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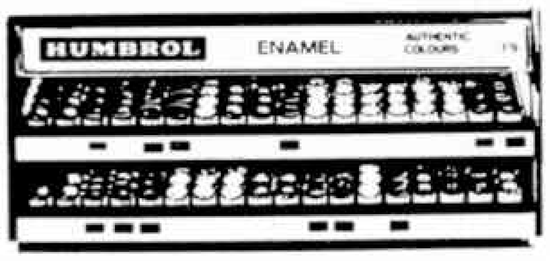

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FEBRUARY 1969 VOLUME 54 NUMBER 2

Meccano Magazine, founded 1916.

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Consulting Editor for Meccano Ltd.
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MAP **HOBBY MAGAZINE**

FRONT COVER

Artist Laurie Bagley captures the drama and excitement of a night time emergency call on the City of Plymouth Fire Brigade. The appliance depicted with lights blazing and its Rolls-Royce engine screaming in 3rd gear is a Pump Escape machine, roaring round a corner to pull up in front of a blazing building.

NEXT MONTH

Look out for the exciting Spitfire cover by artist Laurie Bagley. This heralds a complete Spitfire history by our aviation correspondent, John W. R. Taylor. Meccano models include a Meccano Power Drive Set tram that is fully operational, designed and constructed by Bert Love. For the junior Meccano enthusiasts there is a selection of simple Standard Meccano car models. The Outfit model of the month is a simple Fork Lift Truck from a No. 1 Outfit. Among the Model Builders with Spanner is here again. Other features include a review of the Monogram B-52 giant plastic kit; Snow Vehicles; The Forgotten Pioneer of Aviation; Battle; Stamps; and all our other regulars.

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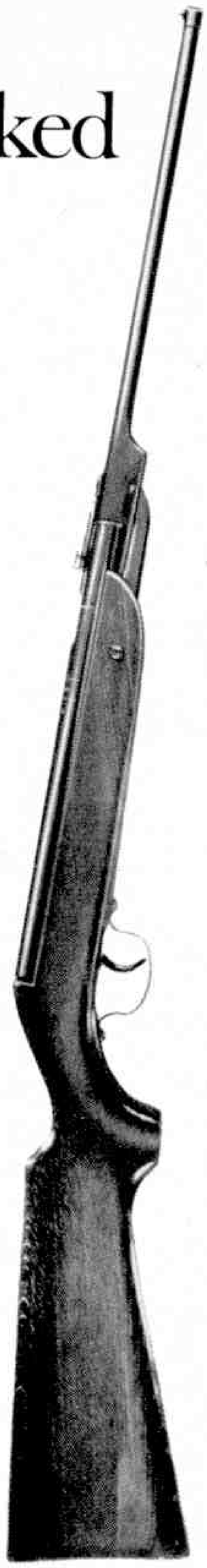

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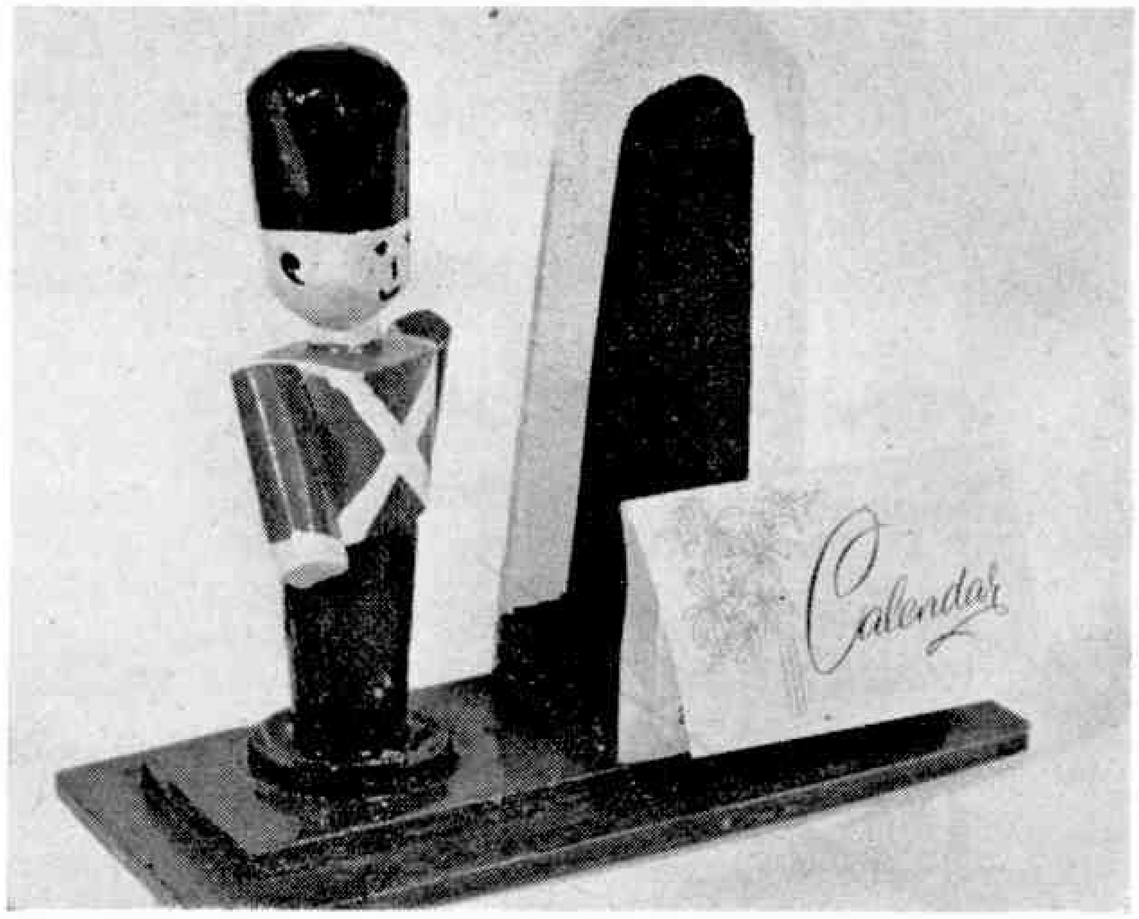

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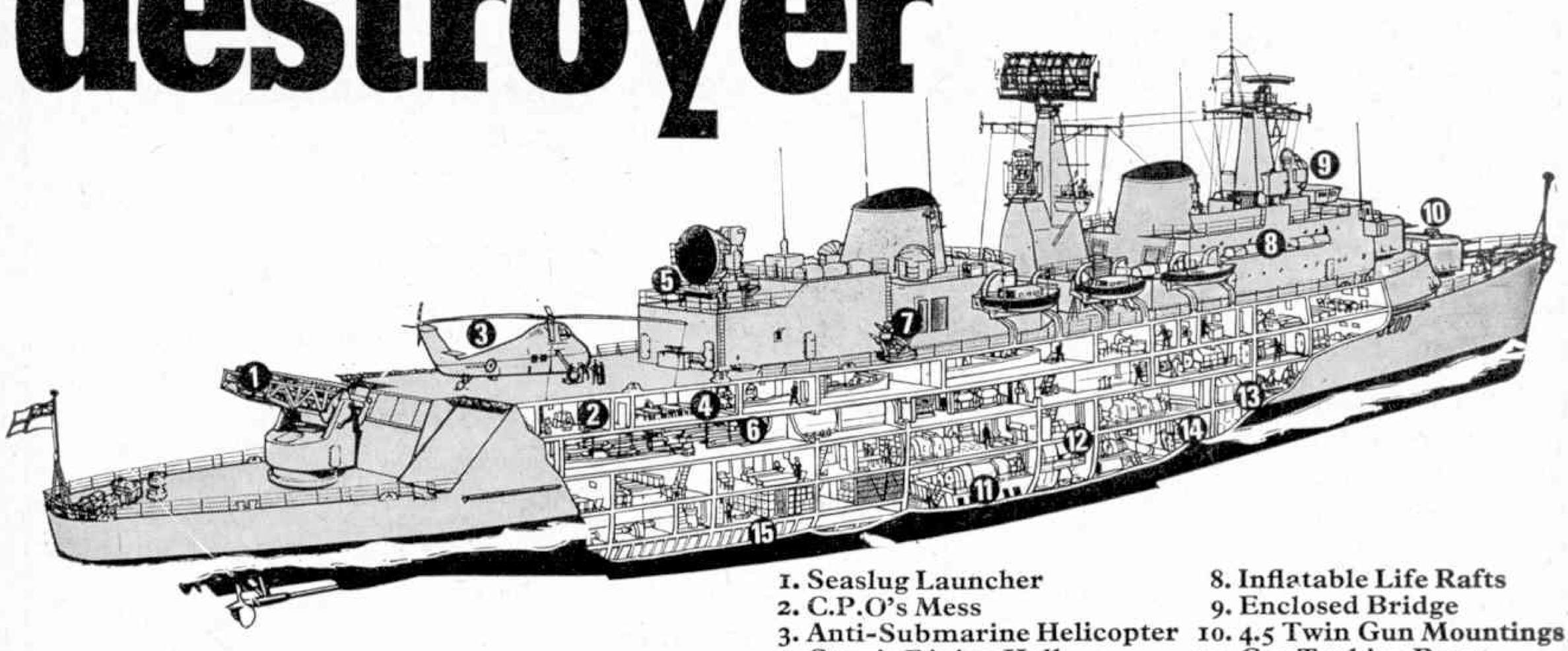

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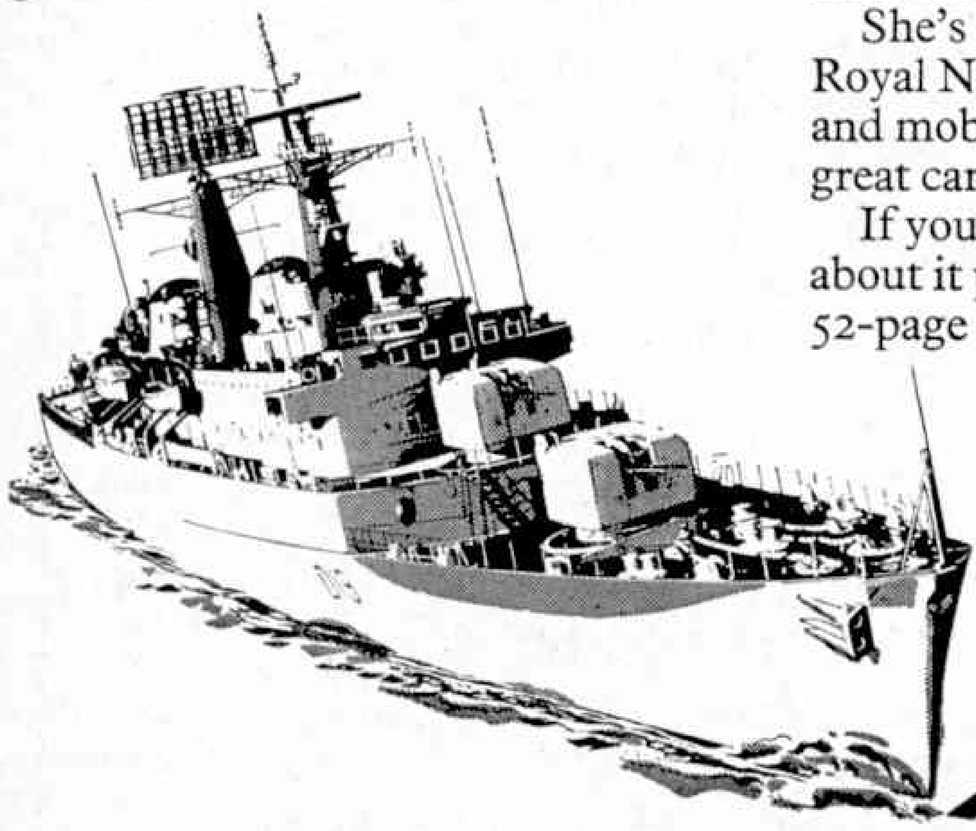

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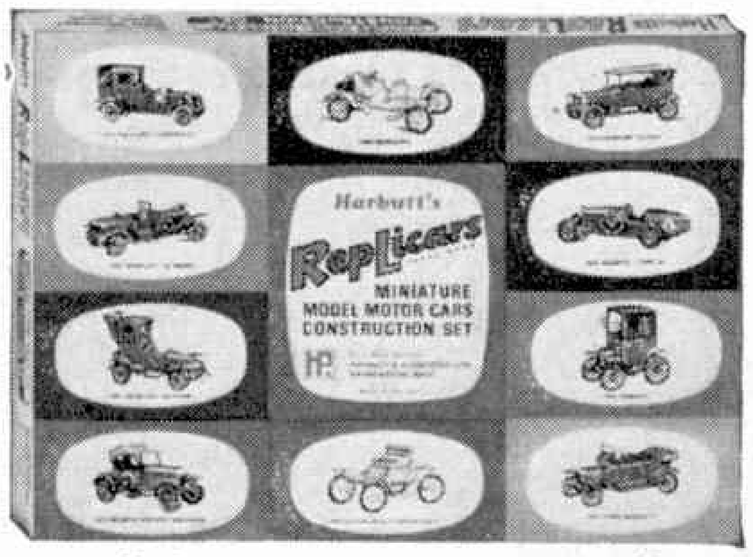

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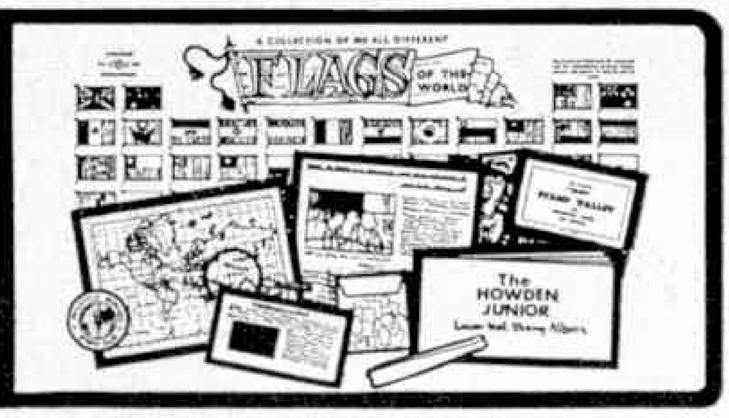

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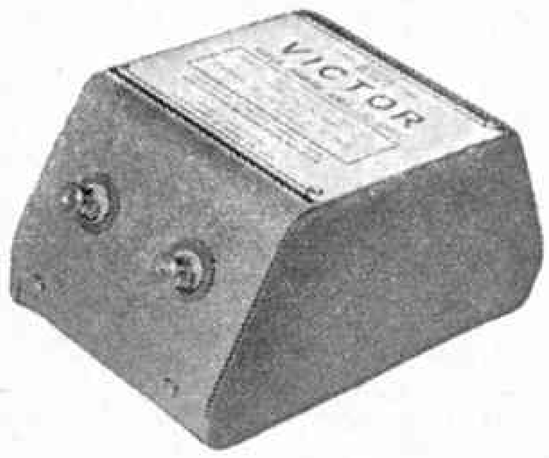

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When the old Meccano Magazine ceased publication last year, Meccano Limited were forced to abandon the model-building competition they were running at the time. This, however, did not mean that the Contests which, over the years, had become part of the Meccano tradition were being abandoned for all time—definitely not ! Now that the new Meccano Mag. is well and truly here, in fact, we are delighted to announce the start of yet another contest in which valuable cash prizes are offered to the builders of Meccano models which the judges, taking all things into consideration, feel to be most worthy of success.

ALL COMERS WELCOME

As usual, the competition is open to every owner of a Meccano Set living anywhere in the world and no limit, maximum or minimum, is set either on the number of entries which may be submitted or the quantity of parts which may be used. Any kind of model is eligible for entry unless taken direct from a Meccano manual, and all will be judged on their individual merits. *The only stipulations are that the model or models must be built entirely of standard Meccano Parts and must be your own unaided work.*

Prizes will be awarded for what the judges consider to be the best-built models with particular attention being given to those in which the more unusual parts are put to good use, as well as, of course, to originality of subject. Remember, too, that a small well-built model stands just as much chance of success as a large, unstable example, so don't be put off entering the contest just because you don't own a big stock of Meccano. The competition closes on January 31, 1969, for competitors in the U.K. and Ireland and two weeks later, on February 14, for overseas competitors.

Entries will be divided into two sections, A and B. Section A is for competitors under 14 years of age on the closing date and Section B for competitors aged 14 or over on that date. Prizes in these sections are as follows: Section A, 1st. £5.5.0; 2nd. £3.3.0; 3rd. £2.2.0; 10 prizes of 10s.6d. Section B, 1st. £7.7.0; 2nd. £5.5.0; 3rd. £3.3.0; 10 prizes of £1.1.0.

HOW TO ENTER

Once you have built the model, obtain a good photograph of it, or, failing this, a reasonably detailed sketch. If you are not an artist yourself, it is quite permissible to have a friend prepare the sketch. It is also advisable to include a short description of the main features of the model with your entry, mentioning any points of interest that you would like brought to the attention of the judges. *Under no circumstances, however, must the actual model be sent.*

In entering the Contest, write your name and address on the back of *each* photograph or drawing, together with the letter A. or B. depending on the Section for which you qualify, and forward to **Model-building Contest, Meccano Magazine, Binns Road, Liverpool 13.**

Prize-winning entries become the property of Meccano Limited but unsuccessful attempts will be returned if accompanied by a suitable stamp-addressed envelope or, in the case of overseas entries, a self-addressed envelope and the appropriate International Reply Coupons. Note that entries can be accepted only on the understanding that Meccano Magazine will not be held responsible for any entry damaged or lost and that the judges' decisions are final. No correspondence relating to unsuccessful entries can be considered.

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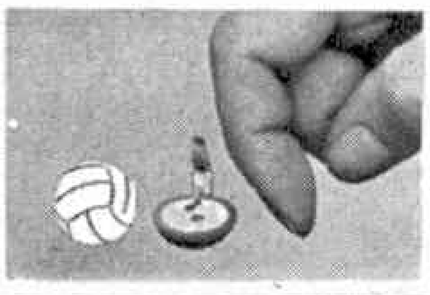

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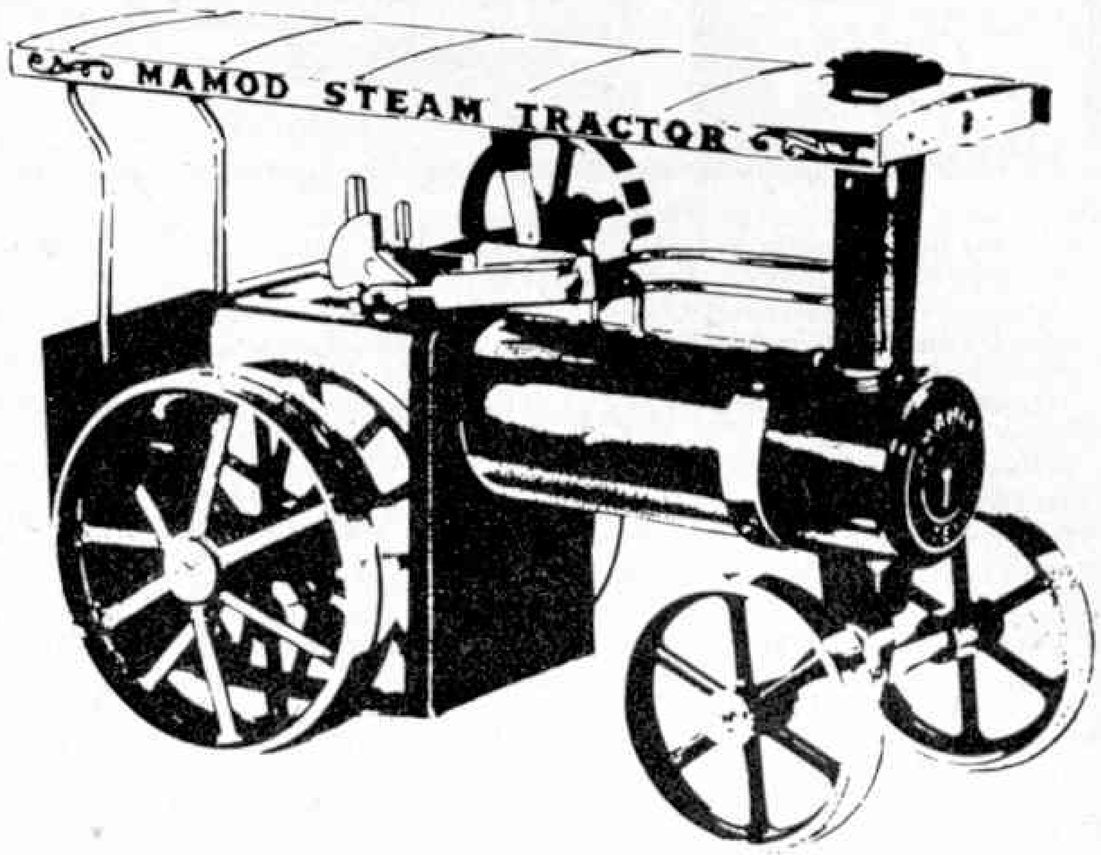

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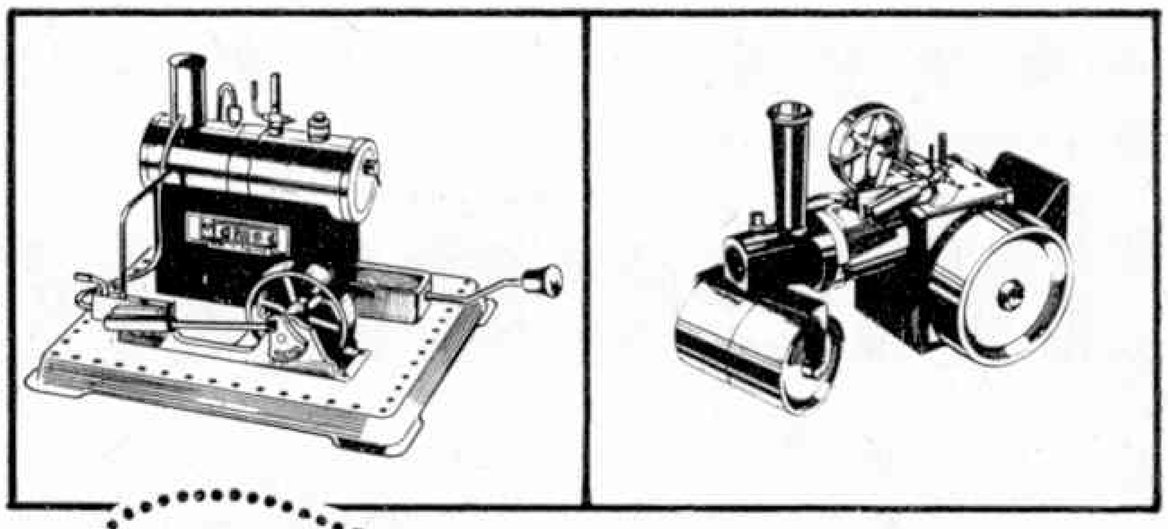

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MECCANO

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	11
1. Junior Kit	1	5	11
2. Super Junior	1	18	11
3. Highway Vehicles	2	9	11
4. Airport Services	3	15	6
5. Site Engineering	4	19	6
6. Ocean Terminal	6	7	6
7. Mountain Engineer	8	13	6
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9. Master Engineer's Set	25	5	0
10. Meccano Outfit in 4-Drawer Cabinet	66	15	0
Meccano Gears Set	1	8	6
Meccano Mechanisms Set	2	5	0
Elektrikit	4	15	0

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	11
No. 4a " " 4 " " 5	1	15	6
No. 5a " " 5 " " 6	1	8	6
No. 6a " " 6 " " 7	2	7	6
No. 7a " " 7 " " 8	5	19	6

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	£	s.	d.
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Power Drive Set	6	17	6
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Power Drive Gear Box and Coupling	1	14	6
Power Drive Steam Engine	3	15	0
Reversible 4½ volt D.C. Motor	1	6	11

MECCANO MOTORS, ETC.

	£	s.	d.
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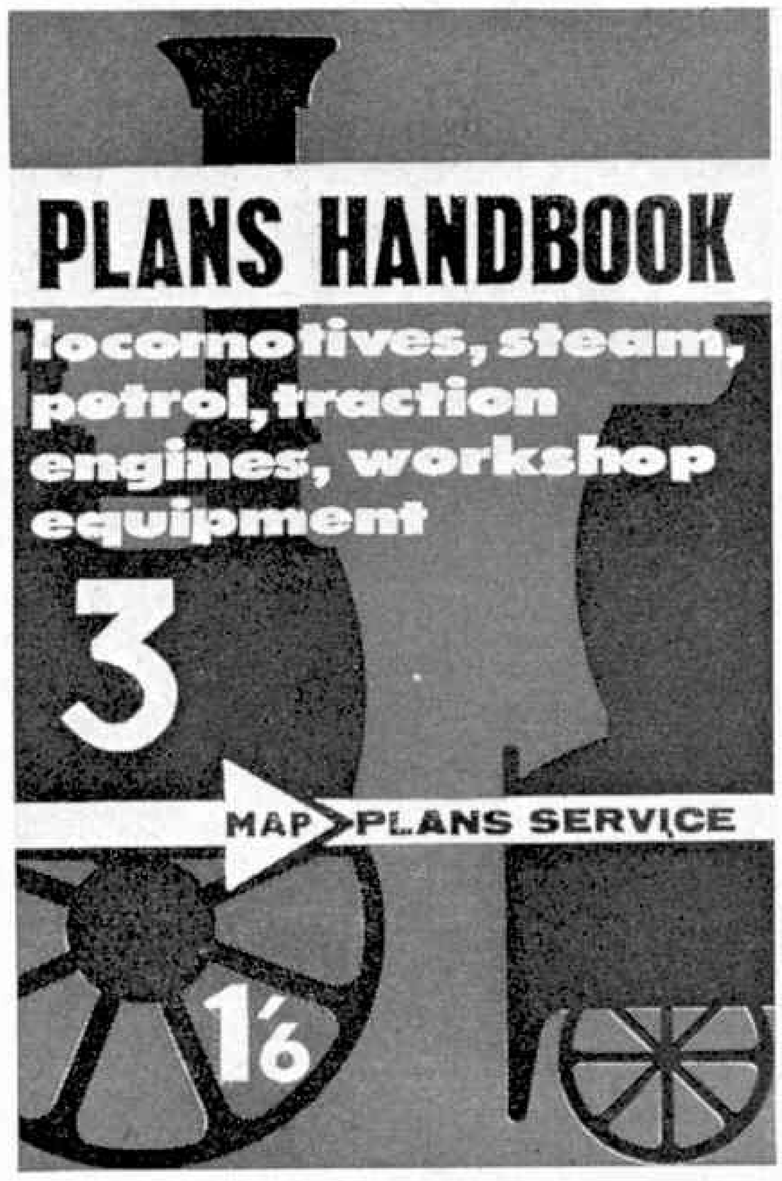
Clockwork No. 1, reversing (including key)	1	11	0
E15R Electric, reversing*	3	5	0
EMEBO Electric Motor (Battery operated)	1	8	6
43901 B Key for No. 1 Clockwork Motor		1	3
43903 S Key for Magic Clockwork Motor			6

* 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.



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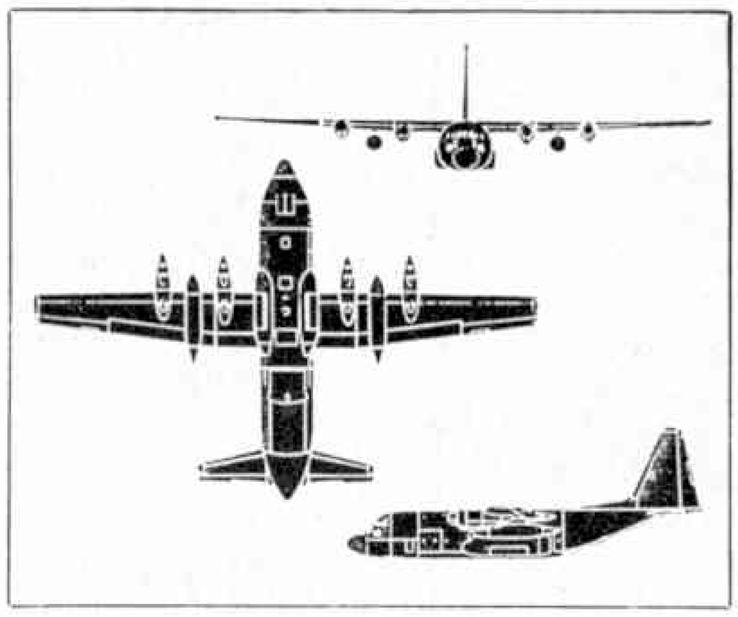
When you next see a Hercules winging its way through the sky, remember it's just about the most versatile freight-transport aircraft yet built. To keep it effective needs the talents of all sorts of different specialists. Aircrew, technicians, mechanics, suppliers, administrators—these are some. And all of them get a first-class, full-time training. If you're interested in aircraft and technology, the R.A.F. might be the life for you one day. Think about it.



Royal Air Force

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WORKBENCH

Those Electric Aircraft

The M.A.P. offices have been a hive of activity during the last few weeks with members of the staff constructing electric powered, round the pole flying aircraft models for the Model Engineer Exhibition showpiece. Several had flown electric R.T.P. before but never on a 15 foot long line to give a 30 foot diameter flying circle. After building several different types of aircraft and experimenting with motors the following conclusions were arrived at. All sheet models of 15-20 inch wing span flew the best and were easy to construct; Cox .010 glow plug engine propellers of 3 in. diameter × 1¼ in. pitch were about right; and standard RIKO—RIKOWHIP slot car motors were the most suitable. We have had three models flying very well now on 12 volts, supplied from the mains through a transformer, and via a RIKO slot car hand controller so that the aircraft can be taxied, flown fast and slow, and landed. The 3 foot tall pylon uses Meccano Elektrikit parts, slot car motor carbon brush for circular power transmission and this is fed from the pylon head to the model by two 32 s.w.g. copper wires while the models flying weight is taken on a third, twine restraining line. To date the most suitable aircraft have been the Hales Frogflite Quick Build Series at 7/11d. each. The Editor constructed a Veron Tru-Flite "Buster" Goodyear Racer which flew very well, from a 6/2d. kit, but these seem a little too complex to make in quantity. Several models are now ready for flying and we are commencing experiments with two models flying on one pylon, both under independent control. More news on the project next month—so don't forget to see the final result at the Model Engineer Exhibition, Seymour Hall, London, W.1. Full constructional details of the project will be published in MECCANO MAGAZINE in a few months time. Although too large for the average house the flying line length may be shortened, or you can use it as a school project where use of the assembly hall may be allowed.

Readers will be interested to see this 1/200th scale model of the Queen Elizabeth II. Note how the superstructure of the model has been superseded by a modified design—recent newspaper pictures of the real liner show its final guise.

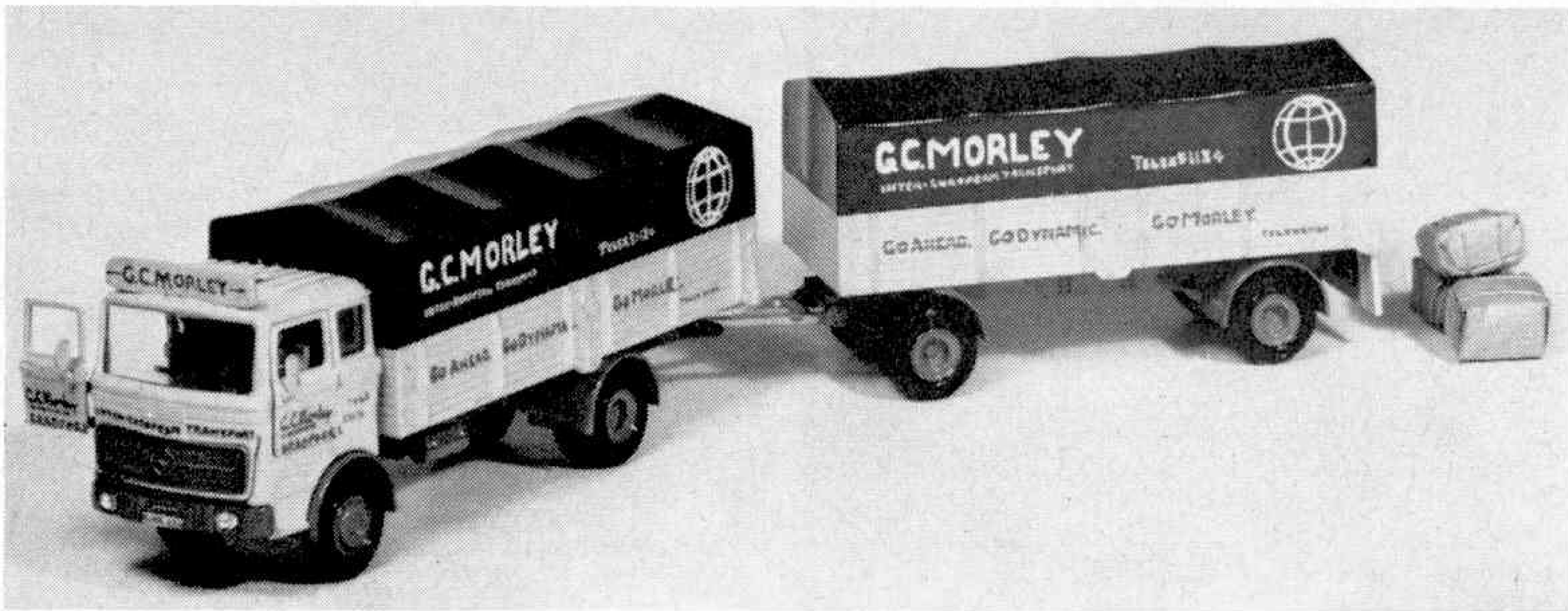
Supermodels of the Year

Following numerous requests by Meccano enthusiasts at home and overseas, comprehensive building instructions with whole plate photographs have been prepared for two models. These are the Crawler Tractor (October '68 MECCANO MAGAZINE) and Level Luffing Crane on page 100 of this issue by Eric Taylor. These are not "official" from Meccano Ltd., or Meccano Magazine—but from the Midlands Meccano Guild, of which Eric Taylor is a member. Full particulars will be sent on receipt of a S.A.E. (foolscap) sent to B. N. Love, Hon. Sec., Midlands Meccano Guild, 61 Southam Road, Hall Green, Birmingham, 28.

Price Changes

Recent increases in purchase tax mean that many model goods will be subject to an immediate increase in price. This wil amount to approximately 5d. in the pound extra. Advertised prices in this issue may not necessarily have been adjusted to include this increase.

Meccano Limited always endeavour to produce their Dinky Toys in a suitable colour-finish, but there is certainly nothing to prevent collectors repainting the models to meet personal requirements. This picture shows a Dinky Mercedes-Benz Truck and Trailer which Malcolm Jackson of Bradford, Yorkshire has repainted in the livery of G. C. Morley, a Bradford haulage firm specialising in inter-European travel. Malcolm recently started working for this company.

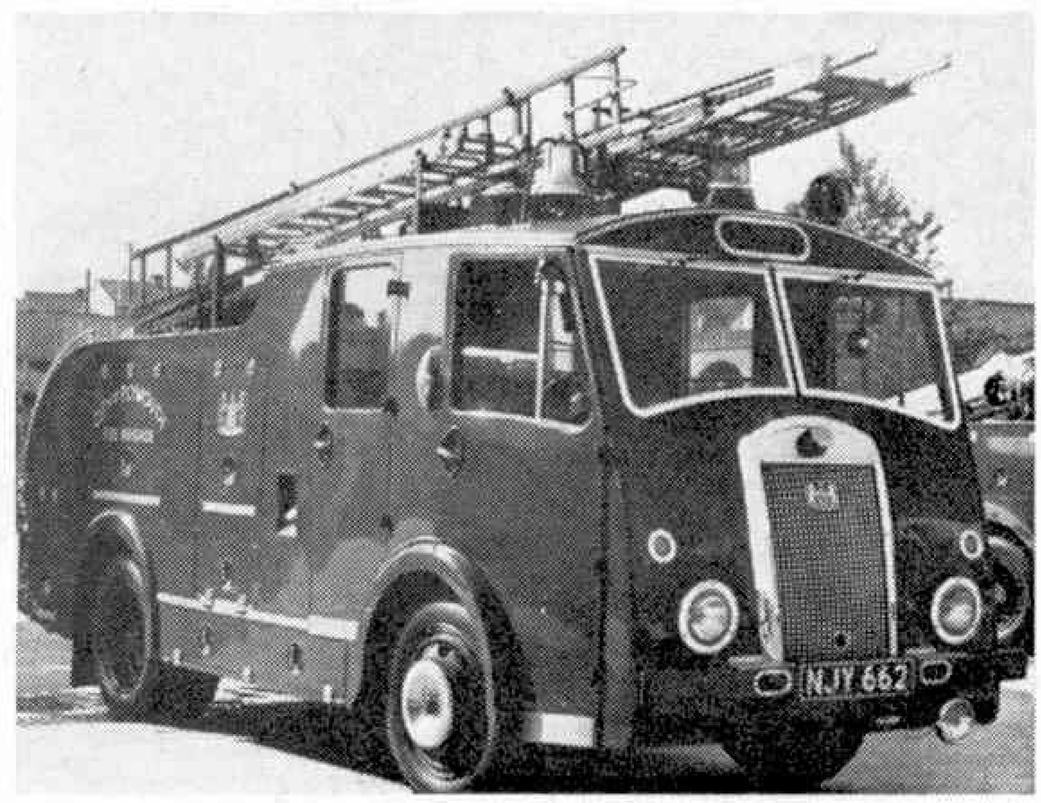


THE FIRE BRIGADE

Dave Rothwell describes some of the lesser known aspects of this very essential life saving public service and its advanced rescue equipment.

YOU, LIKE me, know that the Fire Brigade's main function is to put out fires. We've all heard tales of Firemen climbing ladders to rescue frightened kittens trapped on the tops of telegraph poles, but very few people outside the Brigade know of the many other functions that it is called on to perform, or of the amount of teamwork that goes into making this very necessary Public Service as efficient as is humanly possible. It was with these thoughts in mind that I approached the Fire Brigade for permission to spend some time at a Fire Station, and find out for myself

The heading photo shows recruits receiving instructions on operating the " Simon Snorkel " one of the latest fire fighting devices. Left: Pump outlets and controls on a " Pump Escape Vehicle ". Below: This Pump machine is almost 18 years old !



exactly what goes on behind the familiar large red doors.

I mentioned earlier that the Fire Brigade has many different kinds of emergencies to deal with. Every kind of fire, from huge factories filled with dangerous or inflammable material, down to small boys lighting fires in fields, is a job for the Brigade; as also are people trapped in vehicles in motor accidents, or locked out of their homes—and even little lads with their heads stuck between park railings ! All this means that the Fire Service is a pretty busy, and certainly an exciting, job to be in.

I was most interested to know exactly what happens when a telephone call for help is made, so here is a report of what happens when someone dials 999. The telephone operator at the G.P.O. asks which of the three services i.e. Police, Ambulance or Fire Brigade, is required, and upon receiving the request, puts the caller through to the service needed. In the case of the Fire Brigade, the call will go through to the Brigade Headquarters. In the front of the Brigade Headquarters building is a room with a large table with telephones and various other pieces of equipment, known as the "Watch Room". This is the nerve centre of the Brigade, where all the orders are issued from. The Fireman on watch duty obtains from the caller, the address of the fire and the extent. He then refers to a special map, which apart from showing him the nearest Fire Station to the blaze, also informs him of the type and number of Fire Engines that will be needed to fight a fire in that particular building. This information is incidently obtained from the Fire Prevention Officers of the area concerned, part of whose job it is, to pass on the information as to the type of buildings in the streets in this area, so that these maps can be compiled. This pre-determining and recording of the types of buildings in the area, saves considerable time and enables a Fire Engine to leave the station with the minimum of delay.

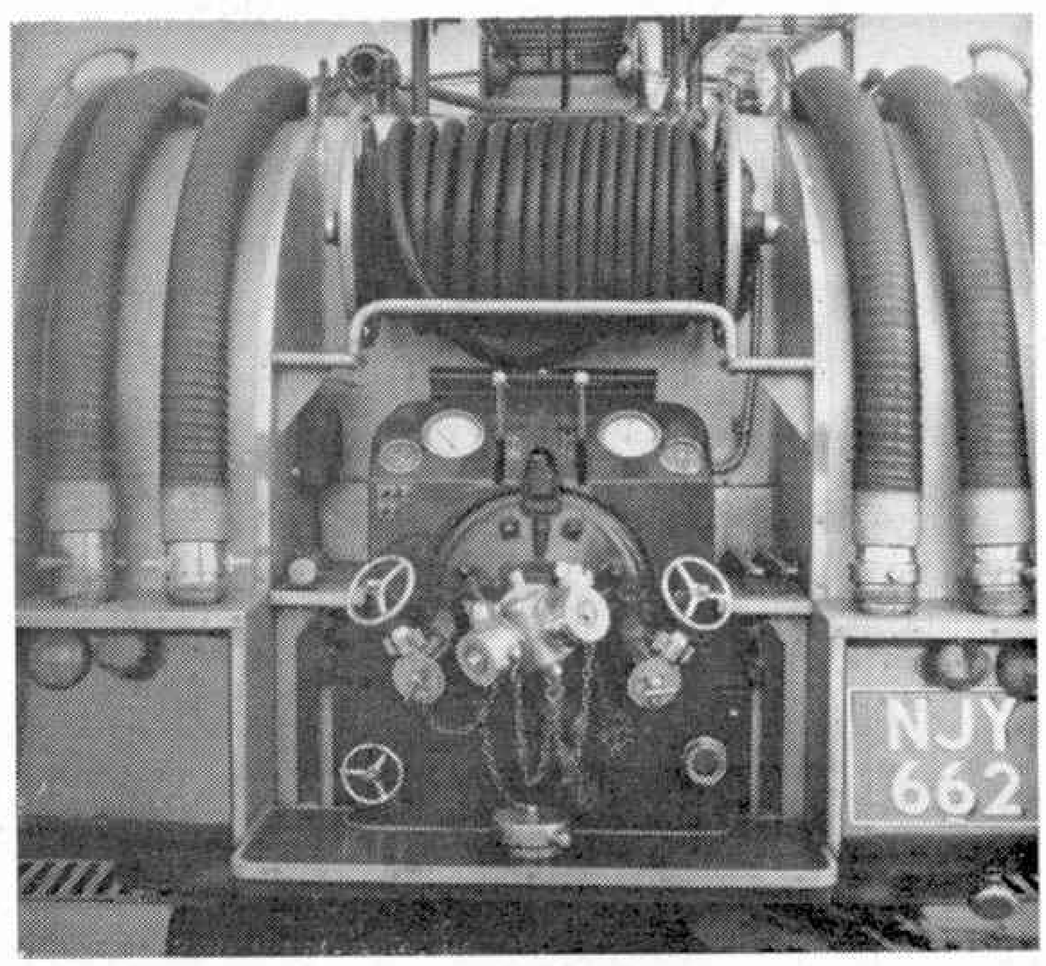
Once the officer of the watch at the nearest Station to the incident has received the information from Brigade Headquarters, he then sounds the alarm. The alarm system is so designed that no matter where a fireman may be in the Station, he will never be out of earshot of the bell. No matter what a Fireman on duty may be doing, or wherever he may be, when the bells are rung he must get to his Fire Engine as quickly as possible.

There are of course, several types of Fire Engine, each designed for filling the requirements of various emergencies, but as at this stage none of the Firemen know exactly what the emergency is, all must get into their own machines. The engines are started, and all eyes are on the illuminated board on the wall in front of the machines, waiting to see a letter light up which tells them which engine or engines will be needed.

