VOL. XXIII. Nº 11. NOVEMBER 1938

MECCANO MAGAZINE

STREAMLINE AND POWER

6D.

THE 1938-9 HORNBY BOOK of TRAINS

The 1938-9 issue of the "Hornby Book of Trains" should be in the hands of every railway enthusiast.

The beautiful coloured cover shows a striking picture of the famous "*Cornish Riviera Limited*," specially painted by the well-known artist Bryan de Grineau. The contents of the Book are more varied than ever. They include articles, fully illustrated by splendid photographs, dealing with little-known features of railway goods traffic, automatic train control on the G.W.R., the famous L.N.E.R. and L.M.S. expresses on the London-Scotland routes, the mysteries of the Travelling Post Office, and the Continental Boat Trains of the Southern Railway.

In addition the Book forms a complete catalogue of Hornby Trains for electric and clockwork railways. All the Hornby Locomotives, Rolling Stock and Accessories are beautifully illustrated in full colour.

How to obtain the Book

The Hornby Book of Trains may be obtained from any Meccano dealer, price 3d., or direct from Meccano Ltd. (Dept. A.M.), Binns Road, Liverpool 13, price 4½d. post free. In the latter case a remittance in stamps should be sent and the name and address of the sender should be clearly written.

Readers living in Australia, New Zealand or South Africa who require copies should send their postal orders for 8d. (which includes postage) to the addresses given below. The Meccano Branch at Toronto will deal with Canadian orders and the price is 15 cents postpaid.

Readers living in countries other than those mentioned should order from Meccano Ltd., Binns Road, Liverpool 13, sending 6d. in stamps with their order.

3D

AUSTRALIAN AGENTS: E. G. Page & Co., 52, Clarence St., Sydney (P.O. Box 1832k).

NEW ZEALAND AGENTS: Models Limited, Paykel's Buildings, Anzac Avenue, Auckland C.1 (P.O. Box 129).

SOUTH AFRICAN AGENT: Arthur E. Harris, 142, Market Street, Johannesburg (P.O. Box 1199).

CANADIAN BRANCH: Meccano Ltd., 187-189, Church Street, Toronto.

Published by MECCANO LTD. (Dept. A.M.), BINNS ROAD, LIVERPOOL 13

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GROW 2 FT. TALLER

Hamley's News

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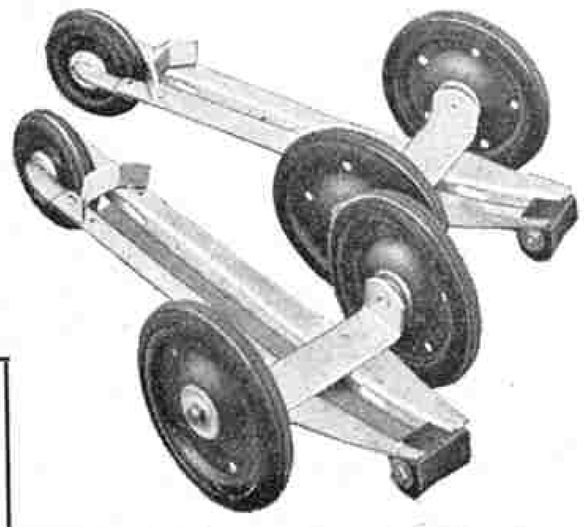
No. 34 *November, 1938*

BE A GRASS-HOPPER

TRY THREE-WHEELING - The Latest Craze

Vastly different from ordinary roller skates, this specially designed model has three big, ball-bearing mounted wheels, with rubber tyres. Now you can skate on any hard surface at greater speed and greater comfort. Solidly and strongly made with straps complete.

PRICE **19/6**
POST 6d. *Foreign*



HAMLEY'S MAKE HUMAN GRASSHOPPERS

The POGO STICK provides constant amusement for both boy and girl. An attractively coloured stick with sprightly action.

PRICE **10/6**
JUVENILE SIZE **8/11**
CARRIAGE 1/-

CLOCK BUILDING MADE EASY!

All the working parts are here and all you have to do is to fit them together. See for yourself how a clock really works. Fully illustrated manual.

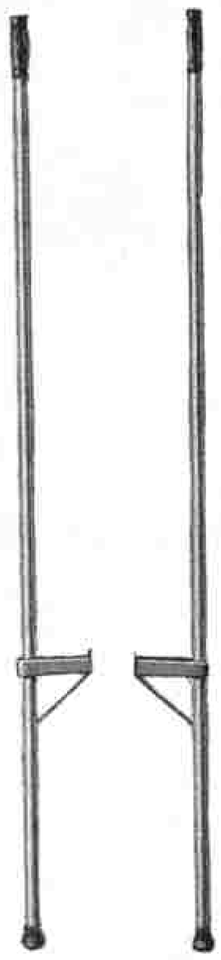
PRICE **10/6**
POST 6d.

CUT IT OUT!

A most attractive knife fitted with compressed leather handle and Sheffield blade. Complete in leather sheath.

PRICE **4/6**
Postage 3d.

JOHNNY HEAD IN THE AIR!



On STILTS—the old traditional trial of skill for boys and girls of all ages has held the place of honour in every generation. Metal with adjustable footrests. Rubber hand-grips, footrests and ends eliminates slipping.

PRICE **6/11**
CARRIAGE 1/-

GOT IT!

FIRST TIME

Plumb on the weathercock and it's still spinning, now let me have a go! What fun and what a toy!!

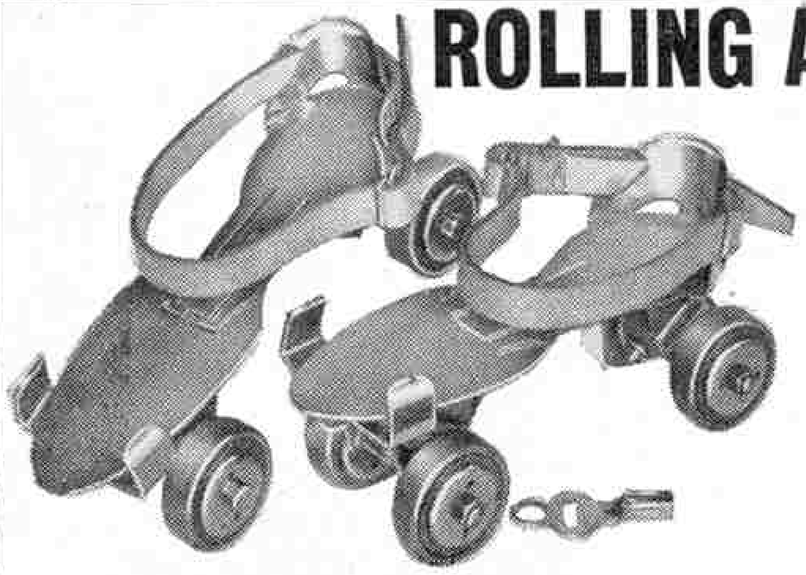
PRICE **2/-**
POST 2d.

GOAL!

A school ball made specially for Hamley's. Constructed of strong hide.

SIZE 3 Price **7/11**
SIZE 4 Price **8/9**
SIZE 5 Price **10/6**
POST 6d.

ROLLING ALONG



A special ball-bearing skate made by one of the leading American skate manufacturers. Self guiding and adjustable. Suitable for boys or girls.

PRICE **10/-**
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LEARN WHILE YOU PLAY

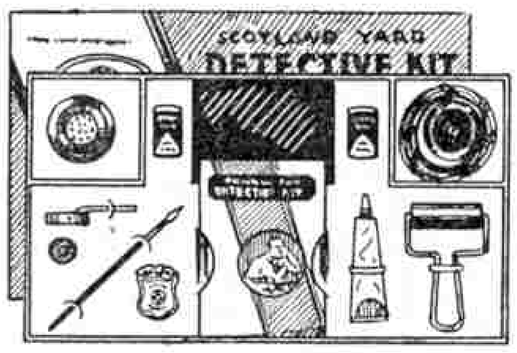
in a Thrilling way

with one of these instructive

GILBERT SETS

Spell-binding discoveries with a microscope . . . fascinating stunts with electricity and magnetism . . . chemical magic . . . thrilling fun as an amateur detective . . . these are some of the enthralling kinds of amusement you can enjoy with GILBERT Outfits. Instructive, ingenious, they enable you to gain exciting new knowledge while you revel in never-ending fun. You'll never have a dull moment if you have a GILBERT gift for clever boys.

BE A DETECTIVE!



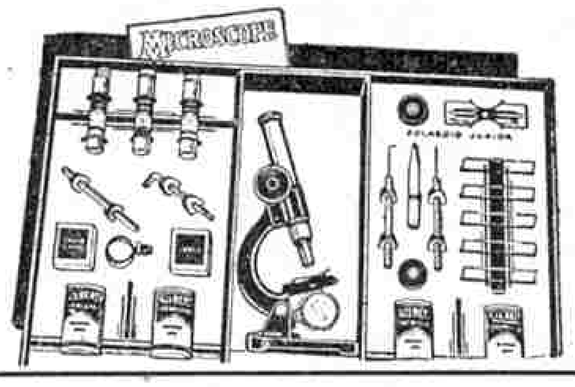
Imagine the thrill of being an amateur "C.I.D." man. With this new set you can detect finger prints and make complete finger print records of your family and friends. There is also a sensitive Detectaphone, enabling you to listen-in secretly to conversations in other rooms. Information book shows the way to endless amusement.

Price **10/6**

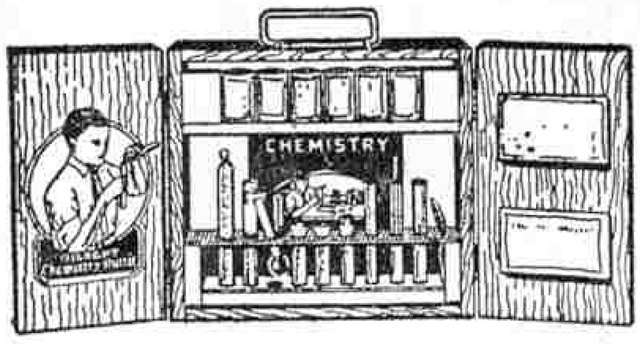
Amazing Secrets Revealed by a MICROSCOPE

Weird secrets invisible to the naked eye are revealed by the powerful microscopes in Gilbert Micro-Chemistry Outfits. A drop of water is seething with strange life! The microscopes are high-grade instruments which magnify over 200 times. Sets include a POLAROID which reveals beauties usually unseen in microscopy; also other chemicals and parts for fascinating experiments.

No. 5. Micro-Chemistry - - - **12/6**
No. 7. Super Outfit - - - - - **21/-**



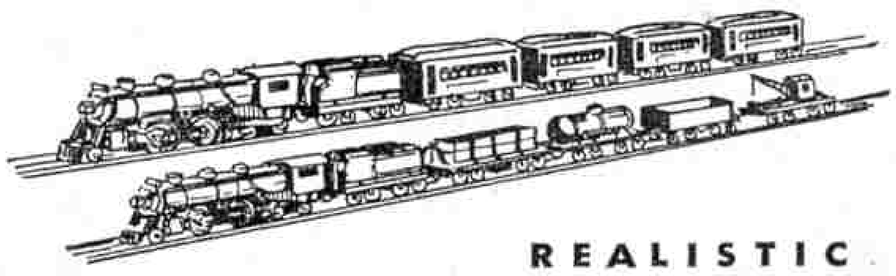
Have your own CHEMIST'S LABORATORY



Gilbert Chemistry Outfits are real laboratories in stand-up cabinets. They contain an unequalled supply of chemicals and apparatus for performing hundreds of experiments in chemical magic.

No. 1 Outfit, **5/-** No. 3 Outfit, **12/6**
No. 2 Outfit, **7/6** No. 6 Outfit, **21/-**

Wonderful New *American Flyer* ELECTRIC TRAINS



These famous trains are now made in a greatly improved form by the Gilbert Co. Built to scale from actual railway blue-prints, they are remarkably realistic. Amazing pulling power is given by extremely robust electrical mechanism. The trains can be operated by remote control. The Pullman Cars and Locomotives are lighted and have automatic couplers. Every detail of the trains is exactly like the real thing. There are Passenger, Goods and Miniature Train Sets. Wonderful gifts!

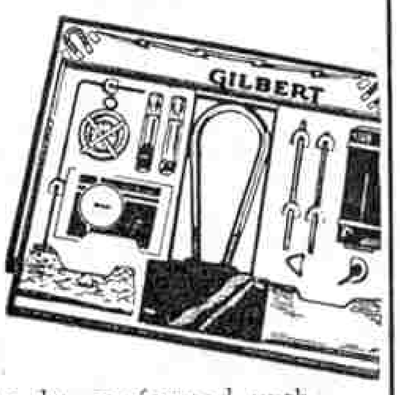
REALISTIC SCALE MODELS

REMOTE CONTROL

AUTOMATIC COUPLERS

Sets from 30/-

FASCINATING ELECTRICAL OUTFITS that Teach



Electricity is an enthralling hobby and Gilbert Electrical Outfits teach all about building an electric motor, fixing up bell and buzzer systems and house lighting, etc. Fascinating stunts can be done with static electricity and magnetism. Unbelievable tricks can be performed with the Gilbert "Electric Eye."

Magnetic Fun and Facts - - **5/-**
Electric Motor Kit - - - - **5/-**
Electricity and Magnetism - **10/6**
Gilbert "Electric Eye" - - - **25/-**
No. 10. Electrical Set - - **42/-**

Entertain the Family with "MYSTO-MAGIC" CONJURING TRICKS

You can give mystifying conjuring displays with a "Mysto-Magic" Set. You'll always be "the life of the party"—and will get invitations everywhere. These sets contain ingenious tricks not found in any other sets. Although mystifying, the tricks are easy to perform. Even the smallest outfit contains twelve surprising tricks.

Outfits from **5/-** to **21/-**

POST the COUPON for FREE Catalogue in Colour

To **THE A.C. GILBERT CO., 109, Kingsway, London W.C.2**
Please send me, absolutely FREE, your new catalogue showing the scores of Gilbert Outfits in full colours.

Name.....
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M.M. NOV. .....

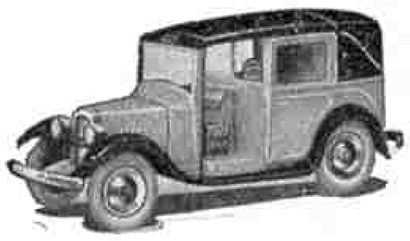
Don't be disappointed! If you have any difficulty in obtaining Gilbert Outfits or American Flyer Trains locally, send your order—with Postal Order—direct to us. Cash returned at once in full if not satisfied. Where's your pen or pencil? Post the coupon at once!

MINIC

ALL TO SCALE CLOCKWORK TOYS

Almost every type of vehicle on the road represented; some with ELECTRIC LIGHTS. Strongly constructed and fitted with powerful, long-running mechanism, they will run anywhere, EVEN ON THE CARPET. Each model is beautifully finished in a variety of colours, and packed singly in an attractive box.

MINIC Traffic Control Car
LENGTH 5 ins. Price **1/6**

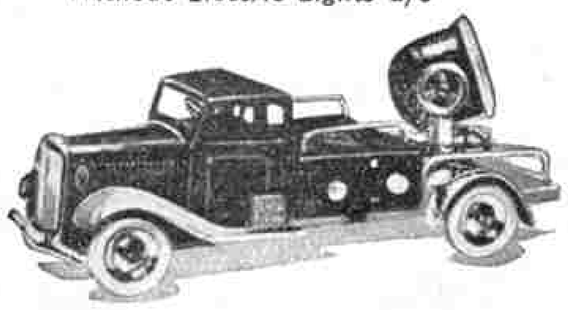


MINIC Taxi
LENGTH 4¼ ins. Price **2/-**

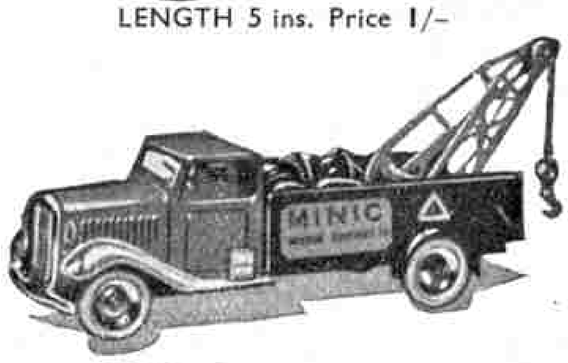
MINIC £100 Saloon
LENGTH 3¾ ins.
Price **6d.**

MINIC Daimler Sunshine Saloon
with Electric Headlamps and Battery.
LENGTH 5¼ ins. Price **3/6**
Without Electric Lights **2/6**

LENGTH 5 ins. Price **1/-**



MINIC Searchlight Lorry
with Electric Searchlight and Battery.
LENGTH 5¼ ins. Price **3/6**



MINIC Breakdown Lorry
with Mechanical Crane.
LENGTH 5½ ins. Price **3/6**

SERVICE STATIONS

Specially Designed for Your Minics

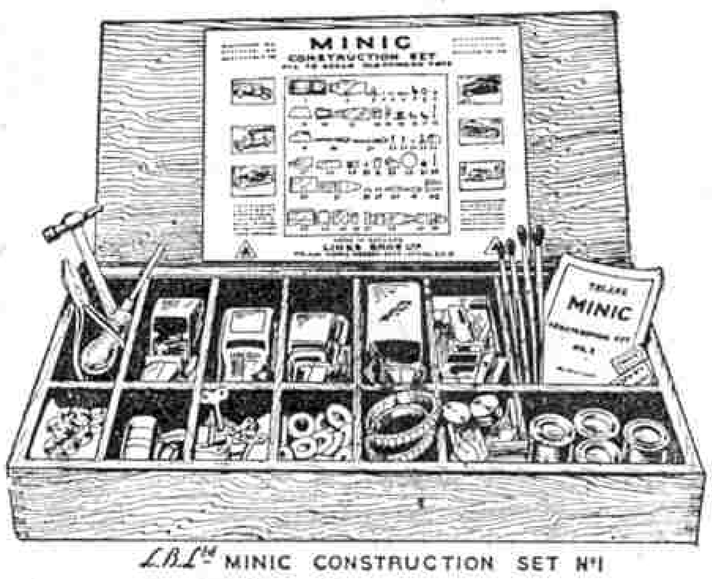
MINIC Service Station No. 3

Realistic design, imitation red tiled roof with sign, three large petrol pumps, one large oil cabinet, two electric lights and battery, dummy clock face and other signs. LENGTH 16 ins. Price **9/11**
CARS NOT INCLUDED. OTHER MODELS from **1/11** to **32/6**

BOYS!

Learn the Principles of Engineering Mechanics

MINIC
Construction Set No. 1



L.B.Ltd MINIC CONSTRUCTION SET Nº1

A complete set of parts for making six types of MINIC all to scale clockwork models. All parts, including powerful clockwork motor units, are made with precision tools and machines. Full instructions and tools are included in each set which is packed in a handsome oak finished cabinet 18 ins. x 9¾ ins. x 2½ ins.
PRICE **15/-**

TRI-ANG

GYRO CYCLE

TRI-ANG GYRO-CYCLE

Astonishing Robot Pedal Cyclist

The GYRO-CYCLE is an amusingly clever toy. The gay little figure astride the saddle appears to balance himself as he pedals merrily all over the place, and with his flexible arms creates the illusion in the most realistic way that he is steering the Gyro-Cycle by the handle bars.

The Gyro-Cycle will perform the most amazing evolutions for over one minute. Ask your dealer to give you a demonstration.

PRICE ONLY

5/-

British Patent 479430. Patents pending in other Countries.

TRI-ANG

LINES BROS. LTD. *Makers of the famous* TRI-ANG TOYS

TRI-ANG WORKS, MORDEN ROAD, LONDON S.W.19

TRI-ANG

PERFECT SCALE MODELS

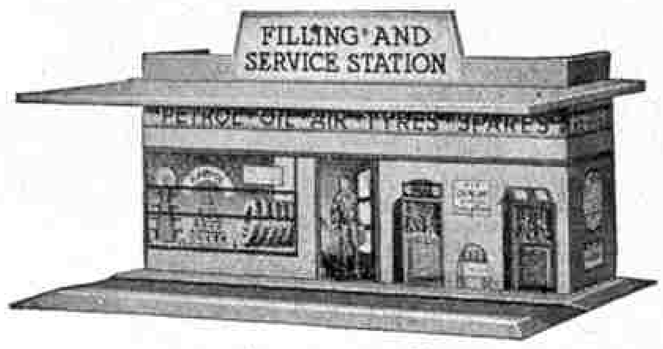
DINKY TOYS

OVER 300 VARIETIES

Collecting Dinky Toys is one of the most fascinating of all hobbies. These realistic miniatures are unique in their rich colouring and perfection of design and finish, and their range is so wide as to appeal to all tastes. This season many new items have been introduced including wonderful scale models of military Tanks and Aeroplanes, latest types of Motor Cars, complete with driver and passenger, and many others.

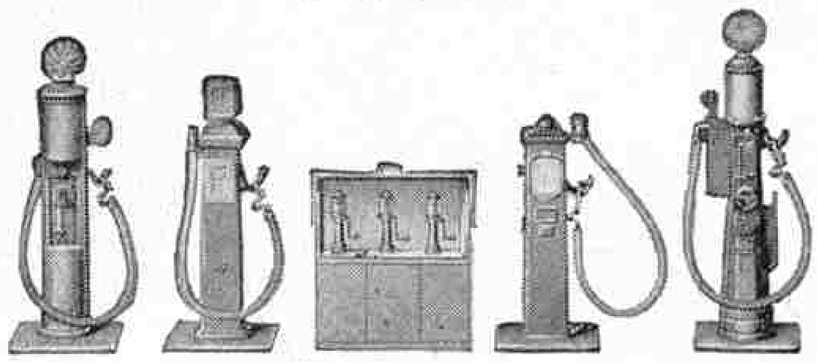
Every boy or girl who has not already done so should start this delightful collecting hobby to-day. All the models can be purchased either separately or in complete sets.

PETROL STATION



Dinky Toys No. 48
Accurate reproduction of a filling station.
Price **1/3** each

PETROL PUMPS

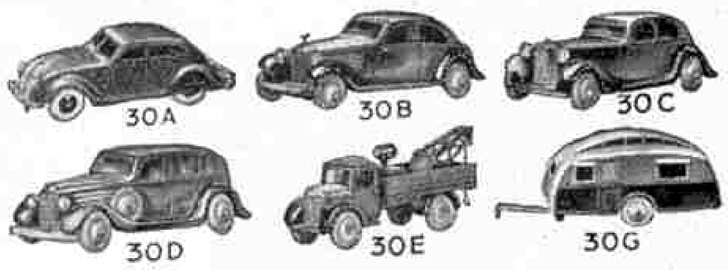


Dinky Toys No. 49
Scale models fitted with rubber hose pipes. Finished in correct colours.

No. 49a Bowser Pump	each	**3d.**
No. 49b Wayne Pump	"	**3d.**
No. 49c Theo Pump	"	**3d.**
No. 49d Shell Pump	"	**3d.**
No. 49e Oil Bin (Pratts)	"	**3d.**

Price of complete set **1/3**

MOTOR VEHICLES



Dinky Toys No. 30
Fitted with detachable rubber tyres.
Silver-plated radiators.

No. 30a Chrysler "Airflow" Saloon	each	**6d.**
No. 30b Rolls-Royce	"	**9d.**
No. 30c Daimler	"	**9d.**
No. 30d Vauxhall	"	**9d.**
No. 30e Breakdown Car	"	**9d.**
No. 30g Caravan Trailer	"	**6d.**

Price of complete set **3/11**

MOTOR TRUCK

Dinky Toys No. 22c
Assorted colours. Fitted with detachable rubber tyres.
Price **6d.** each

STREAMLINED SALOON

Dinky Toys No. 22h
Assorted colours. Fitted with detachable rubber tyres.
Price **4d.** each

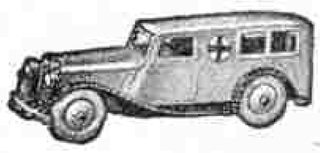
REFUELLING TENDER

Dinky Toys No. 60y
Realistic model of Thompson Bros. Tender used for refuelling aeroplanes at aerodromes.
Price **8d.** each

BEACON

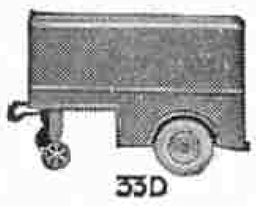
Dinky Toys No. 47d
Realistic model of the Belisha Safety Beacon.
Price **1d.** each

AMBULANCE



Dinky Toys No. 30f
Fitted with detachable rubber tyres. Finished in grey, with red cross. Silver-plated radiator. Price **6d.** each

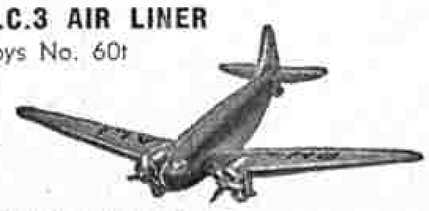
BOX VAN



Dinky Toys No. 33d
Fitted with detachable tyres.
Price **8d.** each

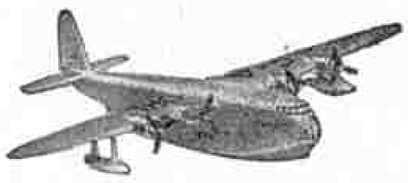
DOUGLAS D.C.3 AIR LINER

Dinky Toys No. 60t



A scale model of a Douglas D.C.3 air liner, a type in regular service on American and European routes.
Price **9d.** each

EMPIRE FLYING BOATS

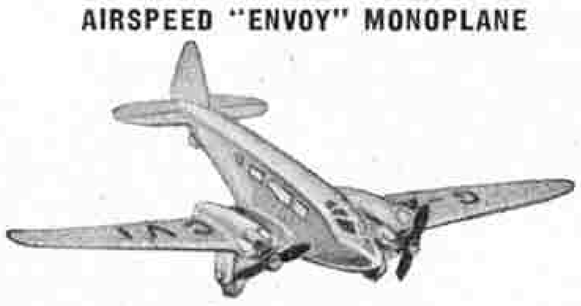


Dinky Toys No. 60r
Scale models of the latest Imperial Airways Flying Boats. Twelve models available named: *"Caledonia," "Canopus," "Corsair," "Challenger," "Centurion," "Cambria," "Calpurnia," "Ceres," "Clio," "Calypso," "Corinna"* and *"Cheviot."* Price **1/-** each

ATLANTIC FLYING BOAT

Dinky Toys No. 60x
Similar in type to the Empire Flying Boat. Assorted colours.
Price **1/-** each

AIRSPEED "ENVOY" MONOPLANE

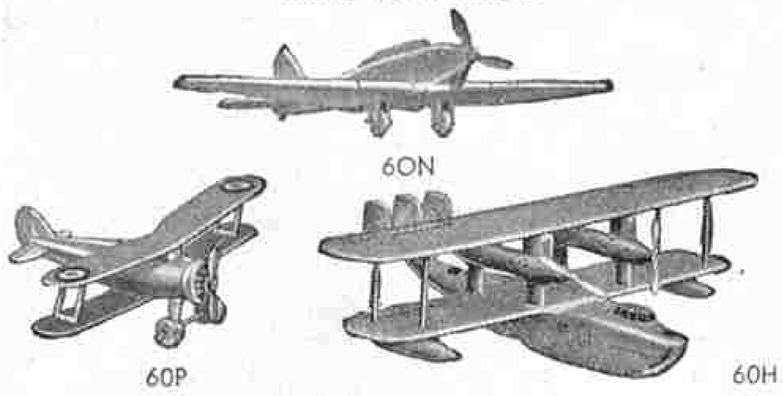


Dinky Toys No. 62m
Scale model of the Airspeed "Envoy" twin engined commercial monoplane. Assorted colours. Price **6d.** each

THE KING'S AEROPLANE

Dinky Toys No. 62k
Scale model of the Airspeed "Envoy" supplied to the Air Council for the King's Flight.
Price **8d.** each

R.A.F. AEROPLANES



Dinky Toys No. 61

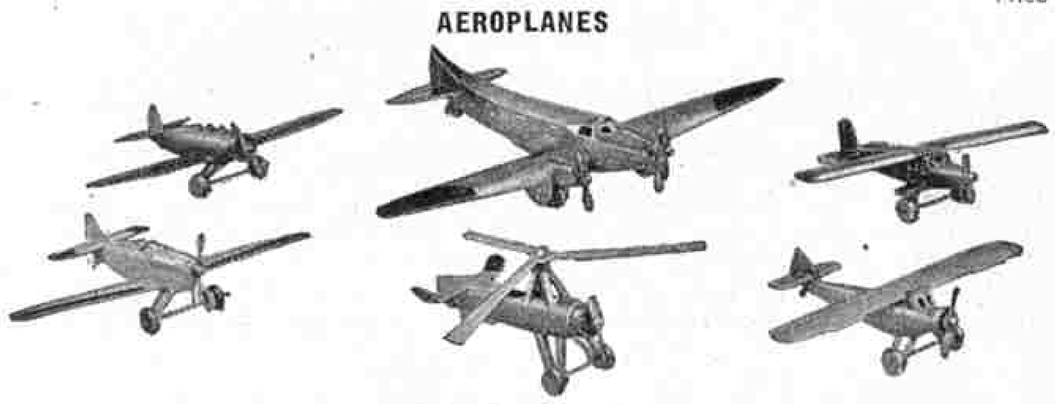
No. 60h "Singapore" Flying Boat	each	**1/-**
No. 60n Fairy "Battle" Bomber (2)	"	**4½d.**
No. 60p Gloster "Gladiator" Biplane (2)	"	**6d.**

Price of complete set **2/9**

MEDIUM BOMBER

Dinky Toys No. 60s
Similar to Fairey "Battle" Bomber (No. 60n), but with new Air Ministry Shadow Shading. Price **6d.** each

AEROPLANES



Dinky Toys No. 60z
The set consists of six models of famous French aeroplanes—"Arc-en-Ciel," Potez 58, Hanriot H180T, Breguet-Corsaire low wing monoplane, Dewoitine 500 and Cierva Autogiro. (Made in the Meccano Factory in Paris.) Price **3/-**

MONOPLANE "ARC-EN-CIEL." Dinky Toys No. 60az
A Scale model of the famous French triple-engined monoplane "Arc-en-Ciel." (Made in the Meccano Factory in Paris.) Price **9d.** each

ARMSTRONG WHITWORTH "WHITLEY" BOMBER

Dinky Toys No. 60v
Scale model of the "Whitley" long-range heavy bomber adopted by the R.A.F.
Price **9d.** each

FLYING BOAT "CLIPPER III"

Dinky Toys No. 60w
Scale model of the Pan American Airways flying boat that took part in the transatlantic experimental flights in 1937
Price **1/-** each

MECCANO LIMITED — BINNS ROAD — LIVERPOOL 13

A FASCINATING COLLECTING HOBBY

DINKY TOYS

FINISHED IN RICH COLOURS

"THUNDERBOLT" SPEED CAR

Dinky Toys No. 23m
A fine scale model of the car in which Capt. G. E. T. Eyston set up a world land speed record of 357.50 m.p.h. at Bonneville, Utah, U.S.A., recently. Price **1/-** each

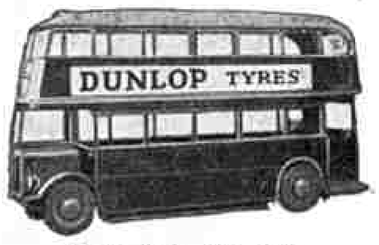
SIX WHEELED WAGON

Dinky Toys No. 25s
An interesting model of a modern three-ton wagon. In assorted colours.
Price **1/-** each

TAXI WITH DRIVER

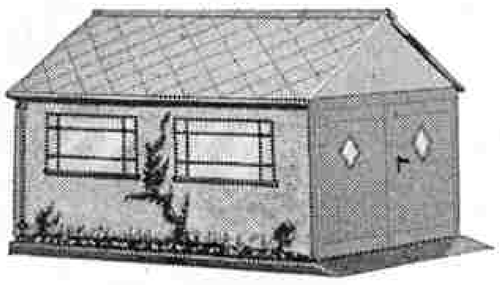
Dinky Toys No. 36g
Fitted with detachable rubber tyres.
Price **11d.** each

DOUBLE DECKER BUS



Dinky Toys No. 29c
Assorted colours. Fitted with detachable rubber tyres.
Price **1/-** each

GARAGE



Dinky Toys No. 45
Fitted with opening double doors. Will accommodate any two Dinky Toys Motor Cars.
Price **1/3** each

POLICE MOTOR CYCLIST
Dinky Toys No. 37b

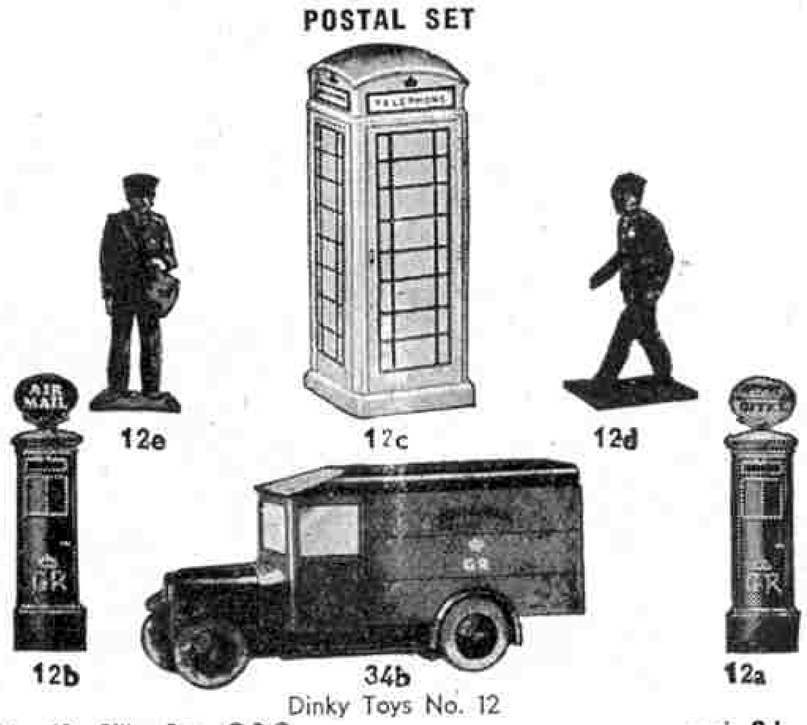
Price **6d.** each

CIVILIAN MOTOR CYCLIST
Dinky Toys No. 37a

Assorted colours. Price **6d.** each

Royal Corps of Signals Despatch Rider. Dinky Toys No. 37c
Similar to Dinky Toys No. 37b. Finished in correct colours. Fitted with solid rubber wheels. Price **6d.** each

POSTAL SET

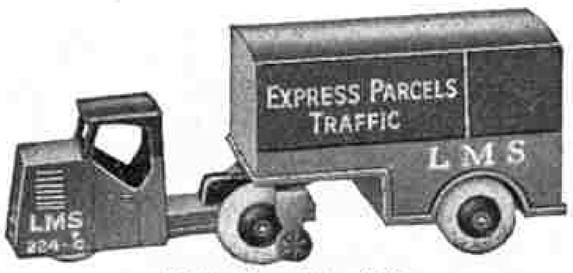


Dinky Toys No. 12

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**

RAILWAY MECHANICAL HORSE AND TRAILER VAN

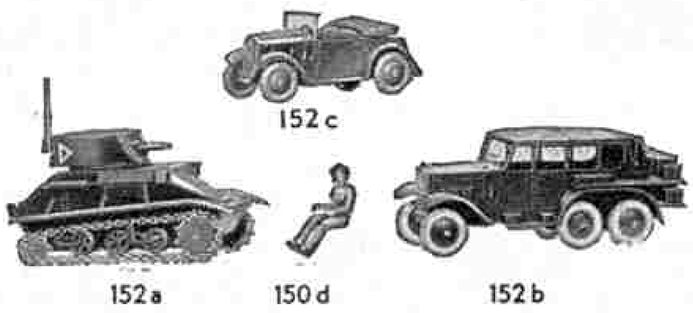


Dinky Toys No. 33R
Fitted with detachable rubber tyres.

No. 33Ra	Railway Mechanical Horse	each **8d.**
No. 33Rd	Trailer Van	" **10d.**

Price, complete, L.M.S.R., L.N.E.R., G.W.R. or S.R. ... **1/6**

ROYAL TANK CORPS LIGHT TANK SET

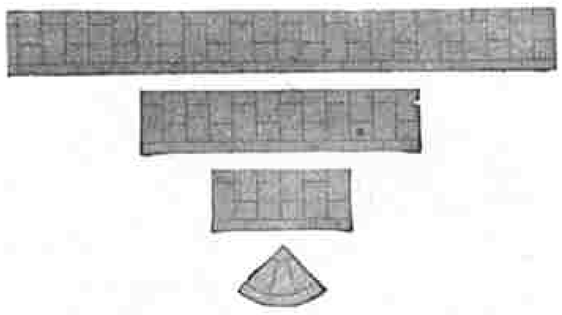


Dinky Toys No. 152

No. 152a	Light Tank (4½ tons, 25 h.p.)	each **1/2**
No. 152b	Reconnaissance Car ...	" **1/-**
No. 152c	Austin Seven Car ...	" **4d.**
No. 150d	Driver	" **3d.**

Price of complete set **2/9**

PAVEMENT SET



Dinky Toys No. 46
The contents of this set are four 3 in., six 6 in. and four 12 in. strips of pavement and four quarter discs for corners. Price of complete set **6d.**

SMALL CARS

Dinky Toys No. 35 Fitted with solid rubber wheels.

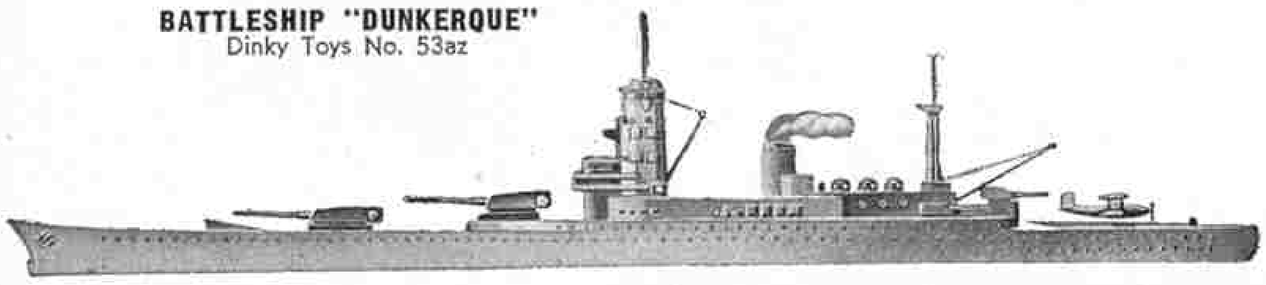
No. 35a Saloon Car	each **3d.**	No. 35b Racer	each **3d.**
No. 35c "M.G." Sports Car			" **3d.**

Price of complete set **9d.**

AUSTIN SEVEN CAR
Dinky Toys No. 35d

This model is the same as No. 152c, illustrated above, except that it is finished in a range of different colours. Price **4d.** each.

BATTLESHIP "DUNKERQUE"
Dinky Toys No. 53az



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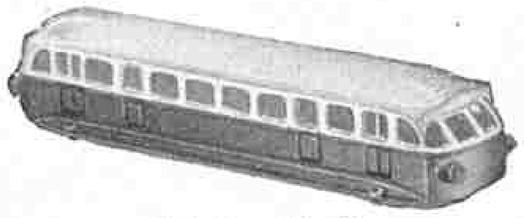

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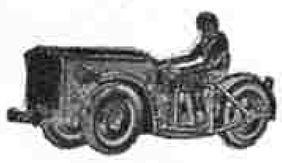

Dinky Toys No. 14z
Fitted with opening lid.
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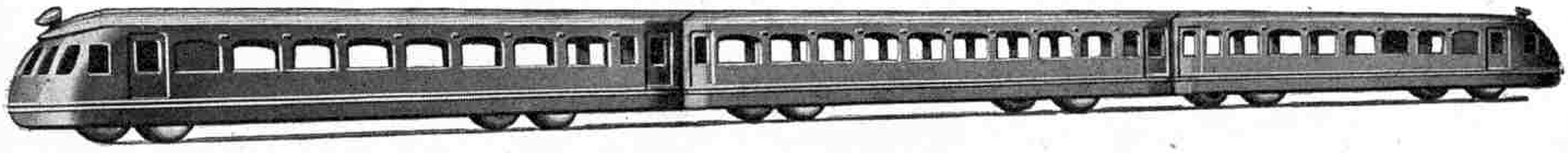

Dinky Toys No. 16z Price **1/6** each (Made in the Meccano Factory in Paris.)

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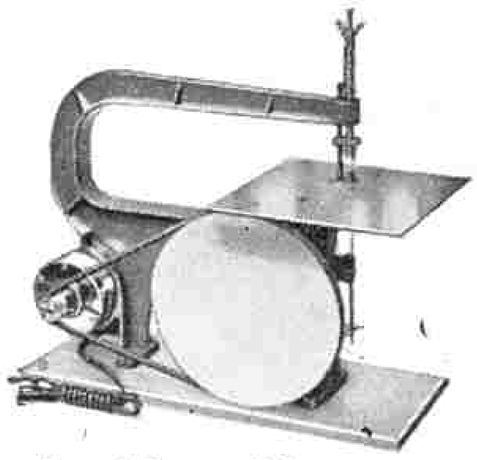

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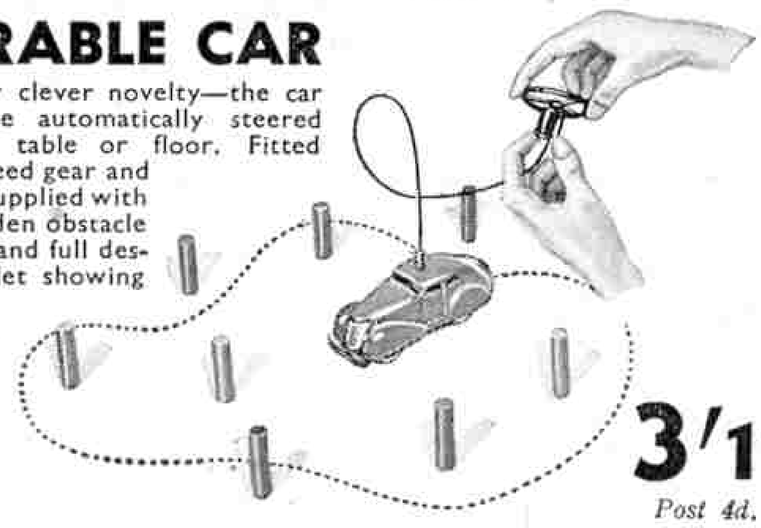

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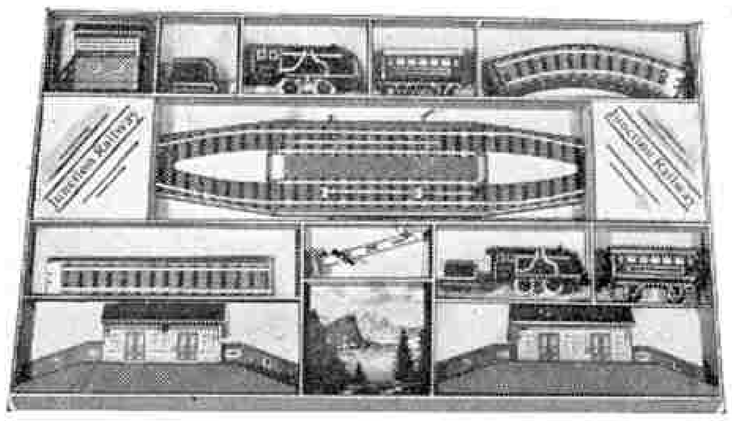

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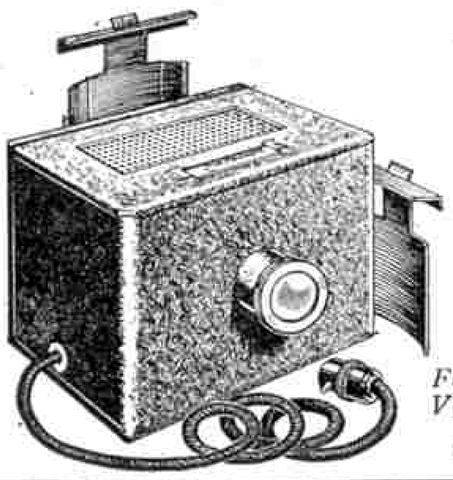

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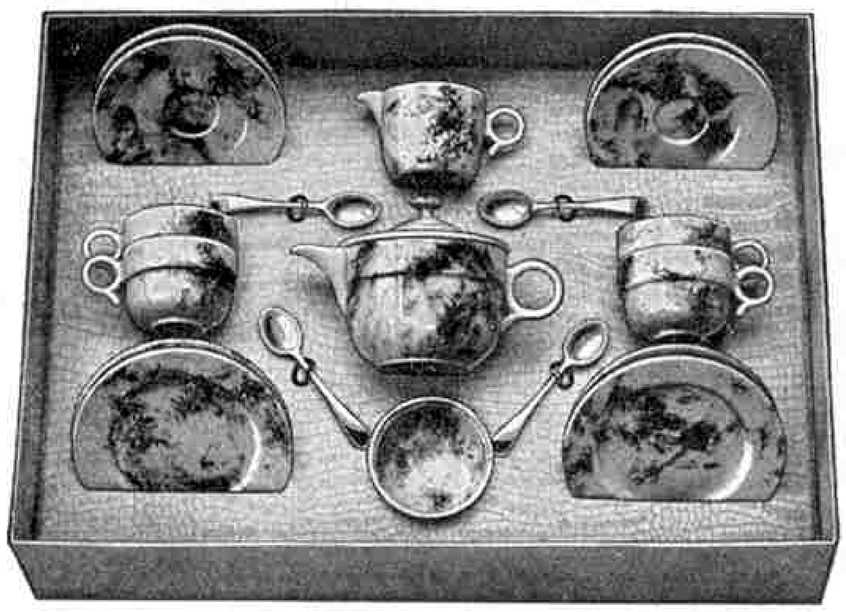

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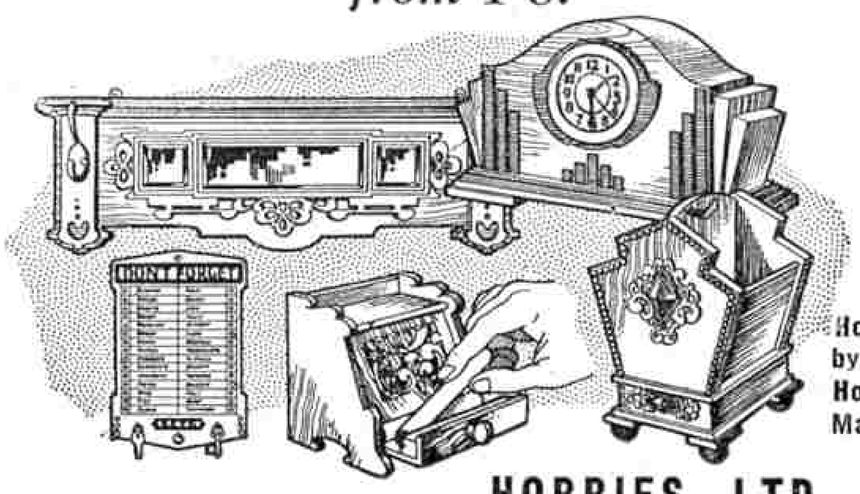

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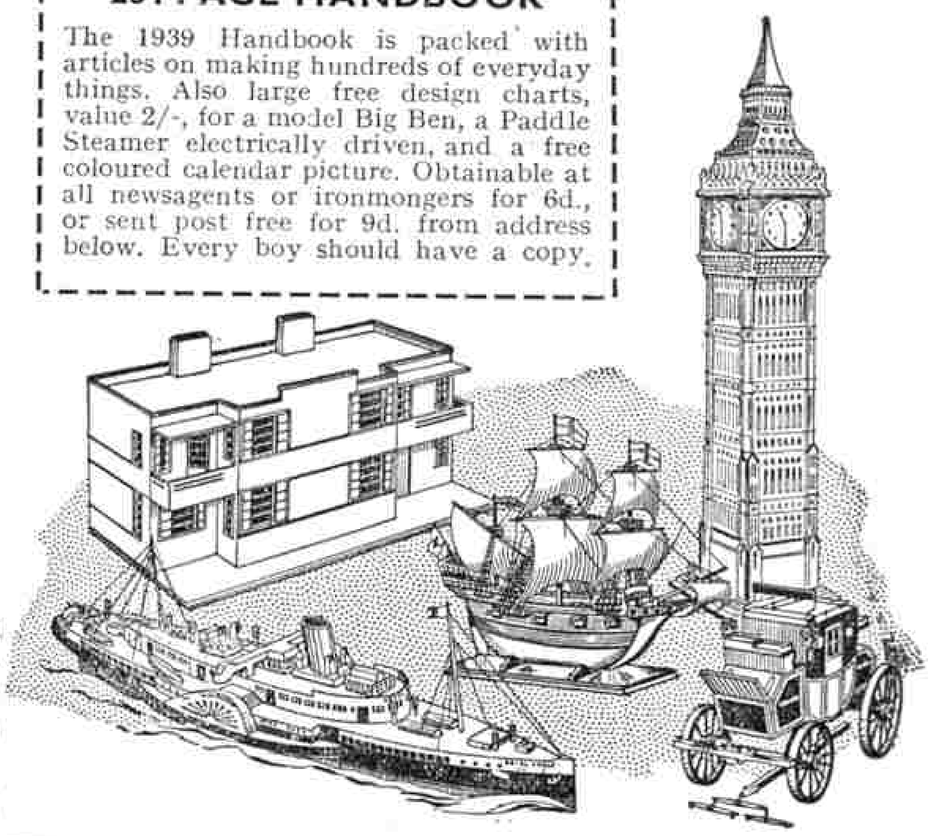

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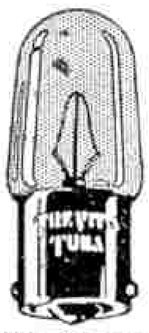

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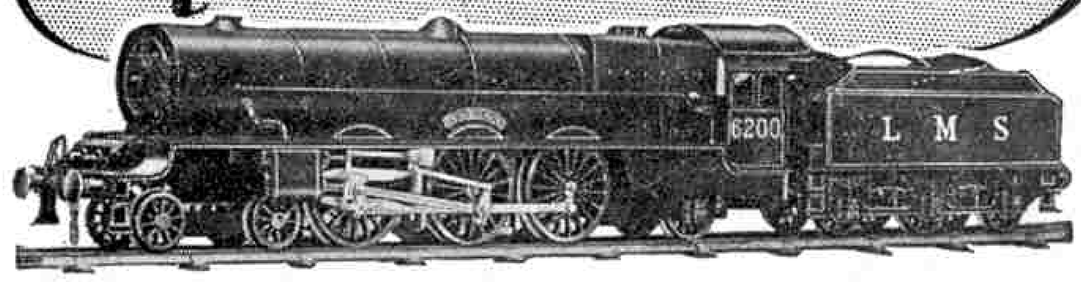

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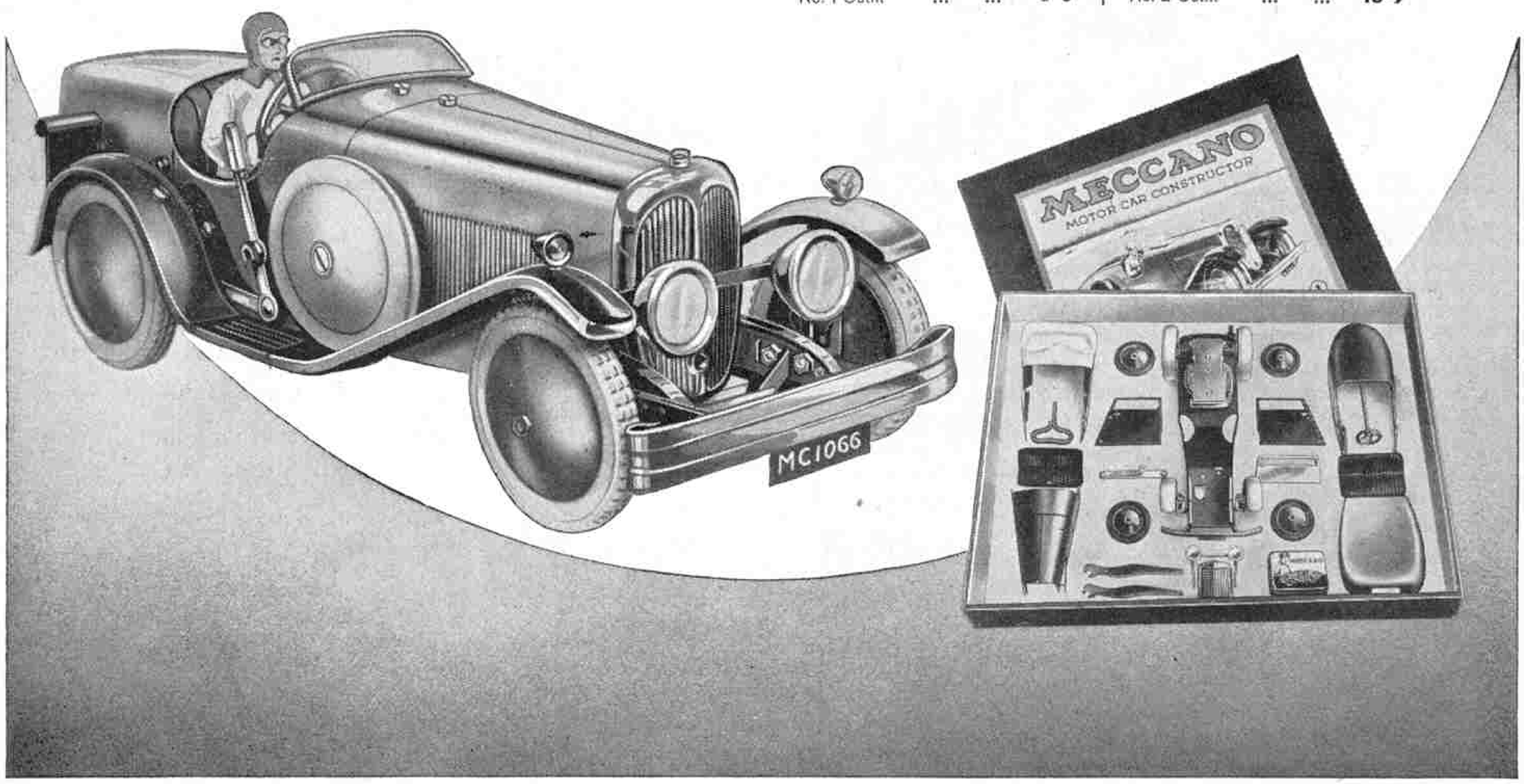

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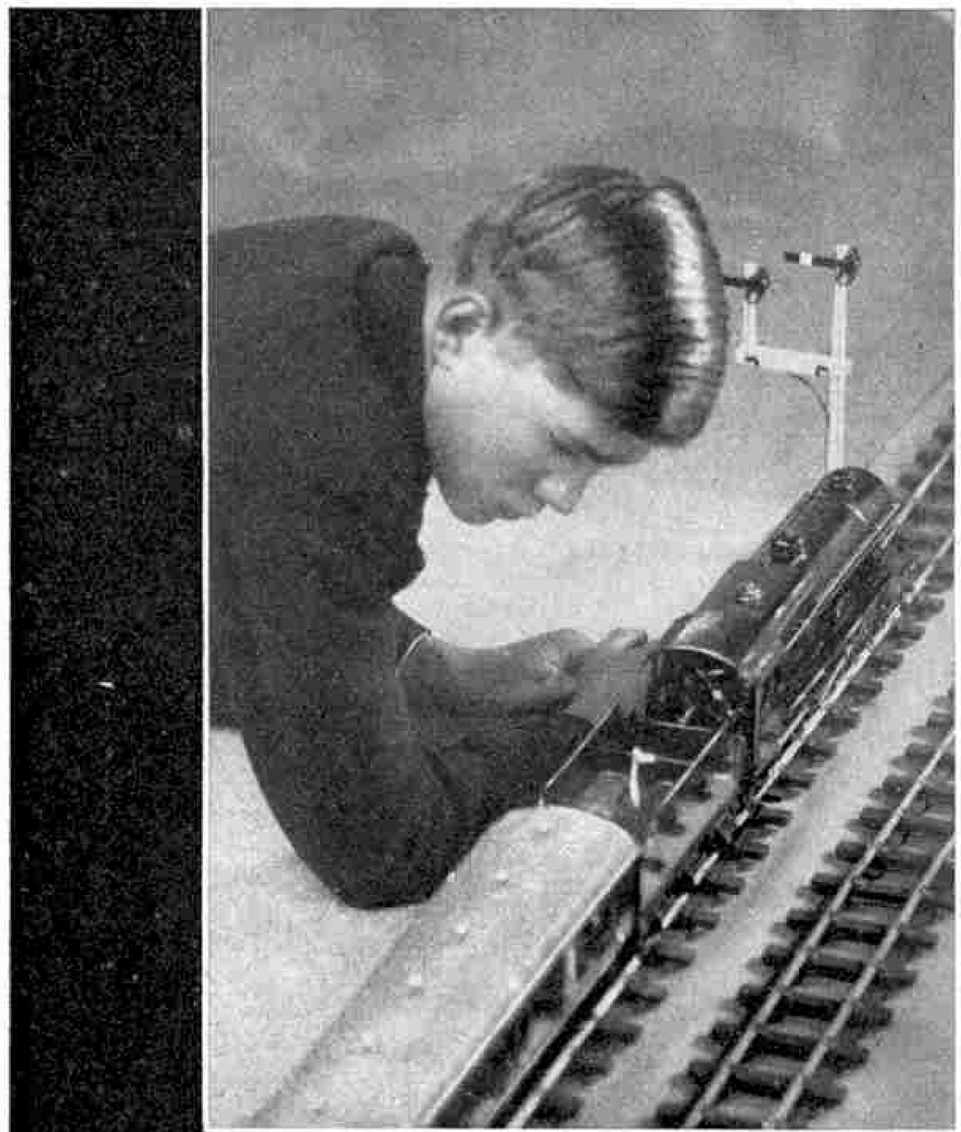

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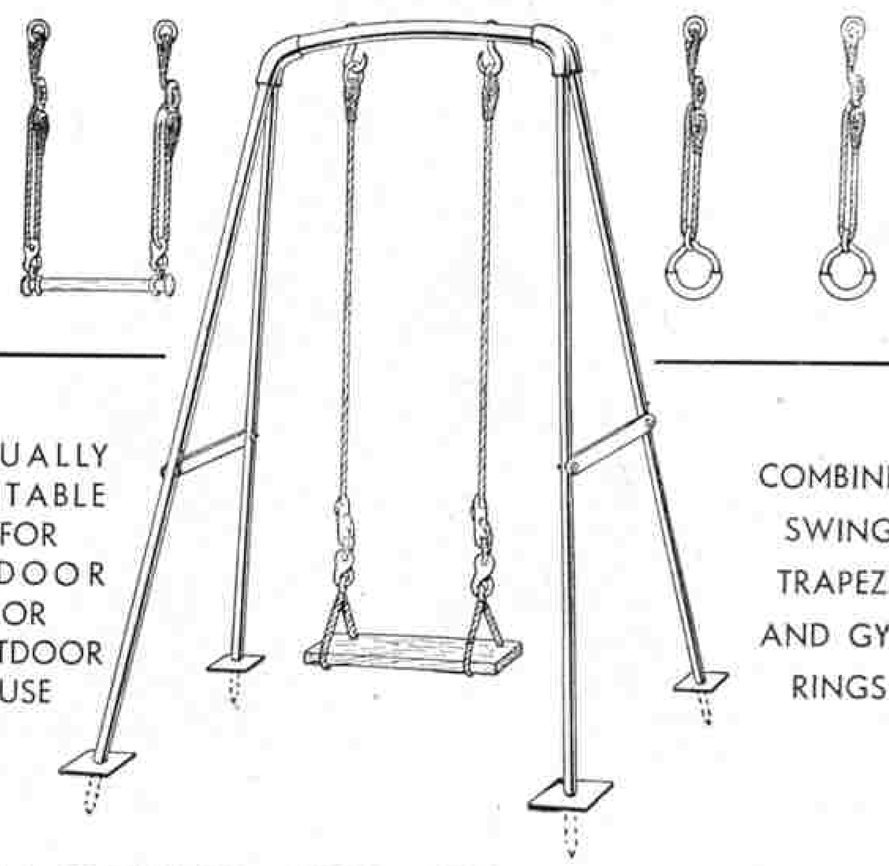

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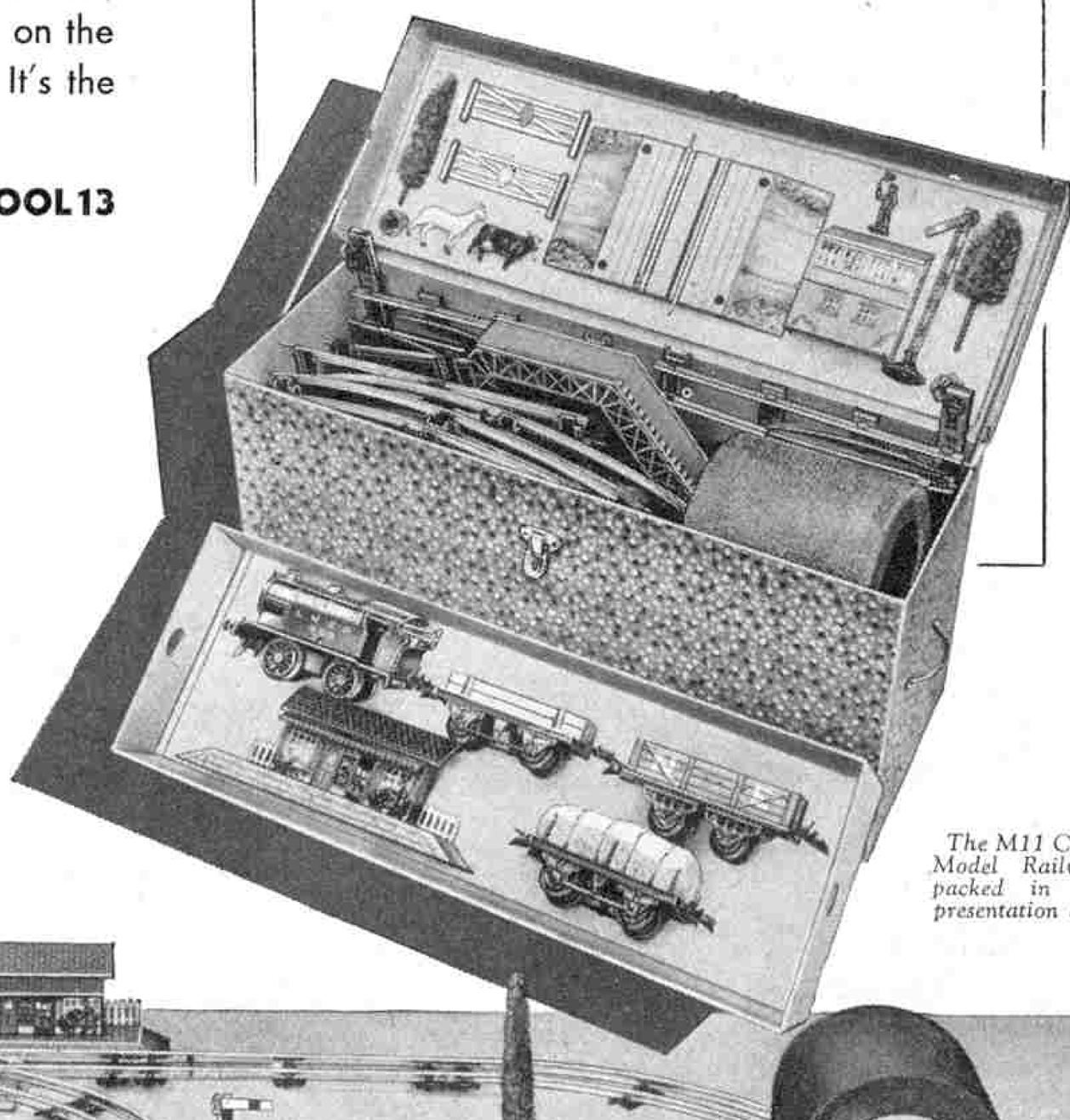
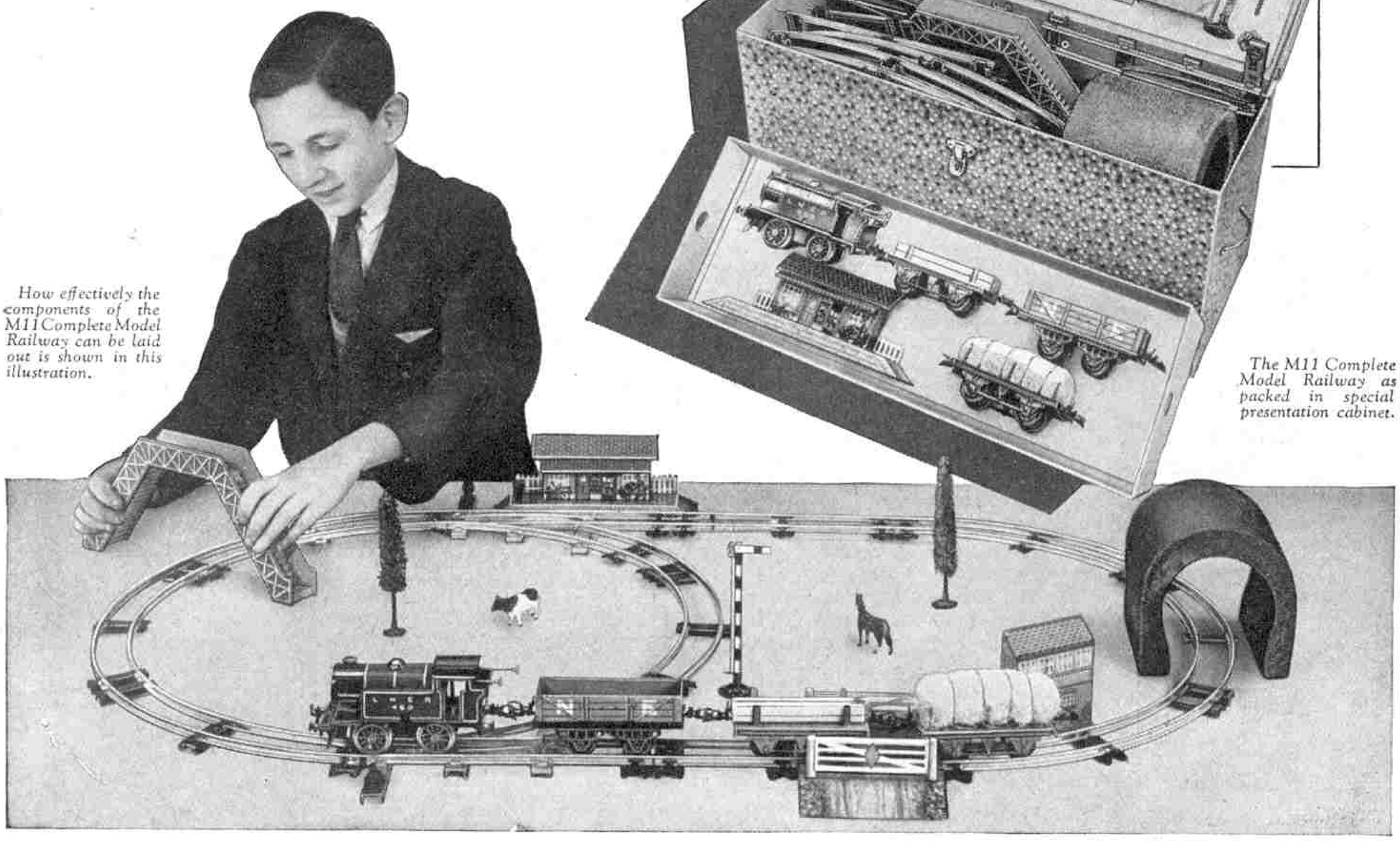


The M11 Complete Model Railway as packed in special presentation cabinet.



How effectively the components of the M11 Complete Model Railway can be laid out is shown in this illustration.

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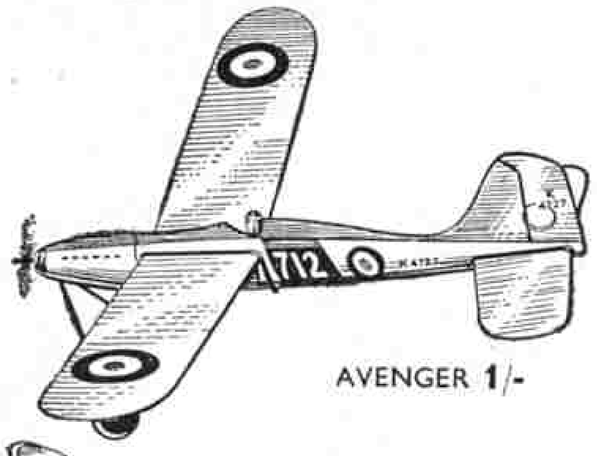

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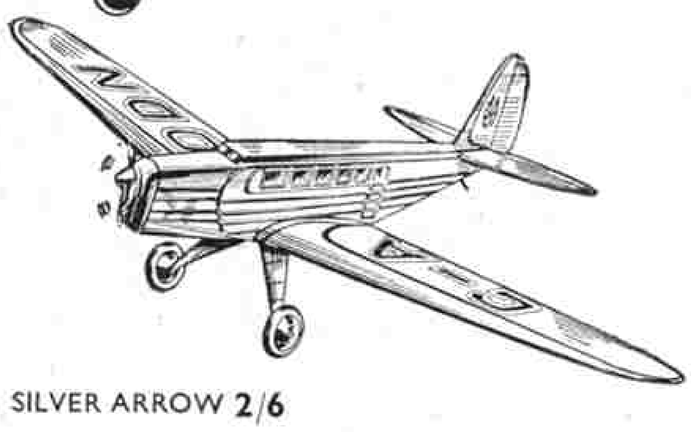
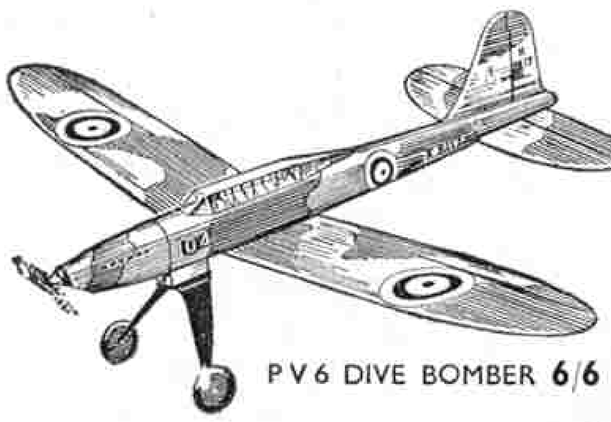
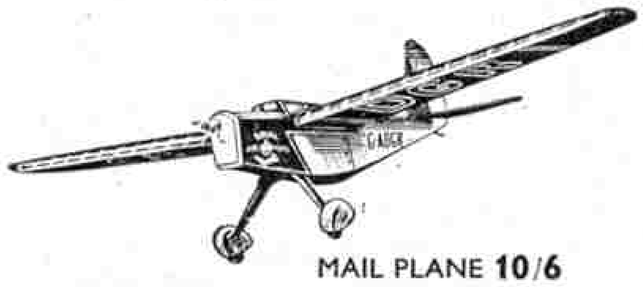


SILVER ARROW **2/6**



PV6 DIVE BOMBER **6/6**



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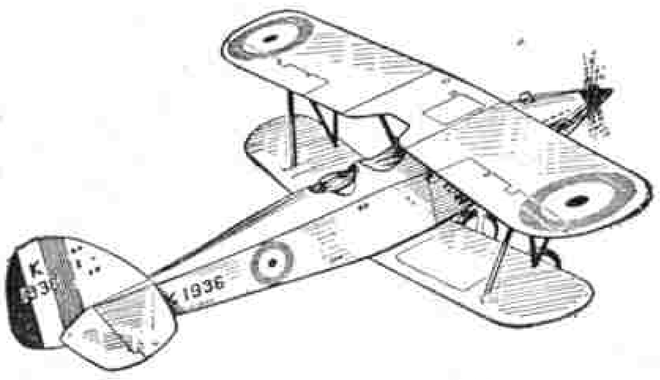
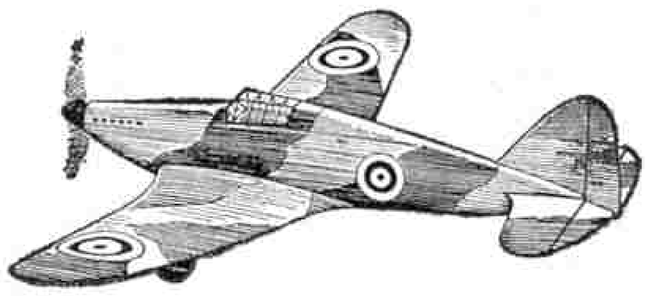


HAWKER DEMON **4/6**



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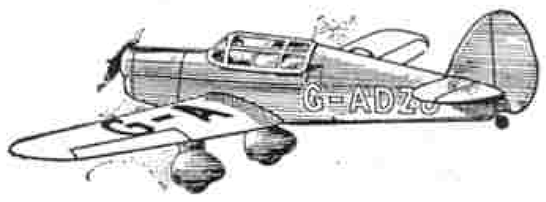

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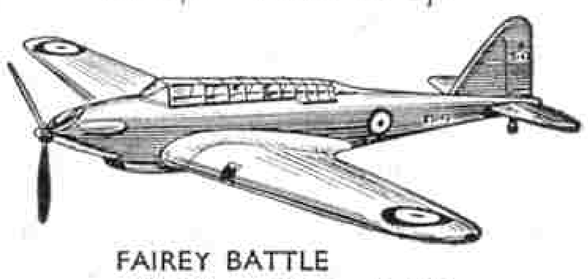

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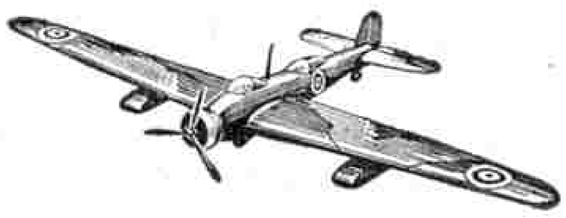

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20.	Flanged Wheels, 1 11/16" diam.	„	0	3½
20b.	„ „ ¾" „	„	0	2½
	Pulley Wheels			
19c.	6" dia., with centre boss and set screw	„	1	9
20a.	2" „ „ „	„	0	3½
21.	1½" „ „ „	„	0	3
22.	1" „ „ „	„	0	2
23a.	½" dia. with centre boss and grub screw	„	0	2
22a.	1" dia. without centre boss and grub screw	„	0	1
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26b.	„ „ ½" „ ¾" „	„	0	6
	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
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45.	Double „ „ ...	„	0	1
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90.	2½" Curved Strips, 2⅜" radius	„	0	1
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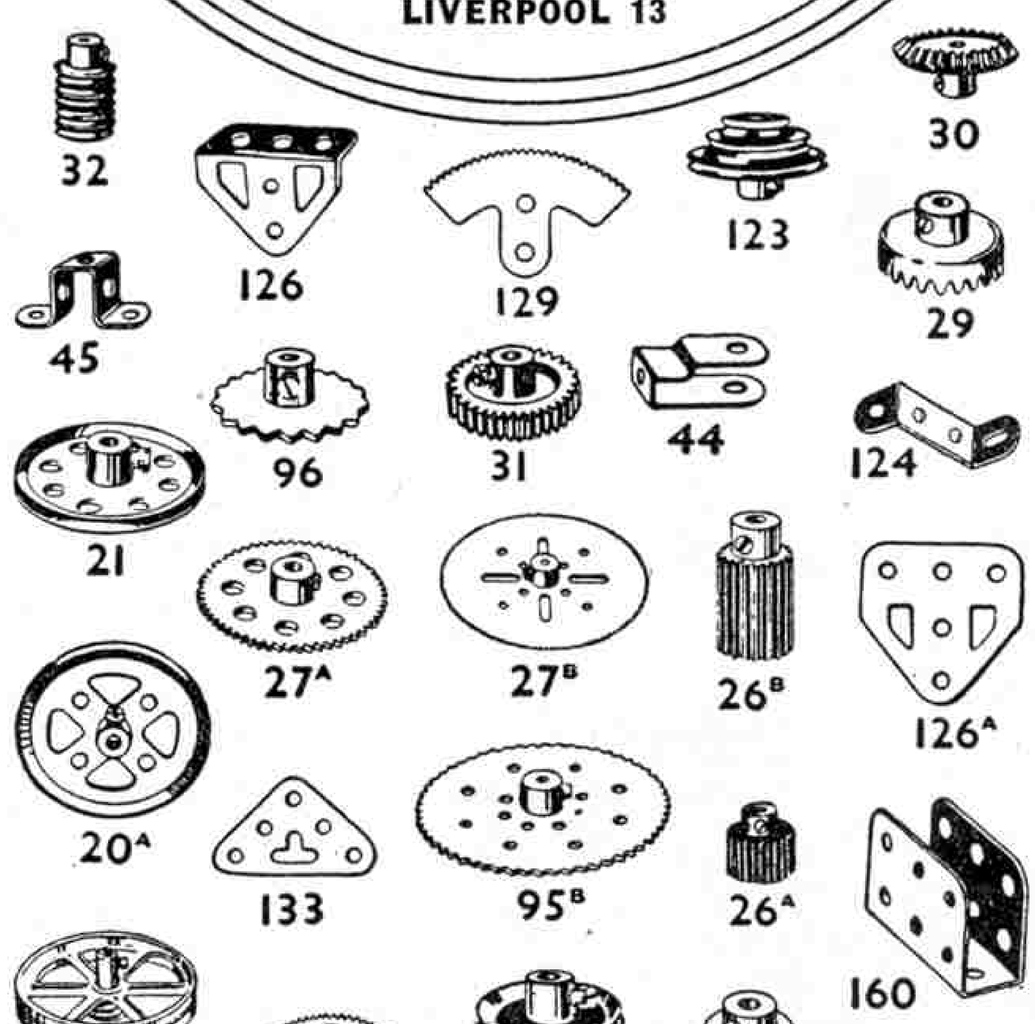
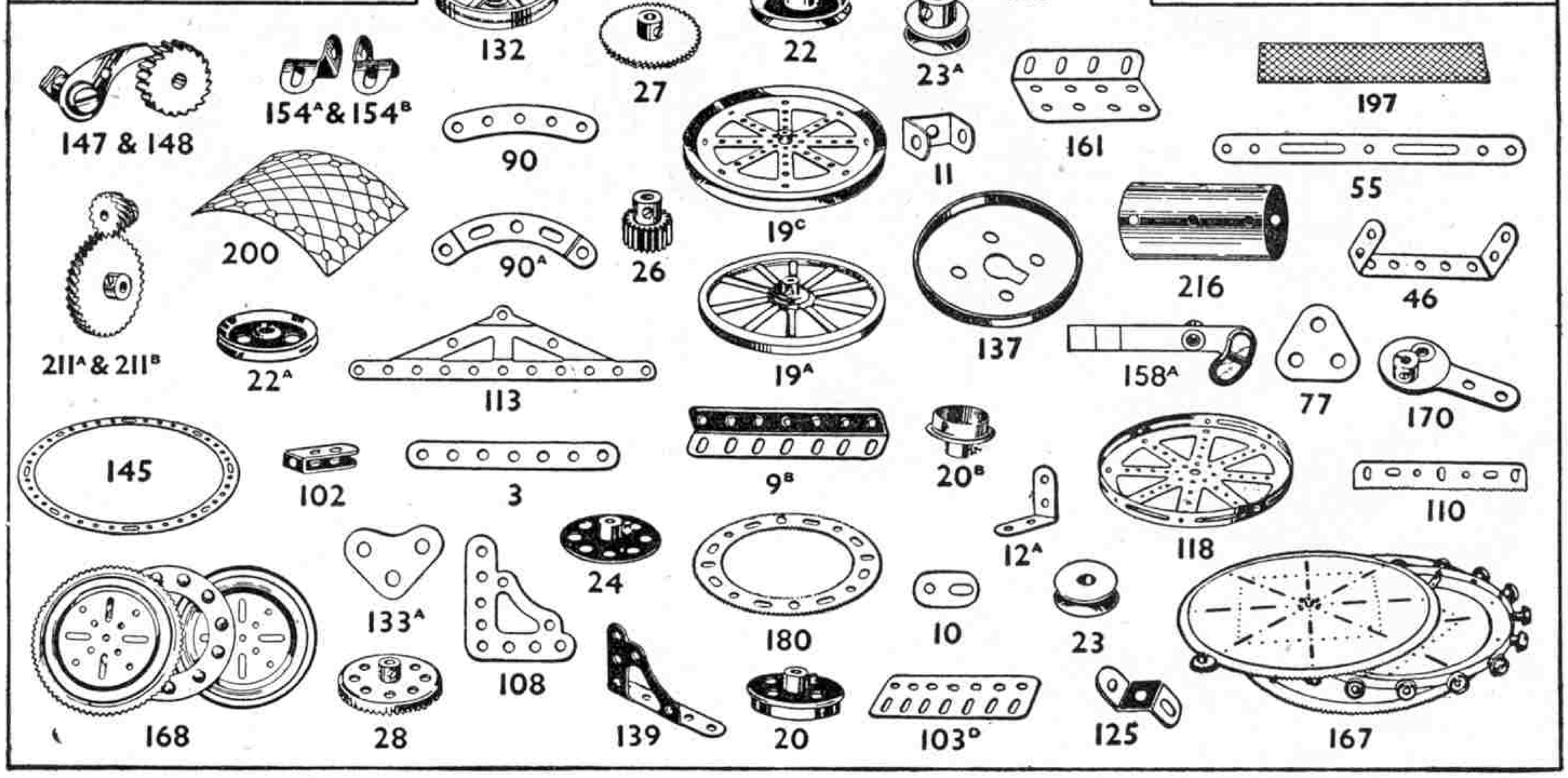
113.	Girder Frames	„	0	3
118.	Hub Discs, 5½" diam. ...	„	1	0
123.	Cone Pulley	„	1	0
124.	Reversed Angle Brackets, 1",	½ doz.	0	4½
125.	„ „ „ ½",	„	0	3
126.	Trunnions	each	0	1½
126a.	Flat Trunnions	„	0	1
129.	Rack Segments, 3" diam....	„	0	5
132.	Flywheels, 2¾" diam. ...	„	2	0
133.	Corner Brackets, 1½" ...	„	0	1
133a.	„ „ 1" ...	„	0	1
137.	Wheel Flanges	„	0	2½
139.	Flanged Brackets (R.H.) ...	„	0	2
145.	Circular Strips, 7½" diam. overall	„	1	0
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" x 2½" ...	„	0	7
200.	Curved Plates, 1 11/16" radius	„	1	1½
211a.	Helical Gears, ½" (Can only be used together)	„	0	10
211b.	„ „ 1½" (Can only be used together)	„	2	3
216.	Cylinders, 2½" long	„	0	3½





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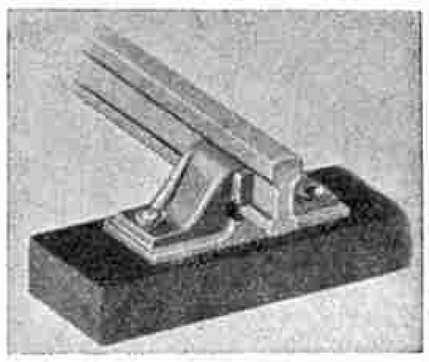

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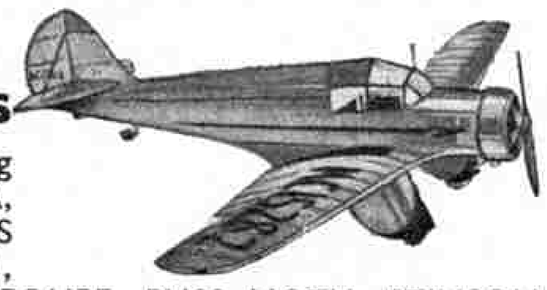

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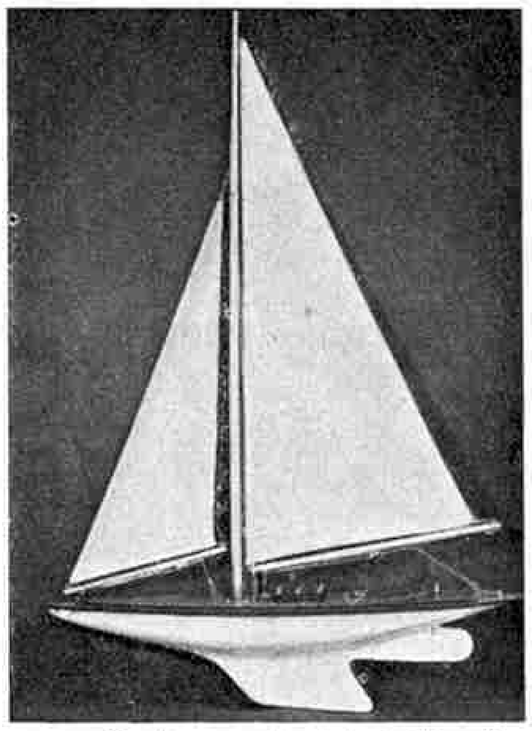

These new Yachts are the latest thing for fast racing work. All of the hulls are hand made in best yellow pine. The two largest Yachts are fitted with Braine type automatic steering. Painted Pale Blue. Cabin Skylight extra.

Prices:

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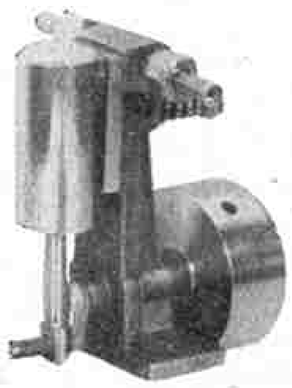

These engines have been completely re-designed throughout to get higher speed and more power. The main engine standard is now made from a hot brass stamping and is complete with pipe unions. The cylinder and pistons are machined from solid brass. All engines are fitted with large flywheels.

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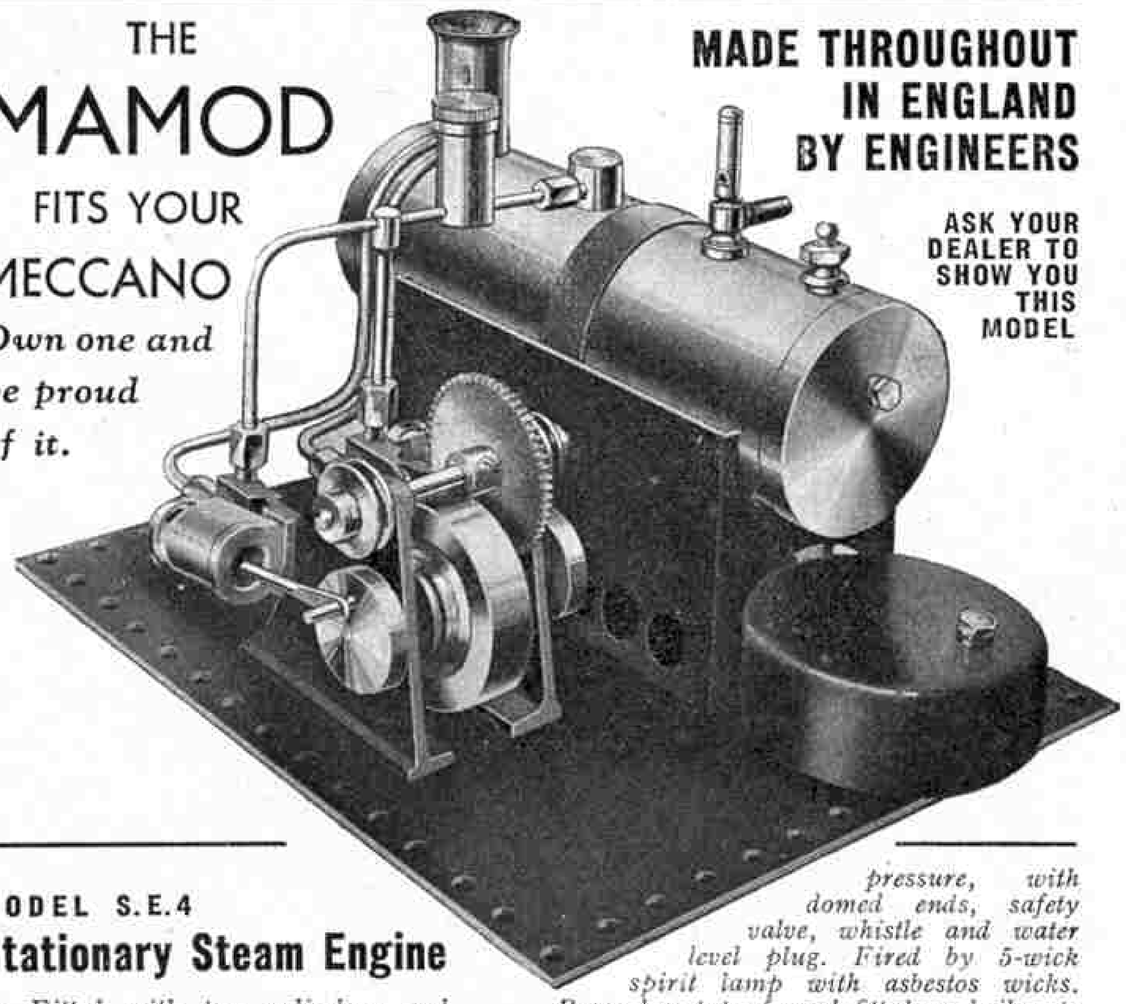

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Stationary Steam Engine

● *Fitted with two cylinders and geared reduction shaft. Built on heavy cast brass frames. Long lubricated bearings, heavy solid brass flywheel, turned brass crankdiscs and pulleys. Driving pulley incorporated in flywheel. Cylinders lubricated by lubricator in steampipe. Solid drawn brass tube boiler guaranteed to 100 lbs. pressure, with domed ends, safety valve, whistle and water level plug. Fired by 5-wick spirit lamp with asbestos wicks. Brass loco-type funnel fitted on boiler, to which exhausts of engine are led for realism as in large practice. Mounted on steel baseplate 7½" × 6½", drilled at edges to fit Meccano; enamelled oil-resisting signal red. This is a very powerful engine—2,000 revolutions per minute. Packed in strong plywood box, with filler funnel and instructions.* **29/6** Postage 8d.

