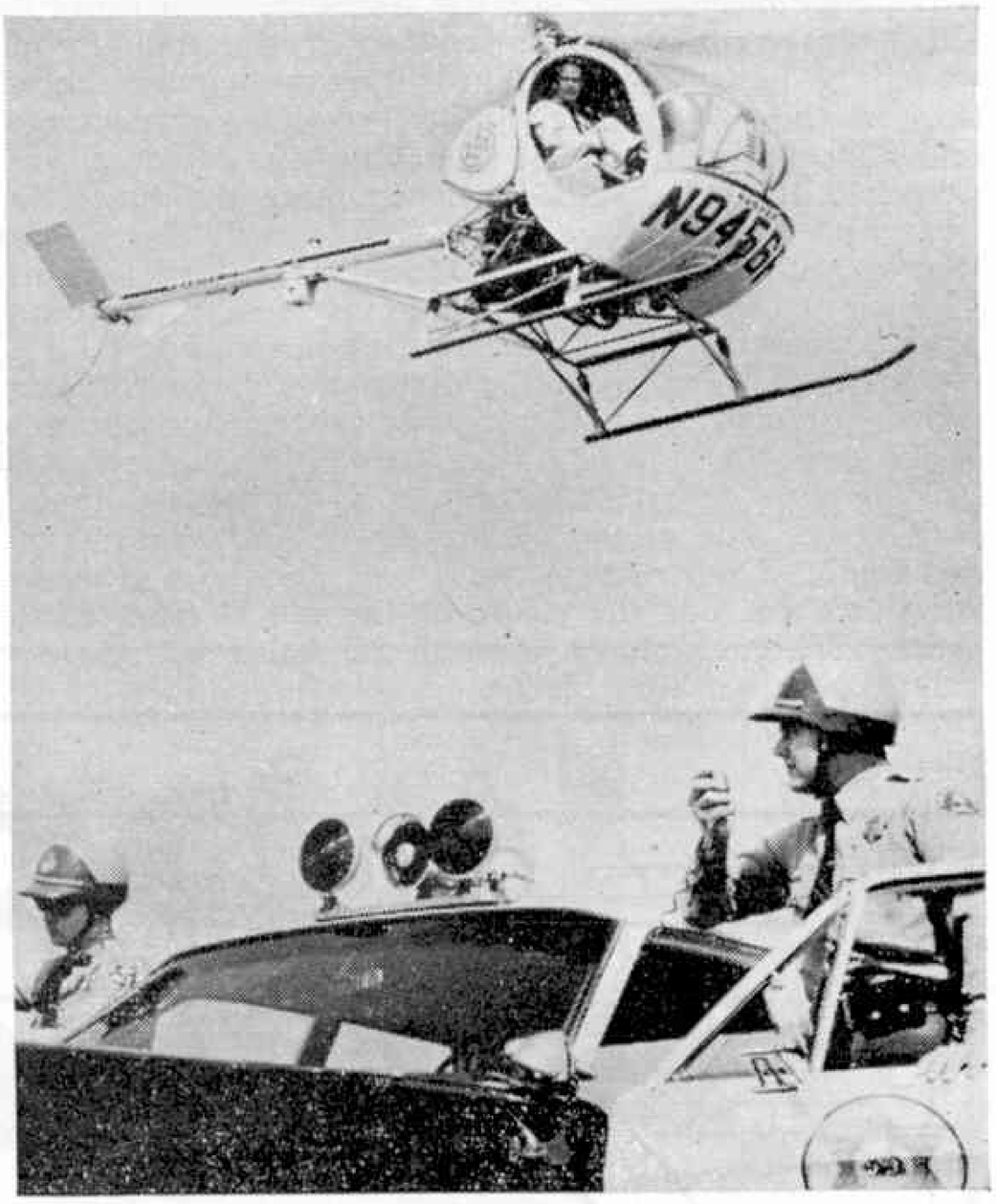
breakers little opportunity of escape. As a result, the crime rate in Lakewood fell by 8 per cent, compared with an increase of 9 per cent throughout America as a whole. Such figures easily justify the cost of the helicopters.

Nine-year-old mechanic

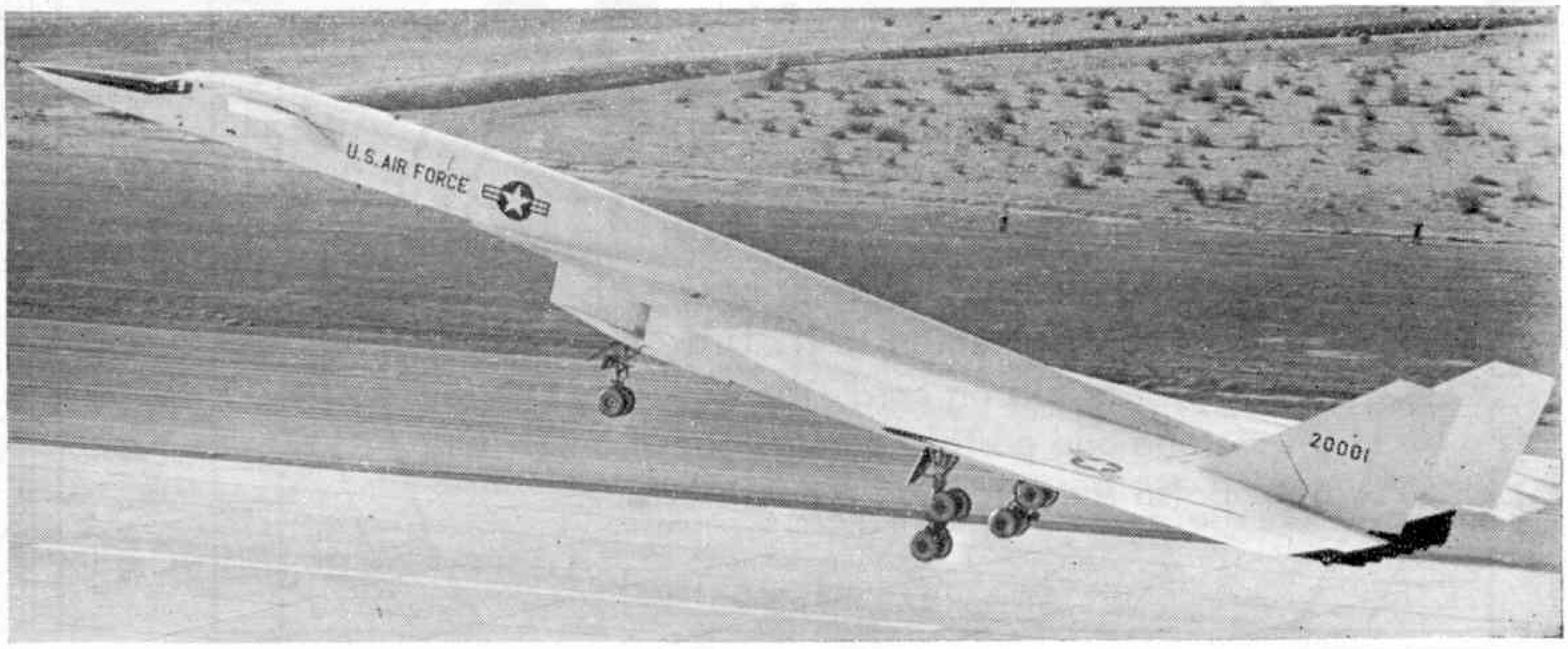
Maintenance staff at the U.S. Marine Air Station at Cherry Point, North Carolina, ran into real trouble when they tried to replace two sets of bolts inside the wing of a Phantom jet fighter after a repair job. They discovered that the only access hole in the wing measured 2½ in. in diameter, which was too small to admit an adult's hand and arm.

After trying to solve the problem for two days, one of the engineers asked his nine-year-old daughter, Marion Bynum, to help. She went to work after a few minutes of instruction and installed the bolts in 15 minutes, as well as connecting the tools needed to tighten them. It was then found that the bolts were too long; so Marion removed them and replaced them with a new pattern. The entire job took her 2½ hours.

Figures released by the U.S. National Aeronautics and Space Administration show that every test flight made by the big North American XB-70A research aircraft costs $800,000.



Above, the amazing variable geometry Westland-Hill Pterodactyl IV, complete with fearsome décor. At right, a Hughes Model 300 light helicopter works with Lakewood police in California. The crime rate in Lakewood fell by 8 per cent compared with an increase of 9 per cent throughout America as a whole since the introduction of these Hughes helicopters.
Below, the gigantic, arrow-like North American XB-70A.