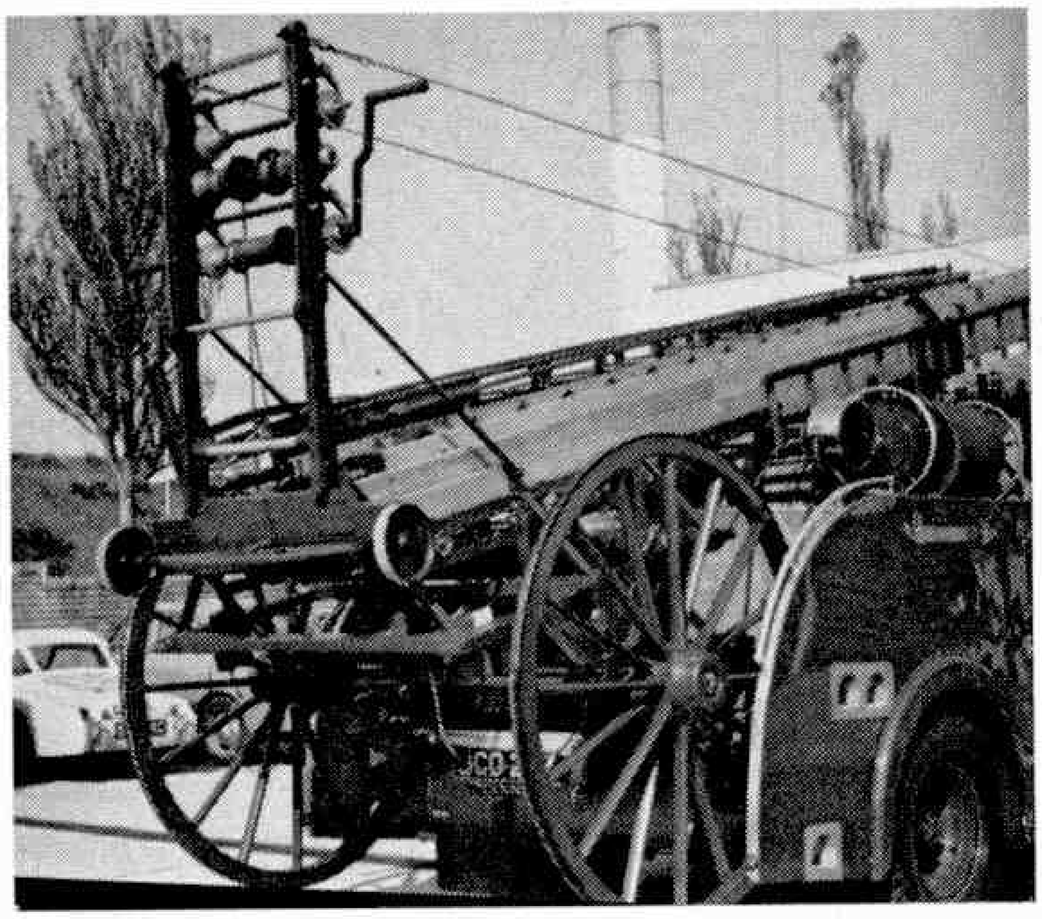
Once this signal is flashed up, the doors are swiftly opened, and away goes the Fire Engine concerned. Those Firemen that are left behind, climb out and carry on with whatever they are doing, until the bells are rung again.

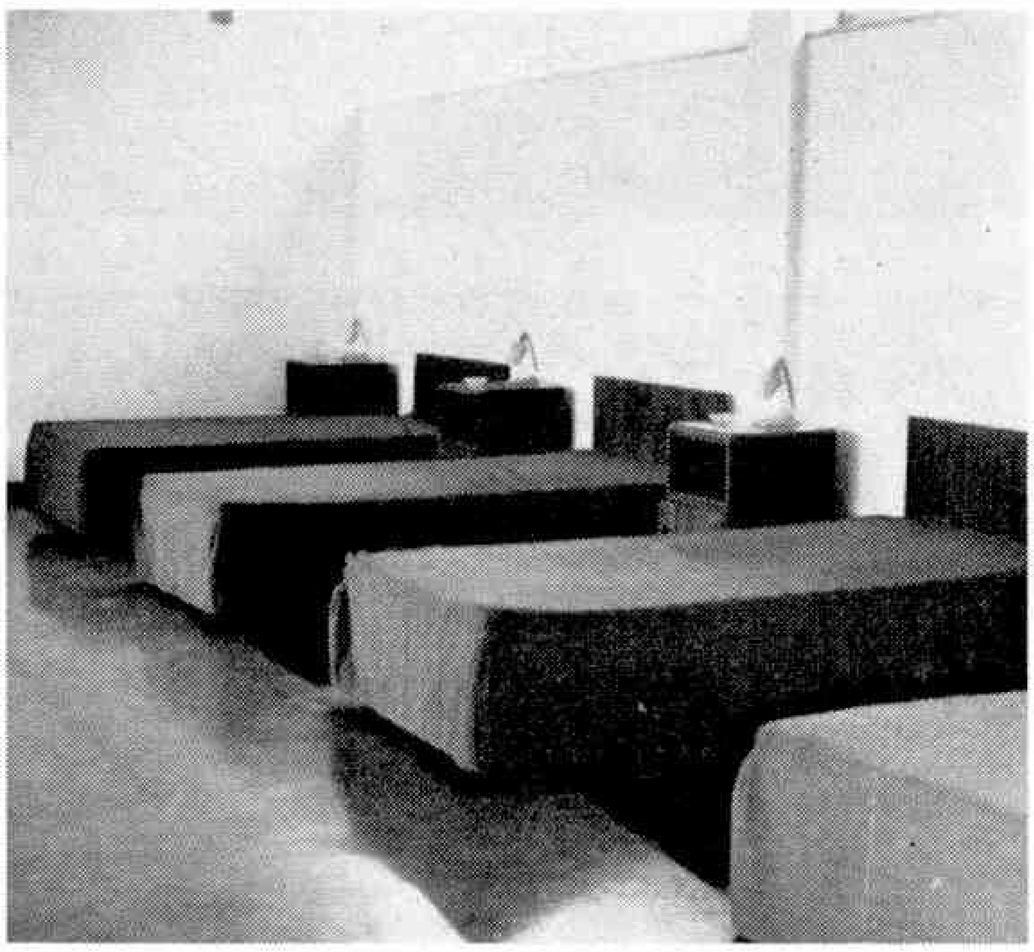
With all these activities to contend with, the Fire Brigade naturally has to have a tremendous amount of equipment to deal with them.

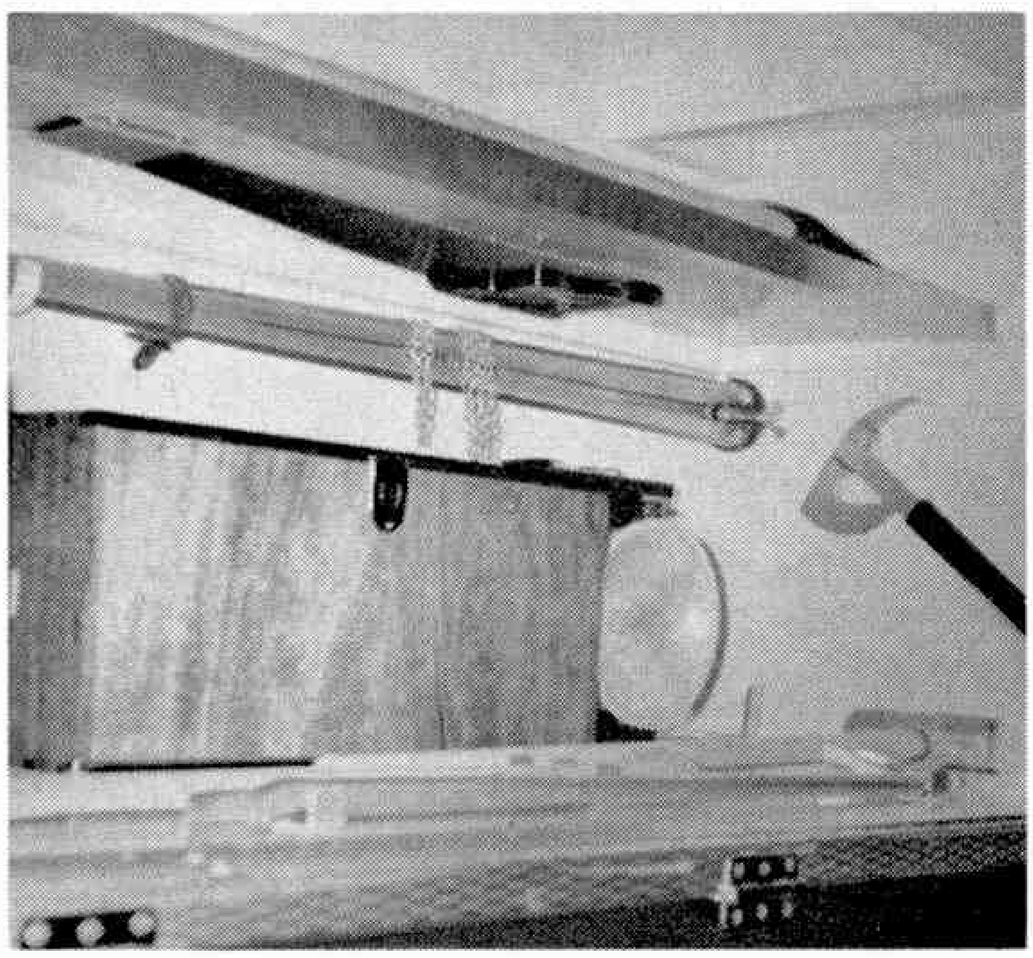
We'll start off by having a look at one or two of the Fire Engines in service today, and the various equipment that they carry.



Top: The watch room radio board. This is the nerve centre of any Fire Station. Centre: Pump outlets and controls on the Pump Escape Vehicle. Right: The Pump Escape as depicted in action on the cover of this issue painted by Laurie Bagley.







The Pump Escape

This machine is particularly useful for fighting fires where access to the blaze is limited. The ladder can be completely removed from the vehicle, and by means of two very large "Cartwheels" (known as carriage wheels), can be manoeuvered down narrow lanes, etc., where it would be impossible for the Fire Engine itself to go. The ladder is a 50 ft. "Bailey" type, made of wood with small wheels at the top end. A smaller extension ladder of 35 ft. is also carried, and can be seen in the photograph just to the right of the main ladder. This machine is built by "Dennis" and powered by an 8 cylinder Rolls-Royce engine of 5,675 ccs., producing 160 b.h.p. at 3,500 r.p.m. It carries 100 gallons of water, and like most engines can pump water from a Fire Hydrant etc., at a rate of 700 g.p.m. at 100 p.s.i. It's hardly surprising to learn with all the equipment and water, that the weight of this machine is 7 tons 4 cwts. ! Due to the fact that Fire Engines are very special machines, produced in fairly low numbers, compared with ordinary vehicles they are pretty expensive. This one costs in the region of £9,000.

The Pump

This machine is really a smaller version of the Pump Escape. Its ladder is only 35 ft. long when extended, although like its larger cousin, it also carries smaller ladders and 100 gallons of water. Built once again by "Dennis" it is powered by a smaller Rolls-Royce engine, 6 cylinders with a capacity of 4,256 ccs., which produces 123 b.h.p. at 3,750 r.p.m. It can pump water at the rate of 500 gallons per minute at 100 p.s.i. The weight of this engine, less crew, is 5 tons 12 cwts. and the cost is once again £9,000.

Recently, the Plymouth City Fire Brigade have taken delivery of two of the very latest types of Fire Engines, to be brought into service. The first is the new "Multi-Service" machine, designed to replace no less than four of the existing types of engines; and the second, the "Snorkel", an incredibly versatile machine which has no ladder at all, but utilises a hydraulic arm that is over 60 ft. long. Both these machines will be the basis for an article in the next issue, complete with numerous photographs.

Apart from the normal types of Fire Engines, there are vehicles which attract far less attention, but are, however, very necessary in ensuring that all emergencies can be dealt with. One of these is the "Emergency Tender", which looks very much like a furniture van from the outside. However, once you open the door the similarity ends. Inside, a long gangway extends right down the centre of the van, up to the back of the cab. On either side of this gangway, are large shelves with rolling shutter doors. On these shelves are carefully clipped literally hundreds of tools, of just about every kind you can imagine. Kits of engineers' tools, carpenter's tools, axes, drills, hammers, metal cutting shears, searchlights and many, many more gadgets and pieces of equipment, to enable the crew to tackle any type of accident or emergency.

Last of all is a Mobile Canteen, used to provide tea for the Firemen who may have been many hours fighting a blaze. Thanks to the efficiency of the modern Brigade, most fires are quickly dealt with, thus reducing the need for these machines to be used.

Top: A rear view of the Pump Escape showing the "Cartwheels" for pushing the ladder into alleys etc. Centre: Sleeping quarters for firemen on the night shift. At left: One of the well stocked Emergency Tender lockers. Note the saw and axe.

FIRE FIGHTING AND PREVENTION ON STAMPS

by James A. Mackay

ONE TENDS to take fire brigades for granted; something which figures on rating notices as one more item along with sewage and street lighting. The existence of the fire brigade is really only blessed when its prompt services are required and everyone always hopes they will never be needed. Compared with miners and farm-workers, firemen are a non-productive section of the community. Consequently, while there have been many stamps honouring and publicising others trades and professions, fire brigades have rather unfairly had very little attention of this kind.

The United States can claim to have one of the oldest fire services of modern times, dating from the middle of the seventeenth century. Pieter Stuyvesant, the Dutch colonial administrator, having lost a leg in the service of his country fighting the Portuguese in the East Indies, was rewarded with the appointment in 1647 to the New Netherlands (now New York) as " redresser-general of abuses ".

One of the (literally) most flagrant abuses he found to redress was the extreme carelessness of the burghers of New Amsterdam where fire hazards were concerned. The suburb of Manhattan in the 1640's was a terrible sprawl of timber and thatch which was ravaged periodically by accidental conflagrations. Stuyvesant immediately issued an edict compelling the citizens to build new houses, to sweep their chimneys regularly and do away with wooden chimneys and thatched roofs. There were still plenty of fires, however, so this was followed by a fire ordinance. Four fire wardens, nicknamed by their fellow burghers " The Prowlers ", were appointed to inspect chimneys and superintend fire-fighting operations.

In 1948 the United States issued a 3c stamp portraying Pieter Stuyvesant, flanked by a modern fire engine and a primitive hand pump to commemorate the tercentenary of America's volunteer firemen. Most of the fire brigade stamps so far issued have come from the American continent. Brazil celebrated the centenary of her firemen in 1956 with a fiery red stamp depicting dramatically the fireman in his romantic pose—descending a flame-shrouded ladder with an unconscious young lady draped across his shoulders. Uruguay issued a black and red stamp ten years later to mark the golden jubilee of her Firemen's Corps. It showed a fireman with a fire engine in the background. To the stamp was attached a label depicting the Corps badge and a fire prevention slogan.

Undoubtedly the only country in the world where the fire service is exalted above all other vocations, if stamps are anything to go by, is Panama which has issued no fewer than 24 stamps honouring its fire brigades. The first stamps ever produced in this theme came in the series of nine issued by Panama in 1937 to mark the 50th anniversary of the Firemen's Corps. These stamps depicted fire chiefs past and present, including D. H. Brandon who founded the Corps in 1887. In 1942 a long airmail set, depicting Panamanian scenery, included three stamps featuring the Fire Brigade headquarters in Panama City.

In 1948 the Colon Fire Brigade celebrated its jubilee, so a set of six had to be issued in honour of the occasion. In November 1962 another series of six stamps honoured the 75th anniversary of the Panama Fire Brigade. These showed different types of fire engine ranging from the " China " manual pump of 1887 to the modern motorised engine of today. The one centavo stamp depicted the Water Exercise which the Brigade laid on in June 1906 as part of the celebrations marking the inauguration of the Panama Canal.

Portugal issued two stamps in 1953 portraying General Gomez Fernandez, the founder of the Portuguese Fire Brigade, in full dress uniform complete with gleaming " gladiator's " helmet. Romania issued stamps in honour of Firemen's Day in 1955 while Czechoslovakia released stamps in 1960 to mark the 2nd Firemen's Union Congress. Poland issued a set of three stamps in 1957 to publicise the International Fire Brigades Conference. These were extremely realistic—perhaps too much so—including one gruesome scene showing flames enveloping a little girl, and another depicting a fireman in asbestos suit plunging into the blaze.

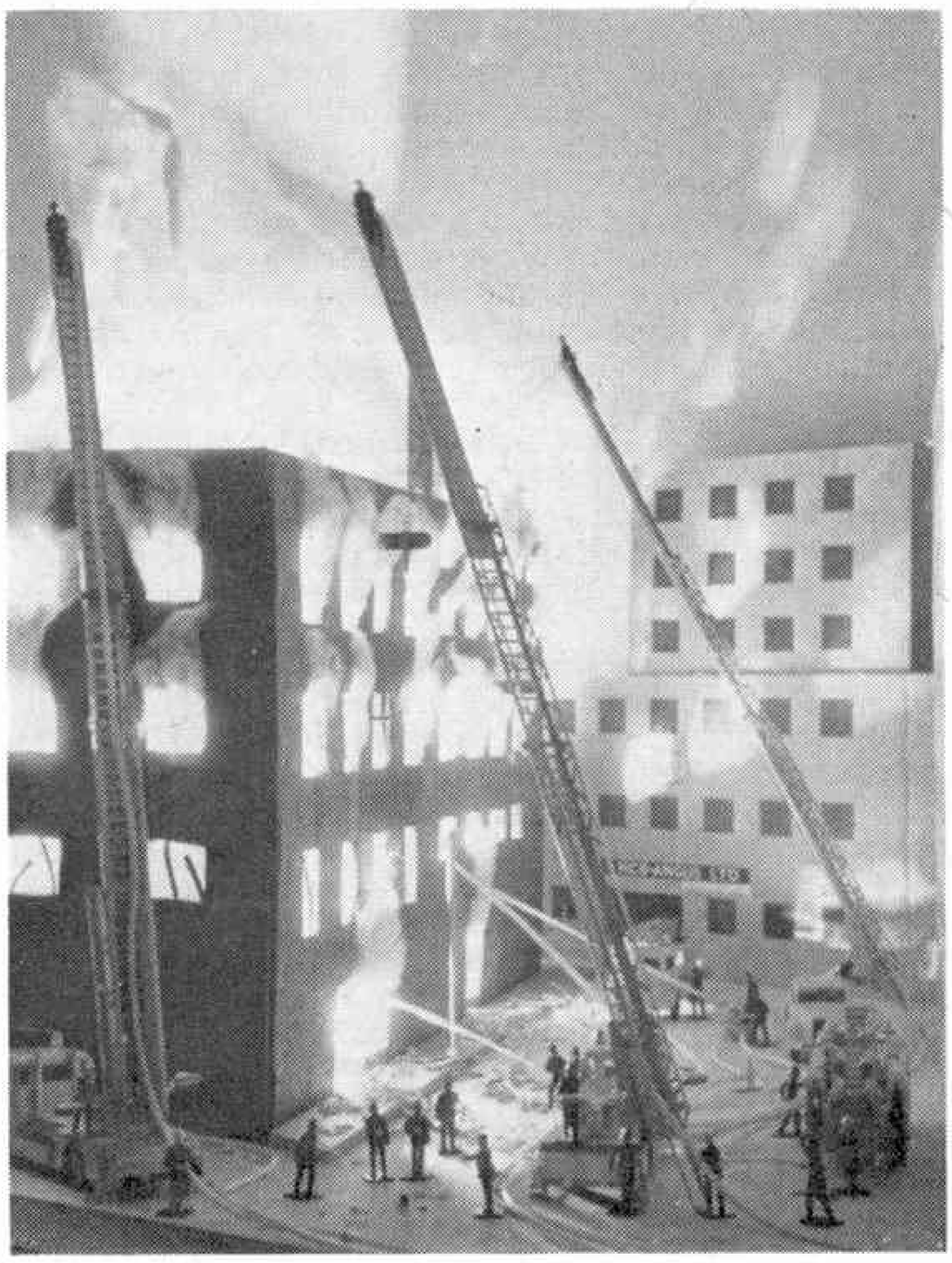
Austria issued a stamp in August 1963 to mark the centenary of the Volunteer Fire Brigades. The brigades, which are organised and manned on a purely voluntary basis, were raised in 1863, each town and village providing its own corps of volunteers. Within six years they had been organised into a national federation and in 1885 the Austrian Fire Brigade Board was established to co-ordinate the work of individual fire services on a national level.

The firemen are unpaid and the expense of maintaining the brigades is met by local rates and a grant from the insurance companies, amounting to 2 per cent of their total gross premiums. Vienna itself has a municipally-paid professional brigade which is independent of the volunteer movement.

The Austrian stamp depicted the statue of St. Florian in the Kefermarkt in Vienna. St. Florian, who was martyred in the eighth century at Puoche in Upper Austria, was regarded as having the power to ward off flame and his protection against fire was often invoked. Nowadays he is the patron saint of firemen and his feast day is celebrated on May 4th.

DINKY FIRE BRIGADE

by R. H. Knowles



THE buildings used in the author's fire scenes are a simple construction of cardboard and wood, the distant background buildings are flat drops as used on a theatre stage, behind which is a wall of very smooth plaster, painted with flat white emulsion as in a theatre cyclorama. The building on fire is cardboard with all the windows cut away, behind which is placed red cellophane paper. The smoke effect is produced by the careful application of cotton wool torn out very finely, and made to curl upwards. The flames and smoke coming from the roof are also cotton wool but this time supported on a lightweight wire frame work. Inside the building is a 150 watt lamp bulb and this is the only illumination used for the night scenes, which are photographed with an ordinary 35 mm camera on a tripod, 3 feet from the centre of the scene using a 15 second time exposure at F.11. The daytime scenes are taken with normal daylight plus one No. 2 photo-flood at F.11 and a 60th of a second, or F.8 and the same shutter speed 60th sec. The film used is Kodak TRI.X. PAN/ASA 400.

There are only 3 types of ladder and hydraulic mechanisms for fire escapes, Merryweather made in Britain and Meiz and Magirus both made in Germany. All three are in common use in this country. Dinky Toy No. 956 is based on the Magirus type but in reality these ladders are constructed in 4 sections extending to a height of 100 feet. The Dinky ladder has only 2 sections giving the equivalent in scale of 50 feet. This is not enough, so the author added a third section made of alluminium strip, which runs in and is held in position by 2 small rollers fitted into the second section of the Dinky ladder, and elevated by a secondary cable fastened to the bottom of the alluminium strip, and then fastened to the top of the first ladder section. The action of the second section pulls the third section upwards. The author is at present experimenting with a ladder containing 4 sections, which will be the only one in existence as no toy maker has yet got round to such an ambitious project to the best of his knowledge.

Dinky Toy No. 955 fire engine with extending ladder, is authentic, and they are used as they come; however, the first line appliance in all large Brigades is the Pump Escape. The escape ladder runs up to 50 to 60 feet, and is carried on a wheeled carriage for ease of movement. The author has detached the ladder from Dinky Toy No. 955, and added wheels taken from toy field guns, fitted brackets of alluminium strip, drilled holes to take the cable drums and winding handles. The midships pump panel consists of holes drilled in the side of the model with hose couplings pressed in. The couplings being machined from alluminium on a model makers lathe.

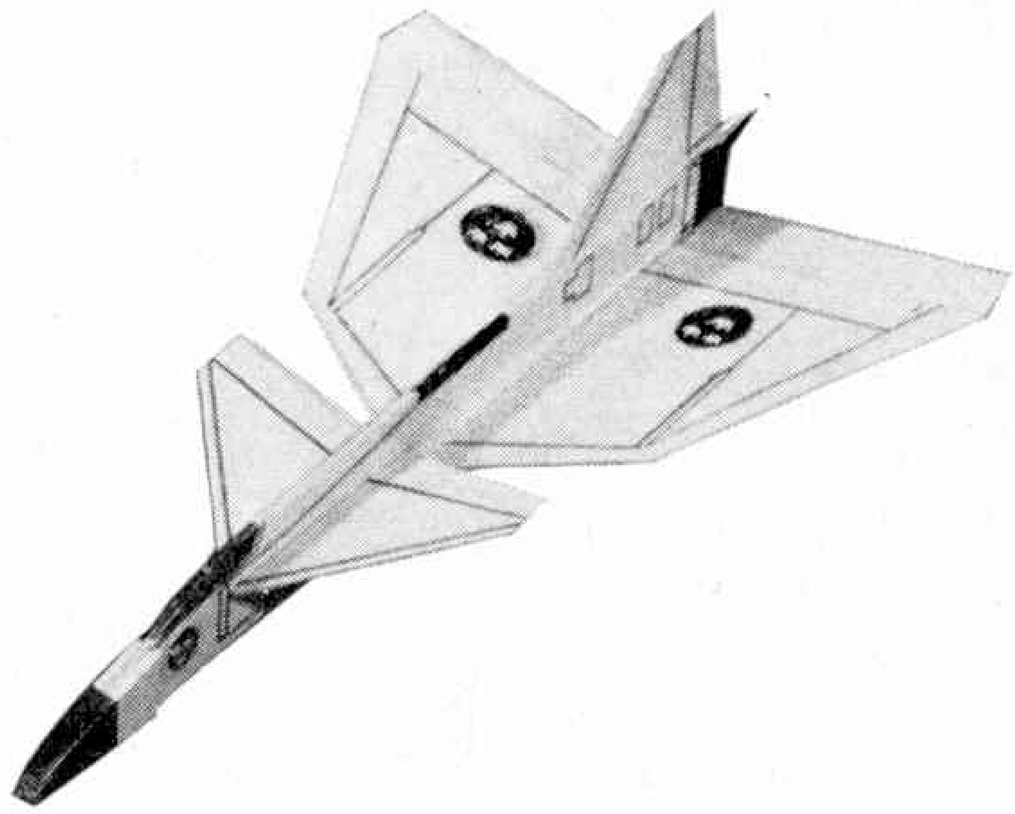
All hose is made from various lengths of Viaflex produced by Jones, Stroud & Co. Ltd., Long Eaton, after trying various products this was found the best because it lays flat, and is very flexible without kinking. To each length of hose couplings have been fitted to match those on the pump panels and jets of water are produced by the simple means of rolled paper, the firemen being Dinky Toys.

The author loves the world of model making and can work far into the night without thought of time. Photography as an art in this connection gives him immense satisfaction. So far as the fire brigade is concerned it was his job until he was invalided out with rheumatic fever after the bonded warehouse fire in Glasgow in 1960, when 19 firemen lost their lives.

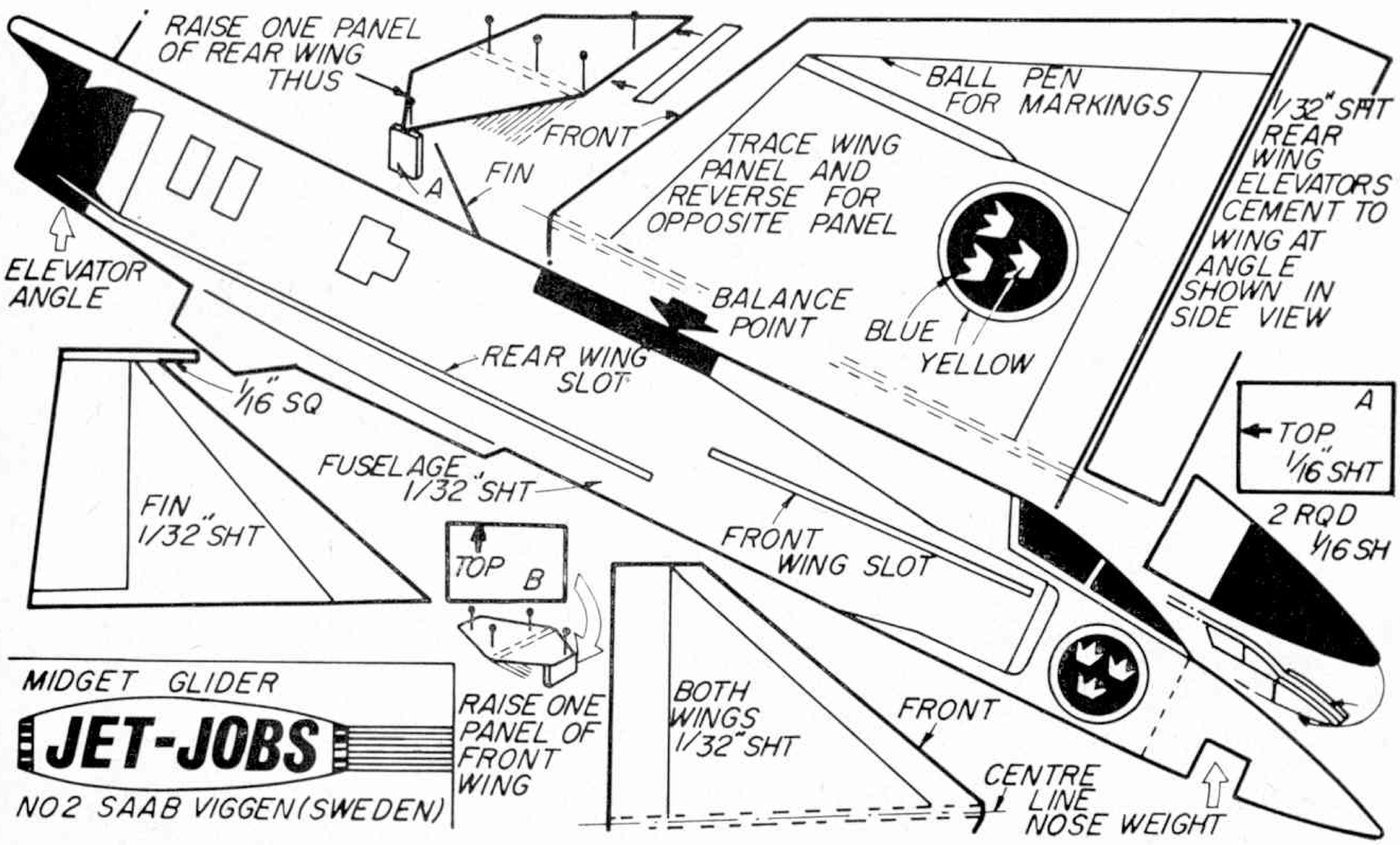
Readers interested in fire brigade models are invited to contact the Author c/o Meccano Magazine Editorial Office, 13/35 Bridge Street, Hemel Hempstead, Herts.

Full size plans for a simple sheet balsa midget glider, designed by Ray Malmstrom

WITH THE production of the SAAB AJ37 Viggen, Sweden can claim to possess one of the most formidable combat aeroplanes in the World. The Viggen is a double-delta canard type aircraft, that is to say the main wing, roughly triangular in shape is at the rear end of the fuselage and the smaller triangular stabilising wing is at the front. This unconventional arrangement together with its extremely powerful RM8 jet engine, gives it very short take-offs and landings, very high supersonic speeds, and a climb to 36,000 ft. in 2 minutes ! Our small model of this top-line combat aeroplane is extremely quick and simple to construct. The plan contains all of the parts full size with assembly sketches and instructions. From a sheet of $\frac{1}{32}$ and $\frac{3}{16}$ balsa you could build several Viggens for yourself and your friends. Carefully cement the elevators to the rear of the mainwing and set at the angle shown. A tiny piece of lead or folded used cement tube is pushed into the noseweight recess until the model hangs level when suspended by cotton and a pin pushed into the balance point. Gently bend the elevators up or down until your Viggen gives a long shallow glide. Happy gliding to you.



This photograph shows how simple this inexpensive, all sheet balsa wood model is to make. Use a ball pen for marking.



BATTLE

Part X—Anti-Tank Guns —The Final Points

by Charles Grant

WHEN CALCULATING Defence Values for our tanks and so on we used as a basis a single thickness of armour, a figure derived mainly from the maximum armour thickness as given in the appropriate specifications, but which, in practice, would really amount to an average sort of thickness. In turn, this logically produced an average sort of Defence Value. It would be a simple matter to take this as a constant, but this would tactically speaking be a terrific unfair, as I hope to show, taking an ordinary example to do so. This involves the use of the 'bazooka', an infantry ambush weapon, although it can also apply to any vehicle armed with a gun. A lightly gunned tank, for instance, if it is going to take on a stronger and more heavily armoured opponent, is not going to take the bull by the horns and meet it head on, but is going to lurk about and wait for the opportunity of slamming home a shell into the weakest part of the enemy. This kind of tactics is particularly applicable to infantry bazooka teams and of course the "panzerfaust"—where the use of the weapon immediately gives away its position and in whose case the first shot must really strike home. Or else! So, what does the bazooka team do? It does not fire at the front or even the side of an advancing tank, but waits until it has passed, when it endeavours to send home a shot into the more vulnerable portion of the enemy's metal anatomy, the rear.

In fact, although we did allocate a single Defence Value for each tank or other armoured vehicle, this indeed must vary with the three aspects we have to consider—front, side and rear. The proportion of armour thickness varied from tank to tank, but if we take the German Mark IV as an average sort of example, we find that the thickness of hull armour was thus:—front—50 mm., side—30 mm. and the rear—20 mm. The turret armour was more or less the same, except that the rear thereof was 30 mm. instead of the 20 mm. of the hull. In effect, what we can say then is that the Defence Value of the front of the tank is, or should be, higher than that of the side, which in turn is higher than that of the rear. In the case quoted we can ignore the fact that the turret rear armour is the same as that of the side—the hull aspect is considerably greater than the turret's. What all this amounts to is that, although we could use the Defence Value as given in the Table for all cases—this would be simple—it won't really be a great deal of trouble to make allowance for difference in armour thickness and we do this in a very simple way. When a tank has been hit we consider the Defence Value in relation to the position of the strike—if the side is involved, the standard or given Defence Value is used to decide whether the strike has been effective or not. So, when the shell has hit the front of the target tank, we add 1 to its Defence Value, and when, happily for the 'general' who has caught his opponent at a disadvantage, the rear has been assailed, a deduction of 1 is made. Just one example to make this clear—if this has not already been done—the Sherman, with a D.V. of 14, if hit in front, adds 1, and if hit on the more lightly protected rear, loses 1, making the Defence Value only 13.

Hit determination

So far, so good, but we have to determine which part of the tank has been hit by the shell—if at all, of course. This is easy. Just take a direct line from your gun muzzle to that portion of the enemy you want to have a go at—this process giving us the opportunity of demonstrating our first 'Battle' device, this being a very elementary one indeed. The player can have recourse to a tape measure—the metal type is satisfactory for simple distance or range computation, although it does tend to whizz back into the holder at the slightest opportunity. Myself, I use a species of home-made straight-edge, in fact a length of ¼ in. half-round wooden beading. In fact, I have a number of them of different lengths, for in the heat of an engagement it's quite easy for a single measure to disappear, to turn up under the table some time later, and if a number of 'sticks' are lying about, the player can conveniently grope around for one, while keeping an eye on his enemy's activities at the same time! The various sticks can be easily and clearly graduated by painting the flat surface of the beading white and marking on the necessary measurements in black, either by painting or by using a felt-tipped pen, both these methods being eminently suitable.

The first one required, as it happens, is the one used for anti-tank range and it need be only 45 in. in length (as already said, it is not anticipated that we shall use, for the time being at anyrate, longer anti-tank gun range). On this we mark off the distances referred to in our Strike Value Table. Accordingly it is divided into four sections, so, having painted the flat side of the beading white (and let it dry, of course) we mark in the divisions we have decided upon —i.e. 0 in. to 10 in., 10 in. to 20 in., 20 in. to 30 in., and 30 in. to 45 in.

In passing, it is obvious that a simple wire properly marked, or even a piece of string with knots in it to indicate the various ranges, would do the trick, but for one reason which I hope to demonstrate, the stick—which can be ½ in. in width if the narrower one is found to be too fragile—is really recommended.

Angle of strike

Anyhow, armed with the suitably calibrated 45 in. stick, the next step, involving a little do-it-yourself work, is as follows, and it concerns the angle at which the shell strikes the armour of the target tank. First of all, the reader doubtless knows full well that a shot striking a surface at right angles to it has a far greater effect than one striking a glancing blow—and the more acute the angle between the direction of the shot and the surface the less will be the effect, and the greater chance there will be of the missile's ricocheting off into the blue. One of the most important and most highly scientific part of tank design is the angle of setting of

armour plate, but it will be sufficient for the purposes of " Battle " if, in the rules, we make an allowance to ensure that the shot which strikes fair and square will have a greater effect than that which strikes at an acute angle.

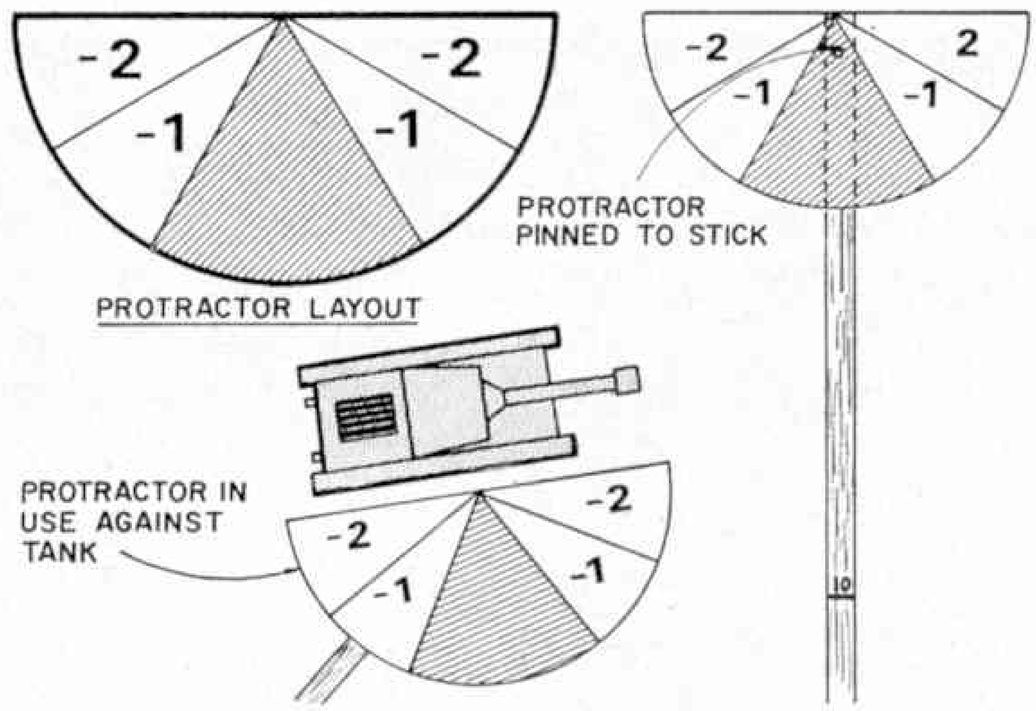
Construction

This we can do if we construct a device, which can be elaborate or simple as desired, but which amounts basically to a home made protractor. Get a piece of card—this is really a very simple way of doing the job—and with an ordinary pair of compasses inscribe thereon a circle, drawing in the diameter as well. With a scissors or sharp knife cut out one of the resulting half circles. The size does not matter terribly—it can be 2 in. to 3 in. in diameter, or even a little larger. Then with the aid of an actual protractor draw in the lines showing angles of 30 and 60 degrees, on both sides of the vertical. In effect each right angle has been divided into three equal sections. With this in hand, we can make allowance for the strike angle and this is done by simply adjusting the given Strike Value of the gun firing. This was initially calculated as an optimum —i.e. when the shot had impacted more or less at right angles—and in this case the normal S.V. was used. When, however, it strikes at an angle of between 30 and 60 degrees to the surface a deduction of 1 is made to the Strike Value, and when the angle is less than 30 degrees, the reduction is 2. Lest this be thought to be an exercise in geometry I hasten to reassure the reader. Have another look at the half-circle you made and mark the appropriate sections with '— 1' and '— 2' as the case may be. You will have something like that shown in diagram. This is looked at with the horizontal side uppermost for the simple reason that this is the way it will appear to the player using it.

Now take the graduated stick and down the centre of the 0 in. — 10 in. section draw a straight line, to indicate the exact path of the shell. The semicircular card is now pinned to the extreme end and the final result can be seen in diagram—this being the Tank Range and Strike Angle Stick, which is a dreadful mouthful and instead of which we shall simply say the " Tank Stick ". An ordinary pin or fine nail may be used for the job of joining the two component parts, or a small nut and bolt, it does not matter so long as the 'protractor' part is allowed to pivot fairly easily on its spindle. Quite certainly the enthusiast with the requisite time and the necessary skill may desire something a little more substantial than that which I have described, but even with this it might be necessary to reinforce the beading at the swivel point, either with a tiny block of wood, or with a blob of plastic putty. In any case, some care will have to be taken in driving the pin into the stick to prevent splitting, and yet to get it as near to the end as possible. I have no doubt that the ingenious reader will be able to complete the device to a much more elaborate and solid specification than that detailed.

Using the protractor

Now for its use. The diagram and the accompanying photograph make this pretty obvious, but in brief, when tank " A " fires at tank " B ", say, the head of the Tank Stick is placed against the latter and the Stick extended back over " A ", when, at practically the same time the range and any required



deduction to the Strike Value for angle can be read off. At the same moment it can be seen where the tank has been hit and any alteration to the standard Defence Value noted. This all sounds terribly complicated, but so indeed does the explanation of any sort of simple action, and in practice it takes only a few seconds. It is a remarkably quick process to place the stick in position and do the rapid sums required, then roll the necessary dice.

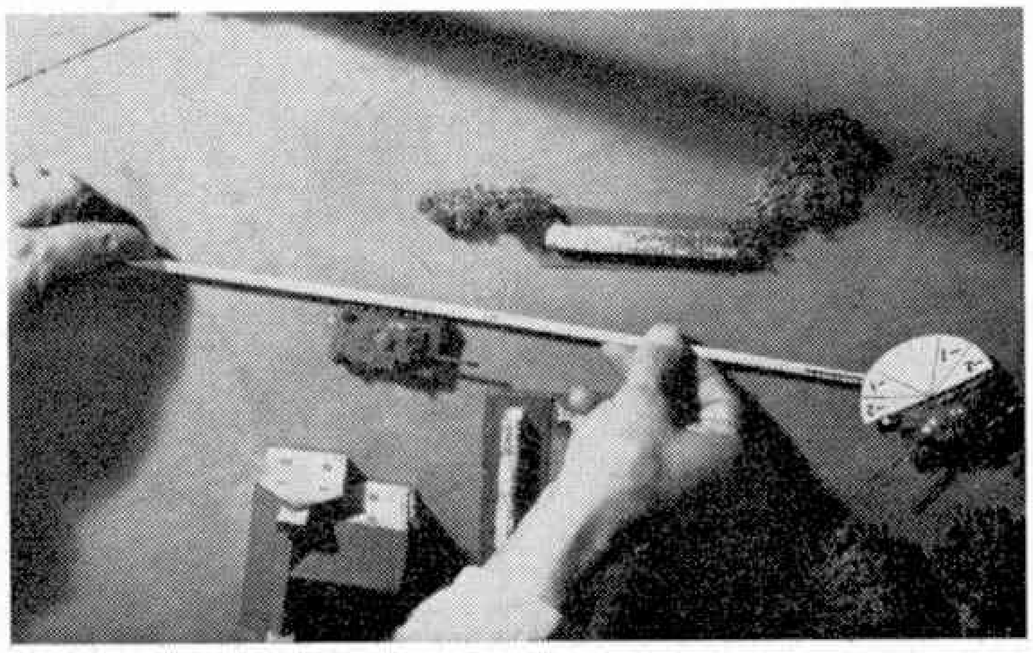
An example

Just one example—suppose a German Mark IV with 'long 75' fires at a Sherman at 15 in. range; Strike Value at this range is 6; the deflection was between 30 and 60 degrees, therefore 1 is deducted, making it 5. Defence Value of the Sherman is 14—hit is on the side, so no deductions; two dice rolled by the 'Mark IV' player—he gets a 6 and a 4 making a total, with his Strike of 5, of 15—one more than the Defence Value, therefore—a kill !

And next month, at long last, ACTION !

Correction

(Note:—In Part VIII of " Battle " (December 1968) reference was made to the " 21 possible variations " in the throwing of two dice. I wrote that I was possible to score 11 or 12 in two ways, and 7 or more in 12 ways out of the possible 21. This actually referred to the *apparent* combinations, because there are obviously 36 different ways in which the dice can fall—six times six, in fact. The chances of getting a total of 11 or 12 are actually three out of 36—a possibility of 1 in 12—and 21 out of 36 of getting 7 or more—or one in under two. All this hit me in the eye when I read the published text and I hasten to apologise for my carelessness in using the wrong set of figures.)



The " Tank Stick " in use—a 'Sturmgeschutz' having a 'go' at a T.34—the 'Stick' is placed alongside the former for the sake of clarity.

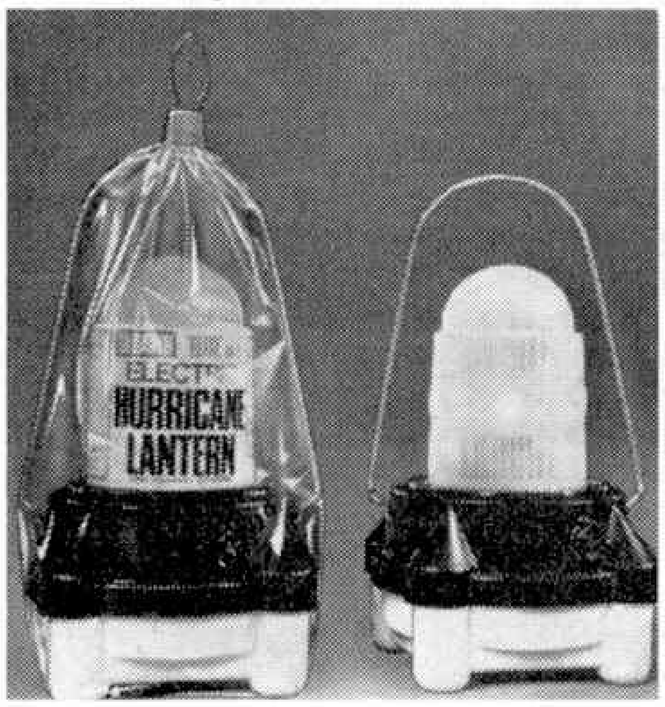
HAVE YOU SEEN ?