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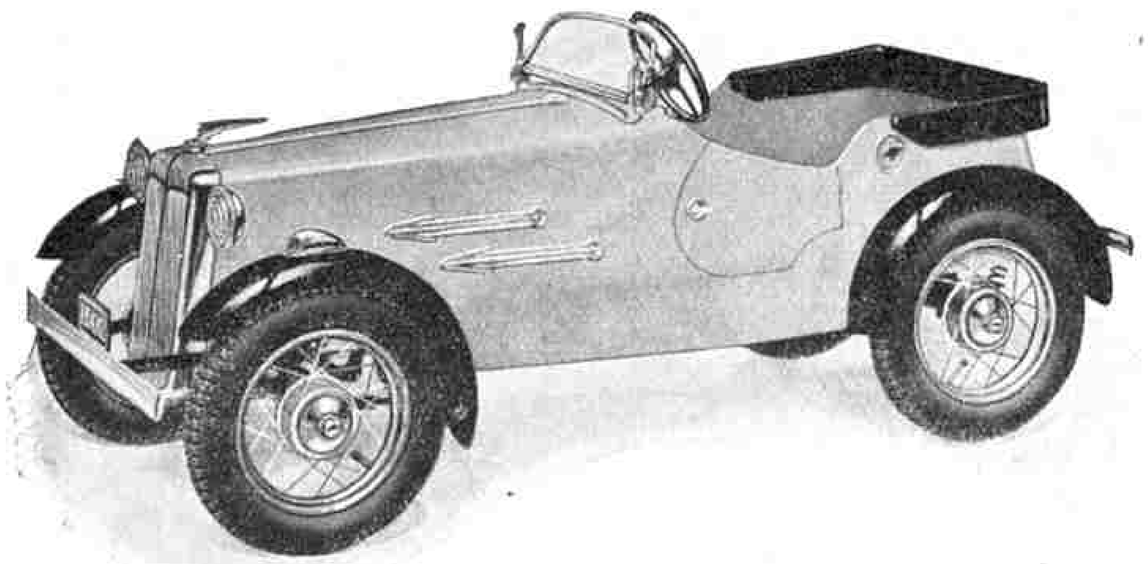

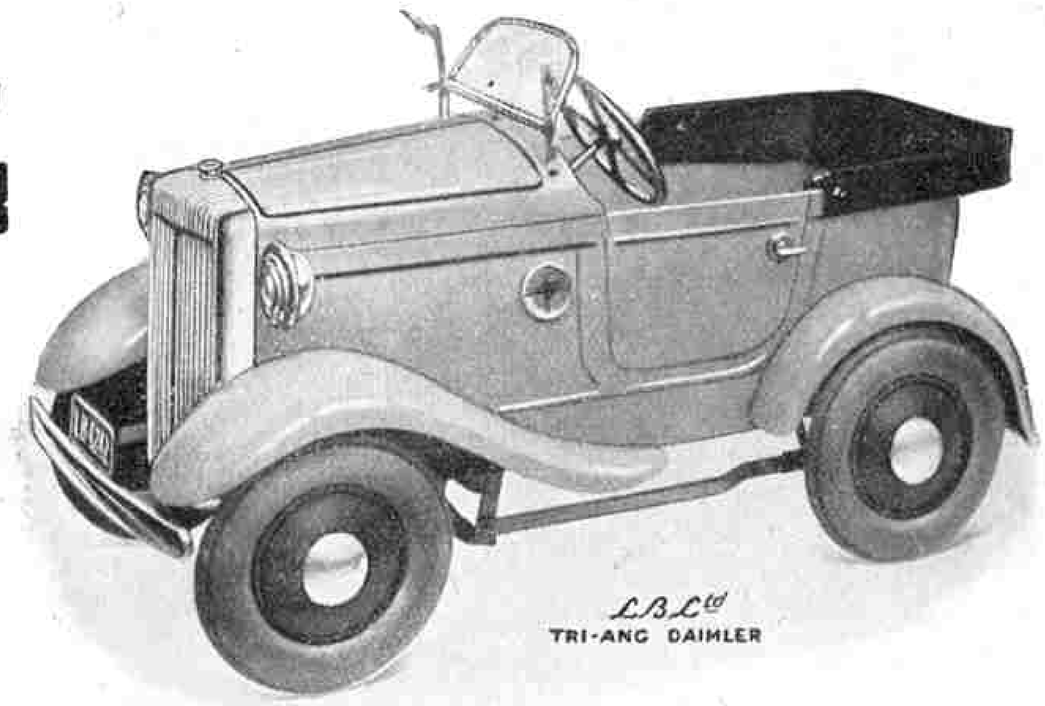

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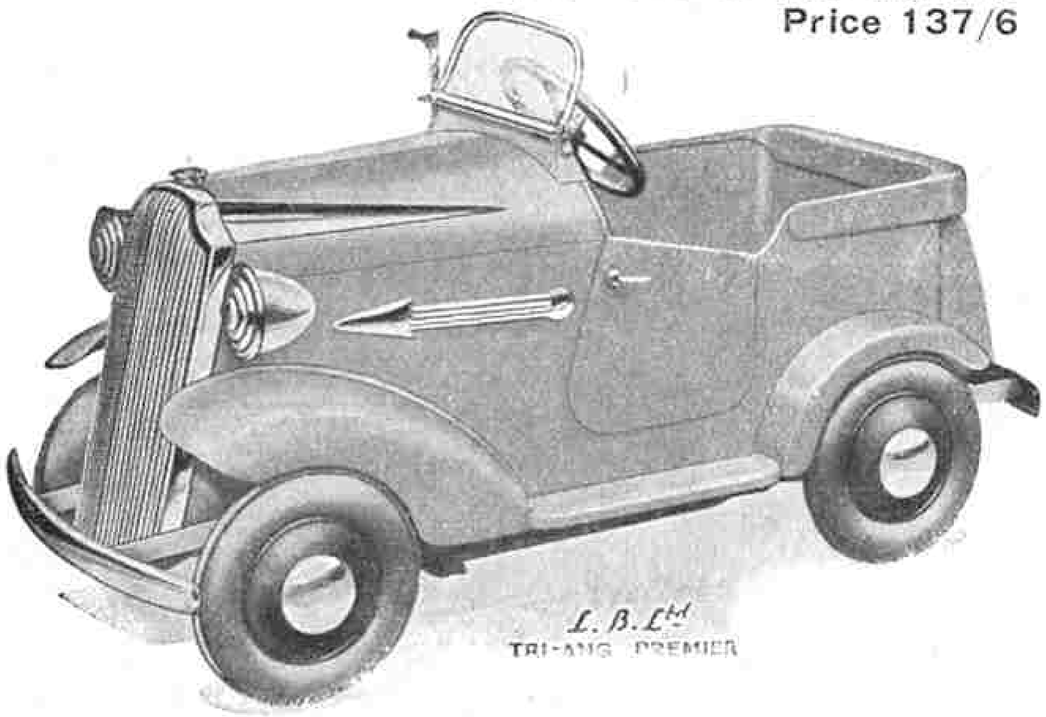

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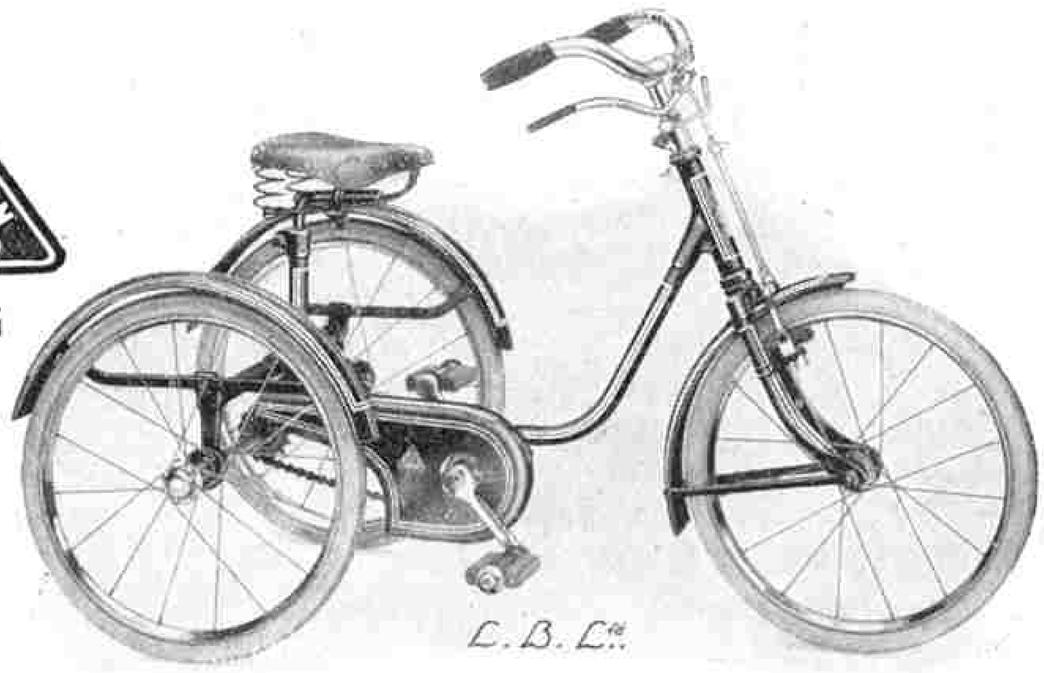

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MECCANO MAGAZINE

Editorial Office:
Binns Road, Liverpool 13
England

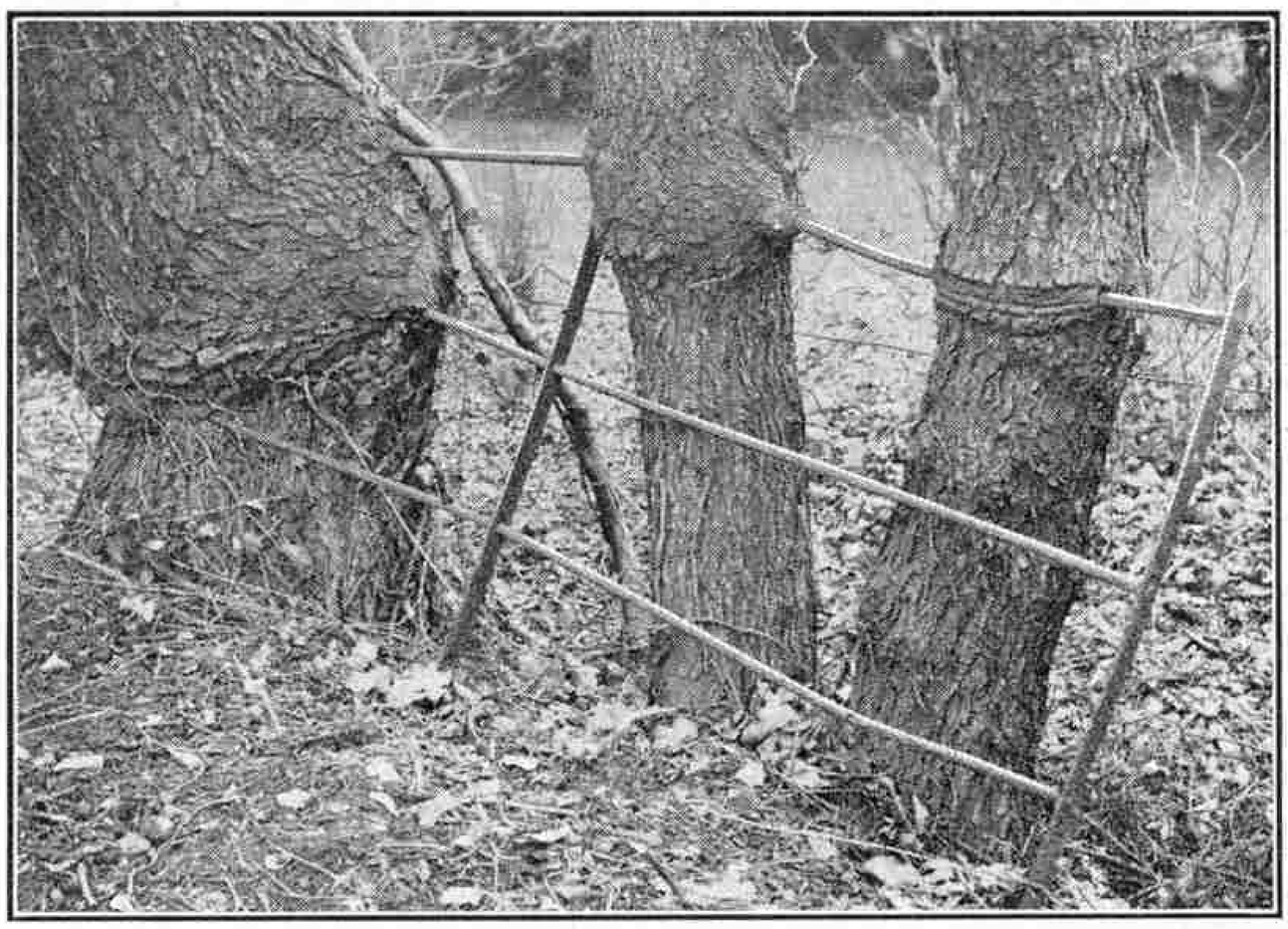
Vol. XXIII. No. 11
November 1938

With the Editor

Railway Companies Fine Each Other!

The general speeding up of British railway services goes on, although this year has not been such an eventful one as 1937, which might fairly be described as a "boom" year in railway speed. Improvements continue in the long-distance trains between London and Scotland, which have been the subject of remarkable alterations since 1932, when the long-standing agreement limiting the times of trains between London and Glasgow and Edinburgh was abandoned. Last year saw the institution of two remarkable high-speed services, *"The Coronation Scot"* of the L.M.S. and the *"Coronation"* of the L.N.E.R., each consisting of special stock and each hauled by a streamlined locomotive. This year there have been no further introductions of this kind, but general improvements have been well maintained.

It is interesting to recall that *"The Royal Scot"* passes over the route of a railway that was completed just over 100 years ago, the North Union Railway between Wigan and Preston. At Parkside Junction the North Union trains connected with those of the Liverpool and Manchester Railway, and between the two companies there existed the unusual arrangement whereby each fined the other £1 for every minute by which its trains were late!



How did this happen? The trees in this photograph, taken in the grounds of the Old Rectory at Rufford, Lancashire, have grown completely round the iron rails, which are now firmly embedded in them. Photograph by T. C. L. Hutchinson.

A Lancashire Curiosity

There are many quaint and curious things to be seen in the British countryside, and the illustration on this page is an excellent example. The rails shown are embedded completely in the trees, which have grown round them.

The photograph was taken in the grounds of the Old Rectory at Rufford, Lancashire, which has now been demolished. The building was said to be haunted, but the ghost could scarcely be blamed for what happened to the rails!

I am curious to know what my readers think about it. No doubt many of them could give similar examples, or could provide details of other quaint or unusual things that they have come across, for *"M.M."* readers miss very little of what is to be seen. I should like them to write to tell me of any interesting things of this kind that they know, and I will reproduce in the *"From Our Readers"* section of the Magazine the most attractive of the stories I receive, especially those that are illustrated by means of original photographs.

This reminds me that in response to a large number of requests I intend to commence next year a new series of *"Whatever Is It?"* photographs on this page for readers to worry their brains over. In each of these popular picture puzzles a familiar object shown from an unusual angle has to be identified, and the hunt provides considerable amusement. To add a little more interest to the search a small prize will be offered each month to the reader who sends in the first correct solution.

Our Special Christmas Issue

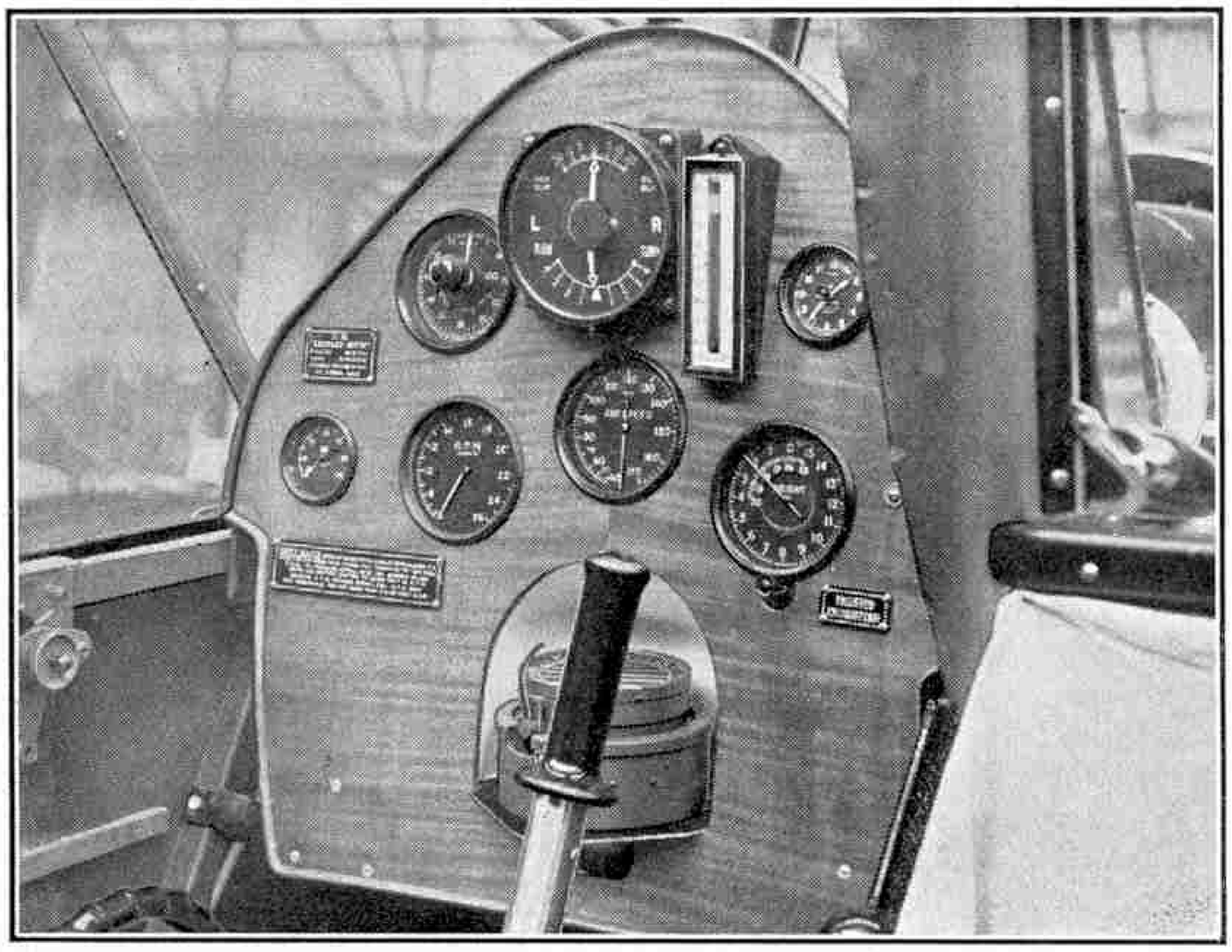
Next month's *"M.M."* will be the special Christmas issue, and as usual will be greatly enlarged. There will be fascinating articles of the kind that have made the Magazine so popular with many thousands of readers, together with all the regular features giving the latest information on engineering and railway progress. Puzzles, conjuring tricks, and many other attractions also will be included, and the issue will be one of the best that has yet appeared. It is sure to be sold out quickly, so that readers who wish to make certain of their copies and have not already placed a regular order should do so at once.

The Aircraft Dashboard

How the Essential Instruments Work

By Wing Commander G. W. Williamson, O.B.E., M.C., M.Inst.C.E., M.I.Mech.E., M.I.E.E.

A PHOTOGRAPH in one of the aeronautical papers recently showed the cockpit of an aeroplane of nearly thirty years ago; the dashboard carried only a single instrument, and for all the other instrument indications that pilots nowadays rely upon, the pilot used the evidence of his senses. That single instrument was the engine revolution indicator, by which pilots still judge whether or not their engine is in perfect time. Its principle is exactly the same as that of the speedometer of a motor car. The engine drives a shaft in the instrument on which are mounted two or more governor type weights. The greater the speed of this engine-driven shaft the further the weights will fly out under the action of centrifugal force; and this outward movement is geared to the pointer on the face of the instrument. In a steam engine governor, the two weights tend to fall to their lowest point under the action of gravity; but in revolution indicators the weights are returned to the inmost position by means of a spiral spring at each end of the governor system.



The dashboard of the de Havilland "Leopard Moth." On the upper row from left to right are the air log, Reid two needle gyro turn indicator, liquid fore and aft level and watch. On the lower row there are the oil pressure gauge, engine revolution indicator, air speed indicator and altimeter. In the recess at the bottom is the magnetic compass.

A revolution indicator with two pairs of weights at right angles to each other is shown in the upper illustration on the opposite page. When the shaft is running at a speed corresponding to engine revolutions of more than 600 per minute, the weights fly outward in a movement similar to the closing of a pair of scissors. This movement is transmitted to a sliding collar of fibre, above the weights, and in that collar are placed two fingers by which the collar movement upward or downward is transmitted by pulley and chain to the shaft on which the pointer is fixed, at the top left corner. When the instrument is on the dashboard, the shaft carrying the weights is almost horizontal.

An expensive part of the revolution indicator system is the flexible shaft connecting the indicating instrument with the engine. It will be obvious that the faster this shaft runs the shorter will be its life, owing to the more rapid wear. At the engine end, therefore, it is connected to a gear-box that reduces the speed of the shaft to one quarter that of the engine. If the governor shaft in the indicator were to run at only that low speed, however, the indications would be inaccurate unless the governor weights were made large and heavy. To overcome this the governor shaft is speeded up to engine speed by means of a wheel seen at the lowest point of the illustration, which gears into another one on the inside of the instrument case, connected in turn to the instrument end of the flexible shaft.

The next instrument to find a place on the dashboard of old-time aircraft was the air speed indicator. In the early days, air speed was measured upon a U tube half filled with a pink liquid. Somewhere out on the wing of the aircraft there was and is a device styled the Pitot head. It consists of two tubes pointing into the line of flight; one is open so that the wind can blow straight into it, and the other closed so that the air within it is static, or standing still. Each leg of the U tube was connected to one of these two tubes; and it will be clear that the wind blowing into the open tube would depress the liquid in the corresponding leg of the U tube to an extent depending on the speed of flight. A scale of miles per hour was marked against the other leg, and the higher the speed the higher the liquid stood in the tube.

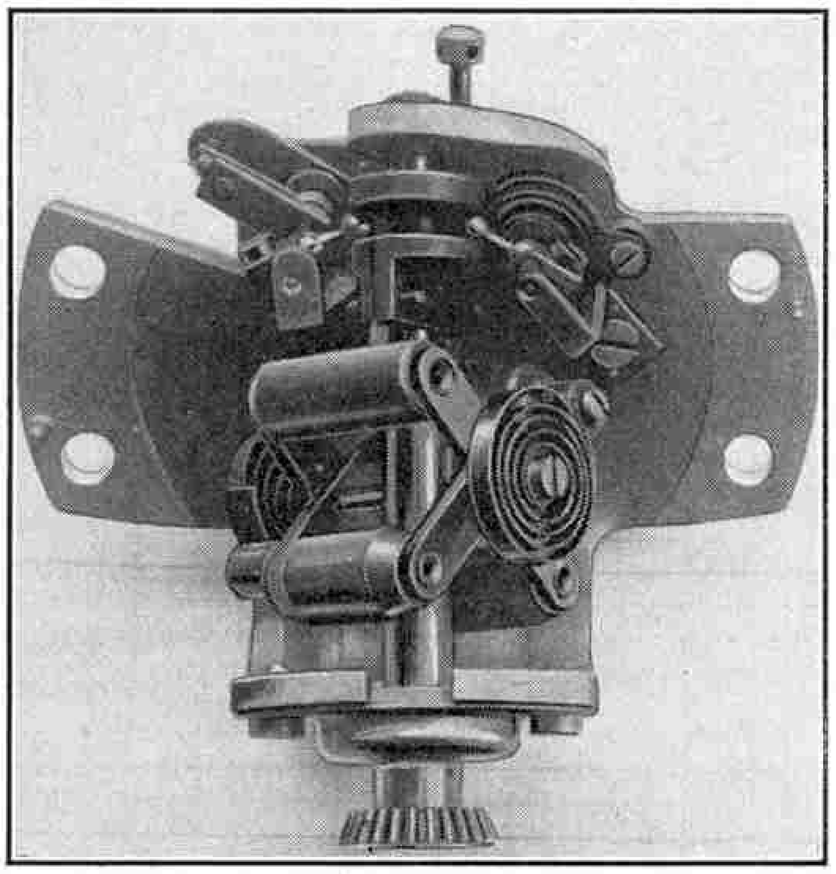
Exactly the same type of Pitot head is used to-day, except that we have refinements such as a winding for electrical heating, and a trap that will prevent rain water filling the open tube, or insects from nesting within it.

The indicating instrument nowadays is of the capsule type; the same principle is used in the altimeter, a sample of which is illustrated. The capsule consists of a corrugated aluminium box, which expands or contracts according to the pressure on its walls. An increase of pressure will cause the walls to sink in, and a decrease of pressure outside the box would permit the walls to expand, provided that there was some external influence to encourage them to do so. This is provided by a powerful spring in the shape of the letter U, seen in front of the corrugated capsule in the illustration.

Suppose now that the pressure side of the Pitot head is connected to the interior of the capsule, and the static

side to the airtight case of the instrument; the capsule will be distended to an increasing extent as the speed rises. This movement will be assisted by the spring, and the distension of the capsule is transferred by a long connecting rod to a rocker shaft seen at the top of the instrument. From that shaft a rod projects, which is connected by a metal chain to a pulley on the shaft of which the instrument pointer is fixed. These parts are clearly visible in the illustration.

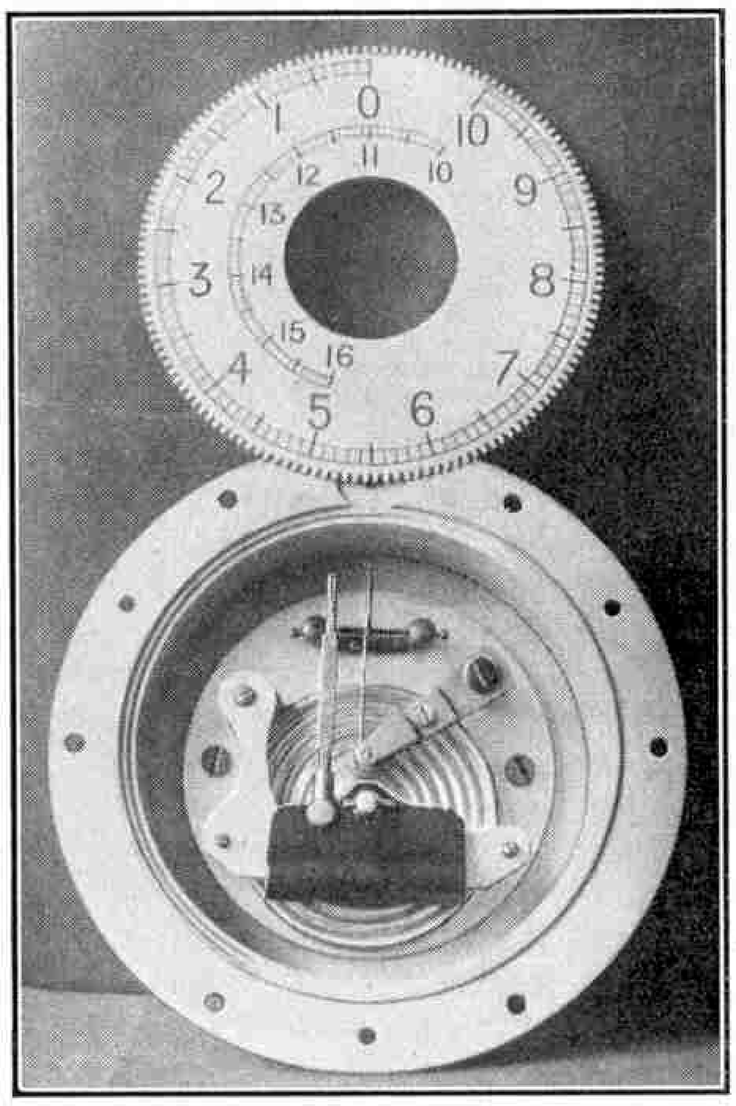
The dial of the air speed indicator is marked in miles per hour; the altimeter dial in the illustration is graduated in thousands of feet. The capsule can be applied to both instruments, but in the altimeter it is airtight and almost entirely exhausted of air. At ground level the box would normally be squashed flat by the air pressure were it not that it is already held open against the air pressure by the same type of U shaped spring.



The movement of a revolution indicator with four weights. The drive is transmitted through the gear wheel at the base.

This time the instrument case is not airtight, but is connected to the outer atmosphere. If now the aeroplane were to ascend to 10,000 ft., the air would be very much less dense, and the pressure on the walls of the capsule greatly reduced. The effort of the spring is now balanced by less pressure, and the capsule is again expanded, this time by reducing the pressure on the outside instead of increasing the pressure on the inside. By exactly the same mechanism this expansion is transmitted to the pointer.

The altimeter capsule is exactly of the same type as used in a barometer, and it will follow that it will expand or contract as the barometric pressure falls or rises. An aeroplane put into its hangar at night may be left with its altimeter showing zero or ground level; but if there is a change in the weather the pilot may return in the morning to find some such figure as 200 ft. indicated. To compensate the altimeter for weather changes, it is possible to rotate the dial in relation to the pointer by means of a small gear wheel let into a recess seen immediately below the lowest point of the dial. The little wheel is operated by a button external to the instrument case, and gears into the teeth shown around the edge of the dial in the illustration.



A capsule instrument. This is an altimeter, and the corrugated aluminium capsule is at the back, with a dark spring of U shape holding it open.

The old type altimeters were graduated only up to 10,000 ft., which in those days was almost the limit of climb of even military aircraft. Nowadays any light aircraft can exceed that height, and it is necessary either to close up the scale, or to permit the needle to begin upon a second round after 10,000 ft. has been indicated.

Another aeroplane instrument is similar to its brothers used on the dashboards of modern motor cars; the principle of the pressure gauge, whatever its purpose, is the same in aviation as in other branches of engineering.

The soul of a pressure gauge is the so called Bourdon tube. This consists of a flat tube bent into the arc of a circle, sealed at one end, and connected to a source of pressure at the other. In an oil pressure gauge there is a pointer that moves over the dial carrying the graduations. Behind is the Bourdon tube and movement, which varies in type in different instruments. In each the sealed end of the Bourdon is connected by a linkage to a quadrant, gearing into a little wheel mounted on the same shaft as the pointer. In each, the open end of the Bourdon is sealed into a casting connected to a tube to which the pressure pipe can be joined.

Suppose now that the instrument is standing at zero with no pressure inside it; any increase of pressure will make the Bourdon tend to straighten out, and this movement is transmitted through the linkage, quadrant, and gear wheel to the pointer.

The natural spring left in the Bourdon tube when it was first built up will suffice to bring it back to the zero position. There is bound to be a small amount of play in the gear wheel, quadrant, and linkage, however, and this play is taken up, and the instrument pointer returned to zero at the same time as the Bourdon tube reaches its normal position, by means of a small spiral spring on the pointer shaft. In the top instrument that spring is at the far end of the shaft, while in the larger movement it is visible on the face side of the instrument.

On the dashboard illustrated there is a liquid fore-and-aft level that will indicate angles of climb or glide up to 20 degrees in each direction. It consists of a triangular glass tube half filled with liquid, one side of which appears on the face of the dashboard. When the aircraft is in the level position the liquid will be exactly half way up that side of the triangle. If the aeroplane is put into a climb, the liquid will run into the vertical side, and stand higher in the tube; while if a gliding attitude is adopted, the liquid will run away from the vertical tube in the dashboard, and will stand at a lower level, being practically off the scale when a glide of 20 degrees is being made. It is not difficult to design a liquid level that would show angles of dive as steep as 90 degrees, and one or two of these have been experimentally produced; but as pilots generally are not much interested in the exact angle of descent or climb when these are extremely steep, the 20 degrees fore-and-aft level retains its popularity and is used on modern aircraft in thousands.

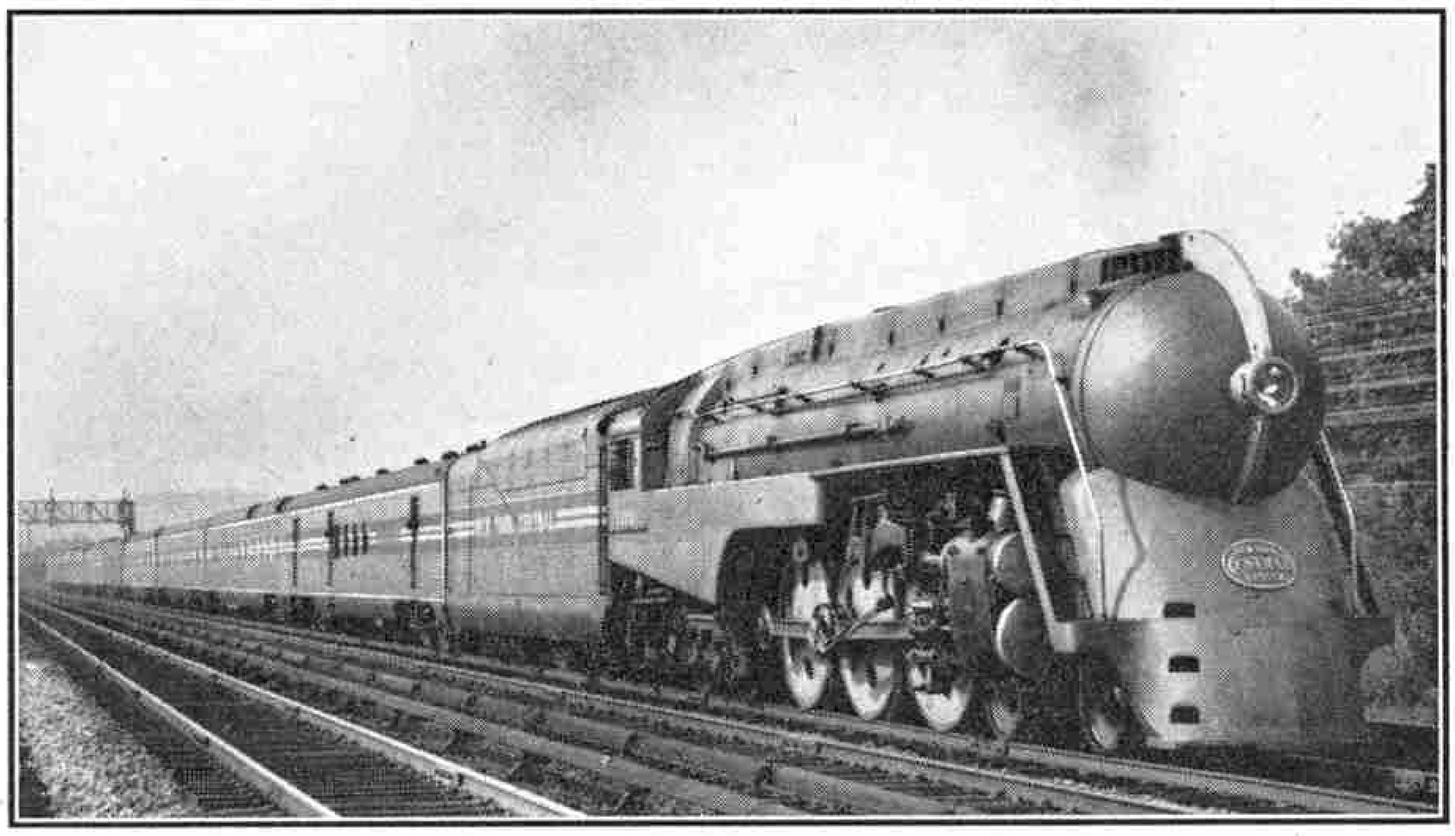
All instruments that involve the use of liquids for levelling purposes are subject to gravitational errors although this disadvantage may be turned into an advantage, as in a ball bank indicator, (Continued on page 662)

The New "*Twentieth Century Limited*"

Luxury Trains for Famous American Service

THE "*Twentieth Century Limited*" of the New York Central Railroad, which is shown on our cover, is one of the most famous of the world's great trains. It has run between New York and Chicago since June 1902. In its early days it covered the distance of 960 miles between the two cities in 20 hours, its average speed being nearly 49 m.p.h. It was then said that the experiment of running a train over such a long distance at this high speed could not be maintained, as neither the rolling stock nor the track would be able to stand up to the treatment they would receive, but the train was immediately successful and grew more and more popular.

To begin with there were only five coaches, carrying 27 passengers, but the train soon grew to enormous dimensions, and on rush days had to be run in sections. New and more luxurious rolling stock has been introduced from time to time, more powerful engines have been designed to haul it, and the journey time has been reduced step by step until to-day the "*Twentieth Century Limited*" takes only 16 hrs. for its long journey. Every day sections leave New York in the east and Chicago in the west in the evening, and run through the night over the water-level route of the railway along the shores of the Great Lakes and the banks of the Hudson River, reaching their destinations at breakfast time on the following morning.



The streamlined "Twentieth Century Limited" on its 16-hour run between New York and Chicago. The train is headed by one of the streamlined "Hudson" locomotives described on this page. Photograph by courtesy of the New York Central System.

The reduction to 16 hrs. for the time between New York and Chicago was made in June of this year, when streamlined locomotive giants and new coaches were introduced. Altogether 62 coaches and 10 streamlined locomotives were built for this purpose in order to allow the operation between the two great cities of four sections. From front to rear each complete train appears like a smooth, jointed metallic tube on wheels. In its first month of operation there was a great increase in the number of passengers travelling by it, and equal interest was shown by onlookers. Every night thousands of motorists made special trips to crossings to see it speed by at 80 m.p.h., and in the cities through which it passes seeing the "*Century*" go by is a recognised diversion.

Between New York and Harmon, a run of 46 min., the train is hauled by an electric locomotive, for steam locomotives do not work into New York City. For the rest of the journey, between Harmon and Chicago, the most modern of steam locomotives are employed; sleek grey giants, streamlined and finished generally to match perfectly the rolling stock. How striking in appearance these engines are is shown in our cover illustration—prepared from a photograph kindly supplied by the New York Central System—and from the photograph on this page. They have the sheet metal "prow" or apron that is a popular fitting on American streamlined locomotives, and this rises up to a bulbous boiler front on which is a characteristic fin in which the headlight is centred. The cylinders, wheels and motion are all exposed; there is no mystery about these parts of the engine, for utility has made the shrouding of the working parts inadvisable.

The chimney is not visible externally, but is contained within a trough-shaped casing running the length of the boiler top. Smoke deflection is provided for by means of louvred openings at the front end of this casing; these openings can be seen in the illustration on this page.

The wheel arrangement of the engine is the 4–6–4 or "Hudson" type introduced into the United States by the New York Central in 1927. Since that time engines of this type have given splendid service on the "*Century*" and other main line trains. They are simple in general design and robust in construction, as is characteristic of most American locomotive types. Two cylinders only are fitted, but these in conjunction with the vast boiler provide sufficient power for the haulage of the heaviest and the fastest expresses. The locomotives have aluminium-finished driving wheels. The fin already mentioned is of aluminium with a special satin finish.

The new "*Twentieth Century*" trains are made up of from 13 to 16 coaches of weights varying from 57 to 67½ tons empty. All the underframes, sides, ends and roofs of the new vehicles are of "Cor-Ten" steel, assembled as far as possible by welding. This form of construction, together with the use of aluminium alloy for various parts, gives the new coaches a weight of little more than two-thirds of that of the older all-steel stock previously used.

There are no open berths in the sleeping coaches, where the accommodation consists of what are known as "roomettes," bedrooms, compartments and drawing rooms. The "roomettes" are private sitting rooms by day and bedrooms by night, with every modern comfort for their occupants. A greater novelty is provided by the duplex compartments, an ingenious "upstairs and downstairs" arrangement of rooms on two levels, in each of which is a sofa that becomes a bed by night. The dining cars also are specially luxurious.

How Geographical Globes Are Made

Reproducing the World on Glass Spheres

By K. J. Schaub

WHETHER in London, New York, Capetown, Bombay or Berlin, few people rotating a globe on their desks, seeking some definite spot on the many-coloured sphere, have any notion where the globe comes from.

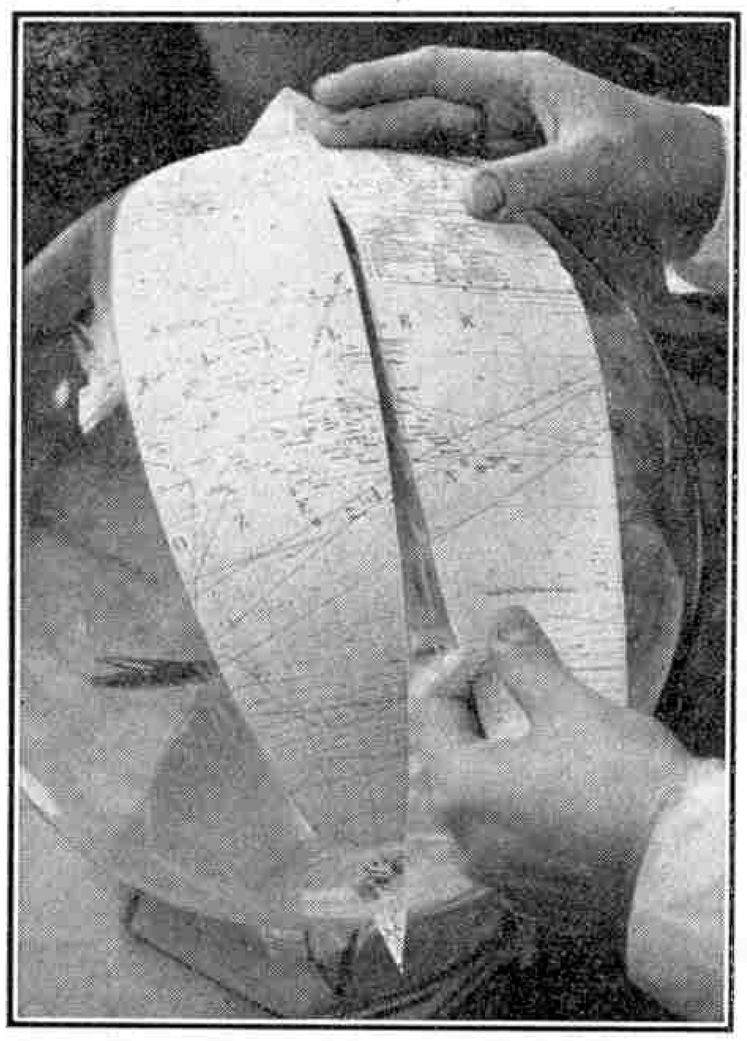
In Lichterfelde, a suburb of Berlin, there is a factory that produces geographical globes for the whole world, with the 5,000 names on each, translated into 24 different languages. It is a long, laborious process from the first dab of paint to the finishing touch.

Famous scientists are studying day in, day out, examining and noting every change undergone by Mother Earth. Here a town has been renamed; there near the South Pole new land has been discovered; here again an important canal has been cut, and there new frontiers have to be taken into account.

Gluing a map section on a glass globe. There are 12 sections to each globe, and they are illuminated by an electric lamp placed inside it.

Political events can alter the whole cartographical face of the earth in a night. A short time ago, for instance, Manchukuo in Asia was made an independent state and had to be given a national colour of its own on the map. Ethiopia, as part of the Italian Empire, had to be re-coloured in the same hue as Italy, and forthcoming editions will portray Austria in the same colour as Germany. The recent frontier changes in Czecho-Slovakia also will be shown in due course by the globe maker.

One of the most essential foundations of globe manufacture has long been the sub-division of the map of the world into 12 equal segments. These ellipse-shaped sections of map are printed in 24 different grades of colour, and these when put together later on will form the multi-coloured surface of the globe.



Fitting two of the 12 map sections together. The greatest accuracy is necessary in this work.

The globes have diameters varying from 5 in. to about 3 ft. 6 in. The core consists of papier maché and iron in the smaller models and of steel and aluminium in the larger ones. The papier maché is shaped into hemispheres by means of hydraulic pressure, and these are afterwards placed together to form the complete globe.

Next begins the deft work of expert gluing girls. The 12 map sectors are carefully cut out and glued in succession to the pressed globe. This sounds very simple, but to watch this work is to get quite a different impression of the difficulties involved. It is a question of accurately fitting frontier to frontier, river to river and degree to degree. Not a crease must be made. The sectors must not be even a fraction of an inch too narrow or too wide, for with the 12 sections this would cause too large an error, and in the end the last piece of map would not meet its neighbours, or would overlap them.

Eventually each globe is set up on its North-South Pole axis, and the many-coloured sphere is ready in its final make-up. The globes are next washed in warm water, coated with ordinary edible gelatine, and finally painted all over with oil lacquer. They are then ready to begin their journey across the world.

Two new inventions have recently taken their place in this workshop. One is the extremely practical, so-called light globe. In this case the globe is not made of cardboard or aluminium, but of glass, and it is lit from within by means of an electric light bulb. The internal lighting makes the map particularly clear and colourful.

The second invention is the "Great Globe." This is a masterpiece of workmanship, with a diameter of over 3 ft. Nearly three years of scientific work were required in order to reproduce the Earth in this size for the first time. This impressive picture of the world indicates not only the political configuration, but also the river and mountain systems. There is also the whole traffic network of the world, including caravan routes, steamship lines, railway lines and air routes, and finally all the large radio stations are shown. Furthermore this map also marks deserts and the limits of pack ice.

When the idea of constructing such a mighty globe was first mooted the manufacturers pondered for a long time whether it would be possible to find a purchaser. To-day so many orders have been received from all over the world that the firm does not know which to supply first. Not only scientific institutes and political organisations, but also many private individuals have purchased these globes.

How the Locomotive Works

1. Steam-Raising and Superheating

By a Railway Engineer

A LITTLE thrill goes through the group of onlookers as departure time comes. Then—*"Right Away!"*—the driver gives a sharp tug at a slender-looking rod; there is a hiss as the sanding valves open, a first explosive burst of the exhaust, and they are off. Fascinating, is it not? The steam locomotive is the embodiment of power, especially if, just as it is getting under way, there comes a slip, the wheels spin round, and with a thunderous roar, a great column of exhaust steam goes high in the air. In spite of its fascination, however, the steam locomotive remains one of the least understood of machines, and at the Editor's request I have prepared a couple of articles which, it is hoped, will make clear the principles on which it works.

The upper illustration on the opposite page shows a longitudinal section through the boiler and fire-box of a typical locomotive. Considering first of all the fire-box end, it is perhaps not generally realised that what is externally visible is not the actual fire-box but only an outer shell. The fire-box proper, which on British locomotives is usually made of copper, is surrounded, except on the underside, by a jacket of water; this not only produces extremely rapid boiling of the water, but also prevents the fire-box walls from getting unduly hot. The locomotive fire-box has got to burn coal at a tremendous rate. Imagine burning two hundredweight of coal every hour on a space as big as an ordinary household grate, and you have some idea of the rate of combustion in the engine of a fast express!

To burn coal at this rate it is of course essential to have an ample supply of air. As will be seen from the diagram, this air is provided from two sources; one is through the front damper into the ashpan, and so up through the fire-bars, and the other through the fire-box door. A large grate helps in the burning of the coal, for the fire can be spread more thinly over the surface, and the air can pass up from the ashpan more freely. The speed of the engine would naturally cause air to pass through the dampers and the ashpan, but a very powerful system of forced draught is in action all the time the regulator is open. The exhaust steam, shooting through the smoke-box to the chimney creates a partial vacuum in the smoke-box, and this produces a powerful draught from the fire-box to the front end all the time the cylinders are exhausting.

In the fire-box itself this strong current of air has to be carefully directed to provide the air just where it is wanted, so that complete burning of the fuel takes place over the whole area of the grate. The air-stream entering through the front damper, and thence up through the ashpan, is directed by means of an arch built of firebricks, which spans the full width of the fire-box. The directions imparted to the air-streams by this brick arch are shown in the sectional diagram. On reaching the backward end of the arch the air is swept round by the draught from the smoke-box and joins the direct stream from the fire-box door. A further study of the diagram shows another valuable function of the brick arch; it draws all the air-streams together so that they impinge upon the tube system exactly at right-angles to the tube-plate. Thus there is a minimum of resistance at entry.

This brings me to the boiler proper. It is often thought that steam locomotives are fitted with a water-tube boiler; this is not the case. The water is contained in the cylindrical drum, and it is the hot gases, hot air, and fumes from the fire that pass through the tubes. In a locomotive boiler the tubes act as flues. There is a very large number of these tubes; on the standard non-streamlined "Super-Pacifics" of the L.N.E.R. for example, there are 121 tubes, each just under two inches in diameter inside. The outside of every flue tube is in direct contact with the water. Steel is an excellent conductor of heat, and as the tubes are only $\frac{1}{16}$ in. thick the intense heat of the flue gases rushing through inside is very easily transferred to the water. The outside surface area of the tube is accordingly termed heating surface.

The more tubes there are the more readily will the water be boiled, though there comes a point in any locomotive design where the crowding of more tubes into the boiler in order to obtain more heating surface will defeat its own object, by offering too restricted a passage for the flue gases. The steaming ability of a boiler depends almost entirely upon the draught. It is easier to maintain a powerful draught through a comparatively small number of large tubes than through a great number of small ones, and although the heating surface of the two boilers may be exactly the same the one with the larger tubes will steam much more freely.

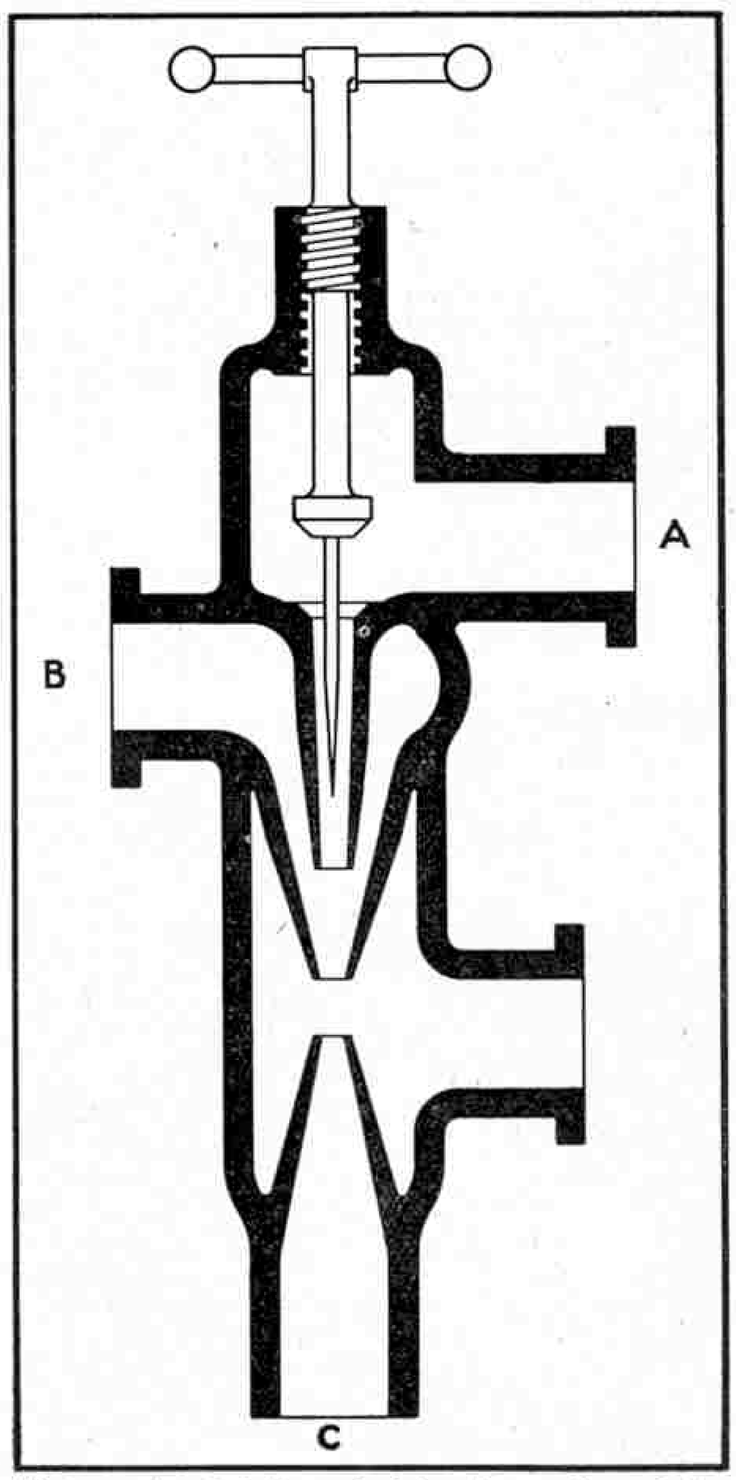
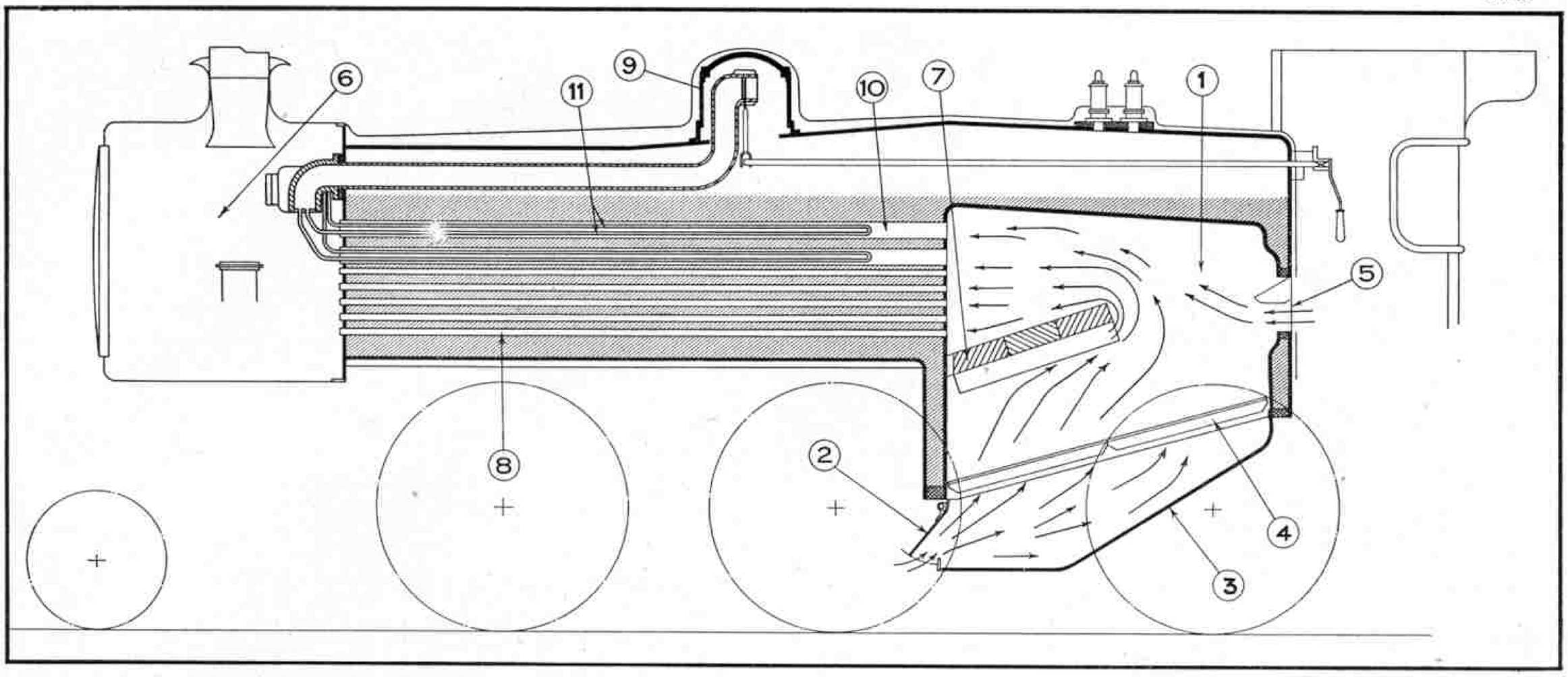


Diagram showing the principle of operation of the injector. A represents the steam inlet, B the entry of the water supply and C the delivery outlet. The other opening, unlettered, is the overflow.

A very striking illustration of this point is afforded by the original L.N.W.R. "Claughton" class 4–6–0s, and the three-cylinder reconstructed "Claughtons" of the modern L.M.S. "Patriot" class. The original class had 149 tubes the internal diameter of which was 1.667 in., and, as an old driver once expressed it to me, the engines were often "shy to steam." In the rebuilds the number of tubes is reduced to 140, and the internal diameter is increased to 1.917 in. It is of course well known that the "Patriots" are wonderfully free-steaming engines.

The steam that collects at the top of a locomotive boiler is termed "saturated steam." The vapour rising from the surface of the boiling water carries with it innumerable particles of moisture, and although the pressure may gradually be built up to, say, 200 lb. per sq. in., the steam still remains saturated. In this state it is often called "wet" steam. Modern practice however is universally in favour of using steam that is not merely dry, but is heated above its natural temperature of formation. After the steam has collected at the top of the boiler, either in the dome or in the perforated pipe used on certain types, it is led back into the boiler to be superheated, that is heated above the temperature at which the water naturally boils. I should explain here that whereas under atmospheric conditions water boils at 212 degrees F., when it is boiled under pressure, as in a locomotive boiler, the temperature at which boiling takes place is much higher; at 200 lb. per sq. in. water does not boil until 380 degrees F. is reached.

The steam is carried through a series of special tubes, and to accommodate these a re-arrangement of the flues is necessary. In the case of the L.N.E.R. non-streamlined "Super-Pacifics" there are, in addition to the 121 small flue tubes previously mentioned, 43 large tubes, and these contain the superheater tubes, or elements as they are called. Saturated steam enters a tube at the front end of the superheating system; it is then conducted, as the diagram shows, right back to the fire-box end of the boiler, and then to the front again. In the process the steam is made hotter and hotter until it finally emerges at a temperature of about 700 degrees F. As just explained, the temperature of saturated steam under a pressure of 200 lb. per sq. in. is only 380 degrees F., so that the degree of superheating attained is quite large. The steam is then absolutely dry—a searing, scorching gas, which, unless the greatest care is taken with the lubrication system, will play havoc with cylinders and valves. Saturated steam is far easier to deal with in this respect, for the moisture in it acts as a natural lubricant.

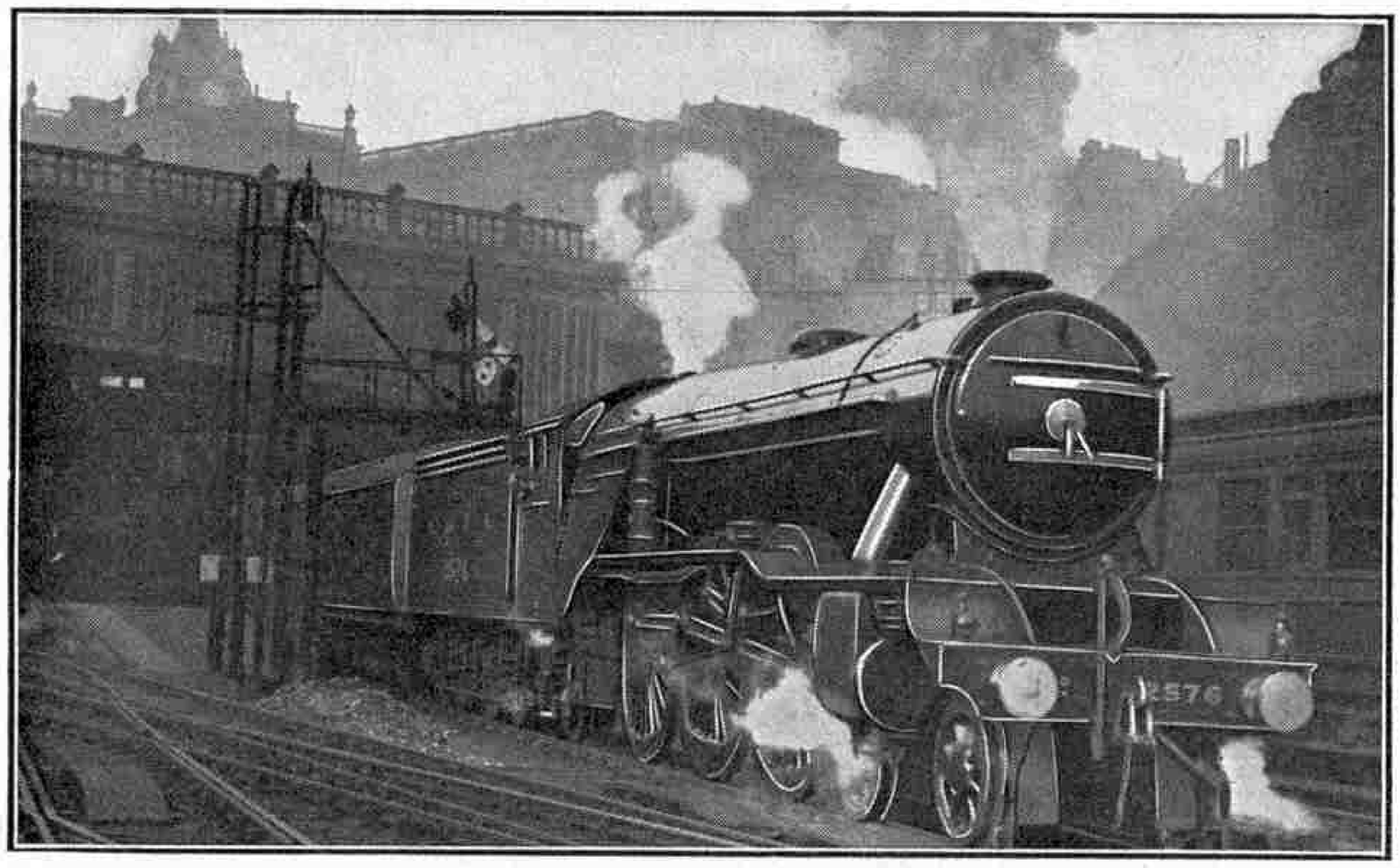


Sectional view of a locomotive boiler and fire-box. The numbers indicate different parts as follows: 1. Inner fire-box, 2. Front damper, 3. Ashpan, 4. Fire-bars, 5. Fire-box door, 6. Smoke-box, 7. Brick arch, 8. Small tubes, 9. Dome (inner), 10. Large tubes, 11. Superheater elements.

In view of this considerable disadvantage, it may well be asked "Why use superheated steam at all?" Another point that is not generally realised adds further weight to the question; superheated steam at, say 200 lb. per sq. in., however much hotter and drier it is, can exert no more force on the pistons than saturated steam at the same pressure. The great advantage of superheated steam, and one that far outweighs any difficulties experienced in the mechanical working of the locomotive, lies in the greater volume of steam obtained from the same amount of coal. Supposing a cubic foot of saturated steam at 175 lb. per sq. in. is superheated to 670 degrees F.; the pressure is kept constant, as in a locomotive boiler, and in consequence the steam expands under the additional heat, just as would steel. That cubic foot of saturated steam would become no less than 1½ cubic feet of superheated steam. This means that to produce the same volume of steam only two-thirds of the amount of water used in a saturated engine needs to be boiled, and of course less coal needs to be burned.

It would thus seem that by superheating one gets something for nothing; actually of course some of the heat from the flue gases, which would otherwise have been used for evaporation of the water is used in heating the steam that is passing to and fro through the superheater elements. This amount of heat has been found to be practically negligible in proportion to the greatly increased volume of steam obtained. The superheating elements are of necessity placed along the middle of the flue tubes, and here of course the hot flue gases are of little or no value for heating the water; it is the gas immediately in contact with the flue tube walls that provides most of the heating. So what would otherwise be waste heat is utilised for superheating, and this of course is the secret of the great increase in efficiency.

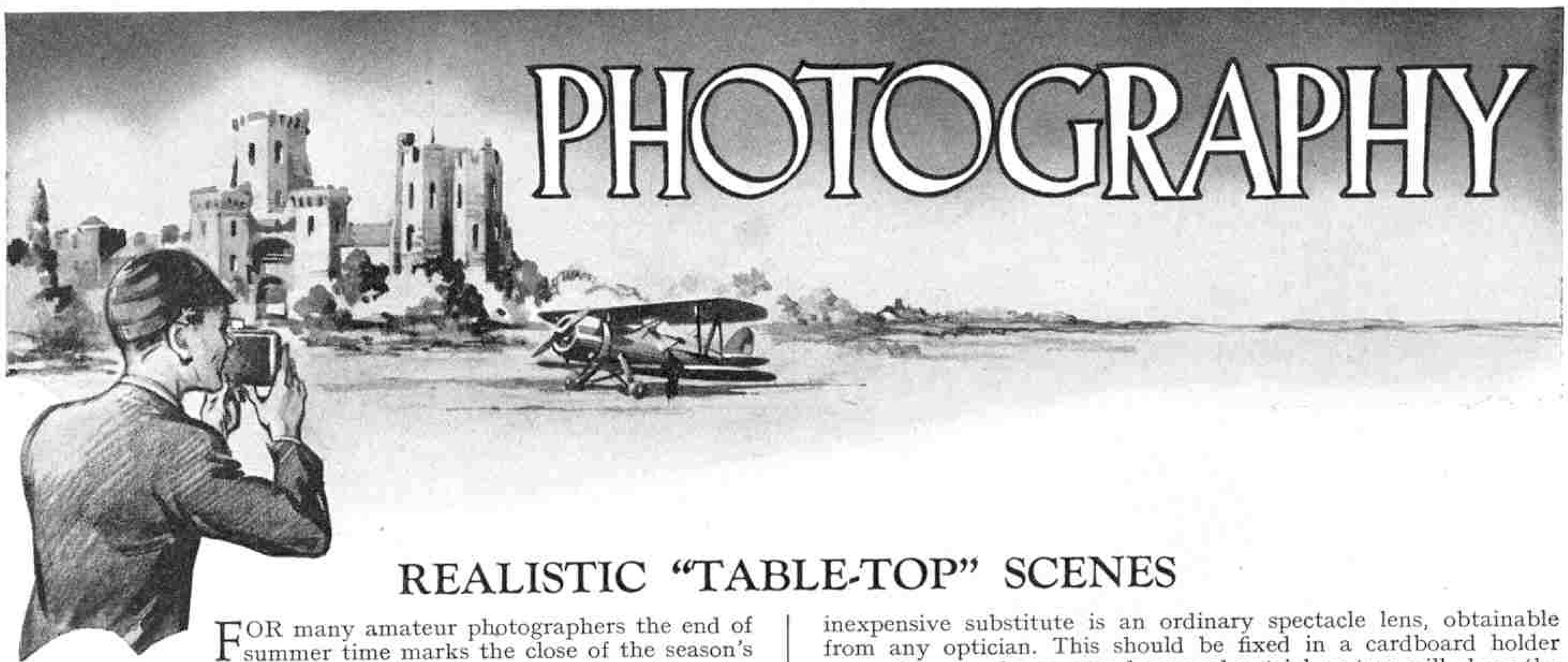
A point that will probably have occurred to readers by this time is "How is the boiler kept full of water?" On the earliest locomotives a simple pump was used, driven off the crosshead; and that method had, of course, the serious drawback that replenishment of the boiler ceased when the engine stopped, as for example during the time of standing at a station. It was a Frenchman, Henri Giffard, who made the wonderful invention of the injector. The diagram on the previous page illustrates the principle upon which the injector works. The pipe A is connected to a steam supply, which can be controlled from the footplate; the pipe B is in direct communication with the water tanks. When steam is turned on through pipe A its passage through the gap where the water pipe joins in creates a partial vacuum and sucks water through the pipe B. The steam then continues through the narrowing cone and, as in the nozzle of a turbine, greatly increases its speed of flow. But it is now thoroughly mixed with cold water sucked in from the tender tank. This mixing causes the steam to condense, and the jet changes into one of hot water travelling at high speed into the delivery pipe at C. The power of this jet is great enough to lift the non-return, or "clack" valve and force a steady stream of hot water into the boiler against the normal working pressure.



Off to the South! A Gresley "Pacific" locomotive makes the first few puffs of its journey and forms an impressive sight as it leaves Waverley Station, Edinburgh.

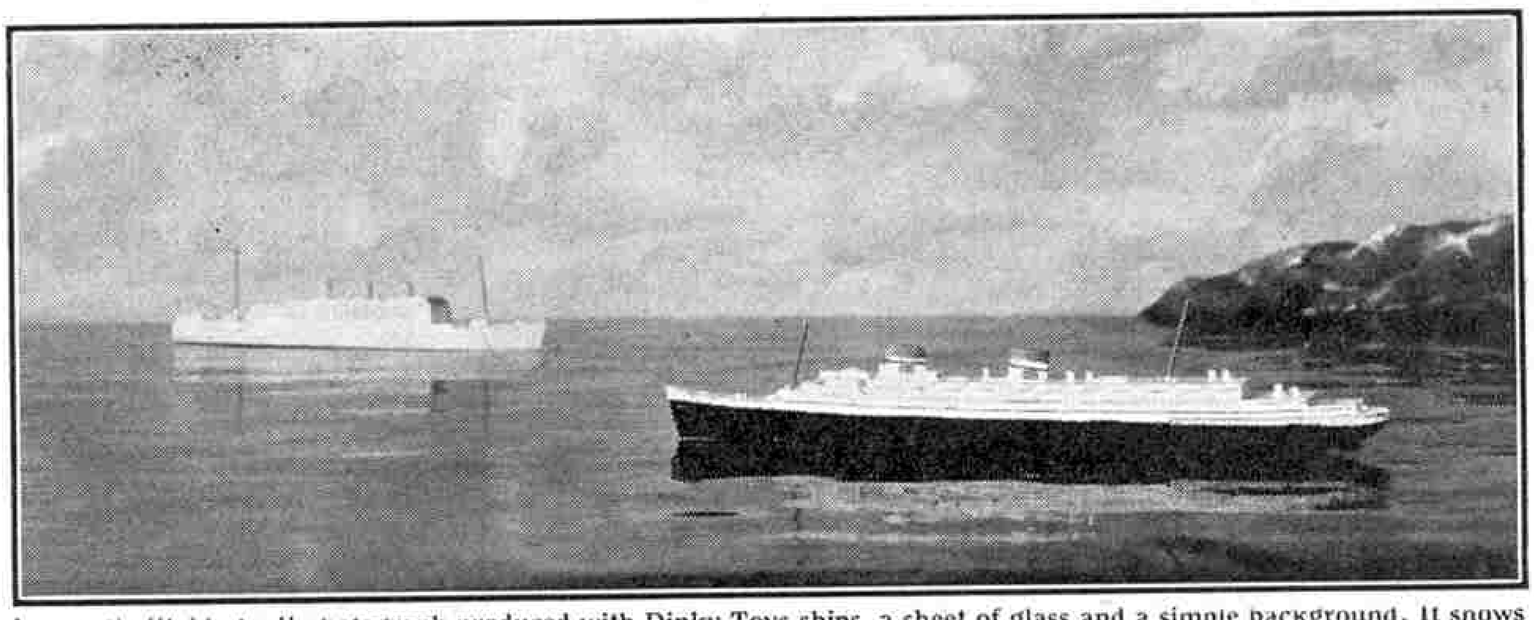
Almost all modern locomotives are fitted with two injectors, one using live steam and the other putting some of the exhaust steam to very good purpose. The exhaust steam injector is one of the most ingenious appliances ever invented. Not only does it make use of what would otherwise be waste steam from the exhaust for feeding the boiler, but it also acts as a feed water heater. Working on a steam pressure of no more than 15 lb. per sq. in. one of these marvellous injectors can feed water into the boiler against a pressure of 240 lb. per sq. in.; not only this, the water enters the boiler at nearly 200 degrees F. At such a pressure the boiling point of water is 390 degrees F., so that by means of the exhaust steam injector the water is half-way to boiling point before it even enters the boiler! On fast express runs it is usual to keep the exhaust steam injector on all the time, and to use the live steam injector as a reserve of power when the engine is working especially hard and the water in the boiler is being evaporated very rapidly.

(To be continued)



REALISTIC "TABLE-TOP" SCENES

FOR many amateur photographers the end of summer time marks the close of the season's activities, and they are apt to put their cameras aside until spring returns. There is no reason why they should do this, however, for there are many pleasant ways in which photography can be carried on indoors, even if one possesses only a simple box or folding camera. For example, in last month's "*M.M.*" we dealt with the making of "trick" photographs indoors, and this month we are giving some suggestions concerning another very fascinating branch of indoor work, namely "table-top" photography.



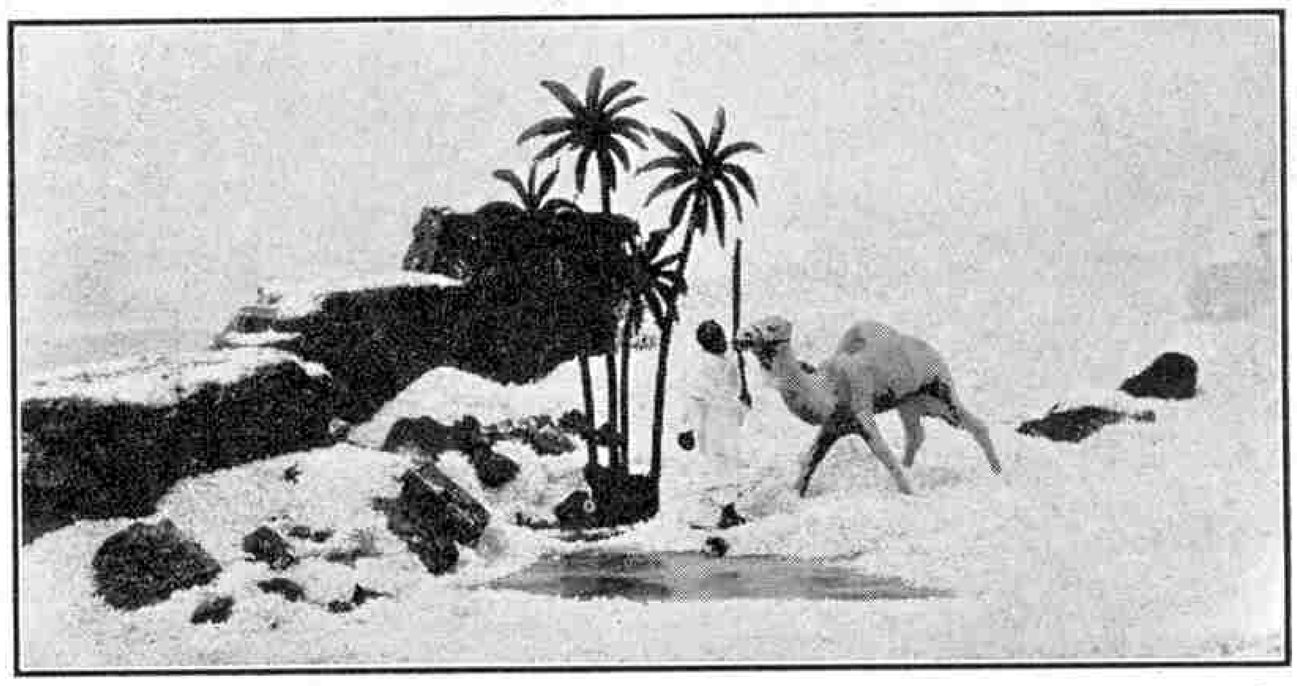
A realistic "table-top" photograph produced with Dinky Toys ships, a sheet of glass and a simple background. It shows the Italian liner "Rex" outward bound, passing the P. and O. liner "Strathaird."

"Table-topping" is simply the assembly and photographing of made-up scenes in miniature, usually arranged on a table, and those who have not yet tried their skill in this work can have little idea what interest and pleasure it can bring. All the operations involved are so simple that even a beginner in photography can obtain satisfactory results, while on the other hand more advanced workers will find plenty to interest them in planning unusual settings and lighting effects, and incidentally will add to their knowledge of photographic technique generally.

The best type of camera for this work is one fitted with a focussing screen. Accurate focussing is very important, and with a camera of this type the photographer is not only able to ensure that his picture is sharp, but also can study the general arrangement of the scene with greater ease than in the view finder of a non-focussing camera of the folding film or box type. In order to ensure a good-sized picture that covers the plate or film, it is essential that the camera should be brought near the subject. There will be no difficulty about this with a camera fitted with double extension bellows, but with a box camera, or some other type of non-focussing camera, a supplementary lens or "portrait attachment" must be fitted to the ordinary camera lens. These attachments bring objects at close range into sharp focus, and are readily obtained at small cost. An inexpensive substitute is an ordinary spectacle lens, obtainable from any optician. This should be fixed in a cardboard holder centrally over the camera lens, and a trial or two will show the best distance at which to place the camera.

An essential requirement for most table-top scenes is a stage or baseboard, which should be about 3 ft. long and 2 ft. wide. A cardboard background of the same size also will be necessary. For pictures of interiors the background may consist of a piece of buff-coloured cardboard on which is drawn or painted a simple sketch representing the wall of a room. For outdoor scenes a picture with trees and hills on it is the most suitable. The stage or baseboard should be tilted slightly so that the rear is a little higher than the front.

The most important point to remember in arranging a scene is that all the models and component parts must be in keeping with the general scale of the scene. The whole effect will be spoiled if the resulting photograph shows, for instance, a man twice the size of a horse, or standing in front of a house that is obviously too small for him to enter! It is easy to go astray on this point, and attention given to securing good proportion between the various parts of the picture will be amply repaid in the greater realism of the finished picture.



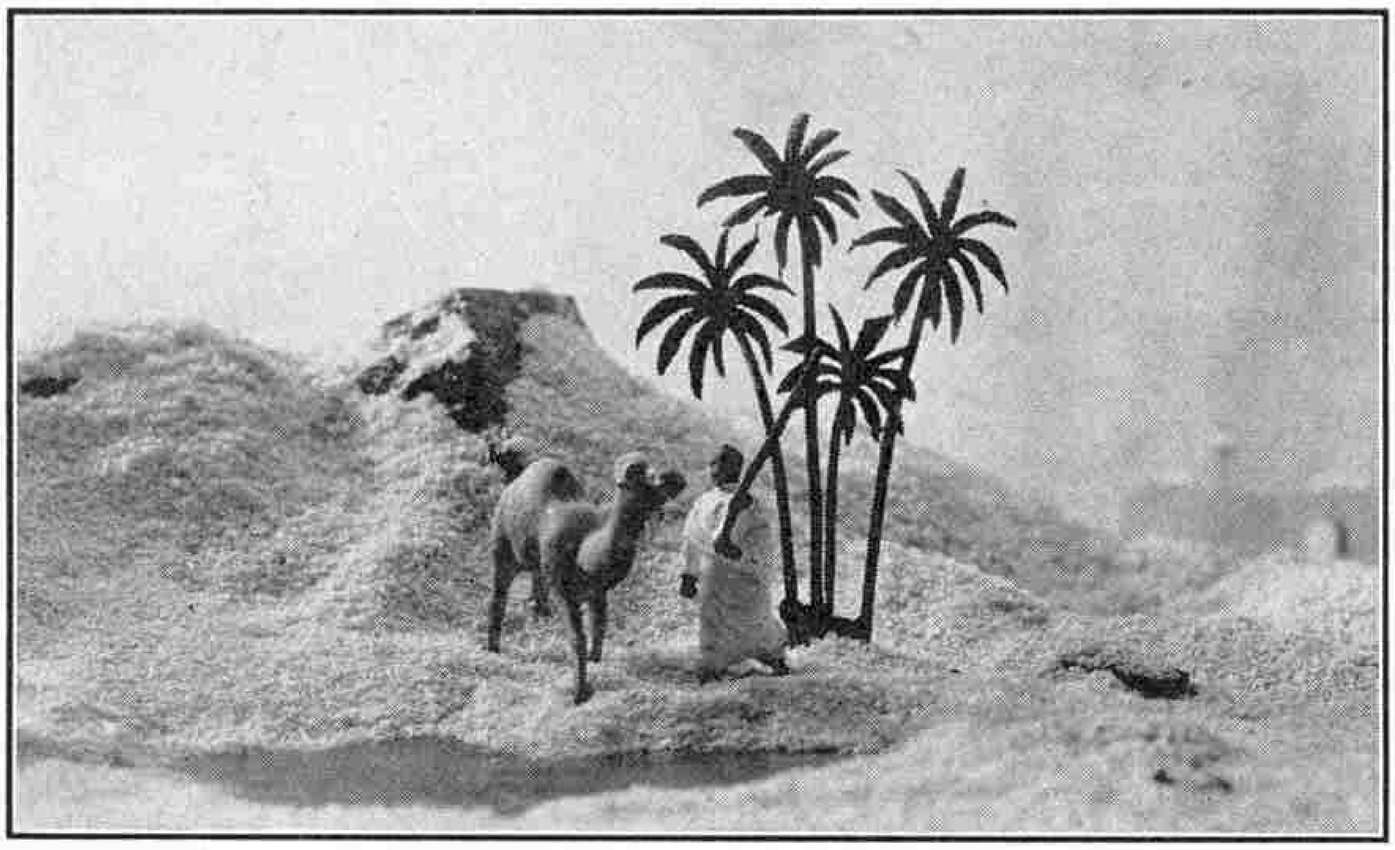
A halt at a desert oasis. Table-top scenes of this kind are quite easy to arrange, and the manner in which the photograph was produced is fully explained in the accompanying article.

One of the great difficulties of table-top photography in the past has been that of obtaining model animals, motor cars and ships, etc., small enough to be in keeping with the general scale of a scene. Since the introduction of Meccano Dinky Toys, however, this difficulty no longer exists. These splendid little miniatures are available in such a wide variety of subjects, and are so realistic in detail that they supply at once the needs of most table-top photographs. The Dinky Toys motor cars and wagons lend themselves perfectly to the production of realistic road scenes; the trains provide material for railway photographs, and the liners and war vessels make it possible to produce harbour and coastal scenes in great detail. The aeroplanes too, can be

used to produce remarkably realistic flying scenes.

One of the most important features in ensuring successful table-top photographs is good lighting. This requires careful arrangement, and conditions vary so much that only a few hints can be given here. If a scene is to be photographed indoors by daylight, the stage or table on which the scene is arranged should be placed close to a window in such a position that the light comes from the side and slightly in front. When using artificial light, it is best to place the stage almost directly under a top light, such as a 60-watt globe, and to have a second and rather more powerful light to one side and slightly in front of the scene, in order to avoid flat and uninteresting lighting. A table lamp is suitable for side illumination, and a few experiments with different arrangements will provide a useful guide for future operations.

It is not possible to give definite instructions in regard to the length of exposure required, as this will vary according to the lighting conditions and the type of film or plate used. Daylight is very variable and it is best to work out the exposure with an exposure meter or calculator. The Wellcome or Imperial calculators are particularly useful for this purpose.



Comparison of this scene with the lower illustration on the opposite page shows the widely different effects it is possible to obtain by making slight rearrangements of the setting and lighting.

Readers who have not yet experimented with "table-top" photography can have no idea of the realistic effects that can be obtained with even the most simple materials. A heap of alum or salt for example, suitably arranged, and lighted from one side by means of a 60-watt globe, looks remarkably like a snow-covered mountain peak sparkling in sunlight when photographed. Alternatively a lump of coal or rock sprinkled with flour can be used to good effect for this purpose, and if a miniature stag is added to the scene a very life-like effect is obtained. A rocky path can be represented by small pieces of stone or brick and sand, while a few carefully selected twigs provide trees and hedges. Sawdust coloured grey or green with ordinary clothes dye bought for a few pence can be used for grass. These examples serve to indicate the possibilities of easily obtainable materials in the hands of an ingenious boy or girl, and it is great fun to experiment with different substances and compare the results obtained.

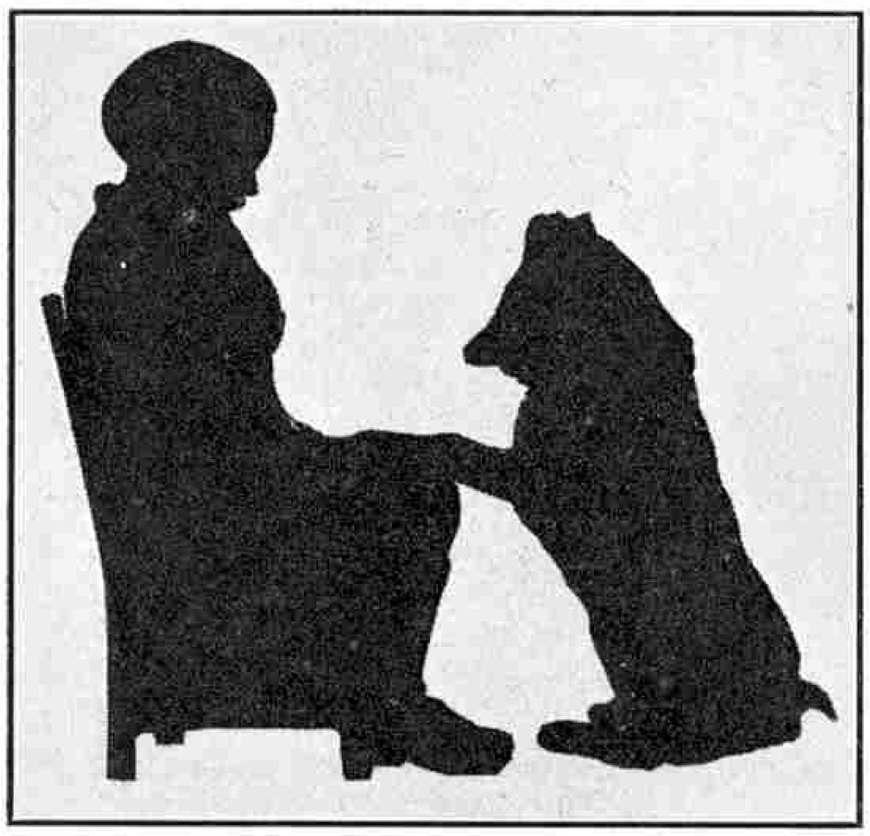
The realistic desert scenes shown on this and the opposite page were very easily arranged. Small pieces of coal were used for the rocks and fine sawdust for the sand. The "water" in the pool is merely a small piece of white ripple glass. This is excellent for representing water, and a piece of suitable size can be obtained quite cheaply from any glazier. The sea in the accompanying illustration showing the Dinky Toys liner *"Rex"* outward bound, and the *"Strathaird"* steaming into harbour, was made by placing a sheet of the glass about half an inch above dark blue paper. The background consisted of a sheet of white paper, on which the sky and clouds were roughly drawn in with blue and grey paint. In making a background of this kind, the broader the effect the more realistic will be the resulting photograph. The camera was focussed on the nearer ship and the lens aperture was reduced to F/64. Panchromatic film was used and an exposure of 3½ minutes was given, the scene being lighted by means of two 60-watt globes.

It is great fun to make table-top photographs of dock scenes, using the Dinky Toys liners and warships as models. In arranging scenes of this kind it is always worth while experimenting with the ships in different positions in order to secure the best composition and "balance" in the finished picture. Many different effects can also be obtained by altering the positions of the lights, and if an exposure much shorter than that required to produce a normal negative is given, realistic "night" effects are secured.

Another kind of table-top photography that provides plenty of scope for pleasant experiments is that of making silhouettes of the kind shown in the lower illustration on this page. Silhouettes such as these are admirable for use in making one's own photographic Christmas cards and calendars and for passe-partout mounting, and they are very easily prepared. The only materials required are a piece of clear white glass or a discarded picture frame about 12 in. by 10 in., a sheet of white tissue paper of the same dimensions, a small pair of sharp scissors and a penknife, one or two unwanted and unmounted photographic prints of human figures or animals, some paste and two or three candles.

