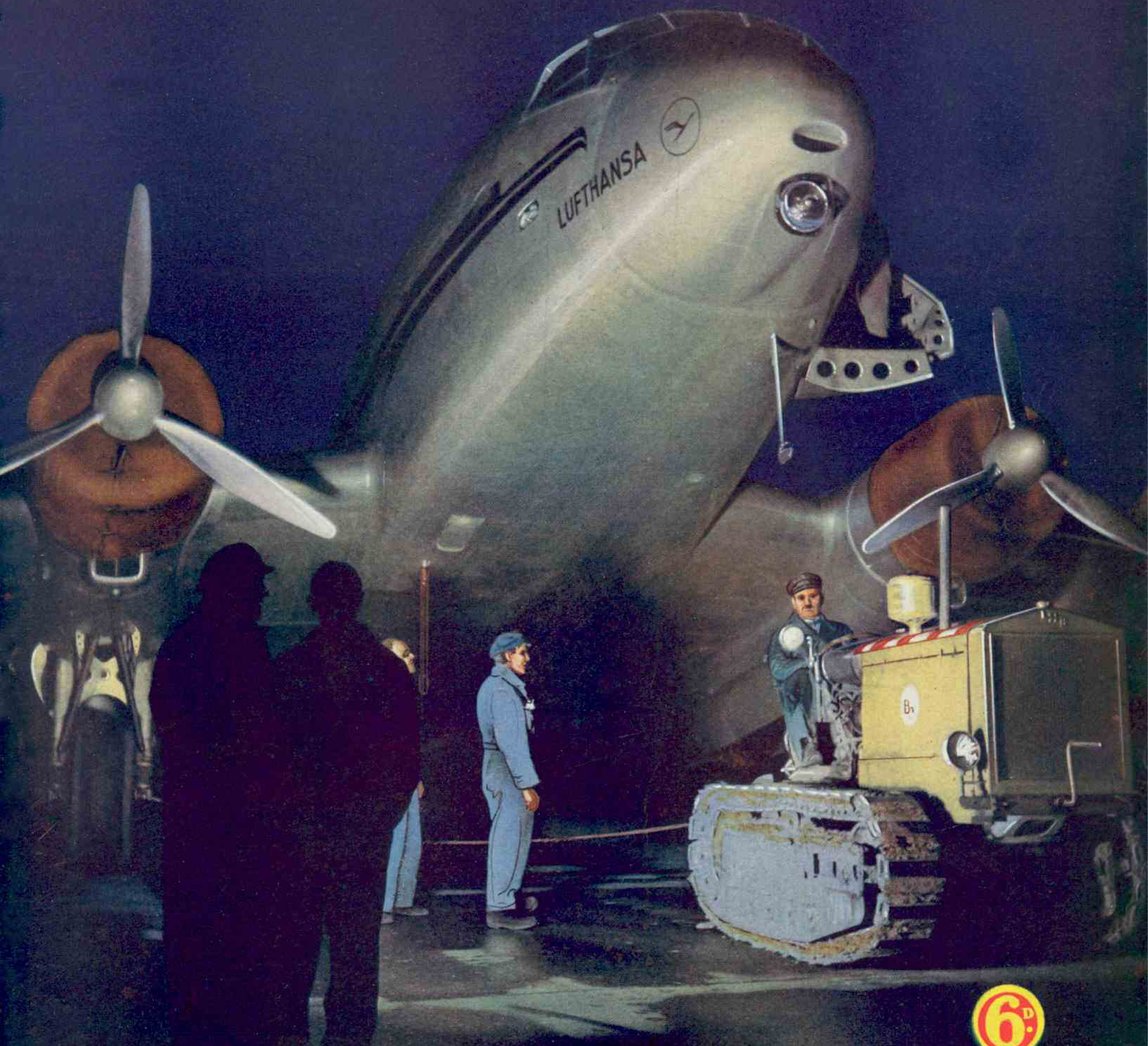
VOL. XXIV. Nº 4 APRIL 1939

MECCANO MAGAZINE



JUNKERS JU 90 BEFORE A NIGHT FLIGHT

6D.

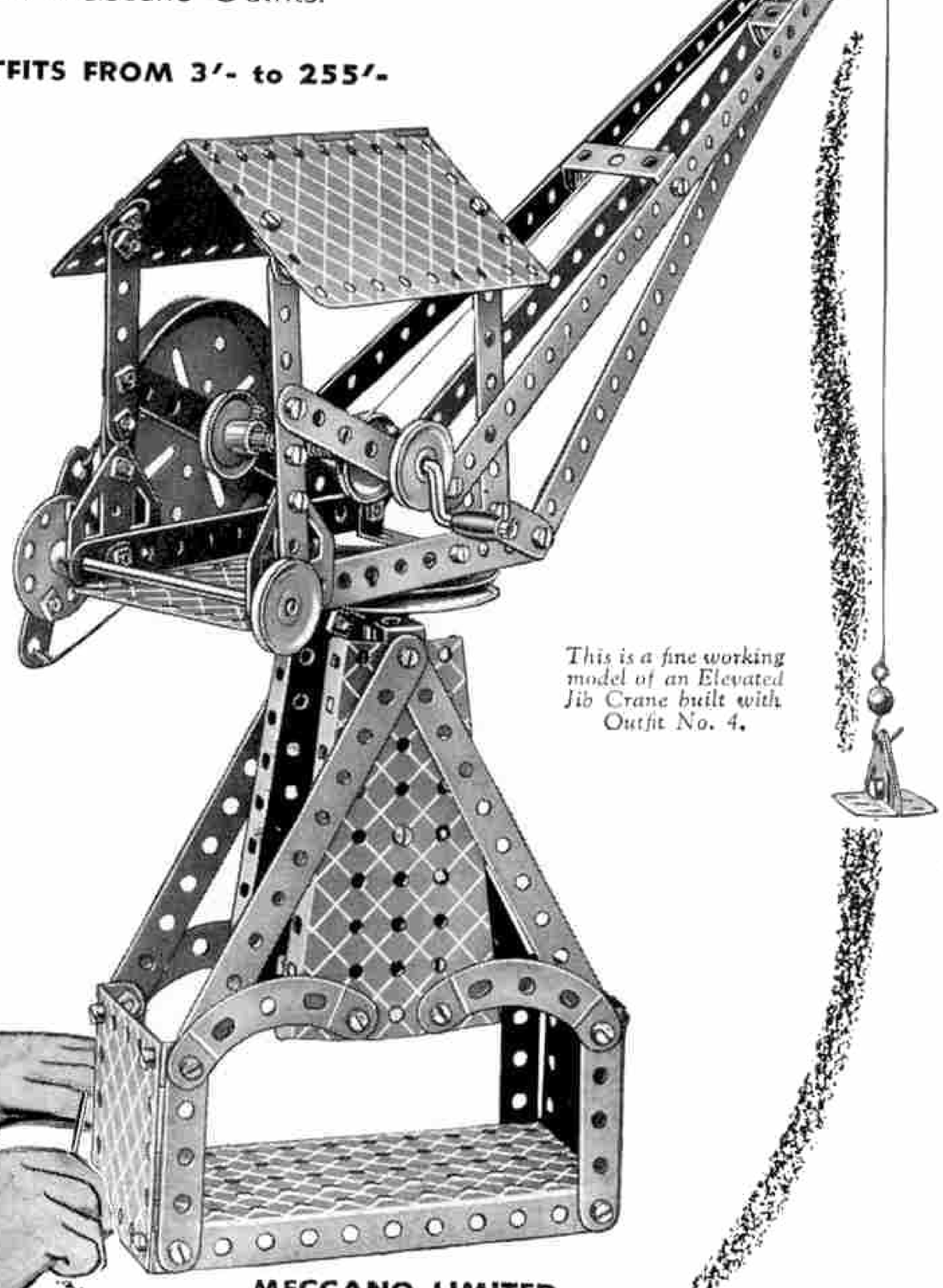
★ MORE FUN . . MORE THRILLS . . MORE VALUE . .

WITH MECCANO

Every Outfit bigger—so that you can build more models. Every model better—so that you get more fun making and playing with them. Boys! These thrilling improvements have made Meccano more than ever the greatest hobby in the world.

Bridges, cranes, aeroplanes, ships—the standard interchangeable Meccano parts make them all. Think of the endless fun you could have with your friends building these magnificent models. The thrill of Meccano model building never ends—there is always something new to make and something new to invent. Your dealer will be glad to show you the latest Meccano Outfits.

PRICES OF COMPLETE OUTFITS FROM 3/- to 255/-



This is a fine working model of an Elevated Jib Crane built with Outfit No. 4.

MECCANO LIMITED
BINNS ROAD
LIVERPOOL 13

By Appointment to H.M. Queen Mary

HOW HIGH WAS IT?

Hamleys News

HAMLEY · BROTHERS · LTD · ESTABLISHED · 1760

200-202, REGENT STREET, LONDON W.1. OUR ONLY ADDRESS

Telephone: REGENT 3161

No. 34 April, 1939

By Appointment to H.M. Queen Mary

HOW FAR WAS IT?

CYCLISTS! DON'T MISS THIS PAGE!

Do you remember that steep hill that you were so proud to have climbed on your bike last holidays? But it makes an even better story if you can tell people how high it was! This grand gradometer which works like a spirit level can be easily fixed to your handlebars and will tell you the gradient of any hill.

GRADOMETER

Price **3/6**

Post 3d.

Do you remember that long ride you went with your chum last summer? And when you told people how far you had gone, no one would believe that you could have gone so far. You can now check the length of every ride with the aid of this grand cyclometer. It fits easily and is obtainable in 26 in. or 28 in. wheel.

CYCLOMETER

Price **2/6**

Post 2d.

Do you remember that time when you beat your own speed record and you wondered just how fast you were going? This speedometer will tell you at any moment what your speed is. A cyclometer incorporated in it will tell you how far you go, too!

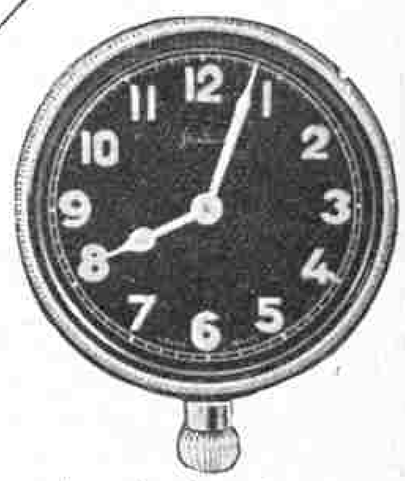
SPEEDOMETER

Price **19/6**

Post 6d.

(Speedometer only 12/6)

DO YOU REMEMBER?



Do you remember the last time you were late for school because the clock at home was slow? You can always have the correct time if you fit this shockproof clock to your handlebars.

CYCLE-WATCH

Price **12/6**

Post 4d.

Do you remember how much you spent on having your snaps developed and printed last year? Why not do it yourself? This Ensign printing outfit contains printing frame, measuring jug, fixing bath, two tins hypo fixative, packet of developer. For the Ensign camera.

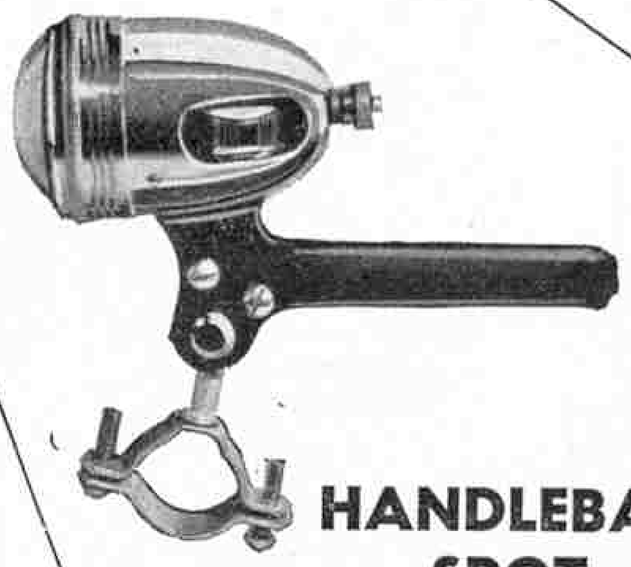
ENSIGN PRINTING OUTFIT

Price **2/6** *Post 6d.*

Do you remember that grand camping holiday that you had last year? Have one again this year, but this time make it a bicycling tour as well. Just fit this grand portable tent on your carrier and away you go! Weight 6 lb., yet it is 6 ft. long, 4 ft. wide and 3 ft. 6 ins. high.

BIKE TENT *Price* **15/-** *Post 6d.*

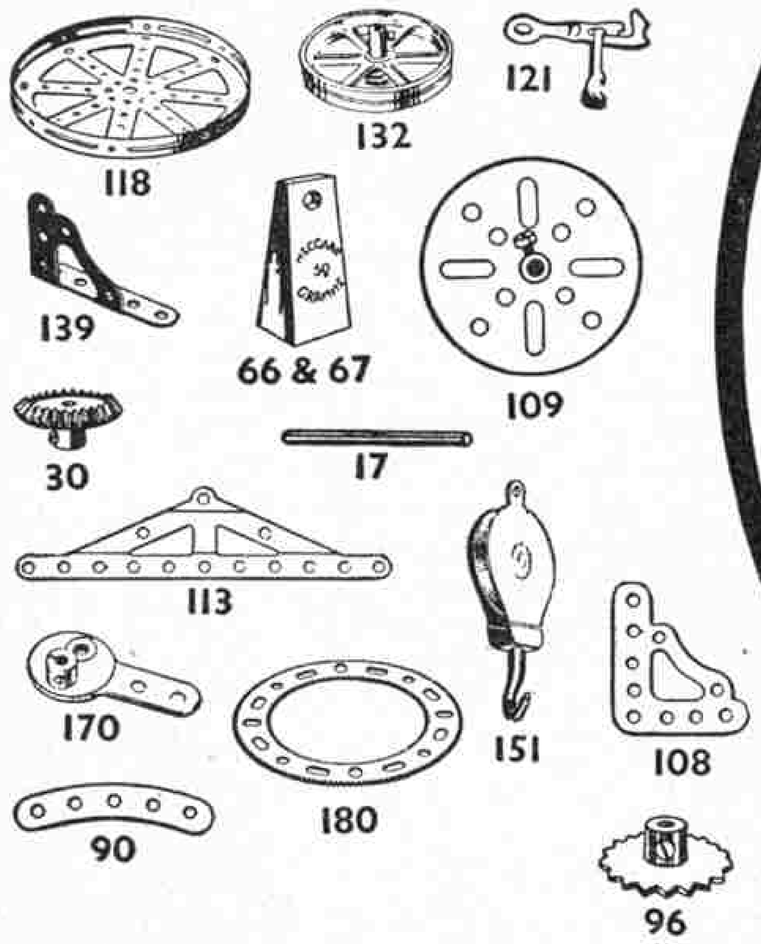
Do you remember that night when you nearly ran over a dog that you just hadn't seen? This spot lamp will enable you to see far ahead. Throws a strong beam and is operated from the dynamo.



HANDLEBAR SPOT LAMP

Price **3/6** *Post 3d.*

MECCANO PARTS



Meccano parts, a small selection of which is illustrated here, combine to form a complete miniature engineering system with which practically any movement known in mechanics can be correctly reproduced. New parts are always being introduced in order to keep Meccano model-building in line with the most modern engineering requirements. Ask your dealer for the latest complete illustrated price list.

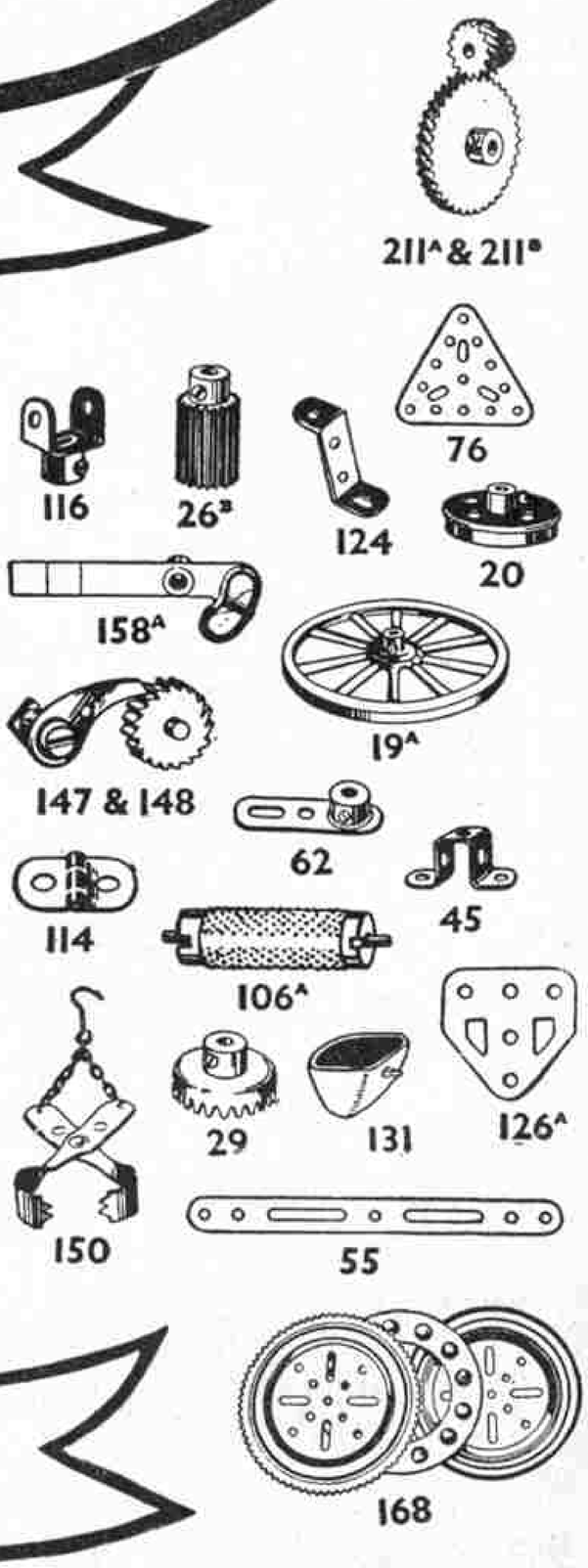
No.			s.	d.
17.	Axle Rods, 2"	doz.	0	3
19a.	Wheels, 3" diam., with set screws	each	0	6
20.	Flanged Wheels, 1½" diam.	,,	0	3½
26b.	Pinion Wheels, ½" dia., ¾" face	,,	0	6
29.	Contrate Wheels, ¾" diam.	,,	0	4
30.	Bevel Gears, ⅞", 26 teeth	,,	0	6
45.	Double Bent Strips ...	,,	0	1
55.	Perforated Strips, slotted, 5½" long	doz.	1	3
62.	Double Arm Cranks	each	0	2½
66.	Weights, 50 grammes	,,	0	9
67.	,, 25 ,,	,,	0	6
76.	Perforated Triangular Plates, 2½"	,,	0	2
90.	2½" Curved Strips, 2⅝" radius	,,	0	1
96.	Sprocket Wheels, 18 teeth, 1" diam. ...	,,	0	3
106a.	Sand Rollers	,,	1	3
108.	Architraves	doz.	1	9
109.	Face Plates, 2½" diam.	each	0	3½
113.	Girder Frames	,,	0	3
114.	Hinges	,,	0	3

No.			s.	d.
116.	Fork Pieces, large ...	each	0	2½
118.	Hub Discs, 5½" diam.	,,	1	0
121.	Train Couplings ...	,,	0	1
124.	Reversed Angle Brackets, 1"	½ doz.	0	4½
126a.	Flat Trunnions	each	0	1
131.	Dredger Buckets ...	,,	0	2½
132.	Flywheels, 2¾" diam.	,,	2	0
139.	Flanged Brackets (R.H.)	,,	0	2
147.	Pawls, with Pivot Bolts and Nuts	,,	0	3
148.	Ratchet Wheels ...	,,	0	4
150.	Crane Grabs	,,	0	6
151.	Pulley Blocks, single sheave	,,	0	7
158a.	Signal Arms, Home	,,	0	5
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
*211a.	Helical Gears, ½"	,,	0	10
*211b.	,, ,, 1½"	,,	2	3

**Can only be used together*

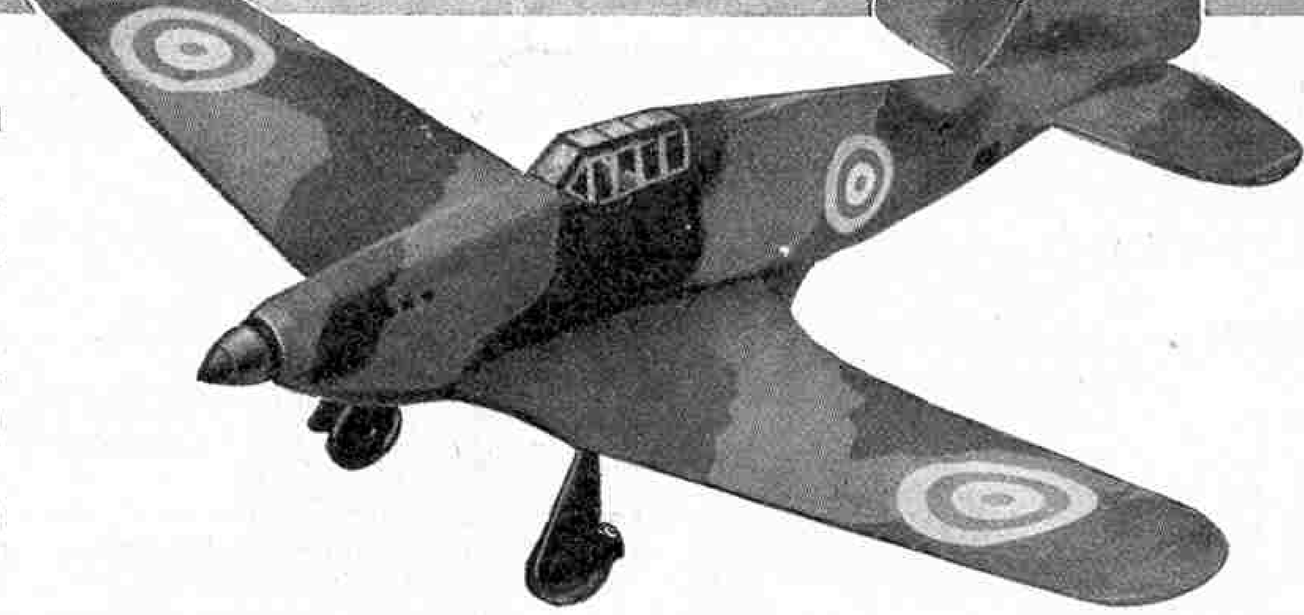
MECCANO LTD., Binns Road
LIVERPOOL 13

MORE PARTS . . .



A Meccano enthusiast putting the finishing touches to a splendid model Pontoon Crane. The model is driven by a Clockwork Motor and will lift actual loads.

BETTER MODELS



The correctness of aircraft design is measured by performance.
FROG construction kits enable the enthusiast to build a model with both high performance and excellent appearance.
Now is the time to build your model aeroplane. Buy a FROG construction kit and see how easy it is to make a "super" machine. *No tools required —all parts cut to shape.*
Prices range from 1/6 to 21/-, and include flying scale models of military and civil aircraft also. Competition models to S.M.A.E. specification.

HAWKER HURRICANE KIT **2/-**

DO NOT MISS THE NEW KITS!
Supermarine Spitfire 2/- and Vickers Wellesley 2/6
AVAILABLE SHORTLY

NO TOOLS REQUIRED · ALL PARTS CUT TO SHAPE · INSTRUCTIONS EASY TO FOLLOW · EXCELLENT PERFORMANCE

FROG **MODEL AIRCRAFT**
Covered by World Patents granted and pending.
Made in England by International Model Aircraft Ltd.

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FROG Trade Mark Regd.

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

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ADDRESS.....

PLEASE WRITE IN BLOCK LETTERS 10/38

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. New items are continually being introduced. The latest additions are small models of a Mobile Anti-Aircraft Unit and an 18-Pounder Quickfiring Unit.

EMPIRE FLYING BOATS

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

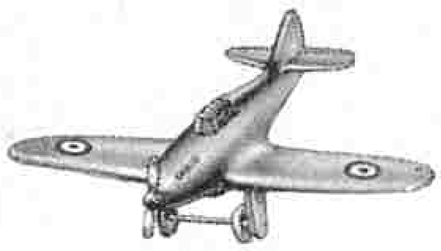
ATLANTIC FLYING BOAT

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

HAWKER "HURRICANE" SINGLE-SEATER FIGHTER (Shadow Shaded)

Dinky Toys No. 62h
Scale model of the Hawker "Hurricane" single-seater Fighter extensively used by the R.A.F. Price **6d.** each

HAWKER "HURRICANE" SINGLE-SEATER FIGHTER (Aluminium Finish)



Dinky Toys No. 62s
Similar to Dinky Toys No. 62h, but with Aluminium finish. Price **6d.** each

JUNKERS Ju 90 AIR LINER

Dinky Toys No. 62n
Scale model of the latest type of German air liner, having a top speed of 256 m.p.h. Price **11d.** each

GIANT HIGH-SPEED MONOPLANE

Dinky Toys No. 62y
Similar in type to Junkers "Ju 90" Air Liner. Assorted colours. Price **11d.** each

IMPERIAL AIRWAYS "FROBISHER" CLASS LINER

Dinky Toys No. 62w
Scale models of the Imperial Airways "Frobisher" class liners. Three models available, named: "*Frobisher*," "*Falcon*" and "*Fortuna*." Price **10d.** each

DE HAVILLAND "ALBATROSS" MAIL LINER

Dinky Toys No. 62r
Scale model of one of the "Albatross" mail liners built for the Air Ministry for experimental flights. Price **10d.** each

FAIREY "BATTLE" BOMBER

Dinky Toys No. 60n
Model of the Fairey "Battle" day bomber, a type much used by the R.A.F. It carries a pilot and gunner. Price **4½d.** each

REFUELLING TENDER

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

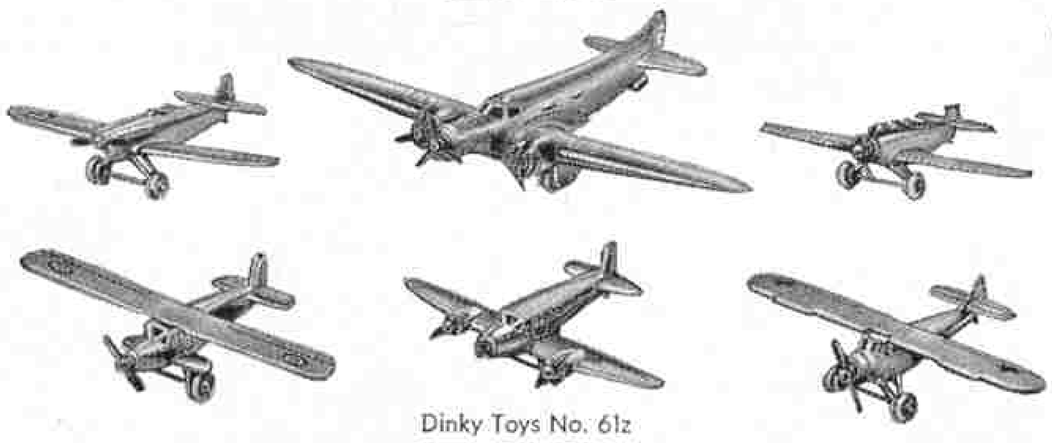
FLYING BOAT "CLIPPER III"

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

"DOUGLAS D.C.3" AIR LINER

Dinky Toys No. 60t
Scale model of the "Douglas D.C.3" air liner, which is in regular service on American and European routes.
Price **9d.** each

AEROPLANES



Dinky Toys No. 61z
This set consists of six models of French Aeroplanes—Dewoitine 338, Dewoitine 500d, Potez 58, Potez 56, Hanriot H180M and Farman F360. (Made in the Meccano Factory in Paris.) Price **3/-**

OUR MECHANISED ARMY!

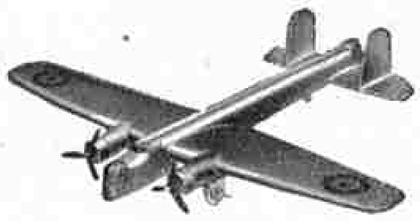
MOBILE ANTI-AIRCRAFT UNIT

Dinky Toys No. 161
Comprises scale models of a quick-firing anti-aircraft Gun mounted on a mobile platform and a Searchlight mounted on a lorry. Both Gun and Searchlight have elevating and swivelling movements. Price **3/-** per set

18-POUNDER QUICK-FIRING FIELD GUN UNIT

Dinky Toys No. 162
Comprises scale model 18-pounder quick-firing Field Gun, Trailer and "Light Dragon" Motor Tractor. Price **2/-** per set

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

ARMSTRONG WHITWORTH "WHITLEY" BOMBER

(With Shadow Shading) Dinky Toys No. 62t
Similar to Dinky Toys No. 60v but with Air Ministry Shadow Shading. Price **11d.** 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

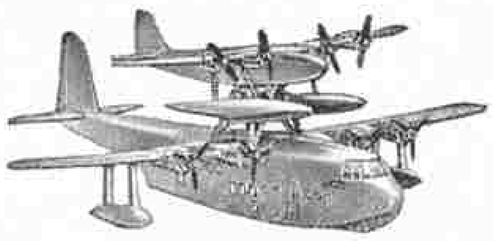
ARMSTRONG WHITWORTH "ENSIGN" AIR LINER

Dinky Toys No. 62p
Scale model of the largest British air liner. Six models available, named: "*Ensign*," "*Elsinore*," "*Explorer*," "*Echo*," "*Ettrick*" and "*Elysian*." Price **1/-** each

BRITISH 40-SEATER AIR LINER

Dinky Toys No. 62x
Similar in type to the Armstrong Whitworth "Ensign" Air Liner. Assorted colours. Price **1/-** each

MAYO COMPOSITE AIRCRAFT



Dinky Toys No. 63
Scale model of the Mayo Composite Aircraft. Price **2/-** each

The components of the above can be purchased separately.
No. 63a Flying Boat "*Maia*" ... **1/3** each
No. 63b Seaplane "*Mercury*" ... **9d.** 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. Price **10d.** each

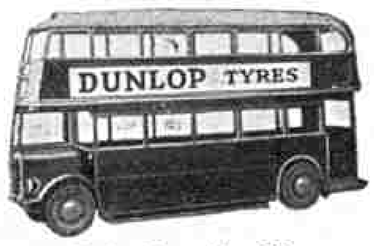
SIX-WHEELED WAGON

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

STREAMLINED RACING CAR

Dinky Toys No. 23s
Similar in type to the "*Thunderbolt*" Speed Car. Assorted colours. Price **9d.** each

DIESEL RAIL CAR

Dinky Toys No. 26z
A realistic model of a modern Diesel-engined rail car. Price **5d.** each
(Made in the Meccano Factory in Paris.)

POLICE MOTOR CYCLIST

Dinky Toys No. 37b

Price **6d.** each

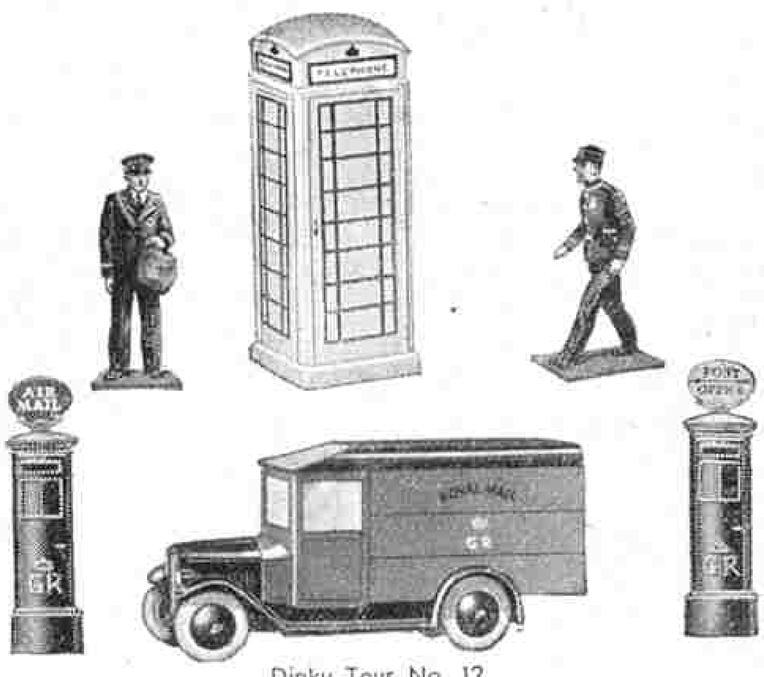
CIVILIAN MOTOR CYCLIST

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

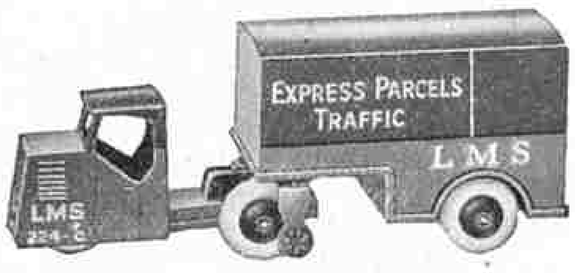


Dinky Toys No. 12

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

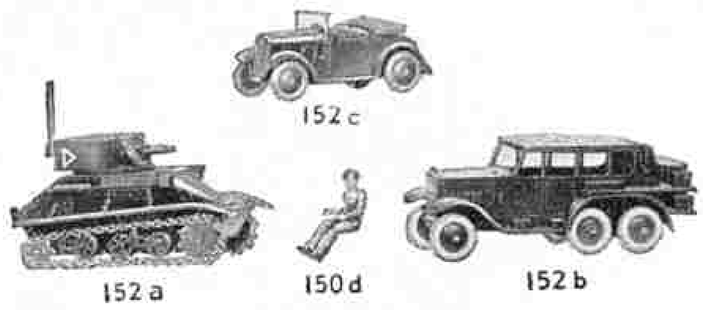


Dinky Toys No. 33R

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

Fitted with detachable rubber tyres.
Price complete, L.M.S.R., L.N.E.R., G.W.R. or S.R. ... **1/6**

ROYAL TANK CORPS LIGHT TANK SET

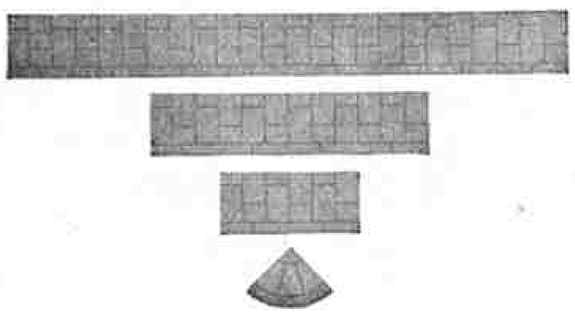


Dinky Toys No. 152

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.**

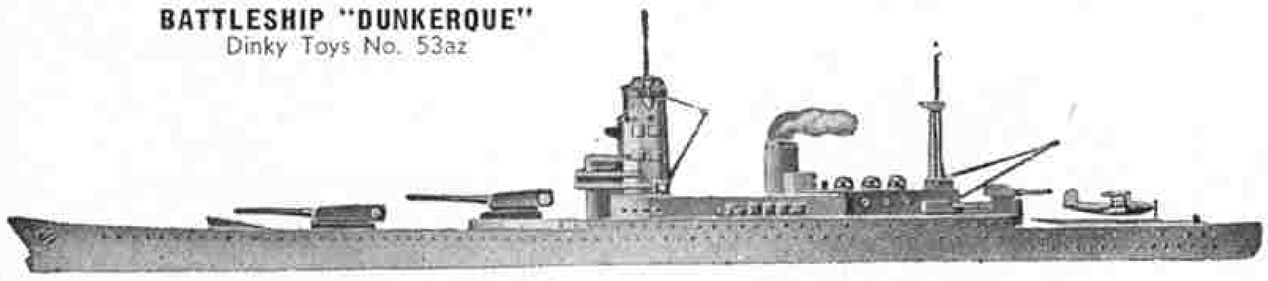
Price of complete set **9d.**

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

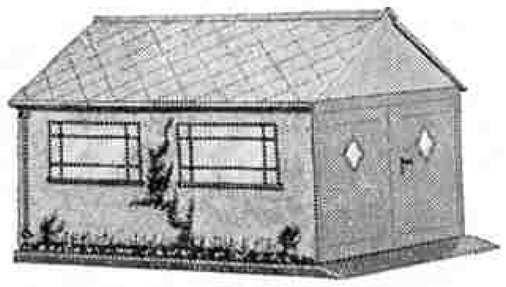
BATTLESHIP "DUNKERQUE"

Dinky Toys No. 53az



Scale model of the French 26,500 ton Battleship "*Dunkerque*," which has an overall length of 702 ft. 9 in., and a main armament of eight 13 in. guns. Price **9d.** each
(Made in the Meccano Factory in Paris.)

GARAGE

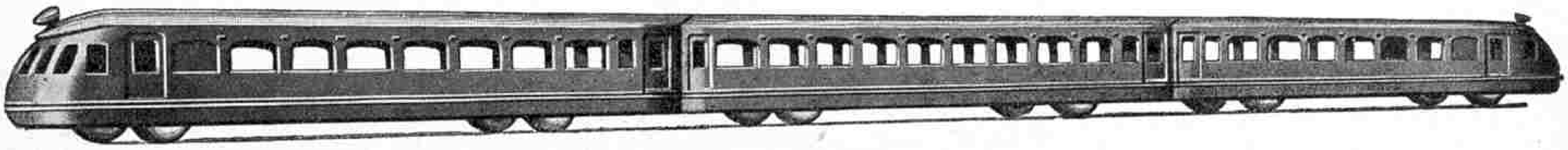


Dinky Toys No. 45
Fitted with opening double doors. Will accommodate any two Dinky Toys Motor Cars. Price **1/3** each

THREE-WHEELED DELIVERY VAN

Dinky Toys No. 14z
Fitted with opening lid.
Price **10d.** each
(Made in the Meccano Factory in Paris.)

STREAMLINED DIESEL ARTICULATED TRAIN



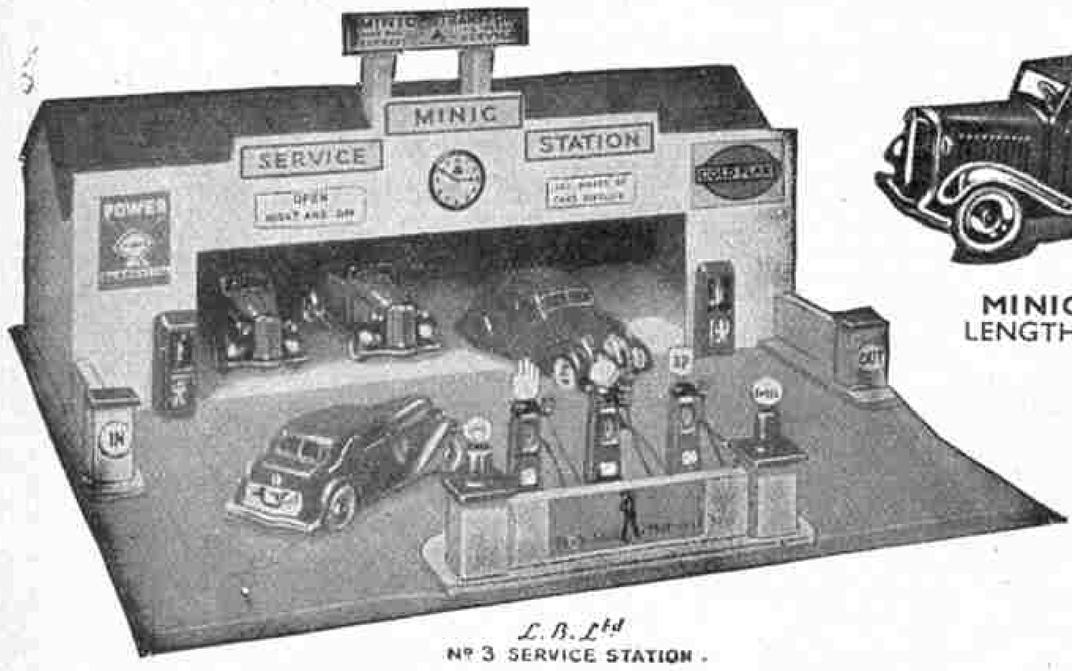
Dinky Toys No. 16z Price **1/6** each (Made in the Meccano Factory in Paris.)

MECCANO LIMITED — BINNS ROAD — LIVERPOOL 13

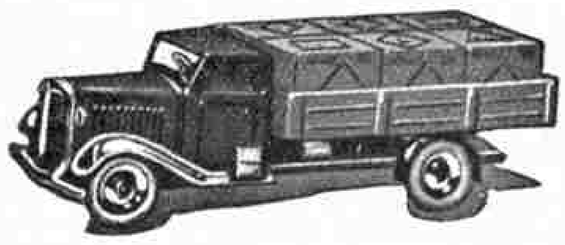
MINIC MODELS

ROAD TRANSPORT TRUE TO SCALE

Here's a fascinating new hobby, collecting real true-to-scale models of every form of road transport, with perfect replicas of garages, petrol stations, etc. If you are already a model railway enthusiast become a transport enthusiast as well—or start with a hobby by becoming a model transport collector. Almost every type of road transport is represented. Each model is strongly constructed and fitted with long running mechanism and some are even fitted with electric lights.



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 8/11
CARS NOT INCLUDED.



MINIC Lorry with Cases.
LENGTH 5½ ins. Price 1/6

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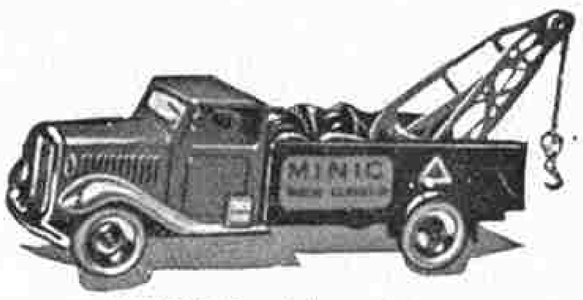

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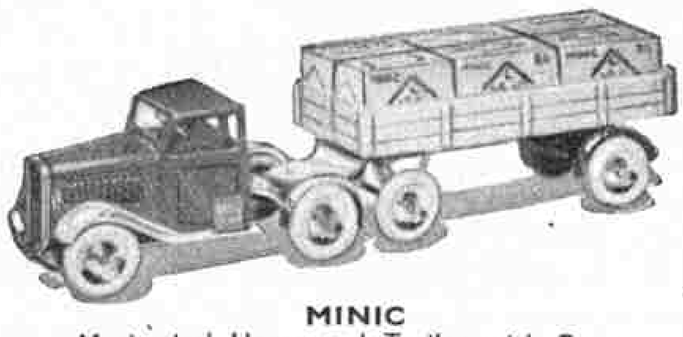

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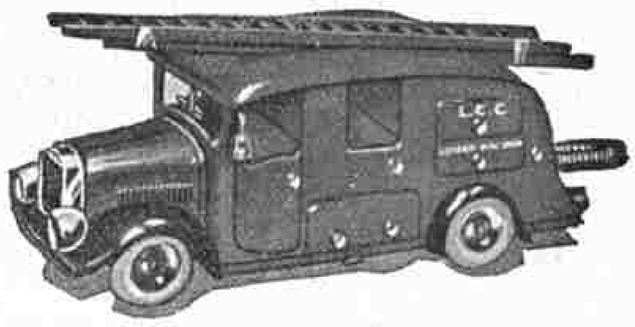

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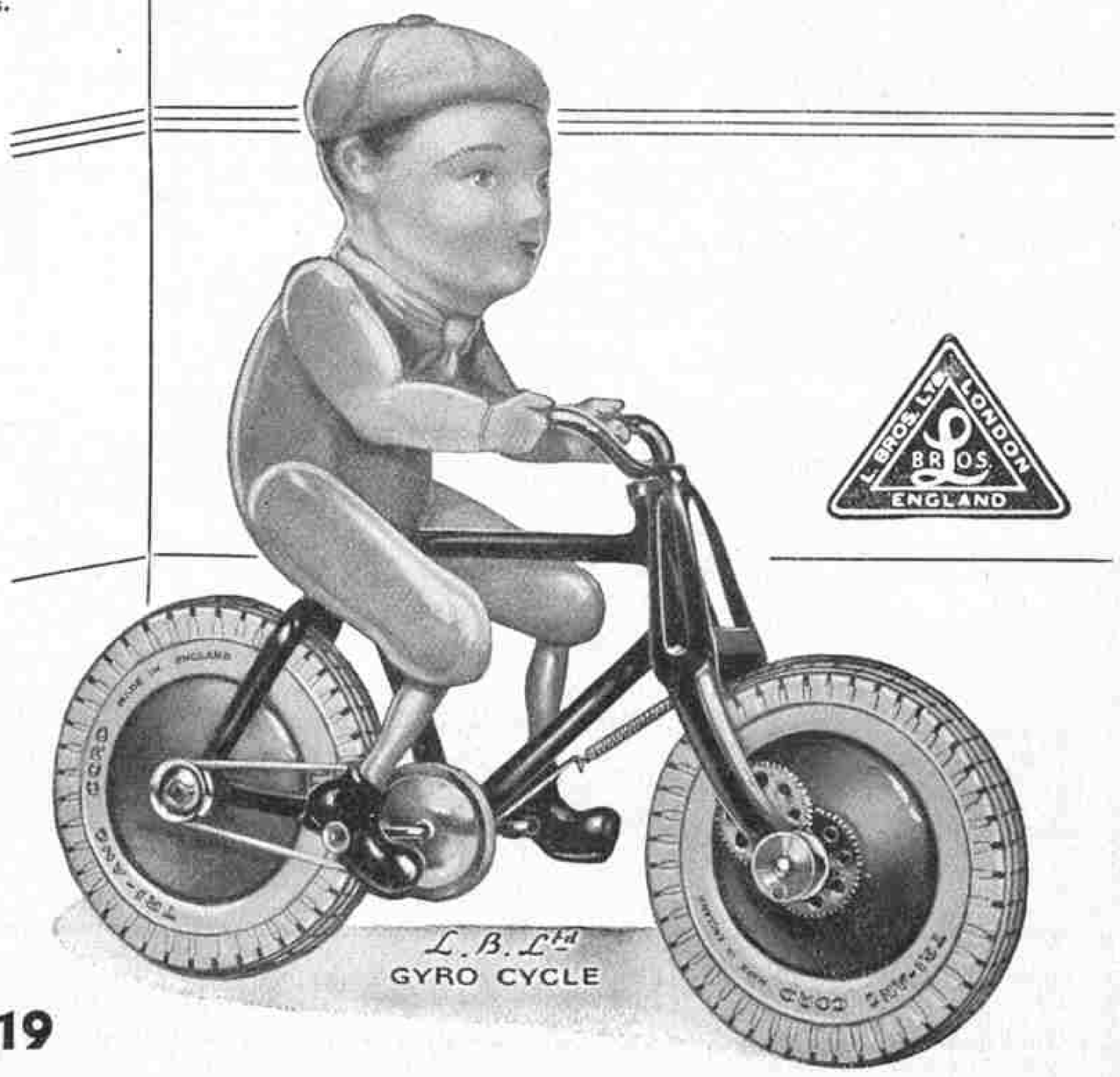

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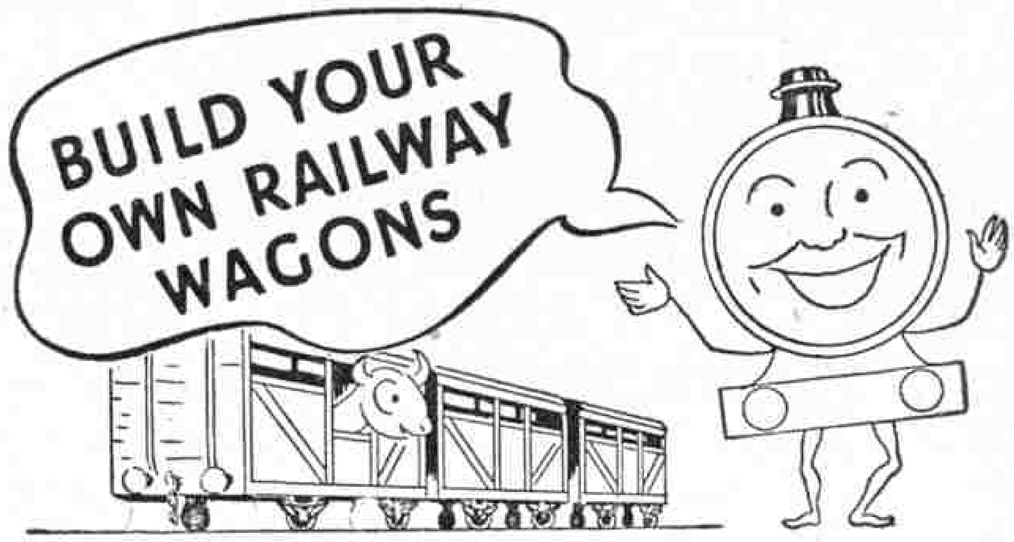

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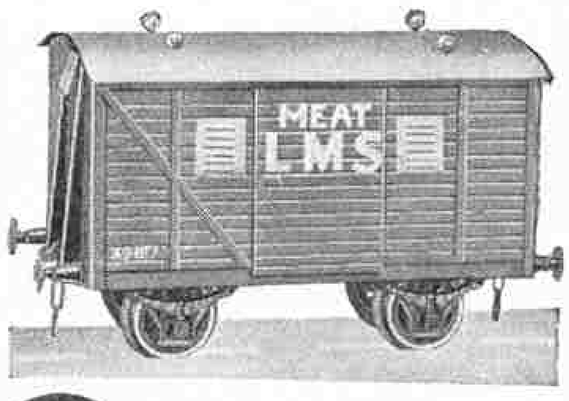

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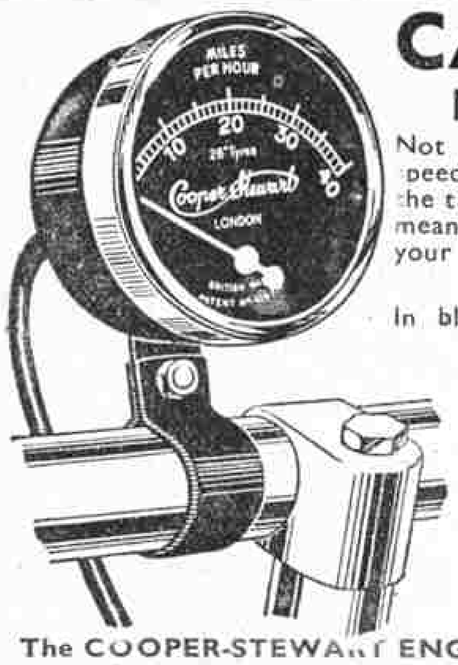

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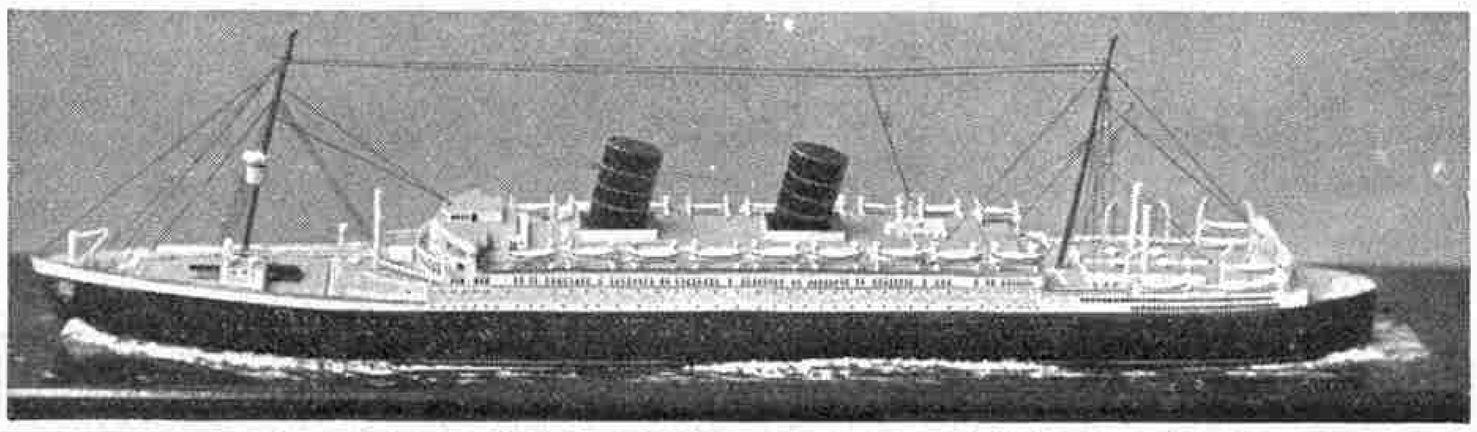

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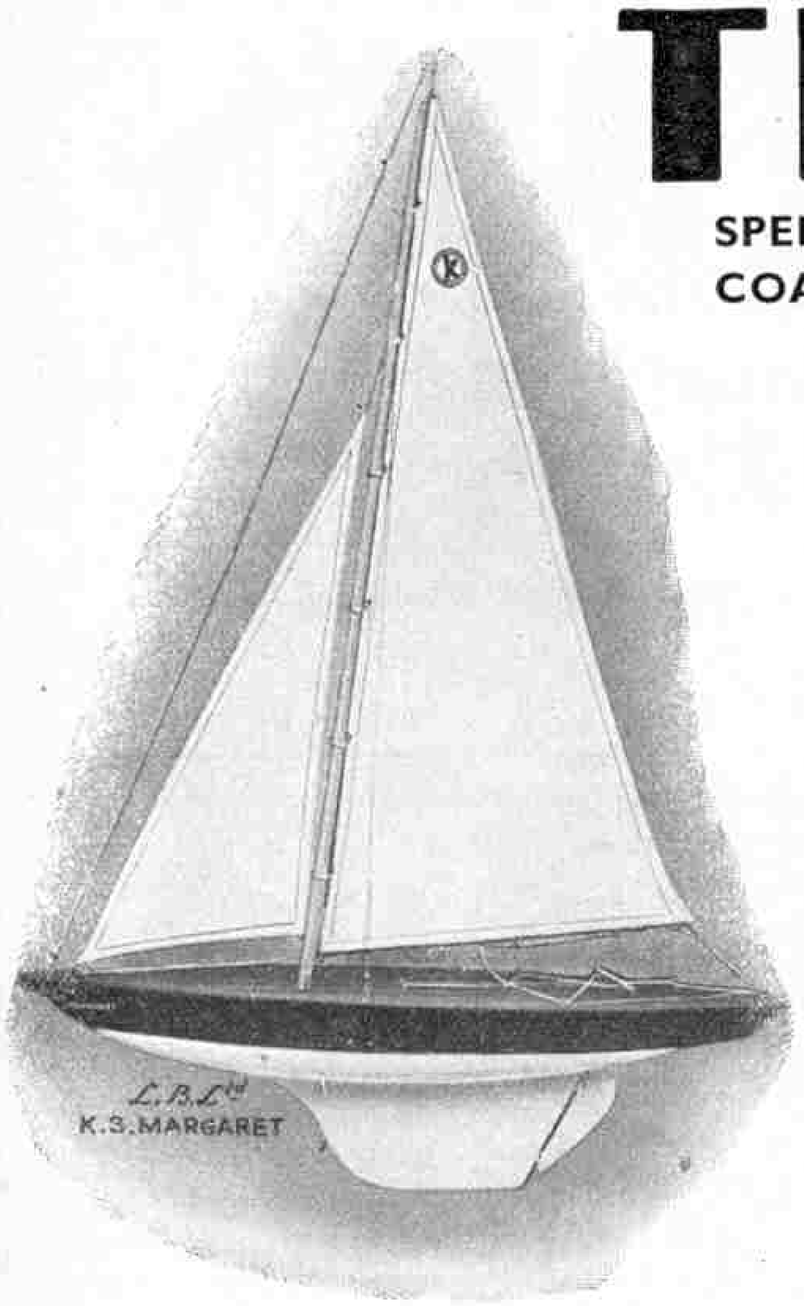

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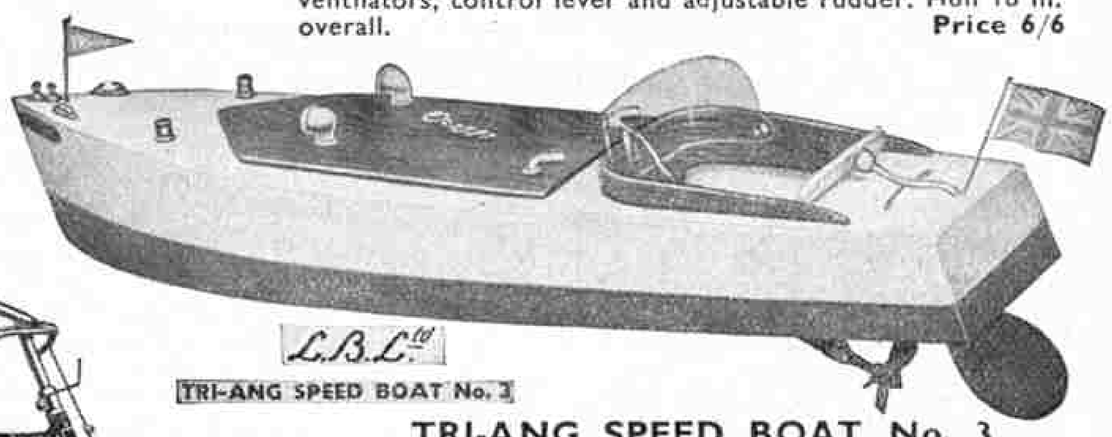

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MECCANO MAGAZINE

Editorial Office:
Binns Road, Liverpool 13
England

Vol. XXIV. No. 4
April 1939

With the Editor

The "Early Bird"

Much of the varied literature issued by the railway companies in connection with their campaign for a "square deal" has of necessity dealt with facts and figures and out-of-date legislation, and therefore has been rather "heavy going." A recent booklet issued under the title *"Ride With Me On The Early Bird"* comes as a pleasant change. The *"Early Bird"* is the unofficial nickname given by the men who work her to the G.W.R. express freight train that leaves Acton every night at 7.25 for Cardiff, carrying a mixed freight for South Wales. The G.W.R. people seem fond of picturesque names; I recall, for instance, the *"Flying Pig,"* the *"Farmer's Boy"* and the *"Mopper Up,"* among others.

The booklet describes a ride to Cardiff partly on the engine and partly in the guard's brake van. "The *'Early Bird'* started to show her paces and we were soon running along at a spanking 45. That was quite fast enough for me! Travelling in a brake van at the end of a goods train nearly half-a-mile in length is like hanging on to the tail of a kite. It 'waggles' and you 'waggle' with it, and you also hold on tight for your safety's sake." The conversation between the traveller and the guard gives a splendid impression of the thrills of a night ride. On the way one learns many interesting facts, such as the maximum speed of a freight express, and why a freight train carries three rear lights. It will certainly come as a surprise to many of my readers to know that 678 trains similar to the *"Early Bird,"* and made up of more than 27,000 wagons, run each night of the year, linking all the important towns and cities in the country.

The booklet has many attractive illustrations of scenes on the engine, in the brake van at goods depots and along the track. It can be obtained free from the Railway Companies Association, Fielden House, Great College Street, London S.W.1.

Farming Indoors

Farmers and gardeners are always grumbling about the weather. It rains when they want sunshine, and when they get a long period of fine weather they begin to sigh for rain. Their troubles might end if they could bring their farms and gardens indoors. This sounds ridiculous, but I have been wondering lately if the notion is quite as foolish as it sounds. Strange as it may seem, soil is not necessary for growing plants. All of us at one time or another have grown hyacinths or crocuses by placing the bulbs in glasses or jars with their bases in contact with water. Roots then develop and the plants grow, to flower in due course. Another experiment that we can all make is to grow peas or beans in this way, or perhaps in sand that is kept moist. Other interesting examples of growing plants without soil that all my readers can test easily for themselves are given in the article that appears on page 238 of this issue.

Now we have news of an amazing development of these simple experiments in the United States, chiefly in California. There tomatoes and cucumbers, flowers and beans, and even tobacco have been grown on a large scale without soil, so the dream of farms indoors, where the weather can be adjusted to the crops, seems to have come true, on a limited scale at any rate. The plants grow in tubs and tanks, and are far more prolific than when they are grown in the way to which Man has been accustomed for thousands of years. There is a secret behind this. They cannot grow on pure water, but the addition to this of certain chemicals supplies them with all the food they need in such a way that it is easily absorbed and digested. The benefit to the plant is seen in the increase of the yield of tomatoes to something like ten times that of outdoor growing in the genial climate of California. These plants certainly seem to appreciate indoor farming.

Mystery Photograph No. 3

The mystery photograph that appeared on the Editorial page of the March *"M.M."* did not prove as difficult as I had expected, and there were 30 readers sharp-eyed enough to realise that it showed a cross-section of a carrot. The first correct solution to reach me was that of D. Bennett, Warrington, to whom I have sent a copy of my *"Modern Book of Ships."*

Many readers came near the actual solution by suggesting that the photograph showed a cross-section of a pineapple, and there were other plausible suggestions, such as a cross-section of a tree, a flower stalk or a cucumber. Some of the other guesses were distinctly wild, however. A few saw in the photograph a lighted candle viewed from above; others imagined it to represent the crater of Vesuvius, a hole burned in a piece of cloth or paper, and an umbrella "nearly up"; and there were four competitors who thought they recognised a sunspot, in one case "viewed through a large telescope." An ink stain on blotting paper was a popular suggestion.

In view of the keen interest that these photographs have aroused I am continuing them as competitions, and this month's mystery picture, together with the rules and conditions of the contest of which it forms part, appear on page 263 of this issue.

British Stone Circles

Marvellous Work of Prehistoric Builders

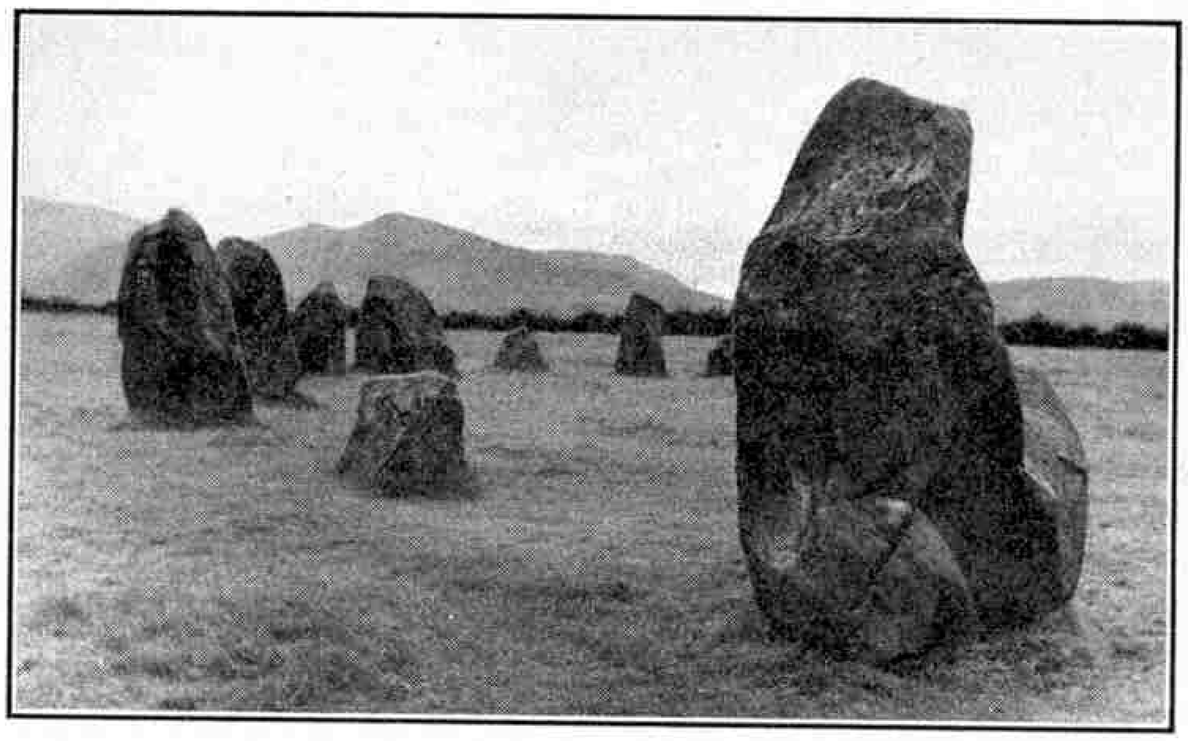
WE are apt to think of the men of the Stone Age as crude and primitive beings living in wild conditions. Actually they were comparatively highly civilised, enterprising, and skilled in making and using tools. One of the surprising things that we have learned about them is that they were builders on a huge scale, and we wonder at the size of some of the stone structures they have left behind. Sometimes they simply stood single huge stones on end to form a monument of some kind; at other times they built gigantic tables each consisting of an enormous flat stone block resting upon others placed upright in the ground.

Even more remarkable are their immense stone circles. Some of these were amazingly elaborate, the uprights of the circle being connected at their tops by flat stones or lintels carefully dressed and fitted in position by elaborate jointing. These stone circles seem to have been designed as places of assembly for religious ceremonies or law making. A religious origin is certainly suggested by the fact that burials have taken place at their centres. The people who built them probably reached our shores from western France and northern Spain, and on reaching Britain they appear to have passed right along the western coasts, for there is a trail of stone monuments leading northward to the Hebrides and Orkneys. From the coasts they penetrated inland, and it was in Wiltshire that they built their greatest monuments, the famous stone circles of Avebury and Stonehenge.

Stonehenge, Britain's most complete stone circle. The huge blocks of this monument are fitted together with great skill. The illustrations to this article are from photographs by F. R. Winstone, Bristol.

Stonehenge is the best known and most complete of British circles. It is built within an earthwork, with an avenue approaching it on the north-east, and when seen from a distance is apt to be a little disappointing, for it is somewhat dwarfed by its position in a vast and bare expanse of plain. This impression is dispelled immediately the circle is reached, however, for the immense size of the stones can then be realised. Many of them weigh between 20 and 30 tons, and one of them is 30 ft. long. Yet they were stood on end, each exactly in its appointed place, as well as if the huge and powerful cranes of to-day had been used. The flat stones laid across the tops of the uprights weigh nearly 7 tons. Only the crudest of mechanical appliances could have been available for handling all these huge masses, and most of the work must have been done by sheer man-power. That the builders of the monument were skilled and experienced in their task is shown by the use of the carefully-worked joints that locked the stones in position.

The greatest of all these stones originally formed a horseshoe in the centre of the monument. Legends often associate such places as Stonehenge with buried treasure, and in 1620 the Duke of Buckingham began digging within this horseshoe in the hope of unearthing a store of gold. He did not find any treasure, but he did bring down two of the great upright stones, one of which cracked into two pieces.



Castle Rigg, a Lake District stone circle to be seen near Keswick.

All that we know of the tools and methods used in building Stonehenge has been gained by digging on the site. For instance, we know that the stones were dressed there, for stone tools used by the ancient masons have been dug up, together with chippings. Huge mauls or hammers of sarsen stone from 36 lb. to 67 lb. in weight also have been discovered. These may have been slung on a rope so that they could be swung by two men to give a crashing blow. Some of them are round, and might have been used to grind holes in the stones when the joints by which they were fitted together were made. Holes in the ground to receive the upright stones were dug with picks made of the antlers of the red deer. Many of these picks have been unearthed, and pick holes in the chalk as well as splinters of picks also have been found.

The stones seem to have been slid down inclines into the holes; at any rate, at all but two of the holes inclines have been traced by noting the disturbed character of the ground on excavating. The stones were then pulled or levered into an upright position, and wedged in place with small blocks of stone while the holes were being filled in. The builders were clever enough to give the bases of their stones the shape of chisel edges so that movements backward and forward, or from side to side, were made comparatively easily.

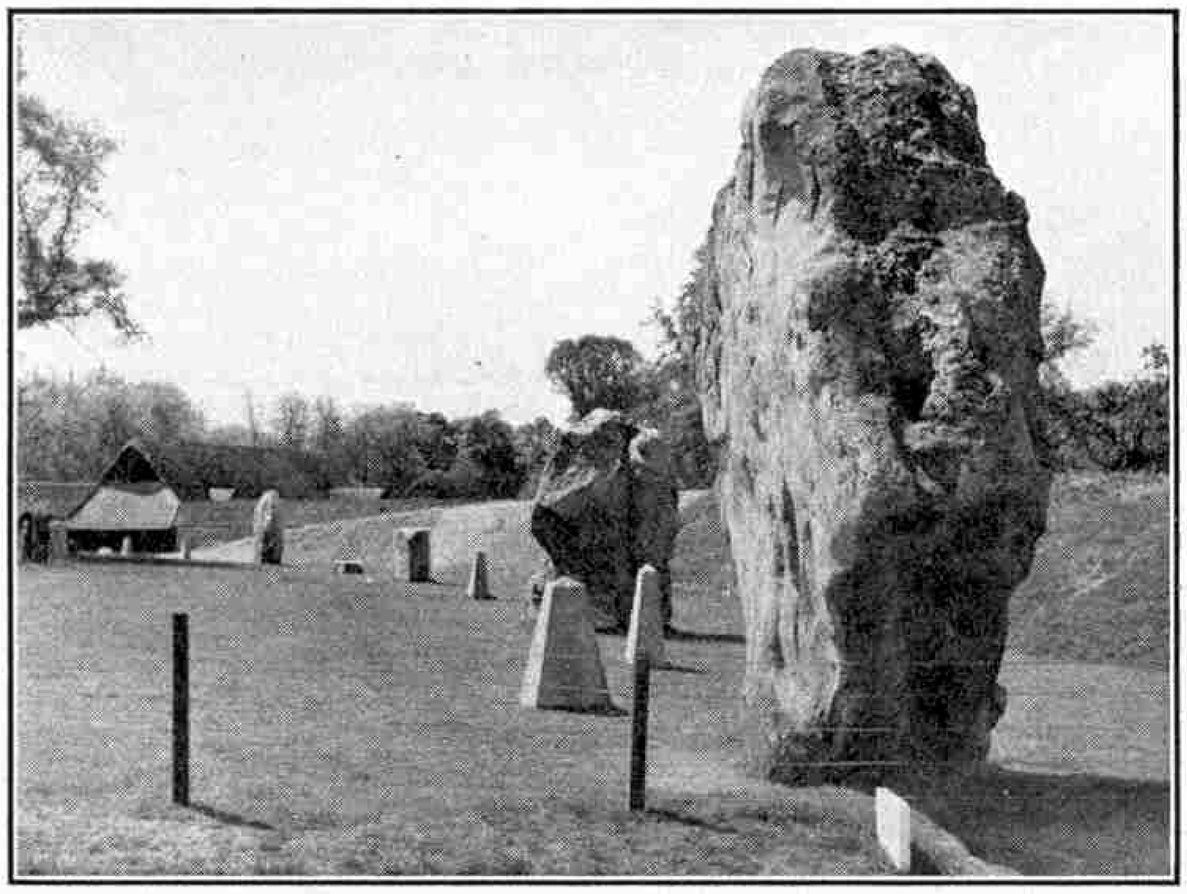
The stones across the uprights may have been levered up a little at a time, being packed up with timber after each lift, or they may have been rolled up inclines leading to the tops of the uprights. An interesting feature is that the surfaces of the stones that have been protected by burial underground still show sharply and clearly the marks of the stone tools of the masons who worked on them some 4,000 years ago. The tool marks on the exposed parts of the stones have long since weathered away.

For years one of the greatest mysteries of Stonehenge was the origin of certain of its stones, for none like them are to be found on Salisbury Plain or in its neighbourhood. At one time it was suggested that they were boulders carried there by the gigantic glaciers of the Ice Age. The reality is more exciting than this, however, for it is now known that they were brought by the builders from the Prescelly hills in Pembrokeshire, 180 miles away! Why these huge stones were brought so far, and how they were transported, we do not know. They may have been dragged or hauled on rollers along ancient trackways, or carried by water round Land's End and up the River Avon. Another stone from the same hills was discovered in a prehistoric burial place, one of the type known as long barrows, 14 miles west of Salisbury; and its presence there seemed to show that it was moved from its Welsh home about 1,800 B.C.

The solution of this mystery suggests that the builders of Stonehenge, or their ancestors, came from South Wales, for

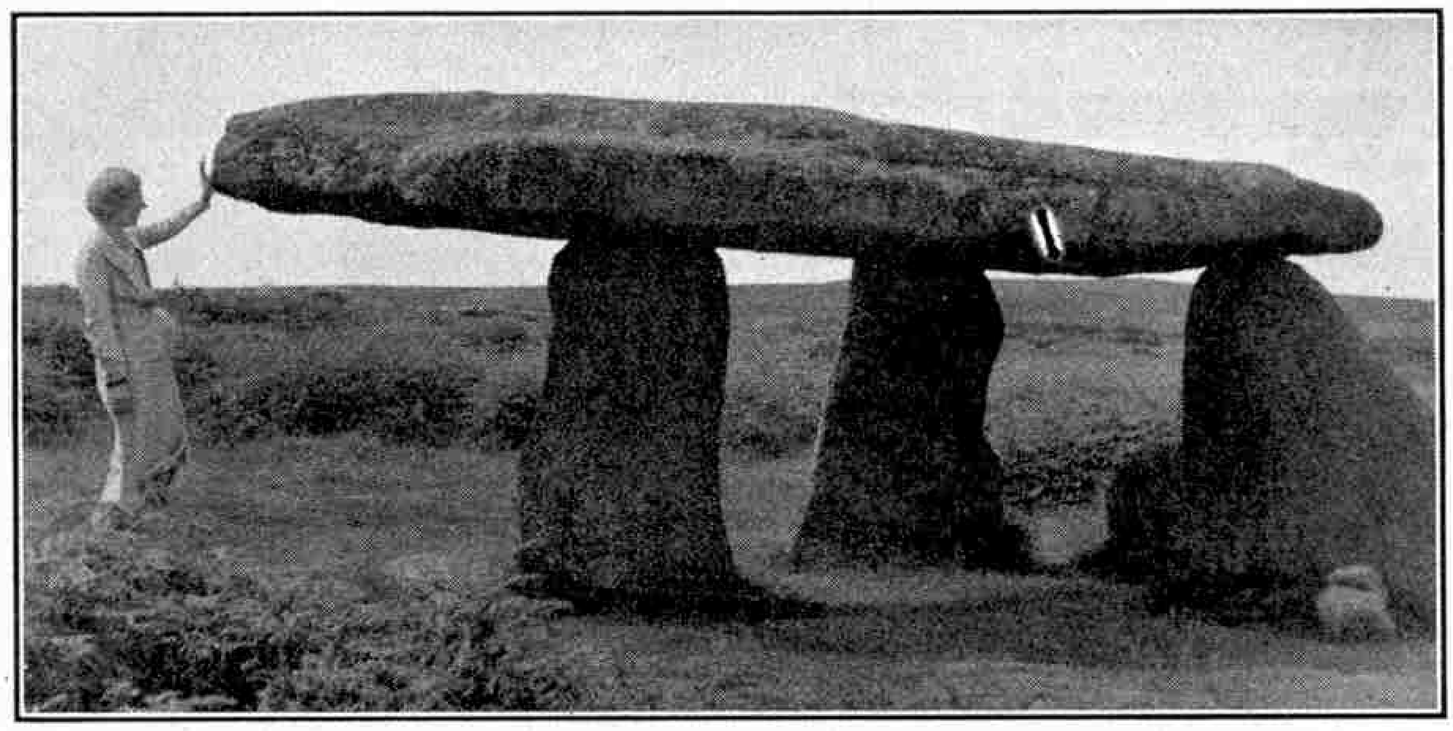
otherwise it is difficult to see why they should have gone to the enormous trouble of dragging huge stones from that district to such a distance. There are eight stone circles at Prescelly as well as other traces of stone monuments. These must have been important religious centres of the stone builders of prehistoric times, and when the latter went inland to Salisbury Plain it was only natural that they should take their sacred stones along with them.

What Stonehenge was used for we can only guess. Formerly it was thought that the Druids used the place as a temple, and that a flat altar stone, as it is called, in the centre of the ruins, was the scene of gruesome rites, perhaps of the sacrifice of human beings. Nothing to support this idea has ever been discovered at Stonehenge, however, and in any case the monument was built long before there were any Druids in Britain. There is little doubt that it was one of the sacred places of the men who inhabited this country 4,000 years ago. Near it are many ancient burial mounds, clustering about it as graves surround a country church, and suggesting something of the reverence then felt for the great stone circle. Possibly there was some connection between Stonehenge and the Sun, or Sun worship, and it has been suggested that it was deliberately placed so that at sunrise on Midsummer Day the Sun shone directly along the approach avenue to the so-called altar stone in the centre. The Earth has tilted a little since Stonehenge was built and the rays of the rising Sun on Midsummer Day no longer follow this exact line; but it has been calculated that they did so about 1700 B.C., and this has been suggested as the date of building Stonehenge.



Typical stones of the circle at Avebury, which was larger than Stonehenge. Less than 20 of the original 500 stones now remain, white blocks marking the positions of those removed.

An interesting legend gives a very different account of the foundation of Stonehenge. It is said that the Devil determined to carry out some stupendous work that would astound and puzzle all beholders. He had seen some huge stones in an old woman's garden in Ireland, and decided to fulfil his determination by removing them to Salisbury Plain, the most unlikely place he could think of for such things to be seen in. He gained the owner's consent by promising her as much money as she could count while he was removing them, and then cheated her twice, first by giving her only small copper coins of the value of 4½d. and 2¾d. respectively, and then removing the stones so rapidly that she only had time to count two of the coins. On reaching Salisbury Plain he was boasting that nobody would ever know how the stones had got there, when a friar he had failed to see contradicted him. In his rage the Devil flung one of his stones at the friar and struck him on the heel with it as he ran away. In proof of this there is a great stone, at the entrance to the avenue, on which the friar's heel mark can be seen!



Lanyon Quoit, West Cornwall. The table stone of this monument is nearly 20 ft. in length.

At Avebury, about 17 miles north of Stonehenge, are the remains of yet another stone circle, older and larger, that would have created even more astonishment if we could have seen it as it was in the prehistoric times when it was built. The area enclosed by its surrounding earthworks is nearly 30 acres, and it has been calculated that half a million people could stand within its original outer circle of stones. This outer circle seems originally to have consisted of 100 stones from 15 ft. to 17 ft. in height. It is over 1,400 ft. in diameter, and inside it are the remnants of two smaller circles, each over 300 ft. in diameter and consisting of a double row of stones. At the centre of one of them is a gigantic pillar 30 ft. in height. Here again there is a splendid approach, known to-day as Kennet Avenue, which stretches away to the south-east for a distance of 1,430 yards.

To-day little remains of this great monument, which once contained 500 stones, some of them weighing 90 tons, but now has less than 20 to show. The sites of many of the missing stones have been traced and their positions marked by white blocks. We have the inhabitants of the village of Avebury in past centuries to thank for this destruction. One Farmer Green has earned particular notoriety by breaking up the stones that he found placed providentially near his home by heating them strongly and then throwing water over them. It is said that 20 loads of building material came from a single stone, and the Avebury circle has been used in the construction of cottages, cowsheds and even pigsties, a sad end for one of the wonders of the world and a centre of the social and religious life of a great race of 4,000 years ago.

If the people who built the stone circles of Britain approached our coasts from France, as has already been suggested in this article, it would be expected that Cornwall would be rich in their remains. This certainly is the case, for there are many stone circles and gigantic prehistoric monuments in that county. One of them is Lanyon Quoit, shown in the lower illustration on this page. The "quoit" or table stone of this structure is 18½ ft. long, and stands solidly on its three pillars, looking as if it had never been disturbed since it was placed there. Actually it was upset early last century, and was built up again in its present form in 1824. Last century a simple grave was discovered under the monument, the bottom of this being reached at a depth of 6 ft.; but no articles of any value in helping us to reconstruct the life and the customs of the age when the monument was erected were discovered.

Another monument of the same kind is Trevethy Quoit, the table stone of which is over 14 ft. long and 9 ft. wide and is supported at a height of 4 ft. 6 in. from the ground. This also marked another ancient tomb, and as one supporting stone has fallen this could readily be entered and actually was used as a tool house. Elsewhere in Cornwall there are circles and other similar structures to be met with, not perhaps so closely clustered as in certain parts of France, where there are 3,500 of these monuments, but sufficient in number to show the importance of this county in those prehistoric times.

Farther north there are important stone circles in various places. Some of these monuments may have marked trackways, and others are associated with ancient mines. A famous example from Cumberland is illustrated in this article, and in the extreme north of Scotland there are outstanding circles in Lewis and in the Orkney Islands. That in Lewis is at Callernish, and is one of the greatest of the stone circles of this country. It surrounds a small cairn and consists of 13 stones set in a circle with a diameter of 37½ ft. Here also there is an avenue that must have been used for ceremonial approach to the circle.

In the Orkney Islands there are two outstanding circles, both on Mainland, not far from Stromness. One of them is called the Ring of Brogar, and stands on a ridge between the two lochs of Stenness and Harray. To the south is the second famous stone monument of the Orkney Islands, the Stones of Stenness, a circle for which it is claimed that only Stonehenge exceeds it in completeness.

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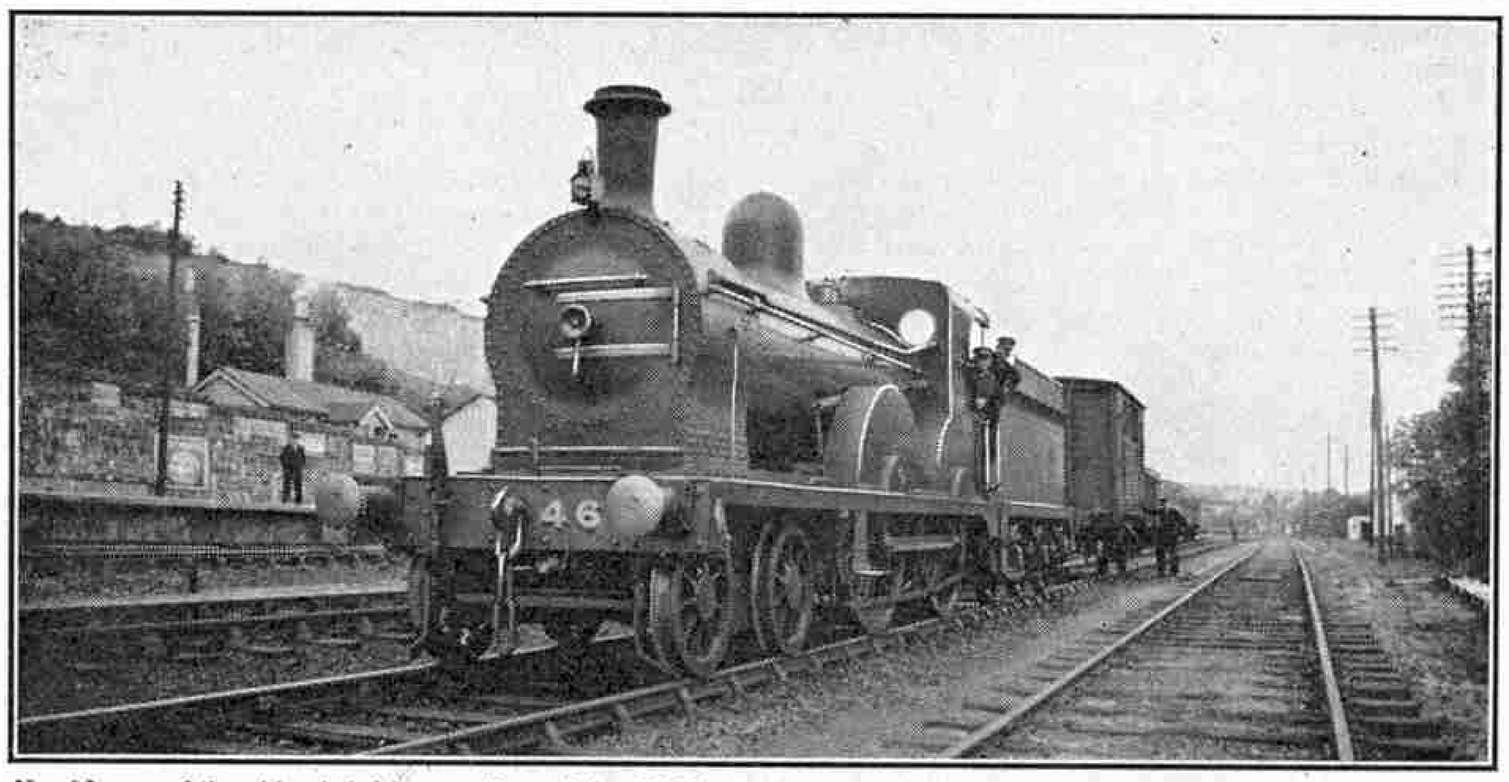
On the Footplate from Belfast to Dublin

By a Railway Engineer

A MOST interesting process of renewal is being applied to each in turn of the powerful two-cylinder simple 4–4–0s of the Great Northern Railway of Ireland. It is not rebuilding in the sense usually applied to locomotives, for the new machines are literally new save for the bogie, bogie wheels, some of the boiler fittings, and one or two other details such as coupling rods. Yet they are identical in outward appearance with the earliest examples of the type, which were built in 1913. As originally turned out these handsome engines carried a working pressure of 165 lb. per sq. in.; in the later additions to the class this figure was raised to 175, and when the time came for reboilering some of the earliest batch opportunity was taken to raise the pressure still further to 200 lb. per sq. in. As such they did very fine work, though naturally yielding first place to the portly three-cylinder compound 4-4-0s, when the latter came upon the scene in 1932.