The Tildawn Electric Hurricane Lantern

The Tildawn Hurricane Lantern, moulded in black and yellow polythene, is a virtually indestructible lamp. The 5 in. high polypropylene dome gives out a bright, all-round illumination that is so useful for the camper, caravanner, motorist, etc. Specially designed to withstand rough usage, the lamp can be dropped or even thrown without causing any damage to it. The wide base makes the lamp very stable when standing, and the handle enables it to be hung in any position, even upside down.

The lamp is powered by two AD28 or similar batteries, giving up to 50 hours of constant light. It has an on/off toggle switch and a simple clip-on base for quick battery changing.

This amazing lantern costs only 32/6d. and can be obtained from electrical stores, camping specialists and motoring accessory shops.



Monogram's Huey Cobra Team

Monogram's latest introduction to their series of military aircraft now being used in Vietnam is the 1/72 scale AH-1G Huey Cobra.

These helicopters, armed with the Emerson TAT-141 flexible turret, mounting for the 7.62 mm. minigun, and carrying 40 mm. grenade launchers in the nose and four 19 rocket packs on the stub wings, are used in close support of Ground Troops.

As the Cobras usually work in teams of two, Monogram's kit is so realistic it contains parts for two models. Both models contain cockpit interior, clear canopy, two crewmen, rotating main and tail rotars and authentic, matt finished transfers. Also included is a display stand which enables the helicopters to be mounted in combat formation.

Humbrol Tinlet Palettes

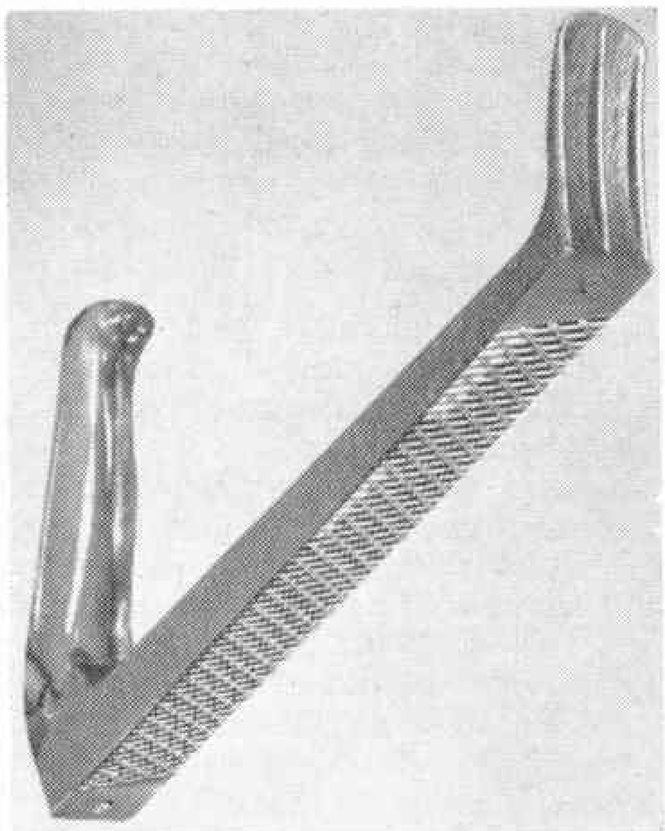
Humbrol Ltd., the tinlet paint manufacturers, have introduced a new idea for the plastic modeller—plastic palettes to hold their mini tins of paint.

There are three trays in all. The first contains 18 gloss colours and costs 28/-. The second tray, which interlocks with tray No. 1, contains an additional 18 gloss colours and costs 26/-, and the third contains 12 matt colours, interlocks with tray No. 1 and 2 and costs 20/-. Tray No. 3 also has 4 spaces for additional tinlets. All 3 trays have space for brushes.

The Steadfast Versaplane

The makers of the Steadfast range of hand tools, Balfour and Darwins Limited, have introduced a tool specially designed to make filing and planing easier. The tool, named the Versaplane, which utilises the same blade as the Versafile, has a handle that can be set in two positions, one for filing and the other for planing. The blade gives edge to edge cutting on materials such as metal, wood, plastics, rubber, etc. In addition to this, the blade is double sided, so that when one side is worn out it can be turned over and a new set of cutting edges can be used.

We have used the Versaplane on a number of modelling and domestic chores and found it to be entirely satisfactory. The only trouble is that whenever we put it down in the office after a bit of woodworking it disappears—so popular is it with other members of the staff here at M.A.P.



Airfix Mercedes 280 SL

The name Mercedes-Benz has always been associated with luxury and high performance motoring, obtained by their six cylinder engine, giving Merc's a top speed of 130 m.p.h. Probably everyone at one time has been excited at the sight of a Mercedes thundering round the race track or cruising along the motorway. Now, thanks to Airfix, you can own a Mercedes, the 280 SL, though it be only 1/32 full size, and costs a mere 3/8d.

The kit, made up out of 88 parts, can be assembled in two variations. Either the hard top coupe or the roadster with the flush-folding soft top can be built. The soft top can be in the erected or lowered position.

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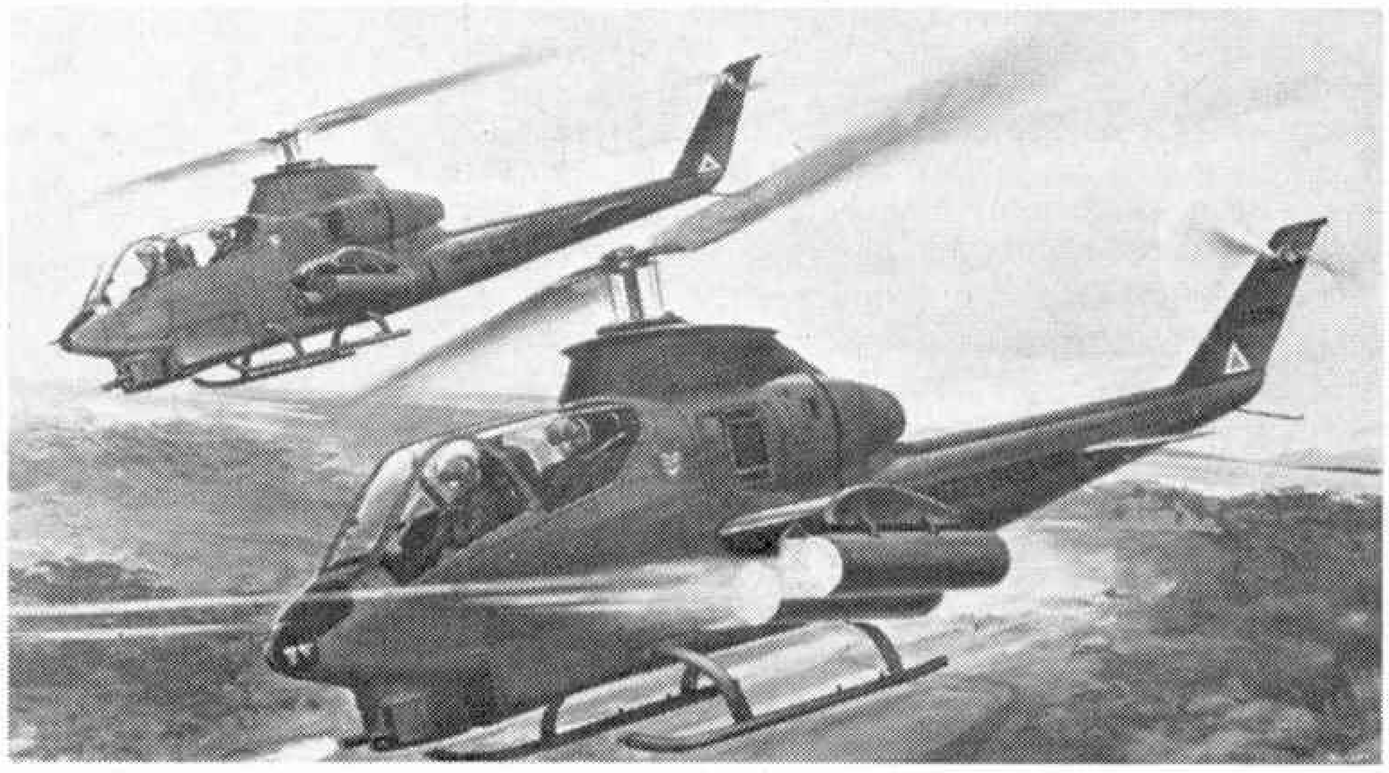


RECOMMENDED READING

" Aero Modeller Annual 1968-69 ", Published by Model & Allied Publications. Price 10/6d.

This M.A.P. publication may be new to readers of MECCANO MAGAZINE but most experienced aeromodellers read it every year without fail. As you may have guessed it has been going for a long time—in fact—for more than 20 years now. Each year all of the World's top designs in control line, free flight and radio control are to be found in the Annual and this year is no exception. The 130-5½ x 8½ in. size pages contain no less than 58 reduced scale constructional plans and leading features.

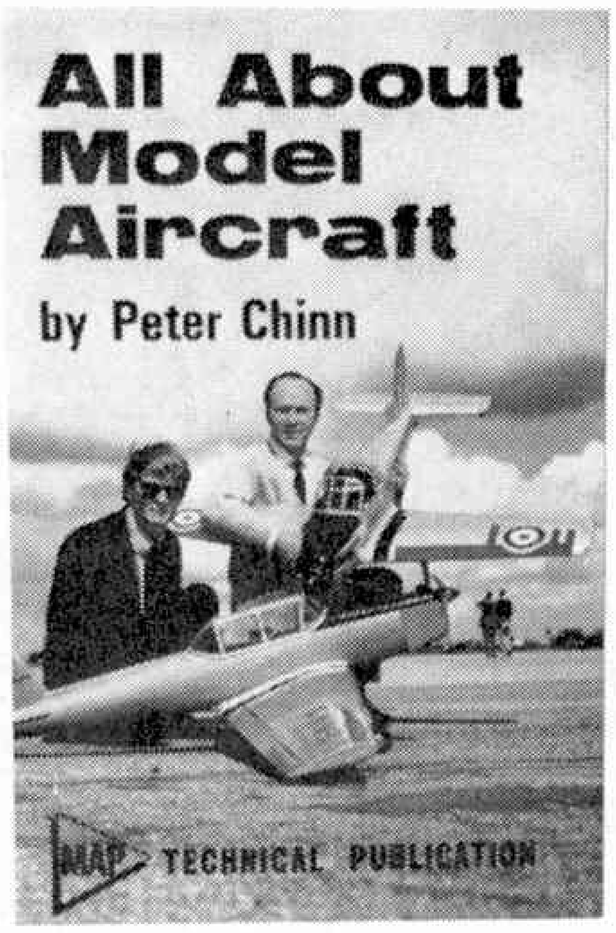
The range is tremendous, with Ron Warring on the principles of flight, through to an American speed ace on the art of engine tuning for control line speed, and details of the combat model that won the National Championships, through to top Canadian free flight power models and small Italian rubber powered free flight designs.

For the active model enthusiast, and those who are only just getting started and want to know a lot more, we can really recommend this 10/6d. book—this price being very good in today's age of spiralling costs and increased prices.

" All About Model Aircraft ". Published by Model & Allied Publications. Price 15/-.

Here at last is a really up to date model aircraft handbook for young and old alike. For many years now there has been a great need for a really basic model aircraft book, written in such a way that the novice can really get to grips with model flying.

Almost every point that gives the novice trouble is covered in this book from simple free flight to advanced radio control models. It details the tools needed to get started in aeromodelling and then goes step by step through the theory of flight, construction, flying and how to operate diesel and glow plug



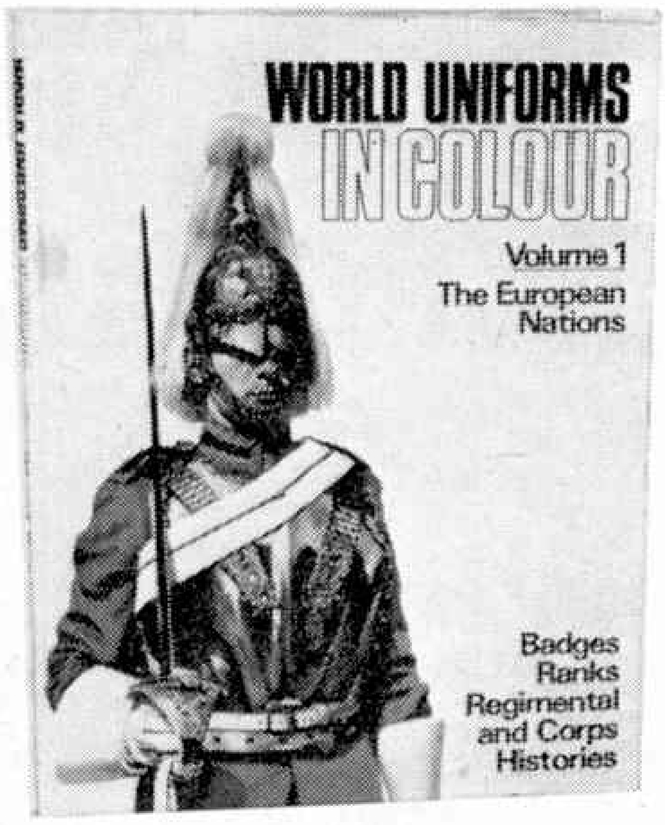
engines. The engine chapter is most useful as this is where most juniors have trouble. Even with today's advanced model engines, there is still a knack to the starting of engines—and the book explains this very well. As well as these basic subjects it also explains how to make fuel for your engine, how to solder, and how to make a good job of covering the model and painting it.

All in all, we think this 160 page book with its large number of illustrations on its 5½ x 8½ in. page size is invaluable for the novice and it could well save hours of trouble and costly mistakes. Come to think of it—we can call to mind a few expert modellers who could well learn from this 15/- book by M.A.P.

" Keil Kraft Handbook ". Available from your model shop. Price 2/6d.

Every person who has constructed model aircraft will need no reminding that Keil Kraft is one of Britain's most go ahead kit manufacturers and model distributors.

For only 2/6d. this 90 page book with 7 x 9 in. page size is extremely good value and we always use one for checking on available wood sizes, etc. The 74 page catalogue section is most interesting as it illustrates the entire Keil



Kraft line of kits and all products they distribute to the model shops, from engines to proportional radio gear to balsa wood and model railway trackside buildings. The editorial features are most basic and give the novice a real insight in the very often overlooked basics of modelling. The chapters include titles on trimming free flight models, engine reviews, adhesives and how to make a rubber motor.

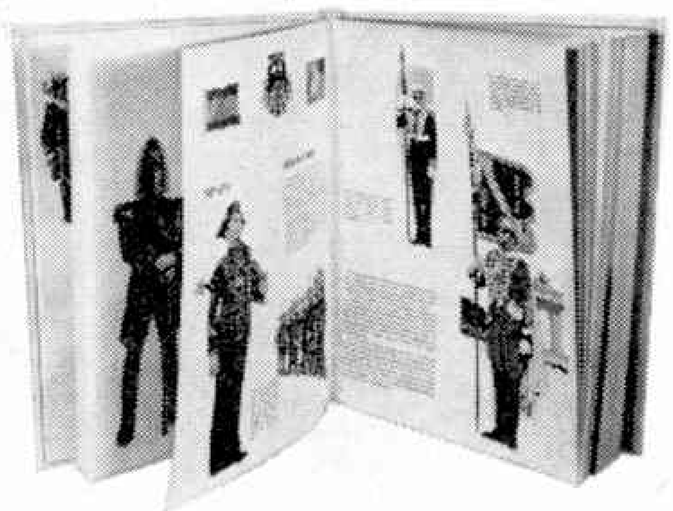
In our opinion, every youngster who has a model kit, or is going to purchase one soon, should have a copy of this invaluable reference handbook.

" World Uniforms in Colour, Vol. 1, The European Nations ". Published by Patrick Stephens Ltd. Price 30/-.

Uniforms of both military and non-military organisations have an endless fascination for everyone. Almost all nations maintain forces who still parade in ' traditional ' uniform, derived, perhaps, from centuries of campaigning. Police forces, militia, and honorary organisations also have their traditional uniforms and equipment. The two volumes of " World Uniforms In Colour " covers all current ceremonial uniforms; those that are likely to be seen when visiting foreign countries.

Volume 1 covers the soldiers and other uniformed organisations of the European nations. Included in its pages are large accurate paintings of all the major units which still parade in full dress. Altogether the uniforms of more than 150 famous units are illustrated in colour. Also illustrated are badges, emblems and flags. In addition to unit historics there are full descriptions of ceremonies, traditions, customs, and badges associated with the units described.

This book will appeal equally to everybody. While being easy to read and follow, it is factual and detailed in content.



Simple Slot Car Modifications

Dave Rothwell continues this month with simple modifications to three " over the counter " commercial slot racing cars

EVER SINCE the introduction of electric model car racing, followers of the hobby have been striving to make their cars go just that much faster than everyone elses. It is the purpose of this article to pass on some of the hints and tips collected from various sources to improve the performance and handling of cheap cars, in this one of the most exciting and interesting forms of modelling.

To explain and illustrate the various methods of making faster cars, we have taken three of the most popular models available today and by carrying out a few simple modifications, managed to improve their performance above that of the standard kit.

The models modified were the Scalextric-Austin Healey, Airfix-Lotus Cortina and Revell-Cooper Cobra.

The Scalextric and Airfix models were ready to run straight from the box, the odd one out being the Revell-Cooper Cobra, which was purchased in kit form.

General modifications

Some of the modifications described can be applied to all three cars, but each also required individual attention, because of the different ways in which they were each constructed. To start with we will concentrate on the general modifications that applied to all three cars.

The first impressions of all three cars when run round the test track was that the electrical pick-up from the track was rather poor. The fault in all three cases seemed to be due to rather stiff braids which were unable to flex up and down when the cars rolled on corners, thus creating intermittant contact with the track. These were replaced with soft-braided copper pick-ups.

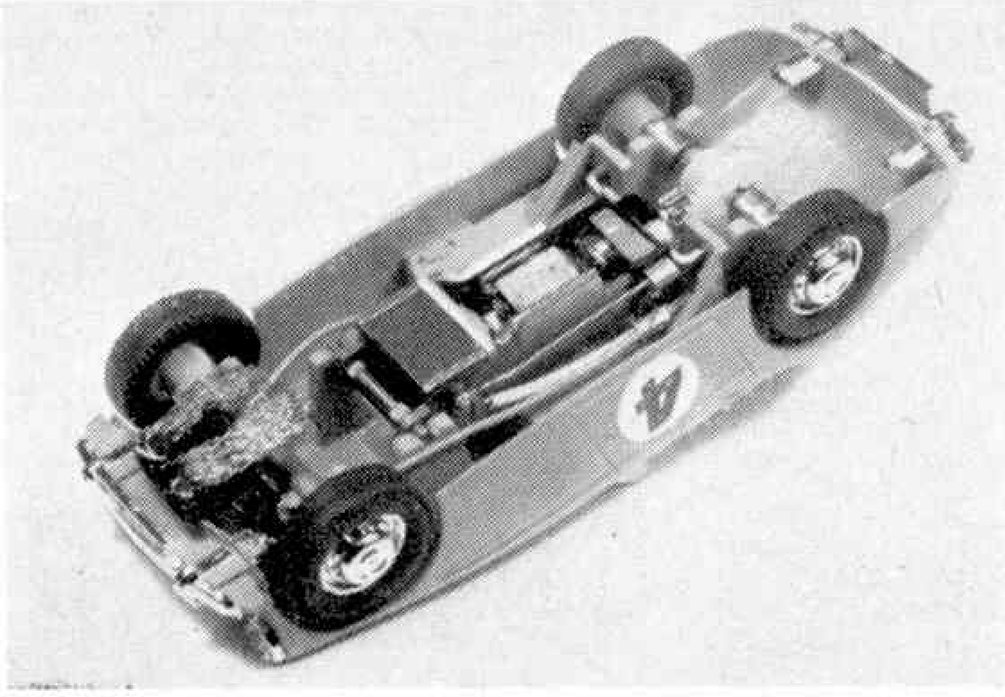
The pick-up braids on the Airfix-Cortina are extremely long, extending right to the motor itself. In order to fit the new braids, two short pieces of wire had to be carefully soldered to the terminals on the motor, which were then continued down to the new braids near the slot guide and soldered into place. The braids on the other two cars were fairly straightforward to replace. " Riko " braids are among the cheapest and are made from extremely soft copper. It is common practice among the " Club Racing Types ", to shred out the braiding with a knife into strands, thus increasing the amount of contact between car and track.

Motor rotation direction

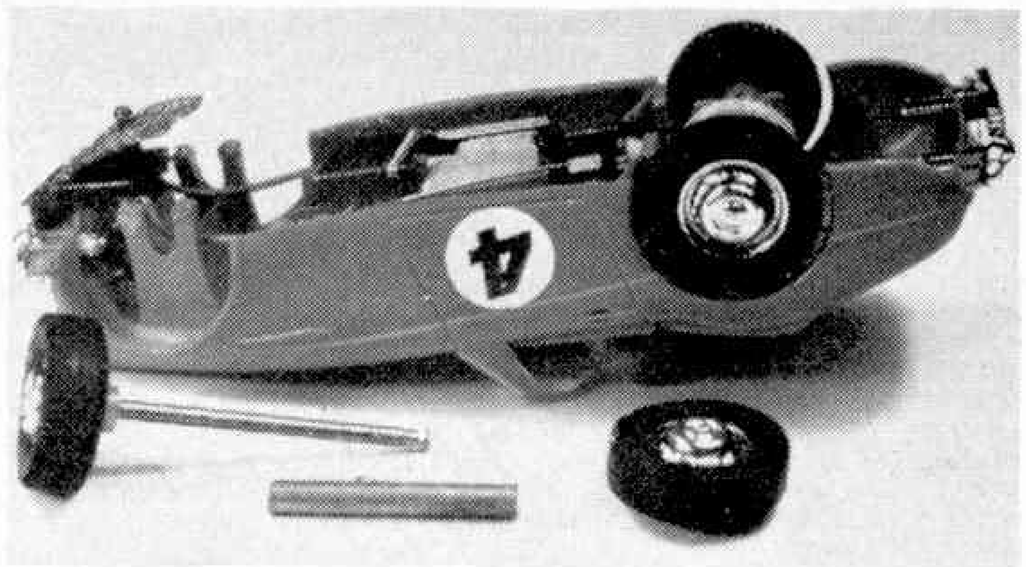
Most electric car motors, indeed almost all electric motors run faster in one direction than another, so, we tested each car for fastest direction of motor rotation. This was done by holding the pick-up braids on the track with the rear wheels off the track and pressing the hand controller hard down. Memorise the noise the motor makes, and then turn the car round on the track and repeat the operation. The direction in which the motor was running and making the highest whine indicates the direction in which the motor was made to run. If the motor was running fastest when the rear wheels were going backwards you will have to either reverse the motor leads *or* reverse the gear on the rear axle to the opposite side of the motor pinion—both straightforward jobs. During our direction tests only the Scalextric car motor leads needed changing to make the motor run in the opposite direction. When you have sorted the motor rotation direction out, try pressing the carbon brushes on the motor lightly; if the motor slows, leave them alone. On the other hand, if the motor goes faster, this indicates the wire brush compression springs are too weak. To strengthen them, lever one end of the spring away from the brush and stretch it out to increase its tension. Unfortunately with the Airfix Cortina this proved to be rather tricky, so it is best to leave this motor alone.

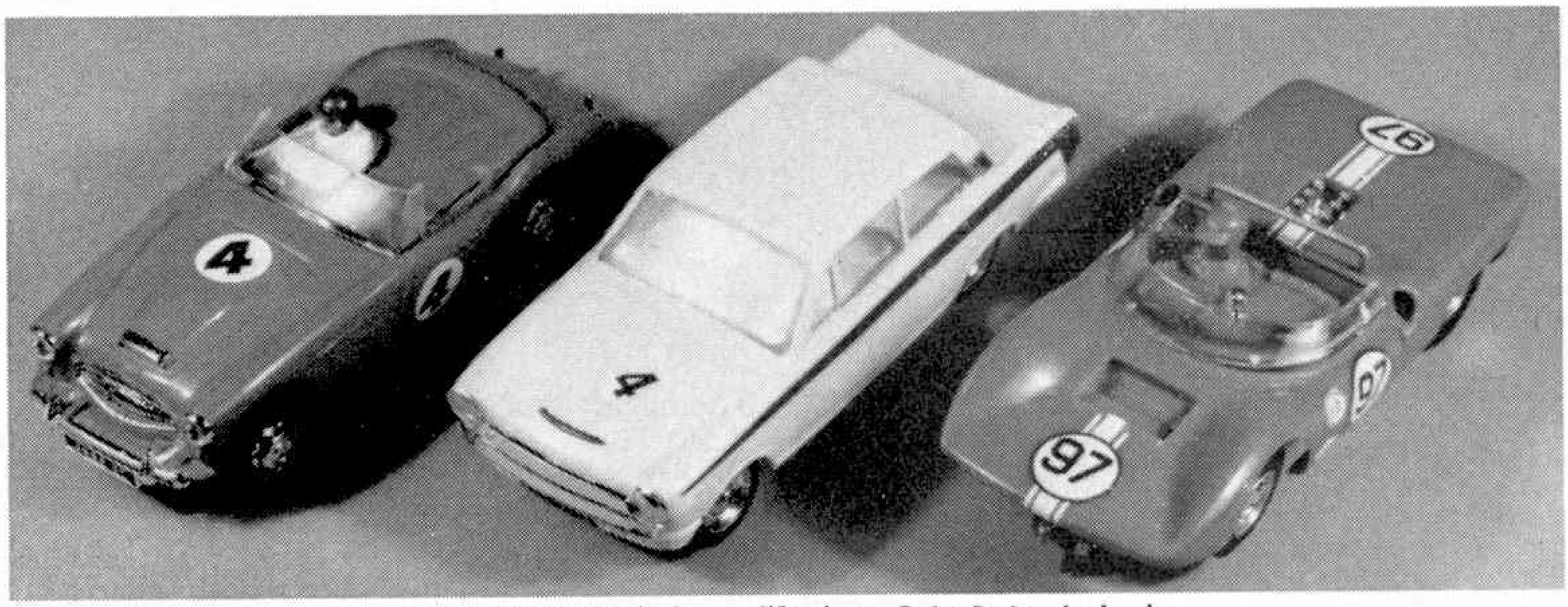
Running in and oiling

When a model car is new, all the moving parts are a little tight, especially the mesh of the gears. Smear a small amount of toothpaste onto both gears, then run the car slowly for half an hour to bed the gears down. After this remove all traces of toothpaste with a soft cloth. Finally lightly oil all the moving parts.



Left: An underside view of the Scalextric Austin Healey. The brass tube fitted over the front axle can be clearly seen. Below: Front axle removed from the body ready for fitting of the tube.





The three cars ready for modifications. Left: Scalextric Austin Healey. Centre: Airfix Ford Lotus Cortina. Right: Revell Cooper Cobra. The Revell car was in kit form and took approximately 1 hour to complete and check over.

DO NOT be tempted to swamp everything with oil, but use it very sparingly. Check the wheels to ensure that they revolve freely, slackening off as necessary. Oil on the tyres can ruin your chances of winning a race, and oil in the motor can stop it running. This completes the general tune up tips, so we will now proceed with the various modifications for improving the three individual cars.

Airfix Cortina

This car was the slowest of the three, both before and after modifications had been carried out. However, there were a few small easily performed "mods", which did increase its performance. Fitting the soft copper braids, as well as giving a more constant supply to the motor, allowed it to "lean" slightly more on the corners. The running in, and oil treatment made the car much quicker down the straight. The tyres on the car were, especially on the rear wheels, far too narrow, these were duly replaced with the same tyre as fittted to the Scalextric car, and vastly improved the road holding. This was very noticeable when cornering.

Scalextric Austin Healey

This car was extremely quick off the mark but quite noisy. The careful application of oil made it run a lot quieter, but it was by far the noisest car at all times.

It suffered from very poor cornering, which we eventually put down to the rather more than normal up and down movement of the front wheels. The front axle runs in plastic "lugs" which allow the wheels to tilt on the corners, a good thing, but these moved about so much that the tyres fouled the wheel arches with disastrous results at times! This was corrected by sliding a piece of brass tubing over the axle. This still allowed the wheels to move up and down enough, but restricted the amount of movement and also allowed them to turn far more easily.

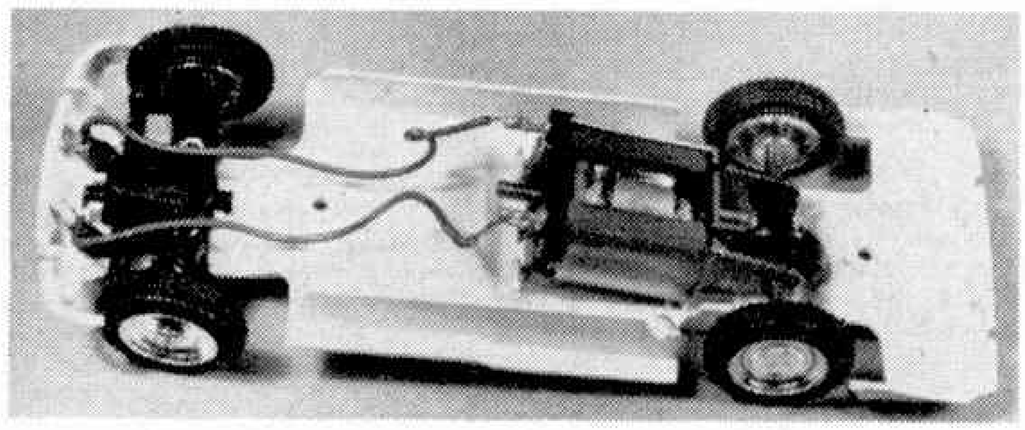
Revell Cooper Cobra

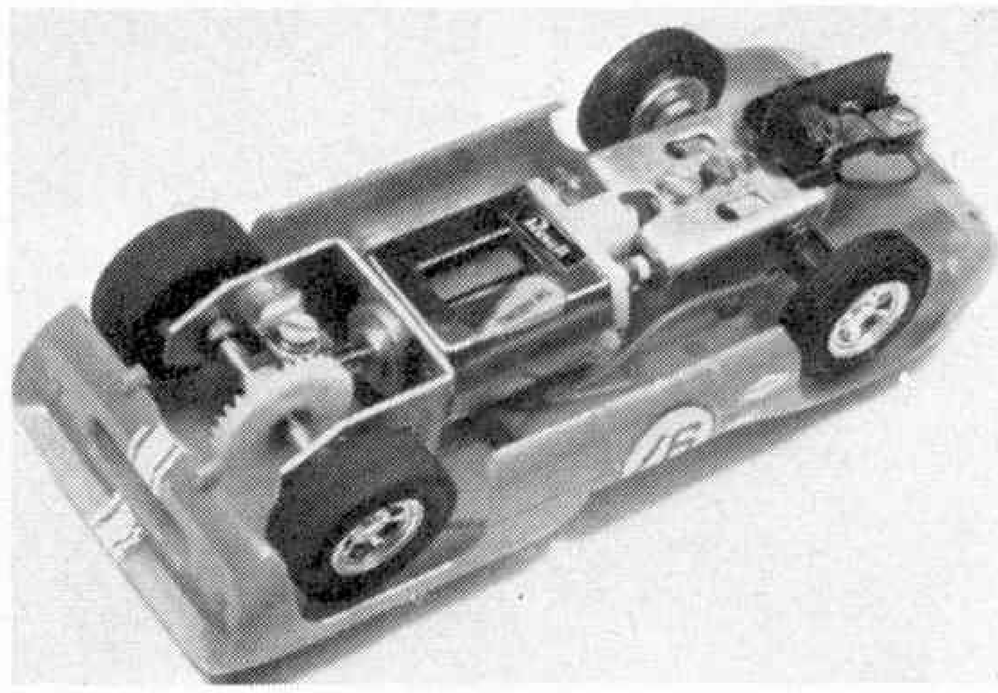
This car was the fastest, and generally handled fairly well. Fitting hard narrow tyres on the front wheels, and wide soft ones on the rear improved the handling, although it seemed to be rather unstable on the corners. Filing out the front axle guides, thus allowing the wheels to move more up and down cured the problem to a great degree and certainly made the car easier to handle.

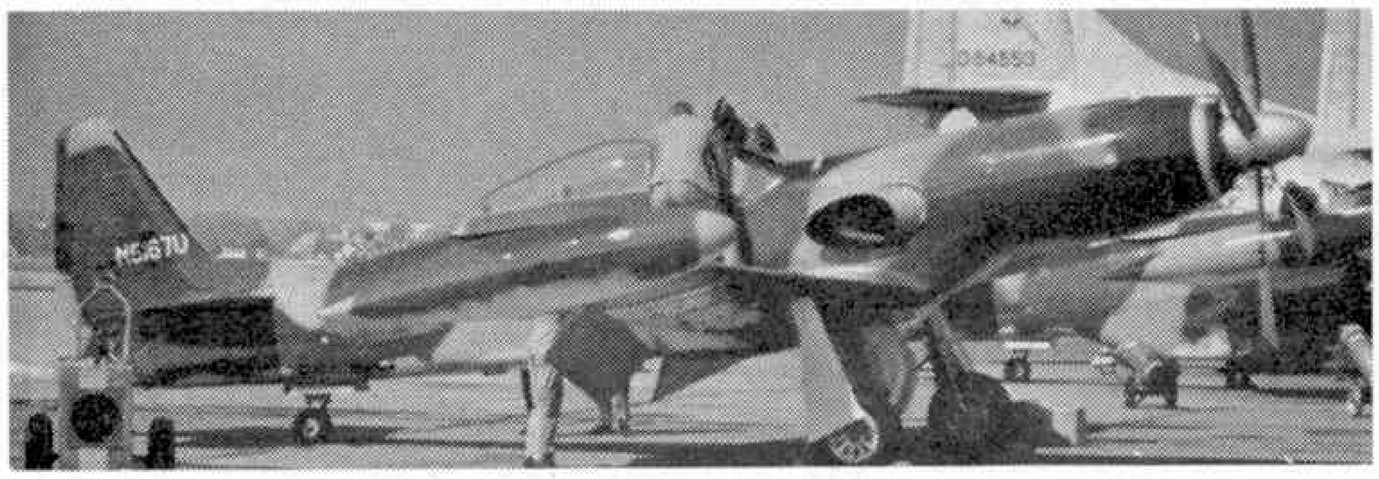
All the above tests were made on a V.I.P. track and you may find that on Scalextric track different tyre combinations to the ones we used may be needed. All of the other modifications, however, apply to any type of track surface.

No end of fun can be had from "front room" slot car racing and these three cars, although not very fast are as good as they need to be for most small tracks. These cars would never win anything at "Club" racing level—but we are sure most MECCANO MAGAZINE readers do not belong to such clubs, and do most of their racing at home with friends.

Below: The chassis unit of the Airfix Ford Lotus Cortina. The two braids have been removed, and leads soldered into place on the motor. At this stage the larger rear tyres were not fitted. Right: A worm's eye view of the Revell Cooper Cobra showing the narrow tyres on the front wheels and the wide soft "spongies" on the rear wheels for better grip and traction.







At left: The Cavalier Mustang III at headquarters Tactical Air Command, Langley Air Force Base, U.S.A. Note the extremely long thin nose on this turboprop version. Maximum speed is some 541 m.p.h. The basic Mustang design dates back over 30 years to a British specification.

AIR NEWS

by J. W. R. Taylor

Thoroughly modern Mustang

ABOUT A YEAR ago, in the first of the new-style *Meccano Magazines*, I told how the Cavalier Aircraft Corporation of Sarasota, Florida, had put back into production for the USAF the famous P-51D Mustang fighter-bomber of World War 2. Since then, this vintage aircraft has shown such promise for counter-insurgency operations that Cavalier decided to up-date the design further by replacing the original 1,680 h.p. Merlin piston-engine with a turboprop.

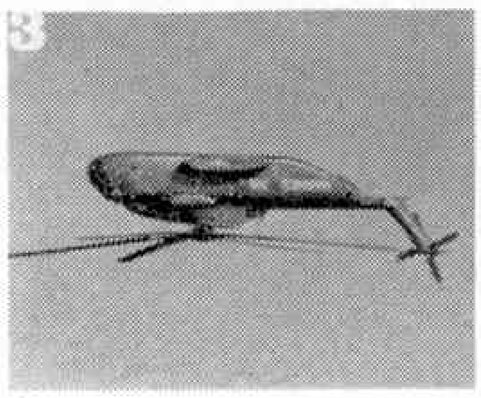
In its new form, as the Turbo Mustang III, the fighter is still Rolls-Royce powered, as the engine fitted in the prototype (illustrated on this page) is a 1,740-bhp Dart Mk. 510 of the kind used in the series 800 Viscount airliner. Production models will have a 2,185-bhp Dart Mk. 529, giving them even better performance.

The switch to turboprop power has tremendous advantages. The Dart weighs less than the lower-powered Merlin and is easier to maintain, cheaper and more reliable. It runs on kerosene, which offers much less of a fire risk than high octane petrol, and can be operated for 6,000 hours between major overhauls. Because it is lighter, it has to be mounted further forward, giving the Mustang III an unusually long nose. This does not improve the forward view from the cockpit while taxying on the ground, but none of the old piston-engined fighters with tailwheels deserved any medals in this respect.

Performance-wise the Mustang III can probably beat anything in its class, old or new. It takes off and lands in well under 300 yards and can spend 1¾ hours over a target area 170 miles from its base when carrying its full load of more than two tons of armament. This includes six 0.50 in. machine guns, mounted in the wings, and a variety of bombs, rockets and other weapons on six underwing pylons.

Top speed of the Turbo Mustang is 541 mph and another advantage that should not be overlooked is that the quietness of the Dart would often enable the aircraft to catch enemy ground forces by surprise in the kind of jungle and swamp areas where counter-insurgency campaigns usually have to be fought.

Cavalier say that they could supply up to 2,000 Mustang IIIs during the next 4½ years. Many would be existing piston-engined Mustangs, re-engined for the air forces in which they continue to serve. Others would probably be built from scratch and there could be no better tribute to the qualities of the fighter which North American designed to a British specification nearly 30 years ago, before anyone had ever flown with a turboprop engine.



This series of photographs shows how the Marine Corps Sikorsky CH-53A Sea Stallion performed unprecedented rolls for a helicopter of its size. (1) Vehicle is just beginning to roll. (2) Helicopter is half way in roll, flying on its side. (3) Upside down. (4) Almost fully recovered from the roll and completing turn for level flight. The Sea Stallion is also capable of looping, and that's some task for a 15 ton, 38 seater, helicopter.

B.E.A.'s latest livery as seen at the Farnborough Air Show. Rather "way out" the rather hacked about lettering and Union Jack seem symbolic of a passing fad in the art world. This may very well date the airline's markings, whereas more conventional lettering would not have.

BEA's new livery

Not everyone is impressed by BEA's new livery. One critic, seeing it on a Trident Two at the Farnborough Show, said that it looked as if some of the Trident's ancestors—de Havilland Moths—had got at the lettering. Moth-eaten or not, the overall effect is striking and it is good to see a symbolic "Backing Britain" Union Jack on the tail-fin.

No airline has backed Britain's aircraft industry more loyally than BEA. It has existed for just over 22 years, or 268 months, during which time it has ordered a total of 294 British aeroplanes, of which 243 had been delivered by last September. In other words, it has taken delivery of British airliners at the rate of nearly one a month since it began operations. The cost of all 294 will total close on £300,000,000 by the time the last BAC One-Eleven and Hawker Siddeley Trident 3B have been delivered.

Snakes on Wake

It's one darn thing after another on Wake Island, the tiny mid-Pacific atoll governed by America's Federal Aviation Administration. Back in 1967, Typhoon Sarah hit the island with 120-mph winds, causing the evacuation of hundreds of residents. Then came the "mystery gas" incident, when a large part of the north end of the island had to be placed off limits because of tear gas leaking from canisters jettisoned on the reef during World War 2.

The most recent crisis involved two boa constrictors, one eight feet long and the other five feet, which escaped from the luggage of two service-men who were transporting them home as souvenirs of south-east Asia. After several hours of frantic searching by a posse armed with baseball bats and machetes, the snakes were located huddled together on the edge of a thicket not far from the airport. Their subsequent fate is unknown, but a report from the Wake Island Epicurean Society comments ominously that snake steak isn't at all bad !

Chopperbatics

Sikorsky's CH-53A Sea Stallion is the largest helicopter in production outside Russia, with a loaded weight of around 15 tons and a cabin large enough to seat 38 fully-equipped soldiers. Powered by two 2,580-hp General Electric T64-GE-6 shaft-turbine engines, it has a top speed of nearly 200 mph and, like other helicopters, can take off and land virtually anywhere. This makes it a useful aircraft and many pilots forced to bale out of crippled aircraft over Vietnam owe their lives to quick rescue by CH-53As after parachuting down into the jungle or sea.

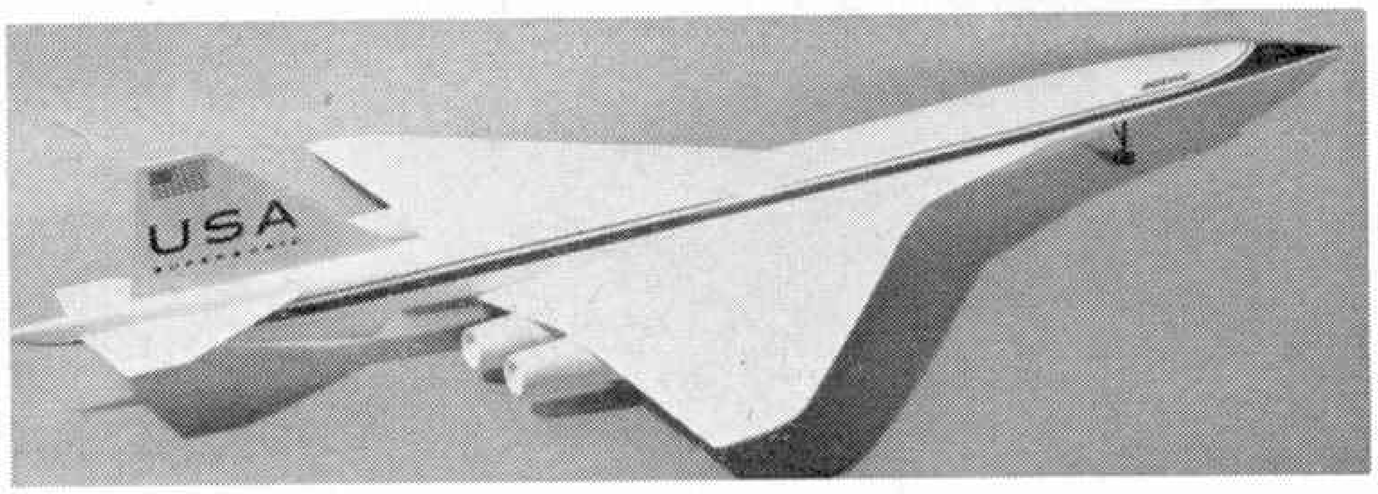
The old idea that helicopters are of little use for anything but slow and rather staid transport operations died long ago in Vietnam, where Bell Iroquois and Huey Cobras, armed with rockets and machine-guns have developed into formidable ground-attack aircraft; but nobody expected "choppers" ever to be able to engage in the kind of aerobatics that are associated with fighter-planes. So it was startling to receive recently some photographs showing the CH-53A—biggest of them all—performing loops and rolls in flight.

Such exploits make it difficult to realise that less than 30 years have passed since Igor Sikorsky flew the first practical "single-rotor" helicopter and founded an entirely new industry.

From swing-wing to Delta

After checking their sums, Boeing decided a few weeks ago that their "swing-wing" supersonic transport (SST) design, on which they had already spent many millions of pounds, would never do the job expected of it. They have, therefore, switched to an entirely different design, with delta wings, which looks like a big brother of the Anglo-French Concorde. If the US government gives them the go-ahead, they will begin by building two prototypes, of which the first will fly in 1972.

In its new form the Boeing SST will have a length of 280 ft., height of 50 ft. and wing span of 142 ft., with a leading-edge sweepback of 50 degrees. Built of titanium and powered by four General Electric GE4 turbojet engines, each giving more than 60,000 lb. of thrust, it will cruise at 1,800 mph at altitudes above 60,000 ft. With a payload of up to 280 passengers, it will be able to operate from the same runways as its stable-mate, the Boeing 747 "jumbo-jet", taking off and landing at much the same speeds as the big jets of today. Flight time from New York to London or Paris will be about 2 hours 40 minutes.



This sleek looking model is a scale replica of the "new" Boeing "S.S.T." design. Their swing wing concept has now been abandoned after an outlay of many millions of dollars—and an enlarged "Concord" type shape decided on. Design cruise speed is 1,800 m.p.h. at above 60,000 ft. altitude.