At first it is best to confine one's efforts to the making of simple silhouettes of one or two figures such as that illustrated. The figures are carefully cut from the selected print and pasted to the tissue paper. The paper is then attached to the glass, which is propped vertically on a table, with one or two lighted candles or two 40-watt globes placed behind it at such distances as to give even distribution of light over the entire area of the glass.

In some cases the effect is improved by pasting pieces of black paper and blades of grass on the glass to suggest the trunks and branches of trees, while rocks, ships and hills also may be imitated by pieces cut from black paper. This method of silhouette making is particularly well suited for the production of humorous effects, a pastime that alone will provide many a pleasant evening's work. As a general rule it will be found that with two candles placed about 12 in. behind a 12 in. by 10 in. screen an exposure of about 3 to 4 minutes will be required for a fast film or plate used with a lens aperture of F/11.



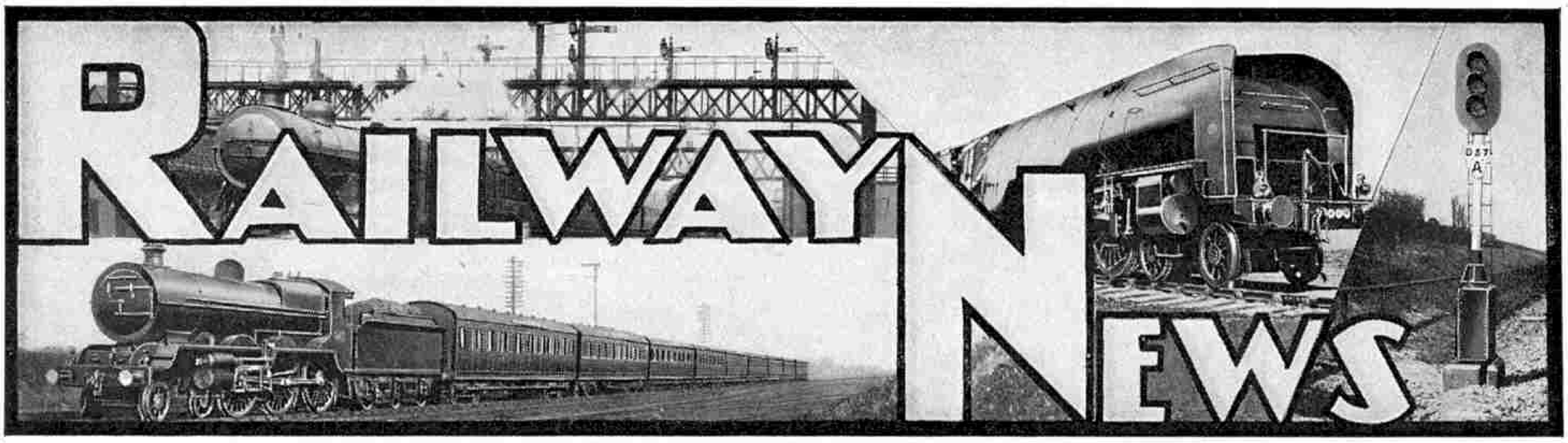
"Pals"—a simple table-top silhouette suitable for use in making photographic Christmas cards or calendars.

Readers who wish to make humorous silhouettes will find it a good plan to investigate the possibilities of figures formed from pipe cleaners. With these it is easy to make up really amusing groups of people or animals in all kinds of attitudes, and the field for experiment is limited only by the imagination. The figures can be stuck to the tissue-paper screen with Seccotine, or simply placed against it while they are photographed. In the latter case the outlines will be slightly blurred, and this is an advantage in certain kinds of work.

The examples of table-top work we have described indicate the extent of the opportunities the hobby provides for a photographer to exercise his imagination and artistic ability.

The development of the plate or film and the making of the print are of course carried out in the normal manner, but special attention must be paid to the finishing of the print. It is probable that the table-top scene has not occupied the whole of the plate or film and to secure the best effect the unwanted portions must be trimmed away from the print. Care must be taken that the sides of the print are parallel with the known vertical lines in the picture.

The need for trimming is too often overlooked by inexperienced photographers, but the improvement in appearance of a print that is properly trimmed is so great that one experiment is sufficient to ensure trimming becoming a regular practise.



The Winter Timetables

The winter timetables introduced last month show considerable saving in time on those of last winter. On the G.W.R. high-speed trains cover 2,207 miles at a speed of a mile a minute and over. This is an increase of 91 miles over the corresponding figure last year. Faster services are provided from Paignton and Torquay, Weston-super-Mare, Bristol, Bath and Plymouth to Paddington, and the new timetable includes 3,644 miles to be covered daily by the G.W.R. streamlined railcars.

"The Royal Scot" of the L.M.S. system is 25 min. faster than last year and the total saving on the whole of the L.M.S. system is 825 min. affecting a total of 237 trains. The fastest train is the 6.20 from Birmingham to Euston which covers the 65.0 miles from Rugby to Watford in exactly 60 min. The next fastest train is the *"Liverpool Flyer,"* the 5.25 from Lime Street, which runs from Crewe to Euston, a distance of 158.06 miles, at a speed of 64.08 m.p.h. *"The Coronation Scot"* is the third fastest train, the run from Euston to Carlisle being made at an average speed of 63.42 m.p.h.

The L.N.E.R. winter trains cover 3,392 miles per week more than last year. Improved services are provided in East Anglia, and faster journeys from Yarmouth and Lowestoft to London are included. The early morning service from Glasgow and Edinburgh to King's Cross is accelerated by 10 min.

The new Southern Railway timetable retains the whole of the electric expresses running during the summer, including four trains per hour from London to Brighton and four trains per hour to Portsmouth.

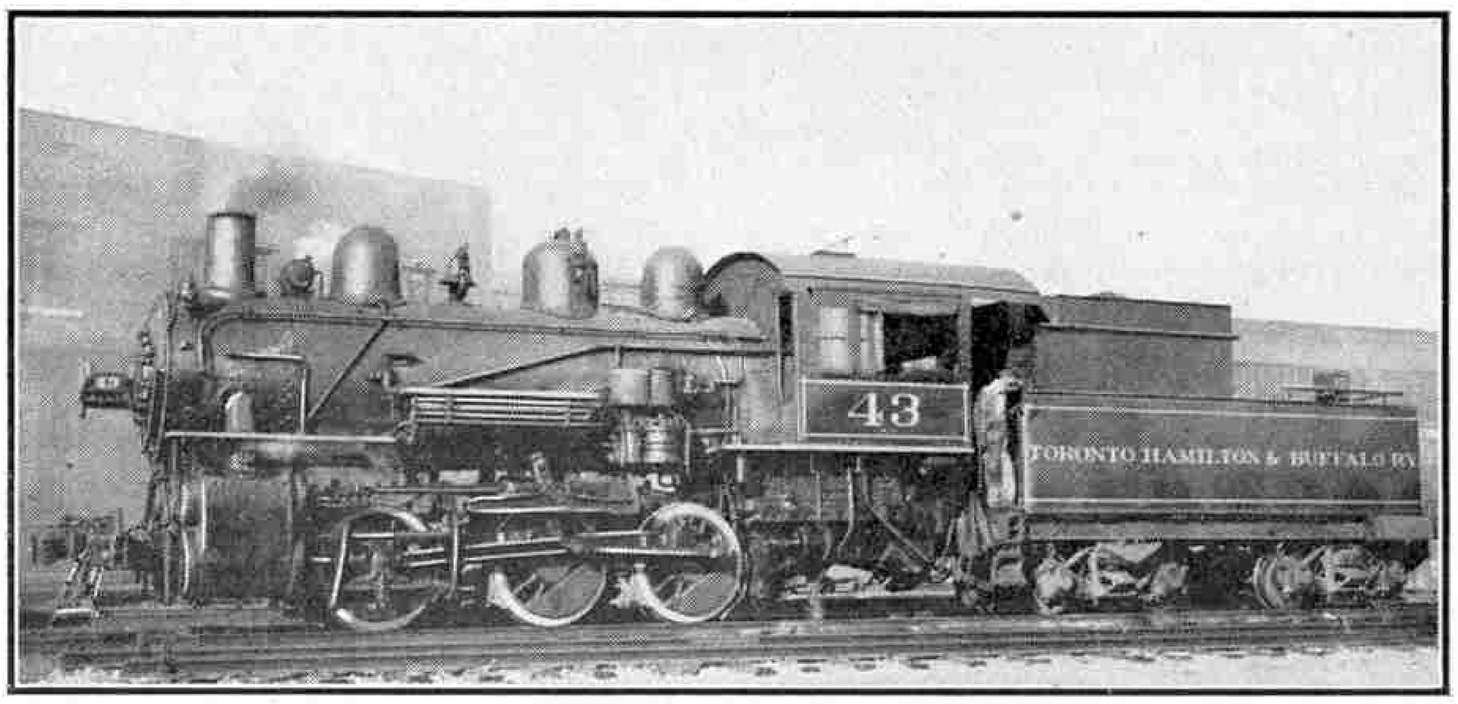
L.M.S. Diesel Train

In September the L.M.S. brought into service the experimental streamlined Diesel-driven light passenger unit, which has undergone several service tests. The train is driven by six 125 h.p. Leyland Diesel-hydraulic traction units and is capable of a maximum of 75 m.p.h.

The train makes three trips daily from Cambridge to Oxford and two from Oxford to Cambridge, with additional short trips from Bletchley to Cambridge and Oxford to Bletchley, making a total mileage of 462 daily. Including stops at Sandy, Bedford and Bletchley, the 77 miles between Cambridge and Oxford take $1\frac{3}{4}$ hours. The highest booked average speeds are 53.3 m.p.h. from Bletchley to Bedford, and 52.1 m.p.h. from Oxford to Bletchley.

The Largest Wagon in Britain

The L.N.E.R. are to build a special trolley wagon that will be capable of carrying a dead load of 120 tons. This will be the largest and heaviest single freight-carrying unit in Great Britain. It will have at least 12 pairs of wheels and will be so arranged that by the use of cantilevers its load capacity can be increased at will up to 150 tons. The wagon will be used for the conveyance of such exceptional loads of machinery as stators and turbines. It will be specially adapted for running over the lines of continental railways, thus avoiding the need for unloading and reloading for shipment.



A 0-6-0 shunting or "switching" locomotive of the Toronto, Hamilton and Buffalo Railway. The New York Central System and the C.P.R. have joint interests in this line. Photograph by H. McMichael, Waterford, Ontario.

Kid Gloves for Railwaymen

Strange to relate, one of the largest and most varied collections of gloves in England is to be found, not in an outfitter's shop, but at the Swindon Stores of the G.W.R. Gloves of all kinds are housed there, from the smart kid gauntlets worn by the company's chauffeurs to the specially tested rubber gloves worn by men doing high tension electrical work. There are gloves for locomotive builders, for those who reduce to scrap-iron a veteran that was once pride of her driver's heart, and for the diver on the river bed surveying the piers of a bridge. Most of the gloves are designed to give protection from fire and electricity, sharp metallic edges and biting acid. They are all useful, but rarely elegant.

A Brisk Run Behind *"Sir Daniel Gooch"*

Last month we announced that one of the latest engines of the G.W.R. "Castle" class has been named *"Sir Daniel Gooch,"* after the celebrated first Locomotive Superintendent of the company and designer of the broad-gauge engines. It was a happy thought to bestow such an honoured name upon one of the "Castle" class, for to the speed and haulage power of the modern type is brought some of the romance always associated with broad-gauge days.

As might be imagined the new *"Sir Daniel Gooch"* is a speedy runner. As an example, on a recent up run on *"The Bristolian,"* despite very rough weather, some fine speeding was done. Adverse signals caused a loss of $1\frac{1}{2}$ min. at the start, so that it took nearly 13 minutes to pass Stoke Gifford East Box, only 6.1 miles out. But after that *"Sir Daniel Gooch"* got going in great style and hauled his 225-ton load over the 72.9 miles on to Tilehurst in $58\frac{1}{2}$ min. A steady 60 m.p.h. up the 1 in 300 to Badminton was followed by a joyous 90 at Little Somerford, and east of Swindon speed lay between 80 and 85 m.p.h. for nearly 30 miles of level road. Reading would have been passed comfortably ahead of time, but heavier trains, normally well ahead of the flyer, had not been able to battle so successfully with the wind, and a series of slight delays prevented a punctual arrival in London. The net time for the 117.6 mile journey from Bristol to Paddington was only $102\frac{3}{4}$ minutes, however; a fine performance.

This run was timed by Mr. O. S. Nock.

G.W.R. Increase Use of Loud-Speakers

The loud-speaker installations at Paddington, Birmingham (Snow Hill), Cardiff and Newport Stations have proved so successful in directing passengers to trains during rush periods that the G.W.R. are to install similar equipment at Torquay.

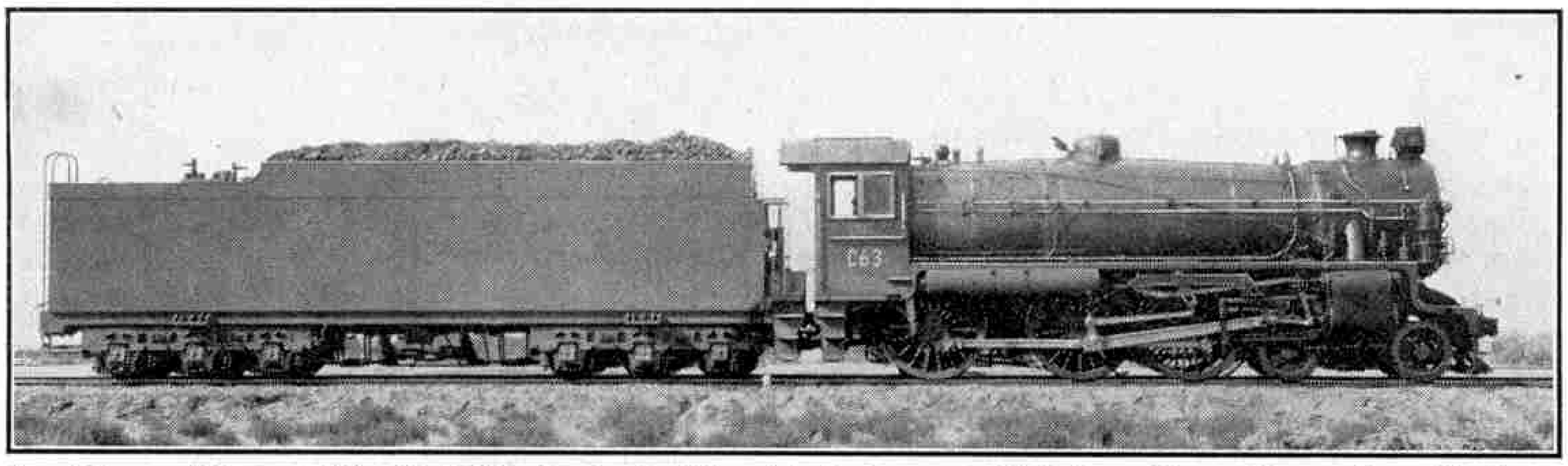
A second portable loud-speaker unit will also be in use this winter at G.W.R. stations where large sports crowds are anticipated.

* * * *

L.N.E.R. locomotive No. 4806 has been named *"The Green Howard"* by Major-General H. E. Franklyn, D.S.O., M.C.

New Australian 4-6-0s

The upper illustration on this page shows one of a new series of locomotives that has been introduced in Australia. Except for their larger tenders these engines are identical with the C36 class of the New South Wales Government Railway System. The tenders in use are the largest in service in Australia. The new engines are used on the Trans-Australian line between Kalgoorlie (Western Australia) and Port Pirie Junction, a distance of 1,108 miles. The engines are changed once during the run, at Cook, which is approximately the half-way point of the journey.



One of the new "C" class 4-6-0s with 12,000 gallon tenders delivered to the Commonwealth Railways. These engines are for working Trans-Australian expresses between Port Pirie Junction and Kalgoorlie. Photograph by T. Watson, Sydney, Australia.

At 85 per cent. boiler pressure the tractive effort of the new engines is 30,500 lb. Their length over buffers is 81 ft. 3 in. and the total weight of the engine and tender in full working order is 205 tons 10 cwt. The tender capacity is 12,000 gallons of water and 17½ tons of coal.

L.M.S. Notes

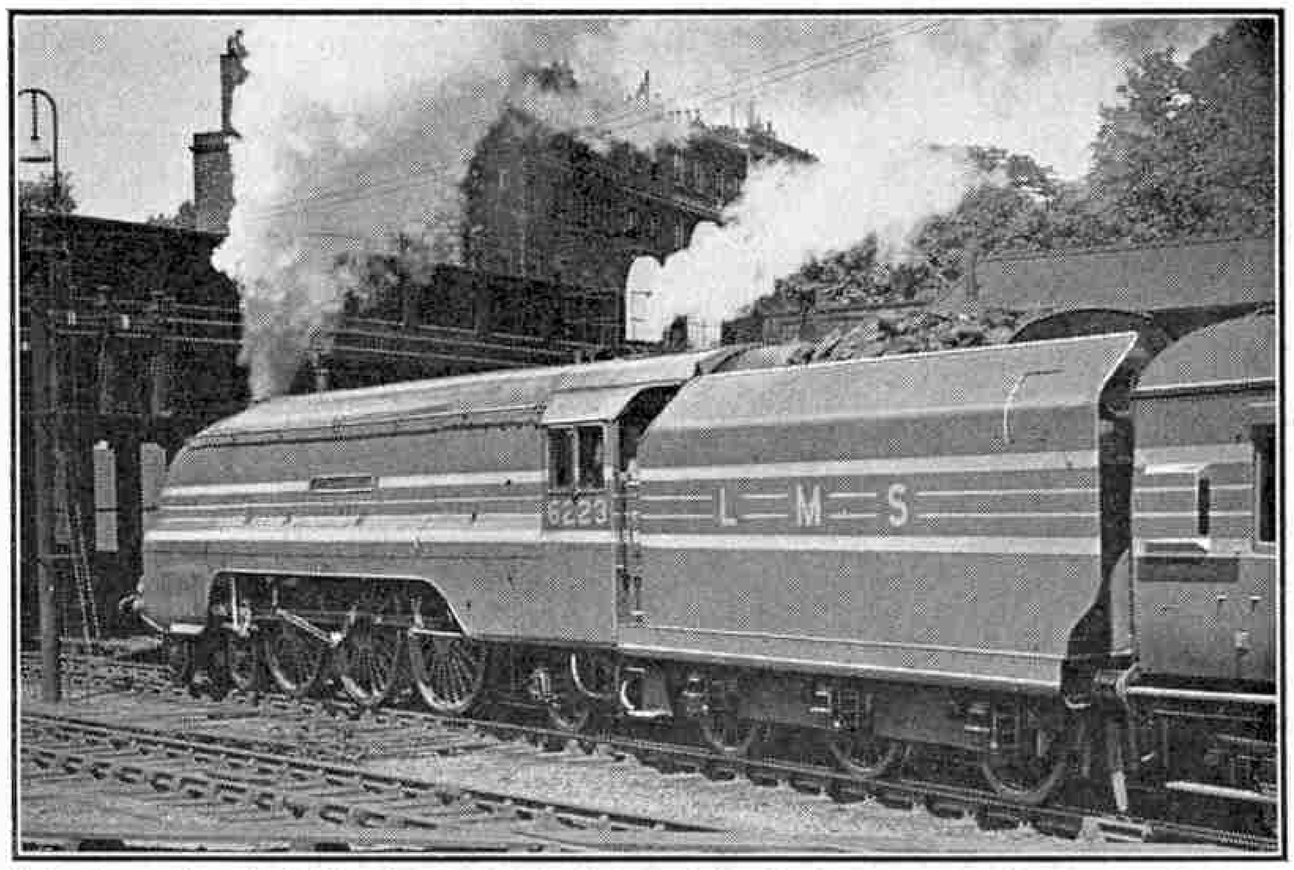
The L.M.S. ran 11 special trains carrying a total of over 5,000 passengers to Glasgow for the launching of the new Cunard White Star liner *"Queen Elizabeth"* on 27th September.

The Garratt locomotives Nos. 4967–4999 have been renumbered 7967–7999 in order to provide for prospective class 5P5F 4–6–0s.

All-steel wagons of 16 tons capacity are being built for Imperial Chemical Industries traffic. There will be 50 of them, and they will be used for the conveyance of light soda ash in bulk.

The L.M.S. print five tons of tickets each week, representing five million pieces of cardboard. The annual coal consumption of the company is five million tons, a total that keeps 18,000 miners busy all the year round.

Nearly 15,000 L.M.S. employees will attend evening classes this winter at the company's expense. Various aspects of railway work will be taught at these classes.



"The Coronation Scot" leaving Euston in charge of No. 6223, "Princess Alice," one of the blue streamlined 4-6-2s. Photograph by J. P. Wilson, Nottingham.

New L.N.E.R. Luxury Train

Last month the L.N.E.R. placed in service a new train between Liverpool Street and Harwich (Parkeston Quay). It is known as the *"Hook Continental"* and consists of 11 coaches having seats for 84 first and 240 second class passengers. In accordance with usual practice for Continental services, two Pullman Cars are attached. The *"Hook Continental"* leaves Liverpool St. at 8.15 a.m. and the up train commences at 6.20 a.m. arriving at Liverpool Street at 7.53.

Improving L.N.E.R. Locomotive Depots

The last stages of the work in connection with the improvements at the L.N.E.R. locomotive depot at Lincoln are now in hand and a contract has been placed for the extension of the general stores, in which spare locomotive parts and materials will be kept. A new locomotive depot is being constructed at Darnall, near Sheffield, in connection with the Manchester and Sheffield electrification scheme. This depot will provide accommodation for both steam and electric locomotives. Work is to be commenced almost immediately, as it is desirable that this depot in particular should be ready for the changeover which, according to present schedules, should take place in about two years.

At Darlington, where the depot is being completely modernised, a contract for the rebuilding of the locomotive sheds has already been let. This depot has associations with the earliest public railway in the country, and when complete will be one of the most up-to-date on the L.N.E.R. A mechanical coaling plant, new engine disposal pits, up-to-date repair equipment, new offices and a new mess room are all included in the scheme. The present turntable is to be replaced by one of 70 ft. diameter, which will be able to deal with the largest engines at present in use.

* * * *

L.M.S. Film Units have commenced their tour of the system and 100,000 members of the L.M.S. staff are expected to visit them.

G.W.R. Station Improvements

G.W.R. engineers are at present busy changing Brunel's famous arch roof at Paddington. The old arrangement of a series of hipped sky-lights that extend from the centre of each of the four spans like fishbones is being altered. The new glazing now being fitted to the bay that covers No. 1 platform follows the curve of the roof and admits more light and air. This bay is 700 ft. in length and the work will involve the use of 29,000 sq. ft. of glass and 95 tons of steel work.

The cleaning of the roof will in future be much easier and quicker, as new gangways are being provided, together with a water supply with stopcocks at every 40 ft. The cleaners will work from movable platforms mounted on ball-bearing wheels, which will run on rails stretching the whole length of each side of the bay.

At St. Davids, Exeter, the G.W.R. are carrying out the first instalment of their comprehensive scheme of improvements. This part of the scheme provides for the complete remodelling of the station building on the down side, the widening of the station approach side by 11 ft. for a distance of 170 ft., and the erection of a canopy covering for cars, 350 ft. in length and running along the whole front of the building. The present architectural features of the station will be retained and the new work will be faced with stone to match, so that the completed building will be in harmony with the Cathedral City.

Traffic Speed-Up at Holyhead

With a view to speeding-up the handling of newspapers and merchandise between trains and steamers at Holyhead, the L.M.S. are to instal conveyors. The conveyor on the quay will include a portable section of belt 43 ft. long and 3 ft. wide, adjustable for all conditions of the tide and with speed variable up to a maximum of 200 ft. per min. Each of the three steamers working between Holyhead and Kingstown will be fitted with a separate distributing conveyor, which will be stored on the ship's deck when not in use.

L.M.S. Centenary Exhibition at Birmingham

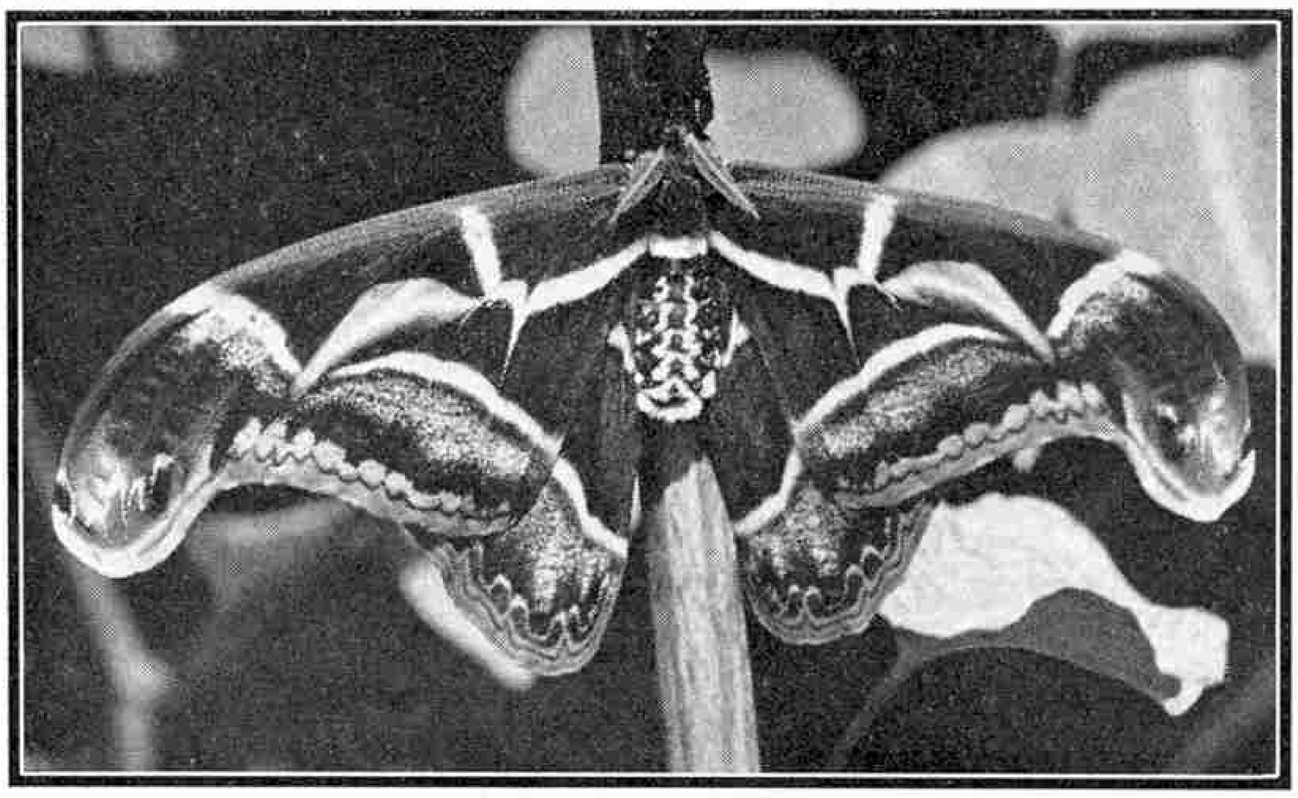
Last month the L.M.S. arranged for the "Century of Progress" Exhibition held at Euston to be repeated in Birmingham. Historic locomotives and coaches were on show and a collection of relics and models were exhibited at the City Art Gallery.

The World's Giant Silk Moths

Cocoons Brought to England by Air

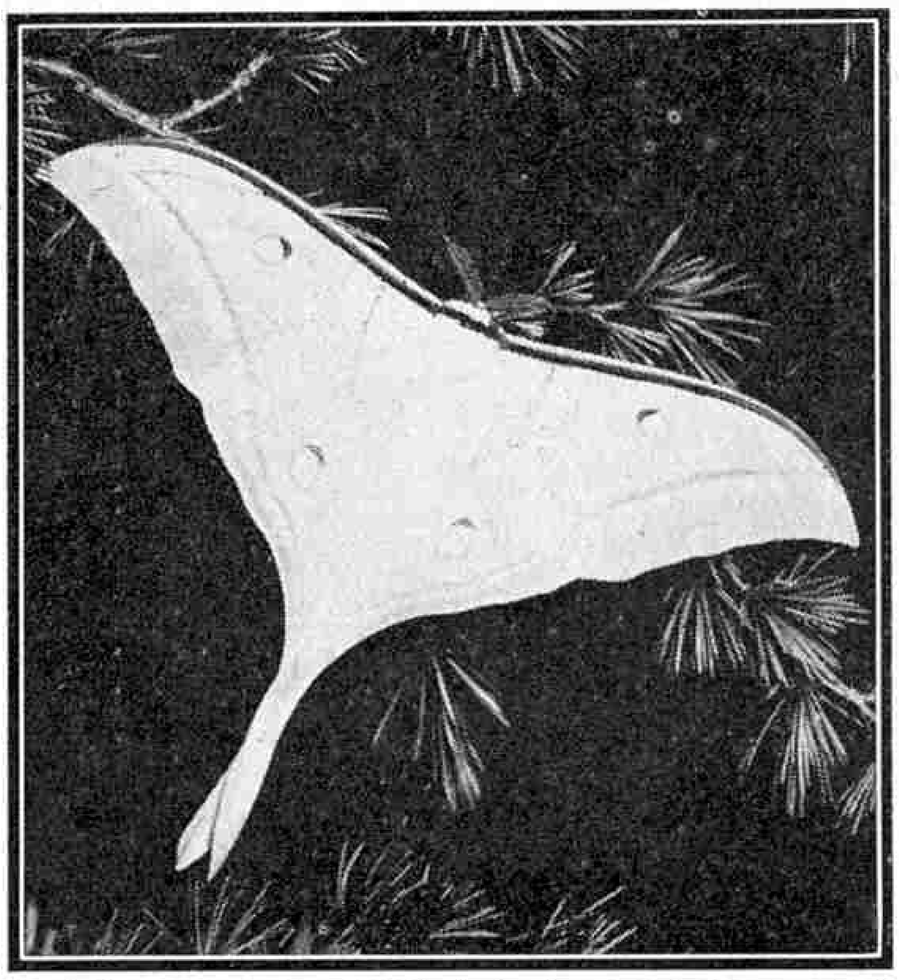
By L. Hugh Newman

THE silk-producing insects of the world form one of the largest family of moths, and their life histories are extraordinarily interesting. Most of them have on one or both pairs of wings distinct "eye" spots that undoubtedly serve as warning colouration. All the moths in this family have large plump bodies that would make a tasty meal for any insect-eating animal or bird. When they are at rest, with forewings drooped down over the hind wings, the spots are covered; but immediately the insects are disturbed they raise and expand their wings and thus expose the spots, which give the impression that some animal has awakened and opened its huge eyes!



An Atlas moth drying its wings shortly after emerging from its silk cocoon. These giant moths from the Himalayas often require a whole night for this, and in the meantime they hang motionless from a twig, as shown in this illustration.

Apart from our old friend the silkworm moth, the silk moth most commonly reared in this country is the oak silk moth, the scientific name of which is *Telea polyphemus*. This richly coloured moth is a native of North America, where it is bred commercially for its pure white silk. Its larvæ feed on oak leaves, and are possibly the most beautiful in the world. They are really quite hardy, and thrive in our climate. When the caterpillars are full grown they have lovely apple-green coloured skins, flecked all over with gold and silver "spots," which glint in the sunlight with superb effect as though studded with jewels. They have the strange habit of inflating their heads at any sign of danger. This action makes them look grotesque, and apparently has an alarming effect on any bird that settles near them with an eye to a nice juicy meal, as they are seldom attacked in the wild.



An Indian moon moth, photographed a few hours after emerging from the pupa, brought to this country by air mail.

These moths spend the winter as pupæ inside cocoons, and emerge in May or early June. The eggs are deposited on the underside of an oak leaf, and it has been found that the tiny caterpillars when just hatched welcome a varied menu of food in the form of green leaves. They flourish and grow fat on the leaves of the willow, plum, hawthorn, pear or apple, but those of the elderberry are their favourites.

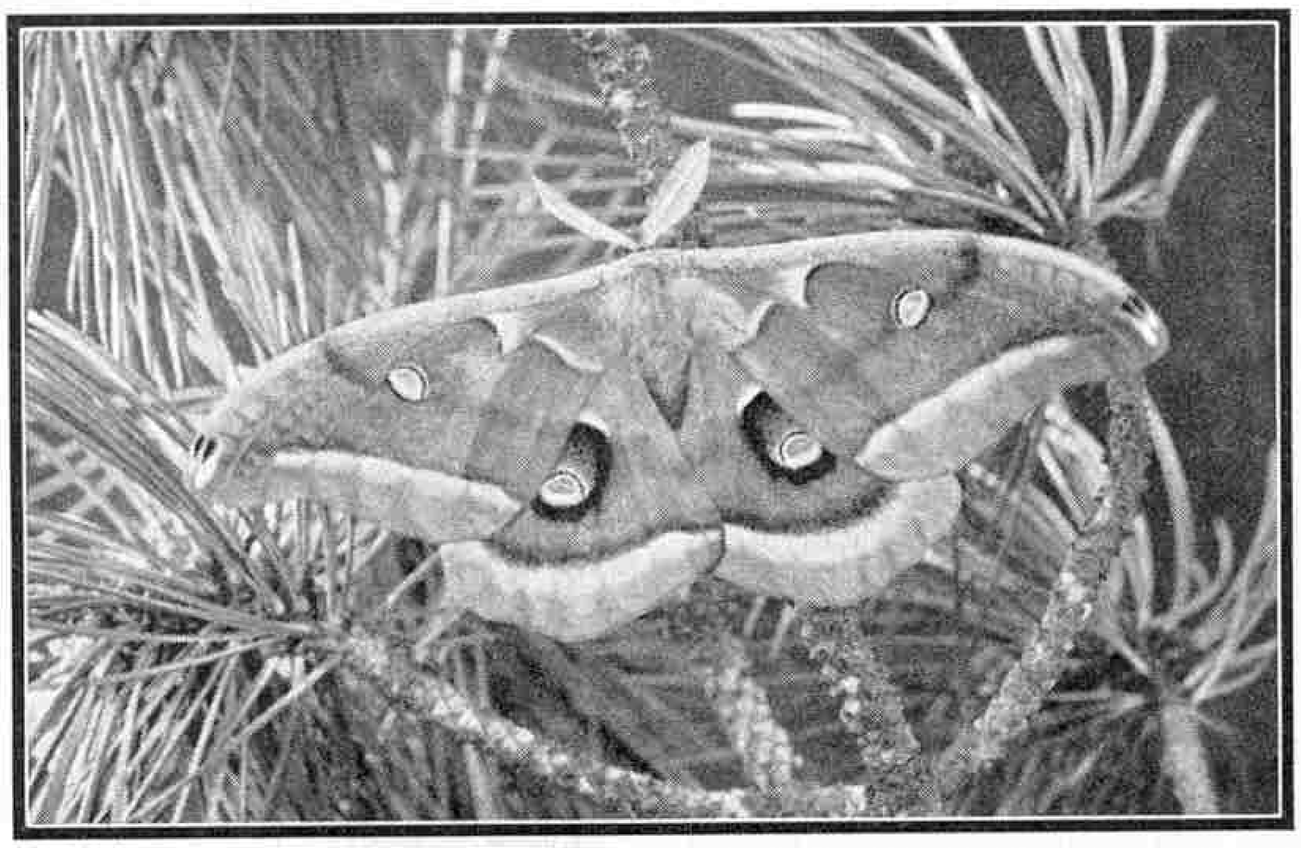
Another silk moth from North America is one that has the picturesque English name of the robin moth. It is very lovely to look at, for it has a prettily banded body, and the "eye" spots on the wings are of rich brown, shading to pink and cream. It naturally feeds on much the same kind of food as the oak silk moth, and so in this case the difficulty of feeding the caterpillars, which sometimes makes it impossible to breed foreign insects in England, presents no difficulties. The caterpillars themselves are sturdy-looking creatures, greenish-blue in colour, with pink "prickles," or tubercles as we call them, all over their bodies. They do not look anything like the caterpillars we see in this country, and for this fact alone it is interesting to breed them, and to watch them develop through their successive stages until they eventually emerge as glorious moths.

Of the foreign insects we can easily breed in our own gardens, the simplest to deal with, and at the same time the most beautiful, are the two moon moths, one a native of India and the other of North America. Visitors to the Insect House at the London Zoo no doubt have seen these lovely pale-green moths, with long sweeping tails, fluttering about in the little glass houses specially heated and lighted for them.

The large dark-brown cocoons of this moth should be kept indoors in a warm room away from frost. About the middle of April strange scratching and "picking" noises suddenly may be heard. These are made by the struggling moth trying to get out of its cocoon. Now is the time for quick action. In the wild state the cocoon would be exposed to a steamy atmosphere and would be fairly soft, so that the moth inside would be able to push its way to liberty. A cocoon kept in the manner described is hard and tough, however, and therefore should be soaked in a basin of

tepid water for a few minutes. An airing cupboard backing on to a water tank in the bathroom is the best place of all to stand the cage when the moths are emerging. Then there will be none of the crippled moths that are obtained when the cocoons are not treated properly.

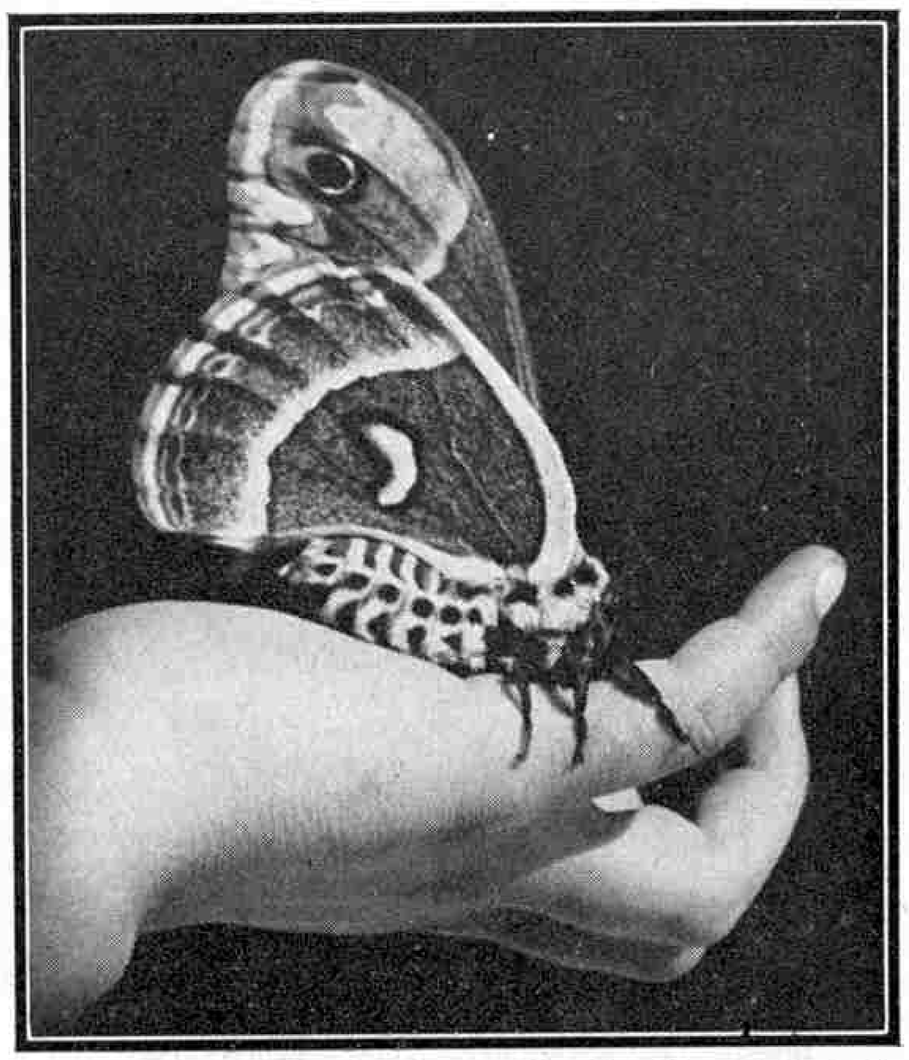
It is a revelation to watch one of these moon moths actually emerge. First of all the strange "picking" noises are heard, and then careful watch reveals a damp patch appearing at one end of the cocoon, where the moth has pressed an alkaline gland on the top of its head against the side of the hollow dome. When this alkaline liquid has softened the gum that holds the silk threads together, the moth inside commences to "tease" the fibres apart by using its head as a battering ram. It seems that the moth actually needs this violent exercise, for on more than one occasion I have "helped" a moth out when it seemed to be "stuck," or too exhausted to get out by itself, and in each case the lovely tapering tails have never developed properly.



The oak silk moth, a native of North America that thrives in Great Britain. The caterpillar is apple green, flecked with gold and silver spots.

The time these giant moths take to expand and dry their wings is amazing. Some of the largest wait a day or more before they fly. Moon moths usually take about four hours to unfurl their wings, but sometimes one that is apparently a cripple in the evening will prove to be perfect next morning.

It is worth while clearing out a box room or an attic in order to give these moths plenty of space to fly and pair, and they will not spoil their wings so badly if ceiling and walls are draped with muslin. They appear to have to learn to fly. At first they have a curious way of jerking their wings in one sharp flip, which shoots them into the air like a shuttlecock, only to fall clumsily down to the floor again. Each moth will do this a dozen or more times before it flies properly, and then it looks like a great white bat.



The robin moth of North America, an attractive silk moth that can be reared from cocoons bought in Great Britain.

Of the two moon moths, one from India, and the other from the United States, the former is the best to breed over here, as the caterpillars will feed on a variety of foods, including leaves of the walnut, hawthorn, plum, apple, nut, and wild cherry. The American moth will only feed on walnut, and is smaller when it is bred in captivity. Both take their names from the crescent marks in the centre of each wing.

The tiny caterpillar of the Indian moon moth on first hatching from the egg is red and black, but after skin casting it takes on a green shade and a number of "warts" appear on its body. Very soon the caterpillar grows as thick as the thumb, and the "warts" turn bright yellow and become larger, crowned with magnificent tufts of hair. By about the end of August they should begin to spin their cocoons, rather large, flexible, brownish balls of silk.

It is from India that the largest moths in the world come to us, in the form of live pupæ of the Atlas moth sent over by air mail in November or December. Natives are employed to go out into the jungle and collect the cocoons, which in districts where the insects are common are dotted about among the foliage like plums on a plum tree. As a matter of fact these balls of brown silk do not look unlike plums! They are packed in specially constructed boxes, made of a very light but strong wood, and despatched by the first possible air liner carrying mail to this country.

A collector of my acquaintance tells me that these giant insects look more like ungainly birds than moths as they fly up and down the lower slopes of the Himalayas. I know they can grow to an enormous size. A female I once bred out myself in a greenhouse measured just under a foot across the wings, and I believe that even larger specimens have been caught in the wild.

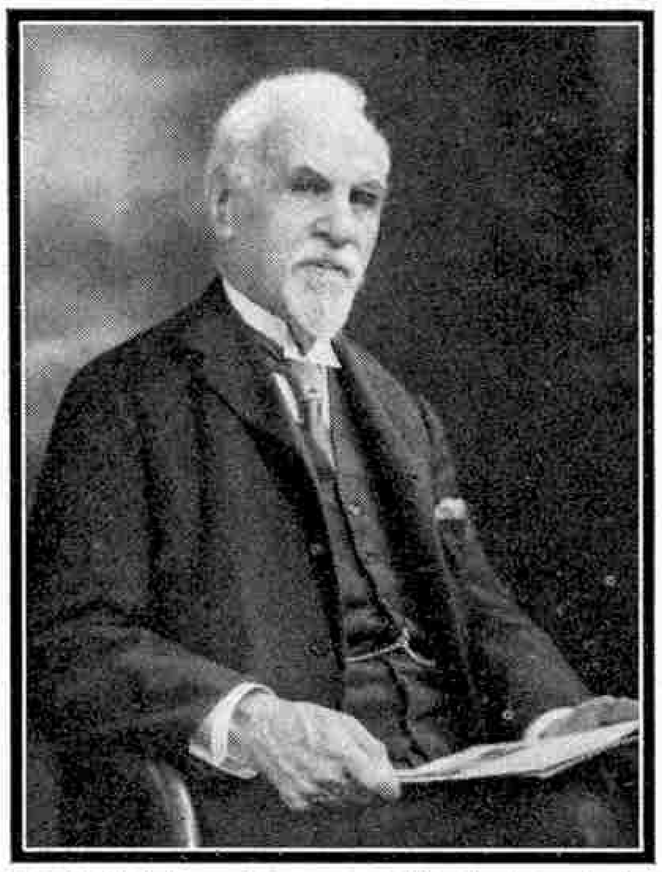
Most people favour breeding this moth indoors on cut food in a large breeding cage, as the caterpillars are inclined to be delicate, resenting cold winds, damp, and any change in temperature. The best place for the cage is in the window of a room facing south, with a stove or open fire burning day and night if possible; and the feeding caterpillars should be given fresh boughs of their favourite food every day so that they keep healthy and free from disease. The larvæ will feed on oak, plum, apple, beech, and barberry, but I have always found they do best on willow, which they prefer. Breeders must be patient when they receive their cocoons, as the moths emerge over a long period, commencing soon after Christmas and continuing right into the Summer. In order to get pairings and obtain eggs, it is best to keep the cocoons fairly cool so that they won't emerge before the trees are in leaf.

NOTE: The author of this article will be glad to give further information and advice on the rearing of silk moths to any reader who writes to him at The Butterfly Farm, Bexley, Kent. THE EDITOR.

A Versatile Railway Engineer and Inventor

The Career of Alfred Whitaker

THOSE who read the article in the March issue of the *"M.M"* on the working of *"The Pines Express"* over the Somerset and Dorset Joint Railway will remember the references to single-line working over sections of that line, and to the apparatus employed for the mechanical exchange of single line tablets. The pattern of apparatus used has always been associated with the Somerset and Dorset system, for it was originally designed by Mr. Alfred Whitaker, who for 22 years held the position of Locomotive, Carriage and Wagon Superintendent at the Highbridge works of that company. Mr. Whitaker's recent death at the age of 91 has removed from the railway world a remarkable personality whose professional acquaintance with the locomotive and railway work dated back to 1860. Readers will be interested in the career of this ingenious and versatile engineer, and through the courtesy of his son, Mr. A. H. Whitaker, at present L.M.S. District Locomotive Superintendent at Bristol, we are able to publish the accompanying portrait and details of the life of this remarkable railwayman.



Alfred Whitaker at the age of 90. Photographs by courtesy of his son, Mr. A. H. Whitaker, Bath.

Alfred Whitaker's railway career commenced at the age of 14, when as a pupil he entered the Derby Works of the former Midland Railway. After serving seven years in working through all the different branches of locomotive construction, he spent six months firing on shunting, goods and passenger engines. In those days the minimum hours were 72 a week. The engines were fitted with hand brakes, which it was the duty of the fireman to operate, and the protection from the weather was the very inadequate weather board. St. Pancras had not then been built, and Midland trains reached London by the Great Northern line, running into King's Cross.

After completing his training Mr. Whitaker was given charge of the locomotive depot at Lancaster and was subsequently appointed to a similar position at Bradford. When the Midland line was extended to Carlisle in 1875, he was put in charge of locomotive matters in the Carlisle district and six years later became District Locomotive Superintendent at Leeds.

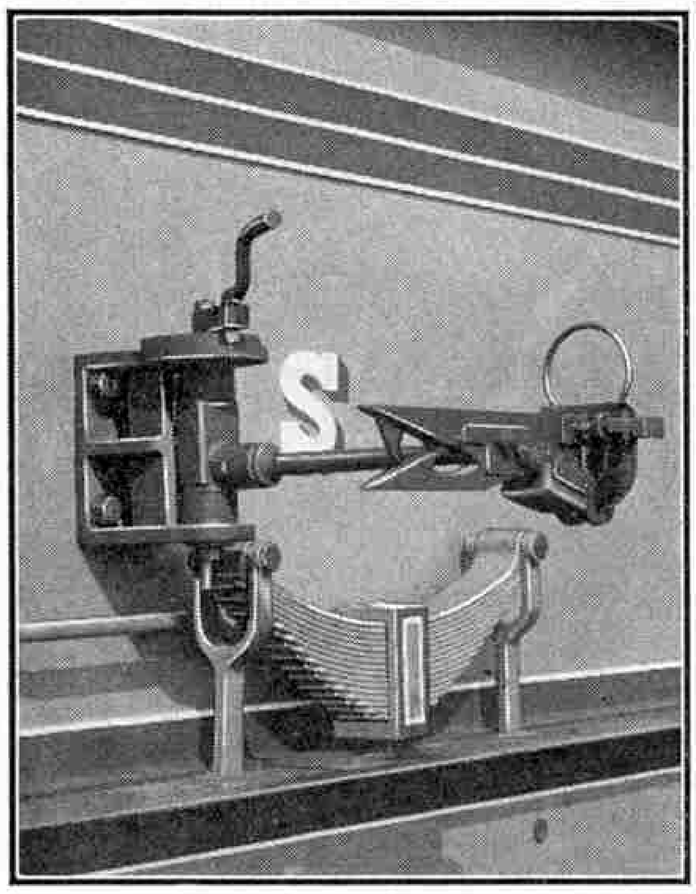
It was in connection with the Somerset and Dorset line, however, that Alfred Whitaker was best known. This system was originally an independent line, but in 1876 it became the joint property of the Midland and L.S.W. Railways. Locomotive matters then came under the control of the Midland authorities at Derby, and from that time engines for Somerset and Dorset work were, in fact, built to Derby designs. In some cases they were practically replicas of Midland types of the time, and the appointment of a locomotive engineer who had been trained at Derby to supervise local mechanical affairs therefore was a natural step.

Mr. Whitaker became the Locomotive, Carriage and Wagon Superintendent of the Somerset and Dorset Railway in 1889 and during his term of office he was responsible for the building of the Company's workshops at Highbridge, including the installation of new machinery and plant. He also brought the rolling stock up to date by the introduction of new and more powerful locomotives and rebuilding of the old ones, and by building a large number of passenger and goods vehicles of various types in the Highbridge shops. The Company's steamers plying in the Bristol Channel also came under his supervision.

During his railway career extending over a period of nearly 51 years Mr. Whitaker brought out numerous patents in connection with railway equipment. These included adjustable extension rails, or "crocodiles" as they were known, to allow the turning of longer engines than those for which turntables were designed. A tender water indicator and an inclined traverser for moving locomotives from one line to another in shops fitted with only one overhead crane also were among his inventions. One of these traversers was in use in Highbridge Works for nearly 40 years.

The invention that brought the name of Whitaker most prominently before the railway world was the apparatus, already referred to, for exchanging train tablets on single line railways. It was first used on the Somerset and Dorset system in 1905 and is in use to-day in various parts of the world. Its purpose was to allow exchanges to be made at speeds of 50 m.p.h. or 60 m.p.h., thus avoiding waste of time in stopping or slowing down.

The train tablet is encased in a leather pouch with a steel loop attached to it, and how this is mounted on the engine or tender for exchange is shown in the lower illustration on this page. The turnover arm carrying it is attached to a bracket, and projects from the side of the tender when set for exchange. At its end are a pair of jaws to engage the steel loop when picking up a tablet from the lineside, spring triggers closing behind the loop to prevent it from rebounding after being caught. The rear end of the jaw is constructed so as to carry the tablet about to be given up at the end of the section over which it gives the driver the right to proceed. The pouch is held in a spring clip with the loop projecting upward in a position in which it can be caught by the jaws of the ground apparatus, which is carried on a column at the lineside. The column has two arms, the upper one to receive a tablet and the lower one to carry the tablet to be picked up. The arms normally stand parallel to the running track, but they are swung out at right angles to the line when it is required to exchange tablets so as to bring them into such a position that they are ready to engage with the corresponding apparatus fixed on the locomotives. The moment the exchange has been made, the arms automatically swing back clear of the line to their normal position.



Whitaker tablet exchange apparatus in the working position on a locomotive. When out of action the arm is turned back to lie parallel to the tender side and the jaws then are allowed to hang downward.

Alfred Whitaker retired from railway work in 1911, and in 1915 he was elected to the Board of the Whitwick Colliery Company, Leicestershire, where his mechanical skill and inventive ability found ample scope during the complete modernisation of the equipment and plant carried out at Whitwick a few years ago. One of his inventions was an ingenious arrangement of automatically-operated pithead gates. An interesting point is that he always made his own working drawings and tracings, from which the blue prints were taken by the engineers; and as an instance of his practical skill may be mentioned a working model of his pithead gates that he made to demonstrate their action before they were installed at the Whitwick Colliery.

In addition to his colliery activities he was also a Director of the Swannington Pumping Company, and held this position at the time of his death. He was keenly interested in technical education and was a member of the Technical Education Committee of Burnham and Highbridge for a number of years. Many engineers holding important positions in various parts of the world owe their success in life, in no small measure, to the early training, both practical and theoretical, which they received under his ever watchful supervision, and firm but kindly guidance.

He retired finally in February of this year, so ending an engineering career of nearly 74 years' active service, of which 51 years were spent on the Midland and Somerset and Dorset Railways.

Man-made Lightning

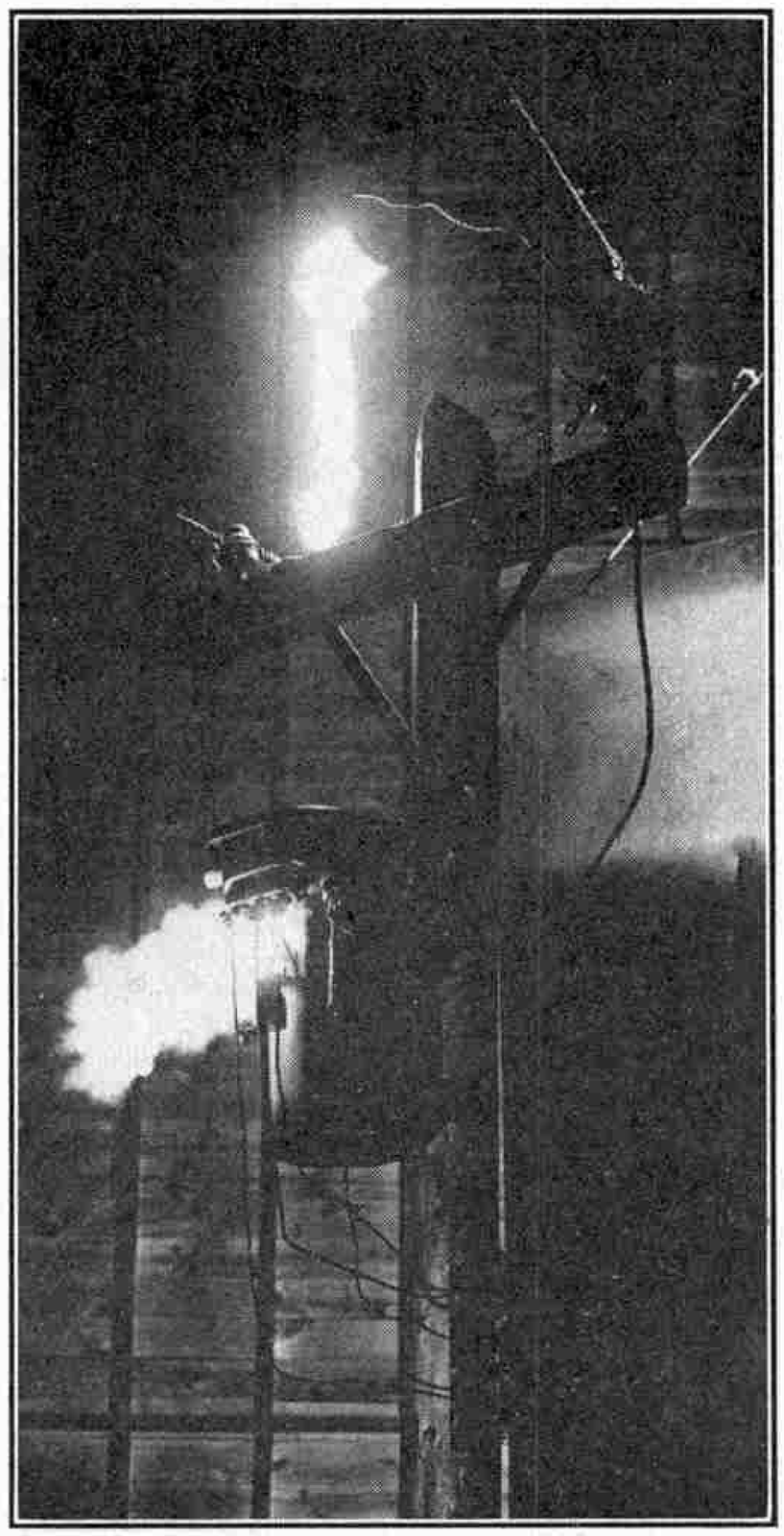
Tests with Strokes of Nearly Four Million Volts

DURING the past five years the research engineers of the Westinghouse Electric and Manufacturing Company have been making experiments with artificial lightning, and in that time have sent a quarter of a million flashes, each of more than three million volts, into transmission poles and steel-covered electrical apparatus. This number of discharges is greater than the number of strokes of natural lightning sustained by the high voltage power transmission systems of the United States during that time.

The average flow of current in each flash was approximately 65,000 amp., and if the energy in all these discharges of artificial lightning were released at once it would be sufficient to light 333 million 60 W. lamps, or more than are in operation at any one time in the world—but they would only be lit for a second! The total current amounted to 16 thousand million amperes, and its cost at a charge of about 2½d. per kilowatt-hour or unit would work out at a little more than four shillings for every thousand strokes.

It is estimated that any stretch of transmission line a mile in length is not struck more than once in two years in the United States, although there may be millions of lightning strokes to earth in the same time. Nevertheless lightning could play havoc with power transmission lines and electrical apparatus connected to them if it were allowed to have its own way. It did so several years ago, when there was no means of preventing a really violent stroke from flashing over insulators and burning a path to earth. Insulators were made stronger, and protective devices such as lightning resisters were developed as a result of studies on natural lightning, in which its power was measured and its effects carefully examined. The engineers who did this were handicapped by not knowing where the lightning would strike, however, and this led them to make their own lightning. With the aid of condensers they were able to imitate natural lightning in regard to its voltage or the density of the current, but at first they were unable to reproduce these together, as Nature does, and thus to imitate her destructive force.

Nature builds up a giant electric charge in the clouds. The clouds rise to very high voltage from tiny particles of moisture which are electrically charged by their movement through the air and forced up by wind action. The earth has an opposite charge and the air serves as an insulator between the two. A thunder cloud discharges its load of electricity as a lightning stroke when some good conductor such as a church steeple or tree comes between it and the earth.



Fifty discharges of artificial lightning at three million volts failed to injure the transformer shown under test in this illustration. Photograph by courtesy of the Westinghouse and Electric Manufacturing Company, Pittsburgh, U.S.A.

It has long been known that a stroke of lightning combines a heavy flow of current with pressure up to about 10,000,000 volts, but it was not until five years ago that a generator and a switch capable of imitating a powerful segment of natural lightning were invented. This achievement is due to Dr. Bellaschi, of the Westinghouse Electrical and Manufacturing Company, whose generator is in two parts. One consists of a huge three-storey stairway of 36 banks of condensers, each with a charge of 100,000 volts, so that the combined output is 3,600,000 volts. The second is formed of eight banks of eight condensers, carried on a shorter stairway, each of which represents a certain volume of thunder cloud. When acting together they produce a current of 150,000 amp. lasting over a period of 200 millionths of a second.

The problem of releasing the outputs of the two sets of condensers in perfect sequence was a difficult one, and was solved by the use of what is described as a microsecond switch. This is a block of insulating metal that melts when the voltage reaches a certain critical value, setting free the high current and combining it with high pressure to form a genuine replica of real lightning, representing all its effects from the crash of thunder to the shattering of poles and steel-covered electrical apparatus. The switch takes its name from its ability to act in a millionth of a second.

This man-made lightning has been used to bombard electrical apparatus and equipment. It has been photographed by special cameras and its effects have been measured, with the result that the average stroke has been found to consist of a core, about the size of a man's finger, which upon completion of the discharge explodes into a column of sponge-like fire about four inches in diameter. This explosion is the cause of the thunder. Pressures of up to 20,000 lb. per sq. in. are reached in the core when the discharge is confined, and it is these pressures that in a lightning stroke rip trees and crack metal pipes. The discharge also is very hot, the temperature rising to about 14,000 deg. C., which is high enough to vaporise anything on Earth if it were sustained.

These figures help us to understand the destructive character of lightning on objects that it strikes. The discharge from a thunder cloud consists of a relatively harmless leader stroke that cuts the trail to earth, followed by a heavier core stroke carrying with it the heat and destructive energy. The speed of the leader stroke is about 186 miles a second, but the heavy current discharge that follows when an object is struck moves 200 times as quickly. The Westinghouse lightning machine reproduces these components of lightning exactly, the discharge from the high voltage generator opening the path, and the microsecond switch then releasing the current from the second generator to form the core.

By wresting these secrets from lightning engineers have learned how to defend their products against its attack. Only five years ago it was almost certain that a direct lightning hit on a distribution transformer would blow it up and cause a service interruption until the transformer could be replaced, and at times large areas of a city were plunged into darkness momentarily during a thunderstorm. To-day only the most severe of lightning strokes will affect a protected transformer. These now are equipped with what are known as de-ion protector tubes, which consist of two electrodes and a fibre lining. The tube allows a lightning stroke to pass out of the power line, but the normal current carried by the line is unable to follow. One of these protected transformers has been hit 50 times by man-made lightning without any ill effects. Larger new type lightning arresters have been designed to utilise a spark gap and a block of highly resistant material, which holds down the high voltage of the lightning stroke by drawing current out of it and leading it to earth. The ordinary line voltage is not powerful enough to force current through the block, and thus the current remains in the line to continue its useful work.

Following upon these experiments with high-voltage discharges, a dozen lightning generators of Dr. Bellaschi's design have been constructed and put into operation. All are being used to reveal more secrets, a knowledge of which will help to take more risks out of living.

The New *"Graf Zeppelin"*

On 14th September the most recent German airship, LZ 130, was named *"Graf Zeppelin II"* at Friedrichshafen by Dr. Hugo Eckener, and thus became the successor of the famous airship of that name which was withdrawn from service last year. The new *"Graf Zeppelin"* is 803 ft. long and her four Daimler-Benz Diesel engines develop a total of about 2,800 h.p., giving her a cruising speed of nearly 80 m.p.h. Each engine is installed in a separate gondola, and these are suspended two on each side of, and almost underneath, the body of the airship. The vessel is designed to be filled with helium, but as the United States Government still refuse to supply this gas to the company, the 16 gas-bags have been filled with hydrogen, of which they contain a total of 7,062,000 cu. ft. After the christening the *"Graf Zeppelin II"* made a successful trial flight lasting eight hours, with Dr. Eckener and Capt. von Schiller in the control room, and 75 people on board, of whom 35 were crew and the remainder officials. Other test flights have since been carried out. A trial flight across the Atlantic will not be undertaken until a supply of helium is available for use instead of hydrogen. After this flight the *"Graf Zeppelin II"* will be available to resume the German airship service to America that is at present suspended.

"Sunderland" Flying Boats for the R.A.F.

The latest type of flying boat to be built for the R.A.F. is the Short "Sunderland," a military development of the Empire flying boats used by Imperial Airways. The pilots' cabin is much farther aft than in the civil aircraft, as a power-driven gun turret is fitted in the nose of the hull, and there is also one in the stern. The "Sunderland" has four Bristol "Pegasus" engines, and is believed to be capable of over 200 miles per hour.

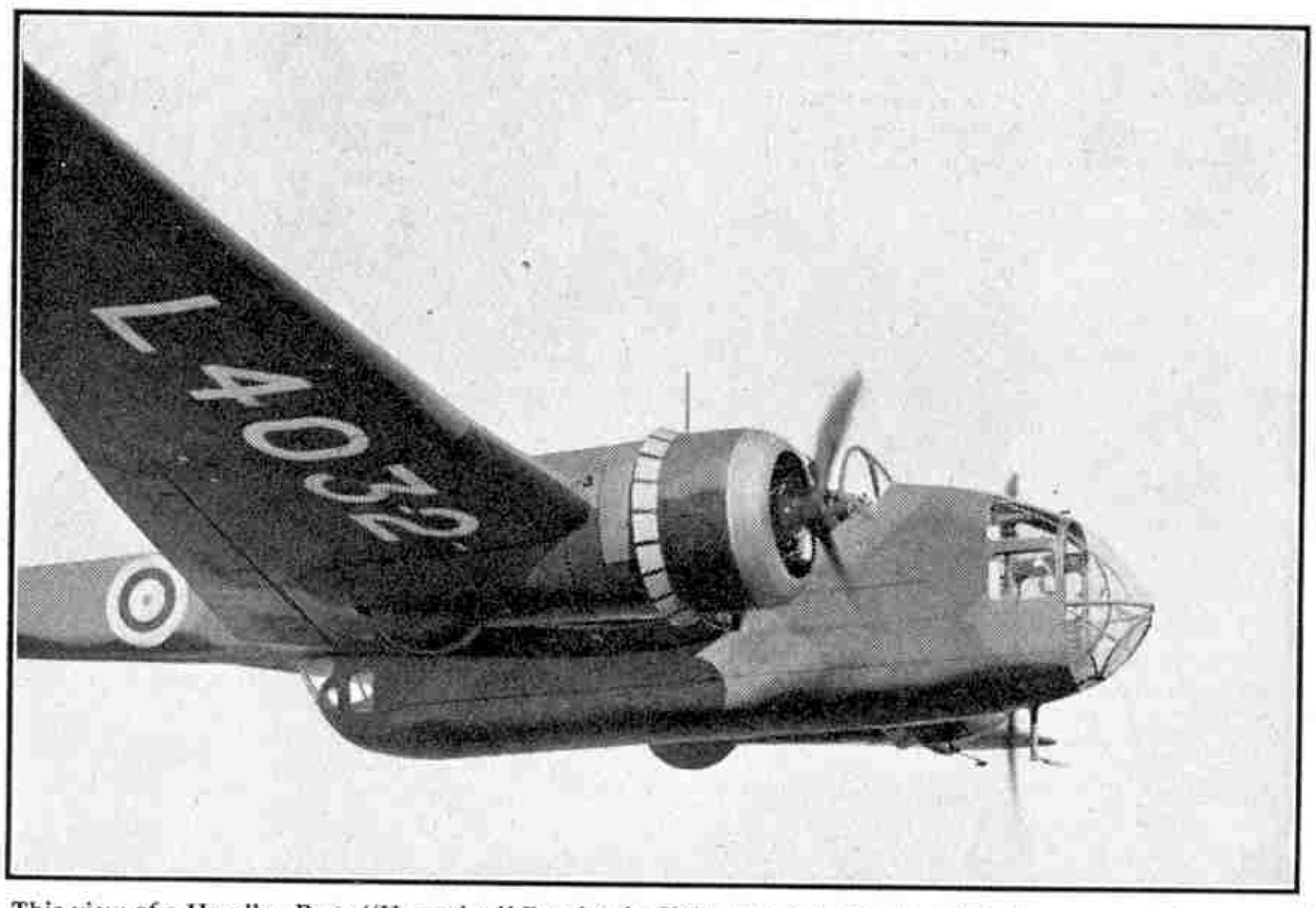
A squadron of these new flying boats is now stationed at Singapore. The aircraft were flown to that base one at a time by crews provided by No. 210 (General Reconnaissance) Squadron, of Pembroke Dock. One of them, flown by Flight Lieut. W. A. Hughes, covered the 1,250 miles from Pembroke Dock to Gibraltar in 8 hrs., averaging a speed of 156.25 m.p.h., and the 1,200 miles from there to Malta in only 6¾ hrs., at an average of 177.77 m.p.h.

More Boeing Bombers for United States Army Air Corps

In 1937 the United States Army Air Corps acquired a fleet of 13 Boeing YB-17 "Flying Fortress" heavy bombers. These large aircraft have proved so satisfactory that a further 26 have been ordered for the Corps. Delivery of these is to begin early next year, and it is expected that the entire fleet will be completed early in 1940.

The "Flying Fortress" is a streamlined all-metal middle wing monoplane 105 ft. in span, 70 ft. long, and with a gross weight of more than 20 tons. It is fitted with four 1,000 h.p. Wright "Cyclone" engines, and is stated to be one of the fastest aircraft of its type in the world. Normally it carries a crew of five to seven men. There are five gun positions, one of which is the usual gun turret in the nose of the fuselage. The arrangement of the other four is interesting, as they are in the form of streamlined "bulges" in the fuselage, one about two-thirds of the way along each side, one almost mid-way along the top of the fuselage, and the fourth just over half-way along the underside. It is claimed that the speed, range, bomb-carrying capacity, and heavy defensive armament of the "Flying Fortress" make it a very formidable Air Force weapon.

In February last six United States Army Air Corps "Flying Fortresses" made a record one-stop mass flight from Miami, Florida, to Buenos Aires, Argentina, and covered the distance of 5,260 miles in a total flying time of 27 hrs. 50 min. This was the longest mass flight ever carried out by that Corps. The stop en route was at Lima, in Peru.



This view of a Handley Page "Hampden" Bomber in flight shows the gun turret in the nose and the unusual "balcony," below the wing, in which the rear gun is installed. (See special article on page 628.) Photograph by courtesy of "The Aeroplane."

Scientists and Explorers Use Aircraft

The value of aircraft in aiding scientists when making expeditions into remote and only partially-explored territories is demonstrated by an undertaking being carried out by the American Museum of Natural History. A party of naturalists representing the Museum are spending a couple of years in various parts of New Guinea, studying birds and animals. They are using a specially-equipped flying boat to maintain communication between their camps in the interior and a supply base on the coast, and supplies for the expedition are being dropped by parachute. The boat is also being employed to take specimens to the base, where they are stored ready for despatch to America.

Mr. Lincoln Ellsworth, the American explorer, also makes use of aircraft in his expeditions. Recently he flew as a passenger in an Imperial Airways flying boat from England to Africa. From Kisumu he travelled in another aeroplane into the big-game territory, where one of the chief objects of his visit is to obtain special colour films of wild life in its natural surroundings. When this work is completed Mr. Ellsworth will join forces with Sir Hubert Wilkins, another American explorer, for a joint exploration of Enderby Lane, in the Antarctic. Their equipment will include two American single-engined monoplanes, a Northrop "Delta" and an "Aeronca," and these are now on board the Norwegian ship *"Wyatt Earp,"* which is on its way to the Antarctic. The "Delta" will be used as a base and the "Aeronca" as a means of communication with the ship.

Automatic Radio Distress Signal for Aircraft

The California Institute of Technology have devised an automatic radio distress signal for aircraft making forced landings. A battery-operated radio transmitter, insulated from fire, is suspended from coil springs in the tail of the fuselage, the part of the aeroplane least likely to be wrecked by such a landing. The heavy jolt when the aeroplane strikes the ground will start the set transmitting short-wave distress signals, and it is claimed that these will continue uninterruptedly for four days however badly the aeroplane may have been smashed. The signals should prove of great help to the pilots of aircraft trying to find a wrecked machine in mountainous or other isolated territory.

Monoplane Fitted with Twin Engines Driving a Single Airscrew

In last month's *"Air News"* we reported the successful tests in America of a new type of engine installation called "Unitwin Power," in which two in-line aero engines are coupled together side by side and drive a single airscrew through reduction gearing. It has since been announced that a light low wing monoplane designed to take this interesting engine unit is to be produced by the Vega Airplane Company, a subsidiary of the Lockheed Aircraft Corporation. It will be of metal construction with a wing span of 41 ft., and will have seating for five or six persons according to whether it is required as a private aeroplane or for operating on "feeder" line air services. The undercarriage will be of the three-wheel, or "tricycle," type now coming into fashion. The nose wheel will retract into a recess in the underside of the engine compartment and the two main wheels into the wings.

The two engines coupled together will be 280 h.p. "Menascos," mounted in the nose of the fuselage and driving a single constant-speed airscrew. No performance figures are available yet, but the company state that the monoplane will be capable of flying at over 200 m.p.h., and at cruising speed will have a range of about 1,000 miles. It is expected that the first of these aeroplanes will be ready by the middle of next January.

Good Work by Douglas DC-3 Air Liners

Statistics published recently in the United States show that at the end of last June there were 102 Douglas DC-3 air liners in service in that country, and that 86 of them had completed 1,000 hrs. of flying. There are also 56 Douglas DC-2 air liners in daily service on American air lines, all of which had completed over 2,500 hours' flying by the end of June. One of them had flown a total of 9,000 hrs., and 15 had completed 8,000 hrs. in the air.

British Air Ambulance in Australia

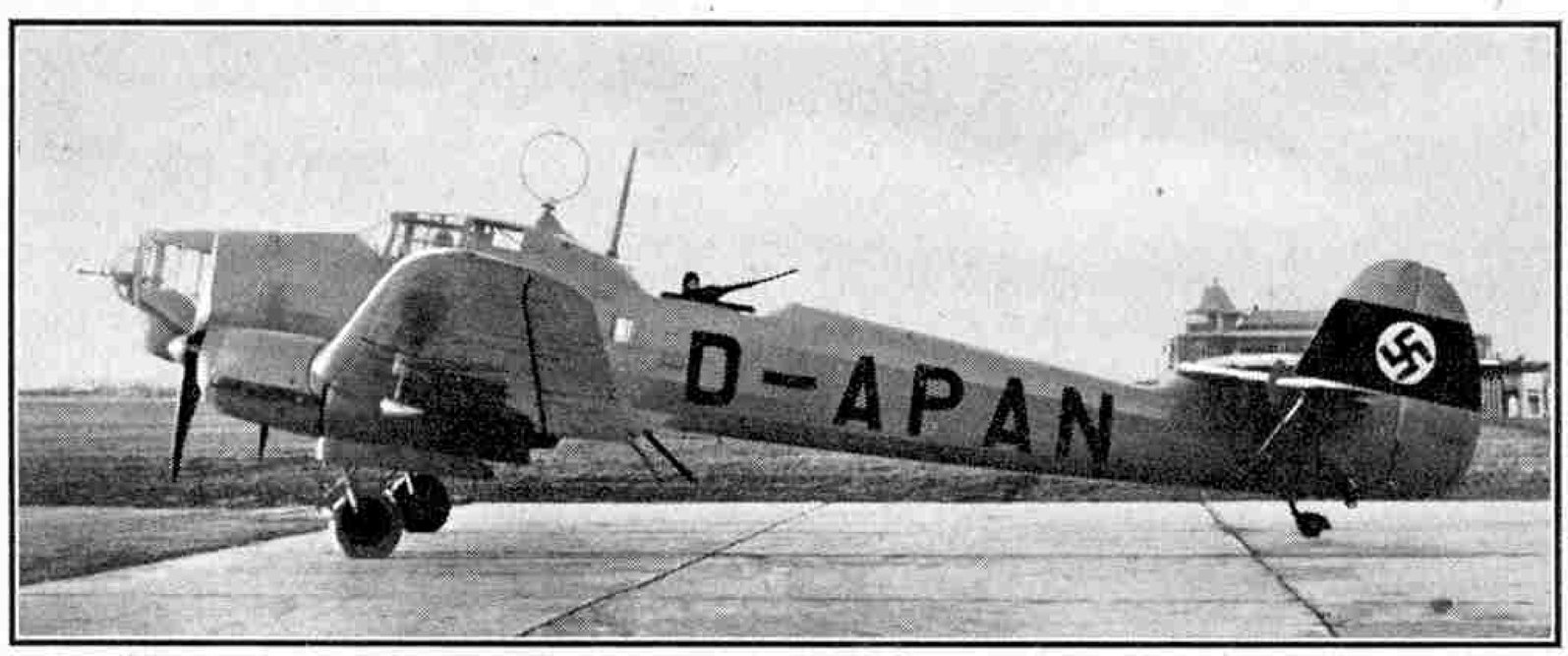
One of the best uses to which aircraft are put is the transport of sick people from remote districts to hospitals or centres where treatment can be given. In Australia splendid work is being done in this connection by Australian Aerial Medical Services, and the D.H. "Fox Moth" employed until recently by this organisation made 53 such flights in three years. It has been succeeded by a larger and more up-to-date aeroplane, a D.H. "Dragon" air ambulance, which within two weeks of being put into service made three long-distance S.O.S. flights, flying a total of 1,500 miles.

Another Fine Flight by *"Mercury"*

Another long-distance flight has been made by *"Mercury,"* the upper component of the Mayo composite aircraft, this time to South Africa. The composite aircraft took off from Dundee on 6th October last, and when it had reached a height of about 4,700 ft. and a speed of 160 m.p.h. the two components separated. *"Mercury"* set off on her 6,370-mile flight to Capetown, and the flying boat *"Maia"* returned to Dundee. The seaplane was piloted by Capt. D. C. T. Bennett.

It was hoped to make the flight to Capetown non-stop, and thus beat the record set up by the Soviet airmen last year when they flew non-stop from Moscow to San Jacinto, California, 6,305 miles. Bad weather defeated the British fliers, however, and they had to land for fuel at Alexander Bay, near the mouth of the Orange River, thus failing by about 300 miles to set up a new record. They had the satisfaction of beating the world's seaplane long-distance record of 5,219.8 miles achieved last March by a Dornier Do 18 flying boat, which flew from off Start Point, Devon, to Caravellas, 480 miles from Rio de Janeiro. The boat made the flight in 43 hrs.

A remarkable photograph in which the rays reflected from the Croydon airport floodlights by the metal blades have traced the circular path of the airscrew. The liner is a Lockheed "Electra" of British Airways Ltd., to whom we are indebted for the photograph.



The Focke-Wulf "Weihe" Trainer. This very adaptable monoplane can be used for instruction in blind flying, radio, machine gunnery, and bombing. Photograph by courtesy of Focke-Wulf Flugzeugbau A-G., Bremen.

Nautical Uniforms for Empire Flying Boat Captains

Until recently the Captains of Imperial Airways flying boats wore a uniform cut on R.A.F. lines and including a double-breasted coat with outside pockets, brass buttons, and stripes denoting rank on the cuffs. This uniform has been succeeded by one of a nautical type in which the double-breasted coat has black buttons, and the officer's rank is indicated by epaulettes, which are ornamental badges worn on the shoulder.

United States to Build a Large Airship

The Congress of the United States has voted £100,000 toward the cost of constructing a new large airship, 650 ft. long and of 3,000,000 cu. ft. capacity. This news indicates a revival of the interest in this type of aircraft that lapsed after the loss of the *"Macon"* in February 1935. The *"Macon"* was 785 ft. long and her helium-filled gas-bags had a total capacity of 6,500,000 cu. ft. She was wrecked during a storm off the Californian coast, but fortunately 81 of her crew of 83 were rescued.

American Lockheed "Super Electras" for British Airways

The four Lockheed 14 "Super Electras" for British Airways have been delivered. They were shipped to Southampton, where they were re-assembled and then flown to Heston airport, now the headquarters of the company. An extended trial flight was carried out with one of the first two to be ready for service. It flew non-stop from London to Stockholm in 4 hrs. 36 min., at an average speed of 212 m.p.h., and the return trip was made in 6 hrs. 10 min., giving the average speed of 146 m.p.h.

The new liners are to be used for survey flights between London and Lisbon, and later a regular air service will be established over the route. This service will form the first section of the company's proposed South Atlantic air service by way of Bathurst, on the west coast of Africa.

British Airways have now ordered two more Lockheed 14s. This modern type of air liner is also becoming popular in other countries, and a fleet of 11 has been delivered to the Royal Dutch Air Lines, of Amsterdam, and its associate company Royal Netherlands Indian Air Lines, of Batavia. Five of the machines were shipped to Java for the latter company.

Oban to Staffa and Iona

A Trip in a Unique Turbine Steamer

By O. S. Nock, B.Sc., A.M.I.Mech.E.

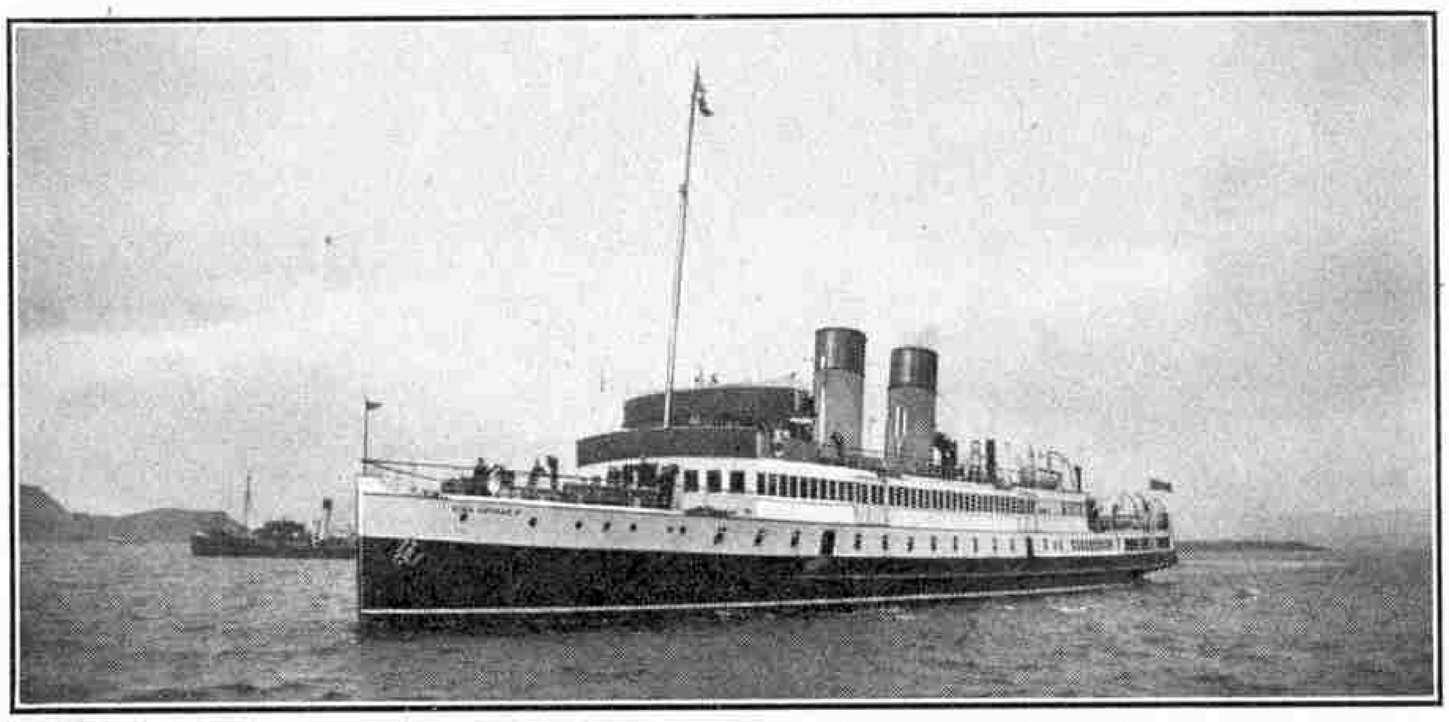
STAFFA and Iona—two names as closely linked in travellers' minds as Dover and Calais; yet what an odd association they make! Staffa is a tiny uninhabited islet barely a square mile in area, and boasting some of the most amazing cliff scenery in the British Isles. Its wonders remained unknown to the world at large until it was "discovered" in 1772 by an English traveller, whereas the fame of Iona dates almost from the dawn of our history. Yet scenically Iona might easily pass unnoticed. It was not until Macbrayne's vessels began to ply the sounds and fiords of the Western Isles that the caves and cliffs of Staffa, and the ancient cathedral of Iona, became linked within the compass of a day's tour from Oban.

In recent years a considerable variety of ships have worked on this service. There was the ill-fated *"Grenadier,"* a sturdy paddle boat very similar in outward appearance to the famous *"Columba."* The *"Grenadier"* was destroyed by fire, and pending the completion of a new ship the veteran *"Fusilier"* undertook the run. Then came the Diesel-electric *"Lochfyne,"* which has figured in several of my Scottish sea trips. Finally, when the Williamson-Buchanan fleet became merged into that of Macbrayne, the *"Lochfyne"* was transferred to the Fort William run and the Mull and Iona service taken up by the twin-screw turbine steamer *"King George V."* It was in the latter that I made this most interesting voyage.

The *"King George V"* was built in 1926, when engineers all over the world, on both land and sea, were going in for higher steam pressures in an attempt to secure greater efficiency. *"King George V"* was fitted experimentally with boilers steaming at 550 lb. per sq. in., and was the very first high-pressure turbine steamer in the world. I am indebted to her builders, William Denny and Brothers Ltd., of Dumbarton, for particulars of the interesting layout of machinery as first installed. There were two Yarrow water-tube boilers, fitted with superheaters, and also with air heaters in the uptakes to heat the air on the way to the grates. The degree of superheat attained, 750 deg. F., was however not unusually high; such a figure is often attained in modern types of locomotives in combination with boiler pressures of 250 lb. per sq. in. or so.

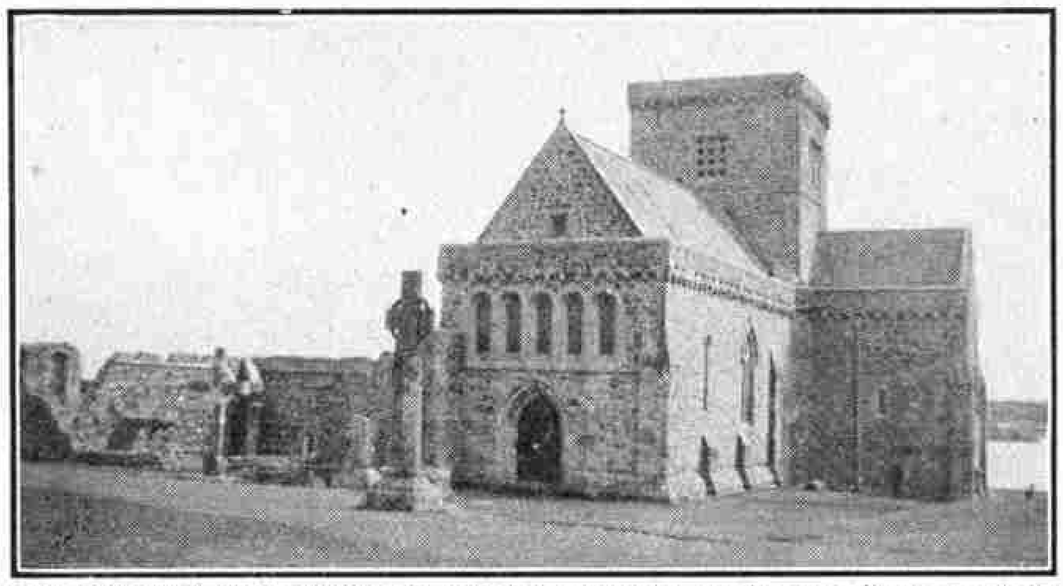
As I shall explain in a moment, the steam-raising plant has undergone several changes, but the original layout of turbines remains. It is in some respects rather peculiar. On both the starboard and the port side there is a set of three turbines, geared by single reduction on to the propeller shaft. Then, on the port side only, there is in addition the special high-pressure turbine. In the original arrangement there was thus a total of one high-pressure, four intermediate-pressure, and two low-pressure turbines. In order to equalise the power on the two propeller shafts the intermediate and low-pressure turbines were designed to use a larger proportion of the steam passing from the high-pressure turbine. Purely from the point of view of appearance this original layout looked somewhat lop-sided, but now, when the high-pressure boilers have been removed and five out of the seven turbines take live steam at 200 lb. per sq. in., the arrangement seems odd in the extreme.

The ship is now fitted with one double-ended Scotch marine boiler steaming at 200 lb. per sq. in., and no little ingenuity was displayed in adapting the seven original turbines to work satisfactorily with the altered steam raising plant. It was done by a comparatively small modification to the turbine blades. I should mention that the turbines were built by the Parsons Marine Steam Turbine Co. Ltd., of Wallsend. The total shaft horse-power is 3,500, and this is developed at the unusually high propeller speed of 570 r.p.m. The one-time high-pressure turbine, and the first two turbines on each shaft, run at 6,000 r.p.m.



The twin-screw turbine steamer "King George V" in Oban Bay. This vessel was built in 1926, and was the first high-pressure turbine steamer in the world.

But although the vessel remains somewhat of a curiosity as far as her machinery is concerned, she has rendered excellent service, first on the Clyde, and then under the Macbrayne flag. On my trip she was commanded by Captain McKechnie, and the machinery was in charge of Chief Engineer MacGregor. It was a rather colourless morning, and isolated grey clouds scudding along under a generally overcast sky suggested squalls on the way. We left Oban punctually at 9.5 a.m., and were soon slipping quietly across the Firth of Lorne, to the faint musical purr of the turbines. The lighthouse at the southernmost point of Lismore Island gleamed whiter than ever against the grey-green of the sea; we passed very close and then entered the Sound of Mull. The Gaelic word of which "Mull" is a phonetic rendering means "a mass of hill," and from this viewpoint the description suits perfectly; as far as the eye could see grey-brown ranges rose one behind each other like the waves of the sea. By now an ancient fortress, perched commandingly on a cape jutting out into the sound, was a striking object on our port beam; this was Duart Castle, the ancestral home of the Chief of the Clan Maclean. Not long ago it was little more than a picturesque ruin, but through the care and enterprise of the late Chieftain, who lived to be over 100 years of age, the castle has been completely restored.



Iona Cathedral. This photograph and the upper one on the opposite page are by H. Black, Glasgow.