Now that the time for replacement of the simples has arrived, after 25 years of yeoman service, the unique step is being taken of building brand new engines to the original design. Opportunity has been taken to introduce various modern improvements, however, which although leaving the appearance of the engine practically unchanged, have had a striking effect on their performance. The Stephenson link motion fitted to the original engines has been redesigned to give a freer flow of steam, and the adhesion weight has been increased from 34 to 36 tons, largely on account of the deeper frames used in the new engines.



No. 46, one of the older 4-4-0 locomotives of the G.N.R. (I). The "family likeness" characteristic of all G.N.R. engines is very apparent when No. 46 is compared to No. 173 in the upper illustration on the next page.

Easily the most striking outward change is the adoption of the handsome blue livery hitherto confined to the compounds. In pre-War days Great Northern engines were painted a bright and pleasing shade of green, and it was in this finish that the class first appeared. During the War this was changed to a sombre unlined black, from which the present beautiful colour scheme is a very welcome change. This blue is a shade lighter than that of the L.N.E.R. streamlined "Pacifics," and the new Irish engines are strongly reminiscent of the Caledonian 4–4–0s in pre-grouping days.

The new engines have now taken up the duties so long worked by their predecessors, and in 1939, when to almost any train service one finds larger engines being drafted, it is remarkable that crack expresses booked at the speed of the *"Limited Mails"* should be entrusted to a type so comparatively small; yet, as I shall show in a minute, these arduous turns are being brilliantly performed. In the decade prior to the War of 1914-18, the inside-cylinder 4–4–0 might well have claimed to be the standard express passenger type in Great Britain and Ireland; and the results of its revival, in these days of streamlining and giant "Pacifics," are naturally of the greatest interest.

By the kindness of the Great Northern authorities I was privileged to make some journeys on the footplate of the first of the new engines, No. 173 *"Galteemore,"* and out of these I have chosen for description a through trip from Belfast to Dublin on the 5.40 p.m. up *"Limited Mail."* After a hard, bracing winter's day fog seemed to be coming on with the dusk, and when, at Great Victoria St. Station, I joined Driver Davis and Fireman Nelson on No. 173 it seemed as though trouble was storing up for us. Our load was one of seven bogie coaches, including the through carriage and postal van for Dun Laoghaire pier; with passengers, luggage and mails this made a total of 225 tons behind the tender. This may not seem a vast tonnage by modern standards, but for a 4–4–0 locomotive having cylinders 19 in. diameter by 26 in. stroke it represents no mean weight at the kind of speed maintained by the 5.40 p.m. out of Belfast.

We got away in excellent style. The crisp, business-like exhaust as we accelerated through the suburbs was a sure sign of steam being used to good purpose, and by the time we passed Balmoral, 2¼ miles out, *"Galteemore"* was doing a good 40 m.p.h. despite continuous rising gradients. The visibility was now excellent. From the pall that hung over the city we had come out into a clear, brilliant night, and the full moon, already high in the south-east, was transforming the handsome livery of our engine into a strangely beautiful impression of polished silver. No. 173 was already well linked-up, with the valves cutting off steam at about 30 per cent. of the piston stroke, and although at Balmoral the rise had stiffened to 1 in 200 the pace was quickening at every furlong. Dunmurry, 4.1 miles out, was passed in 8¼ minutes; we topped the first stage of the bank at 46 m.p.h., whereupon Driver Davis shortened the cut-off still further to what proved the favourite position for the whole run, 25 per cent. Almost from the start the regulator had been round about three-quarters open.

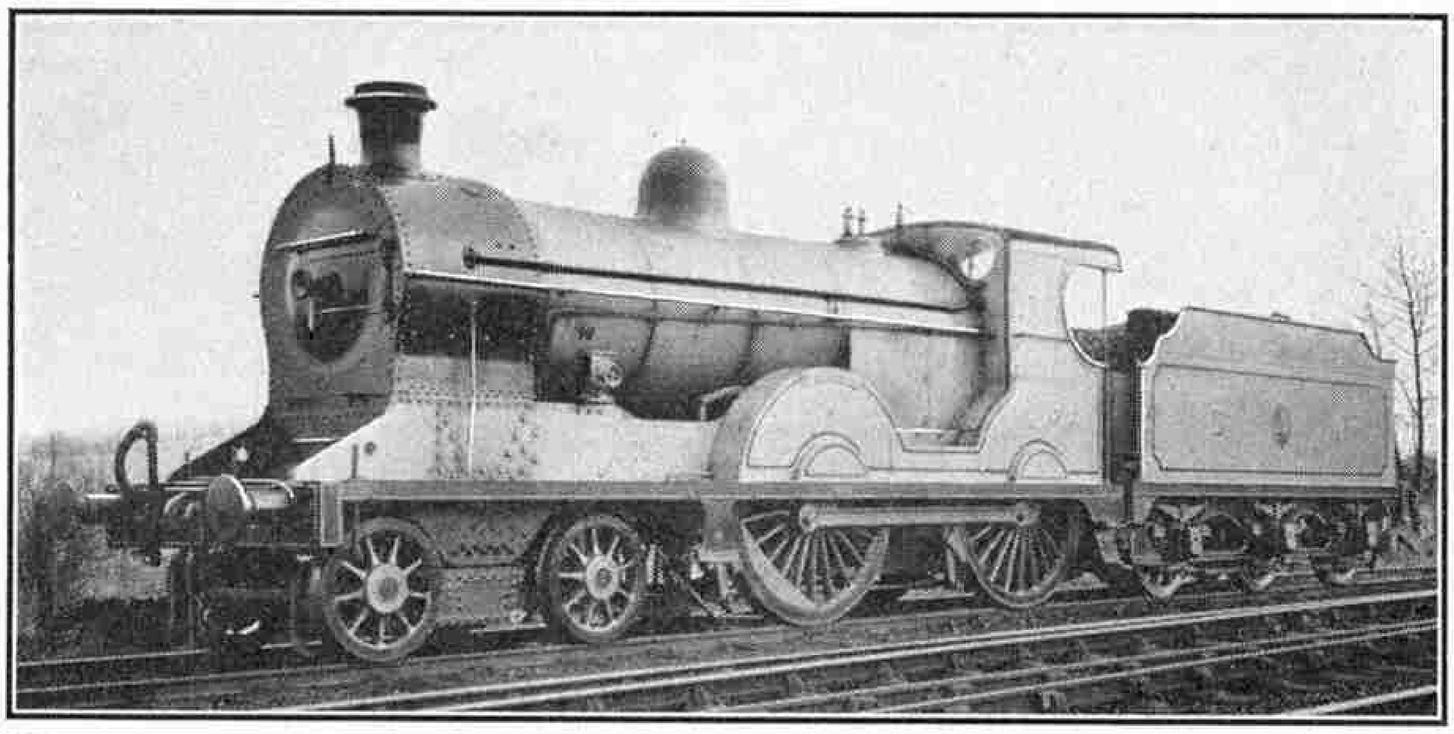
The line now changes to a switchback at gentle inclinations up and down, and *"Galteemore"* was soon showing off her paces. Moira was passed at 67½ m.p.h., and the two-mile bank that finishes near Kilmore signal box, where the gradient is 1 in 185 at first and then 1 in 145, was climbed without speed falling below 58½ m.p.h. Once over this little summit there is a fine racing stretch. The driver brought his regulator right back; we dashed through Lurgan at 76 m.p.h., and I was the more able to appreciate the beautiful riding of No. 173 at high speed—4–4–0s are not usually the steadiest of locomotives! By now we were running into Portadown, a junction that has been called the "Crewe" of the Great Northern system. This initial run of 24.9 miles from Belfast took 29¼ minutes against the even half-hour scheduled.

Connecting trains stood at adjoining platforms and, as always, one could not help noticing the homogeneity of the G.N.R. locomotive stock. Under Mr. Glover's regime a very thorough process of modernisation of older types was carried out, with the result that a strong family likeness persists everywhere; one never sees, in the neighbourhood of the main line at any rate, the oddities glimpsed in other parts of Ireland. Another 4–4–0 was standing abreast as we drew up; a much taller chimney and dome-cover proclaimed her greater age, but she was a Glover engine to the last rivet!

This point is brought out well when one compares the illustration on this page of No. 46 with that of No. 173 on the opposite page. There is the same straight running plate, rather low-pitched so that the driving wheels fit well into the splashers and the coupling rods are hidden through the upper part of their travel. The cab outlines are similar, the upper part of the side sheets being turned over to merge into the curved roof. Chimneys and domes are of similar pattern, though of different heights, and the same horseshoe-shaped smoke-box with its prominent rivets and characteristic door appears on each engine.

Now came the *"right-away"* for the most exciting stage of the whole journey, the 33.4 mile stretch to Dundalk. The railway cuts an arduous track through the mountains of County Armagh to the sea,

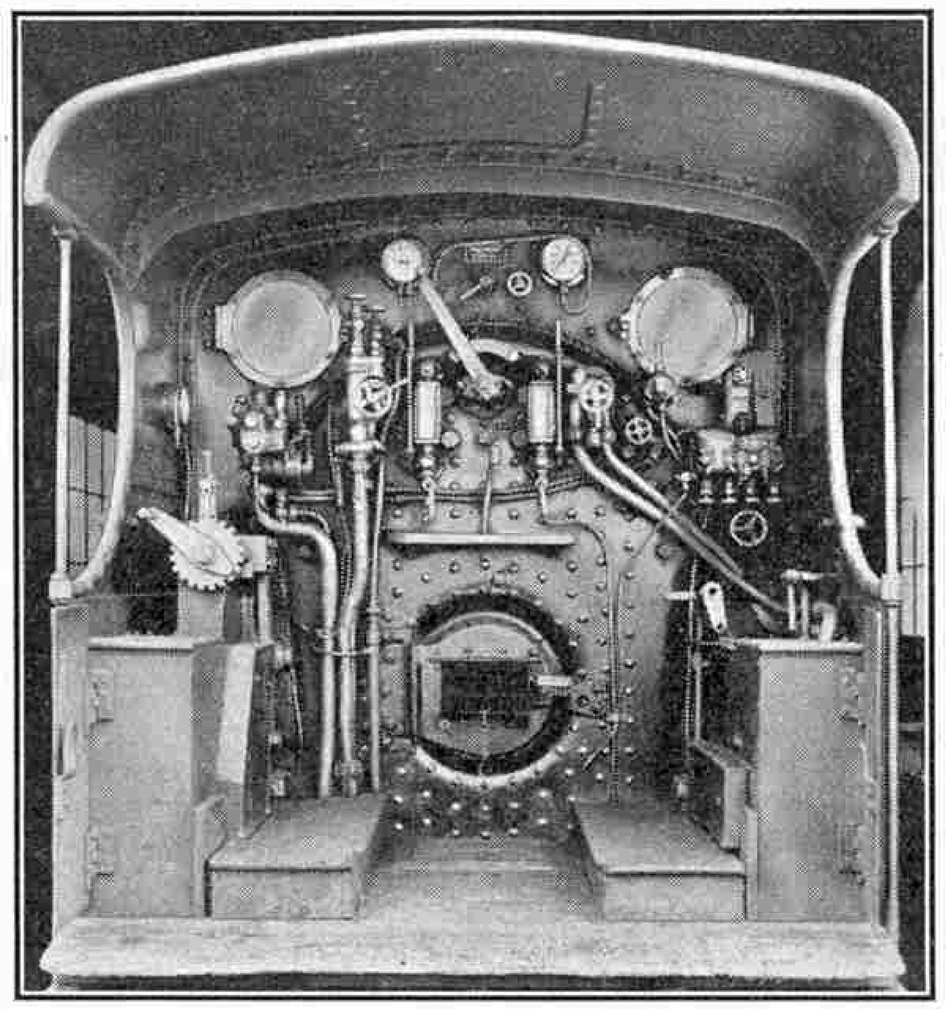
and among those windy heights the frontier is crossed, from Northern Ireland into Eire. A modest 38 minutes are allowed for this run, and now Driver Davis put *"Galteemore"* about her business with the vigour appropriate to such an exacting schedule. With glimpses of many a fine locomotive in the running sheds, big 4–4–0s not unlike *"Galteemore,"* 0–6–0 freighters, and handsome 4–4–2 tanks, we swung over Portadown South Junction, and in less than six miles from the start we were speeding at 71 m.p.h. on level road. But the curves through Scarva and Poyntzpass require considerable moderation of the speed, and the 40 m.p.h. slack through the latter limits a driver's chances of really charging the big bank.



G.N.R. (I) No. 173 "Galteemore" on which our contributor rode. The handsome lines of the design are well shown up by the light blue livery. The photographs on this page are by courtesy of the G.N.R. (I).

Once round the curve Davis gave her "the lot," or full regulator. No. 173 fairly leapt away, and we accelerated so rapidly as to begin the ascent at 68½ m.p.h. For a long way up nothing more than 22 per cent. cut-off was used, and at Bessbrook after five miles of steep climbing we were still doing 45 m.p.h.; but for the last four miles, mostly at 1 in 100, the cut-off was advanced to about 30 per cent. As we forged our way up in the moonlight the performance of the engine was most impressive; from the very start I had been surprised at the small amount of coal burned, and now on this toilsome ascent, with the regulator wide open and the speed below 40 m.p.h., not a spark was being thrown from the chimney. The town of Newry lay far below on our left, its lights shimmering in the frosty air; the whole countryside was bathed in the moon's pale radiance, and for the first time in all my experience I was able to sight and clock the quarter-mile posts after dark.

So at a steady 34 m.p.h. we came into the deep rock cutting that marks the summit of the line, 522 ft. above sea level. Although the 22.2 miles up from Portadown had taken only 27½ minutes, such is this schedule that we had only 10½ minutes left for the remaining 11.2 miles into Dundalk. With regulator still open full and cut-off back to 22 per cent. we swept through Adavoyle at 70 m.p.h. Little by little the regulator valve was closed, but *"Galteemore"* on the steepening descent worked into a perfect hurricane of a stride that took us up to a thrilling maximum of 86½ m.p.h. Mist was lying near the sea, however, and Davis ran very cautiously over the last mile into Dundalk; we should have kept exact time, but this slight hindrance made us 22 seconds out on arrival.



The footplate of No. 173, showing the neat and convenient arrangement of the cab fittings.

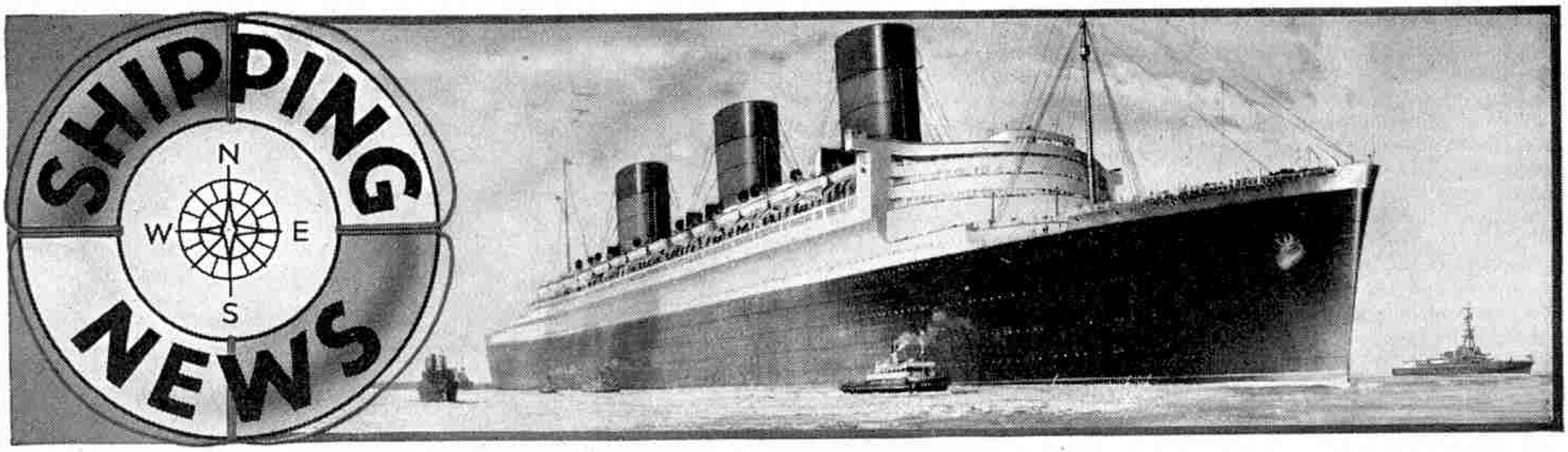
The stopping time of 12 minutes at Dundalk is very fully occupied; the customs officials of Eire make their examinations, a through carriage is attached from Enniskillen, and the Belfast enginemen who have worked the train thus far are relieved by a Dundalk crew. When I got back to the engine, after seeing my own luggage through the customs, I was delighted to find *"Galteemore"* now in charge of my old friend Paddy Muckian, whose portrait appeared in a previous article on Great Northern locomotive work published in the *"M.M."* for October 1936. His mate on this more recent occasion was Fireman McMahon. The addition of the Enniskillen coach brought our gross load up to 260 tons behind the tender, and with this the timetable demands some fast work on both stages of the run to Dublin. The line follows the coast practically all the way, and except for the Dunleer bank, where the gradient is 1 in 197 for 5 miles continuously the section is not unduly difficult. There is however an awkward start out of Dundalk, where the line rises at 1 in 160 for the first 1½ miles. With heavy trains rear-end banking assistance is sometimes provided; but we needed no such help and, with that purposeful exhaust of her's beating a lusty tattoo, *"Galteemore"* accelerated in fine style up the bank.

Once over the top we were soon flying again. Down near to the sea at Castlebellingham we touched 71½ m.p.h.; Dromin Junction, 10.7 miles from the start, was passed in no more than 11¾ minutes, and we were in fine trim for the ascent of Dunleer bank. We struck the 1 in 197 grade at exactly a mile-a-minute; cut-off had been fixed at the favourite 25 per cent. after we had climbed the initial rise out of Dundalk, and Paddy now gave the engine a trifle more regulator. This was enough to take us sailing up the bank without speed falling below 50½ m.p.h. The summit is almost exactly marked by a tiny signal box called Kellystown, and passing this point, 17 miles from Dundalk, in 18½ minutes we had the difficult booking of 25 minutes for the 22.6 miles to Drogheda in our pocket. Unfortunately the cold air that was bringing on fog when we left Belfast, was now sending a thickish mist rolling up from the deep valley of the Boyne, and instead of sprinting downhill at 70 or 75 m.p.h. we had to run cautiously at not much over 60 m.p.h.; eventually we came down to such a slow rate that the driver had to put on full steam again to get across the Boyne viaduct and into Drogheda. So we took all but 26 minutes for the run from Dundalk.

But this slight loss was more than regained by some splendid running on the last lap. By Gormanston, 7.7 miles out, we were travelling at 69 m.p.h., and over the slightly adverse stretch along the coast, past the picturesque fishing villages of Balbriggan and Skerries, *"Galteemore"* raced along at 65-66 m.p.h. The night was clear again, and the view across the sea delightful, and here especially one noted the particular clearness of the signal sighting, which is generally characteristic of the whole route. Often when approaching a wayside station four successive green lights could be seen from afar—the distant, outer home, inner home, and starting signals—and it was only as we drew nearer that the distance between them resolved itself.

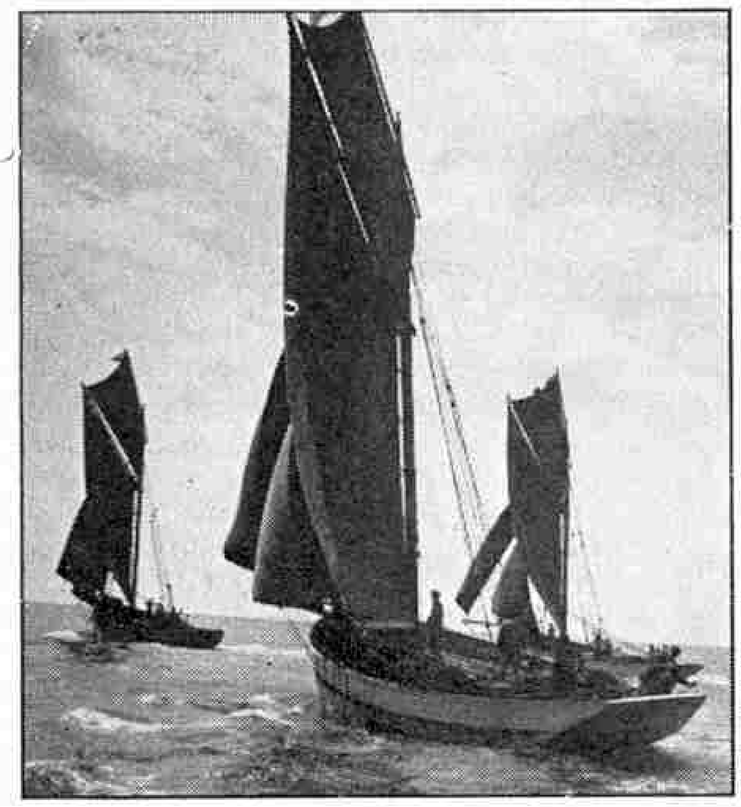
The only appreciable bank on this section comes after passing Skerries, when the line rises for 1½ miles at 1 in 150. *"Galteemore"* took this in her stride, without going below 58½ m.p.h. and then we went full tilt down the aptly named Rush bank, touching 78 m.p.h. near Donabate. Splendid running continued over the gentler grades beyond, and we were through Howth Junction in less than "even time" from the Drogheda start, 26.9 miles in 26¾ minutes. Soon we were running through the outskirts of Dublin. Clontarf, just 30 miles from the start was passed in 29½ minutes, and we were out on the causeway crossing the northern arm of Dublin Bay. Under clear signals we ran briskly in, and stopped at Amiens St. station in 32½ minutes from Drogheda, 31.7 miles. The schedule of 34 minutes demands an average speed of 56 m.p.h. over this length, but the excellent work of *"Galteemore"* and her crew improved this to a start-to-stop average of 58¾ m.p.h.

How completely these fine engines are on top of their job is evident enough from the details of this one run. Other notable feats that I have recorded with No. 173 include a sustained maximum speed of 77½ m.p.h. on a level stretch of line with 240 tons behind the tender, and later in the same journey a very smart start-to-stop time of 24 minutes for the 22.6 mile run from Drogheda to Dundalk, including a top speed of 82 m.p.h.



The Sturdy Crabbers of Brittany

Around the coast of Cornwall French crabbers of the type shown in the upper illustration on this page are a familiar sight, and their crews always welcome visitors. They hail chiefly from Camaret, on the coast of Brittany, and are engaged in fishing for lobster, crab and crayfish. The French crabber is a sturdy vessel, manned by crews unusual in habit and dress. Many of the older French seamen I have met aboard the crabbers might easily have been reincarnated buccaneers! They are certainly romantic seamen and handle their stout craft exceptionally well in a heavy sea. I have seen them riding out a gale when much larger vessels hurried back into harbour.



Crabbers from Brittany, a familiar sight off the Cornish coast. Photograph by A. Lamsley, Southsea.

The crabber is generally yawl-rigged, with bark-tanned sails. The crew live very hard lives on the simplest possible food, usually a rough bread and vegetable soup of which onion is the major constituent. On each boat there are several apprentices of 10 years of age and upward, all hardy youngsters who have played with boats and the sea since they could toddle. The original name of Brittany was "Armorica," which means the "Land of the Sea," and practically every family around the richly indented coast of Brittany sends some of its male members away in the fishing fleets.

A. LAMSLEY.

Overseas Naval Orders for Britain

Following an agreement between Turkey and the United Kingdom regarding orders for British-built warships, the Turkish Government have placed several contracts with British shipbuilders. Two destroyers are to be constructed by William Denny and Brothers Ltd., Dumbarton, and another two by Vickers-Armstrongs Ltd., at Barrow-in-Furness, the latter providing the armaments for all the four vessels ordered.

Tenders have been invited for submarines, minelayers and smaller craft, and the Barrow firm expect to receive an order for four submarines, for which the Vickers-Armstrongs design has been adopted.

Vickers-Armstrongs Ltd. recently handed over the training cruiser *"La Argentina"* to the Argentine Naval Commission. This vessel is the last of four ordered in 1935, and is designed for service as a cruiser if required. Parsons turbines driving four screws give her a speed of 30 knots. Her displacement is 7,000 tons, and 60 cadets can be accommodated. A crane is fitted between the two funnels for the handling and landing of two amphibian flying boats. *"La Argentina"* has a unique system of fire-control, which was developed while she was under construction.

J. Samuel White and Co. Ltd., Cowes, Isle of Wight, are to build two motor torpedo-boats for the Polish Government. Each craft will be fitted with three Isotta-Fraschini engines.

A new type of motor torpedo-boat has been ordered from John I. Thornycroft and Co. Ltd., Southampton, by the Estonian Government. It will be 72 ft. long, with a beam of 16 ft., and will carry two officers and eight men. The propelling machinery will consist of four Thornycroft 12-cylinder petrol-driven marine engines, which are designed to develcp a total of 2,400 b.h.p.

New Boat on Calcutta-Rangoon Service

The twin-screw steamship *"Amra"* illustrated below has been specially designed for the Calcutta-Rangoon service of the British Indian Steam Navigation Co. Ltd. She was built by Swan, Hunter and Wigham Richardson Ltd. at Newcastle-on-Tyne, and was handed over to her owners late last year.

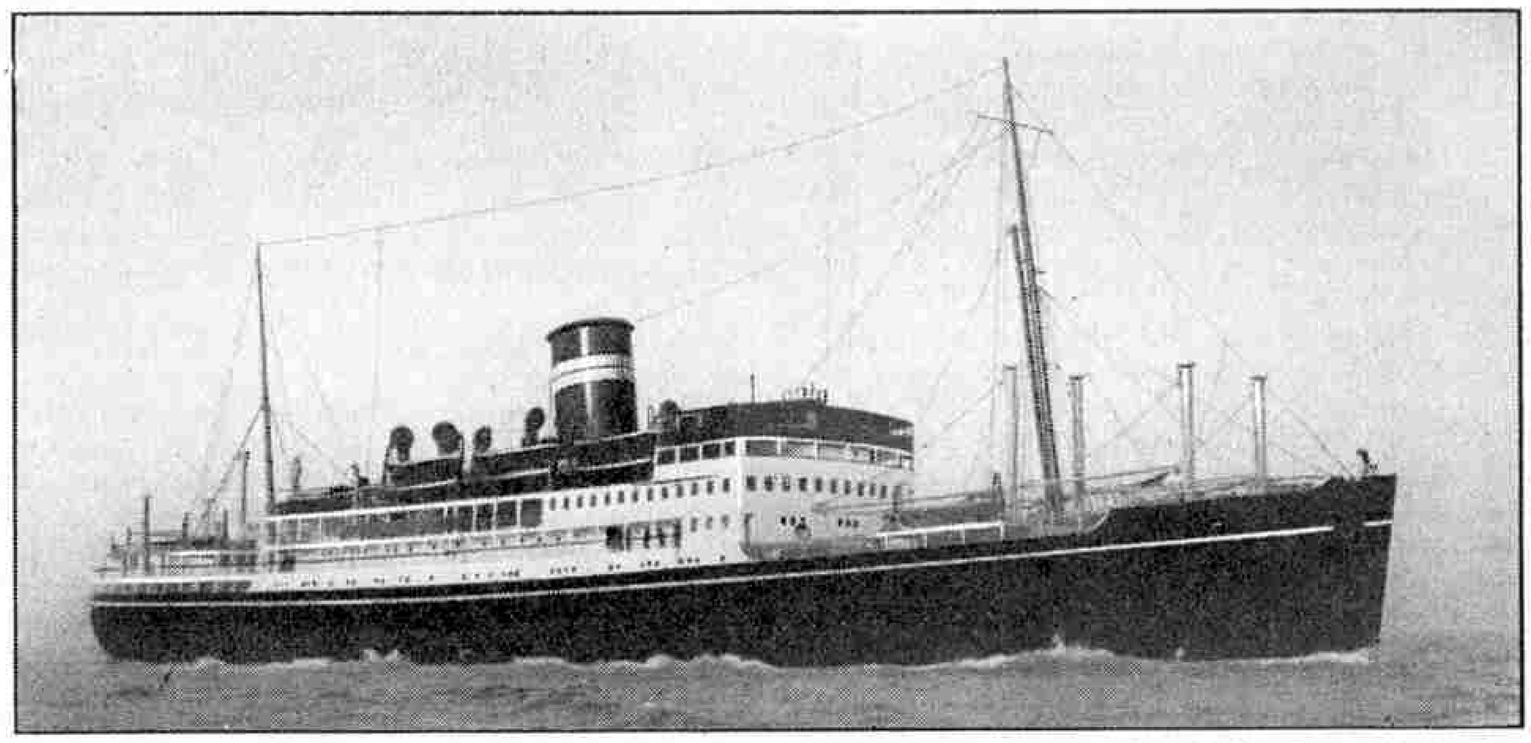
The vessel has a length of 460 ft., and a deadweight tonnage of 6,200. Provision has been made for the carriage of a variety of cargoes, including cattle, fruit and refrigerated cargo, and there is extensive passenger accommodation, 135 being provided for in the first and second classes, and about 2,000 on deck.

The propelling machinery of the *"Amra"* consists of two sets of single-reduction geared turbines, taking steam from three coal-fired water-tube boilers. The output is 8,800 s.h.p. at about 130 r.p.m., giving a service speed of 16½ knots, and on her trials the vessel reached 18½ knots. Electrical auxiliary machinery is fitted, current being provided by three turbo-generators developing 275 kW at 220 volts.

A sister ship, the *"Aska,"* is under construction at Newcastle.

A Swedish Floating Dock

Transoceanic traffic at Stockholm has increased to such an extent in recent years that the docking facilities are proving inadequate. It is therefore proposed to provide a floating dock capable of lifting ships of 10,000 tons deadweight. Plans are being considered for a dock to cost about £110,800, most of which would be paid by the Aktiebolaget Finnboda Varv, the largest shipbuilding and repairing firm in the port, to whom the dock would be leased. This firm would also construct the dock.



The smart new steamship "Amra," built for the Calcutta-Rangoon service of the British Indian Steam Navigation Co. Ltd. Photograph by courtesy of Swan, Hunter and Wigham Richardson Ltd., Newcastle-on-Tyne.

"Blue Flash" in the Solent

The motor launch *"Blue Flash"* shown at speed in the lower illustration on this page, was built by J. Samuel White and Co. Ltd., of Cowes, Isle of Wight, for service between their works and the mainland, and also for demonstration purposes. She is constructed throughout of Birmabright aluminium alloy, making her of special interest, as the use of metals and salt-resisting alloys is not generally favoured owing to the considerable initial cost and difficulty of repairs.

"Blue Flash" is 35 ft. long, with a beam of 9 ft. 3 in., and is driven by three 125 h.p. six-cylinder Gray Phantom engines. These give a speed of about 40 m.p.h., so that the boat can make the run between Southampton and Cowes in under 30 minutes. A fine all-round view is given from the wheelhouse right forward, from which individual control is given of each engine. A car-type steering wheel is provided and an easily readable instrument panel. The cabin can accommodate six comfortably, or nine in an emergency. Electric lighting is installed throughout. Sufficient fuel can be carried for a trip of over 100 miles at full speed.

Germany's Largest Battleship

Germany's largest battleship, the 35,000-ton *"Bismarck,"* was launched recently at the Hamburg yard of Blohm and Voss. The vessel has a length of about 794 ft., with a breadth of about 118 ft. and a mean draught of 26 ft., and she is fitted with triple screws. The main armament comprises an arrangement of eight 15 in. and twelve 5.9 in. guns.

The *"Bismarck"* is the first of three similar battleships that have been laid down, while a fourth has been projected. The second ship, which will be launched in May, is under construction at the Wilhelmshaven Naval Yard and the third at the Kiel Naval Yard.

More Motor Boats for German Navy

The German fleet of high-speed motor torpedo-boats is to be enlarged. At present there are about 20 of these vessels in the fleet, including a number of 90-ft. craft of the "S" or "Schnellboote" class, fitted with two torpedo tubes of about 19¾ in. and having a speed of well over 30 knots. About a dozen more of these are under construction, or have recently been completed.

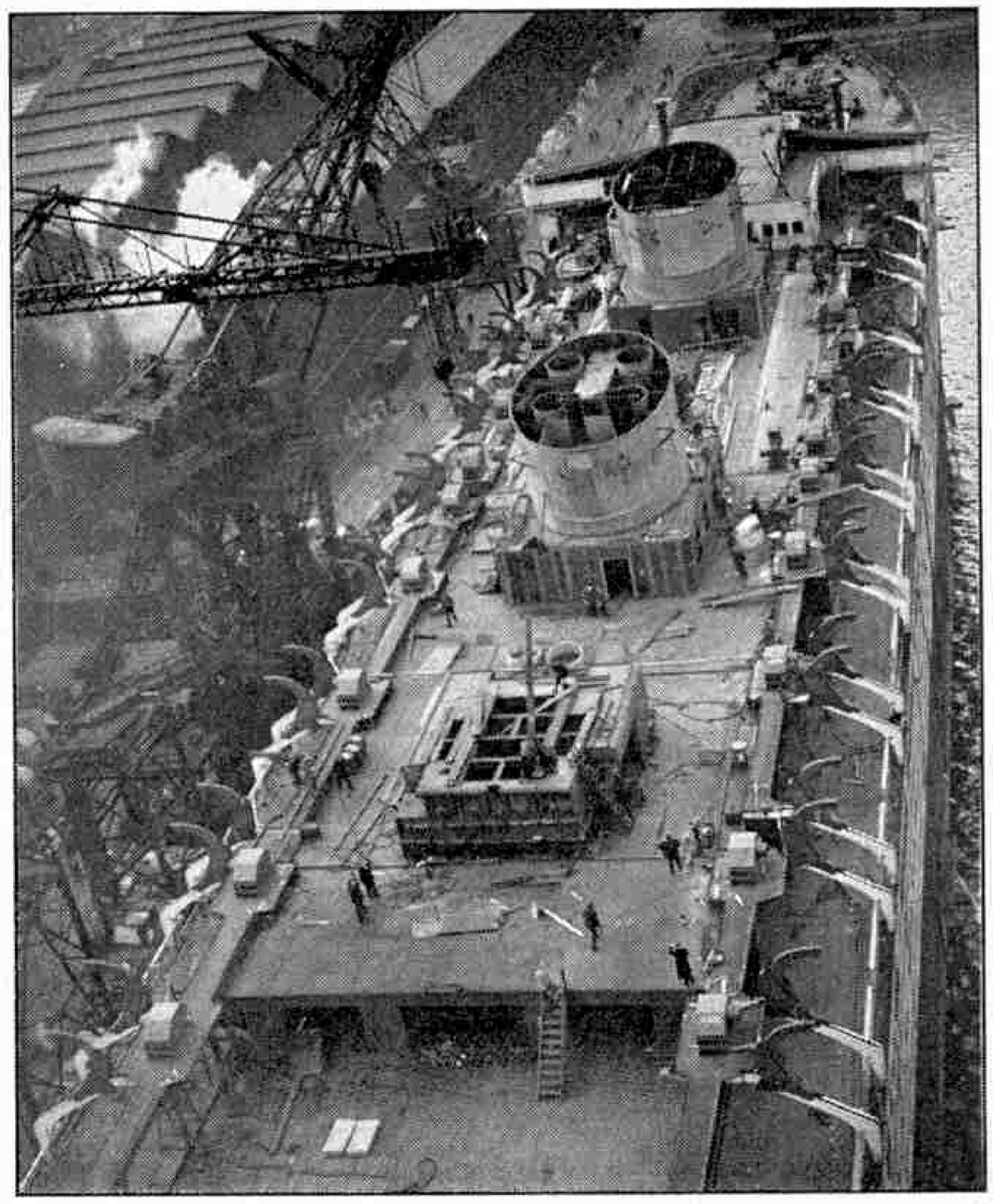
Germany also has about 20 motor boats of the "R" class, which are similar in size to the "S" class, but have smaller engines, and are not filled with torpedo tubes.

Life-boat News

During the first two months of the year life-boats of the Royal National Life-boat Institution were launched on service 66 times and helped or saved no fewer than 64 boats, rescuing 39 lives. The Institution made rewards for services, compensation for injuries and payments to dependents of life-boatmen who have lost their lives in the service amounting to £2,090.

A motor life-boat built at Cowes by the Royal National Life-boat Institution for service at Fleetwood, Lancashire, recently made the trip up the west coast to her station. The new boat, which replaced another motor craft, is of the 41 ft. Watson type, with two 35 h.p. engines giving a speed of 8¼ knots. She can take 50 people on board in rough weather, and has a range of 117 miles at full speed without refuelling.

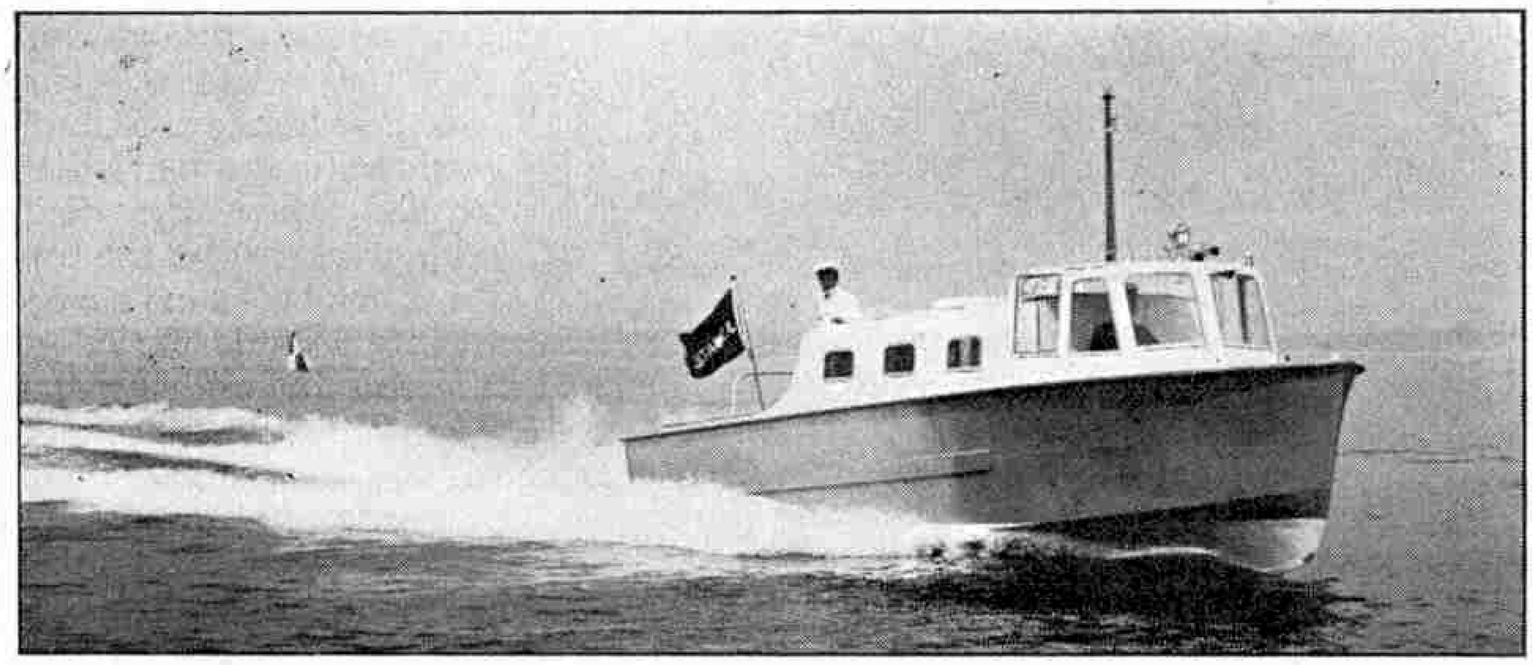
Fleetwood has had a life-boat station since 1859, and its life-boats have rescued 157 lives.



The new "Mauretania," rapidly nearing completion at the yard of Cammell Laird and Co. Ltd., Birkenhead, seen from the top of a giant crane. Some of the 2,000 men working on the ship are erecting the funnels. Photograph by T. C. L. Hutchinson.

Frost Stops a Launch

An unusual situation arose at the launch of the 12,000 motorship *"British Liberty"* during one of the cold spells this winter. The vessel is being built by the Furness Shipbuilding Co. Ltd., for the British Tanker Co. Ltd. When the time came for her to take the water the blocks were knocked out, and the tugs stood by, but apparently she did not relish the prospect of the icy plunge, and refused to budge! It was then discovered that the tallow and other lubricants on the slips had become congealed owing to the intense cold, and any real movement of the ship was thus prevented. A pneumatic jack and a tow rope from one of the tugs were tried in vain, for at the end of half-an-hour the ship had only moved three yards. The launch therefore was postponed, and later took place in more favourable conditions.



The all-metal launch "Blue Flash," built for service between the Isle of Wight and the mainland by J. Samuel White and Co. Ltd., East Cowes, by courtesy of whom this photograph is reproduced.

Lloyd's Register Scholarship

The General Committee of Lloyd's Register of Shipping offer a scholarship, valued at £100 per annum and tenable for three years, to be awarded on the results of the Studentship Examination of the Institute of Marine Engineers, to be held in May. The Scholarship is intended to assist marine engineering students to take an advanced course of instruction in engineering subjects, and the age limits are 18 to 23 years. The closing date for entries is 8th April 1939. Further particulars, entrance forms, and copies of previous papers may be obtained on application to the Secretary, The Institute of Marine Engineers, 85, The Minories, London E.C.3. The entrance form for the scholarship is distinct from that for the Studentship Examination, and a candidate in the latter who wishes to compete for the scholarship must complete and return both forms to the Secretary by the specified dates.

Floating Hotels of Imperial Airways

An unusual ship conversion is in progress at Mozambique, on the south-east coast of Africa, where many craftsmen are engaged in making the former tug *"Richard King"* into a "floating hotel" to accommodate passengers on Imperial Airways long-distance services. When the work is completed the vessel will be a luxurious house-boat with accommodation for 30 passengers and having extensive facilities, including electric light, electric fans and hot and cold water. There will be a lounge, a dining saloon, a food storage room, and a completely equipped gallery and pantry.

The *"Richard King"* will be the second houseboat employed by Imperial Airways for this purpose. The other is the *"Mayflower,"* stationed on the Nile at Rod-el-Faraq, Cairo.

Blind-Flying Instruments

Guiding the Aircraft Pilot in Fog and Cloud

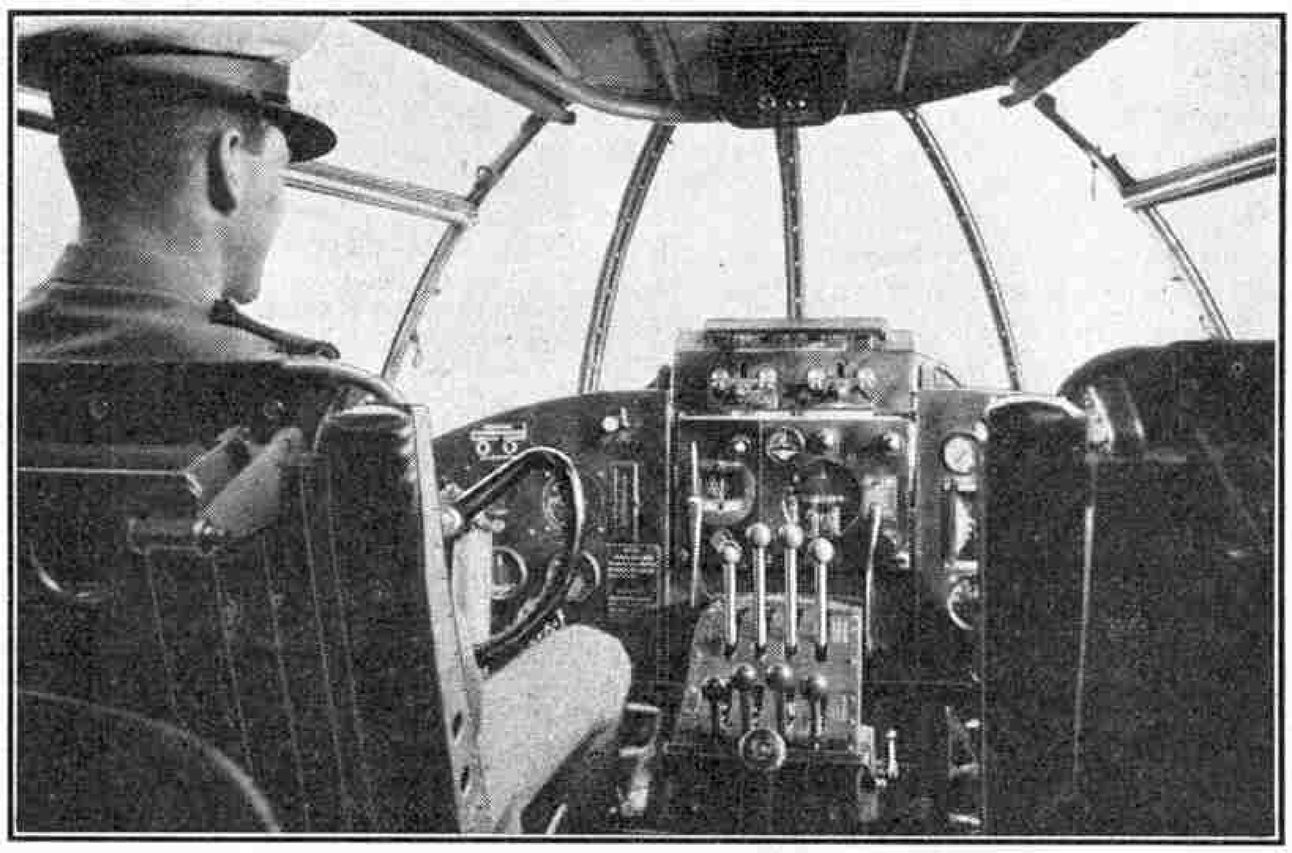
By Wing Commander G. W. Williamson, O.B.E., M.C., M.Inst.C.E., M.I.Mech.E., M.I.E.E.

IN the "*M.M.*" for November last I described the essential instruments of the aircraft dashboard. Other instruments are used to enable the pilot of an aeroplane to follow his course in fog or cloud, and the present article deals with these blind-flying instruments, as they are called.

Upon the dashboard of any light aircraft there is, nowadays at least, one gyro instrument enabling the pilot to maintain his course under conditions of bad visibility. This instrument is the turn indicator. Prior to its invention pilots were accustomed to avoid flying in cloud or in any conditions in which the horizon was invisible. In flight a pilot judges whether or not his aircraft is flying straight and is level by keeping his eyes fixed on some point on or near the horizon, and aligning his wings with the horizon line itself. If he can see no horizon and, worse still, if he cannot see the ground, he has no visual means of correcting any deviation of his aircraft from straight and level flight, except by recourse to instrumental aids.

The turn indicator has changed all this, for it provides a needle controlled by gyroscopic means that immediately gives an exact indication of the slightest deviation from course. In the Reid two-needle type of turn indicator there appears on the same dial another needle indicating sideslip. If there is no sideslip the aircraft is either flying straight and level without bank, or else is making a turn correctly banked so that it will not slip outward and upward under the action of centrifugal force, or inward and downward under the action of gravity, as happens when the turn is over-banked.

In recent years other gyroscopic instruments have been developed for use in aircraft. One is the direction indicator, which is an instrument designed to register the amount of turn that the aircraft makes, and thereby to allow the pilot to turn accurately from course to course without waiting for the compass needle to settle. The other is the artificial horizon, which provides the pilot with a luminous bar lying parallel to the normal horizon, and a miniature aeroplane that follows the movement of the aircraft in which the instrument is fitted. This enables the pilot to fly his machine by manœuvring the miniature aeroplane about the luminous bar in exactly the same manner as he would fly his aeroplane in clear weather conditions.



First Officer Shakespeare at the controls of the Imperial Airways flying boat "Capella," on the dashboard of which is the Sperry gyropilot, incorporating the artificial horizon and the directional gyro.

Unlike the turn and bank indicator, these two instruments are not essential for blind-flying, but when fitted they very greatly increase the ease and accuracy with which the aircraft can be flown in bad weather. They occupy the centre of the R.A.F. blind flying panel containing the six primary instruments. The two-needle turn indicator is in the bottom right hand corner.

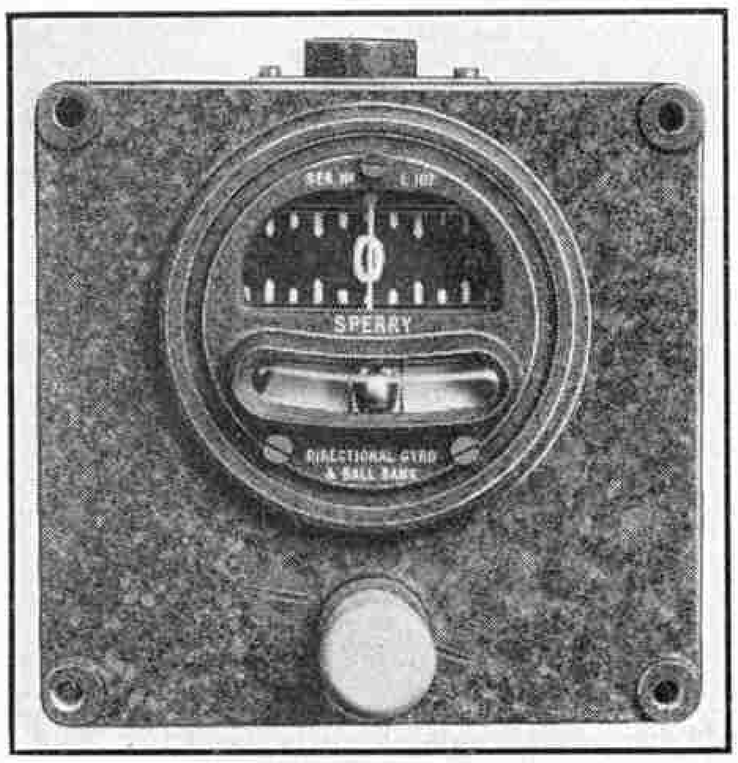
The artificial horizon provides the pilot with a dial indication, styled the horizon line, exactly parallel to the horizon in all except extreme attitudes of the aircraft. This is all that will be required for blind flying purposes, because even military pilots would not choose to attempt aerobatics in conditions of very bad visibility. The greatest use of the artificial horizon is to keep the aircraft level, both fore and aft and laterally, when flying through cloud.

Fixed to the case of the instrument is a miniature aeroplane lying approximately in the centre of the dial. Behind this is the horizon line, which is controlled or stabilised by the gyro and always lies parallel to the natural horizon. Behind this again is a black dial called the sky dial, which carries at the top a small luminous pointer. Now if the aircraft is put into a bank of 45 deg. from the true horizon, then the horizon line and sky dial will remain stationary, held by the gyro, while the case of the instrument, which is attached to the aeroplane, will rotate round the gyro element, carrying the miniature aeroplane with it.

This will give the pilot a picture of the miniature aeroplane flying at an angle of 45 deg. to the horizon line, exactly as his own aeroplane is at an angle of 45 deg. to the normal horizon. Also the luminous pointer at the top of the sky dial will register against the scale mounted on the case of the instrument showing a bank of 45 deg. To level the aeroplane the pilot has merely to apply opposite bank, until the wings of the miniature aeroplane once more lie parallel with the horizon line, when the miniature pointer at the top of the sky dial will register against the zero mark on the case.

This instrument indicates also the exact angle of a dive or climb. When the aeroplane is flying level as regards its fore and aft attitude, the nose of the real aeroplane as seen by the pilot will be practically on the horizon, and the little aeroplane on the dial of the artificial horizon will be level with the pictured horizon line. Should the nose of the

real aircraft be depressed by the pilot pushing the control column forward so that the aircraft enters a glide or dive, the horizon line on the instrument will stand above the little aeroplane, just as the nose of the real aeroplane is depressed below the real horizon. Conversely, in a climb, when the nose of the real aeroplane rises above the horizon the little aeroplane on the dial will be higher than the horizon line.



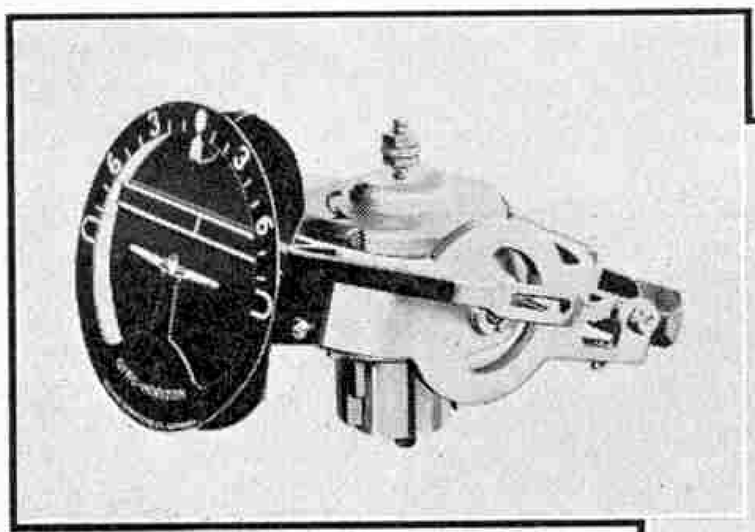
The Sperry directional gyro, with ball bank indicator.

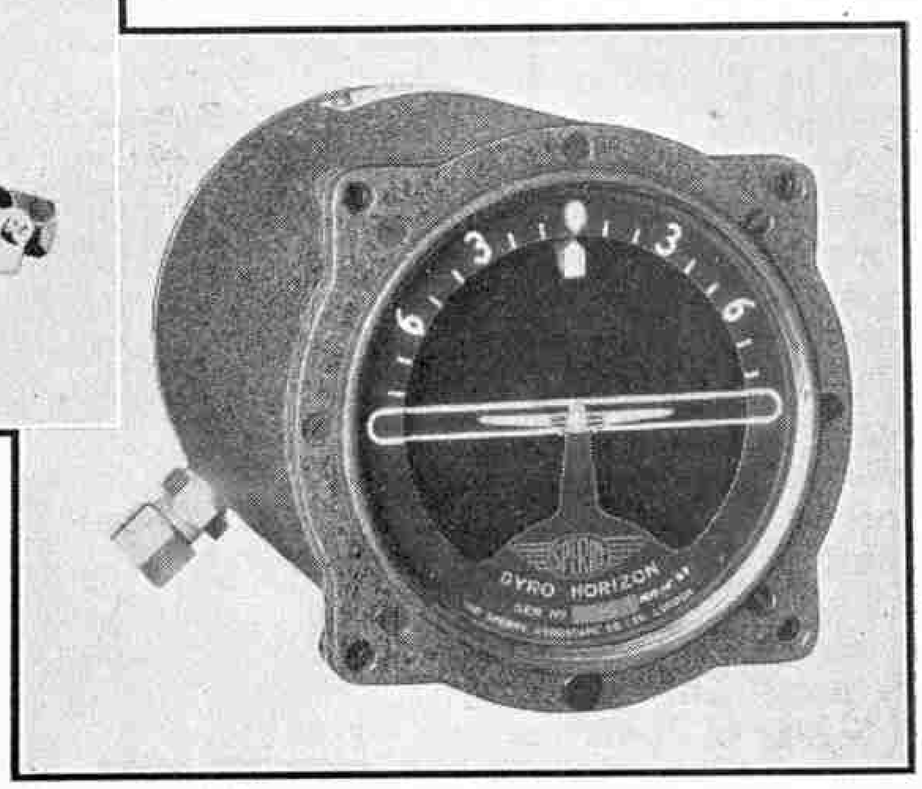
The directional gyro, or gyro compass, would not be necessary if it were not for certain disadvantages in the magnetic compass, especially those due to the time lag before the indication of a new course can be obtained. A directional gyro incidentally gives the new course, and in flight has much more use than the magnetic compass.

In an artificial horizon it is possible to ensure that the horizon line is always truly horizontal by means of a pendulum, hanging vertically below the spindle of the gyro wheel. If in straight and level flight any disturbance should tend to move the gyro and this horizon line from the horizontal, the pendulum operates a set of air valves, and restores the wheel to its true position. But in a directional gyro there is no reference such as that of gravity which would restore it to the true course reading, if it were once disturbed.

Within the graduated ring of the instrument there is a gyro wheel with its spindle horizontal, and in the fore and aft line of the aircraft. The wheel runs in a vertical plane athwartships of the aircraft. It is spinning at approximately 10,000 r.p.m. and remains fixed almost rigidly in space despite the turns made by the aeroplane.

As in the artificial horizon, the case of the instrument, carrying the pointer, turns around the circular graduated ring that is fixed to the gyro, both gyro and graduated ring remaining in the same position in regard to the North Pole or the course on which the aircraft was previously travelling. Assuming that the pilot is flying a zero course and wishes to make a turn through 90 deg., all he has to do is to put the rudder over in the appropriate direction and take it off as soon as the card of the directional gyro reads the required amount.


On the right is the Sperry artificial horizon, with the miniature aeroplane on the horizon level indicating level flight fore and aft, with the wings level. Above the principal parts of the instrument can be seen. The miniature aeroplane is below the horizon, showing that the real aircraft is gliding.



All artificial horizons bear a close resemblance to that shown in the lower illustration on this page, and all directional gyros are like the instrument seen in the upper illustration. The turn indicators may have such different types of needle and sideslip indicator as to appear to provide entirely differing indications.

In this country the turn indicator most used is that standardised by the Royal Air Force, with a turn needle at the bottom and a sideslip needle at the top. The sideslip needle is coupled to a small pendulum, and if the aircraft were banked without turning, the pendulum would hang down and the top needle would indicate sideslip. Supposing that the aircraft is now put into a turn, centrifugal force will tend to throw the pendulum upwards and outwards, and if the turn were of exactly the right speed so that no sideslip were occurring, the top needle would be standing at zero whatever the angle of bank.

On all turn indicators the turn needle indicates rate of turn. On the two-needle turn indicator, the scale is graduated from 1 to 4, both to the right and to the left. If a pilot is making a turn with the needle standing at rate 1, he knows that he will have made a complete circle in two minutes; whereas at rate 4, a complete circle would be turned in only 35 seconds.

Service pilots have an affection for the two-needle type of turn indicator on account of the correspondence between its needles, and the controls of the aircraft. The top needle is high up like the control column, the bottom needle is low down like the rudder. But the correspondence is even closer than this. If the pilot puts on left rudder to a certain angle, the turn needle will also swing over to the left, approximately parallel to the rudder. Conversely in flight should any deviation occur, which moves the turn needle away from zero, a glance at the dial will instantly tell the pilot what movement of the rudder has to be made to bring the needle back to zero.

The same logic applies to the sideslip needle. If a sideslip is indicated by the top needle and it is standing either to left or right of the zero, the pilot knows that he must move the control column in the same direction in which he wishes the sideslip needle to move back to zero. In effect, the angle of the sideslip needle is approximately parallel to the angle of the control column.

In the belief that these indications might be confusing to a beginner, a simplified type of turn indicator styled the Gyorizon has been designed. Here the turn needle is at the top; and the bank needle is replaced by a liquid cross level or liquid horizon. But this is not a true artificial horizon, since if a turn is correctly banked the liquid will be truly horizontal as regards the datum marks on the instrument case, but may be standing at an acute angle in regard to the real horizon. In a correctly banked turn the horizon is horizontal with the case, and the aeroplane wings bank in regard to that datum similarly to the real wings in regard to the real horizon.

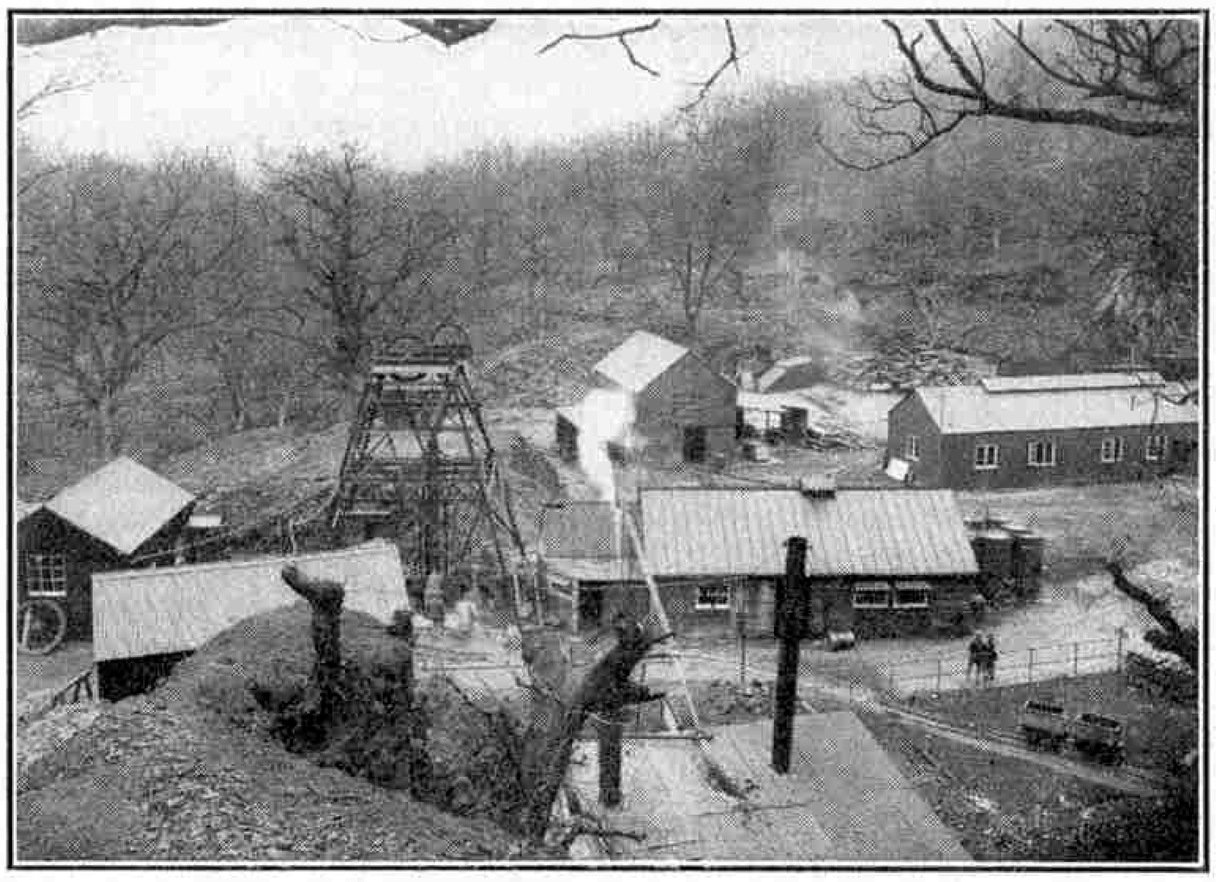
Goldmining in Britain

A Reef Worked in Roman Times

By Sydney Moorhouse, F.R.G.S.

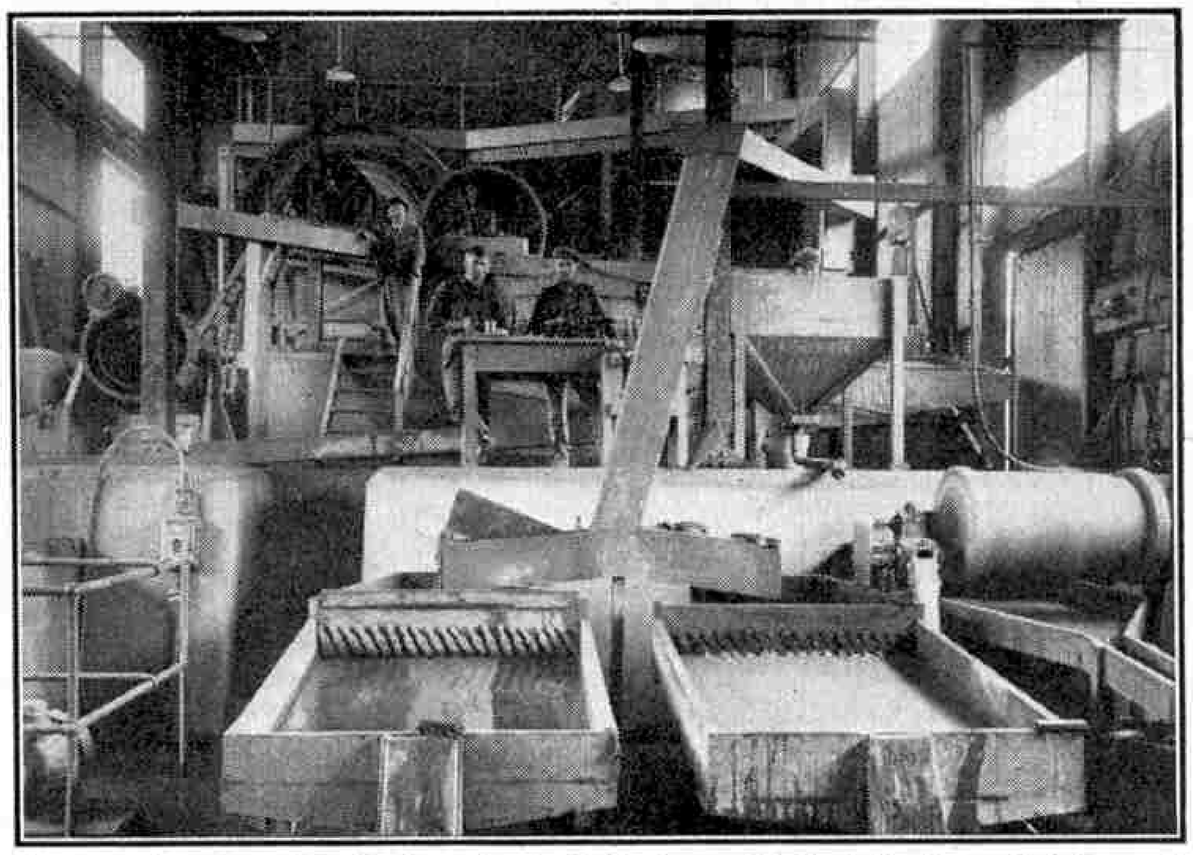
VERY few people realise how much gold has been taken from the soil and rock of Britain. Even to-day, goldmining is still carried out in various parts of the country and it is more than likely that the industry is one that will be developed considerably in coming years, although it would be futile to attempt to compare our British gold mines with those of South Africa.

It was the mineral wealth of Britain that attracted most of the early invaders, and there are many stories to the effect that the tin mines of Cornwall were worked by the ancient Phœnicians. Later the all-conquering Romans began to realise the extensive mineral wealth of their furthest-flung outpost. In many parts of the North and Midlands are relics of lead mines that were worked by these invaders from sunny Italy. Remains of their iron-ore workings can still be seen in the Forest of Dean, and it has been said that one of the main sources of gold for the entire Roman Empire was in the mountains of Wales.



A general view of the Ogofau mine at Pumpsaint, Carmarthenshire. This mine was one of the chief sources of gold in the Roman Empire. The illustrations to this article are reproduced by courtesy of British Goldfields (No. 1) Ltd.

Since Roman times British goldmining has been somewhat spasmodic, but from time to time unique finds have been made and our Royal family have always been willing to give encouragement to British mine owners. For instance, the wedding rings worn by Queen Elizabeth, the Princess Royal and the Duchess of Kent were all made from gold found in the hills of Wales. Scotland too has its treasures of mineral wealth of the past, and those who visit Edinburgh Castle will be interested to learn that the Scottish State Crowns to be seen there were made in 1542 from gold found in the southern uplands of the country. The King's Crown contains nearly 60 oz. of the metal, and 35 oz. were used in the Queen's Crown. Also in the Castle is a belt of pure Scottish gold that weighs almost 20 oz.



The extraction plant at the Ogofau mine. In the background is the ball mill in which the ore is crushed and in front are the plates on which the gold is taken up by mercury to form amalgam.

At the present time, the greater proportion of goldmining in Britain is carried out in Wales, and at Pumpsaint, in Carmarthenshire, is the Ogofau Mine, which has recently taken on a new lease of life. It is now being worked by British Goldfields (No. 1) Ltd. Ancient records indicate that Pliny quoted this mine as one of the five chief sources of gold in the Roman Empire, and many discoveries made in the district and on the property confirm this. These finds include slave pits, and an aqueduct eight miles long leading to the mine, and the extent of the ancient workings revealed is another proof. Towards the end of the 18th century a gold necklace, some bracelets and some rings were found near the property, and the remains of a Roman villa also have been discovered.

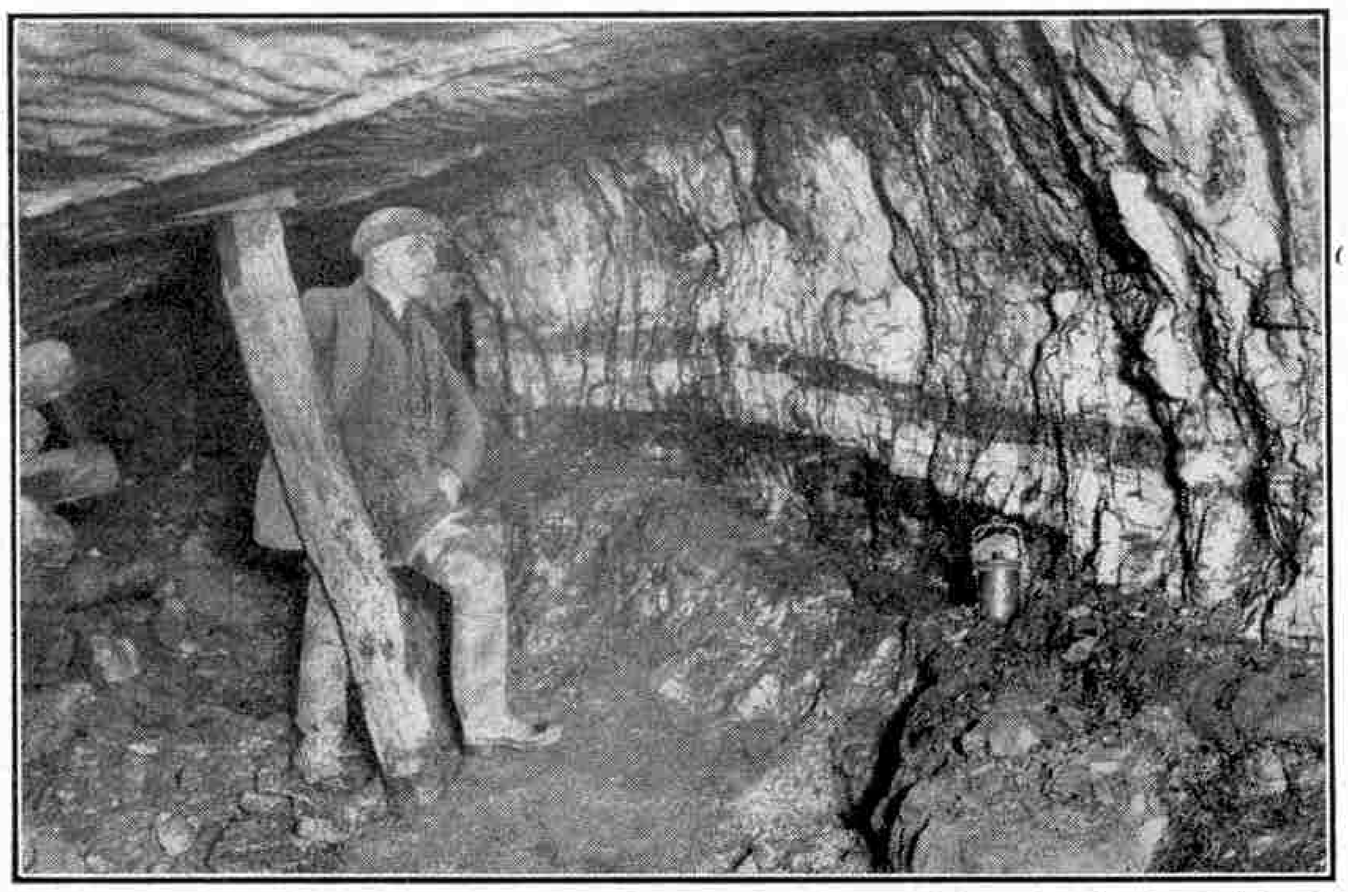
Many years afterwards the Normans endeavoured to re-open the Carmarthenshire workings, and it is quite possible that further attempts were made in the reigns of Queen Elizabeth and Charles I. Water seems to have frustrated these attempts, for the workings, which extended well below the bed of the River Cothi, are found 160 ft. down the present shaft.

To-day the mine is well served with a 500-ft. vertical shaft, off which five levels are being worked. A completely modern mill to treat the type of ore found has been erected, and a battery of four 150 h.p. Diesel engines generates the electric power by which all machinery is now run.

During 1938 the company employed 200 men above and below ground, and the peak of production was attained in October of that year, when nearly 1,000 oz. of pure gold were produced. At the time of writing, however, this mine has ceased operations pending the

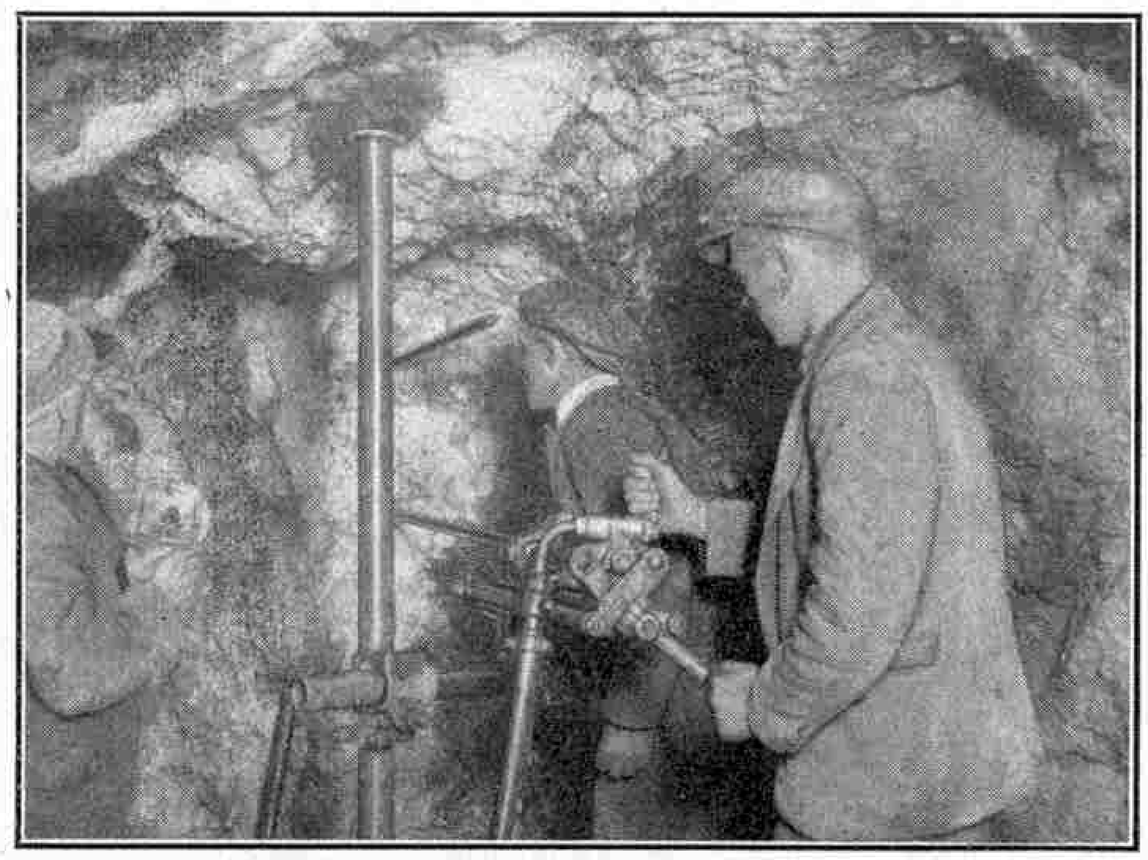
completion of a general reorganisation in progress.

The mountains on the north side of the Mawddach estuary, between Barmouth and Dolgelley, have been referred to as the "Hills of Gold" by several writers, and goldmining certainly has been carried on there for several centuries, although not continuously. It is difficult to distinguish fact from fancy when seeking to unravel the story of goldmining in Merionethshire. According to some authorities gold was carried across the Rhinog mountains from the mines of the Trawsfynydd area to the port beneath Harlech Castle in the time of the Romans, traffic that gives the name of "Roman Steps" to the old trackway. This trackway has now been definitely established as a mediæval traders' route, however, so that the older story cannot be regarded as authentic. There are definite records of a discovery of gold there in 1843, however, and in a report to the British Association in 1844, it was stated that a complete system of auriferous veins extends throughout the whole of the Snowdonian formations.



Underground at the Ogofau mine. On the right is the quartz lode, containing gold, with two dark bands of shale in it. Above is the hanging wall, or roof, of shale.

Mining operations in this district were in full swing in 1852, and 10 years later an illustrated magazine published a short feature on the Vigra gold mines, which were described as "situated in a most picturesque and mountainous range in the parish of Llanabar, on the north of the navigable River Mawddach, about five miles from and midway between Dolgelley and Barmough, in the county of Merioneth, North Wales." Accompanying the description was an engraving of the gold mill, equipped with a waterwheel, some 60 ft. in diameter, which worked a Cornish crushing machine capable of dealing with 40 tons of ore daily. It was stated that the average yield for the three months ending 31st December 1861 was $32\frac{3}{4}$ lb. of gold per month.



Compressed air drills at work in the Ogofau gold mine.

In the year 1872 the Clogau Gold Company are said to have obtained £30,000 worth of metal, but their mines were closed down again towards the end of the century. In 1912 gold-bearing quartz was again struck, however, and in May 1918 a discharged Australian soldier, an expert engineer, found a streak on a mountain side near Barmouth.

A further rich vein was struck in this neighbourhood in 1929. The Gwynfynydd mines were reopened, and in 1932 powers were given to a London company to dredge the estuary for gold. It was also said that the gold reef itself passed right under the estuary from a point two or three miles from Barmouth to Fairbourne, but the cost of working this has proved prohibitive.

It will be seen that goldmining in Merionethshire has been a very spasmodic affair, but the St. David and Clogau mines are now working again and mining is carried out on up-to-date lines, the latest crushing plants and valuable assay instruments having been installed.

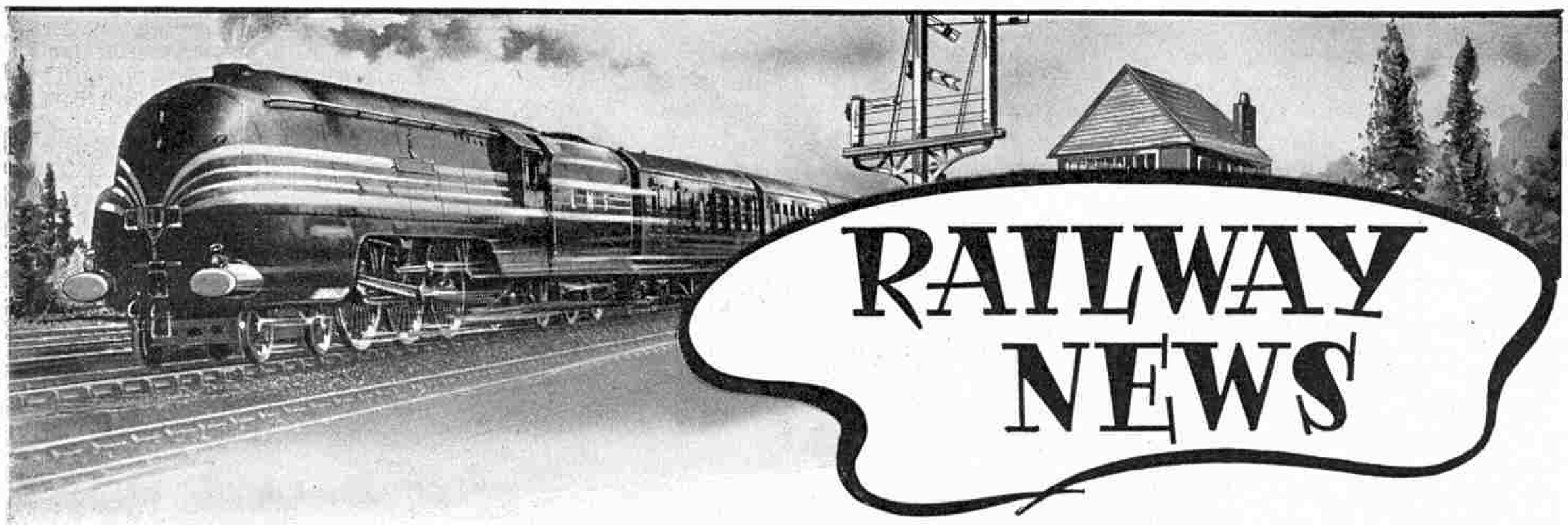
At the beginning of the present century geologists located a gold-bearing reef running right underneath the Forest of Dean, and great hopes were entertained that the Forest, already famous for its iron and coal mines, would become a goldmining district. Finds were reported in 1909, but on investigation it was discovered that the reputed gold was nothing more than yellow ochre.

Another disused gold mine lies up one of the remote valleys behind the North Welsh coastal village of Aber, between Bangor and Llanfairfechan, and a long tunnel penetrating the hillside, the work of prospectors many years ago, can still be seen. Although traces of gold were discovered here, it was found that the cost of mining it would be greater than any profits likely to be derived.

This Aber gold mine lies up the valley leading towards Aber Lake, and is reached by following a footpath from the village, for some three miles. A pile of debris beside the tunnel opening is then plainly seen. Some strangely-built sheep folds near the stream serve as a useful guide to the place in which to commence looking around for the opening.

There are other places in the southern portion of these islands where the presence of gold has been discovered. An analysis of the water of Dartmoor streams has shown that they contain gold, and it is quite possible that their beds are rich in the metal, while only a year or two ago a Hampshire farmer found a rich bunch of gold-bearing nodules beneath his ground at Fordingbridge.

Between Leadhills and Wanlockhead, in the Southern Uplands of Scotland, was once the richest gold-bearing reef in Britain. As long ago as in 1578, one Bevis Bulmer, a Yorkshireman, was successful in finding a rich vein near the head of the Longcleugh Burn, and by 1592, when the vein had become worked out, more than £100,000 worth of gold had been extracted.



Veteran Engine's Feat

To entrust the maintenance of a mile-a-minute schedule to a veteran engine speaks volumes for the efficiency of its design and management. This is frequently the case with the 3.4 p.m. L.N.E.R. express from Peterborough to King's Cross which conveys through portions from Cromer, King's Lynn, and Grimsby. This train is booked to cover the 76.4 miles from Peterborough to London in 76 minutes start-to-stop and it is often hauled by a Great Northern type "Atlantic," as an alternative to a "Pacific" or a "V2" 2–6–2.

On a recent occasion the former G.N.R. 4–4–2 No. 4429, 32 years old, was 5 min. late leaving Peterborough at the head of an eight-coach train weighing 247 tons tare. Driver Vines of New England did his best to make up the arrears until foiled by fog and signal delays in the London area. The overall time from Peterborough to a signal stop outside King's Cross was no more than 73½ minutes for 75.5 miles. Finsbury Park, a distance of 73.8 miles, was passed in 68½ min. Outstanding features of this excellent performance include an average of 66.6 m.p.h. over the 70 miles between Yaxley and Finsbury Park, and a minimum speed of 57 m.p.h. at the top of the 8½-miles climb from Arlesey to Stevenage, most of which rises at 1 in 200. The maximum speed attained on the journey, which was recorded by Mr. D. S. Barrie, was 81 m.p.h.

L.N.E.R. Locomotive News

The L.N.E.R. "A4" streamlined engine No. 4469 formerly named *"Gadwall"* has been renamed *"Sir Ralph Wedgwood."* Nos. 4815-19 are the latest 2–6–2 class "V2" tender engines in traffic.

Mr. J. W. Armstrong of Darlington informs us that when the King and Queen visited Newcastle recently the Royal Train was in charge of "A4" No. 4498 *"Sir Nigel Gresley,"* and that 2–6–2 tank engines Nos. 461 and 477 were used for local journeys in the Newcastle area. On the return journey *"Sir Nigel Gresley"* worked through from Bishop Auckland to King's Cross. This is the first occasion on which the Royal Train has run over the old Stockton and Darlington Railway between Shildon and North Road, Darlington.

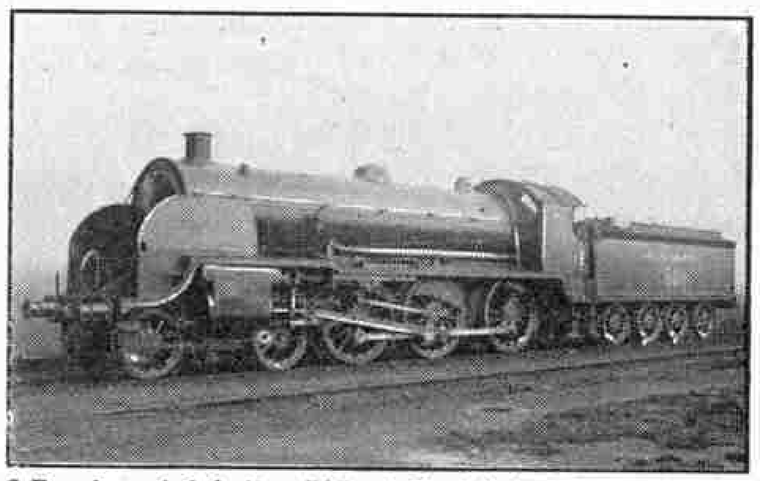
L.M.S. Locomotive Notes

On the occasion of the King and Queen's visit to the B.I.F. at Birmingham, the Royal Train was worked from Euston to Birmingham and back by "Jubilee" 4–6–0s Nos. 5686 *"St. Vincent"* and 5692 *"Cyclops,"* the former piloting.