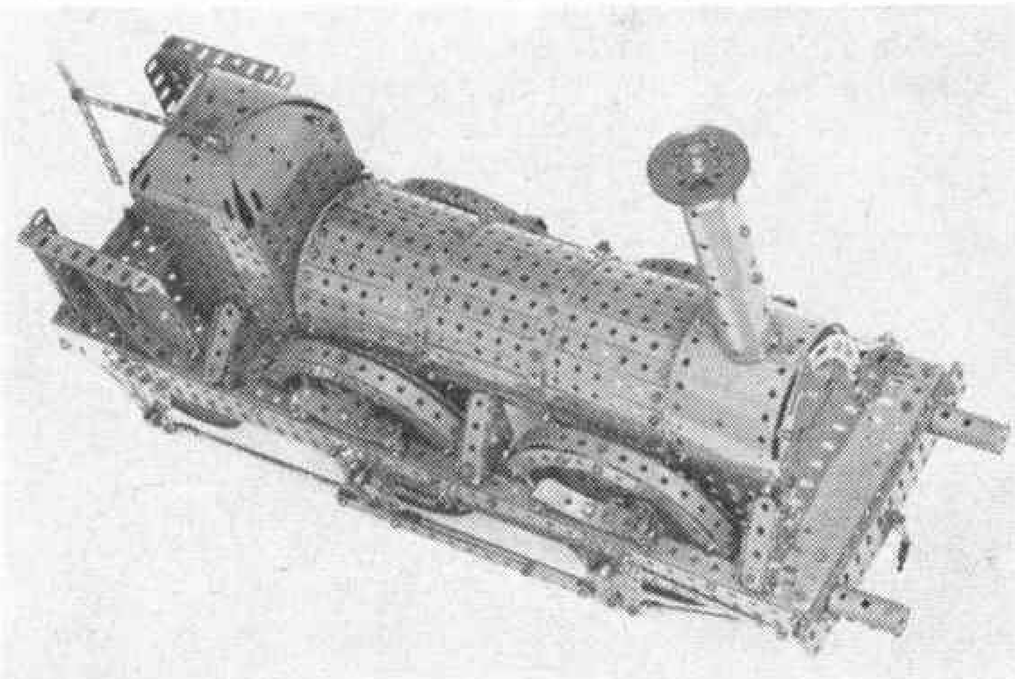
THE "LION" LOCOMOTIVE

by Spanner

An historic railway locomotive re-built in Meccano for advanced modellers. The "Lion" Meccano model is really impressive when completed.

IN THE May 1968 issue of Meccano Magazine, Mike Rickett described the discovery in 1929 of a dilapidated old steam engine that was being used for pumping water in Liverpool docks. Before she could be banished to the scrapyard, however, researchers found that, instead of being just another heap of rusting junk, the engine was in fact one of the early locomotives built in 1938 for the historic Liverpool and Manchester Railway who had christened her "Lion". It was saved and subsequently restored to health by the Liverpool Engineering Society and the London, Midland and Scottish Railway Company. Since then it has had a distinguished film and exhibition career and is shortly due to go on permanent display in Liverpool Museum's new transport section.

The photograph of the restored "Lion" which was published in last May's M.M. was all that Meccano Magazine's chief model-builder required for a blueprint, and from this he has now built the advanced model featured here. It is actually not as complicated as it looks, but it is certainly extremely rugged and has the particularly novel feature of "floating" bearings for the main driving wheel axles. It is not motorised, but sufficient space for a motor has been included in case any builders should wish to incorporate one. Construction is not difficult.



Chassis

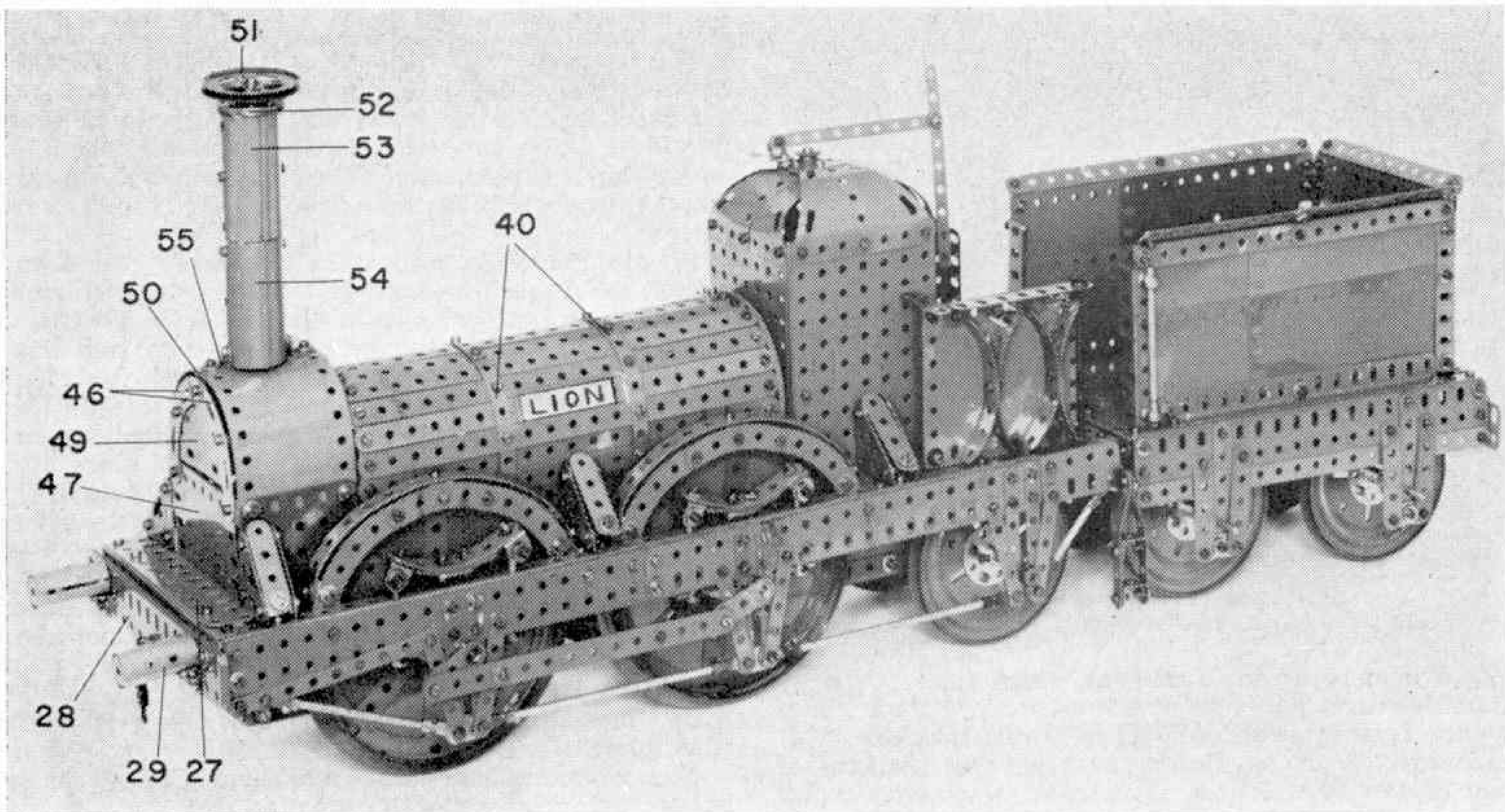
Beginning with the chassis, a rectangle is produced from two 20½ in. compound angle girders 1 joined at their ends by two 6½ in. compound angle girders 2. Each large girder consists of an 18½ in. Angle Girder extended by a 3 in. Angle Girder, while each small girder is made up from two 5½ in. Angle Girders overlapped nine holes. Bolted to the vertical flange of each 18½ in. Angle Girder is a *double-thickness* 18½ in. compound flat girder 3, obtained from two pairs of 9½ in. Flat Girders, the securing Bolts also fixing a 1½ in. Strip 4 in position at the front end of the Girder and a 3 in. Narrow Strip 5 in place at the rear. A single 2 in. Flat Girder 6 is bolted to the 3 in. Angle Girder.

Narrow Strip 5 is braced by a 2½ in. Narrow Strip 7, as also is a second 3 in. Narrow Strip 8, the Bolts fixing the short Strips to Strips 5 and 8 also fixing two Rod and Strip Connectors 9 and 10 and a 1 in. Triangular Plate 11 in place. Another two similar Narrow Strip arrangements 12 and 13 are added to the chassis in the positions shown, the arrangements being produced identically to the first example except that Triangular Plate 11 is replaced by a Fishplate. By using the Rod and Strip Connectors, the three finished arrangements are joined together by two 5½ in. Rods 14, then Rod and Strip Connector 10 is connected by a 2½ in. Rod to a further Rod and Strip Connector bolted to Flat Girder 6. The forward Connector in the front Narrow Strip arrangement is connected by a 3½ in. Rod to a final Strip Connector bolted to a 4½ in. Narrow Strip 15 fixed between Strip 4 and compound flat girder 3.

At this point the floating bearings for the main driving wheels can be built up. Four curved leaf springs 16 are each produced from two 3 in. Strips, two 2 in. Strips and two Fishplates. Two Angle Brackets are bolted one to each end of the 3 in. Strips and, to the free lugs of these are fixed two Collars in each of which a 1½ in. Rod is held. These Rods are then inserted into holes in girders 1, as shown, and a Coupling 17 is mounted on the lower end of each Rod. These Couplings are connected by two further 1½ in. Rods joined by another Coupling 18, care being taken to ensure that the centre transverse bore of this Coupling remains clear and also coincides with the gap between the two 3 in. Narrow Strips in the above-mentioned Narrow Strip arrangements.

Journalled free in the centre transverse bore of each pair of Couplings 18 is one of the two main axles, both of which are built up from one 3½ in. and one 4½ in. Rod joined by a Coupling. Each axle projects through the gaps between the Narrow Strips; each is held in place by Collars inside Couplings 18 and each carries two main driving wheels, the rear axle also carrying a 3 in. Sprocket Wheel 19. Each main wheel, by the way, consists of a 6 in. Circular Plate 20, to which a Hub Disc, overlayed in the centre by an 8-hole Bush Wheel 21, is bolted. Two washers space each Coupling 18 from the appropriate Narrow Strip arrangement, then a Crank 22 is mounted on the end of each axle outside the Narrow Strips. Lock-nutted between Cranks 22 at each side is a 7 in. compound strip 23, obtained from two 5½ in. Strips.

The small trailing wheels at the back of the model each consist of a 4 in. Circular Plate 24 to which a Ball Thrust Race Flanged Disc, centrally overlayed by an 8-hole Bush Wheel, is fixed. The wheels are



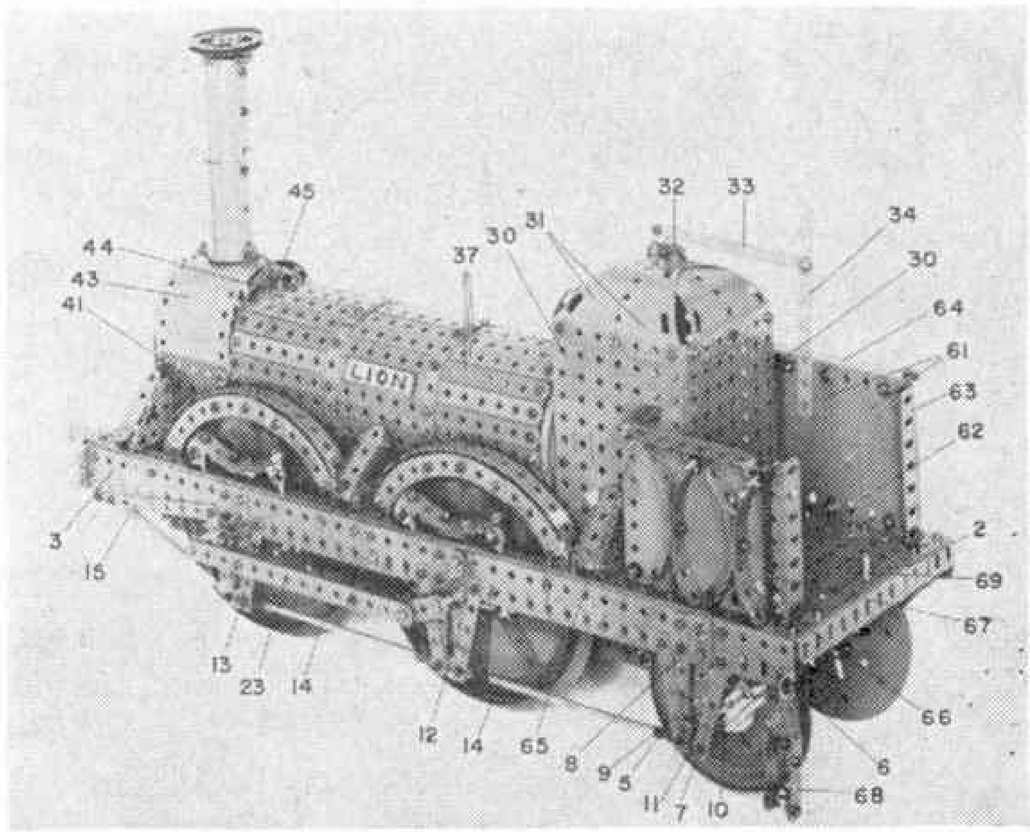
The Meccano version of the historic railway locomotive "Lion", built in 1838 for the Liverpool and Manchester Railway. Since then, it has had a colourful career ranging from a pumping engine in Liverpool Docks to a star in films and is shortly due to be preserved for all time in Liverpool Museum.

mounted on a $7\frac{1}{2}$ in. compound rod held by Collars in the apex holes of Triangular Plates 11, the rod consisting of one $3\frac{1}{2}$ in. and one 4 in. Rod joined, as before, by a Coupling. Bolted to rear compound girder 2 as well as to girders 1 is a $5\frac{1}{2} \times 3\frac{1}{2}$ in. Flat Plate 25 extended five holes up each side by two $3 \times 1\frac{1}{2}$ in. Flat Plates 26, the latter also bolted to girders 1. At the front of the model, a $5\frac{1}{2}$ in. Flat Girder 27 is bolted to the horizontal flange of the other girder 1, five $7\frac{1}{2}$ in. Flat Girders 28 being bolted to the vertical flange of the same girder. A pair of buffers are represented by two Sleeve Pieces 29 attached by Angle Brackets to Flat Girders 28. A Chimney Adaptor is wedged in the end of each Sleeve Piece, then a coupling is represented by a small Hook attached by a short length of Sprocket Chain to the centre of Flat Girders 28.

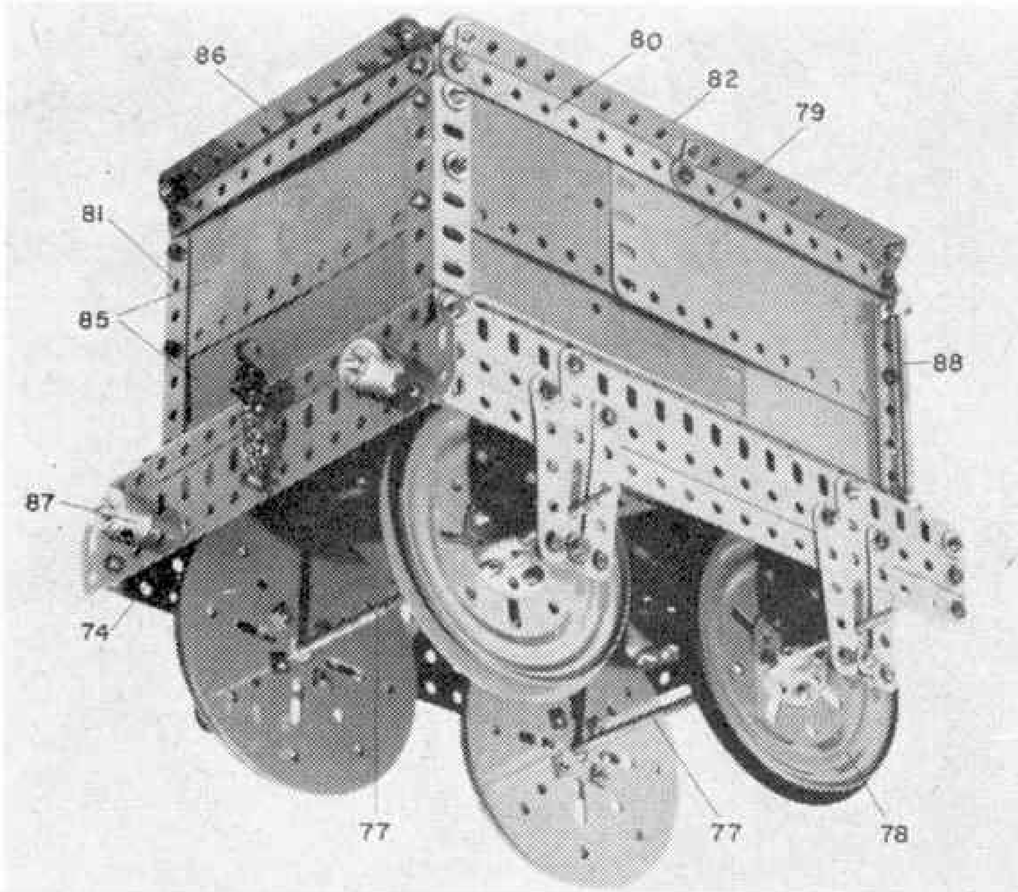
Firebox, boiler and smokebox

Turning to the firebox, boiler and smokebox, it is best to build up these items into one complete unit separately and to add it to the chassis when finished. The firebox is simply produced from four $5\frac{1}{2}$ in. Angle Girders to which four $5\frac{1}{2} \times 3\frac{1}{2}$ in. Flat Plates 30 are bolted to form a box shape. A top is supplied by eight $3\frac{1}{2} \times 2$ in. Triangular Flexible Plates 31 bolted in pairs as shown to each Flat Plate. The apex of the resulting triangles are curved over and are bolted together in the centre, then the imitation regulator gear is added. This consists of a $\frac{1}{2}$ in. Pulley without boss 32 fixed to the top of the firebox and an Angle Bracket separated from the firebox by three Washers on the shank of the securing Bolt. Lock-nutted to the free lug of the Angle Bracket is a $4\frac{1}{2}$ in. Narrow Strip 33 to the other end of which a second $4\frac{1}{2}$ in. Narrow Strip 34 is bolted at right angles to the former. An imitation firebox door is represented by two $2\frac{1}{2}$ in. Narrow Strips bolted, with one hole separating them, to rear Plate 30. The "handle" is supplied by a Handrail Support in which a 1 in. Rod is fixed. A Ball Thrust Race Flanged Disc 35 is bolted to front Plate 30 in the position shown, while two $2\frac{1}{2} \times 2\frac{1}{2}$ in. Flat Plates 36 are bolted one to the lower edge of each side Plate 30. Plates 36 are connected by a $3\frac{1}{2} \times 2\frac{1}{2}$ in. Flanged Plate to provide a mounting for a motor if one should be fitted. The drive could, in due course, be taken to Sprocket Wheel 19.

To build the boiler, nineteen $12\frac{1}{2}$ in. Strips 37 are bolted between two $9\frac{1}{2}$ in. compound narrow strips, the fourth, seventh, tenth, thirteenth and sixteenth securing Bolts also each fixing a $1 \times \frac{1}{2}$ in. Angle Bracket 38 to the underside of the narrow strips. The narrow strips are then curved round until their ends are



In this general view of the Meccano "Lion", the fine detail built into this basically simple model locomotive is shown.



An underside view of the tender showing the simple layout of the chassis and wheel arrangement. Note the plate overlap.

approximately $2\frac{1}{4}$ in. apart—at which time Strips 37 should form a reasonable boiler—and two Face Plates 39 are bolted one to each set of Angle Brackets 38 at each end. A $1\frac{1}{8}$ in. Bolt is next fixed in the boss of one of the Face Plates, is passed through the centre hole in Flanged Disc 35 and corresponding Plate 30 to be secured by a Nut, thus fixing the boiler to the firebox. Two further $9\frac{1}{2}$ in. compound narrow strips 40 are bolted to the outside of the boiler to help strap Strips 37 together.

Coming to the smokebox, two $4\frac{1}{2} \times 2\frac{1}{2}$ in. Flat Plates 41 are joined together at the front by two $3\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strips 42, the Bolts fixing the upper Double Angle Strip also helping to hold two $4\frac{1}{2} \times 2\frac{1}{2}$ in. Plastic Plates 43 in place. The rear edges of Plates 41 and 43 are attached by Angle Brackets to the long lugs of Angle Brackets 38, the securing Bolts also fixing two 4 in. Stepped Curved Strips 44 in position. At the top, these Curved Strips are brought together and bolted to the centre of a $\frac{1}{2}$ in. Reversed Angle Bracket 45 secured to the top of the boiler.

Another two 4 in. Stepped Curved Strips 46 are bolted, along with a $3\frac{1}{2} \times 2\frac{1}{2}$ in. Plastic Plate 47, to upper Double Angle Strip 42, Plate 47 being extended by a similar $3\frac{1}{2} \times 2\frac{1}{2}$ in. Plastic Plate 48 which is in turn bolted to lower Double Angle Strip 42. Curved Strips 46 are also brought together at the top and are fixed, together with a $2\frac{1}{2} \times 2\frac{1}{2}$ in. Triangular Flexible Plate 49, to an Angle Bracket 50. Note that Plate 49 is further secured to Curved Strips 46 by the trapping action of Washers on Bolts held in the Curved Strips.

Plastic Plates 43 will later be curved round and bolted to Angle Bracket 50, but first the chimney should be produced. A 2 in. Pulley 51 is fixed on a $\frac{3}{4}$ in. Bolt to be followed by a Conical Disc and three 8-hole Wheel Discs 52, after which the Bolt is screwed into one transverse tapped bore of a Threaded Boss. The resulting construction is then mounted on one end of a Cylinder 53, where it is held in place by a $\frac{3}{8}$ in. Bolt which is passed through the end hole in the side of the Cylinder, is fitted with a Collar to act as a spacer and is screwed into the longitudinal bore of the Threaded Boss. The Cylinder is butt-jointed to a second Cylinder 54 by two $3\frac{1}{2}$ in. Narow Strips inside the Cylinders, two Angle Brackets 55 being bolted to the lower end of Cylinder 54. Plastic Plates 43 are now curved together, the join overlayed by a $2\frac{1}{2}$ in. Strip, the chimney added, then everything is bolted to Angle Bracket 50 and Reversed Angle Bracket 45.

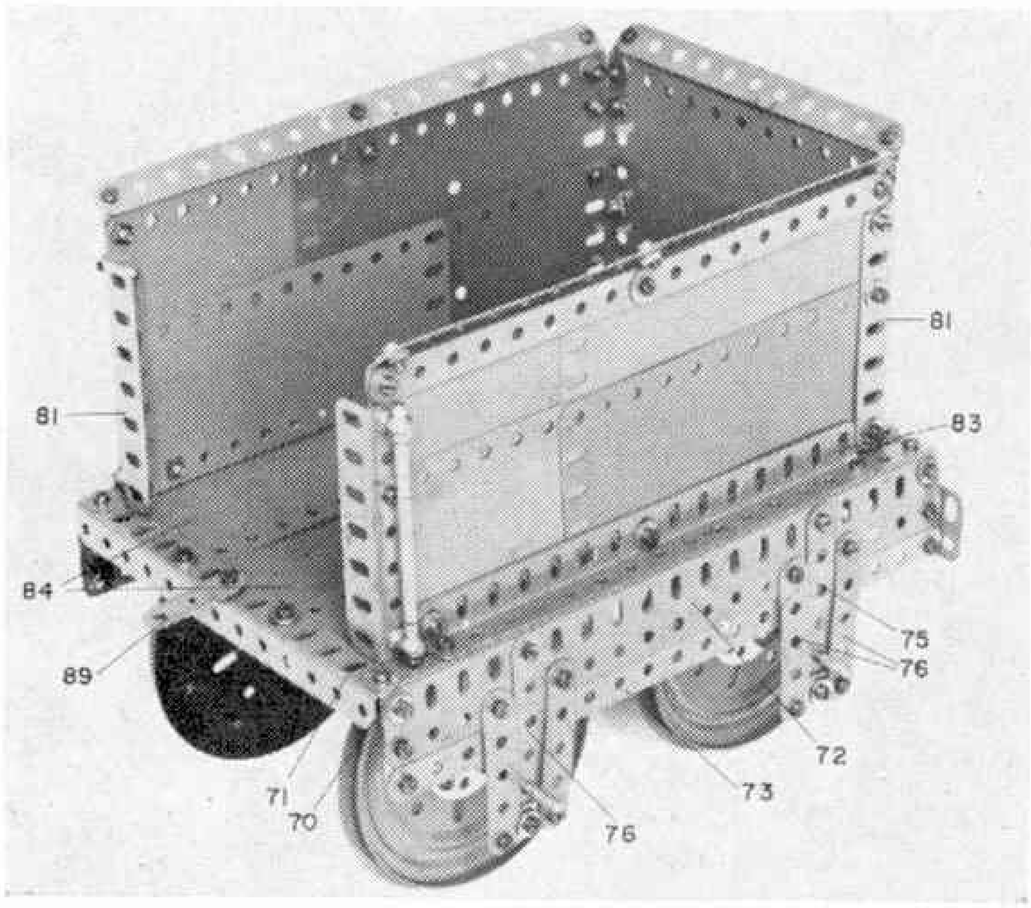
The completed assembly is now secured to the chassis by six stanchions placed three at each side in the positions shown. Each stanchion consists of two $1\frac{1}{2}$ in. Corner Brackets 56 connected by two Double Brackets, one of the Bolts securing the lower Double Bracket also holding in place an Angle Bracket to which a 2 in. Strip 57 is bolted. The Double Brackets, of course, provide the anchoring points for the stanchions.

Once the body of the model has been mated to the chassis, mudguards for the main driving wheels are each provided by a shaped $7\frac{1}{2}$ in. Strip 58 which is attached by Angle Brackets to a $7\frac{1}{2}$ in. compound curved strip 59, obtained from three $2\frac{1}{2}$ in. Curved Strips and two Fishplates. Compound strip 59 is fixed by Nuts on two $\frac{3}{4}$ in. Bolts 60 held by Nuts in the side members of the chassis.

Each side of the footplate is enclosed by a "barrier" built up from two $3\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plates 61 overlapped two holes and attached to the footplate by a $3\frac{1}{2}$ in. Angle Girder 62. A second $3\frac{1}{2}$ in. Angle Girder 63 is bolted to the rear of Plate 61, a third similar Girder 64 being bolted to the top edges of the Plates, as also is a $\frac{1}{2} \times \frac{1}{2}$ in. Angle Bracket and a $1 \times \frac{1}{2}$ in. Angle Bracket 65. Embellishment is added by four curved $3\frac{1}{2}$ in. Strips 66 bolted together in pairs, each pair being attached by an Angle Bracket to Girder 64. This Girder is also connected to compound girder 1 by a 4 in. Screwed Rod 67, as shown, then a set of steps is provided by two 3 in. Narrow Strips 68 joined by two Double Brackets. The Strips are bent together at the top and bolted to an Angle Bracket which is in turn bolted to Flat Girder 6. A Threaded Pin 69 fixed in the centre of rear compound girder 2 serves as the coupling hook for the tender linkage.

Tender

We are now left only with the tender to be built and this is not difficult. The chassis consists of two $9\frac{1}{2}$ in. Angle Girders 70 joined by two $6\frac{1}{2}$ in. compound angle girders 71, each of the latter built up from two $5\frac{1}{2}$ in. Angle Girders. Bolted to the vertical flange of each Girder 70 is a $9\frac{1}{2}$ in. Flat Girder 72, to which a $9\frac{1}{2}$ in. Strip 73 is attached by Fishplates,



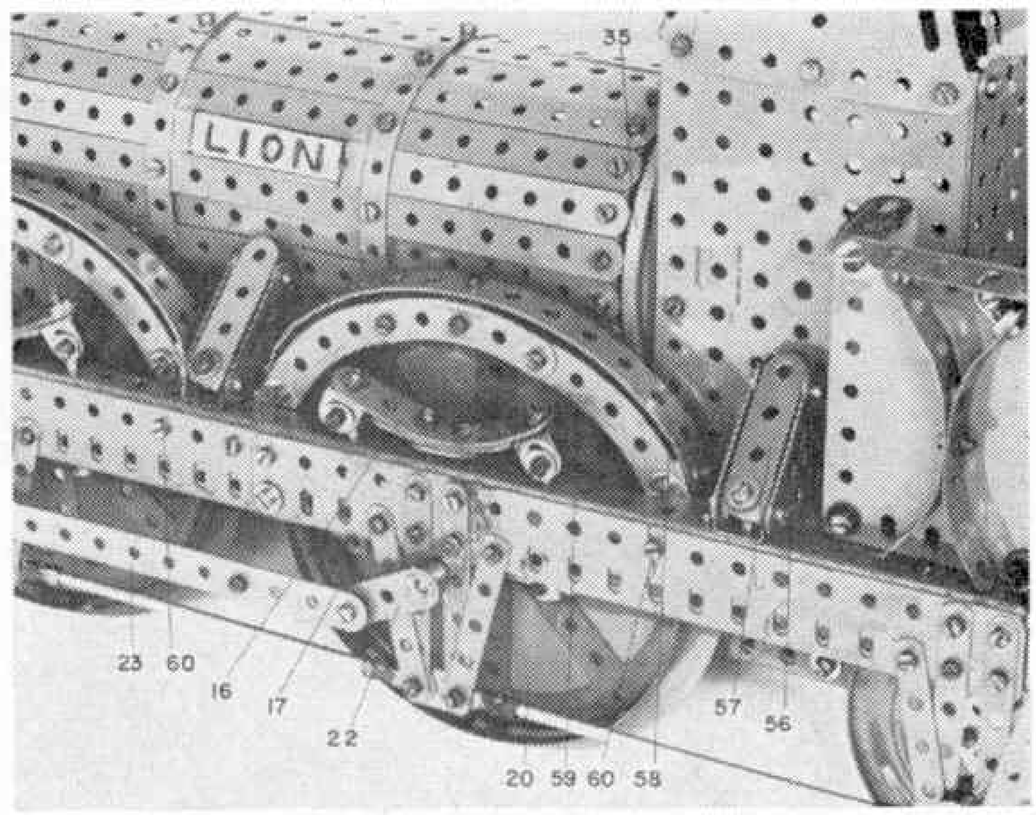
The tender, as this picture shows, is perfectly straightforward in design and should present no constructional difficulties.

a Fishplate also being used to fix a $7\frac{1}{2}$ in. Flat Girder 74 to rear compound angle girder 71.

Bolted to each Flat Girder 72 are two 3 in. Strips 75, each flanked by two $2\frac{1}{2}$ in. Strips 76, the lower ends of the latter attached to the former by Fishplates. Journalled in the second holes of Strips 75 are the axles—8 in. Rods 77—held in place by Collars and each carrying two wheels built up from 4 in. Circular Plates to which Ball Thrust Race Flanged Discs 78, centrally overlayed by 8-hole Bush Wheels, are bolted. The height of the axles can be slightly adjusted by making use of the elongated holes in Flat Girder 72 and Angle Girder 70 when positioning Strips 75.

Each side of the tender consists of an 8 × 4 in. compound flexible plate 79, obtained from four $5\frac{1}{2}$ × $2\frac{1}{2}$ in. Flexible Plates and edged at the top by an 8 in. compound strip 80 and down the sides by $3\frac{1}{2}$ in. Angle Girders 81. Compound strip 80 is built up from two $5\frac{1}{2}$ in. Strips, similar Strips being used to produce a second 8 in. compound strip 82, attached to strip 80 by Obtuse Angle Brackets. The finished side is fixed to Angle Girder 70 by a $7\frac{1}{2}$ in. Angle Girder 83, at the same time helping to fix the floor in position. The floor, incidentally is provided by three $9\frac{1}{2}$ × $2\frac{1}{2}$ in. Strip Plates 84. The rear of the tender is enclosed by two $5\frac{1}{2}$ × $2\frac{1}{2}$ in. Flexible Plates 85, bolted between Girders 81 and edged along the top by a $5\frac{1}{2}$ in. Strip. Another $5\frac{1}{2}$ in. Strip is attached by Obtuse Angle Brackets, as before, then buffers are supplied by two Chimney Adaptors 87 fixed to Flat Girder 74. Two handrails are obtained from $3\frac{1}{2}$ in. Rods 88 held in Handrail Supports secured to appropriate Angle Girders 81, as shown.

Finally the couplings are provided, that at the front consisting of nothing more than a $1\frac{1}{2}$ in. Strip 89, free on a Bolt held by Nuts in front girder 71. (This Strip, of course, engages with Threaded Pin 69 at the back of the engine.) Like the front coupling of the engine, the rear coupling of the tender is a small Hook attached to Flat Girder 74 by a short length Sprocket Chain.

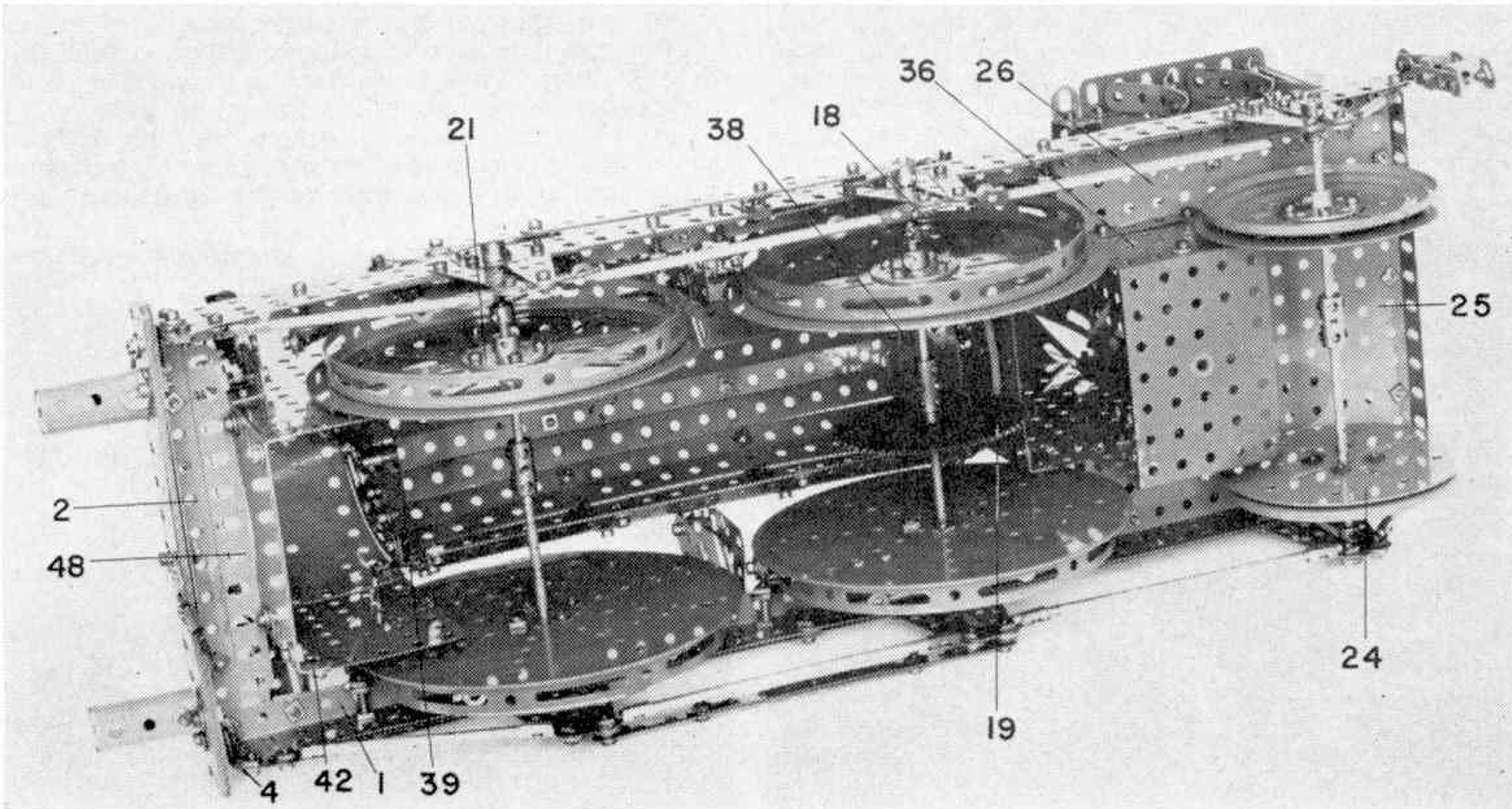


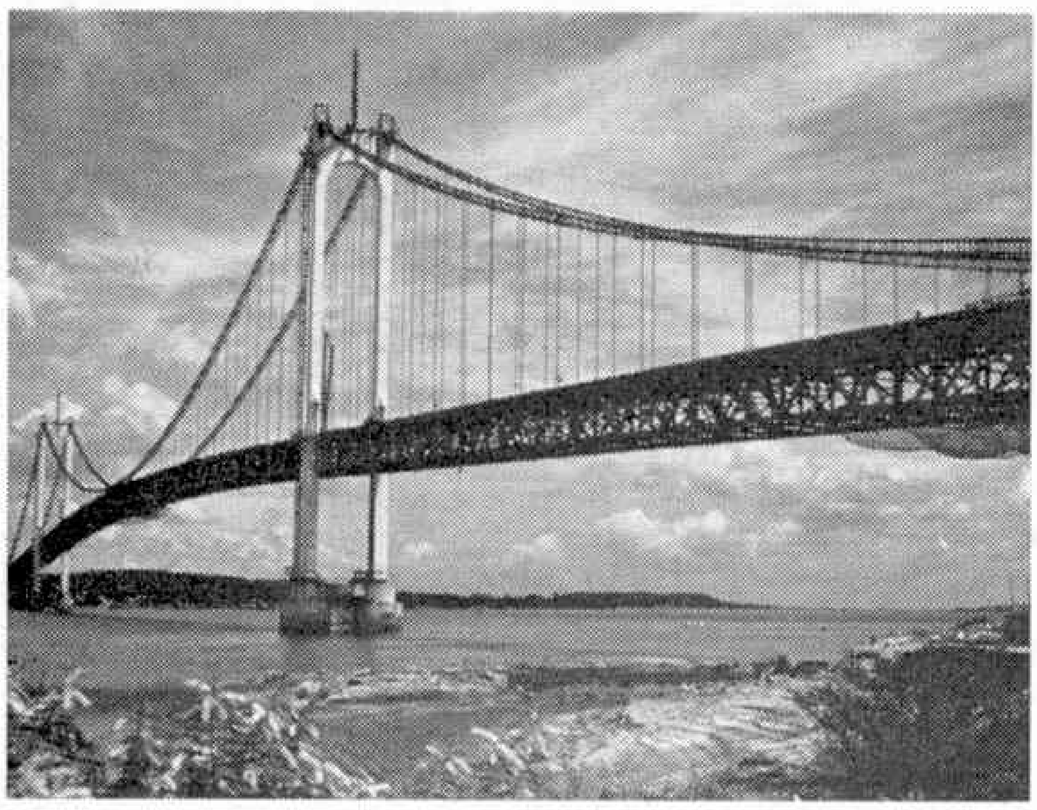
A close-up view of the model showing the sprung driving wheels, mudguards and stanchions fixing the boiler and firebox.

PARTS REQUIRED

25—1a	2—13a	1—64	12—133
4—1b	4—14a	2—72	5—136
2—2	3—15b	2—73	4—146
8—2a	7—16	2—77	6—146a
8—3	2—16a	2—80b	2—163
12—4	16—18a	4—89a	4—164
9—5	1—18b	12—90	7—168a
14—6	1—20a	2—94	1—187a
3—6a	1—23	1—103	4—190a
2—7a	10—24	6—103a	10—192
2—8a	3—24a	2—103g	2—194b
2—8d	530—37a	6—103k	3—196
13—9	476—37b	2—109	16—212
12—9b	120—38	11—111	2—216
2—9c	2—48b	3—111a	1—223
26—10	1—52a	18—111c	8—225
16—11	2—57c	1—111d	14—235
49—12	21—59	1—115	14—235a
12—12b	4—62	4—118	2—235b
8—12c	15—63	1—125	8—235d
			4—235f

An underside view of the " Lion " showing the interior of the boiler. No motor is included in the model, but, if required, one could be fixed to the top of the Flanged Plate bolted between Flat Plates 36. The drive would be taken to Sprocket Wheel 19.





GREAT TRAFFIC BRIDGES

by W. H. Owens

HIGH-LEVEL bridges, suspended across busy harbours and wide rivers, are among the most spectacular engineering feats of this century. Many of those built around the world during recent years are as remarkable for their slender design as for the length of their main water spans. But through the advance of modern bridging techniques and the use of prestressed constructional materials, these aerial roadways can carry far greater traffic loads than did the heavier bridge structures of earlier years.

Replacing slow and uncertain ferry boat services, many of the new harbour bridges are key links in the motorway system of congested waterfront cities. Other high-level bridges provide the first permanent highway connections between the regions of countries previously separated by broad, fast-flowing rivers which flood and become impassable in the rainy seasons.

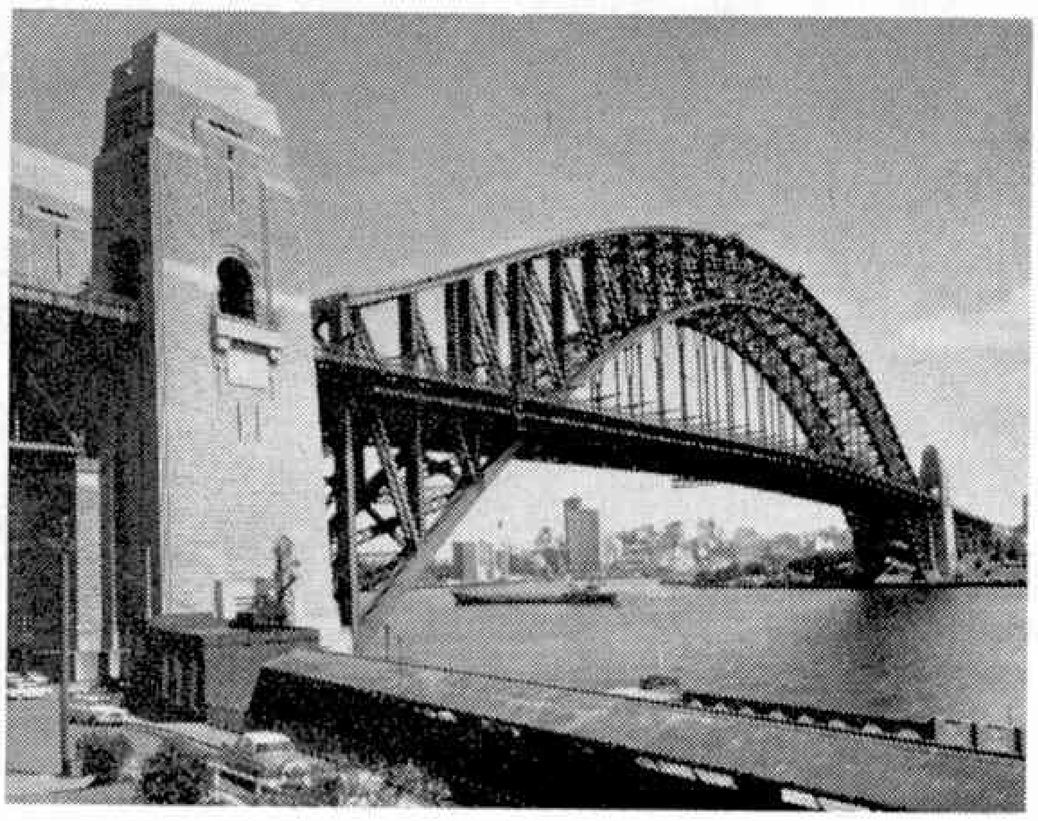
Britain's two outstanding high-level bridges built in the 1960's—the Forth Road Bridge and Severn Bridge—are each more than a mile long with clear main spans of 3,300 ft. and 3,240 ft. respectively. They rank sixth and seventh among the world's long-span bridges. Although both these structures are of similar design, the Severn Bridge is of more advanced construction, being the lightest for its length and loading ever built. It used only 19,000 tons of steel compared with 39,000 tons which went into the Scottish bridge. Its suspension cables were spun from 18,000 miles of high-tensile steel wire.

The Forth Road Bridge was opened in 1964 (two years earlier than the Severn Bridge) and makes handsome and striking contrast to the world-famous old cantilever railway bridge, spanning the river estuary nearby. This has carried main line trains to and from the North of Scotland for almost eighty years, and is still in excellent repair. However, the task of painting and generally maintaining the old Forth Bridge goes on continuously.

For nearly a century the Portuguese dreamed of bridging the wide Tagus River at Lisbon to link their capital city directly by road and rail with Southern Portugal. But advanced scientific knowledge and construction techniques, and the availability of high-strength steels, were necessary to overcome this quite formidable natural barrier to travel and trade. Not surprisingly, when the dream was finally realised in 1966, Europe's most gigantic bridging project set up new records.

The Tagus River Bridge has the longest main span of any bridge outside the United States. Its 3,323 feet just exceeds that of the Forth Road Bridge. The bridge towers are also the highest in Europe, while the world's longest continuous road deck—nearly 1½ miles—runs at a height of 299 ft. above water level to permit the free passage of the largest ships. Pencil-thin wires totalling 33,686 miles went to the making of the two 23-inch cables supporting the bridge deck.

