VOL. XXIV. Nº 6. JUNE 1939

MECCANO MAGAZINE

A PUFFIN AND PROUD OF IT!

6D.

HORNBY TRAINS

Perfect Model Railways

Hornby Trains not only look like actual trains, but work like them. The Hornby Railway system includes everything that is required to reproduce in miniature almost all the operations that are carried out day by day on the real railways. You can operate long-distance expresses with fast passenger locomotives, or local trains with splendid little tank engines; and for freight working there are vans and wagons of almost every kind.

Look at the magnificent models below from the wide Hornby range. Note the wealth of detail and the perfect lines that characterise each one.

Get to know more about Hornby Trains. Ask your dealer about them to-day.

Ready to go! Departure time for the Hornby express draws near

PRICE LIST

CLOCKWORK TRAIN SETS

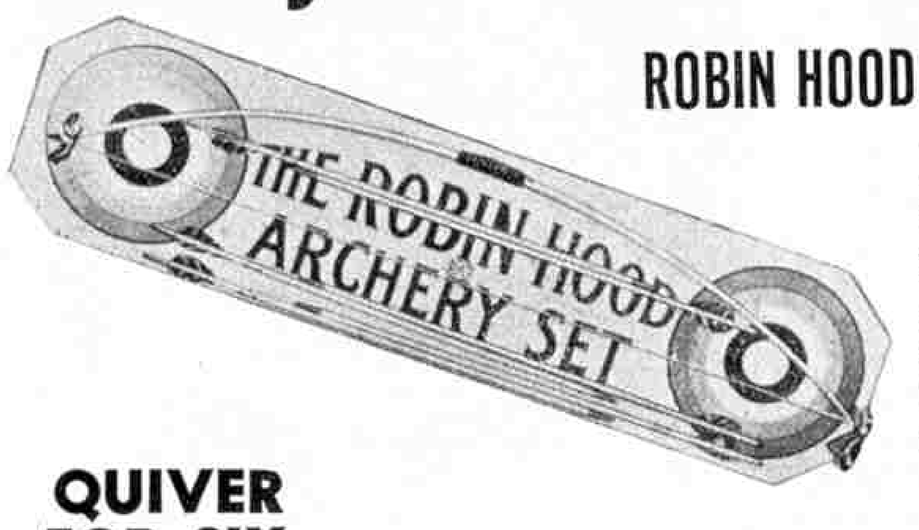
M1 Passenger Train Set (reversing). Price **9/11**
M3 Tank Goods Train Set (reversing). Price **16/6**
No. 0 Passenger Train Set (reversing). Price **17/3**
No. 1 Tank Goods Train Set (reversing). Price **23/6**
No. 1 Special Passenger Train Set (reversing). Price **33/6**
No. 2 Tank Mixed Goods Train Set (reversing). Price **35/-**
No. 2 Special Passenger Train Set (reversing) Price **55/-**

ELECTRIC TRAIN SETS

E020 Passenger Train Set (20-volt) reversing. Price **28/6**
E120 Tank Goods Train Set (20-volt) reversing. Price **33/6**
E120 Special Passenger Train Set (20-volt) automatic reversing ... ... Price **48/-**
E220 Tank Mixed Goods Train Set (20-volt) automatic reversing ... ... Price **48/-**
E220 Special Passenger Train Set (20-volt) automatic reversing ... ... Price **76/-**
E320 Riviera "Blue" Passenger Train Set (20-volt) automatic reversing ... ... Price **69/-**

Ask your dealer for a copy of the new 1938-9 Hornby Trains Folder, or write direct to Meccano Ltd., Dept. HF, Binns Road, Liverpool 13.

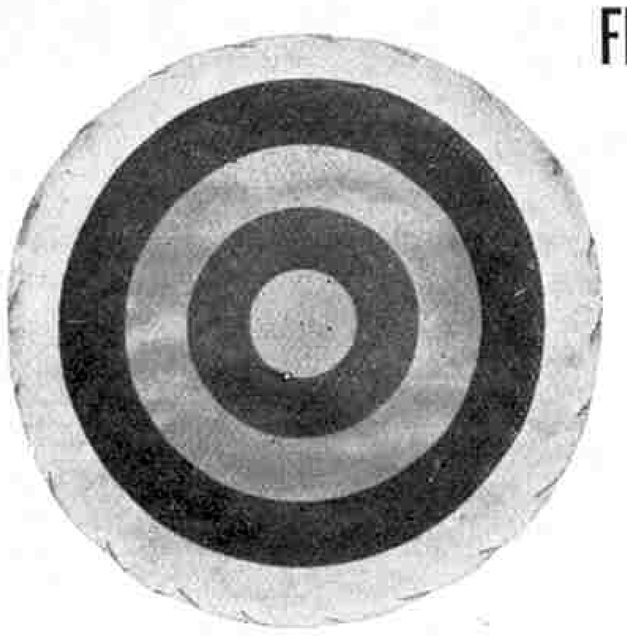
Are you another WILLIAM TELL?



ROBIN HOOD ARCHERY SET

A well made set for the young archer. 3 ft. 3 in. bow made of best selected lancewood, horn tips, and the six arrows are strong and fitted with a half nock. Also two target faces.

PRICE **11′6**
Carriage 1/-



FINE ARCHERY TARGET

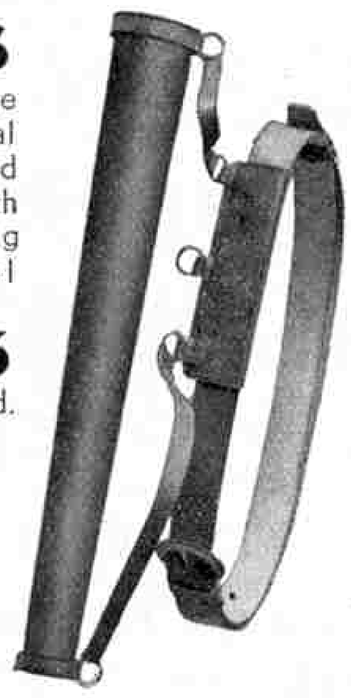
For great fun and plenty of practice. Thick matted straw boss, with canvas face, painted in four colours.

15″ diameter, price **6′3**
18″ diameter, price **7′6**
21″ diameter, price **10′-**
Post 9d.

QUIVER FOR SIX ARROWS

To be worn at the side, strong metal container covered leather cloth, with comfortable webbing belt and metal fastenings.

PRICE **7′6**
Post 4d.

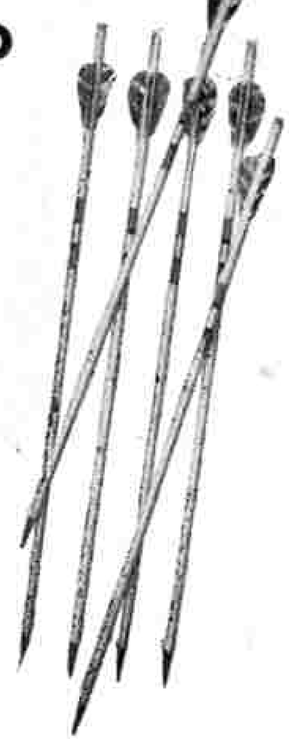


By Appointment to H.M. Queen Mary

FEATHERED ARROWS

For the more ambitious young archer a set of arrows, extra to those supplied with the Robin Hood Archery Set. Metal pointed, gaily coloured ends, beautifully finished.

21″, set of 6, price **4′-**
24″, set of 6, price **4′3**
28″, set of 6, price **6′-**
Post 6d.



DON'T try shooting apples off people's heads as he did, though! But it is a jolly good sport at which to challenge your friends. It takes a steady hand and a good eye to hit the 'gold,' but you can soon get proficient. You'll get hours of amusement from it.

Hamleys
Estd 1760
HAMLEY BROTHERS LTD

200-202, REGENT STREET, LONDON W.1
(Our only address) **Telephone: REGENT 3161**

12
pictures instead of eight and they are easier to take, too

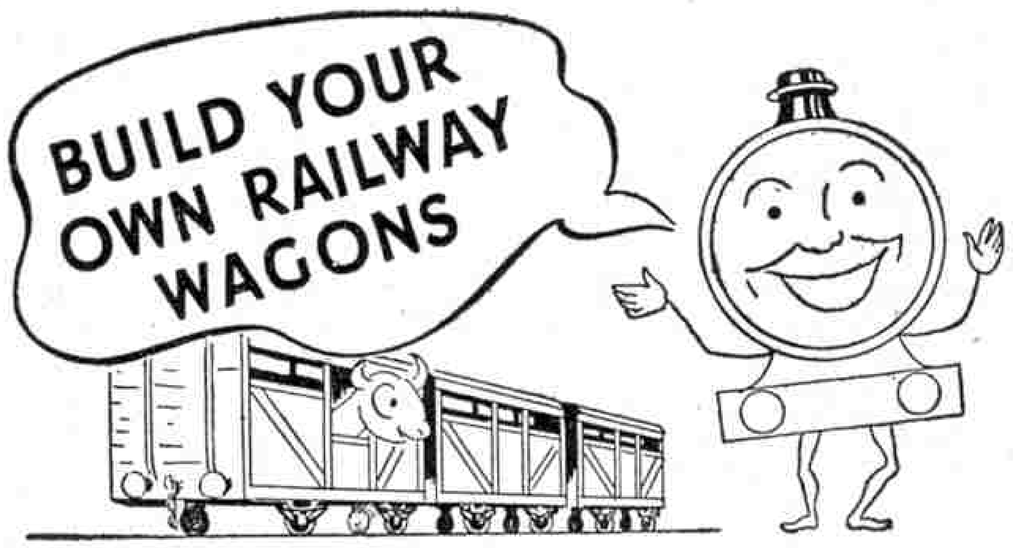
The Voigtlander Brilliant has advantages over several more expensive cameras. It takes 12 pictures 2¼″ square, like the one above, on standard 8-exposure 3¼″ x 2¼″ film and it shows the picture almost full-size while you take it. You can also use it at eye-level for speed work and an automatic brake prevents the film from being over-wound. A strong, moulded body, a built-in hold-all to carry filters, etc., and excellent lens and shutter equipment are other advantages. Prices range from £8-2-6 with F/3.5 lens to the F/7.7 model costing as little as

55/-

Voigtländer

Ask your dealer to show you the Brilliant or write for details to SCHERING LTD. *(Voigtlander Dept. 4), 185-192, High Holborn, London W.C.1*

OPTICAL CRAFTSMEN SINCE 175[illegible]

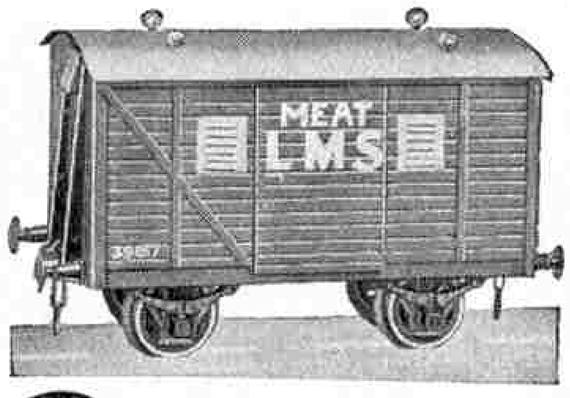


Half the fun of running your rolling stock is the knowledge that you have built it yourself. Milbro true-to-scale replicas of Cattle Wagons, Box Wagons, Open Wagons, etc., are supplied with working blue print for easy assembly. It's cheaper to buy them this way, too, than ready assembled.

MEAT VANS

A fine reproduction of its prototype, made from best quality seasoned timber.
Go—Finished **10′6** each
Gl— „ „ **17′6** each

Milbro rolling stock, locos and track parts are **the real thing in miniature!** *Precision-built to give the same exacting service expected of the great British railway systems. Send 6d. for Catalogue describing the full Milbro range.*



MILBRO *TRUE·TO·SCALE replicas for reliability*

MILLS BROS. (Model Engineers) LTD., Dept. M.M., ST. MARY'S ROAD, SHEFFIELD.
London Showrooms: 2, Victoria Colonnade, Victoria House, Southampton Row, W.C.1.

BRYLCREEM

your hair—it pays to be smart!

A GOOD appearance is half the battle. People admire a man whose hair is always in order, but they don't like it to look "gummy." Brylcreem keeps the hair smart, controlled and natural-looking. From all Chemists and Hairdressers.

In bottles and tubes 1/-

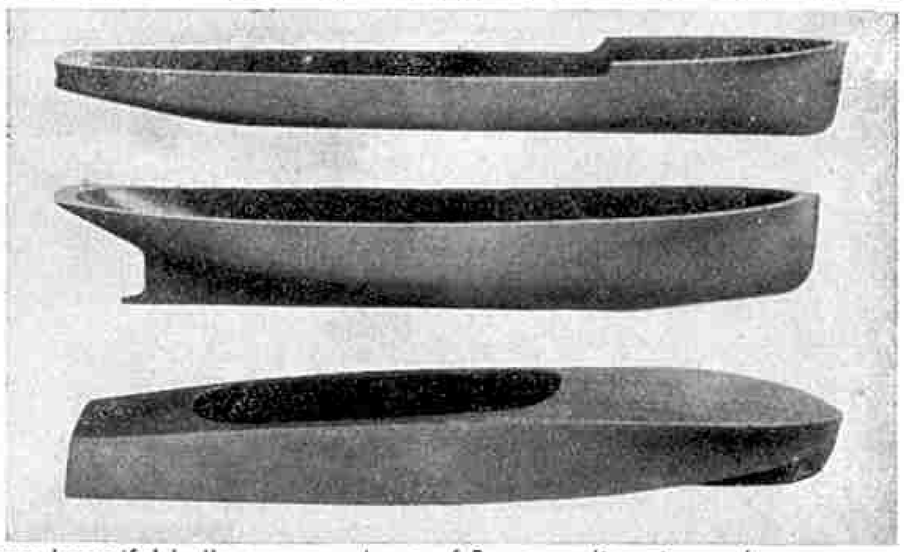
Larger bottles 1/6, 1/9, 2/6

BRYLCREEM—THE PERFECT HAIR DRESSING

The County Perfumery Company, North Circular Road, West Twyford, London N.W.10

royds C550

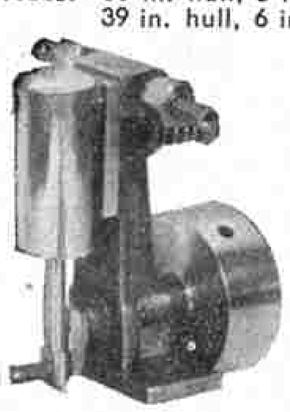
SUPER BOAT HULLS



These beautiful hulls are carved out of finest quality pine and are extremely light and strong. The 30 in. hulls have $\frac{5}{16}$ in. thick sides whilst the 39 in. hulls are $\frac{3}{8}$ in. thick.

These can be supplied for building up Destroyer, Cargo, Liner and Speed Boats.

Prices. 30 in. hull, 5 in. beam, 4 in. depth overall ... ... **21/-** each
39 in. hull, 6 in. beam, 5 in. depth overall ... ... **33/-** ,,
Plus Carriage.



Steam Oscillating Boat Engines

W252. OSCILLATING MARINE ENGINE. Single oscillating type. $\frac{3}{16}$ in. Bore, $\frac{3}{8}$ in. Stroke. Suits Boats 18 in. long ... ... Price **3/9**

W253. OSCILLATING MARINE ENGINE. Oscillating Single Acting Cylinder. $\frac{1}{2}$ in. Bore, $\frac{3}{4}$ in. Stroke. Suits Boats 24 in. long. Price **5/-**

Suitable Boilers for above, complete with lamp and safety valve ... ... Price **8/-**

Carriage extra in all cases.

Send for Bond's 208 page 1939 Catalogue, **Price 6d.** It illustrates and lists 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.**

"L" LEARN to do your PHOTOGRAPHY by the JOHNSON'S Way

YOU WILL BE ABLE TO DO **DEVELOPING** AND **PRINTING** AFTER READING OUR **FREE** INSTRUCTION BOOK.

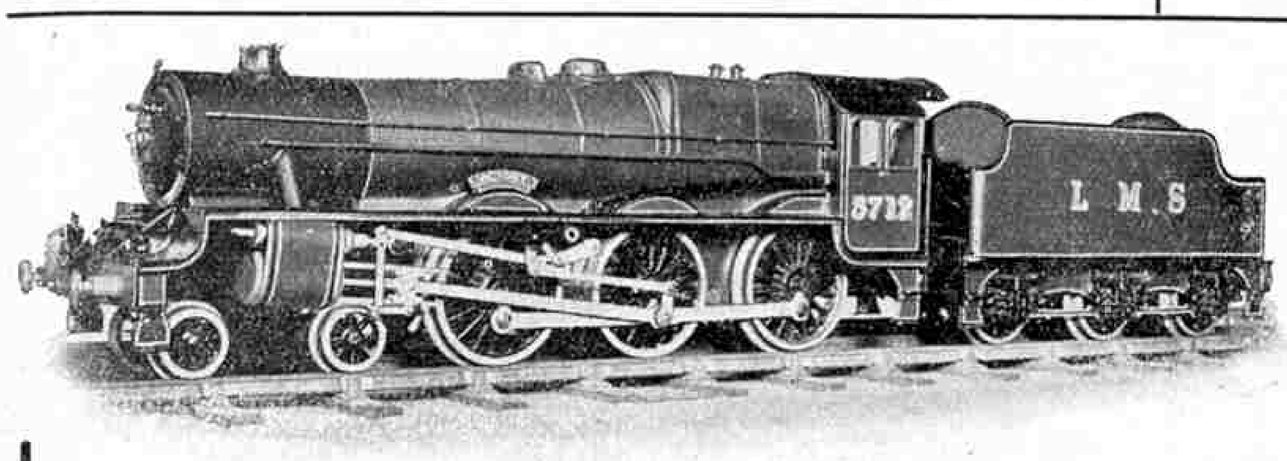
Write at once for a copy showing "How to do your own Developing." "How to do GASLIGHT PRINTING." "How to do FLASHLIGHT," "ENLARGING," etc.

- **You can make a practical test by sending a P.O. for**
- **1'7 for a trial set of chemicals, including:**

1-oz. bottle of AZOL, to develop 12 spools $3\frac{1}{4}$ X $2\frac{1}{4}$.
4-oz. tin ACID-FIXING, to make 30 to 60 oz. solution.
1 Packet M.-Q. Developer, sufficient to make 3 dozen Gaslight Prints.

Address letters E'M Dept.

JOHNSON & SONS *Manufacturing Chemists Ltd.* **HENDON London N.W.4**



L.M.S. "VICTORY"

Our model of the L.M.S. 5XP Class Locomotive "CONQUEROR" No. 5701 has proved so popular that we have already sold out the first batch. We have ordered a second batch from our works and the new model is No. 5712 "VICTORY." We think our readers will agree from this illustration it is a considerable improvement on our previous models.

The price it will be noted remains unaltered at **£7 7s. 0d.** Clockwork, d.c. 8-10 volts or a.c. 20 volts.

- We can also supply the L.M.S. 5P 5F class 4-6-0 Mixed Traffic Locomotives painted black, lined red, at the same price.

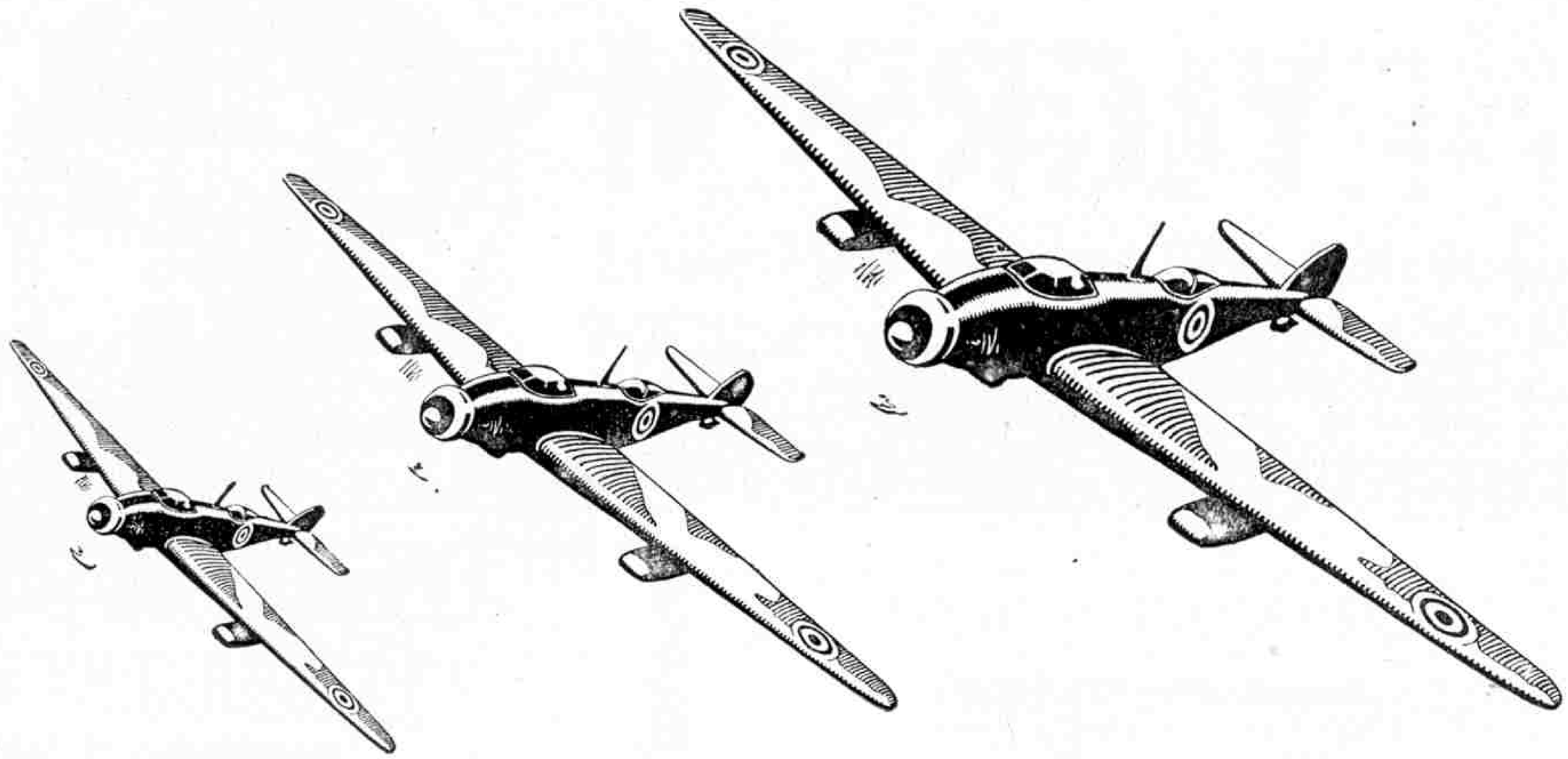
For details of all other Models in Gauge "0," Clockwork, Electric or Steam, send for

GR 17 GAUGE "0" RAILWAYS EQUIPMENT, Post free **3d.**

also: Attractive free Railway Booklets FB17 and TT17.
Complete Ships List **S17 6d.**

- The ultra-careful or more fortunate model engineer would perhaps be surprised to know that repair jobs numbering some thousands pass through our hands in the course of a year. To cope with this we have long ago instituted a Special Department, which deals with all types and makes of railways. Don't forget when sending to **enclose** your name and address **in** the parcel. Quotations given with pleasure.

BASSETT-LOWKE LTD., NORTHAMPTON
LONDON: 112, High Holborn, W.C.1
MANCHESTER: 28, Corporation Street



VICKERS WELLESLEY CONSTRUCTION KIT **2'6**

RECORD BREAKERS

The Vickers Wellesley came into public favour by its wonderful Egypt-Australia non-stop flight.

Frog Aeroplanes have always been favourites of the air-minded youth of Britain.

The new FROG model of the record-breaking Vickers Wellesley is perhaps the most interesting of the FROG range of inexpensive constructor kits. It will give hours of pleasure to any amateur constructor, and, when it is completed, it really does fly.

Constructor kits from **1/6** to **21/-**, including models to S.M.A.E. competition specifications.

USE THE BEST MATERIALS

Promising models sometimes give disappointing results; not because of errors in design, but through the use of inferior materials and inefficient airscrews. Do not make this mistake when building your new machine.

International Model Aircraft Ltd., so long famous for the excellent workmanship of the FROG models, are now supplying balsa wood, tissue, fully shaped airscrews and everything needed by the model aeroplane maker. These materials are of the same high standard as used in FROG S.M.A.E. Competition Models. Ask for them by name at your local FROG stockists.

FROG SERVICE IS ALWAYS AT YOUR SERVICE

ALWAYS ASK FOR

FROG

AERO SUPPLIES

Covered by World Patents granted and pending.
Made in England by International Model Aircraft Ltd.

OBTAINABLE AT ALL GOOD DEALERS AND STORES. *Sole Concessionaires:*

LINES BROS. LTD., MORDEN RD., MERTON, S.W.19

COUPON

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

To Lines Bros. Ltd. (Dept. 5), Morden Road, London S.W.19

NAME.....

ADDRESS.....

.....6/39

TRADE MARK REGD.

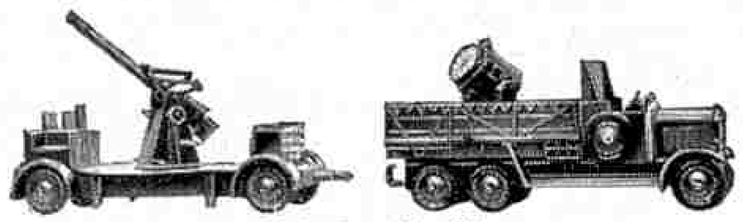
START COLLECTING

DINKY TOYS

PERFECT SCALE MODELS

Territorial Army Field Brigade in action with 18-Pounder Guns, and (right) a 3-inch Anti-Aircraft Gun with crew.

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

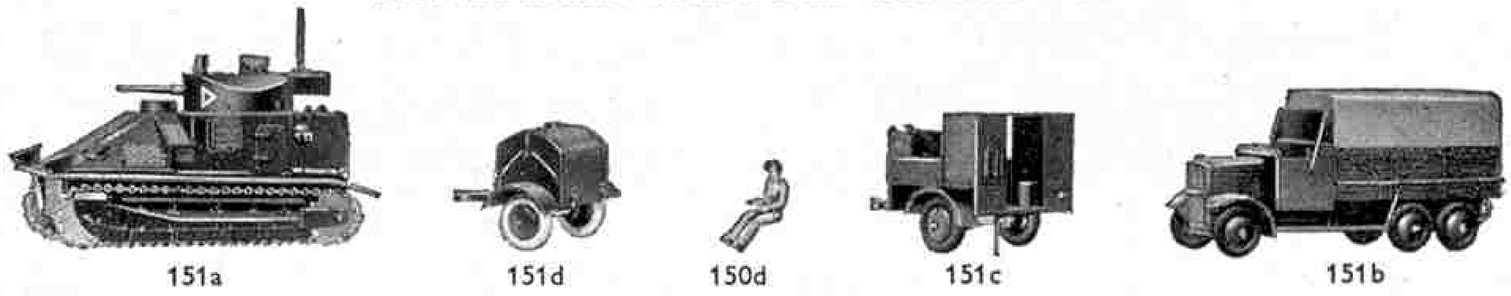
18-POUNDER QUICK-FIRING FIELD GUN UNIT

Dinky Toys No. 162

Comprises scale models of an 18-pounder quick-firing Field Gun, Trailer and "Light Dragon" Motor Tractor.
Price **2/-** per set

Nowadays every boy is interested in the Mechanised Units of the British Army. The Royal Tank Corps Sets have been great favourites since their introduction into the Dinky Toys range in 1937. The 18-Pounder Field Gun Unit and the Anti-Aircraft Unit that have just been added promise to enjoy even greater popularity.

ROYAL TANK CORPS MEDIUM TANK SET



151a 151d 150d 151c 151b

Dinky Toys No. 151

No. 151a	Medium Tank	...	each **1/6**	No. 151d	Water Tank Trailer	each	**6d.**
No. 151b	Transport Wagon	...	„ **1/1**	No. 150d	Driver ...	„	**3d.**
No. 151c	Cooker Trailer	...	„ **7d.**				

Price of complete set **3/11**

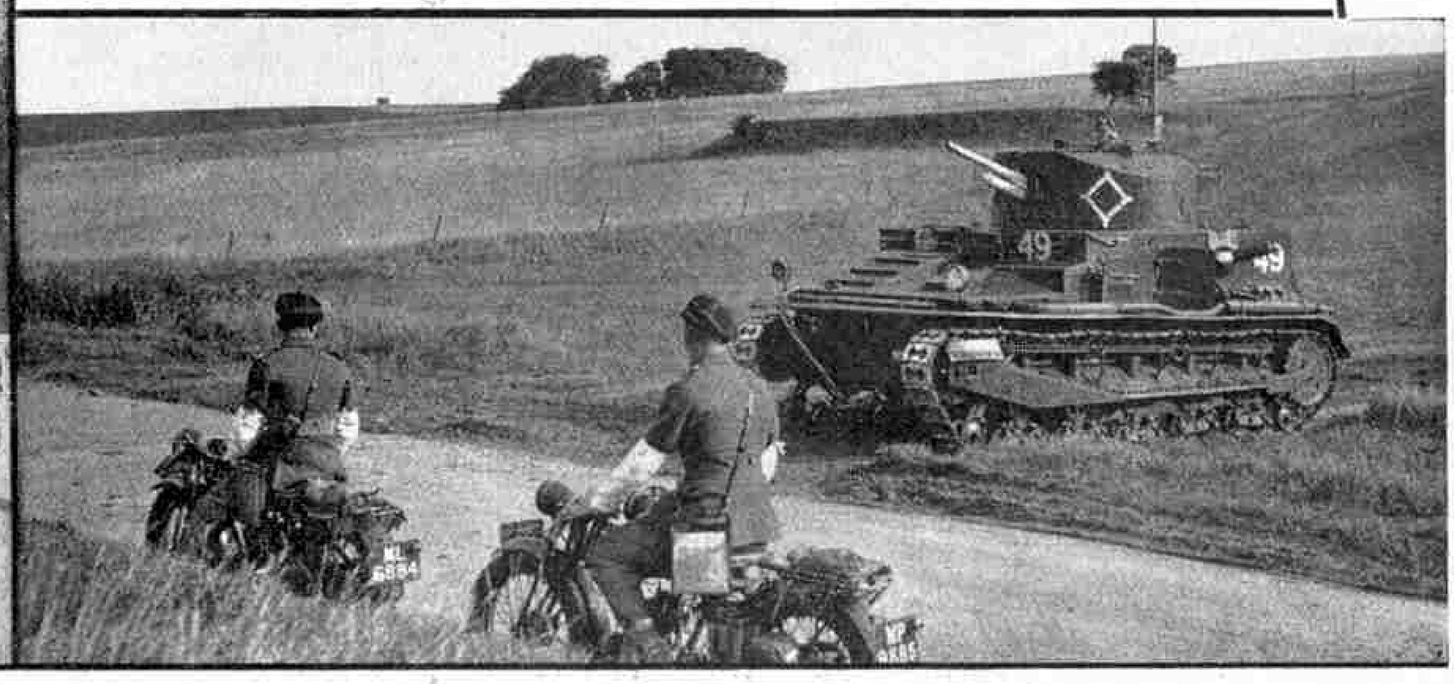
ROYAL TANK CORPS LIGHT TANK SET

152a 150d 152b 152c

Dinky Toys No. 152

No. 152a	Light Tank	...	each **1/2**	No. 152c	Austin Seven Car	each	**4d.**
No. 152b	Reconnaissance Car		„ **1/-**	No. 150d	Driver ...	„	**3d.**

Price of complete set **2/9**



A FASCINATING COLLECTING HOBBY

DINKY TOYS

OVER 300 VARIETIES

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

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

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

HAWKER "HURRICANE" SINGLE-SEATER FIGHTER (Camouflaged)

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

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

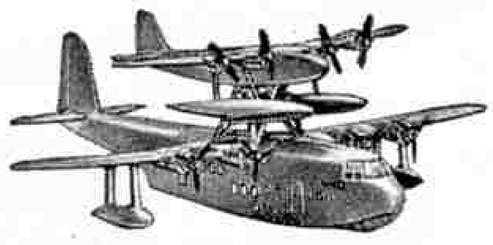
PRESENTATION AEROPLANE SET

Dinky Toys No. 64

This composite Aeroplane Set, in presentation box, consists of one each of the following Dinky Toys:

No. 60g D.H. "Comet" Aeroplane.
No. 62h Hawker "Hurricane" Single-Seater Fighter (Camouflaged).
No. 62k The King's Aeroplane – Airspeed "Envoy."
No. 62m Airspeed "Envoy" Monoplane.
No. 62s Hawker "Hurricane" Single-Seater Fighter (Aluminium Finish).
No. 63b Seaplane "Mercury." Price **3/3**

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

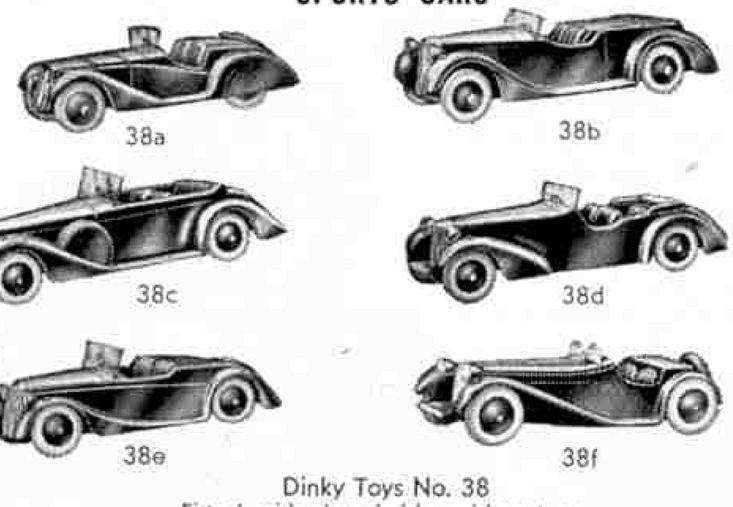
PRESENTATION AEROPLANE SET

Dinky Toys No. 65

This composite Aeroplane Set, in presentation box, consists of the following Dinky Toys:

No. 60r Empire Flying Boat.
No. 60t Douglas "DC3" Air Liner.
No. 60v "Whitley" Bomber.
No. 60w "Clipper III" Flying Boat.
No. 62n Junkers Ju 90 Air Liner.
No. 62p Armstrong Whitworth "Ensign" Air Liner.
No. 62r De Havilland "Albatross" Mail Liner.
No. 62w Imperial Airways "Frobisher" Class Air Liner. Price **7/-**

SPORTS CARS

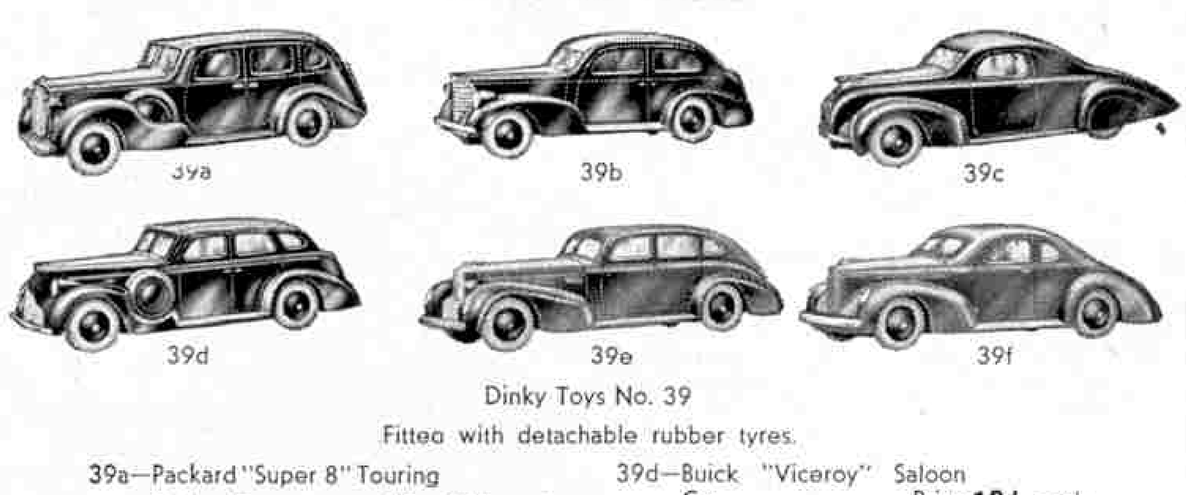


Dinky Toys No. 38
Fitted with detachable rubber tyres.

38a—Frazer-Nash B.M.W. Sports Car. ... ... Price **10d.** each
38b—Sunbeam-Talbot Sports Car... ... ... ,, **10d.** ,,
38c—Lagonda Sports Car ,, **10d.** ,,
38d—Alvis Sports Tourer. Price **10d.** each
38e—Triumph "Dolomite" Sports Coupe ... ,, **10d.** ,,
38f—S.S. "Jaguar" Sports Car... ... ... ,, **10d.** ,,

Price of complete set **5/-**
Ready August

SEDANS AND COUPES



Dinky Toys No. 39
Fitted with detachable rubber tyres.

39a—Packard "Super 8" Touring Sedan Car ... Price **10d.** each
39b—Oldsmobile "Six" Sedan Car ... ... ,, **10d.** ,,
39c—Lincoln "Zephyr" Coupe ... ... ,, **10d.** ,,
39d—Buick "Viceroy" Saloon Car ... ... Price **10d.** each
39e—Chrysler "Royal" Sedan ... ... ,, **10d.** ,,
39f—Studebaker "State Commander" Saloon Car... ... ... ,, **10d.** ,,

Price of complete set **5/-**
Ready July

MECCANO LIMITED — BINNS ROAD — LIVERPOOL 13

TRI-ANG

"FAIRYCYCLES" and TRICYCLES (Regd.)

TRI-ANG TRICYCLE No. 5B (Regd. Trade Mark)

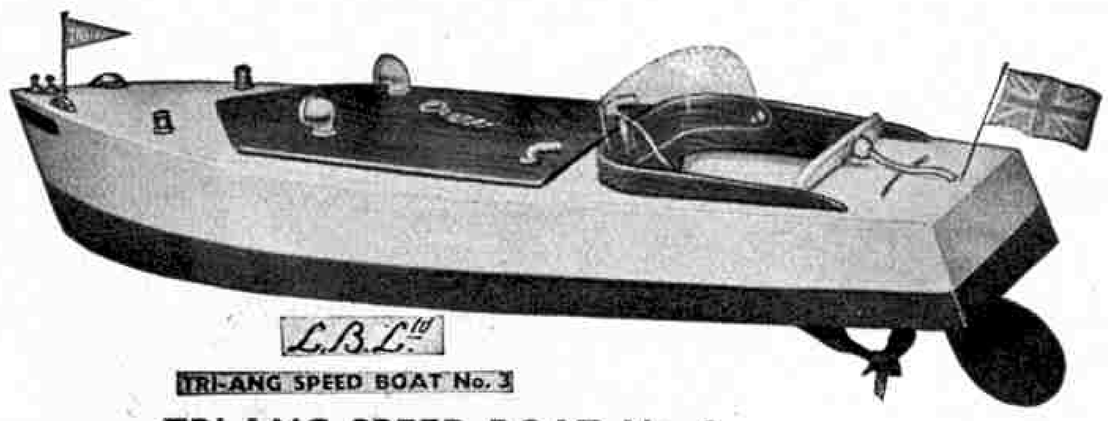
Cycle chain drive with free-wheel. Ball-bearings throughout. Frame best quality weldless cycle tubing. 16 in. front and rear wheels. 1½ in. jointless sponge-rubber tyres. Roller lever brake. Coil spring saddle. CHROMIUM FITTINGS. Black, blue or maroon. **Price 59/6**

"FAIRYCYCLE" (Regd.) MODEL No. 2

Cycle tubular frame and forks. 14 in. wheels. 1⅜ in. jointless sponge-rubber tyres. Ball-bearing pedals. Roller lever brake. Two-coil saddle. Chain cover. Stand. CHROMIUM-PLATED FITTINGS. Black, blue or maroon. **Price 39/6**

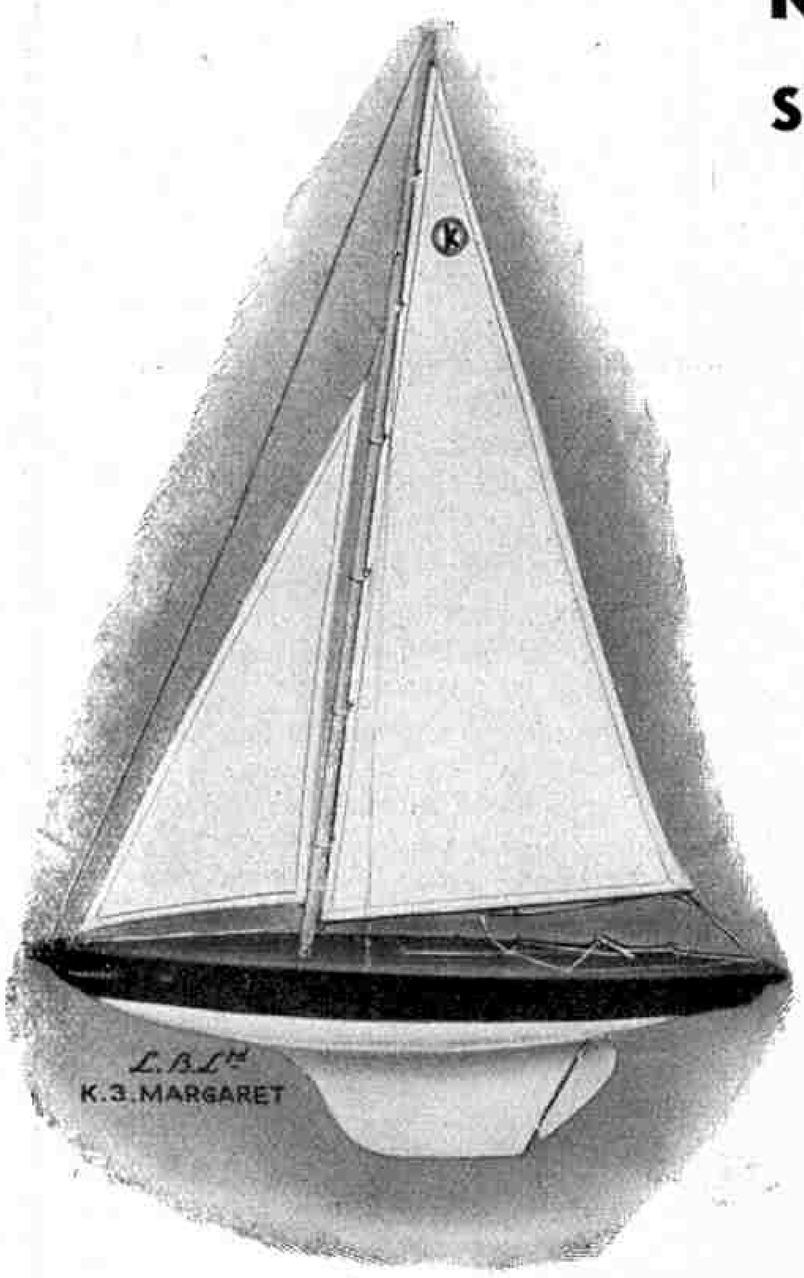
'K' YACHTS

TRI-ANG SPEED BOATS



TRI-ANG SPEED BOAT No. 3

Specially designed hull with mahogany deck, brass fittings, ventilators and detachable motor cover. Very powerful clockwork mechanism. Complete with bow pennant and stern flag. Hull 20½ in. overall. Electric Motor 22/6 **Price 21/–**

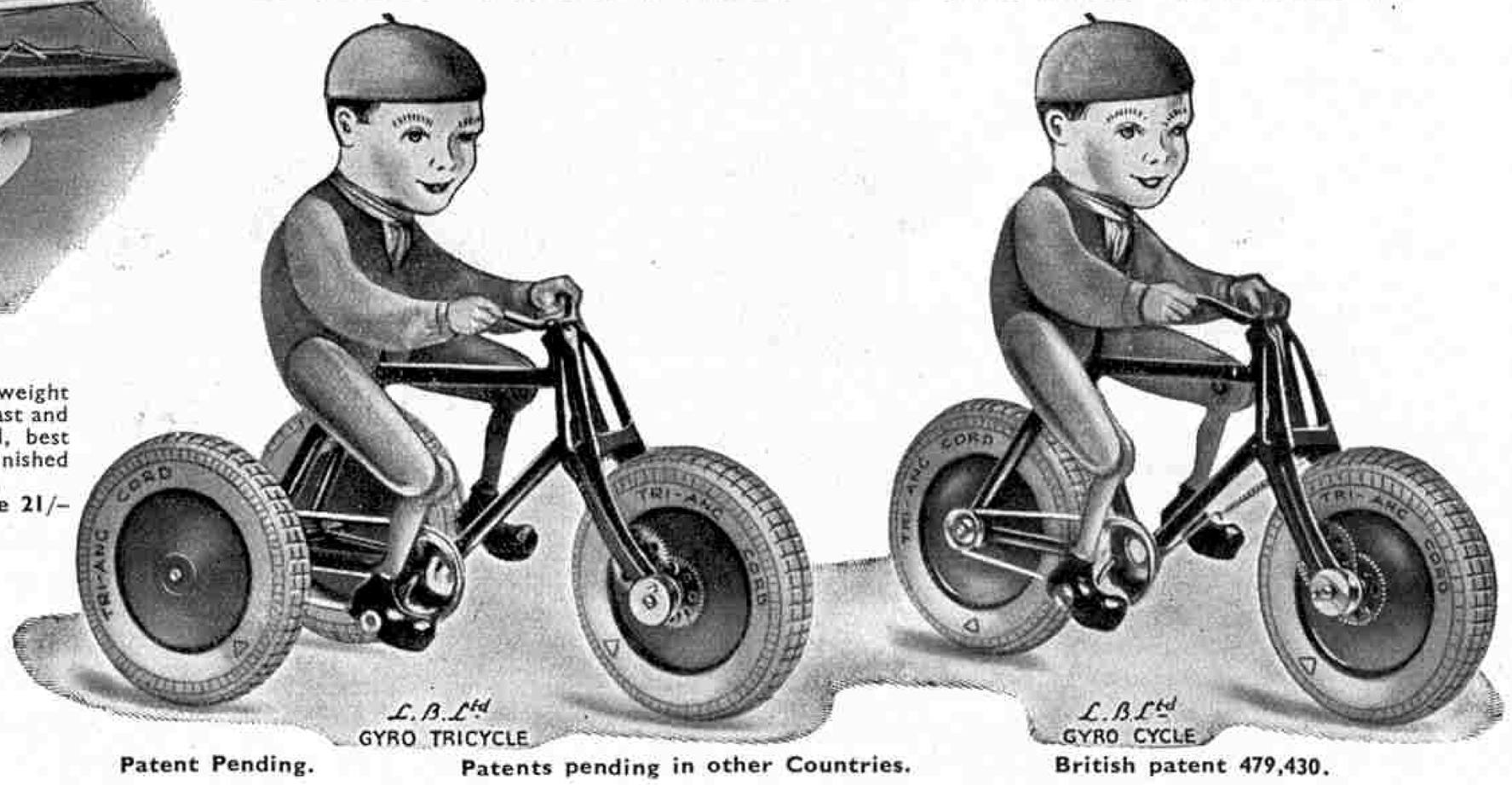


"K" YACHT "MARGARET"

AUTOMATIC STEERING. Patent light-weight weather resisting hull. Mahogany deck. Mast and boom made from finest selected material, best quality sails, fully adjustable. Beautifully finished in blue and white. Length of hull, 26 in. **Price 21/–**

TRI-ANG

GYRO TRICYCLE AND GYRO CYCLE



Patent Pending. **Patents pending in other Countries.** **British patent 479,430.**

The Gyro Tricycle is an outstanding novelty with many new tricks, fitted with Gyroscope in front wheel on similar principle to the famous Gyro Cycle. **Price 5/11**

The gay little figure astride the saddle appears to balance himself as he pedals merrily all over the place, and with his flexible arms creates the illusion in the most realistic way that he is steering the Gyro Cycle by the handlebars. **Price 5/–**

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MECCANO MAGAZINE

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With the Editor

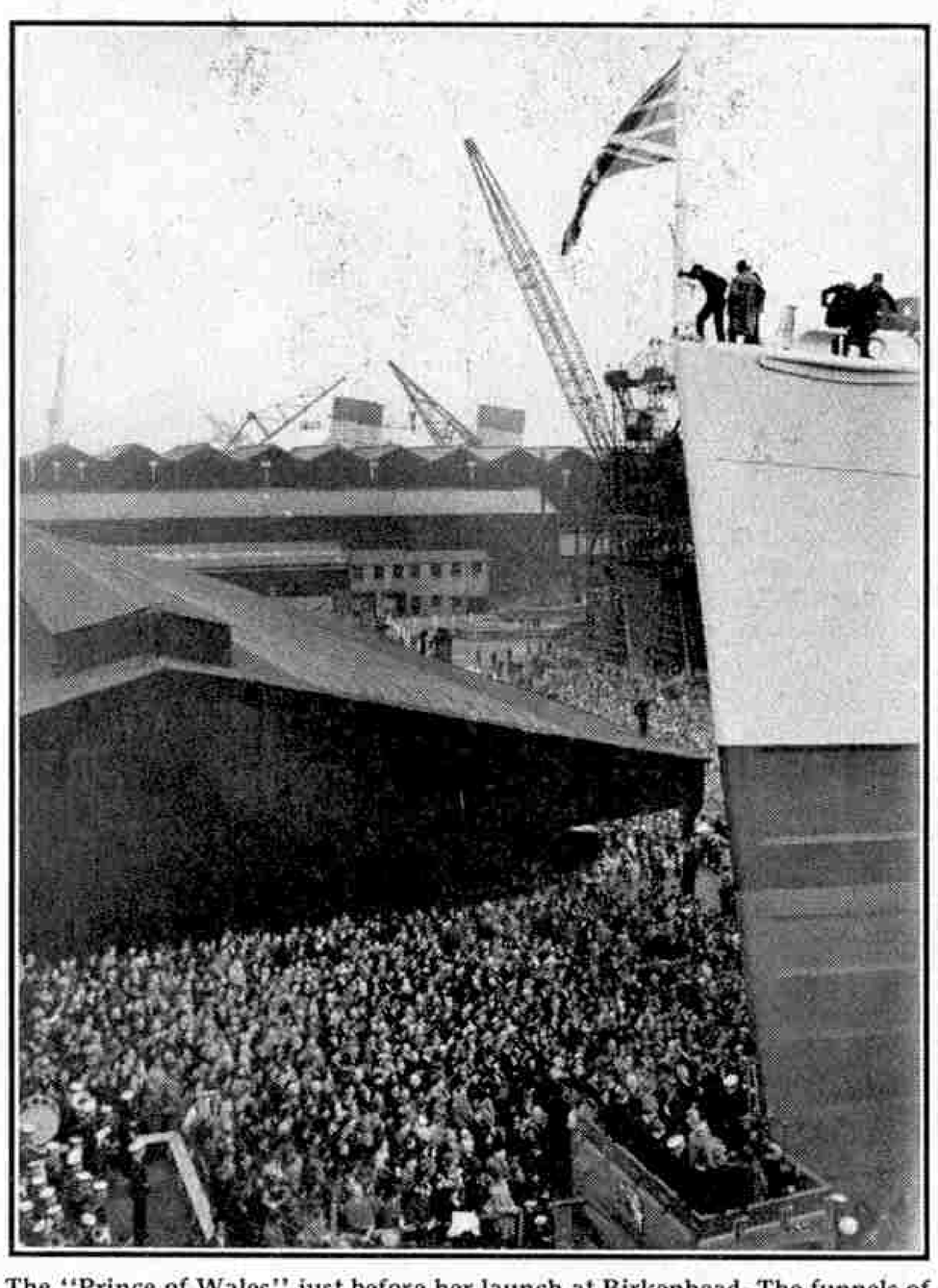
The Thrill of a Great Launch

Few sights are more thrilling than the launch of a great ship, whether for the Navy or the Mercantile Marine. Even those of us who have been present at many launches still feel the same breathless excitement as the critical moment approaches. And then, as the vessel begins her majestic sweep down the ways to the water that is her element, we make our contribution to the great cheer that goes up from the vast crowd of spectators.

It was inevitable that there should be some form of ceremony when a ship takes to the water for the first time. In past centuries it was usual for the health of the ship to be drunk from a silver goblet that afterwards was thrown overboard. To the shipwrights this seemed a waste of good silver, so they fixed nets round the ship to catch the goblet. Then more important people began to quarrel as to who should have this when it was retrieved, and the result was that for some time ceremonies were out of favour.

When the present custom of breaking a bottle of wine over the bows was introduced is not known. Gradually it became officially recognised by the Admiralty, and early last century it became usual to ask a lady to perform the christening, although nobody can explain why. This soon led to disaster, for a certain titled lady who was invited to christen a naval vessel launched at Plymouth dockyard completely missed the ship when she threw the bottle at it, and hit a spectator instead! The poor man was seriously injured, and naturally sued for damages.

After this mishap the precaution was taken of tying the bottle to the bows of the vessel by means of a rope. Even then there were occasions when two or three attempts had to be made before the bottle hit the ship's bows and broke.



The "Prince of Wales" just before her launch at Birkenhead. The funnels of the "Mauretania," receiving her final touches in the fitting-out basin, appear above the roof of the shed in the background. Photograph by T. C. L. Hutchinson, Liverpool.

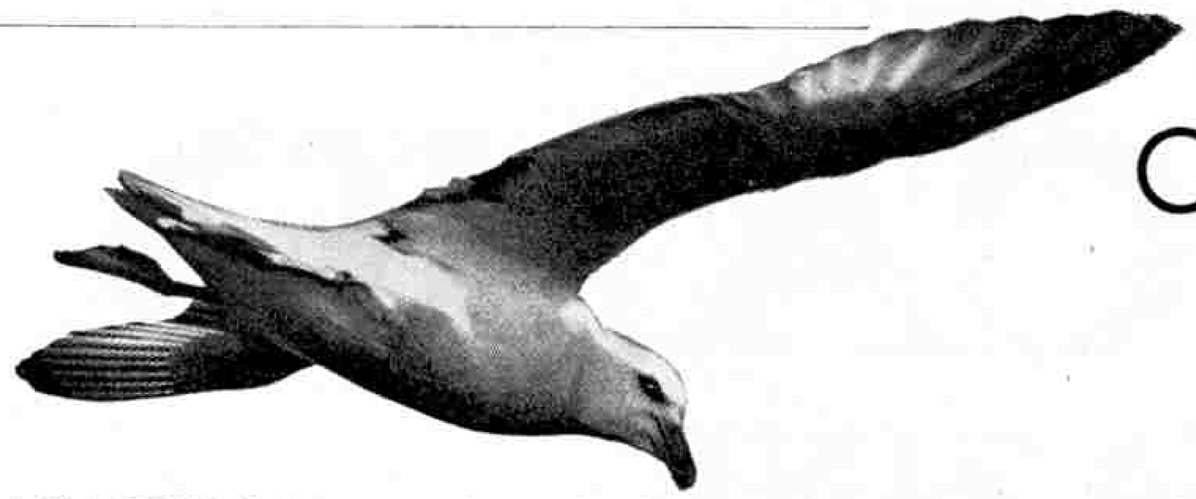
No such mishap could have occurred at the launch of the battleship "*Prince of Wales*" at the yard of Cammell Laird and Co. Ltd., Birkenhead, described on page 343. The bottle was suspended by two chains in such a manner that the Princess Royal had only to walk backward with it in her hand and release it in order to crash it fairly against the stem of the vessel, so that it could not fail to break. This plan has the additional advantage that the lady christening the ship keeps clear of the champagne splashes!

Coming Attractions

Next month's "*M.M.*" will contain an unusual article on the ranches in the far West of America where visitors can spend their holidays riding, fishing and hunting, and even taking part in real cowboy activities of the kind that most of us can only read about in books. Visitors enjoying this glorious kind of life are described as "dudes," and with the owner of the ranch, who is known as the "dude wrangler," and his cowboys and staff, they make up the "outfit," to use the true Wild West word.

Another feature of great interest will be the first of a series of articles dealing with the romantic story of Edison, the famous inventor. This article will describe how the one-time newspaper boy got his chance and grasped it with both hands, and how he founded the laboratory at Menlo Park, New Jersey, from which came such a marvellous stream of electrical and other wonders.

Other fine articles I have in preparation tell how the C.P.R. gets its sleepers in the lumber camps in the mountains of British Columbia, and describe the wonderful submarine plough that buries ocean cables in the bed of the sea to keep them out of the way of trawling gear. Still another article deals with the marvels of butterfly migration.



Our British Sea Birds

Some Favourite Cliff Nesters

By H. Auger

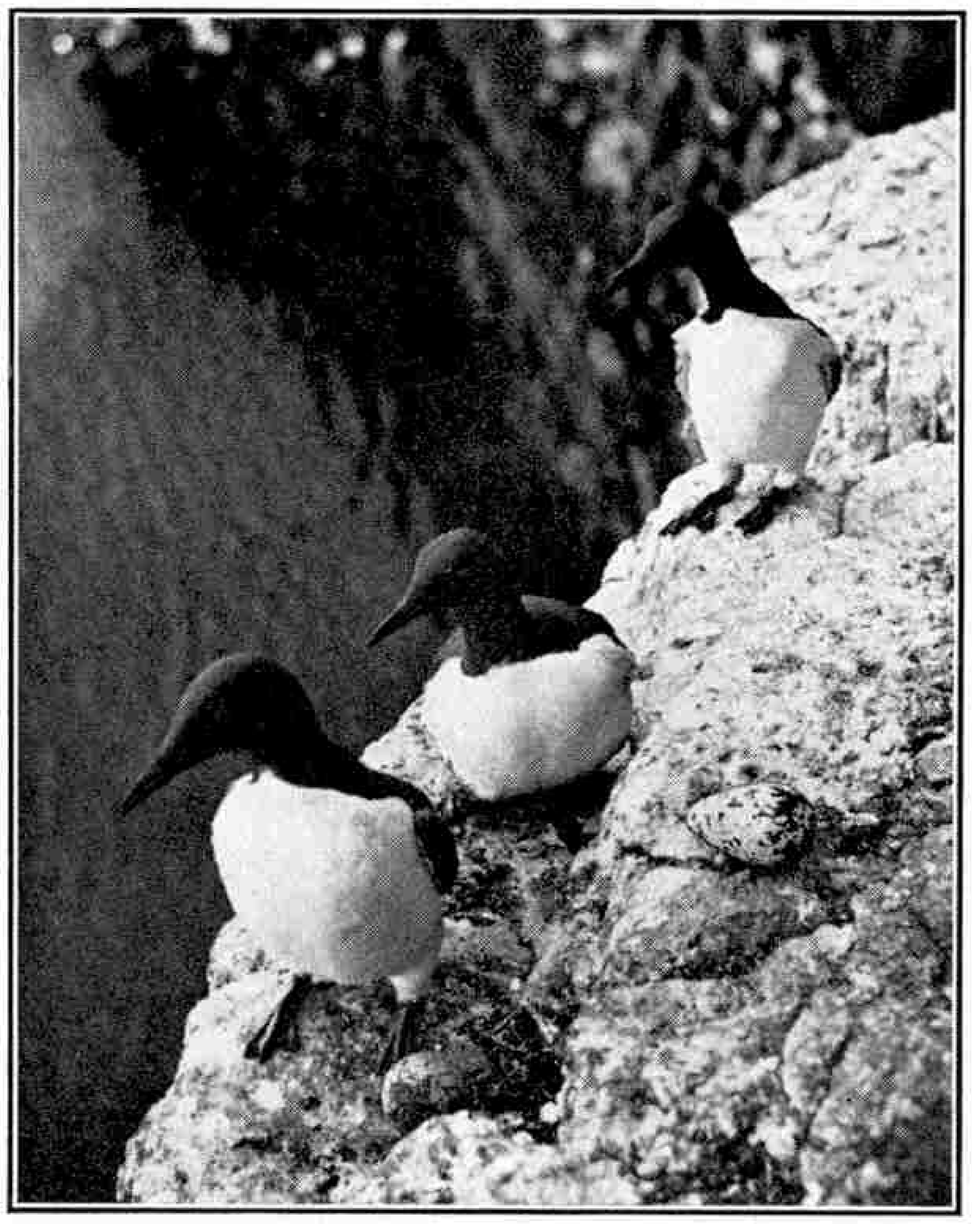
SEA BIRDS that nest along the shore or dunes are great favourites among bird watchers. True sea birds, which apart from nesting do not approach the shore, appear to possess more individual character than those of their kind that are land bound, and the cliffs, headlands and rocky islands of the British Isles are particularly attractive to them. The number of sea birds nesting round our shores indeed is incalculable. Comparatively small islands like St. Kilda and Mingulay in the Outer Hebrides house hundreds of thousands annually. The way in which guillemots pack themselves and their eggs on the tops of isolated stacks off some parts of the coast has to be seen to be believed, and the surface of some islands used by puffins has become so honeycombed with their burrows as to make walking over the nesting area dangerous.

There are eight fairly common British breeding cliff nesters. These are the herring and kittiwake gulls; three members of the auk tribe, the razorbill, guillemot and puffin; the cormorant and its smaller cousin the shag, and the increasingly numerous fulmar petrel. All except the fulmar petrel nest more or less in colonies.

To the average visitor to cliffs where sea birds throng, the one that perhaps commands most attention is the puffin. This comical bird, with its huge and vari-coloured bill is, as our cover suggests, an entertainment in itself. Standing on top of the cliff edge in rows, the father puffins appear to be showing off to one another their own importance. Some have several small fish dangling crosswise in their colourful bills. When seen thus, one imagines that the fish were intended for the Mrs. Puffins, and that on seeing their friends the birds had decided to join in the party before delivering the food they had caught. Judging by some of the deep grunts and growls from down the nesting burrows, which are followed by the hurried retreat of the male puffins, domestic troubles are by no means confined to human beings! These growls are quite startling when first heard, coming as it seems out of the Earth itself.

The puffin is fairly tame and will allow close approach, following one with its staring eye, apparently even more interested in the human being than is its disturber in itself. At a distance of about 10 ft. the features of the bird may be examined in detail. The large red, yellow and blue bill, and the orange feet and legs, contrast with the black and white of the rest of the body. The bill is no less remarkable in form than in colour, for it is provided inside with spikes projecting towards the throat to retain the fish as caught, and to allow the bill to be opened to enable further fish to be caught without loss of the first. In the autumn the coloured outside of the bill scales off and is lost.

For the size of its body, the wings of the puffin, as with all the birds of the auk tribe, are comparatively small, limiting its lifting powers and necessitating rapid wing beats. Its inability to rise quickly is best seen from a boat. On being approached the puffin paddles along the surface of the sea with wings and feet, relying almost entirely on the lift of a wave to give the necessary toss into the air. Even then its speed is sometimes insufficient, with the result that collision with the next wave crest stalls its flight completely. In these circumstances, or when the sea is calm, the bird realises its plight and promptly dives, reappearing well away from the cause of its fears.

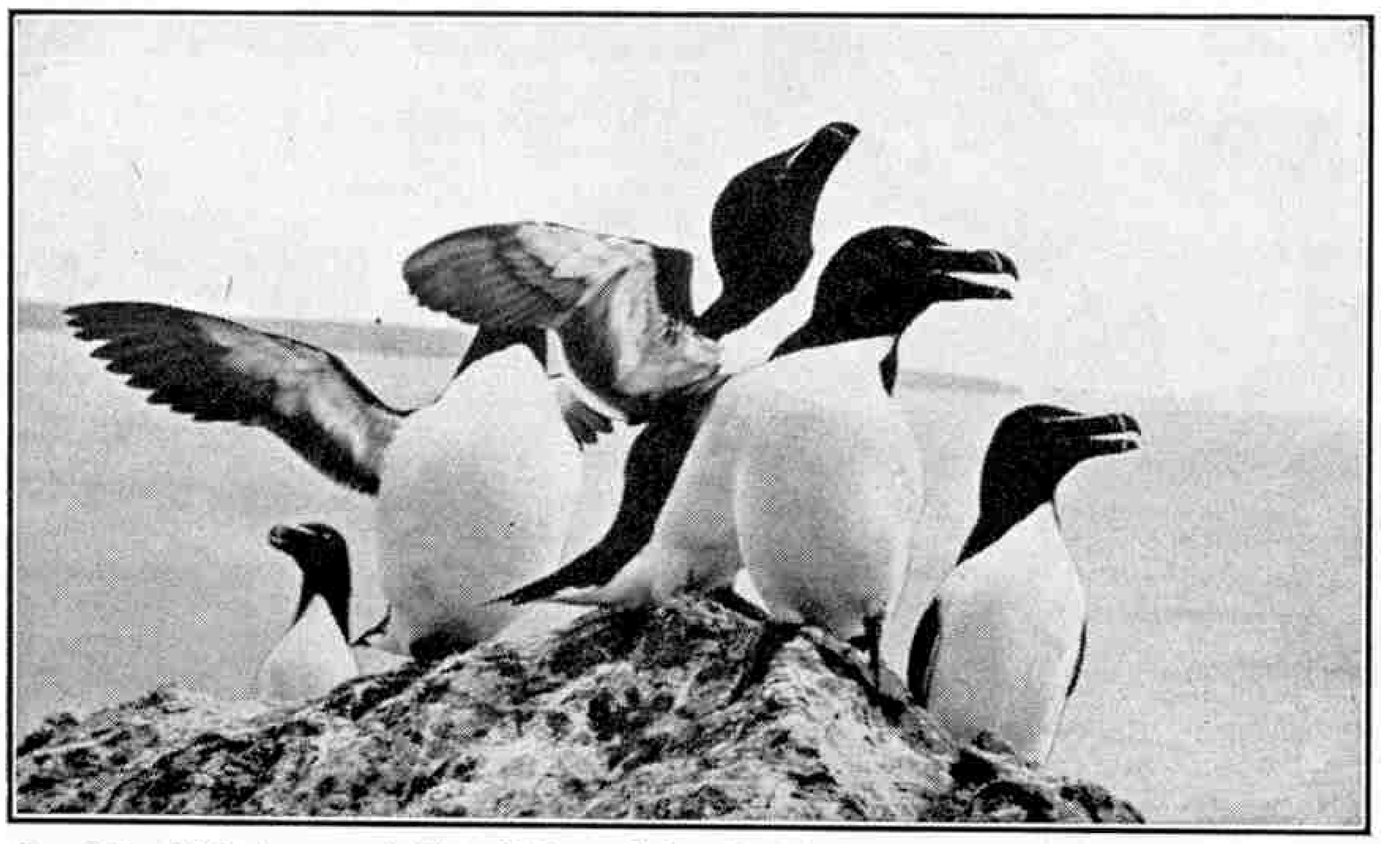


Guillemots with their eggs. These are laid on narrow ledges and often are rolled off by the feet of the owner diving seaward when alarmed.

Great numbers of puffins perish during the nesting season. They are victims of murder by the great black backed gull, which waits outside the puffin's burrow and seizes him by the neck as he comes out. This gull is the puffin's most dreaded enemy.

The two other auks found on British cliffs are the razorbill and the guillemot, birds that are very much alike and appear to enjoy each other's company. Both birds have white fronts and dark backs, although the dark parts on the guillemot are brown rather than black, and when seen together they may be distinguished by the razorbill's deep bill, with its curious white stripe, against the guillemot's pointed bill and longer neck. Both guillemot and razorbill, like the puffin, lay only a single egg, but what an egg! It is huge for the size of the bird, being long and pointed; and that of the guillemot possesses one of the most varied colour schemes ever seen on birds' eggs. As only one egg is laid, no nest is required to hold the eggs together as is usually the case with other birds, and it is laid on a bare rock ledge that sometimes is hardly wide enough to hold the brooding parent. From this perilous position the egg is often rolled into space by the feet of the owner diving seaward when scared.

The pear shape of the egg is supposed to allow it to roll



Razorbills alighting on a rock. These birds are distinguished from guillemots by their deep bills, on which there is a curious white stripe.

round in a circle on its ledge, and so prevent it from toppling into the sea. If it were not for this shape it would be difficult for the auks to brood their eggs, and even as it is the bird can only stand over its egg, placing the pointed end between its legs. One wonders at the egg hatching at all, especially as it is in contact with the hard cold rock. It is a still greater mystery how razorbill and guillemot chicks reach the sea alive from their dizzy cradles, even if they happen to have a clear drop into the water and there are no jagged rocks at the foot of the cliff.

The flight of the adult auks is none too certain. The birds have to make several efforts to gauge the right height and speed before landing, and then appear to crash into the cliff, displaying none of the grace of, say, a gull. Should there be no wind when the guillemots leave their ledge no great distance is reached before the sea is struck with a loud smack. The guillemots crowd together on the ledges more than the razorbills and a strange sight they present, all nodding and swaying their heads, occasionally swelling their growls and grunts into a loud chorus.

The kittiwake and herring gulls, although hard to distinguish from a distance, are as unlike in habits as if they belonged to different families. The kittiwake is timid and apparently oblivious to all other cliff life, while the herring gull is a thief and general mischief-maker, among other crimes eating quantities of eggs. Each species lays two or three eggs, varying in colour from cream to dark brown with darker markings.

The tiniest ledges in the most precipitous parts of the cliff are chosen by the kittiwake as a support for its neat nest. Great trouble is taken in pulling grasses out of the cliff top for the nest construction, whole patches of turf above the colony being stripped. The young of the kittiwake are white with a black collar and bar across the wings, and in this dress are the most attractive of all the gull family.

The herring gull is the one most commonly seen all round the shores of Britain, the immature birds having a mottled brown appearance. Young herring are the main food supply of this bird, this accounting for its name. The kittiwake's name comes from the sound of its oft-repeated cry.

The cormorant and the shag are two striking and weird birds, less common than the foregoing species. The cormorant is the larger, and, in Britain, the rarer of the two. Both are expert fishermen, and in China the cormorant is tamed and trained to the advantage of the owner. A curious habit of this bird is that of standing on a low rock and holding its wings out to dry.

Early in the year both species make a large nest of coarse seaweed and lay three or four long white eggs. The young, when hatched, are covered by skin with no down or feathers, and, when able to stand up, tremble violently if approached and cry like small children. The shag usually chooses the darker parts of the cliff, such as caves, gullies and ledges sheltered by an overhanging rock.

A bird that is rapidly extending its numbers and its range as a breeding bird in the British Isles is the fulmar petrel. A common Arctic bird, at one time it nested in the British Isles only on St. Kilda, but it now nests all round the cliffs of Scotland, and as far south as Flamborough on the east coast and Pembrokeshire on the west. It has a preference for the top ledges of the cliff, where its single white egg is laid. No notice is taken of its neighbours, as the fulmar is fearless, sitting alongside whatever other species of cliff bird happens to be on the ledge chosen. Other usually aggressive birds well know the effectiveness of the fulmar's defence, for when annoyed it ejects a well-directed jet of slimy oil from the back of its throat, as the observer quickly finds out.

In flight, the fulmar is the finest glider of all birds, as the heading illustration on the opposite page suggests. It delights in tracing the edge of the cliff on the upward current of air, but on land it is helpless, its legs appearing useless. It resembles a dark-coloured herring gull, with a bill possessing a curious notched upper mandible. The sight of a gliding fulmar is sufficient excuse for favouring cliff nesting birds above all others.

A cormorant with young birds. The cormorant is an expert fisherman and in China is tamed and trained to catch fish for its owner.

In winter the nesting cliffs are deserted, and except for gulls, the only sea birds seen near land are dead or storm-driven vagrants. The migration of the fish upon which they feed may be the controlling influence over their winter movements. Ringing of young birds in certain areas and their later recovery has shown that these birds travel hundreds of miles in all directions, and that they have no fixed migration routes.

"London's Underground" Grows

By a Railway Engineer

Looking into the pilot tunnel under the Waterworks River from the full-size tunnel. The photographs to this article are reproduced by courtesy of the London Passenger Transport Board.

A REMARKABLE scheme of development of "London's Underground" has been prepared in conjunction with the main line railways, and is now being carried out. Any such extension involves a host of problems in construction. In the present instance the most interesting work is the extension of the Central Line eastward from Liverpool St., and in this article I will deal with this section of the scheme.

To permit of through running between the Central London line—the old *"Twopenny Tube"*—and the various L.N.E.R. lines that serve the "dormitory" boroughs in Essex the tube railway is being extended to Stratford. At this point it will come to the surface, and the re-arrangement of the station here will permit of easy interchange of passengers between surface and underground trains. A glance at a map is enough to suggest that this might prove an awkward section in which to drive tunnels. Between Bow and Stratford the course crosses the delta of the River Lea; the Hackney and Leyton marshes are near at hand, and the river itself is flowing in five separate channels! A deep-level tube line would have been a fairly straightforward job to construct, but just where this difficult ground is entered upon the new railway is rising to the surface.

By the courtesy of the London Passenger Transport Board I was privileged to see the works in progress on this very interesting section. The tunnels are being bored from a number of working shafts. In the River Lea area, where the railway is rising to the surface, the new line is carried immediately beneath the embankment of the L.N.E.R. and the tubes pass through some very difficult ground. In a typical location there is ordinary gravel, or ballast as it is here termed, for a few feet, and then after a shallow layer of mottled clay there comes a section of silt, stuff that is little removed from wet mud. Not until some depth below the line of the new railway is the hard blue London clay reached.

I was taken into the tunnels down a working shaft adjacent to Pudding Mill river. At this point the line is so near to the surface that a minute's descent on a vertical ladder brought us to the workings. Where the tunnels are driven through water-bearing ground the construction has to be carried on under compressed air, and the first business was to go through an air lock, from the open air to the sealed chamber within. Owing to the presence of the L.N.E.R. embankment the working shaft is situated to one side of the line of the new tube railway, and the passageway containing the air lock is at right angles to the tunnels. The passage through the air lock is a strange experience. The chamber itself has a distinctly forbidding look; it is sealed off from the open air, and from the portion of the tunnel already driven, by massive steel doors only about five feet high. Once inside the air pressure is allowed to build up gradually, and the increase is quickly felt by a slight pain on one's eardrums. My guide suggested swallowing repeatedly; this I found a very successful remedy, so that by the time we were up to the working pressure and the inner door came swinging open I had grown more or less accustomed to the unusual conditions. The pressure being used on this particular section was 8½ lb. per sq. in. above atmosphere; this is comparatively low, for on stretches where the actual working face is in "the water," as they usually term the silt, an air pressure of 25 lb. per sq. in. above atmosphere has been found necessary.

The interior of a tube is a fairly familiar sight nowadays, though when one comes to examine it, "in the raw" so to speak, there are many interesting and perhaps unexpected features in its design. The tunnel walls consist of a series of cast iron rings, each 20 in. long, and each complete ring is made in seven sections. These rings have deep flanges on each side through which the adjacent rings are bolted together. The flanges are finished off with a smooth surface so that when adjacent sections are bolted together they make a good joint; the inner edge of the joint is caulked with lead, so that should any water manage to creep through the joint of the flanges none could possibly percolate through into the tunnels. During constructional work the compressed air keeps back all the water, but one cannot retain compressed air when the line is open! The amount of metal used in tube construction is perhaps not generally realised. A single ring weighs roughly 1⅔ tons, and this is only 20 in. long; a mile of single-line tunnel weighs over 5,000 tons!

We now set off towards the working face. Along the completed line of tunnel a light railway is laid, and on this the material excavated is brought to the shafts for conveyance to the surface. One quickly notices, too, a slight fogginess in the atmosphere; this is characteristic of tunnels under air pressure. My guide told me that in the sections under high pressure, 25 lb. per sq. in. or so, this slight mist develops into a real "fog." After about 10 minutes walking on longitudinal planks resting on the cross sleepers of the railway we came to the shield itself. One's first impression is that of the comparatively few men at work. It takes a gang of only six men to drive the tunnel for a tube railway.

The shields being used for the construction of this part of the line may be likened to a short length of tubular tunnel, with the addition that the forward end is provided with a hood extending round the upper half of the circle of the tunnel. Before the shield can advance a narrow trench has to be dug in the working face; this trench is semi-circular and accommodates the hood of the shield when the latter is pushed forward. The hood also supports the roof. Across the middle of this tubular shield, at right angles to its axis, is a bulkhead that can if necessary be made watertight.