Class 8 freight engines Nos. 8098-8110 have been completed at Crewe, and 2–6–4 tank engine No. 2652 has been turned out from Derby. The former L.N.W.R. "George the Fifth" 4–4–0 No. 25357 *"Bassethound"* has been withdrawn from service and condemned.

British Railways at the New York World's Fair

The British Railways, in co-operation with the Travel and Industrial Development Association of Great Britain and Ireland, are providing an exhibit at the World's Fair, New York, which opens on the 30th of this month. This takes the form



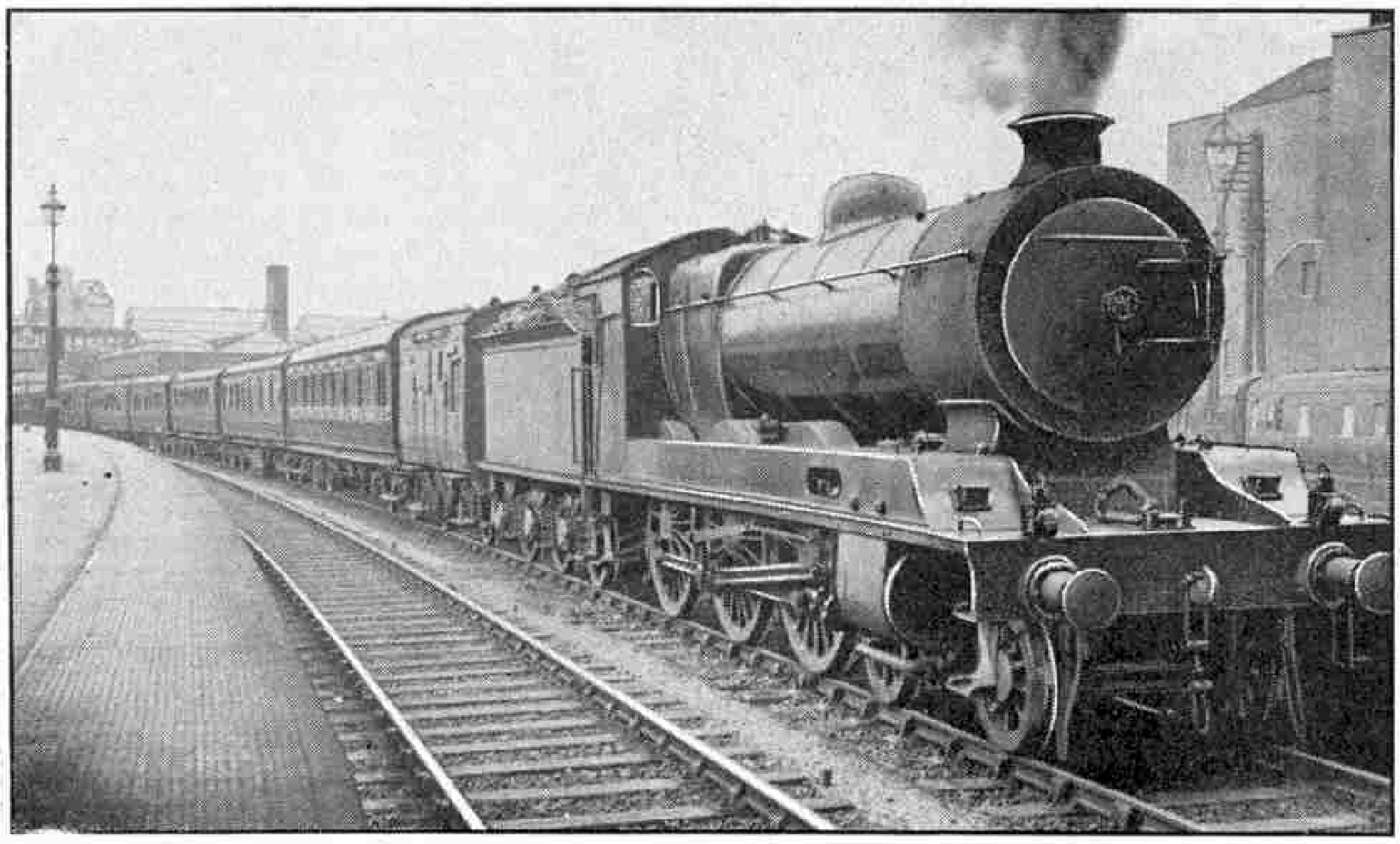
S.R. class 4-6-0 No. 509 at Eastleigh. Photograph by E. C. Morgan, London S.W.18.

of a Railway and Travel Information Bureau, the entrance to which will be flanked by models of four famous British expresses. These are *"The Coronation Scot"* of the L.M.S., the *"Coronation"* of the L.N.E.R., the *"Cornish Riviera Limited"* of the G.W.R. and the electric *"Brighton Belle"* of the S.R.

The most prominent feature of the interior display will be an illuminated map, measuring 10 ft. by 6 ft., which shows the main railway routes and places of scenic and historic interest in Great Britain and Ireland. Prospective visitors to these countries will thus be able to plot their journeys visually, assisted by experienced travel representatives sent to New York specially for the Fair. Maps and literature will be displayed and there will be a frieze of posters, while other posters will be displayed on a special machine that automatically shows a series of illuminated pictures.

Rail Thrill for 600 Schoolboys

A real railway thrill has been planned for 600 schoolboys who are visiting Crewe Locomotive Works on the 17th of this month. The return journey to Euston will be made via Northampton and at the Junction at Roade the special train is being timed to run parallel for some distance with *"The Coronation Scot."* Travelling at between 80 and 90 m.p.h., the streamlined train will finally draw ahead and the special will then follow it over the same metals from Bletchley to Euston.



L.M.S. 4-6-0 No. 14764 "Clan Munro" on Glasgow to Oban express at Stirling. Photograph by J. P. Wilson, Nottingham.

A Provincial Visits London

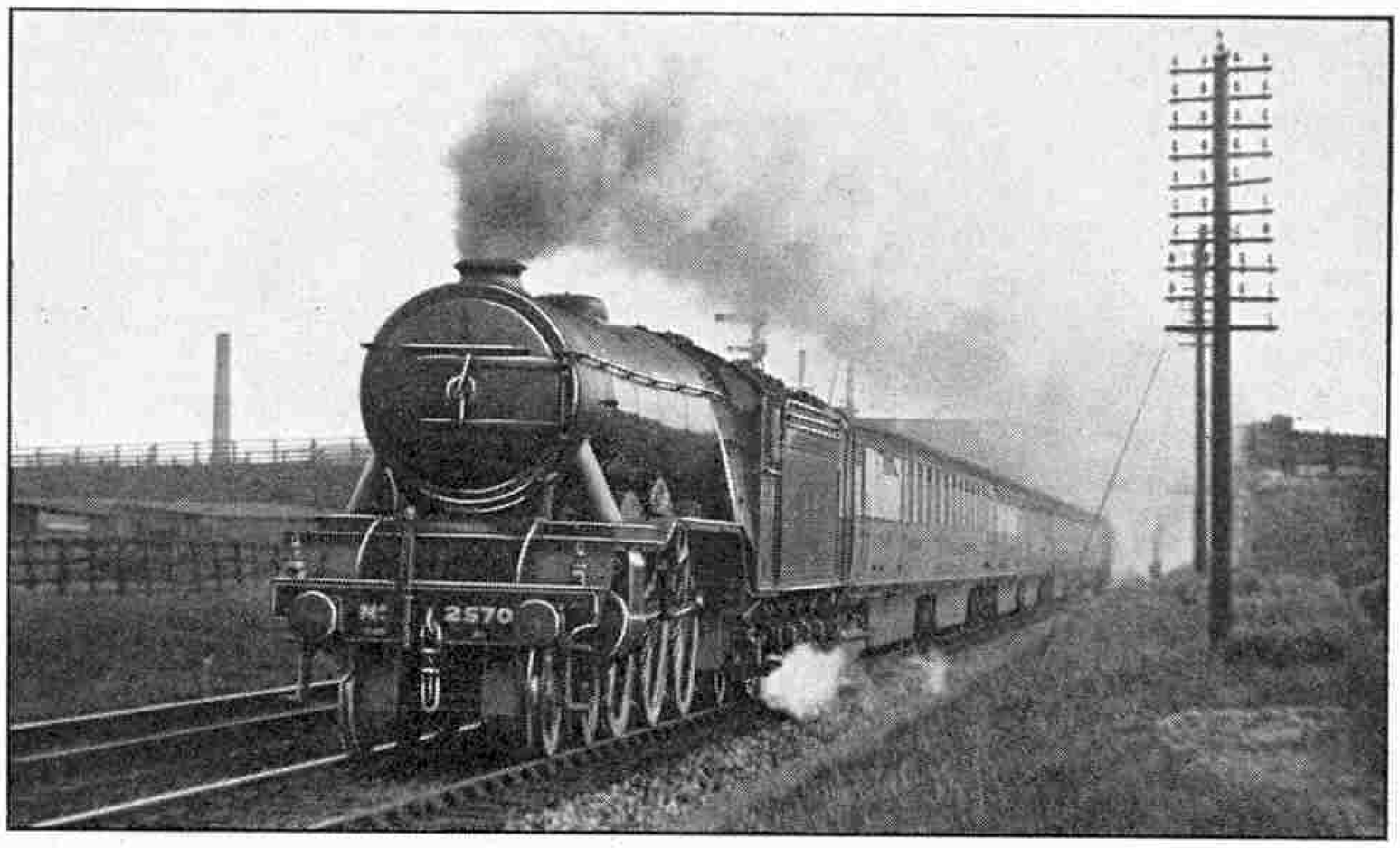
Recent visits by a provincial railway enthusiast to some of the London termini yielded various items of interest. At Victoria, most cosmopolitan of stations, in spite of intensive electric services, steam locomotives belonging to each of the three S.R. constituent companies and others of definite group origin were observed within a very short space of time. These included "King Arthur" No. 767 *"Sir Valence"* on an up Continental Express, and "Schools" class No. 923 *"Bradfield"* on an outgoing train for the Kent Coast. Of pre-group designs there was No. 416, one of the former L.S.W.R. "Drummond" 4-4-0s, which worked in on a train from Chatham. Brighton 0-6-0 tanks Nos. 2103 and 2109 were on empty carriage duties, and ex-S.E.C.R. 0-4-4T No. 1553 was engaged in miscellaneous shunting. At the same time the stock for the 10 p.m. "Ferry Boat" Train was in the station, and with its S.R. coaches, Pullmans and blue International Sleeping Car Company *"Wagons-Lits"* bearing destination boards *"London-Paris"* added to the variety of the scene.

At Waterloo there was a dearth of modern locomotives, but the S.R.'s last word in main line electric stock was well in evidence on the Portsmouth services. "Drummond" 0-4-4 tanks Nos. 241 and 33 were seen on empty stock work, the latter bringing in a "French Line" special. No. 522, a mixed traffic 4-6-0, was observed waiting to back out and the only other engine of up-to-date design was "U" class 2-6-0 No. 1808. "Drummond" 4-4-0 No. 415, the first of its class, built in 1904, arrived with a stopping train, and the final development of this type was represented by No. 472 of the larger class built in 1912. These engines were commendably clean, the latter especially so, the brass and copper work being well polished and the paint smartly kept.

A novelty at Paddington was a restaurant car provided with 6-wheeled bogies, this being one of several recently dealt with in this way, the original 4-wheeled bogies being removed.

There was a quartette of "Castles," No. 5014 *"Goodrich Castle"* on an up Bristol and Weston-super-Mare express, No. 5001 *"Llandovery Castle"* on an up Birmingham and Shrewsbury train, No. 5047 *"Earl of Dartmouth"* on an up South Wales express and No. 5034 *"Earl of Ducie"* on the down "Irish Mail via Fishguard." Among these the veteran 4-6-0 *"Ivanhoe"* looked strangely slim. Now No. 2981, this engine was once one of the Swindon "Atlantics" and was then No. 181. No. 4047, *"Princess Louise"* represented the earlier Swindon 4-cylinder class, bringing in a train from Weymouth and Frome, and of the useful "Hall" class No. 4903 *"Astley Hall"* worked out a stopping train to Reading and Didcot. Various 2-6-2 tanks were hard at work on suburban and empty carriage duties, being ably assisted in the latter by the characteristic "Pannier" 0-6-0 tanks. Some of the latter also were in charge of goods trains coming off the Metropolitan line.

At Liverpool Street things were quiet; a reboilered 4-6-0 No. 8561, a "Super-Claud" 4-4-0 No. 8822, and a "Sandringham" No. 2804 *"Elveden"* were observed. Several "N7" 0-6-2 tanks were in evidence on suburban trains, also two of the old 2-4-2 tanks of the former G.E.R. Nos. 7001 and 7991.



L.N.E.R. "Pacific" No. 2570 "Tranquil" making up lost time at the head of the down "Coronation" after the original engine, No. 4482 "Golden Eagle," had failed near York. Photograph by J. W. Armstrong, Darlington.

Time on the Illinois Central Railroad

Over 9,000 members of the staff of the Illinois Central System of America carry standard watches that must keep time within a variation of 30 sec. per week. These include drivers, firemen and conductors, and all other employees who have anything directly to do with the operation of trains and the maintenance of schedules.

Members of the train crews have to compare watches with a standard clock before starting on each trip, and to enter on the train register the variation in seconds from standard time. Members of the crews are also required to compare watches with each other before leaving each terminal.

The standard watches carried by the Illinois Central staff are compared with master timepieces twice a month, are given thorough inspection every six months, and are completely overhauled, reconditioned, reoiled and rated periodically. This work is done by accredited watch inspectors, of whom there are 110 on the Illinois Central System. The present system of watch inspection on the I.C.S. was organised 35 years ago.

Resignalling Scheme for Preston

The L.M.S. are to carry out an extensive scheme of new signalling at Preston, the busy junction through which passes the whole of the Blackpool seasonal traffic as well as the heavy West Coast main line traffic. At peak periods, as many as 900 trains pass through Preston in 24 hours. The number of special trains run to Blackpool in connection with the holiday traffic exceeds 2,500 in a typical year, and for the Blackpool Illuminations approximately 1,500 special trains are run.

Under the scheme multi-aspect colour-light signalling will be provided through the station and for a total distance of 3½ miles over the main line from Farington on the south to Oxheys on the north. Alterations will also be made in the track arrangements, and additional through lines will be provided for passenger trains.

Two large new power signal boxes are to be constructed, one at the north end of Preston station and the other at the south end. The former will do the work of two existing boxes while the latter will take over five of the boxes now in use.

"The West Coast Postal." This famous train is seen here loading at Euston prior to its departure at 8.30 p.m. Photograph by W. P. Conolly, London S.W.11.

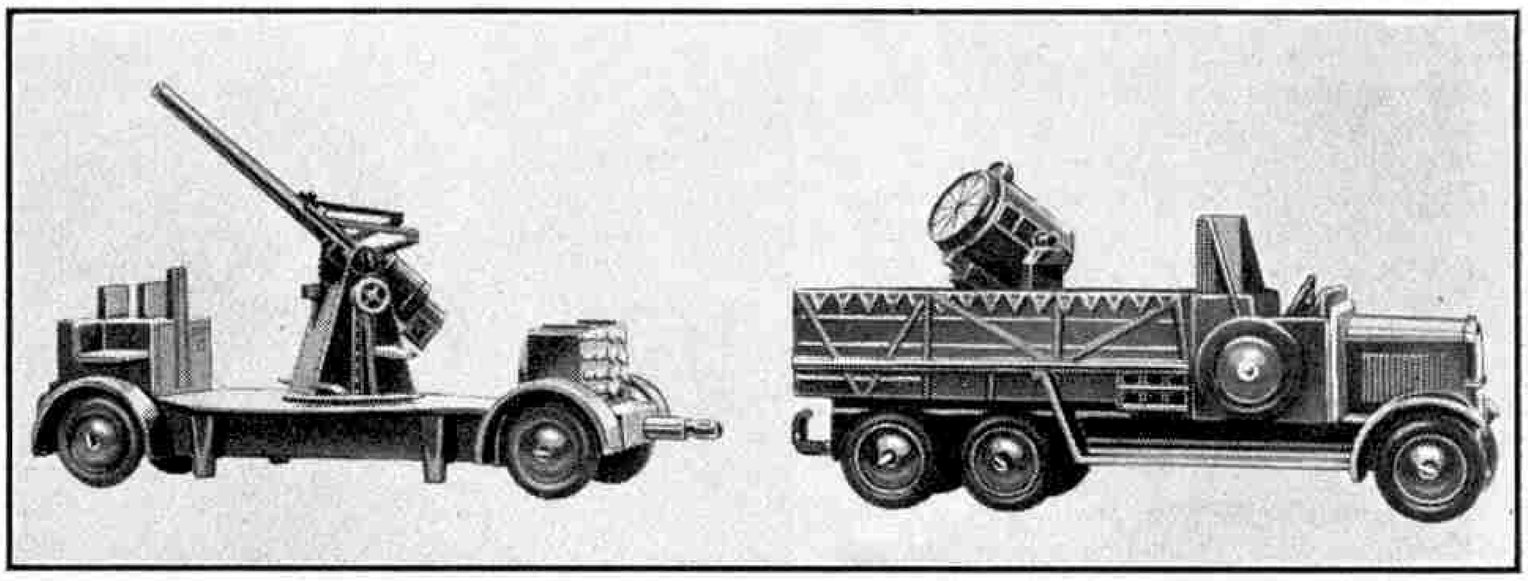
Anti-Aircraft Defence

Remarkable Models in the Dinky Toys Series

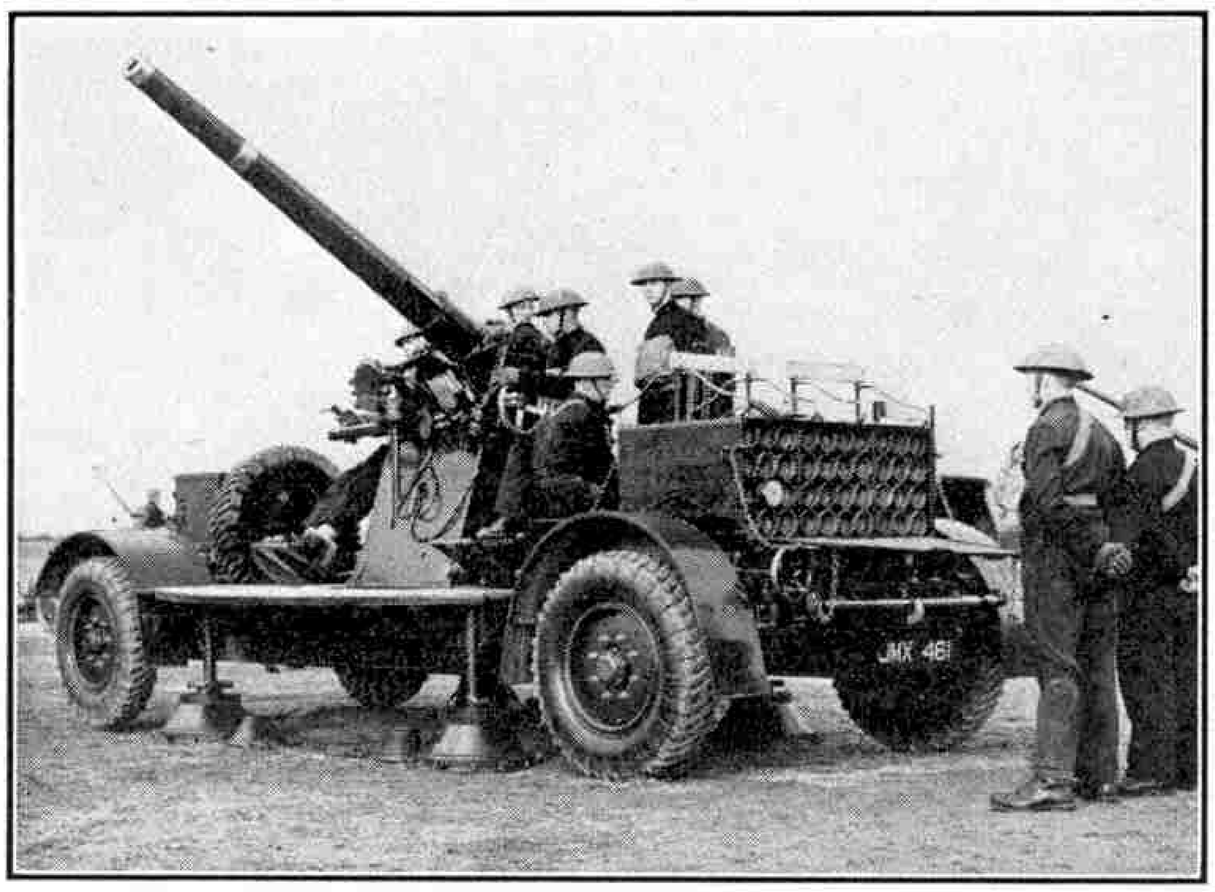
THE rapid development of long-range aircraft has produced the serious problem of providing adequate air defence. The first necessity of any scheme of defence is that of securing the earliest possible warning of the approach of enemy aircraft, and this becomes more difficult as the speed of bombers increases. It has long been realised that human eyes and ears, unassisted, cannot be relied upon as aircraft detectors, and in consequence scientific instruments of ever-increasing accuracy have been introduced.

The Dinky Toys Mobile Anti-Aircraft Unit comprises a scale model of a Quick-Firing Anti-Aircraft Gun mounted on a four-wheeled mobile platform, and a Searchlight mounted on a 6-wheeled lorry. The operation of a searchlight unit of this kind in actual practice is extremely interesting. In brief, the direction of an approaching enemy aeroplane is found by means of a Sound-Locator, which is a sort of mechanical ear consisting of large movable trumpets. One man operates the trumpets for the horizontal plane and another those for the vertical; and a third man works out from the relative positions of the trumpets where the aeroplane is at any particular moment. This information is passed to the searchlight crew, who direct the beam accordingly.

The height of the enemy aircraft is ascertained by a crew of three men working a Height-Finder, which might be described as a mechanical substitute for eyes. The remaining calculations for directing and firing the guns are carried out with great rapidity by a marvellous instrument known as the Vickers Predictor, the gun crews having little more to do than maintain certain mechanical pointers continuously in line with electrical pointers. Thus controlled, the 3.7 anti-aircraft gun can fire twelve 28 lb. shells in one minute, and these shells reach a height of 10,000 ft. in 8 seconds.



Dinky Toys No. 161, comprising a Mobile Quick-Firing Anti-Aircraft Gun and Searchlight.

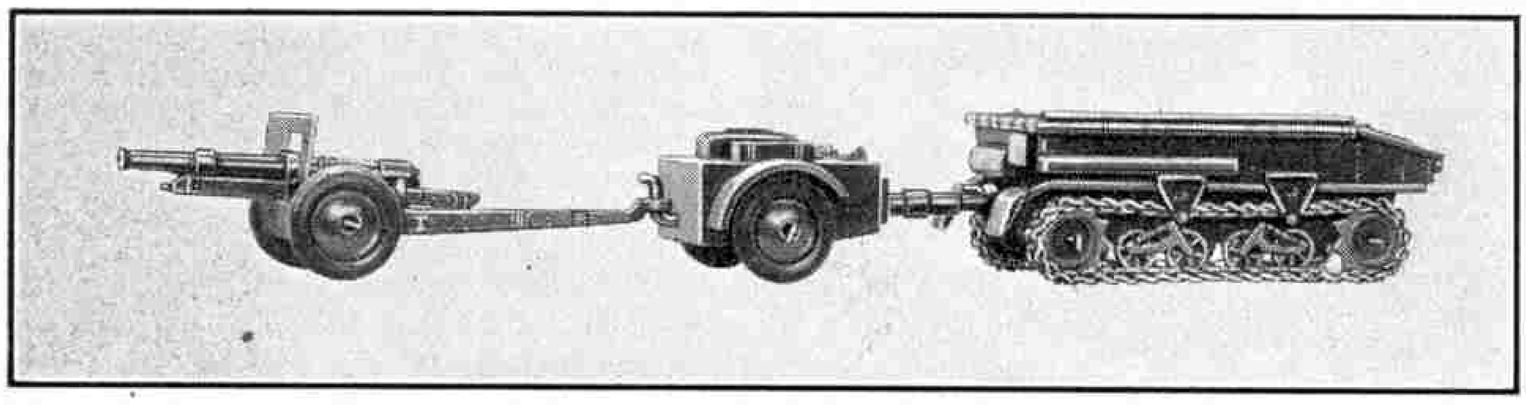


A 3 in. mobile anti-aircraft gun and crew.

The upper illustration on this page gives a good idea of the realistic appearance of the Dinky Toys Anti-Aircraft Unit, No. 161, the Gun of which can be elevated or lowered by means of an actual gear operated by a small wheel, and also can be traversed in any direction.

At the foot of the page is illustrated another interesting Dinky Toys model. This represents an 18-pounder Quick-Firing Field Gun, Trailer and "Light Dragon" Motor Tractor.

The 18-pounder gun has an extreme range of almost 10,000 yds., and a maximum rate of fire of eight rounds per minute. It is hauled, through a trailer, by a "Light Dragon," a fast tracked towing vehicle. The gun crew, including the driver of the "Light Dragon," numbers 10. Guns of this type are used to support infantry in attack and defence. They are not associated in fixed proportions with battalions of infantry, but are used as circumstances require. Thus one, two or three troops of guns, or even a whole regiment, may assist infantry in an assault on a strongly-held line by providing a creeping barrage. A regiment consists of six troops, and its war strength is 24 guns.

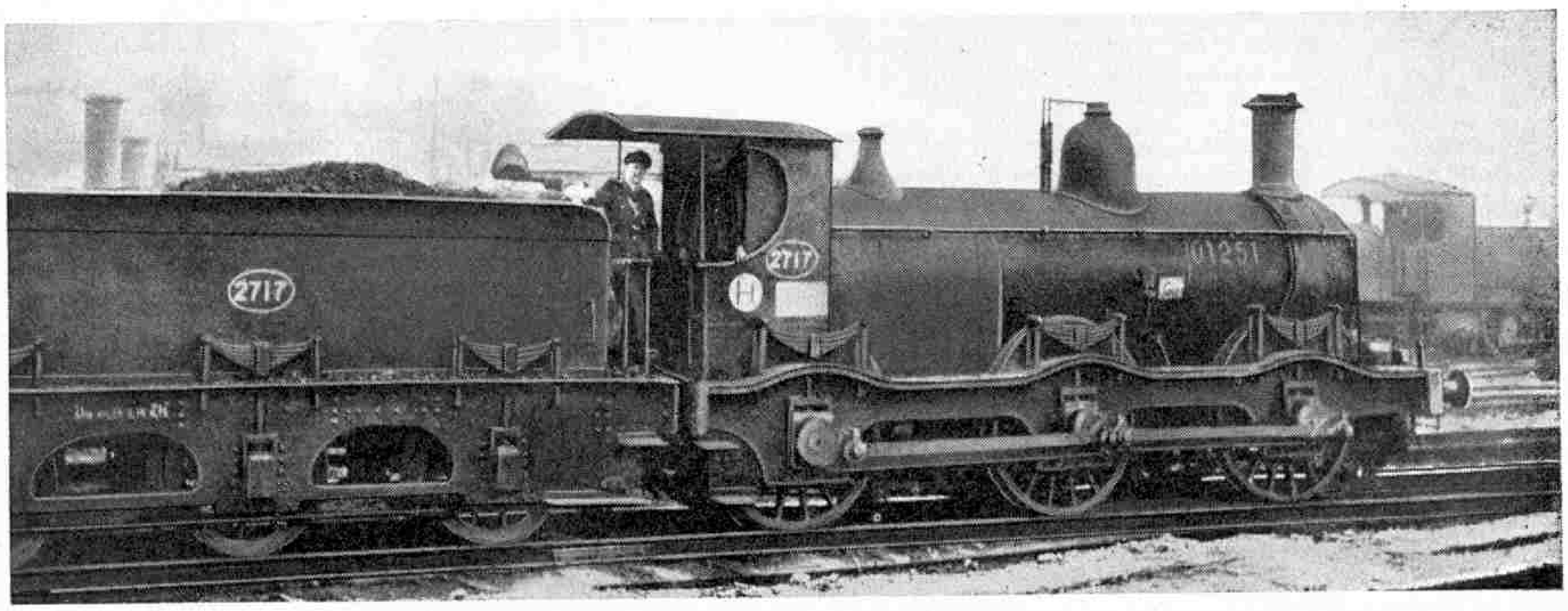


Dinky Toys No. 162, consisting of an 18-Pounder Quick-Firing Field Gun, Trailer, and "Light Dragon" Tractor.

Historic Locomotives

IV. The Midland War Engine, No. 2717

By C. Hamilton Ellis



Former Midland Railway 0-6-0 No. 2717 after its return by the Germans. Photograph by courtesy of the L.M.S.

TO an uninformed observer, Midland Railway 0–6–0 No. 2717 was not a very exciting or even adventurous-looking engine. She was designed by Matthew Kirtley, and generally speaking was old-fashioned, dating back to the eighteen-sixties. She was a stolid and useful six-coupled goods engine with double frames and inside cylinders, and had been built at Glasgow by Dübs and Company in 1871.

During the period in which she became famous, her original design had been somewhat modified, following a rebuilding carried out by S. W. Johnson. At this time she had 5 ft. 3 in. driving wheels, 17 in. by 24 in. cylinders, a working pressure of 140 lb. per sq. in., and weighed 39½ tons, or 66 tons with tender, in working order. She was therefore a small and old-fashioned engine which in the normal course of events would have gravitated through lighter jobs on local goods traffic to an undistinguished end in the scrap yard. Her number, 2717, was not the original one, but was given her when the whole of the Midland stock was renumbered in 1907.

After the start of the Great War in 1914, there was a shortage of locomotives on the lines in France and elsewhere that came to be used by the British army. Before new engines could be built specially for work overseas, the Railway Operating Division of the Royal Engineers was supplied with hundreds of locomotives from the British railways. Most of the big companies contributed to this army of engines, and the batch sent by the former Midland Railway consisted of 78 Kirtley goods locomotives, including No. 2717, the subject of this article.

In October 1917 a British advance was made up the line of railway between Peronne and Cambrai. This line had been in the thick of the fighting, and could scarcely have been expected to present a very workable aspect. It was full of holes, with the permanent way in a very sad state of disintegration. At the time No. 2717 was on ballasting duties in this area, and she was sent up the Cambrai line with a trainload of chalk for filling in a big crater near Marcoing. That was early in the morning of 30th November, on which day the Germans made a fierce counter-attack on the Cambrai salient. Retreating British troops passing the ballast train advised its crew to return down the line with all speed. The train came under heavy fire, and the enginemen did indeed retreat with it, only to have to abandon No. 2717 and her wagons some three miles back.

So the old Midland engine passed into the hands of the Germans, who took her far away to their own workshops, repaired her, gave her the number 01251 H, and placed her in service again on their own military railways in Belgium. She was the only British locomotive to be captured during service on the Western Front, and for the remainder of the war she was in German hands.

After the Armistice in November 1918, several locomotives from the German Military Railways, which had been handed over to the Allies, stood in the yard outside Charleroi station. Most of them were of Belgian or German origin, but one was the wandering No. 2717, which was recognised by her former driver, J. Woodhouse, while he was taking a British supply train through to Cologne over the Belgian lines. She had not altered much during her year of German service, although some of her equipment which had been damaged in the battle of Cambrai had been replaced by new German fittings.

Eventually No. 2717 came back into British hands and in due course she was returned to England, and placed in service again on the Midland Railway. The L.M.S. took her over in 1923, her number remaining unchanged. She continued to do useful work on L.M.S. goods traffic until as recently as 1933, when she was withdrawn from service, having covered more than 1,220,000 miles since 1871. A relic of her was preserved in the form of her old dome casing, which was riddled with bullet holes.

A Holiday on the Norfolk Broads

Fine Sailing on Inland Waters

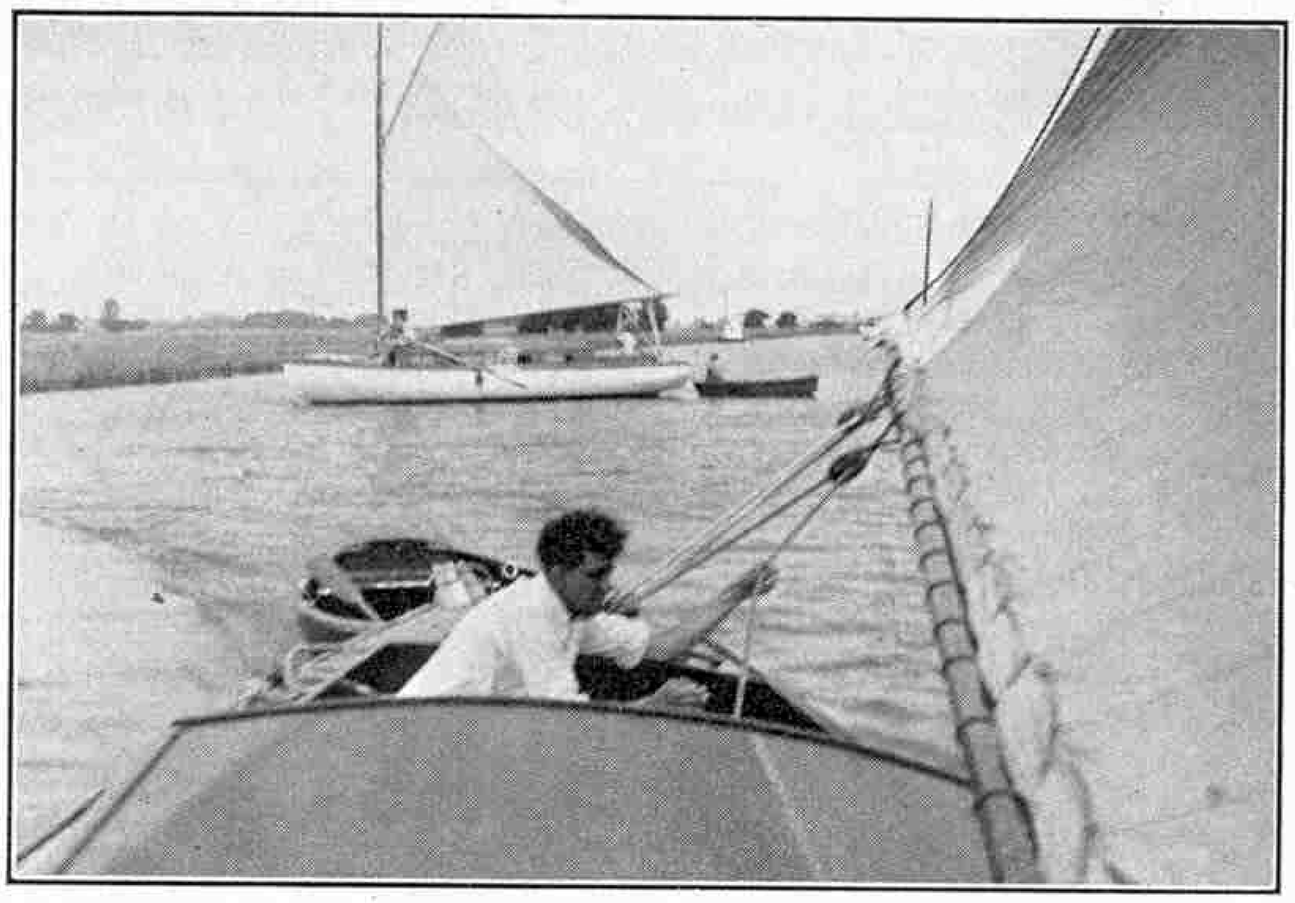
By A. C. Gee

"WELL, how about the Norfolk Broads?" asked Bill. "Yes," said Bob. "Let's go there this year. I've always wanted to see that part of the country. I believe it is very pretty—and besides, we could get some sailing. That would be fine."

Bill, Bob and I had been wondering what to do for our holidays. We had intended visiting the Norfolk Broads before, but it had never come off. So this time we resolved that we would spend our holiday there, where we should get a change of scenery and be able to indulge in our favourite sport—sailing.

So a Saturday afternoon in July found us on the road bound for Wroxham, on the Bure, which we reached about six o'clock. There was our boat, at the end of some staging by the water's edge. She looked a jolly nice little boat, just the thing for the three of us, and quite up to the photograph of her we had seen in the holiday agent's catalogue earlier in the year. The cabin was very roomy, and the bunks, of which there were three, one down each side of the cabin and the third across the forward end, looked particularly comfortable. Bob, the junior, was told off to the for'ard one, whilst Bill and I reserved the port and starboard bunks respectively.

Our gear stowed away, we were at last ready to push off. It was a glorious evening, with a fresh breeze parting the clouds and showing us little patches of blue sky. We had about an hour to spare before sunset, so we decided to set sail and go down to Wroxham Broad to see how the "*Norman*"—as she was called—handled. We were greatly impressed by the spread of canvas she carried. Bill, the senior, took the tiller, and Bob and I shoved off with the quant, or pushing pole.



There is really fine sailing to be had on the Norfolk Broads and their connecting rivers.

Out on Wroxham we found a splendid breeze—and we found that our "*Norman*" was a handful too. Did we have a sail that evening! Beating up the Broad with a good stiff breeze, lee rail down and under too at times, then running down with a few shots at gybing just to see how she took it, we all took turns at the tiller until we had had our "fill" for one evening. Then we decided we had better find a berth for the night. So out of the Broad we sailed back into the river and set course down to Horning. Much of the river bank here is privately owned; most beautiful gardens and lawns surrounding charming riverside bungalows come right to the water's edge, and as we sailed along tall pine trees, rose beds, boxes of geraniums and many other plants in bloom helped to make a scene delightful to the eye.

We drifted along slowly in the quiet of the evening, the Sun nearly set and the water fowl scurrying back to roost. Suddenly Bill's voice broke the silence. "Say chaps, guess we'll tie up here for the night. Let go that jib sheet," he exclaimed, and he swung the "*Norman*" round across the river, and over to the opposite bank. Bob and I jumped ashore and made fast.

After supper we set up the cabin table, lit the lamp and got out the 'chart,' a map of the Broads we had brought with us, to decide on a plan of campaign. We wanted to see as much of Broadland as our short stay would permit, and to get some good sailing, weather permitting.

"Right," said Bill finally. "From here we'll sail down through Horning, and carry on down the Bure until it meets the Ant. Then we'll bear up the Ant as far as Ludham Bridge. We had better tie the '*Norman*' up there and continue up by dinghy to see Barton Broad. The chart shows only three or four feet of water above the bridge and it looks somewhat narrow to me. I don't fancy getting the '*Norman*' stuck up there. From Ludham Bridge we will make our way back into the Bure, and continue down as far as Acle Bridge. We'll take a look round there and then I suggest we return up the Bure to Thurne Mouth, up the Thurne through Potter Heigham, and along up to Hickling and Horsey. We should get some fine sailing there. They look lovely sheets of water. I guess by then it will be getting time to think about returning home. We'll keep going until Wednesday and then we will head straight back for Wroxham."

Bob and I murmured our approval. Bob was nearly asleep. The warmth from the oil lamp had made us all drowsy and so, our course settled, we turned in.

It was 10 o'clock next morning before we had cleared away breakfast and set sail. It was a bit cloudy, but it looked as though it might clear later, and a westerly wind gave us a run through Hoveton Long Reach and we were soon into Horning.

With a fair wind we sailed on through Horning and decided not to stop until we got to Ludham Bridge. There we nearly came to grief. The river bends sharply in an S bend just before the bridge and trees, and sheds obscure it from the river. We came round the first part of the bend in grand style and were just going about to take the second part when we found ourselves practically on top of the bridge. Fortunately we had room to come up into the wind and run into the bank, where the soft mud held us. We scrambled ashore and made fast. Hardly had we done so than the first drops of rain descended, so we decided to lower and stow sails and stay where we were.

We awoke next morning to grey skies, but it was not raining and by 11 o'clock the Sun was shining and all suggestion of rain gone. We had an early lunch and got the dinghy ready for the run up to Barton. We had a nice stiff breeze and in spite of an unfavourable tide made good going up the Ant.

The Ant is a very pretty river. Just after clearing Ludham Bridge we passed a large windmill with its sails whirling round in grand style. It was quite impressive and we stopped to watch it. These windmills, which are such a feature of the Broads, are really wind-driven water pumps. They lift the water back into the rivers from the dykes that divide the marshes into plots and serve the dual purpose of hedge and drainage system. After a fall of rain the marshman goes round and starts up the mills in the area for which he is responsible. In this way the marshes are kept dry and in a fit condition for grazing cattle on.

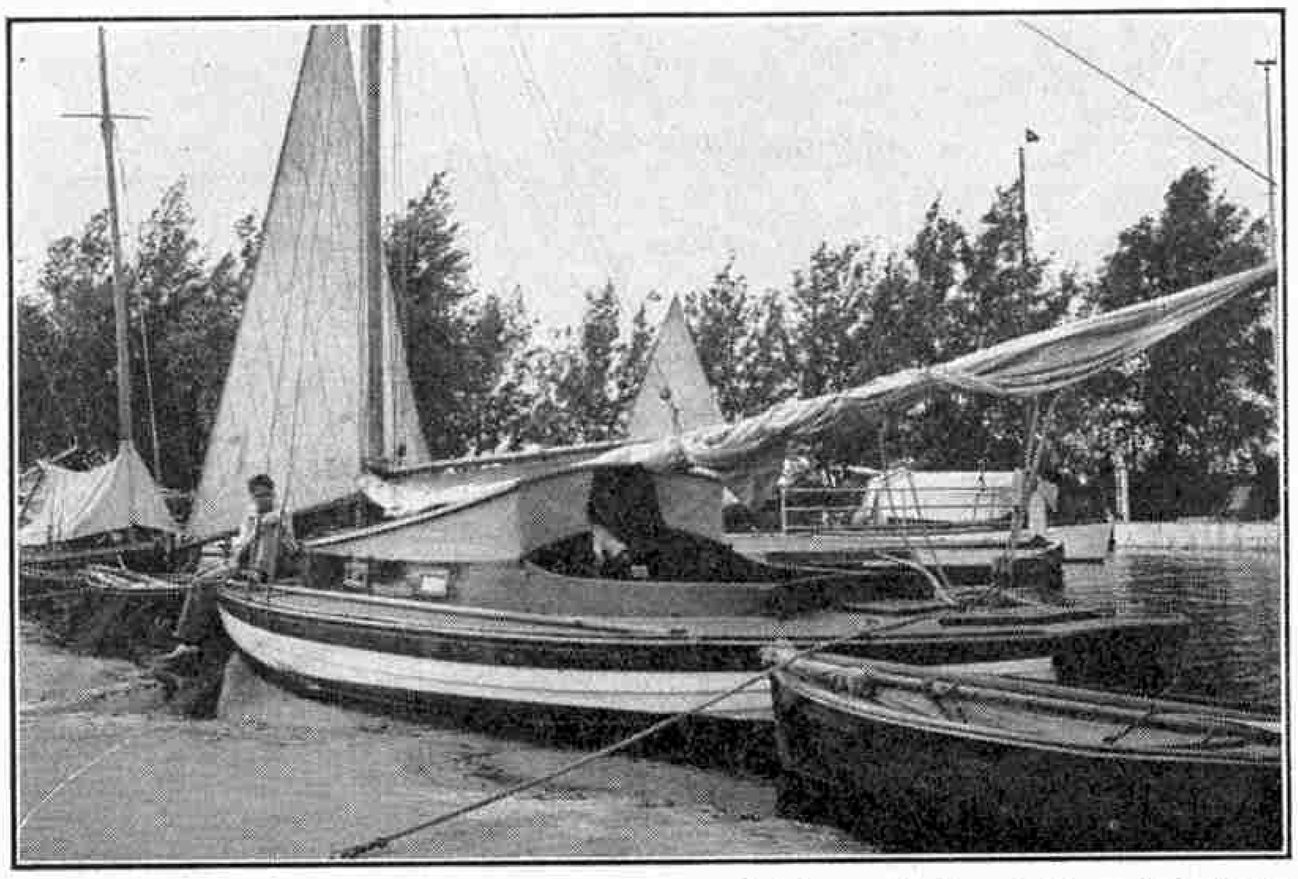
Towards Irstead the river banks become wooded and the scenery is very pretty indeed. We were soon on to Barton Broad. This is a large wild Broad, with edges bordered by reeds and small island-like areas of reeds sticking up here and there. We crossed it to the village of Barton Turf, where we had tea at the village post office, and after a short walk ashore decided it was time to be returning.

The run back to Ludham was uneventful though somewhat prolonged. The wind dropped completely, as it often does in the evenings, and we had to take to the oars, getting back to the "*Norman*" just as it was getting dark.

The following morning was a glorious one, and after a hasty breakfast we set sail and headed down the Ant for Acle Bridge. There was a real stiff breeze and we were soon back on the Bure. We passed the mouth of the Thurne and from there to Acle Bridge the

river was wide and gave us a fine morning's sail. We sailed in company with a number of other boats, some larger than ourselves, others smaller, and as it seemed an excellent opportunity to test the "*Norman's*" capabilities we set out to see if we could not work our way up and become the leading boat. It required some skill, for owing to the narrowness of the river one often had to go about suddenly to avoid running down the boat ahead. However, by dint of much cunning and a few well timed short tacks we succeeded and led the fleet into Acle.

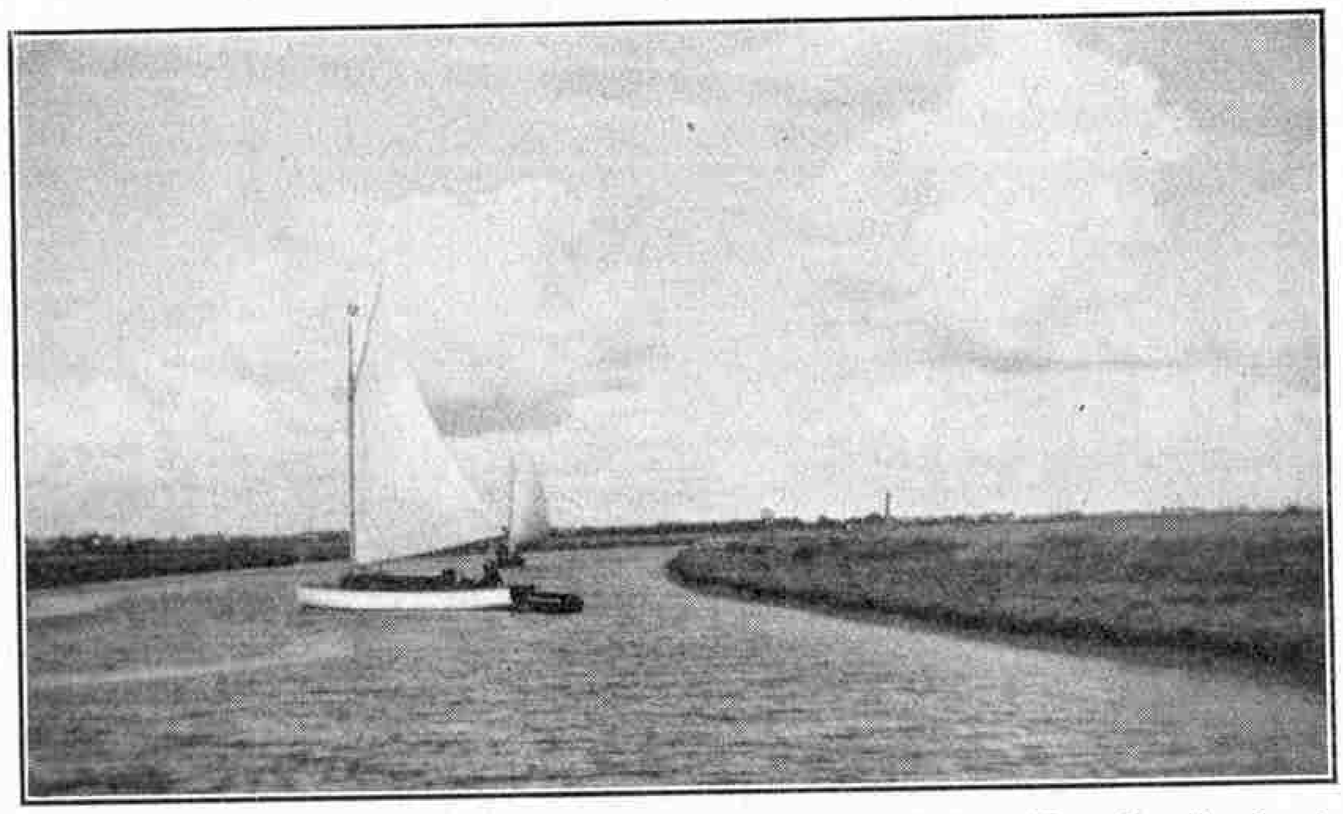
We did not stay long, as it was a perfect day for sailing, and we set off for Potter Heigham as soon as we had restocked the larder. The river is wide and deep, and there are no trees to spoil the breeze in this part of the Broads. White fleecy clouds sped across the sky, the wind was stiff and steady and the Sun shone brilliantly. The "*Norman*" lay over with her lee rail skimming the surface of the water, and every now and then, as a motor cruiser passed and we ploughed through her wash, the spray flew up over the bows and into our faces. It was grand and we kept going with a free wind nearly all the way into Potter Heigham, where we found a berth near the Bridge and tied up for the night.



Tied up at Hickling Staithe after sailing up from Potter Heigham, with the wind becoming almost squally and dark masses of cloud looming up.

The next day we got under way for Hickling. The weather began to break that afternoon. Large grey clouds drifted across the Sun, their shadows making dark patches on the water. The wind moaned across the reeds, coming in strong puffs that were almost squalls and are known as "Rogers" by the local boatmen. The water was greeny grey in colour, with little white-topped wavelets running across it. On the horizon dark masses of cloud piled up, and as the day wore on these became larger and larger and the sunny intervals less frequent. Occasionally heavy squalls of rain swept past. And so on to Horsey Mere, where we moored just off the entrance to the Staithe. The only form of anchor we had was a kedge weighing perhaps 30 lb. This was obviously not going to hold in the gale that was brewing, so we plunged the quant down into the mud as far as it would go and made fast to it as well. Everything seemed to be holding nicely, so cold and wet we turned in.

"What the ———?" exclaimed Bill, sitting up in his bunk next morning and staring out of the cabin door. Bob and I, waking at his exclamation, rubbed our eyes and looked out too. Overhanging the stern of our boat and surrounding us on all sides were tall green reeds. The awful truth gradually dawned on us. We had been blown ashore! Nothing but shiny liquid mud and reeds surrounded us. We jumped out of our bunks and made our way up on deck. There out in the deep water was our quant, lying over at an angle. Our kedge had not held and was still at the end of its rope. We had drifted, our extra mooring had gradually pulled the quant over, and the rope had slipped over the top. We appeared to be hard and fast in the mud. It was a dull dismal morning and it was just beginning to rain again.



Up the Thurne to Potter Heigham on the way to Hickling Broad and Horsey Mere. Here the river is wide, and there are no trees to spoil the breeze for steady sailing.

"The sooner we get out of this mess the better," said Bill. "The first thing we have to do is to get that wretched quant back." We dived into the cabin again and put on the first clothes we could lay hands on. With great difficulty we got the dinghy off the mud and rowed out to the quant. Getting a quant out of heaven only knows how many feet of mud is no joke. Our efforts at pulling it up nearly sent the dinghy under, but we got it at last and made our way back to the "*Norman*." Before going aboard we hitched the dinghy on to her bows and straining at the oars tried to pull her off, thinking she might come off without our weight in her. But she would not budge. Then Bob went aboard with the quant, and tried shoving over the stern, whilst Bill and I did our stuff with the oars. Still, no movement. We all tried quanting. Then we all tried rowing. Finally we did all the other things one thinks of on such occasions, but it was no use.

"Well," said Bill, "she seems stuck as hard as she's ever likely to be, so I guess we had better get some breakfast and then go over to the Staithe and get some one to tow us off."

The conversation at breakfast was not elevating and is not fit to record. However, before we had finished, we heard the "pop-pop" of a motor engine and someone hailing us. Our plight had evidently been spotted.

"Someone on the lookout for salvage money, even up here," moaned Bill.

It turned out to be a couple of men who had seen our fruitless efforts to get off, and had borrowed a motor boat and come over to see if there was any way in which they could help us.

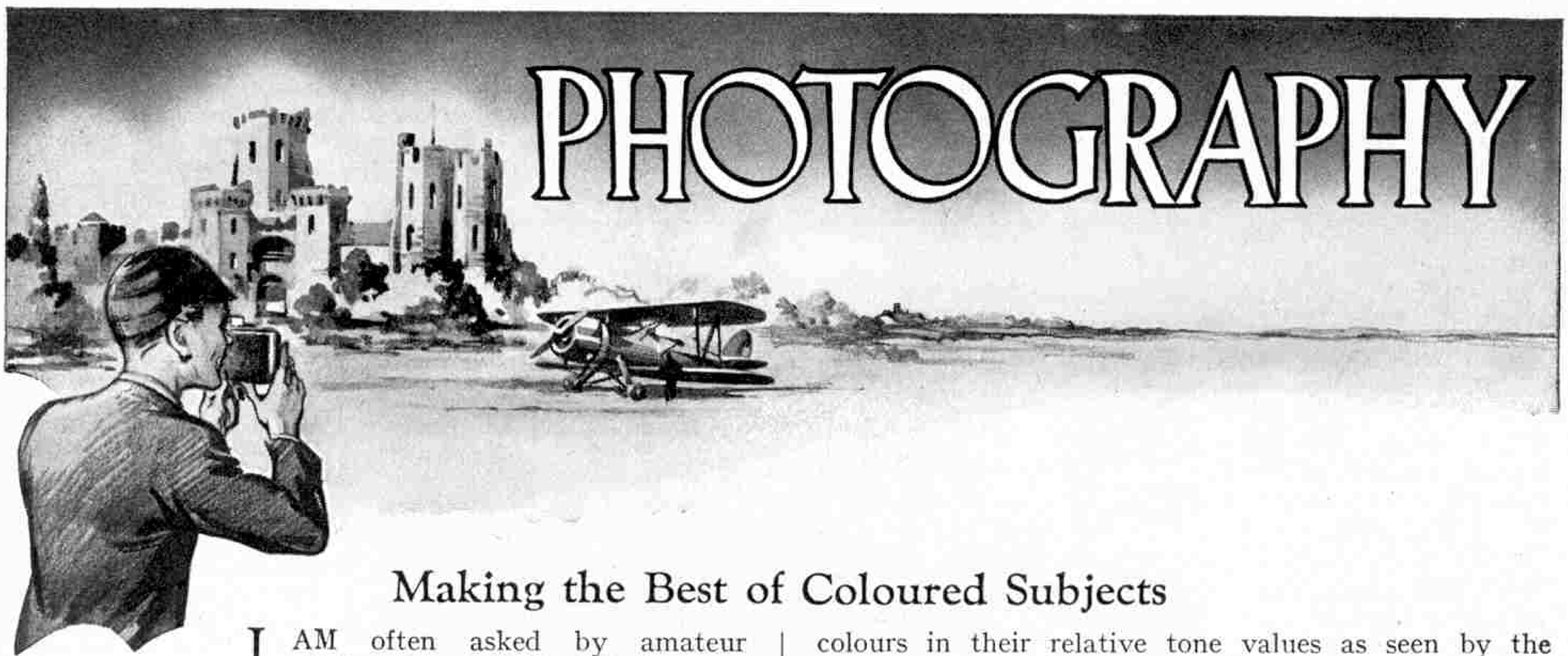
The next quarter of an hour was great fun. I think we all enjoyed it. The motor boat coughed and spluttered, churning up the water as it strained at us. Bill, Bob and I manned the quant and heaved and shoved at it until it nearly broke. Gradually the "*Norman*" moved, little by little, until with a shout from all she slipped off, floating once again in her natural element.

The next time we go up Horsey way, we shall take a proper "hook" with us.

Thursday morning we awoke to find a deluge. We could not possibly start for Wroxham in it. So we spent the morning tidying up, and generally putting things in order. After lunch the rain stopped a bit, so donning oilskins we hoisted the sodden mainsail and jib and set off across Horsey Mere for Potter Heigham.

We were almost the last boat to tie up at Potter that night. The rain had stopped and the wind had dropped a little and we had hopes that Friday, our last day, would be somewhat more pleasant from the weather point of view. It so happened that I had a most important appointment in London at 10 o'clock on the Saturday morning. It also happened that the "depression from Iceland," which we had been experiencing during the two previous days, decided to fill up at approximately noon on Friday. The result was that we had no more wind at all after that, and we had to quant from just below Horning right up into Wroxham. At least Bob and Bill quanted. Bob quanted because he said he liked it, and Bill quanted to give Bob a rest. I did not quant because five minutes after beginning my first effort, I misjudged things and should have had a ducking had not the dinghy been made fast close astern. As it was I succeeded in falling into it instead of into the water. It was therefore thought advisable that I should employ myself at something less skilful, such as packing suitcases and washing up!

We arrived at Wroxham at 9.30 that evening, and at 10.30 we started for home, the journey through the night being adventurous and a fitting conclusion to our week on the Broads.



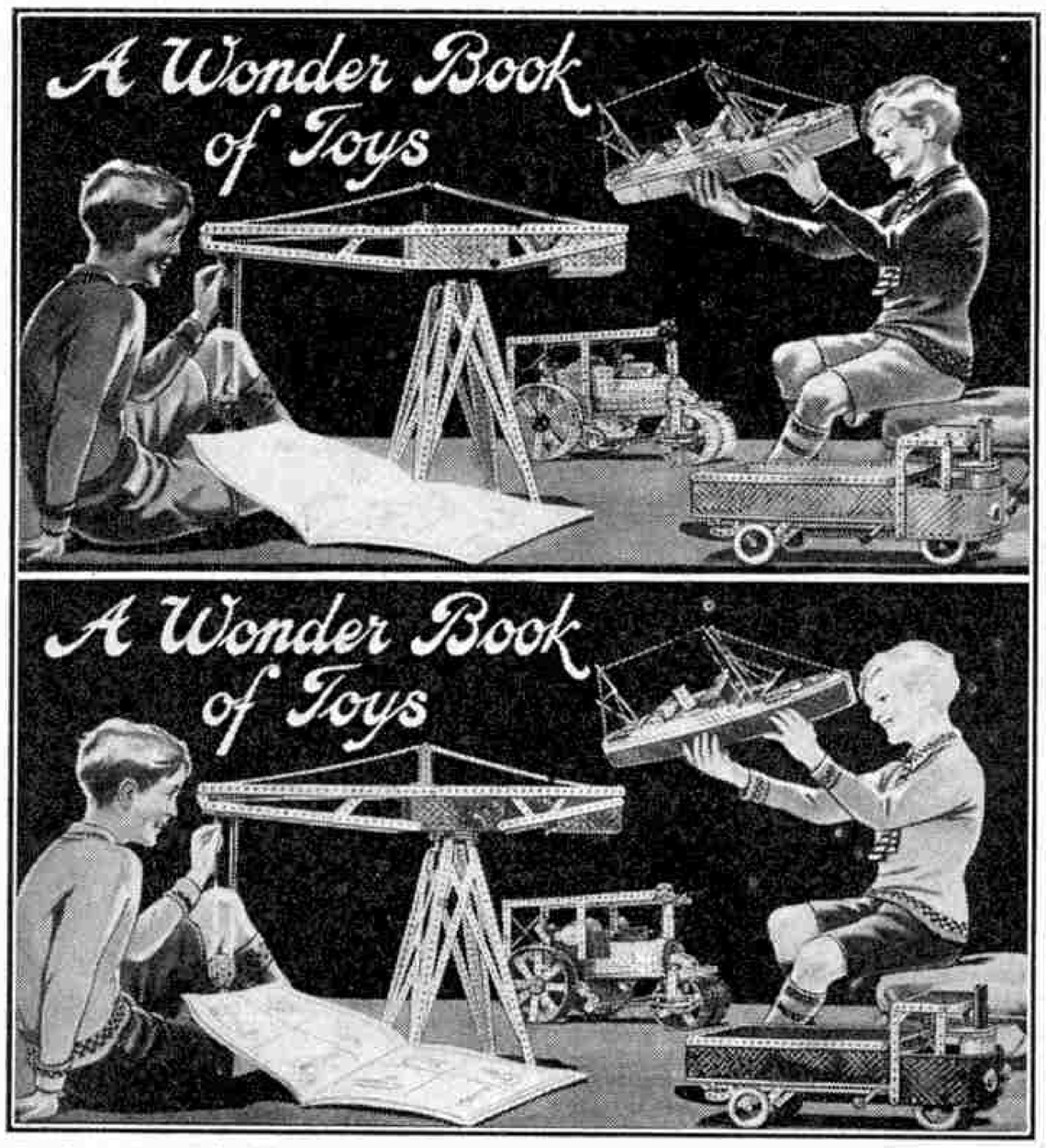
Making the Best of Coloured Subjects

I AM often asked by amateur photographers "Which is the best film or plate?" Apart from material designed for professional and specialised work, there is a wide variety specially suited for the use of amateurs, and beginners in the photographic hobby may well be puzzled as to which to select. All modern films and plates of reputable make are good in the sense that they can be relied upon to do the job for which they are intended, but they differ greatly in their characteristics, chiefly in their speed and in the extent to which they are acted upon by light of various colours. The secret of success therefore lies in using the right type of plate or film for the subject it is desired to photograph.

As readers will be aware, ordinary white light is made up of a number of different rays, which, when separated, are visible to the eye as violet, indigo, blue, green, yellow, orange and red. When an object is illuminated by the white light from the Sun or other source it absorbs some of the rays and reflects the remainder. It is these remaining rays that constitute what we call the colour of the object. Unfortunately for the photographer, however, the photographic emulsion, unless specially prepared, is more or less colour-blind. It is acted upon very strongly by violet and blue, but it is almost unaffected by orange, yellow and green, which are very bright to the eye. Red it does not see at all. The result is that blues are reproduced too light, while other colours appear as black, or at best as dark grey.

It will be seen therefore that if we wish to photograph a coloured object so that a monochrome print, that is a print entirely in one colour, will reproduce the various colours in their relative tone values as seen by the eye, we must make the plate or film more sensitive to colours such as yellow and orange, and at the same time must make it able to defend itself from too powerful attacks by violets and blues.

Both of these requirements are almost completely fulfilled by modern orthochromatic and panchromatic films and plates. The first is accomplished by including various colouring matters in the sensitive emulsion during manufacture, while the second is effected by placing a coloured screen or light filter in front of the camera lens when an exposure is given, so that the subject is photographed through it. The filter acts as a kind of sieve and prevents certain portions of the violet and blue rays from reaching the sensitive surface.



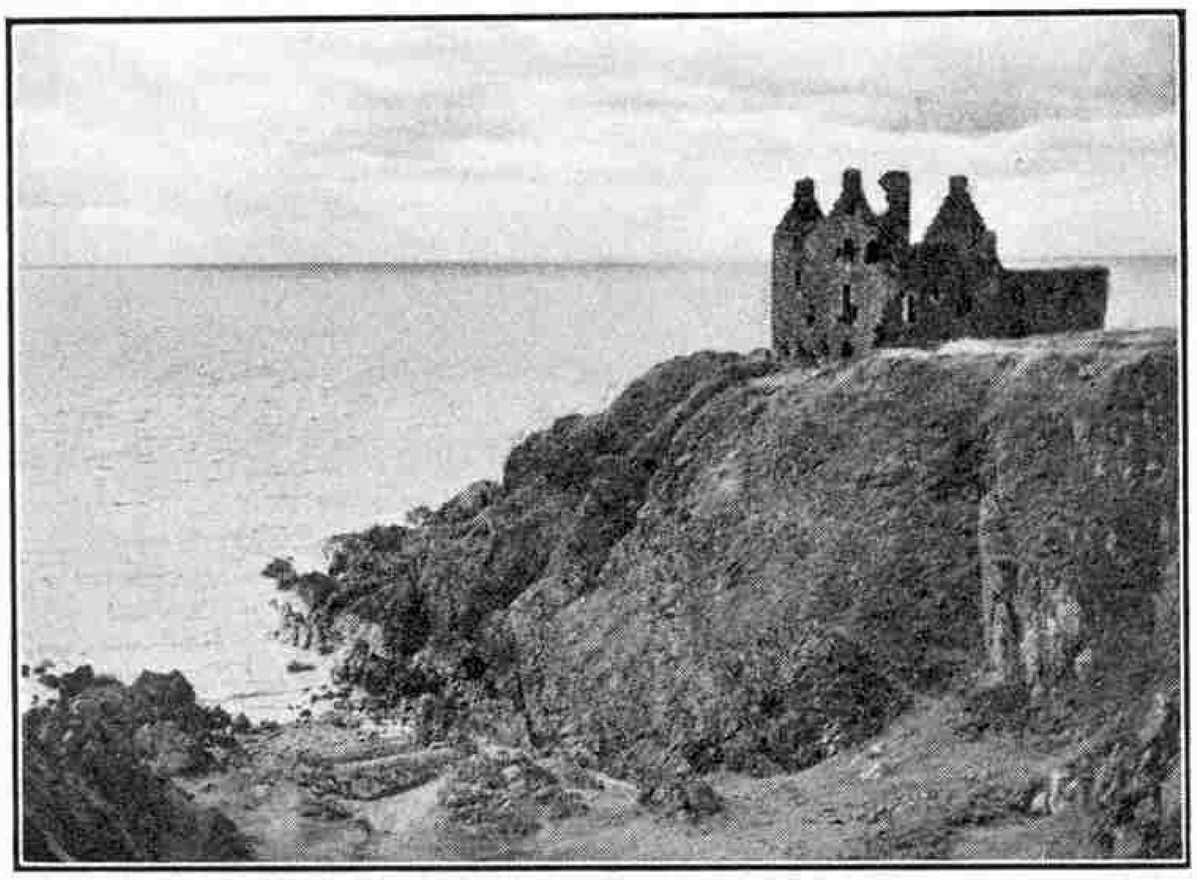
Readers who are familiar with the cover of the Meccano catalogue will realise the striking differences in colour rendering shown in these two illustrations. The upper one was photographed on an orthochromatic film and the lower one on panchromatic material.

Orthochromatic, or isochromatic plates and films, as they are sometimes named, are those that by the addition of dyes are capable of being acted upon by yellow and green light rays as well as by blue. They are not sensitive to red light, however, but this is not a drawback with many subjects, and for all general purposes orthochromatic materials will give excellent results. Some of them are of very high speed and are very suitable for snapshot work. However, to get the best possible results from an orthochromatic film, and to cause it to render blues, yellows, and greens in proper tone values, it is necessary to use a yellow filter, the colour of which serves to tone down the blue in the subject and prevent it from acting too powerfully on the sensitive surface.

Panchromatic or "pan" films and plates are those whose sensitivity has been extended to make them react to red and orange light as well as to yellow, blue and green. They

give more life-like reproduction of colours than any other type and as they are acted upon by all the colours of the spectrum they can be made extremely fast, thus allowing very short exposures to be given even under difficult conditions when the light is not too good.

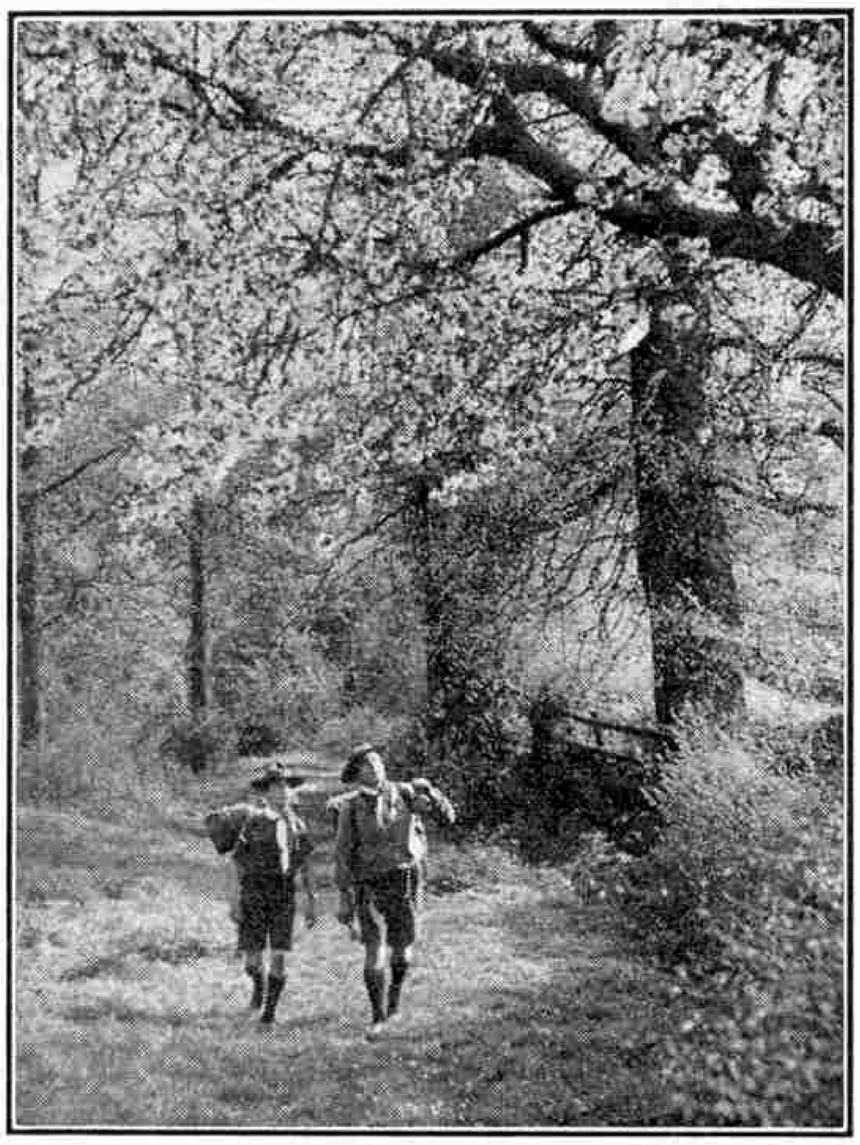
Panchromatic plates or films can be used to advantage for practically every subject, and as they are sensitive to red light they are useful for photography in the early morning or late evening, when there is more red in natural light than during the daytime. They are also particularly suitable for photography by artificial light, which contains a large amount of red and orange, and therefore can be used for photographing theatre scenes by means of the ordinary stage lighting arrangements.



"Castle of the Western Isles." An interesting photograph by F. Culverhouse, Sheffield.

In order to illustrate the effects produced by the same coloured subject first on an orthochromatic film and then on one of the panchromatic variety, I have prepared the two prints reproduced on the opposite page. The subject is the coloured front cover of a Meccano and Hornby Train catalogue, and the illustrations show in a very striking manner how the various colours were recorded by the two kinds of sensitive materials.

The colours of which the design is composed range from blue to red, including green, yellow and orange. The boys are shown against a background of dark green, and both of them are wearing blue trousers. The boy on the right has on a red jersey, while his playmate has an orange-coloured jersey. At the foot of the cover is a broad band of green with a black edging, and the words "A Wonder Book of Toys" are in yellow. The various models are in the familiar Meccano blue and gold colours. Both plates were exposed without filters, and the prints were made on the same make and grade of paper. Readers who are able to compare the illustrations with the actual catalogue cover will see that red and yellow are reproduced with much greater accuracy on the panchromatic film than on the orthochromatic film. A particularly striking instance of this is to be seen in the check pattern band on the boys' jerseys.



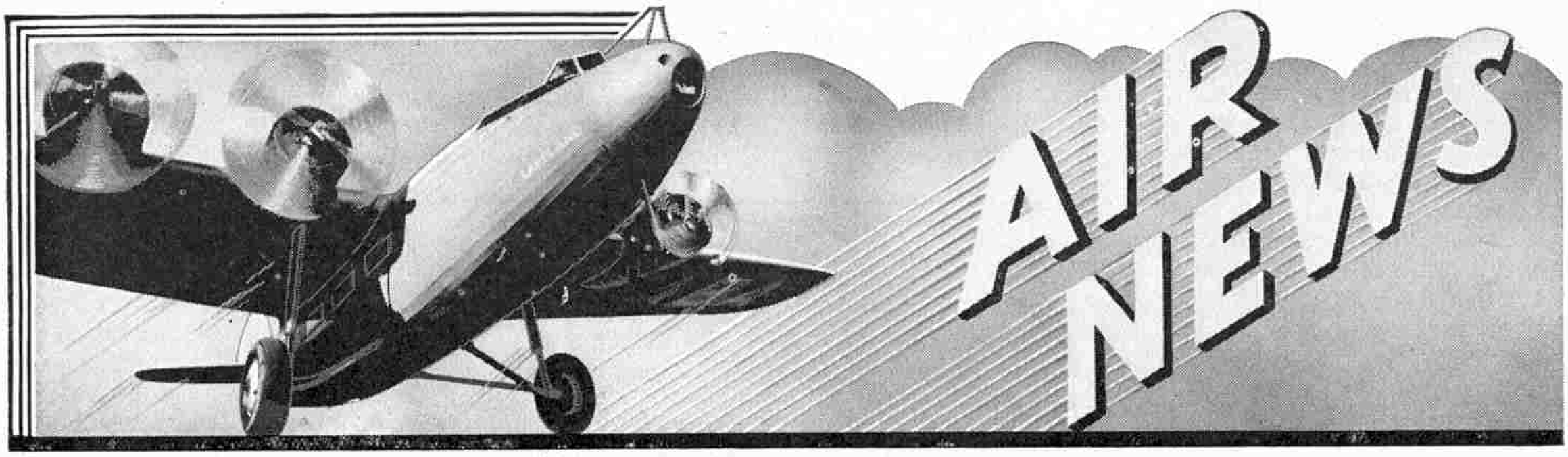
"Springtime in the Woods," by James Hampson, Edgware. Topical photographs of this kind provide plenty of scope for experiments with filters and panchromatic materials.

Even orthochromatic and panchromatic plates and films, however, are not affected by colours to exactly the same extent as the eye, and when the very best results are required it is necessary to use a filter. The latter is really a coloured screen, which is placed in front of the lens while the photograph is being taken. Filters are available in various colours, and are provided with a mount for attachment to the camera lens.

It would take much more space than I have left this month to explain the effects of using filters of different colours, but I hope to be able to deal with this matter in detail in the "*M.M.*" in due course. For the guidance of readers who have not used a filter of any kind, however, and who wish to experiment, I suggest that one of the medium yellow variety will be most generally useful. A filter of this type can be used with either "ortho" or "pan" materials, and will give excellent results on most daylight subjects that the amateur is likely to tackle.

Amateur photographers who specialise in open landscape and sea pictures will find a filter of great assistance in obtaining good cloud effects, thus eliminating the unpleasant "whitewashed" sky that is the ruination of many otherwise attractive prints. A filter is also particularly useful in photographing gardens and flowers, and there are many other colourful subjects such as woodland and countryside scenes that can be properly recorded only when a suitable filter is used. For example, suppose it is desired to photograph a cornfield dotted with masses of blue cornflowers and red poppies, the scene being set against a background of blue sky in which glorious white clouds are floating. A scene of this kind can be properly shown only by using a yellow filter, for the sensitivity of the film to blue is so great that without a filter, unless a very short exposure were given, the blue flowers and sky would appear almost white on the print and the fine clouds would be indistinguishable! As the yellow cornfield also would appear light the blue flowers would not stand out in anything like the same contrast that they did in the actual scene. A yellow filter, however, will tone down the blue in the subject and prevent it from affecting the film or plate too strongly.

It must not be thought, however, that the use of a filter alone will ensure perfect results. A great deal depends on giving a correct exposure time for the subject and lighting conditions, and this should always be taken from a meter or calculator. It should be noted also that filters increase the exposure required because they absorb part of the light passing through them. Exact details of the increase required over normal exposure will be found in the lists given by makers of filters and films.



New Boeing "Flying Fortress"

The illustration on this page shows the first of the new Boeing YB-17A "Flying Fortress" Bombers now being built by the Boeing Aircraft Company for the United States Air Corps. This 20-ton, four-engined aeroplane is similar in general design and identical in size to the well-known B-17 "Flying Fortresses" in service with the Corps. It is intended for operation in the stratosphere, and is fitted with special engine superchargers that enable the engines to maintain approximately their maximum power output in spite of the decreased density of the air at high altitudes.

The new "Flying Fortress" bomber is armed with five machine guns, and carries a crew of seven to nine men, consisting of a commanding officer, pilot, second pilot, navigator, engineer, bomber, radio operator, and one or two gunners. All the members of the crew can freely change stations while the aeroplane is in the air, and on long flights sufficient extra men can be carried to enable the operators of the aeroplane to be relieved from time to time. It is fitted with four Wright "Cyclone" engines, and if necessary can fly and maintain height with only two of them working, a safety factor that practically eliminates the possibility of forced landings due to engine failure.

Balloon Barrage Squadrons

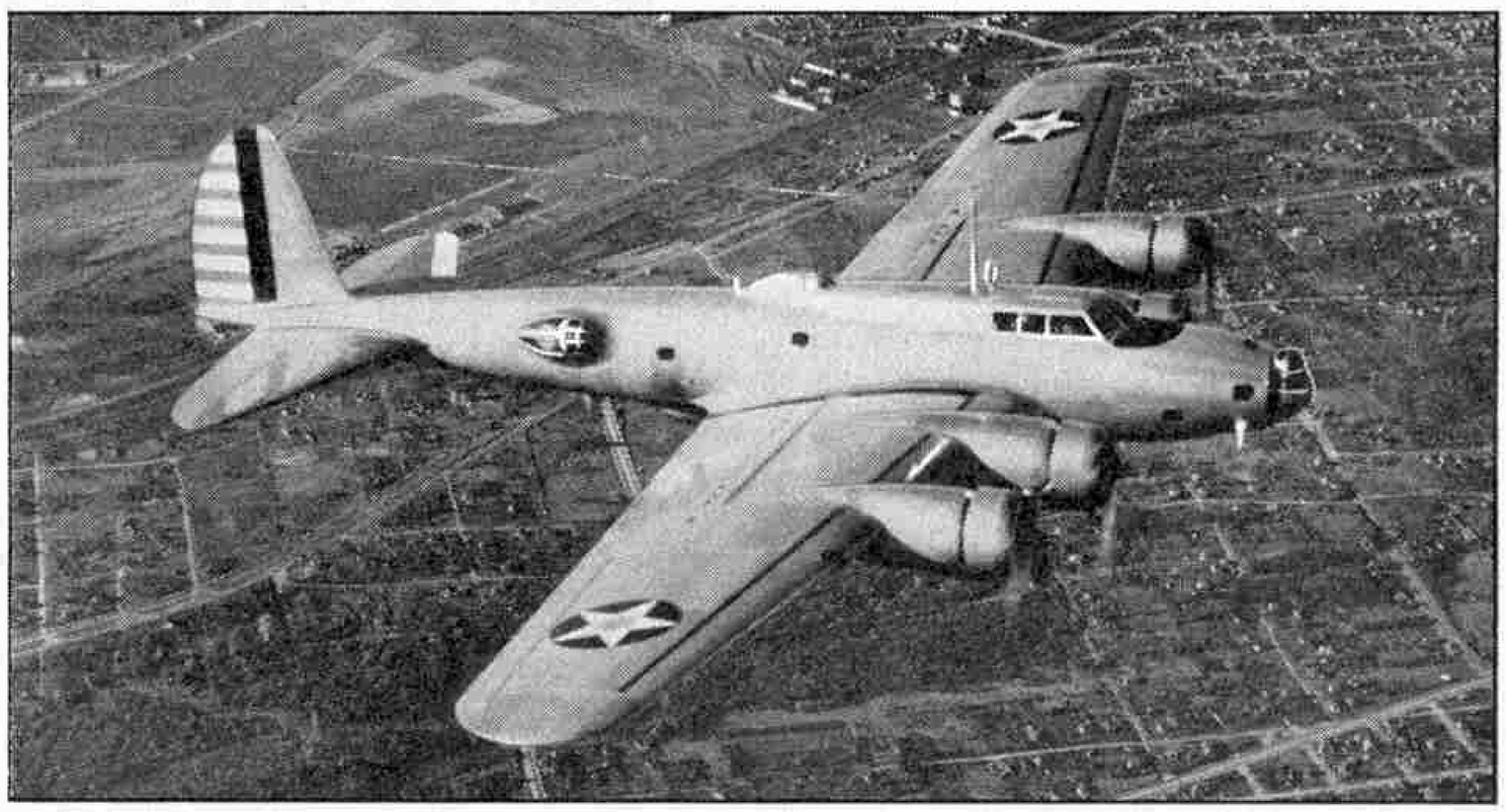
The Balloon Barrage squadrons of the Auxiliary Air Force are being organised to provide defence against attack by hostile aircraft in defined areas. They are being formed in London and certain parts of the provinces, and when equipped with mechanical transport and balloons they will be ready to play their part as an important line of defence. Good progress is being made with the scheme.

Most of the men enrolled are volunteers recruited from the Auxiliary Air Force and the local Territorial Associations. Candidates must be at least 25 years of age, but normally must not be older than 50. Men under 25 may be accepted, however, if, although not physically fit for ordinary enlistment in the Auxiliary Air Force, they are of a suitable standard of health for the Balloon squadrons. The age limits for candidates seeking appointments to commissions are 32 and 50 years, but special consideration may be given to older applicants. Men will be engaged for a period of four years, with opportunities for re-engagement, and officers for an initial period of five years, to be followed by five years in the Auxiliary Air Force Reserve of Officers.

Both officers and men are required to carry out 30 hrs. training every year, and to attend at annual camp for 15 days. The rates of pay are the same as in the R.A.F.

Blind-Flying Course for French Pilots

The instruction given to pilots of Air France includes a blind-flying course at the company's training ground at Trois, and a novel method is employed to make them familiar with the signals sent out by an approach transmitter. A portable receiver is fitted to the waist of the pilot, and earphones are attached to the receiver. The pilot is blindfolded and then has to walk forward, receiving the audible signals of the transmitter through his earphones and correcting any deviation he makes from the correct path. This deviation is made known to him by the transmitted signal changing to dots or dashes, according to whether he has wandered to the right or to the left. It is reported that this practical training has proved so effective that Imperial Airways are sending some of their pilots to the Air France training ground to undergo the blind-flying course.



The first photograph of the new Boeing YB-17A "Flying Fortress" Bomber. It carries a crew of seven to nine men, and is fitted with special engine superchargers for operation at very high altitudes. Photograph reproduced by courtesy of the Boeing Aircraft Company, U.S.A.

R.A.F. Long-Distance Record Confirmed

The non-stop flight from Ismailia, in Egypt, to Darwin, Australia, on 5th November 1938 by two Vickers "Wellesley" bombers of the R.A.F. Long Range Development Unit has now been confirmed as a world record by the Fédération Aéronautique Internationale. The distance flown is given officially as 7,158·653 miles. It will be recalled that three machines took off from Ismailia, and that one ran short of petrol and had to land at Koepang, on Timor Island. This aeroplane had covered 6,658·452 miles, and the Fédération have confirmed this as a record at that time.

Exporting Empire Produce by Air

Interesting experiments are being carried out to test the practicability of transporting fresh Empire garden produce to England by Imperial Airways flying boats. Specially selected consignments of fruit and vegetables are brought from overseas in these aircraft, and on arrival in London are examined by experts from Covent Garden market. The experts then send the exporters any suggestions that may arise as to the selection of the produce, and the kinds of packing to be adopted.

One recent test concerned a special consignment of fresh green peas from the fertile delta of the Nile. The shipment consisted of two sacks of peas in the pod, one box of unshelled peas packed in dry ice, and a box of shelled peas without ice. The peas were flown from Egypt to England by Imperial Airways flying boat in a day and a half, whereas they would have taken about 12 days to reach this country by surface transport. In London the peas were examined by experts, who found them to be in excellent condition and decided to display them at once on the market stalls.

Autogiro School for Civil Air Guard

The Cierva Autogiro Company have established a Civil Air Guard school at Hanworth aerodrome, where accommodation for instructors and pupils has been built in one of the large hangars. The cost of instruction is 5/- for week-days and 10/- for weekends. Cierva C.30 type Autogiros are used, and it is estimated that a pupil can qualify for his licence in 15 hrs.' flying.

R.A.F. Vacancies for Apprentice Clerks

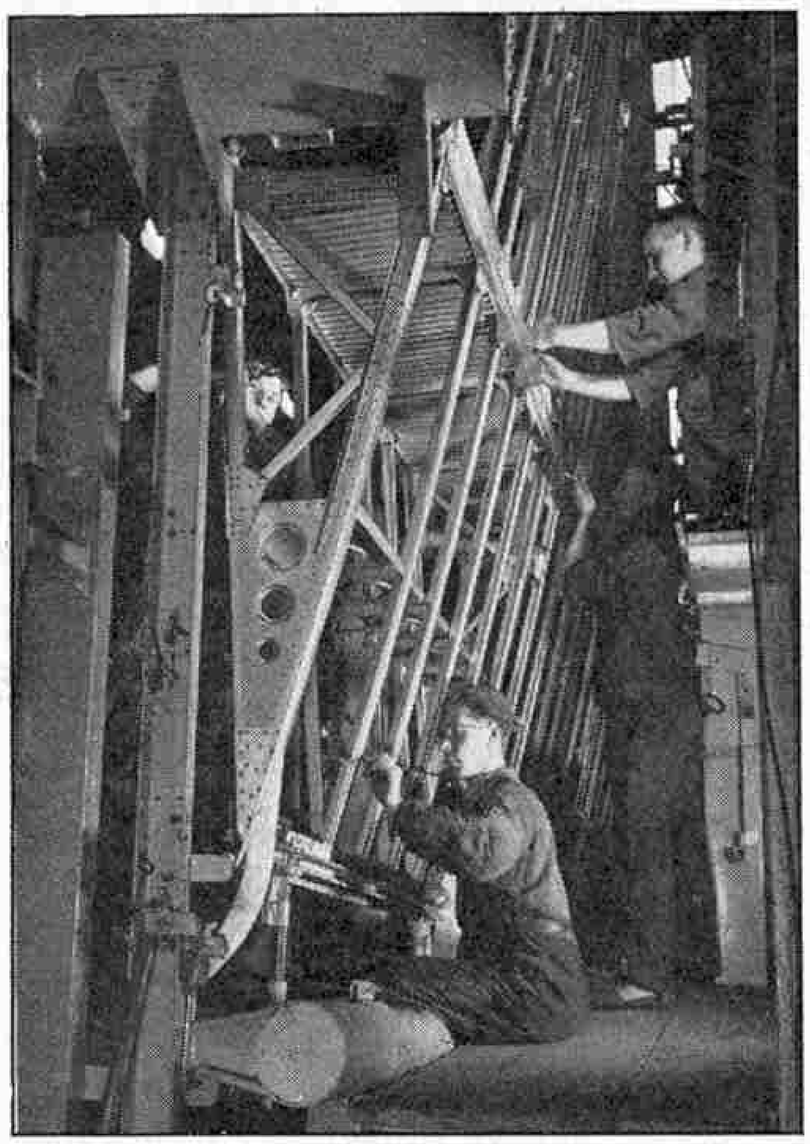
The Air Ministry announce that owing to the continued expansion of the Royal Air Force a substantial number of boys of School Certificate or approximately equivalent educational standard will be required next month to fill vacancies for Apprentice Clerks.

