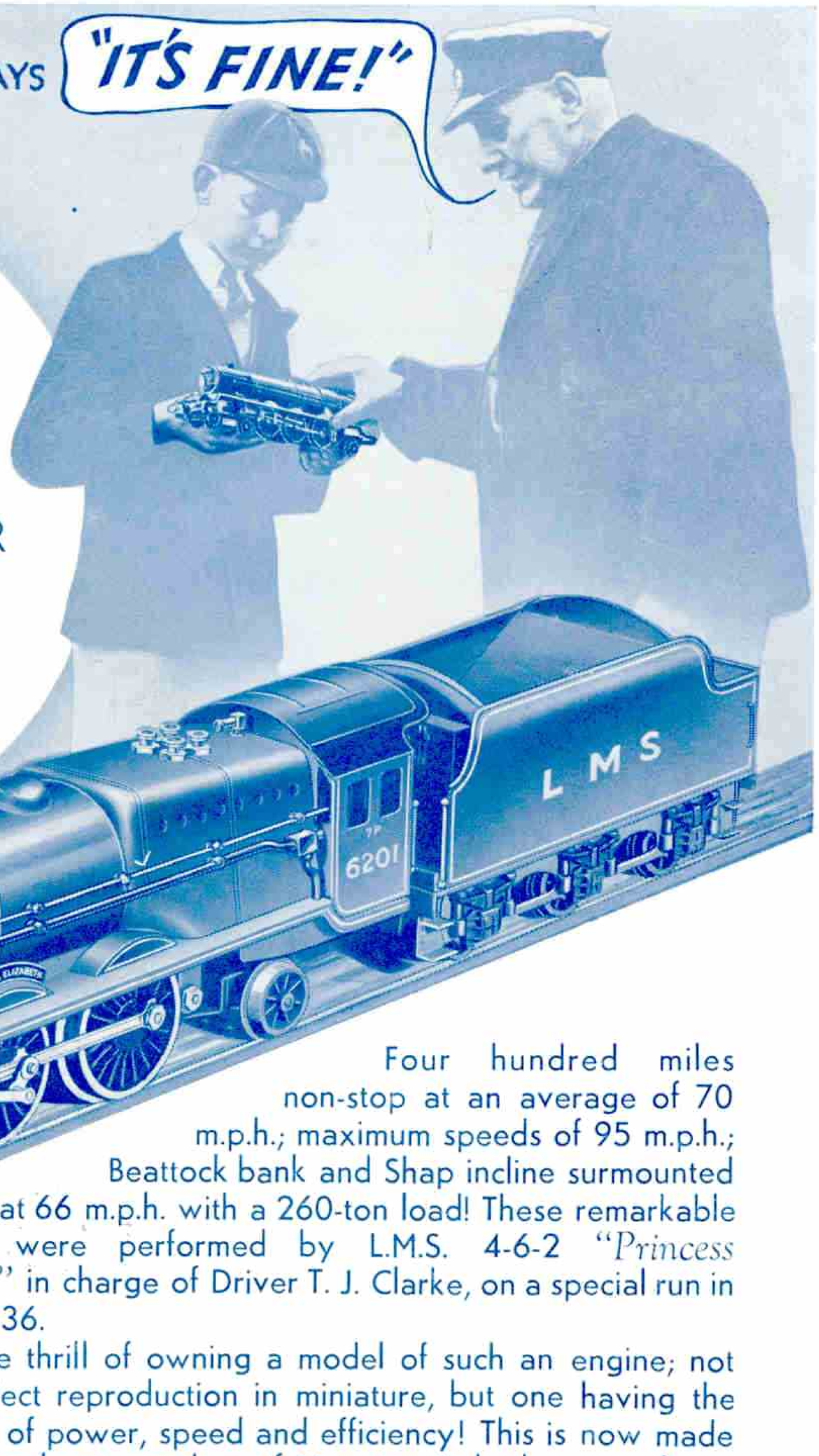
VOL. XXII. Nº 9 SEPTEMBER 1937

MECCANO MAGAZINE

TUNNELLING IN A CANYON

6D.

DRIVER CLARKE SAYS "IT'S FINE!"



The new

HORNBY

SCALE MODEL OF
L·M·S RECORD-BREAKER

"Princess Elizabeth"

Four hundred miles non-stop at an average of 70 m.p.h.; maximum speeds of 95 m.p.h.; Beattock bank and Shap incline surmounted at 66 m.p.h. with a 260-ton load! These remarkable feats were performed by L.M.S. 4-6-2 *"Princess Elizabeth,"* in charge of Driver T. J. Clarke, on a special run in November 1936.

Think of the thrill of owning a model of such an engine; not merely a perfect reproduction in miniature, but one having the same qualities of power, speed and efficiency! This is now made possible by the latest product of Meccano Ltd.—the magnificent Hornby scale model locomotive *"Princess Elizabeth."* Look at the photograph above! What a splendid appearance the model has with its massive six-coupled driving wheels, fascinating valve gear, and Royal nameplate! It is driven by a 20-volt electric motor, fitted with the world-famous Hornby Remote Control.

Price, complete with tender, in special presentation box, £5 5s 0d.

The model may be purchased also through the new Hornby Deferred Payments Scheme. Ask your dealer for details (Not available outside Great Britain and Northern Ireland.)

HORNBY TRAINS

MECCANO LIMITED, BINNS ROAD, LIVERPOOL 13

AEROPLANE CONSTRUCTION EDITION

GRAND PRIZES TO BE WON

Hamleys News

HAMLEY · BROTHERS · LTD · ESTABLISHED 1760

200-202, REGENT ST., LONDON, W.I. OUR ONLY ADDRESS

Telephone: REGENT 3161

No. 24 September, 1937

HAVE YOU ENTERED YET?

2nd ANNUAL COMPETITION

THERE ARE TWO SECTIONS

SENIORS (16 years and over) and JUNIORS (under 16 years)

PRIZES

SENIORS (2 Classes)

Class "A" Flying Scale Models
First.....Trophy and Replica
Second.....£2.2.0 Voucher
Third.....£1.1.0 Voucher

Class "B" Flying Non-scale Models
First.....£3.3.0 Voucher
Second.....£2.2.0 Voucher

JUNIORS (2 Classes)

Class "C" Flying Scale Models
First.....Trophy and Replica
Second.....£2.2.0 Voucher
Third.....£1.1.0 Voucher

Class "D" Flying Non-scale Models
First.....£2.2.0 Voucher
Second.....£1.1.0 Voucher

Three Consolation Prizes of books written and autographed by the Editor of the "Boy's Own Paper" will be given in each class of the Junior Section.

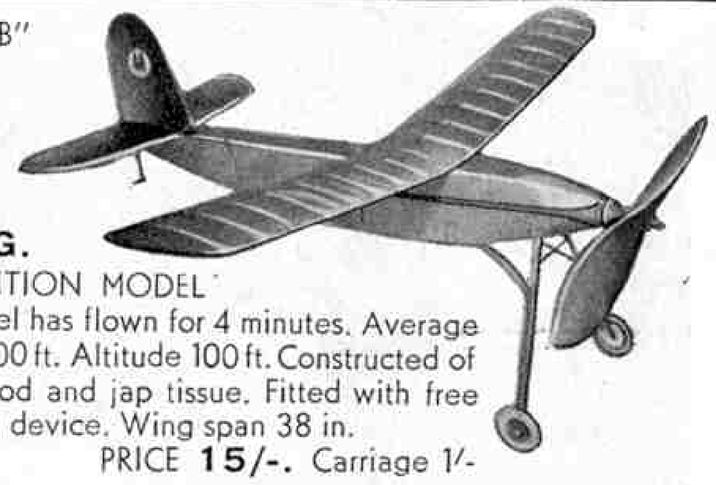
The competition is open to all purchasers of certain constructional kits which must be purchased from Hamleys.

All Models entered must be accompanied by the entry form which can only be obtained at the time of purchase of the constructional kit.

Hamleys reserve the right to exhibit any aeroplane entered for the competition in their Model Aeroplane Exhibition, held January 6th—15th, 1938.

Entries to be received between December 28th, 1937—January 3rd, 1938.

CLASS "B"



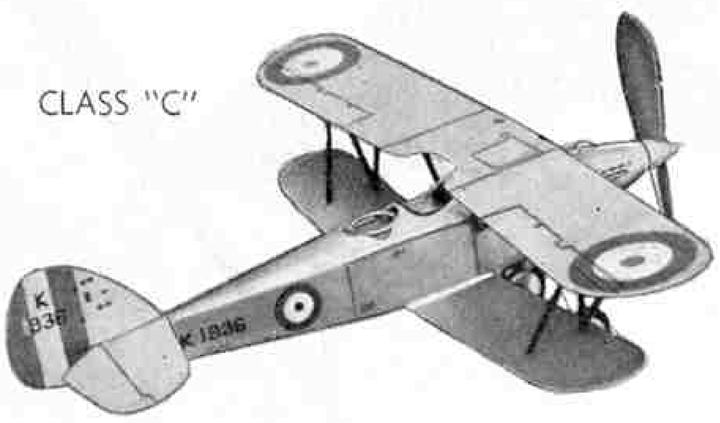
F.R.O.G.
COMPETITION MODEL
This model has flown for 4 minutes. Average flight 1,800 ft. Altitude 100 ft. Constructed of balsa wood and jap tissue. Fitted with free wheeling device. Wing span 38 in.
PRICE **15/-.** Carriage 1/-

CLASS "C"

MILES "HAWK-MAJOR"
Wing span 16¾ in., flies 300 ft. Kit includes precision cut gear-box, completely finished airscrew. All parts ready for assembly. PRICE **10/6.** Carriage 1/-

CLASS "A"

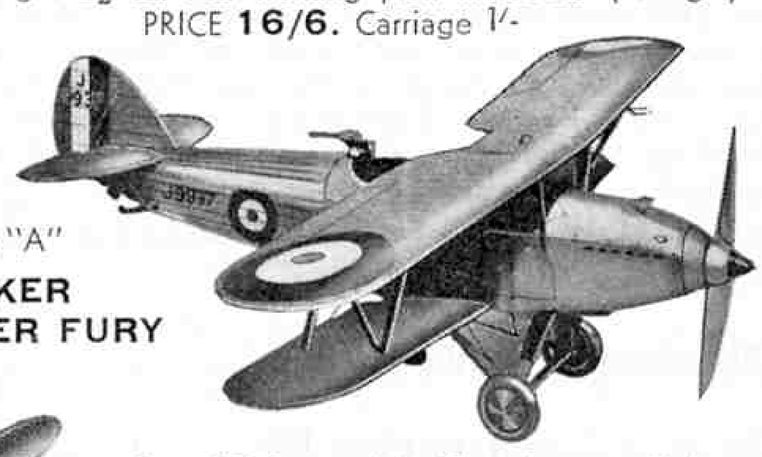
BOEING F.4.B.4
Navy pursuit plane. Kit complete with all necessary parts.
Completed model will fly 500 ft. Wing span 22½ ins. Weight 2½ oz. Full working plan included. (Foreign.)
PRICE **16/6.** Carriage 1/-



CLASS "C"

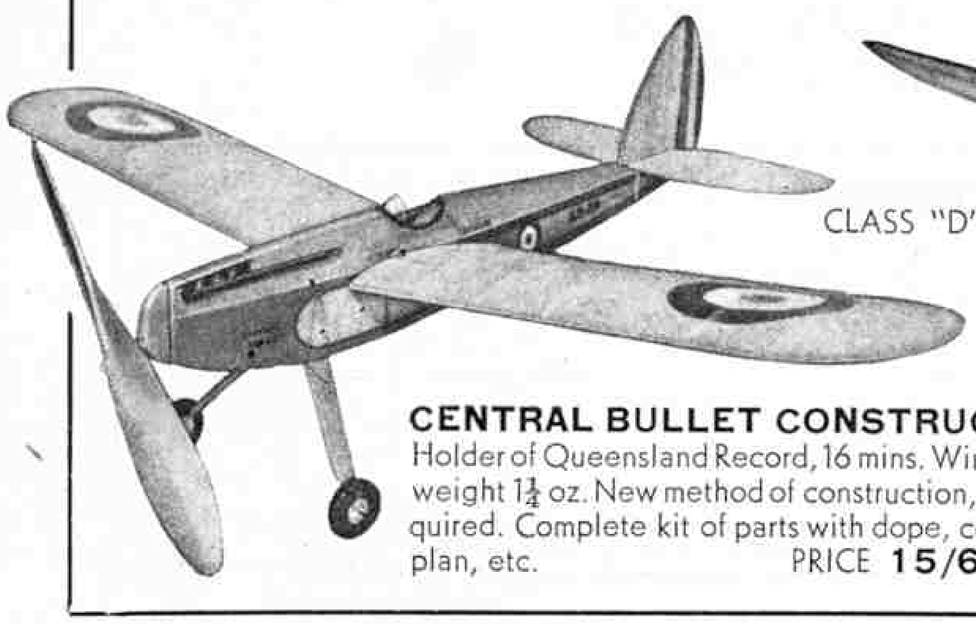
HAWKER DEMON
2-seater Service Plane. Complete with main and tail planes ready to cover, fuselage sides cut out, full size working plan, etc. Flies 200 ft.
PRICE **4/6.** Carriage 1/-

Full particulars sent upon request



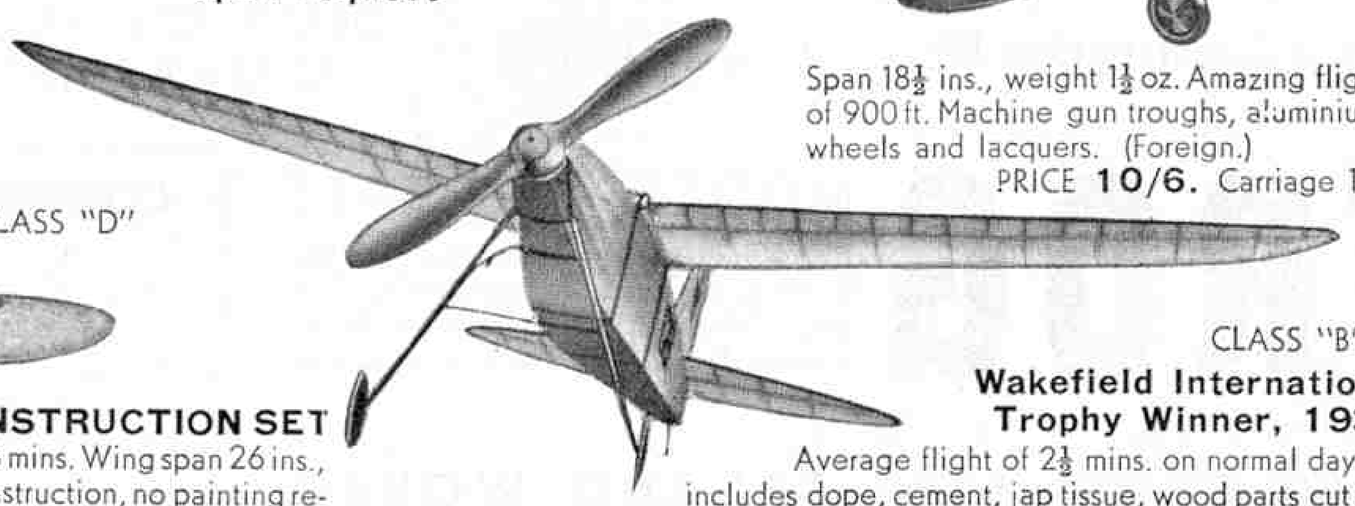
CLASS "A"

HAWKER SUPER FURY
Span 18½ ins., weight 1½ oz. Amazing flight of 900 ft. Machine gun troughs, aluminium wheels and lacquers. (Foreign.)
PRICE **10/6.** Carriage 1/-



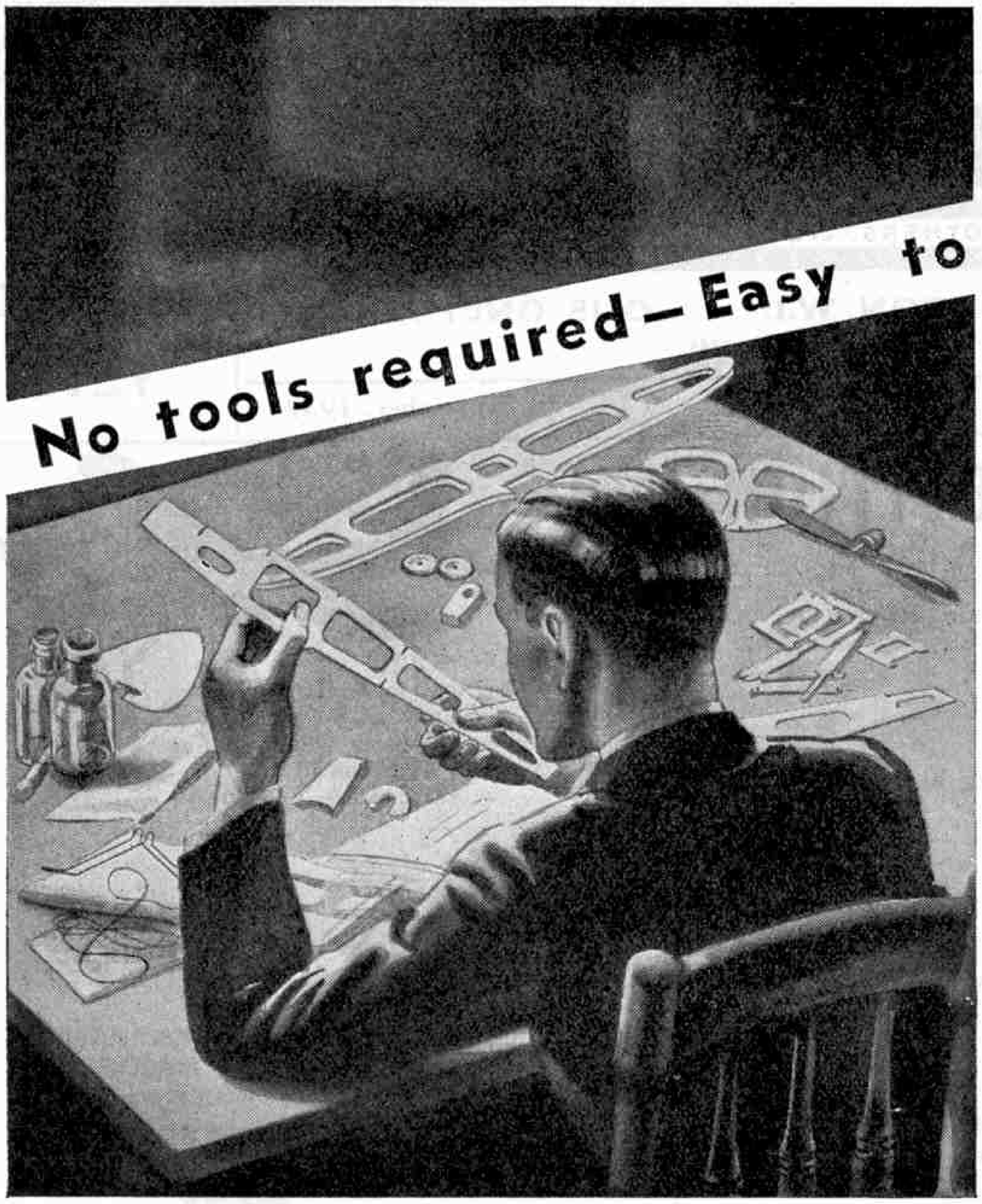
CLASS "D"

CENTRAL BULLET CONSTRUCTION SET
Holder of Queensland Record, 16 mins. Wing span 26 ins., weight 1¼ oz. New method of construction, no painting required. Complete kit of parts with dope, cement, working plan, etc. PRICE **15/6.** Carriage 1/-



CLASS "B"

Wakefield International Trophy Winner, 1936
Average flight of 2½ mins. on normal day. Kit includes dope, cement, jap tissue, wood parts cut out, carved airscrew with free wheel, wire parts bent to shape and soldered, transfers, flying instructions, etc. PRICE **21/-**



FROG

Trade Mark Regd.

FROG scale-model CONSTRUCTION KITS

make aeroplane building easy. Follow the simple instructions and you can be sure that the finished model will fly.

All the parts are blanked out and fit together perfectly. No tools whatsoever are required, the parts needing only to be glued. Wire parts are already bent to shape. The coverings are printed in the correct colours, and glue, motor lubricant and spare elastic motor are included in the kit.

De Havilland "LEOPARD MOTH" Wing Span 12¼ ins. Length 9¼ ins	2/6
De Havilland "HORNET MOTH" Wing Span 11 ins. Length 9½ ins	3/6
Hawker "DEMON" 2-seater fighter Wing Span 12¼ ins. Length 11 ins	4/6
The FAIRY IIIF fighter Wing Span 15 ins. Length 13 ins	5/6
And for the more experienced model maker The MILES "HAWK MAJOR"	10/6

Here's another winner!

The FROG COMPETITION MODEL

This Frog High-Performance Model conforms to the S.M.A.E. formula and is eligible for official competitions. It has a maximum power duration of 90 seconds, but because of the efficient design and low wing loading, it will fly for much longer periods. When the elastic motor is unwound the combined free-wheeling and tensioner device allows the propeller to idle and at the same time prevents the elastic becoming loose enough to upset the centre of gravity. The elastic motor is enclosed in a balsawood cylinder, a unique feature which serves the double purpose of stiffening the fuselage and protecting it in case of a motor breakage.

Wing Span 38". Weight 4 oz. Wing Loading 3.87 oz. per square foot.

Obtainable ready to fly - - - 49/6

Or as a Construction Kit - - - 15/-

OBTAINABLE AT ALL GOOD TOYSHOPS AND STORES

FROG MODEL AIRCRAFT

FROG model aircraft are covered by world patents granted and pending. Made in England by International Model Aircraft Limited.

Sole Concessionaires:

LINES BROS. LTD., TRI-ANG WORKS, MORDEN RD., MERTON, LONDON, S.W.19

COUPON To Lines Bros. Ltd. (Dept. 5) Tri-ang Works, Morden Road, Merton, London, S.W.19

Please send me your "Frog" coloured leaflet with particulars of the "Frog" Flying Club and how to obtain handsome enamelled "Frog" Pilot badges.

Name.....

Address.....

.....

Please write in block letters. 9/37

CASH PRIZES and CAMERAS -FREE

OFFERED BY

Hercules

THE MAKERS OF THE HIGHEST QUALITY CYCLES

5 PRIZES OF £1·1·0

AND

5 FOLDING KODAK CAMERAS

Who wants a fine cash prize — or a NEW CAMERA! They're going free to the winners of a very amusing competition. It's just a game of scissors and paste, of sticking the figures of certain men and girls on the models of certain Hercules cycles. You know Hercules cycles by name and by sight. The new 1937 models are the smartest, smoothest-running machines you've ever seen — made by the largest cycle manufacturers in the world.

Fill up the form below — write clearly.

Go MODERN ... Go Hercules

THE HERCULES CYCLE & MOTOR CO. LTD. BRITANNIA WORKS, ASTON, BIRMINGHAM 6.

ENTRY FORM

Please send me details of the Hercules cycle competition. I understand it places me under no obligation.

NAME .....

ADDRESS .....

.....

M.937

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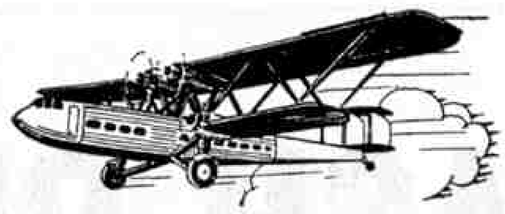
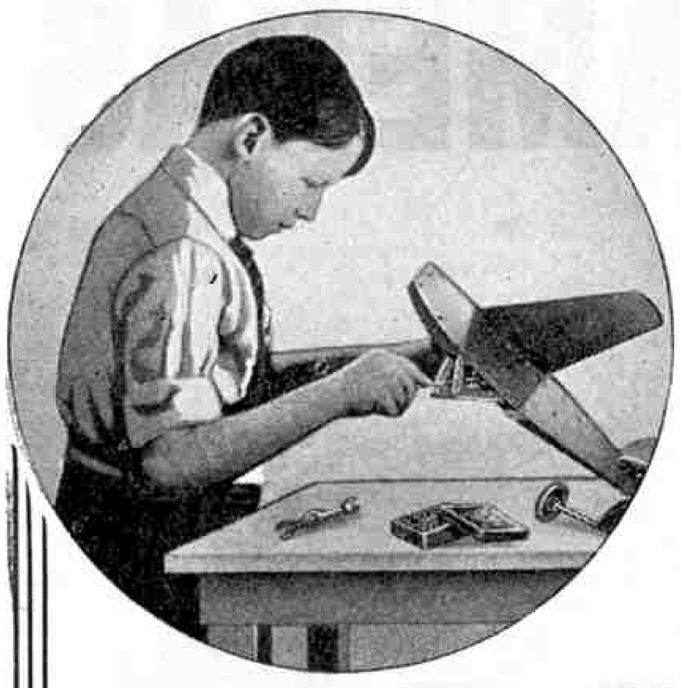
AEROPLANE CONSTRUCTOR OUTFITS

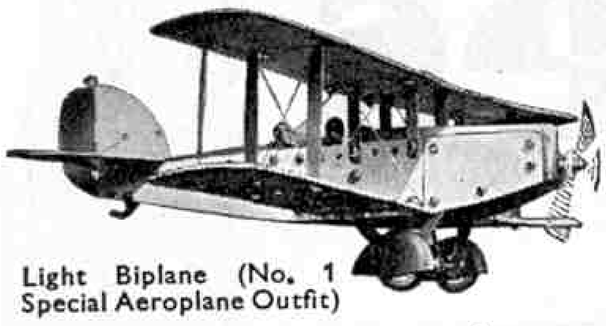




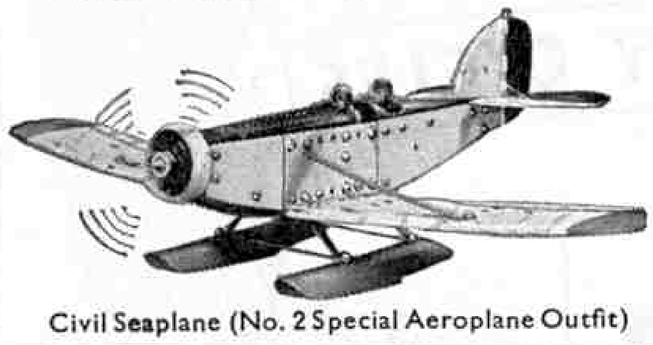
Boys! build your own model aircraft

Every boy should know how aeroplanes are designed and constructed, and should be able to recognise the different types of machines at a glance. These fine Constructor Outfits contain a range of aeroplane parts by means of which boys are able to design and build their own Aeroplanes quite easily.

The illustrated Manual of Instructions included in each Outfit shows how to build wonderful models of high and low wing Monoplanes, Biplanes, Seaplanes and many other interesting types.



Light Biplane (No. 1 Special Aeroplane Outfit)



Civil Seaplane (No. 2 Special Aeroplane Outfit)

Price List of Aeroplane Outfits

Standard Series.

No. OO Outfit	... 3/3	No. 1 Outfit	... 7/6
No. O Outfit	... 4/6	No. 2 Outfit	... 12/6

Special Series.

No. 1 Special Outfit **12/6** No. 2 Special Outfit **21/–**

Note. The parts in the No. OO and No. O Outfits are not intended for use with the larger Outfits.

No. 2 Special Aeroplane Outfit. Price **21/–**

No. 1 AERO CLOCKWORK MOTOR

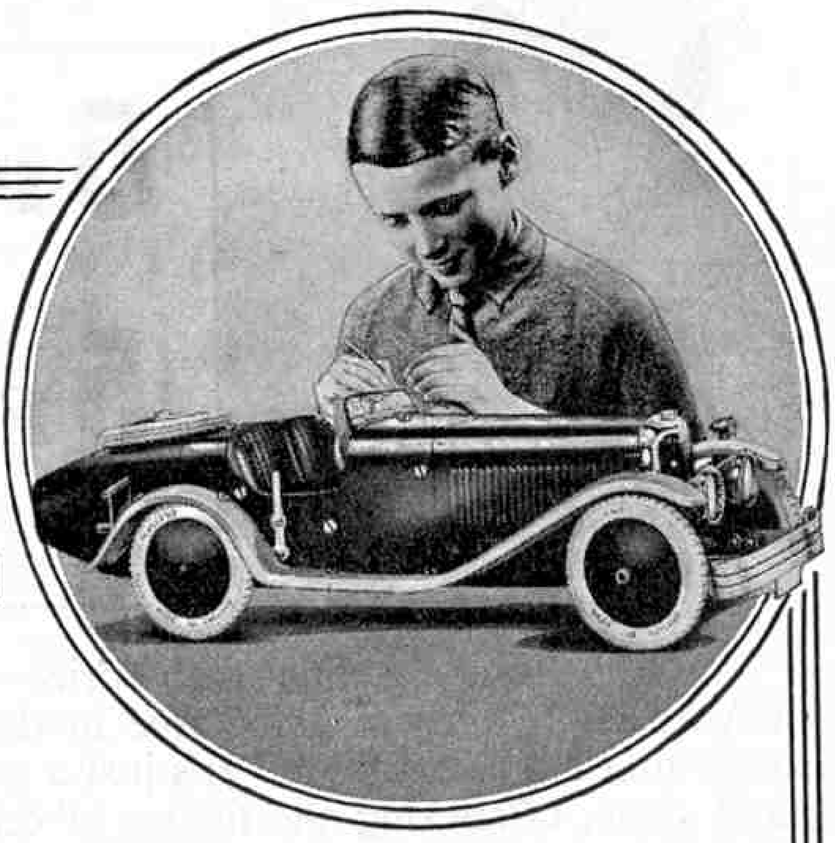
This Motor fits into the fuselage of models made with No. 1, No. 2, No. 1 Special or No. 2 Special Aeroplane Outfits. It will rotate the propeller at high speed, thus adding to the realism of the model. Price **1/9**

No. 2 AERO CLOCKWORK MOTOR

In addition to rotating the propeller, this Motor drives the landing wheels of No. 1, No. 2, No. 1 Special or No. 2 Special Aeroplane Outfit models, making the machines taxi along the floor in a most realistic manner. Price **3/6**

MOTOR CAR CONSTRUCTOR OUTFITS

You will be keen to have one!



No. 1 Motor Car Constructor Outfit. Price 8/6

No. 1 MOTOR CAR CONSTRUCTOR OUTFIT

The motor car models that can be built with this Outfit are perfect examples of miniature automobile construction. Think of the fine fun you could have building these wonderful models, each one of which faithfully resembles its prototype.

No. 1 Outfit is supplied complete with powerful Clockwork Motor. Price **8/6**

No. 2 MOTOR CAR CONSTRUCTOR OUTFIT

Larger models of a superior type can be built with No. 2 Outfit. Their handsome and realistic appearance may be judged from the model illustrated in the circle.

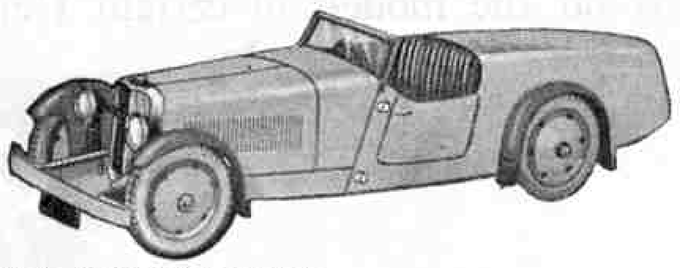
A powerful Clockwork Motor that gives a run of 150 feet on one winding is included in the Outfit. Price **17/6**

MOTOR CAR LIGHTING SET

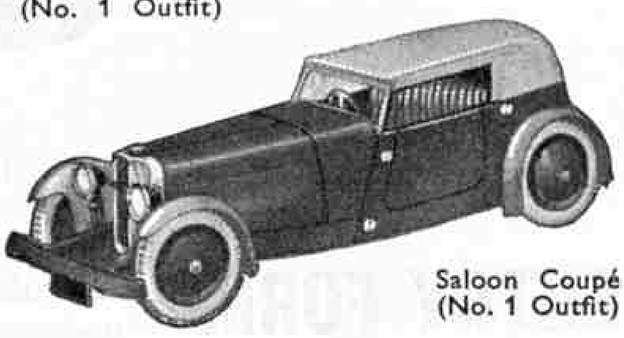
With this Lighting Set the headlamps of Motor Car models built with the No. 2 Motor Car Outfits can be electrically lighted. Price **2/6**

MOTOR CAR GARAGE

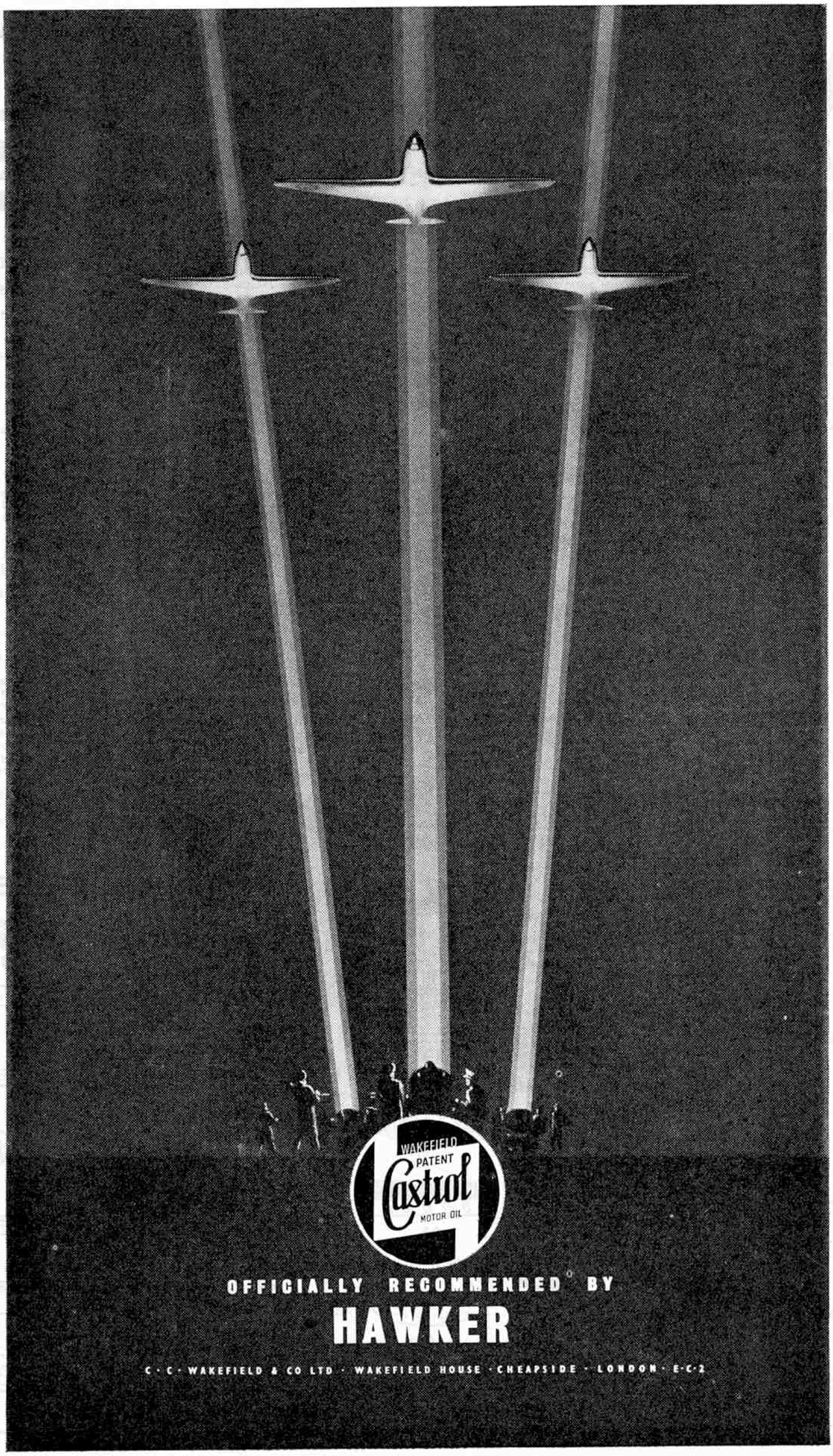
This realistic Motor Car Garage provides accommodation for any Meccano model motor car or other cars of suitable size. Inside dimensions: Height 5 in. Length 13 in. Width 7¾ in. Price **5/6**



Light Sports Two-seater (No. 1 Outfit)



Saloon Coupé (No. 1 Outfit)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OFFICIALLY RECOMMENDED BY
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MECCANO
PARTS & ACCESSORIES

REAL ENGINEERING PARTS IN MINIATURE

Meccano parts, many of which are here illustrated, combine to form a complete miniature engineering system with which practically any movement known in mechanics can be correctly reproduced. New parts are always being introduced in order to keep Meccano model-building in line with the most modern engineering requirements. The greatest care is taken in the designing of these parts to ensure that they function exactly as their counterparts in actual engineering practice. Ask your dealer for the latest complete illustrated price list.

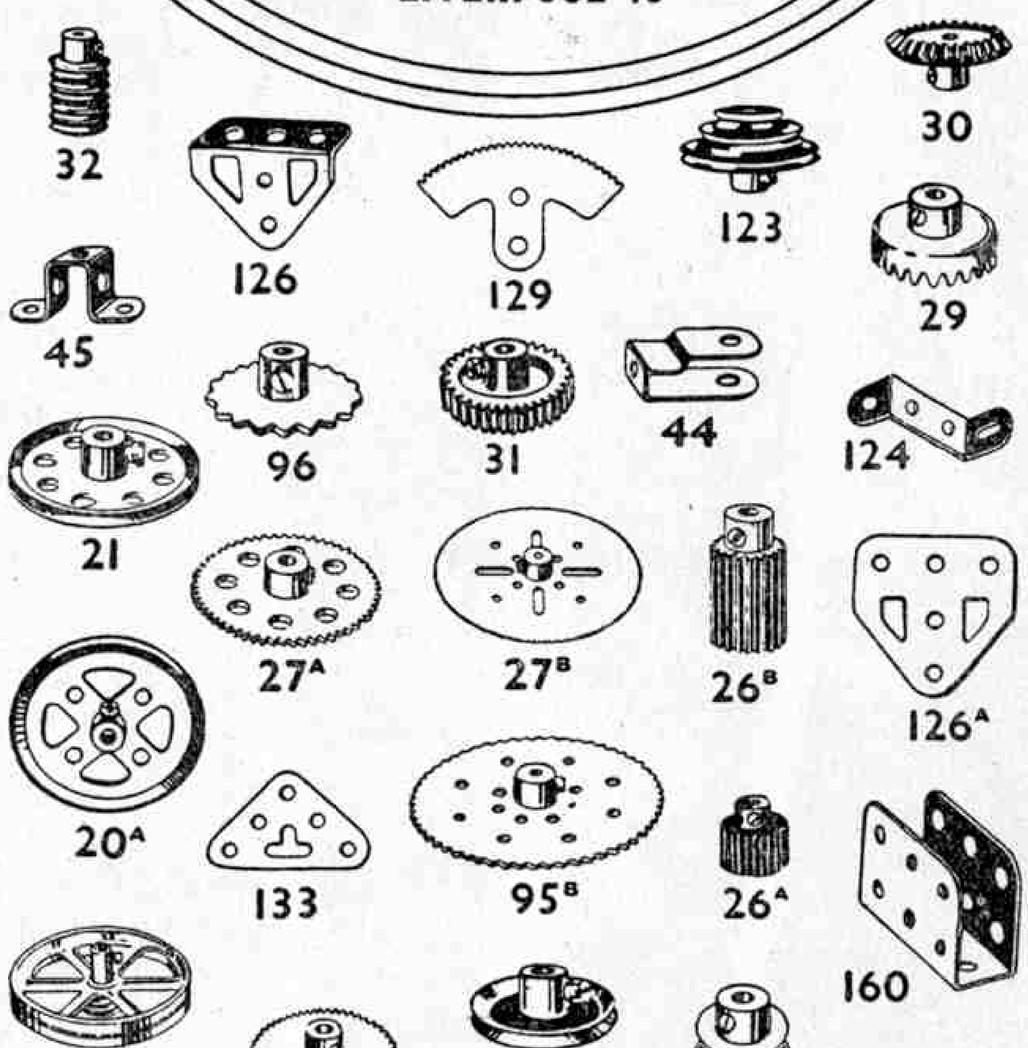
MECCANO LTD., Binns Road
LIVERPOOL 13

PRICES OF PARTS ILLUSTRATED

No.			s.	d.
3.	Perforated Strips, 3½"	½ doz.	0	4
9b.	Angle Girders, 3½"	„	0	7
10.	Flat Brackets	doz.	0	1
11.	Double Brackets	„	0	3
12a.	Angle Brackets, 1" x 1"	„	0	6
19a.	Wheels, 3" diam., with set screws	each	0	6
20.	Flanged Wheels, 1½" diam.	„	0	3
20b.	„ „ ¾" „	„	0	2
	Pulley Wheels			
19c.	6" dia. with centre boss and set screw	„	1	9
20a.	2" „ „ „	„	0	3
21.	1½" „ „ „	„	0	2½
22.	1" „ „ „	„	0	1½
23a.	½" dia. with centre boss and grub Screw	„	0	2
22a.	1" dia. without centre boss and grub Screw	„	0	1
23.	½" „ „ „	„	0	1
24.	Bush Wheels	„	0	2
26.	Pinion Wheels, ½" dia., ¼" face	„	0	3
26a.	„ ½" „ ½" „	„	0	4
26b.	„ ½" „ ¾" „	„	0	5
	Gear Wheels			
27.	50 teeth to gear with ¾" pinion	„	0	4
27a.	57 „ „ „ ½" „	„	0	5
27b.	133 „ „ „ ½" „	„	1	3
28.	Contrate Wheels, 1½" diam.	„	0	6
29.	„ „ ¾" „	„	0	4
30.	Bevel Gears, ⅞", 26 teeth	„	0	6
31.	Gear Wheels, 1", 38 teeth	„	0	8
32.	Worms	„	0	3
44.	Cranked Bent Strips	„	0	1
45.	Double „ „	„	0	1
46.	„ Angle Strips, 2½" x 1"	½ doz.	0	6
55.	Perforated Strips, slotted, 5½" long	each	0	1½
61.	Windmill Sails	„	0	1½
77.	Triangular Plates, 1"	„	0	1
90.	2½" Curved Strips, 2⅜" radius	„	0	1
90a.	2½" Curved Strips, cranked, 1⅜" radius, 4 to circle	„	0	1

PRICES OF PARTS ILLUSTRATED (Cont.)

No.			s.	d.
95b.	Sprocket Wheels, 56 teeth, 3" diam.	each	0	6
96.	Sprocket Wheels, 18 teeth, 1" diam.	„	0	3
102.	Single Bent Strips	„	0	1
103d.	Flat Girders, 3½" long	½ doz.	0	7
108.	Architraves	doz.	1	6
110.	Rack Strips, 3½"	each	0	2
113.	Girder Frames	„	0	3
118.	Hub Discs, 5½"	„	1	0
123.	Cone Pulley	„	1	0
124.	Reversed Angle Brackets, 1"	½ doz.	0	4
125.	„ „ „ ½"	„	0	2
126.	Trunnions	each	0	1½
126a.	Flat Trunnions	„	0	1
129.	Rack Segments, 3" diam.	„	0	5
132.	Flywheels, 2¾" diam.	„	2	0
133.	Corner Brackets, 1½"	„	0	1
133a.	„ „ 1"	„	0	1
137.	Wheel Flanges	„	0	2
139.	Flanged Brackets (right)	„	0	2
143.	Circular Girders, 5½" diam.	„	0	8
145.	Circular Strips, 7½" diam. overall	„	0	10
147.	Pawls, with Pivot Bolt and Nuts	„	0	3
148.	Ratchet Wheels	„	0	4
154a.	Corner Angle Brackets, ½", right hand	½ doz.	0	3
154b.	Corner Angle Brackets, ½", left hand	„	0	3
158a.	Signal Arms, Home	each	0	5
160.	Channel Bearings, 1½"x1"x½"	„	0	2
161.	Girder Brackets, 2"x1"x½"	„	0	1½
167.	Geared Roller Bearings	„	20	0
168.	Ball Bearings, 4" diam.	„	3	0
170.	Eccentrics, ¼" throw	„	0	9
180.	Toothed Gear Ring, 3½" diam. {133 external teeth / 95 internal}	„	1	0
197.	Strip Plates, 12½"x2½"	„	0	5
200.	Curved Plates, 1 11/16" radius	„	0	1
211a.	Helical Gears, ½" {Can only be used together}	„	0	9
211b.	„ „ 1½" {Can only be used together}	„	2	0
216.	Cylinders, 2½"	„	0	3



★ NATIONAL HEADQUARTERS for MECCANO ★

• GAMAGES •

Present the Finest Exhibition of Meccano Models Ever Held!

Every Meccano enthusiast, and enthusiast-to-be, should see this brilliant demonstration of the possibilities of Meccano. As National Headquarters, it is fitting that Gamages should stage this event on a scale never before attempted.

Wonderful new 1937 Meccano models from the smallest to the giants are here, and several ingenious ideas are shown for the first time.

Admission is free, and Gamages is easily reached by 'bus, tram, tube, and train from all parts of the London area.

A complete range of the latest Meccano Outfits in stock at from 2'6 to 5 gns.———and, of course, all spare parts.

NOW ON **EXHIBITION ENDS SEPT. 18th**

GAMAGES, HOLBORN, LONDON, E.C.1 *Telephone: HOLborn 8484*

A fascinating building hobby

FOR BOYS AND GIRLS

Dinky Builder Outfits are great favourites with boys and girls. The parts contained in them provide a most fascinating constructional hobby, specially designed for the younger children. These brightly coloured parts are fitted together in a most simple and ingenious manner without the use of any nuts and bolts.

There are four Outfits in the series, Nos. 0, 1, 2 and 3, in all of which the parts are beautifully enamelled in striking colours, giving a distinction to the models that is outstandingly attractive.

No. O DINKY BUILDER OUTFIT

This is an excellent Outfit with which a splendid range of models can be built. The Instruction Folder included gives examples of 40 delightful models. Price 2/6

No. 1 DINKY BUILDER OUTFIT

This fine Outfit contains a varied selection of parts, including a set of four road wheels for constructing miniature wheeled toys, many examples of which are illustrated in the Instruction Manual. These instructions show a total of 56 fine models that any boy or girl can build. Price 4/11

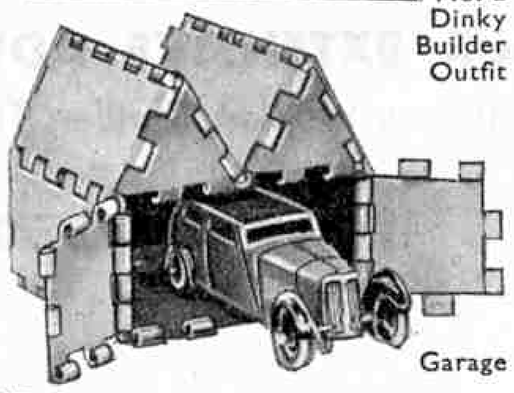
No. 2 DINKY BUILDER OUTFIT

The No. 2 Dinky Builder Outfit contains a comprehensive selection of parts with which all the No. O and No. 1 Outfits models can be built. In addition, the parts in this fine Outfit make possible the construction of six groups of miniature model furniture. Full instructions are given in the Instruction Manual included in the Outfit. Price 7/9

DINKY BUILDER "A"

The Dinky Builder "A" packet contains a useful assortment of Dinky Builder Parts with which Outfits No. O, No. 1, No. 2 and No. 3 may be supplemented. Price 1/–

No. 2 Dinky Builder Outfit



Garage

No. 3 DINKY BUILDER OUTFIT

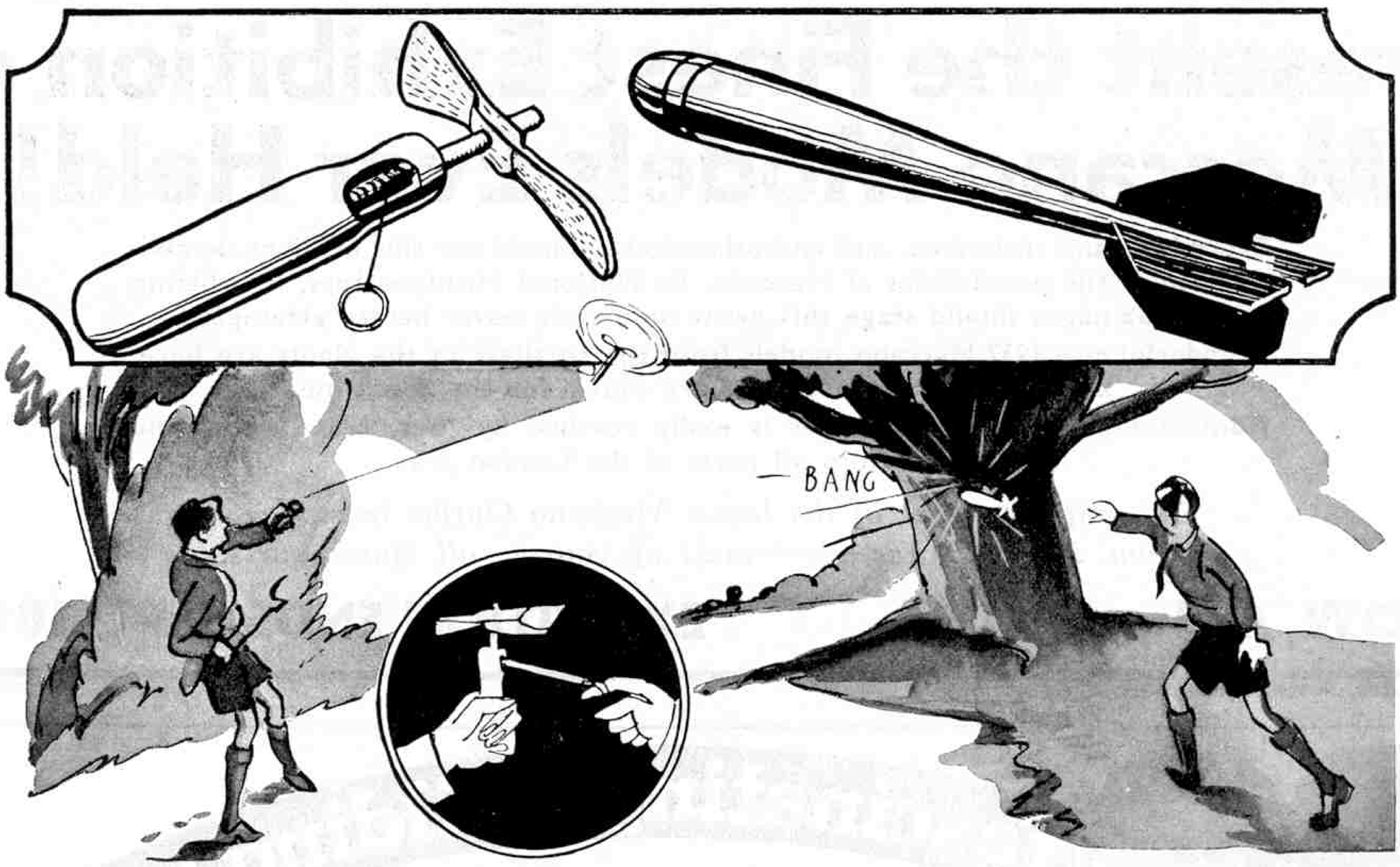
This is the largest Outfit in the series, and its model-building possibilities are almost limitless. It is the ideal gift for young boys and girls.

The parts contained in this Outfit can be used over and over again to make hundreds of different models, including Towers, Bridges, Buildings of all types, Furniture, Aeroplanes, etc. Complete instructions are provided. Price 10/9

DINKY BUILDER

Manufactured by Meccano Limited, Binns Road, Liverpool 13

THEY "FLY THROUGH THE AIR WITH THE GREATEST OF EASE"



TWO GREAT 6d. TOYS

AIR-SPORT PROPELLER

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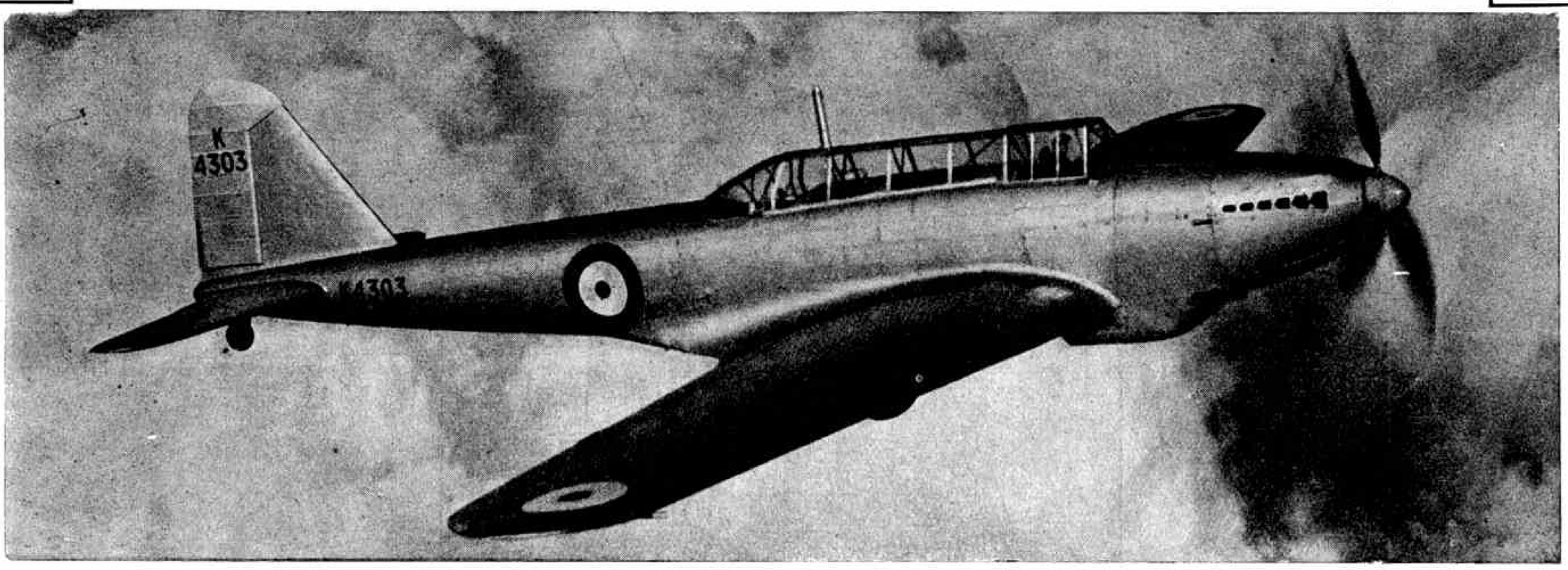

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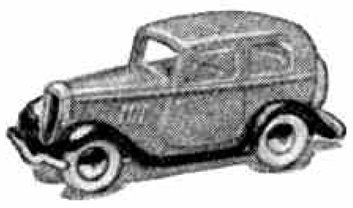
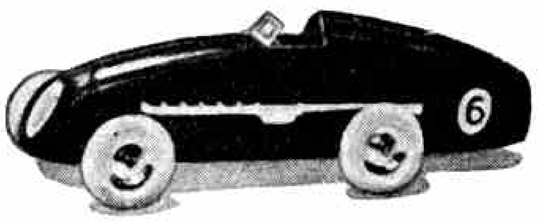


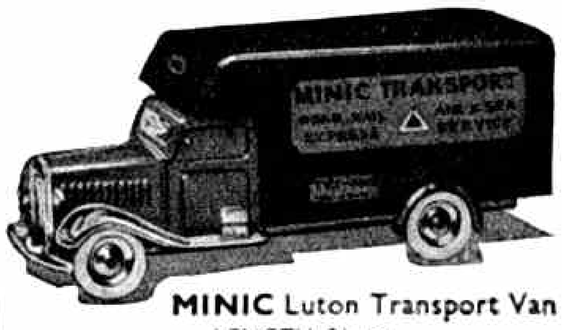
MINIC Ford £100 Saloon
LENGTH 3¼ ins.
Price 6d.

LENGTH 4⅞ ins. Price 1/3

LENGTH 5¼ ins. Price 2/–



MINIC Racing Car
LENGTH 5½ ins. Price 1/–



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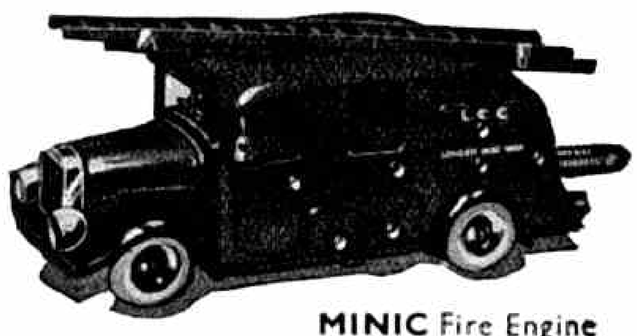

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LENGTH 6¼ ins.
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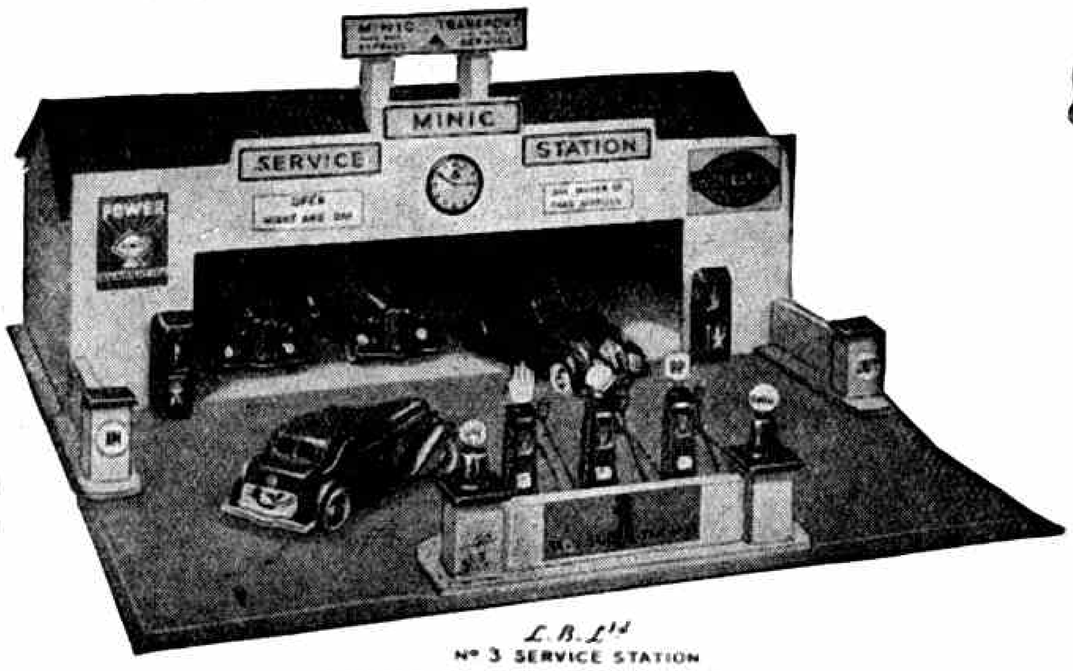

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MINIC Single Deck Bus
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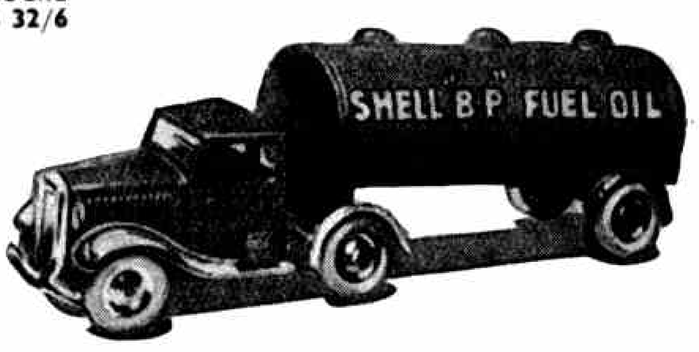
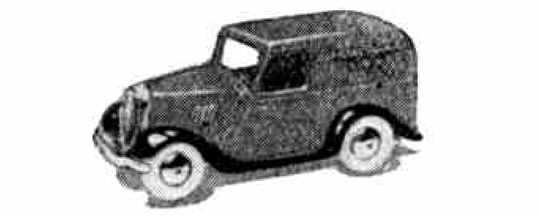
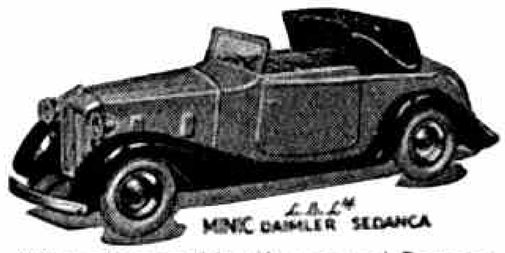


MINIC Mechanical Horse and Fuel Oil Trailer LENGTH 7 ins.
Price 2/–

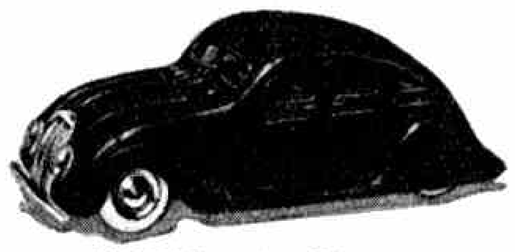


MINIC Ford Royal Mail Van
LENGTH 3¼ ins.
Price 6d.

LENGTH 4⅞ ins. Price 1/3

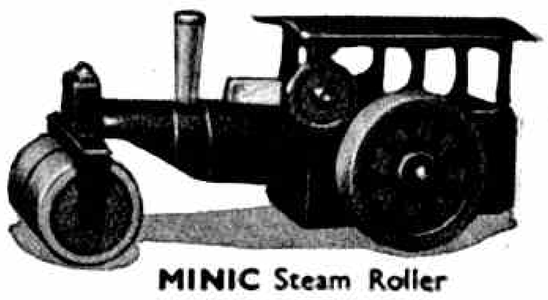


With Electric Headlamps and Battery
LENGTH 5¼ ins. Price 3/6



MINIC Streamline Saloon
LENGTH 5 ins.
Price 1/–

MINIC Dust Cart
LENGTH 5¼ ins.
Price 2/–



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MECCANO MAGAZINE

Editorial Office:
Binns Road, Liverpool 13
England

Vol. XXII. No. 9
September, 1937

With the Editor

Schools for Motor Drivers

There is a special interest attaching to the article on page 519 of this issue, which describes the schools recently established by the L.M.S. for the training of drivers for motor vehicles. The company have something like 3,500 road motors of various types, and a staff of drivers numbering somewhere about 5,000. In the past these drivers have been trained by allowing them to accompany the driver of a vehicle in actual service. This method, which proved fairly satisfactory a few years ago, has had its weaknesses shown up more and more as traffic on the roads has increased and as highway regulations have become more stringent and complicated. Road conditions to-day demand far more from a driver than the mere ability to manipulate the controls of his vehicles. Unless he is to be a possible danger to himself and to other road users he must not only have a sound knowledge of the principles of the Highway Code, but also must possess what may be described as "road sense," the absence of which leads to so many serious accidents that ought to have been avoided.

With this in mind the L.M.S. tried the experiment of opening a school in which prospective drivers could receive a thorough preliminary training before commencing actual driving lessons on a vehicle. The most interesting part of this training consists of a course of lessons devoted to illustrating the principles of safe driving. In these lessons continuous use is made of miniature road vehicles of various types, which are operated on a large table laid out as a highway, with crossings, Belisha beacons, and all the various road traffic signs with which we are now familiar. The experiment proved so successful that four schools of instruction are now established, and the 600 new drivers trained every year by the L.M.S. will take the road thoroughly equipped for safe driving. Incidentally, readers will be interested to note from the illustration on page 519 that the models used are Meccano Dinky Toys vehicles.

SPECIAL NOTE TO READERS

The Meccano Magazine celebrates next month its Twenty-First Birthday!

MAKE SURE OF GETTING YOUR COPY

The North Atlantic Air Route

The programme of preliminary commercial flying on the North Atlantic has been carried a stage further by the survey flights made by the Imperial Airways long-range flying-boats *"Caledonia"* and *"Cambria."* Technical information of great value is being obtained from these flights. Before each one the captain concerned was provided with detailed forecasts as to the weather ahead along his route, and as to the wind conditions he might expect. He then plotted the course he would follow, and made estimates of the varying heights at which he would fly to obtain the best results from wind-conditions prevailing.

In studying the actual logs of each trip it is remarkable to see how accurate were these previous estimates. The speeds made good, for example, on various stages of the crossings, were strikingly in accordance with the figures worked out beforehand. This was due largely to the splendid work done by the meteorological departments. Previous research work on Atlantic weather, from a flying viewpoint, enabled the meteorologists to provide forecasts that were consistently accurate, not only as regards general weather conditions, but also as to the wind direction and speed at the altitudes at which the aircraft would be operating. One particularly interesting feature has been the way in which, thanks to rapid and efficient wireless signalling between aircraft in flight and ships and shore-stations, it has been possible for flying-boats to make slight deviations from their pre-arranged courses in order to take advantage of increasing wind velocities, or to avoid areas where conditions would tend to reduce estimated cruising speeds.

The present series of tests, in which no commercial loads are being carried, will be followed by a second phase in which mails will be carried. After that will come the final and of course the most interesting phase of all, in which there will be scheduled two regular services in each direction every week, carrying passengers in addition to mails.

Marvels of Automatic Weighing

From Eggs to Coal, Grain and Tinplates

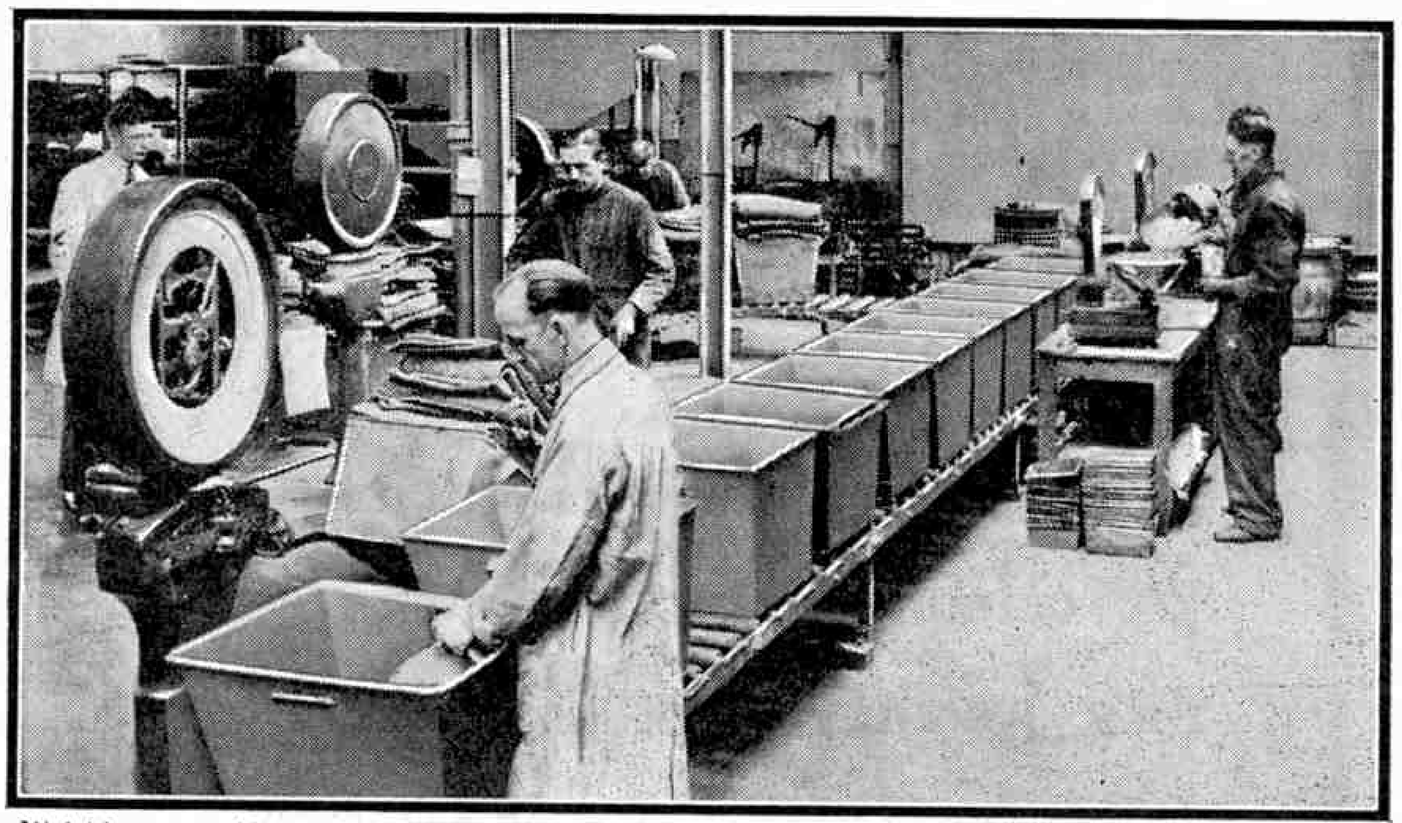
EVERY reader of the "*M.M.*" is familiar with a wide range of weighing equipment, from the scales used in retail shops to the giant weighbridges on which huge lorries and their loads are weighed. Few realise, however, what an enormous variety of machines have been designed for industrial weigh ng operations. Accurate weighing is an absolute nece sity in modern industry. The equipment by means of w ich it is carried out must work quickly and as far as possible automatically, and the demands that have been made on the engineers who specialise in this direction have led to the development of a wide range of interesting machines. Even the difficulties of weighing goods while they are being carried on conveyors of various types have been overcome, and materials of all kinds can be weighed and measured in predetermined quantities, with practically no interruption in their progress.

The weighing equipment used in conjunction with conveyors is of special interest because of the variety of the materials handled and the many operations to which it is adapted. For ordinary weighing on an indoor conveyor, the platform of the scale is built into the conveyor system with a section of the conveyor mounted on it, and is connected to a self-indicating headwork. The weight of each load in turn is indicated on the dial as it moves on to the weighing platform. The illustration on this page shows this method of weighing in a rubber tyre factory. The conveyor employed is of the roller type, along which raw rubber and the ingredients to be compounded with it are carried in containers. In their progress along the conveyor they pass over the weighing platform, above which, in a position where it can be read, is the indicator showing the weight of the container and its load.

Some weighing machines not only give visible indication, but also are fitted with an electrically-operated weight recorder. This prints on a ticket or a continuous tape, or on both, an accurate record of the weight of every load passing over the machine. It can be fitted with very little alteration to most types of scales, from platform machines to large weighbridges; and the record produced is completely accurate and trustworthy, for interference during the actual recording is impossible. The whole of the recording unit can be swung out from the side of the headwork, so that a periodical inspection and renewal of the paper tape and inking ribbon can be easily and quickly carried out.

Overhead monorail tracks, from which containers are suspended on pulley wheels or bogies, are used extensively in large factories, and these also can be fitted with weighing equipment. For this purpose a section of the track is connected to weighing levers, thus forming in effect a weighing platform, so that the exact weight of a container and its load passing over this section is transmitted to the indicator of the scale. It is an easy matter, where containers are of the same weight, to subtract this "tare" of the container to ascertain the net weight of material carried.

Where trucks are used for indoor conveying, their loads can be weighed by passing them over a scale fitted with tare beams that deduct the net weight of the truck and allow the net weight to be indicated on the dial of the machine. An interesting method, and one that is particularly useful when known quantities of material have to be placed in each truck, is to make the container itself a weighing machine. For this purpose the truck is mounted on weighing levers and is provided with a self-indicating dial.



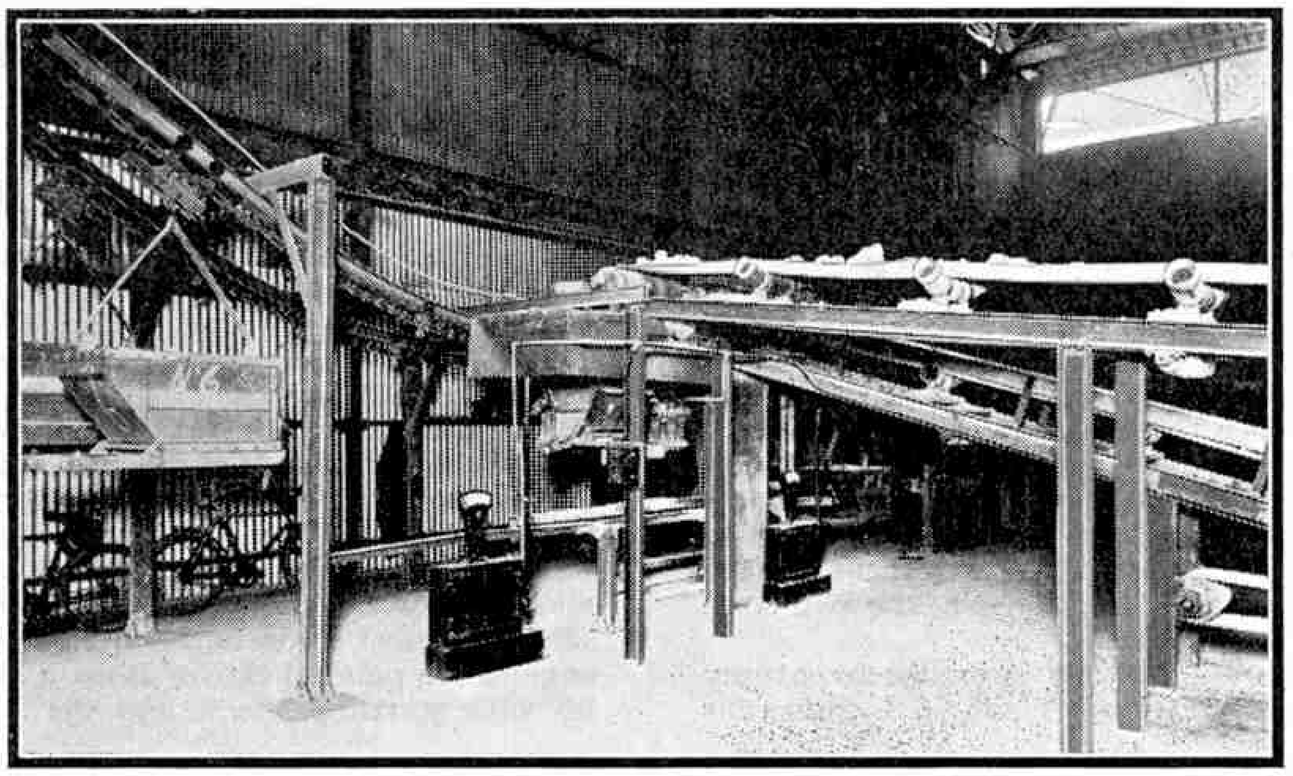
Weighing raw rubber, and other ingredients required in the manufacture of tyres, in containers carried on a roller conveyor. The illustrations to this article are by courtesy of W. and T. Avery Ltd., Birmingham.

This method is shown in use in the lower illustration on the opposite page. Here the truck is loaded with various ingredients that are afterwards tipped into a mixing machine. The ingredients are fed from a series of overhead hoppers into the truck standing beneath each in turn until the correct amount has been delivered, when the flow is checked by the operator. By the time the truck has passed along the line of hoppers its load is completed, and it is run along the rails to the point where its contents are discharged into the mixer.

Weighing machines can be incorporated also in an automatically controlled charging system. One example of their use is in weighing the ingredients used in the making of cement, as shown in the upper illustration on the next page. In this case the scales are of the predetermined load type, and are connected to hoppers set over a monorail conveyor carrying skips. The materials are fed into hoppers by belt conveyors, which run until the predetermined load has been delivered into the hopper, when an electric switch operated by the scale stops the motor driving the conveyors. The contents of the hoppers are then released into a skip standing beneath, which moves on to the furnace in which the cement is fired. The hoppers are then refilled and the

predetermined load is again discharged into the next skip, which by this time has travelled beneath it. A system of electrical interlocking prevents any operation from taking place at the wrong time, and the work continues automatically without interruption.

Good use is made of another type of predetermined weight scales in modern bakeries. One machine for work of this kind is designed to weigh lumps of dough. The pieces are brought to the weighing machine on a conveyor, and slide down the sloping side of the pan. Red or green electrical signal lamps then show at a glance whether they are over or under correct weight. A similar machine is used for checkweighing bread travelling from the wrapping machine.



Weighing-hoppers in a cement factory. Material is brought to them on belt conveyors, which stop when the required weight is made up, starting again when this is released into the skips of a second conveyor of the monorail type.

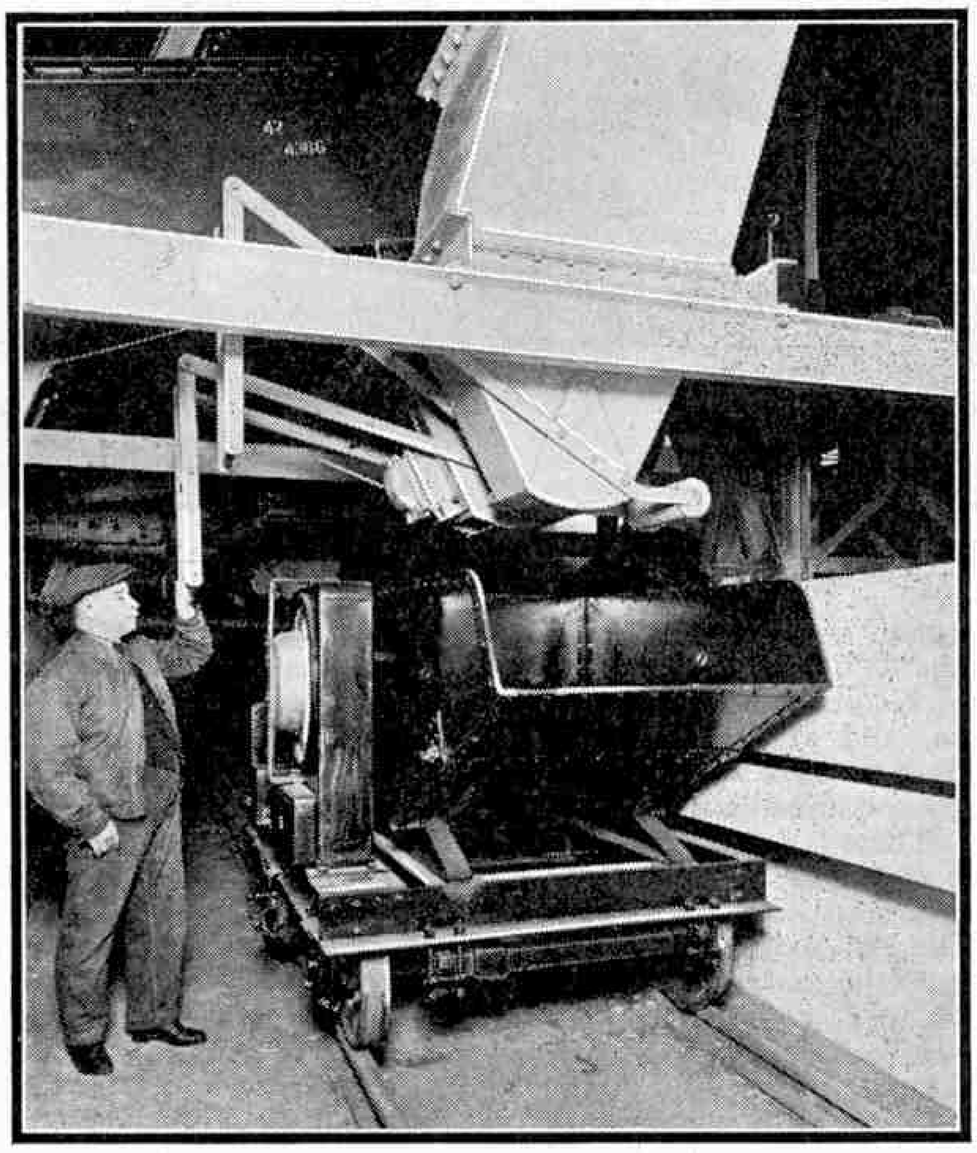
Flour, rice, tea, grain, and in fact any free-flowing materials of a similar nature, are weighed by automatic machines that are operated entirely by gravity, and continue to weigh so long as a sufficient supply of material remains. These weighers may be comparatively small, or huge machines at the dock sides where they deal with large quantities of grain raised from the holds of ships. Some are capable of weighing loads to 6-tons per discharge and operated twice a minute, and are so accurate that when their loads have been weighed separately for special tests they have been found to be accurate to within the small margin of 1 lb.

In a typical machine of this kind the grain is taken from the hold and elevated to the top of the granary, where it is discharged into the hopper of the automatic weigher. It pours into the scale at first in a steady stream, which is gradually reduced as the correct weight is approached. When this is reached the feed is cut off entirely and the scale discharges its load. Provision is made for a record of the total amount of material handled during the time the scale is in operation.

From machines weighing grain on such a huge scale it is interesting to turn to others handling such fragile articles as eggs. These not only weigh the eggs, but also grade them into different sizes.

Another grading machine used for dealing with tinplates, weighs and separates them into different grades. The predetermined correct weight is set on a graduated dial, and also a percentage underweight or overweight tolerance. When this is done the machine is set in operation. Tinplates from the cleaning machine are fed into the scale singly, and as each is brought on to the sloping weighing platform its progress is arrested by a stop. The plate is weighed, and the scale takes up a position dependent upon its weight, this position determining the group into which the particular plate will be discharged. If the weight of the plate is within the predetermined tolerances, the stop is released and the plate passes into the correct weight group. If it should be too heavy or too light, however, it is diverted into the overweight or underweight groups. As each plate is discharged from the platform the stop returns to its former position in readiness to arrest the next plate, and the whole cycle of 19 operations necessary for the functioning of the machine is carried out so rapidly that plates are graded at the rate of 18 per minute.

The machines so far dealt with are largely used for indoor work, but weighing facilities are provided also for outdoor conveying and transporting systems. For instance, weighing equipment for travelling cranes, bucket loaders and grabs take the form of automatic weighers with a large top hopper into which the material is released. After weighing it is discharged into trucks or on to conveyors for transportation. Travelling hoppers of the kind already described are also used outdoors, where they are fitted to special wagons for carrying such materials as coal and coke. The weighing levers of these hoppers actuate self-indicating dials and allow very accurate weighing to be carried out.



Tipping trucks that are weighing machines. Ingredients to be mixed are delivered into them from overhead storage hoppers, which are closed when the scale on the truck shows the required weight.

The most common method of outdoor transportation is of course by road or rail, and the great weighbridges on which the loads of motor vehicles and railway wagons are weighed are very interesting. They are constructed to carry the maximum loads met with either on road or track, and every care is taken to ensure that they carry out their work accurately and quickly. As indicative of such care it may be mentioned that the knife-edges and bearings—vital components—are all enclosed in rubber baths filled with grease to resist corrosion.

A great saving in time and labour results from the use of continuously-operated weighing machinery.