Steaming up the sound, several other West Highland steamship services were seen in operation. The tiny little steamer *"Princess Louise,"* little bigger than a naval pinnace, came speeding along bound for Oban, after having called at small piers serving outlying districts. She had hardly gone when a conspicuous patch of scarlet against the tawny hills of the mainland showed the whereabouts of another unit of the fleet. This turned out to be the cruising vessel *"Lochgarry,"* berthed alongside the pier at Lochaline. In the course of a seven days' cruise from Glasgow she works her way right up the west coast to Lochinver, in Sutherlandshire. Lochaline as seen from the mail steamer is a charming place. The steamboat pier and the village lie on the Sound of Mull at the entrance to the loch proper; this entrance is extremely narrow, but beyond the loch

broadens out into quite a spacious sheet of water, ringed with trees, and lying snugly among the mountains.

Meanwhile we were forging away into rough weather. Even in this sheltered reach there was a great wind going, and low clouds were just glancing the summits of Mull's highest mountains. But while the hills of the mainland appeared as little but grey shapes, lessening in depth as the distance increased, on the port side we were skirting one of those surprising belts of woodland and luxuriant vegetation that one finds in sheltered corners of the West Highlands; this was Calve Island, lying so close to the shore as to appear part of Mull.

And now the *"King George V"* was turning and entering the bay of Tobermory. This little port, the metropolis of Mull, is typical of many settlements in the Western Isles. A craggy knoll guards the entrance, and a line of low cliffs continue round the semi-circle of old houses, shops, dwellings, and the inevitable inns, one of these bearing the odd name of the district in which Tobermory is situated—Mishnish. The new pier buildings, square and severe in white-washed concrete, bring a striking touch of modernity to what otherwise would be a very old-world scene. We were off again at about 10.40 a.m., with rain in the wind, and each gust making louder music in the rigging. Across the widening Sound of Mull, the mainland of Inverness-shire appeared as a tumbled wilderness of barren rocks. It seemed like the very end of civilisation, and the broadening expanse of grey-green sea, covered with white breakers, only heightened the general effect.

Joining the ferryboat at Iona. In the background is Fionphort Mull.

Against the wild array of hills to the north, now seen tapering down to the Point of Ardnamurchan, a little ship was passing. Glasses revealed once again the scarlet funnel, and I recognised the squat distinctive lines of the *"Lochearn."* She is a sister ship to the *"Lochmor,"* in which I made the trip to the Outer Hebrides described in the *"M.M."* for April and May 1937. The *"Lochearn"* was en route from Lochboisdale to Oban, and had called at Castlebay in Barra, and the dead flat islands of Tiree and Coll. As I watched her, a mere toy ship, moving slowly amid stormy seas towards Kilchoan, she seemed to embody all that is adventurous and romantic in West Highland seafaring.

By this time we were rounding the northwest corner of Mull. Although a bare six miles away, Coll looked no more than a faint pencil-stroke on the grey western horizon. The *"King George V"* plunged and reared on her way. A wild reef, the Treshnish Isles, lay on our port beam, and ahead of us was an isolated black rock, its modest summit nearly lost in driving sea mist. I looked at my map, and was incredulous—Staffa! Could this mere shapeless lump of an islet be the renowned object of our journey? It was half an hour or so before we drew abeam, and right up to the last minute she remained an enigma. Then, as the engines stopped, and the ship turned a point or two to starboard, the stupendous south face of the island was revealed.

Tobermory seen from the "King George V." This little port is the metropolis of the island of Mull.

Unfortunately it was far too rough to land, but in the few minutes the *"King George V"* lay off we were able to drink in the splendour of caves like some vast irregular Gothic archways, and to see the strange geometrical perfection of the basalt pillars thrown into bold relief where the rock was covered with primrose-yellow lichen. And to-day the lash of the rain, the roar of the sea boiling in and out of the caves, and the ceaseless cry of the gulls, all added their quota to the scene of unexampled grandeur. But the telegraph was ringing, and we were soon on a southward course again, with Iona some six miles ahead.

The Sound of Iona was indeed a haven on this rough day. While the mails and daily newspapers were put ashore the *"King George V"* lay at anchor in the clearest of green water, and passengers visited the 1,400-year-old shrine of St. Columba. The cathedral, which has been beautifully restored, is cruciform in plan, simply and ruggedly built, yet sheltered from the worst weather by a rough hillock lying just to the west. It was built in 1203, some 600 years after Columba's day, by the Lord of the Isles, and located almost exactly on the site of the ancient monastery. Across the Sound one could see the road by which pilgrims came to Iona before the days of Macbrayne, a road that, after traversing miles of austere glen, moorland and coast, ends on the charming silver-white sands of the Ross of Mull.

But the afternoon was passing, and there are timetables even in so out-of-the-world a place as Iona. So, down the hill again. But there was time for a look at the wayside crosses that embody some exquisite examples of Celtic sculptural art; they are by far the oldest Christian monuments on the island, and are said to date from the ninth or tenth century. Back at the landing place Iona's mail was being shipped in the motor boat in readiness for going aboard the *"King George V,"* and at 3.30 p.m. we were off again, next call Oban.

We emerged from the Sound into wild seas, and skirting a coast as devoid of vegetation as the Outer Hebrides. Here too, although we were no longer catching the Atlantic rollers, one could not help admiring the fine seamanship that took us comfortably through a veritable archipelago, where currents run strong and the sea was extremely choppy. I joined the first officer for a short time on the bridge. Like all vessels built for service on the Clyde the *"King George V"* has a bridge quite devoid of shelter. While admiring the hardihood of the men who navigate their ships from such an exposed place it seems a rather curious tradition on waterways where inclement weather is the rule rather than the exception. It probably dates from the time of the intense competition when rivals would race one another to the piers; an absolutely unobstructed look out all round was then necessary in order to avoid all possibility of collision.

We were now making a course due east. The rain coming up from the west however proved a well-nigh impenetrable curtain and hid from our view the isles lying just to the south; for a few moments there was a faint glimpse of Colonsay, but of the high mountains of Jura there was not a sign, and ahead of us there might have been a hundred miles of ocean. With the rain coming on harder than ever, and the far away clanging of the steward's bell ringing passengers to tea I must confess I did not stay on the exposed bridge for long!

We steamed on in a deluge, and for an hour or more the high cliffs of the south coast of Mull passed in fascinating procession before the saloon windows. At the Carsaig Arches fragments of loose cloud were drifting vertically up the crags; the green flanks of the Loch Buie mountains loomed out of the mist, and then vanished again. The sea grew calmer, land was glimpsed to starboard, and we were soon passing up the Sound of Kerrera. The green dripping woods and placid water, and then the sight of yachts and other craft lying motionless in Oban bay, were indeed a contrast to what we had seen that day west of Mull.

With drifters getting up steam in the harbour, and the old paddle steamer *"Mountaineer"* bustling off on some short-distance trip, we manœuvred up to the North Pier, and at a little after six o'clock we were berthed.

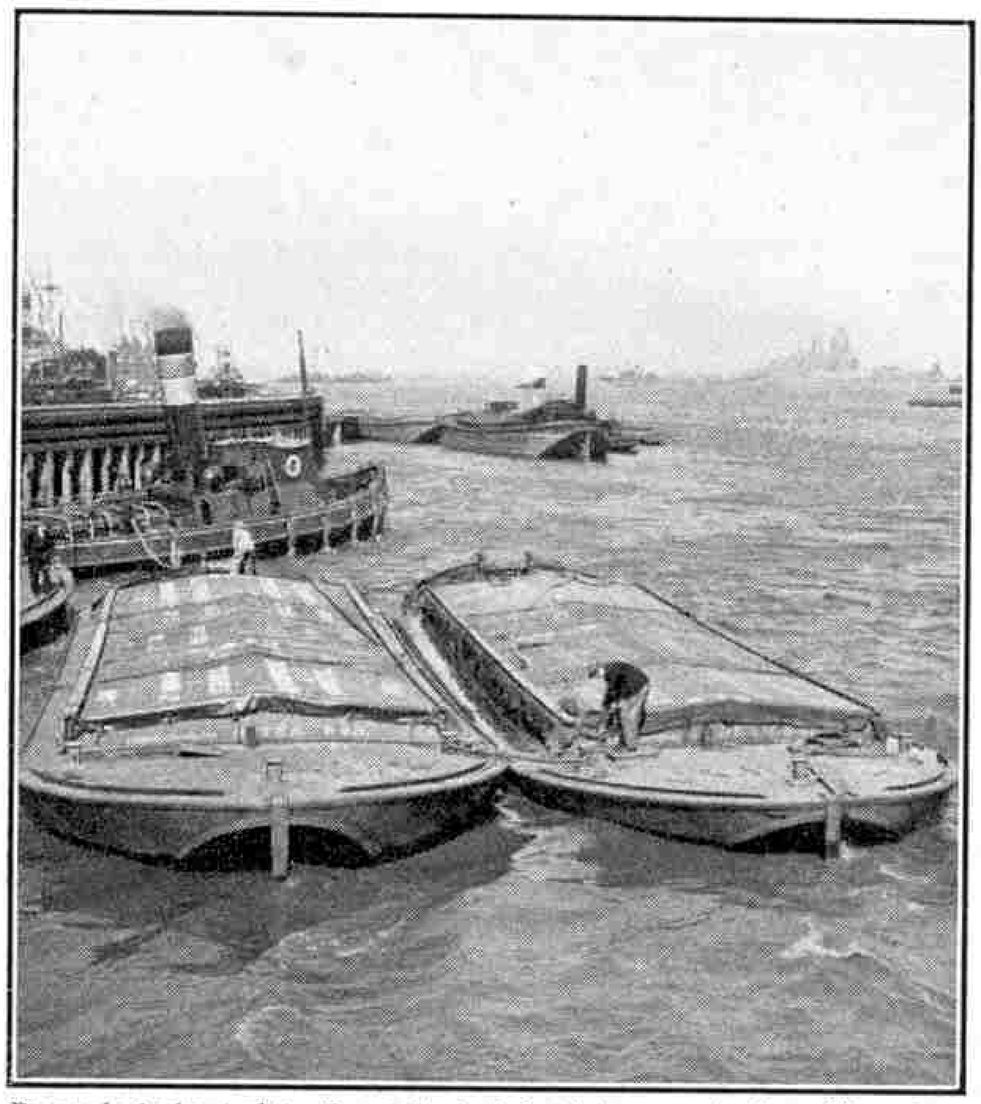
Lorries of the Thames

The Craft of the London Lightermen

By W. Philip Conolly

THE Thames lighterman is often known as a "Charlie," or, if most of his work is done in the docks, as a "poker," from his method of working barges about the basins by poking and pushing with an oar or a hitcher. He is a familiar enough figure on the river, but Londoners know very little of his work or the trade he is engaged in. Lighterage indeed is a form of transport that on the whole attracts very little attention, but the men in it form the largest group of workers on the river and the trade is responsible for much of the carriage of goods up and down the river and between the various docks.

There are 9,000 or more lighters on the Thames, and the use of such a large number is explained by the fact that the Port of London, despite its great chain of docks, quay and warehouse accommodation, is pre-eminently an overside port, where the majority of ship's cargoes are loaded to or from lighters, both in the docks and the river, rather than to or from quay or wharf. Freights are then towed, or otherwise worked to their destination, or to intermediate storage in one of the many warehouses within the port. In addition London has a large transhipment trade, and goods to and from all parts of the world pass through the port in the course of their journey.



Barges locked out of the Royal Docks being taken over by tugs. These tugs fetch and carry for the big ships and are in effect the lorries of the river. Photograph by Stanley.

It must be admitted that dumb barges or lighters, always termed craft by river workers, are extremely prosaic in appearance, with little more shape than has an oblong box. There is rather more in their construction than a casual glance reveals, however. A barge is built either of timber or steel, mostly the latter nowadays; and must be strongly constructed, both to stand up to the rough handling of the tugs and to sustain the stresses, or "wringing," set up when resting on an uneven shore. The majority of lighters are stemless, having instead an overhanging swimhead like that of a pleasure punt. The stern, although of similar construction, has an addition in the shape of a vertical centre board or plate called a "budget," which assists in keeping the vessel on a straight course while in tow. The sides slope slightly inward down to the flat bottom, and as most of the deck is taken up by the hatch, only a narrow gunwale runs along each side of the hatch coamings. A cabin aft provides accommodation for the lighterman, and a stove is also fitted, except in craft carrying dangerous or inflammable freights such as petrol.

At the head of the barge are placed either single or double bitts, which are stout posts taking the tow-rope. A windlass is placed between the double bitts for lifting the anchor that is often carried. A headfast, or length of rope fastened to a short chain, is situated at the extreme head of the barge and is used as a mooring rope. Oars or sweeps, a cylindrical lifebuoy, and a pump often referred to as the "spear and brake," are additional equipment carried.

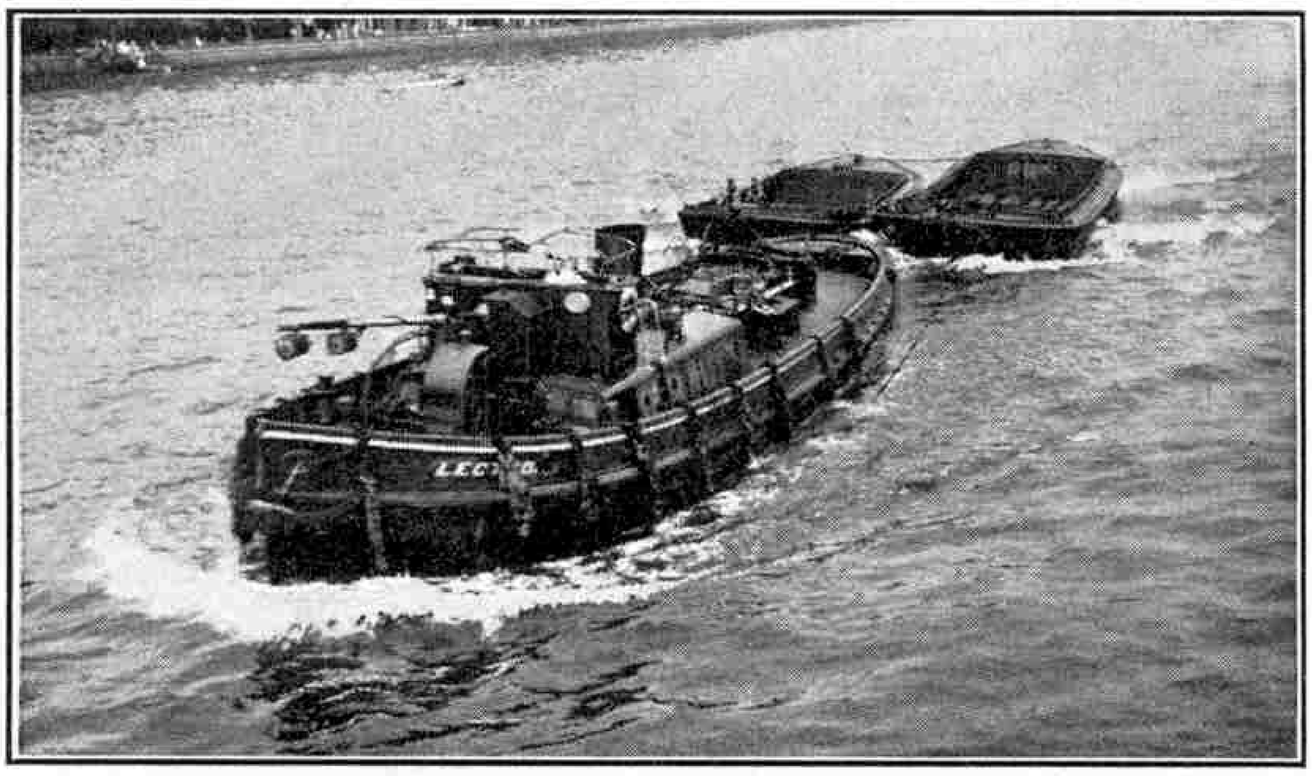
The lighter in general use has a registered tonnage of from 70 to 100, but there are very small types or "punts" of 20 or 30 tons and, at the other extreme, lighters of 500 tons that are in use in the lower parts of the river. Various trades have their own special types of craft, such as the 75,000-gallon tank barges of the petrol and oil companies, and the refrigerated lighters used for the transport of imported meat.

The predecessors of the modern lighterman were exceedingly numerous on the Thames during the 16th and 17th centuries and in the year 1600 the names of 40,000 Watermen were on the Rolls of the Watermen's Company, these all finding employment on the river in the carriage of both passengers and goods. They were a somewhat obstructive body of workers, objecting to many improvements of the age, not only on the river itself, but also ashore. Upon the introduction of hackney coaches in the City streets they complained that their passenger traffic, on what was then the great thoroughfare through London, would practically cease. Later the early steam passenger boats were to provide a further cause of grievance.

At the present time there are between 6,000 and 7,000 licensed watermen, lightermen and bargemen, including apprentices, at work on the river. Of these 500 are purely watermen, or "scullers;" most of their work is dependent on ships moored in the river and they wait on crews and others, ferrying them between ship and shore. They are also responsible for the actual mooring operations when a ship ties up at her buoy.

There are 5,000 lightermen, most of whom hold both watermen's and lightermen's licences, which are earned during an apprenticeship of between five and seven years, according to the age on taking out indentures. At the end of the first two years apprentices able to pass an intermediate examination, are granted a Two Years' Licence, which allows them to navigate craft under a Freeman. At the close of the full period the passing of a further examination secures for the apprentice the Freemanship of the Watermen's Company, and he in his turn can engage apprentices.

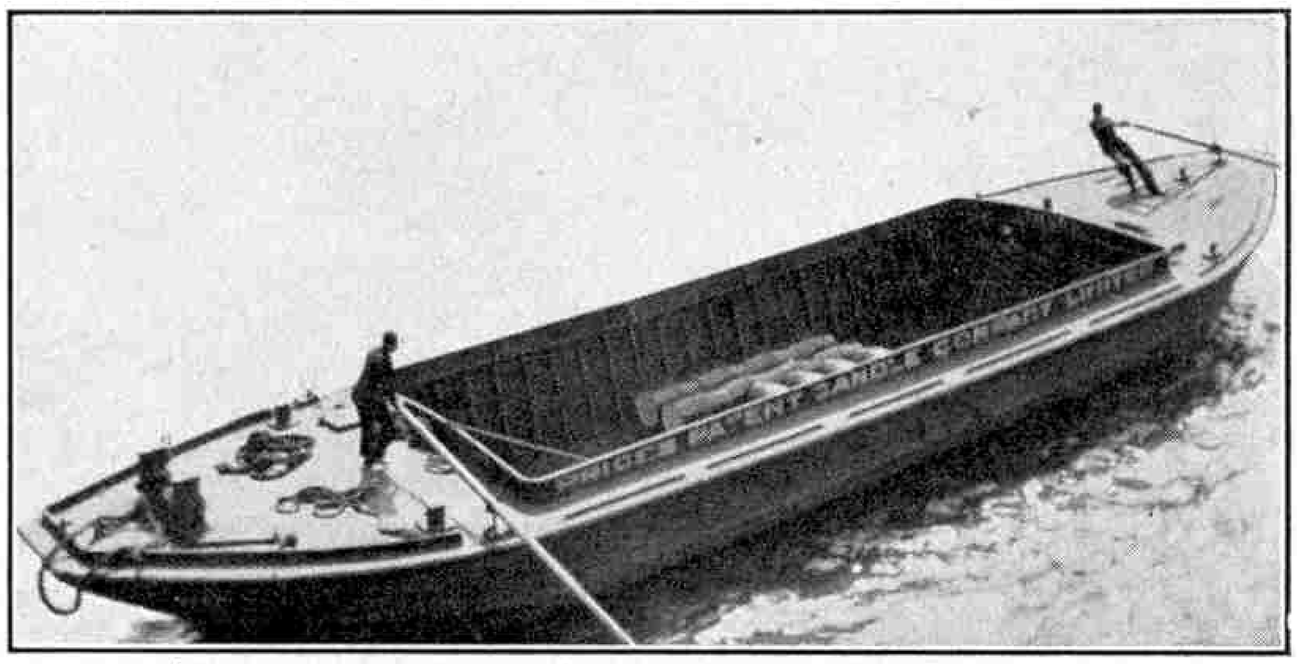
Every year five or six lightermen who have completed their term of apprenticeship during the preceding 12 months enter for Doggett's Coat and Badge Race, sculling between London Bridge and Chelsea for the honour of winning the orange coat and silver arm badge presented annually from a fund left for the purpose by Mr. Thomas Doggett. Mr. Doggett, who was an actor, chose this method of celebrating the accession of George I of Hanover to the English Throne in 1714. The race, which is rowed in early August, has taken place every year since, with a few exceptions, and until about 25 or 30 years ago ordinary watermen's wherries were used. Today the men row in regulation racing skiffs, but they still row their race among all the other river traffic, contending with the wash of tugs, and negotiating barges and any other craft that may be met with on the course.



The Diesel-electric tug "Lectro" with barges in tow in Chelsea Reach.

A particular type of lighterman is a boatswain, who takes over craft from the tugs either at the wharf or at adjacent barge roads, where they remain until needed. In many cases the boatswain drifts them to the wharf when the tide serves. He also arranges their mooring and generally handles craft, preparing them for unloading, and to be taken away by the tugs when empty. A roadsman has somewhat different duties when craft are at barge roads or tiers, then keeping watch on mooring ropes and pumping out the bilges of craft when necessary.

Barge roads or tiers have such names as Bugsby's Hole, Church Hole and Hanover, and many of them accommodate 100 or more craft. They are the storage sidings of the river and in part provide the necessary facilities for craft that cannot be got on the shore, or "hard," during neap tides through lack of water. The craft at these roads must be well secured, and the "collar" barge on the buoy, which takes the most strain, is often equipped with heavy chains to prevent its breaking adrift.



Lightermen driving a barge with the aid of oars or sweeps 30 ft. in length.

Sometimes the shore is covered by deep mud that will hold a barge fast, causing it to fill when the tide rises. Again, a lighter will at times slide down a sloping shore on the mud, breaking its mooring ropes in doing so. A "luter" has the job of keeping the shore clean, pushing the mud away with a long pole that has a board similar to a squeegee at its end. Barge beds of chalk and campsheds with timber edges are sometimes constructed to allow the barge to rest flat, and where the shore is some distance below the quay a half-tide dock keeps the barge at a convenient working height during times of low water.

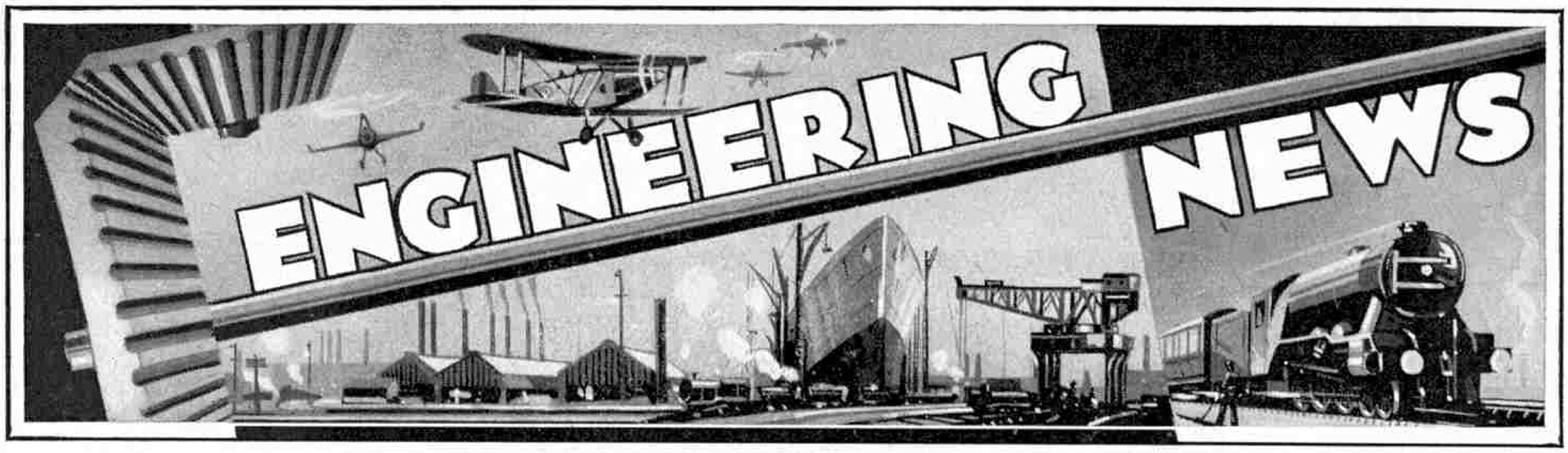
Six barges in three ranks of two each make up a tug's maximum tow, but only four petrol-laden tank barges are allowed. Some tugs work only daily tides, while others are 24-hour boats, being double manned and working all tides except Sundays. Quite a fair amount of work is undertaken without the services of a tug, however, and the lighterman then navigates his barge up or downstream with the tide by the aid of his 30-ft. oars or sweeps. Not a little skill is required in avoiding other vessels and in working through the arches of bridges. He seldom gets into serious trouble, but is often a cause of loss of temper to the masters of other vessels.

"Charlie" makes every possible use of tidal currents, and day or night he can place his craft to within inches of where he wants it, but if he does occasionally find himself athwart the piers of a bridge, well—a struggle will get him through. Incidentally, he becomes a target for missiles of all kinds hurled by small boys leaning over the parapets of bridges, and one lighterman I know still broods darkly over the thrower of a huge vegetable marrow that only just missed hitting him on the head.

The lighterage trade has a language of its own. A man on early morning duty says that he is on "early shoot," and late duty he refers to as "tidgin." When he navigates a barge "up along" or "down along" he is "driving," and he sometimes classes himself and his associates as "rowers and towers;" the latter group are not the most efficient and are not entrusted with a driving job. A barge immediately at the wharf side is "in the parlour," while all craft lying outside this one are in first, second or third "bottom" as the case may be.

The lighterman's job can at times provide its own hazards and needless to say a steady head is a very necessary attribute when trouble threatens. More than one man has had to take a sudden dive overboard when he could not get his craft out of a ship's way, one a short time ago taking such a course when a collier rammed and sank his barge.

Recently two lightermen had some anxious moments when the contents of their vessel caught fire while it was in tow. On another occasion a lighterman stepping from one of the barges on to the tug's deck missed his footing and fell between the tug's stern and the swims of his own craft. Fortunately the skipper with great presence of mind did not ring his engineer for "*Stop*," when the man would have remained under the barges. Instead he kept going, with the result that the lighterman was washed astern from under the six craft, whereupon the tug rounded up and picked him up safely.



Making a River Navigable

Until 1930 the River Nene, a Northamptonshire and Fenland river, was in a bad state, the channel being narrow and silted up in many places, causing frequent floods. In that year the River Nene Catchment Board took over control, and commenced its work by making a complete survey of the river. An improvement scheme was drawn up, but the Board could do little with its own limited resources. In 1935 a Government grant was obtained, however, and work was started in earnest.

Improvements between Peterborough and Northampton necessitated the rebuilding of many locks, and the widening and straightening of the channel. This is being carried out by the Board itself, and will make the river between the towns named navigable for all craft of the standard canal type.

The scheme for improvements below Peterborough involved more specialised work and the contracts were awarded to private concerns. It involved the dredging and widening of most of the 30 miles of river below Peterborough; the piling of the river banks for a distance of two miles above Wisbech Bridge; the building of locks and sluices at Dog-in-a-Doublet, seven miles downstream from Peterborough, making this the tidal limit of the river; and the rebuilding of two bridges, which were so low that boats could not pass at high tide.

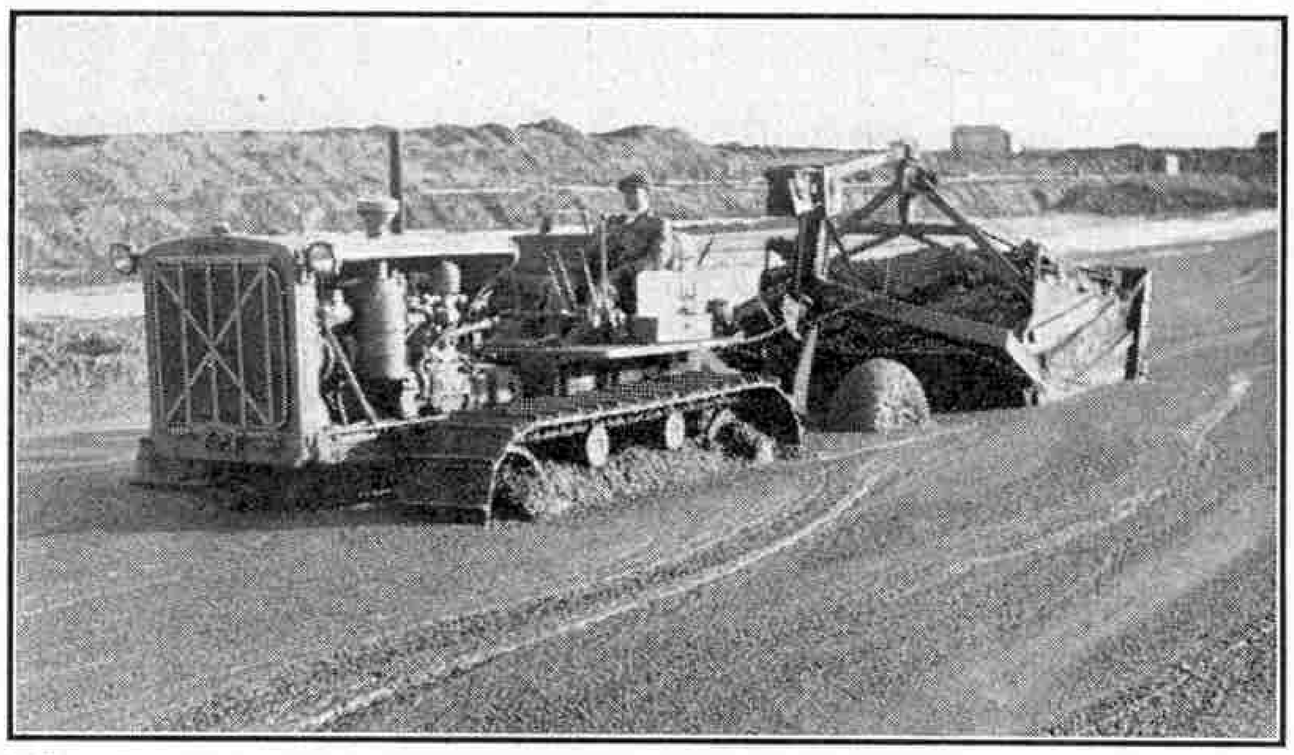
The dredging scheme was completed recently. More than three years were spent in the work, and in all 1½ million cu. yds. of material were removed from a stretch of river 25 miles in length. The contractors used bucket dredgers, driven by steam and Diesel engines, and Diesel draglines. An endless chain of buckets removed the mud from the river and discharged it into hopper barges, which were towed by powerful tugs to suction dredgers, where the spoil was discharged and deposited on land.

The suction dredgers, one of which is shown in the lower illustration on this page, were equipped with powerful pumps driven by steam and Diesel engines and with an auxiliary pump. The latter was used to force a jet of water into the barge, the diluted spoil then being removed by the main suction pump and forced along pipelines to the "depot." This is a piece of land surrounded by a bank 10 ft. high on which the mud was allowed to settle, the water running off into the river. When full it was left to dry, and in a few years may be put under cultivation.

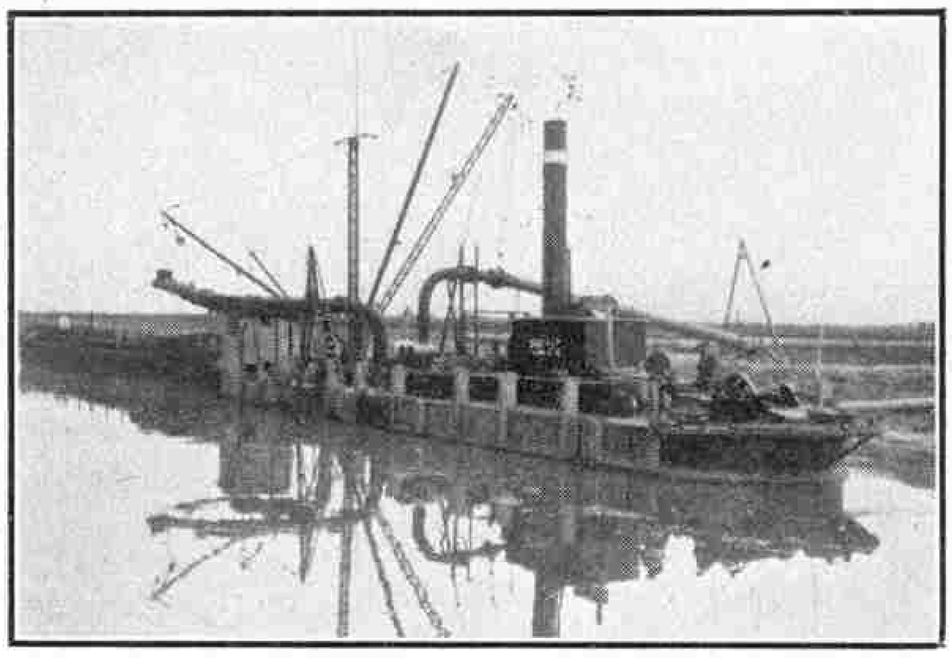
Shortly after the dredging scheme was completed the first coastal vessel successfully ascended the river to Peterborough. She was a 250-ton ship, and loaded creosote at Peterborough. The lock and sluices at Dog-in-a-Doublet were officially opened in July 1937, and one of the bridges has been rebuilt.

It is hoped that when the scheme is completed a busy trade will be developed by means of the River Nene.

H. VAN OOSTEROM (Wisbech).



A 95 h.p. Caterpillar Tractor sunk almost to its axles in soft gravel hauling a Le Tourneau cable-operated scraper excavator during the construction of a large reservoir in England. Photograph by courtesy of Jack Olding and Co. Ltd., London.



One of the powerful suction dredgers used in the work of making the River Nene navigable, which is described on this page. Photograph by H. van Oosterom, Wisbech.

Safeguarding a Great Dam

The great Grand Coulee Dam that is being constructed across the Columbia River Valley in America, is being made crackproof by actually providing it with what are known as "twist gaps." When the dam is completed, the enormous quantity of water held up behind it may exert sufficient pressure to cause the structure to "give" and possibly put a crack right through the middle. To control this tremendous force and to prevent it from doing serious damage, gaps 6 ft. wide and running the width and length of the dam are being left in the concrete. These will be filled temporarily with sand, which is to be removed and replaced by concrete as soon as it is definitely established that the "give" has been taken up.

The Grand Coulee Dam is said to be the first built on this principle.

France to Build 280-Mile Pipeline for Oil

A great oil pipeline 280 miles in length is to be built in France. It will run from Donges, a small port near the naval base of St. Nazaire, to oil reservoirs at Montargis, 280 miles away in the interior of the country. The pipe will be completely underground, at a depth of about 3 ft., and will have a diameter of nearly 12 in. It will run through the Loire Valley, one of the areas of France most easily defended from attacks by enemy aircraft, and large secret underground reservoirs will be constructed at various points. The reservoirs will have a capacity of about seven million tons, which is the normal peace-time annual oil consumption of France.

An Under-water Power Station

A new hydraulic power station, in which the generating machinery is under water, was placed in service recently in Germany. The station is the second of this type in Germany, and is located in the River Iller, near Augsburg, Bavaria. The plant consists of four 10,000-h.p. turbines, built into the pipes through which the water flows. By placing the turbines under water in this manner considerable saving in construction time and in material is effected owing to the elimination of the usual machine house, barrage and by-pass canal for shipping, necessary on navigable rivers.

A Mobile Shovel Excavator

The upper illustration on this page shows an adaptable mobile excavator specially designed to be moved from point to point on public highways at a relatively high speed. It is known as the Allen Super Duty Shovel, and is a product of John Allen and Sons (Oxford) Ltd., Cowley, Oxford.

The machine comprises a special strongly constructed motor chassis fitted with a turntable, on which are mounted the digging mechanism and shovel arm. Power for travelling, digging, and rotating the turntable is supplied by either an oil or a petrol engine, which is mounted under the bonnet of the chassis in the usual manner. The bucket has a capacity of ½ cu. yd. If desired the shovel arm can be replaced by a special lattice boom and equipment for dragline operations, and the machine also can be converted for use as a grab crane or as a skimmer shovel.

The Allen mobile mechanical excavator described on this page loading material into a lorry for removal. Photograph by courtesy of John Allen and Sons (Oxford) Ltd., Cowley, Oxford.

Plan to Bridge the Ribble Estuary

Various plans for bridging the estuary of the River Ribble have been considered in the past, but none of them has so far been adopted. Recently a new scheme has been put forward by Alderman C. W. Urwin, Lytham St. Annes. His plans provide for a roadway and dam across the estuary from Crossens, near Southport, to Lytham Pier, which would shorten the present route along the Lancashire coast by 10 miles. The proposed dam would be 42 ft. high and 40 ft. wide, with reinforced concrete conduits, sluice gates, and a lock system that would allow shipping to pass up the Ribble to Preston. The estimated cost of the scheme is about £3,000,000.

Air Raid Protection for Oil Depot

An interesting scheme has been evolved by C. C. Wakefield and Co. Ltd. to protect 30 oil tanks at their depot at Hayes from air attack. Each of the tanks contains 12,000 gallons of oil, and they are all grouped in the same area. A circular concrete saucer 4 ft. deep is to be constructed around the tanks, and it will be supported by earthworks. If a tank is wrecked by a bomb in the event of an air raid the oil will drain into the saucer, from which it can be pumped later.

A Giant Astronomical Clock

An astronomical clock that weighs approximately two tons and has 93 dials, has been sent from Antwerp to the United States of America in readiness for exhibition at the great New York World's Fair, which is to be opened next year. It was made by M. Louis Zimmer, Lierre, Belgium, and is one of the finest of its type yet built.

Oil in Scotland

Drilling at the experimental test well of the Anglo-American Oil Co. Ltd., at Dalkeith, Midlothian, has now reached a depth of 3,857 ft. where tests showed the presence of natural gas. Small quantities of oil have been found at depths between 1,733 and 1,760 ft., and tests of this gave a yield of 12 per cent. petrol and 12 per cent. kerosene. At present the well is capable of producing from eight to 10 barrels of crude oil daily, and in an effort to increase the flow 500 lb. of explosive have been fired at the level of the oil-bearing sands. Further tests will be made as soon as the well has been cleaned out.

A Highway with Coloured Traffic Lanes

A section of a highway half a mile in length at Ewell, Surrey, is being widened from 20 ft. to 44 ft. The new road is to have two carriageways and a central dividing strip, and each carriageway will be separated into two traffic lanes. The surfaces of the near-side traffic lanes will be coloured red and those of the off-side or overtaking lanes, will be white. The central dividing strip, which also will be red, will be treated as a danger zone, to be left clear except in cases of emergency. The colours applied to the concrete will be indelible, and if the experiment is successful the idea will no doubt be adopted in the construction of other new roads.

An Electric Arc Saw

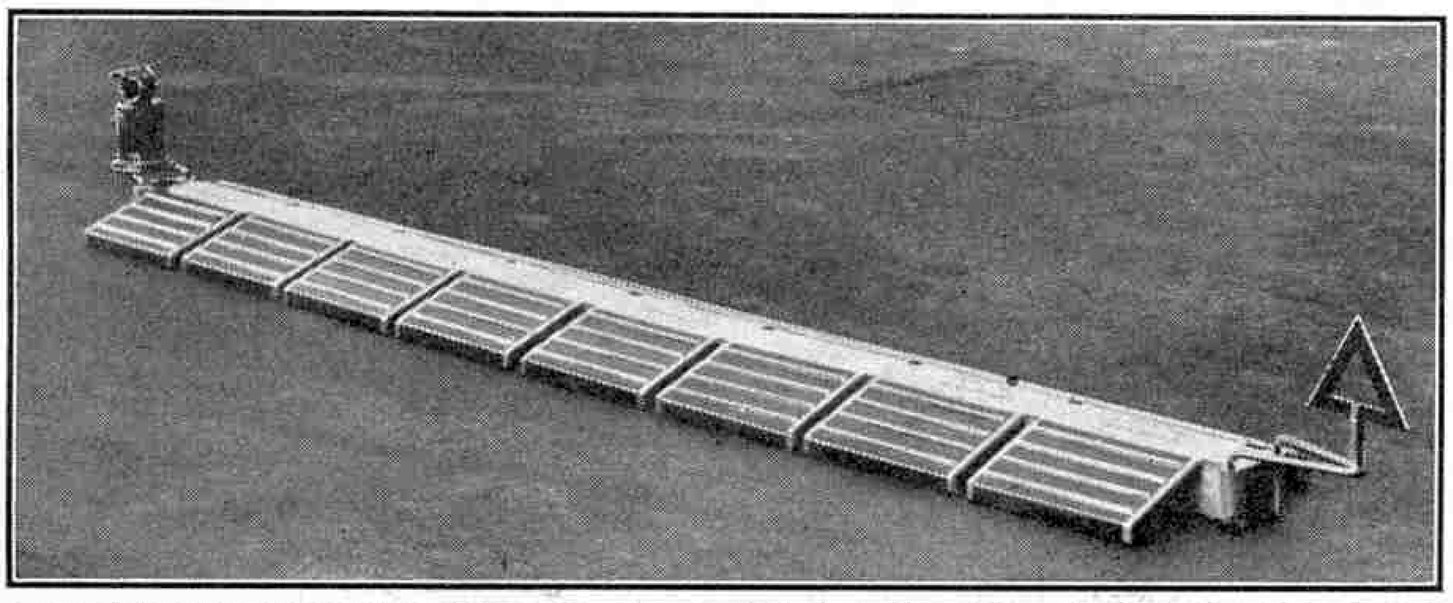
A new type of electric saw, which cuts all kinds of metals and alloys, is now being made in the United States by the Miller Electric Manufacturing Company. The device consists of a rotating soft alloy circular steel blade, on the rim of which are set a number of small teeth. When the saw is in action a controlled electric arc leaps ahead of it and heats a narrow ribbon of metal a few thousandths of an inch wider than the blade. This has the effect of reducing the metal to a molten or plastic condition. The blade therefore has no actual cutting to do; it simply sweeps aside the softened metal and acts as an electrode from which the heat-generating arc "jumps" to the work. A specially-built welding transformer is used to provide current of suitable voltage and amperage to melt the type of metal to be cut.

Elevator Inside a Mountain

Visitors to Whiteface Mountain in northern New York State can now reach the summit by means of an elevator that works in a vertical shaft constructed in the heart of the mountain. The shaft is 271 ft. in height and its lower end is reached from a tunnel, the entrance to which is situated at the terminus of an existing roadway up the mountain. The road ends at a point 273 ft. below the summit, and before the elevator scheme was completed the climb from there to the top of the peak had to be made by foot up a steep pathway and a series of steps.

A New Fire Hose Ramp

Road traffic in the vicinity of a fire often is interrupted by the laying of hose across the roads. With the object of preventing this The South Wales Fire Protection Engineers Ltd., Cardiff, have produced the "Bain-Bridge" hose ramp shown in the lower illustration on this page. This consists of units or sections, each of which is tested to withstand a pressure of over eight tons, and two or more of which can be assembled to form a complete ramp up to 8 ft. 6 in. in length.



A special hose ramp designed to allow vehicles to proceed freely in the neighbourhood of a fire. Photograph by courtesy of The South Wales Fire Protection Engineers Ltd., Cardiff.

When the ramp is used in daylight its ends are indicated by red discs, which fit into sockets projecting from the end sections; and at night the discs are replaced by continuous or flashing lights. The ramp shown in the accompanying illustration is fitted with a day signal at one end and a flashing night signal at the other.

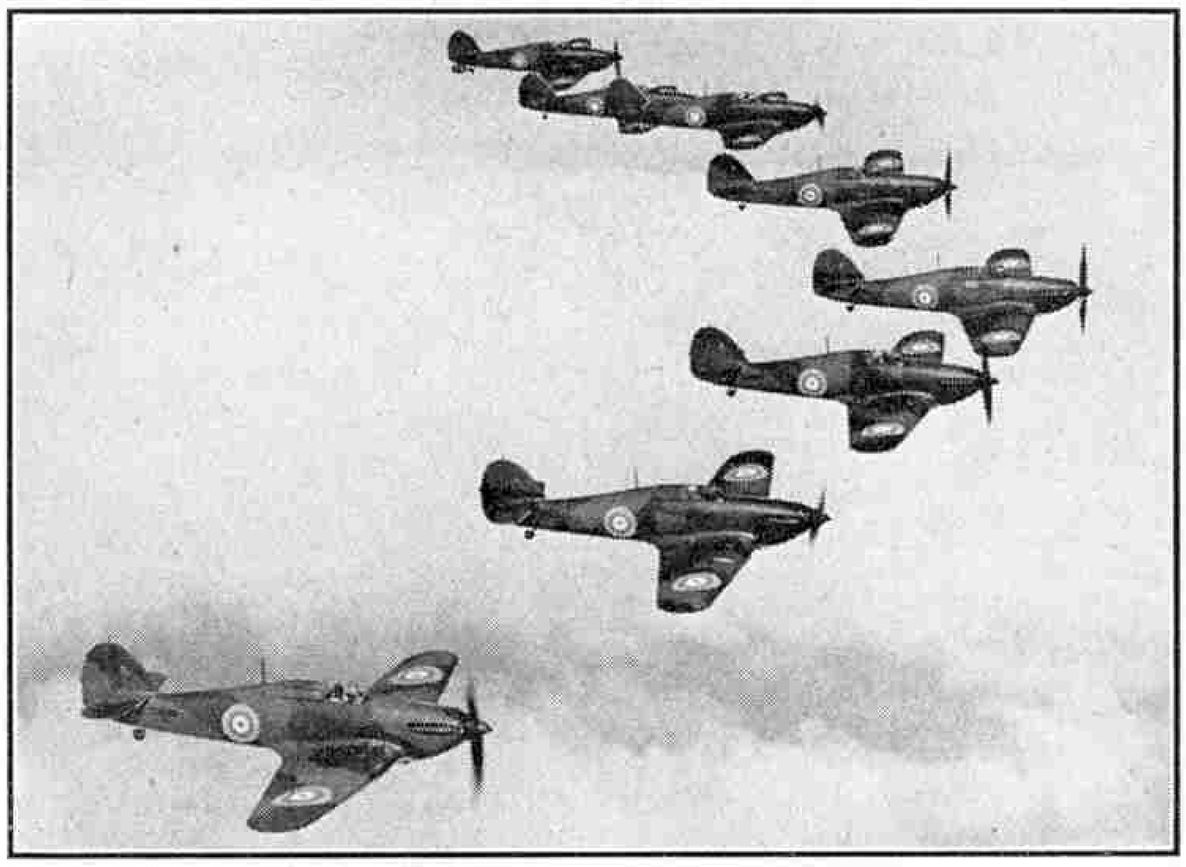
A modified form of ramp is provided for carriage on fire-engines on which the stowage space is limited. This consists of two parts of three units each connected by parallel tie rods, a central section of hose 2 ft. 6 in. in length remaining uncovered.

High-Speed Fighters and Bombers

More Outstanding R.A.F. Types

THE quantity production of equipment for the greatly enlarged R.A.F. has now begun in earnest, and aero engines and military aeroplanes are coming from the huge factories created under the Government Aircraft Shadow Factory scheme, as well as from those of regular aircraft producers. The aircraft that are being produced in large numbers include the Hawker "Hurricane" single-seater fighter and the Handley Page "Hampden" and Fairey "Battle" bombers, and these three types are described in this article.

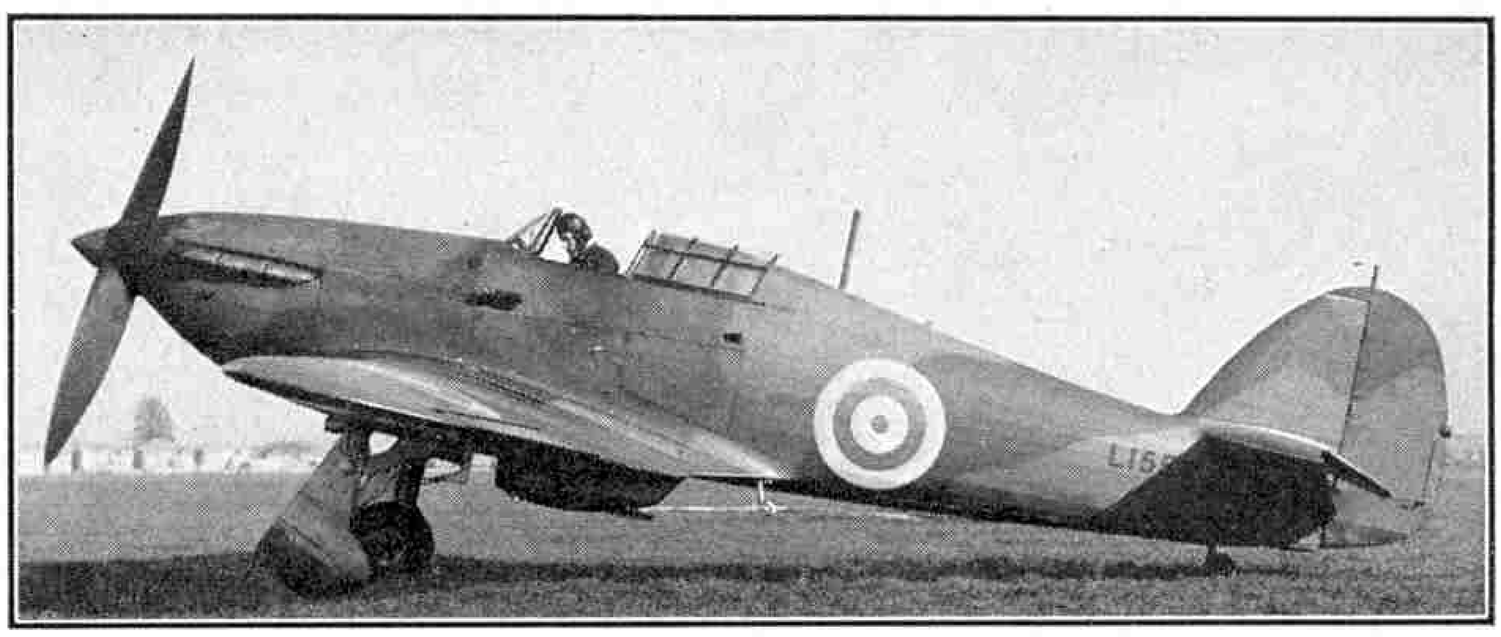
The chief requirement of a fighter aeroplane is speed, and the Hawker "Hurricane," illustrated on this page, is one of the fastest aircraft of its type in the world. Early this year several very fast flights were made between Northolt aerodrome and Edinburgh by "Hurricanes" of No. 111 (Fighter) Squadron, R.A.F. On one such flight made by the aircraft in formation the 327 miles were flown in 65 min., at an average speed of 301.8 m.p.h. A more notable achievement was a flight by one "Hurricane" from Turnhouse aerodrome, Edinburgh, to Northolt aerodrome, in 48 min., at the remarkably high average speed of 408.75 m.p.h. This is the highest speed ever attained by a landplane. The aeroplane was piloted by Squadron Leader J. W. Gillan, Commander of the Squadron.



Hawker "Hurricane" 8-gun single-seater fighters of No. 111 (Fighter) Squadron, R.A.F., flying in formation. The illustrations on this page and the lower one on the opposite page are by courtesy of "Flight."

The "Hurricanes" of this Squadron were again in the news on 8th July, when 11 of them flew from Northolt aerodrome to Le Bourget airport to take part in the French Air Display at Villacoublay. In spite of a strong south-westerly wind the aircraft made the flight in 66 min. at an average speed of 213 m.p.h. They returned to England on 12th July, and improved upon their outward time by crossing from Le Bourget to Northolt in 55 min., their average speed on this occasion being 260 m.p.h.

This fast single-seater fighter is a low wing monoplane. The framework of the wings is of light metal, but the covering is of fabric, a fact which might seem surprising in an aeroplane designed to fly at over 300 m.p.h. Special care has been taken, however, to secure the fabric to the wing in a manner that prevents any tendency to break away when the aeroplane is flying at top speed. The ribs of the wings are spaced only about 7 in. apart, and the fabric is drawn over them and inserted into special channels at the top and bottom of each rib. A metal strip shaped to fit into the channel is then placed over the inserted fabric, and the whole secured by bolts that are held by special nuts on the underside of the channel. As the nuts are tightened the fabric is drawn firmly into the channel. By this method the wing covering is held down by the whole area of the strips instead of only by the parts where the bolts occur.



A near view of a Hawker "Hurricane." This modern fighter has a top speed of over 300 m.p.h., and is one of the fastest aircraft of its type in the world.

The leading edge of each wing is of metal, and inserted in it is a landing light. The wing centre section is a separate unit, and is bolted to the fuselage at four points. Ailerons are fitted to the trailing edge of the outer portion of each wing, and hydraulically-operated split flaps to the inner portion. They are called split flaps because only the underpart of the wing acts as a flap.

The undercarriage is retractable, and when the aeroplane is in flight the wheels are drawn inward and up into recesses in the underside of the wing centre section. The apertures are then closed automatically by fairings attached to the outside of the undercarriage, thus preserving the perfectly smooth surface of the wing. If the hydraulic gear that operates the undercarriage should fail, there is an arrangement of cocks by which the pilot can relieve the pressure in the hydraulic system and release the catches that hold the retracted wheels in place. The weight of the wheels will then pull down the undercarriage.

The cockpit is fully enclosed, and the transparent front, roof and sides of the forward portion provide a wide and unobstructed outlook for the pilot. It is closed by a sliding transparent hood, and there is an emergency escape panel between this hood and the top longeron of the fuselage. The extensive equipment includes oxygen apparatus and a two-way radio outfit.

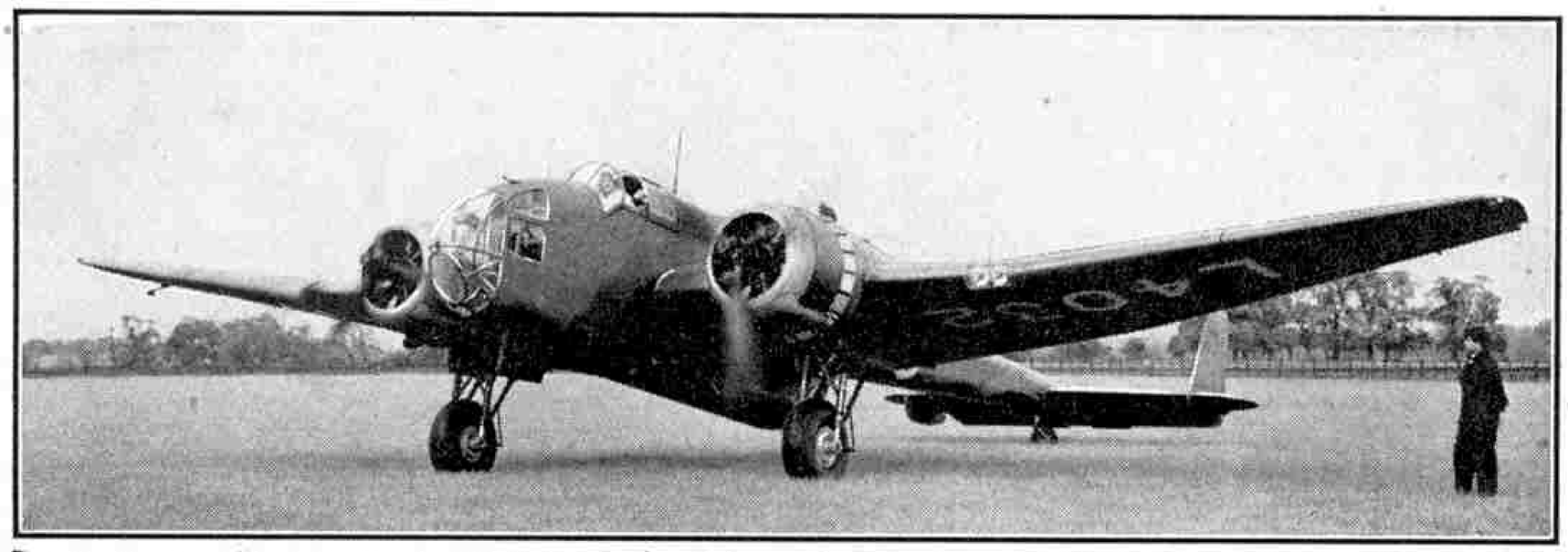
The guns of a fighter aircraft must be placed where they will not obstruct the airflow past the machine and thus cause unnecessary drag. Generally a gun is mounted in each side of the fuselage, near to the pilot, and these fire through the airscrew, interrupter gear preventing the shots from hitting the airscrew blades. Any additional guns are mounted in the wings, and fire outside the arc of the airscrew. All the guns are fired by remote control. In the case of the "Hurricane," however, all the eight guns are mounted in the wings. The reason for this is that the pilot of a modern high-speed fighter has only a very brief opportunity for accurately sighting his targets, and the gun-placing adopted in the "Hurricane" is intended to enable him to use that opportunity to the best advantage.

The Rolls-Royce "Merlin II" 1,050 h.p. engine is fitted in the tapering nose of the fuselage, and the metal cowling has detachable panels to facilitate inspection or adjustment. Official performance figures of the "Hurricane" are not available for publication, but the excellent flights mentioned at the beginning of this article give a good indication of its speed capabilities. In addition it is known that it can climb to a height of 15,000 ft. in 6 min. and that the service ceiling is 39,000 ft. The dimensions of the "Hurricane" are span 40 ft.; length 31 ft. 5 in.; height 13 ft. 3 in.

The other two aircraft illustrated here are the Handley Page "Hampden" and the Fairey "Battle." Both are medium bombers,

military aeroplanes that form a middle class between the high-speed single-seater fighter and the heavy bomber and have to be very fast and highly manœuvrable. They must also be strong and large enough to carry a heavy load of bombs for long distances, but not to the same extent as heavy bombers.

The "Hampden" is the latest Handley Page aeroplane to go into quantity production for the R.A.F., and the first machine to be completed is illustrated on this page. It was christened by Viscountess Hampden at Radlett aerodrome on 24th June, and is named after John Hampden, an English statesman of the 17th century who was famous as a defender of civil liberties. Sir Kingsley Wood, the Secretary of State for Air, was among the many notable people present at the ceremony, and in a speech made immediately after the christening he described the "Hampden" as a fine example of the aeroplanes which are being produced to-day for the R.A.F. He went on to say that the military aircraft produced in this country are among the best in the world, as is proved by the keen desire of foreign countries to purchase them. "The rapidity with which design is progressing," he said, "is shown by the fact that the 'Hampden,' though its dimensions are smaller than those of its predecessor, the 'Harrow,' is able to carry a bigger load over a longer distance and at a much higher speed."



The Handley Page "Hampden" twin-engined bomber is now in quantity production for the R.A.F. The first to be completed is shown about to take off from Radlett aerodrome for a demonstration flight. Photograph by courtesy of "The Aeroplane."

The "Hampden" is a middle wing cantilever monoplane of all-metal construction. The fuselage, wings, and tail unit have stressed skin covering, which is flush-riveted to give an absolutely smooth surface. The wings incorporate the latest types of wing tip slots and hydraulically-operated trailing edge flaps, and the wide tail unit has twin fins and rudders. The undercarriage is retractable, the wheels being drawn up backward into recesses in the stern of the engine nacelles. The tail wheel also retracts, into the underside of the fuselage.

This medium bomber has enclosed accommodation for a crew of four, consisting of the pilot and three gunners. One gunner occupies the transparent gun turret in the nose of the fuselage; the second is accommodated in a gun position in the upper part of the fuselage, immediately above the trailing edge of the wings; and the third one occupies a position in a special "balcony" midway along the bottom of the fuselage. This balcony is shown in the illustration of this machine that appears on page 620, and it enables effective defensive fire to be brought to bear on any aeroplane that is rash enough to attempt to attack the "Hampden" from underneath the tail.

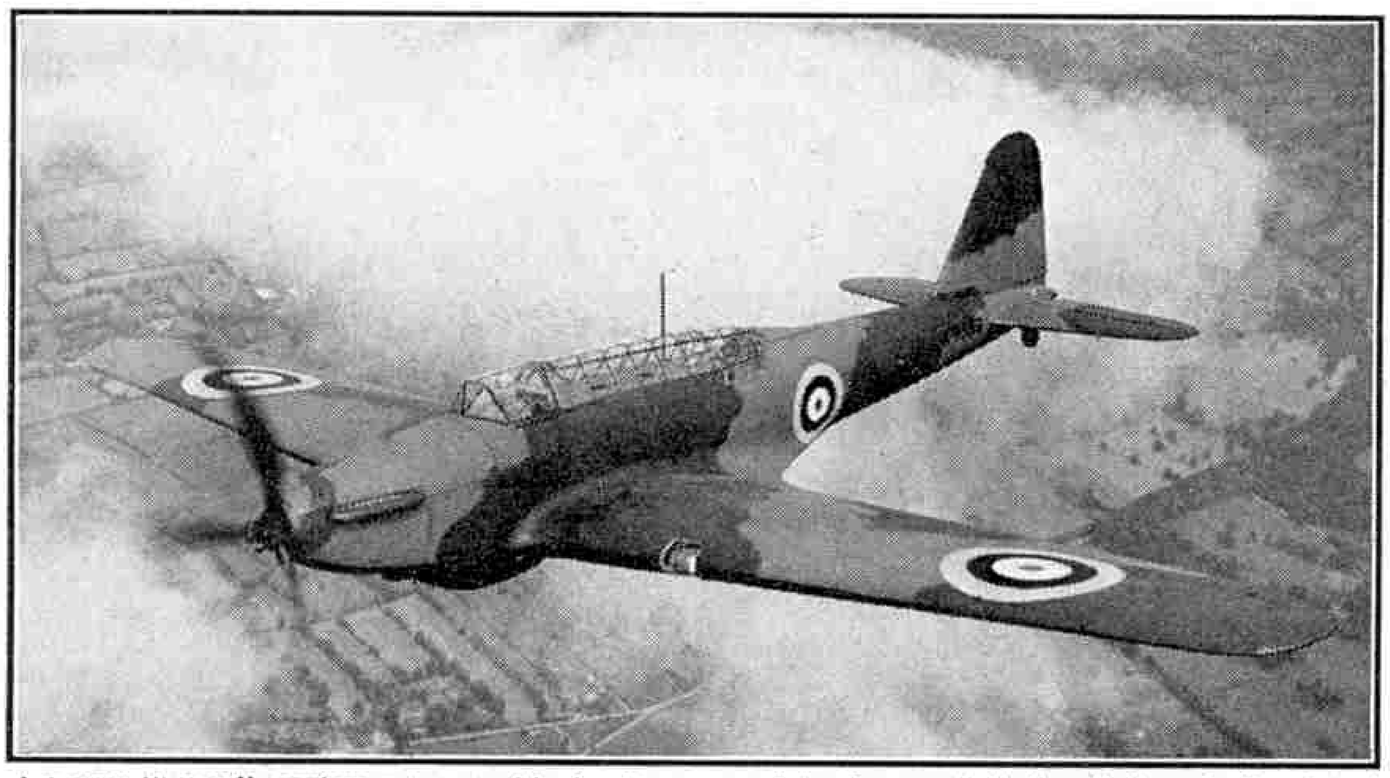
The two Bristol "Pegasus XVIII" radial air-cooled engines are mounted in streamlined nacelles in the leading edge of the wings, and three-bladed D.H. constant-speed airscrews are employed. No details of the size and performance of this aeroplane can be published, but it is known to have a wing span of about 70 ft., and to be very fast.

The Fairey "Battle," shown in the lower illustration on this page, is an outstanding example of the single-engine type of medium bomber. It is a stressed skin low wing monoplane. An interesting feature of the wings is that one panel, running spanwise, is so fitted that it can be detached easily and quickly for inspection of the interior of the wings when desired.

When the undercarriage is raised the wheels project about 40 per cent. below the wings, and this would be an advantage if ever the aeroplane had to make a forced landing with the undercarriage out of action. Normally the undercarriage is raised and lowered by means of two Lockheed hydraulic jacks, but a hand pump is also provided for use in emergency. In the rare event of both these methods failing, the undercarriage can be lowered mechanically, in which case an automatic release valve in the hydraulic locks frees the undercarriage wheels. Special attention has been paid to ensuring that the undercarriage is fully down, with the wheels locked in position, before the aeroplane lands. Immediately the pilot throttles back the engine the word "wheels" appears in lights on the dashboard in the cockpit, and an electric horn just behind him commences to blow and does not cease until he releases the undercarriage. The word "wheels" is then replaced by a red light that shows until the undercarriage is fully down and the wheels are locked again, when the light changes to green.

The Rolls-Royce "Merlin I" engine fitted in the "Battle" is fully supercharged and is rated at 950-990 h.p. at 12,250 ft. With this equipment the "Battle" has a top speed of 257 m.p.h. at 15,000 ft. and can climb to that height in 13 min. 36 sec. The service ceiling is 25,000 ft. Sufficient fuel is carried for a flight of 1,000 miles at a speed of 200 m.p.h. and at a height of 16,000 ft., and even if flying at full throttle all the time the aeroplane can cover 640 miles without a stop for refuelling.

Normally the crew of the "Battle" consists of a pilot and an observer, who also acts as rear gunner. The pilot's cockpit is in line with the leading edge of the wing, and that of the observer is about 6 ft. behind it. Both are covered by a single transparent hood, the front portion of which, above the pilot, can be slid back. A rear section is hinged so that it can be pushed up when the rear gun is required for action, and serves to protect the gunner from the rush of air when he is standing to operate his gun.



A Fairey "Battle" bomber in the air. The long transparent hood covers both the pilot's cockpit and that of the observer, who also acts as the rear gunner.

The Vickers gun for the pilot is fixed in the starboard wing in a position that enables it to fire just clear of the arc of the airscrew, and the sight for it is mounted on the windscreen of the cockpit. The machine gun for the observer is mounted in the rear cockpit in such a manner that it can be stowed in a conical fairing there when not in use. There is also provision for the observer to act as a bomb-aimer, and he then lies prone on a cushion on the floor of the wing centre section. A sliding hatch allows part of the floor immediately in front of him to be moved back so that he can use the bomb sight. The bomb release switch is close to his hand, and there is also one in the pilot's cockpit. If the observer cannot be spared for this duty, the crew is increased to three.

Another type of fast, medium bomber that is being produced in large numbers for the R.A.F. is the Bristol "Blenheim." This is fitted with two Bristol "Mercury" engines and has a nominal speed of 280 m.p.h. when fully loaded and flying level. It is a middle wing monoplane built entirely by a method of stressed skin construction developed by the Bristol company.

OF GENERAL INTEREST

Coracles in Modern Britain

Many articles and booklets have been published on how to build a canoe, but I cannot recall ever having seen instructions on how to build a coracle. Yet coracles are handy little craft, more stable and more easily transported than canoes. They afford less opportunities than canoes for "showing off" or looking smart, but they might justly be described as the ideal of the poor angler.

The illustration on this page, taken at Llechryd on the River Teifi, which divides Cardiganshire from Pembrokeshire, shows the Teifi type of coracle and the method of carrying it. The Teifi coracles are the purest and most ancient type, but they are not covered with animal hides, as were those of the early Britons. The skin is of canvas, and

A salmon fisherman with his coracle at Llechryd, on the River Teifi, in South Wales.

the framework is of ash, hazel and willow. An average coracle measures barely 5 ft. by 4 ft., and weighs about 30 lb. or a little less, and its cost is about £2.

The Towy coracles, often to be seen at Carmarthen, are of a slightly different form, and there are considerable variations in the types of coracles used on the Upper Severn and the Dee. In recent years at least one Welsh coracle has been made with aluminium ribs. The experiment was costly, however, and little weight was saved; but doubtless the aluminium coracle will, with the help of new skins, outlive many of the older kind.

Robot Inspects 100 Grains of Rice a Second

One of the many interesting uses to which inventors have put the photo-electric cell is the sorting of rice. In a machine recently devised for this purpose the cell scrutinises each grain of rice separately, and rejects any that are not up to the required standard of whiteness. The rice travels through the machine at a speed of 100 yards a minute, and 100 grains are examined every second.

The rice sorter is built up of units comprising a feeding mechanism, a photo-electric cell and an amplifier for the current flowing through it, and a device for ejecting unwanted grains. Rice under examination falls on to the centre of a rapidly revolving disc, on the outer edge of which is a stationary guide, and the grains are whirled outward by centrifugal force, lining up in single file against the guide. From this position they are shot off at a tangent and each in turn passes underneath a circular mercury vapour lamp, light reflected from the grain passing through the middle of the lamp to the photo-electric cell.

At the point where each grain is "viewed" in this manner it is moving over a small platform of the required standard of whiteness for good rice. Grains up to or above this standard pass unnoticed, but one that is slightly stained, and therefore below the standard, reflects a slightly smaller amount of light. This is detected immediately by the photo-electric cell, electrical changes in which immediately bring into action a mechanism that blows a puff of compressed air across the path of the rice, directing the bad grain into a separate compartment.

For commercial purposes any number of units can be built into a battery, and a machine with 10 units has an output of 150 lb. per hour.

Sunlight in Every Room All Day Long

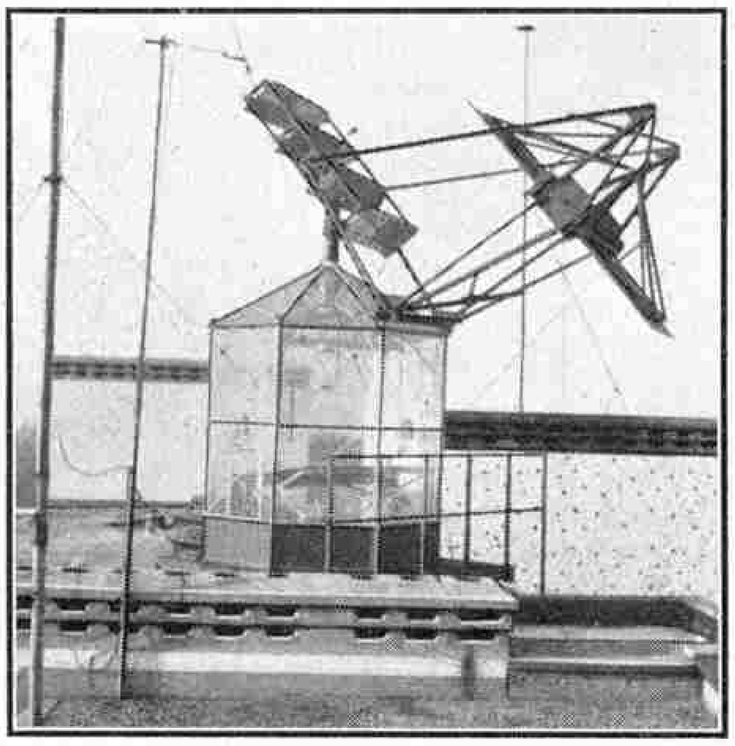
We cannot have too much sunlight, for more Sun means greater health. Yet most of us spend the greater part of our working lives in rooms into which the Sun's rays only penetrate for a short time of the day, and where there are spaces into which they never go. The modern tendency to build houses to face the Sun, and to provide them with larger windows, is a step in the right direction, but very large buildings offer many difficulties, and most of the sunlight reaching them simply falls on their roofs and walls.

A machine has now been devised that enables us to change this, and to illuminate apartments, offices and even basements with the light of the Sun. The accompanying illustration shows the Arthel Sun-conditioning machine, as it is called, on the roof of a large building. It consists of an enclosed glass cabin inside which is a movable mirror balanced so perfectly that it can be moved by two small propellers driven by electric motors of only 1/60 h.p. This mirror follows the Sun in its movement across the sky, the motors being set in motion through switches operated by sunlight itself. There is no mechanical gear to wear or to get out of order, the movements of the mirror being achieved by the propellers alone, which work like those of an aeroplane. The switches too are of a special kind to ensure long life and freedom from defects. In effect they are delicate thermometers, depending for their action on the expansion of mercury under the influence of the heat received from the Sun.

The moving mirror always throws the beam it reflects on a fixed mirror above it, from which the light passes to a third mirror, also motionless, that directs it into the building to be Sun-conditioned. In a sense the combination of mirrors fixes the Sun's rays so that they can be further reflected through mirrors and lenses to any part of a building, entering through windows and skylights. When brought into a space to be illuminated, the rays can be directed to the ceiling, which if white is capable of reflecting nearly 95 per cent. of the light it receives, or on to special opal glasses or other devices to give the necessary lighting effect and to concentrate or diffuse the Sun's rays. This light is always provided above eye level and the effect is to supply a stream of steady and transportable controlled sunlight.

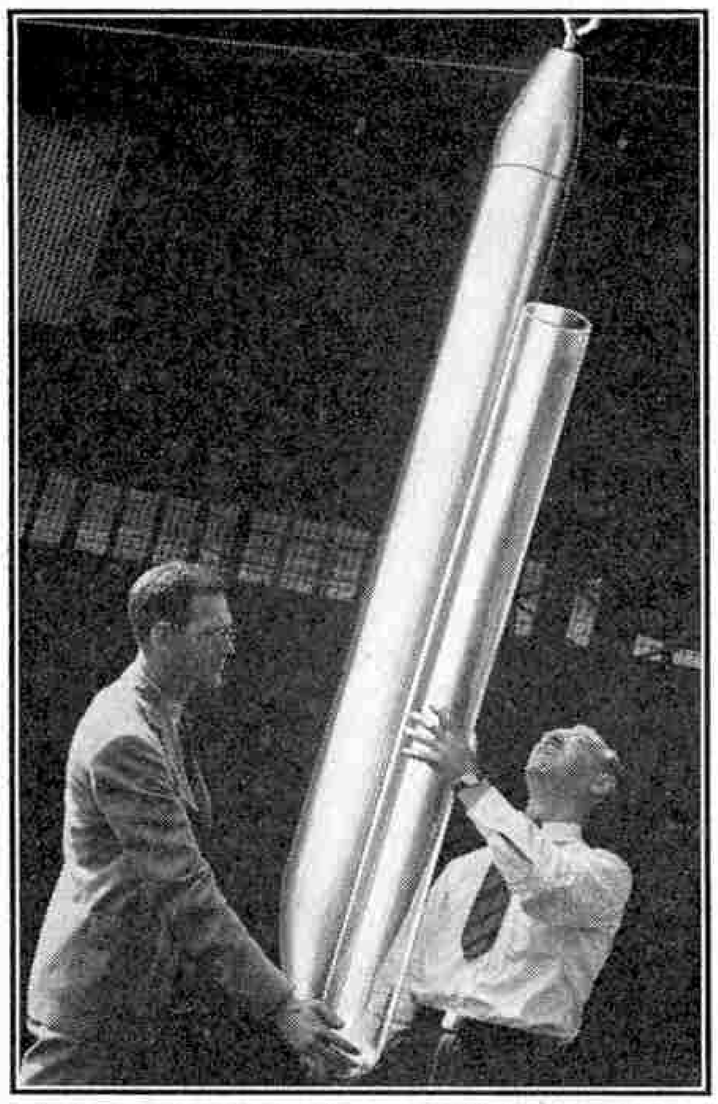
An interesting feature of the Arthel machine is that the rays of sunlight it passes into a building have practically no heating effect. The reason for this is that the quantity of sunlight caught by the mirror is no greater than that a large window will transmit. A photo-electric cell installation can be fitted to switch on the lights in an interior room when sunlight fails, and to switch them off when not required.

Four different sizes of Arthel machines are now manufactured. The largest gives sufficient sunlight to illuminate an area of 4,400 sq. ft. and even in winter such an area will be nearly twice as well lighted as when



The Arthel Sun-conditioning machine. Its mirrors reflect the Sun's rays into the rooms of the building on which it is installed. Photograph by courtesy of Messrs. Arthel, London.

equipped with average electric lighting. The advantages of the system are obvious. Besides providing cool white light in ample quantity for comfort in reading, writing and other occupations, the machine provides a healthier atmosphere and reduces the cost of lighting in interior rooms. The cost of running the installation is small, and almost the only maintenance required consists in washing the glass cabin and the mirrors.



A letter for the future. Tubes in which records of our civilisation have been buried. Photograph by courtesy of the Westinghouse Electric and Manufacturing Company, Pittsburgh.

A Message for the Future

What will the people of 5,000 years hence know of the world to-day? A spectacular effort is being made to tell them how we work and play by the Westinghouse Electric Company, which has buried a huge tube or capsule containing a record of life in our time on the site of the World's Fair to be held in New York next year. The tube is described as an 8,000-lb. letter addressed to the inhabitants of the Earth in the distant future.

To enable the tube to survive its burial for such a long period it has been made of Cupaloy, a special alloy of copper containing small proportions of chromium and silver, a combination that unites hardness with a high resistance to corrosion. It consists of a shell built up of six sections screwed together and brazed, with a final section that was shrunk on the end on tapering threads to make a perfectly watertight joint. It is 7 ft. 2 in. in length and 8 in. in diameter, and within it is a Pyrex glass envelope embedded in mastic, in which the objects to be preserved for examination 5,000 years hence are enclosed. The air in this envelope has been replaced by the inert gas nitrogen.

It has been not an easy task to decide what should be included in the smaller space in an attempt to give a full record of our civilsation. The objects finally selected include about 35 in common use, among them a can opener, a hat, a Bible, a toothbrush and a camera. Next come about 50 small samples of textiles, seeds and such common materials as coal, asbestos, cement, metals and rubber. The seeds are sealed in glass tubes in the hope that they will be capable of germinating when this letter to the future is opened.

A Hundred Books on a Microfilm

Books form an important part of the contents of the tube. These take the form of a news reel showing characteristic scenes of modern times, from President Roosevelt making a speech and a baseball match to bombing by Japanese airmen in China and a fashion show in New York. Most important of all is a micro-film on which is printed the equivalent of more than 100 thick volumes of fine print, with over 1,000 illustrations. This includes complete books, sections from the Encyclopædia Britannica and a world almanac, together with messages from Einstein and other famous men. Although space is limited, so much material has been packed into the micro-film that it would take more than a year merely to read. A microscope is thoughtfully provided for the finders of the tube, and instructions are also given for making projection machines.

The delivery of this strange letter cannot be left altogether to chance. It has been buried in the earth under New York because it is thought that future archæologists will naturally dig on the site of such a great city, of which ruins necessarily will still remain, even if New York and our present day civilisation has perished, like those of Egypt and Mesopotamia where excavations are in progress to-day. As a further help, instructions for finding the tube have been printed on special paper in bound books that are to be sent to the famous libraries and museums of the world, in the hope that a few copies will survive through the ages. These state the position of the tube, the latitude and longitude of which have been determined so exactly that they would enable a coin about the size of a shilling to be found.

Sea Currents and Fish

The greater part of the Gulf Stream, the famous ocean current that warms our shores, comes from West Africa and never enters the Gulf of Mexico at all! This part makes up about four fifths of the combined current. It begins in the Gulf of Guinea and flows westward to the West Indies. It then bends northward, finally turning north-east to join the current from the Gulf of Mexico.

Flowing south from the Arctic Ocean is the Labrador current, which is fed by the glaciers of Greenland and carries icebergs into the track of Atlantic shipping. It ends by plunging under the Gulf Stream, where it can readily be detected because its water is so cold. Where the two currents meet seems to be the starting point of Atlantic cyclones, and our weather is partly determined by this event, which occurs over 2,000 miles from our shores.

The effects of these two currents go much deeper than this, however. The Gulf Stream brings with it sea animals and plants that our food fish do not like. When it is strong, it pushes back the currents flowing down from the Norwegian coast, and the fish this brings with it are prevented by huge quantities of plant life from the Atlantic from coming south to the East Anglian Coast. The fishing harvest of the North Sea therefore falls away. This does not happen when the Labrador current is strong, for then the Gulf Stream is weak. Thus fishing conditions in the North Sea are affected by the flow of the cold current along the coast of Labrador.

Ice Cream "On Tap"

Victoria Coach Station, London, was the first place in England to offer ice cream "on tap." Between the arrival and the departure platforms stands a new invention, rising six feet from the floor, like a huge block of ice cream in a spotless wrapper of cream-colour, blue, and chromium.

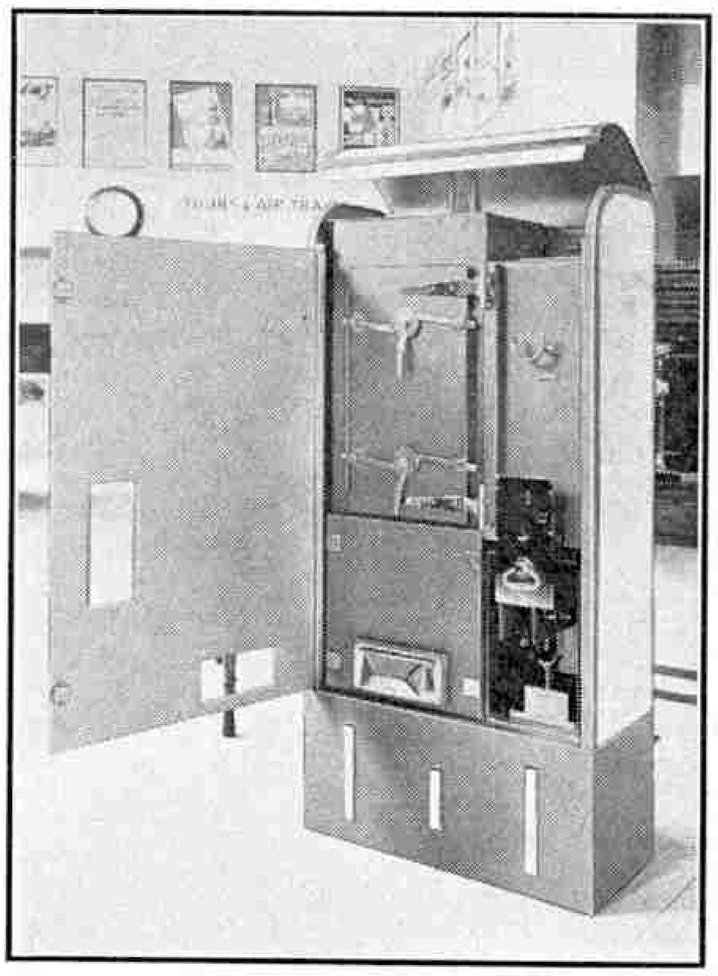
Everyone who puts in his two pennies and pulls the handle finds a familiar "tuppenny" block of a well-known make of ice cream waiting beneath a flap. After the two hundredth brick leaves the cabinet, a warning disc reads "EMPTY," and a coin-returning device is ready for operation.

For 40 years slot-machine experts have been trying to perfect an automatic vendor for ice cream, but refrigeration proved a stumbling block. One by one expensive mechanical means of maintaining the necessary low temperature had to be ruled out. Not only their initial cost but the requirement of skilled inspection prevented the sale of ice cream at the usual prices. Also, the piping or wiring for water, gas, or electricity limited the places where the machine could be used.

Another trouble was the entrance of warmer air from outside whenever a packet of ice cream left the machine. The resultant formation of frost inside interfered with its operation.

Now, after six years' experiment, the solution to these problems has been found by a leading authority on low temperature work, Prof. W. J. de Haas, of the University of Leyden, Holland, working with Mr. W. W. Hamel, an Austrian engineer. Using only solid carbon dioxide, familiarly known as "dry ice," without mechanical means of refrigeration, thermostats, or adjustable controls, their invention relies on the skilful design of the interior, on the conductive property of the metal employed, and upon advantage taken of the gas emitted by the "dry ice."

Twice weekly a standard 12½-lb. block of "dry ice," in a cloth bag is placed in the thermos-like container made for it, and covered with a thick, insulating cushion. The "dry ice" rests on a copper plate, which is connected with the back of the ice cream storage chamber, containing the packets stacked in four vertical compartments. Below them is a revolving, cylindrical,



An automatic ice cream machine. The cover has been opened to show the containers.

wooden block, divided into four segments, each of which removes one brick of ice cream from each compartment in turn. When the customer lifts the flap on the outside of the cabinet to remove the packet, an inner flap drops to insulate the interior.

As the "dry ice" decomposes, the carbon dioxide gas given off which is not only very cold but preservative in effect, is allowed to pass through the ice cream chamber.

M. D. Bensusan.

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.

"Haste, Post, Haste!"

By George Walker. (Harrap. 10/6 net)

To-day the postman is such a familiar figure that we take him for granted. Actually he is only one of an immense host of letter-carriers of all ages and countries who have travelled the roads or crossed the seas. The post indeed is as old as the art of writing, and Mr. Walker's story shows it to be one of the most romantic as well as the most useful of all our institutions. Every page of his book is of absorbing interest, and the many splendid illustrations add greatly to its attractions.

Mr. Walker first touches on the post runners of the Ancient World, and then strides forward to the appointment of the first English Postmaster. This was Sir Brian Tuke, who held this position in the reign of Henry VIII. There had previously been efficient and regular posts, notably in the days of Edward IV, but it was Tuke who firmly established the post.

Then follows the intensely interesting story of the development of the post in Elizabethan and Stuart times. It is crowded with exciting incident, including attacks on post carriers by highwaymen, trouble following the refusal of mayors and other officials to supply the post with horses, and preparations for resisting the Spaniards in the time of the Armada. There are thrilling struggles to maintain posts in the face of stupendous difficulties and keen rivalries, and the contents of the postbag itself yield many interesting stories. How the post was extended overseas forms a particularly romantic chapter.

When he comes to more modern times the author has an equally fascinating story to tell, passing from the mail coach, rattling over English highways, to the railways, which were pressed into service almost as soon as they were built. How Roland Hill introduced his great scheme for penny postage and put it into operation with success is fully explained, and in other sections we read of the famous Falmouth packets which were concerned in many valiant fights against privateersmen.

Indians climbing the Andes, African runners in the bush with letters placed in a cleft stick, and riders of the Pony Express figure in the many thrilling tales of posts that the author has to tell.

Picking up the mail without stopping in the early years of Queen Victoria's reign. This illustration appears in "Haste, Post, Haste," reviewed on this page.

"The Romance of Flight"

By Capt. Norman MacMillan, M.C. (Evans Brothers Ltd. 1/6 net)

This book has been written specially for young people by a practical airman of great experience. The author, Capt. MacMillan, first began to fly in 1916, and since that time has flown over long distances and in many parts of the world. He has had experience of aircraft of all kinds, from the smallest of light planes to big multi-engined air liners and flying boats, and has made the first test flights of many important new aeroplanes.

After describing the first attempts of Man to fly, and the outstanding balloon, glider, and airship flights of the early pioneers, the author relates how the Wright brothers achieved the triumph of being the first men in the world to fly in a power-driven aeroplane. He then traces the development of the modern aeroplane, and describes briefly the various types of aircraft in use to-day. Subsequent chapters explain how an aeroplane flies, and tell the reader what the various controls, levers and instruments in the cockpit are for. The author describes what London looks like from the air, and how great mountain ranges appear to the pilot of an aeroplane in flight. This leads naturally to a brief discussion on map-making from the air. Finally there is a chapter on the many different purposes for which aircraft are employed to-day.

The book ends with a series of questions, grouped according to the chapters, that provide an interesting memory test; and there is an excellent glossary of aeronautical terms, with some useful notes upon civil aviation as a career.

Many photographs and line drawings add to the interest and value of the book, which is published in three different bindings at 1/6, 1/9, and 2/6 respectively.

"From Pathway to Flyover"

By D. A. R. Kemp. (The Percy Press. 3/6 net)

There is no more fascinating story than that of our English roads, which originated long before the beginning of history in the trackways of the lower parts of England. Mr. Kemp begins with these and then tells us how the Roman roads that followed them were made. He explains why they decayed, and tells vivid tales of the difficulties of travel in later centuries, when roads were mere muddy trackways and highway robbers abounded. The author tells the truth about these "gentlemen of the road," very few of whom were romantic characters.

The revival of the English road came in the days of Telford and Macadam, who constructed highways over which swift coaches laden with passengers and mails could run. Those were the great days of the roads. The coaches had names, just like the railway engines and ship of to-day, and provide many interesting stories of famous coachmen and guards.

This prosperity came to an end when the railways were built, however, and by 1850 the old road was dead, seemingly for ever. Then came the sudden turn of fortune by which our roads were lifted into greater importance than at any time in their history; and in the last chapters of his book Mr. Kemp describes the birth of the new road that the motor car and motor lorry have made necessary. What the future is likely to bring is well discussed by the author, who gives examples of modern motor roads, with flyovers at crossings and junctions.

The book is illustrated by six full-page plates.

"The Pirate Island"

By D. E. Heming. (A. and C. Black. 3/6 net)

Thrills in the air and desperate fights with gun-runners are combined in this stirring story. The gun-runners have an air base in one of the smaller islands of the Azores, and defy all efforts to discover their haunt and stop their evil trade. By a series of accidents Jack Hawkins, a midshipman undergoing instruction on an aircraft carrier, lands on their island with his grandfather, a retired Admiral who has set out to trail the gun-runners. There are many exciting scenes, and narrow escapes for all members of the party, before the miscreants are rounded up; and how the midshipman and the Admiral solve the problem of dealing with their wily and alert enemies forms a fine climax.

"The Pirate Island" is a splendid book for boys, who will revel not only in the fighting, but also in the fine flying episodes.