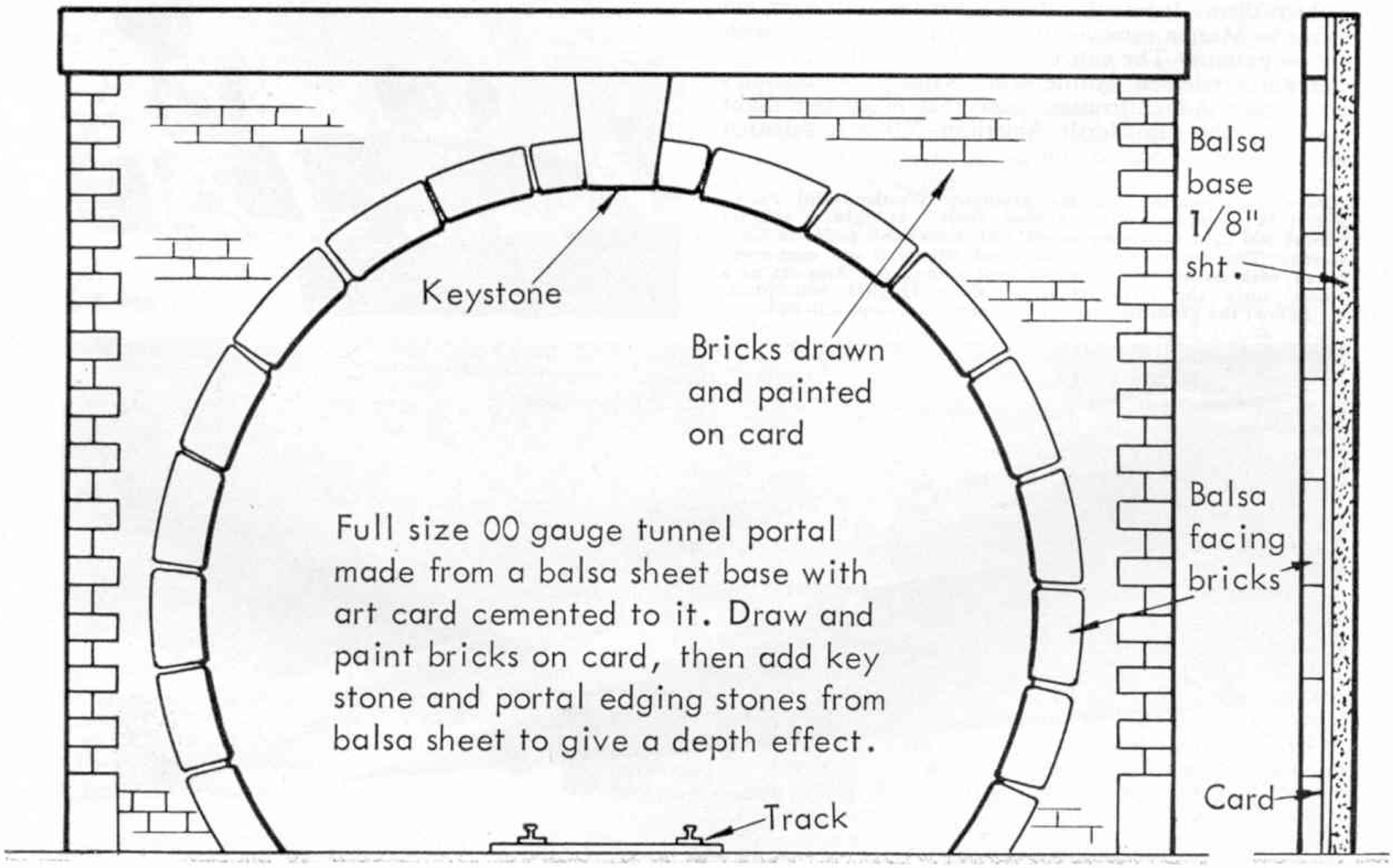
OO Gauge Trackside Construction

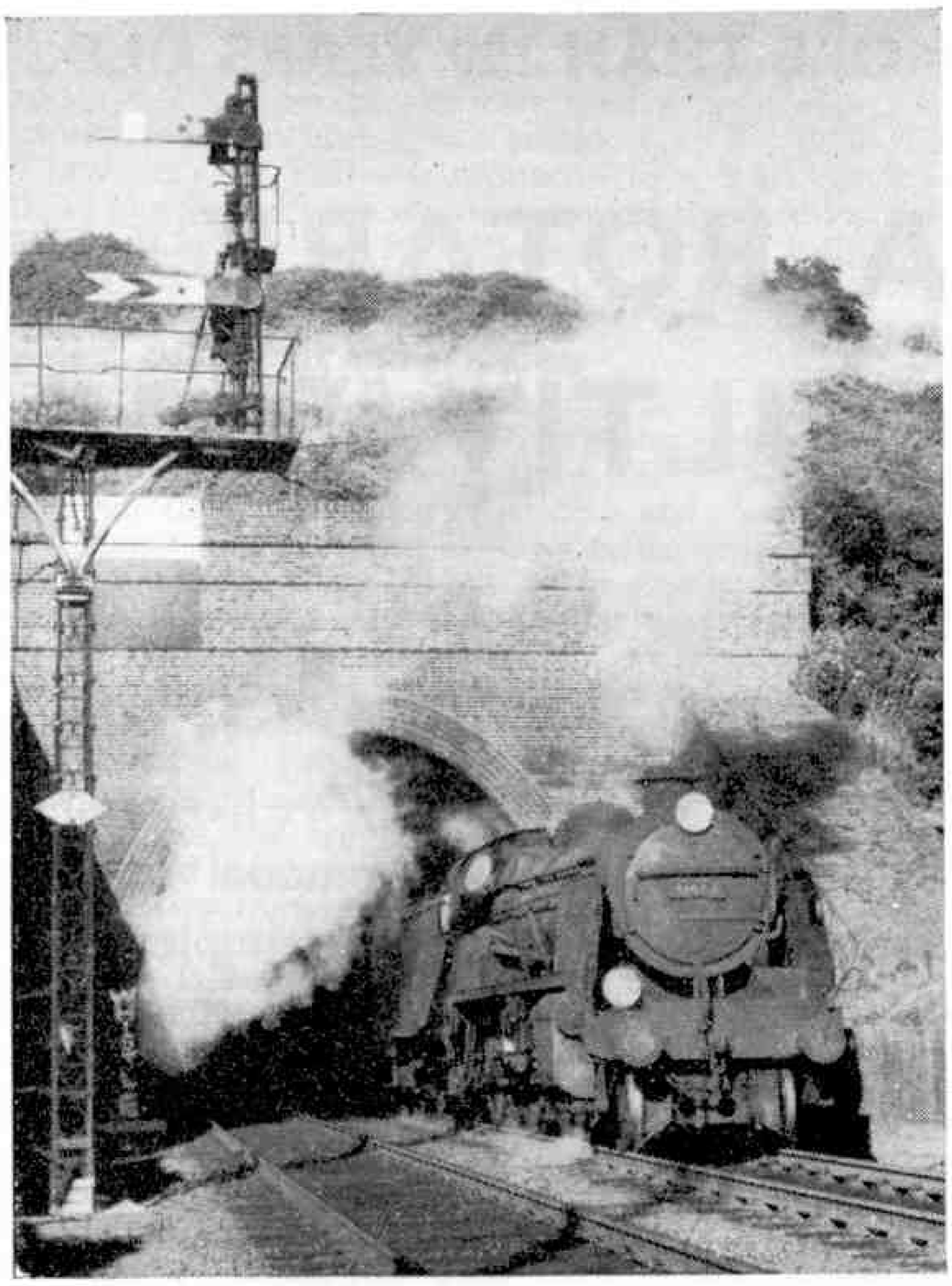
TUNNEL PORTAL

THIS MONTH, our OO gauge "trackside" subject is a very simple one, although it is also a very common sight on railways the world over—a tunnel portal. The word portal just means "entrance" and some tunnel portals are magnificent entrances indeed. In the early days of railways, a great many people were very frightened at the idea of travelling in a train at all, and were even more terrified at the thought of travelling *underground*. The railway engineers knew this, so they designed tunnel portals to look as large and imposing as possible. Sometimes the entrance was disguised to look like a castle or large building. So impressed were the passengers in the early days, that they either quite forgot their fears in the wonderment of it all or decided that if the entrance looked as strong as that, then the tunnel itself must be safe enough!

As can be seen from the pictures and the full-size drawing, our tunnel mouth is very much like thousands which can still be seen up and down the country. Although it is designed for single track, the clearances both at the side of the passing trains and above them are ample. Construction could be carried out in many ways; we cut out the shape of the portal from balsa sheet. We could have covered the balsa with brick-paper, but we decided to be clever, and make our own. The shape of the balsa portal was traced on to a piece of art paper (with a nice smooth finish; ours was the back cover of a motor car catalogue!). The paper was then painted with Humbrol matt "Camouflage" green. Why green? Well, if you look at the average tunnel mouth, usually buried deep in a cutting, you will see that so much green moss is growing in the cracks between the bricks or masonry blocks, that the whole affair has a very distinctive green tinge. We then picked out one or two "bricks" with white, before the green had quite dried. This ensures that the white does not look too "starey," as it tends to take on a little of the green colour. The next stage was to cut out the keystone (the large stone at the top of the arch) from the same sheet of art paper, and stick it in place with cement. The thickness of the paper gives just a slight "relief" to the stone, and makes it look as if it were really a separate fitting. The same thing was done with the ring of stones around the tunnel entrance itself. This done, the long "lintel" along the top of the wall was added.

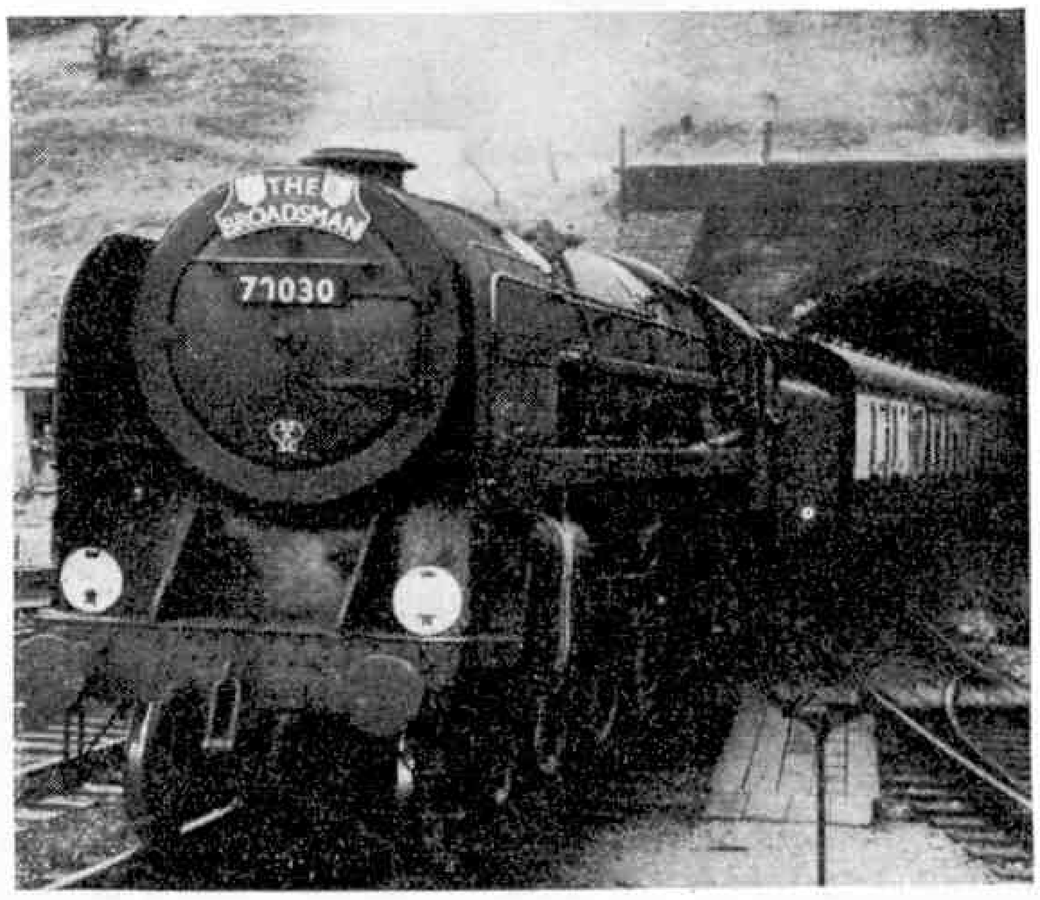
At this stage, it is best to stick your paper facing on to the balsa former. After this, when the whole thing is nice and rigid, the painted "bricks" can be touched up with a ball-point pen or Indian ink. The finished product is only the tunnel portal, of course. A tunnel must have a hill to go through and the construction of a hill from "Mod-Roc" will be the subject of a later article. In fact, the tunnel portal would almost certainly have retaining or "splay" walls on either side of the entrance, to retain the embankments of the cutting on either side of the line. However, we have not shown these in this article, as their application varies a great deal, depending on the contours of the country through which the tunnel is driven.

