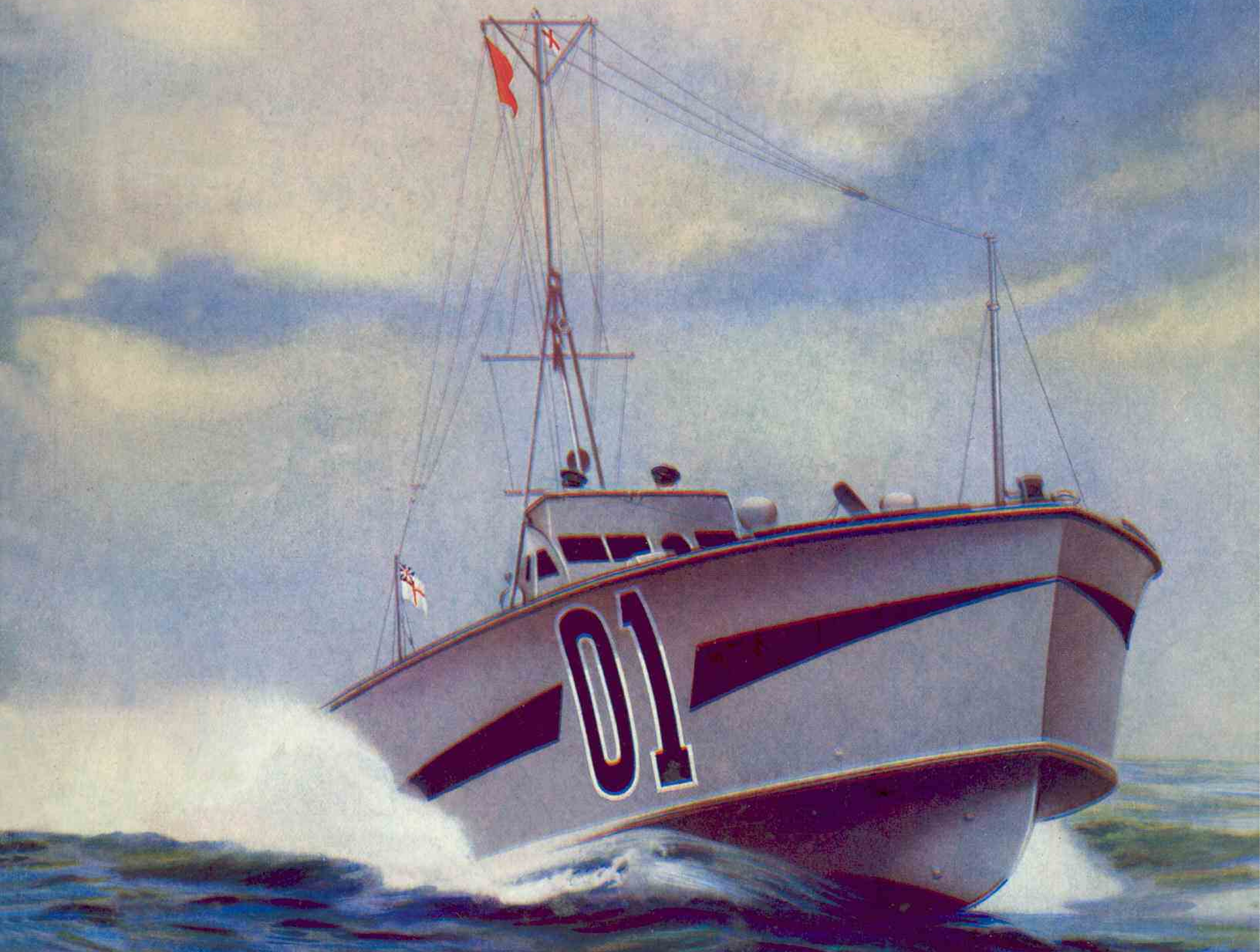
VOL. XXII. No. 12. DECEMBER 1937

MECCANO MAGAZINE



THE NAVY'S MOTOR TORPEDO BOATS

6D.

★ IMPORTANT TO ALL READERS

"Princess Elizabeth"

A MAGNIFICENT HORNBY SCALE MODEL OF THIS WORLD RECORD-BREAKING LOCOMOTIVE

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

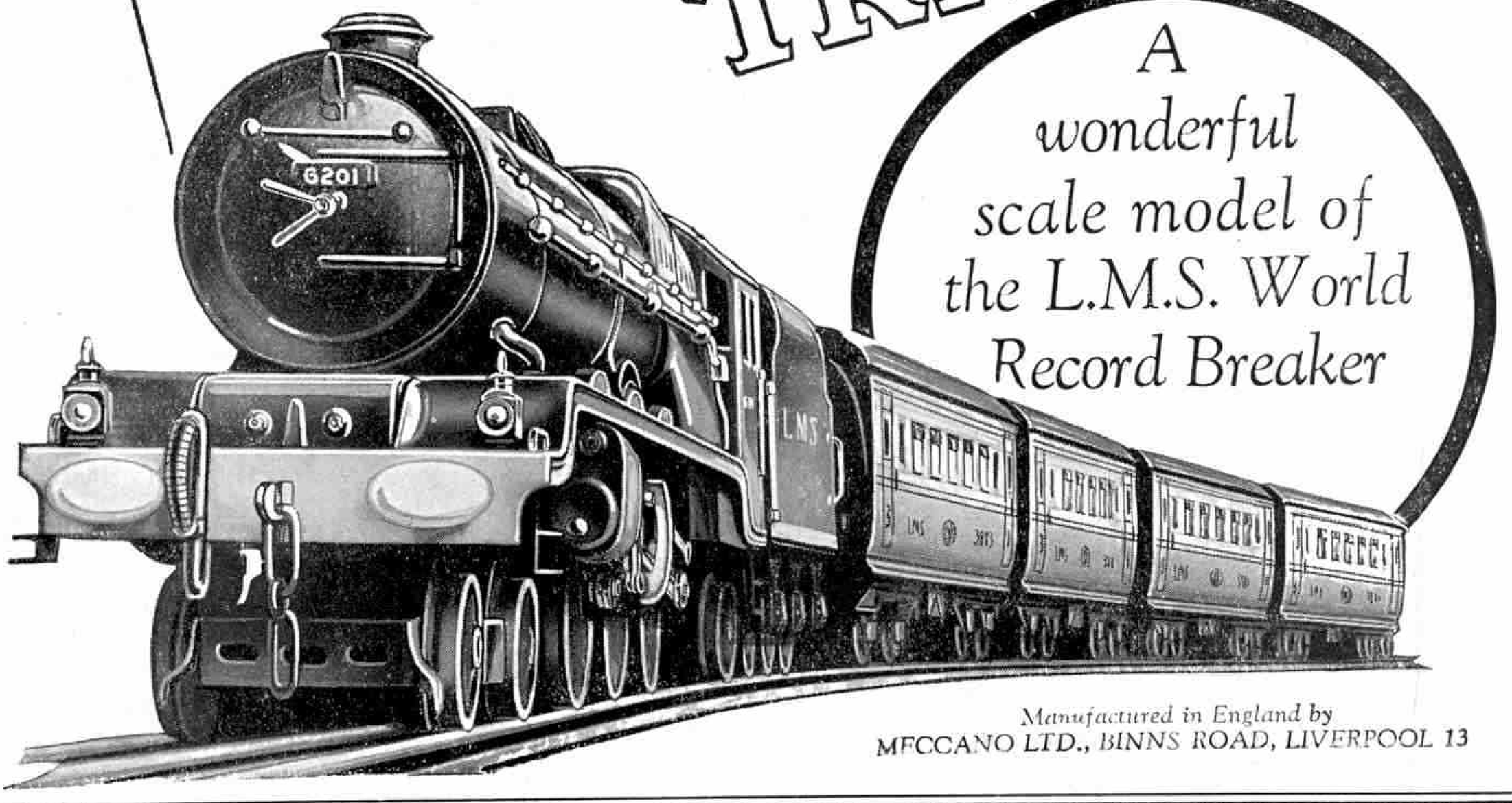
Think of the thrill of owning a model of such an engine; not merely a perfect reproduction, but one having the same qualities of power, speed and efficiency! This is now made possible by the latest product of Meccano Ltd.—the magnificent Hornby scale model locomotive *"Princess Elizabeth"*—20-volt automatic reversing.

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

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

HORNBY TRAINS

A *wonderful scale model of the L.M.S. World Record Breaker*



Manufactured in England by
MECCANO LTD., BINNS ROAD, LIVERPOOL 13

Hamley's News
·HAMLEY·BROTHERS·LTD·ESTABLISHED·1760·
200-202, REGENT ST., LONDON, W.1. OUR ONLY ADDRESS
Telephone: REGENT 3161
No. 27 December, 1937

THE MYSTERY CAR!!!

RUN YOUR OWN CINEMA

A REVOLUTION IN MODEL CARS!!

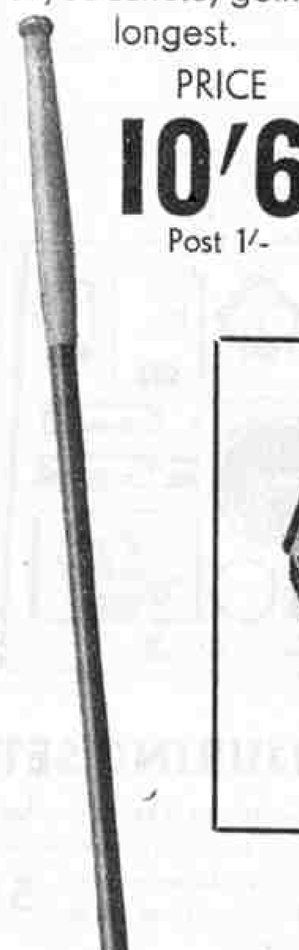
A Car that obeys your orders

'Go!' you shout, and the car will move off smartly and speedily and then just as it is going over the edge of the table 'Stop!' you shout, and up she pulls at your command. Truly a wonder car entirely motivated by the human voice.

PRICE **3/6** Post 3d.

CAN YOU POGO?

Learn this fascinating pastime and become the human grasshopper. You can have hilarious competitions with your friends to see which of you can stay going longest.



PRICE **10/6** Post 1/-

CAN YOU BUILD A CLOCK?

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

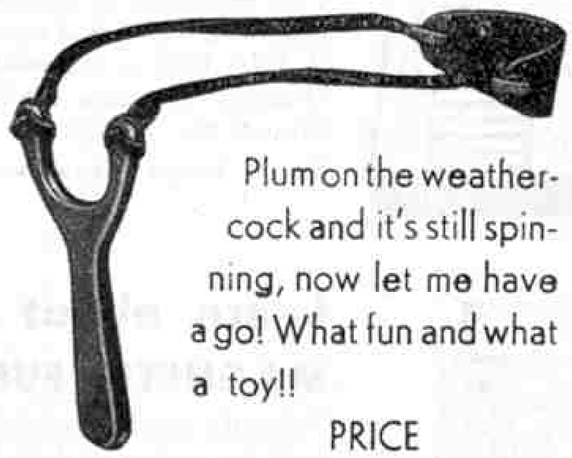
PRICE **10/6** Post 6d.

For the Budding Scientist

Chemicals, magnifying glass, slides, etc., complete realistic scientific outfit. Finely made adjusting microscope, beautifully finished.

PRICE **15/-** Post 9d

WHAT A SHOT!



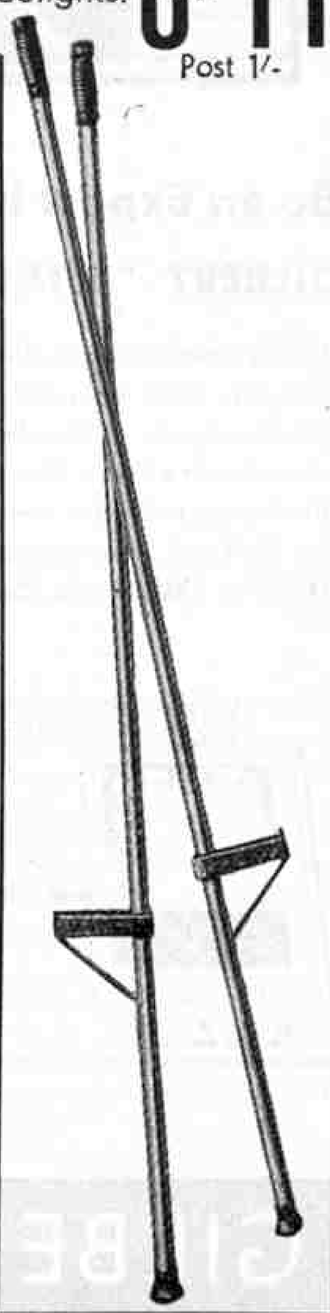
Plum on the weathercock and it's still spinning, now let me have a go! What fun and what a toy!!

PRICE **2/-** Post 2d.

KEEP YOUR HEAD IN THE AIR!

Johnnie, head-in-the air and head and shoulders above his friends! Stilt-walking is the most fascinating craft in which each new generation of children delights.

PRICE **6/11** Post 1/-



BACK IT COMES!

The Boomerang—true weapon of the original Aborigines of Australia corresponding in purpose with the Tomahawk and Assegai.

PRICE **3/11** Post 6d.

A HANDY FILM UNIT

The 'Bingoscope' Safety Cinema is a real projector workable with an ordinary pocket lamp battery. 8 ft. 9.5 mm. films 1/- each. Complete with battery and 2 films.

PRICE **7/6** Post 6d.

WONDERFUL NEW HOBBIES—NEW FUN
thrilling Discoveries in Science!

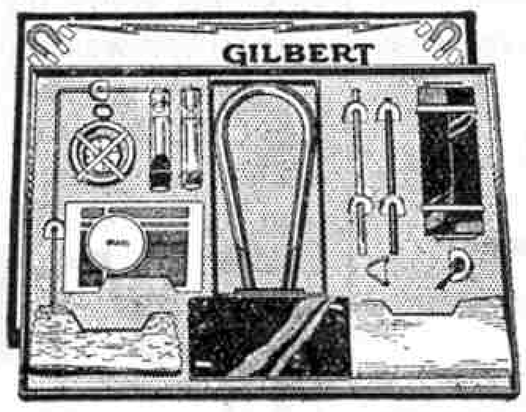
Boys! You surely want this Christmas to be the best ever! Then ask for one of the marvellous Gilbert Scientific Toys. They are interesting, amusing, mysterious. No other kind of gift could give you such fun. You'll be able to make exciting discoveries in science, do amazing stunts and tricks, and at the same time gain new knowledge. Post the coupon for our Free Catalogue, and when you get it, show it to Dad. He'll agree at once to giving you one of the splendid Gilbert Toys. Get the scissors and an envelope NOW.

Explore New Worlds of Mystery!

MICRO-CHEMISTRY SETS

Hidden from the naked eye there is a mystery world full of astonishing creatures and exciting secrets. A drop of stagnant water is teeming with life. Weird wonders are disclosed by the Microscope in Gilbert Micro-Chemistry Sets. There is also a big assortment of chemicals and apparatus for performing hundreds of experiments. The mystery of Polar Rays is explained by the remarkable "Polaroid." Complete with Instruction Manual. No. 5 Outfit **15/-**

No. 7. Larger Micro-Chemistry Set **25/-**



Learn about Electricity

MAGNETIC FUN & FACTS

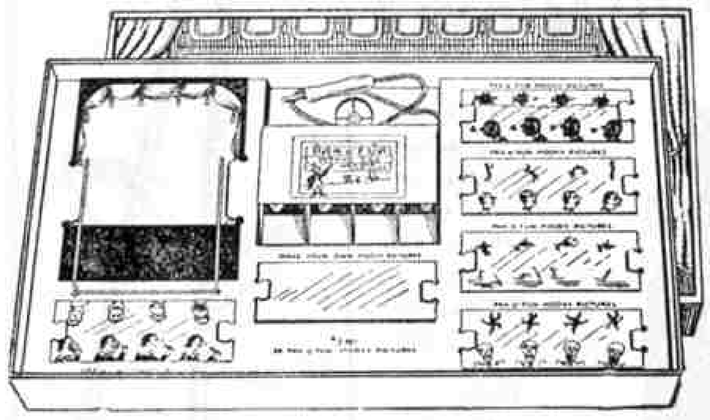
This is the age of Electricity! Here's an instructive outfit that teaches all about Magnetism and Static Electricity. Gives endless amusement. Enables fascinating experiments to be performed. Contains a powerful horseshoe magnet, bar magnets, compass and other parts for doing numerous stunts and tricks. Complete with instruction book **5/-**

Also larger outfit **10/6**

Be an Expert Handyman

GILBERT "JUNIOR" ELECTRIC DRILL

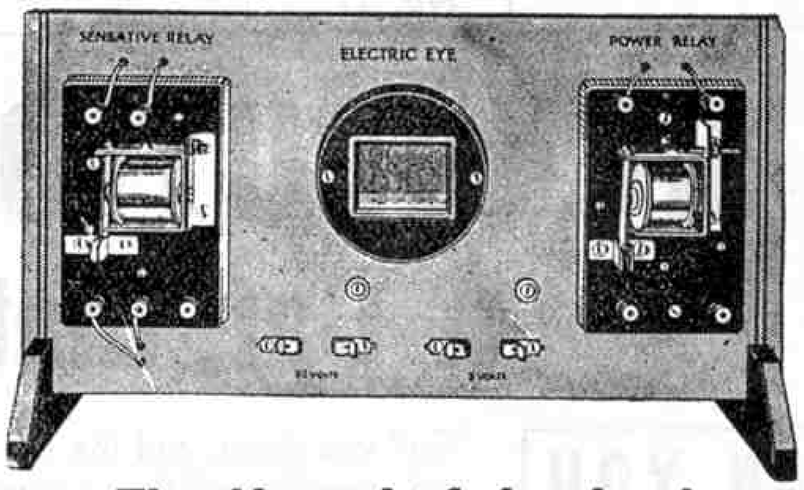
Here's a powerful, speedy Electric Drill for the young handyman. It saves time, saves work, enables you to make better models and do better woodwork. A boon for dozens of jobs around the house. Much faster, easier to use and more accurate than old-fashioned breast drills. Drills wood, metal, tiles, etc. Also has scores of other uses. Takes up to ¼" drills. Complete with switch, chuck and flex. Works off house current. Supplied for A.C. or D.C. mains, 105/115, 200/220 or 230/250 volts. (State voltage and supply when ordering.) Price **32/6**



Amazing Simple Home Cinema!

PAK O' FUN MOOVY SHOW

You'll have endless fun with this miniature cinema. It shows animated pictures in a simple manner. Works off a pocket lamp battery. Contains screen, lighting equipment, amusing films, and also plain films on which you can draw your own cartoons. **5/-**



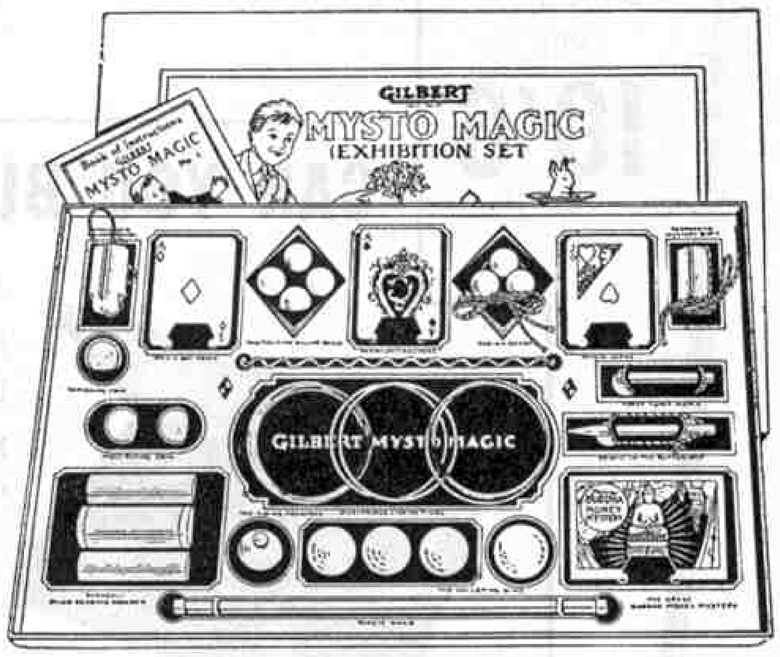
The Marvel of the Age!

GILBERT ELECTRIC EYE

One of the most amazing discoveries of the day is the Electric Eye. It enables you to do astonishing things. A flash of light will ring a bell. You can switch off the radio by waving your hand, switch off the electric light by lighting a match or rig up fire alarms or bells that ring at sunrise. Hundreds of intriguing things can be done with this simple, scientific Outfit. Nothing to learn. Nothing to go wrong.

Complete with instruction booklet **25/-**

Be the "Life of the Party"



GILBERT Mysto-Magic CONJURING SETS

Few things make a boy so popular as being able to do conjuring tricks. If you have a Gilbert Conjuring Trick Set you will be in demand at parties. These sets contain amazing, mystifying tricks that are not found in any other sets. All the tricks are easy to perform. Set No. 1, containing twelve mysterious tricks **5/-**

Larger Sets: No. 3, **10/6**; No. 4, **12/6**

IF any difficulty in obtaining these locally, send your Order, with Postal Order, to us.

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The A. C. GILBERT Co., 109, Kingsway, London, W.C.2

Please send me the Free illustrated Catalogue of Gilbert Scientific Toys.

Also send me..... *Write here which of these goods you want.*

for which I enclose Postal Order for.....

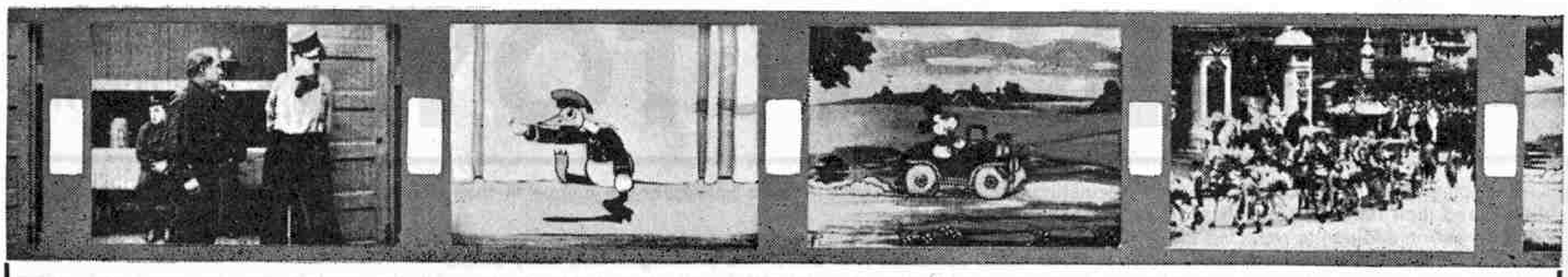
Name.....

Address.....

M.M.3 .....

Print Clearly in Capital Letters

GILBERT Scientific and Instructive products for Young People



We've all the film stars at our party

FILMS OF POPEYE—MICKEY MOUSE—CHARLIE CHAPLIN—DONALD DUCK—AND HEAPS OF OTHERS (INCLUDING A WONDERFUL "CORONATION" FILM). IT'S JUST LIKE A REAL MOVIE SHOW IN YOUR OWN HOME.

For the Bingoscope is a mechanically perfect miniature Cinema Projector that shows brilliant flickerless pictures and is in every way the equal of projectors costing very much more.

It is solidly built to last, and designed to take 9.5 mm. *non flam* Films. Ask for a demonstration at your toy shop or stores. But first write for the illustrated leaflet, and a free gift that will appeal to every boy or girl, comes with it.

BATTERY MODELS			MAINS MODEL B.4.
Model B.1.	...	5/-	25/-
Model B.2.	...	10/6	
Model B.3.	...	17/6	

25/- MAINS MODEL

BINGOSCOPE

MADE IN ENGLAND

FREE GIFT

of Safety Dart Board with rubber-nosed dart.

Send the Coupon now!

THE LEADING JUVENILE CINEMA

Write now for the Safety Dart Board and for the new Bingoscope illustrated leaflet to L. Rees & Co. Ltd. (Dept. M.M.), 12, New Union Street, London, E.C.2.

Name.....

Address.....

.....

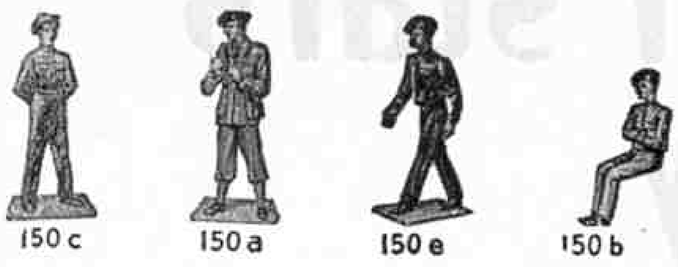
PERFECT SCALE MODELS — DINKY TOYS — OVER 250 VARIETIES

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 year, in addition to reducing the prices of many of the existing models and sets, we have introduced several new items, including wonderful scale models of military Tanks and Aeroplanes, latest types of Motor Cars, complete with driver and passenger, and many others.

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

ROYAL TANK CORPS PERSONNEL



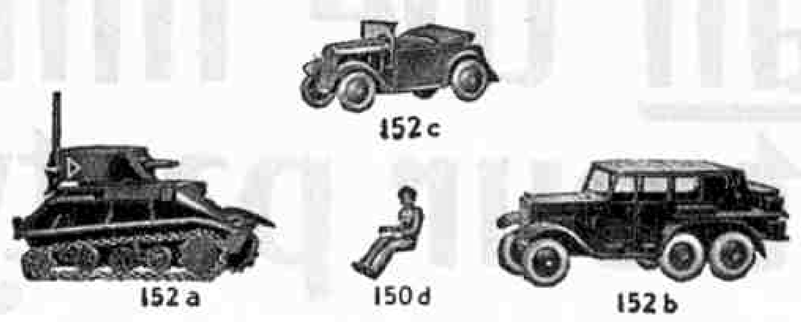
Dinky Toys No. 150

No. 150a	Officer	each	**3d.**
No. 150b	Private in sitting position (2) ...	„	**3d.**
No. 150c	Private in standing position (2) ...	„	**3d.**
No. 150e	N.C.O.	„	**3d.**

Price of complete set **1'6**

Dinky Toys Nos. 150b, 150c, 150d and 150e can each be purchased in boxes containing one dozen at the special price of **2'9** per box.

ROYAL TANK CORPS LIGHT TANK SET



Dinky Toys No. 152

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

Price of complete set **2'9**

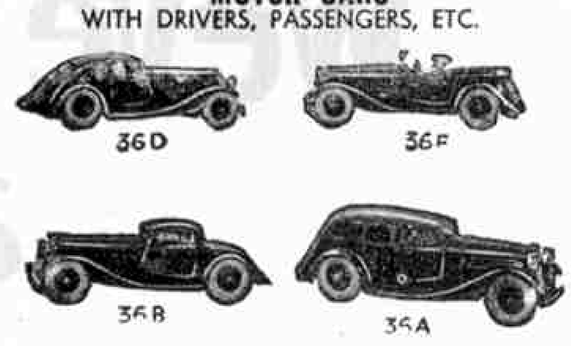
AUSTIN SEVEN CAR

Dinky Toys No. 35d

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

MOTOR CARS

WITH DRIVERS, PASSENGERS, ETC.



Dinky Toys No. 36

Fitted with detachable rubber tyres. Silver-plated radiators.

No. 36a	Armstrong Siddeley (Limousine) with driver and footman ...	each	**11d.**
No. 36b	Bentley (Two-seater Sports Coupe) with driver and passenger ...		**11d.**
No. 36c	Humber (Vogue Saloon) with driver and footman	„	**11d.**
No. 36d	Rover (Streamline Saloon) with driver and passenger... ...		**11d.**
No. 36e	British Salmson (Two-seater Sports) with driver	„	**11d.**
No. 36f	British Salmson (Four-seater Sports) with driver		**11d.**

Price of complete set **5/6**

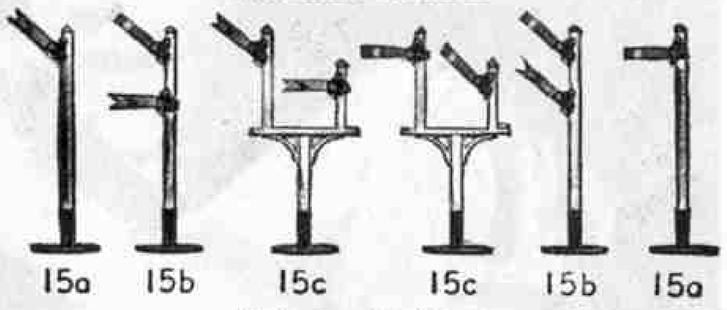
ROYAL TANK CORPS MEDIUM TANK SET

Dinky Toys No. 151

No. 151a	Medium Tank (12 tons, 90 h.p.)	each	**1'6**
No. 151b	Three-ton Transport Wagon	„	**1'-**
No. 151c	Cooker Trailer with jack stand	each	**7d.**
No. 151d	Water Tank Trailer ...	„	**5d.**
No. 150d	Driver	„	**3d.**

Price of complete set **3'9**

RAILWAY SIGNALS



Dinky Toys No. 15

No. 15a	Single Arm Signals ("Home" and "Distant")	each	**2d.**
No. 15b	Double Arm Signals (2)	„	**3d.**
No. 15c	Junction Signals ("Home" and "Distant")	„	**4d.**

Price of complete set **1/6**

R.A.F. AEROPLANES

60N

Dinky Toys No. 61

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

Price of complete set **2/9**

EMPIRE FLYING BOATS

Dinky Toys No. 60r

Scale models of the latest Imperial Airways Flying Boats. Twelve models available named: *"Caledonia," "Canopus," "Corsair," "Challenger," "Centurion," "Cambria," "Calpurnia," "Ceres," "Clio," "Calypso," "Corinna"* and *"Cheviot."* Price **1/-** each

ATLANTIC FLYING BOAT

Dinky Toys No 60x

Similar in type to the Empire Flying Boat. Assorted colours. Price **1/-** each

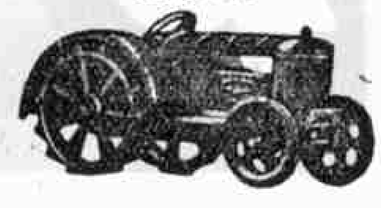
Ask your dealer to show you the complete range of Dinky Toys.

ARMSTRONG WHITWORTH "WHITLEY" BOMBER

Dinky Toys No. 60v

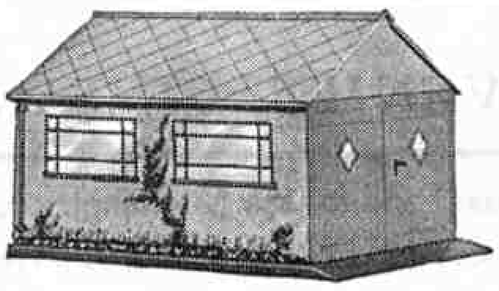
Scale model of the "Whitley" long-range heavy bomber adopted by the R.A.F. Price **9d.** each

TRACTOR



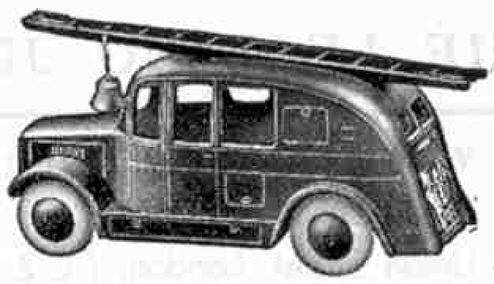
Dinky Toys No. 22a
Price **9d.** each

GARAGE



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

STREAMLINE FIRE-ENGINE



Dinky Toys No. 25k
Finished in red.
Fitted with six firemen, bell, ladder and detachable rubber tyres. Price **1/-**

POLICE MOTOR CYCLIST

Dinky Toys No. 37b

Price **6d.** each

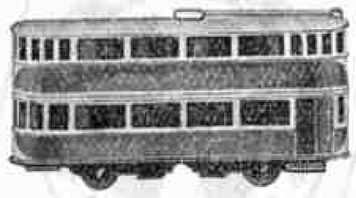
CIVILIAN MOTOR CYCLIST

Dinky Toys No 37a

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

Royal Corps of Signals Despatch Rider. Dinky Toys No. 37c
Similar to Dinky Toys No. 37b. Finished in correct colours. Rubber tyres. Price **6d.** each

TRAM CAR



Dinky Toys No. 27
Assorted colours.
Price **3d.** each

MECCANO LIMITED — BINNS ROAD — LIVERPOOL 13

A FASCINATING COLLECTING HOBBY

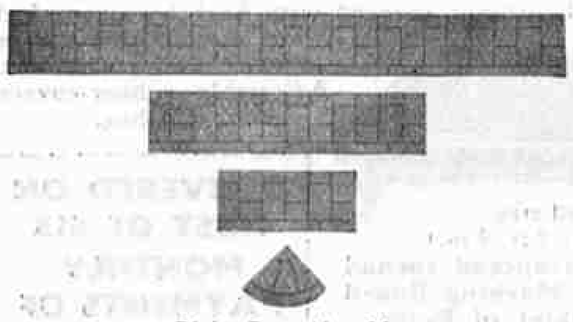
DINKY TOYS

FINISHED IN RICH COLOURS

PETROL STATION

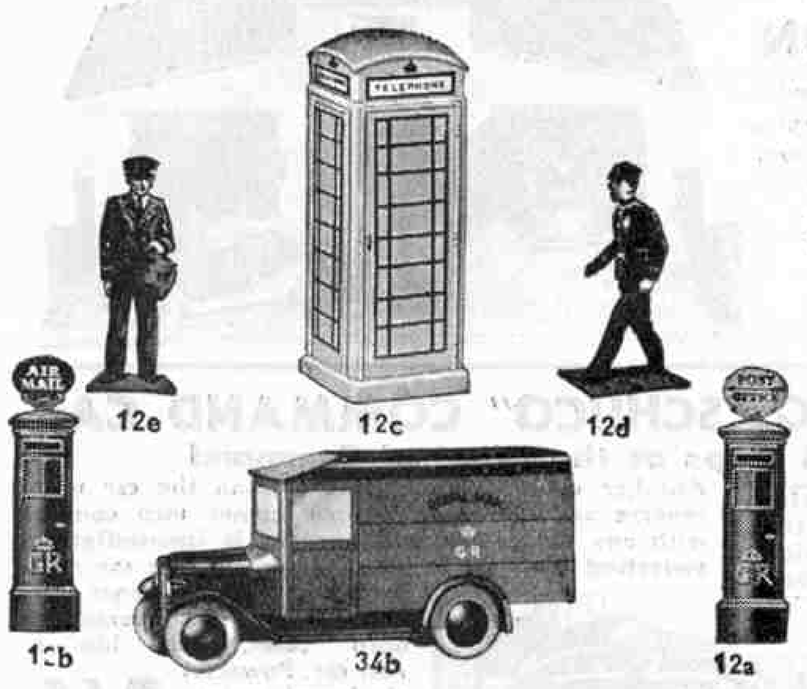
Dinky Toys No. 48
Accurate reproduction of a filling station.
Price **1/3** each

PAVEMENT SET



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

POSTAL SET

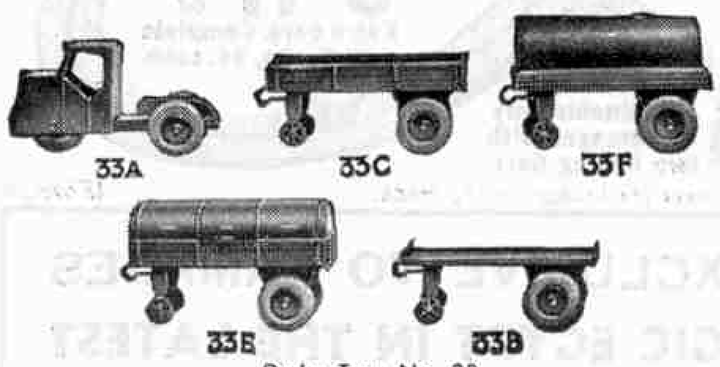


Dinky Toys No. 12

No. 12a	Pillar Box, G.P.O.	each **3d.**
No. 12b	„ „ Air Mail	„ **3d.**
No. 12c	Telephone Call Box	„ **4d.**
No. 12d	Telegraph Messenger	„ **3d.**
No. 12e	Postman	„ **3d.**
No. 34b	Royal Mail Van	„ **10d.**

Price of complete set **2/3**

MECHANICAL HORSE AND FOUR ASSORTED TRAILERS

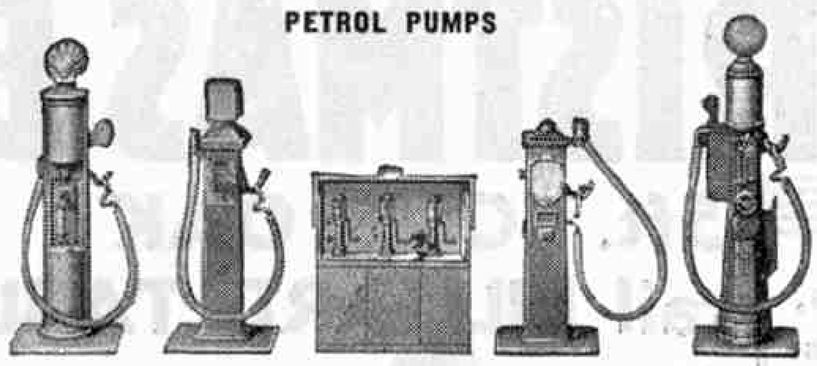


Dinky Toys No. 33
Fitted with detachable rubber tyres

No. 33a	Mechanical Horse	each **6d.**
No. 33b	Flat Truck	„ **6d.**
No. 33c	Open Wagon	„ **6d.**
No. 33e	Dust Wagon	„ **8d.**
No. 33f	Petrol Tank	„ **8d.**

Price of complete set **2/9**

PETROL PUMPS



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

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

Price of complete set **1/3**

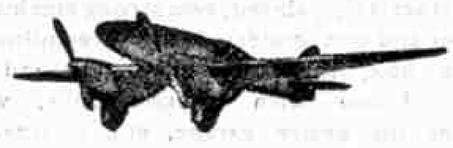
STREAMLINE SALOON

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

STREAMLINE TOURER

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

D.H. "COMET" AEROPLANE



Dinky Toys No. 60g
Scale model of the plane used by C. W. A. Scott and the late T. C. Black in their Australian flight. Price **6d.** each

MOTOR TRUCK

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

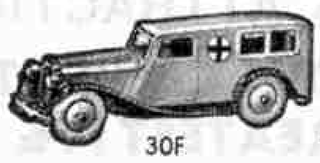
BEACON

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

BOX VAN

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

AMBULANCE



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

MOTOR VEHICLES

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

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

Price of complete set **3/11**

SMALL CARS

Dinky Toys No. 35 Fitted with rubber tyres

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

Price of complete set **9d.**

STREAMLINE BUS

Dinky Toys No. 29b
Fitted with rubber tyres.
Price **6d.** each

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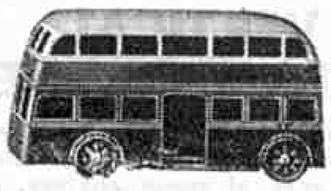

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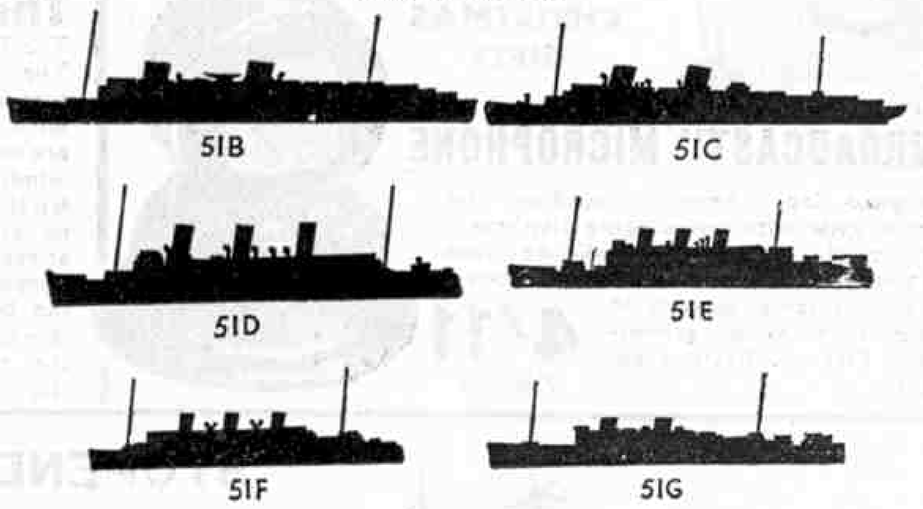

Dinky Toys No. 51

No. 51b	"Europa"	each **6d.**
No. 51c	"Rex"	„ **6d.**
No. 51d	"Empress of Britain"	„ **6d.**
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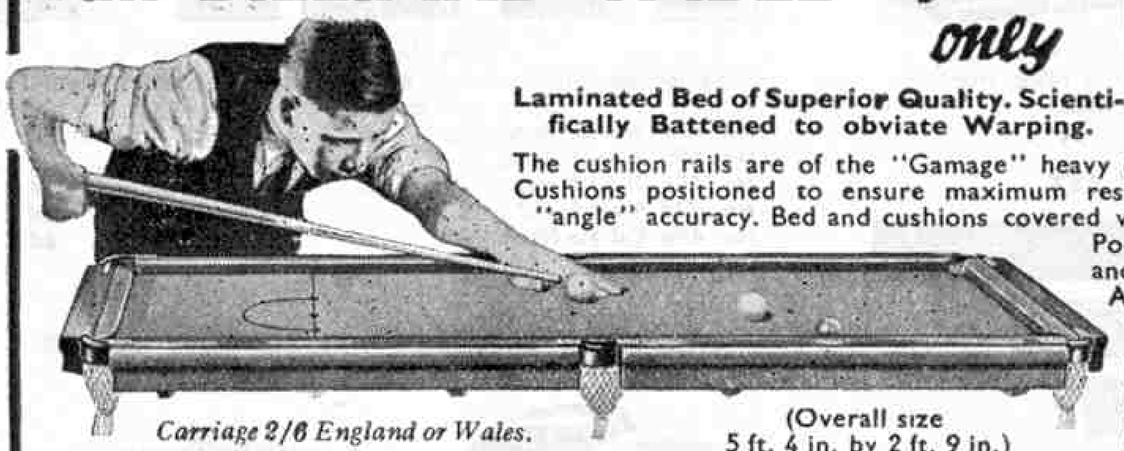

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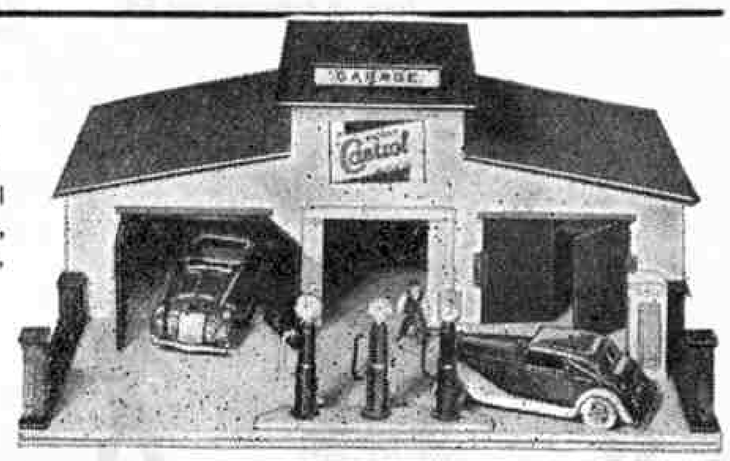

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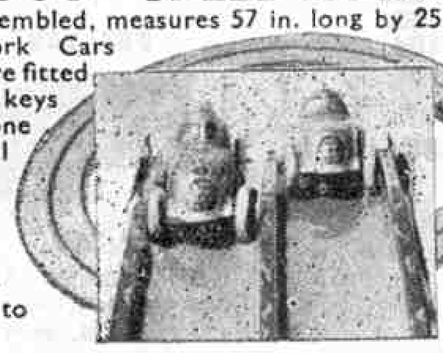

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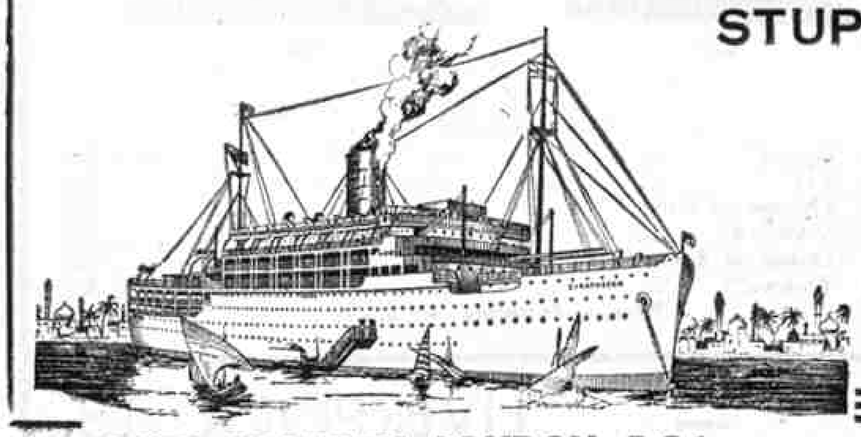

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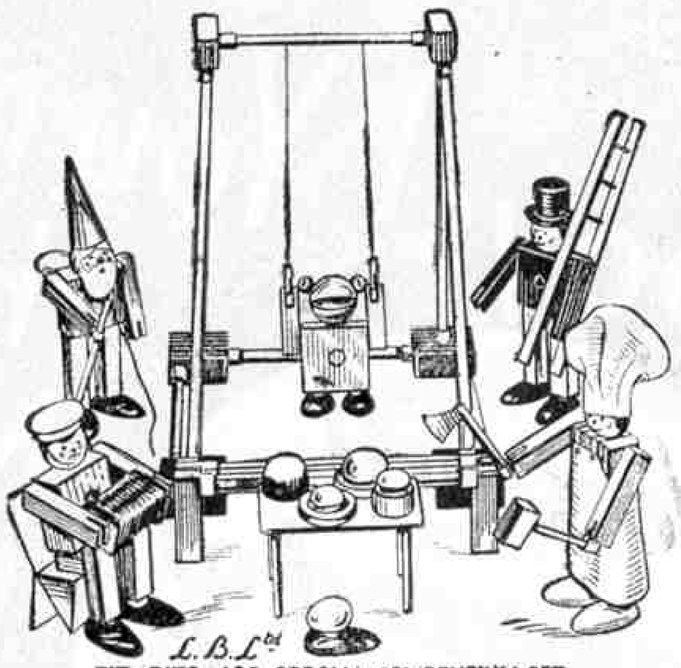

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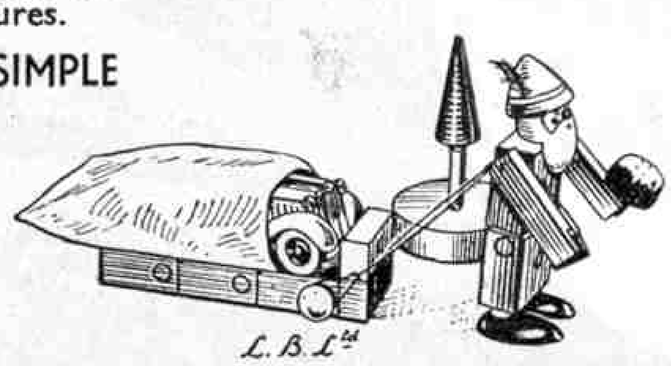

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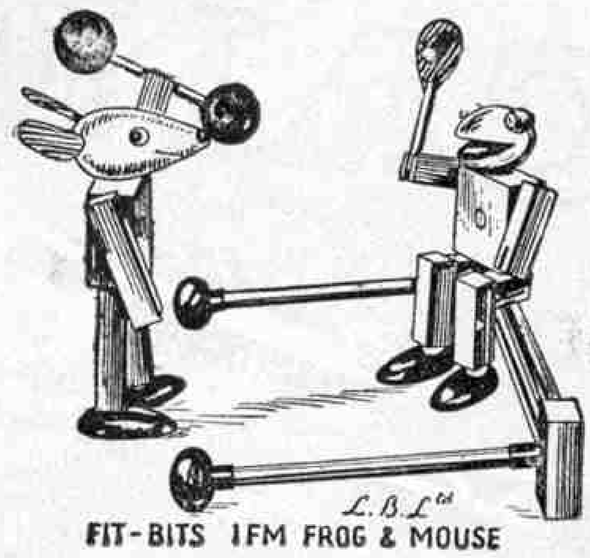

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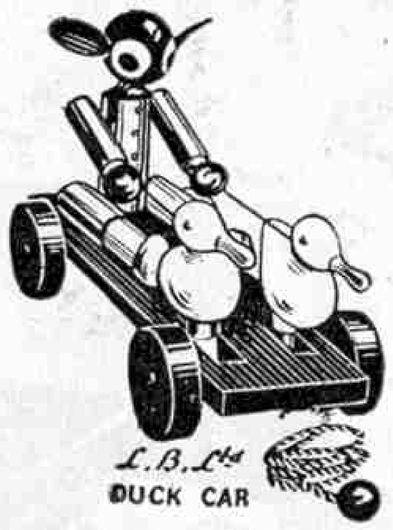

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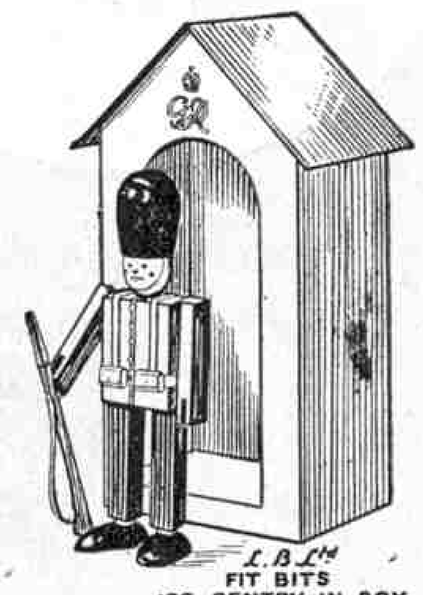

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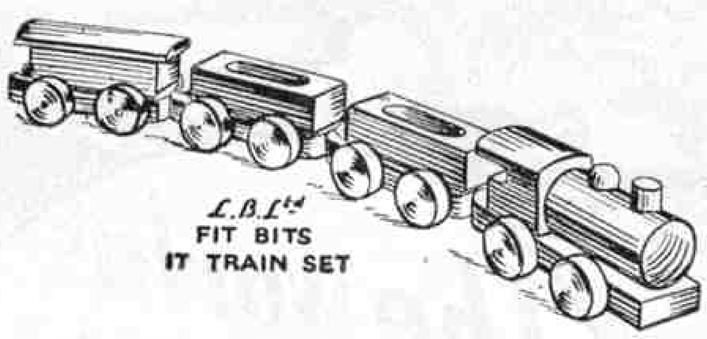

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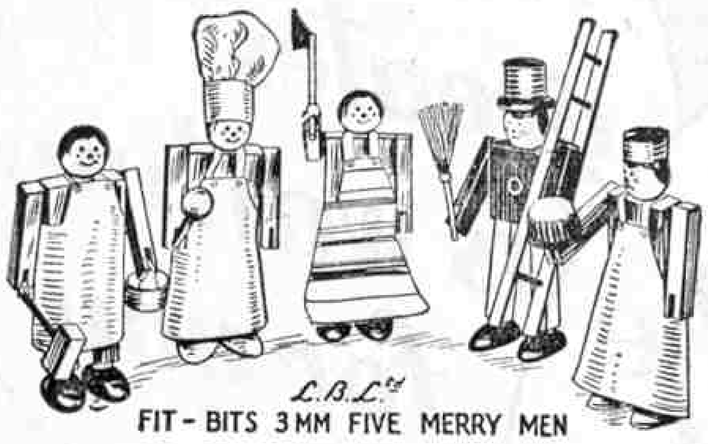

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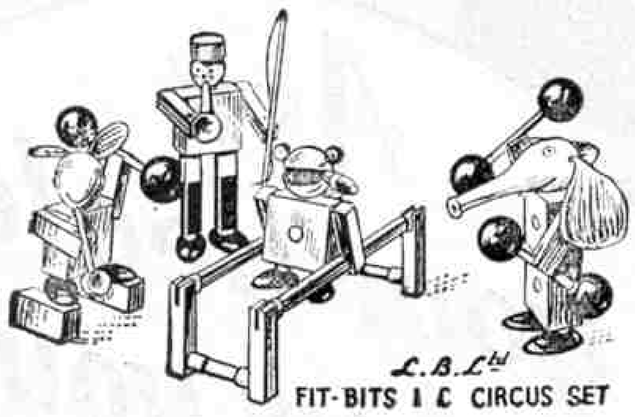

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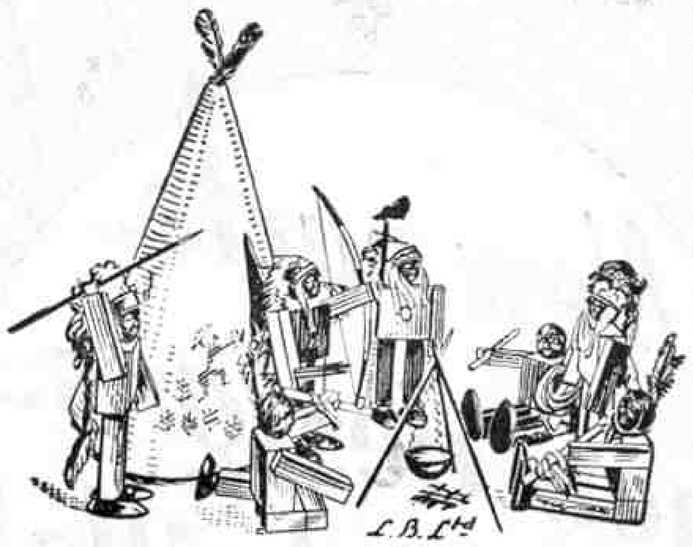

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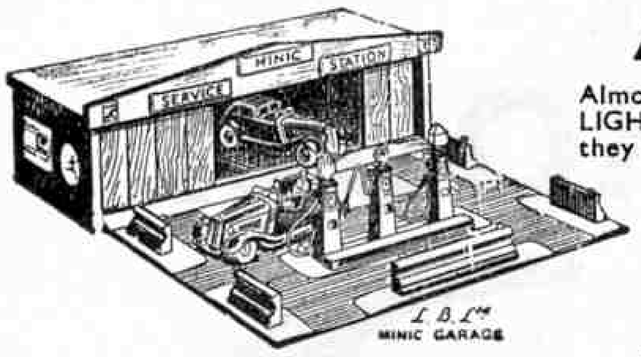

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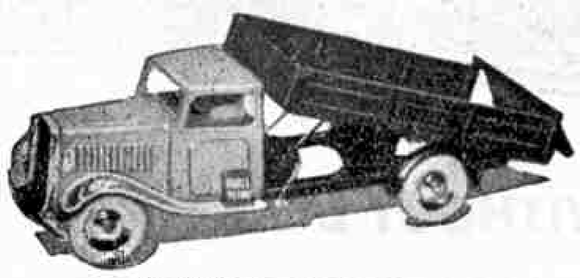

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LENGTH 5½ ins.

LENGTH 5½ ins.
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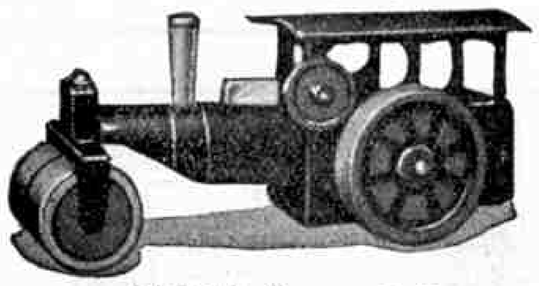

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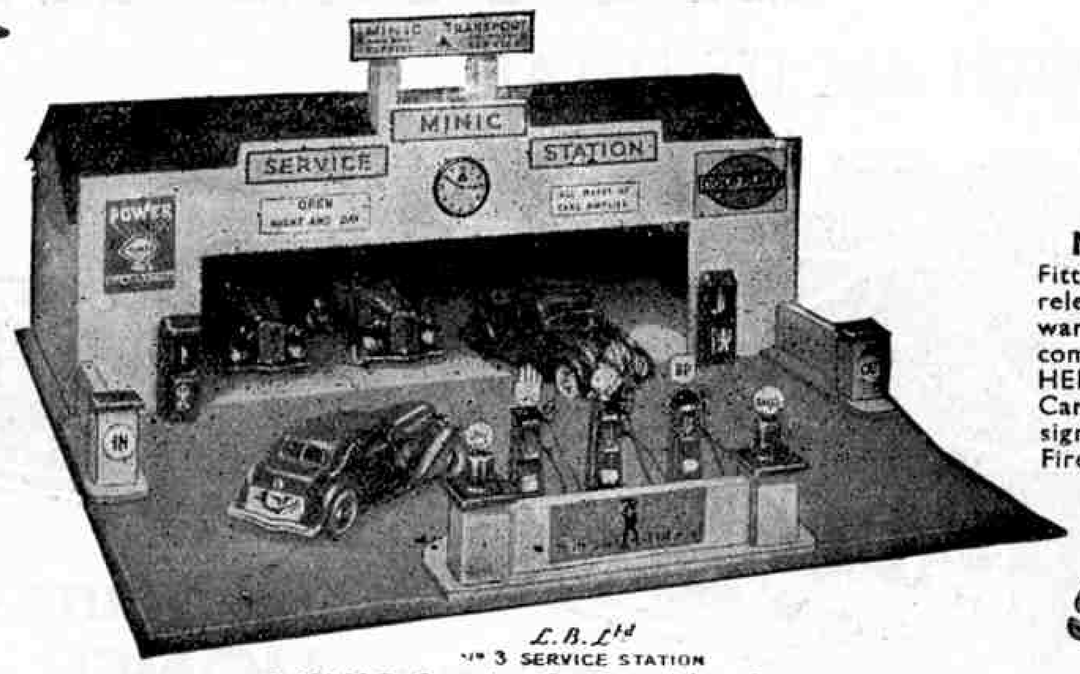

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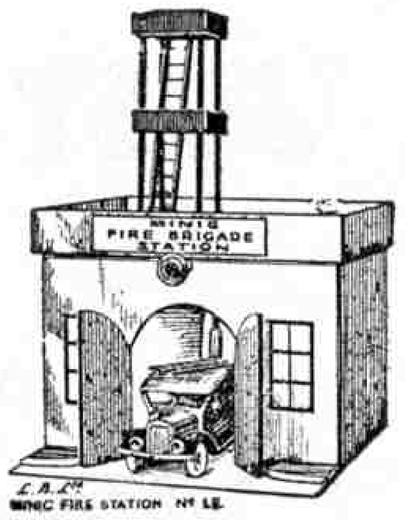

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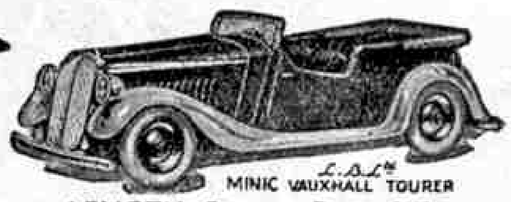
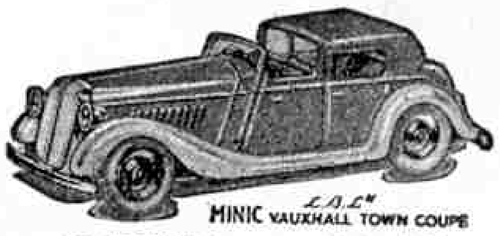
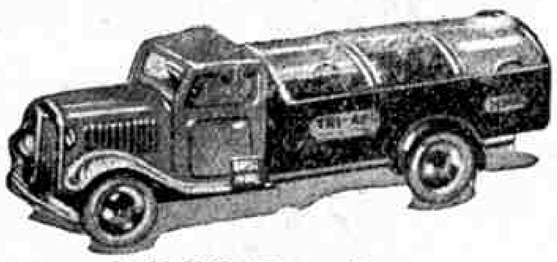


LENGTH 5 ins. Price 1/3



LENGTH 5 ins. Price 1/3



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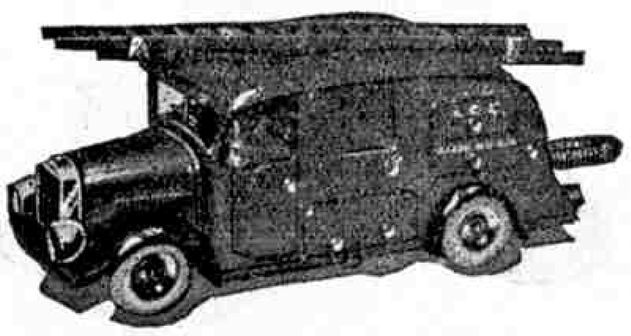

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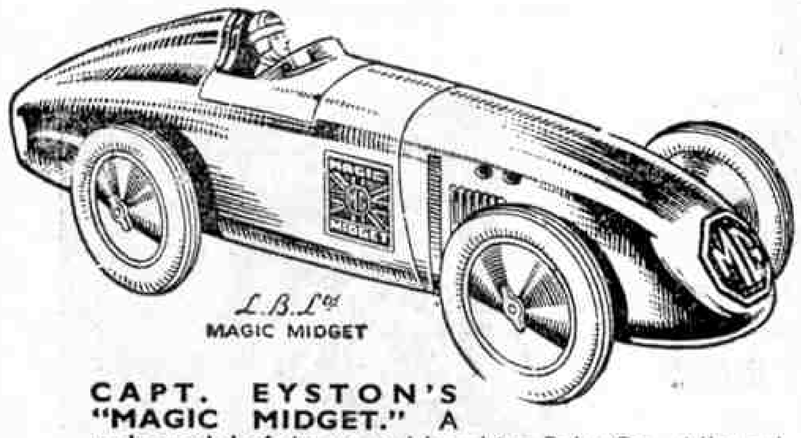

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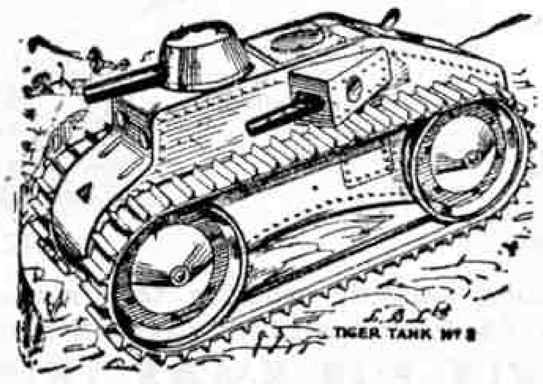

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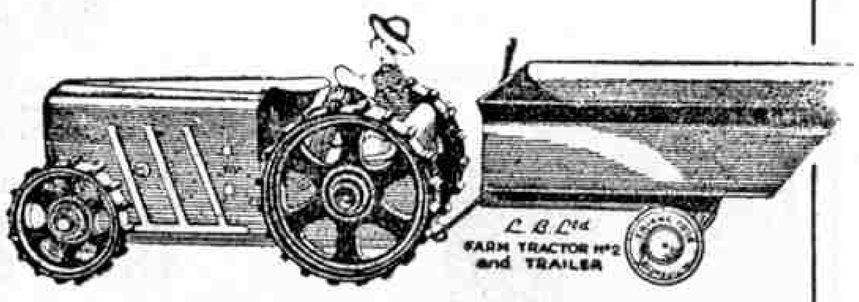

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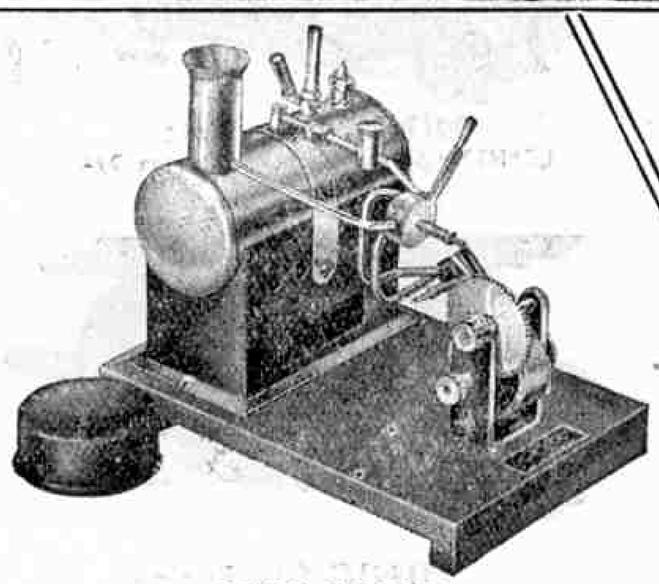

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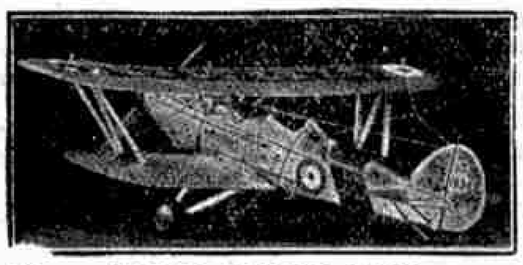

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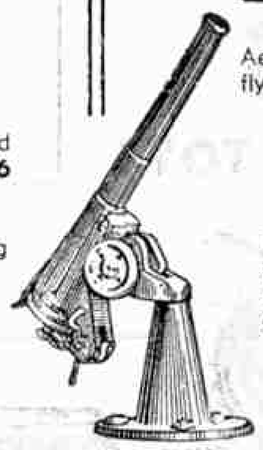
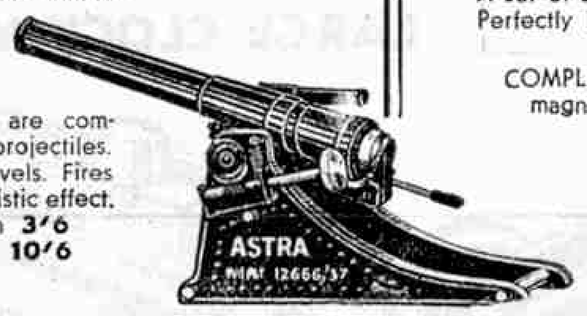


A.A. GUNS



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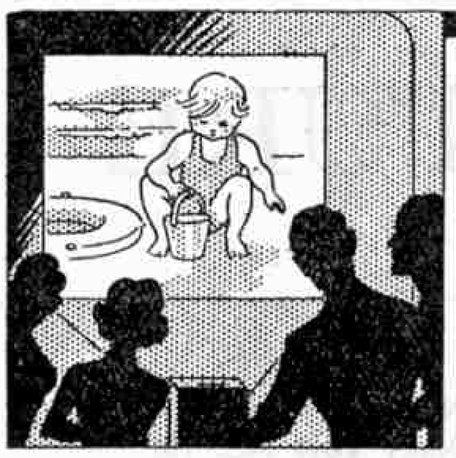

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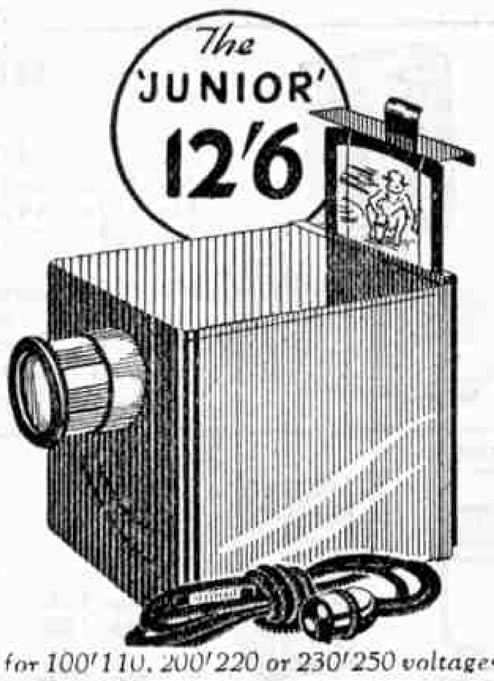

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COSTS YOU ONLY

2/6
Post Free
Larger Model 5/-

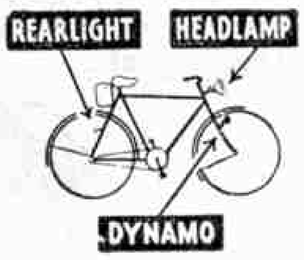
Brings before your eyes the amazing detail of insect life, fingerprints, marks on foreign stamps, etc., etc. This sturdily-built little instrument is fitted with three focusing lenses, swivel mirror reflector, specimen and spare slides. You'll never get a better bargain!

Write for free list of many other inexpensive novelties we can supply.

Send your P.O. to-day to

STOREY & CO.
NEW BRIGHTON, WALLASEY

Wise wheelers fit lamps that never fail. A brilliant headlight with 100ft. beam and red rear light, automatically generated as you ride. Safer! More sensible! And a Pifco Lighting Set saves money. No batteries. Extremely light, silent, easily fitted, weatherproof and guaranteed. Costs nothing to run.

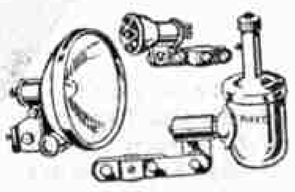


PIFCO "Service" Dynamo Set:—
6-volt dynamo, headlamp, red rear lamp, all chromium-plated.

10/6
From all Cycle Shops.

PIFCO

DYNAMO LIGHTING SET



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Write for Free Catalogue of Britain's Best Electric Cycle Lamps. (Prices from 1/11.)

PIFCO LTD., WATLING STREET, MANCHESTER

London Office: 58, City Road, E.C.1.

Dinky Toys

DOLL'S HOUSE FURNITURE

A WONDERFUL SERIES OF ACTUAL SCALE MODELS

The addition to the range of Dinky Toys of true-to-scale modern Furniture has been welcomed by all who appreciate the charm of these perfect miniatures. Much care and thought have been given to the finish and presentation of every article of this Furniture series. Each piece is based on a typical example of modern design, and **all are actual scale models made to a scale of 7/16th of an inch to one foot.** There is a tone and individuality of style about Dinky Toys Doll's House Furniture which cannot fail to appeal. Among the most attractive features are the opening doors and drawers. This furniture is far superior to anything of its kind that has ever before been produced for the delight and pleasure of young people.

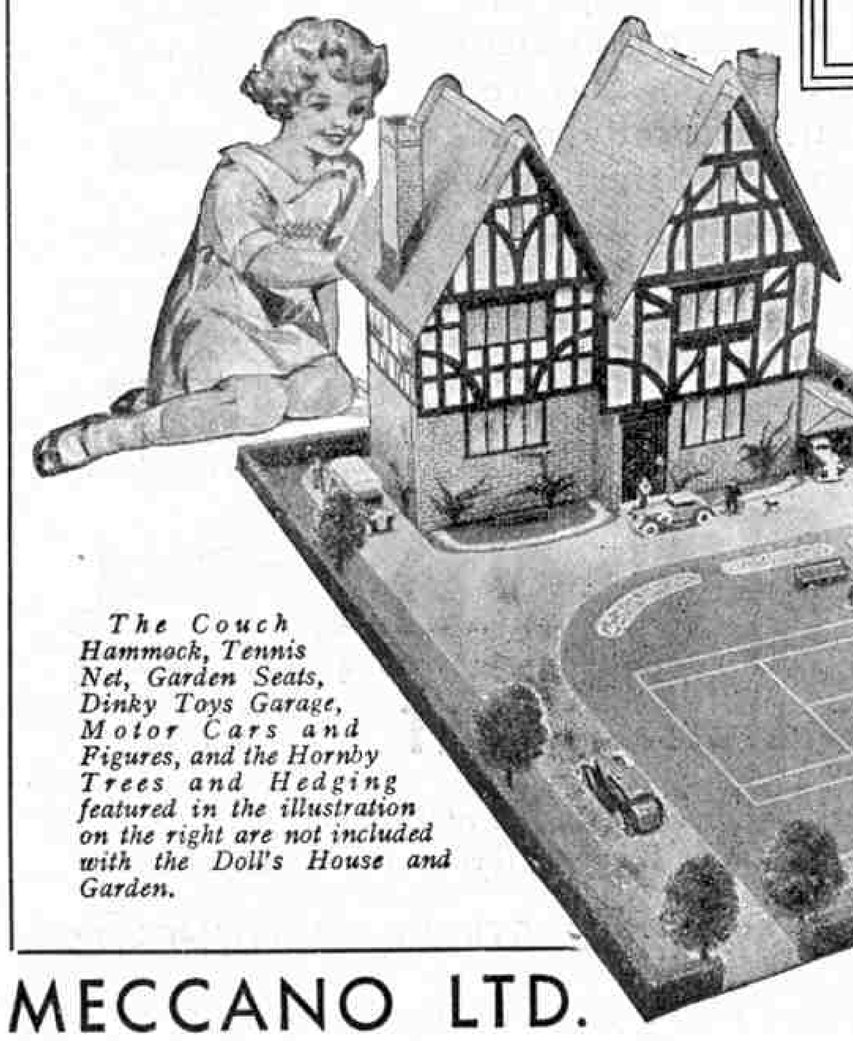
The Dinky Toys Furniture is fascinating! See it at your dealer's.

"Dolly Varden" Doll's House

The "Dolly Varden" Doll's House illustrated below has been specially designed for use with Dinky Toys Doll's House Furniture.

The house is collapsible and the exterior is designed to represent a half-timbered dwelling, while the interior decorations, which are printed in nine colours, are in an attractive modern style.

Reinforced leather board is the material of which the house is constructed, and when set up it is as strong as a wood structure. The container, which also is made of reinforced leather board, opens out to show a lovely garden with Tennis Lawn, Carriage Drive, and Rockery, providing an exquisite setting for play with Dinky Toys and Hornby Trees, Hedging, etc. Price 4/11

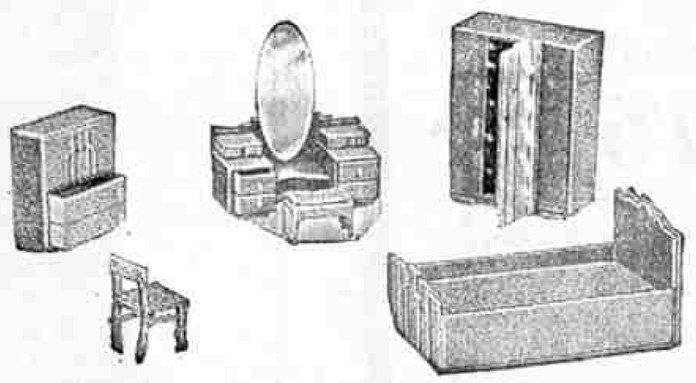


The Couch Hammock, Tennis Net, Garden Seats, Dinky Toys Garage, Motor Cars and Figures, and the Hornby Trees and Hedging featured in the illustration on the right are not included with the Doll's House and Garden.

DINING-ROOM FURNITURE
Dinky Toys No. 101
Price of complete set 2/3

No. 101a.	Table...	5d. each
No. 101b.	Sideboard (Opening doors)	9d. ,,
No. 101c.	Carver Chairs (2) ...	3d. ,,
No. 101d	Chairs ... (4) ...	2d. ,,

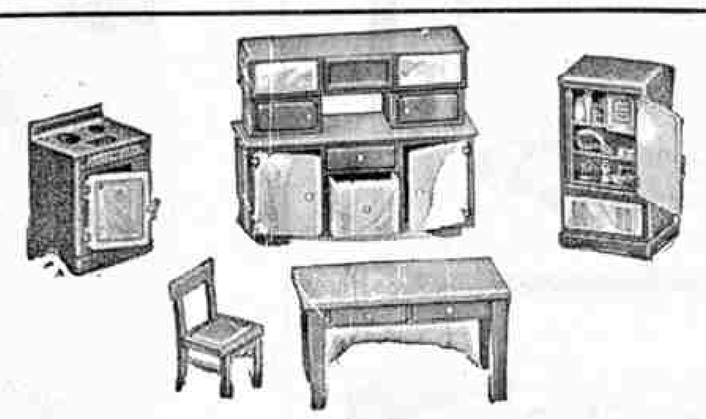
Supplied in walnut brown finish only.



BEDROOM FURNITURE
Dinky Toys No. 102
Price of complete set 2/11

No. 102a.	Bed	6d. each
No. 102b.	Wardrobe (Opening door) ...	9d. ,,
No. 102c.	Dressing Table (Opening drawers)	10d. ,,
No. 102d.	Dressing Chest (Opening drawers)	6d. ,,
No. 102e.	Dressing Table Stool	2d. ,,
No. 102f.	Chair	2d. ,,

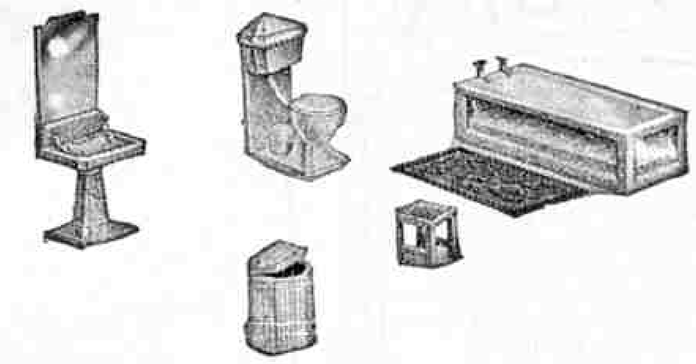
Supplied in colour or walnut brown finish.



KITCHEN FURNITURE
Dinky Toys No. 103
Price of complete set 2/6

No. 103a.	Refrigerator (Opening Door)	8d. each
No. 103b.	Kitchen Cabinet (Opening doors and drawer) ...	10d. ,,
No. 103c.	Electric Cooker (Opening door)	6d. ,,
No. 103d.	Table...	4d. ,,
No. 103e.	Chair...	2d. ,,

Supplied in two colour schemes—light blue and white; light green and cream.



BATHROOM FURNITURE
Dinky Toys No. 104
Price of complete set 2/-

No. 104a.	Bath	6d. each
No. 104b.	Bath Mat	1d. ,,
No. 104c.	Pedestal Hand Basin ...	6d. ,,
No. 104d.	Stool...	2d. ,,
No. 104e.	Linen Basket (Opening lid)	4d. ,,
No. 104f.	Toilet (Lifting lid)	6d. ,,

Supplied in two colour schemes—pink and white; light green and white.

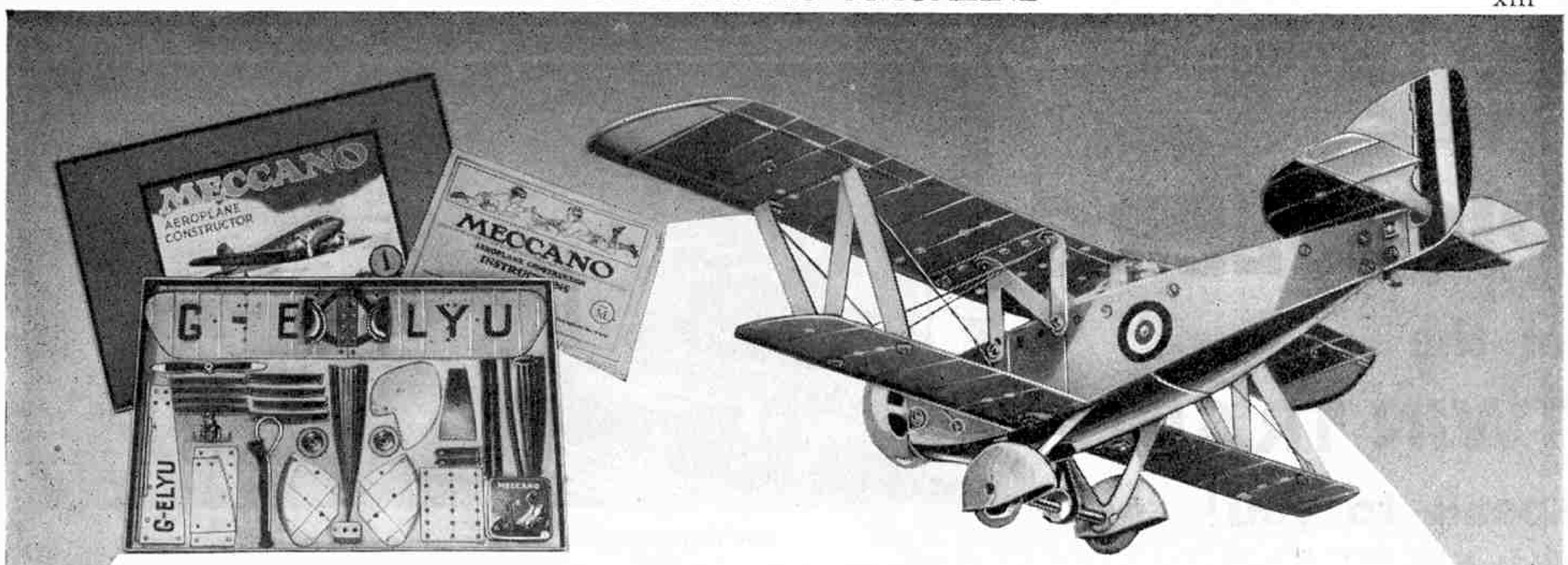
DIMENSIONS

The following are the overall dimensions of the "Dolly Varden" Doll's House when built up ready for play. Length, 1 ft. 6¾ in. Depth, 10¼ in. Height, 1 ft. 6¾ in.

The open container on which the house stands measures 3 ft. 3½ in. by 2 ft. 5½ in.

When the house is dismantled and packed in the container, the overall dimensions of the parcel are ¾ in. x 1 ft. 7½ in. x 2 ft. 5½ in.

MECCANO LTD. BINNS ROAD - LIVERPOOL 13



MECCANO AEROPLANE CONSTRUCTOR OUTFITS

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

Price List of Aeroplane Outfits

Standard Series

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

Special Series

No. 1 Special Outfit ...	12′6	No. 2 Special Outfit ...	21′-

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

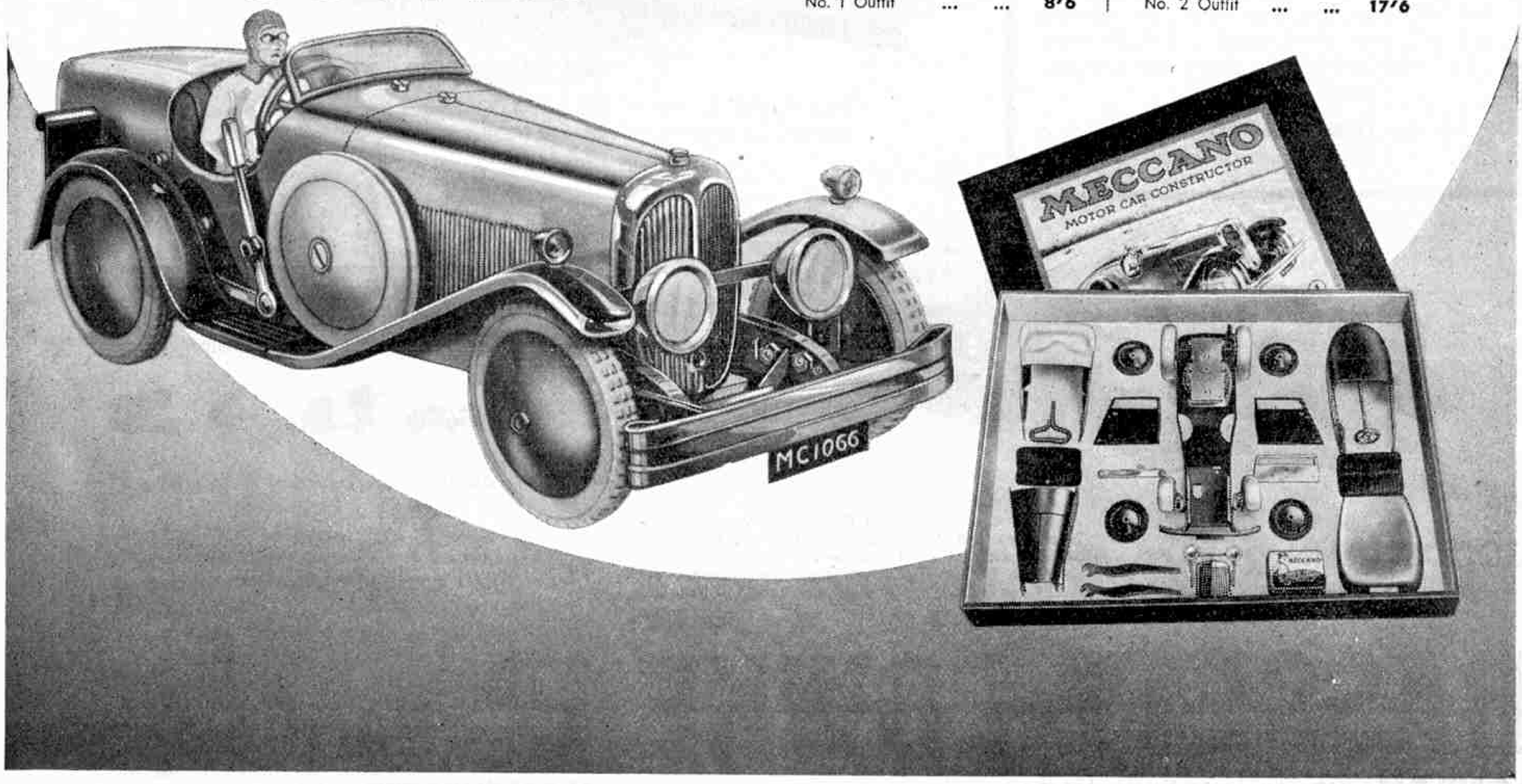
MOTOR CAR CONSTRUCTOR OUTFITS

Now is the time to get a Meccano Motor Car Outfit. You will never grow tired of building and running the superb models that you will be able to build. Your days will be full of fun and thrills!

Perfect miniature reproductions of many different types of car can be built with these splendid Outfits, and a powerful clockwork motor, that gives the models a long run on one winding, is included in each Outfit.

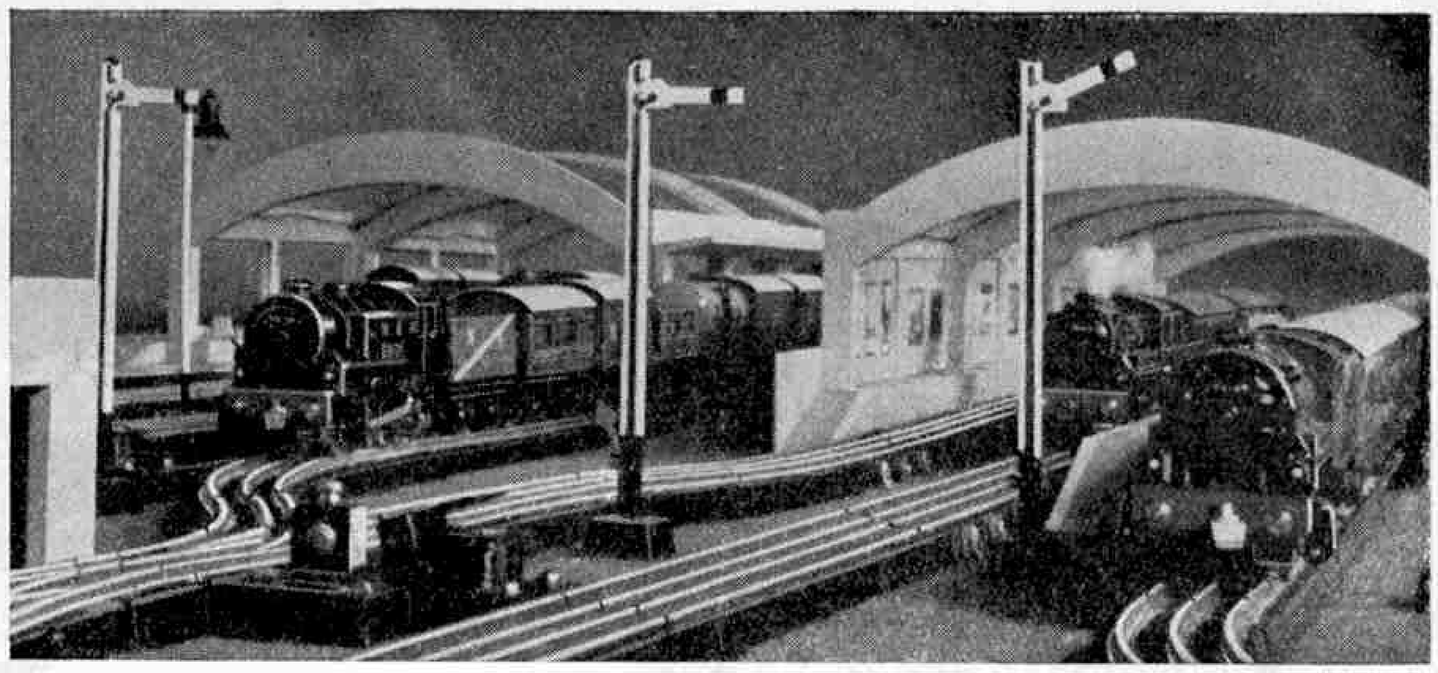
Prices of Motor Car Outfits

No. 1 Outfit	8′6	No. 2 Outfit	17′6



MECCANO LIMITED, BINNS ROAD, LIVERPOOL 13

THE PIONEERS of the "TWIN TRAINS" speak to you!