The "knife," as the hood is sometimes called, is driven forward in steps equal to the length of one tunnel ring. Around the inside of the tubular shield are fixed 20 compressed-air rams, so arranged that their pistons push in a line parallel to the direction of the tunnel. These pistons push against the flange of the last tunnel ring fixed in position. After the shield has advanced, that portion of earth inside the hood has to be excavated. On the particular section I visited all this excavation was being done by hand, and the gravel is shovelled through one of the bulkhead doors into the wagons waiting just outside. While this is being done the pistons of the rams are withdrawn, and a further 20 in. long section of tunnel lining can be fitted into position. How much force is necessary to drive the shield takes some realising; the rams work at 3,000 lb. per sq. in., and the maximum combined thrust of the dozen of them is just over 600 tons!

Night work. One of the cross girders for underpinning the L.N.E.R. line being put into position.

The rate of progress naturally varies according to the nature of the ground, but when matters are going fairly smoothly an advance of 40 in. or two section lengths, during an eight-hour shift represents an average rate. This is equal to about 55 ft. per week.

A question that naturally arises is "How do they keep the shield going straight?" The general line of advance is checked by a sight on the bulkhead of the shield which is kept in true alignment with two fixed sights accurately located in the completed line of tunnel. There is often, too, a tendency for the shield to skew in its advance, due possibly to its meeting with a greater resistance on one side than the other. To keep a check on progress at each forward drive an ingenious, yet very simple device is used. To each side of the shield is attached a tail-rod, in a manner that may be likened to the reins on a horse; these rods are the same length, and the amount of advance on each side of the tunnel can be readily checked by marks on the tunnel walls. The water pressure in any of the rams can be regulated independently of all the others, and if it is found that a shield is tending to skew in one direction the pressures can be adjusted so as to produce a straight drive. Where it is necessary to put a curve in the line of railway a special tail rod, shorter in proportion to the radius of curvature, is used on the inner side of the curve.

Owing to the nature of the ground it is not always possible to go straight ahead with the full-sized tube tunnel, which is 12 ft. in diameter. An interesting case occurred where the line of tunnel passed very close underneath that channel of the Lea which is known as Waterworks River. The ground just beneath the river bed was so very "lively" that it was necessary to inject chemical consolidating matter in order to make it sufficiently solid to drive a tunnel through it, even in compressed air. A fair proportion of this consolidation was applied from above, from a boat, but this was not possible in mid-stream where there is a pier of the bridge carrying the L.N.E.R. Accordingly, from the nearest point reached by the full-sized tube tunnel a pilot tunnel 7 ft. in diameter was driven underneath the Waterworks River. From this the chemical consolidation was injected upwards, and the ground thus rendered sufficiently stable for the full-sized tunnel to be constructed.

One of the most complicated pieces of work is necessary just to the east of Stratford station, where the new line, after making a surface connection with the L.N.E.R., is burrowing again. In a very short distance the tracks have to pass under the four-road main line to East Anglia. Head room is not sufficient to drive a tube tunnel, and so the engineers have had to resort to the cut-and-cover method. Now it is one thing to build a tunnel in this way when the ground on the surface is clear, but quite another matter when cutting under one of the busiest main-lines of the country! Little by little the L.N.E.R. tracks are being underpinned, and the permanent way carried on heavy cross-girders. It is a lengthy process, for to put in the cross-girders entails complete possession of at least one of the four roads, and that can only be obtained at week-ends.

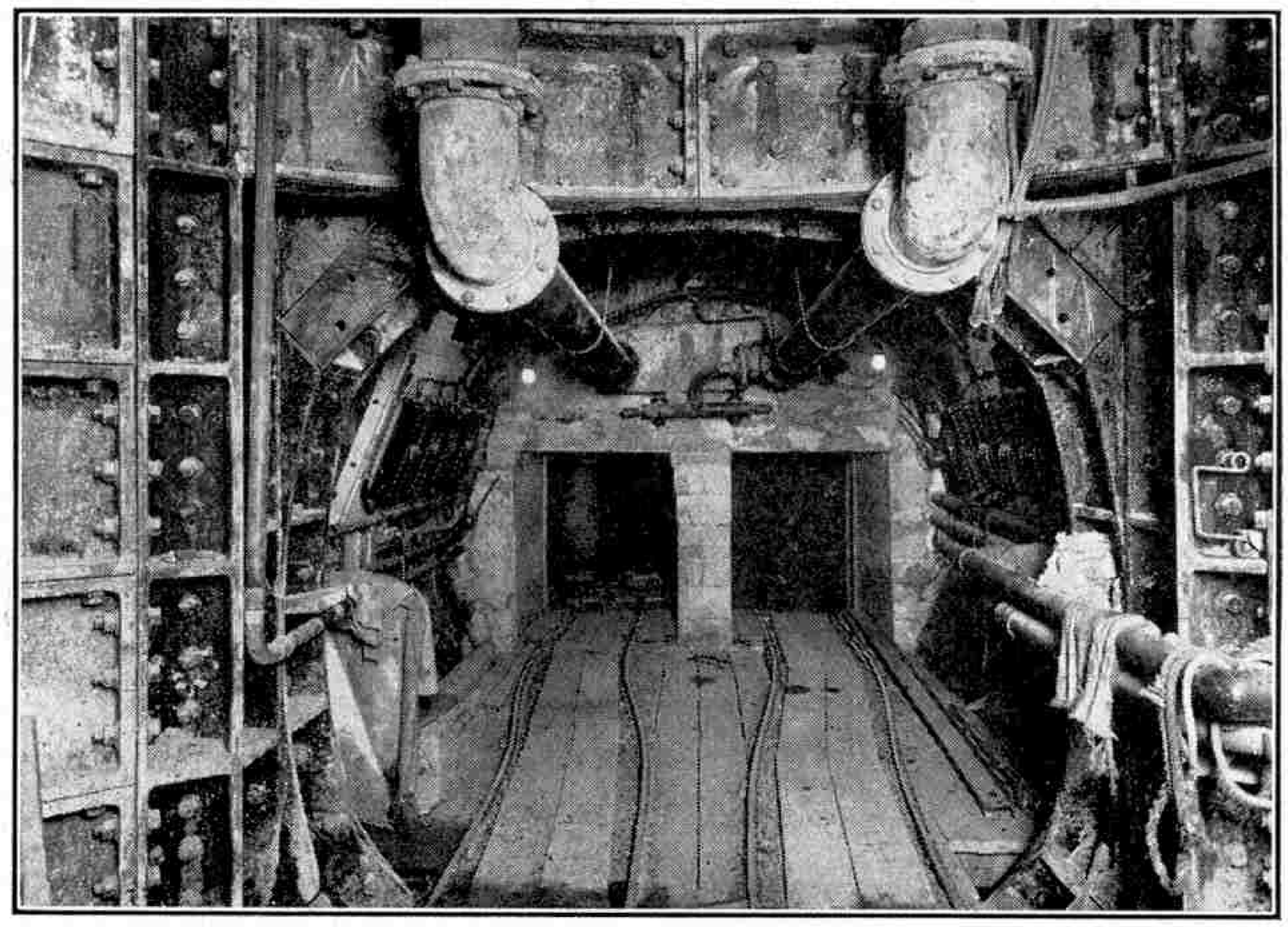
Further complications at this point—if any were needed!—have been caused by the bottom of the new cut-and-cover section being "in the water." The cross-section of this part of the tunnel is rectangular, and the vertical side walls are based on tubular sections filled with concrete. These foundations were constructed in just the same way as an ordinary tube tunnel, under compressed air. The two foundation tubes are being linked together by a third tube of oval section, in which the formation to carry the permanent way will eventually be built up.

At this same location two other obstacles were encountered. Just at the point where the line crosses under the L.N.E.R. a main sewer and a gas main ran across the direct line of the new tunnel, and both of these have had to be diverted. In the case of the gas main it was a comparatively easy matter to construct a new section dipping underneath the new railway. With the sewer the gradient of course could not be altered, however, and a deviation has been built to bring the pipe under the railway at a point where the latter is at a higher level, quite close to Stratford station.

Such is but a mere outline of the wonderful work now in progress under East London, work unparalleled for difficulty in the history of tube railway construction. In little more than a year's time miles of shining rails will have replaced the shields, the mud, and the air-locks in the tunnels; colour-light signals and automatic train stops will be functioning, and brilliantly-lighted trains will be carrying Londoners in their millions through the silt of the Lea delta. A few of them will recall days and nights spent in the clouded atmosphere of tunnels under compressed air, but to the vast majority the eastern extension will mean no more than yet another ramification of the magic carpet of "London's Underground."

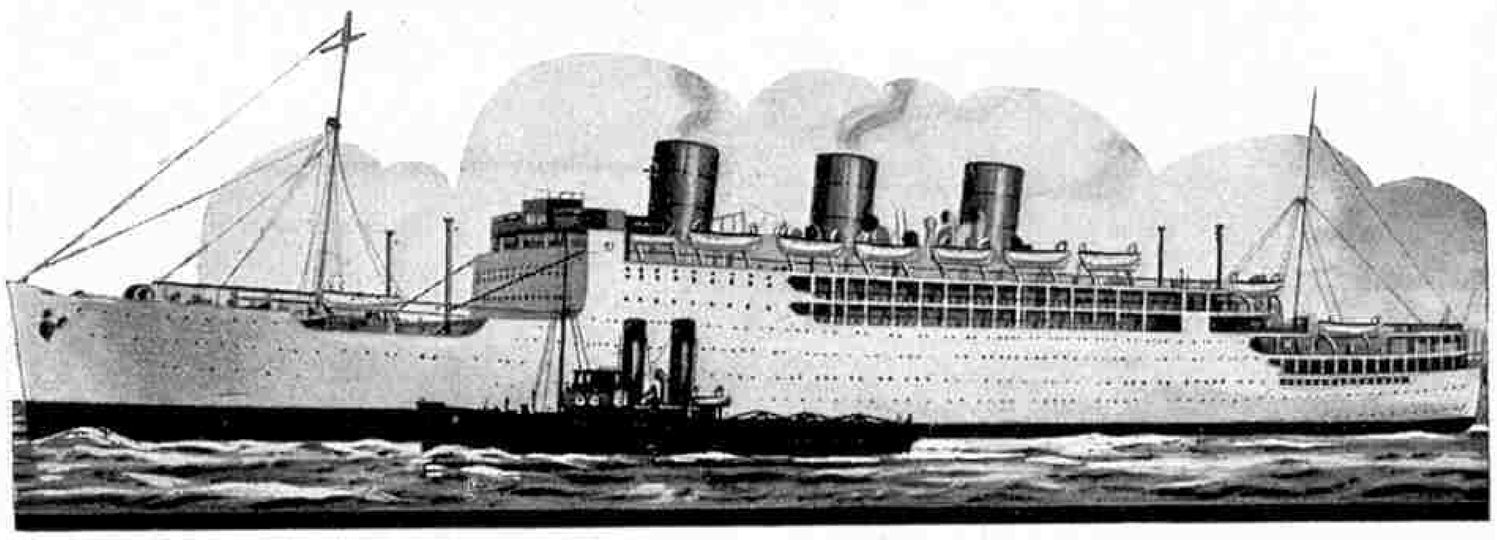
This Tube extension is closely associated with the L.N.E.R. Eastern Section electrification scheme. After passing under the L.N.E.R. tracks the Tube line is to remain beneath the surface as far as Leyton, where a junction is to be made with the L.N.E.R. branch to Loughton and Ongar that is to be electrified from Leyton onwards. From beyond Leytonstone a new line will link up with the L.N.E.R. route to Hainault.

In addition to the equipment of the Ongar and Hainault branches with electric conductor rails the L.N.E.R. Liverpool Street and Shenfield lines are to be electrified on the overhead wire system.



The two small openings into which the tracks pass give access to the air locks dividing the compressed air workings from the outer atmosphere.

SHIPPING NEWS



A Centenary Sailing

On 26th September is the Centenary Anniversary of the Royal Mail Lines Ltd., and on that date their new luxury liner *"Andes"* will leave this country for South America on her maiden voyage. The *"Andes"* is being built at Belfast by Harland and Wolff Ltd., and until her launch in March she was the largest merchant ship on the stocks in a British shipyard. She is now fitting out afloat, and her distinctive design is already taking effect in a raked rounded stem, cruiser stern, rounded bridge front and streamlined funnel. The illustration shows well her fine hull lines.

The *"Andes"* is a twin-screw turbine ship, with a length overall of 669 ft., and a gross tonnage of about 26,500. The accommodation for her 607 passengers, in two classes, well maintains the Royal Mail fleet's reputation for comfort and luxury.

Notable Motorships to be Built Abroad

A triple-screw passenger liner of 18,000 ton gross to be built for the Cie. des Messageries Maritimes, of Paris, will be France's most powerful motorship. The new vessel, which will be 594 ft. in length, will be driven by three Sulzer single-acting, two-stroke Diesel engines, each driving one propeller shaft, and having a total power output of nearly 31,000 b.h.p. This is designed to give a trial speed of about 22 knots, and a service speed of 20 knots. When completed the liner will be placed in the company's Marseilles-China-Japan service.

Another high-power motorship under construction abroad is the *"Stockholm,"* a passenger and cargo vessel ordered by the Swedish-American Line for their Göthenburg-New York service. The original *"Stockholm"* was destroyed by fire while being fitted out afloat at Monfalcone, Italy. Part of the hull of the vessel that was not damaged will be utilised in the construction and equipment of the new ship, and the main engines and other machinery unaffected will be installed. The design of the vessel provides for a length of 625 ft. between perpendiculars, accommodation for 1,350 passengers, and engines of 22,000 i.h.p., giving a service speed of 19 knots. The new *"Stockholm"* is to be ready in 1940.

Our Growing Navy

Three giant warships for the British Navy have been launched so far this year. The first of these to leave the slips was the battleship *"King George V,"* which on 21st February took the water at the Walker-on-Tyne Naval Yard of Vickers-Armstrongs Ltd. This is the first battleship to be launched in Britain for 14 years. She will have a displacement of 35,000 tons, and a quadruple-screw arrangement of Parsons geared turbines developing some 130,000 s.h.p. will give her a speed of about 30 knots. Her armament will include ten 14-in. guns arranged in three turrets and sixteen 5¼-in. guns arranged in twin turrets, together with anti-aircraft guns. Aircraft carried in special hangars will be launched into the air by catapult. The ship will be manned by about 1,500 officers and men.

In April Vickers-Armstrongs Ltd. launched at their Barrow yard the largest ship yet built there for the British Navy. This was the aircraft carrier *"Illustrious,"* the first of four vessels of this class laid down in 1937. She is 753 ft. long, with a displacement of 23,000 tons, and accommodation is being provided for 70 aircraft. The Parsons turbines are designed to develop 110,000 s.h.p., and should give a speed of over 30 knots. There will be hangars on two decks, connected to the flight deck by means of lifts. To ensure against fire, electrically-operated fireproof curtains will divide the hangars into sections.

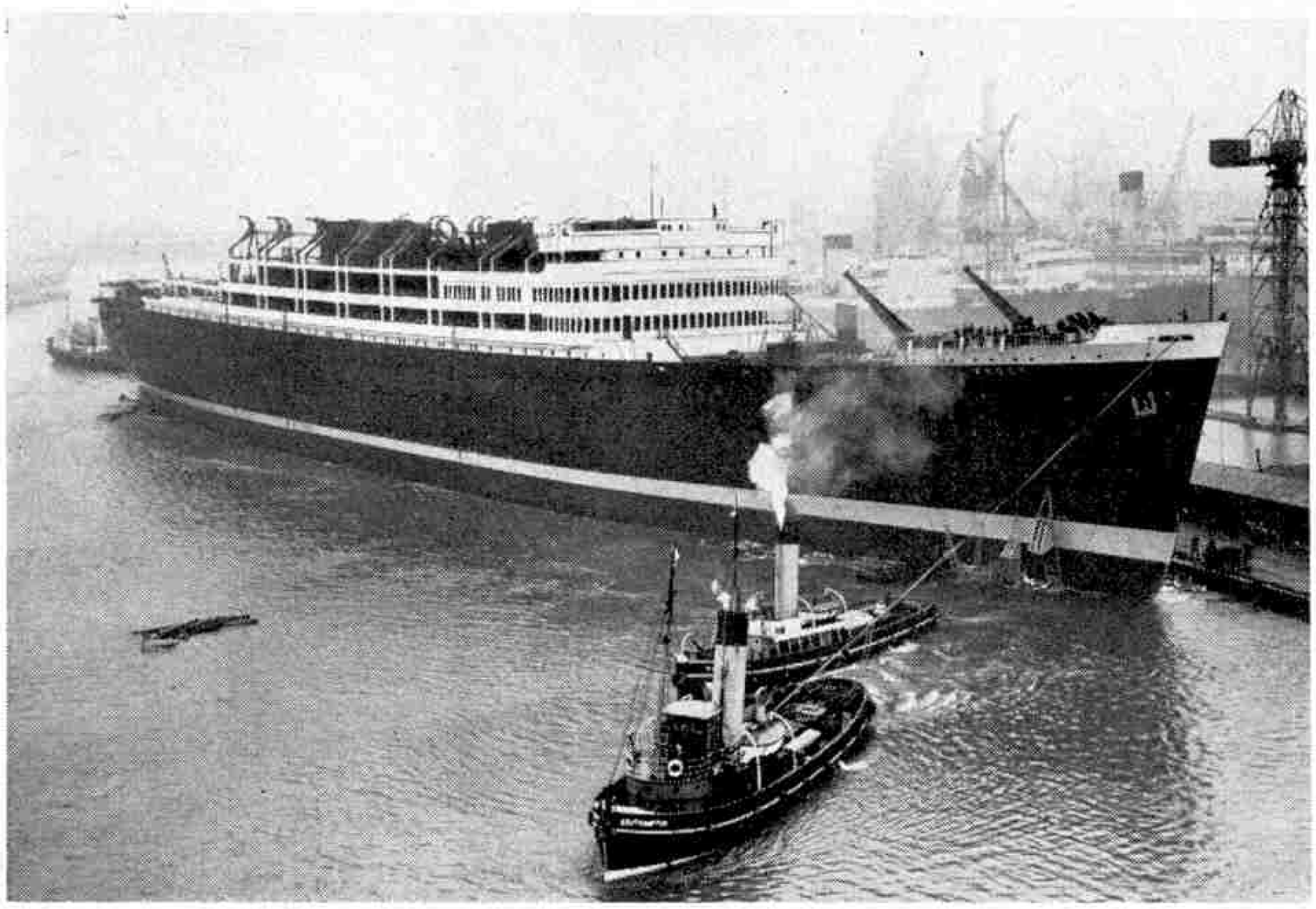
The third large warship to be launched was the battleship *"Prince of Wales,"* a sister ship of the *"King George V."* She is being built by Cammell Laird and Co. Ltd., at Birkenhead, and was sent off the slips on 3rd May by H.R.H. The Princess Royal. An article on the launch of this warship appears on page 343 of this issue.

Altogether the British naval programme for 1939 provides for the construction of two battleships, two destroyer flotillas each comprising five vessels, and 20 fast escort vessels. When orders for these vessels have been placed there will be under construction for the Navy nine battleships, six aircraft carriers, 25 cruisers, 39 destroyers, 19 submarines and many smaller vessels. In addition to the three warships already referred to, two further battleships and three more aircraft carriers are to be launched this year, together with seven cruisers of 8,000 tons and seven of 5,000 tons, 10 destroyers, six submarines and several auxiliary ships. During the present financial year about 60 warships with a total tonnage of 120,000 will be added to the British fleet, together with miscellaneous naval vessels totalling about 25,000 tons.

Harland and Wolff Ltd., of Belfast, are to build and engine the Fleet Air Arm supply and repair ship H.M.S. *"Unicorn."* This vessel will be the first of her kind in the Navy, and will supplement the aircraft carrier in the maintenance of aeroplanes. Its particular purpose will be to provide facilities for the repair and overhaul of engines, which can only be carried out with difficulty in the aircraft carrier.

A Speedy Italian Cruiser

The Italian naval authorities recently took over the new light cruiser *"Taschen,"* on the completion of successful trials. The vessel has a length of 453 ft., with a beam of 45 ft., and a displacement of 3,000 tons. The two sets of geared high-pressure turbines installed have a total output of 110,000 h.p., and gave a speed on trial of 45 knots. The armament comprises six 130 mm. guns mounted in three turrets, six 45 mm. anti-aircraft guns, and nine torpedo tubes.

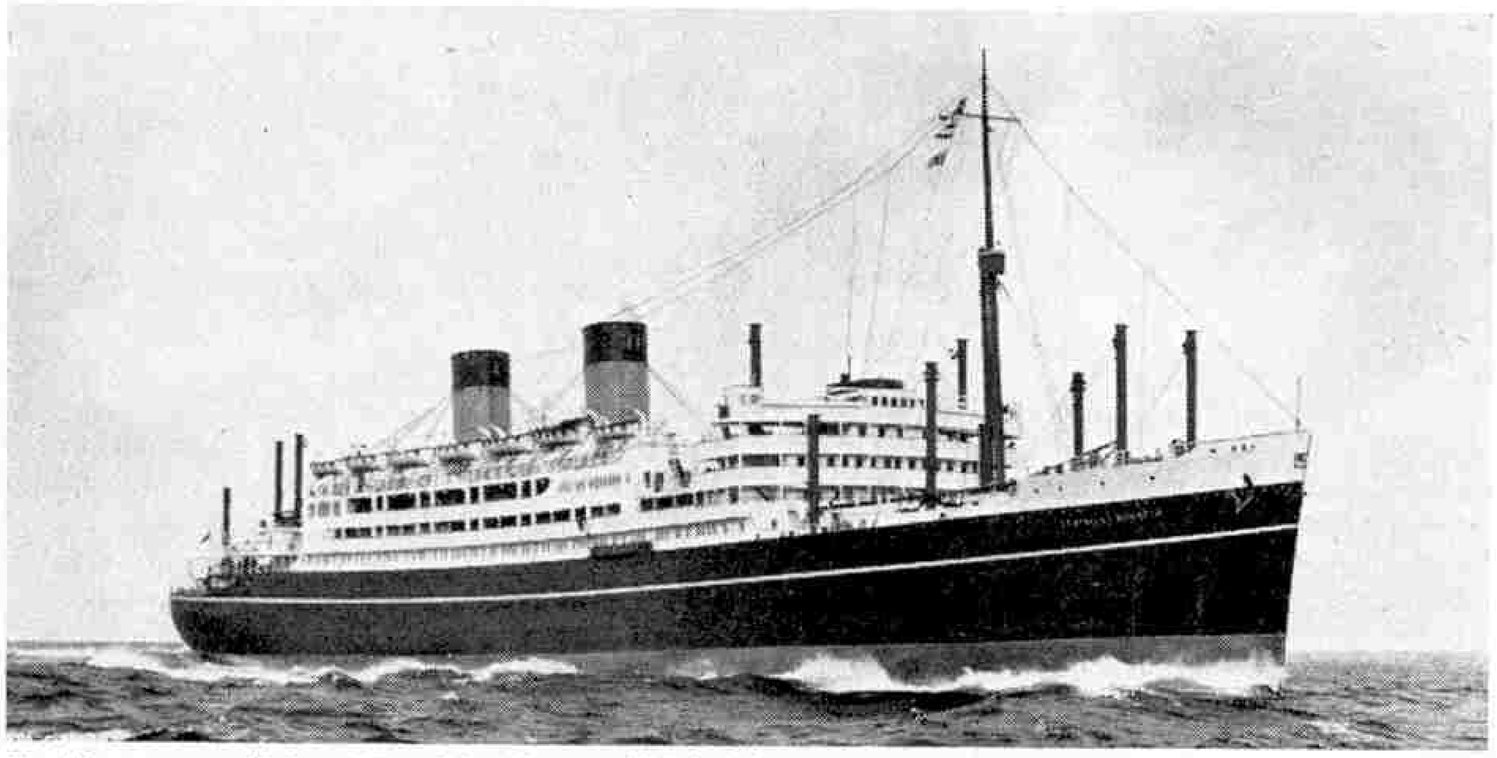


The Royal Mail liner "Andes" after her launch in March at the Belfast yard of Harland and Wolff Ltd., by whose courtesy this photograph is reproduced.

Liner Breaks Records on Maiden Voyage

The accompanying illustration shows the quadruple-screw motor liner *"Dominion Monarch,"* recently built by Swan, Hunter and Wigham Richardson Ltd., of Wallsend-on-Tyne, for the Shaw, Savill and Albion Co. Ltd., which is celebrating its 80th year in the New Zealand trade. This fine vessel has made the occasion of particular note by breaking two records on her maiden voyage on a new service. She left Southampton on 17th February and reached Freemantle, Australia, on 15th March, by way of the Cape, in a steaming time of 23 days 17 hrs. 22 min. Mail ships on this route usually take 28 days. Between Durban and Freemantle she averaged 19.97 knots, yet another record for this route.

The *"Dominion Monarch"* has an overall length of 682 ft., a breadth of 84 ft. 6 in., and a displacement of about 36,000 tons, making her the largest vessel in regular operation between England, Australia and New Zealand. Four Doxford oil engines comprise the main propelling machinery, and have a maximum output of 32,000 b.h.p., making the *"Dominion Monarch"* Britain's most powerful motorship. Provision is made for 525 passengers, all in one class, and the vessel has sports decks with an area of some 18,500 sq. ft.



The Shaw and Savill liner "Dominion Monarch," Britain's most powerful motorship, which on her maiden voyage broke the record for the England-Cape-Australia run. Photograph by courtesy of the builders, Swan, Hunter and Wigham Richardson Ltd., Wallsend-on-Tyne.

New Tonnage in 1938

The tonnage of merchant vessels launched in the world, excluding Russia, during 1938, was the greatest for 17 years. According to Lloyd's Register of Shipping it was 3,033,593 tons, an increase of about 343,013 tons or 12.7 per cent. on that for 1937. This total represents 1,119 vessels of 100 tons gross or more, and of it 1,030,375 tons were from berths in Great Britain and Ireland, and 2,003,218 tons overseas. Of other leading countries, Germany's output was 480,797 tons, and those of Japan and the United States of America were 441,720 and 201,251 tons respectively.

Homeward bound from Beira, South East Africa, the Houston cargo liner "Halizones," passes along the Manchester Ship Canal. Photograph by A. R. Prince, Manchester.

Isle of Man Steamer Passes

The *"Peel Castle,"* of 1,500 tons gross, the oldest vessel in the service of the Isle of Man Steam Packet Co. Ltd., has been sold for breaking up. She was built for the Lancashire and Yorkshire Railway Company in 1894 by William Denny and Brothers Ltd., of Dumbarton, and later bought by a Turkish firm of Constantinople. She returned to British ownership after the War, when she was acquired by the Manx company.

Safety in Ship Design

It is claimed that special features of construction in three new American steamships, the *"Ancon"* and her sister ships *"Panama"* and *"Cristobal,"* owned by the Panama Railroad Steamship Line, will make them the safest vessels in the world. On their completion this year they will operate a passenger service between New York and the Panama Canal, by way of Haiti.

Before designing the new ships experts carried out a long series of tests on an old steamship, the *"Nantasket,"* in which a number of state-rooms were built of a variety of materials, including impregnated and untreated wood, several asbestos compositions, aluminium, and steel. Fires were then started, and as a result valuable information was gained in regard to the behaviour of these different materials.

The new ships are being constructed of incombustible materials, so that a fire can be confined within a small area. In addition, each ship is sub-divided into 12 compartments, and any two of them can be pierced at the same time without endangering the ship. In some cases even three compartments could be damaged without causing the ship to sink. The *"Ancon"* and her sister ships will be the first American vessels to be fitted with life-boats that can be launched safely even if a vessel has a sharp list. The life-boats will be driven by hand levers connected to the propellers, so that passengers can operate them easily.

* * * *

Swan, Hunter and Wigham Richardson Ltd., of Wallsend-on-Tyne, are to build a cable-laying vessel to the order of the Postmaster-General. She will be about 250 ft. long, and in design is similar to other cable ships built in recent years by the Wallsend company. The new vessel will also be used for repairing submarine cables.

Attacks on Water Speed Records

Hans Stuck, the famous German motor racing driver, is reported to have nearly completed the boat he is building for an attempt on the 800 kg. Class water speed record of 93 m.p.h., to be made on the Starnberge Lake, near Munich. The boat is fitted with engines of the Auto Union car type.

Last summer Mr. Edward Spurr carried out tests on Lake Windermere with the hydroplane *"Empire Day,"* with a view to attacking the water speed record. During the winter his boat has been rebuilt and fitted with a 1929 Schneider Trophy type Napier engine that develops 930 h.p. at 3,400 r.p.m. *"Empire Day II"* is 16 ft. in length, with a beam of 6 ft., and has a hull of Alclad alloy with a steel bottom. The main step is 4 in. deep and 5 ft. wide.

The World's Most Powerful Lighthouse

New equipment at present being fitted in the Creach lighthouse at Ushant will make it the most powerful in the world when completed next year. The new optical installation finished and put into service has unusually high illuminating power, and gives a flash at two levels once every 10 seconds. Work is now going ahead on the generating station, the output of which is being increased to raise the candlepower of the lantern from 5,000,000 to 500,000,000. The light at present is visible for nearly 30 nautical miles under prevailing conditions.

Cross-Channel Steamers to be Replaced

The Dieppe-Newhaven steamers *"Rouen"* and *"Newhaven"* of the French National Railways are reaching the end of their term of service, and two similar vessels are being built by the Forges et Chantiers de la Méditerranée to replace them. They will have a length of 308 ft., with a displacement of 2,000 tons, and will be capable of carrying about 1,450 passengers. Twin propellers will be driven by Parsons turbines developing about 20,000 h.p., and giving a speed of about 25 knots. All auxiliary machinery will be electrically driven.

One of three cargo steamers on the same route is also to be replaced by a vessel under construction at the Rouen yard of the Chantiers de Normandie. Two 500 h.p. M.A.N. engines will be fitted, and 58 motor cars will be accommodated.

* * * *

A large tank for experiments on ship propellers is to be built in Holland for propellers up to 20 in. in diameter and driven by engines of up to 250 h.p.

Recent Types of British Light Aircraft

Monoplanes for Training or Touring

THE increasing range of British light civil aircraft now includes many types suitable for flying clubs training Civil Air Guard pilots, and for the trained pilot who can afford to buy a light aeroplane for himself. The four monoplanes described in this article are typical examples of these aircraft.

This "Wicko" 2-seater cabin monoplane was the first of a series delivered to New Zealand last year, and now in use there as trainers. Photograph by courtesy of Foster, Wikner Aircraft Co. Ltd.

The first one illustrated is the "Wicko" two-seater monoplane designed by Mr. Geoffrey Wikner, an Australian engineer who began his business career as technical adviser to an electrical and refrigerator company. In 1929 he became interested in aviation, and particularly in the construction of gliders, and later he founded an aircraft company at Brisbane, where he designed and built his first aeroplane. This was the "Wicko" single-seater sports monoplane, which was fitted with an "Anzani" engine salvaged from the wreck of the first aeroplane Wikner ever flew, an old Farman sport biplane bought—and crashed!—in 1929. The "Wicko" was flown for the first time in January 1931 at Archerfield Aerodrome, Brisbane. Wikner had only three hours solo flying to his credit when, in this aeroplane, he set up an Australian height record for light aircraft by climbing to 17,000 ft.

Other very successful "Wicko" light aeroplanes were built, in 1934 the designer came to this country, where the firm of Foster, Wikner Aircraft Co. Ltd., was founded, and British "Wicko" two-seater monoplanes began to make their appearance. The latest type produced by this company, which is the one illustrated here, is a sturdily-built cabin monoplane of wood, with a high wing almost rectangular in shape and 31 ft. 6 in. in span. The wing is built in one piece and is attached to the top longerons of the fuselage, and its centre portion forms the roof of the cabin. Additional support is provided by two pairs of inclined bracing struts which extend from the base of the fuselage to the underside of the outer portions of the wing.

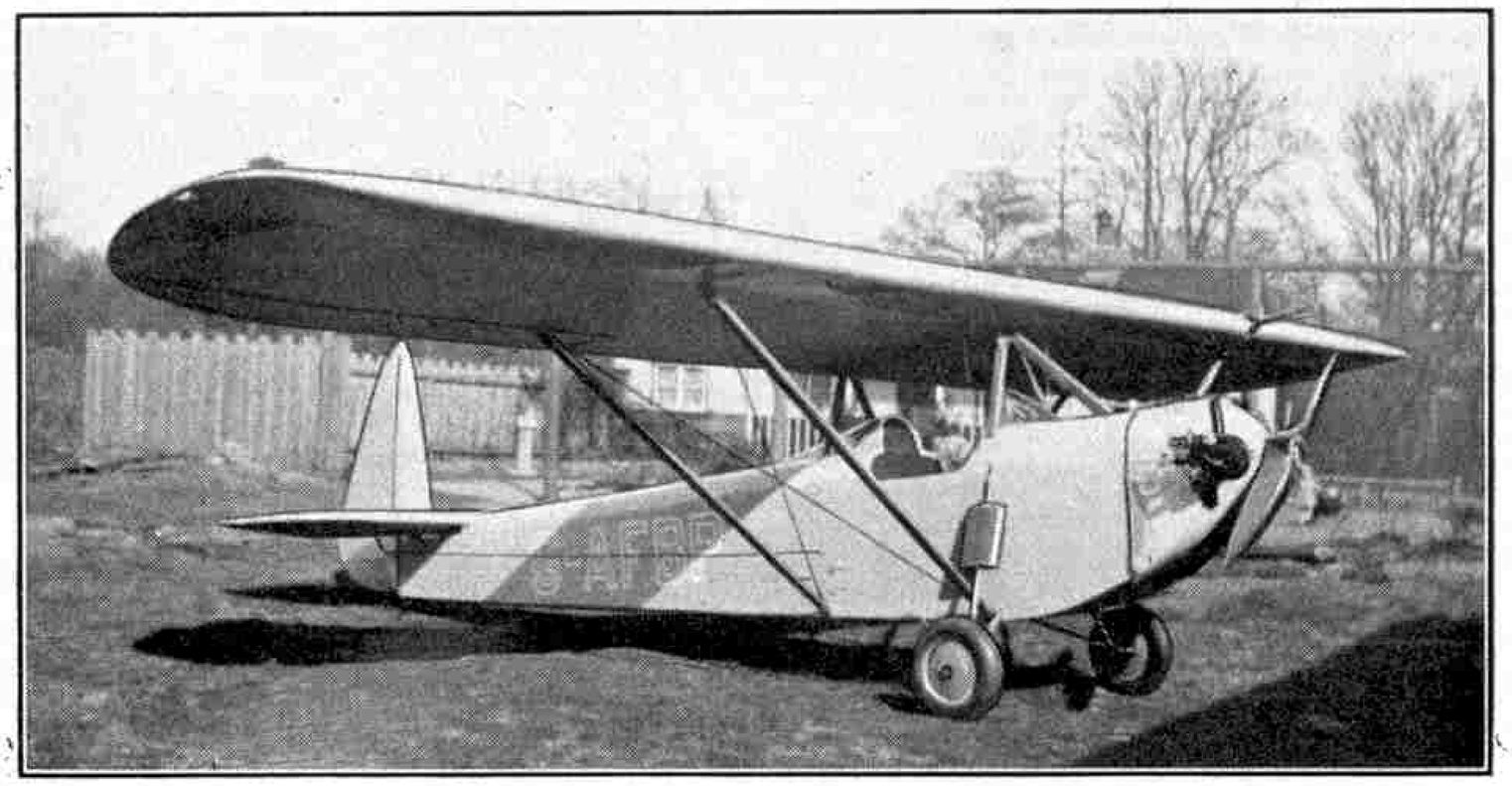
The box-type fuselage is of a simple construction that enables it to be built without the use of costly jigs, and this in turn greatly helps in producing a cheap aeroplane. The cabin has side-by-side seating and dual control. The short legs of the fixed undercarriage are enclosed in streamlined fairings, and the wheels are almost hidden in spats that taper sharply to a point at the rear. The 130 h.p. D.H. "Gypsy Major" engine of the "Wicko" gives it a top speed of 140 m.p.h. The aeroplane cruises at 122 m.p.h., and at this speed has a range of 500 miles.

The other high wing monoplane shown on this page is the Luton "Minor." The development of this attractive small aeroplane dates back to 1936. The famous French *"Pou du Ciel"* or "Flying Flea" "baby" aeroplane was then in the news, and when this quaint machine with its tandem-wing arrangement first appeared in this country, there were many who doubted whether it would be a success, and questioned the wisdom of adopting the unusual methods of construction and control employed in it. The "Flying Flea" quickly became popular, and many hundreds were built, most of them by enthusiastic amateurs. When these aircraft were flown, however, many accidents took place, and although usually they resulted only in a few cuts and bruises, some were fatal, and in most cases the machine was considerably damaged.

The reaction to this general experience was that practically all flying in these tiny aircraft was first suspended and later abandoned. It was felt that there was some good in the design, however, and Luton Aircraft Ltd. decided to determine whether the wing arrangement used in the "Flying Flea" possessed the many advantages claimed for it and borne out by theory. They therefore built an experimental aeroplane, which had two wings in tandem but an orthodox tail unit and normal controls, and subjected it to flight trials over a period of about two months. It did not show any of the vices that characterised the French machine, but some mutual interference took place between the wings at certain flight attitudes, and particularly when the aeroplane was climbing. This interference reduced the efficiency of the aeroplane to an undesirable extent.

The experiment proved that if a light aeroplane was to be produced for the novice pilot and at a price the many interested amateurs could afford, it must be designed along orthodox lines, and have effective, but gentle-acting and well synchronised controls. It must be essentially stable both in flight and on the glide, and with simple take-off and landing qualities so that it would practically perform these manœuvres of its own accord.

The Luton "Minor" single-seater monoplane was then designed to meet these



The Luton "Minor," one of the few types of parasol monoplanes produced in this country. Photograph by courtesy of Luton Aircraft Ltd.

requirements. It has a long fuselage to give flight stability, control surfaces of ample size, and carefully selected gearing. The first flight proved the correctness of the theory on which the design had been based, and not a single modification, from an aerodynamic standpoint, was found necessary for the production model.

This light aeroplane is one of the few British types of parasol high wing aircraft, the wing being held above the fuselage rather like a parasol instead of being fixed to the upper longerons. It is built of wood, and the extremely strong wing is supported by two steel pylons, one just in front of the open cockpit and the other just behind it. It is braced on each side of the fuselage by a pair of long tubular steel struts. The wing is not made to fold, but can be detached very easily if it is required to store the aeroplane in a small hangar or other very limited shelter. The detaching of the wing takes only 5 min., and reassembly about 15 min. No rigging adjustments are necessary, as once the aeroplane is built there is nothing to get out of place.

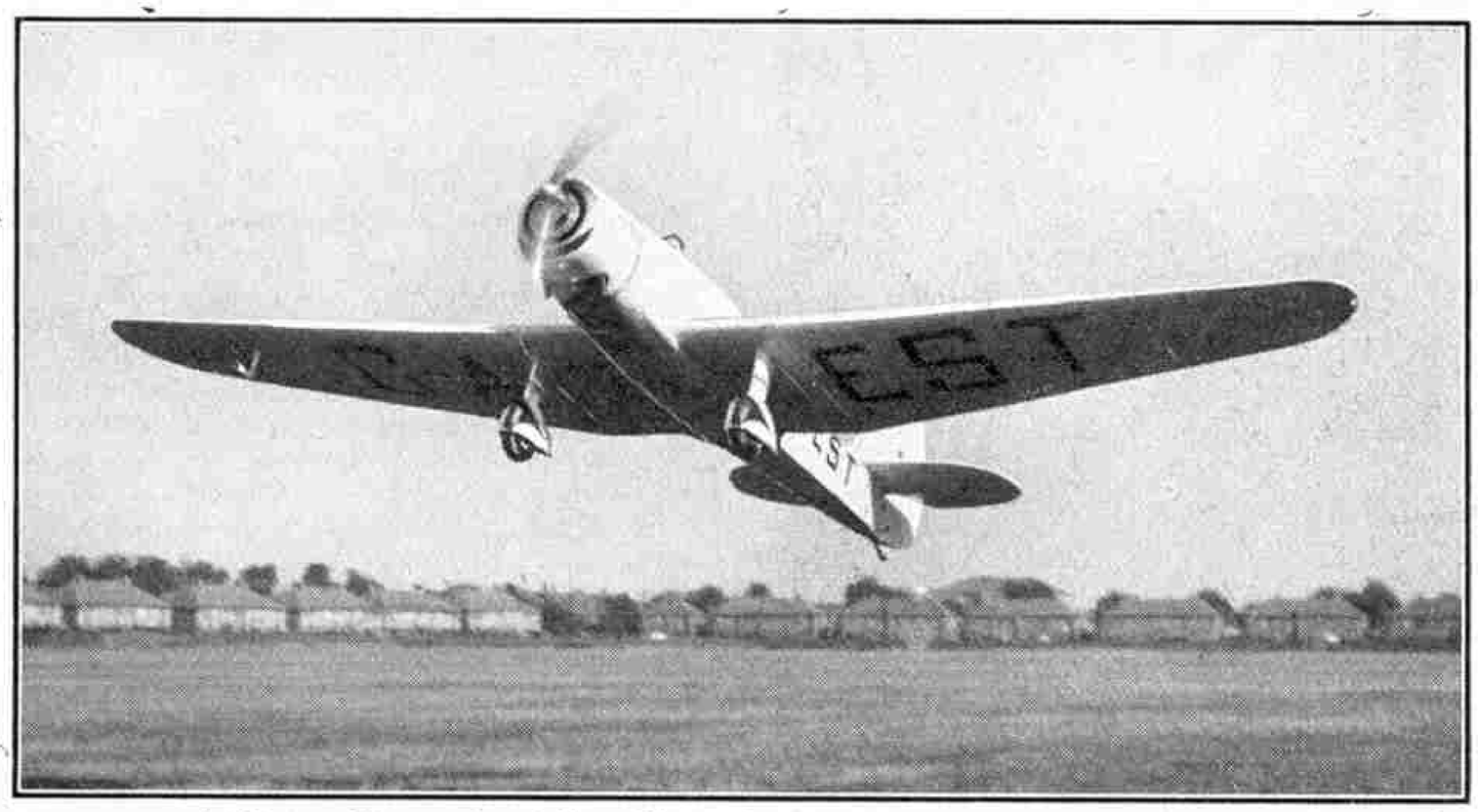
When fitted with a 35 h.p. Luton "Anzani" engine the "Minor" has a top speed of 85 m.p.h. It cruises comfortably at 75 m.p.h., and at this speed it has a range of 225 miles. It also cruises with the engine at half-throttle, a good test for an aeroplane of this class, and the speed is then 60 m.p.h. and the range is increased to 270 miles. Larger fuel tanks can be fitted if longer non-stop flights are required.

The Luton company have completed the prototype model of a two-seater high wing cabin monoplane designed as a safe training and touring machine. The wings of this aeroplane are arranged to fold, each one being released merely by the removal of a special pin. A 55 h.p. Walter "Mikron"

Flying the "Tipsy" 2-seater, a light but very strong machine that can be used for aerobatics instruction in addition to normal flight training. Photograph by courtesy of Tipsy Aircraft Co. Ltd.

5 cwt. Any type of engine up to 40 h.p. could be fitted, and with one of this power the aeroplane could attain a speed of 124 m.p.h. Owing to its light weight and carefully streamlined form it consumed much less power than most machines of its class.

Mr. Tips followed up this early success by introducing the "Tipsy" B, a slightly larger machine of similar design and seating two people. It is designed for use either as a tourer or trainer, and in the latter capacity is excellent for giving Civil Air Guard instruction. Since the original was produced and tested several modifications to the design have been made. These have



A "Mosscraft" monoplane taking off in good style. Photograph by courtesy of "Flight."

engine is fitted, and gives the aeroplane a top speed of just over 100 m.p.h.

The low wing monoplane shown in the upper illustration on this page is the British "Tipsy" B, built by Tipsy Aircraft Co. Ltd. under licence from the Fairey Aviation Co. Ltd. Mr. E. O. Tips, the creator of the "Tipsy" aeroplanes, is the General Manager of the Belgian Fairey Company. The first model was introduced in 1937, and was a single-seater low wing monoplane designed as a light tourer. It became popular on account of being both efficient in the air and very cheap and easy to fly. With full load, including enough fuel for a flight of four hours, it weighed under

included increasing the angle and taper of the wing, adding flap gear, and mass-balancing the ailerons and rudder. The structure of the aeroplane also has been strengthened as a whole in order to make it even more suitable for its dual purpose of trainer and tourer. The first production model successfully passed its tests for the normal Certificate of Airworthiness at Martlesham last August and shortly afterwards qualified for an aerobatic C. of A.

As a training aeroplane good points about the "Tipsy" B are that the slight staggering of the side-by-side seats in the cockpit makes for ease of movement, gives greater confidence to the pupil and permits easy conversation between him and the instructor. The visibility from either side of the cockpit is excellent, both when the aeroplane is in the air and when taxi-ing along the ground, an important consideration when operating from congested aerodromes. For the private owner, the good take-off and the slow landing speed enable the aeroplane to be operated from small fields, and the easy maintenance and very low petrol consumption of about 3 gall. per hr. at cruising speed reduce running costs to a minimum.

The "Tipsy" B is a low wing cantilever monoplane of wood. The wing is made in one piece and is secured to the fuselage by four bolts that pass through stainless steel fittings on the front and rear spars of the wing. A specially designed extension to the tail skid, working in conjunction with the rudder movement, enables the aeroplane to be easily controlled when taxi-ing.

The "Tipsy" B has a 62 h.p. Walter "Mikron" II engine, and is capable of a top speed of 110 m.p.h. The stalling speed is as low as 35 m.p.h. The service ceiling of this aeroplane is 15,000 ft., and the range is 300 miles.

Another interesting low wing monoplane is the "Mosscraft" two-seater shown in the lower photograph on this page, and produced by Moss Brothers Aircraft Ltd., of Chorley, a company formed in 1936. The five directors are brothers and all are experienced pilots. The eldest holds British, American, and Argentine licences, and four of them have the Instructor's Certificate in addition to their pilot's licence. The company therefore have considerable actual flying experience to guide them in designing really practicable aircraft. Their first aeroplane, introduced in September 1937, was a two-seater light cabin monoplane fitted with a 95 h.p. Pobjoy "Niagara" III engine and capable of a top speed of 130 m.p.h. The fuselage of this aeroplane is very slim for a two-seater, achieved by arranging the cabin seats in tandem.

Last year the company introduced an open cockpit version of this monoplane, and this is available in two forms, one intended for use as a tourer and the other for training. When equipped as a trainer the "Mosscraft" low wing monoplane has a top speed of 127 m.p.h., and when fitted out as a sports machine the top speed is 135 m.p.h. In both cabin and open cockpit form it is flown normally from the front seat, and has a range of 500 miles.

RAILWAY NEWS

"The Coronation Scot's" American Tour

Driver Bishop, who was given charge of the engine of *"The Coronation Scot"* during its stay in America, unfortunately was stricken with pneumonia soon after he landed, and was able to make only one test run on the Washington Branch of the Baltimore and Ohio Railroad. There was no spare crew, so Fireman Carswell was temporarily promoted driver by Mr. Robert Riddles, the L.M.S. Scottish Mechanical and Electrical Engineer who is in technical charge of the train while in America, and Mr. Riddles himself took over the fireman's duties. Readers will be pleased to learn that Driver Bishop has now fully recovered.

The action of Mr. Riddles, a "white-collar" man as he was aptly termed in the States, in assigning himself a heavy, dirty and arduous task, was greatly appreciated and admired by our American friends. On one trip Mr. Riddles had to feed the fire-box with 12 tons of coal! For this information we are indebted to the *"Baltimore and Ohio Magazine."*

American observers have been very favourably impressed by the paintwork of the locomotive and coaches of *"The Coronation Scot."* This was described as the "most lustrous and beautiful paint job" they had seen on any train.

* * * *

Platform C at London Road Station, Manchester, is at present 2 ft. 2 in. in height above the rails and is considerably below the level of carriage floors. It is therefore to be raised to the standard height of 3 ft.

L.M.S. Locomotive Notes

Class 8 2–8–0 tender engines Nos. 8117 and 8118 have been seen at work at Crewe.

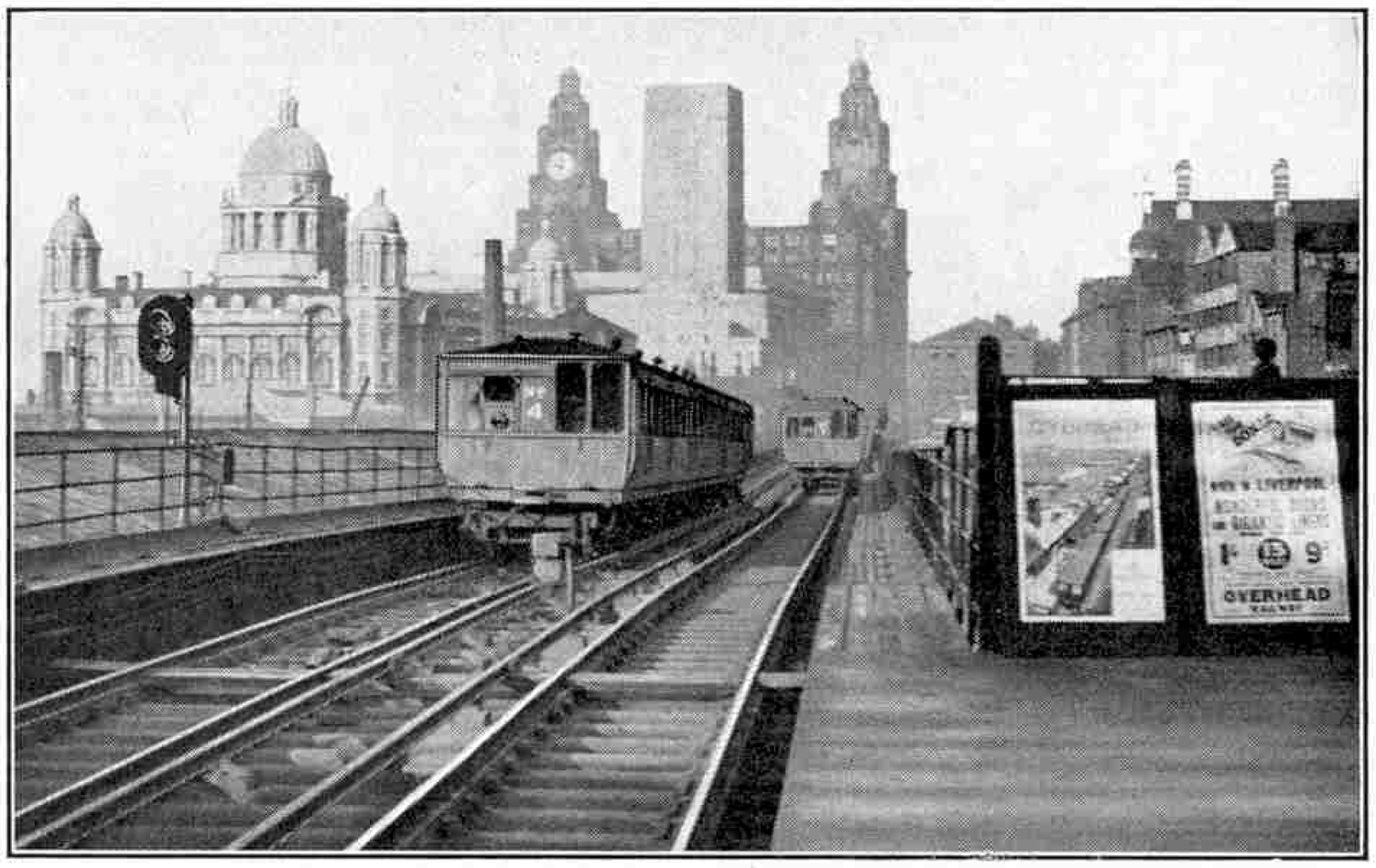
Among the engines condemned are 4–4–0s Nos. 14342, 14347 and 14362 of the former Caledonian Railway, and *"Fire Queen,"* No. 25362, one of the well-known old L.N.W.R. "George the Fifth" class.

A link with the palmy days of the "American Special" traffic between Euston and the Riverside station at Liverpool has been severed by the withdrawal of 0–6–0T No. 27334 *"Liverpool."* This was one of the two "Special Tanks" of the former L.N.W.R. allocated to the working of these trains between Edge Hill and Riverside.

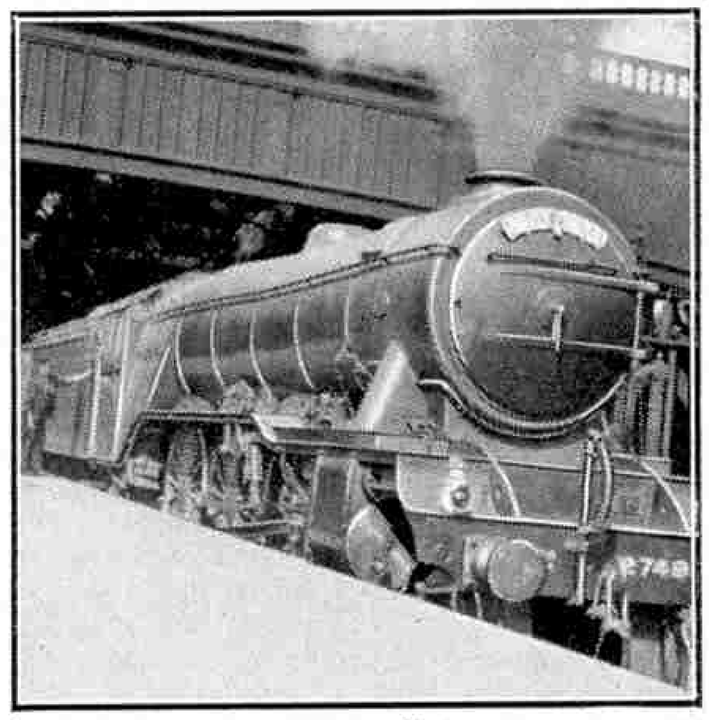
In view of their special duties these engines were named *"Euston"* and *"Liverpool"* respectively; apart from this distinction from the remainder of L.N.W.R. tank engines they were fitted with condensing apparatus as the greater part of their one-time regular beat is in tunnels. Another peculiar feature was the fitting of square-section tanks, the remainder of the L.N.W.R. engines of this class having round saddle tanks. *"Euston"* was built in 1876 and was withdrawn some time ago, so that *"Liverpool,"* built in 1875, has had the longer life.

Riverside traffic is now worked to and from Edge Hill by the familiar Crewe 0–6–2 "Coal Tanks."

It is expected that the first of the new batch of streamlined 4–6–2s will be ready early this month.



The Liverpool Overhead Railway with the Dock Board Building, Royal Liver Building and one of the Mersey Tunnel Ventilating Shafts forming the background. Photograph by T. C. L. Hutchinson, Liverpool.



L.N.E.R. "Pacific" No. 2749 "Flamingo" on the up L.M.S. "Thames-Forth Express" at Edinburgh in readiness for the run over the Waverley route to Carlisle. Photograph by G. L. Wilson, Wormit-on-Tay.

Fine Running by "Castle" Locomotives

The following notes of G.W.R. runs are contributed by Mr. R. A. H. Weight.

On the 1.15 p.m. from London for Bristol and Weston-super-Mare, which runs the 106.9 miles to Bath in 102 minutes at an average speed of 62.8 m.p.h., a full load of 335 tons, more than the usual weight, was headed by the Bristol "Castle" class engine No. 5084 *"Reading Abbey."* Acceleration was not so rapid as usual, but between Slough and Twyford speed was maintained on the level at 66-68 m.p.h. A long slack through Reading for relaying occurred, and by Didcot the train was four minutes "down" on schedule. An average of 67.7 was then maintained up faintly rising grades, so that Swindon, 77¼ miles, was passed almost in "even time" in just under 78 min. The final booking is fast, but a minute was won back, speed ranging from 79 on the short Dauntsey descent to a minimum uphill near Corsham of 65. No. 5084 stopped at Bath in an actual time of 103 min. 55 sec.; the net undelayed time would not be more than 101½ min., a half-minute under schedule.

On the *"Cheltenham Flyer,"* No. 5007 *"Rougemont Castle"* hauling the usual 7 cars, or about 230 tons behind the tender, made an unchecked flight in showery weather and knocked off 2½ min. from the allowance; actually an average overall of 74.2 m.p.h. was achieved. Over 75½ miles were covered in one hour from the start and over the 25 miles of first slightly falling and then level track between Uffington and Pangbourne 85.3 m.p.h. was averaged and 88 m.p.h. sustained three times. A slight easing took place, but the train travelled at well over 70 m.p.h. until reaching Acton. After that the last 4.3 miles to the terminal stop took just 5 min.

A fine effort of a different character was made on the same train by No. 4093 *"Dunster Castle."* Time was being nicely kept with maxima of 85-6 when a slowing to 30 m.p.h. was necessitated by track repair work near the Thames at Pangbourne. This put the train 1¼ min. behind time through Reading, but then a mean rate of 82.8 was sustained for 25¼ miles, with nothing less than 80 m.p.h. or more than 85 m.p.h. A slight signal check was experienced as the train slowed in from Westbourne Park, but a stop in the terminus was secured in only 63¾ min. The net time of no more than 61 minutes was equivalent to 76 m.p.h. unchecked throughout.

The World's Fastest Steam Train

The honour of running the fastest steam service in the world now belongs to the Belgian National Railways. Since the introduction of the summer timetables last month two new expresses between Brussels and Ostend have been making the run between Brussels and Bruges at a start-to-stop speed of 75.3 m.p.h. The whole journey of 70.8 miles is covered in 1 hr. in each direction.

New locomotives of the 4–4–2 or "Atlantic" type and, rather remarkably, of inside cylinder design have been introduced for these trains. They have driving wheels 6 ft. 10⅝ in. in diameter, cylinders 18⅞ in. by 20⅜ in. and a boiler pressure of 256 lb. per sq. in. They are provided with streamlined outer casings. The tenders are six-wheeled and are comparatively small, large supplies of fuel and water being unnecessary for the distance involved. The engines have been constructed at the well-known Cockerill Works at Seraing.

Prior to the inauguration of this Belgian service the fastest steam run in the world was that of the American *"Hiawatha"* service of the Chicago, Milwaukee and St. Paul Railroad. This involved an average of 74.6 m.p.h. for 78.3 miles.

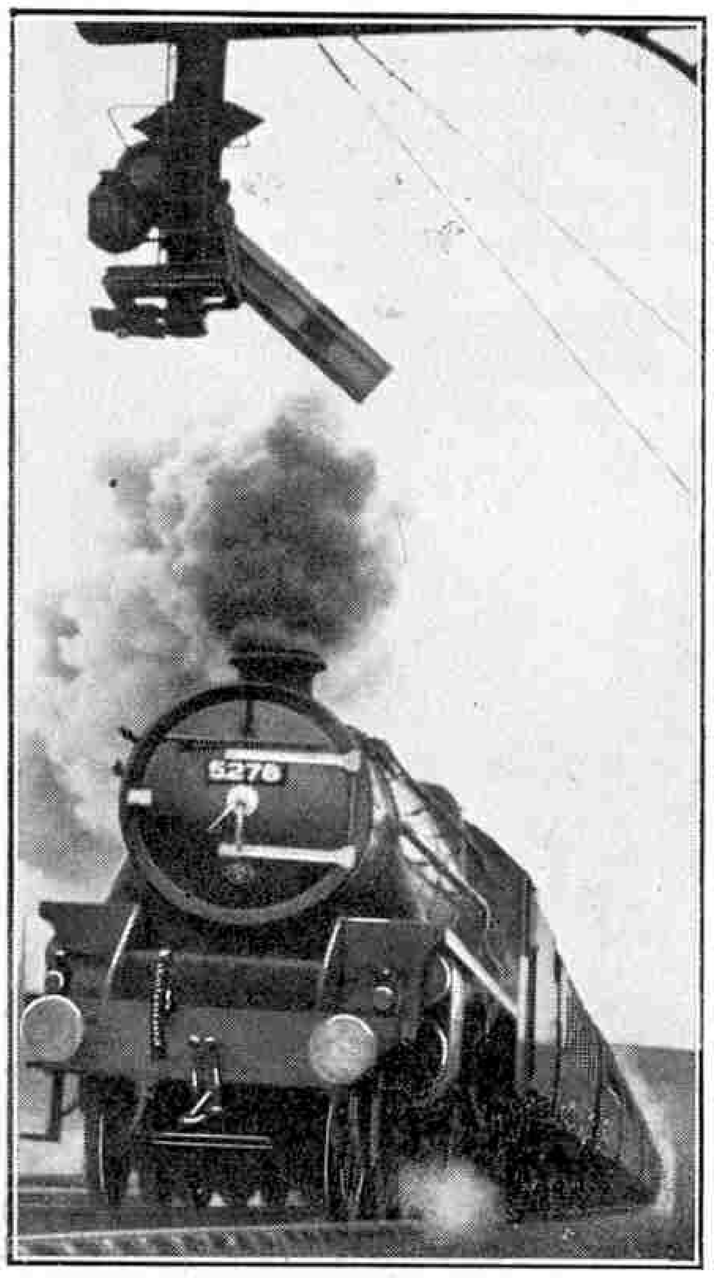
Railway Facts from The United States

The average speed of freight trains in the United States last year was over 60 per cent. higher than in 1920.

A passenger can leave New York by train on a Friday night and arrive on the Pacific Coast on the following Monday morning.

Nearly 11,000 passenger cars owned by the railroads and the Pullman Company are air-conditioned.

Passenger trains operating over 48,247 miles of daily runs in the United States now maintain schedules of 60 m.p.h. Schedules of 70 m.p.h. and more are maintained by passenger trains operating over runs totalling 4,415 miles.



St. Pancras to Manchester express passing Elstree. Photograph by courtesy of the L.M.S.

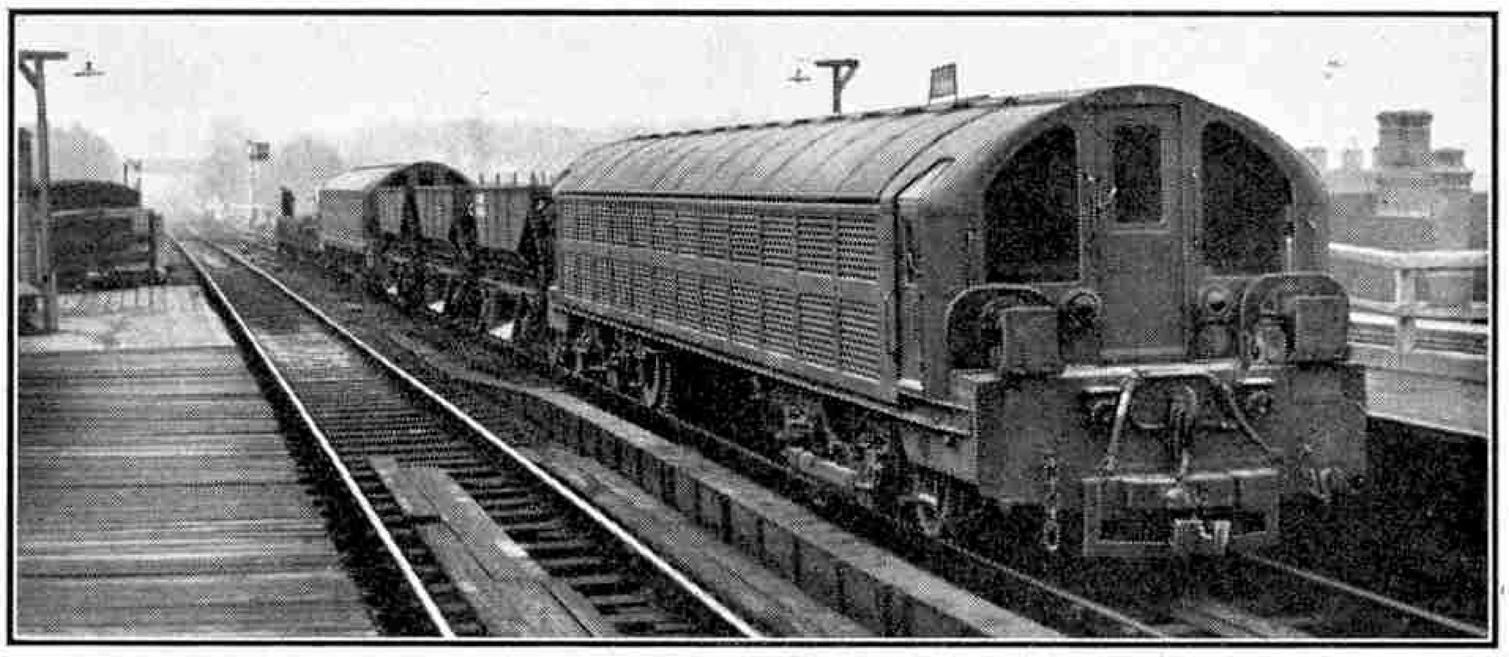
The *"Locomotive Stock Book"* Now Ready

In March last we made a preliminary reference to the latest edition of the *"Locomotive Stock Book"* published by The Railway Correspondence and Travel Society. This first appeared four years ago. The popularity of the book has steadily grown year by year, and it is now the standard reference work of its kind.

The *"Locomotive Stock Book 1939"* contains complete classified lists of the locomotives of all the railways in Great Britain and Ireland as at 31st December 1938, together with the alterations which were made to the locomotive stocks during last year. The list of named locomotives includes the latest alterations, and a new feature is the inclusion of a list of engines that are now preserved, with details of their whereabouts.

The book illustrates every class that became extinct during 1938. There are 56 illustrations, including a series showing different fashions in locomotive name-plates, name and number styles and various locomotive decorations such as coats of arms and so on.

The *"Locomotive Stock Book"* is most useful for reference. It will appeal strongly not only to those "name and number" enthusiasts who wish to keep their knowledge up to date, but to all who are interested in locomotive matters. Copies can be obtained from Mr. R. T. Pollock, 102, Disraeli Road, Putney, London S.W.15, at 2 6 each post free.



L.P.T.B. battery locomotives and train at East Finchley, L.N.E.R. Photograph by W. S. Garth, Luton.

G.W.R. Locomotive News

New engines recently completed at Swindon include 4–6–0s Nos. 6875-72 *"Hopton Grange," "Morfa Grange," "Peterston Grange," "Penrhos Grange," "Resolven Grange," "Bodicote Grange," "Bourton Grange"* and *"Crawley Grange."*

Among the engines taken out of stock are 4–4–0 No. 3268 *"Chough"* and 4–6–0 No. 4065 *"Evesham Abbey."*

Trains to Light their own Signals

A system of approach lighting is to be applied to 17 automatic distant signals in the Southern Area of the L.N.E.R. system. These signals are situated on the main line between King's Cross and Retford, and also near Sleaford and Leeds and on the Cambridge line near Audley End.

Under the new system no lights will normally be visible, but when a train approaches the appropriate signal is automatically displayed immediately the train is within sighting distance, and is extinguished when the train has passed.

Railway Improvements in Essex

The L.N.E.R. have decided to make further improvement in Colchester, where work is at present in progress on a scheme of improvements. Instead of rebuilding the signal box at the west end of the station to deal with semaphore signals of the standard type, colour-light signals are to be installed and will be operated from a relay panel in a signal box of the latest design.

Plans have now been made to build a new combined refreshment room and tea room on the up platform, a new booking office and enquiry office and improved booking hall, and offices for the station-master and staff. On the down platform, the refreshment room and dining room are to be combined and re-designed, the booking hall and booking office are to be reconstructed. The construction of a new awning over the up platform is in progress.

The original scheme, on which work is now proceeding, includes the straightening of the track through Colchester, the provision of new sidings, subways and an improved goods yard and the lengthening of platforms at Hythe and Thorpe-le-Soken. Other work involved consists of improvements to the stations at Frinton and Walton-on-the-Naze, and the doubling of the present single line between Thorpe-le-Soken and Clacton.

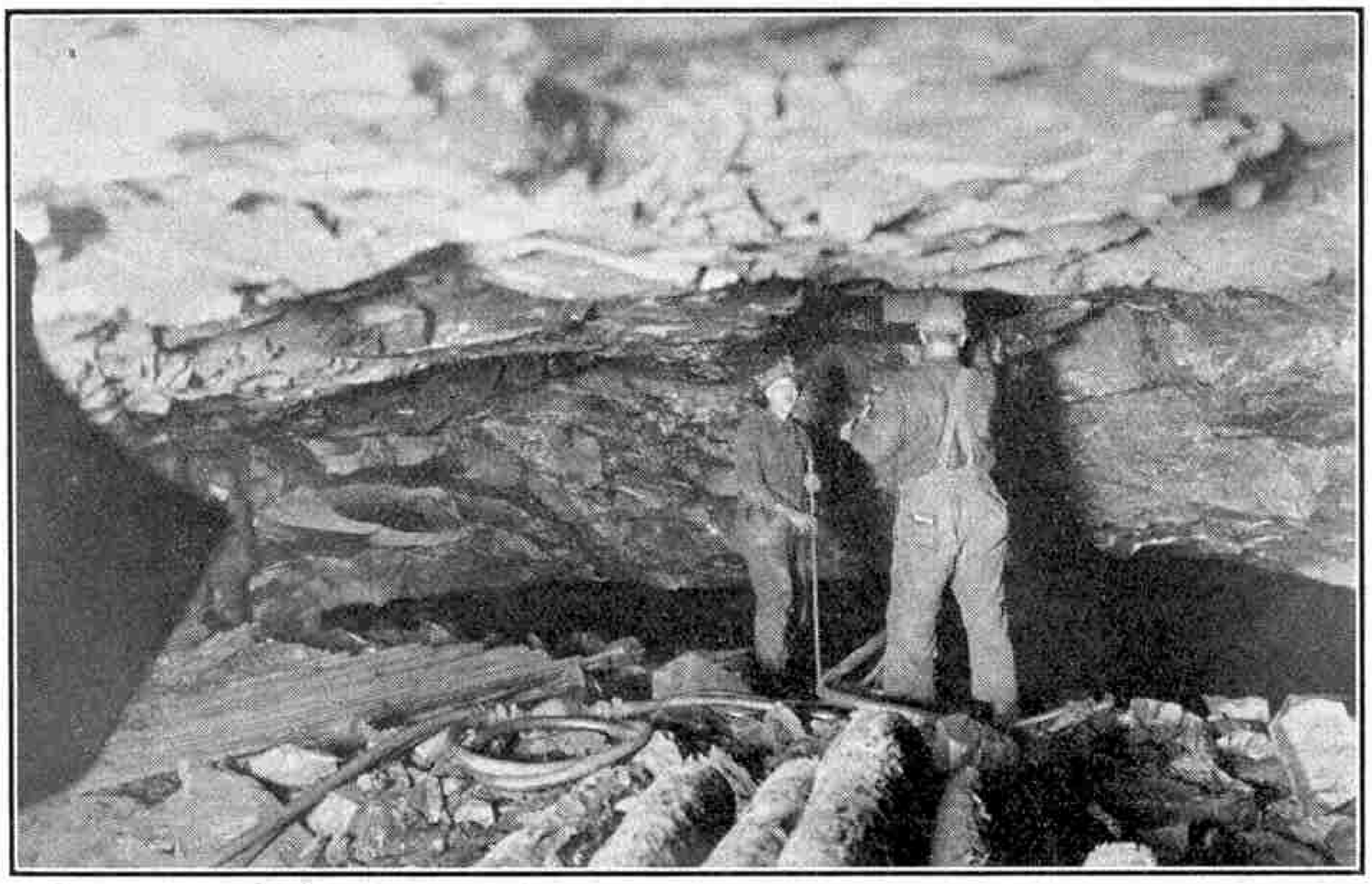
Yorkshire Viaduct Reconstruction

Work has begun on the reconstruction of Snaygill Viaduct, situated on the L.M.S. between Cononley and Skipton on the Leeds to Skipton line, where it takes the railway over the River Aire.

The new structure will consist of two spans, one of 70 ft. over the river, and the other of 50 ft. to the south. Steel main and cross girders and concrete decking will form the superstructure, while the existing south abutment is to be extended to accommodate the extra width of the new bridge. With the same object in view, additional concrete piers and sill girders, spanning the stretch between the new piers and the old piers, are to be constructed at each side of the river.

New Irish Suburban Railcar

The Northern Counties Committee of the L.M.S. has recently completed at its Belfast works a 5 ft. 3 in. gauge 80-seat suburban railcar capable of speeds up to 70 m.p.h. The design of the car follows that of the cars built some time ago, except that it has a teak-framed body and steel outer panels. Power for driving the car is supplied by two Leyland six-cylinder oil engines.



Below ground in a nickel mine, with drilling in progress in readiness for blasting. The illustrations to this article are reproduced by courtesy of the Bureau of Information on Nickel.

The Story of Nickel

I—How the Ore is Mined and Treated

DURING the Middle Ages the craft of mining for metals was associated with much mystery, and miners believed that the gnomes and other supernatural beings supposed to inhabit the mines had influence over the metals that were present. At that time the demand for copper was largely met by the mines of Saxony and Bohemia. Occasionally the miners there found reddish ore that looked as if it contained copper, but from which it was impossible to extract this metal. They called the ore "Kupfernickel," or "Old Nick's Copper," believing it to be bewitched, and it was not until nearly the end of the 18th century that the presence in it of nickel was realised and the metal was refined by German metal workers.

The first uses of the new metal were in the production of nickel silver for ornamental metalwork and in coinage. Later it was applied in electroplating, but its use was not expanded to any extent until the mining of nickel on New Caledonia in the Pacific Ocean. By 1887 the competition of the ores from this island had brought all other nickel mining, save that in Norway, to a standstill and during the next 15 years this was the principal source of nickel.

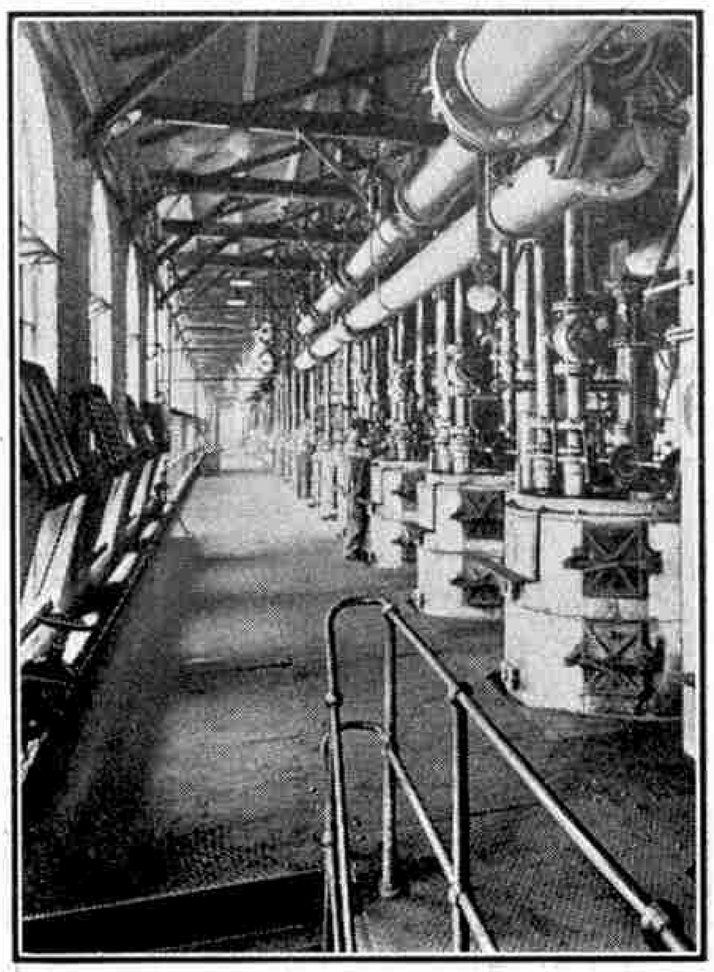
The occurrence of nickel in Canada was first reported in 1848, but its exploitation did not begin until the first railway penetrated the vast wilderness, about 50 years ago. At that time Sudbury, in Northern Ontario, was the terminus of the Canadian Pacific Railway and construction was proceeding westwards. In the course of this work, a cutting was made through an outcrop of copper ore, and following this discovery prospectors flocked to the district and a large number of claims were staked. Even when mining operations were begun the owners were unimpressed by the presence of nickel in the ore, but they failed to extract copper from the ore, all that was obtained being a worthless alloy. Eventually a process of separating the copper from the nickel was developed, however, and this, with certain refinements, continues to be the standard Canadian method for treating the ores.