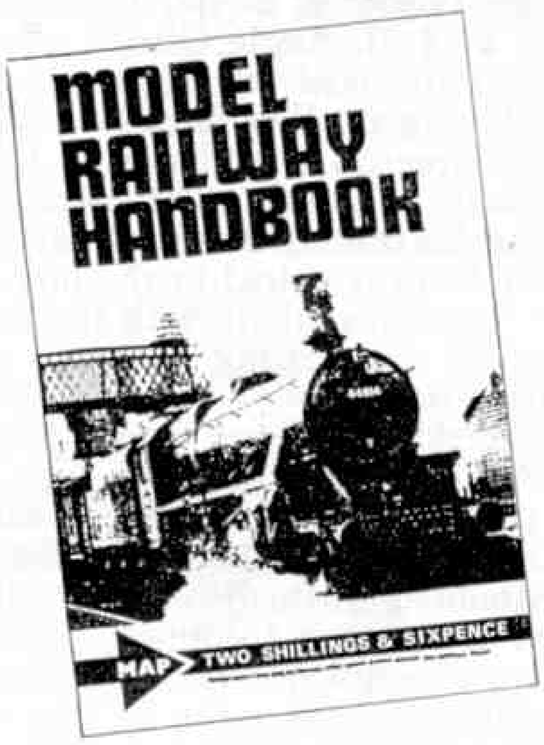




The picture on the left shows a famous tunnel mouth on the Southern Region of British Rail; it is the Martello tunnel at Folkestone and in this picture a Maunsell mixed traffic 2-6-0 is seen emerging.

The tunnel mouth in the picture below is just outside Ipswich station on the Eastern Region. The train is the erstwhile "Broadsman," which used to be the 3.30 p.m. from Liverpool Street. The locomotive is Britannia class No. 70030 "William Wordsworth."





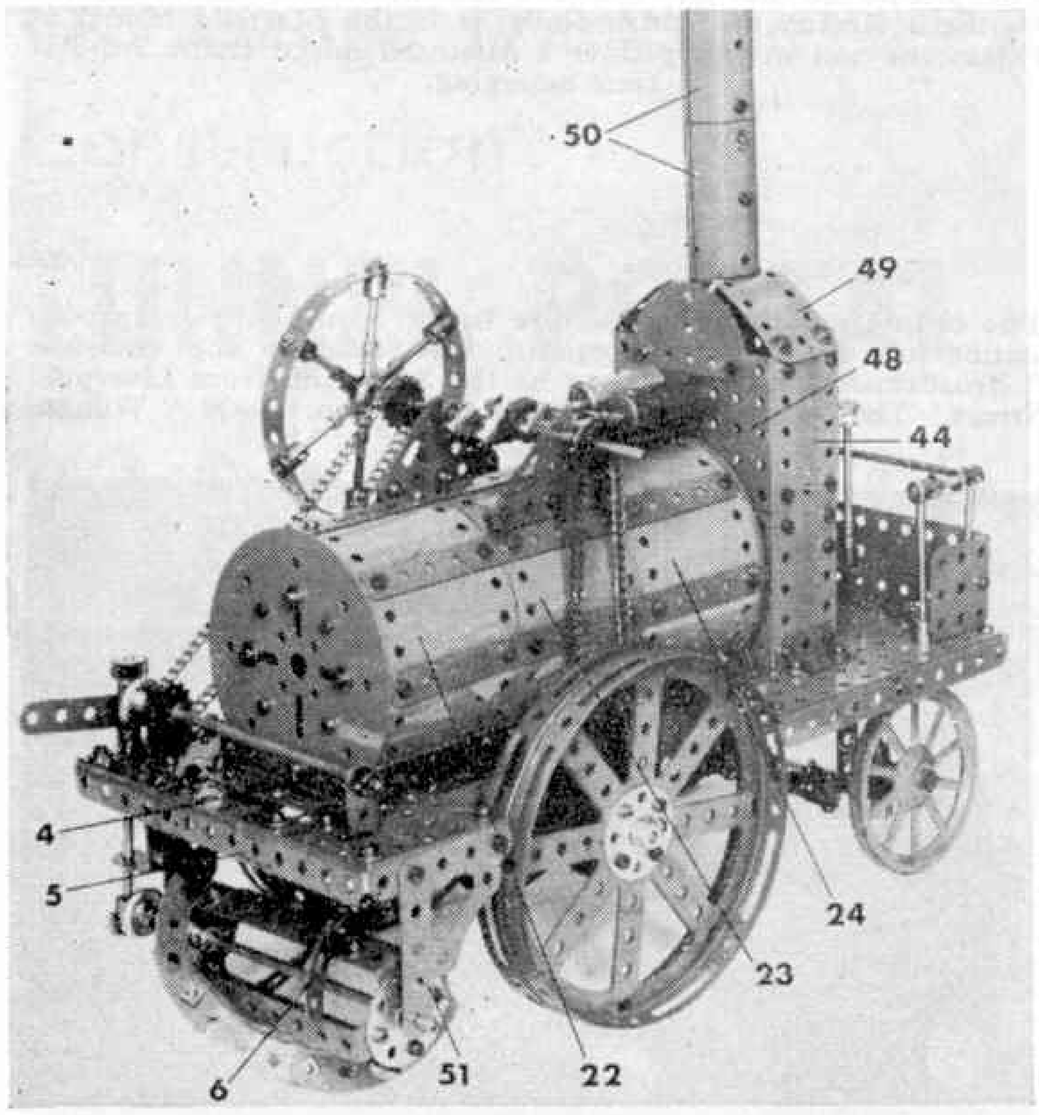
Model Railway News

FREE! MODEL RAILWAY HANDBOOK

Don't miss the MAY issue!!!

A complete guide to railway modelling, this new and revised Handbook will be given away free with the May issue of Model Railway News. Features will include a summary of established standards with dimensional data for all scales from OOO to 1; simple methods of wiring and control for two-rail, three-rail and stud-contact; diagrams of track formations and their uses; practical layout development and operation; Historic and Modern Image modelling; review of recent Trade Developments; lists of Clubs and Manufacturers, in fact a complete run-down on the model railway hobby.

ON SALE FROM: 8th APRIL, 1968



MORE THAN 100 YEARS OLD !

A ROTARY CULTIVATOR

by Spanner

Reaching back into history we have come up with this working model of an ancient steam-powered farm implement, deisgned by the engineer Rickett in 1858

A HUNDRED years ago nearly all work on the rich farmlands of Britain was done either by man or by that proven beast of burden, the horse. Mechanisation as we know it was in its infancy, but, nevertheless, the great engineers of the time were hard at work on machines designed to replace men and horse power with the infinitely greater power of steam. In 1860 the traction engine was introduced and used with considerable success, but even before this, in 1858, Rickett produced a rotary cultivator—an enormous, smoke-belching, steam-hissing monster designed to break up the earth to keep it fresh, soft and "healthy." Despite its awesome appearance, however—guaranteed to scare every horse in sight—it proved reasonably successful and became the forerunner of one of the most useful farm implements in existence today. Our model-builder has reproduced Rickett's cultivator in Meccano, using an Emebo Electric Motor to power the various working movements, and full building instructions are given below.

Chassis and steering

Bolted to each of two 12½ in. Angle Girders 1, at opposite ends, are a 2½ × 2½ in. Flat Plate 2 and a 5½ × 2½ in. Flat Plate 3, the latter projecting a distance of two holes past the end of the Girder. Plates 2 are joined by a 3½ in. Angle Girder 4 and a 6½ in. compound angle girder 5, obtained from two 4½ in. Angle Girders, each Plate also being edged by a 2½ in. Angle Girder 6. Plates 3, in turn, are joined by another 6½ in. compound angle girder 7, a 4½ × 2½ in. Flat Plate 8 and a 3½ in. Angle Girder 9, as shown. Bolted to the tops of Plates 3 is a 5½ in. Angle Girder 10, to the vertical flange of which are fixed two 1½ in. Angle Girders connected by a 5½ × 1½ in. Flexible Plate. The free flange of each 1½ in. Girder is extended by a 1½ × 1½ in. Flat Plate 11, while a Double Bent Strip is bolted to the centre of the horizontal flange of Girder 10. Another Double Bent Strip is bolted to the underside of compound girder 7 and this, along with the first Double Bent Strip, provides the bearing for a 5½ in. Rod 12, forming the steering column.

Now bolted to the underside of Plates 3 and 8 are two 2½ × 1 in. Double Angle Strips, the lower lugs of which are joined by a 4½ in. Strip 13. Fixed to each end of this Strip is a Crank 14, in the boss of which a 1½ in. Rod is secured. Mounted on this Rod, above the Strip are, in order, three Washers, a Coupling 15 and a Collar, the Rod passing through one end transverse smooth bore of the Coupling, which must be free on the Rod. Fixed in the longitudinal bore of the Coupling is another 1½ in. Rod on the end of which a Swivel Bearing 16 is mounted. The Swivel Bearings at each side are joined by a 3 in. Rod.

Lock-nutted to the upper arm of the nearside Swivel Bearing is a 2½ in. Strip 17 which is, in turn, lock-nutted to a 3 in. Strip bolted to a Crank fixed on the lower end of Rod 12. A 1 in. Screwed Rod is then screwed into one end transverse tapped bore of Coupling 15, being prevented from fouling the vertical 1½ in. Rod by a Nut. Loose on the Screwed Rod is a 3 in. Spoked Wheel 18, held in place by two lock-nuts.

Two 2 in. Perforated Slotted Strips 19 are now bolted to each Angle Girder 1 through its thirteenth and seventeeth holes, counting from the forward end. These Strips are brought to a point to provide bearings for a 6½ in. Rod serving as the rear axle. Mounted on

PARTS REQUIRED:

1—1	4—16b	4—55a	4—118
7—1b	6—18a	14—59	4—133
1—2a	4—18b	5—62	2—146a
2—4	2—19a	3—63	2—161
3—5	1—19b	6—63d	2—163
4—6a	1—20	2—70	4—164
2—8	1—23a	2—72	2—165
3—9	4—24	3—74	2—166
4—9a	2—26	1—79a	6—179
2—9b	2—29	1—80	1—185
4—9f	214—37a	2—82	1—186a
1—10	189—37b	2—90	2—188
5—12	54—38	4—90a	3—189
3—12a	2—45	1—94	6—194e
14—12b	2—46	1—95a	1—213a
4—12c	1—48b	3—96a	1—213b
2—14	4—48c	2—111	2—214
2—14a	3—53	4—111a	2—216
3—16a	1—53a	4—111c	2—235b