"The Modern Book of Ships"

By W. H. McCormick. (A. and C. Black Ltd. 5/- net)

Ships are as fascinating to boys to-day as they were in the days of sail. There may be some regret for the passing of the sailing clippers, but the wonders of great liners, warships, cargo boats, coasting vessels and the many special new types of ships have deepened our interest in the sea. The full extent of the romance of the modern ship is revealed by the Editor in his latest book. This is specially notable for the skilful selection of topics, which cover practically the entire range of sea life and explore the byways as well as the highways without plunging into unattractive detail.

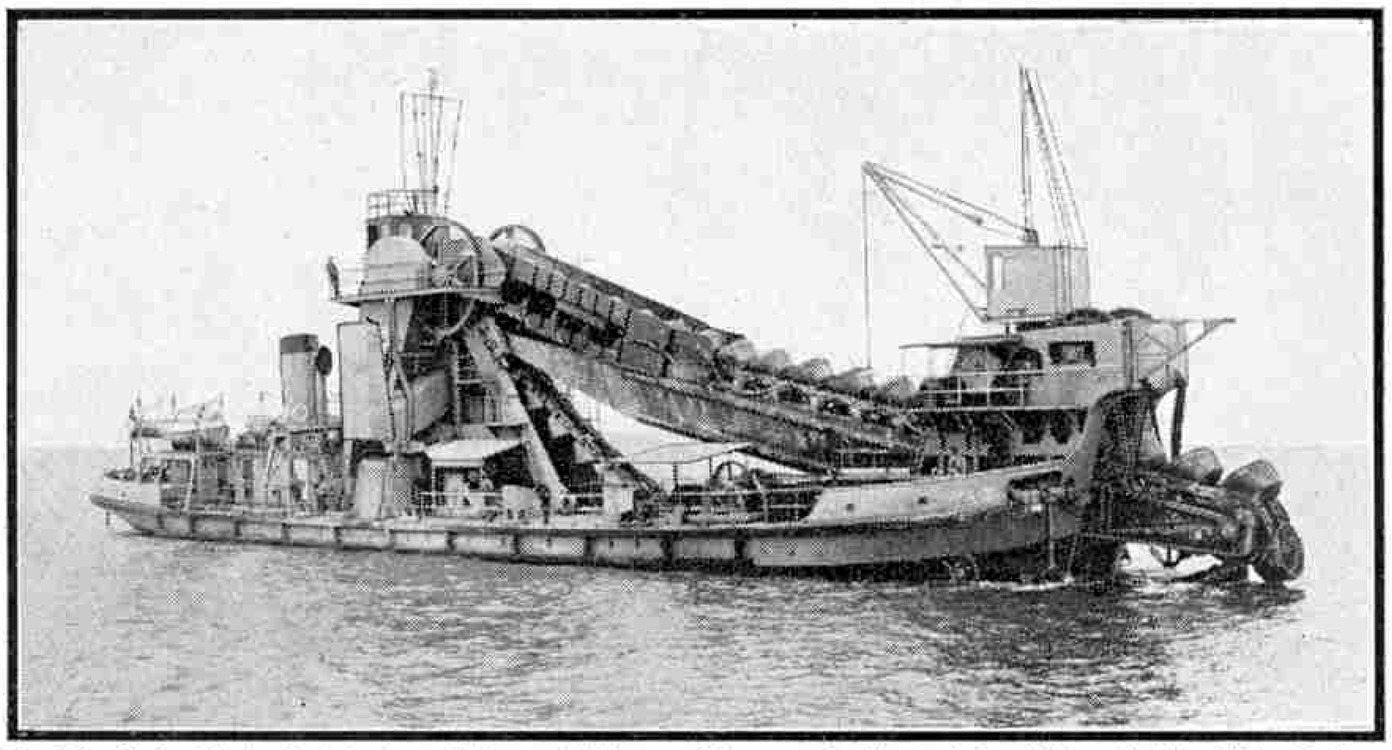
To begin with the conquest of the North Atlantic by steam is told in a chapter that gives interesting details of successive holders of the Blue Riband. Famous steamship companies such as the P. and O. in this country, and the Compagnie Generale Transatlantique in France, are dealt with in the next chapter; after which we turn to the splendid vessels that carry traffic across the channels separating Great Britain from Ireland and from the Continent. Special attention is given to the train ferry between Dover and Dunkerque, the most recent development in these cross-channel services, and to busy train ferries in other parts of the world.

This is followed by fascinating accounts of many special purpose vessels. Among these are the refrigerated ships that bring us meat and fruit; the trawlers and drifters that supply us with fish; oil tankers, whaling ships, and vessels that lay ocean cables. A special chapter is devoted to tugs, dredgers and ice-breakers, vessels that in different ways assist the larger ocean-going ships.

Warships next claim attention. The mysteries of battleships, cruisers and destroyers are well explained, and the story is brought up to date by accounts of the development of the submarine and the aircraft carrier. This section is completed by an informative chapter on modern guns, torpedoes, mines and depth charges.

Navigation at sea, in coastal waters and in the channels leading to ports is next considered. Here we learn how the sailor finds his position by observations of the Sun and stars, or by wireless bearings, and how ships are steered and guided along the courses laid down for them. Lastly comes a miscellaneous chapter explaining ship measurements and nautical terms, and the ranks and ratings in the Royal Navy and the Merchant Navy.

The book will be treasured by any boy who is at all attracted by the story of ships, for it is splendidly written and packed with accurate and interesting information. It is exceptionally well illustrated. L. G. B.



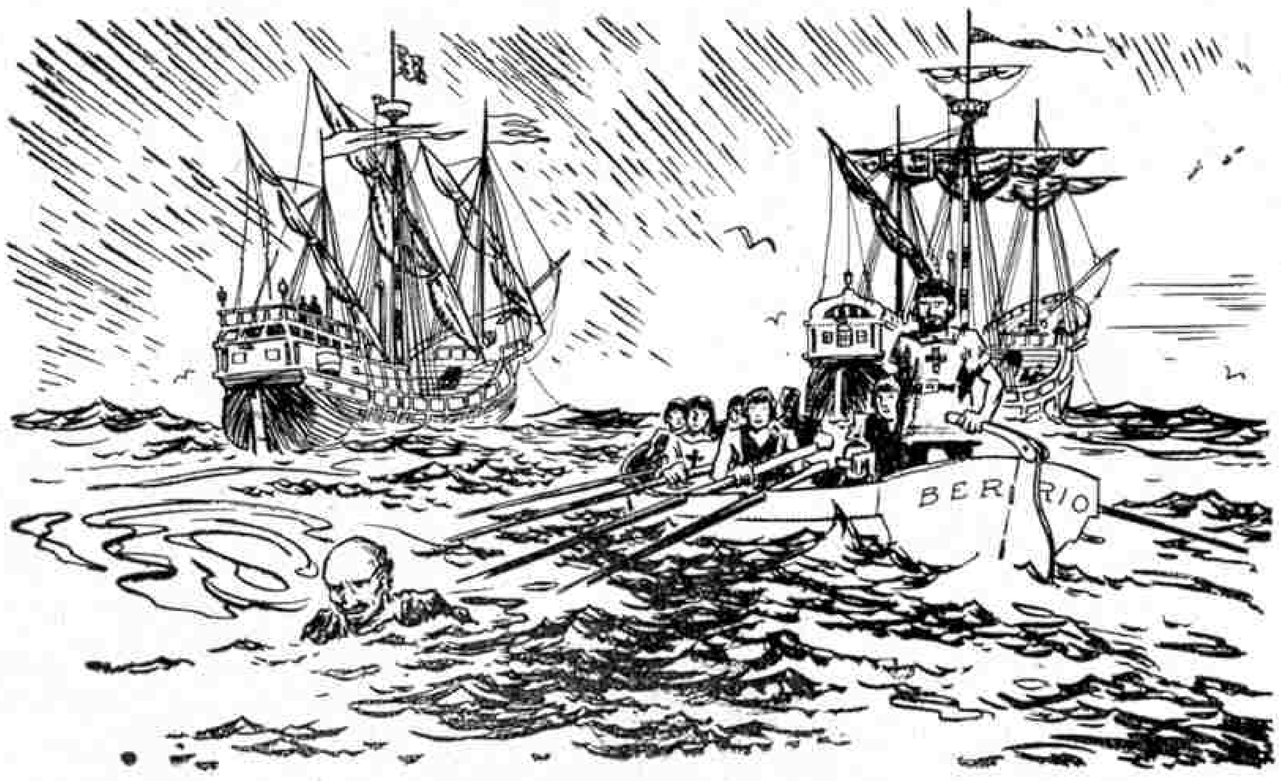
The Diesel-electric bucket dredger "Dieppe IV," one of the vessels illustrated and described in "The Modern Book of Ships," reviewed on this page.

"He Went With Vasco da Gama"

By Louise Andrews Kent. (Harrap. 5/- net)

Vasco da Gama was the great Portuguese mariner who in 1497 boldly rounded the newly-discovered Cape of Storms, later given the more encouraging name of Cape of Good Hope, and then crossed strange seas to India itself. With him went Shane and Dennis O'Connor, Irish boys living in Portugal, and their Portuguese friend Joan.

When the adventurers set off it was reported that they would find themselves sailing across seas of boiling pitch, and that they would end by dying of strange fevers, being swallowed by serpents or being roasted for dinner by savages! None of these dreadful fates overtakes them, but they have sufficiently stirring times battling with storms, suppressing mutinies, and fighting against natives and hostile Arabs. In all these exciting events the boys play a great part, and when India is at last reached they are instrumental in rescuing their leader after he has been imprisoned.



A deserter escaping from one of Vasco da Gama's ships at Mozambique, on the east coast of Africa. From "He Went With Vasco da Gama," reviewed on this page.

Apart from the interest of the exploration itself, the book is attractive for its humour and for the many attractive people who figure in it. Vasco da Gama himself is seen not merely as a stern leader, but also a kindly human being, and there are wonderful pictures of life on the explorers' ships and of the wonderful new countries visited. The story is a merry one, and will be enjoyed by all our readers. There is a coloured frontispiece and many line drawings.

"Man in a Chemical World"

By A. C. Morrison

"Scientific Riddles"

By Sir J. A. Thomson

(Scientific Book Club. Each 2/6 net)

These books are among those selected for circulation to members of the Scientific Book Club, to whom they are available at the special price of 2/6 net. Readers who are interested in the Club should write to the secretary, Mr. Gilbert Foyle, 121, Charing Cross Road, London W.C.2.

The first of the two, *"Man in a Chemical World"* by Mr. Morrison, has been written as a record of the wonderful service that chemical industry gives us. It is so packed with reliable information that it is impossible in a short review to give anything but a sketchy idea of its contents. These show well how chemistry affects practically every detail of modern life. We learn how the chemist has contributed to health, see that the task of feeding the rapidly-growing populations of the world would be impossible without his aid, and realise the part that he plays in such industries as the manufacture of iron and steel. The book is concisely written and is not one to skip through, but rather a store of knowledge in which to delve.

"Scientific Riddles," by the late Sir J. Arthur Thomson, is of more popular interest. The author has selected examples from the thousands of puzzles that living things present, and has provided solutions as far as these are possible. He enquires why we fall asleep, laugh or cry, and also wonders how the Earth is kept so clean, where a cat gets its nine lives, why human beings walk in circles when lost and how we catch cold. With the answers to these go fascinating discussions on such problems as how life began and whence came Man. Wherever one dips in the book there is useful and interesting information.

"Adventures of a Prodigal"

By Edward Sutton

(Harrap. 5/- net)

This story of the adventures of a boy in Kenya is largely based on actual events. Its hero is a failure at his public school, and arrangements are made to send him to a cattle farm in East Africa. There he takes happily to the entirely new life he meets, working steadily on the farm, and seizing every opportunity of travelling into the bush, where he has exciting times with lions, buffaloes, hippopotamus and other wild animals. In the end he becomes restless and joins the police. His experiences in the Force are not encouraging, and he decides to go to sea. On his arrival at Mombasa he finds that he cannot get a job, nor can he pay his passage home, but eventually he finds his way back to England as a stoker.

The story is illustrated by a coloured frontispiece and four full-page drawings.

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THE PERFECT TABLE RAILWAY!

SOME OF THE HORNBY-DUBLO SETS

● EDP1 Hornby-Dublo Electric Passenger Train Set comprising streamlined six-coupled Locomotive "Sir Nigel Gresley," Tender, Two-coach Articulated Unit, Dublo Controller and Rails. (Transformer not included.) Price **70/-**

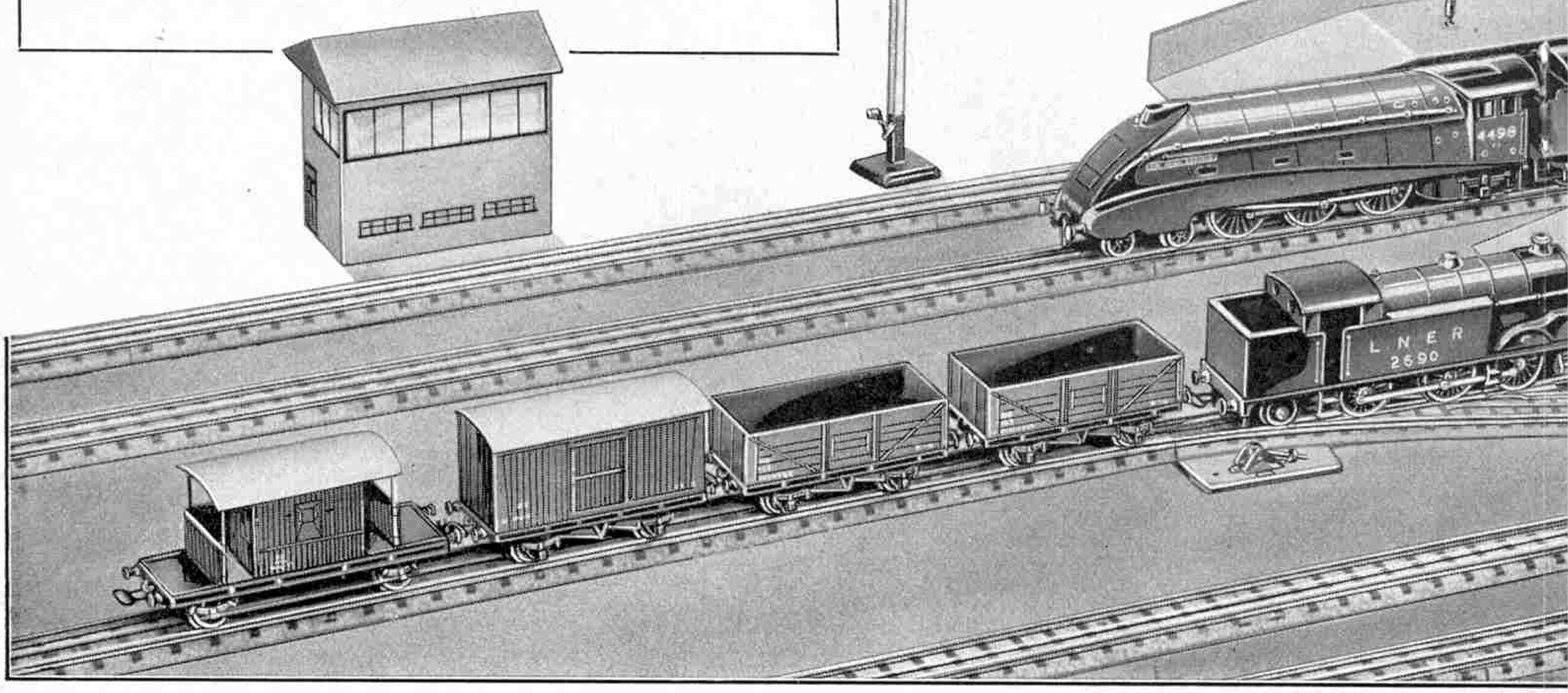
● DP1 Hornby-Dublo Clockwork Passenger Train Set contains streamlined six-coupled Locomotive "Sir Nigel Gresley," Tender, Two-coach Articulated Unit and Rails. Price **39/6**

● EDG7 Hornby-Dublo Electric Tank Goods Train Set contains six-coupled Tank Locomotive, Open Goods Wagon, Goods Van, Brake Van, Dublo Controller and Rails. (Transformer not included.) Price **55/-**

● DG7 Hornby-Dublo Clockwork Tank Goods Train Set contains six-coupled Tank Locomotive, Open Goods Wagon, Goods Van, Brake Van and Rails. Price **27/6**

★ *DO NOT MISS THIS!*

A Special Folder, beautifully printed in colour, is now available giving details and prices of the complete Hornby-Dublo range. Ask your dealer for a copy, or write direct to Meccano Ltd., Dept. D.F., Binns Road, Liverpool 13.



'BY-DUBLO TRAINS

The Hornby-Dublo System, Gauge OO, marks a wonderful advance towards the ideal home railway. By means of it a complete and realistic layout can be developed in very limited space. It is the perfect table railway.

Hornby-Dublo Trains are unique in their scale accuracy and beauty of finish. They have been designed with the co-operation of the Railway Companies, who supplied special photographs and scale drawings. The Trains in motion are fascinating to watch. The Locomotives are fitted with motors, either clockwork or electric, of a power and reliability never before achieved in this gauge. The Remote Control of the Electric Locomotives is perfect—starting, stopping, reversing and speed regulation are all carried out by the movement of one lever. The control is positive. Move the lever to "Forward" and the train goes forward; move it to "Backward" and the train goes backward—every time!

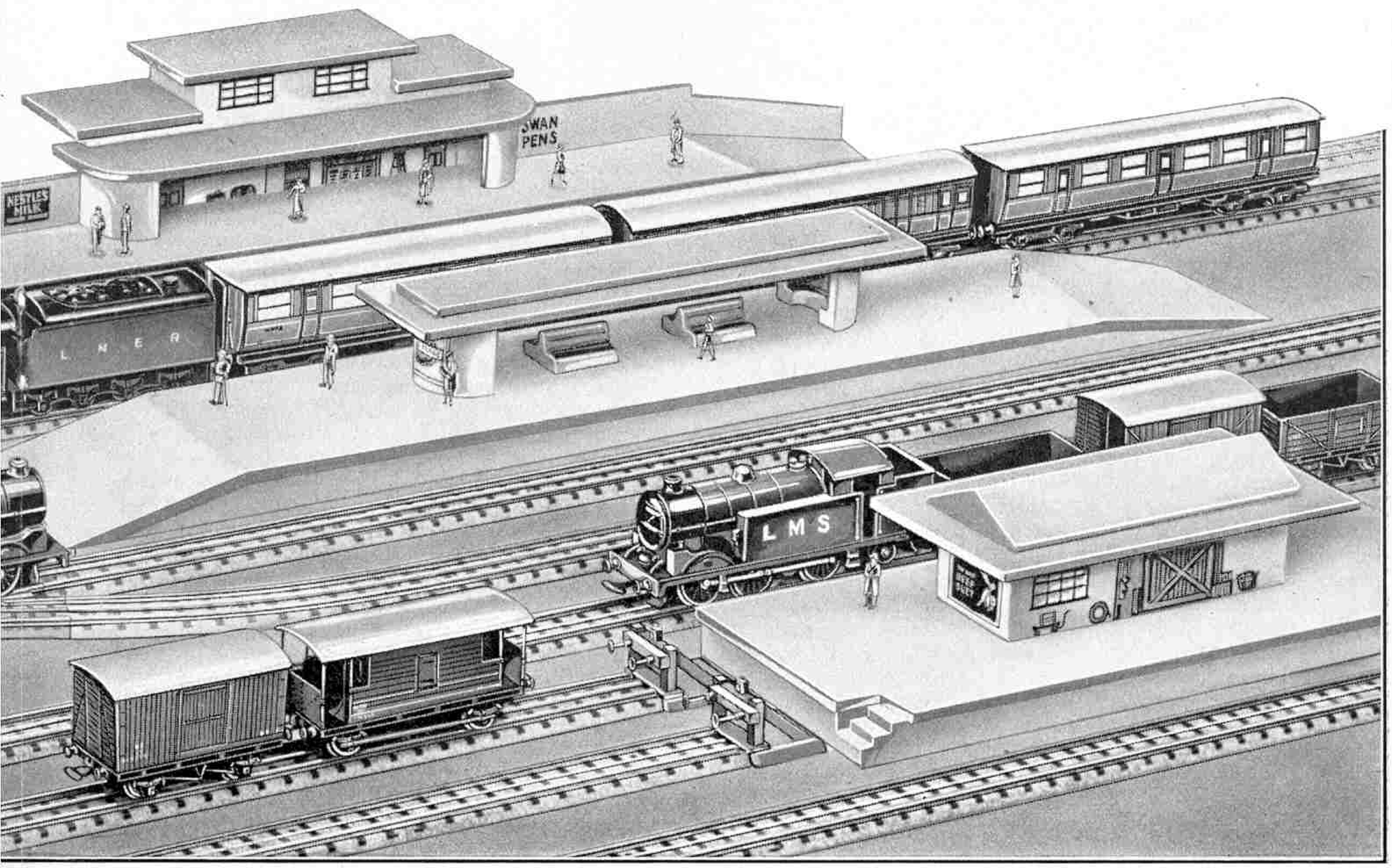
The track consists of solid drawn brass rails, giving the greatest electrical conductivity, mounted on a realistic metal base. All vehicles are fitted with pressure die-cast wheels that ensure perfectly smooth running. Automatic couplings, which link at any point on the track, are fitted to all Coaches, Vans and Wagons. The Signals are realistic working models of the latest upper-quadrant type. The Buffer Stops have working heads.

The Main Line Station, which is constructed in wood, is a splendid model in the modern style. It will accommodate a 3-Coach Train, and by means of printed slips provided can be named "Berwick" (L.N.E.R.), "Penrith" (L.M.S.), "Truro" (G.W.R.) or "Ashford" (S.R.), as desired. An Island Platform of similar style can be used either separately or in conjunction with the Main Line Station. There is also a Goods Depot for goods traffic.

Hornby-Dublo Electric Trains operate on **Direct Current** at 12 volts. This current may be obtained either from **Alternating Current Mains Supply** through a Dublo Transformer, or from a 12-volt accumulator. The Dublo Transformers are specially designed for these Trains, and no others should be used.

Hornby-Dublo Trains are one seventy-sixth of the size of real trains. They enable you to lay out a complete railway on your dining table!

MANUFACTURED BY MECCANO LTD., BINNS ROAD, LIVERPOOL 13



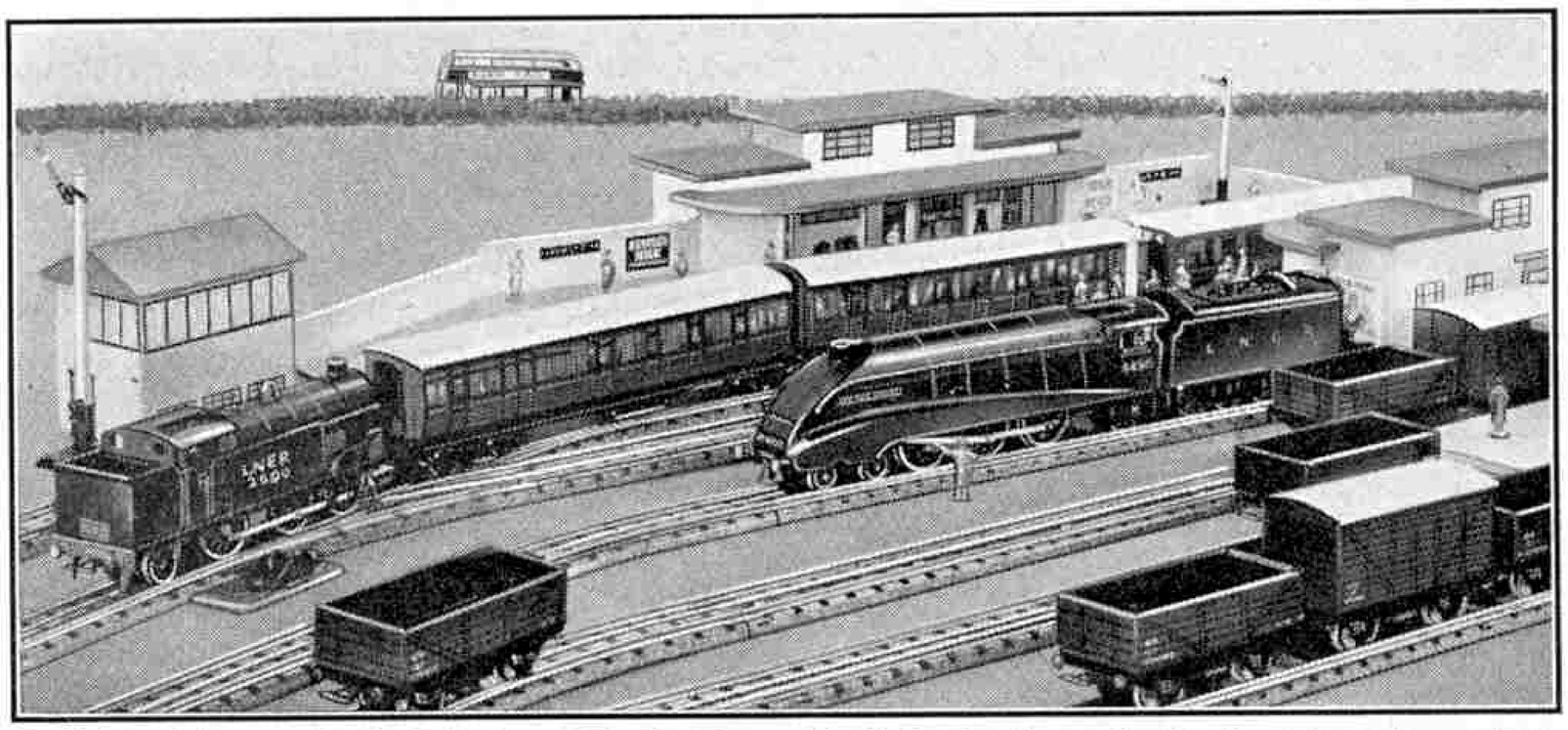
Fun with Hornby-Dublo Trains

The Fascination of Control

LAST month we gave a general survey of the Hornby-Dublo Railway System and of its various components. This month we make suggestions as to the various operations that can be carried out as a result of the special features of the System.

The perfect control that is afforded with the Electric Train Sets makes possible some most fascinating working; the engines can be made to behave exactly as if there were enginemen in charge on their footplates, for they are instantly responsive to every movement of the Controller handle. The laying of the track is easy, and the connections between the power supply—whether Dublo Transformer or accumulator—and the Controller and track, are simply made.

The material available in the Hornby-Dublo range enables the model railway owner to carry out some interesting train working. The components of the Passenger Train Sets, for example, both clockwork and electric, are ideal for the reproduction of L.N.E.R. express operations. The streamlined locomotives, of which *"Sir Nigel Gresley,"* the subject of the Hornby-Dublo model, is the best known, are employed in general main line service and are to be seen working almost any of the more important long-distance trains. Similarly the famous teak passenger stock and the characteristic system of articulation so long familiar on the East Coast Route are splendidly reproduced in the Two-Coach Articulated Unit packed in the Sets.



Realistic working on a Hornby-Dublo layout. The Tank Locomotive is shunting the coaches into the station to form a train. The Streamlined Locomotive "Sir Nigel Gresley" that is to haul the train is in the siding.

There is also a separate Corridor Coach that forms a useful addition to the Articulated Unit in the composition of a miniature express train. This separate Coach can form part of the regular set of vehicles used for a particular service, or it can be used in addition as a through coach for some destination, to be detached at an intermediate point during the journey of the main train.

The running of Hornby-Dublo Trains is perfect, and there is a real thrill in the management of the miniature L.N.E.R. express. Almost any of the important main line trains of real practice can be represented by it, except the high-speed trains such as *"The Silver Jubilee"* that are made up of special stock. By correct management of the single handle of the Dublo Controller all the movements of the train can be regulated to reproduce exactly the behaviour of real trains. Let us follow in imagination the running of a Hornby-Dublo express.

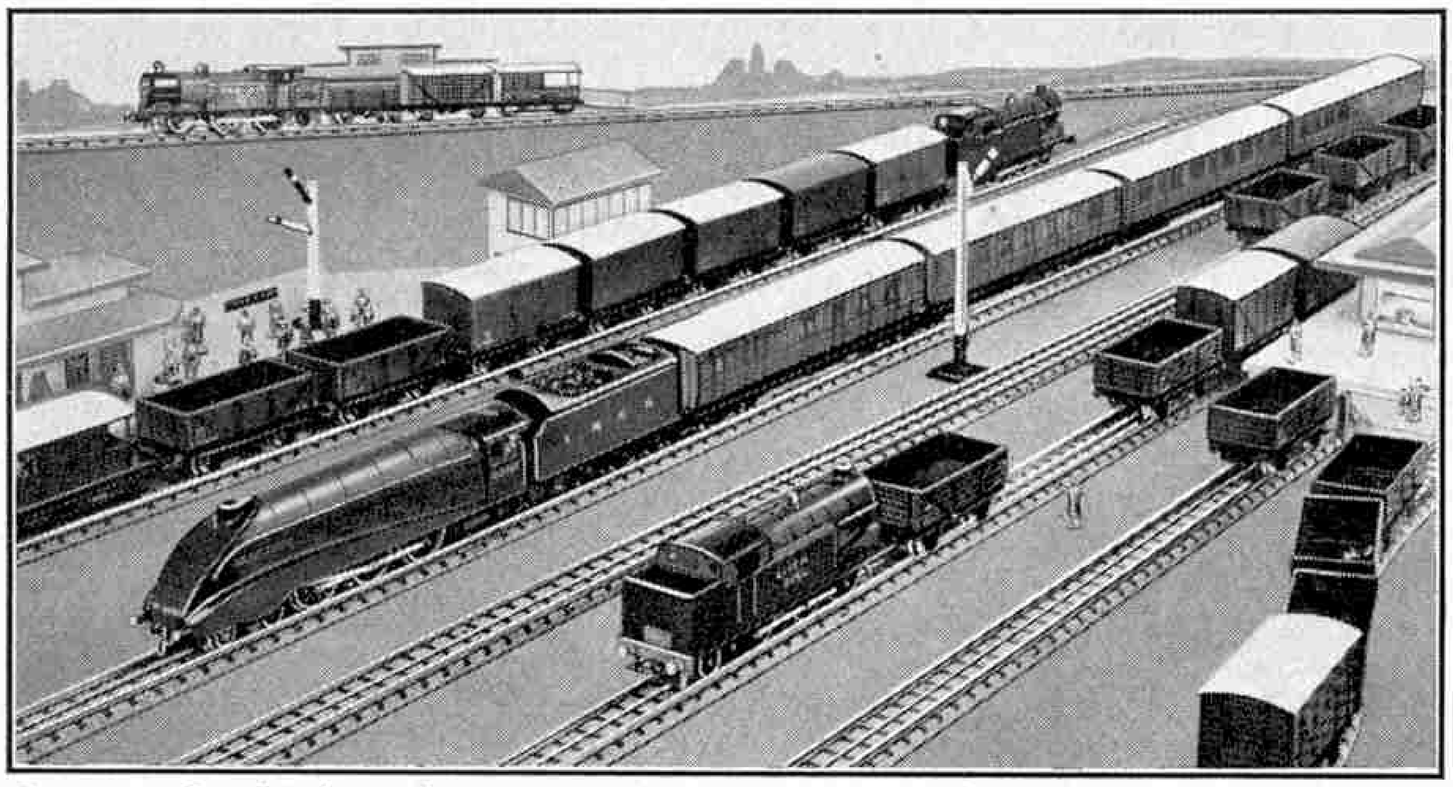
We will assume that the coaches are already alongside the platform of the station. The station is the scene of animated bustle as the Hornby-Dublo railwaymen go about their work and attend generally to the wants of the miniature passengers who are selecting their compartments and getting settled for the journey. The locomotive that is to take the train, No. 4498 *"Sir Nigel Gresley,"* is, we will suppose, waiting in a siding near the station. When all is ready it can be brought gently on to the main line, feeling its way just as the real locomotives do when they are moving slowly. At a touch of the Controller handle the engine is stopped and then reversed in order to back slowly into the station. The operation of coupling up, which in real practice always excites interest among those on the platform, is a simple process owing to the certainty with which the automatic couplings fitted to Hornby-Dublo stock engage with one another.

At last the departure time is near, and at the appointed moment the train moves off in a remarkably realistic manner, the movement of the engine suggesting strongly the characteristic getaway of the real streamliners. Once the train is under way, speed can be varied according to the wishes of the operator. The train can be kept moving moderately at first, as if the engine were climbing as the real L.N.E.R. trains have to do when leaving King's Cross. Then it can be speeded up, and again slowed down, exactly as required. Its passage round certain curves may be made gently, and stations can be passed slowly just as if the train were obeying speed restrictions such as are encountered on a real journey. These variations in speed that are effected at a touch of the Controller handle make us realise the thrill of perfect control; it is most exciting, too, to watch the train dashing through a station or plunging into one of the Hornby-Dublo Tunnels and suddenly emerging at the other end.

Long non-stop runs can be arranged, but it is more interesting from the operating point of view to run trains that make one or two stops during their journeys. The splendid speed regulation that is afforded makes it possible to retard the train gradually and to bring it alongside the platform with the uncanny precision that seems to be second nature to most real engine drivers. The Hornby-Dublo main line Station will accommodate the coaches of a three-coach train alongside its platform.

With a train of this length, therefore, the locomotive has to be stopped a little way beyond the platform, and it is quite good fun to see how closely one can fit the train to the platform when stopping.

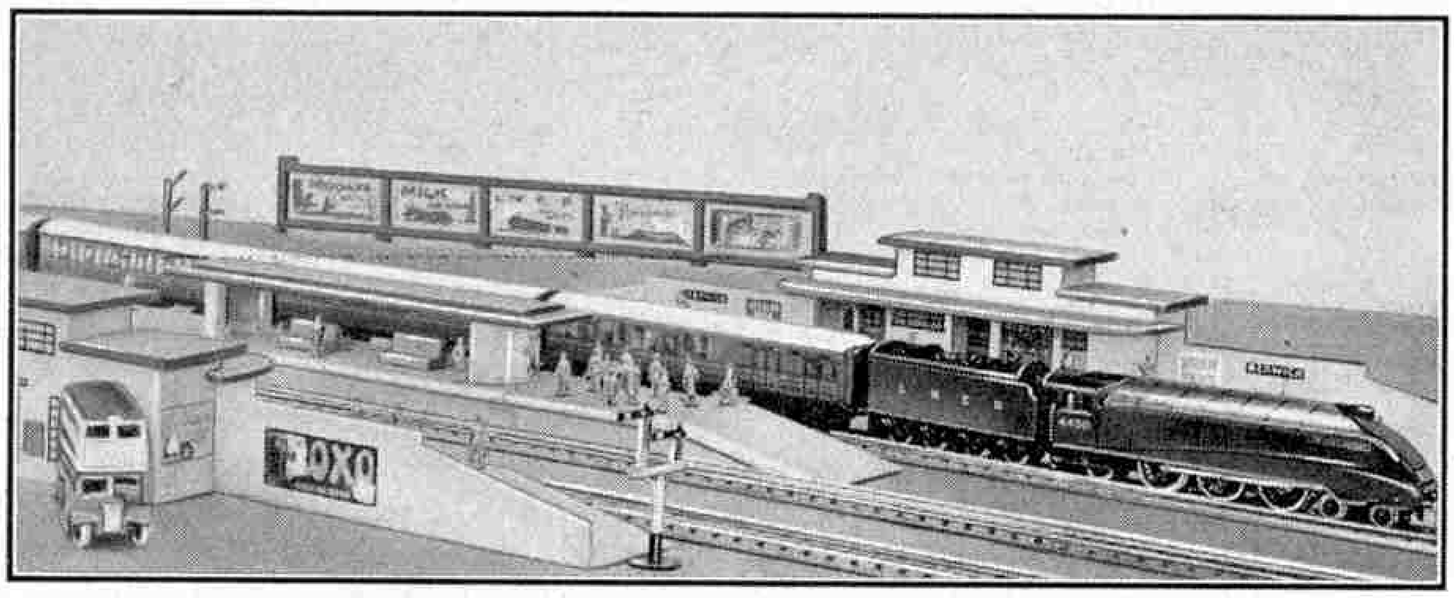
When the train has made the final circuit of its journey it will stand at the platform for a little while to allow its "passengers" to alight. The engine then backs the empty stock out of the station and into a convenient siding where the coaches can be stored until required again. The engine itself can stay with them, or it can be uncoupled, reversed, and run off into a separate siding reserved for locomotive purposes.



Passenger and goods trains passing on the main line. In the foreground a Tank Locomotive is busily engaged in making up a train in the goods yard, where a Hornby-Dublo shunter is directing operations.

Operations just as fascinating can be carried out with the components of the Goods Train Sets; indeed, in goods train shunting and marshalling the perfect remote control of engine and train movements can be employed to the greatest advantage. At the commencement of operations the 0–6–2 Tank, a sturdy representative of a type in use on all the big systems, can come from the engine siding and be made to attach a Goods Brake Van. It then sets off with this on a journey round the main track as if commencing a pick-up trip to collect vehicles from different stations. Actually on most layouts it will make a number of circuits of a continuous main track, calling at the sidings serving the Goods Depot several times over in assembling the train. One wagon only may be collected in one instance, or perhaps two on another occasion, until a full load is obtained.

It is a sheer joy to marshall a train of Hornby-Dublo Wagons; the engine is under complete control and the Wagons need only be pushed together by the locomotive for the couplings to engage. Forward and backward along the different sidings the engine will go, putting its train together in just the same interesting manner as real engines do.



A Hornby-Dublo express makes an intermediate stop. The train is alongside the Island Platform, which here forms part of a complete four-road station.

When running a mixed goods train of Wagons and Vans the operator can please himself with regard to the picking up and setting down of odd vehicles at different stops. With a train of Wagons only, representing perhaps "coal empties" traffic, stops to pick up only will be the rule until the train is complete and can then be despatched on a journey to the loading centre. Through journeys with the load intact throughout can be performed by trains composed exclusively of Vans, which may be considered as conveying "perishable" traffic.

In addition to its goods traffic duties, both in through running and in shunting, the Tank Locomotive is useful in connection with passenger work. It can be made to bring the coaches from the siding to the station to form a train; to add or detach any extra vehicles required, and to carry out the disposal of the train at the end of a journey. It can in fact undertake all the duties that tank engines do in actual practice.

Splendid fun can be had with the Hornby-Dublo Clockwork Trains, although they do not possess the remote control feature that is characteristic of the electric models. They can be braked and reversed by hand, however, by means of levers that project through the cab roof of the streamlined Express Locomotive, and are situated in the bunker in the Tank Locomotive. The locomotives are thus quite easy to handle, and shunting operations requiring the reversing of the locomotives can readily be performed. In order to make the trains stop at the stations it is a good scheme to make a series of test runs in order to find out how many turns of the key should be given to the locomotive so that it comes to rest exactly where required. The carrying out of tests of this kind is always interesting, and is even more so when the actual results are to be put to practical use on the railway.

Clockwork train operation in this manner can be extremely entertaining, and we intend to publish details of a complete scheme of this kind that will provide many hours of real fun.

In a later issue we intend to give details of the various Hornby-Dublo accessories and their uses, such as the various stations. Of these the Main Line Station and the Island Platform can be used separately; or they can be employed together, as shown in the lower illustration on this page, to form a large through station.

The Goods Depot is ideal for its particular purpose, and greatly improves the appearance of any freight yard. Its large "deck" or platform makes possible the realistic arrangement on it of articles of miniature freight, and the Hornby-Dublo figures can be kept busy.

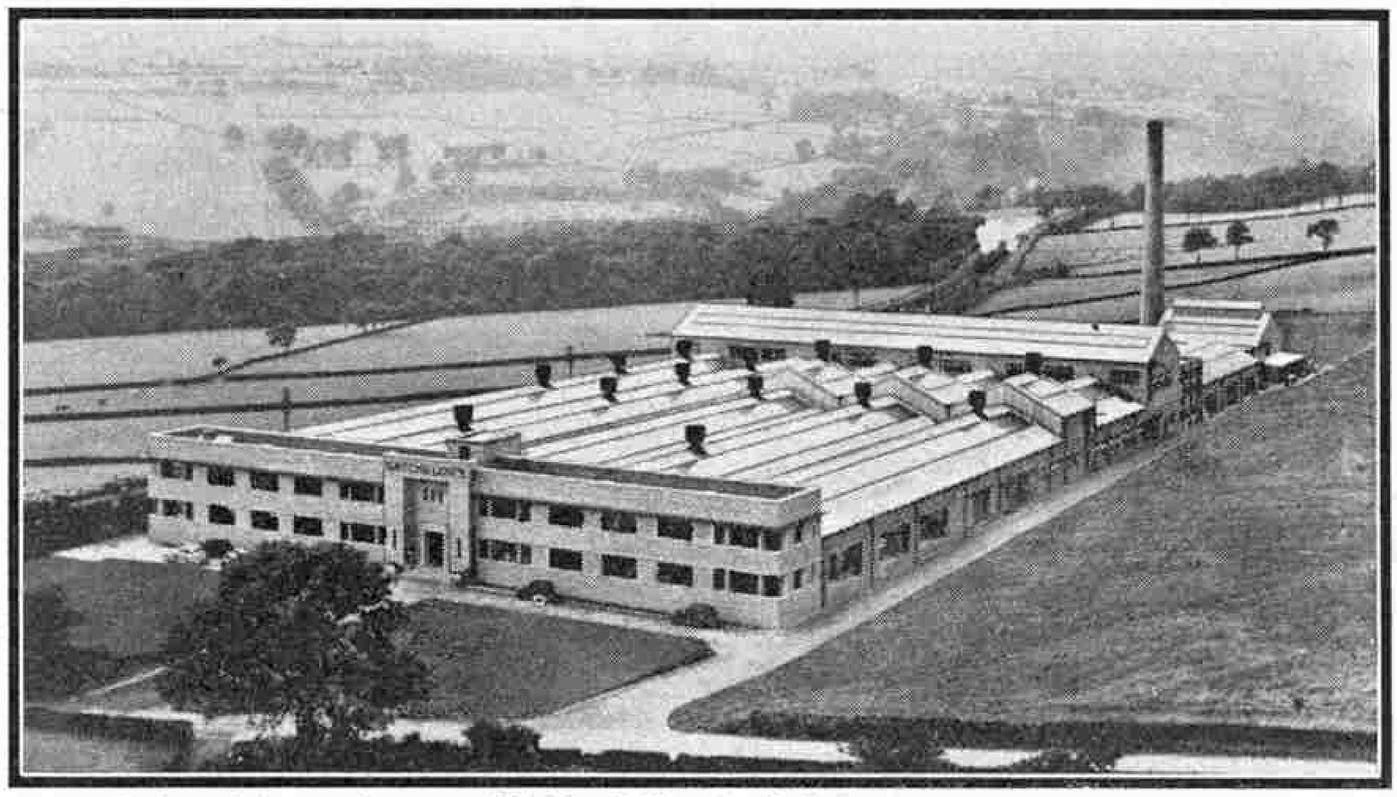
In conjunction with the Stations generally may be considered the Signal Cabin, a typical modern structure. This is useful in many places on the layout, and is most effective when placed near any station on the main line. Associated with it are the Signals themselves; they are necessary to control the traffic and are very realistic.

Large Scale Pea Canning

Mechanised Equipment in New Factory

THE packing and canning of peas sounds a rather dull and unexciting process, and it is therefore surprising to find how interesting the operations really are when conducted on a large scale with the most up-to-date machinery. This can be best appreciated by a visit to the fine factory recently opened by the well-known firm of Batchelor's Peas Limited at Wadsley Bridge, four miles from the centre of Sheffield, where the work has been brought to a high degree of efficiency. The plant already installed has a capacity of 550 cans of peas per minute, and the weekly output of 1½ million cans that will soon be reached will make it the largest of its kind in the world.

The factory is of steel, brick and concrete construction and covers an area of six acres. It is built in five parallel bays with the offices at one end, and another two-storied block devoted to pea-picking divides the main operating parts from the storage department. Features of interest in the building are the roof glazing carried half way down from the peak on the sides of each bay, designed to admit the greatest possible amount of light, and the brickwork specially faced to tone with the surrounding country.



A general view of the new factory at Wadsley Bridge, Sheffield. It covers an area of six acres, and with six acres adjacent for expansion, is the largest establishment of its kind in the world. The illustrations to this article are reproduced by courtesy of Batchelor's Peas Limited.

Throughout the factory the products are practically untouched by hand. An extensive conveyor system makes possible their automatic transfer from one process to the next, and the machines act together as a single co-ordinated unit. Dried peas are brought in by road, or carried in railway trucks right up to the factory, which has its own private siding from the main L.N.E.R. line to Sheffield. They are stored on the ground floor of the building, from which they are lifted by elevators as required to the pea-picking room.

Here they are delivered direct to the automatic picking or "needle" machines, which are very ingenious in construction. They consist of revolving drums studded on their inner surfaces with a large number of sharp needles that engage with damaged and broken peas and carry them upward. The rejected peas then fall into an axial trough, being diverted there by stationary baffles, and a rotating worm moves them along the trough until they pass down a chute into one of two bags attached to the end of the drum. The second bag receives the sound peas. Hand-picking at the tables adjacent to the machines ensures the removal of any damaged peas that have not been caught by the needles of the mechanical graders.

After grading, the peas are discharged down chutes from the picking room to different parts of the factory. They may be required either for canning or for packing in cardboard cartons, each process entailing several interesting features. The firm of Batchelor's was originally founded for pea-packing, and it will be appropriate therefore to describe this side of its activities first.

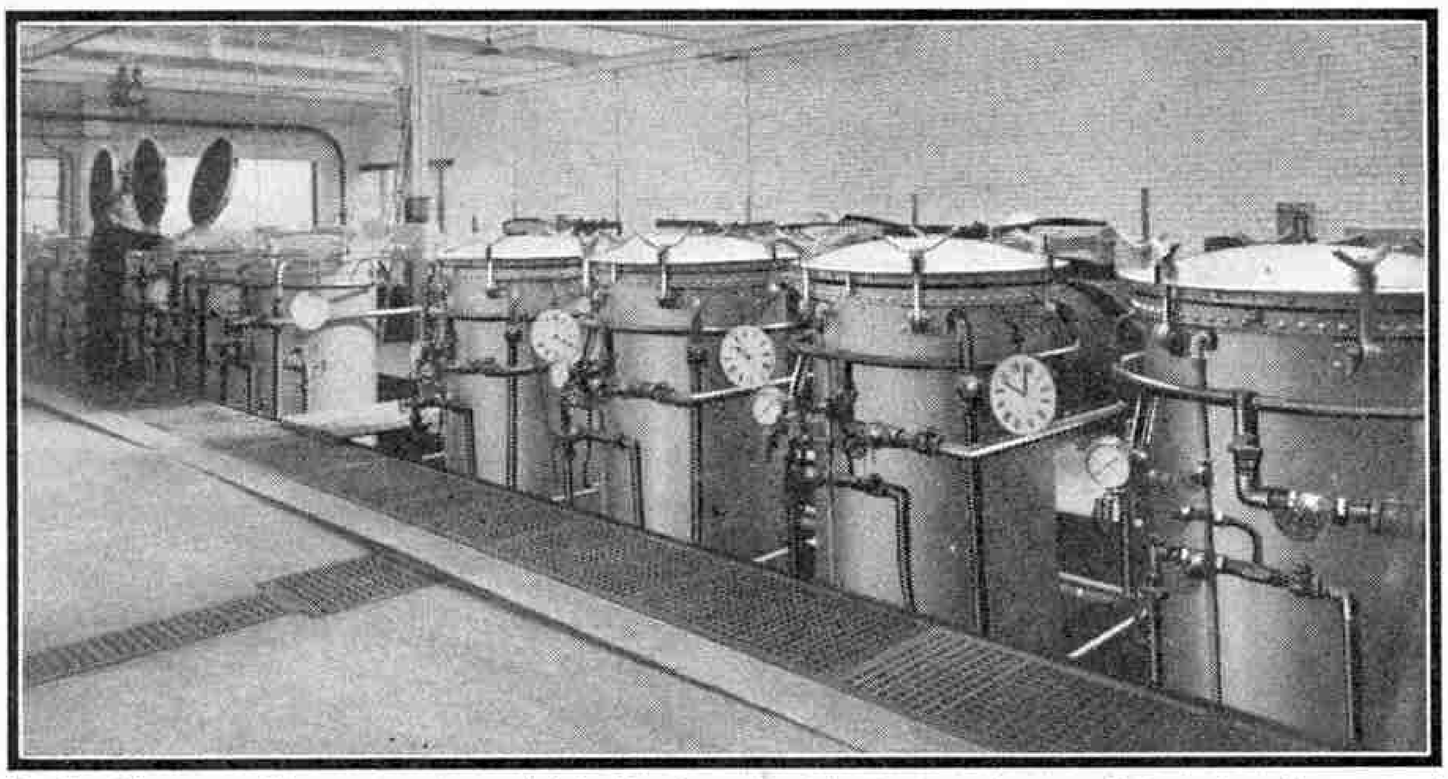
From the chutes the peas are delivered on to electric weighers. The required weight is accurately measured and discharged automatically into a cardboard carton passing underneath. These cartons are fed unopened to the weighing machines and are first of all opened by suction. Then, as they pass along the side of the machine, one end of each carton is folded and glued, and a packet of steeping solution supplied from an adjacent machine is placed inside.

The carton now passes under a revolving head that delivers the measured weight of peas into it; then back along the opposite side of the machine, where the top flaps are folded and glued. The filled packet next moves between two compressor belts that hold down the glued ends to ensure that they are firmly stuck together. All these operations are carried out with amazing rapidity, the packets being delivered at the rate of 100 per minute from each machine. They are packed in large cardboard cases. The flaps of the cases are glued, and then they in their turn move between compressor belts where pressure is maintained until the glue has set. Rectangular cartons of various standard sizes are dealt with by separate machines. Round packages also are handled, a special labelling machine rolling and glueing the appropriate label round them.

Very interesting indeed from the point of view of the machinery used is the canning department. It is partitioned off from the rest of the building by a white glazed brick wall and has been very carefully designed. From the grading room the peas that are to be canned pass down chutes into soaking tanks on the ground floor. The tanks are arranged in two rows, and there are in all 46, of welded steel construction supported on iron legs and rendered mobile by castors. Here the peas are steeped for approximately 15 hours. The water is kept in constant circulation by means of a 3 h.p. motor-driven pump, and in this way the peas are also thoroughly cleaned.

When they have remained in the soaking tanks for the necessary time the peas are automatically delivered by valve control into galvanised iron troughs. A stream of water carries them along the troughs to a perforated bucket-elevator system placed at right-angles to the path along which they have so far been travelling. Sliding partitions stop the peas at whichever elevator is desired. They are then lifted to the blanching machines, which consist of revolving drums with water at the bottom and steam at the top, each driven from the same motor as the elevator that supplies it.

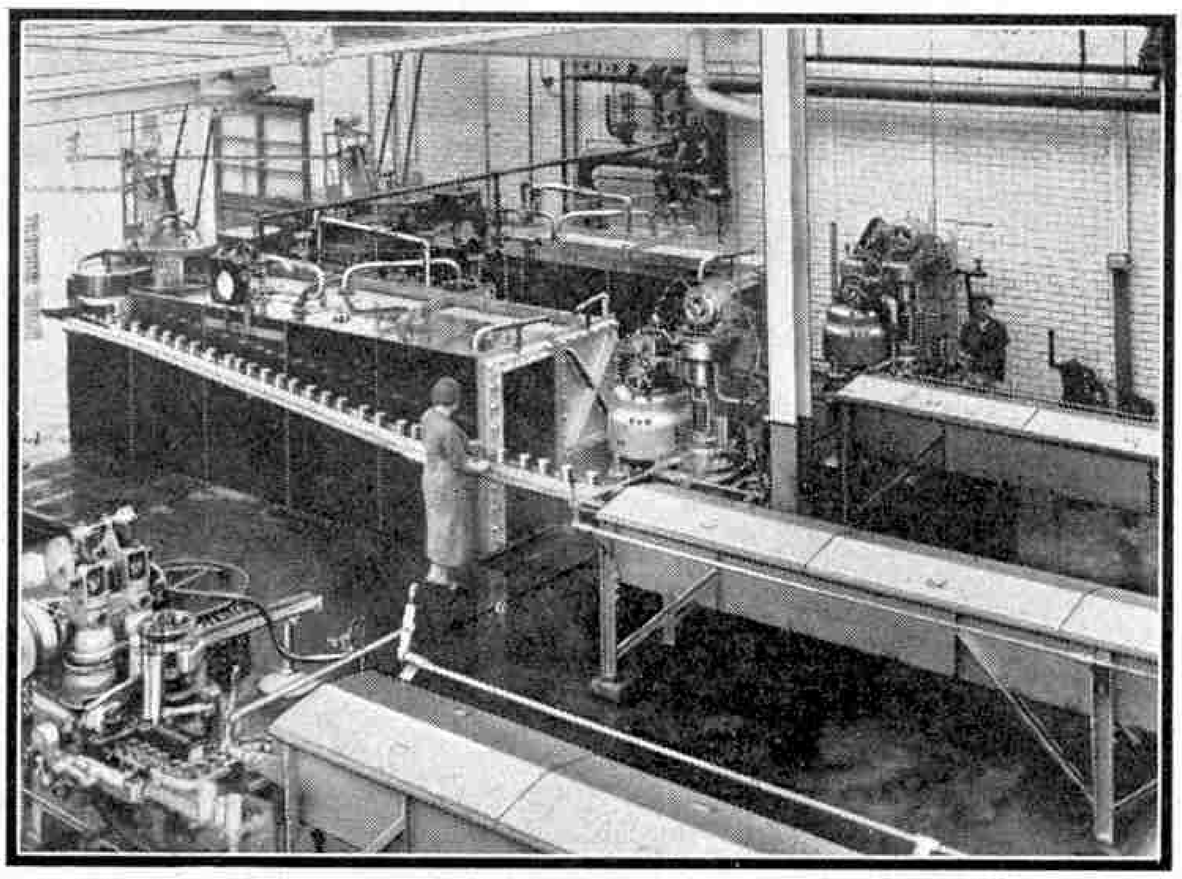
The peas next pass into a revolving cage connected with the blanchers, and are there cooled by water-sprays. Finally from the cage they are ejected on to a broad white endless rubber belt, where they are once more picked over by hand. The belt, which is driven by a 1 h.p. motor, carries the peas to another bucket-elevator system that lifts them to storage bins in a gallery above the can-filling machines to which they are later passed down as required.



Cooking the peas. The cans are lowered into the steam-heated retorts, and removed from them by overhead electric cranes. The clocks show how long cooking has been in progress.

This gallery, which extends the whole breadth of the factory, is the central point of the cannery, for here the empty cans also are delivered and the brine solution that goes into the cans with the peas. The solution is mixed in ten 300 gallon steel coil-heated open tanks on the platform, and from them it is fed by gravity under valve control into the filling machines. The ingredients of the brine tanks are handled by another travelling crane above the platform, which in addition carries three small 50 gallon tanks of syrup for the fruit canning equipment.

One of the most notable features of the factory is the system by which the cans are delivered from the trucks to the filling machines. Though the cannery is situated in the centre of the factory and the cans are received at the far end, the transfer takes only a few minutes. They are unloaded from the trucks on to gantry elevators, iron girder structures about 12 ft. high, each driven by its own small motor. From the chute at the top of the elevator the cans pass through the walls of the factory on to an eight-fold runway, the drive for this system being provided by three motors, located in the gallery already mentioned. The runways are adjustable to fit various sizes of cans, and the cans themselves are moved by endless flexible steel wires direct to the filling machines into which they are delivered by chutes.



An alternative method of cooking The cans of peas move on conveyors from the steam exhausters on the right through the high-pressure cookers in the background.

From these machines the cans, filled with peas, pass on through exhaust-boxes where they are heated to a temperature sufficiently high to ensure that no air is trapped with the peas. Then they move automatically to the seaming machines that deal with up to 120 per minute and carry out the final operation of the canning process. Each lid is placed in position and its edge turned down over the flange of a can to seal it.

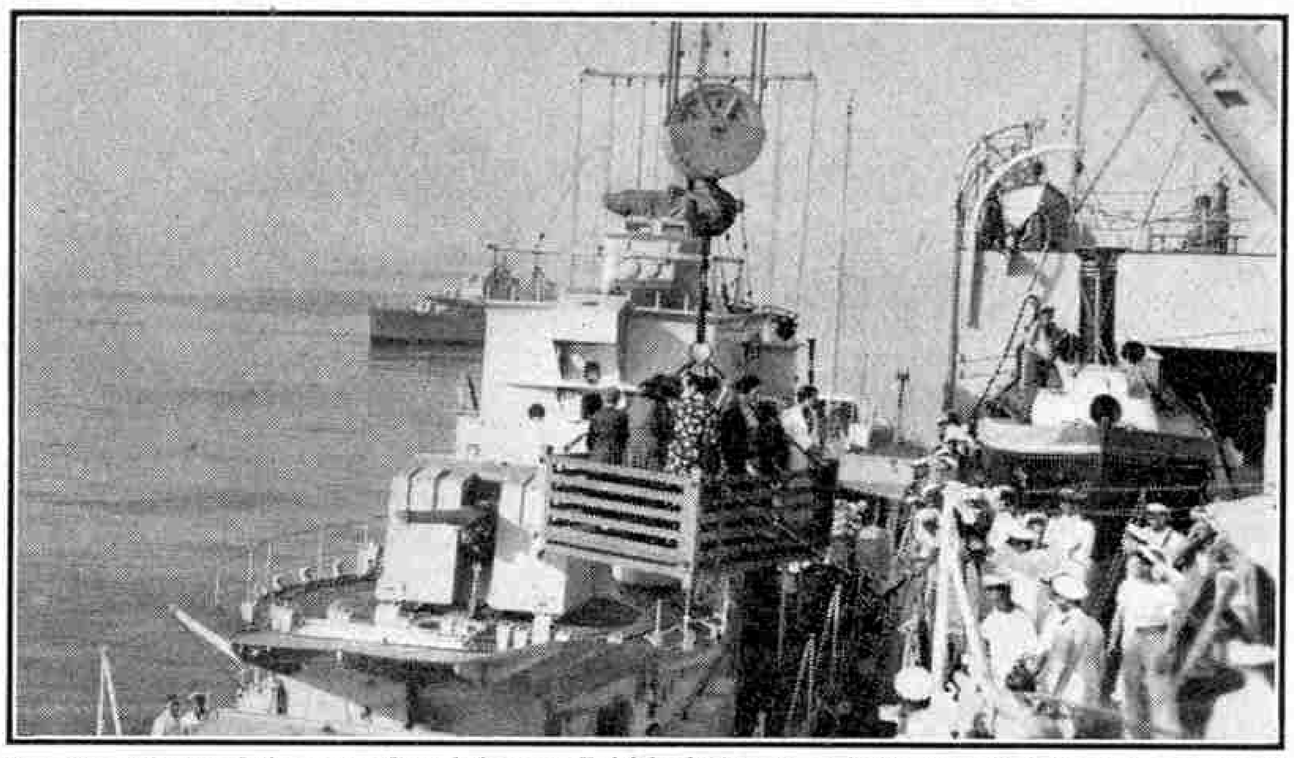
Cooking is the next process and this is done in one of two ways: either in high-pressure steam ovens or in large, steam-heated retorts arranged in two groups of six and five, into which the cans are lifted in crates and from which they are removed by overhead electric cranes. Or they may be passed on conveyors through high-pressure steam ovens, the conveyor system being driven by a 5 h.p. motor. There they are gradually heated to a temperature of 240 degrees F. before passing to another section of the oven where they are cooled by water-sprays. From the retorts or the ovens the cans of peas pass out of the cannery into another part of the building to the labelling machines, each of which deals with 110 a minute. Each can runs over the roller of an electrically-heated gumpot and then enfolds itself in a label that is finally pasted down. The labelled cans are then packed by machines into boxes ready for dispatch from the factory.

Although the packing and canning of peas is the main activity carried on in the factory, other products also are dealt with, and the output of canned fruits and vegetables is rapidly increasing. The equipment is for the most part the same as that already described. Fruit preparing machines such as apple-scrapers are changed according to the season of the year, but most of the machines, such as that used for filling the cans with fruit syrup and the one that finally seals the cans, are the same for every type of product. This is an excellent example of an industry that from small beginnings has grown to a great undertaking in a remarkably short time.

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.

Refugees from Spain

Amid the horrors of the Spanish Civil War, the humanitarian work of evacuating non-combatants carried out by the British Royal Navy has stood out like a beacon. In order to deal with the problem the naval authorities stationed their more commodious ships at Cartagena, Alicante, Valencia and Barcelona, these places being centres of evacuation. In addition, destroyers collected stranded refugees from other points along the coast and took them to the larger ships, where they were fed and housed for a couple of days before being transferred to other destroyers for the run up the coast to Marseilles.


Spanish refugees being transferred from a British destroyer to H.M. Repair Ship "Resource" at Alicante. Photograph by R. L. Mauger, Southsea.

The repair ship "*Resource*" had a particularly busy time at Alicante. Some of the refugees did not like the idea of boarding her by the gangway, and were hoisted from a destroyer's deck to their temporary home in a crate lifted by the larger vessel's 25-ton electric crane, as shown in the upper illustration on this page. R. L. MAUGER (Southsea).

Under Canvas with the O.T.C.

At the end of the summer term most of the various O.T.C. contingents go to camp. This year I went with my school company to Strensall, in Yorkshire, where 26 schools were represented. We slept in bell tents, from four to eight cadets in each, except of course the officers and N.C.O.'s.

The O.T.C. camp at Strensall, in Yorkshire. Photograph by D. Willing, Olton.

We got up each morning at 6.30, made our piles and then paraded for breakfast. Afterwards there was sometimes a parade; on other days we marched off to an immense common near the camp, and there we carried out manœuvres, using blank cartridge or air rifles, or even rattles of the type seen at football matches, for effect purposes! Bayonets were never used, although some of us carried them, but we had full equipment that proved very heavy to march in.

On arrival at camp after a long route march we had to wash our feet and clean our rifles, and then lie on our backs while an officer came round to inspect feet for blisters, and so forth, and to see that our rifles were spotless.

On several afternoons we attended demonstrations of the use of the Bren machine-gun, and anti-tank rifles firing tracer bullets at targets. These bullets leave a streak of fire behind them, and when being fired at the rate of 250 rounds a minute they form an absolute sheet of flame.

"Last Post" or "Lights Out" was sounded at 10 o'clock and that meant bed! A guard was kept at night, and there was a competition for the most efficient guard.

Sometimes in the evening there was a sing-song. One ingenious cadet got a number of mugs, turned them upside-down, and with the aid of a stick played tunes as on a xylophone. He played several popular songs, and soon had the whole company singing away at the top of their voices.

One day was spent in York, where most of us visited the Minster, and many walked round the city on the ancient wall. Others took boats out on the River Ouse. We finally returned to barracks after a really enjoyable day.

Like all good things the camp eventually came to an end, and one morning we were up at 4.30, packing and handing blankets and other material into the stores. Finally, after putting in a good day's work before breakfast, we marched off to Strensall station, homeward bound.

The camp was held at the barracks of the Yorkshire and Lancashire Regiments, and the soldiers acted as hosts during our stay. There was also a detachment of the King's Own Light Infantry at the barracks, and they demonstrated the trooping of the colours to us.

D. WILLING (Olton, Warwickshire).

Making Lime in Somerset

The ancient town of Watchet, near Minehead on the north coast of Somerset, is noted for the alabaster and blue bias rock found there, and the town's name actually means "blue." Wandering along the beach I saw a boy industriously picking up smooth blue stones and loading them into "saddle-like" arrangements fastened on the backs of mules.

Mules at Watchet in Somerset carrying blue bias rock from the sea shore to kilns on the cliff top where it is made into lime. Photograph by L. V. Blackwell, New Malden.

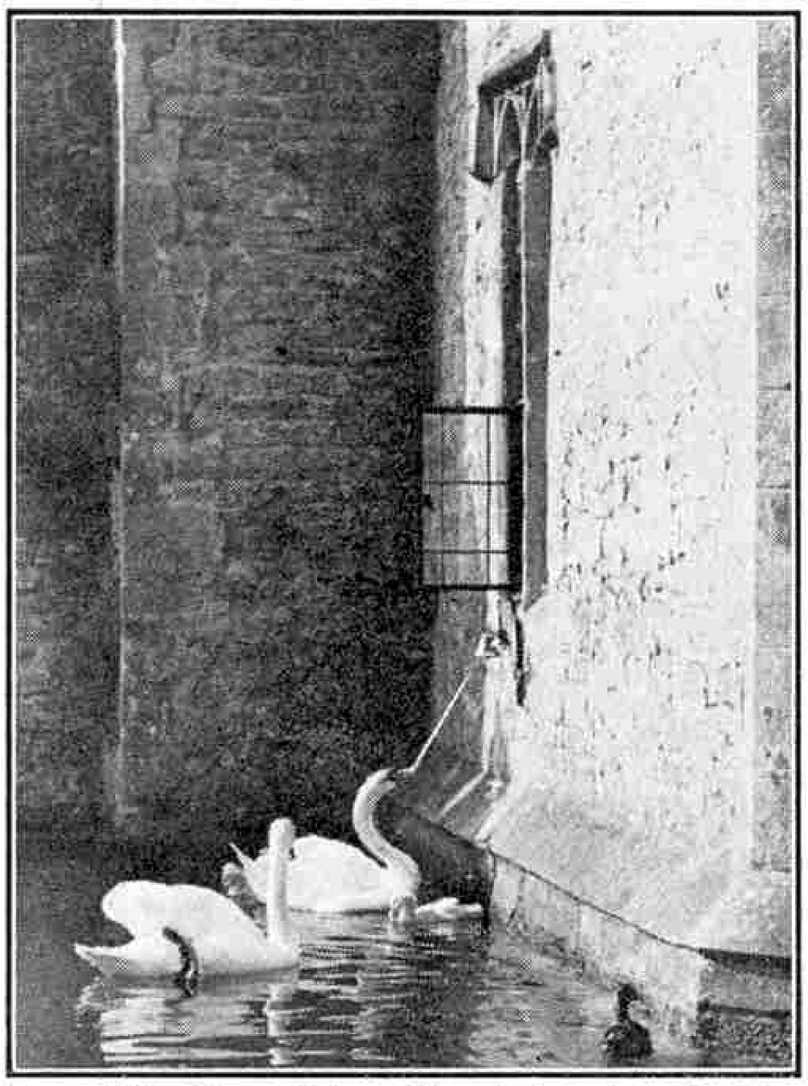
I learned that the stones were for making lime. When the boy had got full loads he drove the mules up a steep path to the cliff top, some hundred feet up, where there were several kilns. The lip of each kiln was flush with the ground, while the furnace was on a lower level, the builders having taken advantage of a natural slope when making them. The stones the boy had gathered were fed into one of the kilns through the top, and as soon as they became hot they split with alarming "pops" and gave off acrid fumes.

The kilns in use had been alight for 18 months when I saw them, and I found that three years was quite a normal length of time for them to be alight. I was also told that this method of making lime was hundreds of years old, and had not varied since it was first used. The product is of very high quality.

L. V. Blackwell (New Malden).

The Bishop's Palace at Wells

Readers visiting Wells should not miss seeing the lovely 13th century Bishop's Palace, which stands close to Wells Cathedral. For a small fee a guide will conduct them over the grounds and point out everything of interest. The great dining hall, once the largest in the country, is now in ruins, although the great old fireplaces can still be seen. The "bottomless" St. Andrews Well, one of the three from which the town gets its name, also can be seen there.



Swans at the Bishop's Palace, Wells, ringing a bell at feeding time. Photograph by J. Hampson, Edgware.

The Palace is surrounded by a moat. This was dragged some years ago and many interesting relics were found, including swords and cannon balls that no doubt played a part in the Civil Wars. Graceful swans now glide over the mirror-like waters of the moat, and they have a quaint custom, handed down through many swan generations. A string is attached to a bell under a window near the drawbridge, and at feeding times the swans pull the string and so ring the bell, as seen in our illustration. Food is then thrown to them from the castle window.

J. Hampson (Edgware).

Bird Life on the Bass Rock

While staying at North Berwick during the summer I went for a sail to the Bass Rock, at the mouth of the Firth of Forth. The Rock is a towering pinnacle inhabited by sea birds, and is similar to Ailsa Craig on the Clyde. When looking at it from the sea I wondered how all the birds found room to move about. The air above it seemed to me filled with screaming birds, and they covered the Rock, jostling each other off the ledges without ceremony.

The first bird to attract my attention was a cormorant. I could see that it was a large black bird with webbed feet, and every now and then it plunged into the sea, to emerge a few seconds later devouring a fish. The bird is a powerful swimmer and an excellent diver. Its diet consists mainly of fish, and it is reputed to be the most gluttonous of sea birds. Certainly the particular one I was watching did not seem to be easily satisfied, for it dived repeatedly, always to reappear swallowing a fish.

The cormorant does not build a nest, but lays its solitary egg on a rocky ledge. The boatman had an egg in a wool-lined case and showed it to me when he saw I was interested. It was curiously shaped, being pointed at one end so that it could only roll in small circles, thus lessening the chances of its rolling off the ledge.

Another bird that I thought at first to be a kind of gull or seamew was also busy diving for fish. I was told that this was a guillemot, notable for its finely-pointed bill and short stumpy tail. This bird is white underneath, with a dark brown back, and it also lays its one egg on a small ledge.

Some birds I noticed were emitting a strange call, and when I heard that they were called kittiwakes I was not surprised, as this name represents as nearly as speech can the call of the bird itself. This bird looks very beautiful with its white and slate-blue colouring and yellow bill curving downward at the tip. The kittiwakes could be seen near the bottom of the cliffs on big nests of seaweed, in which they lay three or four eggs.

Nearer the top of the cliffs, and conspicuous with their bright blue, red and yellow beaks like that of a parrot, was another kind of bird that aroused some amusement because of its awkward way of waddling along the cliff top. It was very graceful in flight, however. This bird also lays just one egg in a suitable cranny, and is known as the puffin.

J. T. Burchell (Edinburgh).

In Search of New Models

Bridges with Opening Spans

WHEN a navigable river has to be bridged, the nature of the surrounding land sometimes makes it difficult to provide the long approaches necessary to allow the building of a bridge of sufficient height to permit tall-masted ships to pass beneath it. Several different types of structure have been designed to overcome this difficulty. In these one span can be moved aside or raised in some manner in order to leave the channel clear.

The main types of movable structures are the bascule bridge, the rolling lift bridge, the swing bridge, and the vertical lift bridge, and all these make fine subjects for Meccano models. They are interesting as structures in which girders, braces and ties can be reproduced in a remarkably realistic manner by means of Meccano Angle Girders and Strips, and the dignified movements of the opening spans of the models add to their fascination. Special bridges of all the types dealt with in this article have been described in the "*M.M.*," and there is a wide choice of originals on which to base really attractive models.

The bascule bridge is perhaps the easiest type of movable bridge to reproduce in Meccano. In its simplest form it consists of a span pivoted at one end so that it can be raised or lowered like the drawbridge of a fort or castle. A counterweight is provided to balance the span, so that comparatively little power is required to operate it.

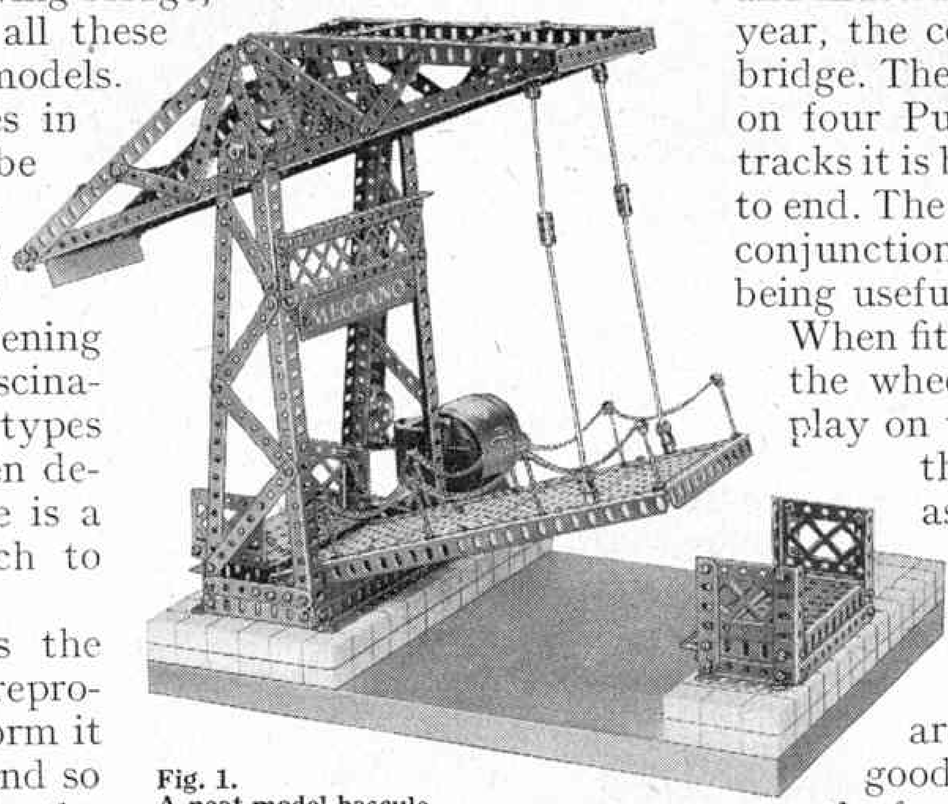


Fig. 1. A neat model bascule bridge of the balanced beam type.

A Meccano model bridge of this kind is shown in Fig. 1. The counterweight beam is connected to the span by a pair of rigid Rods, and is weighted at its rear end by a number of Strips. An Electric or Clockwork Motor can be used as the power unit, and the small *Magic* Motor will be found satisfactory if care is taken to balance the span correctly.

In some bascule bridges the counterweight is mounted on a wheeled carriage, which travels on a curved track that slopes downward from the head of the tower supporting the span to the ground. When the span is fully raised the counterweight is in its lowest position, that is on the part of the track where it is almost horizontal. Most of its weight is then carried by the rails, and only the small amount required to balance the span in its open position is taken by the ropes joining the counterweight to the span.

At the other end of the curved track the slope is almost vertical. When the counterweight is travelling up or down this portion, and the lift-span is almost closed or has just begun to rise, very little of the weight is taken by the track, leaving the greater portion to be carried by the ropes, thus providing the greater pull necessary to balance the span in this position.

A bridge fitted with an automatic counterweight of this type would make a very attractive model, and those in search of a prototype will find a good example described and illustrated in the "*M.M.*" for June of this year, the cover of which shows the complete bridge. The counterweight can be made to run on four Pulleys, and for making the curved tracks it is best to use Curved Strips bolted end to end. The $5\frac{1}{2}''$ Curved Strips should be used in conjunction with $2\frac{1}{2}''$ Curved Strips, the latter being useful for forming the steeper portions.

When fitting the counterweight to the track, the wheels should be allowed a little end play on their axles so that they can adjust themselves to the width of the track, as this may vary slightly from point to point.

Bridges of the double bascule type, that is with a divided span, each half of which can be raised, are sometimes used on wide rivers. A good example of one of these bridges is the famous Tower Bridge, and an interesting model of this is shown in Fig. 3. The balance weights in this case are not visible, because they are fitted on the bascules themselves behind the pivots. When the bascules are raised, the weights sink into wells provided for them.

When building a model of a bridge of this type it is a good plan to make the balance weights slightly heavier than the span. Then it is only necessary to connect the control Cords to the weights inside the towers, so that the bascules can be lowered by winding up the Cords, and raised by slackening them off.

The rolling bridge is really a development of the single bascule bridge. Instead of turning on a pivot, however, the span rolls on quadrants fixed at the sides of one of its ends. The rolling surfaces of the quadrants are provided with openings in which teeth mounted on fixed guides or racks engage to prevent the span from slipping. The counterweight is placed between the quadrants.

The building of suitable quadrants for a Meccano model should not prove difficult. For the teeth it would be a good plan to arrange a number of Threaded Pins or $\frac{3}{8}''$ Bolts, the

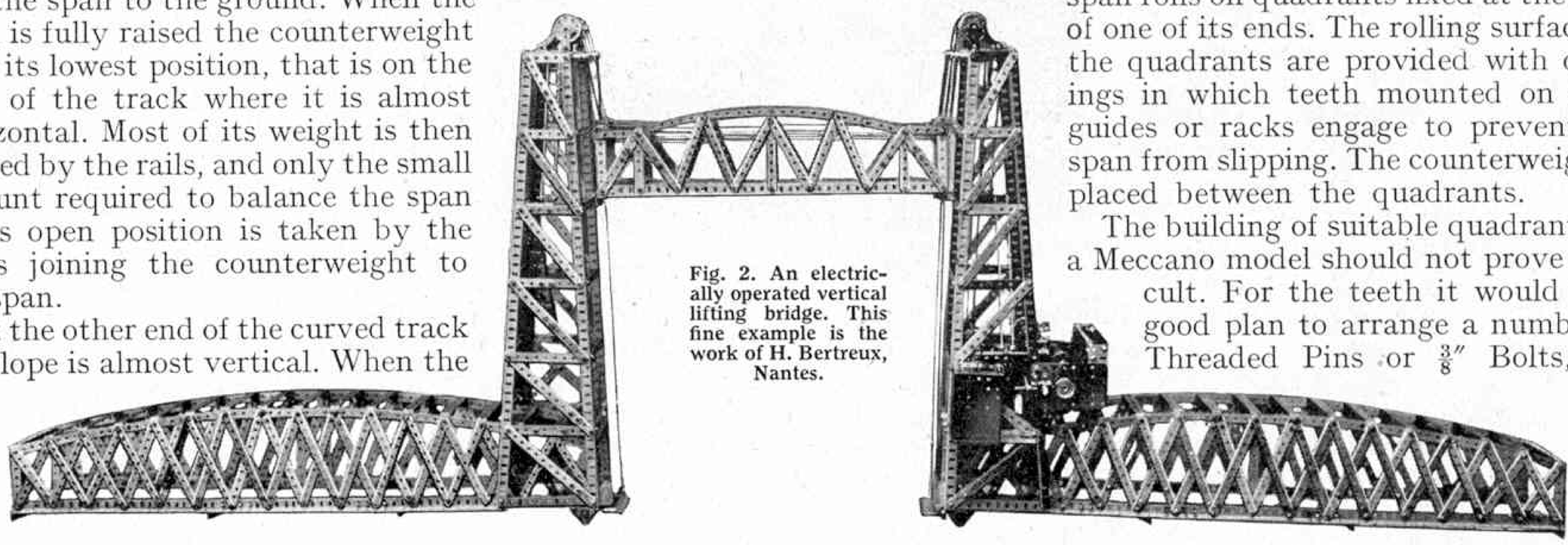


Fig. 2. An electrically operated vertical lifting bridge. This fine example is the work of H. Bertreux, Nantes.

shanks of the Threaded Pins protruding upward so that they engage in the holes of the Strips forming the quadrant.

Fig. 2 illustrates a well-built model of a vertical lift bridge, in which the span is raised vertically by means of a Motor concealed in one of the towers. Balance weights are provided in the towers and are connected to the span by Cords that pass over Pulleys at the tops of the towers. These are built so that they taper towards their upper ends, and inside each is fitted a small inspection ladder constructed of 12½″ Strips joined by Double Brackets. A splendid example of this type at Middlesbrough was described and illustrated in the "*M.M.*" for April 1935, and others in Canada and Holland also have been dealt with in the Magazine.

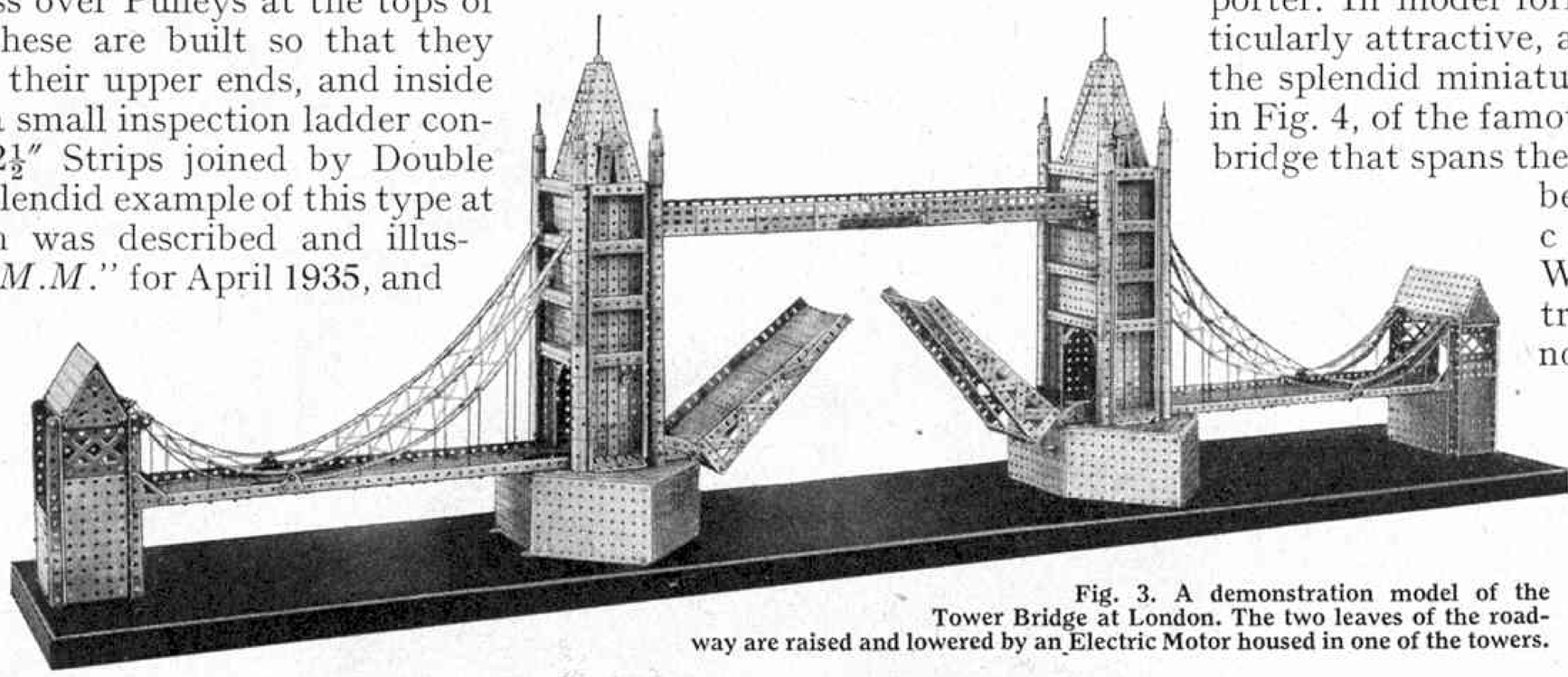


Fig. 3. A demonstration model of the Tower Bridge at London. The two leaves of the roadway are raised and lowered by an Electric Motor housed in one of the towers.

In a large model of a lift bridge, and indeed of any opening type of bridge, interest is added by including the traffic lights on the approach roadways, and the barriers that close automatically just before the span begins to rise, that are features of the actual bridges. Control of these structures is exercised by an operator situated in a special box, usually mounted at a height giving a good view all round, and the flashing of lights of different colours indicates the exact position of the span while it is being raised or lowered. This system of control can be applied to a model with very little difficulty. All that is needed is a number of insulated studs, which are placed at equal intervals along the inner face of one of the towers. The studs are arranged so that the span makes contact with each of them in turn as it is raised and lowered, and are connected to a control board carrying the lamps. The insulated studs can be built up from the 6 B.A. Nuts and Bolts and Insulated Bushes that are included in the Elektron range of parts.

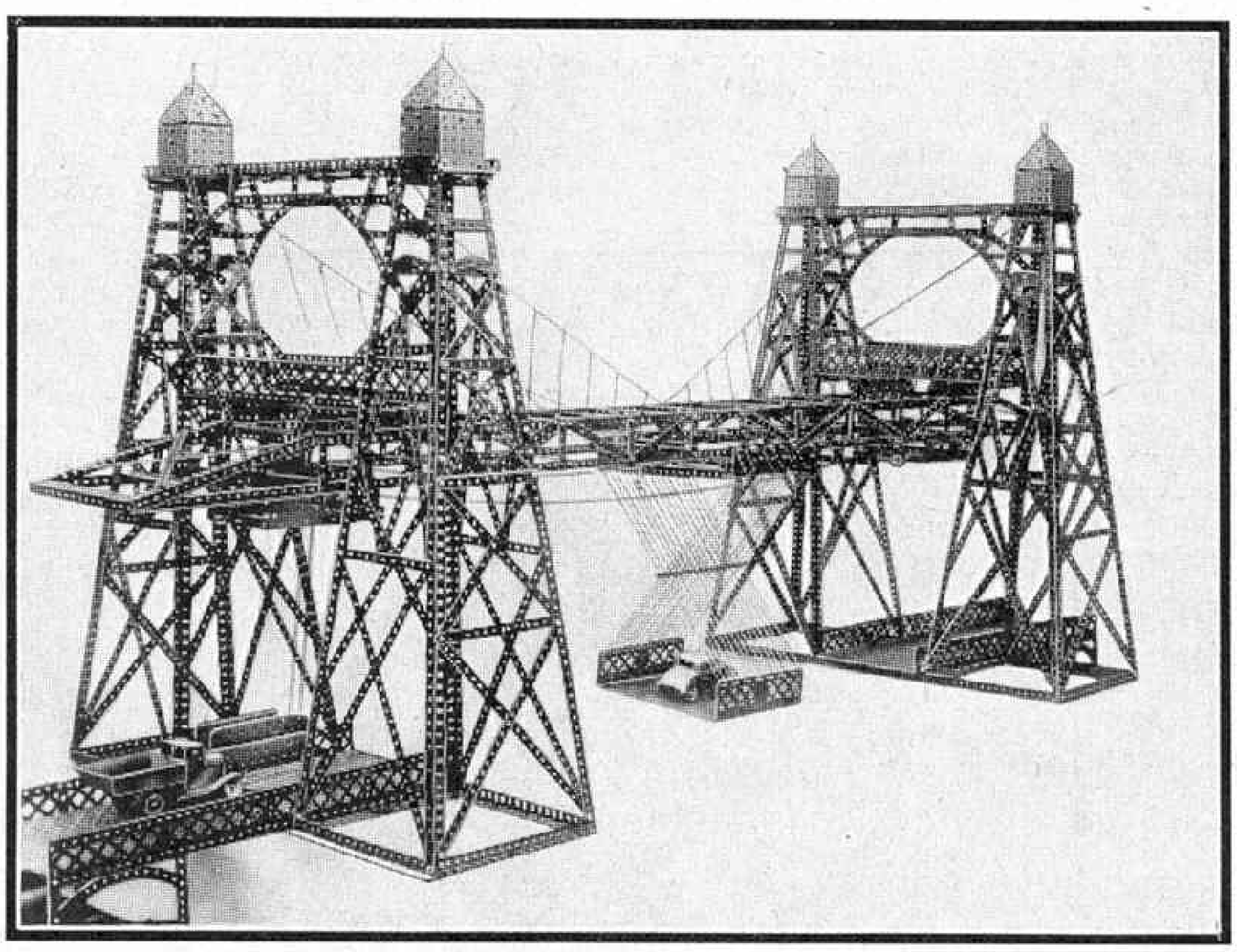


Fig. 4. H. Shorten, Regina, Canada, built this fine model of the famous transporter bridge across the River Mersey at Runcorn.

The best known swing bridge in this country is that at Kincardine-on-Forth, which was described and illustrated in the "*M.M.*" for February 1937. Several fine models have been dealt with in the "*M.M.*," notably that illustrated on page 231 of the April 1938 issue, and readers therefore will be familiar with the general principles on which they operate. The span is pivoted at its centre on an island pier specially prepared for it. Navigable channels are left on each side of the island, so that shipping can proceed up and down the river quite freely when the span is in the open position.

In a model it is best to support the centre span by a Meccano Ball Bearing or, if it is too large for one of these, by a Geared Roller Bearing unit. If neither of these Bearings is available, the next best plan is to use a simple type of roller bearing consisting of Pulleys fixed beneath the span and resting on a circular track on the "island."

One of the most fascinating types of bridge is the transporter. In model form this is particularly attractive, as is shown by the splendid miniature, illustrated in Fig. 4, of the famous transporter bridge that spans the River Mersey between Runcorn and Widnes. A transporter has no opening span in the ordinary sense. Instead a movable section of roadway suspended from a travelling carriage on a high span passes backward and forward across the waterway. In the model shown in Fig. 4 the carriage is slung by cords from a crab driven by an Electric Motor in one of the shore towers. The carriage first travels to one end of the span, pauses there for a few seconds, and then travels back to the other end. After another short pause the sequence is repeated. All these operations are carried out by means of an ingenious automatic reversing mechanism housed in one of the towers.

Model-builders who wish to construct models of this kind will find the automatic reversing mechanism described under S.M. 63 in the "*Standard Mechanisms*" Manual suitable for the purpose. Another good method is to fix trip levers to the span near the limits of travel of the carriage. These trips should be connected by Rods to the switch lever of the Motor, and so arranged that when the carriage makes contact with them they are pushed over and thus reverse the Motor.