Twin Trains leaving a "Many Ways" Central Station

TO-DAY we have to show you the latest and most attractive development of the fascinating little "OO" gauge–the TWIN TRAIN TABLE RAILWAY of 1937.

But do you remember, way back in 1922, the first gauge "OO" railway outfit brought over from the continent by us. It was an inexpensive toy and made of tin, but embodied the principles of a small smart railway outfit at an inexpensive price.

We are proud to be the pioneers of such a smart railway as the "TWIN TRAINS," not only because it is popular but because it is sound good value and a brilliant new idea at that!

Send at once for the Bassett-Lowke Table Railway Booklet No. TT/17.

★GAUGE OO $\frac{5}{8}$"–16 mm. Scale 3½ mm. to 1 ft. **—RADIUS 13½"—** *A railway in a quarter of the space usually needed*

★OPERATED FROM AC/DC MAINS OR ACCUMULATORS

★REAL RAILWAY WORKING IN MINIATURE

You can work TWO Trains on one line at different speeds or let one go on and the other reverse. This feature alone presents unlimited possibilities.

RAILS ON BAKELITE BASE. Perfect insulation, rigid, smooth, non-scratching, non-bending.

NEW METHOD OF CONNECTING RAILS, POINTS and CROSSINGS. Better than anything done before, easy to join firmly, just as easy to take apart, but impossible to bend or damage in disconnecting.

ELECTRIC MOTOR UNIT, extra strongly built, all parts screwed, therefore replacements readily fitted. Runs at all speeds from extra slow shunting to fastest express speeds.

Automatic Couplings fitted throughout.

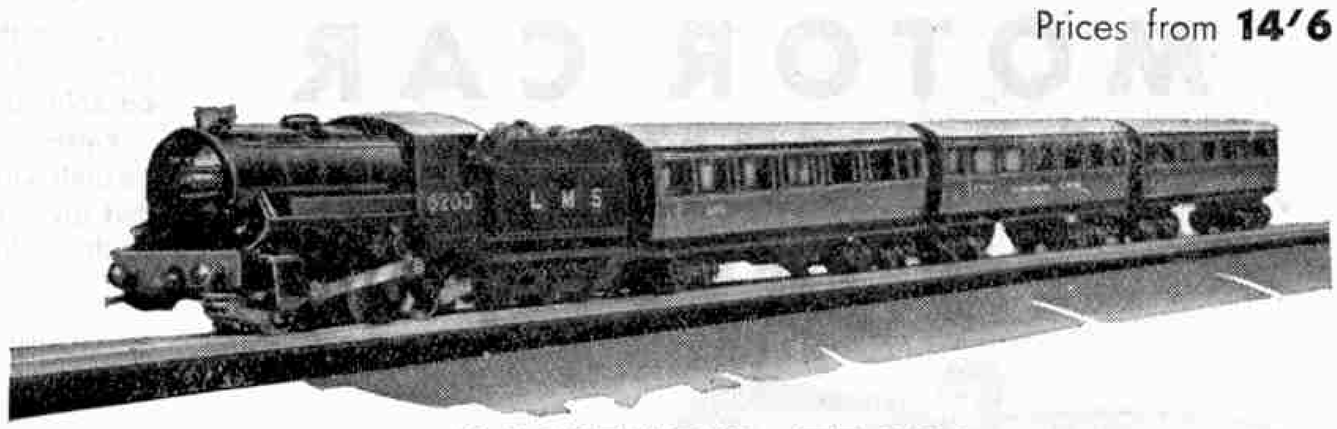
NEW—All Trains are now packed without rails. Seven different self-contained rail formations are available, suitably graded, complete with necessary points, levers, plugs, wire, buffer stops, ½ and ¼ rails and crossings, ready to lay down according to plan enclosed, and included with each formation is a TTR Permanent Way *Manual*.

Prices from **14′6**

"MANY WAYS" STATION BUILDINGS

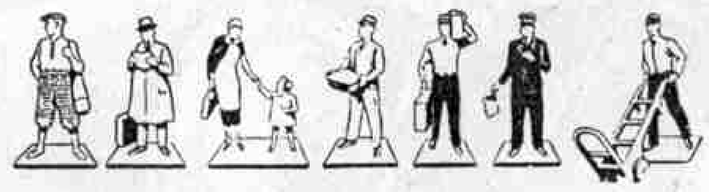
The latest idea in Model Station Interchangeable Units of modern design for making any type and size of station. All finished in Ferro-Concrete colour. Roof and windows glazed with new glass unbreakable material.

Sets from **11′6** and separate units supplied. Full details see catalogue.



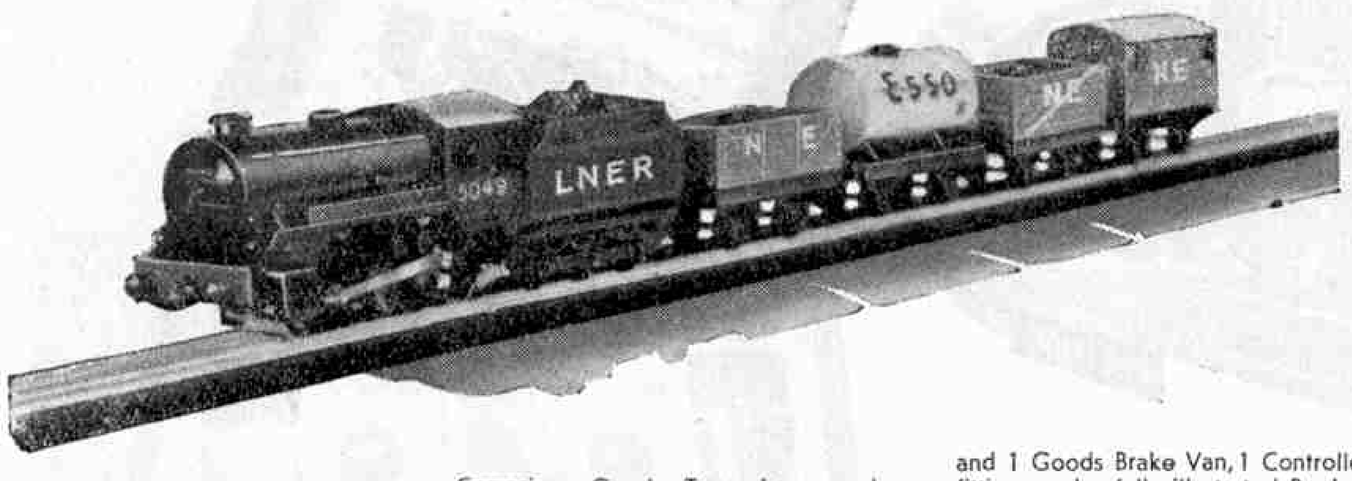
PASSENGER TRAIN

L.M.S. 4, also in L.N.E.R. and S.R. 4. Comprises Passenger Loco and Tender, 3 Bogie Coaches, 1 Controller, fittings and Instruction Book, 28 in. Price **37′-**



SCALE SIZE PASSENGERS–
PLATFORM ACCESSORIES–from **1′-** per set.

SCALE LUGGAGE – 9 pieces – **1′-**



GOODS TRAIN

L.M.S. 4, L.N.E.R. and S.R. 4

Comprises Goods Type Loco and Tender, black with correct Lettering and Lining, 1 High-sided Open Truck, 1 Tank Truck, 1 Low-sided Open Truck and 1 Goods Brake Van, 1 Controller, fittings and a fully illustrated Book of Instruction and information. Correct Colours, Lettering and Lining, in handsome red Box. Length of train, 20 in.

Price **32′-**

Owing to the varying Electric Supply Systems, Transformers are not included in the Train Sets and should be ordered separately, stating voltage, from mains.

Prices from **11′6**

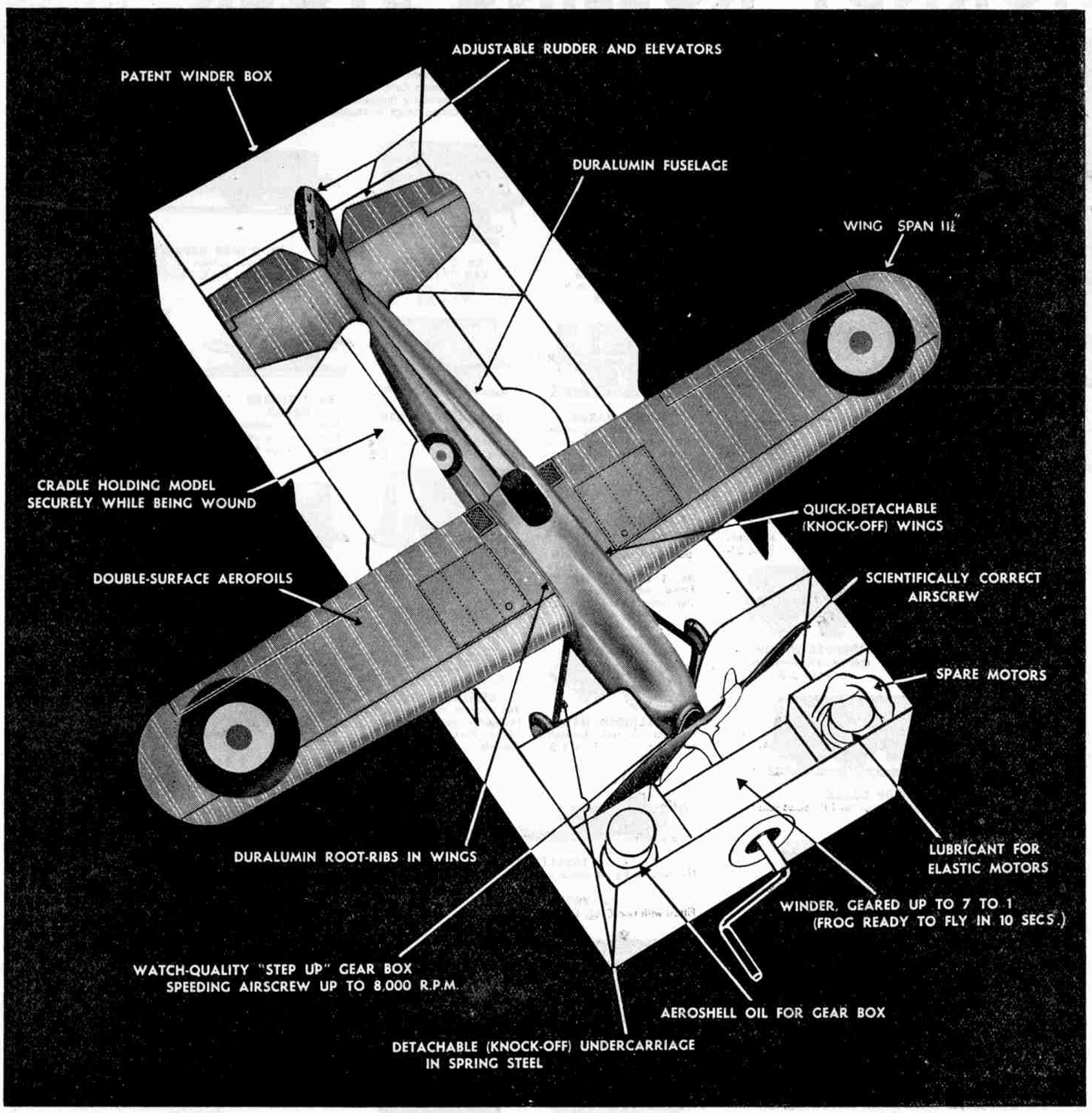
BASSETT-LOWKE LTD. Northampton

LONDON: 112, High Holborn, W.C.1

MANCHESTER: 28, Corporation Street

● *Call and see the Twin Trains working at our London Branch*

This box makes 6 flights possible in the time of one



FROG INTERCEPTOR FIGHTER
Correctly coloured with British Service markings and aluminium finish to Air Ministry specification. Also obtainable with the correct markings of six other countries. Each model is flight tested before leaving the factory.

Trade Mark Regd.

FREE FLIGHT INSTRUCTION
Lines Bros. will give free flight instruction by appointment on the Frog Aerodrome at Merton. Phone: Liberty 1041.

Send the coupon on page xxii for the new coloured 8-page leaflet showing all FROG ranges, including the PENGUIN series.

ONLY **5/-**

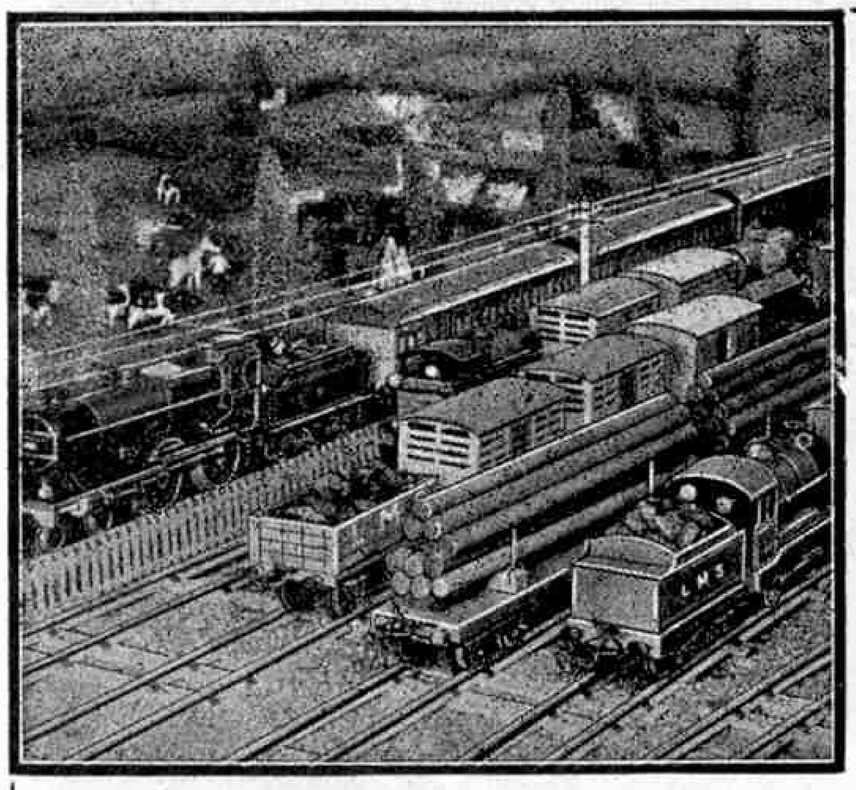
FROM ALL GOOD TOYSHOPS AND STORES

FROG MODEL AIRCRAFT

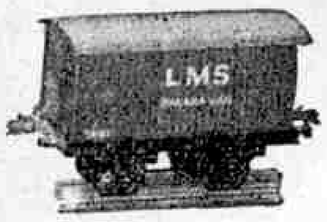
FROG Model Aircraft are covered by World Patents granted and pending. Made in England by International Model Aircraft Ltd. Sole concessionaires:

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

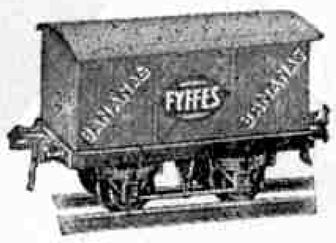
HORNBY ROLLING STOCK



The Hornby Series includes a splendid range of realistic Rolling Stock. Each item is fitted with patented and exclusive automatic couplings, a special feature that places it in a class entirely of its own. There are Pullman Cars, Passenger Coaches, Guards' Vans, Tipping Wagons, Lumber Wagons, and many other types, all beautifully finished.
An attractive selection of Hornby Rolling Stock is illustrated and described on this page. Ask your dealer for a complete price list.

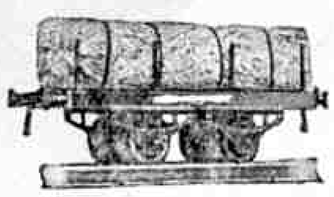


No. 0 BANANA VAN
Lettered L.M.S only.
Price **1/6**

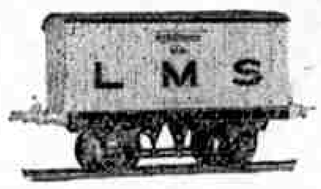


No. 1 BANANA VAN "FYFFES"
Sliding doors.
Price **2/3**

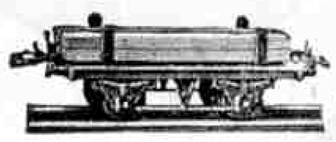
No. 2 HIGH CAPACITY WAGON
Finished in correct colours of G.W. and L.M.S. "Loco Coal" Wagons, or L.N.E.R. "Brick" Wagon. Not suitable for 1 ft. radius rails.
Price **3/9**



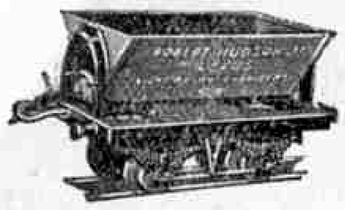
FIBRE WAGON
This is an interesting model of a type of wagon used in France and other European countries.
Price **1/3**



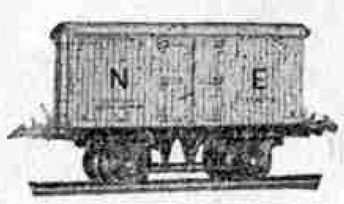
***REFRIGERATOR VAN No. 1**
Finished in white. With sliding doors.
Price **2/3**



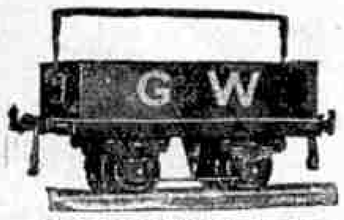
No. 1 TIMBER WAGON
Beautifully enamelled in yellow and red.
Price **1/3**



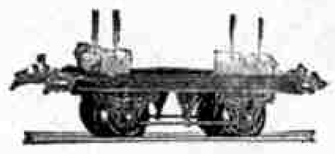
No. 1 SIDE TIPPING WAGON
Excellent design and finish. Lettered "Robert Hudson Ltd."
Price **1/9**



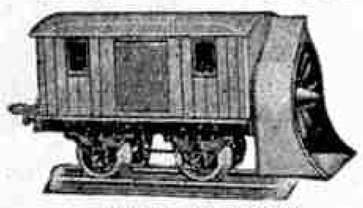
No. 0 REFRIGERATOR VAN
Lettered L.M.S., G.W., N.E and S.R. Finished with the appropriate details.
Price **1/6**



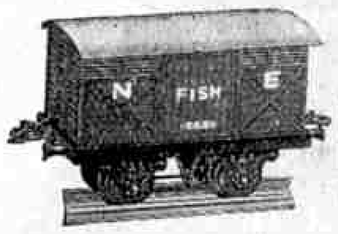
***OPEN WAGON "B"**
Fitted with centre tarpaulin-supporting rail.
Price **2/-**



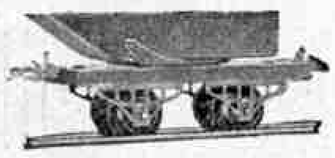
No. 1 LUMBER WAGON
Fitted with bolsters and stanchions for log transport.
Price **1/3**



SNOW PLOUGH
With revolving plough.
Price **3/6**



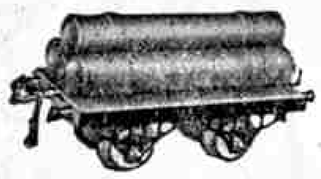
No. 0 FISH VAN
Lettered L.M.S., G.W. and N.E.
Price **1/6**



No. 0 ROTARY TIPPING WAGON
Container revolves and tips.
Price **1/6**

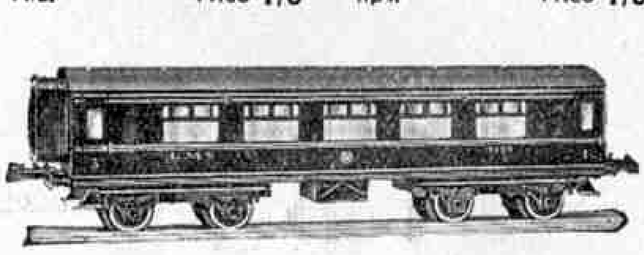
***No. 1 WAGON**
Price **1/6**

***HOPPER WAGON**
Mechanically unloaded
Price **2/9**



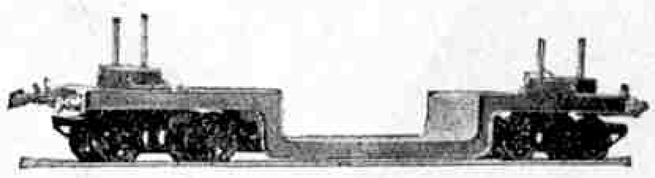
GAS CYLINDER WAGON
Finished in red, lettered gold.
Price **1/6**

CEMENT WAGON
The door at the top opens. Finished in yellow. Lettered "Blue Circle" Portland Cement.
Price **1/11**



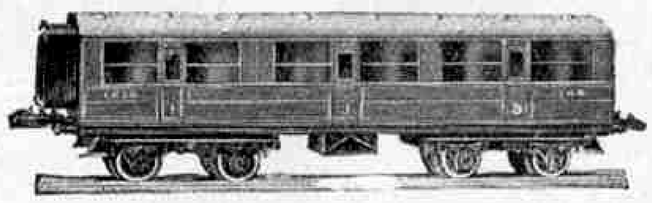
No. 2 CORRIDOR COACH
L.M.S. First-third. Not suitable for 1 ft. radius rails.
Price **7/6**

No. 2 CORRIDOR COACH
L.M.S. Brake-composite. Not suitable for 1 ft. radius rails.
Price **7/6**

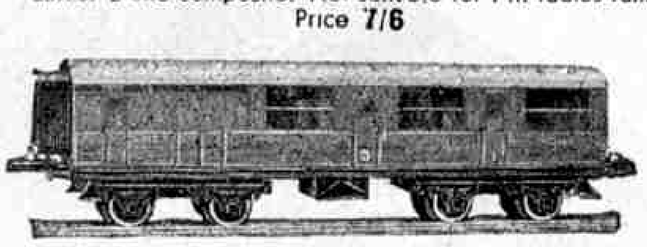


TROLLEY WAGON
Not suitable for 1 ft. radius rails.
Price **3/9**

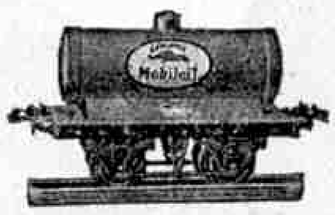
TROLLEY WAGON
Fitted with two Cable Drums.
Price **4/3**



No. 2 CORRIDOR COACH
L.N.E.R. First-third. Not suitable for 1 ft. radius rails.
Price **7/6**

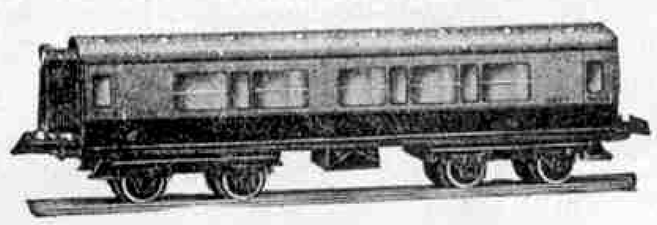


No. 2 CORRIDOR COACH
L.N.E.R. Brake-composite. Not suitable for 1 ft. radius rails.
Price **7/6**

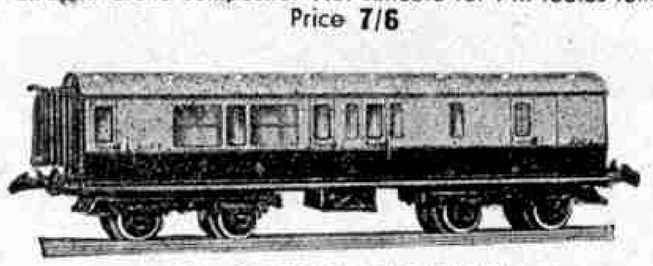


OIL TANK WAGON "MOBILOIL"
Finished in battleship grey.
Price **1/11**

No. 1 PETROL TANK WAGON. "SHELL-B.P."
Price **1/11**



No. 2 CORRIDOR COACH
G.W. First-third. Not suitable for 1 ft. radius rails.
Price **7/6**



No. 2 CORRIDOR COACH
G.W. Brake-composite. Not suitable for 1 ft. radius rails.
Price **7/6**

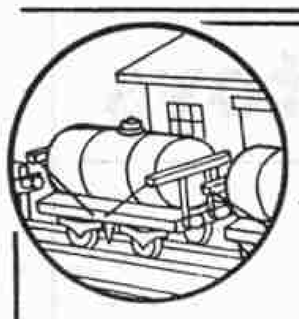
No. 0 MILK TRAFFIC VAN
An attractive model. Available lettered G.W. only.
Price **1/6**

CHOCOLATE VAN "CADBURY'S"
This van is beautifully enamelled in blue with white roof.
Price **2/3**

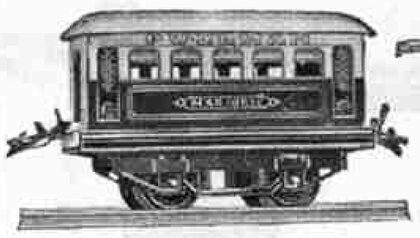
No. 2 CORRIDOR COACH
S.R. Third-class. Not suitable for 1 ft. radius rails.
Price **7/6**

Lettered L.M.S., N.E., G.W. or S.R.

MECCANO LTD., BINNS ROAD, LIVERPOOL 13

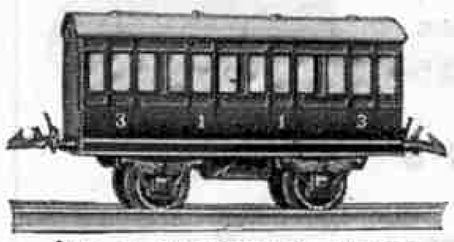


HORNBY ROLLING STOCK



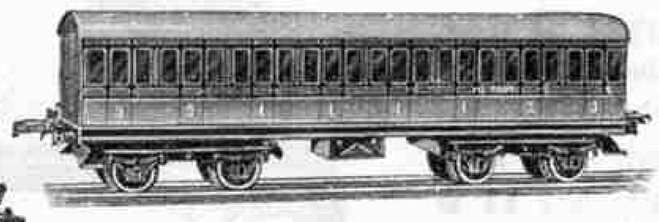
No. 0 PULLMAN COACH
Price **1/3**

No. 1 PULLMAN COACH
Price **2/6**

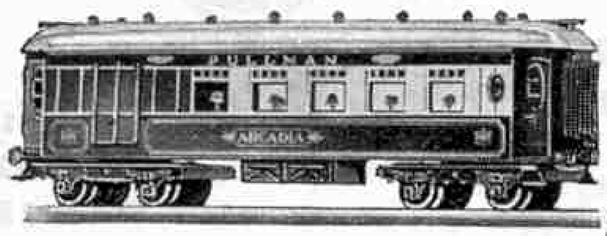


***No. 1 PASSENGER COACH**
Price **2/6**

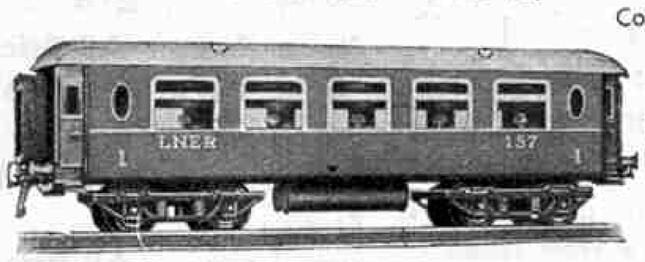
***GUARD'S VAN**
Price **2/6**



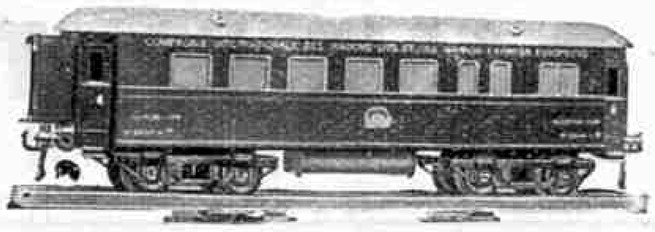
***No. 2 PASSENGER COACH**
Not suitable for 1 ft. radius rails. First-third or Brake-third. Price **6/6**



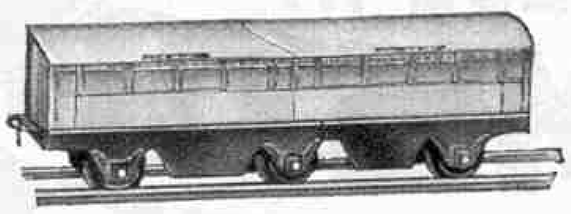
No. 2 SPECIAL PULLMAN COMPOSITE COACH
Not suitable for 1 ft. radius rails. Price **13/-**



No. 2 SALOON COACH
L.M.S. or L.N.E.R. Not suitable for 1 ft. radius rails.
Price **9/6**

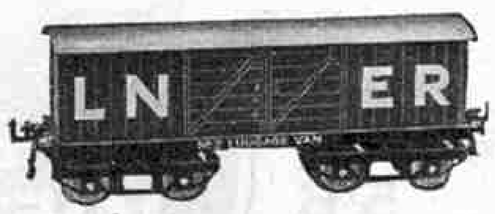


RIVIERA "BLUE" TRAIN COACH
For 2 ft. radius rails only. Price **10/6**
"Dining Car" or "Sleeping Car"

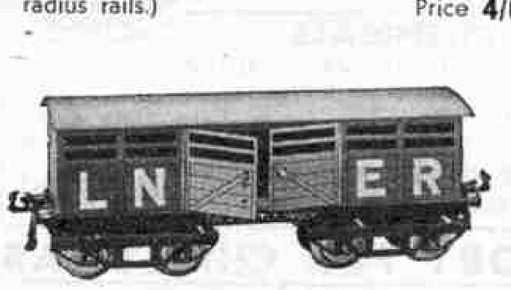


No. 0 "SILVER JUBILEE" COACH
Articulated. Finished in silver and grey.
Price **1/9**

No. 0 STREAMLINE COACH
Articulated. Available in two colour schemes, maroon and cream and light green and dark green. Price **1/9**

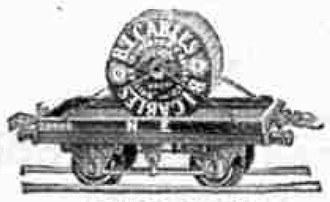


***No. 2 LUGGAGE VAN**
Opening double doors. (Not suitable for 1 ft. radius rails.) Price **4/6**



***No. 2 CATTLE TRUCK**
Opening doors. (Not suitable for 1 ft. radius rails.) Price **4/6**

COVERED WAGON
(French Type)
Fitted with frame and sheet. Lettered "NORD." Price **2/6**



***FLAT TRUCK**
Without Cable Drum. Price **1/6**
Complete with Cable Drum. Price **1/9**

CABOOSE
As used on American railways.
Price **2/-**

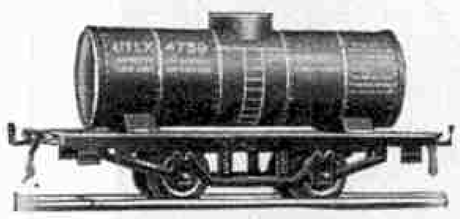
***FLAT TRUCK**
Complete with Container
Price **2/-**

CONTAINERS
L.M.S. (Furniture), L.N.E.R. (Goods), G.W.R. (Insulated), S.R. (Ventilated).
Price **6d.** each.

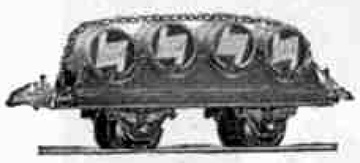
WAGON (French Type)
Lettered "NORD." Price **3/3**

No. 1 PETROL TANK WAGON "ESSO"
Price **1/11**

MILK TANK WAGONS "NESTLE'S MILK"
Price **4/6**

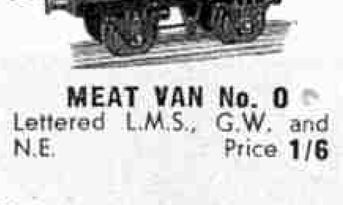


TANK CAR (American Type)
As used in America for the conveyance of oil, etc. Price **1/9**

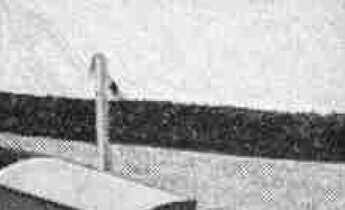


BARREL WAGON
With four "Castrol" Barrels. Price **2/6**

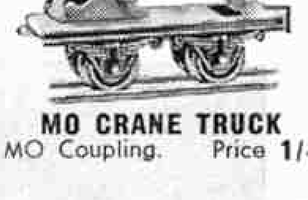
WINE WAGON, DOUBLE BARREL
A fine model of a wagon much used in France. Price **4/6**



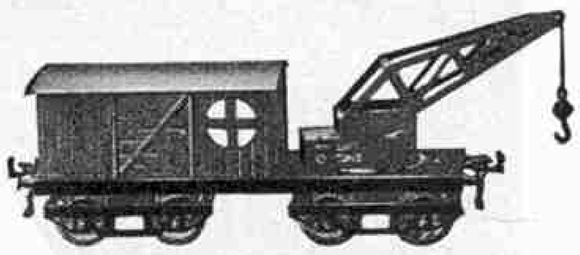
MEAT VAN No. 0
Lettered L.M.S., G.W. and N.E. Price **1/6**



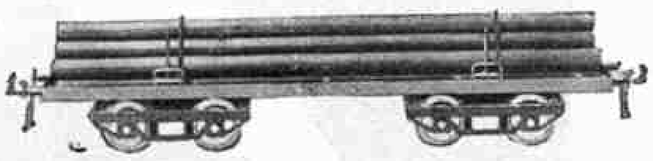
MO PETROL TANK WAGON "SHELL MEX"
Finished in cream with lettering in black. Price **1/-**



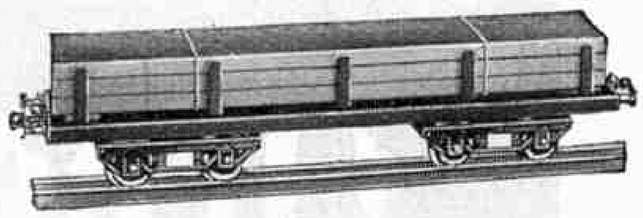
MO CRANE TRUCK
MO Coupling. Price **1/-**



***BREAKDOWN VAN AND CRANE**
Sliding doors. (Not suitable for 1 ft. radius rails.)
Price **5/11**



No. 2 LUMBER WAGON
Fitted with bolsters and stanchions. (Not suitable for 1 ft. radius rails.) Price **2/11**

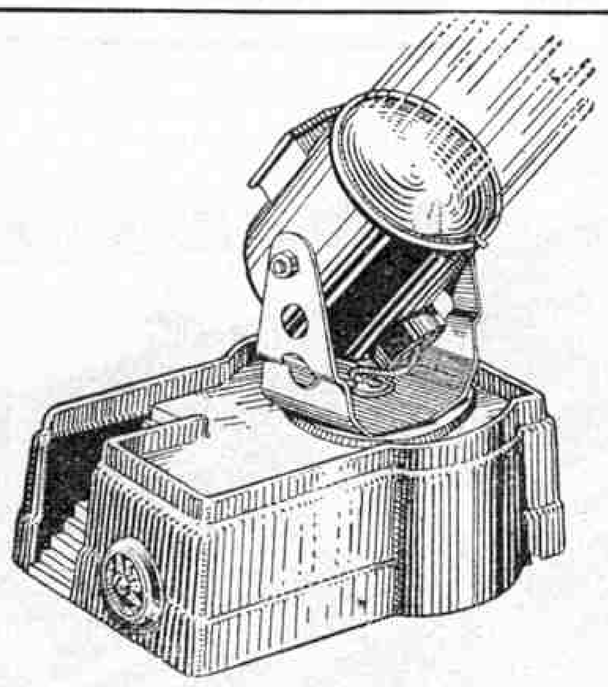


No. 2 TIMBER WAGON
(Not suitable for 1 ft. radius rails.) Price **2/6**

*Lettered L.M.S., N.E., G.W. or S.R.

MECCANO LTD., BINNS ROAD, LIVERPOOL 13

Write to RAVEN'S for these fine toys



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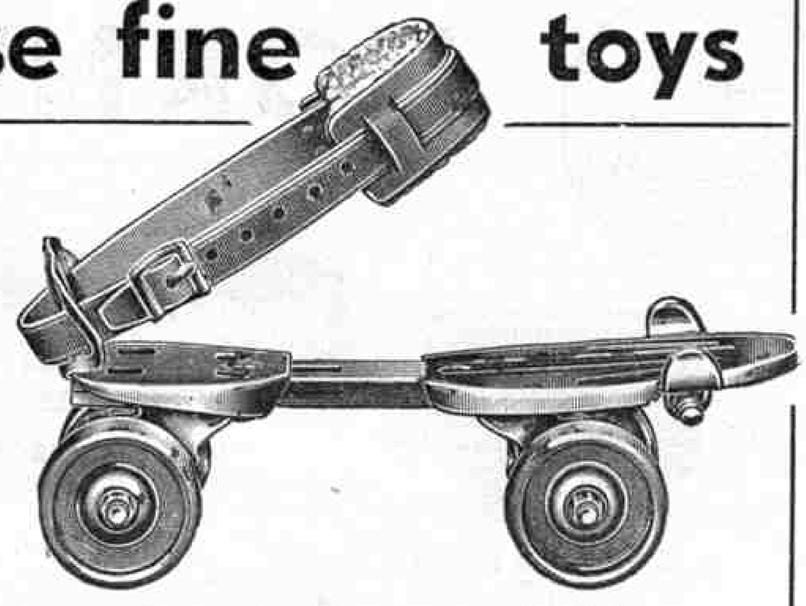
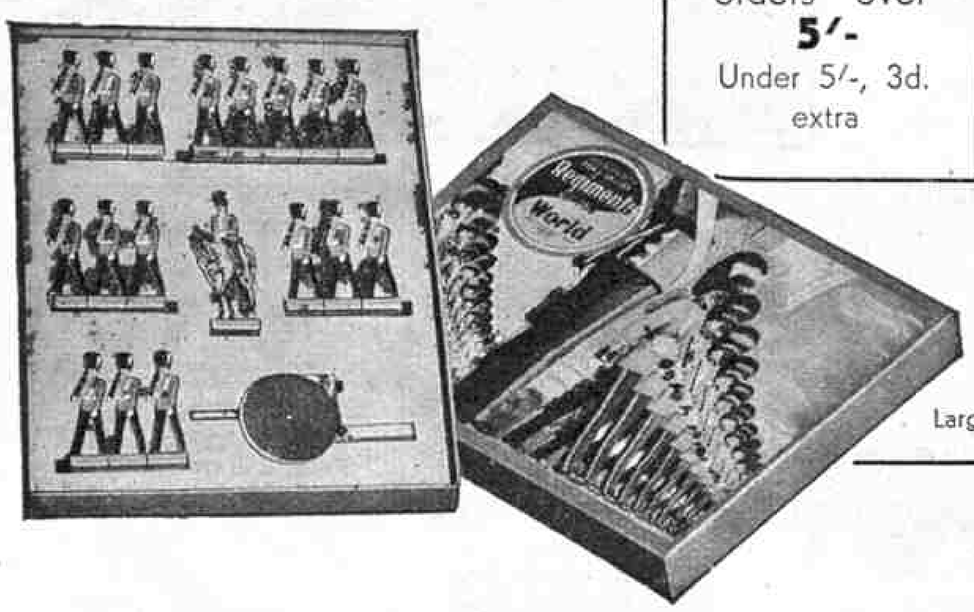
Boys, Heavy Duty **11'6**
Girls, Heavy Duty **12'6**
Solid Rubber Tyred **22'6**



Carriage Paid in U.K. on all orders over **5'-**
Under 5'-, 3d. extra



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MADE FROM 3-PLY WOOD
Infantry 3¼ ins. high
Cavalry 4¼ ins. high
12 Infantry and 1 (per box) Mounted Officer **1'-**
8 Cavalry ... ... **1'-**
17 Infantry, 1 Mounted Officer and 1 Cannon ... **1'11**
or 12 Cavalry and 1 Cannon ... ... **1'11**
All in full authentic colours.
18 Assorted Regiments.

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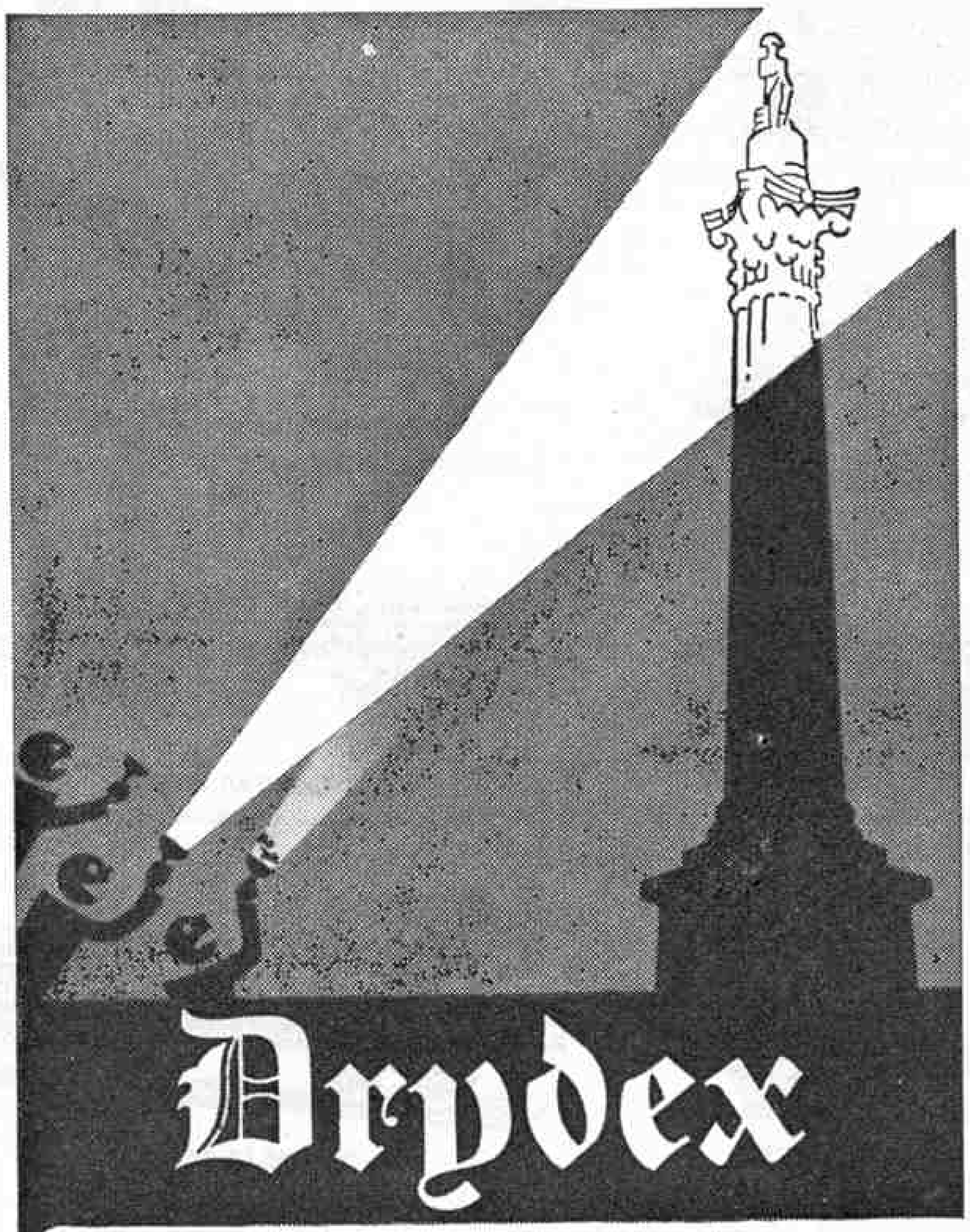

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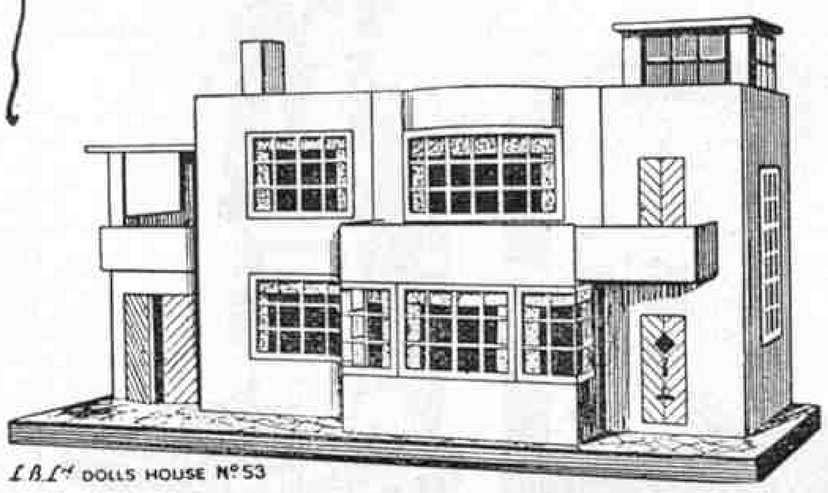
TRI-ANG TOYS

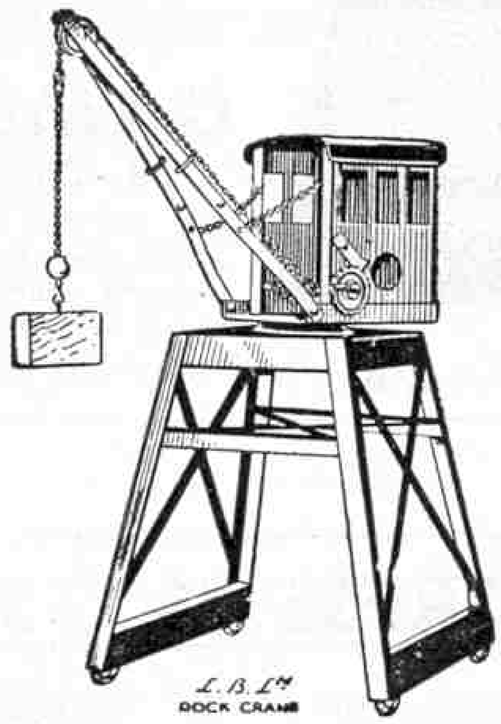


DOLL'S HOUSE No. 53. Four large rooms, fitted with electric wall lights. Metal framed windows. Kitchen fitted with dummy gas stove, sink and dresser. Built-in garage. Movable suntrap. Finished in cream and green, with imitation crazy paving. Length 42 ins. Price **59/6**
Other models **12/6, 22/6, 29/6, 45/–.**

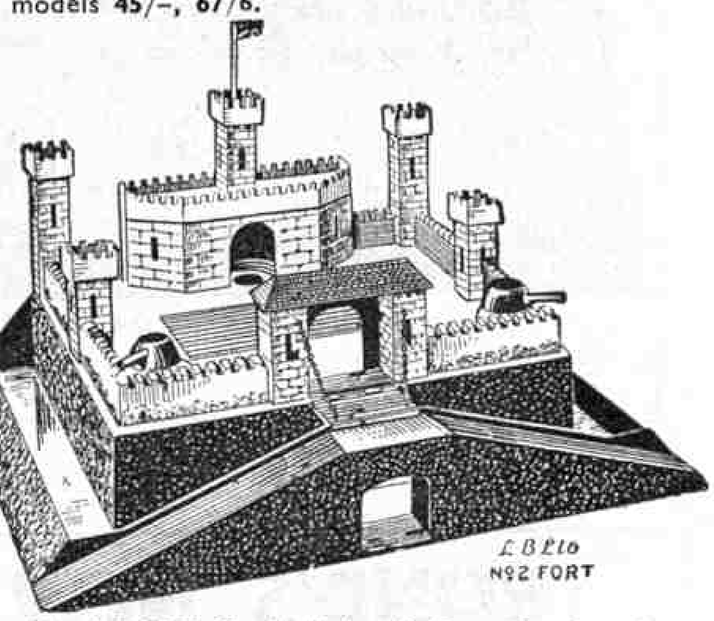
24K DOLL'S PRAM. Handsome design. Steel body. 10 in. tangent spoke, non-track wheels. CHROMIUM PLATED rims. 1 in. cushion tyres. Leather cloth hood and apron. CHROMIUM PLATED handles. Length of body 24 ins. Price **55/–**

DOLL'S HOUSE No. 93. Fashionable Tudor design. Half-timbered gables and front. Built-in garage with opening doors. Two bedrooms, dining room, bathroom and kitchen, with dummy range, dresser and sink. Four ELECTRIC wall lights with switches. Red tiled roof. Steps and dummy shrubs. Length 47¼ ins. Price **75/–**
Other models **45/–, 67/6.**

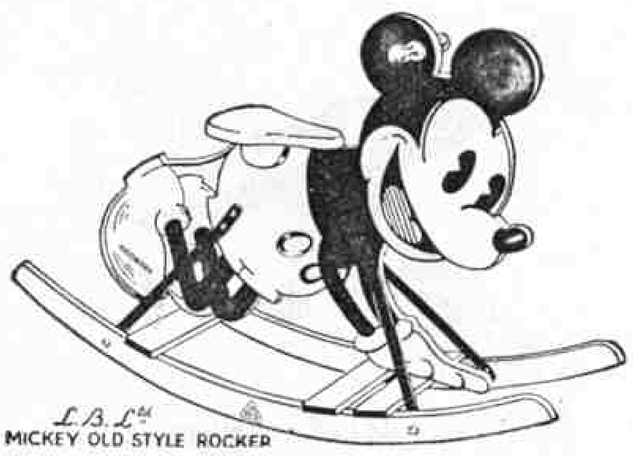
No. 2 THEATRE. Electric footlights and spot-light. Roll-up velvet curtain. Two specially written plays with stage directions. Finished in black and silver. Length 20 ins. Price **25/–**
Other models **15/–, 37/6.**



DOCK CRANE. Realistic all steel model. Working Model Crane with chain winding gear. Crane swivels on stand. Finished in Red. Height 17⅜ ins. Price **4/6**



No. 2 FORT. Castle design. Self-contained moat, ramps, drawbridge and flagstaff. Two spring model cannons. Fitted with electric light, battery extra. Price **9/6**
Other models **7/6, 15/11, 23/6.**

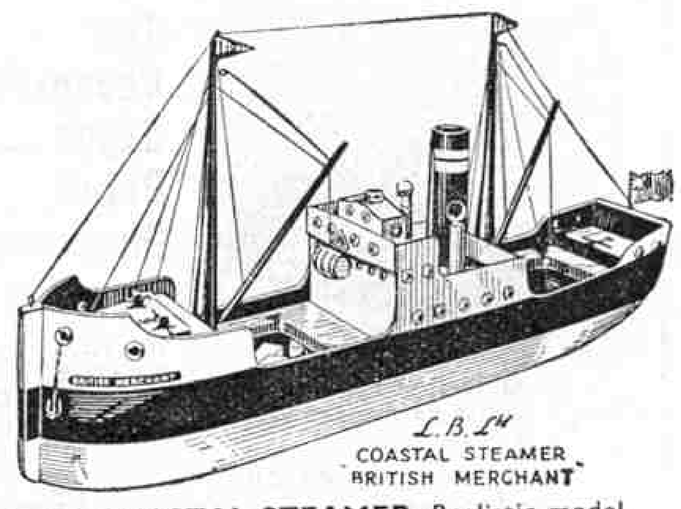


MICKEY OLD STYLE ROCKER. Amusing new rocker, very strongly constructed and fitted with handle grips. Finished in bright colours. Height to seat 16 ins. Price **17/6**

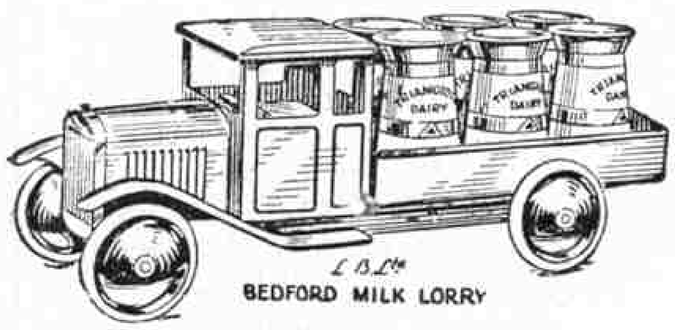
No. 2 KNEEHOLE DESK AND CHAIR. Very strong construction with dark oak finish. Fitted with seven drawers, pen rack and inkwell. Chair nicely upholstered. Height of desk 24 ins. Price **32/6**

ASK YOUR DEALER FOR THE TRI-ANG TOY COLOURED LEAFLET

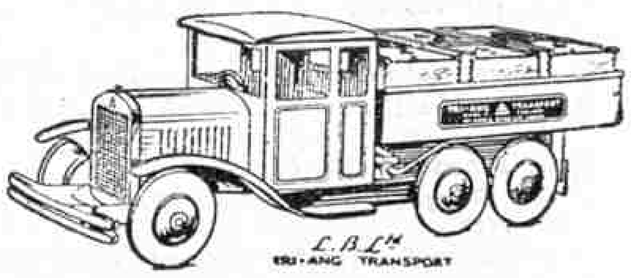
Obtainable from all good Toy Shops and Stores



No. 3 COASTAL STEAMER. Realistic model. Strong clockwork motor. Working derricks and winding winches. Two holds with dummy cargo, dummy port holes, navigating lights and lifebelts. Length of hull 29½ ins. Price **37/6**
Other models **7/6, 12/6, 21/–.**



BEDFORD MILK LORRY. Fully enclosed driving cab, steel wheels, rubber tyres, plated radiator. Complete with six churns. Length 19 ins. Price **6/11**



TRI-ANG TRANSPORT SIX. All steel construction. Special fly-wheel driving mechanism. Motor type steering. Two link tip-up action. Complete with six hardwood cases. Length 19¼ ins. Price **11/6**. With electric lights **13/6**

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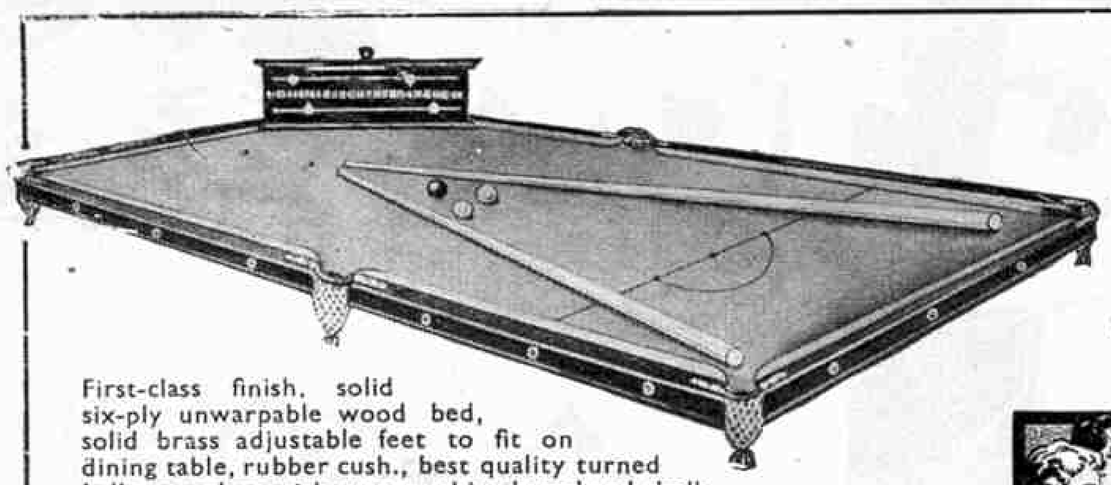

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PRICES THAT UTTERLY DEFY COMPETITION

Overall Size of Table	Size of Cues	Size of Balls	Each
5 ft. 3 ins. x 2 ft. 8 ins.	4 ft. Ash Cues	1⅜ ins.	42/-
4 ft. 9 ins. x 2 ft. 5 ins.	4 ft. ,,	1⅜ ins.	35/-
4 ft. 3 ins. x 2 ft. 2 ins.	3 ft. ,,	1¼ ins.	27/6

Carriage paid to nearest Railway Station.

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for above. 17 balls to the set complete with triangle.

1¼ ins. **12/6** 1⅜ ins. **14/6** 1⅝ ins. **22/6** 1¾ ins. **29/6**

Why not make the game more fascinating with a set of snooker balls.

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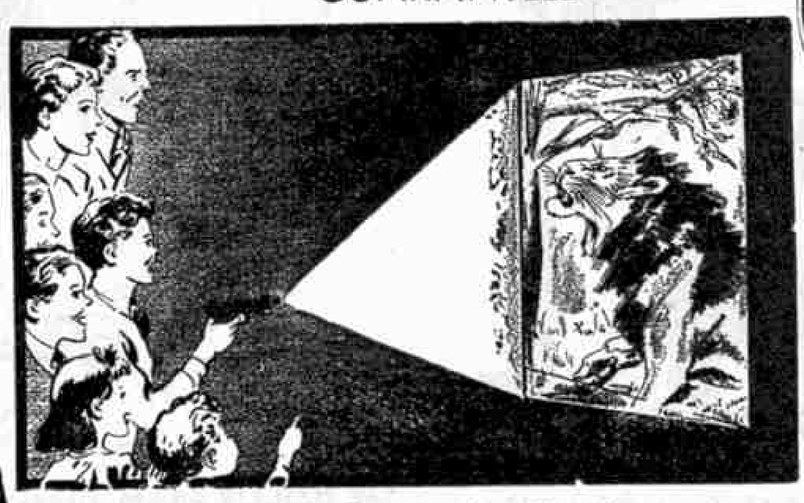

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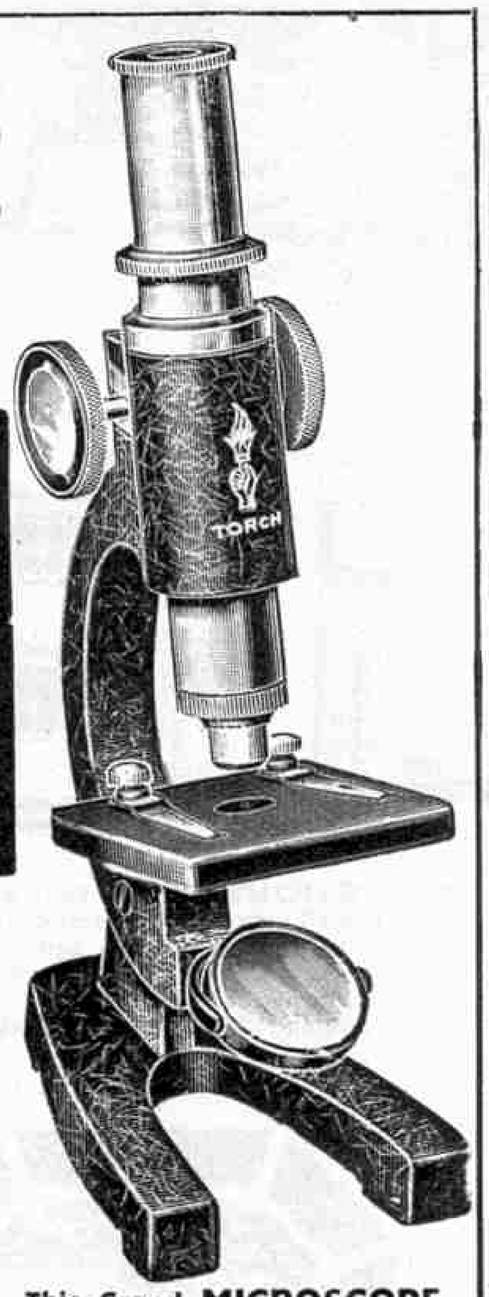

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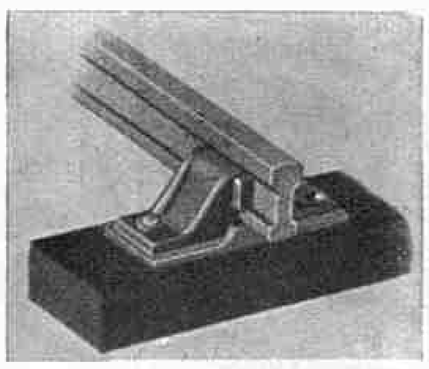

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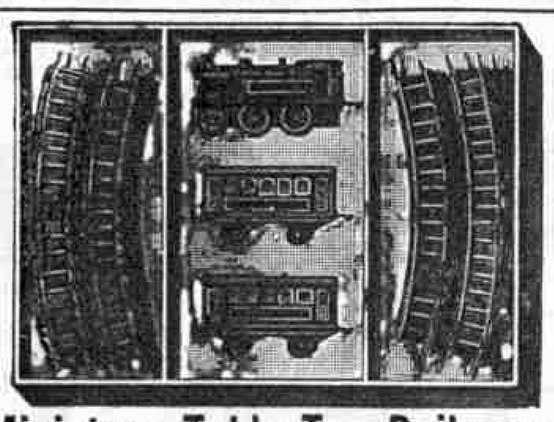

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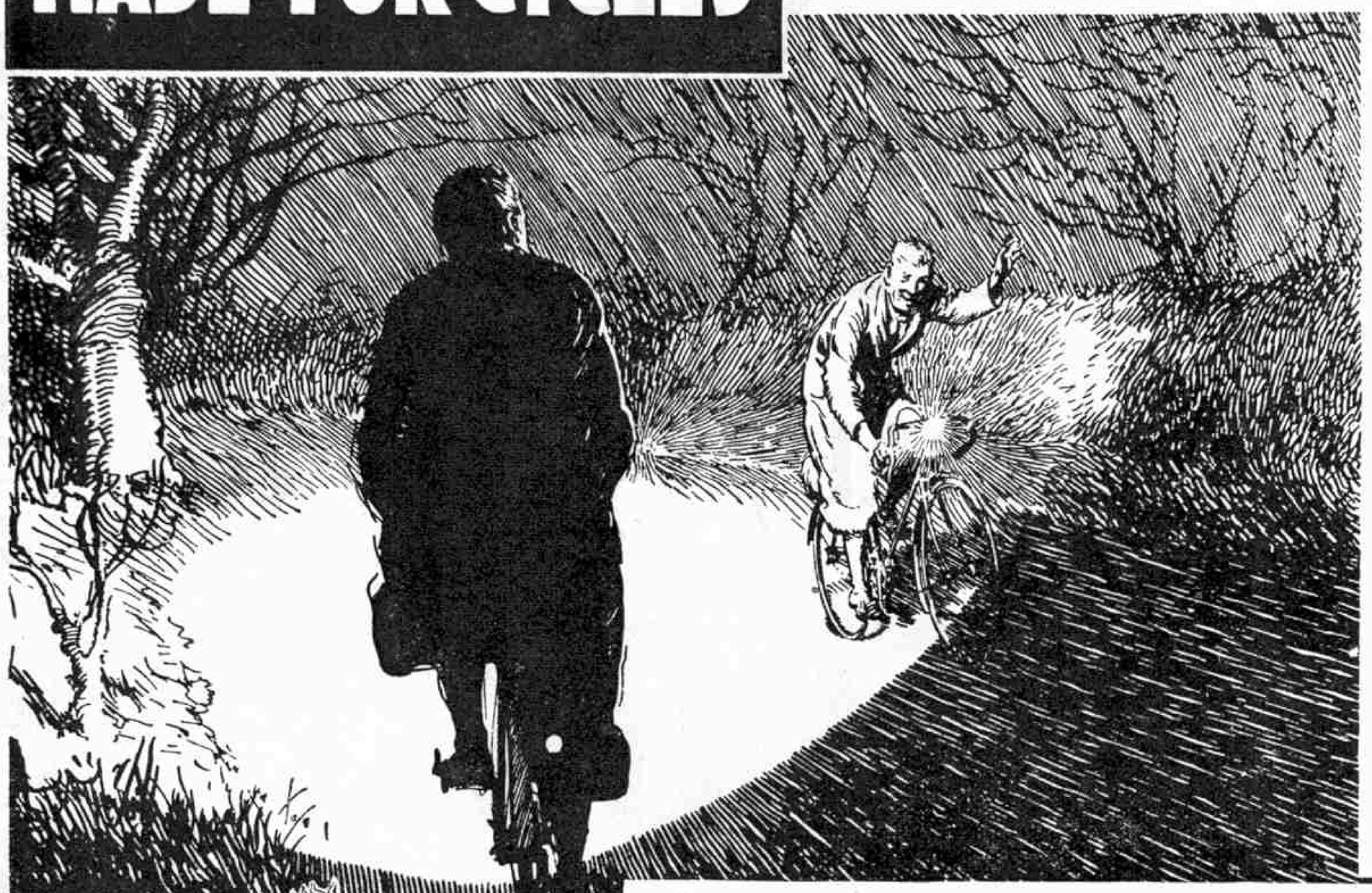

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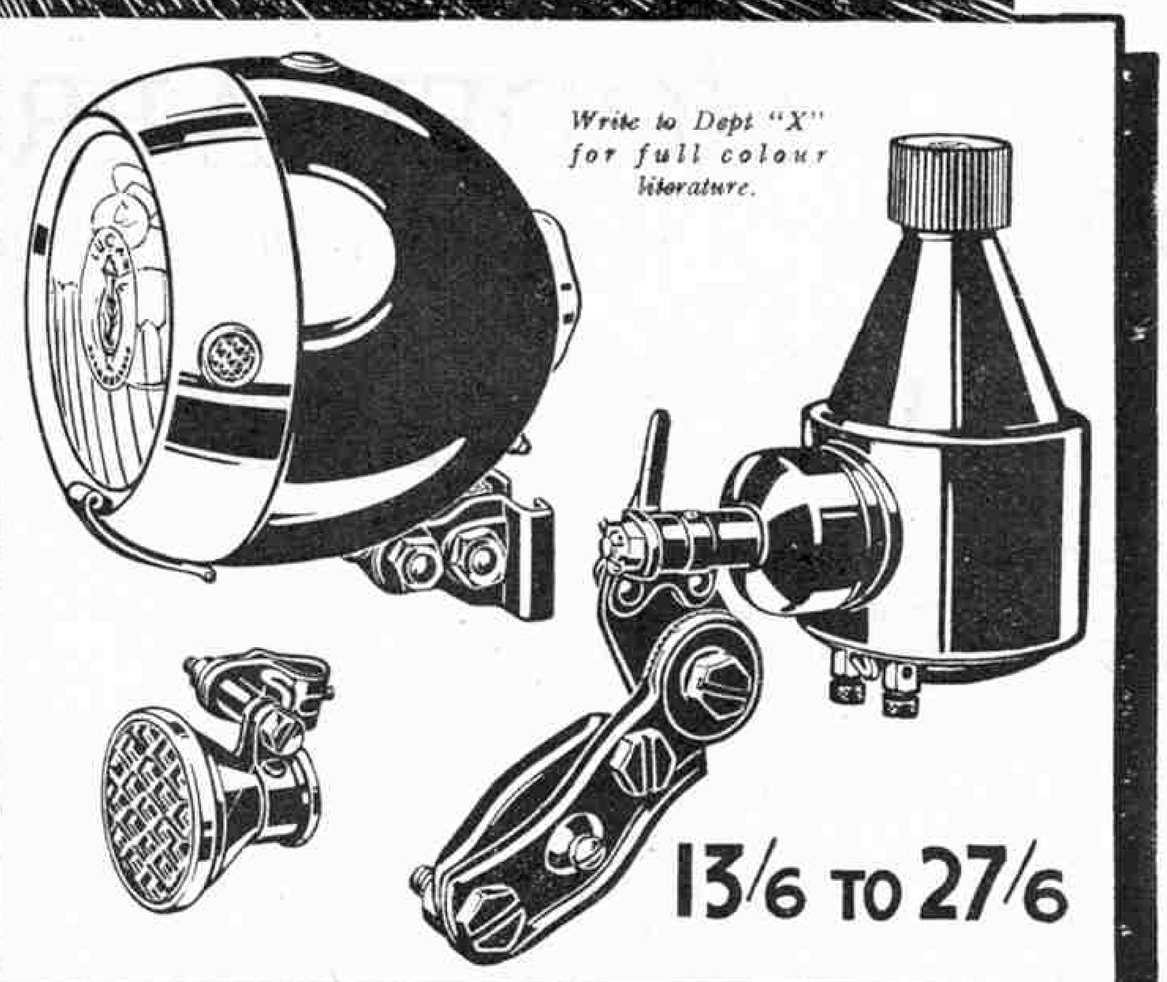

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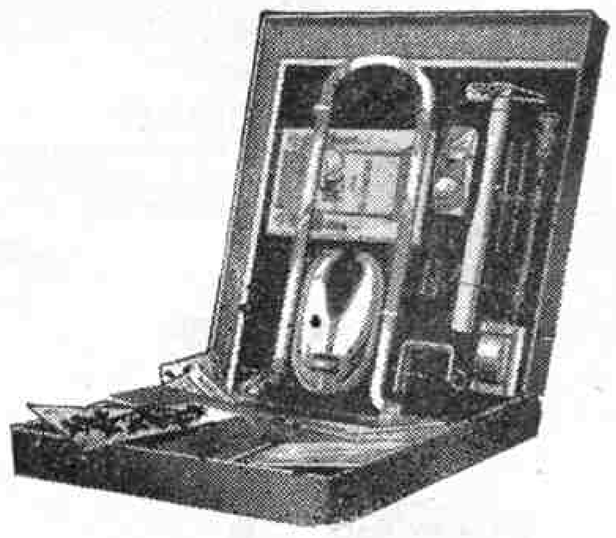

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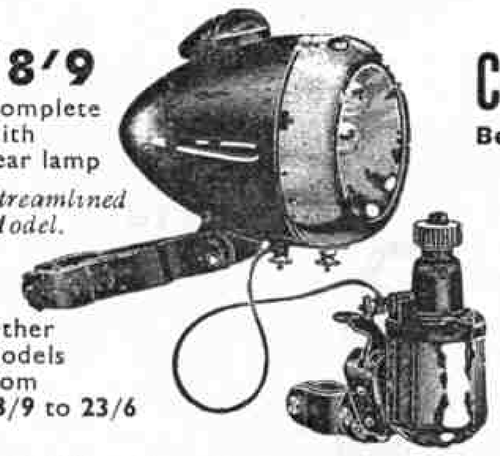

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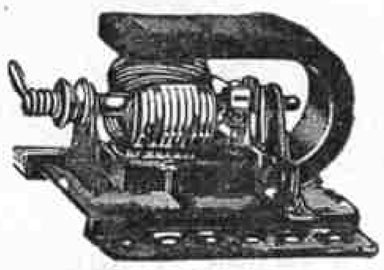

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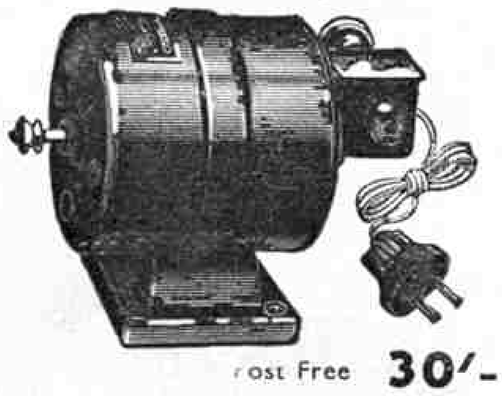

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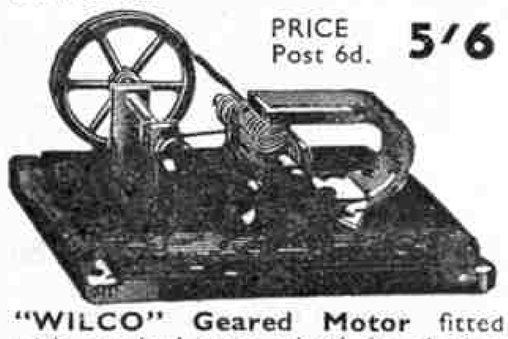

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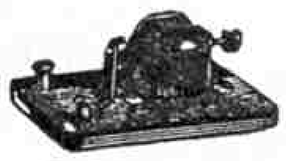

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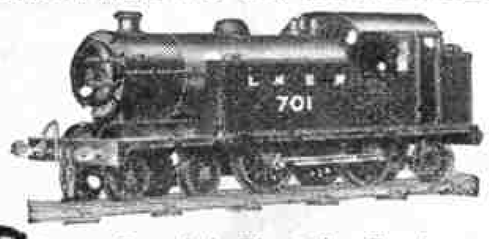

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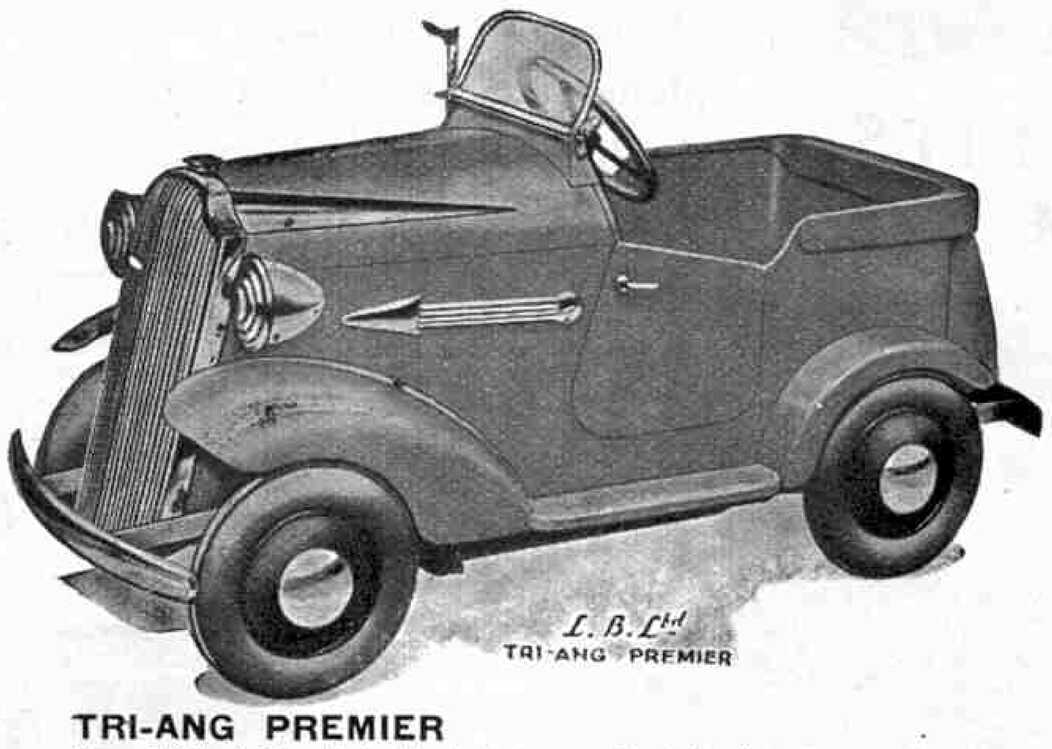

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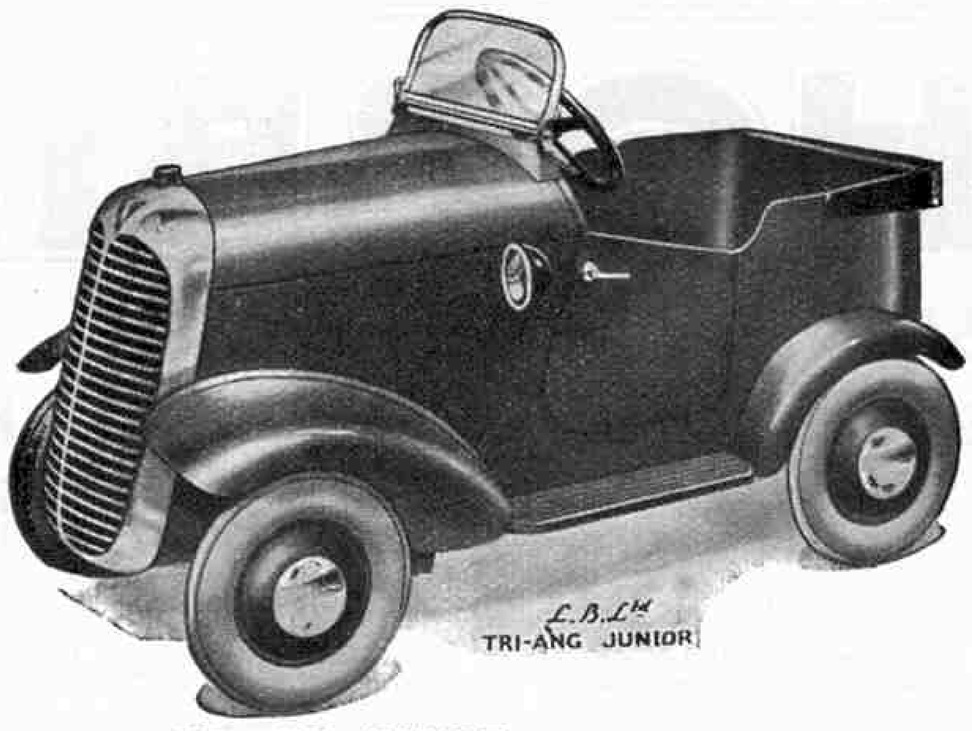

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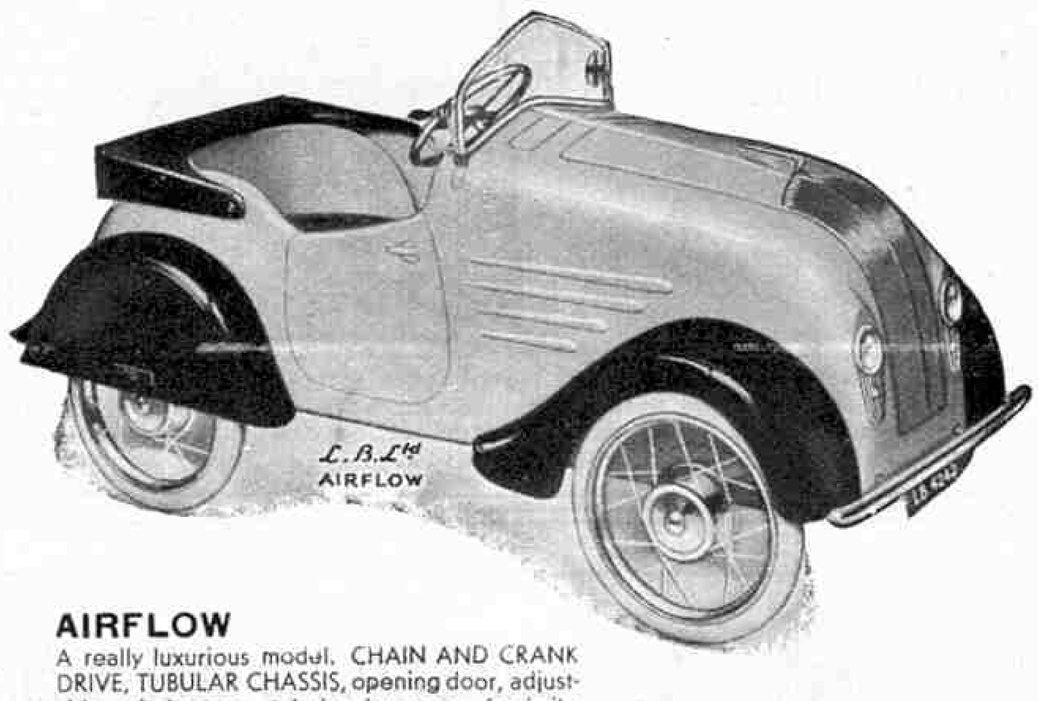

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MECCANO MAGAZINE

Editorial Office:
Binns Road, Liverpool 13
England

Vol. XXII. No. 12
December, 1937

With the Editor

Christmas Greetings

Once again the time has come for me to wish all my readers a Very Merry Christmas. As usual, I am nearly a month ahead, but this does not really matter, as Christmas is in our minds throughout December. Practically every country in which the *"M.M."* is read celebrates Christmas, whether it is in the northern hemisphere where there is always hope of the traditional snow and ice, or in the southern hemisphere where it is the height of summer. To all my readers, wherever they are, I send my greetings.

I cannot be with you all, to join in the fun, but I shall learn all about it from the Christmas letters that will reach me from all quarters. I always look forward to these, and greatly enjoy reading and answering them. Some of them come from old friends, others from new readers; all are equally welcome.

A Great Naval Architect

The death of Sir Joseph Isherwood, Bart., the famous naval architect, set me thinking again of that remarkable ship the old *"Great Eastern."*

Everybody knows that, although she was a commercial failure, she represented a triumph of engineering on the part of Brunel and Scott Russell; but the career of Sir Joseph recalls the less familiar fact that she was one of the first ships built on what is known as the longitudinal system. The wooden ships of former days were invariably built with transverse frames. In the *"Great Eastern"* and certain smaller vessels designed by Scott Russell and Brunel the frames were, so to speak, turned through an angle of ninety degrees, so that they ran longitudinally, from one bulkhead to the next. Transverse strength was maintained by a number of specially stout frames spaced several feet apart. The object of this system of construction was to secure greater strength in a longitudinal direction, with increased resistance to fore-and-aft strains at sea. The system called for costly changes in shipyard arrangements, however, and was practically abandoned. Sir Joseph Isherwood revived the idea early in the present century, and showed how it could be adopted economically.

The late Sir Joseph William Isherwood, Bart.

It was while Sir Joseph was engaged as a surveyor on behalf of Lloyd's Register of Shipping that he became convinced of the superiority of the longitudinal system, of which he designed a greatly improved form. So sure was he that he was right that he gave up his post in order to develop his system, which he patented in 1906. The first vessel to be built in this manner was the *"Paul Paix,"* an oil tank steamship constructed in 1908; and in the following year the *"Gascony,"* a general cargo ship, was built on similar lines. Shipbuilders overseas also began to take up the system, and to-day there are nearly 2,500 vessels of Isherwood design, many of them incorporating other improvements that he introduced after the War. In one respect his work was well timed. The oil era was just beginning when he set out to build ships with longitudinal frames, and it has been found that this system is specially suitable for oil tankers.

Later he became interested in the outward form of the hulls of vessels. Much attention had been given to streamlining the bows and to finding the best shape to be given to the stern; but the middle part of the hull had been neglected. Sir Joseph believed that section to be equally important, and in 1932 and 1933 he made exhaustive experiments with models in tanks in order to find a more suitable design than the usual more or less square or box-shaped hull. The result was a rounded form, with which better streamlining is obtained throughout the entire length. The first vessel of the new design was the *"Arcwear,"* completed in January 1934.

Sir Joseph's death on 24th October is a great loss to British shipbuilding.

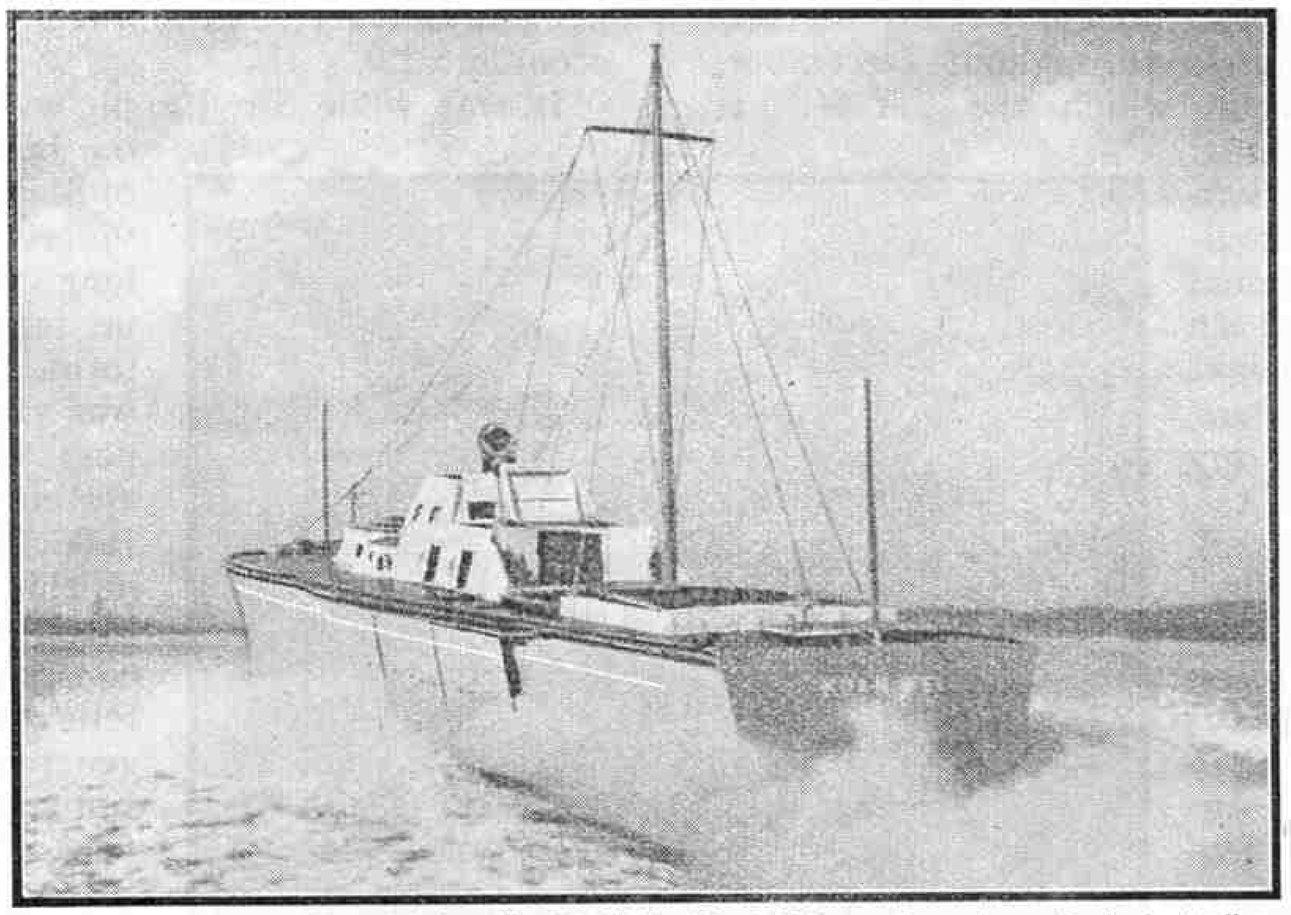
Mr. Scott-Paine Chats about his Boats

Some Advice to "M.M." Readers

THE world's record sea mile made by me at Venice in 1934 was accomplished under particularly hazardous conditions. Prevailing on that day was a dead flat calm, which is perhaps the most treacherous of all water surfaces to race on. It will rise and fall without the pilot having any indication of the trap which is lying in wait for him, and I know of no worse conditions than running fast along a beautiful mirror-like piece of water and encountering a rise that you have been unable to see, probably caused by something that has moved miles away.

You get a terrible feeling of climbing into the air out of the water, the last fraction of it being deflected by the boat, which has left the water, being wound round the propeller by the torque re-action. You know the slightest misuse of the throttle on your regaining the water means almost certain death for you and your mechanic!

When a seaplane took off across my bows at Venice in 1934, and set up a wash that was like concrete, it drove my boat six feet into the air at over 100 m.p.h., the physical shock of which could easily have broken my neck when we dropped back. That experience certainly brought home the advantage of physical fitness and strong neck muscles. Absolute control of one's emotions is pretty necessary for high speed racing or record runs of any kind.



An Armoured Customs Chaser designed by Mr. Hubert Scott-Paine, and now in service in Australian waters. We are indebted to the British Power Boat Co. Ltd., for the illustrations to this article, and for the photograph of O1, the first of their latest type of Mosquito War Vessel, on which our cover is based.

Speed on the water is dangerous and arduous, and calls for the greatest care. The man at the helm has little time to remember incidents which the onlooker sees as "Thrills." You see, developing a theory or invention to perfection means work—work performed thoroughly and methodically until all reasonable possibility of error has been eliminated. There is pride in successful achievement and for the man who personally tries out his ideas, a spur to greater effort also!

When before the War I commenced my researches into speed afloat, I found my sea training and experience of the greatest value. But that was not enough. I had to become an architect to understand ship construction; a chemist to study the effects of salt water on metals, and an engineer to apply the theory of the internal combustion engine to high speed marine requirements in a practical way. Above all, I found I had to work hard and keep my feelings and emotions under strict observation.