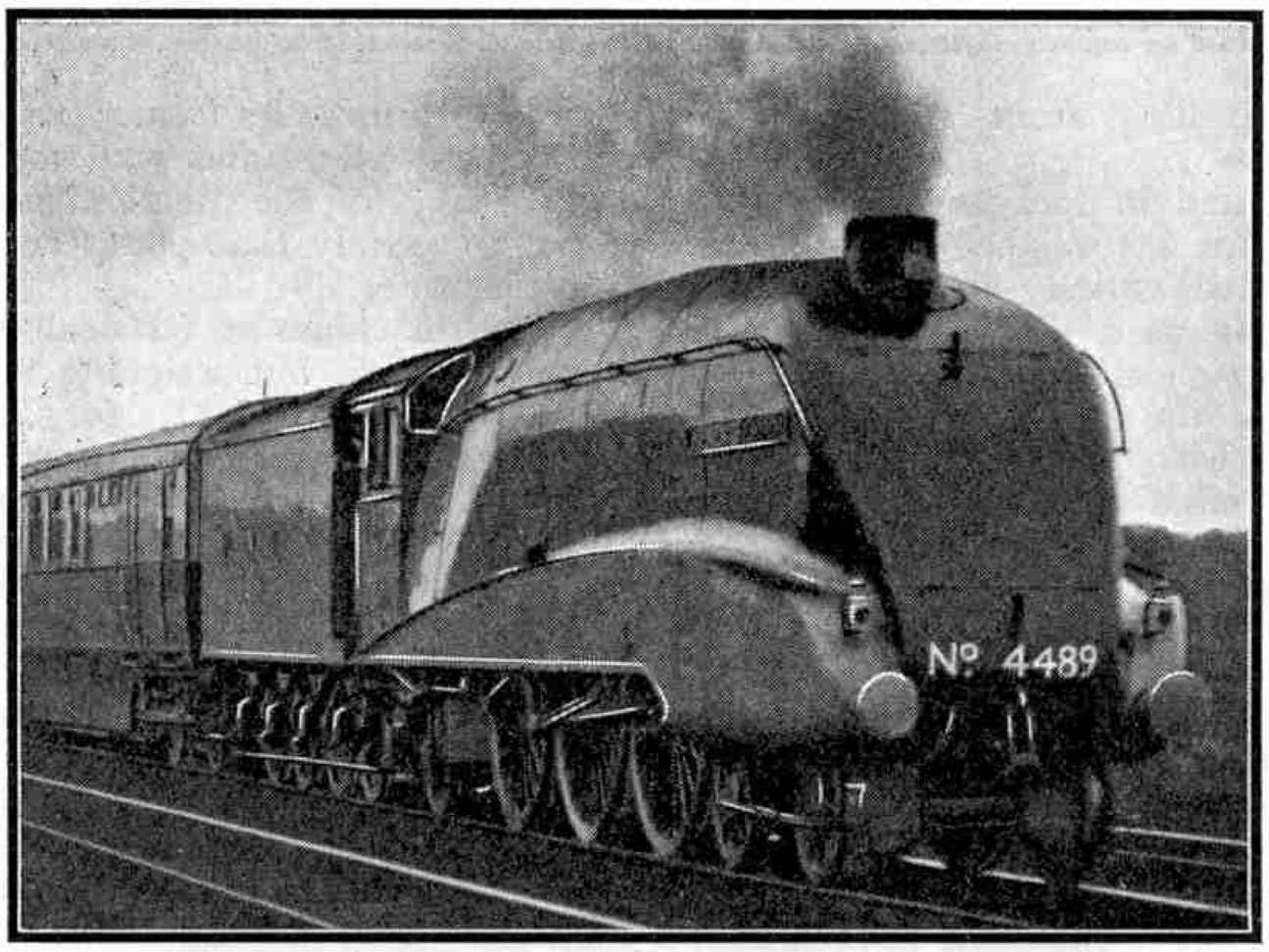
The Empire's Fastest Train

The L.N.E.R. Streamlined "Coronation"

By a Railway Engineer

THE friendly rivalry between the East and West Coast Routes to the north has entered upon a new phase—a competition in streamlining. Rivalry was inevitable from geographical considerations alone. It dates from very nearly the earliest days of railway travel between England and Scotland, and it reached its most exciting pitch in August 1895 when the competitors raced pell-mell for Aberdeen. Since that time rivalry has manifested itself in rather milder forms, such as competition for the most powerful locomotives, the longest non-stop runs, and the most luxurious rolling stock. But in this Coronation year something of the thrill of 1895 was recaptured when, in the last two days of June, the two companies went into streamline competition.

Unlike its rival at Euston, the *"Coronation"* provides an entirely new service between England and Scotland. The L.M.S. train runs at about the same time as the old *"Midday Scot,"* and gives a very much faster journey to passengers who were in the habit of travelling at that time. On the other hand, the *"Coronation"* leaves London at 4 o'clock in the afternoon, a departure time without precedent in the history of Anglo-Scottish train services. With *"The Flying Scotsman,"* and the popular 1.20 p.m. Scotsman running just as usual, the *"Coronation"* has had to attract to itself an entirely new public. It might seem as though this would be easy, in view of the remarkable facilities provided by the new train, but it is surprising how deeply ingrained are the habits of regular travellers. No less established are the ways of tourists, at any rate of those who are able to travel at mid-week; and so, in launching the new service, something very much out of the ordinary was provided in order to attract custom.



L.N.E.R. No. 4489 "Dominion of Canada" hauling the "Coronation" train on the up trial run of 30th June last, when a speed of 109½ m.p.h. was reached. Photograph by Mr. E. R. Wethersett, Harlesden.

The *"Coronation"* is one of the most beautiful trains that have ever run, in this or in any other country; beautiful in its interior decoration, in its external colour-scheme, and above all in the engineering skill manifested in the blending of streamlined grace with great mechanical strength. Both first- and third-class coaches are of the "open," non-compartment type. There is a table opposite every seat, so that passengers can have meals brought to them where they sit, without the necessity of a sometimes hazardous walk along the corridor. In this respect the Pullman principle has been adopted. On the other hand there must be many like myself who enjoy a corridor walk, whether it be to a restaurant car or not; and this is just where the *"Coronation"* excels. On this truly super-train a walk towards the rear end, instead of ending in the guard's van, brings one to the unique tail car, with its array of luxurious armchairs, and its strangely fascinating backward look-out where track, stations, and signals recede in lightning succession. This observation car not only forms a very striking tail to the train, but also assists in reducing the air-resistance. It gradually tapers down to buffer level, and this streamline shape has been proved to save quite a measurable amount of power at high speed.

Apart from such technical considerations as these, the car is a masterpiece of carriage-building. A most accurate curving profile, both transversely and lengthwise, has been produced, with only the slenderest of partitions separating the huge windows; and of the latter those forming the curving rear-end look-out are made of Perspex, a special glass substitute widely used in aircraft construction. Curiously enough it is to those who know the route best that the backward view seems strangest. During the trial trip some of the Doncaster works technical staff foregathered in the car, and most of them frankly admitted a sensation of being "lost," the well-known line looking quite different through being seen backward, as it were.

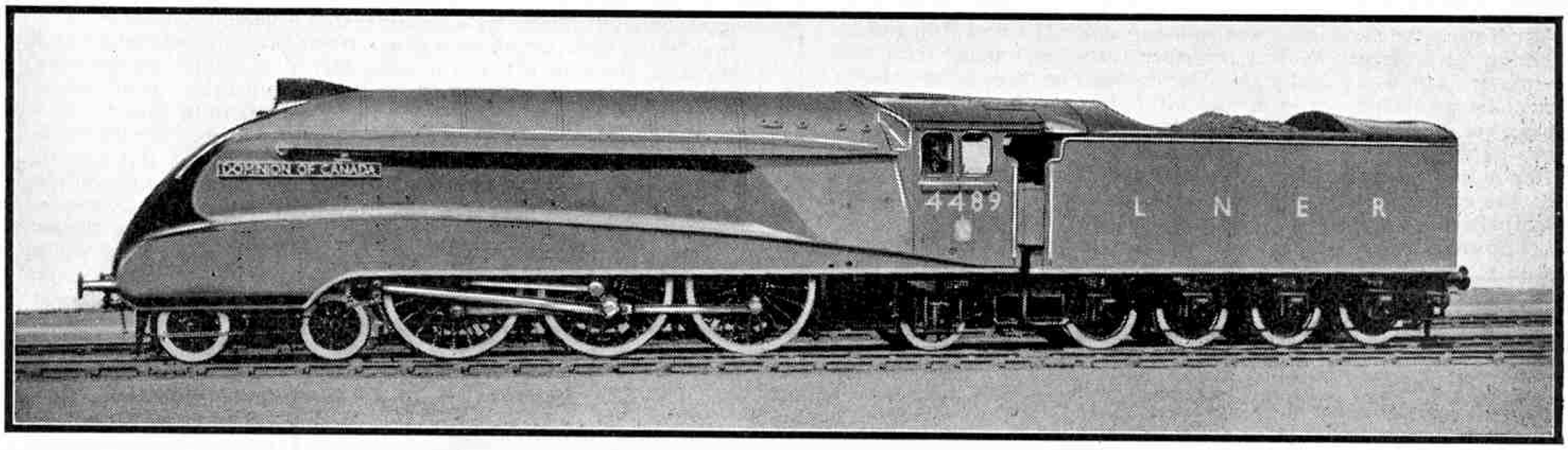
In writing of the *"Coronation"* I have left the engines until last, not because they are of less note than the train, but because they are, except for their splendid livery, identical with the "Silver Links." Five of the class "A4" locomotives have been specially allocated for working the *"Coronation,"* and they have been named after the most important units of the British Empire. These five engines are painted Garter Blue, a beautiful rich colour that shows up with startling effect, and the lettering and mouldings are in stainless steel. The bodies of the coaches are finished in the same colour as the locomotives, but the upper panels are a delicate pale blue—one of the most charming colour-schemes ever applied to a railway carriage.

Each of the five engines was named by the High Commissioner of the particular Dominion concerned, and two of the engines, No. 4489 *"Dominion of Canada,"* and No. 4488 *"Union of South Africa,"* have been fitted with whistles of the types used in the respective countries. I have not yet heard the South African whistle, but the Canadian pattern, the same as that used on the C.P.R., is something entirely new to English ears, and consists of a tremolo mid-way in pitch between the chime of *"Silver Link"* and the deep bass of modern L.M.S. engines.

"Dominion of Canada" was chosen for the trial run on 30th June. A little scepticism existed among certain engineers as to whether the new train could be managed comfortably on the fast timings laid down. The seven-coach *"Silver Jubilee"* set weighs only 220 tons without passengers, whereas the nine coaches of the *"Coronation"* weigh 312 tons. For my own part I had no such qualms. I have a vivid recollection of *"Quicksilver"* tearing across the Plain of York averaging 73½ m.p.h. for 28 miles in the teeth of a blizzard, and hauling not the seven-coach *"Silver Jubilee,"* nor yet the *"Coronation,"* but *"The Flying Scotsman"*—15 ordinary coaches plastered from end to end with ice and frozen snow, and weighing 515 tons behind the tender!

On the trial trip the train was booked to pass Grantham in the standard "Jubilee" timing, 87½ minutes for the 105.5 miles from King's Cross, and after that to run northward to a stop at Barkston, where it would be backed round the northern spur of the triangular junction in readiness for the return to London. Compared to the standards set up on the previous day, the down run of the *"Coronation"* was a placid affair. Driver Burfoot worked closely to schedule time, and speed at no point exceeded 93½ m.p.h. All the same *"Dominion of Canada"* whirled her 312-ton train along the level stretches at 85–90 m.p.h. just as easily as *"Silver Link"* and her sisters speed with the *"Jubilee."*

The return journey, however, included some thrills of the first magnitude. Driver Burfoot coaxed a brilliant start out of his engine. Grantham, less than five miles out, and all uphill, was passed at 66 m.p.h., and in spite of a 1 in 200 gradient No. 4489's stride gradually quickened till she topped Stoke summit at 69 m.p.h.



This photograph of "Dominion of Canada" gives a very good idea of the general appearance and finish of the "A4" series of "Pacifics" specially allocated to the working of the "Coronation." Each is named after an important unit of the British Empire, and carries on the cab side the coat-of-arms of that country. Photograph by courtesy of the L.N.E.R.

Again that glorious racing stretch down towards Peterborough, which has witnessed a large proportion of the greatest speed records made in Britain, was the scene of some hurricane travelling. Once over the summit "*Dominion of Canada*" was driven as near as makes no matter to "flat-out," and the pace quickened with the same hectic rapidity as on the previous day's run from Euston to Crewe. Corby, 3 miles from Stoke summit, was passed at 86½ m.p.h. Acceleration was stayed a moment while the engine stormed over the level mile that leads to Mile Post 96, but once the 1 in 200 descent was begun speed went leaping up so rapidly that the day-old L.M.S. record seemed likely to be smashed.

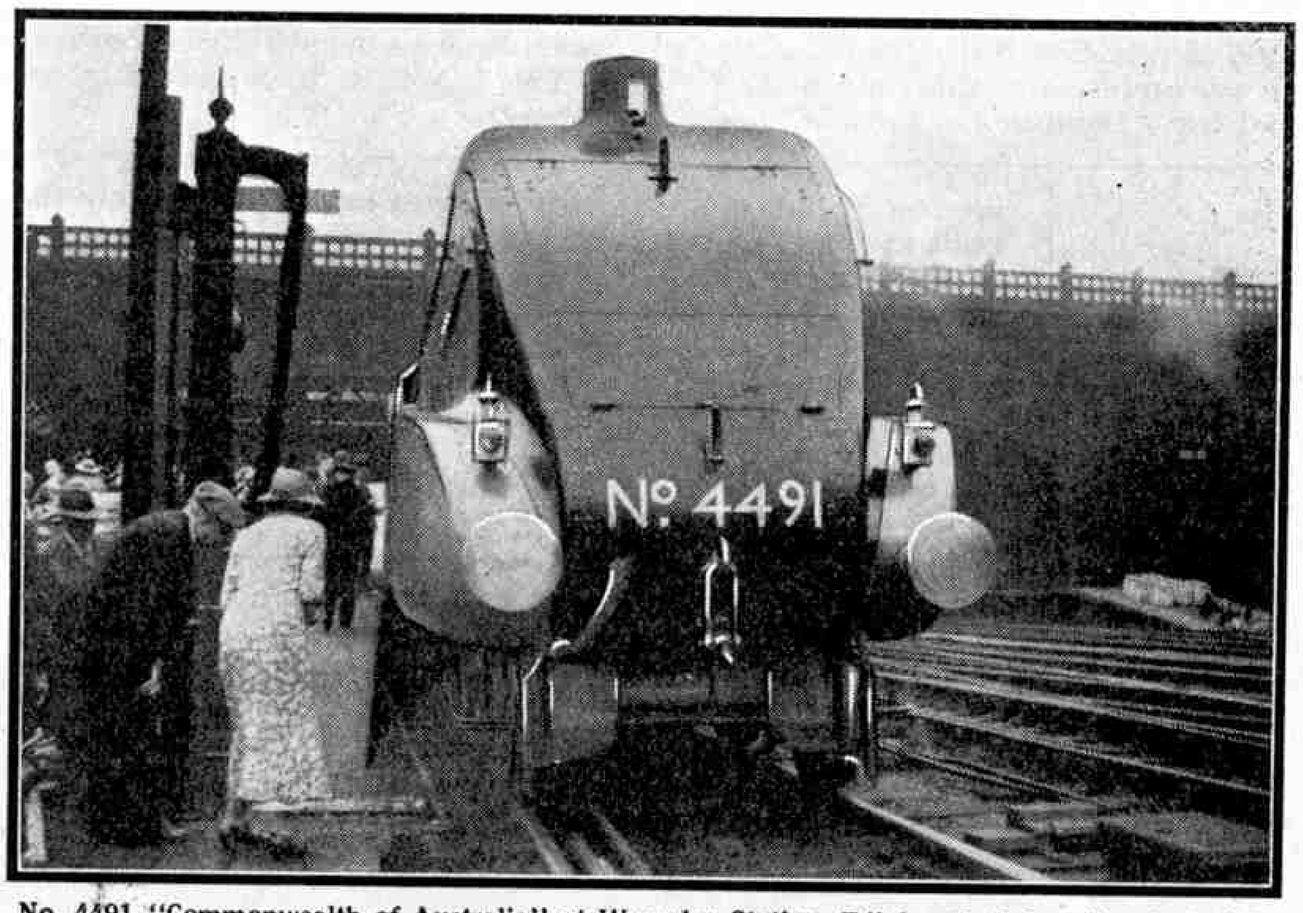
In successive miles speed jumped to 95, 99, 101, 105½, 108½, 109½, but as Essendine was neared there was a drop, imperceptible it is true, to 107 m.p.h., and a moment later the engine was definitely being eased, the flatter gradients having now been reached. Nevertheless the 29.1 miles from Grantham to Peterborough were reeled off in the very fast time of 20 minutes 53 seconds, an average speed of 83½ m.p.h.; and after recovering from the 20 m.p.h. slack through Peterborough, "*Dominion of Canada*" continued in grand style all the way up to London. The finest feat of all was to climb the long Stevenage bank, 7 miles of 1 in 264 to 1 in 200 grade, without speed falling below 76 m.p.h. So, in spite of a severe slack for permanent way repairs at St. Neots, the 105.5 miles from Grantham to King's Cross were completed in 86 minutes.

In regular service the down "*Coronation*" calls at York; the 188.1 miles from King's Cross are covered in 157 minutes, and this average of 71.9 m.p.h. makes the "*Coronation*" the fastest train in Britain. At long last that proud title has been wrested from the "*Cheltenham Flyer*," but only by the very narrow margin of 0.6 m.p.h. Shortly after the service was inaugurated I enjoyed a through trip from Edinburgh to London, and an extraordinary experience it was. No. 4491, "*Commonwealth of Australia*," was the engine, driven, on the first stage, by Ferguson of Gateshead shed. The weather conditions were not at all favourable to fast running, for a heavy mist was driving in from the sea, but from the moment we got the "right-away," engine and crew appeared completely masters of their work. Under the fascinated gaze of a crowd of spectators—and platform tickets cost threepence in Scotland—we made a gentle start, through a maze of difficult junctions; but "*Commonwealth of Australia*" was soon racing along the Lothian coast at 80 m.p.h. The sea mist was very thick as we neared Dunbar, and Ferguson eased up to 55 m.p.h. This gave us a bad start for the formidable climb of the Cockburnspath bank, 4 miles at 1 in 96, and when we emerged from the summit tunnel at Penmanshiel speed was down to 39 m.p.h. But a fine gallop down to the Border, with a top speed of 84 m.p.h., took us through Berwick on time, the 57.5 miles from Edinburgh having taken 55 minutes.

Now we entered upon the central stage of the journey, a period of comparatively moderate speed and many slacks. Easy running is required for a number of reasons. Along the Northumberland coast the schedule provides a useful recovery margin in case time has been lost on the much harder bookings north of the border; through the Newcastle and Durham coalfields several drastic slowings are at present in force owing to mining subsidences; and owing to the curves at Aycliffe, and the very severe speed restrictions through York and Selby, no really high speed is attempted until the train is past the latter point.

For most of this quiet period I was in the observation car. While the outlook is much the same as that experienced from the observation cars running between Glasgow and Oban, and on certain North Wales routes of the L.M.S., one has the unique experience of high-speed travel. It was most curious to watch signals being put to danger behind us, and to see expresses go racing by on the down road and disappear in the distance; but easily the most arresting point was the riding of the car itself. South of Berwick we were making a steady average of about 70 m.p.h. along a track that includes quite an amount of reverse curvature, and all the time the coach rode as smoothly as could be wished for. There was never a suspicion of "tail-wag," let alone anything so pronounced as a lurch.

There was little to be glimpsed in the way of scenery, for the sea mist still persisted; but the very dampness of the atmosphere produced a most interesting exposition of the effect of the tail end streamlining. Exhaust steam from the engine was all the time coming in clouds; a certain proportion was deflected sideways, but when the wind and our direction were favourable smoke passed throughout the length of the train, along the carriage roofs, and on reaching the tail was drawn down in a smooth stream without a suspicion of swirls and eddies. One has only to watch a train with an ordinary upright back running through fog to see the disturbance created in its wake; the contrast in the case of the "*Coronation*" was very strikingly revealed in this moist air.



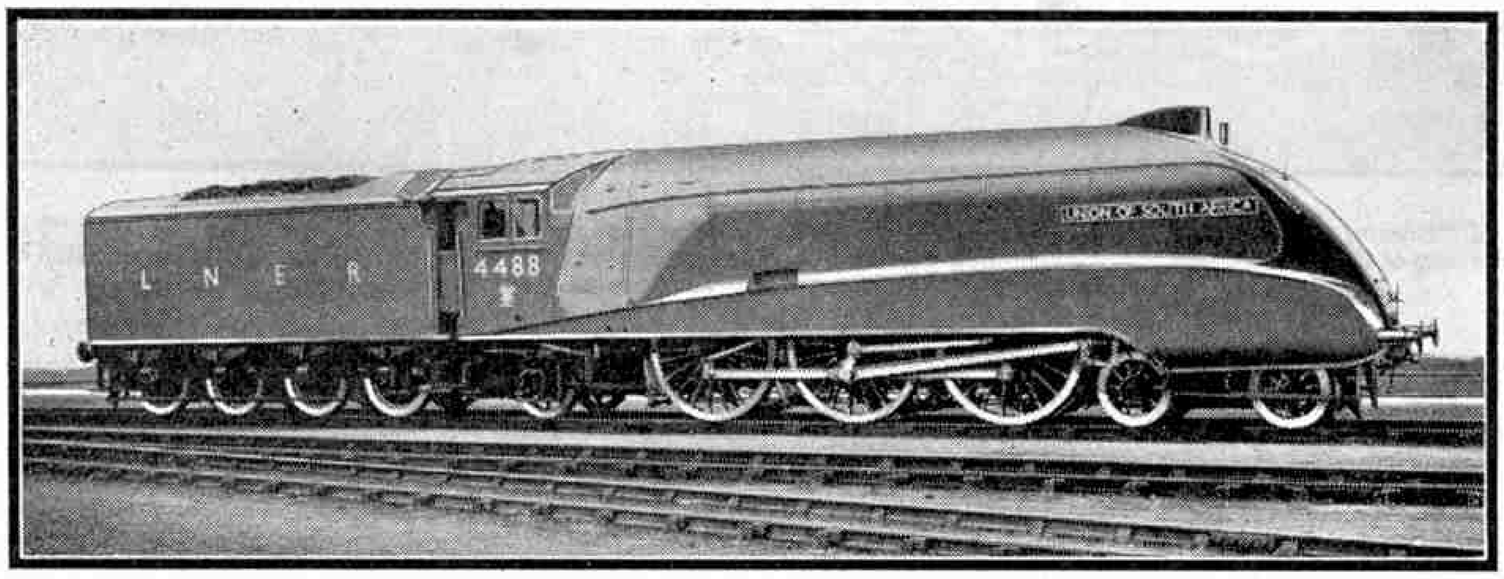
No. 4491 "Commonwealth of Australia" at Waverley Station, Edinburgh, before the start of the "Coronation" journey described in this article. The interest taken in this remarkable train is evident from the photograph.

The 34.1 miles from Berwick to Alnmouth were covered in 28 minutes, with a sustained 79 on the level past Beal and a top speed of 81 down the Loughoughton bank; and we were through Morpeth, 107.9 miles from Edinburgh, in 99¼ minutes. With a smart finish we should have been several minutes early at Newcastle, but the Central Station was not quite ready for us, and we were so severely slackened outside that the last 1.6 miles in from Heaton took 4½ minutes. Nevertheless we arrived a minute early, having run the 124.4 miles from Edinburgh in 119 minutes.

At Newcastle the engine was re-manned for the non-stop run to London, and Driver Walker, another Gateshead man, took the regulator. Almost immediately after re-starting three severe slacks for colliery subsidences were encountered in rapid succession, and these, combined with the usual slowing through Durham, made us take 31¼ minutes for the first 23.2 miles out to Ferryhill. Then, after a brief spell at 82 across Bradbury Moor, came an easing for the curves at Aycliffe, and although we touched 77 before Northallerton, moderate speed was run onwards to York.

A promising burst at 75 past Riccall was cut short by the slack to 30 m.p.h. over Selby swing bridge, and it was not until we were through Doncaster that Driver Walker was really able to let fly.

We had now 125 minutes left in which to cover the 156 miles to King's Cross, and No. 4491 was put to it with a vengeance. Speed leaped up to 86½ m.p.h. at Scrooby troughs, there was a slight check to 50 m.p.h. at Retford, from which the engine accelerated splendidly to 64 m.p.h. up the ensuing 1 in 198 rise to Markham summit. Then came the descent to the Trent valley—an excellent foretaste of the supreme thrill that was to come after Stoke summit had been breasted. Tearing down from Markham we touched 96 m.p.h. at Crow Park, and then kept up 95 m.p.h. for mile after mile across the Trent valley until the speed was eased for Newark troughs.



No. 4488 "Union of South Africa," another of the engines for the "Coronation" service. This locomotive, like No. 4489, has a whistle as used on the railways of the country after which it is named. Photograph by courtesy of the L.N.E.R.

Up the long rise past Barkston and through Grantham we were doing 70 to 75 m.p.h. all the way, and speed then gradually dropped to 64½ m.p.h. at Stoke summit. With that "96" fresh in mind my next few stop watch readings were taken with almost breathless expectation, and I was not disappointed. There was of course no question of driving the engine "flat-out" for a peak speed, she was simply let go. At first the speed did not rise with the hectic rapidity of the trial trip, but once No. 4491 was really going our progress was startling. Corby was passed at 85, Little Bytham at 98, and shortly afterwards we reached 106 m.p.h. Speed dropped slightly approaching Essendine, but there was no restraint this time, and on past Tallington, where on the trial trip "*Dominion of Canada*" had been eased right down, we continued like a veritable thunderbolt.

Just before that station we touched 106 m.p.h., a short rise beyond brought us down to 104, but nearing Helpston signal box we were once again running at 106 m.p.h., now on almost dead level track! At this speed the motion of the train was uncannily smooth, and fellow-passengers frankly disbelieved my figures. During this terrific spurt we covered the 12.7 miles from Little Bytham to Werrington Junction in 7 minutes 22 seconds, an amazing average of 103.5 m.p.h. This beat by a clear minute the time of "*Dominion of Canada*" on the trial run, although on that occasion a higher maximum speed was reached; but what is still more remarkable is the fact that we also beat last year's record descent, when Driver Haygreen coaxed 113 m.p.h. out of "*Silver Fox.*" The latter engine was eased down considerably after the peak speed had been attained, and her average from Little Bytham to Werrington was 98.5 m.p.h. against our 103.5.

After this stupendous effort the rest of the run was bound to be something of an anti-climax, though actually the booked times between Huntingdon and Hatfield provide the fastest intermediate average speed of the whole journey; this 41.2-mile stretch is scheduled to be covered in 32 minutes, that is 77.3 m.p.h. By dint of a fine climb to Stevenage with a lowest speed of 69½ m.p.h., a stirring dash through Hatfield at 96, and a glorious final ascent to Potters Bar, where we stormed over the summit at 85½ m.p.h., this fast timing was more than kept, and we were through Wood Green in comfortable time for a punctual finish. Unfortunately however adverse signals compelled a dead stand outside Finsbury Park. Although we stood for barely a minute, there was no distance left in which to make up the lost time, and we reached King's Cross three minutes late, in four hours to the second from Newcastle. I hastened to congratulate Driver Walker on giving us so thrilling, and at the same time so beautifully smooth a run.

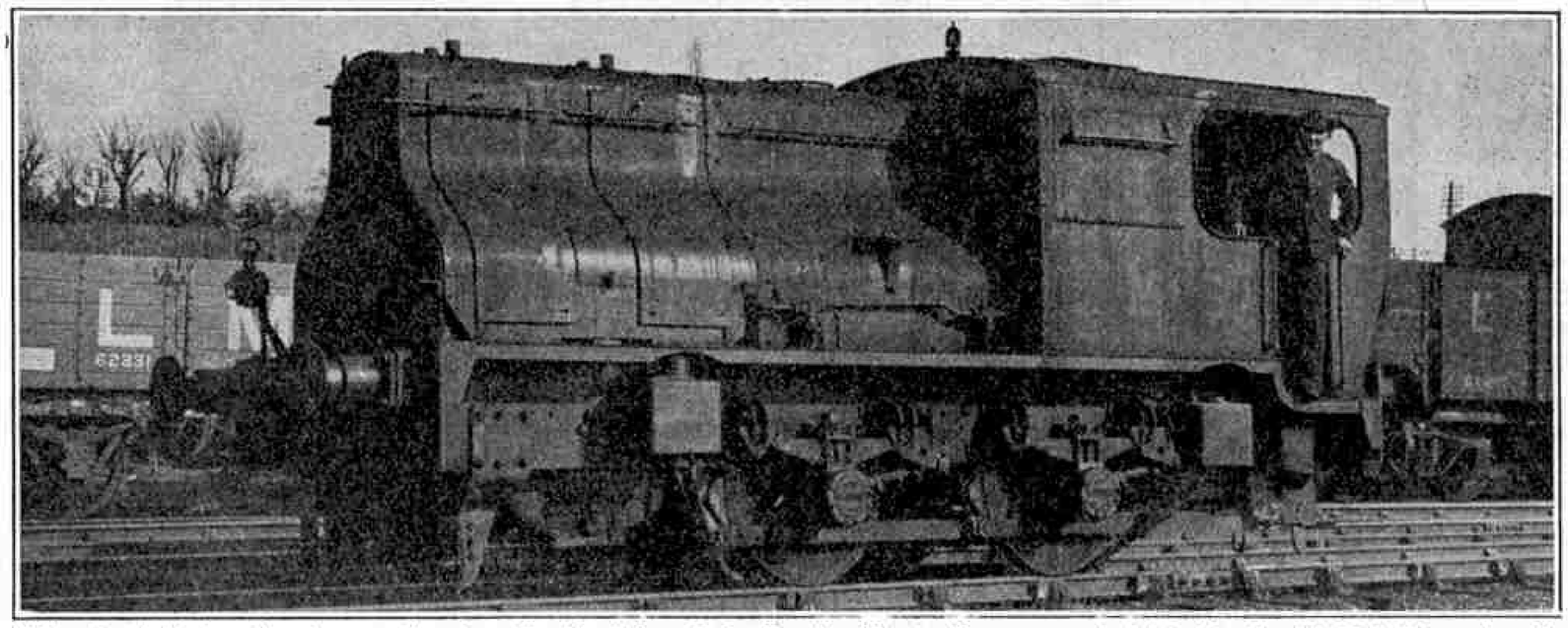
The L.N.E.R. have certainly produced a train of outstanding interest.

"The Beetle"

The special requirements of shunting duties on works premises, docks and in colliery yards frequently account for some curious locomotive designs. There are, for example, fireless steam locomotives for working in and out of buildings where a stray spark would prove dangerous. These resemble the ordinary type of locomotive in most respects, except that they appear to have no chimneys!

The shunting locomotive of unusual appearance shown in the accompanying illustration is familiarly known as "*The Beetle*" to the L.M.S. men who have charge of it. It was one of two originally built for use on two sections of colliery sidings at Radstock, on the Somerset and Dorset Joint Railway. These sidings were connected by a short tunnel 10 ft. 7½ in. high, through which only an engine of very stunted growth could pass. At one time three very small saddle tanks were in use there, one an 0–4–2 and the others 0–4–0s; the latter were interesting in being the only engines ever built at Highbridge, the locomotive centre of the Somerset and Dorset line.

Technically "*The Beetle*" is a four-wheeled 200 h.p. "Sentinel" industrial-type geared steam locomotive. Within its "shell" at the front end there are two twin-cylinder vertical engines with cam-operated poppet valves controlling the admission and exhaust of steam. An oil-tight crank chamber is provided, and the connecting rods, crankshafts and camshafts, timing gears and water pump run in a totally-enclosed oil bath. Lubrication to the cylinders is provided by an oil pump driven from the engine shaft.



"The Beetle" shunting locomotive described in this article. For the illustration we are indebted to the "L.M.S. Magazine."

Below the engine is a gear-box through which the drive is taken to a countershaft and thence by means of sprockets and chains to the driving axles. These axles run in outside bearings mounted in the main frames, which are thus outside the wheels.

The vertical boiler, which is inside the cab, works at a pressure of 275 lb. per sq. in., and its fire-box is arranged for side firing. The boiler is fed by two pumps gear-driven from the engine crankshaft. The water tank, which is housed within the casing between the engine and the cab, holds 600 gallons of water, and the coal bunker that is arranged on the left-hand side of the engine, holds 12 cwt. of coal. Sanding apparatus is provided for both forward and reverse directions, and the sand-boxes mounted on the frames are prominent objects in the illustration.

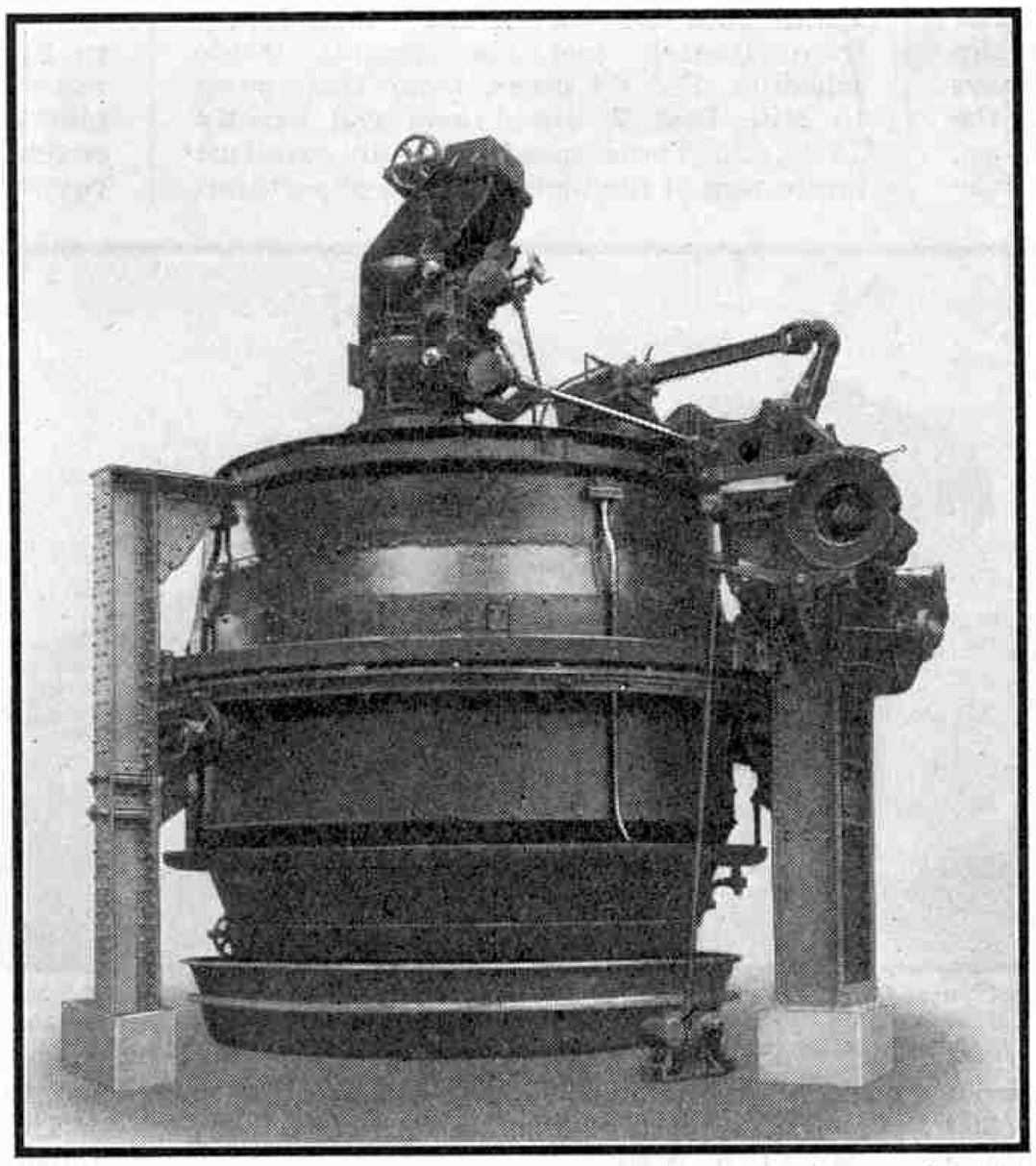
"*The Beetle*" is now used at Kettering on the Midland Division of the L.M.S., and it is shown there in the illustration to this article.

The Wellman Gas Producer

An Interesting Plant for Forge Furnaces

IN this article we describe an interesting plant that is designed for producing coal gas for firing forge furnaces in the iron and steel industries. The plant is made by The Wellman Smith Owen Engineering Corporation Ltd., London, and large numbers are in use in many parts of the world. The particular plant illustrated on this page is designed for use with bituminous coal, but other types are available suitable for the gasification of non-bituminous fuels. The plant consists essentially of a revolving shell lined with heat resisting fire-brick, inside which the coal is placed, an ash pan, and a top plate fitted with a mechanical poker. The shell is driven by an electric motor and rotates clockwise, being supported by either three or six wheels, according to the size of the plant, which run on a main track ring supported on steel columns. The blast of air necessary for the gasification of the coal enters the shell through a hood that is fitted in the centre of the ash pan bottom, the air being delivered to the producer by a steam driven turbo-blower. A carefully regulated quantity of steam is admitted to the shell along with the air, in order to prevent clinkering, and to ensure the production of a rich gas. A steam gauge, and a thermometer that shews the temperature of the steam-laden air in the blast pipe just before it enters the producer are provided, and are under the observation of the operator. The ash pan is an iron casting supported on a substantial ball race in the smaller size of plant, and on roller bearing rollers in the larger sizes. The blast pipe and a metal hood from which the humidified air enters the shell are carried in a hollow hub. Owing to the friction between the ashes in the shell and those in the pan, the two parts rotate together but rotation of the ash pan is stopped about three times during each revolution of the shell by a stop worked from a cam that engages with blocks on the outside of the ash pan. This interruptive action loosens the ashes and allows the air blast to be evenly distributed throughout the combustion zone.

The top plate, which covers the top of the shell is made of rolled steel, and is provided on its upper and lower surfaces with ring angles in such a way that a pan is formed in which cooling water circulates to keep the plate cool. The top plate is provided with a water seal so that the shell is free to rotate without any escape of gas. A water seal also is provided at the bottom of the shell.



The interesting gas making plant described on this page. It produces coal gas for firing forge furnaces, and is manufactured by The Wellman Smith Owen Engineering Corporation Ltd., to whom we are indebted for this illustration.

One of the most important features of this plant is a mechanically operated poker, which is an ingenious device for continually stirring the coal as the shell rotates to ensure that every piece is thoroughly gasified. It consists of a water-cooled steel bar, tipped at its lower end with a replaceable hard steel tip, and it projects into the shell through an oscillating water-cooled bearing mounted on the top plate, the bearing being made to oscillate and so swing the poker from the centre of the producer to the wall and back again, thus stirring the coal effectively. The oscillation of the poker combined with the rotation of the shell produces a cycle of agitating movements that ensures complete gasification of the coal, and is completed in about 12 hours.

The movement of the poker also causes a rubbing action between the pieces of fuel and also of the fuel against the brick lining of the shell. By this means ash forming on the surface of the coal is removed so that new surfaces are continually presented for gasification. The rubbing action against the brick-work prevents ash or clinker from adhering to the walls.

Scrapers fitted in boxes fixed to the bottom rim of the shell assist the downward flow of the ashes, and guide them outwards in the ashpan, and an adjustable ash plough operated by a handwheel regulates the discharge of the ashes from the combustion zone.

In operation coal is fed into the top of the shell producer in a series of very small quantities by a double-bell feed mechanism. This is a patented device, and one of its main features is two cast steel ball valves, which are interconnected so that when one is open the other is closed, thus making a perfect gas trap. The feed mechanism is mounted on the top plate, and is provided with cleaning holes for removing deposits of tar and soot that may choke the delivery.

To put the producer in operation screened producer ashes are packed in the bottom up to the poker. Large clinkered ashes are placed around and above the blast hood. Wood is then filled in about a foot deep, sprinkled with paraffin, and some soaked waste placed on the top. The fire is started by dropping pieces of ignited oily waste on it. Coal is then slowly fed into the producer, until there is a well distributed bed of live coal.

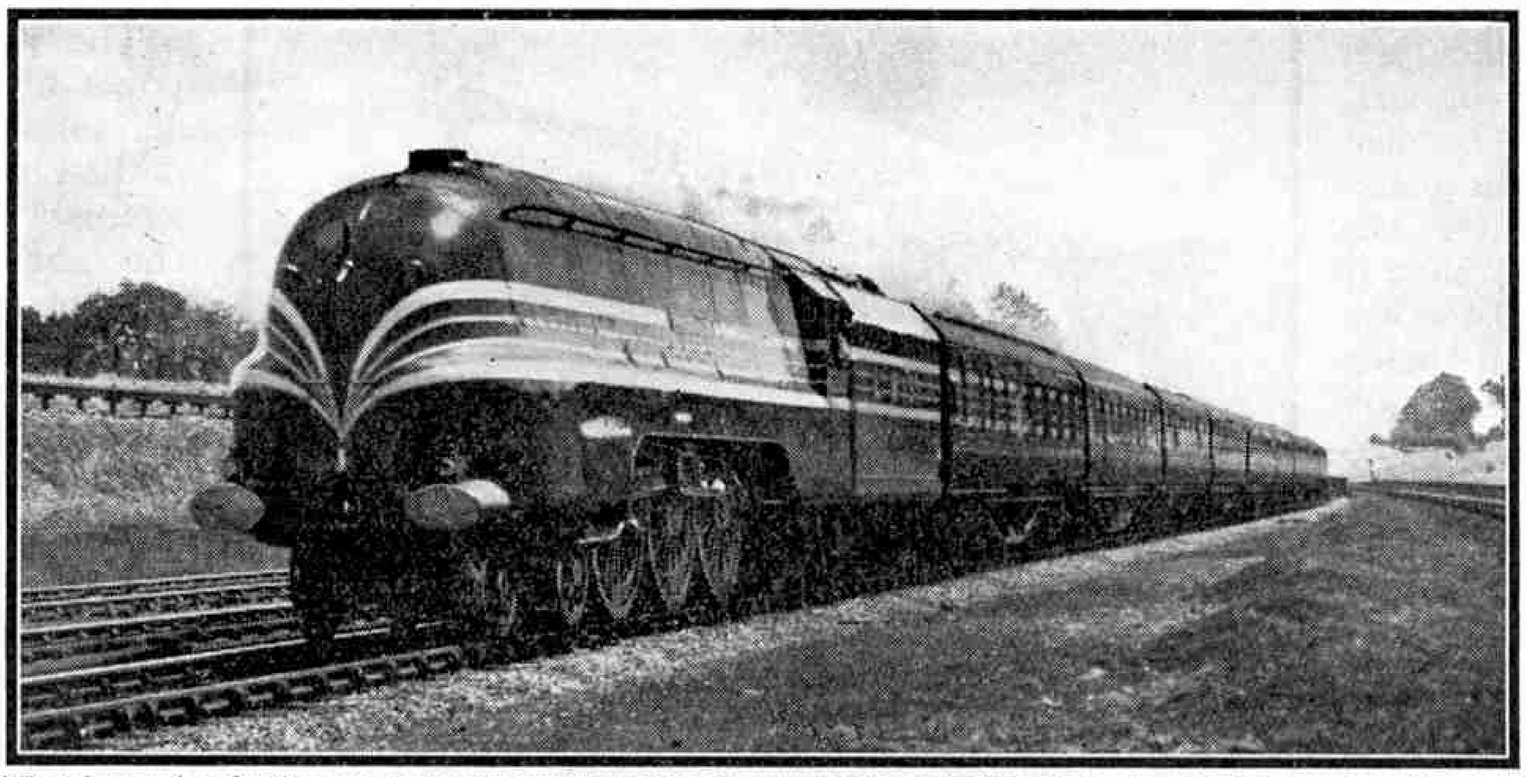
Fine Work by G.W.R. "Castles"

Ever since Broad Gauge days the G.W.R. Bristol expresses have been renowned for speed, and two recent runs by "Castle" class 4–6–0s show how well the tradition is being maintained to-day. The first of these was on the 5.15 p.m. up two-hour train, which, with its slip portions for Swindon and Reading, always leaves Bristol with a substantial load; the second was on the celebrated 4.30 p.m. up, *"The Bristolian,"* booked to cover the 117.6 miles to Paddington in 105 minutes.

Curiously enough it was the first of these trains that provided the highest burst of speed. On this run No. 5048, then *"Cranbrook Castle,"* now *"Earl of Devon,"* took 10 coaches out of Bristol, a load of 335 tons gross behind the tender. Speed fell to 26 m.p.h. up the 1 in 75 of Filton incline, but then recovered well to a steady 54–55 m.p.h. up the long 1 in 300 grade to Badminton. The train was through Swindon, 40.3 miles, dead on time in 47 minutes from Bristol. With load now reduced to 300 tons, Reading was passed nearly a minute late, at a reduced speed in order to take the platform road to detach the slip coach. The load was now 265 tons, and some startling running followed. Eight miles beyond Reading speed had risen to 78 m.p.h., and the pace got progressively faster till at Slough, on the dead level, the train was doing 85 m.p.h. Southall, 108.5 miles, was passed in 106¾ minutes, and but for a bad signal check at Royal Oak the train would have been 3½ minutes early at Paddington. As it was the journey was completed in 117 min. 36 sec., an average speed throughout of precisely 60 m.p.h.

On *"The Bristolian"* No. 5038, *"Morlais Castle,"* gave a very sound display with the standard seven-coach load of 225 tons. Speed fell to 31½ m.p.h. up Filton bank, afterwards recovering to a steady 61–63 m.p.h. all the way up to Badminton. Hullavington was passed at 77½ and speed just reached 80 farther down the bank. With a much faster negotiation of the junction at Wootton Bassett and a brilliant recovery up the rising gradients, Swindon was passed a minute early. After touching 83½ m.p.h. on the dead level at Shrivenham, *"Morlais Castle"* was very slightly eased, but not once in the ensuing 60 miles did the speed fall below 75 m.p.h. There was a long spell at exactly 80 m.p.h. from Maidenhead onward, and Paddington was reached in 104 min. 54 sec. from Bristol, just six seconds inside schedule. For 98 miles, from Badminton to Mile Post 2, speed averaged exactly 75 m.p.h. These speeds give an excellent impression of the high standard of performance required on *"The Bristolian."*

These performances were recorded by Mr. O. S. Nock.



"The Coronation Scot" near Carpender's Park on the down journey, hauled by streamline 4-6-2 locomotive No. 6223 "Princess Alice." This illustration shows how the silver bands springing from the front of the engine are continued throughout the length of the train. Photograph by courtesy of the L.M.S.

A Railway Centenary Exhibition

An exhibition is being held at the Science Museum, South Kensington, London, until 30th September, to commemorate the centenary of the opening of the London and Birmingham and the Grand Junction Railways. Before 1837 there were only a few short, scattered and mostly unconnected railways working in the British Isles. The Grand Junction Railway was 82.6 miles long, and by its junction with the Liverpool and Manchester Railway connected Birmingham with many of the most important midland towns. On the opening of the completed London and Birmingham Railway, 112 miles long, new trade, postal and passenger trunk line services came into being. The London and North Western Railway arose in 1846 by the amalgamation of these two railways. The display includes pictures, drawings, documents, books, etc., relating to these lines, lent for the occasion. The exhibition is open free.

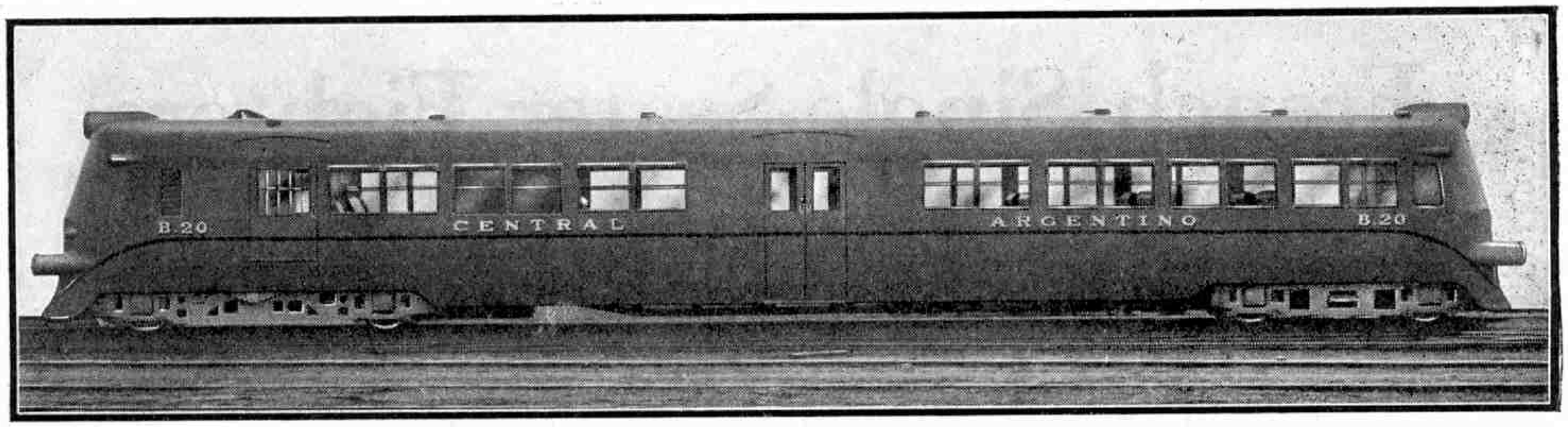
"Schools" on the Bournemouth Route

Since the electrification of the Portsmouth route, the S.R. "Schools" class locomotives Nos. 924–933 have been transferred from Fratton shed to Bournemouth to work on the London expresses. The 4–6–0 "King Arthurs" thus displaced have been sent to Salisbury and Exmouth Junction to work on the West of England trains and relieve the older Urie "736" class 4–6–0 engines of duties that have rather got beyond them. This is the second occasion on which the "Schools" have been ousted by electrification, for in 1935 the Eastbourne electrification displaced them from the Central Section to the Portsmouth line of the Western Section. Perhaps these locomotive wanderers have now found a permanent home! The "Schools" now work on all the important Bournemouth trains, including the *"Bournemouth Limited,"* but do not normally haul the heavy all-Pullman *"Bournemouth Belle."* They run also regularly between Bournemouth, Dorchester and Weymouth.

This transfer of the "Schools" is interesting in view of the experimental running some months ago of No. 929 *"Malvern"* on the Bournemouth route, when the engine proved a great favourite with the Bournemouth men. The "Schools" are evidently satisfactory, although some of the loads are distinctly on the heavy side for 4–4–0 locomotives. Such a reversion from the 4–6–0 to the 4–4–0 type locomotives is unusual in these days, although the "Schools" are the largest, heaviest and most powerful 4–4–0 engines in the kingdom.

L.M.S. Locomotive News

Locomotives of the Mixed Traffic 4–6–0 "5P5F" class continue to arrive from outside contractors. The most recent additions are Nos. 5369–5391. Engines recently withdrawn include No. 25602 *"Bonaventure,"* of the L.N.W.R. "Prince of Wales" 4–6–0 class. Also withdrawn are 4–4–0s No. 25291, *"Harbinger,"* No. 25378, *"Widgeon,"* No. 25382, *"John Rennie,"* No. 25389, *"Eclipse"* and another of the 4–6–2Ts, No. 6969.



The first of four Diesel-engined railcars that are to replace steam trains on the Rosario local services of the Central Argentine Railway. The underframe is of welded construction and the body is built up of steel pressings, with exterior sheeting of aluminium alloy panels. Photograph by courtesy of The Birmingham Railway Carriage and Wagon Co. Ltd., the builders of the cars.

Notable Developments at York

In connection with the enlargement of the L.N.E.R. station at York, one of the largest signalling contracts ever given has been let for the purpose of installing up-to-date colour-light signals. These will be provided from Copmanthorpe and Naburn, each about four miles south of York on the lines from Leeds and London respectively, to Poppleton Junction, 1½ miles to the north, where they will join up with the existing colour-light signalling extending onward to Northallerton and Darlington.

The new installation will be of the relay interlocking type, and will be the largest of its kind in the world. It will be controlled from one new signal box of entirely novel design, situated in the centre of the station. About 300 points will be operated by compressed air electrically controlled, except in the case of the more remote ones at the large double junction at Chaloners Whin, where all-electric operation will be employed.

About 32 miles of actual running lines will be completely track-circuited for the purpose of controlling the points and signals. This track-circuiting will all be indicated in the new signal box on a control panel of unique design, together with the complete indication of all points and signals. All requirements regarding shunting movements and the starting of trains in and around the station also will be indicated to the signalmen.

Many of the points will be as far as two miles away from the signal box, and some of the signals more than three miles away, but they will be operated by simply turning a small thumb switch, the system being what is known as "route signalling." It will only be necessary for the signalmen to work one switch to set all points in the correct position and clear the appropriate signal for any particular route to be traversed by a train; over 800 such routes will require to be provided for. A very definite indication will be displayed to the drivers by a special type of electrical route indicator working in conjunction with the respective signal.

The L.N.E.R. are developing new and modernising existing methods of signalling to provide the maximum safety in conjunction with the running of the now famous flyers *"Coronation," "The Silver Jubilee,"* and *"The Flying Scotsman."* These and many other important expresses pass through York where, particularly in the summer months, the traffic is very heavy. The enlargement of this fine station, together with the new signalling, will greatly expedite the safe handling of the growing volume of train services.

Before the amalgamation, York station was served by no less than six railways including the L. and Y. and the G.E.

A new type of platform buffet trolley in use at Paddington. Photograph by courtesy of the G.W.R.

A Series of "Railway" Cigarette Cards

An interesting series of cigarette cards entitled *"Trains of the World"* is being issued by Gallaher Ltd., with their cigarette packages. The cards are 48 in number, and give very good illustrations of most of the famous expresses and locomotives used all over the world, with complete and accurate descriptions on the reverse. Unusual railways also are represented, including the Romney, Hythe and Dymchurch Railway, the Sligo, Leitrim and Northern Counties Railway, Ireland, on which motor-buses run, and the Vitznau-Rigi Railway, Switzerland. Most of the famous expresses that have been described at various times in the *"M.M."* are to be found in the series, among them *"The Silver Jubilee," "Cheltenham Flyer," "Brighton Belle,"* and *"The Royal Scot."* The G.W.R. Diesel railcars are also included.

T. R. Robinson.

New Electric Trains for Tyneside

In order to improve and accelerate the electric train service between Newcastle and the coast, the L.N.E.R. authorised some time ago the replacement of the whole of the existing carriages by stock of the latest type. The first complete train of four articulated two-coach units was put into service immediately after a special inaugural run. Brightness is the keynote of the external decoration of the new vehicles, the lower portion of the cars being in a pleasing shade of red with light cream above, a black waist line dividing the two colours.

The total new rolling stock programme covers 64 articulated two-coach units and four double-bogie vans, built to the specifications of the Chief Mechanical Engineer, Sir Nigel Gresley. The standard six-car train is made up of three two-coach articulated units, each composed of one motor-coach and one driving trailer. The motor-coach has two motors, together with electric contactor gear arranged for automatic acceleration.

Additional electrical substations have been provided, and improvements in the track and station equipment have been carried out. With the accelerated schedules that will be possible when a sufficient number of the new carriages have been delivered, and the electrified service to South Shields completed next Spring, Tyneside will have a system of electrified suburban services of the highest standard.

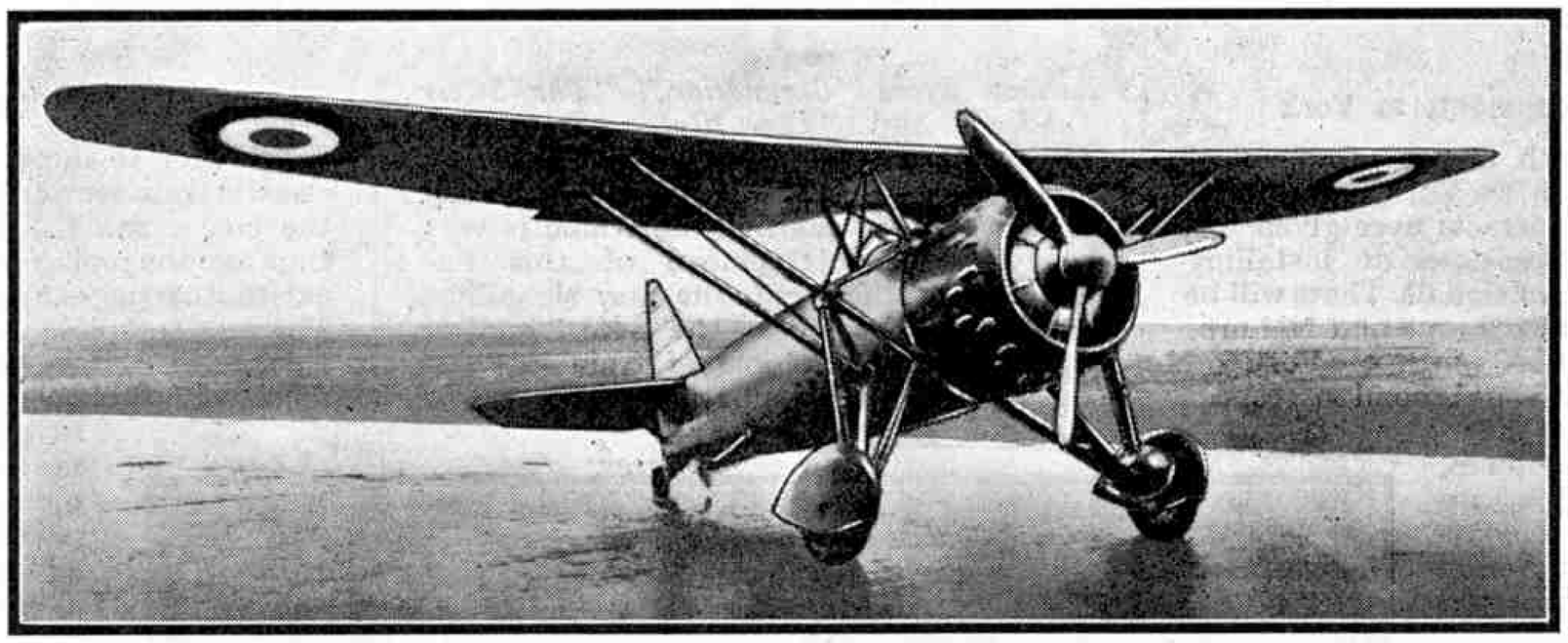
A British Locomotive Testing Station

The L.M.S. and L.N.E.R. companies have decided to construct and equip, as a joint undertaking, a locomotive testing station. A site has been chosen at Rugby, and a start will be made at once in preparing the plans of the building and equipment, which embody all the most up-to-date testing methods. The plant should prove a very important factor in increasing the efficiency of British locomotive practice. In addition, each company will provide a dynamometer car of the latest design, so that the tests that have previously been carried out at the testing station can be linked up with the working of the locomotives in service under actual traffic conditions.

French Single-Seater Fighters

Dewoitine High and Low Wing Types

THE single-seater fighter is a high speed aeroplane with very good climbing powers, and its duty is to patrol certain areas to see that no enemy aircraft get through. The numerous types of French single-seater fighters have always included a good proportion of parasol machines but this form of high wing monoplane has not been particularly popular in England. In the parasol monoplane the wing is held above the fuselage like a parasol, instead of being fixed to the upper longerons.



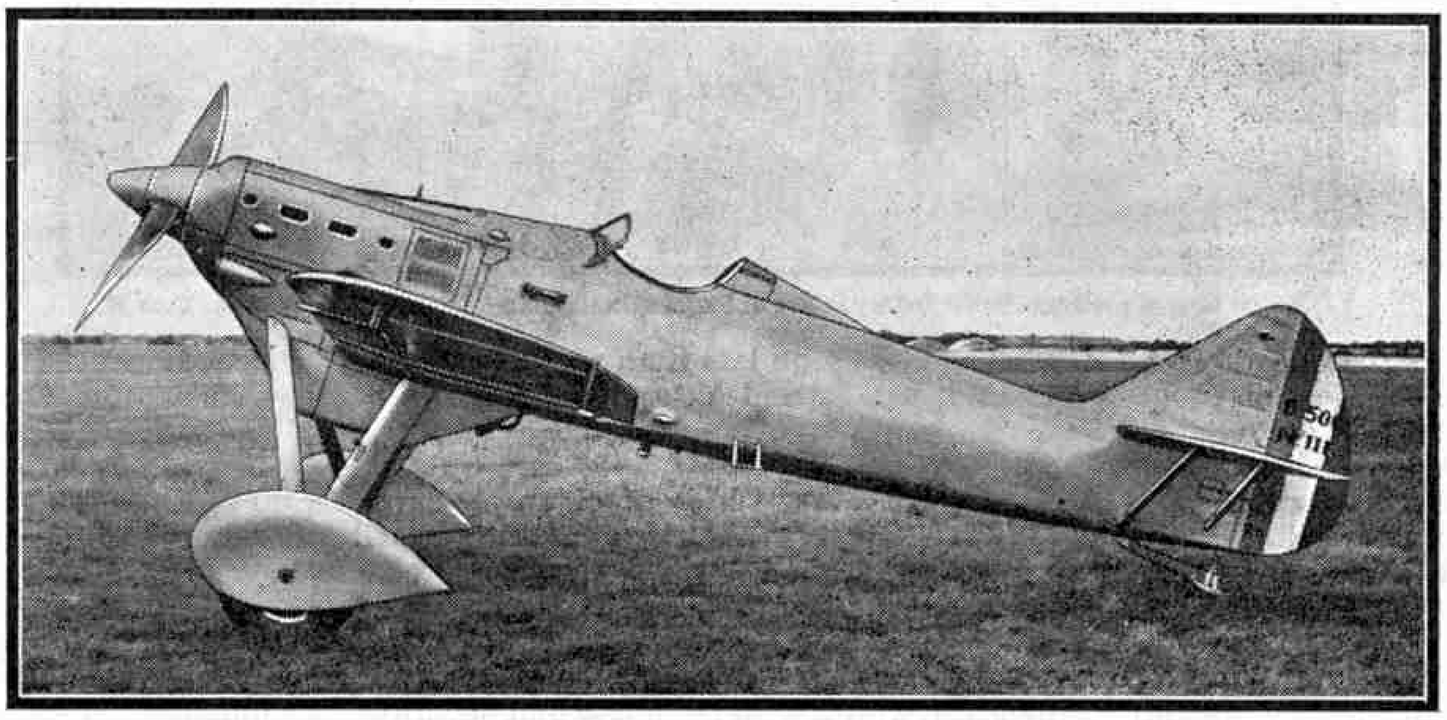
The Dewoitine D.373 Single-Seater Fighter seen above is a parasol monoplane, the wing being held above the fuselage instead of attached to it. Photographs by courtesy of Société Aéronautique Française, Paris.

Dewoitine military aeroplanes are among the best known of French types, and the current range includes several parasol monoplanes. The one shown in the upper illustration on this page is the D.373 single-seater fighter, a development of the D.371 which has been supplied in quantity to the French and Lithuanian Governments. It is of metal construction, the chief material used being duralumin, but the wings are covered with fabric. The wings are braced by long, parallel struts attached at their lower ends to the sides of the fuselage, and are joined to a duralumin -covered wing centre section held above the fuselage by short inclined struts. The trailing edge of this centre section is cut away to provide clearance above the cockpit. The fuselage is oval in cross-section, with the pilots' cockpit almost under the wing. The undercarriage is of the fixed type, and the upper ends of the legs are secured to the front one of each pair of wing-bracing struts; the lower ends of the legs are hinged to the fuselage by axle rods.

A Gnôme Rhône 14 Kds air-cooled radial engine is fitted in the nose. This type of engine develops its greatest output between the heights of 11,480 ft. and 21,330 ft., and the aeroplane then has a top speed of 235 m.p.h. The absolute ceiling is 36,080 ft.

The D.373 carries four machine guns, two of which are mounted in the wings and fire outside the radius of the airscrew, and two that fire through the airscrew. The equipment of this fighter is very complete, and includes wireless and oxygen apparatus. Provision is made for an air photography camera, and thus equipped the aeroplane can be used for army co-operation work. In addition arresting gear can be fitted to enable landings to be made upon the deck of an aircraft carrier. When the aeroplane is employed on this kind of duty flotation gear consisting of automatically inflatable balloons is carried on board in case of a forced landing in the sea.

The other Dewoitine single-seater fighter illustrated here is the D.500, one of several very efficient low wing monoplanes produced by the company. The slim lines of this aeroplane and the absence of any external bracing struts give it a suggestion of being built for speed that is borne out in actual service, for it can attain a top speed of 231 m.p.h. The engine that plays a very important part in this remarkably high performance is a 500 h.p. Hispano-Suiza 12 Xbrs, geared and supercharged.



A good broadside view of the Dewoitine D.500. This low wing single-seater fighter has a top speed of 231 m.p.h. and is armed with two machine guns mounted inside the engine cowling.

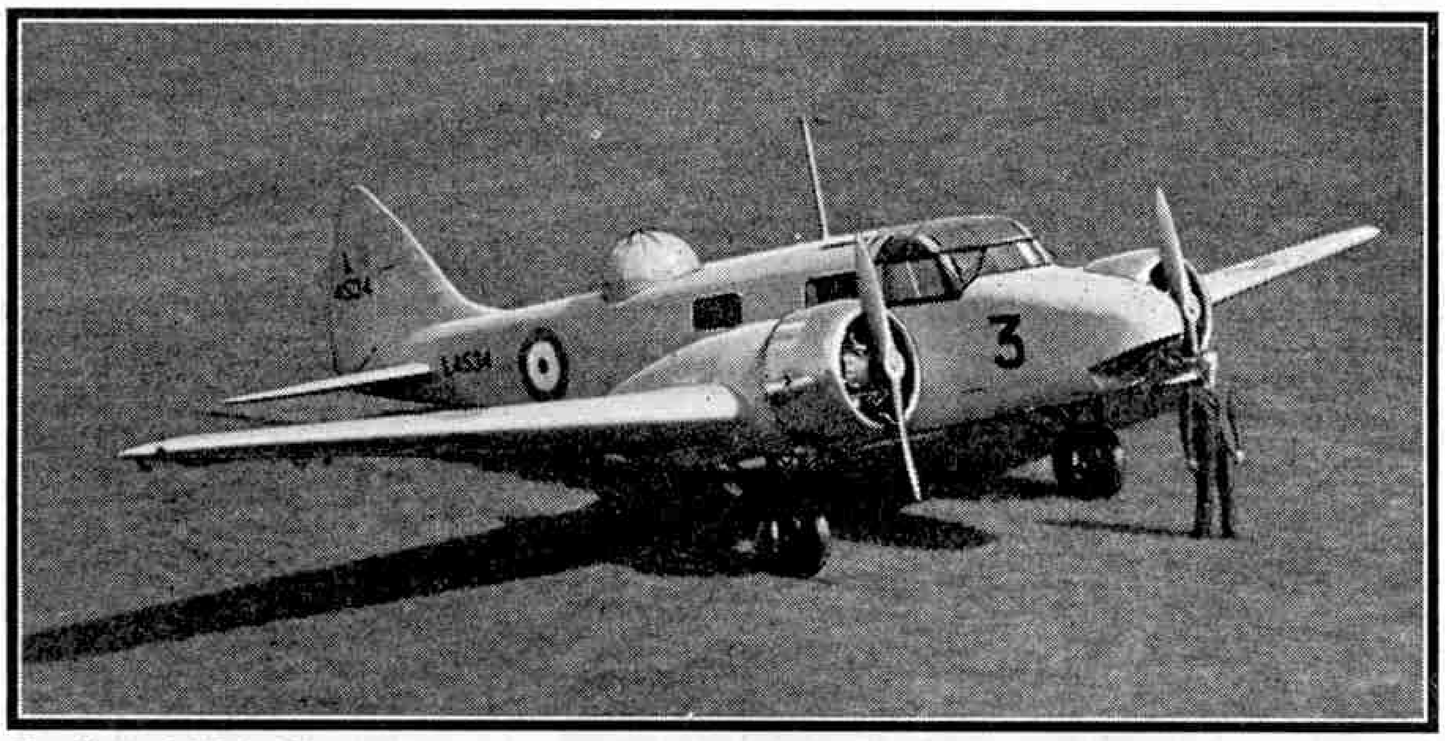
The construction of the wings, fuselage and tail unit follow Dewoitine practice in respect of low wing aircraft, and duralumin is extensively employed both for the framework and covering. The wing centre section is secured to the underside of the fuselage, which is a monocoque structure of oval cross-section. The undercarriage is a fixed one, and the wheels and legs are enclosed in neat streamline casings. An open type cockpit for the pilot is situated almost directly over the trailing edge of the wings, and is very fully equipped. The two machine guns are mounted one on each side of the engine and inside the cowling.

Airspeed "Envoy" and "Oxford" Monoplanes

A Machine for the King

THE recent purchase by the Air Council of a specially prepared Airspeed "Envoy," Series III, for the use of the King and the Royal family, has drawn fresh attention to this excellent type of British twin-engined monoplane. The Royal machine is luxuriously appointed, and is very striking in appearance. The wings are coloured silver, with dark blue registration letters, and the fuselage is in the Royal colours, the lower half being blue and the upper half red, with a silver dividing line.

The "Envoy" is primarily a commercial aeroplane, designed for high speed passenger and mail carrying. It is used by air line companies in France, Australia, India, China and Japan, and is thus operating under very varied conditions of climate and service. Commercial pilots like the "Envoy" because it is easy to fly, the take-off is short, it climbs steeply, and lands slowly with an easy approach due to the efficient split trailing edge flaps. One operator of an "Envoy" has made 20,000 landings in two years, which means that the retractable undercarriage of his aeroplane has been operated 40,000 times.



The Airspeed "Oxford" training aeroplane which has been adopted by the R.A.F. It can be used for training in navigation, aerial photography, air gunnery, and bombing. Photographs by courtesy of Airspeed (1934) Ltd.

The structure of the "Envoy" is very robust. The wings are of the orthodox two-spar type and are built in three pieces, and the covering is of stressed-skin three-ply. The wing flaps can be set to any angle up to 78 degrees, and the flap angle is indicated on a special instrument on the dashboard in the cockpit.

The fuselage is constructed in two sections, the front one terminating at the rear luggage compartment bulkhead, and the rear portion being joined to it by metal plates. Special attention has been paid to ensuring the best possible maintenance and inspection facilities, and large inspection panels permit all the controls to be reached with the minimum of trouble. For instance, the whole of the underneath skin of the fuselage below the pilot's cockpit and the centre section either hinges down or is removable with quick-release fasteners, revealing all the controls, the hydraulic gear, and electrical services. The equipment of the passenger cabin can be varied to seat from four to eight people.

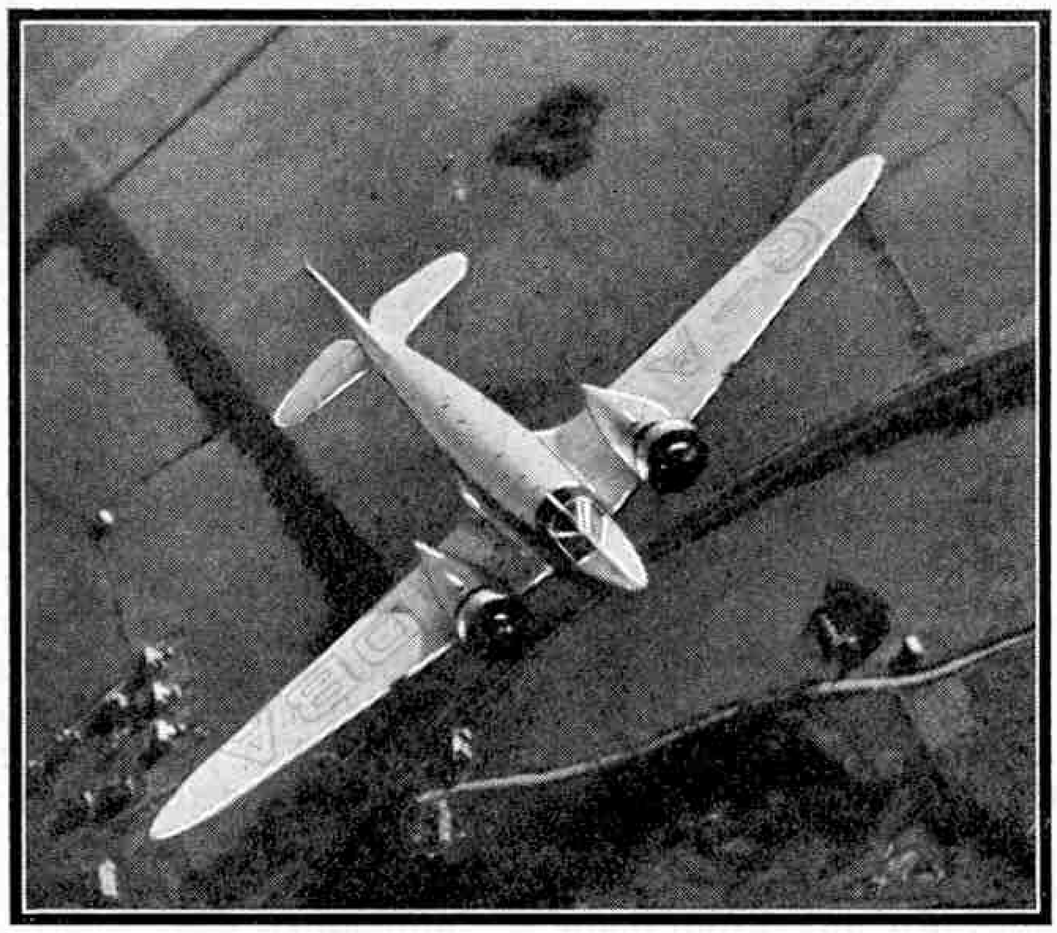
Various types of engines are suitable for the "Envoy," and when fitted with two Armstrong Siddeley "Cheetah IX" engines it has a top speed of 203 m.p.h. Its ceiling is 22,000 ft., and with only one engine running it can maintain a height of 6,250 ft. It can climb to 10,000 ft. in eight minutes.

The dimensions of the aeroplane are:—span 52 ft. 4 in.; length 34 ft. 6 in., and height 9 ft. 6 in.

The monoplane shown in the upper illustration is the Airspeed "Oxford" twin-engined trainer, which was produced to an Air Ministry specification calling for an aeroplane of this type with retractable undercarriage and provision for instructing men of the R.A.F. in navigation, aerial photography, air gunnery, and bombing. The complete success with which the "Oxford" fulfilled these requirements resulted in a large order for the type, and it is now being turned out at the company's Portsmouth factory by mass production. The R.A.F. will use the aircraft for the instruction of pilots and crews who later will be called upon to operate the very high performance military aeroplanes now being built for the Service.

The "Oxford" is a low wing monoplane with two 375 h.p. Armstrong Siddeley "Cheetah X" engines, and has a top speed of 197 m.p.h. at 7,500 ft. It cruises at 163 m.p.h., and carries sufficient fuel for $5\frac{3}{4}$-hrs. flying. The span is 53 ft. The wings taper in plan and thickness, and are attached at their inner ends to a centre section built as a separate unit from the fuselage. This section contains the two fuel tanks. The wings and centre section are built of spruce spars and ribs, and are covered with three-ply over which is a covering of doped linen. Slotted ailerons, and duralumin split flaps that can be lowered to an angle of 80 degrees, are fitted to the wings, and a pair of landing lights are installed in a recess in the leading edge of the port wing, the edge at that point being transparent.

The fuselage is of very clean external design, and there are no outside wires or struts. It is built up of spruce longerons and hoops, with a covering of three-ply, and is in two parts, joined together by aluminium plates. The front portion includes the pilots' cockpit and the cabin.



An unusual view of the Airspeed "Envoy," Series III. A machine of this type was bought recently by the Air Council for the use of the King.

The crew of the "Oxford" will never exceed three, but can be varied according to the particular branch of training for which the machine is required. In addition to the pilot, there can be either a navigator or second pilot, a bomb aimer, a wireless operator, or a rear gunner. The cockpit contains seats for two, the first pilot occupying the one on the port side. When a navigator is carried he occupies the starboard seat, and this can be pushed back into a rear position that brings it into line with the chart table. When the dual control is not being used, space for a prone bombing position in the nose of the fuselage is provided by removing both the control column and the rudder pedals, and sliding back the second pilot's seat. The bomber then lies with his chin on a rubber cushion, and peers through the bomb-sighting window in the underside of the nose of the aeroplane. The bombs are carried in the wing centre section, between spars extending under the chart table. The wireless operator occupies a seat behind the pilot.

When there is a rear gunner on board he is accommodated in a revolving gun turret at the rear of the cabin. The gun in this turret can be elevated until it is vertical, and the gunner's seat, which is also connected to the turret-rotating mechanism, moves up and down with the gun.

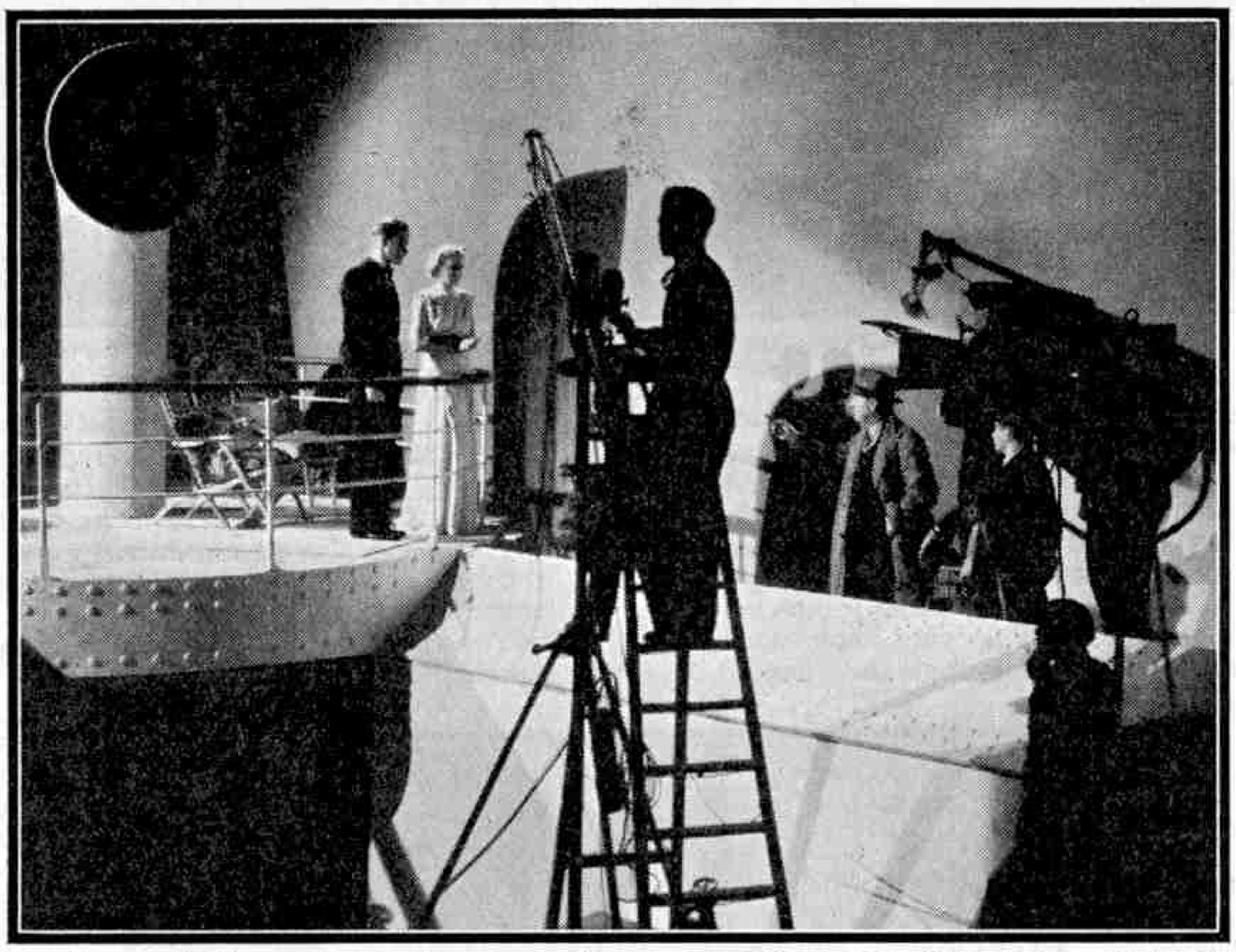
Secrets of the "Talkie" Studio

How Sound Tracks on the Films are Made

By J. Carmichael Johns

"TALKIES," like the electric light, are now taken for granted, and few people realise the wealth of scientific research that has been lavished on sound-recording apparatus and its technique. The process is full of interesting details, but in outline the system now in general use is comparatively simple. The actors speak towards the microphone diaphragm, causing it to vibrate and so to set up a pulsating electric current that is transmitted in amplified form to the recording apparatus. There the pulsations are once more transformed, this time into mechanical vibrations which, by interrupting a beam of light focussed on the sound film, are eventually recorded permanently as a series of light and dark shadings, known as the sound track.

When the sound track is printed on the margin of the action film, and the two together are run through a cinema projector, the original process is reversed. The track interrupts another beam of light focussed on a photo-electric cell, which is sensitive to light fluctuations. The "visual" sound of the track is again converted into electric pulsations, and these pass through a complicated relay system to actuate the loud-speakers behind the cinema screen. Thus the speech of the actors is re-born.



Recording sound when producing a film, showing the microphone boom controlled from an unusual angle. The illustrations to this article are reproduced by courtesy of Warner Brothers First National Productions Ltd.

It is only in the final assembly that action and sound are combined into a single film. Until then the two are recorded as separate components, one being fed through the sound recording apparatus and the other through the camera. As will be seen later, the final process consists of super-imposing the original sound track on the margin of the action film.

How sound is recorded is best made clear by tracing it from its beginnings on the lips of the actors. From there it vibrates through the microphone, and passes as a surging current to what is known as the "movieola." This is a control-desk studded with knobs, dials and indicators. It is situated within view of the set, and from it a technician controls the tone values. Through earphones he hears electrical reproductions of the actors' voices exactly as they will be recorded, and by operating his many instruments he modulates the tone, quality and other features, according to the special requirements of the scene being enacted. He must carefully watch the actors, and at the same time listen very intelligently; for success largely depends on his correct handling of the movieola.

The modified electric pulsations are next led through cables out of the studio to the recording room, in which is placed the camera-like apparatus through which the sound film travels. The electricians in charge must be experts at their work. They feed film into the apparatus, generally see that it works correctly, and obey technical instructions telephoned to them from the set.