1 EMEBO MOTOR

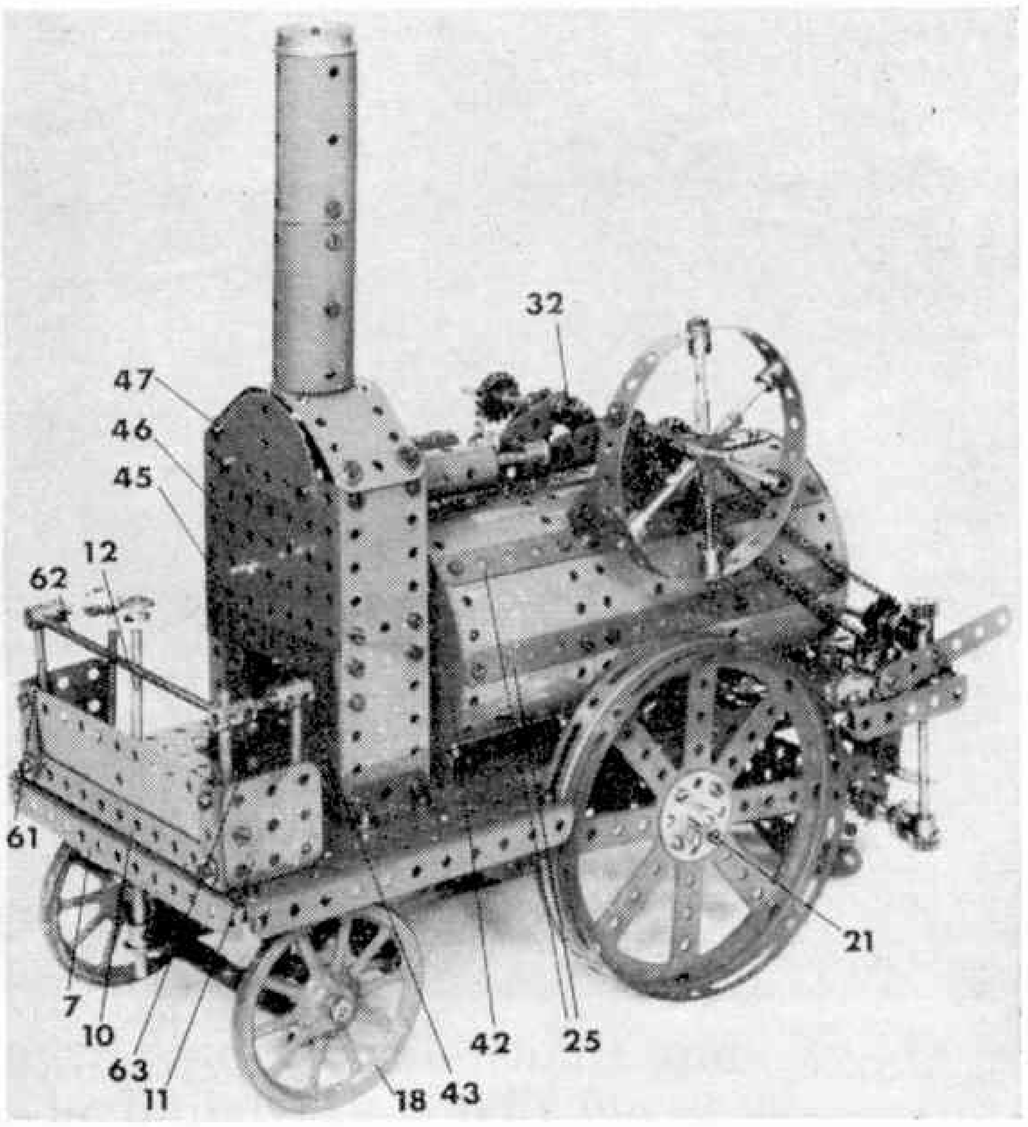
the Rod are a 3 in. Pulley and a 1½ in. Sprocket Wheel 20, in addition to the two rear road wheels, each obtained from two Hub Discs bolted to an 8-hole Bush Wheel 21. The Pulley is connected by a 6 in. Driving Band to a ½ in. Pulley on the output shaft of an Emebo Motor bolted to one Flat Plate 3 and to a Fishplate attached to corresponding Girder 1.

Boiler, crankshaft and cylinders

Next we come to the boiler and the various equipment mounted on top of it. Before describing its construction, however, I should stress that it is advisable to build the entire thing separately and then fit it to the chassis when completed. The actual boiler consists quite simply of three 10½ × 2½ in. compound plastic plates 22, 23 and 24, each obtained from two 5½ × 2½ in. Plastic Plates, connected by seven 7½ in. Strips 25. Attached by Obtuse Angle Brackets to two of these Strips, as shown, are two 1½ in. Corner Brackets 26, overlayed by a 2½ in. Strip 27.

The apex holes of these Corner Brackets provide the bearings for the crankshaft which is one of the few complicated items in the model. A 2½ in. Rod 28 is fixed in one transverse bore of a Short Coupling 29 while screwed into the adjacent tapped bore of the same Coupling is a ¾ in. Bolt carrying, in order, a Nut, a 1½ in. Strip 30, two Washers, another Nut and a Coupling 31. The Nuts should be tight against their respective Couplings, but Strip 30 must be free to move on the Bolt which, incidentally, passes through one end transverse *tapped* bore of Coupling 31. Screwed through the other end tapped bore of this Coupling is another ¾ in. Bolt carrying, again in order, a Nut, two Washers, a 1½ in. Strip 32, a further Nut and a Short Coupling 33, the latter also carrying a 3 in. Rod 34. The completed crankshaft is held in Corner Brackets 26 by Collars 35.

With the crankshaft in position two ¾ in. Sprocket Wheels 36 and 37 are mounted one on Rod 28 and the other on Rod 34. Also mounted on Rod 34 is the flywheel, built up from two 3-way Rod and Strip Connectors 38, one with and one without a boss. Six 2 in.

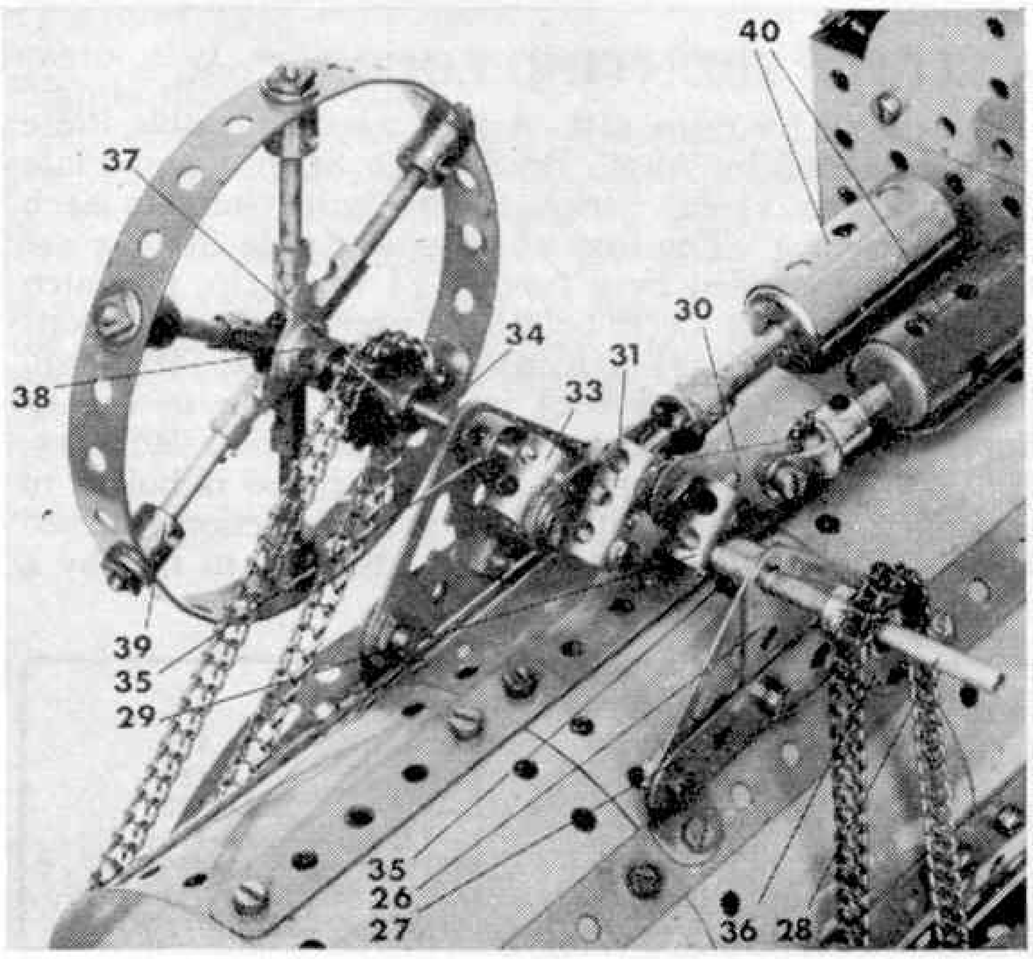


Based on a steam-driven rotary cultivator built in 1858, this intriguing model has various working movements powered by a Meccano Emebo Motor.

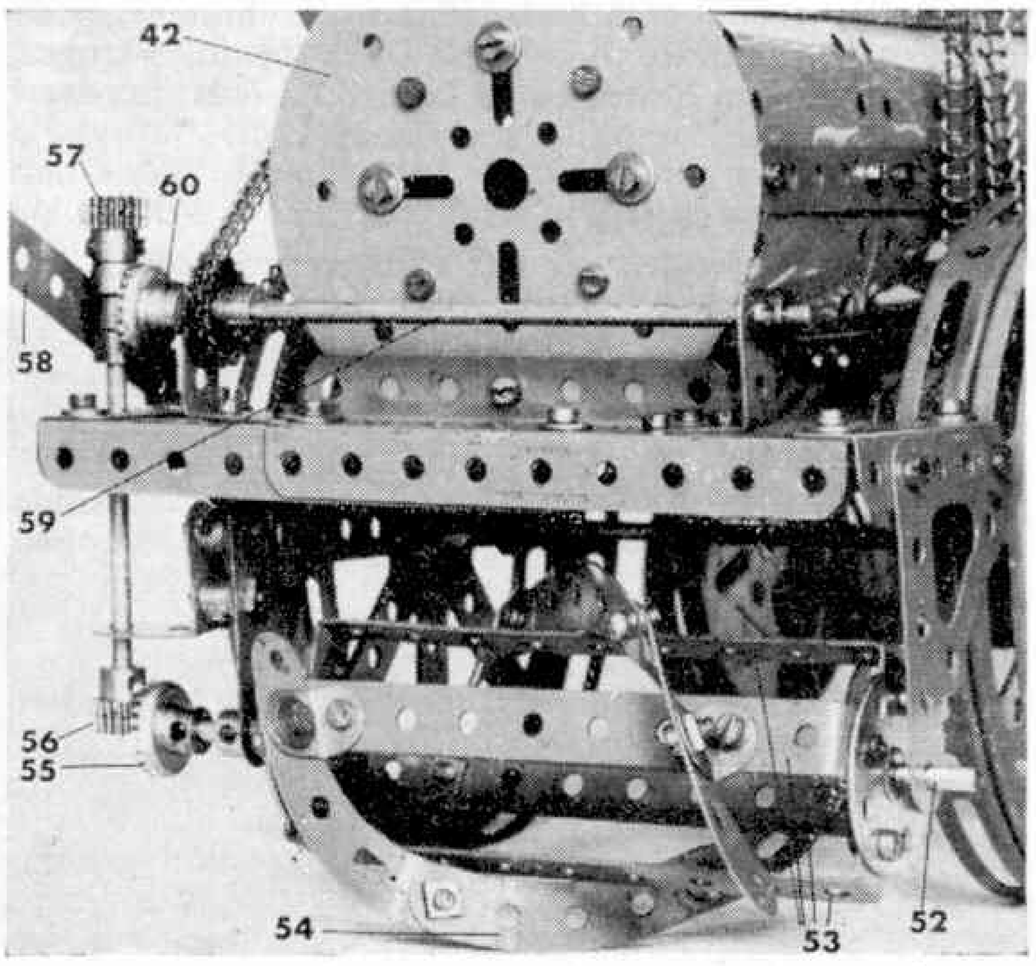
Rods are mounted in these parts, their other ends being held in Rod Sprockets 39, fixed in a 12½ in. Strip bent to form a circle. Sprocket Wheel 36 is connected by Chain to Sprocket Wheel 20 on the rear axle.