In the case of a hand-driven model it is only necessary to arrange a belt of Sprocket Chain between Sprocket Wheels mounted at the tops of the tower, and to connect the crab to it at one point. A Crank Handle is then geared directly to the Rod carrying one of the Sprocket Wheels. Alternatively, Cord passed around Pulleys can be used in place of the Sprocket Chain.

Automatic reversing mechanisms are also useful for incorporation in other types of movable bridges. For example, they can be used for operating the spans of bascule and vertical lift bridges, and with suitable modifications for opening and closing swing bridges.

Meccano Suggestions Section

By "Spanner"

(420) Automatic Speed Controller for Electric Motors

(N. Ta'Bois, Woodford Green)

From time to time I have described in *"Suggestions Section"* ingenious ideas suitable for controlling the speed of Electric Motors. In most of these devices use was made of a centrifugal governor, either connected by a lever to a variable resistance or fitted with a stop to limit the movement of the governor weights, as in a gramophone speed governor.

While devices such as these are satisfactory in most cases where the speed of a Motor has to be kept constant, there are certain instances when this type of mechanism is unsuitable. For example, in an electric clock the speed of the driving motor must be known, and one method of ensuring this is to subject it to the control of an auxiliary motor of the synchronous type, the exact speed of which can be readily calculated. A Meccano Electric Motor controlled by an easily assembled synchronous motor is shown in Figs. 420 and 420a. The mechanism was designed by N. C. Ta'Bois, Woodford Green, Essex, and the synchronous motor is suitable for working from a 6-volt Transformer. The Meccano Electric Motor can be of either the 6-volt or 20-volt type.

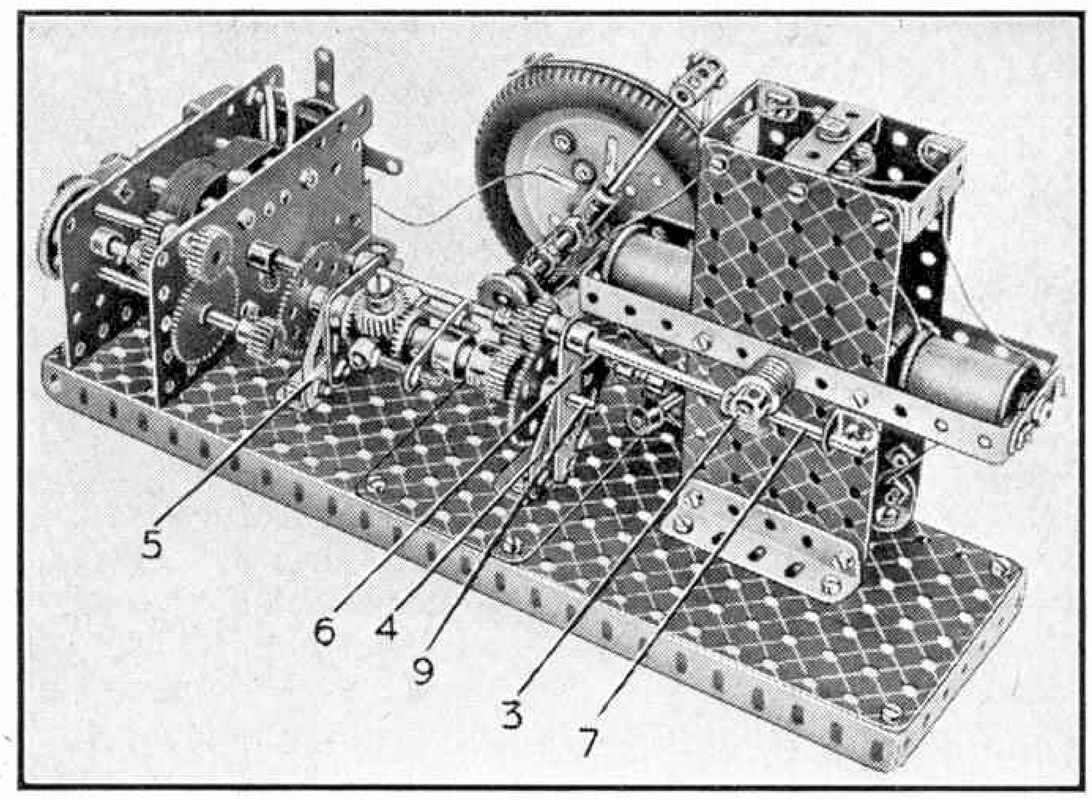


Fig. 420

The principle of the mechanism is as follows. The Electric Motor and the synchronous motor are both coupled through reduction gearing to a differential gear, the cage of which is connected through further gearing to a contact that moves over an electrical resistance connected in series with the Electric Motor. When both driving Contrates of the differential are rotating at the same speed, the cage remains stationary; but it at once commences to rotate if the speed of the Electric Motor fluctuates. The contact then moves over the resistance and increases or decreases its value accordingly, so that the Motor gains or loses speed. This continues until the cage is stationary once more.

The maximum speed of the Electric Motor is considerably higher than that of the synchronous motor, and to obtain the highest efficiency it must be allowed to run as near to this speed as possible. It is necessary therefore to incorporate a greater ratio between the differential and Electric Motor than between the differential and synchronous motor.

The components of the mechanism are mounted on a base built as shown in the illustrations. The rotor of the synchronous motor is a Face Plate 1 and is provided with 8 poles, which on a frequency of 50 cycles give a speed of 750 r.p.m. The casing or stator consists of two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plates 2 in which four Elektron Magnet Coils complete with Cores are mounted, one Coil being secured to the base and the remaining Coils in the positions shown. The Coils are wired together in series.

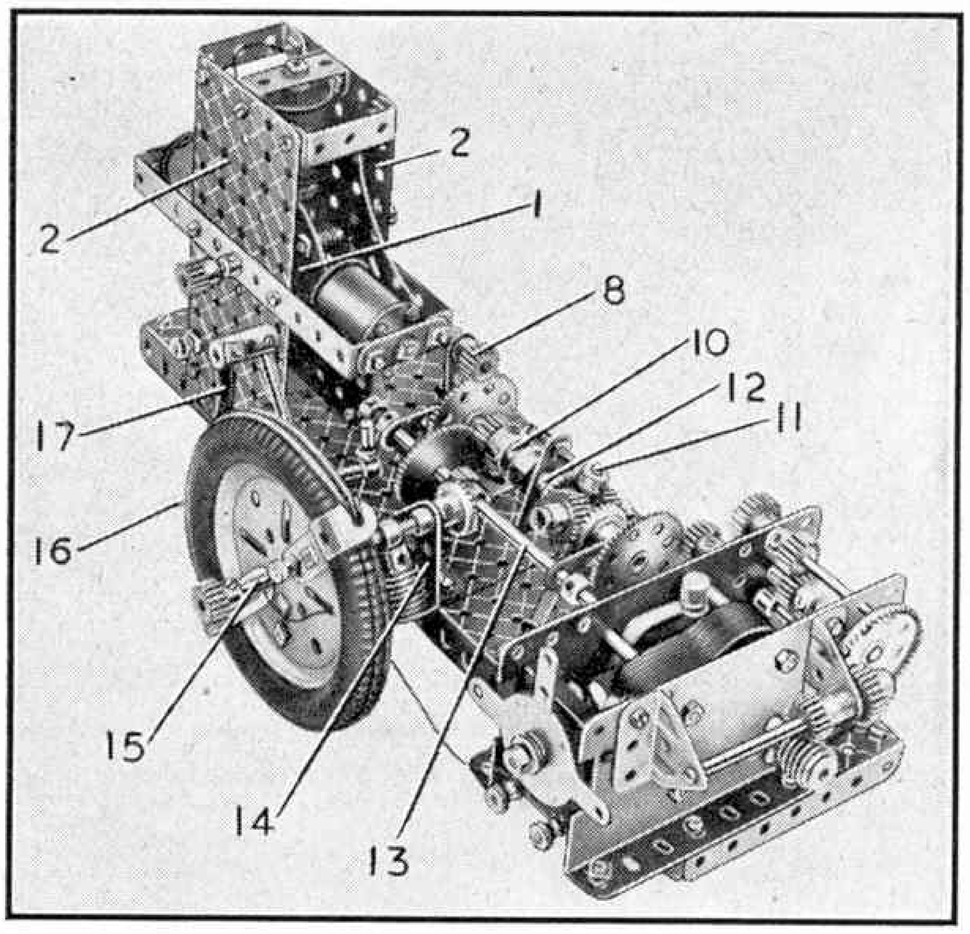


Fig. 420a

Bearings for the differential mechanism are provided by Flat Trunnions 4 and 5. A $4\frac{1}{2}''$ Rod 7 is journalled at one end in a Strip 6, and at its other end in an Angle Bracket as shown. Pinion 8 meshes with a 57-teeth Gear on a 3″ Rod 9, that carries also a Socket Coupling 10 fitted with a $\frac{3}{4}''$ Pinion and a Double Arm Crank, the entire assembly being free to rotate on the Rod. Rod 11 is gripped in a Coupling by two Pivot Bolts, each of which carries a $\frac{3}{4}''$ Pinion on its shank. A $\frac{3}{4}''$ Contrate 12 meshes with these Pinions as shown.

The 5″ Rod 13, which is free to slide in its bearings over a length of about $\frac{1}{4}''$, is fitted with a $\frac{1}{2}''$ Pinion and a 50-teeth Gear that meshes with the $\frac{3}{4}''$ Pinion on Rod 9. A 3″ Pulley with Rubber Tyre is attached to the base by a $1'' \times 1''$ Angle Bracket, and two lengths of Spring Cord are mounted on it as shown, care being taken to stretch the Cord slightly in order to prevent the turns of the wire touching each other.

A Pendulum Connection 17 makes contact with both pieces of Spring Cord of the resistance controller.

The ratio of the gearing between the Electric Motor and the differential permits the armature to rotate at four times the speed of the synchronous motor, that is at 3,000 r.p.m.

In order to operate the mechanism the $\frac{1}{2}''$ Pinion on Rod 13 is thrown out of mesh with the $\frac{3}{4}''$ Contrate by lever 16, and the rotor of the synchronous motor is spun in an anti-clockwise direction. When the synchronous motor commences to operate, the Meccano Electric Motor is switched "on." If the two $\frac{3}{4}''$ Contrates in the differential rotate in the same direction the Motor switch lever must be reversed.

The Pendulum Connection 17 is next moved over the Spring Cord until the $1\frac{1}{2}''$ Rod in the cage of the differential remains stationary, and the $\frac{1}{2}''$ Pinion is then slid into mesh with the $\frac{3}{4}''$ Contrate. Any fluctuations in the speed of the Electric Motor will now be transmitted through the differential cage to the Pendulum Connection 17, which will simultaneously move over the Spring Cord and automatically increase or decrease the resistance in the electric circuit to the Meccano Motor. The model to be driven can be connected to any of the geared shafts in the Motor side plates.

(421) Lubricating Bearings in Meccano Models

When operating Meccano models over long periods, it is always advisable to keep the bearings of the various shafts well oiled in order to avoid wear on the shafts and bearings, and also to reduce friction to a minimum. Normally the model-builder goes over the model with an oil can occasionally, but when a model is required to operate without any attention, some system of automatic lubrication is necessary if it is to remain trouble free.

The best method is to use the Meccano Grease Cup (Part No. 174). This makes use of semi-solid lubricant such as vaseline or graphite grease, which is fed to the bearing by screw pressure.

An alternative automatic lubrication system is the syphon wick lubricator. In this arrangement a cup filled with oil is arranged near the bearing to be lubricated. A short length of wick such as that used in petrol cigarette lighters is threaded through Spring Cord and one end is dipped in the oil, the other end being fitted in the tapped hole of the boss forming the reinforced bearing for the shaft.

(422) Penny-in-the-Slot Mechanism (H. Norton, Sheffield)

In exhibitions of working models, such as those held periodically by Meccano Clubs, it is advantageous to arrange the models so that they can be set in operation by visitors. A simple switch will of course serve the purpose, but where a Meccano Club is concerned a "penny-in-the-slot" mechanism is more desirable. With a device of this kind a model is set in motion when a penny is inserted in the slot provided, and is automatically switched off after a definite period of operation. Such a mechanism is shown in Fig. 422, and as will be noted, simplicity is the keynote of its design.

The mechanism is carried on a base formed by joining a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate to a $5\frac{1}{2}''$ Angle Girder by the Electric Motor and a 3″ Flat Girder. The lever 1 is formed by a 3″ and a $2\frac{1}{2}''$ Strip overlapping three holes, a Double Bracket being clamped between the two Strips. One of the Bolts joining the Strips is an Elektron Contact Screw 4, the purpose of which will be explained later. The Double Bracket is pivotally mounted on a 1″ Rod held in a Collar by Spring Clips. The Collar is supported by a $\frac{1}{2}''$ Bolt fastened to the base, and side play in the Double Bracket is prevented by Washers. At one end of the lever 1 is a Bush Wheel 2, on which the pennies fall. The rear end of the lever 1 is kept in contact with a stop by a length of Spring Cord 3, which is clamped at one end between two vertical 2″ Strips.

The weight of a coin dropped down the chute depresses the Bush Wheel against the action of the Spring Cord and brings the Contact Screw 4 into contact with a second similar part fixed to the base. The second Screw is insulated from the base, but is connected by a length of wire to one terminal of the Electric Motor. One of the leads from the Transformer is connected to the remaining terminal, while the other lead is connected to the Motor frame. When the two Screws make contact, the electric circuit is completed and the Motor comes into operation and drives the model to which it is coupled.

In order to remove the coin from the Bush Wheel, and thus to stop the model, the Screwed Rod 5 is arranged to move across the face of the Bush Wheel. The Screwed Rod is lock-nutted in the tapped hole of a Collar fixed on a $2\frac{1}{2}''$ Rod. The latter part carries a 57-teeth Gear and is journalled in the boss of a Crank bolted to a $3\frac{1}{2}''$ Strip, which can be seen in Fig. 422. The 57-teeth Gear is driven from the Motor, a Worm on the armature shaft of which drives a 57-teeth Gear on a 3″ Rod journalled in two $1'' \times 1''$ Angle Brackets. A $\frac{3}{4}''$ Contrate Wheel on this Rod drives a $\frac{3}{4}''$ Pinion on Rod 7, and a $\frac{1}{2}''$ Pulley on Rod 7 drives through a Driving Band a similar part of a Rod carrying Worm 6, which finally turns the 57-teeth Gear. The ratio of the gearing is such that the Motor is switched off one minute after a coin has been placed in the slot. The height of the Screwed Rod 5 is so adjusted that it continues to press on the Bush Wheel until it has moved clear of its face.

The chute in which the coin is placed consists of four $3\frac{1}{2}''$ Angle Girders, pairs of which are fitted together in the manner shown so that a penny can easily be placed between them. The pairs of Angle Girders are connected by $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips, a washer being used on the inside of each lug for spacing purposes. The angle of the chute is so adjusted that the coin does not slide down too rapidly. The Flexible Plates are then fitted to guide the coins into a suitable receptacle.

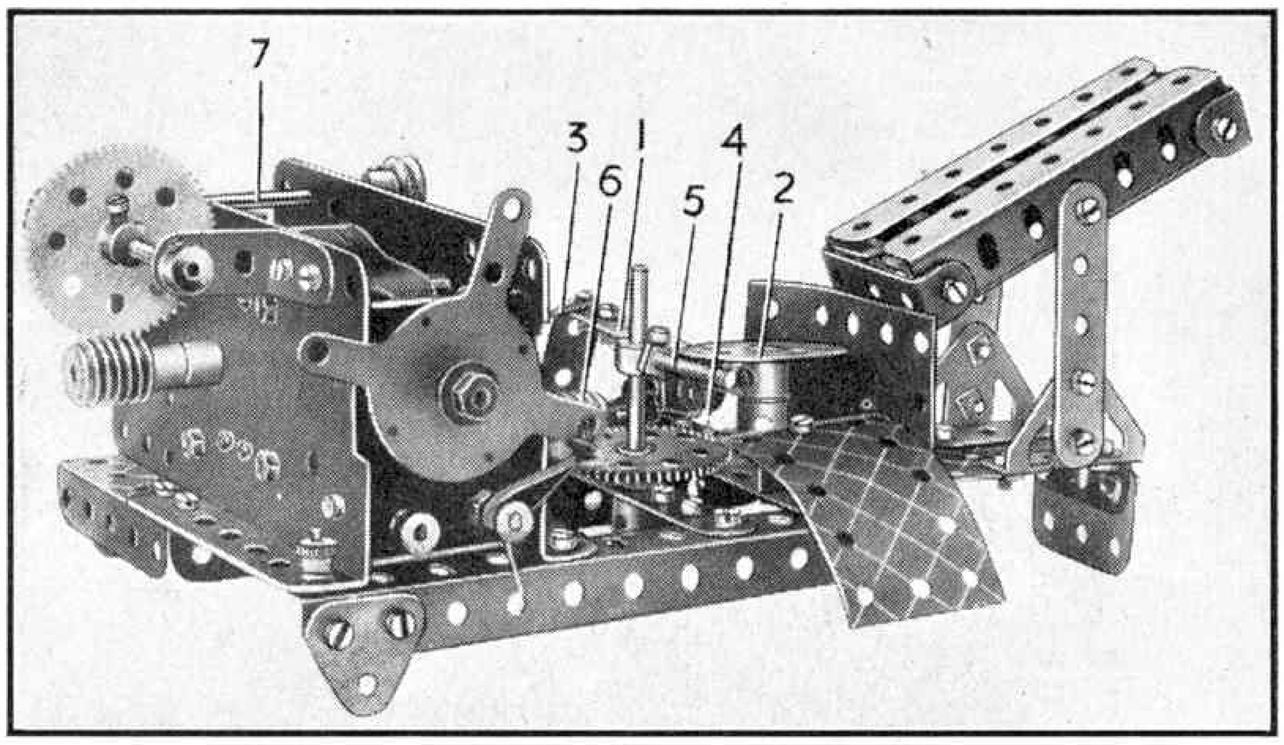


Fig. 422

When mounted in a model, the mechanism should be covered with Plates, and the drive should be taken to the model from the shaft carrying the 57-teeth Gear and Contrate Wheel. If desired a celluloid window can be fitted in the mechanism casing so that the operation of the device can be seen.

The device is shown with a reversing Electric Motor, but if desired either an E1 or an E120 type Motor can be used.

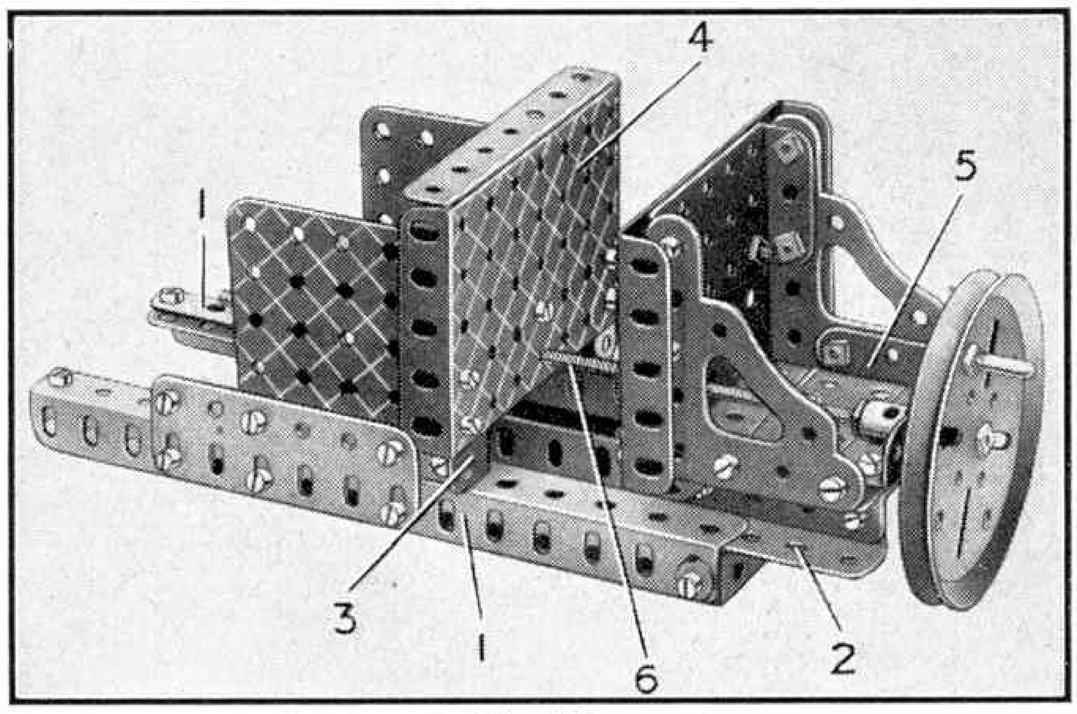


Fig. 423

(423) Meccano Vice (L. Williams, Northampton)

One of the most useful tools in a model-builder's workshop is a vice for holding objects while they are being filed or soldered. A strong Meccano vice of a handy size for average work is shown in Fig. 423, and was suggested by L. Williams, Northampton.

A base for the vice is provided by a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate, to each of the long flanges of which are secured two $7\frac{1}{2}''$ Angle Girders. These form guides for slides to which the moving jaw of the vice is fixed, and each pair of Angle Girders is spaced apart by the flanges of two Angle Girders placed one on top of the other. A $3\frac{1}{2}''$ Angle Girder is attached to each guide by a 3″ Flat Girder, and each supports a pair of $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plates. The vertical 3″ Angle Girders 3 carry the fixed jaw of the vice.

The slides for the moving jaw are pairs of $5\frac{1}{2}''$ Angle Girders 2, which are connected by a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flanged Plate 5 supported by 2″ Angle Girders. A $3\frac{1}{2}''$ Angle Girder bolted across the 2″ Angle Girders carries the $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate that forms the moving jaw. This Plate is braced at each side of the jaw by three Architraves, which are bolted to Flanged Plate 5 and to a second similar Plate fixed to the $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate.

The vice is operated by a Screwed Rod 6, which is screwed into a Threaded Crank bolted at the back of the fixed jaw. The Screwed Rod passes through a $1\frac{1}{2}''$ Angle Girder fixed to Plate 5, end play being prevented by a Threaded Boss clamped in position by a nut, and the 3″ Pulley. The latter part is fixed to the Screwed Rod by its set screw and is additionally gripped by two nuts placed one on each side of its boss.

The vice can be secured to a work bench by passing screws through the Flanged Plate forming the base.

(424) Wind Direction Indicator (P. Lees, London N.1)

P. Lees, London N.1, recently sent us details of an interesting wind direction indicator that he constructed from Meccano parts. In this a large vane is mounted on the end of a horizontal Rod fixed in a Coupling on the upper end of a vertical Rod. The latter Rod is supported by a framework of Angle Girders, and at its lower end is a $\frac{7}{8}''$ Bevel Gear that meshes with a second similar part on a horizontal Rod. This Rod is fitted with a pointer that moves over a circular dial on which the main points of the compass are marked. The pointer is set so that it indicates north on the dial when the vane is pointing in that direction, and the true direction of the wind at any time can then be seen at a glance.

Another ingenious device, also made by Lees, is a wind speed indicator. This consists of a two-bladed fan mounted on the end of a Rod journalled in a suitable framework of Strips. The Rod is fitted with a lever arm that is connected by a Spring to the framework of the model. The shaft on which the fan is mounted has a Rack Segment fixed to it, this part being meshed with a $\frac{1}{2}''$ Pinion. A further step-up gear of 2 : 1, consisting of a 50-teeth Gear and $\frac{3}{4}''$ Pinion, is arranged in the framework of the mechanism, the final shaft being fitted with a pointer. This pointer moves over a dial graduated in miles per hour, and in order to graduate the scale correctly Lees took the device out in a motor car on a calm day and noted the position of the pointer at various road speeds. The device depends for its operation on the tendency of the airflow to turn the fan blades against the Spring.

New Outfit Models

Gantry Crane—Tricycle—Motor Car—Aircraft Carrier

THE chief feature of the four new models described this month is their variety. They range from an aircraft carrier and a small motor car, built from Outfits Nos. 1 and 2 respectively, to a realistic model of an ice cream tricycle and a splendid gantry crane. The ice cream tricycle requires an Outfit No. 4 for its construction, while the gantry crane can be built from an Outfit No. 7 or one larger.

The model aircraft carrier is shown in Fig. 1. Each side of the hull consists of two $6\frac{1}{2}''$ compound strips built up from $5\frac{1}{2}''$ and $2\frac{1}{2}''$ Strips, which are fastened together by Flat Brackets. The sides are joined by $\frac{3}{8}''$ Bolts at the forward end, and the flight deck is fastened to them by Angle Brackets inside the hull.

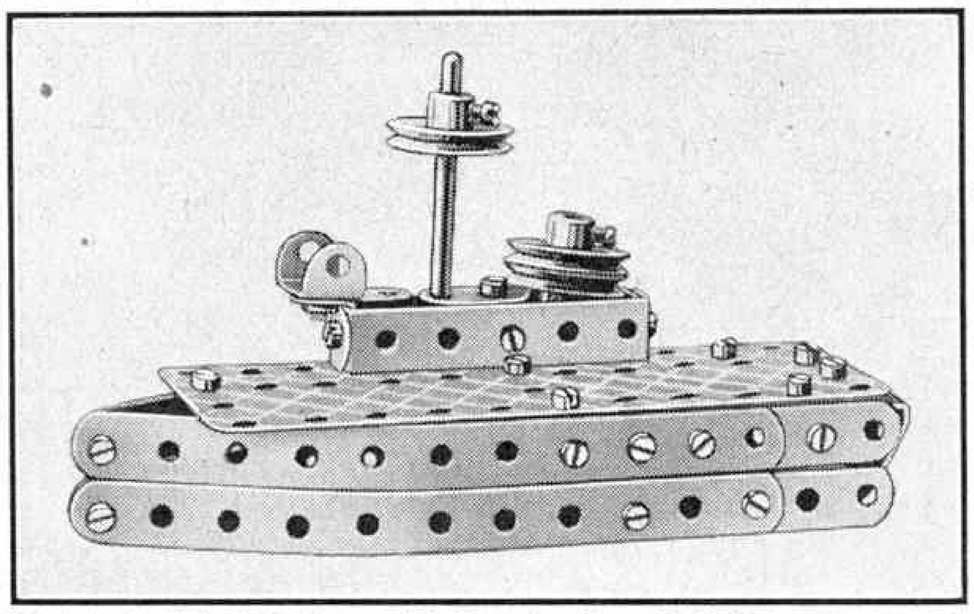


Fig. 1. A simple but effective model of an aircraft carrier built from Outfit No.1.

The deck is formed by two $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates overlapped two holes, and at one side of it two Double Angle Strips are fitted by a Reversed Angle Bracket to form the base of the island superstructure. The Reversed Angle Bracket also supports two Angle Brackets that represent the bridge. A Flat Bracket is fastened to the top of the superstructure by an Angle Bracket to form a support for the $3\frac{1}{2}''$ Rod that is used for the mast.

Parts required to build model aircraft carrier: 4 of No. 2; 4 of No. 5; 2 of No. 10; 7 of No. 12; 1 of No. 16; 1 of No. 17; 3 of No. 22; 26 of No. 27a; 28 of No. 37b; 2 of No. 48a; 2 of No. 111c; 1 of No. 125; 2 of No. 126; 2 of No. 189.

The chassis of the simple model two-seater motor car shown in Fig. 2 consists of two $5\frac{1}{2}''$ Strips 1, which are joined at their rear ends by a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip. Two $2\frac{1}{2}''$ Strips 2 are bolted to each Strip 1 to form the supports for the sides and the roof of the car.

The near side of the car is built up from a $5\frac{1}{2}''$ and a $2\frac{1}{2}''$ Strip together with a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip, while the side not seen is similar except that the Double Angle Strip is replaced by Flat Trunnion 4. A $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate fixed in position by two Trunnions 3 is used for the top of the bonnet and the radiator is represented by a Flat Trunnion attached to the sides of the car by two Angle Brackets.

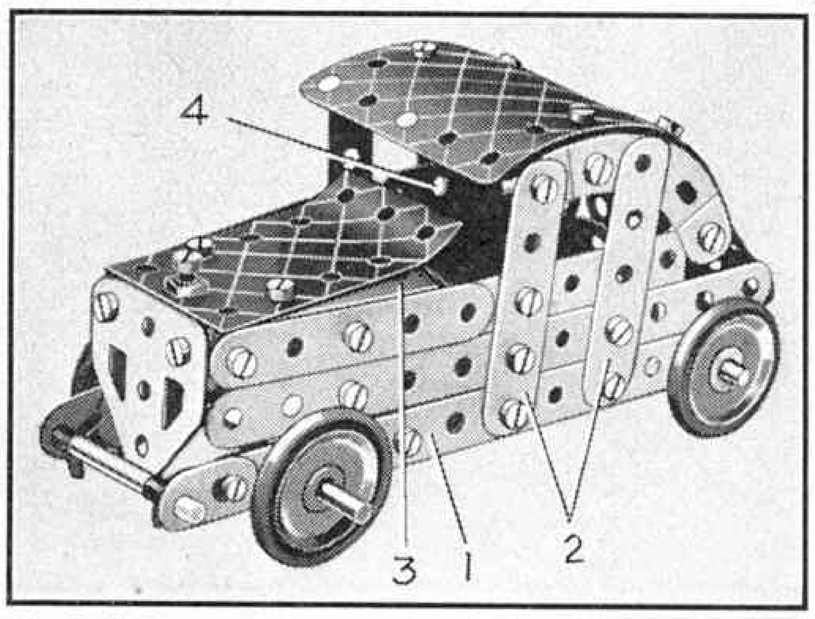


Fig. 2. A Meccano two-seater coupé driven by a Magic Motor.

The roof of the body consists of two $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates curved to shape and fastened by Angle Brackets to two $2\frac{1}{2}''$ Curved Strips, which are secured to the upper ends of $2\frac{1}{2}''$ Strips 2.

Parts required to build model two-seater motor car: 4 of No. 2; 6 of No. 5; 2 of No. 10; 6 of No. 12; 2 of No. 16; 1 of No. 17; 4 of No. 22; 1 of No. 23a; 2 of No. 35; 40 of No. 37a; 38 of No. 37b; 2 of No. 38; 2 of No. 48a; 2 of No. 90a; 1 of No. 111c; 2 of No. 126; 2 of No. 126a; 4 of No. 155a; 1 of No. 186; 1 of No. 188; 2 of No. 190; 1 *Magic* Motor (not included in Outfit).

Construction of the ice cream man and his tricycle shown in Fig. 3 is commenced with the ice cream container. The top of this consists of a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate, to each of the longer flanges of which a $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate is bolted. One of the $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates is extended downwards by a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate to form one side of the container, but to the other are bolted two $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates so that a space is left for the winding shaft of a No. 1 Clockwork Motor. The latter is bolted direct to the flange of the $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate. The lower edges of the $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate and the two $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates are braced by $5\frac{1}{2}''$ Strips.

The front and rear of the container are each formed by a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ and a $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate and a $2\frac{1}{2}''$ Curved Strip, all of which are bolted to the end flanges of the Flanged Plate and also are attached to the sides of the ice cream container by two $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips.

The front Road Wheels are locked on a $3\frac{1}{2}''$ Rod that is journalled in two Flat Brackets bolted to the sides of the container. The Rod carries at its centre a $1''$ Pulley, which is connected by a $2\frac{1}{2}''$ Driving Band to the driving shaft of the Motor.

The lower frame of the tricycle consists of two $5\frac{1}{2}''$ Strips. The latter are bolted at their forward ends to a Double Bracket that in turn is secured by a lock-nutted bolt to the centre hole of a Double Angle Strip fastened between the sides of the container. A pair of $3''$ compound strips, each consisting of two $2\frac{1}{2}''$ Strips overlapped four holes, are used for the rear forks, and they are mounted on the two $5\frac{1}{2}''$ Strips by a $2''$ Rod that forms the axle for the rear wheel. Two $3\frac{1}{2}''$ Strips are mounted on a $1\frac{1}{2}''$ Rod passed through the sixth hole from the forward ends of the $5\frac{1}{2}''$ Strips. The upper ends of the $3\frac{1}{2}''$ Strips and those of the $3''$ compound strips are bolted to the lugs of a Double Bracket. Two Flat Trunnions are fastened to the Double Bracket to represent the saddle. One end of the $1\frac{1}{2}''$ Rod carries a Bush Wheel and at the other end is a $1''$ Pulley that is connected to another $1''$ Pulley on the rear axle.

The illustration shows how the ice cream man himself is built up and secured on the saddle by means of an Angle Bracket. The $2\frac{1}{2}''$ Strips forming his legs are fastened together by lock-nutted bolts. One of his feet is attached to the Bush Wheel and the other to an Angle Bracket bolted to the boss of the $1''$ Pulley on the $1\frac{1}{2}''$ Rod, so that as the model runs along the floor his feet move up and down realistically, as if he were pedalling.

Parts required to build model ice cream tricycle: 6 of No. 2; 2 of No. 3; 8 of No. 5; 4 of No. 10; 2 of No. 11; 7 of No. 12; 1 of No. 15b; 1 of No. 16; 1 of No. 17; 1 of No. 18a; 5 of No. 22; 1 of No. 24; 7 of No. 35; 68 of No. 37; 11 of No. 37a; 8 of No. 38; 1 of No. 40; 1 of No. 48; 3 of No. 48a; 1 of No. 51; 1 of No. 52; 4 of No. 90a; 4 of No. 111c; 2 of No. 125; 2 of No. 126a; 2 of No. 155a; 1 of No. 186; 1 of No. 187; 2 of No. 188; 2 of No. 189; 4 of No. 190; 1 of No. 192; 2 of No. 199; 4 of No. 215; 2 of No. 217a; 1 No. 1 Clockwork Motor (not included in Outfit).

The remaining model to be described is the fine gantry crane shown in Fig. 4. The gantry rails are each formed by a $12\frac{1}{2}''$ Strip to the ends of which are bolted two upright $12\frac{1}{2}''$ Angle Girders. Pairs of the latter are joined across by $17\frac{1}{2}''$ compound strips.

The gantry is constructed from two 19″ compound angle girders 1, the ends of which are joined by two $3\frac{1}{2}''$ Strips. To the horizontal flange of each of the girders three $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates and one $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate are bolted, to form a platform. The outer edges of the Plates are strengthened by $5\frac{1}{2}''$ Strips that are fastened in position by Angle Brackets. Further Strips of different sizes are bolted to the $5\frac{1}{2}''$ Strips to represent the girders used to brace actual gantries of this kind. The gantry runs on $\frac{3}{4}''$ Flanged Wheels, two of which are mounted at each of its ends on a $5\frac{1}{2}''$ Strip secured to the girders 1 by two $1\frac{1}{2}''$ Strips and Angle Brackets. The Flanged Wheels are fastened to the $5\frac{1}{2}''$ Strips by $\frac{1}{2}''$ and $\frac{3}{4}''$ Bolts that are lock-nutted in position.

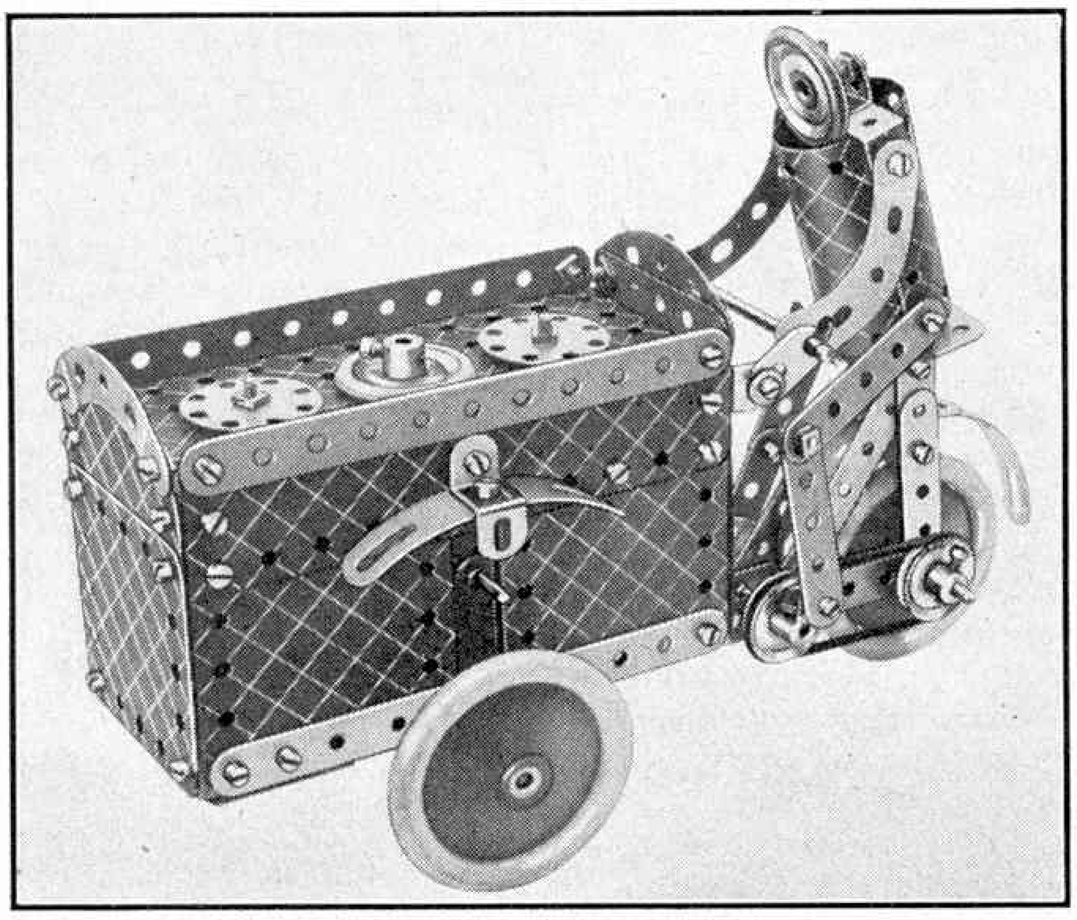


Fig. 3. This working model ice cream tricycle and driver can be built from the parts contained in Outfit No. 4.

The sides of the driver's cabin consist of two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plates bolted underneath the platforms by their shorter flanges so that they are $4\frac{1}{2}''$ apart, and they are extended forward by two $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates. The latter are joined by two further $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates that form the front of the cabin. Two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates are used for the back of the cabin, and two $4\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates for the floor.

The framework of the crab that runs on the gantry is built by bolting two $2\frac{1}{2}''$ Strips to the flanges of a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flanged Plate 2. The free ends of the Strips are joined by a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip 3. The wheels of the crab are mounted on two $3\frac{1}{2}''$ Rods that are journalled in the turned up ends of two $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips. The latter are supported by Trunnions from Flanged Plate 2 and Double Angle Strip 3.

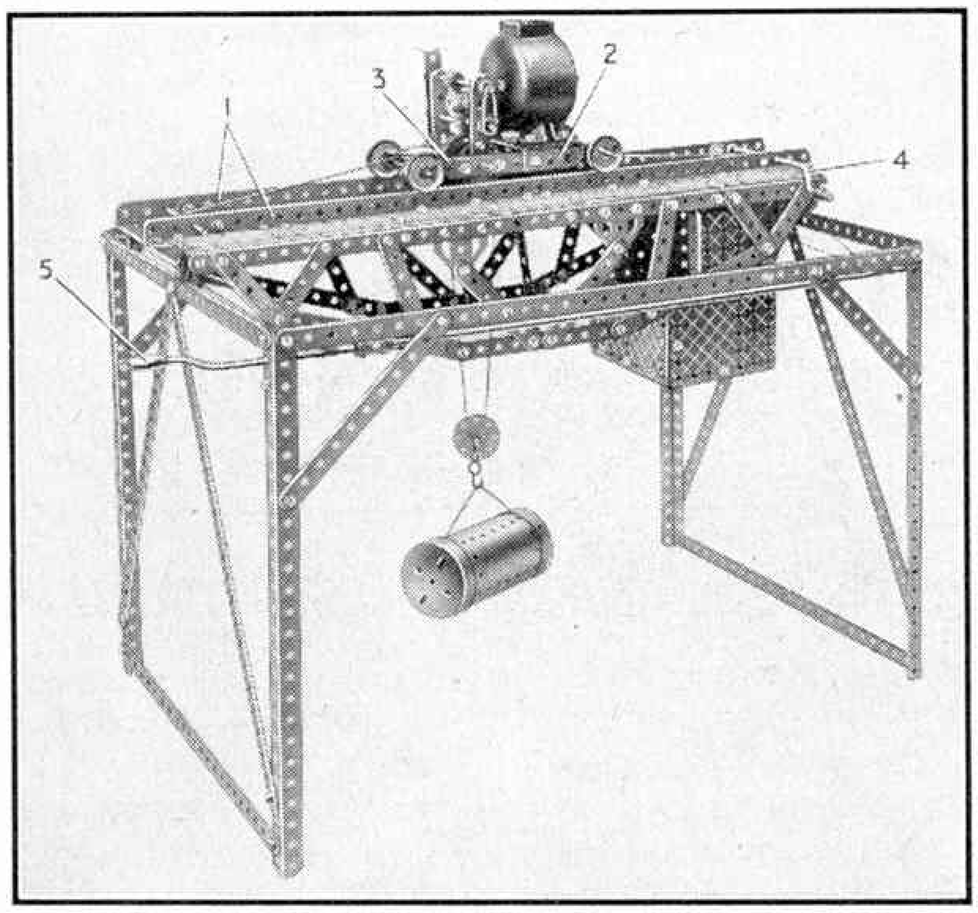


Fig. 4. A fine model electric gantry crane operated by one of the new all-enclosed Meccano Electric Motors.

The Electric Motor is mounted on the Flanged Plate 2 by two $\frac{3}{8}''$ Bolts, each of which carries four Washers on its shank to space the Motor upwards. A Worm Wheel on the driving shaft of the Motor is arranged to mesh with either of two $\frac{1}{2}''$ Pinions, which are fastened on two $3\frac{1}{2}''$ Rods, one of which is journalled above, and the other below the Worm Wheel, in two $2\frac{1}{2}''$ Strips. The $2\frac{1}{2}''$ Strips are not actually bolted to the carriage, but are supported from it by two $1\frac{1}{4}''$ Discs. The lower $3\frac{1}{2}''$ Rod carries at one end the small pulley supplied with the Motor, and a $2\frac{1}{2}''$ Driving Band is passed round this and also round the upper $3\frac{1}{2}''$ Rod.

A 57-teeth Gear on a 4″ Rod journalled in the frame of the carriage is arranged to mesh with the lower $\frac{1}{2}''$ Pinion. The 4″ Rod forms the winding drum, and it can be made to revolve in either direction by sliding first one and then the other of the $\frac{1}{2}''$ Pinions into mesh with the Worm Wheel. When the upper Pinion is in mesh with the Worm the drive is transferred by the Driving Band to the lower $3\frac{1}{2}''$ Rod and from this Rod to the winding drum through the second $\frac{1}{2}''$ Pinion and the 57-teeth Gear. When the lower Pinion is in mesh the drive is transmitted direct to the winding drum through the 57-teeth Gear. The $3\frac{1}{2}''$ Rods carrying the Pinions are connected by a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip, which is held in position on the Rods by Collars, in order to facilitate sliding them into position. The hoisting Cord is tied to the 4″ Rod and wound around it several times. The free end of the Cord is then passed through the hoisting block and tied to the $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flanged Plate 2.

The crab is traversed by turning a large Crank Handle 4 journalled in the girders 1. A length of Cord is tied to Plate 2 of the carriage, wound tightly five or six times around the shaft of the Crank Handle and then passed over a 4″ Rod at the other end of girders 1. The free end of the Cord is tied to the Double Angle Strip 3.

A similar method is used for traversing the gantry along the rails. Two separate pieces of Cord are used in this case, however, and they are wound round the shaft of a compound crank handle consisting of a Crank Handle 5 extended by an $11\frac{1}{2}''$ and a $4\frac{1}{2}''$ Rod. The crank handle is journalled in two of the Angle Girders supporting the rails. At the other end of the rails the Cords are passed over $1\frac{1}{2}''$ Rods journalled in Double Brackets. The Double Brackets are bolted to the $17\frac{1}{2}''$ compound strips joining the rails, and the $1\frac{1}{2}''$ Rods are fastened in them by means of Spring Clips.

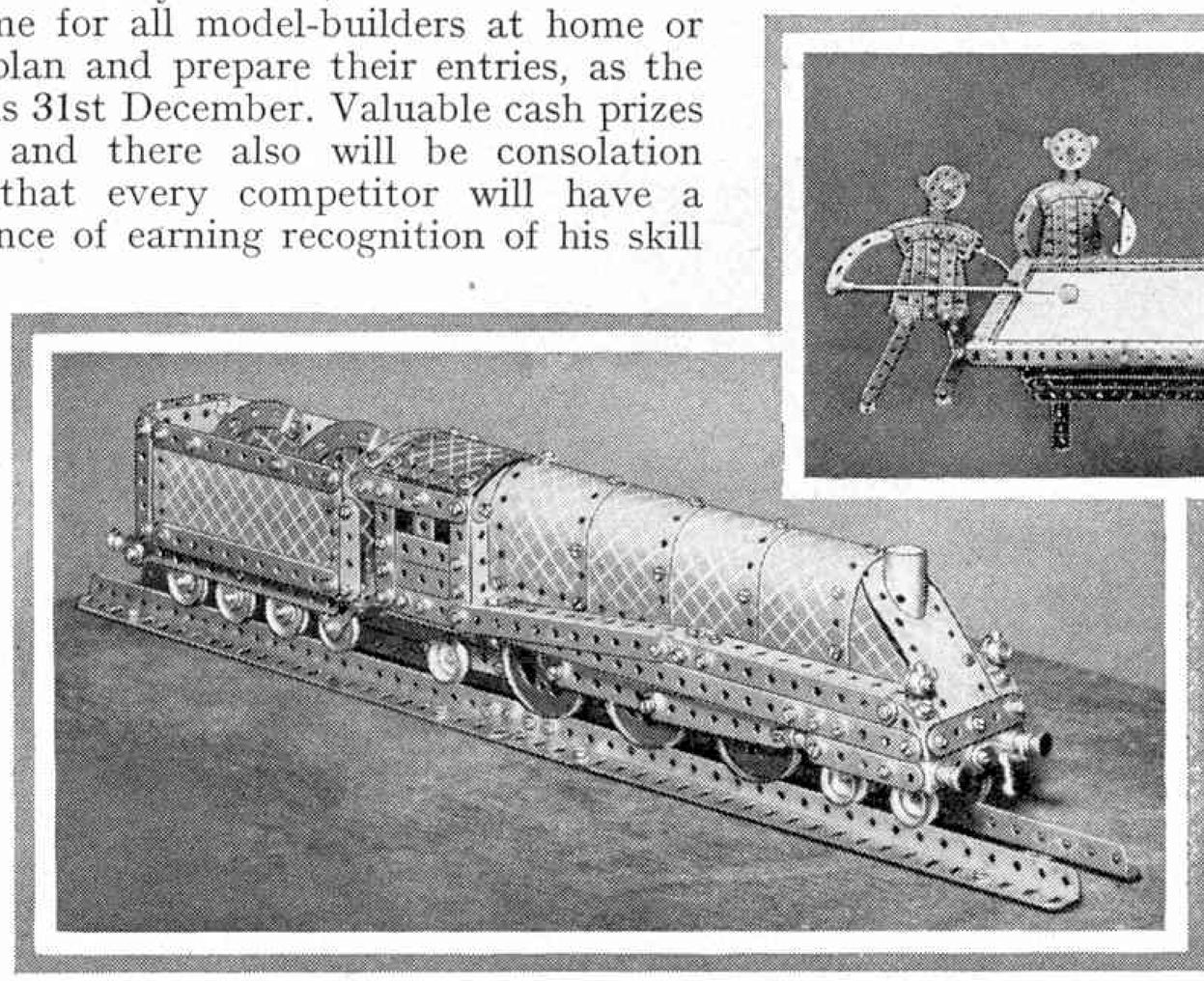
Parts required to build model gantry crane: 12 of No. 1; 16 of No. 2; 6 of No. 3; 2 of No. 4; 12 of No. 5; 4 of No. 6a; 8 of No. 8; 2 of No. 10; 4 of No. 11; 12 of No. 12; 2 of No. 12a; 1 of No. 13; 1 of No. 15a; 2 of No. 15b; 4 of No. 16; 2 of No. 18a; 1 of No. 18b; 1 of No. 19g; 1 of No. 19h; 4 of No. 20b; 4 of No. 22; 1 of No. 23; 2 of No. 26; 1 of No. 27a; 1 of No. 32; 12 of No. 35; 152 of No. 37a; 162 of No. 37b; 20 of No. 38; 2 of No. 40; 2 of No. 48; 2 of No. 48a; 2 of No. 48b; 1 of No. 51; 2 of No. 52; 1 of No. 53; 1 of No. 57c; 5 of No. 59; 1 of No. 63; 2 of No. 111; 2 of No. 111a; 6 of No. 111c; 2 of No. 126; 4 of No. 126a; 1 of No. 162; 1 of No. 176; 1 of No. 186; 2 of No. 188; 6 of No. 189; 4 of No. 190; 2 of No. 191; 2 of No. 192; 1 of No. 213; 2 of No. 217a; 1 EO6 or EO20 Electric Motor (not included in Outfit).

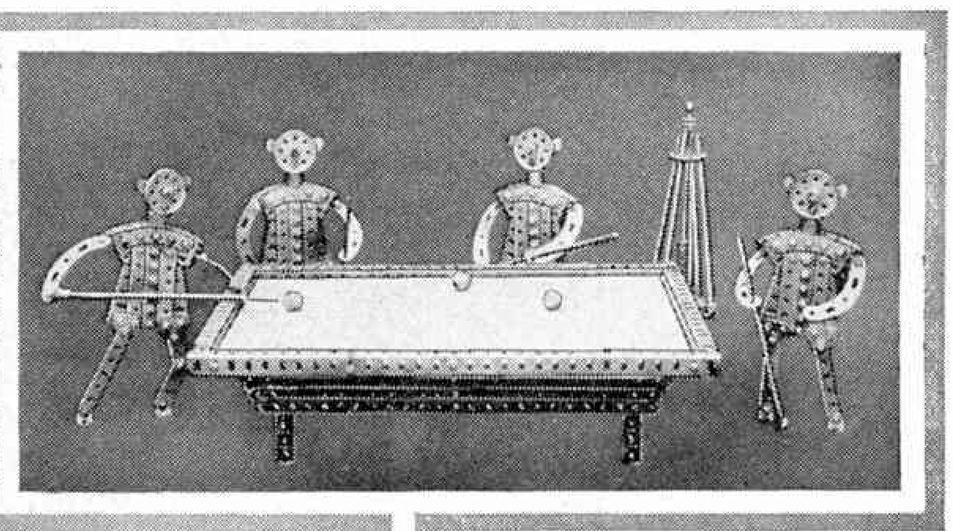
Our Great "Autumn" Competition

Handsome Cash Prizes for Meccano Models

The winter model-building season has now commenced in earnest, and every keen owner of a Meccano Outfit should be busy planning his entry in our great "Autumn" Model-building Competition. This was announced in our October issue. It is the first important competition of the present indoor hobby season, and there is still plenty of time for all model-builders at home or overseas to plan and prepare their entries, as the closing date is 31st December. Valuable cash prizes are offered, and there also will be consolation awards, so that every competitor will have a splendid chance of earning recognition of his skill and merits as a Meccano constructor.

For the benefit of readers who did not see last month's announcement of this contest we again give full particulars. The competition is a general one, that is, the models submitted may be of any size or kind whatever, the only stipulation being that they shall be the competitor's own work. Ships, bridges, locomotives, motor cars, machines and buildings and structures of all kinds are among the many suitable subjects, and any size of Meccano Outfit or any number of parts can be used in constructing entries. There is no age limit, and Meccano owners living in any part of the world can compete on equal terms.





Simple models that won prizes in Meccano Competitions. The group of billiards players shown above is the work of J. Willems, Antwerp, and the model on the left is a reproduction by Edwin Rusted, Royston, of the L.N.E.R. streamlined locomotive "Silver Jubilee."

When the model is built it is only necessary to obtain a photograph of it or, if this is not possible, a good drawing. A small photograph will do, provided it is clear enough to show the general appearance and important details of the model, and it is not necessary that either photographs or drawings shall have been prepared by the competitor himself.

The competitor should write his age, name and full address on the back of each photograph or drawing, and enclose it, together with a brief description of the model, in an envelope addressed *"Autumn Model-Building Competition,"* Meccano Ltd., Binns Road, Liverpool 13. Entries must be posted in time to reach this office not later than 31st December.

The prizes to be awarded for the most interesting and best built models entered include cheques and Meccano and Hornby products. The complete list of these is as follows: First Prize, Cheque for £5/5/–; Second, Cheque for £3/3/–; Third, Cheque for £2/2/–. There also will be ten prizes of Meccano or Hornby products to the value of 10/6 each in addition to a number of consolation awards and Certificates of Merit.

A Chance for Owners of Small Outfits

This is a special model-building contest in which every owner of a Meccano Outfit can enter, for only the few parts shown in the list in the panel at the foot of this page are required. Each competitor can please himself in regard to the subject of his entry, provided only the selected parts are used; but if he wishes he can add either a Clockwork Motor or an Electric Motor to drive his model. It is not necessary to use all the parts; any not needed can be left out.

The more original a model is, the better will be its builder's chance of winning a prize; and all who enter will have the same chance of success.

The actual model must not be sent in. A photograph or a good drawing is all that is required, but should be as clear and detailed as possible. The competitor's age, name and address must be written in block letters on the back of each photograph or sheet of paper used, and competitors must send also a list of the parts used in their models. Envelopes containing entries should be addressed "Selected Parts Contest," Meccano Ltd., Binns Road, Liverpool 13.

Build Your Model with These Parts

4 of Part No. 1	4 of Part No. 22	3 of Part No. 90a
6 of Part No. 2	1 of Part No. 23	2 of Part No. 126
8 of Part No. 5	1 of Part No. 24	1 of Part No. 186
6 of Part No. 12	6 of Part No. 35	4 of Part No. 187
3 of Part No. 16	1 of Part No. 44	2 of Part No. 189
2 of Part No. 17	4 of Part No. 48a	2 of Part No. 190
1 of Part No. 19g	1 of Part No. 52	2 of Part No. 192
2 of Part No. 19b	1 of Part No. 54a	2 of Part No. 217a

The competition will be divided into two sections: A, for competitors living in the British Isles; B, for competitors living Overseas. In each section there will be prizes of Meccano or Hornby products value £2/2/–; £1/1/– and 10/6 respectively. Section A will close on 30th November and Section B on 31st January, 1939.

Model-Building Competition Results

By "Spanner"

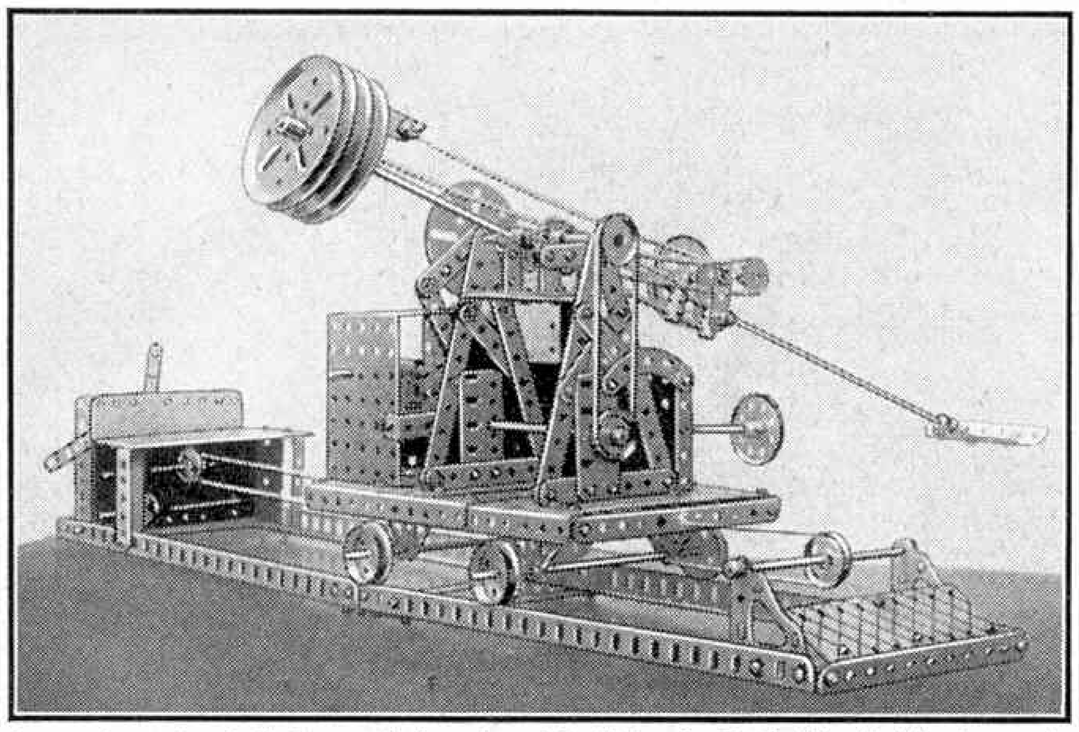
"Originality" Contest (Home Section)

The list of prize-winners in the Home Section of the "Originality" Competition, details of which were published in the May "*M.M.*" is as follows:

1st Prize, Meccano or Hornby products value £3/3/–: J. H. Smith, Teddington. 2nd, products value £2/2/–: E. D. Clements, Orpington. 3rd, products value £1/1/–: G. Sharpe, Sutton.

Products value 10/6: R. Brash, Glasgow; N. Ta'Bois, Woodford Green; C. Harrison, Worksop; P. Wickham, Leicester; D. Goodliffe, Exeter; C. Brown, Bradford.

In awarding the prizes in this Contest the judges based their decisions on novelty in choice of subject and in the use of Meccano parts. Of the models submitted the one that possesses these features in the highest degree is a mechanical shaving machine sent by J. H. Smith, Teddington. The model is shown in the upper illustration, and every reader will appreciate its novelty, although few would venture to try it!



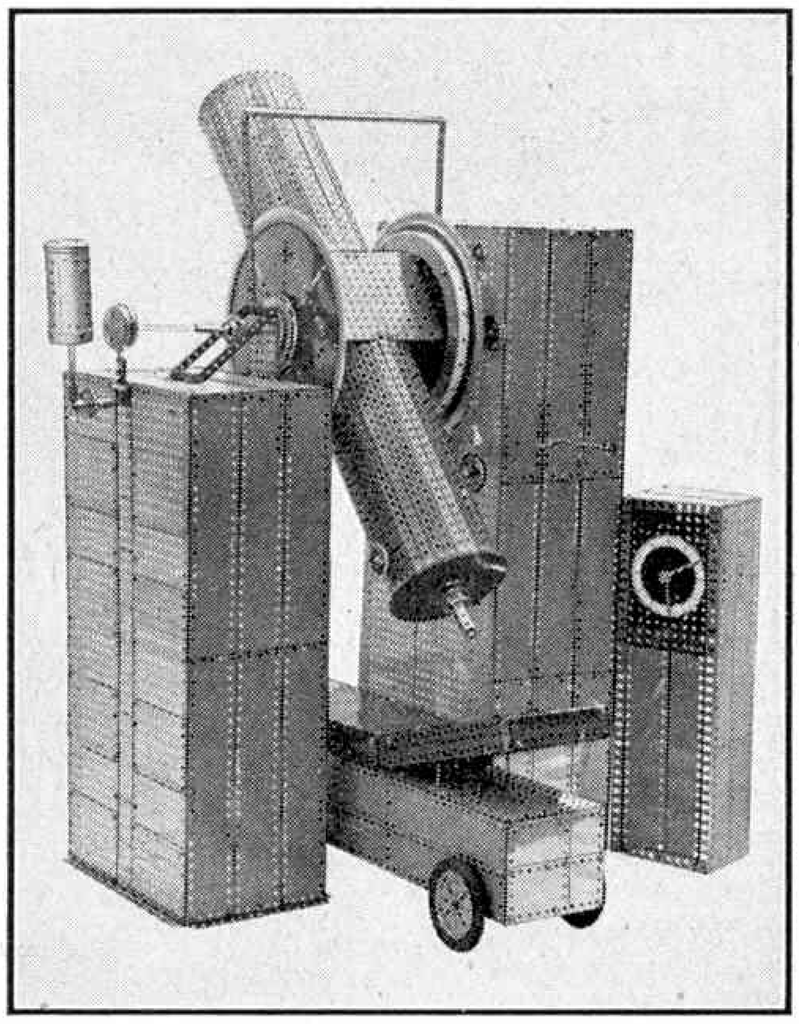
A novel mechanical shaver designed and built by J. H. Smith, Teddington, who was awarded First Prize in the "Originality" Contest.

The essential feature of the machine is a long arm mounted pivotally on a movable carriage that runs on rails. Two Clockwork Motors are incorporated in the machine, and one of these drives the carriage backward or forward on the rails, while the other drives a cam mechanism that causes the arm to oscillate up and down. When it is desired to use the machine for shaving, a shaving brush is first fixed to one end of the arm and allowed to lather the face. The brush is then removed and replaced with a razor, the angle of the blade being adjustable while the machine is in motion.

The model is of course of no practical value, and owes its success in this Contest entirely to its originality and neat construction.

Second Prize was awarded to E. D. Clements, Orpington, for the fine model telescope shown in the lower illustration. The tube of the telescope is built up from 12½" Strips, which are fastened at one end to a 6" Circular Plate, and at the other end to a ring of 12½" Strips. The tube is supported in the mounting by means of a Rod passed through its centre, and the elevation of the telescope is controlled by a handwheel, which is geared to two Roller Races bolted to the sides of the telescope tube. The model is complete with sidereal clock, declination ring and observation bed, the latter being constructed between the two supporting pillars.

An adjustable lamp holder of the angle-poise type used for close-up illumination of work in engineering workshops formed the subject of a neatly built model that won Third Prize for Geoffrey Sharpe, Sutton. In the model the lamp is represented by a Boiler, which is mounted pivotally at the end of a jointed arm. The arm is built up from Angle Girders, and is loaded with Springs so arranged that they balance the arm in any position. At its lower end the arm is fixed to a vertical pillar supported by a ball bearing inside the base of the model.



Model of a meridian telescope, by E. D. Clements, Orpington.

One of the most interesting models among those that were awarded prizes of 10/6 was a neat outline representation of an electric bulb. This unusual entry was submitted by N. Ta'Bois, Woodford Green, and is about three times the size of an actual bulb. The outline of the bulb is formed by Strips bolted end to end, the compound strip so formed being curved to the required shape. The cap is built up from two 5½" × 1½" Flexible Plates and a Flat Girder, and the filament is represented by Spring Cord. The Cord is supported by short lengths of fine wire, and the ends of the filament are connected to Rods fixed to a main supporting column consisting of a 11½" Rod.

A model of Eddystone lighthouse by C. Brown, Bradford, also was awarded a prize of 10/6. The external features of the lighthouse are reproduced by Flexible Plates bolted to a framework of 12½" Strips, and the lamp chamber contains two electric lamps from a Meccano Lighting Set, which are mounted on a vertical Rod that is revolved slowly by an Electric Motor. The lamp chamber is provided with four windows, and as the lamps pass each window they are switched on for a short period. The apparatus for switching the lamps on and off consists of four insulated terminals, one of which is fixed beneath each window. As the vertical shaft revolves, a Crank fixed to it makes contact with each terminal in turn, thus completing the electric circuits to the lamps at the appropriate periods. Current for the lamps is supplied by a small dry battery.

P. Wickham, Countesthorpe, Leicester, built a fine model of the Tower of Empire at the Glasgow Exhibition. The model is 3 ft. 5 in. high and 1 ft. 4 in. wide at the base. It is constructed chiefly from Angle Girders and Strips, while Strip Plates are used for making the observation galleries at the top and also to form the roof of the restaurant. A realistic effect has been obtained by placing a few Hornby Poplar Trees, Dinky Toys Motor Cars and miniature figures around the base of the model.

Another prize-winner who found his subject in the Empire Exhibition was R. Brash, Pollokshields, Glasgow, whose model represents one of the Lister auto-cars used for passenger transport in the exhibition grounds. The cars are electrically driven, and the seats are placed along the sides.

Results of "Sharp Eyes" Contest No. 1

The Manual models from which the fragments included in the illustration of a liner that appeared on page 344 of the June "*M.M.*" are taken, are as follows:

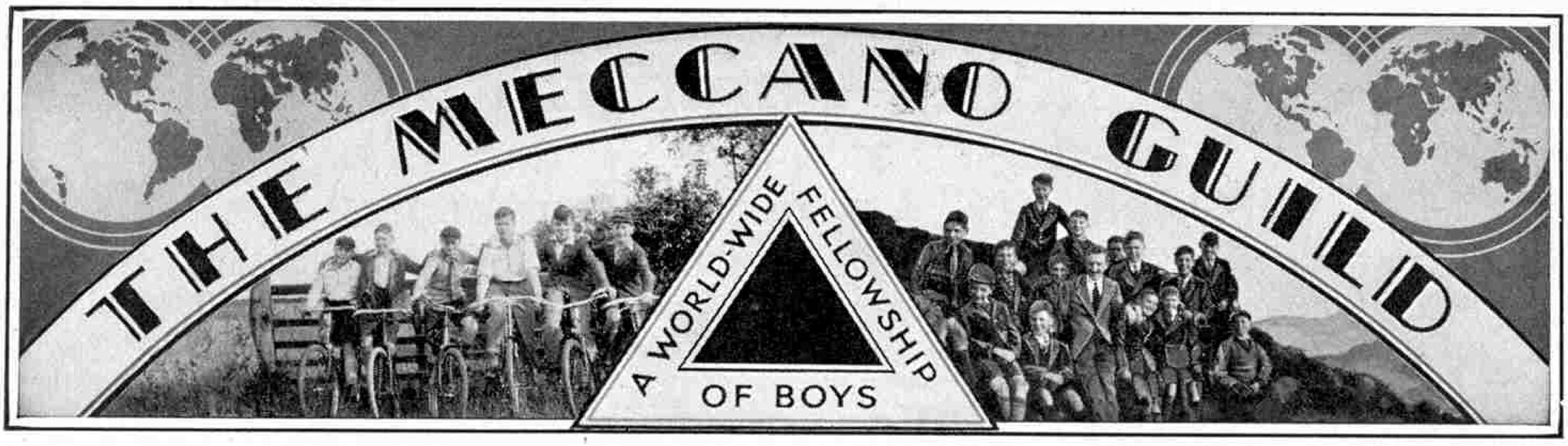
Model No. 0.12, Electric Truck; Model No. 2.1, Railway Footbridge; Model No. 2.10, Roll Top Desk; Model No. 2.16, Steamship; Model No. 3.5, Noah's Ark; Model No. 3.M25, Tractor and Harrow; Model No. 4.8, Elevated Jib Crane; Model No. 4.16, Traction Engine; Model No. 4.17, River Gun Boat; Model No. 4.18, Six Wheeled Steam Wagon; Model No. 5.18, Racing Yacht (2 pieces); Model No. 5.24, Pithead Gear; Model No. 6.9, Tramcar (2 pieces); Model No. 6.10, Liner (2 pieces); Model No. 6.14, Sydney Harbour Bridge; Model No. 6.15, Galleon; Model No. 6.4, Breakdown Lorry.

Many competitors succeeded in identifying all the fragments correctly, and the prizes were awarded as follows, in accordance with the conditions set out in the competition announcement.

1st Prize, Meccano or Hornby products value £3/3/–: R. Biggs, Bristol. 2nd, products value £2/2/–: C. Barnard, Johannesburg. 3rd, products value £1/1/–: R. Roddick, Rosario de Santa Fe, Argentine.

Products value 10/–: H. Johnston, Southall; H. Hussey, St. Helens; C. Keekok, Singapore; A. Abdulrahim, Karachi, India; F. Cooper, London S.W.19.

Products value 5/–: H. Thomas, Edgware; R. Hughes, Llanbedrgoch; N. Ta'Bois, Woodford Green; C. Wrayford, Bovey Tracey; S. Meachem, Birmingham.



Club Entries in "M.M." Model-Building Contests

The reports now coming in from the clubs show that members generally are settling well down to the usual pursuits of the indoor season. Model-building is the activity to which the greatest amount of time is devoted, and models both large and small are being built for competitions, and also for Exhibitions.

Leaders should not overlook the splendid model-building contests that are announced in the Magazine. I do not think that members of Meccano Clubs yet show up sufficiently well in the lists of prize-winners in these contests. Specially attractive competitions are now being organised and two interesting innovations are the introduction of cash prizes and the extension of the time limit to allow the design and construction of really worthwhile entries. There must be hundreds of Meccano models built at club meetings that would make a very good show indeed in these contests, and I urge Leaders to arrange for these to be submitted. If desired, the entries of several members of a club can be collected by the Leader and forwarded in one envelope, provided that the general rules are followed.

The success of a member in a Magazine competition is good publicity, and this should be borne in mind. From the club point of view it is even better as an encouragement to members generally to give of their best in all club work. A good plan to follow is to select the best models shown in club events as entries in "*M.M.*" contests. Thus a double incentive to good model-building is provided.

Fun for the Christmas Season

Christmas will soon be with us, and preparations for the Exhibitions, Concerts and Socials that mark this season of the year should be taken in hand immediately, if they have not already been started. If possible there should be an Exhibition of some kind and a Social, the former for the benefit of parents and friends and the latter for the members themselves.

In all good clubs members are thoroughly entitled to their hours of fun and amusement, and the Christmas Social or party provides the best means of ensuring this. The Exhibition will please grown-up people who are in any way connected with the club, and every effort should be made to give them a good time also in return for their unfailing support.

I have often made suggestions in regard to Exhibitions, and need not repeat them. All that I wish to say now is that whatever is attempted should be well done. The models and other things on view should be well constructed, and arranged with care on some definite plan instead of merely being strewn about on tables. If possible some form of entertainment should be included as part of the Show. For instance a film or lantern lecture could be shown. If there is a club band, such as the Mouth Organ Band to which I have referred elsewhere on this page, this could be pressed into service, or members or friends with musical inclinations might be persuaded to provide a musical background. Most important of all, members should greet their visitors in a friendly manner, making sure that they all feel at home immediately they enter the Exhibition.

Meccano Club Leaders

No. 95. Mr. S. McCready

Mr. S. McCready was the founder of the Islandmagee M.C., of which he is Leader and secretary. This Northern Ireland club was affiliated in January 1938. The chief activities have included model-building, which is carried on enthusiastically, games, rambles and treasure hunts, and the work of the club has aroused great interest locally, long reports of meetings appearing regularly in the Press.

A Meccano Club Mouth Organ Band

Membership of the Maylands (Western Australia) M.C. must be splendid fun, judging by the long and interesting letters I receive from Mr. V. Malmgreen, the Leader, for every pursuit that a keen and active boy can wish for seems to be included in the programme. Now the club has formed its own mouth organ band, and it is easy to realise from the happy faces seen on the photograph on the opposite page that the members of the band are thoroughly enjoying their novel enterprise. Those who listen to them also have really good times, for efficiency is the keynote of all Maylands M.C. activities, and the boys have become so capable that their services are already in great demand at concerts of all kinds and they have figured with great success in the programme of the local broadcasting station 6 PR.

There is a great deal to be said for a venture of this kind, if only with the idea of enlivening club meetings, Exhibitions and Open Nights, and I strongly recommend Leaders of other clubs to proceed on similar lines if this is at all possible. What can be done may be realised from the fact that when the Maylands Mouth Organ Band was formed most of its members understood nothing about music, yet in a few months they were able to give public performances that aroused admiration and interest and spread the fame of the club abroad.

Coming Events

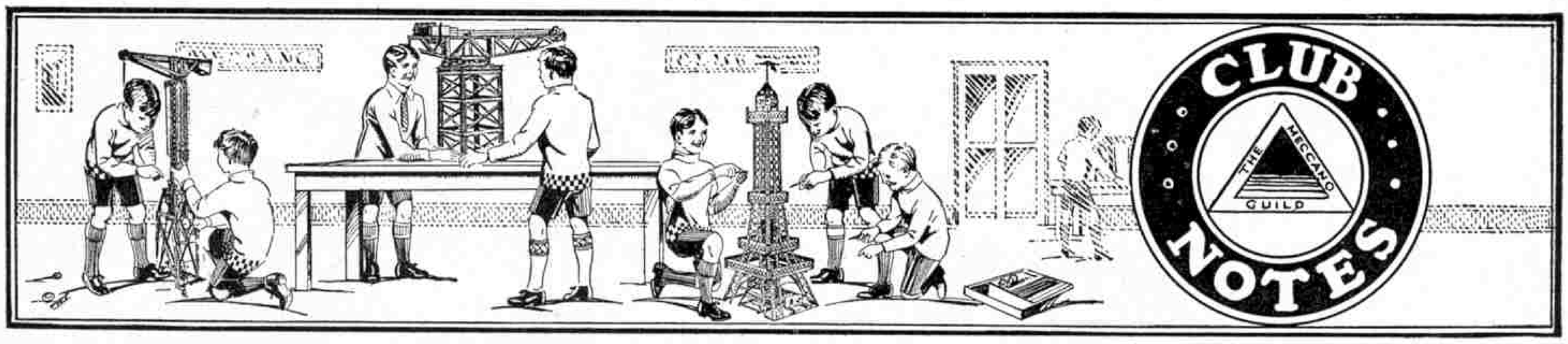
The first Exhibition of the Edinburgh Hobbies M.C. will be opened on Monday, 7th November, at the clubrooms, 33, Lauriston Place, Edinburgh 3, and will continue until Saturday, 12th November, the hours being from 6.30 p.m. to 10 p.m. each night. In addition to the club's extensive miniature railway there will be a splendid display of model boats and aeroplanes, together with exhibits by the Woodwork, Photographic, Radio and other Sections, and it is hoped to show a film of club activities. Refreshments also will be available. The charge for admission will be 6d. for adults, 3d. for schoolboys.

Another Exhibition to be held this month is that of the St. Stephen's (Saltash) M.C. This has been arranged for Saturday, 26th November, in the Saltash Guild Hall. There will be a display of models built by members, and the club's Hornby Railway will be in operation. Refreshments will be available. The Exhibition will be open from 2.0 p.m. to 8.0 p.m., and the charge for admission will be 6d. for adults, 3d. for those under 14 years of age.

Proposed Clubs

Attempts are being made to establish Meccano clubs in the following places, and boys interested should communicate with the promoters, whose names and addresses are given below:

BIRMINGHAM—Mr. L. Brook, 197, Floyer Road, Small Heath.
LONDON—W. J. McDowell, 33, Canrobert Street, Bethnal Green, E.2.
DAGENHAM—R. M. Tindal, 106, Western Avenue, Dagenham.
OXFORD—C. East, "Woodfield," 28, Rose Hill, Oxford.



Hornsea M.C.—Several outdoor meetings have been held, and members greatly enjoyed a boat trip on the Mere, where they "explored" Swan Island. Members have also enjoyed trips on the new Hornsea boating lakes. A visit to Hull Gas Works proved very interesting. The Winter programme has been settled by discussion among officials and members, several of whom have volunteered to give talks. At one meeting an account of a visit to the Empire Exhibition, Glasgow, is to be given. Club roll: 15. *Secretary:* P. Richardson, "Summerleigh," Esplanade N, Hornsea.

Folkestone M.C.—A party of members had an enjoyable time at the local Regatta, which culminated in a firework display. The model yacht constructed by members behaved very well when tried out recently. The construction of a motor launch is now under consideration, and this will probably be carried out during the Winter Sessions. A model liner is to be made for the new harbour at "Folkestone" on the model railway layout, and a new type of crane is being evolved for the same purpose. Club roll: 7. *Secretary:* W. F. Cotter, 52, Hill Road, Folkestone.

Sid Vale M.C.—During a ramble across Muttern Moor the opportunity was taken of holding an informal discussion on the Winter programme. This was eventually decided at the Annual General Meeting, and is now being carried out. Club roll: 20. *Secretary:* L. R. I. Gliddon, Sheffield House, Sidmouth.

St. Oswald's M.C.—A special meeting was devoted to holiday reminiscences and a discussion on recruiting, which ended in a resolve to launch a recruiting campaign. A Darts Match between teams led by the Leader and secretary respectively resulted in a victory for the latter. A gentleman very kindly organised a film show for members, which they greatly enjoyed. At the Annual General Meeting satisfactory reports were given of the year's activities, and officials were elected. Club roll: 25. *Secretary:* J. F. Jaques, "Elmolino," 5, Ingram Road, Thornton Heath.

Edinburgh Hobbies M.C.—Over 200 members have now been recruited, and a further 100 are expected to join during the present Winter Sessions. Club activities cover a wide range. Radio and Photographic Sections have been formed; the latter has a fully-equipped darkroom and full facilities for developing, printing and enlarging. Visits are to be a weekly feature of the Branch programme, which also includes monthly Demonstration Talks and monthly film shows. An Exhibition is to be held this month. Details are given on the opposite page. Club roll: 206. *Secretary:* C. S. Morrison, 28, Wellington Street, Edinburgh 7.

Stretford Public Libraries M.C.—Meetings have been devoted to Model-building, Debates, Games and Competitions. An interesting Debate on "*Should Cycle Tracks be Provided on Our Main Streets?*" was decided in favour of the tracks. General knowledge tests have been held, and observation games played. Good progress has been made in the compiling of club scrap books. A Stamp Club meeting was devoted to methods of writing up stamp collections, and several albums were compared. Club roll: 35. *Secretary:* Miss F. Scattergood, Public Library, Technical Institute, Stretford Road, Old Trafford, Manchester 16.

Winchmore Hill Collegiate School M.C.—Excellent progress is being made with the club's Hornby Railway, more than half the track of which has now been laid down. In a "Simplicity" Contest the first prize was awarded to the builder of a working model of a Diabolo. A Shunting Contest has been held, the winner beating his nearest rival by two minutes. A Variety Show is to be given at the end of the present session. Club roll: 28. *Secretary:* F. J. Hearn, 143, Conway Road, Southgate, London N.14.

Old Charlton M.C.—At the Opening Night of the present session club proceedings were explained to new members. The Annual General Meeting has been held, reports being submitted on the progress of the club and new officers have been elected. Club roll: 34. *Secretary:* D. C. Lambert, 23, Charlton Lane, Charlton, London S.E.7.

St. Stephen's (Saltash) M.C.—Members of the Meccano Section have constructed a Harmonograph for display at the Exhibition to be held this month. Excellent progress has been made with general models, and the engine shed of the Hornby Railway layout has been fitted with a glass roof. The model carriage washing plant has been given an imitation rough-cast finish and steady, if slow, progress is being made with a model cattle dock. Club roll: 5. *Secretary:* B. Braund, 9, Homer Park, Saltash.

Wednesbury M.C.—The club rooms have been redecorated and are now very attractive. Visits, Debates, Talks and Games Nights at which refreshments will be served, have been arranged for the present sessions. The Woodwork Section is specially active. Tools have been re-ground and bookcases, card index files and a desk are being made. Club roll: 15. *Secretary:* M. L. Done, 31, Waverley Road, Darlaston, Wednesbury, Staffs.

Middlesbrough M.C.—The winter programme is now well under way, and some excellent model-building is being accomplished. The lighter side of club life is not being neglected, and plans are in hand for a Parents' whist drive and for a "Ghost Night" that promises to be both exciting and amusing. New members are wanted, and the secretary will be pleased to hear from Meccano enthusiasts in the district who would like to join. *Secretary:* G. Brockhurst, 49, Heythrop Drive, Acklam, Middlesbrough.

The Beeches M.C.—Publication of the September issue of the club magazine "*Our Mag*" coincided with the opening of the winter term, and this was used to introduce the club to many boys, some of whom have become members. It is hoped to arrange an interesting series of Lantern Lectures, as these are always very popular. An exhibition held in conjunction with the school camera club proved very successful. Preparations are already in hand for a Christmas Party *Secretary:* H. Dubras, 14, Broad Street, Jersey, C.I.

The Mouth Organ Band of the Maylands (Western Australia) M.C. The Band was formed early this year by Mr. V. Malmgreen, Leader of this enterprising club, and its members have already become so skilful that they have been able to play with great success at socials and concerts, and have been heard in radio programmes.

AUSTRALIA

Thebarton M.C.—A synchronous electric motor constructed in Meccano has proved very satisfactory in operation, although very careful adjustment was required. The Vice-President has given a Lecture on "*The New Guinea Goldfields,*" illustrating it by means of an epidiascope. Two films have been shown, the subjects being "*The Making of Conway Stewart Pens*" and "*The Port Pirie Smelters,*" respectively. An illustrated talk by the President dealt with "*Modern Aircraft.*" Arrangements are in hand for a series of Model-building Contests. Club roll: 80. *Secretary:* B. S. Clarke, 21, Victoria Street, Glandore, South Australia.

Maylands M.C.—An Exhibition has been held, outstanding models being a railway breakdown crane, a jack-knife bridge, and a truck and trailer constructed by a blind member. A paperchase, with the Leader as hare, developed into a treasure hunt, which was greatly enjoyed. At Inter-Faction Debates such subjects as "*Is War Worth While?*" and "*Should the School Leaving Age be Raised?*" have been discussed. A cycle run to North Beach was greatly enjoyed. Quoits and Darts have been introduced, and are so popular that they now figure in the Faction Tournaments. Club roll: 36. *Secretary:* R. Le Cheminant, 60, Crawford Road, Maylands, W. Australia.

Melbourne M.C.—Further "training" meetings for new members have been held, and one "Apprentice" successfully laid out and wired the underground section of the electric railway, afterwards running trains on it. Other members have been given practice in train control on the main layout; interchange of positions during track working has greatly increased members' efficiency. At full club meetings extensive timetable working has been carried out on the electric layout. New steel track has been obtained to replace tinplate sections wherever possible. A party of members paid a visit to the Scotch College Hobbies Exhibition, where the Leader judged the Meccano models. Club roll: 10. *Secretary:* L. Ison, 8, Hayes Street, Northcote, Melbourne N.16, Victoria.

EGYPT

Zagazig and Misr M.C.—A Model-Building Contest announced in the club magazine "*Mechano*" attracted many interesting entries. An interesting Lecture on "*The Question of Loose Tyres*" has been given by Mr. R. H. Razek, of the Egyptian State Railways. A film show was given at the Annual General Meeting, and the Stamp Section has held several meetings. An Exercise Section has been formed under the guidance of Mr. H. Mangourie. A party of members spent an enjoyable time in camp near Alexandria. Club roll: 24. *Secretary:* A. S. Mangourie, 13, Sharia Badir, Zeitoun, Cairo.

INDIA

Ranjit M.C.—Regular meetings have been held, both indoors and out-of-doors. One afternoon was devoted to an enjoyable ramble in the nearby hills. Metre gauge locomotives were examined on another occasion. Much time has been devoted to photography, and several films of a scientific nature have been displayed. A visit is to be made to a dry ice factory. Club roll: 10. *Secretary:* A. Singh, Krishen, Nagar, Lahore.

NEW ZEALAND

Ashburton M.C.—Regular Model-building Competitions have been keenly contested. The Osborne Model-building Cup was won by T. Taylor, who has been prominent in recent model-building activities. Good use is being made of the club's two mechanical fretsaws. An Inter-Club Debate was held with the Christchurch M.C., the visitors successfully supporting the motion "*That Road Transport is Superior to That of the Railway.*" Preparations are in hand for the next Shield Contest, and arrangements also are being made for the Parents' Night. Several new members have been enrolled, and duly presented with their badges and certificates. Club roll: 26. *Secretary:* E. Lewis, Havelock Street, Ashburton.

Christchurch M.C.—Mr. E. A. Gay is acting temporarily as Leader. Various duties have been allotted to members, and thus all are now sharing in the maintenance of the clubroom. Attendances have been good, and several new members have been enrolled. Regular visits have been paid to the School for the Blind at Sumner, various forms of entertainment being given by members. The club Magazine continues to flourish. Club roll: 43. *Secretary:* S. S. Stringer, 250, Oxford Terrace, Christchurch C.1.

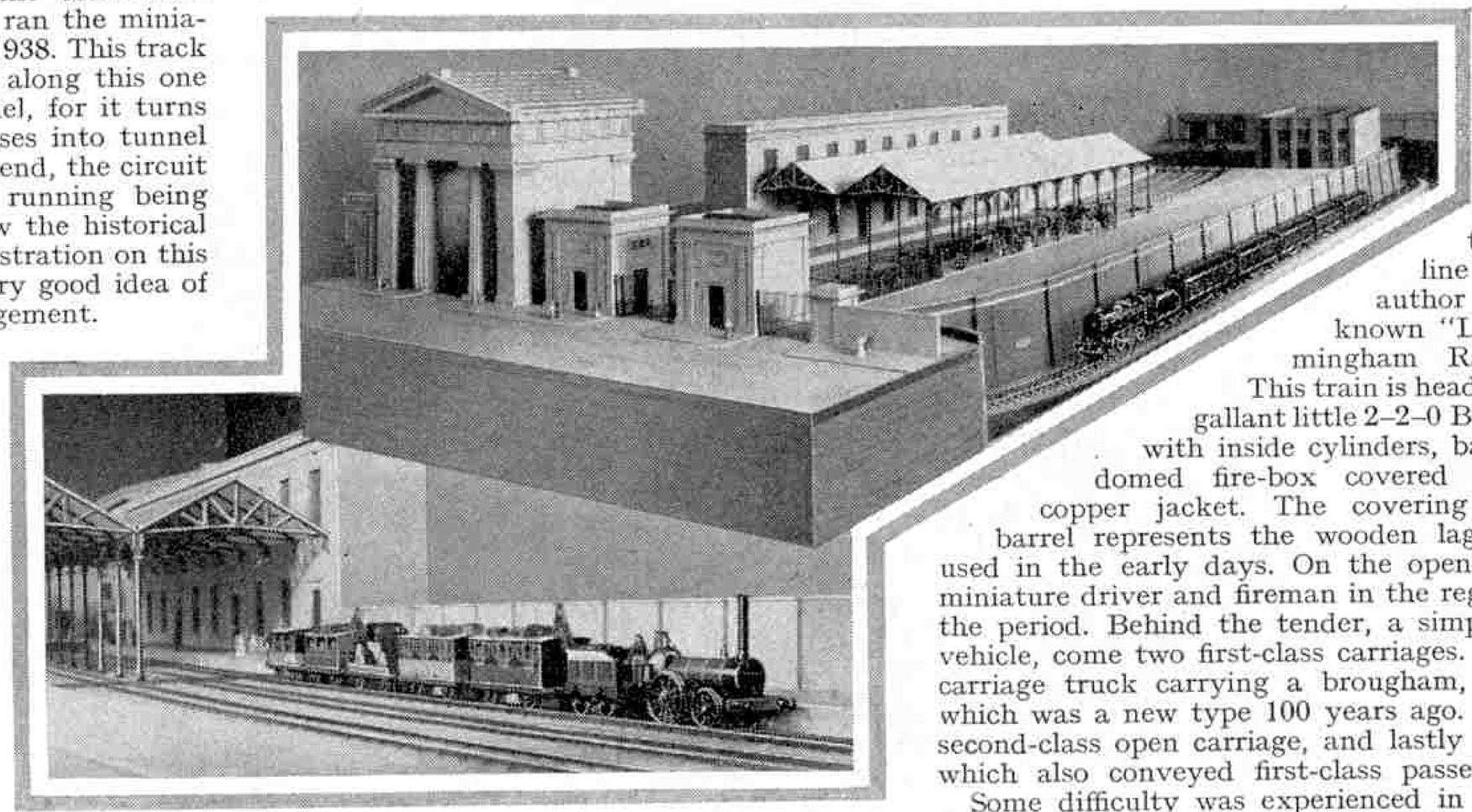
A Fascinating L.M.S. Centenary Model

Travel in 1838 and To-Day

A SPECIAL feature of the L.M.S. Centenary Exhibition at Euston was a model showing the station as it was in 1838. This formed part of the indoor section of the Exhibition, as explained in the article on page 552 of last month's "*M.M.*" It attracted close attention from all visitors, who were keen to compare the modern station and trains with those of 100 years ago. In this they were helped by the presence of a model of a modern London and Birmingham express running on a track round the replica of a train of 1838 in the old station.

The complete model is the work of two noted firms, Twining Models Ltd. being responsible for the historical section and Bassett-Lowke Ltd. for the modern equipment. The display is effectively planned on two levels, the model of Euston in 1838 being arranged on the higher level. On the side facing the onlooker this section is made as if supported by a retaining wall, and alongside this wall at a lower level is the continuous track on which ran the miniature express of 1938. This track is only in view along this one side of the model, for it turns inward and passes into tunnel mouths at each end, the circuit for continuous running being completed below the historical section. The illustration on this page gives a very good idea of the whole arrangement.

At the left-hand end of the model is a reproduction of the world-famous Doric Portico, forming the entrance to the station, that was literally the "Gateway to the North." This was built up in a most realistic manner, with the characteristic tapering fluted columns and other architectural features accurately reproduced. Judging by the model the original must have had a very fine appearance when it could be seen as its designer Philip Hardwick intended it to be seen without hindrance from the structures that now surround it. A point of detail in which there is a difference from to-day is that the word "Euston" does not appear above the columns; this was not added until 1870. Three of the four lodge-type buildings originally flanking the entrance are modelled, together with the gates between them. On the real gates are still to be found the coat-of-arms of the London and Birmingham Railway.



