MECCANO® Magazine

JULY 1968

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MAP HOBBY MAGAZINE

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fly high!
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MECCANO® Magazine

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Editorial Director
D. J. LAIDLAW-DICKSON

Editor
JOHN FRANKLIN

Consulting Editor for Meccano Ltd.
J. D. McHARD

Advertisement Manager
ROLAND SUTTON

MAP **HOBBY MAGAZINE**

FRONT COVER

Area Patrol Car, Delta 3, based in Hemel Hempstead the home of Meccano Magazine, speeds on its way to the scene of a crime. Read "On Patrol" for details of this car and other interesting facts on Police Life. Cover painting by Laurie Bagley.

NEXT MONTH

Have you ever wanted to go to sea and work on aircraft? If you have, the next issue is for you. The Editor describes the training of a Fleet Air Arm Naval Mechanic, and other features describe the latest Navy 'planes and give details of the Fleet Air Arm in general. Meccano models include a Steeple Chaser, Plastic Meccano Punching Machine and a novel Woodworking Machine. Dinky Toy News, Among the Model Builders, Workbench, Battle, Have You Seen and Stamps, make this an issue you must not miss. Look out for the Naval Aircraft and Aircraft Carrier cover painting on your bookstall. As usual we will present a large railway coverage for all our enthusiastic readers.

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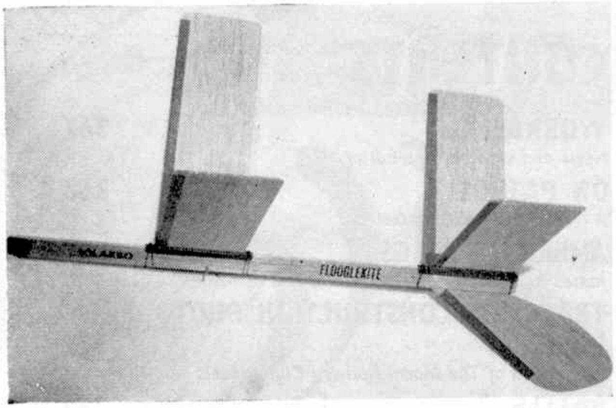
MODEL & ALLIED PUBLICATIONS LTD.

13-35 BRIDGE STREET, HEMEL HEMPSTEAD, HERTFORDSHIRE

Here's the



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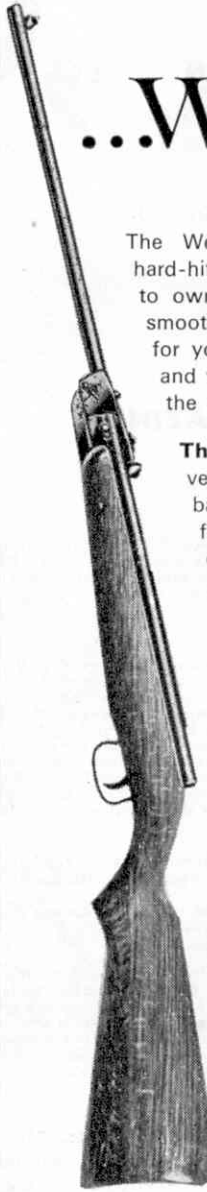
COMMERCE WAY, LANCING, SUSSEX

measure the calibre of this gun by its name

...Webley



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

Price: £12.7.0 (Telescopic Sight all metal 4 x 15 £3.0.0 extra)

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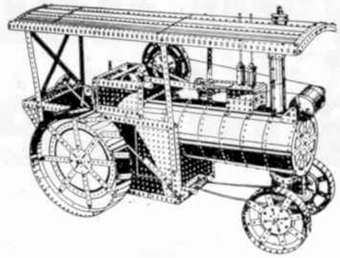


WHAT'S WHAT IN THE MECCANO LINE

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

MECCANO SETS

(Complete with illustrated Books of Models)

Set No.	£	s.	d.
Playset		15	6
1. Junior Kit	1	3	0
2. Super Junior	1	16	0
3. Highway Vehicles	2	7	0
4. Airport Services	3	10	0
5. Site Engineering	4	16	6
6. Ocean Terminal	5	18	6
7. Mountain Engineer	8	2	6
8. Breakdown Crew	13	18	6
9. Master Engineer's Set	23	5	0
10. Meccano Outfit in 4-Drawer Cabinet	61	10	0
Meccano Gears Set	1	5	11
Meccano Mechanisms Set	2	1	0
Elektrikit	4	9	11

MECCANO CONVERSION SETS

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

MECCANO POWER DRIVE SERIES

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

MECCANO MOTORS, ETC.

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

* 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.

WORKBENCH

Meccano Easter Competition

A total of 419 boys and girls entered the Meccano Model Building Competition, organised as part of the Easter Toy Fair at Selfridges. A free Meccano Magazine was given to each competitor, and like the competition held at the Schoolboys' and Schoolgirls' Exhibition last Christmas, competitors had to try and break the record for building a Meccano model truck. Younger entrants were able to build a Plastic Meccano model of a pushchair. A total of only 19 competitors managed to complete either plastic or metal models in the allotted time of fifteen minutes, and the winners were 7 year old Patrick Milme of Beach Grove, Beverley Road, Hove, who completed his plastic model in only 4 minutes, and 12 year old Robert Smith of 17 Bridgeway Road, Whitton, Middlesex, who completed his metal Meccano model in 12 minutes. Both will be presented with Meccano Sets as prizes.

Those Figures

Due to the many requests, for further information, about the figures in the photograph used to illustrate "Battle", in the May Meccano Magazine, here's the gen from Charles Grant: "The figures used were those I use generally in the 18th Century game. They are plastic, size 30 mm., and are supplied by R. Spencer Smith, 66 Longmeadow, Warren Estate, Frimley, Surrey. Strictly speaking they are of the troops engaged in the American War of Independence but this is of course practically the same—uniform-wise—as the European uniforms of the same period. I, of course, use them for the Seven Years War period I normally favour, say 1756-65, but they are perfectly all right for about ten years or so later. They are certainly the most inexpensive 30 mm. figures on the market, and cost about 2d. for an infantryman and 5d. or so for a cavalryman. Not a tremendous amount of detail, naturally, but if painted with a little care, they give a very good show when used in numbers."

April 27th, 1968 was a most important date for the model soldier enthusiast when two major events took place. First, at the Kinnaird Hall, Y.M.C.A., off Tottenham Court Road, was the Annual General Meeting and Competitions of the Society of Ancients. Here, under the genial auspices of Mr. Derek Guyler, the well-known T.V. personality, who is President of the Society and an authority on the armies of ancient Rome, the talk was of hoplites, chariots and knights in armour. The centrepiece was a demonstration of a mediaeval siege which utilised converted Airfix figures from the Robin Hood and Sheriff of Nottingham boxes. This was an exciting operation—one could almost hear the twang of the bowstring and the swish of the cloth-yard shaft!

After this was Caxton Hall and the Annual Competitions of the British Model Soldiers Society. The place was packed with both members and visitors. The number of entries for the competitions was higher than ever and the standard of the exhibits had never been surpassed. Historex figures were numerous, and although there were many commercially produced figures, the production of a comparatively new member of the Society took more than one award. The technique in this case involved carving the component parts of the figure from pieces of lead, and the finished "one-eyed Germanic Chief with captured Roman standard" was quite outstanding. An ex-officer of the Scots Guards did notice that a scene depicting the changing of the guard ceremony, was not quite accurate—so all you model soldier enthusiasts will have to watch your step with such expertise about!

Flying Scotsman Crosses Forth Bridge

When the Flying Scotsman majestically crossed the Forth railway bridge on May 25th, it was probably the last steam locomotive ever to do so.

The privately owned engine had been hired to haul a Special, organised by the Stephenson Locomotive Society (Teeside Centre), and it left Stockton-on-Tees to travel up the coast to Newcastle, and from there run non-stop to Edinburgh. At the Scottish capital, passengers either left the train to go sight-seeing, or went on to Inverkeithing via the Forth Bridge. The engine is owned by businessman Alan Pegler and was restored to L.N.E.R. livery in 1963.

Four contestants race against the Meccano clock to construct their "standard" models in less than 15 minutes. Over 400 boys and girls entered this contest while visiting the Easter Toy Fair at Selfridges, Oxford Street, London.

ON PATROL

The Editor describes his experiences as a passenger in a Cortina G.T. Area Patrol Car of Hertfordshire Constabulary's 'D' Division based in Hemel Hempstead

YOU ARE in the back seat of Area Patrol Car Delta 3 from Hemel Hempstead Police Station. P.C. John Clougher is driving and P.C. Bob Wells is the Observer and Radio Operator. The engine is running quietly at half maximum revs. in fourth gear, when the two channel radio receiver—until now silent—bursts into life with a message from the Information and Control Room at County Police Headquarters. *"Delta 3, Delta 3, over"* . . . *"Hello VH from Delta 3, go ahead, over"* . . . *"Delta 3, your location please, over"* . . . *"Location Boxmoor A41"* . . . *"Message, Berkhamsted High Street, Bank alarm ringing"* . . . *"Message received, Wilko"* . . . *"M2VH to stand by"*. John Clougher revs the engine, slips into third gear. The traffic is quite heavy. Bob Wells turns on the Claxon horn and the blue flashing light—60, 70, 75 m.p.h. weaving in and out of the traffic—this is all-out driving. The tyres scream as John 'S' bends the car around some red traffic lights and waiting cars. The dee-dah-dee-dah of the Claxon is deafening inside the car now, and the traffic just melts out of the way to give the car a clear run as it approaches Berkhamsted. We stop at the Bank—only to discover it was a false alarm!

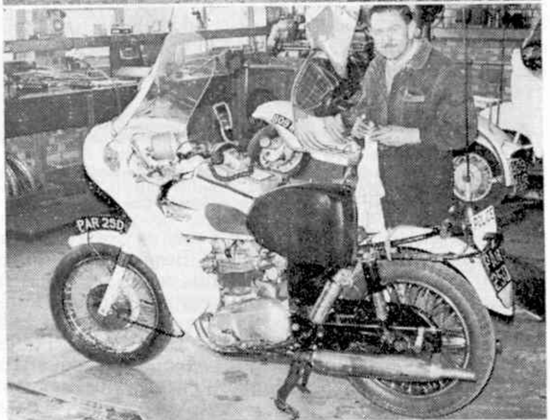
Your Ed. was hanging on very tightly in the back seat during all this, with a tape recorder going; and we can assure you it was some drive! You may be wondering why the car was going so fast? Normally, cars patrol at traffic speed but in a possible emergency—such as this—they go flat out to reach the scene of the alarm call, as seconds can make the difference between a criminal's apprehension or escape. In this case it was a false alarm, but it could well have been for real. Another instance that really did demand an all-out effort, was a serious accident on the A41. Here, an estate car had collided head-on with an articulated lorry and blocked the road. With traffic piling up in both directions during darkness, it was essential that a Police car should arrive quickly to erect flashing blue lights to warn drivers of the hazard ahead, before they caused a multiple car pile-up. In this instance a policeman on a lightweight motor cycle was first on the accident scene and had naturally requested assistance after making arrangements for an ambulance to take one of the drivers to hospital. It was a very bad accident and after assisting the Police by acting as a human traffic light for half-an-hour, your Ed's fast driving ideas were very much subdued.

Don't get the idea that driving a Patrol Car is all fast action and glamour just like the T.V. series, it isn't. There are such things as witness statements to be collected, minor road accidents, standing in the rain taking road measurements at crashes, unpleasant tasks such as family discords and a hundred and one other things to be done. It can also become very boring if the radio remains silent and there are few calls to make. There is no set route for each car to cover, the driver just goes where he feels like or stays in the area of any anticipated trouble—if a tip-off has been received. This means that a car can be at any place, at any time, a situation that criminals do not relish !

The Hertfordshire Constabulary polices an area of nearly 600 sq. miles with approximately 2,500 miles of public road. This huge area includes the Garden Cities of Letchworth and Welwyn; Development Corporation New Towns at Stevenage, Hemel Hempstead and Hatfield; the Borough of Watford; the Cathedral City of St. Albans (Verulamium—the most important centre of Roman occupation in Britain); and many small market towns and picturesque villages, set in rural surroundings including part of the Chiltern Hills in the West of the County. With a population of 750,000 plus, the Constabulary is divided up into six Police Divisions:—A—Hertford, B—Welwyn Garden City, C—Watford, D—Hemel Hempstead, E—Stevenage, and F—St. Albans. Our local Police operate from Hemel Hempstead Police Station which is only a few hundred yards from the *Meccano Magazine* offices.

One of the largest factors in the recent increase in Police efficiency is communications. At Hemel Hempstead they have a radio room that contains the normal external telephone lines; a special '999' line that flashes an emergency lamp and rings a bell; the telex machine; Police call-box phone lines; direct burglar alarms to factories and Banks; and motorway emergency telephones ! Quite an array of equipment. If you dial 999 to report a suspected crime, the local Station relays this information directly through to County Headquarters who then call on any cars in that area to attend; or, the local Station can contact Unit Beat Cars and Area Patrol Cars by means of Ultra High Frequency, personal radios.

Hemel Hempstead (Area D) have Cortina G.T. Area Patrol Cars, Vauxhall Viva Unit Beat Cars for local town work and accidents (sometimes referred



Above left, Area Patrol Car " Delta 3 " with driver P.C. John Clougher (left) and P.C. Bob Wells, the radio operator. Right, top to bottom, Delta 2, a Cortina G.T., at speed. Next, a Triumph 650cc. twin motor cycle in the Welwyn workshops being serviced. Next, the Austin Gypsy used for towing the mobile police station or canteen, and recovery of broken down vehicles, etc. Below, another Austin Gypsy this time an accident tender showing the crew and part of the equipment carried.

Below, a Vauxhall Viva Unit Beat Car with a Bedford Beagle Sectional Van in the background. Below this is the Humber Super Snipe Motorway Patrol Car.

At left, the Telex and Teleprinter room at Welwyn Police Headquarters. Above, the Headquarters Information Room; note the vehicle disposition board and operators.

to as "Pandas"—a ridiculous name anyway); Austin A.60; Austin 1100s and Bedford Beagle vans. Other Areas have similar vehicles and each Area has a defined boundary, but cars do stray off "legal" territory as some roads can be half in one area and half in another. Many other types of vehicles i.e. Traffic Division Humbers, Jeeps and Mobile Headquarters are used by the County Force. The various types of cars require different grades of driving ability, as the higher performance cars need a totally different type of driving from the slow vans. To become an Area Patrol Car driver, you must be a Class 1 or 2 driver. This involves a five week driving course, planned in stages. During the first week the driver is limited to 50 m.p.h. and carefully observed to see just what he is capable of. In addition to this, they are issued with a Roadcraft book and questioned on this subject each morning. During the second week the speed limit is upped to 60 m.p.h. and 70 m.p.h. on the third week. The last two weeks consisting of fast driving, but ob-

serving the legal speed limits as other motorists would, *or should*, and at all times driving with a high margin of safety. All types of road are driven on, and skid correction is taught on the skid-pan at Welwyn Headquarters. During the third and fourth weeks, drivers have to give commentaries whilst driving, on what they are doing and why they are doing it, to an examiner. Finally, they sit a written examination on Roadcraft and the Highway Code, with a 30 minute driving test in an area that the instructor has noticed they are not used to. The final driving Classification is decided by the level of marks on these tests.

Duties as driver and observer are alternated, but as with any other job, one has to do the groundwork first. Bob Wells, who is now a Class 2 driver, walked the beat in Watford for a year and then drove local cars before driving the Area Patrol Car. Even current drivers take turns walking the beat and doing office work.

The County Constabulary Headquarters at Welwyn Garden City are brand new and really up-to-date. Here, they keep centralised criminal records, fingerprint files and have an excellent photographic section. They also handle most of the policy and documentation work, and maintain County cars in their own well equipped workshop, employing civilian mechanics. The Information Room and Radio Room is the centre of all activities. From here they can instantly contact any Police Force, their own cars and plot the position of any activity in the County. A special room contains teleprinters and telex machines with the capability of receiving and transmitting any urgent information. Set in very pleasant surroundings, nearly all the sporting facilities for staff recreation are catered for, and it contains a full-size indoor swimming pool. If you can find a sport that the Police clubs do not cater for, it is remote indeed !

Working in the Police Force must be a very satisfying occupation and as well as the normal adult entry they operate a Cadet Force to prepare suitably qualified boys and girls for a career. There are several basic requirements for entry, and these include:—16 years minimum age; you must be a British subject; you must not be shorter than 5 ft. 7 in. at 16 or 5 ft. 8 in. at 17 and you must pass a written examination; there is also a stringent medical examination. Whilst discipline is part of the job, don't get the idea it's like the military services, you can join and give notice to leave just like any other civilian employment.

AMERICA'S FLAGS

By James Mackay

THE FOURTH of July is America's National Day and it is particularly fitting that this year a set of ten stamps is being issued on that day in honour of famous flags dating from the early days of the United States.

One of the earliest battles between the American colonists and British troops at the beginning of the War of Independence was fought on Bunker Hill. Although the colonists lost the battle, which took place on June 17th 1775, the British casualties were twice as heavy. Tradition has it that the rebels hoisted a blue flag with a red cross set in a white canton and a green pine tree in the upper left portion. The infant American navy, founded by the Scotsman Paul Jones and the Irishman John Barry, had a rather curious flag featuring a rattlesnake with the ominous warning "Don't tread on me" on a field of seven red and six white stripes. This flag was made famous by Commodore Esek Hopkins of Rhode Island, who flew this jack when he captured the island of New Providence in the Bahamas. Until about 1795 American privateers and merchantmen flew a striped flag, sometimes without the rattlesnake. The South Carolina naval ensign was a rattlesnake flag, but the stripes were blue and red.

One of the most select military formations during the war was the Philadelphia Light Horse, a troop of cavalry comprising 28 young men from the leading families of Philadelphia. Their flag consisted of a yellow field with a canton of blue stripes. On the field was a coat of arms with the motto "For these we strive". The Philadelphia Light Horse was the ancestor of the present Presidential Honor Guard, since its main duty was to provide an escort for General George Washington.

One of the earliest flags to incorporate the blue canton with the thirteen stars of the first states was that carried at the battles of Brandywine, Trenton and Yorktown by the First Rhode Island Regiment. This flag had a white field featuring a blue anchor surmounted by the word "Hope". This regiment's most famous engagement took place in 1777 when Colonel Christopher Greene led his 400 men to victory over 1,200 Hessian mercenaries at Redbank, New Jersey.

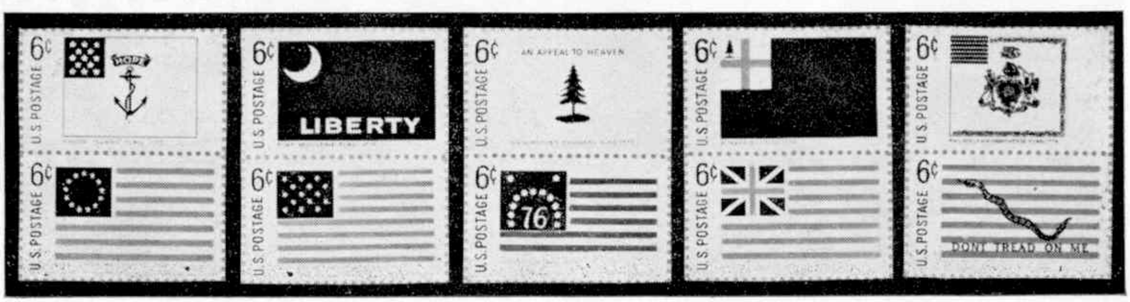
Early in the war the squadron of six cruisers commanded by Washington flew a white flag depicting a green pine tree surmounted by the words "An appeal to Heaven". This flag was subsequently modified and adopted by the Massachusetts naval force. One of these flags is preserved to this day by the British Admiralty, having been captured with the brig *Lady Washington* during a naval battle.

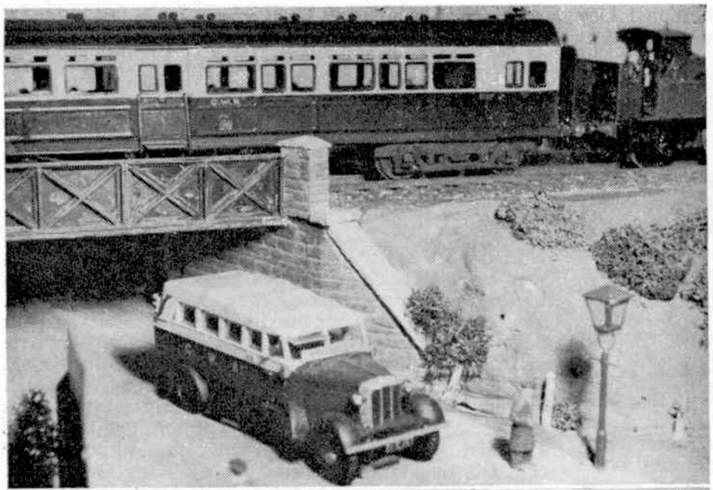
The first flag displayed by the colonists in the southern states flew over Fort Sullivan in Charleston Harbour when the port was under the attack of the British navy. During the ten hour bombardment the flag was shot away. Sergeant William Jasper left the defence and, recovering the flag, hoisted it again. For this brave act he was presented with Governor John Rutledge's sword. A landing force of 2,000 troops was repulsed and the British withdrew. This flag is blue with a crescent and the word "Liberty" in white. The fort was later renamed in honour of its gallant defender, Colonel (later General) William Moultrie and thus the flag is known as the Fort Moultrie Flag.

The first national flag of the United States consisted of thirteen stripes (one for each of the original states) but in place of the stars shown in the present flag there was a miniature Union Jack, proving that although the colonists had taken up arms against King George III they were still British at heart. The Union Jack of the eighteenth century differed from the flag we use today by not having the red saltire cross of St. Patrick. This was not added to the flag till 1801 when Ireland joined Britain to form the United Kingdom. The Grand Union flag was first raised by George Washington near Cambridge, Massachusetts in January 1776 as the Continental army came into being.

This flag was superseded in June 1777, following the resolution of the Continental Congress that the flag of the United States "be made of thirteen stripes, alternate red and white; that the union be thirteen stars, white in a blue field, representing a new constellation." The arrangement of the stars was optional at first; that shown on the stamp is circular, but a curious arrangement of the stars in a semi-circle was adopted by the Bennington Militia, with the figures "76" denoting the date. It is widely believed that this flag was the first stars and stripes to be carried by ground forces and raised in victory. The militiamen carried this flag at the battle of Bennington in which General John Stark defeated the troops of General John Burgoyne. It is now preserved by the Bennington Battle Monument and Historical Association, Vermont.

The tenth stamp in the set depicts a flag of a much later vintage, the stars and stripes with fifteen stars which came into use after the admission of Kentucky and Vermont to the Union in 1795. This was the flag which Francis Scott Key immortalised in the words of the national anthem, "The Star-spangled Banner", which he wrote during the British attack on Fort McHenry during the War of 1812-4. This flag (the original of which is now preserved in Washington) had fifteen stripes: from 1818 onward the number of stripes was fixed at thirteen and a star added for each new state.



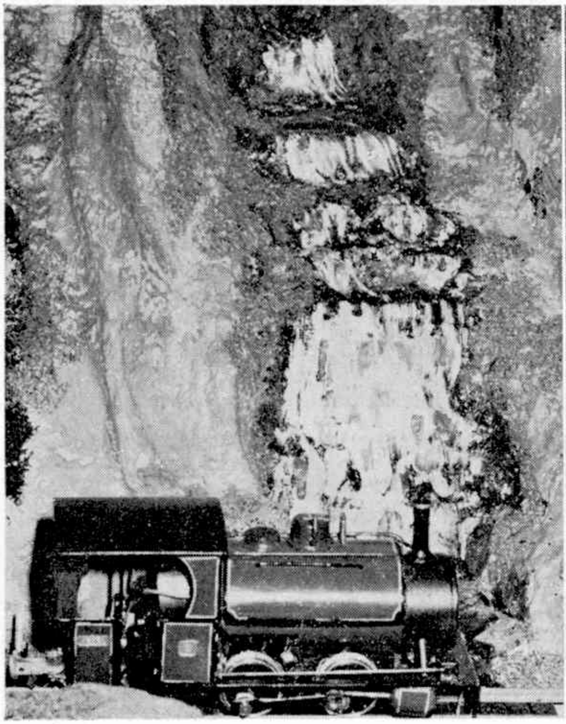


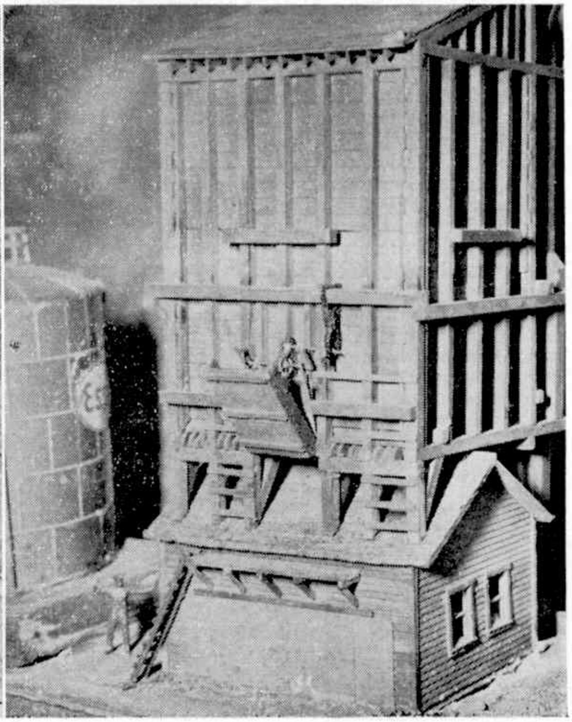
TRACKSIDE CONSTRUCTION PHOTO HINTS

Some of the many models seen at The Model Railway Club's Easter Exhibition at the New Horticultural Hall, London W.I.