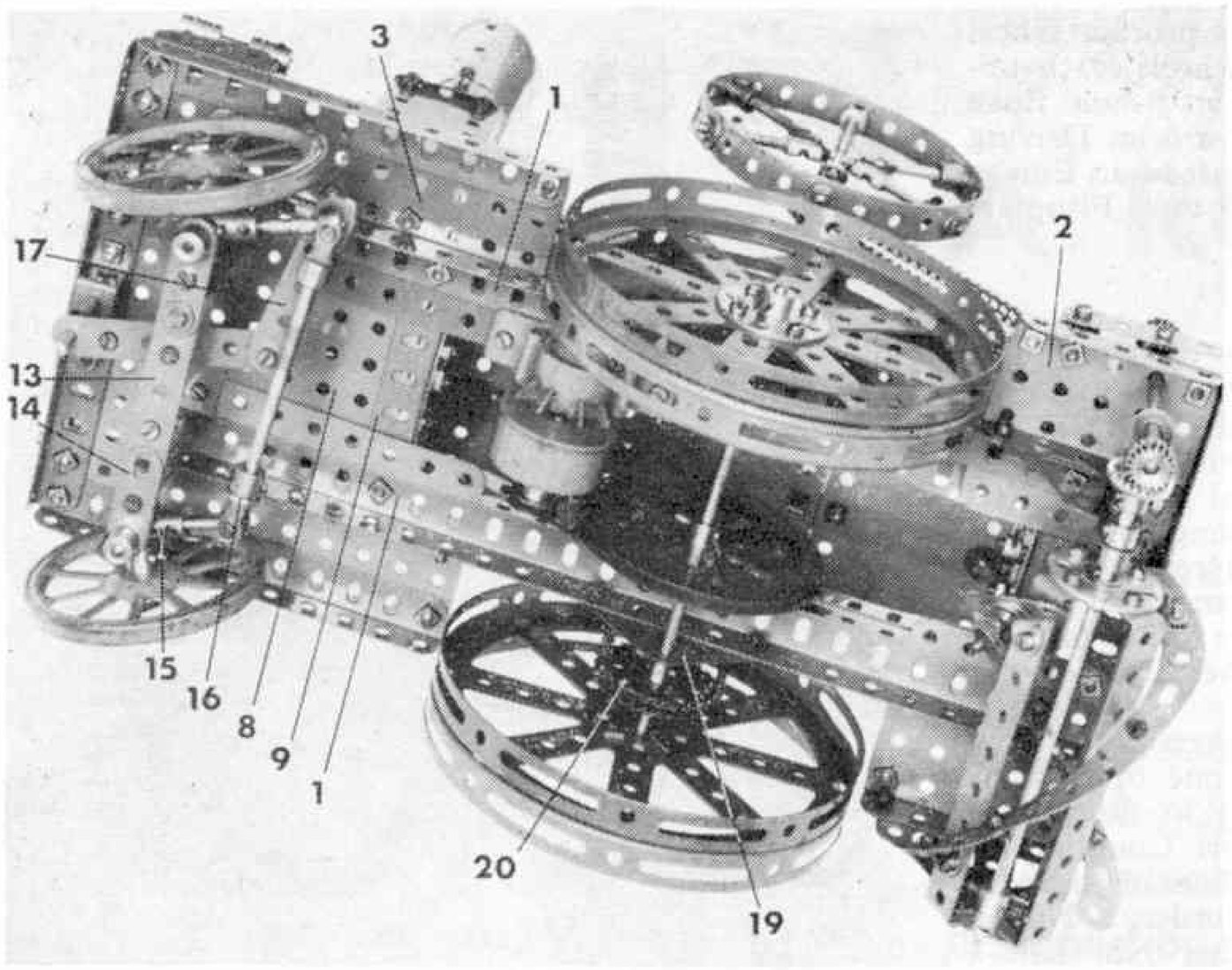
Fixed by ½ in. Bolts to top-most Strip 25, but spaced from it by a Collar on the shank of each Bolt, is a 1½ × 1½ in. Flat Plate, to which two Sleeve Pieces 40 are attached to represent the cylinders. Chimney Adaptors inserted into the Sleeve Pieces act as bearings for two 2½ in. Rods on the end of each of which

The crankshaft, flywheel and pistons, mounted on top of the boiler. Pay particular attention to the construction of the crankshaft.



The cultivator mechanism in close-up. The " rotor " is easily built and can be taken out of operation, while the Motor is running, with the special gearing provided.





An underside view of the Cultivator showing the steering mechanism, Motor-mounting and drive system.

an End Bearing 41 is mounted. These End Bearings are lock-nutted to Strips 30 and 32.

Having got this far, the main boiler plates are curved to shape and the boiler ends—two 4 in. Circular Plates 42—are added using several 1 × ½ in. Angle Brackets at each end to make the connections. The positions of these Angle Brackets coincide with Strips 25. The finished assembly is then bolted to Angle Girders 4 and 9, after which the firebox is built-up from two Girder Brackets 43, joined to a 3½ × 2½ in. Flanged Plate by a 5½ × 1½ in. Flexible Plate 44 attached to Flat Plate 3 by a 1½ in. Angle Girder. The front of the firebox is then completed by a 3½ × ½ in. Double Angle Strip 45, another 3½ × 2½ in. Flanged Plate 46 and a Semi-circular Plate 47. A further 3½ × 2½ in. Flanged Plate 48 and a second Semi-circular Plate completes the back, while the top is enclosed by two 2½ × 1½ in. Flexible Plates 49, joined together, the joining Bolts also holding two 1½ in. Strips, one on top of the other, beneath the Plates. A chimney made up of two Clinders 50, topped by a 1⅛ in. Flanged Wheel, is fixed to Plates 49 by Nuts on a 6 in. Screwed Rod running the length of the chimney.

Cultivator mechanism

The only major feature left to be reproduced is the actual cultivator mechanism. Two Corner Gussets 51 are bolted, one to each Angle Girder 1, and in these are journalled a 6½ in. Rod 52, held in place by Collars. Mounted on the Rod are two 8-hole Bush Wheels, joined by four 4½ × ½ in. Double Angle Strips 53 to which two spiral blades are fixed by Angle Brackets. Each blade consists of two 2½ in. Stepped Curved Strips connected by a 2½ in. Curved Strip 54, all bent to shape. Fixed on the end of Rod 52 is a ¾ in. Contrate Wheel 55.

Attached by two ½ in. Bolts to nearest Corner Gusset 51, but spaced from it by two Washers and a Collar on the shank of each Bolt, is a 1 × 1 in. Angle Bracket. Journalled in this and in corresponding Plate 2 is a 4 in. Rod carrying two ½ in. Pinions 56 and 57, one at each end, and three Collars side-by-side, the centre one free on the Rod. Screwed into one tapped bore of this centre Collar is a Bolt carrying a loose 3 in. Strip 58, one end of which is lock-nutted to one Angle Bracket bolted to Angle Girder 6. Two 1 × 1 in. Angle Brackets are bolted one to each Plate 2 to provide bearings for a 5½ in. Rod 59, carrying a ¾ in. Sprocket Wheel, and held in place by a Collar and a ¾ in. Contrate Wheel 60 spaced from the nearby Angle Bracket by two Washers. The Sprocket Wheel is connected by Chain to Sprocket Wheel 37. Movement of Strip 58 should move Pinions 56 and 57 in and out of mesh with Contrates 55 and 60, simultaneously.

Finally, a 1¾ in. Steering Wheel is mounted on the upper end of Rod 12 and a safety rail for the driver is built up as follows: four Rod Sockets, each carrying a 2½ in. Rod 61 are fixed to the "footplate" and four Short Couplings are mounted on their upper ends. These Short Couplings are then joined, as shown, by a 5 in. Screwed Rod 62 and two 1 in. Rods 63.

A LITTLE SHUNTING LOCO.—Cont.

Lastly we have the cab. A 2½ × 2½ in. Flexible Plate 12 is attached by Angle Brackets to Strip 4 and Plate 8, while two 2½ in. Strips 13 are bolted one to each end of Strip 4. The lugs of Double Angle Strip 3 are then each extended by a further 2½ in. Strip, to which a Flat Trunnion 14 is bolted. Trunnions 14 are connected by another 2½ × ½ in. Double Angle Strip and, to this, is bolted a 2½ × 2½ in. Plastic Plate 15 that is curved under and wedged above Strips 1 and 13. Finally, a 2½ in. Stepped Curved Strip 16 is bolted to the upper edge of Plate 12 and a U-section Curved Plate 17, straightened slightly, is attached to this by a Double Bracket.

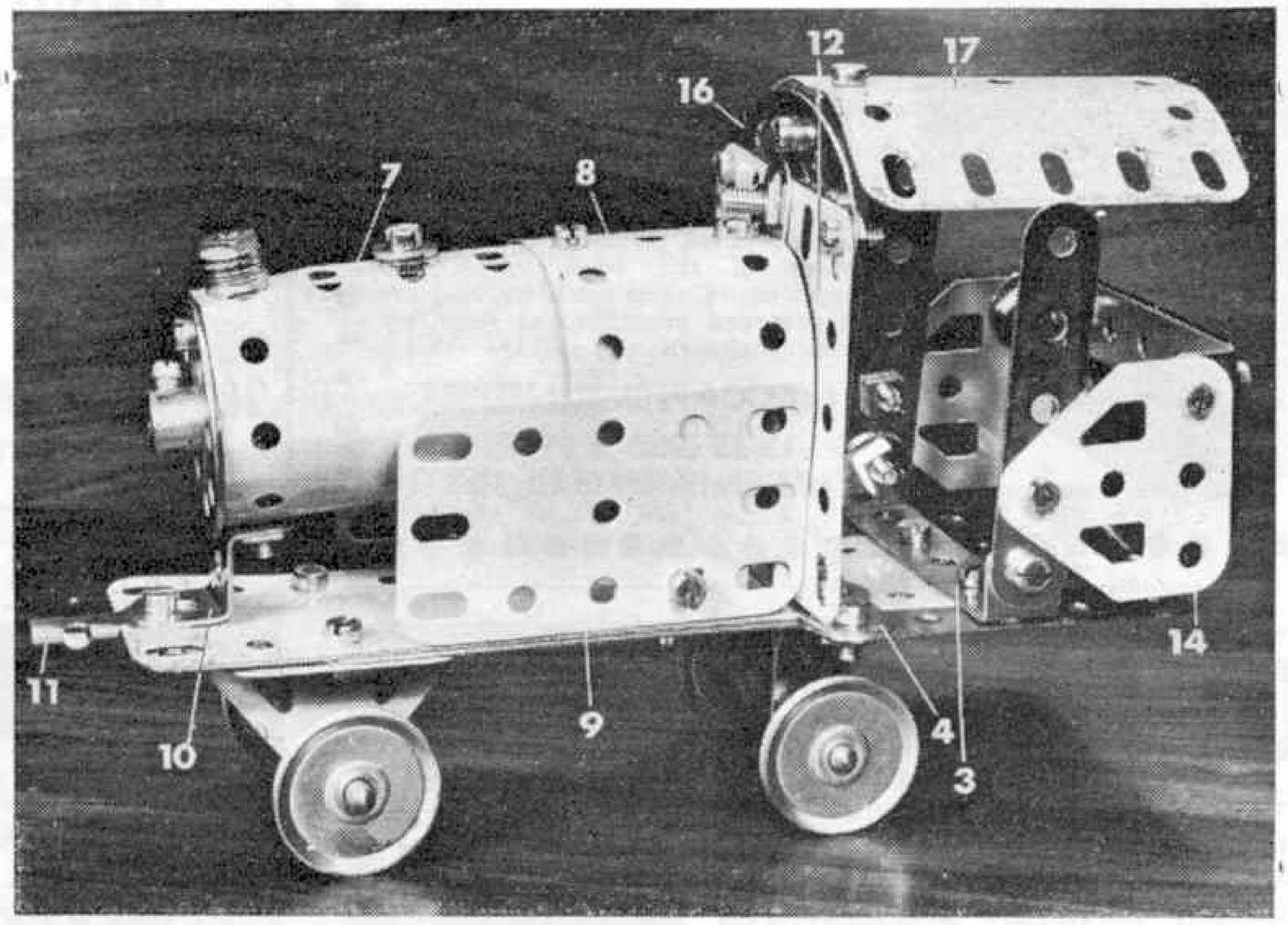
PARTS REQUIRED:

4—2	4—22	2—48a	2—188
5—5	1—24	1—90a	2—189
2—10	4—35	2—111c	2—190
1—11	35—37a	1—125	1—194a
8—12	33—37b	2—126	1—199
2—17	10—38	2—126a	1—212

Rebuilt from the December 1955 Meccano Magazine

A LITTLE SHUNTING LOCOMOTIVE

by Spanner



Included specially for the younger readers, this small and simple, but realistic, model can be built with Outfit No. 2

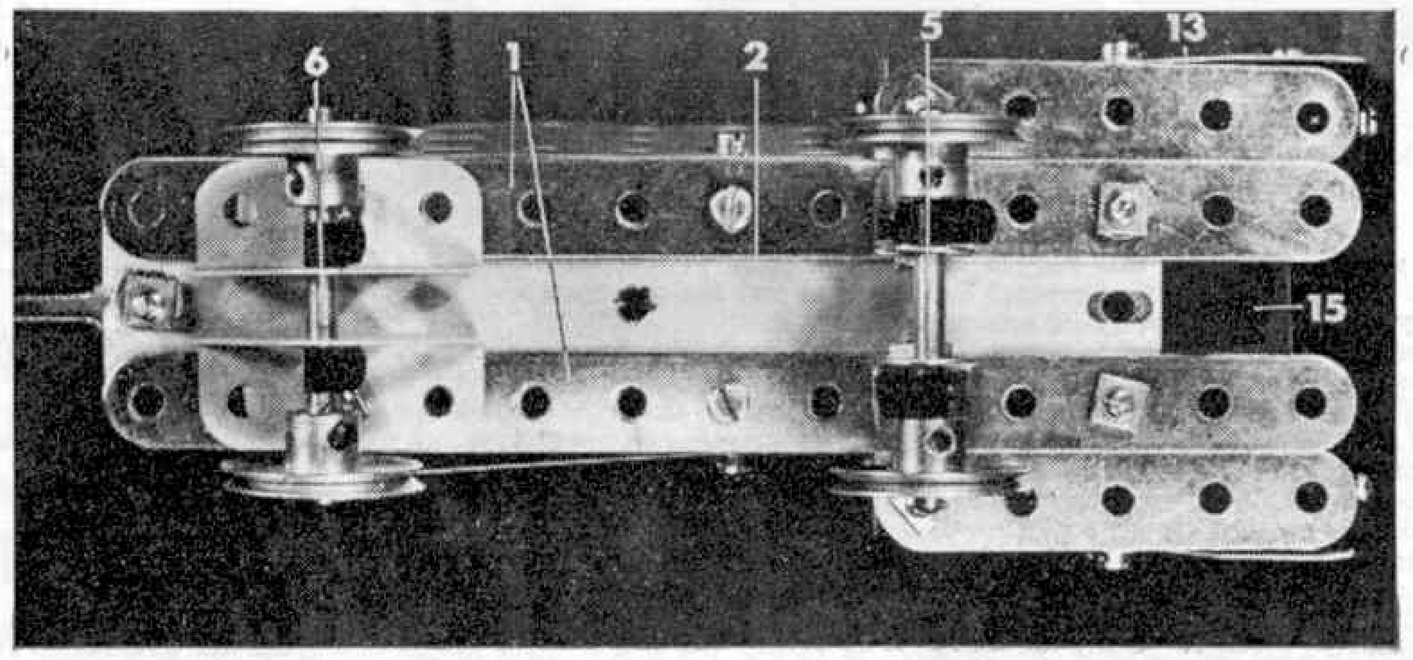
EVEN IN these days of space travel, rocket-ships and nuclear power, it's safe to say that most mechanically minded people still like the good old steam engine. On the railways, for example, you have diesel locomotives and electric locomotives as well as diesel electric locomotives—big, powerful machines, all—but they don't create much interest. Take one of the rare occasions when a now almost obsolete steam engine makes it appearance, however, and you'll find all sorts of people gazing at it with delight. They can't help it. There's something fascinating about a big, whistling monster roaring on its way amidst clouds of dense smoke, white steam and soot!

We have often featured railway engines in *Meccano Magazine* and, as the M.M. was going long before the advent of diesel or electric locomotives, most of these have been based on steam engines. One such example, built with Meccano Outfit No. 2, appeared in the December 1955 issue and it looked so good for a simple model that I decided to feature it here in a very slightly modified form.

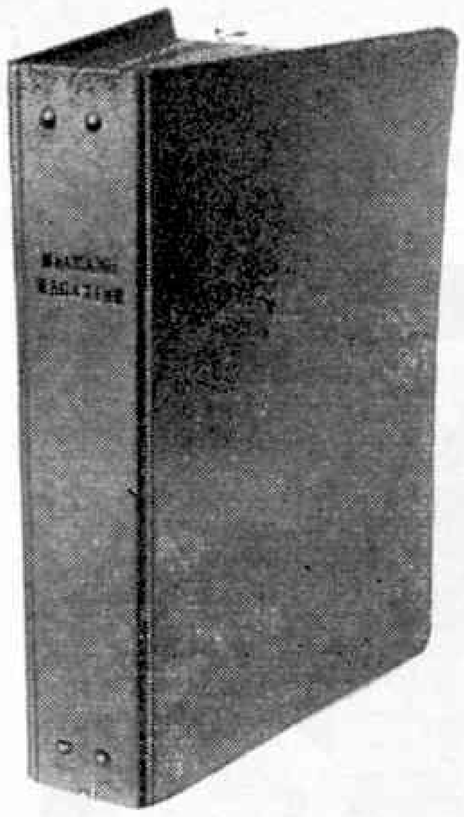
Described originally as a "Shunting Locomotive" the model is very easy to build. The chassis consists of two $6\frac{1}{2}$ in. compound strips 1, each obtained from two $5\frac{1}{2}$ in. Strips, which are joined by a $5\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plate 2. Bolted to the top of the Plate is a $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip 3 and a $2\frac{1}{2}$ in. Strip 4, the Bolts securing the latter also fixing two Angle Brackets to the underside of Strips 1. The free lugs of these Angle Brackets are extended by Fishplates which provide bearings for a 2 in. Rod 5, held in place by Spring Clips. A 1 in. Pulley with Boss is mounted on each end of this Rod, while two similar 1 in. Pulleys are mounted on another 2 in. Rod 6, held by Spring Clips in two Trunnions bolted towards the forward ends of Strips 1.

In the case of the boiler, a $2\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plate 7 is curved to form a cylinder and is bolted to a shaped $5\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plate 8, attached to the chassis by Angle Brackets. The Bolts fixing the Plate to the Angle Brackets also hold two $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plates 9 in position, one each side. At the front, the boiler is connected to the chassis by a Reversed Angle Bracket 10, the lower securing Bolt fixing a Rod and Strip Connector 11 in place at the same time. The front of the boiler is enclosed by an 8-hole Bush Wheel, attached by an Angle Bracket. Note, however, that a $\frac{3}{8}$ in. Bolt is used to fix the Angle Bracket to the boiler, five Washers being carried on the shank of the Bolt to represent the chimney. *(Continued on opposite page)*

Rebuilt in slightly modified form from the December 1955 Meccano Magazine, this delightful little locomotive is produced from parts contained in Meccano Outfit No. 2.



An underside view of the locomotive showing the layout of the chassis and the 0-4-0 wheel arrangement.



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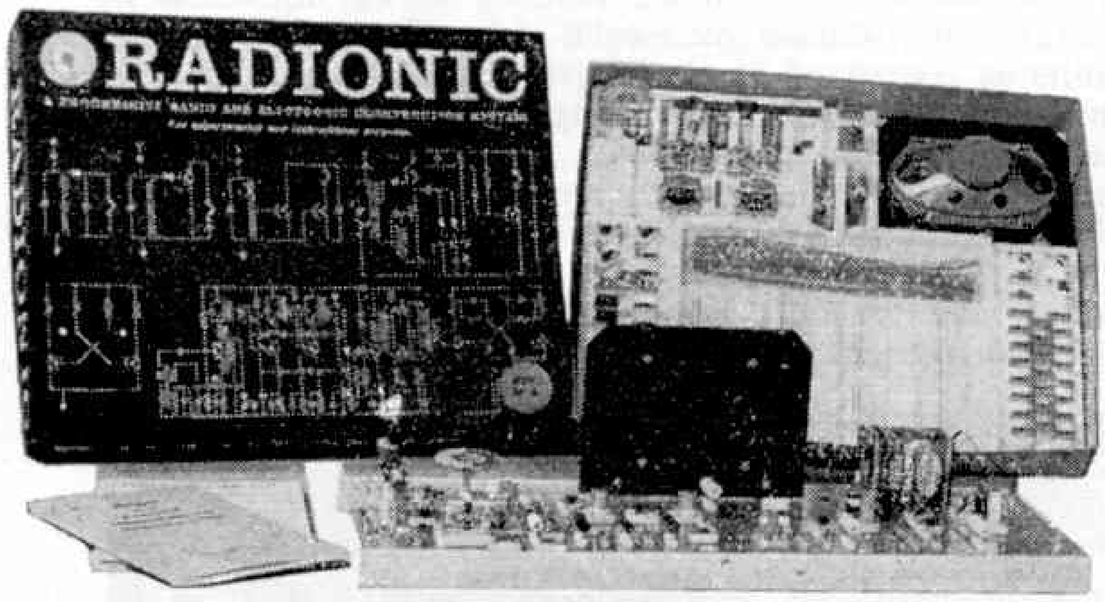