In one of these Canadian mines, known as the Frood Mine, ore is being worked at present from the 2,800-ft. level. The shaft is not sunk through the ore body, but is over 2,000 ft. away and is connected to it by a road with a smooth, dry bed. White painted walls and car tracks running through the capacious tunnel lit by overhead lights are reminiscent of the Underground Railway.

The ore is mined in "stopes" about 40 ft. above the main floor of the 2,800 ft. level. The first step in eliminating unwanted materials is taken there, for the miners sort out the rock broken down with the ore and pack it in behind the cut as a filling. The ore drops into bins above the car tracks, from which it passes to ore cars that are made up into trains and hauled to the main dump at the shaft. There a car unloader spills the ore into a crusher below the tracks, and this breaks up the larger lumps and feeds the ore to the skips that take it quickly up to the surface. At the pit head, ore is once more inspected for elimination of rock, and then passes to another crusher before transport to the smelter.

The smelter is at Copper Cliff, a few miles away from the mine. The ore reaches it on elevated tracks, and is dumped into bins above crushers that commence the process of pulverising. Coarse crushers feed into finer ones, and they in turn into rod mills that pass their products along to the pulverisers. In the last two stages water is introduced, and the result is a suspension to which certain reagents are added to neutralise the acidity. A battery of selective flotation tanks makes a rough but effective separation of the copper and the nickel minerals, and from this point there are two products, one rich in copper and the other in nickel.

Following the course of the latter, the next stage is the elimination of the water, which has now completed its work. Some is removed in a settling tank and some in a battery of

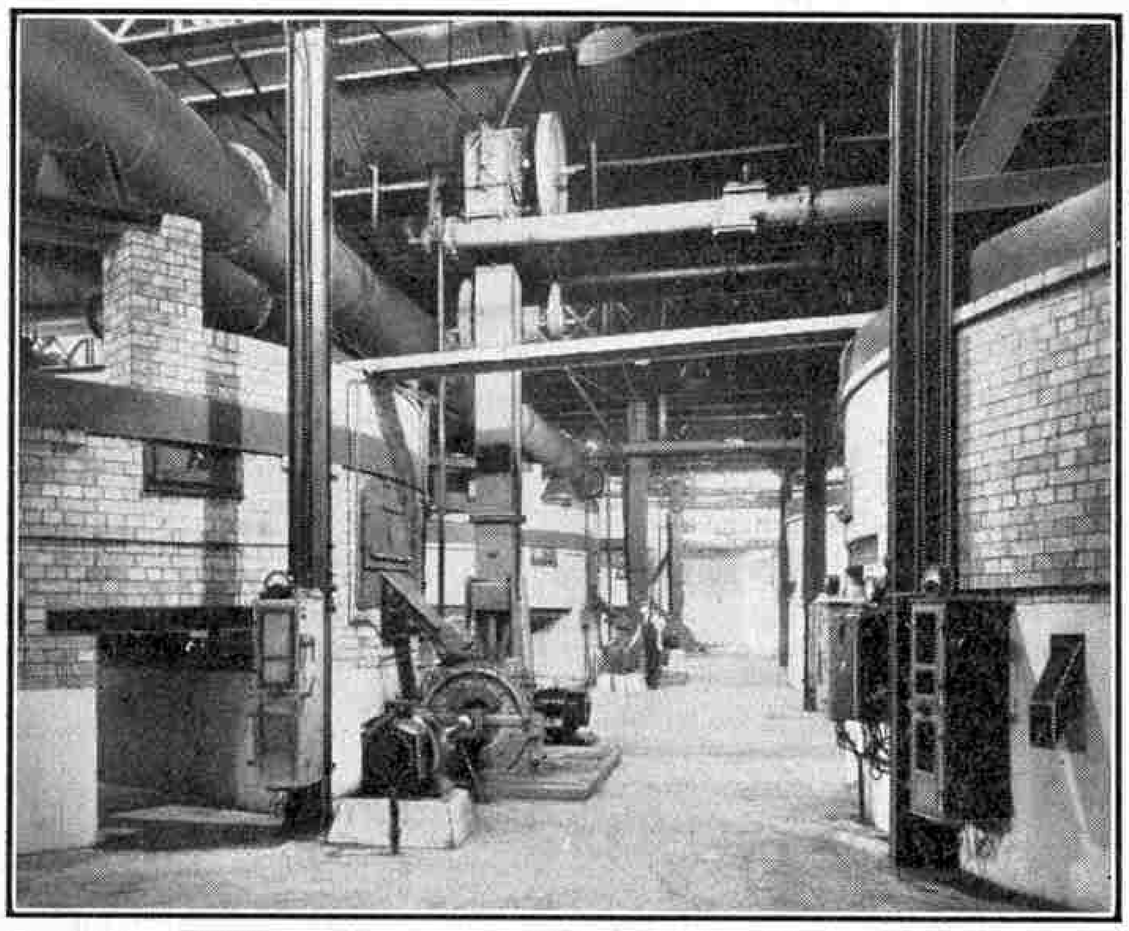


On top of a battery of reducers and volatilisers at the Clydach Refinery of the Mond Nickel Co. Ltd.

thickeners, after which the product has roughly the moisture content of Demerara sugar. It is now taken by conveyors to the tops of multiple-deck roasting furnaces, which are arranged to pass it through a series of hearths of gradually increasing temperature. By the time the material reaches the fourth hearth it is dry, and at the seventh it is red hot. It finally drops into a reverberatory furnace in a condition just below melting point.

Much of the sulphur is burned off in the roasting furnace; still more is removed in the reverberatory furnace. While still molten from the reverberatory furnace, the roasted ore is ladled into basic-lined converters, where more sulphur is burned off and the oxygen unites with the iron to form ferrous oxide, which is slagged off with the aid of silica sand as a flux.

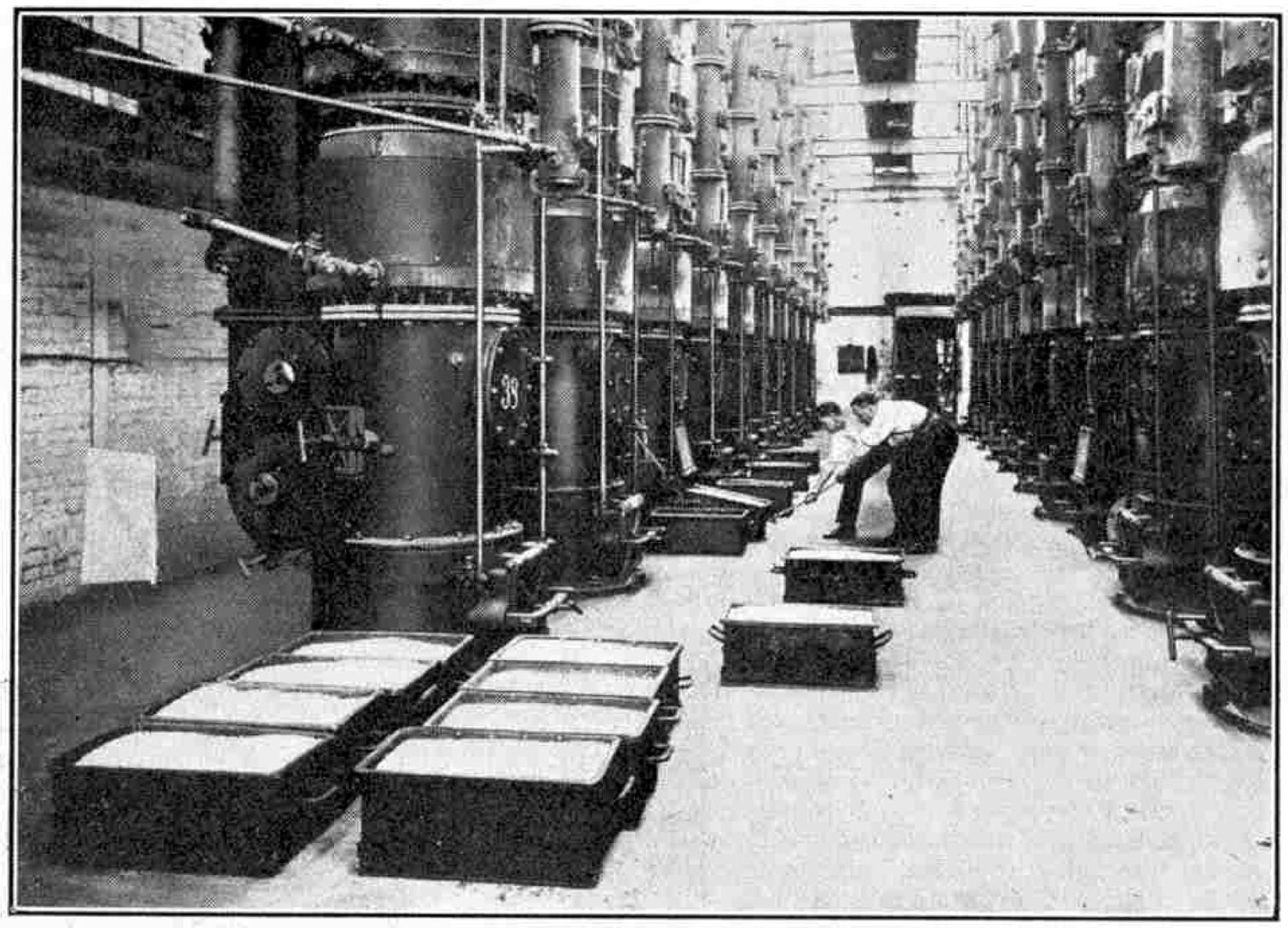
A further separation of the copper is now made by what is known as the "tops-and-bottoms" process. The matte is heated in a cupola with nitre cake and coke, giving a molten product containing sulphides of copper and sodium as well as nickel. The two former are lighter than the molten nickel sulphide, and when the mixture is poured into pots two layers result, the upper one, called "tops," consisting of the copper and



Some of the rotary calciners in which the last of the sulphur in the nickel ore is burned off and the metals are oxidised.

sodium sulphides, and the lower one, called "bottoms," of nickel sulphide. The process is repeated with the nickel bottoms, the result being a product with about 1.5 per cent. of copper and 72 per cent. of nickel.

Further stages in refining are carried out at Port Colborne in Canada and at Clydach in South



Nickel carbonyl is heated in decomposers, where the nickel is formed in pellets and the carbon monoxide passes off, to be used again. This view shows the nickel "make" being removed from a battery of decomposers.

Wales, and the processes conducted at Clydach are of unusual interest. They originated from a chance discovery made in 1888 in the laboratory of Dr. Ludwig Mond. It appears that some valves made of nickel, used in Mond's process for the decomposition of ammonium chloride by distillation, became leaky through the formation of a black crust. Dr. Carl Langer, who was assisting Dr. Mond, made an examination of this crust, and found that it contained carbon derived from the small proportion of carbon monoxide which was present in the carbon dioxide used to sweep ammonia from the apparatus.

This led to the surprising discovery that at ordinary temperatures nickel unites with carbon monoxide with comparative ease, the resulting compound being a gaseous product now known as nickel carbonyl. It was also found that other metals had nothing like the same affinity for carbon monoxide and this, coupled with the discovery that nickel carbonyl is easily decomposed to nickel and carbon monoxide at temperatures round about 180 deg. C., suggested to Mond the possibility of using the reactions as a means of refining nickel.

After a great deal of experimental work a successful commercial apparatus was evolved for this purpose and at the beginning of this century operations on a commercial scale were started by the Mond Nickel Co. Ltd: at Clydach, near Swansea. Although numerous improvements and extensions have been effected at Clydach during the past 30 years or so, the essential process remains the same as when the works were built. Briefly stated, it consists in reducing the nickel oxide in the calcined material to metallic form, though still contaminated with other elements, treating this with carbon monoxide to form pure nickel carbonyl and subsequently decomposing this volatile product to pure nickel and carbon monoxide.

The material received from the smelter is ground and fed to rotary calciners with revolving hearths, crushed matte being pushed from the centre of the hearth towards the circumference, by stationary ploughs. The temperature in the calciners is maintained at 650 to 700 deg. C. and the capacity is 1,500 to 2,000 lb. per hour, according to the size of the calciner.

The material from the calciners has now to be reduced to the metallic state. How this is done will be explained next month in an article that will show also how widely nickel is used in modern life.

A Robot that Walks, Talks and Smokes

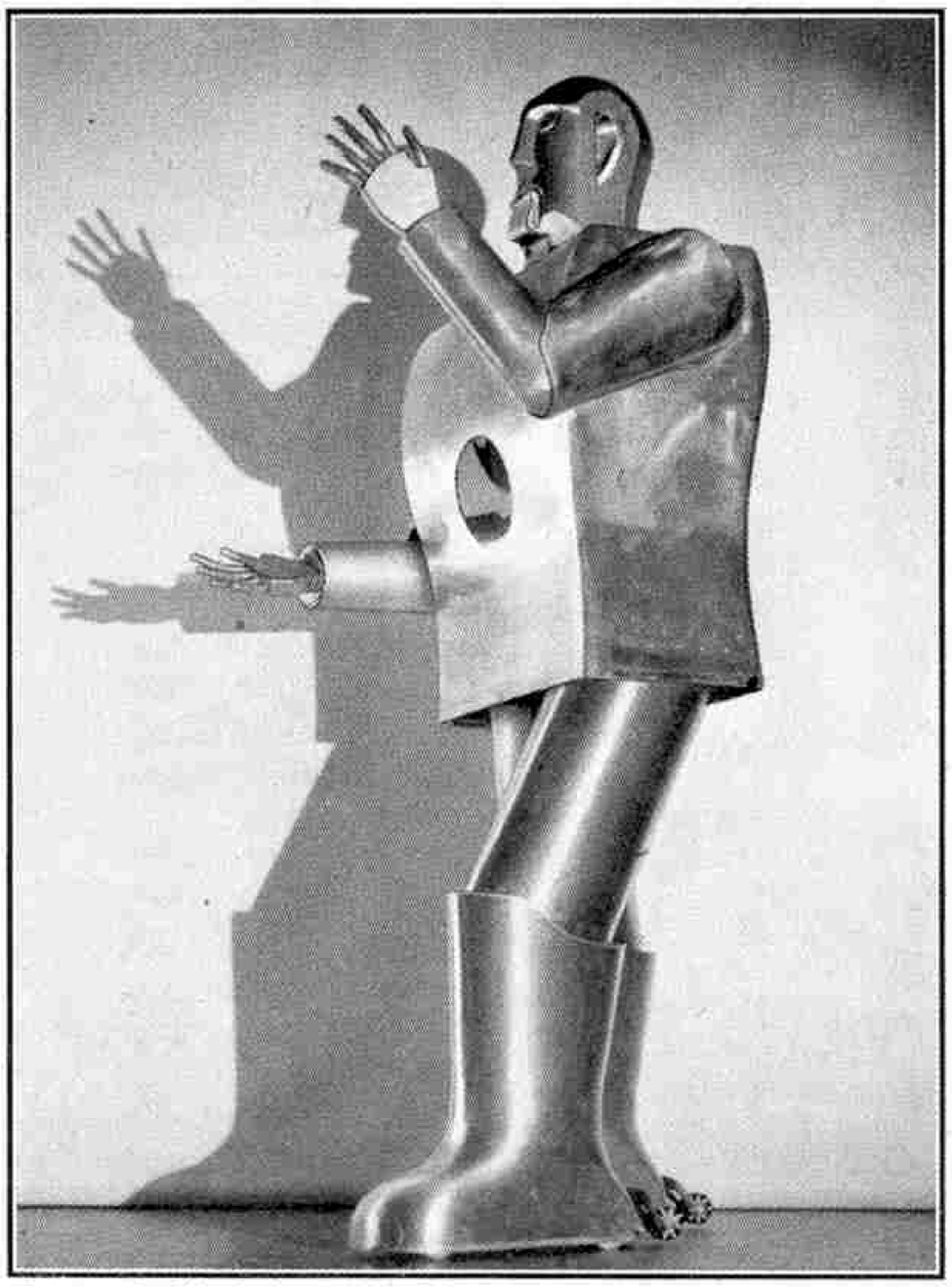
Aluminium Giant with Electric Brain

AFTER two years of life as a sheaf of blueprints and scattered pieces of metal in the laboratory of the Westinghouse Electric Company at Mansfield, Ohio, "Elektro" is ready to go places and do things. He is built up of more than 900 hand-made parts, and these were bolted or welded into place, his motors were tuned up, and his electrical brain set in a whir of excitement to enable him to become a scientific actor at the 1939 New York World's Fair.

Elektro is the youngest of a famous line of mechanical men that have been born in the Westinghouse laboratories. He is less than two years old, but already has a vocabulary of some 77 words and is a real prodigy, for he can walk, talk, count up to 10 on his hands, and smoke cigarettes by the dozen, yet never tires or gets hungry. He stands seven feet in his aluminium feet and has a chest expansion of 82 in. His chest indeed is always expanded because, like the rest of his body, it is made of aluminium over a steel frame. His feet are 18 in. long and half as broad.

This mighty automaton takes food from the nearest light socket, for he is an electric robot. He is never brain-weary because his brain lobes are 48 electrical relays. These devices do all the thinking for him; and he merely obeys their promptings, which are delivered through his nervous system of motors, levers, gears and chains. His spinal column is made of wire, of which enough is wound round his coils to encircle the world at the Equator. All told, he has a bag of 26 tricks. He not only walks forward, but can go backward just as readily, and he can bow his head as prettily as a debutante or turn it 45 deg. in either direction. If in the mood, he will bring either hand up to his face in a patriotic salute, and if properly coached he will raise his hands and count on his fingers, bending them one at a time in approved finger-counting style.

Elektro's favourite colours are red and green. As a matter of fact, they are the only colours he sees, and when they are flashed with a light before his eyes he speaks out "red" or "green" as the case may be. He is at his best when it comes to smoking, however, for he not only puffs and inhales, but also blows the smoke out in great billows from both nostrils.



Elektro, the Westinghouse Moto-Man, who walks, talks, smokes and distinguishes colours. This giant robot is 7 ft. high, and performs for the benefit of visitors to the New York World's Fair. Photograph by courtesy of The Westinghouse Electric Company, New York.

Elektro has to be "bossed" by human commands. When these are spoken softly into a microphone he jumps to obey, although there is no visible connection between him and the microphone. What happens is that the spoken words set up vibrations that are converted into an electric impulse, which lifts a shutter in front of an electric lamp and sends a flash of light across the room to a photo-electric cell, or "electric eye," in the control unit that serves as Elektro's brain. The cell acts as a sensory nerve. It receives the light command, translating it into a feeble electric current that is amplified and sent on to the bank of relays, which close and open electric circuits to start Elektro's motors turning.

Talking to Elektro is like dialing an automatic telephone, using light impulses instead of numbers to cause the relays to act. It makes no difference what words are used to give the command so long as the proper number of light impulses are produced. One word or impulse places a series of relays in position to act. Two words close the electric circuit, and release current to the motors employed in any particular movement of the robot. Three words activate relays to stop Elektro, and four words bring all the relays back to their normal position of rest.

Signal lights on the control panel show which movement of the robot is next in sequence. By speaking single words or a series of words properly spaced, the operator can cause the relays to skip over any number of these "points of motion," and when the light flashes over the one desired a two-word command will start the proper relay.

Just as an electric eye converts light waves into electric currents to put life into the robot, two other electric eyes enable it to recognise colours. A filter in front of one tube lets only red light through to the cell, and similarly a filter in front of the other tube permits only green light to reach the tube. When the proper lights are flashed in Elektro's eyes, one or the other of these electric eyes energises a relay to start the movement of a turntable on which is a record that produces the word "red" or "green."

Elektro's walking is accomplished by means of four rubber rollers under each foot, and these are driven by chains and shafts connected to a motor in the middle of the automaton. Another small motor works the bellows for Elektro's smoking. Nine motors are required to operate the fingers, arms, head and turntables for talking. Like some radio programmes, Elektro does his talking by means of transcriptions. His speech lasts about a minute and uses only 75 words, and a solenoid makes his aluminium lips move in rhythm to his speech-making.

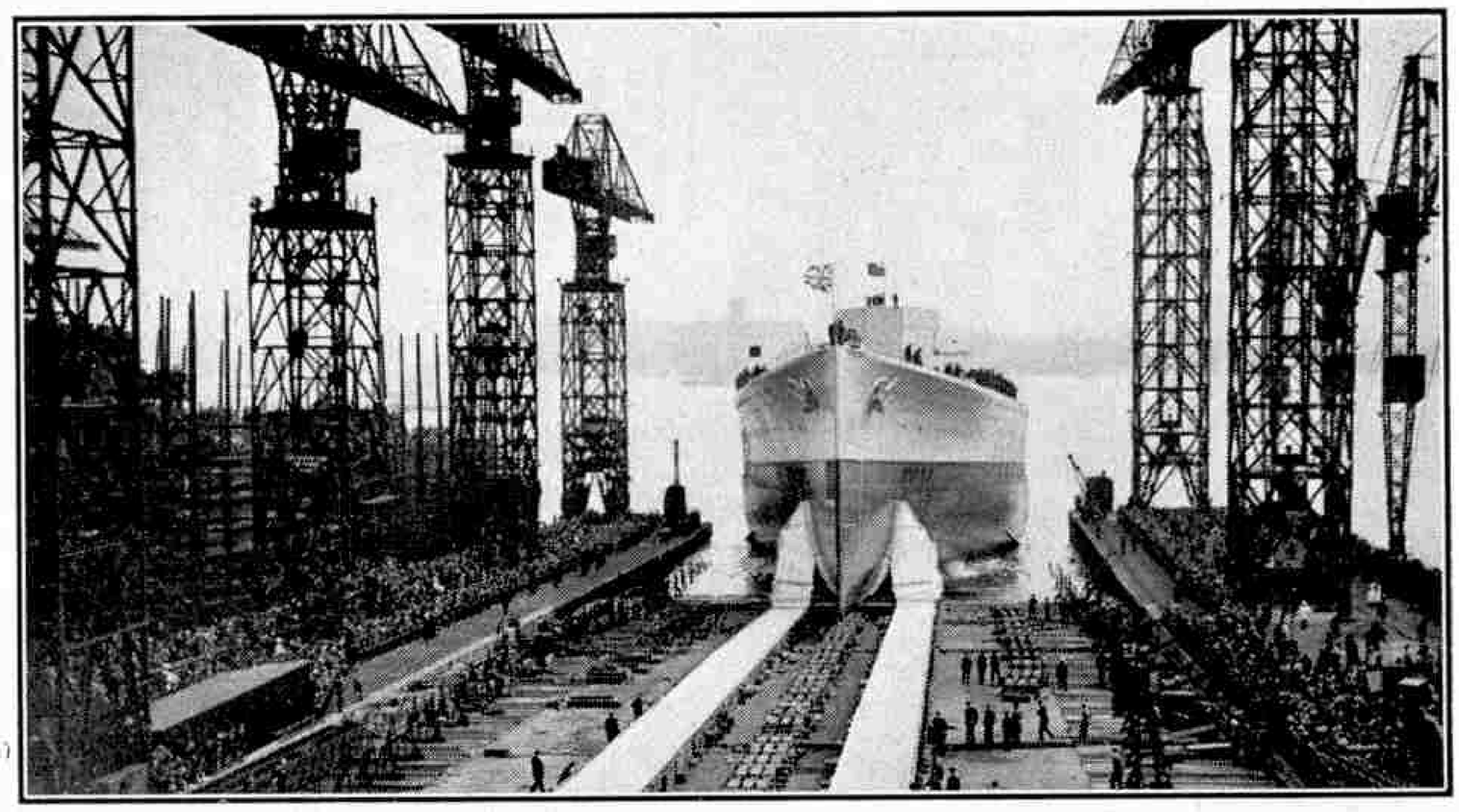
But if robots could really talk, Elektro might do a little boasting on his own, for he may be slow, but he is as strong as a giant. If the energy of all of his 11 motors could be applied to a single task, he would exert, not one man-power, but a horse-power, for he would be capable of lifting a 550-lb. weight at the rate of a foot in a second.

Elektro is a dullard by comparison with any man, however, and he can never hope to compete with human intelligence and muscular control. There are 292 different muscles in the human body, capable in combination of producing unestimated thousands of different movements beyond the 500 most elementary motions. Elektro weighs 260 lb., and does 26 tricks, so that he requires about 10 lb. for every motion. Theoretically he would have to weigh about 5,000 lb., in order to accomplish the most rudimentary human movements.

Even in his present stature Elektro's "brain" weighs approximately 60 lb. and occupies more than 4 cu. ft. of space outside his body. The "brain" or control unit includes 48 electric relays and signal lights in addition to the controlling photo-electric cell. According to J. M. Barnett, the inventor of the Westinghouse "Moto-man," the "brain" alone would have to contain 1,026 electric relays in order to "think" for a robot capable of duplicating the 500 elementary human motions. It would then weigh nearly half a ton, and occupy about 108 cu. ft. of space!

Automatons have indeed come a long way since the first speculations on the possibility of making mechanical men. Elektro's direct forbear is Willie Vocalite, a robot developed a few years ago in the Westinghouse research laboratories. Willie is voice-operated, and can stand up and sit down, but can't walk. Their common ancestor was named Televox, but he responded only to sounds transmitted by telephone wires and went through life without an electric eye. These are actors on the stage of electrical living, and the scientific principles they dramatise are already quietly at work in industry.

The Launch of the "*Prince of Wales*"



Almost afloat. The "Prince of Wales" entering the Mersey.

ON Wednesday 3rd May the "*Prince of Wales*," the second of the six battleships now under construction for the British Navy, was launched at the Birkenhead yard of Cammell Laird and Co. Ltd. The ceremony was performed by the Princess Royal, and was one of the most successful yet carried out at the famous Merseyside shipyard. "Laird's Luck," a local reference to the proverbially good weather that always seems to favour launches at Birkenhead, held as usual, and the ceremony was witnessed by over 50,000 visitors and thousands of shipyard workers, who packed the sides of the sliding ways, the specially erected platforms at the nose of the great ship, and every available vantage point in the vicinity.

Painted in light blue and grey, with the sunlight glistening on her sides and the White Ensign fluttering proudly from her stern, the great ship was a most beautiful and impressive sight, as she towered up between the two rows of huge stockyard cranes used in her creation. As the time fixed for the launch approached, maroons boomed out warning signals to traffic in the river and several tugs steamed into position, ready to arrest the drift of the great hull and to tow her to the wet basin where she will remain while being fitted out. Almost immediately after the ship had been named and the bottle of christening wine had been broken against her bows she commenced to move smoothly down the ways, slowly at first and in almost complete silence, then with gradually increasing speed amid thunderous cheers and a chorus of welcoming sirens from ships in the Mersey. Gradually she swung out to midstream, the tugs racing towards her, so as to be ready when the right moment arrived to pick up cables thrown from her deck and bring her to a standstill. This task successfully accomplished, the operation of towing her into the basin commenced, and within a short time the hull was tied up.

When the "*Prince of Wales*" had gone the yawning space left empty in the shipyard gave almost as vivid an impression of the huge bulk of the vessel as the picture she had presented when ready for launching.

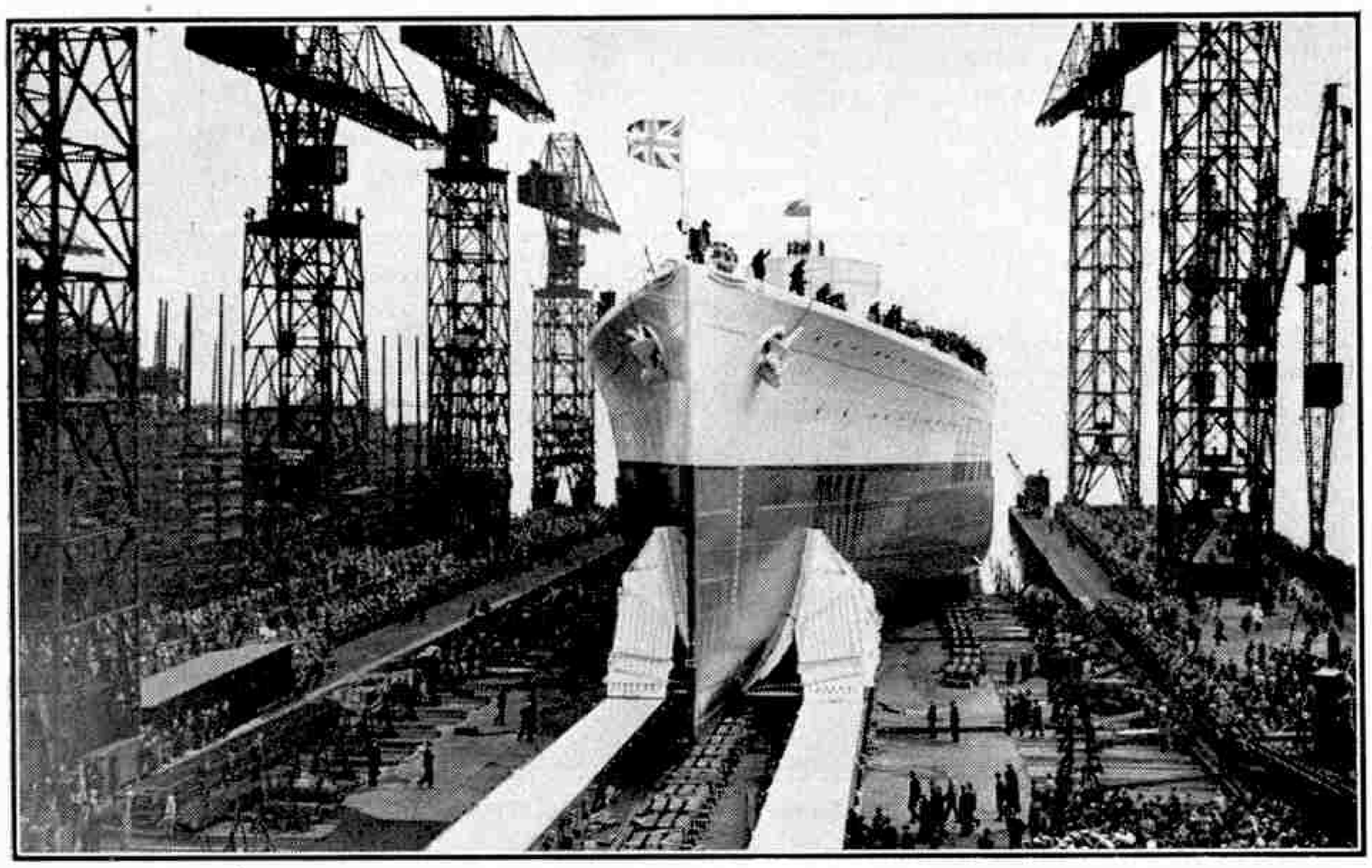
The completed battleship will be of 35,000 tons displacement, and the actual mass of metal launched, consisting of the hull without engines and other fittings, was nearly 20,000 tons. The hull is flat bottomed, relieved only by narrow anti-rolling bilge keels, and the vessel will be able to stand upright in dock without any shoring. Several million rivets were used in its construction, and the efficiency with which the work was done can be gauged from the fact that not a single rivet showed signs of any seepage when tested hydraulically.

When the vessel was launched the two innermost of her four giant four-bladed phosphor-bronze propellers were already in position. The two outer propellers will not be fitted until the ship goes into dry dock for inspection immediately before her steaming trials over a year hence. The shafts for them were there, protected by wooden battens bound with coils of heavy rope, but not the propellers themselves, for the position of these would have exposed them to the possibility of damage from debris and logs from the launchways and launching cradle floating in the river after the launch.

An interesting feature was revealed when the entire hull could be seen before the launch. This was a plate of zinc, two ft. square, bolted over the plating as near as possible to each propeller; and the purpose of this is to prevent corrosion of the steelwork by electrolytic action between bronze and steel immersed in salt water. A heavy band of zinc encircles each propeller shaft to prevent it from becoming corroded. The zinc then bears the whole brunt of the corrosive effect, and it is easy to renew the plates when necessary.

Now the "*Prince of Wales*" is being fitted out in the wet basin into which ships are towed for completion after launching. Alongside the basin are the shops in which her machinery will be built. She will be equipped with four Parsons geared turbines taking steam from three-drum water-tube boilers, some of which were almost complete at the time of the launch and were being placed ready for hoisting on board. The output of the main machinery is likely to be near 130,000 h.p., and is expected to give the vessel a speed of about 30 knots. The armament will include ten 14-in. guns, arranged in two turrets of four and one of two, together with sixteen $5\frac{1}{4}$-in. guns in twin turrets, and anti-aircraft weapons. Specially-designed aircraft will be carried, with a cross-deck catapult for launching them into the air. Protection from torpedoes will be given by a system of inner bulges that replace the old-style "blisters" on the hull. The crew will be about 90 officers and 1,500 men.

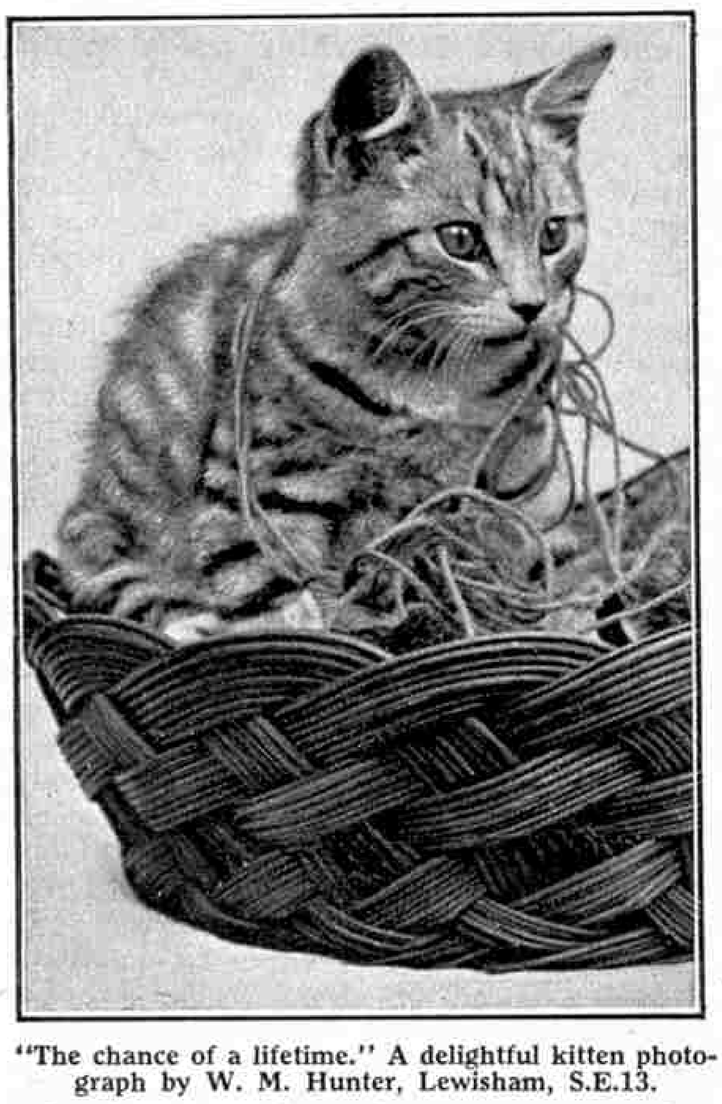
The "*Prince of Wales*" when completed will have cost over £7,000,000. She is the heaviest warship to be built at Birkenhead, and the first to leave the slipway on which she was constructed. Her place will now be occupied by the "*Temeraire*," a giant battleship that will have a displacement of more than 40,000 tons.



The "Prince of Wales" moving down the slipway at her launch. Photographs by T. C. L. Hutchinson.

MAKING PICTURES OF YOUR PETS

DOMESTIC pets form an almost inexhaustible subject for snapshots. Most readers at some time have regretted that they did not photograph their dog or cat in its amusing baby days before it grew up and began to take life more seriously. It is well worth while to take a series



"The chance of a lifetime." A delightful kitten photograph by W. M. Hunter, Lewisham, S.E.13.

of photographs of our pets at intervals so as to form a complete record of their lives. These photographs might be taken at intervals of, say, three months or six months, and ultimately they would provide an interesting album.

The photographs of puppies in baskets and kittens in jugs that are published year by year in various papers become very wearisome on account of their sameness and the obvious fact that the animal has been deliberately posed for the purpose. Snapshots of pets in humorous situations are not to be neglected, however, as many of them are extremely funny. The point is that the picture should be natural. Almost every kitten or puppy, or even grown-up cat or dog, has some little tricks or movements that it has acquired on its own account, and by lying-in-wait, so to speak, with a camera, a first-rate snapshot of the animal in its characteristic attitude can be secured.

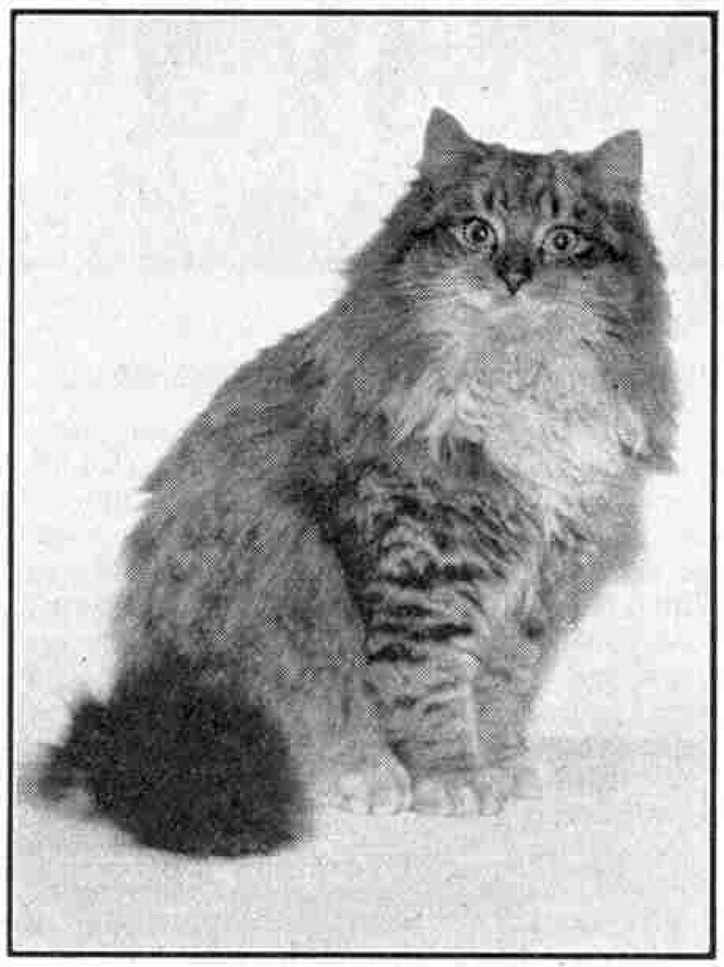
Some photographers complain that they can never get good snapshots of animals on account of their incessant movement. It is true that small animals are extremely active, but so long as they are in familiar surroundings, and among those they recognise as friends, they can almost always be coaxed into a suitable position in which they will keep sufficiently still to allow an exposure of 1/25 of a second or so. Such exposures of course must be given out of doors unless some kind of flashlight or flashbulb can be employed indoors. There is great fun to be obtained from an afternoon or early evening in the garden with a camera and one or two pets. Very often the animal itself will, entirely of its own accord, provide a really funny picture that we never had thought of.

For a really serious portrait of a dog intended to show its good points the best plan is to place the animal on a table not less than about 3 ft. in height. Some dog photographers lay on the table a board or a sheet of thick cardboard with a coating of sand made by brushing the surface with thin hot glue and then sprinkling sand over it. With a

A good dog portrait by K. Dyson, Tadcaster.

An interesting group of spaniel puppies. Photograph by courtesy of Kodak Limited.

little patience the dog can be got to assume an alert attitude by attracting his attention by a sound.



The Editor's cat, "Tim."

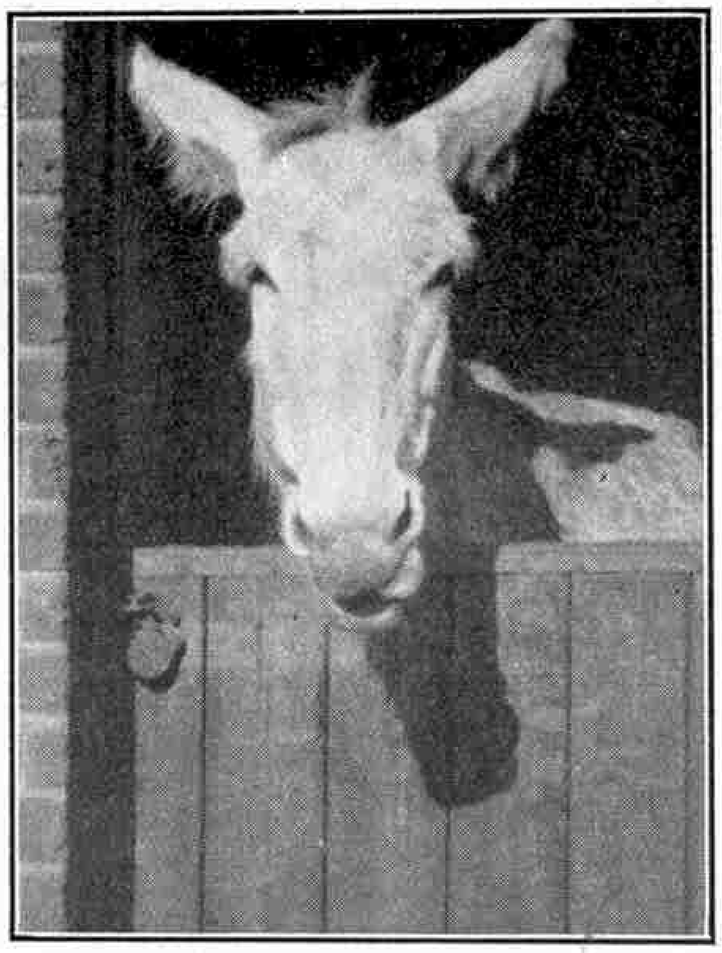
The photograph of the Editor's cat "Tim" was snapped indoors in daylight assisted by a flashbulb. After a good deal of trouble "Tim" was persuaded to sit on top of the radiogram, and this fine picture resulted.

Many interesting and amusing pictures can be obtained with a combination of pets that have been brought up together. For instance, a dog and a cat that are on friendly and playful terms can often be persuaded to stage a really original performance of their own devising; and some episodes of this can be snapped successfully if the person who is wielding the camera is on the alert all the time.

Pet birds such as canaries are more difficult to photograph on account of their smallness, but the problem is much easier with birds that have been taught to perch on a shoulder or finger. As a rule of course this can only be done indoors, but a little observation will show that a bird will take up a favourite perch of this kind and remain quite still for a sufficient time to allow a reasonable exposure in a well-lighted room close to a window. Larger birds, such as parrots, are comparatively easy to deal with so long as they are in a good temper! It is a pity one cannot as easily make a sound picture of the bird's remarks on the situation generally!

Then there are other pets such as rabbits, guinea pigs and white mice, which will reward the photographer with a series of splendid pictures. The most important requirement is patience. It is no use trying to get a guinea pig to take up a certain position if it definitely objects to doing so at the moment. The usual result of trying to force it to do what is required is to get the small creature all hot and bothered, and sometimes in a state of real irritation. If things are not going well the best plan is to postpone operations for another day. It is curious that an animal that has resolutely declined to pose as required on one day, will do just what is wanted without trouble on a later occasion. Animals are very like "humans" in this respect. Sometimes they suffer from "cussedness."

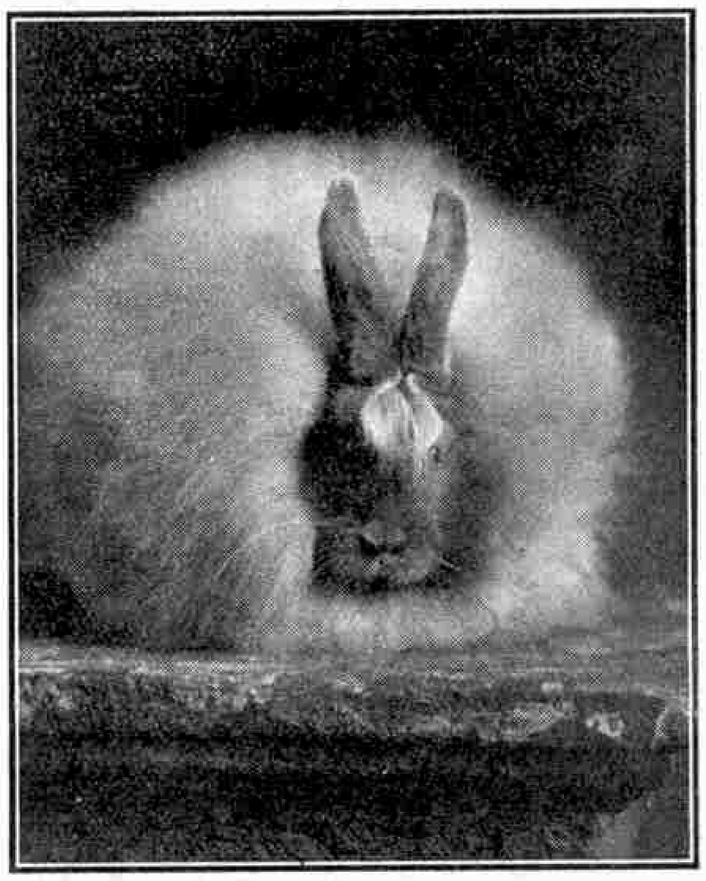
We had almost forgotten a pet of a different type that is nowadays to be found in very many gardens; and that is the tortoise. This curious creature has one outstanding advantage as a subject, and that is that it does not require a fast exposure. No one can accuse tortoises of being frisky in their habits and we have never yet heard it claimed that they have a sense of humour. Nevertheless, they can be placed in situations where they look decidedly interesting and often comical. We know of one reader who has produced some very amusing results by combining his small tortoise with table-top photography. He takes a table out of doors and builds up scenery with sand and other materials, small houses built of toy bricks, and so on, and pops his tortoise down in a suitable position. Then, before the small creature has recovered from his astonishment and begun to think about moving on, a snapshot is taken.



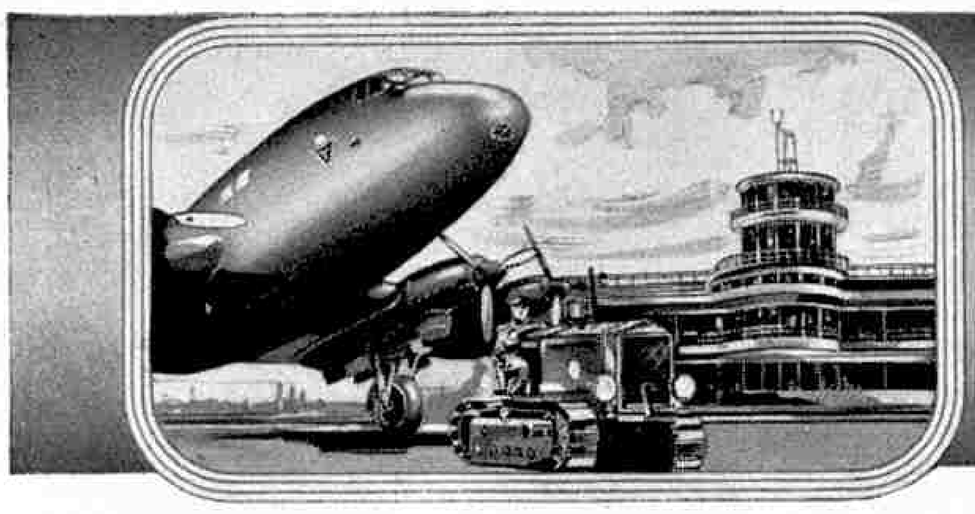
"Hello brother" is the title given by R. Cooper, London S.E.4, to this attractive picture.

"Say Please." A typical child and animal study by N. G. Tudor, Birkenhead.

"Pals." An unusual pet photograph of friendly fox-cubs and fox terriers, by V. Chamberlain, Bath.



Rabbits make good subjects for pet photographs. This example of a blue angora is by J. C. Bristow-Noble.



AIR NEWS

The "Grand Old Lady of the Air"

The Imperial Airways air liner *"Heracles,"* known affectionately as the "grand old lady of the air," is being withdrawn from the company's London-Paris air route after being in constant service on that route since September 1931. In 1935 there were only four days when *"Heracles"* did not leave the ground, and during that year alone she spent 2,500 hrs. in the air, flying 240,000 miles. According to the latest figures available, the mileage total of this wonderful aircraft stands at over 1,250,000, while the passengers carried number more than 100,000. Another outstanding fact is that in all this tremendous amount of flying *"Heracles"* has not been involved in a serious accident of any kind, nor has there been injury to a single one of her passengers, or to any member of the crew.

"Heracles," the "grand old lady of the air" of Imperial Airways. This giant Handley Page air liner is being withdrawn from the company's London-Paris route after nearly eight years of constant service.

It may be recalled that in addition to all her good work on the Paris route, *"Heracles"* was engaged during the September crisis last year in evacuating people by air from Prague, and last Christmas found her flying with special loads of Christmas mails from England above the Mediterranean and on to India. Recently this famous British air liner took a party of boys from a school in Sussex for a trip over London, and later was engaged in a similar flight, this time carrying apprentices of a big London engineering organisation.

"Heracles" is not going into complete retirement, and this summer she will carry passengers across the Channel to Le Touquet.

* * * *

The officers who took part in the world long-distance record flight of 7,162 miles last November by the R.A.F. Long Range Development Unit have been awarded the Air Force Cross and the N.C.O. in the party has received the Air Force Medal.

British Summer Services

The summer schedule of Railway Air Services came into operation on 22nd May last, and involves more than 3,000 miles of flying daily, about one-third more than last summer.

A new feature of the schedule is that there are four services daily between Liverpool, Manchester and London. One early morning service from Liverpool and Manchester to London has been timed to give Continental connections at Croydon, so that northern travellers to France can be in Paris before lunch. Alternatively it allows business men a stay of 8 hrs. in London. The corresponding four services daily between London, Manchester and Liverpool, allow up to 7½ hrs. in Manchester and 6½ hrs. in Liverpool. An important improvement in the schedule is the provision of a direct through service between London, Manchester, Liverpool, and Glasgow. Improved facilities are also available between England, Scotland, and Northern Ireland.

The air services in the territories of the S.R. and G.W.R. Companies until recently operated by Railway Air Services Ltd. and Channel Ferries Ltd. have been taken over by a new company, Great Western and Southern Air Lines Ltd. This company is running a week-day service between Brighton and Liverpool, with calls at the Isle of Wight, Southampton, Bristol, Birmingham and Manchester. It also runs a daily service linking Brighton and Bournemouth with the Isle of Wight, and on Mondays and Fridays there is one between London and Luxembourg. Summer extensions introduced last month include a week-day service between Bristol and Penzance, and one between Brighton and Cardiff, with calls at the Isle of Wight, Bournemouth and Bristol on the way.

Flying Boats for Tasman Empire Airways

On 24th April last two of the three modified "C" class flying boats, with which Tasman Empire Airways Ltd. will operate the Australia–New Zealand air service, were flown from the Rochester works of Short Bros. to the Imperial Airways flying boat base at Hythe. The *"Aotearoa"* was flown by Capt. J. W. Burgess, who is a New Zealander, and the *"Australia"* by Capt. D. C. T. Bennett, an Australian. The third flying boat, *"Awarua,"* will be delivered shortly.

New Types of Lockheed Liners

The Lockheed Aircraft Corporation, of California, have revealed plans for the production of two new Lockheed air liners. The first is a twin-engined low wing monoplane equipped to carry 12 passengers, a pilot and second pilot. It has been developed from the well-known Lockheed "Electra" and will be known as the "Electra 16-E." The new air liner will have a top speed of 228 m.p.h. and a normal cruising speed of 218 m.p.h. Mail and baggage will be carried in compartments in the fuselage nose and in each wing, and the navigating equipment will be adequate for either day or night flying. Engineering details of this aeroplane are nearly completed. It is expected that construction of the prototype will begin very soon, and that it will be ready for its first flights about next November.

The other new type is a four-engined low wing monoplane to be called the Lockheed "Excalibur." It will be equipped to carry 21 to 28 passengers and a crew of three, and will have a top speed of 241 m.p.h. This liner will have new improved high-lift wing flaps, and will be fitted with a fully retractable tricycle landing gear, with a steerable nose wheel and brakes on all three wheels. Actual construction will start late this year, and the first monoplane of this type will be ready for its initial flights in the spring of 1940.

Pratt and Whitney "Wasp" engines will be used for both new types, those of the "Electra 16-E" being of 550 h.p. and those of the "Excalibur" of 600 h.p.

"Pegasus" Engines to be Overhauled at Sydney

At present the Bristol "Pegasus" engines of Imperial Airways Empire flying boats operating on the England–Australia air route are given only a routine servicing at Rose Bay, Sydney, where there is no provision for completely overhauling them. This deficiency is to be remedied, and preparations are well advanced for establishing facilities at Sydney for thoroughly overhauling the engines of these aircraft. The workshops to be erected for this purpose will be equipped to overhaul three "Pegasus" engines a week, and it is expected that the workshops will be in full operation toward the end of this year.

New American High-Speed Bomber

The upper illustration on this page shows the Stearman X-100, a new, secretly-developed, high-speed bomber produced by the Stearman Aircraft Division of the Boeing Aircraft Company. This aircraft was designed and built as an experimental model for entry in the U.S. Army Air Corps attack bomber design competition at Wright Field, Dayton, Ohio, in March last. It was flown to Dayton from the Stearman factory at Wichita, Kansas, only a few days before the competition.

The X-100 is an all-metal, twin-engined, high wing monoplane with a wing span of 65 ft., and a completely smooth exterior surface, obtained by using flush-type rivets. The covering of the upper forward section of the fuselage consists entirely of transparent panels so as to provide maximum visibility for the crew. The aeroplane carries a crew of four, and has bomb and machine gun installations. No performance figures are available, but the Stearman company state that during test flights at Wichita the aeroplane proved to have excellent flying and ground-handling characteristics.

Elephant's Ears as Table Tops

When Squadron Leader T. C. Pattinson, big-game hunter, returned to England recently in the Imperial Airways flying boat *"Calypso,"* from a safari in East Africa, he brought with him the ears of a 3½-ton bull elephant that he shot in Kenya. These massive ears are to be made into tops for tables. It is said that they are excellent for this purpose, as they are easily washed and never wear out.

Squadron Leader Pattinson also brought a collection of elephant and buffalo tails, which he intends to keep as trophies. He made the expedition alone, and all his trophies are from animals he shot during a trip through Kenya, Uganda, and the Belgian Congo. He travelled to and from Africa by flying boat so that he could devote as much as possible of his six weeks holiday to actual hunting.

* * * *

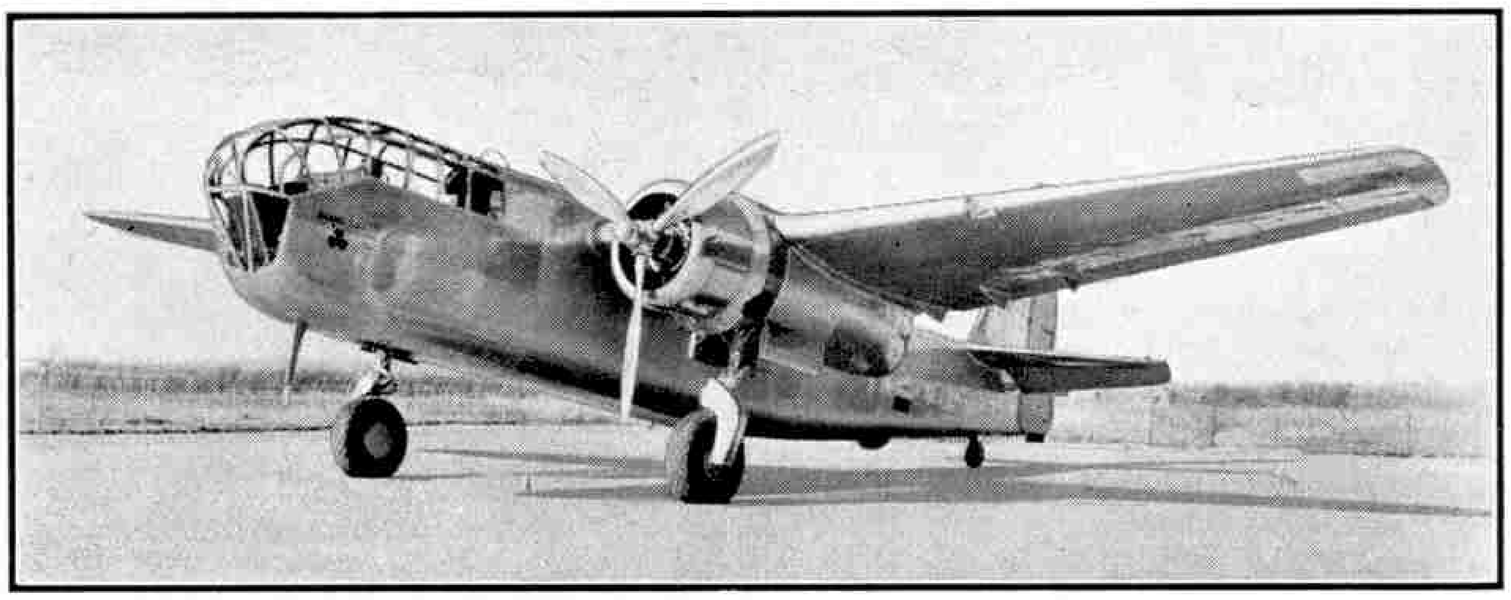
A new speed record of 107 m.p.h. for aircraft of not more than 50 h.p. flying a distance of 1,000 km., or 621.4 miles, has been set up in Germany by a new Bücker Student low wing monoplane flown by Herr Werner Ahlfeld, the chief test pilot of the Bücker company.

North Atlantic Air Mail Plans

If all goes according to plan, this month will see the beginning of the experimental air mail service across the North Atlantic. It will be operated by the North Atlantic Divisions of Imperial Airways and Pan American Airways. The British company will use four of the new 24-ton modified "C" class flying boats, the *"Cabot,"* illustrated below, *"Clyde," "Caribou,"* and *"Connemara."* These flying boats have a range of 3,000 miles, and will fly non-stop the 2,000 miles between Foynes, Eire, and Botwood, Newfoundland. They will take off with a comparatively light load of petrol and complete their fuelling for the trip while actually in the air, the additional fuel being passed down to them through a rubber pipeline from a tanker aircraft.

The new flying boats embody technical developments and improvements suggested by the experience gained in the North Atlantic experiments of 1937. One of the new devices evolved is a special form of retractable transparent dome. This can be raised above the level of the fuselage, as required, to facilitate the taking of celestial observations by the navigating officer, the dome protecting him from the slipstream caused by the swift movement of the flying boat through the air.

The North Atlantic Division of Imperial Airways is under the management of Capt. A. S. Wilcockson, who is also the commander of *"Maia,"* the lower component of the Mayo composite aircraft. The chief flying boat commander of the Division is Capt. J. C. Kelly Rogers, who will be in charge of *"Cabot"* and will inaugurate the experimental service in this aircraft.



The secretly-developed Stearman X-100 high-speed bomber, which has bomb and machine gun installations and carries a crew of four. Photograph by courtesy of Boeing Aircraft Company, U.S.A.

Bombing Forests to Extinguish Fires

A Stinson "Reliant" freighter monoplane just purchased by the U.S. Forest Service is specially equipped for experiments in fighting forest fires from the air. It has two trap doors in the floor of the fuselage through which containers of fire-fighting chemicals or water can be dropped by means of release gear upon the burning forest. A bomb sight designed to be very accurate at low elevation has been installed as an aid to accuracy in "bombing" of this novel kind.

The Stinson "Reliant" is a high wing monoplane and when fitted with a 450 h.p. Pratt and Whitney "Wasp" engine, as in this case, has a cruising speed of 183 m.p.h.

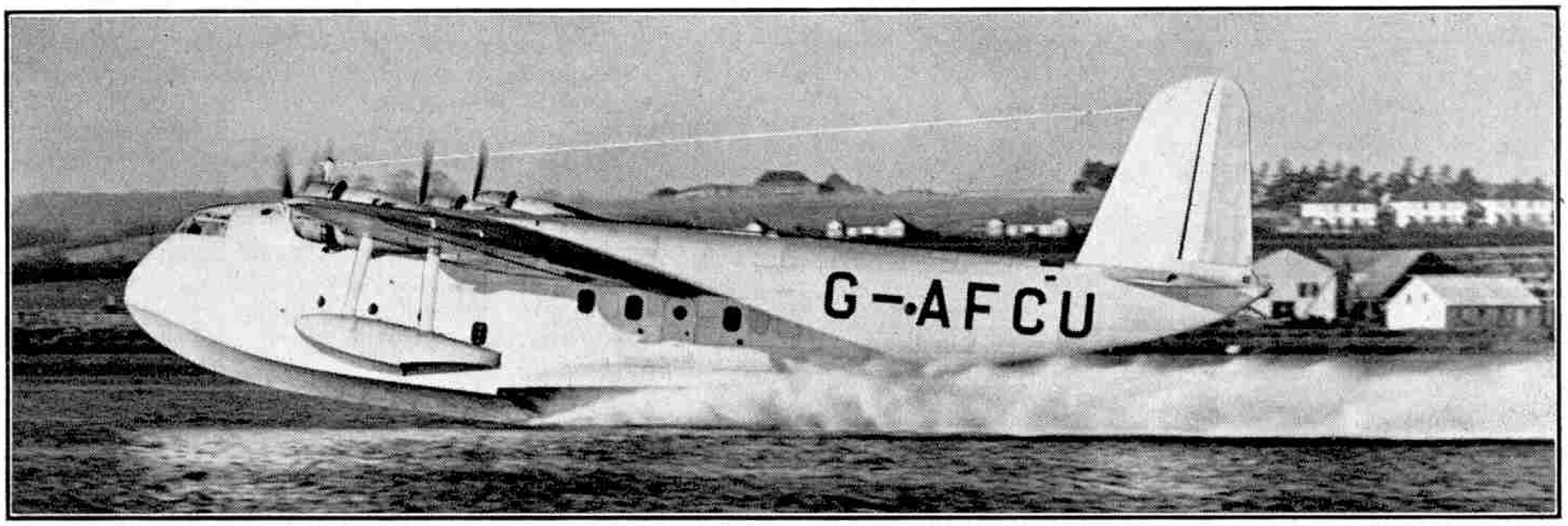
The Mayo Composite Landplane

Major R. H. Mayo, the General Manager (Technical) of Imperial Airways, who evolved the famous Mayo composite aircraft, will be among the many distinguished visitors from this country to the World's Fair at New York, where he will give a series of lectures.

Reference was made in a recent *"Air News"* page to the landplane Mayo composite aircraft now under construction. The upper component of this has been designed to cruise at 270 m.p.h. The lower component will be a modified version of the Armstrong Whitworth "Ensign" air liner.

* * * *

The first of the Dornier Do.26 flying boats acquired by the Deutsche Lufthansa is now in operation on the company's air mail service to South America. On 23rd April last it flew from Bathurst to Natal in the fast time of 10 hrs. 40 min.



"Cabot," one of the new Imperial Airways flying boats that will operate the experimental transatlantic air mail service this summer. It is seen taking off from the Medway for a test flight. Photograph by courtesy of "Flight."

Searching for Buried Treasure

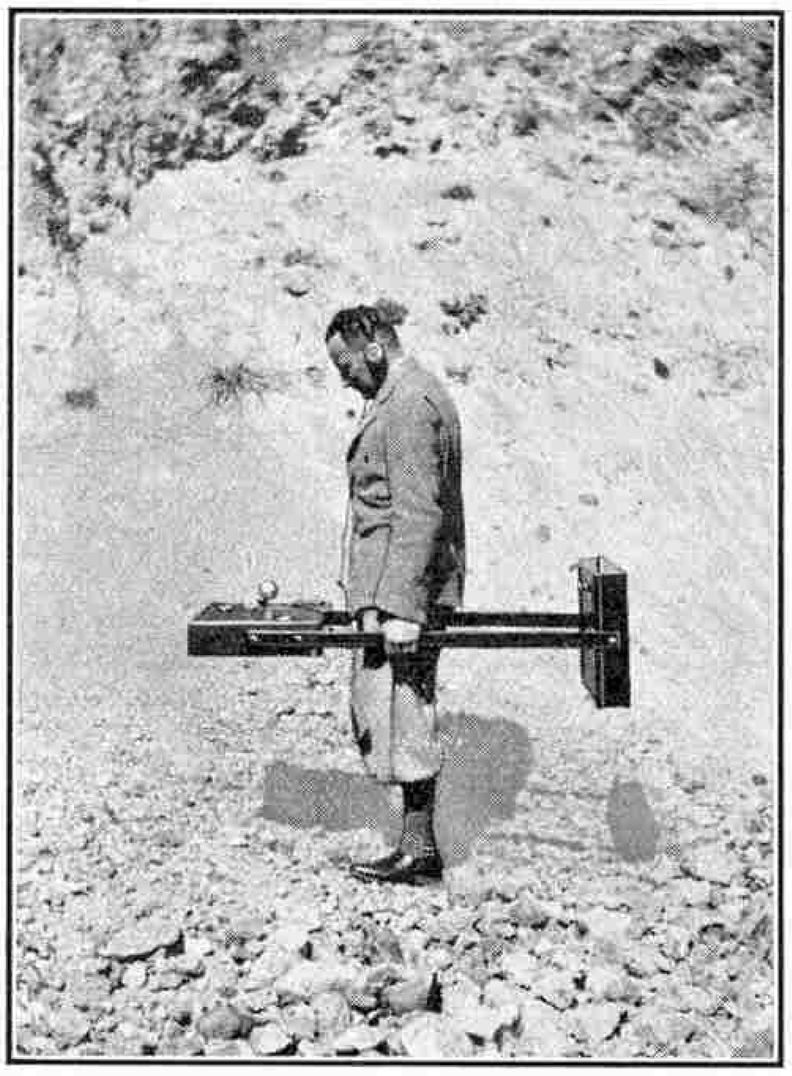
How Electrical Science Aids the Prospector

By W. A. Bagley

THERE are few parts of the world where "treasure" is not reported hidden, and where intrepid explorers have not sought for it. In the Andes of Peru the ancient Incas are supposed to have hidden gold and jewels worth £4,000,000. In the Cocos Islands, in the Pacific Ocean off the coast of Costa Rica, there is supposed to be treasure to the value of £12,000,000, and even in our own country there is enough treasure hidden away to pay off our National Debt and then leave a lot over. The trouble is that very little of it can be found. For instance, nobody has yet found King John's treasure, which is said to have been lost in the Wash about seven centuries ago.

There is treasure galore in Davy Jones' locker. Two centuries ago Spanish treasure ships were surprised by English and Dutch ships in Vigo Bay, where the Spanish commander scuttled his vessels rather than let his precious cargo fall into enemy hands. So £24,000,000 worth of gold went to the bottom of the sea, and none has been recovered. There are many other instances, and gold has even dropped from the skies, eight ingots worth a paltry £22,400 falling from an air liner between London and Paris a year or two ago. Fortunately all were recovered.

These few examples, taken from hundreds, serve to indicate that "hidden treasure" exists not only in the romantic imagination of the story-writer, but in actual fact. But whereas the fictitious treasure hunters were very simply equipped with an old map and the necessary spades and crowbars, the modern treasure hunter needs all the resources that science can give him. Maps are not very helpful. The men who drew the chart showing where the treasure was hidden were not expert cartographers as a rule; and apart from that landslips may have occurred during the ensuing centuries. There also is compass variation, or angle between true and magnetic north, to consider; and this varies at a rate that is not constant. Austin Freeman, in one of his clever detective stories, tells of how two men went treasure hunting, both working from the same chart. One followed the instructions and found nothing; the other made allowance for the variation in magnetic North since the chart was made, and so won the prize.

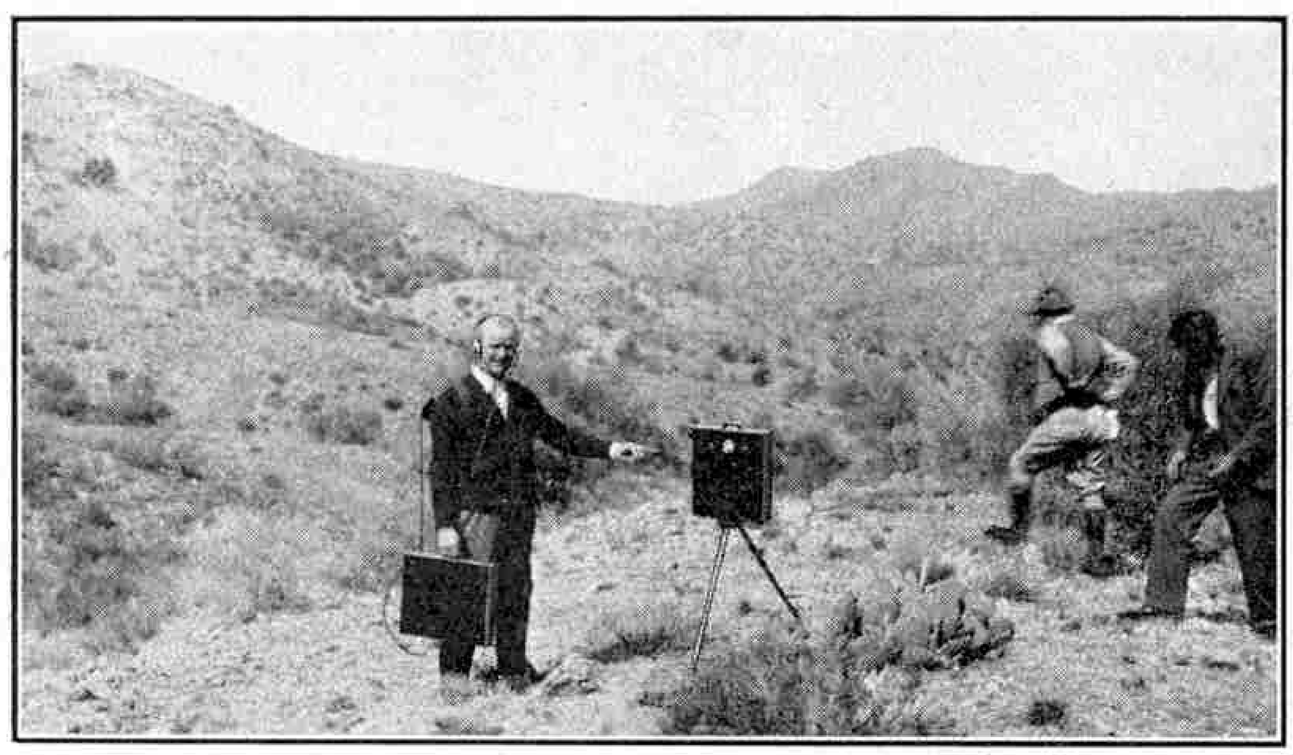


Surveying in Arizona with electrical apparatus. The illustrations on this page and the upper one on the opposite page are reproduced by courtesy of the Fisher Research Laboratories, Palo Alto, California.

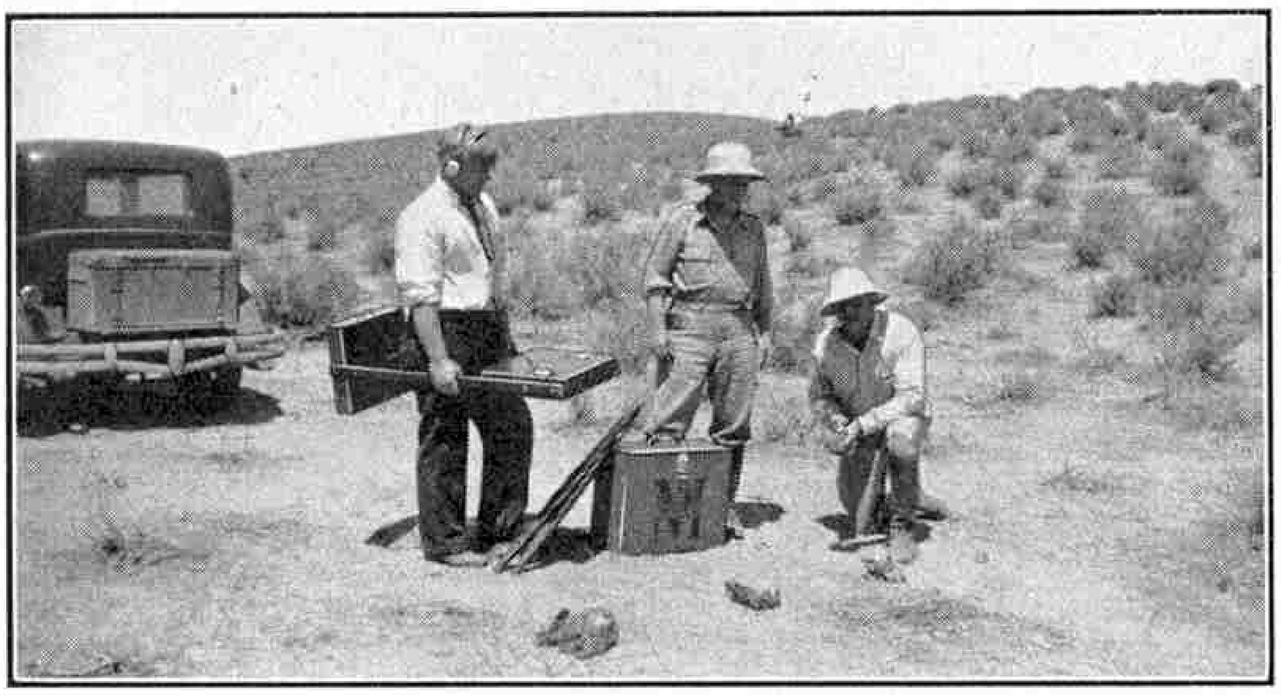
Modern treasure hunters employ electrical instruments to detect the presence of the hidden treasure. They have been encouraged by the undoubted success of instruments used in prospecting for metallic ore and for oil. They often forget that prospectors are surveying huge deposits of ore, the position and depth of which they roughly know, and this is much easier than looking over a wide area for a small cache of treasure. Furthermore, treasure-hunting often takes place in very difficult country amid rocks and dense vegetation, so that delicate apparatus that worked very well in the laboratory or on a nice smooth lawn in England is impracticable. On the other hand, a heavy and bulky instrument that has to be set up and dismantled again every few yards is equally inconvenient.

In one kind of electrical instrument used for underground exploration metal rods something like fencing foils are inserted in the ground to be surveyed, and electric currents are passed from one to another. In soil of uniform electrical conductivity the paths of the current from one electrode to another would be smooth symmetrical curves. The earth is not uniform in this respect, however, a part containing buried metal having a higher conductivity than others, and this divergence is shown by sensitive meters. Thus areas of high conductivity can be plotted, and the treasure or metallic ore located. The charts look something like giant fingerprints, presenting a maze of loops and whorls that can only be understood after much training.

In another kind of electrical treasure finder a loop of many turns of wire, carrying an alternating current, is used in conjunction with a radio type of direction finder. The transmitter sends



Electrical surveying gear that can be carried and used by one man when seeking buried metallic objects.



Checking a report of the discovery of radium ore in the Mohave Desert, California. The instrument has been balanced to the conductivity of the ground being surveyed, and noises in the headphones then show the presence of buried metal, if present.

out radiations in all directions in the earth and the space above. Any conducting body swept by this field will have currents induced in it, and these set up a counter field that distorts the first one by an amount depending on the extent, depth and conductivity of the metallic body.

The loop, called the "transmitter" or "energiser," may vary in diameter from 2 ft. to 8 ft. or more, and the number of turns of wire in it may be several hundred. The strength of the current used and its frequency vary with the depth of penetration required, and also the nature of the ground. This loop is usually mounted vertically on a tripod and arranged to swing in any direction. The direction finder is also fitted on a tripod so that it can be swung and tilted in any desired direction, and either a sensitive meter or a pair of headphones can be used with it.

In practice the transmitter and the receiver are set up at a distance of 50 ft. or more from each other. If the earth below and between the two units is perfectly uniform and free from conductive materials, the direction finder will indicate zero when its loop is tilted to a horizontal position; but if, for example, there is an ore bed intervening, signals will be given as the loop is tilted. By taking a series of readings at various points, information is secured from which the position, depth and extent of the disturbing body can be determined.