Candidates must be between 15½ and 17¼ years of age on 1st April next, and those who are successful will undergo a thorough course of training in clerical duties during their first 18 months' service. They will be attested for 12 years' regular Air Force service from the age of 18 years. The work on which the Service Clerks are employed is varied, and includes administrative duties, shorthand, and in some cases accounting for pay and equipment. They are usually required to spend part of their Service life overseas.

A limited number will be permitted to re-engage to complete 24 years' service and so qualify for an R.A.F. pension. Those who return to civil life after completing only the first period of 12 years' service will be given an opportunity of entering the R.A.F. Reserve and of drawing a gratuity of £100.

All Apprentice Clerks have an opportunity to volunteer for training as airman pilots, and those who are selected become Sergeant Pilots when they have completed their training, and are employed on flying duties for six years. Airman Pilots who are specially qualified may be recommended for permanent commissions in the General Duties Branch, and a limited number of permanent commissions may be granted also in the Accountancy and Equipment Branches to ex-apprentice clerks.

The conditions of entry are given in A.M. Pamphlet 9, a copy of which may be had upon application from The Inspector of Recruiting, Royal Air Force, Victory House, Kingsway, London W.C.2.



Building up in a big frame the wing of a Junkers Ju 90 air liner. A special article on this aircraft appears on page 215. Photograph by courtesy of Junkers Flugzeug- und -Motorenwerke, A.-G., Dessau.

Long-Distance Air Routes in 1939

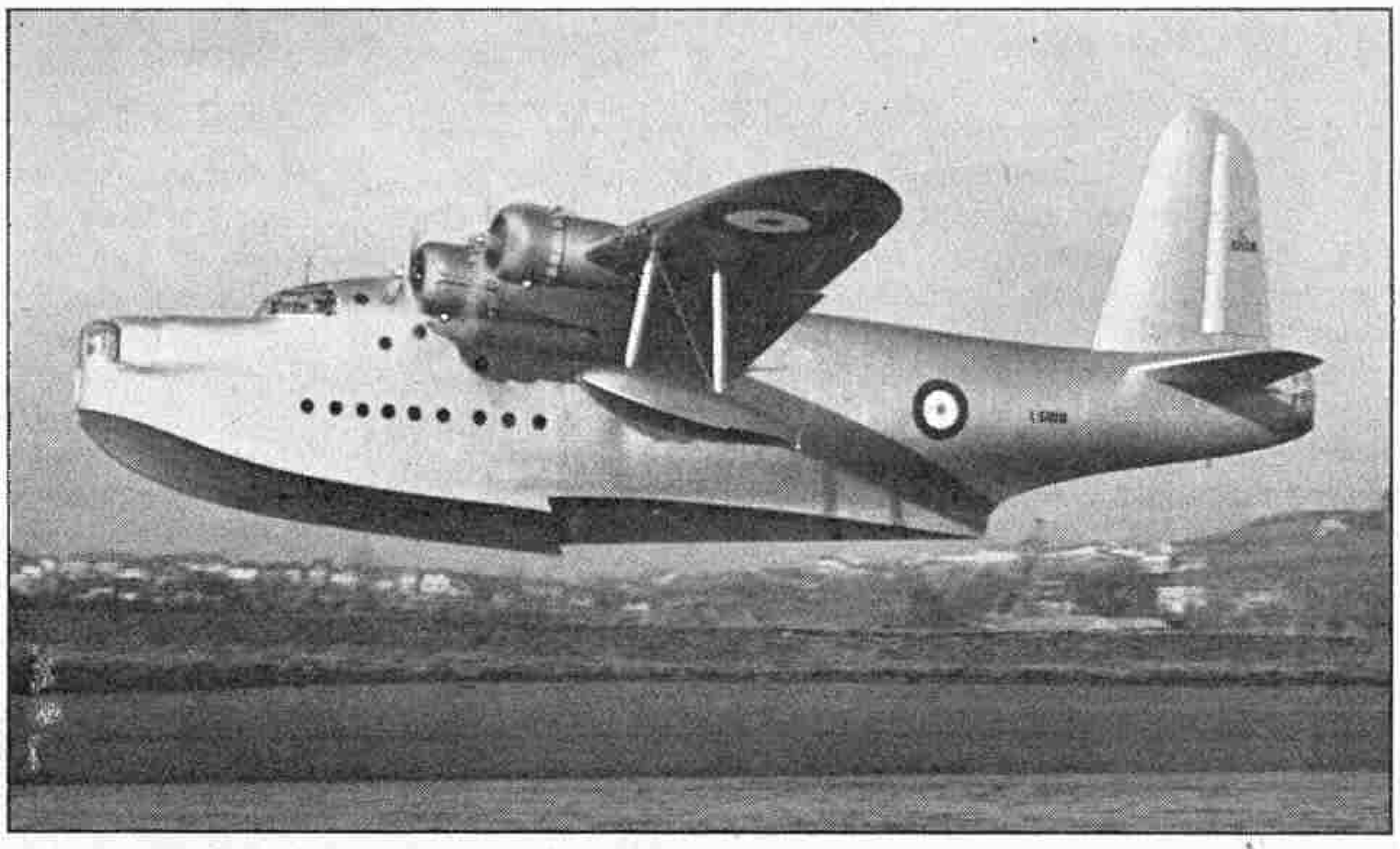
This year will be outstanding in regard to new long-distance air routes that will be inaugurated. These will include two new Imperial Airways flying boat routes, the 1,400 miles Australia–New Zealand service across the Tasman Sea and the 3,277 miles transatlantic service between Southampton and Montreal by way of Eire and Newfoundland. The new services will greatly increase the total length of Imperial Airways air routes, which already amounts to just over 335,000 miles. Another new Imperial Airways service will be one between Europe and Hong Kong by way of Burma and Yunnan. This will be worked in co-operation with the China National Aviation Corporation, who will be responsible for the Chinese portion of the service.

Negotiations are in hand between China and the U.S.S.R. for a proposed through passenger and air mail service between the two countries. The Government of Turkey have granted licences to Ala Littoria, the important Italian air transport company, and Deutsche Luft Hansa, the chief German air line, for the operation of air services between Turkey, Italy and Germany. In both cases the Turkish terminus will be Istanbul.

British internal air lines are also being further developed. Western Airways are planning to inaugurate a half-hourly day service between Weston-super-Mare and Cardiff. The service will be introduced on 1st May next, and D.H. "Dragon Rapide" twin-engined air liners will be employed. The first service of the day will leave Weston-super-Mare at 8.20 a.m. and the last one will leave Cardiff at 10.30 p.m. There will also be a Bristol-Swansea service, via Cardiff.

New Helicopter Height Record

A new height record for helicopters was achieved recently by the German airman, Herr E. Rohlfs, when he flew a Focke-Achgelis machine of this type to a height of 10,700 ft. This was 3,750 ft. higher than the previous record figure, set up by this machine in June 1937.



A Short "Sunderland" flying boat for the R.A.F. taking off from the River Medway, at Rochester, for a test flight. It has been developed from the Empire flying boat. Photograph by courtesy of "Flight."

Clearing Away Fog at Aerodromes

In spite of the invention of blind-flying instruments and blind-approach landing systems, fog continues to be a serious hindrance to regular air transport operations during winter. The London and Counties Coke Association are tackling the problem from another angle, and for some time they have been studying the use of heated coke as a means of causing the fog to lift to a certain height, or "limited ceiling." The research has not yet progressed far enough to prove that the heat could be made quickly enough, or in a really practicable way, on the large scale that would be necessary.

More British Airports

The new airport at Grangemouth is almost completed, and is to be opened on 1st May next It is the largest in Scotland, and is almost circular in shape. The runway is over a mile long, and has been laid out with due regard to the contour of the surrounding country. Aeroplanes taking off from it in foggy weather or mists will be able to follow a flight-path free from obstruction, and those arriving during fog will be directed by radio beam along an approach path that will bring them over the Firth of Forth to the runway. The airport has cost about £200,000.

A new airport at Guernsey is to be opened on 5th May next by Sir Kingsley Wood, the Secretary of State for Air. A large hangar at the airport will be rented by Guernsey Airways.

The Bristol "Perseus X" Aero Engine

The Bristol "Perseus X" aero engine has been ordered in large numbers by the Air Ministry for certain very important new aircraft shortly to go into service with the R.A.F. It is the first highly-supercharged sleeve-valve engine to be put into production.

The "Perseus X" develops a maximum power of 880 b.h.p. at the high altitude of 15,500 ft. This is an advance on the performance of the Bristol "Mercury VIII" poppet-valve engine of the same size, which develops 840 b.h.p. at 14,000 ft. and has become famous for its power at high altitudes. The "Perseus X" has passed the official 100 hrs. type test.

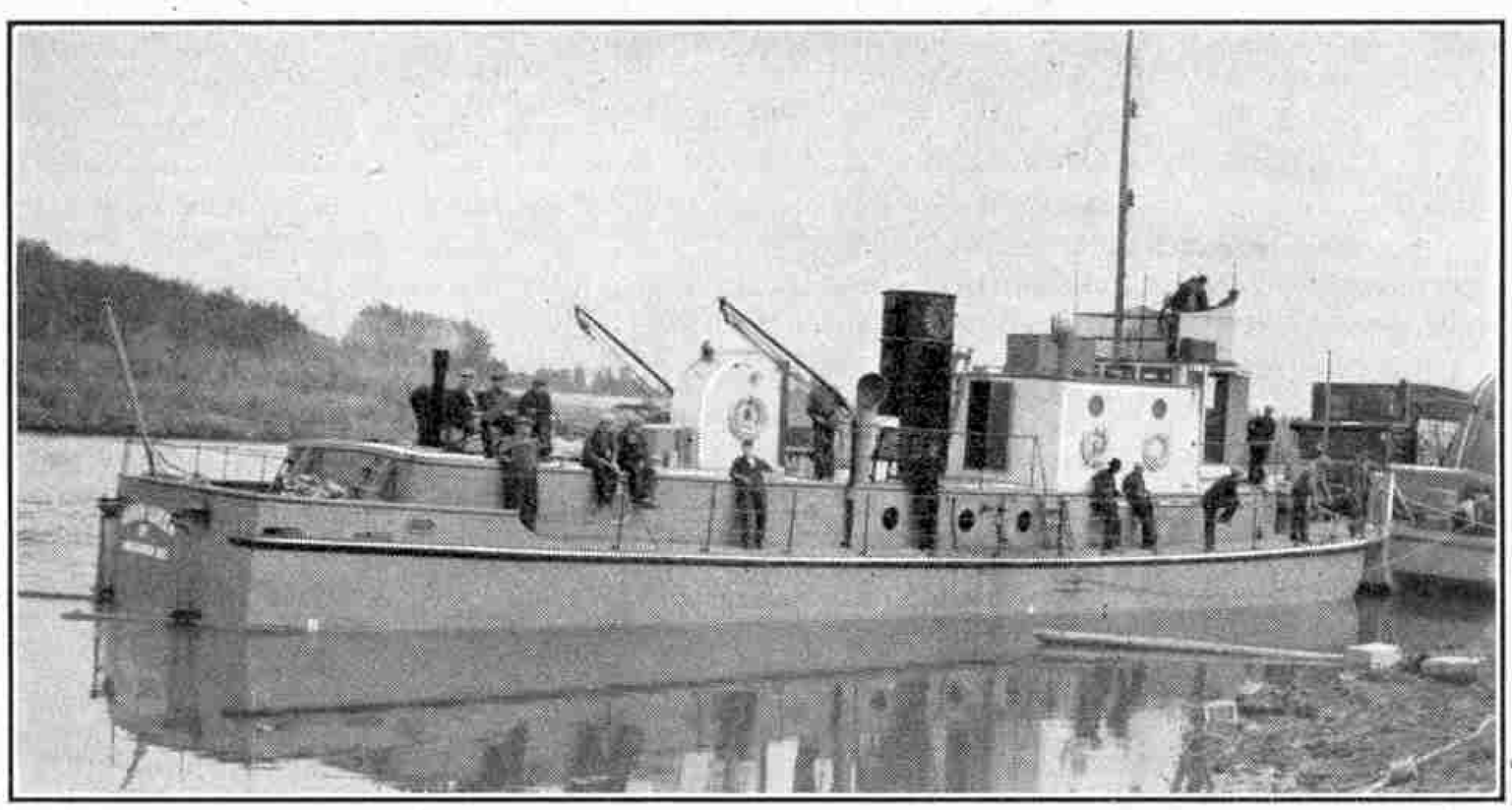
Canada's Most Northerly Mines

Boats Taken to the Arctic in Sections

By James Montagnes

BECAUSE the far northern areas of Canada are now becoming important commercially with the discovery of much gold, silver, oil and radium, transport in Canada's North-West Territories is a booming business. So important is it in this region, the most southerly sections of which are at least 600 miles from a railway, that in 1937 one large mining company had two all-steel Diesel-engined boats specially built at naval shipyards in eastern Canada for service there. These boats were then cut into sections, placed on railway flat cars, and hauled nearly 3,000 miles across Canada to the end of the railway at Waterways, Alberta, where a crew from the shipyard started to put one of the two together so that it could haul the sections of the other 300 miles to the next waterway for assembly there.

Hauling the two boats practically across a continent was an epic in transportation history. At Waterways, the first boat, the "*Radium Queen*," was hauled during the winter months in sections by sled to McMurray, where the Athabasca River becomes navigable. There she was put together by welding instead of riveting. This process was used in order to save weight, and the boat is 20 per cent. lighter than she would have been if the more usual method had been employed.



The "Radium Queen," a steel Diesel-engined boat built in Eastern Canada and taken in sections to McMurray, Alberta, for assembly. The vessel now plies on the Athabasca River.

When the "*Radium Queen*" was launched at McMurray, the crew of 35 men from the shipyards made tank barges for the vessel to tow down the Athabasca River. The barges were designed to hold fuel oil in tanks built into them, and also to carry vast loads of mining machinery, food supplies, clothing, lumber, office furniture, electric lighting plants, refrigerators, and the many other necessities of mining camps in the far north. The first tank barges were loaded with the sections of the second boat, the "*Radium King*," and the "*Radium Queen*" pulled the barges down the Athabasca to Fitzgerald, where shallow rapids made further progress impossible. The "*Radium Queen*" now plies on the Athabasca between Fitzgerald and McMurray.

At Fitzgerald a road has been built for 16 miles past the treacherous rapids, and over this the sections of the "*Radium King*" were portaged to Fort Smith, capital of the North-West Territories. Petrol tractors pulled the sections on specially designed sledges, and on the water's edge at Fort Smith the "*Radium King*" was welded together, the crews taking advantage of the 21 hours of sub-Arctic daylight during the summer months to rush the job to completion. The navigation season from Fort Smith down the Slave River to Great Slave Lake, across this and down the Mackenzie River to Fort Norman is from 15th June to 1st October, ice covering the rivers the rest of the year. This is the run of the "*Radium King*," a distance of 820 miles.

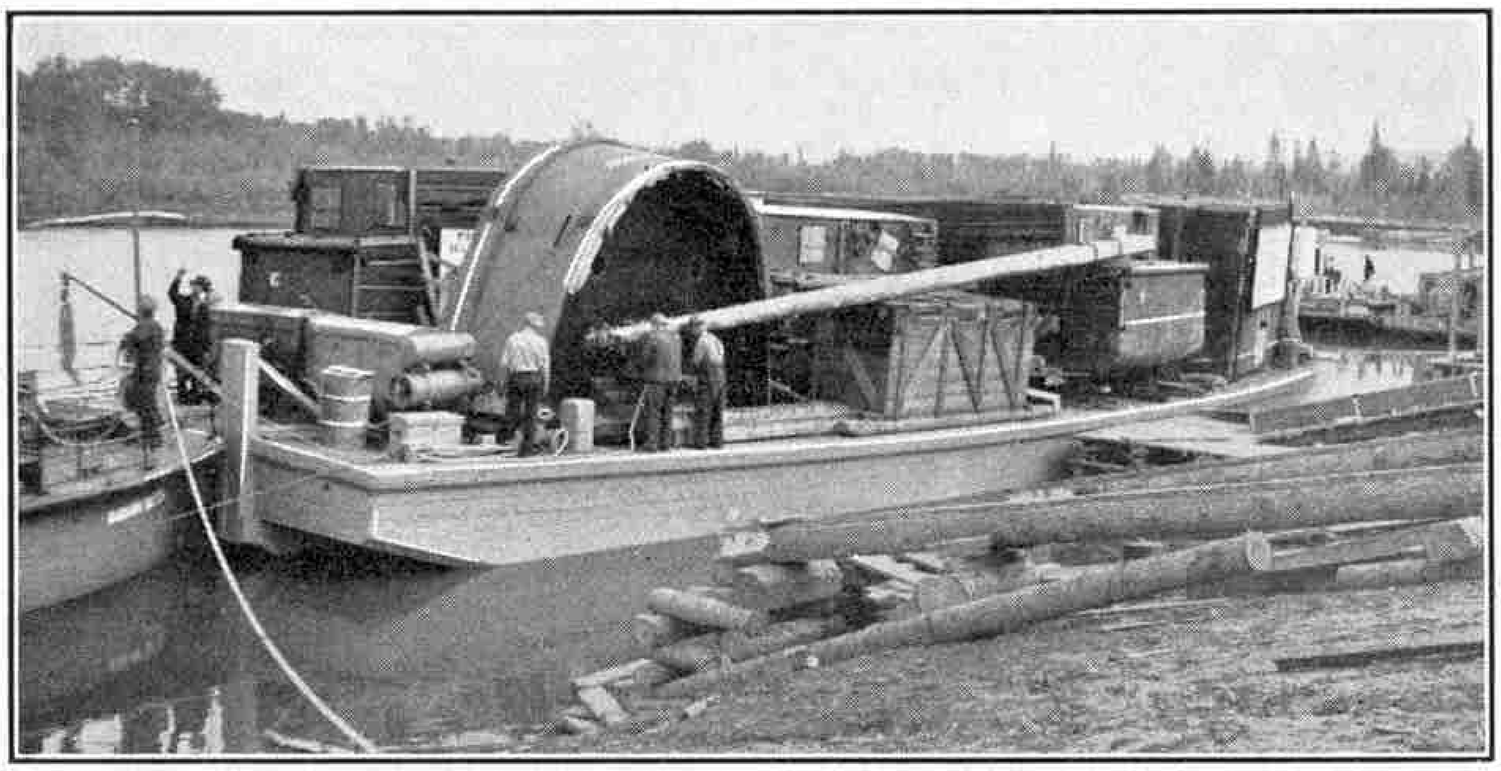
The two boats were designed to draw less than 21 in. of water when fully loaded, as many sections of the Athabasca and Mackenzie Rivers are very shallow. Both have oil-burning engines that use the fuel from the wells at Fort Norman, which is not far south of the Arctic Circle. They are fitted with refrigeration plants for the transport of fresh vegetables, fruit, milk and meat to the Arctic mines during the summer months.

These two boats are the first oil burning all-steel boats in Canada's far north, where until their arrival only a few wood-burning paddlewheel steamers navigated the sub-Arctic rivers. They are operated by the Northern Transportation Company and Eldorado Gold Mines Ltd., and will serve principally the mines operated by the latter company, which include the big radium and silver mine on Great Bear Lake, 26 miles south of the Arctic Circle. On their up-river trips to Fort Smith and McMurray respectively, the ships and their barges will carry tons of silver and radium concentrates for carriage by rail to the refineries. It is interesting to note that when the ships travel north, they travel "down north," for the rivers flow towards the Arctic Ocean.

Mining is booming in the area where these two boats are operating. Not long ago the region was considered too remote for commercial exploitation, except by the fur trade, but now new mining camps are being opened up every month during the summer. Work goes on all the year round at some of the mines that have reached production stage, and machinery is daily crushing rich gold, silver and radium ores. The oldest mine was only staked in this region late in 1930.

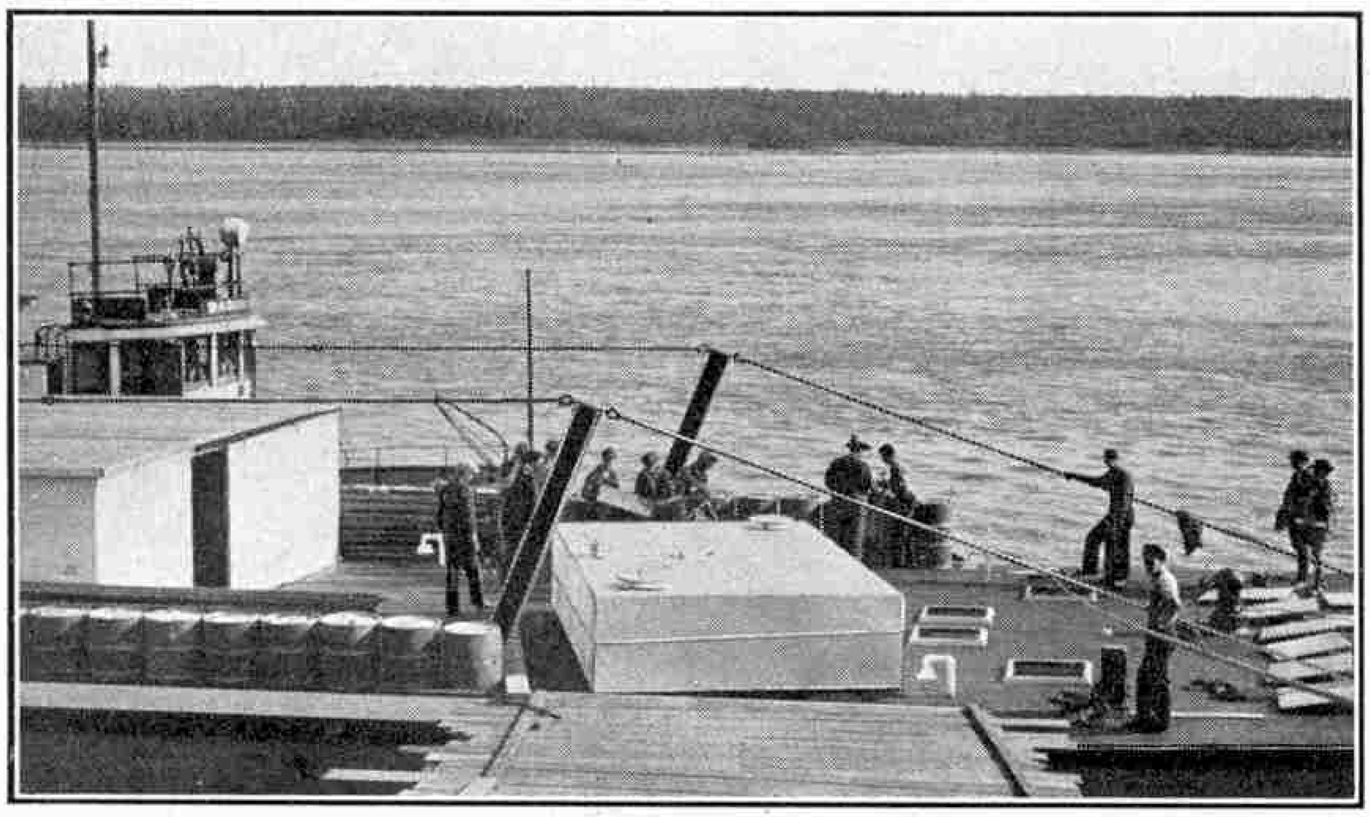
Only a small portion of the North-West Territories has

been explored as yet for minerals, and that area only hastily. The North-West Territories cover an area equal to one-third of Europe, measuring 1,300,000 square miles, and constitute roughly two-fifths of the entire Dominion of Canada, the entire population according to the latest Government figures being just over 15,000, including all whites, Eskimos and Indians. Their mineral development is big business because of the costly transportation item, and transportation is the main factor in changing the area from a fur-trapping region to a mining field. Dozens of large Canadian mining companies have sent in hundreds of prospectors by aeroplane, and their discoveries have been followed up first by diamond drill crews to test the discoveries and then by men and supplies to build camps and work the year round where the finds are large enough.



The "Radium King," a sister vessel to the "Radium Queen," loaded in sections on the barge that carried them to Fitzgerald. The parts were hauled overland to Fort Smith on sledges, and there assembled by welding.

In the short summer season water traffic carries the bulky freight to these new mining camps, but aeroplanes are the principal means of transportation, as most of the country is practically inaccessible by land. Radio stations of the mining companies, air transport operators and the Canadian Government keep the region in close touch with the rest of the Dominion, and the Government has meteorological stations throughout the western Arctic, which have been at work for some years giving weather reports to the pilots who fly the passenger, mail and freight-carrying aircraft. There are no landing fields in the entire region; in summer pontoons are fastened to the aeroplanes, and in winter skis provide landing equipment on the frozen lakes and rivers.



Unloading freight from one of the tank barges built for transport on the inland waterways of the North-West Territories, on which they are hauled by the "Radium King" and "Radium Queen." Photograph reproduced by courtesy of Eldorado Gold Mines Ltd.

The section of the North-West Territories developed so far is in the tree line, so that lumber is available for much of the building, as well as for heating. In addition large deposits of lignite coal have been found in some parts. Oil was first found in this vast area at Fort Norman on the Mackenzie River, but the wells were useless until recently, for there was no sale for the oil and to ship it south was too expensive. Now the mines are using the oil, and a pipeline is being built along the treacherous rapid-strewn Bear River from Fort Norman to Great Bear Lake.

Other minerals found in the North-West Territories include lead-zinc, nickel, copper and platinum, but the most valuable to date is radium, which is present in the rock at LaBine Point, on Great Bear Lake, in such small quantities that it takes 500 tons of ore as mined to produce by an elaborate chemical process a gramme of radium for hospital use! Arctic radium sells for over £5,000 per gramme, however, which is about one-third of its world price before its discovery in the Canadian Arctic.

The mine on the shore of Great Bear Lake from which the radium is obtained is one of the biggest and oldest in the region. It is known as the Eldorado Mine and is the property of Eldorado Gold Mines Ltd., the owners of the "*Radium King*" and her sister ship. Its distance from Edmonton by air is 1,140 miles, and the length of the water route to it from the nearest railway is 1,450 miles. How precious metals were discovered at the site of the mine by Gilbert LaBine, the prospector who first examined the surrounding country with the aid of an aeroplane, was described in the article "*The Romance of Radium*" which appeared on page 142 of last month's "*M.M.*"

Radium is not the only product of the Eldorado Mine. Altogether about 40 metallic minerals have been identified there, among them native silver, and the pitchblende that yields radium also is a source of uranium. These, with an ore of copper, are the only minerals that at present are of commercial importance, but as the mine is carried deeper increasing amounts of ores of cobalt, nickel and bismuth are being encountered, and in time it may be found possible to work these economically as well. Three veins of the many discovered are being worked, and the mine has been opened to a depth of 500 ft. by means of a shaft from which levels have been driven at intervals of 125 ft.

In spite of the low temperatures of the long winter months, work is carried out in this mine the whole year round. Most of the machinery and other heavy materials required are taken there by water during the season in which the rivers and lakes are navigable, and this is so short that it is necessary to plan work ahead with the greatest care.

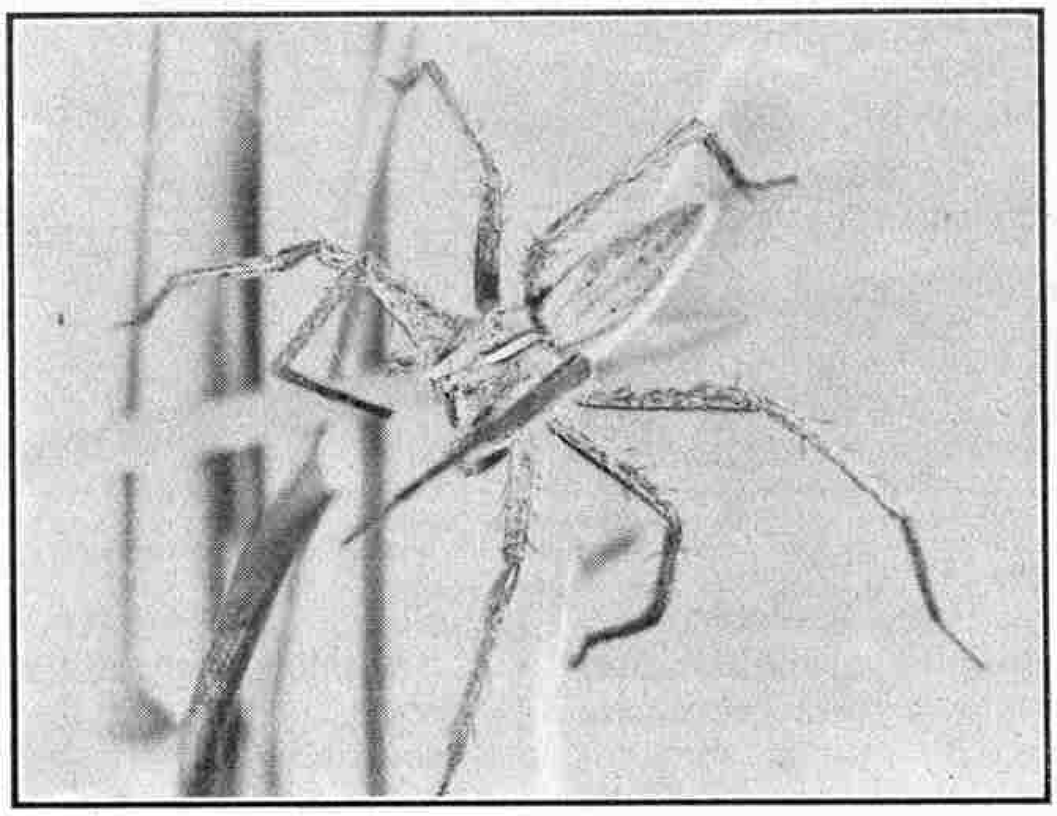
Our Friends the Spiders

How to See Marvels of Web Spinning

By E. F. Linssen, F.Z.S., F.R.E.S., A.R.P.S.

SPIDERS have been very much in the news of late as a result of the interest taken in the deadly Black Widow spiders now at the Zoo. Fears were expressed of terrible happenings if these monsters escaped, for their very bite, it was alleged, meant a quick death, but only after terrible agony.

These fears were exaggerated. The Black Widow spiders at the London Zoo came from South Africa and the United States, and even if they could escape, a most unlikely event, they would not survive our inclement winters. Their bite is very painful, but it can be relieved by an injection of a 10 per cent. solution of calcium gluconate. As for causing deaths, Professor W. J. Baerg of the University of Arkansas says that Black Widow bites do not leave any noticeable after-effects, and that the patient always recovers, excepting possibly infants, unless hampered by a serious complication such as a very weak heart.



The common hunting spider, which is found in open ground and on heaths.

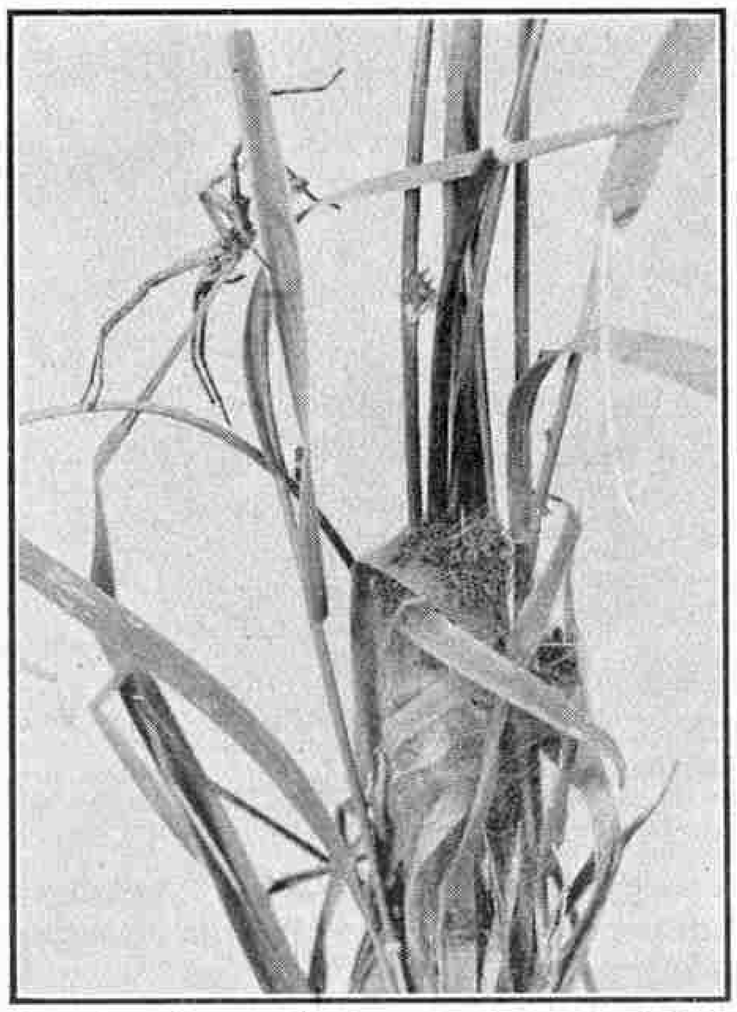
We have also been told that the so-called bird-eating spiders are a menace at the docks, where they arrive in banana consignments and soon meet with a speedy death. One or two have been saved and may be seen at the London Zoo, but on the whole they are harmless creatures of a gentle nature, showing a marked disinclination to bite. Keepers think nothing of handling them, but people with delicate skins should beware, for the spider's fine hairs might penetrate the pores and break off, causing irritation. This indeed may happen with many of our native caterpillars, such as the gardener's woolly bear.

A reluctance to bite is exhibited by all spiders, even by the Black Widows, but let us remember that our native British species may all be caught and handled without risk, as none has fangs capable of penetrating the human skin. A spider can only attack creatures of its own size, or preferably smaller ones, and an essential condition is that its food must be alive. It is therefore a useful destroyer of insects, whose countless millions it helps to keep in check, and this makes us remember the old country rhyme to the following effect:

"If you wish to live and thrive,
Let the spider run alive."

A spider's fangs are jointed, and consist of two sharp opposing blades of formidable appearance. Near the end of each is a small hole from which a duct leads to the poison gland inside the second part, or crushing jaw. When a spider catches a fly poison is injected to keep it still, for the mouth parts of the spider are very simple and it can only suck fluid food from the wound made by the fangs. It cannot break up its prey into pieces and swallow them, and that is why the shrunken remains of insects are found in spiders' webs.

The first thing that comes to mind when considering spiders is the marvellous use they make of silk. It is used for making snares, for tying up victims whose struggles are likely to prove troublesome, for travelling, and even for "flying," as well as for making the cocoon to protect the eggs. The mother shows much solicitude for her eggs. She is an adept at finding suitable sites where they can be hidden, and there she spins her protective mantle of silk around them.



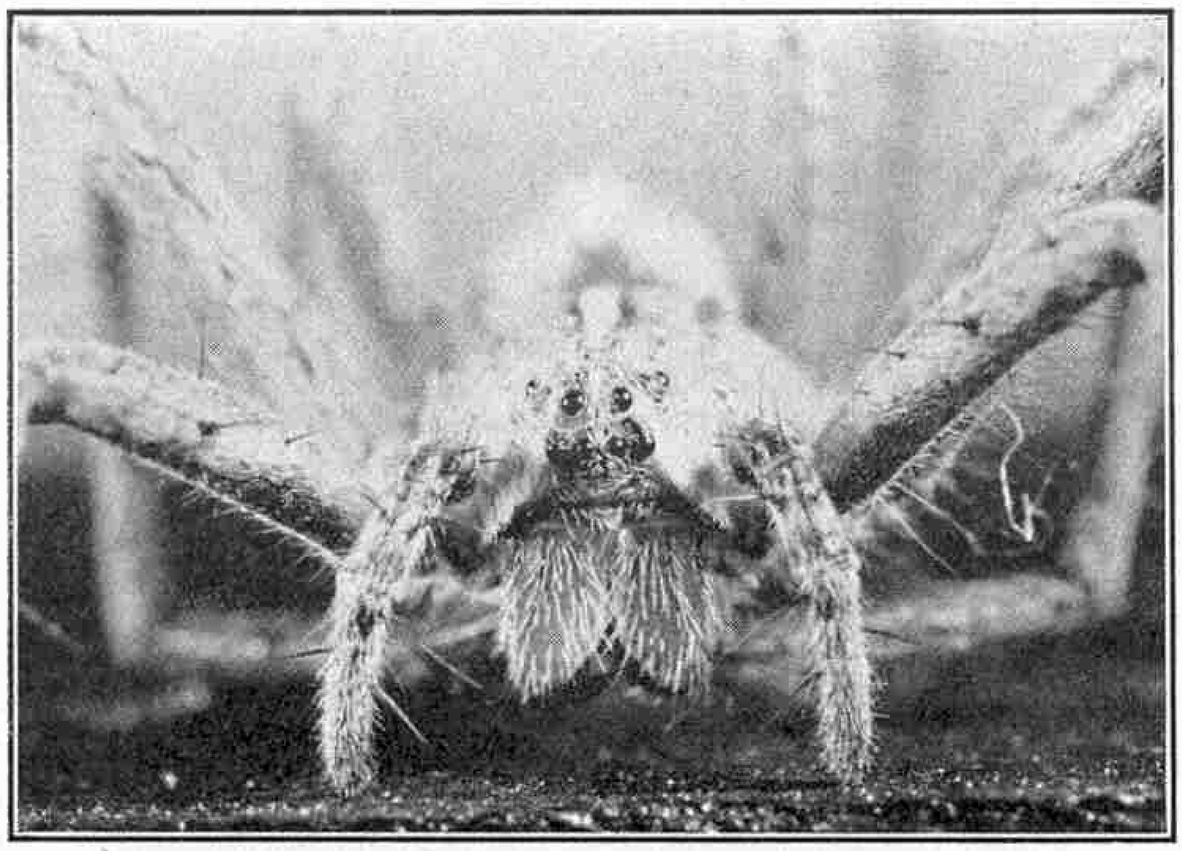
A hunting spider guarding her young. Her cocoon is fixed to a blade of grass and enveloped in a silken web.

Some mothers even go further than this. The common hunting spider, shown in three illustrations on these pages, carries her cocoon about with her, and so does the wolf spider, which is rather sombre coloured in comparison with the hunting spider, but goes further to attract one's attention, for while she is hunting her young cling to her back! If we try to detach the cocoon the mother will offer violent resistance. Smell seems to be the thing that attracts her to the cocoon, because if we take it away from her and rub it on some light pellet, such as a small piece of bread, she will carry this new object away—but not for long! She soon becomes aware of such trickery, and indignantly starts to seek her rightful property.

The hunting spider is one that can be kept well in captivity. To do this a large insectarium should be made. This need only consist of an enclosure of wood, with at least one side of glass for observation and gauze openings in two opposing sides. Grass and small plants should be grown in flower pots and kept properly

moist. Flies can be caught and allowed to escape inside the cage.

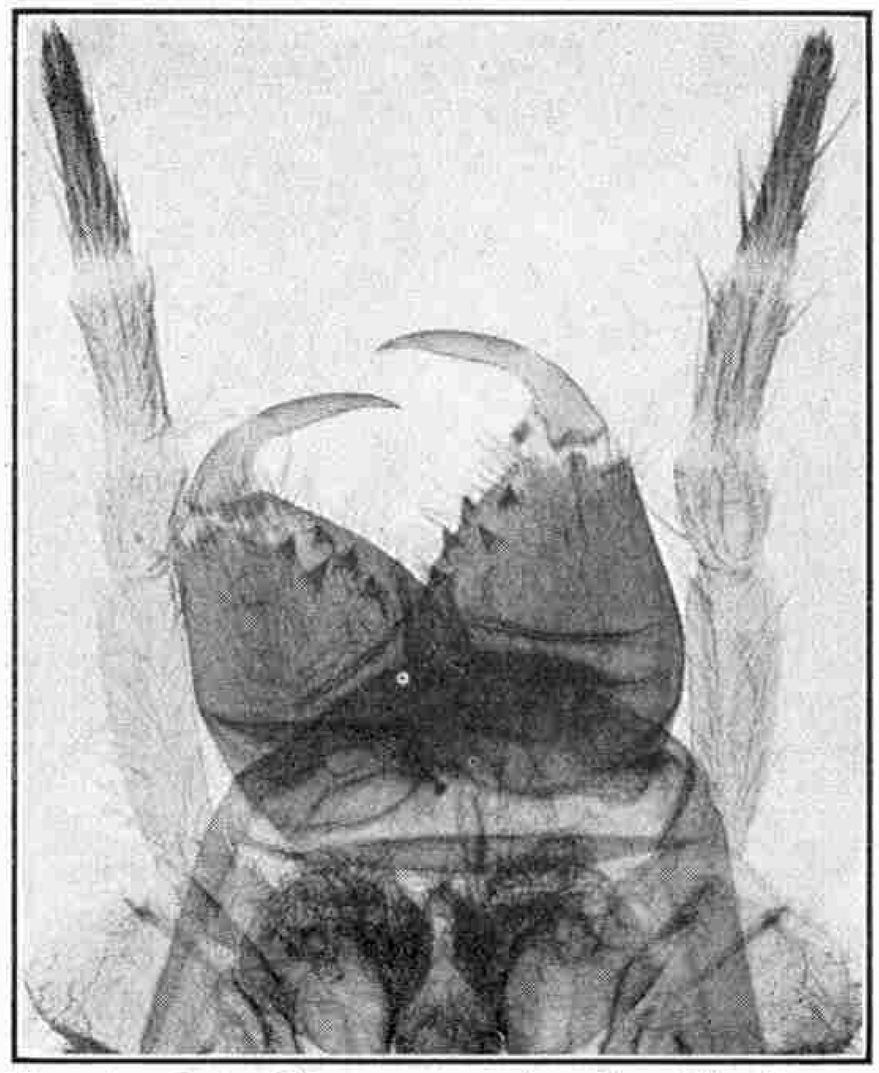
The spider herself can be found by the hundred in open ground and on heaths. If we take her in early summer, when she is carrying her cocoon, and place her in the insectarium we shall see her eventually attach the cocoon to a blade of grass, after which she begins to enshroud it with a close silken web. After that all her hunting takes place on the web or in its immediate vicinity, and she is constantly on guard. If we touch the web with a finger she takes up a threatening attitude, standing up as high as her long legs will allow her, the front pair being stretched forward. Soon the spiderlings emerge from their eggs and the cocoon, but they cannot get beyond the web which the mother spun for just such a purpose. She will not allow them to come out until she deems that they are sufficiently large to sally forth into an unkind spider world. She then tears the web open, and family life within it is at an end.



A close-up of the hunting spider, showing its eight eyes, with fangs below them, and the long hair-like sensory organs.

Most spiders do not show such solicitude for their young, parental care normally ceasing with the spinning of the cocoon round the carefully hidden eggs. Such spiders may lay as many as 800 eggs, and this large number is required, for although the newly-hatched spiderlings do not feed until after their first moult, life begins in a very earnest manner indeed inside the silken home. Cannibalism breaks out, and it has been estimated that only about 100 emerge.

Naturally species that exhibit such ill behaviour from the very beginning of their lives are bent on immediate dispersal as soon as they are able to break out of their cocoon. Some species effect this by climbing on a fence, or into some other exposed position, and letting out strands of silk, or gossamer as it is called, in the breeze. The spider lets go when it finds that the wind gives it sufficient pull, and so we have the remarkable spectacle of a flightless creature sailing through the air. Some observers maintain that the spider is able to control the length of the gossamer by paying out more silk when the wind falls, "shortening sail" when it increases. They naturally have to go where the wind takes them, often to an early doom. A classical example of this is furnished by Darwin, who in 1832, during his famous voyage round the world in the "*Beagle*," observed on one occasion that the rigging of the vessel was suddenly invaded by numerous gossamer-borne spiders when the vessel was some 60 miles from the nearest land. Since then much longer flights have been recorded.



The poison fangs of the common water spider. All spiders are poisonous, but no native species are harmful to human beings.

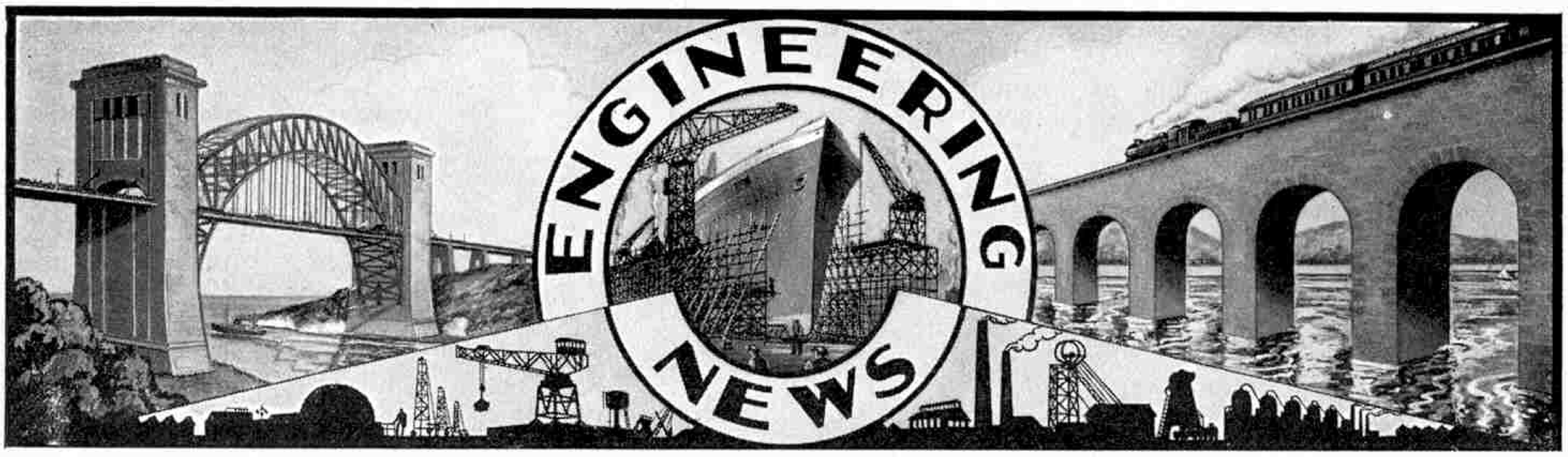
The types of webs spun by spiders vary greatly according to the species. The house spider makes the familiar untidy tangled maze and the garden spider's web is a delight to see, especially when covered with dew or frost. Hammock spiders make sheet webs, which are stretched over herbaceous plants, and have silk threads vertically above them against which insects fly and then drop on the web below. Funnel webs are very common by the side of country paths, they consist of sheet webs with a tube at one end leading to the owner's retreat.

The most wonderful of all spiders is one that readers can study with the greatest ease at home. It is the water spider, a creature that has left the land and made its permanent home in another element, water. This is the easiest of all species to keep in captivity, and will thrive in a small aquarium that is properly "balanced," that is one in which there is an abundance of aquatic plants for supplying oxygen to the water. Specimens can be bought at aquarist dealers, or they may be searched for in the southern half of England, where they will be found among the plants of ponds and ditches.

This spider is famous for the wonderful diving bell it makes out of silk. It does this by laying a sheet of silk among the water weeds, and may be detected in the act by the tugging on the plants, for the silk is quite invisible in the water. When the sheet is complete, the spider swims to the surface and projects the abdomen and hind pair of hairy legs out of the water so that when she returns a bubble of air is brought down. This is released under the web and the process is repeated several times until the trapped air forms a perfect diving bell, which henceforth serves as a home. It is not a trap, for the spider catches other aquatic creatures by hunting, returning to the home to feed.

The male water spider is larger than the female—a rare thing among spiders. When he comes along, he builds a home next to that of his wife-to-be, and when this is completed he bites his way through the silk into her home. Later the eggs and the cocoon are placed in the upper part of the bell. During the winter these spiders hibernate either in the bell, or in an empty shell filled with air and sealed with silk.

Spiders are most interesting creatures to study. There are some 550 species in England alone, so that there is little likelihood of exhausting their attraction.



Giant Motors to Drive Pumps

Six great electric motors, which are claimed to be the largest ever built for driving pumps, are being constructed at the East Pittsburgh Works of the Westinghouse Electric and Manufacturing Company for use in pumping stations in California. The motors are of the synchronous type and are rated at 12,500 h.p. They operate at 450 r.p.m. on a three-phase 60-cycle current at a pressure of 6,900 volts, and will drive huge centrifugal pumps constructed by the Worthington Pump and Machinery Corporation.

Three of the motors will be installed at the Metropolitan Water District of Southern California's Hayfield Station, and the other three at the Eagle Mountain Station. In due course two additional motors will be provided at each of these places. The power to operate the motors will be supplied by the great waterwheel generators in the power house at Boulder Dam.

Sinking a 1,000-ft. Pipe in the Sea

In making arrangements for the San Francisco World's Fair that is being held this year it was necessary to sink a corrugated steel outfall pipe 1,000 ft. long to the bottom of the sea. The method adopted for carrying out this operation is interesting and novel. Tubes made of waxed paper were first attached to the pipe by means of wrapping paper to form buoyancy chambers, and so to keep the pipe on the surface of the water while it was towed out from the shore to the position in which it was to be sunk. A cord placed between the pipe surface and the wrapping paper was then pulled, tearing away the paper and freeing the waxed tubes. Concrete weights attached to the pipe then dragged the latter down to the sea bed.

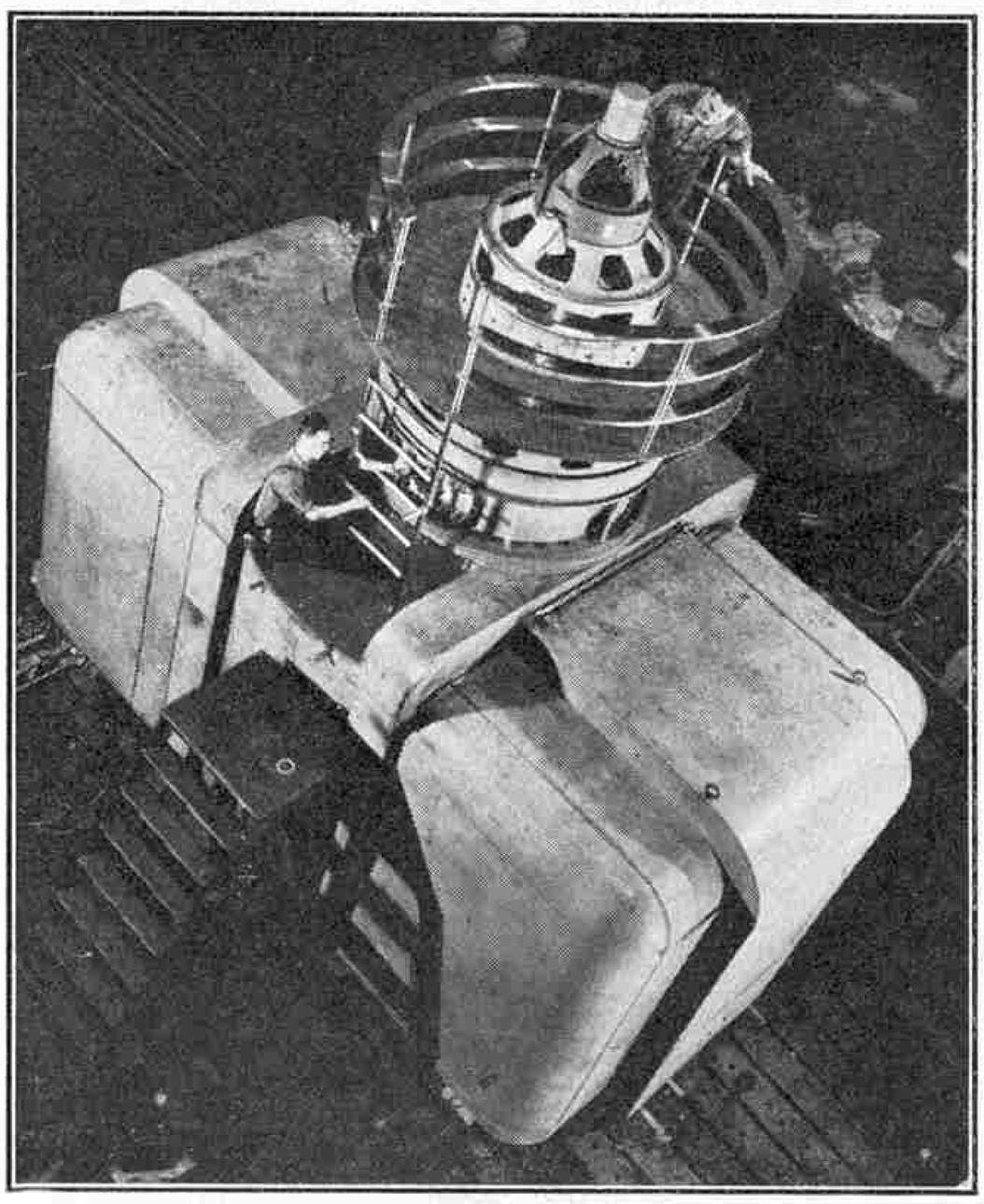
Tunnelling Through a Mountain

Work has commenced in France on the construction of a road tunnel under the Croix-Rousse, which lies between the valleys of the Rhône and Saône rivers at Lyons. The tunnel will be about 1⅛ miles in length and will be driven through granite rock, most of the excavation being done by blasting. Three oval bores measuring 4 ft. by 5 ft. 9 in. will first be made, and these will then be joined to form the finished tunnel, which will be in the shape of a half oval. The work is expected to occupy from three to four years.

A Novel Traffic Control System

An entirely new system by which traffic lights can be regulated by passing vehicles has been installed in Stockholm. It is a Swedish invention, and depends for its operation on current variations caused by the iron of passing vehicles in the windings of electro-magnets buried under the road surface. The device is very sensitive, responding quickly to the passage even of a vehicle with as little iron in it as a handcart.

This device is specially suitable for installation at the junction of a small side street with a busy main road. Normally the signal at such a point shows a green light to traffic on the main road, as this has priority. A vehicle coming from the side street into the main street causes the colours to change to red for the main street and green for the side street, and from 10 to 15 seconds later the normal condition is restored. Main street hold-ups by cross traffic therefore are prevented.



One of six 12,500 h.p. synchronous motors built in America for driving pumps. They are the largest ever built for this work. Photograph by courtesy of the Westinghouse Electric and Manufacturing Co., East Pittsburgh.

Great South African Storage Dam Scheme

If a scheme that is now being considered in South Africa is carried out, Villiersdorp, a village in the mountains between Worcester and Caledon, will become one of the finest pleasure resorts in the Western Province of the Cape, and also the centre of large electrical and irrigation undertakings. The project concerns the construction of a large storage dam across the Zonder End River at Keerompoort.

The dam would create a magnificent lake in the high mountains behind French Hoek and the Hottentots Holland range, which would be about 1,000 ft. above sea level. By means of a short tunnel and a canal from the lake, water would be delivered to a hydro-electric station situated at a level nearly 800 ft. below that of the lake. It is estimated that it would be possible to generate about 6,000 h.p. continuously throughout the year, or more than double that horse-power for peak periods, if the scheme were linked up with the Electricity Supply Commission's system. Some of the power would be used to pump water from the lake into the Steenbras reservoir of the Capetown City Council, and thence through the pipe system serving Capetown.

New Use for Neon Lamps

An interesting application for neon lighting has been found in connection with the dolphin or mooring post that marks the end of a training bank in Poole Harbour. Recently the dolphin has been provided with a neon identification and warning light, which is operated from an ordinary 6- or 12-volt accumulator housed in a watertight casing, and the consumption of the light is so small that it will work for several months before the accumulator needs re-charging. An intermittent flashing light is produced by an electrically operated make-and-break mechanism that can be adjusted to give any desired period between flashes. A light-sensitive switch operated by a photo-electric cell automatically extinguishes the light at daybreak and switches it on again at dusk. All the mechanism is contained in a small box.

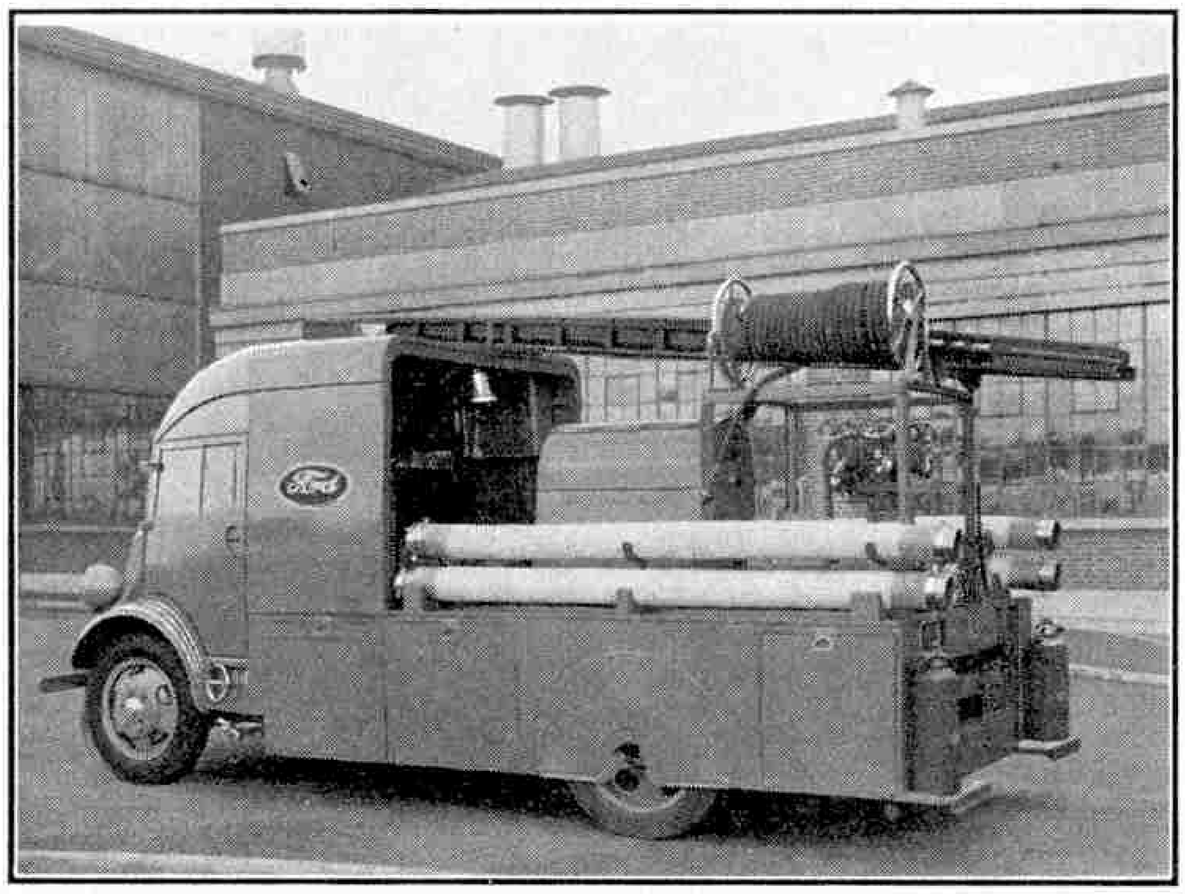
The inventors of this lamp are Mr. A. P. Collier and Mr. John Dossett, of Collier and Co. Ltd., and it is interesting to note that Mr. Collier introduced the first acetylene buoy in Great Britain over 30 years ago.

Ford Fire Tender for A.R.P. Work

In an attempt to meet the special requirements of A.R.P. emergency fire brigades the Ford Motor Co. Ltd., Dagenham, have produced the new type of fire tender shown in the upper illustration on this page. The tender is based on the standard Fordson 2-ton forward control chassis with a wheelbase of 9 ft. 10 in., and is fitted with an eight-cylinder engine of 30 h.p. The fire-fighting equipment includes a Sulzer pumping unit capable of delivering 800 g.p.m. at pressures of from 80 to 160 lb. per sq. in., and in order that it may be used with fresh or salt water all parts of the pump that come into contact with liquid are made of bronze or stainless steel. The pump is driven by a Ford engine unit fitted with magneto ignition.

In designing the chassis and cab special attention was given to the conditions under which the engine may have to work while an air raid is in progress. All the crew of six, together with the driver and officer, are accommodated in a roomy cab. This has a specially strengthened steel roof to provide protection from falling masonry or other objects, and has no padding or other insulating materials that would cause difficulties if the vehicle had to be subjected to gas decontamination processes.

The Ford Company are supplying 100 of these machines to the order of the Home Office.



A special fire tender that has been introduced for the equipment of A.R.P. emergency fire brigades. Photograph by courtesy of the builders, the Ford Motor Co. Ltd., Dagenham.

Possible Rival to The Panama Canal

A scheme for the construction of a great canal across Nicaragua is being considered in the United States. The canal would take about seven years to build and would cost £150,000,000 compared with the £75,000,000 that was expended on the Panama Canal. The new waterway would run between Greytown and the entry of the San Carlos River into the River San Juan above Ochoa, and at the latter point a dam would be built to keep the water in the deepened section of the San Juan at the level of the water in Lake Nicaragua. On the Pacific side vessels would be carried down to ocean level by means of six twin locks, each 125 ft. wide and 400 yds. long.

Giant Cantilever Bridge at Calcutta

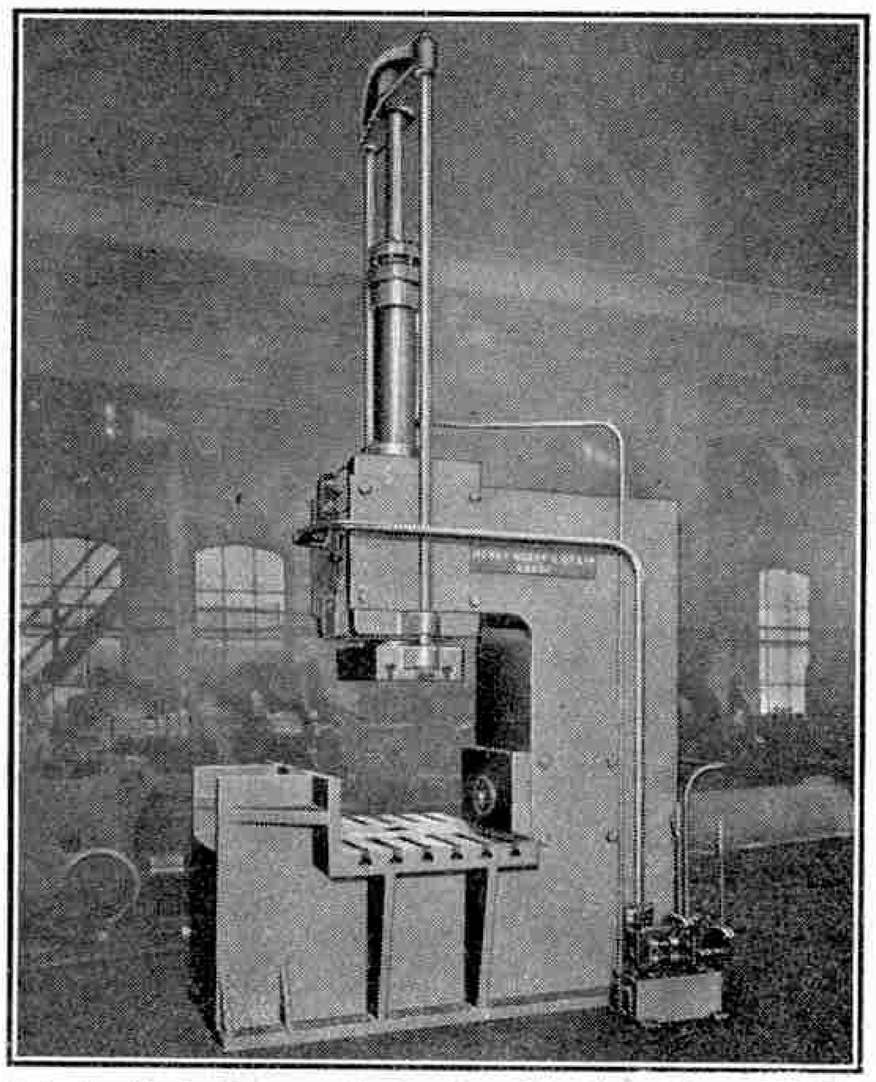
One of the most important bridges now being built by British engineers abroad is the Howrah Bridge across the Hooghly River at Calcutta. This is to replace a floating bridge that cannot accommodate present day traffic. The new bridge will be of the cantilever type. Its span of 1,500 ft. will be the third largest of its kind in the world, and will consist of a suspended span of 564 ft. and two cantilever arms, each 468 ft. long. At each end there will be anchor arms 325 ft. in length, and shore towers rising to a height of 270 ft. above road level, the main piers being supported on concrete monoliths 180 ft. long and 80 ft. wide.

The bridge is being built by the Cleveland Bridge and Engineering Company Ltd., Darlington.

Fire Escape with a Life-Saving Cage

A special life-saving cage slung from the underside of the escape is a special feature of a fine new fire engine that has been ordered by the Blackpool Fire Brigade from Leyland Motors Ltd. The cage is capable of holding two people. It is hoisted by means of winding gear operated by the engine, and can be raised or lowered when the escape is at any elevation or extension, so that it will serve as a lift for rescuing persons from the windows or roofs of high buildings.

The escape will be of the all-steel turntable type with an extension of 120 ft., and the fire pump will have a capacity of 500 gallons of water per minute. The machine is one of the most extensively equipped yet built by Leyland Motors Ltd.



A hydraulic forging press for use in a railway workshop. Welding played a large part in the fabrication of the machine. Photograph by courtesy of Henry Berry and Co. Ltd., Leeds, the builders.

Molten Iron as Train Load

In the Rhenish-Westphalian district of Germany melted iron has for the first time been transported by railway. The metal was contained in two great pans, each holding about 30 tons, and was transported from Duisburg to Stuerzelberg, a distance of about 19 miles. The metal was needed for experiments that were being carried out at Stuerzelberg in connection with a special method of sulphur extraction, and after the experiments had been completed it was returned to Duisburg on the same day.

X-Rays in an Oil Cake Factory

Engineers at an oil cake factory at Odessa, Ukraine, have built a novel device for detecting impurities in the firm's products. The oil cake is carried on a conveyor in front of an X-ray screen, and any impurity is immediately revealed by its X-ray shadow picture. The operator then presses a button and the defective material is automatically marked with a distinctive colouring, so that it can readily be separated from the pure cake.

Another New York Suspension Bridge

Work is proceeding rapidly in the United States on the construction of a great new suspension bridge that is being built across the narrow strait that connects East River with Long Island Sound at New York City. Known as the Whitestone Bridge it will be one of the longest suspension bridges in the world, and it is to be completed and ready for service before the opening of the New York World's Fair. It is 2,300 ft. in length, and will cost about £3,500,000. The Fair will open on 30th April, and the new bridge will be of great assistance in accommodating the greatly increased volume of traffic expected in the vicinity of the exhibition grounds.

A Welded Forging Press

The lower illustration on this page shows a novel hydraulic forging press that has been supplied by Henry Berry and Co. Ltd., Leeds, for a railway workshop in this country. The press has two rams, one of which works vertically while the other operates horizontally. The vertical ram is capable of exerting a pressure of 50 tons, while the power of the horizontal ram is 30 tons. Welding played a large part in the construction of the machine, especially that of the framework, which consists of two square mild steel plates 8 ft. by 8 ft. and 2 in. thick, which were cut to the shape shown in the illustration to form the sides. The sides are spaced by distance plates 1½ in. thick. The hydraulic cylinders, which are made of cast iron and have walls 3 in. thick, are fitted between the side plates.

The bed is a cast steel plate 4 in. thick and is provided with T-slots to take the bolts by which the work is held in position. The bed is welded to the main frame side members and is supported by welded struts and gussets. The complete press weighs 8½ tons.

English Windmills

Vanishing Relics of Old-Time Engineering

By Rev. P. A. Wright

THOSE fine old landmarks the English windmills, which for many generations have helped to beautify our countryside, are fast disappearing. Here and there we find them being used for their original purpose, but it does seem that the days of the windmill are numbered. Millwrights, the craftsmen who built and repaired them, are becoming fewer, and most farms of any size possess either a tractor or oil engine that drives a set of mill stones or a modern steel-plate mill. Thus the grinding is kept on the farm, thereby saving cartage. Before it is too late I would urge all readers who are interested to treat the remaining windmills as important subjects for sketch-book and camera. I have done this myself for a number of years, and in my collection are many pictures of mills that no longer exist, having either fallen into ruin, or been lost by fire or demolition. Meccano enthusiasts will profit by this practice, for windmills provide a fine range of splendid model subjects.

Drinkstone mill in Suffolk. This probably is Britain's oldest working windmill, and is a good example of a post mill with a roundhouse.

The very first written record of an English windmill concerns one erected by Herbert the Dean on the "Haberden," a meadow belonging to the monastery of St. Edmundsbury, now known as Bury St. Edmunds, in Suffolk. Unfortunately the Dean had not secured the Abbot's permission to build. As a result, the worthy Abbot was most annoyed, and ordered the immediate destruction of the mill. In vain did the Dean plead that he was using the "Free winds of Heaven"; the Abbot contended that he had violated the Liberties of Saint Edmund, and the Abbot won. The date of this interesting event was 1119, and it is described in the Chronicle of Jocelin de Brakelonde, a monk at that time resident at Bury Abbey.

East Anglia contains some fine examples of the three types of windmill. One of these types is the smock mill, which has a tower built of overlapping boards, and usually is octagonal. The effect is said to be that of a gigantic smock, similar to the type worn by farm labourers during the last century. Then there is the brick-tower type. Here the top or head carries the sails and revolves independently. More common, and very handsome, are the post mills, in which the whole body revolves on a main centre post above a fixed roundhouse that may be of stone or brick. The early post mills possessed no roundhouse a all, but had instead a sort of skeleton tripod for support. One of these is still working at Great Chishill, on the border between Essex and Hertfordshire.

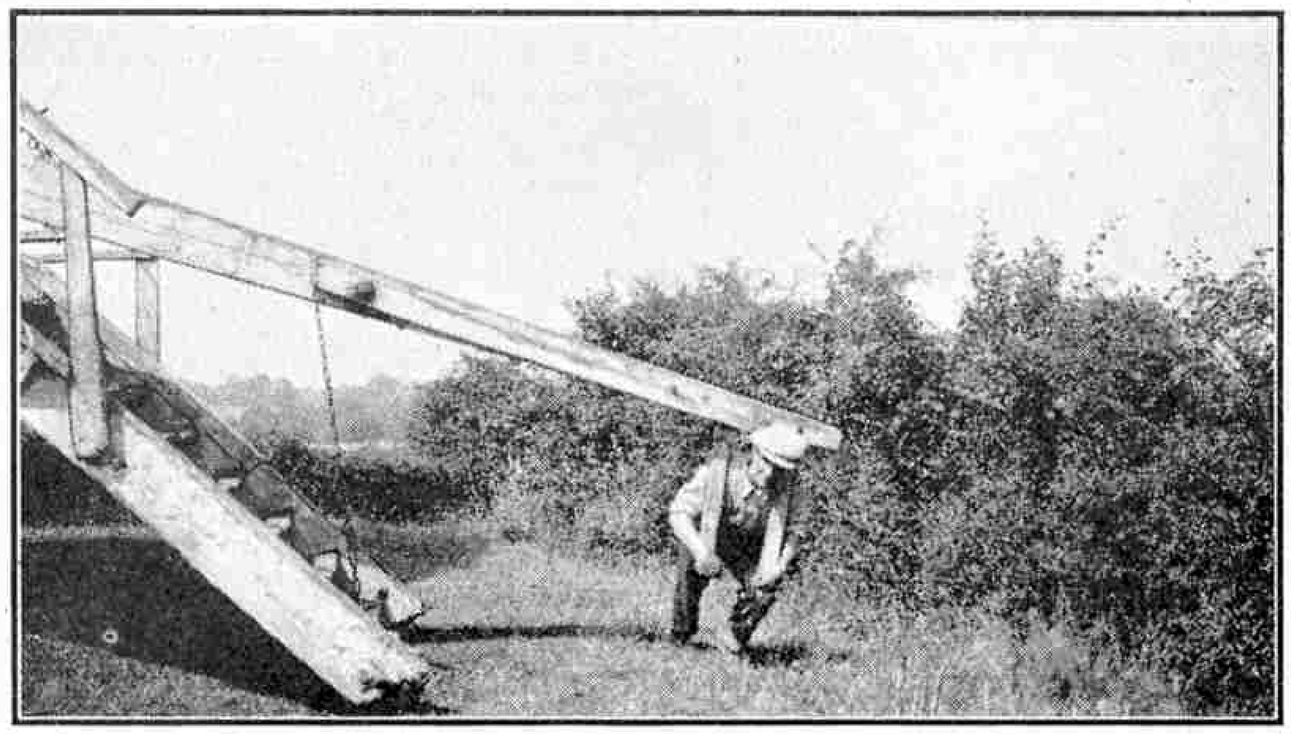
Barnham mill, Suffolk, a tower mill with a fantail to bring the main sweeps into the wind. Sails and fantail are carried by a revolving head.

The sails of a windmill, or sweeps, as the miller calls them, are made to rotate a main shaft to which is attached a large cog wheel called the brake wheel. The cogs are made of hard apple wood. The brake wheel in turn engages with a bevel wheel called the wallower, and the next wheel below the wallower also is fixed to the centre post, and by means of gears operates the hoist that brings up the corn sacks. Below this, a large spur-wheel engages with others called the stone nuts, and these rotate the large millstones that do the actual grinding. These stones had to be dressed periodically to keep their surfaces in good order. The man who did this usually was a specialist, making stone-dressing his life work, and would sit hour after hour, chipping the granite with a special chisel-like implement, which he struck with a mallet. Sometimes he would recline on sacking while he worked, chipping at the feathery furrows of the millstone until they had acquired the keenness necessary for the grinding they had to do. The purpose of the grooves of the rotating stone was to cause the grain to move across the face so that it was delivered as finely-ground meal from the rim. A typical stone weighed about 15 cwt.

It will readily be seen that a windmill can only work when the sails are in the wind. When the wind shifts, therefore, the mill has to be turned to face it. On the old type post mill this was accomplished by a crude process, the miller having to chain up the steps, climb inside the frame and push the mill round bodily. In some cases a beam was attached to the mill to give the necessary leverage, but even then the turning was not an easy task if a gale was raging. The mill at Drinkstone, Suffolk, seen in the upper illustration on this page, is turned in this manner. It is about the oldest working windmill in the country, and still grinds corn regularly and perfectly, although it was built over 300 years ago. It has been in the possession of one family for many

generations. In some later mills of this kind the outer end of the beam was mounted on a wheel to make the miller's labours easier.

Most mills are turned into the wind by means of a fantail and shafting. The octagonal body of a smock mill, the circular brick structure of a tower mill, and the roundhouse of a post mill are all stationary fixtures. The top of each is finished by a circular curb carrying wooden cogs projecting from it, and as it is framed up separately it is able to rotate independently. The fantail at the back turns the top so that its sails face into the wind, by means of a spindle from which two bevel wheels operate a vertical rod, at the lower end of which are other cogs that rotate a horizontal shaft. A worm on this shaft turns the wooden cog wheel on the side of the curb.



The miller at Drinkstone shows how he turns his post mill, seen in the upper illustration on the opposite page. The steps are first lifted off the ground, and chained in position.

On most mills the sails have slats or louvres, and a clever device controls the opening and shutting of these. An iron chain wheel, placed high up, operates a spindle that goes right through the main shaft and opens and shuts the louvres as required. The bore through which the spindle passes is very long and has to be straight.

The older mills had merely stretches of canvas on the sails as a means of wind-resistance, and the necessary reefing of these sheets in a gale was a risky job. The windmill indeed has taken its toll of life and caused many an injury in various ways. A miller at Lawshall, Suffolk, was drawn into the gearing by his clothes and killed. At Cockfield, in the same county, the mill was blown down during a gale and the miller, who was inside at the time, was killed. The mill at Fornham Road, Bury St. Edmunds, suffered a similar fate, but in this case the miller escaped injury. An unusual accident occurred at the mill at Dalham, near Newmarket. The miller was using the chain-hoist during a thunderstorm when the mill was struck by lightning, the current travelling down the chain and killing the man.

Windmills look light and airy structures in the distance, but closer examination amazes most people, revealing as it does the colossal sizes and weights of all the working parts. It seems almost unbelievable that these massive structures were sometimes removed almost bodily to quite another district. A mill that formerly stood at the entrance to the cemetery at Bury St. Edmunds was removed to Wickhambrook, and still stands there. It has only two sails left, but Brockley mill actually was worked with only two sails for many years before suffering demolition. Bury St. Edmunds always seems to have been rich in windmills. A row of three of them once stood at Southgate, and one of these had no fewer than six sweeps. Bocking windmill in Essex was raised several feet, the tower of the roundhouse being lifted a little at a time by jacking it up while additional courses of brick were inserted. This mill has been preserved for the nation, as has the tower mill at Bidston in Cheshire, and at the moment the Suffolk Preservation Society are considering how their work may be furthered by application to other worthy mills.

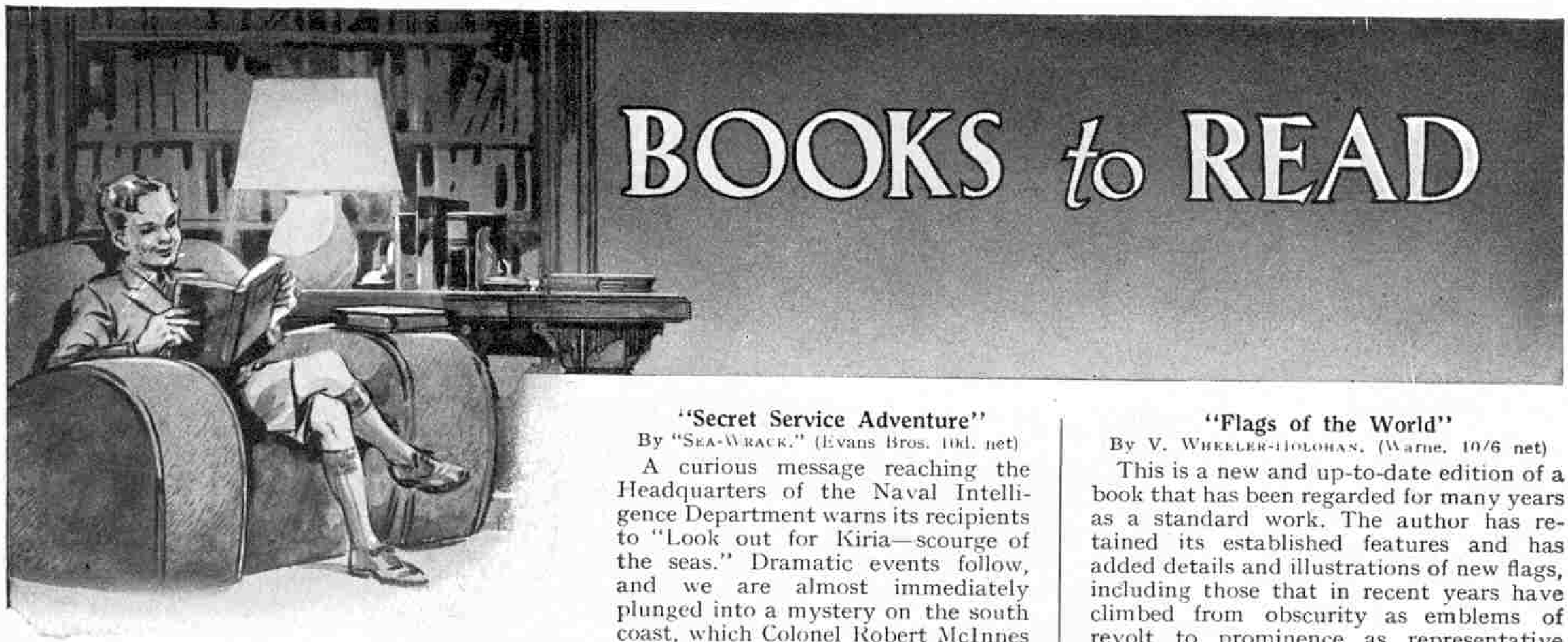
A smock mill in decay. This photograph shows the mill at Stapleford, Cambridgeshire.

Mills and mill towers have been put to a variety of uses. One formerly at Aldringham has been moved to Thorpeness, where it now pumps water for the town. Drainage mills are common on the Norfolk flats towards Great Yarmouth. There are others in the fen country, but these have been built for that purpose and are smaller and less handsome than the corn mills. The tower mills at Duxford, Cambridgeshire, and Dunmow, Essex, have been turned into houses, and the mill at Hempton, near Fakenham, Norfolk, is now the headquarters of the local troop of Sea Scouts. Those of you who saw the Will Hay film "*Oh Mr. Porter*" will remember the incident in which that artist and his colleagues were each hanging on to one of the sails of a windmill while these were whirling round; this was filmed at the mill at Terling, Essex. I know a mill that is used to drive a dynamo for charging batteries; it was given to a young man as a cheaper means of recreation than a motor bicycle.

A windmill working at night is awe-inspiring. The weird noise of creaking and swishing is quite eerie, and there is mystery in the light from the small windows of the rooms where the miller is busy. This light is given by the old hurricane lanterns that are so popular in the countryside.

The mill at Haverhill is unique for a corn mill in having a circular arrangement of sails. It is a landmark for many miles around, and can be seen from the three counties of Essex, Suffolk and Cambridgeshire. It is interesting to find windmills in the midst of built-up areas in these days. There is still one in the town of Woodbridge, and there was yet another near to the gasworks at Newmarket, but this was demolished a few years ago.

The old-time miller was a genial soul, and took a pride in his job and in his mill. He was allowed four pounds of meal from every coomb of grist that he ground. This was called the Miller's Toll, and may help to explain the presence of the fine batch of pigs that usually was to be found in a sty not far from the shadow of the mill.



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.

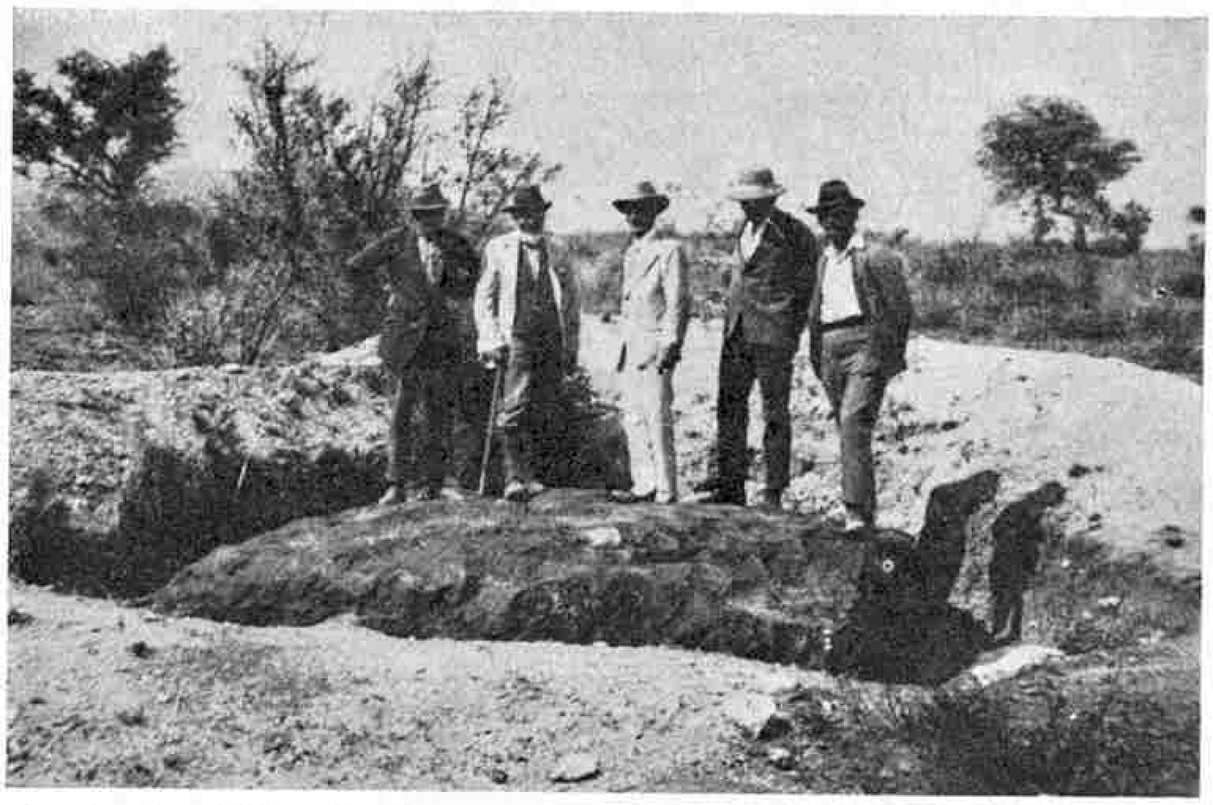
"Everyman's Astronomy"

By Mary Proctor
(The Scientific Book Club. 2/6 net)

Interest in the Sun and the stars never wanes, and reliable popular books on astronomy are always welcome. Miss Proctor's book is a good example. It is not a formal account of the discoveries of the astronomer, but tells stories of such events as the blazing up of new stars, the fate that awaits the Moon and the dramatic arrival of the visitors of many kinds that reach our world from outer space. The selection of topics is excellent, and many secrets of the heavens are revealed to the non-technical reader in an easy and simple manner, with homely illustrations to help him to understand them.