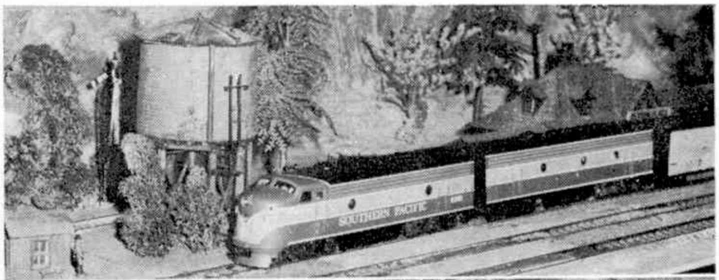
Top left, this attractive set piece which represents a scene on the Great Western about forty years ago, proves that scenic modelling does not have to be involved to be effective and authentic. This scene is very simple and uncluttered; the bridge itself is a very attractive model. Note the stone abutments and " splay walls " which retain the earth of the embankment. The old-time gas lamp adds the final touch to a very realistic scene.

At left, this Great Western pannier tank is having its bunker replenished from a wooden coaling stage, which contrasts vividly with the American coaling tower shown below. Construction is simply of strip balsa, and the whole thing can be made in a pleasant evening's modelling. One nice touch: the track is almost buried in coal dust, with the sleepers completely invisible.

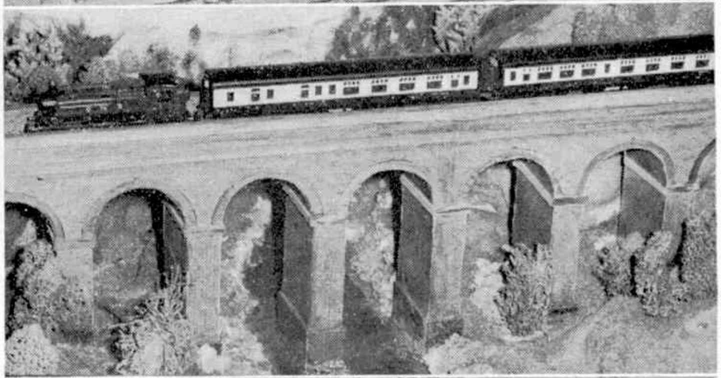




At right, the HO scale " Denver and Southern ", a big two-unit diesel rolls into " Peyton Place " depot, with its outsize water tank. The tank itself stands on a wooden staging (balsa again!) and could easily be made from a handy-sized cylindrical tin or carton, wrapped around with paper to provide a good surface for painting. Some of the trees in the background are Britain's plastic products, which are very realistic.



This long and impressive viaduct shows how the time-honoured brick-paper can be put to good use. The viaduct piers are of solid 2 in. x 1 in. timber, and the resultant construction is very strong. All the surfaces of the wooden structure must be nice and smooth, so that the brick-paper covers them evenly, without wrinkles and tears.

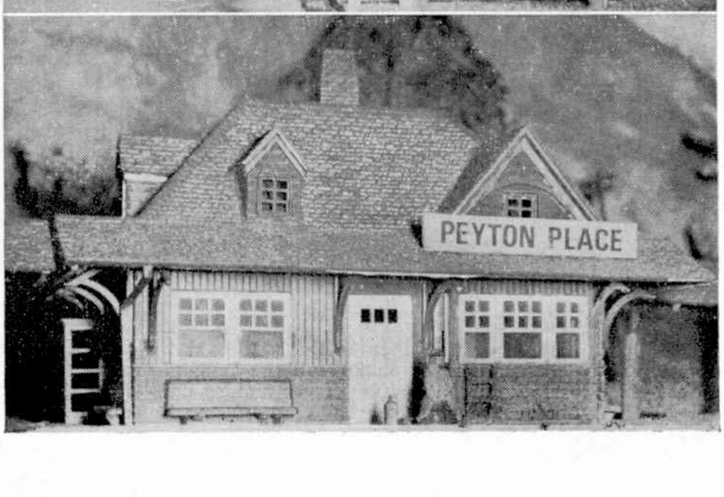


The impressive Swiss hotel behind the trees on Barry Harper's EM gauge Swiss layout is merely cut from a poster—an easy and effective method of obtaining a very realistic backscene. Note that the sharp edge of the bottom of the poster is hidden from view by the grass bank in the foreground.

Another Mid-Western building at " Peyton Place ". This is a kit-built job, but careful painting makes it look really outstanding. Possibly a " flatter " paint should have been used on the roof, though, there's quite a shine on those tiles, but perhaps it's been raining !

The attractive waterfall, seen on the opposite page, was on the narrow-gauge layout of John Kimber and was made by a lady, Miss Ann Twitchen. Construction is simple, using cellophane and careful use of a paint brush.

Also on the opposite page, is a typical American locomotive coaling tower from the " Denver and Southern " layout of Messrs. Holroyd, Martin and Harris. Wooden structures like this are typical of the American railroad scene, but are not unknown in this country. Construction is best carried out with balsa or obeche stripwood, in exactly the same manner as the original was built. No internal framing or strengthening is needed, as the frame of the building is outside on the prototype, as the picture shows. The fine boarding of the shed at the base of the structure is best represented by individual strips of card or Plastikard, as wood is rather thick for this use, especially in OO or HO scale.



BATTLE

by Charles Grant

Part III—Rules for movement

Above, pass in review: a selection of some of the types we shall be meeting in "Battle". They include three of the tanks mentioned in the text—Panther, Churchill and Sherman, as well as two varieties of half-track vehicles and a German armoured car. On opposite page, defending a river crossing, a tank is in position just over the bridge and two anti-tank guns are also located to cover any attempt of the enemy to force a passage.

NOW THAT we have established a kind of yardstick for our movement rules in the shape of the statement that, in one game move, an infantryman may cover a distance of 3 in. on the battlegame table, this being the equivalent of 3 m.p.h. (on the basis that 1 in. equals 1 m.p.h.), it will be an easy matter to determine the speeds—and consequently the moves—of any sort of tracked or wheeled vehicle we consider that we shall find useful in "Battle".

What we shall do is to take a selection of most of the better known types in use towards the end of World War II, German and Russian as well as those of Britain and the U.S.A. If possibly it appears that I give undue emphasis to the 'foreigner' it is simply because I feel that it is better if two opponents in the game choose to have, for example, German and Russian forces respectively, rather than that one should suffer pain when one's national pride is offended on seeing maybe a Churchill tank 'brewed up' by a Tiger. It might be a good idea (and one that I use myself, as do many other players) to have quite fictional armies. I know one player whose country rejoices in the name of 'Myopia'. It also allows complete freedom of choice in the equipment one can 'import' and there is then no reason why, if the player wishes, he should not have German armoured cars and American tanks in the same organisation. It's all part of the fun of the game.

At the beginning at least, though, I shall not have much to say about what you might call the 'super' jobs—the 'Josef Stalin', the King Tiger and so on. It is simply because experience shows that a much better game results from the use of the less enormous varieties of tanks etc. and this indeed will be my guide through this exposition of our game of "Battle". By the same token, it is also better to work on a system of averages—as regards speed, defensive value and fire power.

We shall see this first in our estimation of speeds to calculate the table moves of our vehicles, although in this it is inevitable that we shall have to have a dual scale, but of this more in a moment. Obviously, everything that moves can go dead slow or flat out, but in between there is what can be called an economical cruising speed, which may be maintained for the greatest distance with the minimum expenditure of fuel. Couple this with the fact that, on the battlefield, men and vehicles do not go tearing about at a great rate; among other things it makes firing very difficult, whether it be the rifle of the infantryman or the gun of the tank. It also cuts down the chance of an observer's being able to pick up anything in the way of a target from a rapidly moving platform. There is the additional point that, except possibly in the pretty specialised field of desert operations, speed of tank movement was frequently limited to that of infantry, one in support of the other with a consequent reduction in speed. So we are going to be required to establish two speeds, one which is a sort of battle speed where, shall we say, an advance is being made against a vigilant foe, care being taken to 'flush out' any hiding place where evilly disposed enemy troops may be lurking, and with guns trained ready to fire at any suddenly appearing target. This will generally take place across country, where hedges, muddy fields and all sorts of obstacles will in any case tend to reduce the rate of progress. Opposed to this is the ordinary road speed where the question is simply one of getting from 'A' to 'B' as rapidly as compatible with general conditions and fuel consumption.

It should be pointed out that it is a general experience that the maximum speeds given in specifications for all manner of vehicles—and this applies to aircraft as well—are usually pretty optimistic, and the figure given, if it can be reached at all can be done for only the minimum of time and with the worst possible effect on the engine involved. Thus we shall attempt a compromise, one which will give a road speed something like the economical cruising speed we mentioned already. As time goes on, the enthusiastic battlegamer may well wish to operate rules which allow for such bursts of speed; he may find it necessary to move very rapidly to restore a desperate situation, say, this being similar to the 'forced march' for which rules can be made by players operating in 'horse and musket' periods of military history. In these early days, however, I feel it better to adhere to a fairly basic set of rules, the earlier to get on with having an actual battle.

Let us then proceed to note a series of movement rules—across country and on roads—for the ten or a dozen vehicles we are going to employ in "Battle". May I preface this by saying that I am well aware that many tanks and the like had numerous 'Marks', as improvements and modifications took effect and that each had its own characteristics, but let me reiterate my plea about an 'average'. In any case, as far as estimation of speed is concerned, any difference would be rather negligible in the scale we are using.

First of all, then, we shall take the Panther—the German Pzkw V—thought by many, and with some justification, to be one of the best all-round tanks of World War II. It was more or less inspired by the Russian T.34 which, in their campaign in Russia, the Germans found to be more than a match for the Mark III and Mark IV tanks they had found adequate in their campaigns in Poland and France. Its maximum speed is quoted as being about 30 m.p.h. This is of course a road speed and for our purposes—to obtain the cruising speed—we shall reduce this by half, arriving at a rate of 15 m.p.h., or, translated to our battlegame scale for the table (where 1 m.p.h. equals a move of 1 in.), a road move of 15 in. Similarly, we shall not go far wrong if, for the cross-country move, we again cut this by fifty per cent, giving us a move of 8 in. (the nearest round figure—we don't want to clutter things up with half inches). All this bearing in mind, naturally, that the infantry move is one of 3 in.

The T.34—the Russian job—comes in two varieties when it relates to the question of armament, but this will be discussed later. They are identical as far as speed is concerned, and this is in fact the same as that of the Panther—i.e. a 15 in. road move and an 8 in. overland one. If we take a third tank, the American Sherman, we find that it didn't really measure up to the previous two—although, as World War II progressed, it became of increased importance, if only through sheer weight of numbers. Maximum speed of the Sherman was 24 m.p.h.—by our rules then its

VEHICLE	MOVE	
	ON ROADS	ACROSS COUNTRY
Panther	15"	8"
T.34	15"	8"
Sherman	12"	6"
Churchill	7"	4"
Half-track	15"	9"
Truck, jeep, armoured car	24"	6"
Sturmgeschutz	12"	6"

moves are 12 in. and 6 in., road and cross country respectively.

(May I again remind the reader that these figures are quickly arrived at approximations for the purpose of establishing an elementary set of rules in the shortest possible time).

It would really be incorrect not to include a consideration of a British tank which must, of course, be the Churchill. It was primarily an infantry tank, stoutly armoured, manoeuvrable but slow. Its performance gives it moves of 7 in. and 4 in.—not very fast even in comparison with the Sherman.

Half-tracked vehicles were in general use by nearly all the Powers and they had a multitude of uses. Taking the German SdKG7 as an example, we find that it had a maximum speed of 30 m.p.h.—a 15 in. road move—and a cross country speed of 18 m.p.h.—or a 9 in. move overland.

Wheeled vehicles, such as scout cars, naturally had the advantage over their tracked counterparts on roads, but found it hard going across country. On the former they will therefore have correspondingly greater moves, let us say 24 in. on roads but 6 in. only overland. For the time being we shall lump together all these types—trucks, jeeps, armoured cars—into the same speed category, reserving any refinements until later.

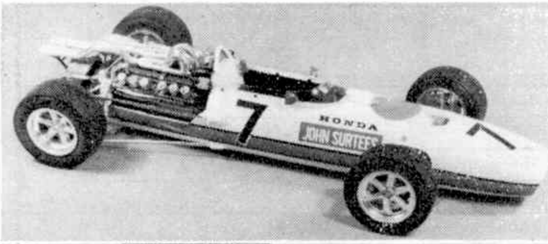
One last type we might mention is the selfpropelled gun. The German version of this, the Sturmgeschutz, is well known. Like other types it was simply a field gun or howitzer mounted on a tank chassis, and used in close support of infantry, its road speed being 12 in. and its overland move 6 in. (It didn't have to be terribly fast, for obvious reasons).

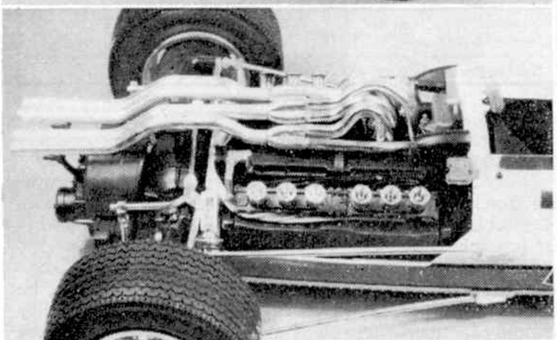
Super Plastic Kits from Japan

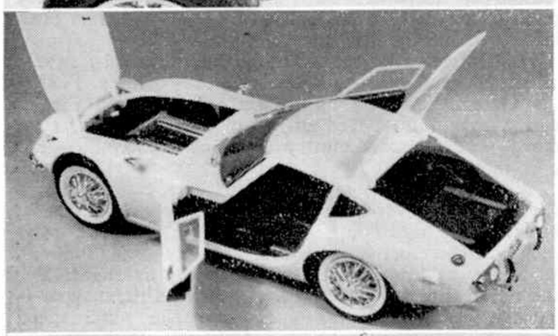
RICHARD KOHNSTAM LTD., (RIKO), have recently deluged us with superb Japanese plastic kits imported by them, and on sale in most large model shops. These kits *are not* for the absolute novice, but if you have assembled plastic kits before these should not present any problems. English instructions are included with each kit and the picture-type assembly details are very easy to follow.

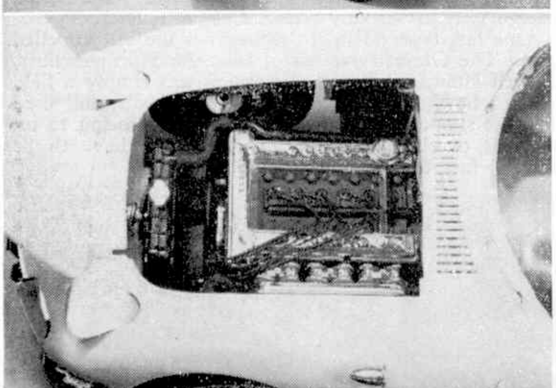
If you would like to own a racing car but just can't afford one, here is surely the next best thing. It is in the form of a Honda F.1. plastic do-it-yourself kit and builds up into a super detailed realistic model; on sale in most large model shops, this Tamiya kit costs 73/-. It's big, 1/12th full-size which makes it nearly 13½ in. long, and it has no less than 200 parts! A good sheet of plans are included, and each part has a number stamped on it which corresponds with a number on the plan. Although it takes a fair amount of skill and time to build, the emphasis is on common sense and patience. The body of the model is white and all the necessary racing numbers, stripes, etc., are included on a sheet of transfers. The model can be fitted with batteries and an electric motor to make it a proper working model, or you can leave out the "works" and have it standing on a shelf as a display piece.

The amount of detail on this car just has to be seen to be believed. The wheels revolve (and on the rear ones turn the drive shaft). It steers, and each wheel is independently sprung on tiny springs. The engine

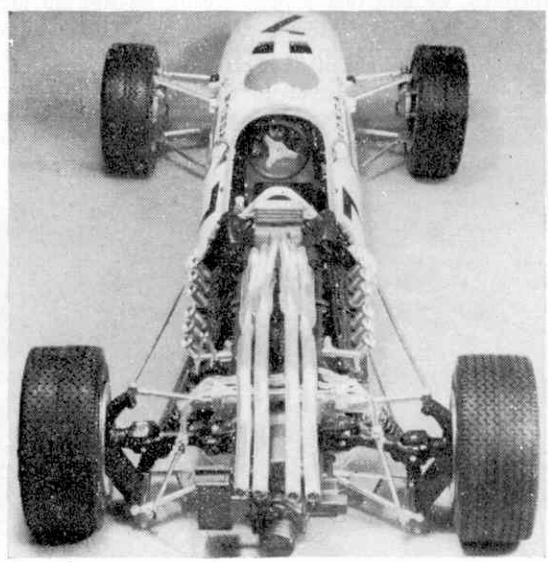








At left, top to bottom: The Tamiya Honda F.I. car has everything, look at those detailed wheels and the exhaust pipes and tyre treads shown in the next picture. This also shows the gearbox and suspension details. Below this we see the Otaki Toyota 2,000 G.T. sports saloon with both doors, boot and bonnet opened. Just look at the engine detail revealed in the next photo, it could almost be the real thing! With all the apertures closed, the Toyota is really sleek and smooth looking. Below, the Honda F.I. again, note the intricate details on the suspension links, yes, those springs really do work, just like the real thing.



is fully detailed right down to sparking plug leads! The cockpit has a realistic seat which looks just like black leather, a chromed gear lever and a fire-extinguisher! Large, fat racing tyres are fitted onto the wheels, and even have the maker's name, size and direction of rotation printed on them!

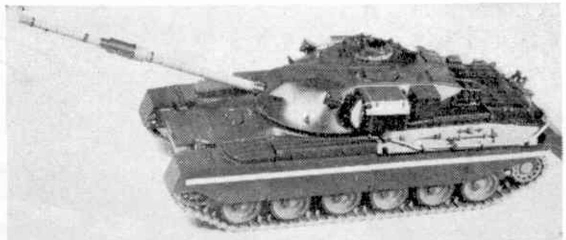
Another car kit, this time the Otaki Toyota 2,000 G.T. sports saloon. This particular model, although containing nowhere near the number of parts as the Honda, has, however, more working parts. The car can be fitted with an electric motor to make it mobile. This is controlled by a switch on the underside of the chassis. A small switch on the opposite side of the chassis controls the headlights. Two small bulbs under the lens covers are the secret here. The steering also works, although it cannot be operated by the steering wheel. We'll start at the front of the model with a detailed description.

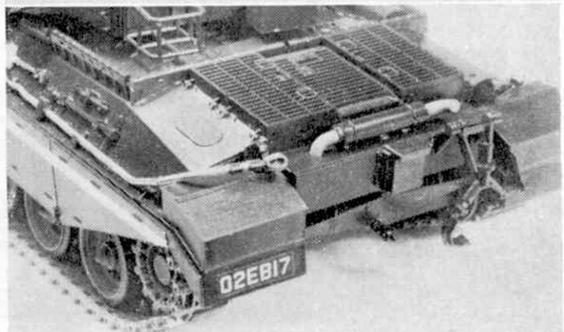
Firstly we find two small flaps on the front of the car which, when lifted up, reveal a couple of extra headlights. We then open the bonnet to find a super detailed, fully wired engine in black and gleaming chrome. Opening either of the doors reveals a well finished interior complete with all the instruments on the dashboard and even a radio! Open the boot-cum-rear window and you will find a suitcase on the floor. This contains the batteries used to power the model and operate the lights. To summarise, a very good kit, strong and nicely detailed. This kit costs 95/-.

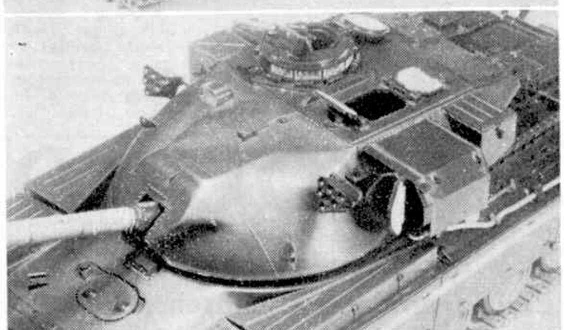
Possibly the most famous of all the tanks, the Jagd Panther, by Tamiya, is 1/25th scale. This type was used extensively by the German Army during the second world war and the model is a superb reproduction, full of eye-catching detail. A point we found very attractive was the inclusion of three "Jerry" type petrol cans strapped to the side of the tank. The wheels

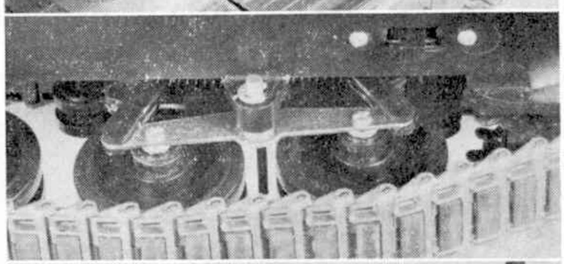
Continued on page 388

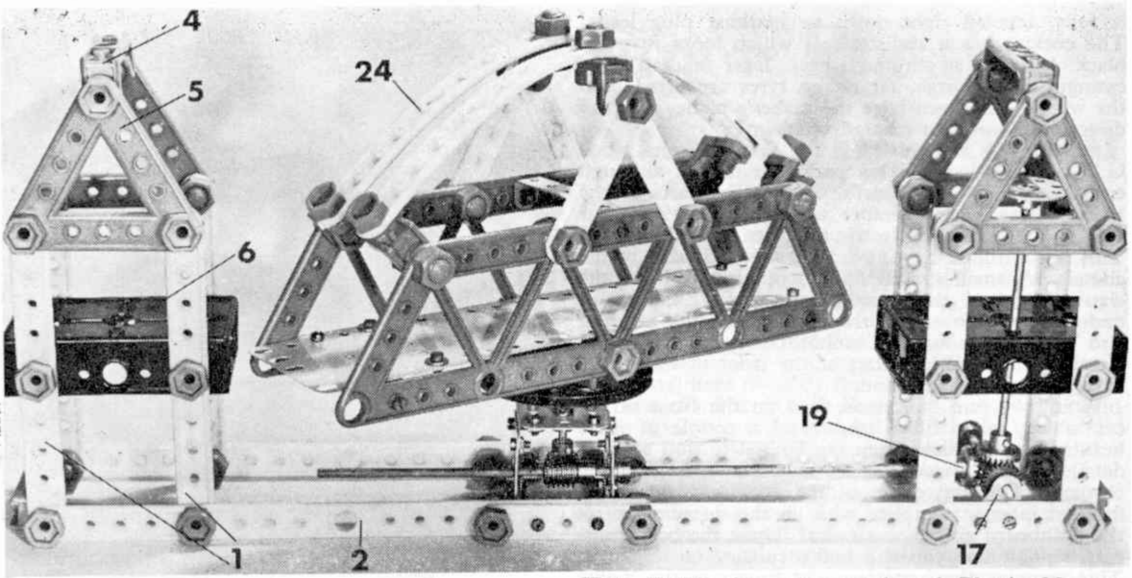
At right, top to bottom. Firstly, the complete Tamiya 1/25th scale Chieftain tank, a real beauty this one, but rather involved. The next photo, a rear close-up discloses the hawser, towing hook and finely moulded details on this kit. A top view next, with the hatch open, we painted the gun barrel for greater realism, but otherwise the model is right out of the box. The track system is very clever as each link is assembled separately and a rubber grip cemented on. This gives fantastic traction, and it climbs over quite large obstacles, not the sprung bogies. Next, the Jagd Panther, also by Tamiya in 1/25th scale, again very detailed with intricate tracks as the front view shows.