You will like to know how my fast boats originated. Well, my researches quickly found me discarding all established theory I had learned. I went right back to the beginning of things and began again. The secrets of the fish fascinated me. Gazing into the pools left by the receding tides, I saw fins that deflected fish into this stream and that current—the tail that turned and held and sent it to the sandy bottom while the streams moved overhead.

By what power does the dolphin make its speed with the tremendous elements of the ocean? Why is it that the gull, the grebe, and the gannet can dive down into the water from a great height and rise again and settle on the crest of a wave and serenely float without fear? These were the questions I asked myself and my task was to find the answers.

I found that the fish does not fight the waves, but uses them to his advantage; that the bird selects an air stream that carries it up and up and sweeps it into a downward swoop, bringing it safely past the waves and spray to the top of the crest where it sits and swings with the movement of the water.

I thought of the hollow birch canoe that the first man used for a boat, which sat on the waves and swung with their motion, directed into this channel and that current by a paddle lopped from a tree. I studied the effects of the tides with their currents, backwash, and slipstream on the odd boxes and driftwood floating round our coasts.

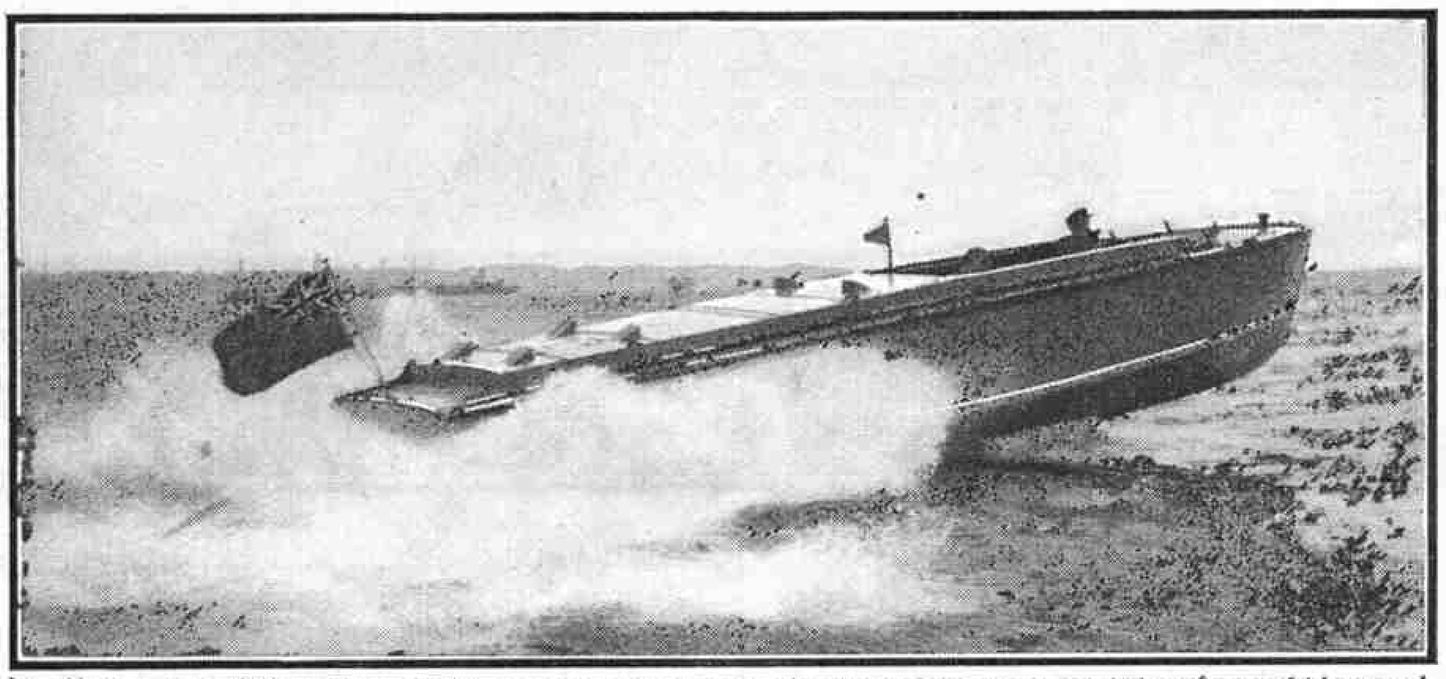
And so it came to me that a structure reproducing these simple yet highly technical things would help me in my search for economical speed and safety on the water. In this way were born the forerunners of the boats you have heard about.

I commenced racing in about 1910, and constructed two famous craft, namely *"Toto"* and *"Vicuna IV,"* which came to be the leaders of their class and helped the long list of British and foreign successes that followed. Those early days were in many ways most amusing, and often fraught with the greatest hardship and long periods of privation and endurance. We had not the machinery and appliances of to-day, and had to turn our hands to everything that had to be done, often after weeks of preparation, meeting disaster five minutes after leaving for trials. But we saw ahead of us the possibility of success in our attempts to retain British supremacy on the sea, and when the War came to stop our efforts in one direction, I saw quite clearly that our pioneer

work would eventually help us to establish the truth of my theory and ideas in another.

The success of my winning Schneider Trophy Cup Machine in Naples in 1922 was the result of hard work, careful planning and attention to detail. It was not a fluke of "luck." This machine, which was the only British competitor, put up a then phenomenal performance, and entirely outraced and outclassed the crack Italian 'planes.

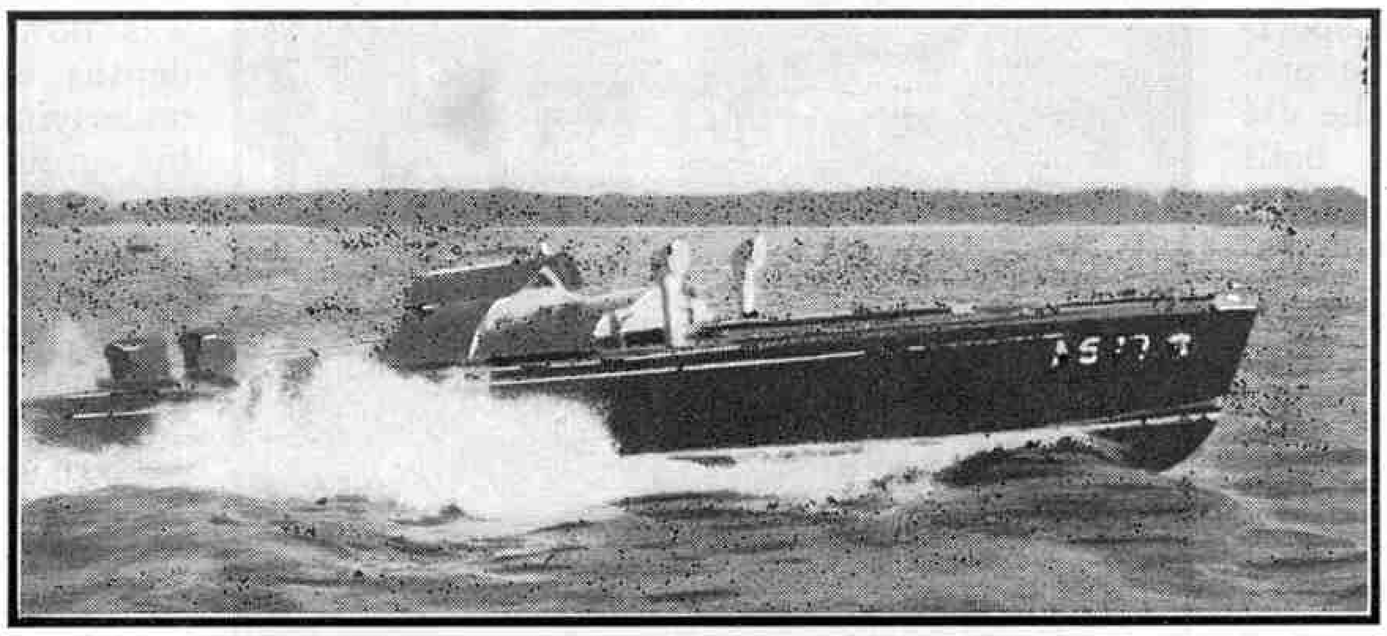
I resumed my development of fast motor boats in 1925 and restarted racing, inaugurating in 1926 the "Puma" class of boat, which was the first British class of racing boat to be started after the War. In 1929 we produced "*Miss England I.*" Up to 1933 this was the fastest single-engined boat in the world, and her amazing speed of 92.8 m.p.h. astounded the critics.



Mr. Hubert Scott-Paine, the world famous designer of motor boats of all kinds, at the helm of one of his experimental boats travelling at over a mile a minute in a "jumpy" sea.

In 1930 my "*Miss Britain I*" captured the Detroit International Trophy in America and retained it in 1931 in England, and then in 1933 I took "*Miss Britain III*" to the United States of America. I lost my only race of almost 25 years of racing, this one against that great American boat driver, Commodore Gar Wood. I was 22 seconds behind him in 30 miles of the worst racing I think anyone ever had. My small 1,375-h.p. Napier-engined boat following the American's 7,000-h.p. boat still remains a nightmare.

Confident of the ability of this valiant little craft to better her performance, I went to Venice in 1934 and there put up a speed of 110.132 miles per hour under conditions I have mentioned previously. After Venice, in my retirement from active racing I turned my interest to the development of fast motor craft for the Royal Navy.



An Armoured Target Boat designed by Mr. Scott-Paine. These boats are used during bombing practice by the Royal Air Force. The crew of three receive orders by wireless telephony.

In 1935 I designed and handed over to the Admiralty the first high-speed Admiral's Barge ever built. In regard to this boat I cannot do better than quote a Press account of a rough weather trial we took to prove her seaworthiness: "An exciting trip in weather which kept all other small craft in port was made by a new motor boat designed by Mr. H. Scott-Paine. A wind of more than 60 miles per hour and an unusually high tide produced very violent seas, in which the 45-ft. boat travelled at speeds between 17 and 33 knots. The seas breaking on the lee shores completely obscured them. Even the pier at Lee-on-Solent could not be seen and the waves through which the boat drove were often 10 ft. high. When Portsmouth Harbour was entered the Dockyard signal tower was flying the blue flag which denotes that no naval boat is considered capable of surviving the sea conditions outside. As the boat left, with eight persons aboard, the sight of the short, steep seas driving at us apparently from all directions was terrifying. Nothing else was moving on the water.

"The most remarkable part of the trip came when course was altered for Southampton Water and we had the wind and sea directly on our beam. In that surging, breaking sea, Mr. Scott-Paine opened up the engines until the boat was making 33 knots. At that speed there was no discomfort and no recurring roll."

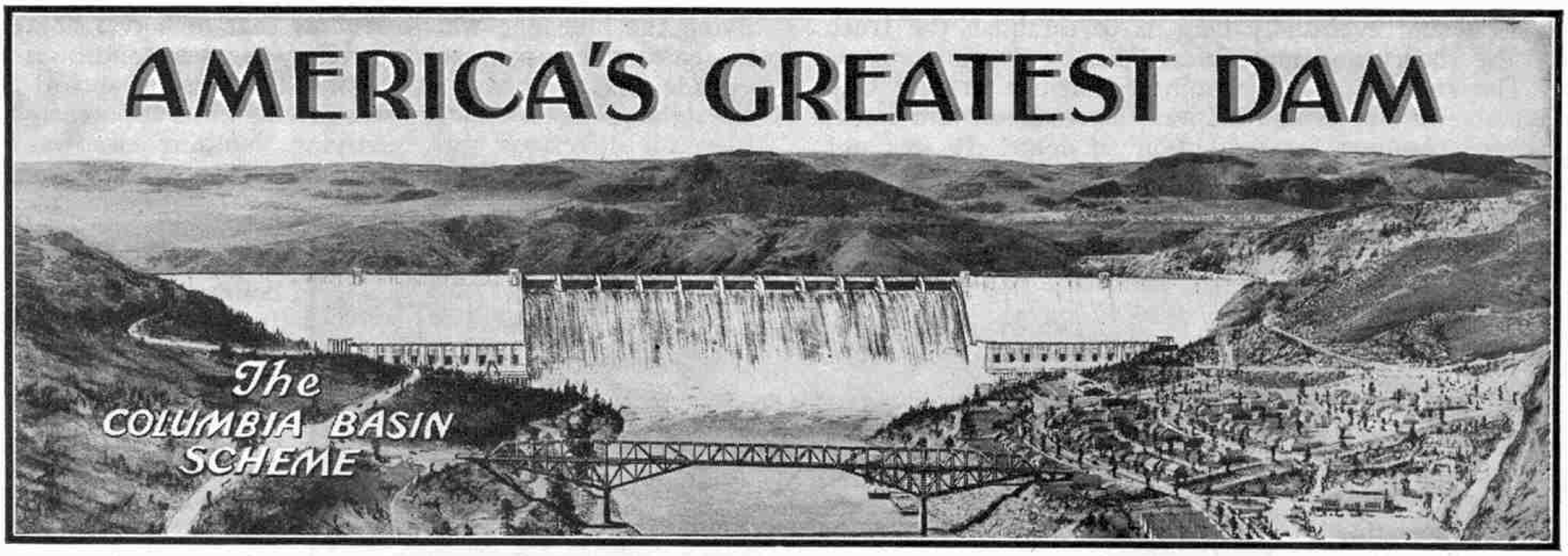
In December 1935 I launched my first motor torpedo boat, which on trials proved herself to be even faster than my designed speed and a better sea boat than even I had anticipated. By the end of 1936 the complete flotilla was in commission.

In 1937, as you know, I was honoured by the choice of one of my Admiral's Barges, then attached to the Nore Command, to take Their Majesties the King and Queen down the River Thames to Greenwich to open the National Maritime Museum. Added to that honour was the use of my motor torpedo boats as an escort. That flotilla is now in service in the Mediterranean, and the second is being built.

And now a few words to "*M.M.*" readers whose ambition it is to succeed as engineers. In engineering everything is possible if you make up your mind to achieve it. Seek practical training; if possible, while at school, spend part of your holidays in workshops or factories. Do not let text books dictate to you. There is no piece of engineering done yet that cannot be improved; most text books follow the result of someone's practical engineering in the first instance. Go into the workshops first, use the drawing office for experience, and then back to the shops again. When there, try for the manager's job, and when you have it aim for a directorship! Always have an objective—and never give up until you succeed in attaining it.

Go on a lot longer than five o'clock—learn to be dependent on yourself and to like to take decisions. A fellow who is nervous and shies responsibility never gets anywhere.

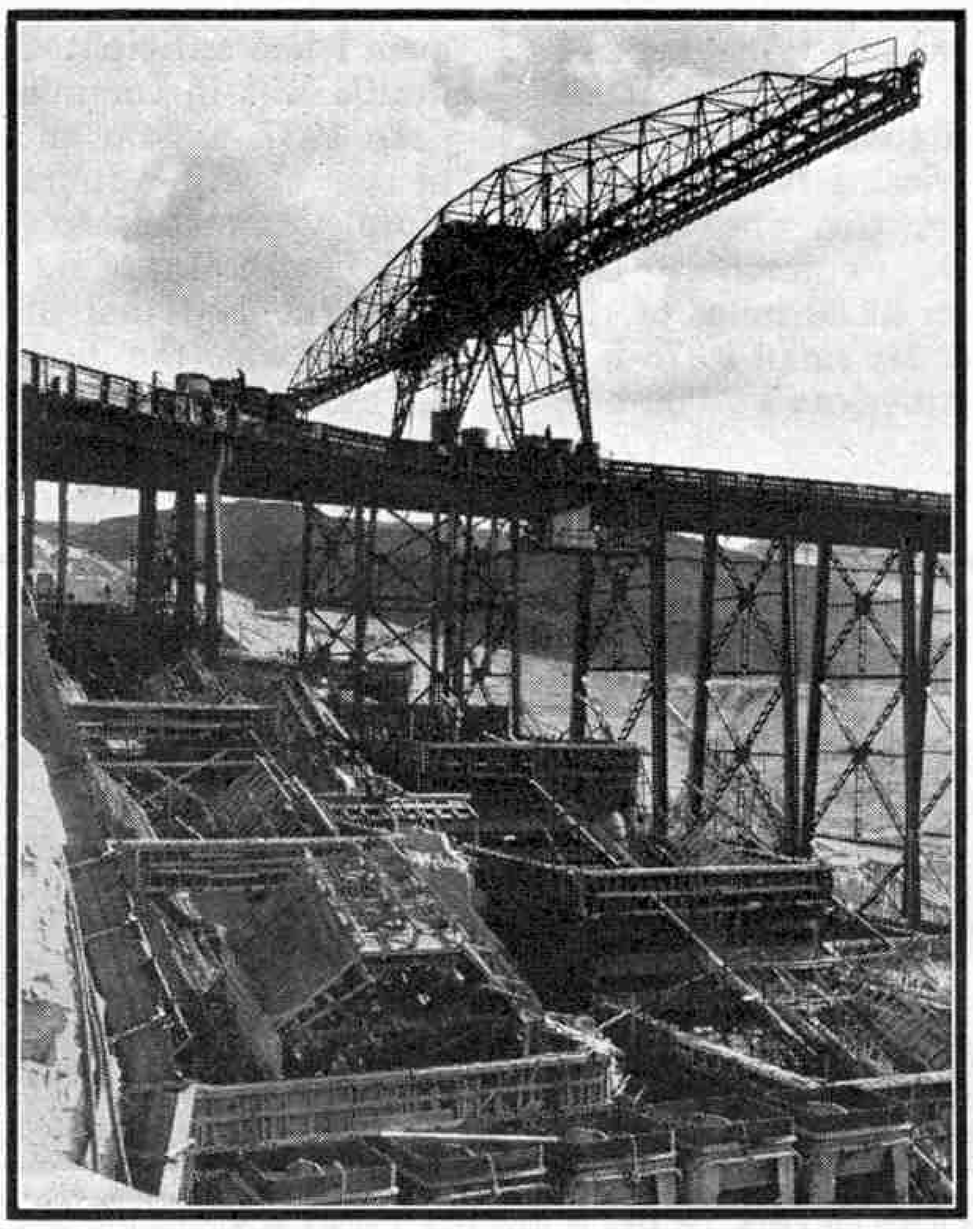
You see—it is the man who personally tries out his ideas, and has the courage of his own convictions, who heads wide open for achievement.



LAST month we described the Grand Coulee Dam as it will appear when completed. It will stretch two-thirds of a mile across the gorge of the Columbia River, and will have a height of 550 ft. and a volume greater than that of any other similar structure in the world. It will supply water for the irrigation of thousands of acres of fertile land, and will be the world's largest source of hydro-electric power.

The construction of the dam is so great a task that three great contracting firms were united to undertake it. A considerable amount of preliminary engineering work had first to be carried out. The Grand Coulee was in an isolated position, 200 miles from the port of Seattle and behind the mighty barrier of the Cascade Mountains. Adequate facilities for transportation therefore had to be provided. Roads leading to the site were re-made, bridges built across the river to replace the primitive ferry, and 32 miles of railway constructed from Odair on the Northern Pacific Railway to the mouth of the Grand Coulee. Electric power was supplied by a 110,000-volt transmission line, and telephone and telegraph services were provided.

When this preliminary work had been completed an enormous task awaited the engineers. This was the diversion of the Columbia River from its normal course so that the foundations of the dam might be constructed. In the case of Boulder Dam, on the Colorado River, diversion tunnels were driven through the walls of the canyon round the dam site, and cross-river cofferdams were then built to divert the river into them. At the site of the Grand Coulee Dam this plan is impracticable. The valley is nearly a mile wide, and on each side of the channel there is a gradual slope. The rock bed of the canyon is covered by a great thickness of soft clay and sediment deposited by the ice sheet that once blocked the valley of the Columbia, as explained last month, and the boring of tunnels through such material would have been very difficult and expensive. The engineers therefore decided to construct first of all the western foundations of the dam, and then to divert the river by means of cofferdams from its normal course through low gaps left in these foundations for the purpose.



One of the cranes used to lower buckets of concrete to the men working on the foundations of the Grand Coulee Dam. The illustrations to this article are reproduced by courtesy of the United States Bureau of Reclamation.

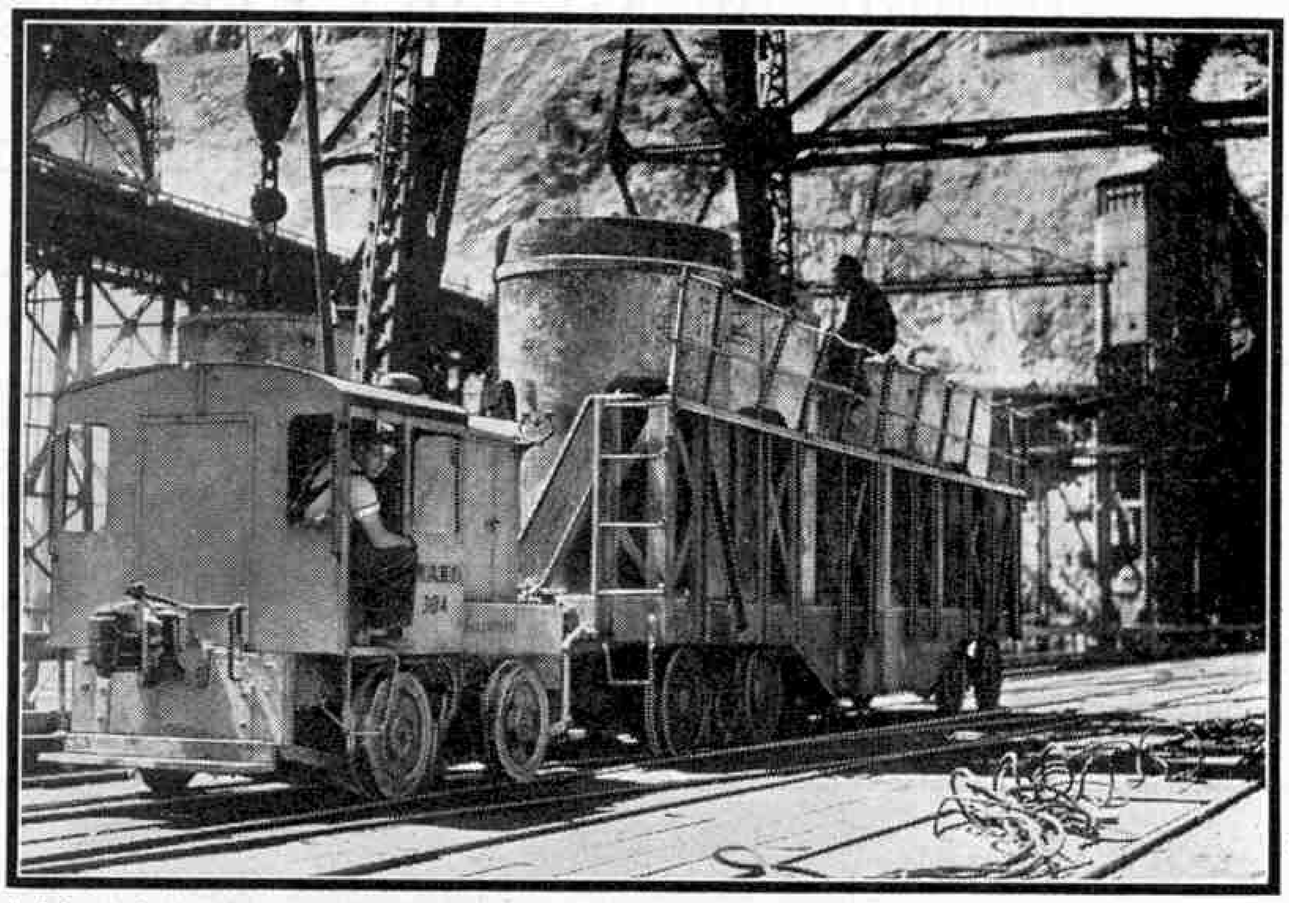
On the west side of the river a huge cofferdam, 3,000 ft. long was built parallel to the bank. It was formed of interlocking steel cells approximately cylindrical in shape, 110 ft. in height and about 50 ft. in diameter, filled with sand and gravel. This was the largest cofferdam ever built, but it was completed in 90 days. It enclosed an area of 60 acres, from which some 10,000,000 cu. yds. of material were removed to lay bare the bed rock of the canyon.

The weathered surface rock was now removed to varying depths up to 10 ft., and the underlying granite strengthened by grouting, a mixture of cement and water, which was forced through holes drilled in the rock, in some instances to depths of 200 ft. Only when this had been done were the concrete foundations of the western section of the dam built. This section extended from the bank of the river to the western wall of the canyon, and four low openings 50 ft. in width were left to allow the passage of the water when the river was diverted.

In the meantime two great cross-river cofferdams were being constructed, one upstream from the site of the Dam to divert the water into its new channel, and the other downstream to prevent the river flowing back into the workings. In building them more than 9,000,000 ft. of lumber, nearly 1,000,000 cu. yds. of gravel and 2,200 tons of steel sheet were employed, and although intended for temporary use they were larger and more durable than many permanent structures. Water was admitted to the diversion channel on November 5th, 1936. About a month later the downstream cross-river cofferdam was completed, and in a few days the entire river was flowing

through the western section of the dam. On January 3rd, 1937, powerful pumps began to remove the water from the enclosed area in the centre of the channel, and in six days 80,000,000 gallons of water had been pumped out.

Excavation on a colossal scale had to be carried out during work on the Grand Coulee Dam, nearly 20 million cu. yds. of material having to be removed from the site. How to get rid of this immense mass of earth and clay was a difficult problem, solved eventually by the construction of a giant conveyor system. This was easily the largest of its kind in the world, carrying the material to a dumping ground in Rattlesnake Canyon, $1\frac{1}{4}$ miles away and 500 ft. above the level of the workings. The main belt was 60 inches in width and was fed by a network of smaller belts, one of which extended 4,000 ft. across the river carried on a suspension bridge. This giant conveyor could dump more than a ton of material a second into Rattlesnake Canyon.



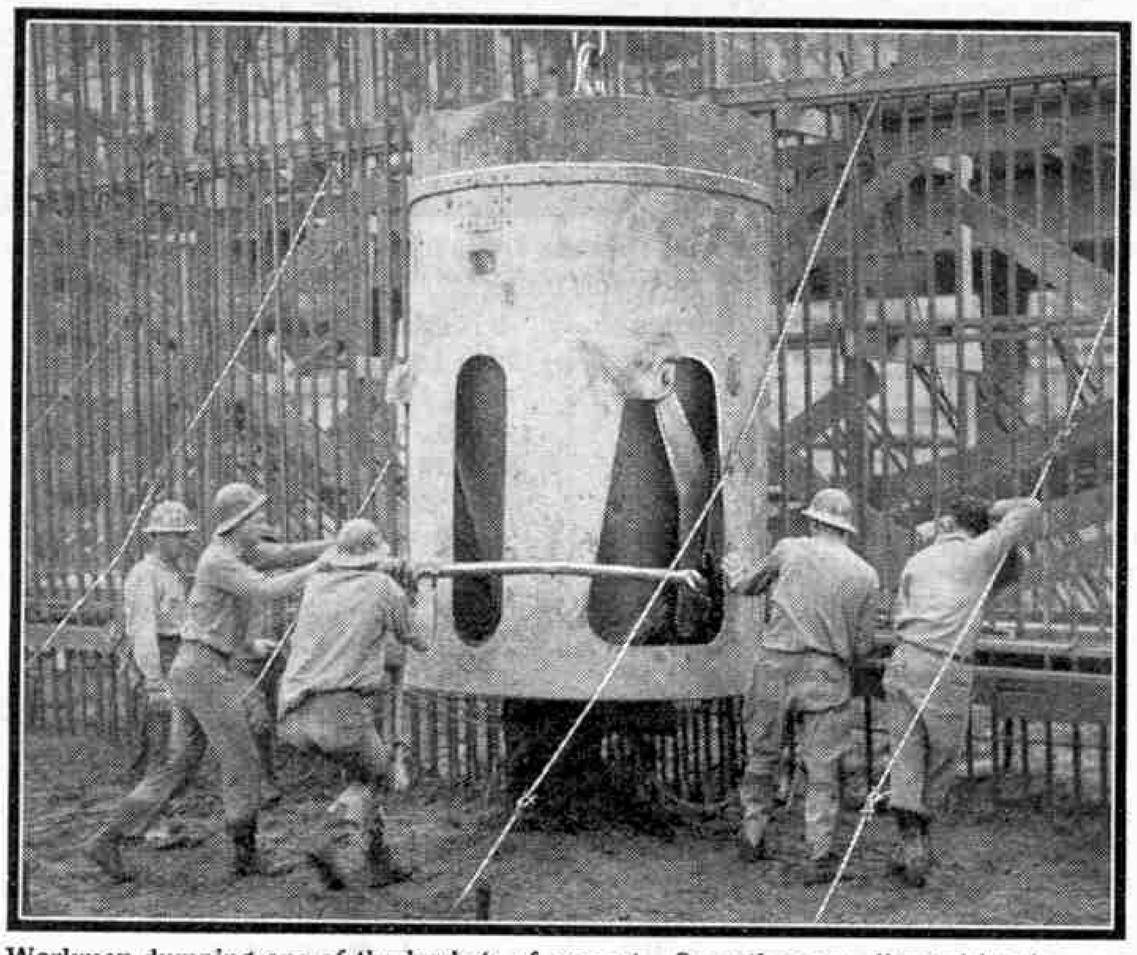
A Diesel-electric locomotive and one of the standard gauge cars carrying buckets of concrete from the mixing plant along the steel trestles.

At one stage the Dam workings were in danger from a threatened landslide of 200,000 cu. yds. of clay. The removal of this great mass of material would have been a slow and very expensive task, and it was decided instead to hold it back by means of a great barrier of earth frozen to make it solid. Six miles of piping were embedded in the barrier, and for seven months brine at a temperature of 30 deg. F. below freezing point was circulated through it.

The Dam will have swallowed up 25,000,000 tons of concrete when it is finished. Sand and gravel for this immense quantity comes from a natural deposit $1\frac{1}{2}$ miles away on the east side of the river, and 1,000 ft. above it, and after grading is brought in by the conveyor already referred to. Cement reaches the site by rail. It is stored in steel silos near the workings, and is transported through an 11-in. pipe to the two concrete mixing plants. One of these is on the western bank of the river, and the other is on the east side, the pipeline crossing the river on a suspension bridge.

The plants that feed the Dam with concrete are towering structures 44 ft. wide and over 100 ft. high. Cement, sand and gravel are weighed out into the mixers by means of electrical devices easily controlled by a single operator, and the concrete is delivered into dumping buckets. These are hauled on cars by Diesel-electric locomotives on tracks laid down on great steel trestles that have been built out over the foundations of the dam. Travelling cranes with a reach of 118 ft. take the buckets from the cars and lower them to workmen employed in placing the concrete far below. The upper steel trestles are over 3,000 ft. long with an average height of over 175 ft. Together with the lower trestles they cost over £100,000 to erect, and with the exception of the decks they are being gradually buried in the rising concrete structure.

The concrete is being placed in blocks 50 ft. square and 5 ft. deep. Steel tubing is embedded in it as it is laid, and before the Dam is completed it is estimated that over 2,000 miles of tubing will have been used. This tubing will strengthen the Dam, but it also serves another purpose. Mixing cement with water results in the slow liberation of heat, and unless this is dissipated in some way the massive concrete structure would expand for some months after it is formed. This would be followed by cooling and contraction, and the result of these changes would be cracks that might lead to structural weakness and leakages. In order to avoid this danger cold river water is circulated in the steel tubes, so that the heat developed is carried away quickly.



Workmen dumping one of the buckets of concrete. Operations are directed by the man on the right, who is speaking by telephone with the crane operator.

The placing of the concrete in the Grand Coulee Dam commenced in December 1935, and by the middle of April 1937 over 2,000,000 cu. yds. were in position. It is expected that work on the Dam itself and on the power plant will be completed by 1941. Then the Columbia River will pile up behind it, and the pumps will begin to raise the water to the Grand Coulee balancing reservoir, from which a great irrigation canal system will eventually conduct it to the fertile lands of the Columbia Plateau.

The cost of building these canals will be greater than that of the Dam and power house, and it will be nearly 50 years before the scheme is completed. By that time the turbines at the foot of the Dam will have been generating electricity for many years, and it is estimated that sufficient wealth will be derived from this source alone to repay the enormous cost of the project.

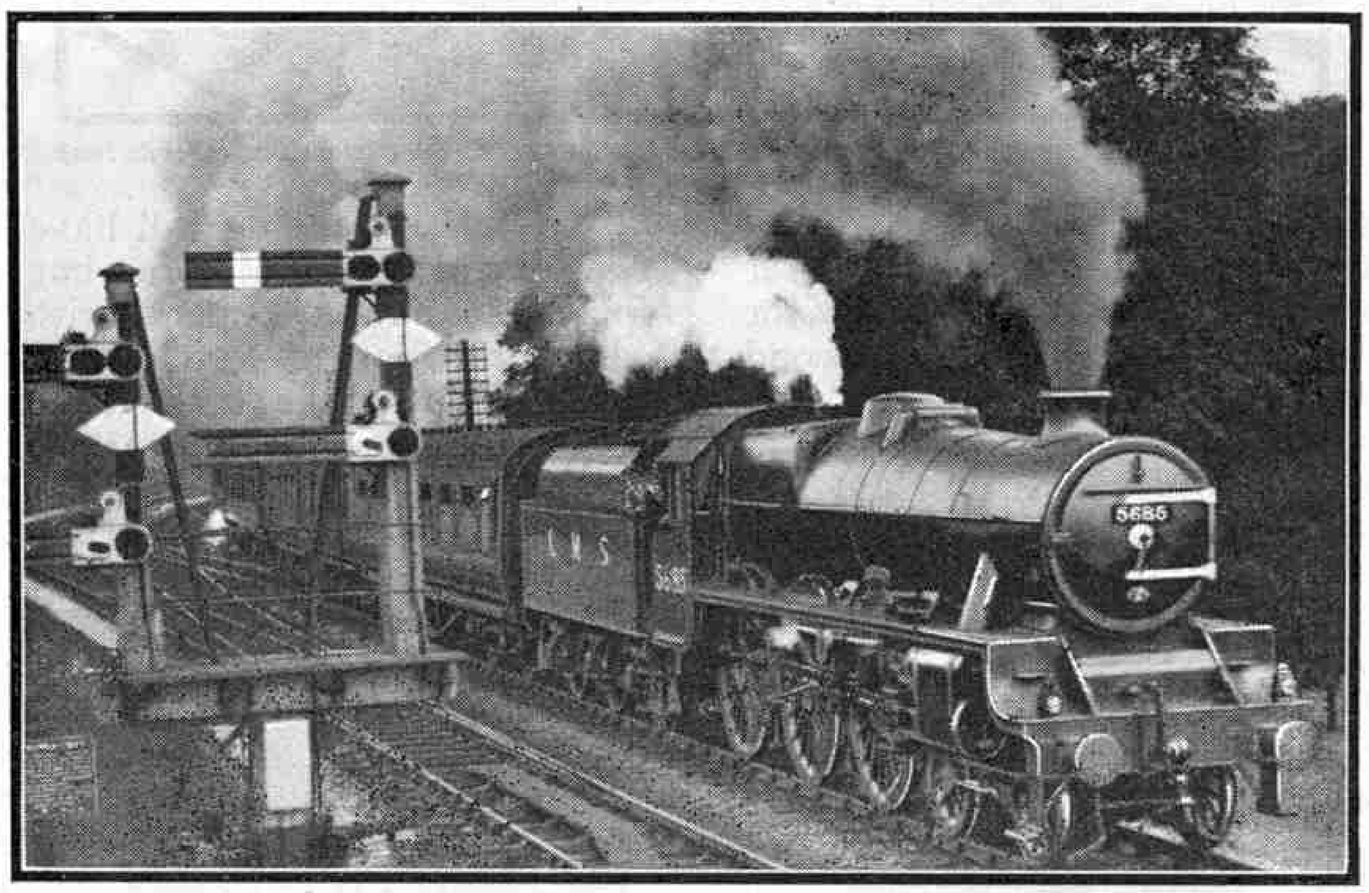
The Great "Speed-Up" on the L.M.S.

Fine Running by Midland Expresses

By D. S. Barrie

NO single programme of railway acceleration in the post-grouping era has probably been so comprehensive in its benefit to the traveller, nor so spectacular in its standardisation of fast start-to-stop schedules, as that which came into force on the Midland Division of the London Midland and Scottish Railway with the introduction of the winter timetable on 27th September.

Bearing in mind the heavy grading of the Midland main line out of St. Pancras (with the exception of the Leicester-Trent section, which is practically level), these accelerations demand day-to-day locomotive performance of the highest calibre. Although at the time of writing the new services have only just come into operation, initial experiences with the accelerated trains suggest that promise is being more than fulfilled by performance. The scope of the alterations from a timetable viewpoint was dealt with on page 654 of the "*M.M.*" last month, and the purpose of the present article is to deal more with the actual operation of the trains and to quote one or two typical examples of their running.



A Sheffield to St. Pancras non-stop train passing Dore and Totley station. The engine is No. 5685 "Barfleur" of the "Jubilee" class. Photograph by courtesy of the "Sheffield Telegraph."

An important feature of these sweeping accelerations is that they have been scheduled, and can be maintained in practice, without the attainment of very high downhill speeds. Rather is the objective, by means of good uphill work and steady fast running over the easier stretches, to maintain high averages without high maxima. The L.M.S. therefore have reviewed the main lines on the Midland Division in respect of the general maximum speeds which can be allowed, as a result of which drivers are now allowed to run, for example, up to a maximum of 85 m.p.h. between St. Pancras and Trent on the main fast and passenger lines. This applies also to the Kettering and Nottingham line, save for a tempting relaxation to 90 m.p.h. for eight miles between Upper Broughton and Edwalton. North of Trent and Nottingham on the Sheffield and Leeds routes the maximum speed allowed is 80 m.p.h., while a similar restriction applies to the Manchester line north of Trent Junction. These general maximum speeds are, of course, additional to reductions to still lower speeds at specified junctions, curves, and other points.

In order to ensure a good standard of punctuality of the accelerated trains, together with a reasonable reserve of power for the making-up of lost time within the limits of speed allowed, the working of the accelerated services has been carefully studied from the standpoint of motive power. The maximum tonnages which the respective classes of engines may take at the new timings are "Jubilee" 4–6–0s (Class 5XP) 300 tons, Mixed Traffic 4–6–0s (Class 5P) 255 tons, and Standard Compound 4–4–0s (Class 4P) 220 tons; as compared with the tonnages previously permitted (except on the down "*Thames-Forth Express*," which was specially restricted) of 350, 310 and 270 tons respectively.

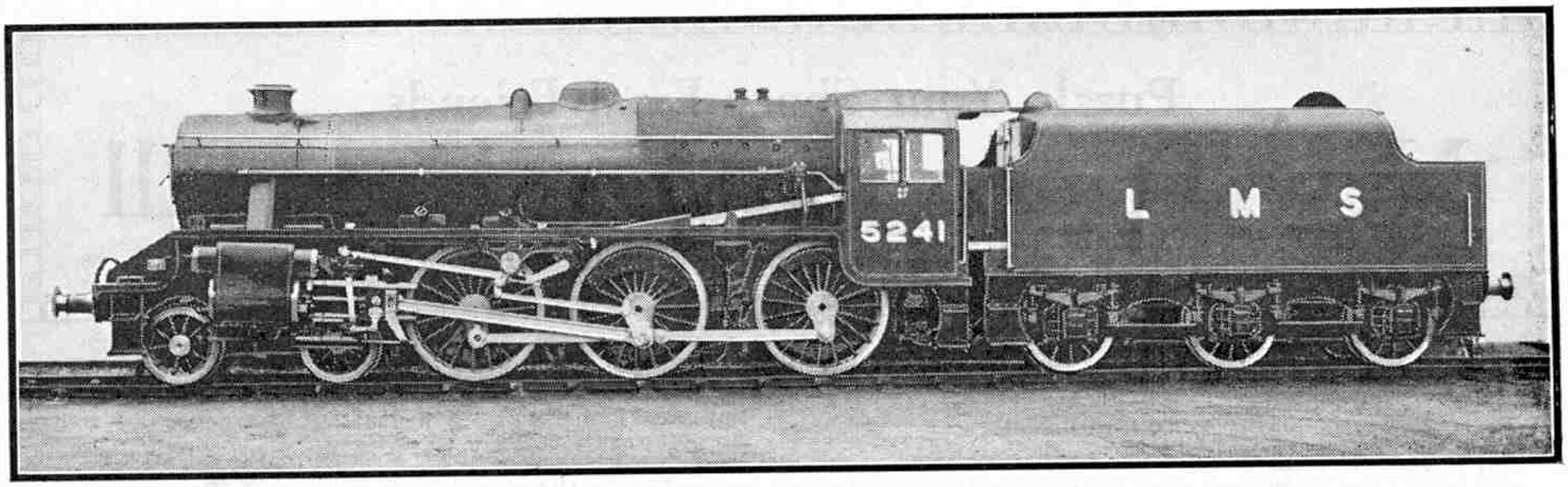
Although these loading figures would seem to suggest that some of the accelerated trains will regularly be worked by Compounds, these engines will be employed only if it should happen, because of exceptional circumstances, that the more powerful six-coupled locomotives are not available. Hence the new timetable marks another stage in the gradual disappearance from express duties on their "native heath" of those splendid little engines, the Compounds, which for so many years now have done such magnificent work in almost all parts of the L.M.S. system. With the drafting to the Midland Division of additional six-coupled engines, there are now available 103 such locomotives (54 "Jubilees" and 49 Class 5s), the "Jubilees" being stationed principally at Kentish Town (18), Leeds (18), and Derby (7); the sheds having the largest number of Class 5s are Trafford Park (8) and Kentish Town and Saltley (7 each).

The majority of the accelerated expresses are being worked to and from St. Pancras by "Jubilees," the Mixed Traffic engines being used on the Manchester line, where their 6 ft. coupled wheels are of considerable advantage on the steeper gradients. Whereas immediately prior to the recent accelerations a number of the Manchester expresses were being worked right through to and from St. Pancras by Mixed Traffic engines, it is now the usual practice to employ them on the mountainous section north of Derby, the trains being worked between St. Pancras and Derby or vice-versa by "Jubilees."

On the first day of the new service a remarkable run was made from St. Pancras to Leicester by the 2.30 p.m. Manchester express, consisting of eight coaches, 257 tons, hauled by the "Jubilee" 4–6–0 No. 5590 "*Travancore*," driven by Sharman of Derby. As between London and Bedford this performance actually eclipsed those of the dynamometer car trials held in April last, and in so doing featured what is probably the fastest start ever made out of St. Pancras. Kentish Town, 1.5 miles, was passed in 3 min. 25 sec., and Hendon, 6.9 miles, in the unprecedented time of 9 min. 25 sec., at over 70 m.p.h. On the ensuing 1 in 176 up to Elstree Tunnel speed fell to 53 m.p.h. but the usual high speed could not be attained past Radlett owing to the driver's expectation of a permanent way caution, which compelled him to shut off steam until well down the bank, when it was found that the slack had been removed Nevertheless St. Albans, 19.9 miles, was cleared in 21 min. 40 sec. (schedule 23 minutes), with a minimum speed of 62 m.p.h. on the four miles climb, mostly at 1 in 177, to Sandridge Summit.

Then came a whirlwind exhibition of speed. The undulating 10.3 miles from St. Albans to Luton took two seconds less than nine minutes, with a maximum of 78 m.p.h. at Chiltern Green, a slack to 70 over the curves beyond, and then a rousing 80 through the town of hats. Thus Luton, 30.2 miles, was passed in 30 min. 38 sec. from the St. Pancras start, a gain of 2½ min. on the new schedule despite the Radlett slack. Flying over the Leagrave crest at a minimum speed of 74 m.p.h. "*Travancore*" was now inside "even time," but there was scant relaxation of the effort, and the 10 miles from Harlington to Elstow Box were reeled off at an average of precisely 85 m.p.h.—the maximum allowed over this section of line. With time now well in hand, the driver then made a pronounced slack through Bedford, to which point the 49.8 miles from London had been covered in the phenomenal time of 45 min. 20 sec., a gain of nearly four minutes on schedule.

Although maxima of 80, 79 and 78 m.p.h. were subsequently recorded at Irchester, Braybrook and Great Glen respectively, and although the nine miles almost continuous climb from Burton Latimer to Desborough North (with a final pitch at 1 in 122) yielded no lower minimum than 53 m.p.h., the run from Bedford to Leicester was in the nature of an anti-climax. When "*Travancore*" finally came to a triumphant stop in Leicester station the 99.1 miles from St. Pancras had been covered in 96¾ min. exactly, or at a start-to-stop average speed of 63.6 m.p.h., with an overall gain on



L.M.S. 2-cylinder 4-6-0 locomotive No. 5241 of the Standard Mixed Traffic class. These engines haul the Manchester trains on the Midland route, between Derby and Manchester. The two photographs on this page are reproduced by courtesy of the L.M.S.

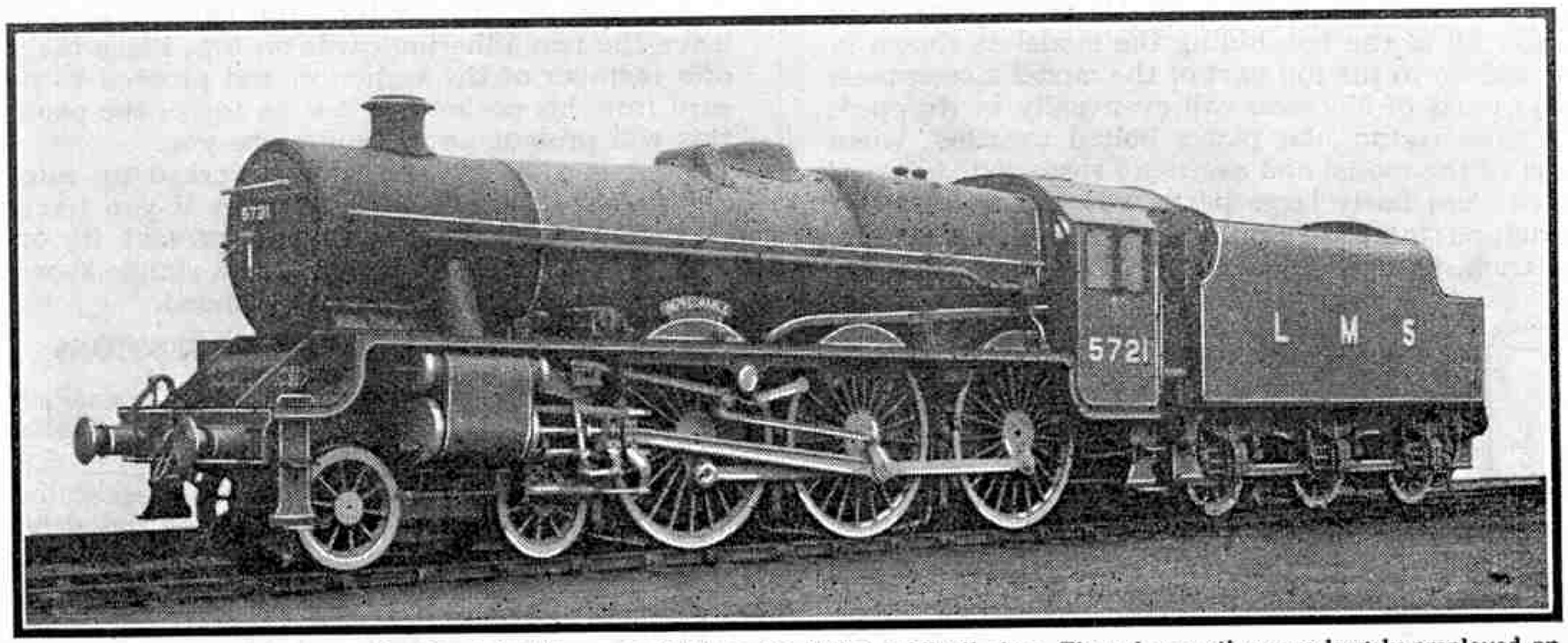
schedule of 2¼ min. Had it been either necessary or desirable to sustain the effort after Bedford, there is no doubt Leicester could have been reached in the hour-and-a-half from London.

Less spectacular but extremely impressive was the work of another "Jubilee," No. 5694 "*Bellerophon*"—one of the engines named after famous warships—between Leicester and London with the 2 p.m. express from Manchester. This is one of the 10 trains now scheduled to cover the 99.1 miles from Leicester to London or vice versa in better than "even time." The load was one of nine vehicles, 289 tons—within 11 tons of the maximum allowed with these engines on the new timings. Between Leicester and Bedford the work was sound, but not exceptional, the 49.3 miles to passing the latter station taking 50 min. 40 sec., or 20 sec. less than booked, the best feature being a fall from 63 to 50 m.p.h. on the three miles at 1 in 120 of the Sharnbrook bank. Passing Bedford at 69 m.p.h., however, Driver Hart of Kentish Town launched a great effort which took this train of 300 gross tons over the 19.6 miles to Luton in 18 min. 7 sec., a gain of nearly a minute on schedule. After nearly eight miles climbing, largely at 1 in 202, from Bedford to Ampthill, speed had dropped only from 69 to 60 m.p.h., with an intermediate rise to 72 in the dip past Elstow; the brief "breather" past Flitwick brought it up to 67, and then came a splendidly sustained effort. On the final 5½ miles rising at 1 in 202 the minimum was the excellent one of 59 m.p.h., bespeaking excellent steaming qualities and good management.

Passing Luton a minute to the good, "*Bellerophon*" then covered the 28.7 miles to Kentish Town in 24 min., with maxima of 81 at Radlett and 79 before Hendon. But for a signal stop outside the terminus, St. Pancras would have been reached in less than 96 min.; as it was, the time to the signal stop at Cambridge Street (98.6 miles) was 94 min. 52 sec., and to the platform, 97½ minutes. Not many minutes later, "*The Thames–Clyde Express*," with nine bogie vehicles behind No. 5734 "*Meteor*," ran in a minute early, having covered the 99.1 miles from Leicester in approximately 91 minutes.

By way of contrast, some particulars may be of interest in regard to typical locomotive work involved in maintaining the accelerated schedules over the mountainous section between Derby and Manchester. The train concerned was the 12.30 p.m. from St. Pancras to Manchester, which is booked to stop at Cheadle Heath, 53½ miles, in 67 min. from Derby. Although it includes an allowance of three minutes extra from Peak Forest to Chinley, to cover the impending speed restriction over the bridges which are to be reconstructed on this section, the timing demands excellent locomotive work, especially between Derby and Peak Forest, 35¾ miles. Except for a few short "dips," this stretch of line is entirely against the engine, the hardest piece being the 15 miles from Rowsley to Peak Forest, on which the gradient rises largely at 1 in 100 or so, culminating in a mile rising at 1 in 101 and then three miles at 1 in 90. Moreover, although the initial 21½ miles from Derby to Rowsley involve a more gradual climb, advantage cannot be taken of this factor to get "a run at the bank," owing to the service speed restrictions which must be observed at Ambergate (25 m.p.h.), Whatstandwell, Matlock and Rowsley.

The journey in question clearly demonstrated, however, that the handsome Mixed Traffic 4–6–0 engines can readily maintain the new timings, even when loaded to their unpiloted capacity of 255 tons. On this occasion No. 5031 actually had a nominal excess of two tons over this figure, but nevertheless more than three minutes were regained between Derby and Cheadle Heath. Starting away from Derby in great style, No. 5031 worked up to 64 m.p.h. on the gentle grades of the Derwent Valley, before we slacked carefully through Ambergate, 10¼ miles in 12½ min. from the start. After observing the Whatstandwell and Matlock slacks, 61 m.p.h. was attained on the slight rise past Darley Dale, before another careful slack was made through Rowsley, 21½ miles in 25 min. 20 sec. (schedule 26 min.). Now came the real "hard graft," and with sonorous exhaust No. 5031 lifted its train of 270 gross tons up the two miles at 1 in 202 to Haddon Tunnel at 39 m.p.h., thus sustaining the rate at which Rowsley had been passed. The trifling fall beyond Haddon Tunnel brought the speed up to 45 m.p.h., and then on the four miles climb, mostly at 1 in 100 or so, to Headstone Tunnel there was no greater fall than from 44 to 40½ m.p.h.



L.M.S. 3-cylinder 4-6-0 locomotive No. 5721 "Impregnable" of the "5XP Jubilee" class. These locomotives are largely employed on the accelerated services on the Midland Division, and some splendid examples of their work are given in the article.

Another slight dip to Monsal Dale witnessed an acceleration to 51, followed by a minimum of 43 m.p.h. on the two miles, mostly at 1 in 100, up to Miller's Dale (31¼ miles from Derby) which was traversed in 38 min. 55 sec., or practically as booked. The last short dip yielded an acceleration to 55 m.p.h., and now the engine faced the final trying ascent of 4½ miles, including three miles at 1 in 90, to Peak Forest. Here through the limestone canyons of the Peak—one of the most fascinating stretches of railway in England—the most impressive locomotive work of the journey was accomplished, a full minute being gained on the 7-min. booking for the 4½ miles, and the summit—nearly 1,000 ft. above sea-level—being surmounted at the excellent minimum of 40 m.p.h. To this point, therefore, the 35¾ miles from Derby, almost entirely uphill and with several service slacks, had been covered in precisely 45 min., or only two minutes slower than on the record-breaking trial run of April this year, both class of engine and train-load being identical. With time in hand, the last 17¾ miles downhill to Cheadle Heath were taken very easily in 18 min. 41 sec., the overall time to Cheadle Heath stop being 63 min. 41 sec. This represents an average start-to-stop speed of 50.4 m.p.h., an excellent figure considering the gradients covered.

Puzzle Your Sharp-Eyed Friends

New Tricks that Need no Skill

By Norman Hunter (From Maskelyne's Mysteries)

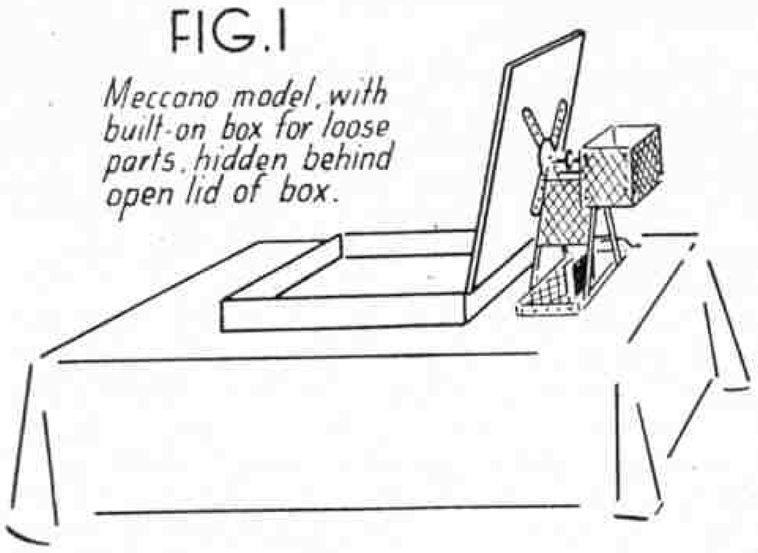
I WANT to start off this year by describing a trick with Meccano. It is quite a simple one to perform, but I think you will find that the effect of it quite takes the breath away from your audience.

THE MAGIC MODEL-BUILDER

This is what happens:
On a table a box of Meccano parts is displayed. You pick up a wide cardboard tube, show it empty and stand it on the table. You then take some of the parts from the Meccano outfit and drop them into the tube. Immediately you lift the tube, and there is a completely built little Meccano model, working away for all it's worth, having apparently built itself by magic from the parts thrown into the cardboard tube.

FIG. 1

Meccano model, with built-on box for loose parts, hidden behind open lid of box.

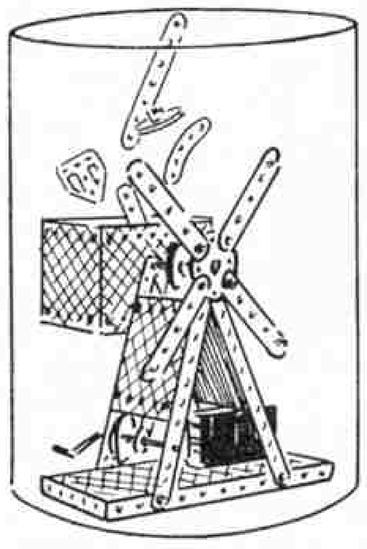


How it is done. I hope you won't be too disappointed when I say that you must make the model first in the ordinary way. It should be a small upright type of model such as a windmill, which can be set going and allowed to run continuously. It is operated by a Meccano clockwork motor built into the base. The model stands near the back of the table and the box of Meccano parts is in front of it, the raised lid of the box hiding the model as shown in Fig. 1. You must build on to the top part of the model a receptacle into which the loose parts of Meccano will eventually be dropped. This is best made from rectangular plates bolted together, when it will look like part of the model and excite no suspicion. Alternatively, if you wish to use fairly large parts, you can build a flat platform on the model and stand on it a suitable-sized cardboard box.

To perform the trick, first show your tube. This is an ordinary cardboard tube, round or square, and big enough to go over the model. Place the tube deliberately over the model and at the same time close the lid of the Meccano box. To the audience you have simply put the lid down on the table, and there is no suggestion that the tube contains anything. Now pick up the box of Meccano, take out a few parts—they need not be the same parts as those of which the model is composed—and drop them into the tube. Naturally these loose parts go into the box provided for them on the model. (See Fig. 2.) You have then only to start the model working by means of a release lever arranged to project at the back of the model, under the tube, and lift the tube and reveal the model working. If you have arranged a loose cardboard box on the model to receive the loose pieces, you will carry this box away inside the tube as you lift it, as shown in Fig. 3.

FIG. 2

Meccano parts being dropped into loose box on the model



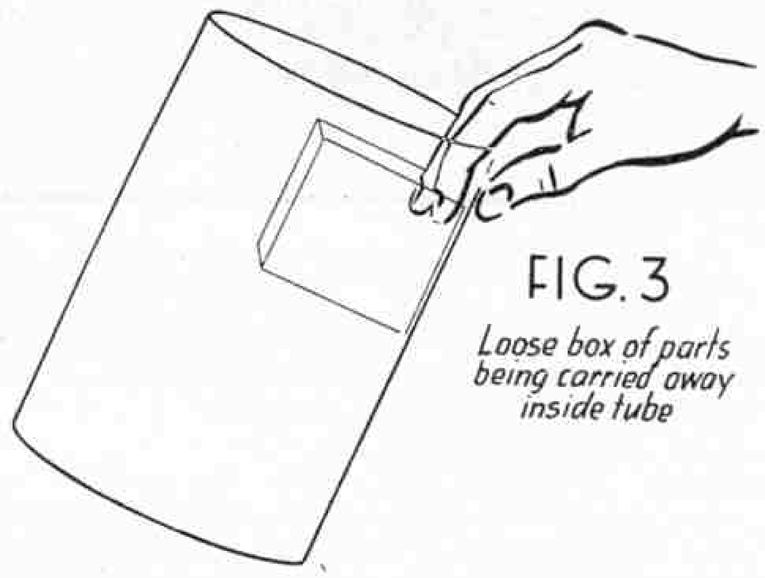


FIG. 3

Loose box of parts being carried away inside tube

MYSTIFYING CARD TRICKS

Now for a very easy card trick, or rather an idea with which you can perform quite a number of card tricks. You have a card chosen, returned to the pack and the pack shuffled. Anyone can shuffle the pack as much as he wishes, yet you are able instantly to find and produce the chosen card.

How it is done. The secret lies in the use of a little bit of wax. If you cannot obtain wax, a small piece of Plasticine will do equally well. Have the wax, a tiny piece half the size of a pea or even smaller is enough, on the back of the top card of the pack. When the card has been chosen, cut the pack and offer the top part for the card to be laid on it. Lay the other half of the pack on this and press the halves firmly together.

The position now is that the chosen card is temporarily stuck fast to the back of another card, and it does not matter how thoroughly the pack is shuffled these two cards will not be separated. You will understand that it is an easy matter for you to locate the chosen card because of the added thickness where the two cards are stuck together. A simple riffling of the edges of the cards will cause a break at the right place.

One way of making this into a trick is to deal all the cards out with their faces upwards and show that the chosen card has vanished. Actually it is hidden behind the card to which it is adhering. Then, in gathering up the cards, you can detach the selected one and in a second dealing show that the card has returned.

Another way to produce the card is to shuffle the pack and leave the two adhering cards on top. Place the pack in the pocket of a member of the audience, and proceed to pick out the chosen card from his pocket. As it is on top of the pack this will present no difficulties to you.

Next is a trick that can be worked up into almost an evening's entertainment if you have an assistant to help you present it, or which can be performed as a simple short trick if you work single-handed.

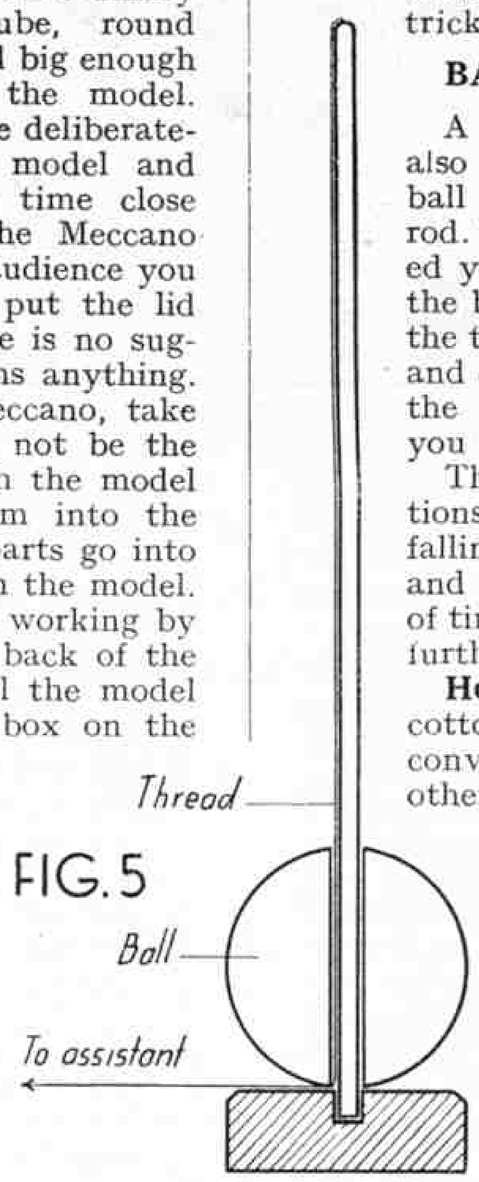


FIG. 5

BALL THAT ANSWERS QUESTIONS

A large ball is given for examination, also a rod. There is a hole through the ball to enable it to be slipped over the rod. When rod and ball have been examined you fit the rod into a stand and slide the ball on to it. The ball will now rise to the top of the rod apparently without aid, and continue to rise and fall up and down the rod quickly or slowly, as often as you wish.

The ball can be made to answer questions asked by the audience, rising and falling once for "yes" and twice for "no," and indicating numbers by the number of times it rises and falls. But before going further I had better explain how to do it.

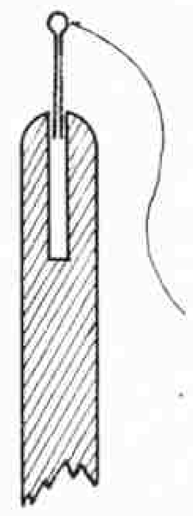
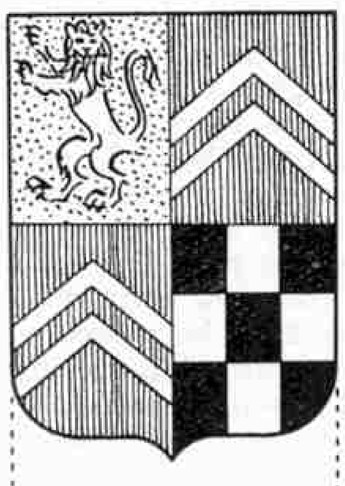


FIG. 4

Section of rod with thread attached to cotter pin, being dropped in

How it is done. You will require a length of fine black cotton, one end of which goes behind a screen, or out of a convenient doorway, to your concealed assistant. The other end of the cotton is attached to a short piece of wire. A small cotter pin is ideal for the purpose. There is no preparation about the ball, but it should not be very heavy. One of the hollow cardboard balls sold for holding sweets is excellent. In each end of the rod a hole just large enough to take the cotter pin is drilled. The stand may be an ordinary music stand, or simply a heavy block of wood with a hole into which the rod can be jammed.

When the rod is returned after being examined, you drop into the hole at one end of it the cotter pin on the thread (Fig. 4). This you have secretly



—The Shield

FIG. 6

—The loose plain fake N.B. Three small holes can fit over short headless nails on the shield to prevent the fake slipping sideways

picked up from your table. The object of having a hole at each end of the rod is to prevent you having to look at the rod to see which is the right end. Now insert the rod in the stand, with the thread at the top, and drop the ball over it. The ball will sink to the bottom of the rod, carrying the thread down as shown in Fig. 5.

To cause the ball to rise, your assistant gently pulls the cotton, which forces the ball up the rod. It will fall again as soon as the thread is slackened. If you are performing without an assistant, the free end of the thread should be attached to a drawing pin left point upwards on the floor. By placing the heel of your shoe on this you will be able to cause the ball to rise and fall by moving accordingly.

If you work alone you will have to limit the rising and falling of the ball to a few quick and slow movements, and then make the ball jump off the top because if you prolong the trick too much your movements may give a clue to the secret. With an assistant well out of sight operating the thread, however, you can carry on as long as you wish, particularly if you have been able to lead the thread away straight behind the stand, through a curtain. With the thread going directly away from the audience nobody is at all likely to see it. Naturally you need a dark background of some kind.

You can get a good deal of fun out of this trick by asking questions of the members of your audience. For instance, you may have a friend present who usually turns up late at school. You might ask if the cause of this is that he cannot get up early, or if he purposely delays his start so that he may have the benefit of the exercise by running to school! In the latter case an answer of "No" will arouse laughter, especially if other school friends are present who are aware of the real cause of his lack of punctuality. Then you can turn the tables on those who laugh by asking humorous questions about them.

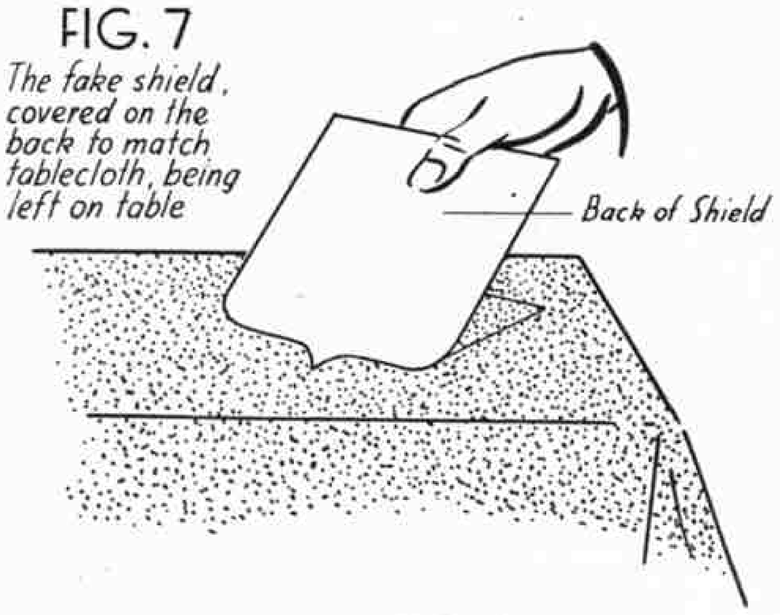
The following trick is a quite elaborate affair, very showy, yet quite easy to make up and to perform.

THE DISAPPEARING PATTERNS

You begin by showing a large shield. It is quite plain, and having shown both sides of it you prop it up with its back to the audience, while you display several sheets of paper, on each of which is a heraldic device. One sheet, for instance, might be yellow with a lion rampant in blue on it, another could have a red chevron on a white background, while others could show either simple patterns of squares or stripes, or more elaborate patterns such as dolphins, fleur-de-lis, etc. Your choice will naturally be governed by what you can draw, or find to trace from in a book. The patterns are painted on the various coloured papers.

FIG. 7

The fake shield, covered on the back to match tablecloth, being left on table



Having shown the designs you fold the papers and put them into an envelope. After making passes, striking a gong or firing a pistol, you open the envelope and take out the papers, when each is seen to have the pattern cut from it, leaving a hole the shape of the lion or chevron, or whatever the device was, cut in the paper. Finally you turn the shield round, and the missing devices are seen on it arranged to form a coat of arms.

How it is done. For the purpose of this trick you need not worry very much about making your coat of arms heraldically correct. In fact it will be better if you make it a bit funny. Your rampant lion, for instance, might be holding up an umbrella. There are two ways of making the pattern appear on the shield, and I will describe the easier one first.

The shield is cut from plywood or stout cardboard, and has the various devices painted on it. Another shield is then cut from thin cardboard, painted plain white on one side and covered with patterned material on the other to match the tablecloth. (See Figs. 6 and 7.) You begin by showing the shield, with the loose plain shield in front of it white side toward the audience. You keep the loose shield in place with your fingers, and the complete affair looks like just a plain white shield. You lay this shield face down on the table while you fetch a candlestick or bottle against which to rest it, then, when you pick up the shield, you leave the loose one behind, and owing to the back of this being covered to match the tablecloth it cannot be seen. You then prop the shield up against the candlestick, back towards the audience, all ready to reveal the heraldic device, at the end of the trick.

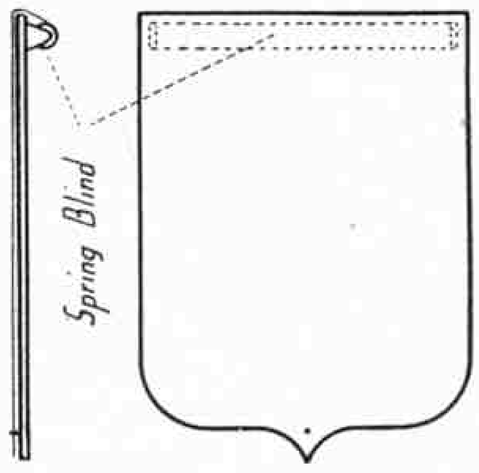


FIG. 8

Spring roller blind fake to hide coat of arms on shield

The second method is more mechanical, but it allows you to make the pattern appear on the shield suddenly, in full view of the audience. This shield is also made of wood and has the pattern already painted on it, and it is covered by a spring blind of white American cloth cut to the shape of the shield. Fig. 8 shows this blind, which is a small spring roller window blind cut to the right length and with the blind part replaced by a shield-shaped piece of white American cloth. The roller is attached at the back, near the top of the shield, and the blind is drawn over and down to cover the latter. The ratchet is removed from the blind, so that when drawn down it will fly up again if not held. You keep it down in position over the shield by a small eyelet in the point of the blind, this eyelet being slipped over a headless nail in the point of the shield.

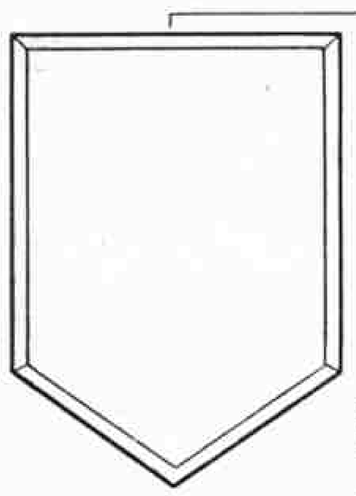


FIG. 9

Blind for framed shield running in groove of the frame

The shield with the blind down can be shown to be quite plain. There is no need to show the back. At the right moment, give the shield a shake and snick round the roller, revealing the pattern on the shield. If you want to make a very neat job indeed of the shield you can make it the shape shown in Fig. 9, and fit a narrow moulding like a picture frame round the edges to mask the edges of the blind. The top moulding must of course have a slit along its full length for the blind to pass through.

Now for the way to make the patterns vanish from the papers. You do this actually by changing the original papers for another set having the patterns cut out. This is accomplished by a trick envelope consisting of two large envelopes glued neatly together back to back as shown in Fig. 10. The cut papers are already in side A and the flap is sealed. When you have shown the patterned papers, fold them, put them in side B, and seal the flap. While you are putting the envelope on the table you secretly turn it over, so that afterwards it is side A which you open and consequently the cut papers come out instead of the others.

FLAGS FROM CONFETTI

Here is a quick and pretty trick in which a handful of confetti dropped into a canister becomes transformed into a string of flags.

How it is done. The canister is fitted with a wedge-shaped compartment that swings out at the back as shown in Fig. 11. The compartment is hinged at the point of the wedge to the bottom of the canister. The canister has a sliding lid and this lid has a hole near the front. When you draw back the lid you do so by putting the tip of a finger through the hole, and this also enables

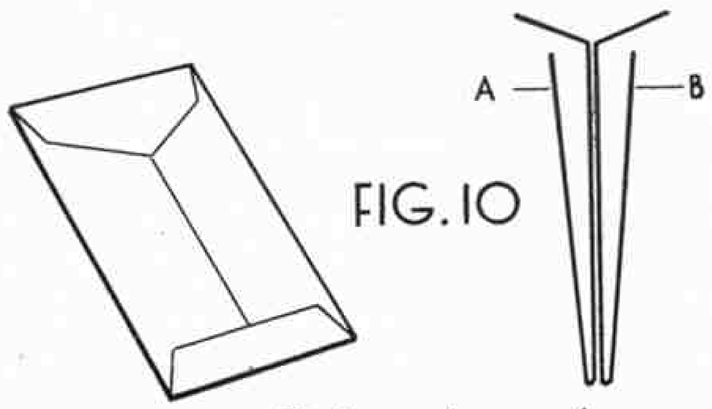


FIG. 10

Trick envelope made from two envelopes stuck back to back

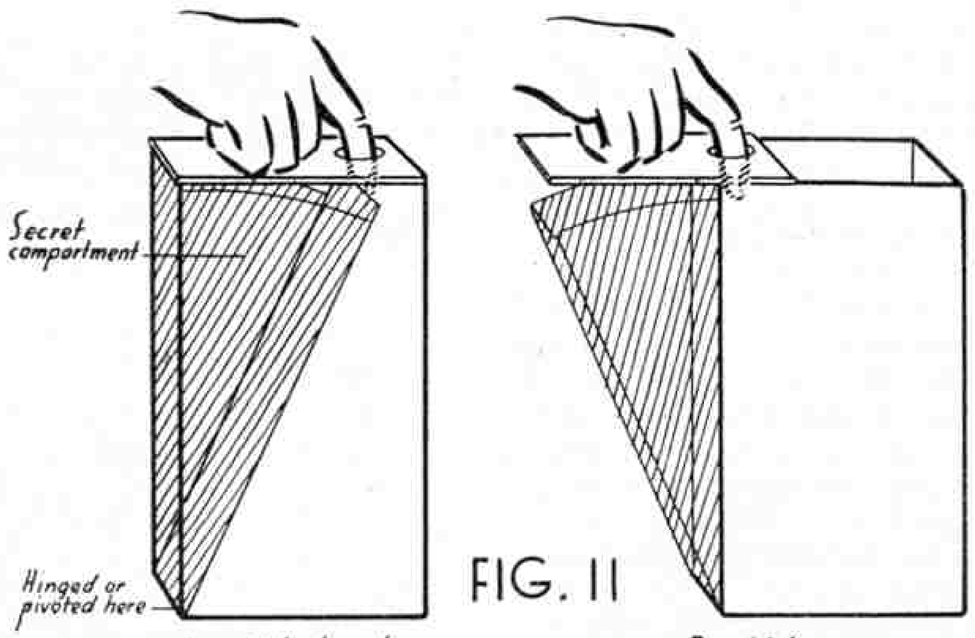


FIG. 11

you to draw back the front edge of the compartment with the lid. The interior of the canister then appears to be empty. The movements are shown quite clearly in A and B, Fig. 11.

The string of flags is concealed in the wedge-shaped compartment. The canister is shown empty by drawing back the lid and the secret compartment together, after which a handful of confetti is dropped into the canister. Lid and compartment are then slid back, and a moment later the lid alone is drawn off and the flags are produced. The canister should be painted in bright colours, but the sides of the wedge-shaped compartment must be dead black so that they will not attract attention.

A SIEVE THAT HOLDS WATER

In an unusual trick with a most unexpected effect, you first show a coffee strainer, just a wire mesh affair on a handle. You pour water into it from a jug. Naturally the water runs through into a basin you have on the table for the purpose. But now you wave your wand and again pour water into the strainer. This time the water does not run through but remains magically in the strainer until you pour it out at the top. You then wipe the strainer on a cloth and hand it to the audience for examination.

How it is done. The strainer should be a small cone-shaped one, as shown in Fig. 12. You will need a fake for the trick. This fake is a piece of talc or transparent celluloid cut in the form of a segment of a circle, curved, and having the edges cemented with Seccotine to form a cone. This cone must fit neatly into the strainer. It is best to make a paper one first, and use this as a pattern for cutting the talc, or celluloid. Put a good-sized blob of Seccotine into the point to make sure that it is well sealed.

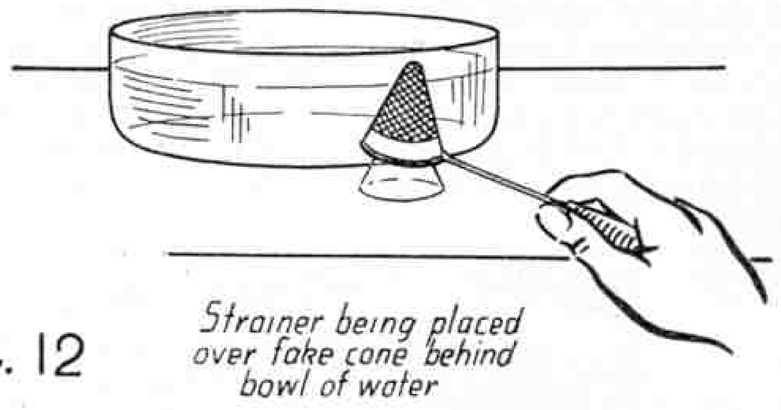


FIG. 12

To perform the trick have the fake cone, point upwards, on the table behind the bowl. The bowl should be of glass and apparently could not conceal anything. The water in the bowl, however, prevents any suspicion of the transparent cone behind being seen. Show the strainer, and pour water through it into the bowl. Now place the strainer upside down behind the bowl, over the fake, as shown in Fig. 12, while you pick up the bowl and show that it contains ordinary water. If the fake cone has been made a good fit it will jam in the strainer and can then be picked up with it, and thus it acts as an invisible waterproof lining into which you then pour water. Finally pour out the water and leave the fake in the cloth in the act of drying the strainer, after which the strainer may be offered for inspection.

THE JUMPING SPOT

The last trick is a neat little dodge with two small dice. Actually it is a sleight-of-hand trick, but the sleight-of-hand is so easy to learn that I am sure you will have no difficulty with it.

Having had the two dice examined, you hold one in each hand. The one on the left shows five spots, that in your right hand exposes four spots. You give your hands a shake, and the centre spot on the five jumps across to the other hand, leaving four spots on the left and five on the right. You can go on making the spots hop backwards and forwards as long as you like. To make the trick even more effective you can use two differently coloured dice, but it is necessary for the spots to be the same colour on both to maintain the illusion.

How it is done. It is all in the way you hold the dice. Take a die, not more than ½-in. square, and hold it between your thumb and forefinger, as shown in A, Fig. 13. Now gently roll the die between thumb and finger so that it turns over sideways. If a small die is used you will find that you can give it one turn without appreciably altering its position between your fingers. Yet this turn brings another side of the die into view, and consequently another number of spots is shown to your audience.

That is the whole secret of this very effective little trick. Arrange the dice one in each hand, the four showing on one side and the five on the other. You will find that by turning both dice one turn you can reverse the positions of the four and the five, and so produce the effect of the centre spot jumping from one hand to the other in a manner that is both puzzling and amusing.

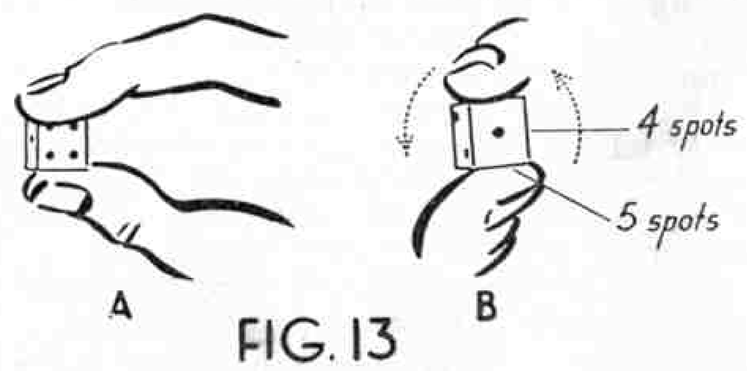


FIG. 13

Winter Fog on the Railway

Comparisons made by operating experts of the L.M.S. Railway suggest that this winter may turn out to be a worse one for fog than last winter. At any rate a bad start has been made. Whereas in October 1936 there were only three days when fog adversely affected traffic operation in various parts of the L.M.S. system, there were no fewer than 21 such days in October of this year. In the whole of November 1936 there were nine days when fog was experienced; last month far exceeded this record, and in some parts of the system the fog was dense. Incidentally it is pointed out by L.M.S. officials that an exceptional amount of early morning fog was encountered during the late summer months of this year, whereas the same period last year was comparatively free from fog.

It is estimated that more than 1,000,000 detonators or fog-signals will be used by the L.M.S. Railway during this winter in ensuring safe working during fog. The ordinary fog signal is somewhat similar to a giant "cap" of the type used by boys in toy pistols, but with its explosive mixture housed in a circular metal casing. From the edges of the casing there hang two strips of soft metal that enable the detonator to be placed in position on the rail, and secured by bending the strips round the edges of the rail head. Each detonator contains a quantity of gunpowder, and a sufficient number of percussion caps to make certain that it will explode when a locomotive wheel passes over it. Special care is taken in the manufacture of detonators and in their storage, and rigid tests are made to ensure that they are not affected by damp, heat or cold.

Where several lines are involved on a busy route the fogman has barely sufficient time to put down fresh detonators after the passage of each train, to look out for the trains, and to observe the positions of the signals near which he is stationed. In order to reduce the danger of crossing the line, and to eliminate walking to and fro as much as possible various kinds of detonator placing machines have been devised. These machines are operated by the fogmen by means of a wheel or lever. Some are arranged on the magazine principle, and contain a supply of detonators that are picked up in rotation by an arm that swings them out over the rail. Others take the form of a number of flat metal "fingers" pivoted so that they can be lowered over the rail. To the end of each of these fingers a detonator is attached, and so held in position on the rail head. After each explosion the empty finger is raised by the fogman's lever, and when all the fingers have been raised a fresh supply of detonators must be fitted to them. With these arrangements the detonators placed on the rail when the signals are at danger can be removed if the signals should happen to be altered to the clear position.

Fogmen are usually recruited from the platelaying staff, for apart from the daily inspection and any necessary maintenance of the track, no permanent way operations of any magnitude are carried out during fogs, so that the men are thus employed in fog service when otherwise they would be idle. Each fogman has his own particular post assigned to him.

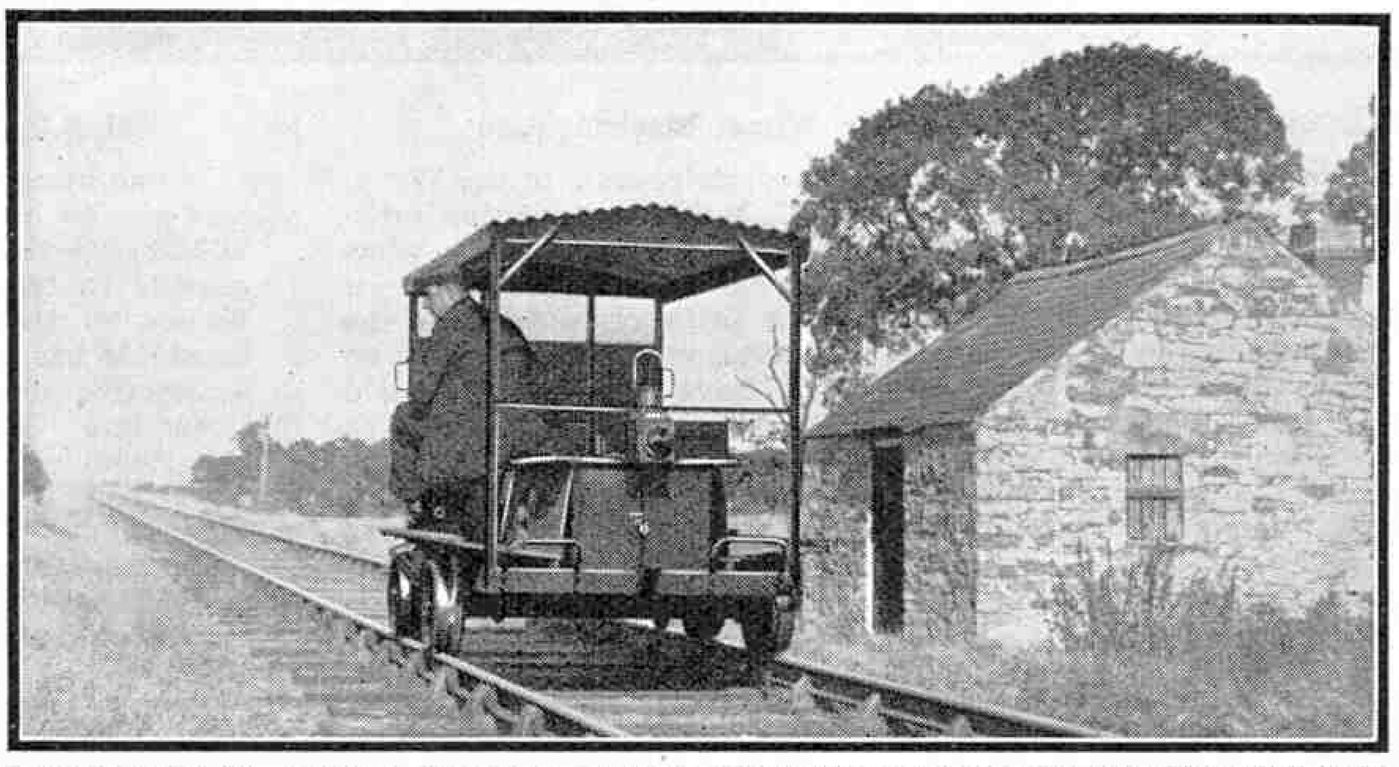
Saving Time in Railway Track Work

Petrol Trolleys for Permanent Way Men

By "Railwayman"

AS in most branches of railway work, the methods of the permanent way men have undergone considerable changes in recent years in order to meet modern conditions. The increasing weights to be carried and the higher speeds at which trains are run have had the result that track technique has improved, both in regard to materials and methods. It is still necessary to give scrupulous attention to the maintenance work, however, and any means of saving of time and labour in all the different track operations is important, especially in the ordinary day-to-day work of the ganger and his men.

In previous days the invariable practice was to divide the line up into short lengths, each assigned to a gang of a few men, who patrolled it and kept it in order. Modern practice favours the employment of larger gangs, covering a greater length of line, and this has made it necessary to find a quicker method of carrying the gang with their usual tools and the more specialised appliances now employed. Formerly they simply walked to the place where work had to be done, pushing along the track small hand trolley carrying their heavy implements.