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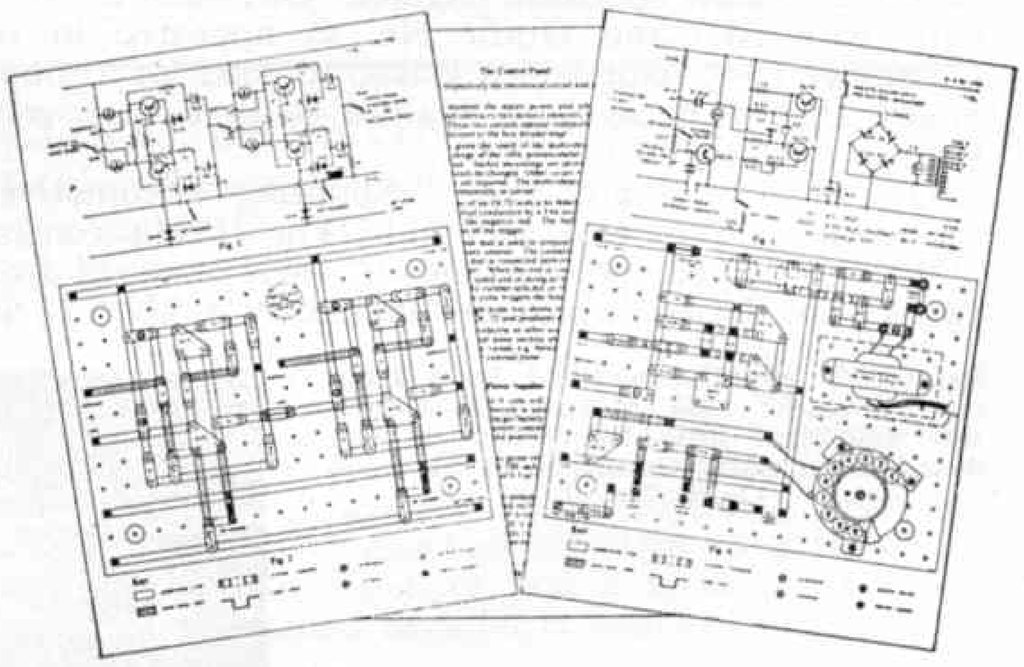

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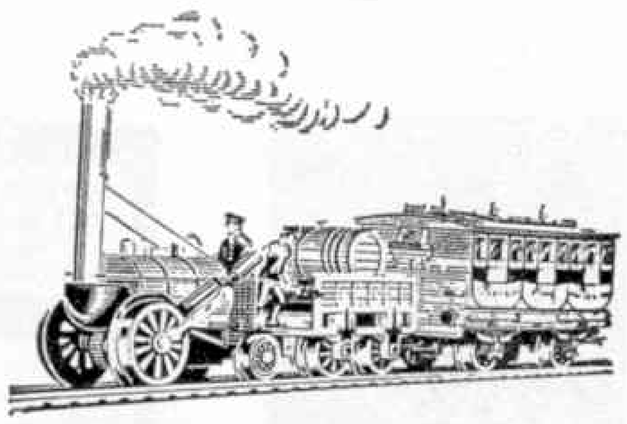

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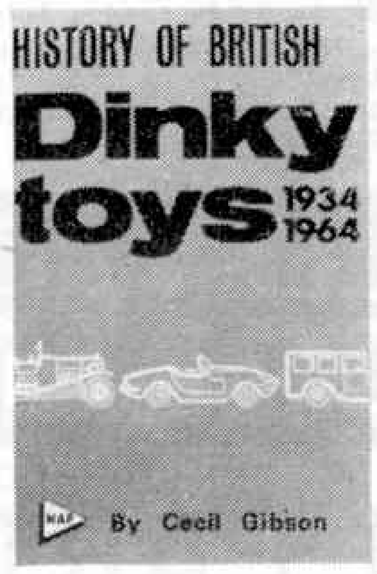

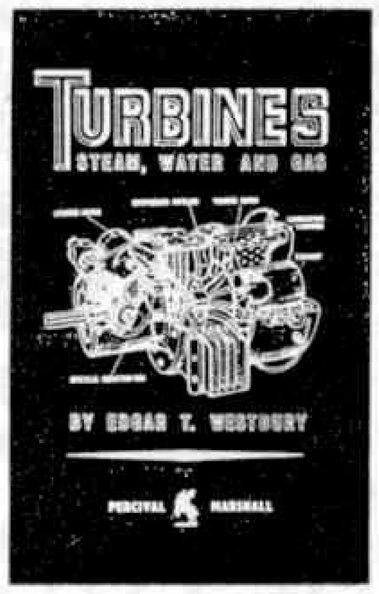

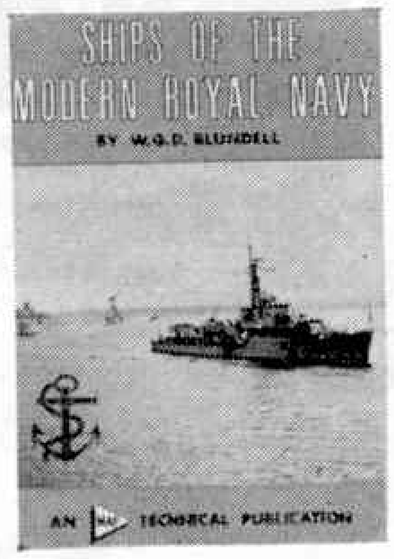

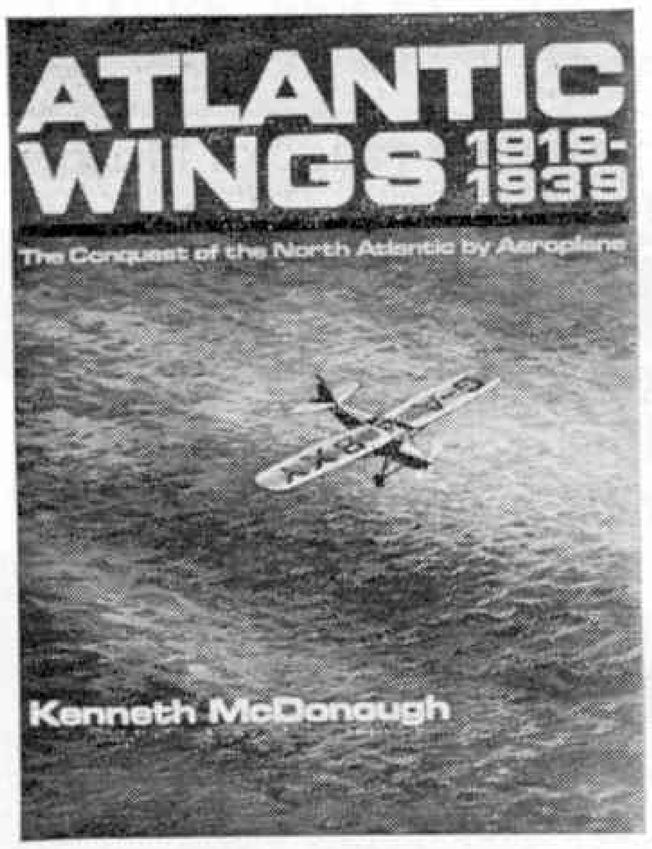

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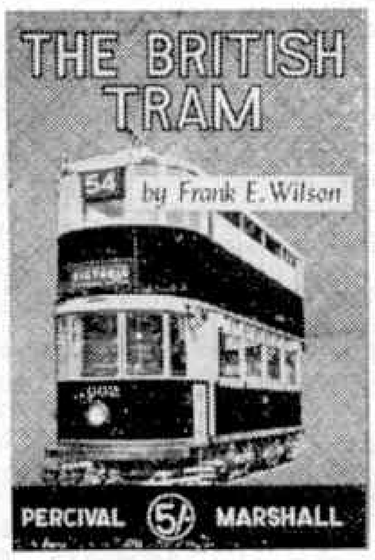

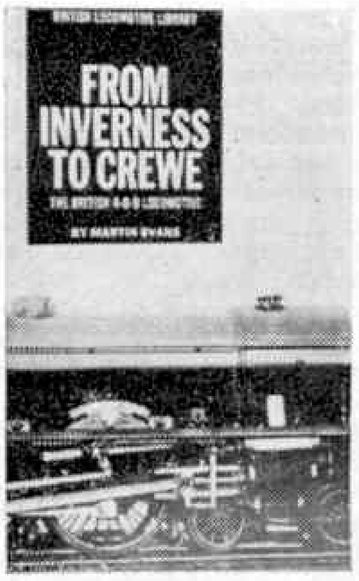

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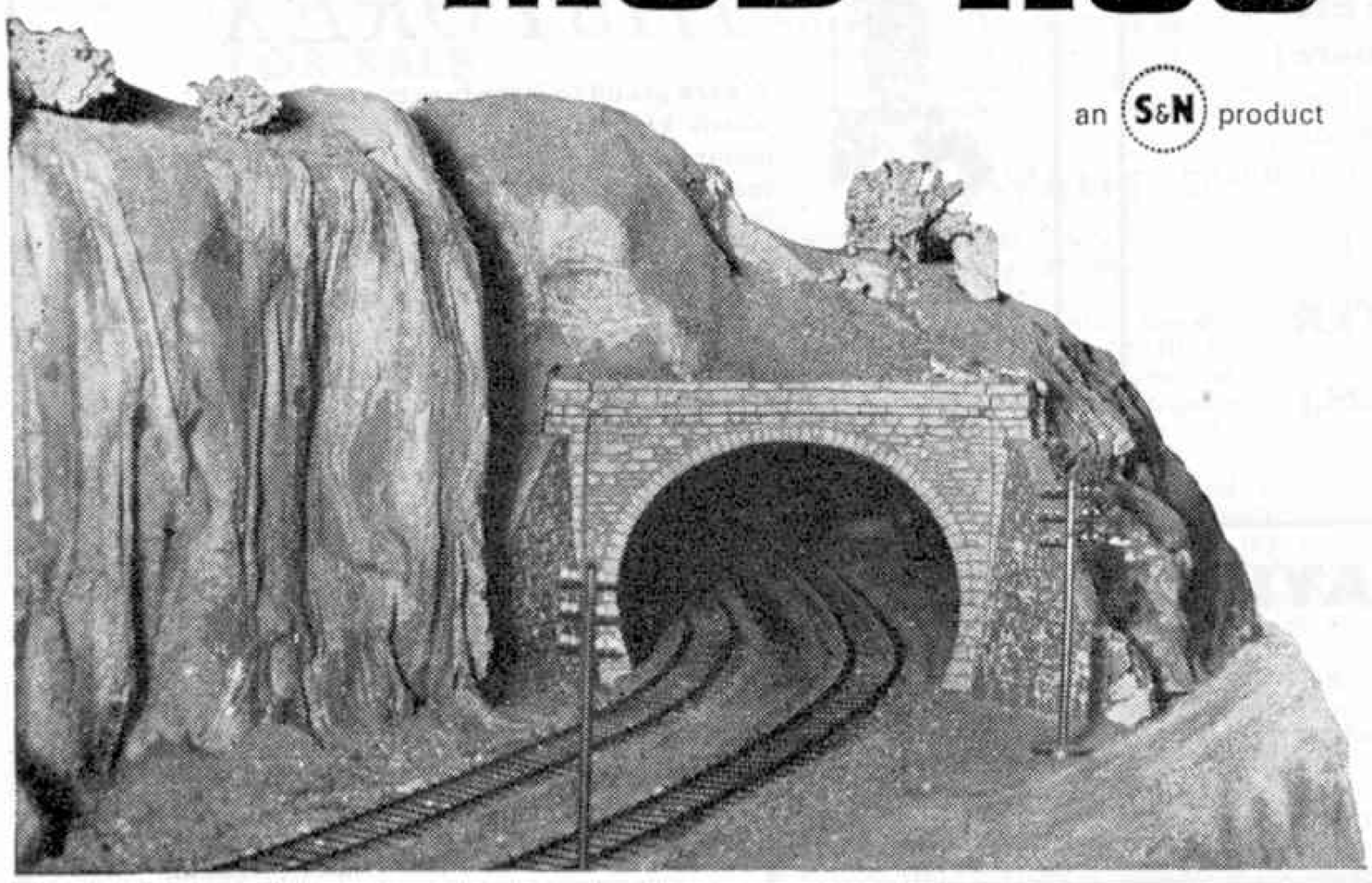