The upper illustration shows the model described on this page, with the modern train running round the historical section; below it a train of 1838 is seen outside the original Euston. Photographs by courtesy of Bassett-Lowke Ltd., Northampton.

At first Euston had only two platforms, which seem then to have been known as "parades" or "stages," one being for departure and the other for arrivals. Of these the departure stage was bounded by a block of buildings comprising the booking offices and waiting rooms, and in the model this block forms the edge on this side. The platforms or parades were covered by what was then described as "a spacious shedding" arranged in two bays, the building previously referred to forming a support for one side of one of the bays. The roof was carried by metal arches on a row of columns, and the same arrangement was in use on the arrival side, where there were no buildings. In the model this arrangement is followed exactly, and the "open" nature of the arrival side with its carriage-way allows the interior of the miniature station to be seen perfectly.

There are four tracks between the platforms, and these are connected by small turntables, a favourite method in the early days when the tables were known as "turnplates." There were three sets of these in the original station at Euston. One was placed at the inner extremity of the tracks, where the buffer stops would be located to-day. Another was placed about half-way along the platform just outside the roof, the platform being cut away at this point to accommodate it; and the third was beyond the outer ends of the platforms. At this point, besides connecting the four tracks together, the turntables also served to lead to the coach shed established at Euston for the stabling and repair of the passenger vehicles. This shed and its yard were placed between the station and the overbridge, then carrying Wriothesley Street over the line. This bridge and its approaches form the right-hand end of the model.

The finish of the various buildings and structures in the model is excellent. They have the air of solidity that was characteristic of the large-scale construction of the London and Birmingham line, and there is a freshness about them, too, that leaves no doubt that they must have had a most imposing appearance when they were new.

Standing on the departure track near the station is an exact reproduction of one of the London and Birmingham trains, as shown in a contemporary illustration included in the map of the line by Osborne, the author of the well-known "London and Birmingham Railway Guide." This train is headed by one of the gallant little 2–2–0 Bury locomotives, with inside cylinders, bar frames and a domed fire-box covered by a polished copper jacket. The covering of the boiler barrel represents the wooden lagging commonly used in the early days. On the open footplate are a miniature driver and fireman in the regulation dress of the period. Behind the tender, a simple four-wheeled vehicle, come two first-class carriages. Then there is a carriage truck carrying a brougham, a road vehicle which was a new type 100 years ago. There follows a second-class open carriage, and lastly the mail coach, which also conveyed first-class passengers.

Some difficulty was experienced in discovering the correct colours for the coaches, but it was finally found that some of the first-class carriages of 1838 had their lower panels painted green of a similar shade to the lagging of the boilers and tenders of the engines. Other coaches were red, as were also the mail coaches, and the second-class "opens" were all varnished oak. Besides the brougham on the carriage truck, which has yellow panels, there is another on the approach road or carriage-way on the arrival side with a dapple grey horse in the shafts. This carriage has panels of blue.

The feature about the model which perhaps more than anything gives it interest and "life" is the large number of miniature figures, nearly 100 in all, in correct costume of the period. The brilliant colouring of the dresses of some of the "ladies" adds greatly to the picturesque effect. All the coaches have a reasonable complement of passengers, many of them looking with interest out of the windows, and brakesmen are riding in the seats provided for them upon the roofs of the carriages. A special feature of these little "people" is that they are all apparently doing something, and have not the appearance of being mere dummies.

The permanent way, upon which the old train stands, is almost exactly a facsimile in miniature of the original. The rails are of a light pattern carried in chairs without wooden keys. These chairs are spiked down to imitation stone sleepers.

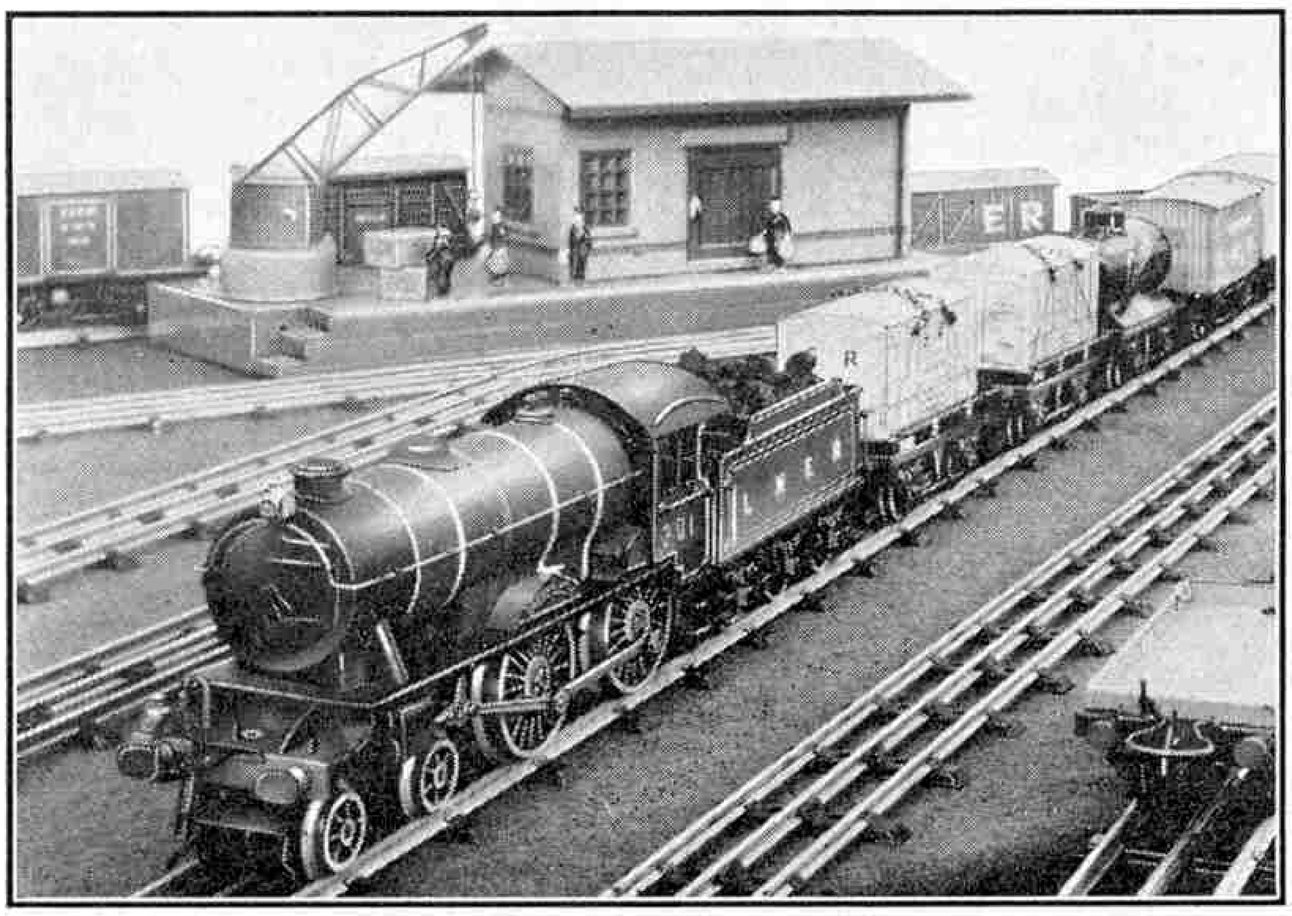
Of the modern equipment, the track is of standard bullhead rail supported in chairs on wooden sleepers with a properly-ballasted road bed. The train that runs upon this is made up of five bogie coaches hauled by a miniature "Royal Scot" locomotive and is typical of the series of expresses performing the journey between Euston and Birmingham in under two hours. Near the entrance to one of the tunnels is a signal of the two-aspect colour light type controlling the running of the train.

Container Traffic on Hornby Railways

Road-Rail Services in Miniature

THE use of containers for freight traffic is an important feature of modern railway operation. The "suitcase of commerce," as the container has been aptly named, is practically a separate wagon or van body that can be conveyed equally easily on a railway truck or a road lorry, so that with it there is no need for transhipment of freight from road vehicle to railway wagon, or vice versa. Various types are in use, and each is distinguished by an initial, such as the "A" type, the "B" type and so on.

With the introduction of miniature Containers into the Hornby System some time ago it became possible to reproduce this kind of traffic on model railways. Great fun is to be obtained by the development of a system of container transport on a Hornby Railway, and as the practice of each of the four great companies is represented by a different kind of Container there is plenty of variety in the traffic that can be handled. Hornby Containers are very close reproductions of their originals, and the amount of detail included in their design is remarkable. For their transport by rail the Flat Truck of the Hornby Series is ideal, and is typical of the vehicles used for this purpose in actual practice. Its low sides are fitted with small rings to which Containers can be secured during transit by means of Meccano Cord.



An express goods train on a Hornby L.N.E.R. layout. Two S.R. Containers conveying "through traffic" and mounted on Flat Trucks are prominent next to the tender of the engine.

The Hornby L.M.S. Container is a model of what is known as the "K" type, which is intended principally for the carriage of furniture and similar purposes. Its finish reproduces the timber construction with vertical boarding of the original, and all the details of the real thing are included. The colouring is attractive, with the ironwork, such as the strappings on the sides and the door fittings, in black, and all lettering in yellow, giving very smart effect on the background of L.M.S. red.

One of these Containers loaded on a Flat Truck can form part of a passenger or a goods train. Several furniture containers are sometimes seen together in actual practice when the complete removal of some large establishment is being carried out. Estate or farm effects, stock and implements are sometimes moved together from one part of the country to the other. In miniature a special "removal" train of this kind would make an interesting variation from the usual programme. One or two furniture Containers on Flat Trucks could be accompanied by several Cattle Trucks for livestock, and a Dinky Toys Tractor and similar items loaded on Flat Trucks or in ordinary open Wagons also would look very effective.

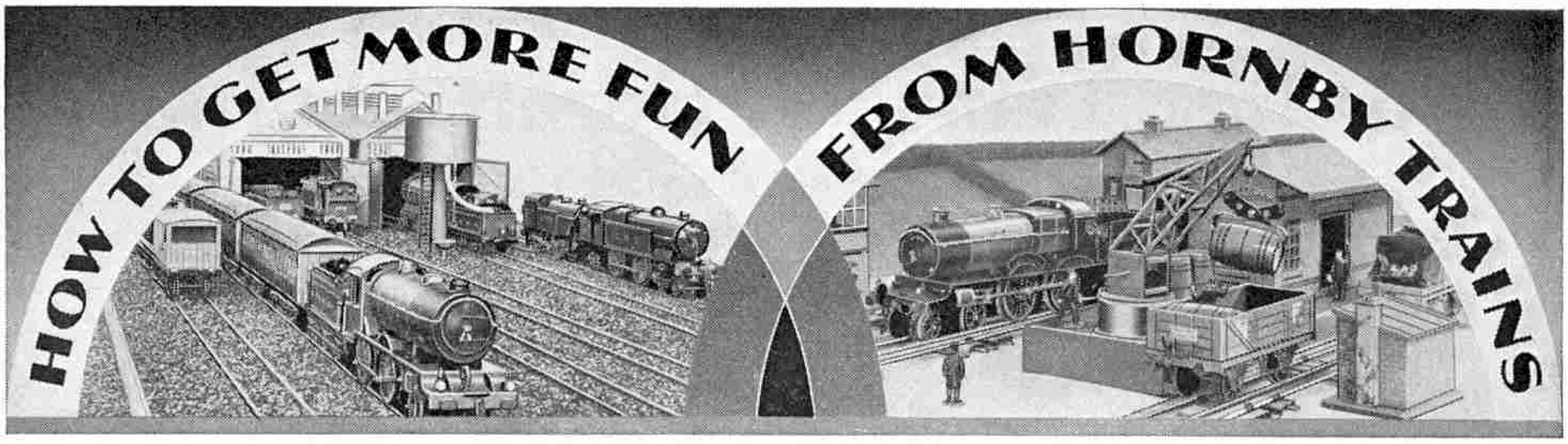
Steel container construction is represented by the Hornby L.N.E.R. Goods Container. This is typical of the real "B" type, which is intended for miscellaneous goods traffic, and it can appear equally well on all kinds of trains, both passenger and goods. It is finished in the familiar L.N.E.R. red oxide used for brake-fitted and piped wagons. The lettering is in yellow, and the appearance of the full title of the company on the Container sides makes a change from the bare initials "N.E." that are familiar distinguishing marks on most of the freight equipment belonging to the L.N.E.R.

Containers of this and other kinds can be seen regularly on what is probably the most famous freight train on the L.N.E.R. This is the "3.35 p.m. Scottish Braked Goods" from King's Cross. It provides a rapid service between London, intermediate stations and Scottish destinations, delivering its freight in Edinburgh and Glasgow early on the morning following its departure from London. A miniature "3.35 Scotsman," as the train is sometimes known, would be a splendid train to run on the Hornby System representing the L.N.E.R. Its load could consist of Containers mounted on Flat Trucks, Vans of various kinds, and if necessary an Open Wagon or two, possibly provided with a Hornby Wagon Tarpaulin.

The G.W.R. Container represents the "FX" type used for perishable traffic, particularly the transport of frozen meat imported from overseas. It is finished in white, as is frequently the case with refrigerated equipment, and the lettering and fittings are in black. This contrast gives the Container a most effective appearance.

The G.W.R. "FX" Container can be used in the composition of miniature freight "fliers" representing the meat trains running from ports and other centres direct to Smithfield Market. In addition to their use for the conveyance of perishable foodstuffs, meat, fruit and so on, "FX" Containers are employed for the conveyance of other delicate loads such as bulbs.

The Hornby S.R. Container is of the "M" type, which in real practice is a ventilated container for the conveyance of perishables that require to be kept cool, but for which refrigeration is unnecessary. The real ones are used extensively for fresh meat traffic between the West Country and London. All the fittings of the real "M" containers are reproduced, as is the effective finish of aluminium with S.R. green lettering.



DINKY TOYS ON HORNBY LAYOUTS

EVERY owner of a Hornby Railway should have Dinky Toys on his layout, for only by their use can he make this look as busy and realistic as an actual line. He needs them in the station, in sidings and shunting yards, along the lineside and in signal cabins; and this article deals with the best way to include them to obtain good effects.

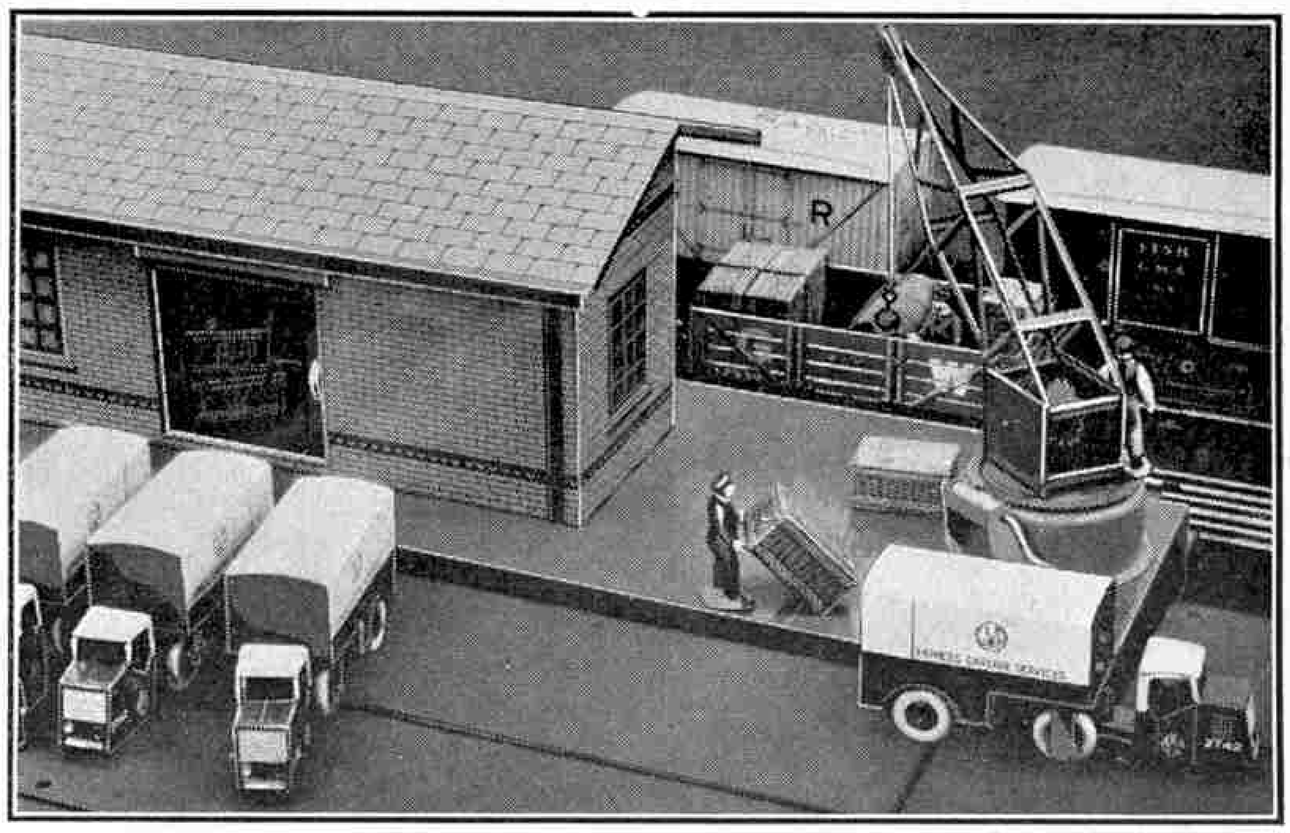
First and most important of the Dinky Toys suitable for railway use are the miniature figures that give life to station platforms and railway premises generally. These little people are grouped in Sets, but each figure is available separately. This is a great convenience, for it enables the Hornby Railway owner to choose his "staff" to suit his layout. For instance, most systems require more engine drivers and porters than stationmasters, and there is no difficulty in arranging for this, or in making similar adjustments.

Railwaymen of various classes are represented by the Station Staff of Dinky Toys Set No. 1, in which there are six figures. A little care should be taken over their arrangement, on the platform or elsewhere, to make sure that each has his right place in the scheme. The upper photograph on page 655 shows how well they can be arranged. Certain figures can be used for purposes other than those for which they are designed. For instance, the Stationmaster can supervise operations on the Goods Platform, and Porters can be employed in the handling of freight in addition to their normal employment in the passenger Stations.

A familiar figure on real station platforms is reproduced by the Newsboy of Dinky Toys Set No. 3, who is mentioned first in order to distinguish him from the Passengers who make up the rest of this Set. In the photograph already referred to he is in a prominent position in front of the bookstall on the station platform. He can also be placed effectively near a train at the platform, as if attending to the wants of some passenger already on board.

In addition to their use in stations, the ordinary Passengers can be placed very effectively outside the station. For example, the two Hikers can be shown on or near footbridges; the Business Man can appear in the roads or streets alongside the railway; and the Woman and Child can be used at any likely spot to reproduce a familiar sight, that of a youngster "watching the trains."

The Engineering Staff of Dinky Toys Set No. 4 can be placed at different points along the line. The Electrician and the Fitters can be used as signal maintenance staff, and might be placed in the neighbourhood of one or other of the Signal Cabins on the line, as if engaged in routine tests and repairs. These men are suitable also for placing in the neighbourhood of large stations. Engine Sheds and similar establishments require to be staffed. The Fitters, Greaser and Enginerooms Attendant are provided for this purpose, and they and the Storekeeper also will be useful on any line where a feature is made of the "Company's" road motor services.



A busy scene at a miniature goods depot. The Railway Mechanical Horse and Trailer units, Dinky Toys No. 33R, are ideal for use in conjunction with railway freight services.

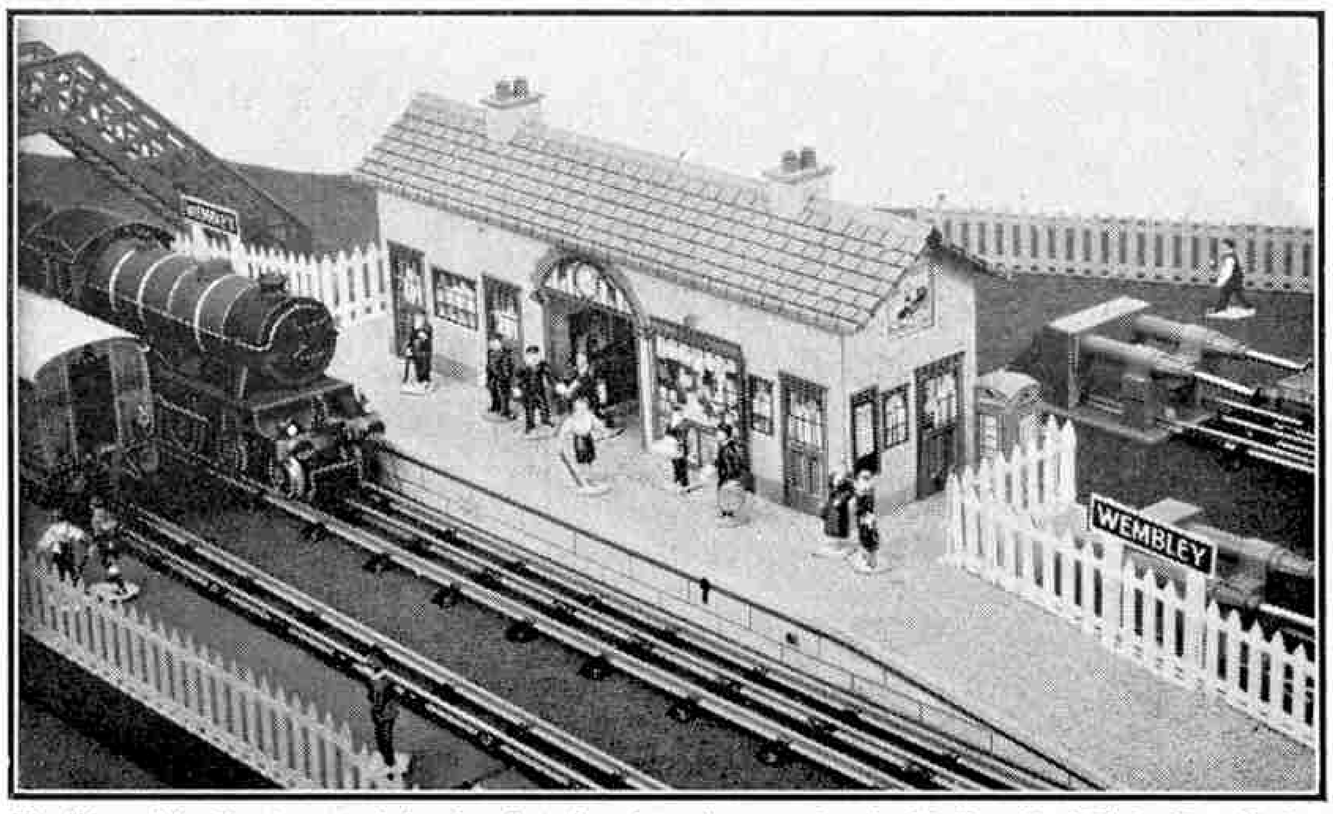
Other splendid platform figures are the Train and Hotel Staff of Set No. 5. This includes a Conductor and two Waiters, who are principally intended for use in connection with Pullman services, but can be employed also as train attendants when no Pullmans are run, and in other similar capacities.

The Farmyard Animals of Set No. 2 have various uses. They can appear in the lineside fields either separately or in groups, and they can also be placed in the goods yard when livestock traffic is being dealt with. The Horse can be pressed into the service of the railway for light shunting purposes at stations where the employment of a special locomotive for the purpose would not be worth while. This would be quite in order, for horses are still used in this manner in real practice. Meccano Cord could be used for the necessary harness, and a further length of the same material would make a suitable miniature hauling rope.

The road side arrangements of Hornby Stations vary according to conditions on different layouts and the space available. In most cases, however, it is possible to make good use of the Pavement Set, Dinky Toys No. 46.

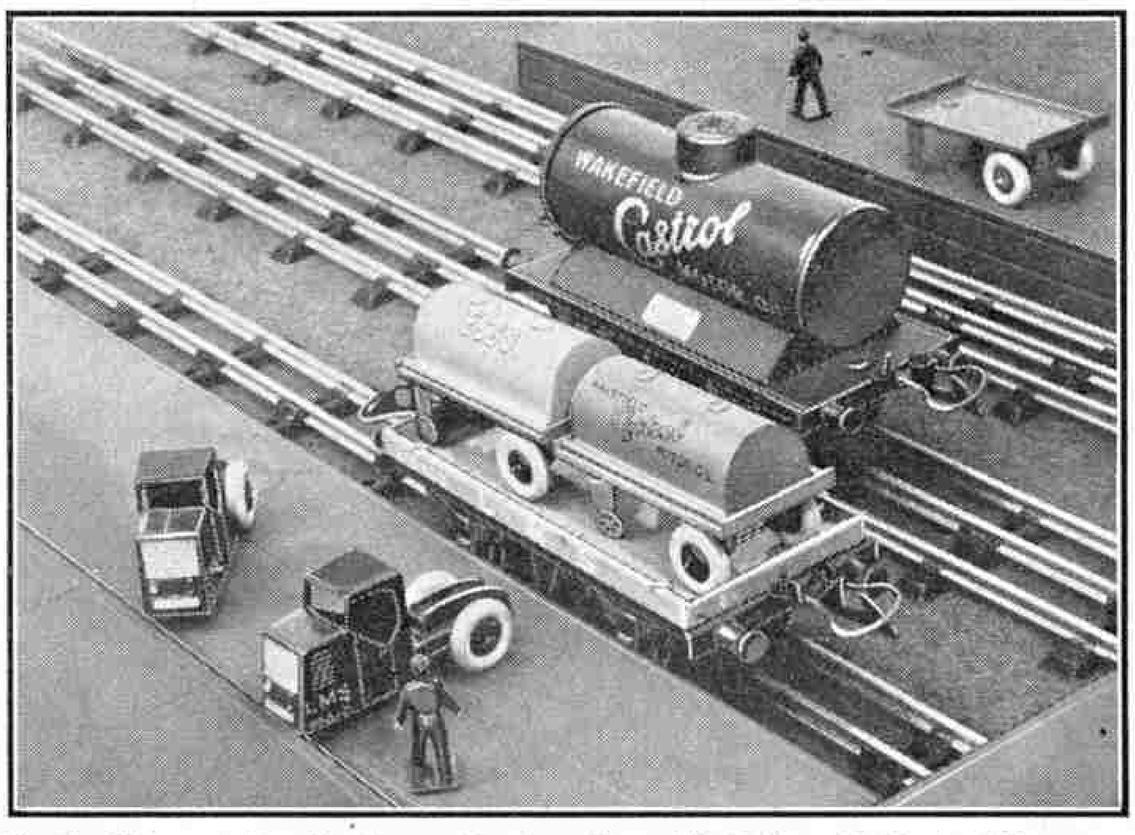
The sections contained in this can be used with good effect on miniature roads, and it is also possible to employ them on the railway itself where a paved way is required, such as in goods yards, at terminal stations, in carriage sidings and so on. The Road Signs of Set No. 47 and the associated Beacons and Traffic Signals also will be required, together with the Police, R.A.C. and A.A. figures, and other components of Sets Nos. 42, 43 and 44.

On some layouts special attention is given to the development of road motor services. To cope with modern requirements a variety of vehicles is necessary, and this is provided in the Dinky Toys Series. The most suitable road vehicles are the Railway Mechanical Horses and Trailer Vans, Dinky Toys No. 33R. Mechanical horse units are necessary and up-to-date pieces of equipment, and can be usefully employed in the collection and delivery of parcels and for the lighter kinds of freight traffic. Several of these vehicles backed up to the road side of the Goods Platform give a splendidly realistic look to a miniature railway scene.



The life and bustle characteristic of real stations is easily reproduced with the aid of Dinky Toys Station Staff and Passengers. Every Hornby Railway requires some of these figures.

A recent development in real practice has been the provision of road-rail tank trailers for the conveyance of liquids in bulk. These trailers are adapted for haulage on the road by mechanical horses, and when loaded for rail transport they are securely held on special flat trucks. This form of traffic can be reproduced very effectively on a Hornby layout. The Tank Trailer, Dinky Toys No. 33F, can be employed in conjunction with the Railway Mechanical Horse already referred to. For rail transport the standard Flat Truck is suitable, and the lower photograph on this page shows how two of these Trailers can be accommodated comfortably on one Flat Truck. An assembly of this kind will add considerably to the interest of any fast freight train.



Road-rail transport for liquids on a Hornby railway. The Railway Mechanical Horses are ready to take away the Tank Trailers loaded on the Flat Truck.

For other road services that are operated by the railway the Six-Wheeled Wagon, Dinky Toys No. 25S, makes a good heavy-duty vehicle. Among the lighter types the Market Gardener's Van, No. 25F, can be used very effectively, not only for its intended purpose, but also as a livestock float. Although a little small for the latter purpose, it can be considered as representing a special type of vehicle for prize animals. An interesting addition to it when loaded would be a net to restrain any restiveness on the part of the load; such a net can easily be made up of Meccano Cord. For general purposes the Motor Wagon, Dinky Toys No. 5A, also is useful.

Of the various Delivery Vans, No. 28C, the "*Manchester Guardian*" Van, is particularly suitable for use in conjunction with railway services. One or two of these vehicles can be employed very effectively in connection with the running of newspaper traffic, which forms an important night-time activity on the railways. Taxis of course are necessary in a passenger station, and if several of them can be arranged in a rank they give a remarkably realistic air to the premises. The Taxi, Dinky Toys No. 36G, will meet the needs of railway owners in this respect.

An interesting and effective novelty would be to use Dinky Toys motor vehicles as loads. This applies particularly to the various Racing Cars, which may be supposed to require transport in connection with some racing event. Strictly speaking such loads should be conveyed under cover, but owing to their spectacular nature they could be conveyed on Flat Trucks. They might be covered with a Hornby Wagon Tarpaulin, and this shrouding would help to give something of the air of mystery that surrounds record-breaking cars when they are travelling.

Another effective load is the Caravan Trailer, Dinky Toys No. 30G. The Tractor, No. 22E, also is useful, and it is quite entertaining to arrange for it to be hoisted correctly by means of the Goods Yard Crane. Heavier loads, such as the Medium Tank of the Royal Tank Corps Set, Dinky Toys No. 51, require special wagons for their conveyance, and for this purpose the No. 2 Trolley Wagon is ideal. The Tank looks most impressive when loaded in the well of this vehicle.

The components of the Postal Set, Dinky Toys No. 12, can be applied with good effect to any miniature railway. An immense quantity of mail matter is carried by the railways, and the Royal Mail Vans and the postal staff are a familiar sight at almost every station. The Telephone Call Box and the G.P.O. Pillar Boxes of the Postal Set can be placed on the platform of more important stations quite correctly; a row of Telephone Boxes will help to give a station a well-equipped and up-to-date air.

It is frequently the practice nowadays for car parks to be provided at railway stations. In miniature the parking of several Dinky Toys Motor Cars in a space enclosed by Paled Fencing will add to the realistic effect of any station on a Hornby railway.

Branch News

WEST HADDON.—The redecoration of the Branch room has been completed. A Hornby Railway layout was prepared for a local fête. The train was worked by a Standard Compound, which ran exceptionally well. Several changes have been made in the staff of the L.N.E.R. section, and alterations have also been made to the track. On the L.M.S. line a large junction is being installed at "Crewe," where the "Liverpool" and "Manchester" lines diverge from the main line. It is intended to inaugurate a Darts Championship. Secretary: D. G. Bush, "Stonelea," West Haddon, Nr. Rugby.

ST. STEPHENS (SALTASH).—Regular meetings have been held, and track building has been pushed on so that more extensive and attractive train working can be carried out. Controls have been fitted to a number of newly-constructed points, while other work has been done in connection with double turnouts. Secretary: B. Braund, 9, Horner Park, Saltash.

ELMSIDE (EXETER).—Attendances have been good at all meetings, and intensive train working has been carried out. A new three-track layout has been put down, and the improved design of this has resulted in more efficient running. Younger members have occupied evenings with Dinky Toys operations. A visit was paid to Exeter Station during holiday time, when the intensive traffic proved very interesting. The resumption of timetable working is under consideration. Secretary: J. T. Fenwick, 45, Calthorpe Road, Exeter.

LOSTOCK GRALAM.—Regular track meetings have been held, and many interesting trains have been run. Considerable work was put in during the preparation and printing of the Annual Report, copies of which have been sent to other Branches. At the commencement of the Winter Session all equipment was thoroughly cleaned and overhauled. The first meeting of the Photographic Section was successful; members are making good use of photographic articles published in the "*M.M.*" Secretary: A. P. S. Milligan, Wincham Hall, Northwich.

SHEFFIELD.—The Branch is now installed in its new headquarters, which comprises two rooms, and the track has been laid. Additional clockwork and electric track has been purchased and incorporated in the layout. The clockwork section includes a terminus with three platforms and goods and engine yards, and a single line to a passing station, which has two through platforms and a bay. The main line runs on to a small terminus, which will also be used by the electric trains. A double triangular junction outside this station joins the two sections. It is hoped to put new rolling stock into service shortly, and also to change from 6-volt to 20-volt motive power. Secretary: W. B. Hutchinson, 11, Sharrow View, Sheffield 7.

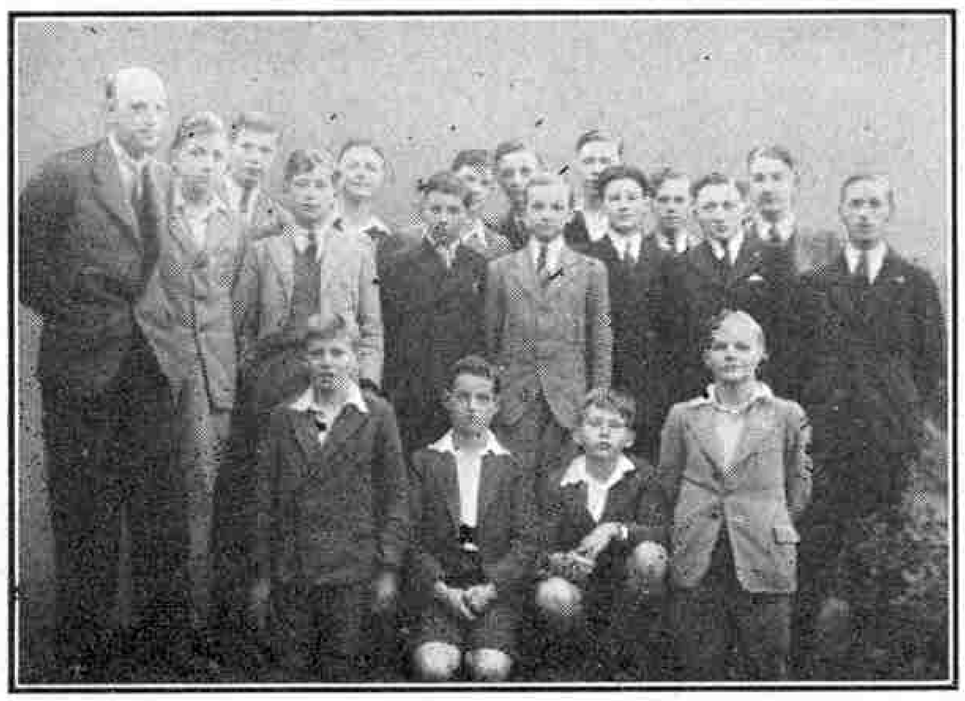
ACTON.—A discussion was held on the subject of "*The Variation of the Branch Programme,*" during which the possibilities of a Branch Library and Magazine were raised and debated. On the second of the series of Evening Tours members travelled to Fulwell Trolleybus Depot, which is the largest in London, returning via Brentford and Hanwell. The club was instrumental in arranging a Congress of London H.R.C. Branches at which five Branches were represented. Various subjects were discussed, including inter-club visits, recruiting campaigns, track operations and clubroom problems, and further meetings are to be held. Secretary: S. W. Simmons, 7, Alfred Road, Acton, London W.3.

WATERLOO (DUBLIN).—Improvements made in the Branch layout, which represents the Kent and East Sussex Railway, include the raising of the baseboard. This line was originally laid down in 1925 as the Rother Valley Railway, and following extensions, was renamed in 1934. Regular train running has been carried out, and great interest was taken in the working of special trains in connection with the annual sheep fair at "Tenterden." Secretary: S. B. Carse, 38, Oakley Road, Ranelagh, Dublin.

FOLKESTONE.—The shed that serves as a clubroom has been repainted, necessitating the dismantling of the extensive Branch layout. It took some two weeks to put this together again, but track working is once more in full swing and winter timetables have been drawn up. Secretary: F. E. Saunders, 79, Dover Road, Folkestone.

ARDSLEY.—The Branch layout now includes a representation of the L.N.E.R. station at Sheffield, with three platforms. There is a branch line to the L.M.S. station. Electric lights have been installed in the L.N.E.R. sidings, and L.M.S. sidings are now to be built. Chairman: Mr. H. Hill, 1, Bank Street, Stairfoot, Barnsley, Yorks.

ISLANDMAGEE.—During the Summer Sessions interest was taken in outdoor sports and recreations. A talk was given by Mr. A. Niblock on "*Ship Design and Construction.*" The Winter Sessions opened with a general meeting, and Hornby Railway operations are now in full swing. Secretary: S. McCready, "Hillmount," Islandmagee, Co. Antrim.



Members of the Northampton H.R.C. Branch No. 284, at their recent Annual General Meeting. Chairman, G. L. D. Hodges; secretary, E. F. Billingham. The Northampton Branch was incorporated in March 1935, and has since made excellent progress. Realistic track operations are the chief feature of the programme. Regular excursions are held in the summer, and members recently enjoyed a visit to Liverpool, where they were shown round the Meccano Factory. Both indoor and outdoor games are played.

Branches in Course of Formation

The following new Branches of the Hornby Railway Company are at present in process of formation, and any boys who are interested and desirous of linking up with this unique organisation should communicate with the promoters, whose names and addresses are given below.

HOYLAKE—Mr. R. E. Fisher, 170, The Promenade, Hoylake, Cheshire.

LEIGH-ON-SEA—T. Brown, 47, Henry Drive.

TUNBRIDGE WELLS—D. Quantrill, 25, Calverley Street.

WORCESTER—D. Cox, 3, Timberdine Cottages, Barnshall.

BOURNEMOUTH—K. Gacon, 136, Spring Road.

LONG EATON—F. R. Davys, 65, Curzon Street, Long Eaton, Notts.

HOUNSLOW—D. Cook, 16, Ivanhoe Road, Hounslow, Middlesex.

LIVERPOOL—M. P. Preston, Copsham Cottage, Alma Road, Liverpool 17.

INDIA—Mr. B. S. Kurwa, Kurwe Castle, Walkeshwar Road, Bombay 6.

NEW ZEALAND—B. H. Paton, 193, Clyde Road, Yendalton, Christchurch.

LLANIDLOES—B. M. Jones, Post Office, Llanidloes, Montgomeryshire.

LONDON—J. B. Minter, 113, Stapleton Hall Road, Stroud Green, N.4.

Branches Recently Incorporated

354. STANMORE—Mr. L. W. Hall, 69, Marsh Lane, Stanmore, Middlesex.
355. ULVERSTON—Mr. H. S. Pursey, Withersden, Rakehead, Ulverston, Lancs.
356. CRAIGAVAD—Mr. W. T. Shaw, Rockport School, Craigavad, Co. Down.

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

H.R.C. COMPETITION PAGE

"MISSING LINKS" CONTEST

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

The popularity of "Hidden Words" and "Missing Links" contests seems to increase with each competition of this kind that is announced. There is great fascination in such contests, and this month we are giving members another opportunity of exercising their detective skill in tracking down the missing links in a collection of railway names.

In the panel in the centre of this page are 32 mutilated names of well-known locomotives, stations and trains. The letters that have been omitted are represented by dashes, and H.R.C. members are set the pleasant task of completing the words. There is no catch in the contest, and in spite of appearances each word will be found to form part of a name of a locomotive, station or train that should be familiar to every H.R.C. member.

When competitors have discovered all the correct names, or as many of them as they can find, they should make out a list of them in the order in which they appear in the panel. Alongside each name must be written the initials of the railway company concerned, and in the case of locomotives their wheel arrangement and class must be stated. If a station is jointly owned the names of all the companies concerned must be given.

Prizes consisting of Hornby Train material or any Meccano product to the value of 21/–, 15/– and 10/6 respectively 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 is presented in the most novel manner. In addition to the three main prizes a number of consolation prizes will be awarded.

Envelopes containing entries must be marked *"H.R.C. November Missing Links Contest"* in the top left-hand corner and posted to reach headquarters at Meccano Ltd., Binns Road, Liverpool 13, on or before 30th November. The entries from overseas readers must reach this office not later than 28th February 1939.

On the back of each entry submitted for this contest must be clearly indicated the sender's name and full address and also his H.R.C. membership number.

WHAT ARE THESE RAILWAY NAMES?

W--- KI-B-	RO-- --R-Y
V---O-N- --RN-	L--T--- H-L-
-H- P--ES --PR---	T-- L---AST-I--
T--BA- ----TE-	---DER---D
-I-H-O-R-E	--DWA--
--R--O-D-N	-H- --R---TI-- --O-
--- R---L ---T	--- CA---IN--R
C-L--- B--	M--NT----E
C---NA---N	W--D---E
----ING-	T-----EL
-E--B-S	P---TO-
B--GH--- --L-E	---E ST-E--
LE---X---N	YS---- -YNA--
--- --ISH --I-	B--C--
---Y --TRI--A	S--KA----W--
L--NG---Y-	----- --OT

November Word-Building Contest

The two words *"Hornby Trains"* are among the most familiar in the English language to H.R.C. members. How many other words can you make up from the letters in them? Handsome prizes are offered for the best lists of standard English dictionary words that can be built up in this manner. Any of the letters in the two words may be used, but no letter may appear more often than it does in the key words.

Entries should be written on one side of the paper only and should state the total number of words. The sender's name, full postal address and H.R.C. membership number also should be given on the back of each sheet of paper used.

The contest will be divided as usual into two sections, Home and Overseas, and prizes of Hornby Trains or Meccano products to the value of 21/–, 15/– and 10/6 will be awarded to the three winners in each section.

Envelopes containing entries must be marked *"H.R.C. November Word-Building Contest"* in the top left-hand corner and posted to reach Meccano Ltd., Binns Road, Liverpool 13, on or before 30th November. The Overseas closing date is 28th February 1939.

July "Mixed Names" Contest Solution

Minster-on-Sea, S.R. (Eastern Section).
"Flying Scotsman," L.N.E.R. 4–6–2 "A1" Class No. 4472.
"Polyphemus," L.M.S. 4–6–0 "Jubilee" Class No. 5688.
"Princess Alexandra," L.M.S. 4–6–2 "Princess Coronation" Class No. 6224. G.W.R. 4–6–0 "Star" Class No. 4053.
"Sir Sagramore," S.R. 4–6–0 "King Arthur" Class No. 771.
"The Pytchley," L.N.E.R. 4–4–0 "Hunt" (D49) Class No. 298.
"Banffshire," L.N.E.R. 4–4–0 "Shire" (D49) Class No. 309.
"Llangedwyn Hall," G.W.R. 4–6–0 "Hall" Class No. 4941.
"The Pines Express," Liverpool-Manchester–Bournemouth.
Okehampton, S.R. (Western Section).
"Sir Nigel Gresley," L.N.E.R. 4–6–2 "A4" Class No. 4498.
"The Merseyside Express," L.M.S. London (Euston)–Liverpool (Lime Street).
"Sir Aglovale," S.R. 4–6–0 "King Arthur" Class No. 781.
"The Mancunian," L.M.S. London (Euston) –Manchester (London Road).
Liverpool Street, L.N.E.R.; Mytholmroyd, L.M.S.; Ambergate, L.M.S.
"The Lancastrian," L.M.S. London (Euston)–Manchester (London Road).

COMPETITION RESULTS

HOME

"August Errors Contest No. 1."—First: F. Mills (31), Kearsley, Nr. Bolton. Second: L. J. Payne (48450), Luton, Beds. Third: J. McIntyre (31781), Paisley, Scotland. Consolation Prizes: J. L. Makin (30933), Allestree, Derby; W. B. Hudson (1733), Weymouth; C. Cosgrave (53957), Grey Abbey, Co. Down; L. J. Slater (49094), Cosham, Portsmouth; H. J. Roberts (55803), Birkenhead.

"August Photo Contest No. 5."—First: D. F. Forbes (14092), Leith, Edinburgh 6. Second: E. Oldham (43390), Hyde, Cheshire. Third: G. L. Wilson (2478), Wormit-on-Tay, Fifeshire. Consolation Prizes: D. J. W. Brough (8246), Cheam, Surrey; E. F. Bradshaw (43645), Gidea Park, Essex; G. Marshall (51888), Whalley Range, Manchester 16; J. Turley (18853), Tunbridge Wells; R. Moss (18993), St. Helens, Lancs.

OVERSEAS

"May Locomotive Contest."—First: W. S. Eagle (31779), Bombay, India. Second: R. Pearson (29199), Victoria, Australia. Third: D. Murison (37642), Buenos Aires, South America. Consolation Prize: D. Parker (38595), Ontario, Canada.

"May Photo Contest No. 2."—First: G. C. Taylor (59265), New South Wales, Australia. Second: A. G. Fellows (29952), Auckland N.4, New Zealand. Third: A. R. Bacon (38242), Bombay, India. Consolation Prizes: P. Macdonald (43305), Toronto, Canada; T. Watson (18065), New South Wales, Australia; G. Pearson (53733), Victoria, Australia; K. R. Cassells (39510), Wellington, New Zealand.

SETS (Postage Extra)

10	United States	... 2d.	5	Venezuela ...	... 2d.
15	,, ,,	... 4d.	10	,, ...	... 5d.
20	,, ,,	... 6d.	15	,, ...	... 8d.
25	,, ,,	... 8d.	20	,, ...	... 1/-
30	,, ,,	...10d.	25	,, ...	... 1/4
35	,, ,,	... 1/-	5	Algeria ...	... 2d.
40	,, ,,	... 1/3	10	,, ...	... 5d.
45	,, ,,	... 1/6	15	,, ...	... 8d.
50	,, ,,	... 1/9	5	Cameroons	... 2d.
5	Uruguay ...	... 2d.	10	,,	... 5d.
10	,, ...	... 4d.	15	,,	... 8d.
15	,, ...	... 6d.	5	Gaboon ...	... 2d.
20	,, ...	... 9d.	10	,, ...	... 5d.
25	,, ...	... 1/-	5	Indo China	... 2d.
30	,, ...	... 1/4	10	,, ,,	... 5d.
35	,, ...	... 1/8	5	Togo ...	... 3d.
40	,, ...	... 2/-	4	Perak ...	... 3d.
45	,, ...	... 2/4	4	Selangor ...	... 3d.
50	,, ...	... 2/9	4	Negri Sembilan	... 3d.

J. RUSSELL,
23, SHANKLIN DRIVE, WESTCLIFF-ON-SEA.

ONE THOUSAND STAMPS ON APPROVAL

From which you may select any 100 for 3/-. This selection is not made up of the very commonest varieties, but contains stamps catalogued at 1/- each or more. (I do not sell less than 100.) Special Offer: Packet of Mint British Colonial, catalogue value at least £1, post free, 5/-. A returnable deposit of £1 is required from overseas applicants.

H. HARDY, "Hoyland," Potter Heigham, Norfolk.

100 DIFFERENT STAMPS FREE to applicants for ½d. approvals. Cox, 14, Broadmead Av., Worcester Park.

TURKS ISLE PACKET — FREE

This wonderful packet of 35 different stamps includes a beautiful unused black Caicos Island stamp just issued. Fine sets of Canada, Australia (including Jubilee and K.G.), Czechoslovakia, Swiss, Italian (portrait of Mussolini), unused Ukraine (Trident), Azerbaijan (Mint), old U.S.A. and Map stamp, Belgium, Hungary, India and obsolete issues. Finally, to the first 500 applicants we are including a large new K.G. VI Ceylon, an unused Duke of Windsor stamp, and a magnificent set of 5 different Danzig, also illustrated Catalogue. Just send 2d. postage and request our famous approval sheets.

LISBURN & TOWNSEND LTD. (Dept. M.M.), LIVERPOOL 3

FREE WONDERFUL 1938 OFFER 20 NEW ISSUES AND NOVELTIES

Including **ANDORRA** (new), Belgium, Canada, Denmark, **FRENCH EQUATORIAL AFRICA** (pictorial), **GRENADA (King George VI)**, **GREECE (Bull vaulting scene)**, Jugo Slavia, **KELANTAN** (Sultan Ismail), **MOZAMBIQUE CO. (Giraffe)**, **MOROCCO AGENCIES (King George VI, already obsolete)**, Turkey, etc. I will send this collection absolutely free to all stamp collectors **sending 2d. postage** (abroad 4d.).

G. P. KEEF, WILLINGDON, EASTBOURNE, ENGLAND.

FREE! 5 REIGN & COMMEMORATIVE BRITISH COLONIAL PACKET

25 different, inc. Q. Victoria, K. Edward VII, K. George V, K. Edward VIII, K. George VI, Jubilee and Coronation. All Br. Cols. This worth-while and as described set ENTIRELY FREE. Ask Approvals enclosing postage only. ALSO FREE EXCHANGE FOR YOUR DUPLICATES. Dealers supplied.

ASTLEY & CO. (M3), NEWBOLDS, WOLVERHAMPTON

THE 'ORIENTAL' PACKET

A really marvellous packet containing 46 fine stamps, beautiful pictorials from **ORIENTAL COUNTRIES ONLY**—Temples, Mosques, Pyramids, Minarets, desert scenery, etc. **SPANISH MOROCCO, 2 IRAQ**, unused **OTTOMAN EMPIRE** (obsolete), Set of **10 TURKEY** including old and new issues, Sets of **5 EGYPT, 4 PALESTINE, BRITISH MOROCCO** (Geo. VI), **5 GEORGIA** (quaint-looking stamps usually sold for 5d.), Set of **5 ALGERIA** (pictorials), Set of **4 FRENCH MOROCCO** (large pictorials), Set of **6 TUNIS** (including bi-coloured Parcel Post). The last three sets alone would sell singly for 1/2—and 2 beautiful **SYRIA**. This is the finest packet for the money I have ever offered. Price 4½d. only. Postage 1½d. (abroad 3d. extra). Purchasers of the above asking to see my approval sheets will be presented with **10 PERSIA**. In addition to this senders of addresses of stamp-collecting friends will receive set of **6 POLAND. BARGAINS:** 20 Airpost, 6d., 100 B. Colonials, 1/-, 6 Triangulars, 7d., 20 Brazil, 6d.

H. C. WATKINS (M. Dept.), GRANVILLE ROAD, BARNET

THE FIRST STAMP Ever Issued

(British 1840 Penny Black) for P.O. **3/6.** It is guaranteed genuine in every respect. Its companion stamp (1840, 2d. blue) for a further **5/9** (cat. 17/6)! Other "Classics" which every Collector should have are the **Cape of Good Hope Triangulars;** we offer 1d. rose (cat. 40/-) for **12/6;** 4d. blue (cat. 15/-) for **5/-;** and 6d. pale lilac (cat. 40/-) at **15/-.** Superb approvals of any country against approved English References or a deposit. **Full Lists Free.**

NORRIS & CO. (Dept. M), Norwood, London S.E.19.

5 Charkhari	5 Costa Rica	5 Cuba
5 Cyprus	25 Czechoslovakia	5 Dahomey
10 Danzig	25 Denmark	5 Dominican R.
10 Dutch Indies	5 Ecuador	10 Egypt
5 Esthonia	10 F. M. S.	25 Finland
25 France	5 Fr. Congo	5 Fr. Guiana
5 Fr. Guinea	5 Fr. India	5 Fr. Soudan
5 Gaboon	5 Georgia	50 Germany

Any **ONE** of the above packets yours **ABSOLUTELY FREE** by requesting approvals and sending 2d. stamps (abroad 6d.) Without approvals 6d. per packet.

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(Dept. M), 59, LEE ROAD, BLACKHEATH, S.E.3.

15 CZECHOSLOVAKIA STAMPS — AND — PACKET OF STAMP MOUNTS

FREE to all approval sheet applicants sending 2d. postage and requesting a copy of our latest list of sets and packets. This offer is for 30 days only, abroad 60 days.

WRITE NOW to: **ERRINGTON & MARTIN,**
Dept. 287, South Hackney, London E.9. Est. 1880.

FREE PACKET of all diff. South American stamps to approval applicants sending 2d. postage. Kimberley, 36, Wycliffe Road, Coventry.

FREE 110 DIFFERENT STAMPS FREE

To introduce my excellent approval selections of British Colonials, I am presenting free of charge this quality packet of stamps, including pictorials from British Guiana, Jamaica, Canada, Malta, Australia, New Zealand, Kenya, Ceylon, Tasmania, etc., and many other stamps too numerous to mention, to all genuine approval applicants (post free).

Eric J. Watts, 184, Northampton Road, Wellingborough.

FREE 16 FOREIGN and 14 COLONIALS CAT. 11/6

THESE TWO WONDERFUL PACKETS, VALUED AT OVER 2/6, FREE to every **genuine** applicant enclosing 2d. postage (abroad 6d.) for my **world-famous "VALUE"** approvals, containing only perfect stamps at very low prices which enable you to buy **TWO** stamps instead of one. **Just look at the contents:**

5 JUBILEE and CORONATION issues, scarce used pictorial **high values** from **ALGERIA, MOROCCO, TUNIS, LUXEMBOURG**, beautiful **NEW ISSUES** from **ITALIAN EAST AFRICA** (first stamp ever issued), **AUSTRALIA, GREECE, MONACO, PICTORIAL INDIAN STATES**, large **ITALIAN COMMEMS., rare** used **American high value**, stamps from out-of-the-way Hyderabad, Jamaica, Gwalior, Travancore, **finally**, a superb **set of 6 Boy King Peter.** You remember my **famous New Year's offer, this** is even **better.**

PHILIP COCKRILL, 13, MONTRELL ROAD, STREATHAM HILL, LONDON S.W.2.

SPECIAL OFFER

FREE 8 Colonial JUBILEES to all genuine approval applicants enclosing 2d. for postage, and stating their interests, and whether beginner or medium collectors—every 20th applicant will receive a COMPLETE set of CANADA JUBILEE. The most interesting BRITISH COLONIAL APPROVALS—containing mint and used Jubilees, Coronations (sets and singles), New Issues—full of BARGAINS.

SPECIAL—FALKLANDS or NEWFOUNDLAND JUBILEE comp., Mint 3/-.

T. R. Hughes (P.T.S.), **'Ibis Cottage,' Amersham, Bucks.**

FREE SET and 50 different to approval applicants. Gosling, 21, Powling Road, Ipswich.

FREE GEORGE VI ANY COLONY

A short set of George VI latest pictorials of your favourite Colony will be sent free of charge to all genuine approval applicants. Choose your own Colony! A set of Indian George VI will be also enclosed as a further gift. Send 2d. for postage, etc., and write NOW to:

G. KINGSMILL (Dept. M.M.), NEW BARNET, HERTS.

"DIAMONDS"

MANY RARE STAMPS have been found by purchasers of **The "DIAMOND" Packet**, which contains approx. **1,000 UNSORTED STAMPS** from convents abroad. **1 pkt. 1/6, 3 pkts. 3/9, 5 pkts. 6/-. All post free inland.** (Postage to Colonies 3d. per pkt. extra. S. Africa and Foreign 6d. per pkt. extra. Places on Empire Airmail Route 1/- per pkt. extra.) Beware of imitations.

O. NERUSH
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My approvals are guaranteed to please because you get such amazing bargains. British Colonies and Foreign Countries from ½d. to £1 each and over. Say what **you** want.

Campbell, Haldon Avenue, Teignmouth.

FIRST 25 APPLICANTS for approvals will receive Mint Federated Malay States 1c., 1925 issue. Good discount. Calthorpe, Cuttings Av., Sutton-in-Ashfield.

UNUSED AFRICAN PACKET

Fine packet of unused African stamps from Belgian Congo (river scene), Morocco Agencies King Geo. VI, already obsolete, Italian East Africa (Abyssinia, etc.), Sudan, Somali Coast, Kenya, Cameroons, a fine set of 5 Ivory Coast, new issue, inscribed in error 'Baloue Woman' for 'Baoule Woman'—one is already obsolete—and another set, only just issued, of French Guinea, Mozambique, etc., etc., 30 stamps in all, sent free to all genuine applicants for approvals enclosing 2d. postage. Only one gift to each applicant.

R. D. HARRISON — ROYDON — WARE

For other stamp advertisements see pages 660 and xxviii

RAILWAY DEVELOPMENT IN STAMPS

PROBABLY most of our readers are familiar with the story of the development of railways. We wonder how many of them have sought to tell the story with the aid of postage stamps. Few stamp stories are so complete, yet so simple to compile. There are only slightly more than 130 stamps in the complete series, but these cover effectively the whole story from Stephenson's days to modern streamlined giants.

Stephenson's *"Rocket"* unfortunately is not to be found in the collection, but it has excellent deputies in the *"Austria,"* shown on the 12 gr. value of Austria's railway centenary commemorative issue of 1937, and the *"Eagle"* built in 1835 for the Bavarian Railways, illustrated on the 60 pf. value of Germany's railway centenary issue of 1935. The first of these stamps is illustrated here. Both locomotives actually were built in England by Robert Stephenson and Company.

The other stamps in these Austrian and German series showed modern steam and electric locomotives, the most interesting being the famous *"Flying Hamburger"* express, a streamlined articulated Diesel engined railcar unit, which at the time of issue of the stamp was the fastest train in the world, covering the run between Berlin and Hamburg at an average speed of 77.4 m.p.h. This train is shown on the 25 pf. of the German series. The 25 gr. Austrian stamp showing a modern steam locomotive is illustrated on this page.

"Le Belge," one of the Belgian State Railway's earliest locomotives, was shown on the higher values of the Belgian 1935 parcel post issue, one of which, the 3 fr., is illustrated on this page. This engine was slightly later in type than *"Austria"* and *"Eagle."* Another design in this series showed a Diesel railcar unit.

The earliest railway stamp design appeared on a 1c. stamp issued in 1860 by New Brunswick. The locomotive shown on this stamp was a wood-burning engine with a 4–4–0 wheel arrangement. Its outstanding features were a tremendous spark-arrester fitted to the chimney, a necessary item of equipment since the railway ran through virgin forests, and a high railing along the running plate, presumably to enable the driver to take a walk around his engine without risk of falling off.

The 5m. value of Egypt's 1933 International Railway Congress issue provides an excellent illustration of the next stage of the development of locomotive design, marked by the introduction of inside cylinders, coupled driving wheels and a cab for the locomotive crew. The engine shown on it is typical of those serving the Egyptian Railways in 1852, and three other excellent designs in the same series show engines of 1859, 1862 and 1932.

Stamps of the American continent are rich in railway designs, one of the most outstanding of which shows a Stirling "single-wheeler" on the 3c. value of Uruguay's 1895 issue. This was of exactly the same type as the famous G.N.R. locomotives that hauled *"The Flying Scotsman"* 50 years ago, described in the August *"M.M."*

Other splendid American railway stamps are a "wood-burner," similar in type to the New Brunswick stamp already described, seen on the U.S. 3c. issue of 1869, and the "mail train" design on the 5c. value of the U.S. 1912 parcels post issue. The latter shows a mail train travelling at full speed about to pick up a sack of mail at a wayside station.

This picture is so splendid an impression of a locomotive at speed that it is a pity the wheel-arrangement is not clearly defined. The leading wheels are apparently the same size as the drivers, and as the connecting rod is partially obscured, we are left in doubt as to whether the arrangement is 4–4–2 or 2–6–2. The 3c. value in the same series showed a postal sorting clerk at the door of a mail van, placing a sack of mail in readiness for delivery into a lineside collecting apparatus.

The 2c. value from the U.S. 1901 series showed a splendid picture of an express train of Pullman cars being hauled by one of the then up-to-date 4–4–2 "Atlantic" type passenger express engines.

Newfoundland's 5c. 1928 tourist publicity issue showed a picture of a 4–6–2 "Pacific" locomotive hauling the cross-country express from St. Johns to Port-aux-Basques.

A typical C.P.R. locomotive is shown on Canada's 1927 20c. Special Delivery stamp but the illustration is a composite picture showing the development of mail delivery services within the Dominion, and the locomotive is too small a feature to be considered a first-class railway picture.

Among South American stamps the best railway specimen is to be found on the 1c. value of Ecuador's 1908 issue celebrating the 25th anniversary of the opening of the Guayaquil-Quito Railway. This is a really splendid locomotive "portrait" and shows a 4–4–0 engine equipped with a pilot or "cowcatcher," a headlight in front of the chimney and a bell.

Salvador showed an early type of 4–4–0 engine on a 3c. stamp issued in 1896, while Honduras featured a still earlier type, complete with cowcatcher, spark arrester and headlight in its 1898 series.

There are no British stamps illustrating home railways but India provides an excellent view of an express passenger train on the 4 a. value of its current issue, and South-West Africa shows a mail train in the design of the current 1½d. value.

There is not sufficient space here to deal with all of the stamps available, electric locomotives for example, but the Editor is compiling a complete list, and will send a copy to any reader who cares to apply.

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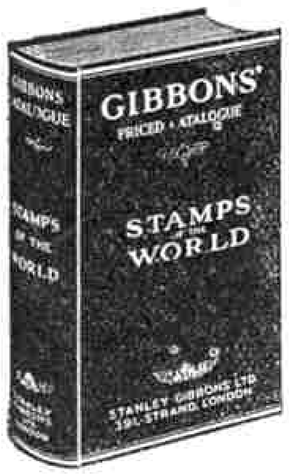

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For other stamp advertisements see pages 658 and xxviii

Stamp Gossip

and Notes on New Issues

New Colonial Issues

Among this month's Colonial new reign issues the low values of the St. Kitts-Nevis issue, ½d., 1d., 1½d. and 2½d. values, are of special interest, for they are among the few new colonial issues that employ a simple King's Head design. Other values from this Colony vary from the previous pictorial designs only in the substitution of the portrait of King George VI.

We illustrate the 6d. value, which shows the King's portrait in the left hand panel, and a picture of Christopher Columbus standing on the deck of the *"Santa Maria"* on the right. This picture is taken from the Badge of the Colony. It is a mistake to represent Columbus looking through a telescope, for that instrument had not been invented in his time, but the error goes back long before the days of stamps to the time when the Colony's badge was first designed.

St. Lucia's new issue also devotes the whole of its low values, ½d. to 3d. values, to a King's Head design, but in this case, as the illustration of the ½d. stamp at the head of the page shows, the portrait is small and surrounded by a border of roses and fleur-de-lys, taken from the Colony's badge, linked by a golden chain.

The higher values are pictorials with designs as follows: 6d., Columbus Square; 1/–, Government House; 2/–, the "Pitons," a group of mountainous rocks on the island's coast; 5/–, illustrated here, a quayside scene showing the loading of bananas; 10/–, the Badge of the Colony.

The Dominican series provides four entirely new and very charming designs. The 2d. and 1/– values show the famous Boiling Lake, reputed to have been discovered by its smell! It was the heavy sulphurous fumes of the volcanic gas given off by the lake that led its discoverer, Dr. Nicholls, to explore the locality and to find the lake 2,000 ft. above sea level. The temperature of the water is only a little below boiling point and the upward pressure of the volcanic gases sometimes is so great as to force the level of the lake several feet upward.

Freshwater Lake, shown on the ½d., 6d. and 2/6 values, lies in the midst of beautiful scenery but its only other claim to fame is a legendary monster, a huge serpent with a gigantic jewel perched on its head, that is reputed to dwell in its depths.

Layon River, pictured on the 1d., 3d. and 5/– values, is one of the island's two rivers, while the principal industry, cultivation of lime fruit, is represented by the 1½d. and 2½d. values, which show a scene during the picking of the limes.

Pictures on Stamps

The Roumanian series commemorating the centenary of the birth of Nicholas Grigorescu, the famous Roumanian painter, provides stamp collectors with a most interesting set of art stamps. There are five stamps in the series, of which one, the 10L value, illustrated here, is devoted to a reproduction of a self-portrait of the painter and the remainder to reproductions of the artist's most famous works. These are as follows: 1L., *"The Spring"*; 2L., *"Escorting Prisoners"*; 4L., *"Returning from Market"*; 6L., *"Robica, the Water Carrier."*

Indo-China Railway Commemoratives

The opening of the Trans-Indo-China railway has been celebrated in French Indo-China by the issue of a short series of three stamps, bearing the design illustrated on page 659. This shows a railway locomotive, types of Indo-Chinese natives and a portrait of President Doumer.

A 65c. air mail stamp was issued simultaneously bearing the same design except for the substitution of the inscription *"Poste Aerienne"* in the top left panel.

A Lithuanian Sports Issue

One of the most extraordinary examples of making a stamp design serve a variety of purposes has recently been provided in Lithuania, where a series of four stamps has been issued at a premium in aid of the National Olympiad Fund.

The same series has been overprinted with the trefoil badge of the Girl Guides Association and two different sets of wording meaning respectively "Guides' National Camp" and "Scouts' National Camp," the premium on the sale of the overprinted stamps being devoted to the camp funds of the twin organisations.

We illustrate the 5c. + 5c. value, which shows an archer. The remaining designs are: 15 + 5c, javelin thrower; 30c. + 10c., diver; 60c. + 15c., relay runner breaking the tape. They form a very attractive series.

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

Australian Platypus Design

The new 9d. stamp issued by Australia in September shows that strange creature, the platypus, and should prove a popular addition to the range of zoological designs. The platypus has the distinction of being amphibious, fur-bearing and duck-billed, and it also lays eggs! Small wonder that it has always been regarded by scientists as a freak.

Since the platypus makes its home in the banks of a stream or pool, with two entrances, one above the other below the surface of the water, it was appropriate that the Postal Department should picture the animal about to enter a stream. The stamp is shown in the heading to this page.

Other new Australian designs are a ½d. stamp portraying a kangaroo, and a ¼d. value bearing the portrait of King George VI.

Celebrating the Penny Black Centenary

The provisional arrangements for the celebration of the centenary of the first adhesive stamps, the Penny Black and Twopenny Blue stamps issued in Great Britain on 6th May 1840, have now been completed, and the Royal Philatelic Society, which has the arrangements in hand, announce that a Centenary Exhibition will be held during the week commencing 6th May 1940 at the Earls Court Exhibition Building in London.

It is intended that the Exhibition shall provide a representative display of the postage stamps of the world to show the development of the use of postage stamps. Two particularly interesting exhibits will be a group entitled "Pioneers of Philately," showing the first stamp of each stamp-issuing country throughout the world, and a demonstration of the development of the design of the postage stamp, illustrating methods of production and intended primarily to interest non-philatelists and beginners.

Other self-contained sections will deal with aero philately and postal history, while the Junior Philatelic Society will undertake the organisation of a section for Junior collections.

We will give further details of this important Exhibition at a later date.

Billiards in the Home

Home billiards is a pastime that offers a solution to the ever-recurring problem of indoor recreation during the winter. Every member of the family finds in it a fascinating diversion that never palls. The game owes a great deal of its amazing popularity to the firm of E. J. Riley Ltd., Accrington, who have long specialised in the production of first-class billiard tables suitable for small and medium sized houses. They particularly claim that their "Home" Billiard Tables are definitely not toys, but that each, whatever its size, is a perfect replica in construction of the full-size billiard table.

There are five different models of the Riley "Home" Billiard Table, varying in price and size, and each one is available for cash or easy terms. The firm were among the pioneers of combined billiard and dining tables, and their present range of "Combines" are wonderful examples of utility and beauty. These products can be transformed in two minutes from a luxurious dining table to a flawless billiard table, or vice versa. Riley "Combines" are made in various attractive designs and sizes ranging in price from £22/10/- upward, and other Riley models include the "Club" and "Institute" Models and, finally, the well-known Riley full-size tables. Rileys are the largest makers of full-size billiard tables in Great Britain, and in addition, they specialise in the supply of accessories, repairs, re-covering tables, and similar work.

A complete illustrated Art List of Riley Billiard Tables will be sent to any "*M.M.*" reader who writes to E. J. Riley Ltd., Deal Works, Accrington, or Dept. 3, 147, Aldersgate Street, London E.C.1.

Cycle Lighting Equipment

The boy who is keen on night riding necessarily must keep his lighting equipment in a state of complete efficiency if he is to cover the miles with confidence and pleasure. This involves keeping up to date, and for that reason every one of our cyclist readers should secure a copy of Bluemel's 1938/9 season's catalogue of cycle dynamo sets and battery lamps, which provides details of a wide range of first-class equipment at prices to suit all pockets.

The catalogue also displays a range of handy pocket torches—an inexpensive item of equipment that every night rider should carry for emergency use.

Bluemel Bros. Ltd., Wolston, Nr. Coventry, will send a copy of this catalogue free to any reader who would like one. The "*M.M.*" should be mentioned when applying.

Heroes of British Lifeboats

Here are lifeboatmen actually telling you of their most exciting rescues! Round the British coast travelled Gerda Shairer and Egon Jameson, persuading shy heroes to talk. You'll meet Henry Blogg, of Cromer, who does not know how many people he has saved; Richard Stephens, of the Lizard boat, who always wears a green hat; Mrs. Amelia Johnson, heroine of Gorleston; and many others. (7/6 *net.*)

Heroes of Forgotten Adventure

You've all heard of Livingstone and Stanley. But do you know of other explorers of the 19th century such as Oswell, the big-game hunter; Lord Milton, who nearly starved to death in the Rockies; Joshua Slocum, who sailed round the world in a tiny boat; and Guinnard, who was captured and enslaved by Patagonians? In this book T. C. Bridges tells of these and other intrepid men. (7/6 *net.*)

HARRAP

ST. DUNSTAN'S VISITORS TO MECCANO FACTORY

From left to right: Mr. W. A. Wiggins, Mr. G. Holme, Mr. G. Fallowfield, Mr. G. J. Wheeler, Mrs. Holme, and Mr. T. J. Edwards of Meccano Ltd., who conducted the visitors round the factory.

Recently we had the interesting experience of receiving at our factory Mr. G. Fallowfield and Mr. G. J. Wheeler, two blind and deaf St. Dunstan's trained ex-Service men. Mr. Fallowfield has been an enthusiastic Meccano model-builder for many years, and for a long time had cherished a desire to "see" for himself how Meccano and Hornby Trains are made. With Mr. W. A. Wiggins, their escort, our visitors were spending a holiday at Hoylake at the Deaf-Blind Hostel maintained by Mr. and Mrs. G. Holme, who very kindly accompanied them on their visit to act as interpreters.

Before he had been inside the factory many minutes Mr. Fallowfield had demonstrated that it is indeed possible for blind people to "see." It was amazing to follow his fingers as they passed lightly over objects that were handed to him, and over the outlines of machines that were stopped momentarily to permit him to examine them, and his lively commentary left no doubt of his understanding of all that was going on around him. Conveyor operations seemed to fascinate him most of all.

It was particularly interesting to watch Mr. Fallowfield running his hands over the Meccano "*Ark Royal*" model, which revealed to him for the first time the chief features of the design of aircraft carriers. A letter that he has since sent to the Editor of the "*M.M.*" reveals most vividly how quickly he and his friend Mr. Wheeler were able to understand the operation of the factory and the make-up of the models they were shown.

The Aircraft Dashboard—

(*Continued from page 607*)

where it is desired to ensure that a turn is correctly banked. In the fore-and-aft level, gravitational error is a disadvantage; an increase in speed of the aircraft, as by suddenly opening the throttle, will cause the liquid temporarily to run back into the vertical tube, and show an increase in the angle of flight, though no such change has in reality taken place. Similarly, flattening out after a glide will result in the liquid in the vertical tube running forward, making the angle of glide appear to be steeper than it really is. These small disadvantages may become serious where aircraft are taking off in mist or darkness; and liquid levels, either fore-and-aft or of the cross level type, are being replaced in military aeroplanes and civilian air liners by gyroscopic instruments.

Most aircraft dashboards, like those of motor cars, are fitted with a clock; aircraft clocks are usually arranged with an additional pair of hands that will indicate the time of flight in hours and minutes. This figure has many uses. It enables the pilot to enter correctly in his log book the total time he has been in the air; it records for the ground engineers the number of hours the engine has run, or the aeroplane has flown, showing how near each of them is to a minor or complete overhaul.

It is essential of course that the time of flight dial should be set to zero at the beginning of every flight; if this is not done, those hours will not be accurately recorded. This disadvantage has been overcome by an instrument that is styled an air log. It sums up the total time the aeroplane and engine have been in flight since their last overhaul, without the necessity for ground staff resetting dials at the beginning of ever flight. It consists of a dial on which the time of flight is shown in minutes round the outside, and in hours in a window immediately below the zero; in order that the time of flight should be accurately registered, the pointer should be returned to zero before the aircraft leaves the ground. Even if this is not done, the instrument will record in windows below the pointer the total flying time since the last overhaul was carried out. The clock inside the air log works only when the aircraft is in flight at a speed in excess of stalling speed. This is carried out by means of a capsule, connected like that of the air speed indicator to the Pitot head, distension of which results in the release of an escapement permitting the clock mechanism to begin recording the passage of flying time.

Competition Corner

A NEW DOUBLETS CONTEST

It is a considerable time since we gave our readers a series of doublet puzzles to solve, and for the benefit of newcomers we explain the requirements of this form of word competition.

Many years ago the doublet puzzle was almost as popular as the crossword puzzle is to-day. It was invented by Lewis Carroll, the author of *"Alice in Wonderland,"* to amuse his large circle of friends. They received it with great enthusiasm, and he was persuaded to introduce it to the public, with whom it caught on immediately and became quite a craze.

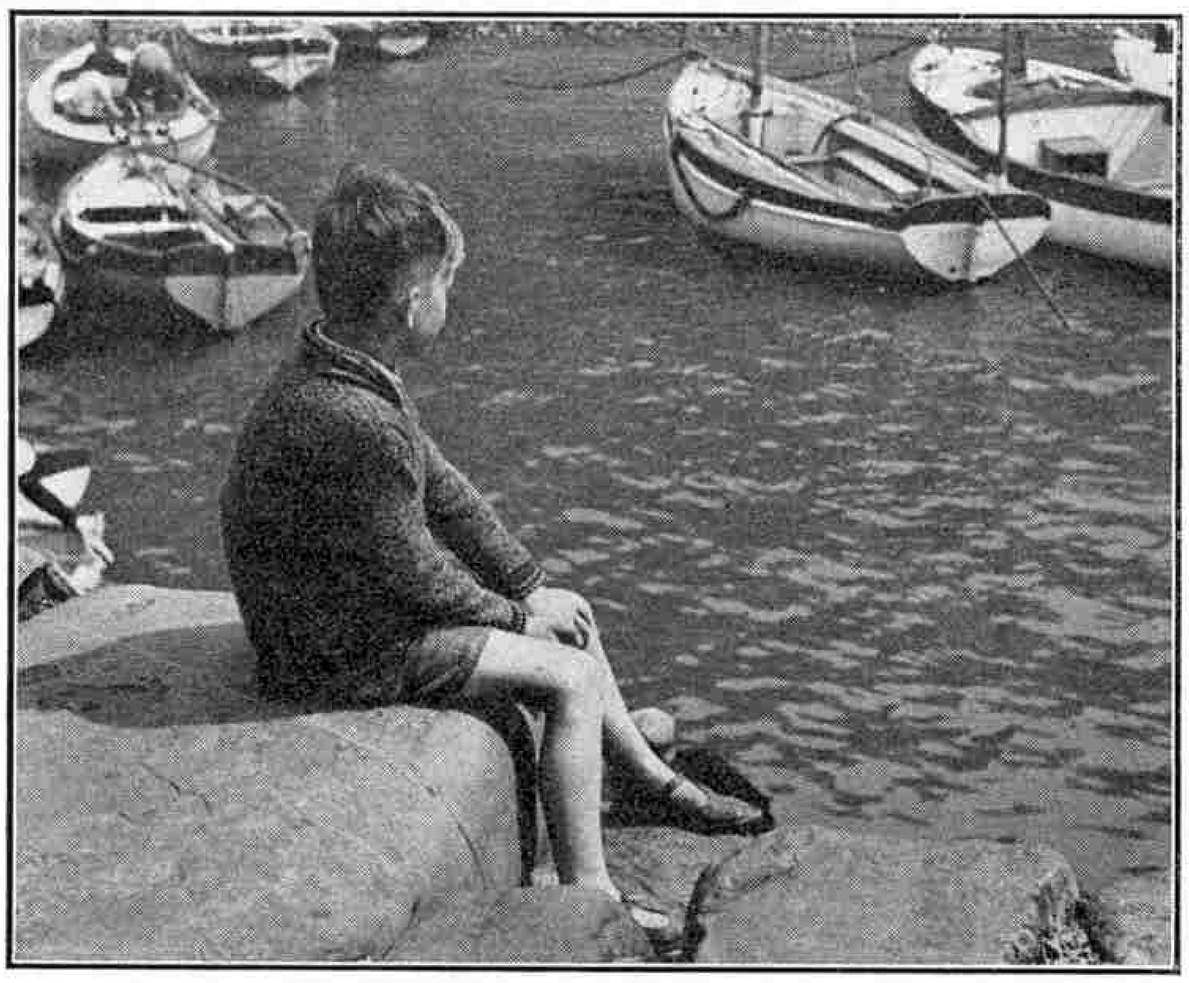
A doublet consists of two given words, each containing the same number of letters. The puzzle requires one word to be changed to the other by placing connecting words between. The connecting words are known as "links," and must differ from the preceding link by the alteration of one letter only. Only words of the same length may be used, obviously, and the test is to make the change in the smallest number of links.

To make the idea clear we give the following examples:
Put LOAD in CART
LOAD-lord-cord-card-CART
Protect CAT from DOG
CAT-cot-dot-DOG

In making the links only English words appearing in a standard dictionary may be used. Proper nouns, names of persons, places, etc., are not permitted. It is important to remember that the first solution arrived at is not necessarily the shortest. Competitors should go over in search of short cuts that will eliminate unnecessary links. Close study will often reveal overlapping links that may be removed.

The doublets to be solved are as follows:

Load	COAL	on	SHIP
Change	WET	to	DRY
Cut	PEAT	for	FUEL
Make	TOWN	into	CITY
Dye	GREEN	as	BLACK
Put	NEWT	in	POND
Raise	SERF	to	LORD
Lower	DIVER	in	WATER
Make	FLOUR	into	BREAD
Change	BUSH	to	TREE
Lift	ROCK	with	GRAB
Wreck	SHIP	on	REEF



"The Young Harbour Master," by J. R. Tottle, Taunton. This charming picture, taken at Clovelly, N. Devon, was awarded First Prize in the A Section of the "August Photo Contest."

In judging the entries, the 12 doublets will be considered as one contest, and prizes of Meccano or Hornby Train goods to the value of 21/-, 15/-, 10/6 and 5/- respectively will be awarded to the senders of the four solutions showing the lowest total of links used throughout. In the event of a tie for any of the prizes, preference will be given to the entry having the neatest or most novel arrangement.

It will be observed that the combination of the 12 doublets for judging purposes will ensure that a brilliant solution of one doublet will carry its full weight by offsetting to some extent failure to secure the shortest chain in another.

Entries should be addressed to *"Doublets,* Meccano Magazine, Binns Road, Liverpool 13," and sent to reach this office not later than 30th November. There will be a duplicate set of prizes for the best entries from Overseas readers, whose solutions must reach us not later than 28th February 1939.

Entries must be written on one side of the paper only, and each sheet of paper used must bear the competitor's name and address. The total number of links used must be noted in the top right corner of the first sheet.

All *"M.M."* competitions are set solely for the purpose of amusement, and as this is one in which every reader at Home and Overseas can take part on equal terms, we look forward to a really big number of entries. The names of the prize winners in the Home section will be published in the January issue.

November Drawing Contest

Each month throughout the winter we shall hold drawing competitions, open to readers of all ages. No special subjects will be set, the monthly prizes being offered simply for the best drawings or paintings submitted during the month. Entries may be of any size, mounted or unmounted.

Each month's entries will be divided into the usual two sections, A for readers aged 16 and over and B for those under 16; and prizes of Meccano products or artist's materials, as chosen by the winners, to the value of 21/- and 10/6 will be awarded in each section. There will be separate sections with similar prizes for Overseas readers.

Entries in the November competition must be addressed *"November Drawing Contest,* Meccano Magazine, Binns Road, Liverpool 13" and must arrive not later than 30th November. Overseas closing date, 28th February 1939.

Winter Photo Contests

As was announced in our last issue, we have decided to continue our photographic contests throughout the winter.

The conditions of the winter series of contests will be similar to those held during the summer. Any outdoor photographs of autumn and winter interest will be eligible, but indoor subjects will be restricted to table-top photographs of the type described in the article on page 612 of this issue.

Entries will be divided into the usual two sections, A for readers aged 16 and over; B for those under 16. Prizes of Meccano products or photographic materials to the value of 21/- and 10/6 will be awarded in each section. Entries to this month's contest should be addressed *"November Photo Contest,* Meccano Magazine, Binns Road, Liverpool 13." Closing dates: Home section, 30th November; Overseas section, 28th February 1939.

COMPETITION RESULTS

HOME

September Photo Contest.—First Prizes: Section A, Miss A. Roe (Sheffield); Section B, J. C. Needham (Enfield). Second Prizes: Section A, Miss J. Wedgwood (Oxford); Section B, M. Pickett (Burton-on-Trent). Consolation Prizes: M. L. Done (Wednesbury); P. Glendenning (London S.W.17); W. B. Greenfield (Gateshead); A. Graham (Edinburgh 4); R. Storey (Barnehurst); V. A. Thomson (Sanderstead).

September Crossword Puzzle.—1. W. K. Cocking (Redruth). 2. G. Patterson (Manchester). 3. A. C. Robb (Upton, Wirral). 4. J. Y. Browne (Luton). Consolation Prizes: J. W. Billinge (Brighton); L. W. Chitty (London S.W.20); W. C. Hannan (Glasgow E.1); A. New (New Barnet).

OVERSEAS

June Photo Contest.—First Prizes: Section A, T. Watson (West Leichardt, N.S.W.); Section B, P. Gilles (Montpellier, France). Second Prizes: Section A, L. W. Humm (Geraldine, N.Z.); Section B, C. R. Anderson (Timaru, N.Z.). Consolation Prize: P. Macdonald (Toronto).

June Crossword Puzzle.—1. E. A. Bunt (Capetown). 2. M. P. Senji (Madras). 3. L. Hurter (Caledon, S. Africa). 4. W. B. Moore (Toronto). Consolation Prizes: P. Cuthbert (Mowbray, S. Africa); R. W. Roddick (Rosario de Santa Fe, Argentine).

NO ACCOMMODATION

Bill: "Go back and lick him."
Jack: "But he's given me two black eyes already."
Bill: "Well, he can't give you any more, can he?"

* * * *

Teacher: "As we walk out-of-doors on a cold winter's morning and look about us, what do we see on every hand?"
Class: "Gloves."

* * * *

Boss: "Who was that on the phone?"
New Office Boy: "Somebody rang up and said, 'It's a long distance from Paris.' So I said 'Any fool knows that,' and rang off."

* * * *

A prospective employer was interviewing a charlady.
"Where did you work last?" he asked.
"Remember Mr. Briggs, sir, wot died so sudden? Well, I did for him!"

* * * *

Teacher: "Give me a sentence with the word 'centimetre' in it."
Tommy: "My aunt came to stay with us, and I was centimetre at the station!"

* * * *

Negro Patient: "Doctor! doctor! I was playing de mouth organ, an' swallowed it!"
Doctor: "Keep calm, man, and be thankful you were not playing the piano."

* * * *

Motorist Father: "What did they teach you at school to-day, sonny?"
"Oh, teacher told us all about Columbus, who went 2,000 miles on a gallon."

* * * *

"Would you like a high tee or a low tee, sir?" asked the caddie.
"What does it matter to you whether I have a high tea or a fish supper?" roared the novice golfer. "You put the ball on the bump and let's get on with the game."

* * * *

Old Lady: "Aren't you afraid you will catch cold on such a night as this, my boy?"
Newsboy: "No, mum. Selling papers keeps up the circulation."

* * * *

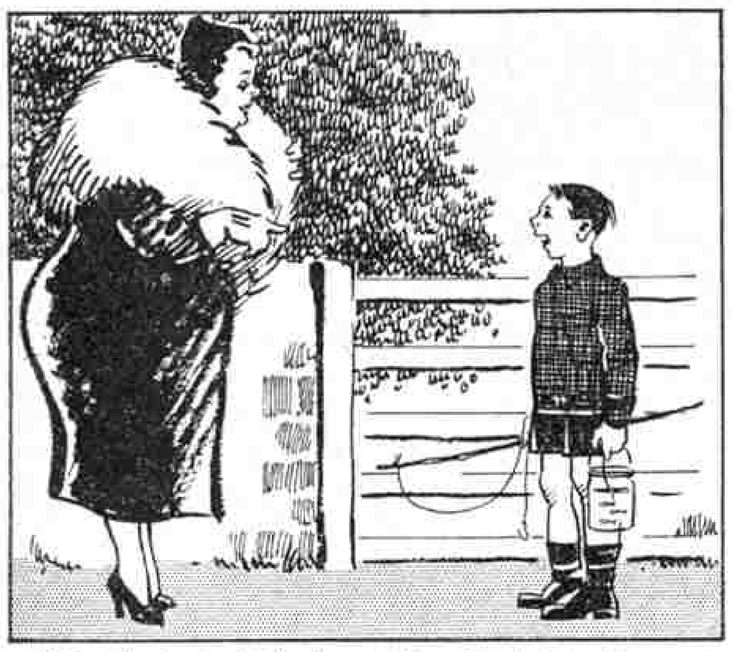
Bob: "What did Noah say when he heard the rain falling on the roof?"
Bert: "'Ark!"

* * * *

Mose: "Dat child o' yourn am mighty slow learnin' at school. How does yo' account fo' dat?"
Rastus: "Well, de school am two miles from heah, an' dat chile done fo'gits all de teachah tells him fo' he git half way home."

* * * *

HOPEFUL



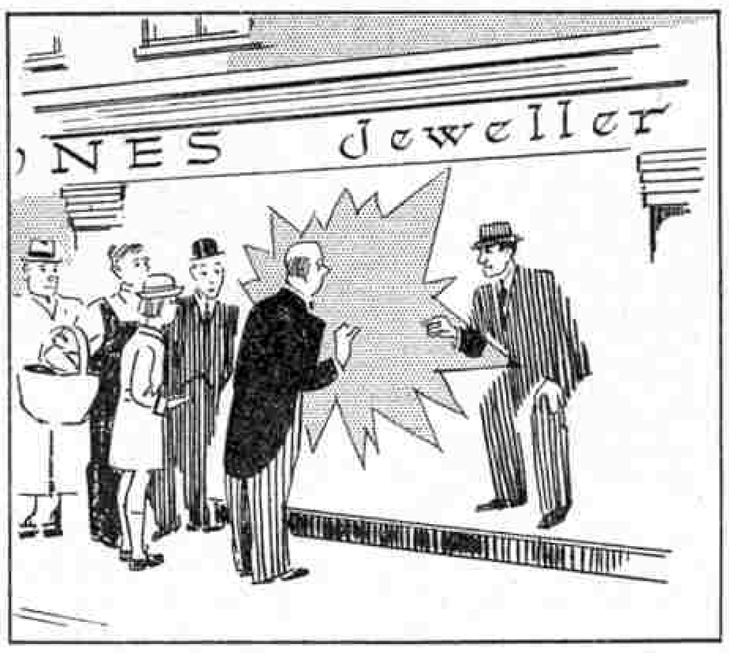
Stout lady to little boy: "Can I get into the park through this gate?"
Boy: "I guess so, lidy. A cart-load of hay just went through."

LIGHT FARE

Customer (in restaurant): "Another sandwich, please."
Waiter: "Yes, sir, and is there anything else?"
Customer: "Yes, bring a paper-weight; the last sandwich blew away."

* * * *

CRACKED!



Famous detective inspecting the scene of a crime: "Gracious, this is more serious than I thought. This window has been broken on both sides."

* * * *

Landlady: "A professor formerly occupied this room, sir. He invented an explosive."
New Lodger: "Ah, I suppose those spots on the ceiling are the explosive?"
Landlady: "No, they're the professor."

* * * *

"Are you Hungary?"
"Yes, Siam."
"Well, come along; I'll Fiji."

* * * *

The manager of a cinema was interviewing an applicant for the position of attendant.
"What would you do in a case of fire?" he asked.
"Oh," said the man, "don't worry about me, I'd soon get out."

* * * *

The examining lawyer was questioning an Irishwoman in court with regard to the stairs in her house.
"Now, my good woman, please tell the court how the stairs run in your house."
"How do the stairs run?" repeated the woman. "Shure, when I'm upstairs they run down, and when I'm downstairs they run up."

* * * *

Detective: "Got away, has he? Did you guard all the exits?"
Village Policeman: "Yes, but we think he must have slipped through one of the entrances."

* * * *

"You sold me this car two weeks ago."
"Yes, sir."
"Tell me again all you said about it then. I'm getting discouraged."

* * * *

Doctor: "I've given you tablets this week instead of pills, Tommy."
Tommy: "But I want pills."
Doctor: "Why? There's no difference."
Tommy: "Isn't there? Have you ever tried blowing tablets through a peashooter?"