It is only possible in a short review to indicate a little of the wide interest of the book. A beginning is made with stars that suddenly burst out into astonishing brilliance, suggesting a gigantic explosion or flare up that justifies Miss Proctor's name for them of "Suns in flames." Beacon lights in the ocean of space then come up for examination. Here again the name is well chosen, for it refers to variable stars, the light of which waxes and wanes with the regularity of that of a lighthouse. Double and coloured stars are then dealt with, after which we turn to the drifts of the stars, which seem to move in battalions along prescribed tracks.

Star photography, the legendary stories of the constellations, and the approach of the Moon to the Earth are next explained. Lastly come interesting stories of visitors from space, among them famous meteorites, such as that believed to have made Meteor Crater, in Arizona, shooting stars and streams of meteors. The final chapter explaining how a camera can be set to detect the latter, and to reveal their height and direction. There are 23 excellent photographic illustrations.



A meteorite weighing about 60 tons discovered in South-West Africa. From "Everyman's Astronomy," reviewed on this page.

"Secret Service Adventure"

By "Sea-Wrack." (Evans Bros. 10d. net)

A curious message reaching the Headquarters of the Naval Intelligence Department warns its recipients to "Look out for Kiria—scourge of the seas." Dramatic events follow, and we are almost immediately plunged into a mystery on the south coast, which Colonel Robert McInnes and Captain Anthony Carstairs, two Secret Service agents, are trying to solve. Eventually they find their way up a river into a quiet backwater, where there is a mysterious hulk that has immense doors in its sides through which a motor boat can pass and obviously is there for no good purpose. Eventually the place is stormed and captured, but not before Carstairs himself has been taken prisoner and threatened with death by Kiria.

Then comes the revelation that in the gigantic hulk the latter has been building an amazing vessel that is at once a submarine and a flying boat. It is on the point of getting away, but luckily coastal motor boats and aircraft have been summoned to deal with matters, and three high-speed torpedoes find their mark in its hull.

"The Story Book of Trains" and "The Story Book of Ships"

By Maud and Miska Petersham
(Dent. 2/6 net each)

These are story books for young children. Each is very simply written, so that the development it describes is easy to follow, but sufficient is said to give readers an idea of the way in which trains and ships have grown up, and to convey something of the romance of the achievements of the early train builders and mariners and explorers through the ages. Both are full of excellent and lively pictures in colour.

"Flags of the World"

By V. Wheeler-Holohan. (Warne. 10/6 net)

This is a new and up-to-date edition of a book that has been regarded for many years as a standard work. The author has retained its established features and has added details and illustrations of new flags, including those that in recent years have climbed from obscurity as emblems of revolt to prominence as representative of sovereign states.

Flags have always exercised a peculiar fascination, even among those who have never taken the trouble to try to understand their meaning. Readers of this kind will find Mr. Wheeler-Holohan's book a revelation. The introductory chapter traces flags back to their origin as national symbols. In it the meanings of such terms as pennon, banner, and standard are explained, and there are many good stories, such as that of the roundshot crashed by Lord William Howard into the side of the vessel of a Spanish admiral who had not struck his colours and topsails as homage to the English flag.

Then follow chapters on the Royal Standard and our national flag, in which the significance of each part is fully explained. Flags of the King's representatives and public departments, British Dominions and Colonies, and the Army, Navy and Air Force are next dealt with. The section dealing with the Army is particularly attractive because of the stirring lists of battle honours on regimental colours.

And so we pass on through the flags of corporations and public bodies, ships and yachts to the international signalling code, which is of intense interest to every boy. Sir Walter Raleigh signalled with his sails and it was not until the 17th century that flags were brought into use for this purpose. The story of the world's most famous flag signal—that of Nelson at Trafalgar—is given special attention, and a reproduction of the historic message provides the frontispiece of the book. Curiously enough an error made by an historian led to the signal being wrongly flown on the "*Victory*" on Trafalgar Day from 1885 until 1908.

We then travel overseas to see the flags of the United States and other foreign countries. Many of these are very attractive in colour and in design, and their stories are well told by the author. A final chapter deals with the identity markings of aircraft.

In a book of this kind illustrations are of great importance, and special care has been taken that the flags and markings reproduced in the 25 full-page plates in colour are accurate in proportion and detail.

"Deep Silver"

By Nora Burglon. (Routledge. 6/- net)

Every reader of the "*M.M.*" would enjoy this Scandinavian fishing story, which deals with seafaring life in a region that is novel and attractive. The characters are unusual and well-drawn, the background is fascinating and at the same time authentic, and there is a story that involves storms at sea, struggles with ice and snow, and other exciting and stirring events, all of which are dramatically unfolded.

The hero of the story is Evald, a waif in a Norwegian fishing village who has two unusual pets, a wolf and an eagle. With these he sails as the youngest member of the crew of the "*Golden Eagle*" to the cod banks along the northern coasts of the country, in sub-Arctic regions. There he becomes mixed up with a feud against the crew of another boat, and is blamed for a series of disasters that in reality are due to the duplicity of an enemy of the boy himself. Then he becomes a castaway and is almost frozen to death. But there is more in the boy than in an ordinary fisherman, and in the end he takes command of the "*Golden Eagle*" when her owner has been compelled to go to hospital, and surprises everybody by discovering new banks where cod abound.

Eleven vigorous full-page drawings make admirable illustrations for this fine book.

"Leader by Destiny"

By Jeanette Eaton. (Harrap. 8/6 net)

The "Leader by Destiny" of this book is George Washington, and here is his story written for young people. We are spared the legends and myths that have grown up around this hero, and are given a plain account of his development into a soldier of the French and Indian wars, commander of the Revolutionary Army and finally President of the United States. This is well written, and shows us the great man at home and among his friends as well as taking part in national affairs; the high lights of his wonderful career are told in dramatic scenes in which we see the man himself come to life.

We meet Washington first in old Virginia and learn of his youthful desire for glory. We then watch him in frontier struggles, saving the remnants of Braddock's army after its rout by the French and their Indian allies, and leading the forces that afterwards defended the colonies and avenged the defeat. After this came another epoch in Washington's life, when he became a revolutionary. Washington it was who held the American armies together in the war with England at times when all seemed lost, and by his reolution and example he fairly earned the name of the Father of the United States. We see him unbroken in defeat, and restrained in victory, and understand why the Americans of his day turned more and more to him in any emergency. We are able also to realise why he became world-famous and is now an outstanding figure in history.

The book is illustrated by 19 full-page drawings, including portraits of Washington and his friends and associates.

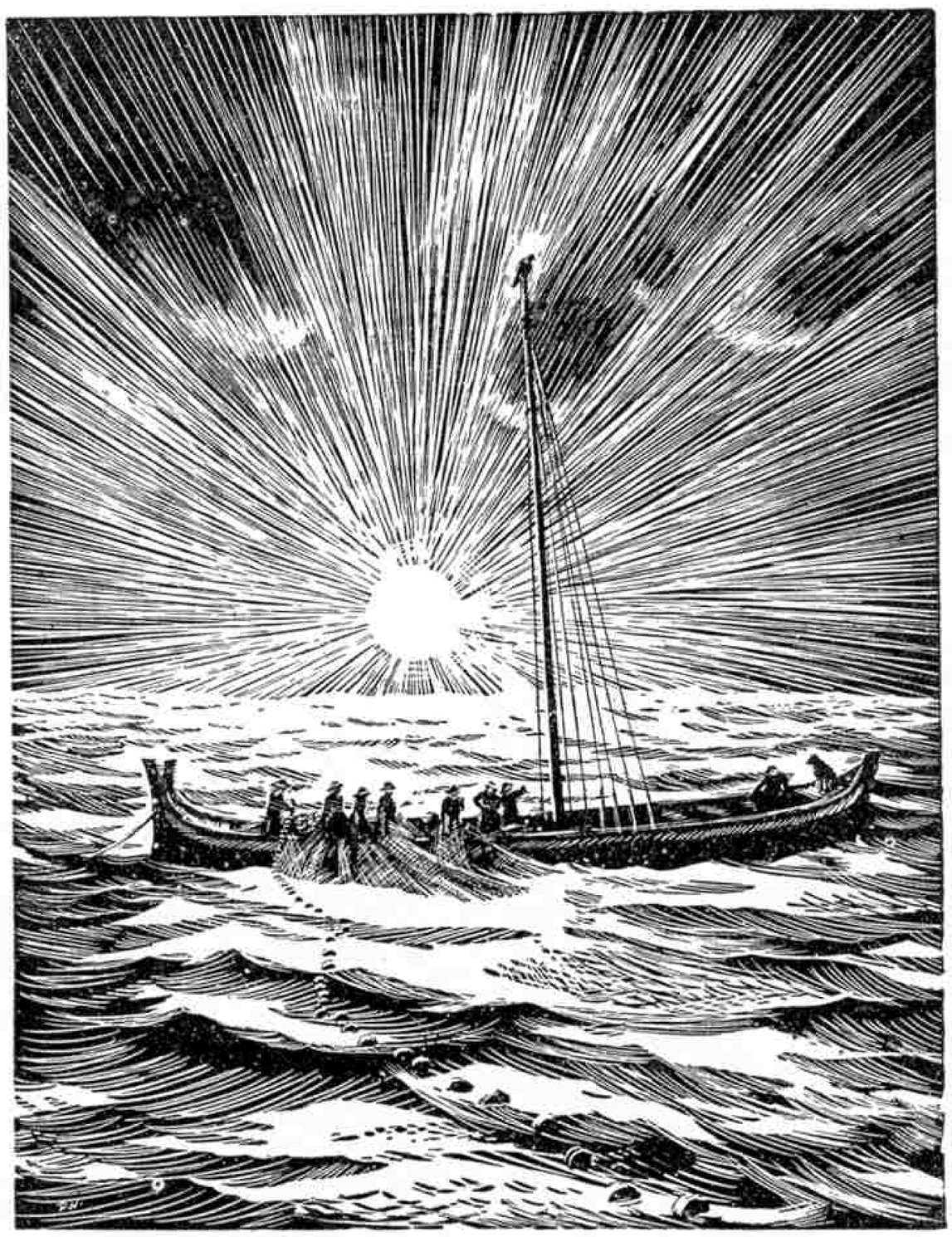
"Lighter Than Air"

By Stephen Wilkinson. (Stockwell. 6/- net)

Many books have been written relating personal experiences at sea, or on one or other of the "Fronts," during the Great War. This one deals with a less familiar side of British military activities at that time—the extensive use of balloons for training and other purposes. The author's acquaintance with balloons began with instruction in the art of observing the effects of gun-fire. He qualified as a pilot and instructor, and was put in charge of one of the large balloons "which formed one of the sights of London during the War." During the next three years he made hundreds of balloon flights, and none of his pupils ever received injury while flying in his charge. He himself was less fortunate, for he was often seriously damaged, and on one occasion had 11 aluminium alloy rivets put into his knee after a bad crash!

The author tells the story of his many exciting adventures in a lighthearted vein, whether he is writing of a thrilling balloon flight in which he descended almost upon a burning kiln, or of an attempt to fly in boisterous weather from London to Scotland that ended on a Yorkshire moor, some 200 miles from London. Towards the end of the War he took part in the preparation of the now famous balloon "fringe net," the forerunner of the Balloon Barrage, which was to protect London from invasion by aircraft, and made all the plans and the original survey for this scheme. In July 1919 he was awarded the Royal Air Force Cross.

The book makes good reading and is illustrated by several excellent drawings.



Casting nets into the black and icy sea on the cod banks off the Norwegian coast. From "Deep Silver," reviewed on this page.

"The Book of Insect Oddities"

By Raymond L. Ditmars. (Harrap. 6/- net)

Mr. Ditmars has written a very interesting book describing the stranger and more interesting insects of the half-million different kinds that are already known to us. The many excellent coloured illustrations by Helene Carter included in the book add greatly to its attractions, giving readers vivid ideas of the insects themselves and of the surroundings in which they are found.

It is impossible in a short review to cover the entire ground of the book, which begins with "singing" insects of the United States and Canada and ends with the compass termite of North Australia, the nests of which are wedge-shaped and always point exactly north and south, so that the midday glare of the Sun falls only on their sharp northern edges. In between there are butterflies, moths, locusts, ants, wasps, flies and beetles of every conceivable variety. Mr. Ditmars has some particularly strange or interesting things to tell about each, and his readers will be enthralled by his stories.

"Tales of the Frontiers"

By Robert Harding. (R.T.S. 2/6 net)

Secret Service adventure in the mysterious borderlands of India and other places east of Suez is a subject that Mr. Harding has made his own. He writes with first-hand knowledge of the scenes of his stories and of the natives, and knows well how to use this excellent material as a background for exciting stories full of unexpected turns.

Five of the yarns in the present volume are set on the North-West Frontier, four in the Persian Gulf and one each in India and Kurdistan. The principal characters, whether in disguise on Secret Service or simply carrying out the every-day tasks of the white man in undeveloped countries, face the greatest dangers with cool skill and courage, and their adventures and stratagems will be very much to the taste of readers. The book has a coloured frontispiece.

"Gentleman Grizzly"

By Reginald Barker. (Harrap. 5/- net)

Gentleman Grizzly is a stout old trapper who owes his nickname to his immense and powerful build, which reminds both friends and enemies of a grizzly bear. He lives in the mountains of Idaho and there are no secrets of the wild life of those regions that are hidden from him.

Each chapter in this very readable book tells the story of one of the adventures of this picturesque and delightful figure. We see him acting as deputy sheriff, tracking down dangerous criminals and exposing swindling fur pirates, and at other times find him capturing a marauding cougar that wantonly kills deer, or otherwise showing his deep knowledge of the backwoods. In every situation he acts not only with courage, but also with wisdom and ingenuity allied to keen commonsense that enables him to solve difficult problems easily. There are four whole-page illustrations, one in colour.

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THRILLS · WITH · TH

HORNB

Built to

The new Hornl
realistic railway
Hornby-Dublo
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Hornby-Dublo
from **Alternating**
The Dublo T

This is how your Hornby-Dublo Railway will look!

HORNBY-DUBLO TRAINS ARE MANUFACTUR

THE PERFECT TABLE RAILWAY

BY-DUBLO TRAINS

:o Scale—Realistic Details—Positive Remote Control

Hornby-Dublo System, Gauge 00, provides the ideal home railway. You can lay out a complete and ay on your dining-table!

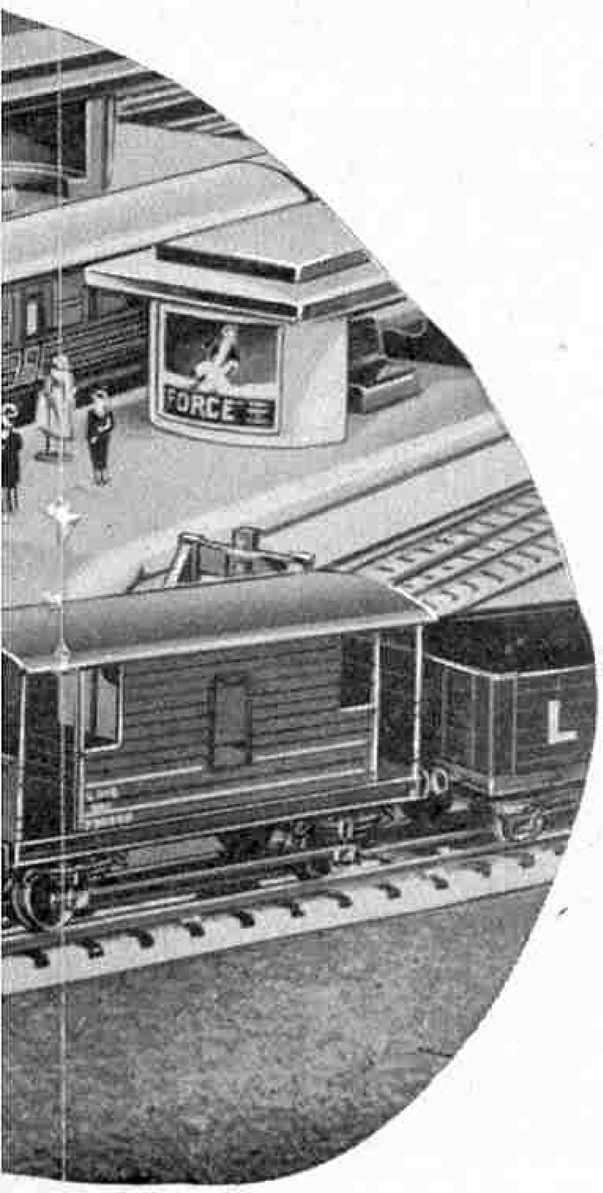
ublo Locomotives are fitted with motors (either clockwork or electric) of a power and reliability chieved in this gauge. All the movements of the Electric Locomotives are perfect—starting, stopping, speed regulation are all carried out by the movement of one lever.

: couplings are fitted to all Coaches, Vans and Wagons. The Signals are realistic working models of er-quadrant type and the Buffer Stops have working heads.

ublo Electric Trains operate on **Direct Current** at 12 volts. This current may be obtained either **ting Current Mains Supply** through a Dublo Transformer, or from a 12-volt accumulator.

lo Transformers are specially designed for these Trains; no others should be used.

Write to Meccano Ltd., Dept. DF, Binns Road, Liverpool 13, for a free copy of the special folder giving details of the Hornby-Dublo Railway System.



HORNBY-DUBLO EDP1 ELECTRIC AND DP1 CLOCKWORK PASSENGER TRAIN SETS

ELECTRIC

EDP1 Hornby-Dublo Electric Passenger Train Set, L.N.E.R. Contains EDL1 Streamlined Six-coupled Locomotive **"Sir Nigel Gresley"** (Automatic Reversing), Tender D1, Two-Coach Articulated Unit D2, Dublo Controller No. 1, seven EDA Curved Rails, one EDAT Curved Terminal Rail and two EDB Straight Rails. (To be operated from Dublo Transformer, not included in Set.) Price **70/-**

Where the mains supply is D.C., or there is no supply, the above Set is available with Dublo Controller No. 1a (for use with 12-volt accumulators) as follows:

EDPA1 Electric Passenger Train Set, L.N.E.R. (With Dublo Controller No. 1a.) Price **61/6**

CLOCKWORK

DP1 Clockwork Passenger Train Set, L.N.E.R. Contains DL1 Streamlined Six-coupled Locomotive **"Sir Nigel Gresley"** (Reversing), Tender D1, Two-Coach Articulated Unit D2, eight DA Curved Rails and two DB Straight Rails. Price **39/6**

HORNBY-DUBLO EDG7 ELECTRIC AND DG7 CLOCKWORK TANK GOODS TRAIN SETS

ELECTRIC

EDG7 Electric Tank Goods Train Set, L.M.S., L.N.E.R., G.W.R. or S.R. Contains EDL7 Six-coupled Tank Locomotive (Automatic Reversing), Open Goods Wagon D1, Goods Van D1, Goods Brake Van D1, Dublo Controller No. 1, seven EDA Curved Rails, one EDAT Curved Terminal Rail and two EDB Straight Rails. (To be operated from a Dublo Transformer, not included in Set.) Price **55/-**

Where the mains supply is D.C., or there is no supply, the above Set is available with Dublo Controller No. 1a (for use with 12-volt accumulators) as follows:

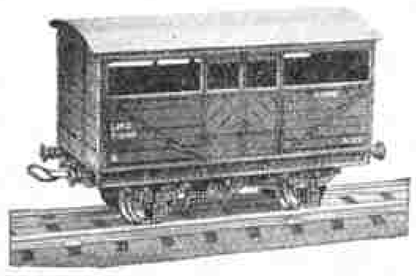
EDGA7 Electric Tank Goods Train Set. (With Dublo Controller No. 1a.) Price **46/6**

CLOCKWORK

DG7 Clockwork Tank Goods Train Set, L.M.S., L.N.E.R., G.W.R. or S.R. Contains DL7 Six-coupled Tank Locomotive (Reversing), Open Goods Wagon D1, Goods Van D1, Goods Brake Van D1, eight DA Curved Rails, and two DB Straight Rails. Price **27/6**

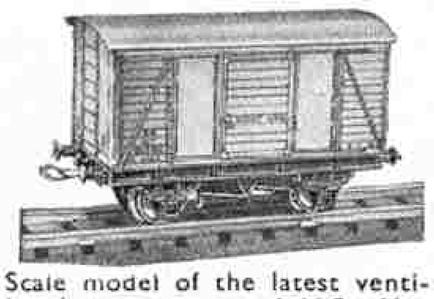
READY DURING THIS MONTH

CATTLE TRUCK D1
L.M.S. and G.W.R.



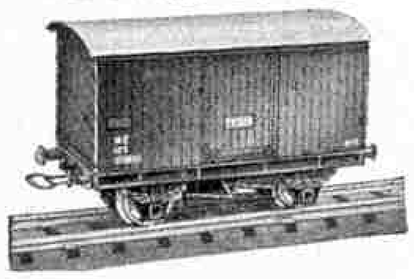
An attractive vehicle, fully detailed and typical of up-to-date practice of the two companies. Price **1/6**

MEAT VAN D1
L.M.S. and S.R.



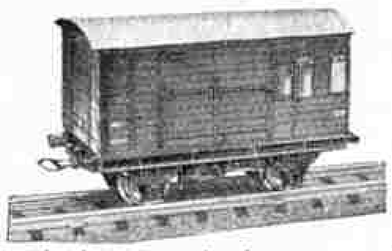
Scale model of the latest ventilated meat vans; L.M.S. Van Bauxite brown and S.R. Van buff. Price **1/6**

FISH VAN D1 N.E.



A characteristic N.E. van used for perishable traffic. Finished in red-brown with white roof and lettering. Price **1/6**

HORSE BOX D1 N.E.



Finished in teak brown with white lettering. Price **1/6**

OIL TANK WAGON
"ROYAL DAYLIGHT" D1

Finished in bright red with gold lettering. Price **2/6**

PETROL TANK WAGON
"POWER ETHYL" D1

Finished in green with gold and red lettering. Price **2/6**

RED IN LIVERPOOL BY MECCANO LIMITED

Scenic Effects for Hornby-Dublo Railways

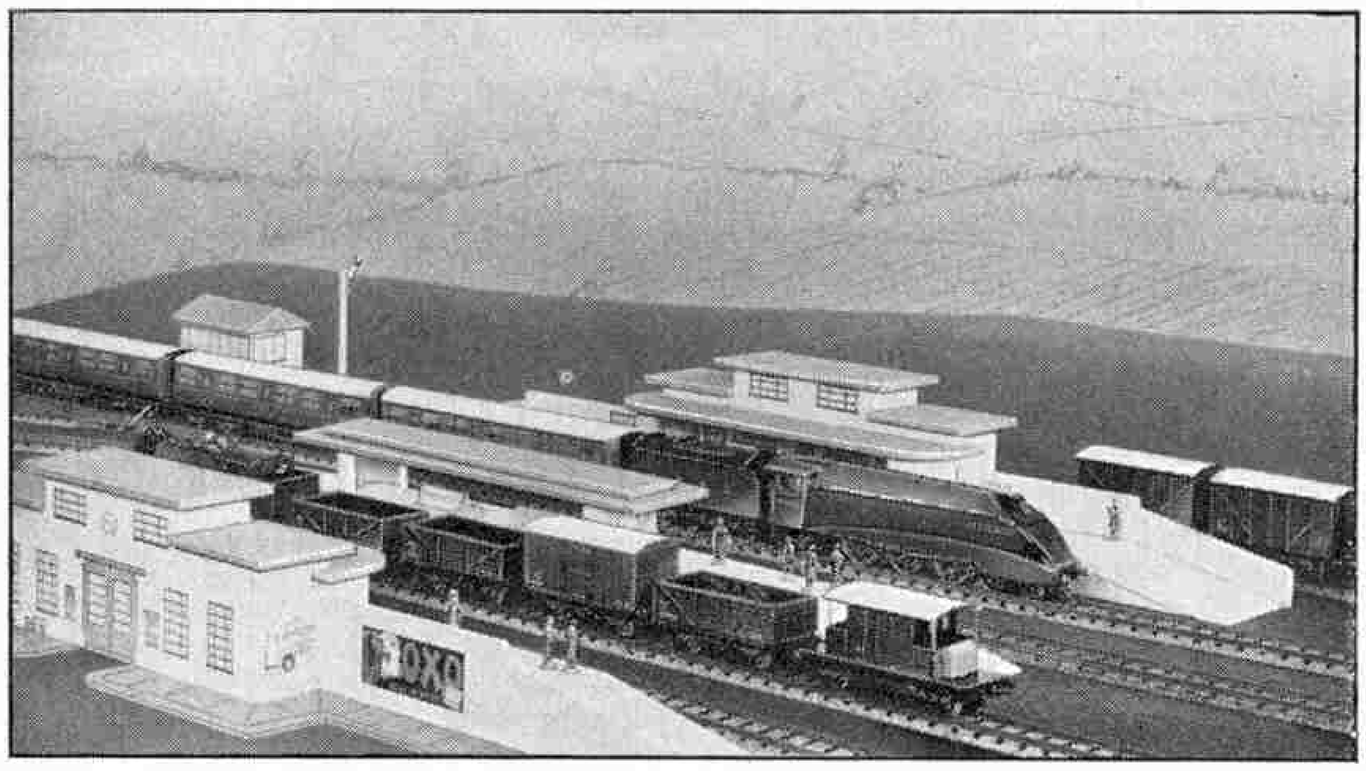
Embankments and other Accessories

THE aim of every Hornby-Dublo enthusiast is to make his railway as far as possible a miniature reproduction of the real thing, and in securing this the arrangement of suitable scenic effects is of the utmost importance. Hornby-Dublo components are wonderfully realistic scale models of real railway equipment and no effort should be spared to give them really worthy surroundings. There is no difficulty in making suitable scenery for inclusion in a layout, and any effort devoted to this side of the hobby will be well repaid by the pleasure of running trains on a railway that looks like the real thing in every respect.

Good embankments are a wonderful help in giving a miniature railway the right appearance. Every real railway has embankments, which are necessary means of ensuring the avoidance of heavy gradients, and making one for a Hornby-Dublo layout is quite a simple affair. If it can be made to carry the track across a depression of some kind it will be in accordance with real practice, but there is no reason why a raised embankment should not be used to carry the track over a road, or over another railway.

The first and most important step in building an embankment is to construct a suitable framework. This is best made of wooden strips about ½ in. wide, as these are strong and at the same time can be shaped and assembled without much trouble. The framework should not be too uniform in shape and sufficient space should be left on top to accommodate the tracks and also to permit "walking space" at each side. Nothing looks worse than an embankment on which the tracks are laid at the extreme edge, and look as if they are going to slip down the side of the embankment at any moment. The actual construction need not be elaborate and scrap pieces of wood can be used provided they are strong and firm, for they will be hidden from view when the embankment is finished. The general outline of the framework should be made the same as that of the intended embankment.

The height of the embankment is an important point to bear in mind. This should not be made so great that the gradients leading to it are too steep if it is of the raised type. A satisfactory height is about 2¾ in. from the base of the layout, but if the embankment is to be tunnelled through, as shown in the upper illustration on the opposite page, this should be increased to about 3¼ in. The approaching gradient should be arranged so that the incline is not any steeper than 1 in 40.

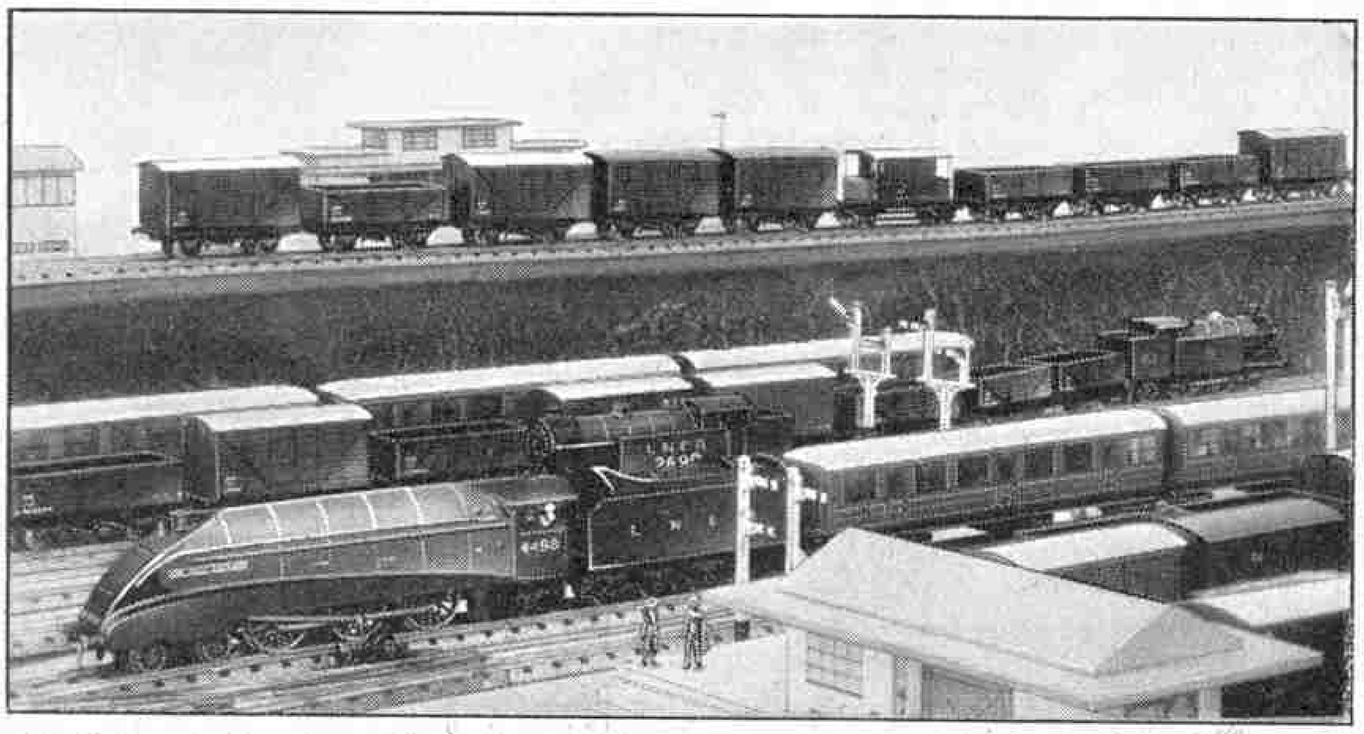


A busy scene on a Hornby-Dublo railway. The embankment is made with felt.

Next comes the covering of the framework. Many embankments have grassy slopes, and when a similar effect is aimed at in miniature the sides should be covered with pieces of old green felting. The shade of green must be carefully chosen, for too light or too dark a green would spoil the effect, and the felt should be rubbed up the wrong way when it has been fixed in place to give the proper "growing grass" effect. One or two scattered dabs of brown paint here and there improve the effect, for an uninterrupted shade is apt to appear too "clean cut."

Another method of arranging lineside hills or embankments is to make up a suitable framework of wood and to cover this over with rough brown paper. This gives a more rugged type of embankment that might be seen on lines in wilder country than that in which grassy embankments are usual. The brown paper should be crumpled and soaked in a fairly thin solution of glue or in ordinary flour paste before setting in position. The effect is really splendid when the paper is spread out and moulded to the required shape over the woodwork foundation and allowed to dry. The covering can be secured to the baseboard of the layout by means of drawing pins, which should be painted over in order to disguise them, and a few fine nails may be required to fix the paper to its wooden framework.

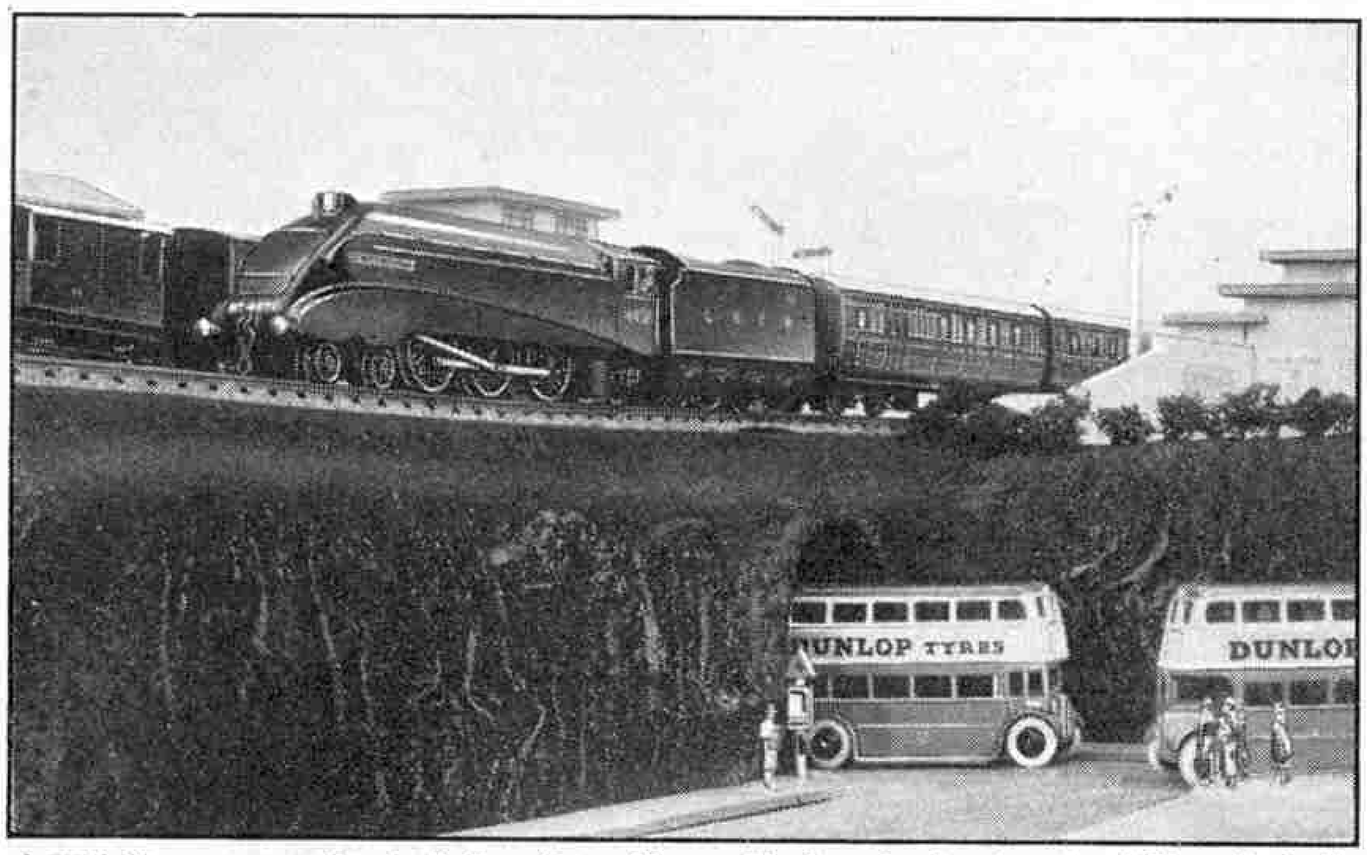
When scenery of this kind has been secured in position, and has set perfectly hard and dry, it should be painted. This is not a difficult



A realistic embankment on which a Hornby-Dublo track is laid. The construction of this type of embankment is described in this article.

process, but a certain amount of care is necessary if a messy daub is to be avoided. Artistic skill is not at all necessary, and it frequently happens that a novice obtains excellent results in spite of his lack of ability of this kind.

The colouring should be carried out with paints having a flat finish, as enamel dries with a shiny surface that would immediately appear artificial. Splashes and dabs here and there of different shades to represent rock, soil, sand, or wild flowers give the best effect, and a good way of giving a splendid finish is to sprinkle over the surface clean sand or even cinders. The patches that are to be covered with these materials should first be brushed over with thin glue or diluted Seccotine, to which the sand or cinders adhere firmly. Any surplus should be removed after the whole is set hard.



A realistic scene on a Hornby-Dublo railway. The combination of rail and road activities adds to the interest. The buses belong to the Dinky Toy Series.

If desired cardboard can be used in the construction of an embankment and it is a good idea to use this material for the "floor" at the top of it. Thick cardboard provides a firm enough surface for the track, but when it is used for this purpose the positions of the wooden cross pieces underneath it should be marked so that the rails can be screwed down to them if desired. When the cardboard has been secured in position it should be coated over with thin solution of glue, and the rails should be screwed down and finely-crushed cinders sprinkled over while this is still wet. The surface of the cardboard not covered by the track is then completely camouflaged to represent the familiar cinder track bed. The result is most railway-like in its appearance.

The card can be covered to suit the taste of the builder himself. Green felt can be used for a grassy slope effect, but if this is not available the cardboard can be treated with sawdust sprinkled over a coating of glue, the whole being then painted green.

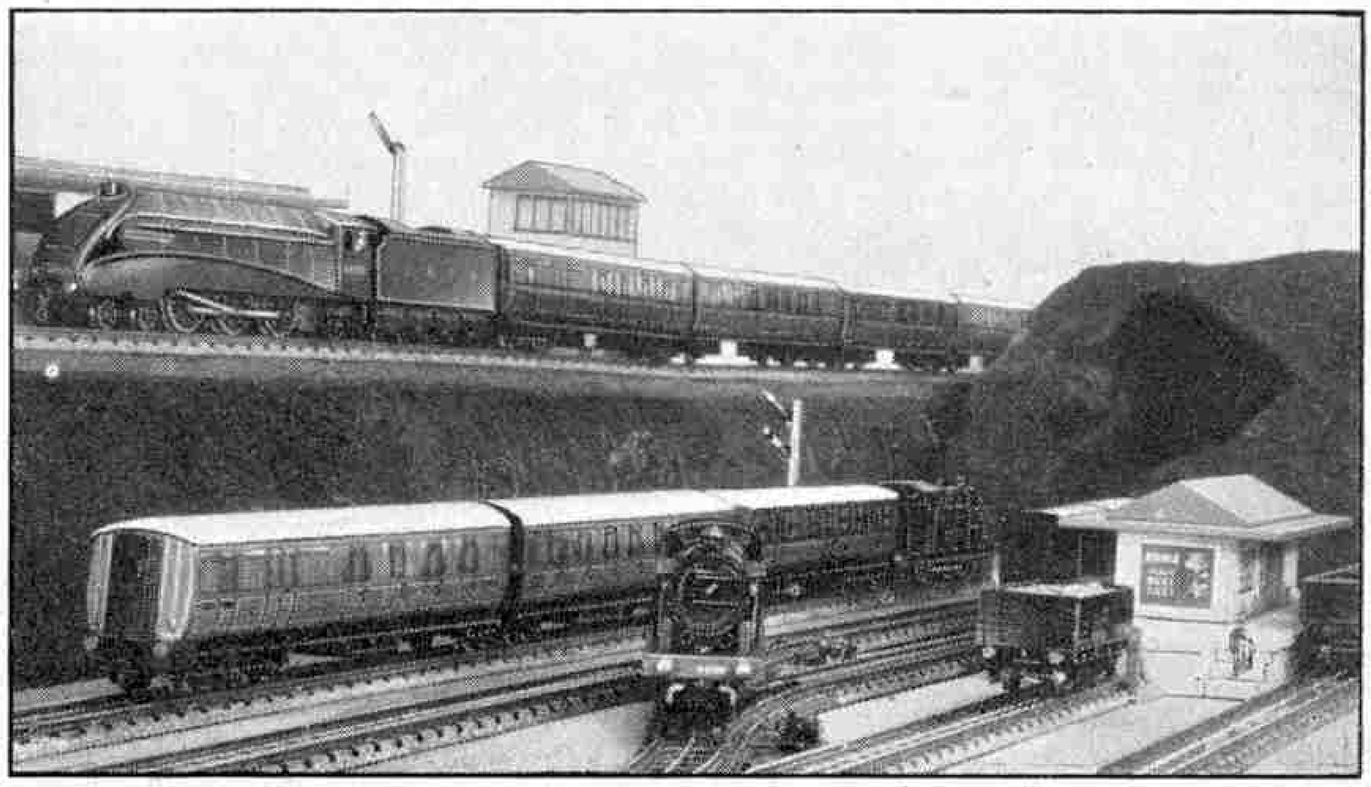
Cuttings for a Hornby-Dublo railway can be made in exactly the same way as described for making embankments. Care should be taken to avoid obtaining too artificial an effect by allowing the banks to be too even and symmetrical; a few bulges and depressions here and there will improve the effect.

Cardboard can be used for many other purposes by the industrious miniature railway engineer. The ease with which it can be manipulated makes it a fairly simple matter to construct various lineside buildings and other structures, such as footbridges of different types and retaining walls. Cardboard structures are quite strong and have a surprisingly long life if properly made. Before any attempt is made to cut out the cardboard it is important to mark it out carefully according to the measurements and the design of the accessory that is to be constructed. If care is not taken in this direction it will be difficult to fit the separate sections together and the whole job will be spoiled.

Cardboard is particularly useful for making tunnel mouths or bridges for use in conjunction with the embankments previously described. The cutting out of the various pieces is best done with a sharp penknife and Seccotine is the best material for adhesive purposes. Any large areas of cardboard should be stiffened on the inner side with thin strips of wood, which prevent damage that might occur through an accidental knock. The realistic tunnel mouth shown in the upper illustration on this page has been made of cardboard, as has the roof of the tunnel. The pavement on both sides of the "road" is the Dinky Toys Pavement, No. 46.

A scenic background is always a great attraction and, in fact, is considered a necessity by the keen model railwayman. Sometimes it is possible to obtain a wallpaper frieze depicting a suitable landscape. These are rather rare these days, but a local wallpaper dealer may have some oddments of old stock on hand and would be glad to dispose of them at a reasonable price. If a suitable frieze cannot be obtained the alternative is to make a background at home. This is by no means as formidable a task as might appear at first. The chief features can be represented roughly in paint or coloured chalk on a plain light blue background, and details can then be worked in at leisure. This plan has the great advantage that the scenery is arranged to suit exactly the requirements of the railway, a much more sensible arrangement than trying to make the railway match the scenery.

Several ideas will suggest themselves to enthusiasts for the making of actual lineside fields of various types for the foreground of the scenery. One ingenious scheme to represent a ploughed field is to use the corrugated board that is employed for parcelling purposes. The effect is excellent and the appearance of this board can be improved by sprinkling small quantities of water over it.


A Hornby-Dublo express at speed on the high-level track, under which a three-coach local train burrows.

New Hornby-Dublo Rolling Stock

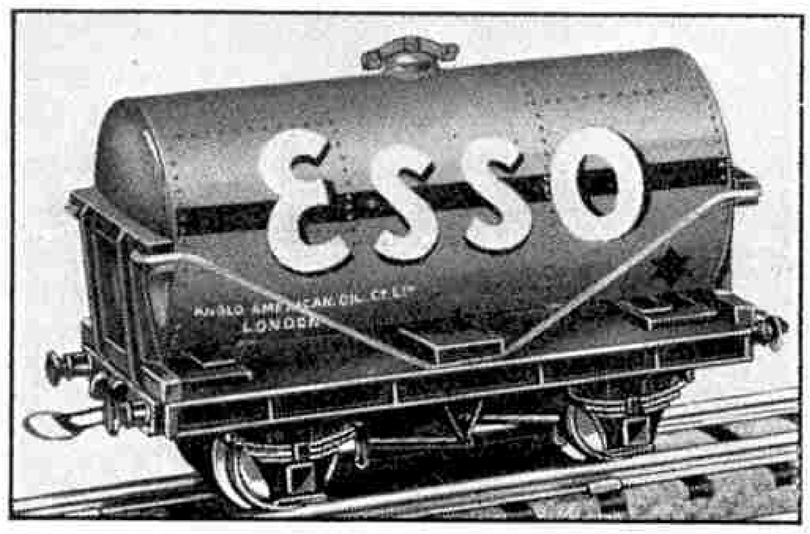
Carrying Oil, Petrol and Coal in Miniature

THE appearance of the Hornby-Dublo Railway last year caused tremendous excitement among model railway enthusiasts and since then the staff at Headquarters have been simply bombarded with enquiries. "Will new Wagons and Vans be added?" and "Will more accessories be introduced?" are the questions that are most often repeated. This article is an answer and all who are looking forward to building up their Gauge 00 railways will welcome its announcement of new rolling stock for the Hornby-Dublo range, especially as the new Tank Wagons and Coal Wagon with which it deals are only the first of many surprising and splendid introductions planned for the present year.

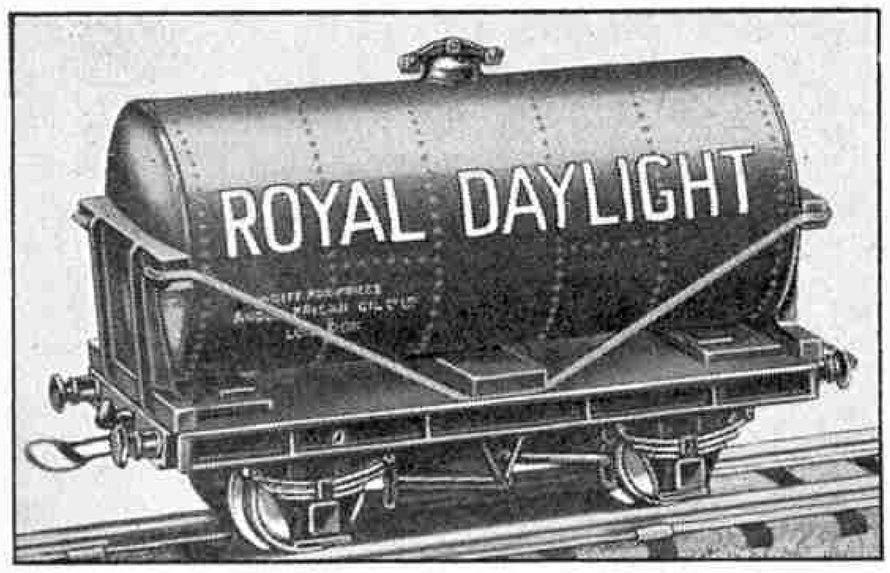
Tank Wagons have always ranked among the most popular models in the Hornby Gauge 0 System, and the new models illustrated on this page will be no less popular with Hornby-Dublo enthusiasts. Their distinctive shape makes them stand out prominently when mixed with other goods vehicles, and it is quite in order to use them in this manner, for petrol or oil tank wagons are to be seen in the make-up of many goods trains. They are usually to be found in the centre of the train so that they are as far away as possible from the engine, no matter in what direction the train is travelling. The purpose of this arrangement is to reduce to a minimum the risk of fire caused by sparks from the engine and a similar disposition should be made when running Tank Wagons on a Hornby-Dublo railway!

Although railway tank wagons are used for widely different commodities, from petrol to milk, they are generally very similar in their outward design. A typical example has a steel tank capable of holding 12, 14 or 20 tons of liquid, and built in sections with riveted joints. This is held in position by "T" section steel girders standing vertically at each end, and the vertical girders are connected by horizontal cross pieces of channel-section steel, into which are fitted stout wooden beams.

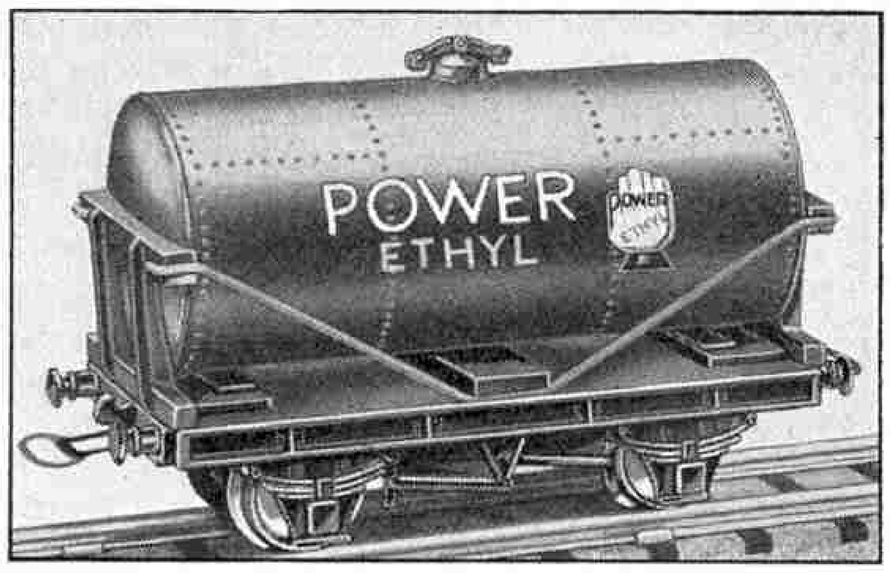
The Petrol and Oil Tank Wagons that have now been introduced in the Hornby-Dublo range are simple but strongly built. The tanks are mounted on the standard Hornby-Dublo Wagon base, which has caused much comment among scale model enthusiasts on account of its remarkable realism. These bases or chassis, to use the more correct term, are produced by pressure die-casting to allow as much detail as possible to be included, and buffers, sole-bars, brake-gear, axle-boxes and springs are among the details represented faithfully and admirably. The bodies of the new Wagons are finished by the tinprinting process, a method that allows the inclusion of a remarkable amount of realistic figuring and marking.

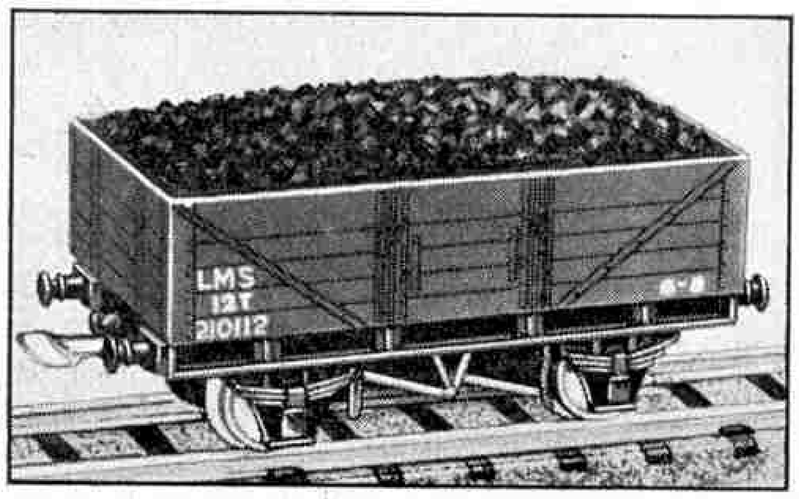


Tanks with sealed ends are usually very difficult to reproduce on model railways. The circular ends of the tanks of new Hornby-Dublo Tank Wagons are die-cast in one piece with the upright girders and horizontal cross pieces already mentioned. These die castings fit perfectly into the ends of the tank body, and the special nature of their design results in a very neat and flush-finish appearance. A man-hole filler is fitted at the top of each Tank Wagon. This is an excellent little casting reproducing all essential features of the real fittings clearly and without distortion.



New rolling stock for Hornby-Dublo Railways. Above is the perfectly finished model of one of the standard four-wheeled petrol tank wagons operated by the Anglo-American Oil Co. On the left is the "Royal Daylight" Oil Tank Wagon, an accurately finished miniature in red with gold letters. On the right is the "Power Ethyl" Petrol Tank Wagon. Below is a Hornby-Dublo reproduction of a 12-ton coal wagon. This Wagon is fitted with a representation of coal and can be used to make up realistic coal trains in miniature.





Of the three Hornby-Dublo Tank Wagons the one shown in the upper illustration on this page is a reproduction of an Anglo-American Oil Company's standard four-wheeled tank wagon. It is correctly finished in buff with bright blue lettering and is a very attractive model. The one lettered "Royal Daylight" is a miniature of another tank wagon of the Anglo-American Oil Company, and is finished in bright red with gold lettering. The "Power Ethyl" Tank Wagon is green with gold and red lettering and is a very distinctive model.

The conveyance in miniature of "petrol" can be made a feature of a Hornby-Dublo layout, and the Petrol Tank Lorries available in the Dinky Toy Series are ideal for road co-operation in this connection. These Lorries are fitted with neat rubber tyres and are correctly coloured representing the "Power," "Shell-B.P.," "Esso" and "Redline-Glico" Petrol Tank Lorries and "Mobiloil," "Castrol" Oil Tank Wagons. Dinky Toys Mechanical Horses and Trailers for the conveyance of "Esso" spirit and "Castrol" oil also can be worked into any scheme of this kind, and Hornby-Dublo owners will have no difficulty in working out plans for supplying the Dinky Toy Garage No. 48 with the realistic Petrol Pumps, Dinky Toys No. 49, with petrol brought from the refineries by rail and further distributed by road.

Another attractive new Wagon introduced this month is the Coal Wagon illustrated at the foot of the page. This is a scale model of one of the standard 12-ton open type wagons seen every day on real railways. The wagon body, which is built on the standard Hornby-Dublo chassis is tinprinted, and all essential features, such as the horizontal boarding, corner plates and strappings, are faithfully reproduced. A feature that makes the Wagon doubly interesting is the realistic representation of its load of coal.

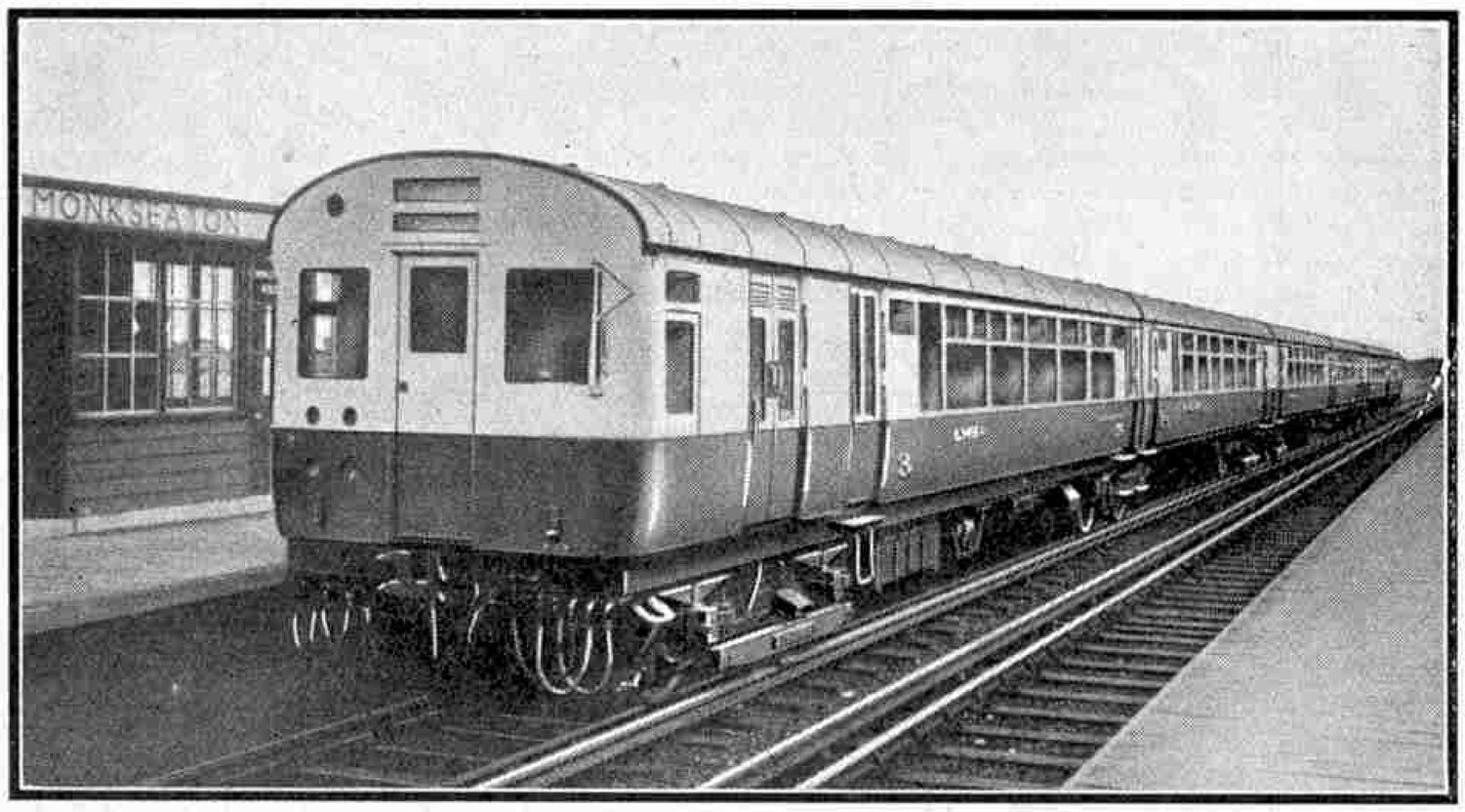
Coal trains are common practically on all railways, and Hornby-Dublo Railways will be all the more realistic for the reproduction on them in miniature of this essential feature. The new Wagons indeed open up a fine field for interesting train running. They are available in the colours of the four main line companies, and their details are in accordance with the practices of the groups they represent.

Extending Tyneside Electric Lines

L.N.E.R. Articulated Trains

THE commencement some time ago of new L.N.E.R. electric train services between Newcastle and South Shields marked the completion of a scheme of work that had been in progress for more than two years. In addition to the extension of electric working from Newcastle to South Shields the whole of the track equipment on the electrified lines already existing between Newcastle and the coastal towns of Tynemouth, Cullercoats and Whitley Bay, together with the loop line running between Manors and Percy Main known as the "Riverside" branch, has been brought up to modern standards.

Tyneside first saw the inauguration of electric working as long ago as 1903. Then contracts were let for the electrification of 37 miles of track. The work had to be carried out without any interruption of the ordinary traffic, but by September 1903 the equipment of a portion of the Riverside line was in a sufficiently advanced stage to permit the experimental running of one of the then new electric trains between Carville on the Riverside Loop and Percy Main, a distance of three miles. At the end of March 1904 the electric trains were running between Newcastle and Benton on the North side of the River Tyne, and this service was extended to Monkseaton at the beginning of June, only three months later, and subsequently to Tynemouth. The Riverside branch did not take long to complete, and on 1st July 1904 the circuit between the Central and New Bridge Street Stations, Newcastle, via Tynemouth was opened. The coaches introduced at that period were particularly smart in appearance, and were somewhat reminiscent of American practice with their end doors, centre gangways, clerestory roofs and vertical boarding. Possibly this resulted from a visit that had recently been paid to the United States by officials of the former North Eastern Railway, for various American ideas were adopted on the system.



One of the new Tyneside electric trains at Monkseaton Station, on the Tynemouth and Benton section. Each train consists of three two-coach articulated units. Photograph by courtesy of the L.N.E.R.

The electrified line running from Newcastle Central to South Shields on the south bank of the river is 11 miles in length and was partly worked by steam trains until the delivery of sufficient electric stock for the full all-electric accelerated service. On the north side of the river, the first new train was placed in service on 30th July 1937 and the delivery of all the new coaches was completed by the end of that year. On 3rd January last year the completion of the scheme was marked by the inauguration of a new train service allowing stopping trains from Newcastle and back to Newcastle via Tynemouth only 53 min. for the complete trip instead of the usual 63 min. Expresses from Newcastle to Tynemouth accomplished the journey in 24 min., an acceleration of 6 min.

In order to secure all the advantages of interchangeability of rolling stock the 630-volt third rail system has been adopted for the South Shields line. A preliminary to the electrification of the line was the lengthening of the platforms at Hebburn, Tyne Dock and High Shields stations to allow eight-car trains to be accommodated. In completing this work 2,360 tons of conductor rails were laid down during the year 1936-7, as well as track cables and other materials, and in November 1937 the third rail was electrified for the first time, tests for leakage, continuity and bonding taking place during the ensuing weeks. New electric substations were provided at Gateshead, Pelaw, Jarrow and Tyne Dock.

Passimeter ticket offices at Monkseation station and Whitley Bay station are included in the improvement schemes carried out in this district.

In connection with the modernisation of the existing electric track an interesting engineering feat had to be performed in making the position of the conductor rail conform to the National Standard to which the conductor rail on the newly-electrified section was laid. This repositioning necessitated moving the rail to the extent of $3\frac{1}{2}$ in. over a distance of 80 miles. It involved the removal of 50,000 insulators and the alteration of track continuity cables as well as current collecting equipment on all coaches. By careful planning however, the whole of this work was done in a single weekend. The Sunday and Monday services were steam operated and there had been certain alterations on the Friday and Saturday, but apart from these slight modifications the services were not interrupted at all.

Brightness is the keynote of the external decoration of the electric coaches now in use on all services radiating from Newcastle. The lower portion of the cars is painted in a pleasing shade of red and the upper portion is light cream. A black waist line divides the two colours. The seats are of the bucket type, and are arranged in pairs on each side of the centre gangway.

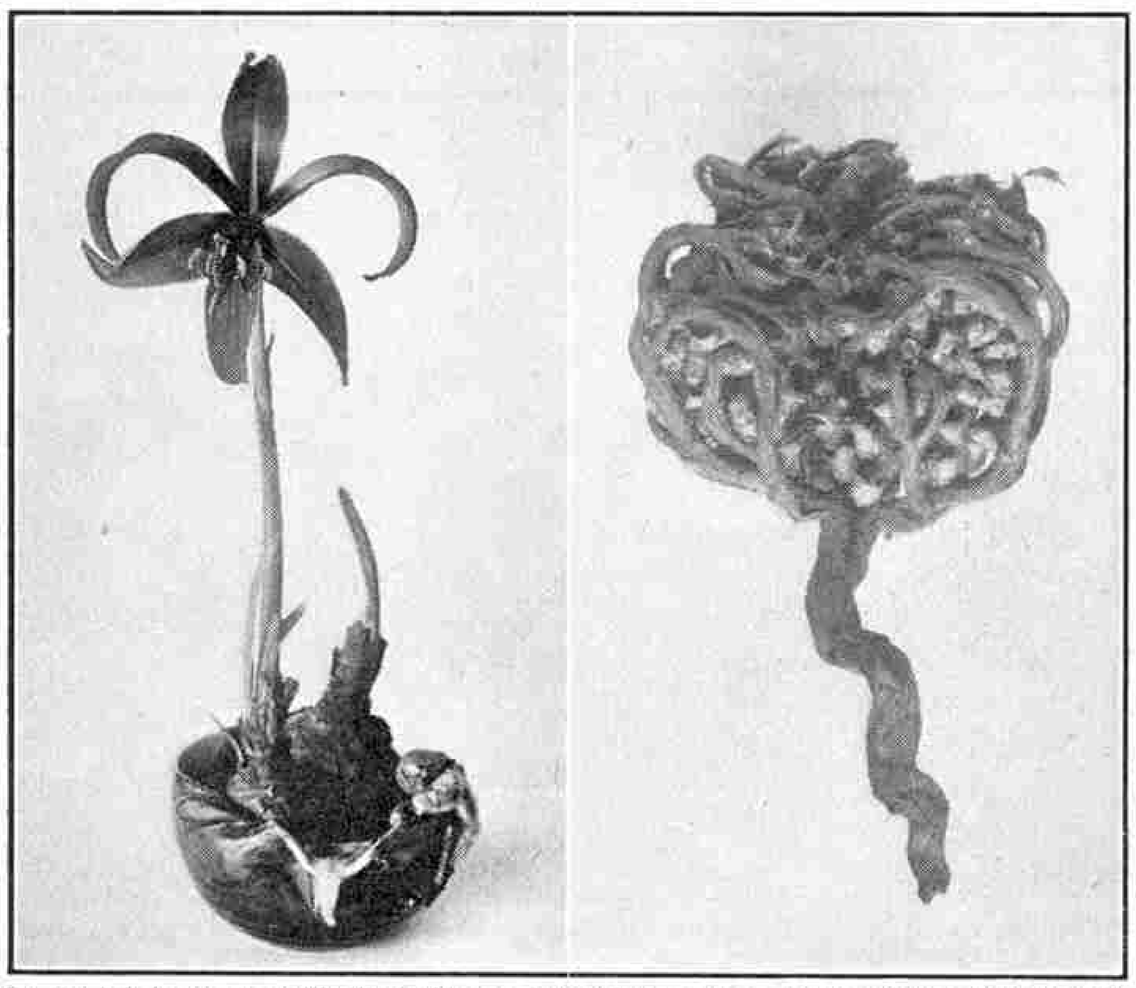
Gardening Without Soil

Easy Experiments with Quaint Plants

By H. Bastin

MOST people imagine that gardening is a toilsome art, involving much digging and delving in stubborn soils. Yet it is possible to grow a variety of interesting plants without soil in an ordinary room. A garden of this kind may be arranged on a table placed in a sunny window. There it will prove a constant source of interest and amusement to its owner, and the plants can be studied and admired at all hours of the day and in any weather, wet or fine. Few difficulties will be encountered, if two precautions are borne in mind. In the first place, whenever standing water is used, one or two small bits of charcoal should be dropped in to keep it sweet and pure. In the second it must be remembered that many plants when grown indoors do best if they are covered with a glass shade, because the air round them is then kept moist and uniform in temperature; but sufficient ventilation must be given. The ordinary air of a room often proves too dry and cold to satisfy a plant's needs.

Some of the best subjects to begin with are flowering bulbs. Hyacinths have been grown in glass jars filled with water since Victorian times; but many crocuses, both early and late flowering kinds, respond equally well to the same treatment. Specially made crocus glasses may be bought for a few pence each, but any bottle with a mouth wide enough to accommodate a bulb may be used. An important point about crocuses is that one can have bulbs in flower practically throughout the year, for no sooner have the spring varieties finished flowering than the autumn kinds will be ready to take their place.



On the left is an amaryllis lily in bloom. It had been grown without either water or soil. On the right is the strange resurrection plant known as the Rose of Jericho, the seeds of which are dispersed in the desert by the wind.

Several other kinds of bulb will blossom freely in the absence of both soil and water. Simply place them in a saucer on a sunny window ledge, and the flowers appear in due course! The colchicum, the so-called "autumn crocus," has this accommodating habit. Several distinct species can be bought from seed and bulb merchants, but the common one, which grows wild in some English meadows, is the best for our purpose. The large brown bulbs, which produce a wealth of pale mauve, delicately perfumed flowers, may be kept quite dry from start to finish, but they do better if a little water is given after the buds have begun to shoot.

Several of the handsome amaryllis lilies may be treated in the same manner. The bulbs shown in the left-hand illustration on this page were placed in the ornamental bowl without soil, and kept dry but in a good light until the flower buds began to appear, when a little water was given. These bulbs bloom in spring or early summer, but the Belladonna lily, which bears attractive clusters of large rose-pink blossoms, flowers in the autumn.

Mention must also be made of the curious "Monarch of the East," a relative of the Arum lily. Its large bulb, or tuber, needs no attention whatever. Kept on the mantelpiece or a shelf in a warm room, it unfailingly produces its flower, which is strikingly coloured and very strangely shaped, in the early spring. Unfortunately its perfume is the reverse of pleasing; but this is given off only for a few hours after its development is complete. After flowering all these bulbs may be planted in a sunny corner of the garden, where they will produce leafage, and in this way recondition themselves so that in the autumn they may be dug up, and stored in a box of silver sand, for use in the soil-less garden the following year.

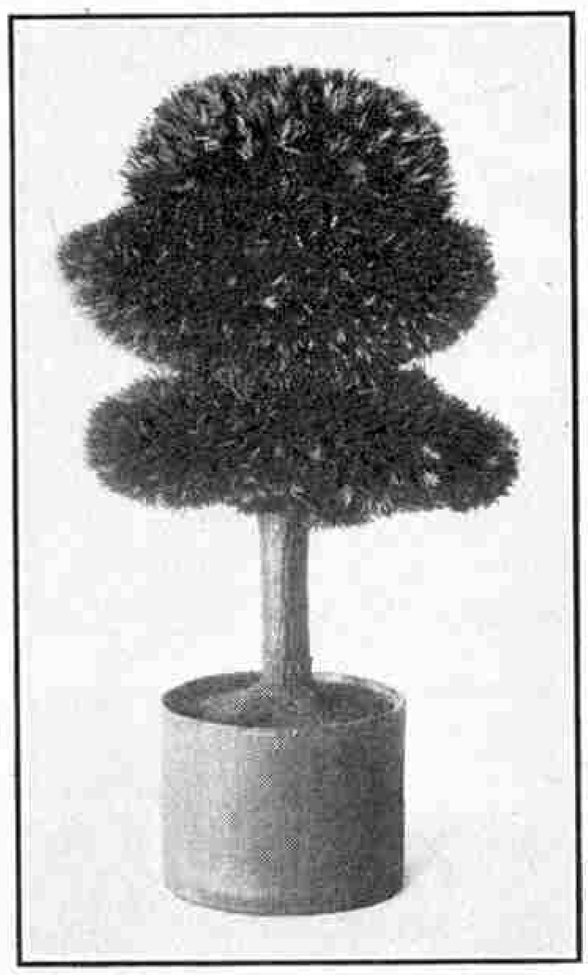
Acorns, horse chestnuts and several kinds of nuts can be grown in glass vessels of water, and the development of their root systems can then be watched. These baby trees will thrive for years if they are given a sufficiency of air and light, producing fresh green leaves each spring just as if they were growing in the open ground.

The curiosities known as "moss-trees" probably would puzzle most botanists at first sight, as strictly speaking they are manufactured articles. To make one, collect two or three shapely cushions of the well-known fork-moss that grows commonly in dry fir and beech woods, and fix these by means of a long toilet pin upon a twig of suitable size. The glass head of the pin naturally sinks into the topmost cushion of the moss, and is thus hidden from view, and the finished article when carefully put together will look like a miniature specimen of the art of topiary. If the "tree" is kept constantly moist it will flourish indefinitely and actually grow, for the moss cushions soon begin to sprout on their under surfaces, with the result that the whole shortly becomes green and charming.

Another attractive novelty is a carrot fern. To make one cut off the broad end of a large carrot and scoop out most of its centre, taking care however not to injure the "crown" from which the leaves shoot. These operations leave you with a kind of cup which, when suspended by means of a wire in a sunny window and kept filled with

water, soon festoons itself with green foliage. A beetroot may be treated in the same manner with similar results, but in this instance the leaves, though colourful, lack the fern-like grace of the carrot's.

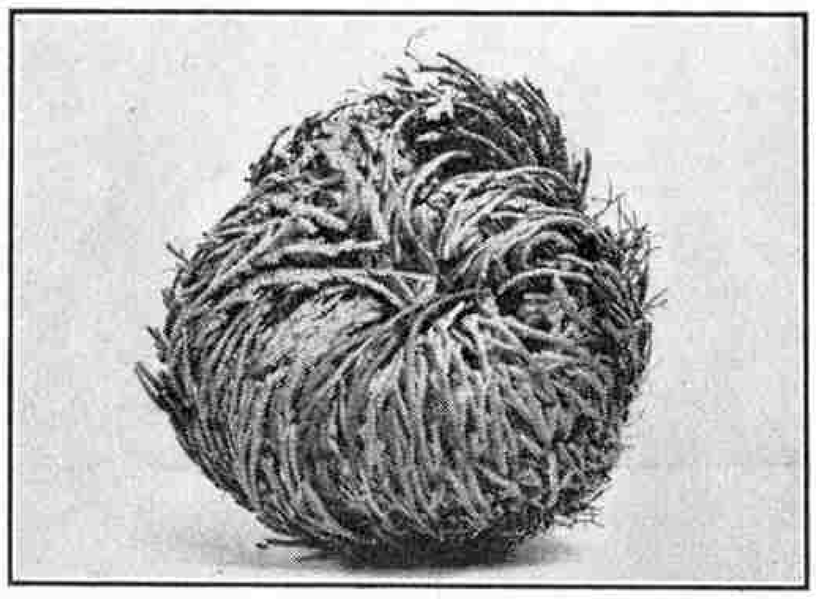
Quaintly shaped articles of unglazed pottery such as laughable heads, broad-backed porkers and so forth, provide a medium for effective seed growing without soil, and can be bought at any florists. They are filled with water, and seeds then sprinkled on their rough upper surfaces soon send up green shoots. The tiny seeds of canary grass are frequently used, and the hair-like effect of the young blades they give is very pleasing. Mustard and cress and other small seeds also can be sown in this way with excellent results, but a better plan is to sow them on a brick wrapped in felt or flannel and placed in a dish of water. The water soaks up through the brick and keeps the fabric constantly moist, so that the seeds sown on it are never in danger of drying up. Home-grown salads also may be cultivated on sponges kept saturated with water, or in saucers and dishes lined with moist felt or flannel.



A moss tree, made by fixing cushions of wood-moss to a twig. When kept moist the moss of this "tree" continues to grow.

Perhaps our readers will hardly credit the statement that excellent new potatoes can be produced as required by the simple process of shutting up old ones in a dry, light-proof box. For this purpose large, sound tubers with plenty of "eyes" or growing points should be chosen. They must be kept in the dark, for if even a tiny ray of light penetrates the potatoes will send out long sickly stems, instead of the succulent new tubers that we wish to see.

Among the several kinds of so-called "resurrection" plants, the one most suitable for cultivation in a soil-less garden is a species of club-moss called selaginella, a native of Texas. Imported specimens are usually obtainable from florists and nurserymen at the cost of a few pence each. When bought they resemble tightly rolled balls of brown fibre; but after soaking in slightly warm water they expand into a mat of bright green fronds, which continue to flourish for some weeks or months. Afterwards they are apt suddenly to show signs of exhaustion, as if protesting that they need a rest cure. When this happens to one of these plants it should be dried off and put away in a cupboard, from which it may be taken after a due interval and once again revived for another spell of activity and growth. It is in this way that the selaginella accommodates itself to the cycle of wet and dry seasons of its native home.



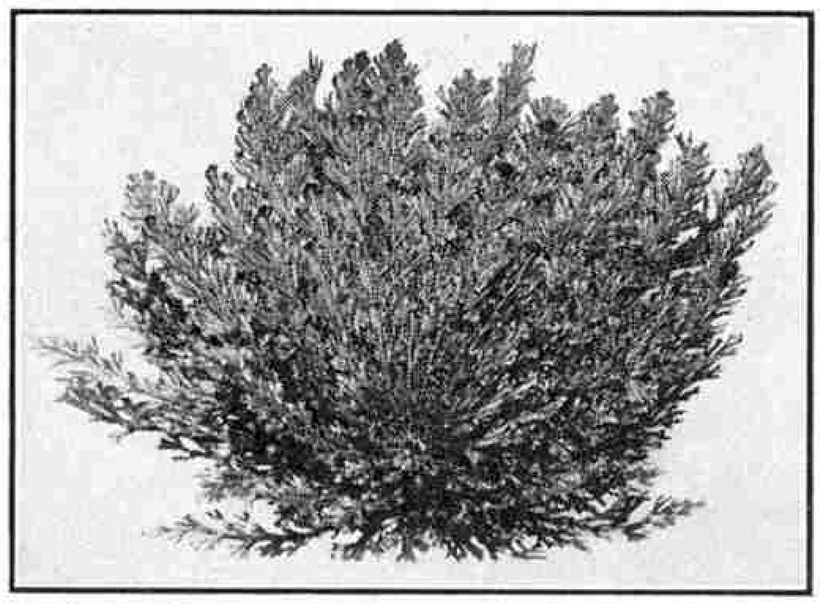
The Texan selaginella, another resurrection plant, which is imported in the dry and dormant state.

The particular kind of resurrection plant known as the Rose of Jericho, while hardly suitable for the soil-less garden, is worthy of mention because of its remarkable habits. Experts tell us that it is probably the "rolling thing before the whirlwind" mentioned in the Bible. The reference is in Isaiah, chapter xvii, verse 13. At the end of the flowering season the parent plant, which forms a small shrub, tightly embraces its own seeds with its small branches and breaks away from its roots. It is then carried over the desert for long distances by the wind. Eventually it comes to rest, and with the arrival of the next rainy season its branches open out, scattering the seeds on the moist soil, where they germinate and take root.

Several kinds of ferns can easily be grown without soil, some of the best being known as davallias, from Japan. These may be bought with the rhizomes twisted and wired into various shapes, such as balls, baskets and monkeys, and when suspended in a sunny window will grow freely during the warm weather, needing only a good watering daily to keep them vigorous. They should be slowly dried off on the approach of autumn and stored during the winter in an even temperature. One of our native ferns, the common polypody, can be treated in the same manner, but must be given plenty of moisture during the growing season. One of its natural haunts is the cleft of a rock or a crevice in an aged tree trunk, often many feet above the soil level.

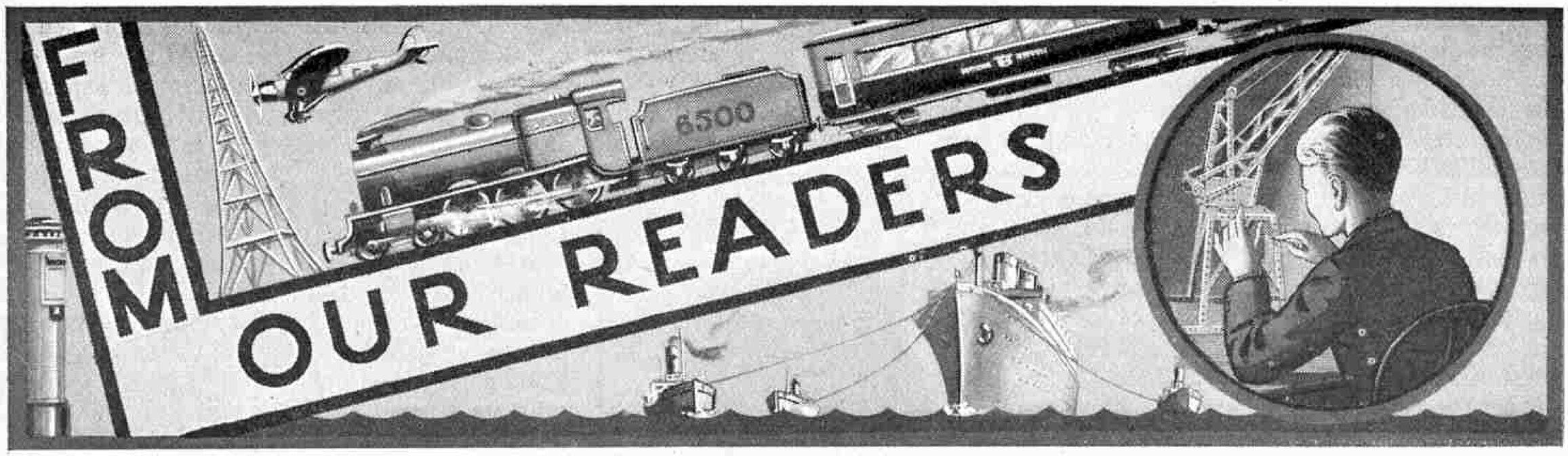
The epiphytes, or "perched plants" of the botanist, have naturally acquired the soil-less habit. Most of them grow on the trunks or branches of trees in humid forests, and take up much of the moisture they need from the air by means of their roots. Some, such as the elk's horn fern and certain beautiful orchids, can only be grown successfully in a hothouse. But several of the remarkable air-rooted plants called tillandsia can be induced to flourish in the temperature of an ordinary living-room, although they are best kept under a glass shade, since they cannot tolerate a dry atmosphere.

It is quite possible to cultivate miniature rock gardens, in the manner of those first introduced into this country from Japan, without recourse to soil. The foundation should consist of several pieces of thick felt placed in a suitable dish above a thin layer of powdered charcoal. This should be thoroughly moistened. Small pieces of stone are then built up on the felt, the crevices being filled in with tiny cushions of moss and wee plants such as may be obtained from any nurseryman of repute.



The result of soaking the dry selaginella in warm water is the unfolding of its attractive green fronds.

The lesser varieties of house-leek and saxifrage are good subjects to choose for such a miniature garden. Better still, perhaps, are such hardy carpeters as helixine, which unfortunately has no English name, and the Balearic sand-wort, both of which ramble freely over porous stone that is kept moist and exist happily with little light.

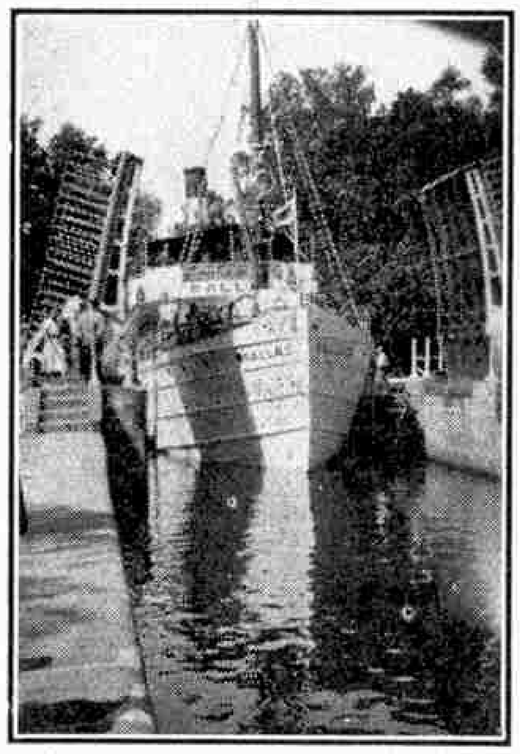


These pages are reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of which the writer has special knowledge or experience. These should be written neatly on one side of the paper only, and should be accompanied if possible by original photographs 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.

On the Göta Canal

The Göta Canal runs between Gothenburg and the Baltic Sea, and has a total length of about 115 miles. It is not strictly a canal throughout its length, however, for part of its course passes along rivers and through lakes. It is used by cargo ships of up to 1,300 tons, carrying timber and ore, and small, comfortable passenger steamers that link the ports of Gothenburg and Stockholm.

I was able to make this trip recently, and it proved most interesting and enjoyable. Starting from Gothenburg we went up the Göta River to Trollhättan. While the steamer was passing through the five locks there I went ashore to see a great power station in which power derived from waterfalls is utilised to generate electricity. The output of the station is about 200,000 h.p., and it supplies current for the electric railway between Gothenburg and Stockholm. After Trollhättan, we passed into Lake Vättern, the largest lake in Europe outside Russia, so large in fact, that crossing it was like being on the open sea and we almost lost sight of land. Then we proceeded by canal to Lake Vänern, another very large lake, the water of which was quite choppy. We stopped at Vadstena, where there was time to do more sightseeing ashore, and at Motala, where there is another large hydro-electric station and also the grave of von Platen, the engineer who built the Göta Canal over 100 years ago.


A boat passing through a lock in the Göta Canal. Photograph by W. L. Dudley, Halifax.

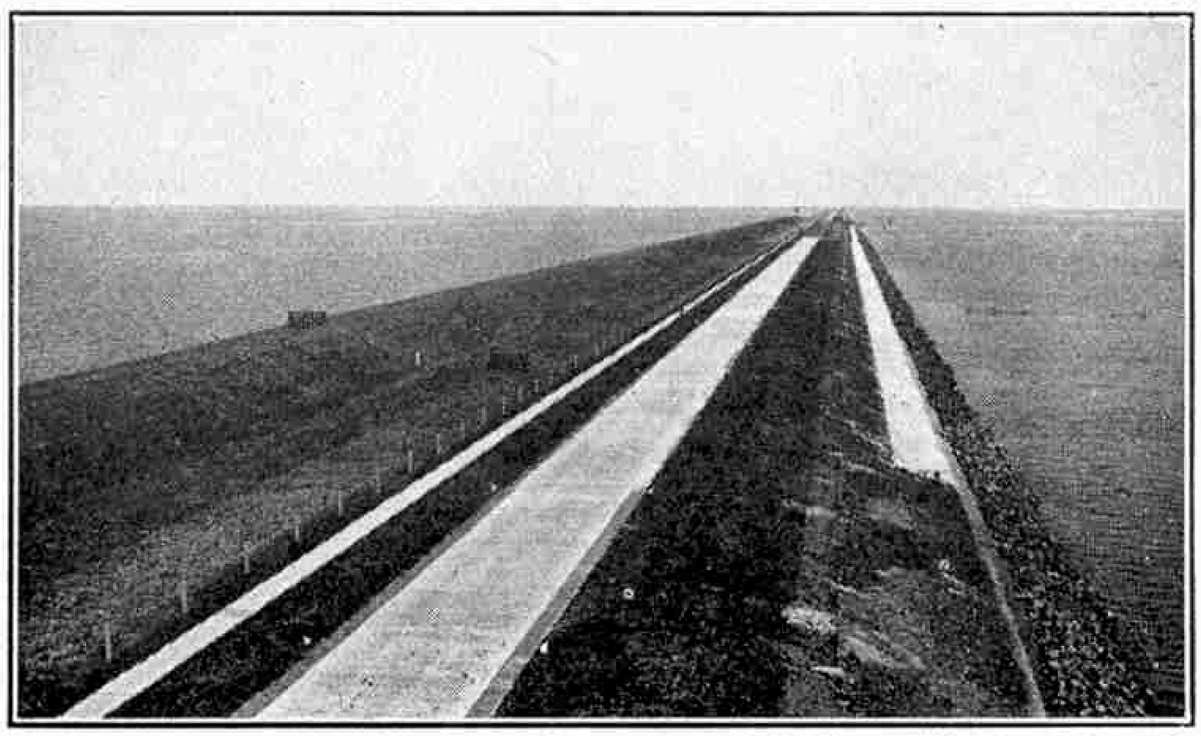
The highest point we reached was 300 ft. above sea level, so that many locks had to be negotiated; and in one place there was a regular stairway of 15 of these. It took about eight minutes to pass through each, so that there was again plenty of time to land and stretch one's legs. After passing through many small and beautiful lakes we reached the Baltic Sea, where for some time we steamed through an archipelago of wooded islands. Then we passed by canal into Lake Mälaren, stopping at several small places for cargo and passengers. Lake Mälaren is, as it were, the back door of Stockholm, the main approach to the city being from the east. We finally tied up quite close to the Town Hall, which is one of the finest modern buildings in the world.