Oil as well as metal can be located in this manner, but it does not seem possible to distinguish with certainty the nature of the buried mass. A large deposit of clay near the surface might easily give the same indications as a deeply buried mass of copper, and the services of a well-trained geologist therefore are essential.

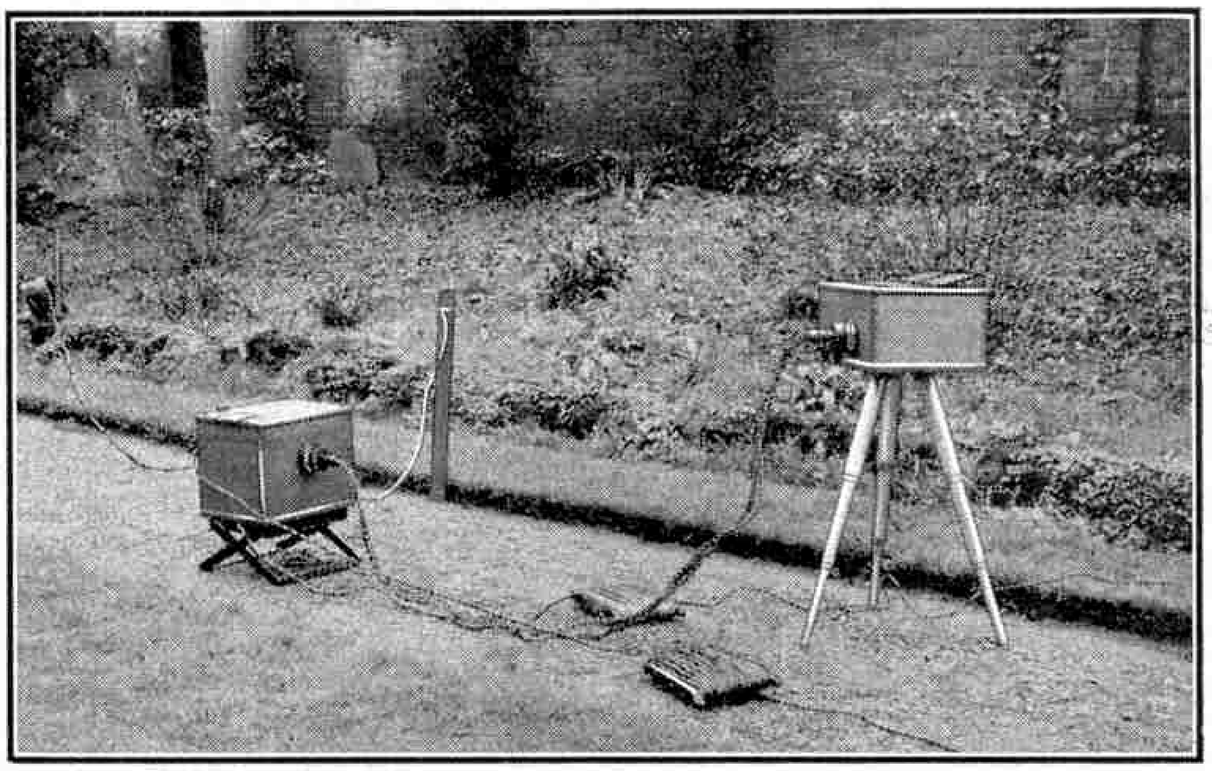
As far as treasure hunting is concerned, gold and silver are highly conductive, and it is quite possible to locate a potsherd of golden coins that has been buried for centuries. At the same time, the seeker must not be surprised if, after much digging, he brings to light not treasure, but an old iron pipe! Apparatus for which it is claimed that it can nose out gold and precious metals, but disdains everything else, should be viewed with great caution. Some people claim to be able to "dowse" for gold in much the same way as others "dowse" for water. Others carry a kind of plumb-bob containing a sample of the material sought for, and this plumb-bob, in the hands of the "dowser" is said to behave in a curious manner in the presence of the "treasure." One expedition actually carried a man who claimed to be able to seek buried treasure with a piece of gramophone spring!

There is another and more recent type of buried metal locator, the use of which is illustrated on these pages. This consists of two cases mounted on a framework carried about by the operator. One contains a radio transmitter sending out waves of carefully selected frequency, and the other is a receiver complete with headphones. When the instrument is carried above buried mineral or metal body, the field of radiation from the transmitter is distorted, and at this instant the meter needle swings downward and signal tone in the headphones becomes loud. After passing the spot above the buried metallic object, the meter and the phones again register normal.

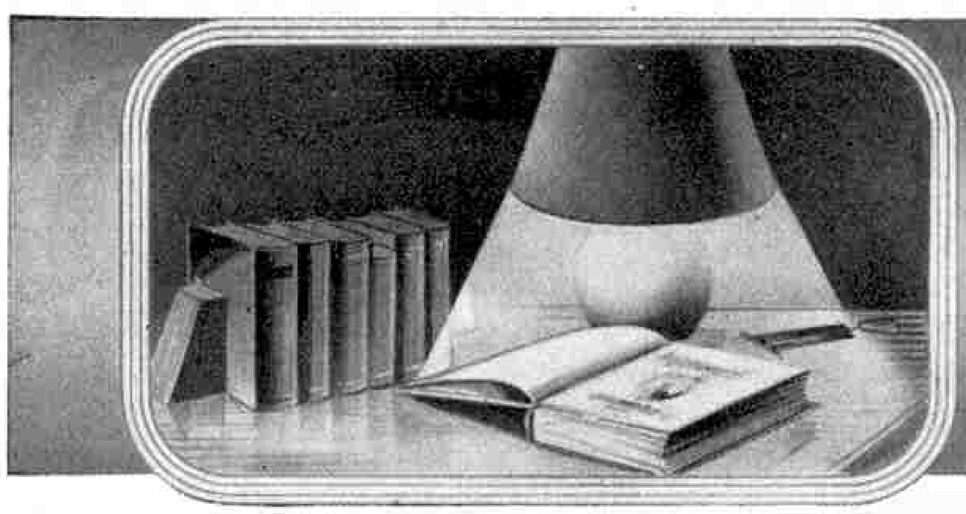
Apparatus of this type has been used successfully in locating caches of hidden treasure, but it has a far greater everyday use in searching for old iron pipes. Why look for old pipes? There may be various reasons. For instance, when using a mechanical excavator it is essential that all metallic hazards shall be removed from the path of its ploughs in order to avoid damage. Motor cars and machinery lost in floods have similarly been located, and these instruments are used to locate used projectiles on bombing and artillery ranges, or old battlefields.

Treasure-finding apparatus has been used to locate some radium that had been inadvertently thrown away with some dressings from a hospital in the north of England. The dressings had been burned and the furnace cinders to which they contributed eventually were used on a cinder track. The radium lost was no more in amount than a few specks of dust, although it was worth about £200, and to look for it in the usual manner would be as hopeful as searching for the proverbial needle in a haystack. It seemed lost for ever, and it remained in the cinder track for eight years. Then a new radium-finding apparatus was tried out, and this unerringly found the precise spot where the radium was hidden. The radium was thus recovered, sterilised and used again for its healing work. The instrument was promptly nicknamed the "radio hen" because a loud clucking noise is heard in the headphones worn by the operator when it is in the presence of radium.

It will be seen that electrical prospecting for large deposits of ore, or for locating such things as lost pipes, cables and missing radium is a practical proposition. There is no apparatus on the market that will unerringly point to valuable buried treasure, however. At the same time it must be admitted that an electrical instrument is a decided asset for modern treasure seekers.



Apparatus used in surveying for oil or minerals. On the left is a generator, current from which is passed through the ground, and on the right the instrument that measures variations in conductivity. Photograph by courtesy of Evershed and Vignoles Ltd., Chiswick.



BOOKS to READ

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

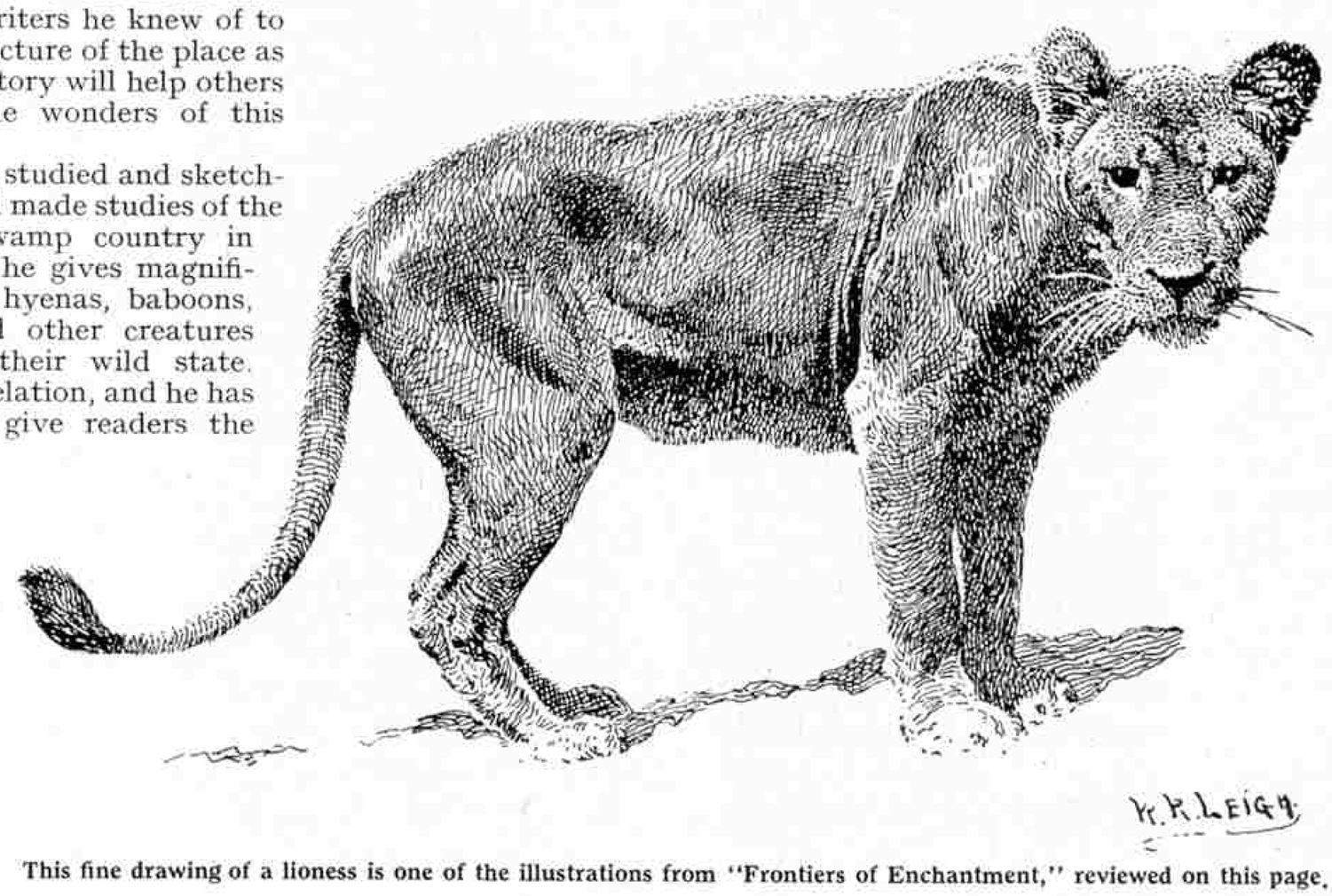
"Frontiers of Enchantment"

By WILLIAM R. LEIGH. (Harrap. 10/6 net)

Mr. Leigh is an American painter who made two long journeys through central Africa in order to draw wild animals and landscapes, the purpose of his drawings being to ensure that the groups of animals shown in natural surroundings in the African Hall of the American Museum of Natural History should be complete and accurate. On reaching Africa he discovered the failure of all the writers he knew of to give him even a faint picture of the place as it really was. His own story will help others to realise some of the wonders of this continent.

Every day Mr. Leigh studied and sketched different animals and made studies of the mountain, plain or swamp country in which they lived, and he gives magnificent pictures of lions, hyenas, baboons, elephants, giraffes and other creatures as he saw them in their wild state. Africa to him was a revelation, and he has tried in his book to give readers the sense of the wonderful scenes and colouring that enchanted him. His animal stories are particularly good, for they are based on careful and prolonged observation by himself and on the accounts he received from hunters and natives who had spent their lives in contact with them. He tells of the black buffalo, the most dangerous animal in the world, of the gorilla, and of the strange spectacles presented by giraffes feeding or trotting along the skyline in single file. One of his finest chapters gives amazing instances of the boldness and strength of the black-maned lion, and he describes vividly a lion hunt by Masai spearmen, describing how they gradually close in upon their victim, which they coax into a charge on to the spear of one man while the others close in upon him on all sides. Smaller creatures of all kinds and birds also figure prominently in the story, and splendid descriptions are given of the mountains and swamps as well as the country inhabited by the Masai and other tribes, with interesting glimpses of native life.

As would be expected in a book by an artist there is a wealth of illustration, splendid line drawings, chiefly of animals and birds, giving vivid ideas of these creatures as they are seen in their native haunts by day or night.



This fine drawing of a lioness is one of the illustrations from "Frontiers of Enchantment," reviewed on this page.

"Other Men's Lives"

By SIR GEORGE DUNBAR. (Scientific Book Club. 2/6 net)

This book, one of the volumes available at a low price to members of the Scientific Book Club, will be of interest chiefly to our older readers. It is described as a study of primitive peoples, and the examples of such races dealt with include savages and backward races of to-day as well as the hunters and farmers of the Old and New Stone Ages. We learn how the hunter of prehistoric times gradually developed into the farmer and learned to use metal. Then follow accounts of three widely differing primitive races of more modern times. These are the Tasmanians, who became extinct only last century, the North American Indians, and the Abors and other tribes who live in the mountains on the border of Tibet. The author's story of the Abors is based on his own observations during an acquaintance of four years.

The illustrations include an excellent frontispiece and 29 line drawings.

"Tommy Hawke—Detective"

By MICHAEL PATRICK. (Harrap. 3/6 net)

A detective story written for boys is something of a novelty, but a welcome one in this instance. Mr. Patrick's hero is a boy who has been apprenticed at the age of 17 to his uncle, who has a private detective agency. With Jim Hart, an ex-Sergeant of the Metropolitan Police, he is sent to investigate a jewel robbery at a country house in Suffolk, where he poses as one of the guests, while his companion becomes a gardener for the occasion. There is only a week in which to solve the mystery, and this is not done until the end of a cricket match on the very last day.

"The Taff Vale Railway"

By D. S. BARRIE. (The Oakwood Press. 2/6 net)

The name of Mr. D. S. Barrie is well known to "*M.M.*" readers and is sufficient guarantee of the interest and accuracy of his account of the Taff Vale Railway, now part of the G.W.R. Railway enthusiasts will take a keen delight in the story, which is complete and admirably set out.

The Taff Vale Railway was the first of any size in South Wales. It was typical of the numerous local lines in that area, enterprising, busy and competitive, dependent on the stream of coal traffic that was its life-blood; and the rise and subsequent decline of its fortunes is a reflection of the conditions of industrial South Wales for the past century or so. Before its coming, pack train, canal and tramroad had helped to transport the products of the mining valleys to Cardiff, but the output rose so rapidly that a railway became a necessity and was promoted in 1836 by the ironmasters of Merthyr. The original main line was laid out by Brunel. Although this famous engineer was the champion of the broad gauge, he employed the standard 4 ft. 8½ in. gauge here; and another peculiarity was that he used stone for his viaducts instead of the timber favoured elsewhere.

The author traces this beginning and then passes on to the period of the expansion that followed, when various troubles in connection with dock matters caused the Taff Vale Company to provide their own dock facilities at Penarth Dock. There was keen competition with rival lines, and in later years efforts were made to include the line in various amalgamations. The Taff Vale continued as an independent company, fighting lustily for its traffic, until the Great War came, and then it united with two other Welsh lines.

In telling this interesting story the author gives full details of the hard-working locomotives of this pioneer Welsh system, so many of which were of the 0–6–2 tank type characteristic of the South Wales area. The operating peculiarities of the line also are dealt with. In its earlier days trains ran on the right-hand track, and for many years some of its coal trains were operated without rear brake vans. The illustrations include six photographs of typical Taff Vale locomotives and two portraits, with a map.

"Baden-Powell"

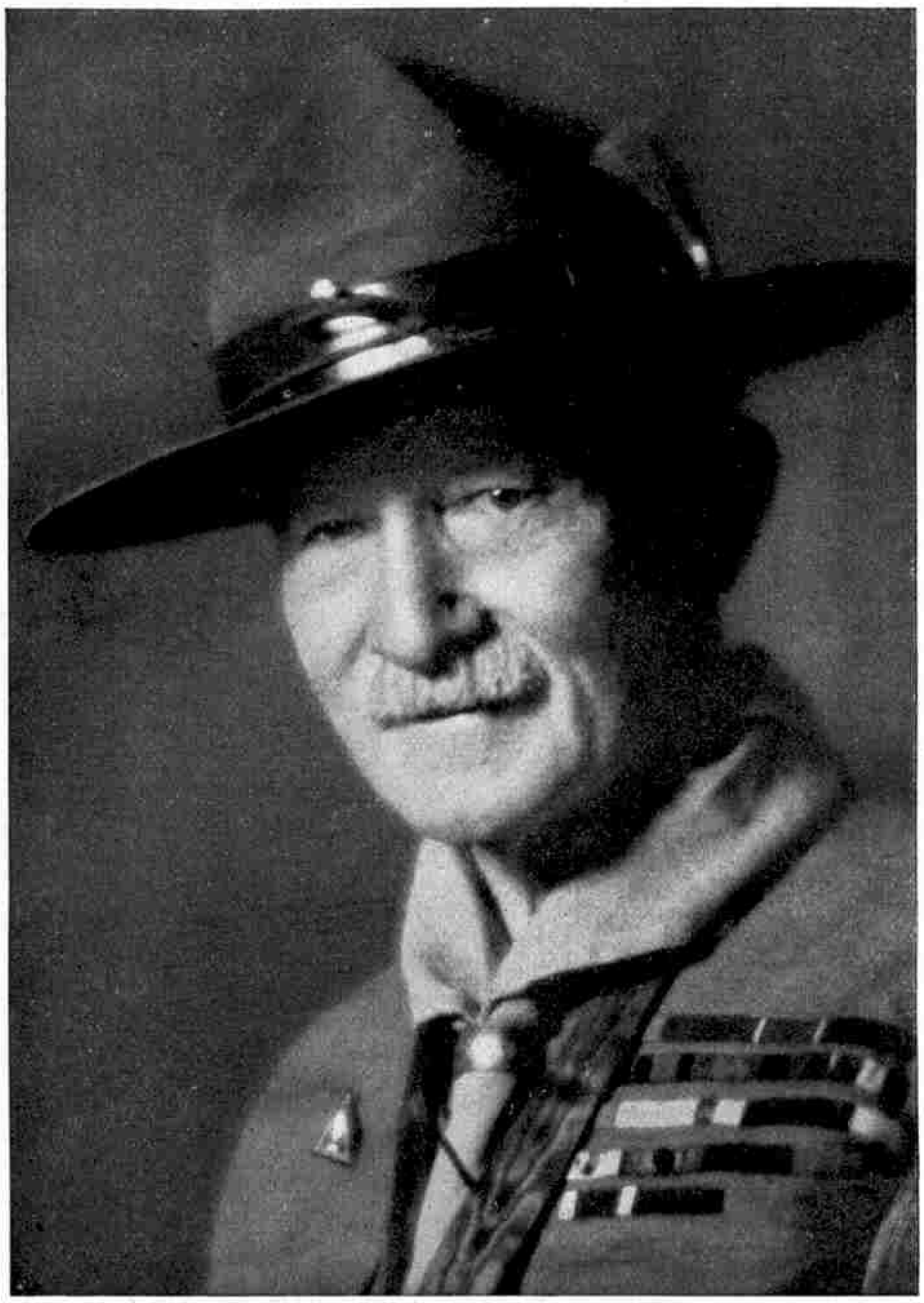
By R. H. KIERNAN. (Harrap. 3/6 net)

Lord Baden-Powell to-day is the greatest of boys' heroes, the originator of the great Boy Scout movement that has swept through the world in the last 30 years. Even before he set out on this great task he had become a hero by his wonderful defence of Mafeking during the Boer War, and by his amazing exploits as a scout and adventurer in South Africa, on the North-West Frontier of India, and elsewhere. All these are well described by Mr. Kiernan, who gives a splendid picture of the man himself.

"B.-P.," as he is familiarly known, was a leader even when at school. He did not shine in ordinary schoolwork, but to his own surprise he passed very high indeed in a competitive examination for commissions in the Army, and joined the 13th Hussars in India. This was the beginning of a life of soldiering in all parts of the world in which the great leader showed uncommon intelligence and originality. The scene of his most famous exploits as a soldier, scout and spy was South Africa. From Zulu scouts he quickly learned how to conceal himself and to read the lessons of the slightest tracks or movements that betrayed the passage of armed warriors, and in Rhodesia he put this knowledge to splendid use during the wars with the Matabele. Then came the event that first made him famous. When the Boer War broke out he was besieged in Mafeking, on the western border of the Transvaal. He had only about 1,100 men, many of them armed with out-of-date rifles, against several thousand opponents; but the Boers feared him as a compound of guile, trickery and coolness, and learned to respect the troops he had trained in his own methods. Many amusing stories are told of bluffs by means of which he hoodwinked the enemy, and of his unwearied efforts to keep up the spirits of the besieged, and all of them are to be found here in Mr. Kiernan's story.

Baden-Powell retired from the Army in 1910, when he was 53 years old, an age at which most men have practically finished their life's work. For him this was only the start of a new and greater adventure, however, for he had begun to feel that "there was a great work to be done among boys in developing ideals, strength of character, self-reliance, and the sense of adventure," to use Mr. Kiernan's own words. He had already tried out his ideas at the famous camp on Brownsea Island three years earlier, and the Boy Scout movement that followed was an instant success. "B.-P." has devoted himself to developing and encouraging the scheme, travelling all over the world for this purpose, and even visiting South Africa, Iceland and Denmark when he had passed his 80th year. The story of this international triumph is told in full by the author, who shows how its success is to be traced to the enthusiasm and unflagging energy of the Chief Scout himself.

The book has eight full page plates, including two portraits of its hero.



Lord Baden-Powell. From "Baden-Powell," reviewed on this page.

"Model Sailing Craft"

By J. DANIELS and H. B. TUCKER (Chapman and Hall. 15/- net)

Model yacht building and sailing is a wonderfully interesting hobby that in recent years has become very popular. Those who are interested in it, and any who are thinking of taking it up, will find in this volume, the second edition of a standard work, a first-class guide to every detail. Its authors are experts, with long experience of the sport, and they deal completely and in practical detail with every aspect of their subject, from general considerations of the lines of a yacht and the drawing up of a design to actual sailing in model yacht racing. There are a very large number of drawings, with 10 full page half-tone illustrations.

"The Adventures of Robin Hood"

(Ward Lock. 2/6 net)

This is a splendid book for our younger readers, telling some of the stirring adventures of Robin Hood and his merry band of outlaws of Sherwood Forest. The story is a familiar one, but the amusing exploits of Robin Hood himself and of his famous lieutenants, and the manner in which they outwit Prince John, the Sheriff of Nottingham and other Normans, never fails to stir the imagination. The book is based on the Technicolor film production dealing with the life of the famous outlaw. It tells the old story in delightful fashion, and is lavishly illustrated, containing 16 splendid plates in colour and 100 other illustrations.

"Tiger Bridge"

By WARREN HASTINGS MILLER. (Harrap. 3/6 net)

This book might have been written for the keen reader of the "*M.M.*," for although it is in the form of a story, it is based on fact and gives a remarkable picture of the difficulties and dangers of building a great steel railway bridge in jungle country in Indo-China. Its chief characters are engineers on the one hand, and savage natives and ferocious jungle creatures on the other; and the struggles between these, together with the resource and skill of the engineers in designing their material, conveying it to the site of the bridge, and erecting it, provide thrills innumerable.

The story starts in a bridge contractor's office in the United States, to which the news comes that a contract for building the structure has been awarded. One of the draughtsmen, a boy of 18, suddenly reveals the fact that he knows Indo-China well, as his father who had disappeared unaccountably was the manager of a tin mine there. He is promptly included in the group of engineers who are given the task of carrying out the actual work in the field. Once there he quickly proves his mettle, first by controlling transport operations, a task for which his knowledge of the Annamite coolie makes him specially suitable, and then in actual work on the bridge, his part on which was to keep the erectors supplied with material, the bulkier parts of which are taken up by elephants.

Troubles soon commence. First tigers threaten the camp, even leaping the protecting stockade and carrying away helpless coolies. Then a bandit chieftain decides to take a hand in the game, but is bought off with tobacco. In the meantime hunger has made itself felt among the savages of the mountains, who resort to war and attack the bridge builders in spite of the protests and orders of a holy man from a distant Buddhist monastery. Brushwood piled under the bridge is set on fire, but the timely explosion of a stick of dynamite blows out the flames and the bridge is saved. In the midst of all this excitement the hero discovers that the holy man is his father.

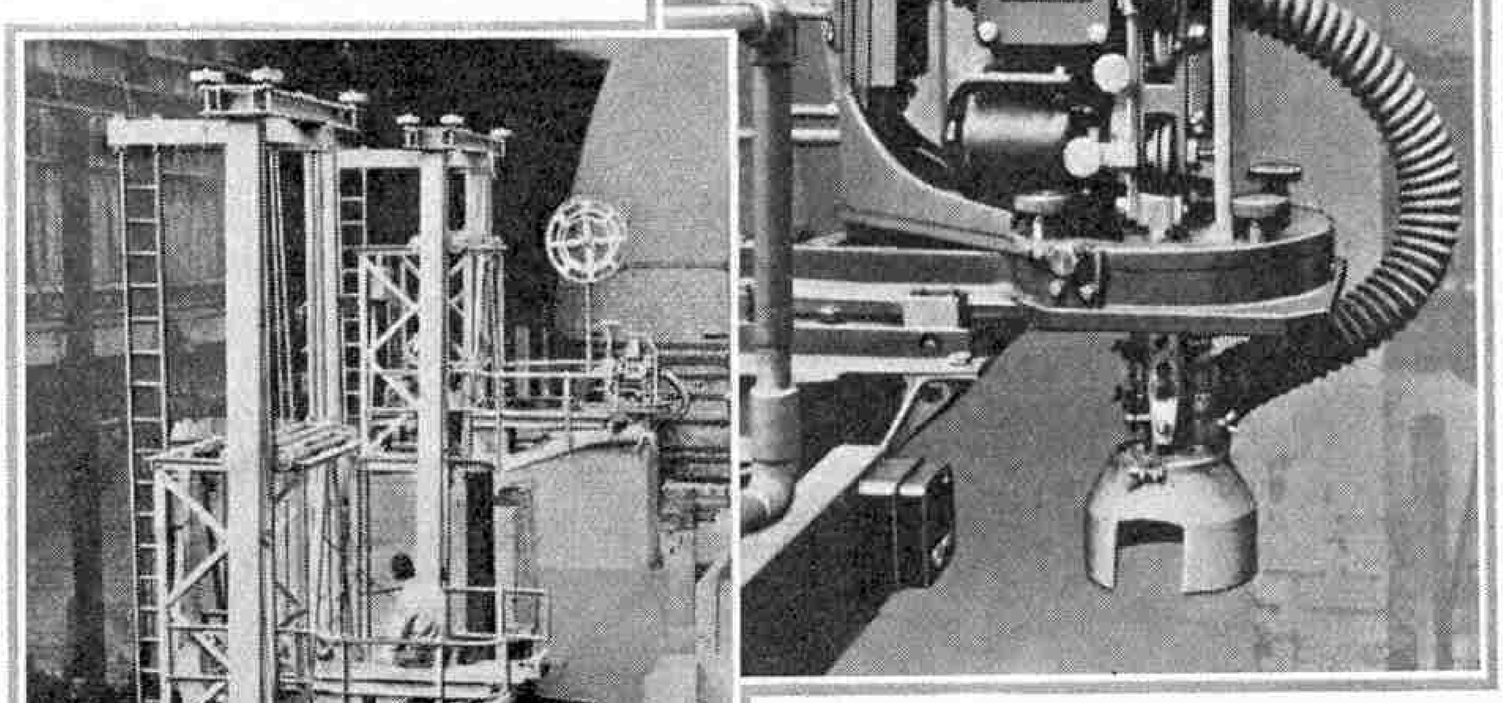
There are five full-page illustrations.

"Explorers on the Wall"

By GARRY HOGG. (Nelson. 5/- net)

This is the story of a group of children, who with a grown-up uncle as their companion and councillor, explore on foot the remains of Hadrian's Wall. We have already met all the characters in Mr. Hogg's "*Explorers Awheel*," reviewed in the "*M.M.*" for February last. This time they are settled for a short time in a tiny cottage near the old Roman wall for a delightful holiday, the atmosphere of which is splendidly captured by the author. The tale is cheerfully and attractively natural throughout, and excitement and danger are brought into it by an escaped lunatic who imagines himself to be the last of the Picts, and makes two desperate attacks on members of the party. The book is well illustrated and is thoroughly enjoyable.

Engineering News



One of the two welding heads of the automatic welding machine referred to on this page. Each head is carried on a travelling column, one of which is seen on the left. Photographs by courtesy of Metropolitan-Vickers Electrical Co. Ltd.

An Automatic Arc Welding Machine

An automatic arc welding machine, designed and manufactured by Metropolitan-Vickers Electric Co. Ltd., for welding large boiler drums has been built for service in Russia. The machine can be used for both longitudinal and circular welding of cylindrical sections with plates up to 3 in. in thickness. It consists of a workbed, two travelling columns that carry the welding heads and a motor generator, transformers and control gear.

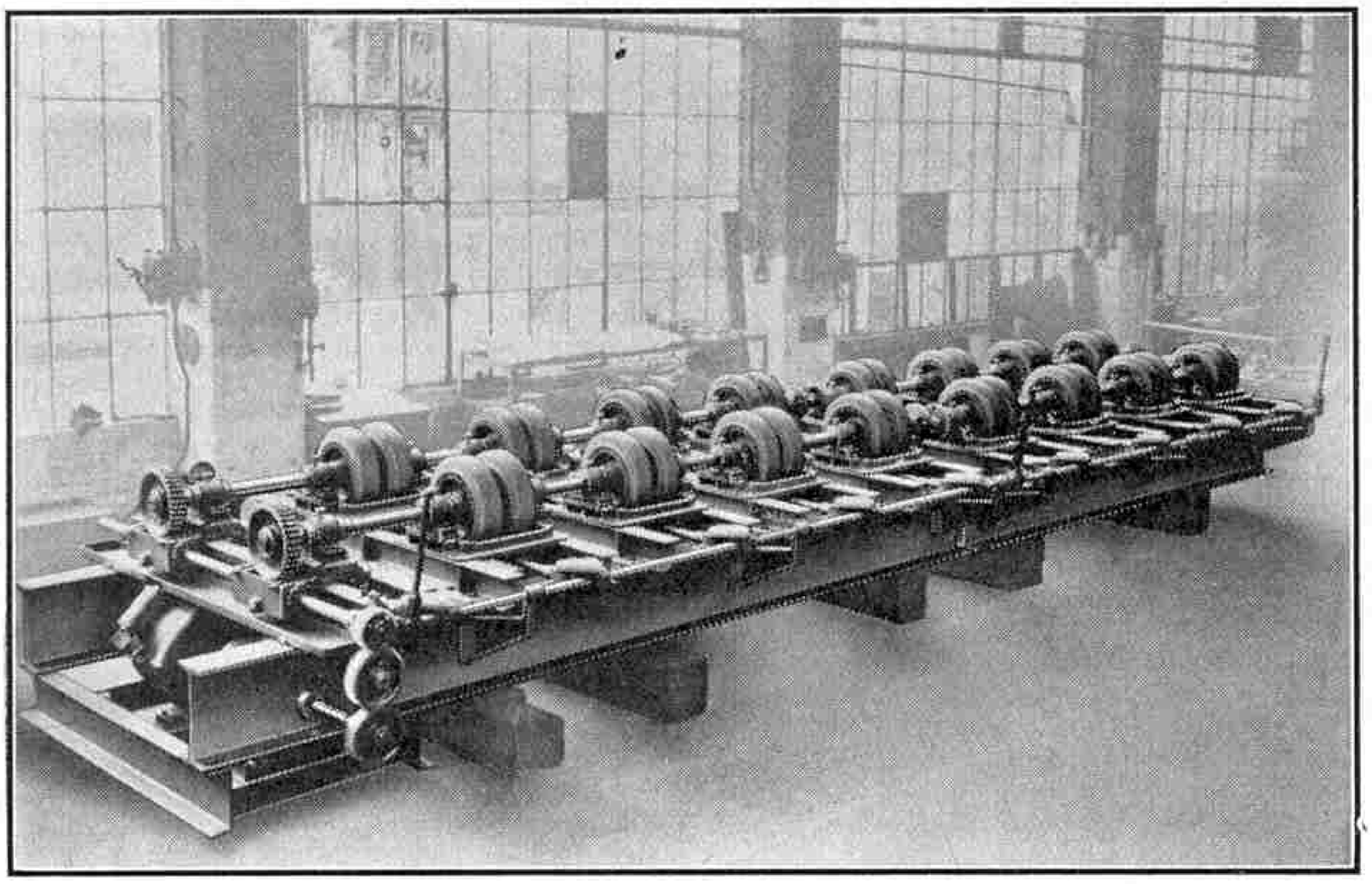
The workbed is approximately 50 ft. long and is made in two independently operated halves, each equipped with eight sets of rubber-tyred rollers on which the job to be welded is placed. The rollers are mounted on cross slides so that their distance apart may be varied to suit cylinders of any diameter between 1 ft. 6 in. and 11 ft. For longitudinal welding the rollers act as stationary supports for the job, but for circular welding they are driven at speeds varying from 3 in. to 18½ in. per min. by a 4 h.p. variable speed motor. The two half workbeds fit end to end making one complete workbed.

The welding heads are mounted on two travelling columns that run on rails laid along the floor behind the workbed. The columns are moved along the track at speeds varying from 3 in. to 18 in. per min. either by electric motors, which operate each column independently, or manually, for quick positioning.

The operator works in a cage-type platform mounted on the travelling columns. This platform carries also the welding head, electrode reel and instrument control panel, and its height can be adjusted by means of an electric motor hoist to suit the various diameters of cylinders on the workbed.

The controls are centralised in a push-button control panel mounted on the platform within easy reach of the operator. These push-buttons are duplicated on the front of the operator's arm rest, and enable cylinders of small diameter to be welded by an operator standing on the workbed.

The machine is fully automatic. Pre-selector push-buttons are provided on the control panel, and when these are set and one of the main "start" push-buttons is pressed, the electrode is fed downwards and the arc struck. Immediately the arc is in operation, the welding travel motion commences. Current for welding is obtained from two 45 kVA transformers, and that for the various driving motors and control gear is a 60 volt d.c. supply provided by a 15 kW motor generator.



One half of the workbed of the Metropolitan-Vickers automatic welding machine, showing the driven rollers on which cylinders are supported while being welded.

The German Autobahn Across Czechoslovakia

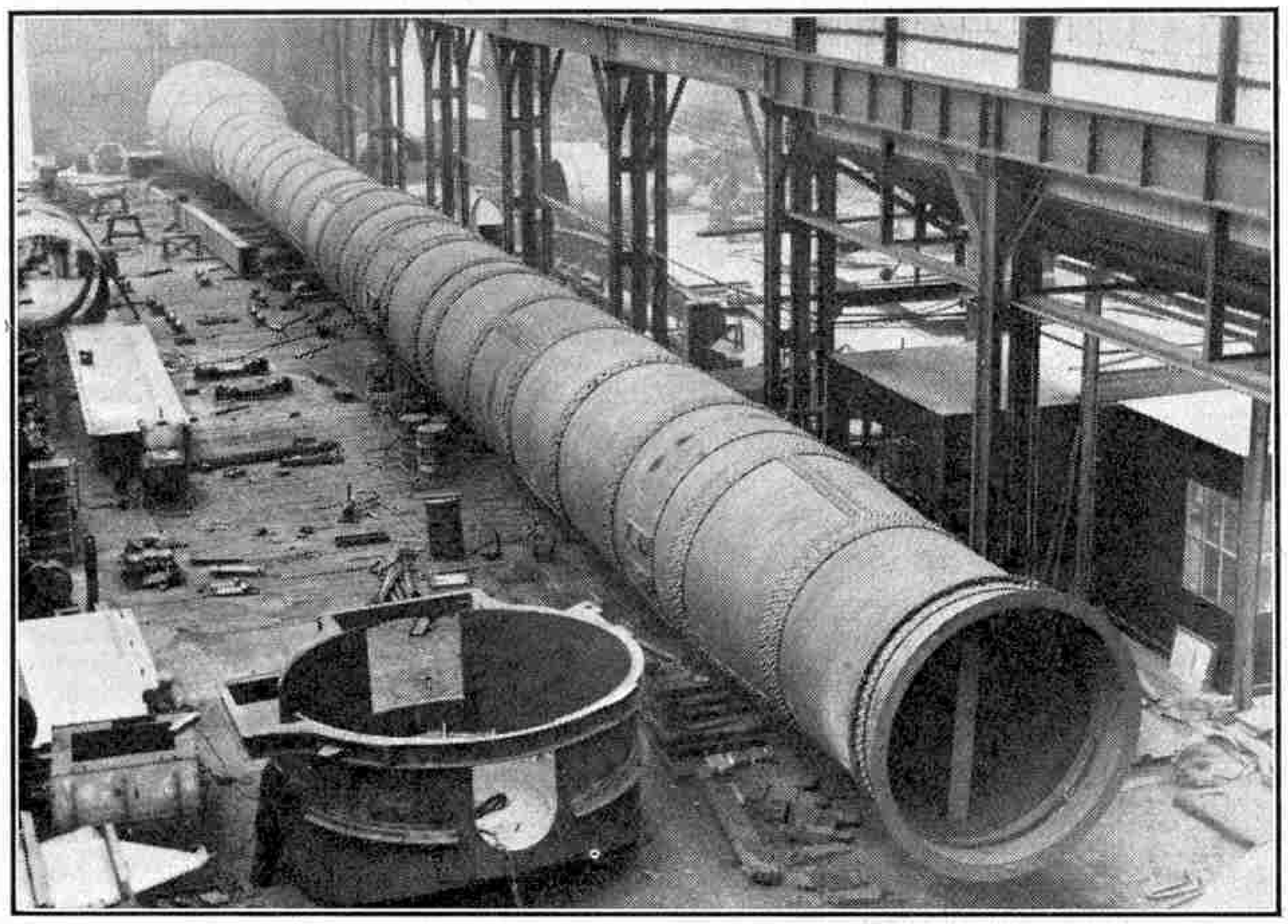
Work is expected to begin soon on the construction of the great German motor road or autobahn to be built across Czechoslovakia. The road will start from Breslau, Germany, and will cross Czechoslovakia to Bruenn Pohrlits on the opposite frontier, continuing from there to Vienna. The new highway will literally cut Czechoslovakia in halves, and the two parts of the country will be linked by roads carried across the autobahn by fly-overs or burrowing under it in tunnels.

Famous Wireless Station to be Dismantled

The Marconi wireless station at Caernarvon, which throughout its 25 years of service has been closely connected with the development of long wave transatlantic transmission, is to be dismantled. The station was completed in 1914 and is situated on the western side of Cefn-du, in the Snowdonia range of mountains. At the time of its construction it embodied the latest knowledge in wireless technique and engineering, and many changes in its equipment have been made from time to time as new methods were developed. The aerials are erected on 10 tubular masts 400 ft. high, each of which is 3 ft. 6 in. in diameter at the bottom and is held by 20 guys. There are also six lattice masts each 400 ft. in height.

Giant Rotary Kiln for British Works

The upper illustration on this page shows a giant rotary kiln that has recently been completed for installation in a large works in this country by Edgar Allen and Co. Ltd., Sheffield. The kiln consists of a huge shell 200 ft. in overall length, and ranging in diameter from 8 ft. 6 in. to 13 ft. 6 in. This is built up of rolled steel plates varying from $\frac{5}{8}$ in. to $\frac{7}{8}$ in. in thickness. The shell is of riveted construction, and is made up of 25 longitudinal sections,



The shell of a giant rotary kiln constructed for a large works in this country. It is 200 ft. in length with a maximum diameter of 13 ft. 6 in., and was built by Edgar Allen and Co. Ltd., Sheffield, to whom we are indebted for our illustration.

secured together with heavy rolled steel butt straps. The total weight of the shell is approximately 145 tons.

British Film Projectors for New York World Fair

Among the features of the British Pavilion at the World Fair, New York, is a cinema in which are shown films portraying conditions and life in England and representative of various industries and institutions of this country. Some of the films used are of standard cinema size and others of sub-standard 16 mm. size, with and without accompanying sound.

The films are shown by all-British projection apparatus manufactured by The British Thomson-Houston Co. Ltd. The complete equipment comprises a 35-watt sound reproducer with rotary magnetic soundhead, projector mechanisms with fireproof spoolboxes and 50 amp. high intensity arc lamps, together with all the necessary associated apparatus such as current rectifiers and control panels.

The BTH sound system uses soundheads which incorporate a drive hitherto used only on recording cameras, in which the film is passed round a drum driven by electro-magnetic means. This method ensures as smooth propulsion as possible and the absolute minimum of film wear and constancy of film path at the point where the track is scanned by the optical system.

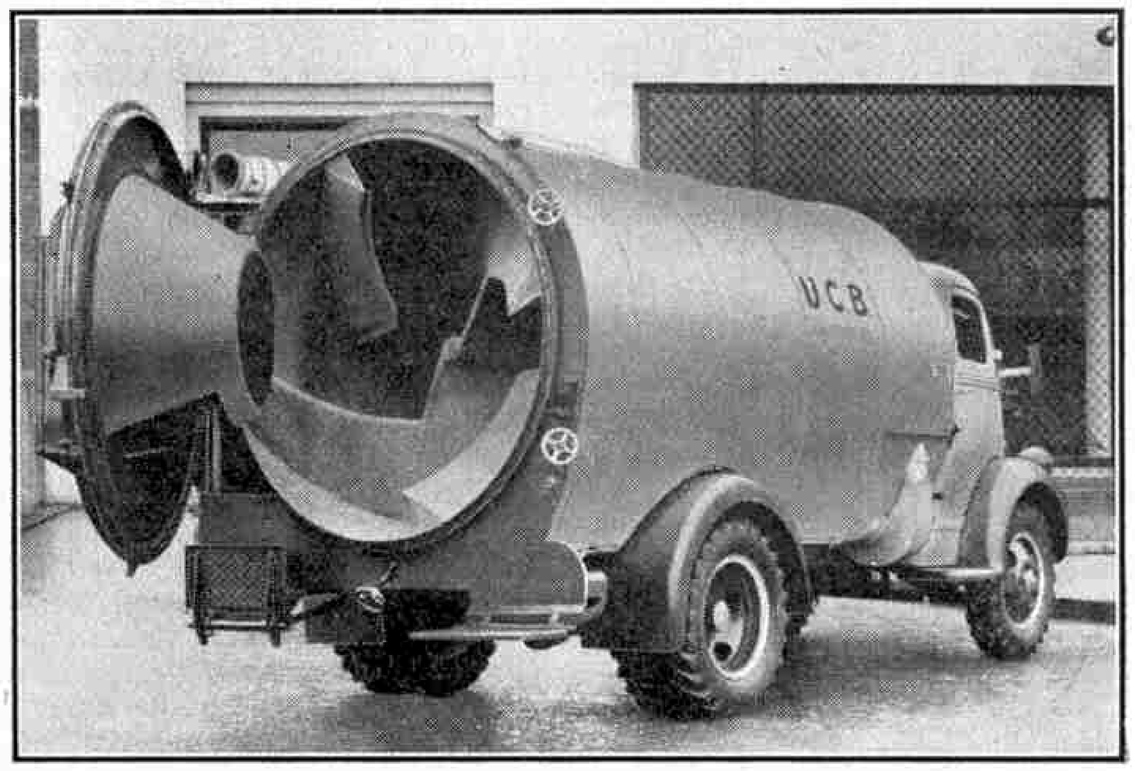
Another noteworthy feature is that the amplifier circuit includes automatic volume expansion, which compensates for the necessary restriction of the volume range recorded on the film track and gives a much more realistic quality in the reproduced sound, particularly with recordings of full orchestras.

The 16 mm. projector installed in the Pavilion represents the outcome of nine years' development work and in its own sphere has a standing comparable with that of the main equipment. It is representative of the latest British cinema practice and will be of considerable interest to American cinema engineers, as it is probably the first British equipment to be installed in the United States.

Kiel Canal to be Re-constructed

It was announced in Berlin recently that extensive reconstruction work is to be undertaken in connection with the Kiel Canal. At present this has a depth of 37 ft., and is available to ships with a beam not exceeding 131 ft. The entrance locks at Holtenau, at the Kiel end, and Brunsbuttel at the Elbe end of the canal, have a length of 1,082 ft., a width of 147 ft. and a depth of 42 ft. Under the scheme of improvements now proposed the locks will be enlarged, the canal itself widened and deepened, and the bridges which cross the canal at several points increased in height.

It is expected that the new measurements of the canal will be brought into line with those of the Panama, Suez, and Dutch North Sea canals, but no details are yet available of the dimensions proposed.



A novel refuse collecting vehicle constructed on the principle of a screw conveyor. It was built for service in Rumania and is described on this page. Photograph by courtesy of The Ford Motor Co. Ltd., Dagenham.

Screw Conveyor Lorry for Refuse Removal

The removal of refuse is always a problem in cities and large towns, for to combine the two main requirements of cleanliness and rapid handling is not always an easy matter. Many types of vehicles have been designed for the purpose, but few are as novel as that built for the Bucharest Municipality, Rumania, by Keller and Knappich, Augsburg, Germany, which is shown below. This vehicle is fitted with an ingeniously constructed cylindrical body incorporating a type of screw conveyor, which rapidly collects the refuse from the tipping platform at the rear and packs it in the inside of the cylinder itself.

The external shape of the body is cylindrical, but this outer casing is not the actual refuse container, the latter consisting of a stout internal drum, which is driven from the engine and is arranged to rotate inside the outer casing. A door fitted to the rear of the outer case has a recess in the middle, the lower part of this recess being cut away to provide an opening through which the refuse falls into the internal cylinder. A tipping shoot is also fitted to the door to enable the dust-bins to be easily emptied by the workmen.

The rotating internal cylinder is provided with a series of baffle-plates and vanes, which work in conjunction with the recess in the rear door and act like the forcing-screw of a mincing-machine. They catch up the refuse as it falls through the door opening, and propel it along the cylinder into the storage space at the front end of the body. The rotation of the cylinder and the shape of the vanes give a complete screw-conveyor effect, and keep the space under the tipping opening clear of refuse. A suction pipe is fitted to prevent the dust that arises from the tipping of the bins from spreading to the surrounding area.

To empty the vehicle it is only necessary to open the rear door and reverse the rotation of the cylinder, when the conveyor propels the refuse backward so that it can be tipped out.

The chassis is of the forward control type, the driver sitting beside the engine, which is a Ford "V-8." This layout saves considerable space and allows more of the chassis area to be devoted to load carrying.

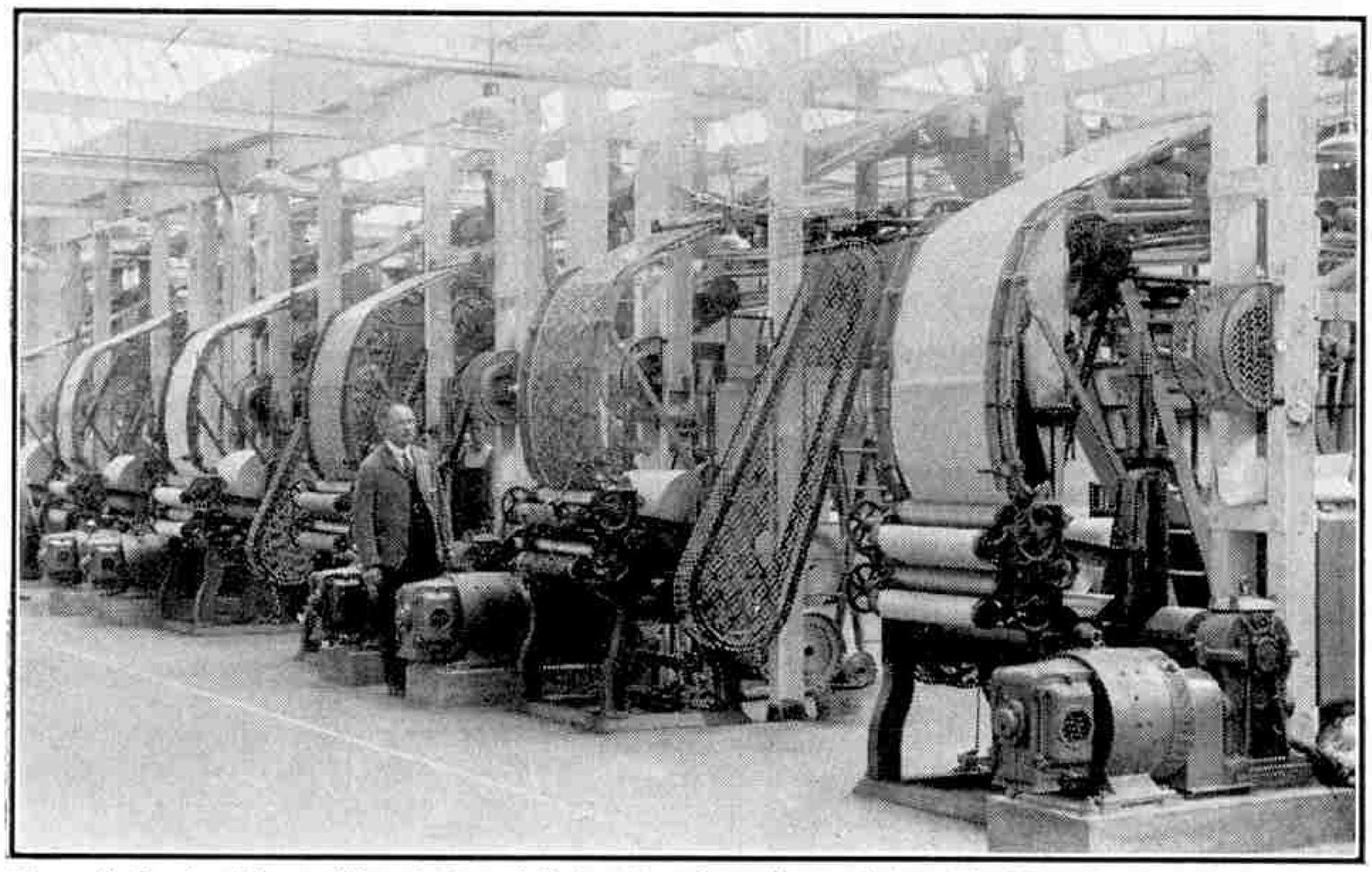
T. R. Robinson.

Designing and Printing Wallpaper

Clever Processes for Producing Wall Coverings

By T. R. Robinson

THE history of wallpaper is interesting, for it is really a development of the tapestry of bygone days. When paper began to be made in sufficient quantities to make it available for everyone, its usefulness as a wall covering soon became apparent, and papers printed with ornamental designs somewhat like those used for tapestry began to be produced. Fragments of a very early paper, dating from 1509, have been discovered at Christ's College, Cambridge, and are the oldest remaining in Europe. The design was apparently hand-printed, and it seems likely that the process used was very much like that employed to-day for hand-printed papers. In those days wallpaper was a luxury, but in these modern times the demand has led to the development of a large industry, producing many miles of paper in thousands of different designs.



The reeling ends of the machines in the printing section of a wallpaper factory. The illustrations to this article are reproduced by courtesy of Wall Paper Manufacturers Ltd., London.

One of the largest of modern wallpaper factories is at Perivale, Middlesex, where three main processes are used for wallpaper production. These are stencil-printing, a hand process used for some special papers, hand-block printing, employing a hand-set wooden block that prints one colour at a time, and machine printing on multi-colour presses, which produce the complete pattern as the paper makes a single journey through the machine.

But before any of these processes can print a design, there must be a design to print, and so the story really starts in the studio, where skilled artists make the watercolour sketches that form the basis of every pattern. This work requires considerable skill, for a design that is pleasing as an original watercolour sketch may prove unsuitable when repeated many times over a big wall surface.

When a new design has been sketched and approved, the next stage is to prepare the blocks, stencils or rollers by which it will be reproduced on the paper. The methods used for this work naturally vary with the kind of printing that is to be employed. In the case of stencil-printing, the design is checked for the number of colours to be used, and is transferred to sheets of zinc, each colour having its own stencil. The sheets are then cut with the perforations required for the particular tint with which they will be employed, and the various stencils are accurately made to fit in with each other in such a manner that as they are applied in turn the pattern is built up, the last stencil completing the design.

Usually each stencil contains one complete unit of the pattern, and is so arranged that when it is moved along the paper for a distance equal to its own length, it will fit in perfectly to the previously stencilled part and give the next "repeat" of the design. In some cases, where the design is small, several repeats may be cut on one stencil. In a pattern made up of simple stripes length is not very critical, but with the usual kind of design the production of the stencil is a very precise business.

In the case of block-printing, and the making of rollers for the multi-colour presses, the method used is to make the original design of exactly the same dimensions as the reproductions that will appear on the finished paper. Then the part of the design needed for each of the colours is individually traced on paper with a special transfer ink. Next the transfer paper is laid on the wood block or wrapped round the roller, and the application of heat transfers the traced design on to the wood. In the case of the rollers, the distance between repeats must be very accurately spaced, for the pattern must fit in with the circumference of the roller surface if a continuous length of paper is to be printed correctly.

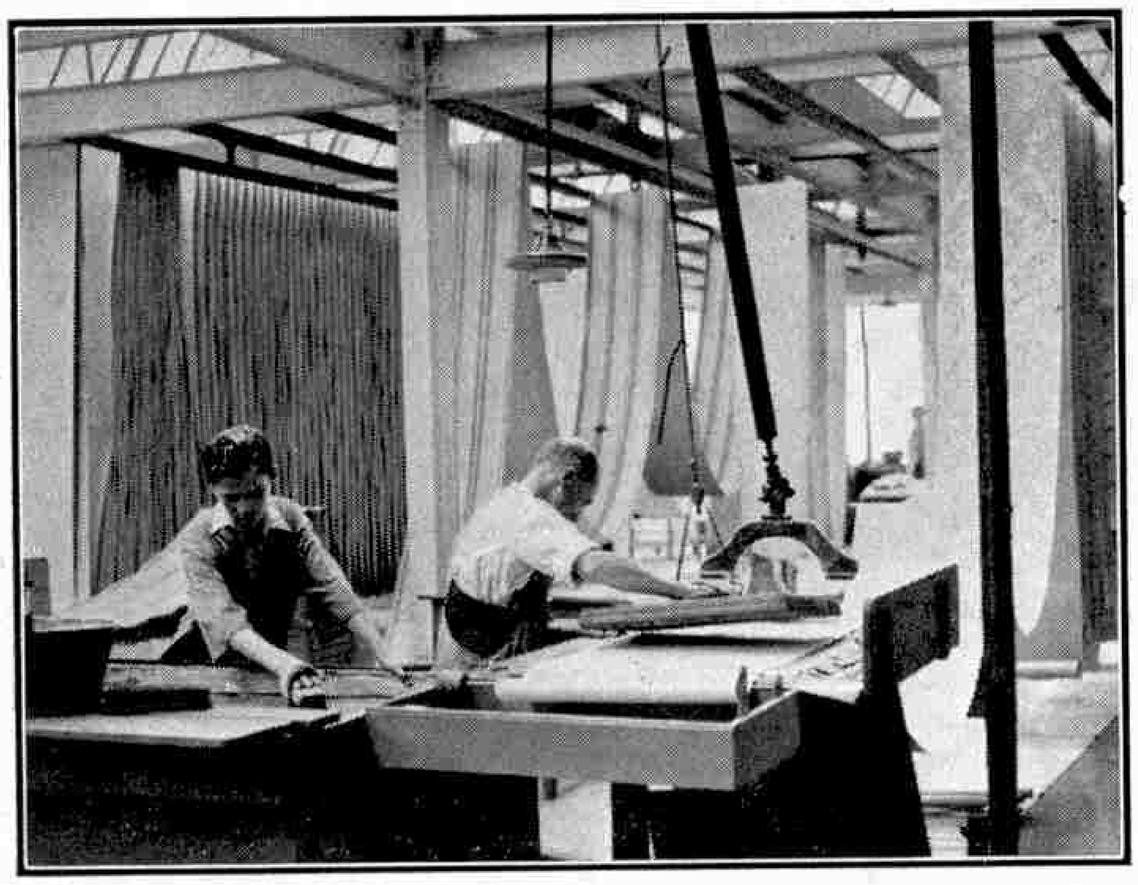
After transferring, the wood is prepared for cutting by staining all the parts of the surface that must be removed a yellow colour, and applying a red stain to those that must be left to print the necessary part of the design. Careful handwork is used for this process, the worker checking the tracing stage by stage against the original design.

Next the wood is "routed" away by rapidly revolving cutters driven by small electric motors. The heads in which these routing-cutters are fitted give control of the depth of cut, and at first the bigger areas are dealt with, smaller and smaller cutters being used in turn to finish the details. For rollers, the cutter-heads have a special guard that is shaped to fit the curve of the roller surface and guide the depth of cut, keeping it exactly that to which it was originally adjusted. Each block or roller is produced in turn, and when all of the set are ready, each part of the pattern is represented by its own shaped part on some block.

For a great number of designs a rather different method of roller preparation is used, for the printing in these cases is not done by the wood surface, but by shaped pieces of felt mounted on the rollers. As with wood-surface printing, the design is traced and transferred to the rollers, but instead of cutting away the parts not needed, the next process is the building-up of the design on the surface of the framework by knocking hundreds of specially-shaped pieces of copper into the wood. Very highly skilled craftsmen carry out this task, shaping the pieces, one at a time, to form their parts of the design, and hammering the finished copper strips into place as they are made. Only a small part of each item of the design is put in position at one time, and such a detail as a leaf may call for a dozen or more shaped pieces of copper.

With each roller fitted with the complete outline of its part of the design in copper strips, it is next necessary to fill in the spaces inside the metalwork. For this, the rollers pass to further craftsmen, who first treat the framework with a cement and then hammer sheets of felt on to the upstanding edges of the copper pattern. This cuts the correctly-shaped filling pieces out of the felt sheets and beats them home into their metal walls, all in one operation, converting the plain outlines into a series of blocks of copper-edged felt that can be used for printing. Finally, the combined felt and copper parts are faced off to a truly circular surface to give a smooth rolling action. This completes the roller and makes it ready for printing.

The printing itself is carried out in large well-lighted shops, provided with windows facing north to prevent glare and permit easy matching of the colours. The colours themselves are prepared by adding various



Hand-block printing in the production of wall-papers. The suspended block is pressed on the colour bed and then swung over and carefully fitted on the paper, on which it is then pressed.

mediums to the raw pigments and beating in special mechanical mixers until all lumps and uneven patches are removed. Careful and accurate control is kept over the matching of the colours, and the mixers are arranged close to the printing rooms so as to give easy feeding to the inking-beds or machines.

For stencil printing, the blank papers are spread out on long benches, and each worker has the necessary stencil for his particular part of the pattern, and a "match piece," or strip of paper showing the various stages of printing down to the finished design. Laying his stencil carefully in place on the paper, he rapidly stencils his part on the paper by means of a brush, which is dipped in the colour and worked on a palette until it holds just the right quantity. As he completes one section of the work he moves his stencil on, matches it to the part already complete, and repeats the process, gradually covering the whole length of the paper on the bench. Other similar stencils are being used along the paper by other craftsmen, and so the paper is finished stage by stage. Great care is necessary in the stencilling to prevent variations of tint along the length of paper, but the workers are so skilled that length after length is turned out without any visible difference of colouring.

In the hand-block printing process, the blocks are hung from above the work benches on flexible cords that permit them to be swung across from the colour-beds to the paper and back again, and the paper is spread over impression tables, being drawn as required from rolls at one end.

The printer first moves the block by a handle on the back, which is uppermost, and "inks" the impression face by pressing it on the colour-bed. After this he swings the block over to the paper and carefully positions it to fit in with the pattern. To give the impression, a universally-jointed arm is suspended over the impression table and connected by levers to a pedal by the printer's foot. As soon as the block is in place, this arm is moved to bring its lower end on to the upper surface of the block, and pressure on the pedal prints the impression on the paper.

The arm is then moved aside, the block swung back for re-inking, and the paper moved onward to bring a fresh piece under the block. The printed section is not re-rolled, but is hung in folds in a drying rack by the printer's assistant, who also keeps the colour-bed fed with colour by means of a soft brush. As each roll of paper calls for many impressions, which must be repeated throughout for every separate tint, hand printing is a somewhat long process, but the results obtained are very beautiful and papers produced in this way are the highest grade of printed wallpaper.

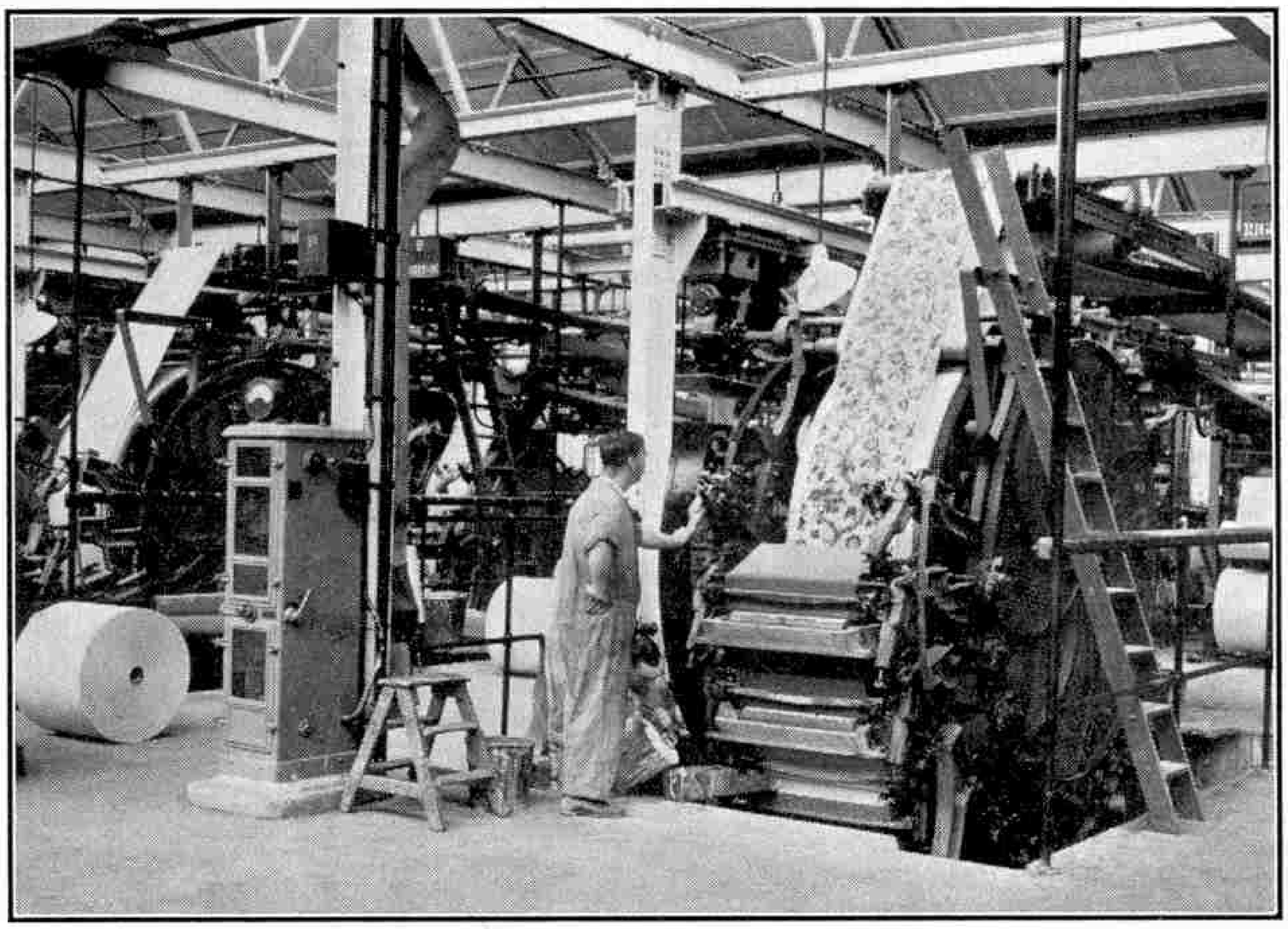
Presses of large size are used for machine production and these are somewhat unusual in design. The paper is fed from a large roll at the back of the press and passes round a large impression cylinder and up over rollers to a drying rack somewhat similar to that used for hand printing. As the paper moves round the impression cylinder, it passes a series of printing rollers in turn, each adding one of the colours necessary for the finished design. The number of rollers can be varied to suit the pattern being printed, and each roller has its own colour-feed, which can be refilled without stopping the operation of the press. The method of driving the rollers is ingenious, for on the spindle of each is a pinion that gears with a large spur gear mounted concentrically with the impression cylinder. By this means the printing rollers are kept in perfect step with the impression cylinder, and any smudging or "out of register" effects on the paper are avoided.

As the paper moves along the drying-rack, which is of the conveyor type, it is carried through an oven having a controlled temperature and when it emerges is perfectly dry. A clever device then draws it out from the loops into which it was formed for drying, and re-rolls it ready for passing to the piece-cutting machine. A large roll placed in this is drawn and rolled on to a core, and as it is fed it is kept under the correct tension by three steel rollers spaced around the piece-roll, which are gradually moved apart as the piece increases in diameter. A cam set on a geared-down spindle makes one rotation during the time taken to wind each piece, and when the right length has been rolled this cam operates a cutter that separates the finished piece from the feed roll. As the girl in charge takes off each complete piece she rapidly stamps it with its pattern number and other particulars, and it is then ready for the finished paper stores.

These stores are really wonderful, for although they contain hundreds of thousands of pieces, an elaborate stock register enables any pattern to be found in a few minutes. Alongside these stores are two others quite as interesting, one housing the hundreds of huge rolls of blank paper, and the other containing the rollers and blocks used for the printing processes. Rollers and blocks are kept in sets for each design, and when any kind of paper is required it is an easy matter to issue the blocks or rolls from the stores.

Another interesting place in the works is the pattern-book shop. Here specimen pieces of paper, together with suitable border designs, are made up into the books that the decorator brings to us when we wish to choose a paper. Piece by piece these books are built up, the identification numbers and other details being stamped on the backs, and when the books are complete, they are firmly bound, cut neatly to size on a guillotine cutter and fitted with stout covers and handles. It seems somewhat strange that the making of these books should take up a large shop, but the pattern book department is one of the largest in the factory.

Outside the factory buildings, extensive railway sidings, a power station, and a despatch-bay shows how much work is done in this busy place.



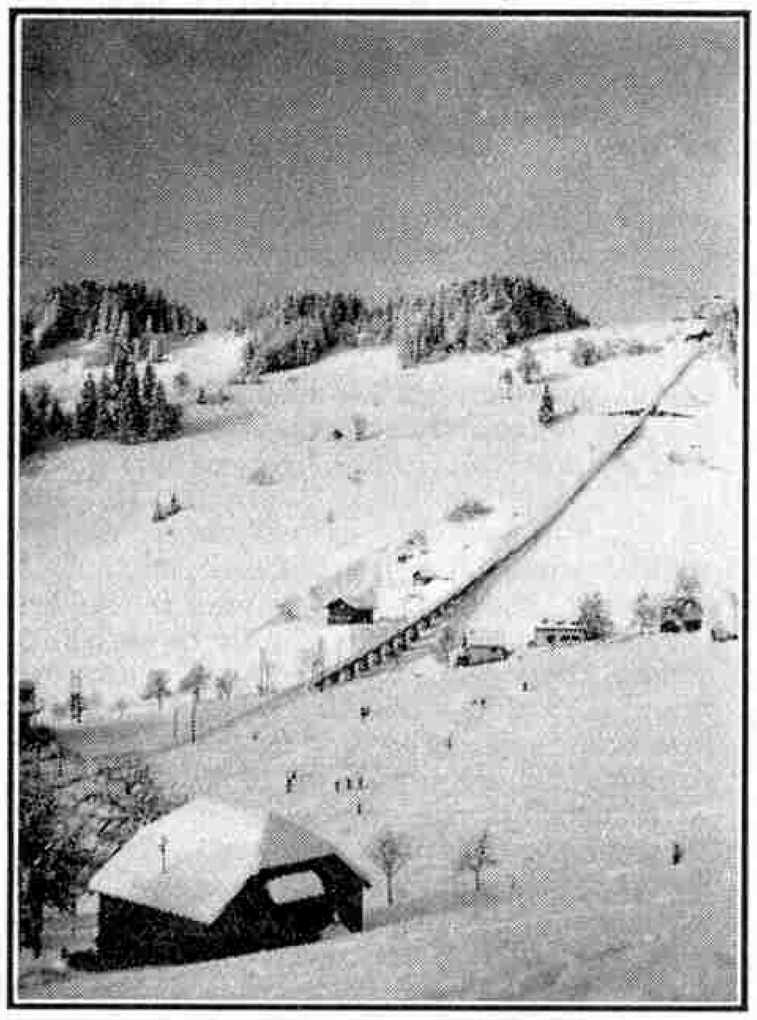
Wallpaper printing presses. The various colours are printed by means of prepared rollers as the paper passes round the large impression cylinder.

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.

A Swiss Holiday Resort

Les Avants is a little village about an hour's journey by electric train from Lausanne. It boasts only two main hotels, but there is plenty of activity there, especially in winter. To start with there are the "nursery" slopes for the ski "babies," or amateur skiers. Then there is a small lake converted into a skating rink. For bob-sleigh and tobogganing there are fine courses, on which international matches as well as Swiss races provide thrilling sights for the spectators. There is also a funicular railway to take more adventurous skiers up to the top of the valley known as Sonloup, and from there they can ski right down to Les Avants. This railway is shown in the upper illustration on this page.

From the Sonloup on a clear winter day there is a marvellous view of both sides of the valley. On the one hand is Les Avants, with the majestic mountains in the background shimmering in the winter sunshine. On the other is an equally enthralling scene, for in the far distance are the snow-swathed vineyards of Montreux, on the banks of Lake Geneva, which in Spring are one mass of red.



A funicular railway at Les Avants, a Swiss winter sports resort. Photograph by S. N. Kashyap, Lausanne.

The small railway station at Les Avants has only one platform, but this rather adds to the charm of the place, and there are no complaints from the holidaymakers who swarm from the trains on Sundays and holidays. As the name implies, Les Avants is a stepping stone to more wonderful ski-fields farther along the electric railway. It is possible to go by train right up to Rochers de Naye, which is 6,141 ft. up, and other places near that have made Switzerland's winter sports famous all over the world.

It must be fun to be the postman at Les Avants, for in winter he always wears skis when going on his round delivering the mail. In summer it is possible for him to walk.

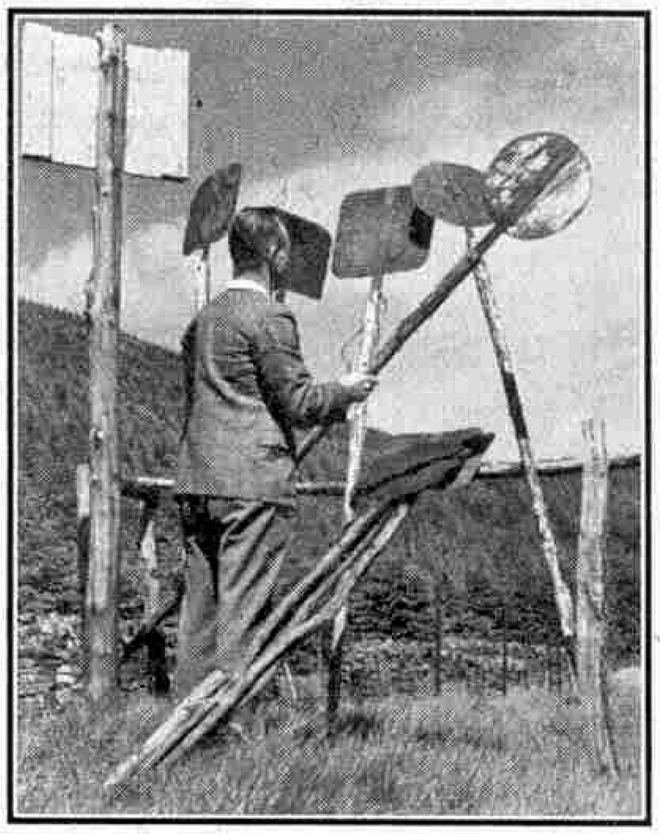
S. N. KASHYAP (Lausanne, Switzerland).

Round London Docks in a Steamship

I was recently one of a party of boys who spent an interesting day in London. We left home early in the morning, and arrived at Waterloo after a train journey of about an hour. We first visited the Tower and St. Paul's Cathedral, and then went on to Tower Pier, where we embarked on the paddle steamer *"Isle of Arran."* This vessel is 210 ft. long, and 24 ft. wide, and she can carry 885 passengers.

At sailing time I watched with interest the bascules of the Tower Bridge being raised to allow us to pass by. We then proceeded up the Thames, past the Surrey Commercial Docks, where the Cunard White Star liner *"Ausonia"* was preparing to sail, and onward to Galleons Reach. There the *"Isle of Arran"* turned into the Royal Victoria, Royal Albert and King George V Docks, where we saw the motorship *"Britannic,"* and many other vessels, including the *"Loch Katrine,"* the *"Largs Bay,"* and the *"El Argentino,"* which was unloading frozen meat. From there we steamed back up the winding course of the Thames, arriving at Tower Pier after a most interesting trip.

L. S. VASS (Bracknell, Berks.).



A unique "fire-station" in the Lake District. Photograph by J. D. Robinson, Darlington.

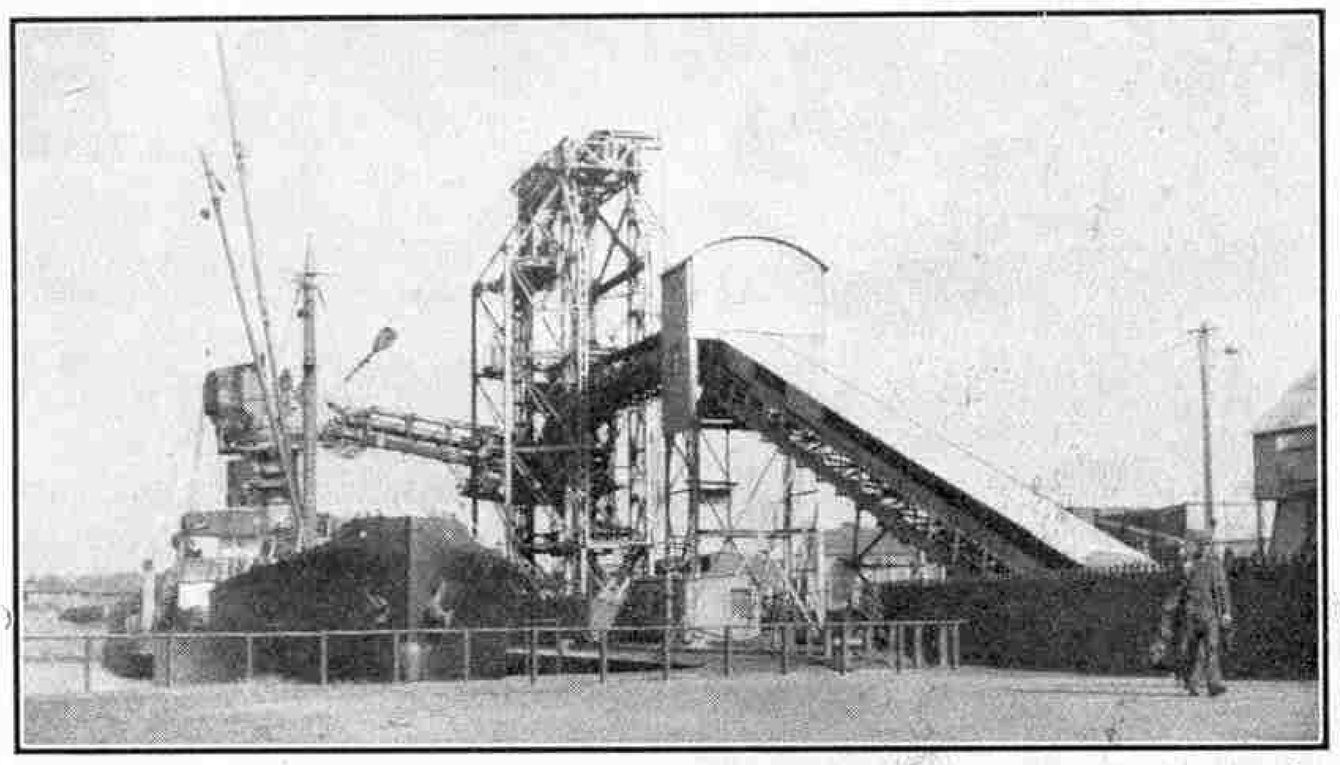
A Country Fire Station

The unique "fire station" seen in the lower illustration on this page is on the roadside between Keswick and Cockermouth, in the Lake District. No firemen are stationed there, and the only equipment is a number of "fire swotters" made from old tin drums. The public are asked to use these to beat out any fire that may break out among the newly-planted trees that cover the surrounding hillside. The station is the property of the Forestry Commission. Similar fire stations, stocked with birch brooms, are to be seen in the New Forest, and elsewhere.