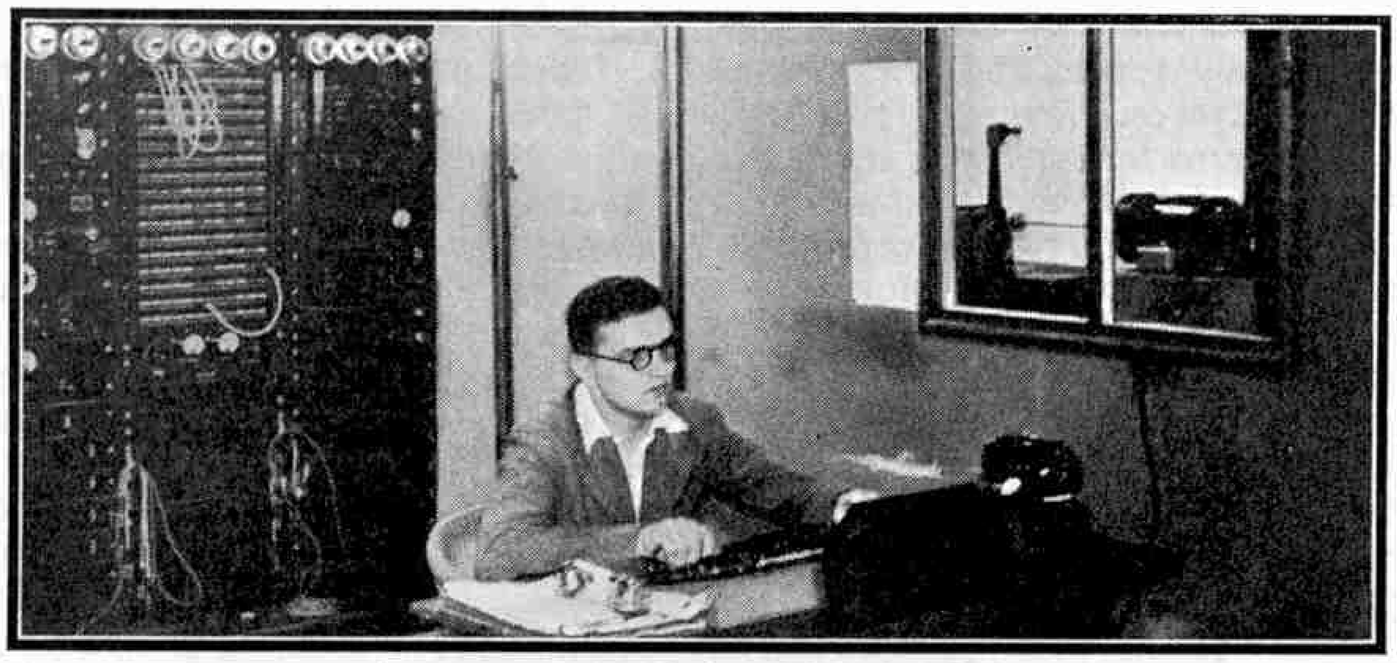
How the actual sound-recording is carried out is shown diagrammatically in the lower illustration on the opposite page. Two parallel steel filaments, with a tiny space between them, are mounted vertically within the powerful magnetic field of a circular coil. The electric pulsations pass through this coil, and sets up corresponding magnetic pulsations in the field that cause the steel filaments to vibrate. These are placed between a light-beam and a sensitive sound film that is made to travel past it, and thus the intensity of the light falling on the film is varied continuously.

When the film is developed, the original sound is reproduced in the form of a shaded track of fine parallel lines, rather like lead-pencil markings. This track is eventually reproduced on the margin of the action film, and the sound must be synchronised, or brought into step with the action. This is effected as follows. Before each scene is recorded, a pair of open clappers is held in front of the camera, and the two are brought together with a sharp snap, thus constituting the first sound and action to be recorded. Each makes a definite mark on its particular film, and it is by putting these marks side by side that the experts are able to find the point from which sound will be "in time" with action.

The straight recording of dialogue is by no means the technician's hardest task. Suppose, for example, the scene to be shot consists of a singer performing with an orchestra in some big café or restaurant. There may be as many as four different sets of sound to deal with. These are the music, the artist's voice, the clatter of knives and

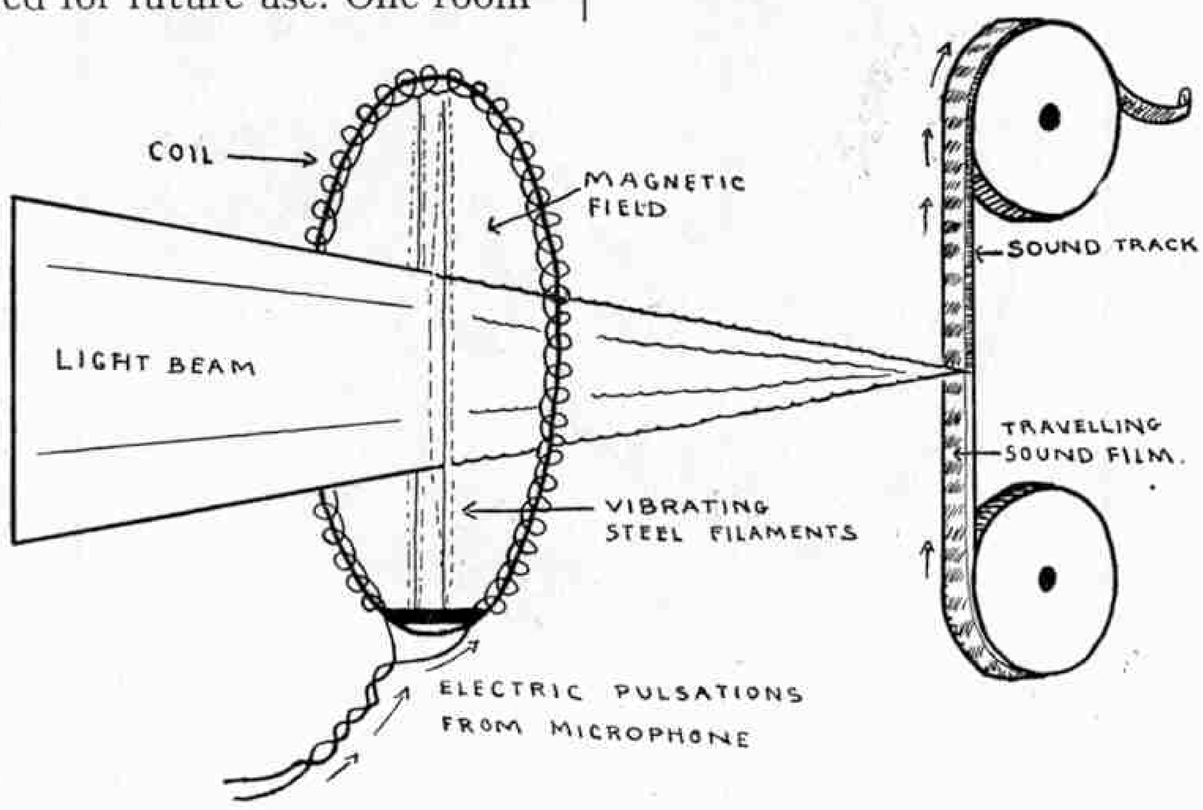
forks, and the buzz of conversation, and they are recorded separately, only being brought together when they are mixed to form the final sound track on the film.

First the artist sings into the microphone. Her voice is not only recorded on the sound film, in the manner already described, but also on a gramophone disc known as the "play-back." This can be played in the recording room, and its sound transmitted to loud-speakers on the set where the scene in question is to be photographed. There the artist performs before the cameras, but with the microphone dead, singing in a whisper in order to reproduce her throat and lip movements, and keeping in synchronisation with her own voice, which she hears over the play-back loud-speakers. Only on the finished film are her movements and singing combined, while the other sound backgrounds are introduced into the final track in a similar manner.



The mixer at work in the dubbing theatre, where the final sound track on a film is built up from its components.

In the case of what may be called standard sounds, such as conversation buzz, crowd noises and dance orchestras, recordings are made and stored for future use. One room in every big studio is a veritable museum of stock sound-tracks. These may range from the roar of lions to machine-gun fire, the sound of waves, or a baby crying. Indeed, "Sound," as the recordist is called, is always on the look-out for fresh material to record and store away. Some years ago a famous company in California was engaged on exterior shots when a rattlesnake was discovered in some long grass near the location. Before anyone could stop him, an enthusiastic recordist crept forward with the microphone, and at some risk to himself "picked-up" the snake's warning rattle. The record was successful, and for a long time copies of the track remained in great demand as the world's only authentic rattlesnake background.



How sound is recorded. The variations in the sound track are due to movement of the parallel steel filaments, which are made to vibrate by amplified currents from the microphone.

The play-back system offers many advantages over the older method of simultaneously recording sound and action. Imagine the expense, not to mention nerve-friction, involved in asking an important singer, or dancer, or orchestra, or all three, to repeat an act five or six times for the benefit of a dissatisfied camera man. But the play-back never gets tired. With it the artist need only sing in a whisper; the dancers dance to the music of a faintly-played piano instead of that of a full orchestra; and "musicians" who may not be able to play a note go through the actions of playing their instruments, synchronising their movements with the music of some first-class orchestra, previously recorded. Any number of rehearsals and re-takes are possible once the necessary sound has been recorded, for the play-back will reproduce it over and over again.

When action has been shot to the director's satisfaction, it is combined with the various other sound-tracks in the "dubbing" theatre, perhaps the most interesting room in any studio. Let us make an imaginary tour of the up-to-date dubbing theatre of Warner Bros. at Teddington. This is like any other small well-appointed cinema theatre, except that instead of seats facing the screen there is a single desk resembling the movieola used in recording. On the wall behind this is a formidable switchboard holding rank upon rank of plug-sockets, valves, switches, dials, fuse boxes, and all the miscellaneous and mysterious devices that are to be found in a complicated electrical system.

Supposing that a film is being dubbed. The action is projected on the screen in the normal way, but instead of relaying sound from one track to the screen loud-speakers, the dialogue and background sounds are transmitted from separate sets of "talkie" apparatus. They are combined at the loud-speakers, but the strength and proportion of their combination depends upon how the mixer regulates them from his desk. For instance, if in the scene being dealt with two people are speaking in a café during a thunderstorm, the sound track of the thunder must be so regulated as not to drown important dialogue, while music and conversation buzz, each recorded on separate tracks, are kept at just the required pitch. The correctly blended electric pulsations, evident as sound from the screen loud-speakers, are led over cables to yet another recording machine, which registers on the final film the mixed sounds from the several original tracks. This last recording is the finished article, and will eventually be printed on the action film's margin.

The mixer must always pay great attention to the picture on the screen, for the proportionate strengths of the various sounds bear a very definite relation to the action. Thus in the "thunderstorm-café" illustration a sudden bright flash of lightning means that the thunder must be amplified into prominence. Similarly a shot of the café orchestra requires that the music must be made louder, whereas in a general view of the scene the various sounds have to be kept at more or less equal volumes.

Unusual sound effects are obtained in peculiar and sometimes amusing ways. For instance, in the film "*King Kong*" the monster's battle-cry was made by reversing the sound track of roaring lions.

A Powerful Brake for Motor Vehicles

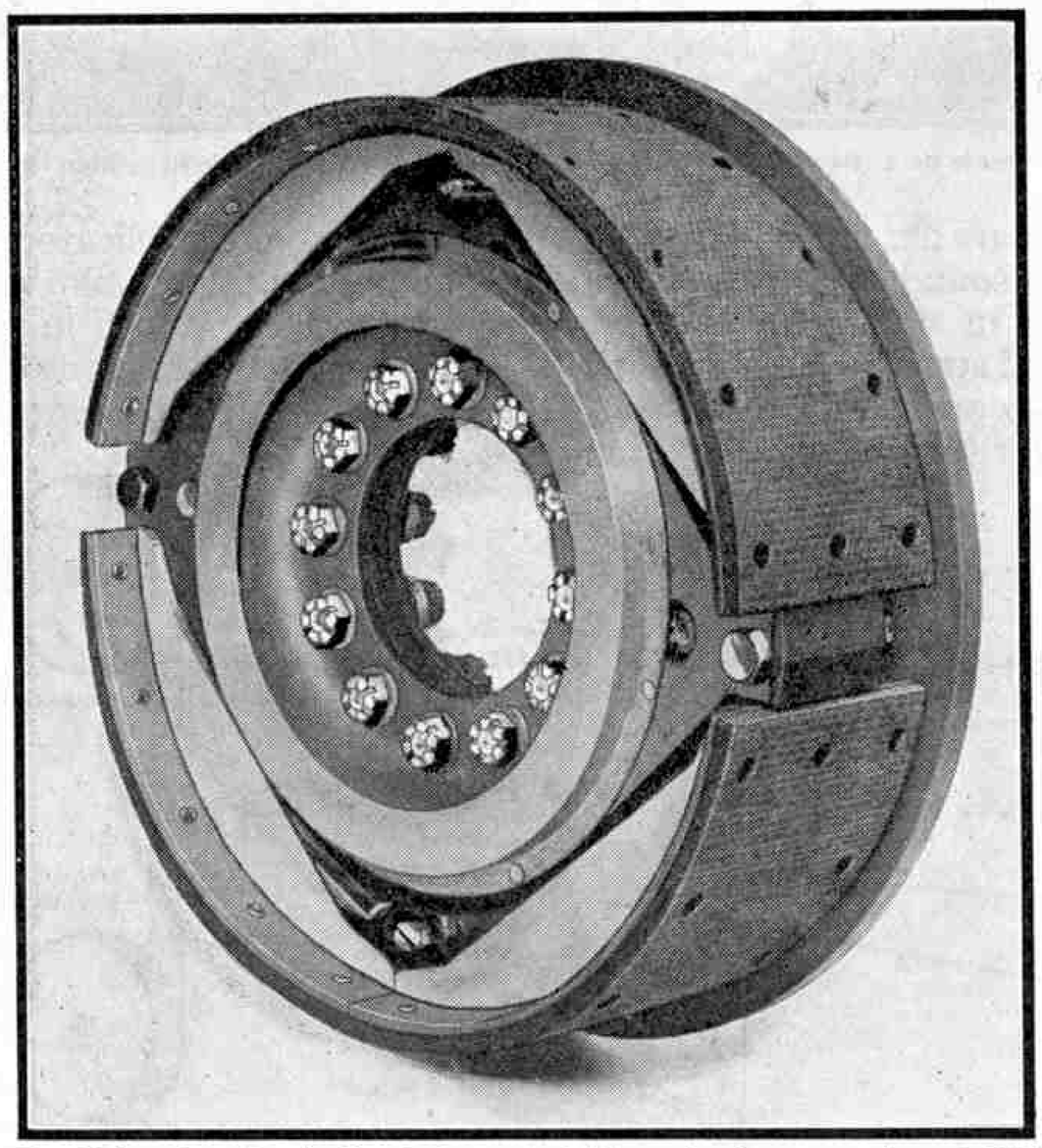
The New Girling Four-Shoe System

TRAFFIC congestion in busy towns and the ever-increasing rates of motor travel on the main highways make it necessary to provide means for rapidly bringing a vehicle to rest from any speed. Consequently, this part of a motor vehicle's equipment has received the constant attention of designers and manufacturers, and efforts are continually being made to obtain the greatest possible braking power, combined with smooth and easy operation. The braking gear must not only be powerful in case of emergencies, but also it must be thoroughly robust and reliable over long periods of service, and must be capable of application with the minimum of physical effort. Brakes fitted to motor vehicles may be divided into two classes, "internal expanding" and "external contracting." The internal expanding type has two metal shoes fixed to a stationary part of the car, and a steel drum fixed to the rotating axle. The shoes are lined with a friction fabric such as "Ferodo," and they are held from the drums by springs. When it is desired to apply the brake, a cam forces the shoes apart so that they make contact with the inner surface of the drum.

The external contracting brake also has a rotating steel drum, but in this case the shoes are replaced by a thin steel band lined with fabric. By moving a lever the two ends of the band can be drawn together so that it is made to grip the drum. Most modern cars are fitted with internal expanding brakes, and owing to weather-proofing difficulties the external contracting type is now almost extinct.

One of the best internal expanding brakes is the well-known Girling system produced by New-Hudson Ltd., Birmingham. For some time this company have been endeavouring to produce a brake of even greater braking power and longer life than the original Girling brake, and they have now made available a new four-shoe brake in which the greatest possible use is made of the inner surface of the drum.

To achieve this, four brake shoes are provided instead of the usual two, and the brake lining therefore is split up into four wide segments, all of which, through a simple arrangement of levers, are forced into absolutely even contact with the drum. There are thus four points of maximum pressure between the linings and the drum compared with two on an ordinary two-shoe brake.



The Girling four-shoe brake, features of which are longer wear and more even and powerful braking. The illustration shows the almost complete circle of friction facings. Photograph reproduced by courtesy of New-Hudson Ltd., Birmingham.

There are two levers or shoe carriers, each of which is fitted with two pivoted rollers. The centre of each shoe bears against its appropriate rollers, and is held in contact with them by springs, one spring serving two shoes. The position of these rollers is calculated to compel all the shoes to move outward towards the drum at an equal rate.

The springs hold the shoes in contact with the rollers in such a manner as to permit free endwise travel and freedom to rock about the rollers. Solid abutments are formed between each pair of shoes, and between the shoe carriers at one end is a Girling expander, while at the opposite end there is a special adjuster that causes the ends of the shoe carriers to move outwards, thus taking up clearance caused by lining wear. The adjuster embodies two screw-threaded plungers, the ends of which bear against the ends of the shoe carriers. The outer screwed portions of the plungers are connected by mitre wheels with an external adjusting spindle. By turning this spindle in a clockwise direction the brake shoes are brought closer to the drum.

Operation of the expander, which is controlled by the driver, forces the shoe carriers outwards, so that the shoes make contact with the revolving drum, and owing to the fact that the shoes are free to rock they bear evenly over their whole area. They also follow the movement of the drum until they are arrested by the abutments already mentioned, which are placed between each pair of shoes. A double servo action is secured because, in the course of this movement, the primary shoe of each pair abuts on to the secondary shoe, and its whole braking force applies the secondary shoe more forcibly while, at the same time, the fact of the shoes tending to move towards the rotating drum develops power additional to that directly caused by the driver's effort.

The four-shoe brake is particularly suitable for the heaviest type of vehicle, for the substantial retarding forces that must be dealt with are sub-divided between the four shoes, and are delivered to solid abutments, while the heavy control forces are divided equally between the shoe carriers, which are not subject to stress by any other forces. With modifications the brake can be applied to heavy and fast private cars in which smooth control at moderate pedal pressures is not always easy to obtain.

L.M.S. Motor Drivers go to School

Dinky Toys Vehicles for Road Instruction

ROAD transport forms an important part of the many-sided activities of British Railways, and the railways are in fact the largest owners of motor vehicles in the country. Over 8,000 parcel and goods road motors are owned by the railways, and of these the L.M.S. share is approximately 3,500. It follows, therefore, that the driving, maintenance and service staff is correspondingly large, the number of drivers being about 5,000.

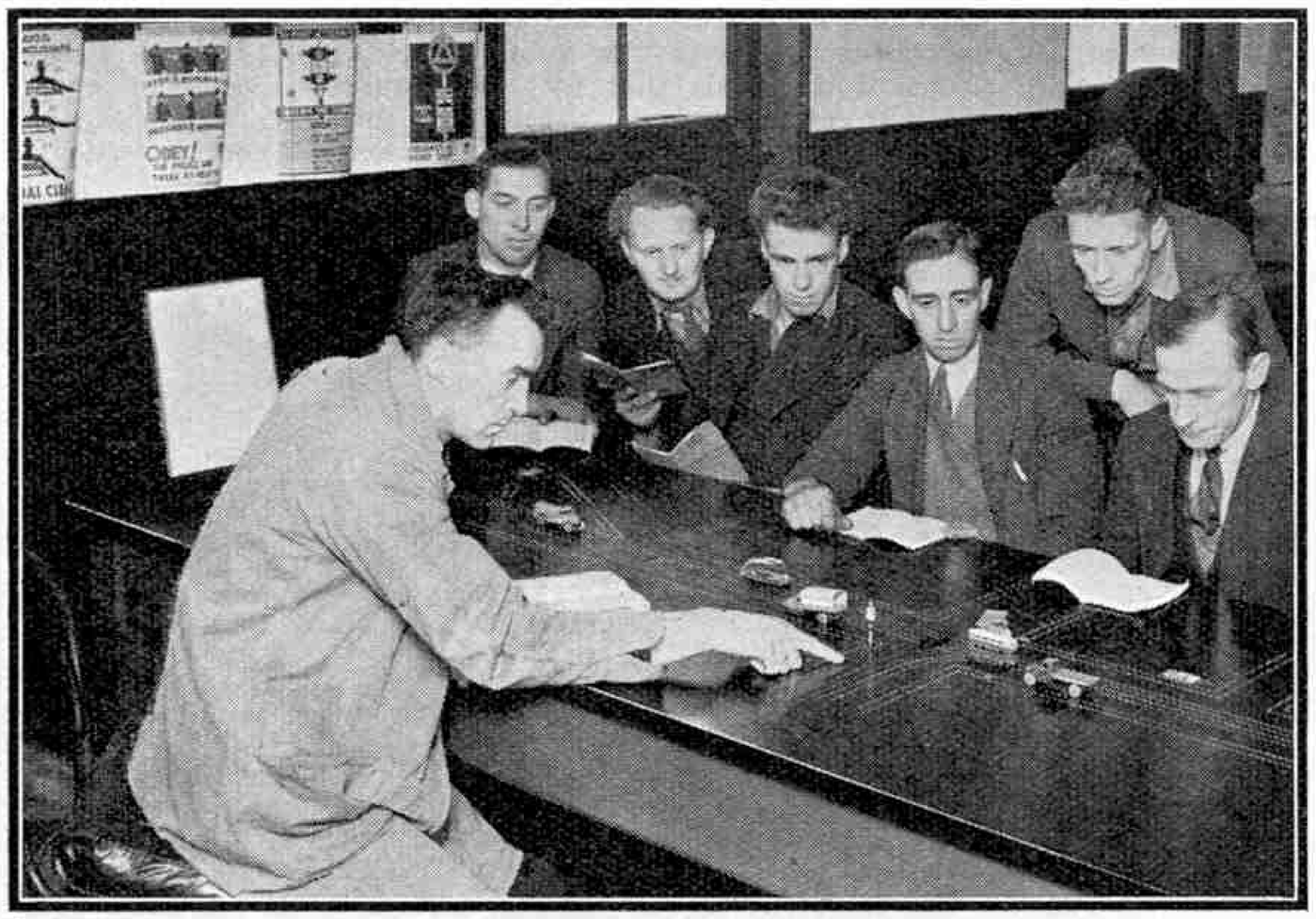
L.M.S. motor drivers are recruited from the company's own staff, and approximately 600 new drivers are required each year. In order to train and instruct these men before they can be passed as drivers, a comprehensive scheme has been evolved by the L.M.S. Road Motor Engineer, Mr. J. Shearman, for the company insists on a rigorous examination of the men before they are promoted to take up driving duties.

For a number of years the L.M.S. had their appointed Driving Inspectors in various parts of the system. It was found, however, that with the development of road motor operation as applied to railway requirements, and with the increase of traffic on the roads and more stringent licensing regulations, a more intensive and more satisfactory system was required than that of training men by allowing them to accompany the driver of a vehicle in actual service on the road.

A tentative step was made in September 1935 with the opening of an experimental training school for motor drivers at Lawley Street, Birmingham. An existing unoccupied building at this place was transformed into a schoolroom and provided with the necessary practical equipment. Within ten months of this experimental school being brought into operation, a total of 89 drivers from the Birmingham and the Midlands, Bristol, Swansea and Derby districts, had successfully passed through it. It was found that these school-trained men were considerably more efficient and in every way more satisfactory than those trained under the old system by another driver on a vehicle in actual service. In addition, the time required for a man of average skill and intelligence to pass the examinations and secure his licenses and certificates was much shorter than under the existing method. It was therefore decided to apply the training school system to all new candidates for positions as L.M.S. motor drivers.

Four Regional Schools of Instruction have been established, and it is anticipated that these will be able to cope with the whole of the 600 men who are required to be trained annually. The schools are situated at Watford, covering the London and Northampton Districts; Sutton Park, covering the Midlands; Oldham, covering the North Western area; and Cleckheaton, covering the Northern, North-Eastern and North Wales areas. The School at Sutton Park replaces the original experimental Birmingham school, being better suited to requirements.

The interior equipment of a typical schoolroom includes complete chassis, sectioned to display the various working parts and their points of access. Engine and vehicle components also are displayed individually on a bench for detailed examination and explanation. These parts serve for the mechanical side of the instruction. For the "road sense" and "*Safety first*" side of the work there is a display of road signs and warnings and "*Safety first*" posters. Most interesting of all probably to "*M.M.*" readers is the table arranged as a model highway marked out with crossings and corners. To illustrate the principles of safe driving and the rule of the road and so on, "traffic" consisting of Meccano Dinky Toys road vehicles is run, and Dinky Toys traffic signals are installed at busy points.



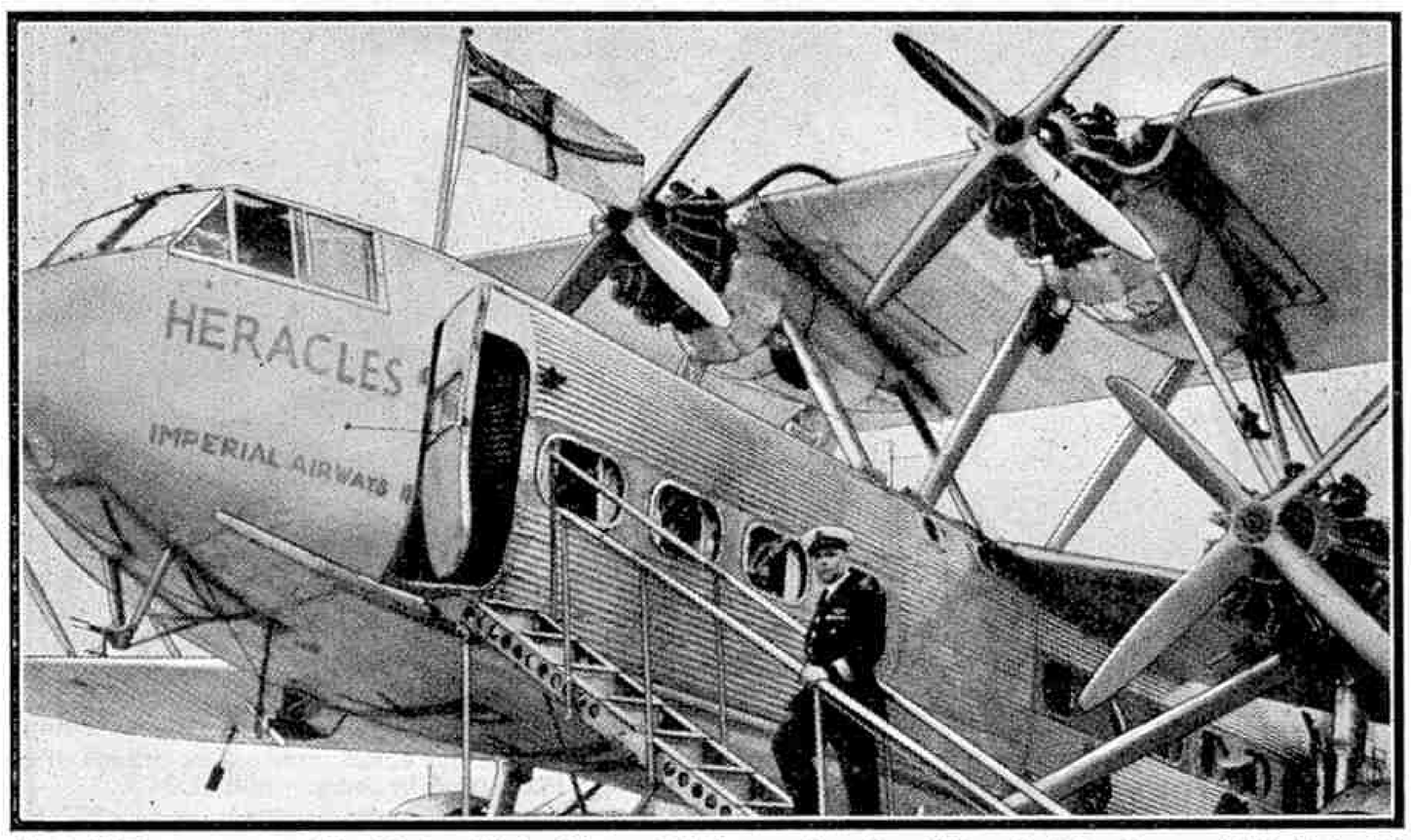
Traffic problems worked out by the aid of Meccano Dinky Toys. Prospective L.M.S. road motor drivers at Sutton Park, one of the company's four instruction schools. Photograph by courtesy of the L.M.S.

In order to help candidates as much as possible, a manual has been prepared covering the design, purpose and operation of the component parts of a motor vehicle, the actual driving of a motor vehicle, and the Highway Code and "road sense."

Adjacent to the schoolroom in each case is an open space with a stretch of private road adjoining, that is used as a training ground. Here, after they have completed their theoretical training, students are given practical driving lessons under the guidance of the Instructor, and are afterwards themselves allowed to drive. A short period of riding with the driver of a vehicle in service on the highway then precedes the examination. Although this part of the training is still necessary in order to impart confidence under traffic conditions, its duration is very much shorter than was the case when the full period was spent in this way. On an average the training of a driver at these schools takes 12 days, as compared with the 18 days necessary under the old method.

"Heracles" Completes One Million Miles

"Heracles," one of the giant Handley Page air liners employed by Imperial Airways, recently completed 1,000,000 miles of flying, and the event was made the occasion for a celebration luncheon flight from Croydon Airport. On this trip over the south coast of England the air liner was piloted by Capt. F. Dismore, one of the company's Master Pilots, and the illustration on this page shows him going aboard *"Heracles"* in preparation for the flight. Capt. Dismore learned to fly as long ago as 1913, and received his tuition on a crude early type of box-kite biplane. *"Heracles"* is one of eight Handley-Page machines that were put into service in 1931. It is a four-engined biplane, with a length of 89 ft. 9 in., a span of 130 ft., and a top speed of 127 m.p.h. A crew of five or six and from 38 to 40 passengers can be carried.



Capt. F. Dismore, one of the Master Pilots of Imperial Airways, boarding "Heracles" for the special flight during which this machine completed 1,000,000 miles of flying. Photograph by courtesy of Imperial Airways Ltd.

Death of Famous French Airman

The death on 11th August last of M. André Beaumont, whose real name was Jean-Louis Conneau, removed a French pioneer of aviation. He was famous for many notable flights carried out during the years immediately before the Great War, and was best known in this country as the winner of a £10,000 prize in 1911 for the first flight round Britain in a heavier-than-air machine.

M. Beaumont was born in 1880, and was the son of a naval captain. He adopted his father's career, but the early achievements of the Wright Brothers aroused his interest in aviation, and eventually he gave up the Navy in favour of an aeronautical career. He spent a year at a flying school, and after several months' further tuition at M. Blériot's school at Pau, he became a qualified pilot in February 1911. He soon began to attract attention by outstanding flights, and within a month of gaining his pilot's certificate he flew from Pau to Libourne, a distance of 110 miles. He won his first big international competition, a flight from Paris to Rome, in May 1911, and two months later he flew round Europe. After the War Beaumont retired to a small villa at Lodève, his birthplace.

"The Great White Birds"

Natives on the east coast of Africa have been greatly fascinated by the giant Empire flying boats now following this coastal route to and from Durban. They have referred to the aircraft as "great white birds," and have described the swift motor control-launches that operate in conjunction with the flying boats as "sons of the birds that fly." At Lindhi the natives have been particularly impressed by the fact that every time one of the control launches puts out from the shore a flying boat approaches through the sky, and this "coincidence" has led the natives to regard the Imperial Airways staff at Lindhi with great admiration, and to describe them as the "masters of the birds."

New Zeppelin to Use Helium

The disaster to the Zeppelin airship *"Hindenburg,"* which was destroyed by fire when about to land at Lakehurst, New Jersey, on 6th May last, has resulted in a decision to employ helium instead of hydrogen in the LZ.130 now under construction at Friedrichshafen. Helium is much heavier than hydrogen, and will add about 20 tons to the weight of gas required for the new airship. The passenger accommodation of the LZ.130 has already been installed, but it is now being re-arranged to save the equivalent of the extra weight of gas. It was hoped that the airship would be ready to make trial flights this autumn, but in consequence of these alterations she will not be completed until next spring.

Another Russian Polar Flight

Another fine flight from Russia to the United States by way of the North Pole was carried out on the 12–14th July last. The aeroplane was a single-engined A.N.T.25 monoplane similar to that used by the two Russian airmen who made the previous notable flight over the same route. It had a heated cockpit, dual control, de-icing equipment, flotation gear and oxygen supply in case a forced landing had to be made, and carried a crew of three. The engine was a Russian one of the liquid-cooled type and of about 950 h.p. Sufficient fuel was carried for a non-stop flight of 7,500 miles, and as a result of this heavy load the aeroplane weighed about 11½ tons and had to make a run of 2,200 yd. before it could rise into the air.

The airmen had planned to fly non-stop from Moscow to San Diego, but when near their destination a petrol leak developed and they landed during a fog in a field at San Jacinto, about 20 miles from San Diego. The total distance covered up to that time was 6,625 miles, and the time taken was 61 hr. 7 min. This notable achievement exceeded the world's long-distance record set up in 1933 by the Frenchmen Codos and Rossi who flew from New York to Rayak, near Damascus, a distance of 5,654 miles, in 54 hr. 45 min. They used a Blériot 110 monoplane fitted with a 600 h.p. engine.

Blackburn "Sharks" to be Built in Canada

The equipment of the Canadian Air Force is to be increased by a fleet of 11 Blackburn "Sharks." The machines will be built at the Vancouver factory of Boeing Aircraft of Canada Ltd., who have been granted a licence to produce them by the Blackburn Aircraft Co. Ltd., of Brough. An English engineer is being sent to Vancouver to act in a consulting capacity while the aircraft are being built. The engines for them will be shipped from England. The Blackburn "Shark" is a single-engined biplane designed for torpedo-bomber-reconnaissance duties, and was described in an article in the *"M.M."* of August 1935.

Forthcoming Trials of Short-Mayo Composite Aircraft

The second double crossings of the North Atlantic by flying boats of Imperial Airways and Pan American Airways have been successfully carried out, and interest is now centred chiefly on the trials that are about to be made with the Short-Mayo composite aircraft, in which a long-range seaplane is to be launched in mid-air from the wings of a large flying boat. The machines have been designed and constructed for the Air Ministry and Imperial Airways by Short Bros. (Rochester and Bedford) Ltd., the builders of the Empire flying boats, to test the principles involved in mid-air launching. They consist of a four-engined flying boat, which has been named *"Maia,"* and a four-engined seaplane named *"Mercury."*

In the trials about to be undertaken these two machines will first be tested as separate units. Later the seaplane will be attached to the top of the wings of the flying boat, and the two will rise from the water and fly as one machine. When a suitable operating height has been attained, the seaplane will be detached from the flying boat, and will continue its flight at high speed as a separate unit. When carrying 1,000 lb. of mails, the seaplane will have a range of about 3,500 miles at a speed of from 160 to 170 m.p.h., which is sufficient for a North Atlantic crossing in face of a continuous head-wind of as much as 60 m.p.h.

The chief purpose of the scheme is to solve the problem of getting long-range aircraft into the air; in other words, to eliminate the "take-off" difficulty with a heavily-loaded machine.

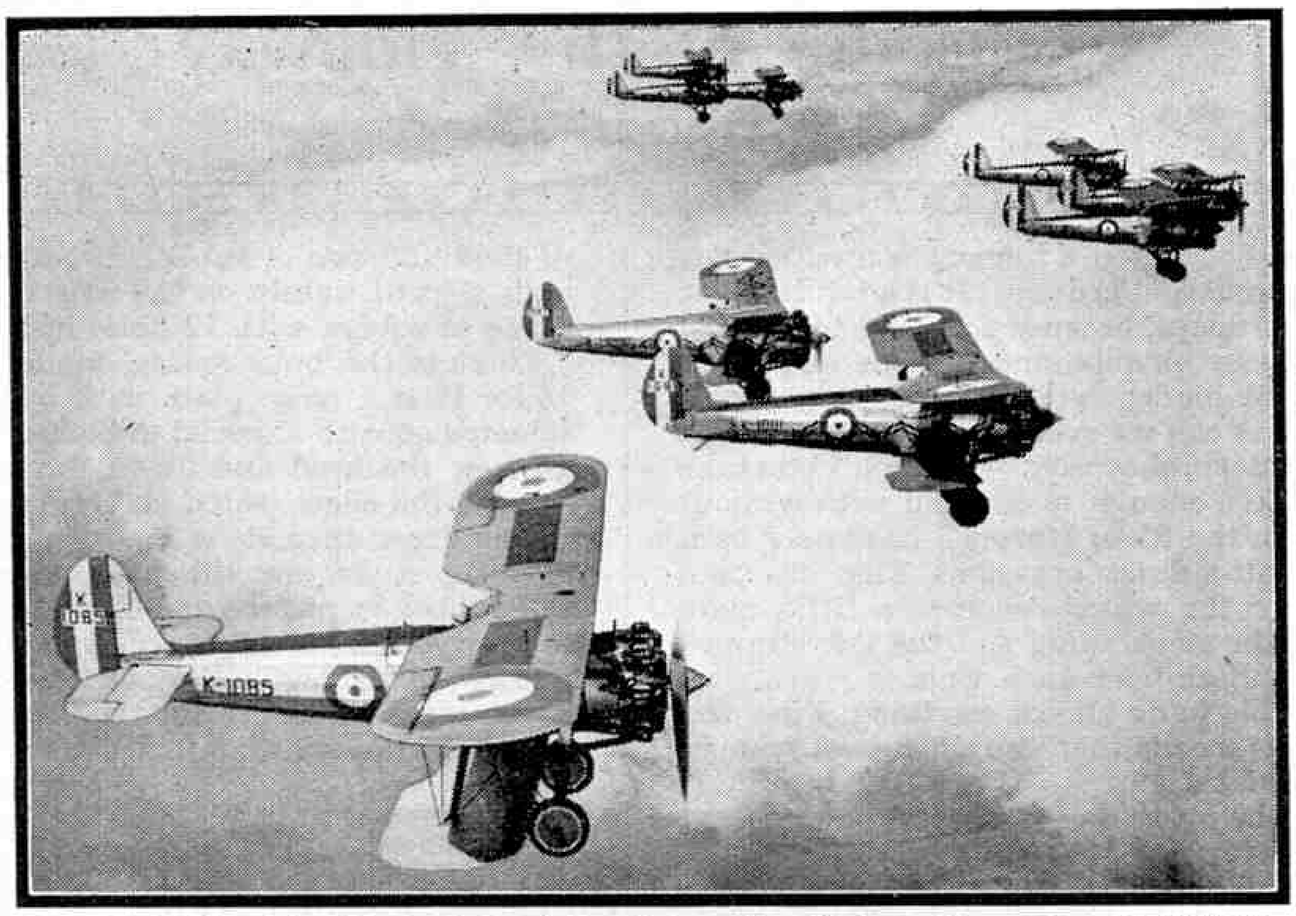
Fast Flight by D.H. "Comet"

The D.H. "Comet" that was flown by the Mollisons in the famous MacRobertson Air Race in October 1934, and afterwards was sold to Portugal, made a fine high-speed flight from Hatfield Aerodrome to Lisbon on 2nd July last. It was piloted by Lieut. C. C. Macedo, Chief Instructor of the Portuguese Military Flying School, and covered the distance of 1,110 miles in 5 hr. 17 min., averaging just over 200 m.p.h., a record for the trip. The previous record was also made by Lieut. Macedo, when in February 1935 he covered the distance in the same aeroplane in 6 hr. 5 min. at an average speed of 183 m.p.h.

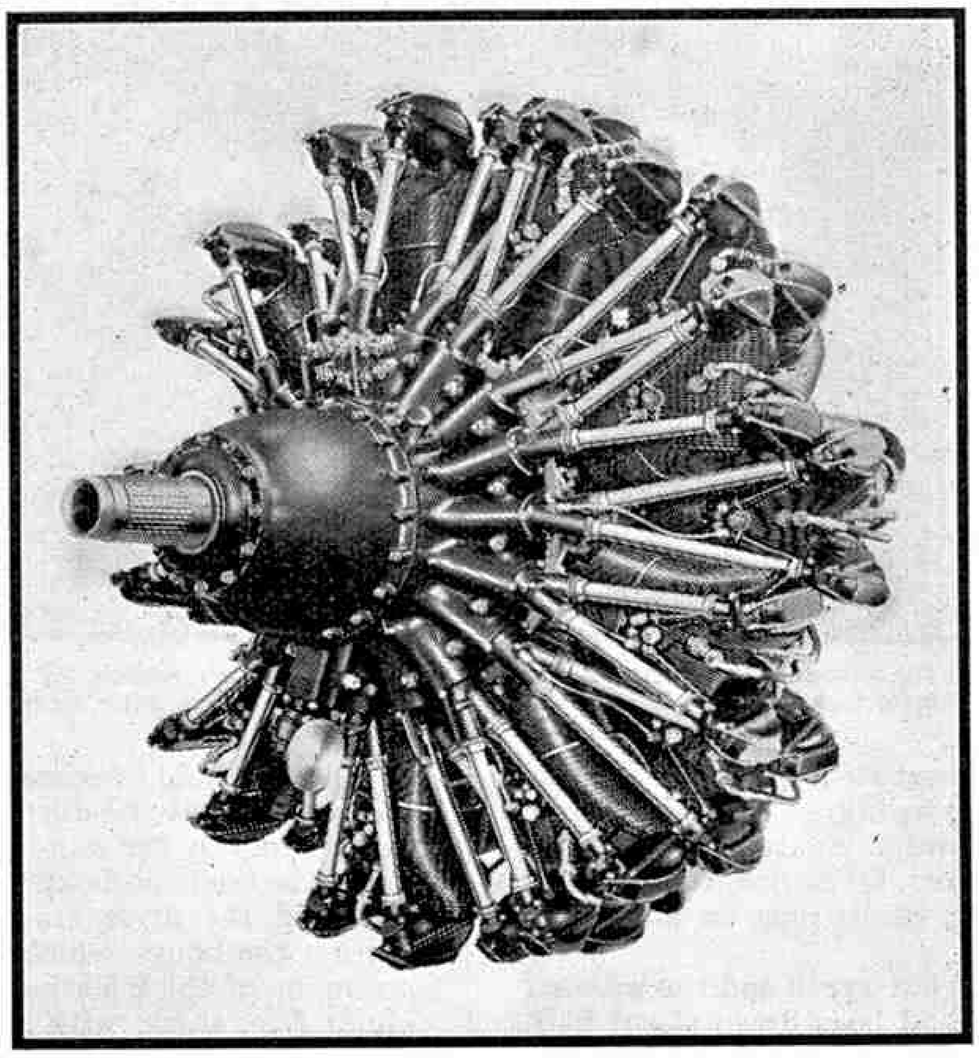
When owned by the Mollisons the "Comet" was named *"Black Magic,"* but it has been re-christened *"Salazar"* by its Portuguese owners. It is a twin-engined low wing monoplane fitted with two special D.H. "Gipsy Six" 220 h.p. engines. These special engines were fitted in all the "Comets" built for the MacRobertson Race. The wings of the "Comet" are very narrow and thin, the greatest depth being only 11 in., and they have a pronounced taper.

Imperial Airways Exhibition Train

A novel travelling Imperial Airways exhibition illustrating British commercial air progress from its earliest days to the present time is now making a tour of more than 30 cities and towns in Great Britain. The exhibition is contained in two specially-equipped railway coaches, and travels by rail from one town to another. At each place visited the coaches are drawn up near the railway station for public inspection. One of the numerous outstanding features of the display is a fine collection of beautifully constructed models of historical and modern transport aeroplanes. Keen interest is also being shown by visitors in the model of a great modern airport, complete with its flying boats. Another highly popular feature is an exhibit illustrating the working of the blind-landing wireless system by which aircraft are guided down to an aerodrome in mist or fog.



R.A.F. Bristol "Bulldog" Single-Seater Fighters in formation. Photograph by courtesy of "Flight."



The Alvis "Alcides" air-cooled radial engine. Photograph by courtesy of Alvis Ltd., Coventry.

German North Atlantic Trial Flights

The United States authorities have granted permission to the Deutsche Luft Hansa to carry out eight more two-way trial flights across the Atlantic between Frankfurt and Port Washington, Long Island. These flights will be carried out by the same method as the company employed last year, catapult ships being stationed at the Azores and off the North American coast, and seaplanes catapulted from these ships for the ocean crossings. The seaplanes probably will be new ones produced at the Bloehm and Voss shipyard, Hamburg, and each will have four Junkers "Jumo" heavy-oil engines. It is not yet known whether seaplanes or landplanes will be used for the portion of the flight between Frankfurt and the catapult ship at the Azores.

Electrical Equipment in the Empire Flying Boats

An interesting feature of the internal equipment of the Empire flying boats is the extensive electrical installation. This includes two 1,000 watt generators driven by the port and starboard inner engines and providing direct current at 24 volts. There are 70 lamps in each flying boat, and they include mooring and wing-tip lights; lights in the cabins, kitchen, baggage compartment, control room, and corridors; and powerful landing lights. Each of the four 740 h.p. engines has a 22 h.p. electric starter-engine capable of turning it at from 30 to 35 r.p.m.

New Alvis Aero Engines

The lower illustration on this page shows the Alvis 1,650 h.p. 18-cylinder "Alcides," one of two new types of Alvis aero engines. The other newcomer is the 1,000/1,050 h.p. 14-cylinder "Pelides Major." Both engines are of the air-cooled radial type, with the cylinders arranged in double banks. The "Alcides" is a geared and moderately supercharged engine, and the "Pelides Major" is geared and fully supercharged. New and important features of the engines are more efficient cooling, and a power-weight ratio that is only a fraction above 1 lb. per h.p. The low overall diameter and the clean external design of the new engines simplify their installation in modern aircraft and also make for more efficient cowling than previously was possible.

Imperial Airways Survey Flights

"Satyrus," one of the "Scipio" class flying boats of Imperial Airways is engaged on survey flights over parts of the Alexandria–Karachi section of the England-Australia Empire air route. These flights are in preparation for the introduction of the Empire flying boat service between England, India and Australia. At the same time aircraft and surface craft are engaged at the Australian end of the route in locating suitable sites for establishing marine airports.

A Mersey Diver Chats About His Work

Episodes of the Tideway

By Frederick Orton

MY experience as a diver who works in a tideway is a varied one in many ways, both dangerous and arduous. It is a far different job from diving in a harbour or docks, because you have the tide to contend with, which carries your air-pipe and life-line away and puts more weight on you and hinders you from getting about.

Many people think that a diver can see everything, but that is not so. When you tell them it is all dark, they say: "Why don't you take a lamp with you?" but you have enough to contend with without a lamp. In all my experience in the River Mersey I have only been able to see a little on about half-a-dozen occasions. That has been outside in the channel, where the water becomes a little more clear, and on a fine day with the sun shining and the tide stopped running, and then only for half-an-hour each time.

In my job you have to be able to do almost anything. First you sign on as a seaman diver. This means that you must be a seaman and know all about ships and their construction, which is a great help to you when you are lifting or destroying a ship that is found impossible to salve. When a ship has to be lifted it is the diver's job to pass a small wire messenger underneath so that the salvage steamers can heave the large lifting wires under the ship and then make them fast to the lifting vessels, which are called "camels." When a ship has to be destroyed it sometimes has to be picked up in pieces afterwards, and that takes a long time because the ship has to be cut in small sections of about two to four tons so that the salvage vessel can heave them up when they have been slung with wires by the diver. Each section is cut with small charges of high explosives so that it will not destroy all the metal. When a ship has been in collision or run ashore, you have to be able to put patches over the fractures, so that the ship can be pumped out with motor or steam pumps that are put on board.

I can remember one occasion when a ship broke in two and could not be salved. All the cargo of any value had to be salved, however, and in one hatch there were a few hundred tons of steel pipes, some 20 ft. and some 40 ft. long, weighing up to a ton each. I had slung one of the 40-ft. pipes and had signalled to my attendant to heave up when I noticed my air supply had stopped, so I signalled that I wanted to come up. I could just get to the ladder, and my attendant could see there was something wrong, so he told the man at the winch to lower the pipe away, and it cleared my air-pipe, which we found was very nearly cut in two. Of course, that did not stop the job. We just put a new length of air-pipe on and down we went again.

On another occasion I was diving at an old wreck and the weather was very cold and everything frozen. I had been down about half-an-hour when I was called up because the men could not turn my diving engine on account of the moisture in my air-pipe having frozen. The pipe was taken off the engine and another one put on while the first was getting thawed out on the salvage vessel. After working two-and-a-half hours I gave it up because all the feeling had gone out of my body, and you should have heard the kind words I got from the Boss because I had finished before my time!

Before I go any further I must try to describe my diving gear and diving boat. The first thing I do is to put on two thick woollen jerseys, two pairs of woollen pants, two pairs of long stockings, and a woollen hat. The idea of so many woollen things is to stop the diving dress from rubbing, and also to keep you warm. Next comes the diving dress, which is made of twill and rubber in layers, two layers of twill and one of rubber in between. On the sleeves are rubber cuffs that fit tightly on the wrists, and around the neck is a collar made of rubber with 12 holes in it.

Next is the breast-plate, made of copper and weighing about 15 lb. It is a large plate with a hole in the centre and a flange soldered on with a special thread on it, and it is shaped so that it will go over the head and fit on the shoulders. It has 12 brass studs around the edge, which go through the holes in the collar on the diving dress; then there are four brass straps with holes in that fit over the studs, and these are screwed down with wing nuts until the rubber is pressed out and made watertight.

Now you put on a pair of extra heavy woollen stockings that are tied round the leg, and a pair of overalls made of heavy moleskin. These are worn to protect the diving dress. Then a broad belt with your knife in a sheath is fastened on. The knife is about 10 inches long and half-an-inch wide, with an edge on both sides, and screws into the sheath.

The author of the accompanying article in his diving suit, waiting for his helmet and air pipe to be fitted before descending to carry out a routine investigation on the river bed.

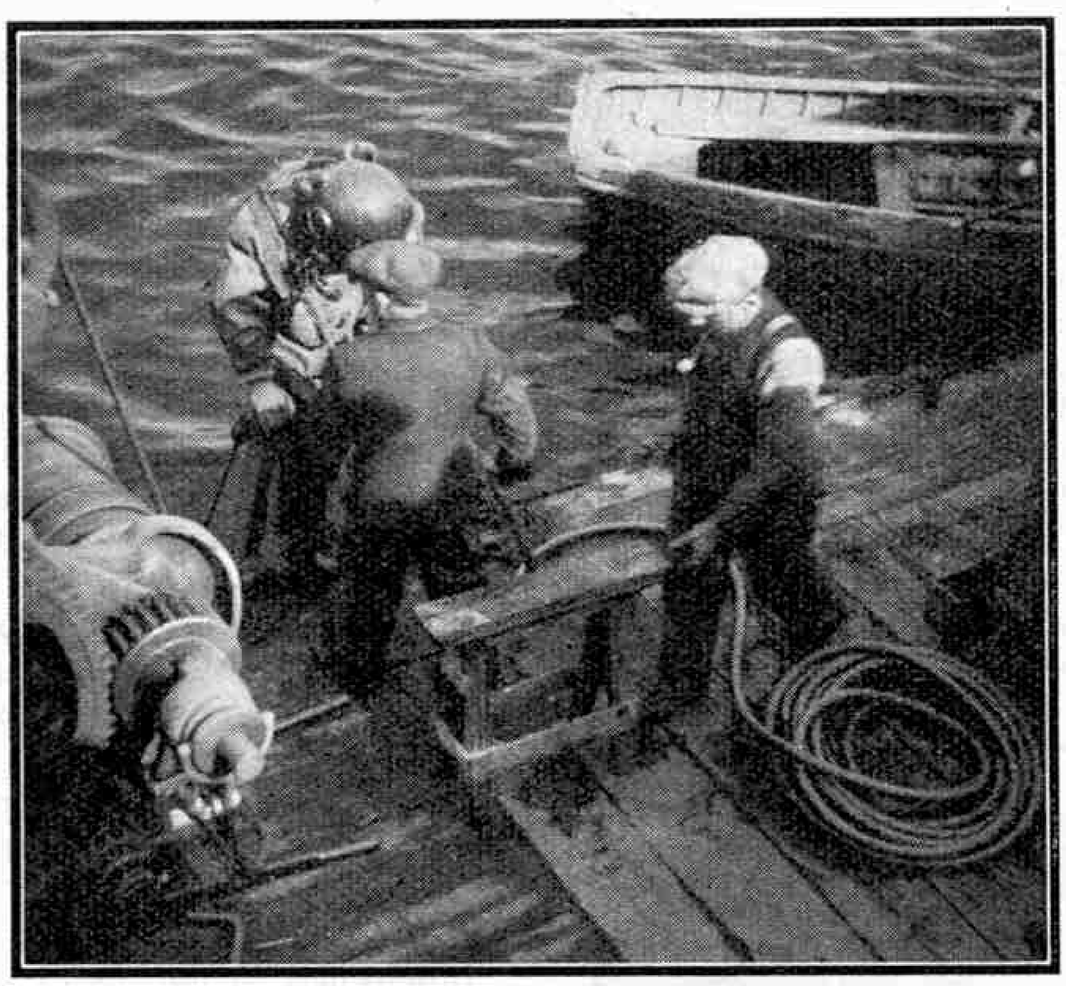
Having got so far you are ready to go in the diving boat, which is 40 ft. long and 10 ft. wide. In the stern of the boat is the diving engine that supplies the diver with fresh air. The air-pipe is screwed on to the bottom and is 180 ft. long, but of course an extra length can always be screwed on if necessary. The diving engine is always lashed to each side of the boat so that it will not fall over when the boat rolls. In different parts of the boat are small coils of rope that are ready for the diver at a moment's notice. In the middle on one side is the diving ladder, about 12 ft. long and made of hard wood. It is made fast so that there are only three rungs in the water. On the other side of the boat are the oars, 16 ft. long, which the boat's crew, consisting of eight men and an officer, have to use to get the boat from the salvage vessel to the job, because we are not allowed to have a motor engine in the boat on account of using explosives. A red flag on a stick is always in the boat, and must always be put up as soon as the diver goes down, to warn any vessel that may be passing. Whenever possible the diving boat is towed to the job by a motor boat that is carried on the salvage vessel.

When the boat is somewhere near the job a small hand grapnel made fast on a line is thrown overboard to try to get a hold of something, and if it does the rope is pulled tight and we are ready to start. First an anchor made fast on a long rope is taken away by the motor boat a good way from the diving boat and let go, to hold the boat in position. Then the ladder is put over the side and the diver starts to put on the remainder of his gear.

First the boots, which weigh about 30 lb. each, are put on. They are made of thick leather sides, which are fastened to wooden soles about $\frac{3}{4}$-in. thick, with lead soles one inch thick screwed on to the wood. They are secured on the diver's feet by leather straps and buckles, and also small rope laces and a rope lashing around the leg. Next comes the helmet, which is made of copper. It has a small window on each side made of glass $\frac{5}{8}$-in. thick; and also one in front called the mouthpiece, which has a thread on so that it can be taken off when the diver comes up. Each of the windows has narrow bars across to protect the glass. On the right-hand side is the air valve by which the diver controls his supply of air. It is lowered gently over the diver's head until it rests on the flange on the breast-plate, and then it is turned a little until it locks in the threads inside the helmet and the threads on the breast plate, when a catch is dropped at the back to prevent it from unscrewing. The helmet weighs about 15 lb.

Two lead weights, weighing anything between 30 lb. and 40 lb. each, rest one on the back and the other on the chest, and are hung over the shoulders by small ropes with clips on the end that fasten on to the breastplate. Another rope fastened on the back lead comes round the waist to the front lead and is then made fast. Next the end of the air-pipe is passed through a ring on the belt and screwed on to the helmet at the back; and then the life-line is passed round the diver's waist and made fast by a small line on the breast-plate. The life-line is a rope two inches in circumference, and is used to haul the diver up, and also as a means of communication between the diver and the attendant by giving so many short and long pulls.

When the diver is dressed the diving engine is given a few turns to see if all is correct. Then the diver gets on to the ladder, the flag is put up, and the diving engine is manned by two, three or four men, according to the depth of water to which the diver is going down. The diver's mouthpiece is then screwed on, he is pulled to the rope which has been made fast, and down he goes to see if it is the right job. If it is not he comes up, and then the job has to be found by sweeping for it, which is done by a motor boat and the diving boat. First the anchor is hauled up. The motor boat then takes one end of a long rope with weights on specially for the job, and this rope is let go out from the diving boat until it settles on the bottom. Both boats drift with the tide until the rope catches on something, and it is then hauled in until both parts become tight. The diver now goes down again, and the process is repeated until the job is found.



A diver descending to carry out blasting operations. This photograph, by F. H. Culverhouse, Sheffield, won a prize in a recent "M.M." competition.

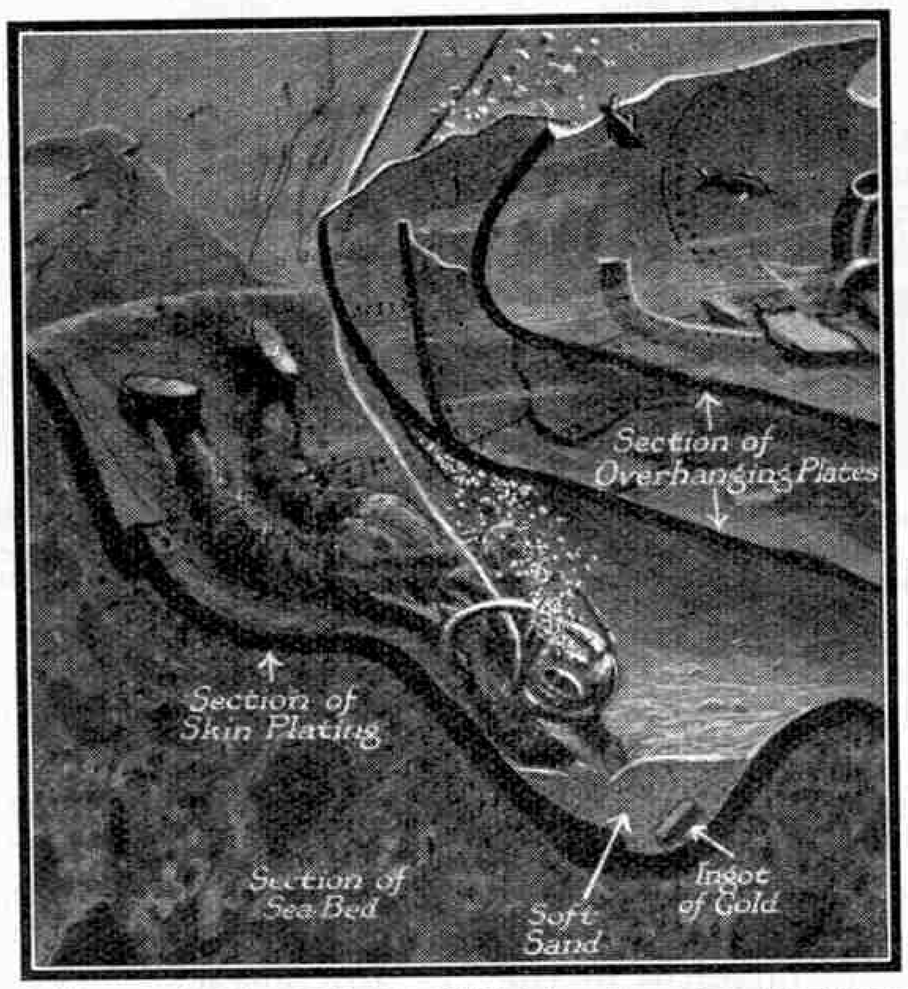
While working at an old wreck I came across the largest conger-eel I have ever seen; it was about 10 ft. long. I was trying to find a way to pass a large wire round the heap of iron bars so that they would be lifted all at once, because they were all stuck together and could not be lifted singly. When climbing over the top I found a space about 3 ft. square, and I was just thinking about dropping down when I saw something white moving about. This was one of the times I was speaking about earlier on, when it was possible to see for about half-an-hour; so instead of dropping down the hole I went down the side of the heap of iron and lay down for a minute until the water cleared, and then I could see it again. I went right up to get a long pole with a hook on, but by the time I got it and went down again the tide had commenced to run, and it was all dark and I could not see anything. A few days afterwards it was decided to disperse the heap with explosives, which was done, and I suppose the eel went as well.

I had a job once to discharge one hatch of a very large ship, and one day my boss brought his wife out to see us working. While I was slinging some large cases I came across one that was broken and was full of ladies' shoes, and I had a couple in my hand when I came up for a spell. The Boss's wife asked me to find her a pair. I asked what size, and she said sixes. Just by sheer luck the next time I came up I had a pair of sixes, and she really thought I was able to see the marks! What made her more convinced about this was that just previously I had sent up a very large case, and where I had put my slings was painted on the side: "Sling Here!"

One day while working on the same job a funny incident occurred. The ship was lying right across a training wall, and was broken in two with her stern in deep water and listed to port; one part was out of water at low tide and was being cut up by the ship-breakers. I was asked to find a certain case that was in the deck under the main deck. It was low water at the time, and I was crawling along to the place where I thought it was. I found I could see better when I stood up, and I was then out of the water close to a bulkhead where the ship-breakers were working. They had just cut a hole in the bulkhead, and one man got through to have a look round, and saw me standing there in the gloom. He gave one look, dropped everything, and jumped for his life back through the hole through which he had just come. What he thought I was I do not know, but it gave him a fright!

A few years ago a practically new ship, the S.S. "*Lochmonar*," bound for Liverpool with a valuable cargo, ran on top of the training wall in the Mersey channel and partly broke in two. It was found that from the fore part of the bridge to the stern was not damaged, and it was decided to cut the fore part away and leave it to be dealt with later, and to salve the after part. The operations of cutting the ship could only be carried out for a short period each tide, and only small charges of explosives could be used, in order that the explosions should not affect the bulkheads in the part of the ship we were trying to salve. If the bulkhead in the engine room had given way the job would have been finished. The work was carried out successfully in about a week, and the section of the ship was towed stern first by tugs to Gladstone Dock, Liverpool, to be discharged. Then it was put into dry dock, where the ship-builders built a new fore part on to it, and the ship sailed again in a few months.

The next thing we had to do was to deal with the section we had left behind, which was about 150 ft. long, the lower part being in about 66 ft. of water at low tide. The mast, derricks and the part of the hull that was above water at low tide were removed with burning machines, and the remainder was destroyed with explosives. This time larger charges could be used, from 50 lb. to 1,000 lb. weight at a time. It is a great sight when a large charge is fired; the water goes up in the air in a great column about 100 ft. to 150 ft. high.



A diver groping for gold ingots 132 ft. below the surface. Illustration by courtesy of Siebe, Gorman and Co. Ltd., London.

I have already mentioned the use of a rope for sweeping the river bottom to find a job. Once when we were trying to find an old wreck with a sweep-rope we came across the remains of another old wreck that had been sunk for over a hundred years, and of which we had no record. There was very little of the vessel left except about 70 tons of iron bars, some flat and some round; and the remains of some cases which, when sorted out were found to contain very old rifles about 7 ft. long. Also there were two or three bundles of swords, just the blades; they had been packed in layers and covered with some black substance like pitch. I think some specimens were sent to the Liverpool Museum or the Liverpool University.

I think the most interesting job of a diver is cargo diving, which means recovering the cargo out of a ship that has sunk in about 10 fathoms, that is 60 ft., of water. The men are keenly interested, wondering what is coming up next. Among the worst things a diver has to handle are reels of barbed wire and bags of nails. When you think of the number of men it takes to load a ship, and then of one man to discharge it, you will have some idea what a diver's job is like.

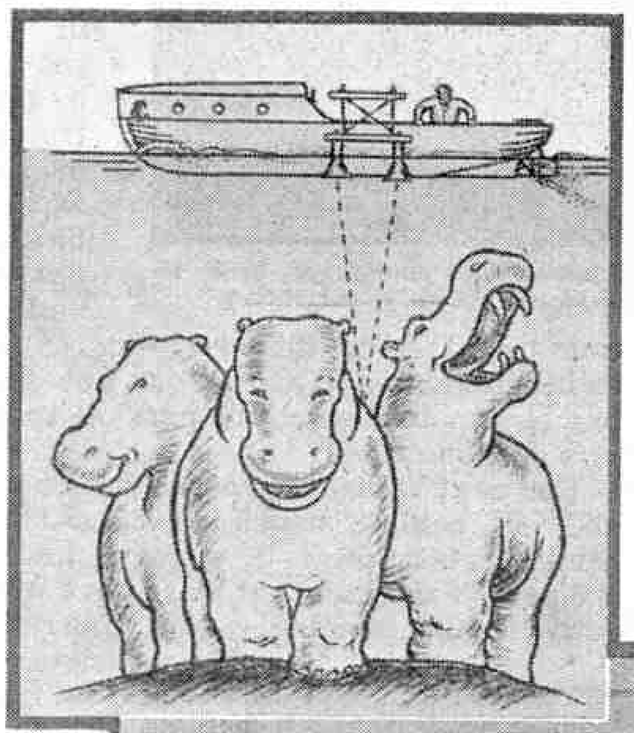
Diving in home waters is not so exciting as diving in foreign waters, as we do not have such thrilling experiences as meeting sharks, etc., which one sometimes reads about. On the whole, however, it is quite as interesting, and sometimes as thrilling; and it is a job I myself enjoy.

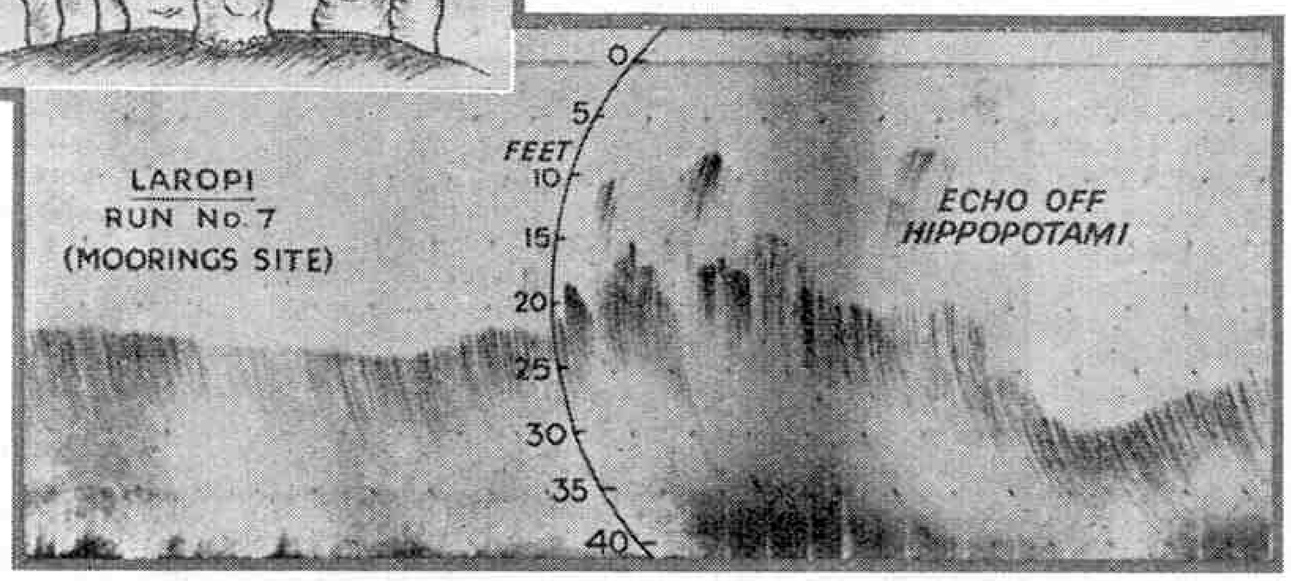
Echo-Sounding in Central Africa

Hippopotami Masquerade as Rocks

THERE are countless occasions when exact knowledge of the depth of the sea at some point, or of a river or estuary, is of very great importance. Seamen depend very largely on knowledge of this kind. The charts that they use in navigation indicate depths at as many points as possible, and at the same time give some idea of the nature of the sea bottom where the sounding is taken. When a vessel is finding its way, especially in the approaches to harbours and in narrow waterways, the depth is constantly measured in order to assist the navigator to find his exact position at any moment.

Formerly depths could only be measured by means of a weighted line, and this method of sounding is known as "heaving the lead." Vessels specially engaged on the survey work necessary for preparing charts were equipped with special sounding machines, which lowered weighted wires to the sea bottom. These wires were of great length, and each sounding occupied a considerable time, taken up in the running out of the line and still more in rewinding it.





An Echo-Sounder record taken at Laropi, showing the presence of hippopotami under the water. Illustrations by courtesy of Henry Hughes and Son Ltd. and "The Motor Boat."

It is no longer necessary to use such laborious processes for sounding the depths of the ocean, or indeed of any stretch of water. Instead the echo-sounder can be used. This ingenious instrument gives the depth of water below the vessel in which it is installed automatically, and almost instantaneously, and also can be made to record it on a chart. The information is given continuously, so that examination of a depth chart made by the instrument in a ship or boat is a complete record of the depth of water along the course followed.

This wonderful device works on a very simple principle. Sound impulses given out from apparatus in the vessel are echoed back from the bottom of the sea. The interval between the sending out of the impulses and the return of the echo is measured, and knowledge of the speed of sound in sea water then gives the distance travelled.

Echo-sounders are automatic in operation throughout. Oscillators are used both for transmitting the sound signal and receiving it, and the vibrating diaphragm in the transmitter that produces the sound waves can be operated electro-magnetically, or by means of compressed air. Usually it is set in the keel of the vessel, inside the bottom plates on one side, and the receiver is placed in a corresponding position on the opposite side. In the latter the echo produces vibrations in the diaphragm, and these produce varying electrical impulses somewhat in the same manner as the diaphragm of the mouthpiece of a telephone. These impulses pass through cables to amplifiers, and thence to a recording arrangement in the receiving box, which is placed on the bridge, or in some other convenient position where its readings can be seen without delay.

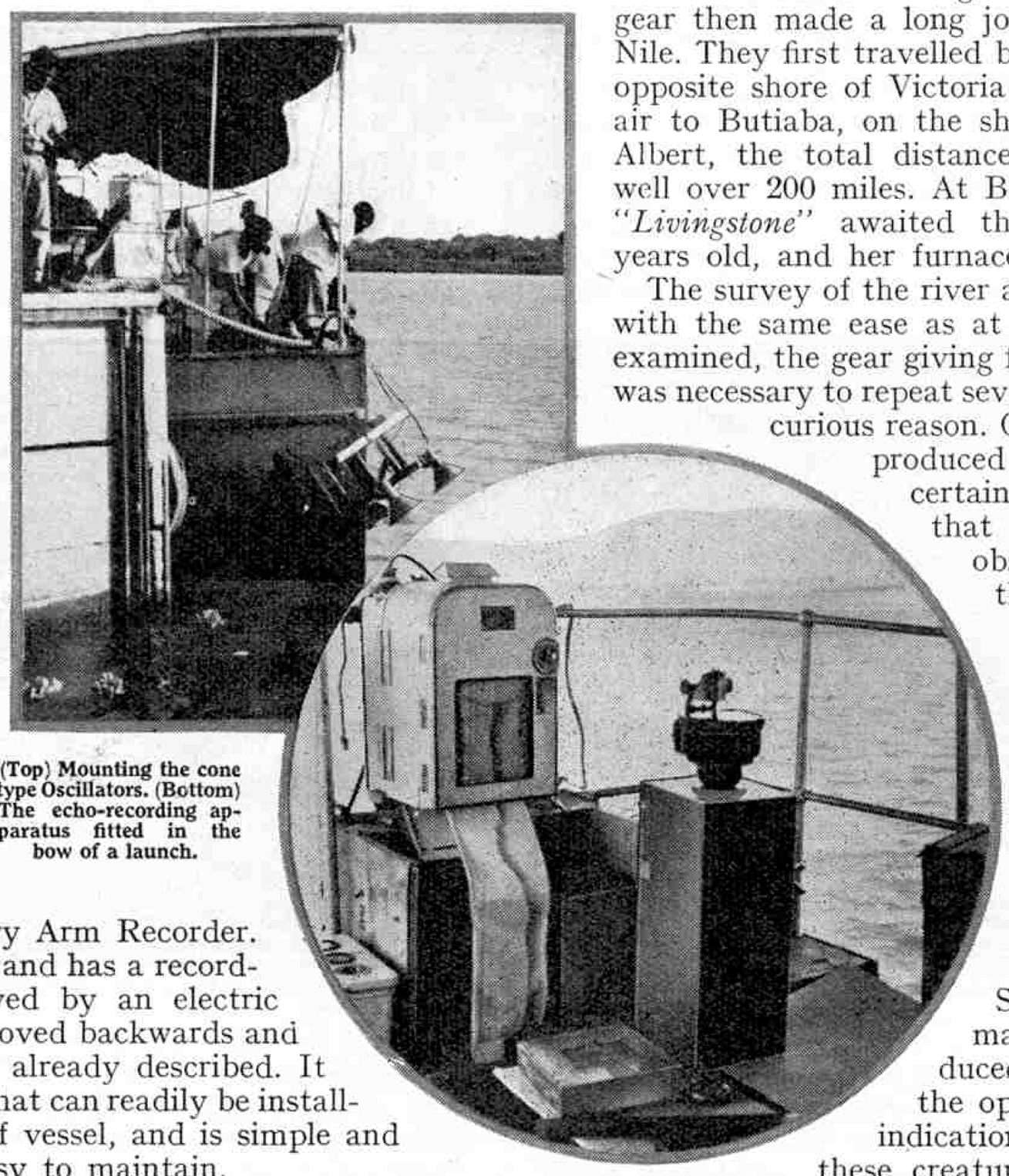
In the recorder they operate a stylus, or pointer, which moves backward and forward at a uniform speed across recording paper that moves slowly past it. The paper is treated with potassium iodide, either as it is about to reach the stylus track, or beforehand, in which case it is moistened when reaching the recording point. When the current from the pointer passes through it to the plate it makes a brown mark due to the liberation of iodine. The line traced out in this manner automatically indicates the time required for the echo to return from the bed of the sea immediately below the vessel, and thus shows the depth at that point. This can be recorded in feet or in fathoms, and the paper on which it is shown passes through a special drier before emerging from the instrument.

Apart altogether from the advantages of being able to take soundings so easily and with the greatest accuracy, it will be seen that this method is invaluable in times of emergency. Vessels groping their way through fog, or in unknown waters, can only move slowly and tentatively if it is necessary to heave the lead whenever they wish to know what depth of water is below. With the echo-sounder the information is given immediately, and steps can be taken to avoid running aground without delay, thus diminishing danger.

One of the most remarkable applications of echo-sounding is in finding fish in the seas. It is easy to realise that sound waves from the transmitter are reflected from any obstacle they encounter in the sea, and the echo-sounder of a vessel passing over a shoal of fish immediately indicates their presence and shows their depth, if the true depth of the sea at that point is known. Echo-sounding, in fact, is being employed very largely in the detection of shoals of herring and cod in the North Sea, which has been extensively surveyed, so that the echoes for the shoals can readily be distinguished from those from the bottom of the sea.

A very interesting example of the value of echo-

sounding was provided recently by a survey of rivers and waterways in Central Africa. This was undertaken by Henry Hughes and Son Ltd., the makers of Admiralty echo-sounding apparatus, on behalf of Imperial Airways. The Empire Flying Boats now in use on the African services of this Company require stretches of water with a minimum depth of 4 ft. 9 in. on which to alight when fully loaded, and the object of the survey was to examine certain parts of the upper reaches of the Nile in order to ascertain whether there was at each a stretch of water of the necessary depth that was sufficiently large and free from obstruction to be suitable as a base. The task was entrusted by Henry Hughes & Son Ltd., to Mr. Reed, one of their engineers, who travelled about 10,000 miles with a complete echo sounding outfit, and completed a detailed and accurate survey of the proposed bases in less than a month.



(Top) Mounting the cone type Oscillators. (Bottom) The echo-recording apparatus fitted in the bow of a launch.

Mr. Reed travelled most of the way from London to Central Africa by air, taking with him as personal luggage an MsXII Rotary Arm Recorder. This weighs nearly 84 lb. and has a recording point that is revolved by an electric motor instead of being moved backwards and forwards, as in the type already described. It has cone type oscillators that can readily be installed in almost any form of vessel, and is simple and robust in design, and easy to maintain.

The survey work was begun at Juba on the River Nile. There the transmitting and receiving units of the echo-sounding gear were fitted into a steel dinghy, which was partially filled with water and lashed alongside a motor launch in which the recording apparatus was mounted.

From Juba a move was then made by air to Kisumu on the shore of Victoria Nyanza. This time a very small motor boat, the "*Hitarum*," was employed for the survey. The engineer who had to occupy the cramped quarters that she afforded while the work was being carried on, uncharitably described her as a sardine tin, and she nearly turned over on several occasions. The echo-sounder settled down readily in its unusual position, however, and gave excellent results throughout.

From Kisumu the engineer and his echo-sounding gear then made a long journey to Laropi, on the Nile. They first travelled by air to Entebbe, on the opposite shore of Victoria Nyanza, and thence by air to Butiaba, on the shore of the smaller Lake Albert, the total distance travelled by air being well over 200 miles. At Butiaba the steam launch "*Livingstone*" awaited them. This vessel is 40 years old, and her furnaces burn wood fuel.

The survey of the river at Laropi was carried out with the same ease as at the other landing bases examined, the gear giving faultless results. There, it was necessary to repeat several of the runs for a very curious reason. On examining the records produced by the echo-sounder on certain occasions it was noticed that there appeared to be obstructions in the bed of the river, at comparatively small depths. Eventually it was discovered that these were simply records of the presence of herds of hippopotami, which were detected by the instruments in exactly the same manner as shoals of fish are revealed by echo-sounding in the North Sea! An actual record made at Laropi is reproduced in the illustration on the opposite page, where three indications of the presence of these creatures can readily be seen.

The survey at Laropi completed the work undertaken on behalf of Imperial Airways. As a result of employing this type of sounder, what otherwise would have been months of work had been compressed into a few weeks. On one occasion two hours only were spent in a survey that would have occupied the local staff, unequipped with the special apparatus, 14 days.

"Horse Power" on the L.M.S.

In spite of the advance of the motor for railway cartage work, the horse still plays a large part in the work of the L.M.S. The company own some 8,000 horses for cartage, shunting and other purposes. The animals are well cared for, and in addition to the ordinary stabling accommodation the company maintain special "homes" for horses that require treatment for their ailments or injuries.

Interesting facts are related by Mr. H. A. Turner, the L.M.S. Horse Superintendent for London, who is in charge of the horse sanatoria at Willesden and Kentish Town, where over 80 cases a week are dealt with. He says: "Horses are just as liable to illness as human beings, no matter how well you look after them. Chest complaints are the most frequent, although there are numerous cases of lameness, influenza, pleurisy, and other ills common to mankind. Some horses have a little holiday, varying in length from a month to three months, and special diets are arranged. The daily feeds include bran, chaff, corn and oats."

"Drivers get very attached to their horses, and several men whose horses have been ordered treatment actually visit the sanatoria during their spare time to see how their animals are getting on. They are constantly making enquiries through their superiors as to when they will get their own horses back.

"Horses that have been in the sanatoria seldom forget the good time they have had there. If any of them happen to be passing when back at work again, the carters invariably have a difficult job to prevent them from stopping or making their way inside the gates! One horse we had to deal with was a regular old dodger. On making my periodical examination I would look at the animal, which was perfectly fit, and say: 'You are sound enough to go back to work.' This old soldier had apparently a quick ear, because ten minutes later he would be found pretending lameness!"

An extraordinary degree of understanding and affection invariably exists between the horses and the men who drive them. A carter was unfortunately killed in a lift accident at a factory where he was collecting goods. Another man was sent to bring in the load, but the horse could not be made to move. Ultimately a chain horse had to be sent to pull him home.

A shunting horse at Bletchley was trained by his driver to refuse to move for anyone else if he had been told to stand. The same horse used to put on the incandescent gas lamp at the bottom of the platform slope by operating the tap with his neck. Having done so he would look up at the lamp to satisfy himself that it was alight!

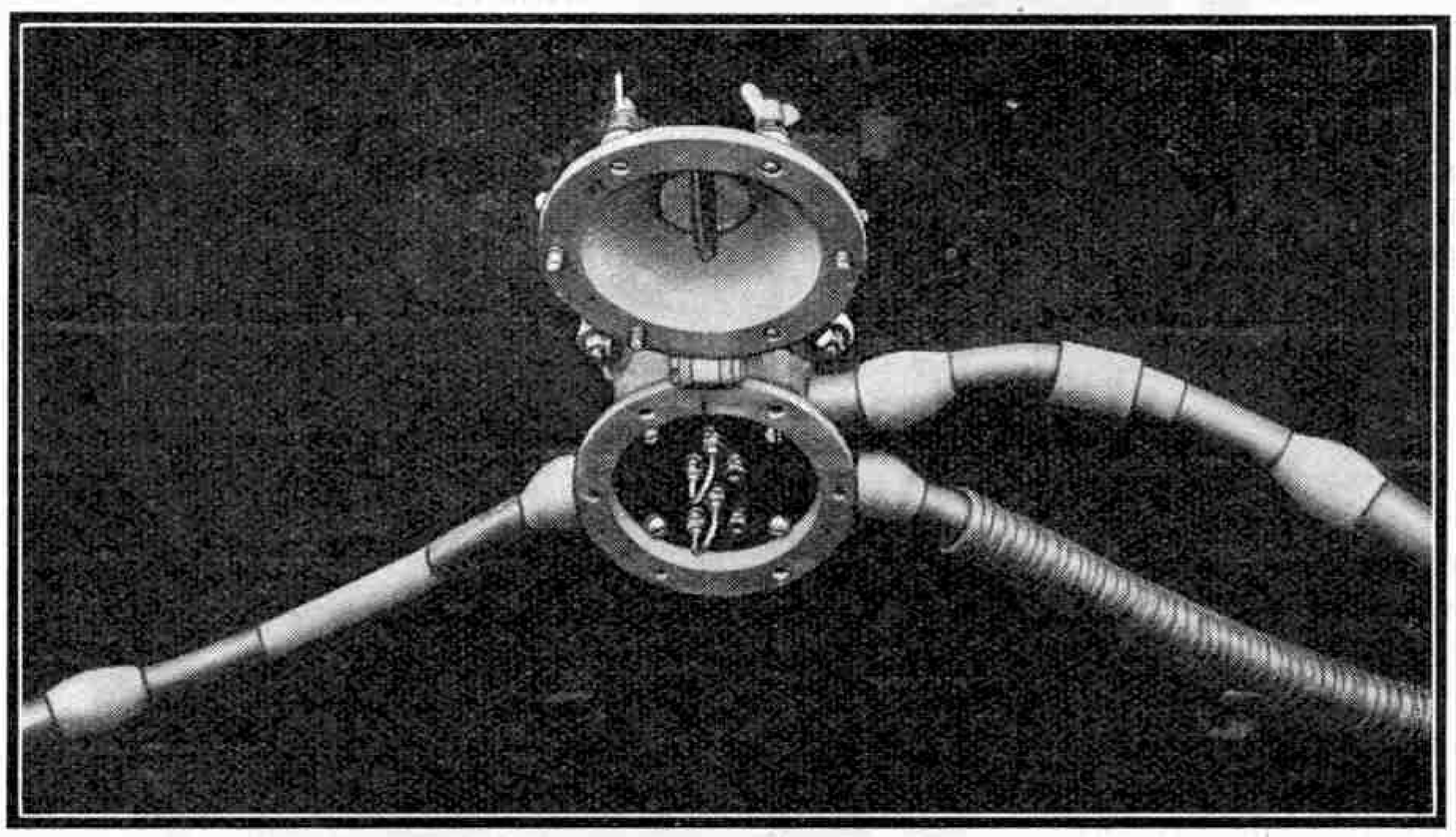
The London Television Cable

A New Network Fourteen Miles Long

By T. R. Robinson

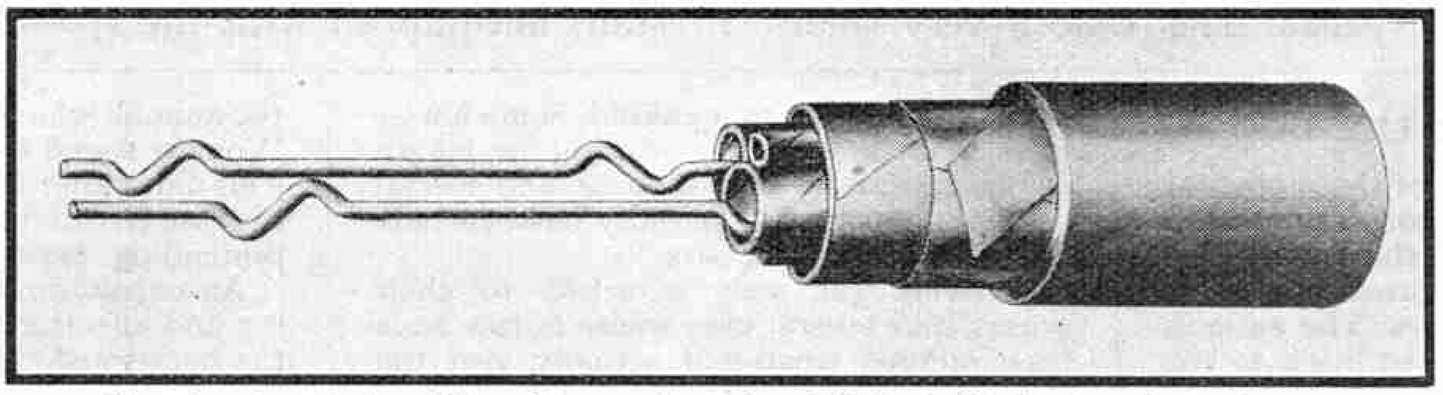
TELEVISION is rapidly advancing to a position of public importance equal to that of ordinary broadcasting. This has been strikingly shown by the laying down of the London television cable. This is the first of its kind, and some 14 miles have already been installed in the form of a network that will enable almost any important point to be tapped for the connection of an Emitron television camera.