The trip actually took three days and on account of the great variety of country passed through, the places visited and, I must add, the excellent catering, it was never for a moment monotonous.

W. L. Dudley (Halifax).

The Zuider Dam

When in Holland last summer I visited the great Zuider Dam, which cuts off the Zuider Zee from the North Sea. The massive embankment is about 18 miles long, and in the middle is a monument commemorating its completion, and also marking the boundary between North Holland and Friesland. From the top of this monument the Dam can be seen stretching away in each direction, as straight as a ruler, until its converging lines appear to meet in the haze on the horizon. It is about 285 ft. wide, and on the seaward side rises about 24 ft. above mean water level. The landward bank is considerably lower, there being a difference in level of about 11 ft. There are a railway track, a road and a cycle track along the Dam. At each end there are sluice gates to regulate the level of the Ijselmeer, as the remnant of the Zuider Zee is now called, and also locks, those at the southern end allowing boats going to and from Amsterdam to pass through. I went across land reclaimed since the completion of the Zuider Dam. It was well laid out, the houses being spaced well apart, each with its own fields round it.


The Zuider Dam, which separates the North Sea, seen on the left, from the Isjelmeer, formerly part of the Zuider Zee. Photograph by R. P. Letcher, Ringwood.

R. P. Letcher (Ringwood).

A One-Man Gasworks

How would you like to run a gasworks all by yourself? The prospect would alarm most people, but Mr. Norman Lee of Seascale, Cumberland, actually does this. He has been the manager, staff and entire personnel of his gasworks for the past six years, before which his father was in charge.

Making my way past the station I came across the works, nestling in a hollow of the fells, with Mr. Lee, an active young man, busily shovelling coal into the furnaces. He told me that his task is most difficult in the summer months, when there is a great influx of visitors in Seascale, and the number of people there and the demand for gas can never be exactly foreseen.

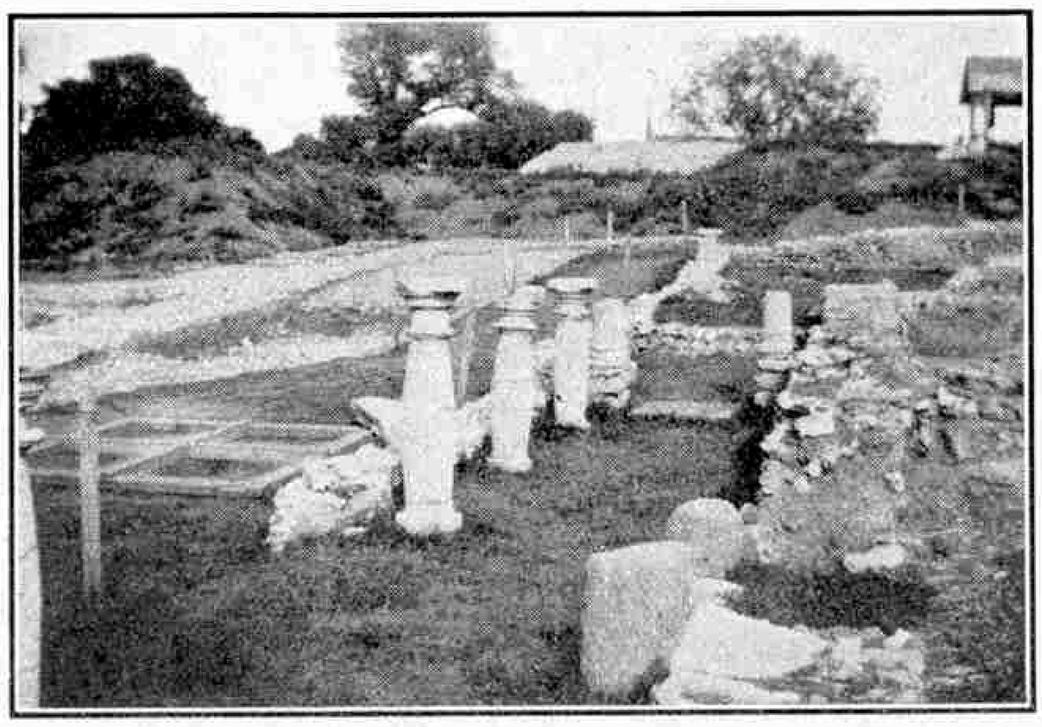
Mr. Norman Lee, firing up at the gasworks at Seascale, Cumberland, which he has run unaided for the last six years. Photograph by L. Sansom, London.

The actual production of gas is not the only work Mr. Lee has to do. The storage tanks have to receive regular attention, and sacks have to be filled with coke and taken round for sale. Another sideline is making barrels of tar, and every other year the work of painting the two large gasholders is tackled single-handed. In addition Mr. Lee personally installs all the gas meters and cooking stoves in the district, and on one occasion was actually called out to mend a burst water main! Yet with all this Mr. Lee has some spare time, and to prove that he thinks of other things than gas there is a neatly-kept garden to be seen, sheltered behind one of the gasholders.

L. Sansom (London).

The Romans at Dorchester

Under the streets and buildings of modern Dorchester lie the remains of the ancient Roman town of Durnovaria. This was built at the meeting-place of four important roads, at a point where the Frome Valley was most easily crossed. Of the town plan little is known, but in an area known as Colliton Park the remains of six Roman buildings have been discovered by archæologists.



Excavations at Colliton Park, Dorchester, where the ruins of six Roman buildings have been discovered. Photograph by J. Wakeley, Bournemouth.

One of these buildings must have been a villa of considerable size, built by people of wealth and importance. Originally it consisted of two wings built at right angles. The living rooms were in the western wing, and had tessellated floors, and the southern wing contained baths and service rooms. In one room was found a large quantity of coloured plaster, on one fragment of which was scratched an inscription "*Maternus scripsit.*" Beneath the floor of the same room was a hypocaust, that is a hot air chamber for heating the room in winter time. The ruins of this can be seen in the accompanying illustration, but all that remains of the stokehole is the foundation on the chalk.

Water was drawn from a well conveniently situated for supplying both the baths and the living quarters. When the well was uncovered it was found to be 3 ft. 6 in. in diameter and 33 ft. deep. According to experts its capacity originally must have been at least 2,000 gallons an hour.

I learned from one of the guides of various discoveries showing that during the closing years of the Roman occupation the villa was occupied by people who treated it with little respect, destroying the floors, and building a primitive fireplace, mostly of broken roof-slabs, for their cooking. There is evidence of much deliberate destruction, and beautiful stone columns seem to have been thrown into the well, from which they have been recovered.

J. Wakeley (Bournemouth).

A Unique Fishpond

There are probably few other fishponds like one I saw at Port Logan in Wigtownshire. This is a circular rock pool, with a wall about 30 ft. high from which a sloping stone pathway leads down to a ledge, visible at low tide only, that surrounds the pool. Opposite the foot of the pathway is a tunnel about 4 ft. in diameter that stretches out to the sea a distance of about 35 ft., and allows the renewal of the water at every high tide.

The pond was built in 1800 to ensure a supply of fish for the people of Logan House, but is now only kept as an attraction for sightseers. It is stocked with common sea fish such as cod, listh and saith, some of which are as much as 10 years old, while others are only a few months. Both young and old are tame, and the young ones soon learn to trust their keeper, who comes every day at regular intervals to feed them with limpets gathered from rocks near by. At feeding time the keeper first of all throws a few limpets into the pond, then goes down to the edge of the pool to feed the fish by hand. She holds a limpet in her fingers, which just touch the surface of the water, and the fish soon gather round and the limpet is snapped up. Some of the oldest are so tame that they allow themselves to be stroked. The rock wall of the pool is dotted over with sea pinks, which are in full bloom in June and July.

C. P. Hay (Stranraer).

Grabs and Hoists for Cranes

Equipment That Will Improve Your Models

By "Lock-Nut"

THE fun of building and playing with a model crane is greatly increased by providing it with alternative types of grabs and hoisting tackle, so that loads of different kinds can be lifted. Actual cranes have to handle loads varying from sand and rock to giant concrete blocks and heavy metal castings, and many different types of grabs and lifting gear have been devised to enable them to tackle their work in an efficient and rapid manner. In this article I am showing how some of the more commonly used types of lifting gear can be modelled in Meccano. All the examples mentioned are easy to build and among them are grabs suitable for building from both large and small Outfits.

One of the most simple and generally used grabs is the bucket type employed in actual practice for lifting loose materials such as mud, sand and gravel. A model of this kind is shown in Fig. 1. It has two scoop-like pivoted jaws, which are controlled by ropes from the driving cab and can be opened and closed as desired. The grab is operated by opening the jaws and then lowering it swiftly on to the heap of sand or other material to be moved. The jaws are then closed, an action that causes them to bite into the material and scoop up a full load, and the grab is then hoisted.

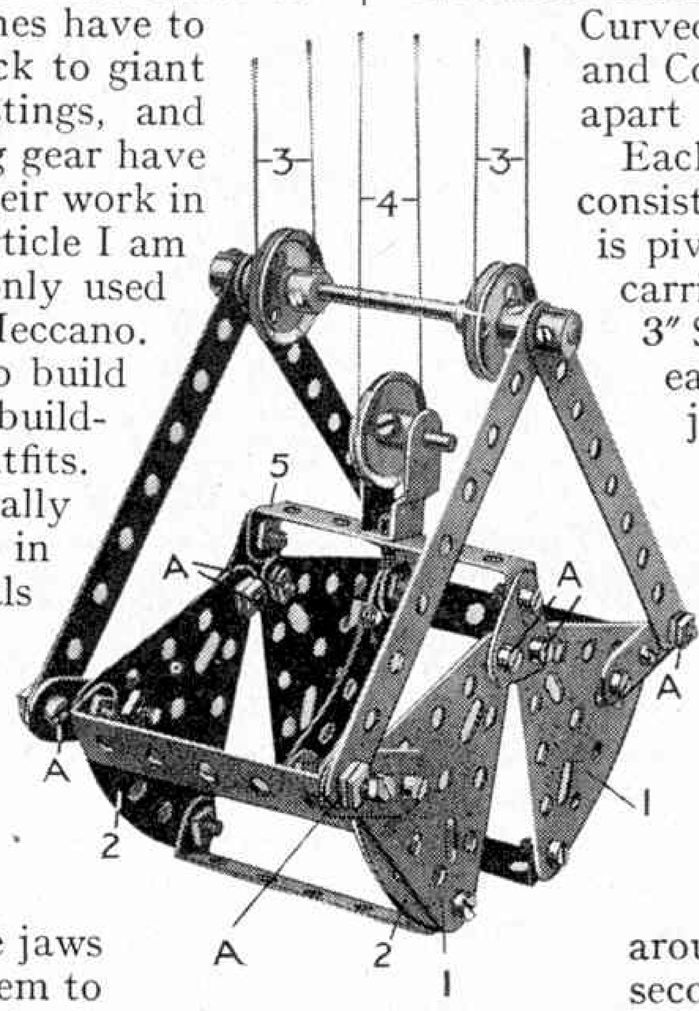


Fig. 1. A model bucket grab used for handling loose material.

The model grab has jaws made of $2\frac{1}{2}''$ Triangular Plates 1 extended at their bases by $2\frac{1}{2}''$ Curved Strips 2. It is raised or lowered by means of cords 3, while another cord 4 passes round a 1″ Pulley carried on the cross-piece 5. All the cords pass around winding barrels in the crane mechanism. If the cords 3 and 4 are hauled in or paid out at the same speed, the grab travels up or down without the jaws moving, but if one cord is stopped, the grab opens or closes according to the direction of movement of the other cord.

The joints "A" are all pivoted by means of bolts and lock-nuts, and real sand or other loose material can be lifted if the outer sides of the grab are filled in with Flexible Plates. The model crane or excavator to which the grab is fitted must have two hoisting drums that are geared so that they may be operated either independently or together.

Although bucket type grabs are used extensively for handling sand, gravel, earth and similar materials, large blocks and stones cannot be dealt with in this manner and sometimes slings are used. This is a rather slow method, however, and it is now more general to use a grab of the kind shown in model form in Fig. 2. The chief part of the grab mechanism is a suspension block made from two 2″ Strips and 1″ Corner Brackets, spaced $\frac{1}{2}''$ apart by means of $\frac{3}{4}''$ securing Bolts. The hoisting Cord is tied to one of these Bolts and the other Bolt carries a $\frac{1}{2}''$ loose Pulley and two washers. The Rod 1, passed through the 2″ Strips and Corner Brackets, serves as a pivot for curved arms to which the gripping jaws are attached. Each arm is made from two $2\frac{1}{2}''$ small radius Curved Strips to which $4\frac{1}{2}''$ Strips are bolted, and Collars are used as shown to space the Strips apart and make the arms rigid.

Each of the jaws that grip the block or stone consists of six $2\frac{1}{2}''$ large radius Curved Strips and is pivoted on a $\frac{1}{2}''$ Bolt 2. Each of the latter carries also two 3″ Strips, and a further pair of 3″ Strips is rigidly bolted in the centre hole of each jaw. The two pairs of Strips on each jaw are pivoted on the $\frac{3}{4}''$ Bolt 3, which carries also two $1\frac{1}{2}''$ Strips. A $\frac{3}{4}''$ Bolt passed through the upper ends of the $1\frac{1}{2}''$ Strips carries two 1″ loose Pulleys, between which a washer is placed for spacing purposes. The 2″ Strips of the suspension block carry a 1″ loose Pulley and a Flat Bracket, both on a $\frac{3}{4}''$ Bolt secured in the lower holes of the Strips. The closing "rope" 5 is tied at one end to the Flat Bracket and passes around one of the lower 1″ Pulleys. It then passes around the upper 1″ Pulley and around the second lower Pulley, finally being pushed through the Strips of the frame and over a Pulley at the head of the crane jib. The $\frac{1}{2}''$ loose Pulley serves as a guide for the cord.

To open the grab the weight is taken by the hoisting cord 4, and the cord 5 is paid out. Thus the jaws are opened, and by hoisting on the cord 5 they can be closed to grip the article that is to be raised. The weight of the load increases the pull on the cord, and consequently the upper and lower Pulleys are pulled together. It will be seen therefore that the greater the weight of the load the stronger is the grip of the jaws upon it. It is important that the hoisting cord 4 should remain slack when the grab is lifting a load. To release the load the cord 4 is hauled in and the cord 5 paid out.

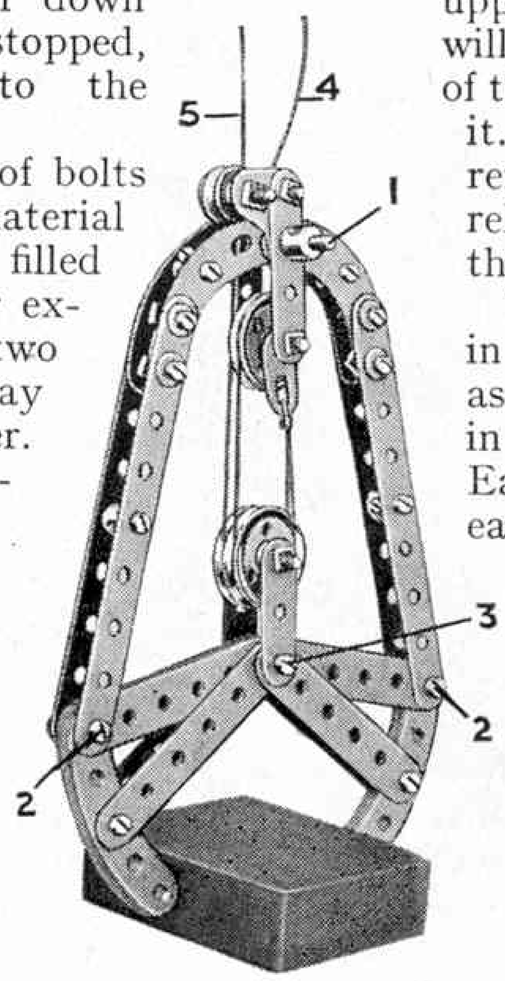


Fig. 2. A novel pincer grab suitable for gripping small blocks and stones.

The outstanding feature of the skip illustrated in Fig. 3 is that it automatically unloads as soon as it touches the ground. The model may be used in connection with cranes or aerial ropeways. Each side consists of two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plates, each of which has two $2\frac{1}{2}''$ Triangular Plates secured to it, and to the ends of these Plates $4\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plates are attached by means of Angle Brackets at the inner edges of the Triangular Plates as shown. Each of the Plates 6, which form the discharge doors, turn on two Hinges each, and they carry $4\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips along their lower edges.

To each end of the Double Angle Strips are pivoted 3″ Strips, and one pair of these is pivoted also to the lower ends of $2\frac{1}{2}''$ Curved Strips, one on each side of the skip. The

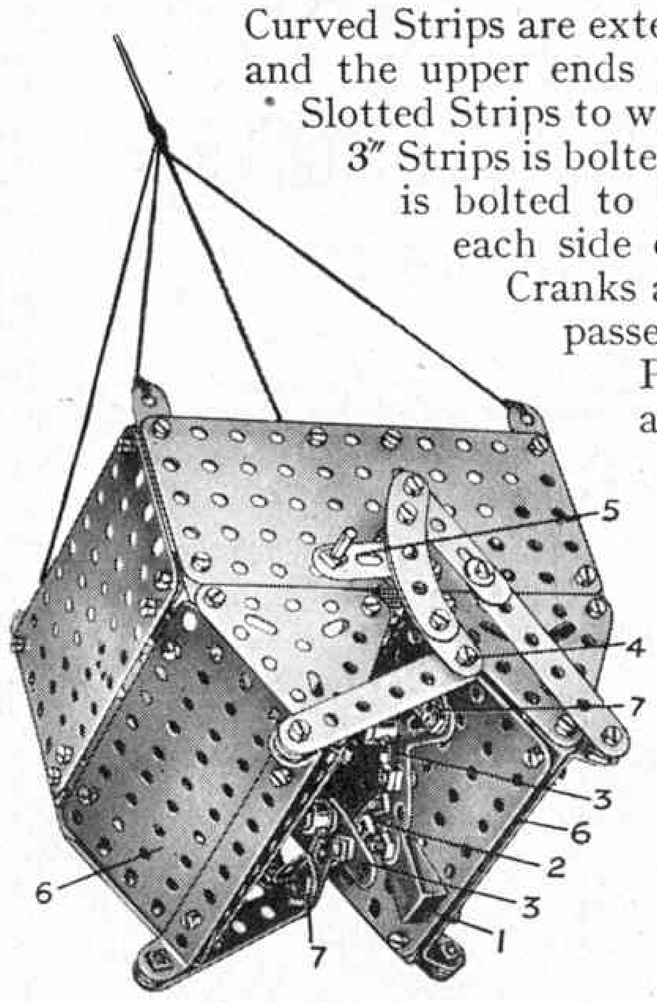


Fig. 3. This twin-chute skip automatically discharges its contents when lowered to the ground.

Curved Strips are extended by similar parts, and the upper ends of the latter carry 2″ Slotted Strips to which the second pair of 3″ Strips is bolted. A Boss Bell Crank 5 is bolted to the Curved Strips on each side of the skip, and both Cranks are mounted on a Rod passed through the side Plates. The Bell Cranks are provided with Threaded Pins for handles.

Two simple Bell Cranks 3 are pivoted on $\frac{3}{8}$″ Bolts gripped in Collars carried on 1″ Screwed Rods secured to a $4\frac{1}{2}$″ Strip fitted across the centre of the skip. Angle Brackets 7 are fitted at the outer ends of the Bell Cranks, and a 2″ Strip 2 is pivoted between the inner arms. The pivots are passed through the elongated holes of the Cranks. A 25 gramme Weight 1 is attached to the Strip 2 by means of a 1″ Triangular Plate.

When the skip is suspended from the crane, the Weight 1 causes the Angle Brackets 7 on the Bell Cranks to move upwards. By depressing the handle 5 the doors 6 are closed, and the $\frac{3}{4}$″ Bolts 4 force down the Angle Brackets on the Cranks 3. As soon as they have passed the Brackets, the Weight 1 causes the Brackets to move up again, thus retaining the Bolts in position. The Weight protrudes below the skip, so that it touches the ground first and then releases the Bolts 4. The Weight of the material in the skip causes the doors to open and the load is discharged without external handling. The doors must be closed by hand.

In Fig. 4 is shown another very useful form of grab that is suitable for handling materials of many kinds. It is constructed on what is known as the single-suspension system, one rope only being used for raising and lowering the grab and operating the jaws. As will be seen from the illustration, the model has eight finger-like jaws, each of which is pivotally connected to the rings 1 and 2. The single-suspension operating gear is a compact unit and may be built separately, its design being such as to permit its use on several other types of grab.

The side plates 3 are 3″ Flat Girders connected at their lower edges by $1'' \times \frac{1}{2}''$ and $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Brackets. The hooks 4 and 5 each comprise two $2\frac{1}{2}$″ Strips carrying between them a Pawl and Flat Bracket. One of each pair of Strips is fixed to a 57-teeth Gear mounted on a $1\frac{1}{2}$″ Rod. These two Gears mesh with each other, and the hooks are held together under light tension by a piece of Spring Cord bolted to hook 5. The right-hand Gear is fitted with a $\frac{3}{8}$″ Bolt, on which is a Collar that forms the stop for the catch 7. The latter comprises a Coupling pivotally mounted on the shaft of hook 5 by a Handrail Support, and it carries in its longitudinal bore a Centre Fork and a 1″ Rod fitted with a Collar.

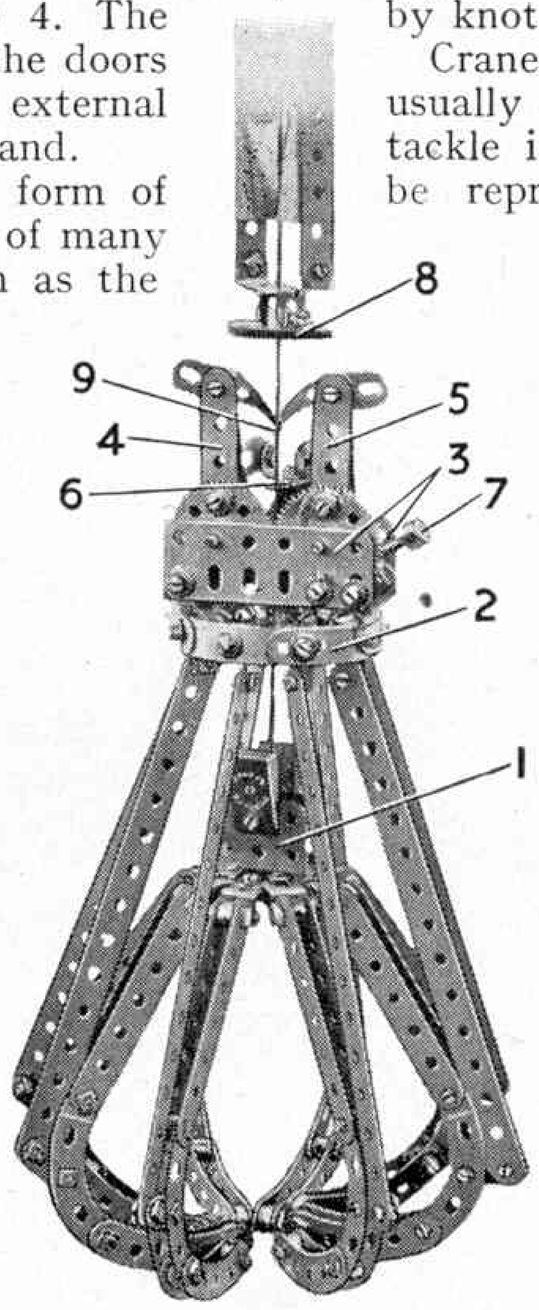


Fig. 4. A multi-jawed grab of the single-suspension type.

At 6 is a $1'' \times \frac{1}{2}''$ Angle Bracket bolted to a 1″ Triangular Plate, a similar assembly being fixed to the lower edge of Girder 3. The angular travel of the hooks is limited to approximately 45 degrees by suitable stops. The hoisting cord passes through the $1'' \times \frac{1}{2}''$ Angle Brackets and then through the central hole of the $1\frac{1}{4}$″ Disc of the ring 1, and is fitted with a Collar at its end. It is important to note that a bulky knot is tied in the Cord as shown at 9.

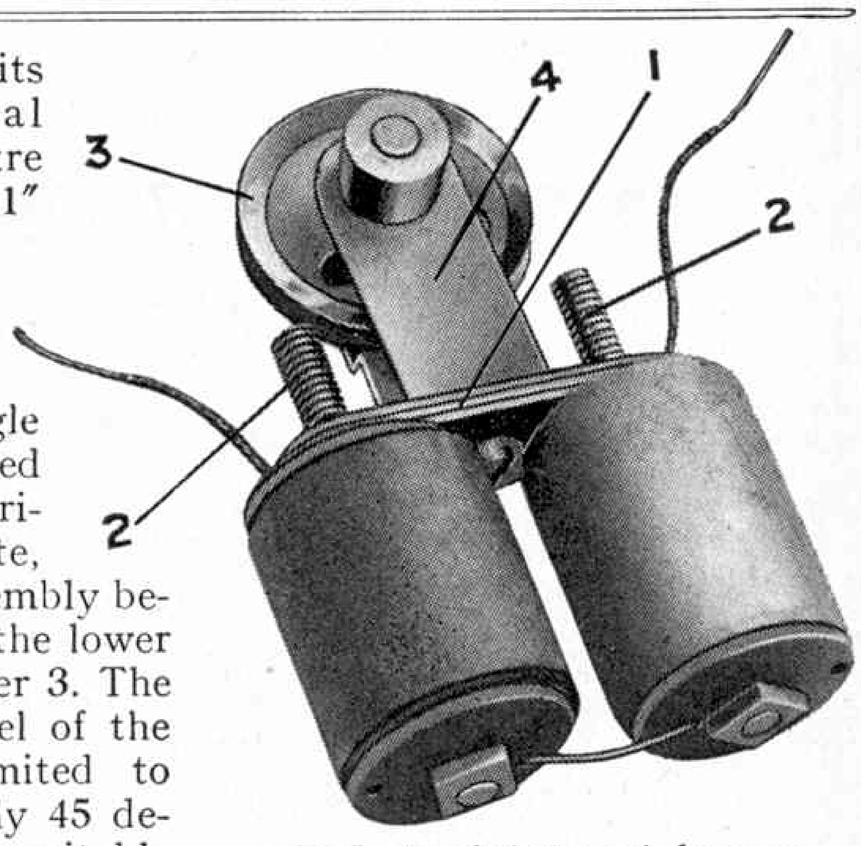


Fig. 5. An electro-magnet forms an interesting alternative to a hook or grab.

When the grab is raised under load the hooks 4 and 5 make contact with the suspender ring 8, which is hung from the jib and through which the hoist cord passes. The hooks are forced apart, and are then drawn together again by the Spring Cord so that they hook over the $1\frac{1}{2}$″ Pulley 8. When the hoist cord is paid out the ring 2 remains stationary but ring 1 falls and the grab jaws open. As the catch 7 is weighted with a Collar, the Centre Fork bears against the hoist rope, so that when this is wound in the knot 9 engages with the Centre Fork and raises the hooks clear of the ring 8. The grab is then held suspended in the open position by knot 9.

Cranes working in metal stockyards and foundries usually are fitted with electro-magnetic lifting tackle in place of a grab or hook. This gear can be reproduced quite easily with Meccano parts and one example is shown in Fig. 5.

Two Bobbins (part No. 181) are wound to capacity with No. 26 S.W.G. wire and attached to the yoke 1, which is composed of three $1\frac{1}{2}$″ Strips, by the Screwed Rods. The inner leads of the coils are then joined and the outer leads are connected to a Transformer or a battery. The crane hoisting cord passes around the 1″ Pulley 3, which turns on a 1″ Axle Rod journalled in a Cranked Bent Strip 4 bolted to the yoke 1.

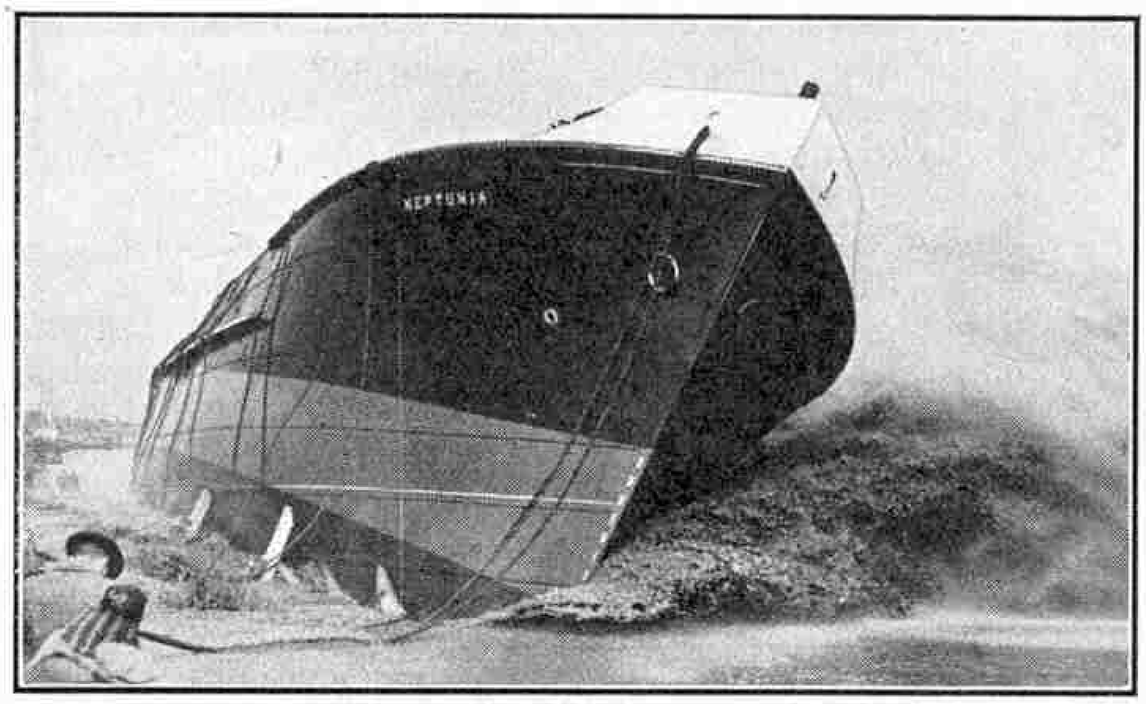
Electro-magnetic lifting tackle of a more powerful type suitable for large model cranes, was described on page 715 of the "*M.M.*" for December 1938. In that case Elektron Magnet Coils were used, and model-builders who do not wish to wind their own coils can also make good use of these in the magnet shown in Fig. 5.

Provision should be made for switching the current on and off, and it is quite easy to make a simple switch by using Meccano parts in conjunction with Elektron parts. One example is a Flat Bracket pivoted on an insulated Bolt and arranged to make contact with a second insulated Bolt.

Britain's Most Powerful Ocean Tug

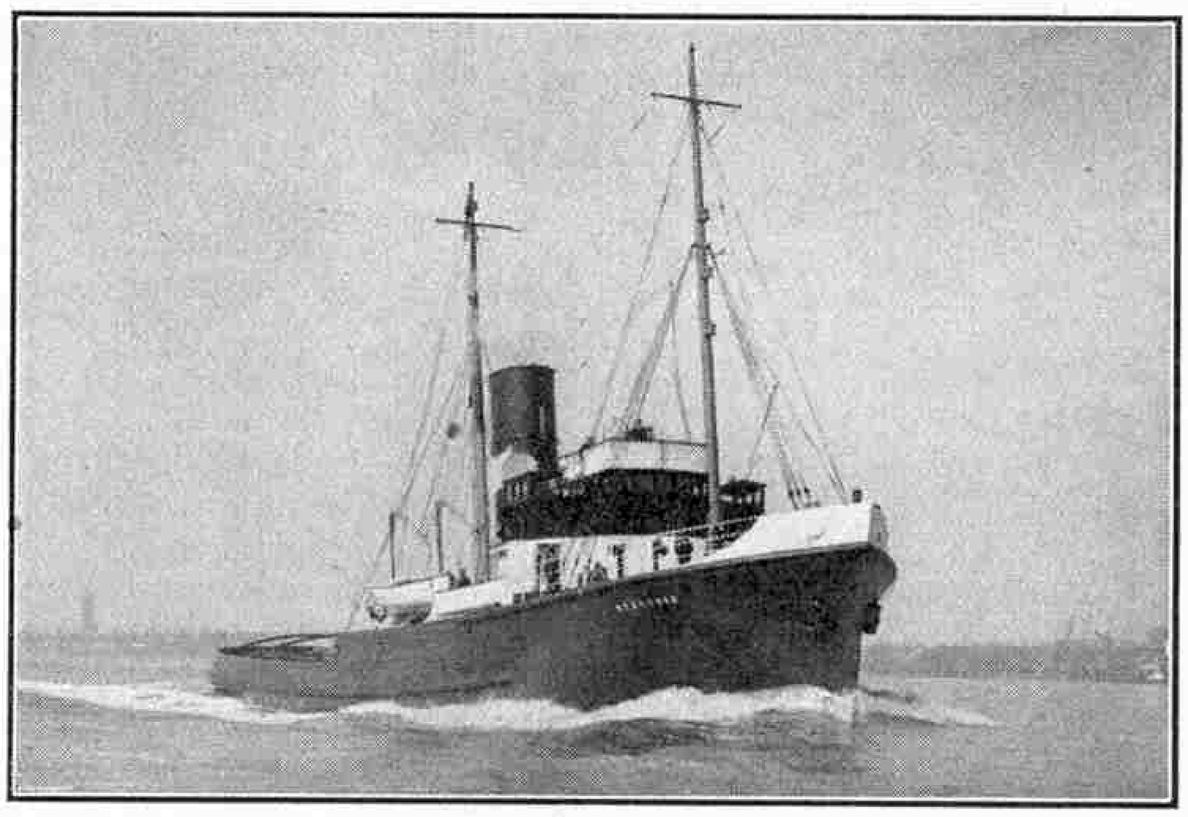
"Neptunia's" Fine Equipment

MODERN steam tugs can be divided into three definite types—harbour, sea and estuary, and ocean. The harbour tug is chiefly employed in the towing of barges and lighters on rivers and canals; the sea tug is required to assist in the berthing and docking of liners and other large vessels; and the ocean tug can be used for a variety of deep-sea purposes, such as towing a floating dock from the builder's yards to its home port, or for bringing into port a ship that has broken down. All these tugs are exceptionally strong and powerful for their size, but the ocean tug is of course larger and more powerful than the vessels operating on inland and coastal waters.



The "Neptunia" entering the Ouse at the yard of Cochrane and Sons Ltd., Selby. The vessel was launched sideways because the river at Selby is too narrow to allow a run stern first. Photograph by courtesy of "The Yorkshire Post."

Most of the high seas work of recent years has been carried out by Continental tugs, chiefly from the Netherlands and Germany. These vessels travel all over the world on salvage, so that they must have most of the sea-going qualities of large vessels, together with ability to manœuvre and strength and power to tow ships many times their size in all weathers over great distances. Last year the Dutch tug *"Ganges"* towed the 5,038-ton steamship *"Kingswood,"* which had been crippled by an internal explosion, from Port Pirie, South Australia, to Middlesbrough, 15,000 miles away, a task that took four and a half months.



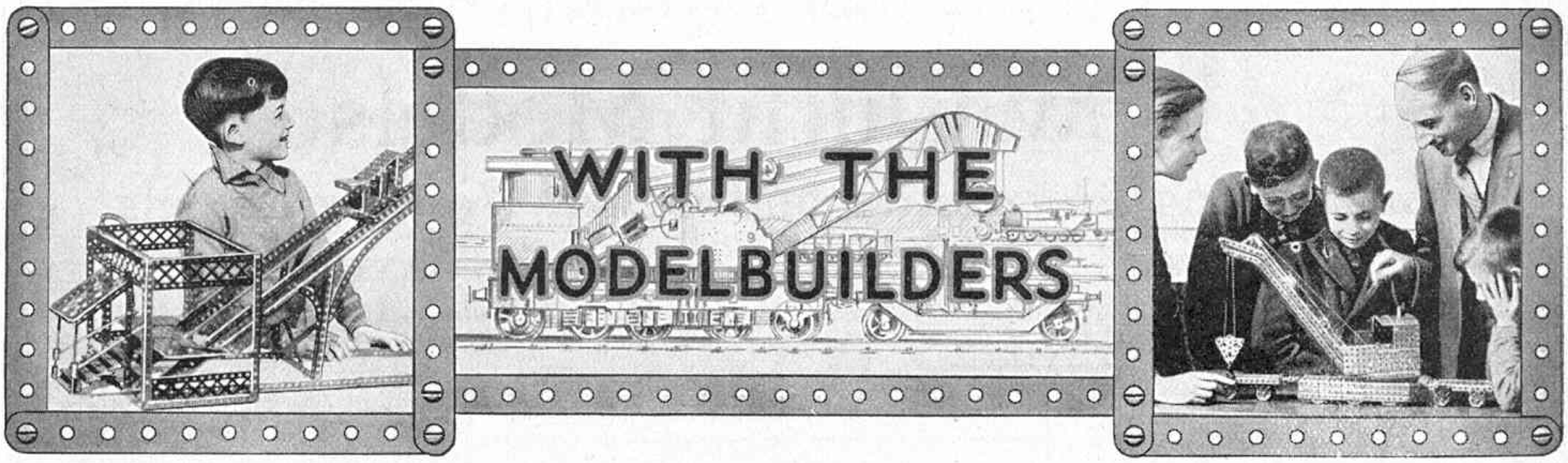
The "Neptunia" in service. This ocean-going tug is the largest and most powerful ever built in Britain. Photograph by courtesy of Cochrane and Sons Ltd., Selby.

British interest in ocean salvage and towage work has now been revived by the construction of the tug *"Neptunia"* specially for this purpose. She was built by Cochrane and Sons Ltd. in their yard at Selby, Yorkshire, for the Overseas Salvage and Towage Co. Ltd., and launched sideways into the tidal waters of the Ouse, which at Selby is too narrow to allow launching in the ordinary manner. She completed successful trials in September 1938.

The vessel is striking in appearance, with a white superstructure and black funnel over a green hull, and she has the sturdy lines characteristic of the tug, which give an impression of reliability and efficiency. With an overall length of 173 ft. 9½ in., and a gross tonnage of 798, she is the largest and most powerful British vessel of her type, and one of the outstanding tugs for power and size in Europe. She is fitted with a triple-expansion engine of 2,000 h.p., supplied with steam by two oil-fired boilers working at a pressure of 210 lb. per sq. in., and has a speed of 14 knots, which she can maintain for 25 days. This gives her a cruising range of over 8,000 miles. Oil for her engines is stored in eight tanks that hold 438 tons, and besides large fresh water and boiler-feed water tanks she has a cold-storage room for use in tropical climates.

The *"Neptunia"* carries a crew of 20, which includes two deck officers, three engineers and a shipwright diver, all of whom are provided with comfortable quarters. She is stationed at Falmouth, an easily accessible port, and can proceed at a moment's notice to the aid of ships over a very wide area. All types of salvage and towage work come alike to her, and she is specially equipped for fighting fires at sea. The latest type of steam towing winch is installed, with two steam capstans for handling the tow ropes, a very delicate task and at times a dangerous one; and special arrangements have been made to prevent any fouling of lines from the various towing connections. A 5-ton derrick for heavy lifting purposes is fitted to the mizzen-mast, and there is a special salvage pump that can deal with 400 tons of water an hour. A powerful searchlight is provided for use during salvage operations carried on at night.

An ocean-going tug, especially when engaged on salvage work, must be capable of receiving news and reports without difficulty or hindrance, and the wireless cabin of the *"Neptunia"* is equipped for this purpose with an elaborate Marconi installation. In it one of three operators carried is always on duty, keeping careful watch for distress signals, receiving weather reports and other information, and sending out reports when necessary.



A SPEED CAR SUSPENSION SYSTEM

Recently I received details of a Meccano model of the front wheel suspension system and steering mechanism of the "*Railton*" speed car, with which Mr. John Cobb set up a world's land speed record last year. The model was built by K. Pritchard, Horsham, Sussex, and is a fine example of Meccano construction. The chassis of the "*Railton*" consists of a single curved steel girder, at ends of which the wheel axles are mounted. At the front end of the girder is a fork-shaped extension that carries the driving seat and controls, and it is this part of the chassis that is represented in great detail by Pritchard's model.

Each wheel is independently sprung and is driven from a differential gear through universally-joined Rods. The differential is made up of Bevel Gears and is mounted in a frame having a 3½" × 2½" Flanged Plate as its base. The stub axle of each wheel is journalled in the centre holes of two Flat Trunnions bolted together at their broad ends, a 2½" Strip being bolted across the joint to form the pivot arm of the steering mechanism. The top hole of the upper Flat Trunnion is connected to the differential frame by a V-shaped member consisting of two short Rods gripped in the bosses of small Fork Pieces. The latter parts are bolted to the spider of a Swivel Bearing fixed to the Flat Trunnion, and the other ends of the Rods are connected to the differential frame by Swivel Bearings. A similarly jointed Rod connects the lower Flat Trunnion to the 3½" × 2½" Flanged Plate. This arrangement of links is sprung diagonally from the 3½" × 2½" Flanged Plate by means of compression springs. The tie-rod of the steering mechanism is connected to the 2½" Strips by End Bearings and Hinges.

TWO NEW MECCANO CLUTCH DESIGNS

Recently J. A. Rolfe, Ruabon, sent us details of a novel form of clutch he designed. The driving member is a 57-teeth Gear suitably mounted on a Rod, and the driven member is a Bush Wheel, the boss of which is gripped in the end of a Socket Coupling. In the eight holes pierced in the Bush Wheel are fixed cylindrical rubber inserts, which protrude slightly on the face that comes into contact with the 57-teeth Gear. The Bush Wheel and Socket Coupling are mounted on a suitable shaft and a bolt fixed in a Collar engages with the slot in the Socket Coupling. The clutch is kept in engagement by a Compression Spring, and when it is in this position, the rubber inserts on the Bush Wheel engage in the holes of the 57-teeth Gear and thus provide a positive drive.

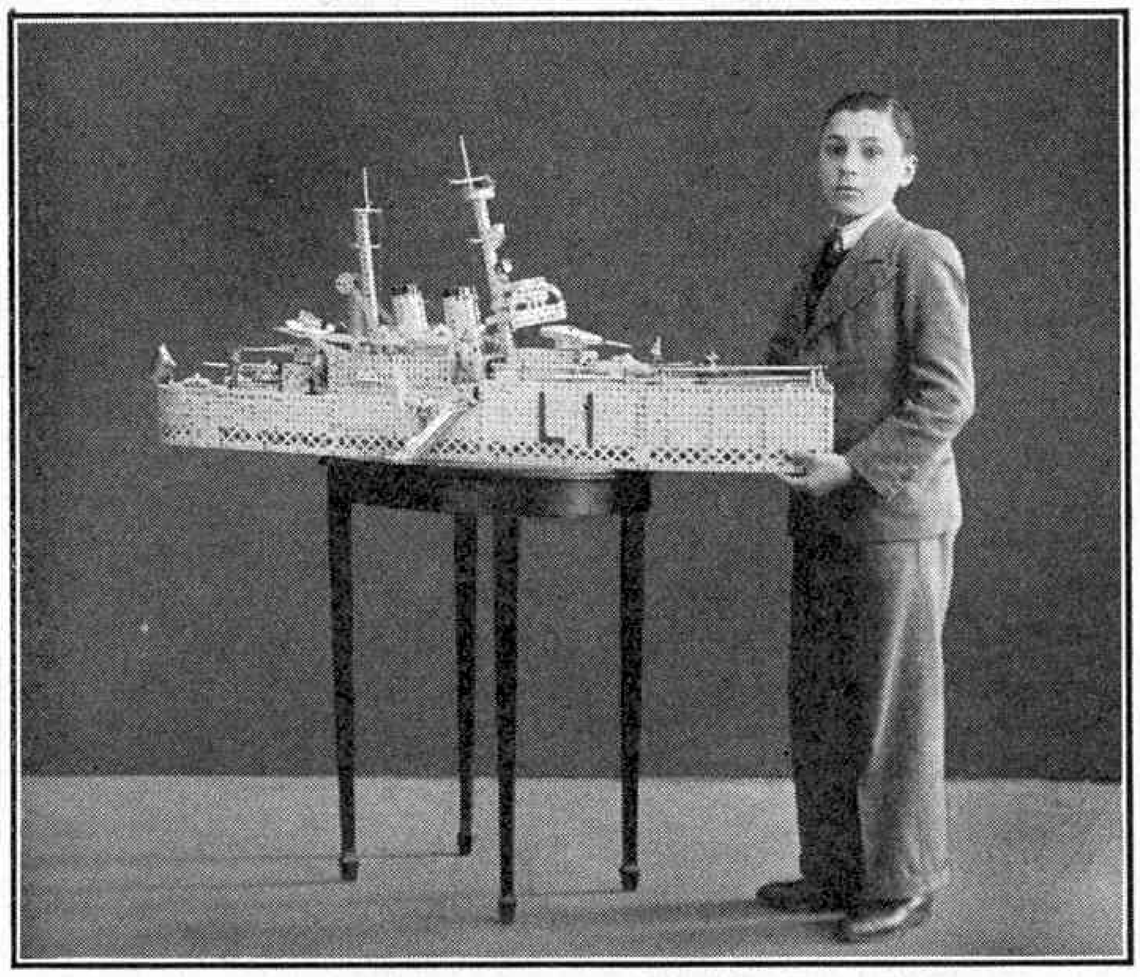
A disadvantage possessed by this clutch is that at times it does not take up the drive smoothly, owing to the inserts catching the edges of the holes in the Gear Wheel.

Another model-builder, H. Rainer, Stoke, submitted designs for a compact single-plate clutch. Readers will remember that a small clutch of this type was described by "Lock-Nut" in the March issue of the "*M.M.*" Rainer points out that this clutch takes up less space if a ½" fast Pulley is substituted for the Flanged Wheel used in the design described by "Lock-Nut," and the floating plate is replaced by one or two ¾" Discs. In order to provide good friction surfaces, cork washers of the type found in the metal caps of mineral water bottles should be glued to each side of the Discs. The Bevel Gear also should be replaced by a ¾" Pinion or ½" fast Pulley. Rainer assures us that this clutch is very efficient, and he intends to include it in a model motor car that he is building.

DINKY TOYS AEROPLANES AS DESK MASCOTS

The range of Dinky Toys Aeroplanes includes scale models of representative types of modern civil and military aircraft, and the wonderful detail and finish of these miniatures makes them ideal for demonstration or display purposes. There are many Dinky Toys collectors, however, who prefer to mount the models on stands so that they can be stood upon a desk as a mascot. When so mounted they form ideal ornaments for the "den" of an aviation enthusiast.

Miniatures such as the Armstrong Whitworth "Whitley" Bomber (Dinky Toys No. 60v) and the Hawker "Hurricane" (Dinky Toys No. 62s) can be mounted on a Dinky Builder Rod of suitable length, the Rod being pushed into the hole in the underside of the fuselage. In other models, such as the "Ensign" Air Liner (Dinky Toys No. 62p) and the "Albatross" Mail Liner (Dinky Toys No. 62r), it is necessary to insert some plastic wood or a small piece of Plasticine in the fuselage in which to embed the Dinky Builder Rod. The Rod can then be fixed in the boss of a ¾" or 1½" Flanged Wheel, which forms an excellent base.



A fine model warship and its builder, A. Pereira, Lisbon. The model is fitted with fore and aft gun turrets, torpedo tubes, life-boats and aeroplane launching gear.

Alternatively a more elaborate base that will serve as an ash tray can be made from a Wheel Flange.

A NEW WINDING DRUM FOR CRANES

In building model cranes, and other models that incorporate a rope-operated hoist or crab, it is sometimes difficult to get the cord to lie evenly on the barrel when winding in. G. Hinchcliffe, Gainsborough, suggests that we should introduce a special winding barrel that would prevent the cord from forming an untidy pile. The kind of barrel he has in mind is one provided with a deep screw thread, in which the cord could wind automatically as the barrel was rotated. In traversing mechanisms, where a drum is used to traverse a crab along the boom or gantry of a crane, the screw thread would provide a good grip for the cord, and the crab would thus be capable of handling heavy loads. Hinchcliffe suggests a drum of about ⅝ in. in diameter.

We agree that a winding barrel of the kind suggested would have many useful applications, but we do not think it is really necessary as suitable alternatives can be easily built up from existing parts. For example, it is quite a simple matter to pass the cord through a guide arm before attaching it to the winding barrel. The arm could be attached to a Threaded Crank on a Threaded Rod arranged parallel to the winding barrel, the Rod being driven from the main gear train. Rotation of the Rod would cause the Threaded Crank and guide arm to traverse the Threaded Rod and thus guide the cord evenly along the barrel. Many model-builders would like to design and construct such a mechanism, and we should like to see examples of it.

SUPPORT FOR SPROCKET CHAIN

It must sometimes have been the experience of most model-builders to find that their Sprocket Chains slips off the Sprockets when the latter are placed horizontally. L. Jones, Cardiff, provides a solution of the problem by securing a Pulley or similar part immediately beneath each Sprocket. The Pulley is larger in diameter than the Sprocket Wheel so that it forms a ledge on which the Sprocket Chain is supported while passing round the teeth of the Sprocket. A 1½" Pulley is used in combination with a 1" Sprocket, a 2" Pulley with a 1½" Sprocket, and so on.

A SUGGESTED IMPROVEMENT TO THE ALL-ENCLOSED ELECTRIC MOTORS

The Meccano E06 and E020 type Electric Motors have fully proved their reliability and efficiency as power units for small Meccano models, but several model-builders have suggested that the usefulness of these Motors would be considerably improved if the armature shaft extended through each side of the casing instead of through only one side, as it does in the present design.

Model-builders who put forward this suggestion use the Motor in conjunction with Pulley driven mechanisms, where it is difficult to arrange an independent drive for more than one movement and at the same time to include a reversing gear, which generally is of the friction type. If the armature shaft were extended a drive could be taken through a simple reversing gear from each end of the shaft. In the great majority of models driven by these Motors, however, more than one driving train is seldom required, and in the more complicated models the Motor can be coupled to a suitable gear-box.

A suggestion put forward by S. Compton, Bristol, also concerns these Motors. In certain types of models it is necessary to provide a friction-type reversing gear by mounting a 1" Pulley fitted with a Rubber Ring between two Road Wheels on the driven shaft. Either of these Wheels can be brought into contact with the 1" Pulley by sliding the shaft from one side to the other. Compton points out that a reversing gear of this type is rather bulky. He finds that by equipping the small pulley of the Motor with a Dinky Toys Rubber Tyre two advantages are gained. The first is a saving in space owing to the small diameter of the pulley, and the second is that a greater reduction ratio is obtained between the small pulley and the Road Wheel rims.

A FOUR-WHEEL STEERING SYSTEM

Modern commercial motor vehicles of the long distance type generally are equipped with two steerable pairs of front wheels. Following the article on steering mechanisms that appeared in the "*M.M.*" for February, many model-builders have written asking for constructional details of arrangements of this type. Actually such mechanisms are not difficult to reproduce in Meccano. For example, suppose it is desired to assemble a four-wheel steering gear on the lines of the two-wheel system shown in Fig. 1 on page 110 of the "*M.M.*" for February. It is only necessary to build two of these units, one behind the other, on the model chassis, and to couple their steering arms by a Strip of suitable length. The rear steering arm is then coupled to the steering column in the normal manner. All the joints must be pivoted and therefore should be made with lock-nutted bolts. If the model vehicle is of the forward control type, the connection to the steering column should be taken from the front steering arm. Some of the other examples of two-wheel steering arrangements described in the February "*M.M.*" can be adapted in this manner.

New Outfit Models

A Shunting Locomotive and Other Working Models

EVERY owner of a small Outfit will find a model to suit him among those described and illustrated this month, and probably all will enjoy building the four. Three of them make use of a Meccano Motor. These are a marine engine, Fig. 1, a road worker, Fig. 2, and shunting locomotive, Fig. 3, built from Outfits Nos. 0, 1 and 4 respectively. The fourth model, the fine anti-aircraft gun shown in Fig. 4, is of topical interest and provides a good subject for owners of Outfit No. 2.

The first model to be described is the marine engine illustrated in Fig. 1. The base of the model consists of a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate, to the flanges of which four $5\frac{1}{2}''$ Strips are bolted. Two $2\frac{1}{2}''$ Strips are secured to the upper ends of the $5\frac{1}{2}''$ Strips by bolts passing through their next to end holes. The $2\frac{1}{2}''$ Strips, which are curved slightly, are joined by two $\frac{3}{8}''$ Bolts, and between them they grip the cylinder of the engine. The latter consists of two 1″ Pulleys 1, which are joined together by two Flat Brackets. The Flat Brackets are connected to the Pulleys by threading a nut on each bolt, which is passed through the holes in the Flat Brackets and screwed into the boss of the Pulley. The nut is then tightened up against the Flat Bracket. The shanks of the bolts must not project into the bores of the Pulleys.

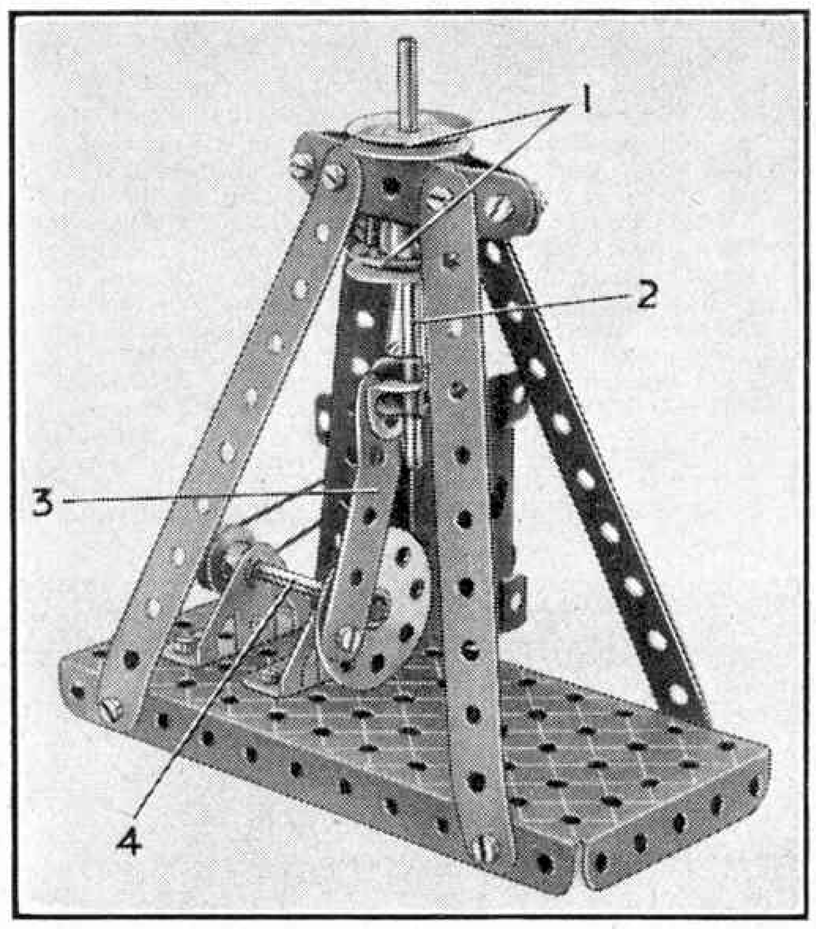


Fig. 1. This simple marine engine is assembled from the parts in Outfit No. 0 and is fitted with a Magic Motor.

The crankshaft of the model is a 2″ Rod 4 journalled in two Trunnions bolted to the base plate, and it carries at one end a Bush Wheel and at the other end a $\frac{1}{2}''$ fast Pulley. The Bush Wheel is connected to the piston rod 2, which is a $3\frac{1}{2}''$ Rod, by a $2\frac{1}{2}''$ Strip 3 and an Angle Bracket arranged as shown.

The *Magic* Motor is bolted in an upright position to one end of the base plate and its driving pulley is connected by a $2\frac{1}{2}''$ Driving Band to the $\frac{1}{2}''$ Pulley on the crankshaft.

Parts required to build model marine engine: 4 of No. 2; 3 of No. 5; 2 of No. 10; 1 of No. 12; 1 of No. 17; 2 of No. 22; 1 of No. 24; 22 of No. 37a; 18 of No. 37b; 1 of No. 52; 2 of No. 111c; 2 of No. 126; 1 *Magic* Motor (not included in Outfit).

The model shown in Fig. 2 represents a road worker wielding a pick, which he handles in a very vigorous manner when the model is set in motion by means of the *Magic* Motor with which it is fitted. The size of the pick lends a touch of caricature to the model, the effect of which is very amusing.

The figure is mounted on a base consisting of a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate, at the back of which is fixed a Trunnion. The latter supports a $2\frac{1}{2}''$ Strip in a vertical position to represent the man's left leg. His right leg also is a $2\frac{1}{2}''$ Strip, and is connected to the base by means of a Flat Bracket, the Trunnion that supports the left leg serving to keep the Strips rigid. His body is represented by two Flat Trunnions bolted together at their pointed ends, and can swing freely on two Angle Brackets that form a connection between the legs and body. One of the Angle Brackets is pivoted on an ordinary bolt, while the other is gripped between two nuts on a $\frac{3}{8}''$ Bolt. The latter Bolt passes through the $2\frac{1}{2}''$ Strip forming the left leg of the figure and carries a $2\frac{1}{2}''$ Strip, which is locked under the head of the Bolt by means of a third nut. When this $2\frac{1}{2}''$ Strip is moved from side to side the body of the man moves also.

The head of the digger is a 1″ diameter Pulley Wheel attached to his body by a Flat Bracket. His arms are joined to the shoulders by two Angle Brackets, and they carry between them a $5\frac{1}{2}''$ Strip fitted with a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip to form the pick.

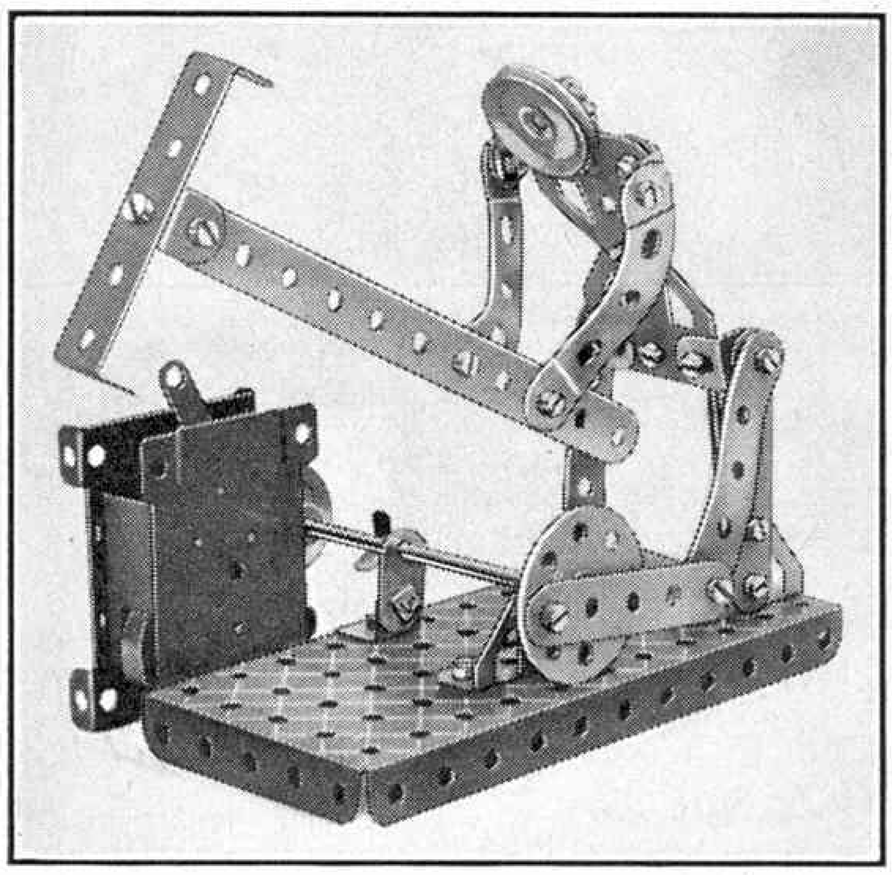


Fig. 2. An amusing model of a road worker. When the Magic Motor with which it is fitted is set in motion, the man attacks the road furiously with his pick.

The driving shaft of the *Magic* Motor is connected to a 1″ Pulley fixed on a $3\frac{1}{2}''$ Rod, bearings for which are provided by a Trunnion and a Flat Bracket. The Rod carries a Bush Wheel, to which a $2\frac{1}{2}''$ Strip is pivotally attached by means of a lock-nutted bolt. The other end of the Strip is similarly pivoted to the $2\frac{1}{2}''$ Strip that rocks the body.

In order to smooth out the motion of the figure, a Driving Band is attached to his back and fixed to the base. The tension of the Band is adjusted until the Motor operates the model smoothly.

Parts required to build the model road worker: 1 of No. 2; 4 of No. 5; 3 of No. 10; 6 of No. 12; 1 of No. 16; 2 of No. 22; 1 of No. 24; 2 of No. 35; 24 of No. 37; 6 of No. 37a; 4 of No. 38; 1 of No. 48a; 1 of No. 52; 2 of No. 90a; 4 of No. 111c; 1 of No. 125; 2 of No. 126; 2 of No. 126a. 1 *Magic* Motor (not included in Outfit).

The model illustrated in Fig. 3 is based on a modern oil-engined shunting locomotive used for assembling trains and moving wagons in railway sorting yards. It is built from the contents of Outfit No. 4, and is driven

by a No. 1 Clockwork Motor housed in the bonnet.

Construction is commenced with the chassis, the side members of which are formed by the 12½″ Strips 1. These are bolted to the Flanged Plate 2, and at the rear end are connected by a 5½″ Strip and Angle Brackets. A vertical 5½″ Strip is bolted to each side member to support the roof of the cab, and between them are fixed two 5½″ × 1½″ Flexible Plates to form the back. The Plates are attached to the 5½″ Strips by Angle Brackets and are joined together by 2½″ Strips.

One side of the engine housing is formed by two 5½″ × 2½″ Flexible Plates, while the rear side comprises a 4½″ × 2½″ Flexible Plate, one half of a Hinged Flat Plate and one 2½″ × 2½″ Flexible Plate. The sides are bolted at the rear to the side members of the chassis, and at their front ends are connected by Angle Brackets to the radiator. The latter consists of a 2½″ × 2½″ Flexible Plate, attached by 2½″ × ½″ Double Angle Strips to a 5½″ Strip that is joined to the lower 12½″ Strips of the side members by Angle Brackets. The radiator also is attached to Plate 2 by Angle Brackets.

The curved top of the engine housing is formed by a 4½″ × 2½″ Flexible Plate, two U-Section Curved Plates and two 1 11/16″ radius Curved Plates.

Each side of the control cabin consists of a 2½″ × 1½″ Flexible Plate and a 2½″ Strip. The windscreen frame is made from two 2½″ Strips connected by a 3½″ Strip, and is held in place by Angle Brackets. The roof is formed of half of a Hinged Flat Plate extended by two 2½″ × 2½″ Flexible Plates, and is connected to the sides by Angle Brackets. Four 1″ Pulleys fitted with Rubber Rings are used for buffers and they are mounted on the shanks of ⅜″ Bolts. The axles of the Road Wheels on which the model runs are 1½″ and 3½″ Rods joined by Rod Connectors. The front axle is journalled in the Flat Trunnions 3, which are spaced from the side members by the thickness of two Washers. The rear axle rotates in bearings formed by two Reversed Angle Brackets, also bolted to the side members.

The No. 1 Clockwork Motor is attached to the sides of the engine housing by Trunnions and its winding spindle projects downwards. The driving shaft of the Motor is pushed down as far as possible, and the drive is taken direct from this shaft to a 1″ Pulley fixed to the rear axle. The Driving Band is prevented from slipping off the Motor shaft by a Spring Clip and a Washer.

Parts required to build the model shunting locomotive: 6 of No. 1; 4 of No. 2; 2 of No. 3; 9 of No. 5; 5 of No. 10; 2 of No. 11; 8 of No. 12; 2 of No. 16; 2 of No. 17; 5 of No. 22; 3 of No. 35; 75 of No. 37; 8 of No. 38; 6 of No. 48a; 1 of No. 52; 3 of No. 90a; 4 of No. 111c; 2 of No. 125; 2 of No. 126a; 4 of No. 155a; 1 of No. 186; 4 of No. 187; 2 of No. 188; 2 of No. 189; 4 of No. 190; 2 of No. 191; 2 of No. 192; 1 of No. 198; 2 of No. 199; 2 of No. 200; 1 of No. 212; 1 of No. 213; 2 of No. 214. 1 No. 1 Clockwork Motor (not included in Outfit).

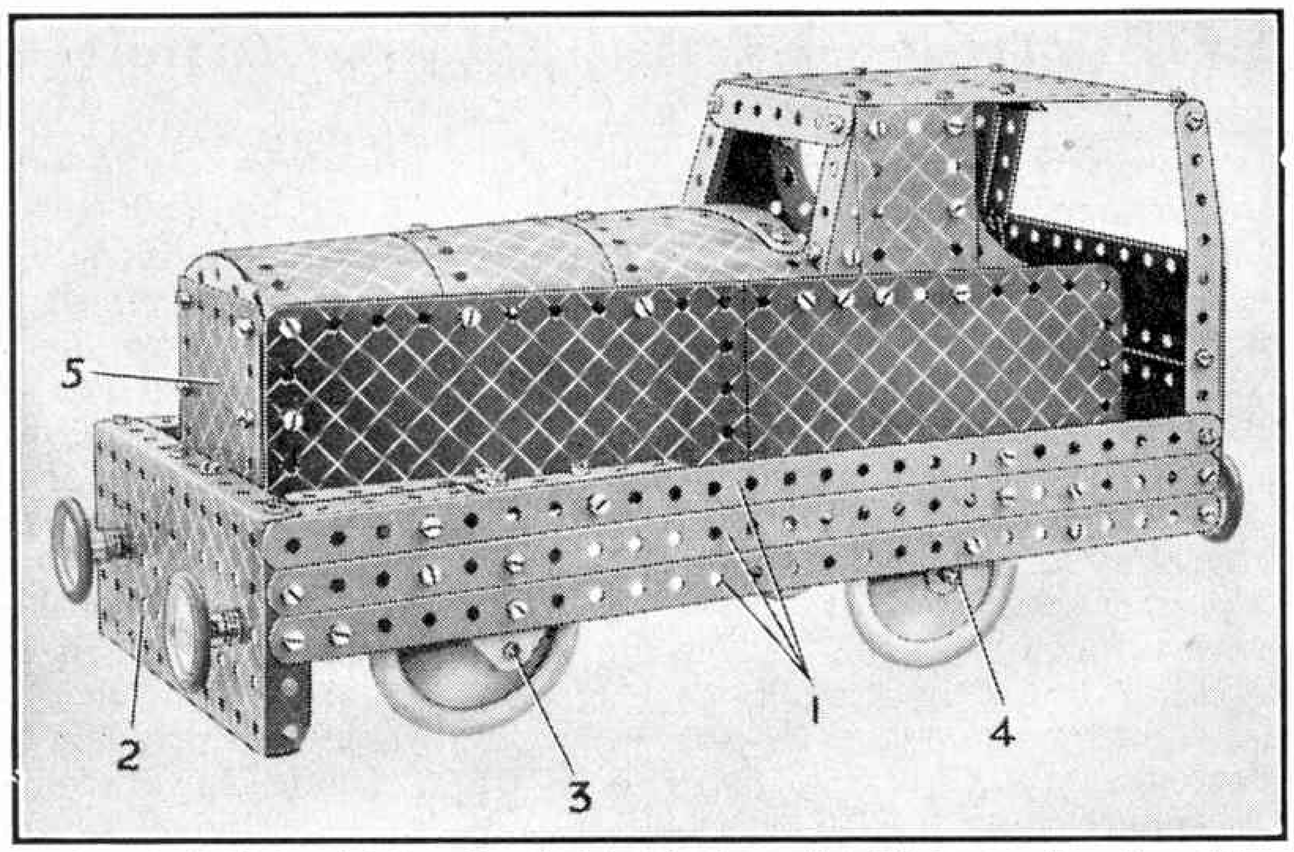


Fig. 3. An Outfit No. 4 model of an oil-engined shunting locomotive of the type used in railway sidings.

The business-like mobile anti-aircraft gun illustrated in Fig. 4 can be adjusted to fire at almost any elevation, and can be rotated to follow the flight of its objective.

The chassis on which the gun is mounted is a 5½″ × 2½″ Flanged Plate, and it runs on four 1″ Pulleys, each of which is fitted with a 1″ Rubber Tyre. The Pulleys are fixed on the shanks of ⅜″ Bolts that are passed through the flanges of the Flanged Plate. The platform on which the gun crew stands is made up of a 2½″ × 2½″ and a 2½″ × 1½″ Flexible Plate, which are bolted across the chassis and extend over each side as shown. One 4½″ × 2½″ Flexible Plate, a 2½″ × 2½″ Flexible Plate and a 1 11/16″ radius Curved Plate are bolted together to form a cylinder, which is capped by a Road Wheel. The cylinder is attached to the Flanged Plate by Angle Brackets.

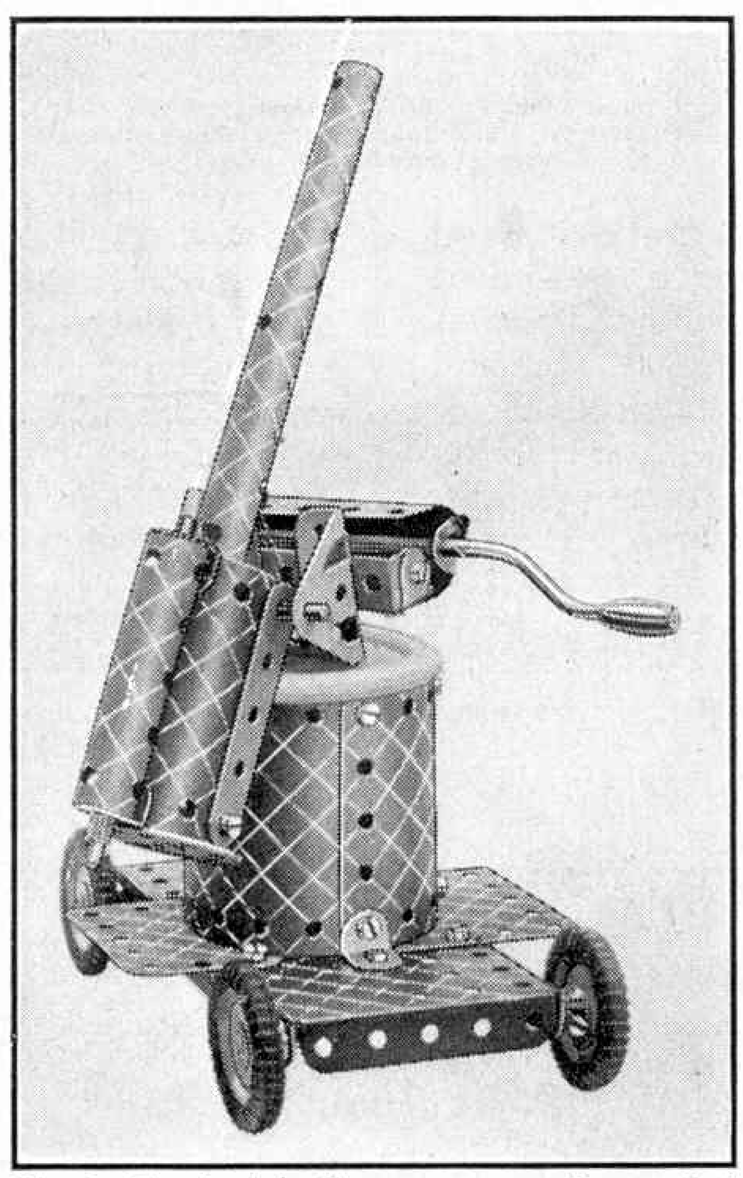


Fig. 4. The business-like appearance of an actual anti-aircraft gun is well reproduced in this Outfit No. 2 Model.

The mounting for the gun barrel comprises two 2½″ × ½″ Double Angle Strips bolted together through their turned-up ends, and to one of them a U-Section Curved Plate is attached. The other Double Angle Strip is fitted with two Trunnions, which support the barrel of the gun. The latter is a 5½″ × 1½″ Flexible Plate rolled into tubular form. To roll the Plate it should first be warmed before a fire and then wrapped around a pencil.

The barrel is attached to a 1 11/16″ radius Curved Plate as shown, the edges of this Plate being reinforced by 2½″ Strips. Angle Brackets are fixed to the Curved Plate, and the Bracket at the lower end is held in place by a ⅜″ Bolt that passes through the Plate into the boss of a Bush Wheel. A 3½″ Rod passed through the slotted holes of the Angle Brackets carries a recoil chamber formed by rolling a 2½″ × 1½″ Flexible Plate into a tube.

The elevation of the gun is controlled by means of a Crank Handle that is journalled in Angle Brackets bolted to the U-Section Curved Plate of the mounting. A length of Cord is tied to the Crank Handle and then wrapped around it several times. The Cord finally is tied to the gun barrel. The barrel mounting is now fitted on to a 3½″ Rod fixed in the boss of the Road Wheel.

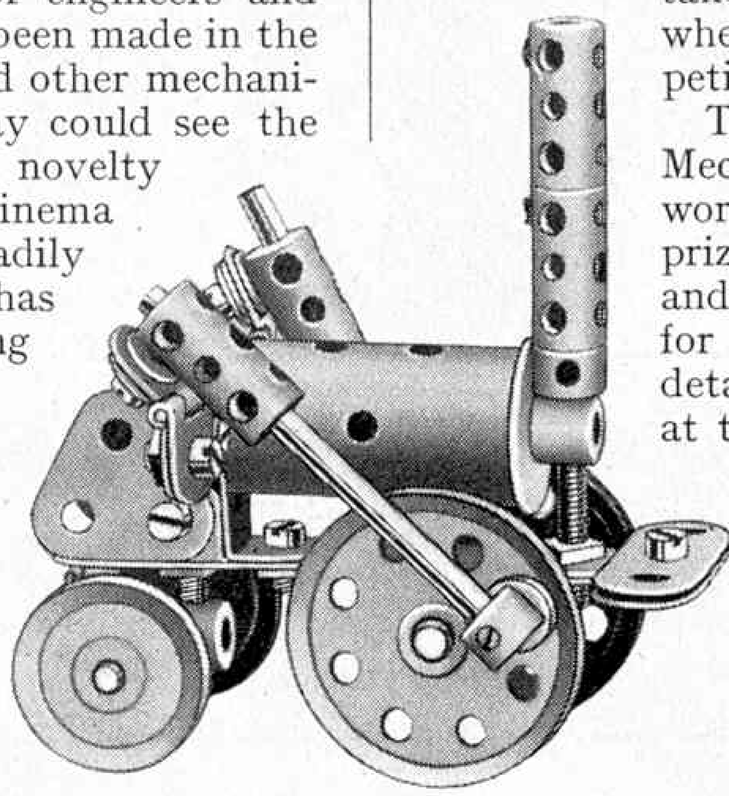
Parts required to build the model anti-aircraft gun: 2 of No. 5; 6 of No. 12; 2 of No. 16; 1 of No. 17; 1 of No. 19g; 4 of No. 22; 1 of No. 24; 4 of No. 35; 26 of No. 37; 4 of No. 38; 1 of No. 40; 2 of No. 48a; 1 of No. 52; 4 of No. 111c; 2 of No. 126; 4 of No. 142c (not included in Outfit); 1 of No. 176; 1 of No. 187; 2 of No. 188; 1 of No. 189; 2 of No. 190; 1 of No. 191; 1 of No. 199; 2 of No. 200.

Prizes for Meccano Model-Builders

"Engineering of the Past" Competition

While it is fascinating to look into the future and try to picture what the world will be like say, 100 years hence, it is also interesting to look back over the years gone by and to compare the commonplace sights familiar to our ancestors with those of to-day. Most of the changes in our daily life brought about in the last 100 years or so have been due to the amazing ingenuity of engineers and scientists, and to the progress that has been made in the invention of labour-saving machines and other mechanical devices. If Meccano boys of to-day could see the world of 1833, when the railway was a novelty and motor cars, air liners, radio and the cinema were unknown, they would more readily appreciate the wonderful progress that has been made in every branch of engineering and science during the present century.

It is easy to give examples of these changes. For instance, there is a vast difference between a modern railway engine and its forerunner of 100 years ago! The development of the motor car has been even swifter, and the car of 1933 differs widely both in appearance and efficiency from that of 1910. Similarly machine tools of 50 years ago appear very crude when compared with the precision instruments in use in engineering workshops to-day.



A typical example of "engineering of the past." The "Rocket" locomotive realistically reproduced with a few Meccano parts.

Many of the early efforts of the engineer make splendid prototypes for Meccano models, and we have decided therefore to organise a competition in which only models representing them may be entered. The *"Rocket,"* a model of which is illustrated on this page, is an example of the kind of subject we have in mind. Others are flying machines and racing cars of 20 years ago, paddle steamships, penny-farthing bicycles, early lathes or other machine tools. In fact any engineering structure or appliance that nowadays is considered old-fashioned and out of date would be suitable. Competitors should try to find an unusual subject, for the judges will look particularly for novelty, as well as for good mechanical construction and ingenious use of Meccano parts. They will take the ages of entrants into consideration when making their awards, so that competitors will have an equal chance of success.

The Contest is open to every owner of a Meccano Outfit living in any part of the world, and there is no age limit. Valuable prizes, including cheques as well as Meccano and Hornby products, will be awarded for the best models received, and full details of these are given in the panel at the foot of this page.

Entries from both Home and Overseas readers will be grouped into one Section, and the competition will remain open until 31st July. Any entries received after that date will be disqualified.

Entries should be addressed *"Engineering of the Past Contest,"* Meccano Ltd., Binns Road, Liverpool 13. Actual models must not be sent. It is only necessary to submit either clear photographs, or, if this is not possible, good drawings of the models, together with a brief explanation of their chief features.

Intending competitors should start building right away. It must be borne in mind that time must be allowed for models to be photographed or drawings prepared, and it is advisable to allow at least a week for this work to be carried out.

"Birds and Beasts" Model-Building Contest

This "Birds and Beasts" Competition is one of the most novel types of contests we have yet organised. Under the title "Birds and Beasts" we include fish, reptiles, insects, and in fact all living things except human beings.

Curiously life-like models of this kind may be constructed from Meccano parts, and as there are great possibilities for ingenuity in devising working models reproducing animal movements, the competition offers very wide scope for originality. Some creatures lend themselves specially well to model-building, and many of them are particularly suitable subjects for caricature or humorous construction.

In order to take part in this Contest competitors should make Meccano models of any birds or beasts and then obtain either photographs or good drawings of the models and send them to this office. Neither photographs nor drawings need be the competitor's own work, but the model itself must be the result of his own unaided efforts.

Competitors may build their models either solid or in the flat, to resemble a drawing, according to their wishes and the quantity of Meccano parts available. Any number of parts may be used and a competitor may submit more than one entry, provided that all his entries are sent in the same envelope.

The Contest will be divided into two sections: A, for competitors of all ages living in the British Isles; B, for competitors of all ages living overseas. The closing date for Section A is 31st May, and for Section B 31st July.

Each competitor must write his age, name and address on the back of each photograph or drawing sent in, and envelopes should be addressed *"Birds and Beasts Contest,"* Meccano Ltd., Binns Road, Liverpool 13.

The list of prizes offered in each Section for the most interesting and ingenious models received, appears in the panel at the foot of this page.

We intend to illustrate a selection of the best entries received when announcing the results of the Contest in the *"M.M."* It is only possible, however, to reproduce photographs that are sharply focussed.

THE PRIZES

"Engineering of the Past" Competition

Closing Date: 31st July.

1st Prize, Cheque for £5/5/-.
2nd Prize, Cheque for £3/3/-.
3rd Prize, Cheque for £2/2/-.
10 Prizes of Meccano or Hornby products value 10/6.
10 Prizes of Meccano or Hornby products value 5/-.

"Birds and Beasts" Competition

Closing Dates:
Section A, 31st May; Section B, 31st July

The following prizes will be awarded in each Section:
1st, Meccano or Hornby products value £2/2/-.
2nd, Meccano or Hornby products value £1/1/-.
3rd, Meccano or Hornby products value 10/6.

Model-Building Competition Results

By "Spanner"

Prize-winners in the "Autumn" Contest

The "Autumn" Model-Building Competition was a great success from every point of view. The number of entries received was exceptionally large, and the novelty and freshness of the subjects chosen by competitors made my examination of them even more interesting than usual. Another thing that pleased me was the large number of "first timers" who succeeded in gaining awards. The general standard of the prize-winning models is very high, and I wish I had space to describe and illustrate all of them. This will be impossible, however, but I am mentioning a few of them on this page, and I intend to include a further selection in next month's "*M.M.*"

The successful competitors were as follows:

1st Prize, Cheque for £5/5/–: J. Nowlan, Dagenham. 2nd, Cheque for £3/3/–: F. Rich, Orpington. 3rd, Cheque for £2/2/–: R. Heathcote, Tamworth.

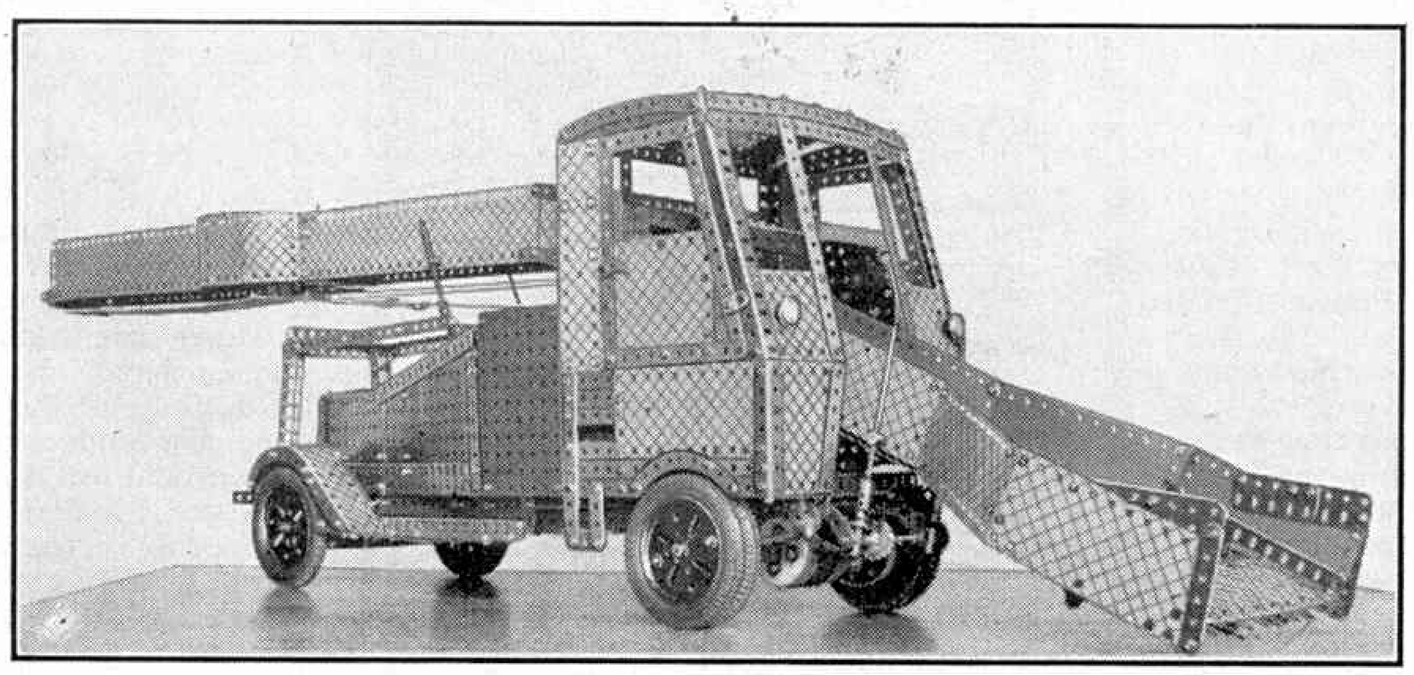
Meccano or Hornby products value 10/6: F. Schorrewegen, Lierre, Belgium; H. Dagenhardt, Amsterdam West, Holland; N. C. Ta'Bois, Woodford Green; J. Giese, Buenos Aires; C. Howard Pendlebury, Hinckley; R. Hilling, Ipswich; J. Matthews, Fillongley; P. Gilles, Montpellier; France; F. R. Higgins, Stourbridge; J. L. S. Smith, Edgware.

Meccano or Hornby products value 5/–: R. Stanley, Liverpool; D. Binstead, Cardiff; D. Weily, Orange, Australia; J. Ancall, Addington, N. Zealand; L. Chitty, London S.W.20.

A few of the prize-winners in the "Autumn" Model-Building Competition. Top: J. Nowlan, Dagenham. Bottom (from left to right): J. L. S. Smith, Edgware; F. R. Higgins, Stourbridge; N. C. Ta'Bois, Woodford Green.

First Prize in the Contest was awarded to J. Nowlan, in recognition of his skilful work in building models of several different types of locomotive valve gear. These models are very interesting and I intend to make them the subject of a special article that will appear in the "*M.M.*" in the near future.