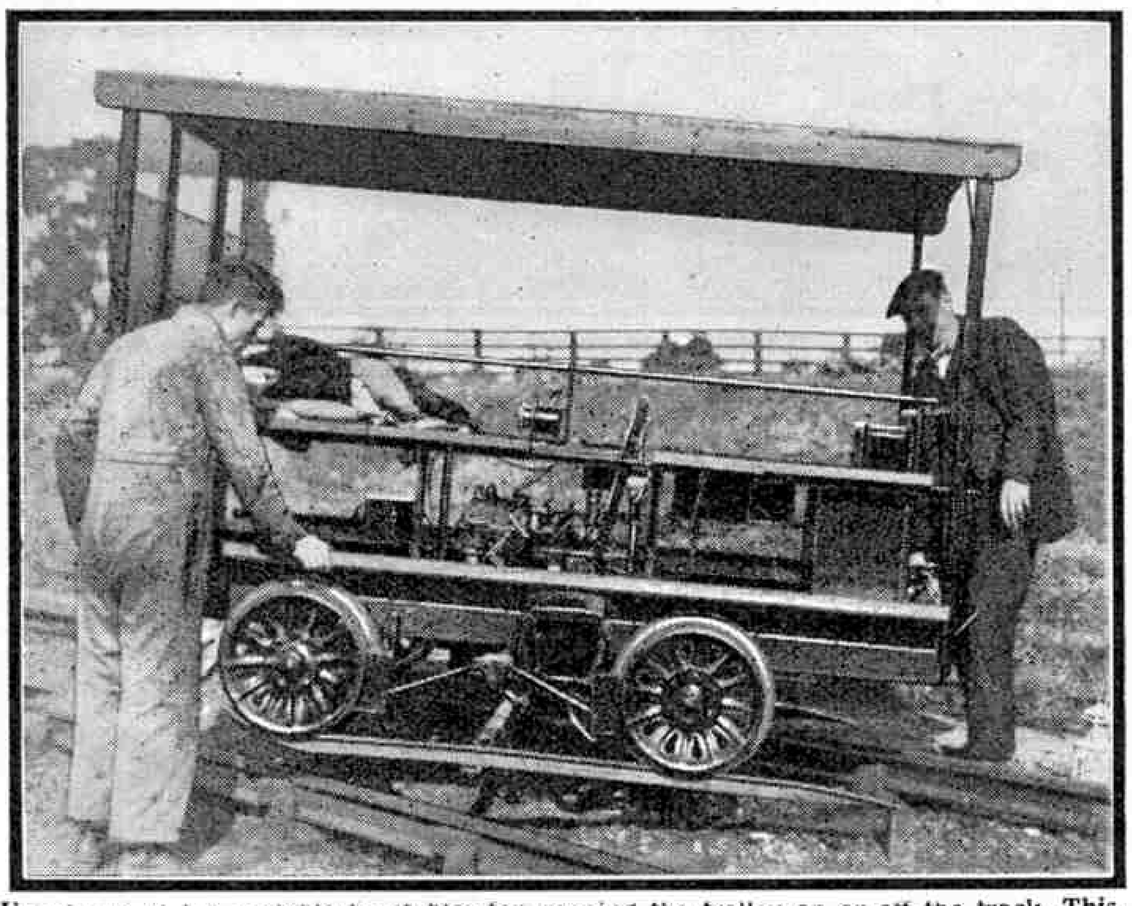


A typical petrol-driven trolley of the kind used on the L.N.E.R. by permanent way men. The trolley ranks as a train when on the track, and therefore carries a tail lamp.

Now petrol-driven trolleys or rail-motors of the kind illustrated on this page are in extensive use, together with suitable trailers, especially on long branch lines.

The L.N.E.R. particularly have made great progress in the use of these trolleys, and have more than 250 in regular use. These rail-motors can attain a speed of 50 m.p.h. though they are not allowed to exceed 25 m.p.h. I have seen them pulling as many as 30 men and their tools, using two trailers behind the rail-motor, and they are often called upon to take heavy loads of sleepers, chairs, keys and other material for a distance of 10 or 15 miles.

Rail-motors are stationed mostly at small country stations, or at junctions having a branch line on which there is a poor passenger train service, or in some instances only a goods train service. If they were used on the main lines, where there are intervals between fast trains they would be liable to interfere with the train service. Where they are used they are housed in a small garage at the lineside near the depots to which they are attached.



Using one of the portable turntables for running the trolley on or off the track. This photograph gives a good idea of the general layout of the vehicle.

A small portable turntable is in use to provide for the removal of the motor trollies from the track when necessary either at the close of work or to allow the passage of trains. This turntable is carried on the trolley itself and is so light that it can be easily handled and used by one man. It consists of two short lengths of rail connected by a cross piece hinged at its centre. As the gauge of the turntable is exactly the same as that of the track, the short rails fit on those of the permanent way when the support is placed centrally on the track.

In order to remove a trolley from the line it is pushed on to the turntable, tiny ramps at the ends of the short rail lengths being provided to allow this to be done. When balanced, the turntable is swung round until its rails are at right angles to those of the track, and the trolley may then be pushed off. This is only done at points where rails have been laid down on to which the trolley may be run in order to be out of the way of passing trains. These small sidings have been constructed at intervals of three-quarters of a mile, and trolleys standing on them can readily be replaced on the track by means of the turntable.

A point that arises from the use of these power-driven vehicles is that it is necessary for their running to be controlled by the signalmen. When a rail-motor is put on the track its movements are carried out under the block system, just as though it were a train; in fact it is treated as such by the signalmen. A small wooden post is fixed near the run-off rails, and this is connected by telephone to the nearest signal box. For permission to proceed down the line the rail-motor driver plugs his telephone into a pair of sockets on this post. His telephone is then automatically locked by means of an electrical device, and he has to ring up the signalman, who will then release him if the line is clear.

Each rail-motor is fitted with a Klaxon horn and carries a supply of detonators or fog-signals, a red and a green flag, and an ambulance outfit. The driver has to understand the signals on his own particular section, and is subject to much the same rules as the driver of a locomotive of the usual kind.

A spare or relief driver always accompanies the regular driver. As the men who drive them are only semi-skilled the vehicles have to be built on simple, yet substantial lines. No gear box is used, and no direct drive, yet the driver has the choice of four forward and three reverse speeds. The drive to the rear axle is effected by means of a sliding friction wheel. A flat steel disc on the end of the crankshaft drives a circular friction wheel with a fibre surface. This can be moved across the face of the steel driving disc, and brought into contact with it by means of a friction drive lever.

The motors also are fitted with a sand box that is used when the rails are wet or greasy, and all of them are fitted with celluloid windscreen panels. When very heavy loads are needed for a section a few miles away, two or even three motors are used.

Rail-motors were on view at recent railway exhibitions at Newcastle and Darlington, and members of the public were allowed to go for short rides on them for a small charge. Adults of both sexes easily outnumbered the children in the rush for rides.

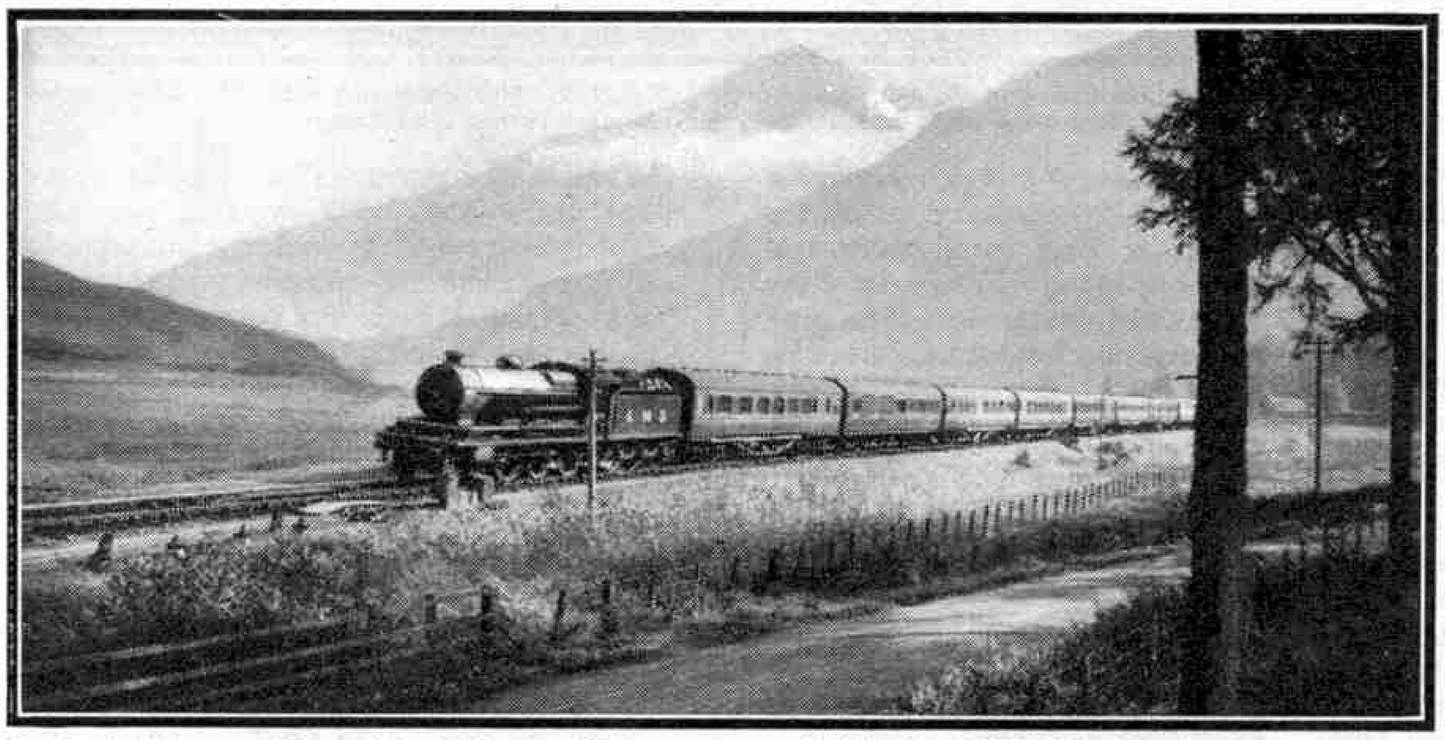
The "Clans" on the L.M.S. Oban Line

On a route such as the Oban line of the L.M.S., which is so infested with severe gradients and numerous curves, one would scarcely expect to find anything very spectacular in the way of locomotive work. Most of the trains load to very heavy formations for so hilly a route, however, and, what is more surprising, they are very rarely piloted. The 4–6–0 "Clan" class engines, for many years the chief passenger locomotives of the former Highland Railway, are used on the principal trains, and their performances are characterised by an almost unfailing reliability.

Up the 1 in 60 banks the "Clans" are allowed to take 255 tons unpiloted, or exactly the same load as the Stanier Class 5P5F engines are permitted over the worst climbs of the Highland main line, but cases have been noted where the "Clans" have handled trains of considerably higher tonnage with complete success. For example, No. 14766 *"Clan Chattan"* had a load of 315 tons, and even on the five-mile ascent at 1 in 60, which begins right off the platform end at Balquhidder, no assistance was taken and a speed of 17 m.p.h. was quickly attained. Glenoglehead crossing was passed in 18¾ min., and the complete 7½-mile run from Balquhidder to Killin Junction was made in 25 min., exactly to time.

Hill climbing forms the sole criterion of running over such a route, and on the shorter but much steeper bank from Connel Ferry to Glencruitten summit, where the grade is 1 in 50 for nearly 3 miles, No. 14767 *"Clan Mackinnon"* made two really grand climbs. On the first of these, with a seven-coach train of 240 tons gross, Glencruitten summit, 3¼ miles, was passed in 9½ min., speed rising to 26 m.p.h. on the ascent. On the second the engine did even better, for the load was 275 tons. Speed rose to 23 m.p.h., and the train stopped at the summit in exactly 10 minutes from Connel Ferry. The finest effort of all was made by No. 14768 *"Clan Mackenzie"* on the climb from Killin Junction to Glenoglehead, 2¼ miles at 1 in 69. The load this time was 235 tons and speed actually rose to 30 m.p.h. in 2 miles from the start!

We are indebted to Mr. O. S. Nock for these notes.



On the L.M.S. near Crianlarich. A Glasgow-Oban express hauled by No. 14768 "Clan Mackenzie," one of the "Clan" class 4-6-0s of the Highland Railway. Photograph by O. S. Nock, Bushey.

The Wirral Electrification

Work on the electrification of the Wirral Section of the L.M.S. is progressing satisfactorily, although it is not yet known when the service will be in full operation. Current for the service is to be obtained from the Liverpool Corporation and feeder cables for carrying it have already been laid through the Mersey Railway tunnel. The supply will be converted from alternating to direct current in six rectifier substations, one of which will be controlled manually while the other five will be remote controlled.

The laying of the conductor rails has been completed. They are of the flat-bottom type similar to those used on the electrified systems of the L.M.S. between Liverpool and Southport and in the London area.

Extending L.N.E.R. Train Control

An extension of the existing arrangements for train control in the area previously served by the old Great Eastern Railway has been planned by the L.N.E.R. Trunk telephone circuits are to be provided between Liverpool Street and other control offices at Stratford, Cambridge, Ipswich and Norwich. In addition, the control system is to be extended to Southend, and a new telephone circuit embracing the section of line from Stratford to Harwich, Clacton and Walton-on-Naze is to be installed. These revised control arrangements will enable the operating staff to regulate the flow of traffic and train working over this busy area. The great advantage of the control system is that it enables those in charge at the control offices to keep in touch with local requirements and conditions, and to facilitate the speeding-up of train working.

L.N.E.R. 70-ft. Turntables

In addition to the 70-ft. turntables that are to be installed by the L.N.E.R. at Marylebone and Leicester to allow larger engines to be used on the Great Central Section of their main line, a new 70-ft. turntable has been ordered for Darlington locomotive depot. This will permit the streamline "Pacifics" to be handled at this depot.

More Teleprinters on L.N.E.R.

Further teleprinter circuits are to be installed on the L.N.E.R. with a view to increasing the efficiency of communications between districts. The teleprinter consists of a device similar to a typewriter keyboard on which the message is typed out, and is automatically reproduced on telegram forms at the destination point.

An interesting feature of the new installations is that they will be connected with a new automatic switchboard at the Telegraph Office at Liverpool Street Station, and direct contact will be established between any two points by operating a dial similar to that of an automatic telephone. This will enable a large number of cross-country circuits to be connected up almost instantaneously when required. A further unique advantage of this system is that telegrams can be despatched to offices that are closed at night or during week-ends, for the receiving instrument works automatically and will record messages in the absence of the staff, who examine them on returning to duty.

New L.M.S. Coaling Plant at Stranraer

The first of a new type of mechanical coaling plant has been installed at the L.M.S. Stranraer Motive Power Depot. It has been specially designed to meet the requirements of a depot where comparatively few engines have to be coaled, but where they arrive for coaling in groups.

The plant is of all-steel construction, and consists of an overhead 25-ton bunker that is filled from railway wagons by means of an elevator. The delivery of the coal from the bunker into the locomotive tenders standing below is controlled by the driver or fireman of the engine.

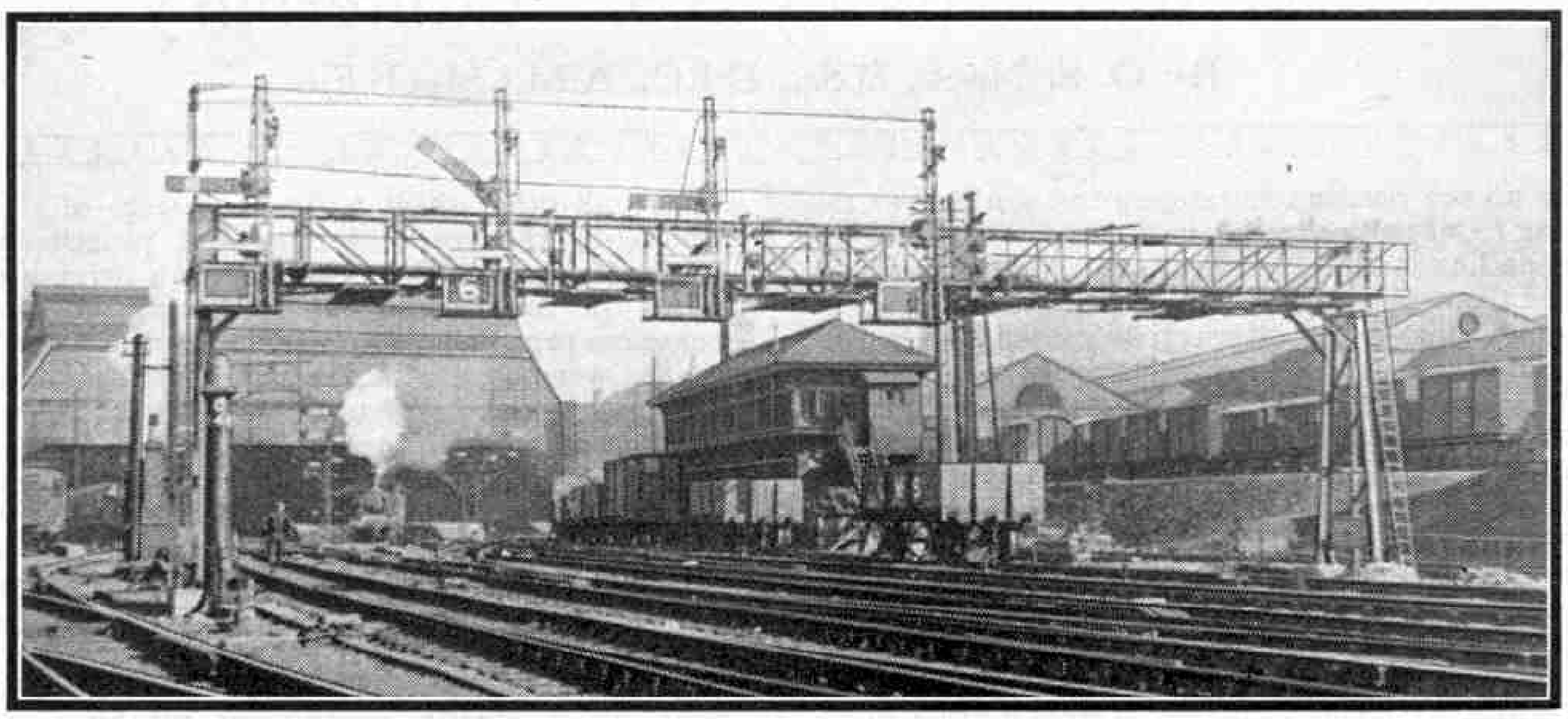
L.M.S. Resignalling at Edinburgh

The signalling arrangement at Princes Street Station, Edinburgh, originally installed by the former Caledonian Railway in 1893, has been replaced by entirely new equipment. The station, which is controlled by one signal box, consists of seven passenger platforms and several sidings, and is served by three running lines, the up line for trains leaving the station, and Nos. 1 and 2 down lines for arriving trains. No. 1 down line is used exclusively by empty carriage trains and light engines.

Under the old arrangement the ingoing and outgoing signals controlling the platform lines and loading dock siding were carried on a gantry at the entrance to the platforms. This gantry carried 45 signals, and an unusual feature of its design was the use on each distant signal of a ring that was fixed on the centre of the arm. This arm indicated to a driver whether the platform he was about to enter was occupied or not. When the particular platform line was occupied, the home signal was cleared but the distant signal was maintained at danger. The driver had then to proceed with caution and to be prepared to stop short. Both home and distant signals were cleared when the platform line was empty.

Under the new scheme, semaphore home and drawahead signals with route indicators have been provided from Nos. 1 and 2 down lines, and from a siding that links up with No. 1 down line. A set back signal with route indicator also has been provided for the up line, and separate dwarf signals are available for movements from Nos. 1 and 2 down lines and the up line to one of the sidings.

In order to overcome the difficulty in connection with the driver's approach view of the ingoing signals, due to the existence of an overbridge, the signals and route indicators are carried on the face of the new gantry, while the signals, by means of which traffic leaving the station is controlled, have been placed at the platform ends.



The new signal gantry at Princes Street, Edinburgh, built to replace the old gantry installed in 1893. Owing to the presence of a nearby overbridge the signals have been specially arranged for easy sighting. Photograph by courtesy of the L.M.S.

Modernising L.N.E.R. Stations

Contracts have been placed for the installation of a Passimeter Booking Office at Gateshead East Station, and for the construction of new offices at Darlington Bank Top Station.

A floodlit "Train Arrival" board of the latest design is to be installed at York Station. It will be erected in a prominent position in the main circulating area and will be designed so that information for the benefit of the public will be clearly displayed.

Fastest Manchester-Glasgow Goods Service

The fastest freight service on record from Manchester to Glasgow is provided by a new L.M.S. express goods train that leaves Manchester (Ancoats) at 8.40 p.m. Glasgow (Buchanan Street) is reached at 4.50 a.m. the following morning. This new service is intended solely for goods to be delivered in the Glasgow city area.

New T.P.O. Vans for the L.M.S.

The personal comfort of Travelling Post Office workers has been specially studied in the design of three new sorting vans, each weighing 33 tons, that have been built at the L.M.S. works at Wolverton. They are nearly 64 ft. long over buffers and many special features have been incorporated in their design, including an electric tea-urn and ovens for cooking meals. Overhead steam-heating pipes suspended from the roof are additional to the ordinary heaters, and curtains have been arranged so that draughts are excluded. The floors of the vans have been treated with a fireproof composition that also helps to reduce noise, while the sides are painted in a special shade of green that is restful to the eyes.

The exterior is painted in the L.M.S. standard colours, with distinctive lettering "Royal Mail" in bold letters. The Royal monogram, surmounted by the crown in black and gold, adorn each side of each coach.

The down "Flying Scotsman" hauled by No. 4487 "Sea Eagle," one of the second batch of streamline 4-6-2s turned out from Doncaster. Photograph by J. P. Wilson, Nottingham.

Evening Classes for Railway Employees

A series of evening classes for the benefit of employees has been introduced by the L.M.S. and the G.W.R. They include courses in signalling, accountancy, goods rates, station working and first aid, and already some 24,000 employees have enrolled. The classes are purely voluntary, and reasonable leave of absence and free travel facilities are given to enable students to attend the classes.

A Novel American Locomotive

The Baltimore and Ohio Railroad of America have completed plans for a new steam locomotive of most unusual design. It has the 4–8–4 wheel arrangement. There are 16 cylinders, for each driving axle has directly geared to it a motor unit of four cylinders. An interesting feature of the new design is that there will be no counter-balancing of any kind and no outside valve gear and connecting and coupling rods will be required. The cut-off position of the valve gear, together with the forward and reverse motion, will be regulated automatically from the locomotive cab by means of electro-pneumatic control.

The total weight of the locomotive will be nearly 180 tons, of which 116 tons will be available for adhesion. It is believed that the engine will develop 5,000 h.p., and that it will be capable of hauling a heavy load of Pullman cars at a speed of 100 m.p.h. on straight and level track.

Unusual "Specials"

The L.M.S. recently removed the entire contents of a farm from Towcester near Nottingham to Newark. Nearly 500 animals were involved, and among them were 100 cows, whose milking time had not to be interfered with. In addition to the livestock there were four containers of furniture and 20 tons of farm equipment.

The G.W.R. also are in the news in regard to special work, for recently they removed the entire equipment of two factories from London to Cheltenham. The contents were moved in 135 containers, and the consignment included 44 tons of machinery, 60 tons of stores and 14 tons of office furniture.

New Freight Wagons for L.M.S.

The L.M.S. have placed orders for the manufacture of 1,160 new freight vehicles, comprising 500 hopper wagons of 20 tons capacity, 650 medium goods wagons and 10 bogie trolley wagons. In order to enable them to be used on express freight trains, 150 of the goods wagons are to be fitted with automatic vacuum brakes.

A World-Famous Sea Passage

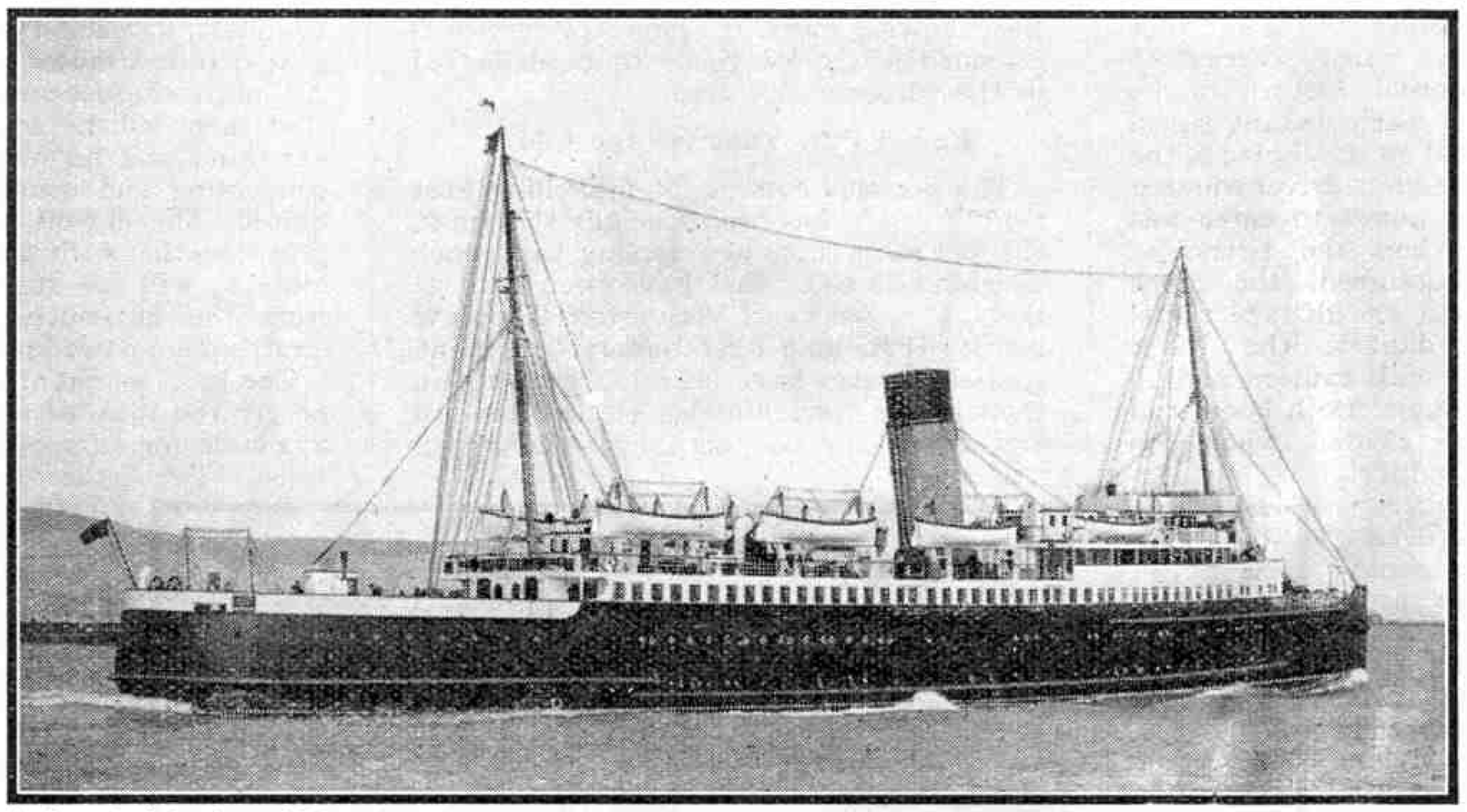
Dover to Calais by S.S. "*Canterbury*"

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

THERE is probably no sea passage so famous the world over as the Channel crossing from Dover to Calais. The very nearness of the Continent of Europe has made Dover from the earliest times a natural gateway to and from England and even to-day, although a traveller outward bound has many alternative routes to choose from, the lion's share of the continental traffic from Great Britain still passes through those queer pointed tunnels under Shakespeare's Cliff, and puts out to sea from the shelter of the Admiralty pier.

The crossing to Calais is the shortest of all the sea routes from British ports. The time from berth to berth is only 75 minutes, shorter than any of the crossings from England to Ireland, shorter even than the voyage from Stranraer to Larne; yet of all crossings none seems, in proportion to its duration, to involve heavier or more complicated working at the ports. In view of the vast amount of traffic handled, the loading and unloading of the ships is extremely smart, and rightly so. Delay at Dover means a great deal more than the boat getting away so many minutes late; any lateness is passed on to the connecting trains across the water, and in addition to the French, Belgian and German services being affected, there may even be repercussions on train running as far away as the Balkans.

"*The Golden Arrow*" swung over Archcliffe Fort Junction, past the locomotive sheds, and so into the Marine station. Waiting porters literally swarmed on board, and in a moment bags and suitcases had been snatched from the luggage racks. Time does not permit of any standing on ceremony at Dover, and long training in the art of bustle has caused her porterage to be rendered with a blunt downrightness that must surprise many travellers. The quayside is parallel with the railway tracks, and a walk of less than 50 yards brought us to the berth where was waiting that finest of all cross-channel boats, the "*Canterbury*."



A characteristic view of S.S. "Canterbury," the S.R. cross-channel vessel on which the journey described in this article was made. This photograph, which shows very well the handsome lines of the ship, is by courtesy of the S.R.

Two trains had preceded us from London, and now the entrance deck of the ship was a scene of bustling animation; porters, seamen, and passengers mingled in one vast rapidly moving crowd. With passport and other formalities quickly settled, I went up to the boat deck. By day or night Dover harbour always presents one of the most fascinating scenes in all England. Stately ranges of chalk cliffs extend both ways as far as the eye can see; there is only one gap in the line of downs, and there the town itself is clustered. At the same time there is no natural harbour. Dover has become a great port solely from its geographical position; it boasts the largest artificial harbour in the world, an anchorage so great that even from a ship one can scarcely appreciate its full extent. Overlooking all, high on the hillside, in one of the most imposing sites imaginable, is the Castle.

Just now a squall was approaching from the direction of Folkestone, and the South Foreland cliffs, still in brilliant sunshine, appeared a strange ghostly white under the darkening sky. Two liners lay under the long outer breakwater, taking up passengers from tenders, the Ostend boat "*Prince Leopold*" was berthed just ahead of us, while the train ferry dock was close at hand; docked inside, the "*Hampton Ferry*" brought an unusual touch to the port, where all other ships to be seen were of strictly orthodox types. Suddenly the squall broke, and practically the whole of this interesting scene was obscured in a driving cloud of rain.

All the time loading up was going on. The gangways were one ceaseless procession of porters carrying hand luggage; the powerful cranes were hard at it, hoisting great net-fuls of heavier baggage, containers full of registered luggage, mails, and a hundred and one other items. With such a volume of traffic—my trip was made in the height of summer—it was almost inevitable that the 20 minutes allowed for transhipment would be exceeded, but at length there came the warning siren, sailors were standing by at the capstans and in a few moments we were under way.

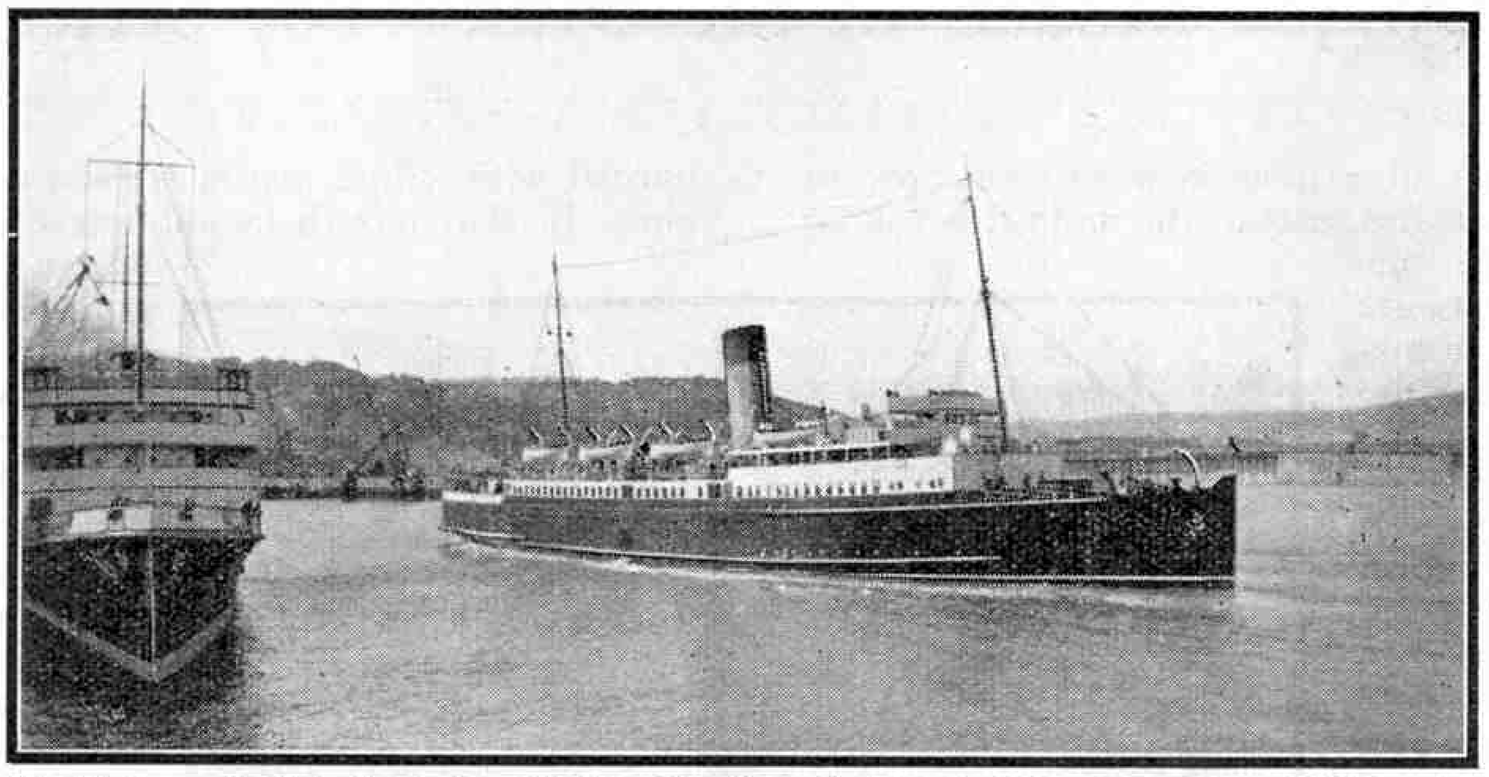
A stiff wind was blowing straight up the Channel, detached rainstorms could be seen in many directions, and the moment we passed beyond the shelter of the Admiralty pier the "*Canterbury*" took up a steady rhythmical pitching action that continued throughout the crossing. As usual the Straits were fairly alive with shipping. The Ostend boat had left some little time before us and was now hidden by the rain, but numerous small merchantmenwere ploughing their way along, and farther out a British cruiser, followed by three destroyers, was making a course down Channel. Then, a short distance beyond, we met the inward-bound Calais-Dover steamer. This was the "*Côte d'Azur*," a French vessel very similar in appearance to the "*Canterbury*," but readily distinguishable by her white funnel. This vessel and her sister ship the "*Côte d'Argent*" are owned, not by the French railway company, but by a private company, the Société Anonyme de Geranee et d'Armément. They are slightly larger than the "*Canterbury*," having a gross tonnage of 3,050; and their horse power is 14,000, a remarkably high figure for a cross-channel ship.

It was clear again now over the land, and as we got farther out the coastline gradually assumed an appearance most unfamiliar. The high ridge of downland lying back from the shore so dwarfed Shakespeare's Cliff as to make it look a very modest bluff, and the great towering precipices of Abbots Cliff gradually blended into the gleaming white wall of chalk. East of Dover, St. Margaret's Bay and the South Foreland lighthouse were at the moment prominent objects, and away on our port beam, in the direction where the "*Prince Leopold*" had vanished into the rain, the South Goodwin lightship could just be distinguished. But soon another squall was blotting out the English coast; ahead of us there might have been a thousand miles of ocean for all that could be seen, and the moment seemed a very suitable one for a detailed look round the "*Canterbury*."

This splendid ship was built specially for the "*Golden Arrow*" service, for those prosperous days when the 10-45 a.m. express from Victoria was entirely composed of Pullman cars, and the Pullman passengers had a ship all to themselves. Even now that there is only one ship for both ordinary and de-luxe passengers, the "*Canterbury*" caters admirably for the traffic. Considering the shortness of the passage the accommodation is altogether remarkable, and savours more of an ocean liner than of a cross-channel boat. On both sides

of the awning deck invitingly cosy armchairs are arranged in foursomes like those of an "open" railway carriage; the after end of this deck leads to an exquisitely decorated garden lounge. Just above, the boat deck gives splendid views of the sea, passing ships, and, if the weather is clear, both the English and French coasts; and at the forward end the boat deck leads to the observation lounge.

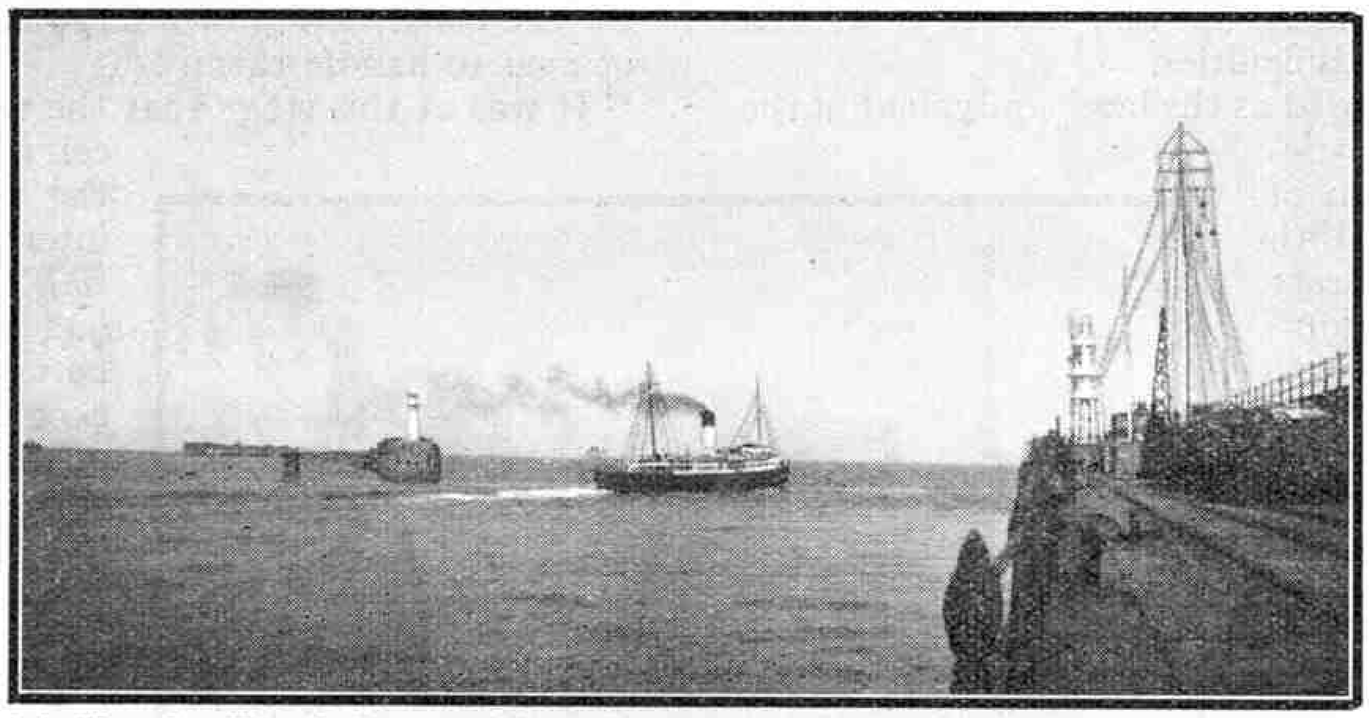
The *"Canterbury"* was built on the Clyde, by Wm. Denny and Bros. Ltd., of Dumbarton, she is turbine driven and has a gross tonnage of 2,909. Amid a brilliant array of shining brasswork, and steel gleaming with the spotless cleanliness that characterises every ship's engine-room, the Chief Engineer indicated the general layout of the machinery, pointing out the various units from a point of vantage on the main control platform. Looking aft, the two main turbine units lay astride the centre-line of the ship, humming with tremendous power. The turbine rotors run at 2,400 r.p.m., and drive on to the propeller shafts through a single reduction gear of 10 to 1. Enormous steam pipes about 15 in. in diameter lead overhead from the boilers, which are situated just forward of the engine room proper.



S.S. "Canterbury" going astern in Dover Harbour. The ship on the left is the Belgian "Prince Leopold" that makes the passage between Dover and Ostend in connection with the boat trains of the S.R.

The Second Engineer took me into the stokehold, which is entered through an air lock, so that the circulating air used for producing the forced draught for the furnaces is not allowed to deviate from its proper circuit. We went through one steel door, into a tiny compartment, and then entered the stokehold through a second door. My guide showed me the effect of the air lock by opening both doors at once; instantly there was a tremendous rush of air from the boiler room into the engine room, the air in the boiler room falling to atmospheric pressure.

The *"Canterbury"* is oil fired, and all the burners are adjusted from a single steel platform running transversely to the length of the ship. There are four boilers of the standard Babcock and Wilcox water-tube type, two forward, and two aft of the firing platform, and each boiler has six oil-burners. The Second Engineer told me that although they can carry 120 tons of fuel, only 4 tons are used on the crossing from Dover to Calais. One of the pleasantest features of an oil-burning ship from the passengers point of view is the almost entire absence of smoke. In the *"Canterbury"* a system of reflecting mirrors enables the engineer in charge to see the exhaust from the funnel, and so any tendency to emit black smoke can be checked at once by altering the adjustment of the burners.



S.S. "Canterbury" leaving Dover Harbour for her dash across the Channel to Calais. On the right of the photograph is the Admiralty pier, on which the railway track and some rolling stock can be seen.

I was then taken through a series of watertight bulkheads to the very stern of the ship, an eerie place where the rolling and pitching seemed more like the antics of a rowing boat, and where the naked propeller shafts, 12-in. diameter rods of shining steel, were making 240 r.p.m. in absolute silence! By the time I got back to the main engine-room we were not far off journey's end, but before going aloft there was just time for a brief look at the electrical switchboard, where ammeters, voltmeters, fuses, and large circuit breakers are mounted in imposing array on a panel of black polished ebonite.

When I was welcomed on the bridge by Captain Hancock we might still have been in mid-Channel. Rain was driving across in sheets and there was not a sign of land. But in a moment the Second Officer, who all the time was peering ahead, called out: "The No. 3 Buoy is right ahead Sir." After a minute or two I just caught sight of a tiny speck in the greyness, and then the Captain added: "You'll have to excuse me; I must go up on top." I should explain that this ship is provided with an upper bridge designed to give an exceptionally clear view of all that is going on. It is equipped with a duplicate set of telegraph instruments, and a device by which the Captain can give the courses to the helmsman below. It also does away with the need of a docking bridge. It is built so high above the superstructure of the ship as to give a clear view astern, and here of course is placed the helm for the bow rudder.

On this drenching day I was glad to remain in the shelter of the wheelhouse. The port of Calais like its counterpart across the Channel, is entirely artificial. On the French side the hinterland consists of absolutely level country, and so the docks, tidal basins and other anchorages have been constructed behind the general line of the coast, beyond which there only extend the two breakwaters that shelter the entrance. As we drew nearer the rain was easing, and the flat coast line gradually took shape. The sky was clearing rapidly now, and the breakwaters were close at hand; lying back from the coast a perfect forest of quayside cranes could now be seen, and rising over all was the magnificent pile of the Maritime station.

The *"Canterbury"* was now being swung round ready to enter the harbour stern first, passengers were queuing up in the gangways with the feverish anxiety to disembark that is so characteristic of these short sea passages, and soon we were gliding smoothly towards our berth. We passed the gateways to huge docks. On our starboard side was the redoubtable Fort Risban, and in a moment we were alongside the Maritime station—75 minutes dead from Dover.

In all one's travels there is little to compare with the thrill and glamour of landing in a foreign country, and at Calais it seems as though half Europe is laid out before one. High above the buzzing conversation of passengers disembarking rise the voices of the Frenchmen at the gangways, demanding in their broken English "landing tickets," and once down the gangway some of the most famous Continental expresses are drawn up close at hand, *"The Blue Train," "The Orient Express,"* and the French edition of *"The Golden Arrow."*

Before continuing one's journey, it is good to pause on the quayside to take a last look at the ship in which the Straits have been crossed; to admire her graceful lines, and spick-and-span paintwork, and to feel proud that the British mercantile marine should be represented in this bustling foreign port by so fine a vessel as the *"Canterbury."* Other important connections are revealed by the flamboyant labels on passengers' luggage, labels that seem to suggest that their owners collect them like stamps or cigarette cards! The foreign atmosphere was completed by a vast French locomotive backing towards *"The Golden Arrow"* or, in France, *"La Flèche d'Or."* Then the Pullman conductor, who travels through from London to Paris, came up to see that we were all getting settled comfortably in the train.

The Royal Tank Corps

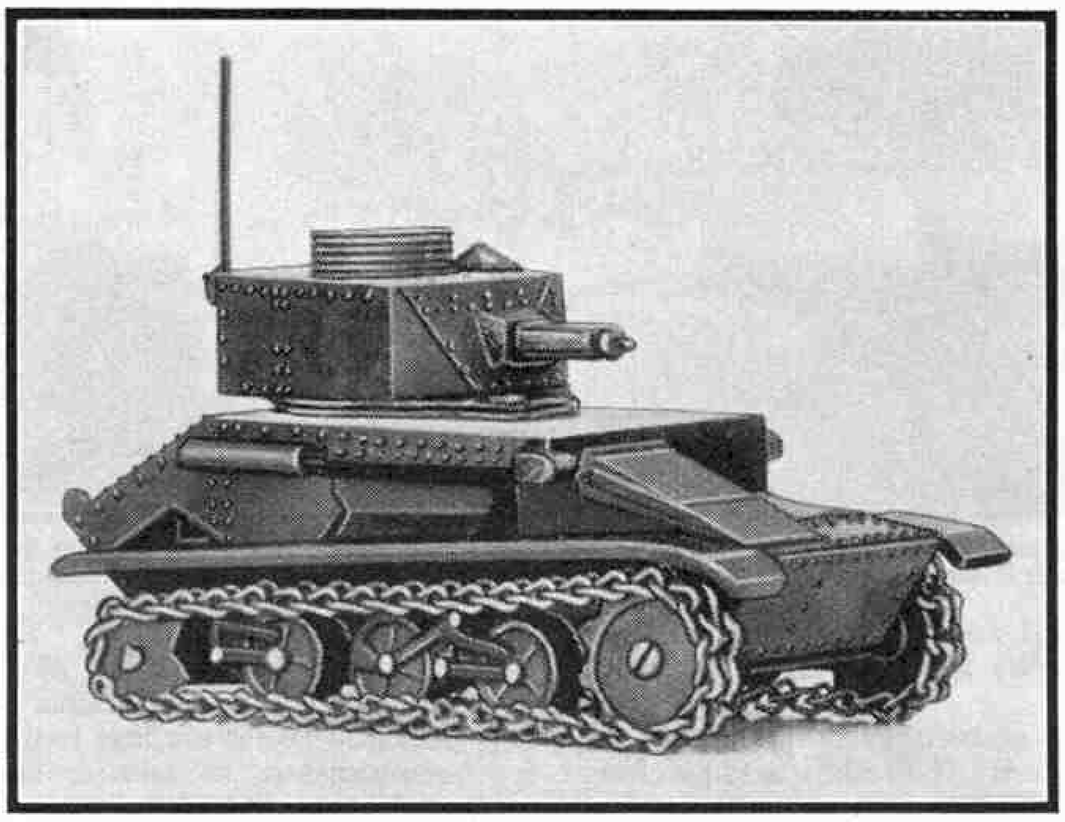
Unique Models in the Dinky Toy Series

THE mechanisation of armies is a process now in progress in all countries, and in the main it is taking two courses. On the one hand cavalry regiments are being transformed into mechanical units, making use of armoured lorries and trucks instead of horses; on the other hand the armoured fighting machines known as tanks are being rapidly developed and increased in number.

The tank made its first appearance as a practical fighting machine during the Great War. This had only been in progress a few months when it was realised that the machine-gun had given the defensive a great advantage, for a few resolute men armed with machine-guns could hold up what formerly would have been overwhelming forces of infantry. This lesson was learned in many bitter struggles, and the idea of providing infantry with protection was then taken up and steadily worked out in the face of many difficulties.

Army tanks of the Medium type crossing Magdalen Bridge, Oxford. A splendid Dinky Toys representation of this tank is shown on the opposite page.

The tank may be regarded as the land equivalent of the armoured ship. A land battleship has been the dream of many inventors. In the 15th century a German military enthusiast produced a four-wheeled van equipped with guns, which was drawn by horses into a position where it could do most damage. Others tried similar schemes, but their machines had the defects that they were not self-propelling, and could only travel on roads, for they were not fitted for rough and broken ground. The development of the petrol engine overcame the first of these difficulties, for this made the machine self-contained; the second was met by the use of caterpillar or creeper track.



The Dinky Toys Light Tank, No. 152a. It is fitted with a wireless mast, and is correctly armed and protected.

It is impossible to name any one man as the inventor of the tank, but the first suggestion for its employment seems to have come from Colonel Swinton, who as early as October 1914 had seen the necessity for some sort of armoured machine that could force its way through barbed wire, climb across trenches, and crush machine guns. In that month he submitted to the War Office a design for armoured machine gun tractors mounted on creeper tracks.

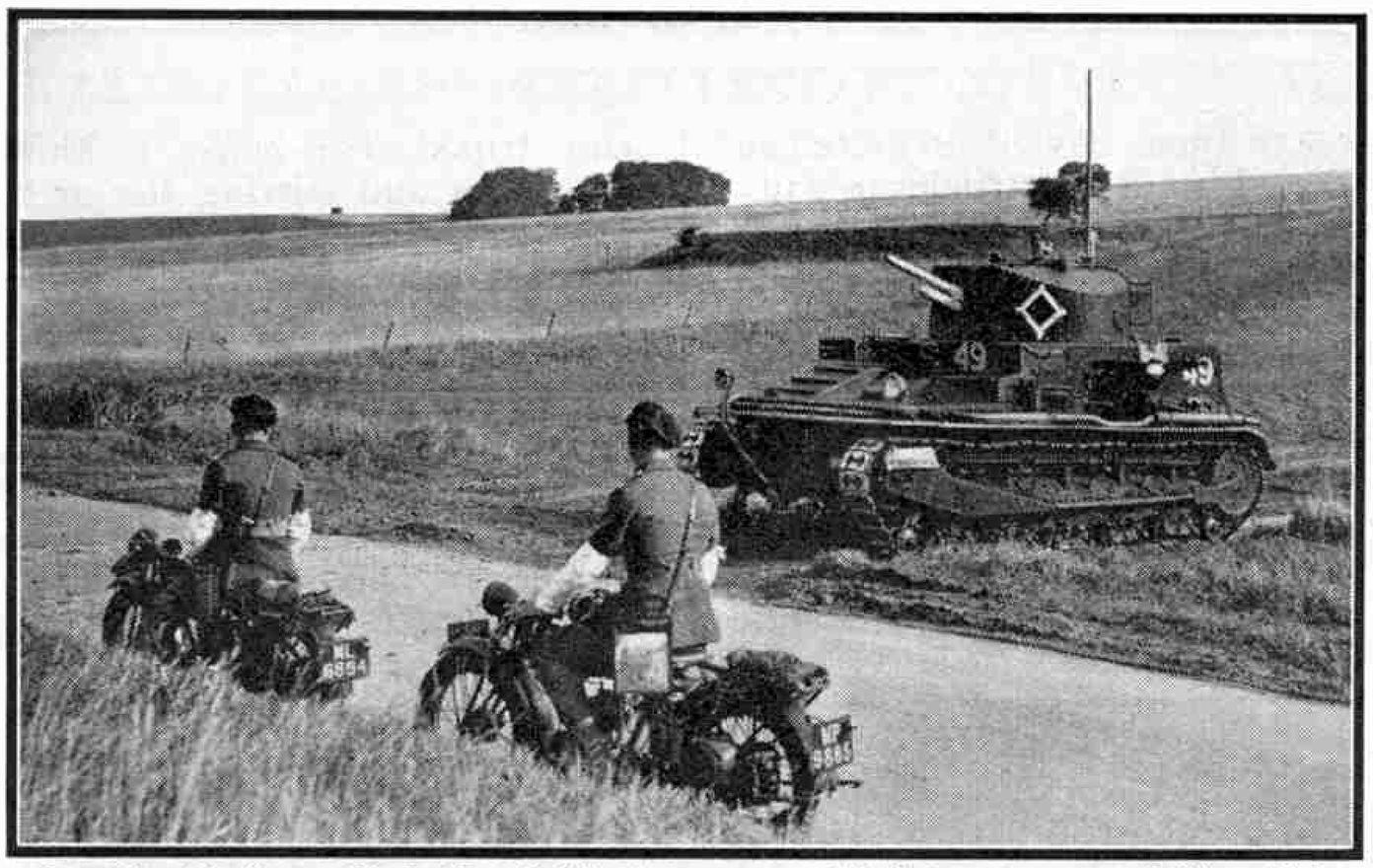
This was the beginning of the story. The idea was not received with great enthusiasm, and it was not until the following year that experiments were begun. In the meantime similar suggestions had been made independently at the Admiralty, and a committee under the direction of Mr. Tennyson d'Eyncourt, Director of Naval Construction, had been formed to consider them. When this became known a combined effort was made, which resulted in the production of a machine designed by Mr. Tritton and Lt. Wilson. This was capable of climbing a vertical wall 5 ft. high and of crossing a ditch 8 ft. wide, and its success in trials early in 1916 led to orders for the construction of a large number and the training of men to handle them.

It was at this stage that the new fighting machine received its name of tank, and the story of its adoption is interesting. Secrecy was essential, and a name therefore had to be chosen that would be mystifying and yet would account for the appearance of the machines, covered with tarpaulin, when seen during transit by rail. Such names as tank, cistern and reservoir were obvious suggestions, and the final choice fell on the first.

The appearance of the new weapon in actual warfare was an instant success, although comparatively few were used. This was in an attack in September 1916, when the battle of the Somme had almost come to a standstill. Only 60 tanks were available, but their effect was amazing. The first news of the success of this powerful new weapon reached the public in a dramatic message, sent back by an observer in a low-flying aeroplane, from which the attack was being observed. This read: "A tank

is walking up the High Street at Flers, with the British Army cheering behind."

The Germans were amazed and terrified as the monster approached them slowly but irresistibly, and it seemed as if means of overcoming their resistance without the appalling losses of previous offensives had been discovered. There were still many who had no faith in the tank, however, and on one occasion orders for the construction of large numbers actually were cancelled. Fortunately higher authorities intervened.



Army dispatch riders waiting while a light tank crosses a road during manœuvres on Salisbury Plain.

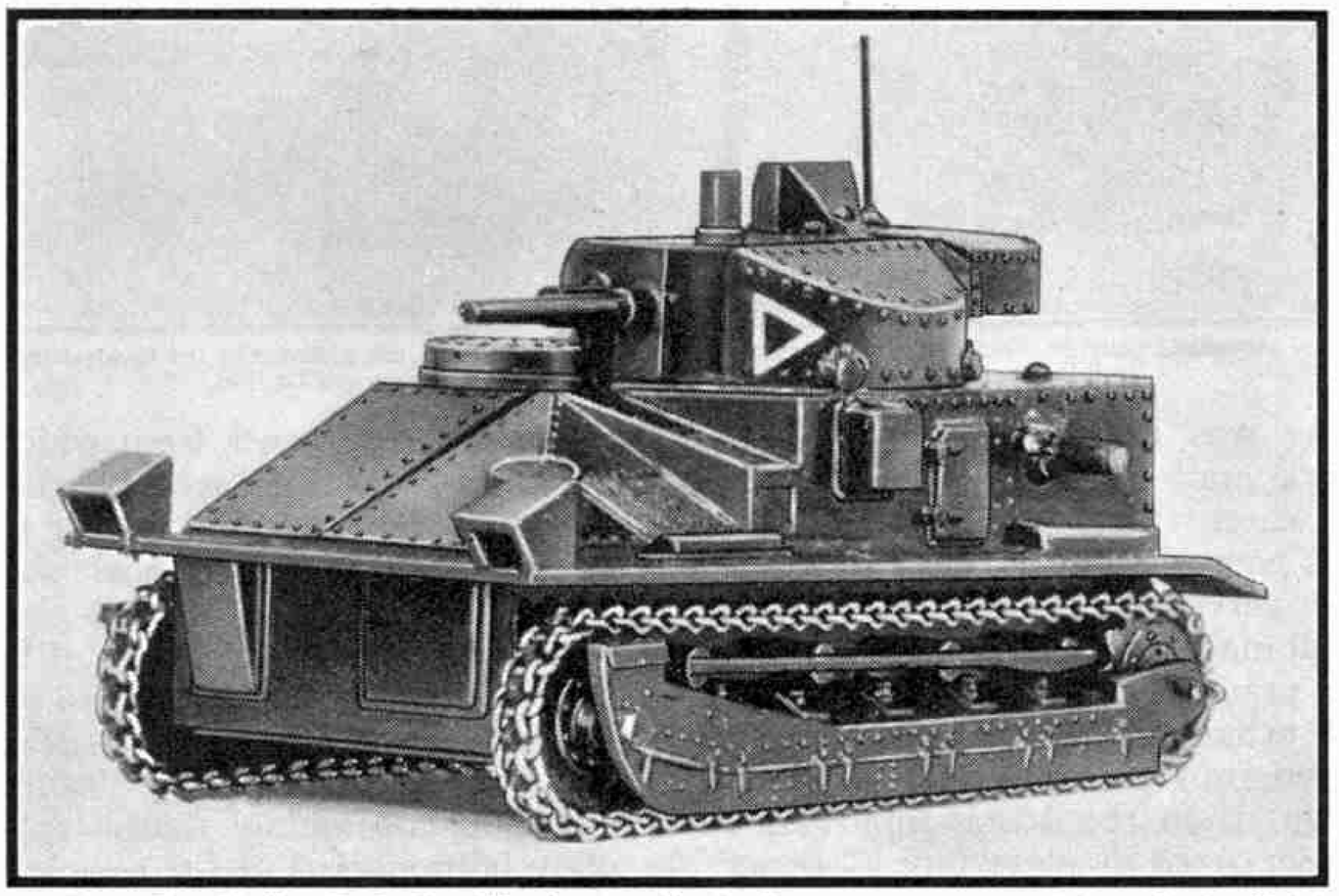
The improved tanks devised after the first successes showed their efficiency in the great offensive at Cambrai in 1917. The Germans responded to the challenge of the tanks by constructing similar machines, and tank met tank for the first time near Villers-Bretonneux in April 1918. After an artillery duel a British tank knocked out the first German tank encountered by three hits with 6-pounder shells, and two others that came up in support backed away. The earliest German tanks were only lightly protected on the roof, and their thick side armour covered their creeper tracks, making them clumsy. They could not cross large shell holes or trenches more than 8 ft. wide. In number and effectiveness the German tanks never reached the standard of the British machines.

The full value of the tanks was not realised until 1918, when they had been made still more efficient and were used in greater numbers. They helped to stem the great German offensive in March of that year; and in the battle of 8th August at Amiens, the first of the great hammer blows that ended the War, 400 tanks played a great part in the resounding success achieved. The Germans were demoralised when tanks were employed in force. If the war had continued they would have been called upon to face even larger numbers, for orders had been given for the production of 6,000 larger tanks, which were designed for all-round fire and did not suffer from the high internal temperature that was a great defect of the earlier models.

The tanks of the present day are far superior in every respect to those used in the Great War. The equipment of the Royal Tank Corps consists of two types, the Medium Tank "Mark" II and the Light Tank "Mark" VI. The former is a 12-ton vehicle with a 90 h.p. engine of the air-cooled aero type. It has a speed of 22 m.p.h. and carries a crew of five.

The Dinky Toys Medium Tank No. 151a, which is illustrated on this page, is a splendid miniature of this type. Its turret swivels completely round, and in front of it is a miniature two-pounder quick-firing gun, with a machine gun beside it, while the driver's look-out manhole is below and to the right. A further machine gun is placed on each side of the tank. On top of the turret is a vertical tube representing the one that in the real tank houses a Morse signalling lamp. To the rear is a look-out manhole, known familiarly in the Corps as "The Bishop's Hat," and behind this is the radio mast. Every detail is shown, even the headlights being covered by metal protecting boxes, exactly as in the prototype.

Some of the Medium Tanks of the Royal Tank Corps are equipped with a mortar instead of a two-pounder. The purpose of this is to enable it to fire smoke-shells in order to create a smoke-screen behind which an advance can be made. A tank equipped in this manner is known as a "close support" tank.



The Dinky Toys Medium Tank, No. 151a, is correct in detail, even to the protected boxes for headlights.

The light tank is much faster than the medium one. It weighs $4\frac{1}{2}$ tons, and its lorry engine of 25 h.p. gives it a speed of 40 m.p.h. There are three men in its crew. In the Dinky Toys Series it is represented by the Light Tank No. 152a, shown in the lower illustration on the opposite page. Its turret swivels round in the same manner as its original. In front of it are two machine guns, and on top are two look-out manholes and a radio mast. There is a tubular projection along the right-hand side to represent the exhaust pipe and silencer. Both Dinky Toys Tanks are scale models, one sixteenth full size, and are fitted with creeper tracks that move independently in a fascinating manner when they are pushed along.

The Tanks, Medium and Light, are included in the Dinky Toys Royal Tank Corps Sets Nos. 151 and 152 respectively. Next month we shall describe the other components of these Sets.

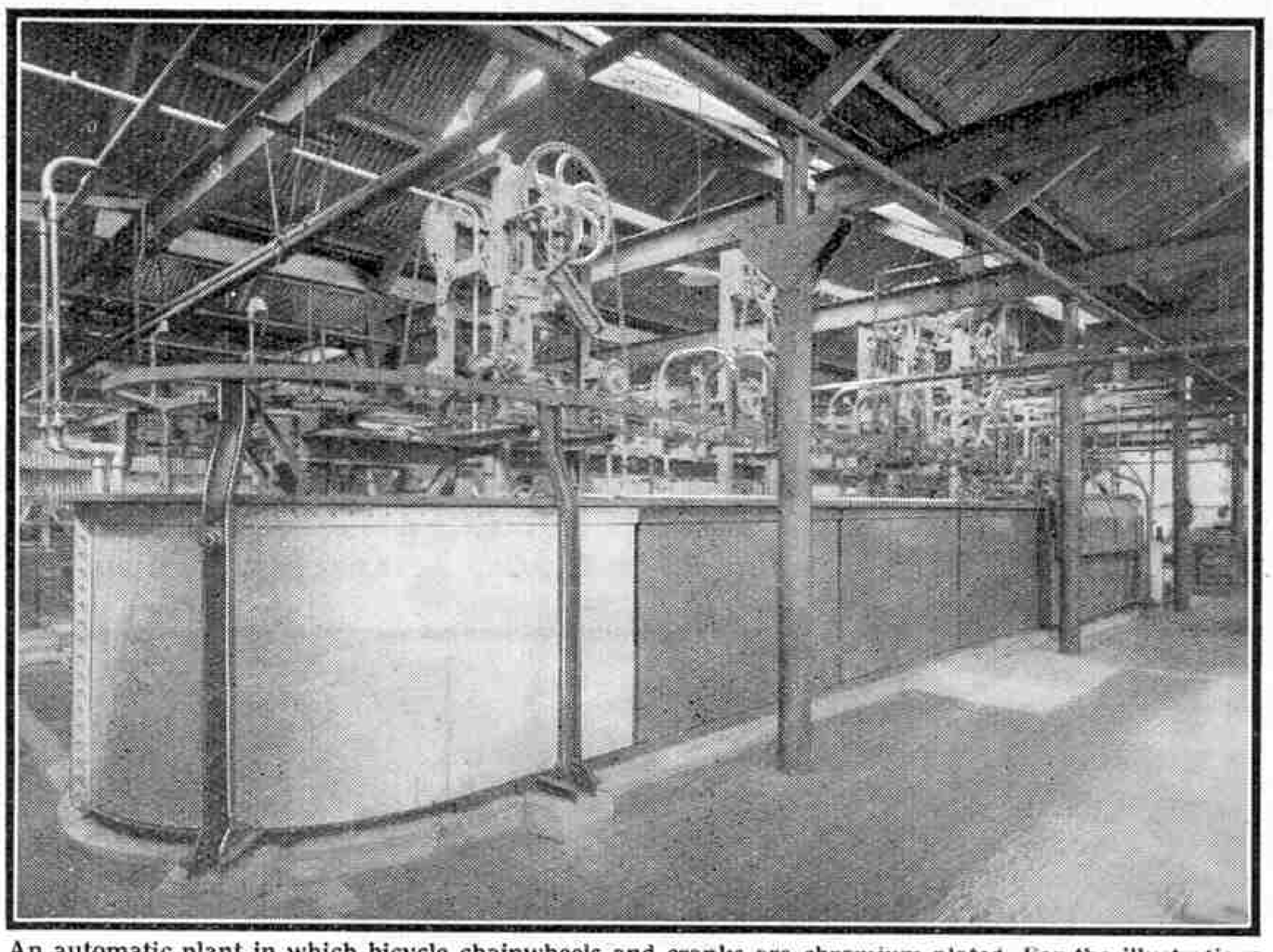
One Hundred Years of Electro-Plating

The Growth of a Great Industry

By A. G. Allen

FEW discoveries of modern times have contributed so much to the usefulness and beauty of articles in daily use as electro-plating. In this process base metals are coated with a thin layer of a superior one, such as gold, silver, nickel, chromium, copper or brass. The finished products have the brilliance and cleanliness of articles made throughout of the nobler metal, and the coatings also protect them from tarnishing.

This year is the centenary of electro-plating, which became commercially possible in 1837, shortly after the introduction of primary batteries giving ample steady supply of current. The practice of covering objects with thin sheets of copper, gold, and silver began much earlier, however, and indeed was known to the aboriginal inhabitants of North and South America, who practised the overlaying of objects with thin sheets of copper, gold and silver. The metal was worked with stone hammers. Copper was beaten out into very thin, uniform sheets, and smoothed and polished, probably with sand. The copper sheet was then carefully fitted over the object, and the edges were turned under, the object of this being to ensure that the metal sheathing was held securely in place.



An automatic plant in which bicycle chainwheels and cranks are chromium plated. For the illustrations to this article we are indebted to the courtesy of W. Canning and Co. Ltd.

Examples of such work may be seen in the United States Indian Museum, where there are displayed two figures of humming birds carved from wood. The wings and tails of the birds are overlaid with sheet copper, and the wing pieces are so well made as to be in contact with the underlying wood at practically every point.

A pair of copper ear ornaments overlaid with thin sheets of silver hammered into place were found in a Florida burial mound, and from the Mississippi Valley have come copper beads wrapped in silver foil, a copper pendant sheathed with gold, and many other examples.

Among the far more advanced Indians of Mexico and Peru, the overlaying of gold and silver ranked far above that of copper, however, and it is thought that fire gilding, or alalgam plating, originated with these peoples. This process was the forerunner of electro-plating. In the Codices, or books of pictures, of the Aztecs of Mexico, may be seen a picture of a smith melting gold over an open fire, and another of a master smith and his apprentice melting gold in a crucible held over the fire by a clay tripod. The helper is blowing the fire through a blow-pipe and stirring the melt at the same time.

In the old Spanish chronicles of the invasion and conquest of the New World there are several passages that refer to plating. Acosta, who wrote about the Indians living in the Isthmus of Darien, said "The copper was gilt by the use of the juice of a plant rubbed over it, then put into the fire, when it took the gold colour." Another historian, Oviedo y Valdez, writes of the Central American natives who, he says, "know how to gild copper in a manner resembling gold of 23 carats, this colour being imparted by certain herbs, which process has been kept a secret from the Spaniards."

The Spaniards were deceived by the natives, however, as was discovered a little later by Martinez Gracida, who wrote "Gilding seems to have been executed by the Indians with quicksilver. The formula was a portion of gold and a portion of quicksilver. The liquid was smeared on a piece of silver or copper and then placed in the fire so as to volatilize the quicksilver."

Dr. William C. Orchard, of the Museum of the American Indian Staff, conducted a series of experiments from which it was concluded that citric acid was employed by the natives to prepare the copper surface before applying the amalgam. The results he obtained were identical with the early examples.

The modern art of electro-plating can be traced back to the pioneer experiments of Sir Humphry Davy and others, but was not developed until the invention of the Daniell cell, which was first described in 1836. This cell contains copper sulphate solution, in which stands a porous pot containing dilute sulphuric acid. A copper plate is immersed in the copper sulphate solution and a zinc rod in the acid, and a current flows through a wire connecting these two. When the cell is in use copper from the copper sulphate solution is deposited on the copper plate. This was noted by several experimenters, among them de la Rue, a British scientist who in 1836 saw also that the metal took the shape of the surface on which it separates from solution.

No immediate practical applications of these facts were made, and the first announcement of an electro-plating method came from Russia, where a scientist named

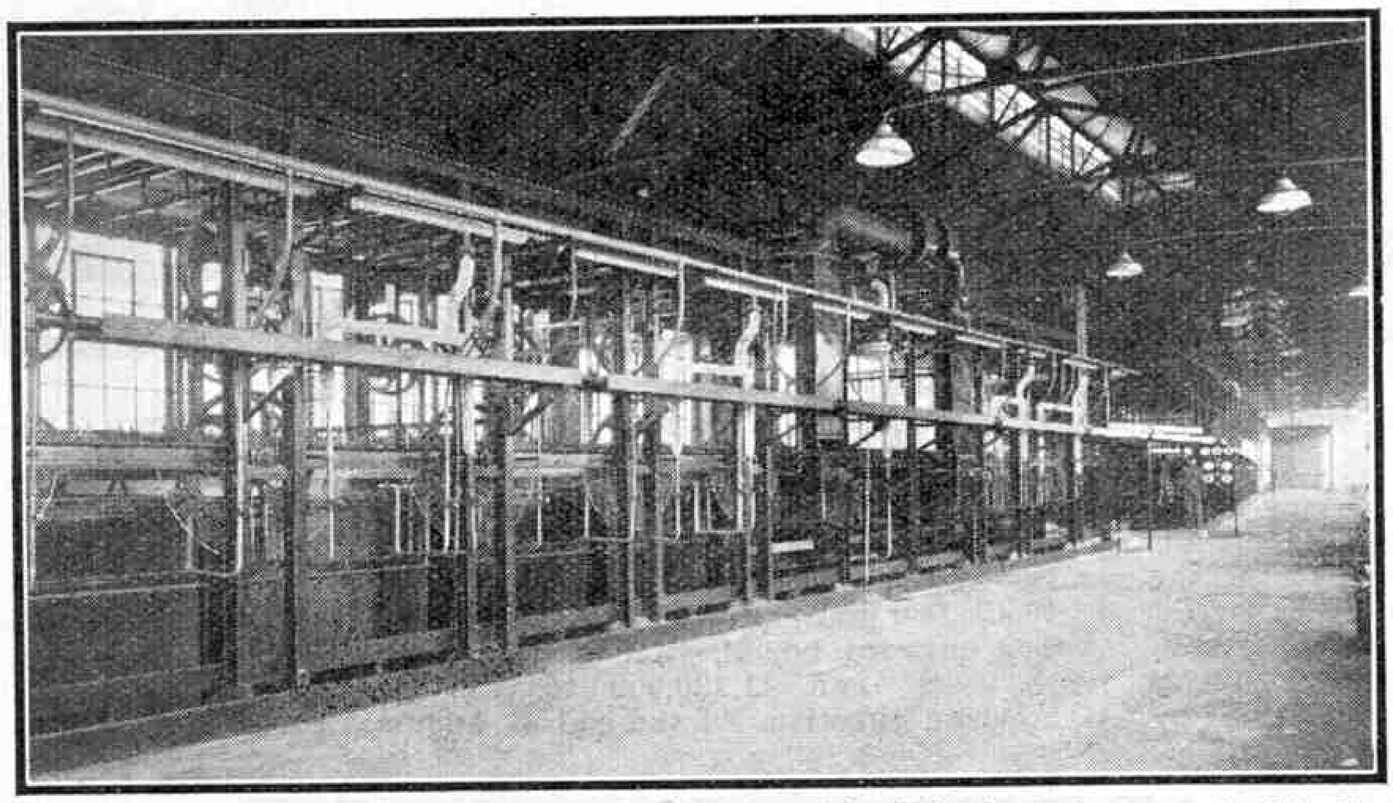
Jacobi succeeded in copying engraved copper plates in this manner. The publication of his results led Mr. T. Spencer, a Liverpool man, to announce similar discoveries. Spencer states that his attention was first directed to the subject by the accidental use of a copper coin instead of a plain piece of copper in a Daniell cell, the result being a faithful copy of the coin, except that the high and low parts of the relief were reversed.

As electro-plating practice grew in importance efforts were made to replace the primary battery first used by the dynamo, the principle of which was discovered in 1831 by Michael Faraday. The first machine of this kind to be used for electro-deposition was made by Woolrych, of Birmingham, in 1844. It was constructed of heavy baulks of timber, erected in rectangular form, on which four sets of permanent horse-shoe magnets were bolted, the armature being made to revolve between the poles of the magnets. This machine was 5 ft. high, 5 ft. long and 2 ft. 6 in. wide, and it was successfully worked for many years by Prime and Son, silversmiths in Birmingham, for the electro-deposition of silver.

The second dynamo used for electro-deposition was also made by Woolrych in 1851, and worked by Prime and Son. It is similar in electrical design to the earlier model, but mechanically is a great improvement. Its weight is nearly one ton. In this respect it is a great contrast to the smallest present-day machine, which is about 8 in. long and 5 in. high, and weighs only about 20 lb., yet gives 10 times the power of the two huge early machines.

About 1885 dynamos suitable for electro-deposition were first constructed with electro-magnets in place of the old horse-shoe permanent magnets. The general principles of these machines have since remained unaltered, except that in the early days most of them were of comparatively small current capacity, whereas electro-plating dynamos are now made to give currents from 6 to 6,000 amp. at 3 to 30 volts.

Types of plating vats with their equipment have changed considerably in recent years, especially since the introduction of chromium plating. A combined automatic plant for nickel and chromium plating with a total length of 250 ft. has recently been installed at the works of Hercules Cycle and Motor Co. Ltd., Birmingham. This is the world's largest automatic plant for electro-deposition. It was designed by W. Canning and Co. Ltd., for plating the steel components of Hercules bicycles.

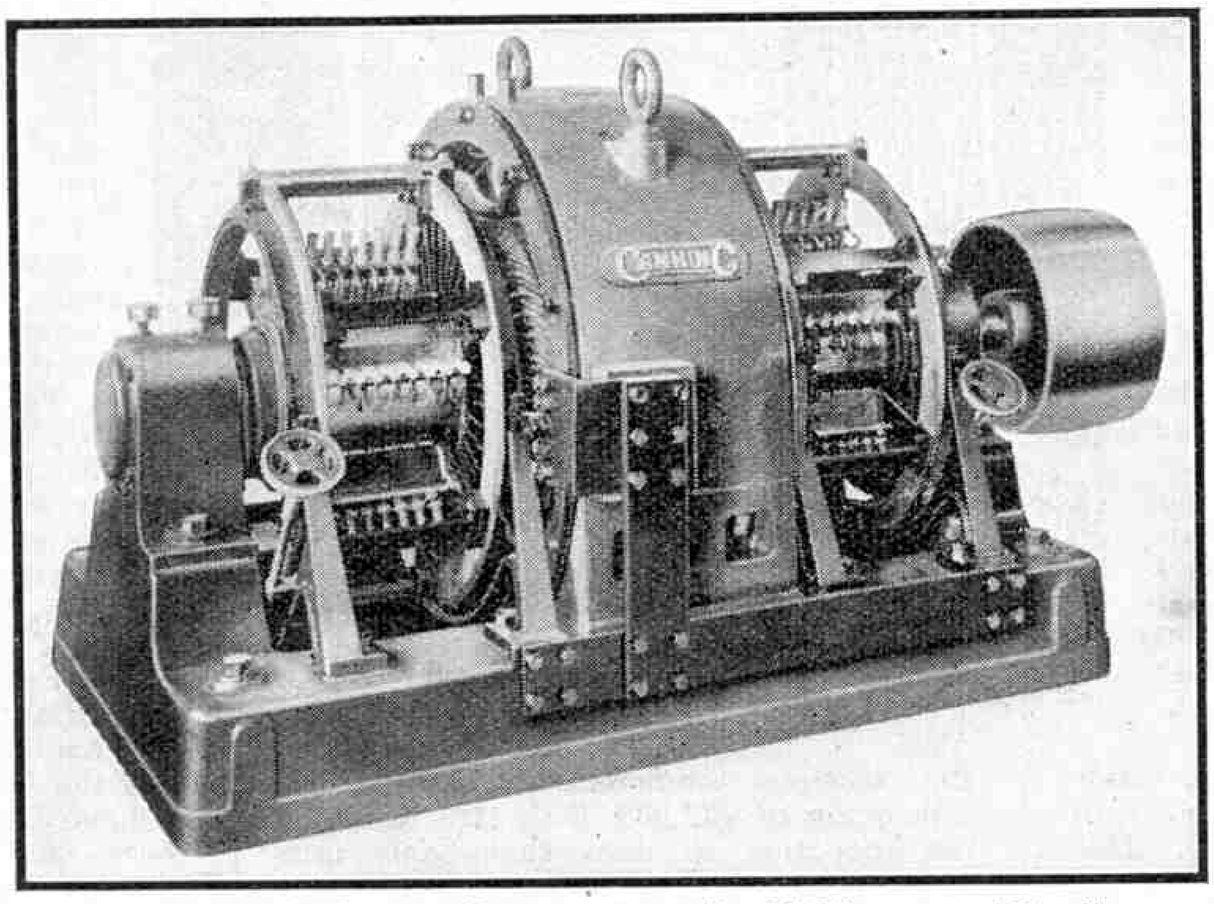


The largest automatic electro-plating plant in the world. It is used for plating the steel components of bicycles at the works of the Hercules Cycle and Motor Co. Ltd., Birmingham.

Articles to be plated are loaded on specially designed work-racks known as cathode suspenders, at one end of the nickel plating plant, and are immediately lifted into an electro-alkaline cleaner tank by means of special attachments on conveyor chains. There they are electrolytically cleaned in a special hot solution, in which they remain a predetermined time before being automatically lifted out and lowered into a hot water swill. They are next passed to an electrolytic acid bath, where they are made ready to receive the nickel to be deposited. Two cold water swills remove all traces of acid, and the articles are then lifted into the nickel plating bath, where exact timing ensures a perfect coating of nickel of uniform thickness..

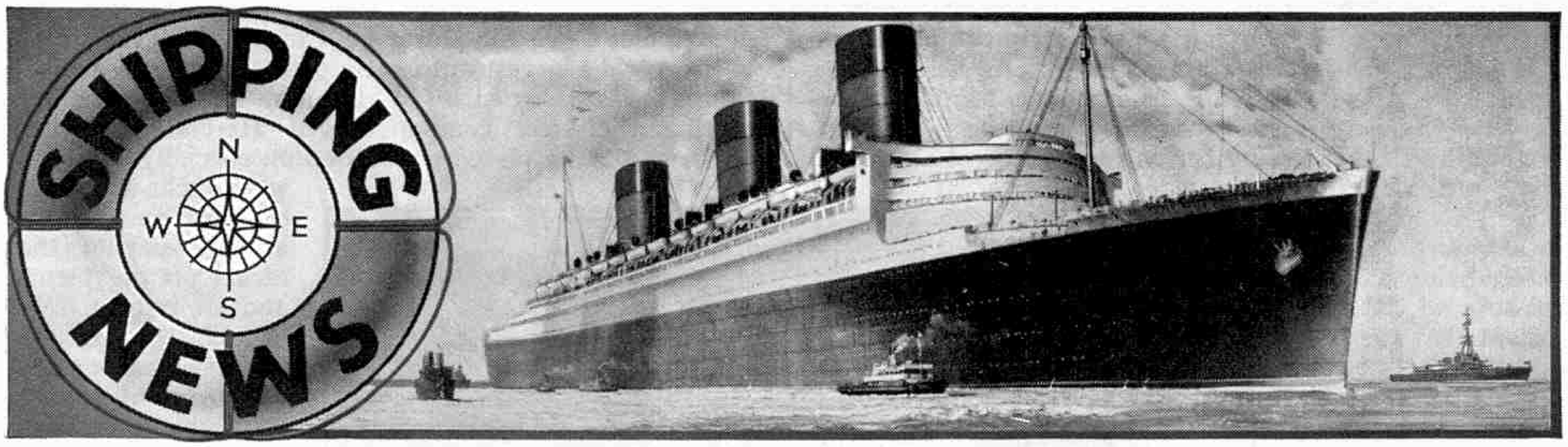
Following nickel plating, articles are subjected to cold and hot water swills. The purpose of the latter is to bring the articles up to a reasonably high temperature before passing them into the oven in which they are dried.

The articles, still hung on the suspenders, are next transferred to the loading platform of the chromium plating plant, where they are immediately passed into the tank in which they are plated. This tank is of special construction, being made of iron, lined with special hard lead and again lined with reinforced glass sheets, and is enclosed in a water-jacketed tank for heating by steam. Exhaust ducting surrounds the surface of the plating solution, and fumes are drawn through it into expansion chambers and discharged to the open air. A "drag-out" tank follows for the purpose of giving the articles a swill in hot water to remove the chromic acid, and they are then given a cold water swill to "clear" them further and a bath in which any acid remaining is neutralised. Cold and hot water swills finally condition the articles for passing through the drying oven, which completes the process.



A modern plating dynamo with a current capacity of 5,000 amperes at 10 volts.

Rapid strides have been made in the design and production of special plating devices to save time and labour. For instance, small articles are now plated in bulk in revolving plating barrels. Various devices enabling higher current densities to be used also have speeded up work.



Largest Union-Castle Liner

The *"Capetown Castle"* was launched from Harland and Wolff's Queen's Island Shipyard, Belfast, in September of this year. This vessel is being built for the Union-Castle Line and is the largest launched in Great Britain and Northern Ireland since the *"Queen Mary."* She is also the largest liner ever commissioned by the Union-Castle Line, and the largest motorship built by Harland and Wolff for an Empire trade route.

The *"Capetown Castle"* is a magnificent example of the latest type of motor passenger liner, and has the same distinctive profile as the *"Stirling Castle"* and the *"Athlone Castle,"* which she will eventually join on the company's mail and passenger service to the Cape. The *"Stirling Castle,"* a vessel of 25,550 tons, was illustrated and described in the *"M.M."* for May 1936. The *"Capetown Castle"* is slightly larger. She is about 734 ft. long with a moulded breadth of 82 ft., and her gross tonnage is about 26,500. There are four complete steel decks and seven cargo holds, certain of which are specially arranged for the carriage of fruits and of chilled or frozen produce, and her main engines are of the Harland-Burmeister and Wain double-acting type, each having 10 cylinders.

Motor Boat Records Broken

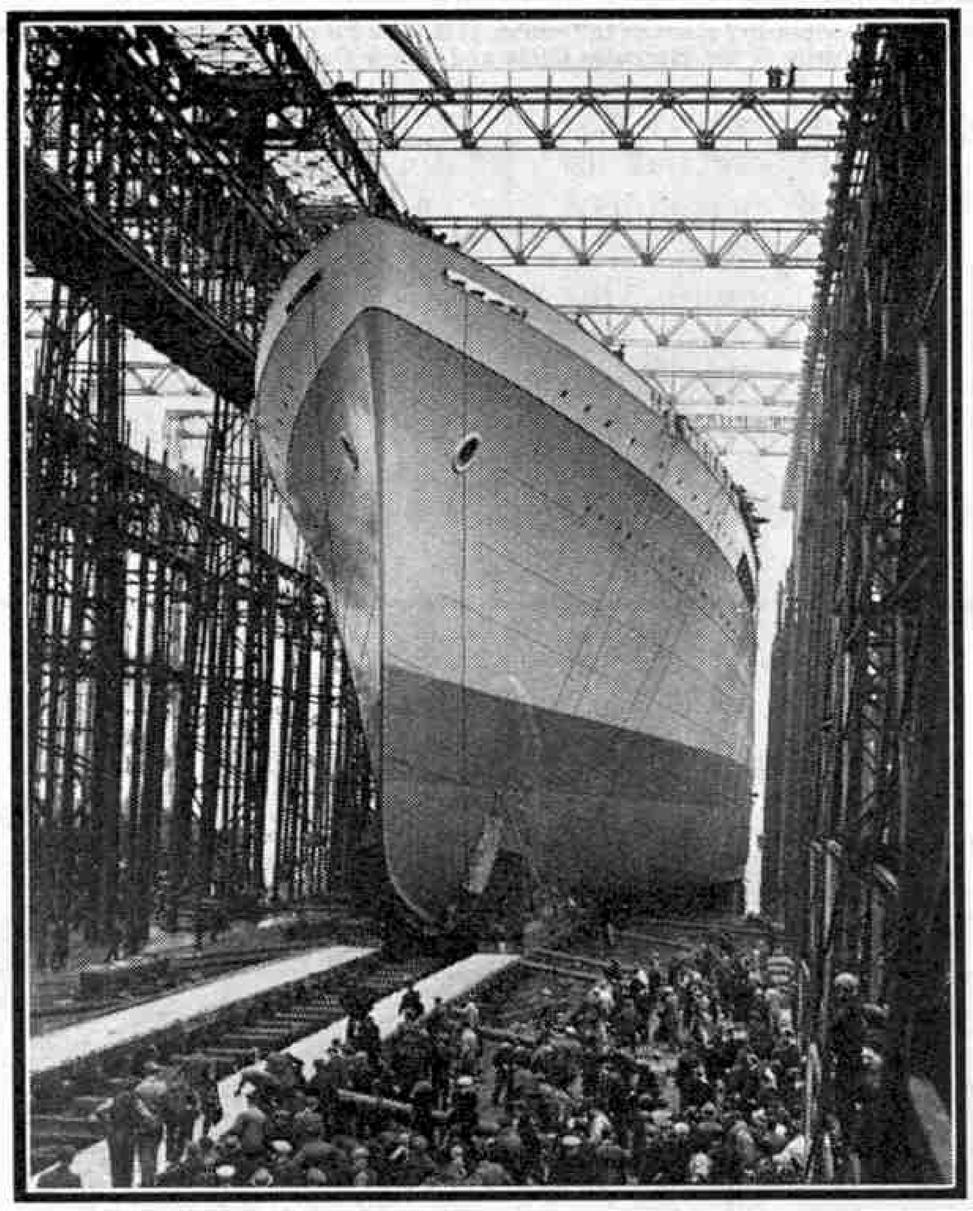
New speed records have recently been set up by two well-known motor boat racing enthusiasts. Mr. E. M. Treglown, commodore of the Oulton Motor Boat Club, set up new National figures for Class A and Class B outboard craft, near Reedham, in Norfolk. For the former class he used a 229 c.c. engine, and attained a speed of 32.53 knots, or 37.46 m.p.h. In the other class he reached a speed of 32.2 knots, or 37.07 m.p.h. with a 326 c.c. engine.

Mr. G. S. M. White, of Bristol, established new records in Poole Harbour for motor boats of the 400-kilo. class. The boat used was *"Bulldog II,"* a runabout, the engine of which was fitted with a silencer, in order to comply with local requirements. This did not affect the performance of the engine, for it ran at 5,750 r.p.m. for 12 hours, and enabled Mr. White to set up new British records from 1 hr. up to 12 hr. In addition, he established several new International figures, for 3, 6, 9 and 12 hrs. The last of these was gained at 21.49 knots.

Mr. B. Davie, a well-known American pilot, has set up a new world's outboard speed record of 78.12 m.p.h.

Traffic on the Suez Canal

During the six months ending on 31st August, the net tonnage of vessels passing through the Suez Canal amounted to 18,546,000. Cargo traffic accounted for 16,420,000 tons, of which 5,300,000 tons was outward bound, that is from north to south, and 11,120,000 tons in the opposite direction. At the end of August, the receipts amounted to £7,403,900, a decrease of £77,000. This is a result of the reduction in dues that came into force in April last.



The "Capetown Castle," built for the Union-Castle Line, takes the water for the first time. A scene at the Queen's Island (Belfast) Shipyard of Harland and Wolff Ltd., by courtesy of whom we reproduce this photograph and the upper one on the opposite page.

The End of *"L'Atlantique"*

The work of breaking up the burnt-out hull of *"L'Atlantique"* has been finished at Port Glasgow by Smith and Houston Ltd. About 30,000 tons of material have been recovered, and these include some 80 varieties of metals and alloys. It will be remembered that this 42,500-ton ship was burnt out in the English Channel in 1933, two years after she was built at St. Nazaire at a cost of approximately three million pounds.

Britain's Mosquito Fleet in Service

In the January 1937 issue of the *"M.M."* we described the trials of No. 1 of the first motor torpedo-boat flotilla of the British Navy. Our cover this month shows "O1" travelling at high speed, her maximum being 55 knots. The Mosquito fleet, as it is known in the Navy, now comprises six 60-ft. craft constructed by the British Power Boat Company, of Hythe, to the design of Mr. Hubert Scott-Paine. An article by this famous builder of motor boats appears on page 694. Following extensive trials and various duties in England, the boats were ordered to Malta, and accomplished the voyage under their own power, arriving one week ahead of schedule time.

As far as possible one of two formations was maintained throughout the voyage, these being "line ahead" and "arrow head." The boats ran steadily throughout, and demonstrated their seaworthiness when they encountered a heavy storm between Brest and Corunna. During this "line abreast" formation was employed, and at times the boats completely disappeared from view in the troughs between the great waves rolling in from the Atlantic. The purpose of the craft was the subject of much discussion at the various ports of call, but it is doubtful whether many realised that they were torpedo carriers.

The M.T.B. flotilla is now attached to the Mediterranean Fleet, thus being the first flotilla of this type to serve in foreign waters. A second series of Mosquito boats is under construction at Hythe.

New American Atlantic Liner

European competition on the North Atlantic passenger shipping service has become so great in recent years that the United States Line have decided to have built a further fast liner for this route. She is to have a length of 723 ft., on a beam of 92 ft., and her displacement will be 34,000 tons. Passengers carried will number 1,200, and there will be 600 officers and crew.