J. D. ROBINSON (Darlington).

Coaling Ships at Ayr

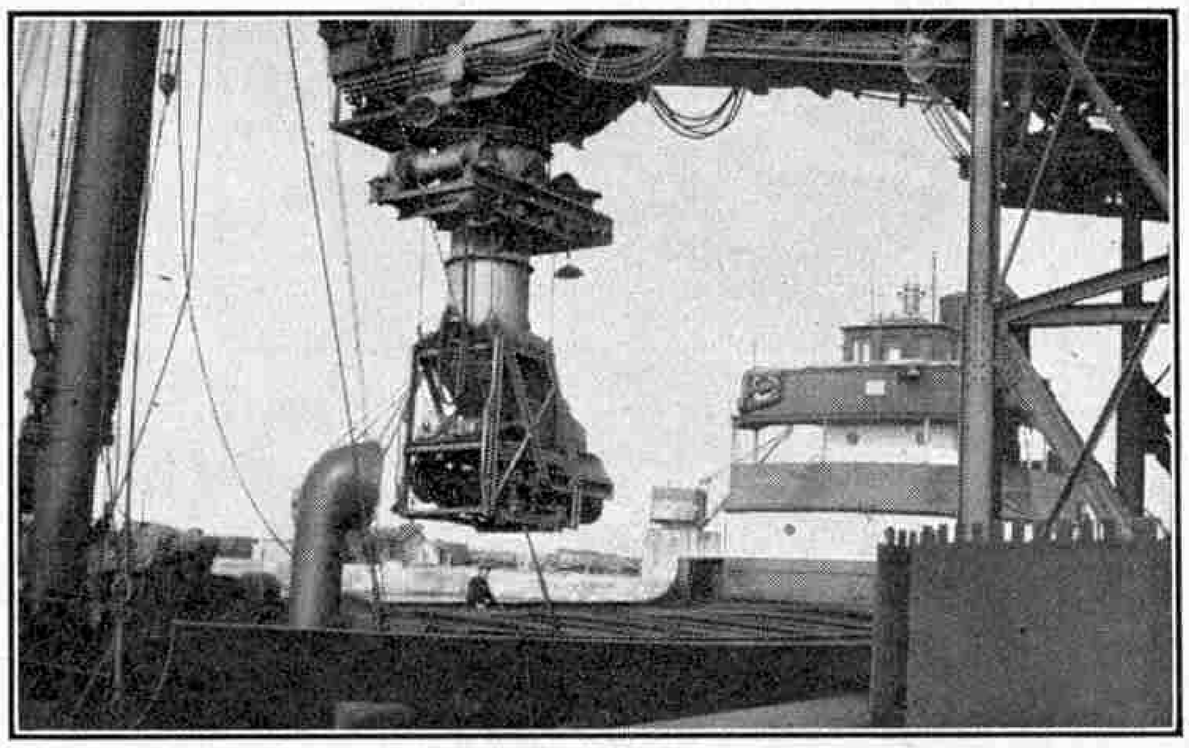
The accompanying illustrations show the motor collier "*Sapphire*," of Glasgow, about to start coaling by means of the large plant installed at Ayr Harbour by the L.M.S. Railway Co. a few years ago. This plant has been in continuous operation, and has many advantages over even the most up-to-date coaling cranes. Not only can a ship be coaled in a fraction of the time taken by the other method, but the process is much cleaner, for the coal is fed directly into the hold by conveyors and dust is not blown about. In addition less trimming is required, as the coal is more evenly distributed in the hold.



A large ship-coaling plant in Ayr Harbour that makes extensive use of conveyors. The photographs on this page are by A. Houston, Kilmarnock.

A loaded coal train is shunted on to a bank behind the hoist, and the individual wagons are brought forward as required by means of an electric capstan. After being weighed on a railway weighbridge each wagon is run into a wagon tipper, which empties the coal into a large hopper, seen at the extreme right in the upper illustration. From there the coal is carried by a large belt conveyor up to the house seen in the centre of the illustration.

The portion of the conveyor between this house and the main structure is pivoted at the upper end; the lower end rises and falls with the arm of the conveyor as required. The coal is carried along the arm by another belt conveyor to the distributor, which can be moved backwards and forwards across the hold, and is not dropped directly down, but is fed in by means of a short belt conveyor at the lower end of the distributor. A cabin is provided above the distributor for the operator in charge, who has control of the complete plant. In the lower illustration part of this cabin can be seen as the distributor is swung over the hold of the vessel, prior to the commencement of coaling.



A close-up view of the distributor of the coaling plant.

Electric power is used throughout, and every section of the conveyor and all the motions have independent motor drives. The empty wagon is replaced on the rails by the tipper, and then pushed on by the oncoming wagon. It runs down an incline and up a ramp, passing over a set of points that automatically close and divert it to another line as it runs back again. Before its momentum is lost, it is caught up by a chain conveyor placed between the tracks and acting on the axles, and drawn on to the train of empty trucks. On the way, it passes over another weighbridge, which registers its tare weight.

A. Houston (Kilmarnock).

Tunnel Cut Through a Glacier

It was about 11 o'clock one morning when the train arrived at the little station of Grindelwald. It was a perfect day, and the sky was cloudless. Grindelwald seemed a typical Alpine village, with brown wooden chalets dotted here and there over the valley and surrounded on all sides by high, snow-capped mountains, among which the Wetterhorn, 12,035 ft., the Schreckhorn, 13,260 ft., and the Finsteraarhorn, 13,894 ft., stand out conspicuously. The range of mountains around Grindelwald is the highest in the Bernese Oberland.

Grindelwald is also noted for its two glaciers, one of which lies between the Wetterhorn and the Schreckhorn and is called the Obere Gletscher, which means the Upper Glacier, while the other lies between the Schreckhorn and the Fiescherhorn and is called the Untere Gletscher, or Lower Glacier. I found the long walk from Grindelwald to the foot of the Wetterhorn Glacier a little tedious owing to the rough state of the roads and paths, but my trouble was amply rewarded by the beautiful scenery round about. From a distance the glacier seemed to have a greenish-blue appearance, caused by the reflection of the sky.

It is possible to walk across the glacier near the top with the help of a guide, and I did so, but at the foot it is ragged and has very deep and wide crevasses, which are dangerous. At the foot of the glacier there are huge boulders and stones that have been brought down by it; also an ice grotto, a tunnel about 3 ft. wide and 7 ft. high cut into the glacier. I went in, and felt as though I were inside a refrigerator, after being in the warm air outside. The ice there also has a greenish-blue tint, which makes it look quite attractive. Embedded in the ice were several large stones that had been carried down by the slowly-moving ice. This tunnel goes a considerable way into the glacier and at the end is a small room about 8 ft. square.

The Wetterhorn Glacier has existed for thousands of years, and it is said to be slowly advancing toward Grindelwald, although in 1930 the Lower Glacier receded about nine yards. This distance was regained in the following two years, however, and the forward movement has been maintained. One Alpine glacier was found to have advanced three miles in the period of 82 years between 1844, when measurements were first made, and 1922.

D. F. Etchells (Baguley).

GAUGE 00

THRILLS WITH TH

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Built to

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realistic railway on

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never before achieve
reversing and speed

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the latest upper-qu

Hornby-Dublo
from **Alternating**
from a 12-volt accu

The Dublo Tr

This is how your Hornby-Dublo Railway will look!

HORNBY-DUBLO TRAINS ARE MANUFACTURE

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

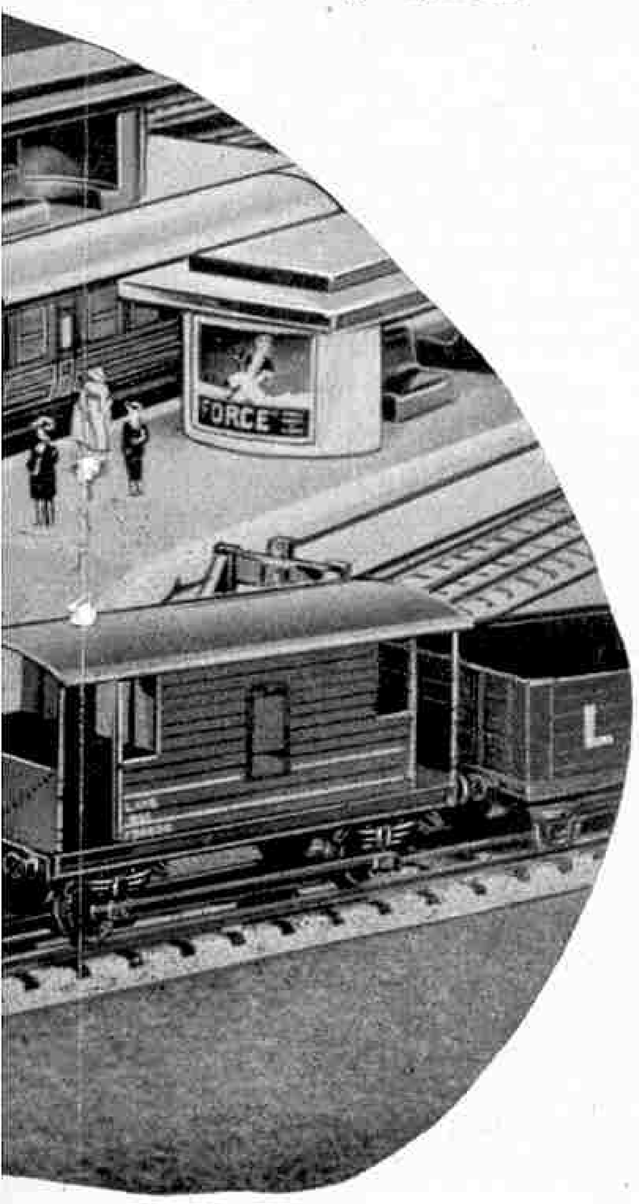
-Dublo Locomotives are fitted with motors (either clockwork or electric) of a power and reliability achieved in this gauge. All the movements of the Electric Locomotives are perfect—starting, stopping, d speed regulation are all carried out by the movement of one lever.

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

-Dublo Electric Trains operate on **Direct Current** at 12 volts. This current may be obtained either **nating Current Mains Supply** through a Dublo Transformer and a Dublo Controller No. 1, or olt accumulator and a Dublo Controller No. 1a.

ublo 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 ELECTRIC AND CLOCKWORK PASSENGER TRAIN SETS

ELECTRIC

Hornby-Dublo Electric Passenger Train Set, L.N.E.R. Contains Streamlined Six-coupled Locomotive **"Sir Nigel Gresley"** (Automatic Reversing), Tender, Two-Coach Articulated Unit, Dublo Controller No. 1, seven Curved Rails, one Curved Terminal Rail and two Straight Rails. (To be operated from a 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:
Electric Passenger Train Set, L.N.E.R. (With Dublo Controller No. 1a.) Price **61/6**

CLOCKWORK

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

HORNBY-DUBLO ELECTRIC AND CLOCKWORK TANK GOODS TRAIN SETS

ELECTRIC

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

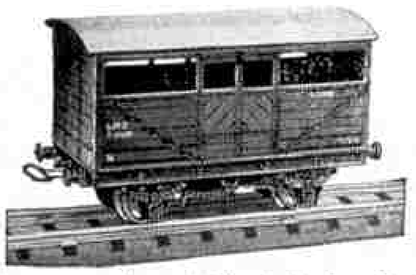
Where the mains supply is D.C., or there is no supply, the above Set is available with Dublo Controller No. 1a (for use with 12-volt accumulators) as follows:
Electric Tank Goods Train Set. (With Dublo Controller No. 1a.) Price **46/6**

CLOCKWORK

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

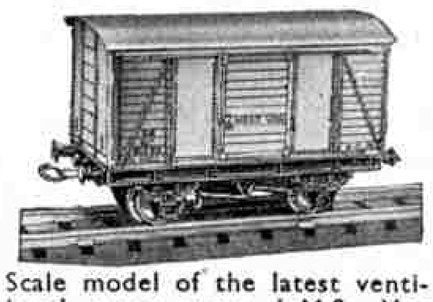
NOW READY

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



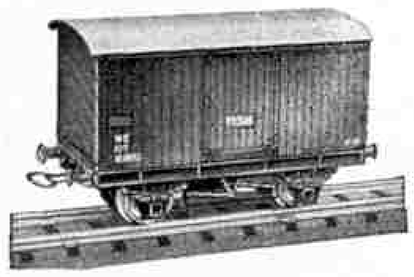
An attractive vehicle, fully detailed and typical of up-to-date practice of the two companies. Price 1/6

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



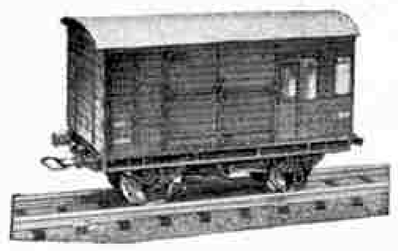
Scale model of the latest ventilated meat vans; L.M.S. Van Bauxite brown and S.R. Van buff. Price 1/6

FISH VAN 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 N.E.



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

OIL TANK WAGON
"ROYAL DAYLIGHT"

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

PETROL TANK WAGON
"POWER ETHYL"

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

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Some New Schemes for Hornby-Dublo Railways

Train Working and Lineside Novelties

ONE of many interesting schemes for novel passenger and goods train working described in last month's article involved the use of the separate L.N.E.R. Corridor Coach to provide a through service to or from some point not served by the main train. A further suggestion that will appeal to those who like variety in train operation is to arrange for a change of locomotives to be made at some suitable point on the through journey of a complete train. As an example, the Hornby-Dublo "Pacific" "*Sir Nigel Gresley*" may be booked to work a complete three-coach train over one section of its run, and replaced for the rest of the journey by the smart L.N.E.R. 0–6–2 Tank. "Weight restrictions," preventing the use of the express engine, over the second part of the run, might well form the imaginary cause of the substitution.

Working of this kind actually is carried out on the L.N.E.R. in connection with the "*West Riding Limited*," which is drawn between London and Leeds by an "A4" streamliner. The train also serves Bradford, and for the section of the journey between Leeds and Bradford tank locomotives of similar design to the Dublo Tank are employed. The thrill of engine changing in miniature—the operation is always interesting to watch in actual practice —will add considerably to the fun normally obtained from the railway.

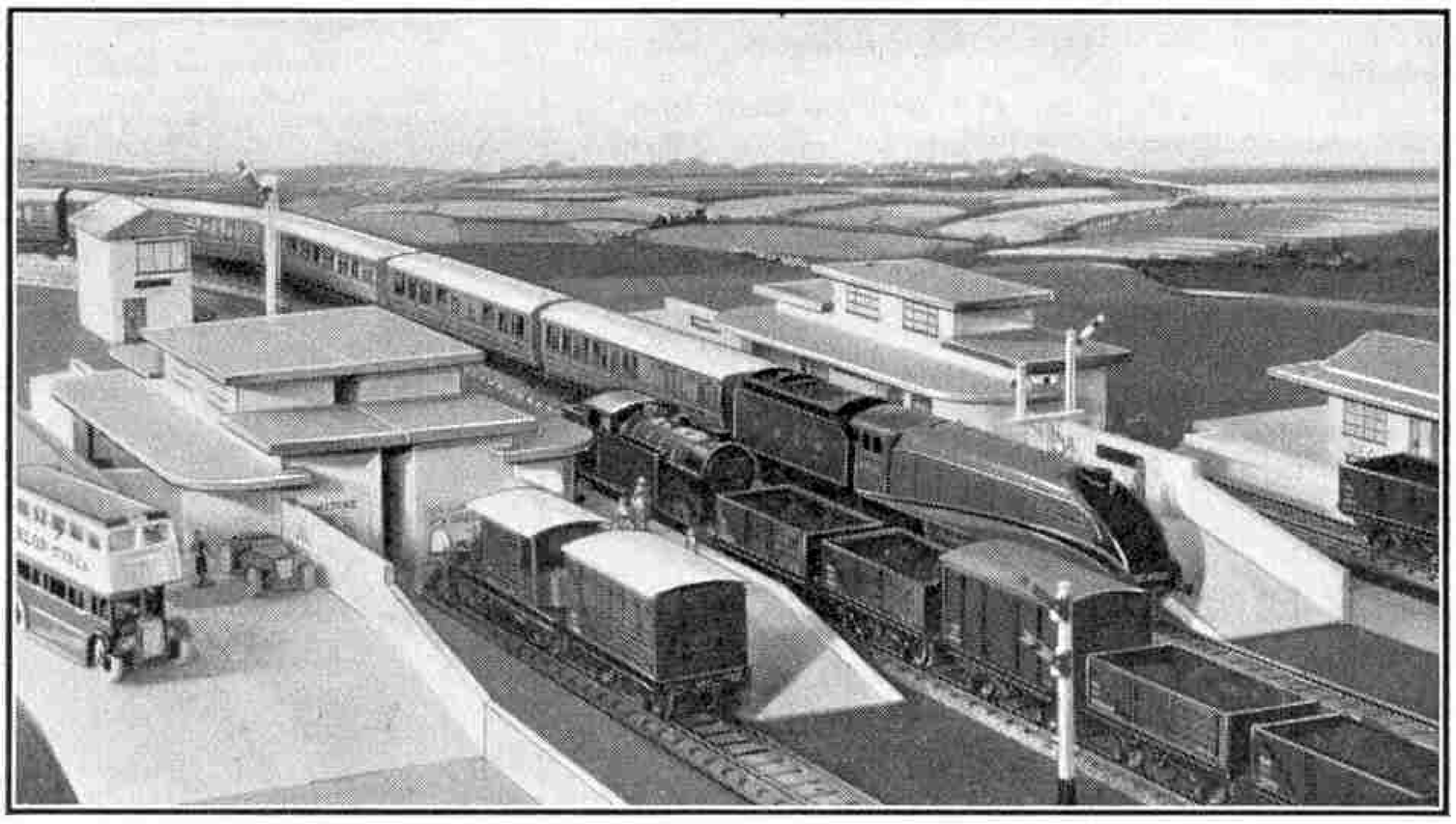
Further variety in train formation is now afforded by the introduction of the splendid new Vans described on page 300 of last month's "*M.M.*" Each of these Vans represents a brake-fitted vehicle of actual practice, and any one of them can be run quite correctly on a passenger train. When this is done they can be attached "inside the engine," to use the railwaymen's expression, denoting that the vehicle is run at the head of the train, or at the tail end, according to requirements. On real railways a horse box, a fish or meat van, or occasionally a cattle truck can be seen attached to a main line train for prompt conveyance, and the practice is quite a good scheme to adopt in miniature. It adds to the realism of operations and is useful on small layouts, on which perhaps only one or two examples of any particular kind of vehicle are in service. For instance, there may not be sufficient Fish or Meat Vans to form a reasonably long "perishables" train, and for urgent transit these Vans can then be conveyed by passenger services.

Where sufficient of these vehicles are available it is quite in accordance with real practice to form them into complete trains of either Cattle Trucks, Meat Vans, Fish Vans and so on. Cattle specials are often run in connection with the shipment of cattle abroad, or their transport to and from agricultural shows, markets and so on. In a similar manner trains of horse boxes are commonly seen on their way to or from race meetings. Specials of this kind are unusual in miniature railway practice and their running will form an interesting new departure.

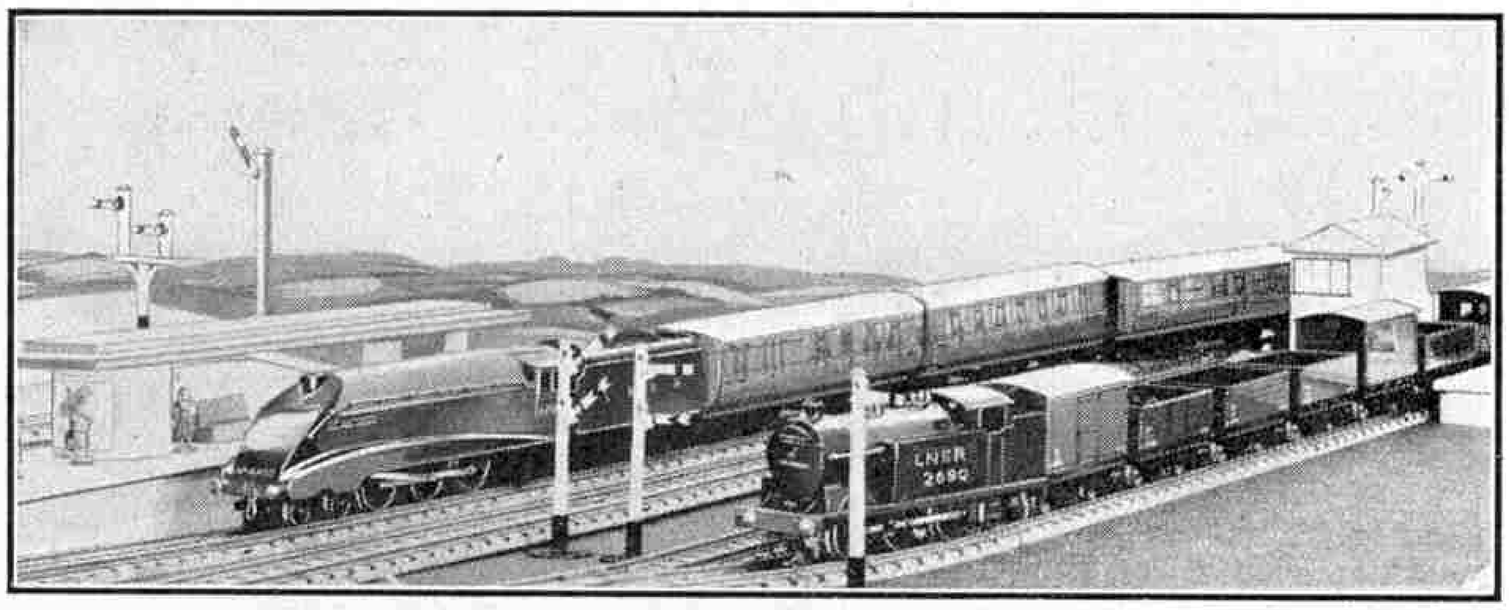
Complete trains of Fish or Meat Vans have a most realistic effect. Perishable traffic of this kind is conveyed at express speeds, and it will be in keeping with the importance of the freight to use the streamlined Express Locomotive for such work. For the shorter journeys, particularly on "trip" workings whereby traffic from wayside stations is concentrated at a marshalling yard ready for the main line run, the 0–6–2 Tank Locomotive is ideal.

A feature of actual practice that is not often reproduced in miniature is the running of special test trains. These may be operated purely for locomotive purposes, or to try out the possibilities of a new schedule or re-arrangement of traffic working. Every owner of a Hornby-Dublo streamliner is proud of the fact that it represents the class of locomotive that holds the world's maximum speed record for steam travel, this having been attained by No. 4468 "*Mallard*" in the course of a special test run last July. It is quite entertaining to carry out locomotive tests on a Dublo system, especially if some new scheme of working is contemplated or some increase in the loads to be taken is proposed. The results obtained from such tests are very useful when timetable working or some other organised scheme of working has to be arranged.

It may be found possible as the result of traffic tests of this kind to reproduce in a sense the intensive long-distance running that is expected of the L.N.E.R. "Pacifics." Rapid turning round of the engines at the end of long journeys is now the rule. This system of working is of benefit to the miniature railway owner. As a rule he has not a large stud of express locomotives at his disposal, and the



An interesting station arrangement on a Hornby-Dublo layout that embodies suggestions made in this article.



A typical lineside scene in which the use of Meccano Dinky Toys Signals is illustrated.

working necessarily adopted in order to provide engine power for his trains exactly reproduces the conditions of practice. Hornby-Dublo Locomotives are built for hard work and will respond gallantly to the demands of intensive duties. During their "shed intervals" they should of course be attended to strictly in accordance with the instructions packed with them.

Real traffic working of the summer season suggests various schemes that the Hornby-Dublo Railway Manager can adopt. "*The Flying Scotsman*" commences its spell of non-stop running between London and Edinburgh; "*The Scarborough Flyer*" begins its speedy journeys between London and York. For these, and for most of the important L.N.E.R. main line trains, the Hornby Dublo "Pacific" and L.N.E.R. Rolling Stock is exactly what is required.

There are various schemes not connected with the trains themselves that can be followed up by the Hornby-Dublo railway owner. Hornby-Dublo Signals have already received attention in these pages. The realistic design and the satisfactory operation of the various types of signals add considerably to the fun of running the trains, and many Hornby-Dublo owners find it a good plan to make use in addition of the slightly smaller signal of the Dinky Toys range. These, Dinky Toys No. 15, can be used in selected positions, such as in spots where the question of convenient sighting calls for a slightly shorter signal than the standard Dublo product. The smaller proportions of these Signals make them useful also for starting signals located at the end of the station platform.

The Dinky Toys Signals include ordinary Single Arm "home" and "distant" signals, one of the Double-Arm type and a very neat Junction Signal. All these are of the modern upper-quadrant pattern. The only drawback to their use is that the semaphores cannot be operated in the orthodox manner from the foot of the post, and therefore have to be moved by hand. Dinky Toys Signals are shown in two of the illustrations to this article, and readers will see that they have quite a realistic appearance.

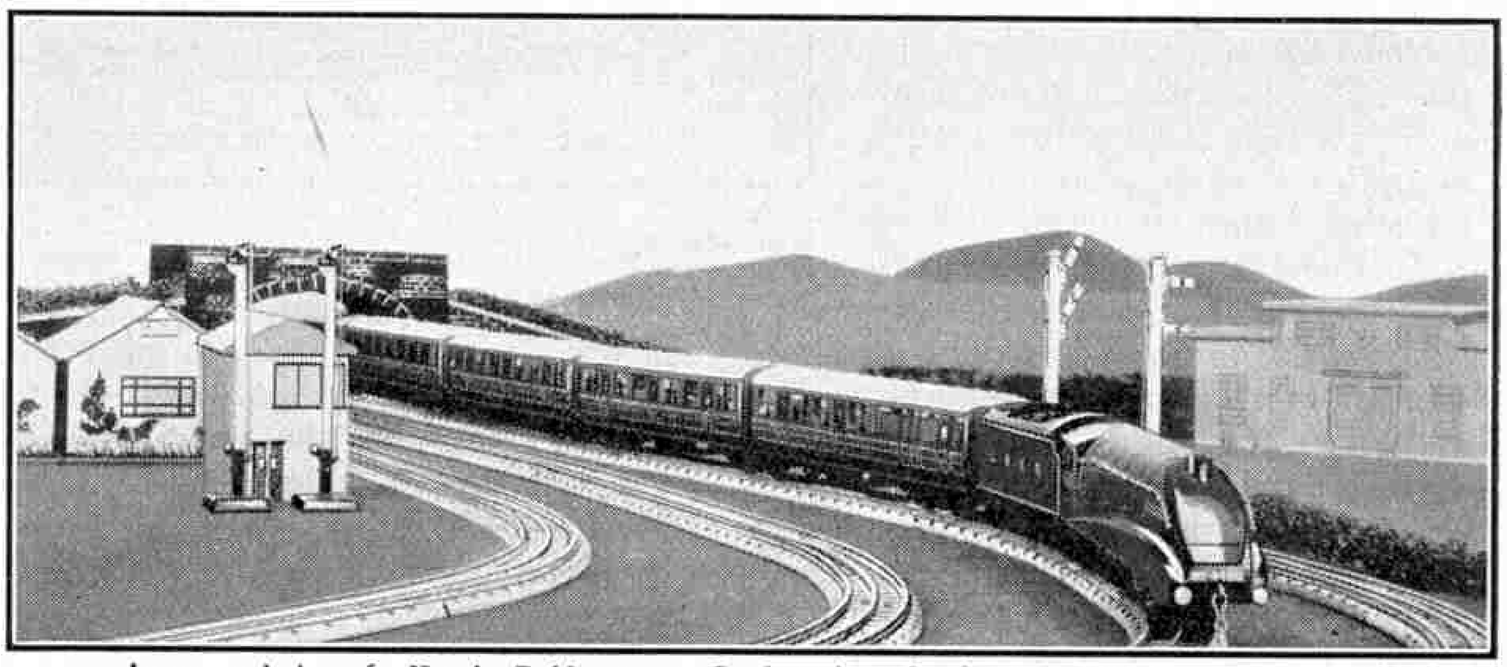
The range of Hornby-Dublo buildings, Stations and Signal Cabins and so on is growing, and some good things in this direction are to be expected later in the year! The buildings of the present range are very adaptable, and many interesting combinations can be arranged to secure particular effects. Thus a Main Line Station can be used alone, or it can be employed in conjunction with another one of the same type to make the usual two-platform type of station. An alternative is to use along with it the Island Platform, which is particularly useful where a branch or loop line has to be accommodated at one side of the station layout. Similarly two Goods Platforms can be combined to form a large depot. The actual platforms of these accessories are not provided with ramps, and so the platforms can be arranged end to end or side by side as required.

A novel station arrangement is shown on the left-hand side of the illustration on the previous page. Two Main Line Stations have been placed back to back, although the railway only serves one of them, and the building on the "town" side is made to form a raised approach. An interesting development that suggests many possibilities is the use of an Island Platform in conjunction to form a bus station.

Although motor bus services are keen competitors of the railways, and are not favoured by model railway enthusiasts, their inclusion on a miniature railway is important if the layout is to be realistic and up-to-date. Bus services are an essential part of our everyday life and a local railway station without a service is unthinkable.

The Dinky Toy Buses, No. 28c, are ideal for linking the "residential quarter" with the local station where connections are made with the business trains running to and from the "City." Bus services also can be arranged to supplement the local train service and will give "employment" to the younger members of the railway staff! Arrangements similar to these add to the fun.

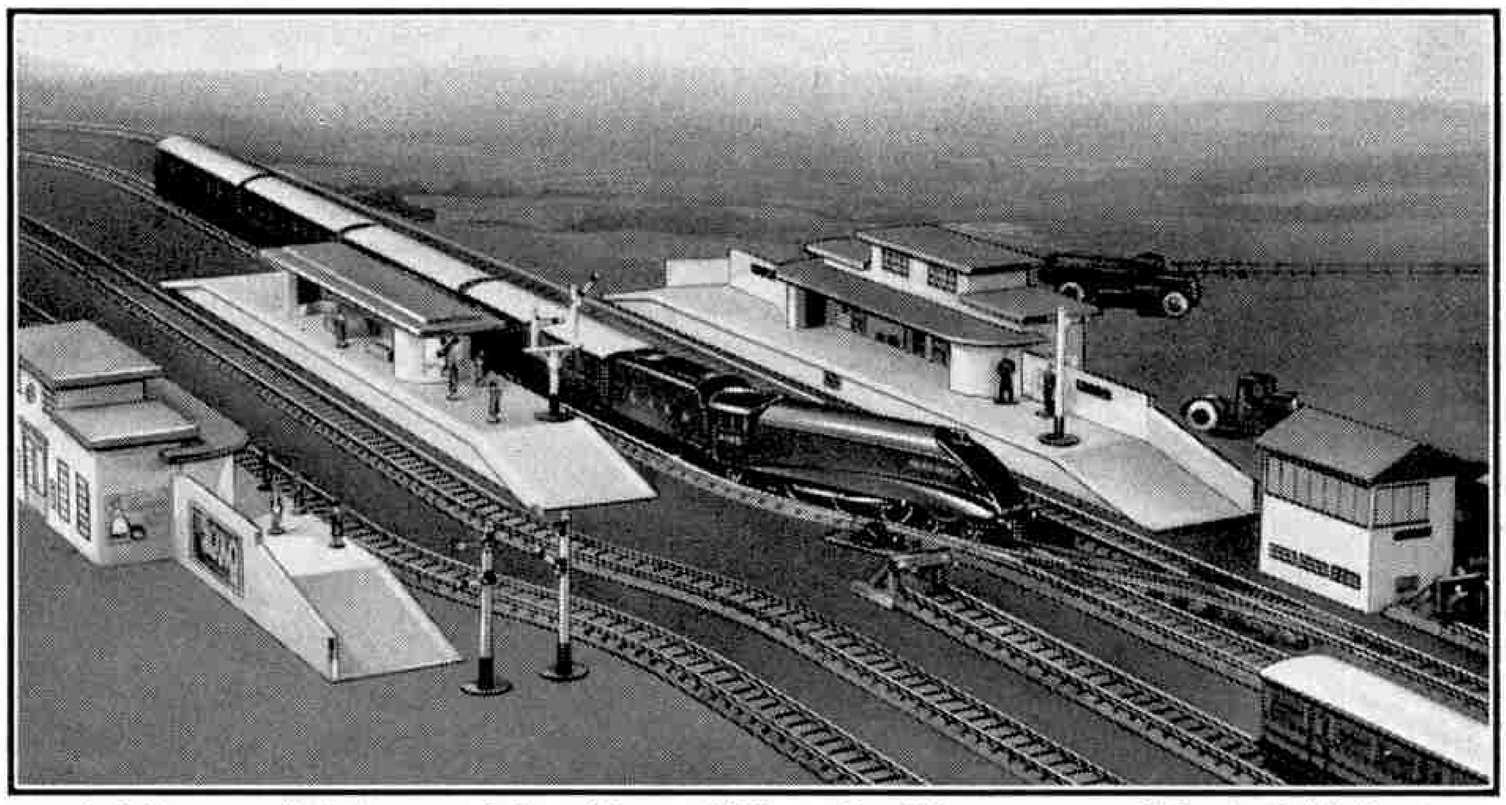
Readers frequently enquire what can be used along the lineside to mark the boundary of the railway property, since fencing for this purpose is not available. The standard Hornby Hedging can be used with quite satisfactory effects, as is shown by the lower illustration on this page. Readers will remember too the splendid illustration on page 299 of the last issue of a very attractive scenic layout, in which Hornby Hedging and the standard Trees were employed with good effect. Ordinary boundary walls can be made of lengths of wood, and can be finished either by painting or by covering with the "brick paper" that is used extensively on doll's houses. This can be obtained at most toy shops and at many decorator's stores.



An unusual view of a Hornby-Dublo express. Good use is made of Hornby Hedging on this layout.

Planning Your Hornby-Dublo Railway

Realistic Layouts in Small Space



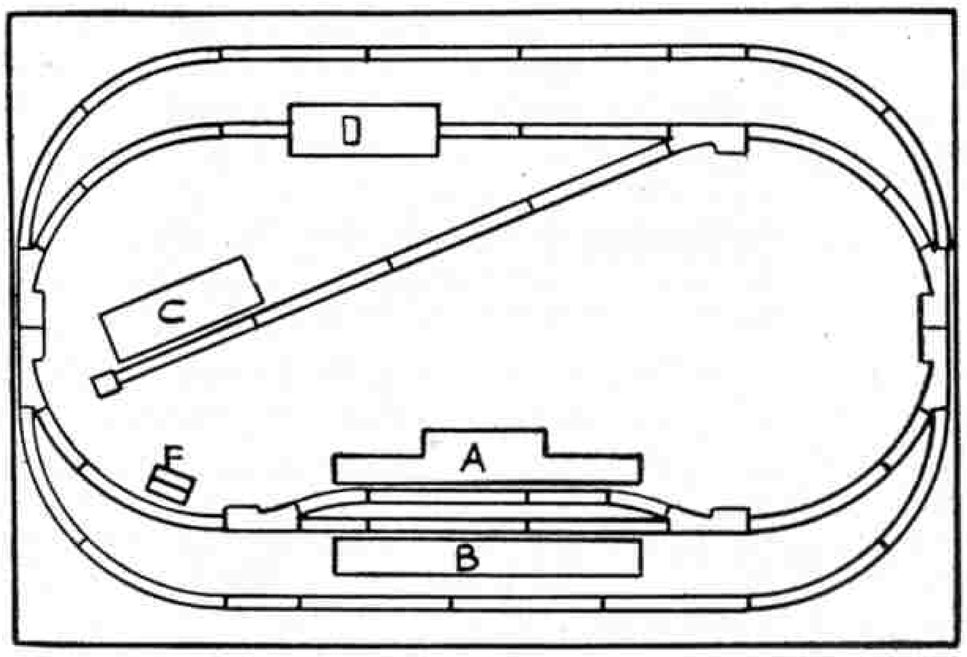
A station scene that gives a good idea of the possibilities and realistic appearance of Hornby-Dublo Track.

HORNBY-DUBLO enthusiasts are fortunate in that the track available for them not only resembles the real thing in appearance to a striking degree, but also has been specially designed to make railway-like layouts possible. One remarkable feature is the small space in which a realistic layout can be accommodated. For details of suitable layouts readers are recommended to obtain from their dealers a copy of the free leaflet *"Suggestions for Hornby-Dublo Rail Layouts."* A typical formation from the selection given in the leaflet is shown in the diagram on this page, which can be accommodated comfortably in a space of 6 ft. by 4 ft.

The diagram serves also to illustrate how the various Hornby-Dublo Track components are related to one another, and how they form symmetrical layouts. For instance, at the station there is no necessity to use parallel points to form the station loop line, for each end of the station loop is formed by Right-hand or Left-hand Points and a Curved Half Rail, and the intervening length is made up of standard straight lengths. Similarly it is possible to form crossover points for connecting two parallel tracks by joining the curved portion of the Dublo Points together. Tracks connected in this manner are the same distance apart as the station lines on the layout illustrated on this page, for the curved portion of the Points is equal in length to a standard Dublo Curved Half Rail and has the same radius.

The station shown in our upper illustration gives a good idea of the realistic effects that are possible with Hornby-Dublo Track. There are four running tracks, with a central siding on which the coach in the right-hand corner of the photograph is standing. An interesting feature that adds to the natural effect of the track is the reverse curve incorporated in the two main tracks nearest the camera. The train shown in the photograph is making use of points connecting two of the parallel main tracks in crossing over from one line to the other.

As regards actual operations, a layout following the lines of the diagram already referred to will afford a great deal of variety in railway-like working, especially if it is an electric line and certain sections of the track are capable of being rendered "dead." How this is done was described in the article in the *"M.M."* last February on *"How We Run Our Hornby-Dublo Railway."* Special equipment for this purpose is being developed, and will be available later.



A useful layout dealt with in this article. The letters denote various Hornby-Dublo Accessories as follows:—(A) Main Line Station; (B) Island Platform; (C) Goods Depot; (D) Tunnel (long); (F) Signal Cabin.

Various interesting operations can be carried out on this layout, their character and extent depending on the amount of rolling stock and number of Locomotives in hand. For instance suppose that both a goods and a passenger train are available. Our goods train, already assembled by one of the Hornby-Dublo 0–6–2 Tank Locomotives, can stand in the siding by the Goods Depot "C" while the passenger train, headed by *"Sir Nigel Gresley,"* the fine scale model 4–6–2 streamlined engine, is making its run round the outer or inner oval of the layout. After completing one or two circuits, the train can be brought to a standstill at the station, either in the loop line or on the main line. The goods train can then move out of the siding on to the main line and be stopped on the outer loop, the passenger train meanwhile entering the siding thus left empty. On the other hand, the provision of a loop line at the Main Line Station "A" makes it possible for the goods train to be kept in the station while the passenger train is in operation, and vice-versa.

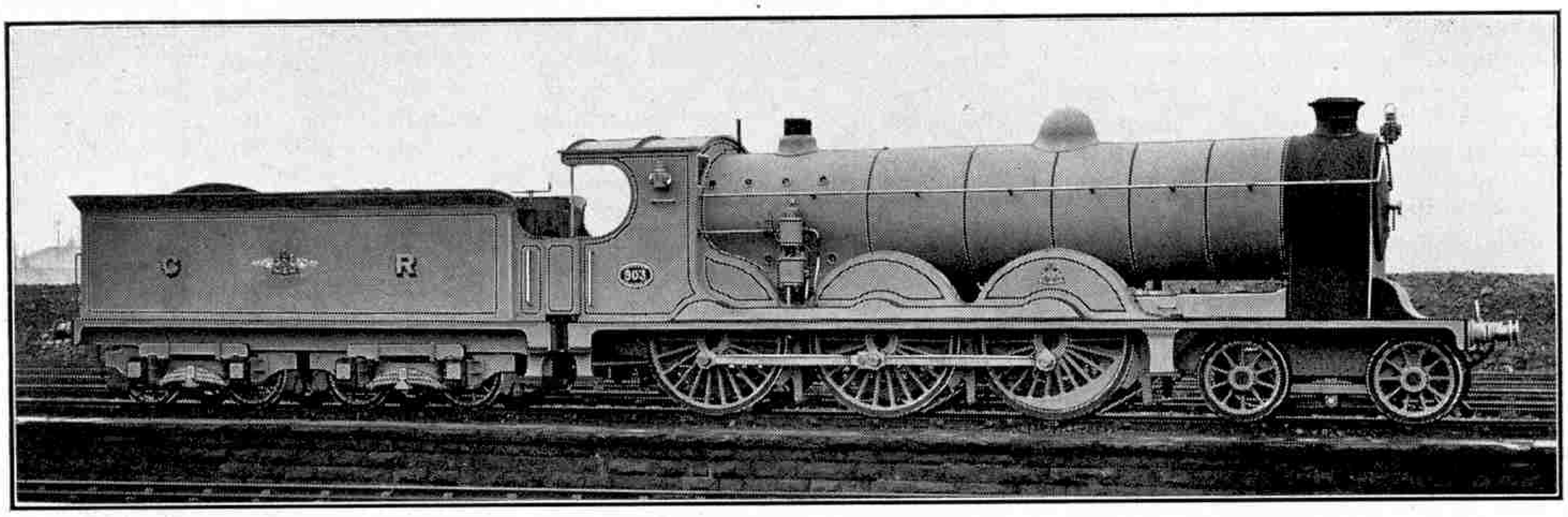
Although it is not possible to control clockwork locomotives to the same extent as electrically-operated engines, it is nevertheless a great advantage to be able to have more than one Locomotive at any point of the layout, without the necessity for sectionalising. Such a layout as the one dealt with therefore is very suitable for Clockwork Trains.

The provision of accessories always does much to add both to the realistic appearance of any line and to the pleasure of operations. Hornby-Dublo Accessories have been designed to fit in with the standards observed for Hornby-Dublo Track. Platform heights, for instance, are in keeping with that of the track, so that the coach footboards pass them at just the right level. The layout diagram on this page shows suitable positions for various Accessories.

Historic Locomotives

V.—A Caledonian Favourite—4-6-0 *"Cardean"*

By C. Hamilton Ellis



The illustration above shows the subject of this article, Caledonian 4-6-0 No. 903 "Cardean." This photograph was taken soon after construction, before the name was added. Photograph by courtesy of the L.M.S.

JOHN F. McINTOSH, the far-seeing one-armed Locomotive Superintendent of the former Caledonian Railway, who was Chief at St. Rollox from 1895 to 1914, was one of the very first designers to realise how much the success of the modern locomotive depended on plenty of reserve boiler power. The production of his "Dunalastair" 4–4–0s of 1896 was the first step toward the large-boilered locomotives of the present century with which we are all familiar, but the most famous of McIntosh's big-boilered express engines, which performed work second to none with the West Coast expresses during the early nineteen-hundreds, undoubtedly was his big 4–6–0 *"Cardean"* No. 903 and her four sisters.

"Cardean" together with her four sisters provided one of the very few instances of 19th century traditions in design being combined with 20th century dimensions that yet produced a handsome locomotive; but then, John McIntosh never designed an ugly engine in his life. The beautiful blue colour of the Caledonian Railway engines, with red-brown underframes and black-and-white lines, suited the design perfectly.

There were five engines in the class, Nos. 903-907, and they had 6 ft. 6 in. coupled wheels, 20 in. by 26 in. cylinders, and a working pressure of 200 lb. per sq. in. Each weighed 130 tons in working order. The eight-wheeled bogie tender was a giant vehicle for those days, holding 5 tons of coal and 5,000 gallons of water. When built, in 1906, these engines used saturated steam, but in later years superheaters were fitted, and the boiler pressure was then reduced to 175 lb. per sq. in.

For years *"Cardean,"* the pride of Polmadie, where she was stationed, was the regular engine between Glasgow and Carlisle for the famous 2.0 p.m. for London and the corresponding return on the 2.0 p.m. from Euston, now known as *"The Midday Scot."* Every evening quite a party of engine lovers used to gather at Carlisle to watch the great blue *"Cardean,"* under the care of the eminent Driver Gibson, who remained in the service to drive "Royal Scots," glide away from the platform with her long white-topped train behind her, to go shouting her way up into the blue Border hills as the Sun went down. To us she seemed like a work of art, and the elaborate decorations that had been applied by the men to her great regulator handle showed that they thought so too.

One of the best runs by an engine of this class was that of *"Cardean's"* sister, the ill-fated No. 907, with a 350-ton train from Glasgow to Carlisle, 102.3 miles, in 122 min. Even on the last climb to the summit level, which was made without any assistance from a banking engine, the speed never dropped below 40 m.p.h. Poor No. 907 came to a sad end, for she was destroyed in the accident at Gretna in 1915.

The scheduled time for the Carlisle-Glasgow run, and its corresponding return journey, was 2 hrs. 7 min., but this was sometimes improved on considerably, in spite of the weight of the trains and the unkindly Scottish climate. Wet rails, on a climb like that up to the Beattock Summit, perhaps in conjunction with a powerful head wind, can be no joke for drivers.

"Cardean" herself had one narrow escape. On 2nd April 1909 she broke her crank axle while running through Crawford at full speed. Her left-hand driving wheel came adrift, and bowled along beside her for 110 yds. The engine, with both brake gear and reversing gear put out of action, ran along for three quarters of a mile on nine wheels, having broken loose from her tender, but came to a halt without further damaging herself or colliding with her own train. Nobody was injured.

"Cardean," together with her three surviving sisters, Nos. 904–906, became L.M.S. Nos. 14752–5 when the Caledonian was merged into the bigger company. They were still magnificent engines, and had there been more of them they might yet be doing useful work on secondary fast trains. They paid the penalty for being a class of very limited numbers, for in an age of standardisation, such small classes are usually the first to go. By 1930 only *"Cardean"* herself survived. She was withdrawn in that same year, and the majestic note of her peculiar deep-toned whistle, which could be distinguished at a distance of several miles on a calm day, became a voice of the past.

New Outfit Models

Good Subjects for Young Readers

THIS month again we are describing four small and easily-built models designed specially to interest and amuse the younger ones among our readers. The first model to be described is a windmill pump. Next comes a formidable-looking machine gun, with a neat little sports car and a tower wagon to complete the list. All the models are easy to build and interesting to use, and give variety in model-building that will appeal to owners of the small Outfits required.

The windmill pump shown in Fig. 2 is built from the contents of Outfit No. 0 and its construction is commenced by bolting two Trunnions to a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate, the Trunnions being spaced two holes apart. Each of the Trunnions supports a $5\frac{1}{2}''$ Strip, in the top holes of which is journalled a 2″ Rod. The Rod is held in its bearings by a Spring Clip, and is fitted with a Bush Wheel, across which two $5\frac{1}{2}''$ Strips are bolted to form the sails.

A $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip also is bolted to the base plate, and supports two Flat Trunnions that form bearings for a Crank Handle. The latter carries two 1″ Pulleys, the boss of Pulley 1 being fitted with an Angle Bracket by passing the set screw of the Pulley through the Bracket and a washer, and screwing it into the boss of the Pulley. A pillar formed by a Double Angle Strip and a $2\frac{1}{2}''$ Strip, carries the $2\frac{1}{2}''$ Curved Strip 2.

The connecting strip between Strip 2 and Pulley 1 and the Angle Bracket carrying the pump rod are pivotally connected to Strip 2. The bolts supporting them are not lock-nutted, but are left sufficiently loose to enable the model to operate smoothly. Finally a belt of cord is passed around the 1″ Pulley on the Crank Handle and around the shaft of the windmill sails.

Most model-builders who construct this model will want to operate it by means of a *Magic* Motor. It is not a difficult matter to arrange this. The Motor is bolted to the $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate on the right-hand side of the Crank Handle, by passing bolts through the lugs of the Motor and through the first row of holes in the Plate. The $\frac{1}{2}''$ fast Pulley supplied with the Motor is fastened on the Crank Handle, and the drive is then taken from the small pulley of the Motor to the $\frac{1}{2}''$ Pulley through a small Driving Band.

Parts required to build the model windmill pump: 4 of No. 2; 2 of No. 5; 4 of No. 12; 1 of No. 16; 1 of No. 17; 1 of No. 19g; 2 of No. 22; 1 of No. 24; 4 of No. 35; 22 of No. 37a; 18 of No. 37b; 2 of No. 38; 2 of No. 48a; 1 of No. 52; 1 of No. 90a; 4 of No. 111c; 2 of No. 126; 2 of No. 126a.

A model of a very different type is the formidable looking machine gun shown in Fig. 4. This can be built with Outfit No. 1. It is best to commence building the model with the gun barrel, which consists of two $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates rolled into U-section and bolted together to form a tube. A Bush Wheel 1 is then fixed to the tube in the position shown. The barrel of the gun is completed by the addition of an Angle Bracket fitted with a $\frac{3}{8}''$ Bolt at its front end. The breech consists of a $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate bent to the shape shown in Fig. 4, the ends of the Plate being bolted to the barrel of the gun. The top of the breech is a $2\frac{1}{2}''$ Strip, which carries an

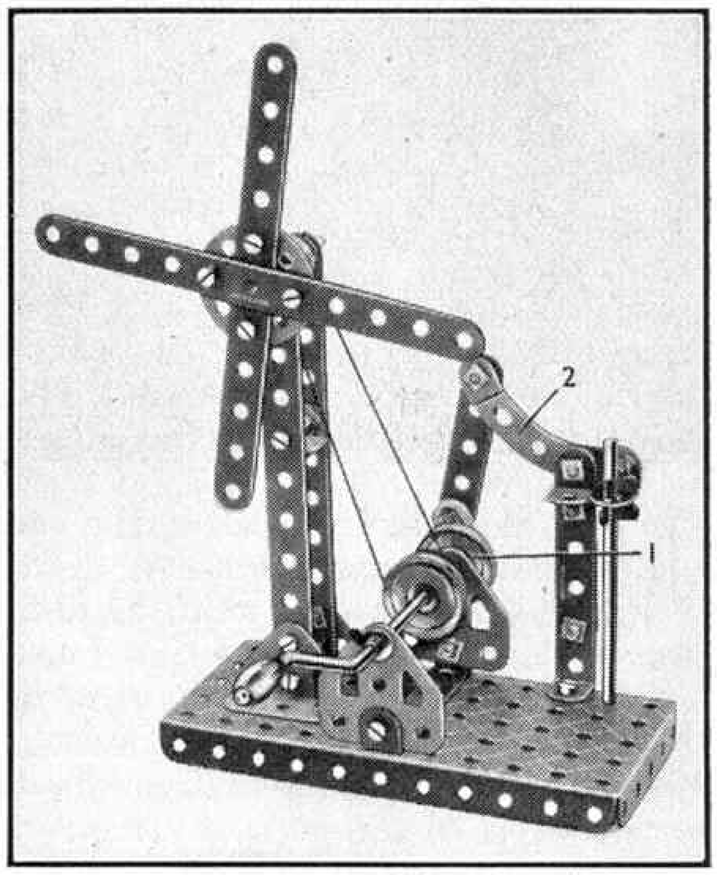


Fig. 2. This simple model windmill pump forms a good subject for Outfit No. 0.

Angle Bracket to represent the rear gun sight. A $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip bolted underneath the breech completes this part of the model. Two 2″ Rods supported by Flat Brackets and Spring Clips form the firing levers.

The tripod stand is made by bolting $5\frac{1}{2}''$ Strips to a Flat Trunnion and is fitted with a seat consisting of a second Flat Trunnion. A $3\frac{1}{2}''$ Rod 2 is locked in the boss of Bush Wheel 1 and is fitted with two 1″ Pulleys as shown. The Rod is then passed through the Flat Trunnion and is retained in position by another 1″ Pulley. This arrangement allows the gun to be slewed in a horizontal plane.

Parts required to build the model machine gun: 4 of No. 2; 2 of No. 5; 4 of No. 10; 3 of No. 12; 1 of No. 16; 2 of No. 17; 3 of No. 22; 1 of No. 24; 4 of No. 35; 23 of No. 37a; 22 of No. 37b; 2 of No. 38; 1 of No. 48a; 1 of No. 111c; 2 of No. 126a; 1 of No. 155a; 1 of No. 189.

The next model to be described is the two-seater sports car shown in Fig. 3. It is fitted with a *Magic* Motor which drives it at a good speed, and is an excellent subject for Outfit No. 2.

Each side of the body consists of a $5\frac{1}{2}'' \times 1\frac{1}{2}''$ and a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible

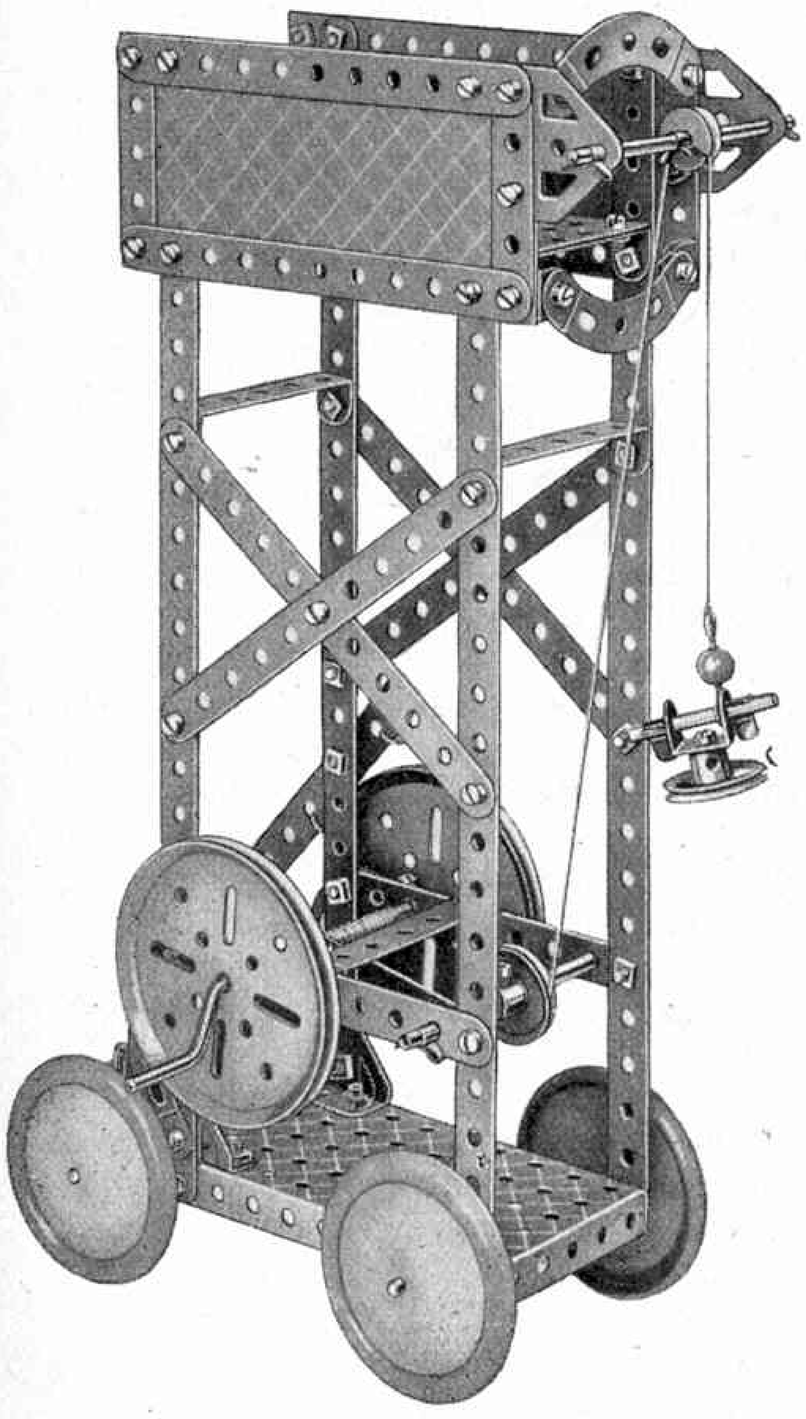


Fig. 1. A fine model of a tower wagon built from the parts in Outfit No. 4.

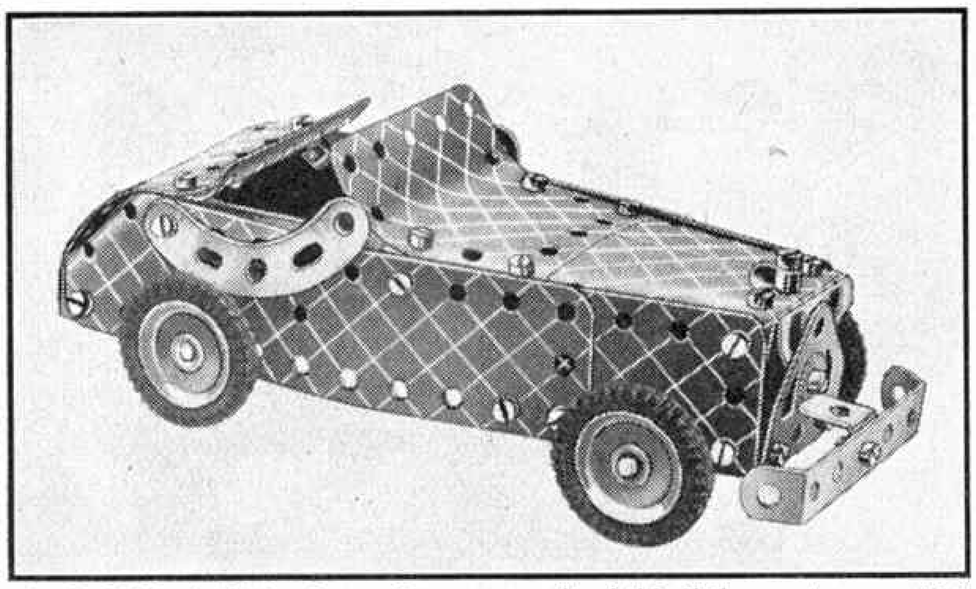


Fig. 3. A Magic Motor forms the power unit of this little sports car, which can be built with Outfit No. 2.

Plate overlapped two holes. Each of the lower edges of these Plates is strengthened with a $5\frac{1}{2}''$ and a $2\frac{1}{2}''$ Strip, and the sides are then bent to the shape shown in Fig. 3. The two sides are joined together at the rear by a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip, and at the front by a Trunnion, a Flat Trunnion and Angle Brackets, these three parts together forming the radiator. The curved rear end of the car comprises two $1\frac{11}{16}''$ radius Curved Plates, overlapped four holes and connected to the sides by Angle Brackets and the $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip previously mentioned.

The bonnet consists of two $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates, which are bolted together and have their edges bent over so that they fit exactly between the sides of the car. The Plates are then bolted in position as shown.

The *Magic* Motor that forms the power unit of this little car is next fitted. It is bolted by its lugs to one of the $5\frac{1}{2}''$ Strips strengthening the sides of the car, and is located underneath the bonnet. The rear axle is a $3\frac{1}{2}''$ Rod fitted with 1″ Pulleys, and it carries at its centre the $\frac{1}{2}''$ fast Pulley supplied with the *Magic* Motor. A Driving Band of suitable length is passed round this Pulley and the small pulley of the Motor.

The front axle is a $3\frac{1}{2}''$ Rod fitted with 1″ Pulleys, and side play is prevented by two Spring Clips and washers placed on each side of the car body.

In the illustration the model is shown fitted with 1″ Rubber Tyres (Part No. 142c). These are not included in the Outfit, but their use considerably improves the appearance of the model. The Rubber Rings can be used if the Tyres are not available.

The front bumper consists of a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip attached to the radiator by means of a Reversed Angle Bracket. All that then remains is to give a finishing touch to the model by the addition of a radiator cap, represented by a Spring Clip and $\frac{3}{8}''$ Bolt.

Parts required to build the model sports car: 2 of No. 2; 2 of No. 5; 6 of No. 12; 2 of No. 16; 4 of No. 22; 1 of No. 23a; 3 of No. 35; 29 of No. 37; 1 of No. 37a; 4 of No. 38; 2 of No. 48a; 2 of No. 90a; 1 of No. 111c; 1 of No. 125; 1 of No. 126; 1 of No. 126a; 1 of No. 186; 2 of No. 188; 2 of No. 189; 2 of No. 190; 2 of No. 200; 4 1″ Rubber Tyres, 1 *Magic* Motor (not included in Outfit).

The largest of this month's models is the tower wagon shown in Fig. 1, built with the parts in the No. 4 Outfit. This is a reproduction of a vehicle used for servicing electric street lamps and overhead cables. It is built up on a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate that forms the chassis. Four vertical $12\frac{1}{2}''$ Strips are bolted to the Flanged Plate, additional support for the rear pair of Strips being supplied by Trunnions. To the upper ends of the $12\frac{1}{2}''$ Strips are bolted two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates, the edges of which are strengthened with $5\frac{1}{2}''$ and $2\frac{1}{2}''$ Strips in the manner shown. The $12\frac{1}{2}''$ Strips are joined by $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips in a position five holes from their upper ends, and a $4\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate is bolted to the Double Angle Strips to form the platform. Two Double Angle Strips are also bolted five holes below the first pair, and cross braces consisting of $5\frac{1}{2}''$ Strips are added to strengthen the structure and make it quite rigid.

Two compound strips are bolted in a position six holes from the lower ends of the $12\frac{1}{2}''$ Strips. Each consists of two $2\frac{1}{2}''$ Strips bolted end to end, and they are connected at their centres by a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip. They form bearings for a small Crank Handle, on which are fastened two 3″ Pulleys. A $3\frac{1}{2}''$ Rod also is journalled in the compound strips and it carries a 1″ Pulley. This forms a guide for the hoist Cord in the winch, the purpose of which is to raise material to the men working on the platform. The platform sides are connected at one end by $2\frac{1}{2}''$ Cranked Curved Strips and Angle Brackets, two Flat Trunnions being held by the same bolts. The Flat Trunnions provide bearings for a $3\frac{1}{2}''$ Rod that carries a $\frac{1}{2}''$ loose Pulley. Cord is tied to a Cord Anchoring Spring on the shaft of the Crank Handle, and after passing round the guide Pulley is led over the $\frac{1}{2}''$ loose Pulley on the Rod journalled in the Flat Trunnions. A Small Loaded Hook is tied to the end of the Cord and it supports a load consisting of a 1″ Pulley fixed to a Double Bracket to represent a street lamp. The rear 3″ Pulley on the Crank Handle is fitted with a Cord band brake, which brake is controlled by a lever consisting of a $3\frac{1}{2}''$ Strip pivotally attached to one of the $12\frac{1}{2}''$ Strips by a $\frac{3}{8}''$ Bolt and lock-nuts.

The model is mounted on four Road Wheels, which are locked on the ends of two 4″ Rods journalled as shown. Like the windmill pump, this model is suitable for Clockwork Motor drive and the fitting of the Motor is quite an easy matter. The most suitable type to use is the No. 1 Motor, as it is more powerful than the *Magic* Motor. A few small structural alterations to the model will be necessary. First, the Rod carrying the guide Pulley for the hoist Cord must be moved to a position 4 in. higher up the front pair of $12\frac{1}{2}''$ Strips and the $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip connecting the horizontal $5\frac{1}{2}''$ Strips removed. The Crank Handle is then journalled directly in the $12\frac{1}{2}''$ Strips.

The Motor is fitted inside the tower and is bolted to one of the horizontal $5\frac{1}{2}''$ Strips and also to one $12\frac{1}{2}''$ Strip. The winding spindle of the Motor should project outwards to facilitate winding. The drive is taken direct from the driving spindle of the Motor to a 1″ Pulley fastened on the front Road Wheel axle, through a $2\frac{1}{2}''$ Driving Band. The Band is kept in place by Washers and Clips.

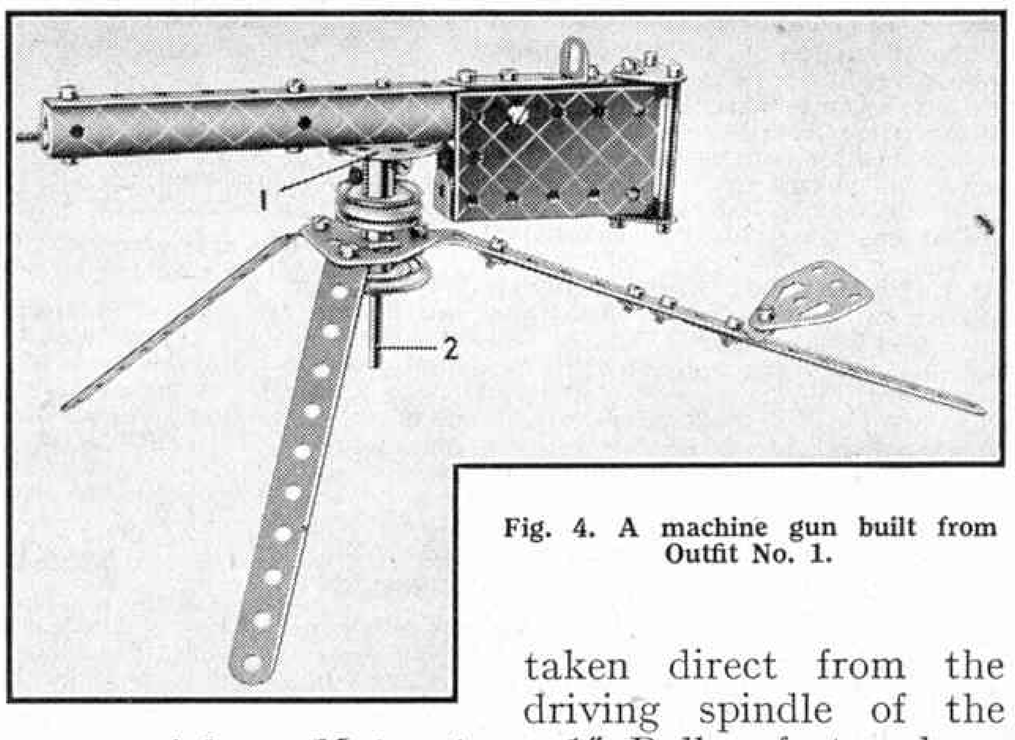
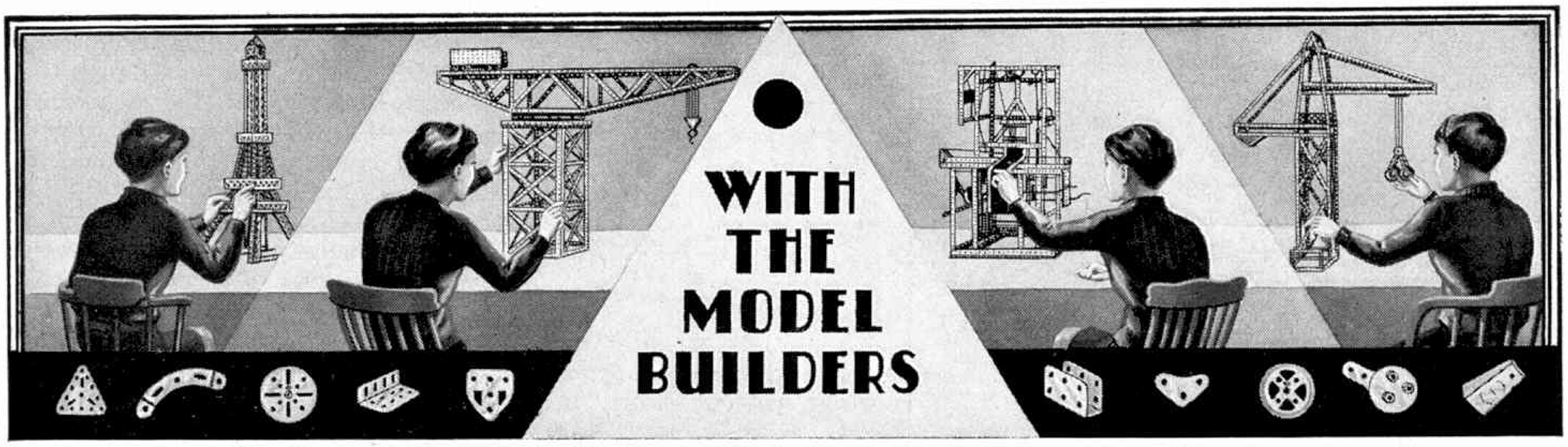


Fig. 4. A machine gun built from Outfit No. 1.

Parts required to build the model tower wagon: 4 of No. 1; 8 of No. 2; 1 of No. 3; 8 of No. 5; 1 of No. 11; 4 of No. 12; 2 of No. 15b; 2 of No. 16; 1 of No. 18a; 2 of No. 19b; 1 of No. 19g; 2 of No. 22; 1 of No. 23; 8 of No. 35; 56 of No. 37a; 54 of No. 37b; 8 of No. 38; 1 of No. 40; 5 of No. 48a; 1 of No. 52; 1 of No. 57c; 4 of No. 90a; 2 of No. 111c; 2 of No. 126; 2 of No. 126a; 1 of No. 176; 4 of No. 187; 1 of No. 191; 2 of No. 192.



A MECCANO MICROSCOPE

The illustration in the centre of this page shows a young Meccano enthusiast, Stephen Fogg, Bristol, with a model microscope that he has made with his Meccano parts. The model does not include an optical system, but reproduces in a wonderful manner all the mechanical refinements of a modern microscope. It follows modern practice in being mounted on a tripod stand. The focussing arrangements include the rack focussing system for coarse adjustment of the eyepiece, and also a fine adjustment. On an actual microscope the latter consists of a spring-loaded lever arrangement operated by a screw, which when turned many times moves the eyepiece only a fraction of an inch. This is well reproduced in the model.

Another feature incorporated in the Meccano microscope, and which is found also on actual instruments, is an adjustable stage to carry the microscope slide. This stage can be moved from side to side, or backward and forward, by simply turning handwheels fitted with Screwed Rods. With this special adjustment it is not necessary to handle the slide when it has been fitted on the stage and is under observation.

All high-class microscopes are fitted with a sub-stage condenser, the purpose of which is to focus the rays of light from a mirror or lamp on to the object under observation. The condenser is represented on Master Fogg's model by Pulleys and Flanged Wheels and, like an actual condenser, it can be adjusted with a screw adjustment.

WHEELS FOR SMALL MODEL MOTOR CARS

In building motor car models of the smaller type it is usual to equip them with working brakes incorporating a Boiler End for the friction drum. When this is bolted to the wheel, usually a 2″ Pulley, however, the complete assembly is rather wide. Although this is not a serious drawback, wheels built up in this way make the track-width of the model too great in proportion to the wheel base. One method of avoiding this is to use the Boiler End itself as the wheel and fit it with a 2″ Rubber Tyre pressed directly onto its rim. A Double Arm Crank bolted to the inside of the Boiler End can be used to form a boss so that the wheel can be mounted on the axle.

A 2″ Tyre used in this way does not fit squarely on the flange of the Boiler End because the latter is of larger diameter, but H. Seaman, Chester, points out that it can easily be fitted by clamping it in position with the aid of a Wheel Disc. The Boiler End is first fitted with a Double Arm Crank so that it can be fixed to a Rod, and a 2″ Rubber Tyre is placed against its convex face. The Wheel Disc is then pushed up against the Tyre and firmly held there by a Collar.

In a similar manner the Tyre can be fixed to a Wheel Flange, which also makes a serviceable brake drum.

NEAT HOISTING BLOCK FOR MODEL CRANES

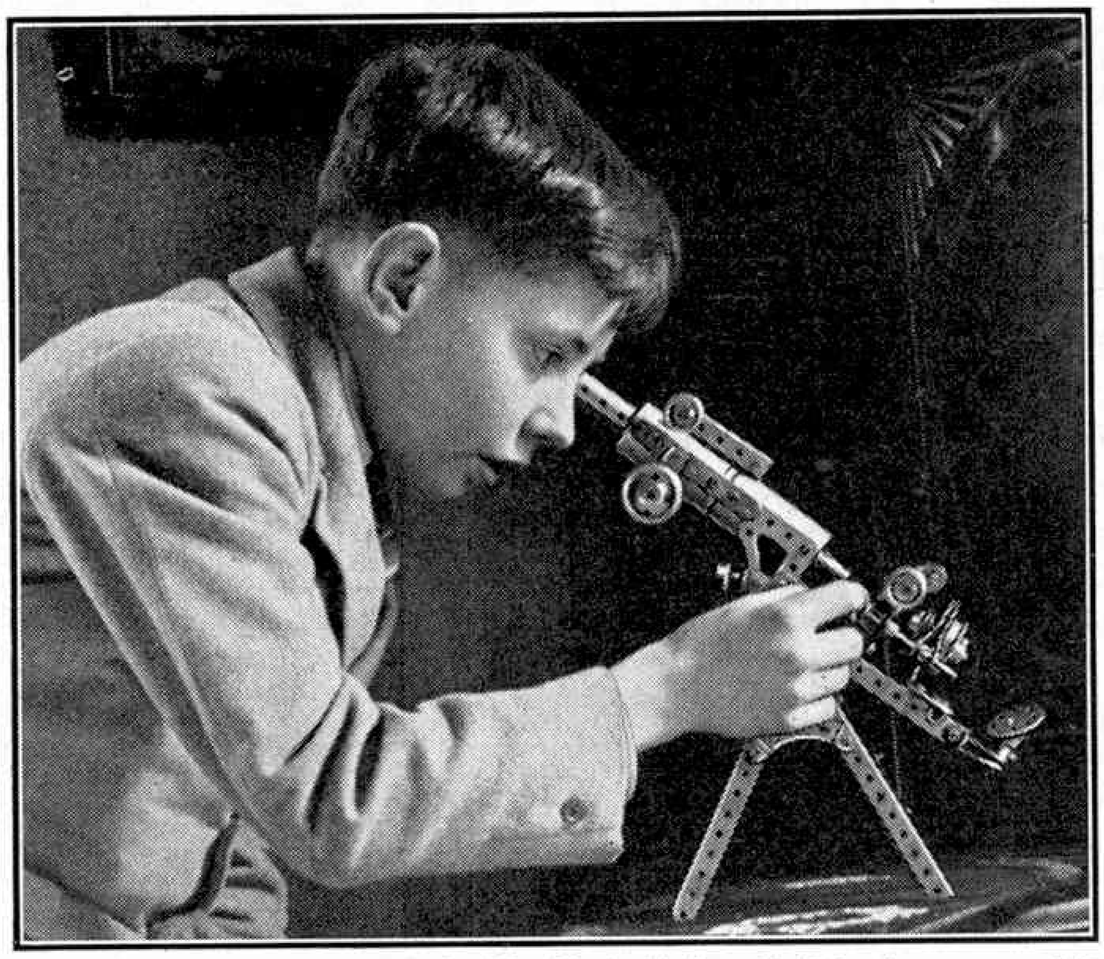
When building small models of cranes or hoisting gear, model-builders often find that a hoisting block assembled in the usual way from Flat Trunnions is rather clumsy owing to its size, and it is then necessary to use only a single fall cord for hoisting purposes, with the Meccano Small Loaded Hook tied to the end. A small hoisting block designed by L. Fawcett, Stoke, therefore will be of special interest, especially to owners of small Outfits, for only a few simple parts are necessary for its construction. A Small Loaded Hook is bolted between two Flat Brackets, using three washers for spacing purposes. A second $\frac{3}{8}$″ Bolt is passed through the unoccupied holes of the Flat Brackets and on its shank is a $\frac{1}{2}$″ loose Pulley. The Bolt is fitted with lock-nuts.