Lisbon's record-breaking bridge was so designed that, with a minimum of effort and without interruption to road traffic, a lower deck can be constructed later



At left: Striding high across the Orinoco River, the new mile-long Angostura Bridge near Ciudad Bolivar, in Venezuela, has the longest clear span (2,336 ft.) in South America.

to carry a double-track railway. An ingenious secondary cable system will be installed to carry part of the extra load.

High-level harbour bridges, allowing clearance for ocean shipping, were developed between the world wars when motor traffic was beginning to grow rapidly in the world's commercial and maritime cities. Among the first of its kind was Sydney Harbour Bridge—a masterpiece of British engineering skill—which for well over thirty years has been the symbol of modern Australia. Even today, it still arouses the wonder and admiration of travellers arriving at Sydney by ocean liner.

Sydney Harbour Bridge was designed for three kinds of traffic—trains, trams and motor vehicles. A few years ago, the tram tracks along the eastern side were pulled up and the area converted into much needed extra space for motor vehicles. With a total of eight traffic lanes, the bridge carries around 100,000 vehicles in and out of the city each day. To avoid bottlenecks at either end, approach roads have been widened to motorway standards.

Apart from the complicated technical problems that modern bridge-builders have to overcome, there is also the problem that, owing to big traffic increases locally, the vehicles capacity of a new bridge may be outstripped soon after its completion.

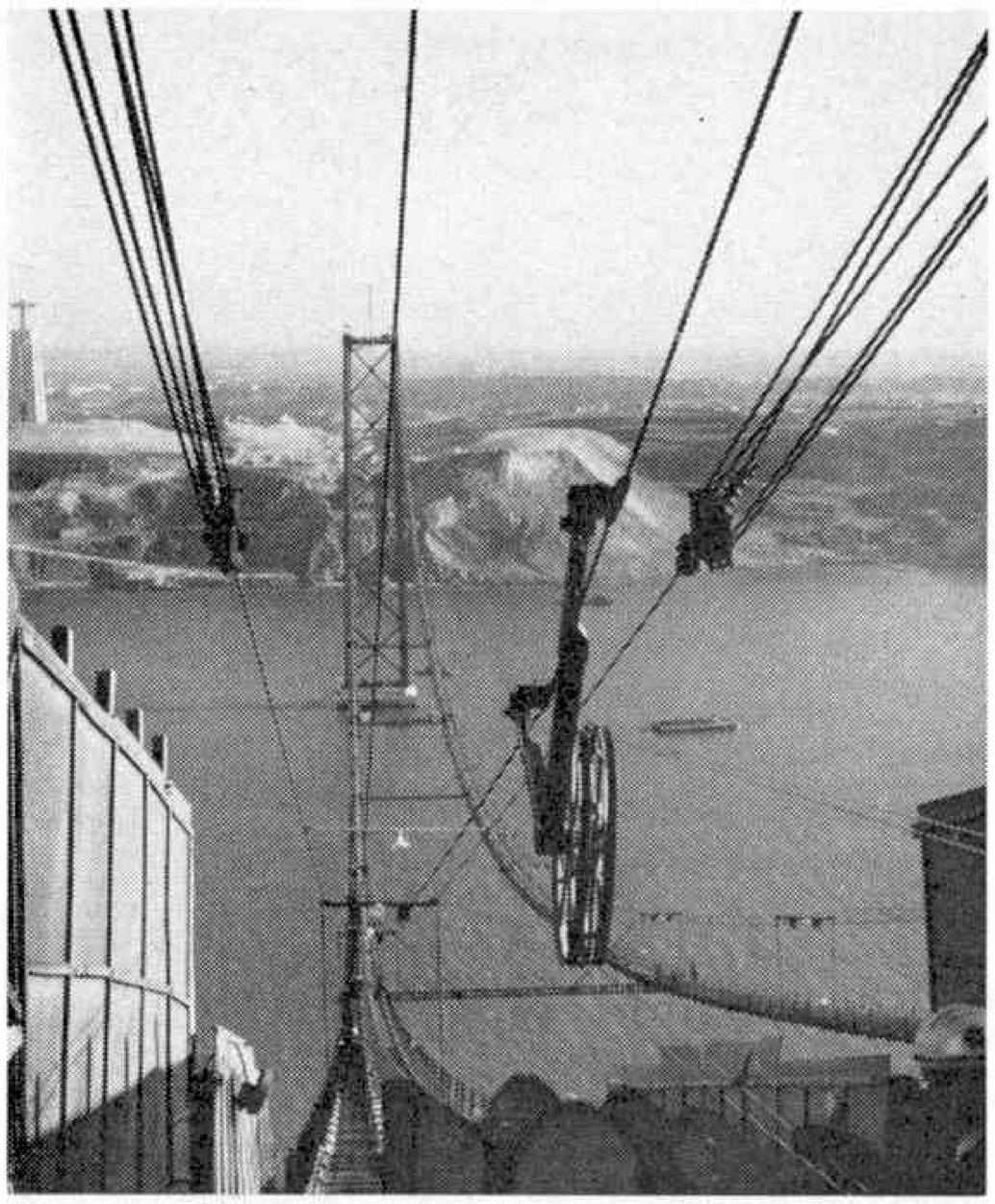
For example, since the four-lane Auckland Harbour Bridge in New Zealand was opened in 1959, the original traffic estimates have been vastly exceeded. Since 1960 the bridge traffic has increased from about 13,000 vehicles a day to more than 33,000 daily. However, its capacity has just been doubled by the simple but ingenious method of mounting two outrigger roads on extensions of the existing piers. These provide an additional two lanes on each side of the main bridge deck.

The George Washington Bridge, which spans New York's Hudson River between Manhattan Island and New Jersey, has been enlarged twice in the past twenty years to cope with changing traffic conditions. Extending 4,760 ft. between anchorages, 3,500 ft. of its length is over water. Originally opened in 1932—and then the world's longest suspension bridge—the main deck was widened just after World War II to carry eight instead of six lanes of traffic.

During the 1950's, there was such a rapid traffic build-up across the Hudson that engineers were called in to construct a new six-lane deck under the existing one. So, in 1962, the George Washington Bridge became the first 14-lane vehicular suspension bridge, and today it is used by more than a million motor vehicles every week. A system of approach roads on two levels permits the free flow of traffic to and from the upper and lower bridge decks and links them to the New York-New Jersey expressway network.

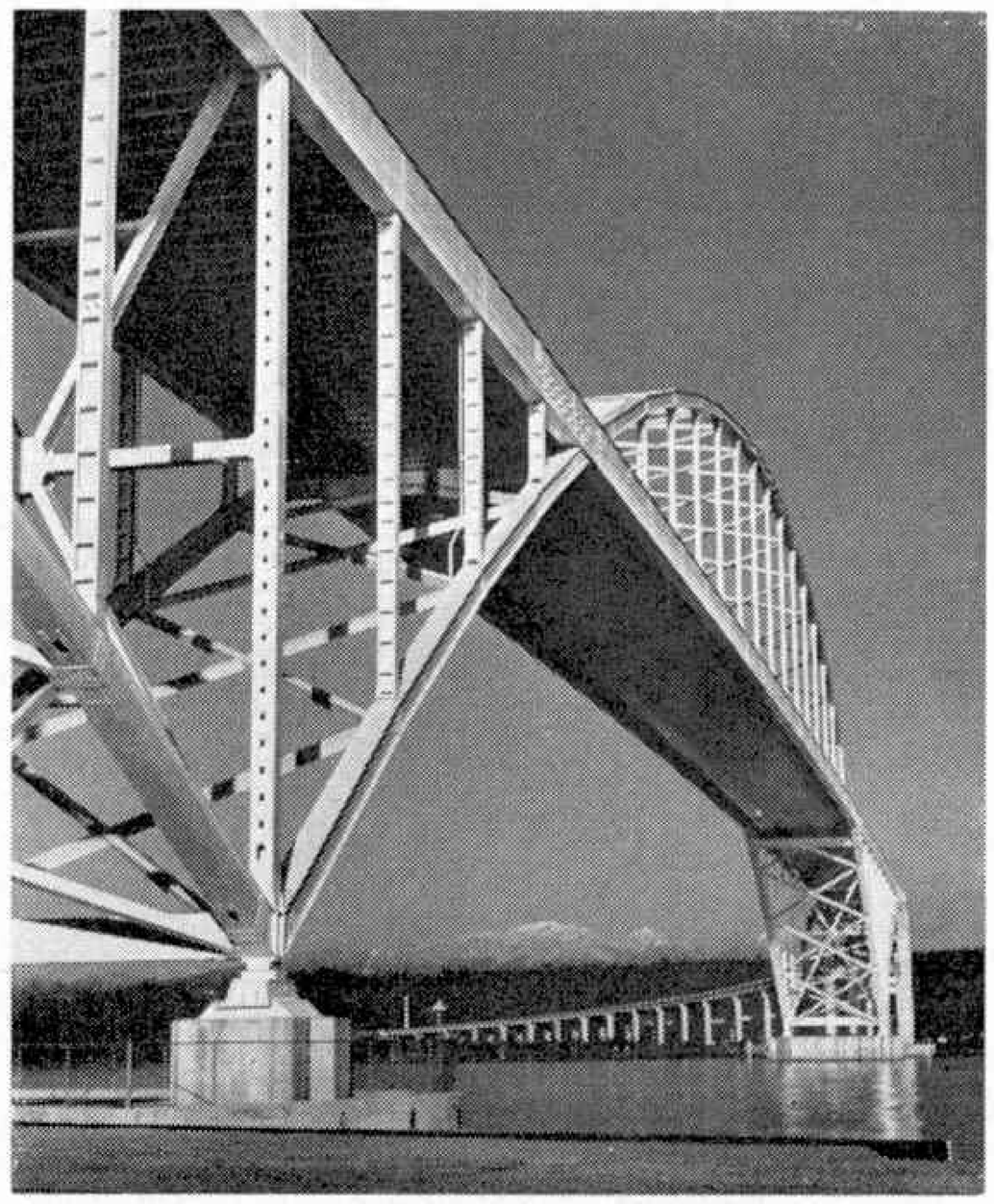
The only two bridges in the world with spans of over 4,000 feet are both in the United States. One is the new Verrazano-Narrows Bridge, carrying the 12-lane Brooklyn-Staten Island expressway across the entrance to New York harbour. The other is the famous Golden Gate Bridge at San Francisco on the Pacific coast. The Golden Gate—one of the most

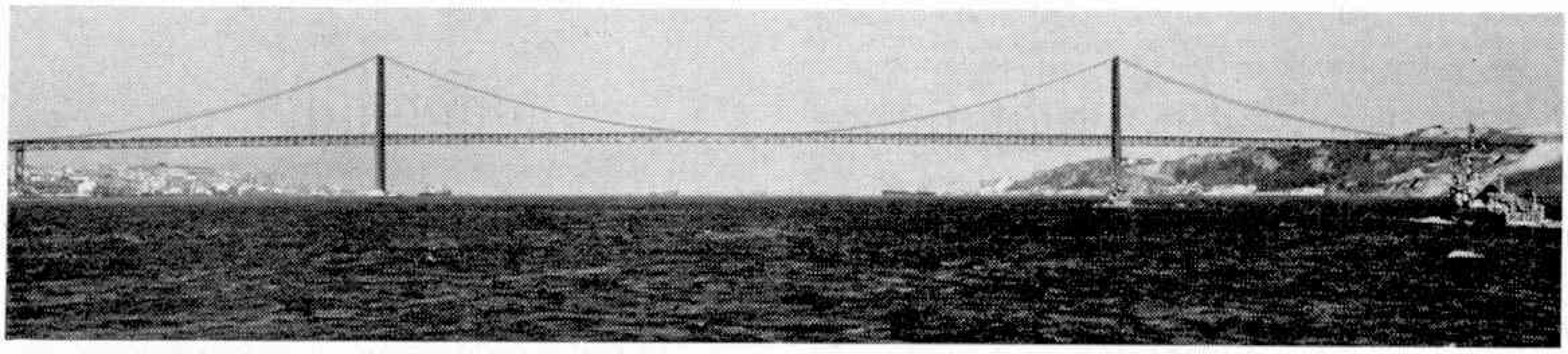
At far left: Combining a 1,200 ft. navigation span and gently rising causeways, the 3-miles-long Tappen Zee Bridge carries the New York State Thruway across the Hudson River. The six-traffic-lane structure took three years to build. At left: After more than 36 years, the British-built Sydney Harbour Bridge remains a masterpiece of high-level bridge construction, and the most famous building in the Southern Hemisphere.



Above: Spinning wheels shuttled to and fro almost continuously above Lisbon Harbour as the main cables for the Tagus River Bridge were being completed. 33,686 miles of steel wires went into the two 23-inch support cables.

Below: Vancouver, on Canada's Pacific coast, is famous for its harbour bridges, but none is more striking than the new Port Mann Bridge, one of the last links in the coast-to-coast Trans-Canada Highway.





Above: How the Tagus River Bridge, opened in 1966, is seen by ocean voyagers entering Lisbon Harbour. With its main span 3,323 ft. long, this Portuguese bridge is the fifth largest in the world. Below: The George Washington Bridge spanning New York's Hudson River, showing the lower deck opened in 1962, and approach roads. When this bridge was originally opened thirty years earlier, it was twice as long as any other suspension bridge in the world. Its 3,500 ft. span is now 4th.

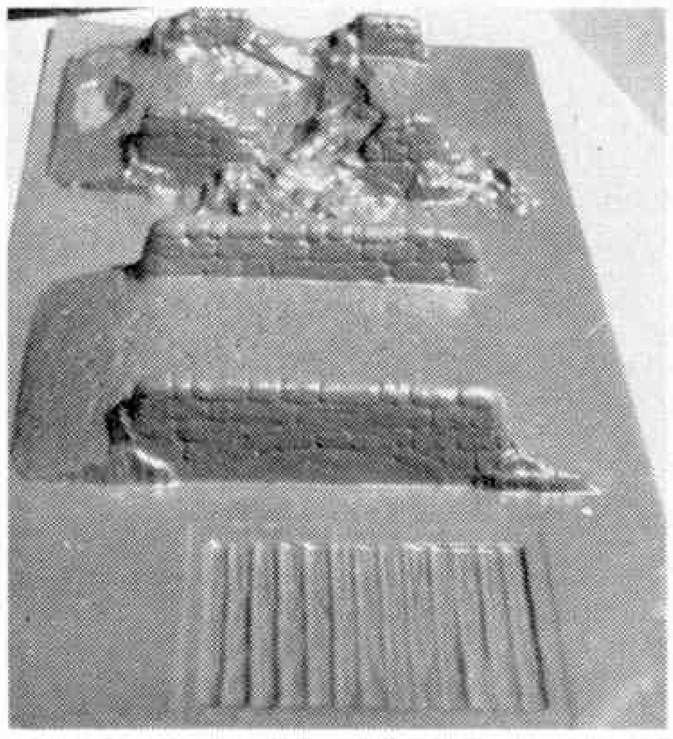
graceful suspension bridges—was built thirty years ago to link the San Francisco peninsula to Northern California and the giant Redwood groves of the coastal forests.

Much more spectacular, however, is the Bay Bridge, eight miles in length, which joins San Francisco to its suburb of Oakland on the far side of the harbour. This bridge, with its causeways and elevated approach roads, was built as two complete halves, which are linked together through a road tunnel on an island in mid-harbour.

But by far the greatest project of its kind in the world is the new 18-mile long Chesapeake Bay Bridge-Tunnel on the U.S. Atlantic coast. Built across a stretch of water so wide as to be like the open sea, it has been justly described as one of the 'seven engineering wonders' of the modern world. The Bridge-Tunnel consists of a series of low-level trestle roads, two tunnels—each more than a mile long—which burrow under the main shipping channels, and two high-level bridges over secondary channels. Four artificial islands had to be constructed in Chesapeake Bay in order to link up the trestle and tunnel sections. The Bridge-Tunnel replaced a series of ferries which had plied across the mouth of the bay for eighty years, and the crossing time has been cut from an hour and a half to about twenty minutes.

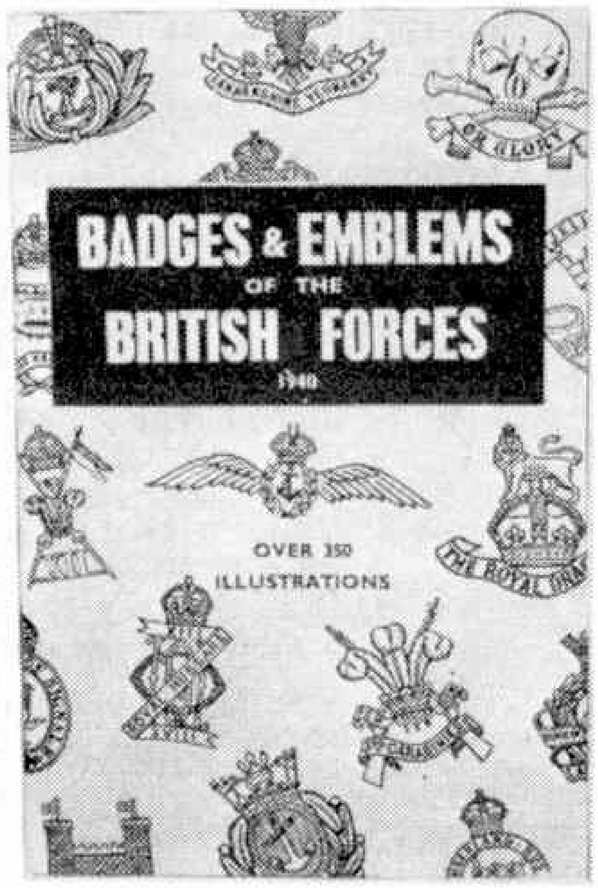
MILITARIA Contd. from Page 95

Latest from **MERBERLEN LTD.** (of Badger's End, Hawthorn Hill, Bracknell, Berks.), manufacturers of the Bellona series of battlefield terrain, are three most useful adjuncts to the dioramic side of "Battle". First, two different items of stone walling, one (W.V.1) consisting of six lengths, one being partially ruined, and a second (W.V.2) incorporating three extra long sections. The latter is very good value, each length being about 10 in., so you have, for 3/2 (plus postage), price of each set, about 2½ feet of well moulded stone wall, just the job for battlegame terrain. Like all



Bellona terrain features, these are of hard plastic and—as I know personally, having used them all—if painted even without an enormous amount of care, give a most realistic appearance. I've tried various different types of colour, oil paints, enamels and so on—the lot, in fact—and I find that oil colours, pretty well thinned, give the best results. Paint quickly, mixing the colour on the object itself and having it pretty 'runny' and the results will be found to be most pleasing. However, to continue, the third feature is well worth attention; described as a "Wargame Bridge", it is designed to provide this article at three different stages of an engagement—first in an untouched condition, then in ruins, from gunfire or some such, and finally repaired with wooden beams to take traffic again. This I think is a really great idea, and I would hope that, it being designed to use with the 'stream' sections made by Bellona, the firm will come out with a larger bridge in the same three stages for use with the wider 'river' sections. I consider it one of the best of the smaller pieces to come from the firm and it costs 3/2, plus postage, like the others.

More for the model soldier collector than for the battlegamer are two booklets published by **ARMS AND ARMOUR PRESS** (150 Broadfields Avenue, Edgware, Middlesex)—these being "Badges and Emblems of the British Forces 1940" (16/-) and "Red Army Uniforms and Insignia 1944" (17/6). The former's sixty or so pages contain nothing very new, and consist mainly of line drawings of badges, plus potted biographies on each unit, as well as some belonging to Dominion and Civil Defence units. Not terribly exciting, but useful for reference. The other, "Red Army Uniforms etc.", is a very diffrent kettle of fish—it is a most exhaustive source of data—within the scope of its forty pages—of Soviet uniforms, badges of rank, insignia and decorations. The whole is well illustrated with detailed drawings as well as a few photographs. I found this book most interesting and for the model soldier enthusiast keen on the World War II Soviet Army it is a well worth while 'vade mecum'.

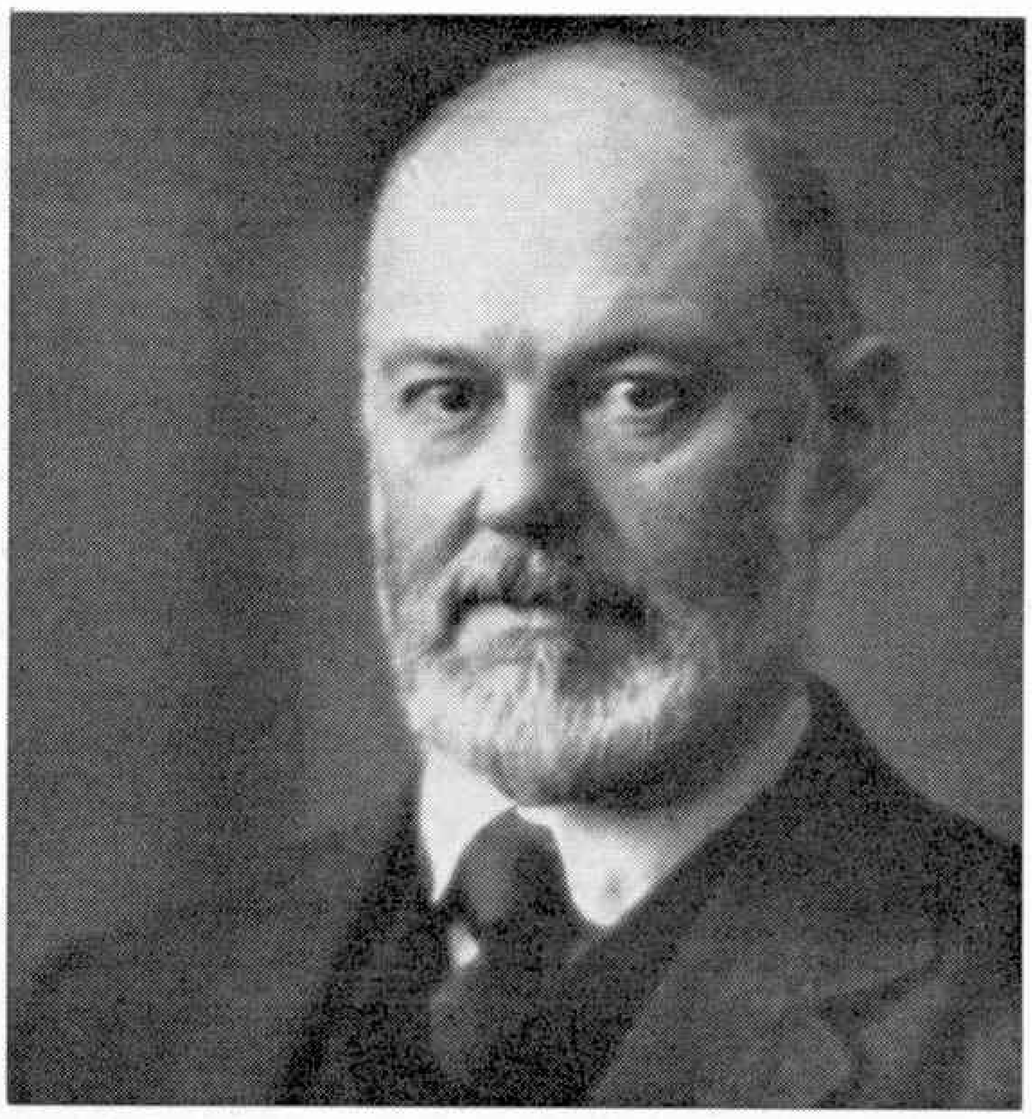


Great Engineers No. 13

F. H. ROYCE

Frederick Henry Royce will be remembered as a pioneer of precision engineering applied to motor cars. The fact that Rolls-Royce cars are still seen on the roads today proves the basic soundness of Royce's ideas.

by A. W. NEAL



THE CAREER of Frederick Henry Royce is an excellent example of a man rising to fame as an engineer and manufacturer without having had a high standard of education.

He was born in 1863 at Alwalton, Lincolnshire, the son of an unsuccessful miller. The family moved to London, where Frederick took employment as a newspaper boy with W. H. Smith and Sons, the well known newsagents. When he was only nine years old, his father died and his family's increased difficulties forced him to apply more time to earning than learning. For a time he had to take a job as a messenger at the Mayfair post office, London.

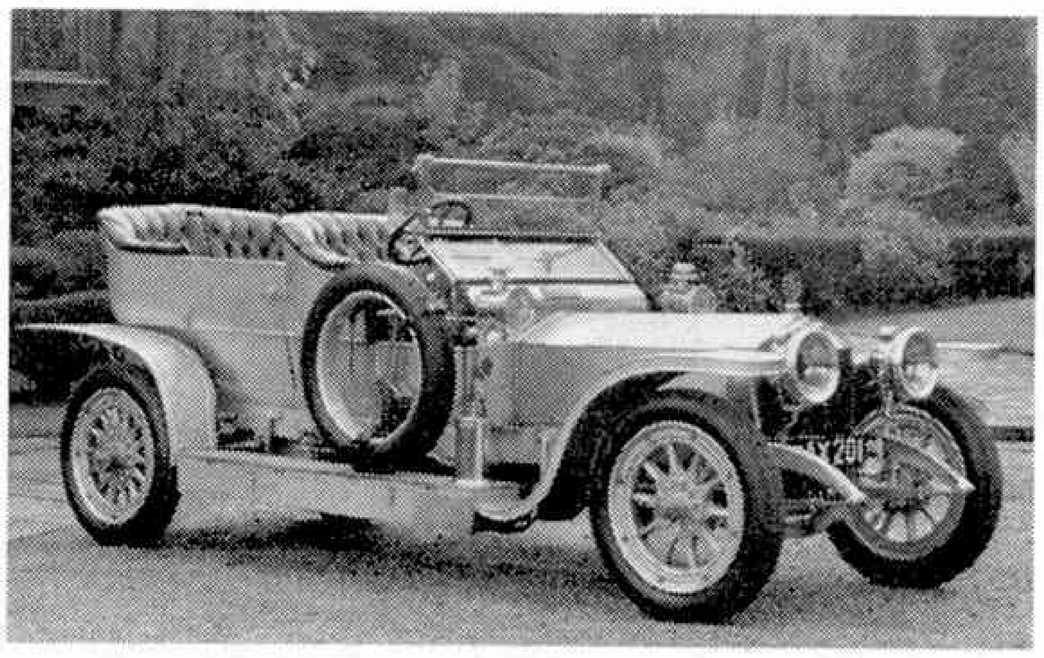
The future of this active and intelligent youngster looked bleak until a kindly aunt took the responsibility of apprentising him to the Great Northern Railway, at their works in Peterborough. Frederick's reaction to this apprenticeship was to supplement his existing education by attending evening classes. Unfortunately his apprenticeship came to an abrupt end, when his aunt could no longer afford to pay the annual £20 fee, so Royce had to leave the railway works. He searched for another job, and eventually found one with a toolmaking firm in Leeds. His pay was 11s. for a 54-hour week. While with these people he began to study electricity and, despite his scanty knowledge of the subject he did well, and obtained a post as an electrical inspector and later as an electrician. But then fate stepped in and the firm closed down.

By then he had made friends with one A. E. Claremont, and together they set up business as electricians, calling themselves A. E. Royce and Co., to make small things like electric lamp holders. Later Royce invented an electric bell-set for the home, and it sold very well. He then proceeded to make a dynamo with some new features, and this was an instant success. Business thrived and the little company was converted into a limited liability concern and named Royce Limited, who then began to make electric cranes, which sold very well.

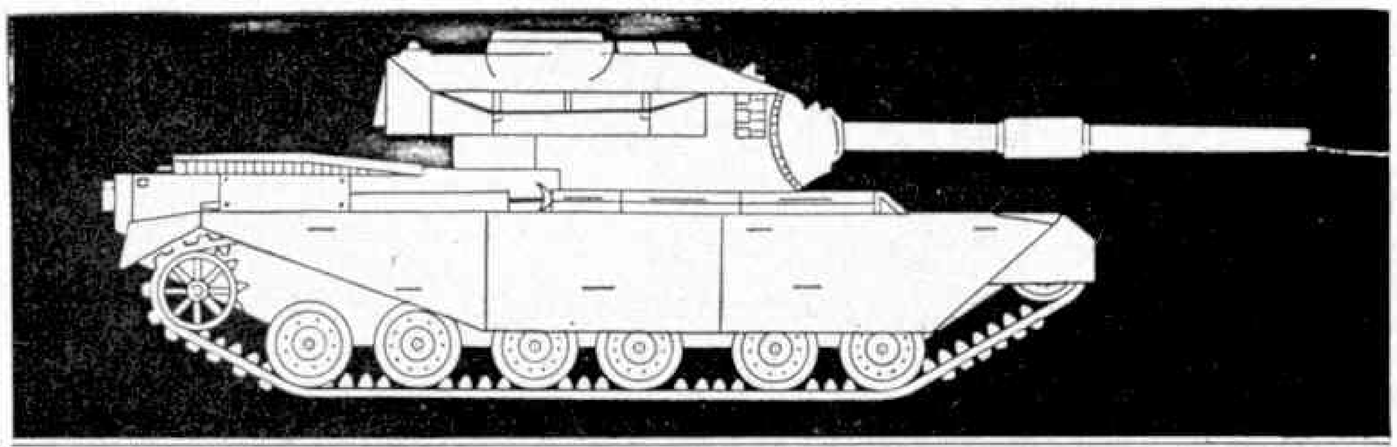
But Royce began to move away from electricity and took a very active interest in motor cars. In 1903 he started to make a number of cars to his own design, the first being completed in 1904. Press reports of the day praised its excellent performance and two more identical vehicles followed, one going to Mr. Edmunds a director of Royce Limited, who, incidentally, brought about the meeting between the Hon. Charles S. Rolls and Royce, and from which resulted the world-famous firm of Rolls-Royce Limited. Rolls was the third son of the first Lord Llangattock, and among his many sporting activities was motor racing. He also had a car sales business. Rolls and Royce worked together on the sales of the Royce car, and soon the two firms were joined, and a firm's factory was established at Derby. Rolls made good publicity by winning important races like the T.T., and in 1906 Royce developed a 40/50 h.p. six-cylinder car which became known as the Silver Ghost.

From cars the company turned to aircraft engines, and in 1915 Royce and Elliot (Royce's chief assistant) designed their first. It was of 225 h.p., and rated 1,800 r.p.m. Then followed a long line of famous bird named engines, a list too long to detail here.

Henry Royce was never a man for publicity. He often said " I am only a mechanic ", but his company's accomplishments is an obvious measure of his greatness. In 1929, following the British Schneider aeroplane race victory, a baronetcy was conferred upon him. He died on April 22nd, 1933.



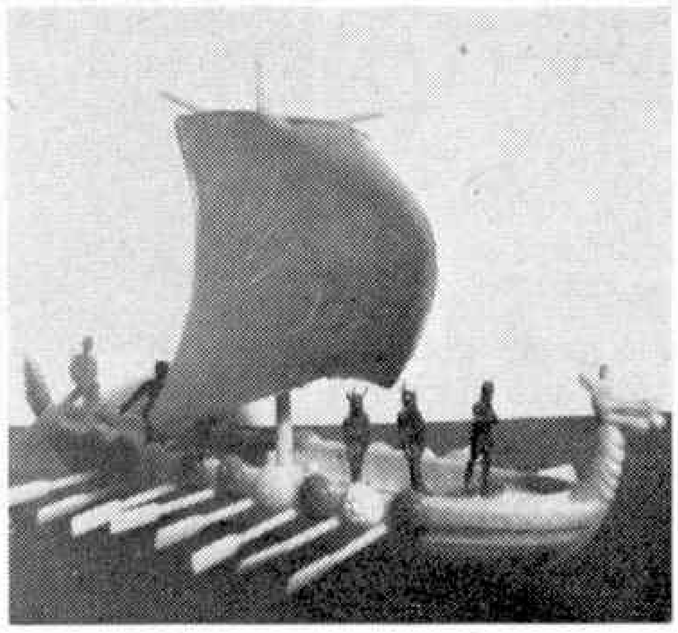
This beautiful Rolls-Royce, thought to be Frederick Royce's finest car, is still owned by Rolls-Royce Ltd.



MILITARIA A REVIEW BY CHARLES GRANT

COMPARATIVELY NEW in the commercial production of metal figures for battlegames is "**THE GARRISON**", **W. & P. (MILITARIA) LTD.**, of 198 Northolt Road, South Harrow, Middlesex, but even so, their list of troops available is a pretty impressive one, and at the moment it comprises figures representative of armies of the ancient world—Roman and Persian especially—and of the Colonial Period of the late 19th century. These, of course, are of the popular 20 mm. size—or something very close to it—manufacturers having a very elastic idea of scale—and I estimate that the 'masters' have been produced by more than one artist, so different is the technique and style of various types. Happily—for me, at least, with my soft spot for the "ancients"—these are really excellent, as can be seen from the selection reproduced, and are as good as, or in some cases, better than anything I have seen. Particularly notable are the Persians and Romans. Have a look at the "Immortal", and that magnificent mounted Roman Legate—not much wrong with these—and don't overlook the camel-mounted archer! His existence might surprise anyone without knowledge of ancient warfare, but these intractable beasts had their uses—no horse would do anything but bolt forthwith if within smelling distance of a camel! I've seen 'ancient' battlegames wherein whole cavalry regiments have beaten ignominious retreat when confronted—downwind, naturally—by a few camels! The Legate, incidentally, is cast together with the horse, in contrast to most of the others, where steed and rider are two separate castings and are thus interchangable. Prices—and a list of types available my be obtained on request—are pretty standard for the present day, they are 1/- for an infantryman and 2/6 per mounted figure. Those illustrated are well worth the price, without a doubt.

A. A. JOHNSTON, of Pitney, Langport, Somerset, produces and sends out regular lists of books, new and second-hand, on every subject with even the slightest military bearing, and his latest contains some good items, including a number of useful regimental histories, as well as some old service training manuals, the latter being of enormous use to the battlegamer intent on creating his own rules, or doing research with the full intent of confounding those of other players! A card to Mr. Johnston will bring regular lists to the interested party.



Shown above is the 20 mm. scale Viking Ship obtained from Woolworths. Moulded in polythylene, is complete with crew and costs only 3/-. Above right: The September issue of "SLINGSHOT" containing features on ancient China, Athenian navy, and battle reports.

Treasures are to be found in the most unlikely places, small stores or toy shops in side streets or even the big well-known stores can be visited with profit, and from one of the latter—**WOOLWORTHS**, no less—came the Viking Ship shown herewith. In approximately 20 mm. scale this vessel, made, it is claimed, of unbreakable polyethylene, is complete with crew, but they are a feeble looking lot and can be readily discarded for something better. For 3/- —that's the price—the ship is a bargain, just the thing for the battlegamer of the 'ancient' period. It is shown as purchased—the plastic is pretty garishly coloured—but with a little paint work, it could be made into a worth while model. Fill her up with Viking warriors—**MINIATURE FIGURINES**, of 5 Northam Road, Southampton, have a line of these—and you are well away. It is said that, long before Columbus set sail, America was discovered by Norsemen, and here we seem to have one that went a little further, its place of origin, not terribly

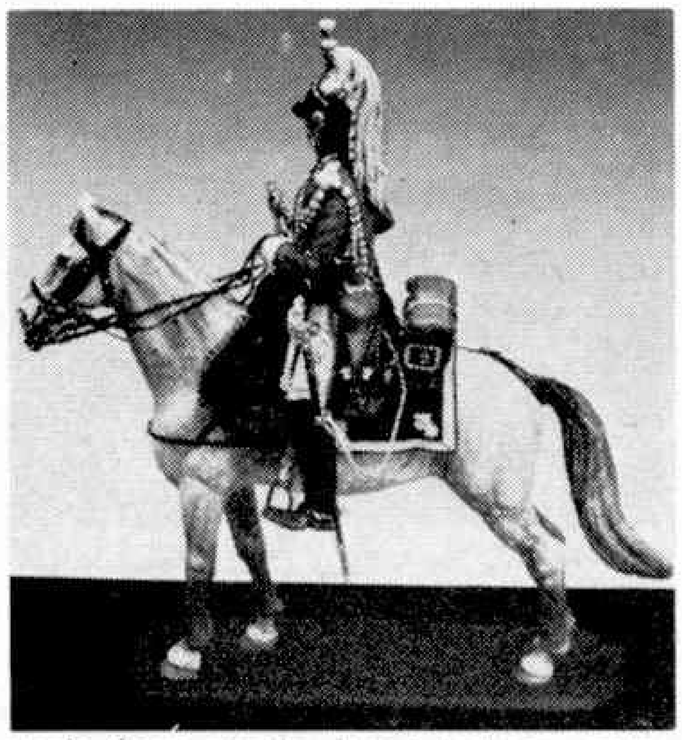
surprisingly, being Hong Kong! A certain celebrated player of 'ancient' wargames, Tony Bath, editor of "Slingshot" (Journal of the Society of Ancients), on first seeing these longships, was so taken with them that he purchased the entire stock of the shop—now has a fleet of no less than sixteen! And that was at the time of writing!

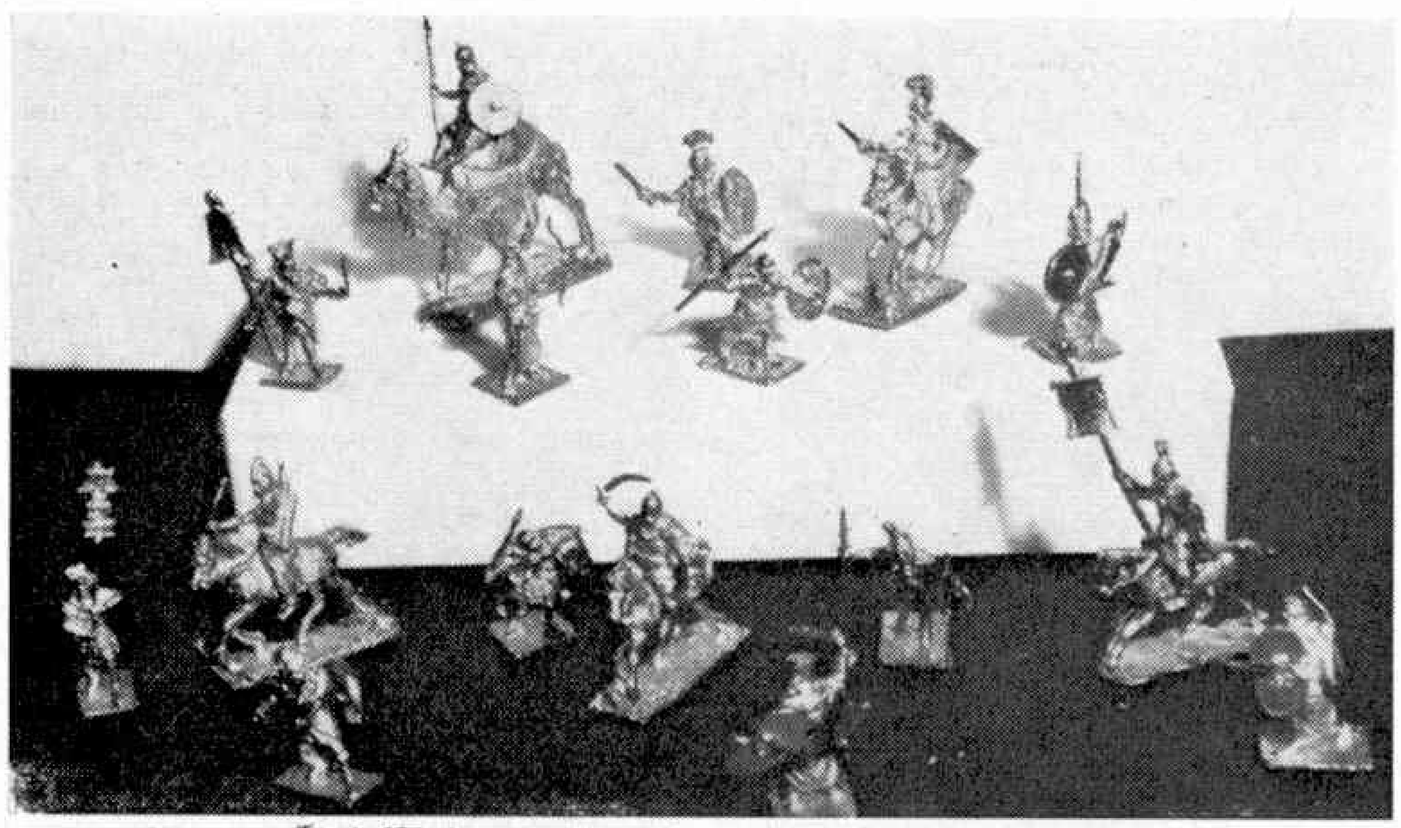
On the subject of "**SLINGSHOT**", the most recent issue to hand, that for September, 1968, is a most entertaining one and contains, among some excellent reading material, an account of warfare in ancient China, the organisation and battle tactics of the Athenian navy, illustrations of coats of armour of the Agincourt time, as well as an exciting battle report and the customary review and news features. (Society Secretary—E. Smith, 90 Burrage Road, Plumstead, London, S.E.18).

I have been trying out a couple of the recent six-tin "Authentic Colour Kits" by **HUMBROL** (of Hull, England). At first glance, I wasn't too happy about the idea of having to buy six tins of different colours to obtain a certain one particularly required—obviously some colours are going to be used up more quickly than others, and a second set might have to be purchased with some tins of the first pretty well untouched. I have heard it rumoured though that the firm is going to retail single tins, but, be that as it may, the paints themselves cannot be faulted. The two I have dabbled with are "Ceremonial Uniforms" and "Military Equipment" and very good they are. The former contains quite the best scarlet for use with model soldiers that I have come across—really bright—while the 'flesh' is much better than the one previously obtainable, which I thought pretty 'wishy washy'. This one is warmer and in fact 'fleshier'. In the "Military Equipment" set, the great find is 'brass'—this I'd been trying to simulate for ages, with little success. It's just right. Sufficient to say that I've just completed the painting of a regiment of 20 mm. Assyrian cavalry (more evidence of my 'ancient' proclivities) with brazen shields and helmets. Magnificent! I can't wait to get them into action. The price, by the way, of each set of colours is about 9/6—and they are matt, of course, not glossy.

Being a dyed-in-the-wool lead figure man—brought up that many years ago in the Britains tradition—it took me, I must confess, a little time to get used to the idea of model soldiers entirely

Left: A selection of 54 mm. figures issued by ROSE MINIATURES. These are Assyrians, fully armed for battle with pick axes, crow bars, slings, spears, etc.





made from plastic, but I had no option but to do so, once I had set eyes on the admirable 54 mm. types produced by the French firm—**HISTOREX**—and very spectacular figures they are. As most people know they are in kit form, ready to assemble, and consist of anything up to 50 or so parts, some of them quite minute. At the moment, they are entirely of the Napoleonic period. I need not say too much about the commercial background as **HISTOREX** was dealt with in an article in the June '68 issue of "Meccano Magazine" ("Aspects of Model Soldier Collecting and Constructing"). As the article rightly indicated, the assembly of a Historex figure is not a task for the beginner, some of the details being "fiddly" to say the least. However, and there is no arguing with this, the finished article—as the photographs show—does take a bit of beating. Well painted—and the moulded detail is such as to make this a relatively easy job—the Historex figure is as good as any other in appearance—as the increasing numbers seen on such occasions as the Annual Competitions of the British Model Soldiers Society would indicate. I have but one small criticism in that I feel that, with mounted figures, the rider is a shade too large for his mount, but I may be wrong—it's just an impression. Anyway, cost is not by any means excessive—infantry are 13/- per figure and cavalry 28/- while more elaborate jobs, like gun teams and so on, are naturally rather more costly. The HISTOREX agent—Mr. L. Sangster, 3 Castle Street, Dover, Kent, in addition to supplying the individual figures, runs a most useful spare-parts service, and is also ready and willing to furnish the most esoteric uniform details regarding the painting of the figures.

The Autumn 1968 Supplement to the Catalogue issued by **ROSE MINIATURES** (45 Sundorne Road, Charlton, London S.E.7) has the usual splendid

Above: The picture shows a completed model of an infantry drummer produced by HISTOREX. These models are in kit form and contain 50 or so parts. The infantrymen cost 13/-. Below: More figures from ROSE MINIATURES. This time they are the Highland Regiments of 1880-1914. The prices of these good quality figures are under 25/- a piece.

Above left: Another highly detailed figure by HISTOREX, not a task for the beginner. These cavalry figures cost 28/-. Above: A selection of Persian and Roman figures from "THE GARRISON". Although cast in metal, they still hold a high degree of detail.

selection of 54 mm. figures, ranging, as our photographs show, from the furthest reaches of 'ancient' times with those magnificent Assyrians to the 'classic' period of the British soldier, the Highland Regiments of 1880-1914. Of these it can only be said that the standard of the figures is as high as ever. The Highlanders are especially good, and I like particularly the tenor drummer in full leopard skin. The Assyrians are an aggresive and formidable looking bunch. They developed siegecraft to an art and the two chaps with pickaxe and absolutely enormous crowbar are good examples of the troops employed in this type of operation. It's unlucky, though, that the two best—in my opinion, that is—of the new additions to the ROSE range are not illustrated, because they are really quite oustanding examples of the model-maker's skill, They are portrait figures, really, and are Napoleon's personal Mameluke, Roustan, and a Colonel of Hussars. The latter is about the best 54 mm figure I have seen, and in position and detail it cannot be faulted. Indeed, he could well be modelled on Conan Doyle's Brigadier Gerard, as he has all the flamboyance and colour of that fabulous old character. Prices are under 25/- per infantry figure, and, by the way, the firm produces a catalogue containing numerous photos of their models, as well as hints on painting, articles on conversion of figures and so on. At 15/- it may seem a lot for a catalogue but it's a fairly good investment, even so.