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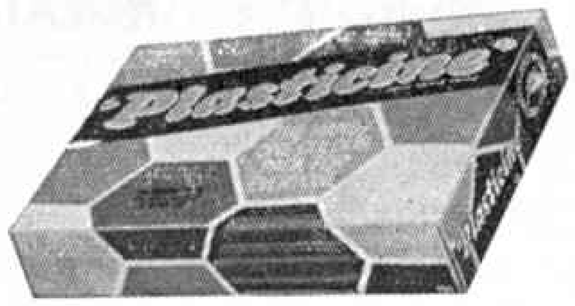

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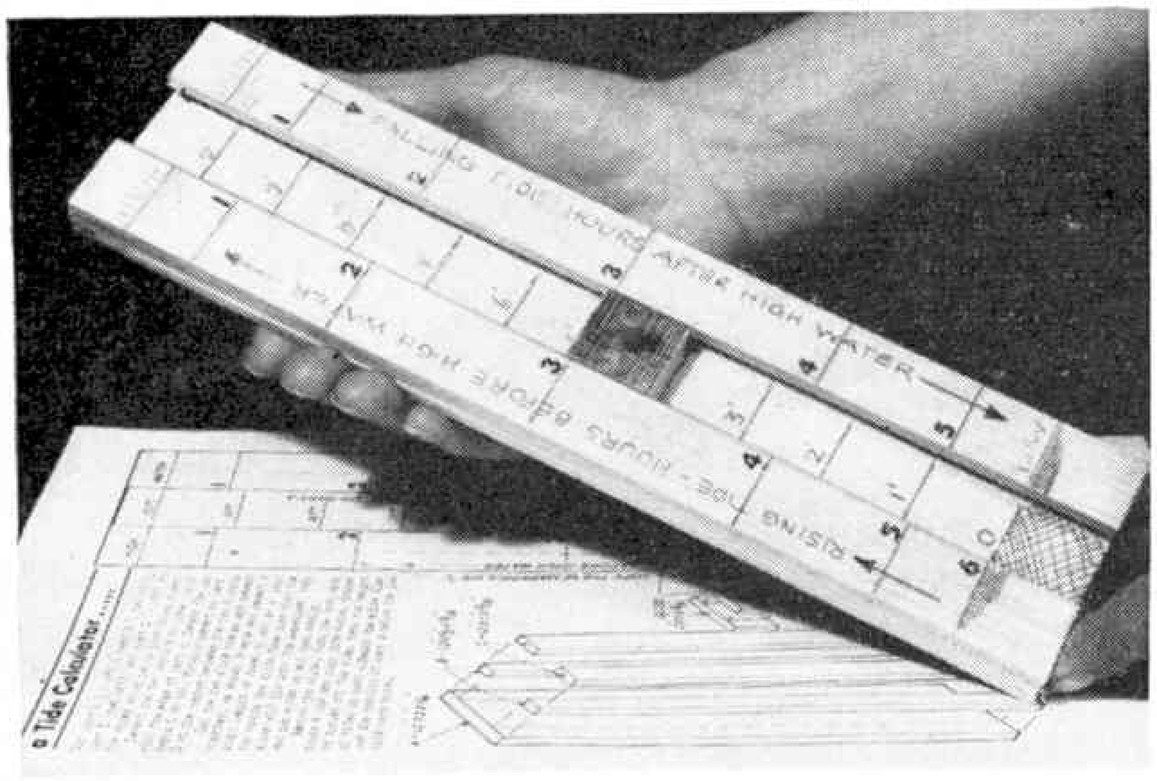

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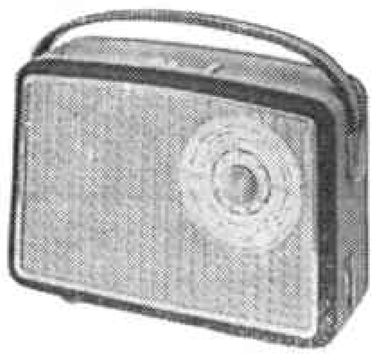

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model shops who specialise in MECCANO spare parts

Listed below are some of the dealers who sell Meccano accessories and spare parts. This is intended to aid enthusiasts—and there are many of them—who constantly require additional spare parts for their sets. All dealers can, of course, order Meccano spare parts for their customers, but those listed here are among our spare part specialists.

Dealers wishing to advertise on this page should contact **MECCANO LTD., LIVERPOOL** direct, M. A. P. do not accept bookings.

C. G. MARSHALL
Maxwell Road
BEACONSFIELD
Telephone: 4092

TAYLOR & McKENNA
203 Marlowes
HEMEL HEMPSTEAD, HERTS.
Tel: Hemel Hempstead 53691

"WALKERS"
15 St. Thomas Street,
SCARBOROUGH, YORKS.
Tel: SCARBOROUGH 3223
(Mail orders welcomed)

JOHN WEBBER
Sports Ltd.,
223 High Street
EXETER
Telephone: 74975

THE GUILDFORD DOLL'S HOSPITAL LTD.
13 Swan Lane, GUILDFORD
Telephone: 61331

BARRETT'S LTD.
2 St. George's Street
CANTERBURY
Telephone: 66161

JEREMY
16 Princes Arcade,
Piccadilly
LONDON S.W.1
Telephone: Regent 1846

M. H. B. DAWSON
96 Whiteladies Road,
BRISTOL 8.
Telephone: 38534

LUCAS'S (Hobbies) LTD.
7 Tarleton Street
LIVERPOOL 1
Telephone: Royal 7562

Cheltenham Motor & Cycle Co. Ltd. 31 High Street
CHELTENHAM
Telephone: 53099

F. T. B. LAWSON
New George Street
City Centre, PLYMOUTH
Telephone: 65363

JOHN W. BAGNALL LTD.
18 Salter Street
STAFFORD
Telephone: 3420

BEATTIES OF LONDON
112 & 112A High Holborn,
LONDON W.C.1.
Telephone: HOL. 6285

CANADA

W. PAINE & CO. LTD.
168 High Street
CHATHAM,
Also at Grays
Telephone: 45215

H. A. BLUNT & SONS LTD.
133 The Broadway,
Mill Hill
LONDON N.W.7
Telephone: Mill Hill 2877

LESLIE BROWN
Super Toy and
Model Store 95 High Street,
Stockton-on-Tees
Telephone: 67616

ESBE SCIENCE CENTRE
3431 Bathurst Street
TORONTO, 19
Telephone: 789-3161

NEW ZEALAND

YOUNGSTERS (THE DOLL'S HOSPITAL)
55 Hallgate
DONCASTER
Telephone: 2831

THE MODEL SHOP
7-13 Bootle Street,
Off Deansgate,
MANCHESTER 2.
Tel: Blackfriars 21935

WILTONS
GAMES/SPORTS STORE
Corner House,
Canal/Queen Street
SALISBURY
Telephone: 22984

BUNKERS LTD.
P.O, Box 58
HASTINGS
(Mail orders from all countries welcomed)

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Model No. 404 CONVEYANCER FORK LIFT TRUCK

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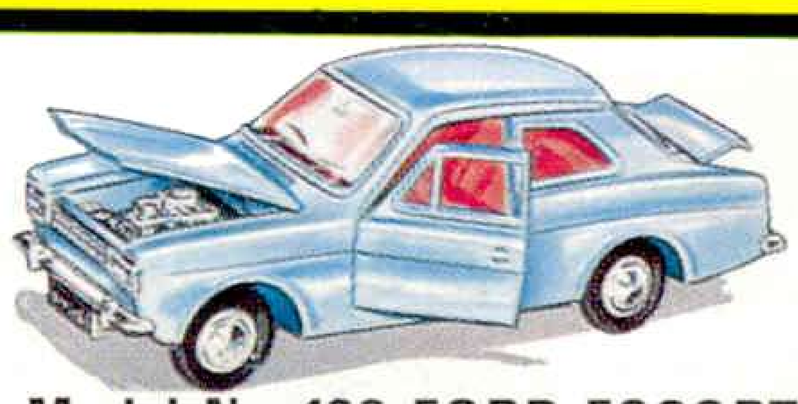

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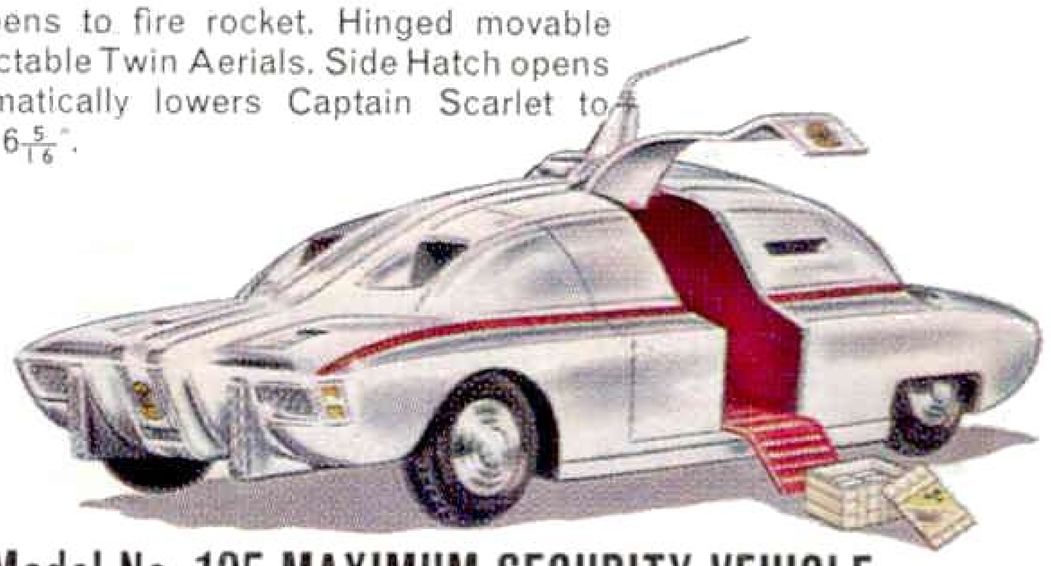

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