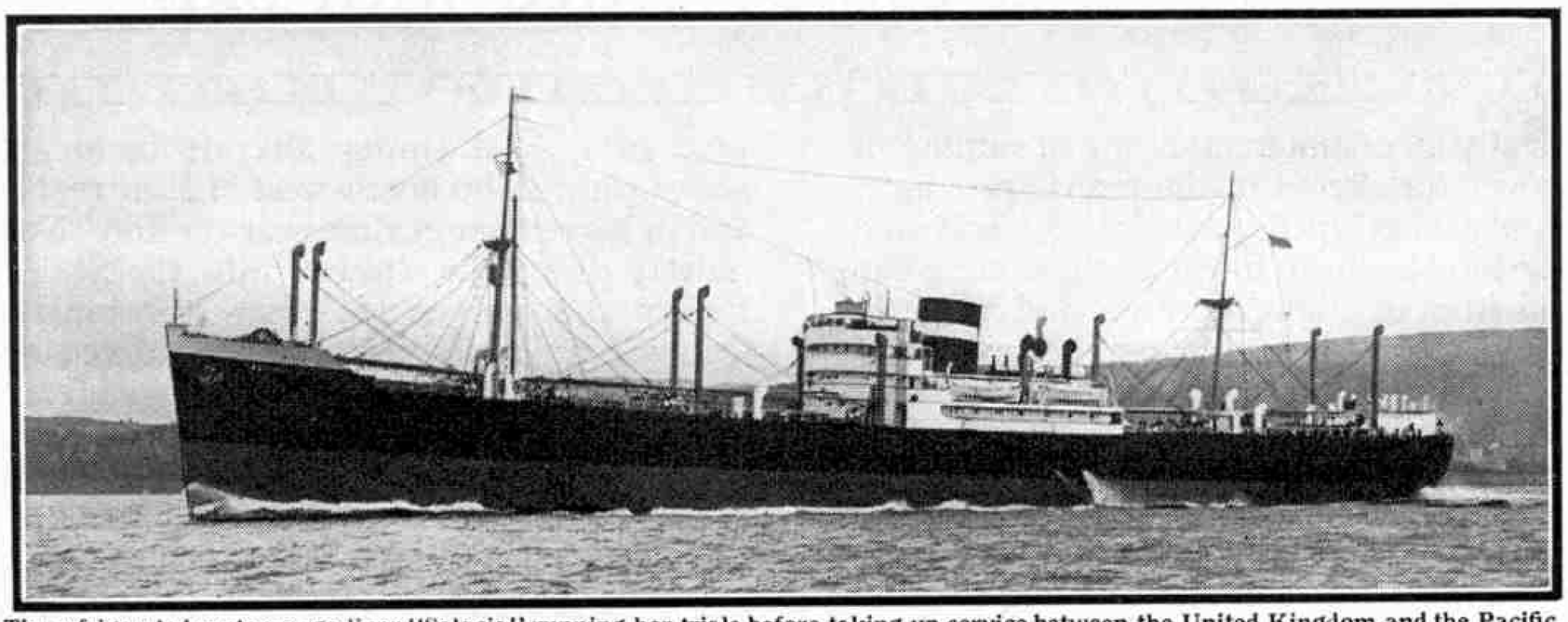
The new liner will run on the trans-atlantic route with the *"Washington"* and *"Manhattan,"* and is intended to take the place of the *"Leviathan."*

* * * *

"Endeavour I" is now berthed for the winter at Gosport. Examination has shown her hull to be in excellent condition below the water line, despite the rigours of her recent Atlantic crossing.

New Refrigerated Motor Cargo Liner

The upper illustration on this page shows the *"Salacia,"* a refrigerated motor cargo vessel recently completed for the Donaldson line at the Govan yard of Harland and Wolff Ltd. This firm has had considerable experience in the construction of refrigerated cargo liners, or "food ships" as they are popularly termed. At present there are six liners of this type building in the company's yards at Belfast and Govan, and two others were completed recently in addition to the *"Salacia."*



The refrigerated motor cargo liner "Salacia" running her trials before taking up service between the United Kingdom and the Pacific Coast of North America. A description of this vessel is given on this page.

The new Donaldson vessel is designed for service between the United Kingdom and the Pacific Coast of North America. She has a well-raked stem and cruiser stern, with two masts and a single low funnel. Her length between perpendiculars is 425 ft., her moulded breadth 57 ft., and her gross tonnage 9,200. Seven bulkheads divide the ship into five cargo holds, an engine room, and fore and after peaks respectively. Two of the holds are insulated for the carriage of refrigerated produce, the total refrigerated space measuring about 200,000 cu. ft.

A distinctive feature of the vessel is the main propelling machinery installed. This comprises the latest design of Harland-Burmeister and Wain double-acting two-stroke Diesel engine. The pumps fitted for general service, fresh water and salt and bilge circulation, and for fuel service and lubricating oil distribution, are all driven from the main engine.

A Famous Turbine Steamer Passes

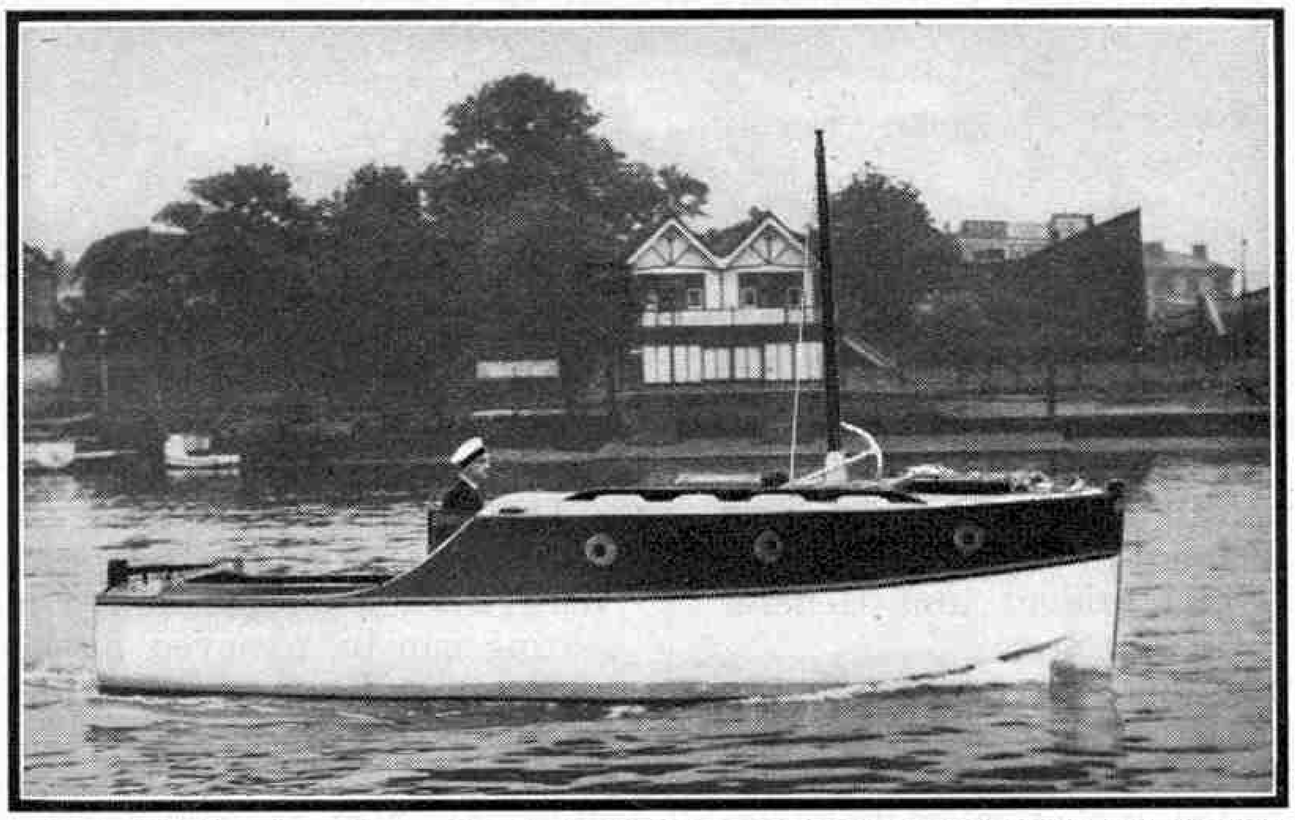
The principle of the modern steam turbine was discovered 2,000 years ago, but it was not until last century that this type of engine was installed in a ship, and only in 1901 were turbines first fitted in a merchant vessel. In that year the 650-ton Clyde passenger steam-ship *"King Edward"* was built and equipped with Parsons turbine engines. On trials she attained a speed of 20½ knots, a better performance than could have been expected with triple-expansion engines. A second and larger turbine steamer therefore was built in 1902, and named *"Queen Alexandra."* A speed of 21½ knots was reached by this steamer on trials, and it was mainly the success of these two vessels that led to the general adoption of the turbine for larger vessels.

The *"Queen Alexandra,"* the second of these two epoch-making vessels, was placed in the Campbeltown service, and continued on that route until badly damaged by fire in 1911. She was then reconditioned and bought by the Canadian Pacific Line, who renamed her *"Princess Patricia"* and placed her on the Pacific Coast passenger service. Recently she was sold at Vancouver to be broken up, and thus the career of a famous pioneer vessel was brought to an end.

The 1937 Motor Boat Show

The annual Motor Exhibition was this year held from the 14th to the 23rd of October in the new Earls Court Building, London, which is the subject of an article on page 722 of this issue. In the marine section there were 41 exhibitors displaying a variety of cruising craft, petrol and paraffin engines, Diesel engines, outboard motors and general accessories and equipment.

A feature of the show was the number of motor cruisers exhibited, the total being more than three times that at the 1935 Show. These cruisers range in length from one of 18-ft. to a fast 40-ft. boat capable of a speed of 22 m.p.h., and having sleeping accommodation for 6–8 people. A boat of this type exhibited by the British Motor Boat Manufacturing Co. Ltd. is illustrated on this page. It has a length of 22 ft. overall, and is fitted with a four-cylinder four-cycle "Solo" marine engine developing from 10 to 18 h.p., and giving a speed of 8 knots. A feature of the craft is the ample accommodation provided. The hull is of the round bilge type, and is planked with larch on oak framing.



A standard 22-ft. motor cruiser produced by the British Motor Boat Manufacturing Co. Ltd., to whom we are indebted for our illustration.

Damaged Vessel Towed 15,000 Miles

The Dutch deep-sea tug *"Ganges,"* of 516 tons, left Port Pirie, Southern Australia, in April last, towing the damaged Middlesbrough cargo steamship *"Kingswood,"* a vessel of 5,038 tons gross. She towed the steamship about 15,000 miles, and arrived safely in the Tyne in September, the voyage having occupied about four and a half months.

The *"Kingswood"* was extensively damaged by explosion while in Port Pirie Harbour last January. Her donkey boiler, weighing about 15 tons and installed about 165 ft. from the stem, was blown right through the ship into the fore peak. The engine and boiler were wrecked, as also were the bulkheads in the track of the flying donkey boiler, which lodged in a hole in the hull forward and was scarcely damaged. Temporary repairs were effected to enable the vessel to be brought to England, where the extensive reconditioning necessary is now being carried out.

Progress on *"No. 552"*

Preparations are in hand for the dredging of the River Clyde in readiness for the passage of the new Cunard-White Star liner, at present known as *"No. 552,"* at John Brown's yard at Clydebank. Much of the plating work on the vessel has now been finished, and work on the main hull is progressing.

If the present rate of construction is maintained, *"No. 552"* should be ready for launching next autumn. Her maiden voyage is scheduled for 1940, a century after the *"Britannia,"* the earliest Cunarder, made her first crossing from Liverpool to Boston.

The Motorship *"Venus"*

In a review of *"The Boy's Book of the Sea"* in the *"Books to Read"* pages of the October *"M.M.,"* reference was made to the rescue early this year of the crew of the Norwegian freighter *"Trym"* by the 5,407-ton motor packet *"Venus."* In error the *"Venus"* was described as British. Actually she was built at Helsingör, Denmark, in 1931, and is owned by the B. & N. Line, a Norwegian company, and manned by a Norwegian crew under Captain Dryer. A plaque has been mounted in the entrance to the dining saloon by The Committee of Lloyds to commemorate the rescue.

* * * *

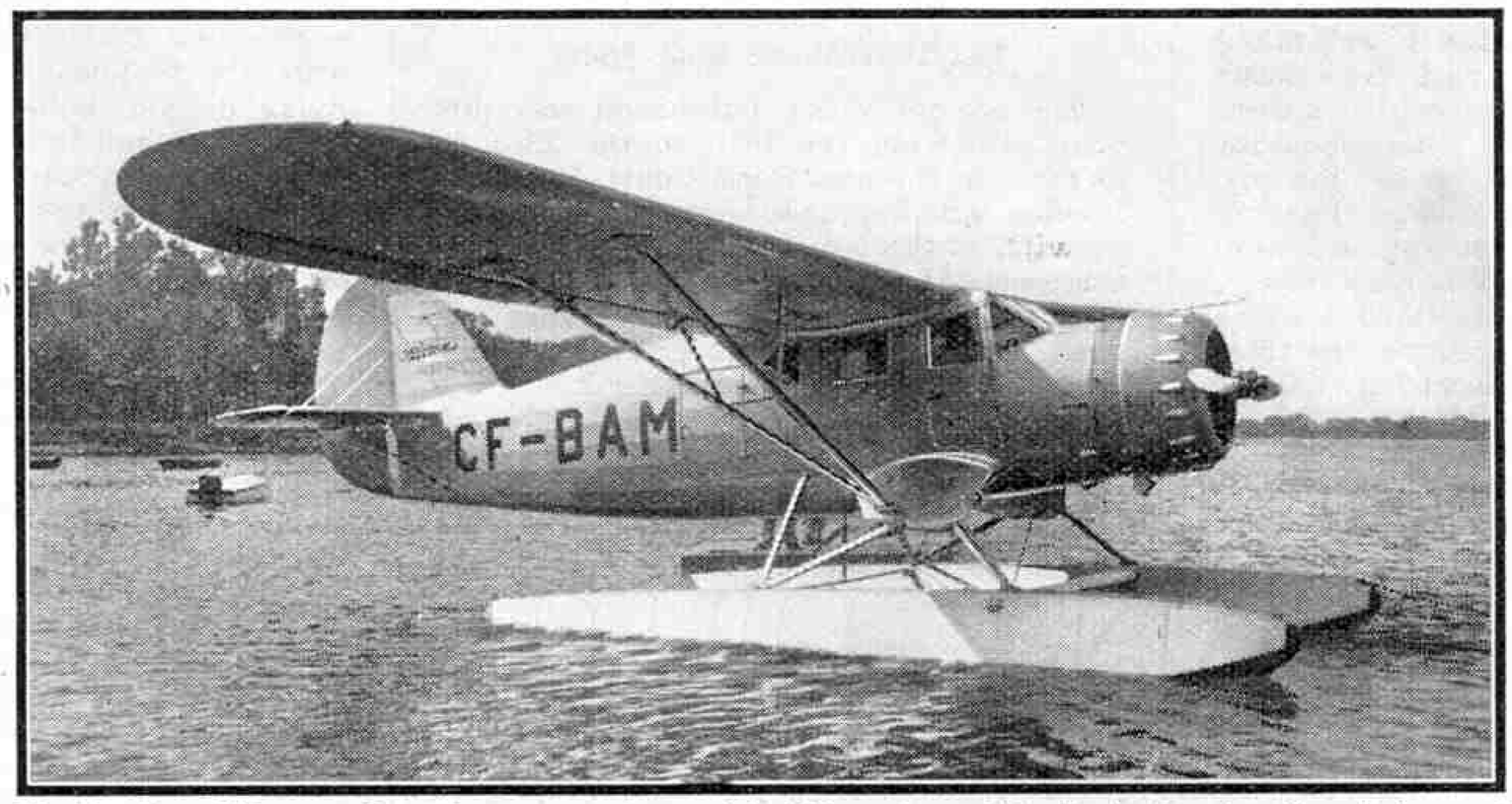
The new Cunard-White Star liner being built at Birkenhead by Cammell Laird and Co. Ltd. is to be named *"Mauretania"* at her launch on 28th July next.

Air Transport in Canada

Seaplanes that can be Fitted with Skis

IN Canada practically all commercial flying in summer is done with seaplanes, for except in the prairie provinces and the more highly developed parts of Ontario and Quebec, most of the land is virgin forest and machines can most easily take off from or alight on rivers and lakes. In autumn the lakes and rivers become frozen, however, and the floats of the seaplanes are then replaced by land undercarriages that have skis instead of wheels. The machines are largely employed in the transport by air of passengers, freight, and mails to mining fields in remote parts of the country. Many of these areas are otherwise accessible only by canoe in the summer and dog team in the winter, and the introduction of aircraft, making use of the lakes that abound in most of them, has greatly improved communication with them.

Canadian aircraft producers have given special attention to the designing and building of commercial seaplanes suited to the severe conditions under which the machines have to work. One of the most successful of recent types is the Noorduyn "Norseman" illustrated on this page, and now in regular use by Canadian Airways Ltd., Mackenzie Air Service, and other important air transport firms in Canada. This seaplane is of special interest as it is the first produced by Noorduyn Aircraft Limited, a company formed in 1935 to build aeroplanes to the designs of Mr. R. B. C. Noorduyn, the Vice-President and General Manager.



The Noorduyn "Norseman" seaplane, a passenger and freight carrier used by the leading Canadian air transport companies. This illustration and the lower one on the opposite page are by courtesy of Noorduyn Aircraft Ltd., Canada.

Mr. Noorduyn was at one time associated with the Fokker and Koolhoven aircraft companies, of Holland. Later he was concerned with the sale of various American machines in Canada, and then acquired an intimate knowledge of operating conditions in Canada. In 1934 he settled in Montreal to undertake the design of an all-Canadian transport aeroplane. When the rough design was completed a "dummy" of the proposed machine was erected in the top storey of a Montreal office building, and every air pilot and operator who could be reached was invited to inspect it. In this manner Noorduyn obtained much helpful advice and criticism from men who were well able to judge the merits of his design. He then revised his drawings, incorporating as many as possible of the pilots' demands.

The final design of the machine was completed by May 1935, and a company was formed to undertake its production. An empty aircraft factory at Cartierville, about eight miles north-west of Montreal, was taken over, and in November of that year the first "Norseman" moved quietly down the slipway into the St. Lawrence River. Before the end of the year it completed its tests at Ottawa, where its performance proved even better than had been anticipated. These tests were a race with time and climate, for although the Ottawa River itself was clear of ice, spray splashed on to the seaplane while taxying and taking-off froze where it landed, and remained on the machine during the test flights.

In the "Norseman" from 50 per cent. to 100 per cent. more payload has been provided than has been previously considered normal in an aeroplane of its size and power. This has been achieved without sacrificing the quick take-off, steep angle of climb, and low landing speed made necessary by the difficult operating conditions in the Canadian North country, and without affecting the comfort of the pilots. The pilots' cabin is slightly in front of the wings and is roomy and airy, with large windows and good outlook. Side-by-side seating is provided for the two pilots, the seat and rudder pedals for the first pilot being adjustable; and there is a central control column.

The cabin to the rear of the pilots' compartment is equipped with bench-type seating for eight passengers. When the machine is required only as a freight carrier this seating can be removed by manipulating quick-release fasteners, or it can be folded flush against the cabin walls. Provision is made for individual upholstered chairs to be installed, if preferred, to the bench seating. There is an additional 20 ft. of space for baggage, freight, or operating equipment in an all-metal compartment under the cabin floor, and a large outside door gives access to this compartment. Sometimes the varied freight carried in these seaplanes includes articles longer than the cabin, and the lower part of the back wall of this can be easily removed so that one end of the lengthy articles can be housed in the tail of the fuselage. There is a 26-in. wide door on each side of the cabin, and each door is hinged on a quickly removable section of the cabin wall so that an opening 46 in. wide can be obtained when required in loading very bulky freight. The cabin is heated and ventilated.

The "Norseman" was designed primarily as a passenger and freight transport aeroplane for Canadian air services,

but it is also ideal for high-altitude photography. Various types of single-lens cameras can be installed without any structural alteration to the fuselage, and removable panels in the doors permit of oblique photography. Only a minor structural change in the fuselage is necessary to enable a Fairchild 5-lens camera to be installed. The height to which an aeroplane can climb is important in air photography, and the "Norseman" can reach 25,000 ft. in 40 min., with a load consisting of pilot and photographer, parachutes, and 250 lb. of photographic equipment.

The Fairchild "Eighty-Two." This transport monoplane carries 10 passengers, and can be fitted with twin floats, skis, or wheels. Photograph by courtesy of Fairchild Aircraft Ltd., Canada.

As the illustration on this page shows, the "Norseman" is a high wing, braced monoplane. Its span is 51 ft. 6 in., and the wings are of exceptionally rugged design to withstand summer and winter exposure. They are built of routed spruce spars, with walnut packing pieces under the fittings and $\frac{1}{4}$-in. spruce ribs, and are covered with fabric. The ailerons and flaps are of tubular steel, with stainless steel trailing edges. The wings are attached to the top of the fuselage longerons, and additional support is given by two inclined Vee type struts, one to each wing. The framework of the fuselage is of welded tubular steel. The front portion, and the underneath section of the rear of the cabin, are covered with Alclad, a specially light alloy extensively used in aircraft production, and the remainder of the fuselage is covered with fabric.

The twin floats give a track width of 10 ft. 4 in., which is sufficient to give excellent lateral stability when the aeroplane is being manœuvred on the water. Specially designed skis or an ordinary wheel undercarriage can be fitted when the machine is required to operate on snow or ice, or from ordinary landing grounds respectively. In the land undercarriage the wheel legs are secured in fuselage sockets by two bolts on each side. The streamlined wheels are 31 in. in diameter, and are fitted with hydraulic brakes.

The "Norseman" equipped with skis for taking-off from frozen lakes and rivers and landing on them during the Canadian winter.

The Pratt and Whitney "Wasp S3HI" engine fitted is rated at 550 h.p. at 5,000 ft. The performance figures of the "Norseman" differ slightly according to the type of undercarriage employed, however. When equipped with the ordinary land undercarriage and carrying full load the machine has a top speed of 170 m.p.h., and the corresponding figures for the skiplane and seaplane versions are 155 m.p.h. and 154 m.p.h. respectively.

The other Canadian seaplane illustrated here is the Fairchild "Eighty-Two," a recent product of Fairchild Aircraft Limited, of Longueil, Montreal. This machine can be fitted with either float, ski or wheel undercarriage, and thus is adaptable for any type of Canadian air service. It is a high wing cabin monoplane, with spruce wings covered with fabric. The wings can be folded back, and the span is then reduced from 51 ft. to 16 ft. The fuselage is rectangular in section and the welded tubular steel framework has a fabric covering. The steel tail unit also is fabric covered.

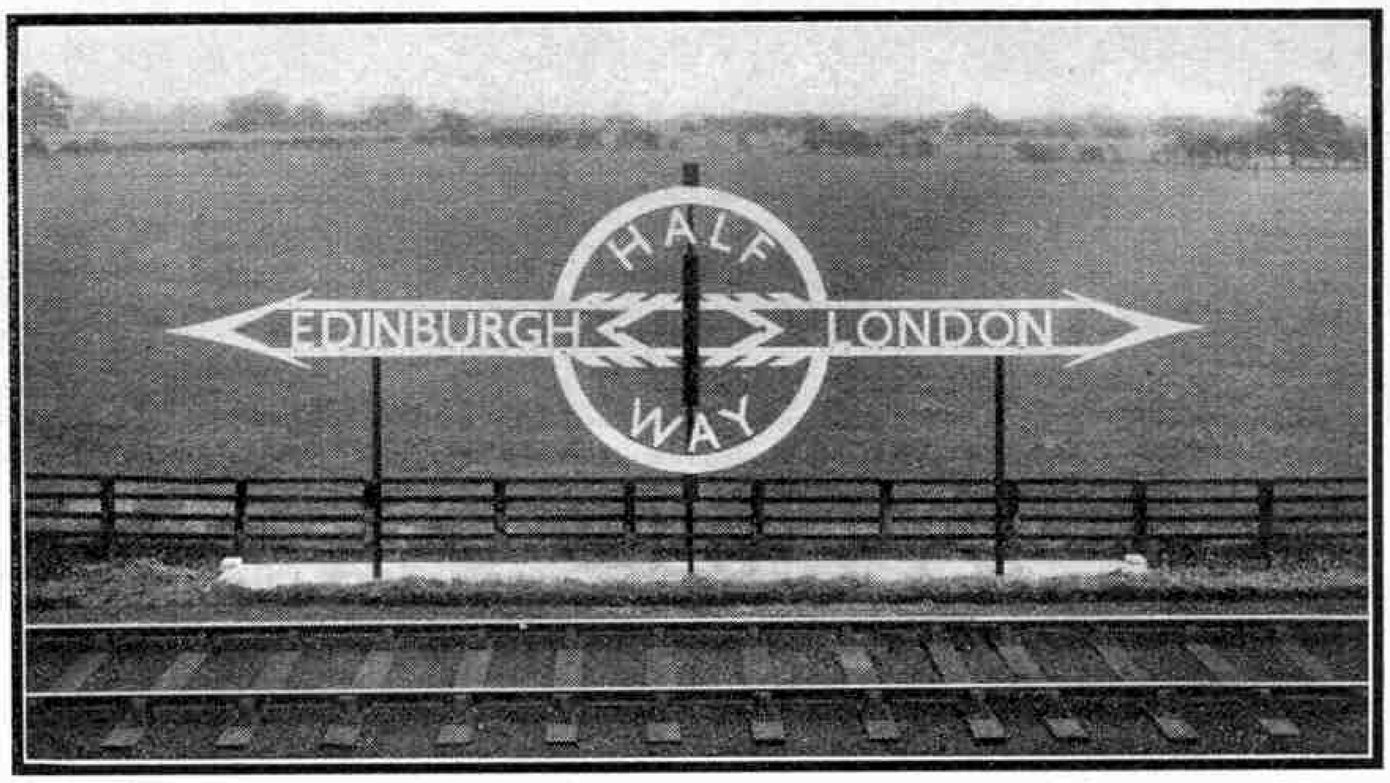
The pilots' cabin is high up in the fuselage, a position that gives the desired unobstructed outlook. A sliding roof hatch provides access over the wings, and is very useful when the engine is being refuelled and when throwing a line as the seaplane approaches a dock after alighting upon the water. There is a door on each side of the cabin, and a third one behind the right-hand seat gives communication with the passenger cabin, where there is removable bench-type seating for 10 people. Individual chairs can be fitted, however, if a greater degree of comfort is required. The windows are so arranged that the passengers have a good view outward, and they are of $\frac{1}{8}$-in. celluloid, set in rubber to allow for expansion in hot weather.

When equipped as a landplane the "Eighty-Two" has a fixed wheel undercarriage, as a seaplane it is fitted with all-metal twin floats, and for winter service it is equipped with ash skis with brass-covered runners. The engine is a Pratt and Whitney "Wasp S3HI," and enables it to attain a top speed of 155 m.p.h. when fitted as a landplane and 152 m.p.h. when equipped as a seaplane. The greatest height to which the landplane version of the machine can climb is 19,500 ft., and the service ceiling is 17,500 ft. The corresponding figures for the seaplane version are 500 ft. less. The respective ranges of the landplane and seaplane types are 500 miles and 490 miles.

Lineside Signs of the L.N.E.R.

Making Railway Travel More Interesting

RAILWAY companies are now making efforts to entertain travellers as well as to carry them comfortably and speedily. Attractive travel books that deal with the country traversed by most of our famous trains are issued by all the groups, and the stories of the trains themselves and of the locomotives that haul them also are told in various popular publications. The L.N.E.R. have long been prominent in this movement, and one train the 10.10 from King's Cross to Leeds has a special cinema van attached regularly to it, in which a "talkie" programme of news films is shown.



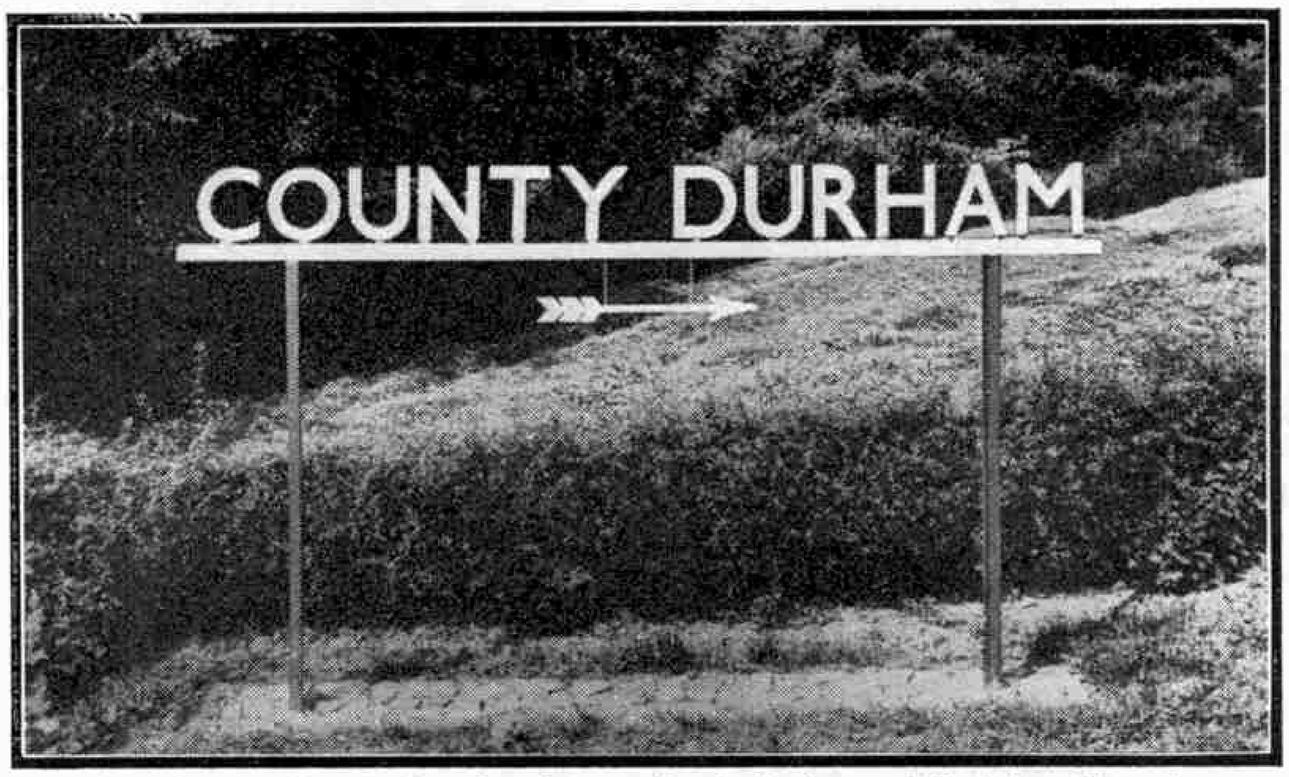
The "Half-Way" sign 8¼ miles north of York, midway between London and Edinburgh on the L.N.E.R.
The illustrations to this article are reproduced by courtesy of the L.N.E.R.

Recently steps have been taken by the L.N.E.R. to add to what may be called the "outside" interest of journeys. Most passengers enjoy the pastime of looking out of the window, and for their benefit lineside signs have been set up to mark points or objects of importance on the way. These show where notable altitudes are attained, indicate county boundaries and, most important of all, indicate the exact point at which trains cross the Border between England and Scotland, and all form landmarks that add to the interest of a journey while increasing the passenger's stock of railway and general knowledge.

One of the most interesting points in any journey by train is the half-way mark. There is some subtle attraction about knowing when we are "half-way there," although midway in distance is not always midway in point of time. When the journey is half done we begin to wonder how the "second half" will proceed, and it is almost a habit to compare the time already taken with the mileage covered and with that remaining for the rest of the run. If our train is one of a twin service between our departure and arrival points, such as the *"Coronation"* or *"The Flying Scotsman,"* it is fascinating to mark the half-way point, and to keep a look out for the corresponding train in the opposite direction in order to see how far from this point the up and the down trains are when they pass each other at speeds of 70 m.p.h. or more.

Travellers on the L.N.E.R. between London and Edinburgh can readily satisfy their curiosity on these points, for the unique "half-way" sign shown in the upper illustration on this page has been erected on the lineside at a spot 8¼ miles north of York. The central feature of this sign is a disc in which the words *"Half Way"* appear. Arrows built out from the sign in each direction point to London and Edinburgh respectively, and have the names of these cities clearly marked on them.

We frequently have a rough idea of the counties traversed on a particular journey. We do not know when we pass from one county to another, however, unless we are following the path of the train by means of a route book or map, and even then usually have only a vague idea. It is of interest to know the exact point at which one county is left and another entered, and another step in the L.N.E.R. scheme has been to erect suitable signs to show passengers when they do this. The accompanying illustrations show signs that have been put up to denote the county boundaries of Yorkshire, Durham and Northumberland. These consist of cut-out letters mounted on a bar supported on suitable uprights. Below the bar is an arrow pointing in the direction of the county named above. The "Yorkshire" and the "County Durham" signs illustrated on this page are erected on the banks of the River Tees south of Darlington.

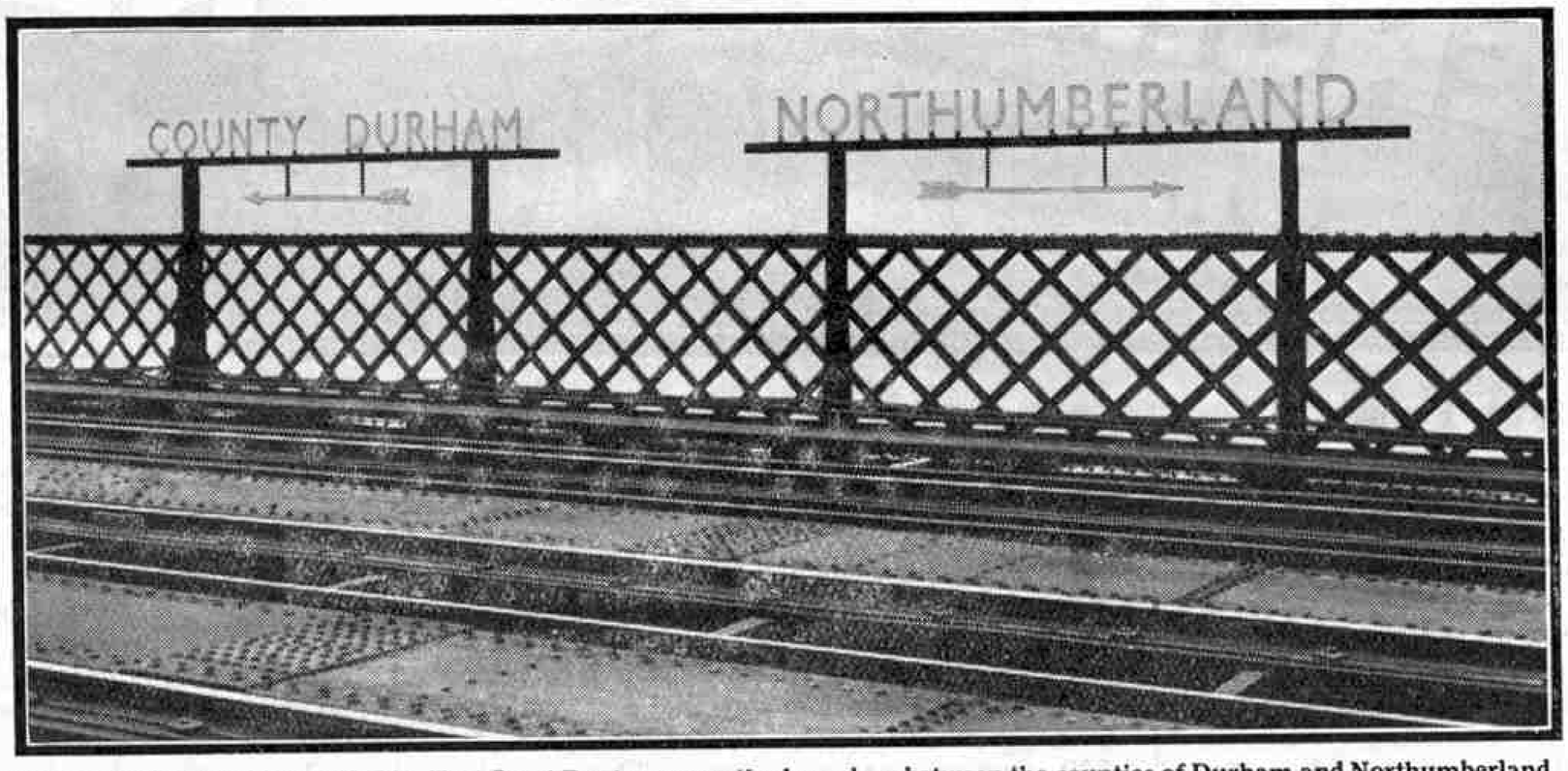


One of the signs marking the boundary between County Durham and Yorkshire. These signs are placed on the banks of the River Tees. The corresponding Yorkshire sign is similar in style.

A particularly interesting county sign is that seen in the upper illustration on the opposite page. It marks the

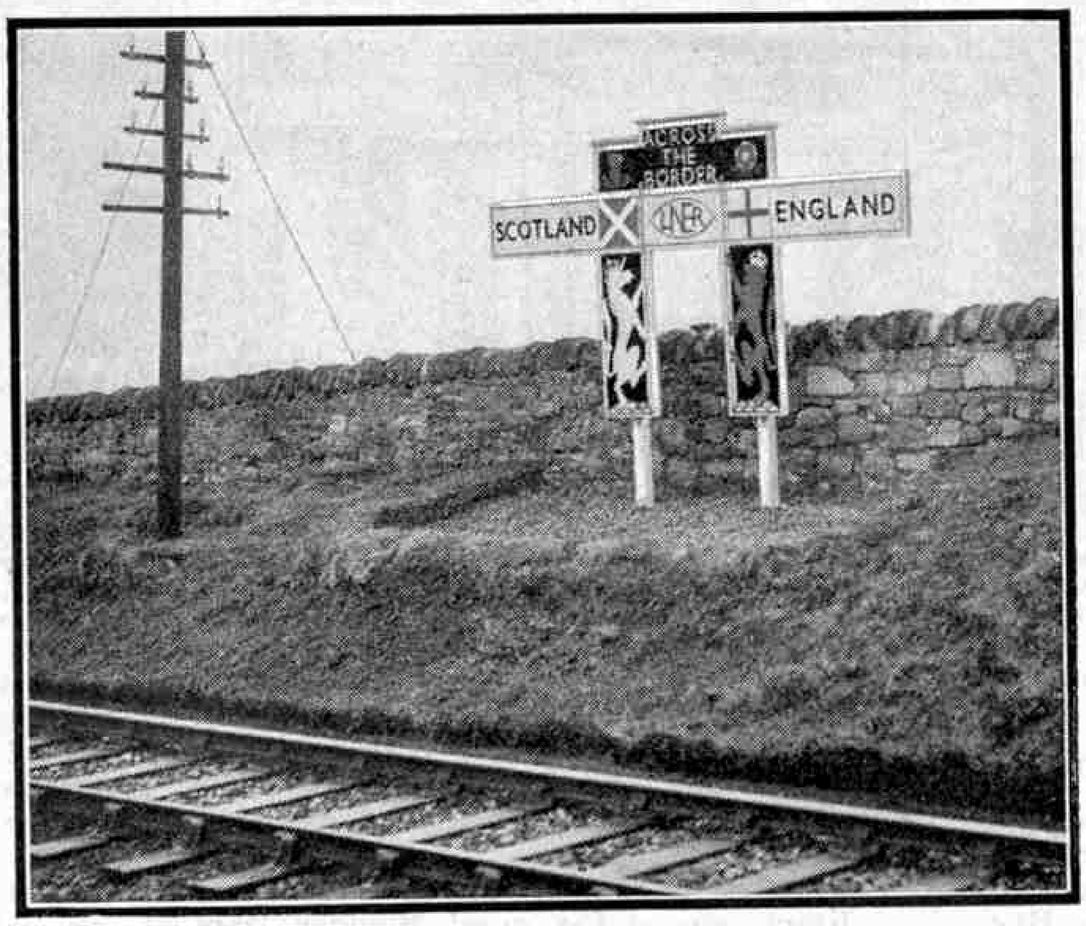
passage between the counties of Durham and Northumberland on the East Coast Route. These are closer together than the signs that have just been described for they are in the middle of the King Edward Bridge over the River Tyne at Newcastle.

Even in these matter-of-fact days there is a definite sense of adventure in passing from England to Scotland, with its reminder of the Border feuds and of the romantic tales told about them. It is curious to find how few people travelling on the East Coast Route know where the Border is crossed. Some appear to think they are in Scotland when they reach the north end of the Royal Border Bridge across the Tweed. Actually the boundary is about a mile north of the city, and the exact position is now marked by striking signs that have been erected on opposite sides of the main line. Each consists of a symmetrical two-armed sign, the arms indicating on the one hand "*England*" and on the other "*Scotland*," in black letters on a yellow background. In the centre of the sign at the top appear the words "*Across the Border*" in yellow letters on a black background; below are the Company's initials L.N.E.R., arranged in the form of a neat monogram.



Signs showing where the L.N.E.R. East Coast Route crosses the boundary between the counties of Durham and Northumberland. It stands on the King Edward Bridge over the River Tyne at Newcastle.

On the English side of the centre is shown the Rose of England in red and green, and below it is the Cross of St. George in red and white. The corresponding Scottish emblems on the other side are the Thistle in green and purple, and the diagonal Cross of St. Andrew in blue and white. On the supports of the sign, which are arranged as downward projections of the centre portion, are shown the Lion Rampant of England and the Unicorn of Scotland in their respective places. The Lion is shown in red and gold and the Unicorn in white and gold, a black background being employed in each case. This sign is a very striking contribution to the L.N.E.R. effort to denote interesting features of the lineside.



Across the Border! This sign marks the actual Border between England and Scotland and is decorated with the national emblems of both countries.

Before the present scheme was launched, a different form of sign had been designed to mark the summit of Stainmore, where the line from Darlington to Kirkby Stephen attains a height of 1,370 ft. This sign takes the form of a curved heading across the top of two vertical members. The heading consists of sheet steel with the words "*Stainmore Summit*" cut out, and cannot fail to be seen by the passing traveller. Below this is a similar, though straight, connection between the two uprights and from this the words "*Height 1370 feet*" have been cut. These are simple but very effective signs for the purpose, and add to the interest of the bleak spot where they stand.

Another lineside erection that can be seen from the window of a train on the East Coast Route is situated on the down side of the line near Prestonpans station, which is 9½ miles from Edinburgh. This is a reminder of the Jacobite Rebellion of 1745, for it is a monument erected in memory of Colonel James Gardiner, who fell at the Battle of Prestonpans between the Highland insurgents of Charles Edward Stuart and the Royal troops under Sir John Cope. The monument is in the form of a tapering column and actually stands a few feet from the boundary wall of the railway. Bankton, the home of the Colonel, forms the background to it.

Gardiner was in command of a new regiment of Dragoons, the men of which broke their ranks and fled at the first few shots from the opposing Highlanders. The gallant Colonel endeavoured to rally them, but in vain, and he himself was killed. The site of the battlefield was on the up side of the line, not far away from the Colonel's home, and wounded of both sides were taken there after the battle.

A historic building that in a sense incorporates a lineside sign is passed earlier in the northward journey. This is of special interest from the railway point of view for it is the house at Killingworth where George Stephenson once lived. It is an ivy-covered cottage, right by the railway, that was described in the "*M.M.*" in October 1934. The "lineside sign" is an inscription over the front door that refers to Stephenson having lived there from 1805 until 1823. This inscription is placed below a sundial cut in a stone block that was made by the great engineer and his son Robert in 1816. On a track nearby Stephenson tried out his first locomotive, known as "*Blücher*," in 1814.

A Large Electric Furnace

The illustration on this page shows a double-ended electric furnace used for annealing aluminium alloy billets prior to forging, and also for the heat treatment of parts used in the manufacture of aeroplanes. It provides temperatures up to 600°C., the current being taken from a 440-volt 50-cycle three-phase supply, which is reduced to a voltage suitable for the heating coils by means of transformers. The heating chamber is 16 ft. long, 7 ft. wide and 5 ft high, and has nickel chromium elements, wound in coils, supported by specially moulded refractories in the roof, hearth and side walls. The billets are carried through the furnace on heat-resisting steel rollers, which are mounted on external bearings fixed along each side of the casing. The rollers are provided with sprocket wheels at each end, and are driven through roller chains by an electric motor.

The furnace is equipped with three pyrometers that indicate the temperature in the furnace. These are mounted on the side of the installation, together with pilot lamps that show when the temperature is "high," "normal," or "low."

For heat treatment purposes the furnace is provided with two patent centrifugal fans to accelerate the process of heating-up and to ensure an even distribution of heat over the charge.

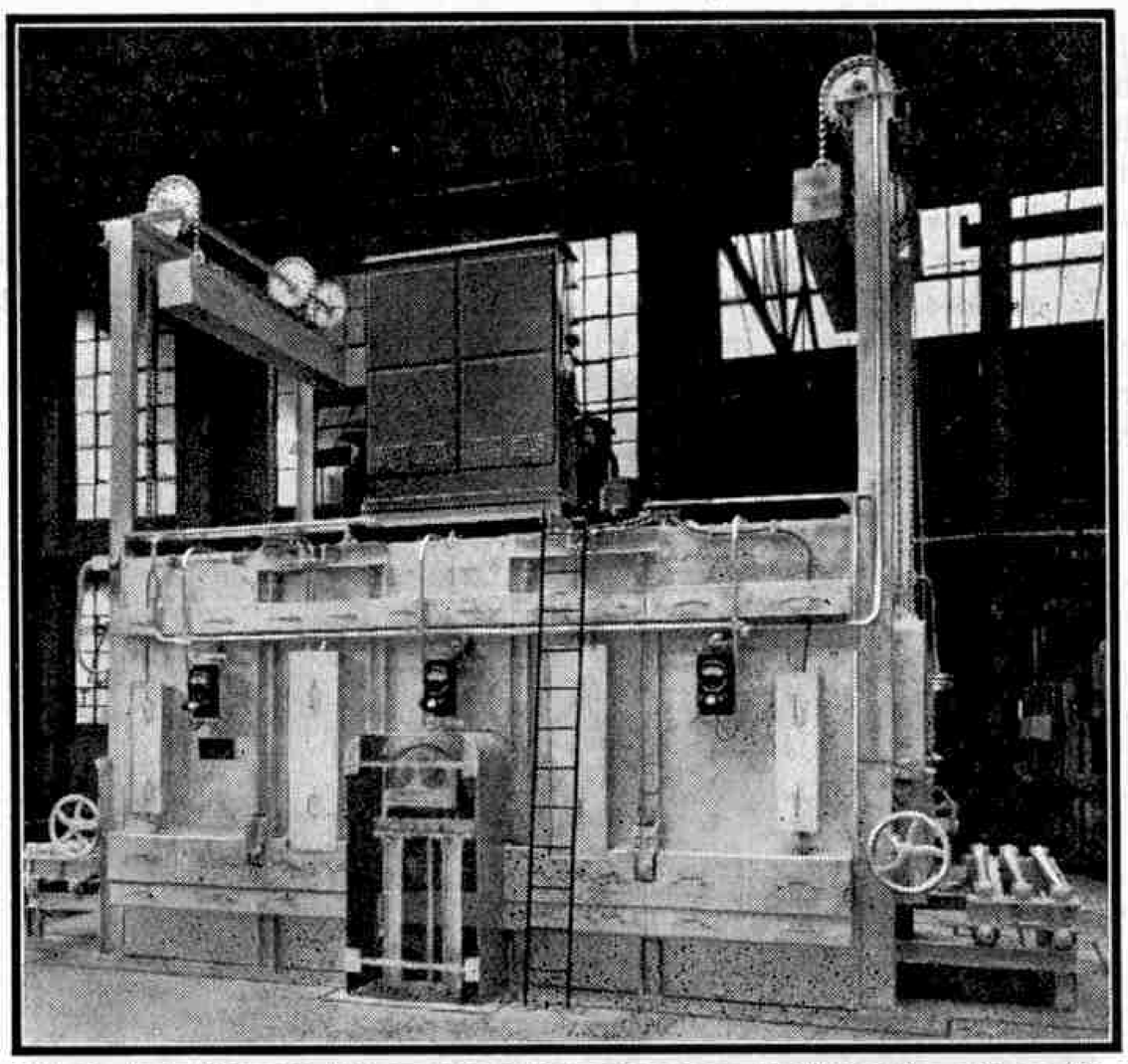
The furnace is the largest of four of similar type now working in a large factory, and was built by G.W.B. Electric Furnaces Ltd., London. Two other furnaces designed on the same lines are now in course of construction.

Motor Car Factory for Palestine

The first omnibus and car body factory to be built in Palestine is now under construction. The new factory is situated in the Jewish industrial area of Haifa Bay, and the premises, which occupy two acres, comprise steel-built workshops. machine and tool shops, service depot, locksmith's and living and dining quarters of the workers. The factory will be fitted with modern electrical equipment and machinery. The building was designed by a native architect and is planned to give ample ventilation and as much natural light as possible. It will be no higher than 18 ft., and its non-conducting asbestos-covered roof will slope down to a height of 12 ft. on each side.

Giant Tower for Exhibition Grounds

A steel skyscraper, 300 ft. high from the top of which it will be possible to see a distance of nearly 100 miles, will be one of the chief features of the Empire Exhibition to be held next year in Glasgow. The tower has been designed by Mr. Thomas S. Tait, F.R.I.B.A., the exhibition architect. At the top it will have observation galleries with accommodation for 600 persons at one time. The position chosen for it is at the top of Bellahouston Hill, in the middle of the exhibition grounds, and the concrete base on which it will stand will be the largest single concrete block ever made in Glasgow.



A large electric furnace that operates at temperatures up to 600 deg C. and is used for annealing aluminium and the heat treatment of parts employed in the building of aeroplanes. Photograph by courtesy of G. W. B. Electric Furnaces Ltd., London.

Lifts at Boulder Dam

Employees at the great Boulder Dam power station in America are carried to their work by a high-speed passenger lift, which lowers them 528 ft. to a gallery leading to the power plant. The lift will carry a load of 5,000 lbs., or about 2¼ tons, and travels at a speed of 500 ft. per minute.

In addition to carrying the men to their working positions the lift is used also for carrying visitors, and has transported as many as 3,741 people down and up in 15 hours. Two other lifts of a smaller type are installed in the power house itself and two more in the canyon walls.

Tunnel to Link Asia and North America

If plans that have been prepared by the Russian Government are carried out it will be possible in the future to travel by train from Asia to North America. This will be made possible by a tunnel that it is proposed to bore under the shallow Behring Sea. The tunnel would be 38 miles long, and through it would run an extension of the Trans-Siberian railway. On the American side the line would link up with Canadian and United States railways.

The tunnel would be bored from Cape East, Siberia, to Cape Prince of Wales, Alaska, and experimental investigations have shown that it would pass through solid rock. Two islands in the Straits lie on the direct route of the tunnel, so that work could be carried on at six faces simultaneously and adequate ventilation shafts could be built. A Soviet delegation is to be sent to North America to bring the scheme to the notice of the American authorities, and to negotiate a treaty for the construction of the connecting railways.

Canada's Trans-Continental Motor Road Nearly Completed

The last link will be forged in the western half of the trans-Canada highway from Halifax, Nova Scotia, to Vancouver, British Columbia, when the "Big Bend" highway is completed. This section is being built around the great northern curve of the Columbia river, between the towns of Golden and Revelstoke, British Columbia. The only other section of the great thoroughfare not yet completed is in its eastern half, in north-western Ontario.

The "Big Bend" highway includes about 177 miles of new road between Donald and Revelstoke, together with an existing provincial road 16 miles in length between Golden and Donald. The unfinished section of 50 miles, on which work is now proceeding, lies between Revelstoke and the apex of the great northern bend of the Columbia River. The road passes through a magnificent mountain region, within sight of snow-fields and glaciers, and for the greater part of the way skirts the Columbia River, affording splendid views of the snow-capped Selkirk Mountains and other giant peaks that form part of the main divide of the Rockies.

A Road-Rail Shunting Tractor

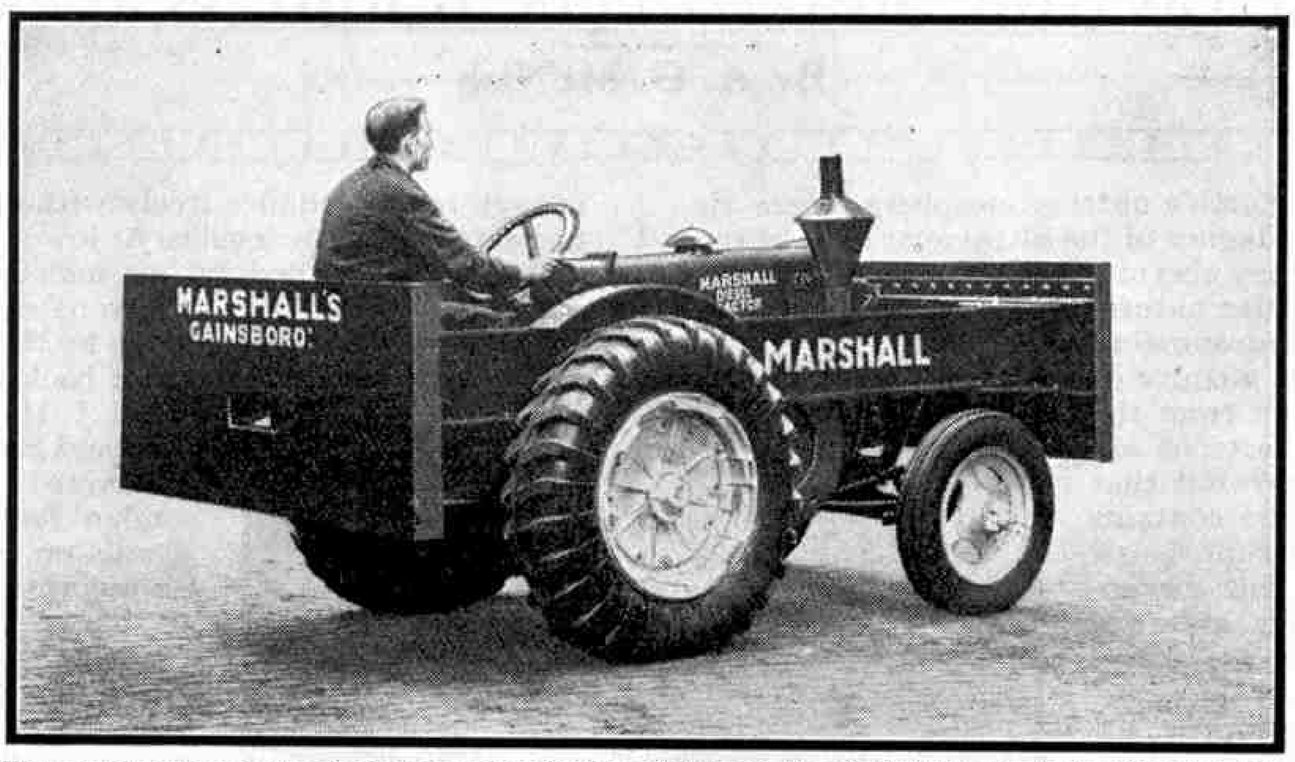
The Sunderland Corporation, on behalf of the River Wear Commissioners, have recently purchased the novel road-rail shunting tractor shown in the upper illustration on this page. It is employed on the Corporation Quay, and runs on rubber-tyred wheels, which make it independent of railway tracks.

The tractor was made by Marshall Sons and Co. (Successors) Ltd., Gainsborough, and is driven by means of a 24 b.h.p. single-cylinder oil engine. The fuel pump and injector are of the C.A.V.-Bosch type, the pump being controlled by a fly-ball governor working in an oil bath. A hand control allows the driver to set the governor to operate at any speed between 300 and 700 r.p.m.

The drive is transmitted through a multi-spring cone clutch, which works in an oil bath, to a three-speed and reverse gear-box. The speeds of the tractor in first and second gears are 2.25 m.p.h. and 3.25 m.p.h., respectively, while the third gear can be supplied to give a speed of 5, 7 or 9 m.p.h., whichever is desired. The speed in reverse gear is 1.7 m.p.h. The final drive to the rear axle is through a differential gear, and when the tractor is working on wet and slippery ground the differential can be locked so that it is then impossible for one rear wheel to slip while the other is stationary. The lock is hand-controlled from the driver's seat. The wheels are made of cast iron and are fitted with large pneumatic tyres, those at the rear being 11.25 in. by 24 in., and those at the front 6 in. by 19 in.

Two brakes are fitted, one applied by depressing the clutch pedal and acting on the belt pulley, while the other is a hand brake operating on the final gear shaft.

The machine is provided with strong buffer plates 2 ft. 6 in. deep and 6 in. wide, which are constructed of 9/16 in. thick steel plate, stiffened with angle sections top and bottom. The main frame of the buffer attachment consists of 12 in. by 3 in. channel sections placed on each side of the tractor, and secured by means of brackets to the outer axle castings. As the brackets are fixed directly over the rear axle bearings, the reaction of the buffer plates is transmitted almost directly to the rear wheels. Gussets and cleats are used to fix the buffers to the main frames. The complete tractor weighs 3½ tons.



The novel road-rail shunting tractor described on this page. It was built by Marshall Sons and Co. (Successors) Ltd., Gainsborough, to whom we are indebted for our photograph.

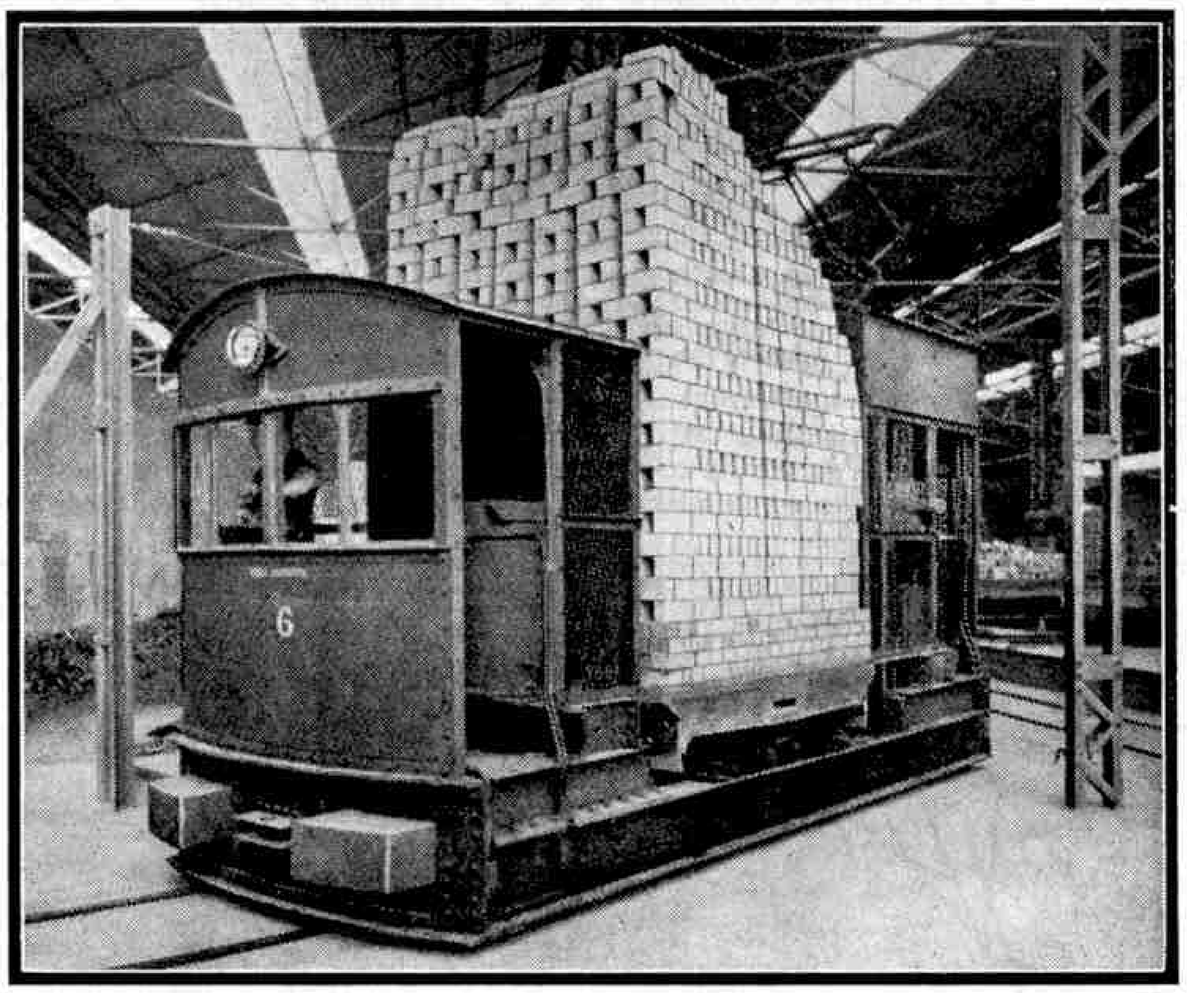
Another Large American Power Station

A single 80,000-kW generator, and giant boilers working at a pressure of 1,200 lb. per sq. in. are to be the main features of a new power station that is to be built in the United States by the Buffalo Niagara Electric Corporation. The station is to be constructed in Buffalo Harbour and will cost about £1,750,000.

A Highway Over the Sea

The railway that runs out to sea from Florida is being converted into a motor highway. This railway was described and illustrated in the *"M.M."* for March 1929. It connects the island of Key West with the mainland by way of a chain of small islands separated by deep-sea channels, and is supported by innumerable concrete arch bridges, viaducts and embankments across rock islets. It was not a success financially and in 1935 was so badly damaged by a great hurricane that it was abandoned. Now a local company has bought the property and is converting the line into a concrete road that will link up with the highway system on the mainland.

About 15 miles of the line are carried on bridges and viaducts, the largest continuous stretch of this kind being seven miles long, part of it consisting of steel girder spans. The highway that is now being built is 20 ft. wide. It is wider than the old single-line railway, and transverse steel beams 25 ft. long and 10 ft. apart are laid in trenches cut across the concrete structures, or across the girders of steel spans, in order to support it.



This electrically-propelled car is used at a large brickworks for transferring loads of bricks from one set of rails to another set laid at right-angles. Photograph by courtesy of the British Thomson-Houston Co. Ltd., Rugby.

New Uses for Pumice

Pumice, which is abundant in the volcanic regions of Italy, is being used in road construction and as a substitute for sand in making artificial building sheets and blocks. The pumice is mixed with asphalt to produce a very light material that can be sawed and nailed, and is not affected by moisture or changes in temperature. The material is said to offer more resistance than concrete to heat and sound, and has excellent wearing qualities.

Giant Shaft Removed from Rotor by Dry Ice

At the Queenstown hydro-electric station at Niagara Falls recently, a 30-ft. hollow steel shaft weighing 40 tons was extracted from a 270-ton rotor, in which it was a shrunk fit, by cooling and contracting the shaft with a mixture of dry ice and alcohol. To make the freezing mixture 350 gallons of alcohol were mixed with 3 tons of dry ice, and the liquid was then pumped through the shaft. The shaft was completely free of the rotor in about two hours.

Electric Transfer Car for Brickworks

Six electrically-propelled cars, one of which is shown in the lower illustration on this page, are now being used at the Stewartby Works of the London Brick Company Ltd., to transfer loads of bricks weighing about 15 tons from one set of rails to another set at right angles. Each car is driven by a 20-h.p. vertical-shaft motor, which runs at a speed of 650 r.p.m. and is supplied through an overhead collector with direct-current at a pressure of 220 volts. The motors were constructed by the British Thomson-Houston Company Ltd., Rugby, and are totally enclosed to protect them from dirt and grit in the atmosphere in which they operate.

The car is controlled by a tramway type controller, which also was constructed by the British Thomson-Houston Company Ltd., and a special feature of this is that the accelerating resistances are provided with an additional section, so that a creeping speed is obtained. This enables the cars to be stopped exactly opposite the junctions of the adjoining rails, which are at right angles to the running rails, and this operation is further facilitated by two push-buttons marked "Forward" and "Reverse," which are mounted in a conveniently accessible position on each side of the car. When the car approaches the point on the track where it is required to discharge the load at right angles, these buttons allow the operator to leave the driving cab and to control the movement of the car in either direction from the track.

When the car has been stopped in the correct position the load is traversed sideways on to the adjoining line by a 5-h.p. motor.

The Atmosphere's Electrical Fringe

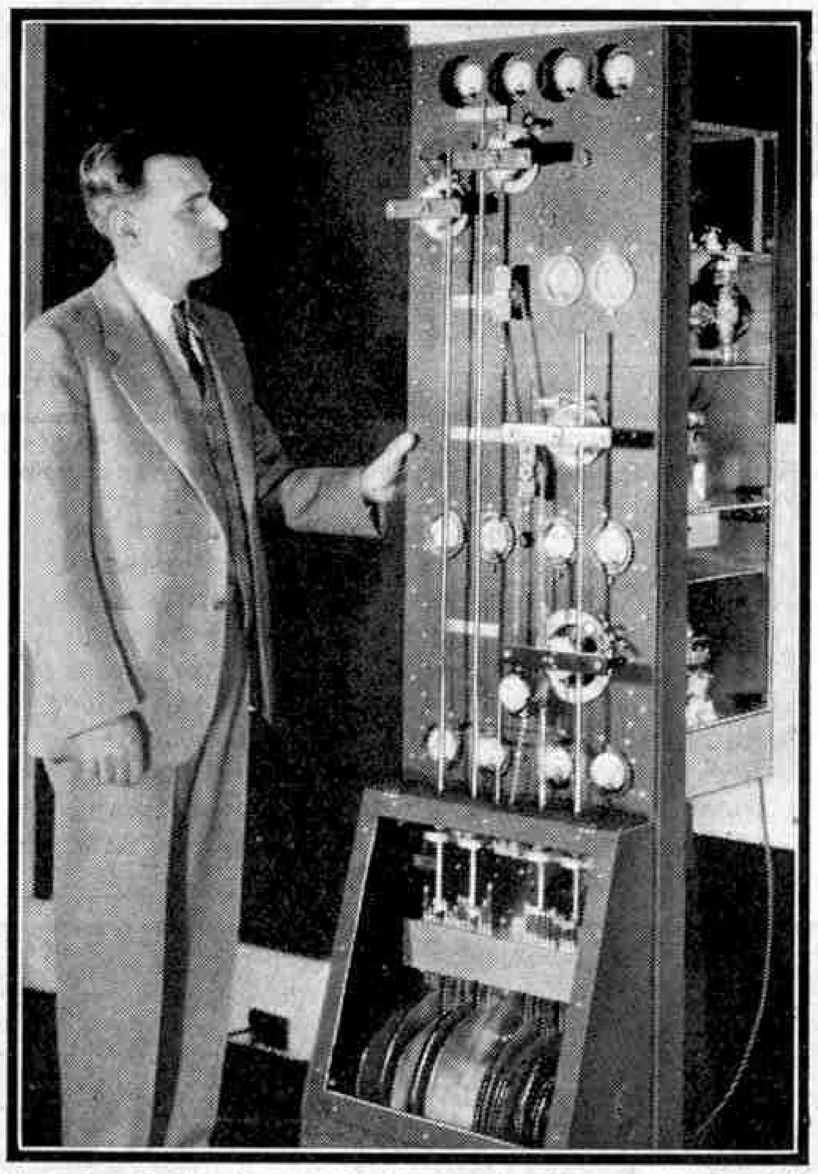
How the Sun Affects Radio Waves

By A. G. McNish

THERE is a portion of the Earth's outer atmosphere where air molecules come under the influence of the ultraviolet light of the Sun, and where, it is thought, they also may be subject to bombardment by particles of a corpuscular nature, such as electrons, ions, atoms, presumably emanating from the Sun in the vicinity of sunspots. When these radiations from the Sun strike molecules of air, electrons are freed from the latter, with the result that the shell of the outer atmosphere contains both free electrons and disrupted air molecules which, because of this disruption, are electrified. In such state of electrification these molecules are called "ions."

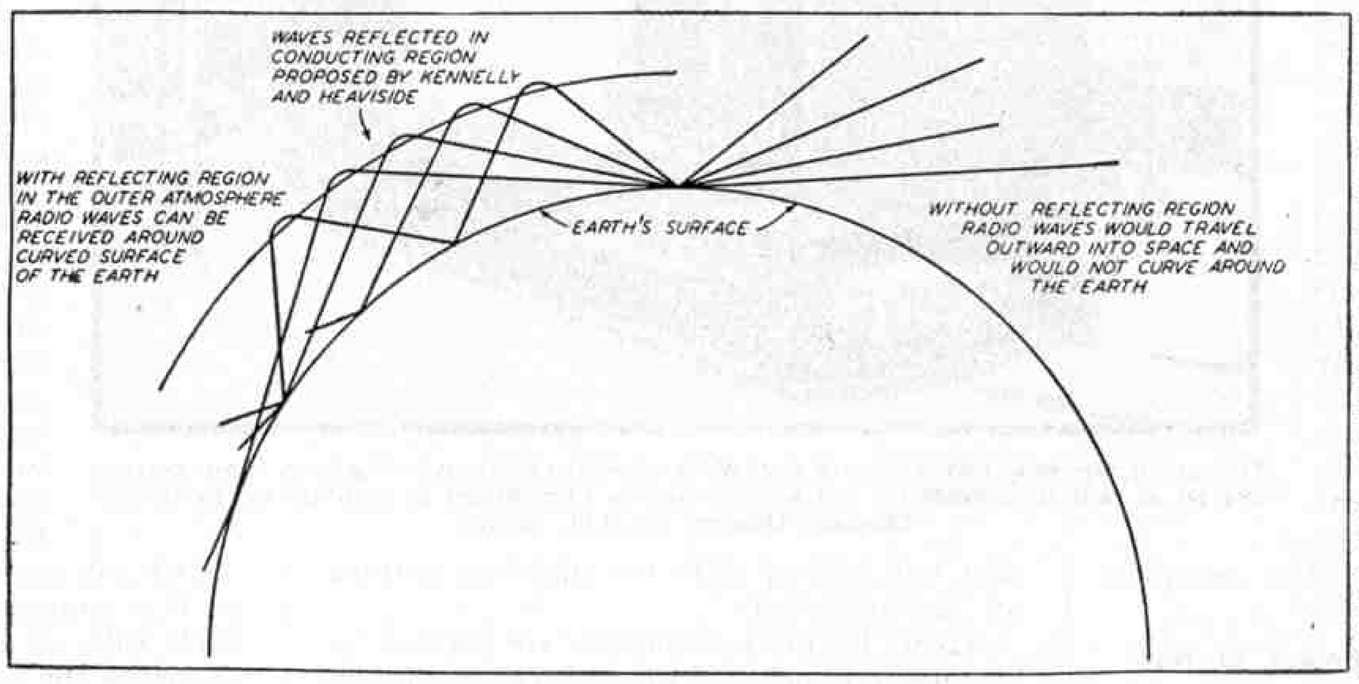
This electrification of the upper atmosphere causes it to reflect radio waves back to the Earth that would ordinarily pass out into space. Although this electrification of the atmosphere was suggested in 1882 by the British meteorologist, Balfour Stewart, to explain certain facts of terrestrial magnetism, the possibility of reflection of radio waves from the region was not suspected until many years later. When Marconi first succeeded in transmitting a radio signal across the Atlantic he performed a miracle, because the feat was in contradiction of the then-known principles of nature.

But scientific men are not inclined to accept miracles. Very soon Kennelly in America and Heaviside in England offered an explanation. It had been thought previously that radio waves transmitted from a point would not follow the curvature of the Earth, but would fly off into space like mud from a wagon-wheel. Reception of the signals on the other side of the Atlantic clearly indicated that they were reflected back to Earth by an electrified condition of the upper atmosphere. Definite experimental demonstration of this electrical mirror was not accomplished until 1925, when Breit and Tuve, of the Carnegie Institution, and Professor Appleton, in England, independently succeeded in obtaining direct reflections of radio waves from the upper atmosphere.



A device that automatically sends out radio wave pulses into the upper atmosphere at the Department of Terrestrial Magnetism of the Carnegie Institution of Washington, U.S.A., to whom we are indebted for the illustrations on this page.

We now know that the Sun is the only important agent in producing the ionizing upon which depend the peculiar electrical properties of this region, known as the ionosphere. Although first thought of by Kennelly and Heaviside as a single region of ionization, it is now known that several distinct layers exist. The chief of these are a lower layer, capable of reflecting fairly long waves, situated at a height of about 60 miles; a second, capable of reflecting shorter waves, at a height of about 120 miles; and a third capable of reflecting still shorter waves, which is at a height of about 180 miles.



How radio waves can be received around the curved surface of the Earth because of reflection from a region containing electrons and other electrified particles, through which they cannot penetrate.

Since ions are much more massive than electrons, and consequently are harder to set into motion, about 30,000 of them are required to give the same effect as a single one of their light-heeled cousins, the electrons. These conditions apply only in the uppermost portions of the ionosphere, where the electrons or ions have enough room to dance freely without colliding too frequently with unelectrified air molecules. At lower heights, where the atmospheric ballroom is crowded by air molecules, frequent collisions of the electrons cause them to waste the energy given by the radio waves instead of reflecting it back to Earth.

Dr. J. H. Dellinger of the United States National Bureau of Standards, has recently discovered a new effect, which consists of a sudden fade-out of high-frequency radio signals on the daylight side of the Earth, lasting at times from a few minutes to over an hour. During these fade-outs, long-distance communication on any short wave lengths is completely impossible. Ships at sea, aeroplanes in flight, commercial and amateur stations all find short wave communication impossible during the interval if the path of the radio waves involves reflection from the ionosphere.

During the past year about 100 such cases have been reported. About half of these occurred at times when bright flares of hydrogen light were visible on the Sun, revealed by a special instrument called a spectrohelioscope. It is believed that all of these fade-outs occur simultaneously with solar eruptions. The most intense manifestations were accompanied by sudden changes in the Earth's magnetism, and in the natural electric currents flowing in the Earth's crust.

Special observations of the electrical state of the Earth's outer atmosphere being made at the Carnegie Institution's observatories at Huancayo, Peru, and Watheroo, Western Australia, and by other organizations elsewhere, serve to indicate the nature of the effects. At these observatories short pulses of radio waves are sent up into the ionosphere 10 times a second. The reflections of these pulses are received and, by measuring the time required for them to come back, the height of the reflecting region is determined, in very much the same manner as the distance of a cliff can be determined by the time required for an echo to be returned from it. Short waves require greater numbers of electrons to reflect them. The number of electrons at each height from which reflections are returned therefore is determined by decreasing the wave length until the waves just penetrate the region and are reflected from the next higher layer, or are not reflected at all but escape into space.

When a fade-out occurs, no reflections can be obtained from the electrified layers, just as if one were looking into a looking-glass and suddenly ceased to see his reflection. The only way such a thing can happen is for the looking-glass to be broken or an opaque object to be interposed in the line of vision. The second explanation is the only tenable one, and the opaque object in this case is a cloud of electrons or ions at low heights, where numerous air molecules interfere with their free movements.

For the information in this article we are indebted to the courtesy of the Carnegie Institution of Washington.

Puzzle No. 1

Farmer Giles has a square field in which are 12 apple trees, as seen in Fig. 1. He is getting old and wishes to divide this field into four parts, of equal size and shape, with three trees in each, so that in his will he can leave one part to each of his sons. Can you help him by dividing the field up as required?

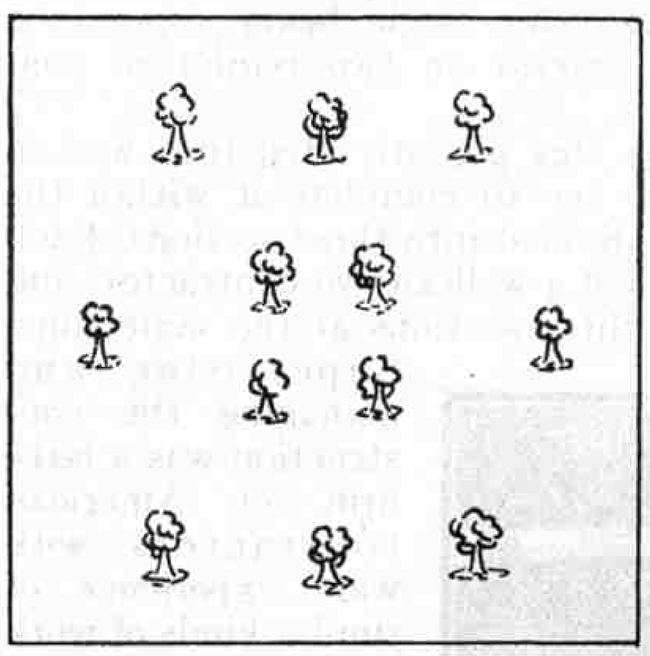


Fig. 1.

Puzzle No. 2

On a table are three glasses, A, B and C, with capacities of 8 pints, 5 pints and 3 pints, respectively. In A there are 5 pints of water, in B 3 pints, and in C 2 pints. No other vessel is available, and it is desired to leave exactly one pint of water in any one of the three glasses. This can only be accomplished by pouring water from one glass to another, and the minimum number of movements in which it can be done is two. That is water is poured from one glass to another twice. Can you find the movements?

Puzzle No. 3

Two boys took up their station near the clock-tower to find out which could hold his breath the longer. The first held his breath from the first stroke of 12 to the sixth, and the other from the sixth stroke to the twelfth. The first boy therefore claimed a draw. Was he correct? If not, who won?

Puzzle No. 4

On a proof of a poster there appeared the sentence: "The conjunctions in the English language are 'and' and 'but'," with large spaces between the last four words. A written comment on this read: "There is too much space between are and and and and and and and and and but."

Can you insert the necessary punctuation in this sentence?

When you have succeeded with the above, try this one. "That that is is that that is not is not but that that is not is not that that is nor is that that is that that is not is not that so."

Puzzle No. 5

Ten coins will enable you to pay any sum from ½d. to 10/11½. What are they? Is this the lowest number of coins with which these sums can be paid?

Puzzle No. 6

As Farmer Giles is getting on in years, he likes to save himself trouble. His barn marked B in Fig. 2 is 20 yds. from the river, and his house H is 36 yds. from the brook, and 28 yds. from the river.

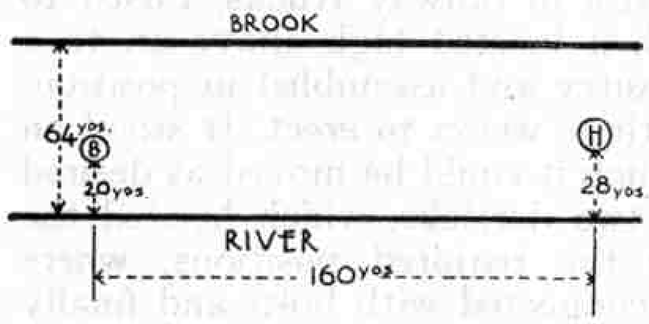


Fig. 2.

One day the farmer had been working in the barn all morning and was feeling particularly tired. He wished to get to his house as quickly as possible, but on the way he had to go to the river bank and note the height of the water, and then go to the brook for the same purpose.

What is the shortest possible route he can take, and how far must he walk altogether?

Puzzle No. 7

A man reading a letter came to this curiously-arranged phrase:

f f
r r
i i
e standing e
n a miss n
d d
s s

After a few moments' thought he deciphered it. Can you?

Puzzle No. 8

Cut four pieces of cardboard to the size and shape indicated in Fig. 3, and then try and form a square with them. It is not quite as easy as it may seem.

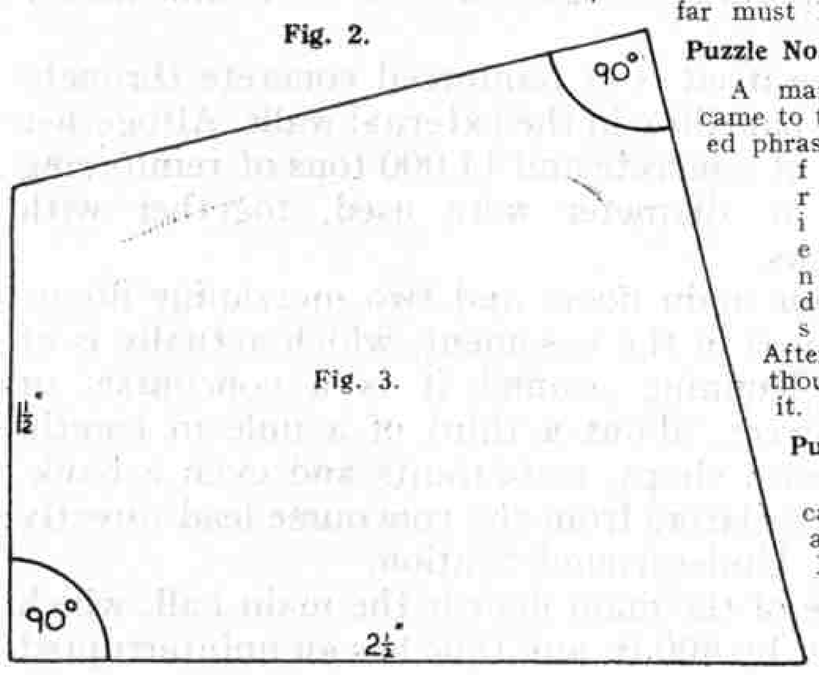


Fig. 3.

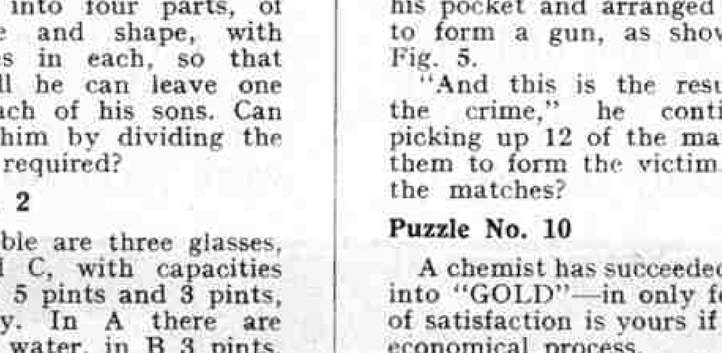


Fig. 4.

Puzzle No. 9

A detective was describing a murder. "The weapon was this revolver," he said, and he took 18 matches out of his pocket and arranged them to form a gun, as shown in Fig. 5.

"And this is the result of the crime," he continued, picking up 12 of the matches and rearranging them to form the victim. How did he arrange the matches?

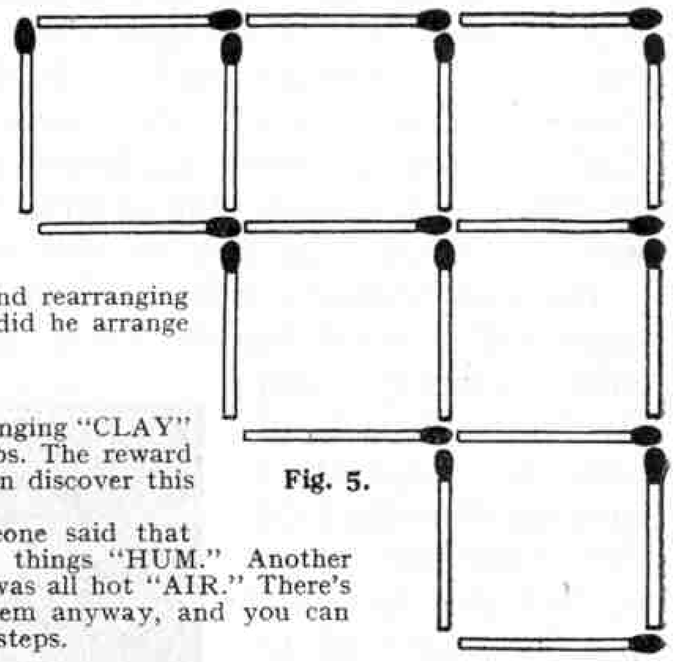


Fig. 5.

Puzzle No. 10

A chemist has succeeded in changing "CLAY" into "GOLD"—in only four steps. The reward of satisfaction is yours if you can discover this economical process.

Surprised by the news, someone said that the chemist was now making things "HUM." Another expressed the opinion that this was all hot "AIR." There's not much difference between them anyway, and you can turn one into the other in three steps.

Puzzle No. 11

In the wild West of America a noted bandit, under arrest in the middle of the train, tried to jump out of the window when the train was travelling at 60 miles an hour. The engine driver and the guard in the van both fired at him at the same time with revolvers with a muzzle velocity for the bullet of 60 miles an hour. Will the bandit be hit by either or both bullets, assuming the accurate aim of each?

Puzzle No. 12

The piece of check linoleum shown in Fig. 4 was originally laid down in a bathroom and the passage leading to it. On moving to another house the owner found it would not fit the new bathroom, but as it was in excellent condition he decided to use it in the scullery, which was square. This he did by making only three straight cuts in the linoleum. The three pieces resulting were fitted together to form a square with the pattern still perfect, that is with black and white squares alternating.

Where were the cuts made on the original piece of linoleum?

Puzzle No. 13

Jack is twice as old as Bill was when Jack was as old as Bill is now. When Bill is as old as Jack is now, Jack will be 35. How old is Bill?

Puzzle No. 14

Tommy was doing his geometry homework, and attempting a problem concerning the diagram shown in Fig. 6. He tried several ways, but could not work it out. As he sat looking at the diagram he idly ran his pencil over the lines. After a few minutes he realised that he had gone over every line without lifting his pencil from the paper, or traversing any line twice. How did he do it?

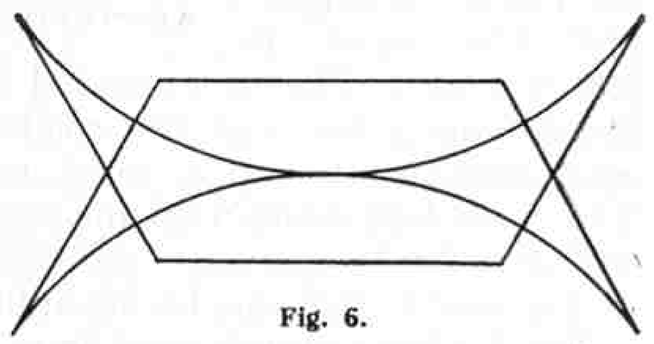


Fig. 6.

Puzzle No. 15

A man without eyes
Saw plums on a tree.
He neither took plums
Nor left plums,
So how could that be?

Puzzle No. 16

In Fig. 7 we have commenced to build up a puzzle with the word "Meccano." With the aid of the clues given below, try and fill in the missing "parts" and complete it. The clues across are as follows:

1. A pioneer of road construction
2. Negative pronoun, adjective, adverb or conjunction
3. Extracts essence by boiling
4. To go on
5. To grow out of
6. A slope
7. A province of Canada

Puzzle No. 17

Three missionaries with three cannibals wished to cross a stream. Their one boat held two persons. If during the crossing the cannibals outnumbered the missionaries on either bank, they would eat them. How did the missionaries arrange the journeys to enable them to get across safely?