The cable is of very special construction, for television currents make special demands on their conductors, and are much more difficult to deal with than ordinary speech or music currents. Musical broadcasting only employs a band of frequencies between 50 and 10,000 cycles per sec. The television camera generates a much wider band, however, varying from zero to as much as two million cycles per sec., and the difficulties of transmission are considerably increased.



One of the watertight tee boxes of the London television cable. The illustrations to this article are reproduced by courtesy of Siemens Bros. and Co. Ltd.

Air is the best insulator in these conditions, and the cable therefore is designed with its conductor wires running in a tubular sheath, and a large air-space between the wires and the enclosing tube. This sounds a little like hanging something on nothing, for normally the wire would just fall against the lower part of the sheath. This difficulty has been overcome by crimping or waving the wire, with each crimping at right angles to those on each side. This causes the wire conductor to take up automatically a central position in the sheath. The cable contains two of these air-spaced conductors, each in its own sheath, and the two sheaths are further enclosed in two layers of paper insulation covered with a lead alloy to give final protection.



The crimped conductors of the cable space themselves in their sheaths, leaving a large air space.

The longest section connects Alexandra Palace with Broadcasting House, and from thence the cable is laid through Oxford Street, Park Lane, Piccadilly and Shaftesbury Avenue to the Whitehall Telephone Exchange. There it makes junction with the other two sections, which pass along Whitehall to the Houses of Parliament and Westminster Abbey, and by way of Pall Mall and Palace Road to Buckingham Palace and Victoria Station respectively.

Considerable difficulty was experienced in finding space for the cable in the crowded Post Office telephone conduits, and this was made even worse by the fact that the cable could not be bent sharply or distorted because of its air-spaced conductors. Careful work overcame the trouble, and there was no loss of efficiency due to laying.

In the jointing chambers the cable is protected by flexible metallic tubing or by channel iron troughing. Special precautions had to be taken against the possible effects of water, which on entering would have been able to flow along the air spaces and do great damage. In order to guard against this, solid joints are made at intervals of 250 yds. by means of a wax composition, which has low electrical losses. By this means it is assured that any water entering the cable could only effect a short section.

It is proposed to instal an additional branch of cable running to the City, and this also will have several tapping points that can be used for televising important events. The cable is only the beginning of a vast network of television cables that eventually may distribute programmes to transmitters all over the country, just as the grid of wireless programme circuits does now.

There is a flexible cable that connects the camera with the tapping points on the main cable, and this, too, has been specially designed. It has two crimped air-spaced conductors, of much the same type as those of the main cable, and in addition there are other conductors of the normal insulated type that carry the filament and anode currents for the camera, and the telephone connections between the control-room and the camera-man. This cable can be used up to 1,000 ft. lengths without affecting the transmission quality. For longer distances a control room on a motor van is used.

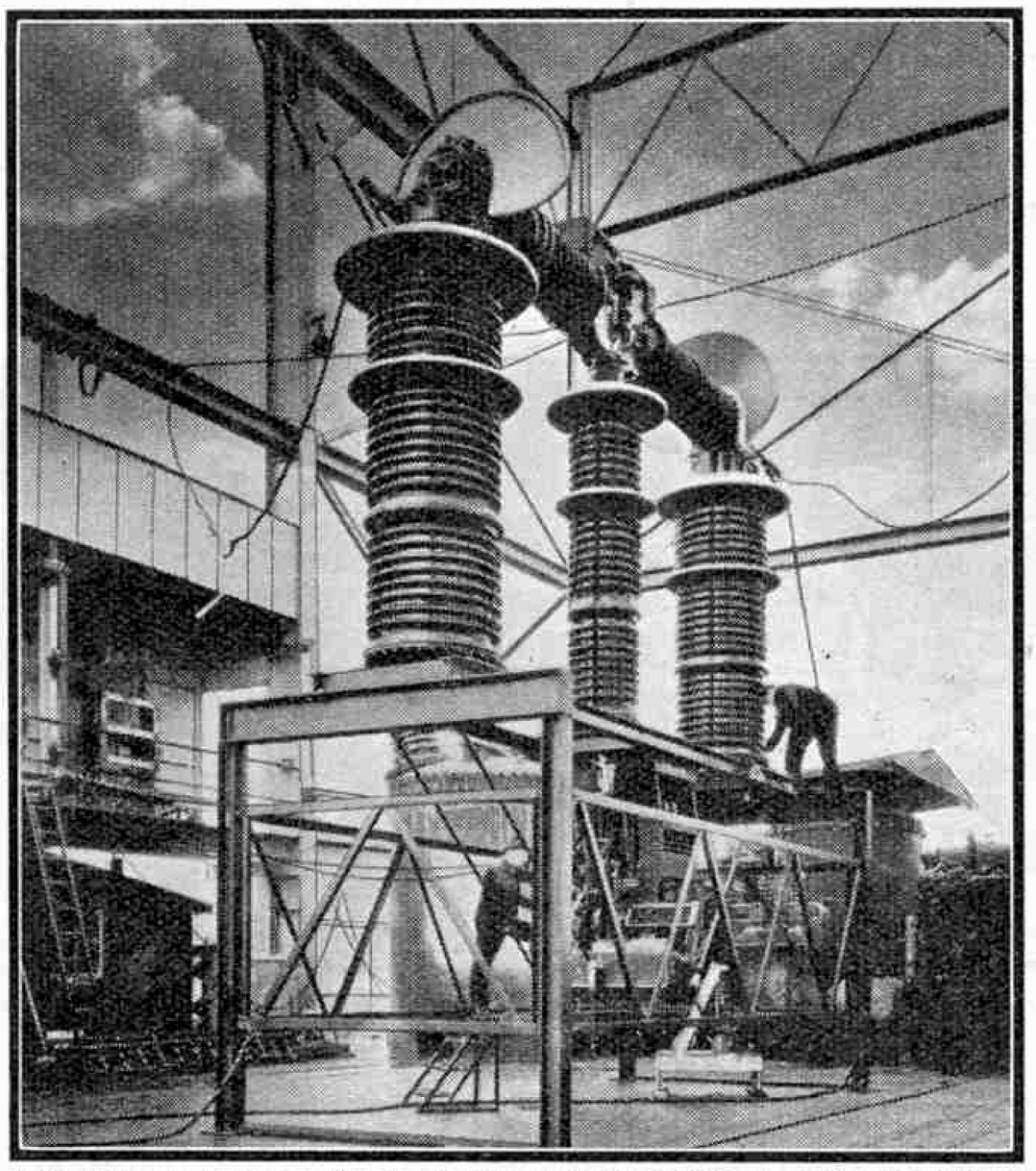
The Boulder Dam

A Mighty Barrage Across the Colorado River

IN articles that appeared in the issues of the *"M.M."* for February, March and September 1934, an account appeared of the early stages of the construction of the Boulder Dam, the official name for the enormous barrage spanning the River Colorado in south-western United States. Since then the work has been completed, and was formally dedicated by President Roosevelt in September 1936.

Readers will recall the difficulties that the engineers had to face before the construction of the actual barrage could be undertaken. Extensive surveys of the river banks and bed had to be carried out, so that full use could be made of any natural advantages in the rock formations of the canyon, and the best possible site obtained for the foundations of the dam. All the machinery and most of the materials for the work had to be transported over difficult country to the scene of operations. A new town had to be planned for the accommodation of the workmen, and equipped with parks, hospitals and recreation grounds, for it was realised that even when the dam had been completed over 1,200 men would have to be employed on its maintenance and operation, and provision would have to be made also for thousands of tourists.

The most difficult task of all was the diversion of the Colorado River so that work on the foundations of the barrage could commence. Our cover shows part of one of the enormous tunnels constructed for this purpose, two from each side of the canyon, entering the cliffs 2,000 ft. upstream, and finding their outlet 2,000 ft. below the dam. Two are now closed with concrete plugs containing valves to regulate the flow of the river below the barrage; the other two serve as outlets for the spillways which take any overflow of water. These spillways, which are each 650 ft. in length, were drilled through the canyon walls of the dam. They are each capable of passing 200,000 cu. ft. of water per second, so that even in the event of the greatest flood there is no danger of the reservoir overflowing.



A 287,000-volt oil Circuit Breaker for the transmission line between Boulder Dam and Los Angeles. Photo. by courtesy of the General Electric Company of New York.

Once the diversion tunnels had been completed, two small cofferdams were constructed, one above the site to divert the water into the tunnels, the other below the barrage to keep the river from flowing back into the workings. Then only could work on the building of the permanent dam be commenced. It was an enormous task that involved the pouring of more than 3,000,000 cu. ft. of concrete, and in its completed form it is one of the greatest feats of constructional engineering in the world. Its foundations are laid 139 ft. below the bed of the river, it is 727 ft. in height, 1,180 ft. long, and has a thickness of 600 ft. at the base, narrowing to 45 ft. at the crest. As the water piled up behind the dam to form a lake extending 115 miles up the valley, 12 valves, six on each side of the canyon, allowed sufficient water to escape to maintain a steady flow of the river below the workings.

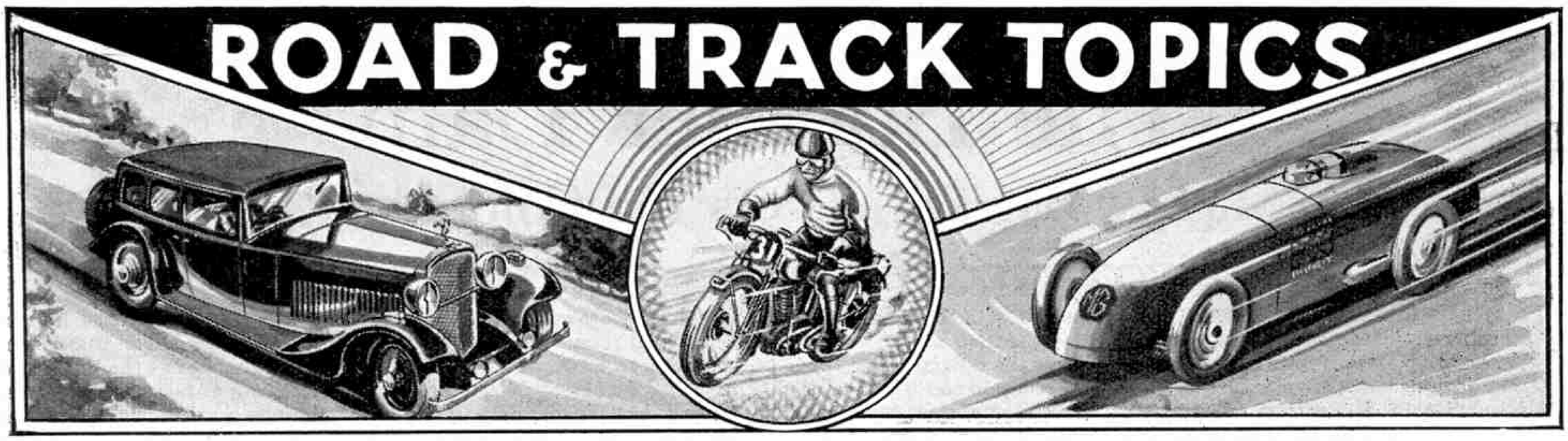
The water to be employed for the generation of electrical power flows through the gates of four intake towers into penstocks or conduits that lead to the turbines of the plant hundreds of feet below. Not all the water taken in through the tower goes to the turbines, however, for they also help to regulate the height of water in the reservoir. Any excess is diverted past the power house to outlet pipes which discharge it from a height of 110 ft. into the channel of the Colorado. The intake towers are built on shelves in the canyon walls, two on each side of the river above the dam, to which they are connected by steel bridges. They are immense hollow reinforced concrete structures, 395 ft. high, with a maximum diameter of 82 ft., and are equipped with huge gates at the bases and at a height of 150 ft. To prevent debris from entering the towers, trash racks are installed at the gate openings, so that the water that flows into the turbines is comparatively clear and free from silt.

Water is carried from the intake towers to the turbines by four main conduits excavated through the canyon walls to a diameter of 30 ft. From them run smaller penstocks 13 ft. in diameter to the butterfly valves in the power plant. Owing to the slight bend in the river the penstocks on the two sides are of different lengths, those on the Nevada side being 390 ft. long, while those on the Arizona side are only 370 ft. The laying of these penstocks was a gigantic task, more than 900 car-loads of pipes, amounting to a weight of 88,000,000 lb., being used in the system.

The great power house, the most important part of the whole project, was the last to be completed. It is a massive U-shaped structure, designed when employed at full capacity to generate electrical energy to the amount of 4,330,000,000 kilowatt-hours. Each wing is approximately 650 ft. long next to the cliff, while the central section where the roof and the dam wall meet is 400 ft. round. Its construction entailed enormous difficulties, for most of the materials had to be lowered hundreds of feet down the canyon walls. Fifteen 115,000 h.p. and two smaller generators are installed in the wings, while the base contains the sump pipes and control and auxiliary equipment. Along the river-side are the main step-up transformers and the low voltage switching equipment, and at the top of the canyon, a short distance from the edge of the Nevada side, is the high-voltage switching station through which the step-up transformers on each bank are connected by a series of overhead high-voltage circuits. The lowest foundation of the power house is 80 ft. below the original river bed, while its roof is about 155 ft. above that level. The structural steel of the roof has a weight of 11,600,000 lb., and is overlaid by layers of asphalt and sand and gravel, making a total thickness of 4 ft. 6 in.

Electricity generated by the plant is delivered to Los Angeles in southern California by one of the largest transmission lines in the world. It is constructed in two sections, the first from Boulder Dam to Cajon Pass, and the second from Cajon Pass to Los Angeles. On the first section, a distance of 230 miles, the two-circuit line is carried by two rows of great towers 109 ft. high, spaced 800–1,000 ft. apart. For the remaining 40 miles to Los Angeles the two circuits are carried by single towers each 144 ft. high. For the construction of the line the materials used included over 26,000 tons of constructional steel, 1,626 miles of conductor wire and 253,700 porcelain insulators.

The Boulder Dam and its auxiliary works represents a great triumph of man over the forces of nature. A river, that for so many years it had been considered impossible to control, has been regulated, and a steady supply of water assured to the thousands of people who dwell in its lower valley and depend upon it for irrigation. At the same time it has been converted into a source of enormous power. Few of the 30,000 tourists who visit the dam every year realise the possibilities that its successful completion open up for future engineering wonders.



An Interesting New Number Plate

An interesting illuminated number plate for motor vehicles has recently been demonstrated in London. It is in the form of a shallow box with an inclined rear part that acts as a reflector. At the top of the box are several small electric bulbs, the light from which is reflected through a plate in which the registration numerals and letters are outlined by small holes.

In order to prevent the holes from becoming stopped up by dirt, they are countersunk from the rear, so that they have very sharp edges to which dust and mud particles cannot adhere. At night the plate is visible for a considerable distance.

A Great Russian Highway

A great new highway to cross Soviet Russia from Moscow to the Pacific Ocean is now being built. It is known as the Stalin Highway, and a portion of it from Vladivostok, on the coast of the Japan Sea, to Khabarovsk, in Siberia, a distance of about 450 miles, has been completed.

The Work done by a Modern Petrol Engine

The Shell Company have compiled an interesting set of statistics that give a good idea of the tremendous amount of work done in an average six-cylindered motor car engine in propelling a vehicle for 10,000 miles. The crankshaft turns 30,000,000 times, and the piston travel totals 28,400 miles, nearly three times the mileage of the vehicle. The magneto contact points open and close 90,000,000 times. Normally a mixture of 2,810,000 cu. ft. of air and 825 gallons of petrol is consumed, and with a final-drive gear ratio of four-to-one, the rear axle revolves 7,500,000 times. In the case of a commercial vehicle some of these figures would be increased, because lower gear ratios are involved.

The 1½-litre M.G. Sports Four-seater

On page 399 of the July 1937 "*M.M.*" appeared an illustration of an M.G. car, which was described in the caption as the 1½-litre M.G. four-seater sports car. Unfortunately this description is incorrect, as the car shown was the M.G. Magnette N. type. In order to avoid confusion an illustration of the 1½-litre M.G. sports four-seater is shown at the top of the opposite page.

Rear-Engined Buses in New York

Rear engines are employed in 100 new double-deck buses that have been put into service in New York by the Fifth Avenue Coach Co., New York. Among the advantages claimed for the rear-engined type of vehicle are increased seating capacity, greater riding comfort, improved head-room, and elimination of fumes from the engine. Among other features the new vehicles include "Mono-drive" automatic change-speed gear.

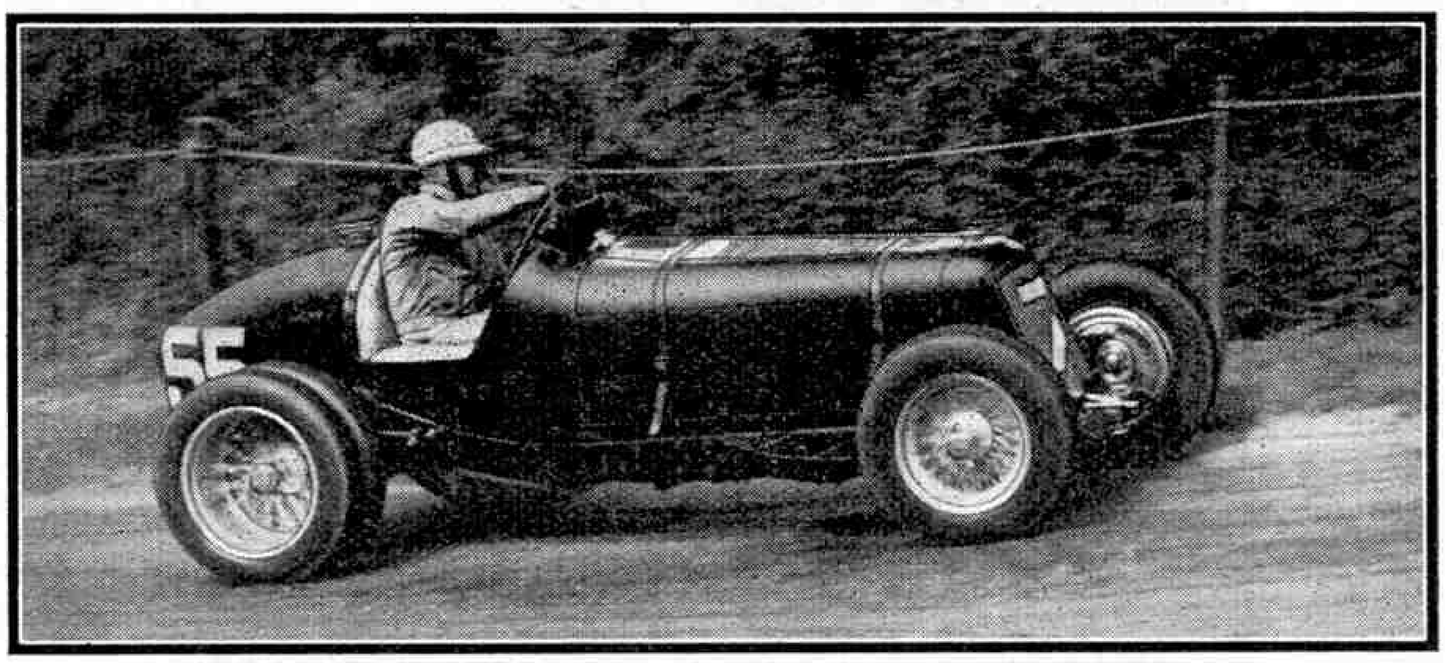
Rear-engined vehicles have not become popular generally owing to the fact that the arrangement of the engine and its auxiliary mechanism at the back of the chassis and the controls at the front, introduces a considerable complication.

Motor Racing in America

Richard Seaman, a young Englishman who has become a first-class racing driver in a remarkably short time, experienced very bad luck in a race over the new Roosevelt Road Circuit near New York. His Mercedes was tearing along close behind the leading car, an Auto-Union driven by Rosemeyer, and seemed about to pass, when his car ran out of fuel. Fortunately the machine was able to "free wheel" to its pit, where it was re-fuelled and got away in record time, thus allowing Seaman to gain second place, only 51 sec. behind the winner.

American interest was centred chiefly in an 3.8-litre Alfa-Romeo driven by Rex Mays. This machine put up a very creditable performance and remained third throughout, but it was not capable of making the extra spurt necessary to pass the leading Auto-Union, which at one time touched nearly 158 m.p.h.

Apart from the splendid effort of Seaman, Rosemeyer had the race all his own way, though for a while there was a great fight between the Auto-Union and the Mercedes, the latter actually passing into the lead at one period, only to experience trouble later on. Soon after the start of the race a fierce duel took place between Seaman's Mercedes and an Alfa-Romeo driven by Nuvolari, but this came to a sudden end when the Italian machine broke down under the terrific strain.



Raymond Mays, the famous racing driver, on a 1½ litre E.R.A. during his record-breaking run on Shelsley Walsh. The hill was climbed in 39.09 sec. This photograph and the lower one on the opposite page are reproduced by courtesy of English Racing Automobiles Ltd.

The winner's average speed was 82.25 m.p.h.

The Le Mans Grand Prix

The 1937 Grand Prix d'Endurance at Le Mans was noteworthy for the fact that a French car was the victor for the first time since a Lorraine-Dietrich carried off the honours at an average speed of 66.08 m.p.h. in 1926. This year the event was won by Wimille in a Bugatti, and the average speed of the machine for the 24 hours was over 85 m.p.h., thus breaking all records by 5 m.p.h. The race was divided into two portions, a plain Grand Prix, which was won by the car that covered the greatest distance in the 24 hours, and another event for the Rudge-Whitworth Cup, which is open only to cars that have completed the last 24-hour race, and so qualified to run in a final this year.

The Grand Prix race started with every promise of an exciting fight between the big French Bugattis, Delahayes and Peugeots, the Italian Alfa-Romeo, and the British Lagonda, but was marred by a tragic crash in which six cars were involved. The Rudge-Whitworth Cup event was won by a British Aston Martin driven by M. Goodall and R. P. Hitchens. This race, which usually results in a victory for a British machine, is run under an interesting system of handicap in which a minimum distance is set for each size of car, the winner being the competitor whose car covers the greatest additional distance in proportion to the distance set.

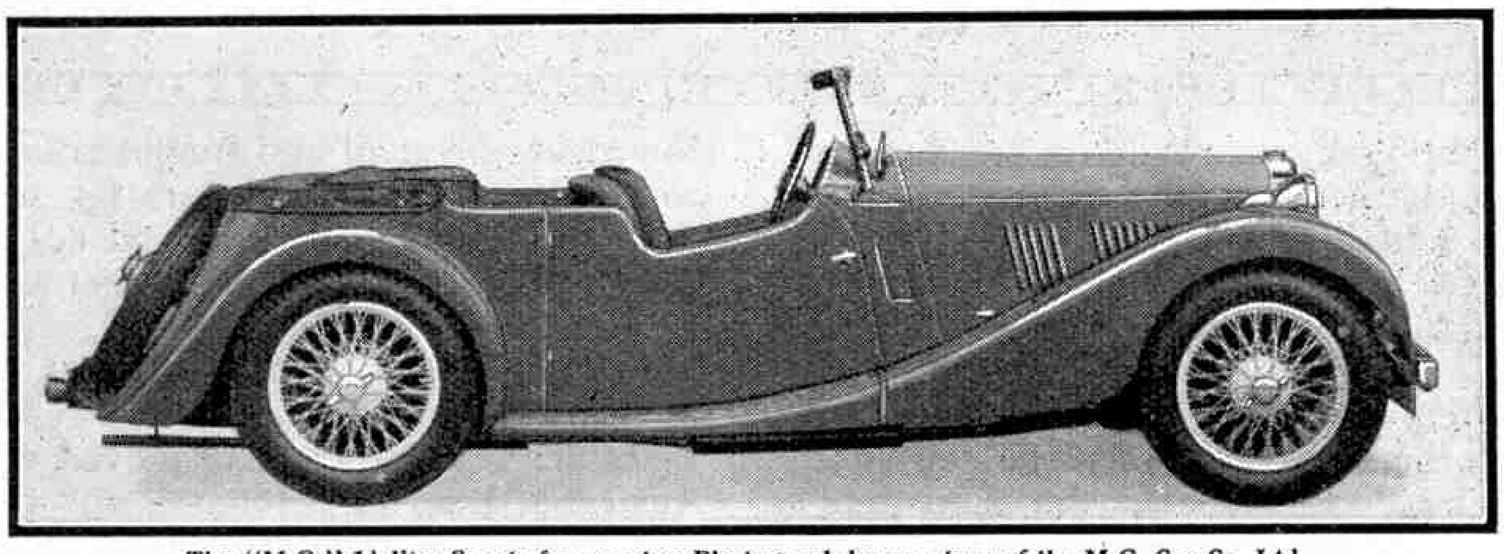
The interest in this arrangement lies in the fact that a car whose cylinders have been re-bored is set a minimum distance of several kilometres more than a similar car with a new engine.

Auto-Union Wins at Nürburg Ring

Driving an Auto-Union car at an average speed of 82.95 m.p.h., Rosemeyer, the champion German racing motorist, won the Eifel Race for Grand Prix type cars for the second year in succession. The race is run on the Nürburg Ring and this year provided a spectacular struggle between the Auto-Union driven by Rosemeyer and two Mercedes machines, driven by Caracciola and von Brauchitsch respectively, these three drivers occupying the leading three positions from start to finish. Very high speeds were witnessed, and Rosemeyer set up a new lap record of 85.13 m.p.h.

The signal for the start was given by means of a red, amber and green traffic light, and almost from the commencement Caracciola shot into the lead. He was followed by Rosemeyer, Lang, von Delius and Hasse, with Auto-Unions. It was during the second lap that Rosemeyer made his first serious challenge. He completed this lap at the great average speed of 85.13 m.p.h., thus setting up a new lap record, and his splendid effort put him only $1\frac{2}{5}$ seconds behind Caracciola. Continuing at a terrific speed he flashed into the lead in the third lap.

During the fifth lap some remarkably efficient pit work was carried out. Caracciola came in with one of his tyres torn to ribbons, and his crew worked magnificently, changing the tyre and refuelling the tanks in 38 secs. Even this fine effort, however, was insufficient to prevent Rosemeyer from gaining a comfortable lead, and at half distance the order was Rosemeyer, Caracciola and von Brauchitsch. By the end of the sixth lap Rosemeyer had a really comfortable lead, and therefore was not seriously perturbed when he in his turn had to call at the pits for a change of tyres. He was away again in 30 seconds, thus holding on to his lead from the Mercedes, and maintaining it until the end. The race provided a splendid example of how greatly efficient team work in the pits can contribute to a driver's success.



The "M.G." $1\frac{1}{2}$ litre Sports four-seater. Photograph by courtesy of the M.G. Car Co. Ltd.

French Grand Prix won by Talbots

The race for this year's French Grand Prix, which usually is a very thrilling affair and produces some of the finest motor racing of the season, lost much of its customary interest owing to the small field that faced the starter. Official Bugattis and a new huge Delage that should have competed were withdrawn on the eve of the event, and only four Talbot cars, six Delahayes and a 3.3-litre Bugatti were left.

Right from the start the Talbots proved extremely fast, and they gained a well deserved victory, occupying the first three places. The winning car was driven by Chiron, his average speed being 82.47 m.p.h. He was followed by Comotti and Divo. This is the third time that Chiron has won the French Grand Prix, and he was given a great reception by the crowd.

The Grand Prix event was preceded by a race for $1\frac{1}{2}$-litre sports cars, in which a six-cylinder T.T. type Riley scored an easy win for Britain. It was driven by A. Dobson, and was followed over to the finishing line by three Rileys entered and driven by Frenchmen. The average speed of the winning Riley was 70.12 m.p.h.

The R.A.C. Tourist Trophy

This year's R.A.C. Tourist Trophy race promises to be a very exciting event, judging from the list of entrants, which includes a strong force of foreign competitors. In addition to several Delahayes, one of which will be driven by "Bira," there will be a team of French Talbots, four B.M.Ws, and several Simca-Fiats. A Bentley driven by E. R. Hall, a Lagonda, a team of three Singers, two Rileys, one of the new Atalantas, and a team of four-wheel Morgans will also take part. Among the remaining entrants are a Fiat entered by Arthur Dobson and an Austin entered by C. J. P. Dodson.

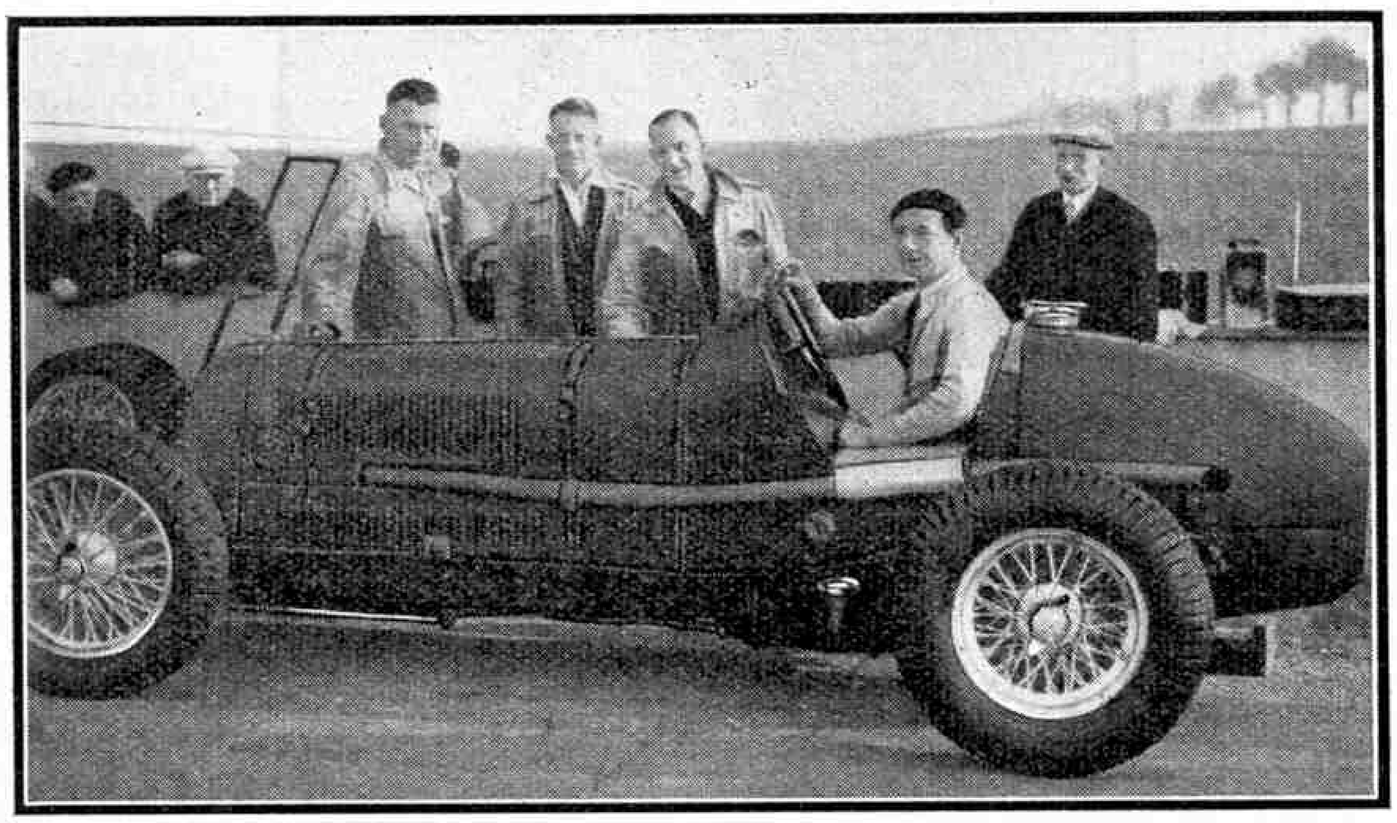
The T.T. was won last year by a Riley driven by F. W. Dixon and C. J. Dodson, at an average speed of 78.01 m.p.h. It will be recalled that some amazing speeds were witnessed, lap records being broken and re-broken. The lap record is actually held by L. Lebeque, who towards the close of the race returned the terrific average speed of 85.52 m.p.h.

108 m.p.h. in Belgian Grand Prix

As has been the case in several recent continental races, the Grand Prix de Belgique developed into a contest between the Auto-Union and the Mercedes-Benz teams. The race consisted of 34 laps of the $9\frac{1}{4}$ miles Spa circuit near Francorchamps, and of the eight starters three were Auto-Unions driven by Stuck, Hasse and Muller, three were the Mercedes of Von Brauchitsch, Lang and Kautz, and two the Alfa-Romeos of Sommer and Trossi.

High speeds were set up soon after the start by Lang, who took the lead from Hasse and Stuck. He lost his advantage, however, when stopping to change tyres. Later his Mercedes lapped at 108 m.p.h., a new record for the course, but he was unable to overtake Hasse and Stuck. The feature of the race was the masterly driving of Hasse, a young German who gained his first big victory. He triumphed over the famous Continental ace von Stuck, and won at an average of 104.07 m.p.h.

Von Brauchitsch, Muller and Trossi all retired at various stages of the race, leaving Kautz, the Mercedes recruit, to drive steadily into fourth place. The event was honoured by the presence of King Leopold, who taak a keen interest in the racing.



After early morning practice for the Picardie Grand Prix. This illustration shows the new $1\frac{1}{2}$ litre E.R.A. car, with torsion bar front suspension, with Raymond Mays at the wheel.

Progress on German Motor Roads

Three further sections of the 63-miles long State motor road between Dresden and Meerane, have now been completed, together with the 140 bridges necessary to allow it to follow an unbroken course. The link with the Thuringian section of the road will be ready in November, so that by the end of the year it will be possible to travel on the State road from Dresden to Jena and Bayreuth. The road will be carried over the Pleissen Valley, near Frankenhause, by a bridge 1,600 ft. long that is now nearing completion. This will be the largest bridge in Saxony.

Diesel Engines for Private Cars

A diesel engine for use in ordinary private motor cars is offered in the 1938 programme of the Citroen Company. It is a lightweight high-speed engine that can be fitted as an alternative to the petrol engine in the Citroen "Family Fifteen" 7-seater saloon.

The chief advantage of the diesel engine over the petrol engine is its economy in fuel, for the price of diesel oil at present is only about two-thirds that of petrol. It has the further advantages of being able to propel a car a greater distance than a similar quantity of petrol, and is practically non-inflammable. In addition the exhaust is free from poisonous carbon monoxide. On the other hand a slight disadvantage is that a diesel engine is apt to be rather noisy when running without load.

Transatlantic Rocket Mails

Stamp Collectors Contribute to Progress

By L. J. Johnson (Vice-President, British Interplanetary Society)

INVENTORS are traditionally poor, and rocket pioneers are no exception to the general rule. So true is this that it would be not a little ironic for them to evolve plans for stratosphere and lunar rockets, involving millions of pounds, if there were not a way out of the difficulty.

Stamp collectors often wish early pioneers of the air, such as the Wright brothers, had possessed the philatelic enterprise displayed by certain rocket experimenters. What would they not give for a souvenir—cover, card or stamp—of the first successful powered flight by the Wrights at Kitty Hawk in 1903! Such items would be of incalculable interest and value, and the gems of any collection of which they formed a part. But alas, it was not until 1910 that there first appeared mention of a craze destined to sweep the world—aerophilately.

Without the interest of stamp collectors in flight souvenirs, the future of rocketry might well be precarious, if not non-existent. But as things are, it now appears that mail rockets and rocket philately have a joint future as boundless as space itself!

In 1931, shortly after Reinhold Tiling had shot 200 postcards 1,800 metres into the sky, Ing. Friedrich Schmiedl inaugurated the first official rocket mail service between the towns of Schöckel and Radegund, near Graz, Austria. The distance travelled was only two miles, but the mountainous nature of the country was ideal for a demonstration of the possibilities of an efficient rocket post, when all other means of transport failed. The amount of fuel in Schmiedl's rockets was so adjusted that the motive power ceased at a pre-determined distance. A parachute was then automatically released, and the projectile, with letters in a special compartment in the hull, floated safely down to earth. Such was the confidence reposed in the service that the authorities even allowed the carriage of registered letters. Later the inventor found, to his surprise and joy, that the demand for souvenirs of flights far exceeded the available supply.

Other experimenters were not slow to take advantage of Schmiedl's experience. In 1933 in Germany Herr Gerhard Zucker successfully projected letters over the Harz Mountains, the proceeds going to swell the coffers of the German Winter Relief Fund. Fresh from his triumphs in the Harz Mountains Zucker came to England, where it was rumoured he planned a Channel crossing, and the formation of a company for the exploitation of the rocket for mail and freight transport. All his efforts were of no avail, however, for his experiments here were a fiasco, and he returned despondent to Germany where, for various reasons, he met with a mixed reception from the authorities.

In the earlier days of rocket mail, Austrian and German inventors held the stage, but in more recent years main activities have moved on to other countries, Australia, Belgium, Holland, and especially to America and India. In the last-named country is a man who must surely be World Rocketeer No. 1, Mr. Stephen H. Smith, Hon. Secretary of the Indian Air Mail Society. Over 140 rockets have emerged from his workshop to take to the air with varying results, but always with a definite measure of success. Specially designed rockets have carried live fowl, and even a live snake, to test the effect of terrific acceleration on organic bodies.

A small pilot rocket being fired in advance of the Coronation Rocket, so that the direction of the wind currents could be observed before firing the main rocket.

Wherever rockets can be of use, there Stephen Smith is to be found. A flood occurs, and a Smith rocket bears food and medicine to the refugees. Every opportunity for technical development is seized in both hands, as the different types of projectile will indicate. Included in the many varieties used are rockets for carriage of livestock—ventilated, and with special provision for landing—telescopic rockets, and a rocket train.

Coronation Day saw the flight of a giant seven-foot model bearing greetings of loyalty to the King and Queen. The flight took place from the Port Commissioners' reclamation grounds lying beyond Alipore, at about 6 a.m., and was witnessed by a large crowd. Prior to the flight of the "Coronation Rocket" a pilot rocket was sent up to test the condition of the atmosphere. This rocket carried 200 "Loyalty" postcards, and landed about half-a-mile away. Immediately afterwards the angle of the launching rack was reduced, and the big "Coronation Rocket" took off against a stiff upper wind to land at a distance of over a mile. When the rockets had been reclaimed the packets of "Loyalty" cards were rushed by motor to Park Street Post Office, Calcutta, where they were posted to their final destinations. Postcards addressed to Princess Elizabeth and Princess Margaret Rose were graciously accorded acknowledgment by the Queen. Mr. Smith, the inventor, regards this token of appreciation as a wonderful gesture of encouragement to him in his difficult avocation.

Several cross-Channel rocket flights have been widely

advertised in the past, but whether reports were exaggerated or merely false, or whether attempts were abandoned as premature, is not known. In any event, no crossing has been made, and truth to tell it will be quite a long while before shots of such a distance become a practical proposition.

To the mind of the rocketeer, however, it is beyond shadow of doubt that the project is well within the bounds of possibility, and will in fact form only a small part of the future planned for the rocket by advocates of jet propulsion, as the new science is called. M. Louis Damblanc, for instance, is confident of the inauguration of a Channel service in the near future. He suggests co-operation between aeroplane and rocket for faster delivery of letters, and goes on to envisage distribution of mail in rockets shot, like spokes of a wheel, from a metropolitan centre to satellite towns up to 20 miles away.

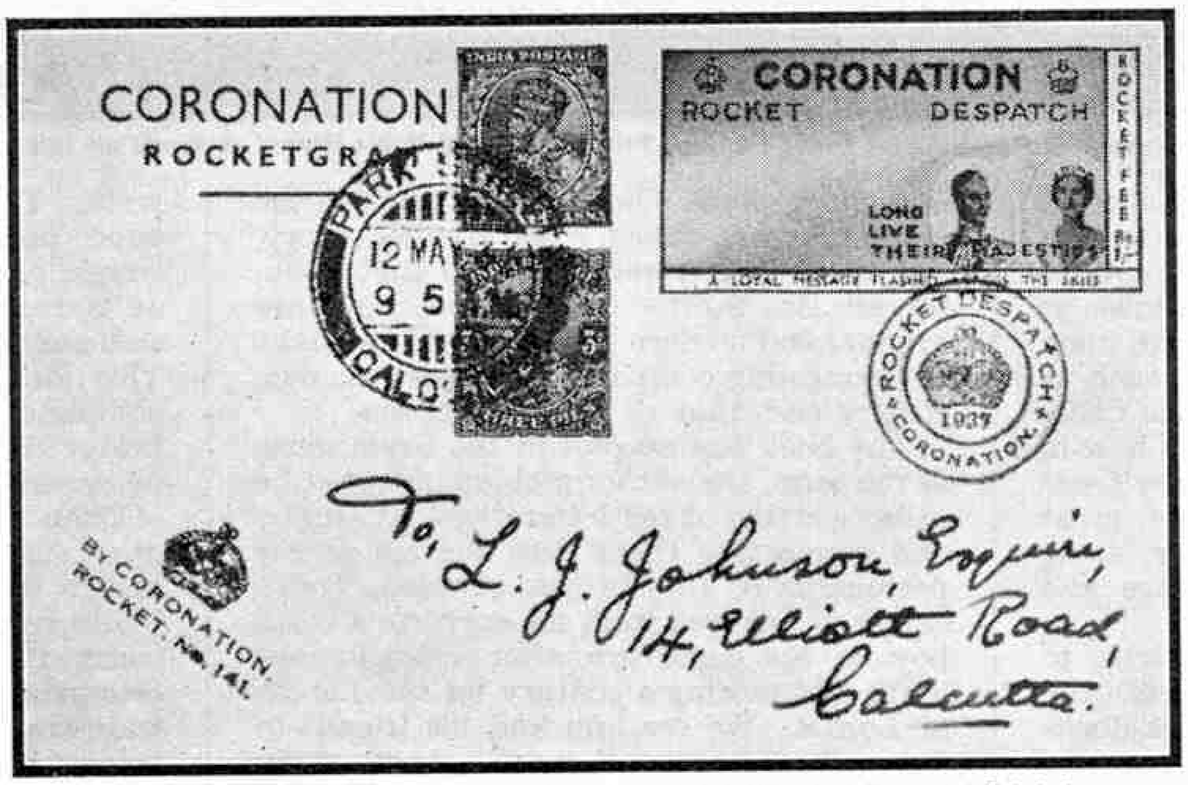
The 7 ft. Coronation Rocket of Mr. Stephen H. Smith, Hon. Secretary of the Indian Air Mail Society, photographed in flight. The rocket carried 200 cards bearing messages of loyalty to Their Majesties the King and Queen.

All rockets so far mentioned have been propelled by powder fuel, and to a large extent this has proved successful. It is true that there have been disasters. In 1933 Tiling and two assistants were blown to pieces in their laboratory, and there have been one or two minor accidents as well. Powders are notoriously capricious, as inventors have discovered, but a lot depends upon such matters as the proportion of the chemicals in the mixture. Providing the proper combinations are used, excellent results are obtainable.

To those in the know, it is significant that Tiling's height record stood for three years, only to be broken during recent experiments by Dr. R. N. Goddard, under the auspices of the Smithsonian Institution of America, using liquid fuel. But Goddard is not at present interested in mail rockets. His work is largely financed by the Guggenheim Foundation as high altitude research, under supervision of an Advisory Board of experts, including Colonel Lindbergh. Strangely enough, to unbelievers in the science the results of his research are tending to vindicate those who speak of the future of jet propulsion in terms of transatlantic and lunar flights, and speeds of thousands of miles per hour. His experiments, though still in their preliminary stages, have resulted in 11-foot rockets attaining a speed of over 700 m.p.h., and a height of over 7,500 ft. It is interesting, too, to compare the power of Goddard's rockets with that, for example, of a famous pioneer aeroplane engine of 1903. The latter developed one horsepower per two and one-fifth pounds of weight, whereas Goddard's rockets developed 206 horsepower per pound of weight.

These results, says Professor Goddard, were obtained without undue economy in weight, and merely to test the possibility of gyroscopic control for stabilisation in flight, and the endurance of the combustion chamber. In future experiments he intends to decrease the mass of the rocket in an attempt to reach heights where the projectiles will begin to earn their own living. Rockets carrying special instruments, cameras, barographs, etc., will yield data from the stratosphere, from which it will be possible to make long-range weather forecasts, and in addition open up new fields of spectroscopic investigation.

When the first two liquid-fuel rocket-mail aeroplanes took off in February 1936 across Greenwood Lake to Newitt, New Jersey, U.S.A., they were regarded as predecessors of transatlantic mail services of the future. The huge streamlined bulk of the transoceanic mail-ship, taking off at an angle of from 60 to 80 degrees so as to reach the stratosphere as soon as possible, will touch maximum speed at the height of its trajectory 400 miles above the earth. As wind resistance is virtually nil above 10 miles high, enormous speeds will be possible with the powerful rocket motors that will be used. Forty miles error will have to be allowed in landing, which will take place by parachute in the sea, or on a large inland lake, a smoke signal indicating the position of the falling vessel.

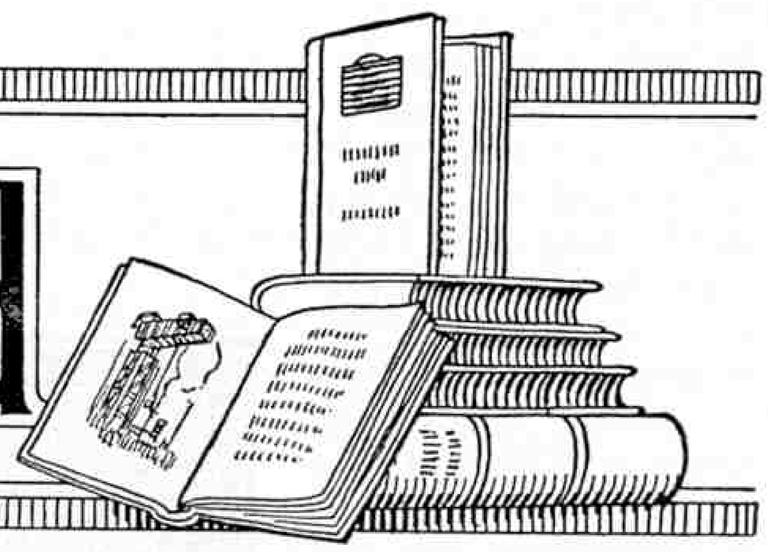


One of the "Loyalty" cards, showing the special "Rocket Despatch" label.

The report of a radio-controlled rocket invented by a Japanese scientist is significant in view of the suggestion that transatlantic flights will be entirely directed by this means. With an inanimate cargo, it is claimed that the crossing will be accomplished in only 15 minutes. Passenger flights will develop later, but will take considerably longer, as long as one hour from London to New York, which even so is not bad going.

When the transatlantic rocket mail becomes fact the science of rocketry will be grateful to the stamp-collecting hobby that enabled it to realise its true place in human progress.

Books to Read



Here we review books of interest and of use to readers of the "M.M." We can supply copies of these books to readers who cannot obtain them through the usual channels. Order from Book Dept., Meccano Limited, Binns Road, Liverpool 13, adding 1/– for postage to the price. Postage on different books varies, but any balance remaining will be refunded.

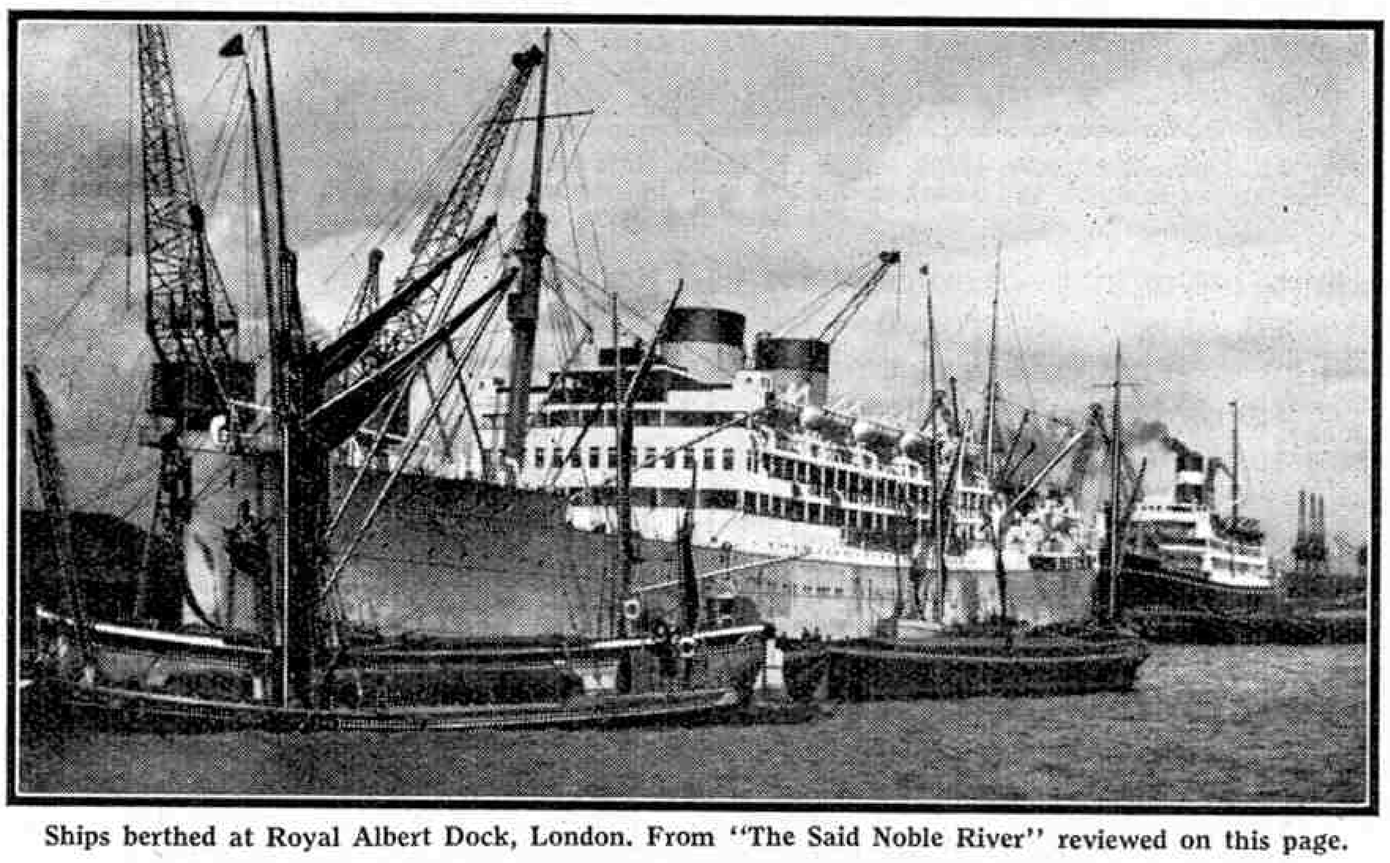
"The Said Noble River"

By ALAN BELL. (Port of London Authority. 2/6 net)

This is a notable book issued by the Port of London Authority to commemorate the Coronation. It tells the story of the Thames, a river that may well be called noble, for it has served the country as a great waterway for 2,000 years, and on it has been built the largest city and the busiest port the world has ever seen.

The full story of the river would be too long for a book of this kind, and the author therefore has given what he calls "samples of the massive deposit of history left by two thousand years of Thames tides." These are well written, and present fascinating pictures of the river at interesting stages. We first make its acquaintance in Roman days, when a bridge was built across it and the city of London was founded, unless, indeed, there was already a British settlement on the site. The Roman bridge collapsed when the country was abandoned by its builders. It was followed by a series of timber bridges, and eventually by the historic stone bridge built in 1176. A reproduction of an old engraving shows us this bridge, with tall houses piled high upon it; and some of the events it saw, such as the rebellions of Wat Tyler and Jack Cade, are vividly described. Then we see how in Tudor and Stuart times the river itself was the great highway of London, a great curving majestic street of water along which passed barges carrying kings and nobles as well as ordinary people.

To-day the river is devoted entirely to commerce. None of its romance has been lost in the change, however, for its docks are crowded with ships from all parts of the world, and its warehouses contain vast quantities of merchandise in curious and unending variety. Since the formation of the Port of London Authority, 28 years ago, about £20,000,000—say £2,000 a day—has been spent in deepening the river, improving the old docks and making new ones; and now more than ever, the Thames is the channel of the commerce and wealth of London. To-day the biggest merchant ships—indeed the greatest North Atlantic liners, with the exception of perhaps the *"Queen Mary"* or the *"Normandie"*—can dock close to the Capital.



Ships berthed at Royal Albert Dock, London. From "The Said Noble River" reviewed on this page.

The book has splendid illustrations, most of them consisting of full page reproductions of photographs of river and dock scenes. Two of these, taken from the air, give a panorama of the river from Westminster to Blackwall.

"A Modern Tom Brown's Schooldays"

By MICHAEL SCOTT. (Harrap. 7/6 net)

Most readers of the *"M.M."* will be familiar with "Tom Brown's Schooldays," the famous book by Thomas Hughes that pictured life at Rugby more than a century ago. Here is a story dealing with the Rugby of modern times. The names of many of the characters are taken from Hughes' story, but there is no resemblance to that book, for all Mr. Scott's masters and boys are original and modern, and he is able to make an interesting comparison between his own Rugby and that of his predecessor.

The book has no plot in the usual sense of the term, the author picking out what he calls "a string of red-letter days" at Rugby and connecting them with the aid of the personality of Tom Brown, his hero. Tom's career is followed from his entry as a small boy to his departure after reaching the Sixth and scoring a century for the Eleven at Lord's. We see him and his friends in one scene after another, in school, study and playing field, and we are given a particularly interesting and intimate glimpse of holiday-time at Tom's home in the heart of the country.

The masters, too, are depicted in very realistic fashion, and their individual characteristics are brought out in a most amusing fashion, recalling vividly one's own schooldays.

The realism of the book, and its background of real people, real events and real places, make it of absorbing interest, and it can be recommended strongly to all *"M.M."* readers.

"The Bridge Builder"

By MAX EYTH. (Sampson Low. 6/– net)

Bridges, and one great bridge in particular, provide the keynote for this splendidly written book, which is the story of a modern bridge engineer, a master of his craft. He is an expert in the calculation of strains and stresses, and in the sinking of caissons, the erection of piers and other intricate details of a bridge engineer's work; but he also takes an artistic delight in the structures he creates, and is deeply sensitive of his responsibility for their soundness and durability when in service.

It is in this spirit that he approaches the task of building the world's largest bridge across a great arm of the sea in Scotland, and an intensely dramatic situation develops as the work proceeds. Unexpected difficulties in finding foundations for the central piers of the bridge tell so heavily on the contractor that he falls ill and dies; but the work goes on with a new contractor. The engineer checks over all his calculations, particularly those of the strength of the steel piers supporting the girder work of the bridge; working anxiously and with a growing sense that some unknown factor may wreck his work. This unknown factor proves to be wind pressure. For various reasons the weight of metal in his piers is reduced, and at last comes the conviction that an insufficient margin of safety has been allowed. This idea worries him to the verge of a complete breakdown, and as soon as the bridge is completed and opened he is persuaded to take a holiday.

Then Nature strikes. One night, during a great storm, the engineer sets out across his bridge in the train to begin his holiday. There comes a sudden gust of terrific violence; the central section of the bridge collapses under the fearful pressure, and the train crashes into the dark and wild waters below. So the bridge-builder perishes with his bridge.

The story is based upon an historic bridge disaster, which readers will be able to identify for themselves without difficulty. The author's main theme is the struggle between Man and Nature, and the imagination of the reader is gripped slowly but surely as the story makes its way to its climax. The book is perhaps not suitable for younger readers, but all older readers will appreciate the skill with which the dramatic story is unfolded. In particular they will revel in the description of the actual design and construction of the bridge.

"The '*Coronation*' and other Famous L.N.E.R. Trains"

By CECIL J. ALLEN. (Nicholson and Watson. 1/- net)

During recent years the L.N.E.R. have aroused the greatest interest among railway enthusiasts by introducing new trains to run at higher speeds than ever before, and handsome and powerful streamline locomotives to haul them. In this book the story of these efforts is told in full for the first time by Mr. C. J. Allen, the well-known expert on railway affairs, whose name is familiar to all "*M.M.*" readers.

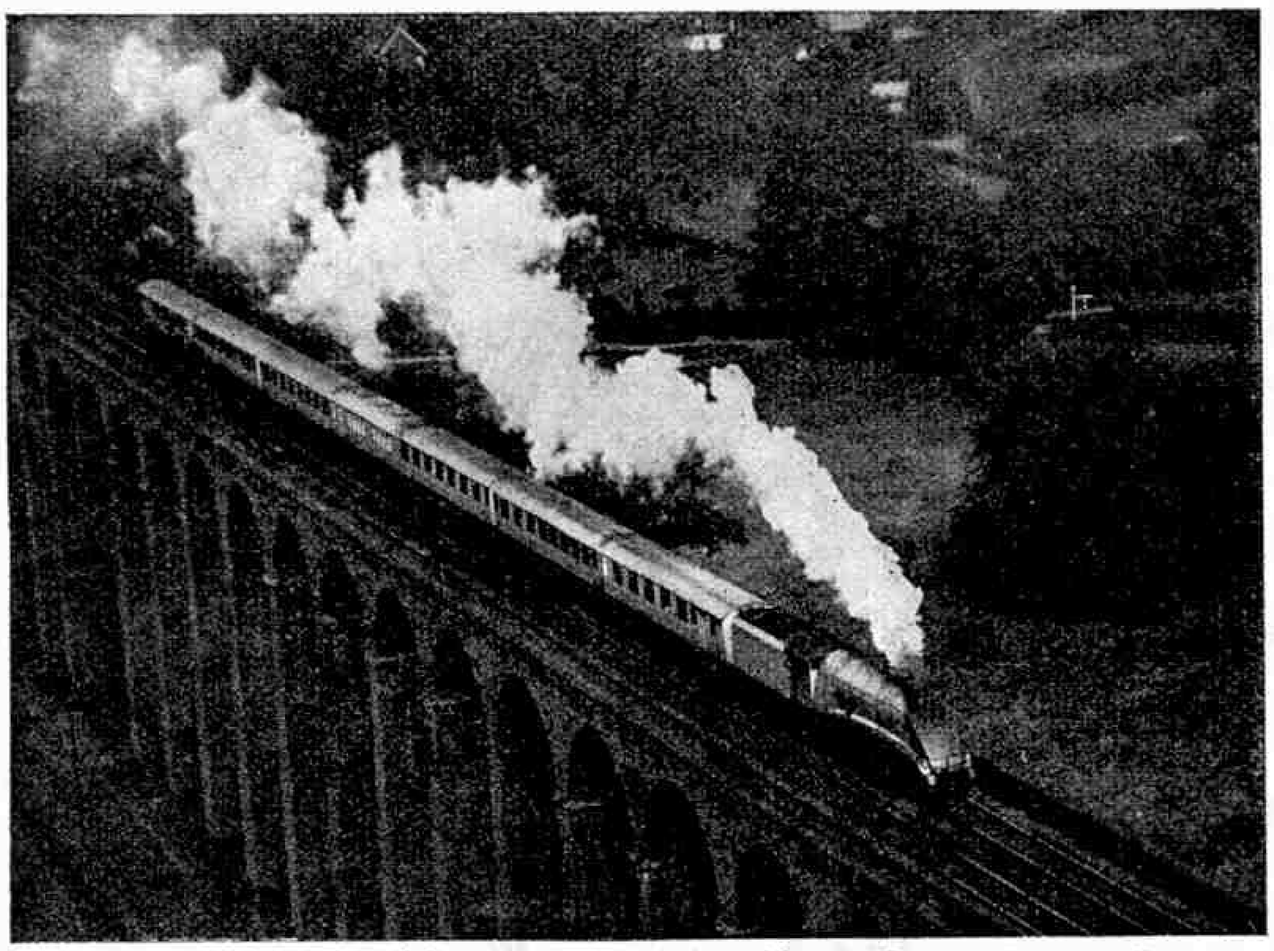
Mr. Allen begins by describing the L.N.E.R. as the railway of records, and gives a remarkable list of the speed achievements and engineering wonders of the line. Then he turns to the famous expresses themselves, "*The Flying Scotsman*" of course comes first. This famous train has travelled between London and Edinburgh every weekday for 75 years, and during the summer months makes the longest non-stop run in the world. It is a flyer in action as well as in name, for its average speed is 56.1 m.p.h.

The author then passes on to "*The Silver Jubilee*" and the "*Coronation,*" the streamline expresses that have astonished the railway world. He describes the trains and gives details of the special streamline locomotives provided for them. Both trains have broken speed records for regular journeys. "*The Silver Jubilee*" maintains an average of 67.07 m.p.h. between King's Cross and Newcastle, and regularly travels for miles at a speed of 90 m.p.h., while at times 100 m.p.h. may be reached. The "*Coronation*" has brought Edinburgh within 6 hours of London and its average speed of 71.9 m.p.h. between King's Cross and York makes it the fastest train in the British Empire.

Mr. Allen takes his readers to King's Cross to board the "*Coronation,*" and those who read his description of his run on this train will not be disappointed. They will appreciate the thrill of the high speeds attained, the interesting comments en route, and especially the climax of the run, when the author makes his way through the corridor in the tender to join the driver and fireman on the footplate. There he shows how the skilled men of the top links of the L.N.E.R. engine sheds drive these monsters of the iron road.

A separate chapter is devoted to a very informative consideration of other L.N.E.R. expresses, including the "Pullmans" and the famous night sleeping-car trains of the East Coast Route. The tightly-timed expresses of the G.C. section and the "Continental" trains of the Great Eastern section also are described.

The book is well illustrated by photographs of the famous trains dealt with, and is astonishingly good value for its low price of one shilling.



The L.N.E.R. "Silver Jubilee" Express crossing Welwyn Viaduct. This and the lower illustration are from "The 'Coronation' and Other Famous L.N.E.R. Trains" reviewed on this page.

"At Grips with Everest"

By STANLEY SNAITH. (Percy Press. 3/6 net)

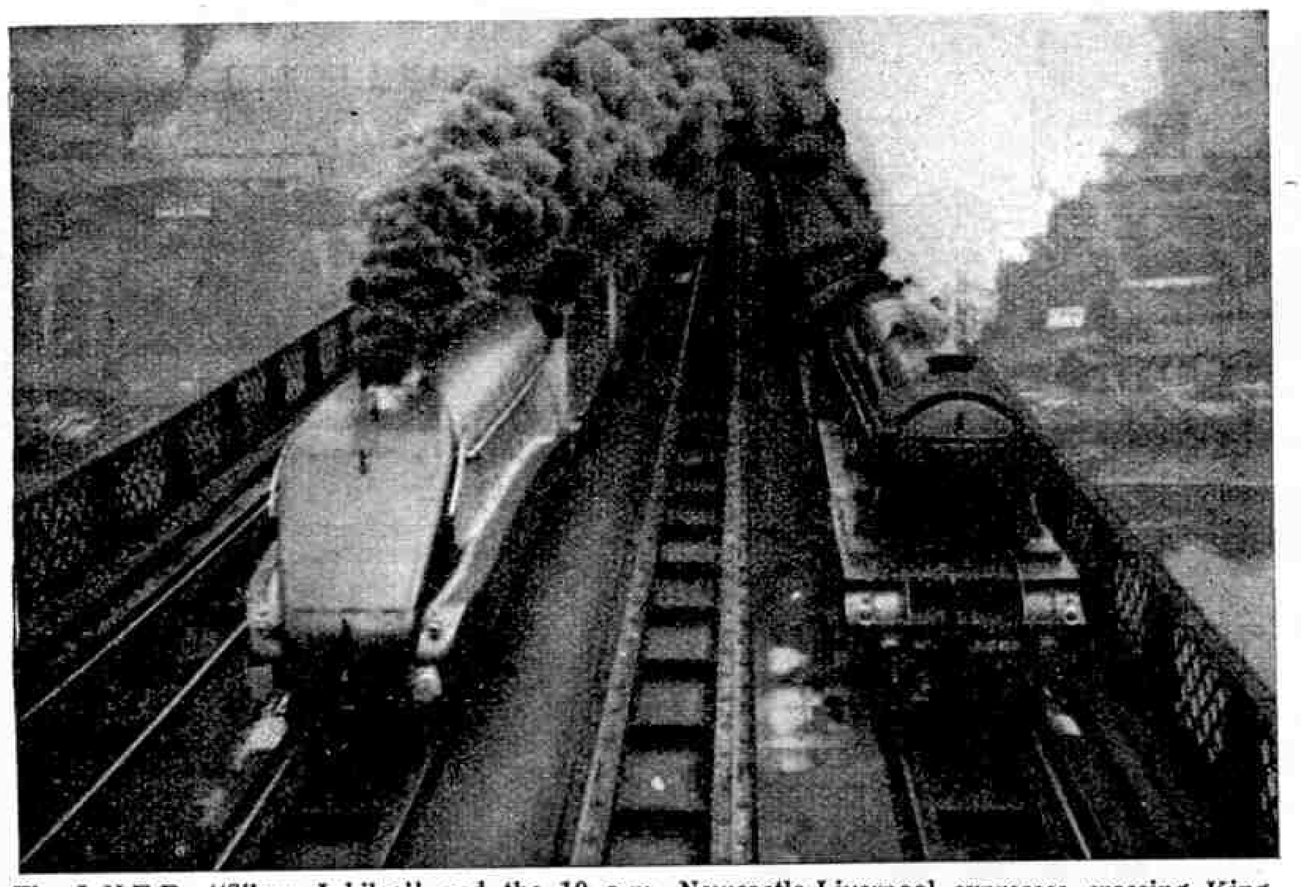
No exploring efforts of recent years have exceeded in interest the attempts to reach the summit of Everest, the highest mountain in the world; and here in compact form is the story of the successive attacks that have been made upon it, and also on other Himalayan Peaks. Now that the Poles of the Earth have been reached, these mountains are the last strongholds of Nature. As Mr. T. H. Somervell, himself one of the Everest climbers, says in a foreword to the book, "nobody will get any benefit or any prosperity when Everest is finally climbed . . . . But a task like the climbing of big mountains calls forth all that is best and strongest." This is the secret of the fascination of the mountains.

The first attack on Everest was made in 1921, and was a survey rather than an effort to reach the summit. The line of approach then discovered has been followed by each of the three subsequent expeditions, camps being established at increasing heights on the mountain slopes with the aid of native porters, to enable the climbers to make their final assaults. They struggled upward, sometimes with the aid of oxygen, at altitudes where the air is rare and difficult to breathe and every step needs immense physical effort, apart altogether from the difficulties created by the snow and ice on the precipitous slopes. Each of these great climbs is well described, and the reader is able to realise what such men as Norton and Somervell, Smythe and Shipton, must have felt in the loneliness at heights of 27,000 and 28,000 ft. An exceptionally vivid account is given of the events leading up to the mysterious disappearance of Mallory and Irvine, who were last seen less than 1,000 ft. from the summit, still struggling upward.

Then comes the story of the famous flights of Lord Clydesdale and his companions over the summit of the mountain. The first flight yielded disappointing photographs, and a second effort was made stealthily and against orders in the hope of securing better results. The reward of truancy was a perfect continuous series of photographs. During the first flight accidents to the oxygen feed pipes and nose pieces of the pilot and the observer of one of the machines nearly brought about disaster.

No less thrilling battles have been waged against Kangchenjunga and other Himalayan peaks, including Nanga Parbat, the highest mountain in the British Empire. German mountaineers have taken part in these attacks, and have struggled as nobly as their British comrades to achieve their purposes, as the author shows.

There are eight full-page illustrations, most of which show scenes on Everest, including a reproduction of a photograph taken at a height of 27,000 ft.



The L.N.E.R. "Silver Jubilee" and the 10 a.m. Newcastle-Liverpool expresses crossing King Edward Bridge, Newcastle.

"Technical Electricity"

By J. E. PHILLIPS and R. W. B. STEPHENS. (Technical Press. 7/6 net)

This book provides an introductory course for students in technical schools and colleges. It deals with the principles of magnetism and electricity and their applications, and is practical throughout, every development being approached by means of interesting and well-chosen experiments. As many technical improvements and discoveries of recent years as possible have been included, and the introductory facts of alternating currents are given as a preliminary to more advanced work. There are nearly 200 explanatory diagrams. These have been drawn specially for the purpose of the book and by reason of their simplicity are easily capable of reproduction by the student. In addition there is a series of very useful worked-out examples.

The book will be useful to those who are about to enter industrial work, and wish to learn something of the instruments and apparatus they are called upon to make or handle. It will be of interest also to all "*M.M.*" readers who are keen on experimenting with electricity.

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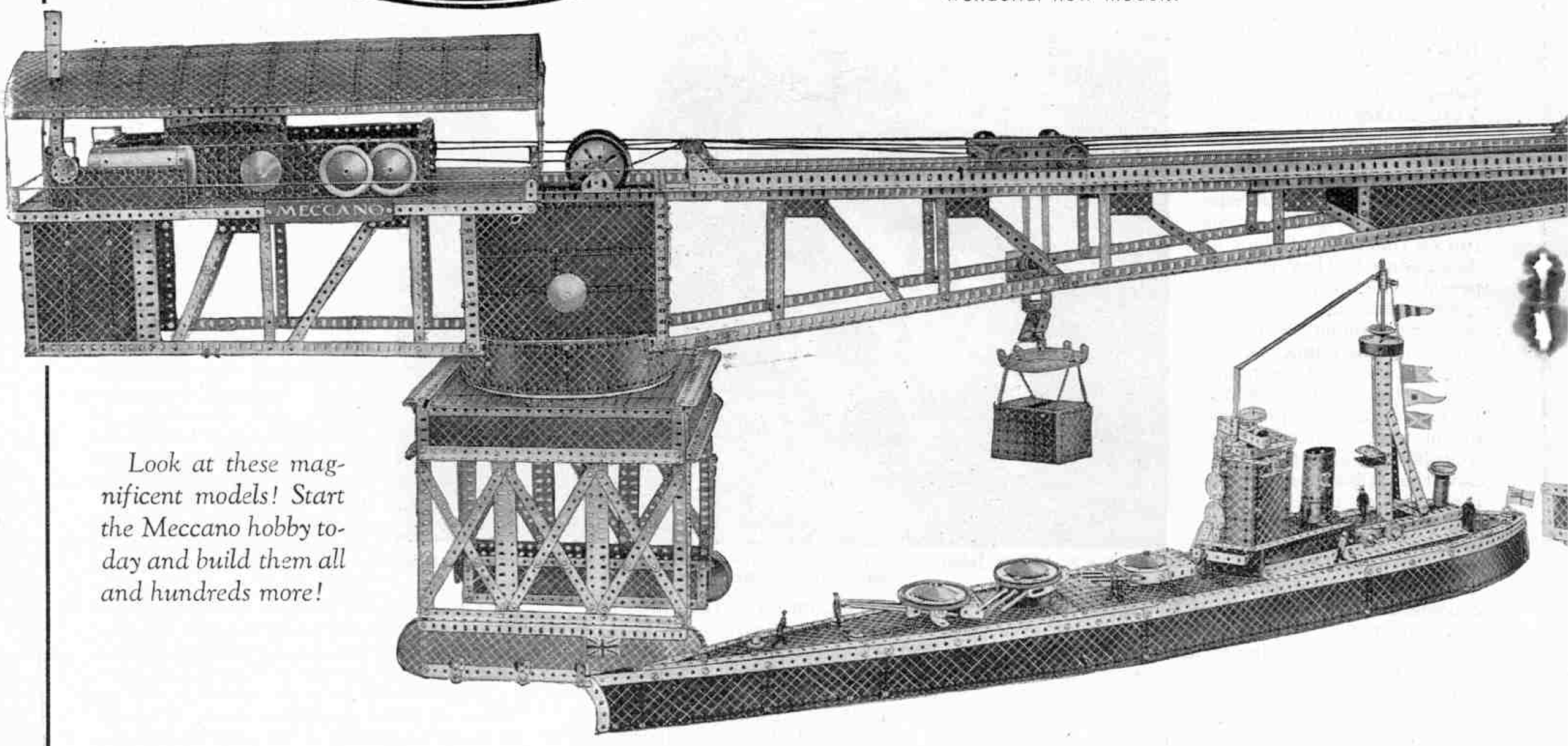

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Electric Motor dull evenings are a thing of ls that can be built. First of all there is the until there appears a complete piece of the model in operation by means of the e the real thing. Afterwards the model can tructure. Something new every day!

BEGINNING

ons in the Instruction Manuals show exactly driver and a spanner, are also included in

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	s.	d.		s.	d.
No. 0 Outfit	2	6	No. 6 Outfit	20	0
No. 1 „	3	6	No. 7 „	30	0
No. 2 „	5	0	No. 8 „	55	0
No. 3 „	7	6	No. 9c „	80	0
No. 4 „	10	0	No. 9w „	105	0
No. 5 „	15	0	No. 10 „	231	0

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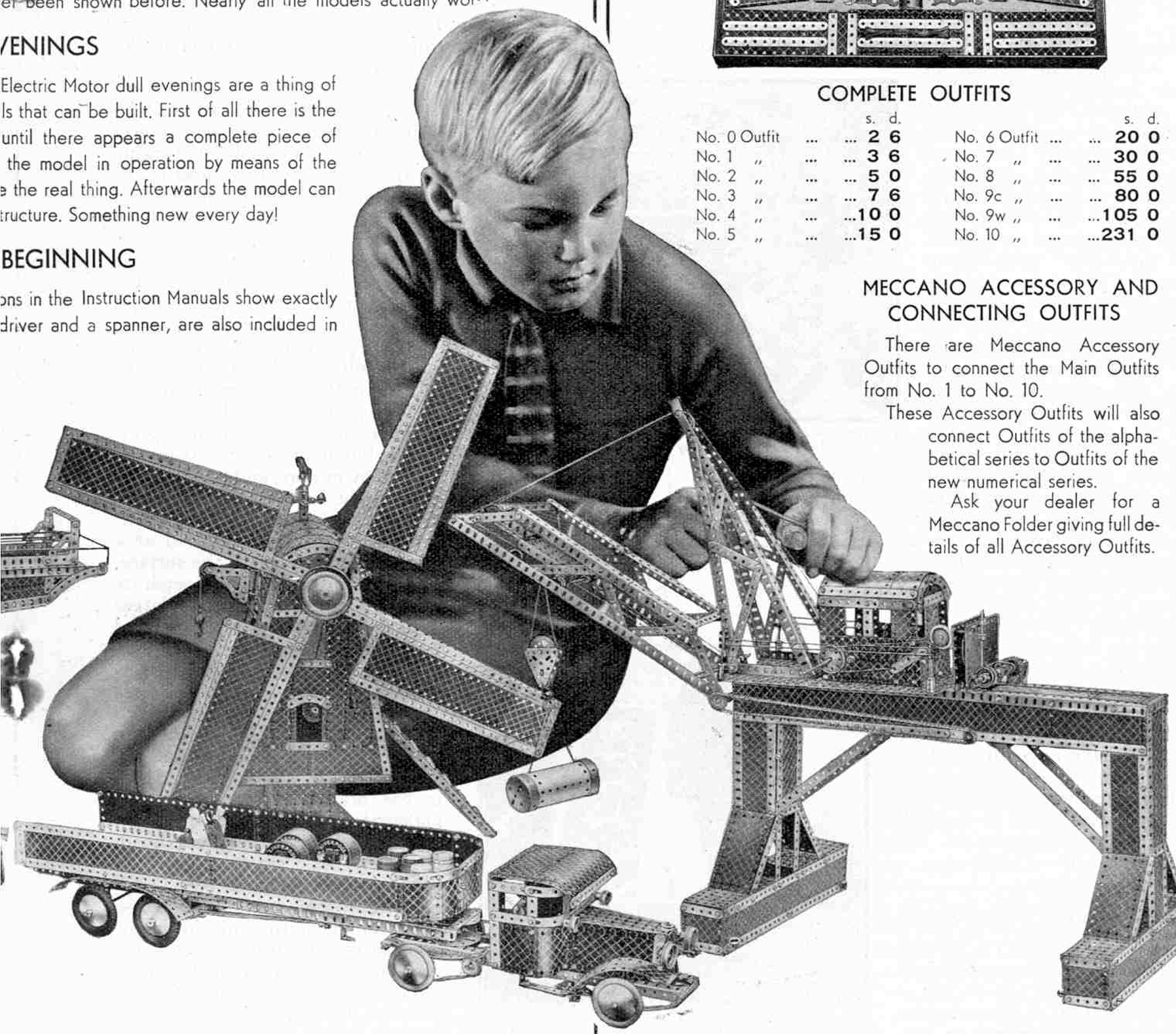


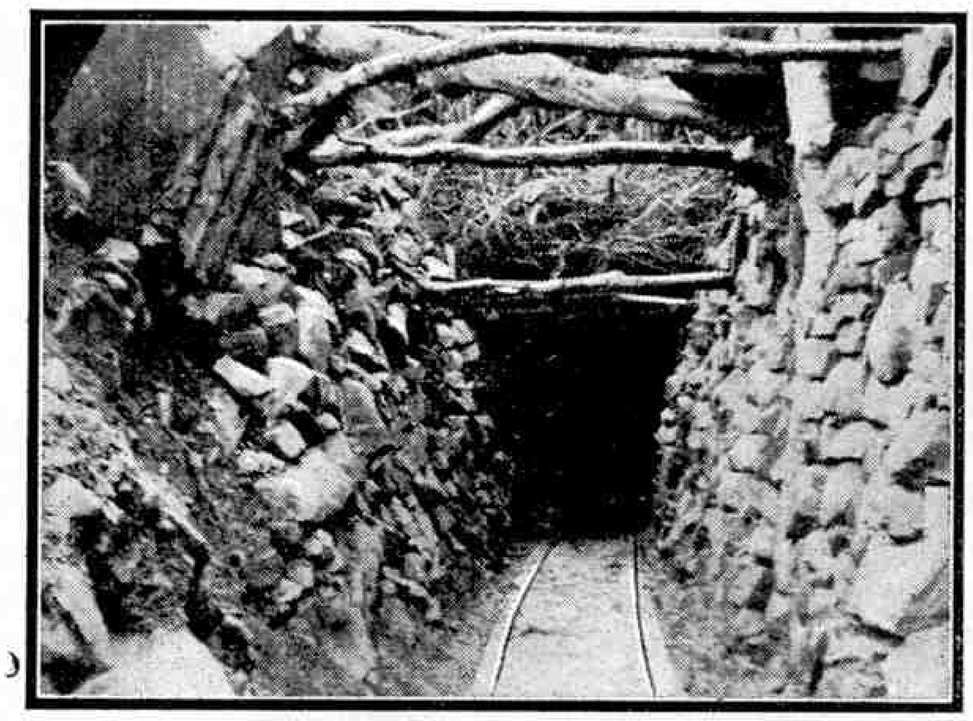
These pages are reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of which the writer has special knowledge or experience. These should be written neatly on one side of the paper only, and should be accompanied if possible by original photographs for use as illustrations. Articles published will be paid for. Statements in articles submitted are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy

Coal Mining in Antrim

Between Ballycastle and Murlough Bay, about two miles east of Fair Head, in County Antrim, Northern Ireland, there are coal seams that can be seen clearly in the cliffs. These are said to have been worked by Phœnician sailors about 1100 B.C., but the only foundation for this story is that in 1770 miners broke into an old shaft in which they found ancient mining implements. The coal near Ballycastle was worked spasmodically from 1770 to 1922, but at no time were any really large quantities raised.

The only mines now active are those at Murlough Bay. These are on the steep slopes practically under Fair Head, which rises to a height of 636 ft. above sea level. Unlike the usual coal mines, those at Murlough Bay have no vertical shafts with elaborate winding gear at their head. Instead the workings are entered through openings in the hill side, into which they penetrate for about 100 yds. Small trucks holding about 5 cwt. each are used for bringing out the coal. This is of poor quality and not suitable for household purposes, but it is used locally and for burning lime. Owing to the rugged nature of the surroundings it is impossible to take the transport lorries down to the mouth of the mines, and an old lorry that can travel over very rough roads is used for this purpose.

B. P. JONES (Ballycastle).



The entrance to one of the coal mines at Murlough Bay, in Northern Ireland. Photograph by B. P. Jones, Ballycastle.