The Joy Snow Loader, which was described and illustrated on page 261 in the "*M.M.*" for May 1938, provided N. C. Ta'Bois, Woodford Green, with the subject for his prize-winning model. The model is illustrated on this page, and readers who are able to compare it with the photograph of the actual machine will see that it is a remarkably close reproduction. For the benefit of readers who are unable to refer to the May issue, however, it must be explained that the Joy Snow Loader is a motor vehicle equipped with a special mechanical scoop and conveyor. It is used for clearing snow from roads and discharging it at the rear into vans for removal or at the sides of the road where it will not impede traffic.



A fine model of the Joy Snow Loader, built by N. C. Ta'Bois, Woodford Green. The actual machine was illustrated and described in the May 1938 "M.M."

Construction of the model is carried out mainly with Angle Girders and Flat Plates, and every mechanical detail has been reproduced as closely as possible. The chassis of the model is provided with a four-speed and reverse gear-box, clutch, differential and brakes, and the power unit is an E1 Electric Motor.

The conveyor consists of three sections, the front and middle sections of which can be raised or lowered by screw jacks, which represent the hydraulic jacks used in the actual machine. The rear section from which the snow is discharged can be slewed from side to side. Screw jacks are also provided for raising and lowering the scoop, and they are operated by an E6 Electric Motor.

Another prize-winner is F. R. Higgins, Stourbridge, who sent a model of a machine he has designed for winding wool. The mechanism of the model is very ingenious, and it is unfortunate that as the photographs submitted are unsuitable for reproduction I am unable to illustrate it. The model is driven by a Clockwork Motor and winds the wool on two Rods in such a manner that each layer of wool is laid in the form of a figure 8.

I am sorry that the space available this month does not allow me to illustrate the very fine model block-setting crane that was submitted by F. Rich, Orpington, who won Second Prize with it. This model is one of the best of its kind that I have seen for a long time, and I intend to illustrate and describe it as fully as possible next month. Third Prize in the Competition was awarded to P. Heathcote, Dordon, Tamworth, who built a splendid model of R.M.S. "*Queen Mary*" that also will be dealt with in next month's "*M.M.*"

One of the portraits on this page is that of J. L. S. Smith, Edgware, who won a prize of 10/6 with a splendid reproduction of a single-cylinder, overhead valve motor cycle. This fine model is one of the most detailed that I have ever seen. Among its many interesting features is a carburetter in which a Threaded Boss represents the float chamber and a ½" Bolt fitted with Collars the air intake. This assembly is fixed to the side of the cylinder head by the appropriate valve port, and a magneto is represented by 1½" Strips fixed side by side and bolted to the crank case. The chain drive cover for the magneto also is represented by a 1½" Strip. Other details are single central sprung forks, foot brake, rear stand, gear-box and enclosed valve and rocker box. The valve push rods are neatly represented by 1½" Rods, which are gripped at their upper ends in Handrail Supports. The latter form the casings of the valve rocker arms. Realistic twin exhaust pipes are formed by Springs extended by Rods fitted with Collars.

Prize-winners in the "Selected Parts" Competition

The prize-winners in the Home and Overseas Sections of the "Selected Parts" Competition, which was announced in the November 1938 "*M.M.*," are as follows:

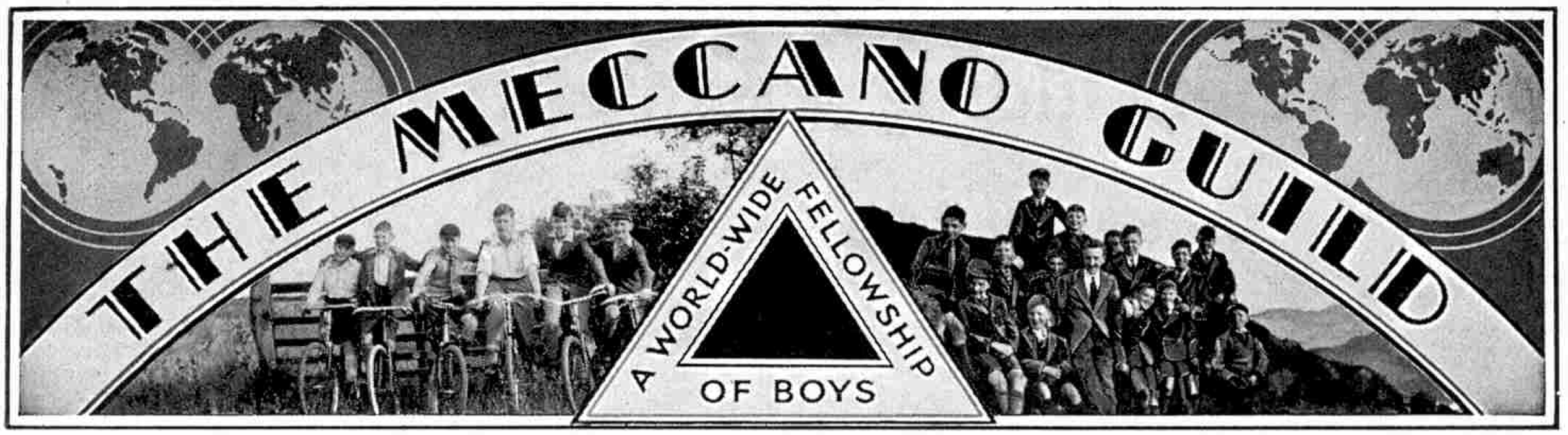
Home Section

1st Prize, Meccano or Hornby products value £2/2/–: A. Skelhorn, Widnes. 2nd, products value £1/1/–: A. Read, London S.E.6. 3rd, products value 10/6: L. Furmedge, Basingstoke.

Overseas Section

1st Prize, Meccano or Hornby products value £2/2/–: P. Hysing, Larvik, Norway. 2nd, products value £1/1/–: D. Perrin, Greymouth, New Zealand. 3rd, products value 10/6: P. Gilles, Montpellier, France.

In this competition competitors were asked to build models using only specified parts. The best model submitted in the Home Section was a really good reproduction of a naval gun, which was sent by A. Skelhorn, Widnes. In the Overseas Section First Prize was awarded for a particularly ingenious and realistic model of a well-known miniature camera mounted on a tripod. This was submitted by P. Hysing, Larvik, Norway.



Preparing for the Outdoor Season

The Spring and Summer Sessions will soon be with us, and it is by no means too early to be thinking over this year's outdoor activities. Most Leaders already know what their members favour, for very few Meccano clubs nowadays fail to arrange attractive programmes of open air meetings for recreation and other purposes. These include visits to places of mechanical or railway interest, including works of various kinds, and on these excursions members not only enjoy the novelty of the proceedings, but gain useful hints for model-building and for other clubroom activities. Then there are recreations of all kinds, varying from outdoor games, such as cycling, cricket or tennis, to rambles on the seashore or in the country, and members of the photographic sections are busier than ever during the summer.

A good programme will mix all or most of these pursuits, and so will provide something for every member. An outline of the programme should be drawn up early, so that the necessary arrangements for the visits and other events decided upon can be taken in hand in good time. Hastily arranged programmes are never satisfactory, for something is sure to go wrong with them at the last moment and spoil the enjoyment of those taking part.

Better Club Reports Wanted

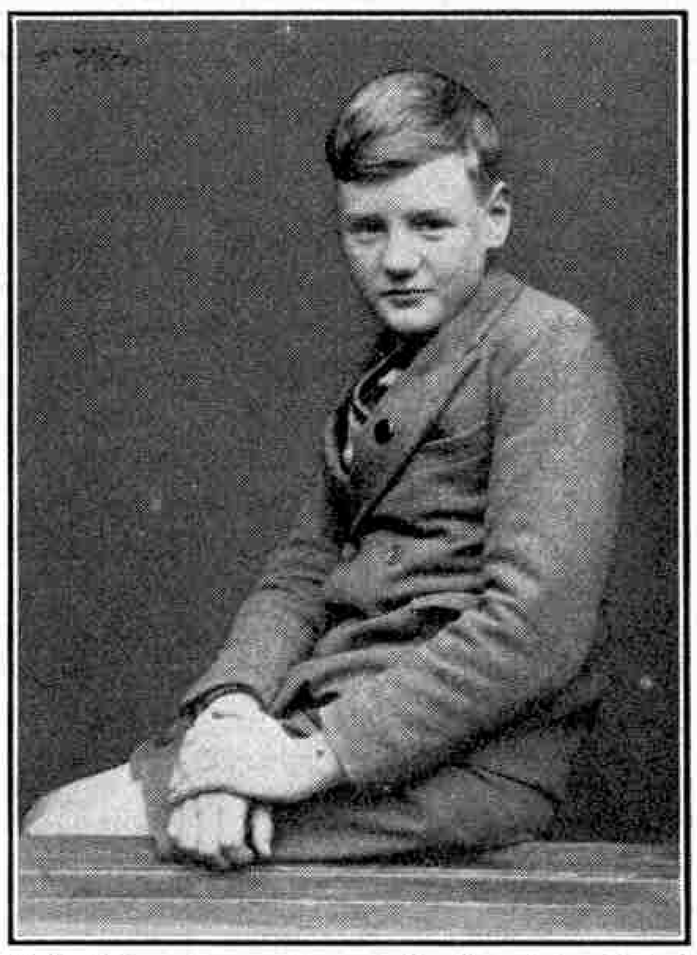
I should like to hear what plans Leaders are making as soon as possible so that I can introduce references to them in the club reports that appear in these pages. Prospective members of a club are interested not only in what it has done, but also in what it is going to do, and more information about coming events undoubtedly would help to secure recruits.

This does not mean that ordinary reports need not be full. Indeed I should like to hear more regularly from some clubs, and to receive from all fuller information of interesting or exciting events. Members sometimes complain that their clubs have not been mentioned in "*Club Notes*" for some time, and I usually find that this is due simply to lack of information. If a club secretary has not sufficient time to enable him to make out full reports himself he should delegate that part of his duty to another member. In this way the appearance of adequate reports regularly can be assured, and clubs who follow this practice will receive due prominence in the official organ of the Guild and club.

It is just as important to send in good reports and to keep in touch with Headquarters during the outdoor season as during the winter months. The foundations of good times indoors are laid during summer, when members learn to know each other and recruits are attracted by seeing what jolly times members of clubs enjoy. This is a point that new clubs formed at this time of the year also should watch carefully. Much depends on their reports. If these show that a really attractive programme is being followed the club is more likely to obtain the recruits that are needed if it is to develop into a successful affiliated organisation.

Meccano Club Secretaries

No. 47. E. S. Milner



E. S. Milner is secretary of the Bryntirion School (Bridgend) M.C., Leader, Mr. J. S. Thomas. This progressive South Wales club was affiliated to the Guild in June 1936. A good programme of model-building events is followed and an excellent display is always made at the Annual Exhibition. Social Evenings also are held, and displays by lantern and episcope add to the variety and interest of meetings.

Club Entries in Model-Building Contests

I want to see more club entries in Model-building Contests announced in the "*M.M.*" I have previously urged the entry in these Contests of models built by club members, and am very glad to find that some Leaders have realised the advantages of this scheme. I should like more Leaders to take this matter seriously, however, for the winning of a prize brings credit to a club as well as to the member concerned, as the experience of clubs sending in members' entries has proved.

Many excellent models built by club members would have excellent chances of success in these Contests, and only a little encouragement is needed by their constructors. For instance, Leaders can be helpful in arranging for the necessary photographs either by a member of the club or of its Photographic Section if one has been formed, or by an outside photographer who would photograph all entries from the club.

Models for entry in these contests can be selected from those entered in club competitions, which can be based on those announced in the Magazine. The practice also can be followed that has been introduced with great success by the Sid-Vale club, the Leader of which sets definite subjects for Model-building Evenings. These subjects are general, so that members can give expression to their own preferences. A typical one is "Motor Vehicles," which gives scope for building a huge lorry, an army tank, a racing motor car, an agricultural tractor, a motor cycle or indeed any type of moving thing driven by a petrol or oil engine that members are interested in.

A Surrey Exhibition

Guild members in the Thornton Heath, Surrey, district, and indeed all who are interested in model-building and Hornby train operations who live in that neighbourhood, should not overlook the Exhibition of the St. Oswalds M.C., which is being held in St. Oswalds Hall, Norbury, on 1st April, the day of publication of this issue. I included a note on this Exhibition last month. It promises to be very attractive, and will be open from 6 p.m. to 9.30 p.m. The charge for admission will be 3d. for adults, 2d. for children.

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—P. Jeffs, 800, College Road, Erdington.
BIRMINGHAM—M. Hodgkiss, Meadowsweet, Grovely Lane, Rednal.
FINEDON—J. E. Ellson, 1, Allen Road, Finedon, Wellingboro, Northants.
KENTON—F. Violett, 34, Brancker Road, Kenton.
KILDARE—J. Harfleet, Leinster Arms Hotel, Kildare.
LONDON S.W.1—F. McKinley, 7, Clarendon Street, Victoria, S.W.1.

Mount Senior School (Newark) M.C.—There has been a steady increase in membership, and good progress is being made by the Meccano and Hornby Sections of the club. Extensive preparations are in hand for the Third Annual Exhibition, to take place in May. A club photograph is to be taken. Club roll: 55. *Secretary:* A. Kemp, Over Barclays Bank, Newark, Notts.

Exeter M.C.—Model-building recently has been devoted to large subjects. An outstanding model was one of the Exeter Odeon Cinema, constructed by one of the club's Directors. The model won first prize in a contest organised in connection with a club attached to the Odeon. Games have been enjoyed at most meetings. The football teams are doing well, and their enthusiastic support of their respective leagues has been the subject of favourable comment. The Junior team put up a stubborn defence in a game against the Senior team, losing by 6 goals to 2. Club roll: 80. *Secretary:* J. T. H. Fenwick, 45, Calthorpe Road, Exeter.

Morison Memorial M.C.—Model-building Competitions have been keenly contested, and a variety of interesting models built. Other activities have included Fretwork, Wax Modelling and Electrical Experiments, together with regular Games Nights. Work is going ahead in connection with the illumination of the station and accessories for the Hornby layout. Outings are being arranged for the summer months, and the Camera Club is looking forward to recommencing activities. Club roll: 36. *Secretary:* J. Muir, 6, Stanley Street, Clydebank.

Winchmore Hill Collegiate School M.C.—An interesting Lecture on "*Model Boat Building*" was given by a member. Model-building, Aeroplane and Railway Nights have proved attractive. A Cinematograph Show was greatly enjoyed. Members recently visited the offices of Associated Newspapers Ltd. at Northcliffe House. Club roll: 28. *Secretary:* F. J. Hearn, 143, Conway Road, Southgate, London N.14.

Great Baddow M.C.—A "Blindfold" Model-building Competition proved a good test of members' constructional ability. The Annual Party held recently was very successful, and after tea parents, friends and members enjoyed community singing, a stage entertainment and a mock trial, followed by games and dancing. A Spelling Bee has been held. Club roll: 21. *Secretary:* K. J. Avis, 3, Crescent Road, Great Baddow, Chelmsford.

St. Stephens (Saltash) M.C.—Good progress is being made on all work in hand, and a Meccano model traction engine has been completed. Models of an air liner and St. Paul's Cathedral are proceeding satisfactorily, and a cardboard model of the "*Queen Elizabeth*" has been commenced. A report of the club's activities appeared recently in the local press by invitation. Club roll: 7. *Secretary:* B. R. J. Braund, 9, Homer Park, Saltash.

Islandmagee M.C.—Meccano and Hornby Sections have been formed, members drawing lots for division. Each section is in charge of an Overseer, and at the end of each month the sections exchange activities. Meccano signals and bridges have been constructed for the Hornby Train layout. Darts are to be introduced. The Library has been enlarged. Correspondence is increasing, and members are in communication with Meccano enthusiasts in all parts of the world. Club roll: 20. *Secretary:* S. McCready, "Hillmount," Islandmagee, Co. Antrim.

Burnley Grammar School M.C.—Model-building interest has been concentrated on preparations for the Hobbies Exhibition this month, at which a large dock scene will be displayed. Many models of ships, warehouses, jetties and cranes have been built or are under construction. Talks on various aspects of railway working have been given by local railway officials. Club roll: 20. *Secretary:* L. H. C. Hawkins, 27, Carlton Road, Burnley.

Barnard Castle School M.C.—The clubrooms have been changed, and members are now settling down again to model-building and other preparations for the forthcoming Exhibition. The Meccano Section have acquired another Outfit, and considerable constructional work is being carried on. The Hornby Section are building up a special layout for display. Club roll: 17. *Secretary:* A. Coates, The School, Barnard Castle.

St. Oswalds M.C.—A Debate has been held on "*Air v. Sea Transport.*" Exhibition models have been brought along and discussed, and suggestions for improvements made. On Games Evenings table tennis and billiards have been played. Club roll: 25. *Secretary:* J. F. Jacques, El Molino, 5, Ingram Road, Thornton Heath, Surrey.

Sid-Vale (Sidmouth) M.C.—A novel subject on a recent Model-building Evening was "G.P.O. Machines and Transport;" most of the entries were models of telephone equipment and mail vans. Other subjects have included "Racing Cars" and "Bridges." Interesting roundabouts and fairground models also have been built. Club roll: 12. *Secretary:* L. R. I. Gliddon, Sheffield House, Sidmouth.

York M.C.—In a recent Model-building Competition a reproduction of a Diesel engine was the best of many outstanding models. A considerable amount of equipment has been made for the club's Hornby Railway, which has been placed on a raised baseboard, and provided with suitable scenic effects. Extensive train running has been carried out, a comprehensive timetable being worked through at each meeting. General knowledge questions in mechanics occupied one interesting evening. Cinematograph Shows have been held. Club roll: 16. *Secretary:* G. Hodgson, 1, Sunnyside, Heslington Lane, Fulford, York.

St. James' (Grimsby) M.C.—The club has been allotted new and larger quarters, and members have been busy building benches and providing cupboards and drawers, as it is intended that each member shall have a drawer in which to keep his equipment. A complete carpenter's bench has been fitted up. In addition to model-building and model railway operations, carpentry, fretwork and model aircraft construction are included in the programme. Work has been commenced on models for an Exhibition to be held in the Grimsby Town Hall in a few months' time. Club roll: 7. *Secretary:* R. Janney, St. James' Secondary School, Bargate, Grimsby.

Old Charlton M.C.—New headquarters have been acquired at "The Limes," 174, Victoria Way, S.E.7. A discussion has been held regarding an intended recruiting campaign. A Visit was paid to the works of the United Glass Bottle Manufacturers at Charlton, where members saw machines turning out 120 bottles a minute. A satisfactory standard of model-building has been maintained, and well constructed models have included a marine engine and a travelling crane. An interesting afternoon was spent at the Maritime Museum at Greenwich. Mr. Fish gave an entertaining lecture on "*The Construction of Model Ship Hulls,*" illustrating it with his own models. Club roll: 20. *Secretary:* D. C. Lambert, 23, Charlton Lane, Charlton, London S.E.7.

Plymouth M.C.—The Meccano Section is engaged on the construction of a large model L.M.S. 4-6-2 express locomotive. At a recent meeting Merit Medallions earned by four members and prizes and certificates awarded in connection with the Exhibition were presented. It is proposed to form a Photographic Section. Several new members have been enrolled. New officers have been elected for the session. The secretary has been in communication with the Norwood Model Railway Club. Club roll: 92. *Secretary:* A. E. Miller, 21, Hamilton Gardens, Mutley, Plymouth.

Mall School M.C.—The programme for the Session was drawn up when members returned to school. It included a Treasure Hunt, a Speed Testing Night for model locomotives, and a General Knowledge Test. A good display of Meccano models has been prepared for the Annual Exhibition to be held on 6th April. Club roll: 30. Secretary: R. J. Petherbridge, 40, Wensleydale Road, Hampton-on-Thames, Middlesex.

Members of the Ashburton M.C. and Christchurch M.C. snapped during a joint outing at Ashburton. This was one of the many inter-club activities of these two New Zealand clubs, who hold Debates, Socials and Sports Contests, and compete annually for a Shield awarded for Model-building and all-round progress.

AUSTRALIA

Melbourne M.C.—An oval high level line with steel track has been completed and successfully tested. At one meeting the club's Gauge 0 electric railway was experimentally operated from a motor car battery, but was much less satisfactory than when worked from the mains. Members enjoyed a bicycle trip to a local railway line to see the signalling system and photograph important trains. Club roll: 10. *Secretary:* L. Ison, 8, Hayes Street, Northcote N.16, Victoria.

Maylands M.C.—A recent Factions Exhibition produced some very interesting models, the subjects including farming implements, a dockyard and a furniture factory. Outstanding models built at regular meetings have included a transporter bridge, tractor, and marine engine. A Fancy Dress Night proved great fun, and the Annual Party also was thoroughly enjoyed. On Presentation Night cups and medals were handed to successful members, and the Faction Shield was presented to the winning section, "Red and Blue." Club roll: 31. *Secretary:* W. Petersen, 1, Warne Street, Maylands, Perth, Western Australia.

EGYPT

Cairo M.C.—At the Annual Meeting held recently the Leader gave a Talk on the Meccano Guild, and a number of interested visitors are expected to enrol. A Visit has been paid to the Almaza Airport, where several members enjoyed an aeroplane flight over Cairo. Regular meetings have been held, both indoor and outdoor, and a ramble to the nearby Mokatam Hills has been enjoyed. New members will be welcomed. Club roll: 35. *Secretary:* Saved Fahmy Awad, 28, El Gezawi Street, Shoubra, Cairo.

Zagazig and Misr M.C.—Model-Building and Games Nights have been very popular. Lantern Lectures have been well attended by members and friends. Prizes were awarded at one meeting for the best speech made on a given subject. A football team has been formed. Gifts of stamps received by the Leader have been distributed among members. Membership is increasing, and the secretary will be pleased to hear from enthusiasts wishing to join. Club roll: 25. *Secretary:* Abdul Samieh Mangouri, 1, Sh. Abdul Hamid, Osman, Zeitoun, Cairo.

SOUTH AFRICA

Pioneer M.C.—An Air Rifle Section has been formed. Two members gained awards in the Hobbies Section at the Pietermaritzburg Horticultural Show, A. Easthorpe winning first prize in the Fretwork Section. The Thrift Club paid out £170 in 1938, and hope to double that amount this year. Club roll: 8. *Secretary:* A. H. Alley, 461, Burger Street, Pietermaritzburg, South Africa.

The Junkers Ju 90 Air Liner

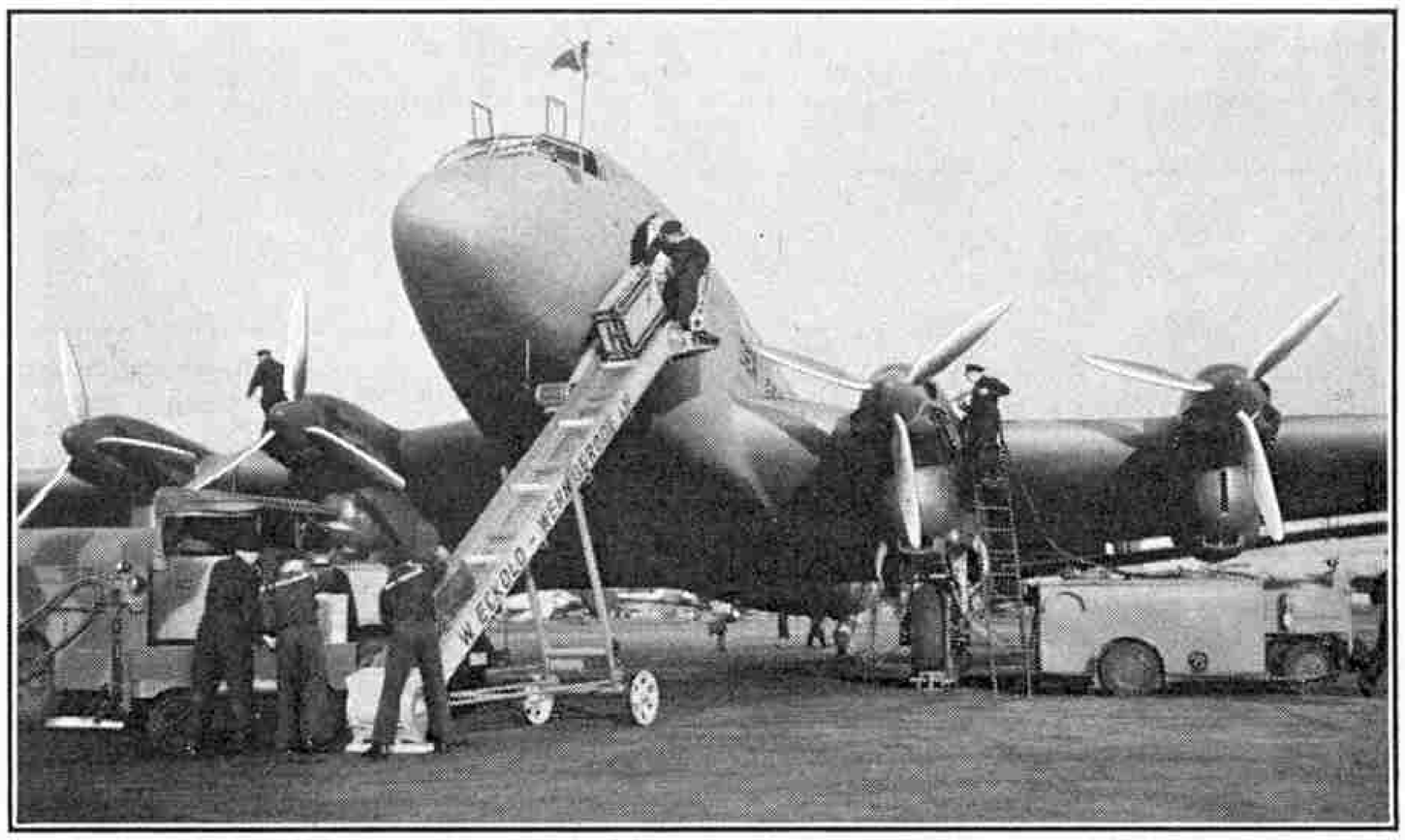
Features of Giant German Monoplane

THE increasing passenger traffic on the great airways of the world is reflected in the growing number of commercial aircraft capable of carrying at least 40 people and of flying at over 200 m.p.h. All are four-engined aircraft, and whether landplanes or flying boats, they are of the monoplane type.

These giant monoplane air liners are being produced in this country, France, Germany and the United States. The latest German example is the Junkers Ju 90, built by the famous Junkers company of Dessau, to whom we are indebted for our fine cover picture of this aircraft, and also for the illustration on this page. The Ju 90 has been adopted by the Deutsche Lufthansa, the great German air transport company that operates regular air lines to many parts of Europe, and one to South America.

Entering the luxuriously furnished passenger cabin of a Ju 90 for the first time, one is impressed by its roominess. Actually the cabin is larger than a modern railway coach, and is 34 ft. 6 in. long and 9 ft. 9 in. wide. It is divided into five compartments, each fitted with four well-upholstered twin-seats, for eight passengers, arranged two on either side of a central gangway. Between each pair of facing seats there is a table that can be adjusted in regard to width, or removed entirely. There are wide luggage racks overhead and suitcase spaces under the seats. The two front compartments are for smokers, and are separated from the non-smoking compartments behind by a door.

A novel system of sound insulation copes effectively with the noise of the four powerful engines. The soundproofing material employed is of soft texture and is made in long sheets, which are pressed into the recesses between the frames during the construction of the aircraft. Conversation in normal tones can be carried on in any of the compartments.



Loading freight into the forward baggage room of a Junkers Ju 90 at Tempelhof Airport, Berlin. Refuelling operations are also in progress. Photograph by courtesy of Junkers Flugzeug- und -Motorenwerke A.-G.

Further comforts provided for the passengers are an odourless hot-air heating system, and general as well as individual ventilators, and in addition to the concealed general lighting of the compartments there is a reading lamp over each seat. This quiet and luxuriously furnished passenger cabin gives the impression of being in a flying hotel, and this impression is strengthened by the ease and efficiency with which anything from a light lunch to a several-course dinner can be served by the uniformed stewardess. This is made possible by the well-equipped kitchen and store room that form part of the "business" section of the liner.

The wide enclosed cockpit is fairly high up in the nose of the fuselage, and its large windows provide an excellent view in every direction except rearward. There are two pilots' seats side by side, and dual controls, and the navigating equipment includes the latest flying and blind-landing devices. The radio operator's position is just behind the right-hand pilot's seat.

The Junkers company claim that the low wing type of monoplane offers the greatest measure of safety for passengers, under all conditions, and therefore the Ju 90, like previous Junkers types, has this wing arrangement. It is built of duralumin. The great cantilever wing is 114 ft. 10 in. in span, with an almost straight trailing edge and a leading edge swept sharply back to the blunt wing tips. The Junkers patent long narrow flap attached to the trailing edge gives the effect of a double wing. It can be operated by the pilot from the cockpit, so as to give increased lift, especially when taking-off, or increased drag when landing, and the outer sections of it can be operated separately as ailerons. The effect of the double-wing flap is increased by a split flap that is fitted right across the underside of the fuselage.

When approaching an aerodrome, the pilot puts the double-wing flap fully down and flies at reduced speed, and the influence of the flap is sufficient to give an excellent gliding angle. This arrangement cuts down to reasonable proportions the long gliding distance that is so objectionable, especially when landing in bad weather.

Great stability is essential in large air liners, and movement of the centre of gravity due to passengers moving about in the cabins has to be provided for in advance. In the Ju 90 a movement of several persons from one end of the main cabin to the other can be balanced by the pilot with only slight pressure on the controls. A handy elevator trimming flap control permits the aeroplane to be trimmed level when flying at any speed from minimum to maximum, with the centre of gravity forward or back. A further trimming control enables the pilot to level the aeroplane laterally, even with the pair of engines on either side of the fuselage stopped. The machine is also noticeably stable when climbing in a horizontal attitude or gliding to earth, and in spite of any atmospheric disturbances that may be encountered. It has no tendency to swing at any speed, and its stability in this respect greatly helps the pilot to keep his course. The passengers also benefit, for it spares them the yawing swing of the aircraft tail that is so largely responsible for air sickness.

The Ju 90 has been arranged to take various types of water-cooled or air-cooled engines of 1,000 h.p. and more. The prototype was fitted with four Daimler-Benz DB 600 water-cooled engines, and proved able to attain a top speed of 250 m.p.h. The production version supplied to the Deutsche Lufthansa has four BMW 132 H air-cooled engines, and is capable of a top speed of 222 m.p.h., and cruises at 202 m.p.h. The service ceiling is 16,500 ft., with an all-up weight of 50,100 lbs.

The trial flights of the first Junkers Ju 90 demonstrated that both the performance and flying qualities are very good with one or even two engines stopped. With three engines running there is ample reserve of power even when fully loaded, which enables the machine to maintain flight at heights up to 10,000 ft.

In June last year the first Junkers Ju 90 set up new altitude records for landplanes carrying useful loads of 5 and 10 tons respectively. The flight with a load of 5 tons on board was made on 4th June, when the air liner climbed to a height of 30,543 ft., and the flight with a 10-ton load took place four days later, when in spite of very unfavourable weather the aeroplane reached a height of 23,754 ft. On both occasions it was piloted by Wing-Captain Kindermann, the chief pilot of the Junkers company. For flights at such altitudes the aeroplane must be protected against the formation of ice on the wings, and the heating system in the leading edge of the Ju 90's wing proved most effective in this respect. This de-icing equipment is fitted to all Junkers machines of this type. During the flights just mentioned the inside of the window panes of the control cabin became coated with ice, but this was removed quickly by bringing into use the built-in hot air fan, which quickly thawed the ice and proved adequate in keeping the windows clear during the rest of the flights.

An Unusual Clockwork Layout

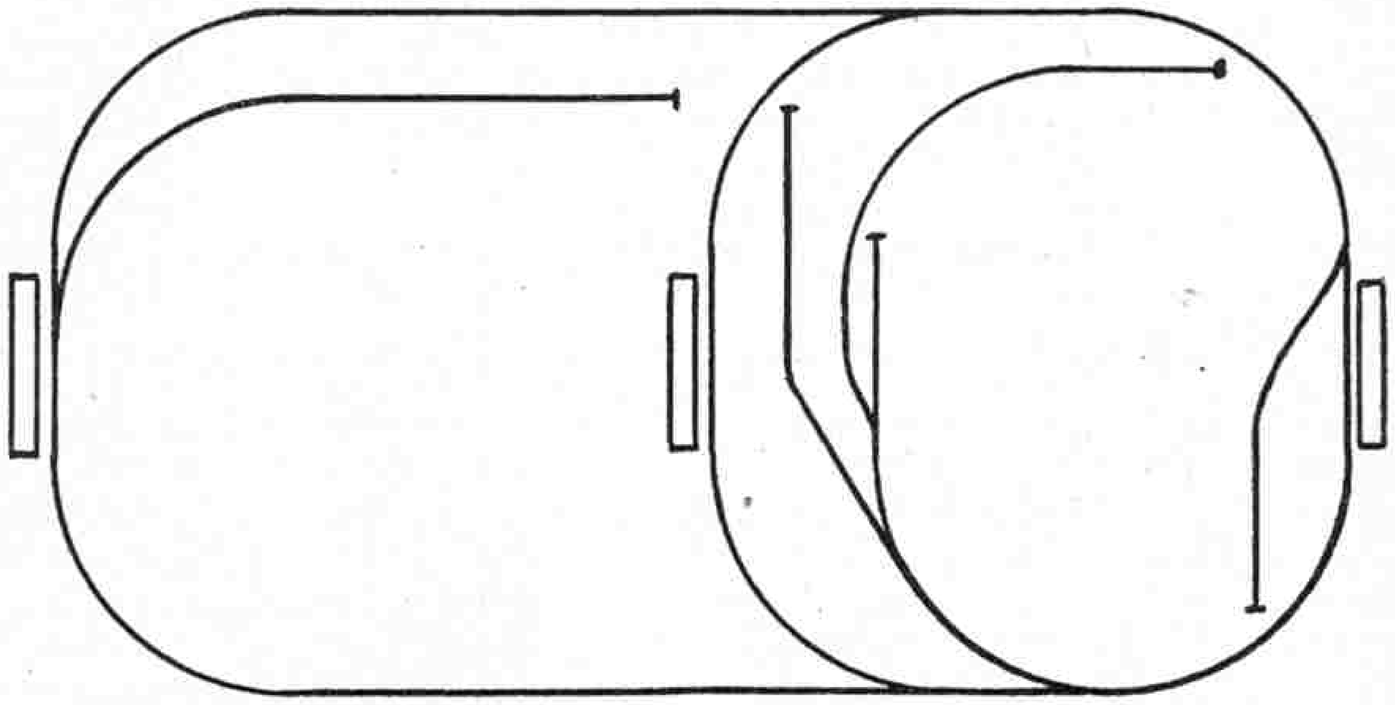
Reader's Scheme for Track-Circuiting

THE layout that forms the subject of this article is owned by J. Smith, of Bawtry, Doncaster, who has adopted the unusual idea of track-circuiting a clockwork railway and using electrically-operated points on it. A feature of many electric layouts is a control panel arranged to indicate by means of lamps operated by track circuits the position of the various trains on the line, but it is very seldom that such a scheme is applied to a clockwork layout.

The diagram reproduced on this page gives railway enthusiasts a good idea of the interesting design of the layout, and they will readily appreciate its possibilities. The main feature of the line is the electrically-illuminated diagram. This consists of a plan of the line that has been fitted with bulbs to correspond with the four circuits into which the layout has been divided, and the points also, with the exception of those in the goods yard in the centre of the layout, are represented on it. As a train passes over the different sections its exact position is shown by the lighting up of the appropriate bulb, and a light appears on the diagram to show when the electrically-connected points are set in the direction required.

Automatically operated colour-light signals are used, and they are so constructed that they do not show green unless the points they cover are fitting perfectly. Probably the most interesting of these signals however is one which is worked by "approach lighting," that is, it comes into action only when a train approaches within a certain distance of the signal. It shows a yellow light if the signal ahead is at danger, red if the track ahead is occupied, and green if all is clear. All rodding for operating points and the hand-operated upper-quadrant type signals leads to a central position alongside the control panel, so that, although the line is a clockwork one, it can be completely controlled from a central position, apart from the operation of the locomotives themselves.

Four Hornby locomotives are in use. These are a No. 2 Special Tank, a No. 1 Special Locomotive, and M3 Tank Locomotive and a veteran Hornby G.N.R. Tender Engine. As will be seen from the illustration, the L.N.E.R. is the line represented, and both passenger and goods trains are operated. The passenger stock is handled either by the No. 2 Special Tank or the No. 1 Special Locomotive, and is made up of two No. 2 L.N.E.R. Saloon Coaches, two No. 2 Corridor Coaches and three No. 0 Pullman Cars. The Saloon Coaches have been fitted with electric lights, another unusual refinement for a clockwork line, and they look very effective.



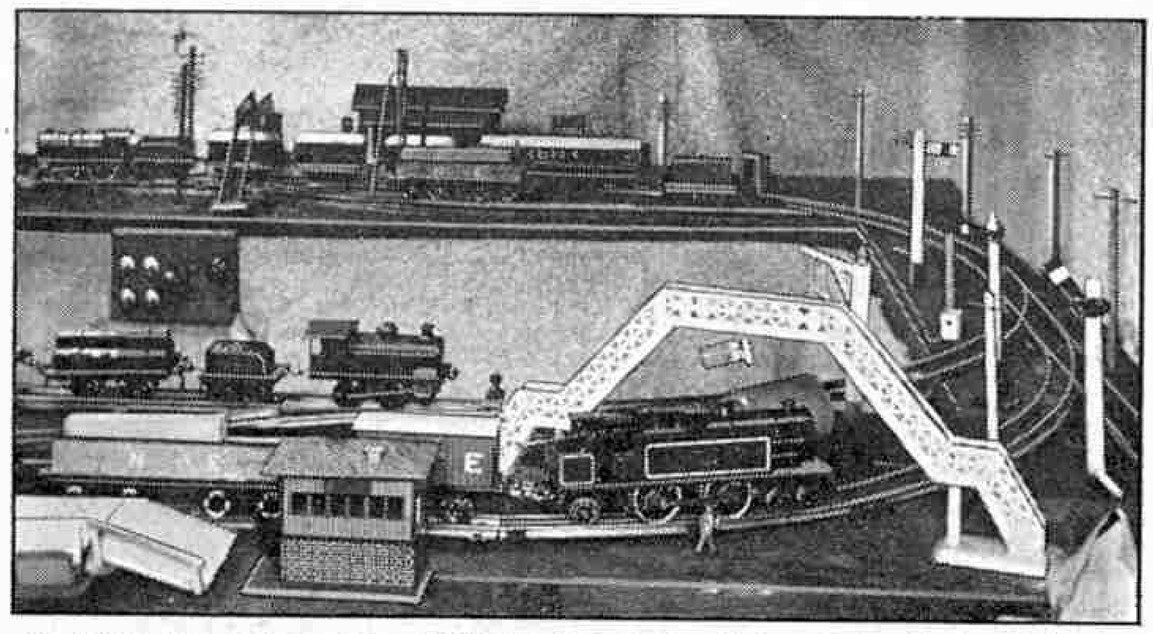
Plan of the layout operated by J. Smith, Bawtry. Unusual features of this clockwork line are that electrically-operated points are used and track circuiting is in operation.

The goods rolling stock consists of some 18 wagons of different types. The freight section is operated chiefly by the M3 Tank, and during very busy periods the G.N.R. veteran is brought into service, although this is generally used for the purpose of marshalling trains in the yards. There is also a Breakdown Train, which is held ready for any emergency that may crop up on the line.

An unusual piece of rolling stock for a model system is a "tunnel van" representing the type of specially fitted vehicle used in actual practice for tunnel inspection purposes. This model has been adapted from an ordinary luggage van, and has at one end an electric "searchlight" to provide a beam of light for the inspection operations. There is a fairly long tunnel on the system, so that this van can be used correctly, when occasion demands, as part of a tunnel inspection train.

The layout is housed in a shed specially built for the purpose. It is screwed down on baseboards fixed on to trestles, the track being some 2 ft. 6 in. above the ground. Tunnels and other accessories have been made at home. Meccano Parts have been used for making a travelling crane that runs on a raised rail across part of the layout and is used for loading Hornby Containers on to the appropriate Flat Trucks. This is an excellent idea, for the operation of loading and unloading Containers adds greatly to the fun to be obtained.

Various line-side accessories help the realistic effect of the railway. In addition to the stations, there are cuttings and various footbridges; and scenic items give a splendid setting to the whole system.



An interesting section of the track-circuited clockwork layout described on this page.

Hornby Solid Steel and Tinplate Track

A Survey of Both Types

"WHICH is the better track for my Hornby Train—Solid Steel or Tinplate?" This is a question frequently asked by Hornby Train enthusiasts. For those who have no need to worry about space the obvious answer is Solid Steel Track, for this is perfect for running and its fine appearance and sweeping curves make it ideal. On the other hand, the use of Tinplate Rails does not mean loss of realism, or that running on them will not be good, and there need be no regret if lack of space makes their employment necessary.

How much space is necessary for a Solid Steel track? This is easily settled. The simplest of all continuous layouts is the plain circle, and for this a space measuring at least 6 ft. 8 in. each way is necessary when using Hornby Steel Track. For oval layouts of any length, using semi-circular ends, there must be a minimum width of 6 ft. 8 in. It will be seen that it is the radius of the Curves that settle what space is required. The Curved Rails of Hornby Steel track have a wide sweep, their radius being 3 ft. 2 in., measured to the outer rail.

The Hornby Solid Steel rail is of a strong and realistic section, and has its surfaces coated with zinc in order to prevent rusting and to ensure good electrical contact. The sleepers are of pressed steel and represent the latest type of real sleeper now being used extensively in actual practice. There are no supporting chairs, but special lugs are pressed up in each sleeper to grip the rails tightly in position.

Each Straight Rail is just over 23 in. long, with 12 sleepers. This gives a most realistic appearance to the track, as can be seen from the photographs reproduced on this and the opposite page. The rails are joined by means of strong Fishplates of spring steel, which grip the lower parts of adjacent rails very firmly and keep the track in perfect alignment. The necessary Fishplates are supplied with the Rails. Half and Quarter Rails also are available.

The Curved Rails are similar in construction to the Straight Rails, and 10 are required to complete a circle. Curved Half Rails also are made. The curved sections are fitted with the same sleepers as the straight lengths.

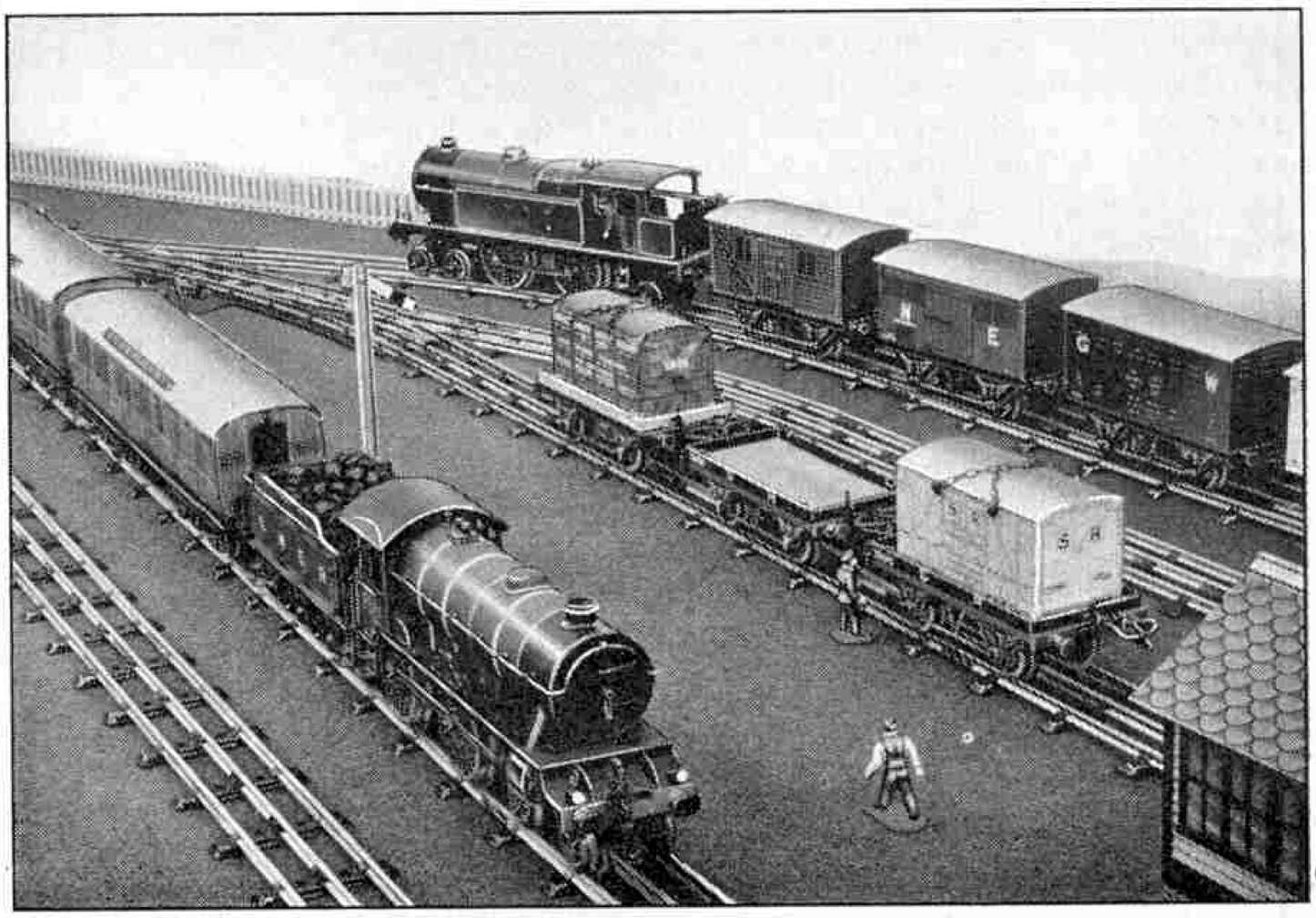
The Points are particularly interesting in design, for the arrangement of the switch and check rails and of the crossing element follows real practice very closely. They are of the ordinary turnout kind, and are made in two patterns, right-hand and left-hand. Separate sleepers are not employed, but rigidity and perfect alignment of the various parts are ensured by the solid base that is used. The "V" shaped frog and the rails alongside it forming the wing rail are combined in one die-cast unit, so that the various components of the crossing cannot get out of alignment.

When a layout is being planned it is easy to make allowances for the Points to be included, for the straight portion is equal in length to a Straight Half Rail, and the curved portion corresponds exactly in length and radius to a Curved Half Rail. One interesting result of this is that two Right-hand or two Left-hand Points can be used on adjacent tracks to form right-hand or left-hand single crossovers respectively, and in these the straight tracks are exactly the same distance apart as those of Hornby Tinplate Double Track. The levers of the Steel Track Points are arranged inside the curve, but they are so placed that they do not foul adjacent tracks.

Sidings and loop lines can be arranged equally readily by means of the Points, and a Curved Half Rail added to the curved turnout of the Points can be made to form a reverse curve and bring the diverging track parallel to the main track. The addition of a Straight Half Rail in the straight track causes the rail joints of the parallel tracks to come exactly opposite each other. Loop lines can be made up in a similar manner.

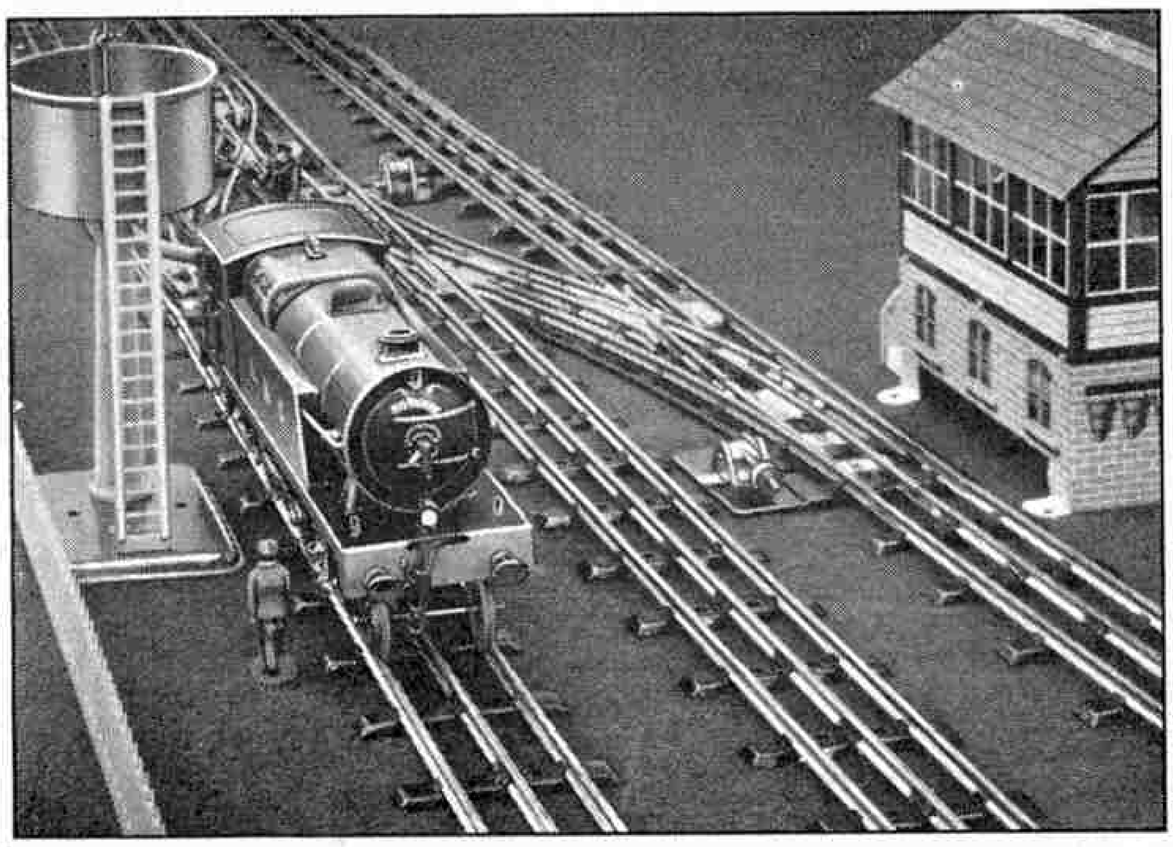
Special double track rails with common sleepers are not included in the Solid Steel Track range, but satisfactory double track main lines can be made up of two single tracks. As the curves of both inner and outer tracks are of the same radius, the necessary adjustments between the lengths of the inner and outer straight tracks are made by means of Straight Half and Quarter rails.

Hornby Tinplate Rails are ideal where space restrictions govern the type of layout to be chosen. Curved Rails of 2 ft. and 1 ft. radius are available, and the former should be used if the layout space has a minimum width of 4 ft. 6 in. Curved rails and points of 2 ft. radius are suitable for running any locomotive or piece of



Main line and sidings laid with Hornby Solid Steel Track. The track is laid on suitably coloured felt to improve the effect and afford quiet running.

rolling stock in the Hornby System. On the other hand, if rails of the smaller radius are used, it is impossible to make use of locomotives larger than the No. 0 Series, or any eight-wheeled rolling stock, because they will not negotiate the small curves successfully. If the available space is very limited, however, it is usually wise to select small radius rails, even though this means using only the smaller engines and rolling stock, for if large radius rails are used in a very confined space, the curves take up so much room that only the simplest rail formations are possible.



A main line "trailing" crossover made with two Hornby EPL3 Solid Steel Points.

Tinplate rails are fitted together by inserting the projecting pegs into the hollow rail-heads. It is advisable however to have some additional connection at the rail joints and special Connecting Clips and Connecting Plates therefore are provided with Hornby Tinplate Rails.

The sleepers of Hornby Tinplate Rails are not flat, but slope upward to one side, which causes the rail at one side to be higher than the other rail. There is a special reason for this. When a train travelling at high speed reaches the beginning of a curve it tends to travel straight on, rather than to take the curve, and thus to fly off the rails. This is checked by raising the outer rail to a suitable height, a practice known as "canting" that is followed as a safety measure on real railways. There is the same tendency on a smaller scale on a model railway, and so the Hornby Tinplate Rails are "canted" to prevent possible derailments. In laying the track, the rails should be joined together wherever possible with the sleepers sloping in the same direction. In some exceptional combinations it is not possible to do this, however.

Hornby Tinplate Points consist of two movable rails called "switch tongues," placed on the inner side of the running or "stock" rails. The switch tongues are worked from side to side by a rod operated by a switch lever, placed at the side of the track.

In addition to right-hand and left-hand turnout points, Double Symmetrical Points and Parallel Points are available. The purpose of the Double Symmetrical Points is to lead one line into two diverging lines, while the Parallel Points lead one straight line into two parallel lines and vice versa.

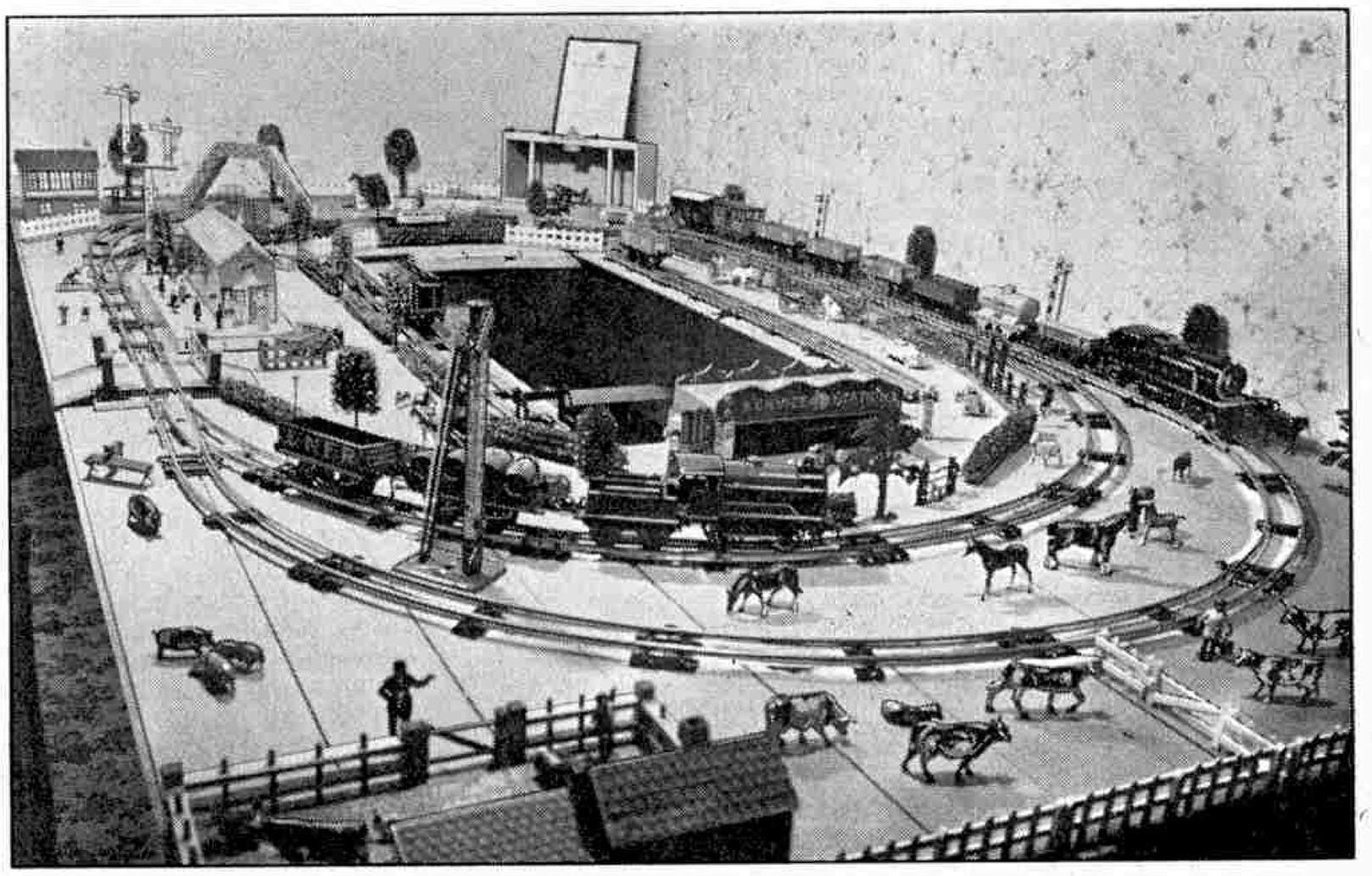
Crossover Points are also available consisting of two sets of points both operated simultaneously by a single lever. The purpose of these points is to permit a train travelling on one of two parallel tracks to pass from one to the other. In the Hornby Series there are separate right-hand, "facing," or left-hand, "trailing," Crossover Points.

Points are known as "facing," or "trailing" according to whether they face the direction of an oncoming train or not. Generally speaking, trailing points are used wherever possible.

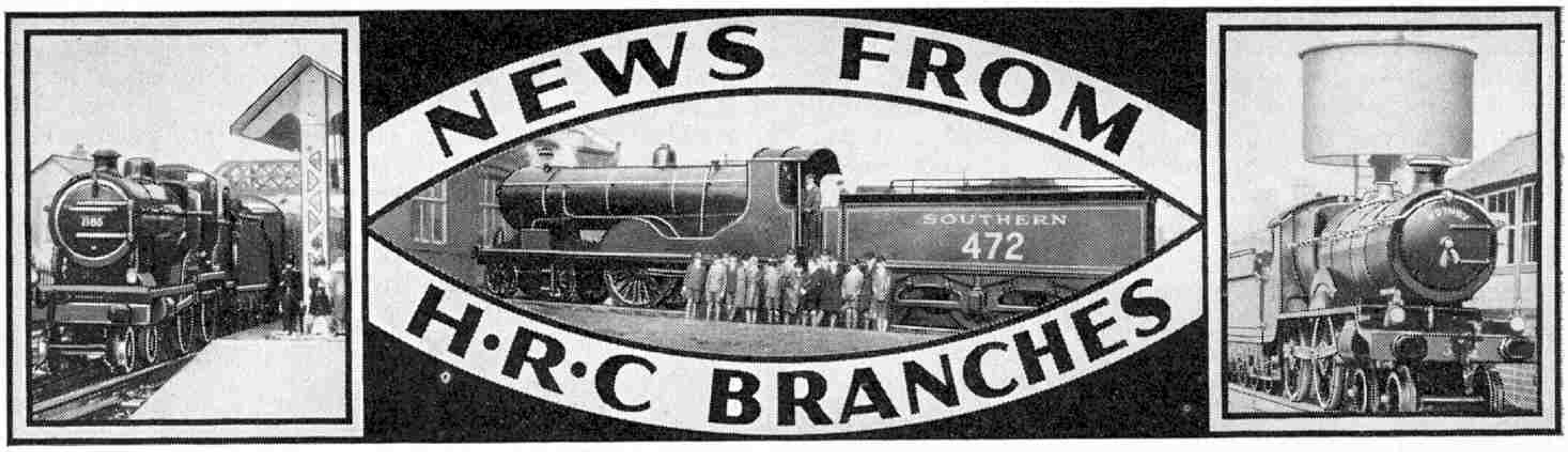
The Hornby System includes also two types of crossings, the Acute-angle, or "diamond" Crossing, and the Right-angle Crossing. These Crossings, which have no movable parts and therefore are always in the correct working position, allow many fine layouts to be constructed. The Hornby Acute-angle and Right-angle Crossings, although consisting of straight track, are known as either 1 ft. or 2 ft. radius. This is to simplify matters when choosing a Crossing for a 1 ft. or 2 ft. radius layout. The 2 ft. radius Crossings have short arms, while the 1 ft. radius pattern have longer arms. Electric 1 ft. radius Crossings are not manufactured and therefore when one is required for a 1 ft. radius layout a 2 ft. radius Crossing is necessary to each arm of which must be added an EB¼ Straight Quarter Rail.

The use of Hornby Tinplate Track in the development of realistic layouts is fully shown in the booklet "*Hornby Layouts.*" This can be obtained from any Meccano dealer, price 3d., or from Headquarters at Meccano Ltd., Binns Road, Liverpool 13, for 4½d., including postage.

The interesting tinplate layout illustrated below is that operated by Nigel Markwell, H.R.C. No. 61047, of New Earswick, York, who is a keen Hornby Train enthusiast. It is laid in a spare room on a raised platform 10 ft. by 6 ft. Hornby single track is used, but two trains can be run, as shown in the illustration below.



An interesting Hornby Tinplate single track layout operated by N. Markwell, York.



BIRCHINGTON.—The first meetings of this newly-incorporated Branch have been devoted to discussion on the form of layout to be used, and to the construction of this when the design had been settled. Train running at first was carried out for testing purposes, so that suitable timetables could be worked out. Improvements are being made from time to time in the layout. Special loads are being made and assembled for use on goods trains. Secretary: R. Pettman, "Little Croft," 30, Crescent Road, Birchington, Kent.

FOLKESTONE.—The electric equipment has been converted to the 20-volt system. Constructional work in hand includes a station with glass roof, a locomotive shed, signals, cuttings, fencing and posters. All existing stations have been repainted white. Fast boat, mail and goods trains have been run to timetable, all locomotives carrying an appropriate route number. New Hornby Refrigerator Vans have been placed in operation and new G.W.R. coaches acquired. Secretary: F. E. Saunders, 79, Dover Road, Folkestone.

ARDSLEY.—The double-track layout has been extended and is now 70 ft. long. Steel track has replaced tinplate where the line runs out of doors. This section was snowbound for a time during the winter. Reconstructional work has been carried out at stations, and scenery also is being made. New passenger coaches have been placed in service. Timetable working continues to be enthusiastically carried out, and several short-distance stopping trains have been introduced. Games periods have been introduced. Secretary: C. Barker, 8, Holgate Mount, Ward Green, Barnsley, Yorkshire.

DUMPTON HOUSE (BROADSTAIRS).—Good progress has been made by the Branch since its recent incorporation. Track meetings are being held regularly and extensive train services have been keenly worked. Meetings for train operation are being held three times a week. Secretary: A. G. Hargreaves, Dumpton House, Broadstairs, Kent.

ELMSIDE (EXETER).—New locomotives have replaced condemned engines. Train running has been energetically conducted, and timetables have been adhered to despite heavy traffic. The running of all trains is logged, and figures for last year show amazing activity. The number of trains run was exactly 1,000, and proceedings so far promise a new record in 1939. The track now in use is an extensive one, on which at times five trains are run at once. Secretary: J. T. H. Fenwick, 45, Calthorpe Road, Exeter.

LOSTOCK GRALAM.—Good train running has been enjoyed at each meeting. Photographs of the clubroom and track have been taken by the Photographic Section, who also have held a discussion on *"Photography by Artificial Light."* An outing to Manchester was enjoyed. Secretary: A. P. S. Milligan, Wincham Hall, Northwich.

BEDFORD SCHOOL.—Constructional work on the layout has been varied by track operations on completed sections. The various working departments have made good progress with equipment in hand. Table tennis and billiards have been played at meetings. Secretary: A. W. R. Coomber, 33, St. Michael's Road, Bedford.

Mr. J. H. Statham, Chairman of the Acton H.R.C. Branch No. 308. This was incorporated in June 1936 and has made excellent progress under Mr. Statham's leadership. The track has been laid down on a firm baseboard constructed by members, and now provides excellent running for timetable services. A Meccano club has been formed to work in association with the Branch.

BARNARD CASTLE SCHOOL.—The Branch has acquired new rolling stock, together with three further Hornby Locomotives. A Hornby-Dublo layout has been added, and accessories for this have been built in Meccano. Secretary: A. Coates, The School, Barnard Castle, Co. Durham.

THE ABBEY (BURY ST. EDMUNDS).—At Track Meetings expresses and goods trains have been run, and shunting practised. Several new points and rails have been added to the track. The Branch has been divided into two sections, "Drivers" and "Firemen." A party of members paid an enjoyable visit to the Bury St. Edmunds Branch Exhibition. The Abbey Branch's own Annual Exhibition was an outstanding success. An extensive layout was operated, a Meccano super-model was on show, and there was a display by the Photographic Section. Secretary: M. D. Forster, 2, Crown Street, Bury St. Edmunds.

PLYMOUTH.—A Library has been commenced. The usual activities, including train running, have been followed, and at one meeting members' parents were shown round during normal work. The Annual Exhibition provided many attractions for visitors, including a large Hornby railway, Meccano models and models of ships and aircraft. A Coach-modelling Section has been formed. Secretary: A. E. Miller, 21, Hamilton Gardens, Mutley, Plymouth.

HOMELEA (NEW MALDEN).—The first meeting of this newly-formed Branch was devoted to business, officers being appointed and rules drawn up. A Branch track has been laid down, and goods train services are being run on it at track meetings. Secretary: B. Cocks, 14, Hillbrow, New Malden, Surrey.

NORTH BRITISH MODEL SOCIETY.—The Branch rooms have been renovated, and improved electric lighting and heating introduced. A radio receiver has been installed. A Library of 300 books has been provided in addition to a large Magazine Library. The rooms are open every day, and all the sections have been active. The Railway Section has commenced the construction of a Gauge 00 model railway. Other activities include Photography, Stamp Collecting, Cycling, Hiking, and Motor Cycling. The club Magazine and *"Daily News"* maintain their usual high standard. Secretary: Mr. T. A. Sharpe, 12, King Street, Dundee.

HOLLAND

MAASTRICHT.—A new track has been laid down to a design inspired by an illustration in the *"M.M.,"* the rails being screwed down on trestles. Hornby steel track is to replace tinplate on the main lines. Wooden signals and stations are to be built, and scenic effects provided. All equipment has been overhauled and repaired where necessary, and new Hornby Locomotives have been obtained. A Word-building Competition has been held. Chairman: F. L. Bingen, Mathias Wijnandsraat 6, Wijk-Maastricht.

Proposed Branches

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 organisation should communicate with the promoters, whose names and addresses are given below.

AUSTRALIA—L. Gliddon, 74, Grange Road, Glen Huntly, S.E.9, Melbourne.

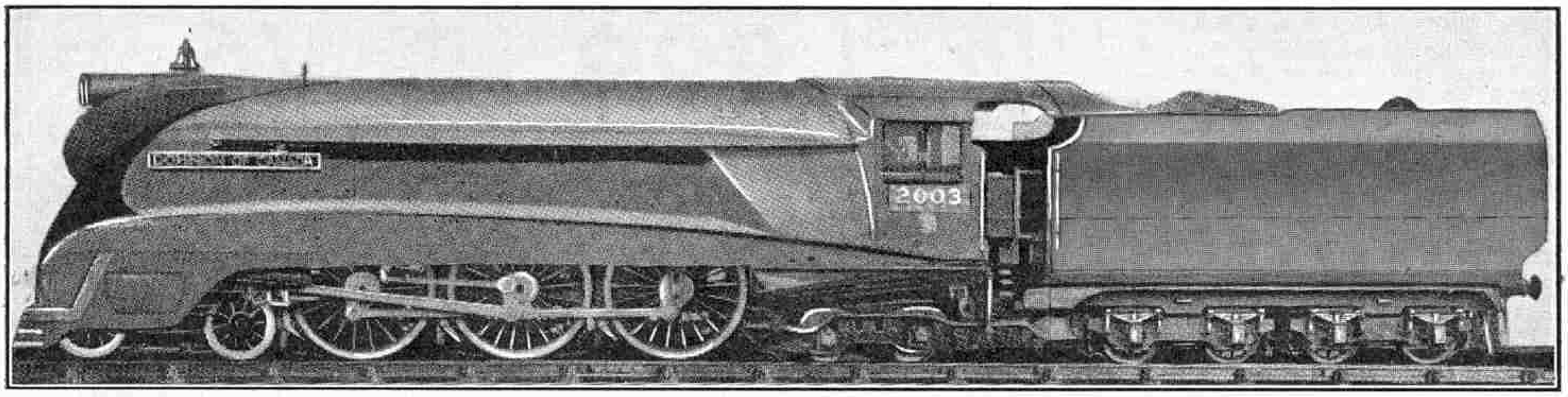
BOLTON—R. Pomfret, 92, Bradshawgate.

H.R.C. COMPETITION PAGE

Competitions appearing on this page are open only to members of the Hornby Railway Company. Envelopes containing entries, should have the title of the competition clearly written in the top left-hand corner and should be addressed to the Hornby Railway Company, Meccano Limited, Binns Road, Liverpool 13. The name, full address and membership number of each competitor should appear in clear writing on every sheet of paper used.

COMPOSITE LOCOMOTIVE CONTEST

It is great fun to imagine what a new engine would look like if prominent external features of famous locomotives were combined to produce an entirely new type. How such an imaginary locomotive design may be evolved, by taking parts from existing British and American types and combining them into a single engine, is well shown by the illustration on this page of a handsome composite streamlined locomotive, which is not a real one but is supposed to have been built up in this manner. The origin of some of the features of this engine are recognisable at first glance. That of others is more difficult to detect, for the various parts have been fitted together so skilfully that even the keenest H.R.C. member will have to spend some time examining them before he discovers the identity of some of the sections used.



In our competition this month we ask members to identify each portion of the engine illustrated, and to state from which locomotives its parts have been taken. We are sure that all H.R.C. members will revel in the detective work of tracing the origin of each part used in the composite, and in explaining how the new giant 4–6–4 has been built up. All the engines represented in the composite engine have been illustrated in previous issues of the "*Meccano Magazine*," so that back numbers can be consulted if there is any doubt as to the origin of any part.

In their entries competitors should give the name of each part that has been collected for use in the composite, and the class and wheel arrangement of the engine from which it has been taken, together with the recognised initials of the railway company owning it. Competitors should make their solutions as brief as possible and, provided that the information given is sufficient to enable the locomotives listed to be identified definitely, the shorter these are the better. Competitors must write their entries on one side of the paper only, and on the back of each sheet submitted must appear the name, full postal address, and H.R.C. membership number of the sender. Members are asked to pay special attention to these requirements as the omission of any one of them may result in disqualification.

The Contest will be divided into the usual Home and Overseas Sections, and in each of these three prizes consisting of any goods manufactured by Meccano Ltd. to the respective values of 21/–, 15/– and 10/6 will be awarded. There also will be several consolation prizes. In the case of a tie for any prize, the award will be made to the competitor whose entry is presented in the neatest or most novel manner.

Envelopes containing entries should be marked "*H.R.C. Locomotive Composite Contest*," in the top left hand corner, and posted to reach Headquarters at Meccano Ltd., Binns Road, Liverpool 13, on or before 30th April. The closing date for entries in the Overseas Section is 31st July.

Railway Photographic Contest No. 1

This month we commence our annual series of Photographic Contests, which will continue until September next. In these Contests members are given full scope for originality and enterprise, as they are not restricted to any special subjects. Instead the prizes are awarded for the best photographs of any railway subjects submitted during each month.

A competitor may include as many photographs as he pleases in his entry, but can only be awarded one prize in any one competition. As in previous Contests of this kind, the only condition is that the photograph must have been taken by the competitor himself, that is, he must have made the actual exposure; the developing and printing may be the work of a professional. It is important that every print submitted should have on the back a short description of the scene of the photograph, together with the competitor's name, his H.R.C. membership number, and his full postal address. Prize-winning entries become the property of Meccano Ltd., and will be filed for possible use in future issues of the "*M.M.*" Competitors desiring their prints to be returned if unsuccessful should send a stamped addressed envelope.

The Contest will be divided into the usual sections, Home and Overseas, and in each will be awarded three prizes consisting of any product manufactured by Meccano Ltd. to the respective values of 21/–, 15/– and 10/6.

Envelopes containing entries must be marked "*H.R.C. Photo Contest No. 1*" and posted to reach Headquarters at Meccano Ltd., Binns Road, Liverpool 13, on or before 30th April. The Overseas closing date is 31st July.

H.R.C. COMPETITION RESULTS

HOME

January "Mixed Names Contest."—First: E. W. Ogilethorpe (46851), Harrow, Middlesex. Second: M. Davies (63084), Weston-super-Mare, Somerset. Third: J. S. Dick (55551), Edinburgh 3.

January "Voting Contest."—First: W. Whitaker (44565), Hornsea, E. Yorks. Second: G. Balfour (57921), Upminster, Essex. Third: C. E. Wrayford (6039), Bovey Tracey, Devon.

January "Drawing Contest."—First: E. Oldham (43390), Hyde, Cheshire. Second: F. Mills (31), Kearsley, Nr. Bolton. Third: R. Smith (14750), Dewsbury, Yorks.

OVERSEAS

October "Layout Planning Contest."—First: K. R. Cassells (39510), Wellington, New Zealand. Second: A. A. Shawky (53749), Giza, Orman, Egypt. Third: J. E. Ridgway (51742), Johannesburg, South Africa.

October "Errors Contest No. 3."—First: D. Murison (37642), Buenos Aires, South America. Second: J. E. Ridgway (51742), Johannesburg, South Africa. Third: R. Corley (58586), Toronto, Ontario, Canada.

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3	,, Cor. ...	8d.	3 ,, Cor. ... ...10d.
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1	,, ,, Jub.	3d.	15 ,, ,, ... 8d.
3	,, ,, Cor.	9d.	1 ,, ,, Jub. ... 1d.
20	Canada	6d.	2 ,, ,, ,, ... 6d.
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20	,, ...	6d.	5 Trinidad... ... ... 2d.
5	,, Pict. Geo.V	6d.	10 ,, ... 5d.
4	,, ,, Geo.VI	5d.	15 ,, ... 8d.
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1	,, Coronation	2d.	2 ,, ,, ... 8d.
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Stamp Gossip

and Notes on New Issues

New British Colonials

With the appearance of the new issues for the Gilbert and Ellice Islands and the British Solomon Islands the series of new reign British Colonials is almost complete. Each of the new sets consists of a full range of 12 values, from ½d. to 5/– and, as the specimens shown on this page suggest, comprises a most interesting series.

The British Solomon Islands designs are as follows: ½d., native spears and shield. 1d., illustrated here, native policeman and tribal chief; in many of the remoter villages the chief, or headman, is appointed as constable to invest his standing as tribal chief with the full weight of Government authority. 1½d., view of Auki Island.

2d., native hut and canoe. 2½d., illustrated on this page, Roviana war canoe; up to quite recent times, the Rovianan people had a most bloodthirsty reputation, and the launching of a war canoe was attended by a veritable christening in blood, prisoners captured in raids being bound and laid in the path of the canoe as it was dragged to the sea. 3d., seascape and canoes. 4½d., native meeting house. 6d., coconut plantation. 1/–, branch and fruit of breadfruit tree. 2/–, view of Mount Tinakula, an active volcano. 2/6, megapodes, a bird resembling a wild turkey that is noted for its trick of burying its eggs in the sand and leaving them to hatch out by themselves. 5/–, illustrated here, native decorated canoe; the amazingly elaborate nature of the decorations is excellently shown in this design, the two mother-of-pearl frigate birds on the stern of the canoe illustrated being a noteworthy example.

The following are the Gilbert and Ellice Islands designs. ½d., illustrated here, frigate bird; although this bird is exceedingly rapacious and strong on the wing, it is, strangely enough, a member of the same family as the gentle non-flying penguin, and the likeness is there for all to see in the stamp design. 1d., Oandamus pine tree. 1½d., native canoe crossing a reef. 2d., native canoe and house. 2½d., illustrated here, native house. 3d., seascape. 5d., native outrigger canoe. 6d., coconut palms. 1/–, illustrated, jetty at Ocean Island.

Irish Stamp Celebrates Foundation of United States

Eire sprung a surprise on the stamp world by issuing at very short notice 2d. and 3d. commemorative stamps in honour jointly of the 150th anniversary of the inauguration of the United States Constitution in September 1787, and of George Washington's installation as first President in 1789. It was felt in Eire that the occasions might appropriately be celebrated in Eire as an expression of friendship to the many Irish connections in the United States.

As our illustration shows, the design incorporates the American eagle, the Irish harp and a portrait of George Washington. The dates link up with Washington's installation and the inscription in Gaelic across the foot of the stamp reads: "The people of Ireland celebrate the 150th anniversary of the American Constitution."

The eagle shown in the stamp design is the principal device in the Great Seal of the United States, and the 13 arrows clutched in the talons of its left foot are symbolic of the original 13 states subscribing to the Constitution. This symbolisation is repeated in the 13 vertical stripes on the shield.

Italian Town on Finnish Stamp

At first sight there seems little reason why Solferino, a town in Italy, should be featured on a Finnish stamp. The connection, is a natural one, however, when it is recalled that the stamp series is Finland's annual Red Cross series and that this year is the 75th anniversary of the Geneva Conference in 1864 at which the International Red Cross movement was inaugurated. Henri Dunant, the pioneer Red Cross worker, had been horrified by what he had seen of the sufferings of the wounded at the Battle of Solferino in 1859, and it was his determination that something must be done to minimise such suffering that led to the calling of the Geneva conference.

South African Voortrekker Issues

Pressure on our space has prevented us from referring earlier to the exceptionally interesting designs of the South African Voortrekker commemorative series that appeared in December last. There are really two series, one of four stamps, each bearing a premium to be devoted to the Voortrekker Centenary Memorial fund, and one of two stamps issued as an ordinary commemorative.

Taking the charity issue first, the designs of the lower values are as follows: ½d.+ ½d., a Voortrekker ploughing, the plough in the design being drawn from an original housed in the Pietermaritzburg Museum; the background shows Table Mountain, Spandoukop, Graaff-Reinet and Soupansberg in the Transvaal. 1d.+1d., a picture of Louis Trichard crossing the Drakensberg at Christmas 1837; the back wheels of the wagon have been replaced by a thick tree trunk, while men dragging on ropes seek to prevent the vehicle from getting out of control during the descent.

Of the two higher values, the 1½d.+1½d. shows the scene at the signing of the Dingaan-Retief Treaty; Piet Retief, the Voortrekker leader, is indicating to the Zulu King the point where he is to sign the Treaty, with Thomas Halstead, an Englishman who acted as interpreter between the two, and in the background is the hill on which later Retief and his band of 71 men were murdered by the Zulus. 3d.+3d., a composite picture showing the proposed monument to Retief, oxen dragging a wagon through the Orange River and a view seen when descending the Drakensberg into Natal.

The two commemorative stamps have designs as follows: 1d. Voortrekker wheel, with skid applied descending a mountain slope; the Drakensberg is shown in the background, and the design is framed by electric power station cooling towers and chimney stacks, symbolising the rise of South African industry and power. 1½d., a Voortrekker family gazing over a wide landscape in which the Blood River and the Drakensberg are shown; in the right background is a double rainbow.

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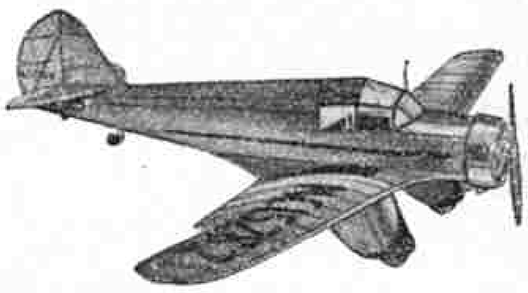
CB1 AUSTRALIA (2) to BASUTOLAND
CB2 BECHUANALAND to BRITISH HONDURAS (1)
CB3 BRITISH HONDURAS (2) to CANADA (1)
CC1 CANADA (2) to CAYMAN ISLANDS (1)
CC2 CAYMAN ISLANDS (2) to CYPRUS (1)
CE1 CYPRUS (2) to EGYPT (1)
CF1 EGYPT (2) to GIBRALTAR (1)
CG1 GIBRALTAR (2) to HONG KONG (1)
CI1 HONG KONG (2) to INDIA (Gwalior) (1)
CI2 INDIA (Gwalior) (2) to IRAQ (1)
CI3 IRAQ (2) to JAMAICA (1)
CK1 JAMAICA (2) to MALTA

STANLEY GIBBONS LIMITED
DEPT. S.15, 391 STRAND, LONDON W.C.2

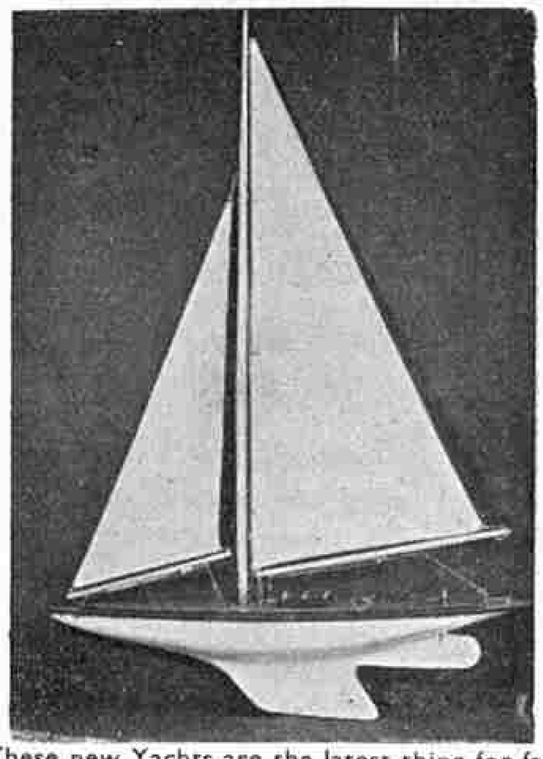
Megow Balsa Flying Kits



Kits for 12 in. wing span Flying Models of the AERONCA, BOEING P12E, CURTISS PURSUIT, HELL DIVER, LOCKHEED VEGA, MONOCOUPE, PUSS MOTH, STINSON RELIANT, TAYLOR CUB, VULTEE VIA, WACO, GULF HAWK, HORNET MOTH, MILES MAGISTER. Price **9d.** Postage 3d.

Kits for 24 in. wing span Flying Models of the STINSON RELIANT, WACO CUSTOM, MONOCOUPE, CONSOLIDATED P/30, FAIRCHILD, HAWKER FIGHTER, CURTISS HAWK, RICHMAN and MERRILL'S VULTEE. Price **2/-**. Postage 6d.

"Endeavour" Yachts



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

Prices:

17 in. Yacht with automatic rudder ...	**12/-**
21 in. Yacht with automatic rudder ...	**18/6**
27 in. Yacht with Braine type steering	**39/6**
36 in. Yacht with Braine type steering	**75/-**

Carriage extra.

Send for Bond's 208 page 1939 Catalogue, **Price 6d.** It illustrates and list all the requirements of the Model Maker and includes all Tools and Materials.

BOND'S O' EUSTON ROAD LTD.
357, Euston Road, London N.W.1
Telephone: EUSton 5441-2. Est. 1887.

A QUALITY GIFT!

Scarce stamps from **BRUNEI**, Estonia, Deccan, **FALKLANDS**, Malaya, Gwalior, Latvia, **JHIND STATE**, Soudan, Perak, **MEMEL**, Cameroons, Iceland and Mauritius. In addition, a fine set of 6 Travancore to the first 200 applicants, so write now.
ALL FREE—Send 2d. for post and packing (abroad 9d.) and ask to see our bargain approval sheets.
J. STOCKTON & CO., Bridgwater, Westcliff-on-Sea.

NM COLLECTION FREE. 60 different stamps including Large Pictorials from **BRIT. GUINEA** and **CEYLON**, Picturesque **SYRIA**, **NIGERIA** George VI, **KENYA** (Pictorial), N. Zealand, Cyprus, etc., and 300 mounts. Request approvals, enclose 2d. postage. **N. MITCHELL, Dept. M.4, 36, Woodville Gardens, Ruislip, Middlesex.**

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

FINE PICTORIAL STAMPS FREE

This wonderful packet containing LARGE PICTORIALS mostly bi-coloured—IVORY COAST, SENEGAL, WALLACE IS., 3 POLAND, ALGERIA 1937, AUSTRALIA (Commemorative), S. AFRICA, UKRAINE, CORONATION, TUNIS, Set of HUNGARY, CZECHO-SLOVAKIA, 2 EQUATORIAL AFRICA (New), etc. The above packet will be sent FREE to all who apply for my new lists of approval sheets and send 1½d. for postage. In addition, all who send me stamp collectors' addresses will receive 6 Persia or 6 Venezuela stamps FREE. 100 B. Colonial 1/-, 20 Airpost 6d., 6 Triangulars 7d., 1,000 different 3/11, 20 Brazil 6d., 20 Peru 6d.
H. C. WATKINS (M. DEPT.), GRANVILLE ROAD, BARNET.

FREE STAMPS

100 all different, 2 Indian Silver Jubilees and 1 Mozambique Triangular Air Mail
to introduce my low-priced approval books containing stamps from ½d. Liberal discount given, and a list of 133 further bonus gifts of Coronation, Jubilees, Commemoratives. Please send 2d. for postage.
C. A. RUSH, 38, Queen's Av., Whetstone, N.20.

MONTENEGRO

1902 5 H. GREEN IMPERF. S.G. CAT. 5/- EACH FOR **4½d.**
A PAIR FOR 8d. OR BLOCK OF FOUR 1/- POST FREE.

GT. BRITAIN 1/- Green, 1871
PLATE 5, S.G. No. 117, NICE USED COPY, 4½d.
N. T. Hillier, "Stamp Club," Horsmonden

FREE! 100 DIFFERENT STAMPS to applicants for Approvals. Gosling, 21, Powling Road, Ipswich.

PICT. & COMM. SETS FREE. Choose any 3 sets, sent with appros. G. Whittleton, 3, Cavendish St., Worces.

A MOUNT DAMPER

FREE TO ALL APPROVAL APPLICANTS. SEND 2d. POSTAGE. **Ph. & F. GATES,**
23, Mansfield Avenue, Tottenham, London N.15.

K.G.VI to 3d. mint, 6 Gilbert 1/-, 6 Solomon 1/-, 5 Fiji 10d. to 2½a., 7 Burma 1/-, 6 Aden 1/-, 6 N. Hebrides to 30c. 1/-, Germany Motor 1/3, Sudeten 4d., Theatre 4d., Breslau 6d., Austria Railways 1/-, Danube Ships 1/- complete. Ptge. 1½d. extra. Selections from 30 for 6d.
J. R. MORRIS, 9, AUDLEY ROAD, FOLKESTONE, KENT.