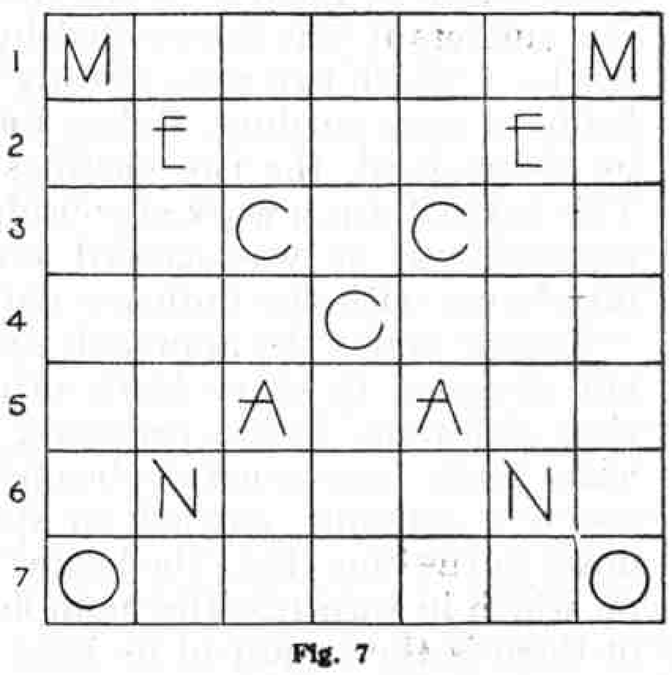


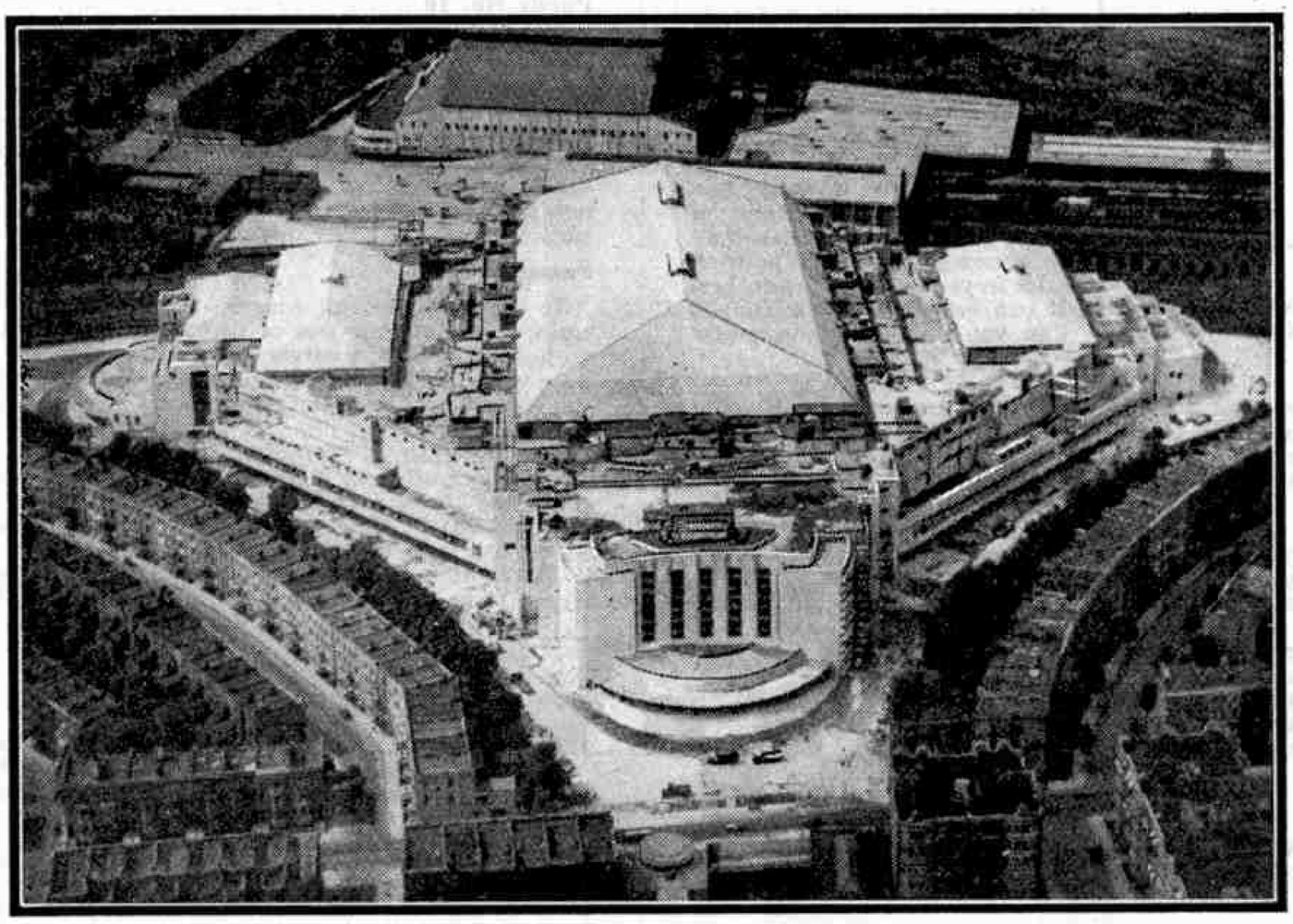
Fig. 7

One of the World's Greatest Buildings

Features of the New Earls Court

LONDON, the largest city in the world, now possesses a building that is one of the greatest in the world, if not actually the largest. This has been erected on the site of the old Earls Court Exhibition, which for years was so well known to Londoners and visitors from all parts of the country, and is about twice the size of St. Paul's Cathedral and five times as big as the Albert Hall. It will be used to house great exhibitions and sporting and spectacular events of all kinds, and may well be considered one of the wonders of the world.

The new building is in the heart of London, less than three miles from Marble Arch. It is easily reached by tube, railway and bus from all parts of London, escalators running directly into the building from Earls Court Station, and is connected to all the main line termini. It is designed and constructed to last for many years, and is in fact one of the strongest and safest buildings in London, or indeed in the world.



A general view from the air of the new Earls Court Building. For the illustrations to this article we are indebted to the courtesy of Mr. R. J. Siddall, A.M.Inst.C.E., Consulting Engineer.

The building is triangular in shape, with entrances at all three corners, which are rounded off in a very effective manner. Two of its sides are 700 ft. in length, and the third is 200 ft. longer. The area covered by the building itself is about nine acres, and the roadway around it and the approaches make up a total area of about 12 acres. The main hall when used for sporting and other events will seat 23,000 persons, probably the largest audience in the world that can be assembled indoors.

The building stands over four railway tunnels with a total length of 4,000 ft. When the site was taken over by the builders it was intersected by four separate railway tracks of which two were already covered, the remainder being in open cuttings. Before building operations could be commenced, the two cuttings had to be covered in. This in itself was a work of considerable engineering skill, especially as it was carried out without in anyway interfering with the ordinary daily traffic.

Except under the approach roads, these tunnels were not designed to carry loads other than the weight of their slab roofs. It was necessary therefore to span them with great ferro-concrete beams resting on reinforced concrete columns, carried on special foundations deep down in the blue clay. The beams support other columns, on which in turn rest the main floors and the roofs. One of them is the largest of its kind ever constructed. It is 105 ft. long by 18 ft. 6 in. wide and 9 ft. 9 in. deep, making up a gigantic mass of about 700 cu. yd. of concrete and 278 tons of steel reinforcing that weighs more than 1,000 tons. Yet the concreting of the beam was completed in two days. This single beam supports a weight of 4,300 tons, carried on two reinforced concrete columns.

The task of building this gigantic structure was so great that, in order to try to complete it within the specified period, it was divided into three sections. Each was placed in the hands of a well-known contractor, and work proceeded on all three sections at the same time. Supervising and managing the construction was a large firm of American contractors, with wide experience of similar kinds of work in America and other countries, and the work was so organised that the building grew as a whole while each contractor concentrated upon only one third of it.

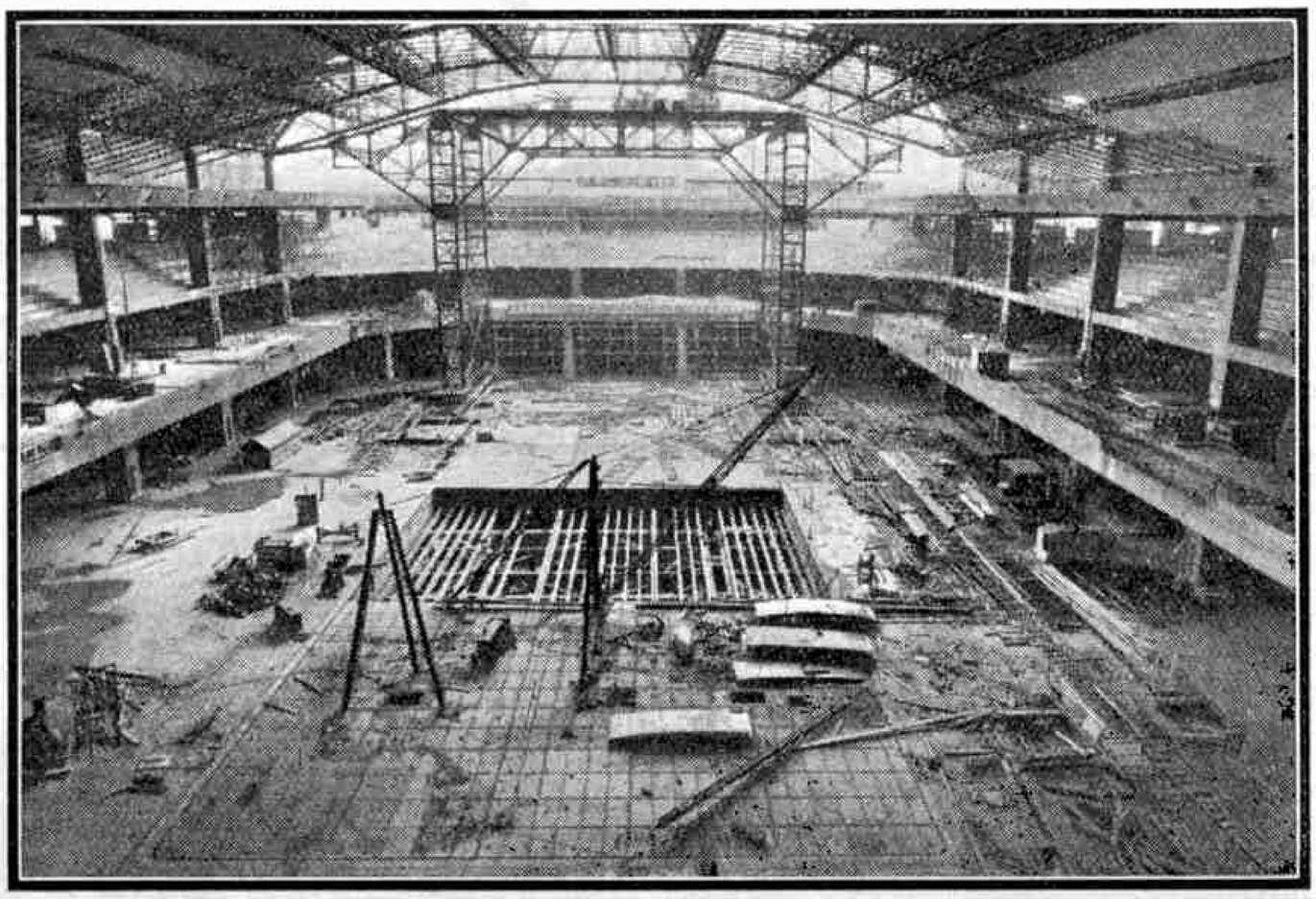
The erection of the steelwork for the roof of the main hall was a feat of great engineering skill. There are seven roof trusses, each weighing 83 tons, and having a span of 250 ft. The material had to be brought alongside the site in railway trucks, raised to main floor level and then hoisted high above on to a temporary travelling gantry and assembled in position. The gantry itself took three weeks to erect. It stood on railway tracks along which it could be moved as desired and on top of it were two derricks, which hoisted the steelwork members to the required positions, where they were temporarily connected with bolts and finally riveted up.

The structure itself is of reinforced concrete throughout, with brick panelling in the external walls. Altogether 80,000 cu. yds. of concrete and 14,000 tons of reinforcing steel up to 2 in. diameter were used, together with $7\frac{1}{2}$ million bricks.

There are four main floors and two mezzanine floors. The lowest floor is in the basement, which actually is at ground level. Running around it is a concourse, or underground street, about a third of a mile in length, which has its own shops, restaurants and even a bank. Subways and escalators from the concourse lead directly to Earls Court Underground Station.

In the centre of the main floor is the main hall, which measures 250 ft. by 400 ft. and thus has an uninterrupted

area of 100,000 sq. ft. It contains a swimming pool that is 200 ft. long and 100 ft. wide, and has a capacity of $2\frac{1}{4}$ million gallons of water. When required for exhibition purposes, a false floor in the pool is raised flush with the main floor. On each side of it is an escalator rising to the first floor, which also is used for exhibition purposes and has the same area as the main floor except for a well, measuring 190 ft. by 350 ft., above the main hall. On this floor are two smaller halls that can be completely closed off from the rest of the building by roller shutters, enabling them to be used independently for meetings or small exhibitions.



Work in progress on the main hall of the Earls Court Building, showing two sections of the swimming pool platform and the gantry used for the construction of the steelwork of the roof.

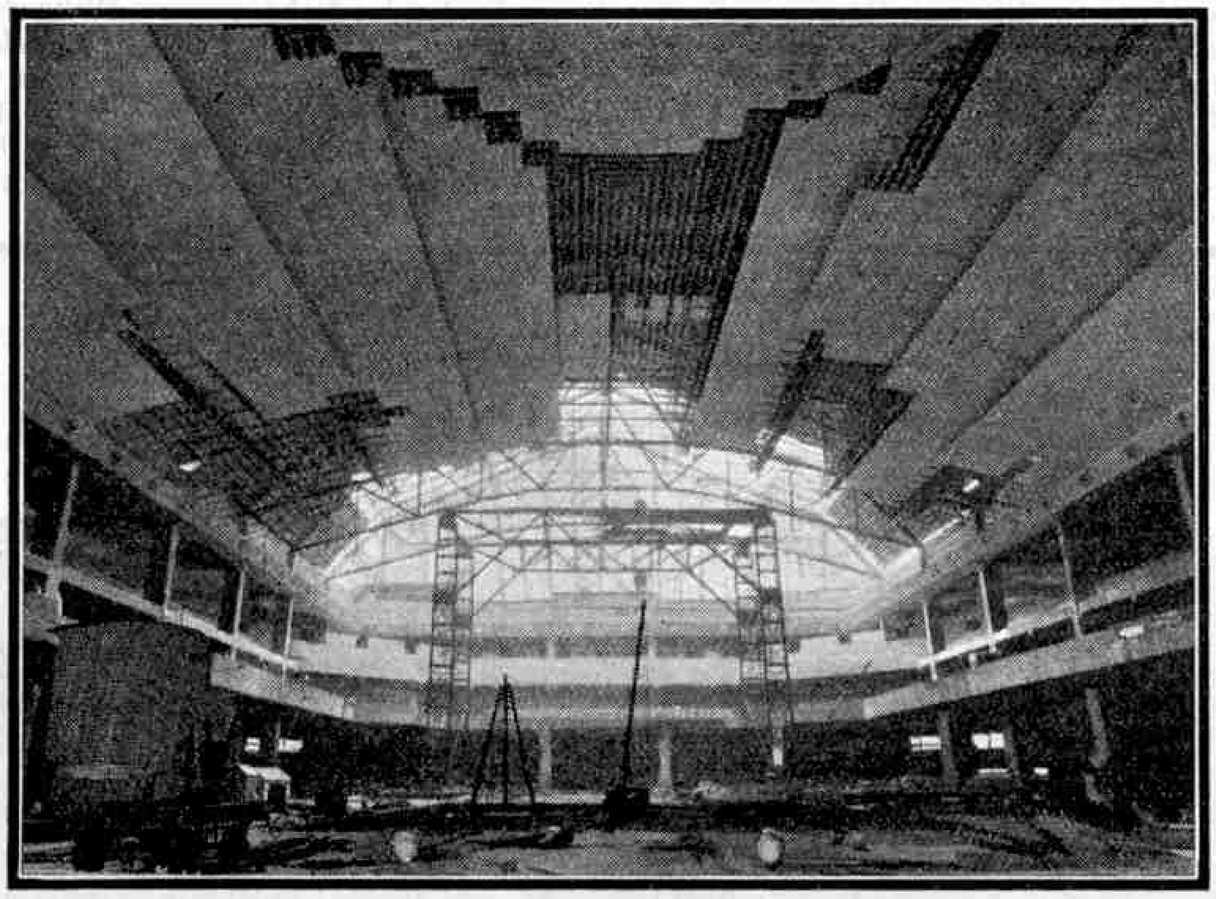
The second floor consists mainly of a large balcony or seating gallery, running round three sides of the main hall. It also contains suites of offices, buffets and other accommodation.

It is easy to take exhibits into the great building, for this is encircled by a suspended private roadway, 50 ft. in width, that gives ready access to the main floor and basement, and to the first floor by means of lifts. There is a large double-decked car park, providing accommodation for 2,000 vehicles, that is easily reached by means of a newly-constructed double-decked concrete bridge across the railway. Over the car park and on the bridge are huge stores and sheds for the storage of the temporary seats from the main hall. These can be removed and stored away in a day, although there are 19,000 of them, small tractors pulling them out in sections of 200 seats mounted on a wheeled framework.

The roof covering to the three main halls is of corrugated asbestos cement sheets, and altogether on these roofs there are enough sheets to cover a model village of 400 houses. The whole of the building is heated by blowing fresh warm air into it. This air is washed and passed through hot water coils, which are fed from seven thermal storage tanks, containing electrically heated water at a temperature of 270 deg. C. Thermostats control the heating of the air as it passes into the building.

The swimming pool is one of the most interesting features of the Earls Court Building. This is a concrete tank 200 ft. long and 100 ft. wide sunk into the floor in the centre of the main hall. It had to be made in such a way that the area would be available for exhibition purposes and sporting events, for it is the most valuable in the whole building. A false bottom therefore was made of steel girders and steel plates, finished with reinforced granolithic. This is divided into three equal sections, each of which in effect is a gigantic lift, and they can be adjusted to give varying depths of water. The entire floor or any of its sections also can be raised 5 ft. above the level of that of the rest of the hall to provide an area suitable for spectacular pageants, boxing competitions and similar events.

In spite of its size the building has no windows, except on the stairs and in the offices. Lighting throughout is electrical. Supplies normally are taken from the Fulham power station about two miles away, but generators installed in the building itself are reserved for emergencies and special work. Special cables have been run from the power station to the intake station of the building. There are also five sub-stations, and the total capacity is equivalent to that of a town of about 35,000 people. An elaborate colour floodlighting scheme shows brilliant colour changes over the entire spectrum on the immense ceiling of the main area. The arena itself is brilliantly lit by means of 28 floodlights suspended from the ceiling, and arc lamps can project their beams through 62 openings in a large trough-like gallery round the top of the main hall. Underwater floodlights illuminate the huge swimming pool.



Another view in the main hall during erection. This shows the steel grid for carrying the slabs of which the ceiling is constructed.

The 48 inlet nozzles through which fresh air enters are under the ceiling of the arena, where they can readily be seen. They look like heavy guns, and can deliver 385,000 cu. ft. per min. of fresh air supplied by the 30 ventilation intake plants installed, which have a total capacity of 800,000 cu. ft. per min.

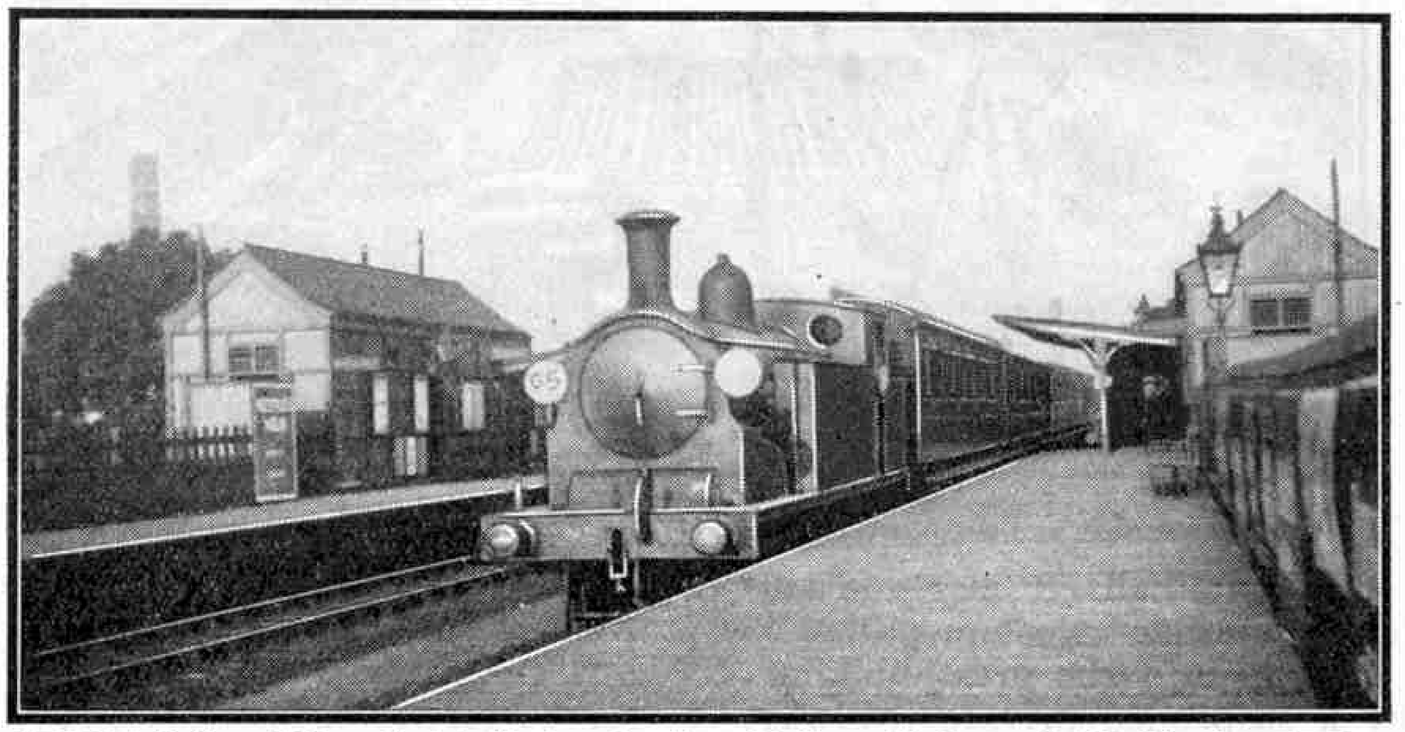
It is interesting to compare the Earls Court Building with the giant New York skyscrapers. The Rockefeller Tower has 71 storeys, but is of about the same size, as its base is much smaller in area. Even the Empire State Building, which is 1,248 ft. in height and is the tallest in the world, is less in bulk than that at Earls Court.

The West London Joint Railways

Where the "*Winkle*" runs!

By W. Philip Conolly

THE railways dealt with in this article are two small lines in West London, running from north to south between the L.M.S. and G.W.R. systems and the S.R. They are the West London Railway and its southward continuation, the West London Extension Railway, and they afford one of the few north to south connections through London. They are controlled by the three companies already named, each working its own trains over them, and provide a route for much important goods and passenger traffic. In addition, a short section between Addison Road and Uxbridge Road Junction is used by G.W.R. and London Transport electric trains to and from Edgware Road.



An S.R. train from Addison Road to Clapham Junction at Battersea Station on the West London extension line. The locomotive is S.R. No. 30, an 0-4-4 "Drummond" tank of the old L.S.W.R.

The West London Railway begins a little to the north of North Pole Junction, which is 65 chains from Willesden on the L.M.S. main line from Euston. The line from Willesden crosses a bridge over the Grand Union Canal at Mitre Bridge Junction. From this, it passes over the G.W.R. main lines on a large single span girder bridge of the Pratt truss type, and, passing North Pole Junction, it immediately commences to fall at 1 in 60 down North Pole bank through St. Quintin Park Station to Viaduct Junction. North Pole Junction gives connections to Old Oak Common East through a short curving tunnel below the West London line, and to the G.W.R. carriage sidings to the east.

Passing St. Quintin Park Station, where there are catch-points and a sand-drag, Viaduct Junction is soon reached, and there connection is made with the Ealing and Shepherd's Bush line, a joint concern of the G.W.R. and the old Central London line. This connection is used by certain milk trains, and the morning and evening Greenford workmen's train to Ealing Broadway. The line continues to fall at 1 in 120, and at Uxbridge Road Junction and Station the G.W.R. and London Transport Edgware Road line joins the West London line on the up side. On the down side are the new United Dairies Milk Depot, a large scrap steel and plant yard and, nearest to Uxbridge Road, the jointly owned L.M.S. and G.W.R. Shepherd's Bush Goods Depot.

An L.M.S. goods train from Shepherd's Bush to Willesden Junction passing through St. Quintin Park on the ascent of North Pole bank, hauled by L.M.S. 0-6-0 freight engine No. 4063.

At Uxbridge Road Station, separate accommodation was provided for the old White City Exhibition, entrance being given from a footbridge at the northern ends of the platforms. Much material still remains, including the turnstiles and ticket barriers. The booking office can still be seen, and ticket racks and small portions of the old train service bills are also in evidence.

On the short run into Addison Road Station, we pass what until only a few years ago was described in the working timetables as "Richmond Junction." At one time this gave access to Addison Road for the L.S.W.R. line from Richmond via Turnham Green. This line was closed in June 1916, but the rails remained for some years later.

Four tracks run through Addison Road, the outer ones serving the up and down platforms. These platforms have bays at each end, but only those on the east or up side are used for passenger working. From the north east bay G.W.R. and London Transport trains leave for Edgware Road. Southern trains for Clapham Junction use the bay at the other end of this platform. Near the northern bay on the down platform a new parcels loading bank has been erected, on which a large parcels traffic is handled.

Addison Road is the most important station on the joint railways, and until about 1919, when control was transferred to Paddington, it was the headquarters of a Joint Superintendent and other officials. The busiest periods experienced now are those when there are Exhibitions and Shows at Olympia, which is on the opposite side of the road from the station. Engines of through trains to and from the main lines are changed here, but on busy days, such as August Bank Holiday Saturday, Lillie Bridge Sidings are used for this purpose.

Passing out of the Southern end of Addison Road, Earls Court Junction is immediately passed, and the West London Railway ends, 3 miles 4 chains from Willesden, by making an end-on junction with the Extension line. L.M.S. electric trains from Willesden pass down an incline on the right to run beneath the main line, and thence into Earls Court. On the left is the Warwick Road Goods Depot, and on the opposite side of the line there is a connection giving entrance to the Lillie Bridge Depot of London Transport. Then come Lillie Bridge Sidings, and there on the left the new Earls Court Building towers above the tracks like an immense cliff face.

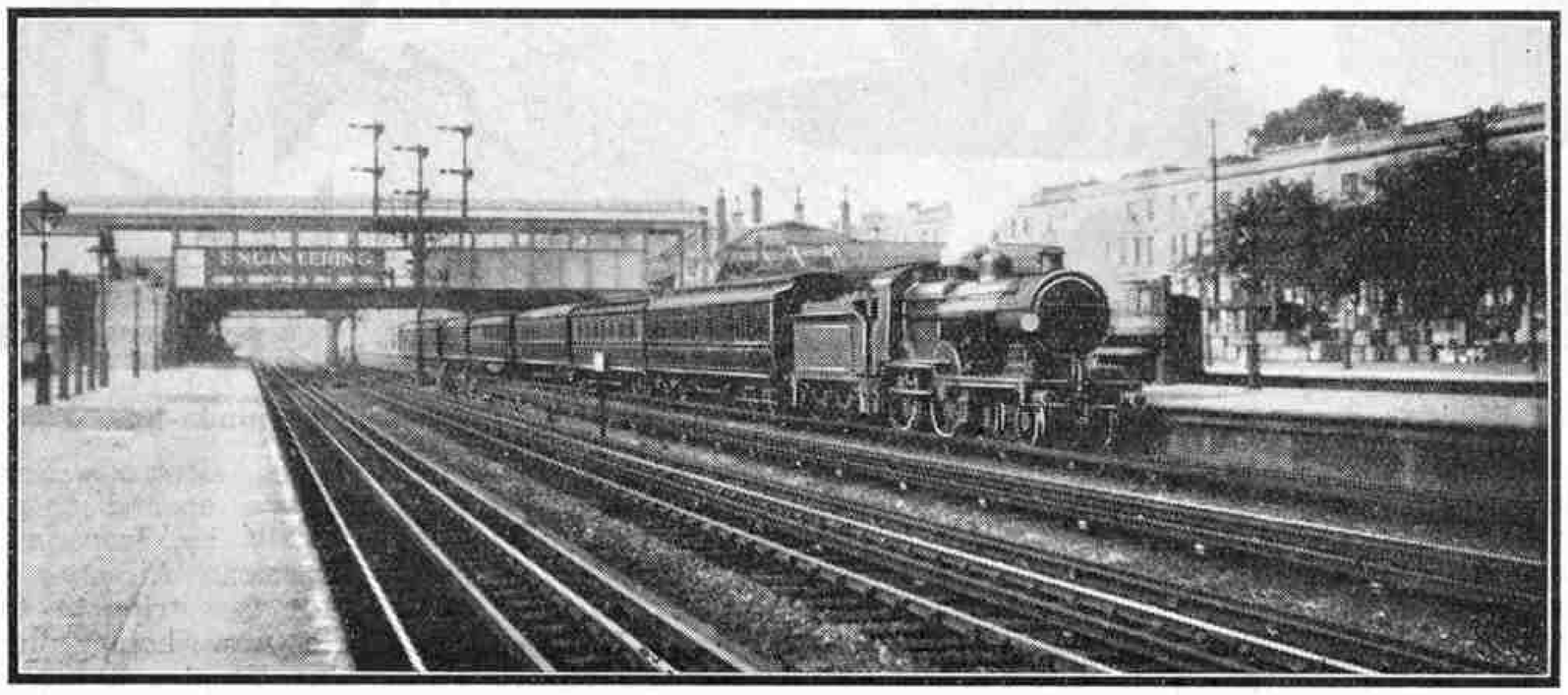
Chelsea and Fulham station is at the foot of the 1 in 104 incline up to the Thames bridge. On the left is Chelsea Basin, where most of the material for the erection of the new Fulham Power Station was handled. Two electric cranes were provided for transferring this from rail to road wagons, and these were afterwards dismantled and removed.

The Thames bridge, the largest structure on the line, is now traversed. It is a five-arched stone and iron lattice girder erection, 825 ft. long between abutments, that was partially reconstructed a little more than 40 years ago. A temporary signal box was then erected at the northern end, and the up and down roads were used as parallel single lines worked in conjunction with a train staff between the temporary cabin and Battersea Box, which then stood near the southern end. These details of working were given in a special notice issued in May 1891 from Addison Road. A signalman who still possesses a copy of this notice kindly allowed the writer to take these notes from it.

The last station on the extension is Battersea, a timber structure

a short distance south of the bridge. Latchmere Junction Box, 500 yds. farther on, controls the two branches to Clapham Junction and the main line to Longhedge Junction. In March 1936, the branch to West London Junction, long known as the "Creep-up," was closed, and permanent way and signals were dismantled. This branch, 31 chains in length, was very little used in recent years, and apart from an occasional engine or a short fruit train during the Hampshire fruit season, it saw little or no traffic. The last important train to run over it was the funeral train of Field Marshal Earl Haig on its journey from Waterloo to the north.

There are two branches to Clapham Junction. The first to leave the main line runs on brick arches for most of its length to the Western Section of the S.R. The second, or Central Section branch, makes a wider sweep and burrows under the S.R. main lines. It runs past Falcon Lane L.M.S. Goods Depot and Coal Yard Junction into No. 12 platform at Clapham Junction, having come a distance of 59 chains from the Junction Box at Latchmere.



A view from the south end of Addison Road showing the four tracks and the main platforms. The train is a portion of the L.M.S. "Sunny South Express," with an S.R. rebuilt 4-4-0 locomotive of the former S.E.C.R. at its head.

Opposite Falcon Lane Depot there stands an unusual type of signal controlling a siding behind Clapham Junction "B" box. This is an "ambiguous" signal, with spectacles on both sides of the arm showing red and green indications. The arm itself is painted the usual red with a white band on both faces. There are only three signals of this type on the whole of the S.R.

The Southern extremity of the West London Railway is marked by Longhedge Junction, 6 miles 22 chains from Willesden, and there the Extension loses itself in the maze of Southern lines in this part of London. Connections are available to Victoria, Battersea Pier Junction, Battersea Yard, and the Brighton main line. Excursion trains from the L.M.S. or G.W.R. main lines are worked through this last section, and out at Poupart's Junction to the south, when a path is not available for them through No. 12 platform at Clapham Junction. Trains are reversed when taking this route.

Stewart's Lane S.R. and L.M.S. Depots also can be reached, and access is given to the G.W.R. South Lambeth Depot. Finally Factory Junction provides connections to the Kent Coast main line. Both L.M.S. and G.W.R. horse-box and other traffic is worked into Victoria, and when an occasional L.N.E.R. engine and van puts in an appearance, all four groups are represented. Victoria is the only London terminal station where such a thing happens.

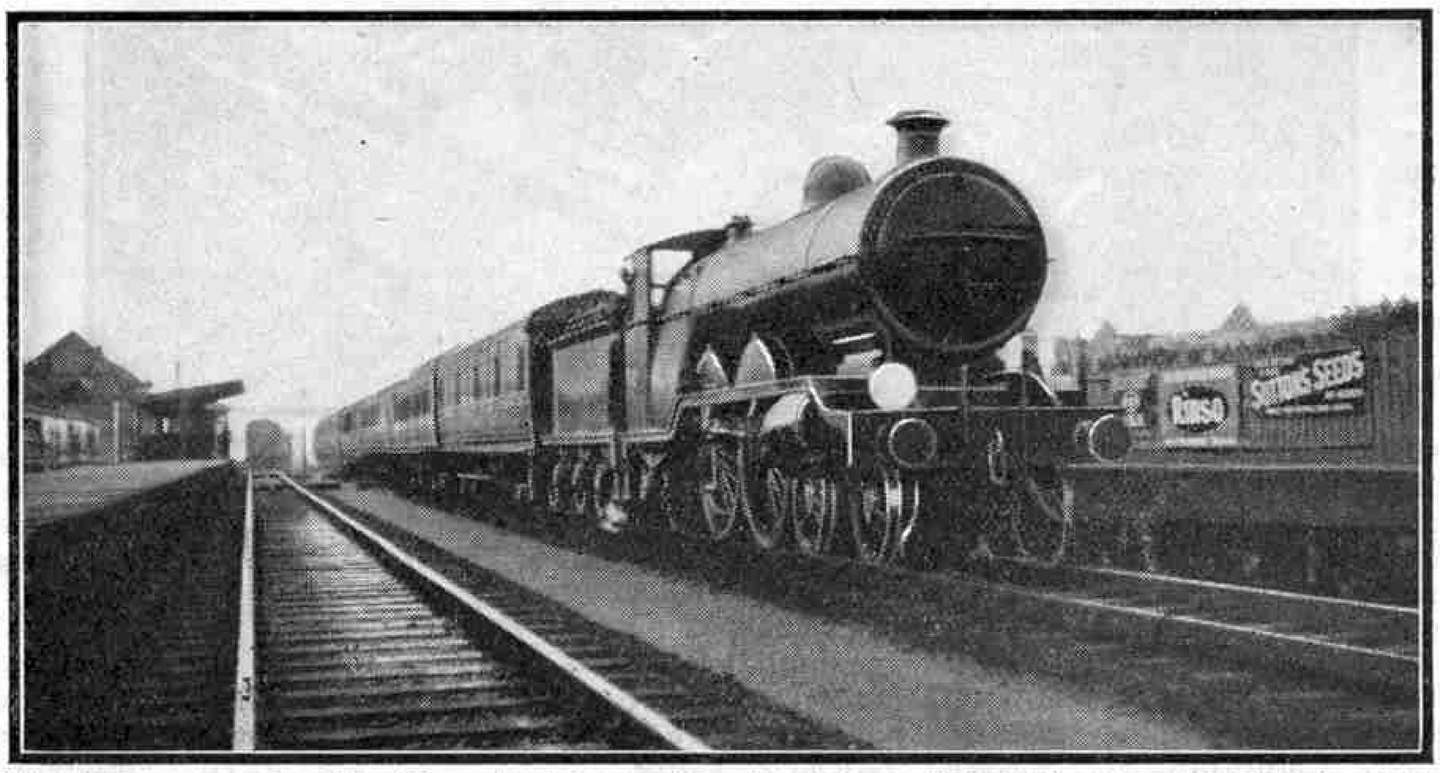
Goods traffic on the West London Railway is of greater interest than the passenger services, but we will examine the latter first. The former L.N.W.R. trains have dwindled to the daily trip of the L.M.S. motor train that has been working from Willesden since 1929. This trip is now only conditionally worked for parcels or horse-box traffic. There was once a service between Waterloo and Richmond via Addison Road and Turnham Green, and still another operated between Ludgate Hill and Richmond over most of the same route. Through trains were worked between Victoria and Birmingham for a short time in 1911 by the G.W.R.

To-day the passenger workings fall into three groups. These include two electric services, worked by the L.M.S. and by the G.W.R. and London Transport joint lines respectively, and the steam services of the Southern Railway. The Southern services between Clapham Junction and Addison Road are worked by both Central and Western Sections, but of late, Eastern Section engines have shared the working on Central Section trains. Engines used are Drummond 0–4–4 tanks, S.E.C.R. Wainwright tanks, and the variations of the "I" class of Central Section 4–4–2 tanks. For years the ex-L.B.S.C. train has been known as the *"Winkle."* It is said that the train earned this name by carrying a winkle man with his basket on the very first trip it made, but there are several stories about the manner in which it originated.

The L.M.S. Willesden motor train makes several trips to or from Clapham Junction, working either to Kensington or through to Willesden Junction. This train also works to Victoria or East Croydon on parcels, horse-box and similar services. In the evening it works into Victoria at 6.58, conveying a van from the L.M.S. with continental mails for Dover.

Various regular through services worked in conjunction with the L.M.S. enable Northern and Midland passengers to journey to and from South Coast resorts without changing trains in London. Probably the best known of these is *"The Sunny South Express"* to Brighton, Eastbourne and Hastings. Ramsgate and the Kent Coast generally also are served.

Goods and allied services provide much of interest. Through standard goods workings amount to approximately 70 daily, and this total does not include a number of conditional services. All three companies operate trains, the S.R. working to both Old Oak Common and Willesden Junction. L.M.S. and G.W.R. goods trains exchange traffic with the S.R. at Hither Green, Norwood Junction and Three Bridges. In addition to these trains, several short trips are now worked to Falcon Lane (L.M.S. only), West Brompton, Chelsea Basin, Lillie Bridge and Shepherd's Bush Depots. To the last-named yard there is a conditional night working from the G.N. section of the L.N.E.R., the only one during the 24 hours.

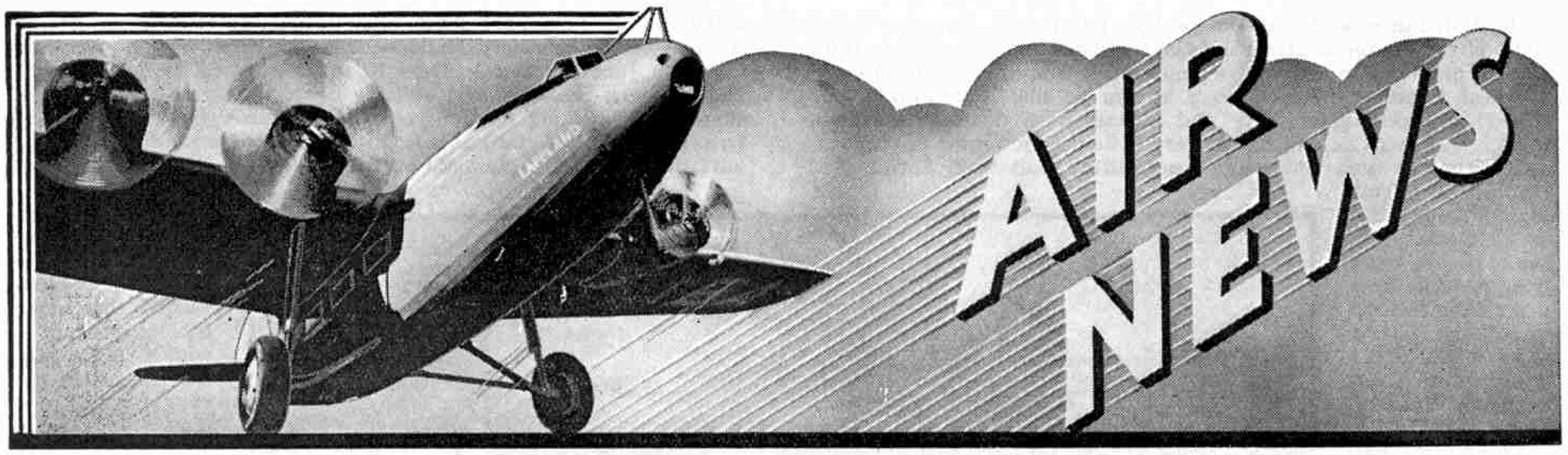


The Eastbourne portion of the "Sunny South Express" passing Battersea Station. The locomotive is S.R. No. 2425 "Trevose Head," one of the Brighton "Atlantics."

Certain close times for goods trains working to the Southern Railway are in force, and trains running late are impounded in Lillie Bridge Sidings. These periods are effective between the hours of 6.20 and 10.30 in the mornings, and 4.0 to 7.20 in the afternoons, except on Saturdays, when the second close time is from 11.50 a.m. to 2.20 p.m.

Engines on L.M.S. freight services to be seen include ex-L.N.W.R. and standard 0–8–0 goods classes, an occasional standard 2–8–0 freight locomotive, and various 0–6–0s. S.R. engines include "W" Class 2–6–4 tanks, "C2x" 0–6–0s, ex-S.E.C.R. 0–6–0s and "K" and "U" 2–6–0s. Most G.W.R. trains are worked by 0–6–0 tanks.

Out-of-gauge loads occasionally traverse the West London lines. In September 1934 an awkward consignment of this type was worked to South Lambeth early one Sunday morning. This was a large generator casing for the Battersea Power Station that had reached Old Oak Common from Manchester on the previous Sunday. It started on the last stage of its journey South at 5.0 a.m. Lineside clearances were too close in some cases, and a certain amount of dismantling of signals, track slewing and so on was necessary.



More Record Flights

Miss Jean Batten, the well-known New Zealand airwoman, has flown from Australia to England in the record time of 5 days 18 hrs. 15 min., which is 14 hrs. 10 min. less than the time taken by Mr. J. Broadbent in May last. The 14,000-mile flight was made in her Percival "Vega Gull" with a D.H. "Gipsy Six" engine. It began at Port Darwin and from Damascus onward bad weather was encountered. When over the hills of Lebanon Miss Batten was forced to turn back to Damascus until conditions improved, and again when only 25 miles from Rome stormy conditions forced her to land at Naples. On reaching England Miss Batten landed first at Lympne, for Customs purposes, and later at Croydon, and at both airports was given a great welcome. This 26-year old airwoman also holds the records for the fastest flights between England and Australia and between England and New Zealand.

A new world long-distance flight record for flying boats was set up recently by French airmen in the giant six-engined flying boat *"Lieutenant de Vaisseau Paris."* The flight began at Port Lyautey, on the coast of French Morocco, and was continued across the South Atlantic to Maceio, 140 miles south of Pernambuco, Brazil, 3,612 miles being covered at an average speed of 103 m.p.h. M. Guillaumet, the pilot, had previously made 56 crossings of the South Atlantic for the Air France service.

The previous record distance flown was 3,280 miles, from San Cristobal, in Mexico, to San Francisco Bay, California, and was flown in October 1935 by an American twin-engined machine.

In Russia a semi-rigid airship, the U.S.S.R. V6, has accomplished a record duration flight of 130 hrs. without refuelling. During that time the airship flew a total of about 3,000 miles over a pre-arranged route. The previous best time was 119 hrs., and was set up by the German *"Graf Zeppelin"* during one of her flights across the South Atlantic.

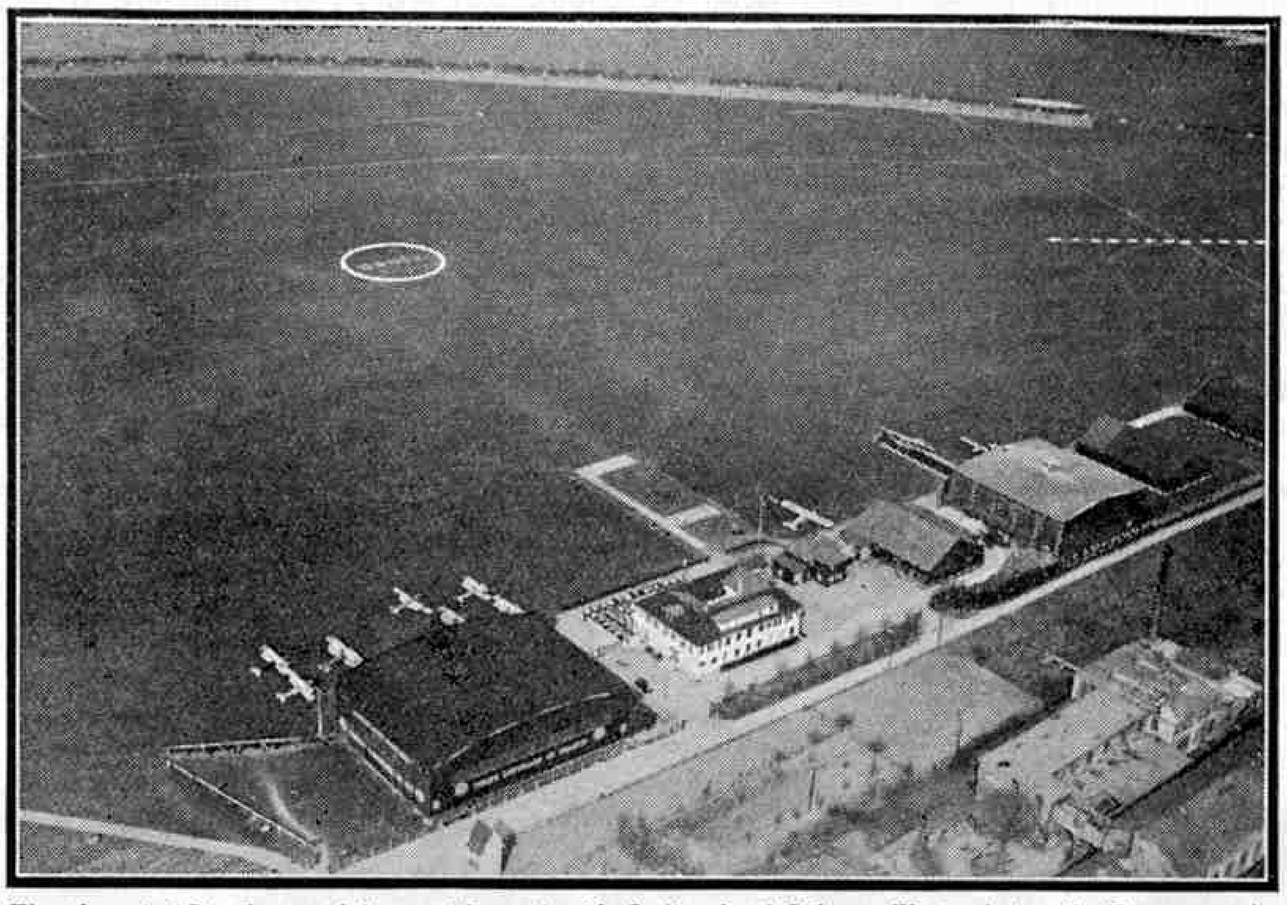
* * * *

The Khartum–Lagos, West Africa service of Elders Colonial Airways has been extended to Nigeria and Accra. The service is operated, under charter, for the company by Imperial Airways.

The Empire Flying Boats

Delivery of the 28 Empire flying boats under construction for Imperial Airways by Short Bros. (Rochester and Bedford) Ltd., is now nearly completed, and many of them are in service on sections of the Empire routes.

The registration letters and names of the first 14 of these aircraft were published in the *"Air News"* pages of the October 1936 *"M.M.,"* and we are now able to give those of the next 14. These are as follows: G-AETV *"Coriolanus"*; G-AETW *"Calpurnia"*; G-AETX *"Ceres"*; G-AETY *"Clio"*; G-AETZ *"Circe"*; G-AEUA *"Calypso"*; G-AEUB *"Camilla"*; G-AEUC *"Corinna"*; G-AEUD *"Cordelia"*; G-AEUE *"Cairngorm"*; G-AEUF *"Cotswold"*; G-AEUG *"Cheviot"*; G-AEUH *"Coolin"*; G-AEUI *"Calpe."*



The airport at Basel, one of the most important in Switzerland. It is a calling point on the European air routes of many air transport companies. Photograph by courtesy of Swissair.

Zeppelins to Cross Atlantic Next Year

It has been officially announced that the German Zeppelin passenger and mail service to the United States, which has been suspended since the *"Hindenburg"* disaster, will be resumed next year, when the two new airships now under construction are ready for service. The airships will employ helium instead of hydrogen. The huge hangar that is being erected for them at Frankfurt will not be completed until the spring of 1939. The airship LZ.130 will be the first to go into service.

The *"Graf Zeppelin"* is now on the retired list, and is to be used as a museum.

Bermuda-New York Flights Duplicated

The Bermuda–New York flying boat service opened this year and operated jointly by Imperial Airways and Pan-American Airways has been so popular that two trips in each direction weekly are now being made instead of one. The Empire flying boat *"Cavalier"* now takes off from New York on Mondays and Thursdays, and from Bermuda on Tuesdays and Saturdays; the Pan-American flying boat *"Bermuda Clipper"* takes off from New York on Wednesdays and Fridays, and returns on Thursdays and Sundays.

Lockheed Fleet for U.S. Air Services

Northwest Airlines, one of the leading American air transport companies, have bought a fleet of Lockheed "14" air liners for their 2,000-mile Chicago-Seattle route. The "14" is the latest Lockheed type. It is larger than the well-known "Electra," and is claimed to be the fastest aeroplane of its type in the world. It is fitted with two 850 h.p. Pratt and Whitney "Hornet" engines, and is capable of a top speed of 260 m.p.h.

This mid-wing air liner is built entirely of duralumin, and has the wide twin-rudder type of tail unit featured in the "Electra." It is 65ft. 6in. in span and 44 ft. in length, and the luxurious, sound-proofed passenger cabin has seating for 10 people.

Hunting Smugglers by Air

The Royal Canadian Mounted Police keep abreast of the times, and the latest development in that Force is the purchase of four D.H. "Dragonfly" biplanes. These twin-engined five-seater aircraft are being employed in spotting the boats of drug and liquor smugglers in the Gulf of St. Lawrence and the eastern coastal area. When the crew of a "Dragonfly" observe a smuggler they radio information as to its locality to high-speed surface craft, which then proceed direct to the spot.

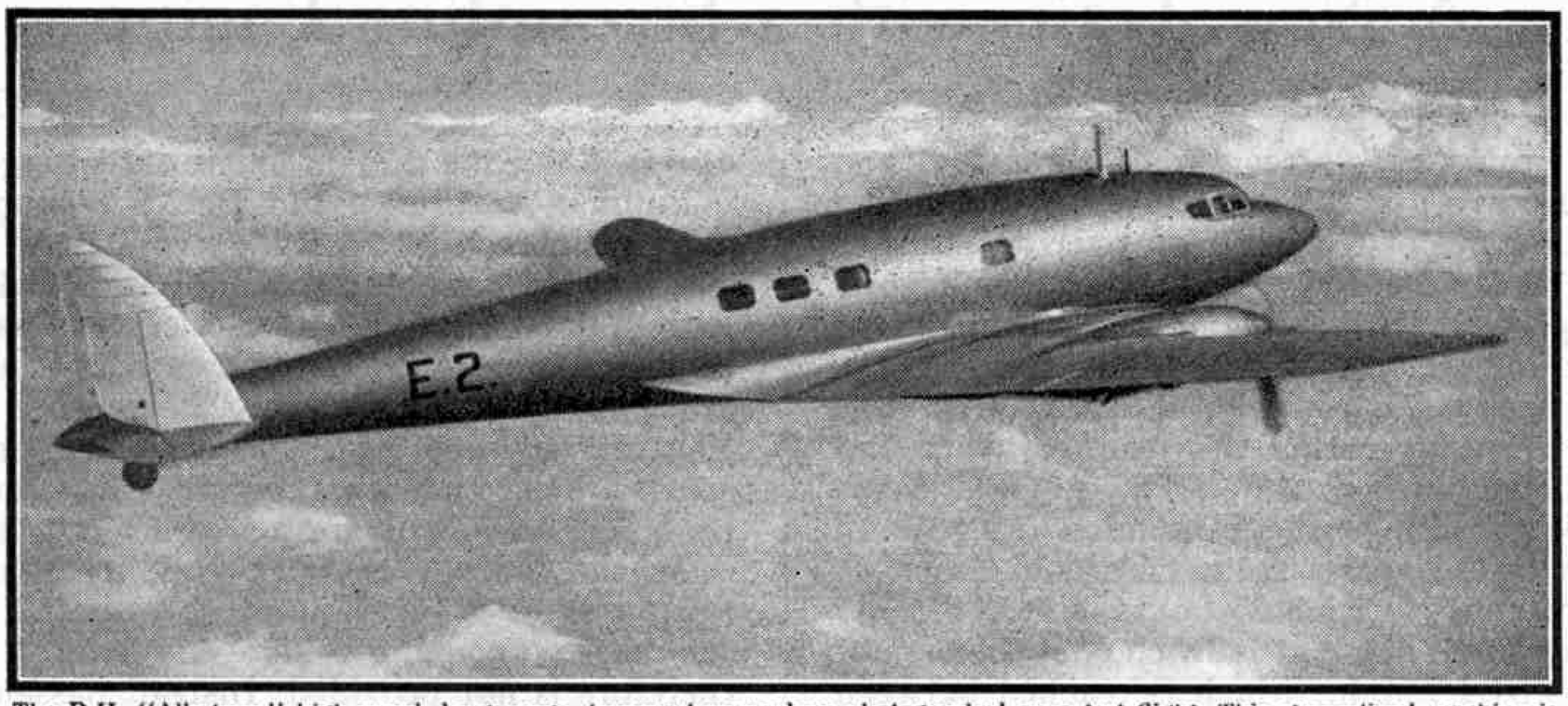
Australia's First Aircraft Factory

Both British and American types of aeroplane are to be produced in the works of the Commonwealth Aircraft Corporation Ltd., at Fishermen's Bend, Melbourne, Australia's first aircraft factory. The factory is now being equipped, and it is hoped to begin production in about six months.

Flight Tests of Bristol "Hercules" Engine

The new Bristol "Hercules" 14-cylinder, sleeve-valve engine develops well over 1,300 h.p. and is the most powerful British aero engine that has been officially approved. The flight trials of this engine were begun recently at the maker's aerodrome at Filton, Bristol. The new machines for which the "Hercules" is intended are not yet ready for flight, and therefore an existing aeroplane suitable for taking such great power from one engine has been adopted for engine flight test purposes. It is an all-metal, low wing, two-seater monoplane elaborately equipped with test observation instruments, and will enable the tremendous output of the "Hercules" to be used fully for tests of maximum speed and climb. Fuel economy will be tested by long periods of flying on fuel mixtures of different strengths, and the cooling characteristics of the engine will be investigated under all conditions of flight by means of temperature and air flow measuring apparatus. The complete programme of trials will occupy 200 flying hours.

The Bristol company's chief test pilot has already put the aeroplane through its preliminary flights, and has expressed great satisfaction with the performance and general running of the engine, which were noticeably smooth and silent.



The D.H. "Albatross" high-speed, long-range, transport monoplane photographed on a test flight. This streamlined machine is to be used for experimental flights across the Atlantic. Photograph by courtesy of "The Aeroplane."

Air Ministry Traffic Control Stations

Four important British airports are now provided with traffic control stations run by Air Ministry staffs specially trained for their work. These are Croydon, Heston, Barton (Manchester), and Portsmouth, where the station began operations as recently as 1st November last. Each of these airports is the centre of a radio communication area, and the air traffic control officer has to keep in touch with the pilots of all aircraft within it, and to keep them informed of the movements of other machines in the area. He also gives them meteorological information, and by means of direction-finding radio helps them to locate the aerodrome. If it becomes necessary for them to alter their altitude or course in doing so, he gives them the necessary instructions.

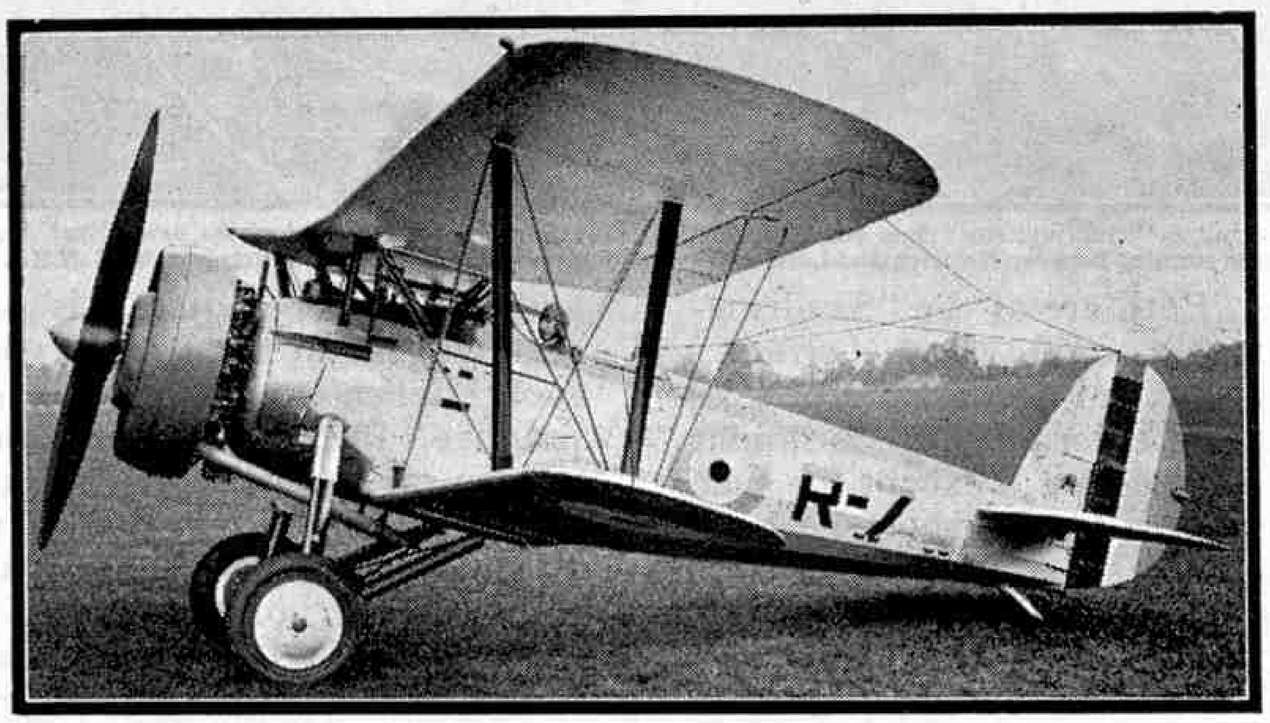
The control officer keeps in touch with outward-bound machines until they reach the boundary of his area, and he then transfers them to the care of the officer of the next communication area. Similar control stations are to be established at other airports.

German Survey Flight

A German survey flight in connection with a proposed new air route to the Far East was carried out recently. The aeroplane employed was a triple-engined Junkers Ju 52/3m., and the route followed was by way of Rhodes, Damascus, Baghdad, Teheran, and Kabul. This is about 1,200 miles shorter than the present route from Germany to the Far East. During the flight the aeroplane passed over the Pamir, a mountain range 24,000 ft. high in Central Asia that had never previously been crossed by air.

Pilotless Balloons Transmit Wireless Messages

An interesting type of pilotless sounding balloon, especially useful for obtaining meteorological data in connection with airways operation, is being employed in Germany. The balloon is designed to climb to a height of over 18 miles, and carries scientific instruments for recording temperature, altitude, and other details. These instruments are linked up with a self-operating radio transmitting device. Changes of temperature as the balloon climbs are signalled by the automatic wireless transmitter to a ground station, where they are "picked up" by a specially constructed receiver, and changes of height are indicated by a series of short, sharp signals. The results obtained by this method of high-altitude research are said to be very satisfactory.



The Bristol "Bulldog" Mk. IV single-seater fighter. This is one of the standard types of fighter aircraft used by the R.A.F., and is armed with two synchronised Vickers guns, one on either side of the open cockpit. Photograph by courtesy of The Bristol Aeroplane Co. Ltd.

R.A.F. Vacancies

The Air Ministry announce that there will be 400 vacancies in the R.A.F. in January next for Boy Entrants for training as photographers, wireless operators, and armourers. Boys between 15¾ years and 17¼ years will be eligible, provided they have had an education equivalent to that attained by boys who have attended secondary, junior technical, or similar schools. No previous experience is required, and applications must reach the Air Ministry not later than the 15th December. Full particulars as to pay, terms of service, etc., are given in Air Ministry Pamphlet, No. 54, a copy of which can be obtained free from the Inspector of Recruiting (Boys' Department), Royal Air Force, Victoria House, Kingsway, London, W.C.2.

Proposed British Service to South America

Regular air services to South America are operated by the French company Air France and the German company Deutsche Luft Hansa. A British firm, British Airways Ltd., is now proposing to seek a share of the growing traffic on this long-distance route by establishing a service between Portsmouth and Port Natal, Brazil. The trip would be made in three stages, consisting of a flight from Langstone Harbour, Portsmouth, to Lisbon, from there to Bathurst in British Gambia, and then across the ocean to Port Natal. It has not yet been decided whether flying boats or landplanes shall be employed, and it is probable that various types of available aircraft will be used while the company's pilots and radio operators gain practical experience of the route.

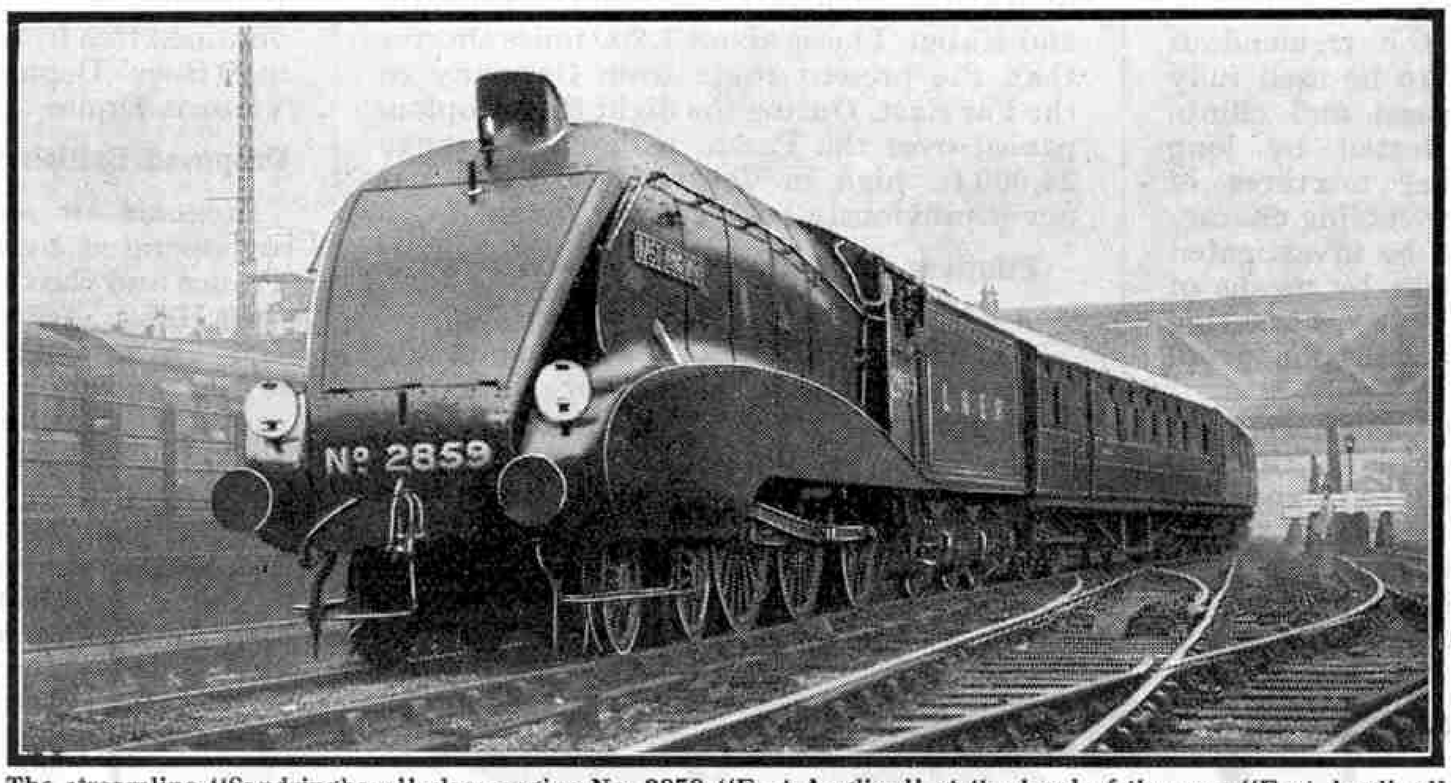
8,000-Mile Demonstration Flight

The proposed French experimental flights across the North Atlantic by the four-engined Farman "2231" built for the Air France-Transatlantique company are held up, as the Portuguese Government have not yet granted the necessary facilities for the machine to use the Azores as a stopping place on the way. In the meantime this huge Farman air liner is being employed on other tasks. It took part in the Istres-Damascus air race last summer, and plans have now been completed for it to carry out a demonstration flight from Paris to Buenos Aires, a distance of about 8,000 miles, in which the South Atlantic Ocean will be crossed. A stop will be made at Dakar, West Africa, and the aeroplane will then fly non-stop to Natal, Brazil, and then on to Buenos Aires.

The L.N.E.R. "*East Anglian*"

A New Train with a Streamline Engine

HIGH speed trains with streamline locomotives and rolling stock have become a familiar feature on the L.N.E.R. main line out of King's Cross, over which "*The Silver Jubilee*," "*Coronation*" and the "*West Riding Limited*" are operated. Now streamlining has made its appearance also on the former G.E.R. lines, where the "*East Anglian*," a new train hauled by a streamline engine, has been in operation between Norwich and London since the end of September. The up train leaves Norwich at 11.55 a.m. and arrives in London at 2.10 p.m., while the down train departs from Liverpool Street at 6.40 p.m. and reaches Norwich 2¼ hours later. The only stop in each direction is made at Ipswich, and the highest average speed is 54.4 m.p.h., which is reached between Norwich and Ipswich by both up and down trains. Owing to the difficult nature of the route over which the "*East Anglian*" travels it has not been possible to arrange high-speed timings approaching those of the famous streamline expresses of the main line from King's Cross.



The streamline "Sandringham" class engine No. 2859 "East Anglian" at the head of the new "East Anglian" train running between Norwich and London (Liverpool Street). Photograph by courtesy of the L.N.E.R.

The engines used on the "*East Anglian*" are the first 4–6–0s in this country to be streamlined. Up to now only two such engines have been provided. Both are of the "Sandringham" B17 class, one being No. 2859 "*East Anglian*," which is illustrated on this page, and the other No. 2870 "*City of London*." Their general external shape is similar to that of the streamline "A4 Pacifics," except for such differences as are made necessary by the shorter wheelbase of the "Sandringham" class, and the effect on the whole is very pleasing.

The train is made up of six coaches that have been specially constructed at York for this service. They are not streamlined, nor are they articulated, each vehicle forming a separate unit. Accommodation is provided for 198 passengers, 54 in the first class and 144 in the third. Unlike the practice on other L.N.E.R. "limited" trains, no supplementary fare is charged.

The coaches are of the open type and the formation of the train as it leaves Liverpool Street is brake-third, kitchen-first, open-first, open-third, kitchen-third and brake-third. The total length of the train, including the engine, is 439 ft. 9 in., and the empty weight 219 tons. The heaviest vehicle is the combined kitchen and first-class car, which weighs 44¾ tons. Standard 60-ft. steel underframes are used for the coaches, which measure 61 ft. 6 in. long over buffers and have a width of 9 ft. 3 in., the measurement extending over handles.

Pullman vestibules and Buckeye couplers are fitted, and each coach is carried on compound bolster bogies. The body framing and panelling is of teak in accordance with standard L.N.E.R. practice. The external finish is carried out in the well-known varnished teak of the Company, no special colour being used for this train. The coaches have wide corridors and ample circulating space at the ends that permit easy movement of the passengers when boarding or leaving the train.

As the journey between Norwich and London only takes just over two hours it is essential that the meals should be served quickly. A separate restaurant car therefore is not provided. Instead passengers take their meals at the seats in which they make their journey, a feature of other L.N.E.R. trains introduced this year. In order to make the service as speedy and convenient as possible two kitchens have been provided, one for third-class and the other for first-class passengers and, as usual on the L.N.E.R., each is equipped with electric cooking apparatus of the most modern type. The equipment in both is identical and the power required is obtained from axle-driven 10 kW generators, two of which are suspended under each kitchen car in accordance with standard L.N.E.R. practice. In addition batteries of large capacity are carried for use when the train is standing.

The interior decoration of the cars is very pleasing. Rexine of varying colours is used for the walls and for the doors in both first class and third class vehicles. Carpets are laid on the floor, and the seats are upholstered in moquette to tone with the general scheme of decoration.

In both first and third class portions of the train there are seats for two passengers on one side of the gangway and single seats on the other. The tables are provided with hinged flaps in order to facilitate movements into and out of the double seats. The table linen, glass, crockery and silver are of distinctive design in keeping with the special character of the train.

Electric lighting and steam heating are fitted throughout the train, and sliding shutter ventilators are provided above each of the large side windows. There are also torpedo ventilators of the usual pattern in the roof. Hot and cold water is available, steam heating being used for this in winter, while in the summer an electric heater supplied from the train-lighting dynamos is employed.

How Gramophone Needles are Made

Specialised Work on Automatic Lathes

By Donald W. Aldous

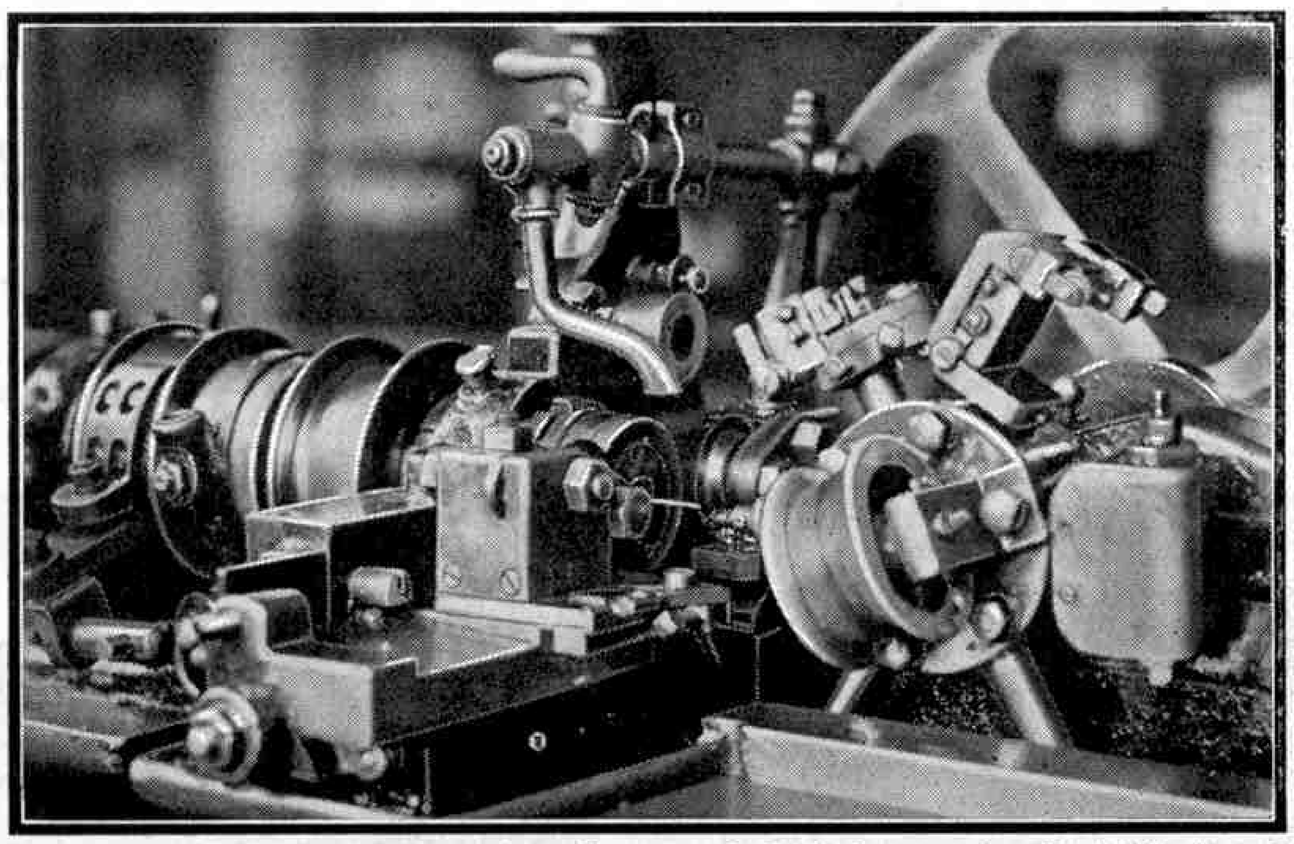
THE chief centre for the production of steel gramophone needles is Redditch, the home of sewing needle making. Their manufacture is skilled and specialised work, as will be appreciated when it is realised that in playing a 12-in. record a needle has to travel between 500 ft. and 740 ft., or over an eighth of a mile. This journey, moreover, is made along a tortuous track under a vertical pressure of from 12 to 20 tons per sq. in.

In the machine making the needles the first operation is to feed forward lengths of wire of the correct gauge for the type of needle to be produced, loud or soft, so that the point is ground conically between two specially shaped grinding wheels. The rough needle blank length is then cut off by means of a guillotine, and the wire is advanced the necessary distance for forming the next needle blank.

These needle blanks are tempered by heat treatment, an operation that is an important factor in ensuring efficiency. They are then collected in batches of about 20 lb., containing roughly about 60,000 needles; and each batch is placed in a strong canvas bag with a mixture of emery dust and oil. The bag is tied so that the needles can only just roll over each other, and is then placed under pressure between two heavy metal plates, which slide backward and forward over each other in order to reduce the bag and its contents to the shape of a roll.

The rubbing continues until the needle blanks become highly polished and the needle tip has the correct radius, a process that takes some hours. The needles are then removed and put into a new bag with a finer grade of emery powder, and this procedure is repeated until the final shape of needle point is obtained.

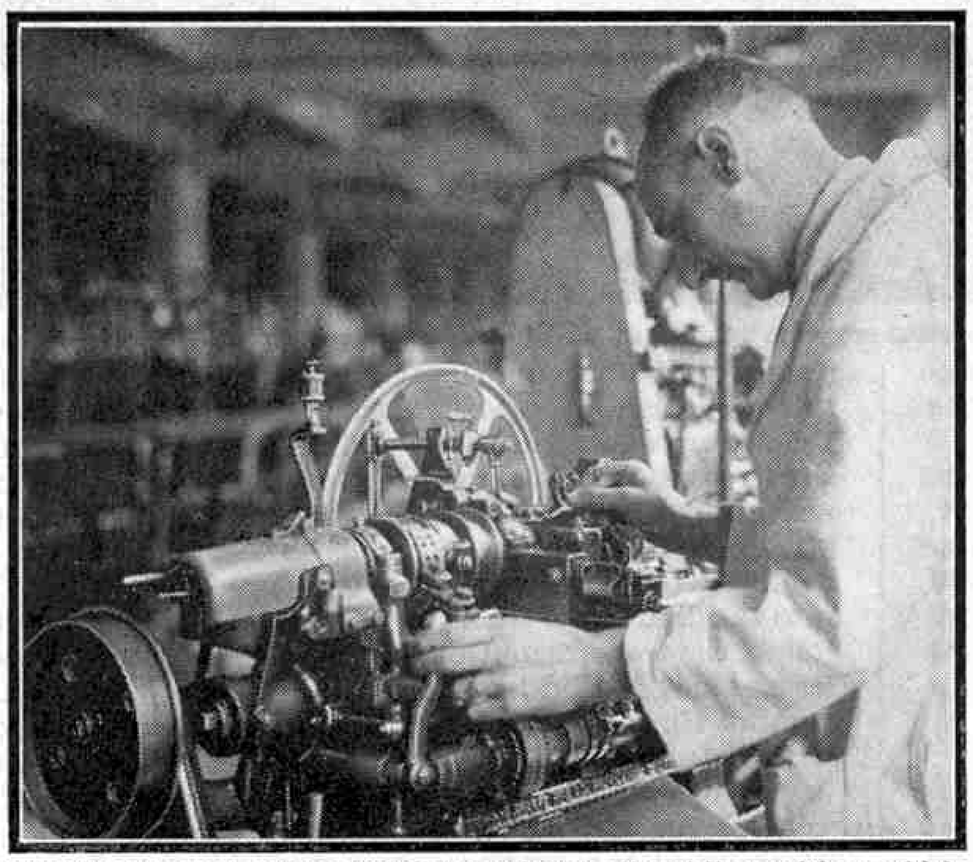
The variation of tone is effected by using different diameters of wire for the needle blanks, and also by grinding the tips to different cone angles. The effect is to vary the flexibility of the needle, or its "compliance," as this property is termed; and thus to change the balance of treble to bass in the reproduction.



The automatic lathe on which Tungstyle needles are made. In the foreground on the right is the reel carrying the tungsten wire of which the actual tip is formed. The illustrations to this article are reproduced by courtesy of The Gramophone Company Ltd.

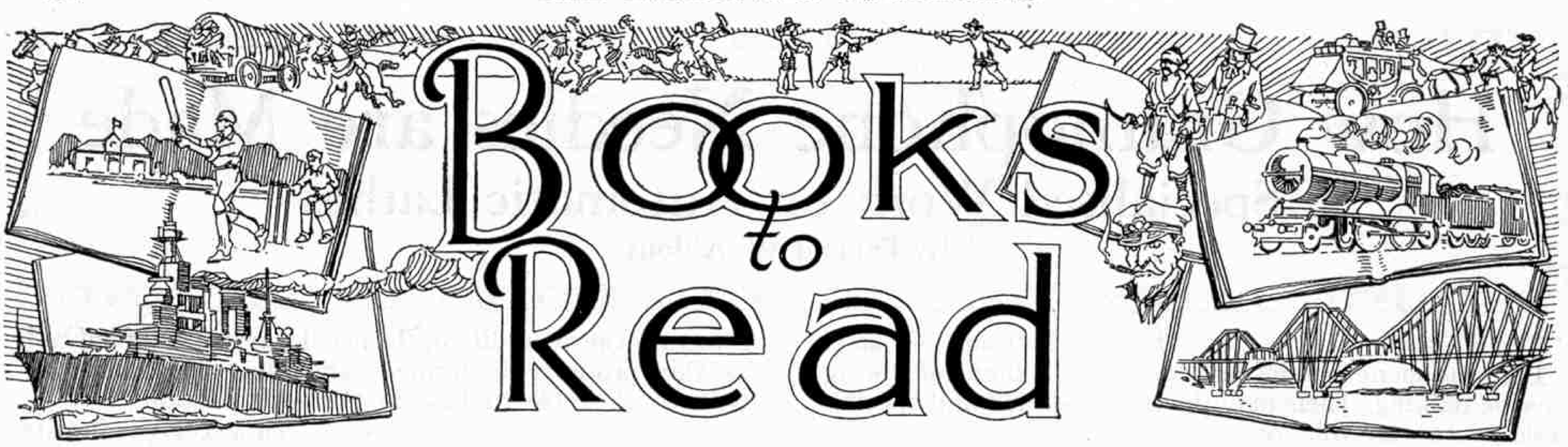
Tungstyle needles are produced on high-speed automatic lathes from coppered mild steel rod of 0.064 in. diameter, known as "stock," which forms the needle shank and is fed automatically into the machine from 15-ft. lengths. The actual point or tip is heat-treated tungsten alloy wire of 0.006 in. diameter, sliced off from a reel containing about 400 ft. of wire when full. This reel is mounted on the lathe in the position shown in the upper illustration on this page.

Operations are begun by chamfering the mild steel rod, and this is then slotted to receive the tungsten wire, which is fed in and swaged or fashioned to fix it in position before the wire is cut to the desired length. The playing tip is shaped by a diamond lap, a rotating cone, to an exact radius of 0.003 in. The pointed rod is now fed forward to the required needle length, and a recess turned for needles of soft or of loud-tone type. The dimensions of this recess determine the tone classification, and the operation is omitted entirely on extra-loud needles. Finally the shank end of the needle is bevelled, the needle being guillotined or cut off simultaneously in order to prepare the nose of the rod for the next needle.



This illustration shows on the left the end of the "stock" or rod from which the needles are made. The operator is removing a finished needle for inspection.

Not every needle made is examined, but sample batches undergo various tests, the principal one being optical examination by a powerful projection microscope for surface flaws, and to observe the accuracy of tip angles. The Tungstyle needles are cleaned prior to plating with nickel and gold. They are then loaded into specially prepared card packets that hold eight of them, and which contain slots for protecting their fine wire tips until the time comes when they are taken out for use in playing gramophone records.



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.

"Explorers Club Tales"

(Harrap. 10/6 net)

The members of the Explorers Club of New York are men who have adventured over mountain and desert, below the sea, to the Poles or into the upper regions of the atmosphere. All have had experiences that help to prove the truth of the old saying that "truth is stranger than fiction," and in this volume stories they have told have been collected together for the first time.

With the authors of these yarns we take part in the last wild buffalo hunt, watch Chinese revolutionary armies on the march, and travel through unknown Central America and among the wild islanders of Cape Horn. We read of witchcraft among the Zulus, of adventure in the Sahara, and of hairbreadth escapes from jaguars and pumas. The book indeed provides a feast of stories of daring and achievement, and short notes tell us something of the careers of the members of the Club responsible for the yarns.

We feel bound to protest, however, against the inclusion of the first article, which is not an explorer's yarn at all, but a deplorable and unjustifiable attack by Roald Amundsen on the explorer Stefansson.

There are 31 full page illustrations, most of which are reproductions of photographs taken by the authors on their travels.

"The Schoolboy's Annual"

(R.T.S. 3/6 net)

This volume contains a varied and attractive selection of school and adventure stories, the scenes of which are set in many different parts of the world. All are by writers well known to boys, and provide a feast of thrills. Along with them are general articles on skating, games and "stunts," a novel and amusing sack gymkhana, and the making of camping gear. There are four full-page plates, three of them in colour.

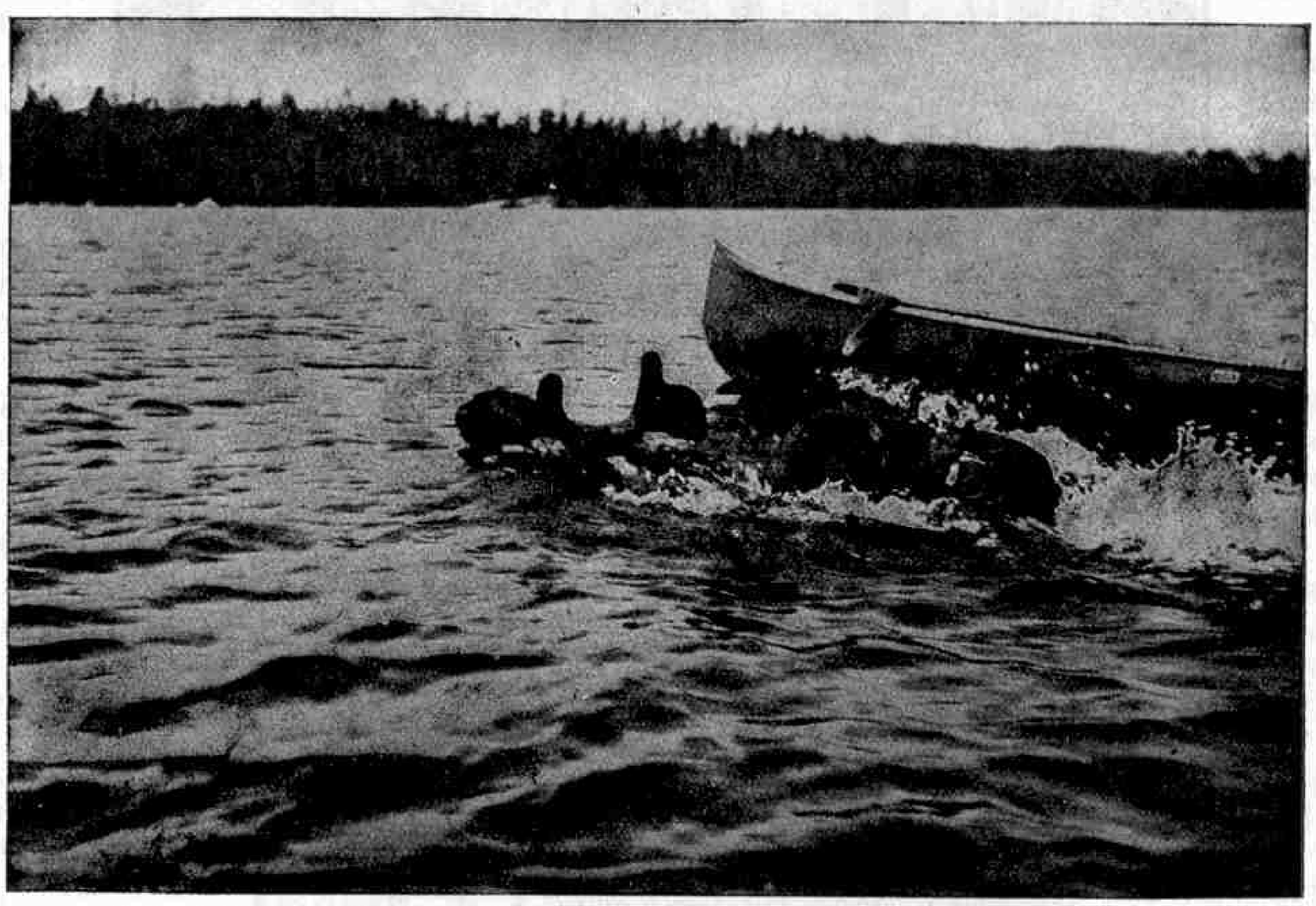
"The Romance of the Alphabet"

By Arthur B. Allen. (Warne. 3/6 net)

We learn our letters in early life and are so familiar with them that we are apt to take them for granted. Few of us realise what a wonderful thing our alphabet is. Its invention and gradual development is one of Man's greatest triumphs. Mr. Allen has set out to reveal something of the romance behind it, and has produced a book that will delight every reader.

The author begins his story with the rough drawings of the caveman artist, traced in dust or on soft earth or clay, with the finger or a splinter of wood or bone. He shows us how little by little drawings of animals, flowers and other things were given definite meanings, and so became symbols that in the end were simplified into the characters we know so well. We can follow the transformation step by step, each letter being traced from the early Egyptian symbol through its Phœnician, Hebrew or Greek forms to the Roman letter we use to-day. The details are given in convenient form, with an explanation of the meaning of the original character.

The mere development of the letters by no means exhausts the romance of the alphabet. Many interesting stories and legends are connected with it, and nearly half the book is concerned with them. There are also sections dealing with the craft of lettering and other associated topics. The book is well illustrated by drawings and diagrams.



Riding a swimming moose in a Canadian lake. From "Explorers Club Tales," reviewed on this page.

"Mixed Traffic"

By R. Barnard Way
(Nicholson and Watson Ltd. 6/-)

In the August 1936 *"M.M."* we reviewed Mr. Barnard Way's *"Famous British Trains,"* which was a chronicle of the daily work of named British expresses. The present book is a similar volume dealing with less spectacular, but equally important trains, and the varied activities that make up the everyday work of the railwayman. The author has met the men actually engaged on the job, in marshalling yards and signal cabins, on the footplate or in the brake van, in order to see exactly how things are done.

Locomotive footplate trips figure prominently in the book, the engines on which they were made ranging from an L.M.S. 4–6–2, at the head of *"The Royal Scot"* on its London to Carlisle non-stop run, to slower moving but equally interesting locomotives hauling milk and coal trains. The author also records cross-country journeys made with the guards of passenger and goods trains, and gives a fascinating account of the work done by the Travelling Post Office staff on the run of the *"West Coast Postal"* from Euston to Aberdeen. His interest is not confined to steam trains, for he describes vividly a run with the motorman on a non-stop electric train from Victoria to Brighton.

Goods traffic is deservedly given special attention in the book. We see how modern mechanised marshalling yards are run, and with the author we travel on the well-known "3.40 p.m. Scottish Braked Goods" from King's Cross to Glasgow, accompany express fish trains from Aberdeen to London and come "home with the milk" on a Southern train from the West Country. The work of the signalman also claims attention and there is a description of the building of a locomotive. The final chapter takes the form of a survey and friendly criticism of British locomotive design.

The book is vividly written and will provide readers with fascinating glimpses of many branches of railway working. It is well illustrated by means of 16 plates.