An Old Fenland Waterwheel

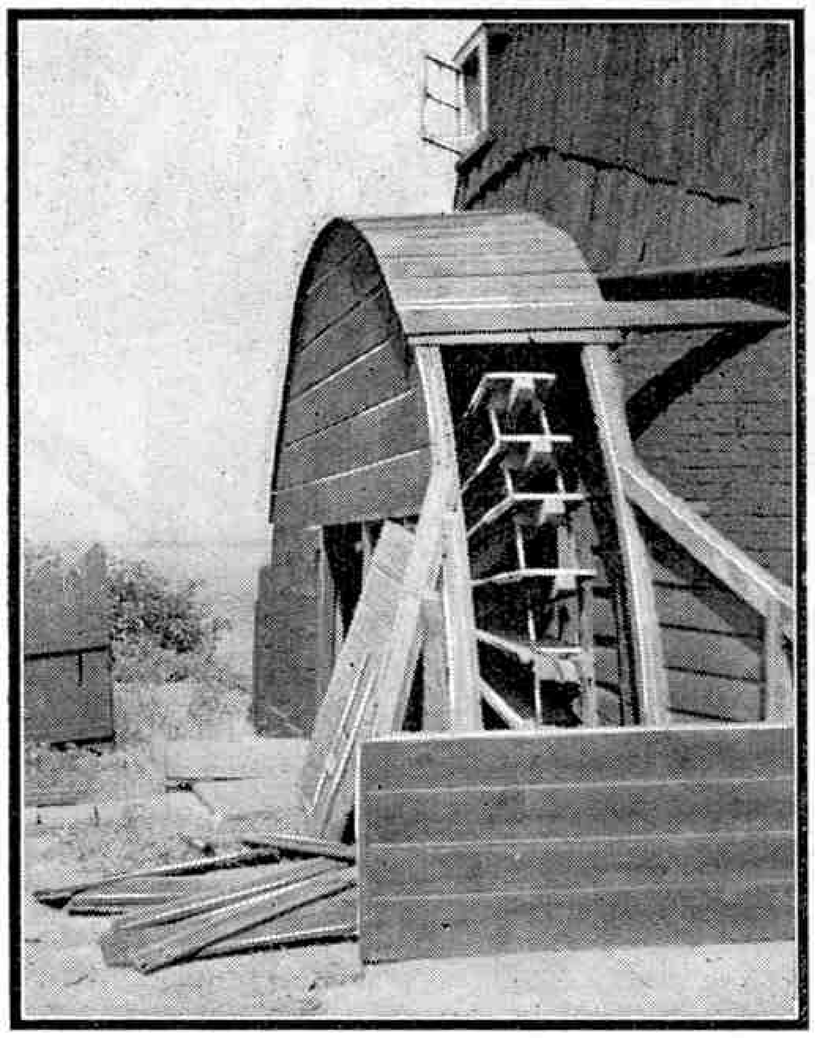
When cycling along a fenland road between the villages of Stonea and Upwell, in the Isle of Ely, I came across the old waterwheel shown in the photograph on this page. This was just about to be demolished, and is perhaps the last of the waterwheels that for so many years kept the fertile land of the fen country almost free from flooding. They lifted the water by means of small buckets or receptacles on their rims.

When first erected these waterwheels were driven by windmills, but later steam power began to be used for turning them. The towers of most of the picturesque old windmills that used to drive the wheels have been reduced in height and converted into houses, which are occupied by the families of the men who drive the pumps. Every year the work of keeping dry the soil in the fens gets more difficult, as the whole of the land in this area is gradually but surely sinking. To-day not only have the waterwheels disappeared, but many of the steam engines also have been replaced by motors, and it will not be long before all the pumps in the fens are motor-driven.

Water is drained from the farms mostly through pipes placed at a suitable depth beneath the surface, and flows into dykes that separate the fields and thence into the larger drains. The waterwheels were used to lift the water from the drains into canals, which were separated from the drains by small sluices or dams.

The quantity of water entering a canal often is so large that the level in it is several feet above that in the drains, and may even be higher than the windows and doors of the houses in the neighbourhood. It is for this reason that high banks of earth have been built alongside the canals. If these banks burst, as they did in one or two places this spring, when there was danger of their giving way on a large scale, the surrounding country becomes flooded. From these canals the water pours into the Wash at low tide, or is pumped into it.

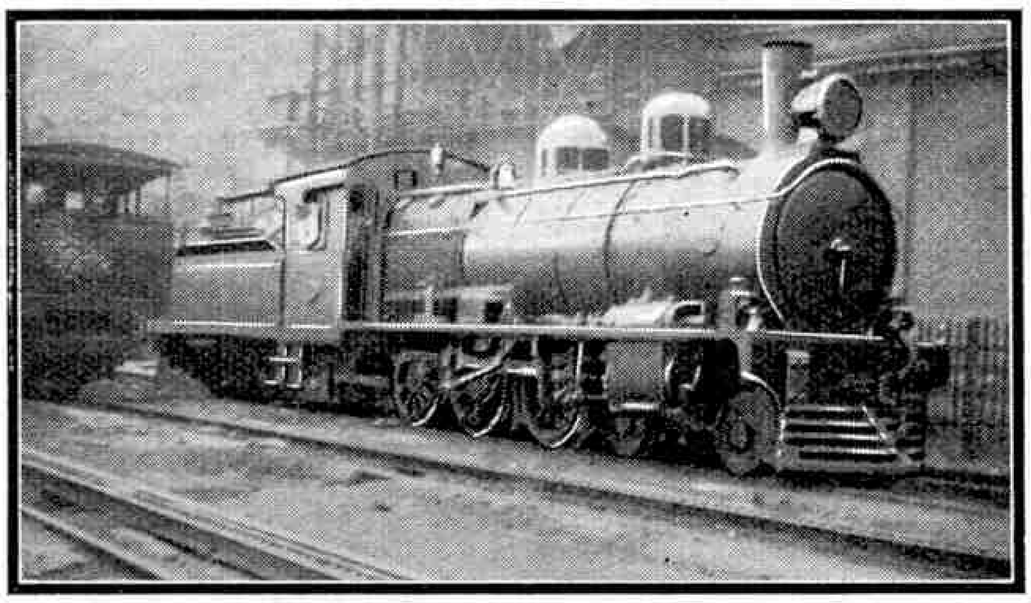
J. W. MORTON (March).



One of the last of the old waterwheels of the Fens. Photograph by J. W. Morton, March.

A Mountain Railway in Brazil

One of the most frequented summer resorts near Rio de Janeiro is Petropolis, where many wealthy Brazilians go in the summer in order to escape the heat. It lies at an altitude of 2,600 ft. and is just over the top of the range known as the Organ Mountains. I went there this summer by the Leopoldina Railway, the largest British-owned railway in Brazil. The trains to Petropolis are the best and fastest on the railway, which is of metre gauge, and they complete the 36-mile journey in an hour and forty minutes. This may not seem fast, but is really quite good, for at one point the mountains have to be scaled by a rack-section at a gradient of 1 in $5\frac{1}{4}$.



A 4-6-2 locomotive at Alto da Serra, the head of the rack section of the Leopoldina Railway, Brazil. Photograph by J. F. McLauchlan, Rio de Janeiro.

We left the Barao de Maua station in Rio at 10.30 a.m. and ran for some time through the suburbs. The last suburban station is Caxias, near the head of Rio de Janeiro Bay, and from there the train took us through flat marshy land, with only a few low hills. At Rosario, which was reached after about 40 min., the main line to Campos and Victoria turned away to the right and single line working began. Soon the flat land gave way to the foothills of the Organ range, the train climbed slightly, and Raiz da Serra, at the bottom of the incline, came into view. There the train was divided into pairs of carriages, each pair being allotted a rack tank engine to take it up the rack section of the line. These little engines have their boilers inclined downward towards the front, so that they are horizontal when a train is being pushed up the incline.

Half way up this incline there is a mill where a halt is made if anyone wishes to get out. The line winds up through beautiful country, and now and again goes over a bridge from which another part of the line can be seen far below.

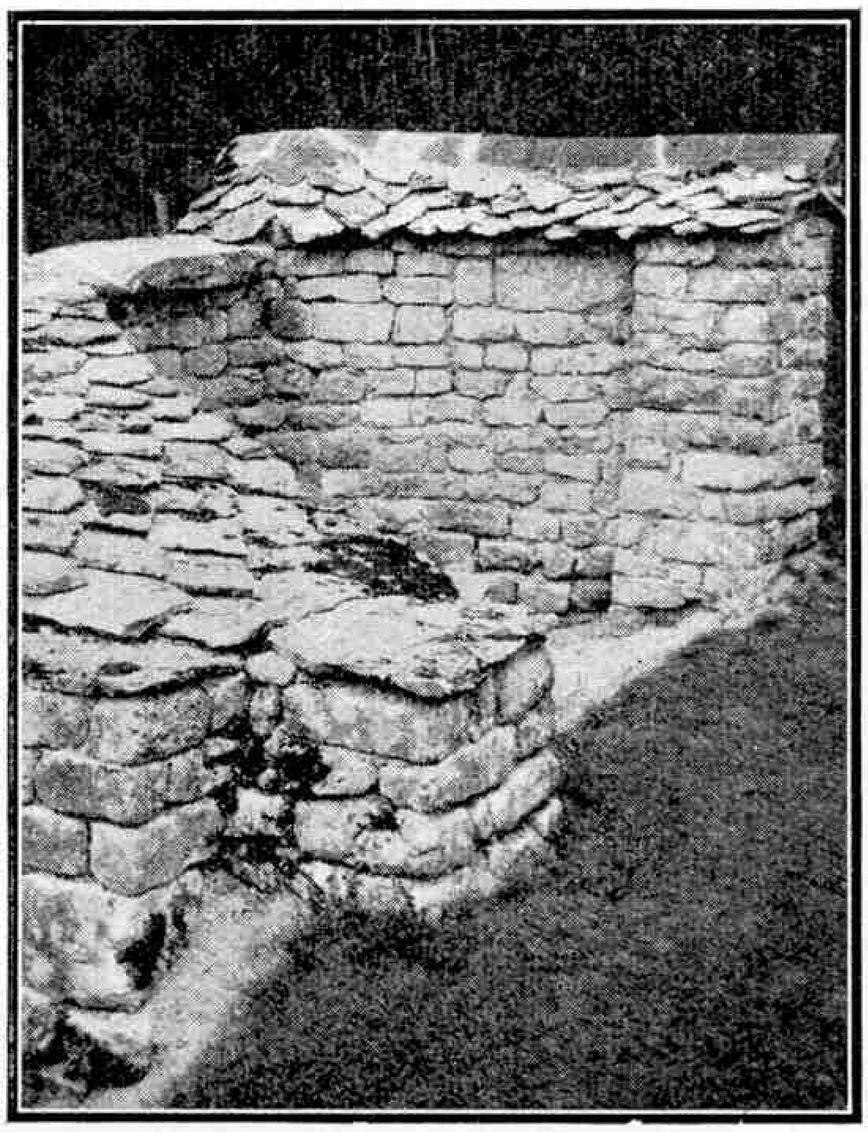
At the top of the incline the engine gave us a sharp push and sent the coaches on under their own momentum, while it was diverted on to a siding. When the rest of the rack engines, each with its two coaches, had arrived, the train was made up once more. This splitting up and remaking of the train are well organised, and the work is carried out with little loss of time, only 5 minutes being allowed at the foot and the top of the Serra for these two operations. The train is then hauled into Petropolis by a steam locomotive of the usual kind. The final stage of the journey is downhill and is soon completed. A good service is maintained on the Petropolis line, for in addition to freight trains, 12 passenger trains are run daily in winter, and 14 in summer.

I F McLauchlan (Rio de Janeiro).

A Roman Villa in the Cotswolds

In the woods at Chedworth, a few miles from Cirencester, the remains of a Roman villa were discovered in 1864. This villa was built towards the end of the second century A.D., and it came to light when a rabbiting party digging for a lost ferret unearthed some Roman tiles. This eventually led to the complete excavation of the site. The remains provide an interesting glimpse of a typical Roman settlement in Britain, and are considered to be the most complete of their kind.

The Chedworth villa was built in a rectangular form facing east, in what must have been rather a cold position 500 ft. above sea level. It was originally surrounded by a wall, most of which has now vanished. The west wing of the villa was purely domestic. At one end was the kitchen, with a furnace that was used to warm the adjoining room. Then came the dining room, the pavement of which is still preserved, and two bedrooms that were heated by hot air from the furnace.



One of two semi-circular dipping tanks in the Roman villa at Chedworth. Photograph by J. Jones, Prescot.

The remaining rooms in this wing are for bathing, always a prominent feature in a Roman household. The first is the undressing room, from which the bather would pass into the corridor that extended along the whole of this section. When his turn came he would then go into two heated rooms in succession, in the second of which hot water would be thrown over him. Finally he would enter the cold plunge at the end of the passage.

The long north wing of the villa shows evidence of conversion to an industrial use in later times, possibly for tanning or dyeing. Many of the rooms are fitted with special heating pipes and drains, and one room was evidently subject to heavy pressure, as the large number of pilae, or stone floor supports, seems to indicate. The accompanying photograph shows two semi-circular dipping tanks found in this wing, in which men or boys probably stood to tread out the linen for fulling or dyeing. The special pipes for the supply of hot water can still be seen, and other interesting finds are smooth stones showing signs of roasting, that were used to heat the water. These stones have been identified as belonging to the Shropshire ice drift.

The interest of a visit to the villa is much increased by the fact that the articles found during the excavation are all housed together in a small museum in the site. These exhibits include some large pieces of iron that were discovered in the "smithy."

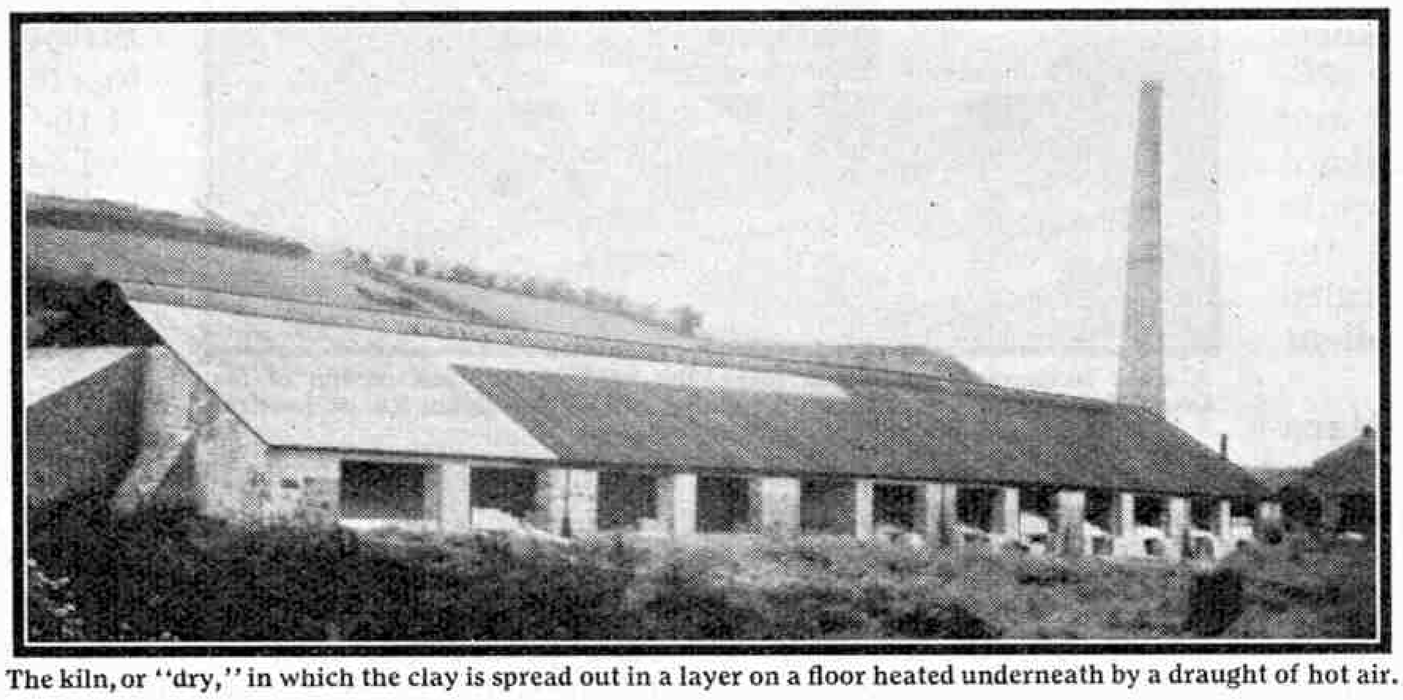
J. Jones (Prescot).

The Cornish China Clay Industry

A Remarkable Mineral of Many Uses

By E. Midgley, B.A.

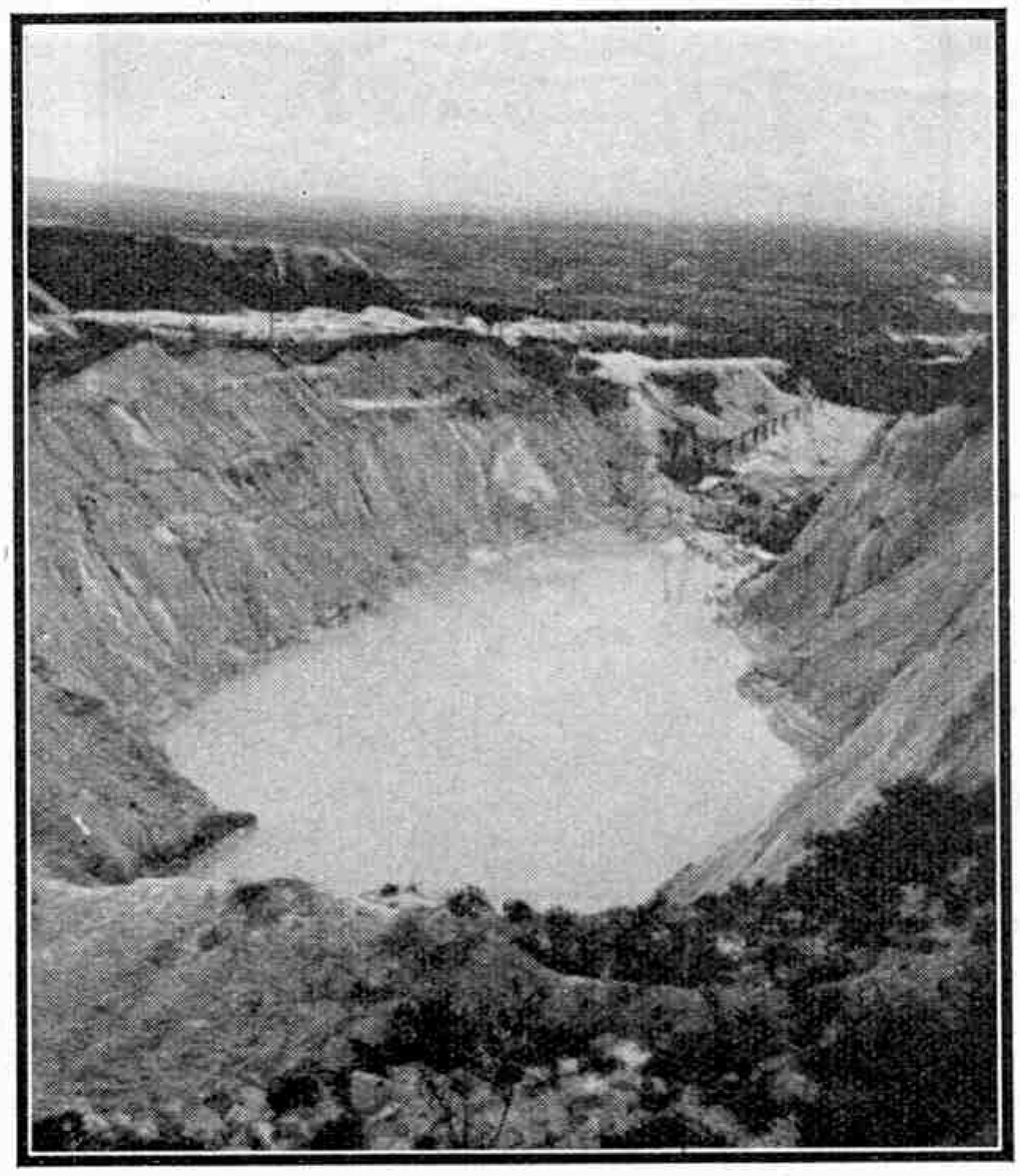
THE visitor travelling for the first time through Cornwall invariably has his attention arrested by the massive white dumps that dominate the landscape in the clay mining area, conical hills rising to a height of 200-300 feet, and sometimes termed the "St. Austell Pyramids." It is an unexpected kind of country to anyone who has gained his first impressions of Cornwall from railway posters and guide books depicting the bold headlands and cliff scenery and the quaint fishing villages. Yet this is one of the most flourishing industries of Cornwall.



The kiln, or "dry," in which the clay is spread out in a layer on a floor heated underneath by a draught of hot air.

The china clay, or kaolin, used for making porcelain, is very different in origin from the clays found elsewhere and used in the manufacture of earthenware, bricks, etc. These latter belong to the sedimentary group of rocks, being muds deposited on the sea floor in earlier geological periods. But the china clay is a decomposition product of granite, which millions of years ago, in the form of lava, pushed its way upward towards the surface of the earth and crystallised in cooling. Any piece of Cornish granite shows clearly its three constituent minerals, the glassy quartz, the milky-white felspar, and the black and silver mica. When the granite decomposes, it is the felspar that changes into the soft china clay.

The name kaolin is derived from Kaoling, a district in China, where it is said the clay was first discovered. The manufacture of porcelain from kaolin in China dates back some 2,000 years. Though granite area in Ireland, France, Africa, Czecho-Slovakia, Norway and America also yield china clay the Cornish product still retains the highest reputation on the world market. Yet the quarrying of the Cornish clay is a comparatively recent industry. China clay was found in Cornwall about the year 1755 by a Quaker named William Cookworthy. As a youth Cookworthy was apprenticed to a chemist in London and ultimately set up in business as a chemist in Plymouth. His business prospered, and he spent a great deal of time travelling about Cornwall with the object of finding a suitable clay for the manufacture of porcelain. After his discovery of china clay he established at Plymouth a factory for the production of china. He applied his chemical knowledge to the work, and succeeded in producing china of first-rate quality, but his venture was not commercially successful.



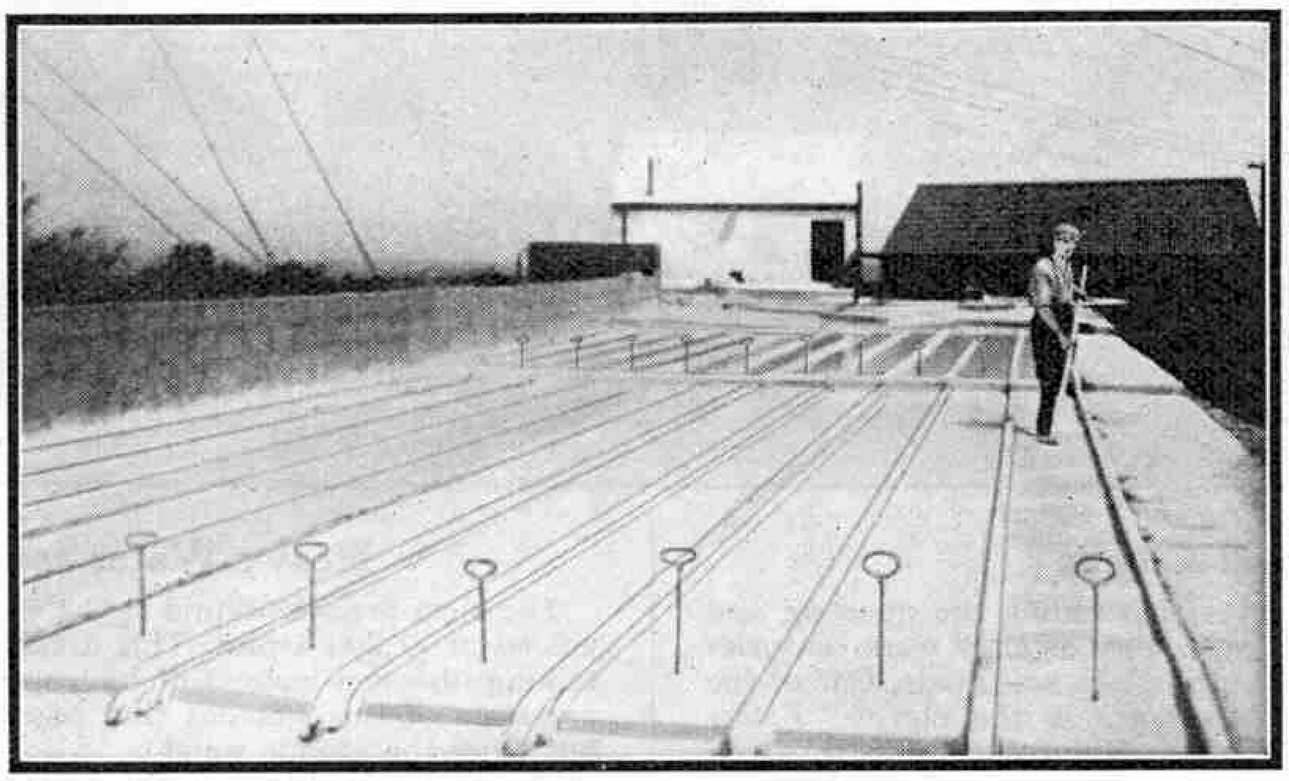
A disused quarry now partly filled with water. Such quarries are a common sight in the clay region.

In Cornwall to-day in its flourishing condition the china clay industry provides a marked contrast to the tin mining industry, which has shrunk almost to nothing and has left a countryside of ugly derelict mining sites some miles to the south-west of the clay area. The average annual United Kingdom output of the clay is about 800,000 tons of which about 90% comes from Cornwall and the remainder from West Devon. There is said to be enough china clay in the Cornish areas already known to last another century, and many deposits are far from being fully developed.

The clay quarries are free from the grime and roar and clatter that accompany many of our industrial processes. There is no blasting; there are no steam navvies or other powerful machines at work. Here and there the characteristic sounds can be caught, though they are often lost in the wide spaces of the quarries—the rattle of the truck as it carries its load to the top of the dump, the throb of the pumps in the small machine house, or the hose at work on the quarry side. But everywhere there are more impressions for the eye than the ear. Unforgettable is the white dustiness of everything—the roads, the hedges, the faces

and clothing of the workers, the lorries transporting the clay, and on a sunny day the dazzling white of large surfaces of clay being treated at the quarries.

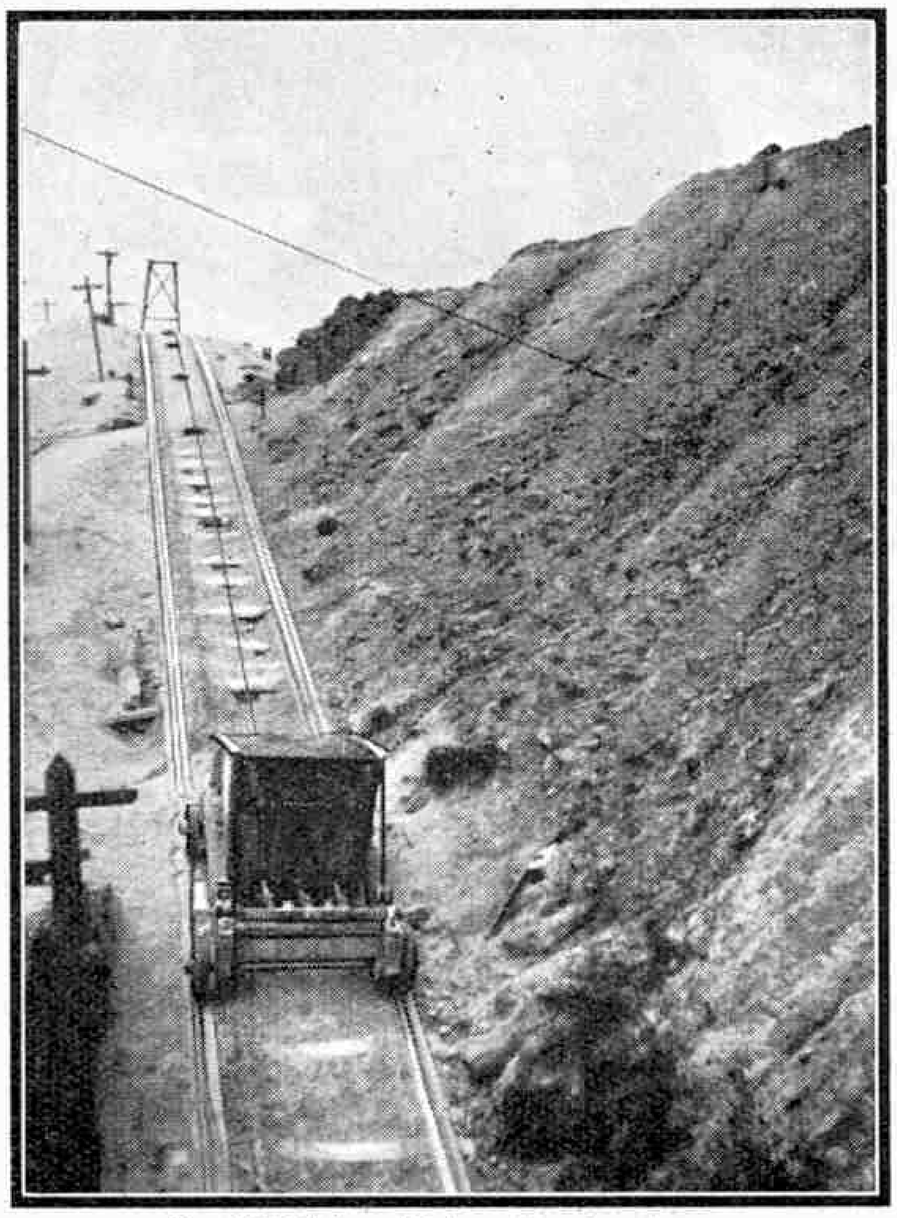
Nowhere is the clay dug out in a pure form. It invariably occurs with the quartz, or sand, and mica, which are also part of the decomposed granite. Hoses are played on the side of the quarry and wash the soft rock to the "bottoms," which have often become excavated to a great depth. Here the stream finds its way into a pit or "sand drag," where the heavier sandy material is rapidly deposited, while the finer clay and mica particles remain suspended. It is here that the first separation takes place. The stream is diverted to an empty pit to allow the sand to be dug out and loaded into the curious V-shaped truck, or "skip," which travels up rails to the top of the dump, where it is mechanically tipped and its contents are shot down the dump.



The long, narrow wooden troughs called "mica traps," through which the milk-like mixture of clay and water is passed.

The milky-looking liquid, now freed from sand but holding the mica and clay in suspension, is led into pipes and pumped up the side of the quarry to the surface. Here it is run slowly through narrow wooden troughs, 30-40 yards long, called "mica traps." The friction of the walls of the troughs causes the mica gradually to settle. A worker is usually found engaged there pushing the deposited mica along to the end of the trough with a rake, where it can be got rid of through a trap door lifted by an iron handle. By the time the milky liquid leaves the last of the mica traps there remains only the pure clay suspended in water. It has next to be run off into the settling ponds. Here the particles of clay sink to the bottom, leaving the bluish-green, clear water above. But as the clay is so very fine the process is a slow one. It may be dug out after only a couple of days, when it is still in such a sloppy condition that it is expensive to dry, and is therefore much better if left in the pond for four to six weeks. To obviate this lengthy process, however, up-to-date mines have introduced recently mechanical presses into which the liquid is poured and the clay separated from the water by closely-woven fabric that acts as an exceedingly fine sieve.

To dry the clay ready for marketing, it is spread out in a layer over the floor of a kiln, heated underneath by a draught of hot air. Before it sets hard a mechanical rake is drawn over it to cut it into pieces about the size of a brick so that it can be more easily removed. Not all the kilns are near the clay works. In order to save the cost of road transport, the clay is often taken, as in the case of oil pipelines, by underground pipes to kilns that are situated near rail or water side.



The "skip" travelling up the clay dump.

As china clay is somewhat rare in its occurrence, and the Cornish product is of such a high quality, it would hardly be an exaggeration to say that it is marketed in all parts of the world. The little clay ports of Fowey, Charlestown and Par harbour ships from almost all countries. Though many of the boats make for the Mersey estuary to supply the home potteries, or to other English ports for transhipment, vessels also take their cargoes direct to European ports, and make for distant ports in North and South America and Asia.

The uses of china clay are astonishingly varied and they tend to find an increasingly wider range. Contrary to the general opinion, the amount of the mineral used in the pottery and porcelain industry is a comparatively small proportion of the total output. The clay is used to a large extent in the finishing processes in paper making, for what is known as "loading." Paper consisting only of pulp fibres would be of very little value for either writing or printing purposes, for its surface would lack smoothness and it would absorb ink far too readily. For this reason it is necessary to add something to fill up the spaces that are left between the fibres. The china clay that is used for "loading" is first ground to a fine powder and then mixed with water. The liquid is strained in order to remove gritty or sandy particles, and is then added to the pulp in a machine called a "beater." China clay is used in the textile industries and in the manufacture of rubber articles, and, astonishingly, it plays an important part in the production of many kinds of face powders and tooth pastes. It is also employed medicinally, as a poultice material instead of bread or linseed, and for a variety of powders for cleaning metals, dusting dance floors, disinfecting, etc.

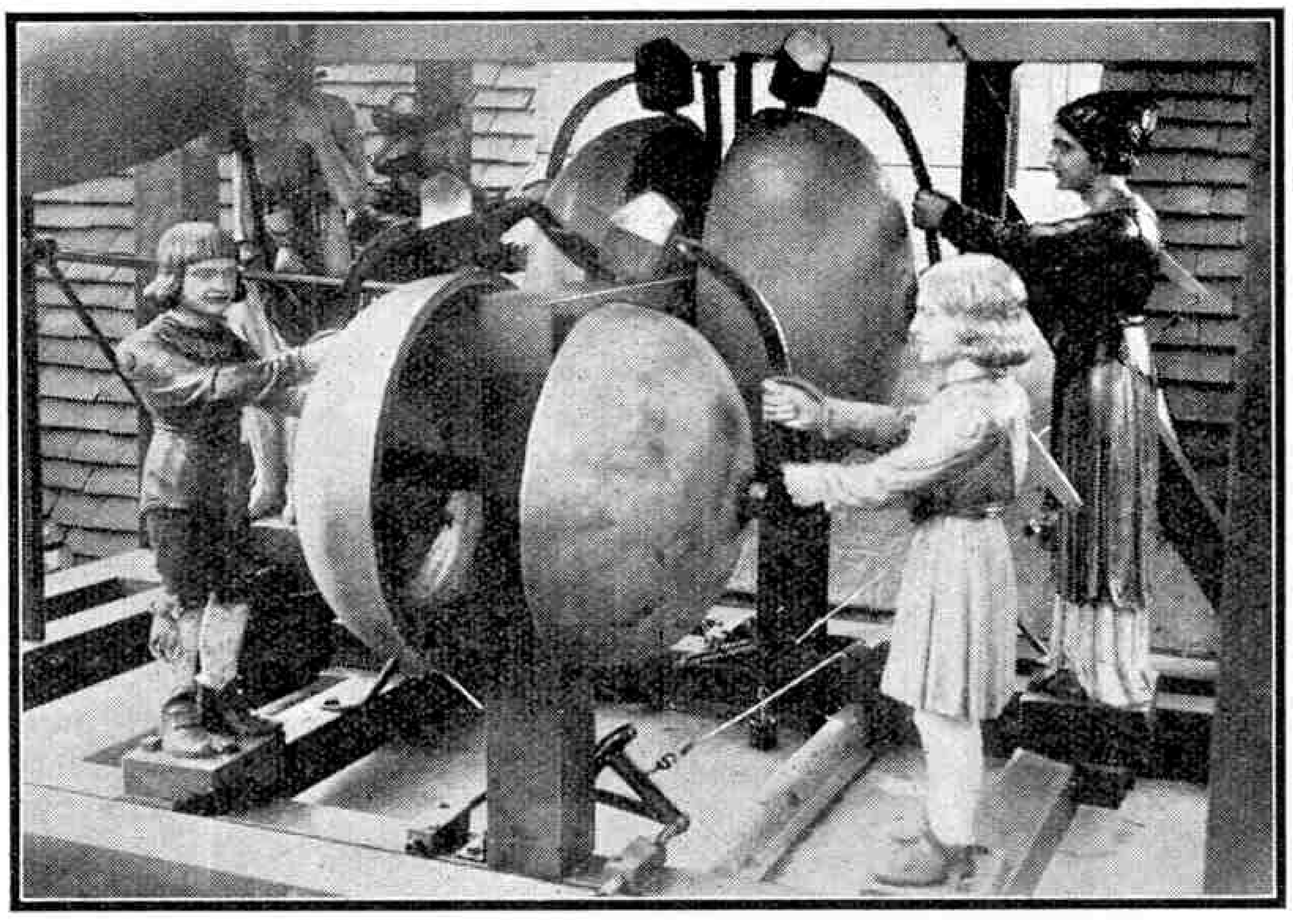
The most important waste material in the production of Cornish china clay is the quartz sand, of which some 4,000,000 tons goes every year to produce the white sky dumps. A use has been found even for this material in the manufacture of concrete and concrete blocks.

Two Novel Clocks

Clocks with little moving figures that chime the quarters and strike the hours are as fascinating to-day as they were centuries ago, when the famous Wells Cathedral clock was made. One of the latest of these entertaining timekeepers is the clever "*Father Time and Family*" clock at Silchester, Hampshire, illustrated on this page. The clock was made by its owner, Mr. T. M. Hartley, and is erected in the workshop adjoining his residence, Silchester House. The five figures, which are carved in wood, represent Father Time, who strikes the hours, and his son and daughter-in-law, with their two children, who sound the notes on the four quarter bells.

Our illustration shows how the arms of the figures are arranged to raise their hammers. Another attachment makes the figures move their heads as they strike the bells, and when they are in action they look particularly lifelike. At each quarter except the hour, Father Time turns his head to look at the other figures as they move, and then shakes it slowly, as if to show that it is not his turn yet. At the hour, however, he looks at them more briskly, and then, as they finish sounding the fourth quarter, he turns back to his own bell, and with great dignity strikes the hour.

The mechanism by which this is done is very cleverly designed. Special rods and levers are used, and are operated by a cam-disc mounted on the end of the quarter chiming barrel spindle. At night a clever contact device is also brought into action, and the group is floodlighted while in action.



Father Time and his family chime the quarters and strike the hours of this novel clock, built by Mr. T. M. Hartley, Silchester. At night the clock is automatically floodlighted when the figures are in action.

The figures were first carved whole, and the arms and heads were then cut off and attached to shafts and rocking joints that are used to give the necessary movement. These shafts run in metal bearings set in the wood of the figures, and an interesting detail is that grease-gun nipples are used to lubricate them.

The bells are of the hemispherical type, and the chimes are of a special kind that Mr. Hartley calls the "Silchester Chime." In addition to sounding the hours and quarters, the clock shows the time also on four dials that are illuminated at night.

The clock mechanism, which is housed in a glazed case in the workshop, just below the dials and figures, is a remarkably fine machine of the weight-driven type, with a gravity escapement; and has a number of constructional details specially designed to give easy adjustment. Both the chimes and the striking are automatically silenced at night.

In the garden of Silchester House is another clock, this time a floral one. Beds of flowers form the dial, and there are flowers even on the hands. The mechanism is housed in a hut in the garden, and there is an arrangement of rods and bevel-gears to transmit the motion underground to the hands. This clock is also the work of Mr. Hartley, and had to be of a special type on account of its strange dial.

T. R. ROBINSON.

Heavy Water for Longer Life

The most precious liquid in the world is heavy water, at present valued at £1,200 a pint. This differs from ordinary water in containing diplogen instead of hydrogen, the former being a strange variation of this element that has the same chemical properties, but twice the atomic weight.

There is very little of this precious liquid in ordinary water, and the process of separating it is laborious and expensive. Cheaper methods may be found, however, and then heavy water may prove valuable for many purposes. It is believed that drinking heavy water would slow down the body's chemical reactions, and thus many illnesses due to its too rapid working, particularly in old age, could be prevented. The span of human life also would be increased, and it almost seems as if heavy water might be an approach in some degree to the Elixer of Life vainly sought by the alchemists of the Middle Ages.

For a long time heavy water was considered a deadly poison, because experiments led to injurious effects on plants. This has recently been proved to be wrong, and a Norwegian scientist is at present carrying out experiments on himself, drinking at intervals slightly increasing quantities of the water and noting how they affect him mentally and physically, and his liability to common bodily ailments. It is believed that its use with other chemicals will make possible a new range of drugs and medicines for doctors.

In England, one of the main plants producing heavy water is that of Imperial Chemical Industries at Billingham-on-Tees.

Treasures in the Ocean

In an article that appeared in the February 1935 issue of the "*M.M.*" a detailed description was given of the plant constructed by the Ethyl-Dow Chemical Company, near Wilmington, in North Carolina, U.S.A., for extracting bromine from the water of the Atlantic Ocean. The bromine is used in the production of Ethyl petrol, and is valuable; yet it forms only a very small part of the wealth in the sea water pumped through the plant. Last year 70 million tons of water were treated, and it is estimated that this quantity contained also gold to the value of £8,400, with silver and magnesium worth £5,860 and £670,000 respectively. In addition there were over two million tons of common salt, 145 tons of iron, 139 tons of aluminium, more than 3 tons of iodine, and large quantities of copper and other materials.

Ocean water contains in solution practically every known element, but the proportions in which these are present are so small that their extraction is difficult. Efforts are being made to discover methods of recovering them, however, and with the gradual exhaustion of land deposits of minerals, the ocean may yet become an important source of valuable raw materials.

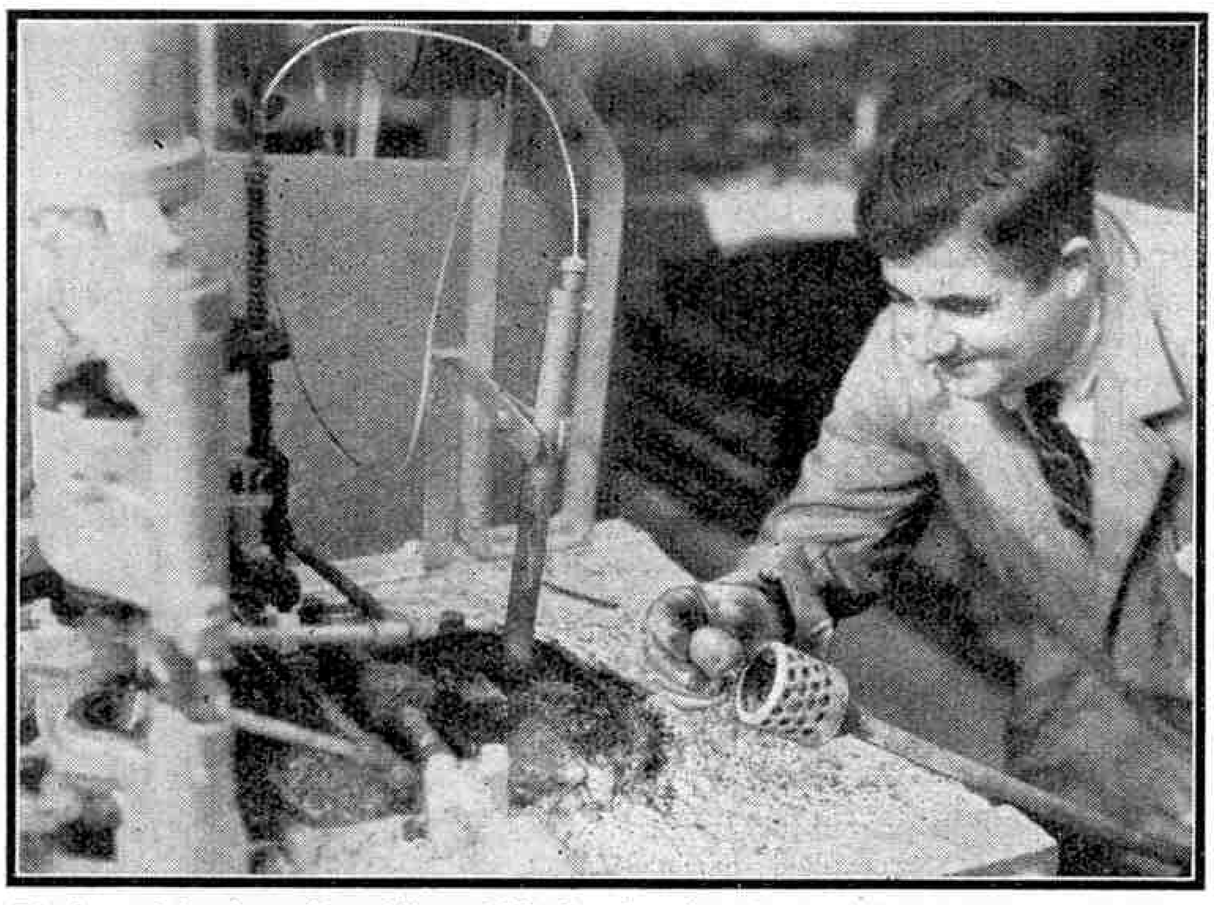
Potatoes Help in Making Motor Cars!

A strange use for potatoes is seen in the upper illustration on this page, which shows one of the processes carried out at the Ford Works at Dagenham. There large quantities of white metal, or babbitt, are used for such purposes as lining the big-ends of connecting rods. It is of the greatest importance that the white metal used should be as pure as possible, for often it has to stand up to severe stresses. It cannot be boiled in order to clear it of foreign matter, and the bubbling effect necessary to bring any impurities to the surface therefore is obtained by immersing small potatoes in it.

The potatoes are placed in a sort of inverted cup fixed to the end of a rod, and forced down into the molten mass. The sides of the cup are pierced with holes, so that the molten metal can come into contact with the potato. This special tool is necessary, for potatoes are lighter than the metal and otherwise would simply float.

The expansion caused by the heat of the metal causes the cells of the potato to burst in a series of minor explosions, releasing the water in them in the form of steam. The bubbling that follows is brisk enough to free the metal from scum and foreign substances, which rise to the top, and can be skimmed off. Our illustration shows the special furnace used for melting the white metal, and also the pyrometer, by means of which the temperature of the metal is checked and controlled.

T. R. Robinson.



Dipping potatoes in molten white metal for bearings, in order to produce bubbling that carries scum and impurities to the surface. Photograph by courtesy of Ford Motor Co. Ltd.

A Mysterious Wind

People who live on the northern slopes of the Pennines are frequently troubled during the spring and early summer months by a piercingly cold wind that blows down from the mountains, causing considerable damage to the young crops. This wind, known locally as the "helm," is felt most severely in Westmorland and Cumberland, to the east of the River Eden. When it is blowing a bank of cloud can be seen stretching for a few miles directly above the crest of the range, while the sky between the mountains and the Eden remains clear.

Meteorologists have been unable to agree upon the cause of this strange wind, and the problem is to be examined by an expert, who will spend several months on the slopes of Cross Fell, where the "helm" is frequently experienced, taking careful recordings of its speed and the conditions under which it blows.

Bible Sold for £8,000

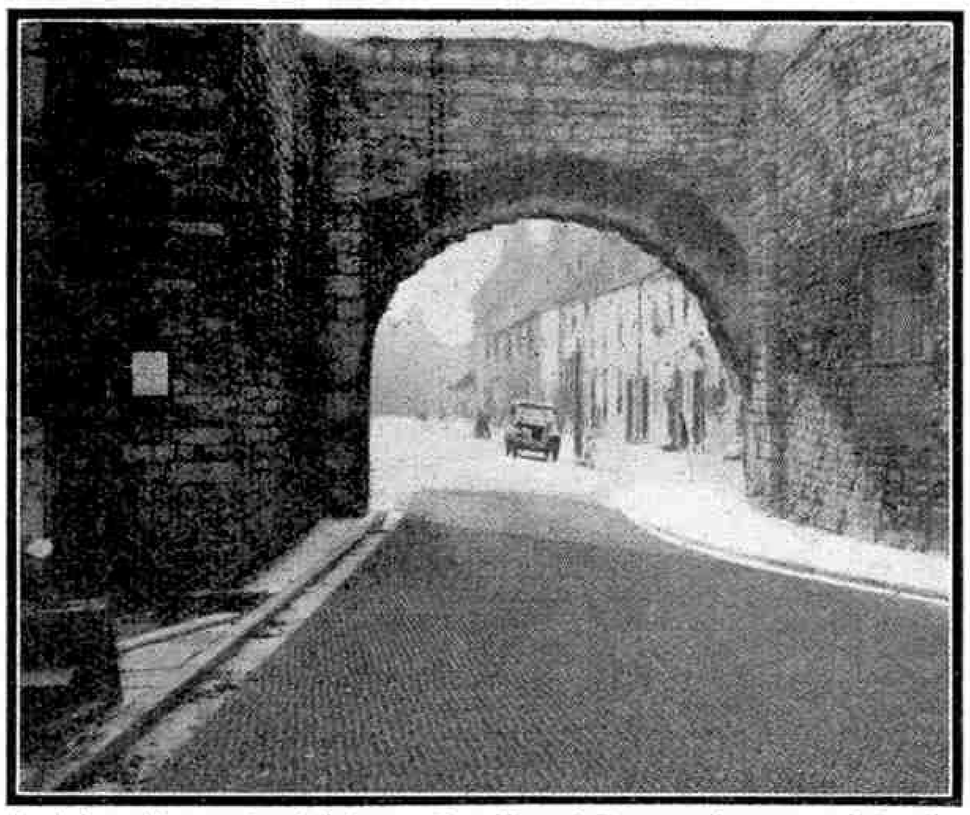
A copy of the first edition of the Gutenburg Bible, discovered by a lucky accident in a Polish farmhouse over a century ago, was recently sold for £8,000. So far as is known, there are only 45 remaining copies of this work, which was one of the first to be printed with the movable types invented by Gutenberg. Previously an extremely laborious method known as block printing had been employed. The text to be reproduced was marked out on a block of wood, which was then cut away to leave the print standing out from the level of the rest of the block. A separate piece of wood had to be prepared for every page of a book, and in consequence printing was a very slow and expensive process.

John Gutenberg was born at Mainz about 1410, and at the age of 10 was taken to live in Strasbourg. There he tried many occupations before he turned in 1436 to experiments in methods of printing from engraved blocks. His skilful work attracted attention and, probably at the request of the Abbot of Strasbourg, he decided to undertake the printing of the Bible. This would have entailed the engraving of 700 separate plates, an impossible task for one man, so Gutenberg adopted the plan he had already tried on a smaller scale. Instead of blocks the size of a page, he cut out single letters that were adjustable in any combination on a special frame. This frame was the first modern printing press.

Listening to the Fall of Dew

It is not easy to detect the exact moment when temperature changes bring about the deposition of dew or its evaporation, but the scientist has solved the problem by the use of that marvellously sensitive instrument, the photo-electric cell. This has been applied in recording the appearance of dew in the cold stores in which meat is kept, where changes of this kind must be avoided if the meat is to remain in perfect condition.

In stores equipped with this device, light is reflected from some cold surface on to the window of the photo-electric cell. As soon as dew forms the light is dispersed by the minute drops of which it consists, however small they may be, and the electric cell immediately responds to the change by a variation in the strength of the current passing through it. This current is amplified and actuates a telephone receiver, in which the fall of dew is heard indirectly as a series of clicks. The clicks decrease or increase in frequency as the temperature changes, and the instrument therefore not only reveals the appearance or disappearance of dew, but shows how conditions in the store in which it is installed are changing by giving audible warning.



An interesting contrast between the old and the new is presented by the modern steel paving, consisting of sections one foot square, with the Newport Arch, Lincoln, built by the Romans about 400. Photograph by courtesy of Stanton Ironworks Co. Ltd.

Ancient Gold Mines in Central Asia

In the heart of the Kazahk steppes of Central Asia, a Russian prospecting expedition has recently reported the discovery of extensive gold mines sunk by men of the Bronze Age. Bronze tools were found in the mines, together with axes made of stone and bone; while close at hand were primitive crushing plants consisting of stone slabs and hammers. Evidently the miners had not learnt to use iron, for no instruments made of this metal were found, although the district has rich and accessible deposits of iron ore.

Two skeletons of gold miners of thousands of years ago also were unearthed. They had apparently been buried by a fall of roof in the workings, for their hands still clutched their bronze chisels and stone hammers. The mines reach a depth of over 70 ft. and are connected by underground passages, supported by stone props. As a source of light, the miners probably burned fat in open clay bowls, several of which were found.

Now it is possible that the mines will be worked once more. In addition to gold, the expedition discovered in the district large quantities of quarrying stone, limestone, brown coal and coking coal, and silver, iron and polymetallic ores. A further extensive survey will shortly be carried out, and plans have already been made for the transport of workmen to the mines and for the setting up of a power station in the vicinity for the mechanisation of the entire operations, which will add greatly to Russia's gold output, now the second largest in the world.

In Search of New Models

Subjects in the House and Garden

MODERN homes contain many features that provide considerable scope for owners of both large and small Outfits. Two particularly good examples that are to be seen in almost every kitchen are gas or electric cooking ranges. A gas-operated range is perhaps the most interesting from the model-building point of view, in that a great amount of external detail can be incorporated, and also there is scope for ingenuity in choosing suitable Meccano parts to form the various rings, grills, taps and gas pipes. The model shown in Fig. 1 is a good example of this type.

Electric cookers usually have less external detail than gas cookers. The top is inset with boiling plates of various sizes and shapes, and below the top is the hinged door that gives access to the grill. A row of heat control switches is placed in a convenient position on one side of the range. Neat models can be constructed from Strips and Flexible Plates, using different sizes of Pulleys for the boiling plates. The interior can be fitted with shelves and miniature heating elements and an oven door is easily constructed with a Flat Plate and a pair of Hinges (part No. 114). If the model is large enough a Hinged Flat Plate can be used for the door.

The ordinary coal fired cooking range also offers plenty of scope, and its construction will prove a good test of a model-builder's ability, for the effectiveness of the finished model depends largely on the builder's skill in selecting the Meccano parts most suitable for the purpose. Small accessories, such as hinged pan rests, a coal scuttle and a fireside set may be included to add realism to the model.

Gas and electric fires are other household fittings that can be reproduced with a few simple parts. Electric fires are the easier to construct, and by using Spring Cord for the heating elements a realistic model can be built up. A simple miniature model of a portable electric fire could be constructed using a Boiler End as the reflector. In such a model the heating element could be represented by a Coupling secured to the centre of the Boiler End, and from the transverse holes of which protrude short lengths of Spring Cord.

A more elaborate subject, which is specially suited to those who possess a supply of Gears, is the wringing machine or mangle. The larger machines are fitted usually with wood rollers and in a model these can be represented by the Wood Roller (Part No. 106). The model-builder will be able to exercise his ingenuity in designing a suitable spring mechanism for applying pressure to the rollers, and a study of actual wringers of different makes will show that there are several interesting methods by which this can be done.

Washing machines and boilers also provide novel subjects, and small working models of this kind can be assembled quite easily. A washing machine consists essentially of a boiler fitted with a revolving top, to which are fastened a number of metal prongs. When the machine is set in motion the clothes in the boiler are whirled rapidly round in the water. The rotating top is driven by a small electric motor, mounted either under or over the boiler.

Another good subject, and one that does not receive much attention from model-builders is the electric vacuum cleaner. There are many different types of these useful machines, and they are all quite easy to reproduce. A model of this kind is shown in Fig. 3. It was built by E. Stevens of Sutton, and as can be seen from the illustration, great care has been taken in obtaining the correct shape. Models of this kind cannot be put to practical use, but there is plenty of fun and interest to be obtained in designing and building them, particularly machines of the type in which the dust collecting bag and motor are a self-contained unit. Generally the bag and the motor are carried in a metal cylinder fitted with wheels so that it can be pulled along the ground as the sweeping operation proceeds. The Boiler can be used for the metal cylinder and $\frac{1}{2}$" Pulleys can be fitted as wheels. A series of Springs joined together make realistic flexible suction tubing.

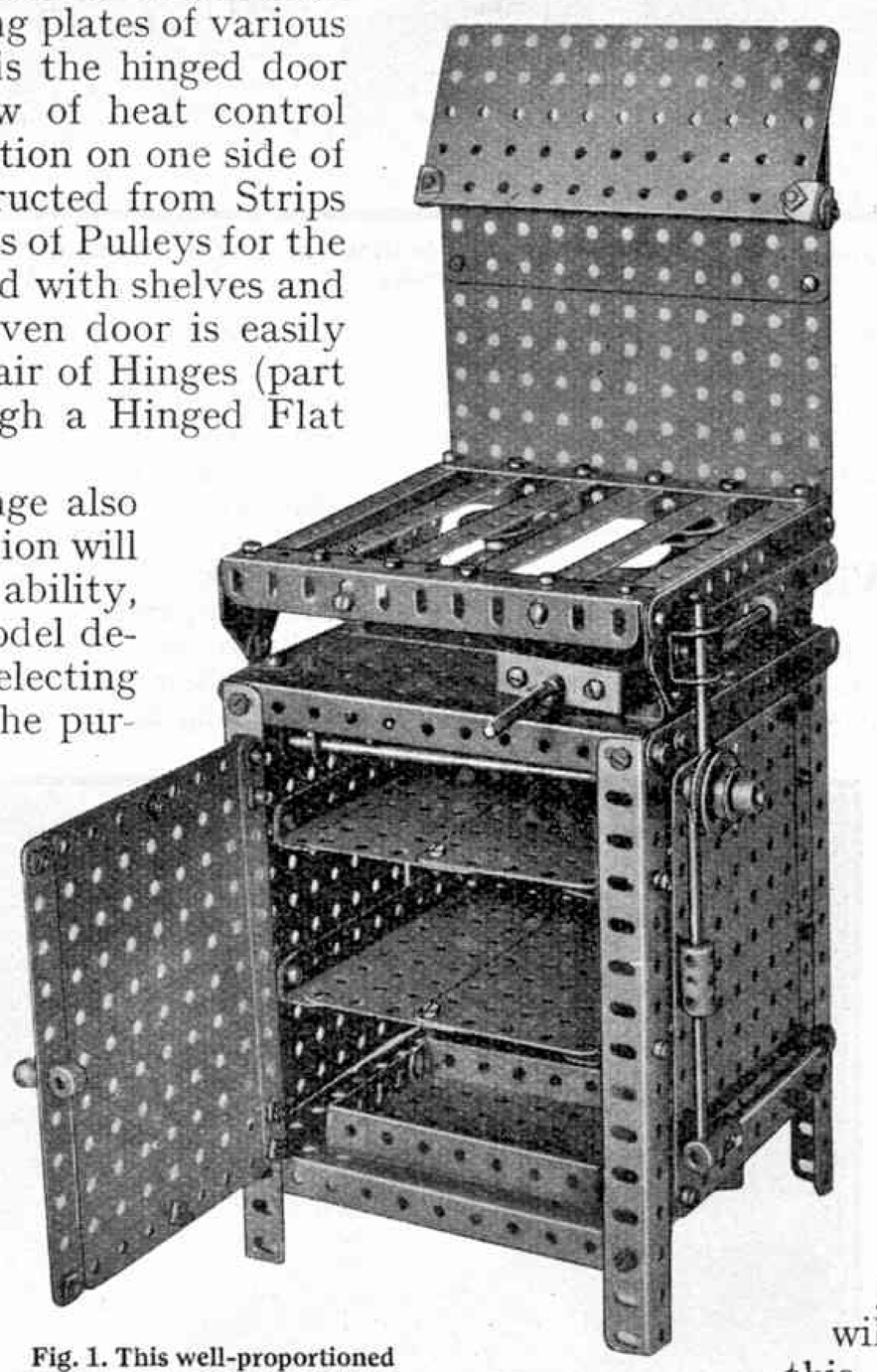


Fig. 1. This well-proportioned model gas cooker includes many fascinating details. It is the work of C. P. Sharpe, Ilford.

Carpet sweepers also provide interesting models, and a glance at the prize-winning entries in the Ewbank Carpet Sweeper Competition, the results of which were announced in the June 1937 issue of the *"M.M.,"* will show what can be done in this direction.

Electric fans for use in hot weather are found in many houses. These are usually of the type in which the current of air is sent in one direction only. In other and more expensive types the fan is supported on a pivoted rod and an automatic arrangement is provided by means of which the fan is moved slowly from side to side in order to spread the air current over a wider area. Useful working model fans can easily be made from Meccano, using an Electric Motor as the driving unit. Rods and Swivel Bearings can be used to make up the swivelling portion, and for the fan blades stiff cardboard edged with Strips to give rigidity and strength will be found useful.

For the model-builder with a fairly large Outfit no better subject could be found than one of the many types of clocks now in use, and several fine examples have already been illustrated in the *"M.M.,"* including

both pendulum and electric synchronous clocks.

The model-builder on the lookout for novelty would find it good fun to build an alarm clock, while a still more advanced and interesting model would be an automatic alarm and breakfast cooker of the kind described and illustrated in the *"Our Busy Inventors"* pages in the February 1937 *"M.M."* In this device an electric clock switches on an electric kettle and an electric toaster at a predetermined time. When the kettle boils, the alarm bell rings. A good Meccano model can be made from a synchronous clock using a time switch to bring the electric kettle into operation, and to automatically ring the alarm bell. Model-builders who prefer breakfast in bed will find this type of mechanism very useful!

Other household apparatus that lends itself for reproduction in model form is the sewing machine, particularly the electrically-operated type. The mechanism that operates the shuttle and needle is rather complicated, but readers who have the opportunity of examining an actual machine should find no difficulty in reproducing it in Meccano. Those who do not wish to make working models will find plenty of interest in reproducing the external features of a simple foot-operated machine. A model of this type built by W. Goodman of Allestree is illustrated in Fig. 2. The table of the machine is built up from small Flanged Plates and Flat Plates, and to it is fastened the arm, which is made from Double Angle Strips and Curved Strips. The needle is represented by a short Rod held by Spring Clips in a Cranked Bent Strip. Two small Pulleys fastened in position by a $\frac{3}{4}$" Bolt are used for the cotton reel. The treadle is formed by a small Plate pivoted at its centre, and it is connected by a Strip to a $1\frac{1}{2}$" Pulley. A smaller Pulley fastened on a Rod at the rear of the working arm of the machine is driven from the $1\frac{1}{2}$" Pulley by a Driving Band.

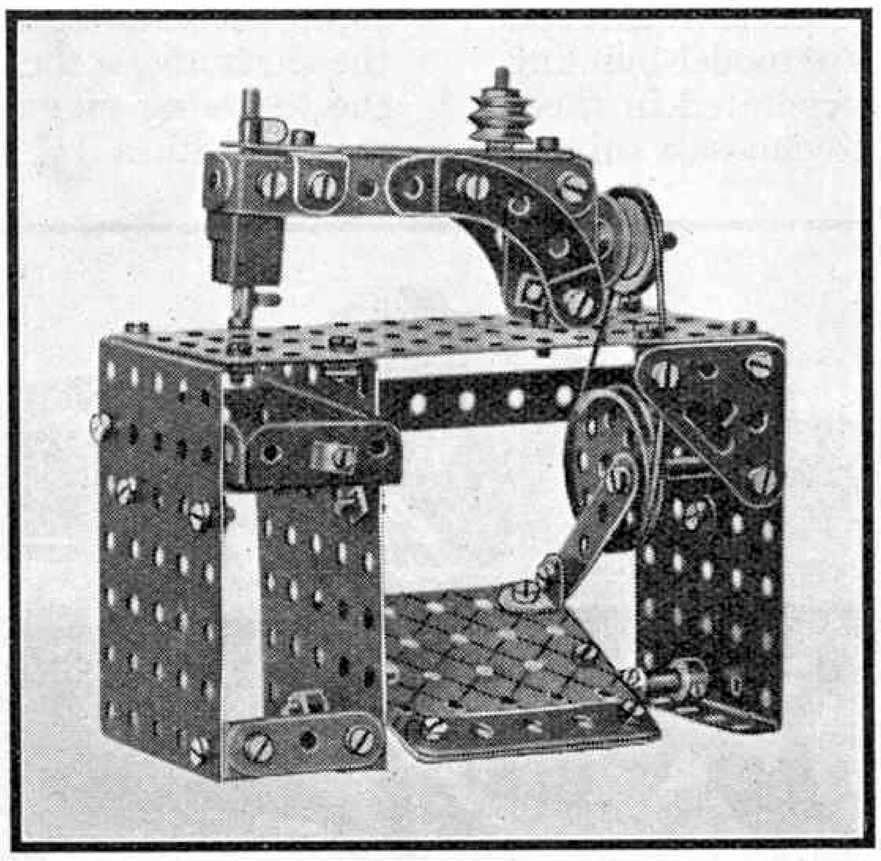


Fig. 2. An excellent model of a pedal sewing machine, built by W. C. Goodman, Allestree, near Derby.

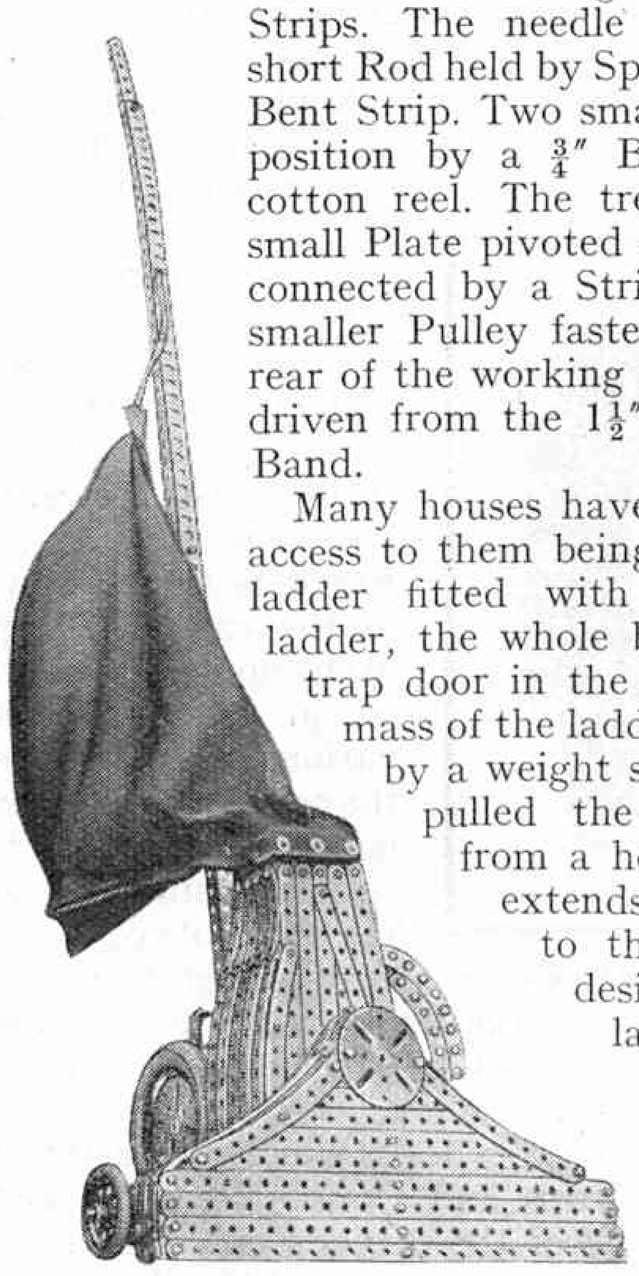


Fig. 3. A vacuum cleaner neatly reproduced in Meccano by E. A. Stevens, Sutton, Surrey.

Many houses have lofts under the roof, access to them being by means of a short ladder fitted with a sliding extension ladder, the whole being mounted near a trap door in the floor of the loft. The mass of the ladders is counterbalanced by a weight so that when a cord is pulled the ladder slides easily from a horizontal position and extends through the trap door to the floor. When it is desired to return the ladder to the loft it is given a slight push, which sends it gently back to the horizontal position under the action of the balance weights. An arrangement of this kind can quite easily be devised in Meccano. The ladder itself can be constructed from Strips and Double Angle Strips, and it is only necessary to carry out a few experiments using Pulleys as weights to produce a successful working model.

Electrical fitments provide a never-ending source of ideas for the astute model-builder, and one of the best of these is the house telephone. There are two types of telephones; in one the earphone and mouthpiece are separate, and in the other, the modern type, the two are joined by an arm, so that only one hand is needed to operate the telephone. The former type probably is the most familiar to the majority of boys, and it is quite easy to represent in Meccano.

Every boy likes a model that can be put to some practical use when it is finished, and that is why subjects such as lamp standards and table lamps are so popular with model-builders. Table lamps are quite simple to construct, and there are many different types from which to choose.

Other electrical fitments that make good subjects for models are chandeliers, lanterns and wall lamps. A good example of a wall lamp was illustrated in *"Suggestions Section"* in the April 1937 *"M.M."* In this model glass rods from the Kemex Outfits, clamped between Angle Girders at each end, are used to disperse the light.

In addition to devices inside the house there are tools and other equipment used in gardens that make interesting subjects for models. The chief of these is the lawn mower, an excellent model of which is shown in Fig. 4. The frame of the model is built up from Braced Girders and Strips of various sizes, the two sides being connected by means of $5\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strips. The neat front roller is ingeniously built up from Sleeve Pieces and Chimney Adaptors, and is fitted to a Rod that is supported at each end in a Rod Socket. Two $3\frac{1}{2}"$ Strips are used for the cutting blades and are secured by Angle Brackets between two Bush Wheels, which are fastened on a Rod journalled in the sides of the frame. This Rod is connected by Sprocket Wheels and Sprocket Chain to the shaft carrying the rear roller, which consists of a Boiler fitted with Boiler Ends. A Pawl is fastened by a lock-nutted Bolt inside one of the Boiler Ends, and is held by a length of Spring Cord against a Ratchet secured on the supporting shaft. This free wheel mechanism makes it possible for the lawn mower to be run backwards without the cutting blades revolving.

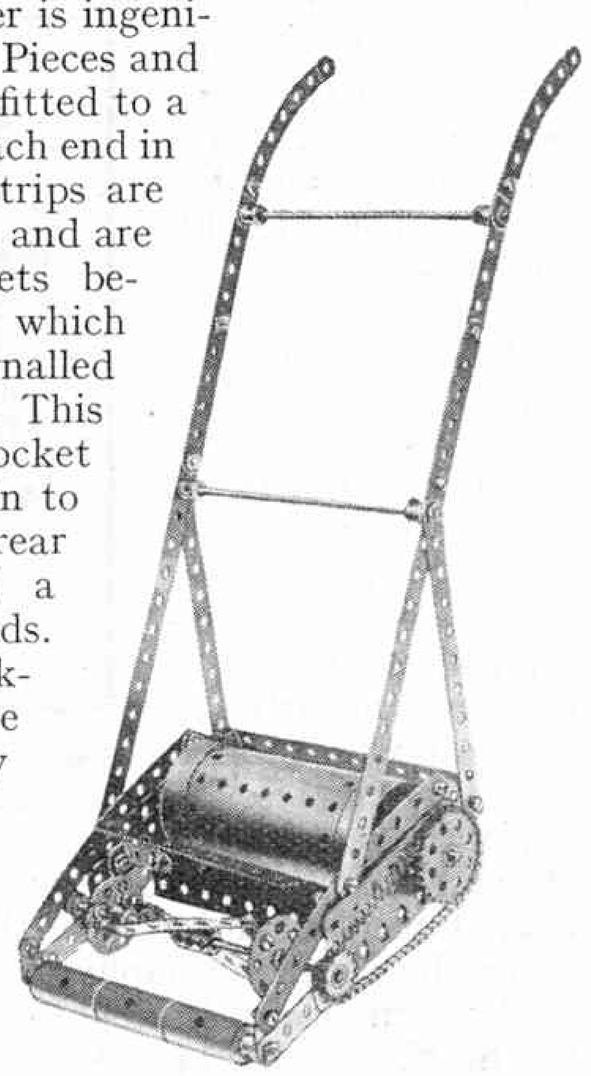


Fig. 4. A realistic model lawn mower.

A Fine Meccano Motor Lorry

Interesting Model with Six-Wheel Drive

THE construction of motor vehicles of various types is one of the most popular branches of model-building, for many working details can be incorporated in them, and there is a wide range from which to choose a subject. A particularly interesting model of this kind, which is based on the A.E.C. six-wheel drive vehicle, is shown in the illustrations on this page. It was built by R. Lawford, Watford, and reproduces all the main features of its prototype. The chassis is of straightforward construction, and is built up from Angle Girders bolted together to form U-section girders and then spaced $4\frac{1}{2}''$ apart by means of Angle Girders and Rods held in Collars fixed to the side members.

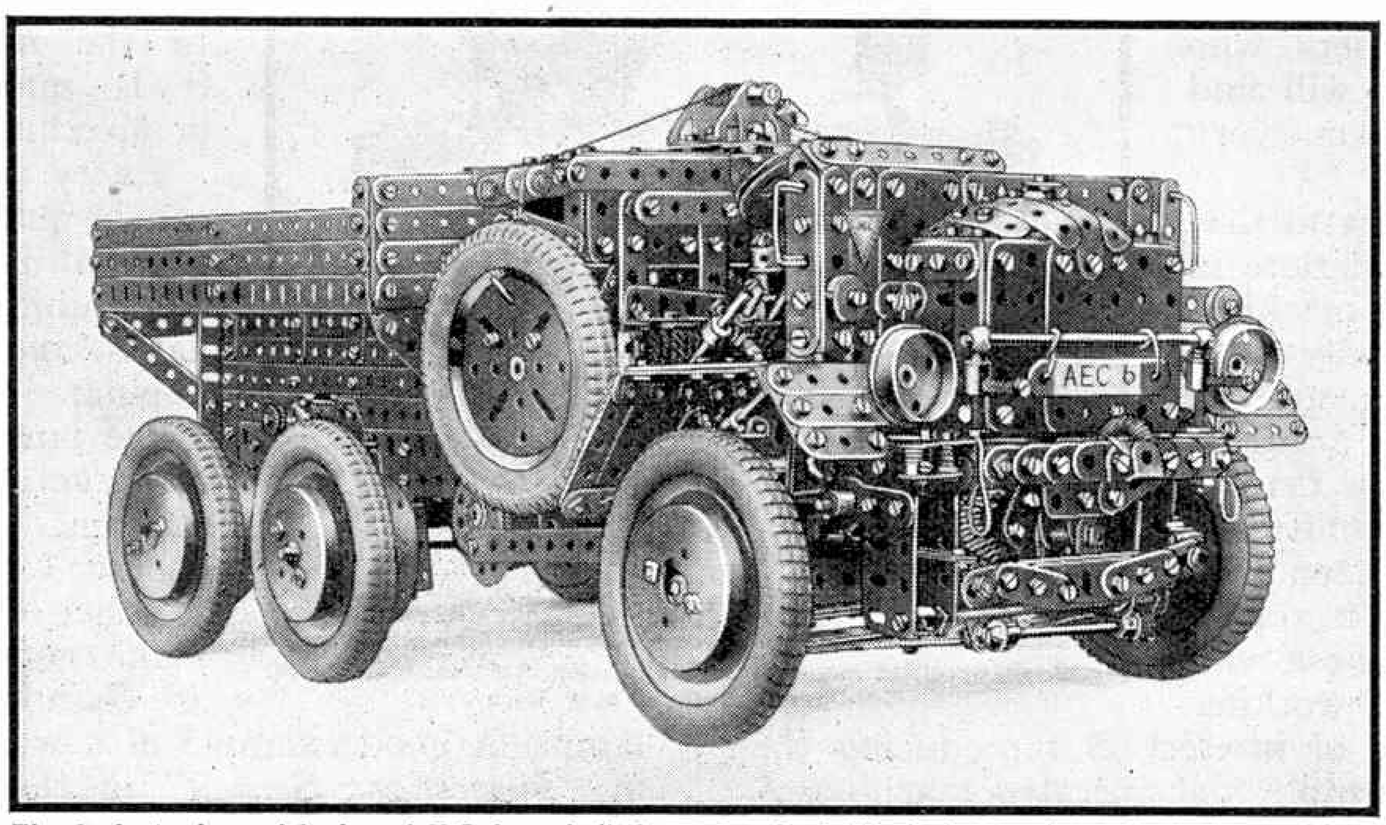


Fig. 1. A sturdy model of an A.E.C. lorry built by R. Lawford, Watford. The six road wheels are driven from a three speed and reverse gear-box.

The driving mechanism to the six road wheels perhaps is the most noteworthy part of the chassis, and model-builders who are keen on reproducing mechanisms of this kind will find plenty to interest them in the accompanying illustrations.

The power unit is an Electric Motor situated under the bonnet and from this the drive is transmitted through a clutch to the gear-box, which has three forward speeds and reverse. The drive for the front wheels is transmitted from a 57-teeth Gear on the driven shaft, to a 57-teeth Gear on the cardan shaft. A Socket Coupling is fitted to the former Gear so that by moving a lever, the drive can be transmitted to the rear wheels only. Two Universal Couplings and a $1''$ Rod connect the front wheel cardan shaft to the differential, which is driven through a 9 : 1 reduction gear, comprising two $\frac{1}{2}''$ Pinions, a $1\frac{1}{2}''$ Contrate, and a 57-teeth Gear. The stub axles are driven by Flexible Coupling Units and are formed by $1\frac{1}{2}''$ Rods journalled in Double Bent Strips pivotally fastened to the chassis by $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips.

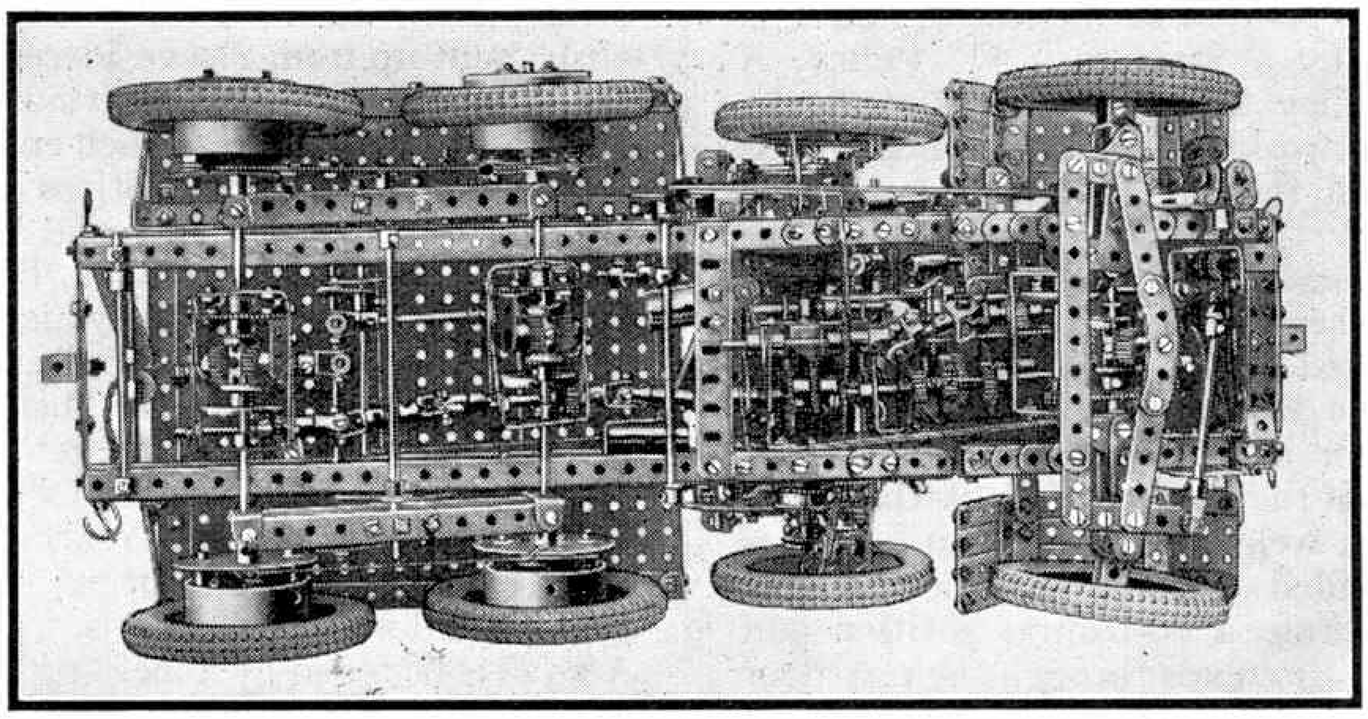


Fig. 2. An underneath view showing the arrangement of the drive to the three differentials and the gear-box.

The differentials of the two rear axles are driven by a common cardan shaft. This is accomplished by taking the shaft above the axles and driving each differential in the following manner. A $\frac{1}{2}''$ Pinion on the cardan shaft meshes with a $1\frac{1}{2}''$ Contrate, which is locked on a Rod carrying a second $\frac{1}{2}''$ Pinion. This, in turn, is meshed with a 57-teeth Gear fastened to the cage of the differential.

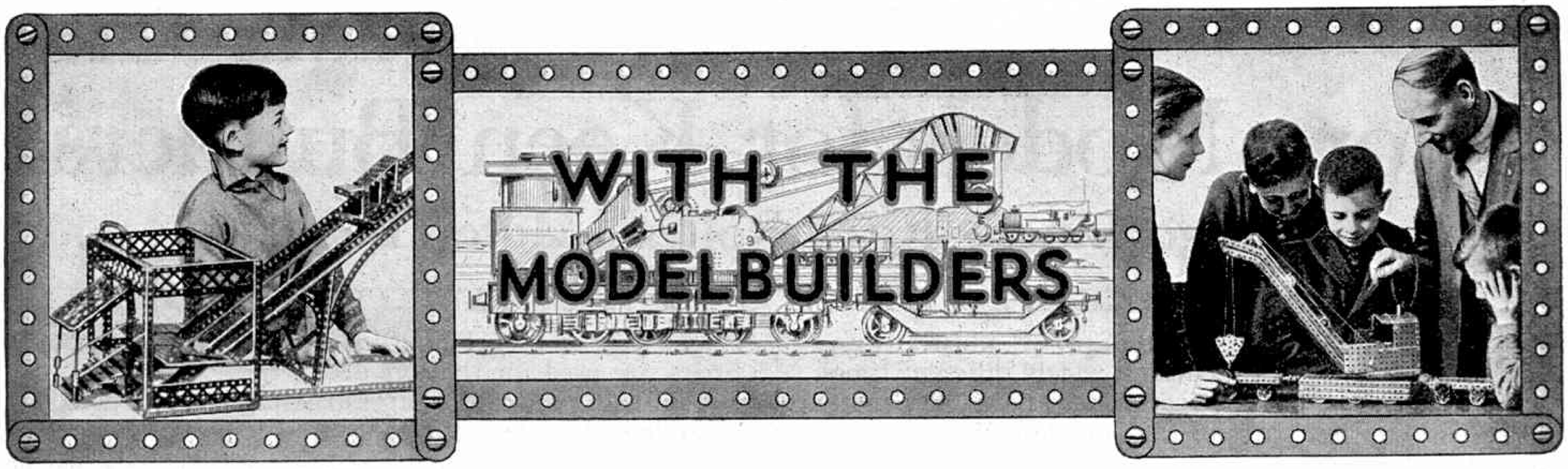
Internal expanding brakes are fitted to all four wheels, all the brakes being coupled together so that they can be operated by a single lever, the operating wire being sheathed in Spring Cord to represent a Bowden cable.

A power-driven winch is fitted to the lorry and the top of it can just be seen in Fig. 1 between the back of the cab and the platform of the lorry. The winch is brought into operation by a friction clutch, which connects it to the gear-box.

The platform of the lorry consists of Flat Plates, bolted to a framework of $9\frac{1}{2}''$ Angle Girders, and it is supported from the chassis by $3\frac{1}{2}''$ Angle Girders. The sides of the platform are built up, as shown in the illustration, by two $9\frac{1}{2}''$ Strips, and the front by three $9\frac{1}{2}''$ Strips.

The radiator and bonnet are constructed from Flat Plates and Flat Girders, and are secured by Angle Brackets to the front of the cab. The top of the bonnet is covered in by Strips of various sizes bent to the correct shape. The inside of the cab is equipped similarly to the prototype, the gear change lever being to the right and the brake lever to the left of the driver when he is seated behind the steering wheel, which is represented by a $2''$ Pulley.

The lorry carries two spare wheels, which are fastened to the chassis by $1\frac{1}{2}''$ Strips and Double Brackets and are situated on each side of the driver's cab. Provision is made at both the front and rear ends of the chassis for hauling trailers.