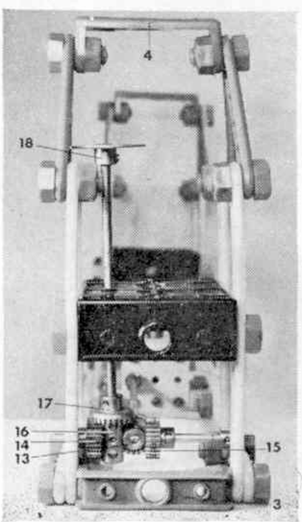






SWING... ...AROUND

...with this operating Swing Bridge built from a well-chosen combination of standard and Plastic Meccano Parts



Heading photo. Built with a combination of standard and Plastic Meccano, this model Swing Bridge illustrates how standard Meccano can be used to give realistic movement to a predominately Plastic model. At left, an end view of the control tower showing the main operating mechanism.

BY THIS time, the metal and Plastic Meccano models we have featured in the M.M. since January have proved to everybody's satisfaction that parts in both systems can be used together to good advantage in no end of cases. The combination models presented so far, however, have really only just scratched the surface of the situation. Generally speaking, we have used a mixture of parts simply to improve the appearance of a model—rarely have we used them to give realistic movement to a model that would otherwise be either static or, at best, unwieldy in working trim. The fact is, however, that a mixture of parts can result in realistic movement although I must admit the "service" is a little one-sided in that it is standard Meccano which can easily give movement to a Plastic model rather than the other way round. I think you will agree, that the model featured here bears out my argument.

It is, as is obvious from the illustrations, a Swing Bridge, the main structure of which is built predominately from Plastic Meccano. The actual bridging section does rotate—slowly, but easily—controlled by a wheel, built into one of the end towers. This controlling mechanism is produced entirely from standard Meccano parts and it is only by using standard parts that it has been possible to give motion to such a comparatively small (for Plastic Meccano) model. Thanks to the small size as well as variety of standard Gears, etc., a compact drive system has been produced and one that would have been impossible with Plastic Meccano.

Before the mechanism can be produced, the towers must be built. Each tower consists of four 3-hole Strips 1, bolted in pairs to two 5-hole Strips 2, the end securing Bolts also fixing a Double Angle Strip 3 between Strips 2. Another Double Angle Strip 4 is bolted to the apexes of two 2-hole Triangular Girders 5 which are in turn fixed to the tops of Strips 1. A Base 6 is fixed to the centre of Strips 1.

Strips 2 are now overlapped two large holes and are bolted together to form two 8-hole compound strips which are joined in the centre by two metal $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strips 7, secured by $\frac{1}{2}$ in. Bolts. Fixed to these Double Angle Strips are two $1\frac{1}{2} \times 1\frac{1}{2}$ in. Flat Plates 8, the centre securing Bolts also fixing a $1\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip 9 between Double Angle Strips 7. Attached by $1\frac{1}{2}$ in. Angle Girders to the top of Plates 8 is another $1\frac{1}{2} \times 1\frac{1}{2}$ in. Flat Plate which, along with Double Angle Strip 9, provides the bearings for a 2 in. Rod carrying a $\frac{1}{2}$ in. Pinion 10 and held in place by Collars. Mounted on the upper end of this Rod is a 3 in. Pulley 11.

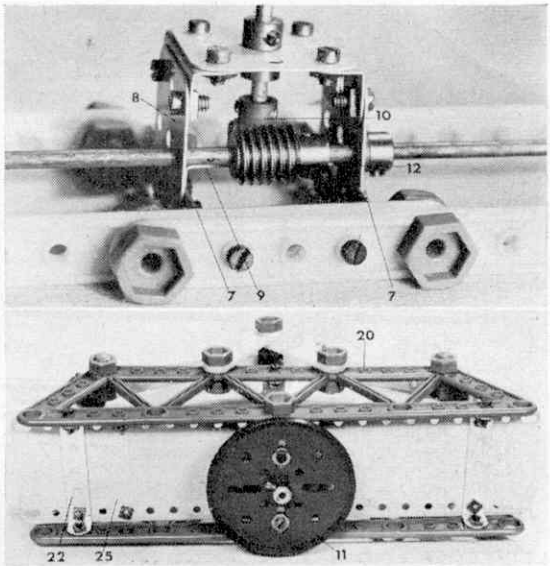
In mesh with Pinion 10 is a Worm 12 fixed on an $11\frac{1}{2}$ in. Rod held by a Collar in Flat Plates 8. One end of this Rod is journalled in the longitudinal bore of a Short Coupling 13 mounted, along with two $\frac{3}{4}$ in. Pinions 14 and 15, and an ordinary Coupling 16, on a $3\frac{1}{2}$ in. Rod held by Pinion 15 and a Collar in two 1 in. Corner Brackets 17 bolted one to each Strip 2. Note that Pinions 14 and 15 are fixed in place while Couplings 13 and 16 are loose on the Rod which, incidentally, passes through the central transverse smooth bore of Coupling 16.

Journalled in the longitudinal bore of this Coupling and in corresponding Base 6 is a 5 in. Rod carrying a $\frac{3}{4}$ in. Contrate Wheel 17 and an 8-hole Bush Wheel 18, the latter fixed on the upper end of the Rod. Contrate 17 meshes with Pinion 15, while Pinion 14 meshes with another $\frac{3}{4}$ in. Contrate 19 fixed on the $11\frac{1}{2}$ in. Rod as shown.

If all is correct then turning Bush Wheel 18 should cause Pulley 11 to revolve.

Having by this time completed the towers and controlling mechanism for the bridging section, all that remains to be built is the bridging section, itself. This consists of two plastic Bridge Girders 20, the lower edges of which are joined, in the centre, by a plastic Double Angle Strip 21 and, towards each end, by a metal $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip 22. Their upper edges are connected in the centre by a metal $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip. Fixed next to the upper edge of each Bridge Girder are two 2-hole Strips 23 which are bolted together at the top, the securing Bolt also fixing a plastic Angle Bracket in place. Two further Angle Brackets are bolted one to each upper corner of the Girder, then a 5-hole Strip 24 is curved and attached to the free lugs of all three Angle Brackets.

To finish, an $11 \times 2\frac{1}{2}$ in. compound strip plate 25 obtained from a $9\frac{1}{2} \times 2\frac{1}{2}$ in. Strip Plate and a $2\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plate, is bolted to Double Angle Strip 22. The complete assembly is then fixed to 3 in. Pulley 11 by $\frac{1}{2}$ in. Bolts secured to plastic Double Angle Strip 21.



Above, top, a close-up view of the central Worm and Pinion mechanism which actuates the swinging movement of the bridge span. Next, an underside view of the bridge span as it appears when removed from the rest of the model. Below, this general view of the model shows the bridge span in the closed position to allow road traffic to pass over it.

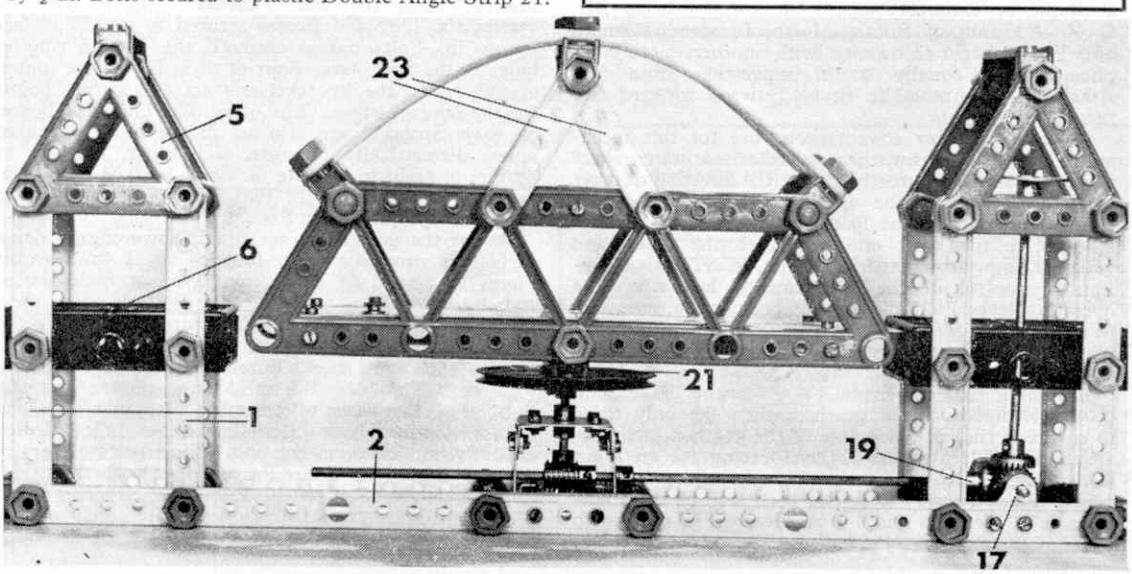
PARTS REQUIRED

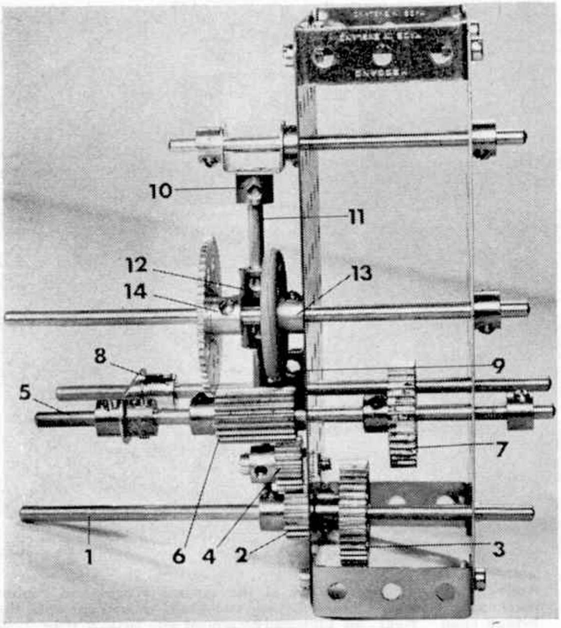
Plastic Meccano

4—2 hole Strips	2—Bridge Girders
8—3 hole Strips	4—2 hole Triangular Girders
6—5 hole Strips	2—Bases
6—Angle Brackets	50—Bolts
5—Double Angle Strips	44—Nuts

Standard Meccano

2—9f	1—24	18—37b	1—63
1—13a	2—25	7—38	1—63d
1—15	1—26	2—38d	3—74
1—16	2—29	1—48	2—111a
1—17	1—32	5—48a	14—111c
1—19b	34—37a	5—59	2—133a
			1—190





Above, Fig. 1. An automatic brake which comes into operation between forward and reverse movements of a central mechanism. The designer is L. R. Atkinson of Putney Heath, London.

AMONG THE MODEL BUILDERS

with Spanner

LAST MONTH, in a special article dedicated to simplicity in Meccano model-building, I featured a couple of extremely useful ideas supplied by Mr. L. R. Atkinson of Putney Heath, London. I would now like to begin this article with another, more complicated, but equally useful suggestion from Mr. Atkinson—an Automatic Brake between forward and reverse movements.

Perhaps the most advantageous use for this mechanism is in a model such as a motorised crane where it is necessary to constantly reverse the direction of drive of at least one of the operating movements. In a crane, for example, the load winding drum is forever required to turn first one way, then the other, and you will know from experience that, in certain circumstances, control of the load can be lost when the operating lever is in the neutral position between forward and reverse. Mr. Atkinson's mechanism completely overcomes the problem by automatically braking the important shaft.

Assuming that the model to which the brake is to be fitted already has a gearbox, then the only thing to ensure is that one sideplate of the gearbox incorporates a Flat Plate to act as one bearing for an input Rod 1 (fig. 1), to which the drive from the motor is taken. Fixed on this Rod, one each side of the Plate, are a ½ in. Pinion 2 and a 1 in. Gear 3. In mesh with Pinion 2 is an "idler" ½ in. Pinion 4 loose on a Bolt fixed in the Plate. Another Rod 5, free to slide in its bearings, carries a ½ × ¾ in. Pinion 6 on one side of the Plate and a second 1 in. Gear 7 on its other side. Movement of the Rod should bring either Gears 3 and 7 or Pinions 4 and 6 into mesh. The neutral space should be as small as possible. Held between Collars on Rod 5 is a Crank 8, the boss of which is fixed on a sliding control Rod also journalled in the gearbox sideplate and carrying a Coupling 9, as shown.

Yet another Rod, on which a Large Fork Piece 10 is firmly held by Collars, is mounted in the sideplates. Fixed in the boss of this Fork Piece is a further Rod 11 on which a Short Coupling 12 is secured, a suitable Dinky Toy tyre being wedged onto this Coupling. The output shaft which, in the case of a crane, would be connected to a winding drum, consists of a final Rod carrying a 1 in. Pulley with Rubber Ring 13 and a 57-teeth Gear 14, the latter in constant mesh with Pinion 6.

When the control Rod is moved laterally, Rod 11 is forced to slide up and over Coupling 9. As this happens, the tyre on Short Coupling 12, if it is correctly positioned, should bind on Rubber Ring 13. The parts, incidentally, should be so adjusted that Rod 11 is at its maximum height at the mid-point of disengagement of the Pinions and 1 in. Gears.

The final word on this mechanism comes from Mr. Atkinson who writes, "For maximum braking effect, the pull (of load or jib) on the output shaft should be so arranged that it tends to turn Pulley with Rubber Ring 13 in a clockwise direction when looking at the Pulley face.

Epicyclic winding drum

As already explained, the above mechanism is ideal for controlling a crane's winding gear and, strangely enough, the next offering is also concerned with winding gear although not specifically for a crane. It is a Heavy Duty Epicyclic Winding Drum designed by B. N. Love of Hall Green, Birmingham as an improvement on the original winding drum fitted to a famous Grandfather Clock produced before the last war and is suitable for inclusion in any weight-driven mechanism requiring a rugged winding drum.

Two 3 in. Sprocket Wheels 1 (figs 2 and 3), bosses inward, form the end "checks". Each Sprocket carries six Threaded Bosses secured to its inside face by $\frac{7}{32}$ in. Bolts passed through the outside ring of holes in the Sprockets. Four of these Bosses are spaced at 90° round the Sprocket and act as securing points for the drum surface. The other two Threaded Bosses on each Sprocket are also set in the outside ring of holes, diametrically opposite each other, and act as bearers to assist in keeping the drum surface cylindrical in form. This leaves the remaining two holes free to carry the epicyclic gear Rods.

Before the gear Rods are fitted, however, the drum surface is produced from four 2½ × 2½ in. Flexible Plates 2, curved to shape, overlayed at their slotted ends by four 2½ in. Strips 3. The Bolts securing these Strips and thus the curved Plates, are screwed into the transverse bores of the four Threaded Bosses set at 90° in each end cheek, but note that the remaining "bearer" Threaded Bosses do not receive securing Bolts. It is important to remember, also, that Threaded Bosses do not have their transverse holes drilled centrally, but closer to one end. When bolting them to the end cheeks, they must be arranged with the transverse holes *furthest away* from the Sprocket face. When assembled, the drum must rotate freely on the central $6\frac{1}{2}$ in. Rod forming the winding spindle.

Next, the epicyclic gear ring is made up using a $3\frac{1}{2}$ in. diameter Gear Ring 4, Part No. 180, which is fixed to a $3\frac{1}{2}$ in. Gear Wheel 5. In the actual unit illustrated, Mr. Love drilled four additional $\frac{5}{32}$ in. holes in the Gear Wheel and bolted the Ring direct to the Gear with a Collar on the shank of each securing Bolt to serve as a spacer. As an alternative, however, he explains that, "For those constructors who prefer not to drill the large Gear Wheel or who have no facilities for so doing, it is a simple matter to turn the Gear Wheel with its boss outward and then to bolt suitable Strips across its face, stood off with Washers, to form spokes to which the Gear Ring may be bolted." Whichever method is used, it is most important that the bore in the boss of the Gear Wheel is exactly central in relation to the Gear Ring.

This combination gear ring must be free to revolve on the central winding spindle, but all other gears in the system are locked onto their respective shafts by Grub Screws.

At this stage the items usually referred to as "sun and planet" gears are added to the drum. A $\frac{3}{4}$ in. Pinion 6 serves as the sun wheel, while the orbiting planet wheels are 50-teeth Gears 7 fixed on $3\frac{1}{2}$ in. Rods journalled in the free outside holes in the end cheeks. Mounted on the other end of each Rod is a $\frac{1}{2}$ in. Pinion 8 which meshes with the inner teeth of Gear Ring 4, when the latter is fixed in position. The drum is held in position on the central winding shaft by Pinion 6 at one end and a Collar 9 at the other end, then the combination gear ring is spaced by Washers and held in place by a further Collar to ensure smooth engagement with Pinions 8.

Under working conditions, the complete Drum is mounted with its central shaft located in strong bearings made of double-thickness Strips or Plates. A Ratchet Wheel is fixed to the shaft and a winding Crank mounted on a convenient end. The large combination gear will be driving a small Pinion in the clock movement and will appear to be stationary as the Drum is wound. As the winding shaft is turned, the main Drum will be seen to revolve at one eleventh of the winding speed, due to the step-down arrangement of the epicyclic gearing and the balanced nature of the system ensures a very smooth wind up of the heavy clock weight attached by wire or nylon cord to the main Drum.

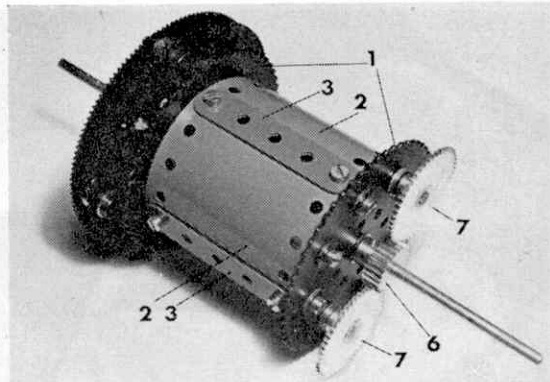
"This type of drum," writes Mr. Love, "Is known as a "maintaining drum" since the clock will continue to be driven while the weight is being wound—a great advantage of the epicyclic system. Since the principal sun and planet gears can quickly be altered, a wide range of gear ratios is obtainable without major changes to the construction."

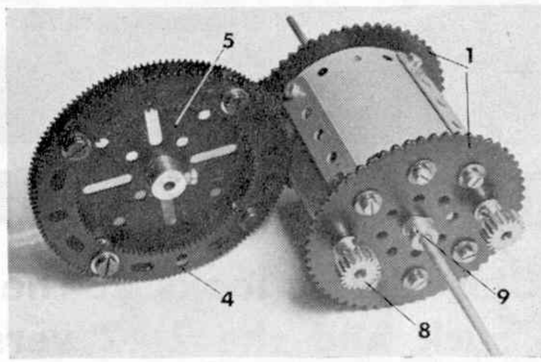
PARTS REQUIRED

4—5	1—25	1—27b	5—59
1—14	2—26	24—37b	16—64
2—16	2—27	26—38	2—95b
	1—180	4—190	4—147b

Small gantry trolley

Illustrated in figure 4 is a very interesting idea from Mr. A. Palmer of Flixton, Manchester, who also featured in last month's "simplicity" article. The diagram shows a trolley suitable for use with small Gantry Cranes, and is so self-explanatory as to require no written description. I need only explain that the gantry rails locate between the pairs of Collars on the ends of the 2 in. Rods, while the travel operating cords are attached to the Fishplates mounted on the Rods. Also, the $\frac{1}{2}$ in. Pulleys must turn freely on their $\frac{3}{4}$ in. Bolts and, of course, the space between the Collars in each above-mentioned pair should be sufficient to allow the trolley free movement on its rails without being so great that the trolley can slew about on the rails.



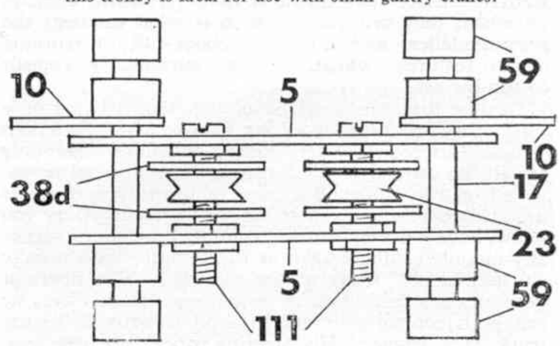


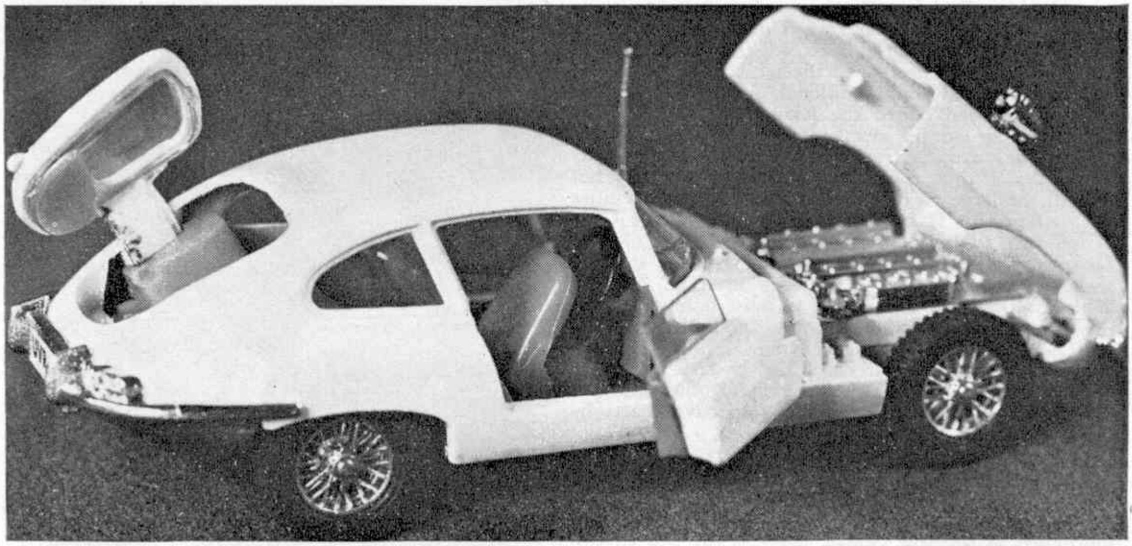
Above top, Fig. 2. A heavy-duty epicyclic winding drum for weight-driven clocks, designed and built by B. N. Love of Hall Green, Birmingham. Next, Fig. 3. Another view of the winding drum showing the built-up epicyclic gear ring removed from the central winding shaft.

PARTS REQUIRED

2—5	2—17	6—37a	2—111
2—10	2—23	8—59	

Below, Fig. 4. Designed by A. Palmer of Flixton, Manchester, this trolley is ideal for use with small gantry cranes.





TWO OF THE BEST FROM DINKY

Chris Jelley looks at the new Dinky Toy Fork Lift Truck and the 2 + 2 version of the E-type Jaguar

"PLAY-VALUE" IS undoubtedly one of the most frequently-used phrases in the toy-making industry. It is not a phrase that I personally like very much, but, nonetheless, it is perfectly correct English and, when used with another phrase it is certainly highly descriptive. Take the expression "packed with play-value", for example, and you not only have a phrase that tells a prospective toy-purchaser a great deal about his buy, you also have the perfect description for the two latest Dinky Toys to be released by Meccano at the time of writing! The models in question?—No. 404 Conveyancer Fork Lift Truck and No. 131 Jaguar E-type, 2 + 2.

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

Dealing first with model No. 404, this is based on a Fork Lift Truck produced by Conveyancer Fork Lift Trucks Limited of Warrington, Lancashire. Not only are all the general visual features of the original reproduced on the model, but most of its *working* features are also represented. Typical fork lift trucks, as you know, have a lifting "fork" running on a set of vertically-mounted rails, known as the "mast" and usually situated at the front of the vehicle. The operator generally sits behind these in a "cab" from where he can both control the fork lift and actually drive the truck as a whole. His steering wheel, by the way, almost invariably acts on the small rear wheels of the vehicle as front-wheel steering would cause problems because of the proximity of the front wheels to the lifting equipment. The Dinky has steerable rear wheels controlled by a steering wheel in the cab, and it also has a working fork lift at the front of the model. The latter, however, is not controlled from the cab (that would be asking too much!), but by a little removable crank handle that slots into a hole in the right-hand side of the body. In addition, the Dinky has an over-alled "operator" sitting on a small black seat just behind the steering wheel. He can be removed, if desired, as can be a large tubular guard which covers the entire body of the model, including the driver. You can imagine that, in a real truck, this guard would be a very useful thing to have—particularly if high loads of boxes or crates were to be lifted!