AN AUTOMATIC ROPE BRAKE

Recently I received details of a rope or band brake which, although of very simple design and construction, can readily be incorporated in Meccano models. The brake was designed by Mr. J. Welsh, Doncaster, who finds it a very useful addition to model cranes. Its special feature is that it is self-sustaining, that is, when power is shut off the weight of the load automatically applies the brake.

The brake drum consists of a $1\frac{1}{8}$″ Flanged Wheel and a Bush Wheel fixed on the Rod that forms the winding barrel of the crane. A $3\frac{1}{2}$″ Strip is pivotally mounted on the same Rod as the Flanged Wheel, and forms the brake lever. A Cord that is used as a brake band is first tied to the side plate of the model crane, and is then wound several times around the Flanged Wheel before being tied to the end of the $3\frac{1}{2}$″ Strip. The cord must be wound on the Flanged Wheel in the direction in which the drum moves when the load is being lowered, and the weight of the $3\frac{1}{2}$″ Strip normally keeps the band in tension.

When the load is being hoisted, the brake drum rotates in the direction that tends to unwind the Cord. As the end of this is tied to the $3\frac{1}{2}$″ Strip, the latter moves and allows the brake band to slacken. When the load is allowed to fall under gravity the cord tightens itself round the drum and prevents further rotation. The brake can be released by moving the $3\frac{1}{2}$″ Strip.



A fine model microscope with its builder, Master S. Fogg, Bristol, who was awarded a prize for it in a recent Model-building Competition.

A SIMPLE DOUBLE ACTION RATCHET

Model-builders will be interested in the simple type of double action ratchet designed by R. Parkinson, Great Yarmouth, owing to the ingenious way in which it is designed. The ratchet wheel consists of a $1\frac{1}{2}$″ Sprocket Wheel fixed on the winding shaft of the model. Engaging with this is the pawl, a Spring Clip mounted on a Rod above the Sprocket Wheel with the wings pointing upwards. On the same Rod as the Spring Clip, with its arm in a vertical position, is a Crank fitted with a Collar as a counter-weight. By allowing the Crank to fall in one direction, one of the wings of the Spring Clip is brought into engagement with the teeth of the Sprocket Wheel. The winding shaft of the model can thus be turned in one direction only. On moving the Crank over to the other extreme position the winding shaft can be turned in the opposite direction only.

A similar arrangement can be made with two Pawls with bosses, which are fixed on a Rod and arranged so that either Pawl can be brought into engagement with a $\frac{3}{4}$″ Pinion or 1″ Gear.

A RELIABLE VERTICAL CONVEYOR

In certain types of Meccano models it is sometimes required to raise a number of Steel Balls, marbles, peas or other small articles to a height, and a chain hopper conveyor is generally employed for this purpose. A conveyor of this type may be constructed by fitting Dredger Buckets to an endless length of Sprocket Chain that passes over Sprocket Wheels mounted in the framework of the model. A Clockwork or Electric Motor is coupled to one of the Sprockets so that the chain carrying the buckets may be driven round.

A vertical conveyor of a rather novel type recently constructed for raising Meccano Steel Balls can be used equally well for raising other small articles. The framework of the conveyor is built up of four Angle Girders assembled to form a square tube or channel. The Angle Girders are bolted together at their ends, with the bolts pushed through their holes from the inside. One side of an endless length of Sprocket Chain passes through the channel and the chain is led over Sprocket Wheels at the top and bottom. Several Angle Brackets are now secured at regular intervals to the chain by means of Dredger Bucket Clips, each clip being pushed partly into the round hole of the lug of each Angle Bracket. One of the Sprocket Wheels is coupled to a Clockwork or Electric Motor so that the conveyor chain with Angle Brackets attached may be hauled up the vertical channel. The Steel Balls are introduced through a trough at the bottom of the vertical channel and are carried up by the Angle Brackets. They are then discharged through a chute consisting of Angle Girders or Sleeve Pieces.

The advantage of this type of conveyor is that the Balls cannot fall out during their passage to the top of the shaft, and for this reason it will be found very useful in demonstration models, where absolute reliability is essential. It is capable of delivering Steel Balls, marbles, etc., at the top of the chute with perfect reguarity over long periods and without any signs of jamming or breakdown.

AN AEROPLANE CONSTRUCTOR OUTFIT SUGGESTION

(reply to V. Moses, London S.16, and others)

One of the outstanding characteristics of modern civil and military aircraft of the multi-engined type is the twin-rudder tail unit. There are two particular designs, one of which has been popular for a number of years, namely the type fitted to the "Whitley" bomber and the tail unit found on the de Havilland "Albatross" air liner. A number of owners of Aeroplane Constructor Outfits have suggested that we introduce special parts to enable them to reproduce the twin-rudder tail unit on models that they design. The idea seems to have possibilities, and we shall certainly give it consideration.

Meanwhile we suggest that those who wish to include twin-rudder tail units in their model Aeroplanes should build these from standard Meccano parts, many of which are suitable for this purpose. For example, a $5\frac{1}{2}$″ × $2\frac{1}{2}$″ Flexible Plate, duplicated for strength, can be used for the tail plane, while the twin rudders can be represented by Flat Trunnions or $1\frac{1}{4}$″ Discs. The latter should be attached to the tips of the tail plane by Angle Brackets. Strips of suitable size can be used for shaping the leading and trailing edges to the correct contour.

If the tail unit to be modelled does not have the rudders at the extreme tips of the tail plane but follows the tail unit of the "Whitley" bomber in design, other Meccano parts can be employed. The $1\frac{1}{2}$″ Triangular Plates, for example, can be put to good use in this respect, or if these are unsuitable the rudders can be built up from a few Strips or similar parts. In this case the tail plane must be made in two parts, using $2\frac{1}{2}$″ × $1\frac{1}{2}$″ Flexible Plates. The square ends can be rounded off with $1\frac{1}{4}$″ Discs.

The complete tail unit can be attached to the tail of the Fuselage by Angle Brackets.

A Meccano Cinematograph

Fine Example of Model-Building

THE illustration on the right shows a working cinematograph for projecting 9.5 mm. films that has been built by Mr. Jean Bihn, a French Meccano enthusiast living in Paris. Many readers will remember that Mr. Bihn designed the Meccano projector for full-sized films that was described in the *"M.M."* for March 1935, and we think that the model illustrated on this page will arouse even more interest than its predecessor, as it projects the 9.5 mm. films used in home movies. With the exception of a few special parts of the mechanism, the machine is constructed from Meccano parts, and the following brief

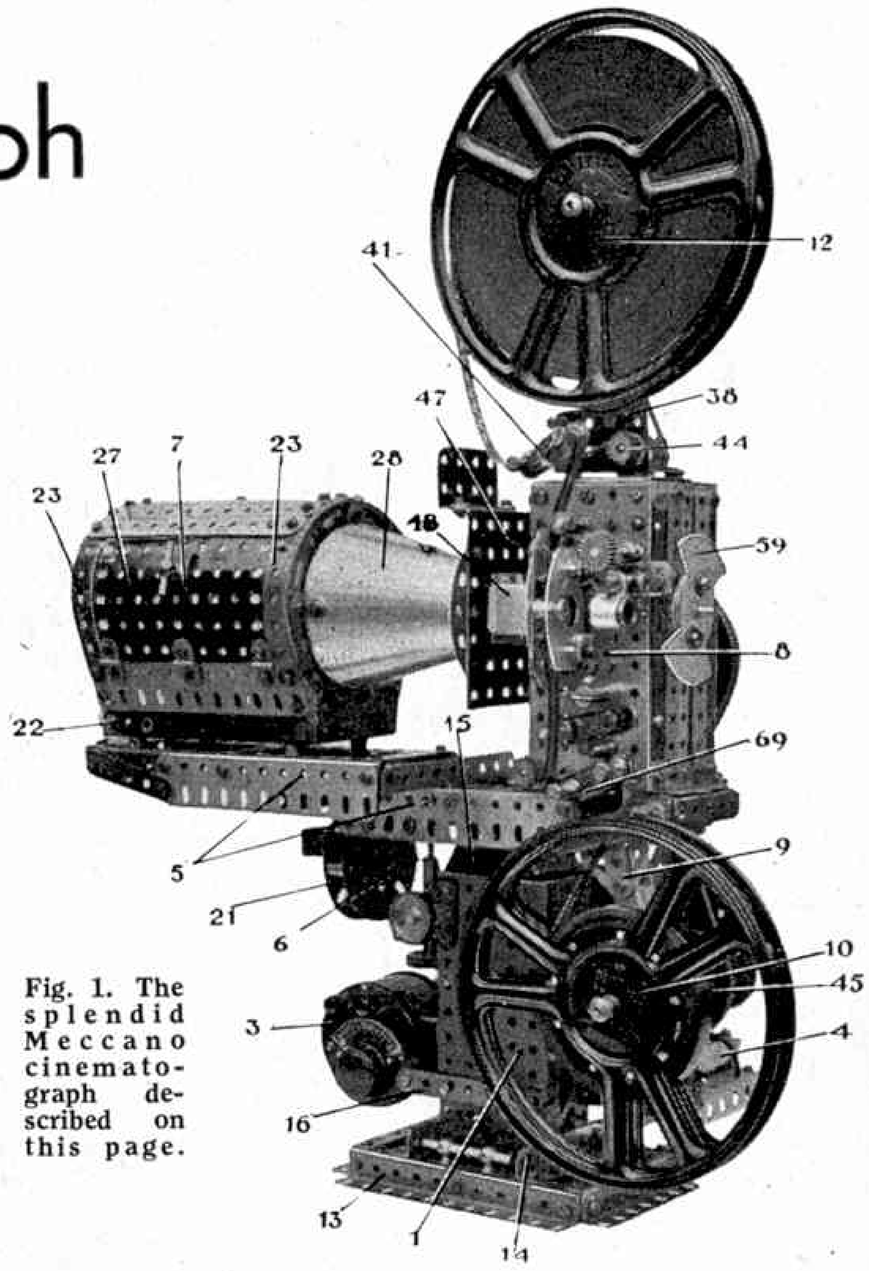


Fig. 1. The splendid Meccano cinematograph described on this page.

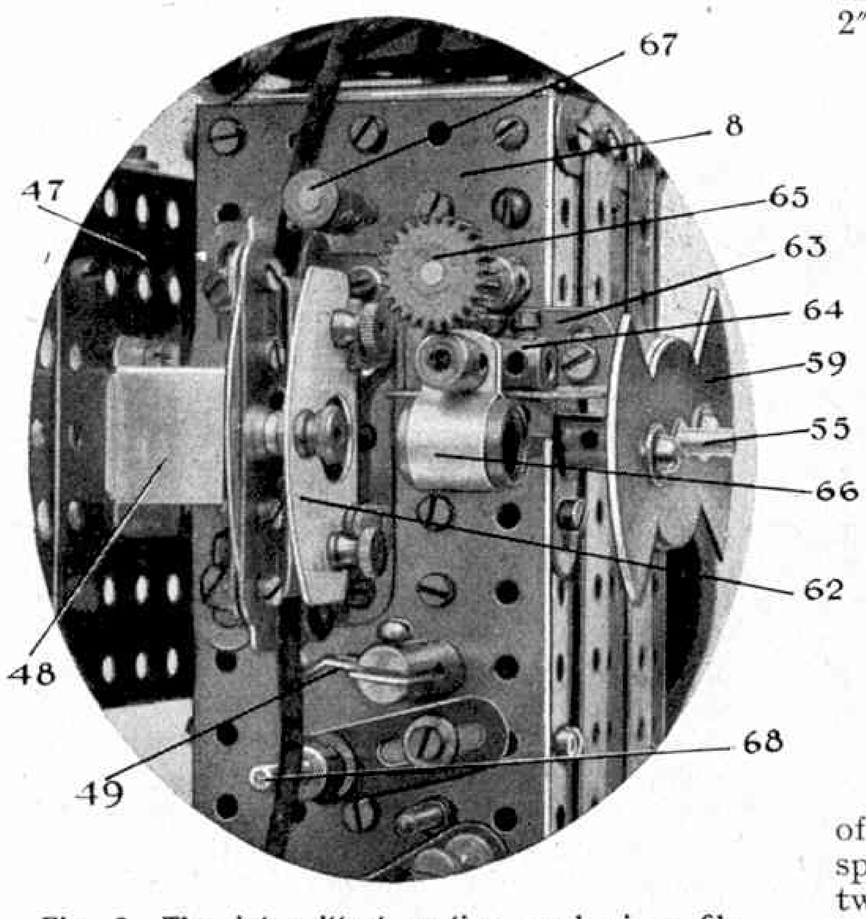


Fig. 2. The intermittent motion mechanism, film "gate" and lens mounting.

description of its outstanding features will be of interest and help to readers who may wish to build models of this kind.

The lamphouse, which is seen in Fig. 1, consists entirely of Meccano parts, with the exception of the cone-shaped light tube at the front, which is made from sheet metal. Inside it is a 12-volt projection type lamp supported on slides in front of a 3″ diameter parabolic mirror. The lampholder is mounted in such a manner that it can be moved to or from the mirror as required to focus the light on the film "gate."

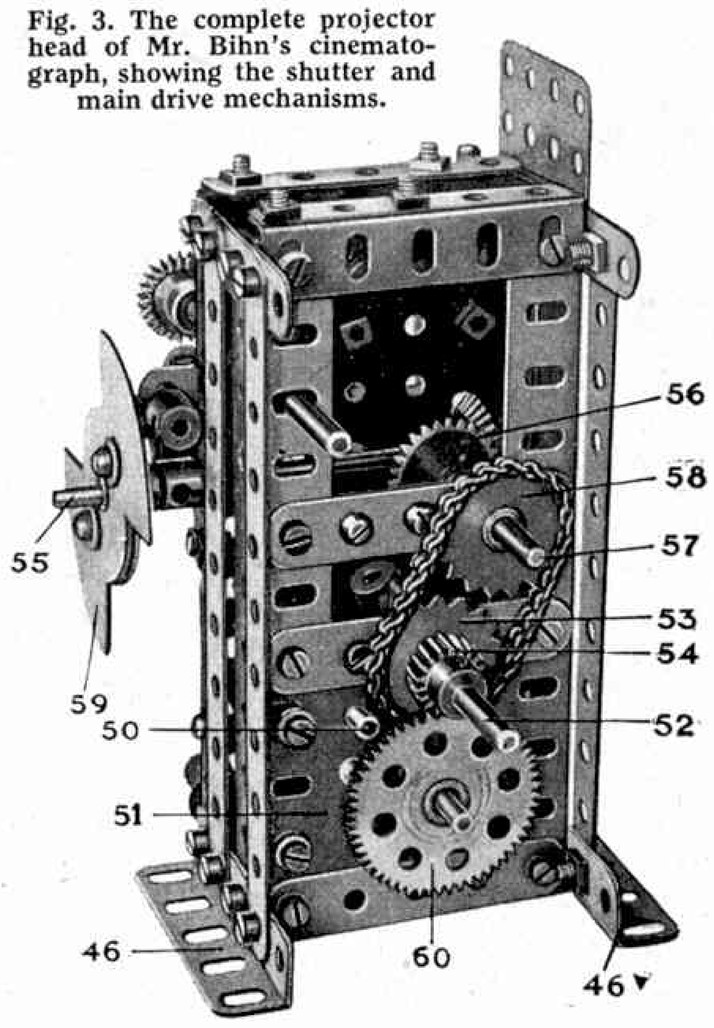
The design of the intermittent motion mechanism that draws the film through the "gate," frame by frame, is one of the most interesting problems met with in the construction of models of this kind. The well-known Maltese cross movement is often used, but the simpler "claw" mechanism is found to be more satisfactory for the machine described here. It consists of a claw 49 (Fig. 2) formed by a Pointer bent as shown and fixed by a bolt in a Strip Coupling on Rod 50 (Fig. 3). An oscillating movement is given to the Pointer by means of a Coupling that slides freely on two 1½″ Rods mounted in a second Coupling fixed on Rod 50. The first Coupling is caused to slide on the Rods by means of a Pivot Bolt held in a crank formed of another Coupling suitably pivoted. The latter Coupling is fitted with a counterweight consisting of a 1″ Rod on which are fixed two Collars. The Coupling forming the crank is gripped on a 3″ Rod 52, which is the main shaft of the mechanism. On this Rod are fixed a 1″ Sprocket Wheel 53, and a ½″ Pinion 54. The former drives the shaft 55 on which is mounted the shutter 59, which is made from a small piece of stiff cardboard bolted to a Bush Wheel. The Pinion 54 drives the 57-teeth Gear 60, the Rod of which carries a ½″ Pulley that is connected by a belt to the 2″ Pulley 45.

The Electric Motor by means of which the machine is driven is mounted on the base of the machine and a ½″ Pulley on its shaft is connected by a belt to a 3″ Pulley on the main shaft 52 (Fig. 3).

The "gate" 62, through which the film passes the projection lens, is made mainly from sheet aluminium and is fitted with a spring loaded pressure pad that keeps the film flat while passing the projection opening. The front of the gate is hinged so that it can be opened to allow the film to be threaded through the machine.

The upper spool arm consists of two 5½″ Angle Girders, which are bolted together on a Girder Bracket and supported by two Corner Brackets bolted on the sides of a Double Bent Strip. A Face Plate fixed to the top of the arm provides a bearing for the spool spindle. A Double Arm Crank fitted with two Pivot Bolts acts as a guide for the film and permits smooth unwinding of the spool. The spool spindle is a 4″ Rod and is driven by means of a 2″ free Pulley 45, which is connected by a belt to the ½″ Pulley on the Rod 60. Pulley 45 is held by a Compression Spring against a 1″ Pulley fixed to the spindle, but between the Pulleys is a friction pad consisting of a felt washer. The spindle carries also a Bush Wheel fitted with a Threaded Pin, and the latter engages the boss of the spool so causing it to rotate with the spindle.

Fig. 3. The complete projector head of Mr. Bihn's cinematograph, showing the shutter and main drive mechanisms.



The lens is mounted in place by means of a metal strap 66 fixed to the Coupling 64 by a 1″ Threaded Rod and a Threaded Boss. The focussing arrangement consists of an Angle Girder 63, in which a slot is cut to accommodate the shanks of two ½″ Bolts that pass through Coupling 64 of the lens mounting. The lens is moved to and fro by turning a Pinion 65, which is fixed on a 4″ Rod that carries a Collar. The latter is fitted with a bolt that engages between the heads of the ½″ Bolts inserted in Coupling 64. Each of the ½″ Bolts is fitted with a Collar to prevent their shanks from leaving the slot.

In order to eliminate vibration due to the Electric Motor when the cinematograph is in operation, the Motor is mounted on felt washers and may be detached from the base simply by unscrewing three Threaded Bosses. The Motor is controlled by a variable resistance 3 conveniently placed at the rear of the base. Its purpose is to enable the speed of the film through the gate to be correctly adjusted. A second resistance 4 is provided for the projection lamp, and it is regulated by a slider.

A feature of the model is the distribution box 21 built up from two Face Plates. From this, current is fed to the Motor and lamp through suitable fuse units.

Readers who wish to build models of this kind can obtain suitable lenses, condensers and lamps from most dealers in home cinematograph supplies. Those who have difficulty in this direction, however, should write to us and we will be glad to give them helpful information.

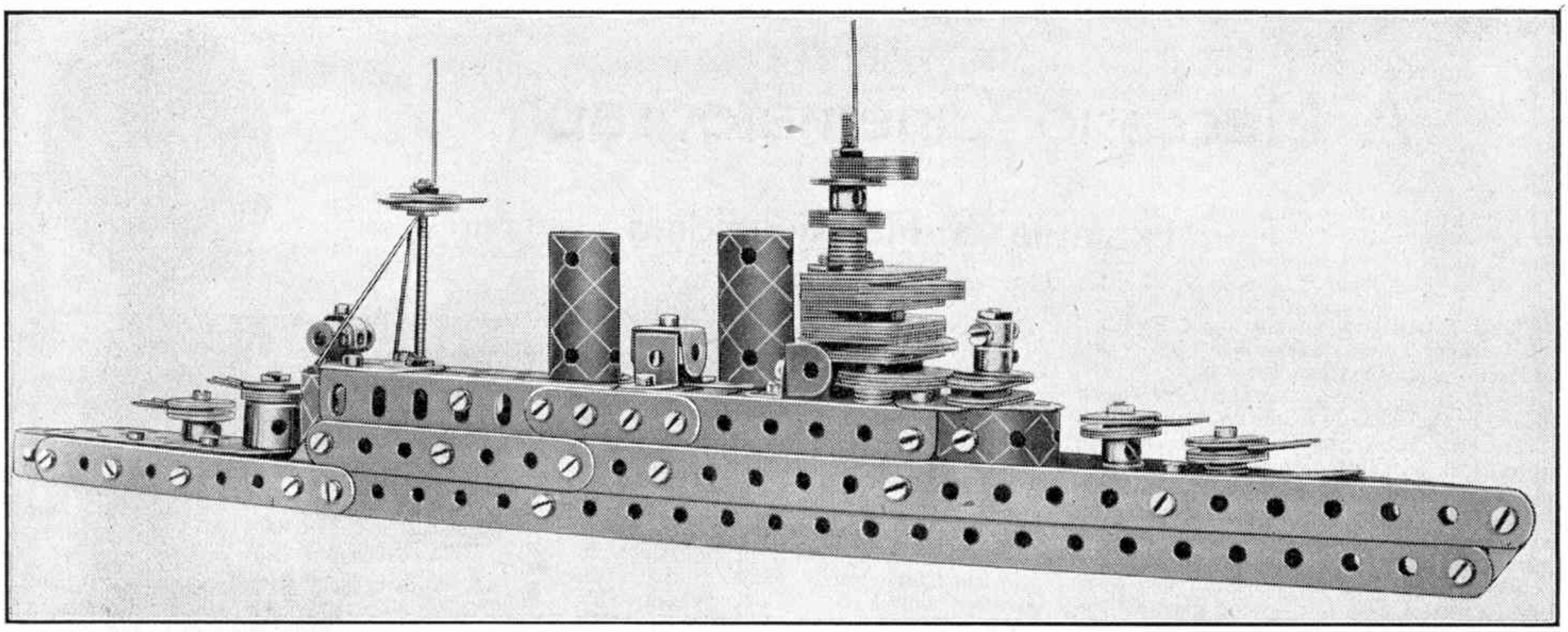


Fig. 1. A fine "simplicity" model of H.M.S. "Hood."

Britain's Fighting Forces in Meccano

(1). Ships of the Royal Navy

WARSHIPS, aeroplanes, tanks and machine guns are very much in the news nowadays, and in this and subsequent articles we wish to draw the attention of model-builders to the splendid opportunities these subjects provide for new and interesting models. These articles will deal with each branch of Britain's fighting forces in turn, and as the Navy is the senior Service the first article is devoted to warships. Meccano parts lend themselves in a remarkable manner to the building of non-working models of many different types of war vessels, but in this article it is not intended to deal with the construction of large detailed models, but to show how easily small realistic outline models representing a complete battle fleet can be built up from a few parts.

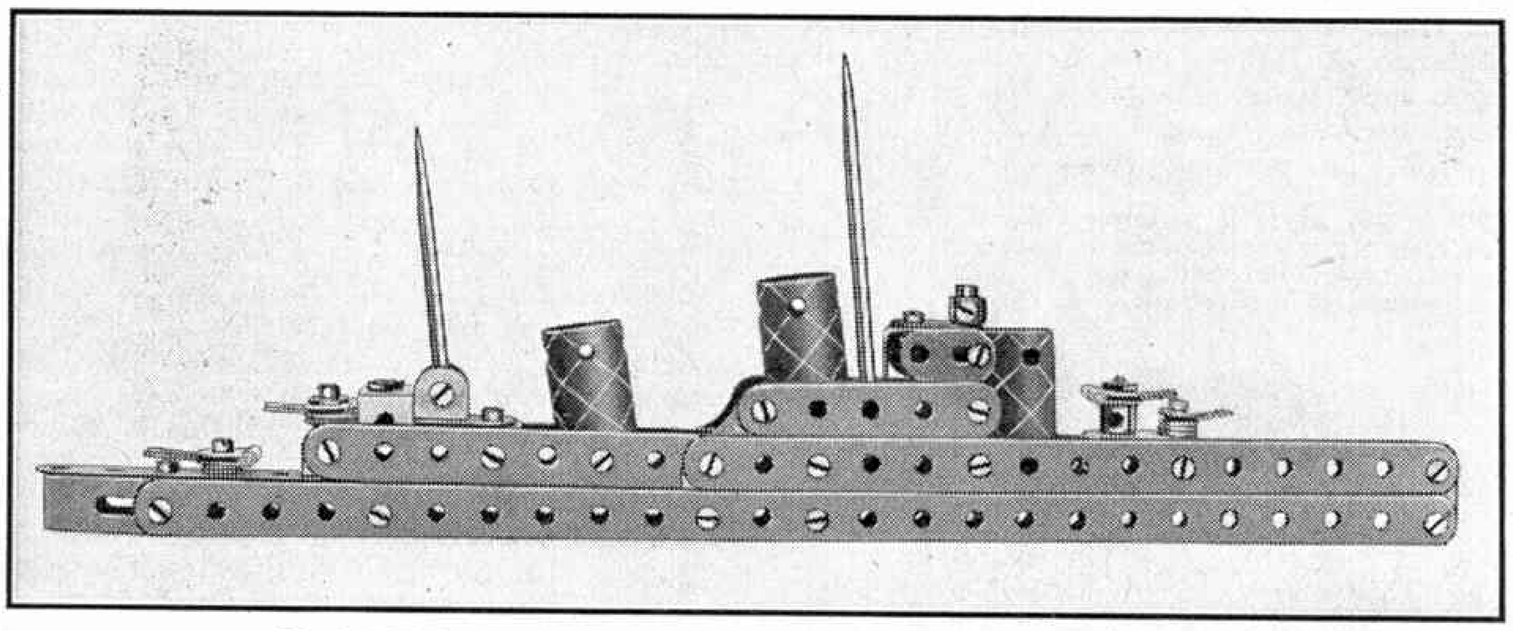


Fig. 2. H.M.S. "Manchester" in Meccano; a good outline with few parts.

The models illustrated on this and the opposite page are typical examples of what can be done by working on "simplicity" lines, but they by no means exhaust the possibilities that remain to be explored by inventive model-builders.

Pictures of all kinds of naval vessels often appear in newspapers and magazines, and from these the Meccano enthusiast should have no difficulty in reproducing correctly the outlines and main features of a war vessel in a model of the type suggested. The best kind of picture for this purpose is a silhouette, as this shows only the outline of the vessel and will eliminate any temptation to include minor details such as life-boats and the smaller deck structures.

The chief requirements in this kind of model-building are good proportions, bold design and correct outlines. No effort should be made to cram in all the external details of the actual ship, but to model only outstanding features, such as the funnels, control towers and masts that make up its outward form and give it individuality. By reproducing these features accurately a close likeness to the original can readily be obtained.

Perhaps the most impressive units of a battle fleet are the battleships and battle cruisers. There are three designs of battleship in service in the British Navy, known as the "Nelson," "Revenge" and "Queen Elizabeth" classes respectively, each of which possesses distinctive features that are easily incorporated in simplicity models. For example, the *"Nelson"* has a very unusual appearance, due to the fact that she was originally designed as a battle cruiser. During construction her plans were altered in accordance with the requirements of the Washington Naval Treaty. Her hull was shortened by 200 ft., and this resulted in her superstructure being farther aft than is customary. This feature, and the distinctive design of control tower, make this ship a particularly good subject for an outline model. The hull can be built up on lines similar to those of the hulls of the models illustrated on this and the opposite page, while the superstructure can be modelled from Strips and Brackets.

The control tower of the *"Nelson"* is solid and wall-like in appearance, and is readily modelled from a few parts, but in ships of the "Queen Elizabeth" and "Revenge" classes, however, a different method of construction must be adopted. For these vessels it is best to use parts such as Strips, Flat Trunnions, and Flat Brackets, arranged one on top of the other to reproduce the required contour. The hulls of these ships also are different from those of the *"Nelson"* class, for the foredeck is higher than the after deck. Gun turrets are easily modelled from Collars, washers, or $\frac{3}{4}$" Discs, depending on the size of the model, while gun barrels can be represented by wire of suitable diameter. Ships of the "Queen Elizabeth" and "Revenge" classes mount eight 15-in. guns in pairs, two turrets being at the stern and two in the bows. The *"Nelson,"* however, mounts nine 16-in. guns in triple turrets, all of which are on the foredeck.

The battle cruisers are really fast battleships, in which a certain degree of gun power and armour protection is sacrificed in order to gain higher speed. There are at present three of these vessels in the British Navy, the *"Hood,"* the *"Renown"* and the *"Repulse."*

The *"Hood"* is the largest and most

powerful warship in the world, with a displacement of 42,100 tons and a main armament of eight 15-in. guns. Readers who have seen the actual ship will recognise the remarkable accuracy with which its outlines are reproduced in the model illustrated in Fig. 1. Distinctive features of the *"Hood"* are her long low hull, rakish bows and twin funnels placed close together, all features that can be reproduced well in Meccano. The lines of the hull are obtained by the skilful use of Strips, while the superstructure is modelled with Angle Girders, the fore and aft ends being formed with Flexible Plates. The after deck is a 3" × 1½" Flat Plate and the foredeck is a 2½" Strip.

The small gun barbettes and boats are omitted. Flexible Plates are the most suitable parts for modelling the funnels. These are first rolled into cylinders and then pressed to oval section, ready for fixing to the deck by means of Angle Brackets. In the case of a larger model Sleeve Pieces could be used for funnels, while in smaller models Couplings or Collars would serve this purpose.

One of the most interesting features of this model of H.M.S. *"Hood"* is the method of building up the control tower, for this system of construction can be used in modelling fighting ships of several other types. The lower part is a Screwed Rod on which 1¼" Discs, 1½" Flat Girders, Strips and Flat Trunnions are fitted, Screwed Rods being used to fix them firmly to the deck. The upper part and the short mast is a Rod carrying washers, ¾" Discs and a Collar, and the direction tower is composed of a number of Flat Brackets held in place on the Rod by a nut. The wireless mast is formed by a short length of wire. In front of the control tower is a range finder, which is represented by two Collars, the upper one being fitted with two Bolts.

The gun turrets, of which there are four, are formed by ¾" Discs fitted on Bolts and spaced from the decks by Collars and washers. As Meccano Rods are too large to represent the gun barrels in a model of this size, short lengths of stiff wire are used. These are clamped in position between the ¾" Discs.

Cruisers are represented in our Meccano fleet by the simple model shown in Fig. 2, which is based on H.M.S. *"Manchester,"* a cruiser of the improved "Southampton" class that was placed in commission in 1938. Vessels of this class are distinguished by the peculiar arrangement of the control tower, for at first glance this part of the ship looks more like the promenade deck of a luxury liner! As a result of this, the ship is very easy to model with Meccano parts. The hull in our example is built on similar lines to the other models illustrated, but the after deckhouse is built with Strips connected by Double Brackets. The control tower of this cruiser is not built around the foremast, and owing to its clean outline it can be represented by a 2½" × 1½" Flexible Plate suitably curved to shape. The rear part of the control tower, supporting the range finder, is built up of Flat Brackets.

A point of interest in this model is the construction of the gun turrets. H.M.S. *"Manchester"* mounts 6-in. guns, and the turrets for these are represented in the model by Hinges, between which are gripped short pieces of wire. Turrets built up in this way are very realistic, as they have approximately the same outline as the actual turrets.

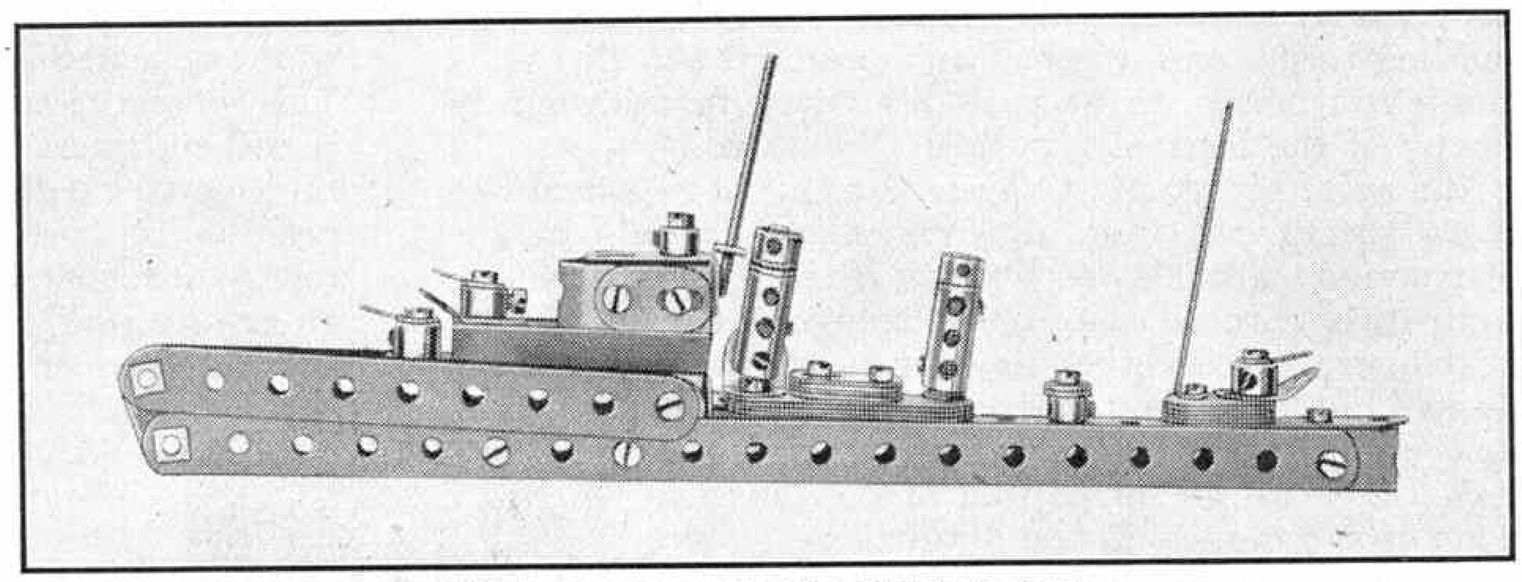


Fig. 3. A simple model of a British destroyer.

Familiarly known as "greyhounds of the fleet," the destroyers of the Royal Navy are among the fastest vessels afloat. Their main duties in wartime are to screen the battle fleet from hostile submarines, enemy aircraft and destroyers, and to make torpedo attacks against the big ships of the enemy. Usually they carry eight torpedo tubes and about four 4.7 in. guns, which are fired electrically from a central station. These vessels generally are organised in flotillas consisting of a leader and eight destroyers.

A good simplicity model of a modern British destroyer is shown in Fig. 3. The high rakish bow common to most destroyers is reproduced with 4½" Strips, while 9½" Strips form the hull. The rounded stern is a formed Slotted Strip. The superstructure on the foredeck is built up on a 2½" × ½" Double Angle Strip, and the main deckhouse comprises 2" Strips spaced apart by washers and filled in with a strip of paper. The bridge consists of Flat Brackets and Double Brackets. The funnels of a destroyer usually are sharply raked, and in some cases the forward one is taller and larger in diameter than the aft one. In the model shown in Fig. 3 both funnels are represented by Couplings and Collars mounted on Rods of suitable diameter and attached to the deck by Angle Brackets. The deckhouse at the stern consists of several Flat Brackets bolted to the deck.

Meccano Rods are too thick for the foremast, but an excellent substitute can be found in an Elektron 6 B.A. Screwed Rod. This is attached to the rear of the bridge by a Flat Bracket. The other mast is a piece of wire. Gun turrets are formed by Collars while the searchlight tower aft of the rear funnel consists of an Aeroplane Collar and washers fixed in place by a Bolt. For a model on a larger scale, funnels could be represented by Sleeve Pieces, while gun turrets could be formed from Angle Brackets.

Another essential unit of a modern fleet is the aircraft carrier, of which the British Navy possesses several fine examples. As most model-builders will be aware, some of our aircraft carriers were originally battleships or cruisers, and were later converted for aircraft carrying. The *"Ark Royal"* was the first British ship laid down as an aircraft carrier, and as it is the newest vessel of its kind in service in the Navy it has been chosen for reproduction in our miniature fleet. The model is shown in Fig. 4 and although it reproduces closely the main features of the actual vessel no attempt has been made to model such details as gun barbettes, small derricks and boats.

The flight deck consists of a 12½" × 2½" Strip Plate lengthened with a 2½" × 2½" Flexible Plate, while the funnel, mast and control tower, placed at one side to form the "island" characteristic of most aircraft carriers, are modelled as simply as possible. A 5½" Strip is bent into U-shape and attached to the Strip Plate by Double Brackets. The funnel is a 2½" × 1½" Flexible Plate, and the control tower from which directions to aircraft are issued is formed from Triangular Plates. The mast is a Meccano Rod topped by a Collar. If the model had been built on a slightly larger scale, Flat Girders could have been used for the hull, while extra details such as gun emplacements, represented by Collars and wire, could have been included.

Some of the older aircraft carriers are interesting on account of their design. In the *"Courageous,"* for example, the flight deck does not cover the entire length of the ship, as does that of the *"Ark Royal,"* but terminates short of the bows. The lower part of the hull therefore can be built up from Strips on similar lines to that of the model *"Hood,"* and the sides can be extended up to the flight deck with Flexible Plates.

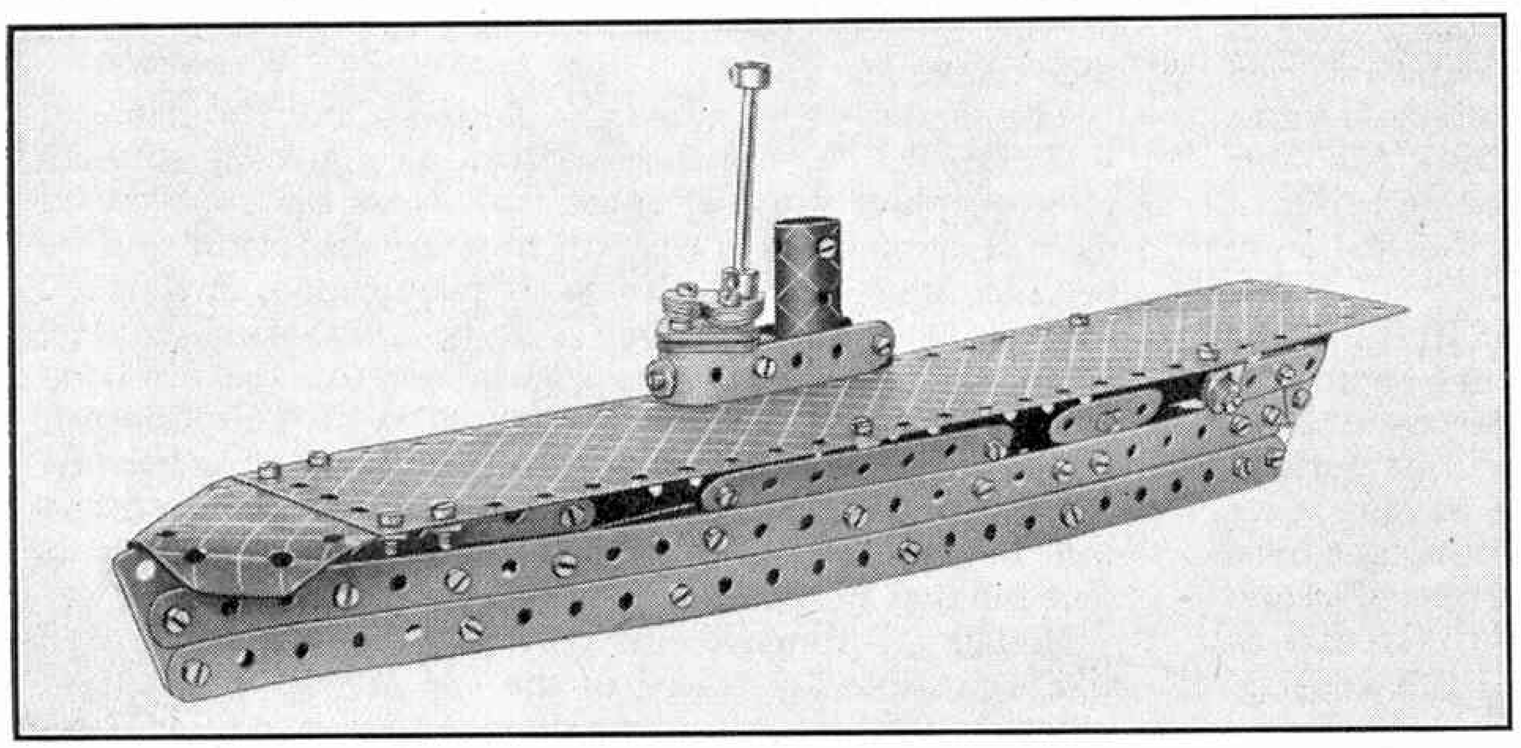


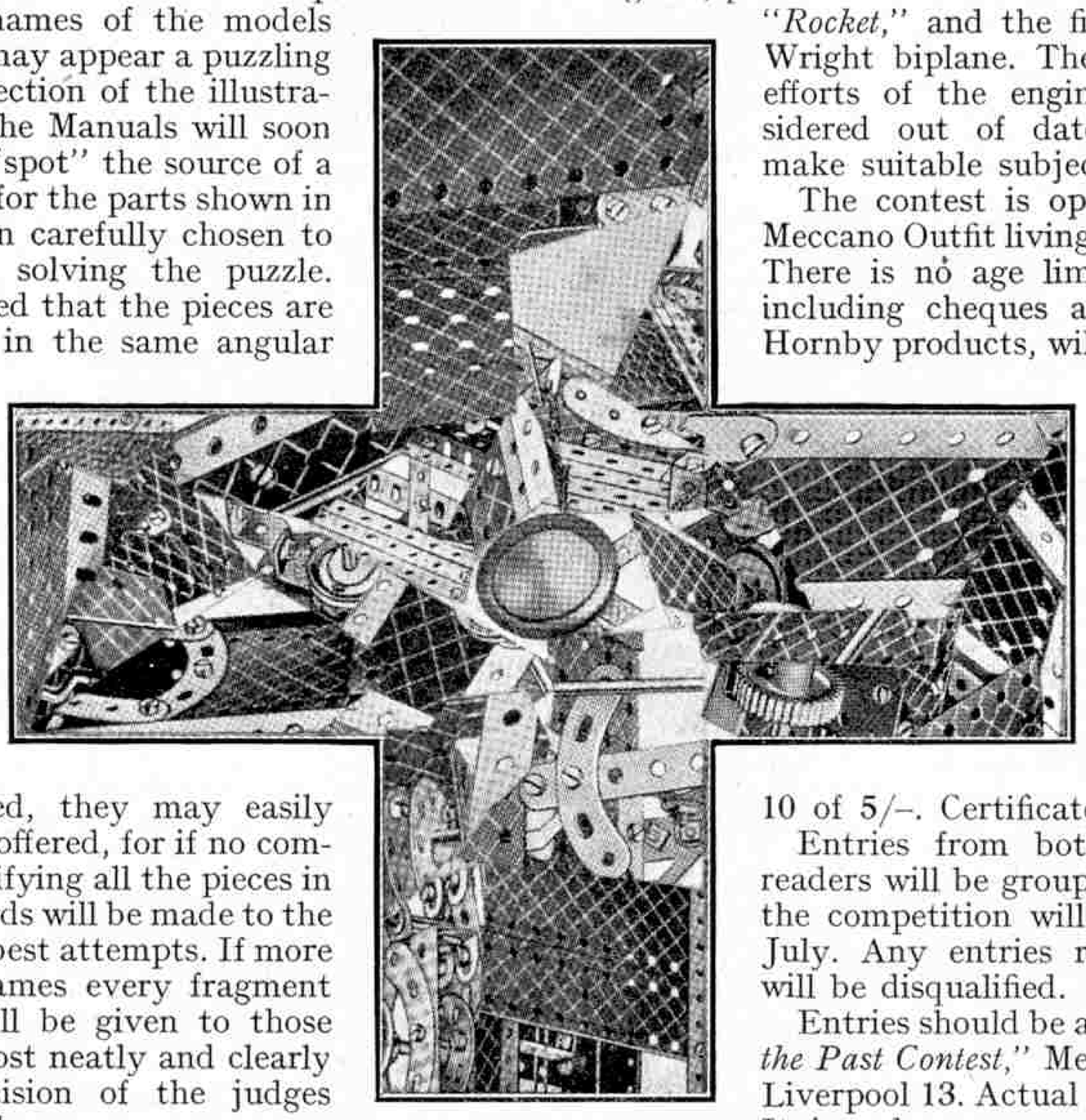
Fig. 4. H.M.S. "Ark Royal" forms the aircraft carrier of the Meccano battle fleet.

Handsome Prizes in Easy Competitions

A Fine Puzzle Picture Contest

Every reader who possesses a copy of the Meccano No. 0–6 Instruction Manual has a fine opportunity to win a big prize by entering this Contest. There is no model-building to do, and a pencil and postcard are all that a competitor needs to prepare his entry in addition to a copy of the Manual for Outfit Nos. 0–6.

The weird picture that appears on this page is made up of 24 pieces cut from illustrations of models in the Instruction Manuals for Outfits from No. 0 to No. 6. Competitors are asked to try to recognise the 24 parts of this illustration, and then to write down on a postcard the Manual numbers and names of the models concerned. At first this may appear a puzzling task, but a careful inspection of the illustrations of the models in the Manuals will soon enable a competitor to "spot" the source of a number of the portions, for the parts shown in the fragments have been carefully chosen to give valuable clues in solving the puzzle.



Competitors are warned that the pieces are not necessarily printed in the same angular positions in the illustration on this page as they occupy in the Manuals; some of them may even be upside down! Those who cannot identify all the fragments should send in their entries. Even if they cannot give the names and Manual numbers of every model represented, they may easily obtain one of the prizes offered, for if no competitor succeeds in identifying all the pieces in the illustration, the awards will be made to the readers who send in the best attempts. If more than one competitor names every fragment correctly, the prizes will be given to those whose entries are the most neatly and clearly prepared, and the decision of the judges must be accepted as final.

The Contest is open to readers living in any part of the world, and there is no age limit. Each competitor is allowed one attempt only. The chief prizes to be awarded are as follows: First, Meccano or Hornby products value £3/3/–; Second: products value £2/2/–; Third: products value £1/1/–. There also will be five consolation prizes of Meccano or Hornby Train products to the value of 5/– each.

The closing date for receipt of entries is 31st August 1939. These must be by post-card only, and should be addressed "*Sharp Eyes Contest No. 1*," Meccano Ltd., Binns Road, Liverpool 13. Prize-winners will be notified by letter as soon as possible after the closing date and they will be allowed choice of any products, to the value of their prizes, that are shown in current Meccano and Hornby catalogues. Competitors should take care to see that their entries bear their name and full address.

"Engineering of the Past" Models

We take this opportunity to remind readers of the fine opportunity to win a big cash prize that is provided by the "*Engineering of the Past*" Competition, full details of which appeared in the April and May issues of the "*M.M.*" This competition will remain open until 31st July, so there is still sufficient time for readers to prepare and send in their entries if they have not already done so. The competition is open only for entries of Meccano models representing machines or other structures of the early days of engineering, such as early paddle steamers, beam engines, pioneer locomotives such as "*Puffing Billy*" and "*Rocket*," and the first aircraft, such as the Wright biplane. These and any other early efforts of the engineer that are now considered out of date or old-fashioned will make suitable subjects for models.

The contest is open to every owner of a Meccano Outfit living in any part of the world. There is no age limit, and valuable prizes, including cheques as well as Meccano and Hornby products, will be awarded for the best models received. The first three prizes will consist of cheques for £5/5/–, £3/3/– and £2/2/– respectively, and in addition there will be 20 consolation prizes of products manufactured by Meccano Ltd., 10 of which will be of the value of 10/6 and 10 of 5/–. Certificates also will be awarded.

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.

The sender's age, name and address, and the name of the competition, must be written on the back of each photograph or drawing submitted. More than one model may be submitted if desired, but no competitor will be awarded more than one prize. If two or more models are sent by one entrant they will be considered jointly.

Models that already appear in any of the Meccano publications are not eligible for entry in this Contest. Photographs or drawings of prize-winning models become the property of Meccano Ltd., but unsuccessful entries will be returned if a stamped addressed envelope is sent for that purpose.

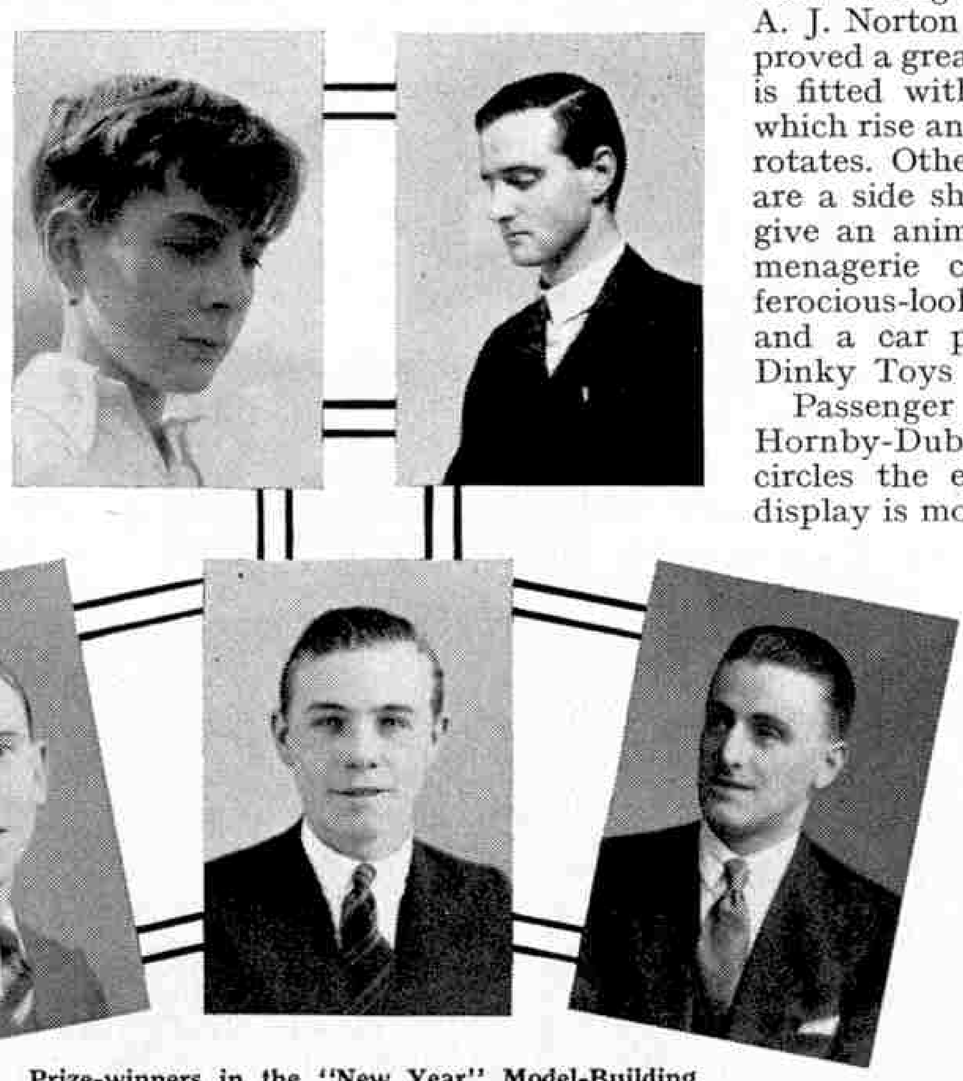
Models of unusual interest will be described and where possible illustrated in the "*M.M.*"

Model-Building Competition Results

By "Spanner"

"New Year" and "Year's Best Model" Contests

Hundreds of Meccano enthusiasts living in all parts of the world have been eagerly awaiting the results of the "New Year" Model-Building Competition, details of which were announced in the January issue of the *"M.M."* This competition was organised at a time when winter model-building activities were at their height, and there were no restrictions as to the kind of models to be submitted. One of the main features of the Contest was the splendid range of cash prizes offered for the best models received, and the prospect of winning one of these fine awards encouraged competitors to put forward their very best efforts. Many of the models submitted were really remarkable examples of Meccano engineering. I thoroughly enjoyed examining every one of the hundreds of entries submitted, and the general standard of these was so high that the judges had a difficult task to accomplish in deciding which were most worthy of prizes. Every one of the fortunate competitors named in the following list therefore has every reason to be proud of his success.



Prize-winners in the "New Year" Model-Building Competition. Top Row (from left to right) A. Audsley, Cobham; K. H. Pritchard, Brook's Green; (Bottom) L. W. Chitty, London S.W.20; E. Barker, Sheffield; E. Druce, Bolton.

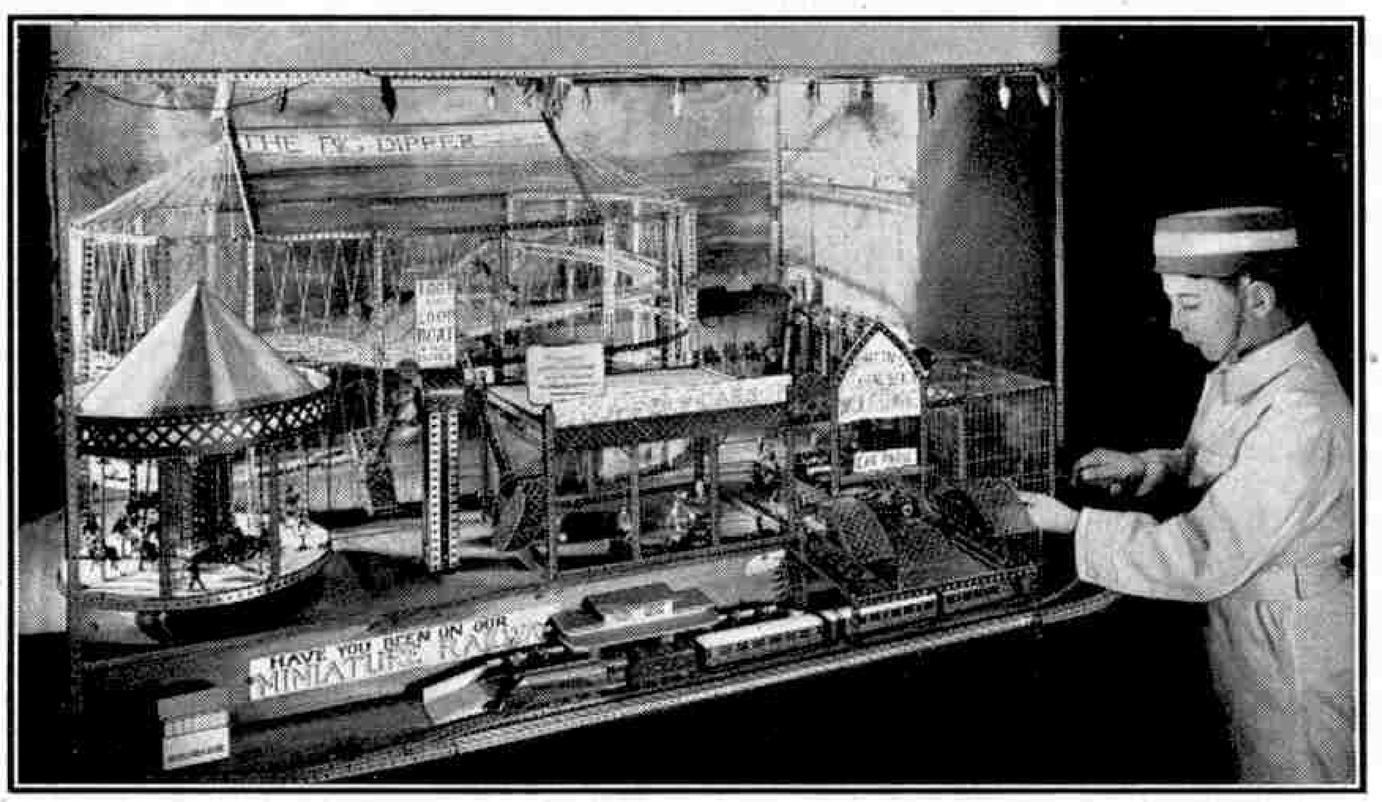
The competitors who received awards are:

1st Prize, Cheque for £5/5/–: F. Rich, Orpington. 2nd, Cheque for £3/3/–: J. Bloom, Birmingham 20. 3rd, Cheque for £2/2/–: P. Todd, Camberley.

Meccano or Hornby Goods value 10/6: G. Dean, Newcastle-on-Tyne; K. Pritchard, Brook's Green; J. Nowlan, Dagenham; D. Davies, Skewen; A. Audsley, Cobham; D. Weily, Orange, Australia; J. Pienaar, E. London, S. Africa; C. Grove Jones, Cheadle Hulme; R. Barraclough, Sowerby Bridge; L. Chitty, London S.W.20.

Meccano or Hornby Goods value 5/–: S. Ellis, Exeter; G. Nobre, Lisbon, Portugal; E. Clements, Orpington; J. Giese, Buenos Aires; J. Philpott, London S.E.3; J. Kershaw, Lees, nr. Oldham; J. Rolfe, Ruabon; G. Griffin, Toronto; E. Barker, Sheffield; P. Bradley, Stanmore; T. Ellis, London N.W.5; E. Druce, Bolton.

One of the main objects of competitions of this kind is to encourage model-builders to search for new ideas and methods of using Meccano parts, and the *"New Year"* Contest was very successful in these respects, for the models submitted cover a very wide range of interesting and novel subjects. Another very pleasing feature of the entries generally was the evidence of careful and neat workmanship they displayed. The best example of this is a fine universal excavator that won First Prize for F. G. Rich, Orpington. This model will be illustrated in next month's *"M.M."* and readers will then be able to see for themselves the excellence of its construction.



A complete miniature pleasure fair built in Meccano by J. Bloom, Birmingham 20, who was awarded Second Prize for it in the "New Year" Competition.

J. Bloom, Birmingham 20, who was awarded Second Prize, owes his success mainly to the originality of his entry, which consists of a group of working models such as roundabouts, scenic railway, bumper cars, and other amusement devices arranged to represent the complete pleasure fair shown in the lower illustration on this page. The fair was originally built for display purposes and was on show during the Christmas shopping period at A. J. Norton and Sons, Birmingham, where it proved a great attraction. The merry-go-round is fitted with eight horses and eight swans, which rise and fall alternately as the structure rotates. Other interesting items of the group are a side show, in which five ballet dancers give an animated performance on a stage, a menagerie containing a number of really ferocious-looking animals made in Meccano, and a car park for the accommodation of Dinky Toys vehicles.

Passenger transport is catered for by a Hornby-Dublo Electric railway, which encircles the entire fairground. The complete display is mounted on a baseboard measuring 6 ft. 2 in. by 4 ft. 8 in., and all the models are coupled up mechanically so that they can be operated by a single Electric Motor. Provision is made for any of the models to be operated independently of the others if desired. It is a great pleasure to find unusual models of this kind among the entries for Meccano competitions and I congratulate Bloom on his ingenuity and skilful work.

Third Prize was awarded to P. C. Todd, Camberley, who sent a well-built model of a streamlined speed car, which he designed himself.

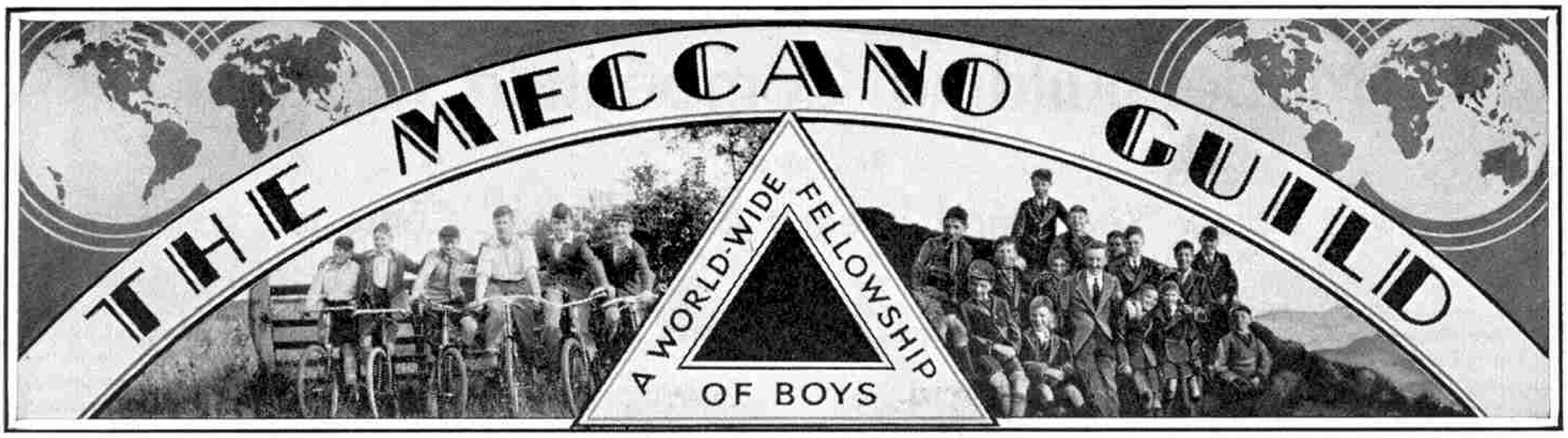
"Year's Best Model" Voting Contest

The massed votes of competitors in the *"Year's Best Model"* Voting Contest resulted in the following six prize models being chosen as the best illustrated in the *"M.M."* during 1938. (1) Traction Engine, by C. H. Pendlebury, Hinckley. (2) L.N.E.R. locomotive *"Cock O' the North,"* by R. S. Miller, Newark. (3) Loom, by S. Coates, Pudsey. (4) Douglas "D.C.3" Air Liner, by D. J. Hofsommer, The Hague, Holland. (5) L.M.S. locomotive *"Coronation,"* by P. Giese, Buenos Aires. (6) Dentist's Chair, by E. D. Clements, Orpington.

These six models, and the order in which they were placed by the voting of competitors generally, were forecast most closely by the competitors named in the list below, who have been awarded prizes as indicated.

1st Prize, Meccano or Hornby products value £2/2/–: M. Nangle, Motherwell; 2nd, products value £1/1/–: G. Balfour, Upminster; 3rd, products value 10/6: B. Malcolm, Preston.

Products value 5/–: F. Hemsley, Dunbar; N. Forrester, Scarborough; C. Wrayford, Bovey Tracey; R. Myburgh, Claremont, S. Africa; W. Tardif, Adelaide, Australia.



What to do in Summer?

Leaders of several clubs have written to ask me for suggestions for the summer programme. Nobody need be at any loss for something to do; the real difficulty is how to squeeze into the time all the activities that will bring pleasure and profit to members.

One summer activity that all can take up is walking or rambling. This requires practically no preparation, and almost every club is within reach of country in which it can be enjoyed, although in this respect some are more fortunate than others. There is nothing that is more health-giving, and which promotes a greater feeling of satisfaction, than a really good ramble in open country and even if rambling is not made a regular pursuit in a Meccano club some effort should be made to arrange good long walks of this kind in suitable surroundings.

The next most popular summer activity among members of Meccano clubs undoubtedly is cycling. Most clubs have cycling sections, in charge of an Assistant Leader, who arranges a regular programme of runs through the outdoor season. Little need be said in regard to the runs themselves, but I should like to impress upon those in charge of cycling sections that they must take the ages of their members into consideration. The younger boys should be given smaller distances to complete than the older ones, and the best way of doing this is to give both seniors and juniors the same rallying point, but to mark out a longer and perhaps more difficult route for the former.

Variety is added to the programme by organising a rally in which cyclists and ramblers combine. The walkers might proceed part of their way by bus or train, or may take short cuts by footpaths and country lanes, leaving the cyclists again to follow a longer road. An essential part of the scheme is that all parties shall arrive at the meeting point about the same time, for tea, or perhaps for games, before the return journey is made.

The Photographic Section

Photography is a hobby that does not seem to me to be given sufficient attention in Meccano clubs. There are a few clubs with organised photographic sections, but generally speaking club photography is half-hearted. Greater interest in this direction would have many splendid results. Club photographers would be able to provide a useful record of club life, photograph models for entry in "*M.M.*" contests, and produce evidence of the enjoyable times that club members have together on excursions of all kinds.

Organising the section should not be difficult, for in every club there must be several members who possess cameras and others who probably would take up the hobby if any encouragement were given. The ideal Leader would be a photographer with experience who can help members in their efforts to "see" pictures on their excursions and to make sure that they get exposure and other details right. This should be followed up by careful examination of the resulting prints, whether development is undertaken by members or not, with a view to doing better next time. There is much fun in the work of a photographic section, especially if developing and printing are carried out by the members, and the articles on photography that are appearing in the "*M.M.*" will form useful guides.

Meccano Club Presidents

No. 13. Mr. J. H. Awad

Mr. Joseph H. Awad, President of the Cairo M.C., with Mr. Mohamed Fahmy Awad, Leader. This active overseas club celebrated its fourth birthday in January of this year. The many interests provided for members include Model-building, Natural History, Stamp Collecting and Aircraft Modelling. Regular excursions and camps are arranged, and a special feature is made of correspondence with enthusiasts in other countries.

Camping Holidays

I have often suggested that camping is one of the finest of summer pursuits for Meccano clubs. It provides a fine open air life for the members, who learn to be self-reliant and resourceful, and get to know each other far better than they could in any other way. Many clubs already organise camps, either spending a special week or fortnight under canvas, or arranging week-end camps, to which as many members as possible go regularly. I strongly recommend one of these courses to Leaders who have not yet taken up camping, and are looking out for a really good way of keeping members together during the outdoor season.

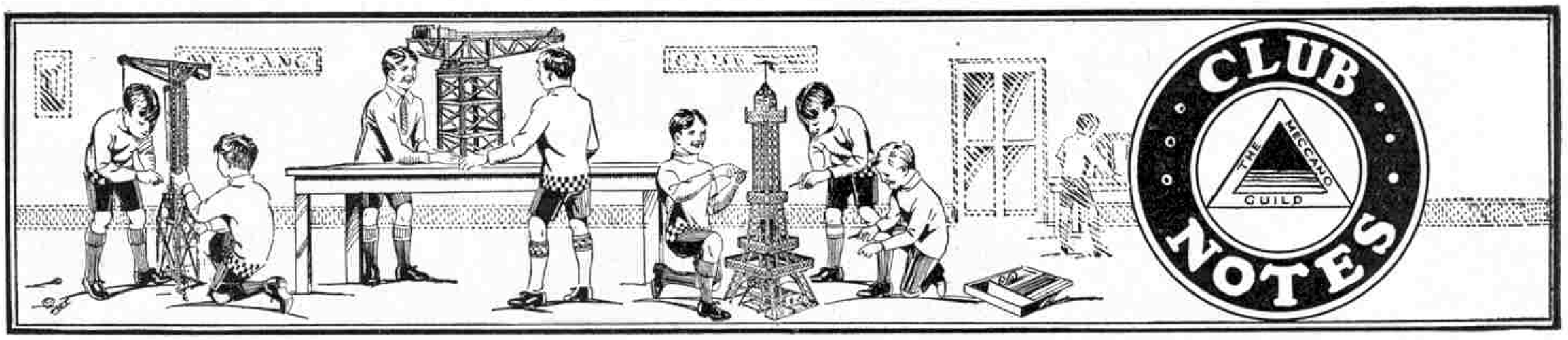
There are good camping sites within easy reach of most centres of population, and it is not usually difficult to find one that is suitable. Those who wish to go farther afield can obtain useful information from the holiday guides issued by the railway companies, and enquiries from the local stationmaster usually will produce a choice of really good centres. The first requirement of a camping site is that it should be away from busy roads and crowded resorts, so that it can be regarded as safe, a point of importance when parents have to be approached for the necessary permission to take their boys to camp. Other important points are that there should be a good supply of water near at hand, and that milk and other necessities can be obtained without difficulty.

Swimming and Life-saving

Next I come to a pursuit in which every boy should be deeply interested. This is swimming. I know that during summer most boys make the best of their opportunities for fun in the water, either at the seaside or in swimming pools, but as far as Meccano club work is concerned I should like to see this organised. Members should obtain their fun in the water together, arranging races with each other, and practising simple life-saving. I do not think there would be much difficulty in organising a swimming section in any Meccano club, to meet at regular times, with a definite programme of activities. The wonderful gain in physique and health that follows from regular exercise, and the confidence and alertness that knowledge of life-saving methods gives, would make any section Leader proud of the efforts he has made on behalf of his boys.

Proposed Clubs

INDIA—Mr. M. P. Polson, "Sea-Side," Sassoon Dock Road, Coloba, Bombay.
LIVERPOOL—A. Robinson, 48, Pecksniff Street, Liverpool 8.
PORTUGAL—Sr. Antonio Sarmento de Vasconcellos e Castro Morais, Rua Macua 18 3° d°, Lisbon, Portugal.
PRESTON—F. Ratcliffe, 2, Wolseley Place, Preston.
READING—P. Duncombe, 167, Peppard Road, Caversham.
SHEFFIELD—Mr. E. Swalwell, 683, Manchester Road, Sheffield 10.
SLIGO—T. Hughes, 10, Cleveragh Road, Sligo, Eire.
SOUTHALL—N. Grew, 29, Burns Avenue, Southall, Middlesex.
WALLASEY—N. McGeoch, 40, Broadway Avenue, Wallasey, Cheshire.
WATFORD—G. W. Burgess, 65, Southfield Avenue, Watford.



Holy Trinity (Mildmay) M.C.—The club's 19th Annual Exhibition, the first in the new club rooms, was held recently, and over 120 visitors attended during the two days. Excellent reports appeared in local newspapers. Two Model-building Competitions have been held, the subjects chosen being "Bridges" and "Boats." A Games Night was thoroughly enjoyed. Visits have been paid to the local electric power stations and a newspaper printing works, and other Visits have been arranged to the new Thames Fire Station and King's Cross Goods Yards. Club roll: 34. *Secretary:* H. C. Boys, 37, Mackenzie Road, Beckenham, Kent.

Northampton M.C.—The club Exhibition, held in conjunction with the associated H.R.C. Branch, was a great success, the total attendance being over, 200. An extensive display of Meccano models included several realistic aircraft and a motor car remarkable for its detail. A meccanograph was used by many visitors to produce designs at the cost of 1d. each. A "Windmill" Model-building Contest was won by G. F. Hodges. An enjoyable Social Evening has been held. Club roll: 8. *Secretary:* E. F. Billingham, 187, Birchfield Road East, Northampton.

Exeter M.C.—During a recent month 21 meetings were held, at which 130 excellent Meccano Models were built. Two members were awarded prizes in a local model-building contest. The senior and junior football teams have now ended a very successful season. A special feature is made of club correspondence, the Leader and members being in touch with other club enthusiasts in all parts of the World. A good programme of excursions and cycle runs has been arranged for the outdoor season. Club roll: 70. *Secretary:* J. Fenwick, 45, Calthorpe Road, Exeter.

Twenty-Eight Edinburgh M.C.—An Exhibition has been held, and many visitors saw a large and varied display of Meccano models. Particular attention was attracted by models of an illuminated funicular railway, a telpher span, and a Belgian waterwheel. Two members were presented with Merit Medallions during the evening. Meetings have been well attended, and very satisfactory progress has been made. *Leader:* W. Brotherstone, 1, Belhaven Terrace, Morningside, Edinburgh.

Stretford Public Libraries M.C.—A fine Meccano model of the D.H. "Albatross" monoplane, with a wing span of 5 ft., has been constructed by a member, and at one meeting he explained to others the various constructional details of this machine. A short Talk has been given on "*Railways of the World*." Exhibitions of Early Printed Books and Manuscripts and Modern Book Production at the Stretford Library were visited. Members of the Stamp Section are maintaining correspondence with pen friends in Australia. Gifts of stamps received have been distributed. Games have been played. Club roll: 35. *Secretary:* Miss F. Scattergood, Public Library, Technical Institute, Stretford Road, Old Trafford, Manchester 16.

Heath Grammar School (Halifax) M.C.—Two separate parties of members have visited the local electricity works. The Meccano Section has devoted meetings to Model-building Competitions and a series of Talks by members on "*Standard Mechanisms*." A Talk by the Leader on "*Pulleys*" was very interesting. An impromptu entertainment by members was given at one meeting and greatly enjoyed. Other Talks have been given on "*A Visit to a Railway Goods Yard*" and "*Signalling*." The Hornby Section has held track meetings, at which train running has been carried out on different layouts, and timetables have been worked out for each. A system of fines and penalties for slackness during operations has resulted in greatly improved working. A committee has been formed to arrange the programme for meetings. Club roll: 53. *Secretary:* M. W. Bottomley, 6, Craven Terrace, Hopwood Lane, Halifax.

Plymouth M.C.—Members forwarded a donation to the St. Ives Life-boat Fund. Visits have been exchanged with the St. Stephens (Saltash) M.C. A Cinematograph Show was greatly enjoyed, the display including a very interesting travel film taken from the "*Graf Zeppelin*" in flight. At a Parents' Evening normal activities were carried out for some time, and a Concert was then given. One meeting was devoted to two Lantern Lectures on "*Antiquities of Dartmoor*" and "*London's Underground*" respectively. Club roll: 95. *Secretary:* A. E. Miller, 21, Hamilton Gardens, Mutley, Plymouth.

Royds Hall Grammar School (Huddersfield) M.C.—The Exhibition held recently was considered the best in the history of the club. Ambitious model-building efforts by members produced some very striking exhibits, in which originality and ingenuity were noticeable. A Traction Engine on loan from Headquarters also added to the attractions of the display. Club roll: 32. *Secretary:* D. Livesey, 30, Heathfield Road, Golcar, nr. Huddersfield.

Members of St. James' (Grimsby) M.C., Leader: Mr. H. V. Hayman, B.Sc.; secretary: R. Janney. This club was affiliated in November 1934. The excellent club room now in use has been equipped with work benches and storage accommodation by members themselves, who are now busy with model-building, carpentry, fretwork and model aircraft construction at meetings. Hornby Railway working has been added to the club's activities.

Burnley Grammar School M.C.—At the recent School Hobbies Exhibition two rooms were devoted to the club's display. In one was an effective river and dock scene constructed in Meccano, while in the other models built by members were on view, together with models on loan from Headquarters. In a third room was a Hornby railway layout with pithead models made of cardboard. Club roll: 20. *Secretary:* L. H. C. Hawkins, "Westhome," 27, Carlton Road, Burnley.

Barnard Castle School M.C.—The recent Exhibition was a great success and resulted in a considerable increase in club funds. Two outstanding models on show were a giant derrick crane and a battleship of the "Renard" class. Track operations by the Hornby Section were carried out perfectly. Club photographs have been taken. Club roll: 17. *Secretary:* A. Coates, The School, Barnard Castle.

Morison Memorial M.C.—Good progress is being maintained, and competition is keen for the various awards given for model-building. A Hornby Evening was very much enjoyed, train running being carried out on a specially planned layout. On Games Nights netball, table tennis, and darts have been enjoyed. Club roll: 36. *Secretary:* J. Muir, 6, Stanley Street, Clydebank.

Barking M.C.—Members visited the Science Museum in London and were particularly interested in the "Special Army Exhibition." At a Camp Fire an interesting story was told. First prize in a club Model-building Competition was won by John Rushan with a hammerhead crane, D. Hughes and A. Stanley being second and third respectively. A Games Tournament was held on one evening, two teams being formed to play a series of enjoyable games. On a Model-building Evening members had to construct models driven by an elastic band or string. Club roll: 35. *Secretary:* F. K. Whitehead, 60, Devon Road, Barking.

Islandmagee M.C.—Members of the Meccano Section have constructed a large overhead bridge and crane for use on the Hornby layout. In addition to a Spelling Bee, minds have been set buzzing by general knowledge and arithmetic "bees" held between two teams representing Meccano and Hornby respectively. A. Storey and A. Forsythe have been presented with Merit Medallions. Further issues of the "*Gazette*" have been produced, and splendid sales have been registered. The club is to form a football team, and steps are being taken to secure the necessary equipment. It is hoped to arrange an inter-club visit with the Malone (Belfast) M.C., and also to have cricket and football matches with this club. The Annual Camp is to be held in July. Club roll: 22. *Secretary:* S. McCready, Hillmount, Islandmagee, Co. Antrim.