Continued on page 92

TRANSPORT TOPICS by Mike Rickett

OF ALL the rallies or races to be organised throughout the year, one of the most popular, without any doubt, is that most unusual and slightly eccentric rally that takes place between London and Brighton. Organised by the R.A.C. annually, this of course is the Rally where all those so-called "old crocks" can be seen every year in fighting fit form. 1968 was a memorable year for the event and the R.A.C. announced that over 250 cars entered for the Rally, which took place along a 52-mile route from Westminster Bridge, to the A.23 Brighton Road, via Lambeth, Streatham, Thornton Heath, Croydon, Redhill, Gatwick new roundabout, Handcross, and Pyecombe.

First away from the Serpentine Road starting line in London's Hyde Park was the oldest car in the Rally, an 1894 Benz, owned and driven by Mr. Louis Holland, of Forest Hill, London. Amongst other early starters was the first of eight American entrants, a 72-year-old Peugot from California and vehicles from Holland, Belgium, and Spain. Over two million people turned out to watch the progress of these delightful "oldies", that every year show us what motoring is really all about.

Because of the popularity of these old cars, I include this month two photographs which readers possibly may not have seen before, showing two of the entrants at various points along the route. I wonder if any reader can name the two vehicles concerned? Write to the Editor if you think you know, and I will personally give a Dinky Toy model of a 1913 Morris Oxford to the first reader who correctly names the two vehicles shown in our photographs. Because only one prize is offered, I must unfortunately insist that all entries be received by February 12. The first correct post card received will win the model.

It isn't very often that you find cars of the type running in the R.A.C. competition on the road these days, and it will be interesting to see how many readers really know their cars! Shown in another of our photographs is a vehicle that you are just as unlikely to see in any great numbers—as yet anyway. This in fact is a very modern Leyland articulated lorry, and readers that keep their ears open and their eyes glued to the newspapers, will know that there is something very special about this particular vehicle—something that sets it quite apart from practically every other lorry of a similar size. Tempted as I am to start another competition to see how many of you know what the difference is between this and other lorries, suffice it to say that I will devote a portion of next month's "Transport Topics" to this particular subject. In the meantime, see if you can find out what this difference is.

Tearing myself away from competitions, I would like to go on to something completely different—something that has not been featured in the news for at least a year, to the best of my knowledge. In November last year, Hawker Siddeley announced to the World that it intended producing a new jet air-bus, capable of seating either 230 mixed class or 300 economy class passengers at the unprecedented low cost per passenger for short haul aircraft, of only one halfpenny per mile, on stages of up to 1,900 miles. An artists impression of this magnificent aircraft has been painted and although this has still not made an appearance, it does have tremendous potential for boosting Britain's vital export market. Designated the A-300 jet airbus, it was designed by the British, French and German aircraft industries and will be powered by two "new technology" Rolls Royce engines developing over 40,000 lb. static thrust. It is expected that sales of over 300 aircraft will result, giving an estimated £800 million worth of business for British industry.

While on the subject of new techniques, I recently heard of one new technique for building ships of up to 600 tons displacement using only glass-fibre reinforced plastics with a cellular core. This has been developed by the Bristol Aeroplane Plastics Ltd., and unfortunately I have not received more specific details of this before going to press. Another interesting development by this Company however is a lightweight plastic armour for protecting aircraft or military vehicles.

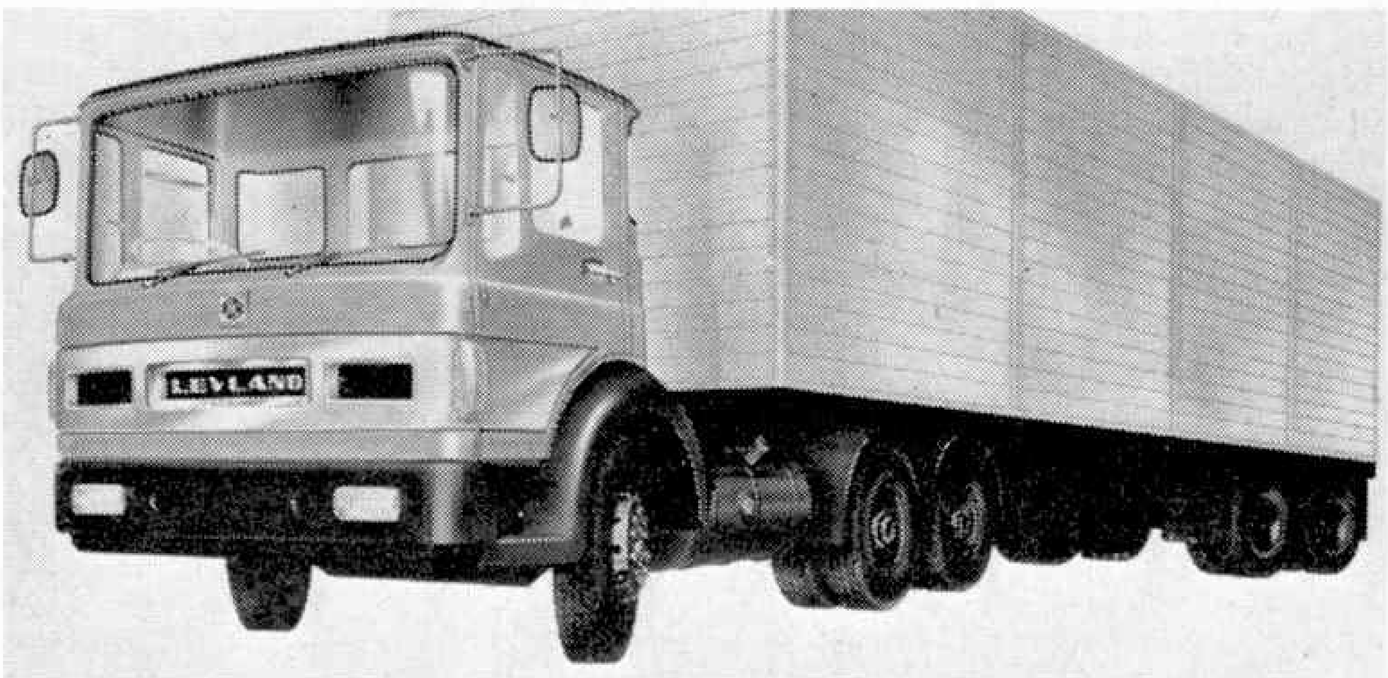
Above and at left: Over two million spectators were present along the route for the R.A.C. London to Brighton Rally. Win a Dinky for identifying these cars.

In Southwest Virginia, U.S.A., an important event took place a few months back when the 3,100 foot long Whitehead Tunnel on the Norfolk and Western Railroad was "holed through"—as they put it over there. The last barrier in the tunnel, an eight foot thick wall of Sandstone, shale, and coal, was blasted through with dynamite skillfully placed in position.

The Whitehead Tunnel is a vital segment of the Norfolk and Western's present project to connect their Buchanan branch with the Clinch Valley line and it is intended that the 8.4 mile connection will provide better service for existing and planned mines producing high quality, metallurgical coal in the Upper Buchanan Field. The tunnel, under Smith Ridge, is at a point approximately 7½ miles north east of Richlands, Virginia and about thirty miles South East of Grundy.

Also in the U.S.A. is the speedist battery powered car ever to have been built. "Lead Wedge"—as it is called—recently became famous for having set up a new world record for battery powered cars when it travelled at 138.862 m.p.h. at the Bonneville Salt Flats at Utah. "Lead Wedge" was designed and built by the Autolite parts Division of Fords and like the turbine-powered cars of Indianapolis fame, it is wedge shaped with a moulded fibreglass body and aluminium chassis. Its weight, which includes 20 production lead acid batteries, is 2,040 lb. and it is driven by a rear mounted General Electric motor, similar to those used in fork lift trucks.

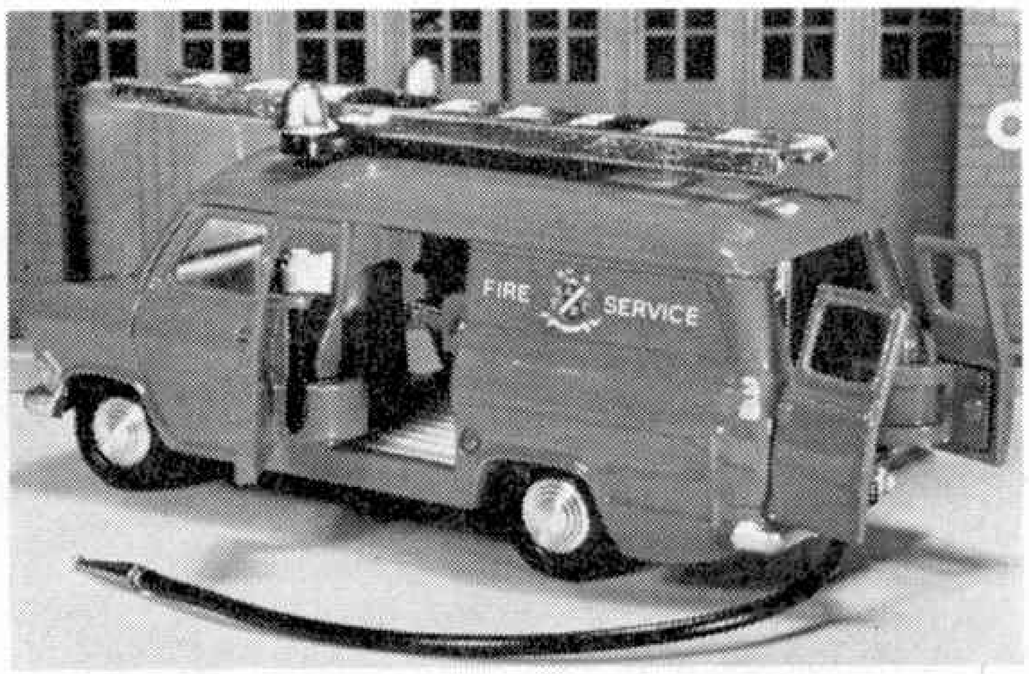
Finally, I was recently informed that the Russell Restoration Fund are in receipt of a formal offer for the restoration of the sole remaining locomotive of the narrow gauge Welsh Highland Railway. While it is anticipated that the complete restoration will cost in the region of £5,000-£6,000, an initial target of £1,000 has been set, and if this figure is achieved before the end of January 1969, then it is anticipated that work on re-boilering will commence within a matter of months. Anyone interested in helping is invited to contact the "Russell Restoration Fund", at 102 Northumberland Avenue, Cleveleys, Lancs.



This articulated lorry made by Leyland is very very new. See if you can guess what is so different about this vehicle.

FIRE FIGHTER

Chris Jelley describes a new fire engine model from Dinky.



Dinky Toy No. 286 Ford Transit Fire Appliance gains another " first " for Dinky by being No. 1 in the world with the very special feature described in this article.

IN REAL life, the Fire Service is one of those organisations which a lot of people seem to take for granted. To them the Fire Station is just another building like the Post Office or the Police Station. They don't think about it and some people even complain at the noise a fire engine makes as it roars on its way in answer to an emergency call with its horn blaring, its lights flashing and its bells ringing. The fact remains, however, that the local Fire Brigade is one of the most essential sections of any community and the excellent job it does is literally invaluable. What's more, although they probably do not agree with me, the fireman who make up the Brigade are all of them heroes in the true sense of the word. They must be because every time they are called out on a job, thy might well be putting their lives in serious danger, yet this thought does not hold them back.

Having established that a Fire Brigade is essential to a real-life community it follows that any range of models based on real-life vehicles would be incomplete without representatives of the Fire Service. For this reason Meccano Limited already include no less than four fire engines, or to use the correct term, fire appliances, in their Dinky Toys range: No. 259 Fire Engine, No. 276 Airport Fire Tender, No. 955 Fire Engine with Extending Ladder and No. 956 Turntable Fire Escape. All have proved highly popular with collectors and the demand for a further addition to the range has been steadily growing. It is naturally good sense to bow to public demand when possible and, in this case, it has been possible. In fact, a new Dinky Toy to fit the bill reached the shops in time for Christmas; a model which represents yet another feature break-through for Dinky—No. 286 Ford Transit Fire Appliance.

When you first take this model from its box you will immediately recognise it as a fire engine for obvious reasons, but you may wonder where the " break-through " came in. Never fear, you will soon find out when you do, if you are anything like me, you will be fascinated by the feature that nets another " first " for Dinky Toys.

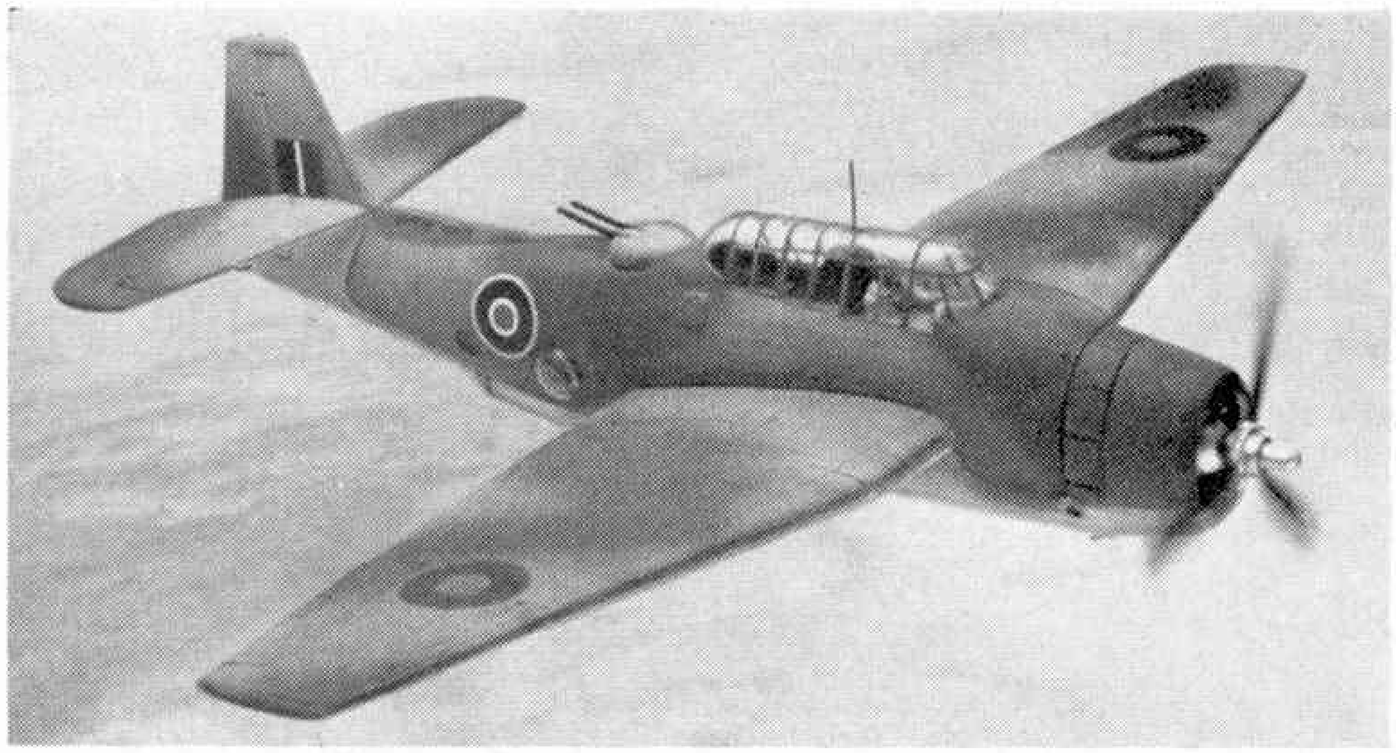
Being based on the Dinky Ford Transit Van, the new fire engine has a sliding driver's door in the cab, an opening access door in the left-hand side of the body and two opening rear doors. When these rear doors are opened they reveal a minutely detailed, silver-finished representation of the water pumping equipment found on fire engines. Protruding from a slot beneath this " console " is a short length of black hose-pipe tipped with a metal nozzle, the rest of the hose-pipe—some ten or more inches of it—wrapped round a spring-loaded drum behind the console. The pipe can be extended its full length by simply pulling it out from the back of the van, a ratchet mechanism on the drum preventing it from automatically reeling in the hose when the hose is released. This would otherwise happen because of the spring-loaded nature of the drum, but how, then, can the drum be re-wound ? No problem, here. The side access door opens to reveal a metal handle inside the van and, when this is pressed, it releases the ratchet holding the drum. The drum immediately revolves at great speed, re-winding the hose in no time at all !

A word of advice should be given at this point, however. If you pull the hose out by its nozzle, make quite sure that you do not continue to pull the nozzle hard once the hose is fully extended as you may pull the nozzle clean out of the end of the hose. In fact, when extending the hose, it is advisable to hold, not the nozzle, but the end of the hose itself although I must say that, with normal use, there is no real danger of the nozzle coming adrift.

Of course, the automatic hose re-wind is not the only feature of the Fire Appliance. Also present is a special roof attachment incorporating two bells as well as anchoring points for a removable metal ladder. The ladder is firmly secured by simply pressing it over these anchoring points and is removed, naturally, by reversing the operation. Held in a rack on the inside of the door giving access to the re-wind control lever are two long-handled firemen's axes with black shafts and silver heads.

Besides the various opening doors, the van itself is equipped with 4-wheeled suspension, windscreen, seats and steering wheel, plus jewelled headlamps, number plates and a radio aerial, the last mounted on the off-side front wing. The model is finished predominantly in red (as is only to be expected !) and on the sides of the body are the words FIRE SERVICE in white lettering, the two words being separated by a fictitious Fire Brigade crest and shield in yellow, green and white. The seats and base of the van body are off-white in colour and, like most other Dinky Toys these days, the windscreen moulding incorporates rear-view mirror and windscreen wiper representations.

I think I have said before in the M.M. that one of the most important factors governing the success of a model is the extent of its " play-value ". Well, the Dinky Ford Transit Fire Appliance is accordingly bound to be a winner simply because its play-value is enormous. You wait and see !

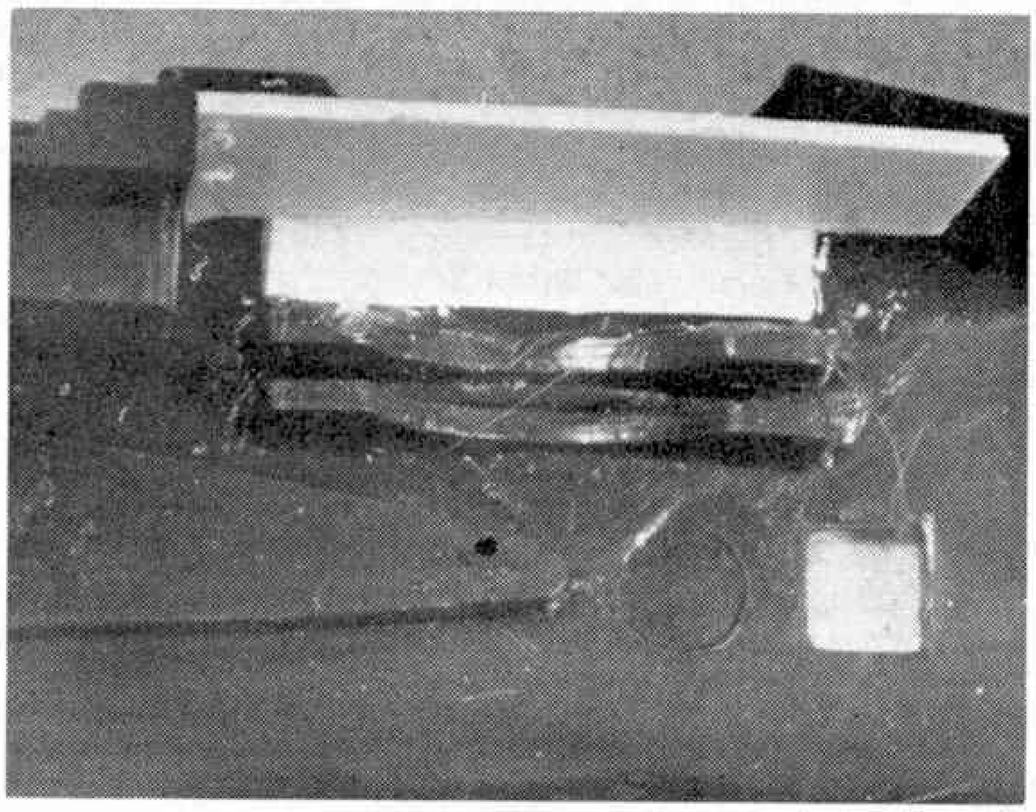


Doug's completed Grunman Avenger decked out with twin barbette guns and Royal Navy markings.

IN MODIFYING plastic models, it is often necessary to fabricate new components and alter the outline of an existing part by adding to the basic form.

Because of the ease with which it can be worked, balsa is often chosen for this purpose, but although it is certainly easy to carve, it is by no means easy for the average modeller to achieve a really good, grain-free finish to match the flawless surface of the plastic kit components.

A JOB FOR PLASTIC PADDING by Doug McHard



A view inside the right fuselage shell. Make a platform from thin polystyrene sheet (Plastikard) to block off the turret opening. Narrow strips of plastic at either side will cover the lower edges of the hole.

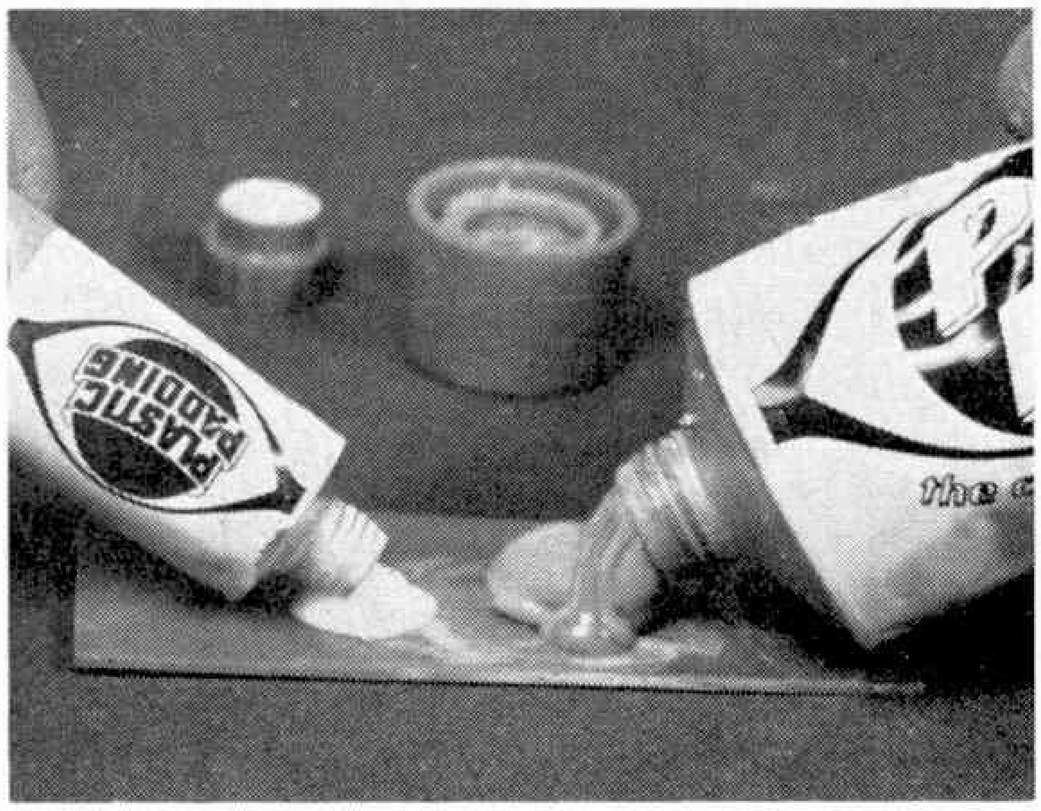
Moreover, balsa is not easy to attach securely to plastic and its soft texture is sometimes a disadvantage when local strength is required. Thin sections are invariably weak. The very softness of balsa which makes it so easy to cut also presents problems when a nice sharp edge is required—it always seems to finish up rounded to a greater or lesser degree.

A far better material for small to medium size fabricating is Plastic Padding. This remarkable medium comes in two tubes of a " thin putty " like consistency which, when mixed together in the correct proportions forms a compound which sets hard in about ten minutes.

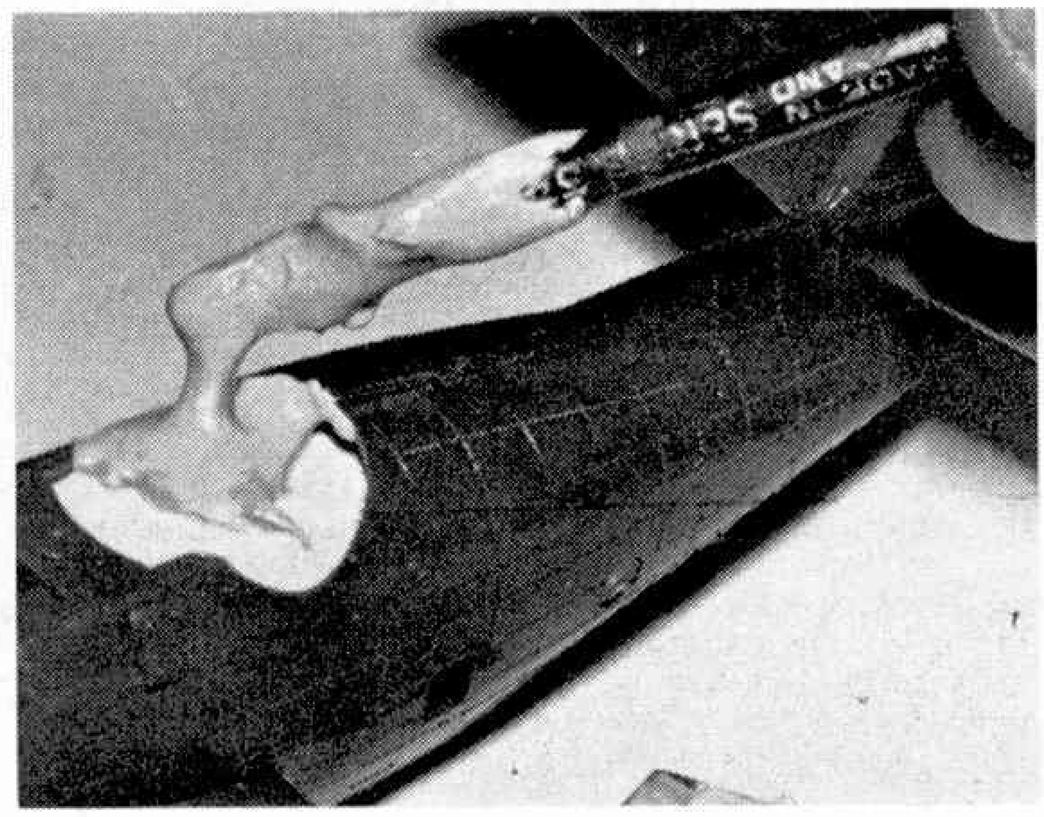
Plastic Padding sets by chemical action and does not depend upon air drying—it will even set under water ! Neither does the thickness of the material make any difference to the setting and no shrinkage occurs in the process.

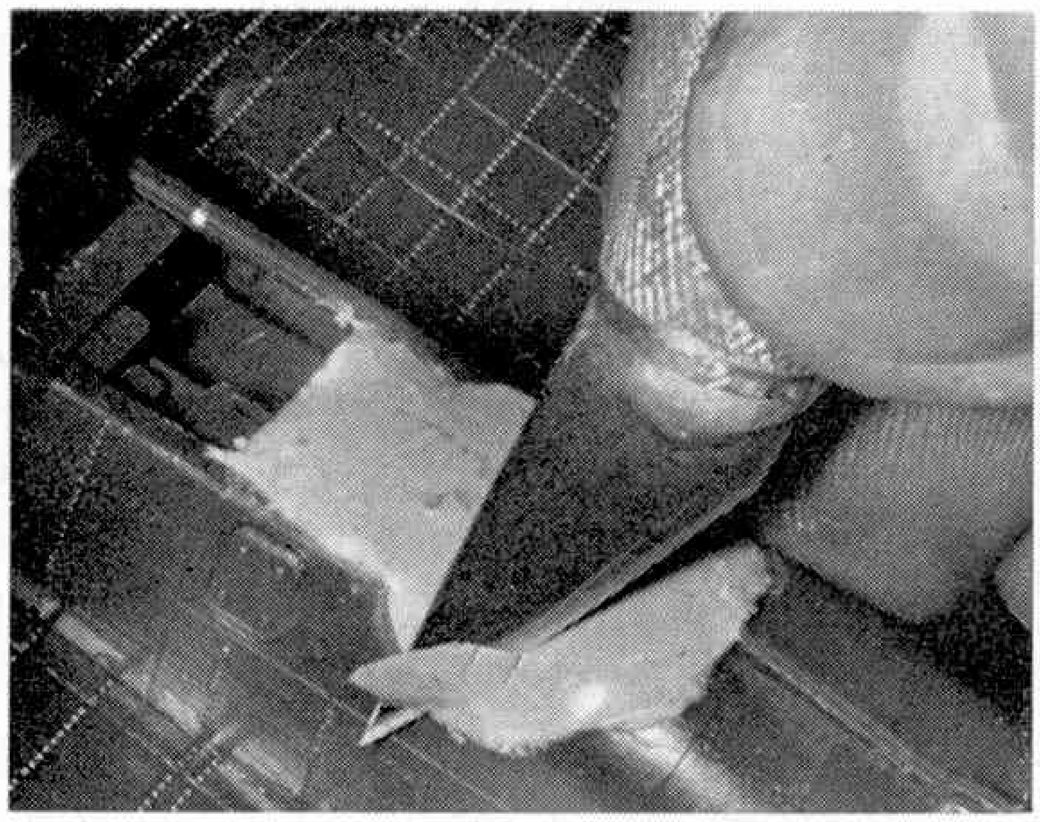
It can be bought at hardware stores in two forms—" Hard " (in a red and yellow tube) and " Elastic " (in a blue and yellow tube). The Elastic sort is particularly easy to shape, being the softer of the two types and can

Plastic Padding is mixed on the palette provided with the material. Prepare it just before you need it because it starts to set a few minutes after mixing.

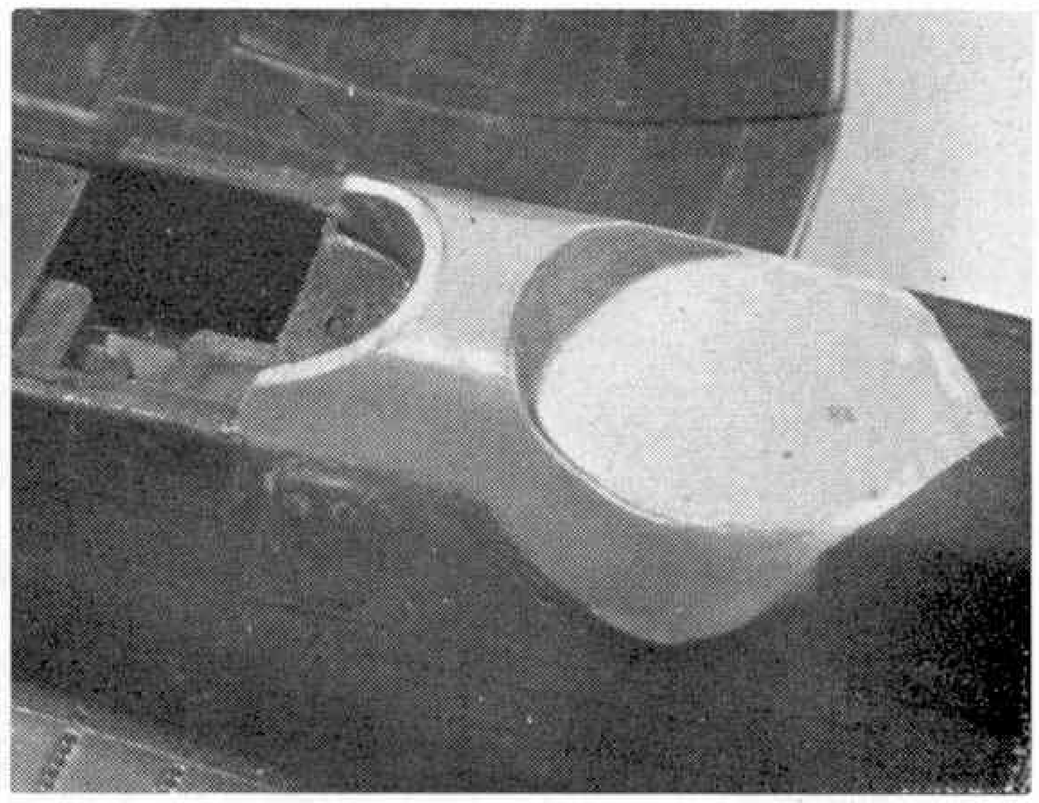


After smearing the polystyrene with Body Putty, the Plastic Padding is built up, making sure it is worked well into the spaces beneath the fuselage shell. Don't try to " form " it at this stage, but try to ensure sufficient thickness to carve to the final shape later.





The " Elastic " kind of Plastic Padding is very easy to carve and sand. You can start this stage within about ten minutes of applying the soft material from the palette. Should you accidentally cut away too much, it is easy to build it up again with more Padding.



This is the final shape, achieved by carving and sanding. A satin-smooth finish is achieved using No. 400 grade Wet-or-Dry abrasive paper (used dry) and the job is then ready for painting. Great care should be taken to do as good a job as possible at this stage.

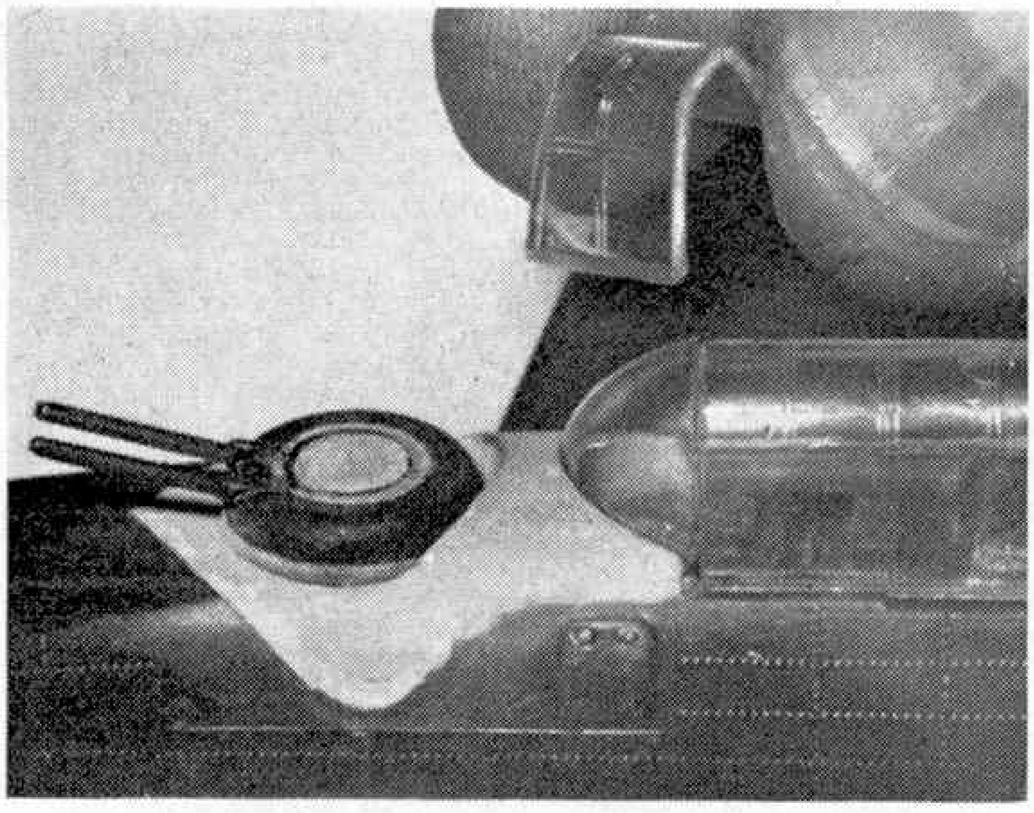
be cut with a sharp knife, filed and sanded. Where greater rigidity and strength is needed, " Hard " should be used.

An important advantage of Plastic Padding over balsa wood is that no grain filling is required. The surface, after final finishing with No. 400 grade Wet-or-Dry paper, is at once ready for painting; the surface quality will be indistinguishable from the rest of the model. The time thus saved can amount to several hours and, what's more, a better job will result.

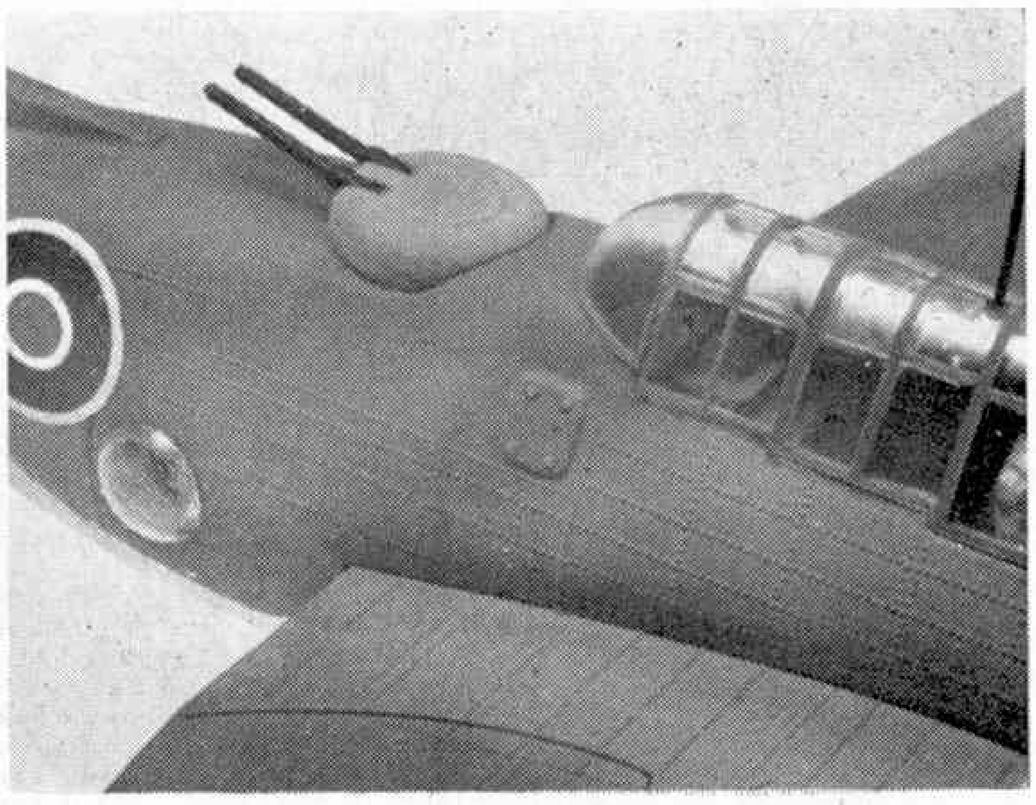
So what are the snags, you ask ! Well, there's really only one, and it is easily overcome. Plastic Padding bonds itself unbelievably well to almost every hard material except Polystyrene plastic ! To make it stick we must therefore smear the parts with body putty. The putty I prefer is the one made by A.M.T. and a thin smear will set in less than a minute. Leave the putty " rough " to provide a good key for the Plastic Padding and remember, only a *smear* to cover the plastic is all that is required.

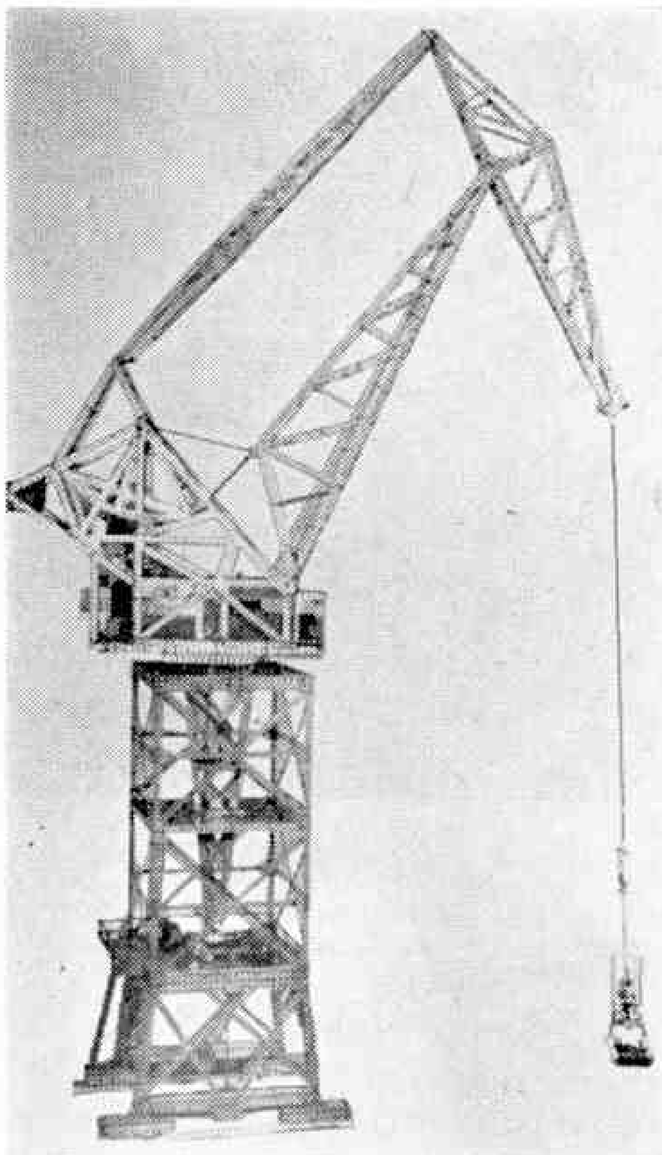
As a demonstration of an ideal project for Plastic Padding, I have chosen the Airfix kit of the Grumman T.B.M.3 Avenger. The modified model itself represents a converted full size machine ! The big rear gun turret was removed, and in its place was fitted a remotely controlled twin-gun barbette. It was, in fact a flying test rig for this armament installation which was eventually intended for the Fairy Spearfish.

The two rear bays of the long cockpit canopy are cut off with a razor saw and replaced by a rounded transparent piece moulded from acetate. If you are not sure how this is done, the process will be described later in this series of articles. If you build the Avenger with its undercarriage retracted you can utilise one of the wheels to represent the new gun barbette. It is just the right thickness and diameter and all you have to do is to fill in the hub with Body Putty and build up the lower edge to form a vertical sided " skirt " of the same material. The disused undercarriage struts (No. 44) are cut down to represent guns and their square ends are slotted into the "tyre".



When painted, it is impossible to see where the alterations have been made. This picture also shows the circular bulbous transparencies just behind the wing trailing edge. These are, again, acetate mouldings fixed in place with Evostik after the model is painted. The original kit is supplied with U.S. Navy markings but our model must be finished in Royal Navy colours so new transfers will be needed. Ours came from the unused half of a Frog Mosquito transfer sheet (the ' Mossie ' being completed with the alternative S.E.A.C. markings). As we said in the December article, never throw anything away—unused bits from other makes of plastic kits always come in handy !



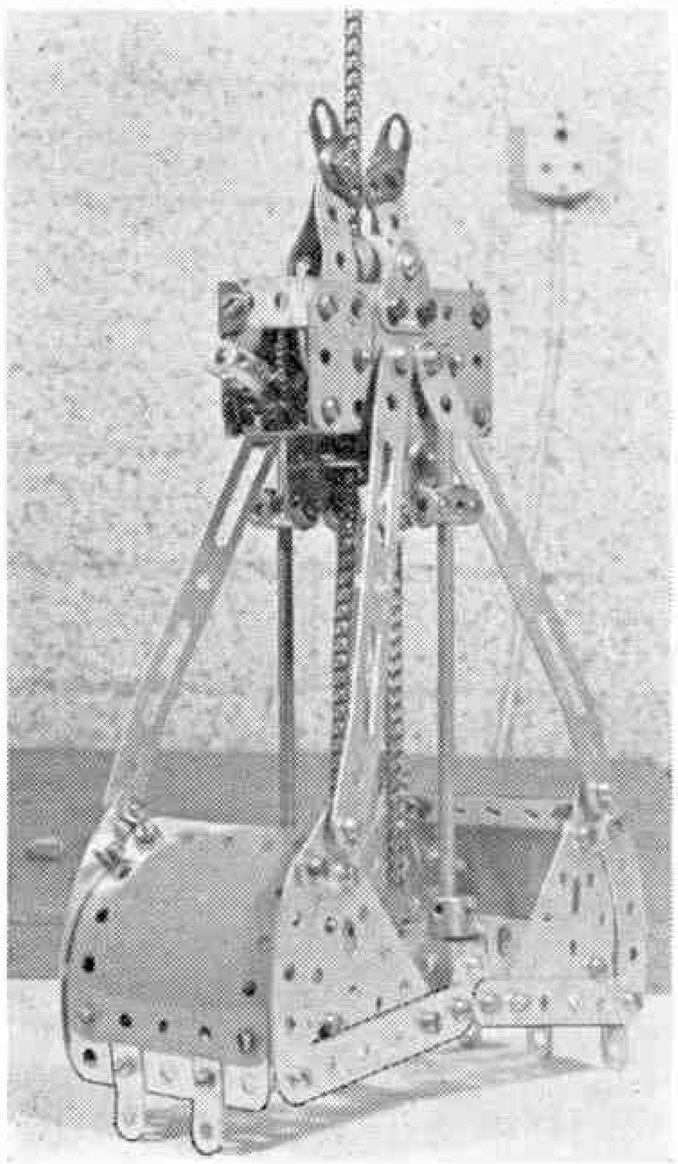


This shows just what can be done with Meccano—a scale model of a Giant Level-luffing Crane built by M.M. reader Eric Taylor of Nuneaton, Warwickshire. The prototype is found in dockyards all over the world.