* * * *

An Irish farmer discovered one of his labourers asleep under a hedge in the middle of the afternoon. Eyeing the man with a smile, he said: "Slape on, ye idle creature, slape on. So long as ye slape ye've got a job, but when ye wake ye're out of work."

* * * *

THIS MONTH'S HOWLER

"Etiquette is the noise you make when you sneeze."

GOING CONCERN

"Daddy, I want to ask you a question."
"Certainly, son; go ahead."
"Why do you wind up businesses when you want them to stop?"

* * * *

An Irish recruit in a cavalry regiment fell off his horse. The sergeant strode up to him and demanded: "Did you receive orders to dismount?"
"I did, sor."
"Where from?"
"From hindquarters," said Paddy.

* * * *

MEN OF LETTERS

The shepherd and the old cowman were discussing the new squire, and the conversation was as follows:
Shepherd: "I.C.E.B.A.O.B.E."
Cowman: "E.B., B.E.?"
Shepherd: "I., E.B."
Cowman: "Y.B.E.A.O.B.E.?"
Shepherd: "Y.E.B.A.M.P., U.C."
Cowman: "O.I., I.C."

* * * *

Dentist: "What kind of filling do you want in this tooth, son?"
Billy: "Chocolate, please."

* * * *

Professor: "Why are summer days longer than winter days?"
Student: "The heat expands them."

* * * *

"Iceland," said the teacher, "is about as large as Siam."
"Iceland," wrote Herbert afterwards, "is about as big as teacher."

* * * *

Paddy walked into a newspaper office and said he wanted to insert an announcement of the death of a friend.
"How much do you charge?" he said.
"Ten shillings an inch," was the reply.
"Begorrah," said Paddy, "he was six feet tall."

* * * *

Street orator: "We must get rid of Radicalism, Socialism, Bolshevism, Communism, and Anarchism."
Voice from crowd: "While you're about it, why not throw in rheumatism?"

* * * *

The tramp called at a cottage and asked for food.
"How would you like a nice chop?" said the owner of the cottage kindly.
"That all depends, lady—is it lamb, pork or wood?"

* * * *

LABOUR SAVING!

Man having his hair cut: "Why do you insist upon telling me these horrible stories?"
Barber: "I'm sorry, sir, but when I tell stories like that, the hair stands up on end, and makes it much easier to cut, sir."

MERSEY MODELS

STEAM ENGINES (From 12′6 to 47′6)
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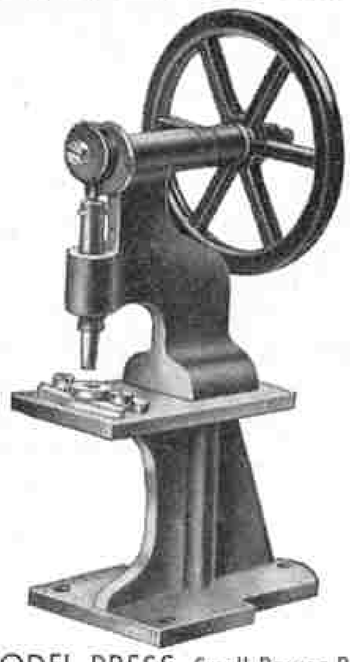

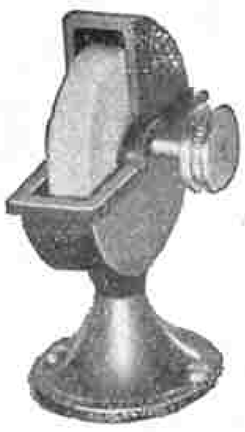

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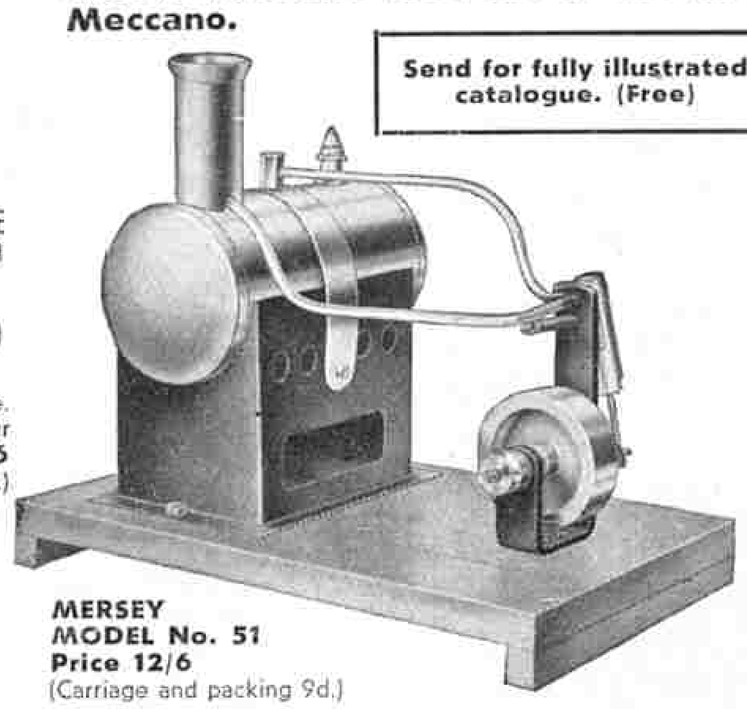

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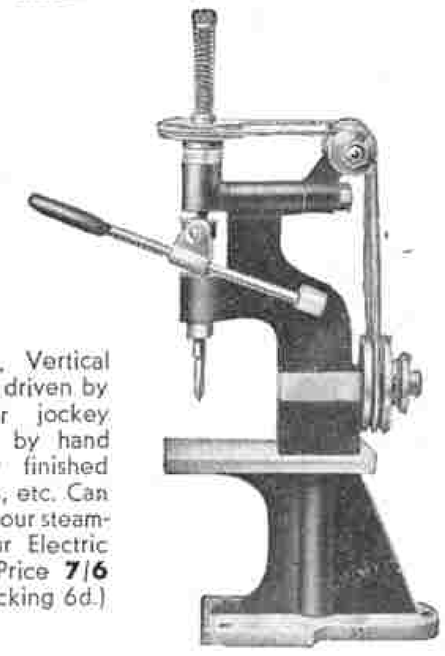

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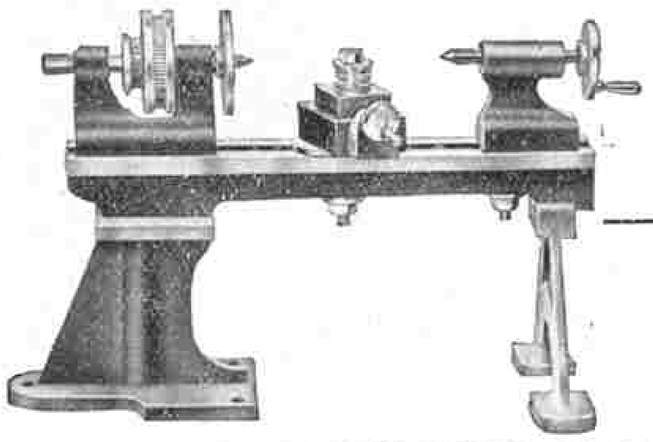

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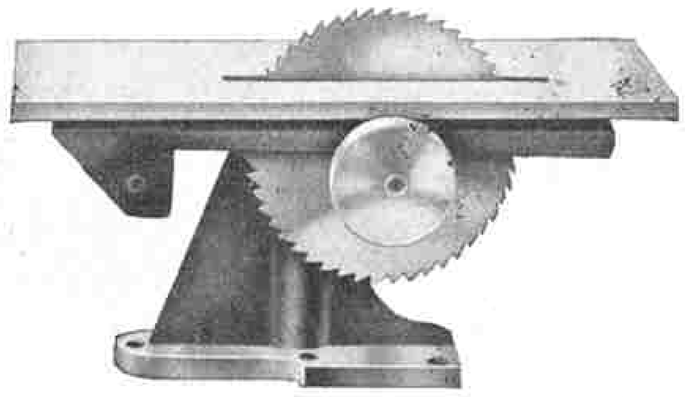

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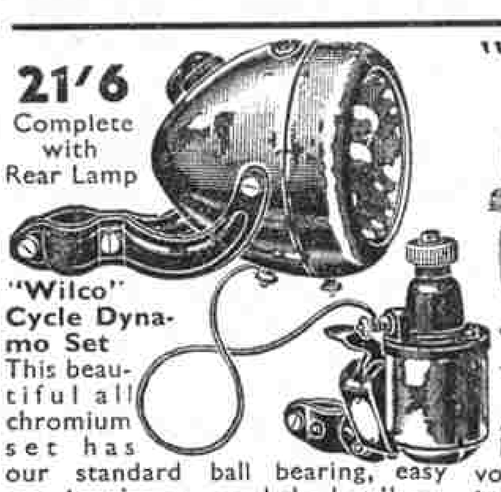

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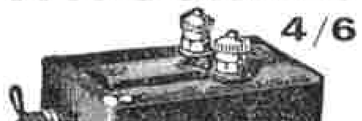
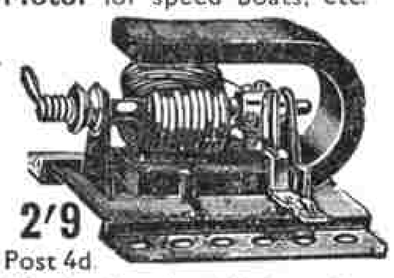


4/6
4-volt Permanent Magnet Motor for speed boats, etc.



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Ideal 4-volt Motor for Meccano models and speed boats, base plate drilled for easy mounting.

Miniature Fittings. Complete with bulb, flex and clip for battery. 1½" to 2½" high. Each **1′-**
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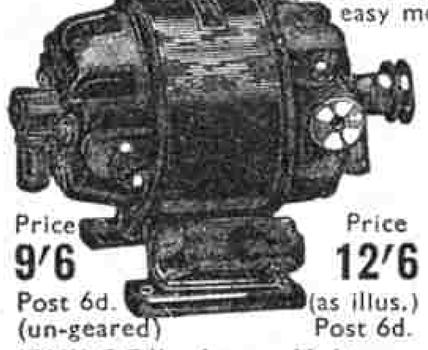

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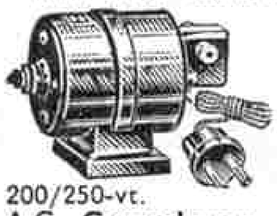

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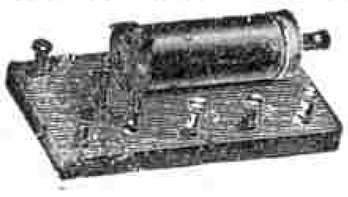

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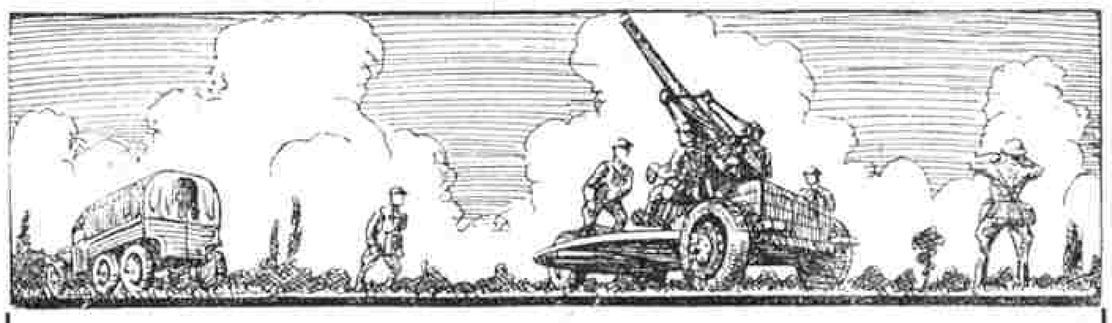

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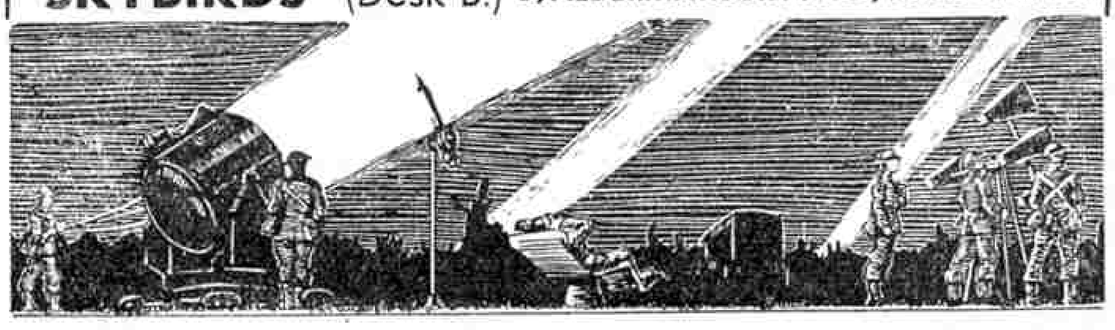

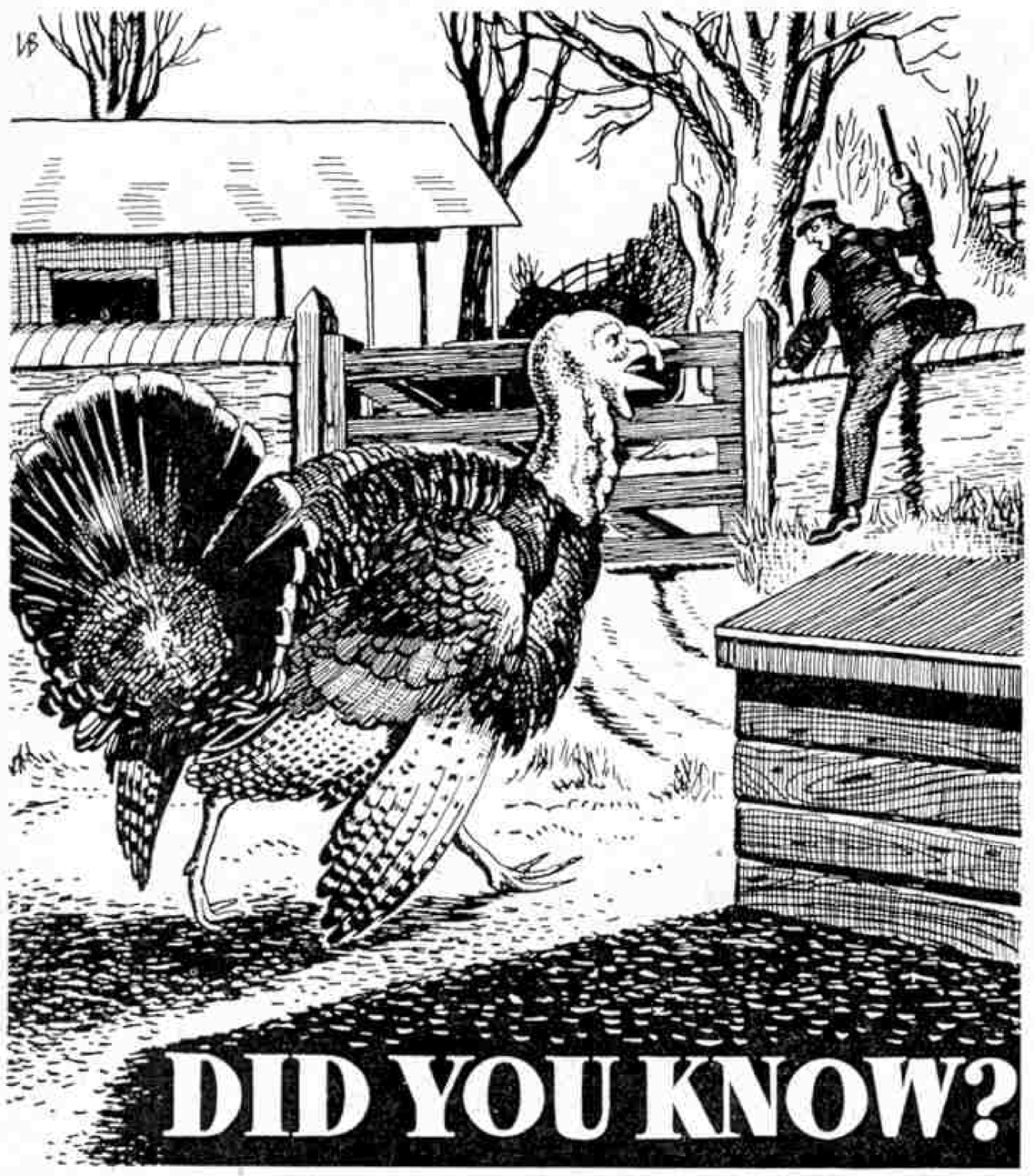

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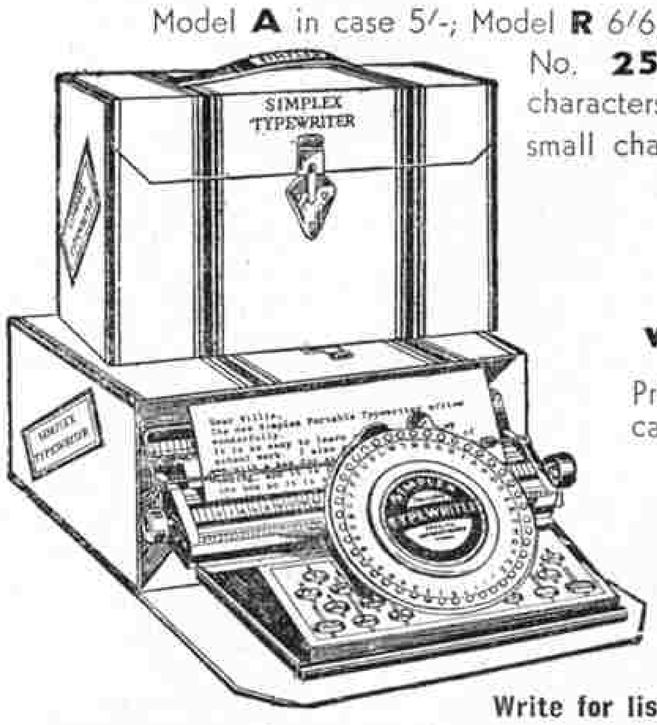

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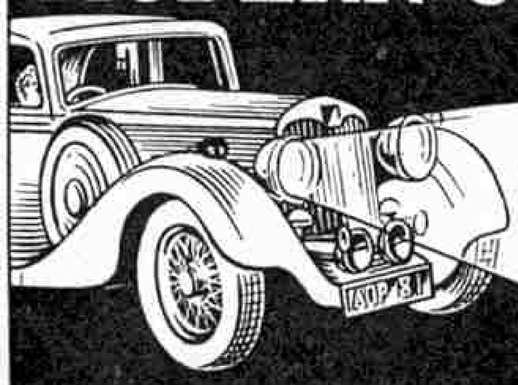

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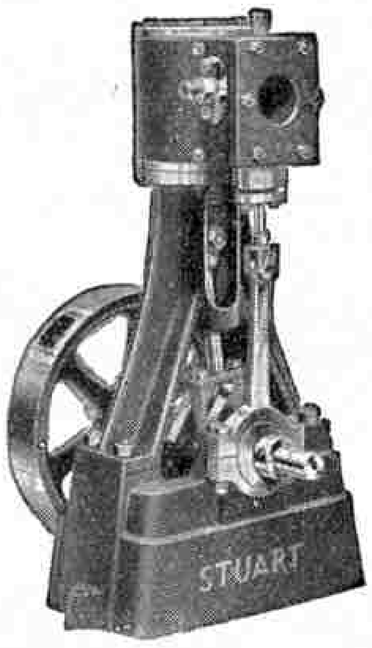

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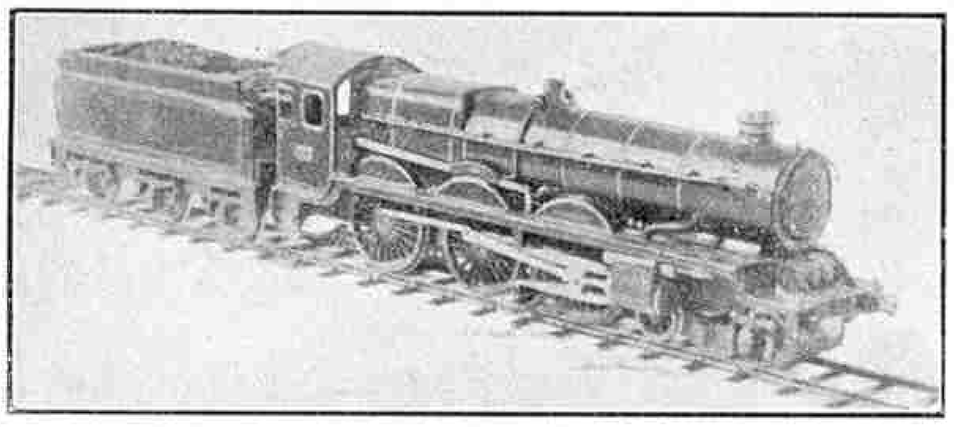

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LOTT'S BRICKS (new series)

Box 4. 10/-

You want to build modern type buildings? Then you'll like these new Lott's Bricks. An entirely brand-new series including new design SUN TRAP windows and doors. They're sold in attractive Silver Boxes with transparent windows and wrappings, but if you still prefer the Old Series (which are as popular as ever) you'll find your dealer has them.

New Series Prices: 3/6, 5/-, 7/6, 10/-
and Supplementary Sets **1/6** and **2/6**

THE NEW WONDERBRIX
For your No. 00 Gauge Railway

These novel and inexpensive Toy Stone Building Bricks are just right for your railway scenery. Be sure to ask your dealer for full particulars.

and the old favourite LOTT'S CHEMISTRY —as good as ever

Box 6. 27/6

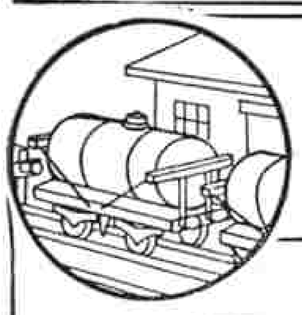
We can't improve on it. And as a hobby neither can you! Imagine the fun you could have with sets like these. If you are interested in experiments at school, here's your chance to experiment for yourself—and to show the family what a really worth-while pastime Lott's Chemistry is. There's an illustrated Book of Experiments written by a Doctor of Science with each of these fine sets, and your dealer stocks spare chemicals and equipment.

Prices: 3/6, 5/-, 8/6, 12/6, 21/-, 27/6 to 105/-

Write for Illustrated Price Lists of all Lott's Products including Electricity Sets and Chemistry Spares. The Real Apparatus illustrated, together with additional supplies of chemicals, will enable you to keep pace with your advancing knowledge.

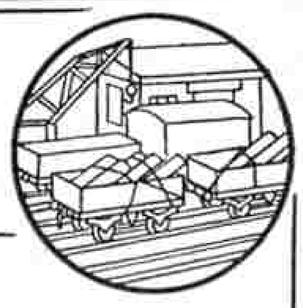
Ask your Toy Dealer for full particulars or write to us (Dept. M.M.) for illustrated lists of all products. 1d. stamp on p.c., 1½d. stamp on letters, please.

LOTT'S BRICKS LTD., WATFORD HERTS.



HORNBY ROLLING STOCK

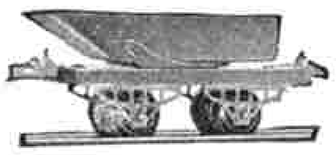
GAUGE O



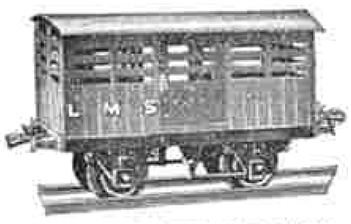
The Hornby Series includes a splendid range of realistic Rolling Stock. Each item is fitted with patented and exclusive automatic couplings, a special feature that places it in a class entirely of its own. There are Pullman Cars, Passenger Coaches, Guards' Vans, Tipping Wagons, Lumber Wagons, and many 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.

BARREL WAGON
This is an interesting model of a type of wagon used in France and other European countries.
Price **2/6**



No. 0 ROTARY TIPPING WAGON
Price **1/6**

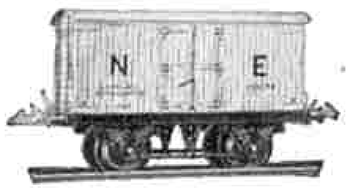


***No. 1 CATTLE TRUCK**
Fitted with sliding doors. Very realistic design.
Price **2/3**

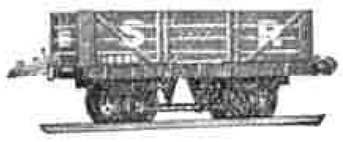
SAUSAGE VAN "PALETHORPES"
Fitted with sliding doors.
Price **2/3**

OIL TANK WAGON "ROYAL DAYLIGHT"
Price **1/11**

No. 1 PETROL TANK WAGON "ESSO"
Price **1/11**



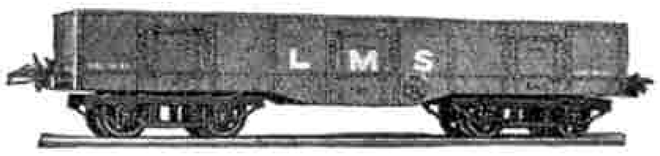
No. 0 REFRIGERATOR VAN
Lettered L.M.S., G.W., N.E. or S.R. Finished with the appropriate details. Price **1/6**



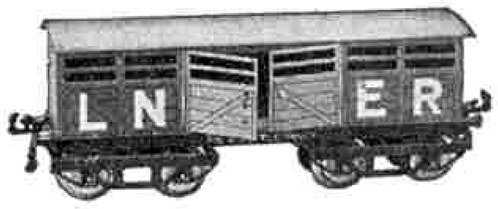
***No. 1 WAGON**
Price **1/6**

***FLAT TRUCK**
Complete with Container.
Price **2/-**

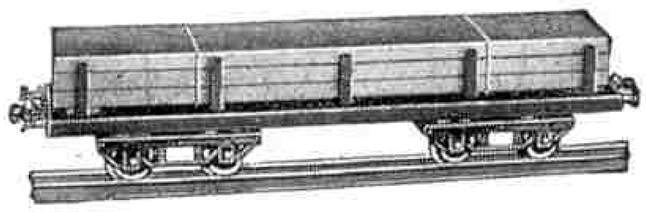
CONTAINERS
L.M.S. (Furniture), L.N.E.R. (Goods), G.W.R. (Insulated), S.R. (Ventilated).
Price **6d.** each.



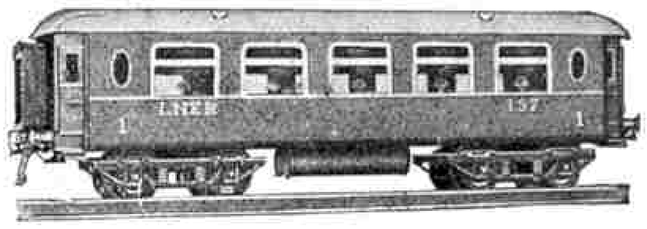
No. 2 HIGH CAPACITY WAGON
Finished in correct colours of G.W.R. and L.M.S. "Loco Coal" Wagons, or L.N.E.R. "Brick" Wagon. Not suitable for 1 ft. radius rails. Price **4/-**



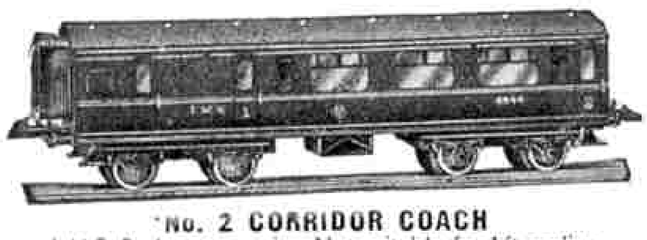
***No. 2 CATTLE TRUCK**
Opening doors. Not suitable for 1 ft. radius rails. Price **4/6**



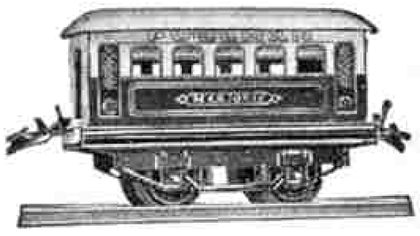
No. 2 TIMBER WAGON
Not suitable for 1 ft. radius rails. Price **2/6**



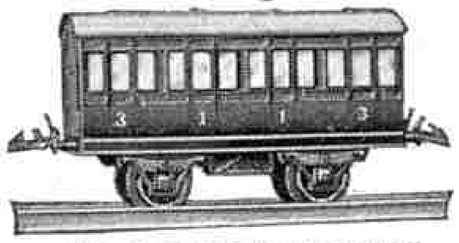
No. 2 SALOON COACH
L.M.S. or L.N.E.R. Not suitable for 1 ft. radius rails.
Price **10/6**



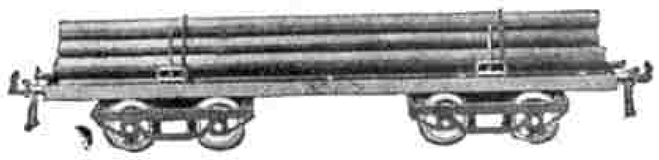
***No. 2 CORRIDOR COACH**
L.M.S. Brake composite. Not suitable for 1 ft. radius rails. Price **7/6**



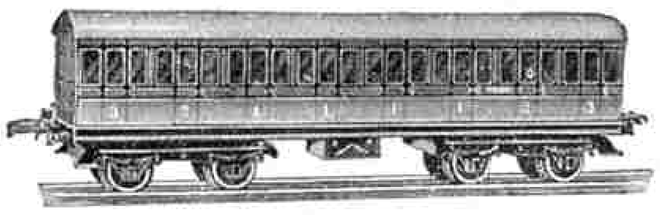
No. 0 PULLMAN COACH
Price **1/3**



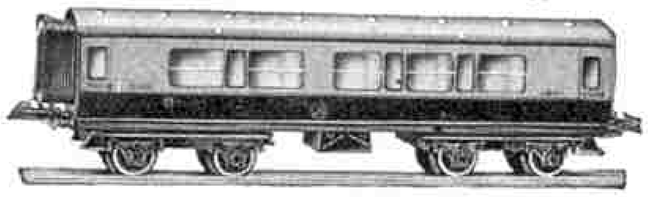
***No. 1 PASSENGER COACH**
Price **2/6**



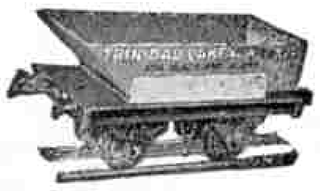
No. 2 LUMBER WAGON
Fitted with bolsters and stanchions. Not suitable for 1 ft. radius rails. Price **2/11**



***No. 2 PASSENGER COACH**
Not suitable for 1 ft. radius rails. First-third or Brake-third Price **7/-**

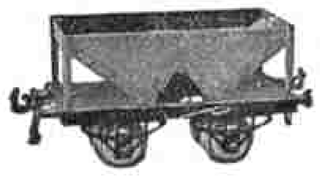


***No. 2 CORRIDOR COACH**
G.W. First-third. Not suitable for 1 ft. radius rails.
Price **7/6**

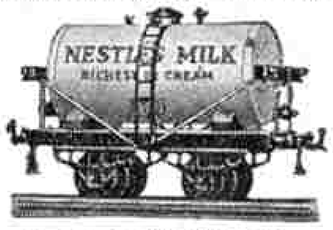


No. 1 ROTARY TIPPING WAGON
Finished in orange.
Price **2/-**

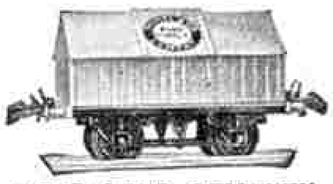
CHOCOLATE VAN "CADBURY'S"
This van is beautifully enamelled in blue with white roof.
Price **2/3**



***HOPPER WAGON**
Mechanically unloaded. Finished in green. Price **3/-**

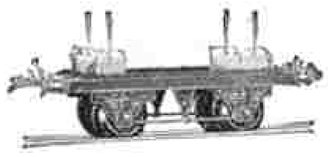


MILK TANK WAGON "NESTLES MILK"
Price **4/6**

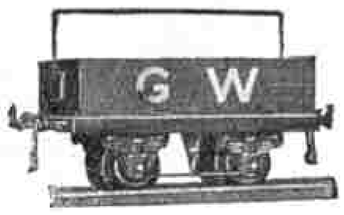


"PORTLAND CEMENT" WAGON
The door at the top opens. Finished in bright yellow.
Price **1/11**

COAL WAGON
Fitted with embossed representation of coal. Price **2/3**



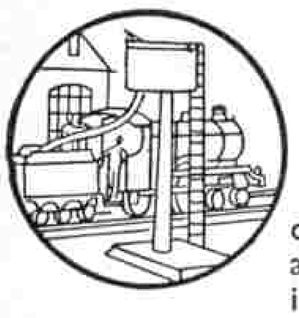
No. 1 LUMBER WAGON
Fitted with bolsters and stanchions for log transport.
Price **1/3**



***OPEN WAGON "B"**
Fitted with centre tarpaulin supporting rail.
Price **2/-**

Lettered L.M.S., N.E., G.W. or S.R.

MECCANO LTD., BINNS ROAD, LIVERPOOL 13



HORNBY ACCESSORIES

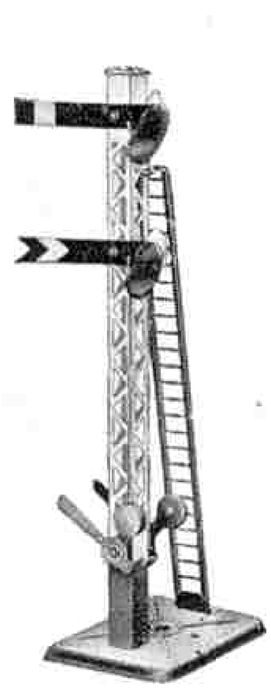
There is a splendid range of Railway Accessories in the Hornby Series, each one built in perfect proportion and beautifully finished. With these realistic accessories the most elaborate model railway can be constructed and operated in exactly the same manner as a real railway.

A selection of Hornby Accessories is shown on this page. Ask your dealer to show you the full range.

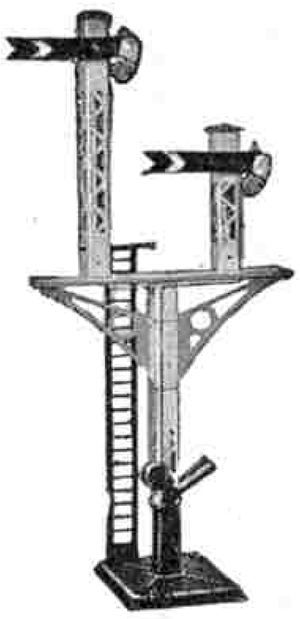
GAUGE O

No. 4 STATION
Built up with three detachable sections. Named "Margate," "Wembley," "Ripon" or "Reading." Strikingly coloured, with accessible Booking Hall and Ticket Office Barrier ... ... Price **10/6**

No. 4E STATION
This Station is fitted for electric lighting, otherwise it is the same as No. 4 Station ... ... Price **11/9**



No. 2 SIGNAL, DOUBLE ARM
"Home" and "Distant."
Price **2/3**



No. 2 JUNCTION SIGNAL
"Home" or "Distant." Signal arms operated by levers at base. A very realistic model. Price **5/–**

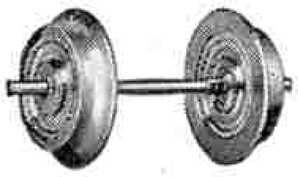
No. 1 SIGNAL GANTRY
"Home" or "Distant."
Price **4/3**

No. 1 WATER TANK
Height 7 in.
Fitted with flexible tube and valve lever
Price **2/6**

TELE-GRAPH POLES
Price per pair **3/–**

No. 2 LAMP STANDARD
Price **3/9**

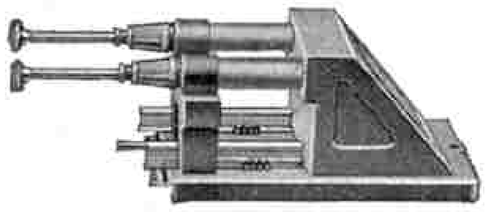
GRAPHITE GREASE
For Springs.
Price per tube **6d.**



MANSELL WHEELS
These solid die-cast Wheels can be fitted to Hornby Coaches, Vans, etc.
Price per pair **3d.**

No. 2 LEVEL CROSSING
Measures 13½ x 10¼ in., with two tracks of gauge O rails in position.
Price **5/3**

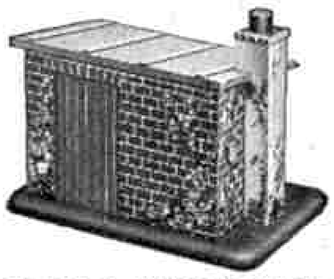
No. E2 LEVEL CROSSING (Electrical)
Similar to Level Crossing No. 2 excepting that a third rail is fitted in each of the two tracks.
Price **7/3**



No. 2A BUFFER STOPS
Hydraulic type. Price **2/9**

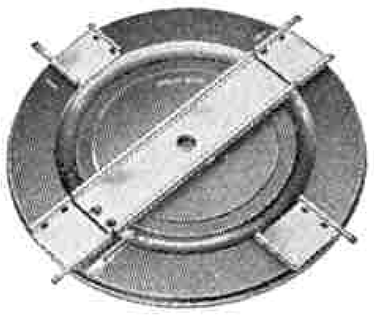
No. 3A BUFFER STOPS
Similar in design to No. 2A Buffer Stops, but fitted for use with Hornby Solid Steel Track. Price **3/6**

No. 1 SIGNAL CABIN
Finished in colours.
Price **2/6**

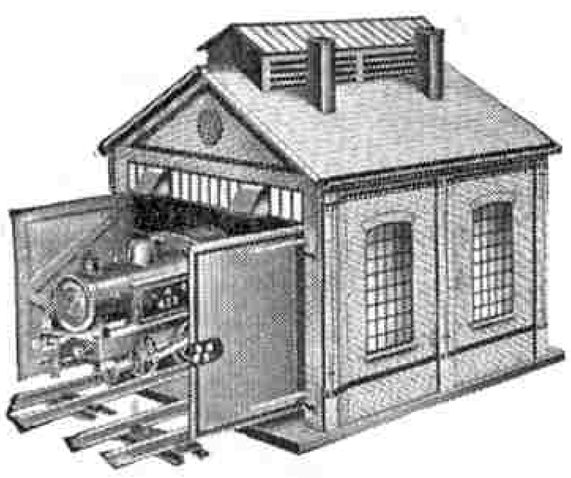


PLATELAYER'S HUT
Price **1/2**

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**



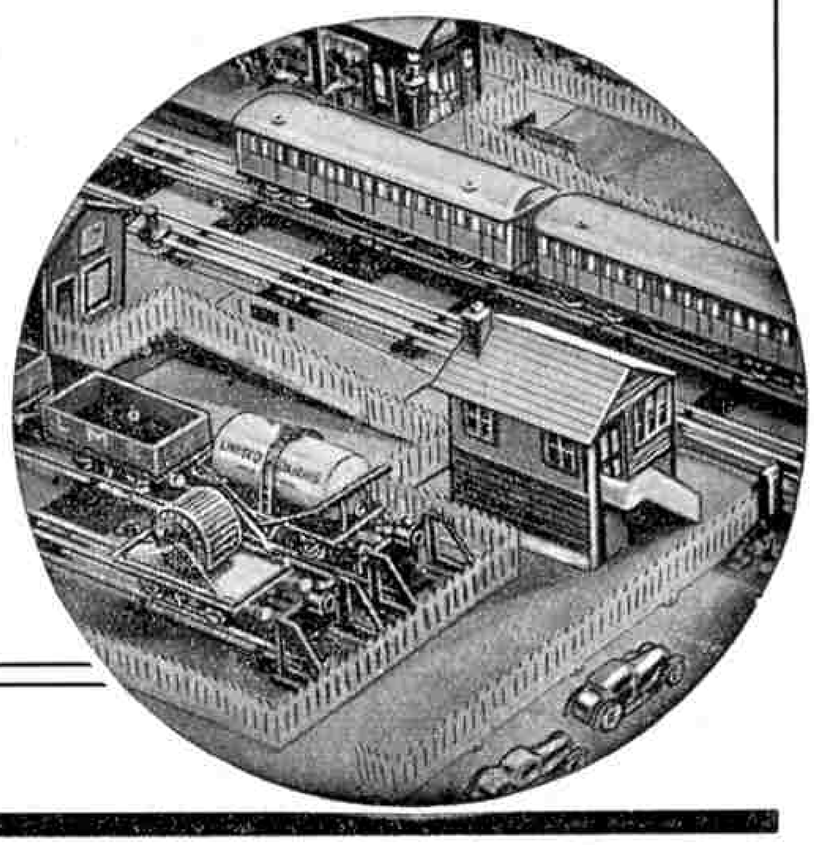
No. 1 TURNTABLE
Price **1/11**



No. 1 ENGINE SHED
This Shed will accommodate any Locomotive and Tender with an overall length not exceeding 8¾ in. Price **15/6**

VIADUCT Price **6/9** **VIADUCT (Electrical)** Price **7/6**
VIADUCT Centre Section only ... ... Price **4/6**
VIADUCT (Electrical) Centre Section only ... Price **5/–**

No. 3 STATION
Length 16¾ in., width 6 in., height 6 in. ... ... Price **5/9**

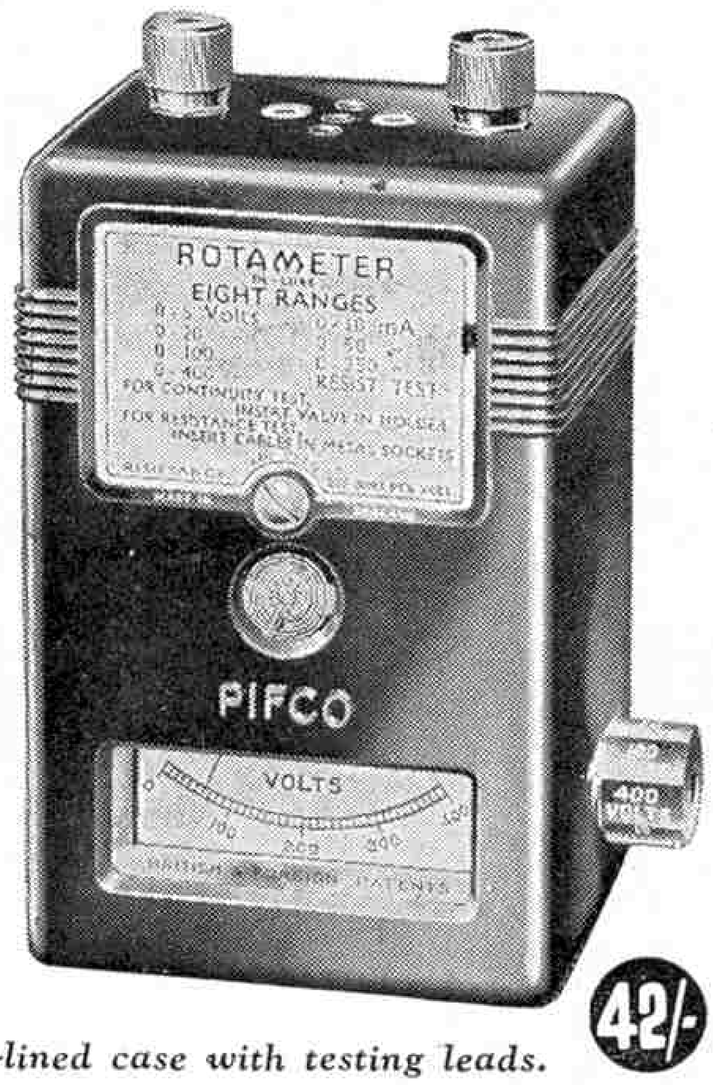


MECCANO LTD., LIVERPOOL 13

"Look Boys..

THIS PIFCO METER WILL TEST RADIO & EVERYTHING ELECTRICAL"

With this sensitive instrument you can make literally thousands of tests. You can find what has gone wrong with your radio, test electric train circuits, transformers, bells, motors and carry out many interesting experiments as well.



RANGES

0-5 volts
0-20 volts
0-100 volts
0-400 volts
0-10 mA
0-50 mA
0-250 mA
Resist/valve test.
Plug-in test for valves.

42/-

Complete in velvet-lined case with testing leads.

PIFCO RADIOMETER. The only instrument of its kind in the world for making both A.C. and D.C. Tests.

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Filament and Resistance Test, and socket for plug-in test for valves. 8,000 ohms Resistance. Complete with two 15-inch flex cables. Fitted with PIFCO DRY CELL.

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ROTAMETERS and RADIOMETERS

PIFCO ON THE SPOT WILL TRACE YOUR TROUBLES LIKE A SHOT

AEROMODELS

1/24 Full Size

FLYING SCALE KITS

ACTUAL PHOTOGRAPH OF MODEL BUILT FROM KIT HAWKER "FURY" MARK II. Wing Span 15 inches

FOSTER WIKNER "WICKO"	Span 15¾ in.	Price 3/–
"TIGER MOTH"	„ 14⅜ in.	„ 3/6
"LEOPARD MOTH"	„ 18¾ in.	„ 3/6
MILES "MAGISTER"	„ 17 in.	„ 3/6
HAWKER "FURY"	„ 15 in.	„ 4/–
HAWKER "HIND"	„ 18⅝ in.	„ 6/–

(POSTAGE 6d. EXTRA)

KITS CAN BE SEEN AT MOST GOOD CLASS TOY SHOPS

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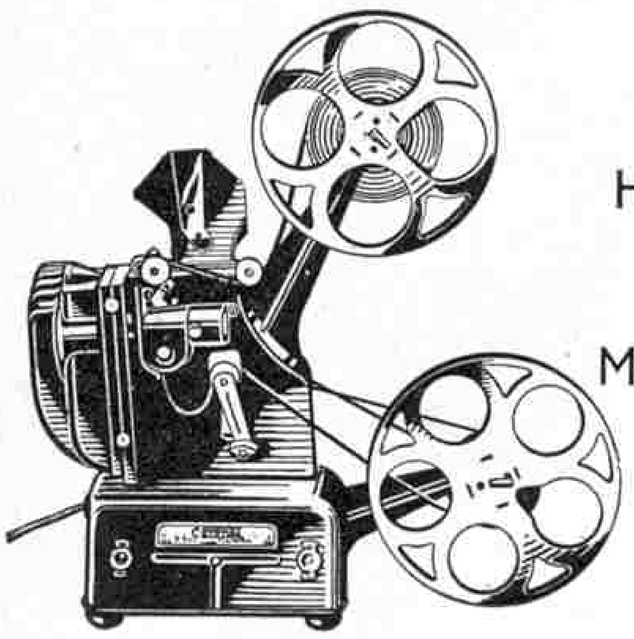
Send 1½d. stamp and ask for illustrated literature describing AEROMODELS FLYING SCALE KITS AND NON-FLYING SCALE KITS, and AERO LARK FLYING KIT, also lists of MATERIALS AND ACCESSORIES to:

AEROMODELS LTD. 48, LARK LANE, LIVERPOOL 17.

CORONET PROJECTOR



Model 11A
9.5mm.
HAND DRIVEN
£7.7.0

MOTOR DRIVEN
£9.17.6

Just the thing for the winter evenings! Give your own movie show, the CORONET Projector is simplicity itself in use. Fitted Anastigmat f/2 lens; suitable all voltages A.C. or D.C. Takes up to 400 ft. of film (17 minutes projection time) without extra attachment.

For further particulars, please write to: Dept. M.M.1
CORONET CAMERA CO., BIRMINGHAM 19

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for the Most Fun SHOOT A "DAISY"

No. 12 Daisy Single Shot.
A genuine Daisy at this low price. Very accurate. Also shoots darts. **6/6**

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Highly polished nickel finish 350-shot lever action repeater. **10/6**

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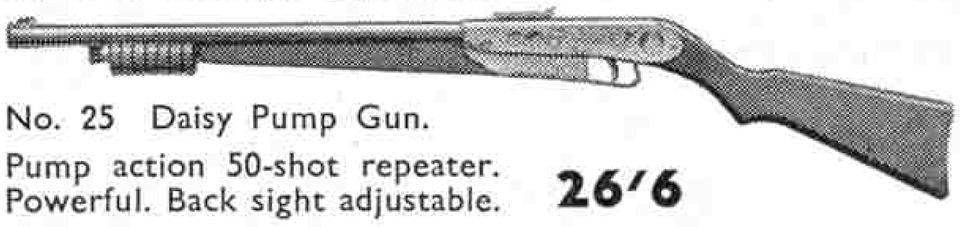
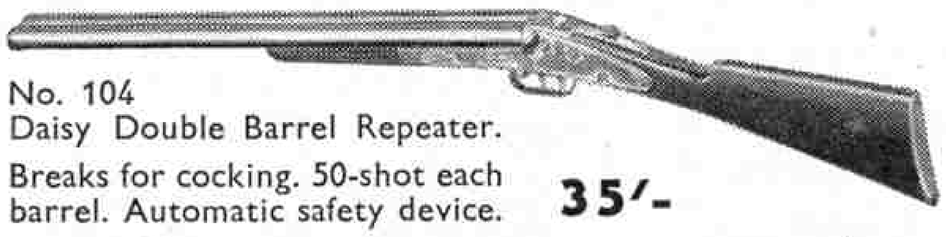
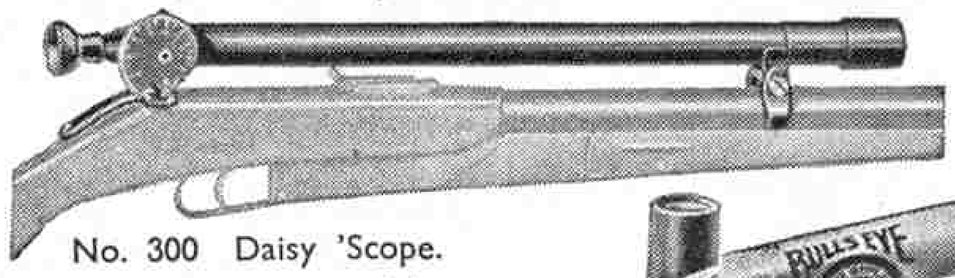
Daisy Buzz Barton Special.
1,000-shot blued-steel repeater with new telescopic-type sights. **13/6**



No. 25 Daisy Pump Gun.
Pump action 50-shot repeater. Powerful. Back sight adjustable. **26/6**



No. 104
Daisy Double Barrel Repeater.
Breaks for cocking. 50-shot each barrel. Automatic safety device. **35/-**



No. 300 Daisy 'Scope.
This sight fits all models. Two-power lens practically doubles size of image. **8/6**

Bulls Eye Shot. Only shot approved by Daisy engineers. Tube of 225 pellets only **4d.** per tube.

TARGETEER, the gun that's fun
Complete pistol target outfit. Repeating air pistol, 2 types of targets. Use box as a back-stop. Set up anywhere.
Complete **10/6**

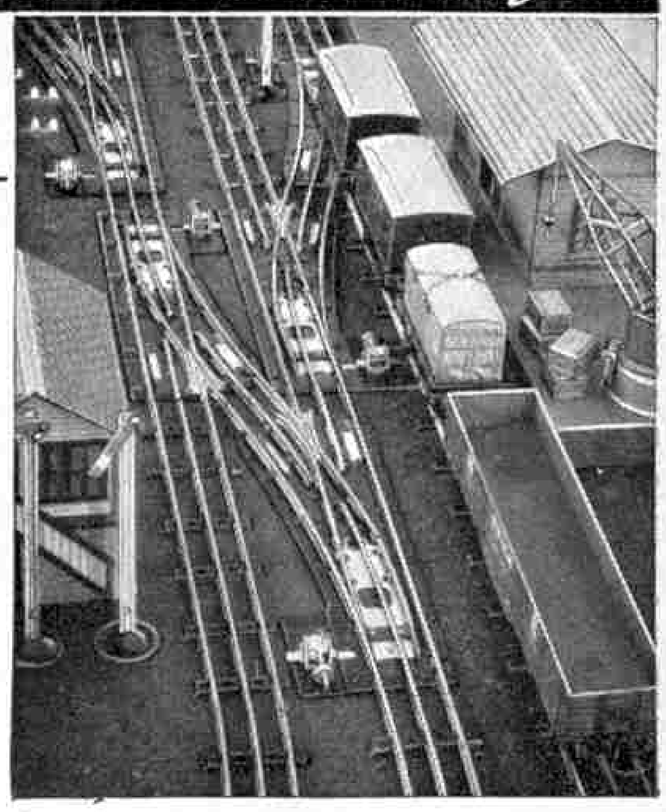
If you are **under** 17 years of age, purchases must be made by an adult. No Firearms Certificate is necessary.

Booklet of Models sent FREE, address
ROLLINS & SONS (London) LTD., 17, St. Bride St., London E.C.4.
Stocked by all Leading Cycle and Sports Dealers.

DAISY AIR RIFLES MADE IN U.S.A.

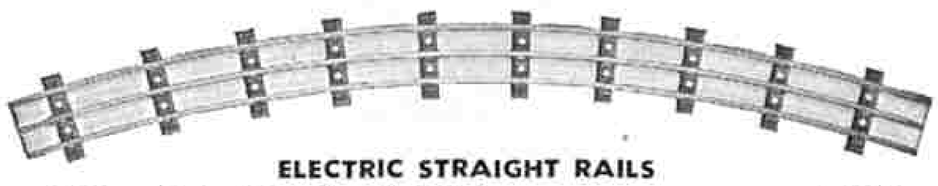
The PERFECT *track for Electric Model Railways*

HORNBY SOLID STEEL RAILS



GAUGE O **GAUGE O**

Although our standard tinplate rails are the acknowledged best of their class, we have felt that in order to do justice to the speed and hauling power of our locomotives, especially "PRINCESS ELIZABETH" and E420 "ETON," a drawn steel rail was essential. Our object was to produce the perfect miniature railway track, and we have achieved our aim in the new system of electric steel rails and points that we introduced recently. These rails are of the very highest quality, yet are sold at reasonable prices. We are confident that they will give satisfaction, not only to Hornby Train users, but to all model railway enthusiasts. The track is joined up by means of fishplates which are supplied with each rail.

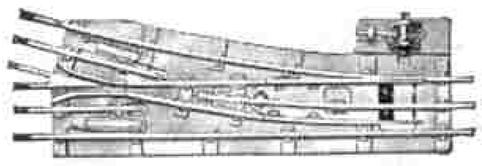


ELECTRIC STRAIGHT RAILS

EB3	Straight Rails (Length 23 in.)	each **2/8**
EB3½	Straight Half Rails	" **1/7**
EB3¼	Straight Quarter Rails	" **1/-**
	TSR Electrical Terminal for Solid Section Rail	per pair **4d.**

ELECTRIC CURVED RAILS

EA3	Curved Rails	each **2/8**
EA3½	Curved Half Rails	" **1/7**



ELECTRICAL POINTS (Hand Operated)

EPR3	Right-hand Points ...	each **8/3**
EPL3	Left-hand Points ...	" **8/3**

FISHPLATES

FP	For joining up track ...	Price, doz. **6d.**

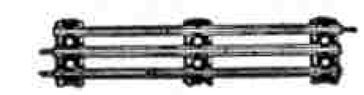
AP Adapting Pieces, for connecting Hornby Solid Steel Track to Hornby Tinplate Track ... ... Per box of six **1/-**

QUALITY FEATURES OF NEW ELECTRIC SOLID STEEL TRACK

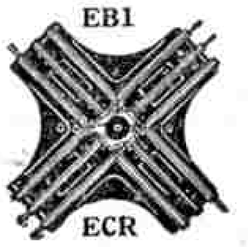
1. RAILS. Solid drawn steel section, zinc coated to prevent rust and to ensure good electrical contact. The space required for a circle made up of 10 Curved rails is 6ft. 8in.
2. SLEEPERS. Pressed steel, of similar design to the steel sleepers used on actual railways. Each sleeper is pierced so that the track can be screwed down to a wood base.
3. POINTS. On solid base, providing the greatest possible rigidity. Lever movement simple and positive. Right-hand and Left-hand points available.

Manufactured by MECCANO LIMITED, BINNS ROAD, LIVERPOOL 13

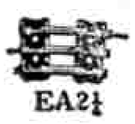
HORNBY TINPLATE TRACK



EB1



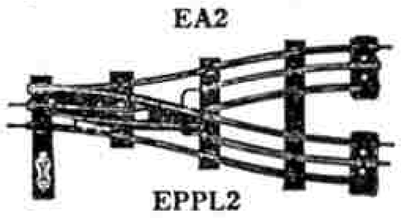
ECR



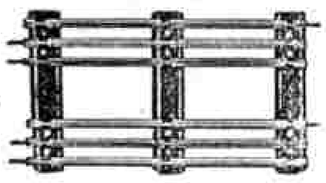
EA2¼

EB¼

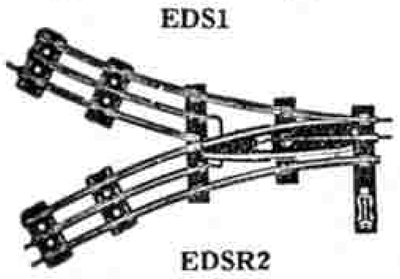
EA2



EPPL2



EDS1



EDSR2

GAUGE O, 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.

A SELECTION OF RAILS, POINTS AND CROSSINGS FOR ELECTRIC TRAINS

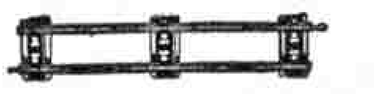
EB1 Straight rails	per doz. 6/-
EB½ " half rails ...	" " 5/-
EA2¼ Curved quarter rails (2 ft. radius)	" " 4/6
EA2 Curved rails (2 ft. radius)	" " 6/-
EPPR2 Parallel points, right-hand	per pair 7/-
EPPL2 Parallel points, left-hand	per pair 7/-
These points can be used with either 1 ft. or 2 ft. radius track.	
EPR2 Right-hand points (2 ft. radius)	per pair 8/-
EPL2 Left-hand points (2 ft. radius)	per pair 8/-
EPR1 Right-hand points (1 ft. radius)	per pair 6/6
EPL1 Left-hand points (1 ft. radius)	per pair 6/6
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)	per pair 7/-
EDSR1 Double symmetrical points, right-hand (1 ft. radius)	per pair 7/-
EDSL1 Double symmetrical points, left-hand (1 ft. radius)	per pair 7/-

FOR CLOCKWORK TRAINS

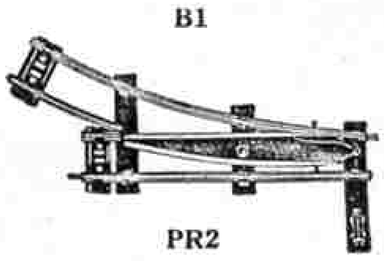
B1 Straight rails	per doz. 4/-
A1 Curved rails (1 ft. radius)	" " 4/-
PR1 Right-hand points (1 ft. radius)	per pair 3/6
PL1 Left-hand points (1 ft. radius)	per pair 3/6
PR2 Right-hand points (2 ft. radius)	per pair 3/6
PL2 Left-hand points (2 ft. radius)	per pair 3/6
CA2 Acute-angle crossings (for 2 ft. radius track) ...	each 1/6
PPR2 Parallel points, right-hand	per pair 4/-
PPL2 Parallel points, left-hand	per pair 4/-
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.

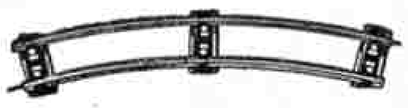
MECCANO LIMITED, Binns Road, Liverpool 13



B1

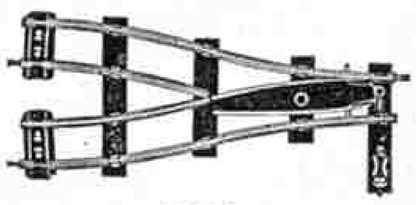


PR2

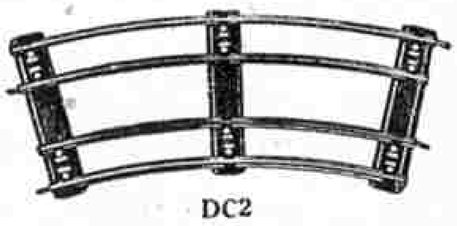


A2

CA2



PPR2



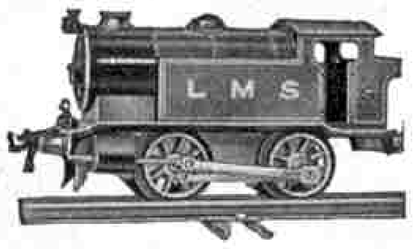
DC2

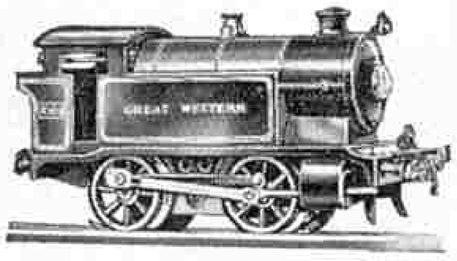
HORNBY

TANK LOCOMOTIVES

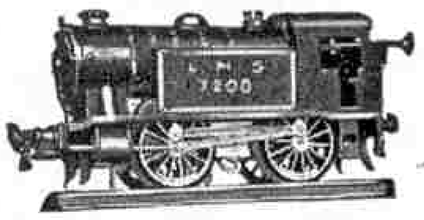
GAUGE O

*No. 1 Clockwork Tank Locomotive
Reversing ... Price **13/-**

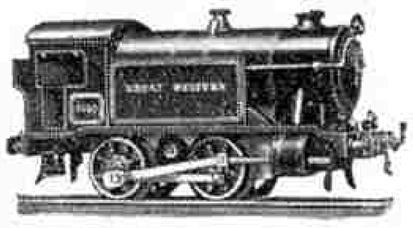




*E120 (20-volt) Electric Tank Locomotive
Reversing ... Price **20/-**



*No. 1 Special Clockwork Tank Locomotive
Reversing ... Price **17/6**



*EPM16 Special Electric Tank Locomotive, complete with Speed and Reverse Controller
(6-volt Permanent Magnet Type) Reversing. Can be run from a 6-volt accumulator, or from A.C. mains through a Transformer-Rectifier ... Price **37/6**

Lettered and coloured to represent L.M.S., G.W.R., L.N.E.R. or S.R. Locomotives.

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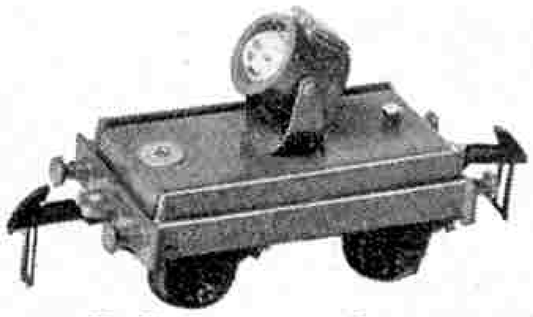
Height 2¼"

Price
Less Battery
1/11

THIS MINIATURE SEARCHLIGHT is a scale model only 2¼" high. Beautifully finished and giving a powerful light. Leads and clips are provided for connecting to flashlamp battery.

SEARCHLIGHT on "O" Gauge Railway Truck



Price
Complete
with Battery
4/11

THE SEARCHLIGHT on "O" Gauge Railway Truck is a beautifully finished model fitted with powerful searchlight, self-contained battery and switch. Standard type couplings are supplied and the wheels and chassis are of die-cast metal and aluminium.

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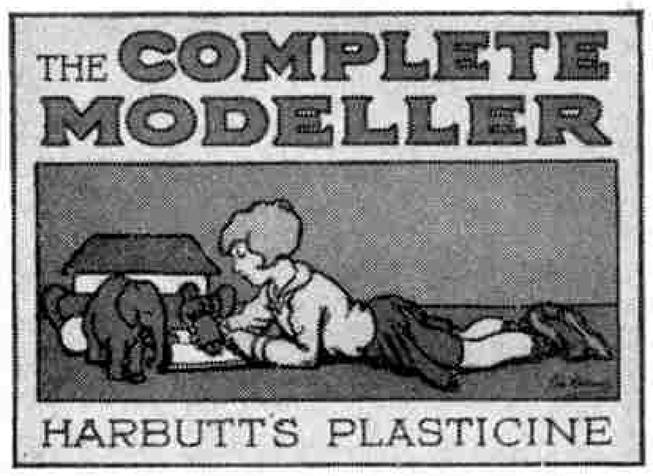

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Post free 4/6

DESIGNER 5/6 and 12/6
Post free 6/1 and 13/5

TRAVEL BOX
(series of six) **2/6** each
Post free 3/-

Post free rates for Great Britain, abroad extra

HARBUTT'S Plasticine

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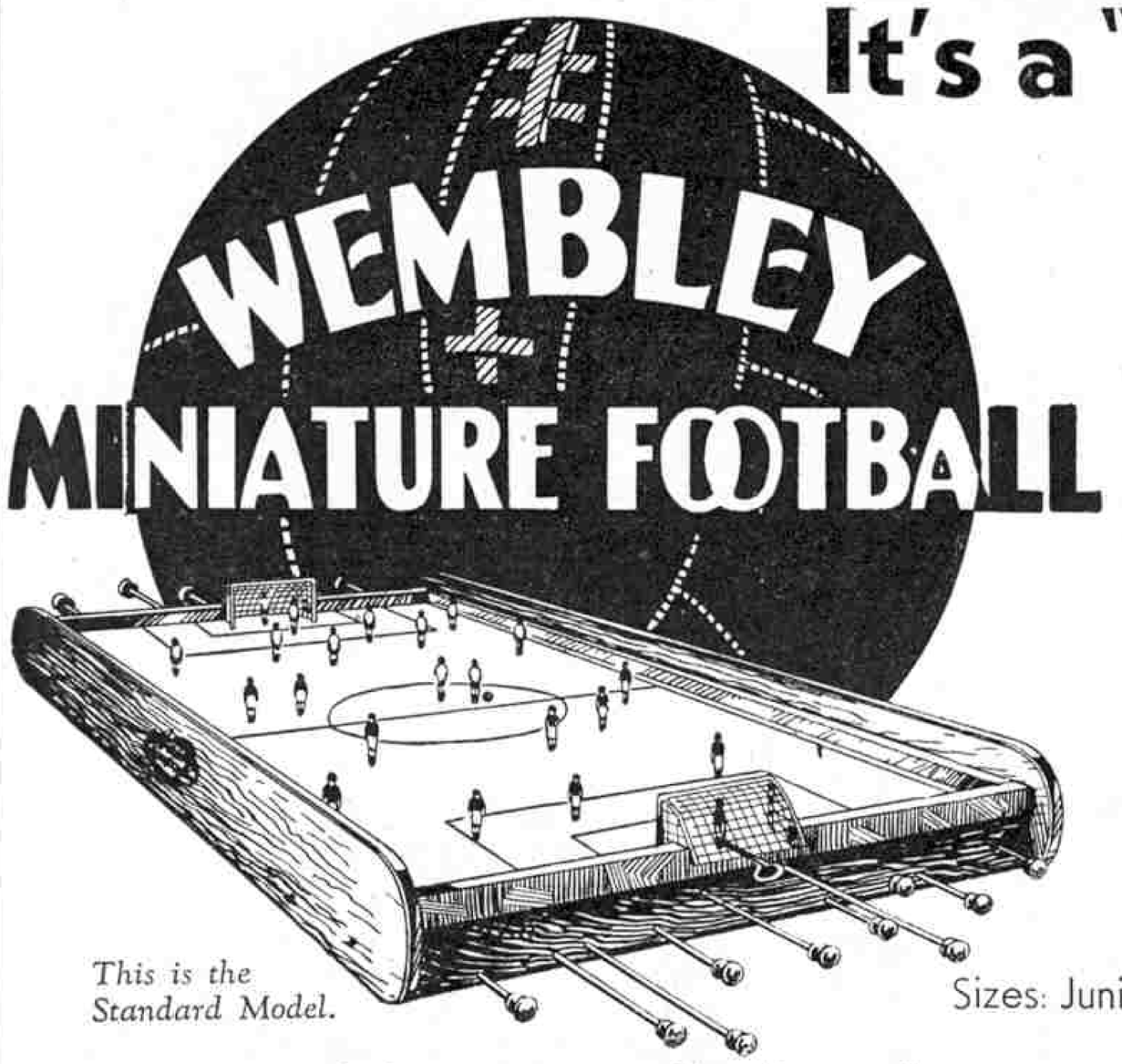
It's a "HOME" Winner!



This is the Standard Model.

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Prices: JUNIOR model 10/6 POSTAGE 7d.
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Sizes: Junior Model 23 ins. x 11 ins. Standard 28 ins. x 15 ins.

Obtainable at all leading Stores and Toy Dealers

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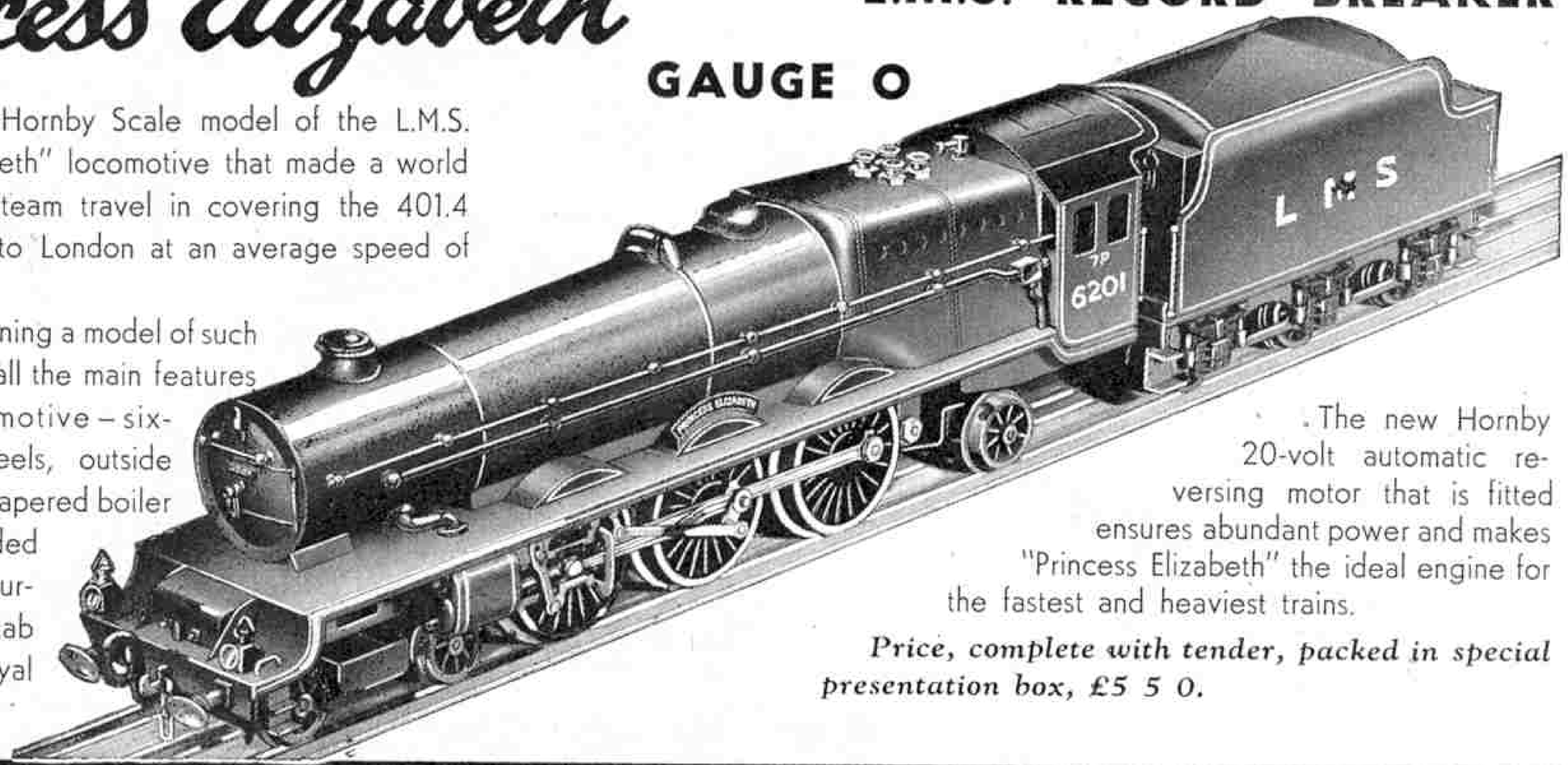
ASAS

"Princess Elizabeth"

SCALE MODEL OF L.M.S. RECORD BREAKER

GAUGE O



This is a magnificent Hornby Scale model of the L.M.S. 4-6-2 "Princess Elizabeth" locomotive that made a world record for non-stop steam travel in covering the 401.4 miles from Glasgow to London at an average speed of 70 m.p.h.

Think of the thrill of owning a model of such an engine. It includes all the main features of the actual locomotive – six-coupled driving wheels, outside cylinders and motion, tapered boiler and fire-box, oval-headed buffers at the front, accurate internal details of cab and tender and Royal nameplate.

The new Hornby 20-volt automatic reversing motor that is fitted ensures abundant power and makes "Princess Elizabeth" the ideal engine for the fastest and heaviest trains.

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HORNBY TRAINS

MECCANO LIMITED — BINNS ROAD — LIVERPOOL 13

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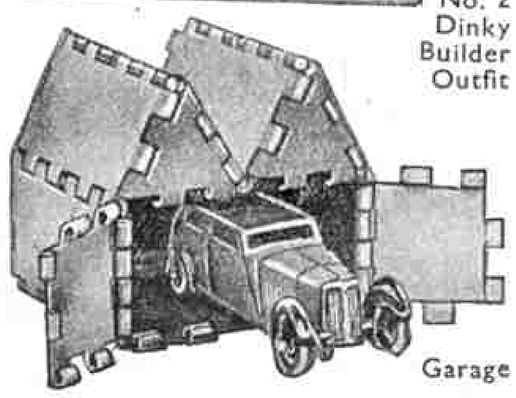
The Dinky Builder "A" packet contains a useful assortment of Dinky Builder Parts with which Outfits No. O, No. 1, No. 2 and No. 3 may be supplemented. Price **1/-**

No. 2 Dinky Builder Outfit



Garage

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This is the largest and best Outfit in the Series. The models that can be built with it are almost endless in number, and the Manual of Instructions illustrates 92 splendid examples. Price **10/9**

DINKY BUILDER

Manufactured by Meccano Limited, Binns Road, Liverpool 13

BAILEY'S "SUPER" PUMP. Celluloid Covered (Made in Two Styles)
ONE WITH STEEL LINING at **2/-** OR ALUMINIUM LINING at **2/3**. 15″ x ⅞″ SIZE

The linings are SOLID DRAWN, cartridge fashion, each pump being drawn from its own metal blank, therefore there are NO solderings or loose pieces to leak. THIS IS THE *ONLY* SOLID CARTRIDGE DRAWN PUMP MADE ANYWHERE. DO NOT BE MISLED WITH IMITATIONS.

Apex "Superlite" Celluloid Pump made of best quality Thick Celluloid, highly polished, 15″ x ⅞″ at **1/6** each.

BAILEY'S "SUPER" CELLULOID MUDGUARDS

Extra Thick Celluloid, Extra Thick Flange. All Steel parts are electro zinced before enamelling.
Price: Black or Black with White end, 4/- per pair. All White, 4/9 per pair.

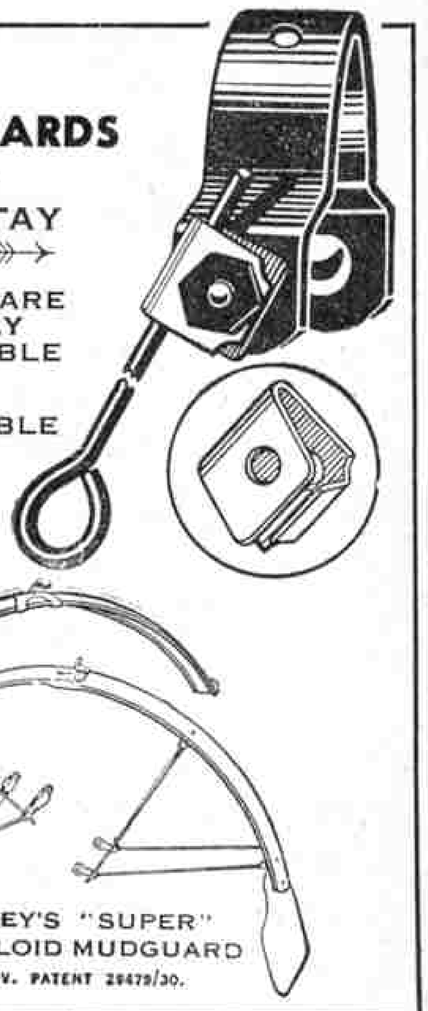
Manufactured by:
APEX INFLATOR CO. LTD., 116, Aldridge Road, Perry Barr, Birmingham

APEX MUDGUARDS

PATENT WIRE STAY CLIP

GUARDS ARE INSTANTLY DETACHABLE

STAYS ADJUSTABLE



BAILEY'S "SUPER" CELLULOID MUDGUARD
PROV. PATENT 29479/30.

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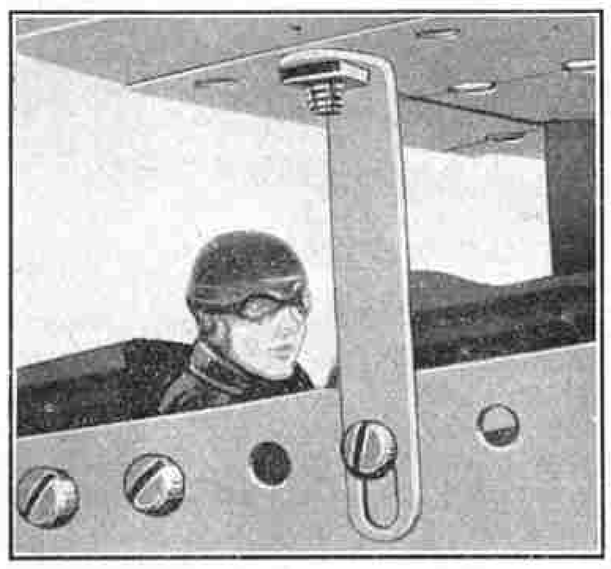
MINIATURE AEROPLANE PILOTS

Aeroplane Parts Nos. P99 and P100



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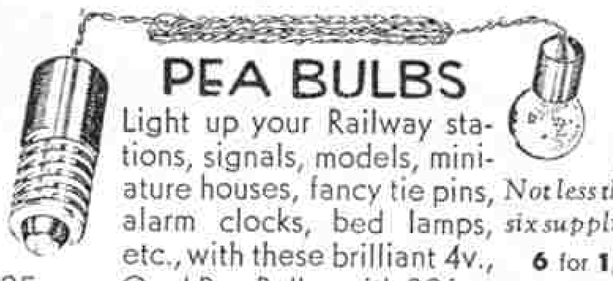

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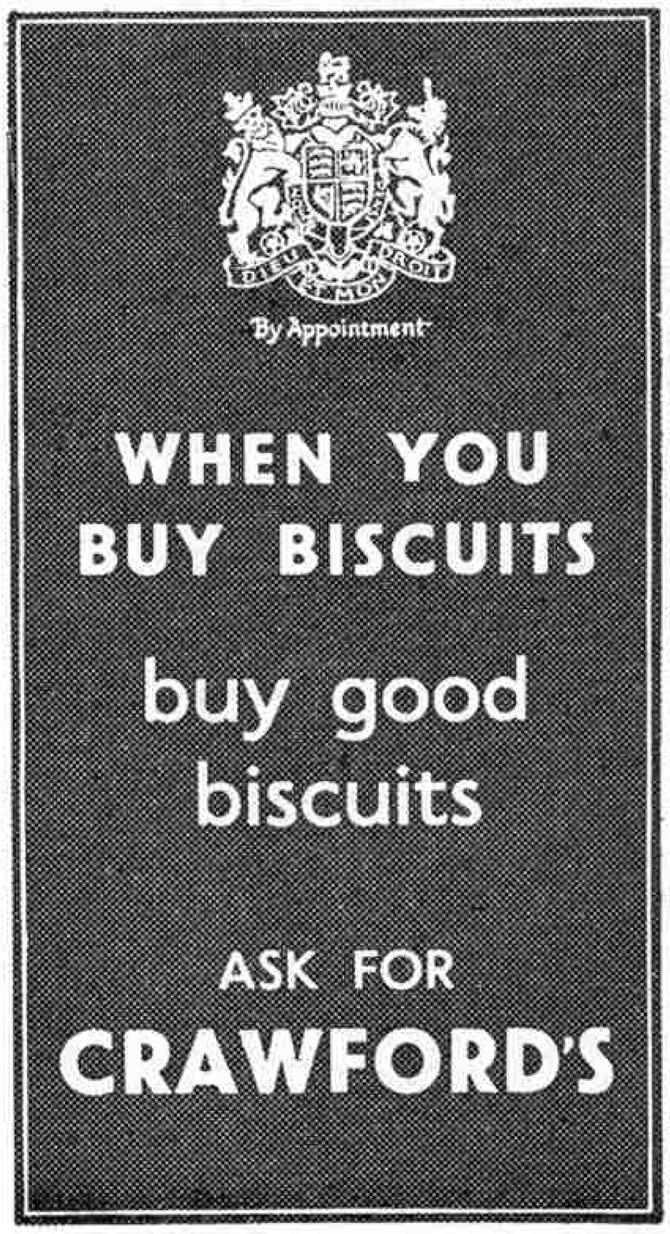

MECCANO MAGAZINE

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EDITORIAL AND ADVERTISING OFFICE:—
LIVERPOOL 13, ENGLAND.
Telegrams: "Meccano, Liverpool."

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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.

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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.

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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.

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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.

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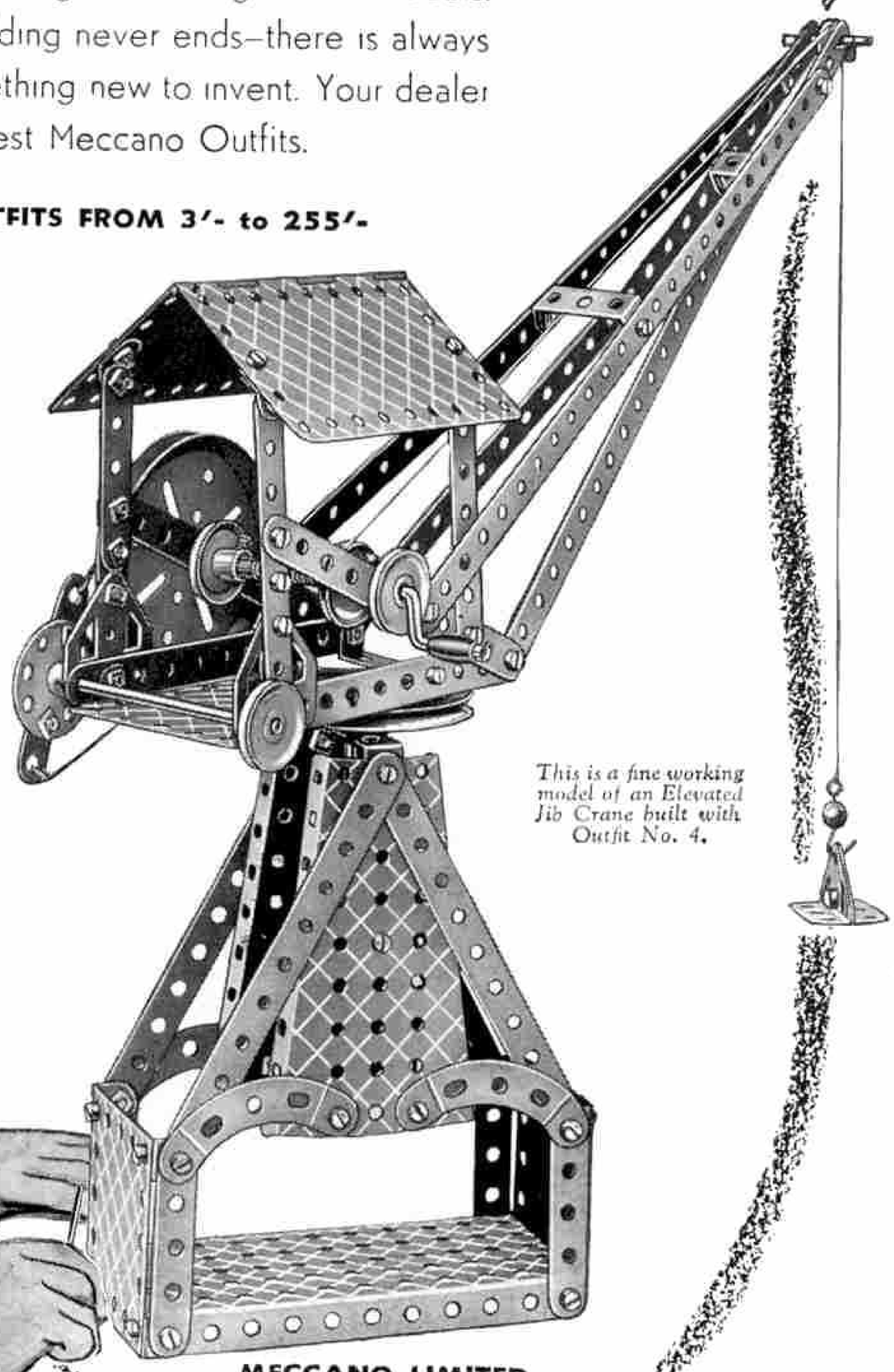

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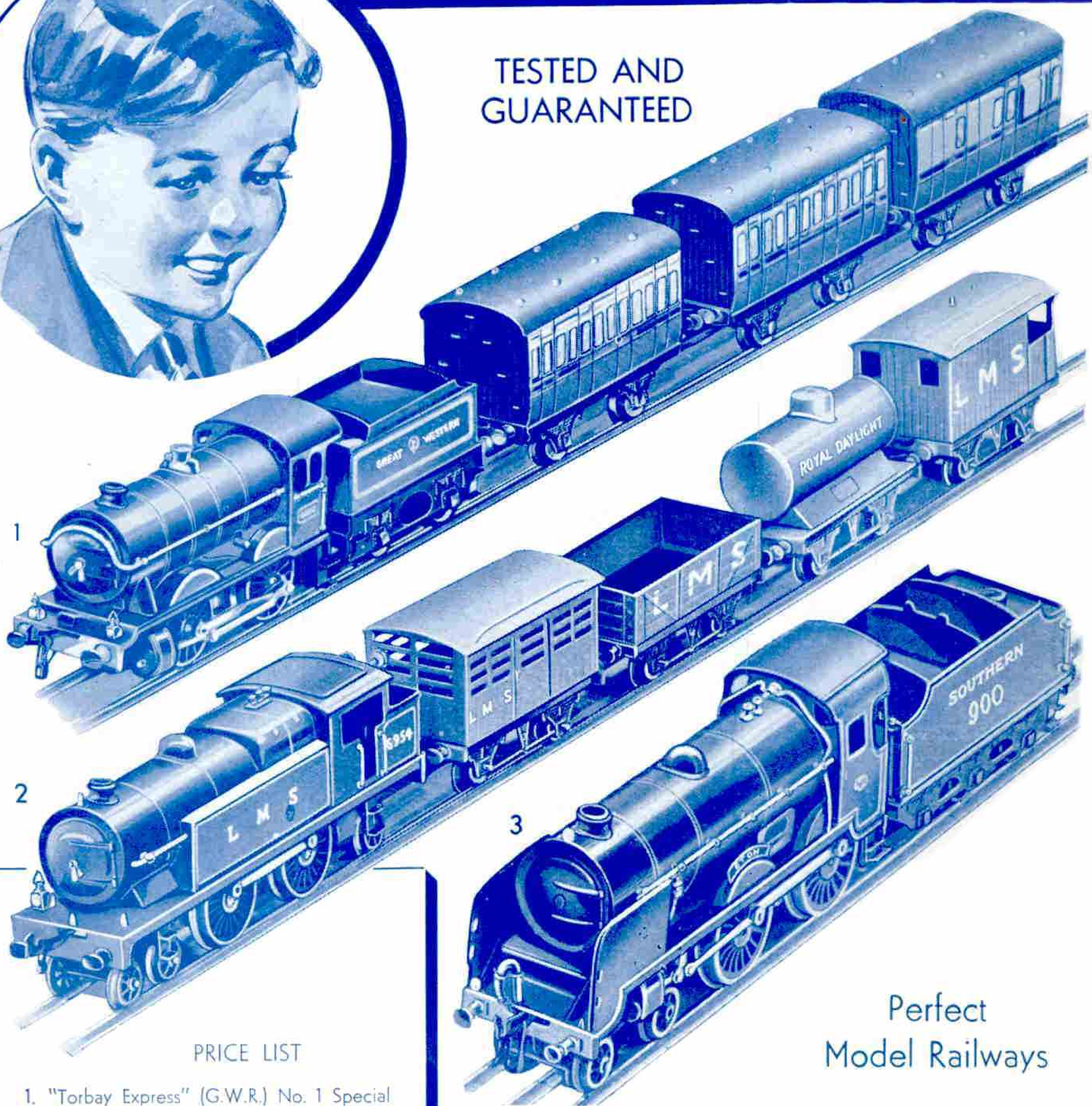

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