A NEAT RACING CAR

The illustrations on this page show a realistic model of a racing car built by S. Draper of Surrey, which incorporates a chassis made from Meccano parts. The model is fitted with an Ackermann type steering mechanism operated from the steering wheel, and the front wheels have a Fraser-Nash type suspension built up from pieces of springs taken from a broken clockwork motor. The gear-box has two speeds and is driven by a Meccano *Magic* Motor. The drive to the gear is taken through Sprocket Wheels and Chain. In order to obtain sufficient power and speed from the Motor, the governor was removed, and Draper assures us that the acceleration of the model car is surprisingly rapid.

Ordinary workshop materials were used for the body, and as can be seen from the illustrations a very effective design has been produced. A certain amount of detail has been incorporated, but parts that are too small to be modelled correctly have been omitted.

Draper uses his model for racing, and in competition with other model cars, it has proved very successful.

AN INTERESTING MECCANOGRAPH

Recently N. Ta'Bois submitted details of a "Meccanograph" that he has built and which he claims to be an improvement on the Meccano Super Model No. 13. The mechanism is driven by an E6 Electric Motor, which is controlled by a resistance. The crown head is driven through a reduction gearing of 54:1 and the table is driven from the crown head through a three-speed gear-box similar to S.M.45. An arrangement is incorporated whereby the table can be made to rotate once for every three revolutions of the crown head, instead of the usual 47.5, 95 and 190 turns of the crown head.

The crown head is a Face Plate which is fitted with Threaded Pins and Bolts in various positions. The Face Plate is carried on a special mounting resembling a crankshaft, and is made from Rods and Couplings. By setting the Couplings at various angles to each other the Face Plate can be placed out of centre and a very fine adjustment is permissible.

Two fountain pens are used for making the designs, each using a different colour ink, and they are carried on a pivot mounting that enables the pens to be used alternately when required. Jerky movement of the table is prevented by using a Strip that bears against the rim of a 2" Pulley fastened on the same Rod as the table.

The designs produced are extremely beautiful and clearly defined. Some of the more elaborate designs take up to half an hour to produce.

A NOVEL DRIVING UNIT

Model-builders who do not possess a Clockwork Motor will be interested in the method used by R. Kale of Nasik, India, for driving small models. Instead of using a Crank Handle for the driving shaft of the model, Kale uses a Rod and a Pulley fitted with a Rubber Tyre. The Tyre is then brought into contact with the turntable of a gramophone, which drives the model at a good speed. One advantage of the scheme is that the speed of the model can be varied by moving the Pulley nearer to the centre of the turntable or by using the governor regulator of the gramophone. Also, by using different sizes of Pulleys, it is possible to obtain a reduction drive more suitable for a particular model. This method is practicable only for stationary models. We do not advise model-builders to use Pulleys without the Rubber Tyres.

AN ESCAPEMENT FOR CLOCKS

Clocks have a considerable appeal to many model builders owing to the care and thought required in the design and construction of compact gear trains. One problem that often confronts the builder is the construction of a really neat escapement. G. Boadle of Stafford decided to experiment with a device planned on similar lines to that which appeared in "Suggestions Section" in August, 1936. Finding this could not be made compact enough for his requirements, he set to work to design one using Gear Wheels.

He discovered that the Gear Wheels and Pinions included in the Meccano range could be utilised, provided that a little care was exercised in constructing the pallet. For this he used an arrangement of Collars and Centre Forks, the latter being used to engage with the teeth of the Gear Wheel or Pinion used as the escapement. The Centre Forks are held in Collars, which are screwed on to a small framework of Rods and Screwed Rods. The Centre Forks are adjusted so that they are diametrically opposite each other on each side of the Gear or Pinion. Lateral adjustment is obtained by loosening the Grub Screws of the Collars and sliding the Centre Fork in or out. Careful adjustment is necessary, but Boadle assures us that once everything is adjusted and tightened up, the mechanism functions perfectly. An advantage of the device is that a wide choice of ratios is available.

A NEW USE FOR THE STEERING WHEEL

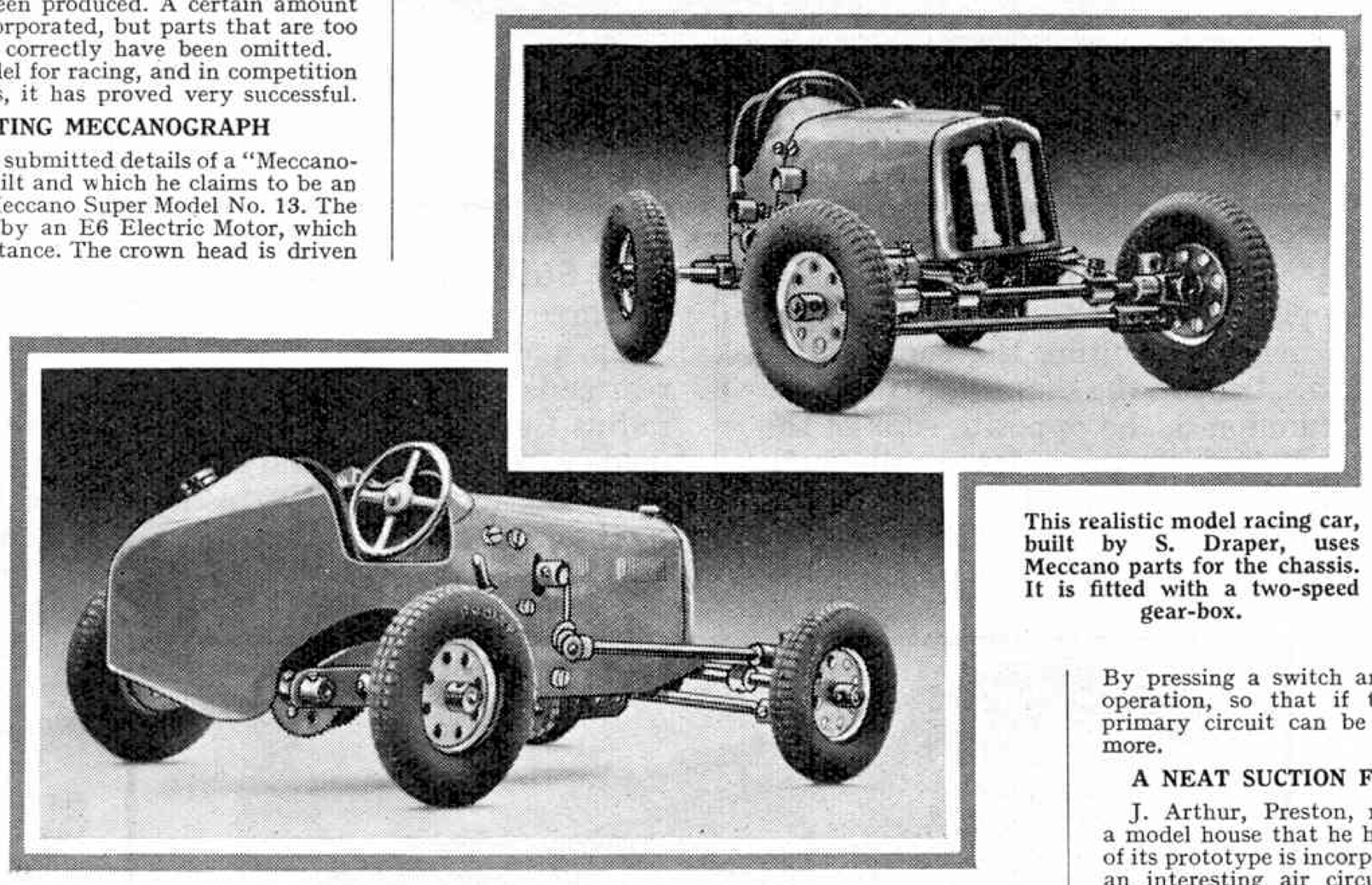
The Wheels (Part No. 19a) are used in carts, and for other vehicles that require spoked wheels a wheel of smaller diameter usually is required. For this purpose the 2" and 3" Pulleys are not reliastic enough, and often make a model look clumsy. E. Gerrard of Stoke-on-Trent tells us that the Steering Wheel (Part No. 185) makes a useful spoked wheel, and in addition the metal cap at the centre resembles a hub cap. He points out that the only disadvantage in using the Steering Wheel is that the metal cap prevents Rods from being pushed right through the boss. It is not often that it is necessary to do this, but if, for example the Steering Wheels are to be used for the Wheels of a model bicycle, they can be mounted between the forks on the shank of a Threaded Pin or a lock-nutted bolt.

IMPROVEMENTS FOR THE AUTOMATIC SHIP COALER

Model builders who have built the Meccano Automatic Ship Coaler will be interested in the improvements incorporated in the model built by J. Cocker of Birkenhead. When inexperienced operators attempt to operate the model the various Cords become hopelessly entangled through overwinding. Cocker overcame this trouble by fitting an automatic device to the model so that the Motors are stopped if the grab or the trolley are out of sequence in their operation, and if the grab is not operated properly.

The height of the grab can be read from a dial over which a pointer moves. Arranged co-axially with this pointer is a second pointer that indicates whether the grab is open or closed. The pointers are geared to their respective hoisting drums.

The arrangement for stopping the Electric Motor when the grab operating cords or hoisting cords become slack consists of two Couplings arranged to traverse two 11½" Screwed drum Rods, which are geared to the hoisting and grab operating drum respectively. A Rod is pivotally mounted to the two couplings, and another Rod, rigidly attached to the first Rod, connects this to a switch unit that slides up and down two 11½" Rods. When one of the drums is overwound the Couplings tilt the Rods, causing the second Rod to move the switch arm, thus stopping the Motor. If the grab is raised or lowered too fast the current pick-ups for the switch run off their respective conductor rails. By pressing a switch another circuit is brought into operation, so that if the Motors are reversed the primary circuit can be brought into operation once more.



This realistic model racing car, built by S. Draper, uses Meccano parts for the chassis. It is fitted with a two-speed gear-box.

A NEAT SUCTION FAN FOR MODEL HOUSES

J. Arthur, Preston, recently submitted details of a model house that he has constructed. Every feature of its prototype is incorporated in the model, including an interesting air circulation scheme. Each of the rooms is fitted near the ceiling with a small suction fan, which is built up by enclosing a Fan (Part No. 157) inside a Boiler End. A 1½" Rod locked in the boss of the Fan passes through the centre hole of the Boiler End, and also through a Double Bent Strip bolted to it. In order to give the Fan blades sufficient clearance from the bolts holding the Double Bent Strip, the Fan is spaced by washers from the Boiler End. In addition to keeping the fan shaft central, the Double Bent Strip serves also to fasten the whole unit in position. A suction fan of this type would also be suitable for use in model printing presses, for lifting a sheet of paper and placing it into position in the press.

A DISC SANDER FOR WOODWORKERS

H. Willmott, Stockport, who is a keen woodworker, has constructed a small sanding machine that he uses for smoothing or truing up small pieces of wood. The sanding disc itself consists of a 6" diameter Circular Plate, to one side of which is glued a sheet of medium grade glass paper. The Circular Plate is secured by a Face Plate. The Rod is geared up from a Crank Handle journalled below it by a ½" Pinion and a 57-teeth Gear. The Shafting Standards can be bolted to a large Flanged Plate, or screwed down to the work bench.

A more compact machine of this type powered by an Electric Motor can be built up. It is necessary to transmit the drive through reduction gearing in order to provide sufficient power, and a speed of about 700 r.p.m. is suitable.

More Models for Keen Builders

Cargo Liner—Road Roller—Motor Lorry

ON this and the opposite page we illustrate and describe three new models of widely different types. They are a cargo liner, a road roller and a light motor lorry. The two first are built with standard Meccano parts only, but the motor lorry includes both standard Meccano parts and parts from a No. 2 Motor Car Constructor Outfit.

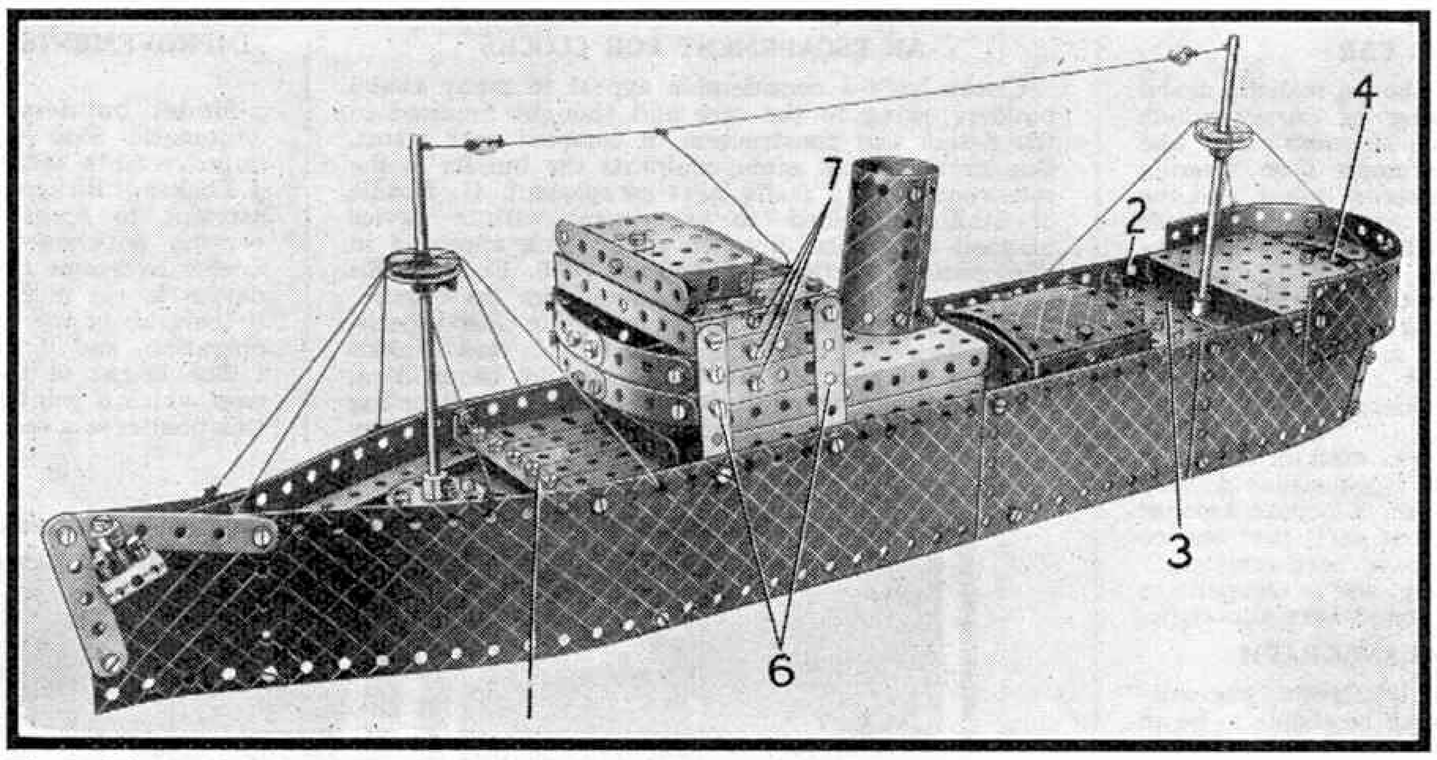


Fig. 1. A fine model of a cargo liner that is easy to construct. The hull is built from Flexible Plates and Strip Plates.

The cargo liner shown in Figs. 1 and 2 is best commenced by building up the hull. The base of the model consists of two $12\frac{1}{2}''$ Angle Girders joined at each end by a $3\frac{1}{2}''$ Strip. To each of the Angle Girders are then bolted a $12\frac{1}{2}'' \times 2\frac{1}{2}''$ and a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Strip Plate and a $4\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate, overlapping as shown to form the sides of the hull. The stern is made by bolting the ends of two $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates, bent to the shape illustrated, to the base of a Flat Trunnion 5, the opposite ends of the Flexible Plates being bolted to the sides of the hull. The upper part of the stern is formed by two $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates overlapped five holes and bolted in position one hole above the general level of the sides of the ship.

The sides are extended to form the bows by two $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates, the forward edges of which are bolted together, and the prow is built up of two 3" and two $2\frac{1}{2}''$ Strips bolted to the $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate. The anchor is formed from a Coupling, a Collar and three bolts.

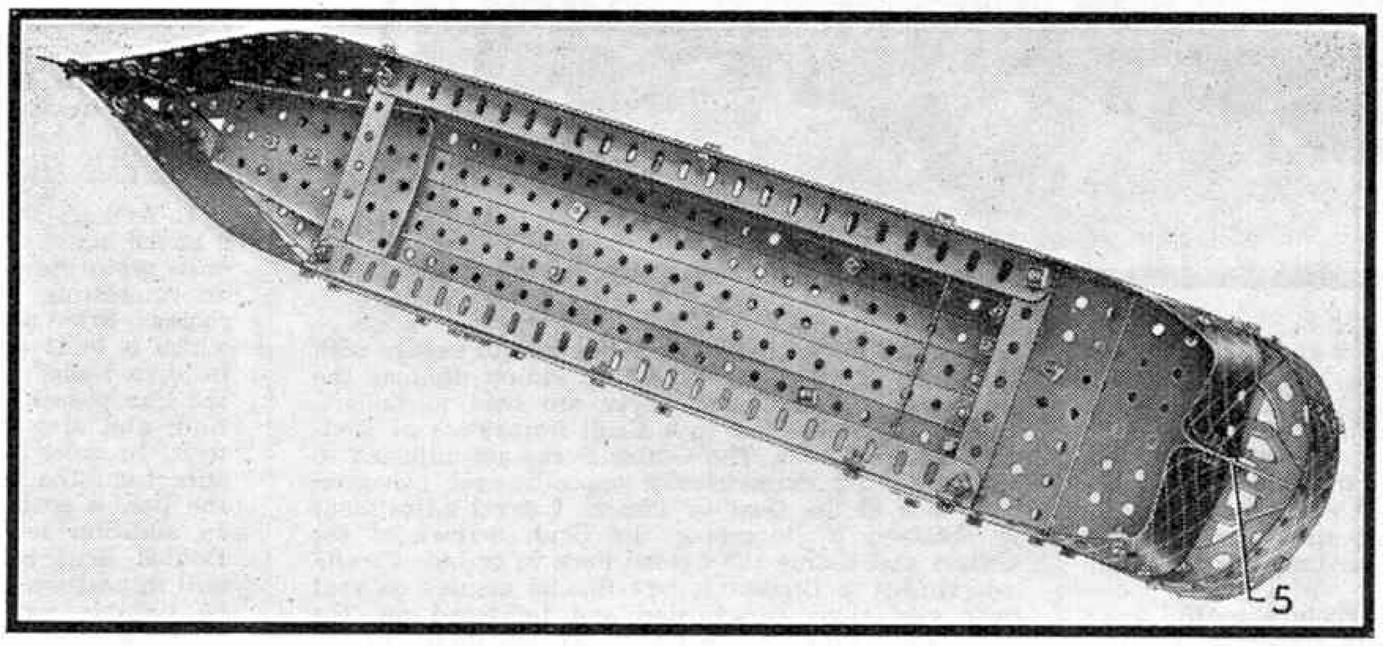


Fig. 2. An underneath view of the cargo liner, showing the construction of the deck.

The stern deck consists of a $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate, to one end of which is bolted a Flat Trunnion 4 and two $2\frac{1}{2}''$ small radius Curved Strips, the Flanged Plate being held by the same bolts as the $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates at the stern. The rear end of the main deck also is formed by a $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate 3 secured by two Angle Brackets 2 to the sides of the ship. The centre deck consists of two $12\frac{1}{2}''$ Angle Girders and five $12\frac{1}{2}''$ Strips, which are bolted at one end to the $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate and at the other to a $3\frac{1}{2}''$ Strip 1 fastened to the sides of the ship by Angle Brackets. A Flanged Sector Plate and two $5\frac{1}{2}''$ Strips are used for the fore-deck.

The main part of the superstructure is constructed by extending the sides of a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate downwards by $5\frac{1}{2}''$ Strips and the ends by $2\frac{1}{2}''$ Strips. The complete unit is then secured to the deck by a $1'' \times 1''$ Angle Bracket. The bridge is built up by bolting two $2\frac{1}{2}''$ Strips 6 to each side of the ship, as shown. The upper ends of these Strips are joined by two $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates overlapped three holes and carrying a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flanged Plate and a $3\frac{1}{2}''$ Strip. The sides of the wheelhouse are each formed by three $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips 7 joined by a $1\frac{1}{2}''$ Strip, and are secured in position by Angle Brackets. The rear ends of the Double Angle Strips are joined by small radius Curved Strips. The curved front of the bridge is made with two compound strips bent to shape and fastened to the forward $2\frac{1}{2}''$ Strips by Obtuse Angle Brackets. Each of the compound strips is formed by two $2\frac{1}{2}''$ Strips overlapped two holes. Two U-section Curved Plates, the ends of which are overlapped one hole, are used for the funnel.

The hatch is constructed by fastening two $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips to the deck by Double Brackets. A $1\frac{11}{16}''$ radius Curved Plate is bolted across the upper ends of the Double Brackets, and the ends of the Double Angle Strips are joined by large radius Curved Strips forming the ends of the hatch.

Parts required to build the model cargo liner: 5 of No. 1; 4 of No. 2; 4 of No. 3; 2 of No. 4; 12 of No. 5; 2 of No. 6a; 4 of No. 8; 2 of No. 10; 3 of No. 11; 10 of No. 12; 1 of No. 12a; 4 of No. 12c; 2 of No. 15; 2 of No. 22; 1 of No. 24; 105 of No. 37; 6 of No. 38; 8 of No. 48a; 1 of No. 48b; 1 of No. 51; 1 of No. 52; 2 of No. 53; 1 of No. 54a; 1 of No. 59; 1 of No. 62; 1 of No. 63; 2 of No. 90; 4 of No. 90a; 1 of No. 111; 4 of No. 111c; 1 of No. 115; 2 of No. 126a.

The novel motor lorry shown in Fig. 3 is fitted with an E6 Electric Motor. The bonnet and centre section are first built up of Motor Car Constructor parts, and the E6 Electric Motor is then secured in position by means of Angle Brackets, so that its side plates project one hole

behind the chassis.

The small Pinion 2 on the driving shaft of the Motor meshes with a 57-teeth Gear 3 on a 3″ Rod journalled in the Motor sideplates. The 3″ Rod carries also a $\frac{3}{4}$″ Sprocket Wheel 4, which is connected by Chain to a 1″ Sprocket Wheel on the rear axle. The axle is a 4″ Rod, journalled in the Motor, and is fitted at each end with a Wheel from the Motor Car Outfit.

A $5\frac{1}{2}$″ Angle Girder is bolted to the upper edge of each side of the Motor, and these support the platform, which consists of two $5\frac{1}{2}$″ × $2\frac{1}{2}$″ Strip Plates and two $2\frac{1}{2}$″ × $2\frac{1}{2}$″ Flexible Plates, arranged as shown and braced around the edges by Strips.

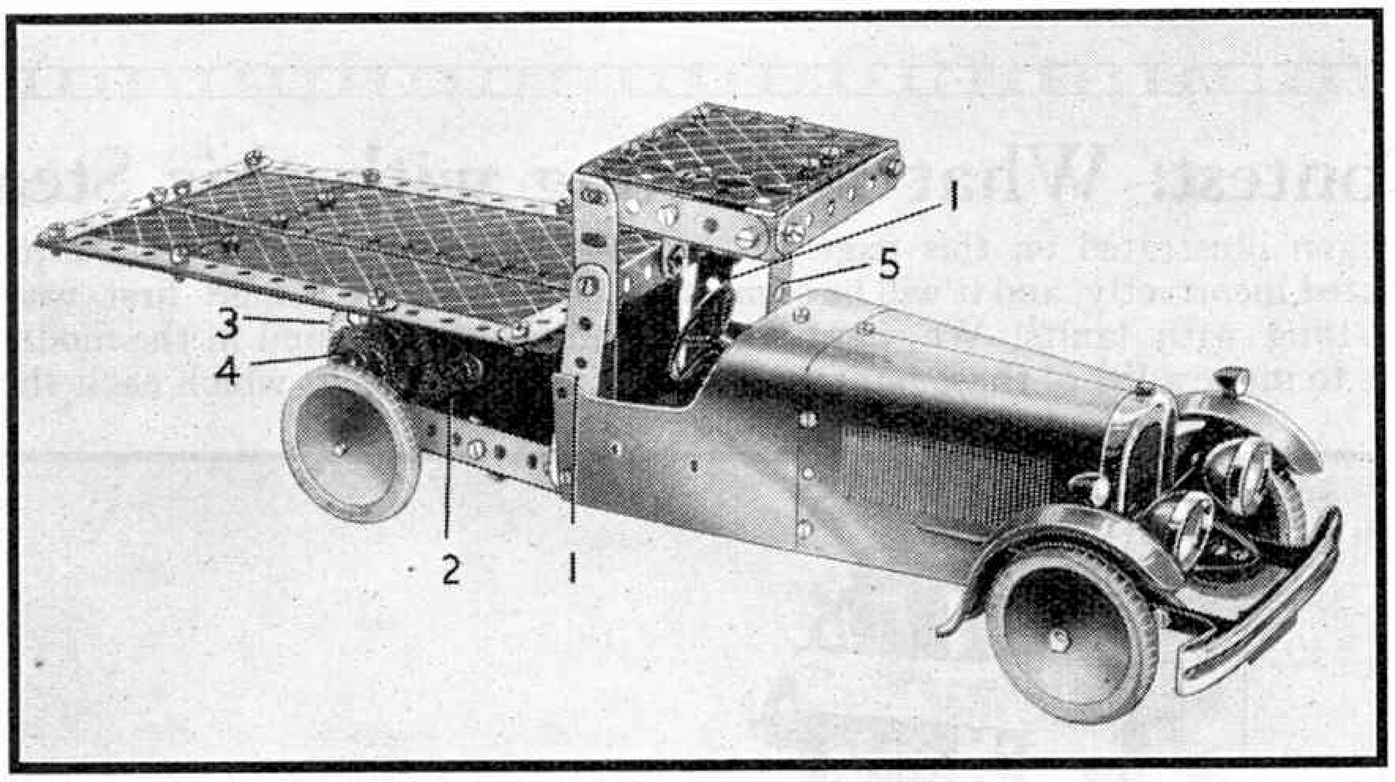


Fig. 3. This light motor lorry is constructed with parts from a No. 2 Motor Car Constructor Outfit and a few standard Meccano parts.

The cab is constructed by bolting a $2\frac{1}{2}$″ Strip 1, the upper end of which is overlapped two holes with a 2″ Angle Girder, to each side of the chassis. The upper and lower ends of the Angle Girders are joined by 3″ Strips, the space between the latter being filled by $1\frac{1}{2}$″ Strips, leaving a gap for the window.

The roof of the cab is formed by a $2\frac{1}{2}$″ × $2\frac{1}{2}$″ Flexible Plate and a $2\frac{1}{2}$″ × $1\frac{1}{2}$″ Flexible Plate overlapped two holes and is supported from the back of the cab by Angle Brackets. The sides of the roof are extended downwards by $2\frac{1}{2}$″ Strips, and the front by a 3″ Strip. The roof is supported from the bonnet by a $1\frac{1}{2}$″ × $\frac{1}{2}$″ Double Angle Strip 5.

Meccano parts required for the model motor lorry: 4 of No. 2; 2 of No. 2a; 3 of No. 3; 4 of No. 5; 2 of No. 6a; 2 of No. 9; 2 of No. 9e; 6 of No. 12; 1 of No. 15b; 1 of No. 16b; 1 of No. 27a; 4 of No. 59; 1 of No. 63; 1 of No. 94; 1 of No. 96; 1 of No. 96a; 4 of No. 190; 2 of No. 192; 1 E6 Electric Motor.

In the model road roller illustrated in Fig. 4, a No. 1 Clockwork Motor is used to form part of the chassis. The Motor is placed in a horizontal position, with the winding spindle upwards, and to the front of it two $2\frac{1}{2}$″ × $\frac{1}{2}$″ Double Angle Strips are bolted vertically. To the upper ends of the Double Angle Strips a Flanged Sector Plate is fastened by its wide end.

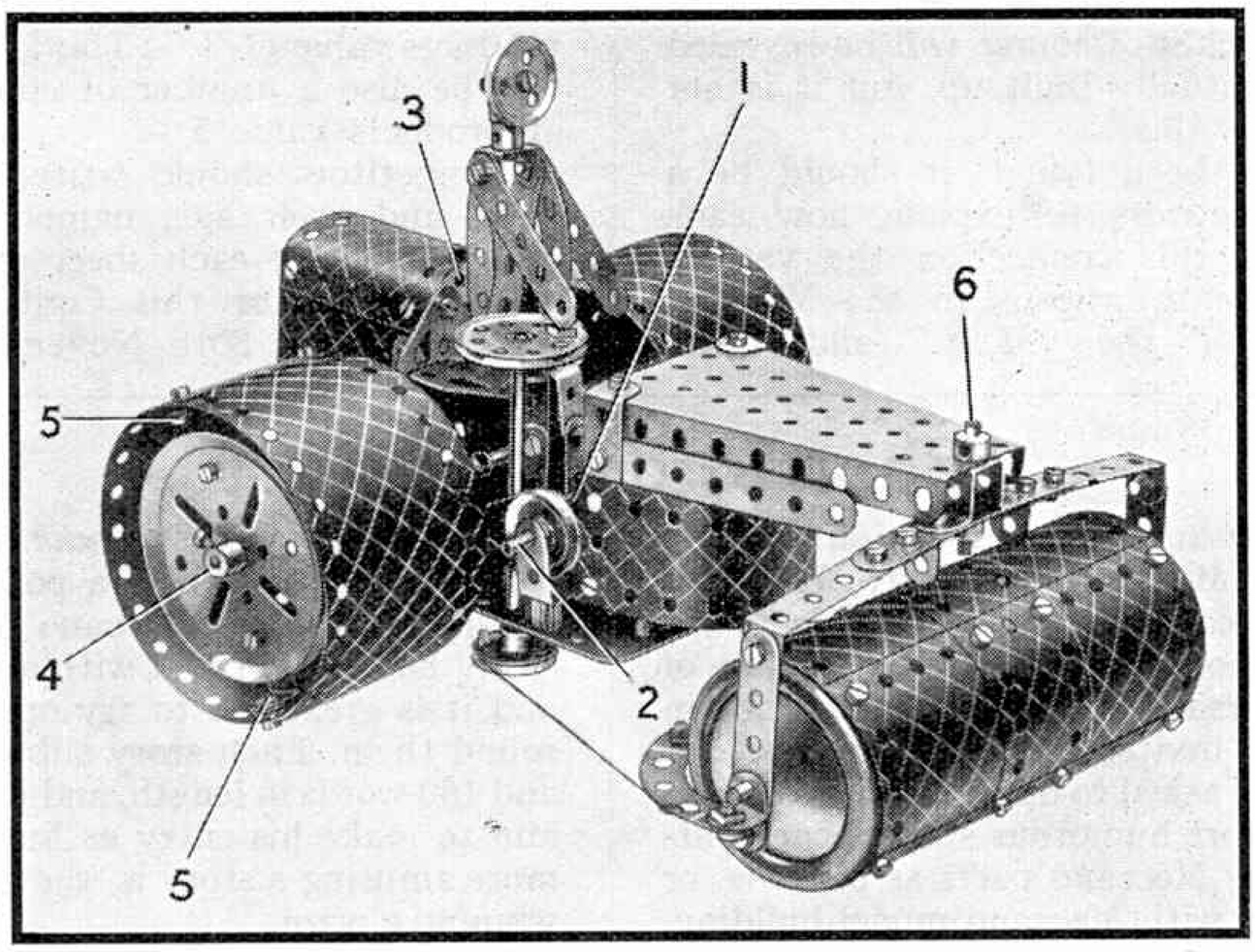


Fig. 4. An unusual and interesting working model of a road roller complete with driver.

The roller is built up from Flexible Plates of various sizes, and into each end of it is pressed a Road Wheel, through the bosses of which a $6\frac{1}{2}$″ Rod is passed to form an axle. The roller is mounted in a frame formed by joining the ends of two $2\frac{1}{2}$″ Strips by a compound $5\frac{1}{2}$″ double angle strip, which is built up by connecting two $2\frac{1}{2}$″ × $\frac{1}{2}$″ Double Angle Strips by a $2\frac{1}{2}$″ Strip. The lower ends of the two $2\frac{1}{2}$″ Strips are joined by a $5\frac{1}{2}$″ Strip and two small radius Curved Strips. A Double Bent Strip is bolted to the centre of the $6\frac{1}{2}$″ Double Angle Strip, and through the former passes the $1\frac{1}{2}$″ Rod 6 that secures the roller to the Flanged Sector Plate of the chassis.

Each of the rear wheels is constructed by bending a $12\frac{1}{2}$″ × $2\frac{1}{2}$″ Strip Plate to form a circle and then bolting together its ends. A 3″ Pulley is secured in the centre of the wheel by a $3\frac{1}{2}$″ × $\frac{1}{2}$″ Double Angle Strip 5, and the two wheels are mounted on a compound $8\frac{1}{2}$″ Rod 4 formed by fastening a 4″ and a $4\frac{1}{2}$″ Rod together by a Coupling. The rod is journalled in the ends of a $2\frac{1}{2}$″ × $\frac{1}{2}$″ Double Angle Strip fixed to the Motor by the two rear bolts securing the Motor sideplates.

A Worm on the driving shaft of the Motor meshes with a $\frac{1}{2}$″ Pinion 1 on a $3\frac{1}{2}$″ Rod 2, which is journalled in the ends of a $2\frac{1}{2}$″ × 1″ Double Angle Strip bolted to the upper Motor sideplate. A 1″ fast Pulley on the end of the Rod is connected by a Driving Band to a second 1″ Pulley on the rear axle.

A $1\frac{1}{2}$″ Pulley fitted with a Threaded Pin for a handle is used for the steering wheel. The Pulley is locked on the end of a 4″ Rod that passes through the sideplates of the Motor, and is held in position by a Collar and a 1″ Pulley. Cord tied to one end of the frame holding the roller is wound several times around the 1″ Pulley, and finally is tied to the other end of the roller frame.

The engine housing is situated at the rear of the machine, and is constructed by joining two $2\frac{1}{2}$″ × $2\frac{1}{2}$″ Flexible Plates by a $1\frac{1}{2}$″ × $\frac{1}{2}$″ Double Angle Strip. The back of the casing is a $2\frac{1}{2}$″ × $1\frac{1}{2}$″ Flanged Plate and the top a $1\frac{11}{16}$″ radius Curved Plate. A Bush Wheel 3 is fastened by an Angle Bracket inside the front arch of the Curved Plate.

Parts required to build the model road roller: 1 of No. 2; 3 of No. 3; 4 of No. 5; 2 of No. 6a; 6 of No. 12; 2 of No. 12a; 1 of No. 15; 1 of No. 15a; 2 of No. 15b; 1 of No. 16; 1 of No. 17; 1 of No. 18a; 2 of No. 19b; 1 of No. 20; 4 of No. 22; 1 of No. 24; 1 of No. 26a; 1 of No. 32; 1 of No. 35; 64 of No. 37; 9 of No. 38; 1 of No. 45; 1 of No. 46; 1 of No. 48; 8 of No. 48a; 1 of No. 48b; 1 of No. 51; 1 of No. 54a; 4 of No. 59; 2 of No. 63; 2 of No. 90; 4 of No. 90a; 1 of No. 111; 1 of No. 115; 1 of No. 126; 1 of No. 126a; 1 of No. 165; 1 of No. 186; 2 of No. 187; 2 of No. 188; 2 of No. 189; 4 of No. 190; 2 of No. 192; 2 of No. 197; 1 of No. 199; 2 of No. 200; 1 No. 1 Clockwork Motor.

Two Novel Meccano Competitions

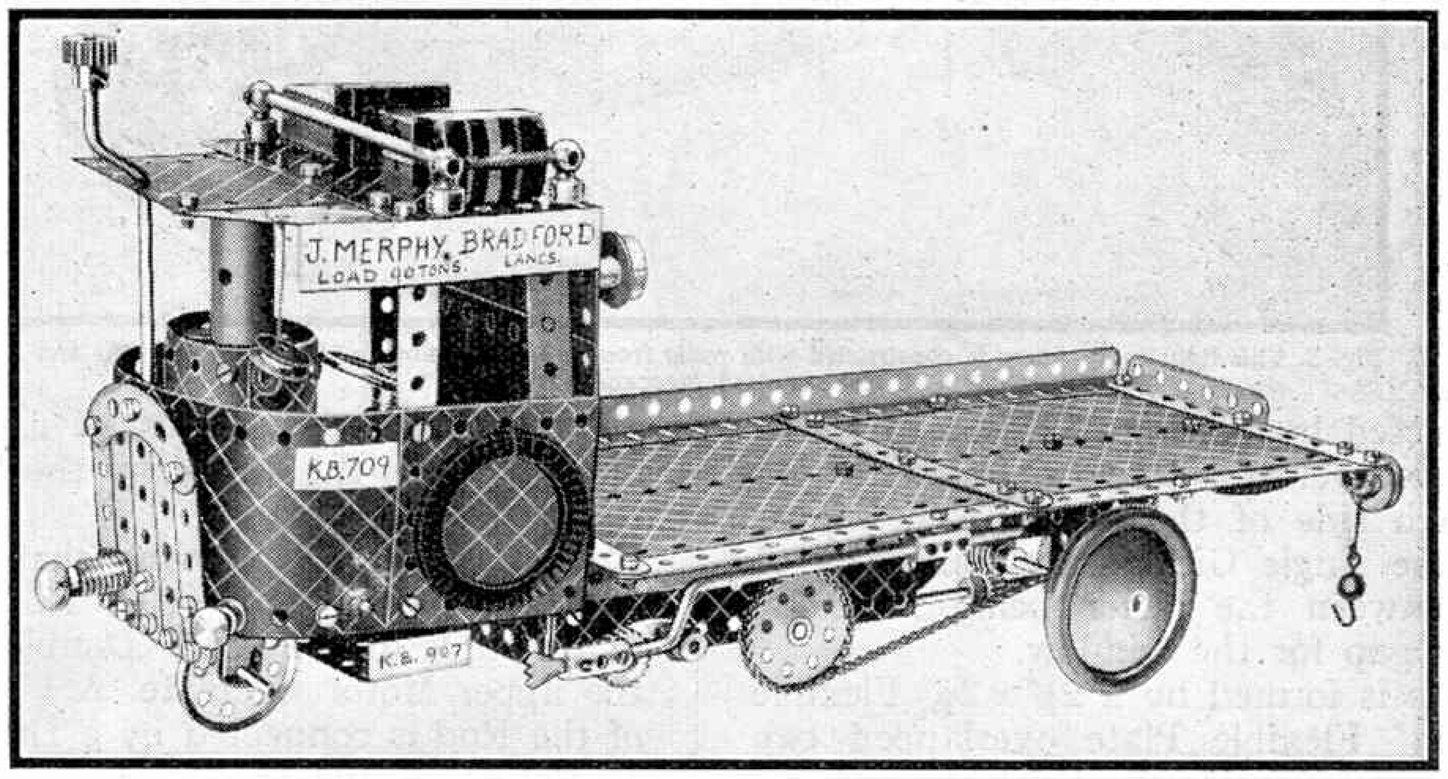
"Errors" and "Short Story" Contests

"Errors" Contest: What is Wrong with this Steam Wagon?

The model steam wagon illustrated on this page has been purposely constructed incorrectly, and it will be seen that it is literally bristling with faults. We want all Meccano model-builders to make a list of these faults and send it in to us, together with their own opinions as to the way in which the construction of the model should be corrected.

A glance at the illustration will show that two definite types of mistakes have been made in building the steam wagon. The first is the incorrect use of Meccano parts; the second concerns the design and equipment of the model, and the errors of this type should be quite obvious to every reader. All the mistakes of course will be revealed readily if the model is actually built up, but it is not absolutely necessary to do this.

When the errors have been found, it should be a simple matter for competitors to explain how each should be corrected. In this connection the various illustrations of model steam wagons in the Manuals of Instructions, issues of the *"M.M."* and other Meccano publications should prove helpful.



Readers who can find the greatest number of errors in this model steam wagon will win handsome prizes.

Competitors should first write out a list of all the faults they can find in the model, and a brief description of the manner in which each should be corrected should then be given on a separate sheet of paper.

The prizes will be awarded to the entries listing the greatest numbers of errors and giving the clearest account of the corrections to be made.

There will be one section only, and competitors of all ages, and living in any part of the world are eligible to compete. The prizes to be awarded are as follows: First, Meccano or Hornby products value £2/2/–; Second, products value £1/1/–; Third, products value 10/6. There will be also a number of consolation prizes, consisting of products value 5/–.

Competitors should write on one side of the paper only, and their age, name and address must appear on the back of each sheet of paper sent in.

All entries for this Contest must reach Liverpool not later than 30th November, 1937.

"Short Story" Contest

Here is a fascinating and amusing competition in which every reader of the *"M.M."* can take part. It is not necessary to possess a Meccano Outfit to be eligible for the Contest, and there is no model-building to do. A range of fine prizes is offered, and readers of any age and living in any part of the world are invited to send in entries.

All that competitors are asked to do in this contest is to write on a post-card a short humorous story incorporating the names of as many Meccano parts as possible, or terms used in connection with Meccano model-building.

The following short story is given as an example, the names of Meccano parts being printed in italics: "The other day *Pawl*, the idol of motor racing *Fans*, entered his home-made car to race for the *Hinged Flat Plate*. The steering *Gear* of the car was so *Eccentric*, however, that halfway round the *Circular Strip* of the track he struck an old *Buffer* in the *Eye Piece* with his *Headlamp*, and knocked him into a *Spring*. 'I'll *Pulleys Nut* off,' yelled the *Buffer*, and then gave *Pawl* a *Clip* over the *Nut*. *Pawl* let go the *Steering Wheel*, and the car *Bolted* down the *Centre Fork* of the road and through a row of *Handrail Supports*. 'If that's the way that *Crank Handles* a car, he must have his *Driving Band*,' said a policeman standing near by."

There are many Meccano parts with names that can easily be incorporated with amusing stories of this kind, and it is great fun to try one's skill in weaving a yarn round them. Each story submitted must be between 50 and 150 words in length, and it should be the competitor's aim to make his entry as humorous as possible, for the more amusing a story is, the greater will be its chance of winning a prize.

Competitors may send in as many different stories as they wish, provided that each story is within the required limits of length. No competitor will be awarded more than one prize, however, and if two or more stories are submitted they will be judged on their joint merits.

There will be one Section only, and the prizes will be: First, Meccano or Hornby products value £2/2/–; Second, products value £1/1/–; Third, products value 10/6.

Entries should be addressed "Meccano Short Story Contest," Meccano Ltd., Binns Road, Liverpool 13, and must reach Liverpool on or before 30th November 1937.

Model-Building Competition Results

By "Spanner"

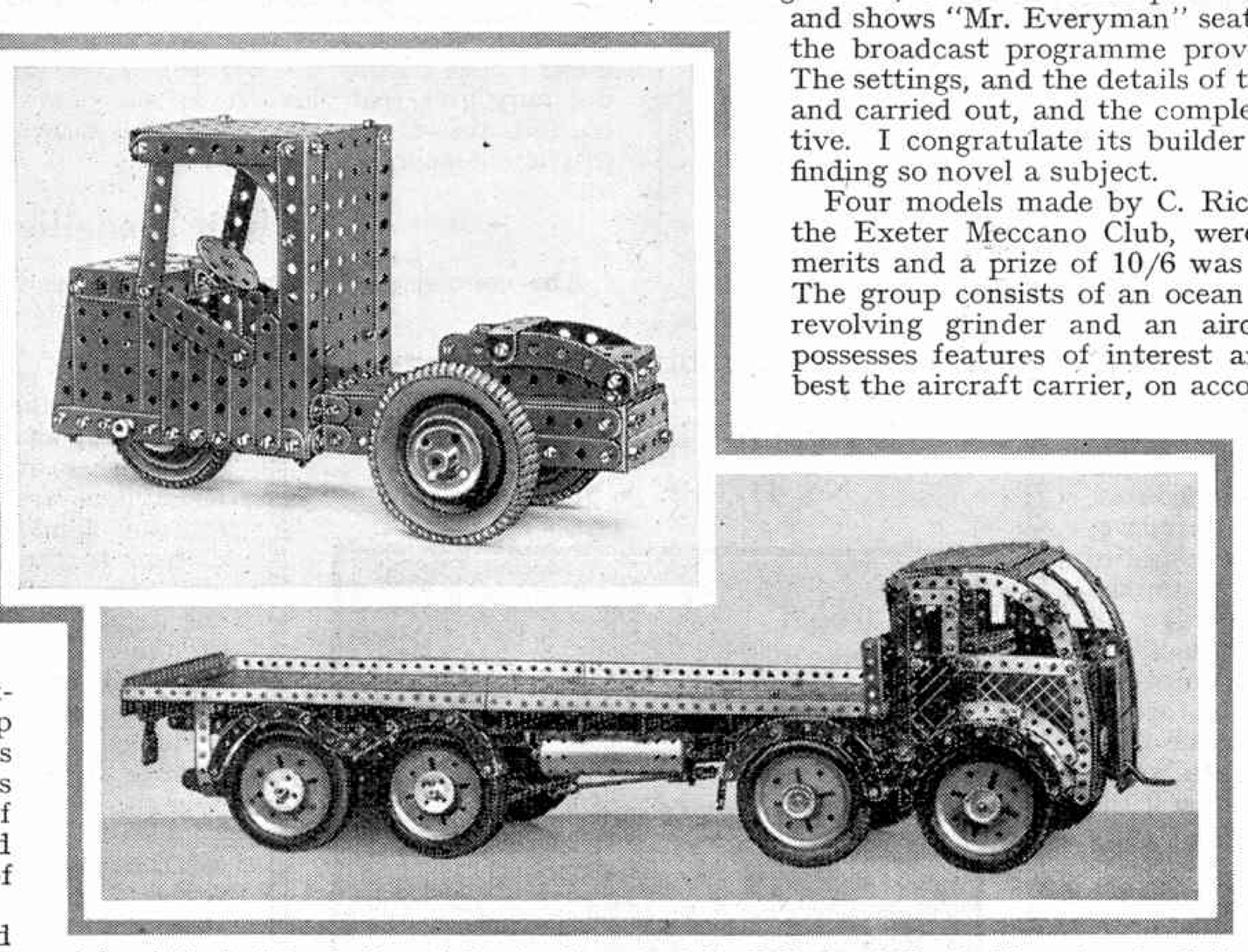
March "General" Contest (Home Section)

The complete list of prize-winners in the March "General" Model-building Competition (Home Section) is as follows:

1st Prize, Meccano or Hornby products value £3/3/–: E. Macdonald, Bramley, Leeds. 2nd, products value £2/2/–: G. Pearce, Woodford, Ches. 3rd, products value £1/1/–: P. Wickham, Leicester.

Products value 10/6: J. Nowlan, St. Pauls Cray, Kent; C. Richards, Exeter; C. Clayton, Hucknall, Notts.; B. Adair, Maryport; J. Elliott, Leeds.

Products value 5/–: K. Warner, Slough; C. Rogers, Camberley; W. Craik, Perth; N. Jones, Rhyl; H. Adams, Exeter.



A fine eight-wheeled motor lorry designed and constructed by E. Macdonald, Leeds. The neat and realistic appearance of the model earned for it the First Prize in the March "General" Contest. Inset is a simple mechanical horse built by W. Craik, Jeanfield, Perth.

The model that won First Prize for E. Macdonald is an eight-wheeled transport lorry. Although the subject lacks originality, the model was considered worthy of the honour bestowed upon it on account of its remarkably neat workmanship and the truthfulness with which it reproduces the essential features of its prototype, coupled with a large amount of detail work.

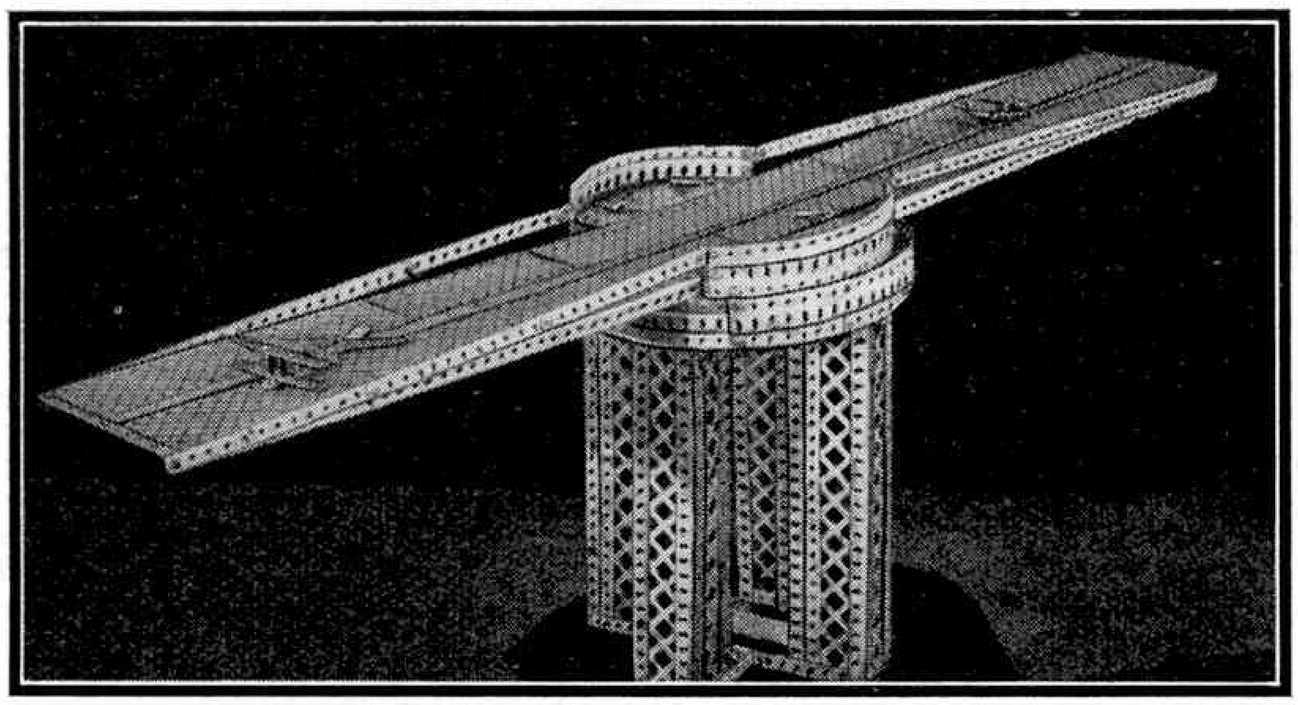
The lorry is illustrated on this page. It is fitted with most of the equipment usual in a vehicle of its type, and has Ackermann steering applied to four wheels, a clutch, a standard three-speed and reverse gear-box, and a differential. It is fitted also with six-wheel brakes and springs on each wheel. The rear bogie is pivoted on a single Rod, each pair of wheels being connected by radius rods fitted to the chassis. There are oil and vacuum tanks, and a representation of a servo brake system by means of which the brakes can be operated from the cab.

The model that was successful in obtaining Second Prize shows more enterprise in choice of subject, but is not quite so interesting as the First Prize model so far as detail is concerned. It represents a train ferry steamer, and its outstanding attractions are solidity and sound construction. This model is the work of G. S. Pearce, Woodford, Cheshire, and is one of the best of its kind that I have seen in any recent contest.

I have had the privilege of examining many thousands of entries in Meccano competitions, and while I am interested in every model submitted I always keep a keen look-out for models that are off the beaten track so far as the subjects they represent are concerned. I am glad to say that in the present contest I found several fine models that fell into this class. One of them was considered by the judges to be worthy of Third Prize, and on giving it my usual careful examination I fully agreed with their decision. The model is entitled *"Both Sides of the Microphone"* and actually is in two parts, one of which consists of a Meccanitian singer and a 'cellist performing before a microphone in a broadcasting studio, while the other part represents a room in a house and shows "Mr. Everyman" seated in his armchair enjoying the broadcast programme provided by his radio receiver. The settings, and the details of the figures, are well arranged and carried out, and the complete assembly is most attractive. I congratulate its builder P. Wickham, Leicester, in finding so novel a subject.

Four models made by C. Richards, who is a member of the Exeter Meccano Club, were considered on their joint merits and a prize of 10/6 was awarded to their builder. The group consists of an ocean liner, an ashphalt mixer, a revolving grinder and an aircraft carrier. Each model possesses features of interest and is well-built, but I like best the aircraft carrier, on account of the particularly neat manner in which its spacious decks are constructed. There is little minute detail work in the model, for this competitor prefers to build on broad lines, trusting to solid well-proportioned masses to produce the desired effect. I shall illustrate one of his models in the *"M.M."* when a suitable opportunity occurs.

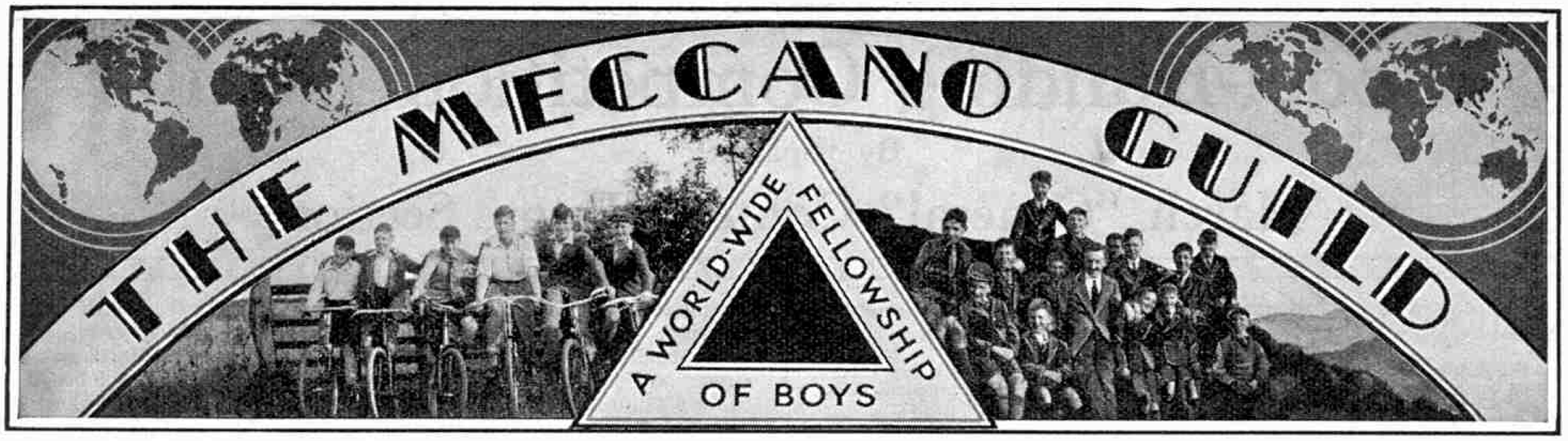
On the cover and also on page 70 of the *"M.M."* for February last appeared illustrations of a suggested rotary aerodrome of the future. These provided H. A. C. Adams, also a member of the Exeter Meccano Club, with the idea for the model that he entered for this contest and which is illustrated on this page. He has endeavoured to copy, as closely as possible, the details of the airport shown in the illustrations referred to, and in this respect has been successful, his model being both neatly and solidly built.



A model of a rotary aerodrome of the future. It was built by H. A. Adams, a member of Exeter Meccano Club, and is based on the cover illustration of the February, 1937 "M.M."

A model that possesses originality combined with simplicity and careful workmanship is the mechanical horse also illustrated on this page. There is nothing elaborate in the construction of the model, and its success is due to its undoubted realism, an achievement of great importance in view of the few and simple parts with which it is built. Willie Craik of Jeanfield, Perth, submitted this model, and I hope he will continue to participate in these contests for I think his work shows great promise, and will meet with further success.

Another original model entered in the competition represented an electric shovelling crane. It was built by N. Jones, Rhyl. Unlike most shovelling cranes, the jib possesses only one arm. The shovel, which is fitted with a hinged bottom, moves up and down this arm, an arrangement that renders the crane very easy to handle. All the controls are grouped at an easily accessible point inside the cab, which revolves on an ingenious roller bearing.



Preparing for the Winter Sessions

In most Meccano clubs this month marks the change from the second Summer Session, with its many outdoor events, to the first Winter Session, in which indoor activities are the general rule. The early days of September therefore find Leaders and club officials busy making plans for indoor work, and deciding upon the policy to be followed in order to make their clubs even more successful than in the past.

It is important that the three great objects of the Guild should be kept clearly in view when drawing up the club programme. These objects are: to make every boy's life brighter and happier; to foster cleanmindedness, truthfulness, ambition, and initiative; and to encourage boys in their studies and hobbies, and particularly in the development of their knowledge of mechanical and engineering principles. The arranging of interesting meetings of all kinds ensures jolly times for the members, and lays the foundation for the growing confidence between members and officials that is necessary if the objects of the Guild are to be fully achieved.

The compiling of the programme for the new Session should be made the subject of a club conference held in advance of the official opening of the Session, so as to allow time for the arrangements decided upon at the conference to be completed. Members should be invited to make suggestions for new schemes or the improvement of old ones, and it will save time if those with bright ideas are asked to explain these to the Leader beforehand, so as to give him an opportunity of considering all suggestions in readiness for the meeting. When every member takes part in the shaping of the club programme, either in this way or by taking part in the conference, all feel that they are really useful and valued units in club life.

Not all the new ideas put forward will receive the approval of the majority of the members. In any case it is unwise to make too many innovations in any one Session, for this may tend to upset the balance of the programme, and the trial of promising suggestions not adopted can well be postponed until a later session.

Membership Cards and Report Forms

Now is the time for secretaries to overhaul their stock of club literature. I shall be glad to forward supplies of membership and subscription cards to all secretaries who are in need of them. Supplies of report forms are being sent to all affiliated clubs, as in the past, and any secretary who does not receive his copies during the next few days should let me know.

I am pleased to say that good use is made of the majority of the report forms sent out, but there are still some clubs that do not seem to have realised the valuable publicity to be gained by sending in regular detailed reports for reference in the *"Club Notes"* page of the *"M.M."* The accounts published on that page not only give real pleasure to the members of the clubs referred to, but also attract the attention of other Meccano boys in the districts concerned.

Merit Medallions

The conclusion this month of the second Summer Session will enable Leaders to let me have their nominations for Merit Medallions earned this Session or during the summer. I therefore take this opportunity of mentioning again that in every affiliated club, either at home or overseas, two Medallions are available each Session for any kind of good service to the club or to the Guild movement generally. The written recommendation of the Leader is sufficient, and the names of the members concerned are then inscribed on their Medallions, which are forwarded to the Leader for presentation. A special list of these coveted awards is published annually on this page.

More Members Means More Fun

The beginning of the Winter Session is a very good time to make special efforts to increase the club membership, and a general recruiting campaign now will enable many new members to be enrolled in time for them to enjoy the full programme of the Winter Session. I shall be delighted to send supplies of the Guild Leaflet for this purpose. This Leaflet explains the aims and organisation of the Guild, and carries on the back an application form to be filled in and signed by the recruit.

When passing Guild Leaflets to club members, officials should impress upon each the importance of writing his own name and address at the top of his forms. The members concerned are then credited with the recruits they have enrolled, and so in time qualify for Recruiting Medallions.

If every member takes part in the recruiting campaign its success should be assured, for if each obtains only one recruit the club membership will be doubled. More members means more income and, what is even more important, more fun; and no effort should be spared to increase club strength by vigorous recruiting.

Numerical strength is not everything, however, and discretion is as necessary in recruiting as in any other worth-while pursuit. One earnest member full of zeal is worth a dozen recruits who are content simply to attend meetings irregularly and make very little effort to display initiative or resource. Before enlisting any likely recruit a member therefore should make sure that he will be an asset to the club. The keen campaigner should also bear in mind that it is not enough merely to enrol a new member and introduce him to the rest of the club. He must continue to keep an eye on his recruit in order to see that the latter becomes thoroughly at home and is made familiar with every branch of the club's activities.

Meccano Club Secretaries

No. 41. Mr. A. J. Piejus

J. A. Piejus is the secretary of the Winchmore Hill Collegiate School M.C. Model-building and Hornby Train operations figure prominently in the club programme, and the many other activities carried on include film shows, model aeroplane and speed boat racing, and visits to places of interest.

The Beeches (Jersey) M.C.—Cricket, bathing, and visits to places of interest are giving the members opportunities of enjoying themselves out-of-doors. A visit to the printing works of the Commercial Art Company, of Jersey, proved especially interesting, and at the close each member was presented with a souvenir. A Correspondence Club has been started, and several of the members are corresponding with pen-friends in New York. Club roll: 21. *Secretary:* J. A. Gardner, De La Salle College, The Beeches, Jersey, C.I.

Winchmore Hill Collegiate School M.C.—A full summer programme is being carried out. The newly-formed Aero Section is doing well, and some exciting air races have been held on the School playing fields. A visit to the aerodrome and factory of the de Havilland Aircraft Company at Hatfield proved very fascinating, and members were greatly interested in the various types of D.H. aeroplanes under construction. The Meccano Section continue to be very busy, and a recent Model-building Competition produced some excellent entries, outstanding ones being a vertical lift bridge and a large cine-camera. A Model Speed Boat Racing Section has been formed. Club roll: 36. *Secretary:* J. A. Piejus, 22, Woodland Way, Winchmore Hill, Londo N.21.

Sid Vale M.C.—Model-building activities have included a Coronation Contest, in which excellent models of Royal coaches, thrones and Coronation regalia, were completed. In addition a Coronation model was built of "*The Royal Glen*," a Sidmouth hotel that bears the Royal Coat-of-Arms, and this was floodlighted by means of red, white and blue electric lamps. This attractive model was subsequently displayed in a Sidmouth Meccano dealer's shop window. Outdoor activities consist of rambles and cricket matches, and both are being greatly enjoyed. Club roll: 20. *Secretary:* L. R. L. Gliddon, Sheffield House, Sidmouth.

Hornsea M.C.—Indoor meetings have been devoted chiefly to Lectures and Games, and have been well attended. On one occasion P. Richardson, the club Engineer, gave a talk on his visit to Catfoss Aerodrome, and illustrated it with pictures from a book. Club roll: 18. *Secretary:* P. Thom, 5, Alexandra Road, Hornsea.

Stratford Public Libraries M.C.—Members have been engaged chiefly in summer activities, such as cricket, swimming, and water polo. Occasionally Model-building meetings have been held, however, and outstanding models completed have been a travelling jib crane, an airship mooring mast and a mechanical shovel. One meeting was devoted to constructing unusual models, and those completed included a cricket bat, comb, electric bell, and the word "Meccano" very ingeniously built up of small Meccano parts. Club roll: 31. *Secretary:* Miss F. Scattergood, Public Library, Technical Institute, Stretford Road, Old Trafford, Manchester, 16.

Coloured Mission (Cardiff) M.C.—Steady progress is being made, and two new members have been enrolled. Keen interest is taken in Meccano model-building, and a fine motor-driven crane has been completed. The jib was 3½ ft. in length, and the motive power was provided by a No. 2 Clockwork Motor. Attention has now been turned to the construction of a motor lorry. Club roll: 13. *Secretary:* D. H. Binstead, 37, Penhill Road, Llandaff, Cardiff.

Holy Trinity (Barnsbury) M.C.—The main features of last session were the Annual Concert, four visits and two outings. One of the visits was to the Kenview Model Railway Club, another to the L.N.E.R. locomotive sheds, and a third to the Royal Mews, where the members, guided by an equerry of the Royal household, viewed the stables and in particular the Coronation Coach. A visit also was paid to the Exhibition of the Islington M.C. Chingford and Elstree were the scenes of the Easter and Whitsuntide outings respectively. A comparatively new idea, which proved very successful, was that of introducing a Meccano Sunday, when a church service was addressed particularly to the Club members. Various cricket matches and swimming outings have been held and have been thoroughly enjoyed by the members. Club roll: 20. *Secretary:* Mr. H. C. Boys, 12, Stonefield Mansions, Cloudesley Square, London, N.1.

Great Baddow M.C.—Early in the Session the members voted in favour of all summer meetings being held out-of-doors, and recent club activities have therefore been of an outdoor character. Games played have included cricket, rounders, and baseball. One cricket match, between the club and the Storekeepers' team, had a very thrilling finish, the club being defeated by the narrow margin of six runs. At one meeting a "chalk chase" was held, during which the 'hares' set a hard run of about five miles. Club roll: 25. *Secretary:* K. J. Avis, 5, Crescent Road, Great Baddow.

Islington M.C.—Meetings have been well attended and the standard of model-building continues to be very high. Members are always seeking new subjects for their model-building, and they are always willing to try experiments with Meccano parts. At one meeting a very neat model steam engine was built by a member. The club Outing this year will be to Southend, and the Islington H.R.C. Branch also will take part in it. The Secretary will be pleased to hear from any local Meccano enthusiasts who would like to join the club. Club roll: 15. *Secretary:* A. D. Straker, 48, Onslow Gardens, Muswell Hill, London, N.10.

Officials and members of the Mount Senior Boys' School (Newark) M.C. This club was affiliated in October 1936, and during its first year it has concentrated on Meccano model-building and Hornby Train operations. It has been visited several times by the local education authorities, who are pleased with the good progress that has been made.

St. Stephens (Saltash) M.C.—Intensive model-building activity continues. The construction of the model liner "*Queen Mary*" is making good progress, and a start has been made upon two American destroyers. The finishing touches are being put to the model of Millbay Station, and printed paper sheets of "stonework" have been fixed in position. The model of Gatwick Airport is well in hand, and other aeronautical models under construction are a D.H. "Dragonfly" and a Vickers-Supermarine "Walrus" amphibian. A short period at each meeting is devoted to Games. Club roll: 9. *Secretary:* B. Braund, 9, Homer Park, Saltash.

AUSTRALIA

Maylands M.C.—The club staged a splendid models display at the West Australian Industries Fair, and the many fine models on view were greatly admired. During the Exhibition blindfold model-building contests were held, and they proved a great attraction. The club has been visited by Mr. E. G. Page, of E. G. Page and Company, the Australian agents of Meccano Ltd., who in a talk to the members gave a brief outline of the history of Meccano. During an inspection of models Mr. Page solved many of the model-building problems of members. The Stamp Collecting Section is conducted by Mr. Jackson, an experienced philatelist, and a meeting is held every fortnight. The Parents Committee have organised a Jumble Sale to raise funds for the extension of the club premises, as many applications for membership have been received, some from boys living eight miles from the clubroom. Club roll: 26. *Secretary:* M. Thomson, 17, Kennedy Street, Mayland, Western Australia.

EGYPT

The Zagazig M.C.—A recent Model-building meeting was devoted to a Ship Competition, and excellent models of various types of ships were built. Some very interesting Outings have taken place. One was a sail on the Ismailia Canal, followed by tea and a round of miniature golf during which the President was heavily defeated! A visit to a signal cabin at Zagazig was greatly enjoyed. A series of Lectures on scientific subjects was given by the Leader during the recent summer holidays. On another occasion a talk on "*Learning how to Swim*" was followed by a very interesting discussion. Club roll: 22. *Secretary:* Miss B. Mangourie, 37b, Gannabiet Sikka Hadid Avenue, Zagazig.

ITALY

Milan M.C. —The President recently gave an interesting Lecture on "*A Visit to a Naval Dockyard*," illustrated by means of excellent photographs. Tennis, basketball and other open-air games continue to be very popular. A Table Tennis match between the club and the Milan H.R.C. Branch was won by the latter after a very keen contest. A "Sympathisers" branch has been formed for the friends of members and other boys who cannot be enrolled in the Club because they do not possess a Meccano Outfit. These sympathisers soon become so interested that they obtain an Outfit, and thus qualify for membership. Club roll: 14. *Secretary:* E. Vigo, Corso Geneva 19, Milan.

NEW ZEALAND

Ashburton M.C. — Further visits have been exchanged with the Christchurch M.C., and several members attended the birthday party of the latter organisation. It has been decided to publish reports of club activities in a local newspaper and in one published at Christchurch. Club roll: 27. *Secretary:* Mr. C. H. Rollinson, 89, Eton Street, Ashburton, N.Z.

Christchurch M.C.—The eighth Birthday Social was held in the Navy League Hall, and was attended by almost 100 people, including a party of 16 members of the Ashburton M.C. The event was one of the most successful ever held by the club. Some very fine models were on view during the evening. The Ashburton members gave a dramatic sketch, and other items greatly enjoyed were a display of conjuring, and musical contributions by the Shapcott Mouth-Organ Band. At supper Mrs. McKenzie, who had presented the birthday cake, was called upon to cut the first slice. Prizes were presented for the year's work, and a special Merit Medallion was presented to Mr. R. A. Handisides, until recently the President. Club roll: 31. *Secretary:* L. P. Chapman, 24, Braddon Street, Christchurch, S.W.I., New Zealand.

SOUTH AFRICA

Malvern M.C.—At one meeting a very interesting talk on "*Facts of Ancient Engineering*" was given. On another occasion the juniors took charge after the business of the meeting had been completed, and Games were played. Some excellent brief sketches were given by the juniors. Club roll: 68. *Secretary:* C. Courtis, P.O. Box 8, Cleveland, South Africa.

Southern (South Africa) M.C.—This club, formerly known as the Continental (S.A.) M.C., is making good progress and the membership is increasing. Particular attention is being given to Model-building. Club roll: 10. *Leader:* Mr. R. H. Moodley, 10, Stirling Street, Capetown, South Africa.

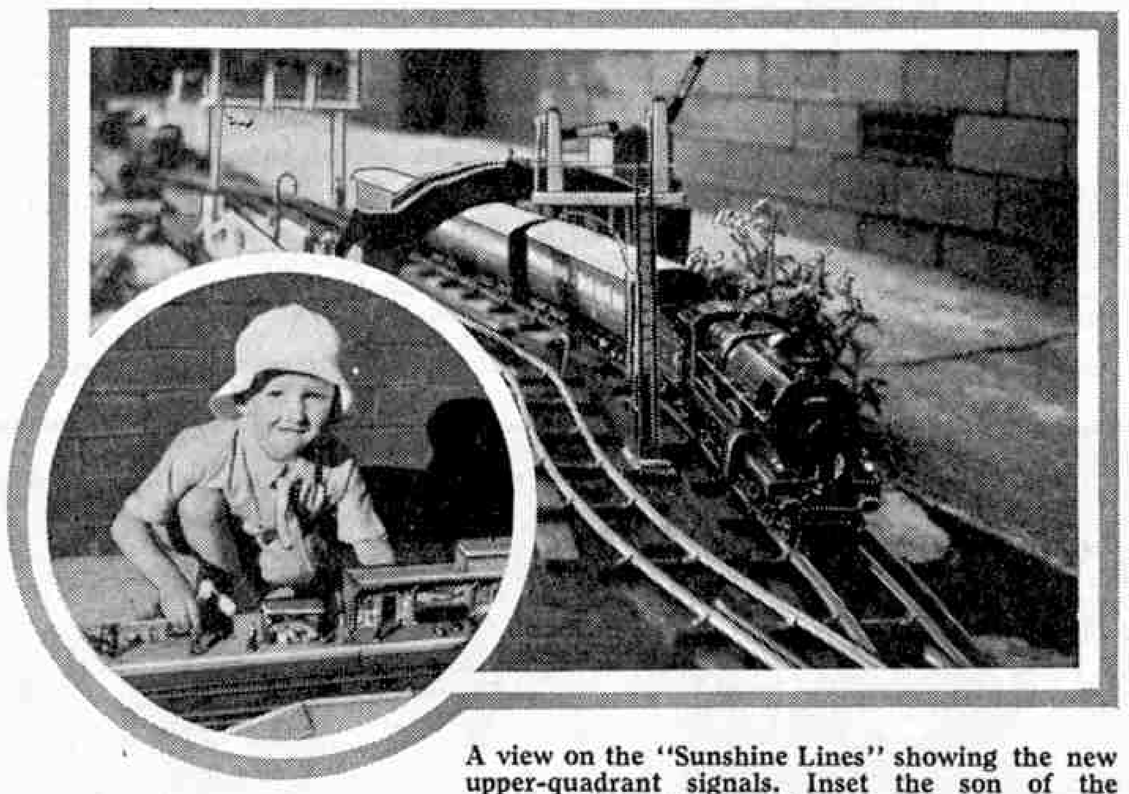
Progress on the "*Sunshine Lines*"

Additions to an Outdoor System

By "Roscoe"

IN the June 1936 issue of the "*M.M.*" there appeared an account of an outdoor miniature railway system known as the "*Sunshine Lines*." This title was chosen because the line was installed out of doors in order to allow of the enjoyment of train operation and summer weather at the same time. Since that article appeared a great deal of work has been carried out in general maintenance and improvement of the line, and various additions have been made to the equipment.

An outdoor system can add considerably to the charm of a garden, and from the railway point of view there is a great advance in realism over an indoor line by reason of the natural surroundings. On the other hand, the "engineer" of an outdoor miniature railway is constantly engaged in a struggle against the elements, as is his professional brother in real practice. Even with first-class construction at the outset there is always a certain amount of maintenance work to be done. Rain and sun take their toll of the woodwork of the foundation, and make it necessary to adjust the levels from time to time; and buildings have to be painted, and fresh creosote or other preservative applied to the foundation structure.



A view on the "Sunshine Lines" showing the new upper-quadrant signals. Inset the son of the "General Manager" is seen at work.

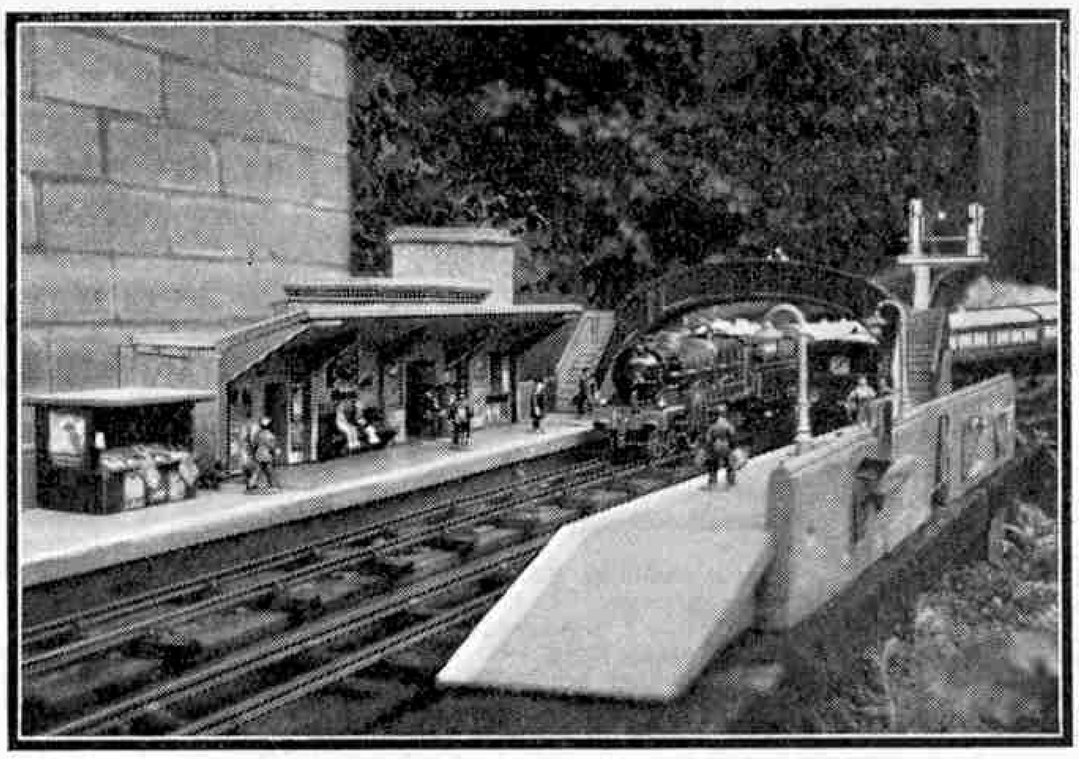
The track itself, just like real track, gradually deteriorates. On the "*Sunshine Lines*" various sections of steel track with which the line is laid have had to be completely renewed owing to rusting. Points also have required readjustment, as the conditions outside are rather severe on their working parts, which are small.

Among the many improvements that have been made to the system, the new signals must be mentioned. These are of home construction, and as seen in the illustrations on this page they are of the modern upper-quadrant type. In connection with these signals a system of electric operation is to be installed shortly. Overbridges too have been installed in convenient and likely spots.

In the motive power department pride of place is still held by the Hornby No. 3C "*Flying Scotsman*" tender locomotive. This engine has maintained a high level of performance, and after 18 months of hard service it hauls easily five bogie coaches on the complete journey of 36 yards round the layout. This not only indicates the quality of the workmanship put into the engine originally, but also shows how care and good management result in a high state of efficiency being maintained. Regular lubrication and cleaning are of course the chief secrets.

Goods and local working, including shunting, are performed with a Hornby tank locomotive. Special interest is added to the shunting operations by automatic reversing trips on the track that have been devised to work in conjunction with the reversing gear on the engine. These trips are so arranged that when a train has been shunted into a siding, the engine can be reversed and returned to its depot running "light," without any handling. This, I think, is a degree of controlled working rarely obtained on a clockwork railway, especially out of doors.

The goods rolling stock also has been increased, all the new components belonging to the Hornby Series. Prominent amongst them are a Breakdown Van and Crane and a Snow Plough, which are kept standing by ready for any emergency that may arise. The Snow Plough of course is very appropriate for an outdoor line, but so far it has not been called on to tackle any snowdrifts!



An interesting station scene showing the lifelike effect obtained by the use of Dinky Toys figures. Note the overbridge referred to in the article.

The station, the only one on the line, has recently been greatly improved by the addition of various Dinky Toys figures, such as Railwaymen and Passengers, which give a wonderfully life-like effect. Some of these are seen on the platform in the lower illustration.

For the benefit of new readers who have not seen the previous description of this railway referred to above, it may be said that this outdoor system is single line throughout, except for a passing loop at the station. It bores through two tunnels, one of which is 5 ft. long and penetrates a genuine "hill" that actually is a mound on which rock plants are grown.

Further Additions to the Hornby Series

New Vans for Perishable Traffic

By "Tommy Dodd"

THIS month I have to deal with some recent additions to the popular range of No. O Vans of the Hornby Series. Like the No. O vehicles already obtainable, the bodies of the new stock are finished by the tinprinting process. This allows of the inclusion of a remarkable amount of realistic detail, as is shown by the illustration on this page; and the result is a series of handsome and useful Vans that will add greatly to the attraction of any Hornby Railway on which they are introduced. Altogether there are eight new vehicles, including Refrigerator, Meat and Fish Vans.

A new No. O Refrigerator Van is available in the colours and style of each group, the body sides and ends of each model correctly reproducing the design and colour of the corresponding vehicle of the company represented. There is a general similarity about real refrigerator vans, and this is reflected in the new Hornby Vans. They are all of the vertical-boarded type, except that of the G.W.R., which has horizontal boarding. The L.M.S. Van is light grey, those of the L.N.E.R. and G.W.R. are white, and the S.R. vehicle is finished in the peculiar buff shade favoured on that line. There are also some interesting differences in lettering. The L.N.E.R. Van is lettered simply N.E., but the other Vans bear the initials of the owning company, and the L.M.S. Van has the word *"Refrigerator"* painted boldly across the doors. The L.N.E.R. Van is described as a *"Ventilated Refrigerator,"* and that of the S.R. as a *"Refrigerator Van"*; while the G.W.R. designation is *"Mica B,"* this being the code name peculiar to the G.W.R.

A selection of the new Hornby No. O Vans described on this page, showing their remarkably complete and realistic appearance. (Top) Fish Van G.W.R. (Centre Right) Refrigerator Van L.M.S. (Centre Left) Meat Van L.N.E.R. (Bottom) Refrigerator Van S.R.

The amount of external detail incorporated in these new Hornby vehicles is surprising. All the boarding, strapping, hinges and handles are shown, as are also the end ladders giving access to the ice-boxes in the roof of the L.N.E.R. and S.R. vans, and the steps and hand rails for the same purpose on the G.W.R. *"Mica B."* The louvred ventilators of the L.N.E.R. van and the ventilating bonnets of the G.W.R. also are included, and tonnage figures, tare weights, running numbers, and even such small details as invoice clips are shown.

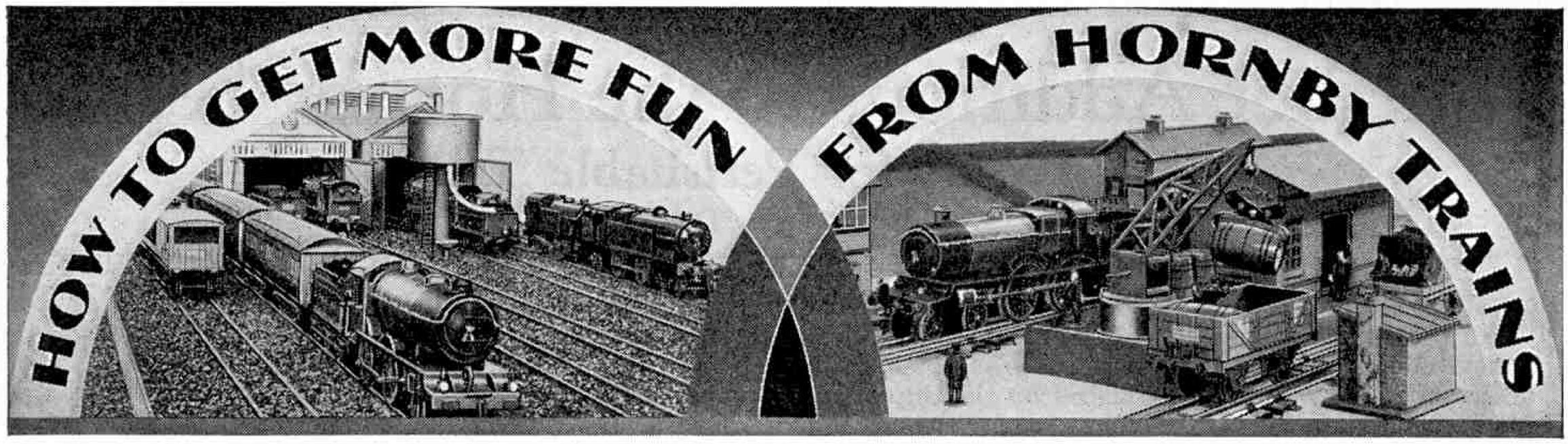
The two new Meat Vans are representations of the L.N.E.R. and G.W.R. vehicles of the ventilated type that are used for the conveyance of fresh meat and other perishables. The typical East Coast vertical-boarded construction is seen in the Hornby L.N.E.R. Meat Van, which has a sliding door represented in the tinprinted design. Louvred ventilators are shown on the upper part of the sides, except for the door, and there are two similar smaller ventilators in the lower part of the sides and at the ends. The Vans are finished in the characteristic shade of red-brown used on the L.N.E.R. for freight vehicles that are fitted with automatic brakes, and therefore are suitable for working in fast trains. The title *"Perishable"* appears on the sides of the vehicle, indicating its general purpose. Other details include the tonnage, tare weight and running number.

The G.W.R. Meat Van is of similar constructional detail to the corresponding Refrigerator Van. It represents an ordinary ventilated meat van that has no ice-boxes, and consequently there are no end steps or hand rails. The code name, which appears on the sides, is simply *"Mica."* This is sufficient to suggest the special character of the van and to indicate the difference that exists between it and the *"Mica B,"* but the colours also are different, the Meat Van being finished in standard G.W.R. dark grey, with the usual white lettering.