Interesting features do not finish with the guard. The complete panel on which the driver's seat is mounted hinges forward to reveal a very well-detailed imitation of the enormous engine used to power the full-size truck. This panel is held in the closed position by a rather interesting method. Protruding from the body casting, immediately to the right of the panel, is the exhaust pipe, the base of which has a small wedge-shaped piece built into it. This wedge lies over the very edge of the panel sufficiently far to hold the panel in place while not being so far that it prevents the panel from being opened. In other words, it acts as a slip-over catch.

Finish of the Dinky is in the correct Conveyancer colours of two-tone red and yellow with the steering wheel, seat, exhaust pipe, lifting fork and mast top in black. The identification "Conveyancer" beneath a

At left, the new Dinky 2+2 E-Type Jaguar. Look at all those operating features! At right, the new Conveyance Fork Lift Truck in both guises. The top picture has the lifting pallet in position and the next the overhead tubular guard, which covers the model's entire body.

red star is transferred down the side of each guide rail, while the same identification written in white flowing script appears on the left-hand side of the body. In addition the code CG4 appears on both sides of the body towards the rear. All in all, this model makes an excellent buy, particularly as it is sold complete with a special load pallet, correctly shaped to receive the lifting forks of the truck.

The above-mentioned star on the guide-rails is of particular significance as, in real life, the full-scale CG4 is the first of a new series of handling equipment, known as the Conveyancer "Starline" series, which is being produced this year to celebrate Conveyancer's 21st year of production. The new range was actually demonstrated for the first time at the Mechanical Handling Exhibition held at Earls Court, London in May, and you will see from the fact that both the actual vehicle and the Dinky Toy appeared at the same time, that this is another case of the manufacture of full-size equipment giving every co-operation to Meccano Limited, for which Meccano are deeply grateful.

In real-life, the CG4 is capable of lifting loads up to 4,000 lb. in weight and is powered by either a Ford Diesel 2506E engine or a Ford Petrol 2505E engine, as required. The diesel unit develops 55 B.H.P. at 2,500 r.p.m. while the petrol unit is slightly more powerful, developing 57.5 B.H.P. at 2,500 r.p.m. Transmission in both cases is via a 2-forward and 2-reverse speed gearbox, which allows the truck a laden travelling speed of 13.8 m.p.h. forward and 13.25 m.p.h. in reverse. Power steering is fitted as standard.

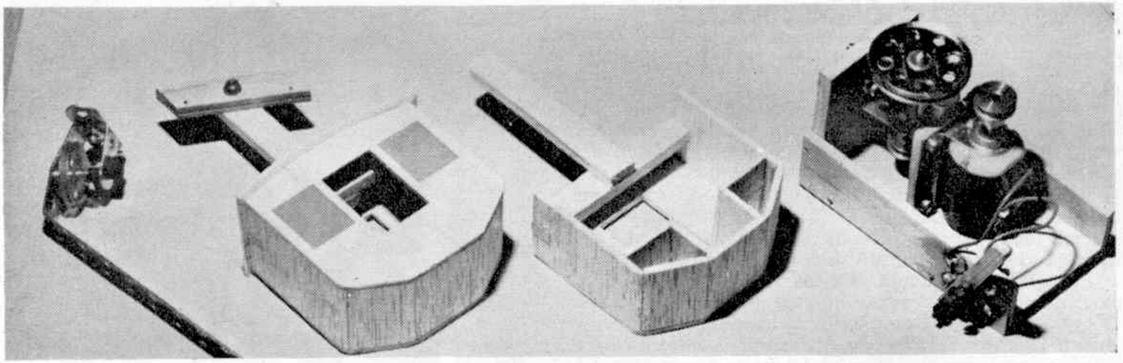
Sleek sports model

Turning, now, to the E-type Jaguar, we go from one extreme to the other. Whereas the Fork Lift Truck has a forward speed of 13.8 m.p.h., the Jag. will travel at something in excess of 140 m.p.h! Before looking at the real car, however, I would like to describe the Dinky Toy which really *is* something to kook at. Capturing all the sleek, high-speed lines of the original, the model is packed with features including opening side doors, 4-wheel suspension, windows, seats, steering wheel and gear-change lever. Complete instrumentation detail is built into the dashboard moulding, while the backs of the front seats tip forward to allow access to the rear of the car. Also opening, in addition to the side doors, are a larger door in the rear of the fastback, giving access to a luggage space behind the rear seat, and the bonnet. Actually it is hardly correct to refer to the "bonnet," as the entire front section of the body, including the wings, hinges forward as a single unit to reveal a large and detailed engine casting. Other features present include spoked wheels, "glass" headlamps, streamlined racing-type plated wing mirrors, radio aerial, also plated, and number plates. Although seemingly unimportant things, the number plates, in actual fact, are brand new, bang-up-to-the-minute items, being reproductions of the popular new-style plates—black lettering on a white background at the front and black lettering on a deep yellow background at the rear. General colour finish is in an off-white hard gloss with gold base and red interior.

We just have space left to take a quick look at the full-size car—something we must do in view of the prototype! The E-type Jaguar, as you know, is one of the most powerful production sports cars in existence to-day. Both the drop-head and hard-top 2-seater versions of the car have been made for some time now, but the 2 + 2 with four seats, is a very much more recent addition to the range. Officially titled "2 + 2 fixed head coupe", it is powered by a 6-cylinder in-line engine of 4,235 c.c. capacity that develops a maximum gross output of 265 B.H.P. at 5,400 r.p.m. Transmission to the rear wheels is either via a 4-speed and reverse, all-synchromesh manual gearbox, or via a Borg Warner 3-ratio automatic unit, the latter available only for the 2 + 2 and not for the 2-seater versions.

Whichever way you look at it, the 2+2 is an extremely attractive and almost frighteningly fast motor car. It's only a pity that full use cannot be made of its performance on Britain's roads.

The real thing; a sleek 2+2 E-Type Jaguar, capable of no less than 140 m.p.h. It is powered by a 6 cylinder 4,235cc engine developing 265 b.h.p. at 5,400 r.p.m.



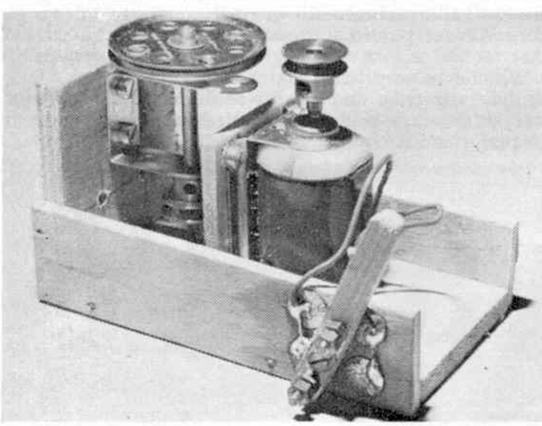
YOUR FULL SIZE PLANS!

A COMPLETE WORKING CABLE CAR SYSTEM

Above, the component parts of the cable car, with one car having a side removed to show the internal construction. Note the different motor fixing and the use of Meccano strip, the plans show alloy strip instead of Meccano if you don't want to bend your parts.

THIS IS a model of a complete cable car system which can be erected on a permanent or semi-permanent basis. That is to say the cable run and upper 'winch house' are both normally left in position once installed, although the cable cars themselves can be removed, if preferred. A typical run can be from a bedroom window down to a post or tree at the bottom of the garden; or any other two points which can be traversed by an uninterrupted run of cable. The run can also be horizontal rather than inclined, if preferred. In fact, there is plenty of scope for using your imagination as to how and where the cable car system can be set up to suit the space available.

The cable system itself will be described first. All details are shown on the full size plan, but these do not necessarily have to be followed exactly. You could, for example, use a hand operated winch instead of a motor-driven system, although a powered system is much more satisfactory. You can also alter the details of the motor drive and switch control, if you wish, as long as the working features basically the same.



The upper winch house is constructed around a base of $\frac{1}{4}$ in. ply. A ply base 4 in. × 2 in. will be large enough to accommodate a suitable size of electric motor. A front panel, also in $\frac{1}{4}$ in. ply, is cut to a size of 2 in. × $1\frac{3}{4}$ in. and screwed to the end of the base with woodscrews. Two side pieces are then cut from $\frac{1}{8}$ in. ply to a size of $4\frac{1}{4}$ in. × 1 in. and again *screwed* in place, as shown.

A bracket is bent from 16 or 18 gauge metal strip about $\frac{1}{2}$ in. wide to carry the pulleys. This bracket should be bolted to the front ply piece. A large pulley (about $1\frac{1}{2}$ in. diameter) and a small pulley (about $\frac{1}{2}$ in. diameter) are then mounted on a common spindle, as shown. The motor is mounted vertically with a small pulley on its shaft, connected to the large pulley with a drive belt (e.g. a rubber band). These two pulleys must be in line.

At the same height as the bottom (small) pulley, drill two $\frac{1}{8}$ in. diameter holes through the front ply piece $\frac{3}{4}$ in. apart. These holes are bushed with $\frac{1}{2}$ in. lengths of plastic fuel tubing pushed in place. This completes the winch house apart from connecting up the motor and incorporating a switch in the wiring.

A suggested switching system is shown. A lever is cut from $\frac{1}{4}$ in. × $\frac{1}{8}$ in. hardwood. This is drilled to take a bolt to act as a pivot, and also two 6 BA screws A and B. A and B are roundhead screws, mounted with the heads on the inside. The mounting bolt is assembled with washers and a small spring, as shown in the plan view, so that the lever assembly is spring loaded to press against the side.

Contact points C, D, E and F are now fitted in position, as shown. These are simply large drawing pins, with the points passed through holes drilled in the ply side.

Wiring up is shown in a separate diagram. Drawing pins C and D are connected together with a short length of wire, which is then taken to one side of the electric motor. Drawing pins E and F are also connected together and this wire taken to the other side of the electric motor. Finally, wires attached to screws A and B on the lever are connected to the battery. With the lever in the vertical position the motor is switched off. Moving the lever one way then connects the motor to run in one direction. Moving the lever the other way makes the motor run in the opposite direction.

The bottom end of the cable system is, basically, a return pulley. A 1 in. diameter pulley will be suitable and this should be mounted in a bent metal strip carrier, as shown. This carrier is screwed to some strong point, such as a fence post. A guide must be fitted to the carrier. This can again be metal strip, or bent from wire, fitted by bolting to the carrier.

Now position the winch house in some suitable position, such as on a bedroom windowsill. This must also be firmly anchored in place, either by clamping or screwing. Make sure that it lines up properly with the bottom pulley, regardless of the length of run, and you are then ready to install the cables.

The 'cable' is a length of Dacron or prestretched terrylene line (the sort of non-metallic line used for control line models is excellent); or you can use fishing line or stout thread (but not nylon line which stretches too much). The cable is fitted as a continuous loop running round the bottom pulley, through the plastic tubes and taken *twice* round the small pulley. Stretch as tight as possible without overstraining the system, so that the two lines of cable run parallel to each other down to the bottom pulley. The knot to complete the loop of cable should come outside the ply front of the winch house. One of the cable cars should eventually be positioned over this knot.

The cable cars are constructed entirely from balsa. All parts required are shown full size. Assembly is quite straightforward, as shown in the detail sketches. They should be painted silver when completed, with the side windows painted on in black. Make two identical cable cars.

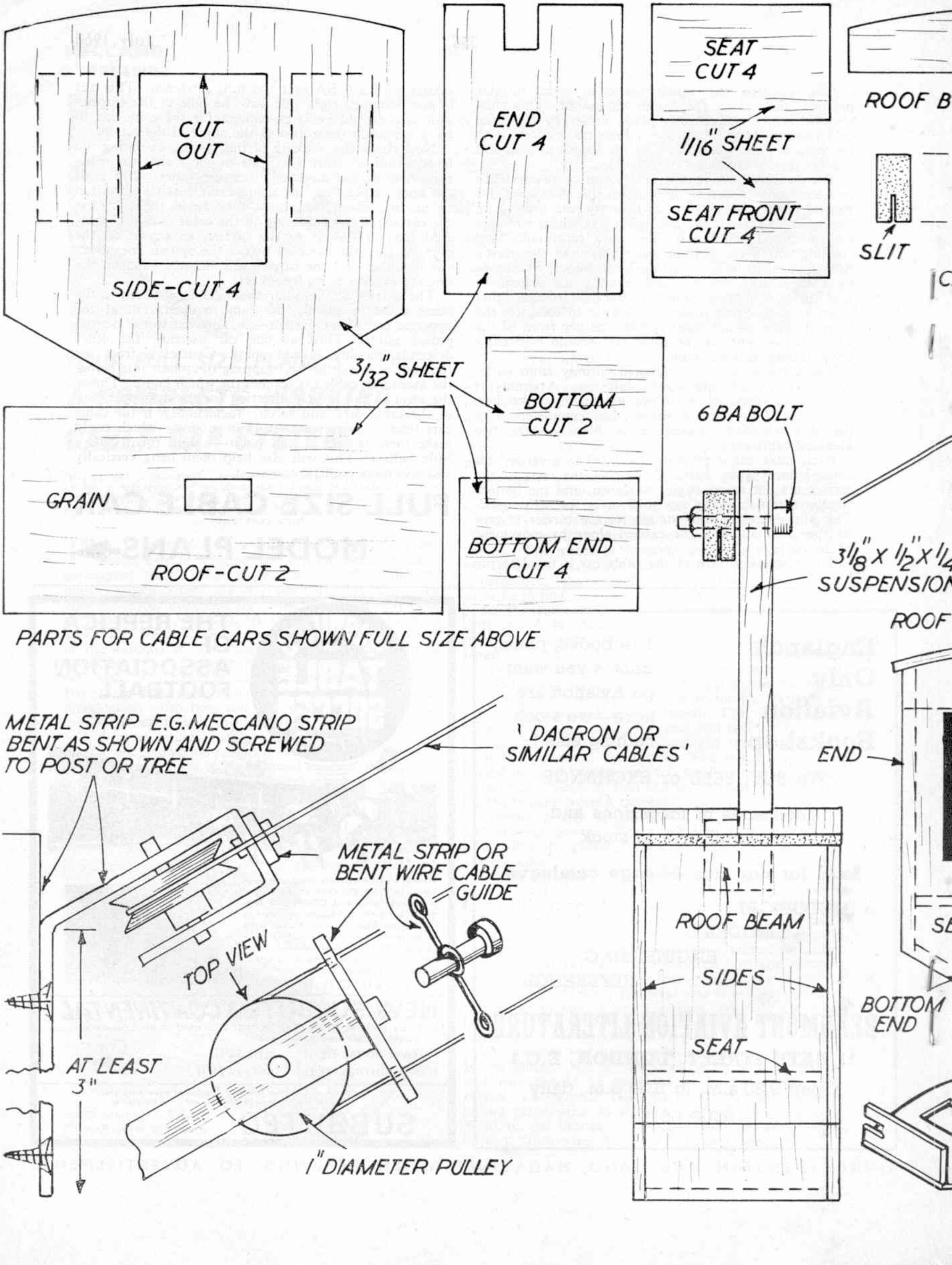
Each cable car is pivotally mounted to a carrier cut from $\frac{1}{2}$ in. × $\frac{1}{4}$ in. balsa. Note that the ends of the carrier are cut at an angle, as shown, and the bottom edge is slit with a fine saw to fit over the cable itself. This slit should be fine enough for the carrier to grip on the cable and thus be carried along by movement of the cable.

The suspension arm of the cable car is fitted to the carrier with a 6 BA bolt and nut, as shown. This nut is not tightened right up; also the hole in the suspension arm should be large enough for the cable car to hang vertically regardless of the angle of the carrier.

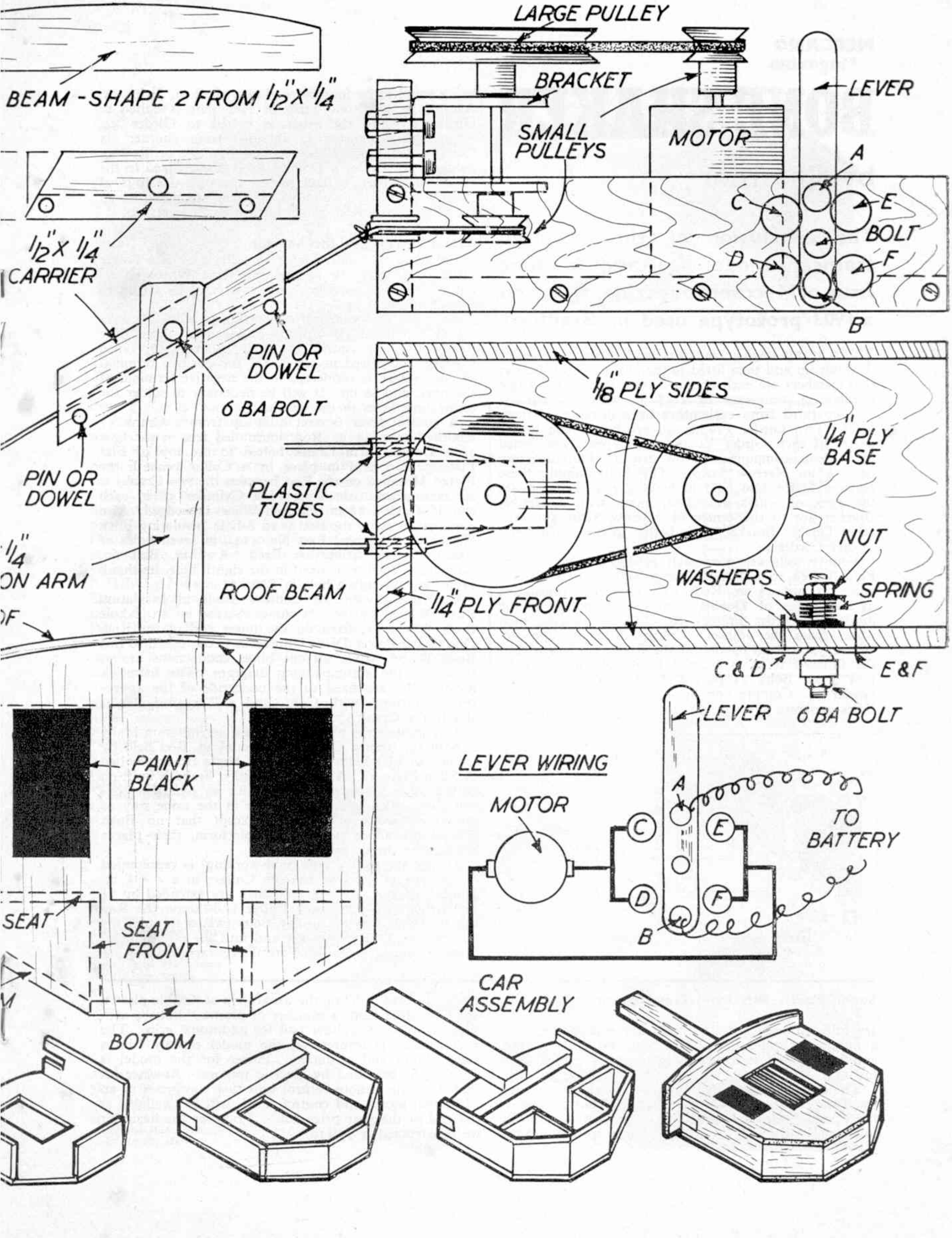
Now check the working of the system, operating the lever switch in both directions to check that the cable runs first in one direction, then the other. Run until the knot in the 'up' or rising cable reaches to within $1\frac{1}{2}$ in. to 2 in. of the plastic tube guide, then position the carrier of one cable car on the cable over this knot. Add pins or dowels to the carrier, as shown on the plan, to trap the cable so that if the system does over-run at either end the carrier will simply 'slip' on the line rather than being forced off.

The carrier of the other cable car is attached to the other cable in exactly the same manner, but at the opposite end of the system—i.e. adjacent to the bottom pulley guide. Thus as one car ascends, the other descends, passing at mid point. Control is from the top end, or winch house, stopping the motor just before the ascending cable car reaches the winch house. Throw the lever in the reverse direction for the next operation of the cable cars, and so on. Incidentally, if the cable cars tend to swing excessively in a wind—which could make them collide at mid point—weight them with a little ballast. This will also help them hang vertically and give more realistic operation.

FULL SIZE CABLE CAR MODEL PLANS→



PARTS FOR CABLE CARS SHOWN FULL SIZE ABOVE


BEAM - SHAPE 2 FROM 1/2" X 1/4"
1/2" X 1/4"
CARRIER
PIN OR DOWEL
6 BA BOLT
PIN OR DOWEL
PLASTIC TUBES
1/4"
ON ARM
ROOF BEAM
OF
PAINT BLACK
SEAT
SEAT FRONT
BOTTOM
LARGE PULLEY
BRACKET
SMALL PULLEYS
MOTOR
LEVER
A
C
E
BOLT
D
F
B
1/8" PLY SIDES
1/4" PLY BASE
NUT
WASHERS
SPRING
1/4" PLY FRONT
C & D
E & F
LEVER
6 BA BOLT
LEVER WIRING
MOTOR
A
C
E
D
F
B
TO BATTERY
CAR ASSEMBLY

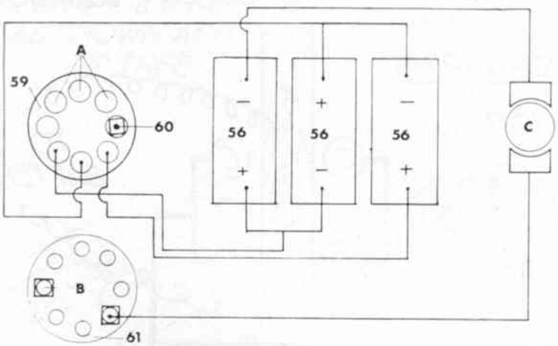
BONE SHAKER

by Spanner

The conclusion of the advanced tramcar model featured in June issue of Meccano Magazine. Based on a 1903 prototype used in Bradford.

IT IS at this stage in construction that the truck can be built up and then fitted to the chassis. Two similar side members are each obtained from two 7½ in. Angle Girders 44, connected by a 5½ in. Narrow Strip 45, but separated from each other by a distance of three holes. Two Girder Frames 46 are bolted one to the centre of each Girder 44 and their apexes are joined by a 9½ in. compound narrow strip 47, built up from two 5½ in. Narrow Strips. The Bolts joining these Narrow Strips also hold in place a Flat Trunion 48, the apex of which is bolted, along with a Double Bracket 49, to the centre of Narrow Strip 45. Another Double Bracket 50 is bolted to the outside end of each Girder 44.

Four wheels are now each produced from a Face Plate bolted to a Wheel Flange and are mounted in pairs on two 4½ in. Rods 51. These are journalled in the bosses of Double Arm Cranks bolted to the insides of Girder Frames 46, a Collar spacing each wheel from the adjacent Crank. A 2 in. Sprocket Wheel 52 is fixed on one of the Rods, as shown, then the finished truck is secured to Angle Girders 1 by four ¾ in. Bolts 53 passed one through each Angle Girder 44. Compression Springs on the shanks of the Bolts separate Girders 44 and 1, further separation being supplied by four pairs of curved 2½ in. Strips 54. As can be seen, one Strip in each pair is bolted to Girder 1 while the other is bolted to Girder 44. Additional suspension is obtained from another six Compression Springs each mounted on a 2 in. Rod 55 held in the boss of a Double Arm Crank (fixed to the inside of Girder 1) and passed through the lugs of Double Brackets 49 and 50. Collars are mounted on the ends of the Rods passing through Brackets 50.



Motor and control mechanism

Bolted to the underside of Flat Plate 27 is a Power Drive Unit carrying a ¾ in. Sprocket Wheel on its output shaft. This Sprocket is connected by Chain to Sprocket Wheel 52.

To make the tram self-supporting, a built-in power source for the P.D. Unit is provided by three Ever Ready 1839 or equivalent torch batteries 56, taped together and wired in series, i.e. the positive terminal of one battery is connected to the negative terminal of the next, and so on. It will be necessary to solder the connecting wires to the terminals.

A control lever is next built up from a Crank 57 mounted on a 5½ in. Rod, journalled free in the boss of a Double Arm Crank bolted to the top of Flat Plate 5, and held in place by a Collar beneath the Plate. Mounted on the Rod between the two Cranks is an arrangement consisting of a Cylinder 58 in each end of which a 1⅛ in. Flanged Wheel is wedged. Also mounted loose on the Rod is an 8-hole Insulating Bush Wheel 59 (Elektrikit Part No. 514), in seven holes of which Contact Studs are fixed. A ¾ in. Bolt 60, carrying a Washer, is fixed in the eighth hole, its shank projecting through a hole in Plate 5.

Connecting with the Contact Studs in Insulating Bush Wheel 59 is a Contact Screw in an 8-hole Bush Wheel 61, fixed on the lower end of the Rod. One of the Power Drive Unit leads is connected to this Bush Wheel, while all the other connections are as shown in the accompanying diagram. The batteries, incidentally, are fixed to the underside of the appropriate platform with Cord, and a Threaded Pin is attached to Crank 57.