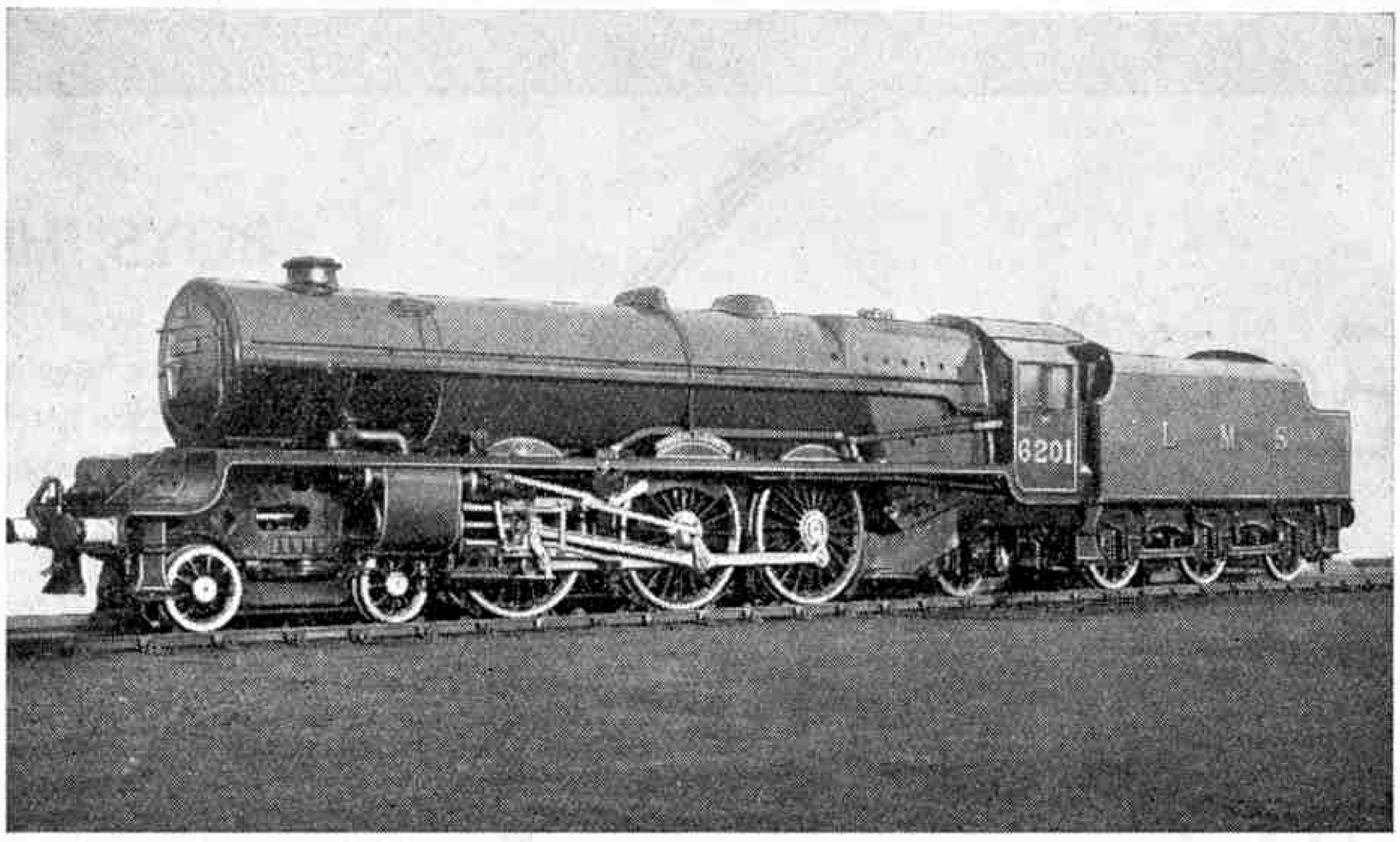
"Modern Locomotives of the L.M.S."

By D. S. BARRIE
(The Locomotive Publishing Co. Ltd. 1/- net)

So many new standard locomotives have appeared on the L.M.S. in recent years that there was need for a book giving illustrations and details of each class. This volume by Mr. Barrie fills the want admirably. It has been issued with the authority of the company, and the author's clear descriptions of the engines he knows so well will appeal strongly to the general reader, as well as the railway enthusiast.

Mr. Barrie begins with a brief account of the locomotive situation in the early days of grouping, when engines still retained the individual characters of the companies from which the L.M.S. was formed. He explains the first standardisation policy adopted under Sir Henry Fowler, and next turns to the standard engines introduced by Mr. W. A. Stanier. The splendid "Princesses" are the first. Why these powerful 4–6–2 locomotives were needed is fully explained, and we are given interesting details of them and of their achievements. The handsome "Jubilees," and other standard locomotives follow, and the climax is reached with an account of the streamlined 4–6–2s of the "Coronation" class specially developed for the high-speed London-Glasgow service of *"The Coronation Scot."*

The book concludes with a useful list of named L.M.S. locomotives of standard types, and this, with Mr. Barrie's masterly survey, will give his readers a clear idea of L.M.S. locomotive power during the past 14 years. There are 29 excellent illustrations of locomotives described, and on the cover is an attractive reproduction in colour of No. 6220 *"Coronation."*



L.M.S. 4-6-2 locomotive No. 6201 "Princess Elizabeth," which made the world's record run from London to Glasgow and back. From "Modern Locomotives of the L.M.S." reviewed on this page.

"The Boy's Own Annual"

(R.T.S. 10/6 net)

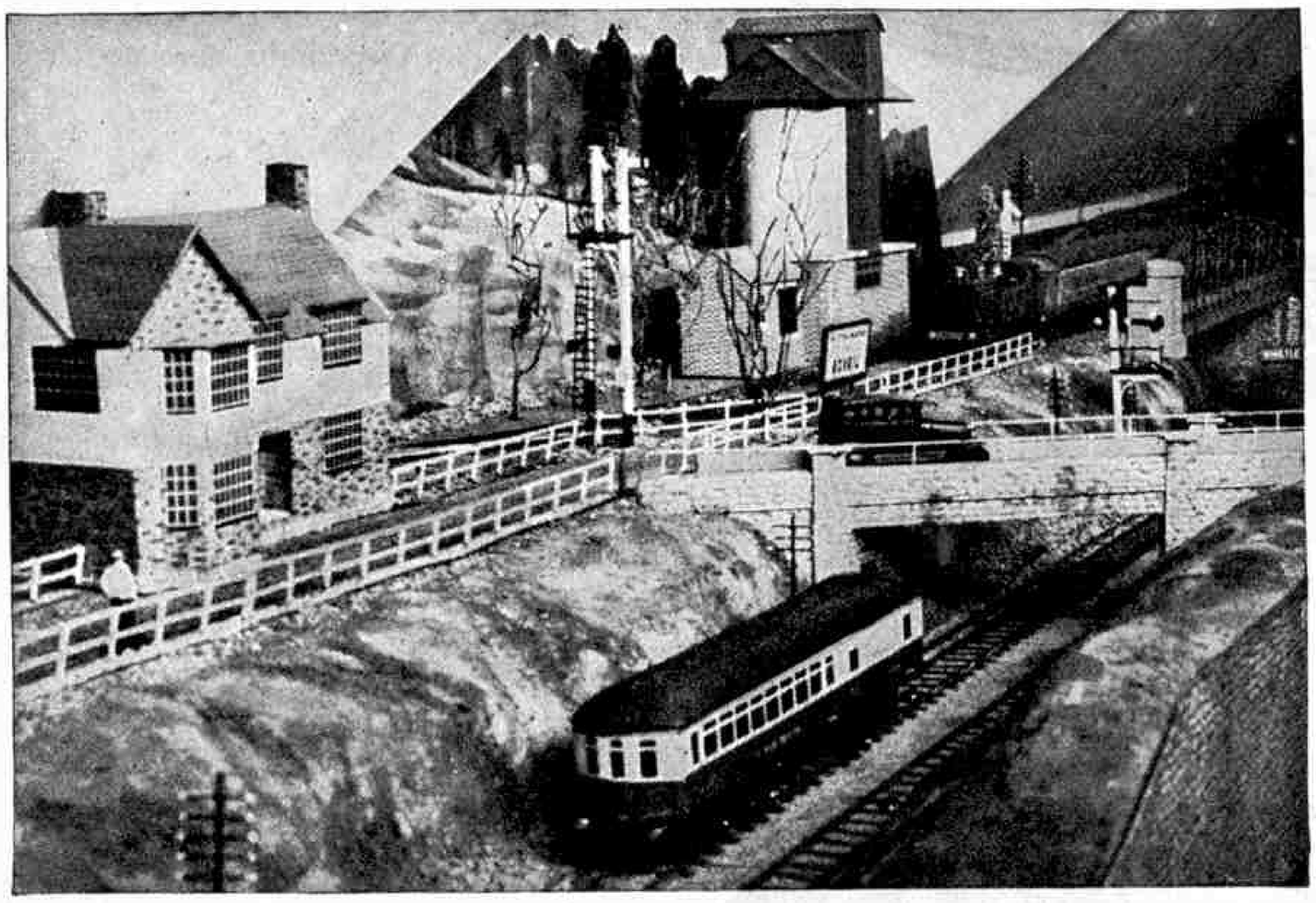
The 59th volume of the *"Boy's Own Annual"* is a worthy successor to its predecessors. As usual it contains a splendid selection of serials and short stories by well-known authors, and these are full of thrills and adventures. There is also a very wide range of general articles, notably on cricket, football and other sports, and on aeroplanes, locomotives, ships and similar topics in which the modern boy is particularly interested. Such hobbies as stamp collecting and wireless receive their usual attention, and useful articles of the "How to Make" type complete an excellent volume.

"Thanks to Claudius"

By JOHN F. LEEMING. (Harrap. 5/- net)

This book is the successor to Mr. Leeming's *"Claudius The Bee,"* which was reviewed in the *"M.M."* for November 1936. Again we meet Mr. Tawney, who was kind to a bumble bee and in return was given a drink that reduced his height to about half an inch, so that he was able to explore the world of bees and make friends with its inhabitants. This time he is called in to deal with two unpleasant grown-ups who eat blackberries on which some of the reducing mixture has accidentally been spilt. One of these involuntary visitors is a pompous chatterbox. She nearly wears out poor Claudius, the king of the bees, who nevertheless is greatly distressed when she is captured by the wasps. Tawney of course comes to the rescue, but all fears were needless, for the garrulous captive talks even the wasps almost to death, and drives them as dejected and spiritless captives to the bees' nest.

Those who liked *"Claudius The Bee"* will be equally delighted with its successor.



A cutting with a model "Sentinel-Cammell" steam railcar passing under an overbridge on the West Midland line built by the author of "The Craft of Modelling Railways," reviewed on this page.

"The Craft of Modelling Railways"

By EDWARD BEAL. (Nelson. 10/6)

Mr. Beal is a recognised authority on model railway matters, and in this book has produced what probably is the most complete guide to the craft of model railway building that has yet been written. In it indoor and outdoor railways of all gauges are dealt with, and all systems of model motive power are considered.

After an introductory chapter on the miniature railway hobby, the various scales adopted are discussed, and then follow chapters on layout planning, track laying and the provision of equipment for passenger and goods traffic. Locomotives, signalling systems, and electric control are given special attention, and there is an excellent chapter on correct operation by timetable, which the author lays down as the true aim in constructing a miniature railway system.

A particularly valuable section deals with scenic realism, and in this Mr. Beal is at his best. Miniature railway photography, model railway clubs, and the components available for model-builders are other topics into which the author goes very thoroughly. He ends with descriptions of the model railways of notable owners, and readers will revel in the details of the splendid layouts described.

"A Pictorial Atlas of the British Isles"

By H. ALNWICH
(Harrap. 5/- net)

This attractive book was written by a well-known geographer for his own children. The maps are brightly coloured and they and the text are provided with many amusing little pictures. In these we see cornfields and orchards, sheep and pigs, locomotives to indicate railway centres, and factory chimneys in industrial districts; so that readers easily gain a good idea of the people of the country and their ways of living. A simple but useful gazetteer also is included.

"Sports Problems"

By HYLTON CLEAVER
(Warne. 1/- net)

Mr. Cleaver has collected 150 problems on cricket, football, hockey, boxing and other sports. Those who think they know all there is to be known about the games dealt with will be surprised when they tackle the teasers that the author asks, many of which will lead to heated arguments. Full answers are supplied, to be consulted only after working out the solutions. The booklet will provide great fun for sports enthusiasts.

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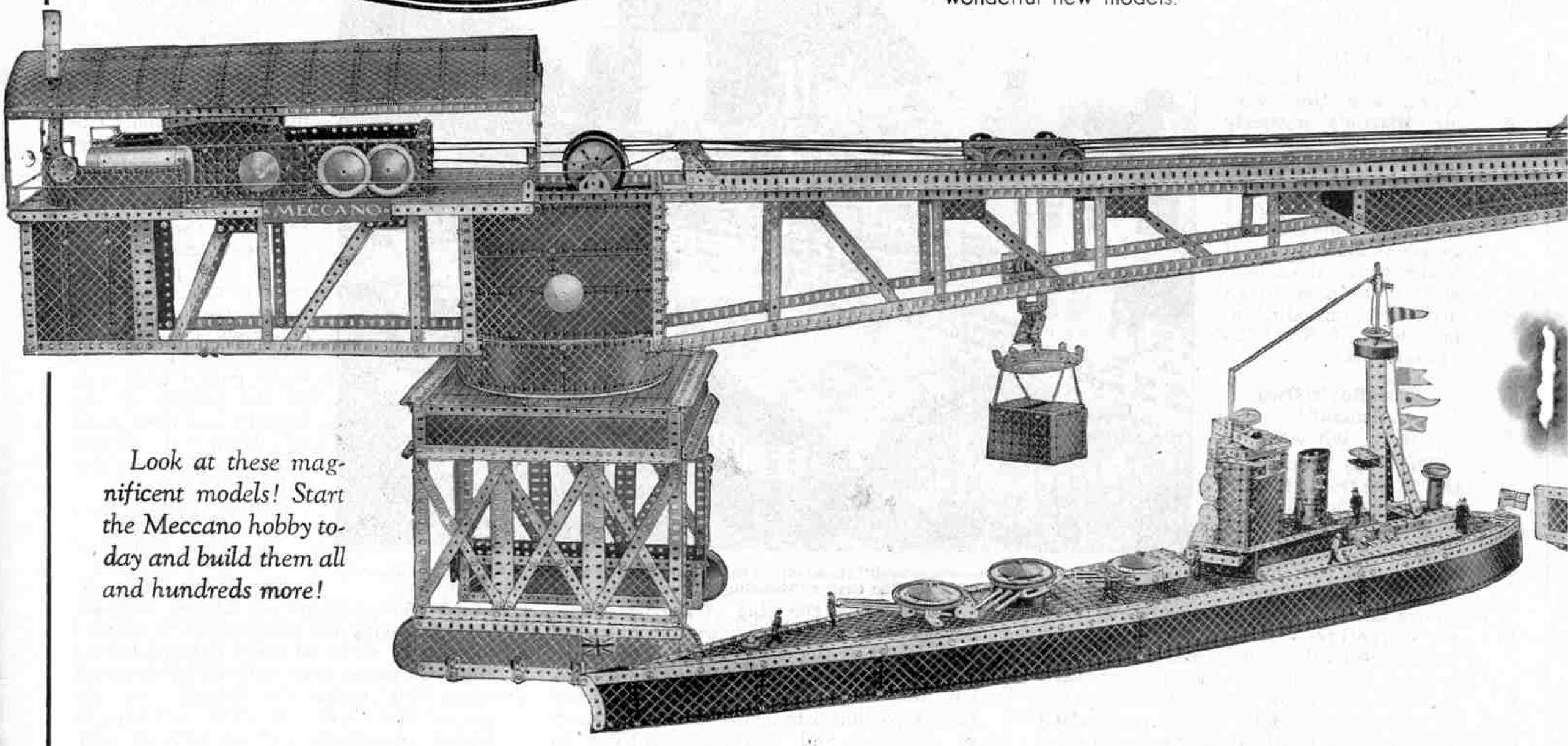

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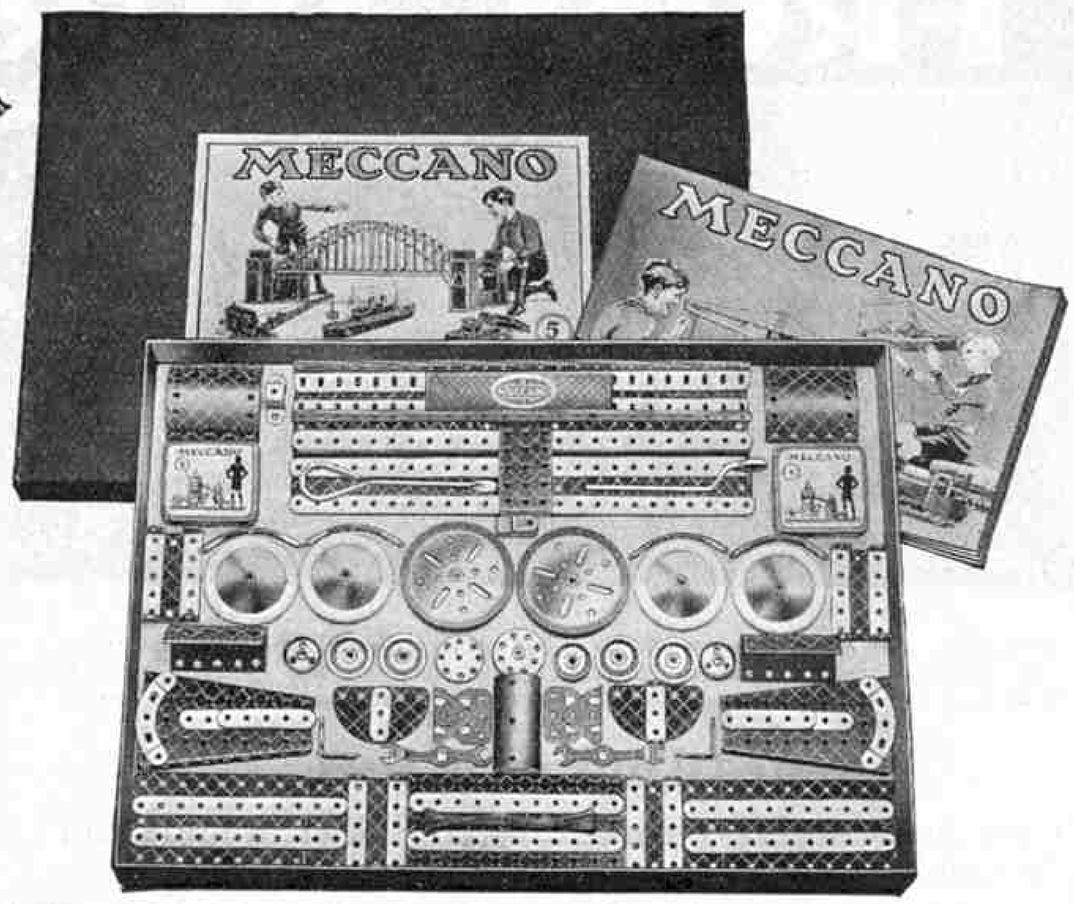
on in the Instruction Manuals show exactly dr er and a spanner, are also included in



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	s.	d.		s.	d.
No. 0 Outfit	2	6	No. 6 Outfit	20	0
No. 1 „	3	6	No. 7 „	30	0
No. 2 „	5	0	No. 8 „	55	0
No. 3 „	7	6	No. 9c „	80	0
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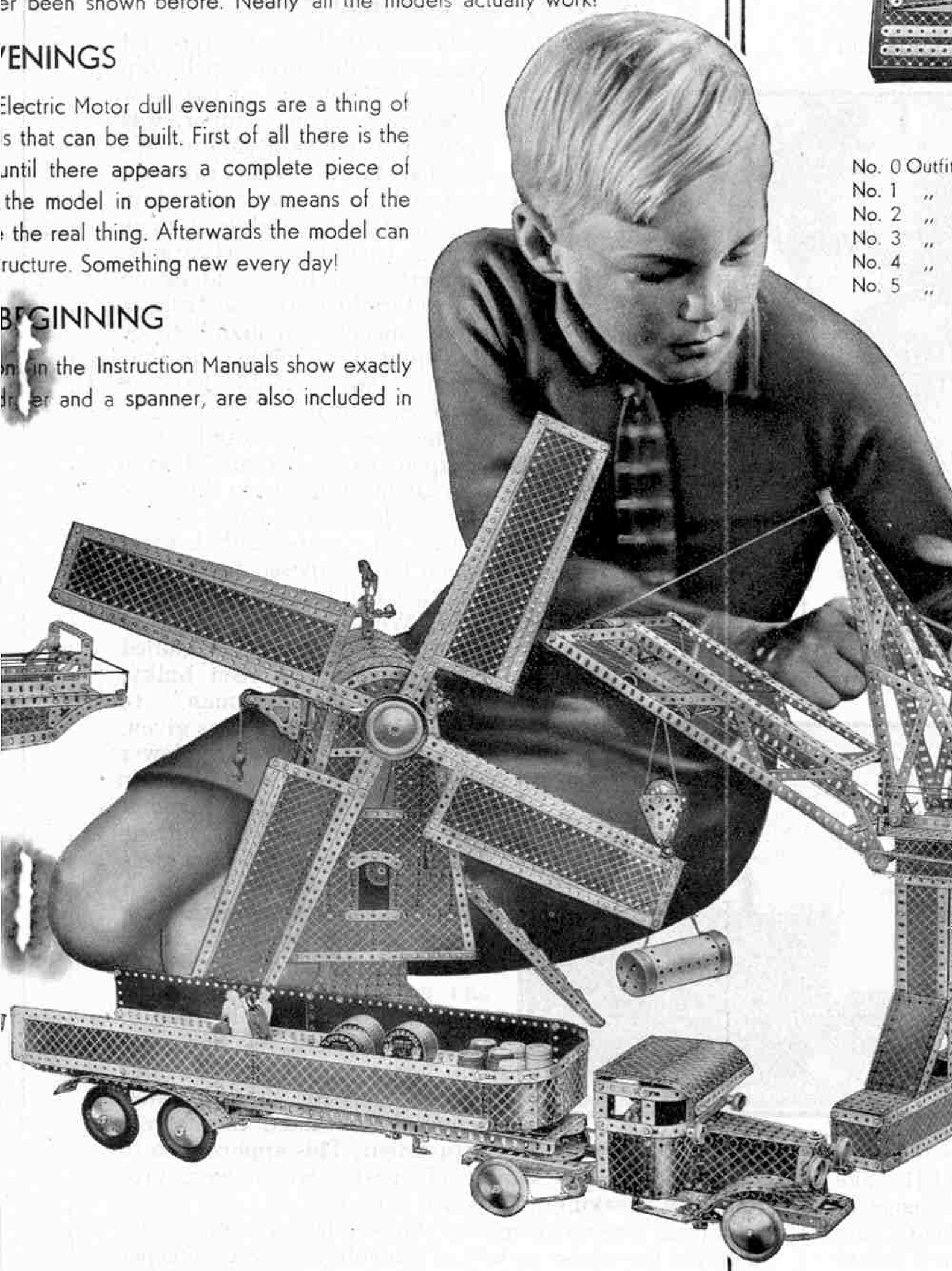


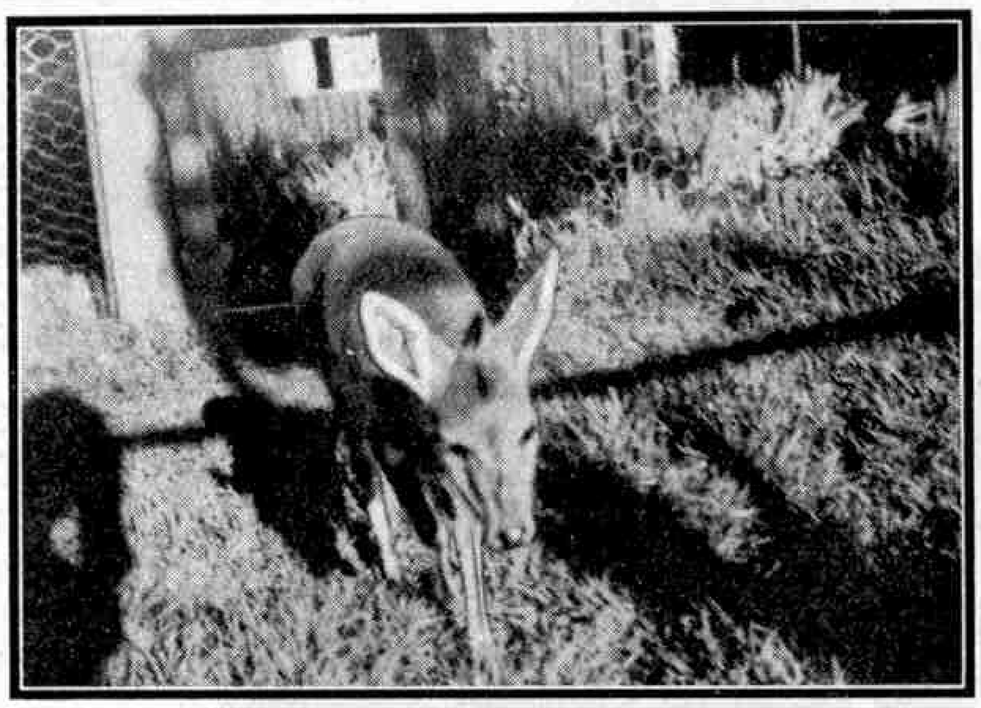
FROM OUR READERS

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.

Crested Duiker as Pets

At my home we have three crested duiker, a male and two females, which live in a large enclosure where they have plenty of room to run about. We reared a baby duiker on milk and water, and this is now the fattest of the three. We feed our pets on crushed maize, alternated with green foods.

One day the male duiker bit a hole in the wire and escaped. He was missing for several days, and every night we left the main gate open in case he should come back. On the sixth night, as we were going to bed, we shone a torch outside, and there was the truant, lying quite contentedly in front of the house.



One of three crested duiker that are kept as pets by our reader Miss June Lavender, at her home at Nakuru, Kenya.

I do not think he will attempt to get out again, for I feel sure that he enjoys captivity better than freedom. What adventures befell him during his short "French leave" I do not know, but I think he learned a sharp lesson. The wild duiker have a very hard life, for they are hunted by natives, who kill and eat them.

The crested duiker lives in Africa's vast forests and grasslands. The male animal is a typical buck, with short horns, but the female has no horns, its distinguishing feature being the black line down the centre of its forehead, from which its name is derived.

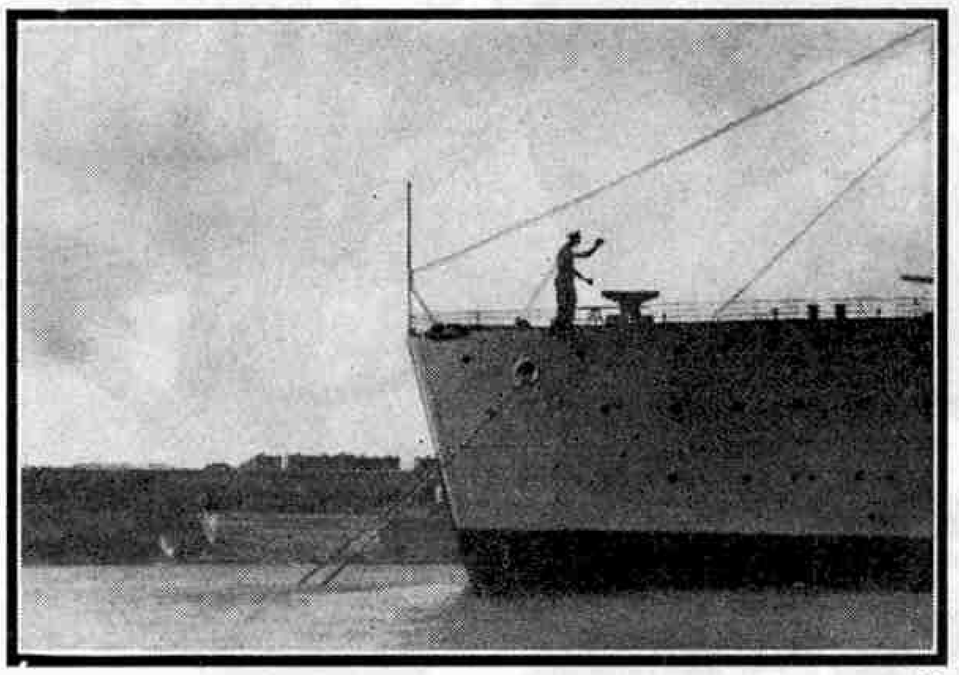
Although the duiker has very thin legs, it can move remarkably quickly in and out the trees and over the course wild grass, and in its speckled brownish coat it is almost invisible in its natural surroundings, for the grass is browned by the heat of the Sun during most months of the year. It does not whistle like other buck, but bleats like a sheep, and its sense of hearing is so keen that it pricks up its delicate ears at the slightest sound. It relies upon this keen sense of hearing, and upon its fleetness for its safety.

MISS JUNE LAVENDER (Nakuru, Kenya).

A Novel Mechanical Man

At the time of the Coronation of King George and Queen Elizabeth the repair ship H.M.S. *"Resource,"* of the crew of which I am a member, was lying in harbour at Malta. We decided that the Navy, as represented by our particular ship, should stage a display of some kind as part of the celebrations, and after careful consideration we determined to construct a large "mechanical man," to be floodlighted at night, so that those ashore would have a good view of it.

The torso, limbs and other components of our model were quickly fashioned from three-ply wood. These parts could not be made of more substantial materials, for then they would have imposed too great a strain on the mechanism, yet they had to be strong enough to withstand chance storms, We also had to keep in mind that spectators ashore would not have gained a clear-cut impression if the figure had been bulky.



A "mechanical man" erected in the bows of the naval repair ship "Resource" during Coronation celebrations at Malta. Photograph by John Lewi.

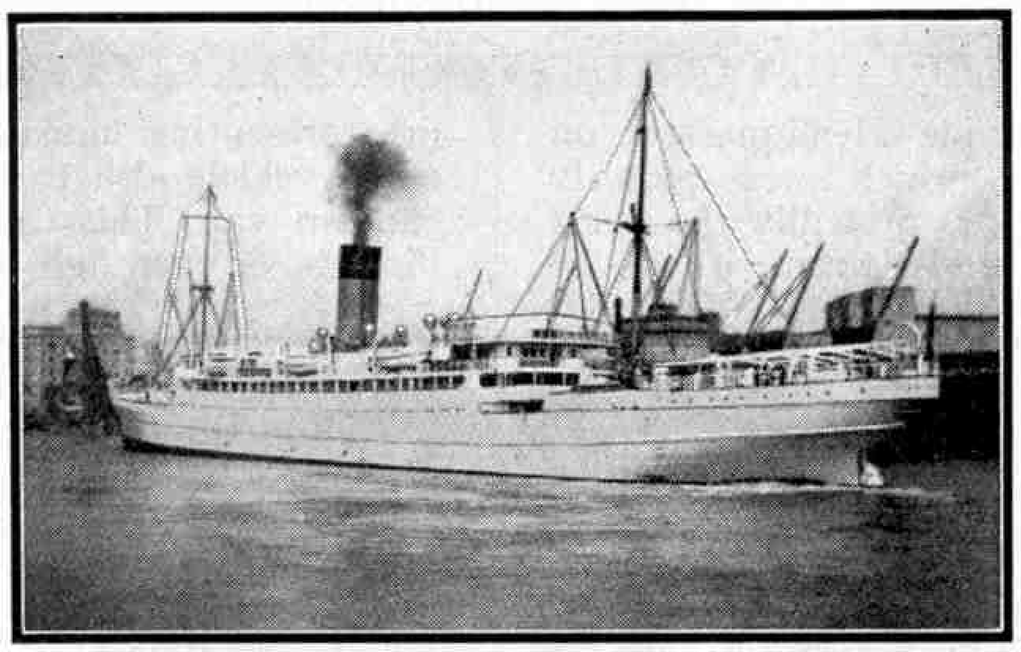
Our "mechanical man," to whom the name Eric was given, is shown in position in the lower illustration on this page. When in operation he raised a hammer and then dropped it, hitting what was supposed to be a piece of iron held on an anvil. A shower of sparks at each blow added realism to his actions. Electric motors drove his works, and gearing was rigged up to make sure that the blow fell at the right moment. We had some fun arranging this, for our "giant" missed several times before we obtained the correct adjustment. This applied also to the timing of the shower of sparks, which were produced by breaking an electric contact.

Canvas screens over the ship's guardrail effectively sheltered the works, as well as the voluntary watchkeeper of our 10-ft. robot. The effect produced was so good that much attention was attracted ashore. JOHN LEWIS.

Unloading Bananas by Conveyor

I recently spent a short holiday at Avonmouth, about seven miles from Bristol. This is an ideal centre from which to visit the beauty spots of the West Country, but I was chiefly interested in the Docks, which together with those at Portishead and Bristol itself, are under the control of the Port of Bristol Authority. There the ships themselves were fascinating, and I never tired of watching the electric cranes, conveyors and floating pneumatic grain elevators that dealt with their cargoes.

The banana ships probably are the most interesting of any that visit Avonmouth. There is a regular fleet of them, running between the port and the West Indies and Bermuda, the round trip taking some 32 days. The illustration on this page shows the *"Carare,"* a typical banana carrier, being towed to a special berth for unloading. This vessel is about 425 ft. in length, and has a gross tonnage of nearly 6,700.



The banana-carrying vessel "Carare" being towed to a berth at Avonmouth to be unloaded by means of conveyors. Photograph by R. Bleach, Tunbridge.

I was an interested witness of the unloading of the *"Carare."* The conveyor equipment used is fairly simple and very efficient, enabling the fruit to be brought out of every hold quickly and easily. The bananas are carried in canvas slings, each of which is large enough to hold a bunch, and in these are lifted vertically out of the holds and carried horizontally over the dockside, where they are dropped on a swiftly moving conveyor. Finally they are picked up by dock workers and passed by hand into railway vans standing on tracks laid parallel with the conveyor.

G. R. Bleach (Tunbridge Wells).

A Day in Middelburg

During a holiday in Holland, recently I went to Middelburg, the picturesque capital of the provinces of Zealand. My visit coincided with the local market day, and on reaching the main square, next to the Gothic Stadhuis, built in the early 16th century, I found that it had been transformed into a large open air market. There were many stalls displaying a wide assortment of goods, which could be bought with either English or French money.

Additional colour was provided by Dutch girls wearing national costume, who were quite eager to be photographed. Immediately I had taken the photograph shown in the lower illustration on this page, the girls seen in it came up to me and pronounced the one English word they knew—"money!" I was about to give them a few cents when a policeman came along and prevented me from doing so, at the same time ordering the girls to move on.

I finished an enjoyable day by visiting the old abbey of St. Nicholas, which was founded in 1106, and contains several beautiful tapestries.

A. Cunningham (Paisley).

Two girls of Middelburg wearing typical Zealand costume. Photograph by A. Cunningham, Paisley.

A Visit to a Norwegian Glacier

During a recent cruise to Norway and Denmark I was a member of a party that visited the world's longest fjord. This is the Sogne Fjord, and we reached it after a very rough day and night at sea. It extends inland 133 miles from the coast and varies in width from two to five miles. In parts its waters are more than three-quarters of a mile deep, and at its head is Norway's largest chain of mountains, the Jortunheimen.

We found our journey along the Fjord full of interest, the steep sides rising above us on each side, with an occasional flat piece of land, where some peasant had tried to earn a living by cultivating a small patch of ground, brightening up the landscape. We turned up a small branch of the Fjord and an amazing sight met our eyes, for away in the distance was the Boya Glacier, one of the largest in Europe. An hour or two later we dropped anchor near the pretty little village of Fjaerland.

The following day we visited the Glacier. After a hot seven-mile walk along a road, which was hardly more than a mountain track, we cut through farms and woods rising to a height of only 300 ft. above sea level, and at last arrived at the Glacier. We were fully compensated for our long walk by the magnificent spectacle. The Glacier itself is half-a-mile wide with a 30 ft. "snout" at the bottom. Its ridge is 4,000 ft. high, with a mountain peak of 5,000 ft. on either side, and we heard the ice cracking and saw avalanches of it sweeping down the Glacier side.

J. P. Stott (Hull).

Saving a Cargo of Iron

Some time ago the 400-ton cargo boat *"Heatherfield"* went ashore at Robin Hood's Bay, Yorkshire, in a heavy gale. The winter gales made attempts to refloat the vessel impossible, and by the time conditions were suitable she was too far gone to be refloated. Instead, it was decided to recover her cargo of pig iron, and the salvage boat *"Harvest Queen,"* of Newcastle, was commissioned for this purpose. She was only able to moor alongside for three or four hours each day at high tide, and I watched operations from the top of a 300-ft. cliff.

The derricks on the *"Harvest Queen"* supported a circular electro-magnet about a yard in diameter. This was lowered into the hold of the *"Heatherfield"* with a resounding splash, to return about two minutes later laden with an assortment of pig iron. The magnet was then moved over the hold of the *"Harvest Queen,"* into which the iron dropped with a terrific clatter. It took about three minutes to deal with a load.

H. Drabble (Mosborough).

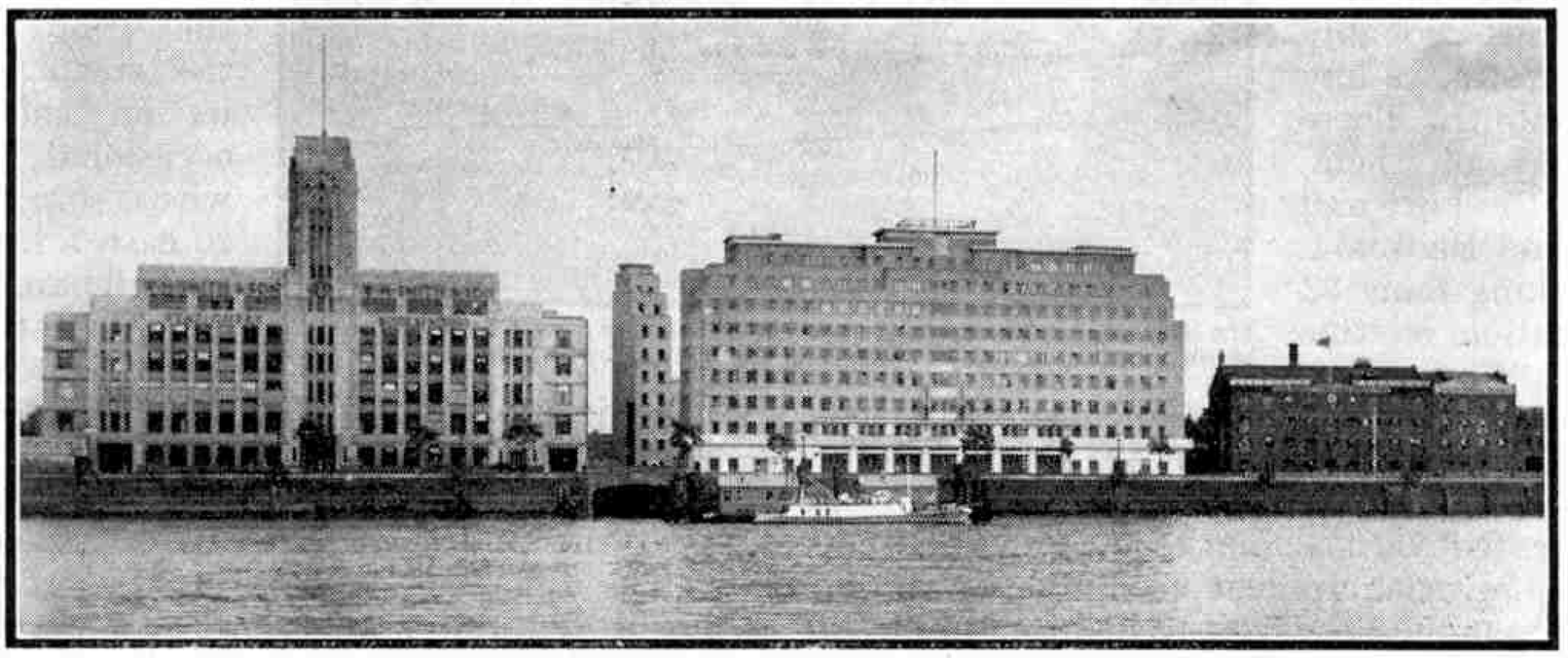
London's New Fire Brigade Headquarters

How Alarm Calls are Received and Answered

By T. R. Robinson

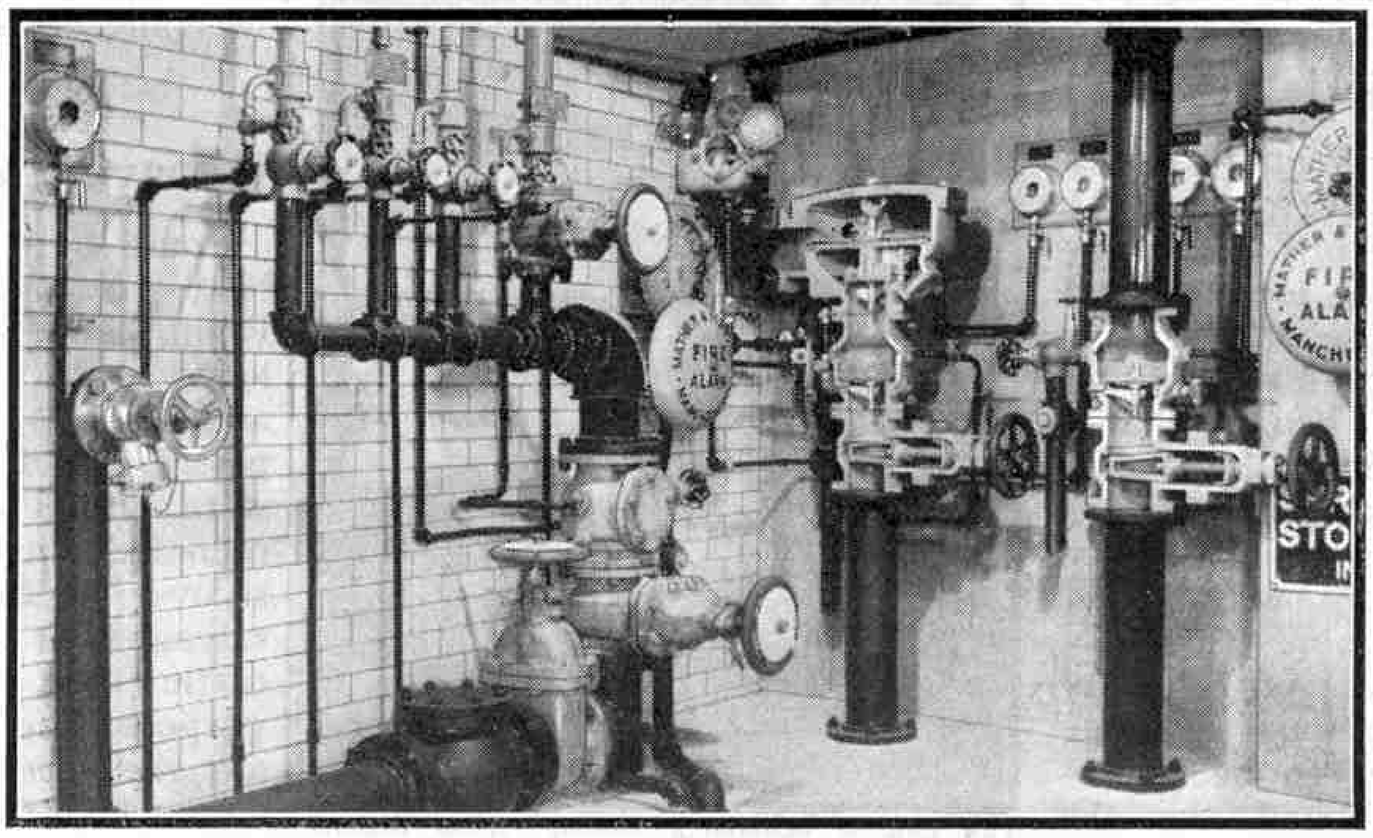
THE new London Fire Brigade Headquarters on the Thames Embankment, which was recently opened by the King and Queen, is probably the finest building of its kind in existence. In future it will be the chief fire station and central control of London's fire fighting equipment, replacing the former headquarters at Southwark which had become obsolete.

The growth of London, and the increasing height and size of the buildings in it, have made it necessary to maintain a steady increase in the efficiency and equipment of the Fire Brigade in order to give the required margin of safety in the control of outbreaks. The present headquarters are designed to house the very latest appliances and to co-ordinate the work of the brigade in the most effective manner through centralised control.



A view from the river of the new Headquarters of the London Fire Brigade on the Thames Embankment. The illustrations to this article are reproduced by courtesy of the Chief Officer, London Fire Brigade.

The new buildings are of very modern appearance, and the main structure has nine storeys and a large basement. The ground floor is occupied mainly by the Appliance Room, in which are kept the fire-fighting pumps, escapes, and similar vehicles. The room is 105 ft. long and 43 ft. wide, and has seven "run-outs," so that all vehicles can leave as rapidly as possible. Special pits and lifts are fitted in the floor of the room in order that repairs and adjustments can be made to the engines in a minimum of time.



The Spr'nkler Room, in which various forms of sprinklers and other fire-fighting fittings are installed for use in instructing the members of the Fire Brigade.

In addition to the usual engines and escapes, the appliances in the room include a breakdown lorry, which has an 8-ton crane, and a complete set of smaller lifting tackle. There is also an emergency tender, carrying more lifting gear, oxygen cylinders, respirators, acetylene flame cutters, and other special equipment for use in fires presenting unusual difficulties. Another somewhat novel vehicle also to be seen in this room is a mobile canteen van. This can be used to supply tea, coffee, biscuits, or even light meals to firemen who are kept on duty for long periods by big fires.

Alongside the Appliance Room is the Watch Room, containing the fire alarm cabinet, to which are connected all street fire alarms in the Headquarters area. Each alarm sends its own special code pulses of current when it is operated. These perforate a paper band on a tape machine in the Watch Room, and by this means the call is recorded and displayed on illuminated panels on the alarm cabinet and in the Appliance Room. Meters and other instruments for locating faults on alarm circuits, and giving visual indications of them, also are fitted to the panel.

Other rooms on the ground floor include a gymnasium for the firemen, a first-aid room, and a store for carbide. In addition there is a most interesting museum containing models of various types of fire-engines and similar appliances, together with bent and battered helmets that tell stories of heroic rescues and great fires, and other exhibits showing how various types of buildings and fittings can either check the flames or actually help them to spread. This museum is open to the public.

The higher floors of the main building are used for offices for Fire Brigade administration, and as residential quarters for officers and men. On the first floor there is also the very important Control Room, one of the most interesting places in the building. In it is a large switchboard with three banks of telephone lines, and every call made in the London area is received and recorded in this room.

A large map on the wall shows the position of every fire station, and variously shaped and coloured symbols, plugged into holes in the map at the points where the stations appear, indicate the equipment available at each point. When engines leave any station in response to a call, the corresponding symbols are removed from the map. If the fire is serious enough to call for a large number of engines from a district, others are moved up from stations farther afield to replace them. By this means continuous protection of all areas is maintained, and the position at any moment is fully recorded on the map.

Still another map in the Control Room covers the area around London, and shows the stations and equipments of other brigades outside the London County boundary with which the London Brigade co-operates if need arises. The symbol system is used for this map as well.

At work in the Watch Room, to which all street fire alarms in the area are connected. Every call is automatically recorded by tape machines and displayed on illuminated panels.

An interesting point is that the lighting of the control room is provided by a separate 50-volt circuit, and thus the failure of the supply mains cannot hinder work at some critical time. There is a special battery room for supplying current for the alarms and other circuits, and this also is on the first floor.

Code indicators, operated from the Control Room, are installed at various points in the building. These give indications of the apparatus that is detailed to go to a fire, and of the officers required to attend, by displaying illuminated letters and figures.

Behind the main building is a large Drill Yard 230 ft. long and 110 ft. wide, and overlooking this, on the rear of the main building, are balconies from which members of the public can watch the periodical displays and demonstrations given by the Brigade. There is a commentator's booth equipped with a microphone and amplifiers at one point, and loud speakers are installed throughout the drill yard. Powerful floodlights also are fitted to assist in night operations.

On the side of the yard opposite the main building is a Drill Tower, rising in nine stages, with staircases to each floor, and a shaft inside the tower in which to suspend lengths of fire hose for drying. Up to 130 lengths of hose can be dealt with in the tower, and an electric hoist is fitted to lift them. A hot air plant and fans are used to assist in the drying.

The main purpose of the tower is for practice and in connection with the displays, and it contains a "dry rising fire main" installation for drill purposes. This is a main that extends to the various floors, but normally contains no water, and in the event of a fire, the brigade can pump water through it direct to the various floors of a building without the necessity of taking their own hoses up to the various levels. Many such mains are being built into modern buildings, and the installation in the tower is for instruction work. Adjoining the tower is a plant by which hoses laid out in the yard can be tested to various pressures.

In the basement are several chambers fitted with various types of sprinklers and other anti-fire fittings, so that men can be trained in working with these under actual fire conditions. A "Smoke Room" also is provided in the basement, and in this respirator drill can be carried out.

In front of the building, on the opposite side of the Albert Embankment, is a Fire Float Station that replaces the old Battersea Bridge float station. It is equipped with a fast fire float, and is in effect a separate station.

Another view of the new Headquarters of the London Fire Brigade, showing the seven "run-outs" for engines, escapes and other appliances called out to fires.

An interesting and very novel installation at the Headquarters consists of a set of three-aspect traffic signals of the usual colour-light type. These can be operated from the control inside the building, and they enable traffic along the Embankment to be stopped when an alarm is received in order to give a clear road for the engines. When the call has been dealt with and the appliances have left, the lights are put out of operation. These are believed to be the first traffic signals that have been put to this use, at any rate in this country.

At the far end of the drill yard is another building that provides garage accommodation and workshops, and also houses a training school and further residential quarters. The general form of this second building is like another fire station, with run-outs, equipment and appliances that enable training to be carried out in conditions similar to those of actual service.

Wool Cleaned by Freezing

Before raw wool can be woven into blankets, cloth and other materials it must be thoroughly cleaned and all dirt, grease and impurities removed. The method of doing this has remained unchanged in essentials for several centuries. The wool is first picked by hand to remove burrs, thistles and vegetable matter, and is then washed, dried and combed out into long fine strands.

Recently a new method of cleaning has been introduced in America that is said to be cheaper and speedier, and to give better results. The wool is passed on conveyors through a large ice box, 40 ft. long, 12 ft. wide and 12 ft. high, the walls and ceiling of which are made of cork 9 in. thick. The temperature in the box is kept at approximately 50 deg. F. below freezing point, and the dirt and grease can then be beaten or shaken off easily. The entire process only takes a few minutes, and about 1,500 lb. of wool can be cleaned in an hour. The cost is very small, working out at roughly ¼d. a lb., and it is claimed that wool treated in this manner is stronger and whiter than that cleaned by the old method.

Sunshine All Day

A most ingenious method of lighting has been adopted by the Imperial Tobacco Company at their head office in Bristol. There is a brick wall only a few yards away from the windows of the Board Room, which was dark and gloomy even on fine days. Now there is sunlight in the room whenever the Sun shines, whatever the time of day.

A clever arrangement of mirrors is responsible for this transformation. A motor-driven heliostat is mounted on the top of the building opposite. This carries a plane mirror, 12 ft. wide and 6 ft. high, which can be adjusted at various angles in accordance with the Sun's elevation at different seasons of the year. It is turned slowly by the motor to follow the Sun, the rays of which are reflected to other mirrors that direct them into the room itself. Thus on a fine day the effect is the same as if the Sun were shining directly upon the windows.

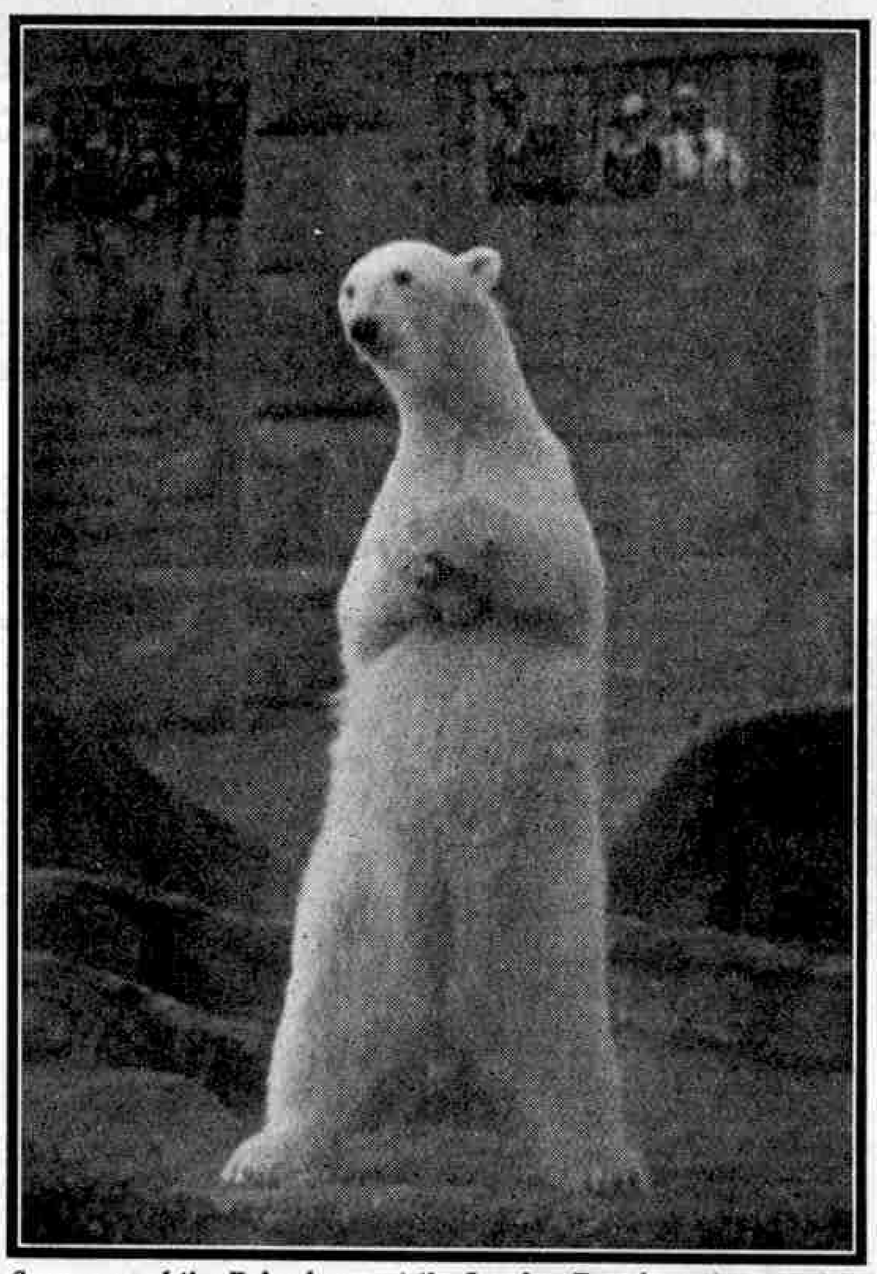
Measuring Noise

It is curious how difficult it is to measure noise. There is a great difference between an actual increase in the volume of sound and the sensation of increased loudness that it gives, and if a volume of sound is amplified tenfold it actually seems only twice as loud to the listener.

An International Conference has just met in Paris in order to look into noise problems, and units have been adopted that agree with the British standards previously fixed. In these the unit for measuring the volume of sound is the "bel" and 10 bels, or one "decibel," equals a "phon," the unit of loudness. At 60 phons of noise it is possible to talk in comfort, but at 90 phons it is difficult and at 110 phons impossible. A road drill produces 110 phons and an aeroplane 120, and the volume of noise in a quiet street is about 40 phons.

Efforts are now being made in Britain to reduce noise. On the railways such methods are used as increasing the length of the rails, and using coaches, with permanently-closed windows, in which air-conditioning plant is installed. On tube railways the problem is particularly difficult because of the reflection of sound from the walls and ceiling. There asbestos shields to absorb wheel and rail noises are being tried and careful attention is being given to smoothing irregularities in the rails. Rubber pads are also used between the coach body and underframe.

As a further step towards dealing with the problem, sound meters invented in the National Physical Laboratory are shortly to be installed in four noise-testing stations for experiments on the production of a noiseless motor car.



Susy, one of the Polar bears at the London Zoo, in a characteristic attitude. This photograph was entered in a recent "M.M." Photographic Contest by Miss F. Thomson, London.

A "Silent" Motor Horn

In view of this attempt to reduce noise in modern cities the recent production in Germany of a "silent" motor horn is of particular interest. The "silent" horn makes a noise, but this is of too high a pitch for the human ear, and can only be heard by means of a microphone that picks it up and transforms it into a low hum. The driver of a road vehicle to which the apparatus is fitted has a loudspeaker beside him, and is able to hear without difficulty the blast of a silent horn on a following car.

Three Million Telephones in Great Britain

It is estimated that Great Britain's 3,000,000th telephone will be installed about the time this issue of the "*M.M.*" is published. The telephone was invented by Alexander Bell in 1876, but it was not till 1922 that the first million were in operation. The second million was reached by 1931, and a further 6½ years has been sufficient to bring the total to 3,000,000. The rate of increase will be even more rapid in the future, and it is believed that 4,000,000 telephones will be in use by the end of 1942.

Fishing Vessels on the Telephone

Another indication of the rapidly increasing employment of the telephone in Britain is the short range service introduced by the Post Office in September for trawlers, coasters and other small craft that work just off the coast and are equipped for wireless telephony. The new service makes it possible for the owners of a fishing fleet to communicate with the captains of their vessels and tell them where to land their catches.

The service is operated through the Humber and Seaforth Post Office Coast Wireless Stations, near Grimsby and Liverpool respectively. The distance over which a conversation may take place varies according to the weather conditions. The average maximum is about 100 miles, and calls may be made from any private or public telephone, the subscriber asking for the Humber Ships Telephone Service or the Seaforth Ships Telephone Service.

Silver-plated Gramophone Records

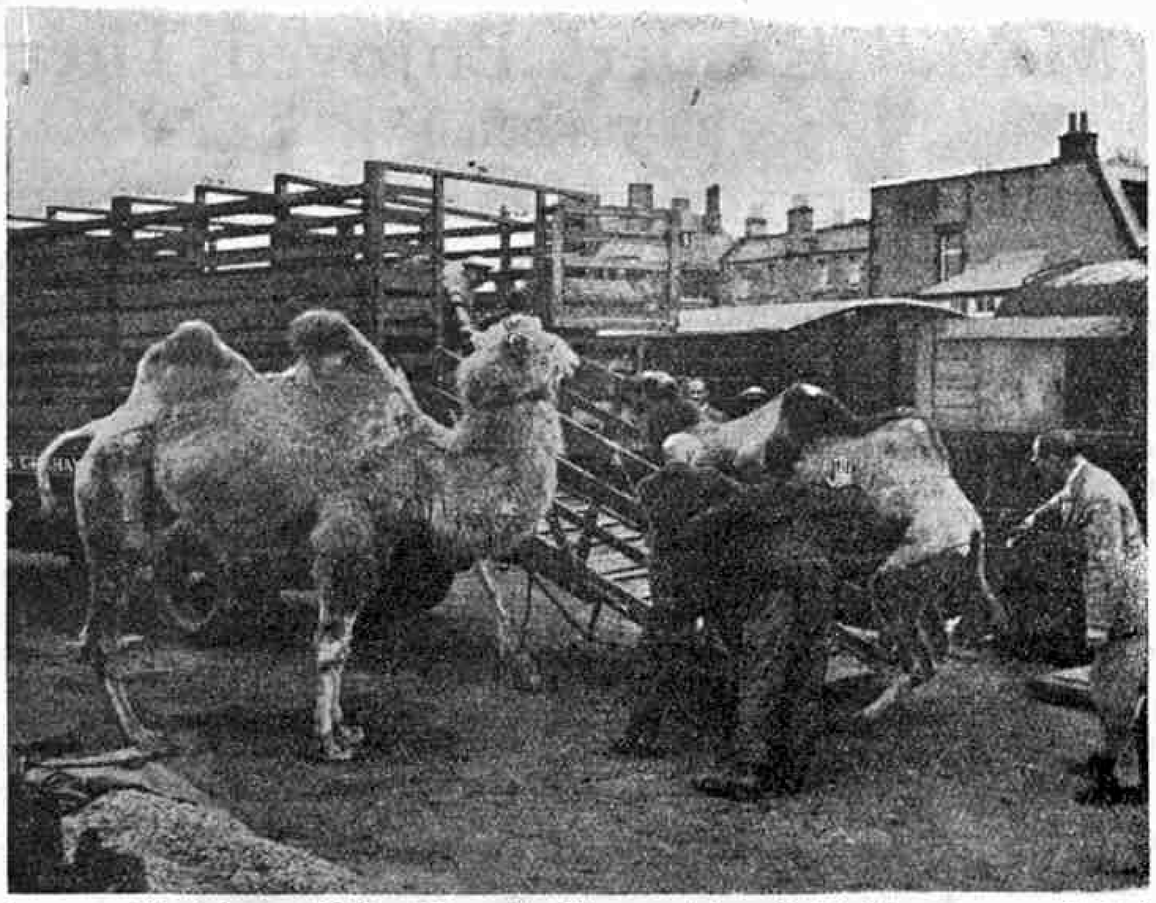
How to give silk, paper and other materials a thin coating of metal is a problem that has long attracted inventors. The coating must be continuous, but when forming it the materials must not be heated, for that would injure or destroy them. Now a process has been worked out for applying coatings of this kind rapidly and easily. Nearly 22,000 yards of silvered paper can be produced in 24 hours, and 200 to 500 yds. of textile fabrics can be metallised in the same time. The process can also be employed on a large scale to reproduce a bright silver layer on the wax plates used for gramophone records.

The new method is called cathode disintegration because the metal is vaporised electrically from a cathode, or negative electrode, and can be used for silver, gold, platinum, copper, nickel zinc and other metals. The electrodes are wire-shaped, and the disintegration is carried out in suitable high vacuum containers, such as that illustrated on this page. The entire space is then filled by metal vapour, which is deposited as a thin film on any material with which it comes in contact. The layers are incredibly thin. For instance, paper can be given a coating about one hundred-thousandth of an inch in thickness.

Silks, paper, mica and wax plates are among the most suitable materials for covering. The plating of gramophone records by silver is particularly interesting, for the wax of which these are made has a smooth and lustrous surface on which the metal forms a mirror. Reproduction is better than with graphited records and there is less needle noise, while mechanical stress on the surface of the wax is avoided. The coating can be completed in less than a minute.

Paper metallised by the cathode disintegration process is used in the cigarette and tobacco industries, and also can be employed for making bags for coffee, tea and other provisions. Silks and fabrics can be coated with silver and gold films, producing very beautiful effects at low cost, and there is a wide field for the new method in electrical engineering.

H. F. KUTSCHBACH.



An unusual load for an A.E.C. cattle carrier. The camels travelled in this manner on the last stage of a long journey from Moscow to the Edinburgh Zoo. Photograph reproduced by courtesy of the "A.E.C. Gazette."

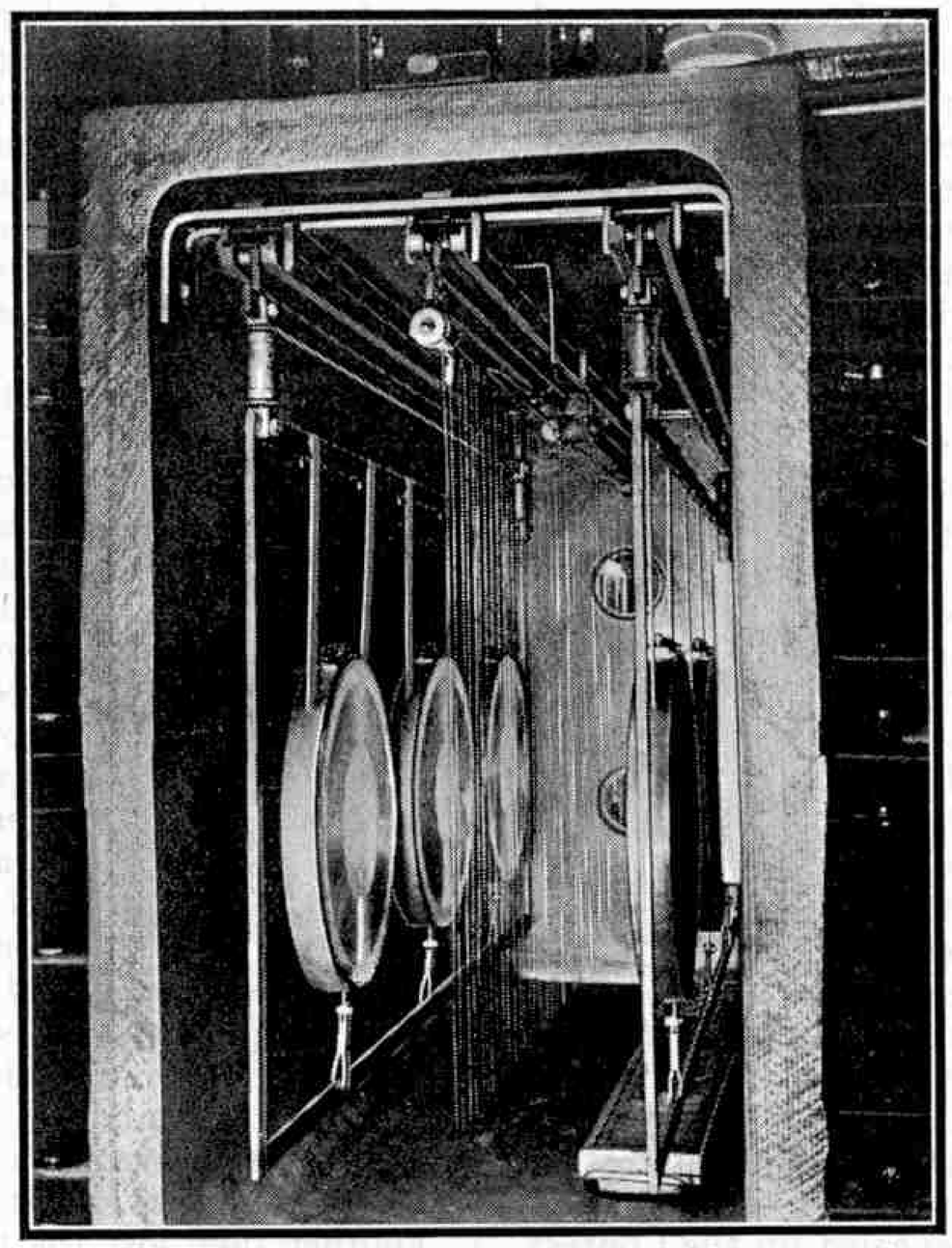
Making Thin Paper Opaque

The production of lighter and cheaper books is made possible by the use of the rare metal titanium. When a very small proportion of titanium in the form of one of its compounds is added to the pulp used in the manufacture of paper, the sheets produced are opaque, no matter how thin they are, and words printed on one side do not show through to the other. The process is very inexpensive, and as a result it will be possible to produce books with exceedingly thin pages on which the type can be read without difficulty.

Fire Proof Fabrics

A disastrous fire can easily be caused by a curtain or some flimsy material in the house being accidentally set alight. This danger will be lessened by the use of a liquid recently produced in America, which when sprayed on fabrics will make them inflammable. The liquid is not poisonous and does not in any way injure even the most delicate materials. It is invisible when sprayed on dark cloth and retains its power for a long time, and is already being used to make such substances as silk, wool, cotton and paper proof against fire.

Another novel material said to be germ-proof is being manufactured by a Manchester firm. It is impregnated by a special process, which it is claimed kills germs and prevents the carrying of such infectious diseases as influenza from those who handle material during its manufacture or sale.



An air tight chamber containing silver wires suspended between wax plates to be coated with the metal. The chamber is evacuated and a high voltage current applied to disintegrate the silver.

Heat from the Ceiling

An electric ceiling paper that has recently been introduced in London will serve the double purpose of decorating and heating a room. Fine wires are concealed in special material, which is placed on the ceiling in the same manner as ordinary paper and can be whitewashed or given any other suitable finish. The temperature is controlled by means of a thermostat, and heat is radiated on the occupants of the room in a similar manner to that from the Sun. The rays do not heat the air through which they pass, but warm the room by reflection from the floor, walls and other surfaces.

In a room heated by ordinary methods the temperature may vary considerably with position, and the air near the ceiling usually is much warmer than at the floor level. The new plan removes this disadvantage, ensuring uniform warmth throughout the room, and it has already proved satisfactory in several new buildings in London in which it has been installed.

The World's Second Largest Telescope

The world's second largest telescope has been made in Newcastle by Sir Howard Grubb, Parsons and Co. Ltd., for the Radcliffe Observatory at Pretoria, South Africa. It cost £40,000 to construct, and is of the reflector type with a 35 ft. duralumin tube and a mirror 74 in. in diameter.

The telescope will be set up in a steel turret 61 ft. in diameter, and the car for the observer will be pivoted in such a manner that it will face in any direction, and allow observation from all angles. The moving parts are operated by 18 motors and weigh 35 tons, but the whole structure can be controlled by push button from the observation car. A special camera is attached high up on the side of the tube.

Beauty Treatment for Fruit

At the Christmas season large quantities of apples, oranges and lemons are imported into England from California. This year they will be subjected to a special treatment designed to keep them fresh and attractive in appearance during the long sea voyage. The fruit is first coated with a layer of paraffin wax, which is so thin that it cannot be scraped off with a knife, and then it is polished automatically to give it a bright gloss. The paraffin serves a double purpose, for it also helps to preserve the skin of the fruit and prevent the appearance of wrinkles. Evaporation from the fruit also is slowed down, and there is less chance of a large cargo going bad when it has undergone its beauty treatment.

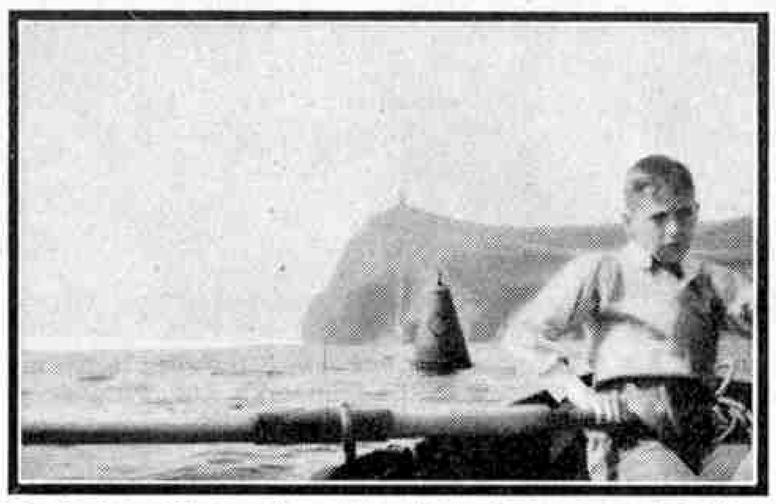
Our Summer Holiday Competition

How "M.M." Readers Enjoyed Themselves

By The Editor

THE introduction of a Holiday Letter Contest to overcome the summer laziness that attacks so many of us during the holiday season was very successful. I announced the Contest in the July Magazine, and looked forward to being overwhelmed with entries that would protect me from an attack of this disease. In this I was justified, for throughout August and September I was kept busy reading the letters that reached me from practically all parts of the world.

Perhaps the greatest attraction of the multitude of entries was that they showed me in what a variety of ways readers of the "*M.M.*" occupied themselves during the outdoor holiday season. Some stayed at seaside resorts; others enjoyed walking or motor tours, or stayed in farm houses and country villages; and there were many who spent their time under canvas, indulged in railway journeys with zone tickets, or adopted some either novel or curious method of enjoying themselves. The Scouts' World Jamboree in Holland played a part in one entry, and excellent letters from readers overseas told of unusual holidays that were described with a freedom and enjoyment that made me wish I had been able to share them.



K. Hordern, Liverpool, a prize-winner in our recent Holiday Letter Contest, pulling out on a deep sea fishing expedition off Bradda Head, Isle of Man.

No two entrants seemed to have had the same ideas as to how they should enjoy themselves, even when placed in similar circumstances. There is no doubt that all were capable of extracting fun of some kind from their holidays, however, even when these lacked adventure or novelty. Letters that described comparatively uneventful times were among the best submitted. For instance, one described little more than a bicycle run from Blackpool to Liverpool, but the account was so brightly written, and showed such keen appreciation of little things seen by its writer, that my interest was retained from the start to finish.

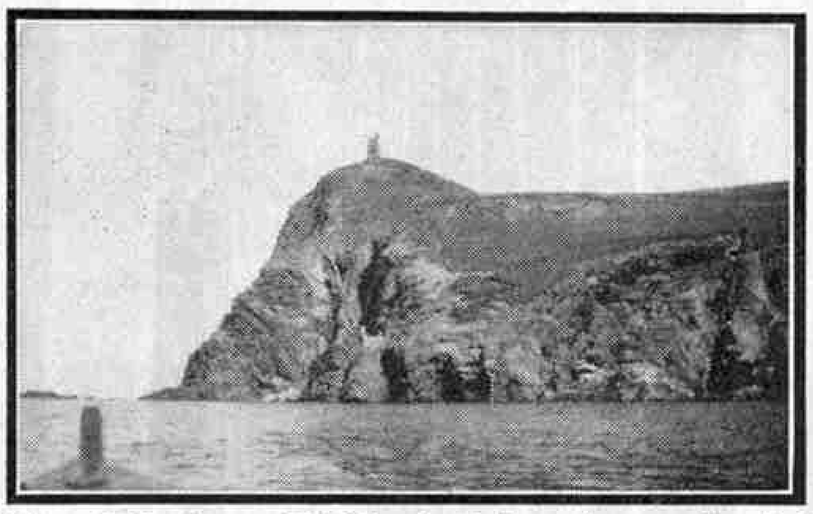
One competitor began politely by hoping that I should not be bored by his letter. This diffident approach was quite unnecessary, for he went on to tell me of a holiday crowded with matters of railway interest, first at home and then at Dawlish. Railways figured prominently in the letters of other competitors, and it is clear that many readers take advantage of holidays to see for themselves as many as possible of the interesting trains described from time to time in the "*M.M.*"

The keenest railway traveller revealed by the Contest was Bryan C. Boyle, of Gilford, County Down, Ireland, who wound up his holiday period by travelling 1,894.1 miles on the N.C.C. with a weekly zone ticket, the greatest mileage in any one day being 346.6. I liked the precision suggested by the .1 in the figure for the total distance run, for it showed how keen Boyle was on detail. Every run was carefully timed, and the highest speed recorded was 78.3 m.p.h. The grand total of railway travel for Boyle's entire holiday was 2,208.1 miles, and as he also covered 2,142 miles by car and cycled 1,416 miles, there is little doubt that he put his holiday to good use! His letter made an excellent story, and he figures in the prize list.

A Glasgow reader showed great ingenuity in his story of a holiday at Peterhead, a famous fishing centre. Naturally he wanted to go to sea, but nobody would take him. So he decided to be a stowaway. "I hid behind great coils of rope," he writes, "and was not discovered until the vessel was pitching and tossing forty miles out. The Skipper smiled—he was a jolly man—he remembered that he, too, was once a boy. I went into the wheel-house, the boat was tossing like a cork. From the window I watched the men casting the nets, the white spray splashed over them, then they began to sink, the heavy weights bearing them down, the floaters keeping the parts to the surface so that the herring would go in. The men then turned into their bunk but I stayed with the watch."

I admired his courage, but I began to wonder when he went on to write of seeing a whale spouting and of a record catch of herring. It all seemed too good to be true, and my suspicions were confirmed by the discovery, at the end of the letter, that the stowaway's trip was a dream! An excellent story, but not quite a holiday letter competition entry.

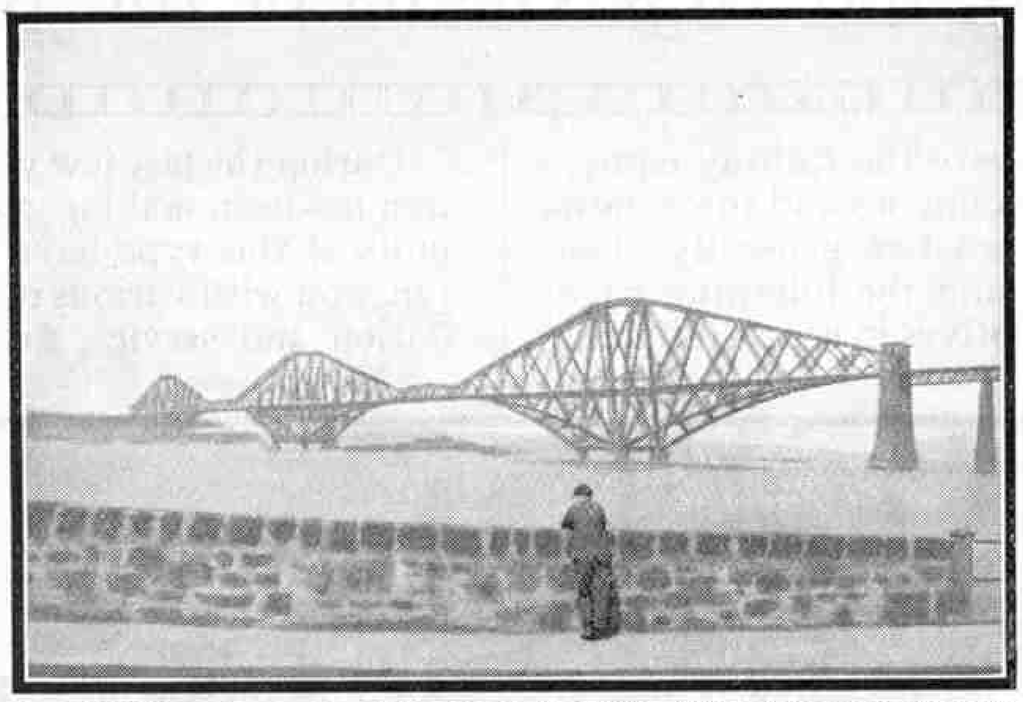
Coming now to the chief prize-winners, I have awarded first place to Peter McDonald, Toronto. With a friend this Canadian reader decided to go hitch-hiking to his old home, a country village 180 miles away from Toronto, as they were tired of the ordinary ways of spending holidays. Hitch-hiking is not merely walking, for it includes lifts in cars and lorries. These are generously given in Canada, the traditional method of asking drivers of approaching cars being to point a thumb in the direction in which the lift is wanted. The two set off, laden with simple camping equipment, and wandered at large through the countryside, seeing many interesting things, staying at farmhouses, and sleeping in their tent or in barns. On one occasion they lost all their clothes through the swamping of a boat from which they were bathing; on another they lost the trail through the bush on a dark night, and after stumbling across it by accident had to follow it on their hands and knees in order to make sure of not losing it again. During their holiday the two travelled 375 miles, at a total cost of 8½d.; and as I read McDonald's letter I could easily imagine myself out in Ontario, tramping through woods and alongside streams, and



Where K. Hordern and his father hooked an octopus, as described in an extract on the next page from his prize-winning letter.

generally enjoying a simple and carefree life. The sustained interest and evident enjoyment of the writer thoroughly earned for him the award of first prize.

The second prize-winning effort, that of K. Hordern, Liverpool, was of an entirely different type, but it told of real pleasure and happiness, and brought back to my mind enjoyable episodes in the days when I could find time for holidays! Hordern had a great time in the southern part of the Isle of Man, and in his letter gave full details of a single crowded day, in which he visited Peel Castle, went on to Ronaldsway Aerodrome to see the Manx Air Derby, in which he confessed to greater interest, and finished with deep sea fishing off Bradda Head. There was an unexpected result to his fishing, and this is best told in his own words.



An "M.M." reader contemplates the Forth Bridge. This photograph shows E. Griffiths, Coventry, on the shore of the Firth of Forth during the motor-car tour he described in his prize-winning letter.

"As we pulled out of Port Erin Bay, a huge basking shark, over 20 ft. in length as I learned from a fisherman later, gambolled along on the surface of the sea. We did not attempt to go too near; we were quite content with the smaller fry that we hoped to catch.

"Dropping the anchor about half-a-mile away from the headland we baited the lines and settled down, like all good fishermen, hoping for the best. My father was the first to feel a tug on one of his lines.

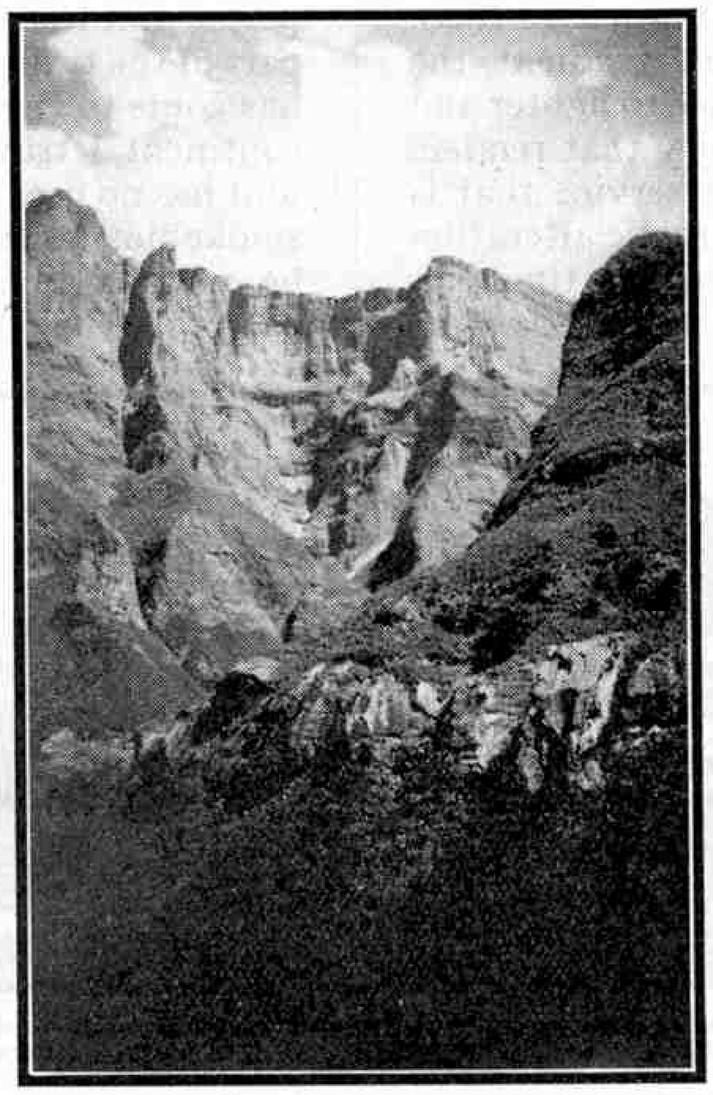
"'This one will need a very big frying-pan, old chap,' he said. After heaving energetically on the line, for we were fishing at a depth of about 50 or 60 ft., there was a great commotion as the 'catch' broke surface.

"Imagine our surprise to find that an octopus was hooked to the line, and its tentacles were threshing the surface into a creamy foam. My father cut the line, and with its tentacles straight out behind its rounded body, it shot off through the water like an arrow from a bow."

Third Prize went to E. Griffiths, Coventry, who was caught in contemplative mood, gazing out over the Firth of Forth, by a friend with a camera, whose snapshot is reproduced on this page. Griffiths was fortunate in the range of his holiday, which included a motor tour round Scotland and a special trip to the Isle of Man to see the Senior Tourist Trophy Race. He made splendid use of his opportunities, keeping an eye open for things of interest and telling his story very well indeed in his entry. His account of his Isle of Man trip was particularly interesting, conveying to the full the thrill of speed, even in the dash to catch a boat immediately after the conclusion of the race.

It was only with the greatest difficulty that I selected these three entries for prizes, as there were many others that vied with them in interest. A particularly meritorious effort came from South Africa, and described a holiday spent among the Drakensberg Mountains by D. Tees, Durban. This competitor thoroughly enjoyed his mountaineering, but just missed a prize because his story is slightly lacking in gusto and variety. The climax of his holiday came when he climbed one of the peaks of the range. In his own words, "The biggest thrills of all came on our trips into the high mountains, with their stupendous walls of rock and their dizzy crags. A party of us succeeded in climbing Champagne Castle, 11,400 ft. high, the highest peak for 50 miles. The upper part of the mountain looks like a castle, with cliffs falling sheer for 2,000 feet! We ascended by the only creek, a very steep gully, the lower part of which was filled with hard snow.

"Although the climb was very tiring, the wonderful view was worth it. North and south stretched a jumble of peaks, the highest being white with snow, while miles below us, it seemed, stretched northern Natal. We could even make out the Hostel, a tiny speck in the distance. Right beside us was another 11,000 foot peak, the Monk's Cowl, which has never been climbed, and from the col between, a frozen waterfall gleamed in the Sun."



Cliffs 2,000 ft. high in the Drakensberg Mountains, Photograph by D. Tees, Durban.

Another consolation prize-winner was J. A. Archer, West Hartlepool, who earned it by the all-round interest that he displayed in describing a holiday spent in a farmhouse near Carlisle, which was a splendid centre for motor runs, games and sports of all kinds.

One of the most interesting entries came from the Rev. R. H. B. Braithwaite, Ilminster. It began with a plea to be allowed to enter the contest, provided that there was no age limit, on the ground that the "*M.M.*" is enjoyed by young and old alike. The entry showed plainly that its author was fully entitled to describe himself as an "*M.M.*" enthusiast, for almost every page showed his keen interest in railways and similar matters to which the Magazine is devoted. His story described a walking tour through the Lake District, which ended with a journey by train to Newcastle that involved a short stay at Darlington. There Mr. Braithwaite hoped to see "*The Flying Scotsman*," but, he writes, "the railway authorities won't allow one to see the fast trains going through this station. You hear them, but you cannot see them. A high brick wall interposes between the platforms and the through lines." With this plaintive reminiscence ends an entry that for its sustained interest and variety is thoroughly entitled to the consolation prize that was awarded to it.

The complete list of prize-winners is as follows:

1st Prize, £2/2/–: P. McDonald, Toronto, Canada. 2nd Prize, £1/1/–: K. Hordern, Liverpool. 3rd Prize, 10/6: E. Griffiths, Coventry.

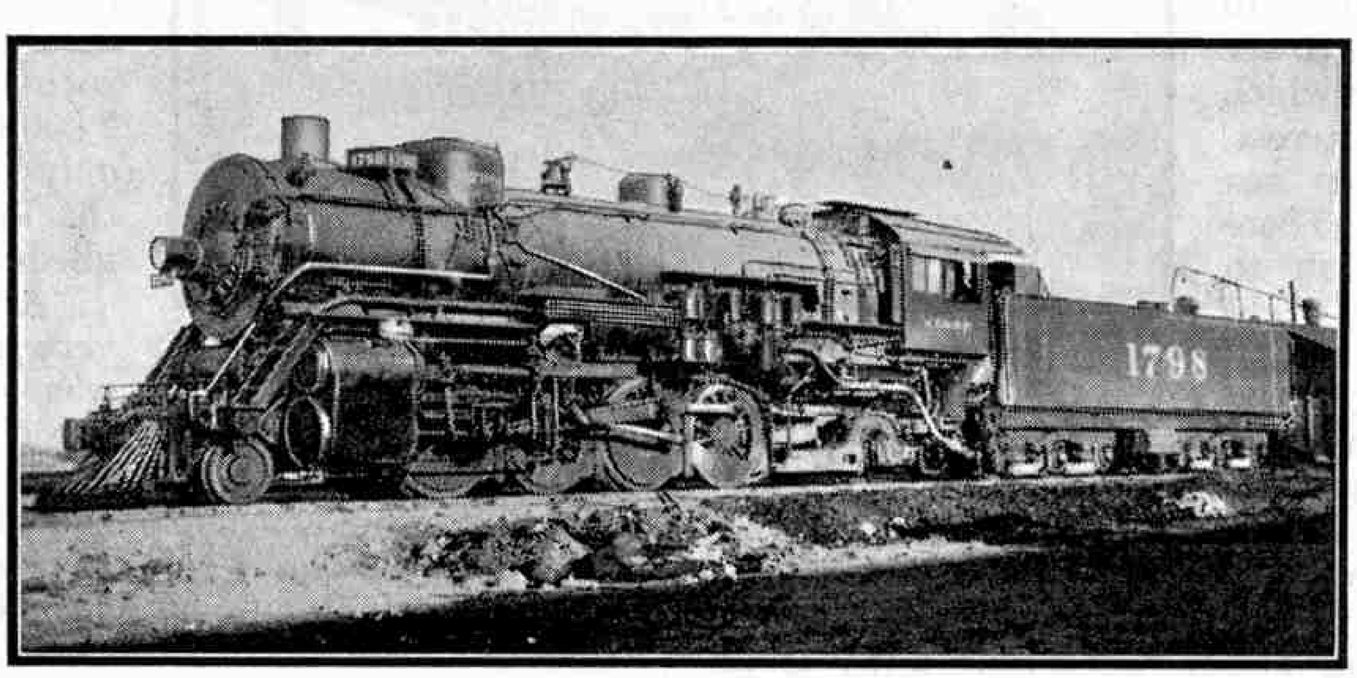
Prizes, 5/–: J. A. Archer, West Hartlepool; B. C. Boyle, Gilford, Northern Ireland; Rev. R. H. B. Braithwaite, Ilminster; D. Tees, Durban, South Africa.