An interesting detail that is peculiar to many G.W.R. vehicles of special kinds appears on the Hornby G.W.R. Meat Van, namely, the small plate at the right-hand end of each side. This bears the words *"Return to G.W.R. Not Common User,"* which indicates that the vehicle must always be returned to the owning company from any foreign line to which it may have worked, and must not be operated under the pooling or "common user" arrangements that apply between the groups for ordinary stock.

The two new Fish Vans, one G.W.R. and the other L.M.S., represent two quite different designs for the same purpose. The G.W.R. model incorporates almost every detail that appears on the real *"Bloaters,"* as G.W.R. fish vans are suggestively known. Two sets of hinged doors are represented on each side, and both sides and ends are provided with slits for the ventilation that is so necessary in the conveyance of fish, which of course is highly perishable. The general details of the ironwork are typical of G.W.R. practice, and the restriction of the vehicle to its designed traffic is noted by the words *"For fish traffic only."* This is accompanied by the instruction *"Return immediately to Cardiff (Gen)"*, the last word being an abbreviation for "General," the chief Cardiff station.

The L.M.S. Fish Van is finished in standard L.M.S. red, with a certain amount of lining out on the sides that adds considerably to the appearance of the vehicle. The model represents the modern type of fish van built for the L.M.S. It has ventilating slits at each end, and also at each side of the sliding door and there are openings between the floor and the bottom of the sides of the van.



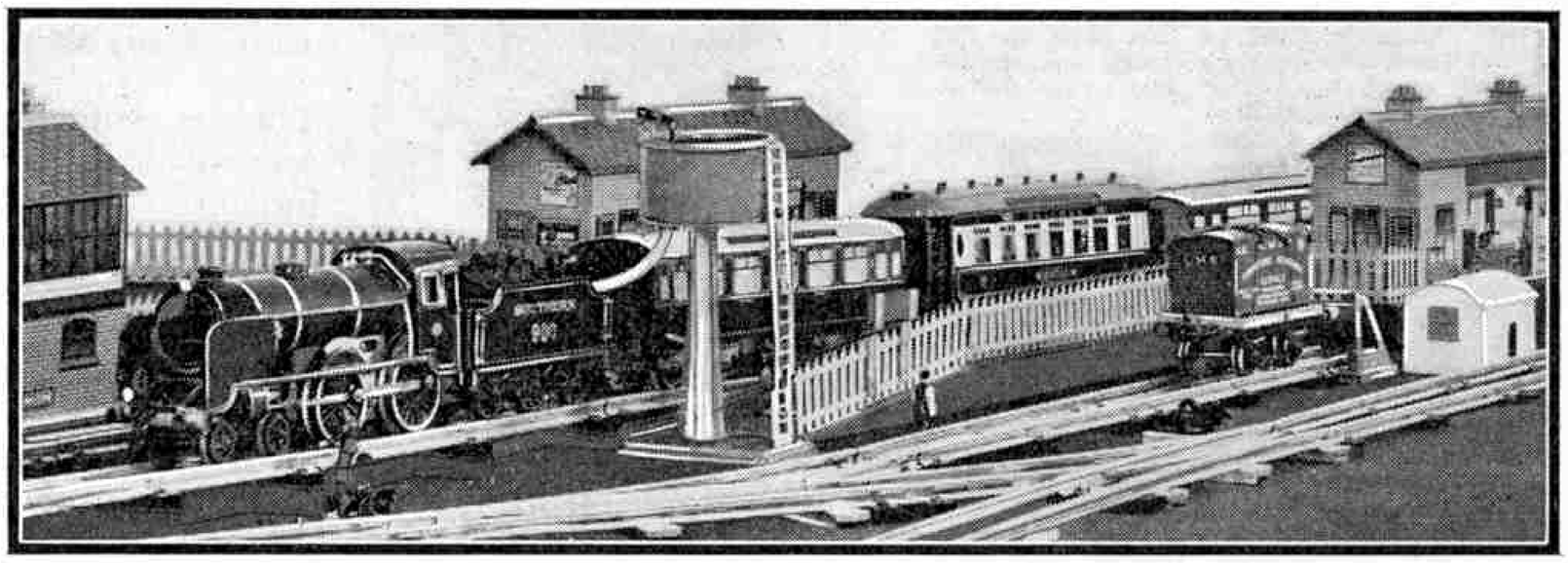
TRAFFIC WORKING ON SOUTHERN SYSTEMS

IN the *"M.M."* last June these pages dealt with certain features of operation on the S.R. that could be reproduced in a realistic manner on Hornby layouts. Since then the splendid new Hornby Locomotive *"Eton"* has been introduced, and the chief features of this engine were described in detail in the *"M.M."* last month. Similarly the new Hornby No. 2 Corridor Coaches have now made their appearance, and these too were illustrated and described in our last issue. These new models add considerably to the traffic working possibilities of a Hornby Railway, and Southern enthusiasts no doubt will welcome an article dealing with some of the schemes now made practicable.

The "Schools" class were originally introduced for Eastern Section duties, and they have made a special reputation for themselves on the Hastings line. They work too on the 80-min. Folkestone trains that were referred to in the *"M.M."* in August 1936 by *"Railway Engineer"* as the fastest group of trains in the country that are hauled by 4–4–0 locomotives. The special interest that is attached to these trains makes them particularly suitable for reproduction in miniature. The formation of such a train on a Hornby layout is easy now that the fine No. 2 Corridor Coaches are available. A train made up of these vehicles connected up throughout with corridor connections, and with the new Hornby E420 or No. 4C S.R. Locomotive *"Eton"* at the head, has a most important and realistic appearance.

A feature of these Folkestone services is that each of the chief trains includes a Pullman car, and this fact immediately suggests the inclusion of one of the favourite Hornby No. 2 Special Pullmans in the miniature train. The design and colour of the Pullman, straight-sided and finished in brown and cream, make a strong contrast with the green Corridor Coaches with their sleek curved sides. Both types of vehicles are of course fitted with standard Hornby corridor connections, so that no difficulty will be experienced in the attachment of a Pullman in the centre of the train.

The illustration on this page shows a miniature Folkestone and Kent Coast express made up in the manner referred to. Advantage is being taken of the station stop to replenish the "water supply" of the locomotive from a Hornby No. 1 Water Tank, thus reproducing a characteristic S.R. practice. This is an interesting feature to copy, and one that will test the skill of the "driver" in "spotting" his engine with the tender conveniently near to the Water Tank. The owner of an electrically-operated layout has a considerable advantage over the clockwork operator in this respect, but with patience it is possible to wind the engine just enough to bring it to rest at the spot required.



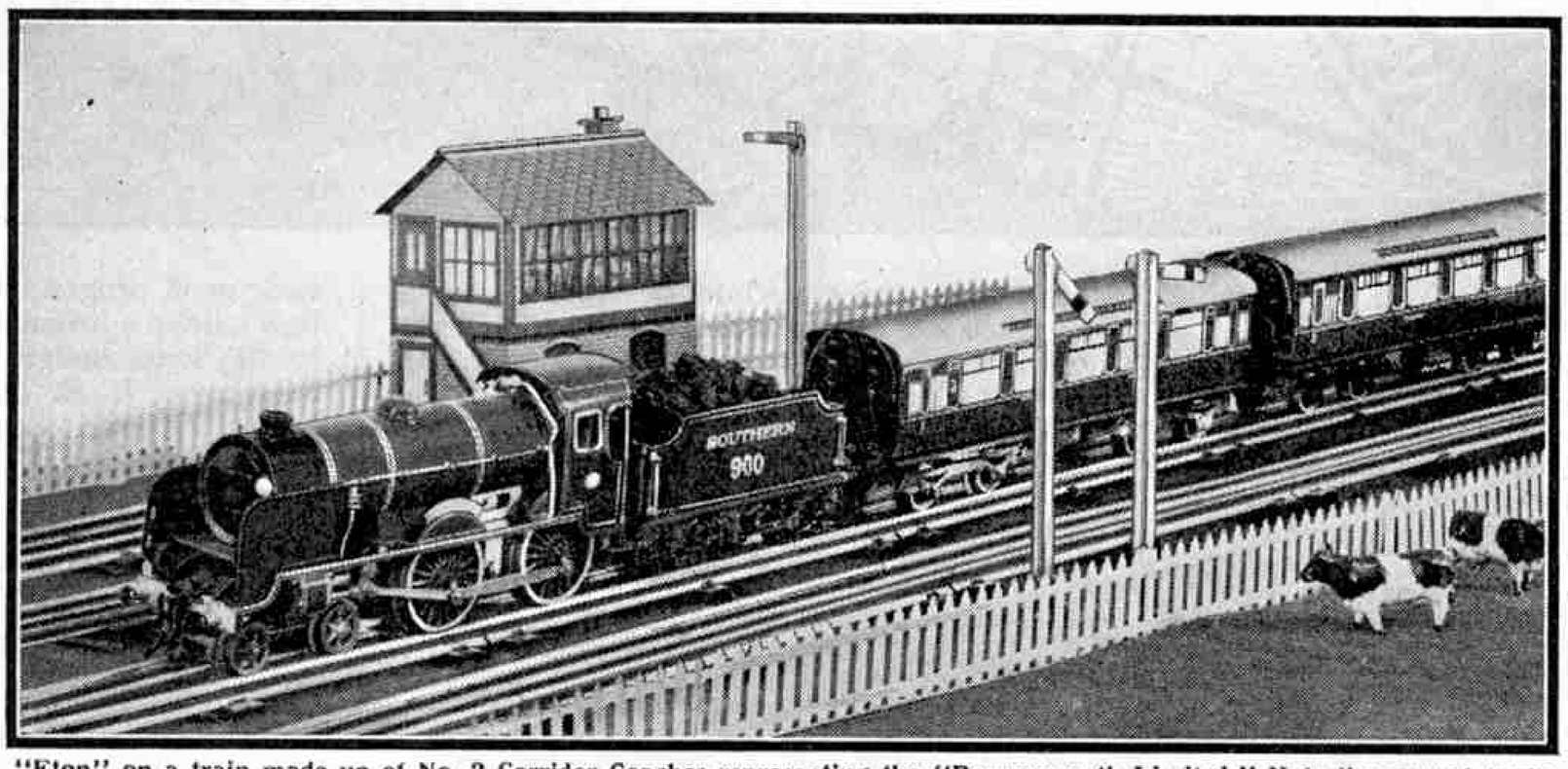
The new Hornby S.R. Locomotive "Eton" taking water at an intermediate stop, a typical S.R. practice. The composition of the train, which includes a Hornby Pullman and several No. 2 Corridor Coaches, exactly reproduces that of a real "Kent Coast Express."

The Folkestone and Kent Coast trains make their first stop at Folkestone, where vehicles are detached on the down journey. The engine and the remaining part of the train travel thence to Dover and so to Margate. This type of working in miniature can be very interesting, a four-coach train perhaps detaching one vehicle at "Folkestone" in one direction and picking it up again when returning. From the scenic point of view the surroundings of the line between "Folkestone" and "Dover" could be made very attractive. The famous chalk cliffs, the Warren cuttings and the various tunnels, including the unusual Shakespeare's Cliff Tunnel with its curious twin pointed entrances, would give the Hornby Railway owner plenty of scope for his modelling and artistic abilities. If well carried out these features would add tremendously to the charm of the line, especially as they would be typical of the actual surroundings of the real railway on which the miniature layout is based.

The miniature route discs that are supplied with the Hornby "Schools" class locomotive make it possible to display the correct route indications, or "engine head signals" as they are officially known, according to the service being operated. Those who live on the S.R. routes concerned will not have any difficulty in observing the codes that apply to their particular line. For the benefit of those who have no means of discovering them, however, it may be stated that the engines of Charing Cross, Folkestone and Dover trains carry one disc placed in front of the chimney and another over the right-hand buffer. Naturally the display of the correct code in front of the

engine adds a great deal to the interest of operation, and gives a characteristic "Southern" atmosphere to the proceedings.

The recent electrification of the Portsmouth route has resulted in the transfer of the "Schools" engines from the Portsmouth to the Bournemouth line. Those owners of miniature Southern systems who wish to be right up to date will no doubt be keen to reproduce this latest working of the "Schools." The Bournemouth service is noted for its frequency, and with one exception, the all-Pullman "*Bournemouth Belle*" trains are all made up of S.R. standard stock, for which the new No. 2 Corridor Coaches are ideal. The best known of the ordinary trains is the famous "*Bournemouth Limited*," and "Schools" class engines now take a share in the working of this train.



"Eton" on a train made up of No. 2 Corridor Coaches representing the "Bournemouth Limited." Note the correct route indication for the Bournemouth line that is displayed by the discs on the front of the engine.

On the up journey, through coaches from the Weymouth line are combined at Bournemouth Central with the actual Bournemouth portion of the train that starts from Bournemouth West, and similarly division of the train into these components is carried out on the down journey. This method of operation also can be followed in miniature if the line includes a junction station with a suitable branch. It will add considerably to the interest of working if the coaches carry roof boards indicating the destination of each portion. Suitable boards of card can easily be cut out to the same dimensions as the standard Hornby Train Name Boards. The boards used in actual practice are green, thus matching the coaches, and they are lettered in gold "*Bournemouth Limited*," "*Dorchester and Weymouth*" or "*Wareham and Swanage*," according to the destinations of the different parts of the train.

S.R. motive power at the Engine Shed on a Hornby layout. The "Eton" and the No. 2 Special "L1" class engine that is on the same track are both true-to-type models that give a distinct and realistic "Southern" touch to the scene.

A feature of the Bournemouth trains is the restaurant service, each of the principal trains carrying a restaurant car; and it will be of interest if this can be represented in miniature. It is scarcely possible to have two of the vehicles of the miniature train representing the combined first-class and kitchen car and the third class car that form the restaurant units of the more important trains. On a model railway one coach is usually sufficient for restaurant purposes, and the latest Hornby No. 2 S.R. Corridor Coach —an "open third" actually—with its end doors and wide windows is very similar in appearance to many dining cars.

One of these new vehicles can be permanently allocated to restaurant duties if required, and keen model railway owners may care to apply additional lettering to its sides to indicate its purpose. Another scheme will be to suggest the presence of table lamps showing through the windows. These can be painted in, and can be copied from the "lamps" that show through the windows of Hornby No. 2 Special Pullmans. A restaurant car arranged thus will certainly add to the realism and importance of any train in which it is included.

The head signals to be displayed at the front of the engine on Bournemouth expresses consist of a disc mounted on the left-hand side of the smoke-box and one above the right-hand buffer. A point to be noticed in this connection is that on the Western Section of the S.R. what are known as duty numbers distinguish the various locomotive turns and these particulars are displayed on one of the discs in front of the engine. The week-day duty numbers applying to Bournemouth engines run from 380 to 413. It will not be difficult for the Hornby Railway owner to mark a suitable number on one or two of his stock of discs. The use of the correct head signals and duty numbers will complete the realistic effect of the train.

In connection with trains running through between Bournemouth and Weymouth, it must be remembered that from Dorchester to Weymouth these follow the same route as the G.W.R. Over this section therefore the engine head signals of S.R. locomotives conform to the positions of the standard headlamp code as used by the G.W.R., an interesting variation from normal S.R. practice. The S.R. code for passenger trains running between Bournemouth Central and Weymouth requires the use of two discs, one over each buffer. At Dorchester these are changed, in the case of stopping trains, to one disc in front of the chimney. Fast trains of course do not require to alter their head signals, which already correspond in position to the standard "express passenger" indication of the standard headlamp code.

Branch News

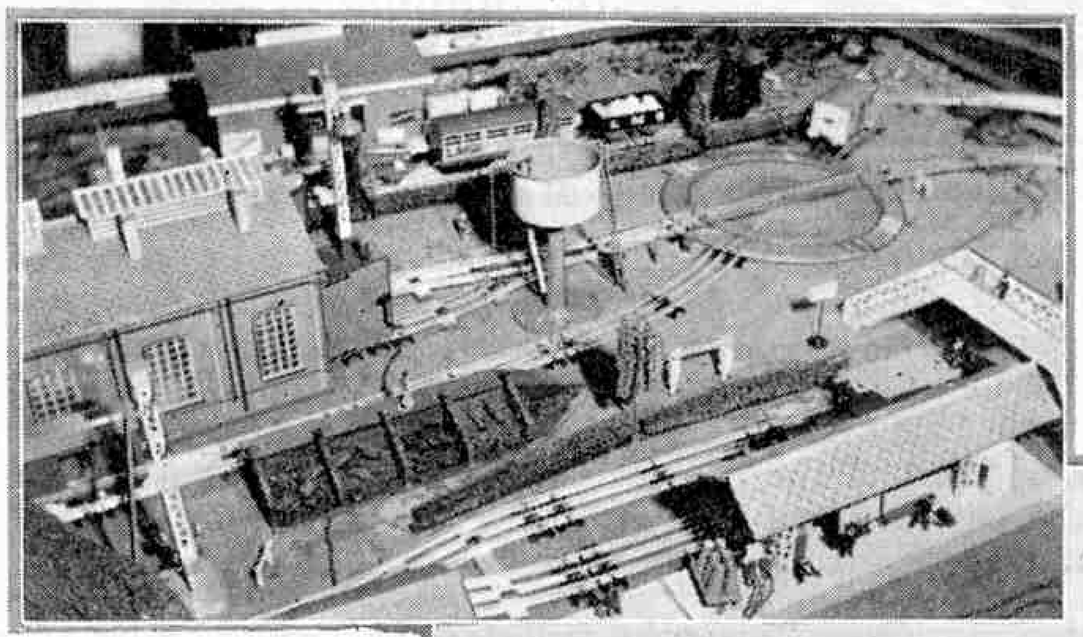
PURLEY COUNTY SCHOOL.—Good progress is being made by this recently-incorporated Branch and an interesting programme of outdoor events has been worked out. Meetings are held twice weekly and both clockwork and electric layouts are operated. Secretary: L. J. Vaizey, 26, Arundel Avenue, Sanderstead, Surrey.

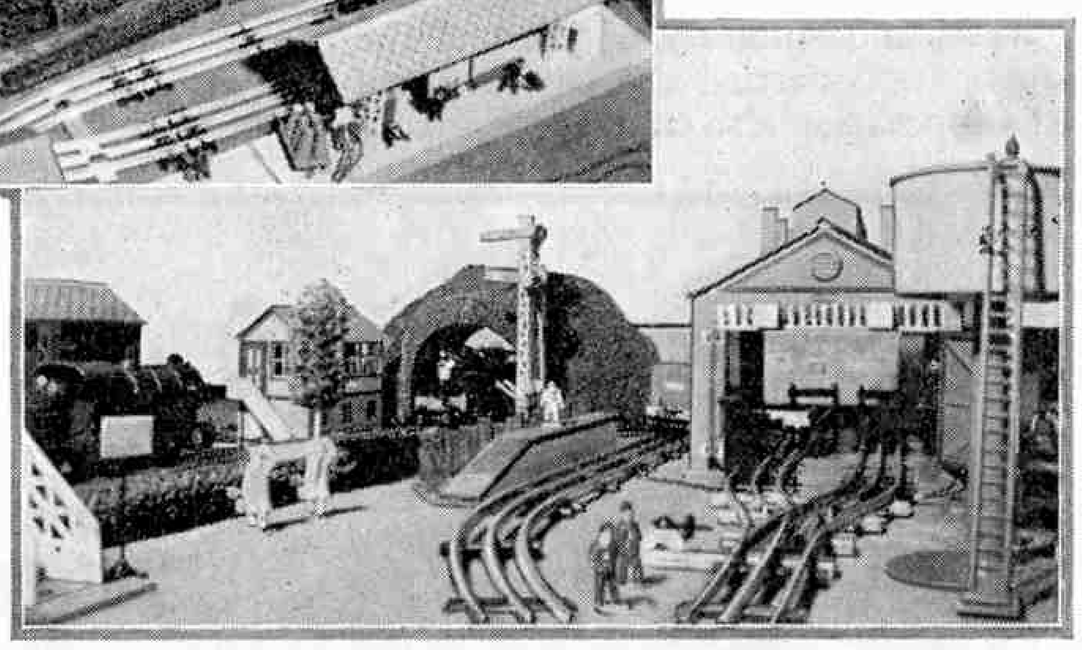
ISLINGTON.—Good attendances lately have resulted in the Branch track being completely overhauled. The necessary repairs and various improvements have now been carried out and have proved of great benefit in the running of the trains. An organised visit has been paid to Southend, where members spent a very enjoyable time. A ramble to Epping Forest and other outdoor events have been arranged. Secretary: A. D. Straker, 48, Onslow Gardens, Muswell Hill, London, N.10.

DOVER.—Attendances have been reduced owing to illness, but good work has been put in by those present at meetings. Services on the Branch layout between "Dover Marine" and "Victoria" were on one occasion increased to the maximum capacity of the line, and the working of the trains then was performed without a hitch. Locomotive tests to determine hauling power have been held, and a Hornby No. 2 Special Tank Locomotive distinguished itself by pulling 20 wagons unaided. Members enjoyed a trip on the 15 in. gauge Romney, Hythe and Dymchurch Railway during a recent visit to that district. Efforts are being made to secure a clubroom, and the Branch Secretary will be pleased to hear from anyone who can help them in this respect. Secretary: D. F. E. Moore, 48, Folkestone Road, Dover.

ST. STEPHENS (SALTASH).—Weekly meetings have been held, and layouts have been arranged to various designs. One of these represented the station at Mortehoe, on the Ilfracombe branch of the S.R., and the lines in the immediate vicinity. Special tracks were laid down to enable new members to accustom themselves to the standard methods of operation adopted by the Branch. The Chairman has completed a quantity of small-scale permanent way with steel rails, and experiments with this type of track are in hand. Games are played at each meeting. Secretary: B. Braund, 9, Homer Park, Saltash.

HORNSEA.—Enjoyable meetings have been held, at which a variety of services have been run, including both regular and special traffic. Special interest was taken in cattle trains operated in connection with a huge "Cattle and Agricultural Show" supposed to have been held in the district served by the lines. This "Show" added considerably to the number of special passenger and freight operations carried out. Attendances at meetings and other functions continue to be good. Secretary: P. Richardson, "The Gowans," Cliff Road, Hornsea.





Interesting views on the Hornby Railway layout operated by F. Burden, H.R.C. No. 40217, and D. Burden, H.R.C. No. 41273, of Peacehaven, Sussex. The illustrations give a good idea of the realistic arrangement of the scenic and other accessories.

BEDFORD SCHOOL.—A goods yard has been introduced at "Leicester" on the extensive Branch layout, which represents the Midland main line of the L.M.S. This new yard includes three reception roads, each capable of accommodating 16 wagons, several sidings and a shunting neck. The new track used in this extension has been assembled from small scale permanent way materials by members. A trailing crossover also has been added to the main line of the layout. Great attention is paid by members to the regular cleaning of rolling stock and track. The rails are overhauled weekly and the rolling stock is examined monthly. The recently-formed Junior Section has made such good progress that its members have now gained admission to the Senior Section, to the keen delight of the younger boys. Secretary: J. E. D. Rothwell, 14, Kimbolton Avenue, Bedford.

LOSTOCK GRALAM.—Train operations have been a feature of recent meetings and the services have been well maintained. Recently members commenced the relaying of the track. Since this has been completed the rails have been further improved by the use of chicken grit for ballast. Detail improvements have been undertaken, and the Dinky Toys figures and other models used on the layout have been re-arranged. Part of the layout has been illuminated, and it is hoped to complete this work in due course. Scenic effects also are under discussion. There has been some activity in Meccano model-building, and outdoor photography also has been indulged in. Plans have been drawn up for an outdoor layout. Secretary: A. Milligan, Wincham Hall, Northwich.

ELMSIDE (EXETER).—Recently the Branch staged a successful miniature railway demonstration at a local Church Fete, when 130 trains were run during the period of 4½ hours, and the engines and stock concerned put up some notable mileage records. Regular meetings have been held, except for a brief break that was arranged to cover the Summer holiday period. Secretary: J. T. H. Fenwick, 28, St. John's Road, Exeter.

OVERSEAS

MILAN.—Members recently had a Ping-Pong competition against the Meccano Guild club. This ended in a brilliant victory for the H.R.C. Branch team. The members recently visited some important buildings that are being erected in the Nord Station, and were very interested in all they saw. The Superintendent Engineer of the works was kind enough to explain everything about the work in progress. Secretary: Enrico Vigo, Milan, Italy.

Branches Recently Incorporated

325. LEIGH-ON-SEA—J. Melling, 84, Chalkwell Avenue, Chalkwell, Essex.
326. GREAT BADDOW (CHELMSFORD)—K. J. Avis, 5, Crescent Road.
327. PURLEY COUNTY SCHOOL—L. J. Vaizey, 26, Arundel Avenue, Sanderstead, Surrey.

H.R.C. COMPETITION PAGE

Join the Hornby Railway Company and become eligible for the competitions announced on this page.

Join the Hornby Railway Company and become eligible for the competitions announced on this page.

MYSTERY STATIONS CONTEST

This month we give H.R.C. members an excellent opportunity of putting their knowledge of station names to a practical test. In the centre of this page are 24 words, which are the jumbled names of British railway stations, and competitors are required to put them in order.

In spite of the rather alarming appearance of the jumbled names, there is no catch in any of them. Several represent stations on the main lines of the railways concerned, but every one will be found in "Bradshaw," and most of them are in any good local timetable. The pleasure of hunting out the more unfamiliar ones will add to the fun and interest of the contest. A competitor who cannot find all the names should not fail to send in his list, for other competitors will have had to meet the same difficulties, and in addition there will be consolation prizes for meritorious efforts.

PADUNTYOSMFROECAR	**UTNEHCQBERE**
DINNLODGYR	**TARSPNOESNP**
MYCSYTDRAAHN	**PEMHOMA**
TEBREHETRR	**TERDASNADES**
NAGDEMUCNIHNHA	**DARWOTNEYS**
TADUHAECRERR	**KOGLERERYS**
LIYARLBIEC	**THEMNAHELC**
IFNALACHELRANF	**LASLEICR**
NAWDIFNANATOELDL	**TORFDAILSTARA**
TETHAOHAHTT	**LIXWOHCB**
LUEGB	**WIWGBSRETHODRA**
EMSHAELER	**YEKCHOM**

In the solutions the names of the hidden stations must be given in order, and alongside each must be written the name or recognised initials of the railway company by whose trains the station is served. If any station is served by two companies, the initials of both companies must be given. No other details are required.

Prizes consisting of any products manufactured by Meccano Ltd., to the respective values of 21/–, 15/– and 10/6 will be awarded to the senders of the entries containing the largest number of correct solutions. In the case of a tie for any prize the judges will give preference to the competitor whose entry is most neatly set out or presented in the most novel manner. In addition to the three main prizes several consolation prizes will be awarded to the senders of entries which, in the opinion of the judges, are praiseworthy efforts, although they are below prize-winning standard.

Envelopes containing entries must be marked *"H.R.C. Mystery Stations"* in the top left-hand corner and posted to reach Headquarters at Meccano Ltd.,Binns Road, Liverpool 13, not later than 30th September. The latest date on which entries from Overseas Competitors can be received is 31st December. Competitors are asked to make a careful note of the closing dates as the entries received late cannot be entertained.

Every entry submitted for this contest must be clearly marked with the competitor's name, full postal address and his H.R.C. membership number. In recent competitions several good entries have had to be discarded because they have been received without either the name or the address of the sender.

Railway Photographic Contest

In spite of the unfavourable weather that was experienced during the earlier part of the season, the entries in our Summer Photographic Contests have been exceedingly good. The present contest probably will be the last in this series, so that railway enthusiasts who are photographers should do their utmost to make use of the opportunity. Several prize-winning photographs have already been reproduced in the *"M.M."* and the best entries in this contest also will be reserved for possible use in future issues.

For the benefit of new readers who wish to enter this contest, we repeat that there are no restrictions in regard to the railway subject chosen. Competitors may send in as many prints as they desire, but no competitor can win more than one prize. The photographs must be taken by the competitors themselves, but the developing and printing may be carried out by professionals.

On the back of each print submitted must be written the competitor's age, name, full postal address, and his H.R.C. membership number. In addition to these requirements a short description of the scene shown in the picture must be given.

The contest will be divided as usual into two sections, Home and Overseas, and in each will be awarded prizes consisting of any products manufactured by Meccano Ltd., or of photographic material, to the value of 21/–, 15/– and 10/6 respectively. Several consolation prizes also will be awarded.

Envelopes containing entries must be marked *"H.R.C. Photo No. 6"* in the top left-hand corner and posted to reach Headquarters at Meccano Ltd., Binns Road, Liverpool 13, on or before 30th September. The latest date for Overseas competitors is 31st December.

Prize-winning prints become the property of Meccano Ltd., and are not returnable. Unsuccessful competitors who desire their entries to be returned should send a stamped addressed envelope of suitable size.

COMPETITION SOLUTION

May Voting Contest

The voting in this contest was very close, each of the nine photographs being strongly favoured. No. 5 received the greatest number of votes, and No. 2 was a close second. The order in which the remaining photographs were placed by the massed votes of the competitors was No. 4, No. 7, No. 6, No. 9, No. 8, No. 1, and No. 3.

COMPETITION RESULTS

HOME

July "Missing Links Contest."—First: D. H. WAKELY (17486), Cheam, Surrey. Second: S. M. WILKINS (42824), West Bromwich, Staffs. Third: K. E. MILBURN (26029), Chingford, London, E.4. Consolation Prizes: R. J. BEALE (43965), Barnet, Herts.; L. C. MAYNARD (32653), Havering, Romford, Essex; C. BAYES (48339), Walthamstow, London, E.17; D. H. EARLE (41617), Wembley Park, Middx.; W. POLLARD (45922), Datchet, Nr. Slough, Bucks.; J. C. BUTTON (10335), Crewe, Ches.

July "Railway Photographic Contest No. 4." The photographs submitted in this contest were particularly good and it is hoped to publish a selection of the prize-winning entries in future issues of the "M.M." First: S. GARBUTT (30122), Altrincham, Ches. Second: C. SPENCER (44179), Sheffield, 6. Third: A. DONALDSON (6868), Belfast. Consolation Prizes: J. H. ROBINSON (26754), Salisbury, Wilts.; F. HODSON (9430), Bolton, Lancs.; B. OSLER (32394), Huddersfield; L. R. HOLLYOAK (3310), Earlsdon, Coventry; J. WATTS (48256), Ilford, Essex.

OVERSEAS

April "Mystery Picture Contest."—First: I. BROUGH (9112), Preston, N.18, Victoria, Australia. Second: A. MCINTYRE (30925), Winnipeg, Manitoba, Canada. Third: D. MURISON (37642), Buenos Aires, South America. Consolation Prizes: R. A. WRAGG (7913), Bandikui, India; A. A. SHAWKY (53749), Egypt.

April "Railway Photographic Contest No. 1."—First: G. E. SCHULZ (15425), Coromby, Victoria, Australia. Second: A. A. SHAWKY (53749), Giza, Egypt. Third: A. A. BOULT (52), Wellington, S.1, New Zealand. Consolation Prizes: W. CARPINTER (42509), Christchurch, New Zealand; H. BENNETT (10615), Auckland, S.W.2, New Zealand; W. S. EAGLE (31779), Byculla, Bombay, India; P. CHAPMAN (24873), Christchurch, S.W.1, New Zealand; P. MACDONALD (43305), Toronto, Ontario, Canada.

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1 Bechuanal'nd Jub.	4d.	2 Nigeria Jubilee	7d.
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3 ,, Coron.	1/-	3 ,, ,, Cor.	1/-
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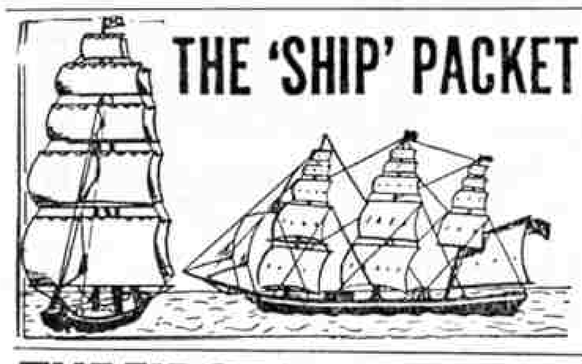

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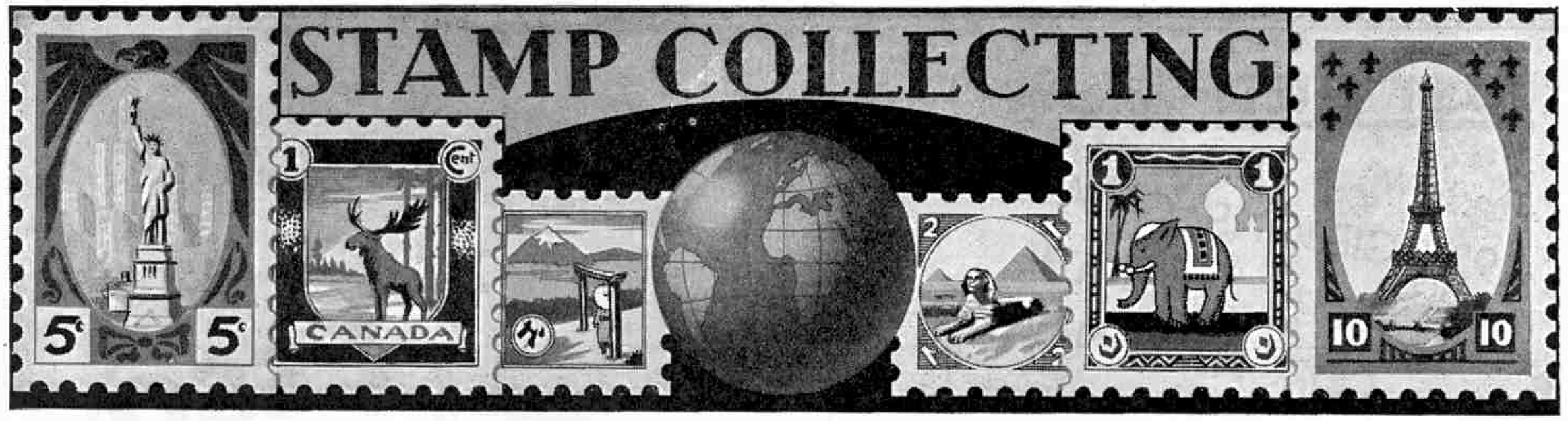

DISPLAYING THE STAMP COLLECTION

U.S.A. 30th September 1935. Perf: 11. No watermark. Commemorating completion of the Boulder Dam on the Colorado River.

IN our article in the July "*M.M.*" we urged our readers to devote a little time during the summer to a quiet survey of their collections, with the object of securing improvements in their appearance. As a result of that article, many readers have written to us for guidance in undertaking a complete re-organisation of their collections; and because the subject is also of special interest to those readers who are taking up stamp collecting for the first time this autumn, it is appropriate to devote our page this month to hints on the arrangement of a stamp collection.

Most boys start collecting with a simple fixed leaf album, given as a present. Such an album fills most early needs, but nevertheless our advice to those who are able to choose for themselves is—get the best loose-leaf album you can afford. It may be rather more expensive than a fixed leaf album, but it has the advantage that the perfect display of one issue creates no difficulty in housing the remaining issues of the same country, for additional leaves can be inserted as required. Further, there is no waste space devoted to countries that are not represented in the collection.

The size of the album page is not an important matter. There are several sizes around 11 in. by 9½ in. that may be considered standard, and for which extra leaves can be purchased cheaply without difficulty. Highly glazed or very rough papers should be avoided, and in choosing the paper it is a good plan to test a sample, rejecting any paper that will not take writing in ink, or that tears even slightly when the stamp mount is detached from it. The paper used in the albums supplied by the leading stamp firms, such as Stanley Gibbons Ltd., can be accepted without hesitation. It is selected specially for the purpose.

New Zealand. May 1935. Perf. 14 × 14½. Watermark: N.Z. and star. Design shows typical panel of Maori carving.

Loose-leaf album pages are usually printed with a series of very faint small squares, known as the "quadrille," to serve as guides in arranging the layout of stamps. Space is provided at the head of the page for the insertion of the title of the country, and sets of printed titles, on gummed paper, may be purchased. Artistically inclined readers may prefer to write their own titles.

The arrangement of the stamps is purely a personal matter for the individual collector. It is his opportunity to infuse personality into his collection and, that being so, we prefer to offer only general suggestions. There is only one hard and fast rule that must be observed. Each stamp must be given plenty of space so that it may be studied as a stamp and not merely as one of a bunch.

At the outset therefore it is well to decide the maximum number of stamps that may be placed on one page and to keep within this limit. In ordinary circumstances it will be found that 18 to 20 stamps is as many as a page will carry comfortably if the "writing up," to which we refer later, is to be included on the same page.

Monotony of arrangement must be avoided. It will be almost impossible to avoid having several pages alike in a fairly extensive collection, but those pages must be kept apart so that a new layout appears with each succeeding turning leaf. No two successive rows on a page should contain the same number of stamps, and it is a good rule to make alternate rows odd and even. Most important of all, the stamps must be balanced on the centre point of the page. This point is actually marked in the quadrille by a little cross, and if it is decided to occupy the point with a stamp, the remaining specimens must be arranged so that they radiate from this point. If the central space is left clear, the stamps should circulate around that pivot, as it were.

New Zealand. 27th April 1936. Perf: 11. Watermark: N.Z. and star. Commemorates 21st anniversary of landing of Anzac Forces at Gallipoli.

Straits Settlements. 6th May 1935. Perf: 11 × 12. Watermark: Mult. Script. C.A. Silver Jubilee of King George V.

The whole idea is that while the collector is arranging his stamps to secure his own pleasure, he should also seek to ensure that the collection will interest others, particularly non-collectors. It is desirable therefore that each stamp should be accompanied by a simply written description. Next to good display, nothing adds so much to the value and interest of a stamp collection as good writing-up. The absence of descriptive matter robs a good collection of a lot of its fascination. The effect is akin to glancing through a lot of untitled holiday snapshots.

Writing-up may range from a brief statement of the essentials—issue date, watermark and perforation—to a full description of all the circumstances of the issue, details of the design, and a philatelic history of the issuing country. The latter extreme involves an enormous amount of research, and is out of the question for most boys. To be effective, the writing up must be constant throughout the collection and therefore the collector must decide in advance just how far he is prepared to carry it. It is best to err on the side of brevity, for by limiting the amount of data to be included a reasonable standard can be maintained throughout. The captions to the illustrations on this page are examples of simple brevity in writing-up. They give just the bare essential data.

Germany. 10th July 1935. Perf: 14 × 13¾. Watermark: Swastikas. Railway Centenary Commemorative Issue. Design shows early locomotive "Eagle."

U.S.A. 2nd May 1934. Perf: 11. No watermark. Mother's Day Commemorative. Design based on famous picture "My Mother" by Whistler.

In dealing with a complete issue certain points will be common to every stamp in the issue. Such detail should be classified as "general," and placed at the head of the page devoted to the issue. Matter relating to the individual stamps, short notes on the designs of pictorial stamps, for example, should appear immediately above or below the stamp itself.

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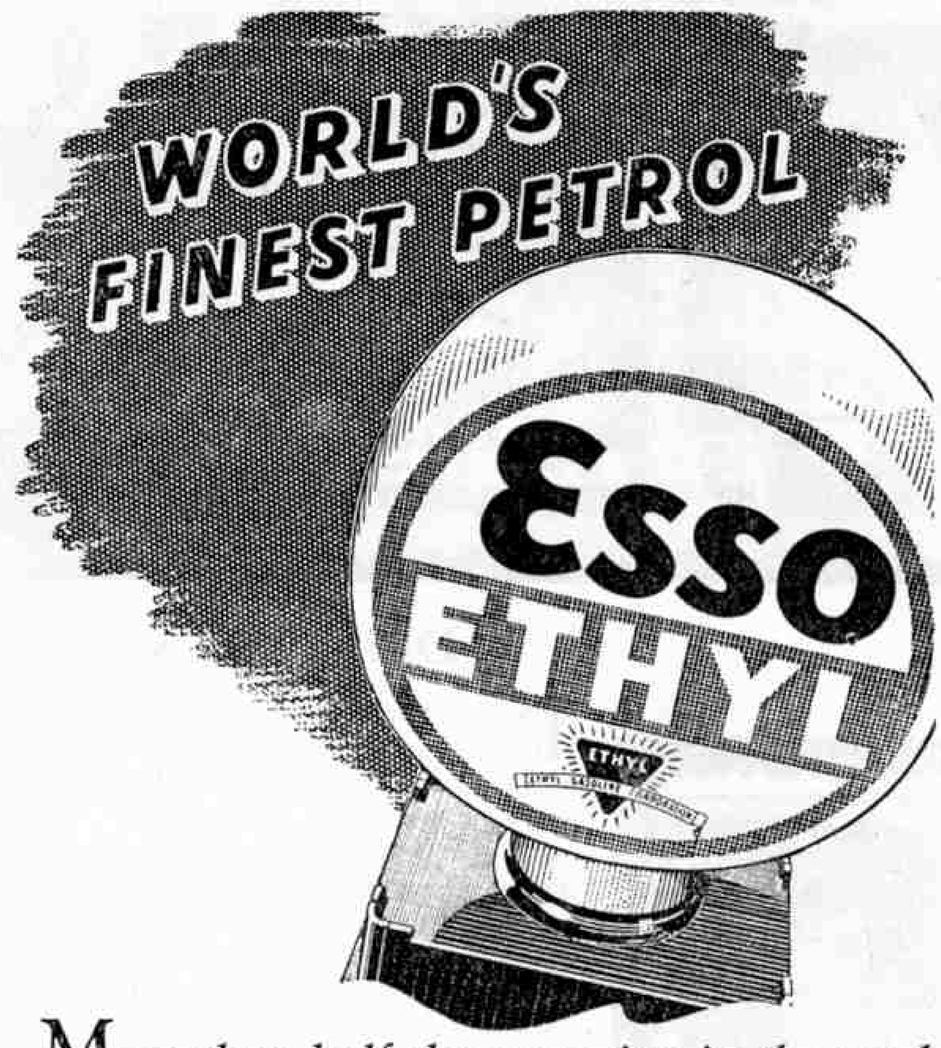

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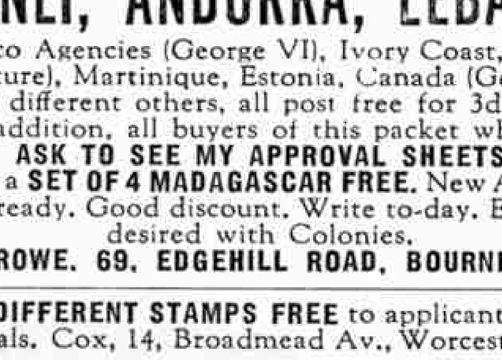
HORNBY SPEED AND RACING BOATS



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Stamp Gossip

and Notes on New Issues

A Faithful Warrior

There is a moving story behind the Japanese stamp reproduced here. The portrait is of General Nogi, commander of the Japanese forces that besieged and eventually captured Port Arthur during the Russo-Japanese war in 1905. Seven years after that victory the Emperor Mutsuhito died, and the faithful old Nogi, a true Samurai, committed *hara-kiri*—the Japanese ceremonial suicide—so that his soul might still attend upon that of his beloved master.

The stamp is issued to mark the 25th anniversary of General Nogi's death.

Danube Centenary Stamps

The note under the above heading in our last issue erred in one particular, and to remove any misconception, it should be explained that the centenary marked by this stamp issue is not that of the Danube Steam Navigation Company, but of the establishment of the company's service between Vienna and Lintz. The company itself was founded in 1829.

The *"Maria Anna,"* the steamer shown on the 12gr. stamp illustrated last month, was built in 1837, to inaugurate the Vienna-Lintz service, and in 1844 her hull was covered with iron plating. The original engines were only 60 h.p. but she carried on in regular service until 1898.

The 24gr. stamp shows one of the Jupiter class of steamers that carry on the express passenger service Vienna and Giurevo in Roumania. Originally it was intended to show the *"Franz Schubert,"* which now operates on the Vienna-Lintz service, but that intention was revised after the sending out of the preliminary press notices concerning the issue, and the Jupiter class substituted.

The *"Osterreich"* shown on the 64gr. stamp is the most powerful river tug working on the Danube. Her engines develop 2,500 h.p.

Liechtenstein Workers Issue

The recent series of stamps issued in Liechtenstein to raise funds for the relief of distress among unemployed workers contained four interesting designs, as follows: 10r. Bridge at Malbun; 20r. (illustrated here) road makers at Triesenberg; 30r. Benner canal junction; 50r. Francis Bridge, Nr. Planken.

More French Pictorials

The flow of French pictorial commemorative and charity stamps continues unabated and the newest issues are a 90c. stamp to mark the 300th anniversary of the publication of Rene Descartes *"Discours de la Methode,"* two stamps bearing premiums in aid of the Unemployed Intellectuals Relief Fund; and three other premium-bearing stamps to raise funds for the augmentation of the Postal Workers Sports Fund.

Descartes was one of the outstanding men of learning of his day, and although it is for his studies in the science of methodology that he has gained stamp recognition, his work in philosophy, metaphysics and geometry was sufficient to secure perpetuation of his name. The stamp design shows Descartes and the title page of his *"Discours."*

The designs of the "Intellectuals Relief" stamps bear portraits of Anatole France (30c.—10c.), who was the dominant figure in French literary circles for over 30 years before his death in 1924; and Rodin, the famous sculptor, who is shown on the 90c.+10c. stamp, illustrated on this page.

One of Rodin's most famous pieces of work, the statue known as "The Thinker," was purchased by Lord Grimthorpe and presented to the British nation in 1904. This statue is depicted on the stamp. A collection of his work, presented to the British nation by Rodin himself in 1914, can be seen in the Victoria and Albert Museum in London.

The Postal Sports Fund stamps bear what might be termed popular designs, the 20c.+10c. showing a group of seaside holiday makers in an impromptu tug-of-war on the sands, and the 40c.+10c. the finish of a sprint race, and a discus thrower. The design of the 50c. +10c. reproduced here is the most interesting of the three. It shows a party of "hikers" on their way through a mountain village, and is, we think, the first time that hiking, as a sport, has been given stamp recognition. As our illustration shows, the series is excellently produced and should prove popular with collectors.

Paris Exhibition Commemoratives

The International Exhibition now being held in Paris has been the subject of commemorative stamps from several of the French Colonies, and we illustrate here the design of the series issued in Great Lebanon.

The design, which shows the Great Lebanon Pavilion at the Exhibition, is used on each of eight stamps in the series.

Last Days of Morocco Agencies

An immediate effect of recent legislation affecting French subjects in Zanzibar and British subjects in French Morocco, has been the closing down of the British postal service in French Morocco, and the application of the 2½d. minimum international postal rate, as against the 1½d. Empire rate.

The offices at Casablanca, Marrakesh, Mazagan and Saffi closed down early in August and the Rabat and Fez offices will be closed shortly. There will remain then only the offices in the International Zone at Tangier and those in the Spanish Zone at Tetuan and Larache.

So approaches the end of an interesting chapter in British postal administration. When the offices were first established, letter carrying in Morocco was a desperately hazardous business. The carriers covered the 156 miles between Tangier and Fez on foot and regularly did it in 70 hours! There were no fixed routes, and they had to cross mountain rivers and traverse forests infested with wild beasts. Frequently they met with hostile tribes and had to fly—sometimes fight—for their lives. In recent years, however, the service in Morocco had attained a degree of efficiency and expedition that compared well with the English service.

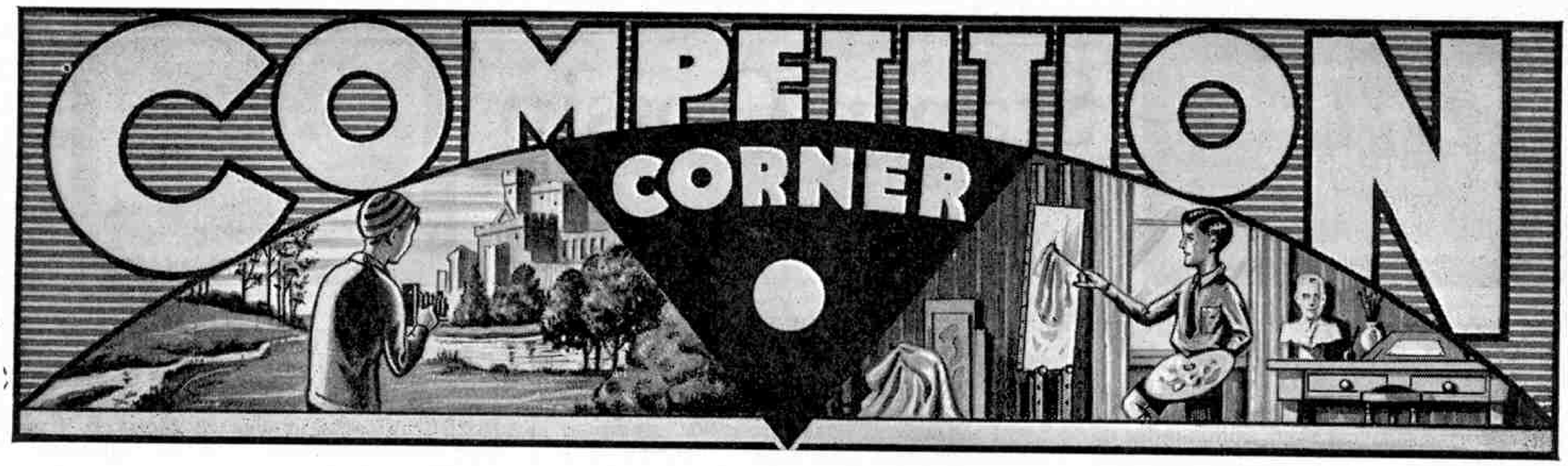
The Post Office Explains

In our last issue we mentioned an apparent curious error in the orb depicted in the G.B. Coronation stamp, to which *Gibbons Stamp Monthly* had drawn attention. An official explanation has now been given to the effect that "the Crown, Orb and Ampulla depicted in the Coronation stamp do not purport to be exact copies of the articles themselves. If the Orb had been otherwise depicted the artist would have been compelled to omit the ascending jewels or to show the cross end on, and the design of the stamp would have been less effective." The Orb was correctly shown on the Crown Colonies issue printed from line-engraved plates.

* * * *

We illustrate here the design used on the special Little Entente stamps issued in Czechoslovakia, to which we referred in our August *"Stamp Gossip"* notes.

We thank Stanley Gibbons Ltd. for their courtesy in loaning the stamps from which the illustrations for our stamp pages have been made.



"POINT WORDS" CONTEST

Those of our readers who have enjoyed our recent Crossword Puzzle competitions will find special interest in the "Point Words" Puzzle that we re-introduce this month. Readers who have not yet tried their skill in solving a puzzle of this kind will find it a distinctly teasing novelty.

In this competition readers are required to take from this issue of the "*M.M.*" any phrase or sentence containing exactly 25 letters, and to rearrange the letters to form a square in which as many complete words as possible may be formed in the vertical and horizontal lines. For each word of five letters in one line 10 points are awarded; for a word of four letters, five points; for a word of three letters, two points; and for a word of two letters, one point. A line containing two words of three and two letters respectively thus scores three points. The maximum possible score is 100, but a score of 60 points from an average phrase may be considered quite satisfactory.

Letters may appear in the square only as many times as they occur in the original sentence, and short words forming part of a longer word in the same line do not count in reckoning up the score. Only genuine English words in current use may be used; proper nouns and coined or slang words are ineligible.

Competitors are at liberty to select any suitable sentence or phrase in this issue of the "*M.M.*," but in submitting their entries they must indicate the page and line from which the words are taken.

In order to make clear what competitors are asked to do, we have taken the phrase "action and sound are combined" from the 42nd and 43rd lines of the first column on page 516 of this issue, and in the centre of this page we have given a specimen "Point Words" working from this phrase. Our example is framed so that the full system of scoring is revealed. We have deliberately chosen this phrase to give what we consider to be an average result, and it will be seen that the total score is 54. The magazine contains other phrases that will give much larger scores, and readers will find it useful to choose one with a fair sprinkling of letters such as T, R, S and E.

	10	2	1	2	5
10	S	E	D	A	N
10	A	D	O	R	E
2	T	I	C	C	O
2	I	N	U	B	N
10	N	O	M	A	D

Total: 54

There are two Sections in this Contest, for Home and Overseas readers respectively, and in each prizes of Meccano products to the value of 21/–, 15/–, 10/6 and 5/– will be awarded to the four best entries in order of merit. In the event of a tie, preference will be given to the entries displaying the neatest or most novel presentation.

Entries should be addressed to "Point Words, Meccano Magazine, Binns Road, Liverpool 13." Those from competitors at Home, that is in Great Britain, Northern Ireland, the Irish Free State and the Channel Islands, must be posted to reach this office not later than 30th September. Overseas closing date, 31st December.

September Photo Contest

This month's contest is the last of the 1937 season's Photographic Contests and we should like to take the opportunity of urging every one of our photographic readers to submit at least one entry this month. The finishing may have been professionally done but, all other things being equal, preference will be given to entries that are the work of the competitor throughout. Such entries should be marked "Own work throughout."

There are no restrictions as to subject, size of the photograph, make of camera, film or paper, the only stipulation being that each print must have a title, and the exposure must have been made by the competitor. Each print must bear on its back the competitor's age, name and address.

Entries for this competition will be divided into two sections, A for readers aged 16 and over, B for those under 16; and prizes of Meccano products or Photographic Materials, as chosen by the winners, to the value of 21/– and 10/6 will be awarded in each section. A separate set of prizes of the same values will be reserved for entries from readers Overseas, i.e. those living outside Great Britain, Ireland and the Channel Islands.

Entries sent this month must be addressed "September Photo Contest, Meccano Magazine, Binns Road, Liverpool 13," and must arrive not later than 30th September. Overseas closing date 31st December.

Competition Closing Dates

HOME

September Photo Contest	...	30th September
"Point Words" Contest	...	30th September

OVERSEAS

June Photo Contest	...	30th September
June Crossword Puzzle	...	30th September
July Photo Contest	...	30th October
July Sketchogram Contest	...	30th October
August Photo Contest	...	30th November
August Crossword Puzzle	...	30th November
September Photo Contest	...	31st December
"Point Words" Contest	...	31st December

Watch the Closing Dates:

Competitors, both Home and Overseas, are particularly requested to make a careful note of the closing dates of the competitions.

In sending entries to competitions that are divided into age groups, competitors should take particular care to mark their ages clearly on the back of the entry. It is not sufficient merely to indicate the age group, as age allowances are given to ensure equality of opportunity for the younger competitors.

Entries, other than prize-winning efforts, for photographic, drawing and similar competitions, will be returned to the competitors concerned if a stamped addressed wrapper is sent with the entry, and its return requested. Prize-winning entries are retained by the Editor.

COMPETITION RESULTS

HOME

July Sketchogram Contest.—Many most intriguing drawings were submitted in this contest, including one very striking though simple effort in which every feature consisted of the sketchogram itself. The prize-winners names are as follows: First Prizes: Section A, G. PATTERSON (Manchester, 8); Section B, A. F. BROWN (Coventry). Second Prizes: Section A, A. F. BAILLIE (Strathaven); Section B, K. R. STEMP (Reading). Consolation Prizes: P. GOULD (Loughton); L. V. T. MEDLIN (Par, Cornwall).

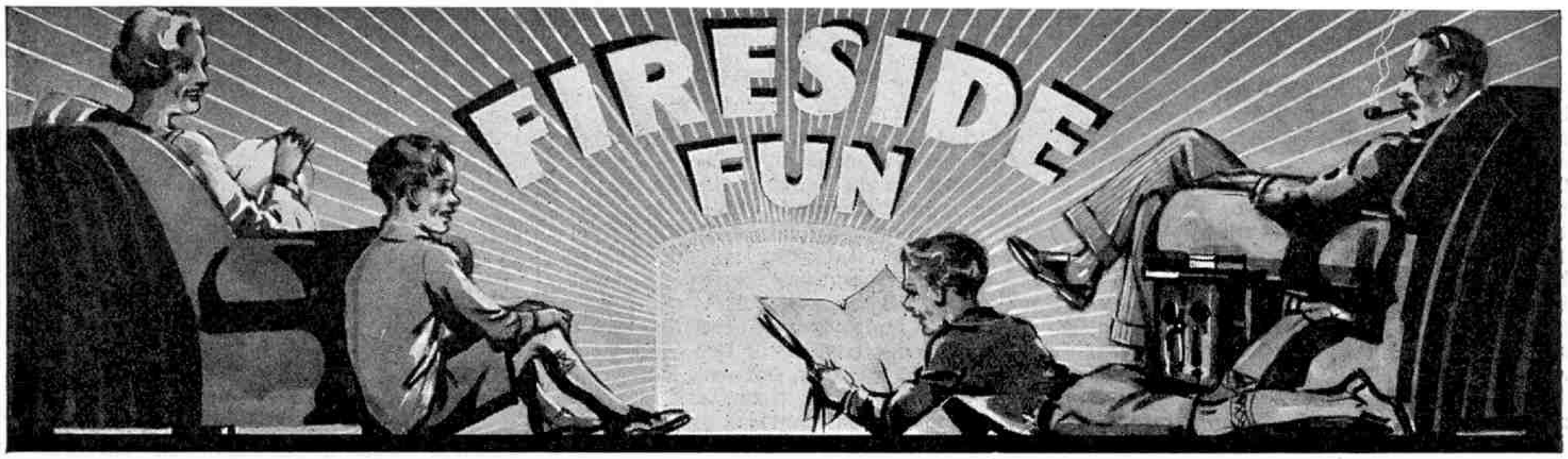
July Photo Contest.—This contest produced so splendid an entry that the judges had considerable difficulty in separating the leading entries. Ultimately it was decided to increase the prize list by awarding two special prizes, value 7/6 each. The list of awards is as follows: First Prizes: Section A, G. EMERSON (West Drayton); Section B, A. S. MCDONALD (Giffnock). Second Prizes: Section A, J. R. TOTTLE (Taunton); Section B, J. A. BELL (Dublin). Special Prizes: A. B. BISHOP (Bristol 4); J. HAMPSON (Edgware). Consolation Prizes: J. BURY (Hereford); I. D. MOGGACH (London, N.W.2).

OVERSEAS

March Drawing Contest.—First Prizes: Section A, S. D. KURLAWALLA (Bombay, India); Section B, R. J. DICKISON (Dunedin, N.Z.). Second Prizes: Section A, J. M. DEMANUELE (Valetta, Malta); Section B, N. P. MEEGAMA (Colombo, Ceylon). Consolation Prizes: K. P. V. ACHAR (Madras); C. CALI CORLEO (St. Julians, Malta).

April Crossword Puzzle.—1. R. W. RODDICK (Rosario de Santa Fe, Argentine). 2. G. E. BROWN (Wellington, N.Z.). 3. F. H. BROWN (Toronto). 4. J. GOWER (Victoria, B.C.). Consolation Prize: A. B. CONLEY (Vancouver, B.C.).

April Photo Contest.—First Prizes: Section A, J. M. DEMANUELE (Valletta, Malta); Section B, B. R. COLLINS (Sydney). Second Prizes: Section A, H. BENNETT (Auckland, N.Z.); Section B, TEO BENG CHUAN (Singapore, S.S.). Consolation Prizes: FIROZEHUSEN (Karachi, India); A. A. SHAWKY (Orman, Egypt).



VISUAL EVIDENCE

A man from Aberdeen came to London to see the sights, and stayed at a hotel. On his departure he gave the head waiter a tip.

"Thank you very much, sir," said the head waiter. "And I hope Aberdeen is looking fine when you return."

"Guid sake, mon, hoo d'ye ken I'm frae Aberdeen?"

"Oh, I guessed it, sir, from the toothmarks on the threepenny-bit!"

* * * *

1st all-in wrestler: "Wow! you're biting!"

2nd wrestler: "Well, what d'you expect me to do? —Swallow you whole?"

* * * *

Diner: "Is there any soup on the menu?"

Waiter: "I don't think so. I've just wiped it off."

* * * *

Staunch Captain: "Now, then, my hearties, fight like heroes till your powder's gone—then run! On account of this rheumatism in my leg I'll have to start now."

* * * *

Big game hunter (boastfully): "On my first expedition I bagged two immense elephants."

She (open-eyed): "Did you have much trouble getting them in the bags?"

* * * *

Jones: "My father was a Pole."

Smith: "Really, how interesting! North or South?"

* * * *

"Now, look here, Johnson, this man is doing double the work you are."

"That's what I've been telling him, sir; but he won't stop!"

* * * *

Small boy: "A loaf of bread, please."

Baker: "It's gone up another halfpenny."

Boy: "When did it go up?"

Baker: "Only to-day."

Boy: "Well, give me one of yesterday's, then."

* * * *

"Too bad about the village blacksmith."

"How so?"

"He was arrested for forgery."

* * * *

Professor: "Why are summer days longer than winter days?"

Student: "The heat expands them."

* * * *

Boss: "You're late this morning, Sambo!"

Sambo: "Well, sah, when Ah looked in de glass dis morning Ah couldn't see myself, so Ah thought that Ah'd gone to work. It was only some time afterwards dat Ah discovered dat de glass had dropped out ob de frame."

* * * *

MIGHT AS WELL HAVE ONE!

Tailor (after measuring countryman for a town suit): "And how about a small deposit?"

Countryman (visiting the city for his first time): "Aye, you can put one in if they're fashionable."

HANDICAP

A sculling match was arranged between an Englishman and an Irishman. The Englishman won with ease, and, for fun, stopped several times during the race.

After the finish the Irishman had to stand a lot of chaffing, but he just shrugged his shoulders. "Faith," he said, "if Oi had had the long rests he took, Oi could have beaten him easily."

* * * *

Teacher: "Johnny, take this sentence. 'Lead the cow to the pasture!' What mood?"

Johnny: "The cow, ma'am."

* * * *

DIFFERENT VIEWPOINTS

Officer (to couple in parked car): "Don't you see the sign, 'Fine for Parking'?"

Driver: "Yes, officer, I see it and heartily agree with it."

* * * *

John: "To be thoroughly interested in your job you should wrap yourself up in it."

Dick: "It's all right for you, but I'm a maker of gum sheets."

* * * *

Father: "No, I won't do your sum for you. It wouldn't be right."

Bobby: "I don't suppose it would, but you might have a try."

* * * *

Customer: "A dozen liver pills, please."

Chemist: "Shall I put them in a box?"

Customer (sarcastically): "No, of course not. I'm going to roll them home."

* * * *

Draper: "These are especially strong shirts, madam. They simply laugh at the laundry."

Customer: "I know that kind; I had some which came back with their sides split."

* * * *

Gym. Teacher: "Take a deep breath and throw out your chest." After a bit of confusion among the boys he said: "Well, hurry up, throw out your chest and step on it."

* * * *

Teacher: "How old is your father?"

Tommy: "Thirty-eight, sir."

Teacher: "Well, I must set you homework more suited to his age."

* * * *

Doctor: "Your husband is not so well to-day. Is he sticking to the simple diet I prescribed?"

Wife: "He is not, sor. He says he'll not be after starvin' himself to death just for the sake of living a few years longer."

* * * *

Flying Officer: "Soar 2,000 feet, then jump."

Pupil Parachutist: "You mean jump 2,000 feet, then sore."

* * * *

THIS MONTH'S HOWLER

Quinine is the bark of a tree; canine is the bark of a dog.

HEADS AND TAILS

Teacher: "Now, Smith Minor, pull yourself together. If the donkey's head points to the west, where does his tail point?"

Smith Minor: "Please, miss, to the ground."

* * * *

Street Orator: "We must get rid of Radicalism, Socialism, Bolshevism, Communism and Anarchism."

Voice from crowd: "And while you're about it, why not throw in rheumatism."

* * * *

Barber: "Will you have anything on your face, sir, when I've finished shaving you?"

Customer: "I don't know, it depends on your razor."

* * * *

After walking a long distance Pat was feeling very dry, when he saw a milkman in the street and asked the price of milk.

"Sixpence," replied the milkman.

"Then give us a quart in pints," said Pat.

After drinking one pint, Pat asked, "How do we stand?"

"I owe yer a pint," said the milkman.

"And I owe you one," said Pat, "so we're quits."

* * * *

"That saw I bought isn't worth sixpence," stormed father. "It wouldn't cut butter."

His small son looked up in surprise.

"Oh, yes, it would, dad," he exclaimed. "Ted and I sawed a whole brick in two with it this morning."

* * * *

Orator: "Remember, my friends, we are all of the same mould."

Voice from back: "Yes, guv'nor, but some is mouldier than others."

* * * *

The salesman, having fitted a farmer with an overcoat, stood back admiringly.

"Fits you beautifully, sir," he exclaimed, "and you can have it for half the catalogue price."

"Thanks," said the farmer feeling for his wallet, "what is the price of a catalogue?"

* * * *

A negro doing a hauling job was told that he couldn't get his money until he submitted a statement of his account. After much meditation he evolved the following bill: "Three comes and three goes, at threepence a went, 1/9."

* * * *

First Tramp: "Yus, I went there once, but I dursn't go again."

Second Tramp: "Why not? 'Fraid because of the dog?"

First Tramp: "No, but me trowsis is."

Second Tramp: "Your trowsis is what?"

First Tramp: "Frayed because of the dog."

* * * *

A POINT OF HONOUR

Two golfers had driven their balls into long grass, and were searching for them. Timid old lady (after watching their unsuccessful efforts for about half an hour): "I hope I'm not intruding, but would it be cheating if I told you where the balls are?"

Tea-Making in Ceylon

By E. R. SWEET

While in Ceylon recently I paid an interesting visit to a small tea factory not far from Kandy. The factory draws its supply from a plantation covering about 200 acres. Only the young shoots of the plant are picked, as these make by far the best tea, and they are first spread out on long trays and left to dry naturally for 18 hours. Then they are moistened and passed into a rolling machine, from which they emerge in a drab yellow mass that again is spread out on trays and turned over at intervals.

The leaves next remain for a time in a roasting machine at a high temperature, from which they emerge looking much the same as we see them in shops. The winnowing process follows. A fan revolving at high speed creates a draught that separates the dust from the roasted leaves, which are graded by placing them on a sieve of medium mesh that is shaken fairly quickly. The finer leaves fall on to another sieve of closer mesh, through which only the best quality tea passes.

All three grades separated in this manner are carefully packed in chests ready for export, and soon are sailing across the high seas. Even the dust extracted has its value, and it is sent to Colombo to be sold.

Treaty Money for Canadian Indians

By P. MACDONALD

Indians in Canada who have ceded their rights to the Government as civilisation has pushed north-west in the last 50 to 60 years, each receive annually four dollars, or approximately £1. This is known as treaty money, and its annual distribution is a great event with the Indians. The Indians of Canada are the wards of the Department of Mines and Resources, but only those who have become parties to the treaty, or their direct descendants, receive the money. The amount paid out has increased steadily as additional Indians have signed away their aboriginal rights.

Treaty Indians are found in Ontario, the Prairie Provinces and the Northwest Territories, but there are none in Quebec, the Maritime Provinces or British Columbia. Those in charge of the distribution of the money travel to isolated portions of Northern Canada by air or canoe, or even on foot. This year the party going to the western part of Ontario left Sioux Lookout, near Ottawa, on 22nd June in two aeroplanes, carrying $9,500 in small bills for distribution among 2,800 Indians, and travelled as far north as Fort Severn on Hudson Bay. Other parties went from farther west, using in all six aeroplanes, and some districts were reached in canoes.

Before the use of the aeroplane the distribution took six months, but now only a few weeks are needed. The Indians are told of the time for distribution by radio, telegraph, Indian runner, and the mysterious bush telegraph of the Indians. They then gather at the posts of the trading companies, where the Government agents meet them, and many of them spend most of the money at the trading post.

Gold Dredging in Central Otago, New Zealand

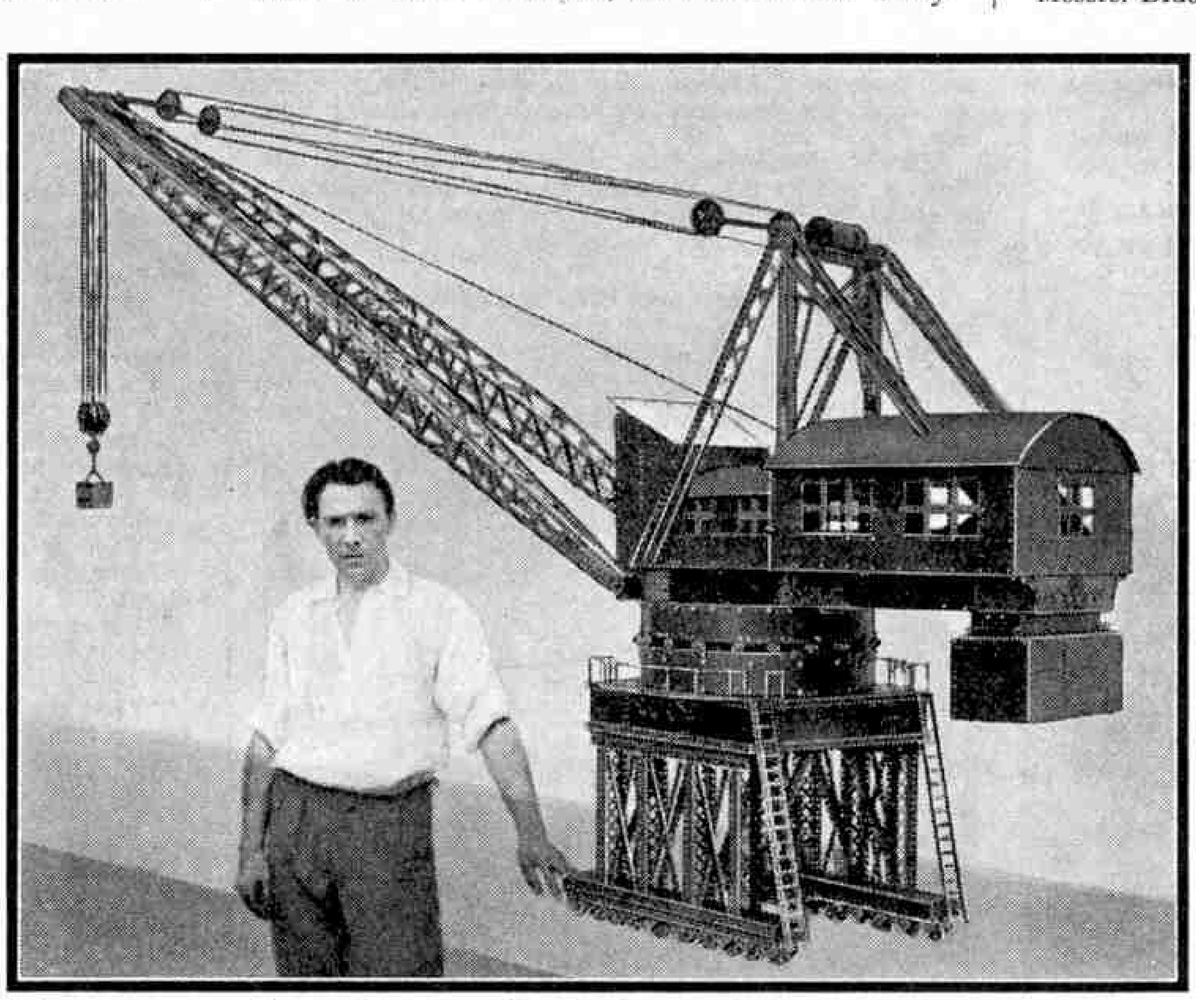
By A. L. TITCHENER

During the school holidays in September last I visited Alexandra, in Central Otago. This town, on the banks of the Molyneaux River, is near Cromwell, the centre of the gold mining industry. The bed of this river is rich in gold, and many companies carry out dredging operations. The swift current makes dredging difficult, and two companies built dredges for the work.

Each dredge consists of two large pontoons braced together, but with a space of about 6 ft. between them, and a steel superstructure that contains the operating machinery. They are the largest of their kind in New Zealand, and are electrically operated. A long ladder suspended from the superstructure passes down between the pontoons into the water, and a bucket chain is driven over it. The material brought up is tipped into a long tube in which it is graded according to size and is then washed, the lighter substance being thus removed.

One dredge was built at Alexandra, and the other, slightly smaller, at Clyde, a town a few miles up the river. When I was at Alexandra the dredge there was nearing completion, but the one at Clyde had not been launched, and work on it was suspended until the river rose high enough for this to be done. It became possible to launch the vessel in January this year, and it was then allowed to move down the slipway, under the control of winches that held it in check. One of the winch cables jammed, however, and caused one end of the dredge to stick high up the slipway, while the other slipped into the water. After much difficulty the launch was completed a week later, and the completion of the vessel then proceeded rapidly.

Ironically enough, the big rise in the river that was so advantageous to the Clyde engineers was a source of trouble to those operating the Alexandra dredge. A suspension bridge crosses the river at the latter town, and the dredge there was built above this bridge. The level of the water on this occasion was so high that the dredge could not pass under the bridge, and it was some time before this was possible.



A fine Meccano working model of a portable electric crane, built by Mr. P. G. Rich, of Orpington, who is seen beside it. The model is 7 ft. 6 in. high and the jib 7 ft. 4 in. long.

The 1937 Cycle Show

This year's Cycle Show at the new Earls Court Exhibition buildings on 22nd to 29th September, marks another milestone in the history of the cycle industry's trade shows. First at the old Crystal Palace, over 40 years ago, later at the Agricultural Hall at Islington, in recent years at Olympia and now at Earls Court, the Cycle Show has gone from strength to strength.

This year's show gains tremendously in interest because it is the first occasion for several years on which the Hercules Company, the largest cycle manufacturers in the world, have been present. Hercules will show a range of 39 of their machines, 36 types of cycle and 3 tricycles, including roadsters, safety and sports models, tourers and tandems, not forgetting machines for boys and girls. Features of the display will be a safety model that allows the rider to place both feet on the ground when stopped in traffic, and another particularly attractive model, known as the "Falcon," that is finished in a new electric blue enamel, with chromium plated fittings and white mudguards and pump.

Another important exhibit that will be of special interest to "*M.M.*" readers will be Messrs. Bluemel Brothers' display of lightweight cycle accessories. Messrs. Bluemels were the pioneers of celluloid accessories, their introduction of celluloid inflators and handles having been made over 40 years ago.

The latest development that Bluemels have to offer is their Duplex mudguard which has the officially approved "Prismatic" reflector actually moulded into the guard, providing a clean smooth contour with no joints or crevices to act as dirt traps. Other refinements for the 1938 season include a front guard with a moulded recess that will fit any width of fork crown without alterations, and a similarly moulded rear guard that will fit any type of bottom bracket. Bluemels will also be showing their "Featherweight" headlamp which will operate off any dynamo providing a suitable bulb is used. It is available in either black or white celluloid construction and weighs only 5½ oz. It is fitted with a most ingenious bracket clip that automatically safeguards the lamp and bulb against theft.

A new type of pocket electric torch will be another feature of the Bluemel display. This has a moulded celluloid case that will not dent, fracture, or become sulphated, but its most interesting feature is its push-button lighting switch countersunk in the base.

Bond's New Premises

Scale model enthusiasts among our readers will be interested to learn that owing to the great growth of their business, our advertisers, Bond's O'Euston Road Ltd., have found it necessary to move to new premises at 357, Euston Road, London, N.W.1. The new premises are conveniently situated between the Warren Street and Gt. Portland Street Tube Stations and possesses ground floor and first floor showrooms each with approximately 2,000 sq. ft. floor area. In addition there is a completely equipped workshop of about 1,200 sq. ft. floor area, in which a 60-ft. run of track for locomotives has been laid down to permit testing of all types of locomotives from Gauge O up to 7¼ in. gauge.

The Hugar Ship Models

Ship model enthusiasts will be specially interested this month in the range of Hugar ship models advertised in our columns. These models possess many interesting features, notably hulls that are machined from the solid to eliminate joints below the water-line and to avoid any possibility of leakage. The superstructures are built mainly of balsa wood to ensure lightness in the finished model and to obviate the necessity for a heavy keel.

All of the models are electrically operated, the motors having been specially designed to run from small dry batteries. The speeds of the boats can be varied by adjusting the propeller blades, but the ordinary cruising speed is from 150 to 200 feet per minute. Each of the models is supplied complete with an attractive sheet of coloured flags, complete with signal chart, a copy of which will be sent to any reader at 4d., post free.

Hugar Models Ltd., of South Street, Epsom, Surrey, will gladly send details of their full range of marine scale models to any reader who writes to them.

A New Skybird Model

Readers who like their aircraft model "stables" to be right up to date, will be interested to know that the latest addition to the range of Skybird kits and models is a reproduction of the Bristol 138a single-engined monoplane in which Flt. Lieut. M. J. Adam made a new altitude record of 53,937 ft. on 30th June last. Messrs. A. J. Holladay and Co., makers of the Skybird Kits, 3, Aldermanbury Avenue, London, E.C.2, will be glad to send details of this and other Skybird models to any "*M.M.*" reader.

STURDINESS / PLUS SPEED

THE NEW

DUNLOP SILVER SPRITE

in this new cycle tyre!

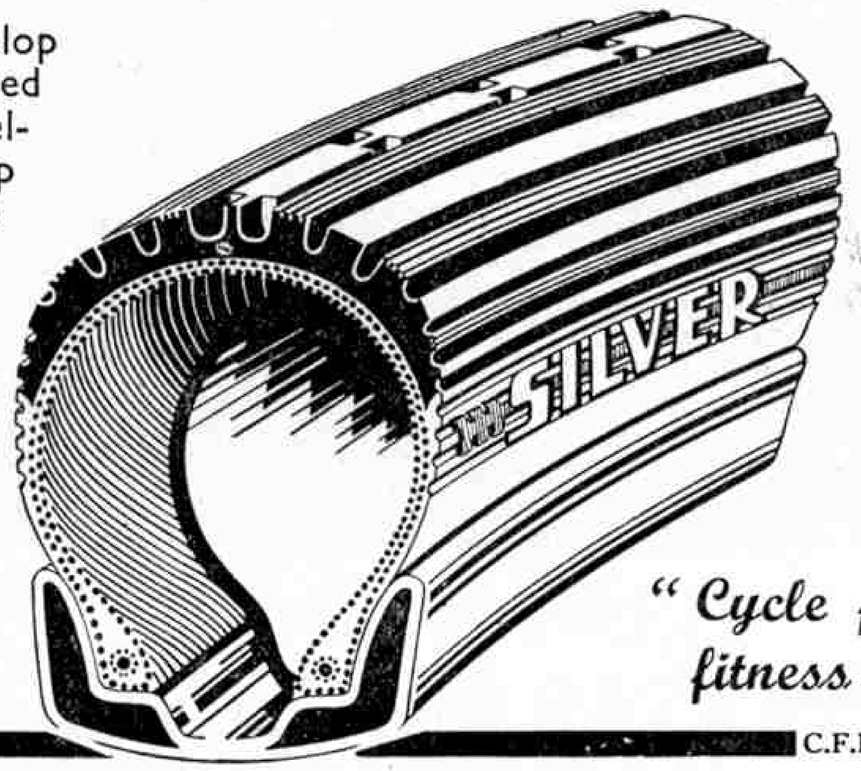
STURDY AS A ROADSTER - FAST AS A SPORTS TYRE

With the new "Silver Sprite" Dunlop have produced a tyre of sporting speed yet suitable for general use. It is modelled on the lines of the famous "Dunlop Sprite" but in order to stand up to the strains and stresses of every-day wear the tread has been redesigned and reinforced. The tyre is heavier and stronger with walls of silver finish and a black tread. Ask your dealer to show it to you.

In two sizes,

26" x 1¼" and 26" x 1⅜"

COVER 7/6 TUBE 2/6



"Cycle for fitness"

Dunlop Rubber Company Ltd. Fort Dunlop, Birmingham.

Branches throughout the World.

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NOTE! BOND'S NEW ADDRESS IS 357, EUSTON ROAD

These New Showrooms and Works are the largest in London devoted to the Model Maker. Come and see them. You will have an interesting time inspecting all the Finest Models, Tools and Materials which we stock.

BALSA MODEL AEROPLANES

REAL FLYERS

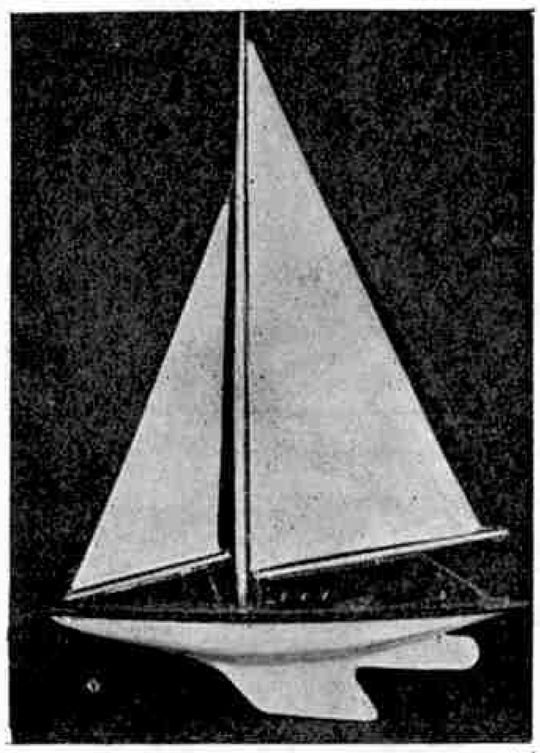
We are offering the finest American Kits of parts ever put on the market for the Model Aeroplane Builder. All kits include all Balsa wood, Japanese tissue, wheels, pins, wire, elastic and full-size Drawing with instructions.

Kits for 12" wing span Flying Models of the AERONCA, BOEING P12E, CURTISS PURSUIT, HELL DIVER, LOCKHEED VEGA, MONOCOUPE, PUSS MOTH, STINSON RELIANT, TAYLOR CUB, VULTEE VIA, WACO.

PRICE **10d.** Postage 3d.

Kits for 24" wing span Flying Models of the STINSON RELIANT, WACO CUSTOM, MONOCOUPE, CONSOLIDATED P/30, FAIRCHILD, HAWKER FIGHTER, CURTISS HAWK, RICKMAN & MERRILL'S VULTEE.

PRICE **2/-** Postage 6d.



The 'ENDEAVOUR' YACHT

■

Will sail in any weather

■

These new Yachts are the latest thing for fast racing work. All of the hulls are hand made in best yellow pine. The two largest Yachts are fitted with Braine type automatic steering. Painted Pale Blue. Cabin Skylight extra.

Prices:

17 in. Yacht with automatic rudder...	11/-	Carriage extra.
21 in. Yacht with automatic rudder...	17/6	
27 in. Yacht with Braine type steering	37/6	
36 in. Yacht with Braine type steering	69/-	

SAILCLOTH. This Super Sailcloth is made from the finest **Union Silk** and is very light, extra strong. **2/3** yard, 42 in. wide. Plus Postage.

Send for Bond's General Catalogue, Price 6d.; this also will interest you as its 200 pages list all the goods we stock.