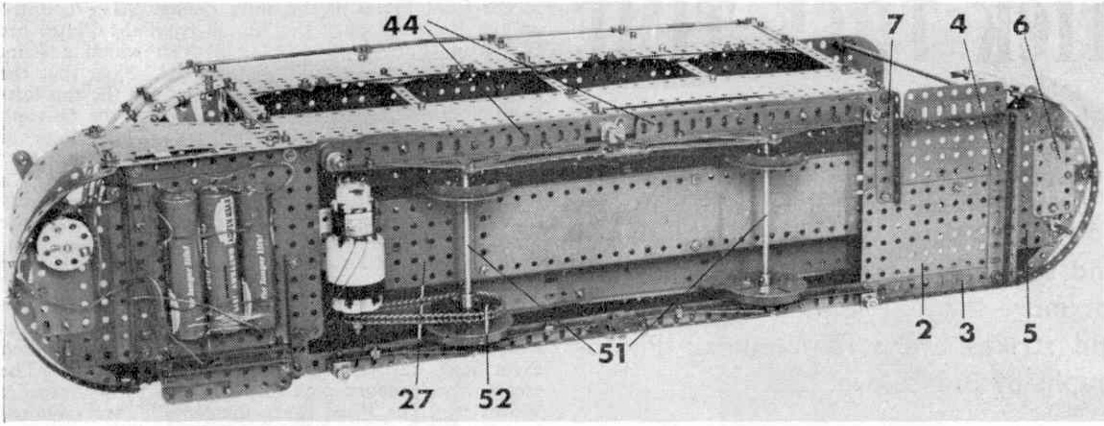
To complete the platform fittings, an imitation brake is built up from a Crank 62 on a 4½ in. Rod held by Collars in Flat Plate 5 and in an Angle Bracket bolted to Strip Plate 38. A similar imitation brake is built on to the other platform together with an *imitation* control lever. The latter is built up in the same way as the above working controller except that no Bush Wheels are added beneath the platform, their places being taken simply by a Collar.

Finally the trolley pole (non-working) is represented by an 11½ in. Rod 63 held by Collars in a 1 × ½ in. Double Bracket, the lugs of which are extended by 1½ in. Strips 64. The lower Collar is held on the Rod not by Grub Screws, but by Bolts passed through the lugs of the Double Bracket and into the tapped bores of the Collar. A Small Fork Piece carrying a ½ in.

Super Plastic Kits from Japan continued

are fully sprung, and the tracks are constructed from a number of small links. The basic kit costs 99/11d. and another kit is available including a control unit for 124/-.

The detail on the Chieftain 1/25th scale model tank by Tamiya is superb. Once again, construction is fairly straightforward, providing each step is carefully followed. All wheels are independently sprung and the tracks, instead of being the usual strip of flexible plastic, are fabricated from a number of plastic "links", each fitted with a soft rubber pad for additional grip. The performance is impressive, the model rapidly climbs steep slopes and obstacles. Power for the model is once again provided by electric motors. Another kit including the remote control unit that comprises of an additional motor and control panel, will be available at the end of the year price 126/-. Price for the basic kit we constructed is 99/11d.



loose Pulley is mounted on the top of the Rod.

The pole base consists of three Sleeve Pieces 65 wedged over two $\frac{1}{2}$ in. Pulleys with boss mounted on a $5\frac{1}{2}$ in. Rod, the Pulleys coinciding with the joints between the Sleeve Pieces. A $\frac{3}{4}$ in. Flanged Wheel 66 is clamped over the top Sleeve Piece, followed by a Collar, then the whole thing is fixed in the centre of the top deck by another Collar mounted on the Rod beneath the deck. The Bolts fixing Strips 64 to the Double Bracket are screwed into the tapped bores of yet another Collar 67 which is fixed to the top of the $5\frac{1}{2}$ in. Rod.

Held by Nuts in the end holes of Strips 64 is a 1 in. Screwed Rod 68 on which a Tension Spring 69 is mounted. The other end of this Spring is bolted to lower Sleeve Piece 65 to complete the model.

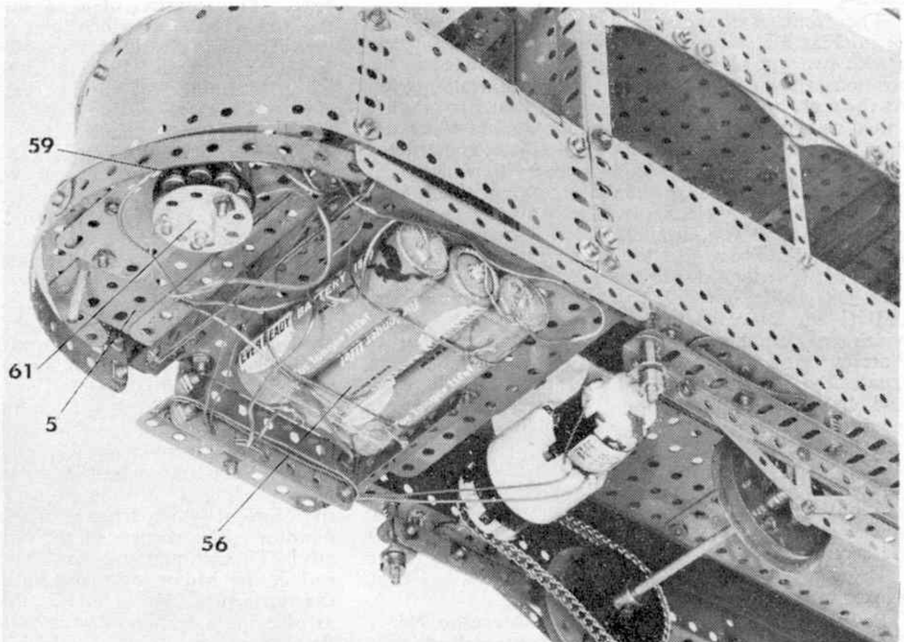
If required, a track can be built up from suitable Angle Girders, but the following parts list applies only to the model.

PARTS REQUIRED

6—1a	4—15a	2—74	2—179
4—1b	2—16a	4—89b	6—188
4—2a	6—17	16—90	18—189
24—3	4—20	1—94	4—191
8—5	1—20b	1—95	14—196
4—6	1—23	1—96a	1—197
20—6a	3—23a	6—103a	22—212a
8—7a	1—24	2—103d	4—213
4—8b	408—37a	2—103k	4—214
8—9	388—37e	4—109	2—216
10—9a	200—38	5—111	8—235
4—9b	1—43	1—111a	8—235a
6—11	27—48	4—111c	4—235d
1—11a	15—48a	4—113	12—235e
30—12	7—52a	4—115	
6—12b	4—53a	1—116a	1—514
6—12c	20—59	10—120b	7—544
6—13a	4—62	2—126a	1—543
2—14a	12—62b	4—137	4—561
7—15	3—70	3—163	
1 Power Drive Unit		3-3 V Batteries	

On opposite page, a wiring diagram showing the connections between the batteries, motor and controller Bush Wheels. A—Contact Studs; B—Contact Screws; C—Power Drive Unit.

Above, a complete underside view of the Tram showing construction of the driver's platform and drive from the motor to the truck.



At right, in this close-up view of the "business end" of the model, the layout of the batteries and controller Bush Wheels is clearly shown.

TICK TOCK TIME

Advanced modeller P. D. Briggs of Wollaton, Nottingham describes the construction of a magnificent clockwork-powered Mantel Clock he has designed and built. It keeps accurate time, runs for more than 30 hours on one winding and strikes every 15 minutes. Photographs by B. N. Love.

CLOCKS HAVE always held a particular fascination for me and, thinking back, it seems only natural that I should have combined this interest with my major hobby of Meccano model-building. I have not, of course, devoted all my modelling time to clocks, but over the years I have managed to produce quite a few workable time-pieces which, much to my delight, seemed to interest fellow Meccano hobbyists. I, myself, was particularly pleased with the 30-hour striking Mantel Clock featured in this article as it worked extremely well despite being built with comparatively few parts and with simplicity very much in mind. Although small in dimension, it includes several novel features that closely follow normal clock design, yet it is not difficult to make.

Casing

The front of the casing is built from three 4½ × 2½ in. Flat Plates 1 bolted to two 9½ in. Angle Girders 2 with two 3 × 1½ in. Flat Plates 3 being added in the positions shown so as to leave a central winding slot. At the rear, a further two 4½ × 2½ in. Flat Plates 4 are bolted as shown to two 9½ in. Angle Girders which are then fixed, along with Girders 2, to a base, constructed from 5½ in. and 3½ in. Angle Girders to which Flat Girders are bolted. Care should be taken with the base to ensure that the clock case does not rock on a flat surface. At the top, front Girders 2 are joined by a 4½ in. Angle Girder 5, while 2½ in. Flat Girders 6 are bolted between the side Girders.

A detachable hood is now produced from 5½ in. and 3½ in. Braced Girders bolted to Angle Girders which are themselves bolted to a 5½ in. × 3½ in. Flat Plate 7. Attached to the centre of this Plate is an ornate handle made from ½ in. Pulleys 8 held on a Rod by Handrail Couplings. These Couplings are mounted on short Rods, each of which is held in the boss of a Double Arm Crank bolted to the underside of Plate 7. A ½ in. Pulley with boss is fixed on each Rod above the Plate, then the completed hood is fixed into position by four ½ in. Bolts secured to the top of the case and onto which four Threaded Bosses 9 are screwed.

Motor and gearing

Power for the clock comes from a Meccano No. 1 Clockwork Motor mounted on 2 in. Screwed Rods held in the front Plates of the outer casing. Also mounted on the Rods to space the Motor from the Plates are two ½ in. Pulleys with boss, between which a ½ in. Pulley without boss 10 is sandwiched. Note that the inner ½ in. Pulley has been omitted from the top left-hand Screwed Rod to allow clearance for the 60-teeth Gear on the Motor output shaft. The Motor is attached to the rear of the case by four ¾ in. Bolts each carrying a ½ in. Pulley with boss to act as a spacer. Use of Pulleys in this way results in a very rigid mounting but lock-nutting would suffice in the absence of sufficient Pulleys.

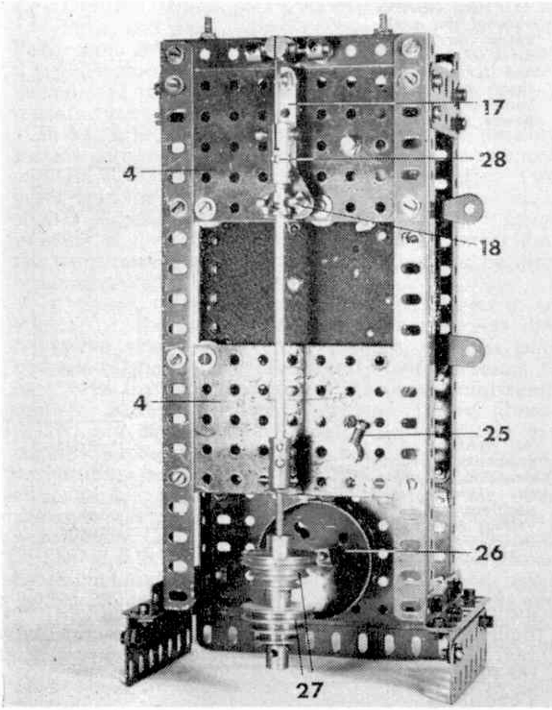
Fixed on the Motor output shaft is a 60-teeth Gear Wheel 11 which meshes with a 7/16 in. Pinion mounted above it on an Elektrikit 2 in. Pivot Rod. Fixed on this Rod in turn is another 60-teeth Gear which meshes with a second 7/16 in. Pinion on another 2 in. Elektrikit Pivot Rod 12 serving as the escapement rod. The escape wheel, mounted on this Rod, is a 1½ in. Sprocket Wheel 13. The Pivot Rods, incidentally, are mounted in the special recessed Elektrikit Pivot Bolts and it is the low friction bearings provided by this combination that is largely responsible for the long-running properties of the clock.

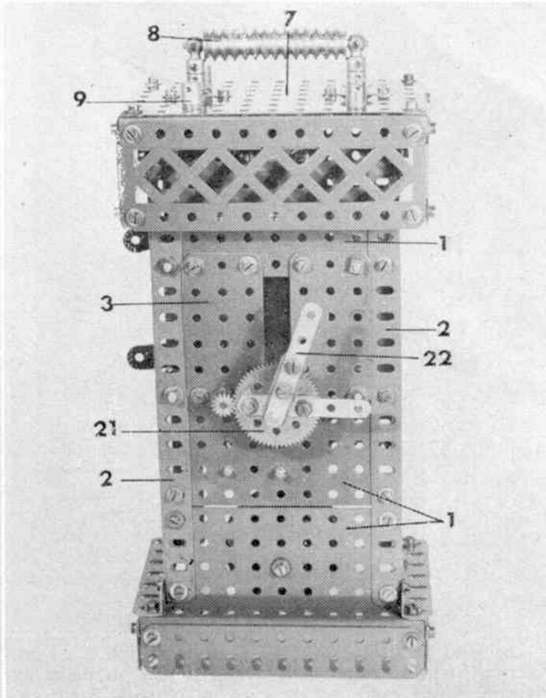
An "anchor" escapment is produced from a 1½ in. Corner Bracket 14, to the apex of which a Double Arm Crank is bolted through its elongated hole, the boss of the Crank coinciding with the vertical slotted hole of the Corner Bracket. Two Angle Brackets 15, at right-angles to each other, are bolted to the Corner Bracket to serve as the pallets and great care must be taken in setting these up as shown in the illustration. The finished unit is mounted on a 3½ in. Rod 16 journalled in the upper Flat Plates forming the front and back of the casing. The Rod is held in the boss of the Double Arm Crank and it will be appreciated that critical adjustment of the "anchor" height is made possible by the slotted hole in the centre of the Corner Bracket.

Mounted on the rear end of Rod 16, outside the casing, is a Rod Socket to which the crutch arm is fixed. This consists of a 2½ in. Narrow Strip 17 to the lower end of which a 1 in. Triangular Plate, carrying two Threaded Pins 18 as shown, is bolted. Note that extended bearings are given to Rod 16 by 1½ in. Strips bolted to the Plates in which the Rod is mounted.

The drive to the hands is taken from the mainspring gear wheel of the Clockwork Motor by means of a 57-teeth Gear 19 which meshes directly with it. This Gear is mounted on a 1½ in. Rod, one end of which is journalled in the rear casing Plate, the other end being journalled in a 2 in. Flat Girder bolted through its elongated holes to the sideplates of the Motor. This permits critical adjustment of Gear 19, to give accurate meshing. The drive continues to a ½ in. Pinion 20 mounted below Gear 19 on a 3 in. Rod that also carries a second, loose, 57-teeth Gear which is held by a Compression Spring against a 1 in. fixed Pulley, fitted with a Motor Tyre, also mounted on the Rod. This forms a slipping clutch for hand setting.

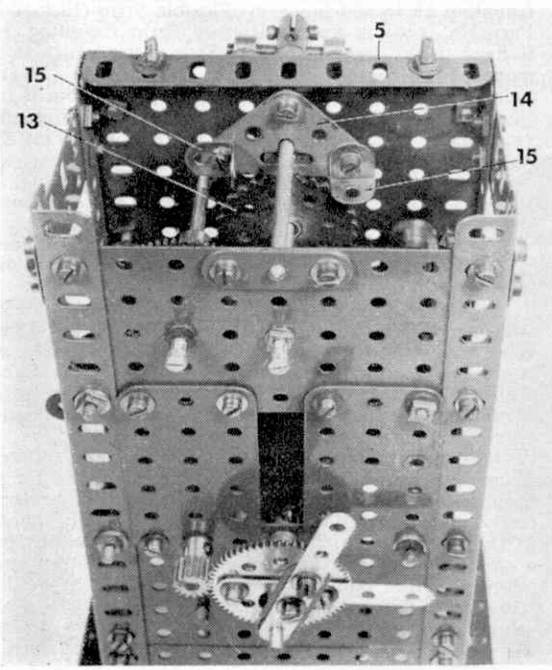
In the mesh with the "loose" gear is a further 57-teeth Gear mounted directly above it, this Gear also acting as the strike wheel, being mounted on the minute hand shaft and carrying in its face four ½ in. Bolts, the Nuts of which trip the striking lever every fifteen minutes. (The corners of the Nuts should be set radially.) The minute hand shaft, itself, is journalled at one end in the Motor sideplates and, at the other end, in the top centre hole of middle Plate 1 where it is held in place by a Collar. Fixed on the Rod just inside the Plate is a ½ in. Pinion, while loose on the outside end

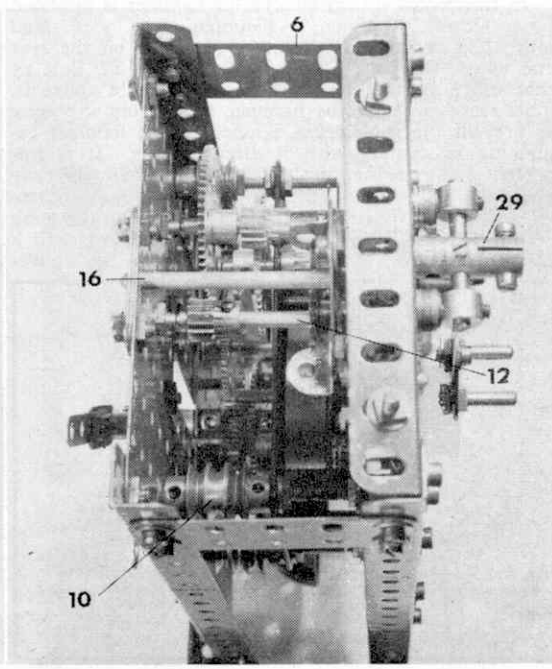


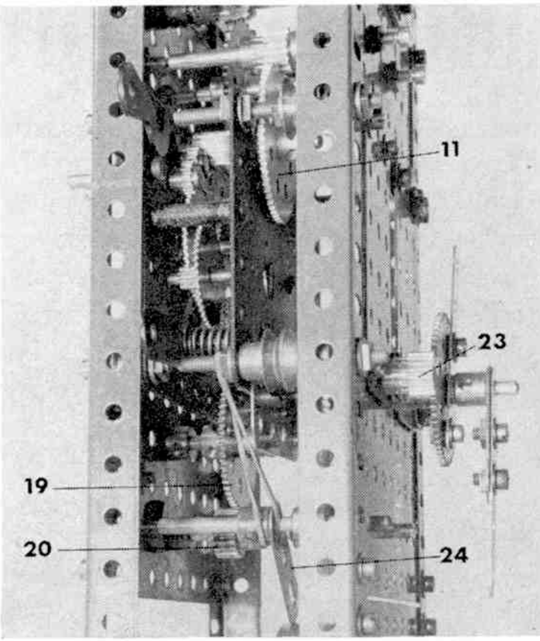


Above left, in this view of the Clock, construction of the pendulum is clearly shown. Below left, a close-up view of the Clock's escapement mechanism. The position of Angle Brackets 18 is critical.

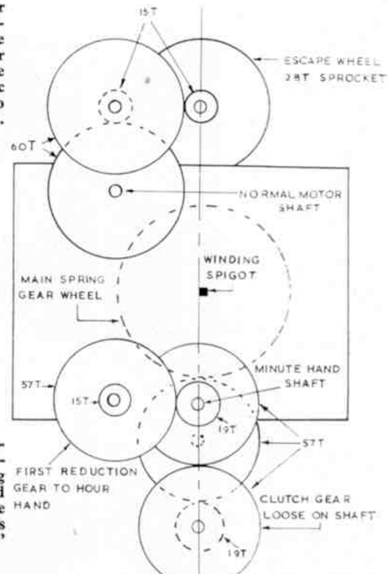
Above right, this superb Mantel Clock is powered by a No. 1 Clockwork Motor. One winding allows it to run for more than 30 hours. Below right, a top view with the upper section removed to show motor mounting.







At left, another view of the mechanism showing the drive to the striker and hands. Note that an elastic band is used to power the striker.



At right, a diagramatical representation showing the layout and positions of the various gear trains in P. D. Briggs' Mantel Clock.

of the Rod is a 60-teeth Gear 21 to which a 2½ in. Narrow Strip is bolted and which is held in place by a Crank, itself extended by a 2½ in. Narrow Strip 22. The ½ in. Pinion inside the Plate meshes with a 57-teeth Gear on another Rod also journalled in the Motor sideplates and Plate 1. A 7/16 in. Pinion 23 fixed on the outside end of this Rod meshes with Gear 21, to give the correct ratio between the minute and hour hands.

Strike mechanism

In this model the strike lever or hammer is provided by a Crank 24 which is mounted on a 3 in. Rod journalled in the casing plates. Mounted on the rear end of the Rod is a Collar fitted with a ½ in. Bolt 25 that bears against the bolthead in the hole above it. This serves to hold the hammer away from the gong to prevent the gong being damped by the hammer remaining in contact with it after striking. It is important however that it should hold the hammer only a fraction of a millimetre away from the gong otherwise it will prevent the hammer from striking the gong at all. The strike Rod carries a Collar fitted with a Long Threaded Pin which is tripped by the above-mentioned trip gear on the minute hand shaft. A Boiler End 26 acts as the gong, being mounted on a Bolt held by a Nut in lower Plate 1 and spaced from the Plate by a Collar.

PARTS REQUIRED

2—6a	82—37	2—103d
4—8a	41—37a	2—103f
2—9	64—38	1—103g
2—9a	1—52a	5—111
6—9b	5—53a	7—111c
4—12	13—59	2—115
1—15	2—62	1—115a
1—16	3—62b	1—120b
3—16b	2—63b	2—123
1—16a	1—63c	1—133
4—18a	5—64	2—136a
2—18b	2—73	1—142c
1—22	1—77	1—179
18—23	1—90c	3—235
13—23a	4—81	
2—26	1—95a	**Elektrikit Parts**
3—26c	4—97	1—530
4—27a	2—100	4—545
3—27d	1—103	2—549
	No. 1 Clockwork Motor	

Pendulum

Lastly the pendulum is built up from a 5 in. Rod, extended, via a Threaded Coupling, by a 3 in. Screwed Rod. The weight, or bob, consists of two Cone Pulleys 27 held on the Screwed Rod by a Threaded Boss which also enables them to be adjusted to the correct height. Mounted on the upper end of the 5 in. Rod is a Collar, which locates between Threaded Pins 18, and a Strip Coupling 28 to which a 2 in. Flexible Strip (Elektrikit Part No. 530) is fixed. Another Strip Coupling 29 is fixed to the top end of this Strip, after which it is mounted horizontally on a short Rod held in Collars bolted to the top of the casing, but spaced from it by Washers. Impulses to the pendulum, coming from the escapement crutch, are imparted by Threaded Pins 18 to the Collar mounted on the 5 in. Rod.

This completes the model but, before finishing, I should like to give the following general hints on construction :

(1) Before installing the Clockwork Motor, it should be lubricated, including the mainspring coils, to prevent sticking.

(2) Care must be taken in setting the recessed Elektrikit Pivot Bolts at both ends of the Pivot Rods. They must neither be too tight nor too sloppy and the Pivot Rods should spin freely for some time when fitted with a Gear Wheel. Aim for accurate alignment with minimum friction, the latter helped by moderate lubrication.

(3) The escapement is the heart of the clock and requires very careful adjustment for accurate and long-term working. It is essential that the pallets be correctly positioned and this should preferably be done, in the first instance, by making up the escapement on a simple jig so that the movement can be studied and adjusted before building it into the model. When the "anchor" is placed in the clock, the boss of the Crank should not be fully locked until it is adjusted so that the "tick" is even on both swings of the pendulum.

RUDOLF DIESEL was born of German parents, in Paris, and was educated at Augsburg and Munuch Polytechnic School. His first engineering interest was the development of refrigeration machinery, and when he returned to Paris he became manager of a firm of manufacturers in that field.

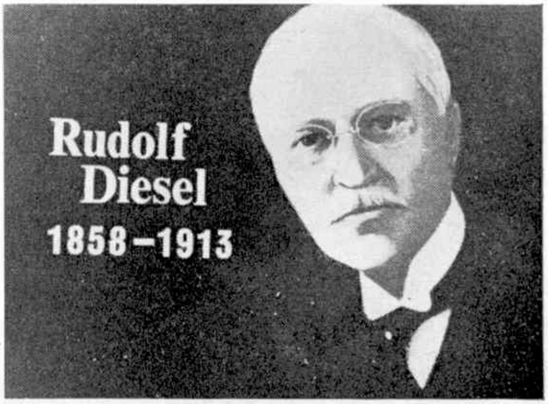
In 1890, he issued a paper on heat engines, possibly for his doctorate, and in the same year he commenced to build a 'Diesel' compression-ignition engine. Two years later he took out a British patent, based on a similar German patent of his, which stated: "Compressing in a cylinder pure air to such an extent that the temperature thereby is far higher than the burning or igniting point of the fuel used."