GIANT LEVEL LUFFING CRANE

An outstanding model by Eric Taylor for advanced Meccano model constructors. See "Workbench" for details of full building notes.

The single suspension bucket grab in the open position to show the trip gear.



ILLUSTRATED IN the accompanying photographs is a Meccano Model of a Giant Level Luffing Crane which was built by Mr. E. K. Taylor of Nuneaton. This model reproduces all the movements of the prototype and was voted to be the most outstanding presentation at the Inaugural Meeting of the Midlands Meccano Guild, an independent Meccano 'Club' made up from enthusiastic adult followers of the Meccano Hobby. The type of crane represented by the model may be seen in many leading ports of the world and is probably one of the most popular types in existence due to the fact that luffing is by jib linkage so that rope replacement is required only for the main hoist.

As in the prototype, the crane illustrated is fitted with an automatic chain-operated discharge bucket but this may be replaced by a cargo hook when necessary. The model stands approximately 7 ft. 8 in. high when the main jib is fully retracted and at maximum radius the jib luffs out to a distance of 4 ft. 6 in. from the centre of the tower. Throughout this movement the load remains at the same height without any adjustment of the hoisting mechanism and this is why such cranes are known as level-luffing types. The grab bucket is of the single suspension variety, meaning that it requires one hoisting rope only. Operation of the discharge is carried out by an ingenious system of trip levers mounted in the bucket head which trigger themselves against a 'chandelier' ring suspended on a very light hoist just above the bucket.

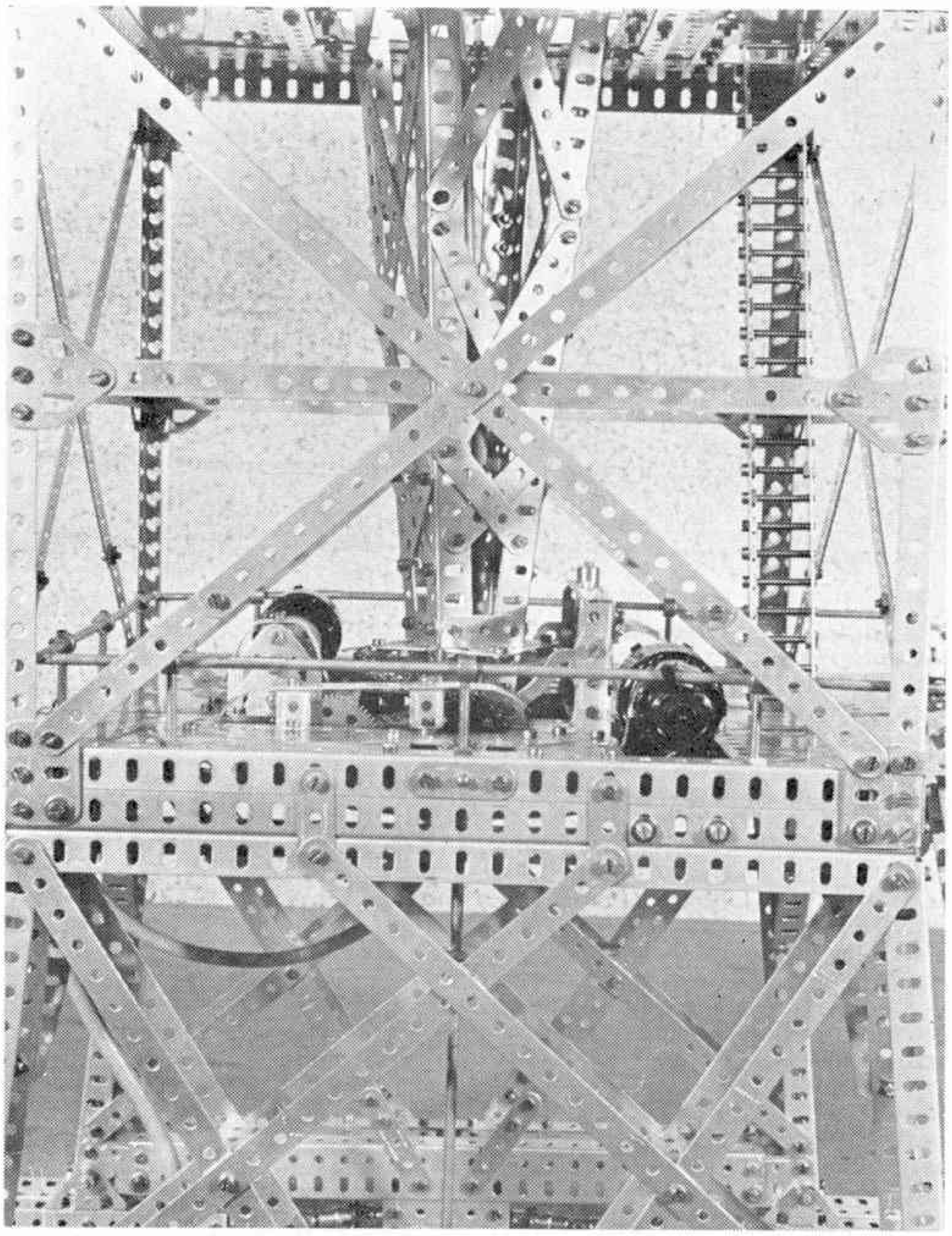
Five movements are carried out by the crane, namely luffing, hoisting, bucket discharge, slewing and travelling which it does with great realism and smoothness. All operations are remotely controlled from a control box fitted with push buttons made from Elektrikit parts. The secret of the remote operation lies in the judicious use of no less than five Meccano Motors, and the versatility of the different types is exploited to great effect in the model. One E15R, three Power Drive Units and one Emebo Motor are incorporated and each Motor is wired on a two-wire system to give forward and reverse directions. The Power Drive and Emebo units are D.C. motors and two-wire reversing circuits are easily applied to them. In the case of the E15R, which is a Universal motor normally requiring four connections for reversing, the 'fourth wire' constitutes the framework of the model, the mechanical reversing lever being removed and the terminals wired directly to the remote controller.

The jib linkage of the type of crane in question requires careful design to maintain correct geometrical motion for level-luffing purposes. The particular real-life version of this model employed toothed rack quadrants operated by pinion drive, and Mr. Taylor was able to simulate the original quadrant by operating its movement with Sprocket Chain. This was kept in tension by the forward weight of the jib system but was relieved by a sliding counterweight on a second set of chains situated at the rear of the control cab. The careful balance then places a fairly light load on the E15R Motor used for the luffing operation.

A Power Drive Unit is employed for the main hoist and an Emebo Motor for the 'chandelier' hoist. Speed of bucket hoist is set by the internal gearbox of the Power Drive Unit. Both hoisting barrels are simple, being Axle Rods fitted with Bush Wheels for end cheeks. These narrow-diameter Rods result in fine control of the bucket or 'chandelier' levels for discharge operations.

It can be seen from one of the accompanying photographs that the control cab is mounted on what appears to be a sturdy roller bearing, but, in actual fact, this is of very simple construction and its only job is to take up the tilting thrust. Hence, its rollers act only in a radial direction. The entire weight of the revolving superstructure is carried by a thrust bearing situated at the base of the long pivot which pass down through the centre of the main tower. The thrust bearing is even simpler, being a pair of wheel flanges running on a roller race of ½ in. Pulleys, the grooves of which make the whole bearing self-centring. This arrangement allows a multi-core control cable to pass up through the central pivot post to the control cab,

In this detail shot of the main tower, the lower machinery platform is clearly shown.



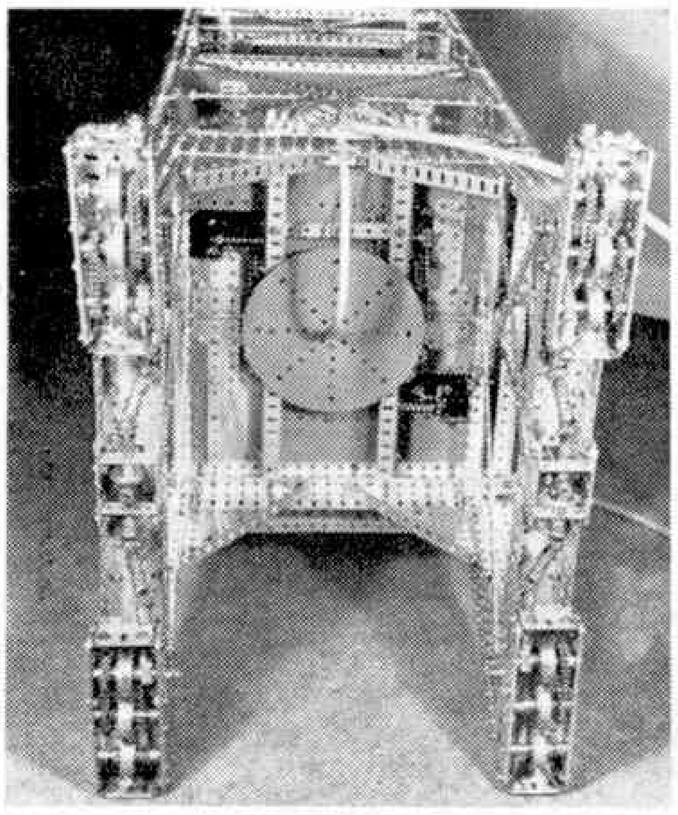
while the flexibility of the cable in turn allows the super-structure to rotate at least two revolutions in either direction without damage to the cable.

The pivot post carries a 3½ in. Gear Ring just above the lower bearing and this is used to slew the superstructure. The Gear Ring is Pinion driven, the drive coming, via a reduction ratio, from another Power Drive Unit, mounted on the machine platform at the base of the pivot. The third Power Drive Unit is connected through reduction gearing and Chain drive to bevel gearing which transmits the drive to the travelling bogies by means of vertical shafts in the portal structures at the sides of the tower base and then by further Bevels. Universal Couplings and Worm drives to the bogie wheels. Each bogie is pivoted at the foot of each 'leg' to accommodate uneven rails or dock surfaces, as in the prototype.

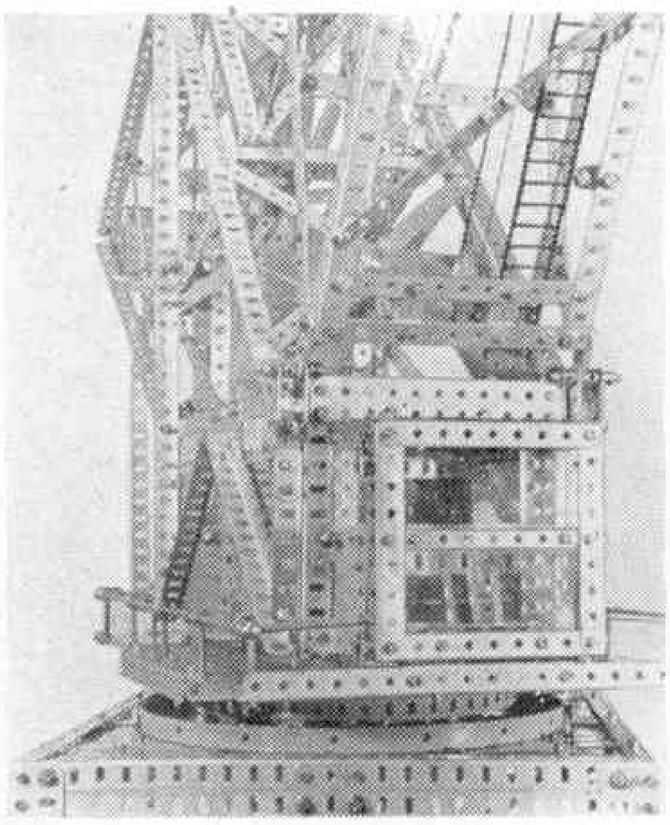
Great care has been taken throughout the construction of the model to reproduce the original outlines as faithfully as possible with a light, but rigid construction. The well-known principle of triangle construction for maximum strength is exploited to the full in the tower, superstructure and jib constructions. All bearings are reinforced by additional Strips to improve the running qualities of the machinery and to ensure accurate gear meshing.

An important requirement of the main hoist rope in any real-life crane is that it be of a non-spinning type. This lets out the common flexible wire rope as this is normally twisted up from strands of wire with a uniform right hand 'lay' and such a wire tends to untwist slightly resulting in an appreciable spin over a long length, when loaded. The normal cargo hook is fitted with a spinning swivel to allow for this, but special non-spin hoisting ropes are woven for single-hoist buckets. In the model, this rope was simulated by a platted cord, patiently made by Mrs. Taylor with a crotchet hook from strong linen thread. It gave a nice chunky appearance to the joisting rope and proved very satisfactory in practice.

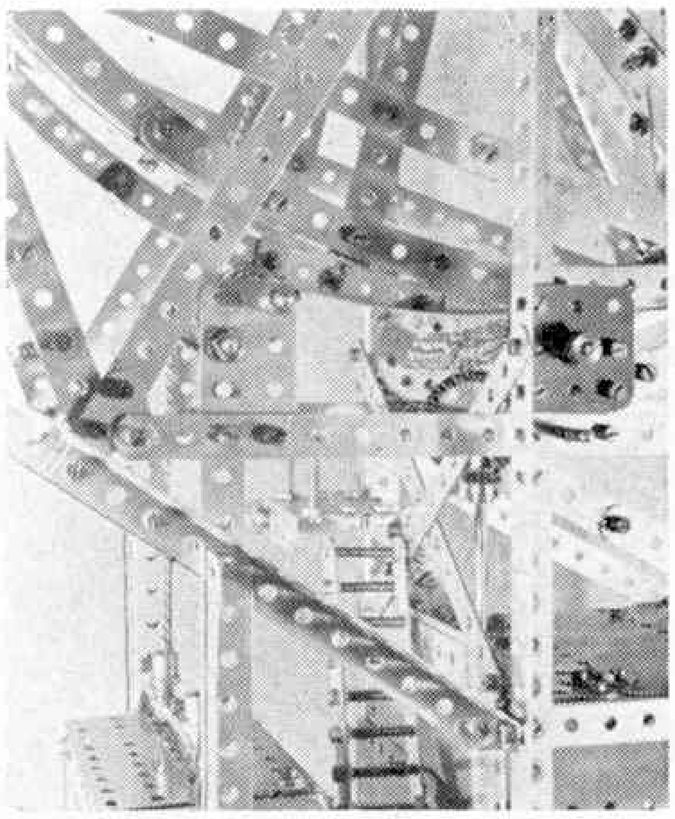
The travelling bogies of Mr. Taylor's Crane use fairly complex drive systems as this photograph shows.

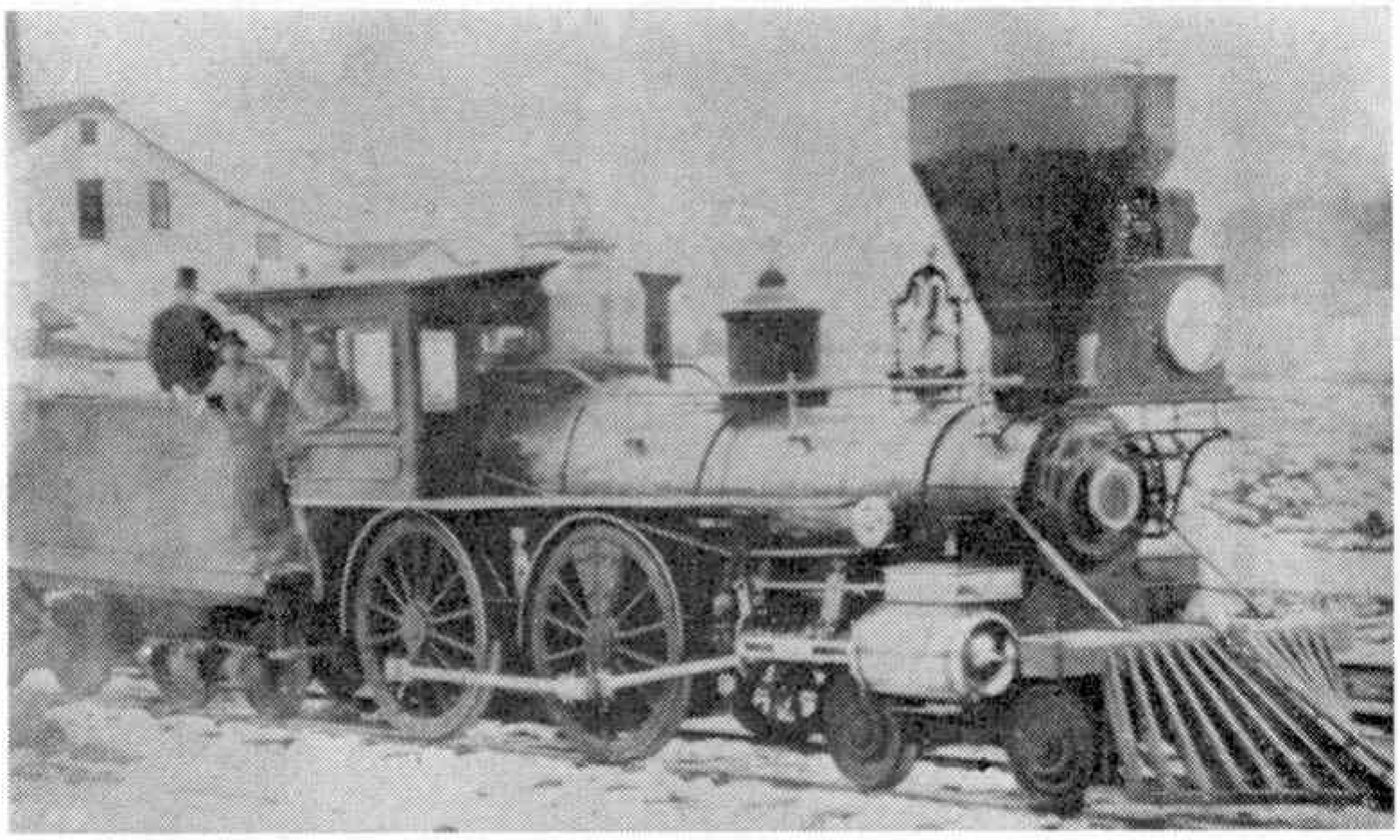


A close-up view of the cab front showing the hoisting compartment. All movements are controlled remotely from an external unit built from Elektrikit Parts.



A view of the rear of the control cab showing the luffing gear and sliding counterweight.





CENTURY OF THE "GOLDEN SPIKE" RAILROAD

by E. R. Yarham

PRESIDENT JOHNSON has signed a Bill whose provisions are designed to commemorate one of the most important events in the entire history of the United States, when the "iron road" conquered the then "Wild West".

A century ago two railways that were destined to change the face of America and which were to be the first east to west of the Western World had been launched: one thrusting across the prairies, the other straining towards the heights of the Rockies.

Yet it was such a gigantic undertaking that the epic was not to be completed for another three and a half years. On May 10, 1869, at Promontory Point in Utah, the tracks of the Central Pacific and the Union Pacific were joined by a golden spike tamped into a cross-tie of laurel wood (it now rests in a California museum). The United States had its first transcontinental railway.

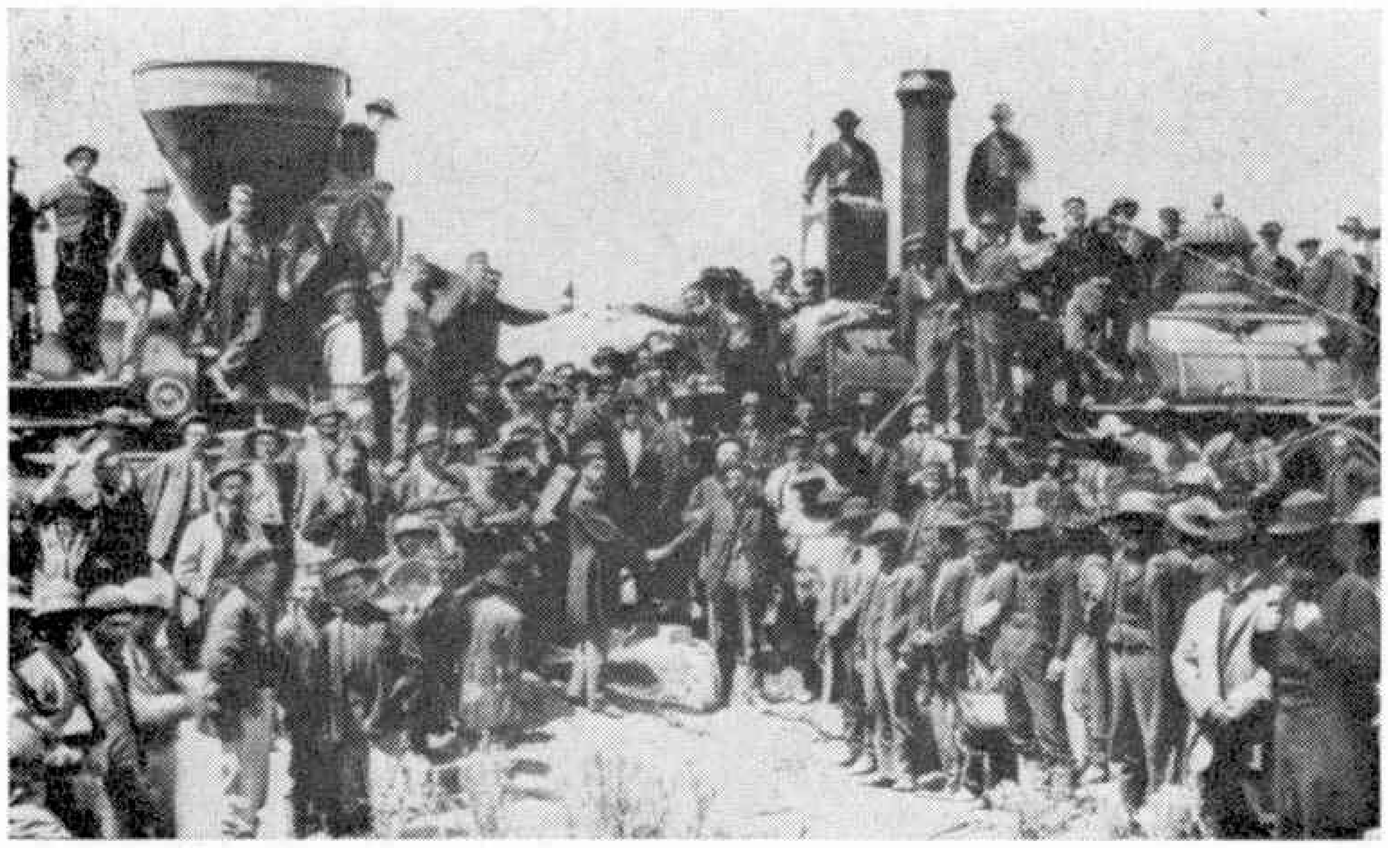
It was a peaceful victory "no less renowned than war". And throughout the United States (except possibly in the conquered South), the telegraphic message "Done", launched a flood of patriotic congratulation. Actually the solemn ceremony had been marred by delay brought on largely by the fact that the chiefs of the two lines regarded each other not as collaborators but as dangerous and dishonest rivals.

There was grim opposition between the two railroads, and at the height of the competition nearly 20,000 men sweated and toiled. The lines could have linked months earlier, for the two advancing railheads were abreast of each other early in 1869. But the construction gangs—Irishmen, Cornishmen, Chinese—passed one another and continued to lay parallel tracks. For week after week the railheads receded rapidly, leaving a double set of metals side by side across the prairie.

The situation was not without its humour, but obviously a halt had to be called in this ridiculous rivalry, and eventually an agreement was reached between the two companies. Although not before the Union Pacific track had reached a point 225 miles beyond the meeting place with the Central Pacific line. The surplus track was abandoned, and the official driving of the last spike was done after three years, six months and ten days.

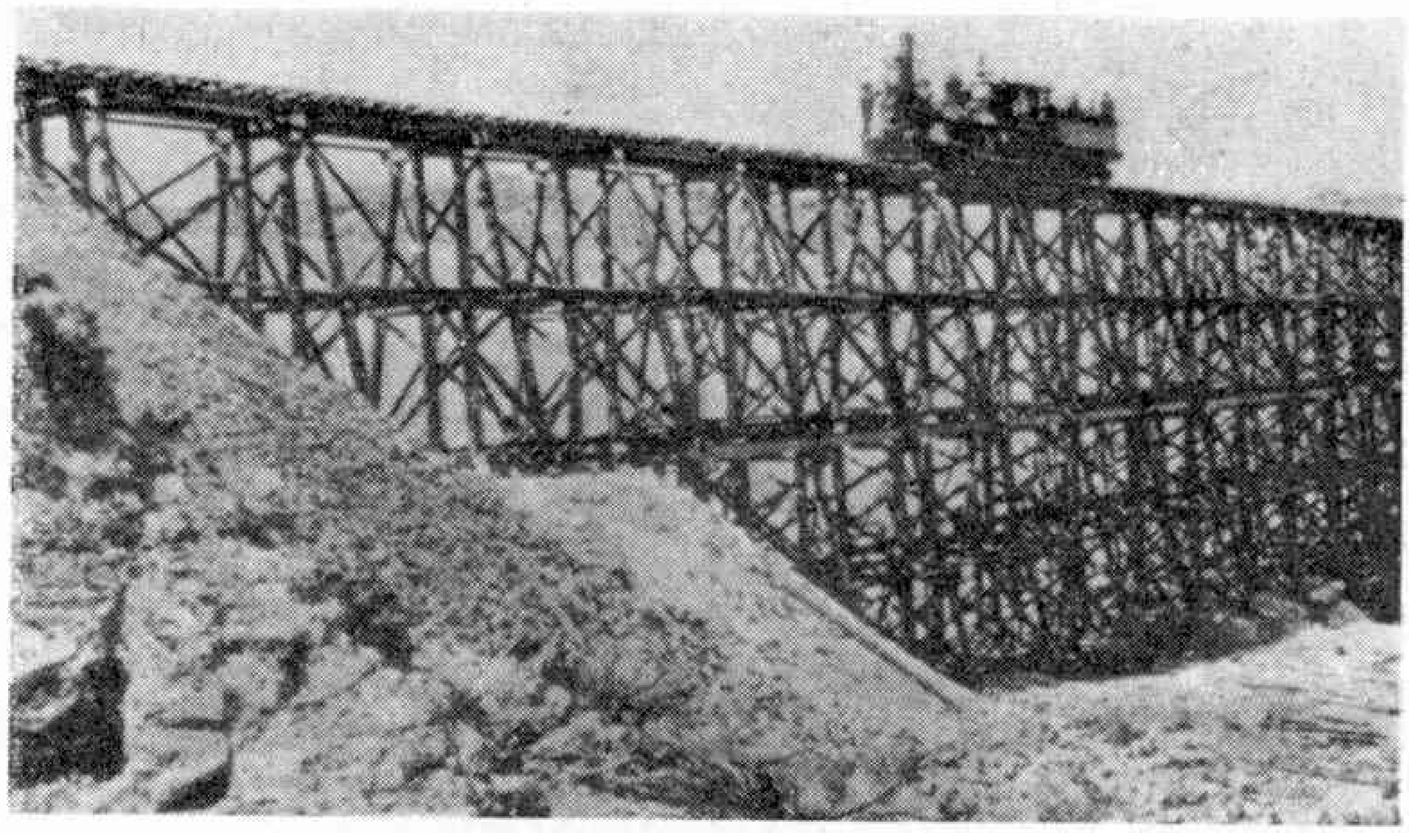
The Bill President Johnson has signed authorises the acquisition of 2,000 acres of sagebrush hillside and history to commemorate that memorable moment. The Central Pacific Railroad's engine Jupiter and the Union Pacific's No. 119, which formally touched iron cow-catchers to mark the meeting of the rails (a photo survives of this great event) have long since been scrapped, but the National Park Service and Utah legislators are scouring the country for a vintage 1870 locomotive or two, plus rolling stock.

Every year hamlets in the neighbourhood of Promontory Point re-enact the "driving of the spike", but the tracks were ripped out in 1941 for smelting into



At left: This picture is the most famous one taken of the Golden Spike railroad. The photographer wrote on the glassplate negative nearly 100 years ago "East and West Shaking Hands at Laying Last Rail". The two men shaking hands in the centre are Chief Engineer Montague of the Central Pacific Railroad and Chief Engineer Dodge of the Union Pacific Railroad at the right. This picture was taken just after ceremony of driving the Golden Spike when the two locomotives moved up to the junction point and touched pilots. Photographs courtesy American Geographic Society.

At right: This locomotive on the high trestle bridge on the east slope of the North Promontory Range is a few miles east of the summit. This picture was taken around May 10th, 1869 and the original is on view at the Union Pacific Railroad Museum. Photograph courtesy Union Pacific Railroad.



Opposite: This picture shows a Schenectady locomotive, factory number 472 (Jupiter was 505) completed in 1868. This locomotive was finished some 7-8 months earlier than Jupiter. Photograph courtesy Smithsonian Institution.

weapons of war. Now only a weed-grown roadbed, and embankment, a few culverts and the remnants of trestles mark the route of the trains once hauled by the coal-and-wood burners. Teams are to survey the old line in seeking to re-locate the right-of-way, discover old ties and spikes, and possibly find tools left behind by labourers and engineers. It may prove possible to relay a length of the line, and if necessary replicas of the old engines and coaches will be built so that visitors will be able to enjoy the flavour of 1869 to the full.

At the time of the construction the "Wild West" was what its name said it was, with tough men, mushroom cities, saloons, dance halls, gambling hells and gun-play. Across seemingly illimitable plains, and through narrow passes between threatening mountain crags the gangs pushed their way driven on by men like Strobridge the Irish martinet who faced down rebellion and defied hostile nature with its scorching heat, sub-zero weather, blinding snowstorms and prodigious snowdrifts, flood and drought.

These were not the only enemies. There were the Indians. Practically every yard of the way across the plains was challenged in no uncertain manner by these warriors, left in supreme control of vast territories after the Civil War. The construction gangs found their labours interrupted and enlivened by many a sanguinary encounter with warring Indian tribes, such as the Pawnees, Sioux, and Arapahoes, and farther west the Crows, Blackfeet, Barnocks, and Shoshones.

So serious did the menace become to both settlers and railway builders that eight military forts had to be established, some of which are still in existence. Mile after mile of track was laid under the rifle fire of warriors on the warpath. Platelayers and construction engineers again and again would be compelled to drop pick and shovel for revolver and repeating rifle.

The encircling tactics of the Indians, clinging to the off-sides of their swift ponies and firing across their saddles, were met by the rapid rifle fire of resolute men ensconced behind the rails and massive wheels of the construction wagons. The Indians were more formidable on the Union Pacific than on the Central Pacific. Finally peace was concluded between the Indian chiefs and the President in person, and the rest of the railway work proceeded without molestation.

To some Indians who saw a train for the first time, it was just a new herd of bison. They followed the trail—and rails—caught the train and plundered, killed and scalped. The story is told of a young Englishman, William Thompson, the only survivor of a Cheyenne raid, who was scalped and left for dead. But he survived, and when the Indians had gone, crawled out holding his own scalp which his would-be killer had dropped.

He hoped it would be possible to graft it on again. But the medical science of that day was not up to the task, so Thompson had his scalp tanned. Eventually it was given to Omaha Public Library.

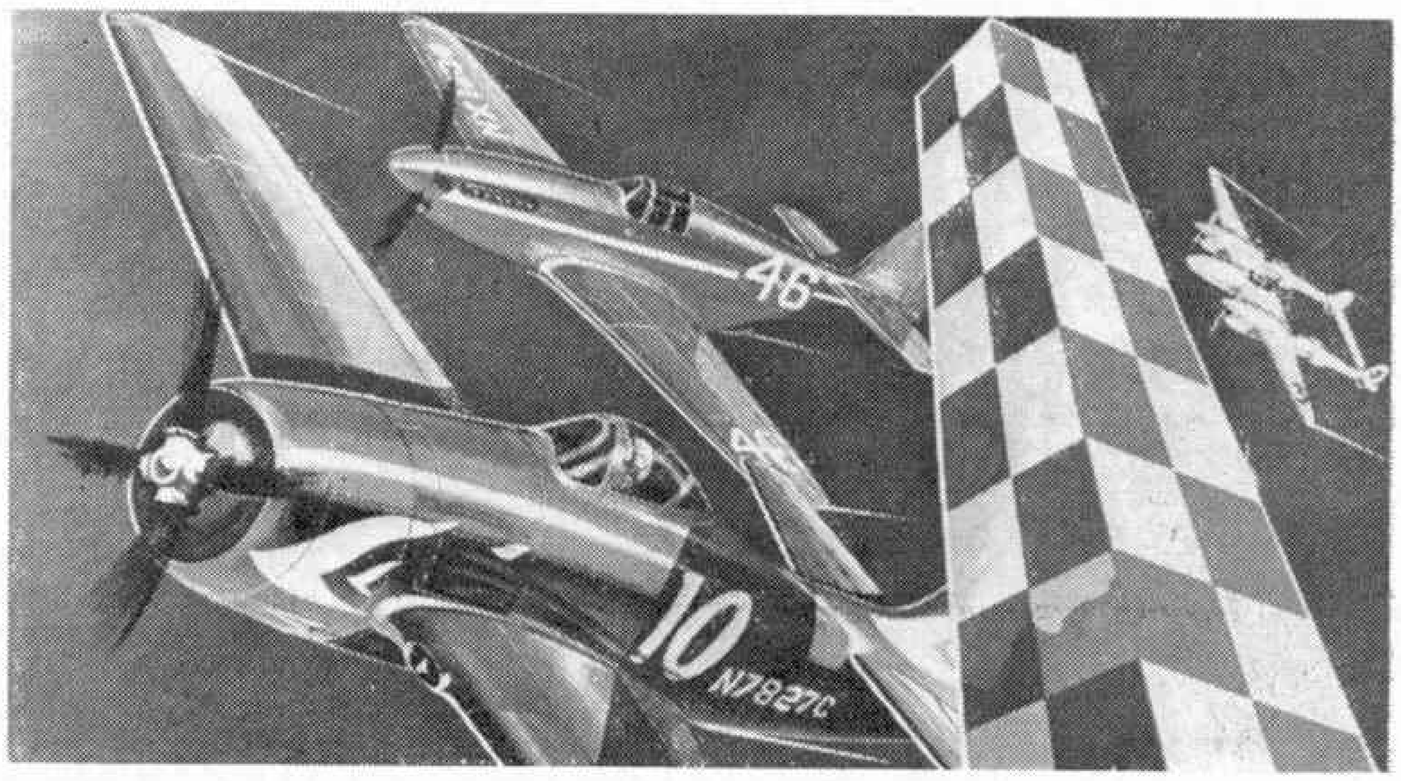
HAVE YOU SEEN ?

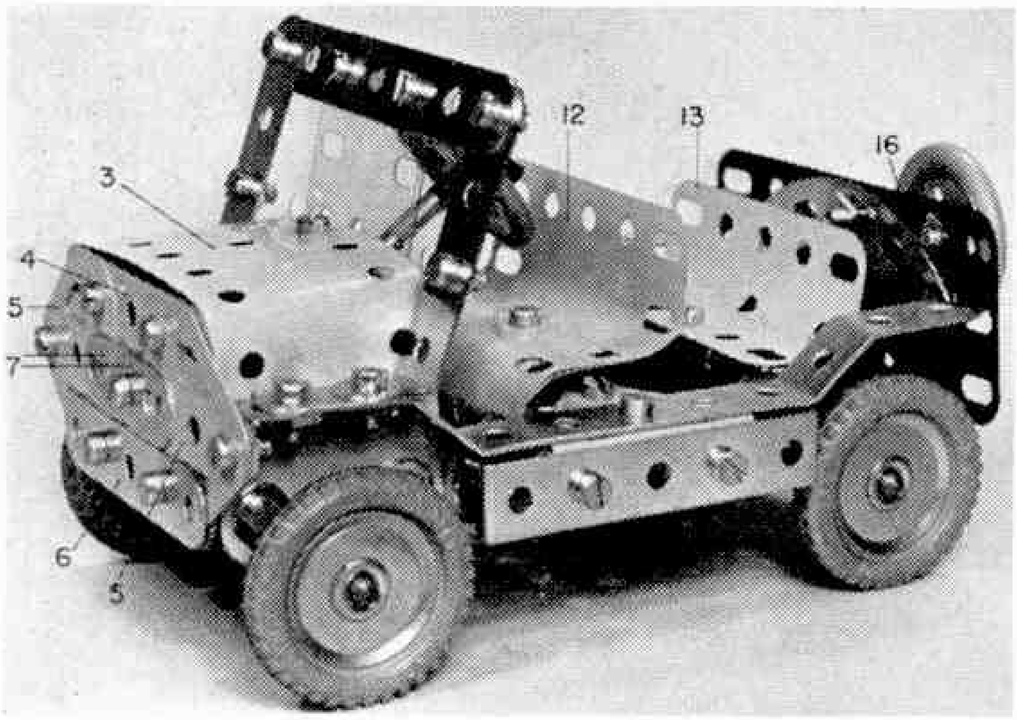
continued from page 80

Monogram's Pylon Racers Kit

After World War II, the famous National Air Races were resumed in the U.S.A., bringing with them fast powerful "Big Bore" racing Planes which were converted from fighters of World War II. Among the fastest and most successful of these were the P-51 Mustang and F8F Bearcat, both setting transcontinental and closed course speed records.

Monogram's Pylon Racer kit contains both of these models in civilian dress of red and blue with racing numbers and trim. Both have such details as cockpit interiors, clear canopies, pilots and optional landing gear. The models can be displayed by themselves or mounted in racing formation on a colourful red and white checkerboard racing pylon included in the kit.





Built with Meccano Outfit No. 2, this delightful little model undoubtedly captures the general lines of the famous B.M.C. Mini Moke on which it is based.

Cross Country Gadabout

by Spanner

A delightful little model based on the B.M.C. Mini Moke.

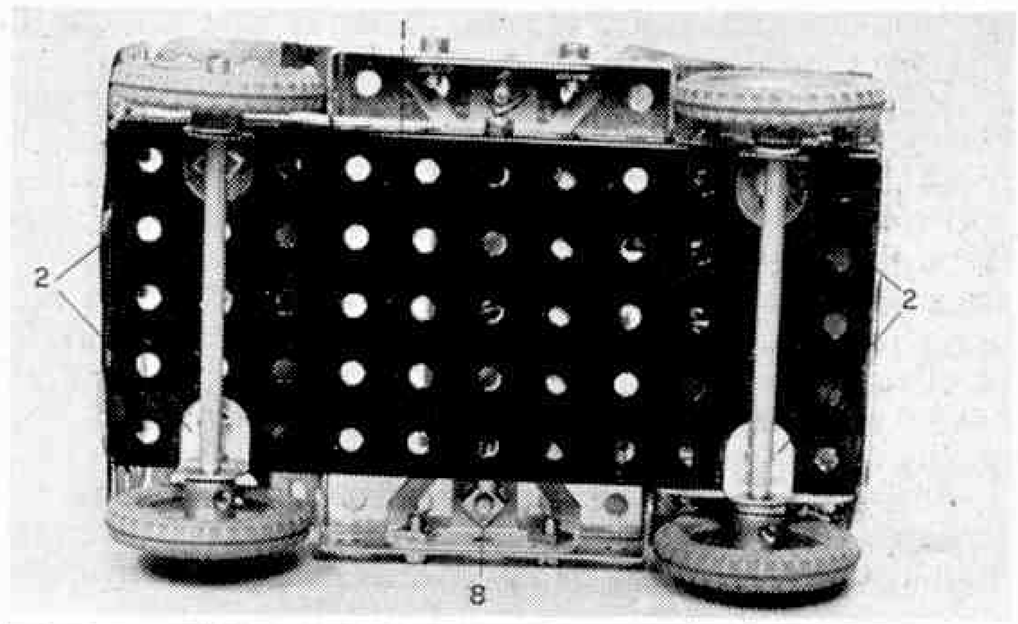
DESCRIBED HERE is a Meccano model which has been based on the Mini-Moke, I think you will agree that it captures the general lines of the original rather well, although the limitations of the No. 2 Outfit with which it is built prohibit too much detail from being included. The base consists of a 5½ × 2½ in. Flanged Plate 1, to the underside of which four Angle Brackets 2 are bolted. These will later provide the bearings for the axles, which should not be fitted until the rest of the model is finished.

Next to be added is the bonnet, representated by a 5½ × 1½ in. Flexible Plate 3, carefully bent to shape and bolted to the side flanges of Plate one in the position shown. Bolted to the front end flange of Plate 1 is the radiator-grille which consists of a 2½ × 1½ in. Flexible Plate 4 extended sideways by two Flat Trunnions 5, everything overlayed at the bottom by a 2½ in. Strip 6. Two Fishplates 7 are bolted to the centre of Flexible Plate 4.

A Trunnion 8, apex inwards, is now fixed by an Angle Bracket to one side flange of Plate 1, another Trunnion being similarly attached to the other side flange of the same Plate. Bolted to each of these Trunnions in the positions shown are a 2½ × ½ in. Double Angle Strip 9 and a 5½ in. Strip 10, the latter carefully shaped to represent the combined running board and mudguards. The front end of Strip 10 is attached to the apex of appropriate Flat Trunnion 5 by an Angle Bracket. A 2½ in. Strip 11 is bent to form a 2 × ½ in. angle bracket and is bolted direct to Strip 10, the securing Bolt passing through the second hole of the Strip. The upper ends of Strips 11 at each side are then joined by a 3½ in. compound strip, obtained from two 3½ in. Strips, at the same time fixing two overlapping 2½ × 1½ in. Transparent Plastic Plates in place to serve as the windscreen.

At this stage, the seats and steering wheel should be fitted, none of which are very complicated. The front seat consists of nothing more than a U-section Curved Plate, extended by a shaped 2½ × 2½ in. Flexible Plate 12 and bolted direct to the top of Flanged Plate 1. In the case of the rear seat, a 2½ in. Strip is bolted flat, also to the top of Plate 1, a ½ in. Reversed Angle Bracket then being secured to the centre of the Strip. A shaped 2½ × 1½ in. Flexible Plate 13 is fixed to the free lug of the Reversed Angle Bracket. The steering wheel is represented by a 1 in. loose Pulley with Rubber Ring 14, held by Spring Clips on a 2 in. Rod fixed in a Rod and Strip Connector. This Rod and Strip Connector is bolted to a Fishplate which is in turn bolted to one lug of a Double Bracket attached to the underside of Flexible Plate 3.

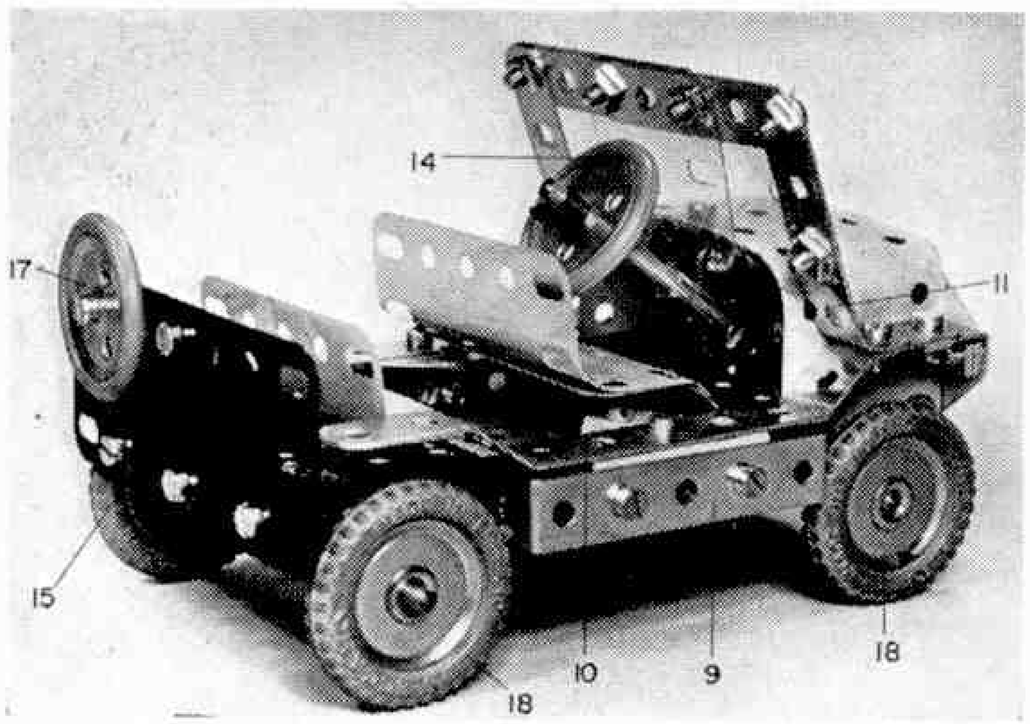
An underside view of the model showing the simple Angle Bracket bearing for both the front and rear axles.