St. Oswalds (Thornton Heath) M.C.—Talks have been given by members on "*Aeroplanes*" and "*Chemicals and Water Softening*." At a Mock Trial the accused's ingenuity resulted in his acquittal. Final arrangements have been made for the forthcoming Exhibition. Club roll: 25. *Secretary:* J. F. Jaques, El Molino, 5, Ingram Road, Thornton Heath, Surrey.

The Leas School (Hoylake) M.C.—In addition to model-building activities have included putting the Hornby Railway layout into working order and train running. Interesting Lectures have dealt with such subjects as "*Early Steam Engines*," "*Oil*," and "*Early Locomotives*." A party of members greatly enjoyed a Visit to the Meccano Factory. *Leader:* W. H. Grainger-Simm, The Leas, Hoylake.

Folkestone M.C.—New trestles 2 ft. 6 in. high are to be made this summer for the model railway, and they will be fitted with hinges so that they can be stored when necessary. The Meccano cranes on the layout have proved very satisfactory in operation. Club roll: 7. *Secretary:* W. F. Cotter, 52, Hill Road, Folkestone, Kent.

Beeches (Jersey) M.C.—A further visit has been paid to the intricate model railway layout owned by Dr. Labesse. A Lantern Lecture has been given on "*Switzerland*." A fine railway layout has been placed at the disposal of the club, and enjoyable train running has been carried out. Club roll: 20. *Secretary:* H. Dubras, 57, King Street, St. Helier, Jersey, C.I.

Sutton Valence School M.C.—Mr. Freeman, Leader, has left the school, and Mr. A. R. Ellender has been elected to this office. In a Model-building Contest a tow lorry was awarded first prize, other outstanding models being a submarine, a pithead gear and a sailing boat. The Leader has given a short Talk on "*Submarines*." Club roll: 14. *Secretary:* V. Bryant, "Sunnyside," The Plough, Langley, nr. Maidstone.

Hornsea M.C.—At a recent committee meeting several applications for membership were received. Interesting Lectures have been given on "*Experimental Electricity*" and "*The Antarctic*." A Talk on "*Rubber and Its Manufacture*" was followed by experiments. An Old Boys' Meeting was very successful. Club roll: 17. *Secretary:* F. Richardson, "Summerleigh," Esplanade North, Hornsea, Yorkshire.

NEW ZEALAND

Ashburton M.C.—The age conditions in the Inter-club Shield Contest have been revised, and subjects chosen for models for this year's contest. A Simplicity Model-building Contest was followed on one evening by an interesting account of a trip to the South Island. A Lecture on "*Fire Fighting*" has been given by the chief of the local Volunteer Fire Brigade, and members visited the Fire Station. *Secretary:* E. H. McGregor, 159, Burnett Street, Ashburton.

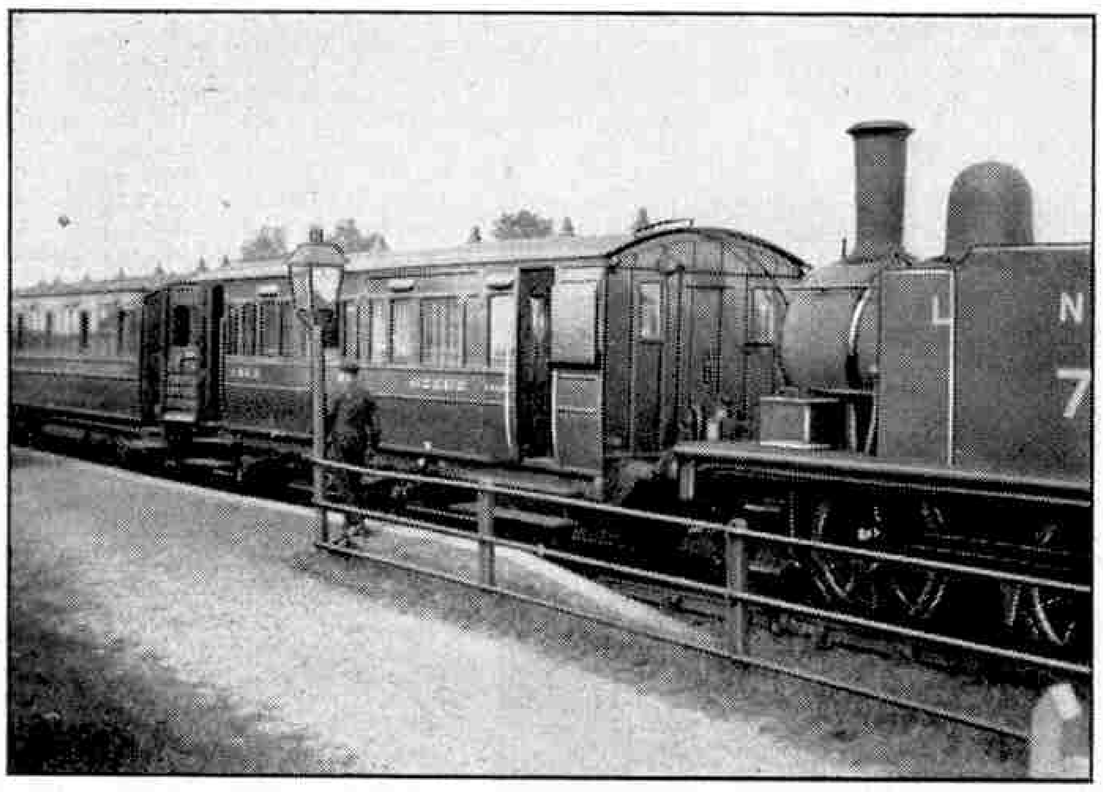
The Tollesbury Light Railway

An Interesting Essex Branch Line

By C. W. Footer and D. J. Agnew

THE traveller on the Eastern Section of the L.N.E.R. when passing Kelvedon, in Essex, may catch a glimpse of a small branch line that bears away towards the coast, almost at right-angles to the main line. This is the Kelvedon, Tiptree and Tollesbury Light Railway, which forms part of the L.N.E.R. system but is more usually known locally as the *"Crab and Winkle."* In some respects it is strangely reminiscent of overseas practice, with its "observation cars," its level crossings and its cattle guards; and it is these unusual features that help to make it of special interest.

This line, some 10 miles long in all, was authorised under the Light Railways Act of 1896 and was laid down for the former Great



A passenger train standing at Tollesbury station.

Eastern Railway. By the autumn of 1904 the line was ready for traffic, although various works on it were then only partly finished, and was formally opened in September of that year. It provided a connection between the Colchester main line of the G.E.R. at Kelvedon and Tollesbury, then quite a prosperous coast town with fishing and yachting activities, and also served the town of Tiptree and four other villages. The line originally continued for 2 miles from Tollesbury station to Tollesbury pier, which was used for unloading fish and so on, and for mooring boats.

After the opening of the line Tollesbury lost some of its prosperity, and the use of the pier diminished. For this reason the two-mile section from Tollesbury station to the pier was closed after the War. The rails and sleepers are still in position, and appear to be in quite good condition, and a little while ago the accumulated overgrowth on this section was cut away and the pier, which is railway property, was repaired, as if a reopening were likely. It would certainly be interesting to see a locomotive again puffing away down the coast over this piece of line, which has been derelict for so long.

The remainder of the branch, between Kelvedon and Tollesbury, still seems to be doing well, goods traffic being more important than passengers. There are three trains each day in each direction, with certain alterations on Saturdays and Wednesdays. Many trains are what is known as "mixed," goods vehicles being attached to passenger trains.

Each station has a fair-sized waiting room, with the usual time-tables and decorative posters, and it is rather amusing to see on Tollesbury's small station a poster portraying a colossal Canadian locomotive hauling a long string of steel cars, and then to turn round and be confronted by a tiny tank engine drawing in with its train of two small carriages! The waiting room at Feering Halt, a stop on the line, also is quite unusual, for it consists of an old omnibus with the wheels removed!

The view of railway from this halt is remarkable. In one direction the line curves off sharply to Kelvedon, which is not far away; in the other it is dead straight but its gradients are extraordinary, for first it descends, then levels out, and afterwards rises steeply to disappear over the top of the next hill in the direction of Tiptree.

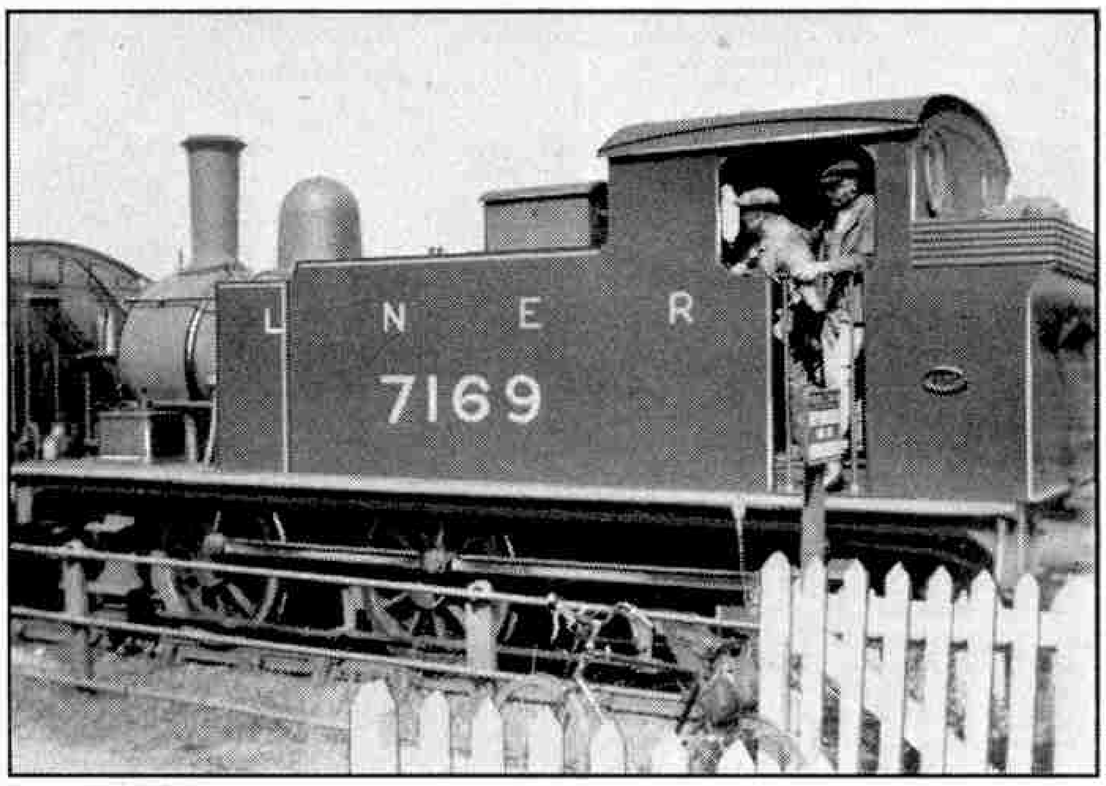
The rail gauge of course is the usual standard, but the coaches are slightly below standard construction gauge. The total number of coaches in use is four. Two of these are of rather peculiar design with end platforms, resembling to some extent the older type of American observation cars, and are bogie vehicles, while the other two are six-wheelers. All coaches are well upholstered inside, although there are no separate compartments, and seats run the entire length of the "observation cars," one on each side. Special steps are provided for passengers to climb up from or down to the low platforms.

Two locomotives take turns on the line, exchanging duties every fortnight. At the time of writing these are Nos. 7161 and 7169, both 0–6–0 tank engines of Class "J67" of the well-known Stratford type used for shunting and on local goods trains on other parts of the system.

The path of a train is marked not only visibly by puffs of white steam and smoke, but also audibly by frequent whistling as it approaches the unguarded level crossings, which occur even on roads of quite a "main" character. At crossings where gates are provided, the train stops and the fireman descends to open the gates, after which he remounts the footplate and the train proceeds. It again halts when all of it has passed the gates. This time the guard jumps down and closes the gates before climbing back and signalling the train on.

On each side of the road at level crossings are placed cattle guards. In days when motor cars were few, cows must often have strayed along the roads and thence on to the railway. These cattle-guards consist of rectangular pits, about two feet deep, extending right across the line, and covered by special wooden gratings; cattle, seeing an empty place beneath the gratings, will not step over them and thus do not stray on to the line.

In many places, the track seems to follow the surface of the

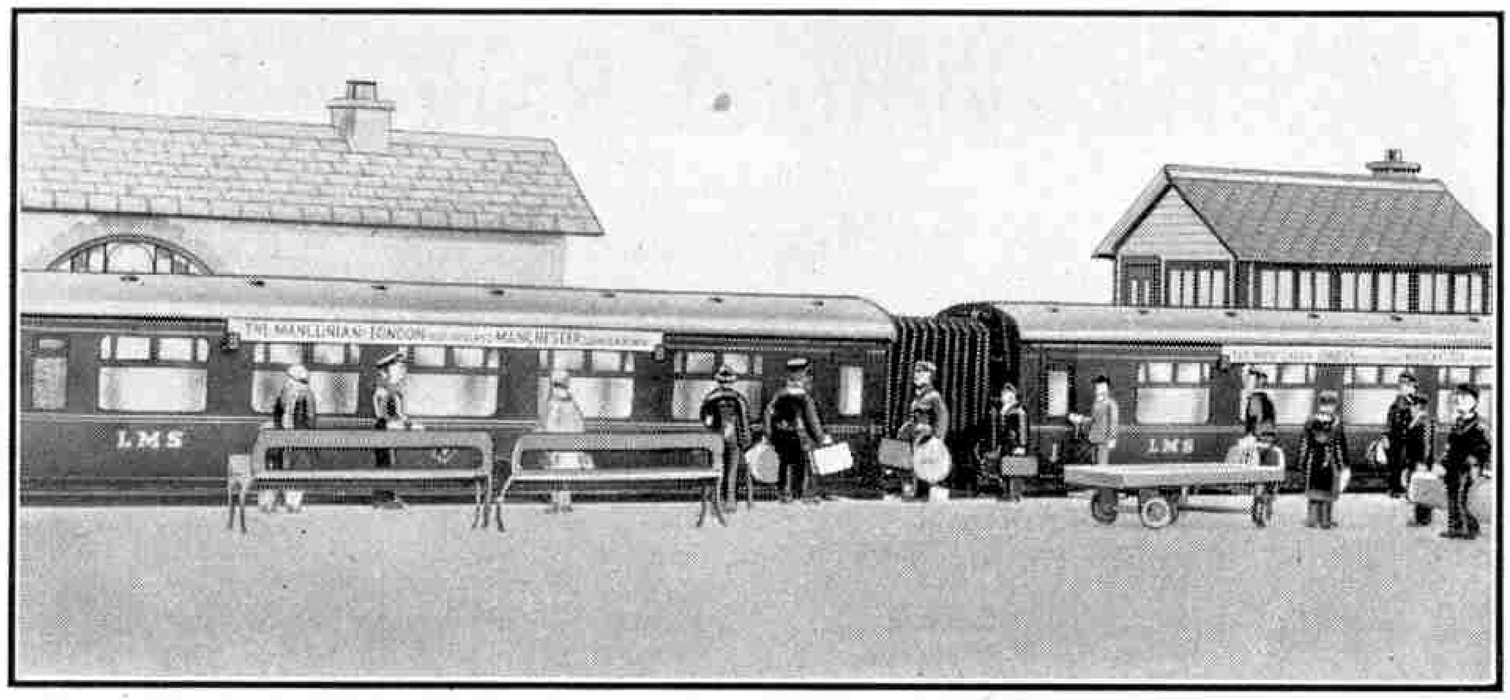


One of the engines working on the Tollesbury line, L.N.E.R. No. 7169.

ground in the most suitable direction, with the result that the line describes quite remarkable curves and gradients. Cuttings and embankments are few, and gradients of 1 in 50 and 1 in 70 occur in several places. This is only to be expected on a light railway of this character, for no attempt was made to secure easy gradients by extensive engineering works of the kind that would be necessary on a main trunk route.

Signals are practically unnecessary, since the branch is worked by "one engine in steam," but at Kelvedon the line has its own independent signal cabin and signals. Here the branch line uses a low-level station separate from that serving the main line, so that the connecting line has a very steep gradient.

For all its peculiarities, the Tollesbury Light Railway has some charm of its own. The scenery passed through is pleasant and, as a fresh experience, the line is amusing to travel upon!



Hornby Train Name Boards

By "Tommy Dodd"

A TRAIN becomes much more attractive when it is given a name instead of being known by the time of its departure. For instance, there is much more excitement and romance in *"The Flying Scotsman"* than there would be if this famous train were simply the "10 a.m." from King's Cross. The use of boards carrying the name of the train increases the interest even further, for they give the coaches an air of distinction that differentiates them from those that make up a more ordinary train.

The thrill that goes with the use of name boards on real railways is obtainable by all Hornby Train owners, for special boards have been provided to enable them to distinguish the miniature expresses on their lines in this realistic manner. The Hornby Train Name Boards are strips of tinplate, about 5 in. in length, and on most of them the colour scheme follows actual practice, in which black lettering on a white background is used. Some of them are not strictly name boards, but should rather be called destination boards, since they give details of the places served by a train, a plan that is largely followed on real railways. All of them are very effective, however, and particular care has been taken to ensure that the lettering on them is clearly reproduced and follows the style of the name and destination boards of real practice.

All four great British railway companies make use of boards, and suitable miniatures for each are included in the Hornby Train range. Considering first the L.M.S., we find that practice varies. Some L.M.S. name boards indicate merely the name of the train concerned. Others show the names of the places that are served by it, and there is an interesting combination of these two kinds that includes both the train name and the terminal points.

Examples of each kind are now included among the Hornby Boards. There is first *"The Royal Scot,"* a distinguished title that is in use probably on most layouts on which L.M.S. practice is followed. Among the destination type of Boards there is *"London (Euston) and Liverpool (Lime Street)."* Examples of the combined type also are available, and these represent the practice followed on the actual boards of *"The Yorkshireman," "The Merseyside Express"* and *"The Mancunian."*

The all-Pullman "Queen of Scots" on a Hornby railway displays the correctNameBoards on the coach roofs.

The general style followed in this type of Board can be seen from the upper illustration on this page. It will be noted that the Boards in this illustration are fitted in brackets just above the windows, in accordance with the latest L.M.S. practice. The provision of brackets in this position is an attractive feature of Hornby No. 2 Corridor L.M.S. Coaches.

Turning now to the L.N.E.R., no mention of expresses on this railway could omit *"The Flying Scotsman"* and, needless to say, there are Hornby Train Name Boards bearing this famous title. That popular holiday train *"The Scarborough Flyer"* also is represented, and its running in miniature lends a topical note to operations at this time of the year.

In order to represent the long-distance Pullman services of the L.N.E.R., Hornby No. 2 Special Pullmans can now be provided with Boards bearing the romantic title *"Queen of Scots"* or the more business-like *"Yorkshire Pullman."* An example of the destination type of Board also is available; this reads *"King's Cross, Edinburgh and Aberdeen."*

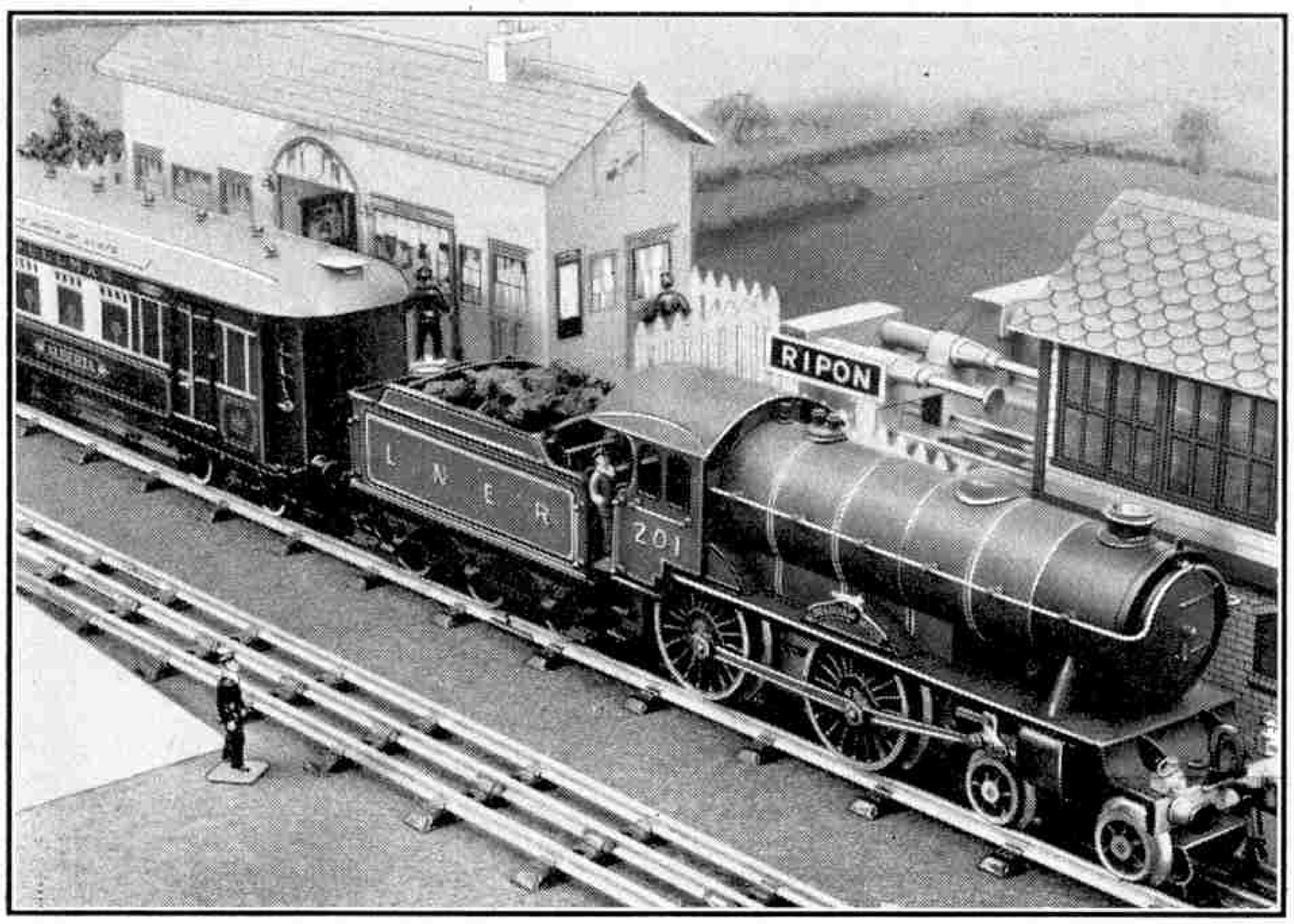
Among the G.W.R. titles available *"Cornish Riviera Limited"* conforms to the latest practice, this name having superseded *"Cornish Riviera Express,"* which was used for a number of years. A similar amendment is incorporated in *"Torbay Express,"* now used in place of the former *"Torbay Limited Express."* G.W.R. trains of a different character are represented by *"The Bristolian,"* a high-speed Bristol and London service, and the popular *"Cheltenham Spa Express,"* better known perhaps by its nickname of *"Cheltenham Flyer,"* and Hornby Train Name Boards are available for both of them.

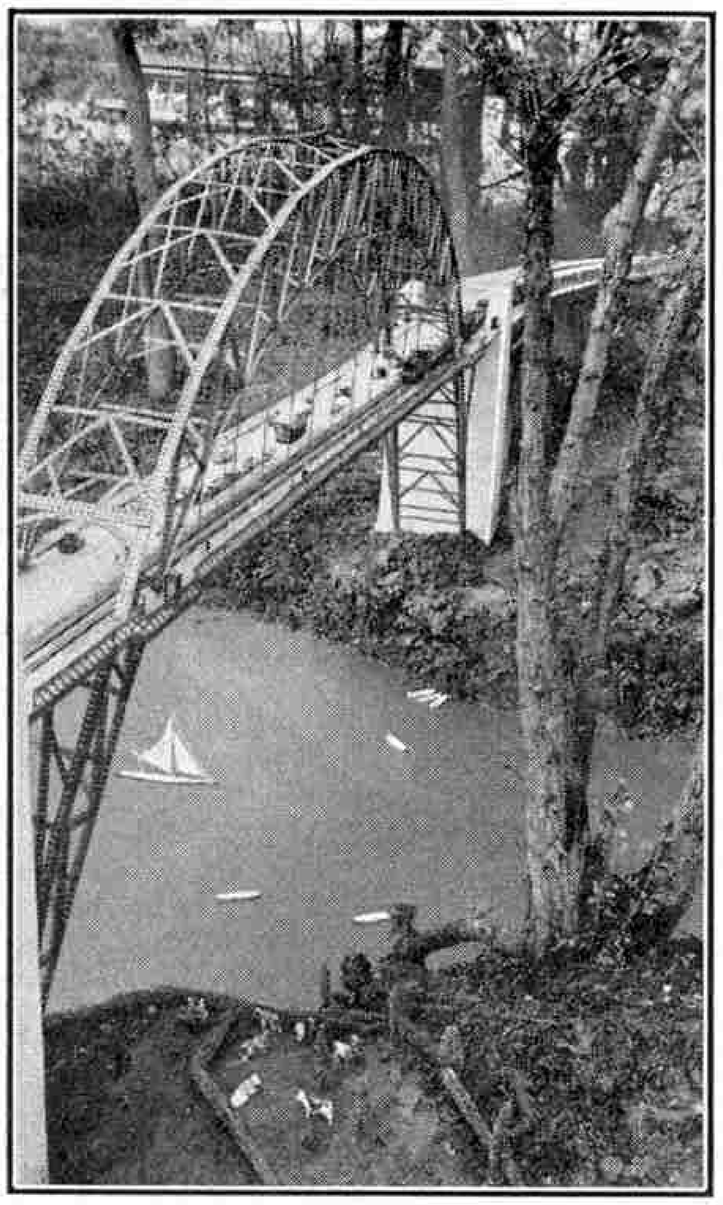
The Hornby Train Name Boards in this illustration follow the latest L.M.S. practice in their wording and in their position on the coaches.

The S.R. is now the principal home of the Pullman train in this country, and the boards carried by that famous Continental service *"The Golden Arrow"* are represented in the series of Hornby Train Name Boards. Another famous Pullman service, this time on the Western Section, is *"The Bournemouth Belle."* Long-distance travel, far beyond the confines of the miniature system, is suggested by the *"Ocean Liner Express"* Boards, which are similar to those used on trains between Waterloo and Southampton Docks.

All these Boards can be attached easily and quickly to various vehicles in the Hornby Series. Special brackets to carry them are attached to the roofs of all Hornby No. 2 Corridor Coaches, with the exception of the L.M.S. models which, as previously explained, carry their brackets above the windows. Brackets also are fitted on the roofs of the No. 2 Special Pullman Coaches.

The No. 2 Pullman and No. 2 Saloon Coaches do not have brackets fitted to their roofs, and special fittings known as No. 2 Roof Clips are available for use on these which have the effect of providing brackets for the reception of the Train Name Boards. Full instructions for fitting the clips are given on the packets in which they are enclosed.





The Ivyhurst Railroad

Traffic on a "Transcontinental" Line

By D. and K. J. Kelk

THE Ivyhurst Transcontinental Railroad is a Gauge 0 miniature railway that was designed from the first as a real system serving the imaginary continent "Ivyhurst," situated "somewhere off the Coast of south-west Ireland," where it was supposed that a number of important towns had sprung up. The chief aim in planning the layout was to provide for the operation of intensive passenger working to timetable, with a fair amount of goods traffic, operated by clockwork locomotives.

The railway is situated out of doors and it took rather more than five years of continuous building work to bring it to its present state. It is not our first railway; we commenced the hobby 14 years ago, so that in the present system we have been able to make use of the varied experience gained previously. Careful surveying was necessary in plotting the route for the line and a good deal of earthwork was necessary in order to obtain the effects required.

The main line is 150 ft. long from end to end; actually a single track forms the route, but it doubles back on itself and returns to the terminal station from which it started. Traffic is thus normally one way only, but much of the return loop is double track and trains can overtake or pass en route. The principal station is "St. Anne's Central Terminus," situated in a shed where the baseboard is at waist level. Besides the two main line tracks, which pass through the station to carriage sidings, there are two dead-end lines for arrival and departure purposes respectively, and two bays. There are in all six platforms from 9½ ft. to 12 ft. in length and two-thirds of the station area is covered by a glass roof. The station building as a whole is in the modern reinforced concrete style, with flat awnings and subways.

The main block of buildings, surmounted by a clock tower, includes a booking hall, dining rooms, lost property offices, administrative offices, and a fruit shop. The layout of the station and yards allows trains to be handled readily, and coaches can be backed in and out expeditiously. Perishable goods traffic is handled on one of the bay lines serving Platform 1, and milk traffic in the other bay. At the time of writing, no other goods traffic is yet working, as arrangements are not complete. It is one of our chief rules that no train may run "just for fun"; there must be a definite job for each to do.

Other stations in order from St. Anne's Central are Essingdene Forest, at a distance of 50 ft. from St. Anne's. This is in a small dairy farming district and also serves a fishing and golfing resort. Then comes Tremayne Bay, 85 ft. from St. Anne's, at the mouth of the River Tremayne. This town is a busy seaport, with docking facilities for ocean liners. Finally there is Cliftonville, a holiday resort 30 ft. beyond Tremayne Bay. Distances therefore are not very great, but loads are heavy and, owing to the geography of the districts served by the line, there are some difficult gradients.

The Meccano arch bridge at "Tremayne Bay." It has a central span of 15 ft.

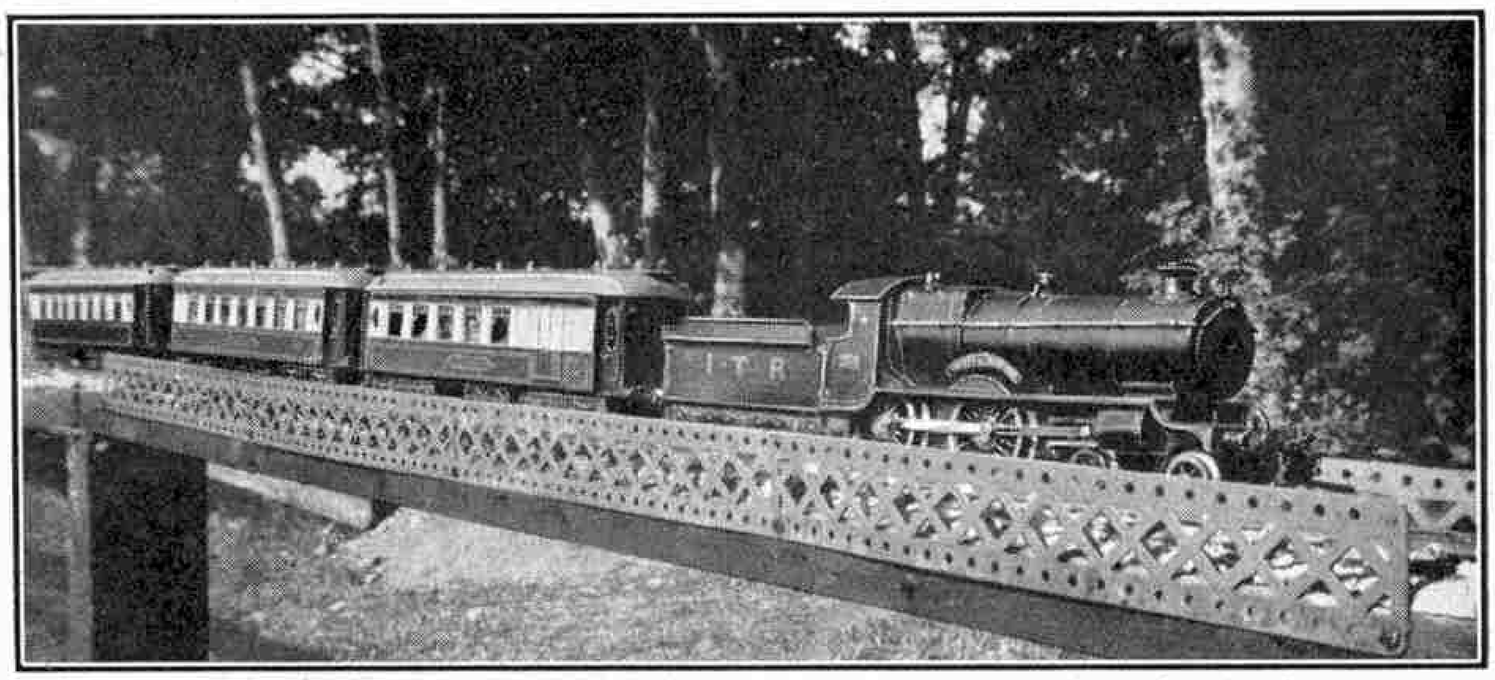
The principal train services from St. Anne's include Restaurant Car and Boat Expresses to Tremayne Bay and Cliftonville. All-Pullman trains run to Essingdene and Tremayne Bay. Empty stock is also moved to these stations as required. There are corresponding up services to St. Anne's, including Pullman Expresses. A local "shuttle" service operates between Essingdene, Tremayne Bay and Cliftonville.

All vehicles are made up in set trains, each of the sets being numbered, as advocated frequently in the *"M.M."* All vans and engines have their own numbers in the I.T.R. books. Every locomotive, coach and wagon has its official "home" position, and returns there at the conclusion of each spell of timetable working. Three operators are required, one each at St. Anne's, Essingdene and Tremayne Bay, and all make use of a copy of the General Working Timetable, which gives each movement involved, with the times, from which the public timetable is worked out.

Various one-hour timetables are used; one which was a favourite last summer gave about 30 arrivals and departures from St. Anne's Central during 56 minutes, so it can be understood the operators are kept very busy! Operations take on an incredibly real aspect when the trains are running exactly to schedule, and even more so if they happen to be half a minute late and efforts are being made to regain "right time." We have many visitors who appreciate timetable working immensely.

No train is allowed to move without being correctly offered and accepted by the different operators. A bell code system is in force and the bells, which are inside the Signal Cabins, are adjusted to give only one beat to each press of the button. The codes used, though adapted to suit our needs, are based on the standard bell code system. The system give a splendidly "real" atmosphere to the system, and the bells are everyone's delight!

The track consists of brass rails laid permanently on longitudinal battens fixed to piles driven deep into the clay soil. We find it stands the weather well. For ballast we use the finest flint-grit mixed with sand and cement, a mixture that sets hard, looks perfect and deadens sound. Each sleeper lies on a strip of rubber cut from an old motor tyre inner tube, which helps to deaden sound and produce that elusive "clickety-click" at the rail joints! Most of the main line is about 3 ft. above ground level, but at Essingdene the earth excavated in forming the River Tremayne has been used to make a double hill, and there the trains run through cuttings.



The Hornby No. 2 Special "County of Bedford" on an all-Pullman train crossing the viaduct.

The great show piece of the line, and its greatest attraction, is at Tremayne Bay. There the double track crosses the river at a height of 7 ft. by means of a large Meccano arch bridge, which is 30 ft. long and has a central span of 15 ft. This is named the "King George V Silver Jubilee Bridge," as it was erected in 1935. It won first prize in the "Summer Realism" Model-building Contest in the *"M.M."* that year. It is similar in scale size and design to the road bridge over the river at Newcastle-on-Tyne, and is a correctly-built working model. The 26 suspension

chains definitely support the trackway, and the arch is so soundly constructed that a man can safely swing in the air with his wrists gripping the top of the arch! This astonished the builders themselves, and is a great tribute to the Meccano system. The arch is quite immovable, and the bridge has real abutments in the base of ornamental concrete towers like those of Sydney Harbour Bridge.

There are several smaller bridges on the line, mostly girder spans built up from brass angles by soldering, and these are used in realistic "flyover" and "burrowing" junctions.

The coaching stock consists of five Hornby No. 2 S.R. bogie Corridor Coaches, which are used to form a "through Sleeping Car train." There are three No. 2 Special Pullmans, and various Hornby Vans. Five Hornby United Dairies Milk Tanks are busily engaged in their appropriate duties, while many other large and small Hornby Wagons are in use. A new luxury train built in the I.T.R. workshops is composed of scale 74 ft. Dining and Kitchen Cars, a 68 ft. Pullman Parlour Car, and a 64 ft. Saloon. These have glass windows, sprung bogies and other refinements, and they ride the track with that musical rhythm of the rail joints, exactly like their big sisters!

There are 10 locomotives. Eight are of Hornby manufacture, and have earned a real affection among the "staff." The fastest expresses are hauled by L.N.E.R. No. 2 Specials, two in number and each three years old. These "Hunt" class engines have been appropriately renamed and numbered No. 3524 *"Linton Beagles"* and No. 3525 *"Rother Valley Harriers."* No. 3524 is the fastest engine on the line and is generally seen on three-coach high-speed trains. The two of them together always haul the heavy new "luxury train" on the up journey from Tremayne Bay, as there is a stiff gradient for five yards or so.

The make-up of this train has something of the character of the modern high-speed limited expresses about it, although it does not follow any definite prototype. The equipment has been developed for the special purpose of meeting the conditions of work on the I.T.R. system. The use of two 4–4–0s together to haul it reminds one of S.R. practice in connection with the *"Ferry Boat Train."*

The third engine is Hornby No. 4c *"Eton,"* No. 900, a little over a year old. This is generally to be seen at the head of the five-coach S.R. Sleeping Car train, which reaches the continent from Great Britain after travelling through an imaginary system of submarine tunnels! *"Eton"* is not yet so powerful as the "Hunts" but is very sweet-running, and the whole train seems quite a favourite with visitors. The green saloon-type Coaches and well-proportioned Locomotive look uniform and businesslike.

Fast excursions are hauled by No. 351, a 4–4–2 Hornby No. 2 Special Tank, which sometimes reproduces the familiar "slipping" of the driving wheels when starting off. It is the only engine we have that does this, and the effect is quite pleasing.

No. 3121 *"County of Bedford,"* one of the Hornby No. 2 Specials, is now in its ninth year of very active service, and has mellowed down to a sweet easy-running engine for secondary duties, something like the G.N. "Atlantics" of the L.N.E.R. It is the quietest engine we have, but still hauls three No. 2 Special Pullmans up the stiff grades easily. *"County"* as we affectionately call her, now handles Pullman Specials and other moderately fast trains not booked at a scale 60 m.p.h. or more.

A No. 1 Special Tank No. 352 is entrusted with the local service. The local track burrows under the main line with gradients as steep as 1 in 23, but No. 352 hauls two bogie coaches easily on the sharp curves and difficult grades between Tremayne Bay and Essingdene.

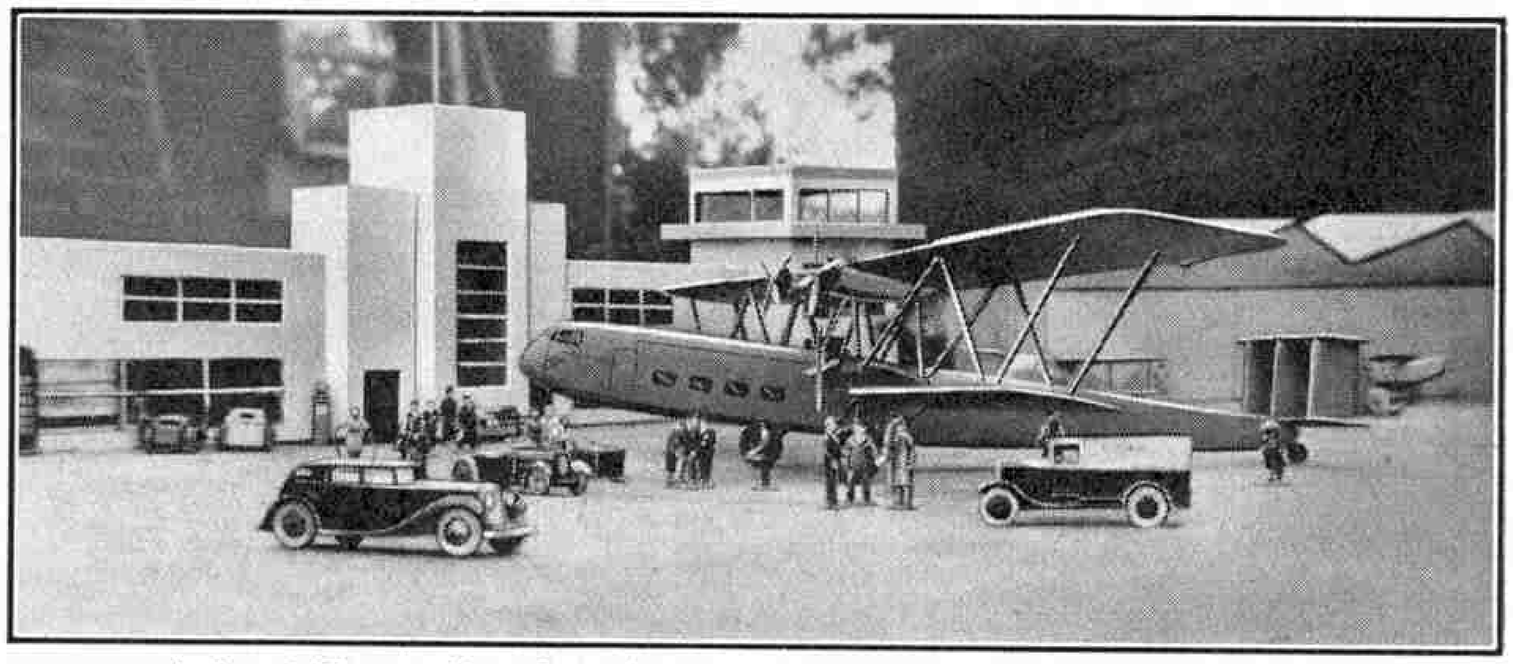
The remaining two Hornby engines are real veterans, an old No. 2 Tank of 1927 vintage and a corresponding 4–4–0, which proudly dreams of her hectic first trials in 1926! Both of these are in active use on assisting work and on light goods trains. They are hard-working and just as fussy as their real "old cousins" sometimes are. Neither has ever given us much trouble. The mainspring in the 4–4–0 locomotive was new 13 years ago; apart from ordinary maintenance the engine has had no special attention since then. Although we work our locomotives very hard, we make a point of looking after them well.

During the last few years the owners have begun to appreciate what it means to have a stud of locomotives that can instantly be brought into action and never let them down. We often wonder whether, during the Saturday afternoons of continuous operation, these Hornby Locomotives and Rolling Stock have travelled many more miles than almost any of their sisters anywhere. We are sure that no others can better their performance!

At Tremayne Bay there is a dock basin constructed of concrete, with a concrete breakwater 10 ft. long, extending into the lake, alongside which model ocean liners unload passengers and freight. An addition of interest last season was "Hurston Airport," a scale model feature with concrete runway, control tower, hangars and hotel buildings. There are aeroplanes too, including a model of the Imperial Airways liner G-AAXC *"Heracles,"* with a wing span of 2 ft. 6 in., which dwarfs the miniature de Havilland *"Dragon"* and Percival "Gull" that also are to be seen. In the lower illustration on this page *"Heracles"* is shown arriving at Hurston, while another machine is preparing to leave with some "distinguished passengers."

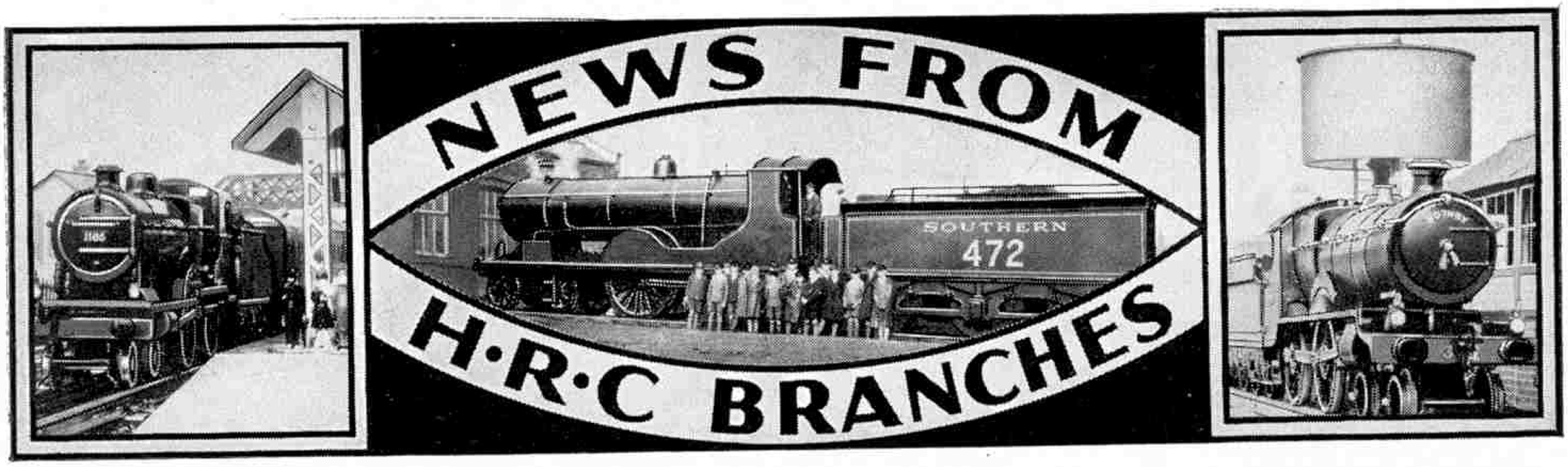
Road traffic is provided for by Dinky Toys Cars, Lorries and Vans and other vehicles. With its shipping facilities, air services, and railway and motor traffic, "Ivyhurst" therefore has a complete transport system. The "inhabitants," who are mostly Dinky Toys, can congratulate themselves that the four interests, road, rail, sea and air all work in close harmony!

Apart from the working of the different services, there is a great deal of work for us in keeping the equipment in good order. The track, bridges, viaducts, building and so on all have to be looked after as well as the trains and other moving models. Weather effects, sun, wind and of course rain, also provide us with maintenance problems.



A view of "Hurston Airport" showing the model Imperial Airways aircraft "Heracles."

The air liner "Heracles" arrives at "Hurston Airport," another machine is preparing to depart.



ST. LUKE'S (BATTERSEA).—The Branch's clockwork and electric layouts are in operation regularly, and very successful train running has been carried out. All electric stock has been thoroughly overhauled. Efforts are being made to obtain a larger room in which to hold meetings. Secretary: W. C. Hill, 29, Eswyn Road, Tooting, S.W.17.

EVERGLADES.—Members paid an interesting visit to the Cosham Junction Signal Box, and learned much about the locking gear, bell code and slot-type signalling. The bell code is to be used in operations on the Branch layout. Three new express services have been introduced, representing *"The Mancunian," "The Yorkshireman"* and *"London (Euston)–Glasgow (Central)"* respectively. The first two are hauled by a "Princess" and a "Royal Scot" or Standard Compound. Secretary: P. D. Stuart, 7, Lodge Avenue, Cosham, Hampshire.

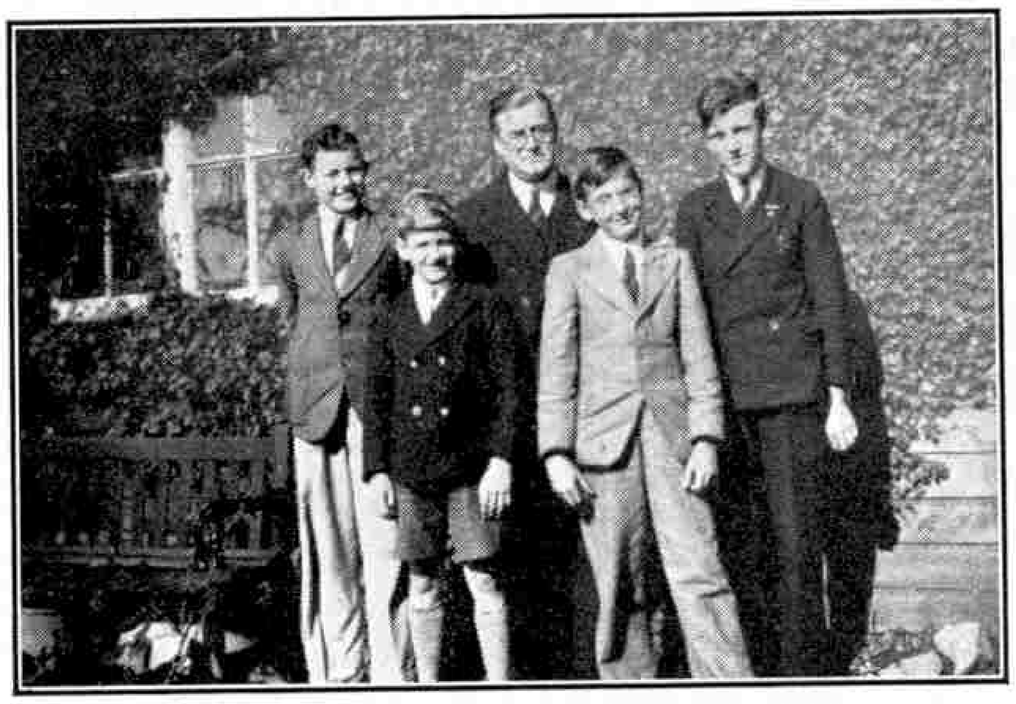
ACTON.—Track designing and laying has been continued at meetings, together with the construction of buildings for the layout and the addition of scenic effects. The clockwork track has been largely replaced with electric track, and test runs carried out. The Second Annual Exhibition held at the club room for three days attracted many visitors. The display included operations on the Branch railway, Meccano models built by members, supermodels on loan from Headquarters, photographs taken on outings, steam locomotives, and a Dinky Toys layout. Copies of a guide leaflet printed by hectograph were distributed among visitors. The Meccano Section have applied for affiliation to the Meccano Guild. Secretary: S. W. Simmons, 7, Alfred Road, Acton, London S.W.3.

COPNOR.—A Lecture given on *"How Electric Trains Work"* also included interesting information on signalling. Train running has been carried out on various designs of layout put down on a baseboard, and timetable working has been tried out with success. Secretary: C. S. Albery, 33, Kensington Road, North End, Portsmouth.

ISLANDMAGEE.—A new Hornby-Dublo layout has been operated, the event arousing great enthusiasm. A happy evening was spent on the first anniversary of the Branch and its associated Meccano club. At the end of the Winter Session all indoor equipment was carefully stored, and a programme of outdoor meetings is now being followed. Secretary: S. McCready, "Hillmount," Islandmagee, Co. Antrim.

ST. OSWALDS.—Several very successful Track Nights have been held. Extensive preparations have been made for an Exhibition. A special track has been designed, and a programme of train services drawn up. Secretary: R. H. Shaw, 16, Covington Gardens, Norbury.

WEST HADDON DISTRICT.—The Branch room is to be renovated, and all track is being taken up and cleaned prior to reconstruction when the room is ready again. It is intended to introduce Hornby-Dublo equipment. Secretary: D. G. Bush, "Stonelea," West Haddon, nr. Rugby.



Mr. H. S. Pursey, Chairman of Ulverston H.R.C. Branch No. 355, with J. H. Pursey, secretary, and other members. This Branch was incorporated in September 1938. An extensive and well-planned layout is operated at track meetings, and this is at present being extended by the construction of a new branch line. A favourite pastime of members is "prowling around" in places of railway interest in the neighbourhood.

BURY ST. EDMUNDS.—A General Knowledge Competition has been held, and several Table Tennis matches played. A Talk has been given by the Chairman on *"Paddington to Plymouth by 'The Cornish Riviera Express'."* A new layout has been completed, and after tests experimental trains were run successfully. Timetable working is to be introduced. Arrangements have been made to visit local engine sheds. Secretary: T. S. West, 10, Crown Street, Bury St. Edmunds, Suffolk.

PURLEY COUNTY SCHOOL.—At track meetings a variety of trains have been run on clockwork layouts. Several Lantern Lectures have been enjoyed, and one meeting was devoted to puzzles. Games Evenings also have been held. The Magazine Library is being well patronised. Secretary: D. Hardwick, "Woodcroft," Beech Drive, Kingswood, Surrey.

NORTHAMPTON.—The fourth anniversary of the formation of the Branch has been celebrated. At Track Meetings different timetables have been run through, and train control generally has improved. In the Inter-Station Games Contests "Stafford" came out top. This station also were first in a Contest in which points were awarded for the best scenic effects. Secretary: D. J. Rushton, 40, The Vale, Northampton.

DUMPTON.—The final meetings of the Winter Session have been very successful. A Hornby *"Eton"* locomotive was available at several meetings, and interesting trains were run. The weekly day for meetings has been changed to give more time for Branch activities. Secretary: A. G. Hargreaves, "Prospect," Blandford Rd., Reigate.

ITALY

MILAN.—The Branch was successful in a lively Table Tennis Tournament against the associated Meccano club, but came off second best in a Draughts Tournament. Interesting track operations have been carried out on Hornby layouts, and profitable discussions on train running held. Books on railway procedure, signalling and similar topics have been added to the Library. Secretary: G. de Corrado, Via Vigna 6, Milan.

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.

COVENTRY—Mr. L. F. Finnerty, 13, Chelverton Road, Coundon.
COVENTRY—C. Emery, 16, Green Lane.
HILLINGDON—F. Smith, 13, Hewens Road, Hillingdon, Middlesex.
ILFORD—R. F. Shurety, 9, Howard Road, Ilford, Essex.
KINGS LANGLEY—R. Garner, 8, Primrose Hill.
MANSFIELD—B. C. Sansom, 24, Sandhurst Avenue.
RAMSGATE—V. G. Heagerty, 40, Nethercourt Hill, St. Lawrence, Ramsgate.
ST. ALBANS—M. Hickman, 113, Tavistock Avenue, St. Julians, St. Albans.
SIDCUP—Mr. J. D. Luckhurst, 51, The Oval.
SKIPTON—W. A. Foster, "Glenside," Gargrave Road.

Branches Recently Incorporated

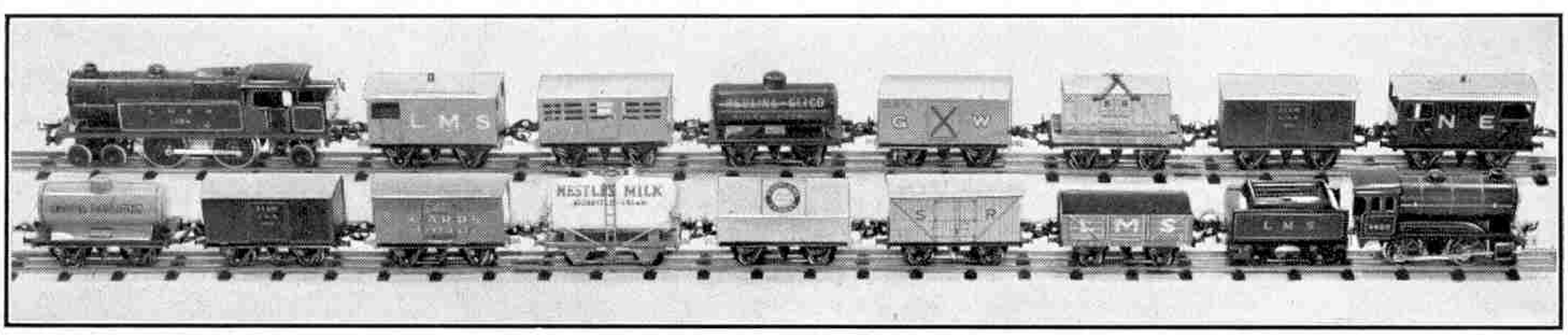
369. WHITECRAIGS—Mr. J. C. Ireland, 11, Torrington Avenue, Whitecraigs, Scotland.
370. HOUNSLOW—Mr. Tappin, 24, Shirley Drive, Hounslow, Middlesex.
371. UPMINSTER—Mr. F. J. Posselwhite, 68, Deyncourt Gardens, Upminster, Essex.

HORNBY RAILWAY COMPANY COMPETITION PAGE

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

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

WHAT IS WRONG WITH THESE TRAINS?



Our competition this month is a novel one, its subject being the make-up of goods trains. In practice this is a very important matter, and one with which Hornby Railway owners should be acquainted if they are to carry out their operations correctly. There is much real railway interest in the marshalling of the various wagons of a mixed goods train, carrying widely different kinds of traffic, for the nature of some of the materials transported makes it necessary to adopt special arrangements. It is their knowledge of these that members are called upon to display in this contest, which nevertheless is both easy and attractive.

For the purpose of this competition the two mixed goods trains shown in the illustration on this page have been specially made up and photographed. Various mistakes have been made in arranging the wagons and vans of which they consist, and competitors are required to rearrange these so as to form two trains that are in accordance with regular railway practice. In making this new disposition the destinations of the vehicles need not be considered, nor is it necessary to keep each in the train in which it is shown in the illustration, the only restriction being that the two trains when completed shall have equal numbers of wagons. For their entry competitors should make out two neat lists showing the order of the wagons and vans behind their respective engines, and they are also required to state briefly their reasons for arranging them in the order upon which they decide.

Prizes in the Home and Overseas Sections will consist of Hornby Train or any Meccano product to the value of 21/–, 15/– and 10/6 respectively, and will be awarded to the senders of the entries in each section which place the most vehicles in their correct position. In the case of more than one entry being correct, preference will be given to the competitor whose entry is neatest or presented in the most novel or ingenious manner. A number of consolation prizes also will be awarded.

Envelopes containing entries must be clearly marked "*H.R.C. Marshalling Contest*" in the top left-hand corner, and posted to reach Meccano Ltd., Binns Road, Liverpool 13, on or before 30th June. The closing date for Overseas competitors is 30th September.

On every entry submitted in this Contest must appear the sender's name, full postal address and H.R.C. membership number. All Senior Section competitors, that is those over 12 years of age, are also requested to mark their entries with a capital "A."

Railway Photographic Contest No. 3

This month we announce the third Contest in the present series of Railway Photographic Contests. During June the days are long and conditions for photography usually are favourable, so that every H.R.C. member who possesses a camera will seize every opportunity of securing good railway photographs. The actual exposure must have been made by the competitor himself. Developing and printing may be the work of a professional.

It is not necessary to submit negatives in this contest; prints are all that is required, and each must have on the back a short description of the scene it shows, together with the competitor's name, H.R.C. membership number and full postal address. Unsuccessful entries will be returned if a stamped addressed envelope of suitable size accompanies the entry.

The Contest will be divided into the usual two sections, Home and Overseas, and in each will be awarded three prizes consisting of any products manufactured by Meccano Ltd. to the respective values of 21/–, 15/– and 10/6. Several consolation prizes also will be awarded. Envelopes containing entries should be marked in the top left-hand corner "*H.R.C. Photo Contest No. 3*" and posted to reach Headquarters at Meccano Ltd., Binns Road, Liverpool 13, on or before 30th June. The latest date that photographs in the Overseas Section can be received is 30th September.

February Voting Contest Solution

The February Voting Contest proved exceptionally popular and also was remarkable for the almost unanimous choice of one of the eight Hornby-Dublo illustrations submitted for the judgment of competitors as the most attractive. This was No. 5, and the life and activity of the scene was given by nearly every entrant as the reason for selecting it. Only a very few votes separated the rest of the photographs, and the final order of the eight photographs was: 5, 6, 1, 8, 4, 3, 2, 7.

COMPETITION RESULTS

HOME

March "Articles Contest."—First: W. Whitaker (44565), Hornsea, E. Yorks. Second: K. E. Milburn (26029), Chingford, London E.4. Third: D. M. Watson (44513), Crewe, Cheshire. Consolation Prizes: M. Hoskins (16653), Exeter, Devon; J. G. Mitchell (41236), Littlehampton, Sussex; D. G. Coakham (28368), Upper Rathmines, Dublin, Ireland; A. F. Milburn (16322), Chingford, London E.4.; D. I. Grant (47298), Acton Vale, London W.3; F. Mills (31), Kearsley, Nr. Bolton.

March "Silhouettes Contest."—First: H. G. Johnston (38784), Southall, Middlesex. Second: G. Head (33088), Kidderminster, Worcestershire. Third: D. B. Blackburn (49069), Kingsbury, London N.W.9. Consolation Prizes: A. Elvey (59159), New Eltham, London S.E.9; D. G. Coakham (28368), Upper Rathmines, Dublin, Ireland; J. T. Fraser (2267), Exeter; A. D. Maclaurin (59461), Bearsden, Nr. Glasgow; D. M. Earle (41617), Wembley Park, Middlesex; J. McCann (63815), Wallasey, Cheshire.

OVERSEAS

November "Word Building Contest."—First: D. J. White (9333), Christchurch, N.1, New Zealand. Second: J. G. Gnanadurai (1964), S. India. Third: E. A. Hamilton (42512), Southland, New Zealand. Consolation Prizes: D. Murison (37642), Buenos Aires, South America; J. S. De' Conti Manduca (63574), Malta; J. E. Ridgway (51742), Johannesburg, South Africa; M. P. Senji (18118), Madras City, India; J. Schulte (63989), Wijk Maastricht, Holland.

ALBANIA

King Zog, the latest King to be exiled, King Farouk of Egypt, King Carol of Roumania, King Alexander, the assassinated King of Jugoslavia and his son King Peter II. All these are represented in this wonderful packet of 50 different stamps. There are fine sets of 12 different Roumania, 10 Poland including Premiers and Dictators. Set of Italy including portrait of the Duce, also fine Danzig, British Colonials from Malta, Australia, Canada and India. Finally, a fine Austrian stamp depicting the two people whose assassination started the Great War. All topical stamps free. Just send 2d. postage requesting approvals.

Lisburn & Townsend (M.M.), Liverpool 3

"DIAMONDS"

MANY RARE STAMPS have been found by purchasers of **The "DIAMOND" Packet**, which contains approx. **1,000 UNSORTED STAMPS** from convents abroad. **1 pkt. 1/6, 3 pkts. 3/9, 5 pkts. 6/-. All post free inland.** (Postage to Colonies 3d. per pkt. extra. S. Africa and Foreign 6d. per pkt. extra. Places on Empire Airmail Route 1/- per pkt. extra.) Beware of imitations.

O. NERUSH

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30	,,	...	10d.	25	,,	...	1/-
35	,,	...	1/-	30	,,	...	1/3
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10	,,	...	4d.	25	,,	...	1/-
15	,,	...	6d.	30	,,	...	1/3
20	,,	...	9d.	5	Ecuador	...	2d.
25	,,	...	1/-	10	,,	...	4d.
5	Gold Coast	...	2d.	15	,,	...	6d.
10	,, ,,	...	5d.	20	,,	...	9d.
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NEVER

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

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Persia—Coronation—Striking set of 17 values ... **1/6**

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NEWFOUNDLAND

New Illustrated Price List.

BARGAIN PRICES for stamps in first class condition. Our revised list of this popular country has just been published, and we shall be pleased to send it post free to all collectors who are interested. In this list we have also included

CANADIAN ISSUES FROM 1912.

Are YOU on our mailing list? If you are a stamp collector just drop us a line and mention what you are particularly interested in. Our price list of special bargain offers is sent out each month to a very large number of collectors. May we include you?

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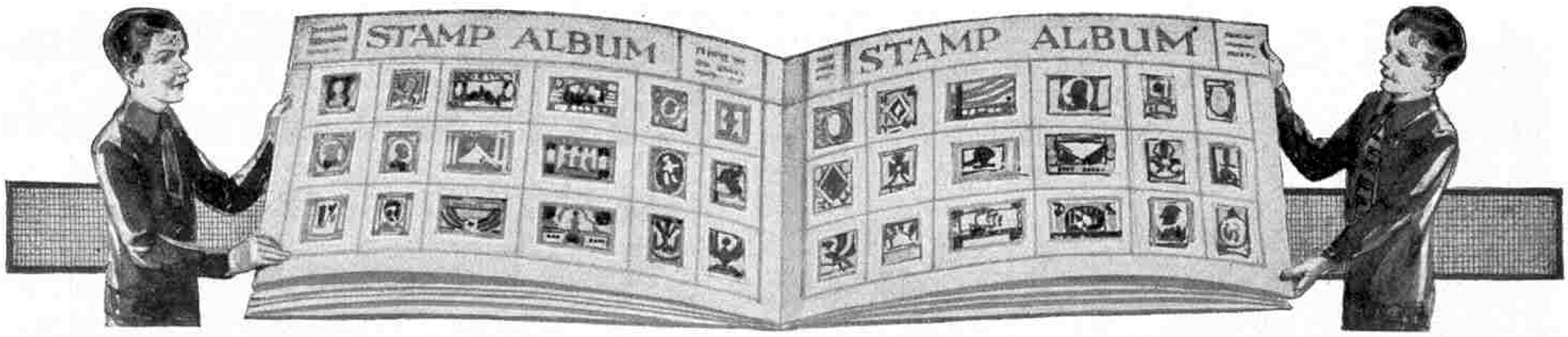


Stamp Collecting

How Collectors Describe their Stamps (II)

LAST month's talk on stamp terms has evidently been of great interest to readers, for we have had a large number of requests for explanations of other technicalities. The expressions dealt with this month have been selected from those requests.

First of all the expression "Plate Number." This is likely to be met frequently in the near future on account of the prominence that will be given to all the early stamps of Great Britain in the celebration next year of the centenary of the first postage stamp, the British "Penny Black." Plate numbers are numbers inserted in the margins of printing plates, and consequently appearing in the margin of the printed sheet, usually for the purpose of indicating the order in which the plates for the particular stamps were made.

In the case of the British stamps issued from 1858 to 1880 the numbers actually appeared on the stamps themselves, as can be seen in the accompanying reproduction, in the bottom right-hand corner of the page, of an enlarged section of the side margin of a British "Penny Red." The number appeared in this position in the 1d., 1½d. and 2d. values, and the example illustrated is from plate number 134.

Nearly 160 different plates were used between 1858 and 1879 in the printing of

the "Penny Reds" alone. The Gibbons Catalogue prices unused specimens from No. 77 at £350, but only seven or eight such specimens are known to exist. Another rare number is 225. We are afraid there is little chance of any reader coming across either of these numbers in a "junk" packet, but all the remaining numbers are fairly common.

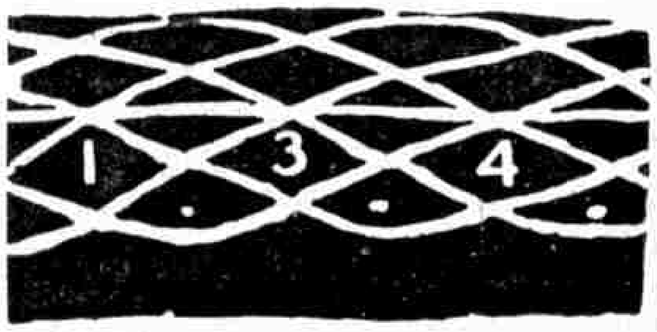
"Controls" are similar to plate numbers in that they are marginal inscriptions serving to identify the plate from which a sheet of stamps was printed, or to identify the date of the printing of a sheet. British stamps to-day are printed by the photogravure process, and the controls take the form of a letter above two figures, written as a fraction, and in addition a "cylinder" number in small figures inserted below the fraction. These symbols serve to identify the series and date of printing, and also denote the cylinder from which the sheet was printed. The cylinder is a printing plate in cylindrical form used in a rotary press.

We illustrate a block of the current 1½d. stamps showing the fractional control $\frac{E}{39}$ and the cylinder number 144. In recent years it has been the practice to use two control letters each year, maintaining an alphabetical sequence and employing the same control for all stamps. Thus $\frac{A}{37}$, $\frac{B}{37}$, $\frac{C}{38}$, $\frac{D}{38}$ and $\frac{E}{39}$ have been the controls used for the King George VI issues to date. Later this year $\frac{F}{39}$ will be used. Certain of the less used values may be found with only one of the letters for a particular year, but that is because the quantities required have not involved printing at all stages of the year.

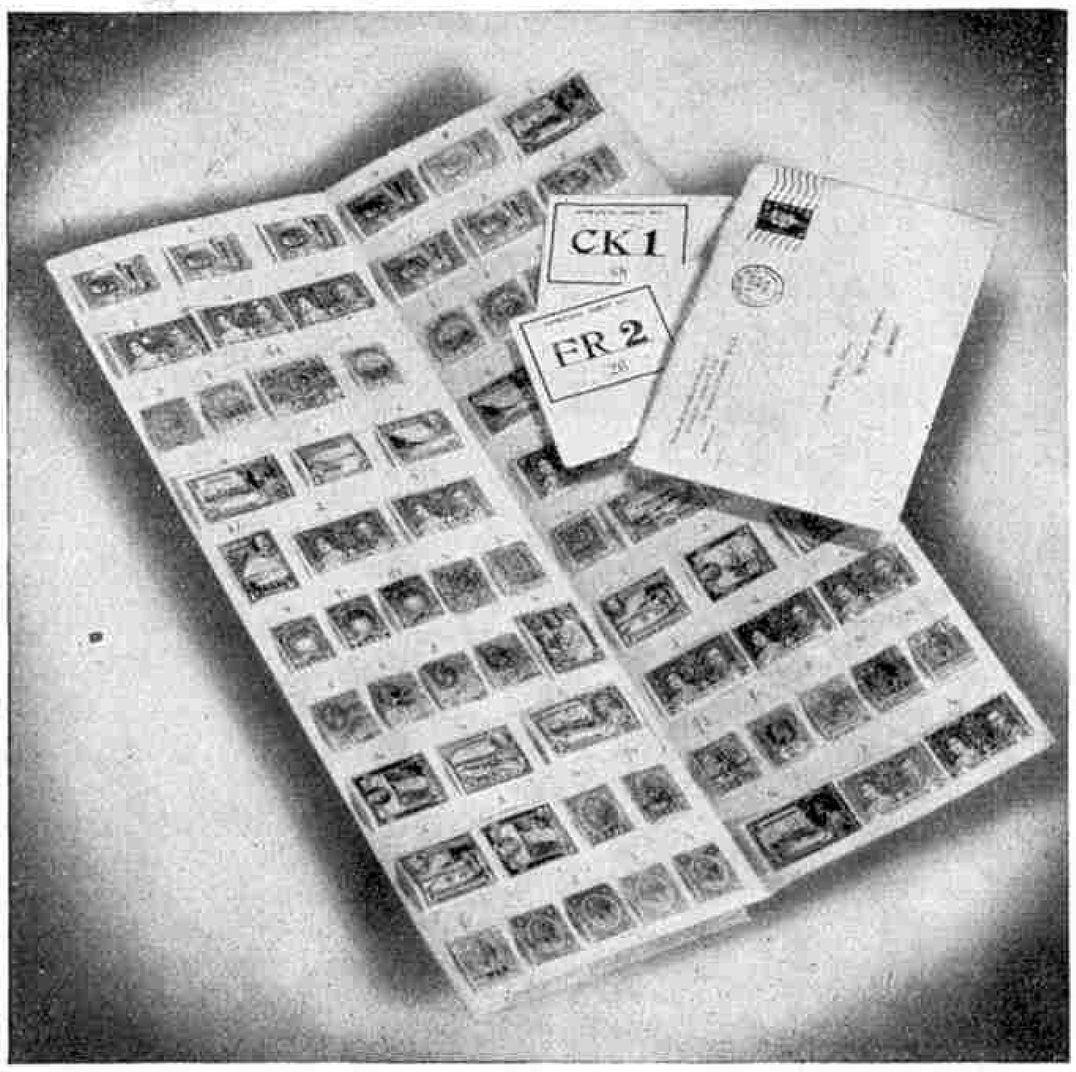
Our illustration shows also a form of "Jubilee line" that has been featured along the bottom of British stamp sheets since 1937. The line is there as a protection for the bottom edge of the printing cylinder, which otherwise might be subject to and show signs of wear along the bottom edge. The idea was first adopted in 1887, the jubilee year of Queen Victoria's reign, and this accounts for the name of the line. In the form shown in our illustration it is said to be "co-extensive," because the line is broken to correspond with the width of the stamps above. An unbroken line is said to be "continuous."

An illustration on page 383 shows a pair of Indian King George V 1 anna stamps in the condition described as *tete-beche*, which is a French expression adopted by English-speaking collectors to describe stamps printed upside down in relation to one another.

This interesting variety arises when one printing plate is inverted in relation to its neighbour, but it has become fairly common nowadays when almost every country sells stamps in booklet form. The stamps for such booklets are printed in normal size sheets, which are subsequently folded and broken down to the booklet page size. If all the stamps were printed right way up in the full sheet, obviously some of the stamps would be upside down when the sheet is folded, and therefore would have to be straightened up before binding into the booklet covers. This operation can be avoided by arranging the



printing plates so that some of the stamps are printed upside down (Continued on page 383)



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THE NEAREST THING TO FLYING — ESSO ETHYL

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.

BINDING THE "M.M."

Binding cases for back numbers of the Magazine may be obtained from Messrs. O. H. Bateman and Co., 23, Hanover Street, Liverpool. These are supplied in two sizes (1) for six copies price 3/3 and (2) for twelve copies price 4/9, post free in each case. The binding cases are supplied in what is known as "Quarter Basil, full cloth." They are tastefully embossed in gold with the name "Meccano Magazine," and on the back is the name and volume number.

Binding 6 and 12 copies. These binding cases are supplied so that readers may have their Magazines bound locally, but where desired, the firm mentioned above will bind Meccano Magazines at a charge of 5/9 for six issues or 7/6 for twelve issues, including the cost of the binding and also return carriage. The covers of the Magazines may be included or omitted as required, but in the absence of any instructions to the contrary they will be included.

Whilst the binding of the twelve Magazines is quite satisfactory, they form a rather bulky volume and for that reason arrangements have been made to bind six months' Magazines where so desired, as explained above.

BARGAIN DISCOUNT APPROVALS

Collectors who want really first-class approvals with a wide selection of less common stamps, should write for our Bargain Discount Approvals (post free on request. Send a P.C.) Our sheets contain Colonial and Foreign New Issues at lowest prices plus a generous discount. We do not offer a free gift, but we DO offer the stamps you want AND at the right prices.

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Postally used 2/6 and 5/- King George V, cat. 2/7, sent free to all genuine applicants for approvals enclosing 2d. postage. Only one gift to each applicant.

Mention "Meccano Magazine."

R. D. HARRISON — ROYDON — WARE.

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Meccano enamel has been introduced to enable model-builders to convert nickel parts to colour or to touch up coloured parts should such treatment become necessary through mishandling. It is available in red, blue or green, each colour being identical in shade with the enamels used in the Meccano Factory for spraying Meccano parts. Price per tin 8d.

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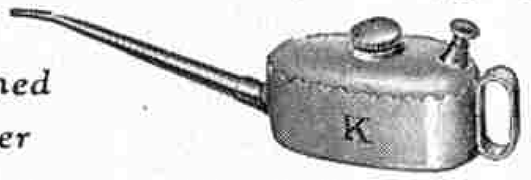

Every Meccano and Hornby Train enthusiast should add a miniature "K" type oil can to his equipment for the purpose of oiling Meccano models, Hornby Trains, etc. The oil is ejected drop by drop by depressing the valve, as in the full-sized model, and in all other respects the oiler is perfect. Price 3/6

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Stamp Gossip

and Notes on New Issues

The Post in Strange Lands

Recently the mails from Fort Rosebery to Ndola, in Northern Rhodesia, arrived six hours late, and an official enquiry into the delay was ordered. The journey of 170 miles ordinarily is covered in six days by six native runners who travel together for safety. On this particular trip the party were three days out from Fort Rosebery when they were met by lions. The postmen turned their bicycles upside down and tried to scare the lions away by rattling sticks on the spokes of the revolving wheels. The noise seemed to interest rather than alarm the lions, however, and they decided to investigate the strange sounds at close quarters. As a result the unfortunate postmen were compelled to take to the trees and stay aloft for six hours!

A Tale of a Watermark

The origin of the multiple turtle watermark in the paper used for printing the stamps of Tonga is one of the most interesting of the many fascinating stamp stories. Captain Cook gave the name Friendly Islands to the group we now know as the Tongas because he was kindly received by the natives on his first visit. When he paid his second visit to the islands, in 1778, he presented a fine specimen of turtle to the native King. The King was reluctant to kill an animal presented to him. Instead he kept it as a pet, and in time it became a popular idol among the islanders, who actually conferred upon it the rank of chief.