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'Phone EUSton 3780

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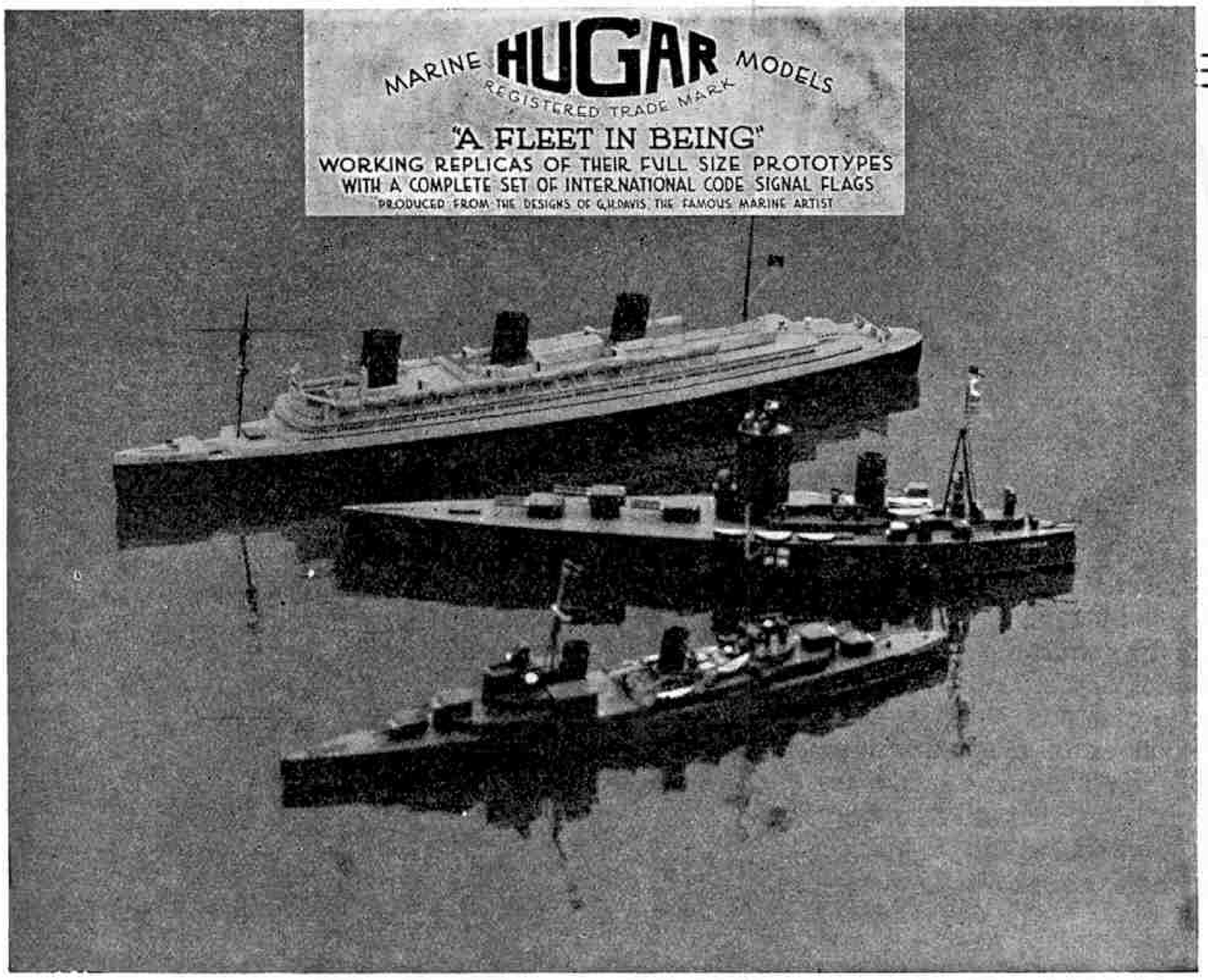
MARINE **HUGAR** MODELS
REGISTERED TRADE MARK

"A FLEET IN BEING"
WORKING REPLICAS OF THEIR FULL SIZE PROTOTYPES
WITH A COMPLETE SET OF INTERNATIONAL CODE SIGNAL FLAGS
PRODUCED FROM THE DESIGNS OF G.H.DAVIS, THE FAMOUS MARINE ARTIST



The accompanying untouched photograph illustrates the wonderfully realistic appearance of these models. They are fitted with electric power units and supplied complete with batteries. A set of our Patented Miniature Signalling Flags is included with each ship.

R.M.S. "Queen Mary."
34 in. long. Price **£3 3 0**

H.M.S. "Nelson."
26 in. long. Price **£1 15 0**

H.M.S. "Southampton."
23 in. long. This ship is the flagship of the latest class of British Cruiser.
Price **£1 10 0**

S.S. "Epsom Downs."
23 in. long. This is a model of a typical modern cargo steamer.
Price **£1 10 0**

Designs for further models in this series are in preparation and all the more important types of Naval vessels will be represented as details become available.

Ask your dealer to show you these models; or order direct from us. Cash with order plus 1/6 postage or C.O.D.

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Stuart No. 10.
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72 pages fully illustrated.

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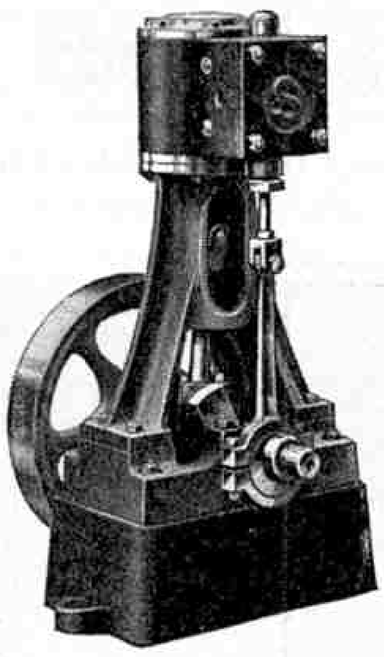


Here is a new and interesting booklet produced in answer to the popular demand of Hornby Railway enthusiasts. It contains a wide selection of attractive rail formations, varying from quite simple layouts to more ambitious designs with double track. The best possible uses of Hornby Rails, Points and Crossings are clearly demonstrated.

The booklet is obtainable (Price 3d.) from any Meccano dealer, or (Price 4d.) post free, direct from

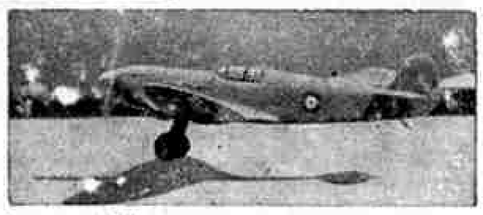
MECCANO LIMITED
Binns Road, Liverpool 13

SKYBIRDS **AERONAUTICAL MODELS**

ALL BRITISH

The First and Still the Best Value!

● Get the thrill of constructing one of these "SKYBIRD" (non-flying) models. True to scale (1/72nd), perfect replicas—British, Foreign, Modern Civil and Military, and famous machines of the Great War.



Latest additions:
(1) Famous War time machine R.E.8.—Outfit **2/6.**
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Completed Models, as photo. **7/6.**

"Aero-Modeller" (7d. post free) contains details and prices all models and accessories. Write:

A. J. HOLLADAY & CO. LTD. (Desk B), 3, ALDERMANBURY AVENUE, LONDON, E.C.2.

NEW MECCANO PARTS FOR OLD!

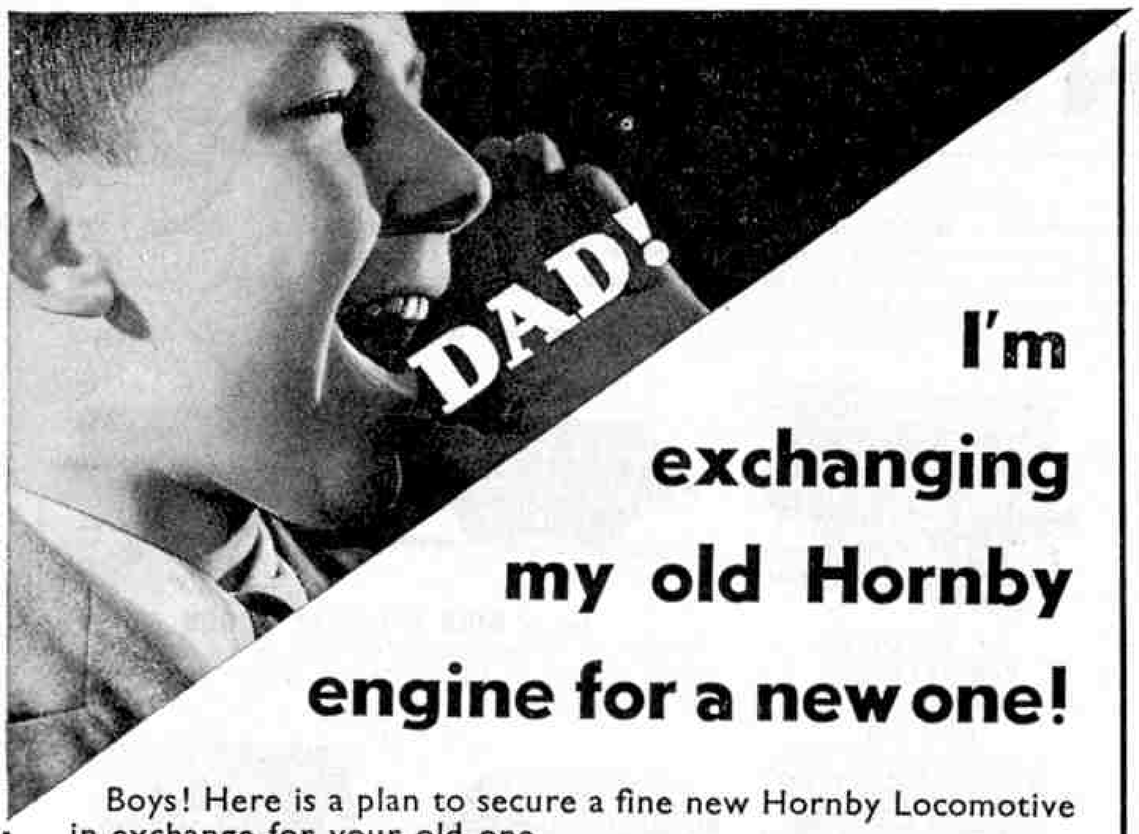
Good News for Meccano Boys

Every Meccano boy should know o. the wonderful Meccano Part Exchange Scheme, in order to take the fullest advantage of it.

We undertake to exchange any damaged Meccano parts for similar new parts at hal the current list price, no matter how old or how much damaged the parts are Just send them to us, addressed to the Service Department, Meccano Limited, Binns Road, Liverpoo 13, together with a remittance covering hal the cost of the new parts. The remittance should include postage on the new parts and will be exactly the same as that you pay on the parcel of old parts you send us.

It is very important that you enclose your own name and address written in plain characters.

If you prefer to do so, you can effect the exchange through your dealer.



I'm exchanging my old Hornby engine for a new one!

Boys! Here is a plan to secure a fine new Hornby Locomotive in exchange for your old one.

First of all, study carefully the latest Hornby Train Catalogue, and select from it the new up-to-date Hornby Locomotive you want. Then pack up your old Hornby Locomotive and send it to us addressed "Special Service Department," Meccano Ltd., Binns Rd., Liverpool 13. Your order for the new Locomotive and the necessary remittance should be enclosed. You can easily ascertain how much to send by deducting the part exchange allowance indicated in the list given below from the price of the new Locomotive, and adding 1/– for postage on the new model you purchase. It is important to note that the catalogue price of the new Hornby Locomotive you purchase **must not be less than double the Part Exchange allowance made for your old Locomotive.**

If you prefer to do so, you can effect the exchange through your dealer, who will be very pleased to give you any information you require.

Part Exchange allowances for Hornby Locomotives

CLOCKWORK MODELS		ELECTRIC MODELS	
M2930 Locomotive	1/–	EM16 or EM120 Locomotive ...	4/3
MO Locomotive...	1/4	No. 1 Electric Tank Locomotive, Permanent Magnet	7/6
M1/2 Locomotive	2/3	EM36 or EM320 Tank Locomotive	8/3
*George V Locomotive ...	3/3	LST M3/20 Tank Loco (20-volt)	8/3
*No. OO Locomotive	3/3	E06 or E020 Locomotive ...	9/6
M3 Tank Locomotive	3/9	LE 120 Locomotive	10/–
M3 Locomotive	4/3	LE1/20 Loco (Swiss Type) 20-volt	10/–
Zulu Locomotive	4/6	E16 or E120 Locomotive ...	10/–
No. O Locomotive	4/6	E16 or E120 Tank Locomotive	10/–
LEC 1 Locomotive (Swiss Type)	5/3	LST 1/20 Tank Locomotive (20-volt)	12/–
Zulu Tank Locomotive... ...	5/9	LST 2/20 Tank Locomotive ...	12/6
No. 1 Tank Locomotive ...	5/9	E3/20 Locomotive	12/6
No. 1 Locomotive	5/9	E3/20 Riviera Locomotive ...	12/6
No. 1 Special Locomotive ...	7/9	No. 2 Electric Tank Locomotive	12/6
No. 1 Special Tank Locomotive	7/9	EPM16 Special Tank Locomotive	13/9
No. 2 Locomotive	9/9	E26 Special Tank Locomotive ...	13/9
No. 2 Tank Locomotive ...	9/9	E120 Special Locomotive (automatic reverse)	13/9
No. 2 Special Tank Locomotive	9/9	E120 Special Tank Locomotive (automatic reverse)	13/9
Metropolitan C Locomotive ...	10/6	E36 Locomotive	15/–
No. 2 Special Locomotive ...	11/3	E36 Riviera "Blue" Locomotive	15/–
No. 3C Locomotive	11/3	E220 Special Tank Locomotive (automatic reverse)	15/–
No. 3C Riviera "Blue" Locomotive	11/3	LE2/20 Locomotive	15/–
		Metropolitan L.V. Locomotive	15/–
		E36 Metropolitan Locomotive...	15/–
		LE220 Locomotive (automatic reverse)	16/3
		E320 Locomotive (automatic reverse)	16/3
		E320 Riviera Locomotive (automatic reverse)	16/3
		E220 Special Locomotive (automatic reverse)	18/9
		Metropolitan H.V. Locomotive	18/9

*These models were identical.

HORNBY TRAINS

BRITISH AND GUARANTEED

Manufactured by

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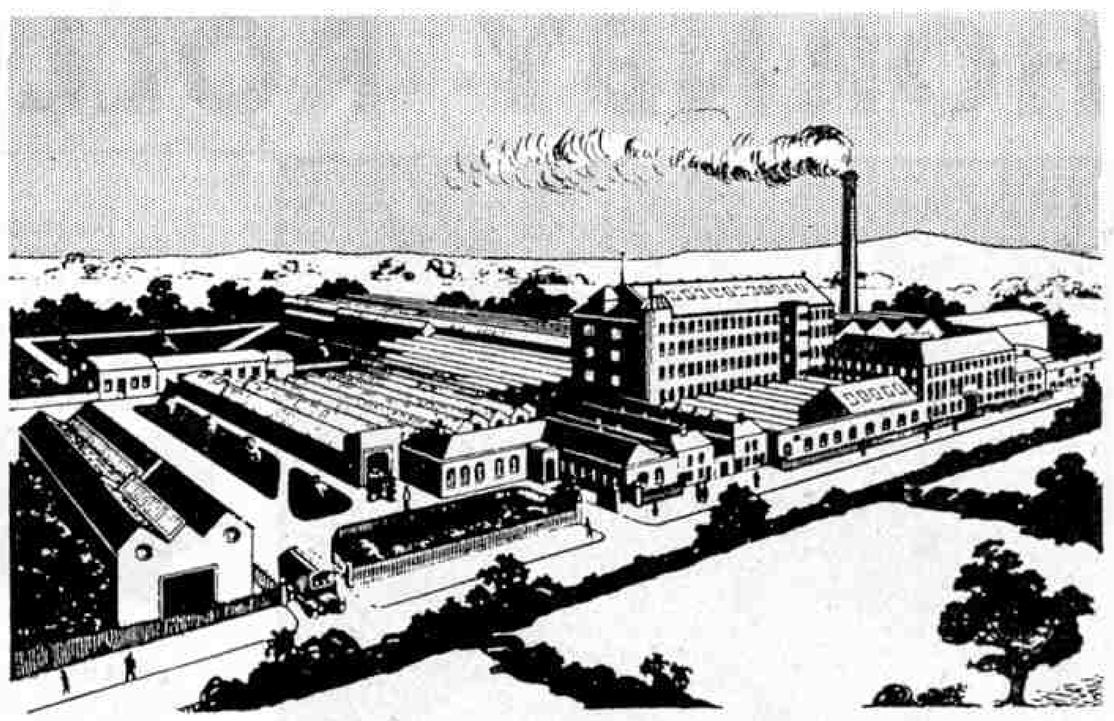

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FACTORY COVERS 5 ACRES OF LAND

Is situated on the outskirts of Belfast. The floors cover an area of 137,293 square feet (an equivalent of five acres), and the tramlines by which material is moved from department to department have a length of 951 yards—considerably more than half a mile.

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Seccotine has been continuously made in Belfast since 1884. The formula is the same to-day as it was then.

Seccotine is recognised all over the world as the strongest and most effective adhesive obtainable. Use it with reliance and confidence on all your making and mending problems. All surfaces—wood—metal—china—glass—cardboard, etc., respond equally well to Seccotine treatment. Remember only a little is needed each time you use it.

951 YARDS OF INTER-DEPARTMENTAL TRAM TRACK

Seccotine is sold in pin stopper tubes (complete with directions)—4½d., 6d., and 9d., at good stationers, ironmongers and general stores everywhere.

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I should like to have, post free, copies of your Free Booklets which describe the many uses for Seccotine.

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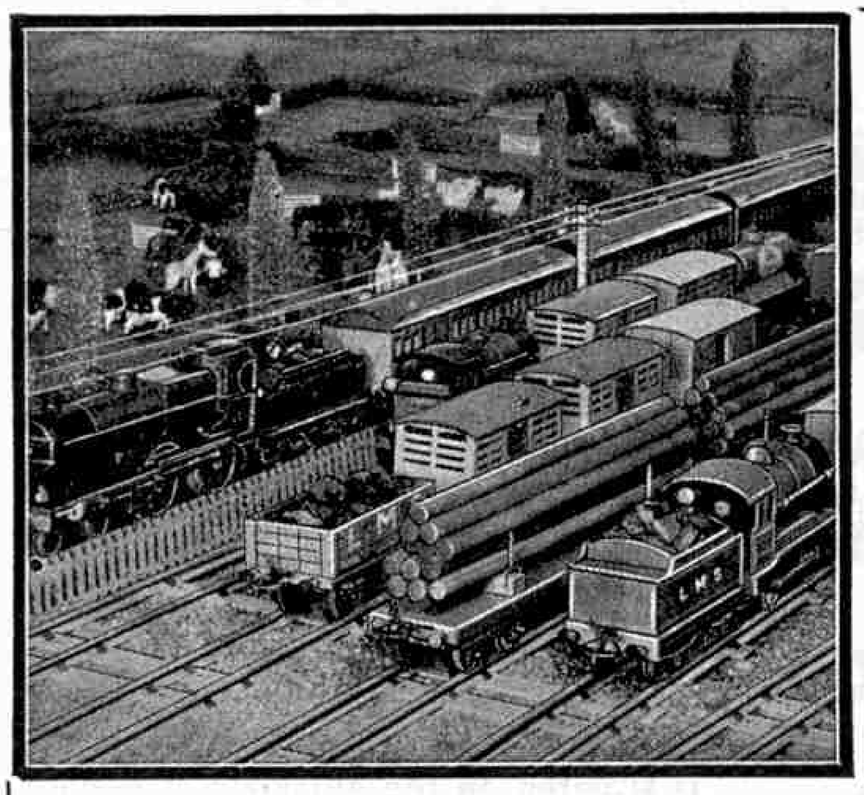
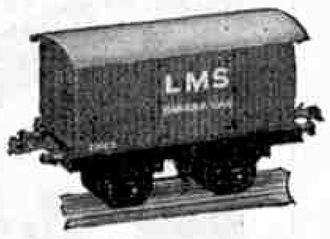
HORNBY ROLLING STOCK

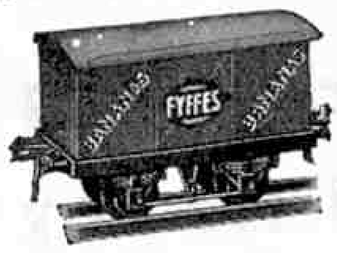


The Hornby Series includes a splendid range of realistic Rolling Stock. Each item is fitted with patented and exclusive automatic couplings, a special feature that places it in a class entirely of its own. There are Pullman Cars, Passenger Coaches, Guards' Vans, Tipping Wagons, Lumber Wagons, and many other types, all beautifully finished.

An attractive selection of Hornby Rolling Stock is illustrated and described on this page. Ask your dealer for a complete price list.



No. 0 BANANA VAN
Lettered L.M.S. only.
Price **1/6**



No. 1 BANANA VAN "FYFFES"
Sliding doors.
Price **2/3**

No. 2 HIGH CAPACITY WAGON
Finished in correct colours of G.W. and L.M.S. "Loco Coal" Wagons, or L.N.E.R. "Brick" Wagon. Not suitable for 1 ft. radius rails.
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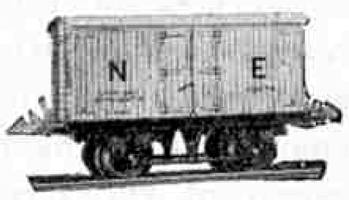

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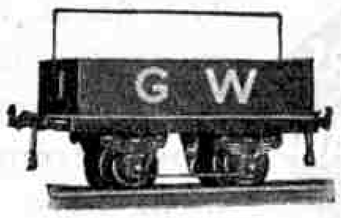
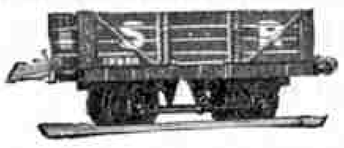
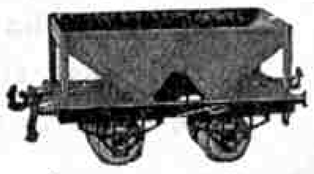


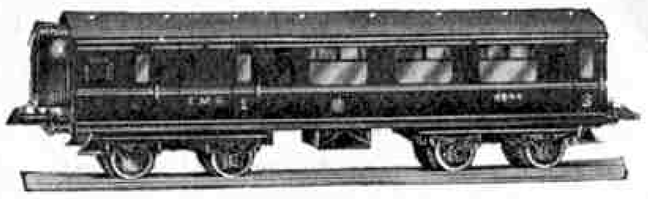
***OPEN WAGON "B"**
Fitted with centre tarpaulin-supporting rail. Price **2/-**



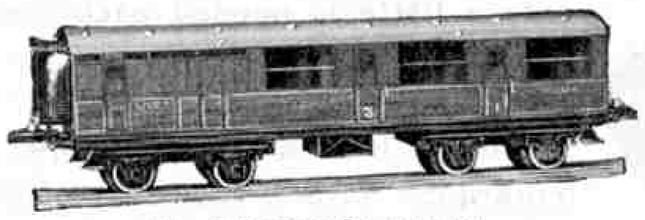
***No. 1 WAGON**
Price **1/6**



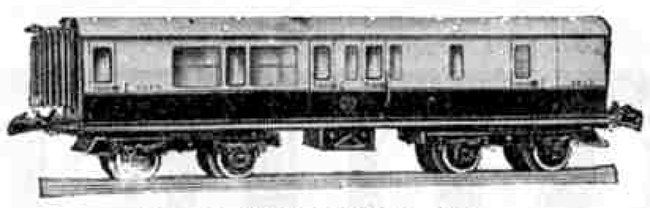
***HOPPER WAGON**
Mechanically unloaded.
Price **2/9**



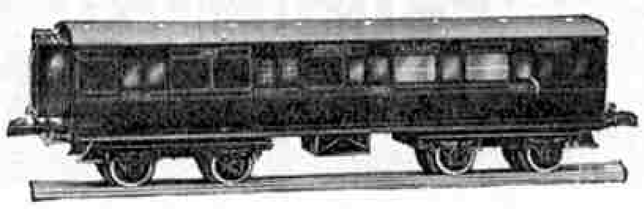
No. 2 CORRIDOR COACH
L.M.S. Brake-composite. Not suitable for 1 ft. radius rails.
Price **7/6**



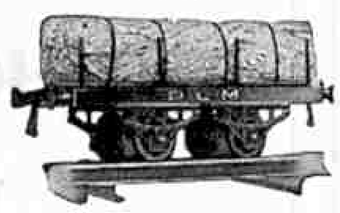
No. 2 CORRIDOR COACH
L.N.E.R. Brake-composite. Not suitable for 1 ft. radius rails.
Price **7/6**



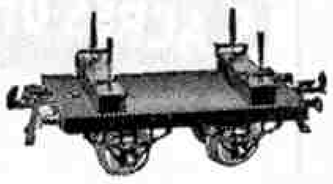
No. 2 CORRIDOR COACH
G.W. Brake-composite. Not suitable for 1 ft. radius rails.
Price **7/6**



No. 2 CORRIDOR COACH
S.R. Brake-composite. Not suitable for 1 ft. radius rails.
Price **7/6**



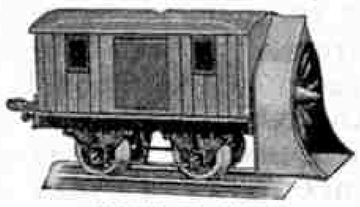
FIBRE WAGON
This is an interesting model of a type of wagon used in France and other European countries. Price **1/3**



No. 1 LUMBER WAGON
Fitted with bolsters and stanchions for log transport.
Price **1/3**

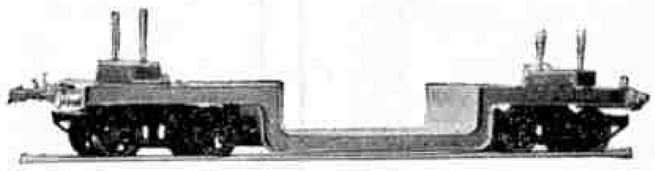
GAS CYLINDER WAGON
Finished in red, lettered gold. Price **1/6**

***REFRIGERATOR VAN No. 1**
Finished in white. With sliding doors. Price **2/3**



SNOW PLOUGH
With revolving plough.
Price **3/6**

CEMENT WAGON
The door at the top opens. Finished in yellow. Lettered "Blue Circle" Portland Cement. Price **1/11**

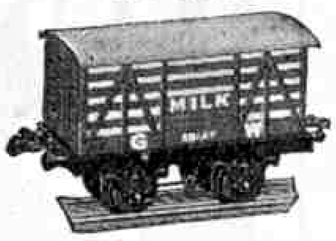


TROLLEY WAGON
Not suitable for 1 ft. radius rails. Price **3/9**

TROLLEY WAGON
Fitted with two Cable Drums. Price **4/3**

OIL TANK WAGON "MOBILOIL"
Finished in battleship grey.
Price **1/11**

No. 1 PETROL TANK WAGON, "SHELL-B.P."
Price **1/11**



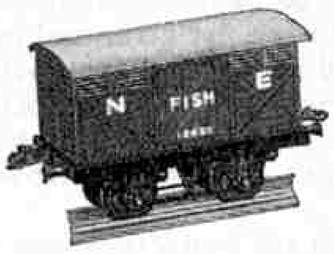
No. 0 MILK TRAFFIC VAN
An attractive model. Available lettered G.W. only.
Price **1/6**

CHOCOLATE VAN "CADBURY'S"
This van is beautifully enamelled in blue with white roof.
Price **2/3**

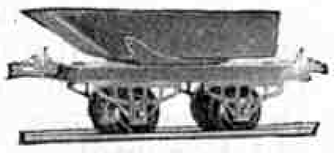
Lettered L.M.S., N.E., G.W. or S.R.

No. 1 TIMBER WAGON
Beautifully enamelled in yellow and red. Price **1/3**

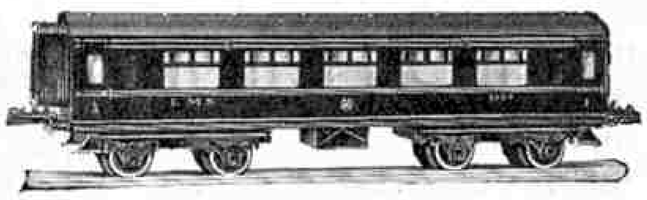
No. 1 SIDE TIPPING WAGON
Excellent design and finish. Lettered "Robert Hudson Ltd."
Price **1/9**



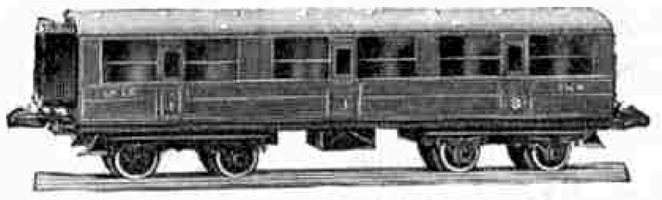
No. 0 FISH VAN
Lettered L.M.S., G.W. and N.E. Price **1/6**



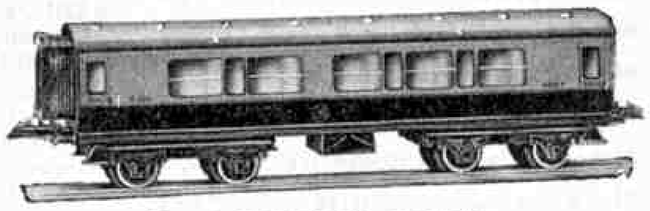
No. 0 ROTARY TIPPING WAGON
Container revolves and tips. Price **1/6**



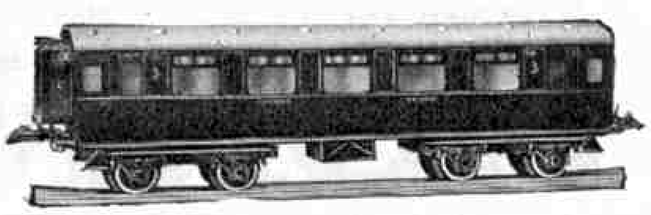
No. 2 CORRIDOR COACH
L.M.S. First-third. Not suitable for 1 ft. radius rails.
Price **7/6**



No. 2 CORRIDOR COACH
L.N.E.R. First-third. Not suitable for 1 ft. radius rails.
Price **7/6**



No. 2 CORRIDOR COACH
G.W. First-third. Not suitable for 1 ft. radius rails.
Price **7/6**

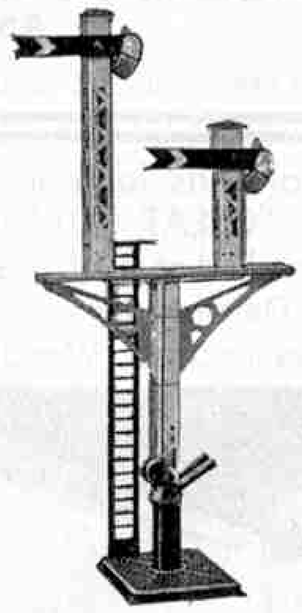


No. 2 CORRIDOR COACH
S.R. Third-class. Not suitable for 1 ft. radius rails.
Price **7/6**

MECCANO LTD., BINNS ROAD, LIVERPOOL 13

Hornby Series **HORNBY ACCESSORIES** Gauge O

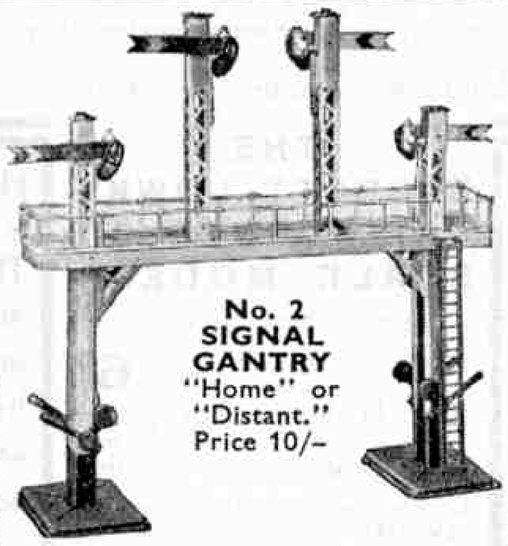
There is a splendid variety of Railway Accessories in the Hornby Series, each one built in perfect proportion and beautifully finished. With these realistic accessories the most elaborate model railway may be constructed and operated in exactly the same manner as a real railway. A selection of Hornby Accessories is shown below. Ask your dealer to show you the full range.



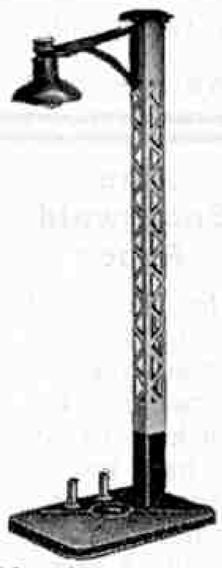
No. 2 JUNCTION SIGNAL "Home" or "Distant." Signal arms operated by levers at base. A very realistic model. Price 4/6

TELEGRAPH POLE Price per pair 3/–

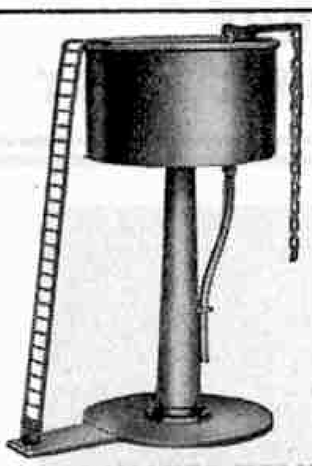
No. 2 SIGNAL CABIN Dimensions: Height 6½ in., width 3½ in., length 6½ in. Roof and back open to allow Lever Frame to be fitted inside cabin if desired. Price 3/6



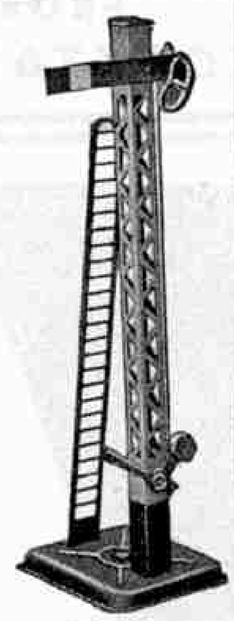
No. 2 SIGNAL GANTRY "Home" or "Distant." Price 10/–



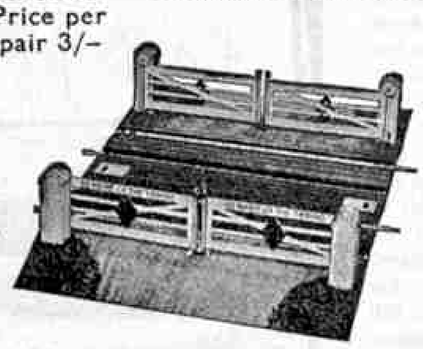
No. 1E LAMP STANDARD (Single) Price 2/9



No. 2 WATER TANK Fitted with flexible tube and valve lever. Stands 8½ in. high. Price 5/9

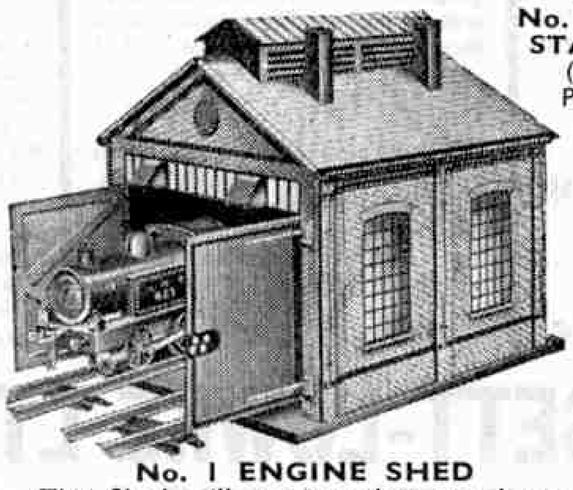


No. 2 SIGNAL "Home" or "Distant." Price 1/9

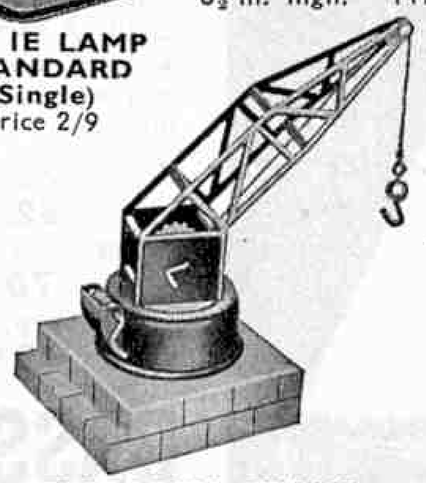


No. 2 LEVEL CROSSING Measures 13½ in. x 10½ in., with two tracks of gauge O rails in position, as illustrated. Price 4/11

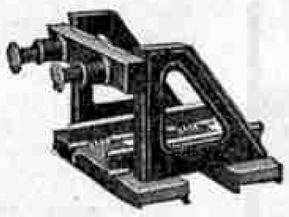
No. 1 LEVEL CROSSING Suitable for single track only. Price 2/11



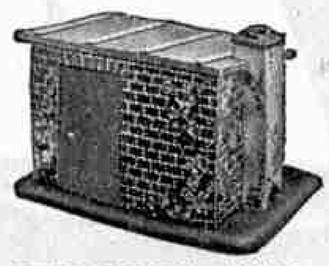
No. 1 ENGINE SHED This Shed will accommodate any Locomotive and Tender with an overall length not exceeding 8¾ in. Price 13/9



PLATFORM CRANE Fitted with a crank handle and ratchet mechanism. Price 3/3



No. 1 BUFFER STOPS (Spring type). Price 1/–



PLATELAYER'S HUT Price 1/–

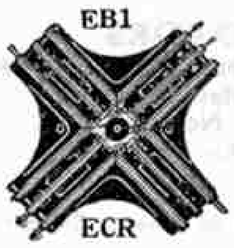
HORNBY RAILS, POINTS and CROSSINGS

GAUGE 0, 1¼". HORNBY SERIES.

Hornby Rails, Points and Crossings are built for hard wear and for smooth running.

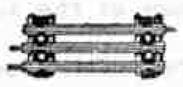
There is practically no limit to the number of rail formations that can be built with them. Their adaptability is well shown in the booklets "How to Plan your Hornby Railway" and "Hornby Layouts–100 Suggestions," both of which may be obtained from your dealer, price 3d., or from Meccano Ltd., Binns Road, Liverpool 13, price 4d.

EB1

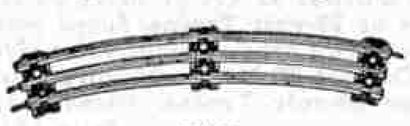


ECR

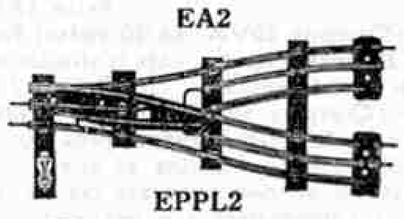
EA2½



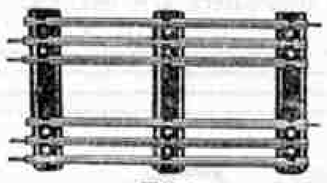
EB½



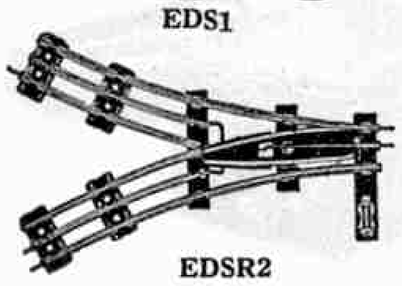
EA2



EPPL2



EDS1



EDSR2

A SELECTION OF RAILS, POINTS AND CROSSINGS FOR ELECTRIC TRAINS

EB1 Straight rails ... ... per doz. 5/–
EB½ „ half rails ... „ „ 4/6
EA2½ Curved quarter rails (2 ft. radius) ... ... „ „ 4/–
EA2 Curved rails (2 ft. radius) „ „ 5/–
EPPR2 Parallel points, right-hand ... ... } per pair 7/–
EPPL2 Parallel points, left-hand ... ... }
These points can be used with either 1 ft. or 2 ft. radius track.
EPR2 Right-hand points (2 ft. radius) ... ... } per pair 7/6
EPL2 Left-hand points (2 ft. radius) ... ... }
EPR1 Right-hand points (1 ft. radius) ... ... } per pair 5/9
EPL1 Left-hand points (1 ft. radius) ... ... }

EDS1 Straight rails, double track ... ... ½ doz. 8/6
EDSR2 Double symmetrical points, right-hand (2 ft. radius) ... ... } per pair 7/–
EDSL2 Double symmetrical points, left-hand (2 ft. radius) ... ... }
EDSR1 Double symmetrical points, right-hand (1 ft. radius) ... ... } per pair 6/–
EDSL1 Double symmetrical points, left-hand (2 ft. radius) ... ... }

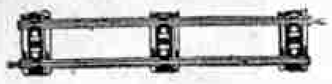
FOR CLOCKWORK TRAINS

B1 Straight rails ... ... per doz. 3/6
A1 Curved rails (1 ft. radius) „ „ 3/6
PR1 Right-hand points (1 ft. radius) ... ... } per pair 3/–
PL1 Left-hand points (1 ft. radius) ... ... }
PR2 Right-hand points (2 ft. radius) ... ... } per pair 3/–
PL2 Left-hand points (2 ft. radius) ... ... }

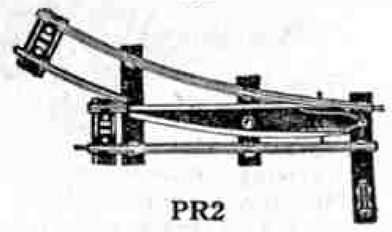
CA2 Acute-angle crossings (for 2 ft. radius track) each 1/6
PPR2 Parallel points, right-hand ... ... } per pair 3/6
PPL2 Parallel points, left-hand ... ... }
These points can be used for either 1 ft. or 2 ft. radius track.
DC2 Curved rails, double track, 2 ft. radius only ... ½ doz. 6/–

Ask your dealer for an illustrated price list.

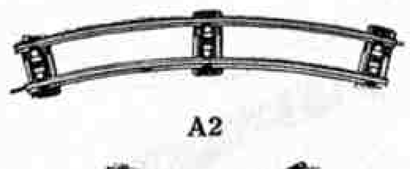
MECCANO LIMITED, Binns Road, Liverpool 13



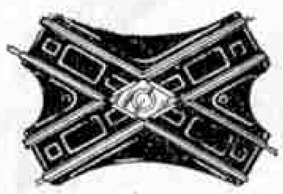
B1



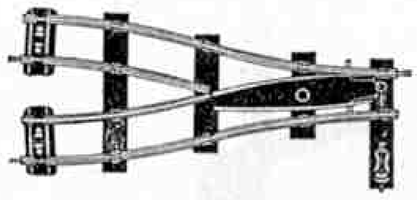
PR2



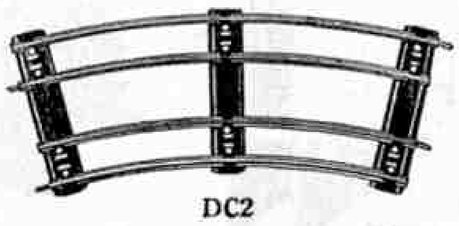
A2



CA2



PPR2



DC2

OUR MODEL BULLETIN

BARGAINS!!

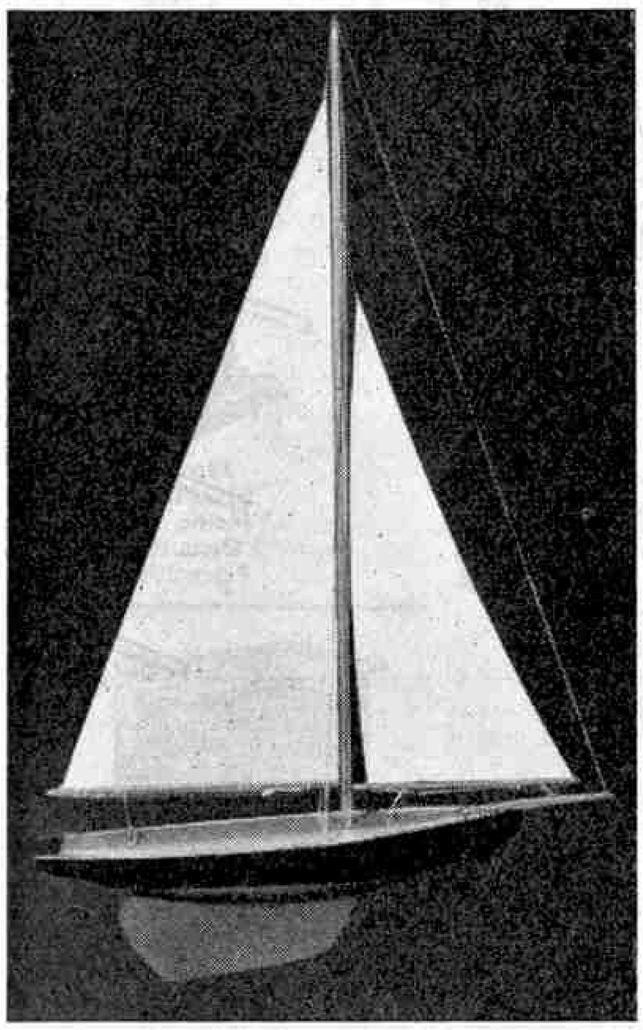
FROM OUR STOCKTAKING LIST

4-coupled model standard Tank Locomotive No. 112, fitted with best quality clockwork mechanism, reversing from cab or track. 1¾ ins. gauge ... ... SPECIAL REDUCED PRICE **30/-**

The same model with electric motor, either A.C. or D.C. 6-8 volts **25/-**

In steam with piston valve cylinders reversing from cab **45/-**

We have other bargains in gauge 1 locomotives and rolling stock. If you are interested send post card for list.



The Southwold Racer

This design of yacht is based upon years of experience and backed by an expert knowledge of sailing craft, large and small. A prize-winning model at a reasonable price.

19 ins. long, **52/6**

20 ins. long, **70/-**

24 ins. long, **92/6**

THE BASSETT-LOWKE CATALOGUES ON SCALE MODELS

are in three sections:

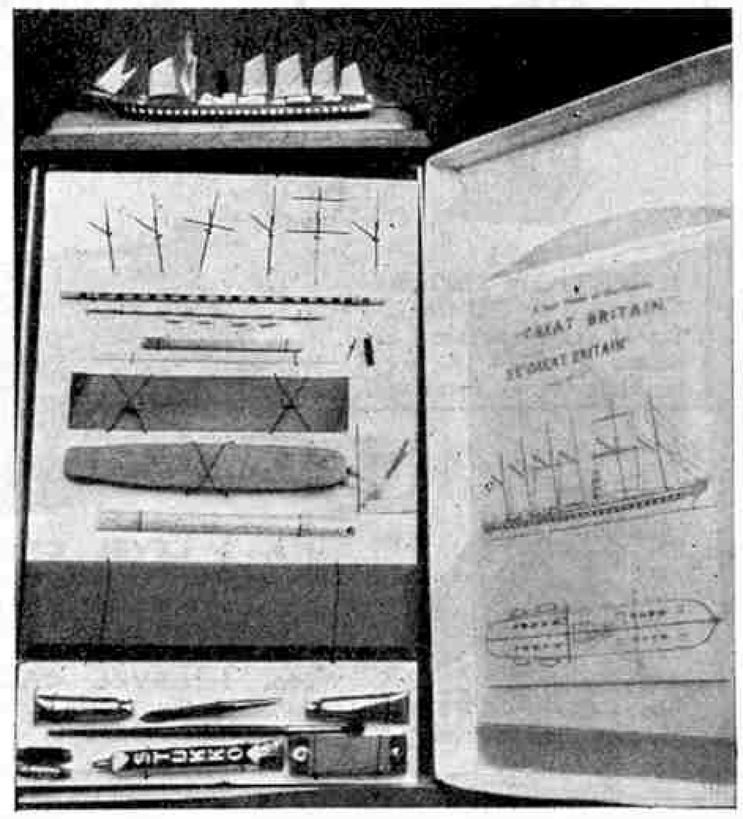
A.17. Model Railways
B.17. Model Engines
S.17. Model Ships

} **6D.** each post free.

Of course you have seen the "TWINS," that wonderful "00" gauge railway introduced by us last season. Folder TT.17 tells you all about it. Another free folder is F.B.17 of "O" Gauge models.

N.B.
We shall be exhibiting our latest productions at the MODEL ENGINEER Exhibition, Horticultural Hall, Sept. 16th-25th, and at the Engineering and Marine Exhibition, Olympia, Sept. 16th-Oct. 2nd.
SEE OUR EXHIBITS THERE!

Here is a 50 ft. to the inch set of parts for building a waterline model of the famous "GREAT BRITAIN." The hull is ready shaped, the sails marked on cloth, masts and spars finished and painted. Detailed instructions and plans, tools and paints are also included. Wonderful value at **13/-** post free.



Other sets at the same price are the "Cutty Sark" (50' to 1"), "Queen Mary" and "Normandie" (100' to 1"). Also more expensive sets for building full hull galleons.

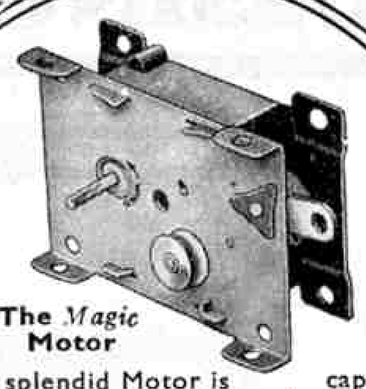
BASSETT-LOWKE LTD.

NORTHAMPTON

LONDON: 112, High Holborn, W.C.1.
MANCHESTER: 28, Corporation Street

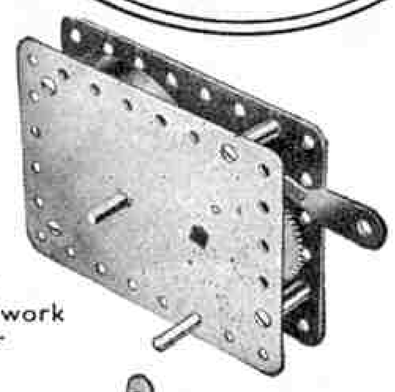
MECCANO

MOTORS FOR DRIVING MODELS

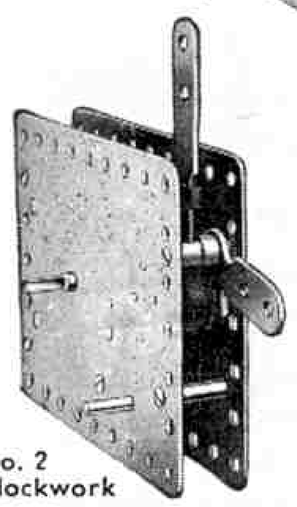


The *Magic* Motor

This splendid Motor is capable of driving models made with Meccano Outfits 0, 1, 2, 3 and 4. It costs only 2/-.



No. 1 Clockwork Motor



No. 2 Clockwork Motor

If you want to obtain the fullest enjoyment from the Meccano hobby you must operate your models by means of one of the Meccano Clockwork or Electric Motors listed below.

CLOCKWORK MOTORS

The *Magic* Motor (non-reversing)	Price	2/-
No. 1 Clockwork Motor (non-reversing) ...	,,	4/6
No. 1a Clockwork Motor (reversing) ...	,,	6/6
No. 2 Clockwork Motor (reversing) ...	,,	9/-

ELECTRIC MOTORS

No. E1 Electric Motor (6-volt). Non-reversing	Price	7/6
No. E6 Electric Motor (6-volt). Reversing ...	,,	12/9
No. E120 Electric Motor (20-volt). Non-reversing	,,	7/6
No. E20B Electric Motor (20-volt). Reversing	,,	13/6

TRANSFORMERS

The Transformers made by Meccano Limited provide a convenient and safe means of driving 6-volt or 20-volt Electric Motors and Train Sets from the mains supply where this is alternating current.

When ordering a Transformer or a Transformer-Rectifier the voltage and frequency of the supply must be stated. These particulars are given on the supply meter.

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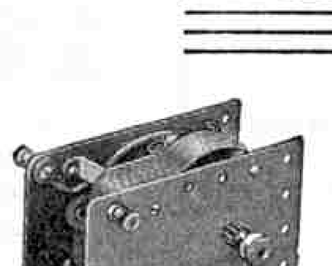

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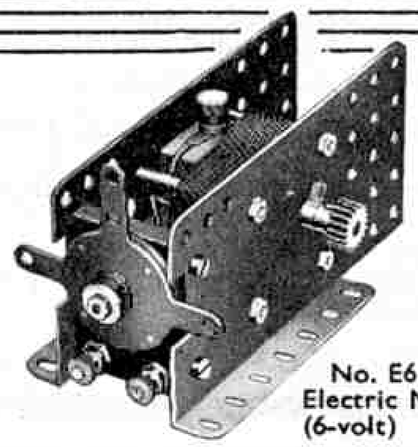

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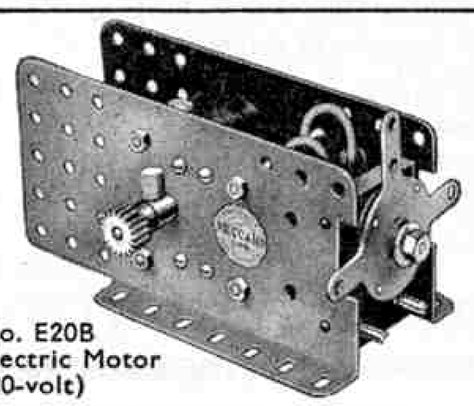

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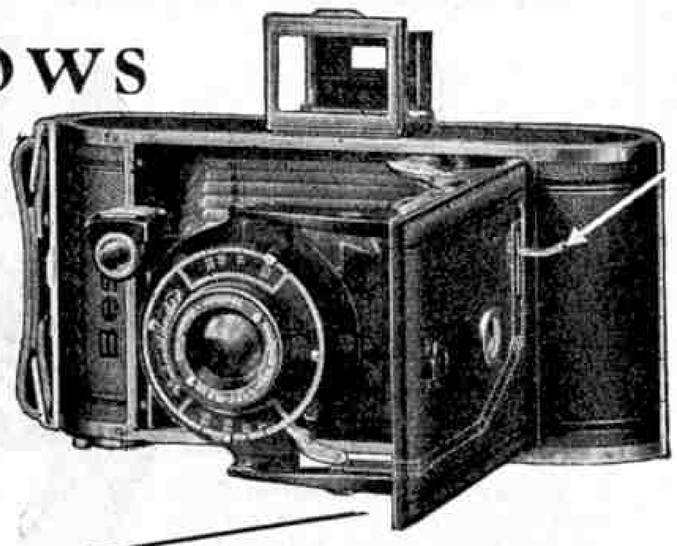

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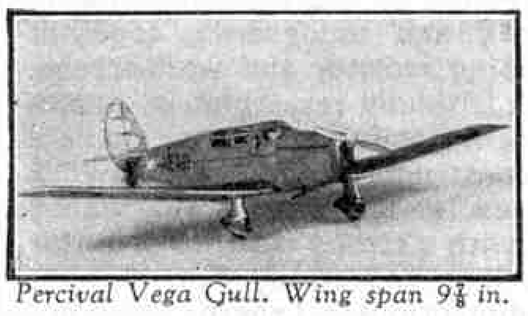

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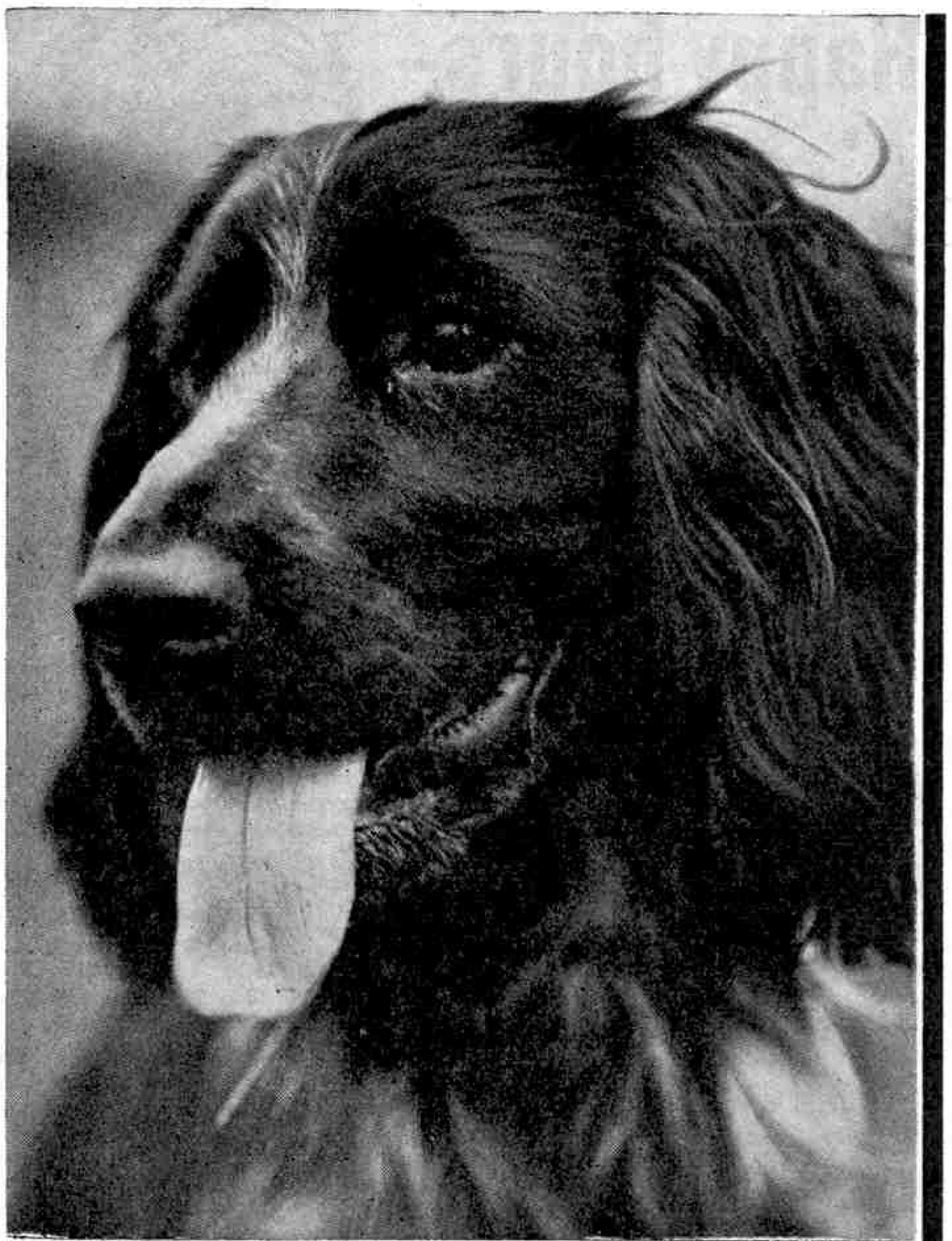

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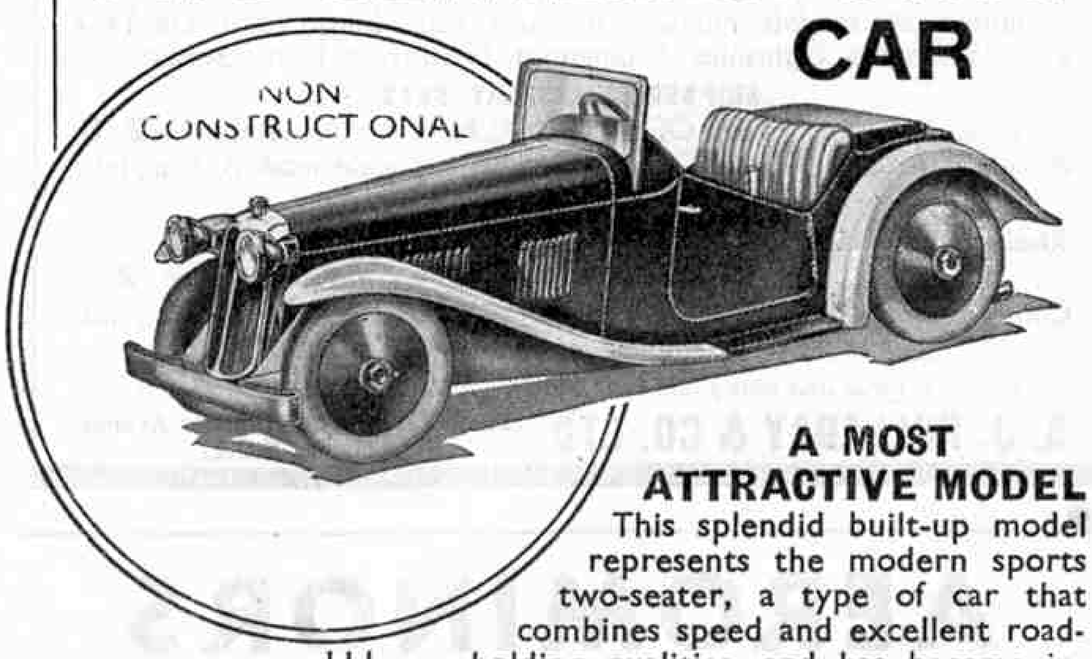

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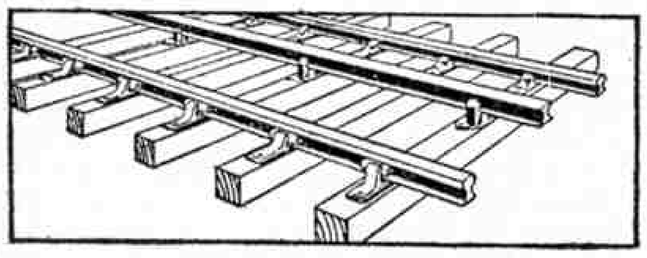

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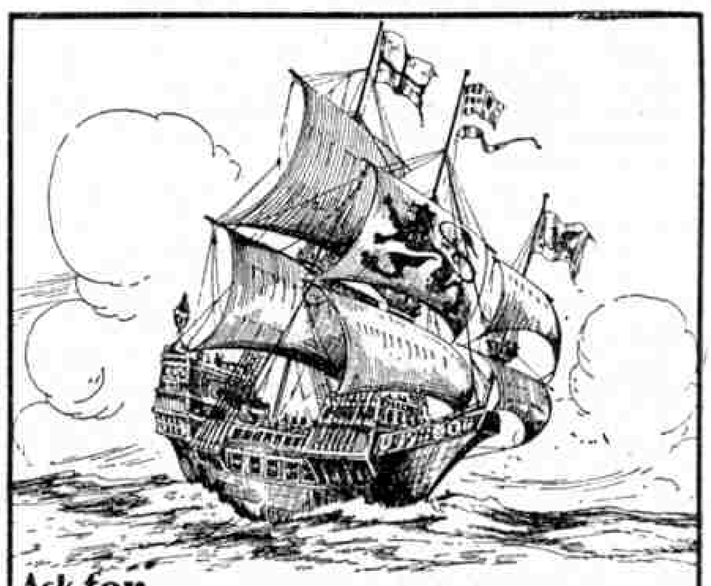

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125 consecutive "Magnets," 16 "Schoolboy's Own Library." Highest offer, together or separately.—M. Lloyd, 96, Wentworth Road, Birmingham.

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Stamps. Breaking collection, 100 different, 1/9. Meccano set No. 1, 7/–. "Swallow" steamboat, 8/6. Stamp for list.—73, Bellemoor Road, Southampton.

For sale. Bassett-Lowke and Hornby railway, 120 ft. Lowke track and 30 ft. Hornby track with points and crossovers, 4 clockwork engines, Hornby and Bassett-Lowke, and rolling stock. Apply for interview.—R. O. Gauntlett, 20, South Pk. Rd., Wimbledon.

"Railway Wonders of World." All parts, perfect condition, 25/–. "Meccano Magazines" Sept. 1923 to Jan. 1924. Oct. 1924 to Oct. 1927, Dec. 1927, March, May, June, October, November, 1928. Jan. 1929 to April 1936. Offers.—Lomer, "Nelsonvale," Highcliffe Park, Winchester.

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"M.M.'s," Jan. 1926–Dec. 1930. Complete and in excellent condition. What offer?—Kenneth, Oakhurst, Brook's Green, Nr. Horsham, Sussex.

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Sale. 116/– worth Red-Green Meccano. Accept 55/– or offers.—Clements, 5, Everton Road, Croydon.

Sale. Lott's Bricks, good condition, cost 25/6, 5/–. Meccano 4A wanted, cheap.—Currall, 24, Enys Road, Eastbourne.

Breaking up collection of 3,500 foreign stamps. Stamp for particulars.—P. Hamilton, Hertford, Southdown Road, Hale, Cheshire.

"M.M's." Feb. 1925–Feb.1936; 10 volumes, no 1931 volume. "Popular Flying," vols. I, II, III, 1932–4. "Aeroplane," vols. XLIII, 1932, XLIV, XLV, XLVI. All excellent condition. What offers, lot or separately? Also Pathéscope Projector with Variable Speed Motor, Transformer, odd films, complete wiring, all in case. Cost £12, worth £6, would accept £4/10/–.—16, Chantry House, Eccleston St., London, S.W.1.

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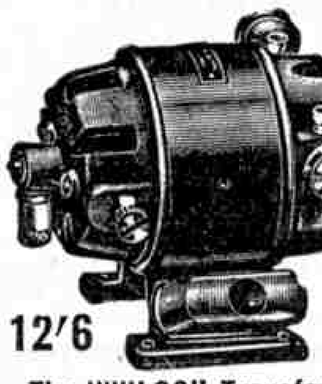
BE TALL Your Height increased in 14 days or money back! 3-5 inches rapidly gained. Amazing Complete Course sent for **5/-** P.O., or details free. Write **Stebbing System, Dept. M., 28, Dean Road, London, N.W.2.**

FAST OR SLOW DRIVE

12/6
With this **"WILCO" GEARED MOTOR** you can vary the speed of drive to suit your models. It works off a 4-volt Battery or Accumulator. A real precision engineering model. Self-lubricating. Gear ratio. 1 to 15. R.P.M. 2,500. Powerful. Price only **12/6.** We also stock Mains Motors, geared and ungeared. *See our Latest Catalogue 4d. Post Free.*
The "WILCO" Transformer with Speed Regulation.
Is ideal for the above motor and enables you to run any 2-8 volt A.C. motor direct from 200/250 volt A.C. mains at no expense and the cost is only **15/6**
L. WILKINSON, 204, Lower Addiscombe Road, Croydon, Surrey.

WHEN WRITING TO ADVERTISERS

Readers are urged to observe the following points when writing to advertisers:

1. **Mention the "M.M." and any special reference number quoted in the advertisement. This helps the advertisers to give prompt attention.**
2. **See that the full amount of the price and any postage is included. It is unfair to expect advertisers to fulfil their undertakings promptly if short remittances are sent.**
3. **GIVE YOUR FULL ADDRESS.**

THE ADVERTISEMENT MANAGER
MECCANO MAGAZINE, Binns Road, LIVERPOOL13

MECCANO MAGAZINE

Registered at G.P.O., London, for transmission by Canadian Magazine Post.

EDITORIAL AND ADVERTISING OFFICE:—
LIVERPOOL 13, ENGLAND.

Telegrams: "Meccano, Liverpool."

Publication Date. The *"M.M."* is published on the 1st of each month and may be ordered from any Meccano dealer, or from any bookstall or newsagent, price 6d. per copy. It will be mailed direct from this office, 4/– for six issues and 8/– for twelve issues.

To Contributors. The Editor will consider articles and photographs of general interest and payment will be made for those published. Whilst every care will be taken of articles, etc., submitted, the Editor cannot accept responsibility for any loss or damage. A stamped addressed envelope of the requisite size should be sent where the contribution is to be returned if unacceptable.

Readers' Sales and Wants. Private advertisements (i.e., not trade) are charged 1d. per word, minimum 1/–. Cash with order. Editorial and Advertising matters should not be dealt with on the same sheet of paper.

Small Advertisements. 1/6 per line (average seven words to the line), or 16/– per inch (average 12 lines to the inch). Cash with order.

Display. Quotations for space bookings, and latest net sale figures, will be sent on request.

Press Day, etc. Copy should be sent as early in the month as possible for insertion in following issue. We usually close for press on or before 6th of each month for following issue. Half-tone blocks up to 100 screen.

Proofs of advertisements will be sent when possible for space bookings of not less than half-an-inch.

Voucher copies. Sent free to advertisers booking one inch or over. Other advertisers desiring vouchers should add 8d. to their remittance and should order voucher copy at same time.

Remittances. Postal Orders and Cheques should be made payable to Meccano Ltd.

Ordering the "M.M." Overseas

Readers Overseas and in foreign countries may order the *"Meccano Magazine"* from regular Meccano dealers or direct from this office. The price and subscription rates are as above, except in the cases of Australia, where the price is 1/2 per copy (postage extra), and the subscription rates 8/– for six months and 16/– for 12 months (post free); Canada, where the price is 10c. per copy, and the subscription rates 65c. for six months, and $1.25 for 12 months (post paid).

The U.S.A. price is 15c. per copy, and the subscription rates $1 and $2 for 6 and 12 months respectively (post free).

Overseas readers are reminded that the prices shown throughout the *"M.M."* are those relating to the United Kingdom and Northern Ireland. Current Overseas Price Lists of Meccano Products will be mailed free on request to any of the undermentioned agencies. Prices of other goods advertised may be obtained direct from the firms concerned.

CANADA: Meccano Ltd., 187-189, Church St., Toronto.

UNITED STATES: Meccano Co. of America Inc., New Haven, Conn., Meccano Co. of America Inc., 200, Fifth Av., New York.

AUSTRALIA: Messrs. E. G. Page & Co., 52, Clarence Street, Sydney, N.S.W.

NEW ZEALAND: Models Limited, Third Floor, Paykel's Buildings, 9, Anzac Avenue (P.O. Box 129), Auckland, C.1.

SOUTH AFRICA: Mr. A. E. Harris (P.O. Box 1199), 142, Market Street, Johannesburg.

INDIA: Karachi: Daryanamal and Bros., Elphinstone Street. Bombay: Bombay Sports Depot, Dhobi Talao. Calcutta: Bombay Sports Depot, 2, Lindsay Street. Madras: Bombay Sports Depot, 162, Mount Road.

The Editor wishes to make known the fact that it is not necessary for any reader to pay more than the published price. Anyone who is being overcharged should lodge a complaint with the Meccano agent in his country or write direct to the Editor.

WEBLEY AIR PISTOLS
Marvellously accurate for target practice.

No license required to purchase.
Senior 45/-, Mark 1 32/6,
Junior 21/-, Webley Air Rifle 84/-
Write for List. WEBLEY & SCOTT LTD.,
87, WEAMAN STREET, BIRMINGHAM, ENG.

DINKY TOYS

OVER 250 VARIETIES

A FASCINATING COLLECTING HOBBY

Dinky Toys are the most realistic and the most attractive models in miniature ever produced. These wonderful toys are unique in their perfection of finish, and their range is so wide as to appeal to all tastes. A selection is illustrated on these pages. As will be seen, racing cars, motor vehicles, aeroplanes, railway signals, etc., are now included in the range. Many other models of equal interest are in preparation.

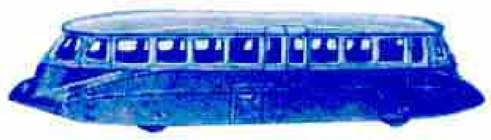
ASK YOUR DEALER FOR A COPY OF THE DINKY TOYS FOLDER, which gives illustrations and prices of the complete range.

SMALL CARS
Dinky Toys No. 35

No. 35a Saloon Car	each	3d.
No. 35b Racer	,,	3d.
No. 35c "M.G." Sports Car	,,	3d.

Price of complete set 9d.

HOTCHKISS RACING CAR
Dinky Toys No. 23b
Assorted colours. Fitted with rubber tyres. Price 4d. each

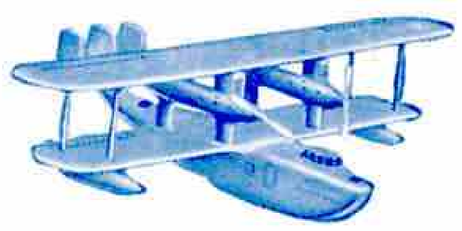


G.W.R. RAIL CAR
Dinky Toys No. 26
Assorted colours. Price 4d. each

BEACON
Dinky Toys No. 47d
(Realistic models of the Belisha Safety Beacons.)
Price 1d. each

Dinky Toys No. 60r
EMPIRE FLYING BOAT "CALEDONIA"
This is a splendid model of the famous Empire Flying Boat that made the experimental flights across the Atlantic recently, in preparation for a regular air service between this country and America. The *"Caledonia"* has a wing span of 114 ft., and is fitted with four Bristol "Pegasus X" engines that give it a top speed of nearly 200 m.p.h.
Models of five other Empire Flying Boats—*"Canopus," "Corsair," "Challenger," Centurion"* and *"Cambria"* will be available shortly. Price 1/- each

60P



60H

60N

R.A.F. AEROPLANES
Dinky Toys No. 61

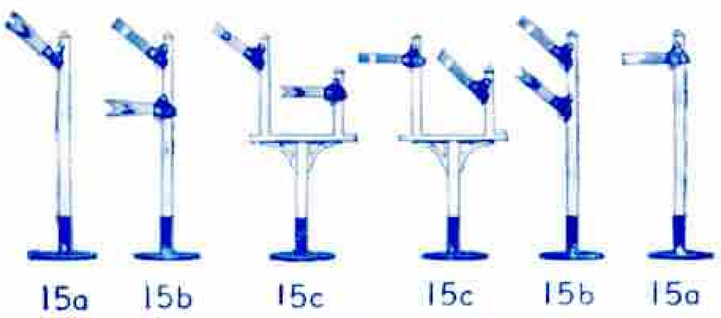
No. 60h "Singapore" Flying Boat	each	1/-
No. 60p Gloster "Gladiator" Biplane (2)	,,	6d.
No. 60n Fairey "Battle" Bomber (2)	,,	4½d.

Price of complete set 2/9

280C 280D 280A
280F 280E 280B

DELIVERY VANS
Dinky Toys No. 280

No. 280a Viyella Van	each	6d.
No. 280b Lyons' Van	,,	6d.
No. 280c Shredded Wheat Van	,,	6d.
No. 280d Bisto Van	,,	6d.
No. 280e Ekco Van	,,	6d.
No. 280f Mackintosh's Van	,,	6d.



15a 15b 15c 15c 15b 15a

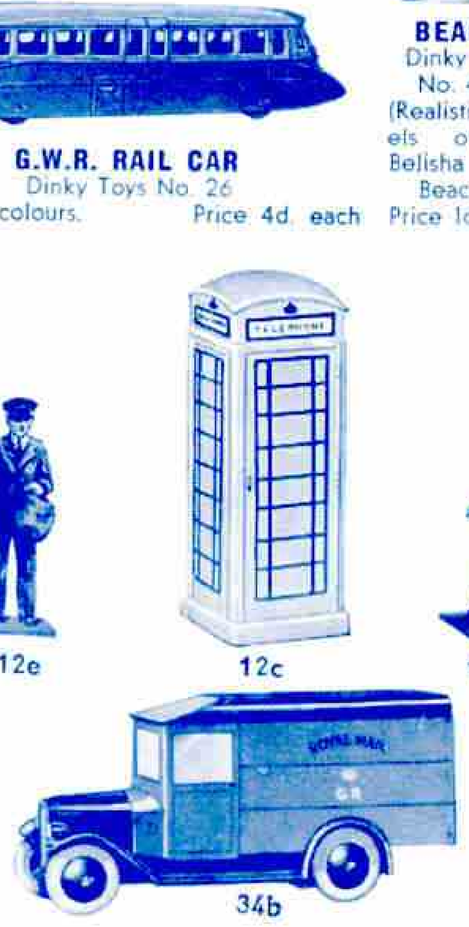
RAILWAY SIGNALS
Dinky Toys No. 15
No. 15a Single Arm Signal (2). "Home" and "Distant" each 2d.
No. 15b Double Arm Signal (2) combined. "Home" and "Distant" ... ... each 3d.
No. 15c Junction Signal (2). "Home" and "Distant" each 4d.
Price of complete set 1/6

12e

12c

12d

12b



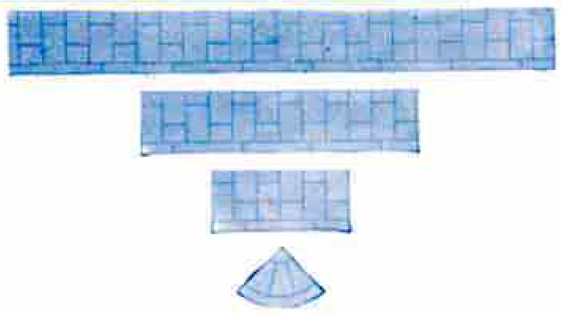
34b

12a

POSTAL SET
Dinky Toys No. 12

No. 12a Pillar Box, G.P.O	each	3d.
No. 12b ,, ,, Air Mail	,,	3d.
No. 12c Telephone Call Box	,,	4d.
No. 12d Telegraph Messenger	,,	3d.
No. 12e Postman	,,	3d.
No. 34b Royal Mail Van	,,	10d.

Price of complete set 2/3



PAVEMENT SET
Dinky Toys No. 46
The contents of this set, which are not supplied separately, are four 3-inch strips of pavement, six 6-inch strips of pavement, four 12-inch strips of pavement, and four quarter discs for corners.
Price of complete set 6d

Every Dinky Toy contained in the complete sets can be purchased separately if desired.

MERCEDES-BENZ RACING CAR
Dinky Toys No. 23c
Assorted colours. Fitted with detachable rubber racing tyres.
Price 8d. each

HALL'S DISTEMPER ADVERTISEMENT
Dinky Toys No. 13
This miniature of a well-known lineside advertisement is intended to be placed in the fields adjoining the railway track. Price 9d. each.

RAILWAY MECHANICAL HORSE AND TRAILER VAN
Dinky Toys No. 33R
Price complete, L.M.S.R., L.N.E.R., G.W.R. or S.R., 1/6

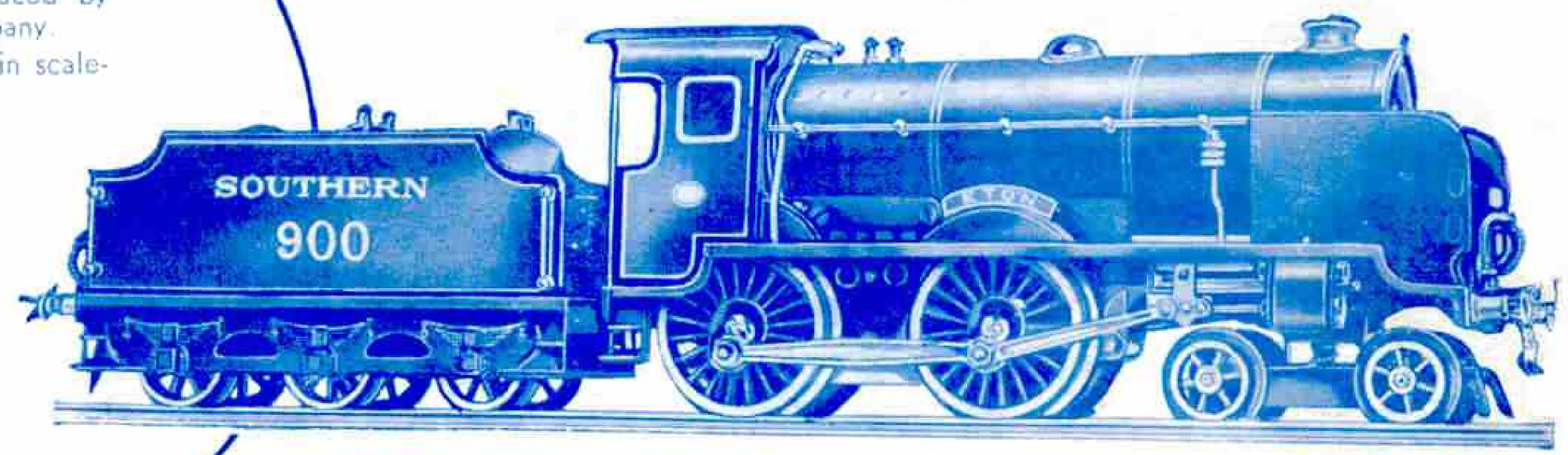
MECCANO LIMITED — BINNS ROAD — LIVERPOOL 13

HORNBY ELECTRIC & CLOCKWORK TRAINS

This is a fine scale model of the first member of the famous "Schools" class, perhaps the most popular series of locomotives ever produced by the Southern Railway Company.

All who are interested in scale-model locomotives, and especially "Southern" enthusiasts, will welcome the "ETON" both for its beauty and its fine performance. It has a 20-volt motor designed for running from Alternating Current mains supply through a Transformer. It is fitted with the famous Hornby REMOTE CONTROL.

"ETON"



E420 "ETON" Locomotive (20-volt Electric)	Price **42/6**
No. 4c "ETON" Locomotive (Clockwork)	**35/-**
Tender	**6/-**

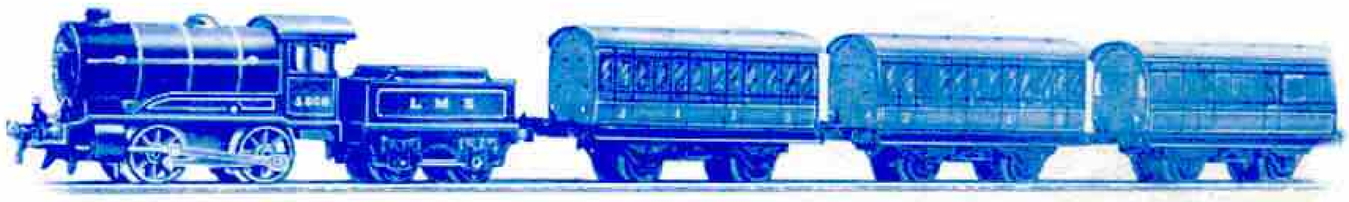
Hornby Trains—the name spells magic to thousands of boys of all ages. It means miniature railways for every home; railways complete with all types of locomotives, coaches and wagons, stations, signals, and all the accessories that make a real railway so full of interest. If the house electric lighting supply is Alternating Current the whole railway can be operated electrically.

The latest Hornby 20-volt electric locomotives fitted with Remote Control can be started, stopped, controlled for speed and reversed entirely from the side of the track without any manipulation by hand from the cab. All this is done with perfect safety by means of a Meccano Transformer, a simple apparatus that automatically transforms the mains current down to the low voltage required for the railway. The Hornby 6-volt Electric Locomotives can be run either from a Meccano 9-volt Transformer or from a 6-volt accumulator.

Then there is a splendid range of Hornby locomotives fitted with clockwork motors. These are extremely powerful, and capable of hauling heavy trains at high speed over long distances.

Hornby Train Sets are available at prices ranging from **15'-** to **72'-** for Electric and **4'11** to **58'6** for Clockwork models.

A SELECTION FROM THE RANGE OF HORNBY TRAINS



Hornby No 1 Passenger Set. Reversing (Clockwork). Price **23/6**

EM320 (20-volt) or EM36 (6-volt) Tank Goods Train Set. Reversing. Price **24/-**

Hornby No 3c Passenger Set. Reversing (Clockwork). Price **47/6**

Hornby No E220 (20-volt) Mixed Goods Train Set. Automatic Reversing. Price **45/-**

No. 2 Special Passenger Set. Reversing (Clockwork). Price **52/-**

Hornby No E320 (20-volt) Riviera "Blue" Train Set. Automatic Reversing. Price **65/-**

PRODUCT OF

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PUBLISHED BY MECCANO LTD., BINNS ROAD, LIVERPOOL 13, ENGLAND
Printed by John Waddington Ltd., Leeds and London.