PARTS REQUIRED

2—2	4—22	1—52	2—188
6—5	2—22a	1—90a	1—189
3—10	2—35	1—125	1—190
1—11	48 37a	2—126	2—193
8—12	48—37b	2—126a	2—194
2—16	6—38	4—142c	1—199
1—17	2—48a	2—155	

Turning to the rear of the model, two 2½ × 1½ in Plastic Plates 15, overlapped three holes, are bolted to the end flange of Flanged Plate 1, a 2½ in. Stepped Curved Strip 16 being added to the inside of the Plastic Plates for embellishment purposes. Bolted to the ouside of the same Plates is a spare wheel 17 obtained from a 1 in. loose Pulley with Rubber Ring, then the whole model is completed by mounting two 3½ in. Rods in Angle Brackets 2. where they are held in place by 1 in. Fixed Pulleys with Motor Tyres 18. The front Pulleys are spaced from their Angle Brackets by Washers.



In this rear view of the Mini Moke, the interior and seating detail of the model can be clearly seen.

38th MODEL ENGINEER EXHIBITION 1969

Seymour Hall, London, W.1.

31st DECEMBER 11 JANUARY 1969

(Excluding Sunday) 31st December open to the Public 2-30 p.m. to 9 p.m. Thereafter daily 10 a.m. to 9 p.m. until Saturday, 11th January, closes 7.30 p.m.

SEE AND ENJOY

There will be a magnificent collection of models of all sorts shapes and sizes covering locomotives, traction engines, steam rollers, ships, yachts, cars, aircraft, in fact anything which can be modelled. These entries will be competing for a wide selection of trophies, cups and other awards as individual entries, in addition this year the emphasis will be very much on the club aspect and not only the governing bodies but some of the larger individual clubs have come together to give a composite exhibit of their efforts.

Meccano will be displayed, both working models sponsored by some of the specialist Meccano Societies and an actual contest for Meccano model entries.

SOUVENIR GUIDE

A very special Christmas Extra issue of Model Engineer will be coming out on 10th December. This will be the Exhibition Souvenir Handbook and Guide. It will contain Exhibition Entries, details of Stands, plus articles by experts on all aspects of modelling. Some special articles include, Clock-making by Claude Reeve, Small Gauge Railway, Sixty Years of Model Flying, Radio Control Aircraft in Films, Approach to Model Car Collecting, Pairs Racing Model Boats, Hovercraft in Model Form, Meccano as Engineering.
The Guide will be 72 pages, our usual magazine size.

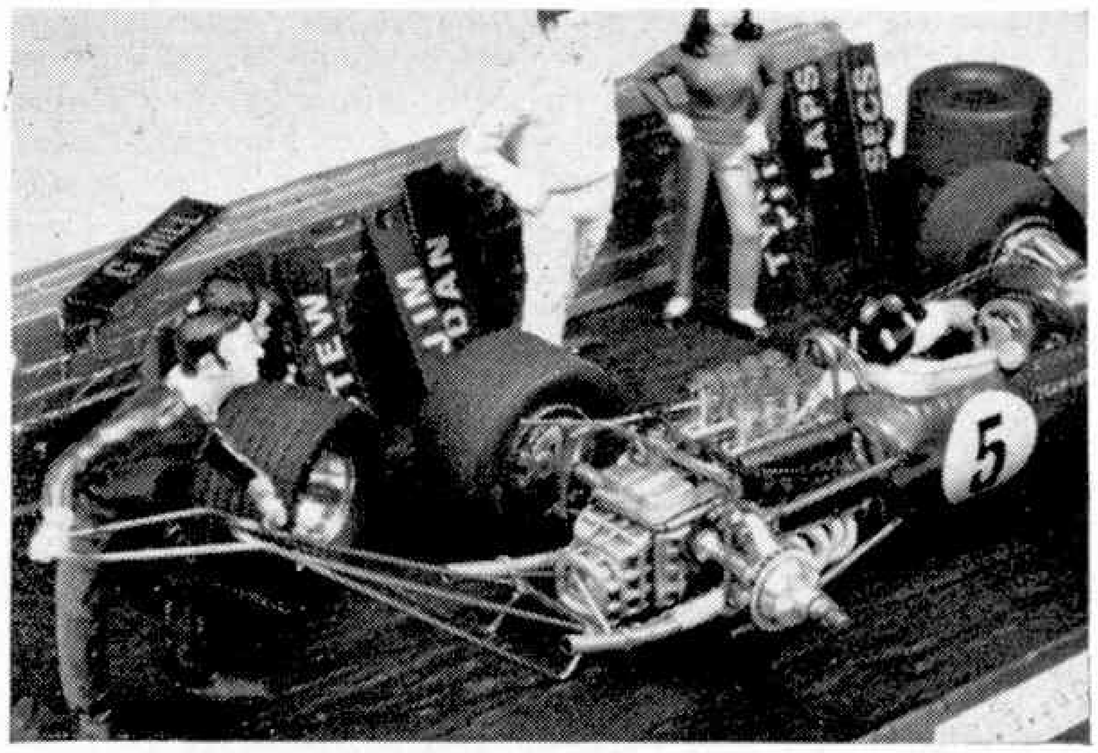
ON SALE EVERYWHERE AND AT THE EXHIBITION 2/6

Model Railway News

The February issue of Model Railway News leads off with a pictorial article on a very comprehensive Continental O gauge layout, which includes much interesting rolling stock and many beautifully detailed historic locomotives. In OO gauge, John Flann continues the story of "Poppy Hollow," his end-to-end layout with a difference. Fully scenic, and mainly G.W.R. in flavour, "Poppy Hollow" is a layout out of the usual run. If coaches interest you, then be sure to read E. R. H. Francis's detailed descriptions of building Great Western bogie "Toplights"—the real gen from a professional model maker.

On sale from 10th January 2/6

Model Cars

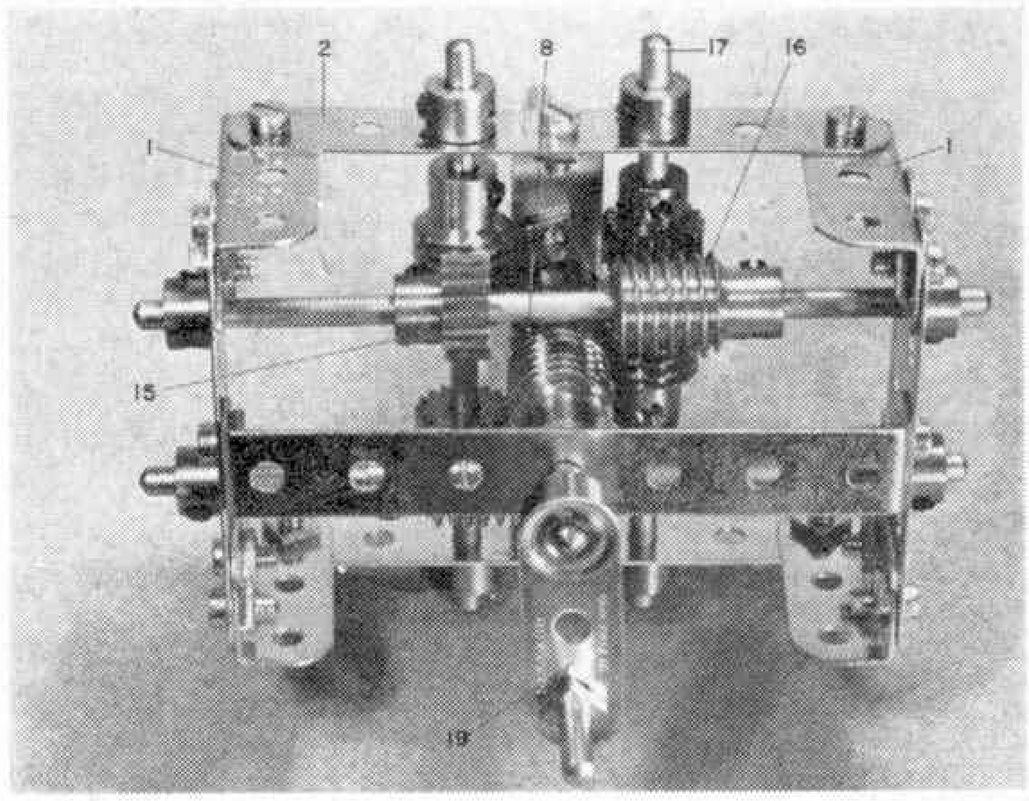


This is the number that slot racing enthusiasts all over the country have been waiting for, reason being the big E.C.R.A. National finals report with complete details of the winning cars and plenty of pictures. Then there's another big photo report on what must surely be the year's biggest meeting, the Tottenham Open for 1/24th scale Sports/G.T. Sporting features include constructional gen on a 1/24th scale McLaren for Endurance, p ans for the latest Matra, Argyle Slick 11, the Taylor and Barrett story together with many more than we can find space for here. . . .

On sale from 3rd January 2/6

AMONG THE MODEL BUILDERS

with Spanner

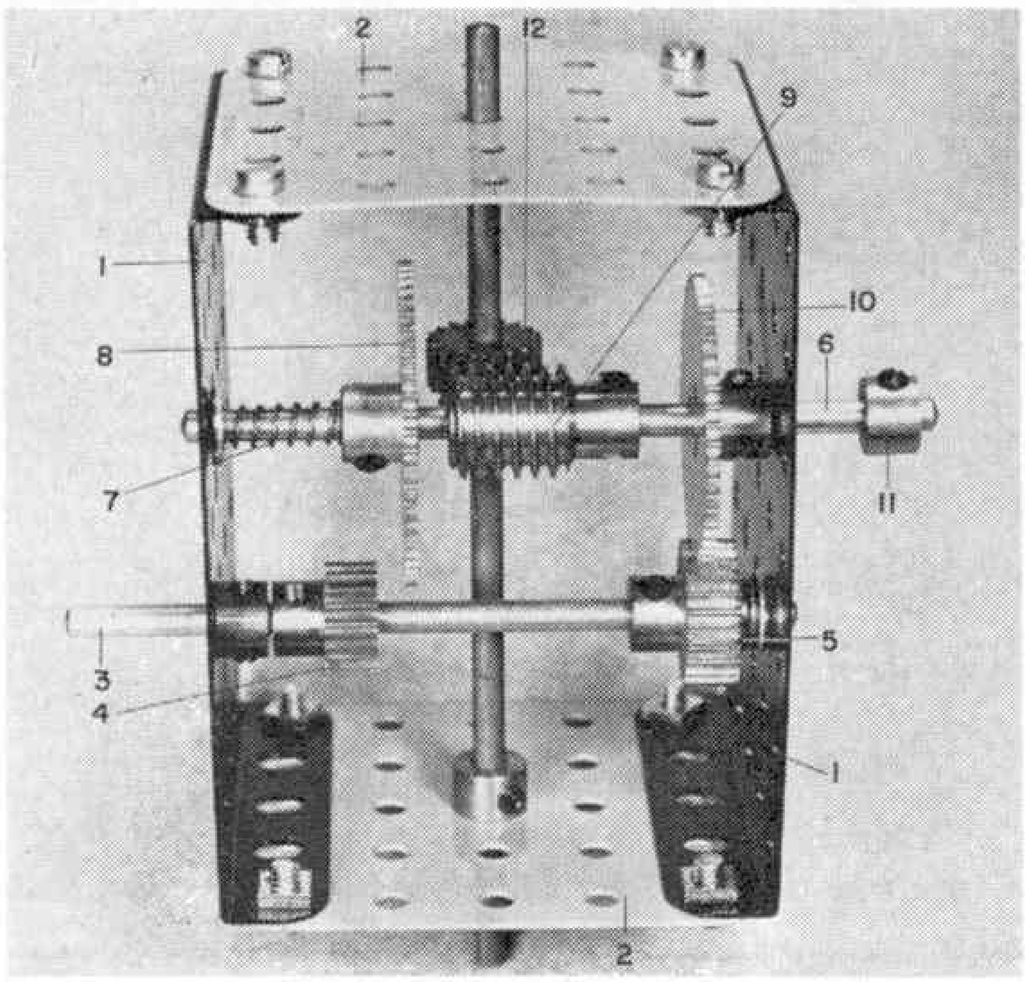


The top three pictures show a rebuilt version of a multi-stage gear box with the phenomenal reduction ratio of 2,476,099 : 1. It first appeared in a pre-war issue of Meccano Magazine and we thank Mr. William Scott of Belfast for drawing it to our attention.

MELTON MOWBRAY in Leicestershire is known to lovers of good food throughout Britain for its magnificent meat pies. It was not, however, a meat pie that I recently received from that part of the world, but something of far more interest to Meccano hobbyists—details of an Automatic Gearbox extremely simple in design, yet highly effective in operation.

Full credit for the mechanism, a copy of which is shown in the accompanying picture, must go to Melvyn Wright and Andrew Osbourne of Melton Mowbray. Credit is certainly in order, here, as I myself built up the example illustrated and can vouch for its operational success. The framework consists of two $3\frac{1}{2} \times 2$ in. Flanged Plates 1, joined together by two $2\frac{1}{2} \times 2\frac{1}{2}$ in. Flat Plates 2. Journalled in Flanged Plates 1 is a $3\frac{1}{2}$ in. Rod 3, serving as the input shaft, on which a Collar, a $\frac{1}{2}$ in. Pinion 4, a $\frac{3}{4}$ in. Pinion 5 and three Washers are mounted in that order.

Also journalled in the Flanged Plates is the sliding layshaft supplied by another $3\frac{1}{2}$ in. Rod 6, carrying a Compression Spring 7, a 57-teeth Gear 8, a Worm 9 and a 50-teeth Gear 10. The Rod is prevented from sliding too far in one direction by Gear Wheel 10, and from sliding too far in the other direction by a Collar 11, fixed on the Rod outside the Flanged Plates. Movement of Rod 6 should bring Gear Wheel 8 into mesh with Pinion 4 or Gear Wheel 10 into mesh with Pinion 5, as the case may be. Note that the neutral period between the two gear ratios should be as small as possible. In constant mesh with Worm Gear 9 is a $\frac{1}{2}$ in. Pinion 12 fixed on a 5 in. Rod, serving as the output shaft and held by Collars in Flat Plates 2.



This completes construction of the gearbox, but it is advisable now to look at the theory behind the "working" of the mechanism. When the Gearbox is in the rest state, Compression Spring 7 holds the unit in top gear, but it will change down to bottom gear when an excessive load is applied to the output shaft. This happens because the load, in effect, causes the output shaft and, consequently, Pinion 12, to "drag", with the result that Worm 9 tends to push hard against the teeth of the Pinion, setting up a sort of back-pressure. As the Rod on which the Worm is mounted is the layshaft, however, this back-pressure will cause the Rod to slide once the pressure becomes greater than that imparted in the opposite direction by Compression Spring 7 and the unit will change gear.

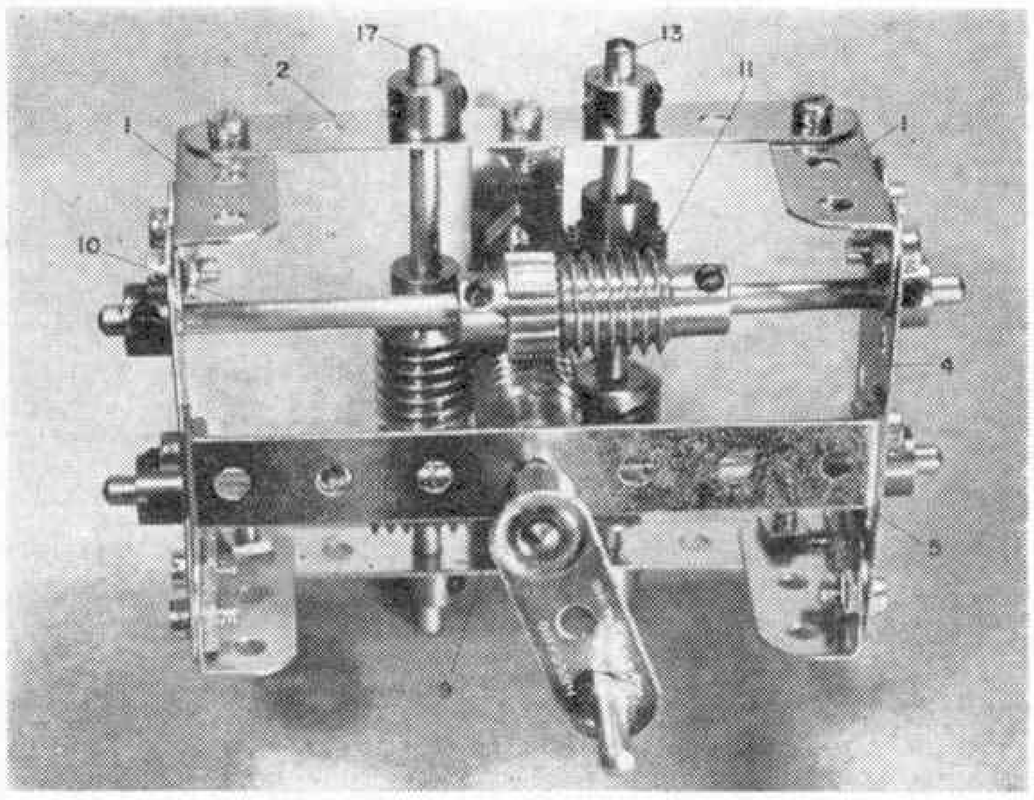
"Of course", say the designers, "the driving force for the automatic sliding movement of the layshaft must come from the input shaft which means that the drive to the output shaft must be suspended momentarily while the gears change. For most models, this will not be too much of a disadvantage as, by the time the gear change takes place, the model will already have gained sufficient momentum to overcome the short "dead spot!" It must be remembered, by the way, that the automatic properties of the gearbox will only come into being when the unit is run in one direction. When run in the opposite direction it will not change gear as the action of Worm 9 on Pinion 12 tends to move Gear Wheel 8 away from Pinion 4.

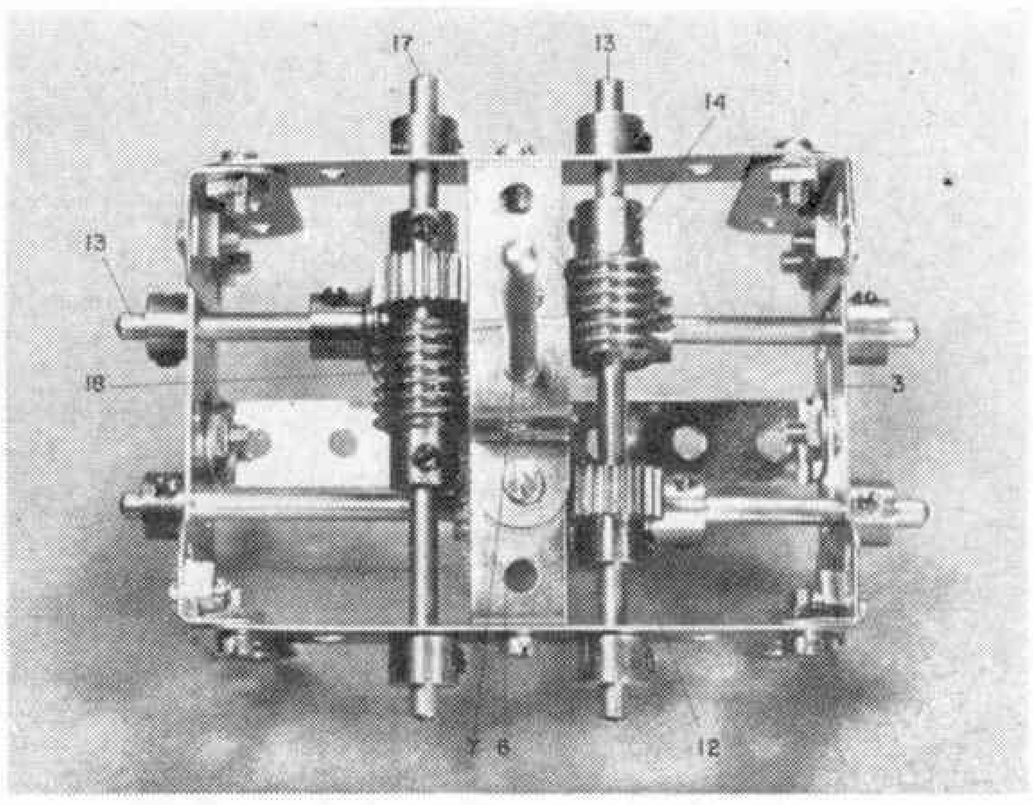
PARTS REQUIRED

1—15	1—27	8—37b	4—59
2—16	1—27a	4—38	2—72
1—25	1—32	2—51	1—120b
2—26	8—37a		

Moving onto a different subject, I recently received a very interesting letter from Mr. William Scott of Belfast, Northern Ireland, a long-standing Meccano enthusiast of, as he describes himself, the "lone wolf" type. This, as you might imagine, means that he is

A simple two-speed Automatic Gearbox designed by Melvyn Wright and Andrew Osbourne of Melton Mowbray, Leicestershire.





not a member of any Meccano Club or similar organisation, but works quietly away at his chosen hobby in anonymity, as, indeed, do thousands of others like him all over the world. "I just build and dismantle," he says.

However, Mr. Scott's main reason for writing was to show me a compact multi-stage reduction gearbox that had appeared in a pre-war issue of Meccano Magazine. He was reminded of it by the multi-stage unit we featured in last September's issue of the M.M., but I must confess that there is really no similarity between the two, other than the fact that they are both multi-stage reduction gearboxes. Not only does the earlier unit make that featured in September look large by comparison—5½ in. long by 2½ in. wide, by 3 in. deep as opposed to 2½ in. long by 2½ in. wide by 1½ in. deep—but the overall ratios supplied are so far removed from each other as to be almost unbelievable. Our recent box gives the paltry ratio of 2,793 : 1 whereas the pre-war unit gives no less than 2,476,099 : 1—in round figures, virtually 2½ million to one !

I was so interested by the gearbox that I re-built it from the details Mr. Scott sent me and I have included it in this article for your interest. Before describing it, however, I should like to repeat a small piece of information given in the original pre-war M.M. article; namely that if the driving handle is turned at 60 revolutions per minute, night and day, without losing a moment of the 24 hours, it will take exactly 28 days, 15¾ hours before the output shaft makes one complete revolution. That's a pretty impressive state of affairs and helps to show just how big a 2½ million to one ratio really is.

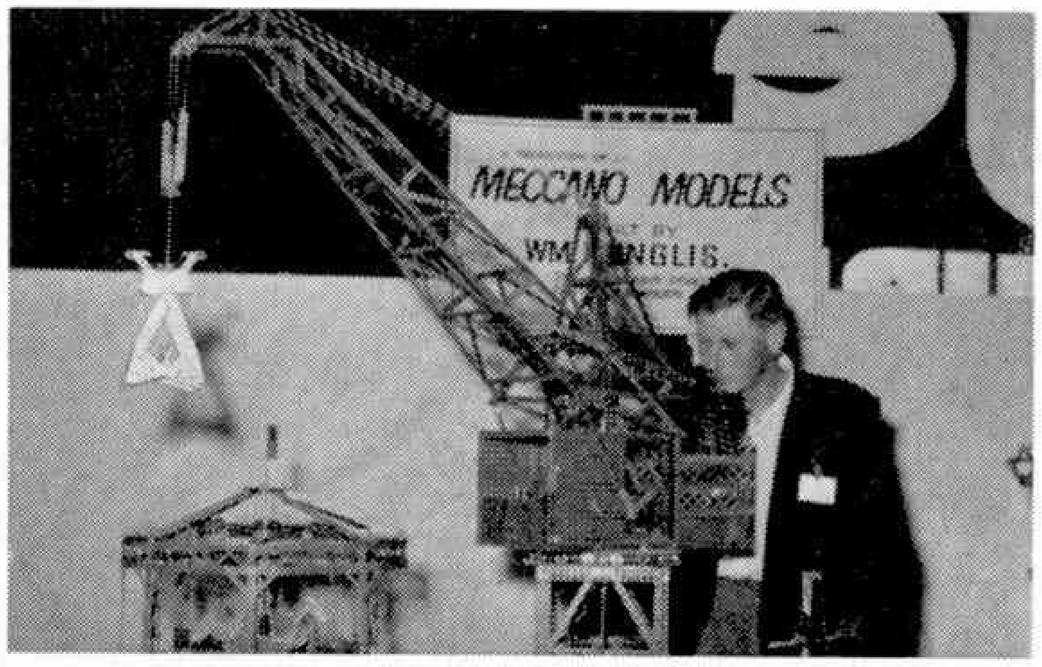
But to get down to business, a framework is produced from four 1½ in. Angle Girders 1, joined at the top and bottom by a 3½ in. Strip 2 and at each side by two 2½ in. Strips 3 and 4. Bolted between the centres of Strips 4 is a 3½ × ½ in. Double Angle Strip 5, while a 2½ × ½ in. Double Angle Strip 6 is fixed between the centres of Strips 2. Journalled in the latter Double Angle Strip, and in a Double Bent Strip bolted to it, is the output shaft 7 on the inside end of which a ½ in. Pinion 8 is fixed, the Rod being inserted only halfway into the bore of the shaft Pinion. Free in the other half of the Pinion bore is the input supplied by a 2 in. Rod journalled in Double Angle Strip 5 and carrying a Worm 9.

In mesh with Worm 9 is a second ½ in. Pinion on a 4½ in. Rod 10, held by Collars in Strips 3. Rod 10 also carries a second Worm 11, this Worm, in turn, meshing with a third ½ in. Pinion 12 on a 3½ in. Rod 13 held by Collars in Double Angle Strips 2. A further Worm 14 is mounted on Rod 13, this Worm meshing with yet another ½ in. Pinion 15 on a second 4½ in. Rod held by Collars in Strips 3. Another Worm 16 on this Rod engages with yet another ½ in. Pinion on a second 3½ in. Rod 17 journalled in Strips 2 and held in place by Collars. A final Worm 18 is also fixed on this Rod in such a position that it engages with Pinion 8 to complete the drive. A handle, consisting of a Crank 19, to which a Threaded Pin is attached, is fixed on the input shaft, as shown.

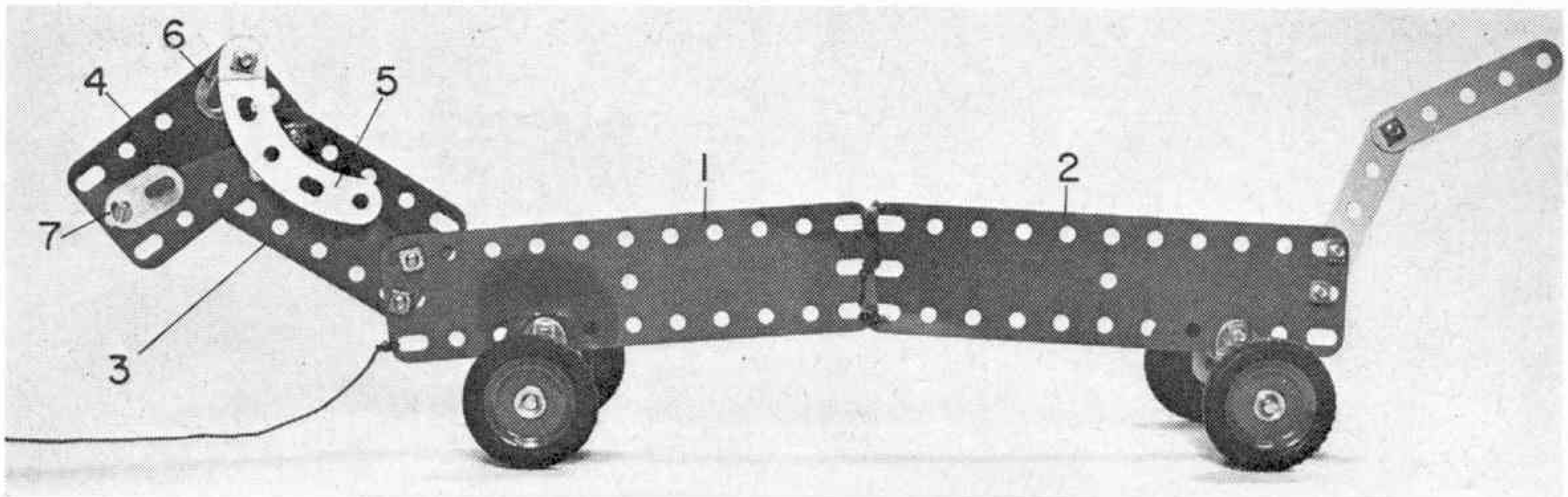
It is interesting to take a quick look now at the way it has been possible to attain the enormous ratio in question. Everybody familiar with Meccano gearing will know that a Worm meshing with a ½ in. Pinion gives a ratio of 19 : 1, the Pinion having 19 teeth. In this mechanism we have a progression of five Worms each meshing with a ½ in. Pinion, therefore the final ratio between the input and output shafts is 19 × 19 × 19 × 19 × 19 : 1 which, when multiplied out, equals 2,476,099 : 1.

PARTS REQUIRED

2—3	3—16	18—37a	1—48a
4—5	1—17	18—37b	1—48b
4—9f	5—26	4—38	8—59
2—15a	5—32	1—45	1—62
			1—115



A reader who believes in showing the public just what can be done with Meccano is William Inglis of South Blackburn, Victoria in Australia. He is seen here with some of the models he exhibited on his own stand at the Nunawading Arts Festival held in October last year.



You never know what to expect from Meccano ! If you have a young brother or sister, this Meccano toy we have christened the " Meccano Dachshund " will give him hours of fun.

MECCANO " DACHSHUND "

by Spanner

A pull-along toy for the very young, built with Outfit No. 1.

THEY SAY that there is something of the child in all of us and I'm inclined to think that " they " might be right, judging by the reaction at Meccano to the toy (I couldn't call it a model !) featured here. It's one of the most ridiculously simple constructions I have ever come across—obviously designed as the easiest of toys for a father to build for his baby—yet everybody I showed it to at the office, including adults of all ages, thought it was absolutely marvellous, as I do myself ! I can tell you that most of us had a good try at towing it around the floor behind us and I'm only too glad that we weren't seen by any strangers, otherwise I'm sure they would have sent for a doctor !

Anyway, if you have any children or young brothers or sisters, then I can guarantee that the Meccano Dachshund, as we have called it, will provide them with plenty of fun. Construction should not present any problems at all. The long body consists of two $5\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plates 1 and 2 which are joined together, not by Bolts, but by Cord, the join being made in such a way as to enable the Plates to hinge easily without allowing them to sag in the middle. A neck is supplied by a $2\frac{1}{2} \times 1\frac{1}{2}$ in. Plastic Plate 3, bolted across the upper corner of Plate 1, while another $2\frac{1}{2} \times 1\frac{1}{2}$ in. Plastic Plate 4 acts as the head. Two $2\frac{1}{2}$ in. Stepped Curved Strips 5, bent outwards slightly are bolted one to each side of Plate 4, as shown, to represent long, drooping ears, the securing $\frac{3}{8}$ in. Bolt also fixing two Fishplates 6 in place for the eyes. A further two Fishplates 7 serve as the mouth.

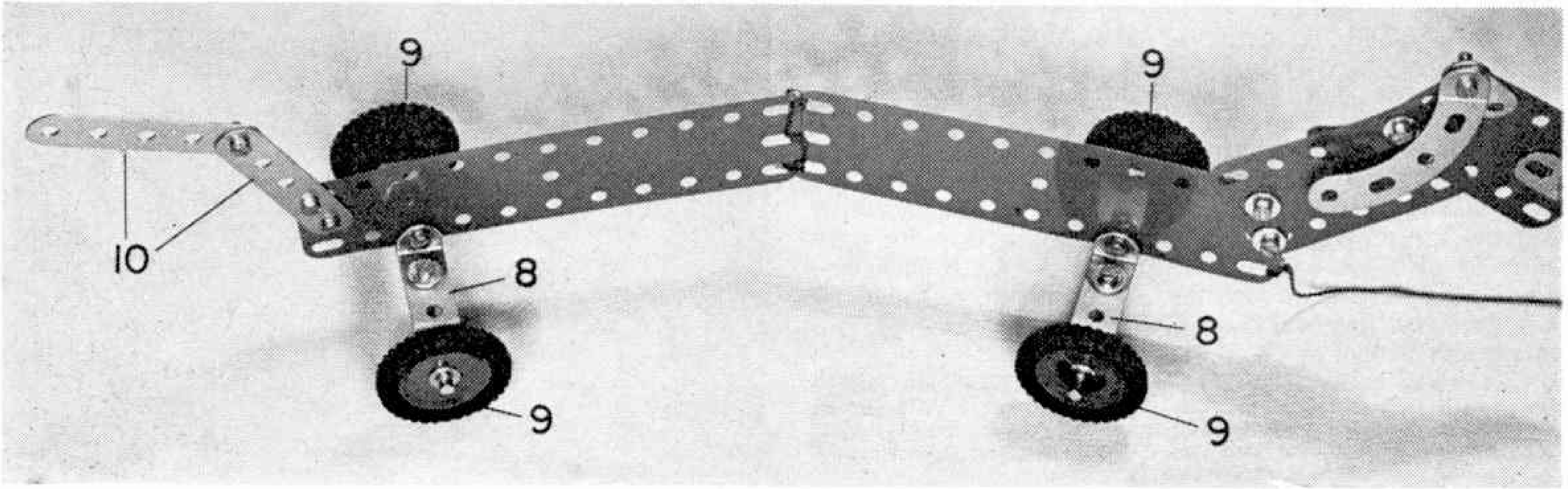
Two legs are next each built up from a $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip 8, attached to Plate 1 or Plate 2 by two Angle Brackets. Note that two Nuts are mounted on the shank of the securing Bolt, one each side of the Plate, to space the Plate from the Angle Brackets. Journalled in the lugs of front Double Angle Strip 8 is a $3\frac{1}{2}$ in. Rod on the ends of which two 1 in. Pulleys with Motor Tyres 9 are mounted. One of the Pulleys is fixed on the Rod whereas the other is loose, being held in place by a Spring Clip. A $3\frac{1}{2}$ in. Rod is also journalled in the lugs of rear Double Angle Strip 8, this again carrying two 1 in. Pulleys with Motor Tyres, but, in this case, both Pulleys are fixed on the Rod.

Finally, a tail is supplied by two $2\frac{1}{2}$ in. Strips 10, bolted to the upper corner of Plate 2, while a length of Cord is tied to the lower front corner of Plate 1 for towing purposes.

PARTS REQUIRED

2—5	4—22	7—38	3—111c
4—10	1—35	1—40	4—142c
4—12	20—37a	2—48a	2—189
2—16	12—37b	2—90a	2—194

A high view of the Meccano Dachshund showing construction of its " legs ".



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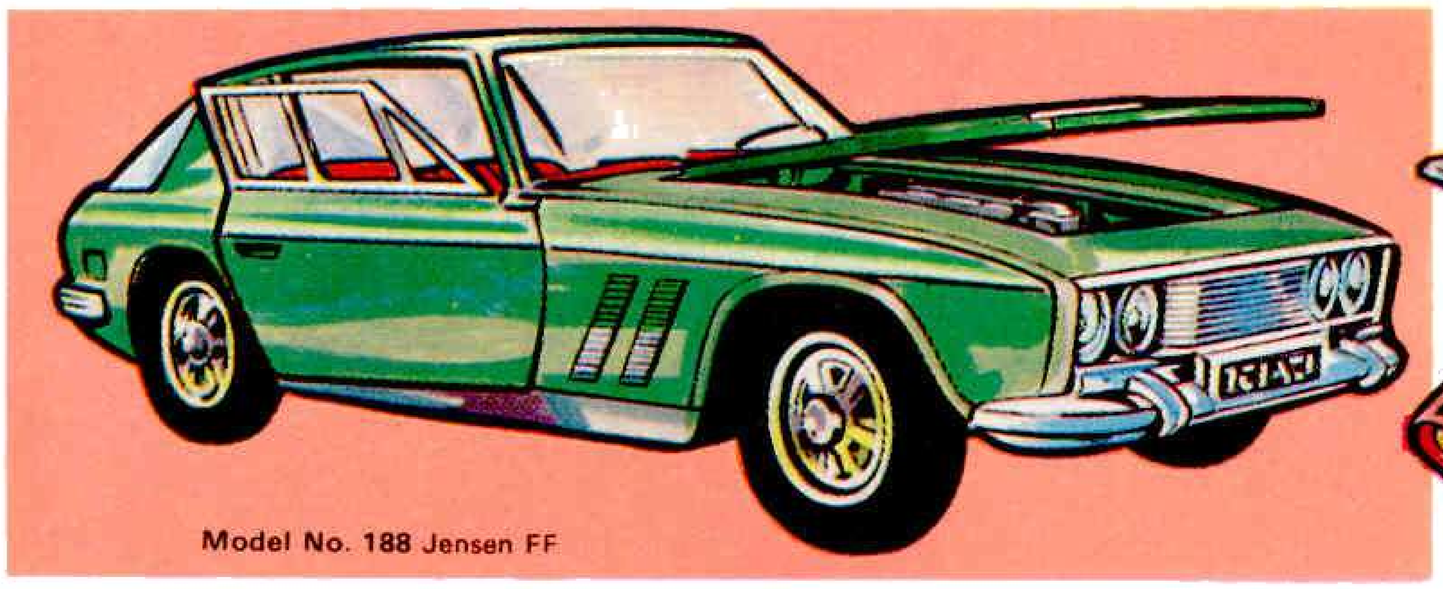

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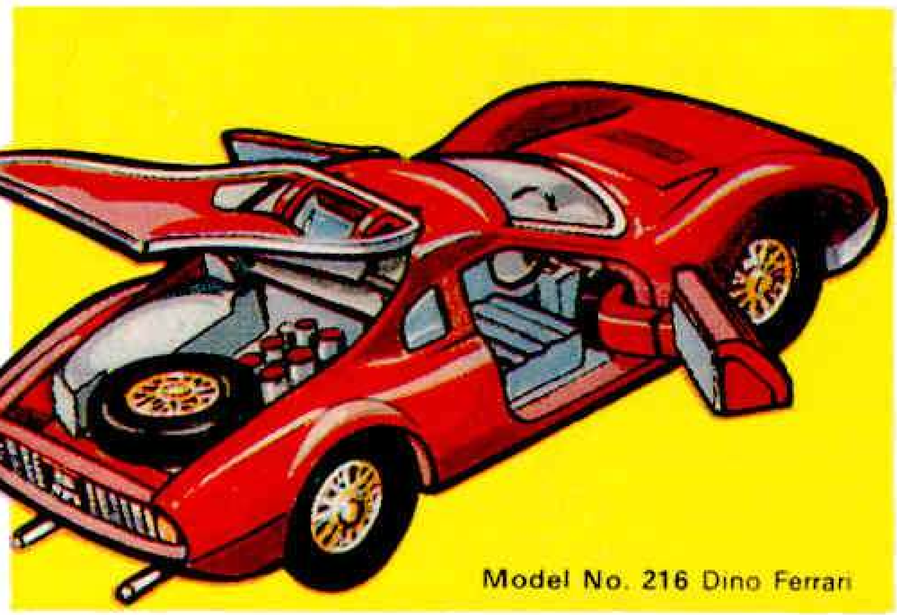

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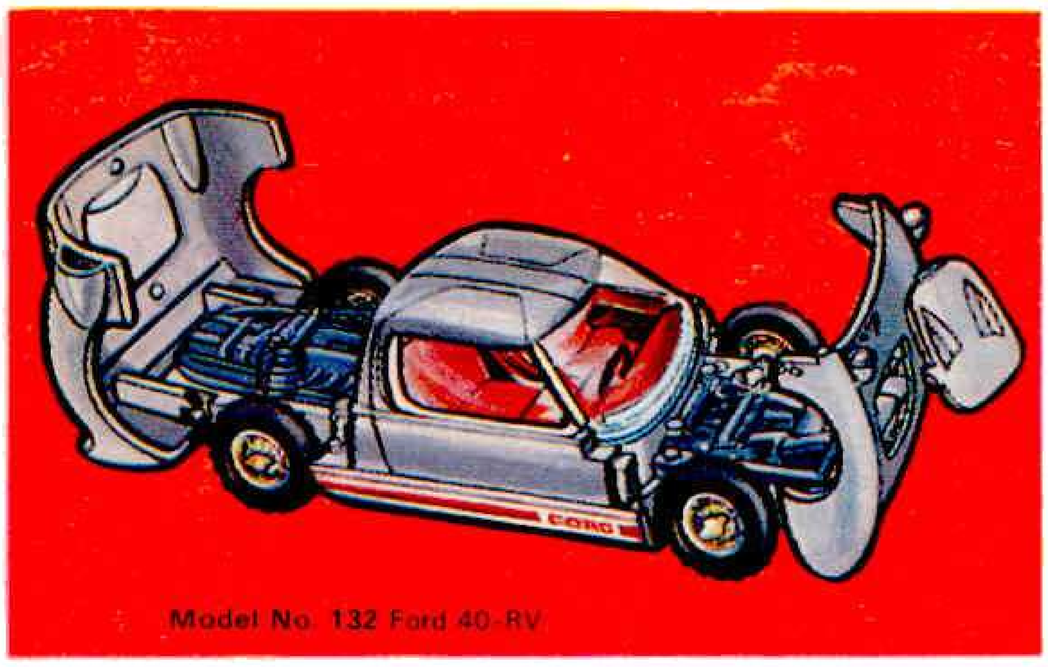

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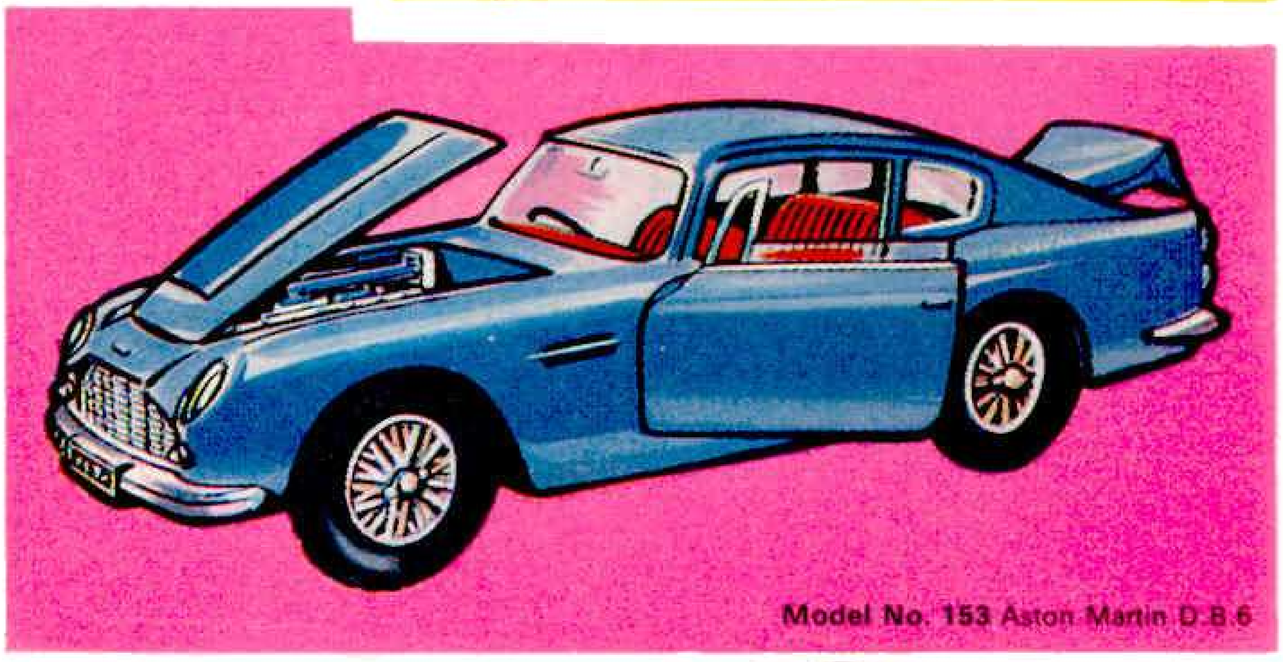

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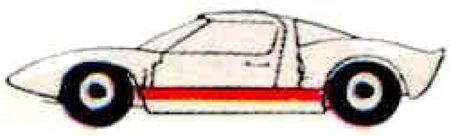

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