Of course, the conception of using fuel direct in an engine (i.e. the internal combustion engine), was certainly not new at that time. Huygens, with his gunpowder engine of the seventeenth century seems to have been the first innovator. Early in the nineteenth century, Barnett produced a pressure-charged atmospheric gas engine, and Reynolds described his gas engine/compressor in 1844. Ackroyd Stuart was experimenting independently of Diesel in England, and although his ideas were slightly different, the basic principle was the same. Other inventors in this sphere were Lenoir, Otto and Brayton—to mention only three.

The idea of the diesel engines may be understood by examining the operation of the old-style cigar lighter. This had a cylinder, closed at one end, and a piston inside. A piece of tinder was fixed to the end of the piston which was then quickly pushed into the cylinder. The air in the cylinder was thereby compressed and its temperature raised sufficiently to light the tinder.

By the end of the nineteenth century the steam engine (i.e. the external combustion engine), was widely used in industrial application, but the internal combustion engine had not made any considerable progress.

The first four-stroke and two-stroke compression engines were made to use a gas/air mixture, compressed in a cylinder and 'fired' electrically or by some other means. The first gas engines used towns' gas, but later came the gas-producer which was supplied with the engine. One of the earliest Kerosine engines was made about 1886 by the Priestman brothers. It was Rudolf



GREAT ENGINEERS No. 6.

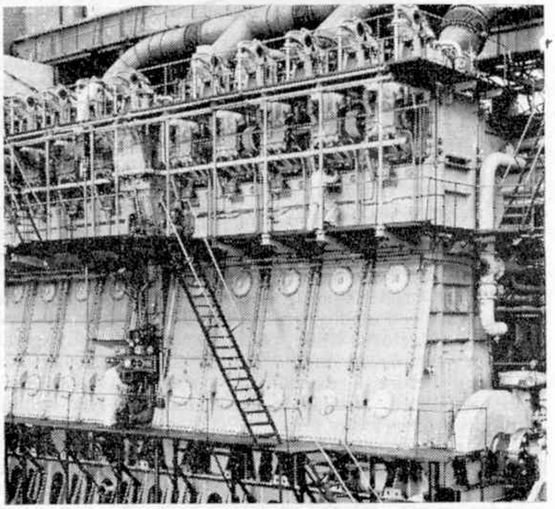
Diesel who successfully developed automatic ignition and cold starting.

Towards the end of the last century diesel engines were being made by Maschinenfabrik Augsburg-Nurnburg A.G. in Germany, by Sulzer Brothers in Switzerland, by Burmeister and Wain in Denmark, and by Mirrlees in England. They were all vertical stationary machines. About 1905, Sulzer's produced the first reversible diesel. By 1908 the Russians had powered two oil tankers, the 'Delo' and the 'Emmanuel Nobel' with diesel machinery; in 1910 diesels were adapted to underwater craft. Soon they were applied to electricity generation and pumping duties, and during the 1920's the diesel became air-borne for the first time in the history of British aviation. The craft was the R.101, the largest British lighter-than-air vessel.

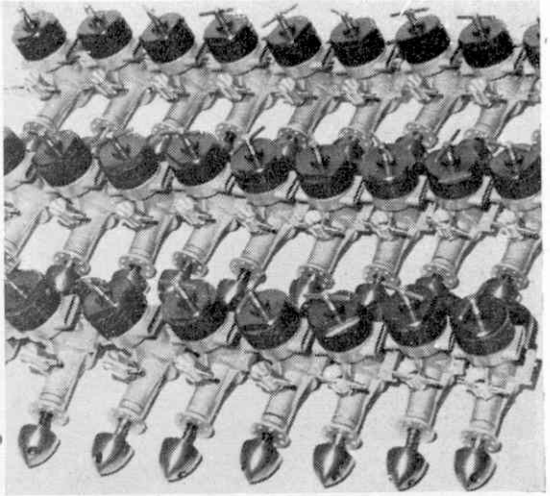
After the factory was built at Augsburg, Doctor Diesel spent the rest of his life there, experimenting, modifying and improving the diesel. In 1913 he published his book 'The Genesis of the Diesel Engine'.

1913 was also the year of his death, as he fell from the deck of the Antwerp-Harwich Mail Steamer during the night of September 29th-30th. So ended the life of one of the world's great engineers.

Below, a modern 10 cylinder poppet valve diesel engine for a large oil tanker, built by Harland and Wolff Ltd.



Below, an array of M.E. Snipe 1.5cc model diesel engines awaiting test at the Marown factory.



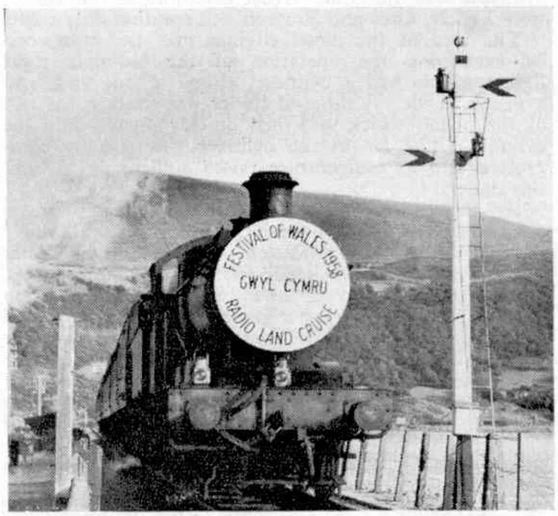
A.B.C. of MODEL RAILWAYS
SIGNALS

Above, the "Golden Arrow" passes under three Southern Railway upper quadrant arms. The left-hand arm is of corrugated construction, for strength. At right, an ex-Great Western Railway No. 2250 hauls a special train through Barmouth Junction. The signal is a "Fixed Distant". The arms are fixed to the post permanently in the "caution" position; the driver must be prepared to bring his train to a stop at the next "Home". Below, "The Broadsman", one-time Eastern region crack express, passes an interesting double-bracket signal which incorporates "calling-on" arms.

DURING A journey by rail, few people these days ever spare a thought for the highly complex signalling system which protects their train from disaster as it speeds along. The modern railway signal is a very reliable and complicated device which has developed over many years, and has made the railways of Britain among the safest in the world.

Signals do not concern the model railway enthusiast from a practical point of view, and most layouts have signals only as part of the "scenery". Nevertheless, they are a fascinating study in themselves, and in this article we intend to describe broadly the development of the semaphore type of signal; modern "colour light" types will be dealt with at a later date.

In the earliest days of railways, signals hardly existed at all. Trains were usually despatched from stations on the "time interval" system. This meant that after one train had departed, another was not allowed to follow it until a certain time had elapsed. The dangers which were inherent in this system of operation are painfully apparent; if the first train broke down out in the country, there was nothing whatever to stop the following train from colliding



with it from the rear. It must be admitted that accidents of this kind were not very frequent, even in those far-off days, but trains travelled comparatively slowly, and drivers could often pull up in time if they saw that the line ahead was blocked.

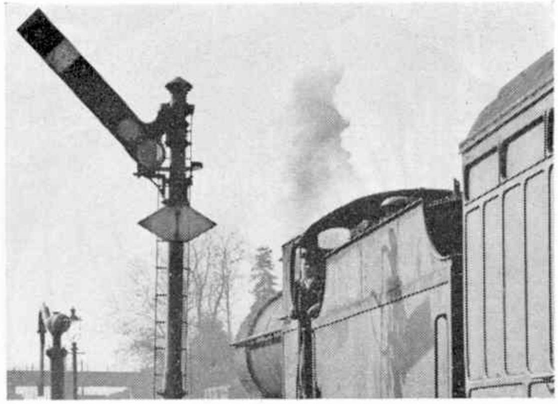
As locomotives developed, and the speeds of trains grew greater, the need of a proper signalling system soon asserted itself. The earliest signals were human beings, in the shape of railway "policemen". These gentlemen performed much the same duties as the present day policeman on point duty; they stood by the lineside at stations and junctions, and signalled the trains with red and green flags. This system proved fairly satisfactory while traffic was light, but great reliance was placed on the human element, and it was not long before a mechanical system of semaphores was introduced, similar in basic form to that which is familiar to us today.

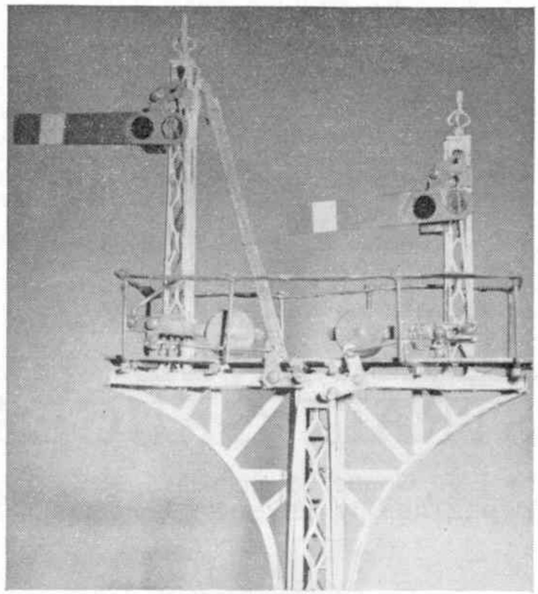
The earliest semaphore signals were arranged in a similar way to contemporary military "signalling posts". The arms of the signals were carried on high wooden posts, which sprouted from the top of a timber-built cabin, which provided shelter for the signalman. Standardisation of signalling between one railway and another was virtually non-existent; some lines used circular discs or large square boards on top of high posts, which presented their faces to the driver for the "danger" position, and rotated to an end-on aspect for "all clear". Others used a semaphore arm much like the ones we know today. This was often carried in a deep slot in the post itself: the "danger" position was indicated by the arm standing out at right-angles to the post, in the modern manner. At "all clear", the arm fell into the slot, and disappeared altogether, presenting the driver with a view of an unembellished post—a development of the old "no signal at all means all clear" philosophy. The slotted-post type of signal had one bad weakness, however. In severe winters, snow could easily block the slot in the post, and the arm was prevented from returning to the "all clear" position. Under these circumstances, the arm often hung at an ambiguous forty-five degrees, and drivers could very easily mis-read the signal, with disastrous results.

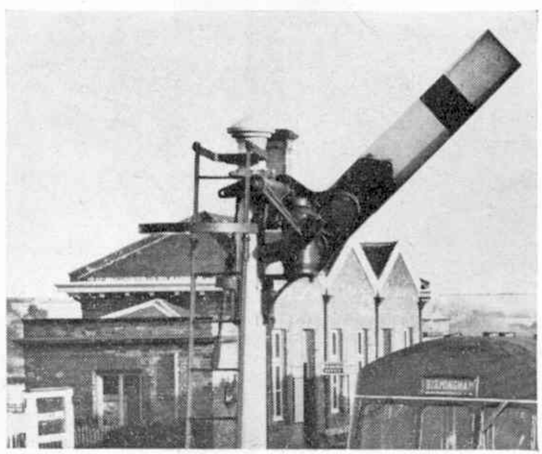
During the 1860's, the semaphore arm signal became firmly established as the standard type of railway signal. Almost all were of the "lower quadrant" type; that is, the arm in the horizontal position indicated "stop" and for the "all clear" position, it dropped to an angle of about 45 degrees. The back end of the arm, which carried the coloured glasses through which the oil lamp shined at night, was weighted so that the arm would return to the horizontal position if the controlling wires broke—a "fail safe" system, in fact. After the grouping of the railway companies in 1923, "upper quadrant" signals began to replace the older types. In this latter type, the signal arm is still in the horizontal position for "stop", but rises through 45 degrees for the "all clear" instead of falling. This made the "fail safe" action of the arm simpler and more fool proof, as it needed no weighting behind the fulcrum; the weight of the arm itself would return it to danger should the actuating wires break. The Great Western Railway never adopted the "upper quadrant" type of signal, and many of that company's very handsome "lower quadrant" semaphores can still be seen on the Western Region of British Rail to this day.

As trains began to travel faster, signalling became necessarily more complicated, and Distant signals were introduced. Most readers will be aware of the familiar yellow arm with the fishtail end and black stripe of this type of signal. Distants are placed in advance of ordinary, or "Home" signals, and give advanced warning of the indication given by the Home signal. A locomotive driver may pass a distant at "danger," but it only warns him to expect the next Home signal to be "on". "On" and "Off" in railwaymen's language mean "Stop" and "All Clear" respectively. Distant signals are rarely provided on a model railway layout, as space does not usually permit their inclusion.

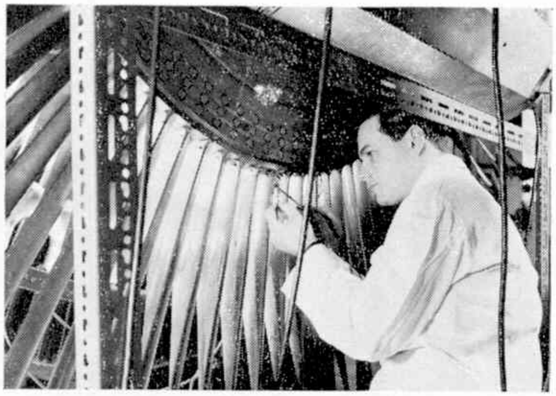
In a later article, we shall delve deeper into the workings of the railway signalling system, and discuss the manner in which stretches of line are divided into "blocks," how single lines are worked with safety, and the various systems of interlocking signals so that the signalman cannot make a mistake.

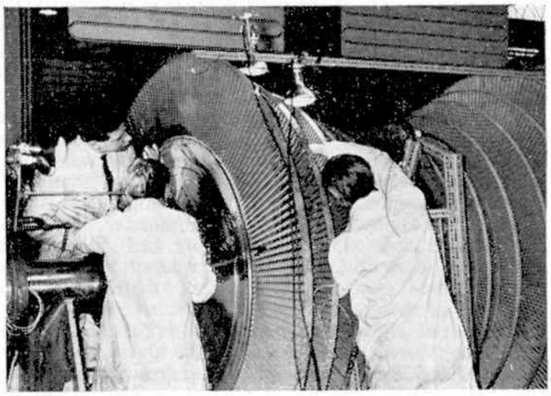






At right, top to bottom, an L.M.S. Class 4 0-6-0 gets the "Right Away" from Stamford Town station, back in 1956. The upper-quadrant signal is of standard L.M.S. design, with tubular steel post. Next, a double-bracket signal in model form, with lattice posts. Note the attractive openwork finials on top of each small post. Lastly, a close-up view of an L.M.S. style upper-quadrant arm.



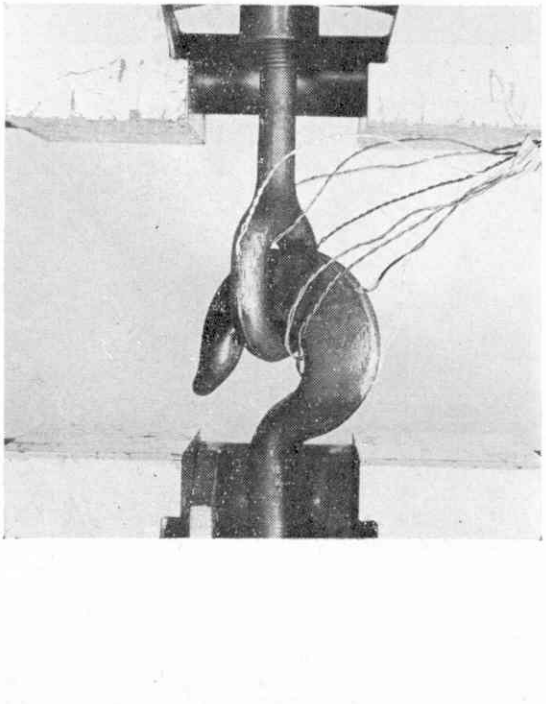


MECHANICAL ENGINEERS are interested not only in the overall performance of the machines they design, but also in the behaviour of the various components. For example, in a steam turbine (*see Fig. 1*) it is useful to know just how the turbine blades behave during use. Measuring this could be quite a problem as they run inside a thick metal casing in an atmosphere of high temperature and pressure steam; if this were not enough they spend their working lives being spun at 3,000 r.p.m. This problem was solved by using a device known as a bonded resistance strain gauge.

If a rubber strip is stretched by holding an end in

ELECTRICAL RESISTANCE STRAIN GAUGES

by J. A. Coutts, Mechanical Engineering Dept, The City University, London, E.C.1



each hand and pulling, it is easy to treble its length; in engineering terms the strain—that is the increase in length divided by the initial length—is now two. If a steel strip is given a similar pull, nothing *very obvious* happens, but it, too, will be strained, although only by a matter of a millionths. Even though you cannot see it, the strain gauge can sense it.

The principle of a strain gauge is very simple; one cements a zigzag mesh of wire to the top surface of a small size piece of paper and this comprises a gauge. The lower surface is now glued to the component under test, and as this is loaded, the strain is transmitted through the adhesive and the paper to the wire element whose resistance changes, and this can be measured very accurately. A diagram showing a typical layout can be found at the top of *Fig. 4*.

Nowadays several thousand different gauges are available commercially in this country; the smallest has a measuring element about 1/64th of an inch long, the largest several inches; prices start at four and sixpence but you can pay pounds for a specialised one. All are basically similar, comprising a wire or foil (from .0001 inches to .001 inches thick) mounted usually on a plastic or paper base; 120 ohms is the most common resistance value. *Fig. 2* shows several incorporating transparent bases, and these have been photographed to show the elements. One is really three gauges in one and is known as a rosette, for use when a piece of material is stretched in several directions. Another looks like a herring bone and its particular use is to measure the strain in shafts when they are being twisted.

Unfortunately, it is only possible to use a gauge once, as having bonded it to the component there is no way of removal without damaging it. It is also necessary to know exactly how a gauge responds to strain before it is of any use. This problem is solved by carefully controlled batch production. From each batch, gauges are selected and tested by the manufacturers, who quote " a gauge factor " which relates strain to resistance change; this factor being assumed to apply to all the other gauges in the batch.

To get good results, it is essential to install gauges with great care. First the component is prepared by rubbing with emery paper and is next cleaned with a suitable chemical before the gauge is fixed in position with adhesive. It is good practice to mount next to the gauge a pair of terminal tabs; the main leads are soldered to these and then linked by fine wire to the gauge itself. *Fig. 3* shows a complete installation in close up.

Unfortunately, these gauges are sensitive to temperature as well as strain, and when temperature variations occur during testing, corrections must be made to obtain accurate readers. This is easily done if the usual measuring circuit, the Wheatstone bridge, is used. *Fig. 4* shows a typical arrangement. R_1 is the measuring gauge which senses the strain and R_2 is identical and mounted on a similar piece of material gauge not subjected to strain. This dummy gauge is kept close to the measuring gauge so that both are at the same atmospheric temperature. R_3 and R_4 are two closely matched resistors and between them is a slide wire arrangement so that the ratio of resistance between A and D to that between D and B may be varied. A voltage is applied across AB and if the meter E which must be a very sensitive ammeter, and preferably a good galvanometer, shows no current flow then C and D are at the same potential and so $R_1/R_2 = R_3/R_4$.

If the resistance of the measuring gauge changes at all due to strain, the meter may be brought back to zero by adjusting the slide wire point at D, and hence R_1', the new gauge resistance, can be obtained by using the equation $R_1' = R_2 \times R_3'/R_4'$ where R_3' and R_4' are the overall values of R_3 and R_4 after the slide wire adjustment. However, if the resistance of the measuring gauge changes due to temperature then so will the resistance of the dummy and the meter reading will stay constant as R_1'/R_2' will equal R_1/R_2.

An alternative method of using the bridge is to dispense with the use of the slide wire during testing, having already used it to calibrate the meter reading in terms of resistance change before the test.

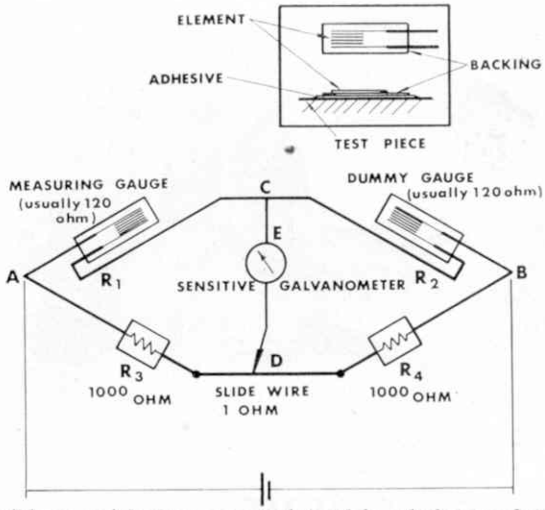
Commercially available strain gauge bridges often use an oscillator as a voltage source and the meter E is replaced by an amplifier. The amplifier output is then demodulated, that is the oscillator frequency is filtered out and the demodulated output is fed to a meter, a pen recorder or an oscilloscope.

It will be noticed that wires AC, BC and EC (in Fig. 4) may be quite long so strains can be measured from some distance away.

The picture of a crane hook (Fig. 5) under test provides an example of how strain gauges are useful in development work.

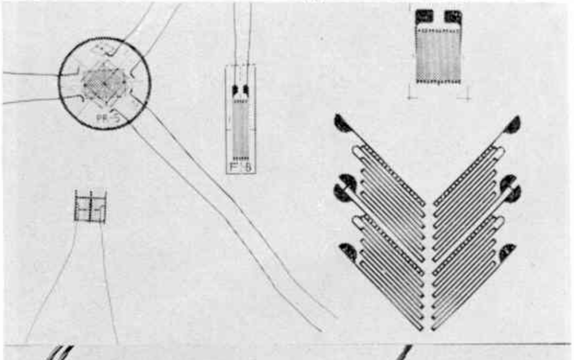
No doubt some applications have already suggested themselves to readers. Let's pose an off-beat problem and offer a possible solution. Let us say we wish to check the weight of a selection of common birds. One way would be to construct a light table of balsa wood, supported on its stand by a spring of low stiffness—a leaf spring arrangement would probably be best. The spring would be strain gauged and leads of some 30 feet length would be wired up. With the aid of a Wheatstone bridge circuit, a slide wire or meter could be calibrated in ounces by placing a series of pennies on the bird table. *Three pennies weigh one ounce.* Then with a suitable bait in place, the table would be set up in the garden and the operator could retire to the lounge to await visitors. Provided the birds come singly, or in very low numbers, and are not too energetic in their at-table behaviour, it should be possible to weigh them accurately and in relative comfort from the point of view of both the birds and the operator. (The use of an oscilloscope would give the landing loads when the birds touch down.)

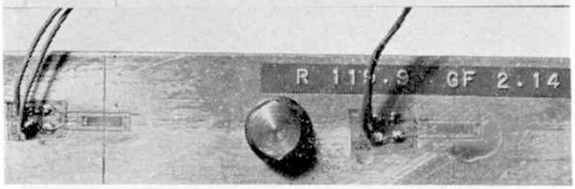
Opposite page, top left, Fig. 1. The low pressure rotor of a 30,000 kilowatt turbine for Meaford Power Station being prepared for testing. At right, centre, Fig 2. A selection of resistance strain gauges. The two on the left are wire, the others are foil. The one labelled F.8, has an element about one-third of an inch long. At right, bottom, Fig. 3. A close-up of a gauge installation. At right, top, Fig. 4. A diagram of the Wheatstone bridge network. A small insert shows a sketch of the mounted gauge. At left, Fig. 5. Aerane hook undergoing tests. Opposite page, top right, Fig. 6. Connecting wires to a strain gauge on the 33.8 inch long turbine blade in a 350,000 kilowatt turbine now in service at Tilbury Power Station. Photographs courtesy C. A. Parsons & Co. Ltd., and City University Materials Laboratory.

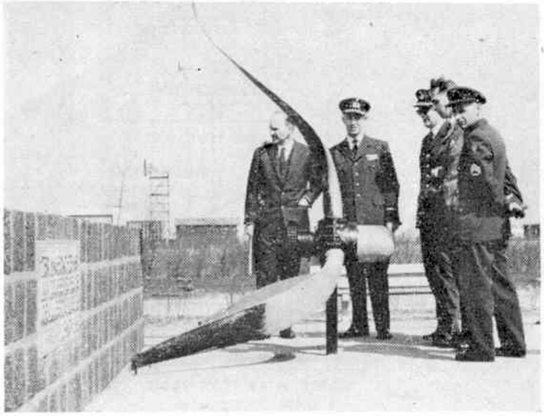


Now to return to the turbine blades mentioned at the beginning of the article. The full story of this work can be found in "The Engineer" dated 25th September, 1964 which your local library will no doubt be able to obtain for you. Briefly, the technique used was to install gauges on the blading and to mount on the turbine shaft near a bearing, a complete AC bridge system. Results were telemetered out by a radio link and recorded externally. By this means it was possible to examine the behaviour of the turbine blades while the turbine was running at full load and feeding power into the national grid. The final photograph (Fig. 6) shows a blade being strain gauged.