115 - DIFFERENT STAMPS - 115

including 15 KING GEORGE VI

To all genuine approval applicants who request my books of British Colonials priced from ½d. each, less 25% discount, I am presenting free of charge 15 Diff. King George VI from six diff. Colonies including **CEYLON, CYPRUS, KENYA, NIGERIA** and 100 Diff. other used stamps. Sent POST FREE.
Eric J. Watts, 184, Northampton Road, Wellingborough.

Colonials and World Stamps. Approvals and Packets. Free Gift. Johns, Shirley, Salcombe, S. Devon.

BRITISH COLONIALS incl. overprints, officials, War Tax, etc. Excellent value. 25 diff. 1/2, 50 diff. 2/2, 75 diff. 3/8. E. Williams, Bronllwyn, Caradog Rd., Aberystwyth.

30 BRITISH COLONIALS

INCLUDING **10 GEORGE VI FREE!**

This wonderful, all different Colonial packet which contains the latest new issues mint and used will be sent to all Approval applicants enclosing 2d. postage and mentioning "Meccano Magazine."
SHIELDS & PLATT,
29, High Street, Harrow, Middlesex.

The COLOSSAL Packet

Entirely **FREE** to applicants for my fine approval books. This packet contains stamps from **GILBERT & ELLICE ISLANDS**, pictorial, **CAYMAN ISLANDS, ICELAND**, the latest stamp issuing country, **SAN MARINO** attractive picture stamp, Coronations including **FALKLAND ISLANDS**, commemoratives of Boy Scouts Jamboree, Queen Wilhelmina Jubilee and many other fine stamps. **FREE and POST FREE.**
Send a post card to-day for your gift.
MISS I. WILKINS, 17, EAST ST., OSNEY, OXFORD.

German Motor Show Commemoratives

We illustrate on this page the attractive set of commemoratives issued for the Berlin International Motor Show held in February last. The three designs show at a glance the amazing strides the motor industry has made in its comparatively short life.

The 6 pf. shows the two German motoring pioneers, Carl Benz, driving his first tri-car, and Gottlieb Daimler, with his son, driving their first car. The 12 pf. gives a striking picture of Daimler-Benz Mercedes and Auto-Union racing cars fighting out a road race. The 25 pf. shows the much heralded "People's Car" that was the premier attraction at this year's Show.

Afghanistan Cancer Charity Stamps

Afghanistan has issued two stamps to commemorate the 40th anniversary of the discovery of radium by the Curies in 1898, the use of the stamps being compulsory as a means of providing funds to assist in the completion of the Cancer Hospital at Aliabad.

The 15p. value is shown here, and it will be noted that the portrait of Pierre and Marie Curie and the inscriptions in the top and bottom panels are taken bodily from the design of the French commemorative issued in November last.

The design of the 10p. stamp shows a view of the hospital at Aliabad.

Pope Pius XI

The late Pope, His Holiness Pius XI, was the first Pope to be portrayed on a postage stamp. His portrait appeared on the special issues produced in Spain in December 1928, to raise funds for the excavation of the tombs of SS. Damascus and Pretextalus in Rome, and show the Pope, wearing the Papal Triregnum, or three-tiered crown, with ex-King Alfonso. Italy's 1924 Holy Year commemoratives also showed His Holiness, opening the Holy Door on the 1L stamp and closing it on the 5L value. These designs were not actual portraits, however.

Vatican City stamps reappeared under Pius XI, and the first series in August 1929 gave a full face portrait on the higher values and also on the express letter stamps. After that issue the Pope's portrait appeared only on the high values of the 1933 general series.

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

"Behind The Stamp Album"

By T. Todd. (Duckworth. 6/- net)

Sooner or later all stamp collectors want to know more about famous stamps and their stories, and here is a book that will meet their wishes. It is very readable, and the topics themselves are interesting and in many cases exciting.

The author begins with the early days of the Royal Mail, when letters were carried by post-boys using relays of horses, and the first postage stamps introduced as long ago as 1680. Modern stamp collecting followed the appearance in 1840 of the famous "penny black" stamps, which are described in a special chapter, after which we plunge into stamp stories of great variety. How stamps are printed and distributed, curious errors, famous stamp mysteries, and discoveries in attics of stamps of immense value that have been lying in hiding for many years are among the fascinating subjects dealt with.

We read also about the British Guiana stamp of 1856, the most valuable in the world, of stamps without a country and others issued to advertise various countries either politically, as in recent German and Italian issues, or commercially. The coming of air mail stamps is explained, and we are given interesting glimpses of famous collectors and their stamps.

The interest of the book is greatly increased by a large number of plates of postmarks, stamps and special covers.

The 1939 Congress

The 26th Philatelic Congress of Great Britain will be held this year at Southport on 13th-16th June, by invitation of the Liverpool Philatelic and Liverpool Junior Philatelic Societies. A set of Congress stamp labels has been issued for publicity and souvenir purposes. These are available in sheets, each bearing twelve typical views of Merseyside, price 1/- per sheet, from the Congress Hon. Treasurer, Mr. S. Lord, 20, Hackins Hey, Liverpool.

Another interesting Congress souvenir is a set of eight postcards bearing reproductions of 90 old Liverpool postmarks. This also can be obtained from Mr. Lord, price 2/-.

Dutch Railway Centenary

The centenary of the Dutch railways, which is to be celebrated next September, will be the occasion for the issue of a set of five commemorative stamps. Details of the designs are not yet available, but it may be expected that they will follow the style of other European railway centenary commemoratives by showing views of early and modern locomotives. There will be plenty of scope for designs of great stamp and railway interest.

The current Dutch stamps are to be withdrawn in September to make way for a new definitive series bearing a more recent portrait of Queen Wilhelmina.

Stamps on Cigarette Cards

Readers who combine cigarette card collecting with their stamp hobby will be interested in a new set of cards issued by the Ardath Tobacco Company showing famous and interesting stamps in full colour. This is the first time that such a set has been issued, for it is only recently that a Post Office regulation forbidding coloured reproduction of postage stamps has been relaxed. Even now it is not permissible to reproduce in colours stamps that are still valid for postal purposes.

2/3rds ACTUAL SIZE OF CIGARETTE CARDS

The set comprises 50 cards covering a very wide range of philatelic interest, from the "Penny Black" and the record-breaking "British Guiana one cent" to common issues possessed by most boy collectors. The stories of the stamps are related on the cards, and the interest is strengthened by the fact that on most cards the stamps are supplemented by portraits of people connected with them, or by views of buildings or scenery of the countries from which they come.

The result is a fascinating series of cigarette cards, and the Ardath Tobacco Company and their collaborators, Stanley Gibbons Ltd., are to be congratulated on the production. The cards are packed with the well-known Ardath and State Express cigarettes.

Newfoundland Stamp to Celebrate Royal Visit

A special 5c. commemorative stamp is to be issued by Newfoundland to celebrate the visit of King George VI and Queen Elizabeth. The design will show portraits of Their Majesties in oval frames, between which the Newfoundland Coat of Arms will be placed. "June" and "1939" will appear in panels in the left and right upper corners respectively, and the words "Royal Visit" will be displayed above the Coat of Arms.

The stamp will be on sale from 17th June to 31st July. The 5c. denomination has been chosen because this is the rate applicable to first-class letter mail to all parts of the British Empire and the United States, and its use will avoid even a temporary withdrawal of the recently issued 2c., 3c., 4c. and 7c. values in their new designs.

A Plant Paradise in the South Seas

By D. K. Ross

Plants and trees with brilliant foliage, and laden with strange blossoms and oddly shaped fruits and nuts, seem to greet the visitor to Tongatabu, the largest of the Friendly Islands, almost as soon as he leaves the steamer that takes him there. Some of those to be seen growing in profusion on the road leading out of the little capital of the island can scarcely be coaxed into flower in hothouses in Great Britain. Their colours are amazing. A convolvulus opens a magnificent sky blue bell; the scarlet pods of the chilli are in deep contrast to the white ones of the cotton tree; and every spot not taken up by another plant is filled with the handsome foliage and crimson flowers of the Indian shot plant.

There are bananas hanging in mighty bunches in long plantations, and the young coco palms, the most graceful trees in the world, wave enormous fronds in the breeze. The world's largest coconuts are said to grow here, and a prosperous industry has been built up under the palms, up which the natives swarm like monkeys.

Another interesting sight is the avava, the sacred tree of the Tongans, with its huge jutting roots. Captain Cook stood among the roots of this tree when he made a speech of goodwill to the natives 150 or more years ago. What is said to be the actual tree can still be seen, a hoary old monster, by the wayside. The Traveller's Palm also flourishes on the island.

How Earthquakes Announce Themselves

A remarkable electro-magnetic device is used to-day for feeling the pulse of the earth, that is for recording and measuring its vibrations, the movements that cause havoc and destruction over large areas. In this device there is a heavy horse-shoe magnet, to each pole of which a piece of soft iron is attached. Round the pole pieces are coils of wire connected in series, from which leads pass to an instrument that can record the passage of electric currents.

The total weight of this part of the device is about three-quarters of a ton, and it is hung up by means of a spiral spring in such a manner that the ends of its pole pieces are about a millimetre away from a bar of soft iron fixed to the ground. An earthquake or other disturbance thrusts the ground upward so that the distance between the pole pieces and the soft iron bar is reduced, and this has the effect of causing an electric current to flow through the coils round the soft iron pole pieces. The passage of the current is recorded automatically on a chart, so that an earthquake writes its own announcement.

Readers who know something of electro-magnetic pick-ups now used so largely by playing gramophone records will realise that this device works on a similar principle.

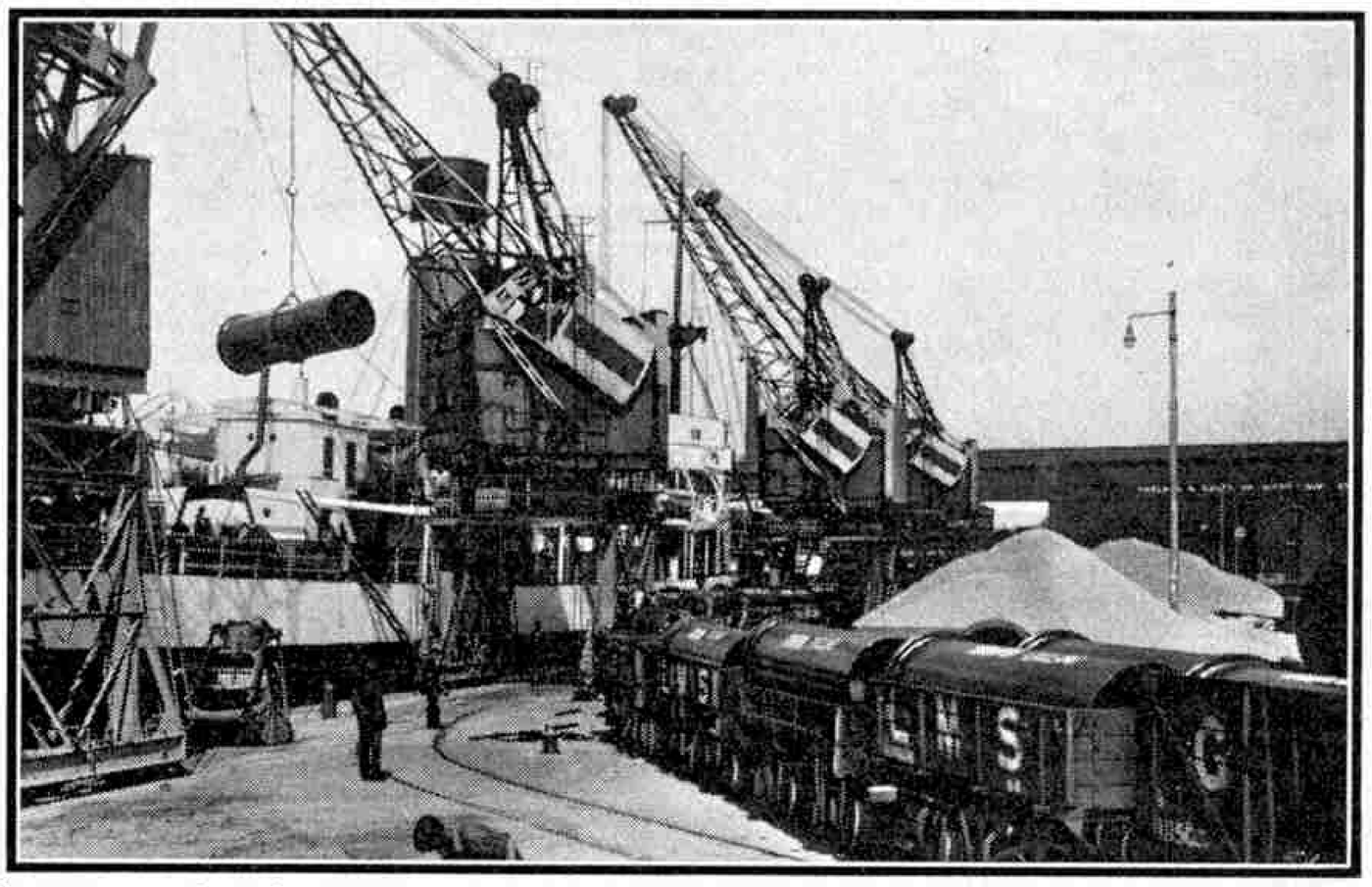
The Most Northerly Coal Mine in Great Britain

By T. G. Cook

While on holiday recently in Scotland, I visited Brora and there saw the most northerly coal mine in the British Isles. This little mine is tucked away in the valley of the river Brora, between the sea and the hills and moors of Sutherland. It is almost invisible from the main road.

The mine is not very large in extent. There are two shafts, the one nearest the engine house carrying the cage, and the other an iron box filled with water to act as a counterweight. The coal is mined on the longwall system and is brought to the surface in small trucks of 2-ft. gauge. At the surface it is tipped on to an iron screen, from which the larger coal is shovelled into trucks, while the smaller stuff falls through. The pit headgear, staging and hoppers are all made of wood. The mine appears to be free from gas, as several of the miners had old naked-flame oil lamps on their caps.

The mine is connected by tramway with woollen mills and brick works that are owned by the same company. The brick-earth used is grey in colour and is quarried nearby. Trucks carry it to the brick works, where it is tipped down a chute into a crusher consisting of a large horizontal perforated disc, which has a raised edge and is whirled round by gearing. Two heavy rollers running in the disc crush the clay, which drops through the perforations. It is then elevated and screened, the large pieces being returned to the crusher. The finer earth is fed into the brick-making machine, which turns out a brick about every 20 sec.



A rough cargo berth in one of the docks of the Port of Liverpool. Photograph by courtesy of The Mersey Docks and Harbour Board.

The Model Railway Exhibition

The 1939 display of the Model Railway Club will be held in the Central Hall, Westminster, from Easter Tuesday, 11th April, until the following Saturday, 15th April. On Easter Tuesday it will be open from 2 p.m. to 10 p.m., and on the remaining four days from 11 a.m. to 10 p.m.

The display will include a greater number than ever of working track layouts of various gauges, with both steam and electric locomotives. There will be an extensive and varied collection of miniature engines, passenger coaches and goods wagons, and model signal cabins, station buildings, locking frames and signals will be on view. Visitors will be able to enjoy free rides behind the larger locomotives, and to see a free cinema display of railway and general interest.

There will be a rest lounge and restaurant for the benefit of visitors. The charges for admission are 1/3 for adults and 6d. for children.

Is Glass Solid or Liquid?

It seems absurd to describe glass as a liquid, but on the other hand it is certainly not a solid. It can be made to flow quite easily without melting it, and actually this happens when a piece of glass is polished. Glass for lenses is polished by rubbing with a paste of finely-divided rouge. This sounds a simple process, for at first glance it might be supposed that the parts of the glass that jut out above the surface are simply worn or planed away.

This does actually happen, but the polishing process is really more complicated than that. One effect of the rouge appears to be to rub off what may be called the skin of the glass, leaving the molecules immediately below it mobile, like a liquid, for a brief instant, and under the polishing pressure this glass flows to fill up the scratches and holes just as if it were really a liquid. When the polishing process is carried out roughly and rapidly this surface flow is more prominent than the wearing away, and it is only in the final stages of polishing, when low pressure is employed, that the planing action of the rouge particles becomes the more effective.

It seems remarkable that even this explanation is not now accepted as sufficient by many who are concerned with the properties of glass. The uncertainty as to what really happens is due chiefly to the fact that glass is trying to be two things, a solid and a liquid, at the same time.

Voigtländer Cameras for 1939

It is nearly 100 years ago since a Mr. Voigtländer of Vienna produced a camera lens that revolutionised photography of that day. It gave no less than 14 times the light intensity of the ordinary lenses of that time, and cut down exposures from the then usual 10 to 20 minutes to 40 to 80 seconds! A few days ago we were shown a charming portrait recently taken with one of those original lenses, and it was interesting to see the exceptionally fine definition still given by it.

The quality is typical of the high standard of the modern Voigtländer photographic equipment, and those of our readers who are thinking of getting a new camera will find much to interest them in our advertisers' 1939 catalogue that has just been issued. This gives full details and illustrations of the latest Voigtländer Bessa, Brilliant and Superb cameras, the various models of which are equipped to give perfect miniature pictures. A splendid range of films, filters, portrait lenses and other accessories also is described. A copy of the catalogue can be obtained free of charge by any "*M.M.*" reader who writes to Schering Ltd., Voigtländer Department 4, 185/192, High Holborn, London W.C.1.

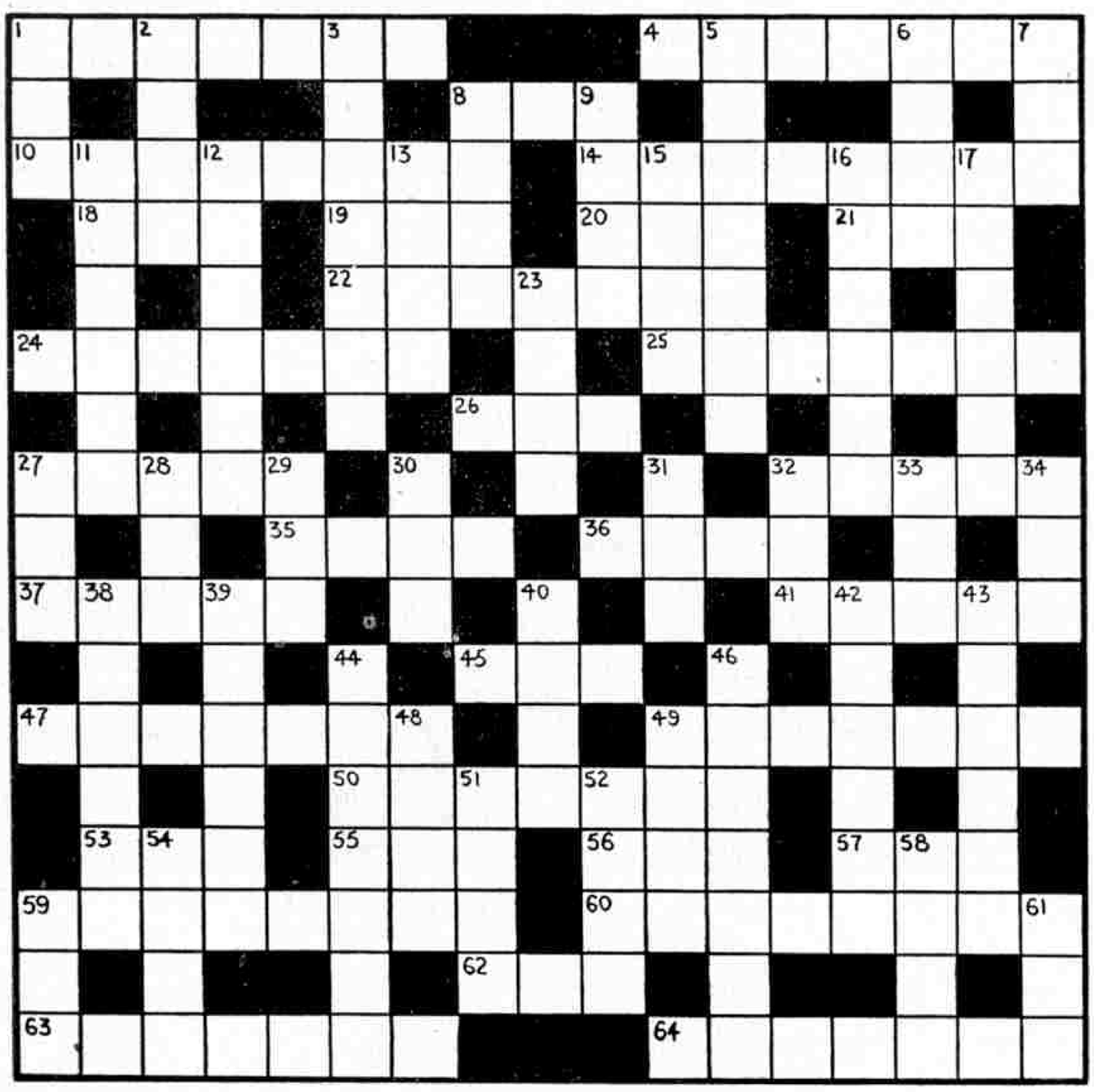
The Folbot Kingfisher Canoe

Readers who are keen on water sports will be interested to know of the new Kingfisher Rigid Canoe that has just been introduced by Folbot Folding Boats Ltd. This canoe has been designed specially for younger boys, whose parents do not feel justified in buying a high-priced article until their sons are of more mature age. Very careful attention therefore has been given to waterproofing, and the hull covering is of double texture canvas, with a layer of pure rubber underneath. The outside is protected further by two coats of chlorinated rubber paint in various colours. All fastenings are of brass and copper. The length of this new canoe is 10 ft. 6 in. and its carrying capacity is 300 lb.; yet its total unladen weight is only 32 lb., and it can be lifted with one hand.

Further details of this canoe are given in the advertisement on page vii of this issue, but Folbot Folding Boats Ltd., 21/27, Hatfield Street, London E.C.1, will be glad to send more information to any "*M.M*" reader who is interested.

Competition Corner

APRIL CROSSWORD PUZZLE



CLUES ACROSS

1. Horribly ugly
4. Spiritual
8. Large tank
10. People
14. Flattered
18. Favourite
19. Earthenware vessel
20. Dirty
21. Japanese coin
22. Split
24. Arranged
25. Various
26. Period of time
27. Causes fermentation
32. Expression of contempt
35. Not occupied
36. Thrilling sport
37. Dreaded punishment
41. Happy
45. Route
47. Stamps
49. Notched
50. Sharp instruments
53. Sheltered
55. Sticky substance
56. Insect
57. Wander
59. Slender shoots
60. Thrilling
62. Consume
63. Dwells
64. Intrude

CLUES DOWN

1. Plan
2. Upper part of neck
3. Passed
5. Tremble
6. Dislike
7. Fish
8. Ban
9. Pack
11. Drug
12. Issues
13. Reserved
15. Fees
16. Behind
17. Contract
23. Young attendant
27. Animal
28. Past
29. Small bird
30. Cunning
31. Decay
32. Cry
33. Scrape
34. Animal
38. Irritate
39. Joined
40. Invasion
42. Bigger
43. Planet
44. Not a Jew
46. Trial
48. Marine animal
49. Despatched
51. An ancient tongue
52. Final
54. Extremities
58. Ready
59. Top
61. Vaporous

This month we give another of the popular "*M.M.*" crossword puzzles, which follows the lines of those set in previous issues. The clues are all perfectly straightforward, and every word used can be found in Chambers' or any other standard dictionary.

Prizes of Meccano products to the value of 21/–, 15/–, 10/6 and 5/– respectively will be awarded in order of merit to the senders of the four correct solutions that are neatest or most novel in presentation. Prizes of the same value will be awarded in the Overseas section.

Entries should be addressed "*April Crossword Puzzle*, Meccano Magazine, Binns Road, Liverpool 13," and must reach this office not later than 29th April. Overseas closing date 31st July.

Summer Photographic Contests

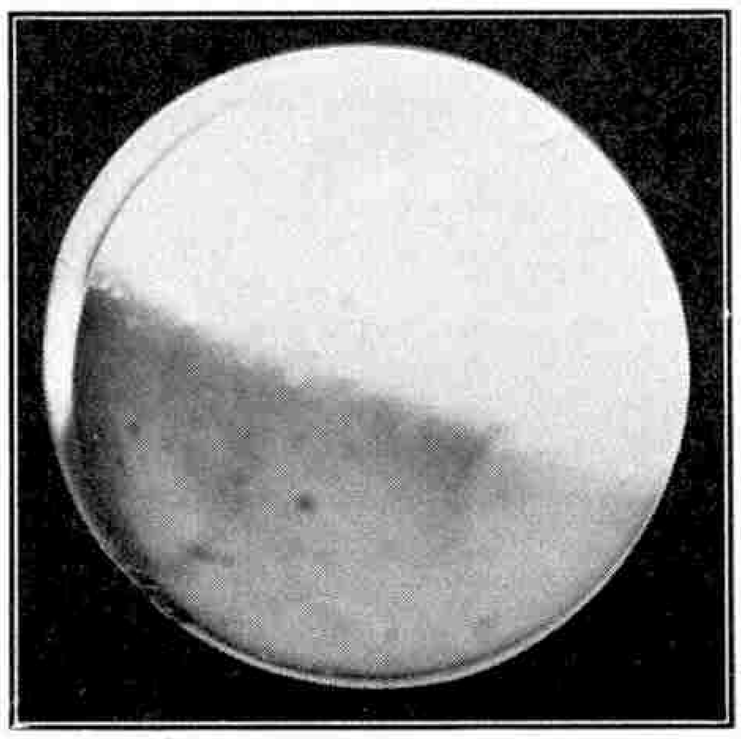
This month we announce a new series of photographic competitions to be featured each month throughout the summer. The conditions will be very straightforward, the prizes being offered simply for the best photographs submitted each month. The only restrictions will be that the exposure must have been made by the competitor and that each print must bear a title.

Each month's entries will be divided into two sections, A for readers aged 16 and over, B for those under 16, and prizes of Meccano products or photographic material, as chosen by the winners, to the value of 21/– and 10/6 will be awarded in each section.

Entries to this month's competition should be addressed "*April Photo Contest*, Meccano Magazine, Binns Road, Liverpool 13," and must reach this office not later than 29th April.

There will be separate sections, with prizes of the same values, open to Overseas readers. Overseas entries must arrive not later than 31st July.

"Whatever Is It?"



This month's puzzle picture, the first of a series of six that form the subject of the novel competition announced on the right.

Mystery Picture Competition Picture No. 1

On the left appears the first of a series of six Mystery Pictures that will be continued in the next five issues of the "*M.M.*" Each picture represents an ordinary object photographed from an unusual angle or under unusual lighting arrangements. To the readers who send in the most accurate descriptions of the objects shown we will award prizes of Meccano or Hornby goods to the value of 21/–, 15/– and 10/6 respectively. Competitors must write their solutions on postcards, together with their name and address, and post them to "*Mystery Picture Competition*," Meccano Ltd., Binns Road, Liverpool 13.

Competitors must send in their entries each month and must not wait until the whole of the series has appeared. Solutions of this month's picture must reach Liverpool before 29th April.

In the event of several competitors solving all the pictures correctly the prizes will be awarded to the neatest entries.

SAFETY FIRST!

Dentist: "Shall I use an anæsthetic?"
Cowboy: "Will it hurt much if you don't?"
Dentist: "I'm afraid it will."
Cowboy: "Then you'd better use the anæsthetic—for your own sake!"

* * * *

"Do you know a man with one eye called Matthew?"
"I can't say that I do. What is the name of his other eye?"

* * * *

The orderly officer received a complaint about the issue of bread.
"Soldiers should not make a fuss about trivialities, my man," he said. "If Napoleon had had that bread when he was crossing the Alps he'd have eaten it with delight."
"Yes, sir," said the lance-corporal, "but it was fresh then."

* * * *

Pat: "I hear you've a very unsettling job at the circus as the human cannon ball."
Mike: "Yes, I get fired every day."

* * * *

"What was Columbus famous for?"
"His memory."
"What makes you think that?"
"Well, they erected a monument to it."

* * * *

Mother asked her six-year-old what loving-kindness meant.
"Well," he replied, "when I ask you for a piece of bread and butter and you give it to me, that's kindness; but when you put jam on it, that's loving-kindness!"

* * * *

A quartet of sailors were singing on the waterfront when the tenor fell off the dock into the water. The incident passed unnoticed by the leader, but he realised that something was wrong with the harmony.
"What's the matter with you chaps?" he asked. "One of you don't sound right."
"It's Bill," replied the bass. "He's off quay."

* * * *

"Hi! You dropped a brick!" yelled a pedestrian, on whose shoulder a brick had fallen from a fourth-storey scaffold.
"All right," answered the bricklayer, cheerfully. "You needn't trouble to bring it up!"

* * * *

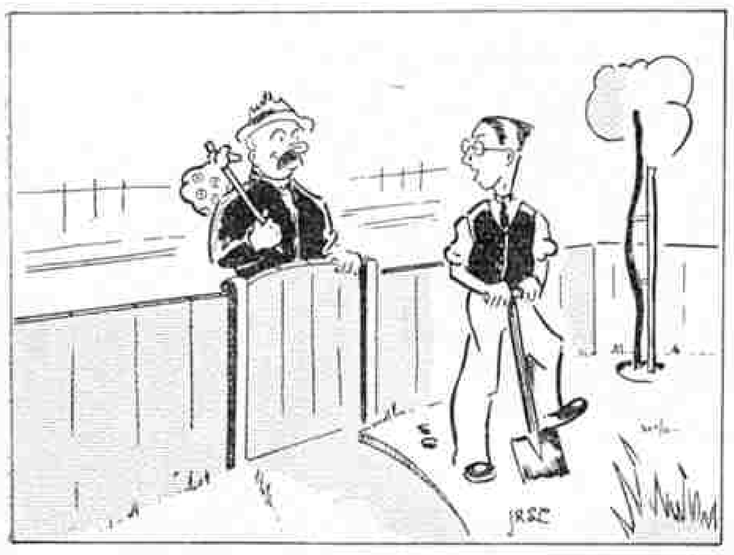
Foreman: "Late again. I suppose you've a dozen good excuses?"
Workman: "That's right, boss. Stop me if you've heard this one."

* * * *

Master: "Jones, this is the tenth time you have been caned this week. What have you to say about it?"
Jones: "Thank goodness it's Friday."

* * * *

BELOW ZERO



Gentleman: "Are you really so hard up?"
Tramp: "Hard up? Why, sir, if suits of clothes wuz sellin' at a penny apiece, I wouldn't have enough to buy the arm hole of a vest."

WASTED ENERGY

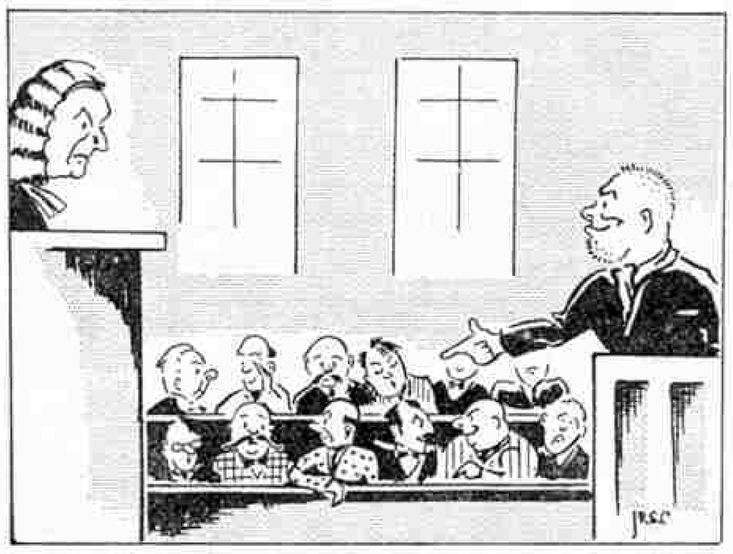
Willie was practising on his violin one windy night when in pounded his father stamping and raving.
"What's wrong, Dad?" asked little Willie.
"Why the dickens didn't you tell me you were going to practise to-night?" he bawled. "I've spent the last half-hour oiling the gate."

* * * *

First Nurse: "It's hopeless!"
Second Nurse: "What is?"
First Nurse: "That glass-blower patient. Every time I try to take his temperature he blows a bubble in the thermometer."

* * * *

WILLING TO TRY



Judge: "Do you challenge any of the jury?"
Defendant: "Well, I think I can lick that little guy on the end."

* * * *

It was during a London fog and the sergeant was showing the new policeman his beat.
"You start here," said the sergeant, "and your beat finishes by that red light up the road." He pointed to a dim red light glimmering in the distance.
Several hours later the new man turned up at the police station tired out.
"Hey, sergeant," he said, "you remember that red light you said marked the end of my beat? Well, that was a motor lorry going to Wembley."

* * * *

A Scotsman was seen prowling from one stall to another at a church bazaar with something under his coat. Finally he was seen to put his burden in the bran tub.
"Do you want a penny dip," asked the attendant.
"Not me," was the reply, "I am just giving my rabbit a feed."

* * * *

"Your cousin didn't speak to me at the party last night. Thinks I'm not his equal, is that it?"
"Why, the conceited ass! Of course you are."

* * * *

Jim: "My father's so strong, he can tear up a pack of cards."
Bob: "That's nothing. My father overslept this morning, and you should have seen him tearing up the road to the station."

* * * *

Ganger: "Come on, Smith, what about using your pick a bit?"
Labourer: "I ain't feelin' well, I'm trembling all over."
Ganger: "Well, then, lend a hand with the riddle."

* * * *

Rastus: "You ain't yo'se'f no mo'. Sick or sump'n?"
Mose: "Ah got insomnia. Ah keeps wakin' up ev'y few days."

* * * *

THIS MONTH'S HOWLER

An artery is a place where paintings are kept.

ODD!

A passenger in an American train, looking under his bunk one morning, found one black shoe and one brown, and summoned the negro attendant. The man scratched his head in bewilderment.
"Well, if dat don't beat all!" he said. "Dat's de second time dis morning dat mistake's happened."

* * * *

"What caused the fire in the match factory?"
"I understand there was some friction among the heads."

* * * *

After six months at a new factory, the works manager developed a feeling that he wasn't popular, so he called aside an old worker.
"Bill," said the manager, "How is it the men don't seem to like me. Why at the last place they gave me a silver teapot when I left."
"Only a silver teapot," exclaimed the candid worker. "If you'd only leave here we'd make it a gold one!"

* * * *

Employer: "I hope you don't sit and twiddle your thumbs when I'm not in the office?"
Office Boy: "Oh, no, Mr. Jones. I do crossword puzzles."

* * * *

Stationmaster (to passengers waiting at country station as a train goes through without stopping): "I thought he wouldn't stop; he owes me five bob."

* * * *

Tom: "Why is it a water-melon has so much water in it?"
Jim: "Because the seeds are planted in the spring."

* * * *

A tramp knocked on the door of the country cottage and begged the cottager to give him some food.
"Why don't you get a job?" she asked him.
"I'd like to, ma'am," said the tramp, "but there ain't any going."
"I heard to-day that Farmer Jones is in need of a right-hand man," she said. "Why not try there?"
"H'm!" sniffed the tramp. "That's just my luck, lady—I'm left-handed."

* * * *

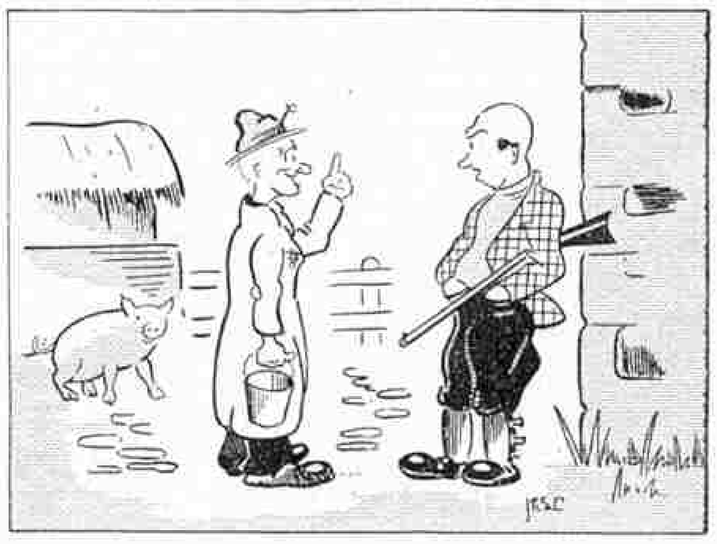
Chinese patient (on telephone): "Doctor, what time you fixee teeth for me?"
Doc: "Two-thirty—all right?"
Chinese: "Yes, tooth hurty, all right, but what time you fixee?"

* * * *

After a long talk on the value of peace, goodwill and disarmament, a teacher asked his class if they objected to war.
"Yes, sir, I do," said one boy.
"Good! Now tell us why."
"Because, sir," added the boy, "wars make history—and I don't like history."

* * * *

NOT WHAT HE MEANT!



"Ye've worked hard and willingly for me, Pat," said the farmer to his old employee, "and I'm going to give ye that fat pig."
"May heaven bless ye, sorr," said Pat, "it's just like ye."

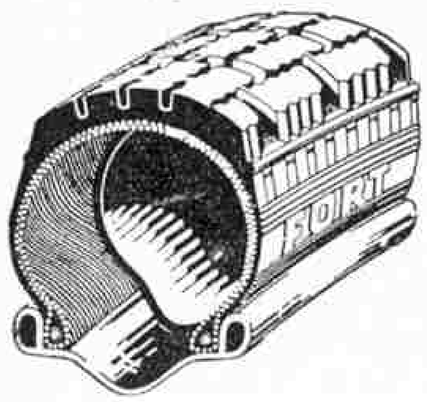
★ **Whatever your cycling needs the best tyre to choose is a**

DUNLOP

The World's Best Cycle Tyre

Whether you demand of a cycle tyre safety, speed, performance, reliability, or hard wear you are most certain of getting it by investing in a Dunlop. Be content with nothing less . . . . whatever you want to pay and whatever your requirements there is a tyre in the vast Dunlop range designed exactly to fit your needs.

A RADIO Programme for YOU Listen to **"CYCLING MAGAZINE"** from RADIO NORMANDY every Saturday at 2.15 p.m.



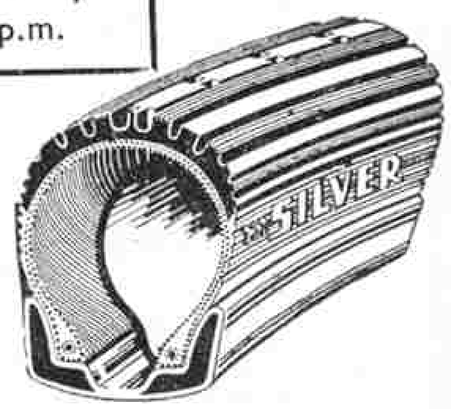
The DUNLOP Fort

with TEETH to bite the road

The DUNLOP 'Fort' with its entirely new tread pattern of tough rubber teeth grips the road more firmly, yet with less frictional resistance than has been possible with any other cycle tyre. It sets a new standard in safe, effortless cycling.

Cover **8/6**
Tube **3/-**

Roadster Strength—
Sports Tyre Speed



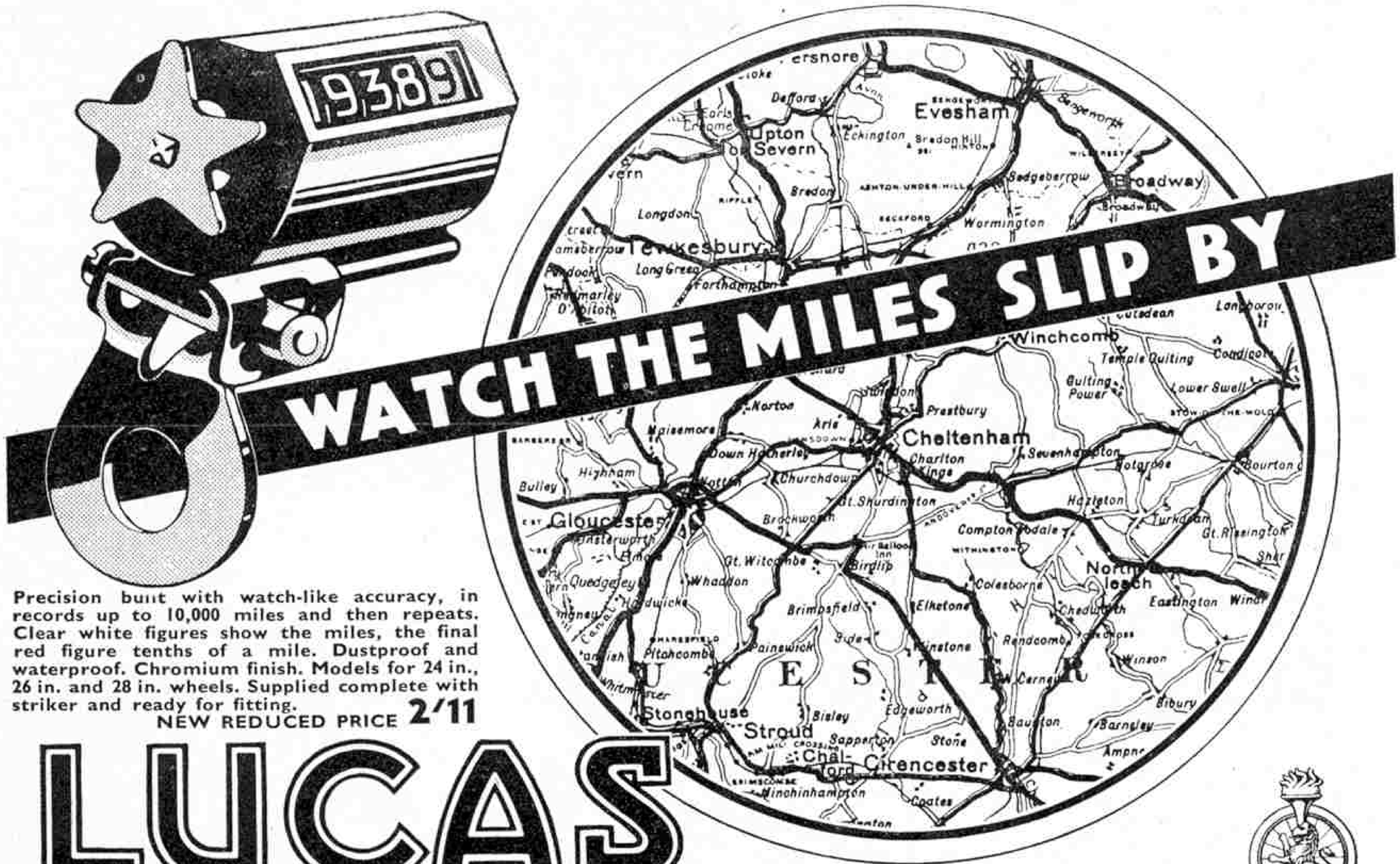
DUNLOP SILVER SPRITE

Cover **7/6**
Tube **2/6**

Here is a tyre built for speed work yet tough enough for general usage. It is the most economical tyre the fast rider can buy. Ask your dealer to show you the Dunlop 'Silver Sprite'.

DUNLOP ROAD RACING	DUNLOP SPRITE	DUNLOP ROADSTER	DUNLOP SPORTS	DUNLOP CHAMPION
Cover 8/6 Tube 2/9	Cover 7/6 Tube 2/6	Cover 7/- Tube 2/6	Cover 6/- Tube 2/3	Cover 4/- Tube 1/9

9H/310



Precision built with watch-like accuracy, in records up to 10,000 miles and then repeats. Clear white figures show the miles, the final red figure tenths of a mile. Dustproof and waterproof. Chromium finish. Models for 24 in., 26 in. and 28 in. wheels. Supplied complete with striker and ready for fitting.

NEW REDUCED PRICE **2/11**

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"KING OF THE ROAD" CYCLOMETER

BRITISH MADE

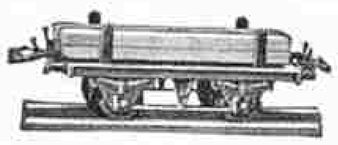
JOSEPH LUCAS LTD., BIRMINGHAM 19.

The Hornby Series includes a wide selection 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.

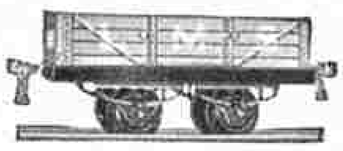
An attractive selection of Hornby Rolling Stock is illustrated and described on this page. Ask your dealer for a complete price list.

HORNBY ROLLING STOCK

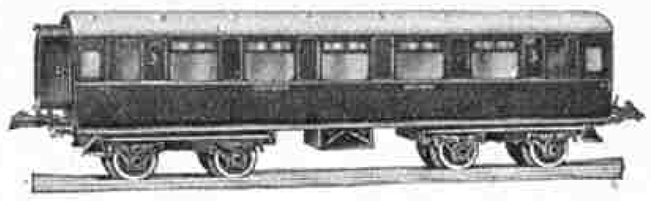
GAUGE O



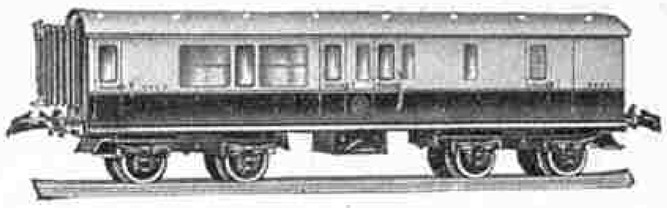
No. 1 TIMBER WAGON
Beautifully enamelled in yellow and red.
Price **1/3**



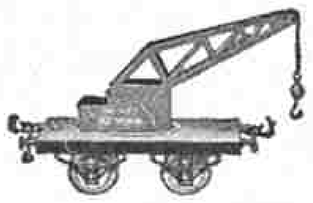
***M1 WAGON**
Price **10d.**



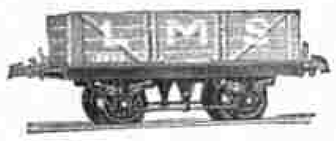
No. 2 CORRIDOR COACH
S.R. Third class. Not suitable for 1 ft. radius rails. Price **7/6**



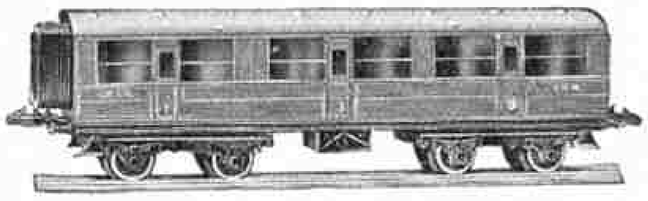
No. 2 CORRIDOR COACH
G.W. Brake composite. Not suitable for 1 ft. radius rails. Price **7/6**



No. 1 CRANE TRUCK
Finished in brown and blue.
Price **2/9**



***No. 0 WAGON**
Price **1/3**



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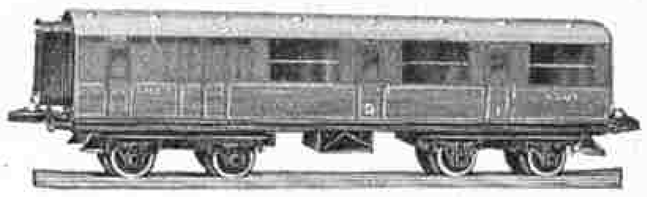
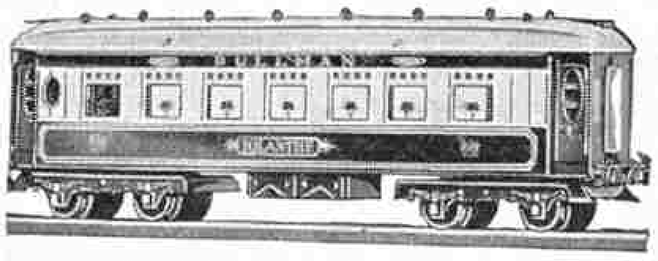
L.N.E.R. First-third. Not suitable for 1 ft. radius rails. Price **7/6**

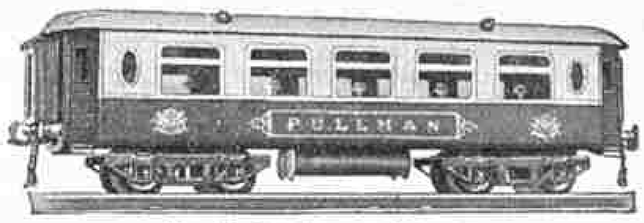


No. 2 CORRIDOR COACH
L.N.E.R. Brake composite. Not suitable for 1 ft. radius rails. Price **7/6**

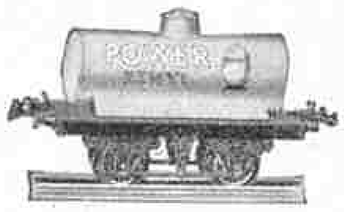
TROLLEY WAGON WITH CABLE DRUMS
Fitted with two Cable Drums. Not suitable for 1 ft. radius rails. Price **4/6**



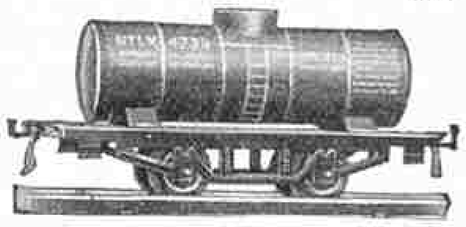
No. 2 SPECIAL PULLMAN COACH
Not suitable for 1 ft. radius rails. Price **13/6**



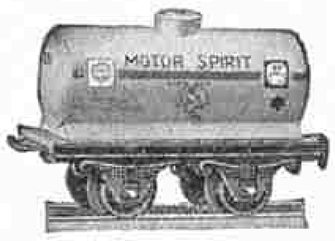
No. 2 PULLMAN COACH
Not suitable for 1 ft. radius rails. Price **10/6**



No. 1 PETROL TANK WAGON "POWER ETHYL"
Price **1/11**

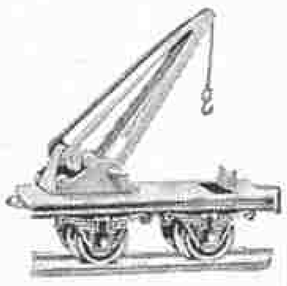


TANK CAR (American Type)
As used in America for the conveyance of oil, etc. Price **1/11**

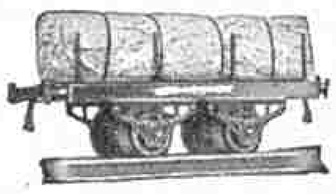


MO PETROL TANK WAGON "SHELL-B.P."
(MO Coupling.) Price **1/-**

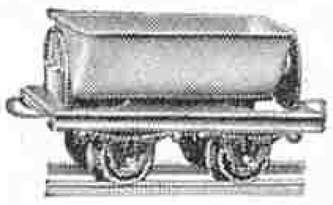
***GUARD'S VAN**
Price **2/6**



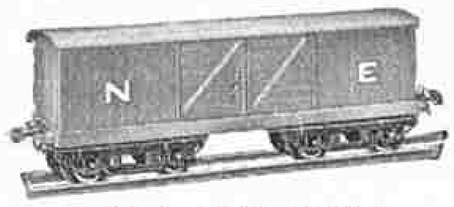
MO CRANE TRUCK
(MO Coupling.) Price **1/-**



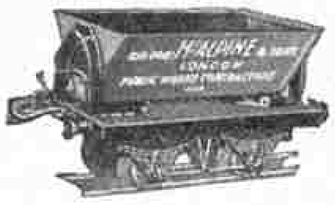
FIBRE WAGON
As used in France and other Continental countries.
Price **1/3**



MO SIDE TIPPING WAGON
(MO Coupling.) Price **1/-**



***No. 2 LUGGAGE VAN**
Opening double doors. Not suitable for 1 ft. radius rails. Price **4/6**



No. 1 SIDE TIPPING WAGON
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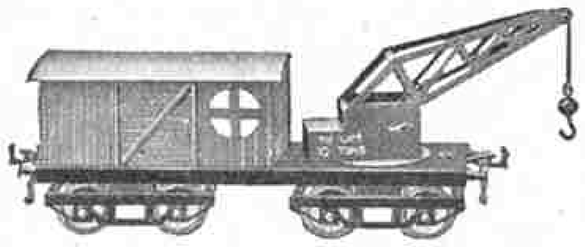
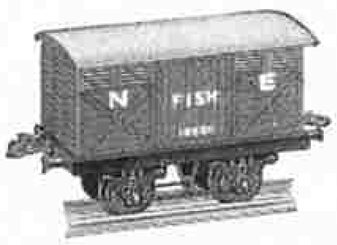
BRAKE VAN
Opening doors. In N.E. or S.R. lettering. Price **2/9**



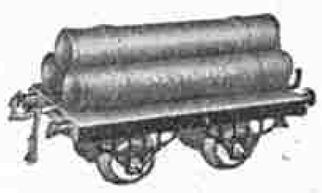
***BREAKDOWN VAN AND CRANE**
Sliding doors. Not suitable for 1 ft. radius rails. Price **5/11**

No. 0 MEAT VAN
L.M.S., G.W. or N.E., each with correct details. Price **1/6**



No. 0 FISH VAN
L.M.S., G.W. or N.E., each with correct details. Price **1/6**

***FLAT TRUCK**
with Cable Drum.
Price **1/9**



GAS CYLINDER WAGON
Price **1/8**

**Lettered L.M.S., N.E., G.W. or S.R.*

MECCANO LTD. BINNS ROAD, LIVERPOOL 13

The bat Len Hutton used in making his record score (364 v. Australians) in 1938.

IF Hutton gave you his bat, you wouldn't expect to break a record; but you would feel, "Here's a bat that's proved its worth and one that I can rely on absolutely." You'd have a little more confidence, you'd feel you might play a little better, and, the chances are, you probably would. The pity is, of course, that Hutton has only the one; but fortunately for other cricketers Gradidges have hundreds more—just like it; just as true and reliable and as ready to give you the same splendid service as his has given him, and to help you make the most of your skill too. And if Gradidge bats are the best that cricketers like Hutton can find, then they should be good enough for anyone, like you and me, who aspires to hit the ball!

use a LEN HUTTON BAT MADE BY GRADIDGES

OF ALL SPORTS DEALERS

Spot the

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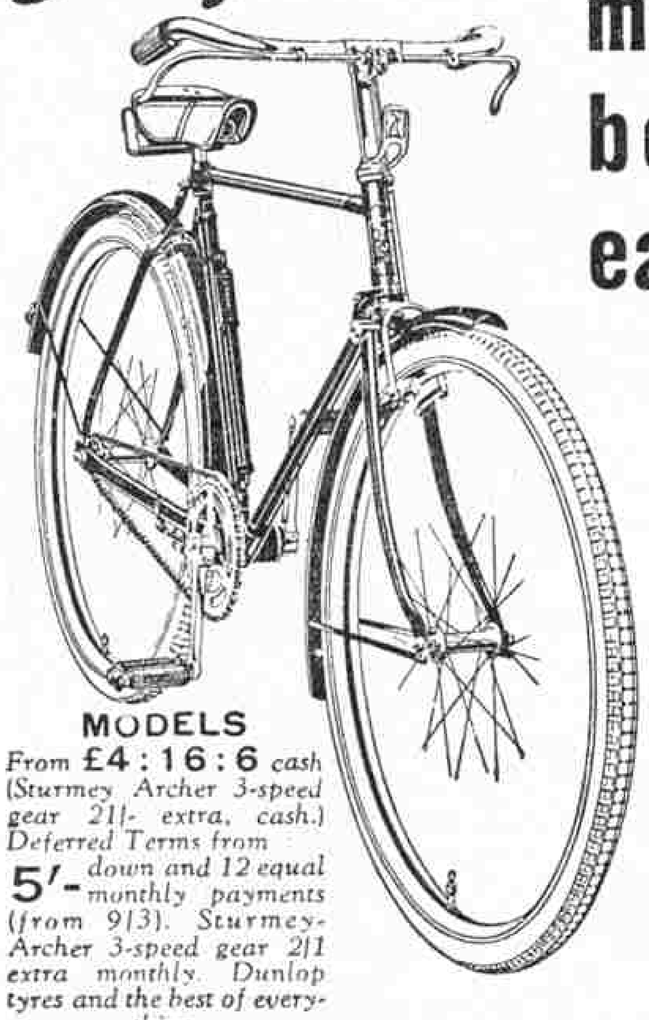
Boys—**Their cycles are miles ahead because of easy-running**



Tom, Dick and Sam *know* the Raleigh must be the world's finest cycle. They know that the Raleigh runs easily and sweetly—that it will stand up to hard knocks and schoolboy treatment. Dad knows it too. You'll find it much easier to get a cycle if you tell him you want a Raleigh.

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From **£4 : 16 : 6** *cash (Sturmey Archer 3-speed gear 21/- extra, cash.) Deferred Terms from* **5/-** *down and 12 equal monthly payments (from 9/3). Sturmey-Archer 3-speed gear 2/1 extra monthly. Dunlop tyres and the best of everything.*

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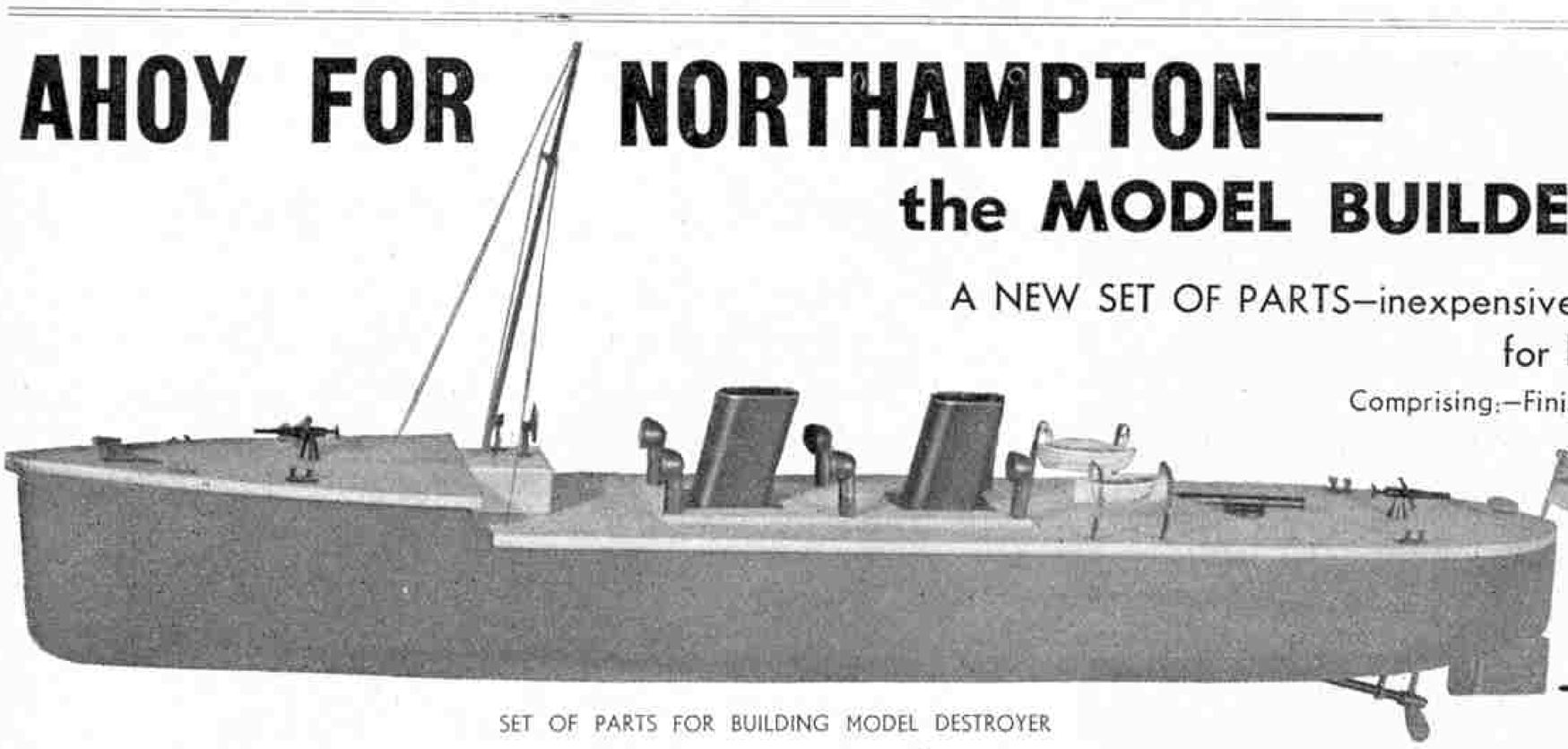
THE ALL-STEEL BICYCLE

Fit the Sturmey-Archer 3-speed gear—the gear that "makes cycling easy

AHOY FOR NORTHAMPTON—

the MODEL BUILDERS' PARADISE



SET OF PARTS FOR BUILDING MODEL DESTROYER

A NEW SET OF PARTS—inexpensive and modern—for building a Model Destroyer

Comprising:—Finished Hull with Bridge and Decking; Electric Power Unit No. 1461 Ufitted, also Propeller Shaft, Stern Tube and Rudder Post; Dry Battery and 26 fittings. Price complete **45/-**

The hull needs ballast and a Brass Keel can be fitted for 5/-

OTHER "HIGH SPOTS" from our NEW SHIPS LIST, S.17, include:

New series of hand-carved boat hulls in three types—Destroyer, Racing and Liner hulls—available in inexpensive pattern or better quality; our new 18/6 "Eclipse" high-speed marine engine; new waterline models of the "Mauretania" and "Dominion Monarch" (100 ft. to the inch); attractive novelty of 3-masted Clipper Ship in bottle; new universal coupling for boats; simplified Destroyer rudder, etc.; extensive additions of drawings and blueprints pages, and so forth.

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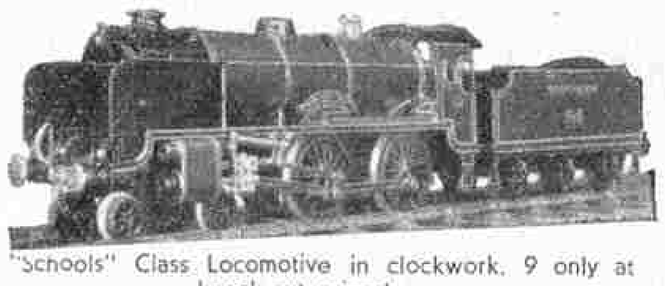

S.R. "Schools" Class Locomotive in clockwork. 9 only at knock-out prices!

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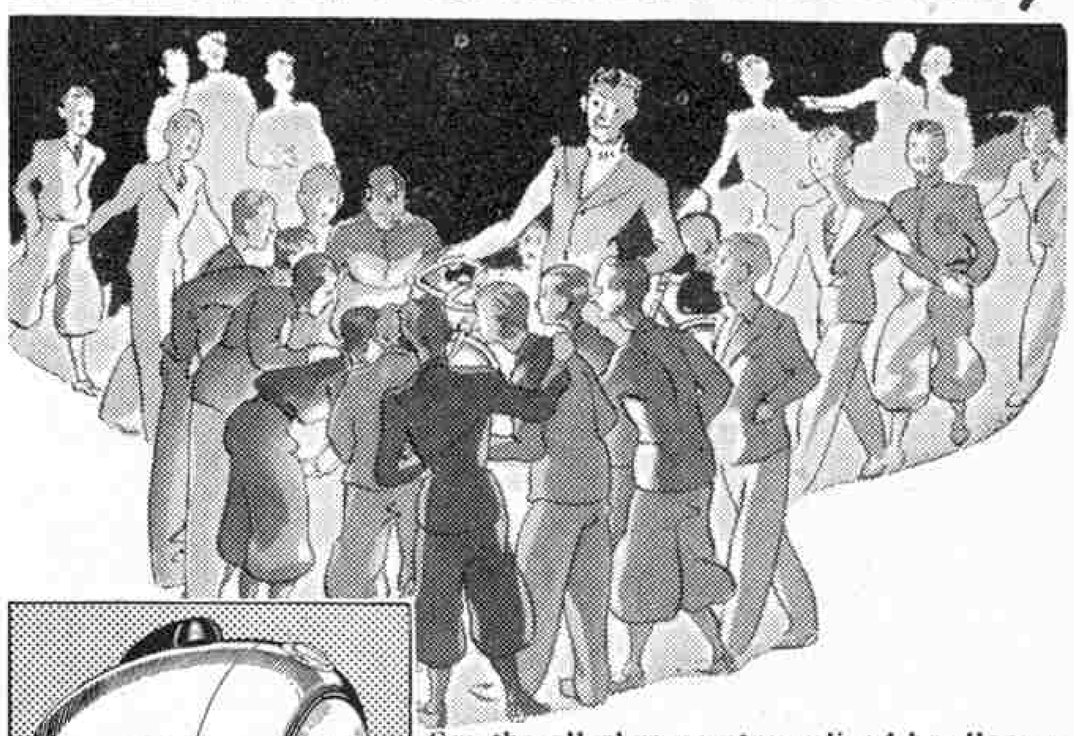

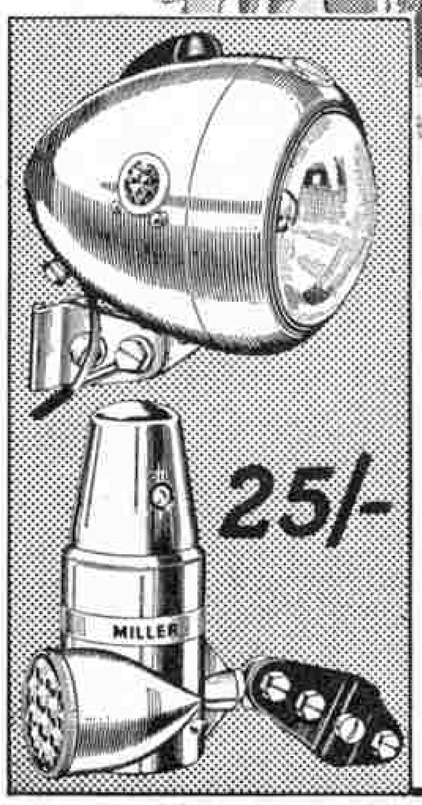

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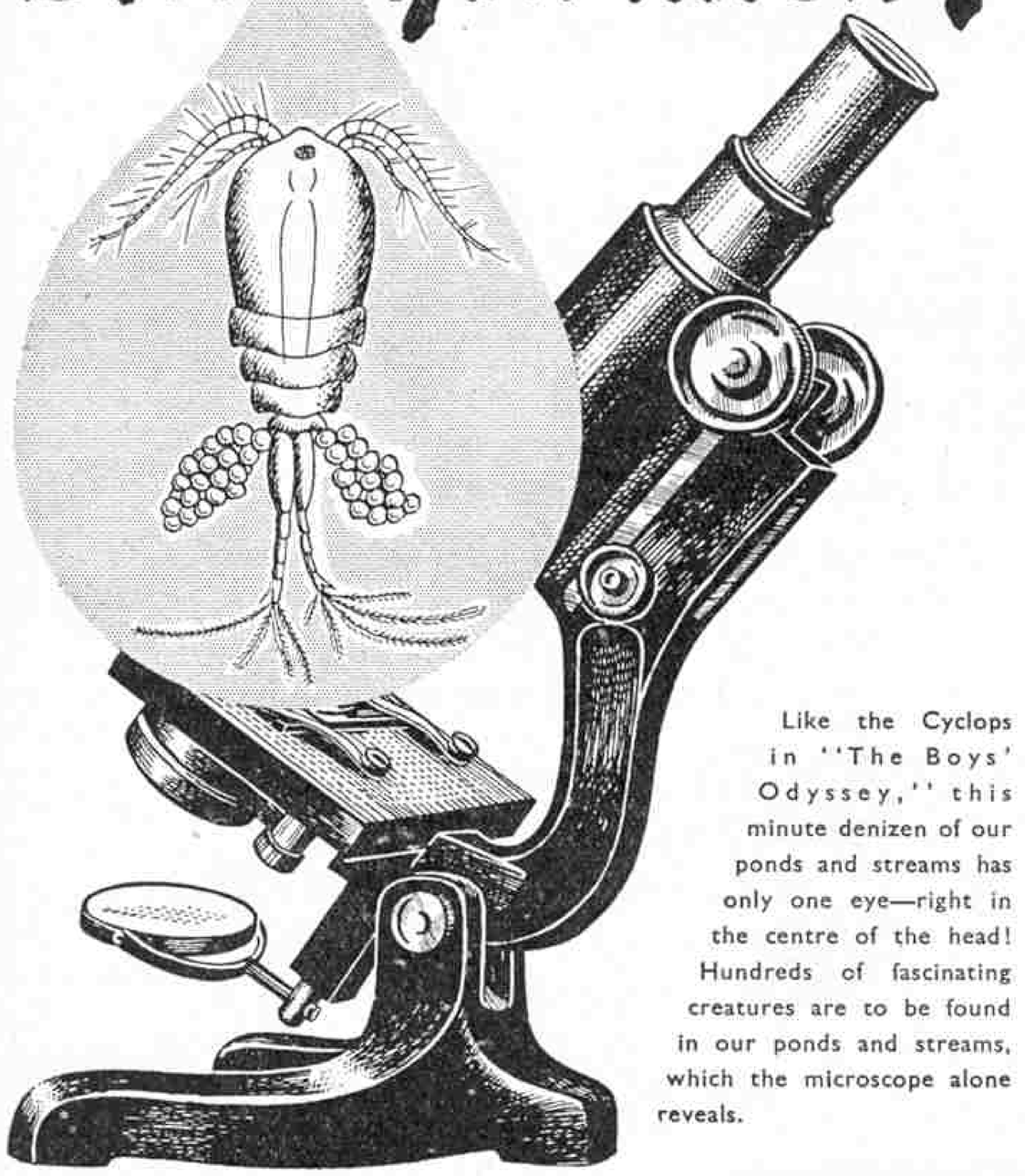

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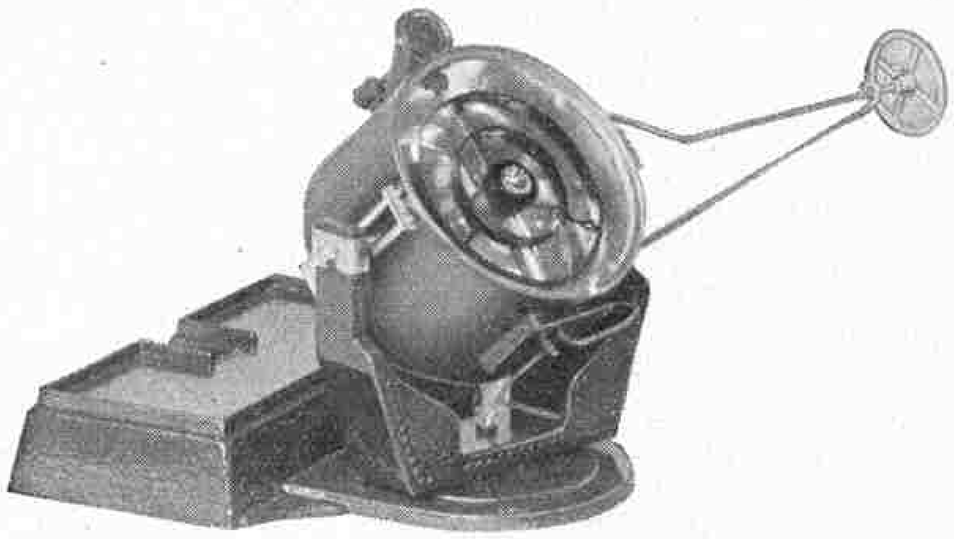

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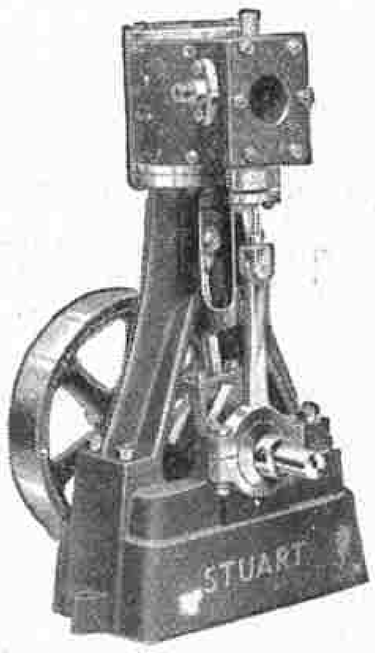

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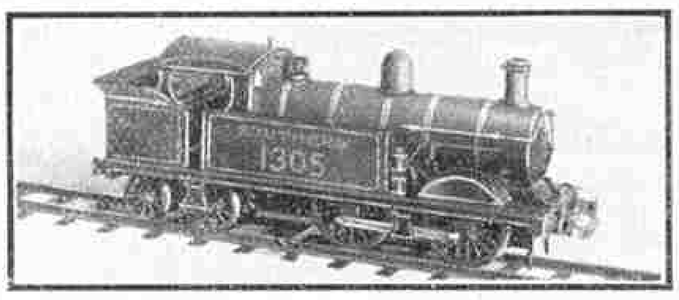

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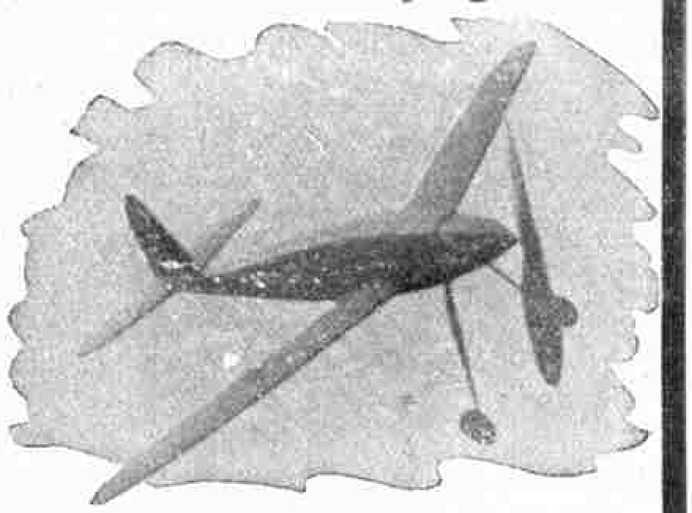

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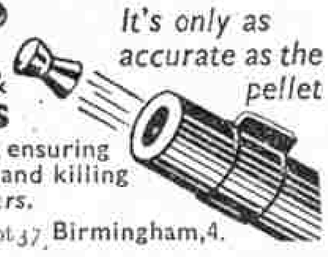

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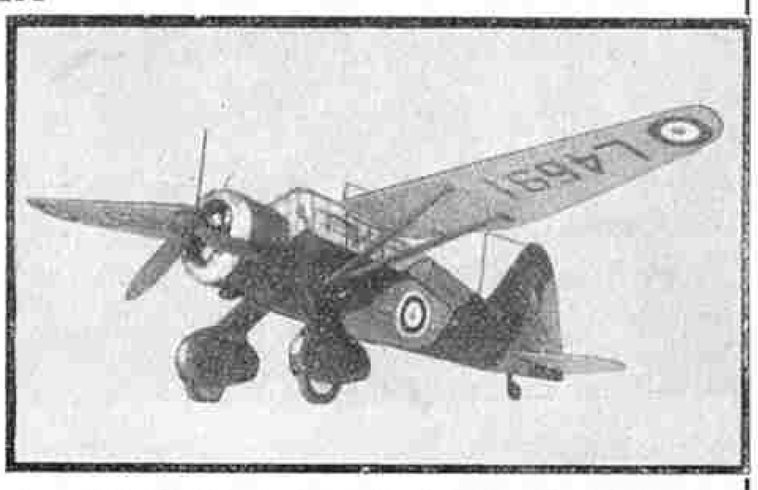

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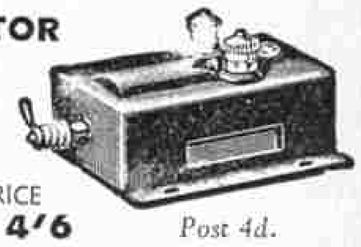

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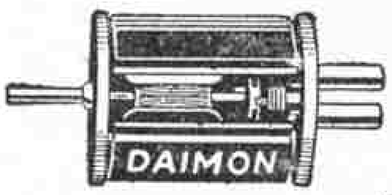

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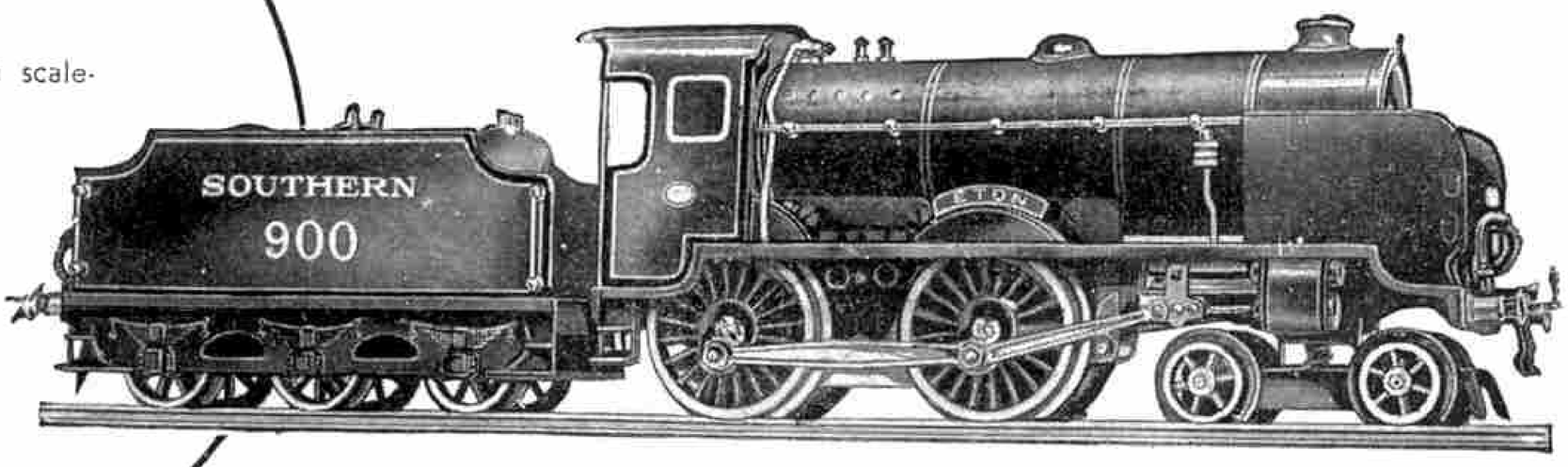

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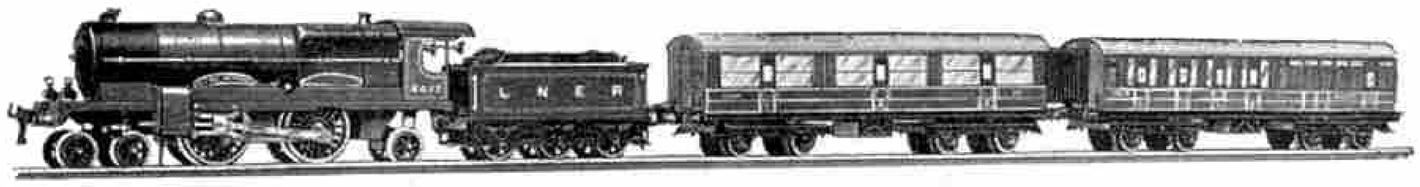

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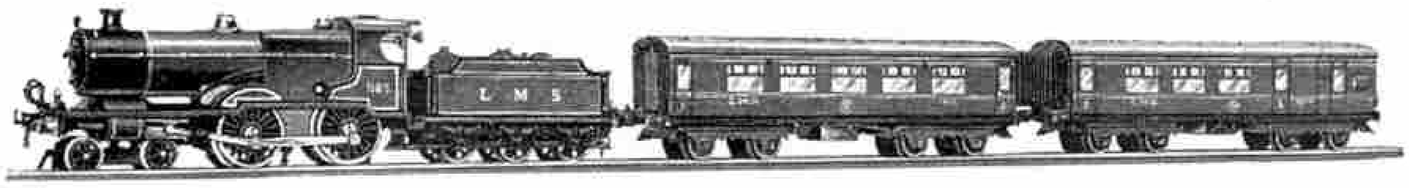
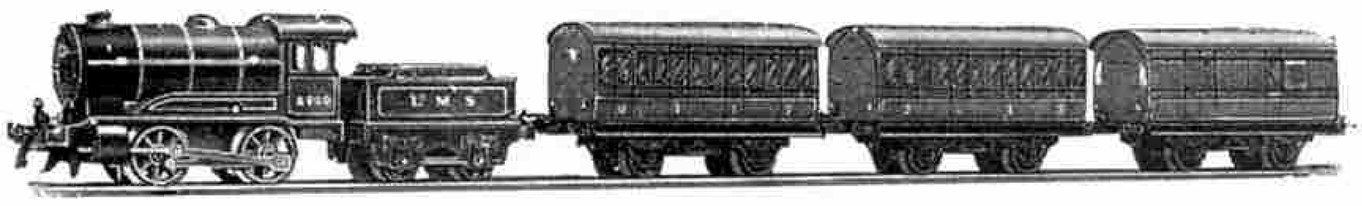
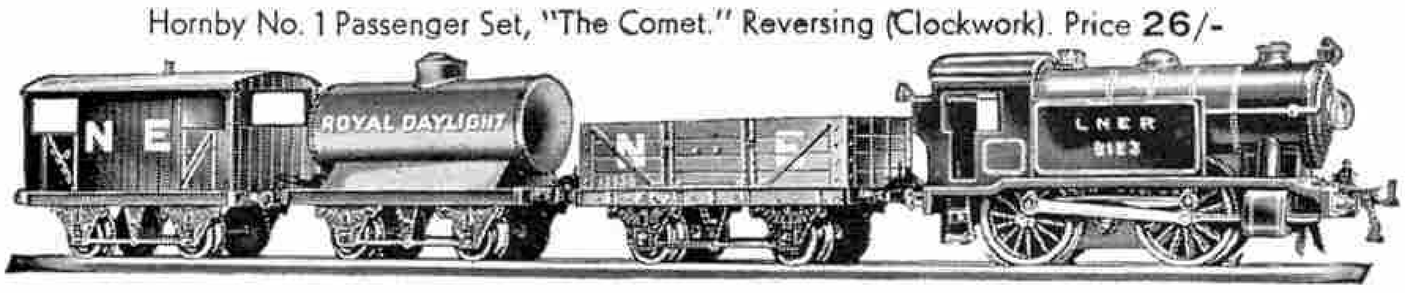


No. 2 Special Passenger Set, "The Yorkshireman." Reversing (Clockwork). Price **55/-**



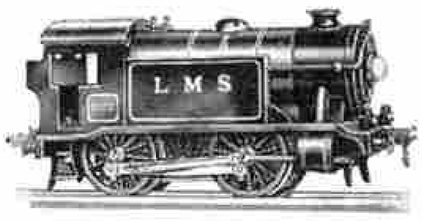
Hornby No. 1 Passenger Set, "The Comet." Reversing (Clockwork). Price **26/-**



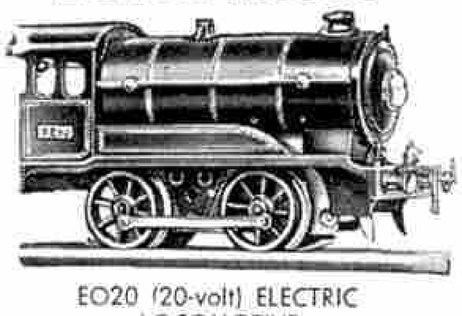
Hornby E120 Special Tank Goods Set. Automatic Reversing (20-volt Electric). Price **43/6**

A SELECTION FROM THE RANGE OF HORNBY LOCOMOTIVES

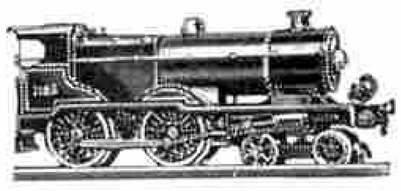
Electric Models



E120 (20-volt) SPECIAL ELECTRIC TANK LOCOMOTIVE

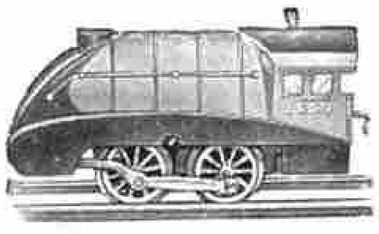


EO20 (20-volt) ELECTRIC LOCOMOTIVE

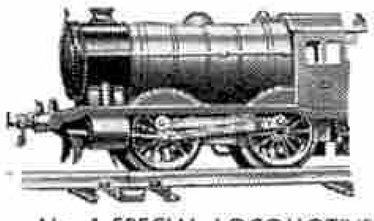


E220 (20-volt) SPECIAL ELECTRIC LOCOMOTIVE

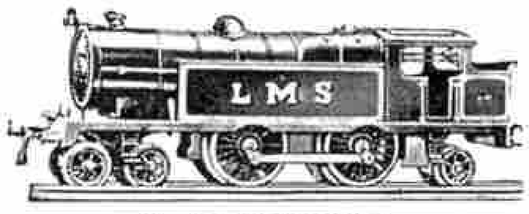
Clockwork Models



No. O "SILVER LINK" LOCOMOTIVE



No. 1 SPECIAL LOCOMOTIVE



No. 2 SPECIAL TANK LOCOMOTIVE

Electric Models

E120 (20-volt) Special Electric Tank Locomotive (automatic reversing). Price **30/-**

EO20 (20-volt) Locomotive (reversing). Price **19/-**

E220 (20-volt) Special Locomotive (automatic reversing). Price **38/6**

Clockwork Models

No. O "Silver Link" (non-reversing). Price **3/6**

No. 1 Special Locomotive (reversing). Price **17/6**

No. 2 Special Tank Locomotive (reversing). Price **21/-**

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