The early stamps of the Tongas, from 1886 to 1892, were printed at the Government Printing Office, Wellington, New Zealand, and the familiar "N.Z. and Star" watermark was used. From 1892 unwatermarked paper was used. When Messrs. de la Rue and Co. printed the 1897 issue, which was one of the earliest British Colonial pictorial sets, some intimate symbol of the Islands was sought to serve as a watermark, and the King's turtle was an almost automatic choice. The turtle is still alive and an honoured member of the Tonga Royal circle.

The King's Stamp Collection

Stamp collectors throughout the world will be delighted with the news that King George VI has decided to maintain his father's interest in stamp collecting. As a first step he will bring up to date the wonderful collection of British Colonials bequeathed by his father, by adding specimens of all stamps issued since his accession. An order for the necessary albums has been placed.

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

Canada Celebrates Royal Visit

By courtesy of the Postmaster General of Canada we illustrate this month specimens of the stamps issued to commemorate the visit to Canada of their Majesties King George VI and Queen Elizabeth. The designs are outstandingly effective and well worthy of a royal occasion.

As indicated in our description of the designs in the May "*M.M.*," the principal features of the stamps are portraits of the Princesses Elizabeth and Margaret Rose on the 1c. value, the National Memorial in Ottawa on the 2c. value, and portraits of the King and Queen themselves on the 3c. value.

A travelling post office, known as the "Royal Train Post Office" was attached to the special train conveying the Royal party for its journeys about the Dominion. Arrangements were made for special covers, handed by collectors to the Philatelic Division of the Post Office, Ottawa, to be despatched from this special office after the start of the tour, so that collectors might have an opportunity to acquire souvenir covers bearing the "Royal Train" office cancellation mark.

United States Commemoratives

The United States have marked the 150th anniversary of the installation of George Washington as first President by the issue of a special 3c. stamp. The design shows Washington taking the oath on the balcony of the Federal Building in New York, which was the capital city in 1789. An arched panel bears the wording "*Sesquicentennial of the Inauguration of Washington as First President.*"

The centenary of baseball, America's national game, is to be commemorated by a 3c. stamp to be issued on 12th June. The design will show a baseball game in progress between two boys' teams, with a background consisting of a church with steeple and a schoolhouse with an American flag flying from the playground flagpole.

Stamp Collecting — (Continued from page 381)

in the sheet; they become right way up in the folding. Occasionally a booklet sheet of stamps is wrongly issued for normal use, and *tete-beche* pairs then become available.

The variety known as *se tenant* is also commoner to-day as a result of the simplification methods adopted in producing stamp booklets. This French expression is used to signify stamps of different values joined together. The central illustration on page 381 shows an interesting specimen secured from a booklet sheet of Germany's 1938 Winter Relief series, showing a 3 pf. and a 12 pf. stamp *se tenant* and *tete beche!*

Se tenant varieties also were known long before stamp booklet days, an outstanding instance being the Cape of Good Hope 3d. issue of 1880, surcharged with the figure 3. There were two distinct types of the figure 3 in use, and vertical strips of three stamps from this issue have been found bearing one type of the figure on the top stamp, the other type on the bottom stamp, and none at all on the middle stamp!

A few weeks ago Germany announced that the use of special air mail stamps was to be discontinued, and that the existing air mail stamps might be used for all purposes until the end of December, when they would be demonetized. That announcement makes it clear that air mail stamps are now obsolete in Germany, but "demonetized" and "obsolete" are not interchangeable expressions. An obsolete stamp is one that is no longer on issue, but it remains valid for use until it is demonetized, which may be many years after it has become obsolete. The G.B. stamps of the reign of King Edward VII were not demonetized until nearly 20 years after the stamps had ceased to be issued.

The word "bisect" is almost self-explanatory, for it indicates a stamp that has been cut into pieces, usually into halves, and the pieces made to serve as stamps. Such a course has been officially authorised on occasions when supplies of a particular stamp have run short and the deficiency could be met by cutting a corresponding higher values into halves. In collecting "bisects" it is desirable that the stamps should be "tied" to the envelopes. This means that the postmark should overlap on to the envelope, as in the example shown in the illustration on page 381, and thus authenticate the stamps.

Lonely Molecules

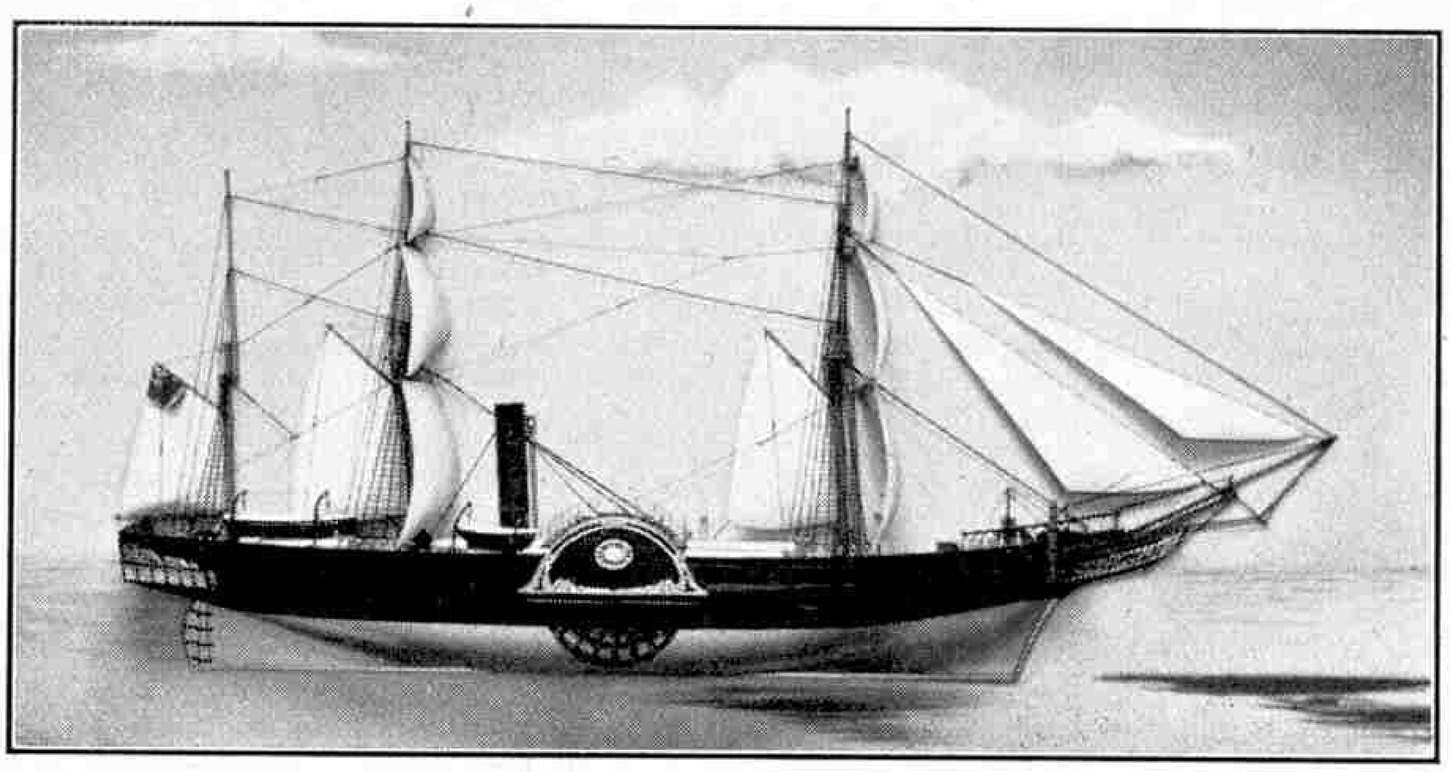
Although we often talk glibly of a vacuum, very few of us realise that this is unattainable. In the nearest approach to completely empty space that has yet been produced each of the molecules of air remaining can travel on an average 500 ft. without encountering another. In relation to their size the molecules in such a space are lonely enough, however, for each will have to travel about 150,000 million times its own length to find a companion. For a man of average height to be as lonely as this molecule his nearest neighbour would have to be much more than 100 million miles away, so that in comparison a solar system in which there was one man on the Earth and one man on the Sun would be crowded.

This astonishing approach to a vacuum has been attained with the aid of a special oil pump that has no valves or mechanical parts of any kind. Instead there is an assembly of glass tubes and columns, at one point of which the oil is heated so that its vapour flows round the circuit and sweeps air out of the chamber to be evacuated.

Making Wood Pulp in Norway

By W. GAPP

I went three miles upstream from the mouth of the River Nid in south-east Norway, to reach a wood pulp factory. I was taken in a motor-launch from Arendal, at the mouth of the Nid, and it was very interesting to see the boatman manœuvre the craft in order to avoid pine logs that were floating down with the current. We disembarked just below some rapids, and completed the journey along a dusty road, which led ultimately to a dam; on one side was a lake, on the other the rocky bed of the river.



A fine model of the "Britannia," the first Cunarder, built by J. Johnston, London, for exhibition at the New York World's Fair. The model is on view in the shipping section of the British Pavilion, along with a huge model nearly 30 ft. long of "Queen Elizabeth," the latest Cunarder, which will be described in an illustrated article next month.

Logs are sawn up into lengths of between 2 ft. and 3 ft. and are stripped of their bark. The lengths then pass into the main building by way of a wide tubular conveyor, which is fitted with an endless chain of grabs. Trucks take the logs to machines, which literally tear them to pieces, after which the chips of wood are passed into huge tanks of hot water, the contents of which eventually look remarkably like steaming porridge!

From the last of a series of tanks through which the pulp passes it is picked up by a huge, slowly revolving cylinder, from which it passes between turning rollers, placed in pairs, one above the other. In this way, all excess water is disposed of, and the pulp appears in the form of thin boards, which are cut into convenient lengths, and delivered on to hydraulic presses, for baling purposes.

The bales leave the damp and noisy factory, and travel on overhead cables across the peaceful countryside to the river's edge, just where we had left our motor-launches. There they are stored in a warehouse, before being conveyed down the river to Arendal, and so to paper works beyond the seas.

Telegrams Sent by Slot Machine

In New York a telegram can now be sent by simply writing the message on a slip of paper and placing it in an automatic machine. All that the sender has to do after writing his telegram is to press a small button on the cabinet of the machine, and hold it until an illuminated panel flashes the words "Deposit message." The slip is then dropped into the slot, when a panel reading "Message being transmitted" is lighted, and another panel is illuminated to say "Thank you" when the message has been transmitted.

Telegrams may be either written in ink or black pencil, or typed. Special forms are provided, so that the writing is kept within the limits required by the transmitting apparatus, and a facsimile is automatically reproduced in the main telegraph office to which the cabinet is connected by wire. As it drops into the machine the form is wrapped round a cylinder that revolves in front of a photo-electric cell, so that a beam of light falling on the cell scans the paper. The beam is interrupted by writing, so that a varying electric current passes into the transmission line and is used at the main office to reproduce the original.

M.G. Booklet Free to Readers

We have received from the M.G. Car Co. Ltd. an interesting booklet dealing with the splendid achievement of Major A. T. G. Gardner in setting up new speed records in an M.G. on the Frankfurt-Darmstradt Autobahn last November. Major Gardner then took the record for the flying kilometre and flying mile for cars with engines of up to 1,100 c.c. capacity at mean speeds of 186.6 and 186.5 m.p.h. respectively. His effort actually established his M.G. as the fourth fastest record holder in the world, irrespective of class, and unofficially the fastest of all cars with engines of capacity up to 3,000 c.c. For this feat Major Gardner was awarded the Segrave Trophy for 1938.

Besides details of the M.G. car and its record-breaking run, the booklet contains an interesting account of Major Gardner's career, and a picture gallery of previous holders of the Segrave Trophy. Any reader can obtain one free of charge by sending a post-card to Publicity Department, M.G. Car Co. Ltd., Abingdon-on-Thames, mentioning the "*M.M.*"

Lott's Stone Puzzle

Readers who delight in puzzles and problems will find Lott's Stone Puzzle great fun. This is the latest production of our advertisers Lott's Bricks Ltd., and comprises seven pieces of stone cut in geometrical shapes from a rectangular block. With these pieces a wide range of designs from a butterfly to a simple triangle can be made up. The problem is, how is it done? A book showing over 100 different designs to be worked out is given with the puzzle.

The puzzle, packed in a handy box, can be obtained for 1/– from most toy shops and through all branches of W. H. Smith & Son, or direct from Lott's Bricks Ltd., Watford, Herts., for 1/3 post free. A separate book of solutions is published, price 6d. post free.

Zeiss Ikon 1939 Catalogue

Photographers delight in the study of new catalogues, and certainly will revel in that of Zeiss Ikon Ltd. This new season's production shows a wide range of cameras, from the Baby Box Tengor, priced at £1, to the magnificent Contax 111, complete with built-in photo-electric exposure meter, combined view and range-finder, and Zeiss Sonnar f/1.5 lens, priced at £78/5/–, and the well known Movikon cine cameras. There is also an interesting range of accessories and gadgets. "*M.M.*" readers who are interested in photography should obtain a copy of this catalogue, which will be sent free on application to Zeiss Ikon Ltd., 46, Maidstone House, Berners Street, London W.1.

The Children's Book Club

The newest development of the book club scheme is the formation of the Children's Book Club, the aim of which is to bring really good books to boys and girls at only a fraction of the normal cost. One book will be issued every two months, and the price to members will be 2/6 per book, although the ordinary editions of the books may be published at much higher prices. The books chosen will include fiction, tales of adventure and stories of the world about us.

There are no fees to pay. All that is required is an undertaking to continue the membership for at least six months, after which membership may be discontinued on giving one month's notice.

The scheme is promoted by the famous booksellers W. and G. Foyle Ltd., 117/125, Charing Cross Road, London W.C.2, who will be glad to send full details to any reader who writes mentioning the "*M.M.*"

Baden-Powell

R. H. KIERNAN *Illustrated* 3/6 *net*

The author of *Lawrence of Arabia* (nearly 25,000 copies sold) shows the Chief Scout and hero of Mafeking as soldier, military scout, intelligence agent and trainer of troops in India, Ashanti and South Africa. Artist and writer, too, is the beloved B.-P. and this story of his life is for "boys of all ages."

Tiger Bridge

W. HASTINGS MILLER 3/6 *net*

A story, founded on fact, of bridge-building in Indo-China and of the difficulties of a young engineer. Recommended by the Junior Book Club.

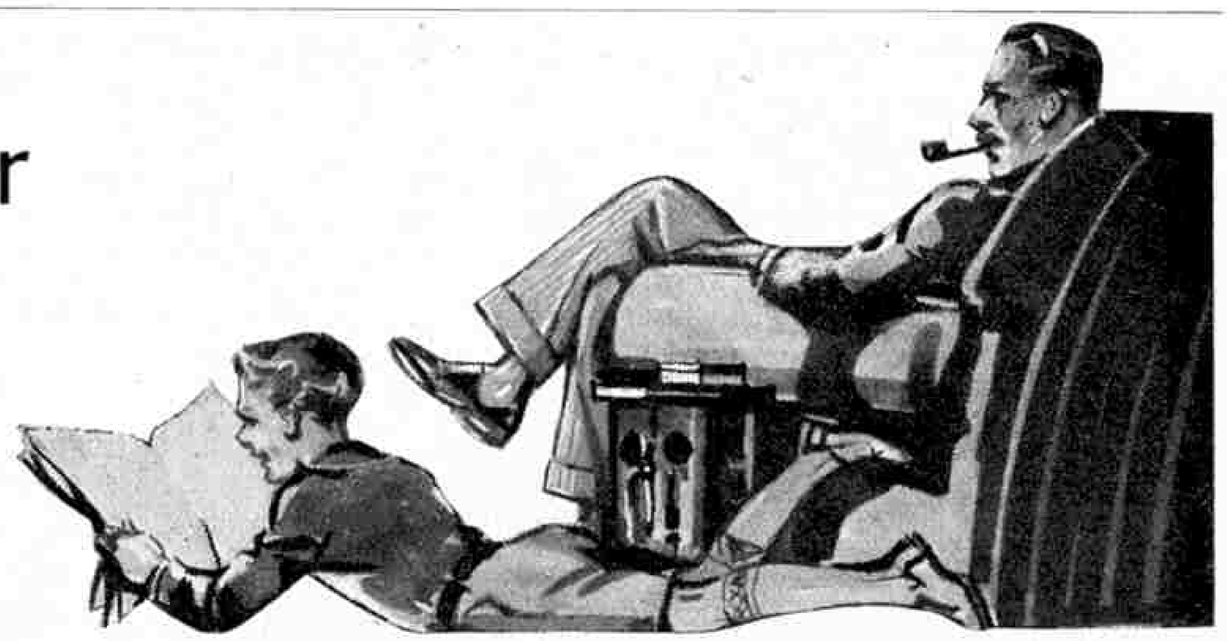
Tommy Hawke —Detective

MICHAEL PATRICK 3/6 *net*

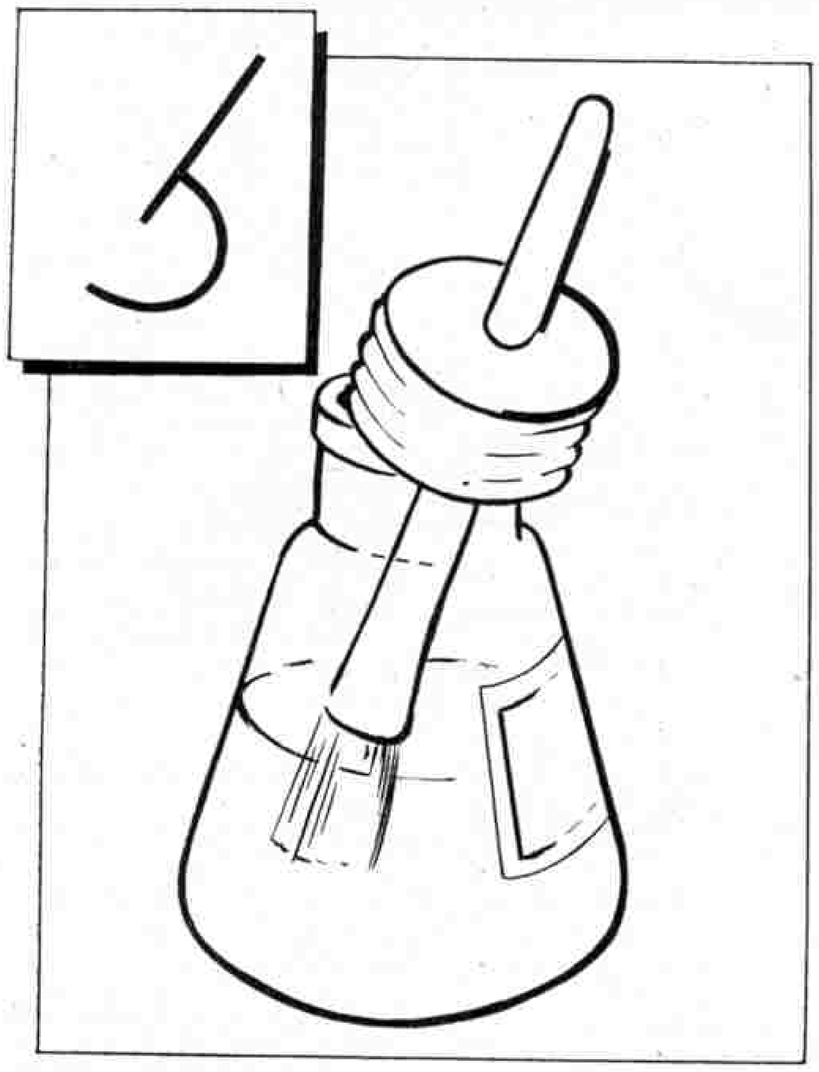
A detective story written specially for boys, of a young man who is sent to investigate the theft of a jewel at a country house. Recommended by the Junior Book Club.

HARRAP

Competition Corner



A New SKETCHOGRAM Contest



Here is a competition providing an opportunity for every reader to take part. Although it is in the nature of a drawing competition, no special skill is necessary, and all that competitors are required to do is to make a sketch embodying the simple line shown in the top left corner of the accompanying illustration.

This line is known as the "sketchogram," and it must form an essential part of the outline of each sketch submitted. The idea is shown in our illustration, where the sketchogram has been drawn in heavily to indicate its position in the handle of the gum brush.

The sketchogram may appear in the sketch as many times as the competitor likes, and it may be tilted to any angle, or turned upside down or completely round to face the opposite way. Our illustration must not be copied, of course, but there are no other restrictions as to the subject or nature of the drawing.

It should be emphasised that a bold and simple drawing in which the sketchogram appears only once, and is immediately obvious, will stand a better chance of success than a complicated drawing in which it appears several times merely as a minor feature.

In order to secure for our younger readers an equal opportunity with the older ones of gaining prizes the entries will be divided into two sections, A for readers aged 16 and over, B for those under 16. Prizes of Meccano products value 21/– and 10/6 respectively, will be awarded in each section.

Entries must be addressed "*Sketchograms*, Meccano Magazine, Binns Road, Liverpool 13," and must arrive not later than 30th June. Overseas closing date, 30th September.

June Photo Contest

As announced in our April issue, we are running a series of photographic competitions each month throughout the summer. The conditions are very simple, the prizes being offered simply for the best photographs submitted each month. The only restrictions are that the exposure must be the work of the competitor and that each print must bear a title. Competitors may submit as many prints as they wish and they may be of any size.

Developing and printing of entries may be done professionally, but in the case of a tie for any prize preference will be given by the judges to photographs that are entirely the work of the competitor. Such prints should be marked on their backs with the words "Own work throughout."

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 "*June Photo Contest*, Meccano Magazine, Binns Road, Liverpool 13," and must reach this office not later than 30th June. Overseas closing date, 30th September.

Unsuccessful entries will be returned if a stamped cover is sent for the purpose.

COMPETITION RESULTS

HOME

Car "Faces" Voting Contest.—1. H. P. Friend (Rochdale). 2. H. Garrett (Edmonton, N.9). 3. G. Storey (Edinburgh 5). 4. B. A. Young (Croydon).

April Crossword Puzzle.—1. E. Knight-Clarke (Enfield). 2. A. Elvey (London S.E.9). 3. C. Bradshaw (Sheffield 9). 4. J. C. Lunt (Seaham).

"Countryside" Photographic Contest.—1. A. G. Dell (London S.E.27). 2. J. Taylor (Bradford). 3. H. Rawcliffe (Huddersfield).

March Drawing Contest.—First Prizes: Section A, E. J. Pearce (Portland); Section B, S. J. Garrett (Liverpool 8). Second Prizes: Section A, R. F. Crane (March); Section B, S. Jennings (London N.1).

OVERSEAS

"Advertisement Jig-Saw" Contest.—1. R. D. White (Brighton, S. Australia). 2. E. Bourgault (Manchoukuo). 3. Loh Meng Chew (Singapore). 4. B. and W. R. Kibblewhite (Temuka, N.Z.).

December "Stamp Voting" Contest.—1. P. Gilles (Montpellier, France). 2. J. Gilles (Montpellier, France). 3. B. Spencer (Big Valley, Canada). 4. G. Myburgh (Claremont, S. Africa).

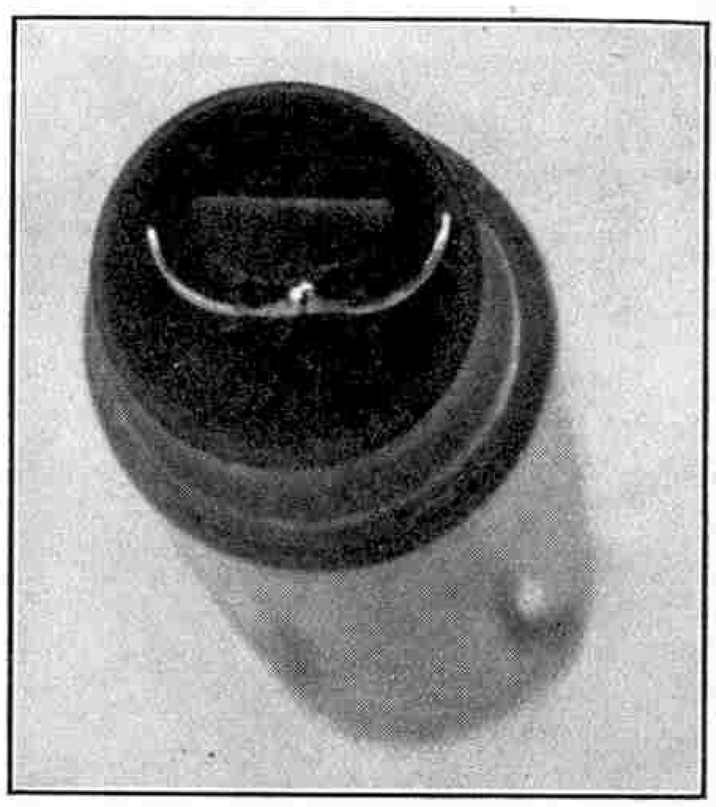
December Photo Contest.—First Prizes: Section A, G. Inson (Canberra, Australia); Section B, J. Simmonds (Vancouver). Second Prizes: Section A, W. M. Goltra (Crawfordsville, Ind., U.S.A.); Section B, Miss T. Chapman (Epping, N.S.W.).

December Drawing Contest.—First Prizes: Section A, C. R. Duncan (Sydney, Australia); Section B, J. T. Brooks (Toronto). Second Prizes: Section A, N. Rawlinson (Hobart, Tasmania); Section B, T. Simins (New York).

Cover Voting Contest.—1. R. Dumont (Quebec, Canada). 2. L. Capelli (Buenos Aires). 3. J. A. Chappell (Arding, N.S.W.). 4. J. Geertsma (Leiden, Holland).

January Photo Contest.—First Prizes: Section A, N. J. Collins (Auckland, N.Z.); Section B, T. S. Roberts (Sydney, Australia). Second Prizes: Section A, J. B. Evans (Wellington, N.Z.); Section B, F. Anderson (Colombo, Ceylon).

WHATEVER IS IT?



This is the third of the series of six Mystery Pictures that commenced in the April "M.M."

Each picture represents a common object photographed from an unusual angle, or under unusual lighting arrangements. Prizes of Meccano products to the value of 21/–, 15/– and 10/6 respectively are offered to the readers who send in the best set of descriptions of the objects.

Competitors must send in their entries on postcards each month, and must not wait until the series is completed. Solutions to this month's puzzle must arrive not later than 30th June, the postcards being marked "Mystery Picture No. 3."

NOT HIS FAULT

Teacher: "Why are you always late for school, Tommy?"

Tommy: "Please, teacher, because you ring the bell before I get here."

* * * *

A Scotsman was set upon one night by two roughs. He put up a good fight but was finally overcome and his pockets were picked. However, all the thieves got was sixpence, and they were thoroughly disgusted.

"Gosh, Bill," exclaimed one, "it's a good job he didn't have a shilling, else he would have killed us!"

* * * *

"Now, when we cross the road, my dear," said the old lady to her friend, "don't look round, because if a motor hits us in the back it's their fault, not ours."

* * * *

"Why were you kept in school this morning, Tommy?"

"Because I laughed when the teacher said: 'Never use a preposition to end a sentence with!' "

* * * *

After the studio fire the artist approached the insurance company for payment.

"About those canvases," remarked the estimating representative. "You say they cost ten shillings each?"

"Yes, but I'd painted on them."

"Then suppose we say half a crown apiece."

* * * *

First Hawker (selling watercress): "Fine watercress—a penny a bunch."

Second Hawker (selling radishes, but somewhat tired): "Same 'ere, lydy—with nobs on."

* * * *

Vicar: "Do you say your prayers every night, Johnny?"

Johnny: "Oh yes, sir."

Vicar: "And do you say them in the morning, too?"

Johnny: "No, sir. I ain't scared in the daytime."

* * * *

Teacher: "Robert, what are your boots made of?"

Boy: "Leather."

Teacher: "Where does the leather come from?"

Boy: "From the hide of an ox."

Teacher: "What animal, therefore, supplies you with boots and gives you food to eat?"

Boy: "My father."

* * * *

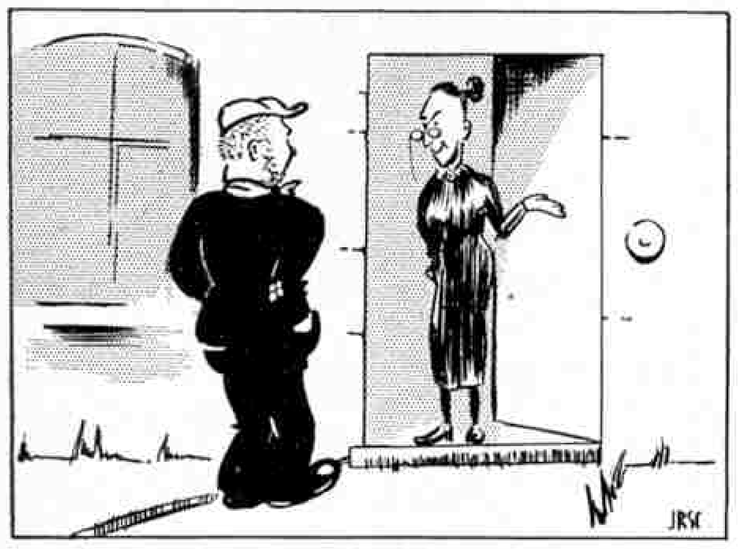
Mother: "I don't think the man upstairs likes Johnny to play on his drum."

Father: "Why?"

Mother: "Well, this afternoon he gave Johnny a knife and asked him if he knew what was inside the drum."

* * * *

READY FOR HIM



Rough-looking Individual: "Is your husband at 'ome, ma'am?"

Lady: "Well, if he's finished his revolver practice, he'll be playing in the back garden with the bloodhounds. Did you want him?"

A POSER!

The dear old soul watched the gaily-clad cowboy dexterously swinging his lasso in the grounds of the circus.

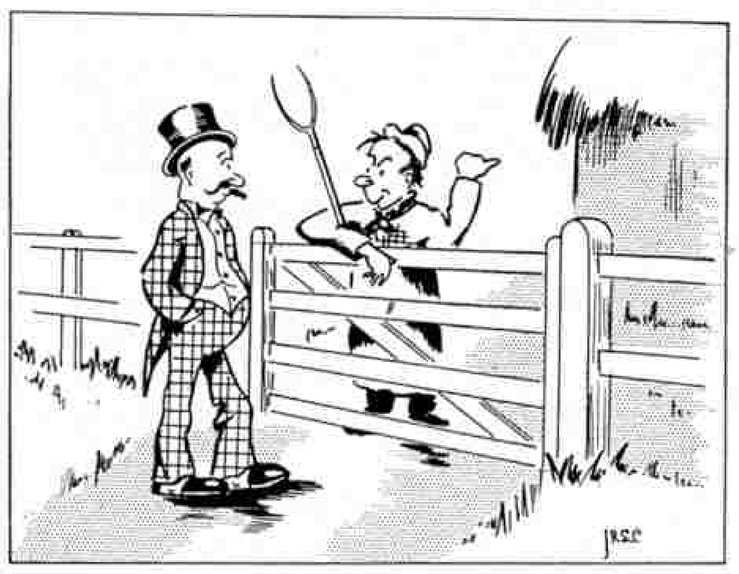
"What a long rope," she said at last. "What do you use it for?"

"Waal, lady," the cowboy replied, "when I'm out West on the ranch I use it for catching cows."

"Catching cows? How very interesting. Tell me, what bait do you use."

* * * *

A TALL YARN



Circus Manager: "Have you seen a giraffe about here, lad? It's just escaped from the circus."

Yokel: "No, sir. I ain't seen no giraffe, but I seen a rubber-necked piebald pony chewing the tops of the trees, back there a bit."

* * * *

Auntie asked Jill what had most impressed her on her first visit to the Zoo.

Five-year-old Jill thought hard for a moment or two, then said: "I think the elephant, Auntie. I loved to see him picking up buns with his vacuum cleaner."

* * * *

Mistress: "Goodness! Why are you giving the cat birdseed?"

Maid: "Well, ma'am, it's time to feed the canary, and the cat's eaten it!"

* * * *

Just before the train started a boy ran up to the ticket inspector and whispered: "Sir, there's two men on that train without tickets."

The inspector searched the carriages in vain, and then seeing the informer standing near, enquired: "Where are they?"

"On the engine," replied the boy, making rapid tracks for the exit.

* * * *

Milkman: "Good morning, Mrs. Brown, it looks like rain to-day."

Mrs. Brown: "Yes, and you are still charging threepence a pint for it."

* * * *

"Officer, I left my car here a few minutes ago, and now it's gone."

"It must have been stolen, sir."

"No, it couldn't be that. It was insured against theft."

* * * *

A determined-looking lady was having much difficulty in finding a seat in the train, when a porter approached.

"Here you are, mum," he suggested. "It's full here, but come this way, and I'll fix you up on the front of the train."

"You'll do no such thing," she replied indignantly. "I'm not a mascot."

* * * *

THIS MONTH'S HOWLER

People go about in Venice in gorgonzolas.

FORCE OF HABIT

Bus Inspector: "Are you aware that none of the passengers on the top deck has a ticket?"

New Conductor: "Bless my soul! That's what comes of living in a bungalow."

* * * *

The electrician was puzzled. "Hey," he called to his assistant, "put your hand on one of those wires."

The assistant did.

"Feel anything?"

"No."

"Good," said the electrician, "then don't touch the other one or you'll drop dead."

* * * *

Owner of very small car: "I want a half pint of petrol and a teaspoonful of oil, please."

Garage Hand: "And shall I cough into the tyres, sir?"

* * * *

"Jones and Murphy fought for 20 years. Now they've stopped."

"Why? Did they bury the hatchet?"

"No, they buried Murphy."

* * * *

Mac: "In Scotland we dinna ca' them mayors. They're provosts."

Sam: "And do they wear chains?"

Mac: "Na, na. They jist gang aboot loose."

* * * *

"It's an old car, but it's sound."

"Yes, I noticed that when driving it. Everything makes a noise except the hooter."

* * * *

Soprano: "Did you notice how my voice filled the auditorium?"

Contralto: "I certainly did. Several people left to make room for it!"

* * * *

Mother: "I'm so glad, twins, you're sitting quietly and not disturbing daddy while he has his nap."

Twins: "Yes, mummy, we're watching his cigarette burn down to his fingers."

* * * *

Boarder: "Look here, I haven't got a decent towel or piece of soap."

Landlady: "Well, you have a tongue, haven't you?"

Boarder: "Sure, but I'm not a cat!"

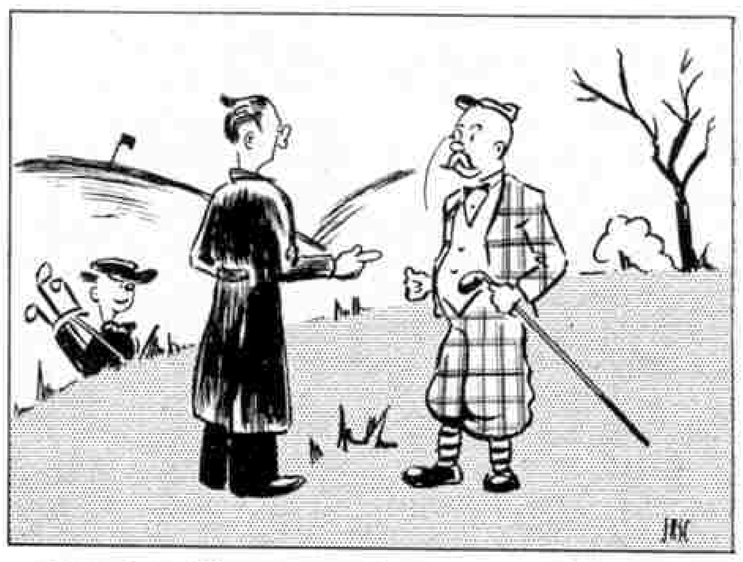
* * * *

"This is the fifth time you have been brought up before me," said the judge, severely.

"Yes, your honour," smiled the offender. "When I likes a feller I generally gives him all my business."

* * * *

RECORD BREAKING



Motorist: "Excuse me, but are you the man who made that long drive from the last tee?"

Golfer (proudly): "Yes, I'm the man. Wonderful drive wasn't it? Nearly 300 yards I should think."

Motorist: "I don't know about that, but you owe me a new windshield and rear window."

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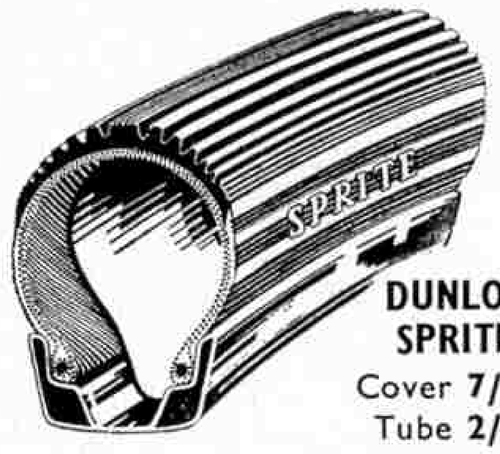

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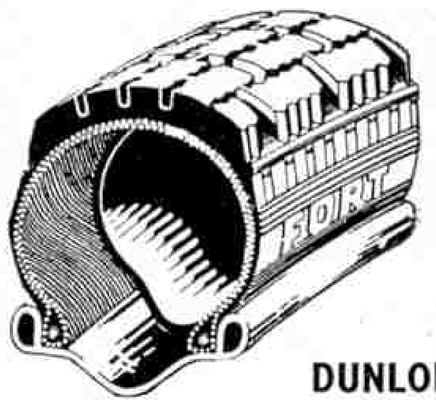
Cover **7/6**
Tube **2/6**

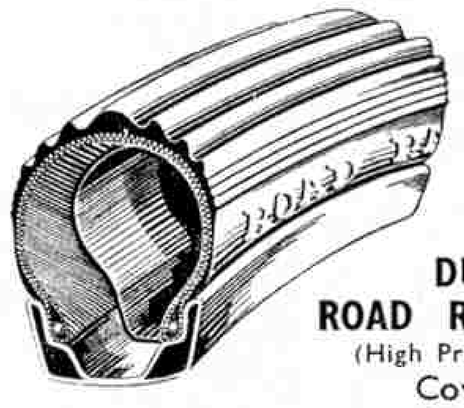
DUNLOP SILVER SPRITE
Cover **7/6**
Tube **2/6**

DUNLOP TUBULAR SPRINTS
See the three new tubulars. No. 0 for very fast short distances on extra fine surfaces. Price **21/-.**

Nos. 9 and 10 for road work and training.
Prices **12/6 & 10/6**



DUNLOP FORT
The tyre with teeth. Definitely the world's best cycle tyre.
Cover **8/6** Tube **3/-**



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(High Pressure)
Cover **8/6**
Tube **2/9**

9H/31

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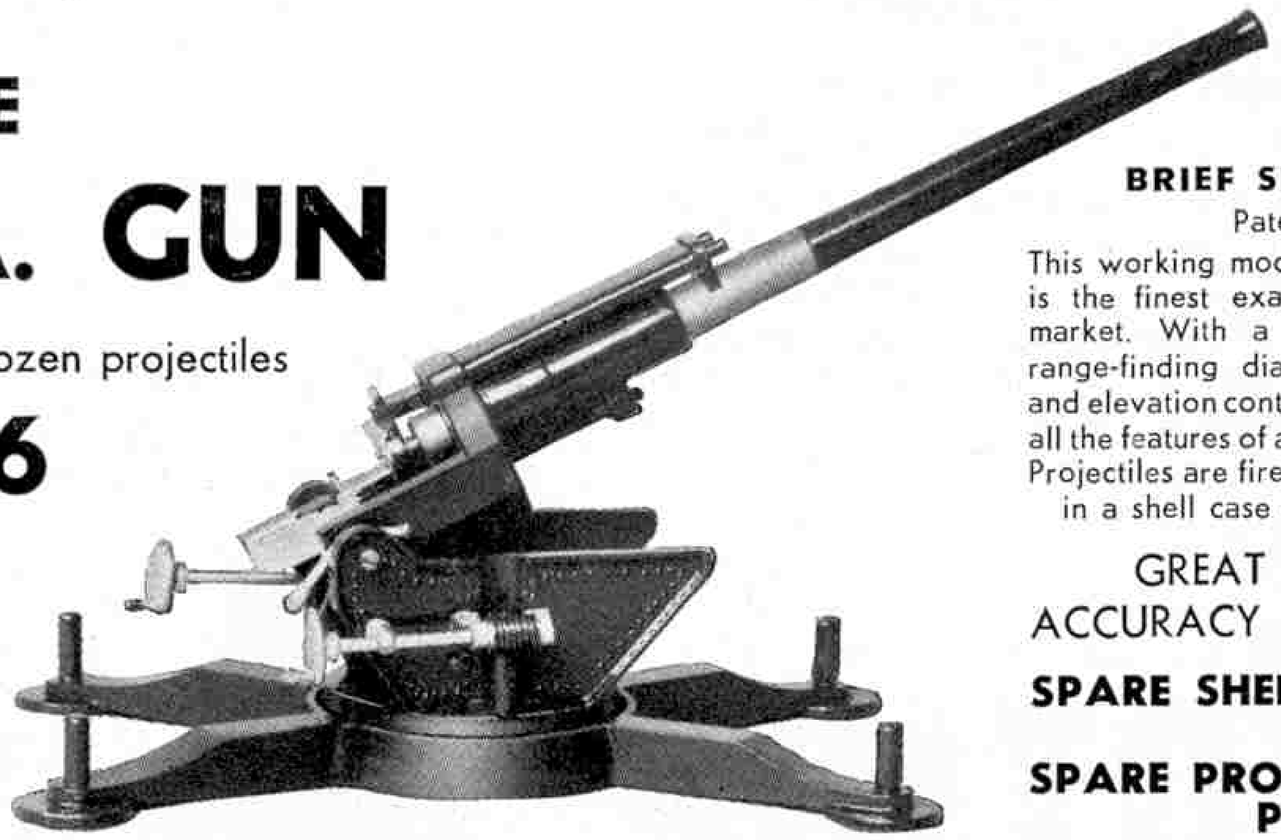
THE 3·7 A.A. GUN

PRICE, complete with 6 dozen projectiles

37′6

OBTAINABLE AT ALL GOOD STORES AND TOY SHOPS



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Patent 492977
This working model of the famous 3·7 Gun is the finest example of its type on the market. With a 9-inch barrel, automatic range-finding dial, gear-operated traverse and elevation controls and breech mechanism, all the features of a real gun are incorporated. Projectiles are fired by means of caps loaded in a shell case as with our other Guns.

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THANKS TO

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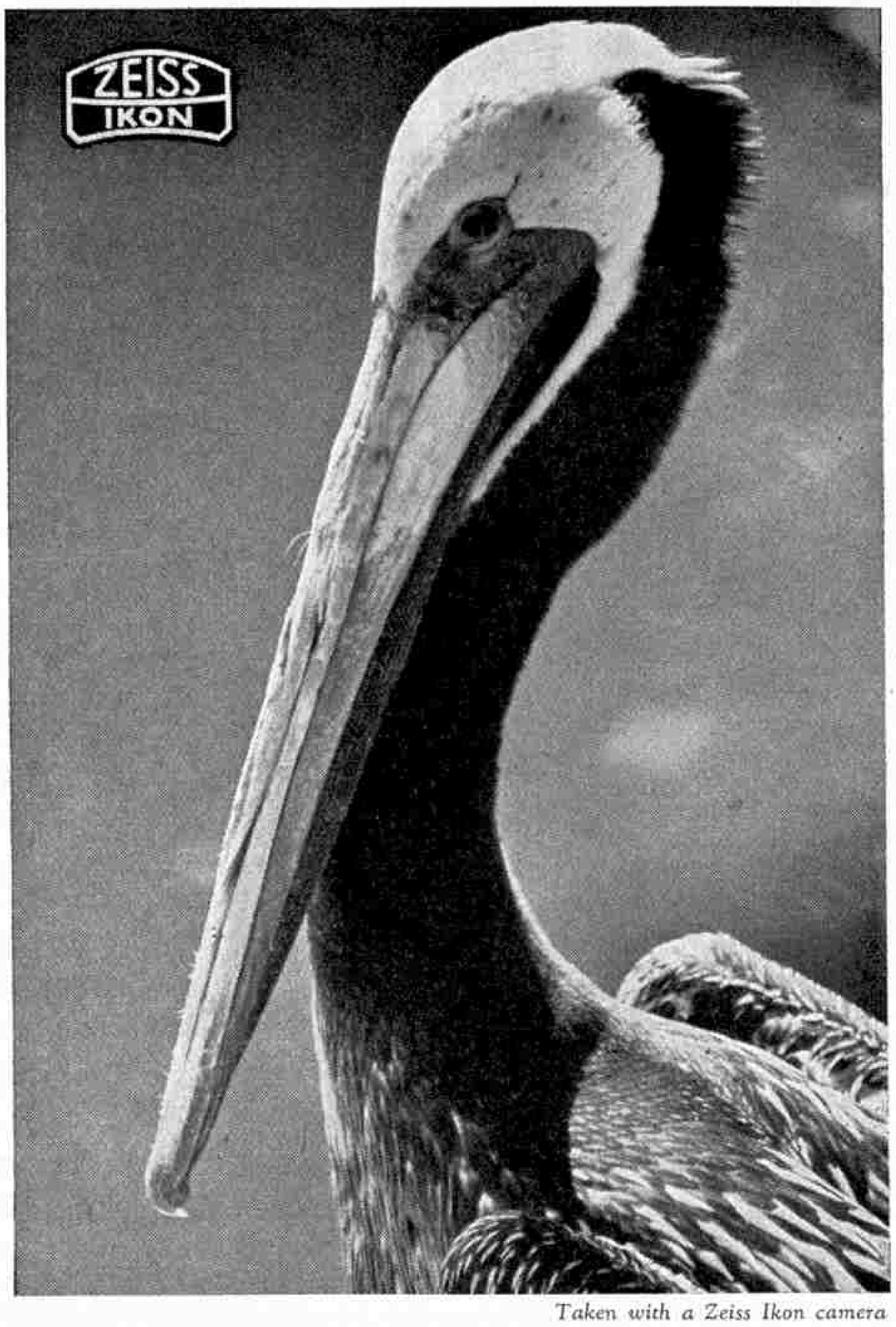

Taken with a Zeiss Ikon camera

"A Wonderful Bird is the Pelican—"

and equally wonderful are the pictures which even beginners in amateur photography obtain—without expert knowledge—if they have wisely chosen a Zeiss Ikon camera. So sensibly designed, so carefully made and so highly efficient, Zeiss Ikon cameras are cheapest in the long run.

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"COMMON-SENSE PHOTOGRAPHY." A new 64 page book by Henry G. Russell, A.R.P.S., which gives a fresh aspect on things photographic. Although published at 1/– a copy can be obtained *entirely free of charge*. For further particulars of this unique offer, post this coupon at once (*½d. stamp if unsealed*).

To: Zeiss Ikon Ltd.,
46, Maidstone House, Berners St., W.1

Please send me the Zeiss Ikon Catalogue and particulars of how to obtain a free copy of "Common-sense Photography."

NAME.....

ADDRESS.....

.....

Great news for Hornby enthusiasts!

Part-Exchange your Old Locomotives

Every owner of a Hornby Gauge 0 or Hornby-Dublo Railway is naturally anxious to have his Trains hauled by the latest and best Locomotives available. In order to help in making this possible we now introduce a scheme in which an allowance is made on an old Locomotive when a new one is purchased. The scheme will help also those who wish to change over from Hornby Gauge 0 to Hornby-Dublo.

The age or condition of the old Locomotive does not matter; but the following conditions are made:

(1) Only one old Locomotive can be accepted in part-exchange for each new Hornby Locomotive, or Hornby-Dublo Locomotive and Controller.

(2) The price of the new Locomotive chosen must be at least equal to the original list price of the old one returned.

HOW TO SECURE THE ALLOWANCE

Detach the coupon printed below and complete it by filling in your name and full address, the type of Locomotive you are returning, and the one you wish to buy in exchange. Then hand the coupon and the old Locomotive to your Meccano dealer, who will complete the exchange for you and send on the certificate to us so that we may register your name and keep you posted with all Hornby and Hornby-Dublo developments.

If you prefer you may make the exchange direct, sending the coupon and the old Locomotive to Meccano Ltd., Department E, Binns Road, Liverpool 13. Enclose the cost of the new Locomotive, less the allowance due on the old one, and include 1/– for packing and carriage.

A Coupon for Locomotive Part-Exchange will be included in future in each copy of the "Meccano Magazine."

IMPORTANT NOTE: This special offer is for Hornby and Hornby-Dublo Locomotives only. It does not apply to Track, Rolling Stock, or Accessories of any kind.

No allowance can be made for locomotives of other manufacture.

Part-Exchange Allowances for Locomotives

Hornby Gauge 0 Clockwork	
Locomotive	Allowance
MO	1/–
No. 0 "Silver Link"	1/–
M1/2	1/6
M3 Tank	2/6
No. 0	3/–
LEC 1 (Swiss Type)	3/6
No. 1	3/6
No. 1 Tank	3/6
No. 1 Special	5/–
No. 1 Special Tank	5/–
No. 2	6/6
No. 2 Tank	6/6
No. 2 Special Tank	6/6
Metropolitan C	7/–
No. 2 Special	7/6
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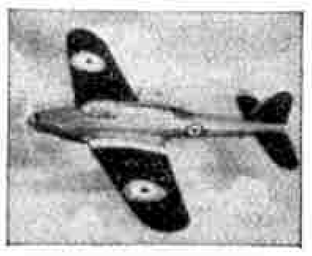

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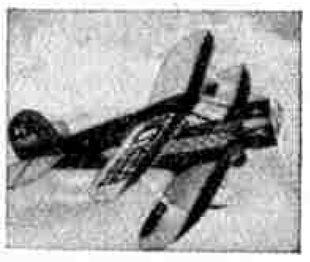

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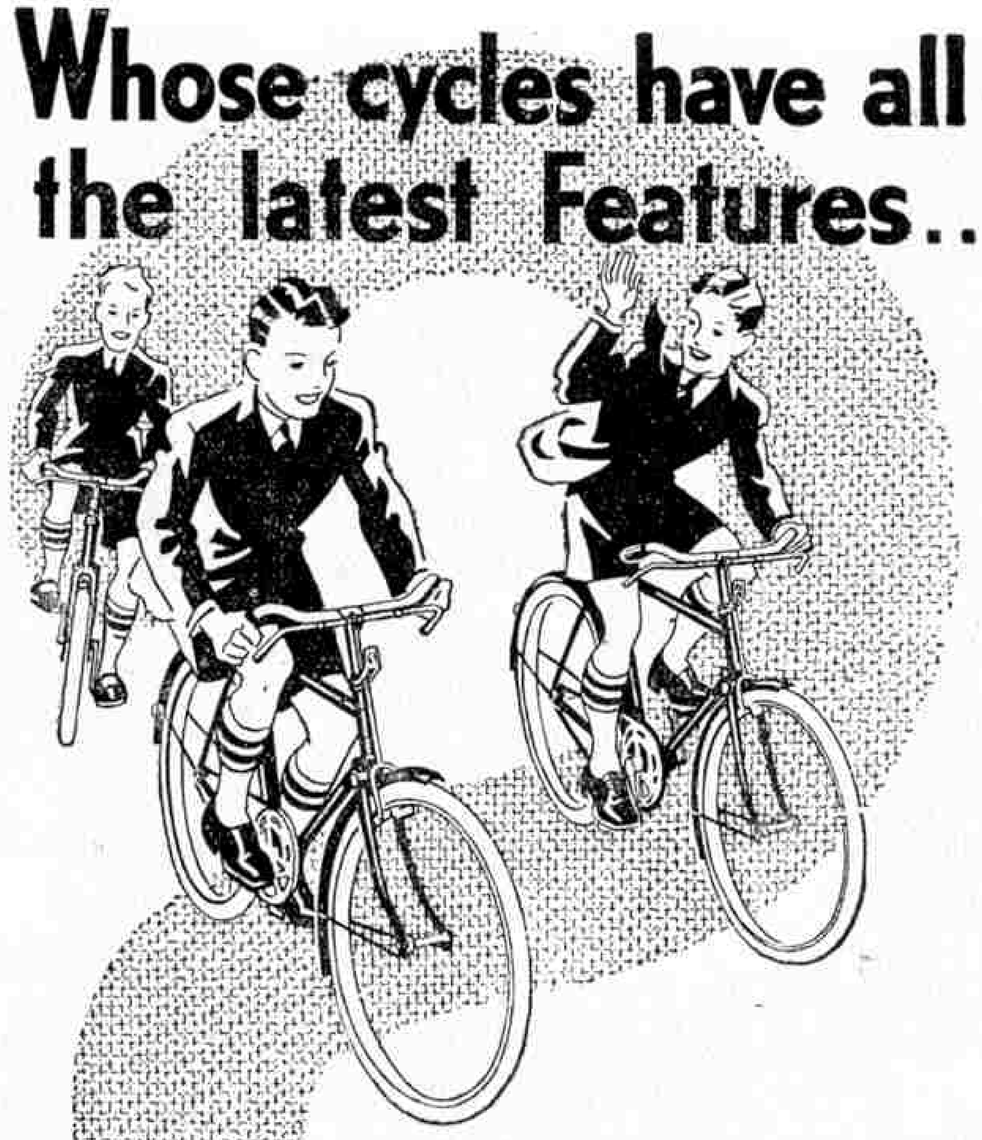

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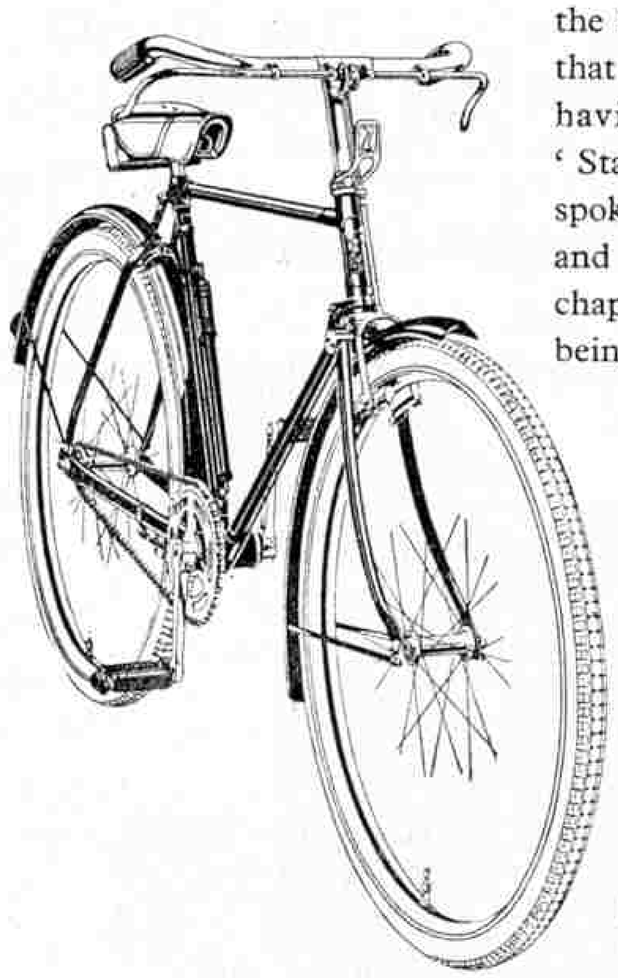

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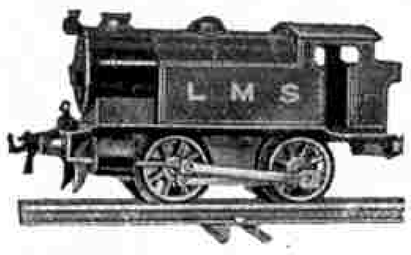

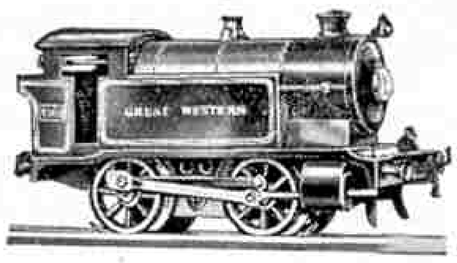

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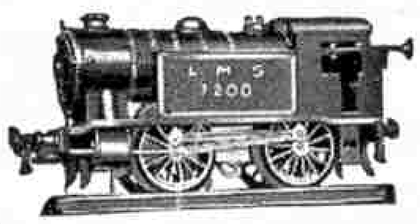

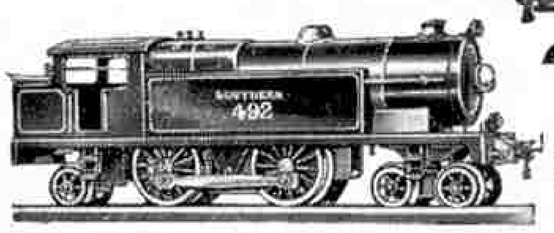

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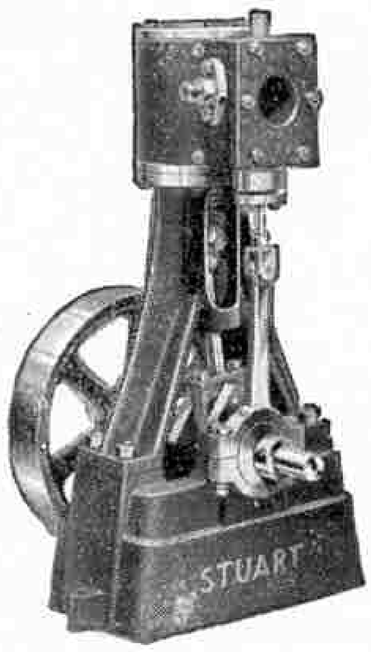

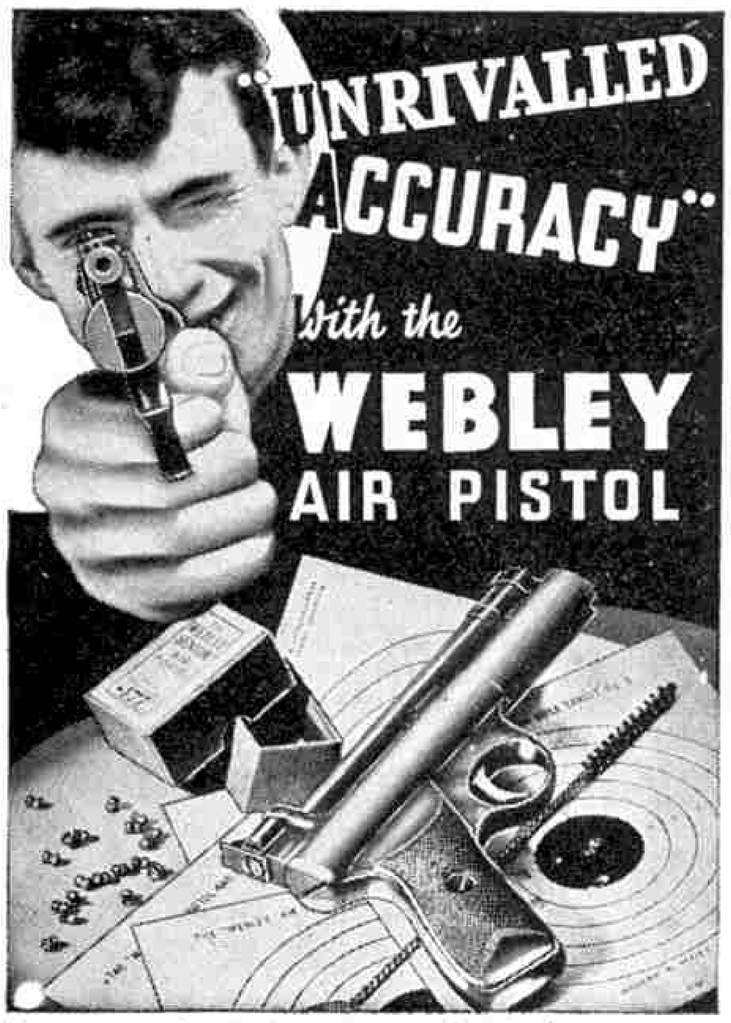

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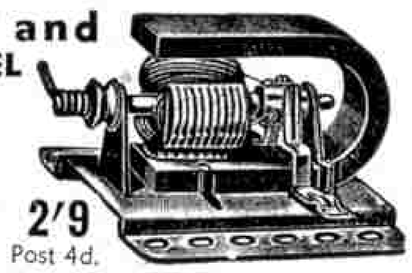

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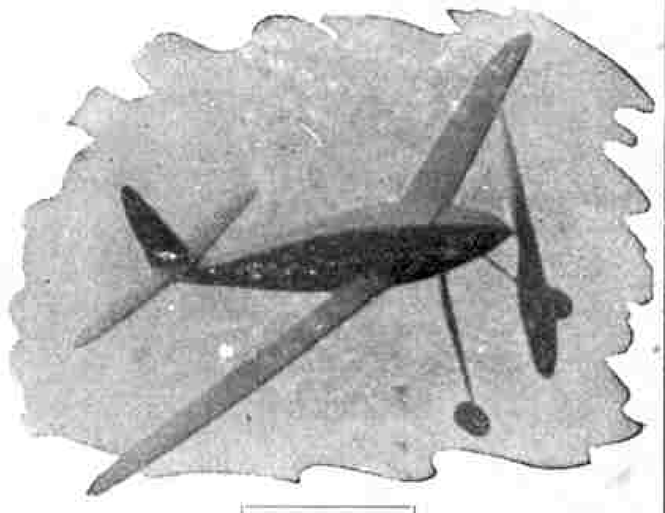

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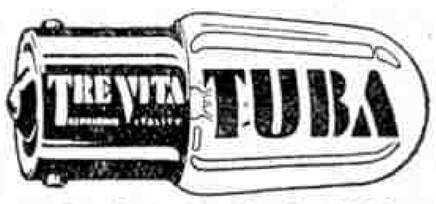

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To Contributors. The Editor will consider articles and photographs of general interest and payment will be made for those published. Whilst every care will be taken of articles, etc., submitted, the Editor cannot accept responsibility for any loss or damage. A stamped addressed envelope of the requisite size should be sent where the contribution is to be returned if unacceptable.

Readers' Sales and Wants. Private advertisements (i.e., not trade) are charged 1d. per word, minimum 1/-. Cash with order. Editorial and Advertising matters should not be dealt with on the same sheet of paper.

Small Advertisements. 1/6 per line (average seven words to the line), or 16/- per inch (average 12 lines to the inch). Cash with order.

Display. Quotations for space bookings, and latest net sale figures, will be sent on request.

Press Day, etc. Copy should be sent as early in the month as possible for insertion in following issue. We usually close for press on or before 6th of each month for following issue. Half-tone blocks up to 100 screen.

Proofs of advertisements will be sent when possible for space bookings of not less than half-an-inch.

Voucher copies. Sent free to advertisers booking one inch or over. Other advertisers desiring vouchers should add 8d. to their remittance and should order voucher copy at same time.

Remittances. Postal Orders and Cheques should be made payable to Meccano Ltd.

Ordering the "M.M." Overseas

Readers Overseas and in foreign countries may order the "*Meccano Magazine*" from regular Meccano dealers or direct from this office. The price and subscription rates are as above, except in the cases of Australia, where the price is 1/2 per copy (postage extra), and the subscription rates 8/- for six months and 16/- for 12 months (post free), Canada, where the price is 10c. per copy, and the subscription rates 65c. for six months, and $1.25 for 12 months (post paid).

The U.S.A. price is 15c. per copy, and the subscription rates $1 and $2 for 6 and 12 months respectively (post free).

Overseas readers are reminded that the prices shown throughout the "*M.M.*" are those relating to the United Kingdom and Northern Ireland. Current Overseas Price Lists of Meccano Products will be mailed free on request to any of the undermentioned agencies. Prices of other goods advertised may be obtained direct from the firms concerned.

CANADA: Meccano Ltd., 187-189, Church St., Toronto.

UNITED STATES: Meccano Co. of America Inc., New Haven, Conn., Meccano Co. of America Inc., 200, Fifth Av., New York.

AUSTRALIA: Messrs. E. G. Page & Co., 52, Clarence Street, Sydney, N.S.W.

NEW ZEALAND: Models Limited, Third Floor, Paykel's Buildings, 9, Anzac Avenue (P.O. Box 129), Auckland, C.1.

SOUTH AFRICA: Mr. A. E. Harris (P.O. Box 1199), 142, Market Street, Johannesburg.

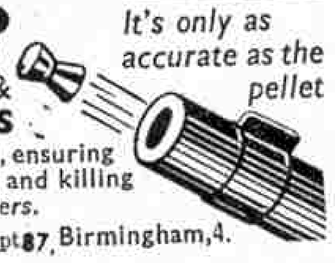
INDIA: Karachi: Daryanamal and Bros., Elphinstone Street. Bombay: Bombay Sports Depot, Dhobi Talao. Calcutta: Bombay Sports Depot, 2, Lindsay Street. Madras: Bombay Sports, 162, Mount Road.

The Editor wishes to make known the fact that it is not necessary for any reader to pay more than the published price. Anyone who is being overcharged should lodge a complaint with the Meccano agent in his country or write direct to the Editor.

DOES *your* GUN SHOOT STRAIGHT?

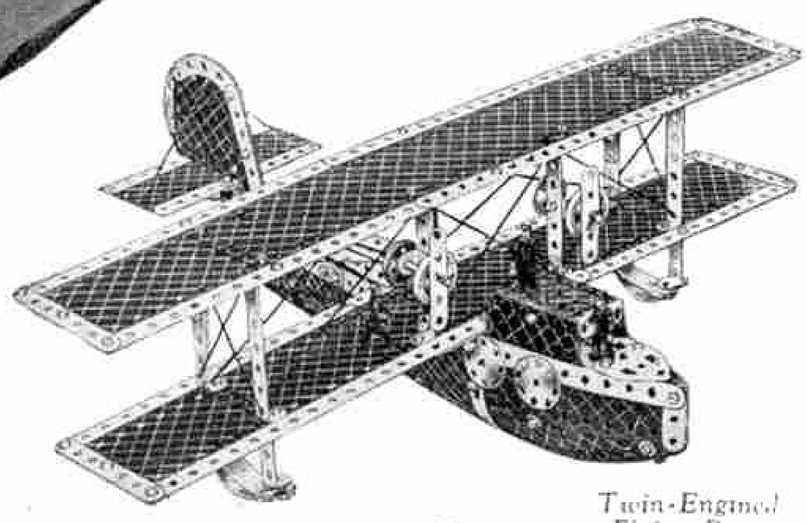
WEBLEY Air Rifle & Air Pistol **PELLETS** are accurate to 1/1000th inch, ensuring maximum accuracy, velocity and killing power. *Stocked by all dealers.*

It's only as accurate as the pellet

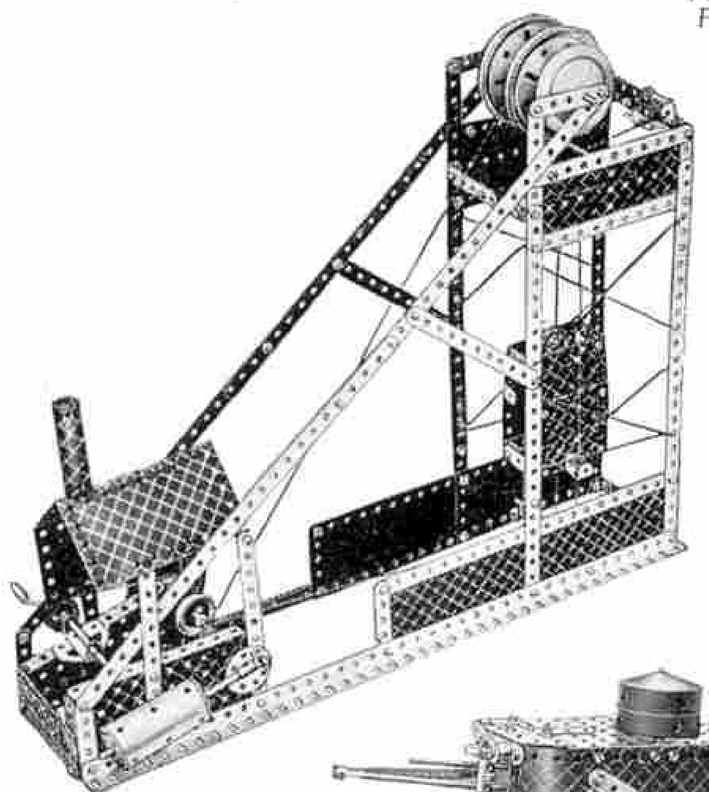


WEBLEY & SCOTT Ltd., Dept 87, Birmingham, 4.

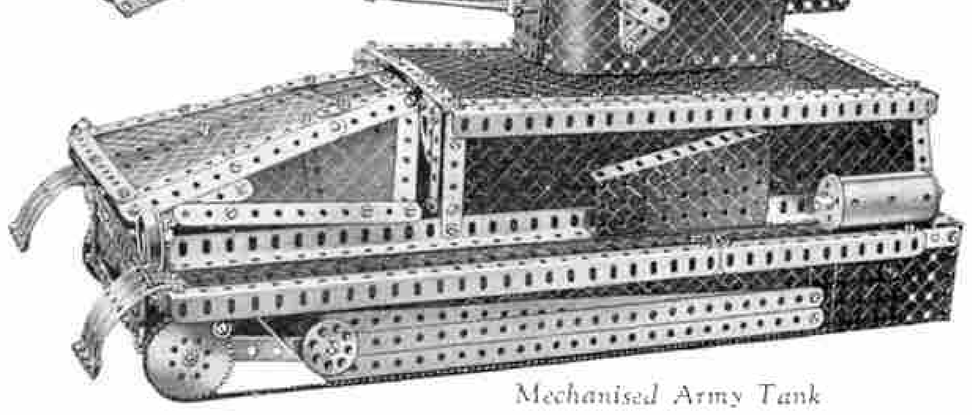
MORE NEW MODELS...



Twin-Engined Flying Boat



Pit Head Gear



Mechanised Army Tank

MECCANO

Boys! Meccano is better than ever!

There are thrills all the time. The models are more fun to build, more exciting to play with. And they actually work just like the real thing!

Get an Outfit to-day and try it for yourself. You can get one for as little as three shillings!

MECCANO LIMITED, BINNS ROAD, LIVERPOOL 13

MECCANO

HORNBY SPEED BOATS

The best of all outdoor pastimes

Sailing a model speed boat is one of the most thrilling hobbies you could have, brimful of excitement from start to finish. But the amount of fun you get depends on the kind of boat that flies your colours. That's why you'll be proud to own a Hornby—every inch a champion, sleek smart and swift.

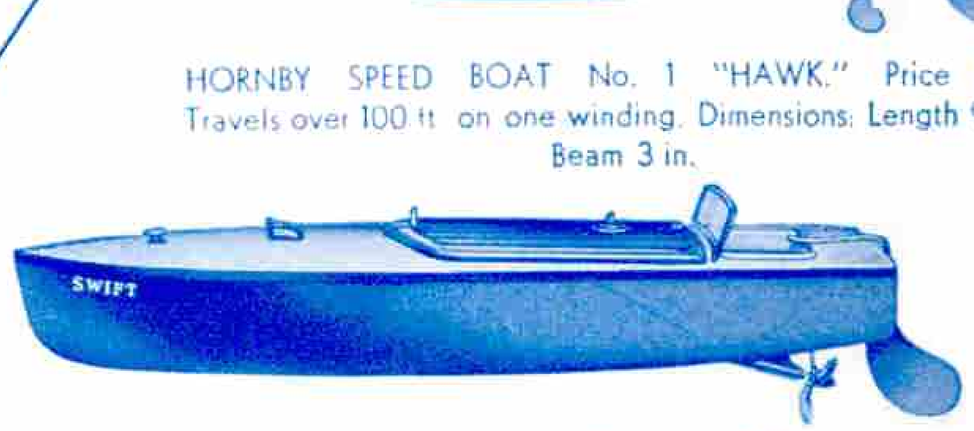
Remember, Hornby Boats are the best that you can buy—best in appearance, and best in performance and reliability.

There are five splendid models from which to choose, beautifully finished in attractive colours. Each one follows closely the design and general characteristics of a famous speed boat prototype.

Each model is built with the same precision and craftsmanship as the famous Hornby Trains. Ask your dealer to show you the full range and see for yourself how perfect they are!

Manufactured by MECCANO LTD., Binns Road, Liverpool 13.

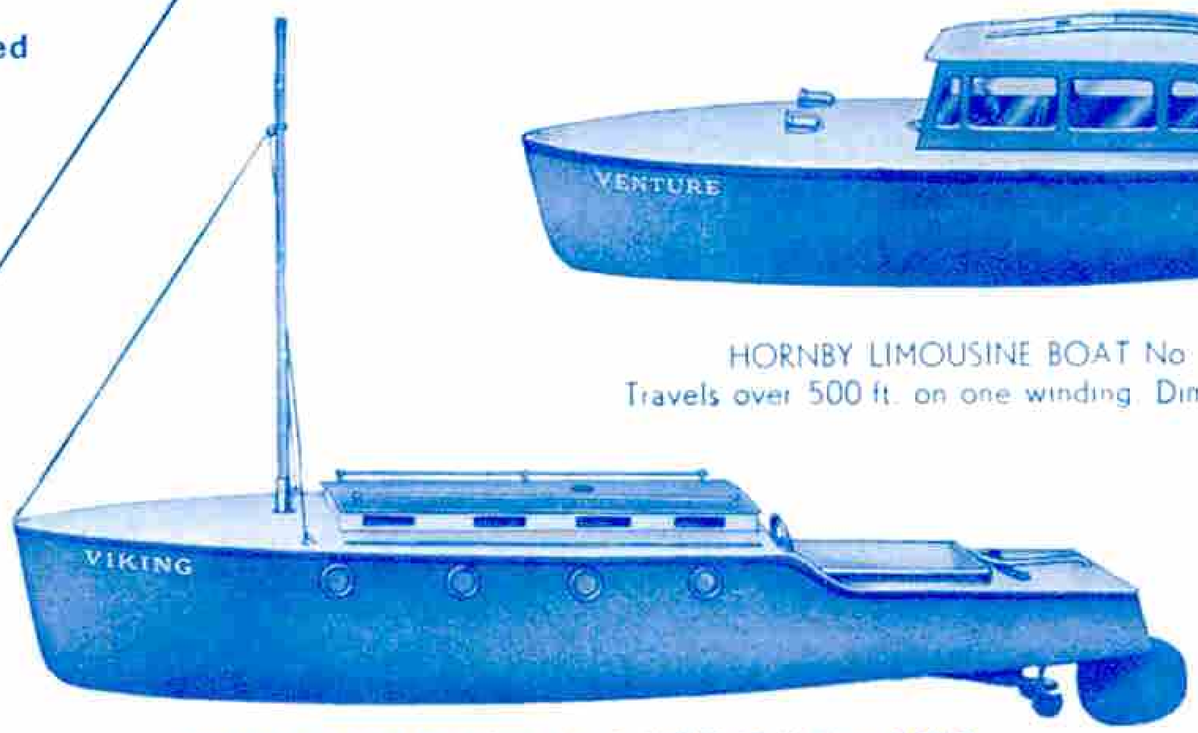
HORNBY SPEED BOAT No. 1 "HAWK." Price **2'9**
Travels over 100 ft. on one winding. Dimensions: Length 9¼ in. Beam 3 in.



HORNBY SPEED BOAT No. 2 "SWIFT." Price **8'6**
Travels over 300 ft. on one winding. Dimensions: Length 12½ in. Beam 3 in.

HORNBY SPEED BOAT No. 3 "CONDOR." Price **14'-**
Travels over 500 ft. on one winding. Dimensions: Length 16½ in. Beam 3½ in.

HORNBY LIMOUSINE BOAT No. 4 "VENTURE." Price **17'6**
Travels over 500 ft. on one winding. Dimensions: Length 16½ in. Beam 3½ in.



HORNBY CABIN CRUISER No. 5 "VIKING." Price **18'6**
Travels over 500 ft. on one winding. Dimensions: Length 16½ in. Beam 3½ in.

Join the Hornby Speed Boat Club

If you own a Hornby Boat you should join the Hornby Speed Boat Club. You can do this by purchasing a special badge (illustrated above) from any Meccano dealer, or direct from Meccano Ltd., price **6d.**

Pennants

Pennants for Hornby Speed Boats Nos. 3 and 4 may be purchased separately. They add the final touch of realism to these boats. Price **2d.** each.

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