On receipt of a stamped, self-addressed envelope, sent to J. A. Coutts Esq., c/o Meccano Magazine, 13/35 Bridge Street, Hemel Hempstead, Herts., the Author will be pleased to send off, free of charge, a sketch giving a possible solution to the bird table experiment, for those with a genuine interest.







At left, this propeller from Lancaster ED-357 of No. 12 Squadron, is part of a memorial to all Allied Air Crew personnel who lost their lives in the Ijssel lake. It is at Dronten in the exact centre of the Eastern Flevoland. On May 4th each year, the townspeople of Dronten—some 5,000-6,000 of them—attend a special memorial service. At foot of page, a 500 lb. bomb from Wellington T-2996 of No. 103 Squadron, that crashed on 12th June 1941, recovered October 1966.

THEY SOLVE AVIATION JIG-SAWS

By John W. R. Taylor

AS DAWN came, cold and grey, on New Year's Day 1945, the engines of nearly one thousand German fighter aircraft burst into life. Squadron after squadron of Focke-Wulf 190s and Messerschmitt Bf 109s, led by pathfinding Junkers Ju 188s and accompanied by a handful of Messerschmitt Me 262 jets, took off and raced at treetop height towards the airfields from which British and U.S. air forces were providing support for Allied armies closing in on the German homeland.

This was Goering's Operation Great Blow, and it came as a complete surprise. When the enemy fighters suddenly appeared overhead, cannons blazing, almost the whole of the great Allied Second Tactical Air Force was caught on the ground at a comparatively small number of airfields in Belgium and Holland. By the time the attack was over, 120 British and 36 American combat aircraft had been destroyed and many more damaged. But the *Luftwaffe* paid dearly for its success. At least 252 of its aircraft were shot down, and it never recovered from the loss of so many of its best pilots. Second T.A.F., on the other hand, was soon back to its former strength.

Most of the *Luftwaffe* aircraft that were lost fell to Allied fighters and anti-aircraft guns; but a considerable number were shot from the sky by German gunners. So well had the enemy succeeded in keeping the operation secret that even their own anti-aircraft gunners did not know what was planned. So, as they hardly ever saw a German aeroplane at that time, they naturally opened fire when large formations of aircraft suddenly hurtled in their direction.

Quite a lot of the FW 190s and Bf 109s that failed to return from Operation Great Blow fell in what used to be called the Zuider Zee, a large gulf in north-western Holland. Today, the area is cut off from the sea by a dam and is gradually being drained, section by section, to provide rich new farming land. The remaining stretch of now fresh water is called the Ijsselmeer.

Ships fishing in the Ijsselmeer sometimes tear their nets on wrecked aircraft, lying just below the surface of the shallow lake. This is hardly surprising, as Royal Netherlands Air Force experts have calculated that at least 3,000 R.A.F. aircraft, 1,650 *Luftwaffe* aircraft and 1,200 U.S.A.A.F. aircraft crashed in Holland and Dutch waters during World War II, of which anything from 650 to 1,200 fell in the Zuider Zee.

A total of 126 have been dredged up out of the water, to reduce the hazards for fishing boats. Many more have been recovered when the water has been drained from the polders, as the reclaimed areas of land are known. In fact, this work of salvage has become so extensive and important that the R.Neth.A.F. has formed a special Excavation Unit for the task.

A few of the "finds" have been quite spectacular. One American B-17 Fortress bomber, for example, was so complete and undamaged that the Unit used it as a "site office" for a time. The port outer propeller had not even been bent as the aircraft ditched. A far older relic was a twin-wheel undercarriage found in 1964 and identified as belonging to a German Gotha G-IV bomber of 1917.

No less intriguing was a strange yellow-painted aircraft that was salvaged and brought ashore at Hoorn harbour in the summer of 1953. Traces of *Luftwaffe* insignia could still be seen, but a plate on one of the engines seemed to be inscribed in Russian characters. The mystery machine was identified as a Tupolev SB-2 twin-engined bomber, captured by the Germans on the Eastern Front in 1941, put into service for target towing and crew training duties in Holland in 1942/43, and eventually lost without trace over the Ijsselmeer.

One other mysterious discovery has yet to be explained satisfactorily. The wreck was easy enough to identify as a Mosquito, as the wooden wing was still in quite good condition after being "mummified" for 20 years in the mud of the lake-bed; but the wing was painted an unfamiliar white-grey colour. The puzzle became no easier when belts of machine-gun bullets retrieved from the wreckage were found to be of German manufacture. One possible solution is that this particular "Mossie" was operated by *Kampfgeschwader* KG-200, Hitler's famous "spy squadron" of captured Allied aircraft.

It is not often that the Excavation Unit comes across an aeroplane in such a good state of preservation as this Mosquito or the Fortress mentioned above. Sometimes it has to dig deep into the ground to find tiny fragments of an aircraft known to have crashed at a particular spot.

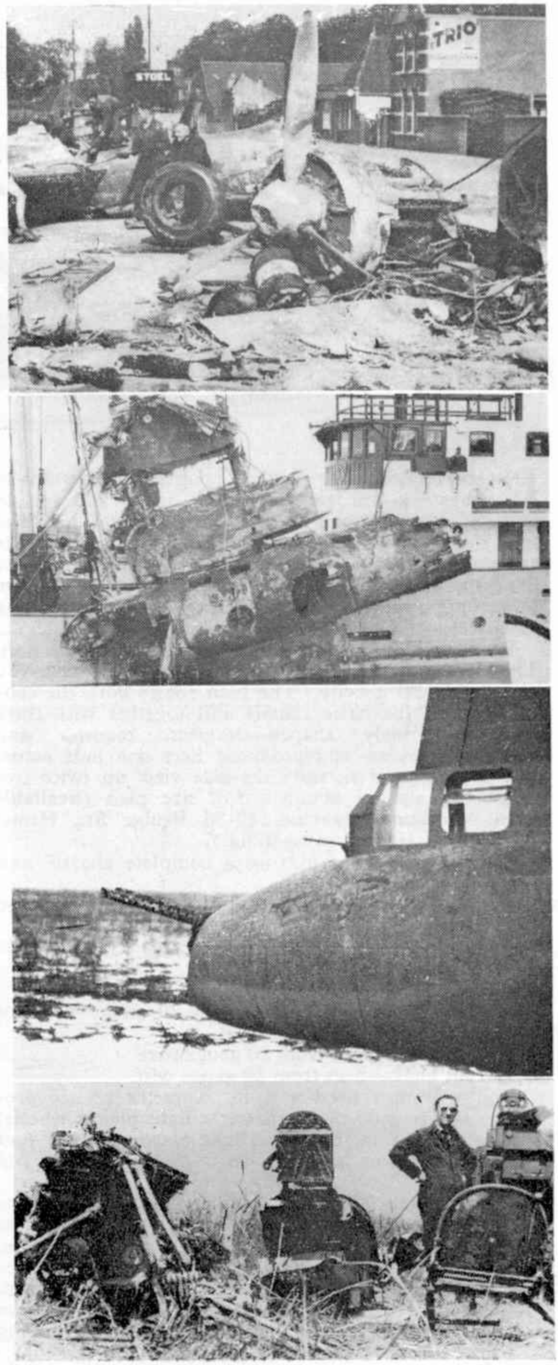
You may wonder why it bothers to search for such valueless scraps of metal, but there are very good reasons. First of all, nations are honour-bound to try to discover the fate of men, friends or foes, who died or were posted as missing inside their borders in wartime. The relatives of such men frequently derive great comfort from learning for certain, after 20 or more years, how and where their sons, husbands or brothers died.

All the skills and techniques of science and medicine are needed sometimes to identify the remains of a crew member. At other times, a wallet, watch or identity disc provides a quick and positive answer. Surprisingly, items such as railway passes, letters, photos and postage stamps contained in wallets are often in good shape after being under water since the early 1940s. A Junkers Ju 88 bomber even yielded a half-full bottle of "4711" eau-de-cologne which the makers declared to be as sweet-smelling as the day it was sold.

As well as helping to solve the fate of missing aircrew, the R.Neth.A.F. has to hunt for unexploded bombs from aircraft that fell in the Ijsselmeer or ashore in 1939-45. Householders feel much happier if they *know* that a Wellington or Lancaster that has been buried at the bottom of their garden for 20 years is no longer housing a clutch of live thousand-pounders.

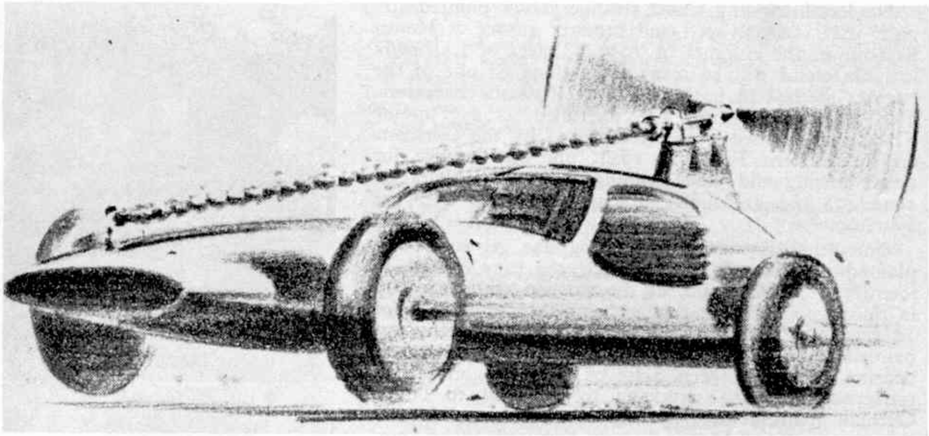
The possibility of finding something valuable or exciting has, of course, attracted other people besides the R.Neth.A.F. to the polders. There was one occasion when a group of youngsters found a Wellington gun-turret complete with 700 rounds of ammunition, loaded it on to a handcart, took it to within 30 feet of a wall and proceeded to find out if the guns would still work. Fortunately, the result sounded so much like an army exercise that they were stopped by the police before anyone—with themselves as the most likely candidates—was killed by ricocheting bullets.

The majority of Dutch people regard the work of the Excavation Unit as just one way in which they can repay the debt they owe to Allied airmen who died in helping to liberate their country.



Top to bottom. Parts of a Ju 88 on the quayside at Hoorn. Next, a He.115 seaplane recovered by the salvage vessel "Poolster" a few miles east of Amsterdam on 14/8/61. Next, the tail gunners position of B-17F, 237950 of 452nd Bomb Group U.S.A.A.F., which crashed into the N.E. Polder on its second mission on 20/2/44. This was used as an office by the Polder's workers for about six years. Lastly, wreckage from this long range Ju 88-D2 included three seats, the pilots being in the centre.

THREE SIMPLE BALSA MODEL CARS FOR YOU TO BUILD



PROPSTERS—OR rubber powered prop-driven dragsters—are very simple to make and fun to operate. Provided you build them quite light and have free running wheels, they can accelerate up to quite amazing speeds over any really flat surface, such as linoleum or wood flooring. If you haven't the room for a long straight run, try them tethered for running in circles.

Propsters are built around a very basic chassis unit. They will run just like this, but for more realism you can easily add a body. The plan shows both the construction of the basic chassis unit together with three alternative body shapes—dragster, roadster and coupe. The plan is reproduced here one half actual size so you need to scale the side view up twice (reproduced) size or obtain a full size plan **(available from Meccano Magazine, 13-35 Bridge St., Hemel Hempstead, Herts.; price 2/6d.).**

Parts required for making a complete chassis unit are:—

One main beam from ½ in. × ¼ in. balsa strip, notched as shown
Two axle beams from ¼ in. × ⅛ in. balsa strip
Two axles—cut from 20 gauge wire
One pylon piece—cut from ¼ in. sheet balsa
One bearing—bent to shape from 20 gauge brass or dural strip
One wire shaft—bent from 20 gauge wire
One front hook—bent from 20 gauge wire

You will also need a 6 in. diameter plastic propeller; one pair of 1¼ in. diameter light plastic wheels; one pair of 1½ in. diameter light plastic wheels, four cup washers and a small bead (or two more cup washers).

Construction should follow this order, after the parts have been cut or bent to shape.

(i) Bind the front hook to the front of the main beam, as shown, and coat the binding with cement.
(ii) Bind the bearing to the top of the pylon, as shown, and coat this binding with cement. (Note the two holes drilled in the pylon piece to facilitate binding the bearing in place, using a needle and thread).
(iii) Cement the pylon to the rear of the main beam.
(iv) Bind an axle to each axle beam, with an equal length of axle protruding each side.
(v) Cement the axle beams and axles into the notches in the main beam, taking care to get them square and symmetrical. Leave the assembly to set at this stage (you can build more chassis units, or cut out the body sides whilst you are waiting).
(vi) Slip a cup washer onto each axle, followed by the wheels, and then turn up the spare end of wire to retain the wheels in place. Note that the smaller wheels go on the front. If you cannot readily get the wheel sizes specified, near sizes will do.
(viii) Finally mount the propeller on its shaft with a bead (or two cup washers) between the bearing and the propeller hub.

The model is ready to run at this stage, so you can try it out with different sizes of rubber band power—or wait until you have fitted the body.

All three bodies are made in the same way. Cut out two sides to the actual shapes shown on the plan. These sides are then cemented to the axle beams (the notches fit over the beams). Note that in the case of the roadster and coupe the sides are parallel. In the case of the dragster the sides are tapered in plan view assembly, and also narrower.

Once the sides have set, simply fill in the top, as shown on the respective plans, with $\frac{1}{16}$ in. sheet to complete a rigid assembly. With the *dragster* an additional canopy piece cut from ¼ in. sheet balsa is added. With the *coupe* the windscreen area is covered with a piece of acetate sheet. Note, too, that with both the roadster and coupe the sides are cut from ⅜ in. thick sheet to leave enough thickness to round off the body shape top and bottom to improve the appearance.

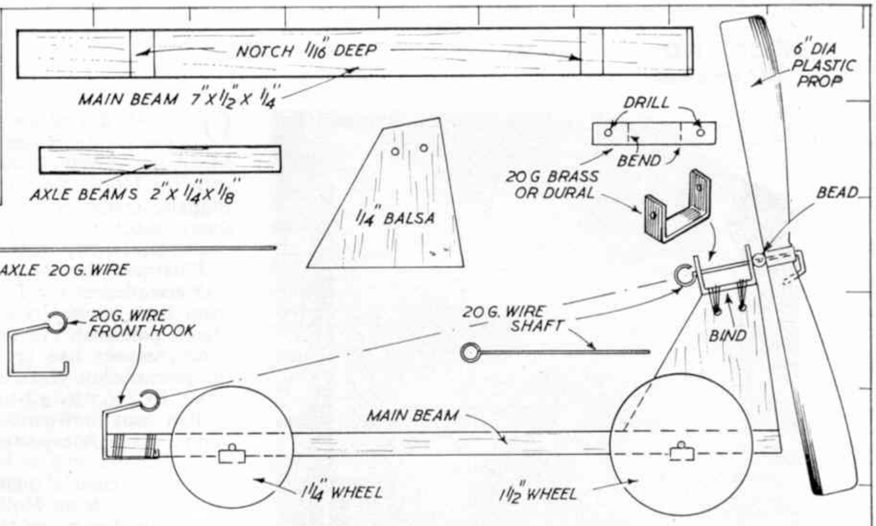
Of course, you are not restricted to just these three body shapes. You can try designing your own, but try to build them from sheet balsa and keep them light as a heavy body will reduce the acceleration possible with your model. For instance, a beautiful body shape carved from solid balsa and fitted in place would probably kill the performance completely, since it would be too heavy. For the same reason, don't overdo the paintwork if you want to finish the models in colour. This, too, can add excess weight.

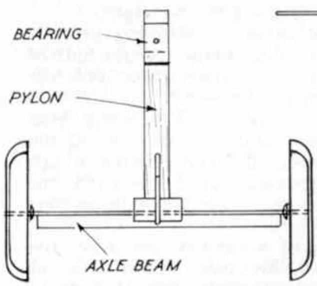
Experiment with different sizes of rubber motors to get best results. The more powerful the rubber motor the better the acceleration, but the shorter the power run. You can adjust power to range from a pure dragster performance downwards. Scale speeds of over 200 m.p.h. are readily possible!

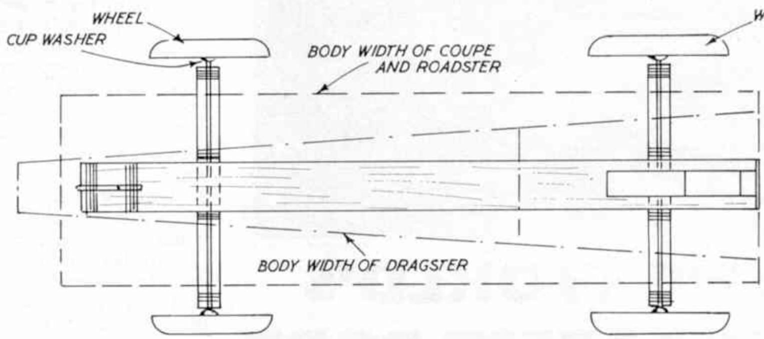
Remember, too, that propsters do need a really smooth surface to run on for best results. They will get bogged down, and may not even move at all, on a rough surface such as a thick carpet. Given a suitable surface, though, they can use all the power you like to apply. They cannot suffer from wheelspin like a conventional racing car model.

PROPSTERS

A SIMPLE RUBBER POWERED RACING CAR THAT CAN BE CONSTRUCTED IN ANY OR ALL OF THREE VERSIONS.

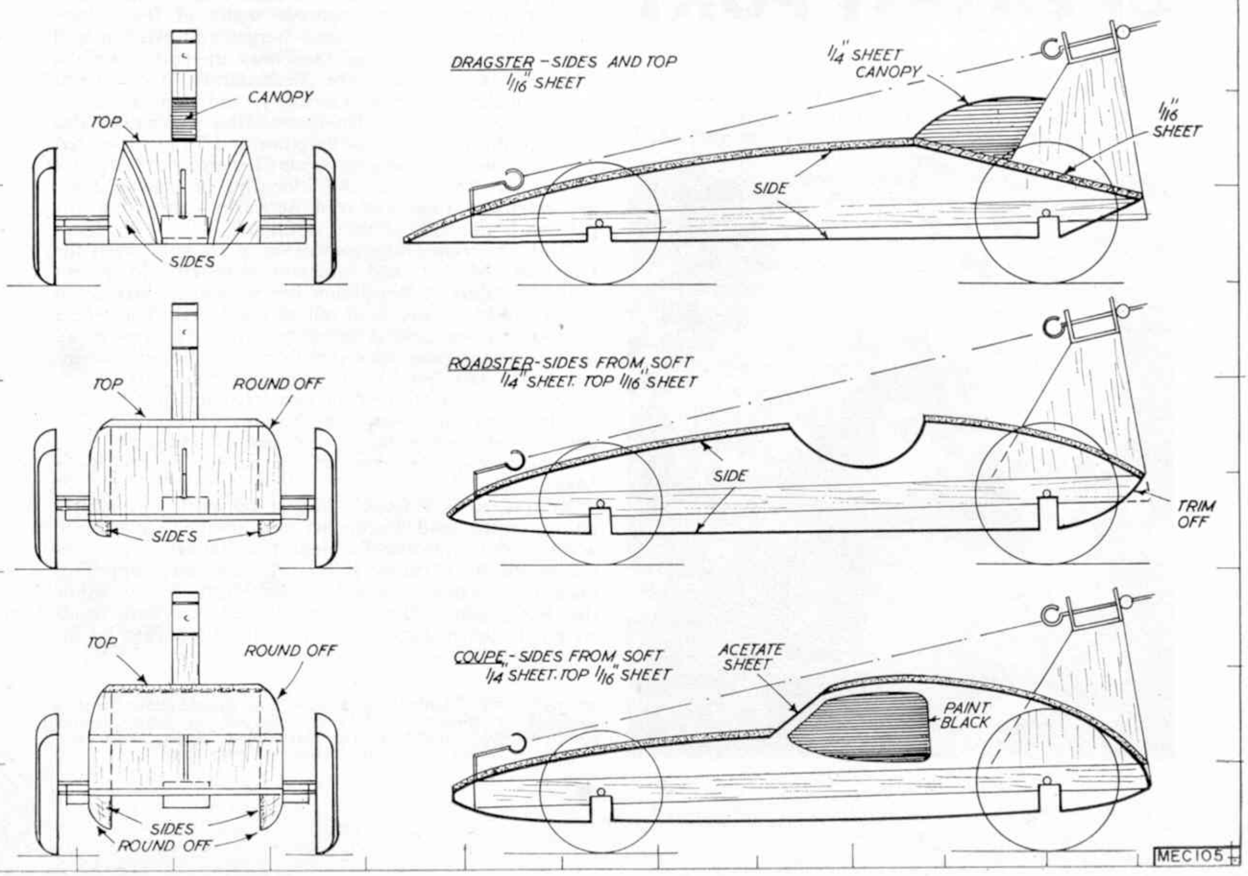






MATERIAL LIST

1 length ½" x ¼" balsa strip
1 length ¼" x ⅛ balsa strip
6" piece of 3" wide ⅜" sheet balsa
2 lengths 20 gauge piano wire
7" length of ¼" wide 20 gauge dural or brass strip
The above is enough for making 5 basic models.
In addition each model will require:-
1 pair 1¼" dia. plastic wheels
1 pair 1½" diameter plastic wheels
4 cup washers, small bead.
1 6" diameter plastic propeller (flying model aircraft type).
1/16" and ¼" sheet balsa for making bodies,



THE WORLD'S GREATEST PORT

by W. H. Owens

ON ANY day of the year as vast population of ships crowds the banks and dock basins of the River Maas, the waterway that connects the city of Rotterdam with the North Sea. Into this 19-mile forest of masts, funnels, cranes, derricks and floating elevators, more than 30,000 sea-going ships sailed last year—about one every twenty minutes of the day and night.

This was the largest number of shipping arrivals ever recorded at the Port of Rotterdam. About half of them were ocean freighters and liners which link the Dutch port with every part of the world.

No seaport has grown so fast as Rotterdam over the past twenty years, and it continues to grow all the time. In 1967 its all-time record cargo tonnage of 140 million was nowhere surpassed. And by 1980 the annual trade is expected to reach the 200 million tons mark.

Yet less than a quarter of a century ago, after the Nazi retreat from Holland, the docks and wharves of Rotterdam lay in an almost complete state of destruction as the result of heavy air bombardment and enemy sabotage. The rate of their post-war reconstruction and repair, however, was so swift and so remarkable that by the early 1960's Rotterdam had overtaken New York as the largest and busiest world port.

Rotterdam owes its unchallenged supremacy among European ports to its geographical position in the Rhine Delta. As the maritime outlet of a far-reaching network of inland canals and rivers, serving the industrial heart of Europe, the port has become the distribution centre for every kind of goods and materials passing between the Common Market countries and the rest of the world.

About half the total seaborne tonnage passing through the Maas is, in fact, transit traffic. In the 40 deep-water dock basins on both sides of the river, cargoes are transferred between many of the 30,000 ocean ships and over 200,000 barges and other inland craft. The barges thread their way up and down the Rhine system through the Netherlands to the Ruhr and Rhineland of West Germany, and even as far as Basle in Switzerland. Interconnecting waterways also carry traffic to and from Belgium and France, so that all the Common Market countries except Italy are served via Rotterdam. Additionally, of course, there are extensive road and rail networks connecting the port with all parts of the Continent.

With the tremendous expansion of trade between the Common Market and overseas countries in recent years, the Port of Rotterdam has pushed its way down the River Maas and even out to the North Sea, where more and more land is being reclaimed for new ocean docks. At the same time the older harbours and basins nearer the city have been completely modernized.

One of the greatest of the new harbour projects since the last war has been the creation of Europoort—a complex of deep-water basins, canals, industrial sites and oil storage facilities at the mouth of the River Maas.

Rotterdam is Europe's largest oil port and oil refining centre, and Europoort was designed chiefly to accommodate the world's biggest oil tankers and other mammoth bulk cargo ships. A new deep approach channel has been dredged in the North Sea to allow the latest giant supertankers of 225,000 tons deadweight to berth there. The crude oil discharged by in-

At right, top. Launching a new transatlantic liner from a shipyard at Rotterdam Harbour. Bottom of page, floating elevators with capabilities for discharging cargoes from sea-going vessels into inland waterway craft.

coming tankers not only feeds the huge refineries in the immediate area, but is also piped direct to industrial Germany through the 257-mile Rotterdam-Rhine pipeline.

Europoort was created out of the desolate sandbanks of Rozenburg Island in the North Sea. Its transformation began just ten years ago, when large-scale dredging operations were undertaken as the preliminary task to constructing the new harbours. In the first two years nearly 50 million cubic feet of sand were removed and piped on to the land. Thus, in a single operation, the new harbour basins and channels were scooped out and the ground level built up behind them. At a height of 15 feet above the high water mark, Europoort is quite safe from flooding by the sea.

This great project will be completed in the early 1970's with the construction of a new harbour area that is actually part of the North Sea. A vast outer protective dyke will enclose 5,500 acres which will contain very deep dock basins in front of new industrial sites. For example, a big steelworks is to be built and will be fed with iron ore from North America and elsewhere brought in by mammoth ore-carrying ships.

To satisfy the future demands of Rotterdam's ever growing general cargo traffic, yet another new complex of harbours is to be built on the north bank of the River Maas, four miles from the sea. This area will be known as the Rijnpoort and will have a cargo handling capacity of about 20 million tons a year. If everything goes according to plan—and it usually does at Rotterdam—the first ships will be berthing there before 1972.

More than two miles of deep water quays will be provided in the Rijnpoort harbour complex where, in addition to the berths for conventional ships, there will also be specialised facilities for the rapid handling of roll-on/roll-off and container vessels. A new terminal is also being provided for the famous Harwich-Hook of Holland railway ferry service, one of the longest established shipping links between Great Britain and the Continent.

Rotterdam was one of the first world ports to provide special dock arrangements for the handling of containers—the new streamlined method of forwarding cargo by sea and over land with no intermediate delays at docks. The new Europe Container Terminal, the largest and most up-to-date of its kind outside North America, occupies a site of 300,000 square feet in Princess Margriet Harbour of the Waalhaven complex. Here the transatlantic container ships berthed for the first time in September, 1967. At present a fleet of four huge container ships maintains a regular service between the East Coast ports of the United States and Europe, but by the end of next year ten ships will be making the Atlantic run.

With such vast transhipment traffic, the Port of Rotterdam has developed the ship-to-ship method of cargo handling in midstream. This technique saves time and labour, and ease congestion at dock berths during busy periods. The port authority has provided an unusually large number of floating cranes and floating loading bridges for the purpose. In the Waalhaven, for example, between 40 and 50 ocean ships anchored midstream can be discharged simultaneously to inland barges with the aid of the modern floating equipment.

Rotterdam is also the largest grain port in Europe.

The view of the Maashaven at right, shows floating elevators discharging grain from sea-going vessels into barges. Innumerable barges, some of which are seen here, maintain services all the way up the Rhine as far as Switzerland.

Above top. Unloading coal into Rhine barges and push boats in the Maashaven at Rotterdam. Next, a general view of the Waalhaven, a bulk cargo harbour. This can accommodate about 40 ocean-going ships at a time.

In the Maashaven, at the heart of the port, the big grain carriers from Canada and the United States, Australia and other parts of the world are discharged at the rate of 400 tons per hour by powerful floating elevators into the Rhine barges. As many as six of these elevators may be berthed alongside a grain carrier at the same time. Pneumatic suction hoses transfer the grain from the ship's hold into the floating elevators from where it is piped into the waiting barges. Other grain carriers berth at shore terminals where their loads are similarly discharged to the storage elevators that tower above the wharves.

PAINTING & FINISHING BALSA WOOD MODELS

MANY READERS will have experienced a great deal of trouble in obtaining a smooth or glass-like surface finish on balsa wood models. The rough surface finish, so often seen, can easily be avoided with very little effort, provided some simple procedure rules are followed.

Balsa wood is a lightweight hardwood, and has a very low density. As it has a large and wide grain the surface tends to be rather rough, even when sanded smooth. Unfortunately, the large grain can absorb a vast amount of paint if the correct finishing procedure is not followed. Always remember that the final finish on any model is only as good as the surface over which it is applied. Cracks, gaps and rough patches show up after final painting quite alarmingly, so fill, remove or sand any blemishes to the best of your ability, before any grain sealing or painting is commenced.

Commence to prepare a smooth and flat surface by sanding the model down with flour paper and filling all the blemishes with body putty, plastic wood, etc. Apply one coat of full strength clear dope and leave until it is thoroughly dry. When completely dry (i.e. the solvents have evaporated from the dope), your smooth, sanded surface will have been transformed into a very rough and sandpaper-like finish; this is a good thing, as the dope has now sealed up the loose surface fibres and started to fill the grain holes. Sand all the fibres off until a smooth hard surface remains.

Several different methods of grain filling can be followed, each one being suited to different types of models due to weight, strength and flexibility. The most common is sanding sealer, which is clear dope with a powder mixed into it, that fills the grain holes as the dope dries. If multiple coats are applied, the surface finish can crack and craze with age; to prevent this, a few drops of oil can be mixed with the sanding sealer to " plasticise " it. As many as five coats can be applied to static models straight onto the clear doped, sealed wood. Each coat should be thinned a little more than the preceding one, up to a maximum of 50 per cent., using the recommended thinners for the dope brand. It is advisable to rub the surface down flat between each coat, leaving the final coat for up to a week to harden off before this is flattened down. For a flying model the sheet balsa surfaces can be considerably strengthened by applying a layer of lightweight tissue onto the bare, clear doped, and rubbed down surface. Apply a coat of thick clear dope and lay the tissue onto this, using the dope as an adhesive; you have to work quickly here or the dope dries before you have time to smooth the wrinkles out! When this has dried, apply up to three coats of sanding sealer, rubbing down between each coat, and thinning as necessary. This method of finishing imparts a great deal of strength to the wood and prevents all sorts of minor damages by really binding the surface grain together.

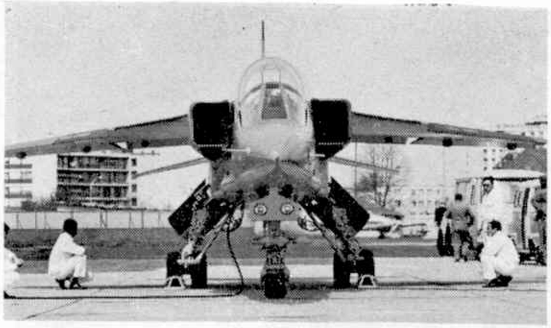
Another type of surface preparation is car primer; although not so well known, it is very effective when used on certain types of models. The thing to watch out for here is weight, as this can mount up very rapidly if four or five coats are used and we would not recommend it for use on free flight models. With " Belco " grey primer, tissue covering is not really needed to obtain the necessary strength for fast control line models or power boats, and it really does fill the grain—if a trifle heavy. With this type of paint, wet and dry paper is best for rubbing down as it tends to clog ordinary sand or flour paper. Wet and dry paper can be purchased from most ironmongers or car accessory shops, it is quite cheap and it lasts for quite a long while. For this type of work, 400 or 600 grade is most suitable, but don't press too hard when it's new, as it has quite a bite and will soon cut the surface down to bare wood.

So much for basic surface preparation, next we come to final colour painting, and here the choice of materials is quite staggering—enamels, dopes, household paints, epoxy paints, polyurethane and acrylic paints abound aplenty. As well as the normal tins, most of these paints are available in spray cans for direct application.

The two most popular methods of finishing are brushed-on enamel and brushed-on colour dope. If you have prepared the surfaces in the preceding manner, you should not experience any problems in getting a fine smooth and glossy final finish. When brushing dope, try and flow it on, rather than brushing it into the surface. With enamel paints this is not so important as it is thinner to start with and withstands the brushing. If you are lucky and the colour has a high density, you may only need one coat; if it turns patchy, it is best to rub it down with 600 grade wet and dry paper used wet, with water for lubrication. Don't rub all the paint off, just remove the surface gloss so that a matt surface remains. For each successive coat of paint add a slight amount of thinners—we use about 20 per cent. for each coat, i.e. one fifth thinners for the second coat, two fifths for the third and a maximum of three fifths for the fourth coat, any other coats should be of the fourth coat consistency. When finally finished, a really gleaming surface should result. For that final professional touch you can rub the surface up with Brasso or Duraglit metal polishes; when the metal polish has dried, rub the painted surface up as hard as you dare with a soft duster and wax polish with as much ' elbow-grease ' as possible. So much for doped or enamel finishes.

If you are painting an internal combustion engine powered model, remember that colour dope with a nitrate base is not proof against any fuels, enamel is usually proof against diesel fuel, and some are proof against ordinary glow plug fuel, always read the instructions on the can to see exactly what the situation is, or check with the model shop manager. If you do have to fuel-proof dope or enamel, several clear varnish fuel proofers are available at most model shops—both " Humbrol One-Pack " and " Titanine " are very good.

The recently developed Acrylic and Polyurethane paints are more expensive as you have to purchase them in larger quantities. We have used both " International " and " Yachtsman " domestic polyurethane paints to obtain very good finishes with just one coat of colour paint and no final rubbing up or waxing. Rather heavier than dope by volume, the finished paint job will not weigh any more as you use proportionally less to obtain a good finish. Most of the best Polyurethane paints are two parts mixed, i.e. the paint and a separate hardener; Acrylic is one part and both types require special thinners. Polyurethane is slow drying (up to 150 hours for complete chemical hardening), but Acrylic dries very quickly. Your best source of supply for these types of paint are Marine shops or large garages.



AIR NEWS

by John W. R. Taylor

England to Australia in three hours

When the Concorde supersonic airliner enters service in a few years' time, British businessmen will be able to leave home after breakfast, fly the Atlantic, spend five hours in New York and return home the same day. The idea of commuting across the Atlantic in this way still seems a little like science-fiction; but Britain's Royal Aircraft Establishment is already studying designs that will make the Concorde as old-fashioned as the Wright biplane.

One shape of the future that is being tested in the wind tunnels at Farnborough looks like an arrowhead, or elongated pyramid. Instead of trying to push its way past almost-solid shock-waves of air, like the Concorde, and so creating sonic booms, this strange-looking aircraft would ride the shock-waves like a surf-board on waves at sea. It is, therefore, known as a wave-rider, and it not only promises to overcome the noise problem created by sonic booms but gains extra lift from the shock-waves.

A wave-riding airliner, powered by ramjet engines, could probably cruise at eight times the speed of sound (5,000 m.p.h.) at a height of around 40 miles. Running on lightweight liquid hydrogen fuel, it could fly from London to Singapore in a little over two hours, or to Australia in three hours. London-New York would be a mere 45-minute hop, but there would be little point in using such a high-speed aeroplane on so short a route.

Don't try to book seats on this hypersonic transport (HST) yet; scientists at Farnborough estimate that it will be about 30 years before airlines are ready to make the next big jump beyond the 1,400-m.p.h. Concorde to what is almost a sub-orbital missile.

Forgotten giant

It is unlikely that any reader of *Meccano Magazine* will have seen before the photograph of a Junkers Ju322 Mammut glider reproduced on this page. Even Junkers had no pictures of this huge wooden freight-carrier until this year, when the photograph was discovered among the mementoes of an ex-soldier who had had it since World War II. He kindly offered it to the company, who sent me a copy print; and when I telephoned their head office in Munich they gave me permission to publish it in the *M.M.*

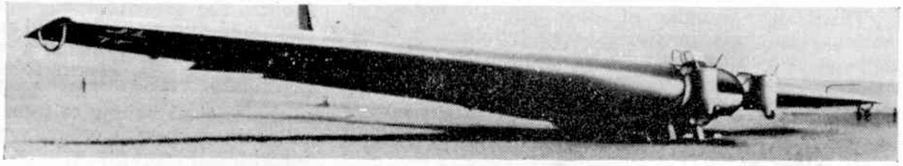
People who worked for Junkers in the 'forties confirm that all other drawings and pictures of the Mammut were destroyed, with the prototypes, when the German Air Ministry decided not to put it into production, in 1941. Little is known about it, beyond the fact that it had a wing span of 270 feet, was intended to carry a payload of nearly 20 tons and was towed by a Junkers Ju 90 four-engined transport during its flight trials. It had a skid undercarriage, plus small nose-wheels built into the bottoms of the barrel-like open gun positions in front of the wing centre-section.

Jaguar unveiled

One of the few international aircraft projects that has survived government economy cuts in recent years is the Anglo-French Jaguar dual-purpose strike/training aircraft, the prototype of which was shown to the press for the first time at Villacoublay airfield, near Paris, on 17 April.

Despite its comparatively small size—its span of 27 ft. 10 in. being nine feet less than that of the wartime Spitfire—the Jaguar looks, and is, a formidable fighting machine. The single-seat combat version will carry nearly five tons of bombs, rockets and other weapons, including a pair of 30-mm. cannon built into the sides of the centre-fuselage. Two 6,6000-lb. thrust Adour turbojets, developed jointly by Rolls-Royce and Turbomeca, will give it a top speed of 1,120 m.p.h. (Mach 1.7) at high altitude or 835 m.p.h. (Mach 1.1) at low level.

As a start, Britain and France have each ordered 200 Jaguars, which will be built jointly by BAC and Breguet. They will come in five different versions, including two-seat trainers and single-seat land and carrier-based strike fighters, with deliveries to begin in the early 'seventies. The prototype, which will take part in the S.B.A.C. Display at Farnborough in September, is a two-seater.



Above, two views of the Anglo-French Jaguar dual-purpose strike/trainer. At right, the long forgotten Junkers Ju 322 Mammut glider.

Simple Home Chemistry

INVISIBLE INK

by Boffin

THE 'CLASSIC' type of invisible ink is one which dries colourless (so you cannot see the message written on paper) and then apepars as coloured writing when the paper is warmed, such as by holding in front of a fire or ironing with a heated iron. There's nothing very complicated about making such inks, for a number of very simple solutions will make invisible inks of this type—such as milk, lemon juice, the juice of an onion or a solution of sugar in water. All these will produce invisible writing which, when heated, will appear as *brown* writing.

There are various chemical solutions which will act in the same way. Thus a solution of cobalt chloride will produce an invisible ink (actually very slightly pink in colour, so it is best used on paper with pink colour). This will turn blue when heated. Other chemical solutions you can try are alum or sodium bisulphate dissolved in water. These will produce colourless inks (and thus 'invisible' on white paper) which turn black when heated.

Using invisible inks of this type, always write with a very smooth ball-type nib (not a ball point pen !) so that the surface of the paper is not scratched, and do not press hard enough to indent the paper. Either could give the game away that an invisible ink has been used. Then, if the other person knows that heat will develop many invisible inks all that the other person has to do is to heat the paper and the secret message is secret no longer ! Better still, write invisible ink messages with a small brush rather than a pen, and use a matt finish rather than a shiny surfaced paper. This should leave no clues at all that a message has been written on the paper.

Of course, that still leaves the fact that once 'in the know', a person has only to apply heat to a suspected secret message to bring out the writing. To avoid this possibility we can use a type of invisible ink which can only be brought out by treatment with another chemical solution. Just heating the paper will not cause the message to appear.

One good invisible ink of this type is sodium chlorate dissolved in water. This is a clear solution which dries colourless, and so will be invisible on white paper. It will *remain* invisible if heated. The only way the message can be brought out is to paint it over with a solution of copper sulphate (or press a pad of blotting paper soaked in copper sulphate solution over the paper). The writing will then show up in green. The second solution (copper sulphate) is, in fact, a *developer* for this particular invisible ink.

There are a number of other simple solutions of various chemicals in water which produce invisible inks and which can only be brought out by treatment with a particular *developer*. Most of them, however, are slightly coloured solutions, so you must either use fairly weak solutions (so that the colour will be too weak to be visible); or use them on paper tinted the same colour.

Here is a list of some of these solutions together with appropriate developers, and the final colour of the writing when developed—

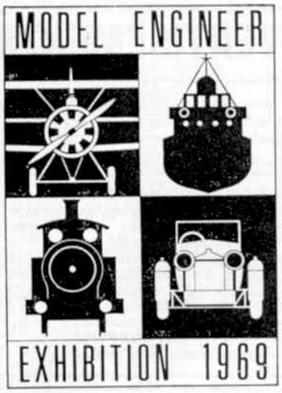
Invisible Ink	Developer	Colour of writing when developed
Copper sulphate	Ammonia	Light blue
Copper chloride	Cobalt chloride	Bright green
Ferrous sulphate	Tannic acid	Black
Cobalt nitrate	Ammonia	Dark blue
Mercuric chloride*	Potassium iodide*	Deep red
Mercuric chloride*	Sodium hydroxide*	Yellow
Potassium ferro-cyanide*	Ferrous sulphate	Blue

* These chemicals are poisonous and cannot normally be obtained from chemists. Your chemistry master may, however, be persuaded to demonstrate these inks and developers in the school lab.

Using the type of invisible ink which needs a developer to bring out, the chance of discovery of secret writing is far less. To check, in fact, anyone would have to try each developer in turn until a positive result was obtained. To make it even more difficult, use the *developer* as the invisible ink and the appropriate invisible ink as the developer ! But avoid ammonia in this case as it could give the game away by its smell (and would also only produce temporary writing).

There is also the 'reversed' type of invisible ink which has its uses—if only to demonstrate a bit of chemical magic. In this case the ink produces an ordinary visible message which is then made to disappear by brushing over with another solution. You can do this with ordinary cheap writing ink, then brushing over with ink remover. Better still, soak a piece of blotting paper in ink remover, then use to blot the writing, when it will disappear. This works best if the blotting is done whilst the original writing is still wet.

If you cannot buy a suitable ink remover, use ordinary bleaching solution instead (sodium hypochlorite solution), and a tartaric or acetic acid solution. Moisten the written ink message with the acid solution (best applied with a glass rod rubbed over the writing), allow to stand for about a minute, then blot dry. Finally apply the bleach solution (with a brush or again a glass rod). This should cause all the colour of the original writing to fade away completely. This will only work with ordinary writing inks, however—not with ball point pen writing.



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● COMPETITORS

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Every form of model and model engineering activity can be entered (see separate lists) including locomotives, aircraft, cars, boats, yachts, radio control equipment . . . in fact anything you can make. Write for entry forms and details.

● SEE & BUY

Full model trade support with well stocked stands. Nearly every exhibitor will be selling from the exhibition. Already taking stands are: Auto-Models, Hugh Evelyn, Howell Dimmock, Kennions, Myfords, Traction Engine Enterprises, etc., etc.

● SPECIAL ATTRACTIONS

Passenger hauling model locomotives—with rides for visitors. *NEW* Model Steam road vehicles will be demonstrated under power. Scenic Model Railway layouts—both commercial and private owners. Historic Model Cars never before in London. Demonstration Deck—many model activities, including Model Engineering and Ship Building will be demonstrated intimately in the gallery demo. booths, plus the country's finest models of every kind.

● SOUVENIR GUIDE

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

● PARTIES

Special reductions for parties, schools and pre-booking. Ask for details. Save money and avoid queuing! Route maps, parking places, full particulars on request.

● WORKING LOCOMOTIVE CLASS

A new contest class with the LBSC Memorial Trophy and £10 award will be inaugurated. Points for performance—locomotives must have a track trial at the show to qualify—Ask for conditions of entry.

● DUKE OF EDINBURGH TROPHY

Open to previous winners of championship cups, silver medals, challenge cups at *ANY* previous M.E. Exhibition. (Note: 3-year time lag rule has been withdrawn.)

● NORTHERN & MIDLAND ENTRIES

A northern collection centre will be established if North of England entries justifies. A similar depot will be arranged in the Midlands, again if entries justify.

● COMPETITION CLASSES

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Class	
A	Locomotives. $2\frac{1}{2}$ in. gauge and over.
A.1	Locomotives—to any LBSC design $2\frac{1}{2}$ in. gauge and over.
B	Locomotives. In gauge 1 and O.
BA	Locomotives. In gauges smaller than O.
C	Rolling Stock and Accessories. Guage 1 and O.
CA	Rolling Stock and Accessories. Gauges smaller than O.

MARINE SECTION

D	Steam and Motor Ships of any period. (Non-working.)
E	Power Driven Prototype Vessels. (Complete with power plant.)
F	Sailing Ships of any period. (Non-working.)
G	Working Yachts and Sailing Ships.
H	Hydroplanes and Speedboats.
I	Miniatures. Length of hull not to exceed: 9 in. for $\frac{1}{8}$ in. to 1 ft. scale or larger; 10 in. for $\frac{1}{16}$ in. scale; 12 in. for $\frac{1}{25}$ in. scale; 15 in. for $\frac{1}{32}$ in. scale. No limit for smaller scales.

GENERAL ENGINEERING SECTION

Class		
J	General Engineering Models (including Stationary and Marine Engines).	working models
K	Internal Combustion Engines.	working models
L	Mechanically Propelled Road Vehicles (including tractors).	working models
M	Racing Cars (1) Working scale; (2) Non-working; (3) Working, i.c.	
N	Tools and Workshop Appliances.	
O	Engineering Scale Models (Non-working).	
P	Scenic and Representational Models (including Architecture).	
Q	Horological, Scientific and Optical Apparatus.	
R	General Craftsmanship—not otherwise classified.	

JUNIOR SECTION

S	For any type of model or mechanical work by a junior under the age of 16 by 31st December, 1968.

AIRCRAFT MODELS

Class	
AA	Flying models of all types; (a) free flight, (b) control-line and (c) radio control.
AB	Scale flying models of all types, rubber, glider, power, control-line or radio control.
AC	Scale non-flying models.

MODEL CARS

AD	1/32 scale working electric powered car.
AE	1/24 scale working electric powered car.
AF	1/32 or 1/24 non-working scale car.
AG	Own design freelance non-working/working car.

PRIZE POOL ALLOCATION. Classes attracting six or more entries will enjoy prizes to value of: 1st, £5; 2nd, £3; 3rd, £1. With over 12 entries: 1st, £7; 2nd, £4; 3rd, £2; 4th, £1. Classes under six will have 1st and 2nd only. Additional Medal Awards will be made at discretion of the judges. Entry fees will be added to the Prize Pool. Prizes may take the form of Vouchers, Cash, Replica Trophies (for Challenge Trophy winners) or Championship Trophies. Please express your preference on entry form.

TRANSPORT GRANTS. Would-be entrants of interesting models that by reason of bulk, weight or distance present special problems are invited to submit details, when in suitable cases we can offer assistance.

Enquiries for Competition Entry Forms, Trade Stands to EXHIBITION MANAGER, M.A.P. Ltd. 13/35 BRIDGE STREET, HEMEL HEMPSTEAD, Herts.

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"Yesteryear" Matchbox, Models Nos. 6, 7, and 8. Also "Covered Wagon." All new. Offers—exchanges.—1 Woodcote, Kingswood, Bristol. G

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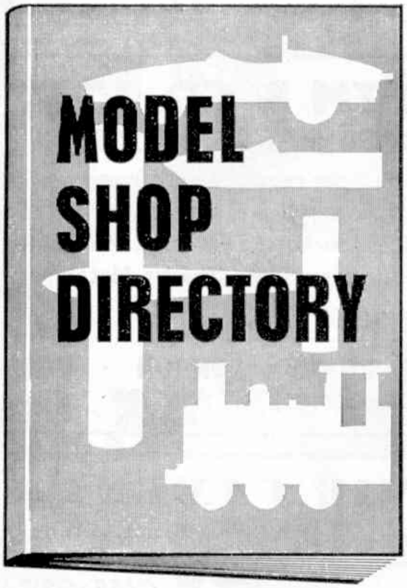

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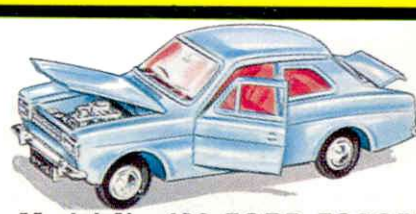

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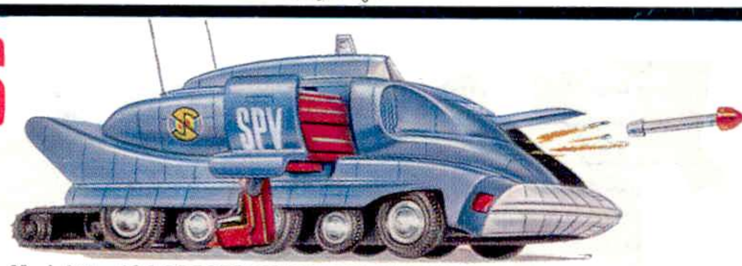

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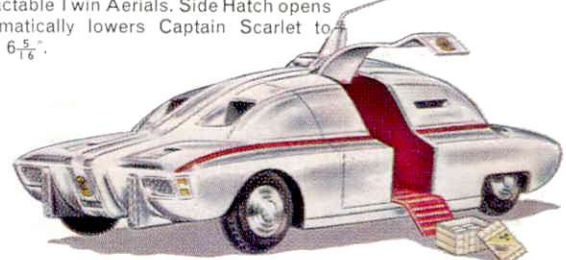

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