Some Locomotives of The United States

Old and New Giants of the Rail

IT is always fascinating to compare the railway equipment and methods of different countries and to see how prevailing conditions influence practice generally. The photographs reproduced on this and the following page show four different types of locomotives in use on different systems in the United States, and it is interesting to see how these illustrate general locomotive practice there.

Taking first the upper illustration on this page, this shows engine No. 1798, a 2–8–2 or "Mikado" type locomotive, of the Atchison, Topeka and Santa Fé Railroad. This is a heavy freight engine with eight-coupled wheels. It has not always exhibited the same appearance, however, for it was once a 2–8–8–2 of the "Mallet" articulated type, and in that form, as No. 1700, it was illustrated in the "*Hornby Book of Trains*" in 1928.



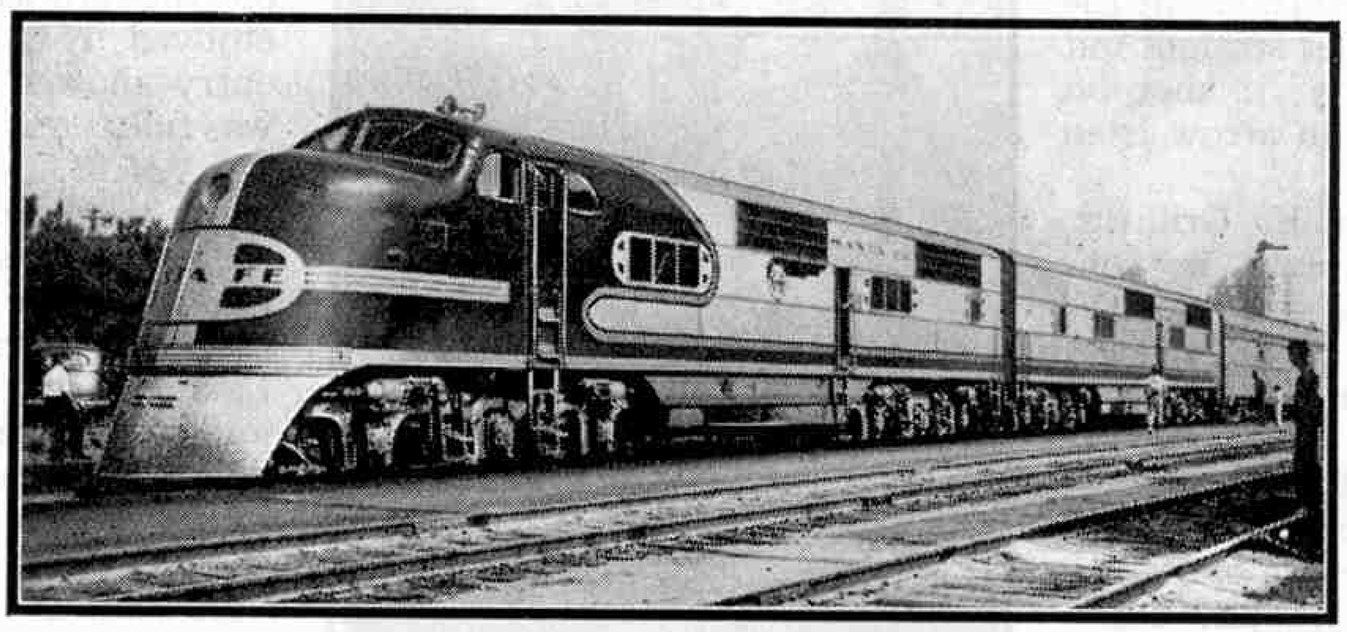
A "Mikado" locomotive of the Atchison, Topeka and Santa Fé Railroad. The photographs and some of the information in this article have been supplied by Allan Youell, of Pasadena, U.S.A.

Except for special conditions of load and gradient, the slow-moving "Mallets" are now giving place to lighter and more efficient units having greater mobility that renders them more suitable for the rapid freight service that is demanded to-day. This accounts for the drastic alteration that has resulted in the appearance of the one-time No. 1700, now No. 1798. The rebuilding of locomotives as practised in Great Britain, although to a less extent nowadays than used to be the case, is not followed in the United States. The complete replacement of obsolete power is the rule there; but when rebuilding is taken in hand, as in this case, it is performed with great thoroughness!

The supremacy of the steam locomotive, with a century and more of reliable service behind it, is now being challenged by new forms of motive power. Electricity of course has long played an important part in long-distance main line service on certain routes, such as the Chicago, Milwaukee, St. Paul and Pacific Railroad. Electric traction is still making excellent headway, as is shown by the electrification of the Pennsylvania main line between New York and Washington. This is the greatest programme of electrification so far carried out as a single job, and an account of it was given in the "*M.M.*" for October of this year.

During the last few years, however, Diesel-electric traction has been making great strides in railway work. Power units of this type have recently been introduced in conjunction with various novelties in the matter of accommodation and service, and the Diesel-electric train is the "fashionable" one in the United States to-day. Steam locomotive designers are not simply looking on and allowing their rivals to forge ahead, however. Proof of this is found in the remarkable Baltimore and Ohio 4–4–4–4 locomotive "*George H. Emerson*" that was illustrated on page 454 of August "*M.M.*" and the 16-cylinder engine of the same line referred to on page 705 of this issue.

The earlier Diesel-electric trains, such as the Burlington "*Zephyr*," were of the motor-coach type, that is with the power unit built into one of the ordinary vehicles forming part of the train set. More recently the separate locomotive has come to the fore, and notable developments in trans-continental travel have taken place. The Diesel-electric unit has no fire to need constant attention, and no grate or smoke-box to be cleared of clinker or ashes, so that it can be operated continuously over long distances with stops only to refuel. We have already referred to the "*Super-Chief*" of the Santa Fé route, the fastest train in the world, which links Chicago and Los Angeles in a 39¾-hour dash across the country. The distance is 2,228 miles, and the same Diesel-electric locomotive works the train throughout. The particular run that gives the train the distinction of being the fastest in the world is made over the 202.4 miles from La Junta to Dodge City at an average speed of 83.7 m.p.h. The train itself, which runs once in each direction weekly, is a remarkable assembly of stainless steel vehicles forming practically a travelling hotel furnished with all the necessary equipment for eating, sleeping and entertainment generally.

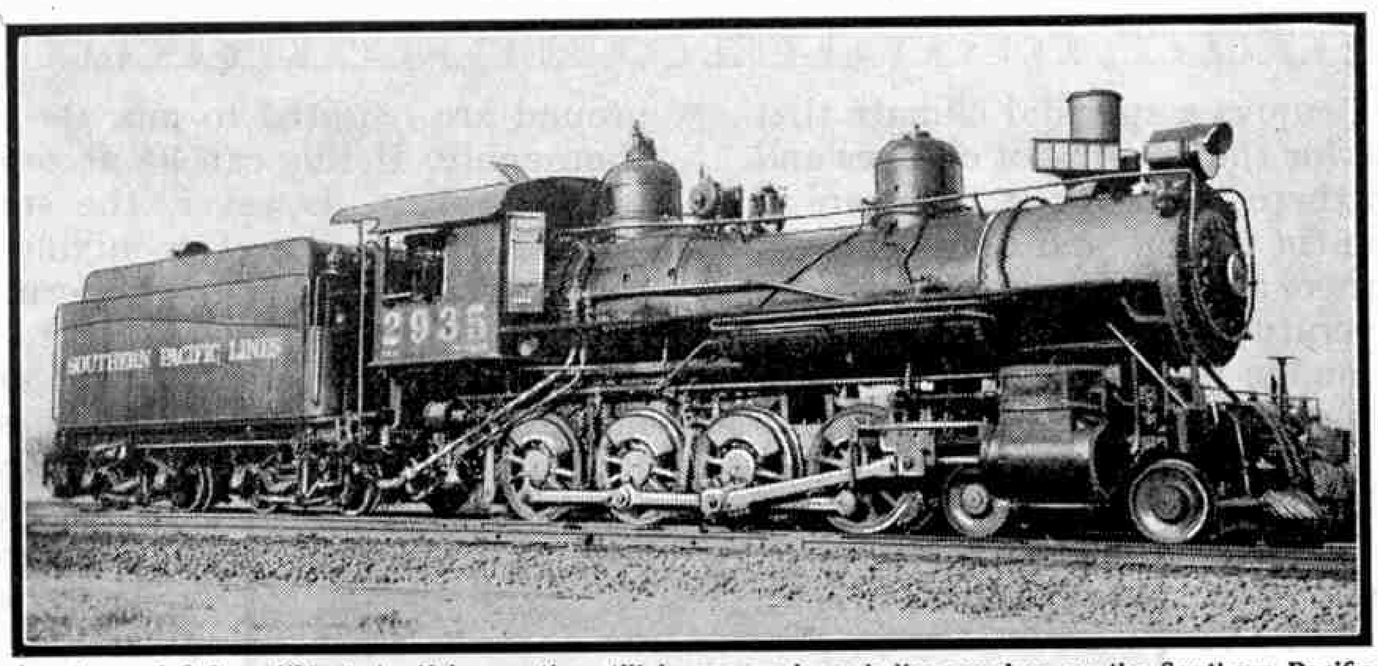


A striking photograph of the twin-unit locomotive and part of the train used on the "Super-Chief" service between Chicago and Los Angeles. It is driven by a Diesel-electric power plant.

The type of locomotive hauling this land liner is shown in the lower illustration on this page. It is a twin unit vehicle developing a total output of 3,600 h.p. The four separate power plants, each of 900 h.p., are controlled as one from the panel in the cab, but separate control for

each unit is available if it is necessary to part the units and work them independently. A feature of the external design is the "wind-break" nose at the leading end. A little behind this comes the sloping front of the cab, which with its elevated position and wide windows gives a splendid view ahead to the operator.

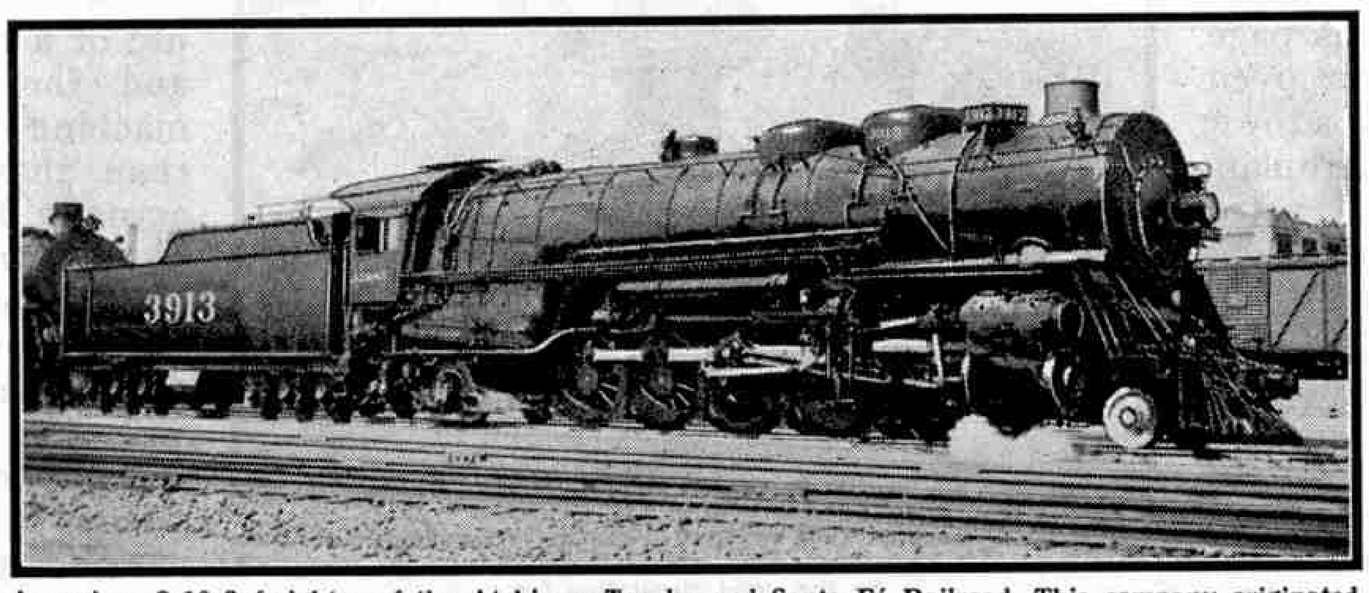
Another notable feature is the striking manner in which the finish is carried out, and the inclusion of the popular name of the owning company, "Santa Fé," in the front. A horn, mounted on the roof, replaces the siren carried by American steam locomotives, the rather mournful wail of which has become familiar to British ears through the medium of the "talkies."



A veteran 4-8-0 or "Mastodon" locomotive still in use on branch line services on the Southern Pacific Railroad. It retains many features typical of U.S.A. practice at the time of its construction.

In spite of the rapid development recently in steam locomotives and equipment, and the usual American practice of scrapping engines after relatively short service, certain older engines survive for branch line and similar light duties. An instance of this is provided by the 4–8–0 type engine of the Southern Pacific Railroad shown in the upper illustration on this page. The Southern Pacific route crosses the Sierra Nevada mountains, where between Roseville, California, and Sparks, Nevada, a distance of 140 miles, the ruling gradient is in the neighbourhood of 1 in 40. This explains the need for powerful and flexible locomotives, so that eight-coupled wheels are used to obtain sufficient adhesion, while the flexibility of the engine is aided by the provision of a four-wheeled bogie supporting the front end.

Present-day locomotives on this line also are eight coupled, but they are of the articulated 4–8–8–2 type, and thus have two sets of driving wheels. A distinguishing feature of these giants is that the position of the boiler and cab is reversed from the normal arrangement, the cab being placed at the leading end of the engine and the smoke-box at the trailing end. This is made possible by the use of oil fuel, which is carried in a tender at the trailing end of the engine and is conveyed to the fire-box by a pipe line.



A modern 2-10-2 freighter of the Atchison, Topeka and Santa Fé Railroad. This company originated the 2-10-2 type in 1903, which explains the use of the name "Santa Fé" that is applied to it.

The appearance of No. 2935 is typical of its period. The narrow stove-pipe chimney, the steam dome above the fire-box, and the box-shaped valve chests above the cylinders and other features, are all of the traditional American design of 40 years or so ago. The first "dome," a little behind the smoke-box, is a sand-box, the distributing pipes from which can be seen outside the boiler casing. This position for the sand-box has long been favoured in the United States. It helps to keep the sand dry owing to the warmth from the boiler and ensures a satisfactory "fall" for it.

Another feature very much in favour at one time is the pronounced taper of the first course or ring of the boiler barrel, just in front of the fire-box. The steepness of this taper led to the use of the term "wagon top" boiler to distinguish it, the resemblance to the front part of the top of a pioneering wagon being very marked. The purpose of the "wagon-top" was the same as that of the more gently-tapered boiler barrel of to-day, to afford additional steam space at that part of the boiler where the steam generation is most rapid.

The high running board alongside the boiler from the cab to the smoke-box is a characteristic fitting, and easy access to it is provided by the door in the cab front plate, which is shown partly open in the photograph. This feature has been rarely found on British locomotives on account of the differences in design and the restrictions of the British loading gauge. The cab of a United States engine can be built above the level of the driving wheels, and a greater width is allowable so that it is easy to provide cab doors, even when, as in this Southern Pacific 4–8–0, the trailing wheels are coupled and therefore of greater diameter than carrying wheels would be.

A fitting provided on each of the three steam locomotives illustrated, but most easily visible on No. 2935, is the train indicator. This displays the number by which a train is referred to in the despatcher's orders, and so enables the operating staff to identify it. An "extra" train, that is one not operating on a regular schedule, takes the number of the engine hauling it, as explained in the article in the *"M.M."* last July *"Riding the cab of a U.S. Freight Engine."* This explains the display of the engine number in the train indicators of the 2–10–2 locomotive No. 3913 in the lower illustration on this page, in which the figures "3913" can just be discerned.

This 2–10–2 engine is product of the Santa Fé line. It is very powerful, having cylinders 30 in. in diameter and with a piston stroke of 32 in. With its 5 ft. 3 in. driving wheels and 220 lb. per sq. in. boiler pressure it has a tractive effort of 85,360 lb. Britain's mightiest locomotive, the L.N.E.R. six-cylinder 2–8–8–2 "Garratt," has a tractive effort of 72,940 lb. and the comparison serves to show what a tremendous power output the designer in the United States, with the greater latitude permitted by conditions, can obtain from a single two-cylinder unit.

Warm Air for Fruit Trees

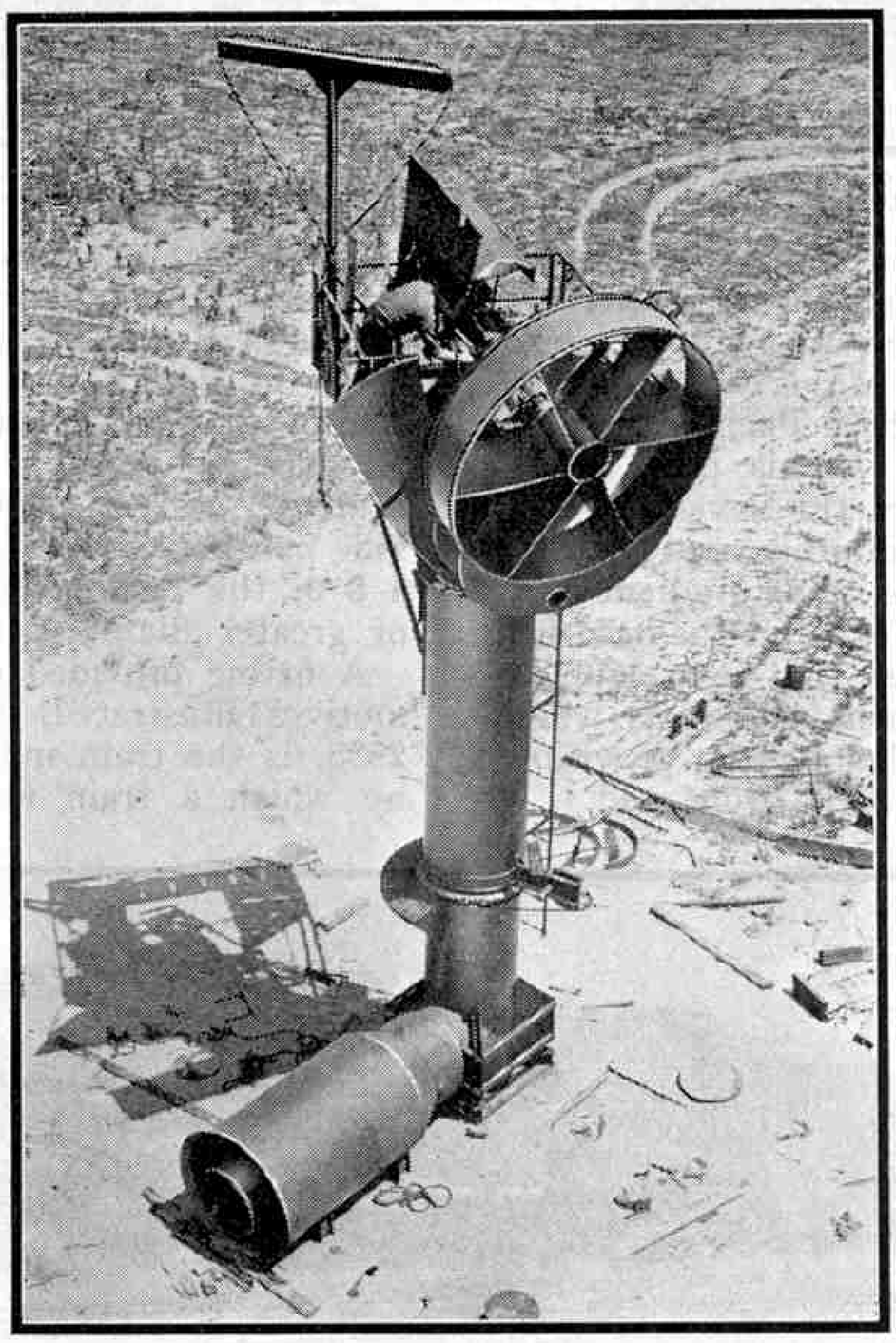
Keeping Frost Out of Orange Groves

By Andrew R. Boone

SOUTHERN California enjoys a splendid climate that is particularly suitable for the growing of oranges and other citrus fruits. Even there the crops at times are in danger from frost early in the season, and citrus growers then place lighted oil burners among the trees at night in order to raise the temperature in the vicinity. These burners are known as smudge pots, and are used on a gigantic scale. On one occasion, in 1936, 28,000,000 gallons of oil were burned in a single night to heat the orchards of Southern California.

Wind machines that mix warmer air from above with the cold air at the surface of the earth also have been pressed into service for saving citrus crops from damage by frost, and wind machines with attached heating systems will prove the ultimate solution for frost problems, however, according to Dr. Irving Krick, a Californian meteorologist. A wind machine combined with an air heating oven has recently been developed by the Conveyor Company of Los Angeles, and is said to operate at only a fraction of the cost of smudge pots.

This novel machine is shown in the illustration on this page. It consists simply of an oven, placed on the ground, and a tower on top of which is an aeroplane propeller driven by a petrol motor. Warm air is drawn up through the centre of the tower by the propeller, and forced down on to a grove by means of deflecting vanes.



Adjusting a machine that protects orchards in Southern California from frost. Air heated by an oil burner is spread over the fruit trees by the great circulating fan.

Both systems of heating orchards are strongly supported, and "smudge potters" and "wind machiners" are strongly divided on the merits of the two as a protection against extreme cold in orchards. For this reason it is interesting to see how and why wind machines are effective.

During the night the earth's surface and the layers of air in contact with it are cooled largely by the radiation of heat into space. If calm conditions prevail, there is a marked rise in the temperature of the atmosphere in the first 50 ft. to 100 ft. above the surface. This is an extremely stable condition, since there is cold air underlying warmer, lighter air. It is rather difficult to overturn, and this can only be accomplished by means of a relatively high increase of horizontal air speed with height within these layers. On a normal winter night, air speeds of 50 m.p.h. to 90 m.p.h. at a height of 25 ft. above the ground are required to mix the strata below that level thoroughly. If this can be accomplished by means of a wind machine, however, the surface temperature will show a definite rise after mixing has taken place, since this tends to establish a uniform temperature throughout the column.

The surface temperature attained by complete mixing depends on the thickness of the layer. On a night when the temperature increases rapidly with height, it is not necessary to stir as thick a layer of air to produce a given rise in the surface temperature as when the temperature increase with height is less pronounced. Then a machine producing a given air speed may not operate efficiently if the flow is purely horizontal at first. One with a movable head therefore is desirable to ensure thorough mixing, and the head would gradually be made to assume a horizontal position in order to transmit the effect to more distant points.

The production of a stream of air at a height of say 25 ft., capable of stirring the layer below, is possible through the use of a motor driven propeller, and the efficiency of such a machine will be much greater than that of any device that actually heats the lower levels of the atmosphere.

Occasionally at night the temperature will decrease with elevation, and no amount of stirring will then cause an increase in the surface value. In such conditions it would be necessary to create artificially a warm layer above that at the surface, which could be mixed with it. This would seem possible if a large enough volume of heated air could be spread above a grove through the use of a propeller. It may be asked why the warm air is not simply spread out upon the ground instead of aloft. One reason is that the presence of the trees would not allow an efficient distribution of the warmed air. Further, a propeller very close to the ground would be required, and this arrangement would not be efficient.

At times the air-drift through an orchard will be so great that the amount of warmed air supplied by the machine will be insignificant. These cases are rare, but a line of heaters on the windward side of the orchard would probably afford some protection, since the air heated by them would be carried through the grove.

BOYS ! JOIN THE MECCANO GUILD

President:
MR. ROLAND G. HORNBY

The Meccano Guild is an organisation for boys, started at the request of boys and conducted as far as possible by boys. At its head—guiding and controlling, and taking a personal interest in it—is the President, Mr. Roland G. Hornby, son of the inventor of Meccano, and it is ready to be of service to each individual member, and to help or give advice whenever requested. Membership of the Guild enables Meccano boys to get the best out of life.

The three great objects of the Guild are to make every boy's life brighter and happier; to foster clean-mindedness, truthfulness, ambition and initiative; and to encourage boys in the pursuit of their studies and hobbies, and especially in the development of their knowledge of mechanical and engineering principles. Every boy undertakes to promote these objects.

A Meccano boy who joins the Guild becomes a member of a great brotherhood of world-wide extent, every member of which has promised to observe its great objects; wherever he happens to be, even in strange countries he will know that he has met a friend whenever he sees the little triangular badge. Thus the Guild brings together Meccano boys all over the world.

THE GUILD BADGE

Membership of the Guild is open to every boy possessing a Meccano Outfit or Hornby Train Set who satisfactorily fills in the application form. The only conditions are that members shall promise to observe the objects of the Guild and to wear their badges on all possible occasions.

The Meccano Guild badge is beautifully enamelled in blue and white. The ordinary form is made for wearing in the lapel of the coat, but brooch badges are issued to members who prefer to pin them in position, and applicants who wish to have this form of badge should indicate this when sending in their forms. In addition to the badge, each member receives a handsome Membership Certificate printed in orange and black.

HOW TO BECOME A MEMBER

In order to join the Guild all that is necessary is to fill up the form of application, and to forward it to the Secretary of the Meccano Guild, Binns Road, Liverpool 13, from whom an application form may be obtained if desired. A remittance to pay for the membership badge should be sent along with the completed form of application. The price of the badge is 7d. post free in the United Kingdom and 1/– post free overseas (25 cents Canada). The applicant is then duly enrolled as a member of the Guild and his badge of membership is sent to him. Each member has the personal interest of the President and is entitled to the friendly advice and assistance of the Secretary.

Boys living overseas should write to one of the Meccano agents at the following addresses: CANADA: Meccano Ltd., 187-189, Church St., Toronto. AUSTRALIA: Messrs E. G. Page & Co., 52, Clarence Street, Sydney, N.S.W. NEW ZEALAND: Models Ltd., 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.

MECCANO CLUBS

Meccano Clubs are founded and established by enthusiastic Meccano boys under the guidance of the Guild Secretary at Headquarters. At the present time there are over 150 affiliated clubs in various towns and villages in this country and overseas, together with many others not yet affiliated. Each club has its Leader, Secretary, Treasurer and other Officials, all of whom, with the exception of the Leader, are boys.

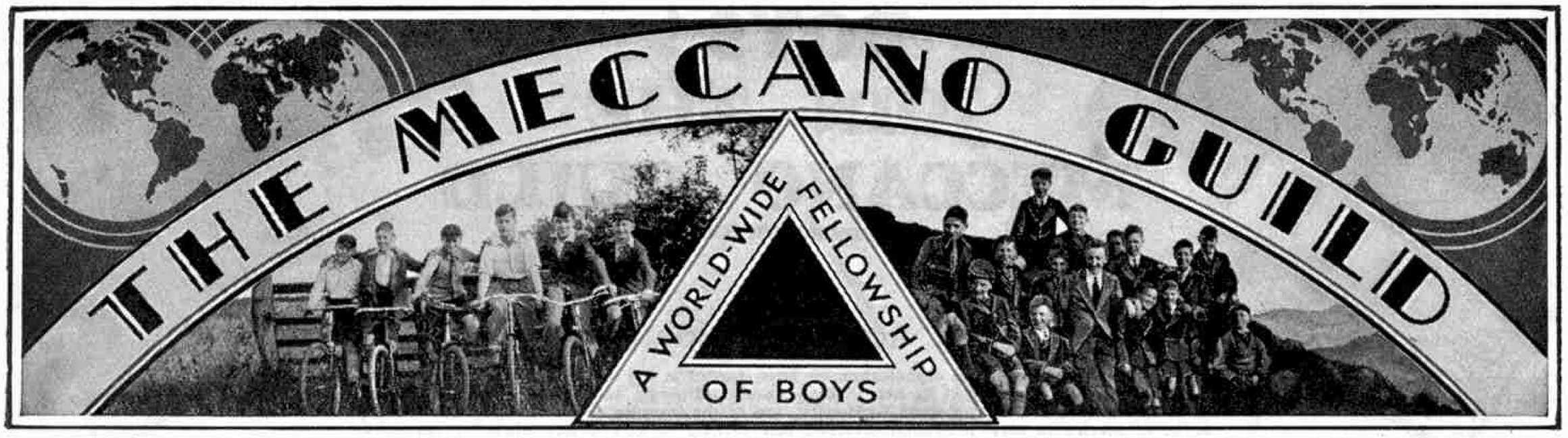
Every Guild member should join a club if possible, for only in association with other Meccano boys is he able to obtain the greatest fun from his hobby. If the nearest club is too far away for him to join, or if he is unable to join it for any other reason, he should consider the possibility of forming a new club in his own district. A special booklet entitled "How to run a Meccano Club" is now ready, and will be sent to any reader (post free) on receipt of 2d. in stamps.

When a Meccano Club has been successfully launched and good progress is being made, affiliation with the Guild is granted. A beautiful club certificate, suitable for framing and hanging in the club-room, is presented, and the club becomes entitled to such privileges as the loan of interesting lectures and large models built at Headquarters.

THE CORRESPONDENCE CLUB

Members of the Guild are eligible to join the Correspondence Club, by which they are placed in communication with other Guild members in some other part of the country or abroad. To those boys who are interested in foreign languages the Correspondence Club presents a splendid opportunity of obtaining a correspondent in the particular country in the langauge of which they are interested. Stamp collectors also find the club of value. Full particulars and enrolment form will be sent on application to the Guild Headquarters.

THE SUN NEVER SETS ON THE MECCANO GUILD



Christmas Greetings

My first thought this month must be to wish to all members of the Guild and Meccano boys throughout the world a very happy and enjoyable Christmas. Nobody looks forward to Christmas more than the Meccano enthusiast, and his pleasure is all the greater when he is a member of a club, and is able to share the delights of the season with his fellow members. Christmas socials of Meccano clubs are great fun, and members invariably show that their capacity for enjoyment is equal to their talent for model-building and organisation of club programmes.

A Time for Review

Even Christmas has its serious side, however. It marks the end of the first Winter Session, when Leaders and officials can count up their gains and losses. Now is the time to ask whether the programme is sufficiently varied and attractive, to think over the meetings that have been held recently in order to decide if they are best calculated to give members the good times they expect, and to plan out new things for coming months. In all these they can obtain guidance from members. The present is an excellent time to encourage them to speak freely on the affairs of the past session, and to make suggestions, for the spirit of goodwill and helpfulness is never shown more than now. At the Christmas Social therefore, or at some meeting near the end of the month, an opportunity should be made for a discussion. This need not take many minutes. A very brief and informal talk should be sufficient to give Leaders all the information they need to guide them in conducting club affairs.

More Members for More Fun

Another feature of Christmas that should not be overlooked is that many boys then make their first acquaintance with Meccano. This means that everywhere possible recruits are to be found, and steps should be taken to find them and persuade them to become members.

As I have previously pointed out, "*More Members means More Fun.*" This might almost be taken as a slogan for a recruiting campaign. New Meccano enthusiasts can learn of the existence of a Meccano club by means of a notice displayed by a dealer or some friendly shop-keeper, and there will be little difficulty in finding suitable openings for such a notice if it is attractive. A make-shift sort of notice does more harm than good.

The most effective form of Christmas recruiting is personal, however. Most members will have friends, especially among the younger boys who are beginners in the Meccano world. To tell them about the club, to encourage them to come to its meetings and to help them generally is the kind of action expected of Guild members; and those who follow out this scheme also will have the satisfaction of knowing that they are doing something to strengthen the club to which they belong.

Meccano Club Leaders

No. 92. Mr. E. Essex

Mr. E. Essex was until recently the Leader of the Winchmore Hill Collegiate School M.C., a photograph of the members of which appeared on the October "Club Notes" page. Model-building is exceedingly popular in this club, and an Advisory Committee helps members in making their Exhibition models.

Useful Exhibition Hints

News of many interesting Exhibitions to be held in December has reached me, among them some of an especially attractive kind that are being organised by school clubs. One of these has been arranged by the Winchmore Hill Collegiate School M.C. A special attraction will be a Dramatic Show, and it is interesting to find that the cost of scenery has been met by the proceeds of Cinematograph Shows held during the session. This plan combines an attractive form of meeting with a method of providing material for an important event of another kind later.

The display will include three Super Models on loan from Headquarters. These are always a great attraction, and a copy of the new list of models available to which I referred last October will be sent immediately on application to any Leader who is planning an Exhibition, or would like to have a model for some other useful club purpose. The expense involved is only the few shillings required for return carriage, and this is well repaid by the interest the models arouse among members and visitors alike.

Announcing Coming Events

Club Leaders and officials generally fully appreciate the importance of giving wide publicity to Exhibitions, Concerts and other special occasions. They should remember also that a note in these pages on an event of this kind is sure to arouse the interest of some reader who would be able to attend and may become a useful member. I am always pleased to insert announcements, provided these reach me in time. Details of the place where the Exhibition is to be held, the dates and times, and the price of admission should be sent at least a month before the date of publication of the issue in which they are to appear, and a few notes on the exhibits and other attractions also should be given.

Proposed Clubs

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

BOSTON—H. T. Stephenson, Vauxhall Foundry, 17, Tower Road, Boston, Lincs.

HALIFAX—Nicholl, Brown and Coyle Ltd., 24, Commercial Street, Halifax.

KIRKCALDY—N. Henderson, "Norlands," Munro Street, Kirkcaldy.

LLANGOLLEN—A. M. Ware, "Pentrepelin House," Llangollen, Denbighshire.

LONDON—D. A. Clack, 24, Moylan Road, London, W.6.

MORPETH—I. S. Rutherford, Heighley Woodside, Morpeth.

NORTH BERSTED—F. Leppard, 30, South Way, North Bersted, Bognor Regis, Sussex.

OAKAMOOR—J. Hardemann, Cotton College, Oakamoor, N. Staffs.

SWEDEN—C. A. Astram, 3, Hogbersgatan, Soderlalje, Sweden.

Old Charlton M.C.—A Mock Trial, adjourned at the end of the Summer Session, was resumed at an early meeting this Session, and resulted in the acquittal of the prisoner. At another meeting drawings by members were exhibited and the Leader gave a short talk on each. Future arrangements include several interesting talks and a Treasure Hunt. Club roll: 23. *Secretary:* K. L. Morphew, 221, Westcombe Hill, Blackheath, S.E.3.

Todmorden Road Central School.—An enjoyable night visit has been paid to the Park Pit, where the party were shown some of the underground workings and the actual coal face. Each member took a pick with him and dug some coal as a souvenir. At recent meetings members have been occupied chiefly in model-building, and many are busy making a model dock. The Meccano and Hornby Train Sections have joined in designing a realistic layout for the dock, and have marked out positions for the various features included. Club roll: 18. *Secretary:* L. Lang, 26, Colville Street, Burnley, Lancs.

Folkestone M.C.—The Leader and secretary recently visited Hythe. A further club visit to the Romney, Hythe and Dymchurch railway is being arranged. Most members saw the Empire flying boat "*Caledonia*" when it passed over Folkestone during its coastal tour. Club roll: 7. *Secretary:* W. F. Cotter, 72, Dover Street, Folkestone.

Well Hall and District M.C.—A visit was paid to the Marine and Engineering Exhibition at Olympia. Members were specially interested in the larger marine engines, and at a subsequent club meeting ideas for models of this type were put forward. Progress with this model has been slow, however, owing to many of the members attending evening classes. A visit has also been paid to the Cycle Exhibition in London. Club roll: 6. *Secretary:* B. R. Frooms, 82, Greenvale Road, Eltham, London, S.E.9.

Wednesbury M.C.—Several new members have been enrolled. There are now three meetings each week, one for the Seniors, one for the Juniors, and a joint meeting devoted to games, film shows, etc. There will also be several Senior meetings during each session for Debates and similar events. A Debate is to be arranged between the President and Vice-President. The Woodwork and Model Railway Sections are still very active. At Games meetings Table Tennis, Bagatelle and Darts have been played. An interesting innovation at a Senior meeting was a gramophone recital, three seniors contributing a dozen records each. This meeting was so greatly enjoyed that more of its kind will be held during the winter. Preparations are in hand for the club's second Annual Exhibition. Club roll: 28. *Secretary:* A. L. Morgan, 17, Cobden Street, Falling's Heath, Wednesbury.

Bristol Grammar School M.C.—Meetings are now held on Wednesday afternoons instead of on Mondays. The programme for the current session includes Model-building and Hornby Train operations, Lectures, and attractive visits to places of interest. Club roll: 18. *Secretary:* L. Stear, "Highbank," Trelawney Road, Cotham, Bristol, 6.

The Beeches (Jersey) M.C.—At one meeting members were invited to give five-minute talks on subjects selected at the previous meeting. It was so successful and instructive that similar meetings are to be held at intervals. Model-building and Hornby Train operations have been carried out regularly, and a fretwork machine has been acquired. Plans are in hand for the celebration of the club's first birthday, and for the first club excursion. The latter will take place during the Easter vacation next year, when it is hoped to spend a few days in St. Malo or Plymouth. It has been decided that club officials shall hold office for one year. Club roll: 21. *Secretary:* A. Shepherd, De La Salle College, The Beeches, Jersey, C.I.

Tolworth Central School (Surbiton) M.C.—An enjoyable programme is being carried out. The Hornby track has been extended. The Cycling Section, called the Bypass Rangers, have held some interesting cycling runs. Club roll: 40. *Secretary:* G. Boulter, Tolworth Central School, Surbiton, Surrey.

Regent Street Central School.—Lantern Lectures are an outstanding feature of the programme. The opening Lecture of the present Session was given by Mr. G. N. Chaplin, Leader, and described "*Some School Excursions.*" A Draughts Match between the club and the school was won by the former. Plans are in hand for an Exhibition and Concert in aid of club funds. Club roll: 150. *Secretary:* J. Shepherd, 29, Bury New Road, Heywood, Manchester.

Sid Vale M.C.—An interesting evening was spent in the workshop recently making a large box for club use. Enjoyable rambles carried out during the past summer included one to Ladrum Bay, the juniors going by the road and the seniors by the cliffs. The two parties met at the Bay, where refreshments were taken before returning home by the cliff route. Club roll: 20. *Secretary:* L. R. I. Gliddon, Sheffield House, Sidmouth.

Plymouth M.C.—The club-room was re-decorated during the summer vacation, and the various Sections are now very busy. The Meccano Section have been concentrating on the building of a hammerhead crane. The Printing Section have produced some attractive club stationery, with a two-colour letter heading. Club roll: 60. *Secretary:* R. G. Symons, 47, Lisson Grove, Mutley, Plymouth.

Islington M.C.—Attendance at meetings has improved this Session. The last meeting of each month is an Open Night, when the Hornby and Meccano Sections join for games, and a small prize is given to the winner of the greatest number of events. Hobbies Evenings have been organised and are proving very popular. Some members have started work on models for the club Exhibition. Club roll: 12. *Secretary:* A. B. Straker, 48, Onslow Gardens, Muswell Hill, London, N.10.

Hornsea M.C.—At the beginning of the Session an Assistant Engineer was appointed to help in putting down the new Hornby layout. Very enjoyable train operation meetings have been held since the layout was finished. Occasional meetings are devoted to games. A Lecture on "*Yorkshire*" was given recently to the Senior Scientists, and at a later meeting was repeated for the Junior Scientists. Club roll: 17. *Secretary:* P. Thom, 5, Alexandra Road, Hornsea.

Sutton Valence Council School M.C.—Keen interest is taken in Model-building, and a special model is set for construction each week. Members are classed in three Grades, and promotion from one Grade to a higher follows good model-building. Other pursuits are Football and Reading. Three former members who have removed from the district, and therefore are unable to attend meetings, maintain touch by letter and send their models by carrier. Club roll: 20. *Secretary:* C. Ansten, East Sutton Park, Near Maidstone, Kent.

St. James (Grimsby) M.C.—Until recently meetings have been held at the Leader's house. A large room at the school has now been obtained as a permanent club-room, however, and it has been possible to admit more members. An Exhibition is to be held in the Town Hall. Club roll: 11. *Leader:* Mr. H. V. Hayman, 21, Park Avenue, Grimsby, Lincs.

Royds Hall School M.C.—This newly affiliated club holds fortnightly meetings in the Physical Laboratory, and members work together in groups. An exhibition has already been held. Club roll: 16. *Secretary:* D. Livesey, Royds Hall School, Huddersfield.

Officials and members of the Malvern (Johannesburg) M.C. This very successful South African club was formed in 1919, and includes both Boys' and Girls' Sections. Extensive Model-building is carried out, and the club has raised considerable sums for charities by organising special Models Exhibitions.

AUSTRALIA

Christchurch M.C.—Members entered models competitions at the New Zealand Industries Fair, recently held at Christchurch, and won several of the prizes. A small party of members visited the Fair one evening. A Surprise Evening that had been arranged proved to be an unexpected visit by six members of the Ashburton M.C., who were immediately arrested and tried on various charges, on some of which they were convicted. It has been decided that the Ashburton M.C. shall become partners in the Christchurch M.C. Magazine "*The Coupling.*" An interesting Lecture on "*The Miracle of Coal*" has been given by Mr. Belton, engineer of the Christchurch Gas Company. On another occasion a talk on "*Mountaineering*" was given. Games Evenings continue to be very popular. Club roll: 37. *Secretary:* L. P. Chapman, 24, Braddon Street, Christchurch, S.W.1.

EGYPT

Zagazig M.C.—The Meccano Section have constructed a horizontal steam engine, the Woodwork Section have made model house furniture, and the Industrial Chemistry Section have continued their perfume experiments. The club's birthday is to be celebrated by an Exhibition. An enjoyable visit has been paid to the Bridge of Zifta, where the members played cricket and baseball. Club roll: 23. *Secretary:* Miss B. Mangourie, 39B, Sharia El Sikka Hadid Avenue, Zagazig.

Maastricht M.C.—Mr. F. L. Bingen, Leader, has worked out a plan for a Model Steam Locomotive to be constructed by the members for the forthcoming Exhibition. Two other super models, a Warship and a Tractor, also are being built. Lantern Lectures are to be given by the Leader at regular intervals during the next three months. Membership is increasing steadily, and it has been found necessary to secure a larger club-room. Members therefore have decided to increase their weekly subscriptions by 1d. The "Air Youth" Section of the club is proving very popular, and four of the members were awarded prizes in a competition for model aeroplanes held by the paper "Limburger Koerier." Club roll: 31. *Secretary:* L. Mulders, Jodenstraat 28a, Maastricht, Holland.

Club Not Yet Affiliated

CANADA

Commissioner's High School (Quebec) M.C.—A large room is available for use as a club-room, and as soon as the club is properly organised regular meetings will be held weekly or twice-weekly. Everybody is very enthusiastic, and membership is rapidly increasing. Club roll: 12. *Secretary:* F. G. Barratt, 30, Cove Fields, Quebec City, P.Q., Canada.

Fun for the Christmas Party

Meccano Games to Amuse Your Friends

THIS month model-builders will be looking forward to Christmas parties and the joys of the festive season. A Meccano Outfit can be of great assistance in preparing for the good times coming, for with its aid it is possible to make various mechanical games that will provide endless fun and amusement for one's friends, and which will contribute greatly to an evening's entertainment. This month therefore we are giving details of three interesting games that can easily be built up in odd moments, and which do not require many parts for their construction.

The first model to be described is the small shooting alley shown in Figs. 1 and 2. It consists of a long narrow base, at one end of which a gun is pivotally mounted. At the other end is a row of hinged trap doors or targets, which are electrically connected to numbered lights above them. The gun fires missiles consisting of Collars, and if a "hit" is registered the target struck falls inward, causing the numbered lamp above it to light up to indicate the score.

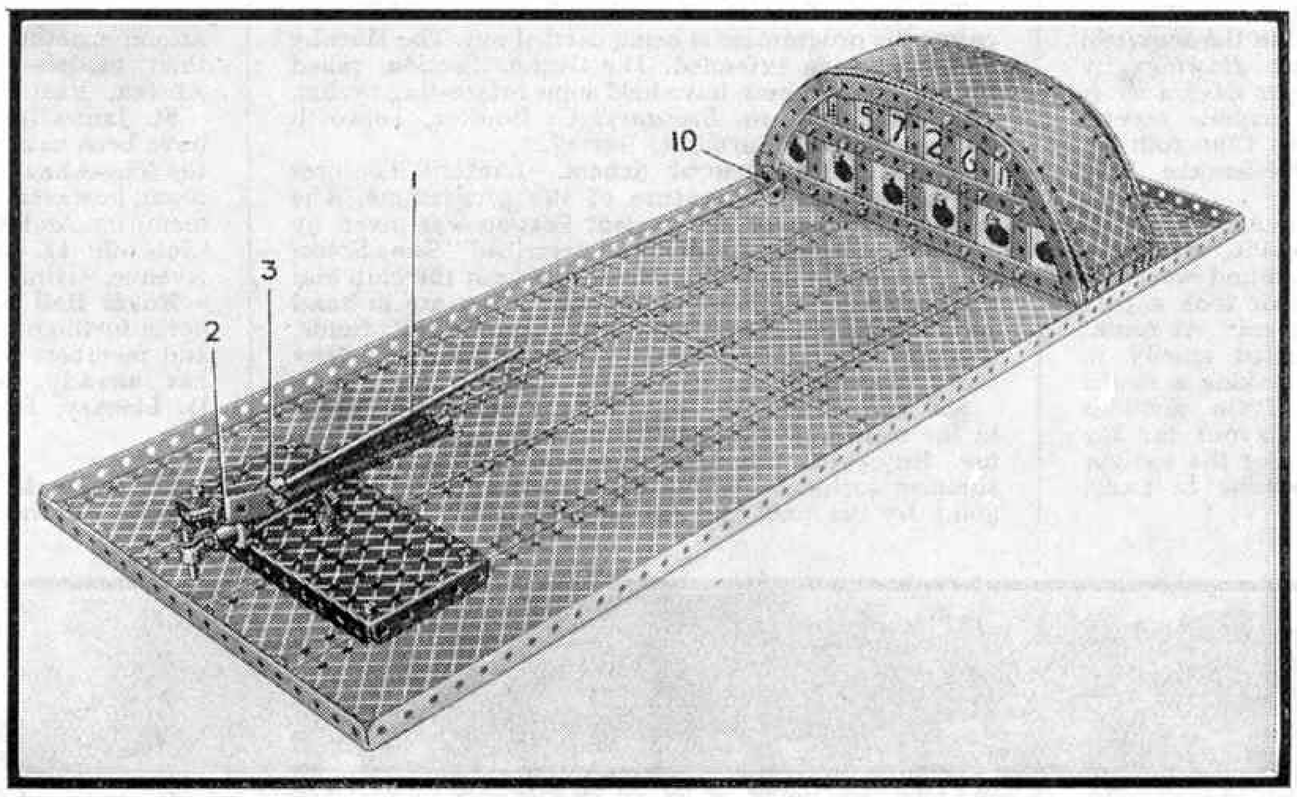


Fig. 1. An interesting shooting game operated by electricity. When a target is struck the score is indicated by a numbered panel illuminated by flashlamp bulbs.

The model is quite easy to assemble, and with the aid of the accompanying illustrations no one will have any difficulty in building it successfully. Meccano T6A or T20A Transformers connected to alternating current mains can be used for supplying current for the lamps, but if a Transformer is not available a 4.5-volt flash lamp battery will be found suitable for this purpose. The constructional details of the game can, of course, be varied to suit the particular Meccano parts available.

The baseboard on which the gun and targets are mounted consists of a frame, built of 24½" Angle Girders and 9½" Angle Girders, which is filled in with 12½" × 2½" Strip Plates. At one end of the base a 5½" × 2½" Flanged Plate is fastened in place by ¾" Bolts, and this provides a platform for the swivelling gun.

The gun is made up of a 6½" Rod 1 and a 4½" Rod fastened in the transverse bores of a Coupling. A Swivel Bearing is fastened by its "spider" to the 4½" Rod, which carries also a Collar fitted with bolts instead of grub screws. A second Collar also fitted with bolts is free to slide up and down Rod 1. The bolts in both Collars are connected by Springs. The mechanism for firing the shot comprises two 1" × ½" Angle Brackets 2 held together at their shorter ends by a Threaded Pin, and pivoted in their elongated holes to the bolts of the upper Collar. The butt, by means of which the gun is held steady while being fired, is a small Fork Piece fitted with a 1" Rod as shown. The gun is mounted on the 5½" × 2½" Flanged Plate by passing a ¾" Bolt through the Plates of the base into the boss of the Swivel Bearing.

The gun is loaded by pulling the Threaded Pin backward and looping the 1" × ½" Angle Brackets over the Coupling. The projectile is a Collar 3 from which the grub screw has been removed, and it is pushed on Rod 1 as shown. To fire the gun, the Threaded Pin is raised until the Angle Brackets are pulled clear of the Coupling and it flies forward by the action of the springs.

The housing containing the targets and lights should next be built. First a base frame is made from 9½" Angle Girders joined at each end by a 2½" Angle Girder. The front of the housing consists of two 4" Strips to which a 5½" Curved Strip is bolted. A 3½" Strip connects the centre of the 5½" Curved Strip to the centre of the front 9½" Angle Girders, and a 7½" Strip is bolted to the centre of the 3½" Strip. The space between the 7½" Strip and the Angle Girder is divided into squares by two 2" and two 2½" Strips, and the upper space also is divided by two 2" Strips and two 1½" Strips. At this stage the card 8 bearing the score numbers is fitted in place. The numbers are cut out, as in a stencil, and the card is bolted in place so that each number coincides with one of the spaces in the front of the housing. Each number is partitioned off from its neighbour by a piece of thin card, which is glued in position as shown in Fig. 2.

The next step is to fit the targets. Each of these is made from a Double Bracket spaced from a 1½" Strip by a Washer, a piece of white card measuring 1" × 1" being bolted to the other end of the 1½" Strip. The Double Brackets are pivoted on an 8" Rod 4 which is held in Handrail Couplings, and each target is prevented from moving sideways by two Spring Clips. Behind the 8" Rod is bolted a 4½" Strip 5, arranged at the angle indicated and fitted with six contacts, each of which is made by bolting a Flat Bracket to the Strip with insulated 6 B.A. Bolts.

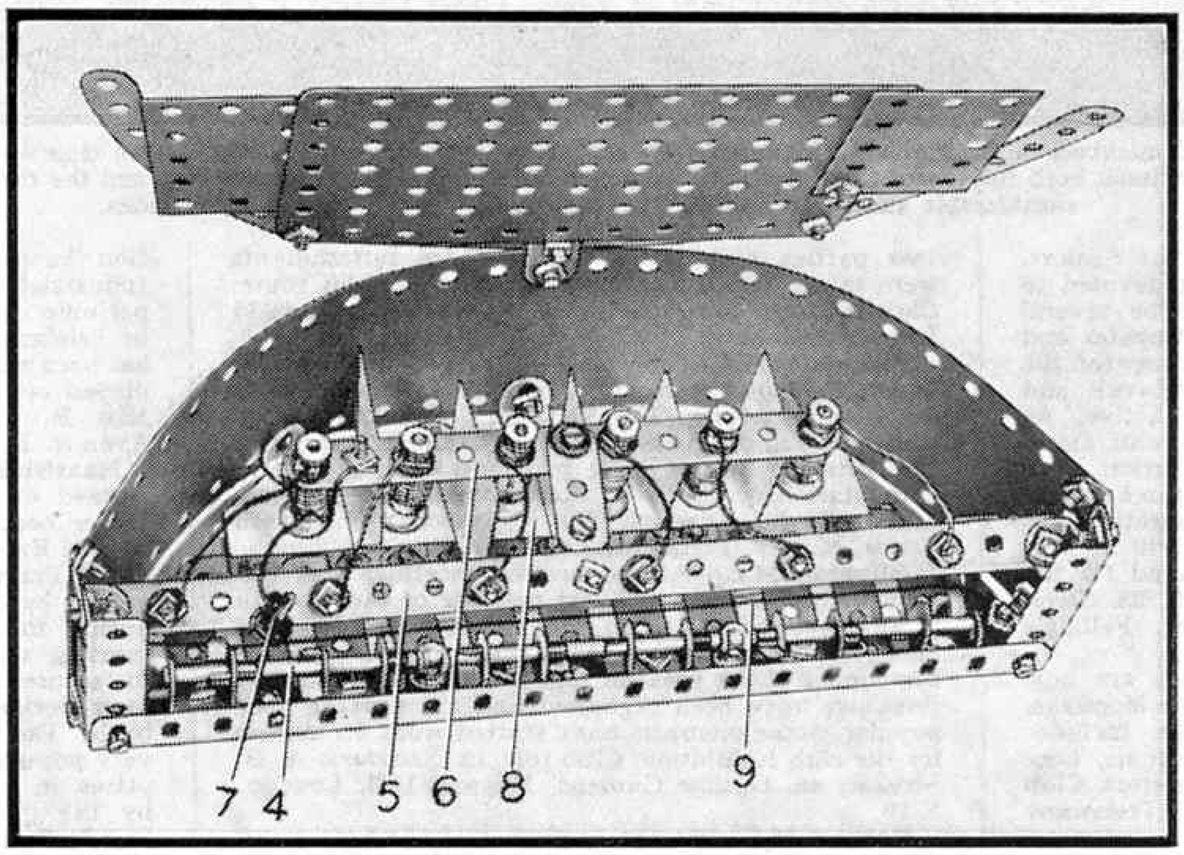


Fig. 2. The target housing with the back removed to show the arrangement of the contacts.

Strip 6 is fitted with six Lamp Holders, each of which carries a 3.5-volt Lamp. The Strip is supported by a 1½" Strip, insulated from Strip 6 by Insulating Washers and Bushes. The Terminals of the Lamp Holders are connected by short lengths of insulated wire to the insulated contacts on Strip 5. The 6 B.A. Bolt 7 is fitted with a Terminal insulated from the rear 9½" Angle Girder of the housing, and is connected to Strip 6 as shown. A second 6 B.A. Bolt is bolted to the same 9½" Angle Girder and to these Bolts are connected the leads from the Transformer or battery that is being used to operate the lamps.

When a target is hit it falls inward, and the bolt holding the card makes contact with the Flat Brackets on Strip 5, thus completing the electric circuit and causing its particular lamp to light up.

The back of the housing is now fitted. It is shown in Fig. 2 and comprises two 4" and one 5½" Curved Strip, two 2½" × 1½" Flexible Plates and a 5½" × 3½" Flat Plate. The top of the housing is a 12½" × 2½" Strip Plate attached by Obtuse Angle Brackets to the 2½" Angle Girders.

In order to reset the targets in their original positions after being hit, a cord 9 is tied to one side of the housing. It is then led behind the targets, and a Flat Bracket 10 is fastened to its other end. When all the targets have been shot down, this Flat Bracket is pulled, in order to bring the targets to an upright position again. The target housing is not bolted to the base but rests on the 24½" Angle Girders, thus allowing the Collars that fall in the housing to be recovered and the range to be adjusted.

Parts required to build model shooting alley: 2 of No. 1a; 1 of No. 1b; 3 of No. 2; 1 of No. 3; 2 of No. 5; 4 of No. 6; 9 of No. 6a; 2 of No. 7; 4 of No. 8a; 2 of No. 9d; 7 of No. 10; 6 of No. 11; 6 of No. 12; 2 of No. 12b; 5 of No. 12c; 1 of No. 13a; 1 of No. 14; 1 of No. 15a; 1 of No. 18b; 12 of No. 35; 95 of No. 37; 4 of No. 37b; 7 of No. 38; 1 of No. 40; 2 of No. 43; 1 of No. 52; 1 of No. 52a; 3 of No. 59; 1 of No. 63; 2 of No. 89; 4 of No. 89b; 5 of No. 111; 1 of No. 115; 1 of No. 116a; 2 of No. 136; 1 of No. 165; 14 of No. 182; 8 of No. 182a; 6 of No. 183; 6 of No. 184b; 2 of No. 188; 9 of No. 197; 9 of No. 1563; 16 of No. 1573; 16 of No. 1583.

Another exciting game, of a quite different type from that already described, is shown in Fig. 3. It consists of a circular platform or wheel carrying eight Dinky Toys Motor Cyclists, each of which is painted a different colour. The platform is rotated rapidly and as it revolves eight electric lamps mounted in front of the game flash on and off. Each lamp bears a card painted in the same colour as one of the Motor Cyclists, and the lamp remaining lit when the wheel comes to rest indicates the winner.

The construction of the model is commenced by joining the ends of two 12½" Angle Girders by two 7½" Angle Girders. This framework is then filled in by two 12½" × 2½" Strip Plates, one 5½" × 3½" and two 4½" × 2½" Flat Plates. The vertical flanges of the Angle Girders are extended downwards by 5½" × 1½" Flexible Plates to form the sides of the base.

The wheel on which the Motor Cyclists are mounted is a 7½" diam. Circular Strip, across which two 7½" Strips are bolted at right angles. A Bush Wheel is fastened to the 7½" Strips at their junction, and in its boss is locked a 3½" Rod. At its upper end this Rod is fitted with a second Bush Wheel, to which is bolted a Hub Disc and also a 1" Pulley complete with Rubber Tyre. The 3½" Rod is passed through a hole in one of the Flat Plates of the base, and on its lower end is secured a Flywheel. A reinforced bearing is provided for the Rod by a Double Bent Strip bolted to the underside of the Flat Plates, and by a Face Plate fixed to the upper side. The Face Plate is fastened to the base by two ½" Bolts, but is spaced from it by a Collar and two washers on each Bolt. Through each of the outer holes of the Face Plate a 6 B.A. Bolt is fastened, the Bolts being insulated from the Face Plate by Insulating Bushes. A Pendulum Connection, which is fastened to one of the 7½" Strips bolted across the Circular Strip, is adjusted so that it makes contact with the heads of the 6 B.A. Bolts.

The eight Lamp Holders are fastened to the base by 6 B.A. Bolts in two rows of four. The Lamp Holders are insulated from the base by Insulating Bushes, but the outer casings of the Holders in each row are connected by a 4½" Strip as shown in the illustration. The two 4½" Strips are joined by a further 4½" Strip, to the forward end of which a terminal for one of the leads from the Transformer or battery is secured. Each of the insulated central contacts of the Lamp Holders is connected by a length of wire to one of the 6 B.A. Bolts fastened to the Face Plate. The terminal for the second Transformer or battery lead is bolted directly to the frame of the model.

The Dinky Toys Motor Cyclists are mounted on the 7½" diam. Circular Strip by Double Brackets. If Dinky Toys Motor Cyclists are not available Dinky Toys Horses or small Cars can be used with equally good effect.

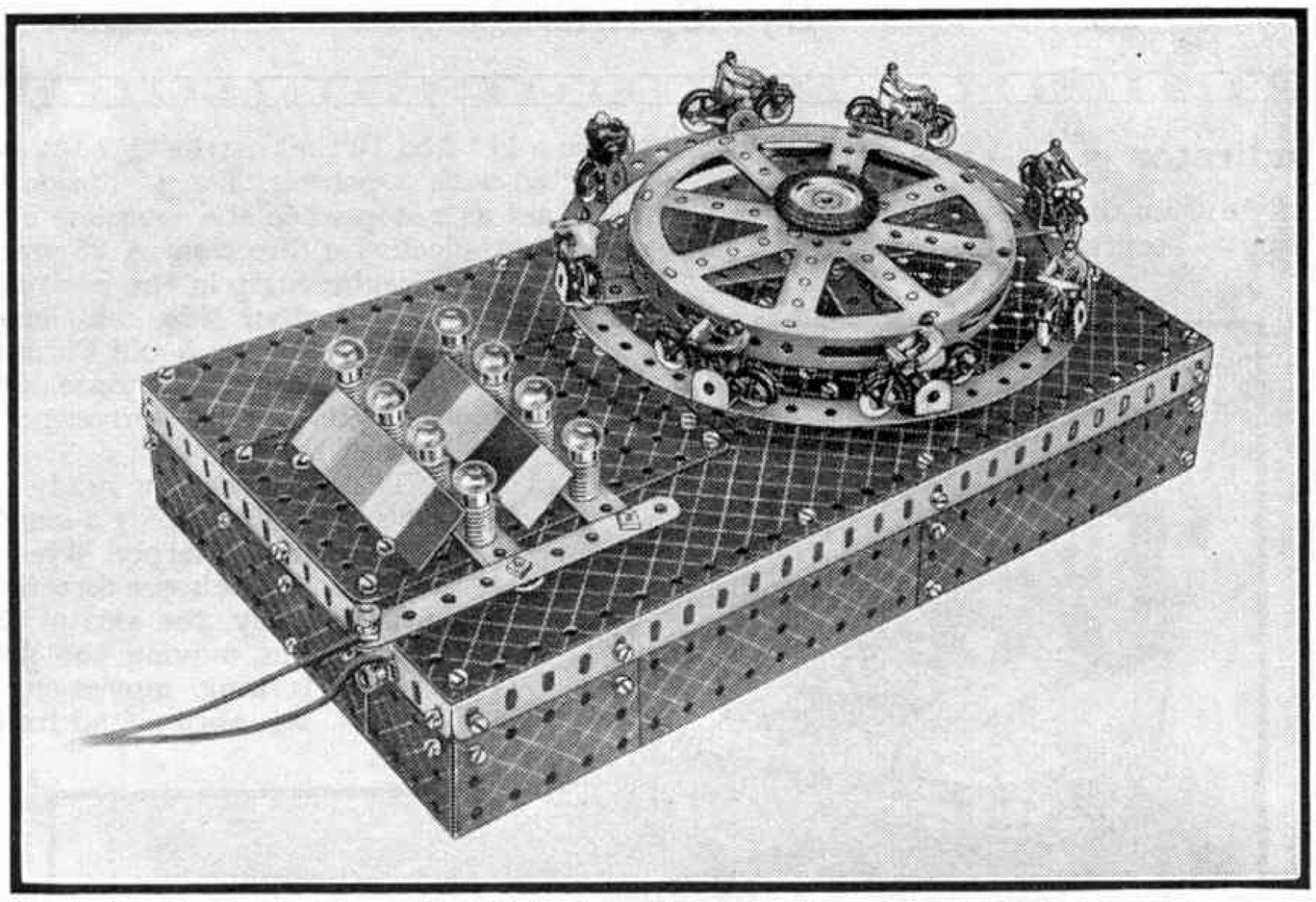


Fig. 3. A fascinating electric race game that will provide plenty of fun for a party. It can be operated either from a Meccano Transformer or a flash lamp battery.

Parts required to build electric race game: 3 of No. 1b; 3 of No. 2a; 2 of No. 3; 4 of No. 6; 2 of No. 8; 2 of No. 8b; 4 of No. 9e; 8 of No. 11; 1 of No. 16; 1 of No. 22; 2 of No. 24; 71 of No. 37a; 30 of No. 38; 1 of No. 45; 1 of No. 52a; 1 of No. 53a; 3 of No. 59; 1 of No. 62b; 1 of No. 70; 1 of No. 109; 2 of No. 111; 1 of No. 118; 1 of No. 132; 1 of No. 142c; 1 of No. 145; 1 of No. 172; 32 of No. 182; 8 of No. 183; 8 of No. 184b; 1 of No. 188; 7 of No. 189; 2 of No. 197; 10 of No. 1563; 22 of No. 1575; 32 of No. 1583; 8 Dinky Toys No. 37a.

The third game to be described is shown in Fig. 4. It comprises a sloping table fitted with an arrangement of deflectors, and having seven pockets, each bearing a number, at its lower end. A Steel Ball is rolled through a pivotally mounted chute at the upper end of the table, and the player attempts to direct the chute in such a manner that the Ball passes through the traps and runs into the pockets bearing the highest numbers.

The table is built up by joining the ends of two compound girders, each comprising a 12½" and a 9½" Angle Girder overlapped four holes by two 9½" Angle Girders, one of which is placed with its vertical flange projecting downward. The frame thus formed is filled in by five 12½" × 2½" and five 9½" × 2½" Strip Plates. The upper end of the table is fitted with two legs, each consisting of a 2" Strip.

The chute through which the Balls are fed consists of two 3½" Angle Girders, clamped by ¾" Bolts between two Flat Trunnions so that they form a box section girder. A Double Bracket is bolted between the lower ends of the two Flat Trunnions, and is also fastened by a lock-nutted bolt, which is passed through its central hole, to a third Flat Trunnion that extends outward from the front end of the table.

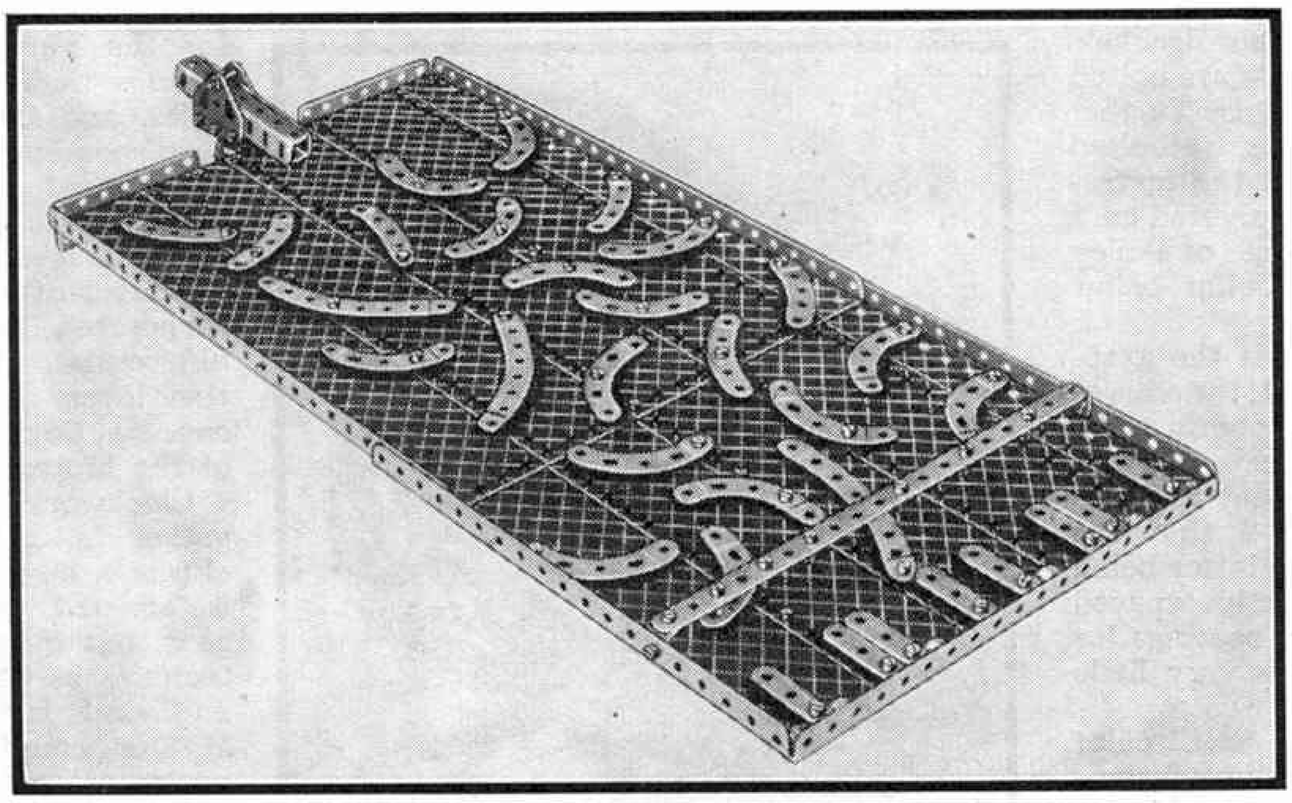


Fig. 4. A novel and easily built bagatelle board that is made entirely from Meccano.

The scoring pockets are formed by bolting 1½" Strips across the end of the table, in the positions shown. The Strips are spaced from the table by Collars. The deflectors are formed by Curved Strips of various sizes, which are bolted to the table so that they deflect the course of the balls as they roll from the chute. Further deflectors are provided by ⅜" bolts fastened through a 9½" Strip that is mounted across the lower end of the table by Angle Brackets. In arranging the Curved Strips and the ⅜" bolts, the builder need not necessarily copy the exact arrangement illustrated, but the aim should be to place the Strips in such positions that a certain amount of skill is required to obtain a high score.

If a sufficient quantity of Curved Strips is not available, ordinary Strips can be used. Alternatively, some of the Curved Strips can be replaced by bolts, which should be fastened in suitable positions to act as stops and deflectors for the Steel Balls.

Parts required to build model bagatelle table: 2 of No. 1a; 2 of No. 6; 8 of No. 6a; 2 of No. 8; 4 of No. 8a; 4 of No. 9b; 1 of No. 11; 2 of No. 12; 51 of No. 37; 22 of No. 37a; 48 of No. 38; 8 of No. 59; 4 of No. 89b; 6 of No. 90; 15 of No. 90a; 2 of No. 111; 8 of No. 111a; 10 of No. 111c; 5 of No. 117; 5 of No. 126a; 5 of No. 196; 5 of No. 197.

Meccano Suggestions Section

By "Spanner"

(394) Turn Indicator (R. Evans, Brighton)

When an aeroplane has to fly during the night or in fog or cloud, the pilot must have at his disposal accurate instruments if he is to keep to his course. One of those on which he must rely is the turn indicator, which tells him when his machine is turning and the extent of this movement. The actual instrument incorporates a gyroscope driven at high speed. In effect this is a small flywheel with a very heavy rim. When the wheel is spinning at high speed, an attempt to move its axis from its normal position causes it to turn at right angles to the force applied to it. This movement is called precession, and the turn indicator makes use of it. This instrument is placed so that the axis of spin lies directly fore and aft in the machine, and the frame supporting it is pivoted. Thus when the aeroplane turns either right or left, the precessional movement of the axis is transmitted through a series of links to a pointer on the dial of the instrument.

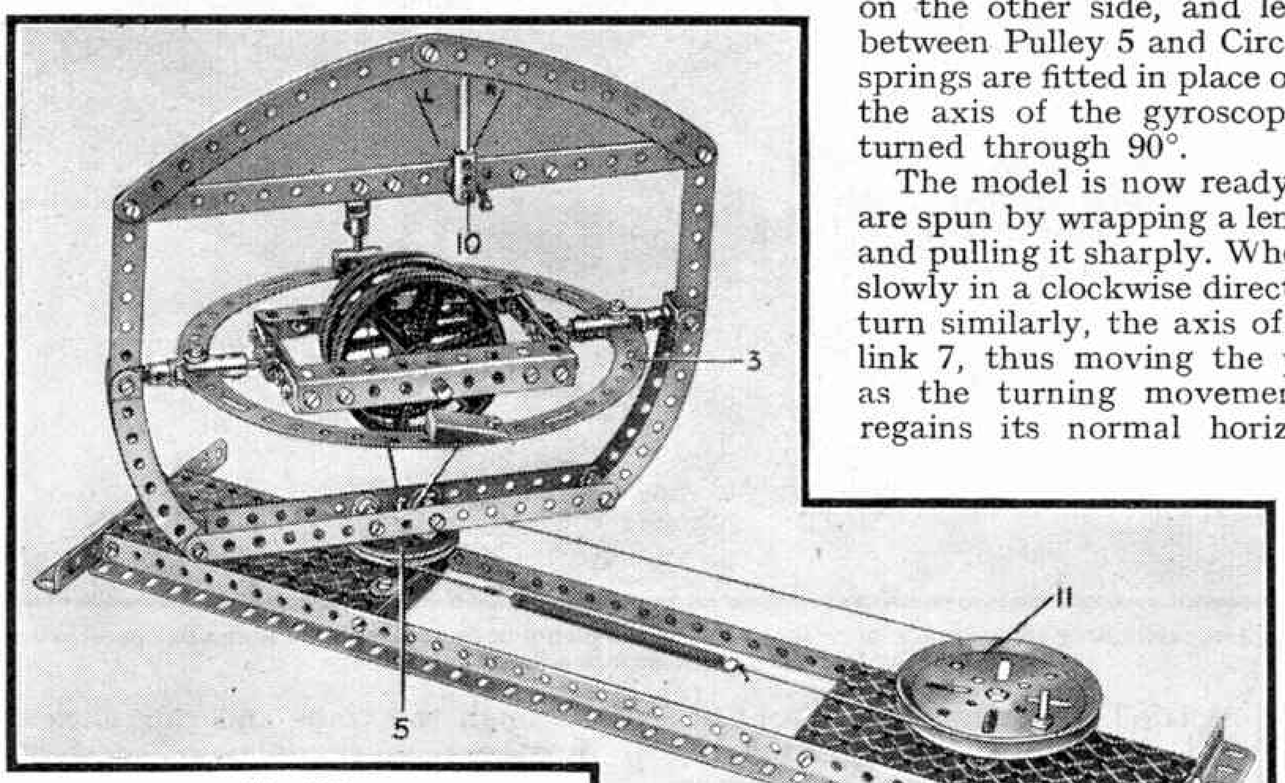


Fig. 394

Figs. 394 and 394a show a Meccano model of this type of instrument, which can be used to demonstrate the action of the actual mechanism. The model is carried on a base consisting of two 18½" Angle Girders bolted at each end to a 5½" × 2½" Flanged Plate. The aeroplane instrument board is represented by a framework made up of a 9½" Strip and two 5½" Curved Strips, filled in with a piece of cardboard. The instrument board is supported by a second framework built as follows. Two 7½" Strips are attached by Double Brackets to a 2" Pulley 5, and to their ends are bolted 4" Curved Strips spaced apart by further Double Brackets. Two 3½" Strips are bolted between the Curved Strips and the instrument board. This framework is pivoted on a 2" Rod, which is locked in the boss of Pulley 5 and is held in place by a Collar below the left-hand Flanged Plate.

The chief part of the model is the gyroscope. The axis of this is a 3" Rod, the ends of which are carefully filed to points. The Flywheels 1 are fastened on this Rod by means of double grub-screws, and the axis is journalled in Grease Cups 2 that are bolted to 4½" Angle Girders, the latter being joined at their ends by 3" Strips spaced inward by Washers. This gives bearings for the Flywheels in which there is very little friction.

This frame is supported in a Circular Strip by locking 1" Rods in Couplings fastened to the frame, the 1" Rod being held also in Strip Couplings. The small Fork Pieces 4 are pivoted on Threaded Pins and are bolted to the Strip Couplings as shown.

The method of linking the Circular Strip 3 to the pointer is shown in Fig. 394a. A Coupling is bolted to the Circular Strip and a 1" Rod carrying Swivel Bearing 6 is fastened in its centre plain transverse bore. A 3½" Strip 7 is pivotally attached to a 2½" Rod that is locked in the "spider" of Swivel Bearing 6. Strip 7 has a Crank bolted to its other end, and a 2" Rod 8, journalled in two 1" × 1" Angle Brackets is locked in the boss of the Crank. Rod 8 carries a Coupling and a ½" Pinion, which meshes with a ¾" Contrate 9. The latter is fastened on a 1½" Rod 10 that carries three Washers, a Collar and a Coupling fitted with a pointer. The ½" Pinion on Rod 10 carries a ¾" Bolt to act as a stop when the complete instrument is turned rapidly in an anti-clockwise direction. A 25-gramme Weight is bolted to the Circular Strip in the position shown to balance the links on the other side, and lengths of elastic are stretched between Pulley 5 and Circular Strip 3. In actual practice springs are fitted in place of these elastic bands, otherwise the axis of the gyroscope would precess until it had turned through 90°.

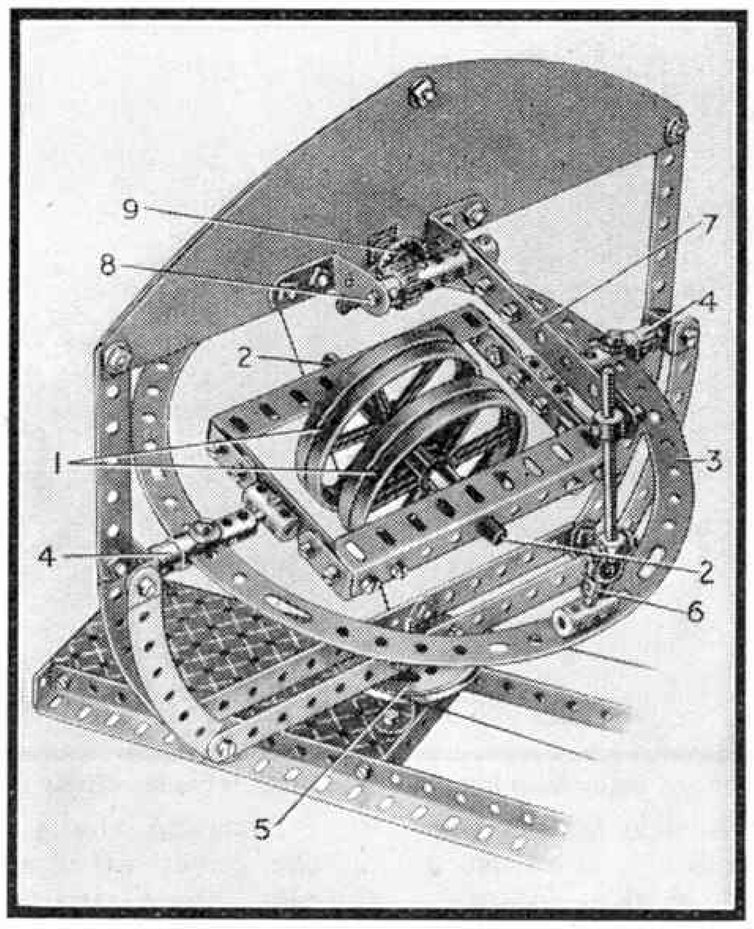


Fig. 394a

The model is now ready for operation. The Flywheels are spun by wrapping a length of Cord round their bosses and pulling it sharply. When the Pulley 11 is then turned slowly in a clockwise direction, causing the framework to turn similarly, the axis of the gyroscope tilts and raises link 7, thus moving the pointer to the right. As soon as the turning movement stops the gryoscope axis regains its normal horizontal position, bringing the pointer vertical. Similarly when Pulley 11 is rotated in an anti-clockwise direction link 7 is pulled downward and the pointer is moved over to the left.

(395) Coupling Electric or Clockwork Motors

(I. Harris, Bexley, Kent)

In *"Suggestions Section"* of the issue of the *"M.M."* for December 1932 a description was given of a device for coupling two Electric Motors together, either to combine their power outputs, or with the object of uncoupling one Motor when the other was reversed. This device has many uses, but it is not always desirable to have such a complicated mechanism as that described. I. Harris, Bexley, Kent, points out that a good plan is to use a simple car-type differential for the purpose. The shafts of the two Motors then take the places of the rear axles, and the drive is taken from a Rod corresponding in position to the cardan shaft used when the differential forms part of a car mechanism.

If it is desired to use either of the Motors independently, Dog Clutches can be incorporated between each Motor and the differential. For simplicity of control, the levers operating the Dog Clutches can be linked to the reversing switches of the Motors.

Clockwork Motors can be coupled together in a similar manner in order to obtain a more powerful drive. This usually is effected by using a large reduction gear, but in some models this is not satisfactory, as the speed of rotation of the final shaft is then very slow. With the two Motors coupled together the necessary power is obtained without a great reduction in speed.

The Clockwork Motors should be arranged so that both shafts revolve in the same direction. It will be seen that if one of the Motors is reversed, the two drives will neutralise each other in the differential and the driven shaft will remain stationary. If both Motors are reversed the driving shaft also will be reversed.

The neutral effect obtained when one Motor is in reverse and the other is driving in the normal direction, is valuable when using Electric Motors, as it obviates the necessity of stopping the Motors at the end of each cycle of operations. Various movements in the model can be coupled to one or other of the Motors with Dog Clutches.

(396) Fast and Loose Pulley Belt Change (G. Hope, Liverpool)

One of the most useful devices in engineering workshops is the fast and loose pulley belt change. This is used where lathes and drilling machines are driven by belts from overhead shafts, which supply power to several machines. In order that any machine can be started or stopped as desired some device is necessary whereby the drive can be controlled without interfering with the main overhead shafting. The fast and loose pulley device fulfils this requirement. It consists essentially of two pulleys mounted on the overhead shaft, one of the pulleys being fixed and the other free to turn independently of the shaft. The fast pulley is used to transmit the drive to the machine, and when it is desired to stop the machine the belt is transferred to the loose Pulley by means of a simple fork, which is moved either by means of a lever or by pulling a cord or chain.

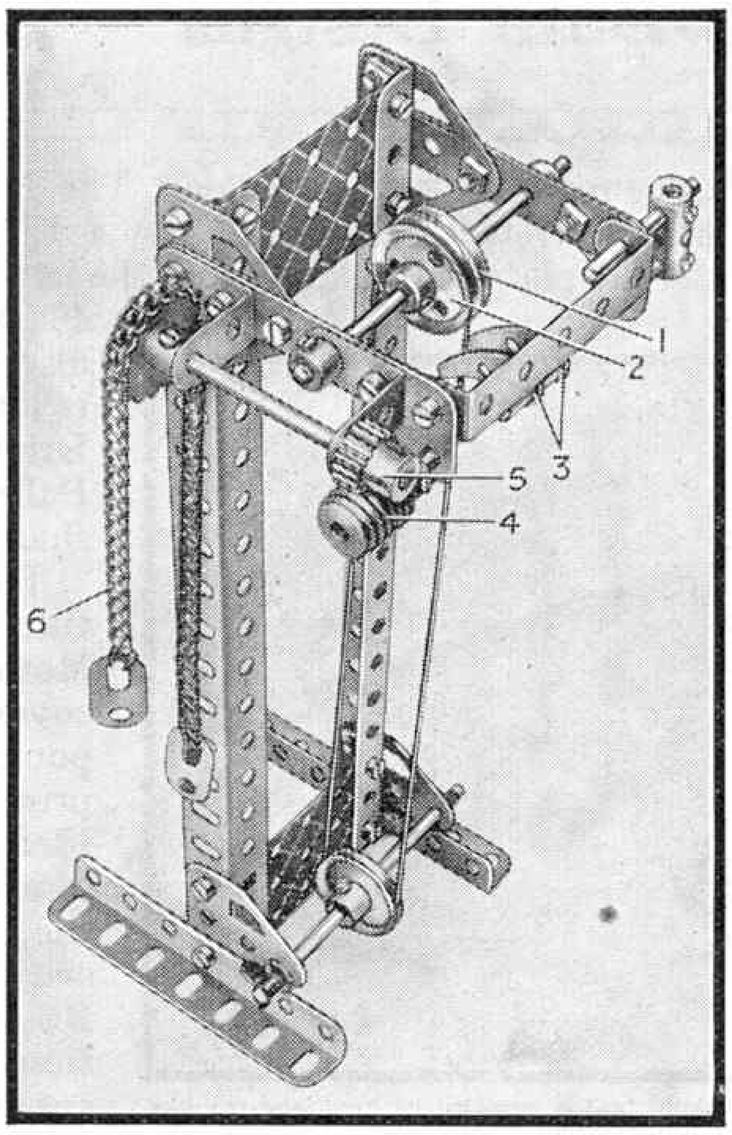


Fig. 396

An ingenious Meccano model of an arrangement of this kind in which a chain is used has been designed by G. Hope, Liverpool, and is shown in Fig. 396. The overhead shaft is a 3½" Rod fitted with a 1" fast Pulley 1 and a 1" loose Pulley 2, the latter being held against the fast Pulley by a Collar. The driving belt is a Driving Band, and it passes between the prongs of a fork made from two Pawls 3 fastened on a 4½" Rod that is journalled in two 1" Corner Brackets. The Rod carries at one end a Coupling, fitted with a 1½" Rod to act as a guide, and at the other a Worm 4 meshing with a ½" Pinion 5 fastened on a 2½" Rod. Sprocket Chain 6 passes over a 1" Sprocket fastened on the end of the 2½" Rod. When the upper shaft carrying the Pulleys is rotated, the Driving Band can be transferred from the fast Pulley to the loose Pulley by pulling one end of the Sprocket Chain 6 by its Flat Bracket.

Another method of using a lever to operate the belt change can be arranged on somewhat similar lines. A Strip is pivoted above the overhead shaft, and a Threaded Pin fastened to the Strip engages between two ½" Pulleys fixed on the sliding shaft.

(397) Electric Candle Lamp

(J. Usher, Dundee)

Model-builders will be interested in the neat candle lamp shown in Fig. 397, which was made by J. Usher, Dundee. It is of special interest as no wiring is needed, and it is very easy to make. The lamp is operated from a small battery housed in the Sleeve Piece that forms the "candle."

The base of the lamp is a Boiler End fitted with a Wheel Flange. A Chimney Adaptor 3 is bolted to the Boiler End by an insulated 6BA Bolt, the nut of which holds also a Flat Bracket inside the boiler end. The other end of the Flat Bracket is held by the insulated 6BA Bolt 4, which carries also a Reversed Angle Bracket. A Double Bracket bolted to the latter forms the handle of the lamp.

An interesting feature of the lamp is the neat switch that is fitted to the handle. This consists of a Spring Clip 5, one lug of which has been shortened by half its length. The Spring Clip is fixed on a Threaded Pin held in a Collar bolted to the Double Bracket previously mentioned. By moving the Spring Clip its shortened end can be brought into contact with the head of the 6BA Bolt 4.

The Sleeve Piece 2 is fitted over the Chimney Adaptor 3 and a second Chimney Adaptor is fitted in its upper end. This Chimney Adaptor carries a Lamp Holder 1, which is held in place by a ⅜" 6BA Bolt, insulated from the Adaptor. A 2½ volt bulb is used and the battery consists of one cell of an Ever Ready Fountain Pen battery type 1915. The battery is fitted in the Sleeve Piece and the ⅜" 6BA Bolt of the upper Chimney Adaptor is arranged to make contact with the brass stud at the top of the battery.

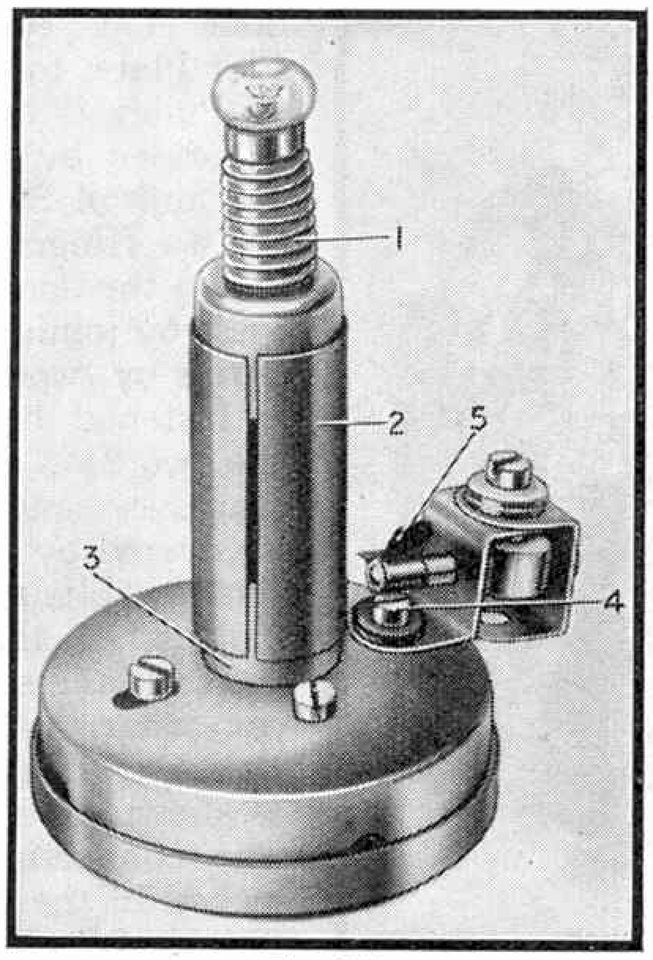


Fig. 397

The Wheel Flange is held in place by three ¾" Bolts, and a 7/32" Bolt is fastened in its remaining hole in order to make the base of the lamp steady when placed on a flat surface.

The lamp can be used as a torch by removing the base, and instead of an insulated 6BA Bolt in the lower Chimney Adaptor an ordinary bolt is then used. To switch the lamp off it is then necessary to pull one of the Chimney Adaptors.

(398) Meccano Ball Bearings

(R. Nelson, Birmingham and A. Alister Inlay, Skene)

In building large working models with many rotating shafts it is necessary to design the bearings so that they introduce as little friction as possible, and this aspect of model-building becomes of even greater importance when only one Motor is available to drive several different movements. The efficient ball bearing unit shown in Fig. 398 can be used with good effect in these circumstances. It was devised by R. Nelson, Birmingham, and is very compact, requiring few parts for its construction.

The bearing consists of two ¾" Flanged Wheels 1 and 2, with four Steel Balls fitted between them. Flanged Wheel 1 is fixed on the Rod, while the other is free to revolve, and a Collar is used to prevent them from slipping out of position. Only a small proportion of the rims of the Flanged Wheels is in contact with the Steel Balls, and as a result, friction is reduced to a minimum.

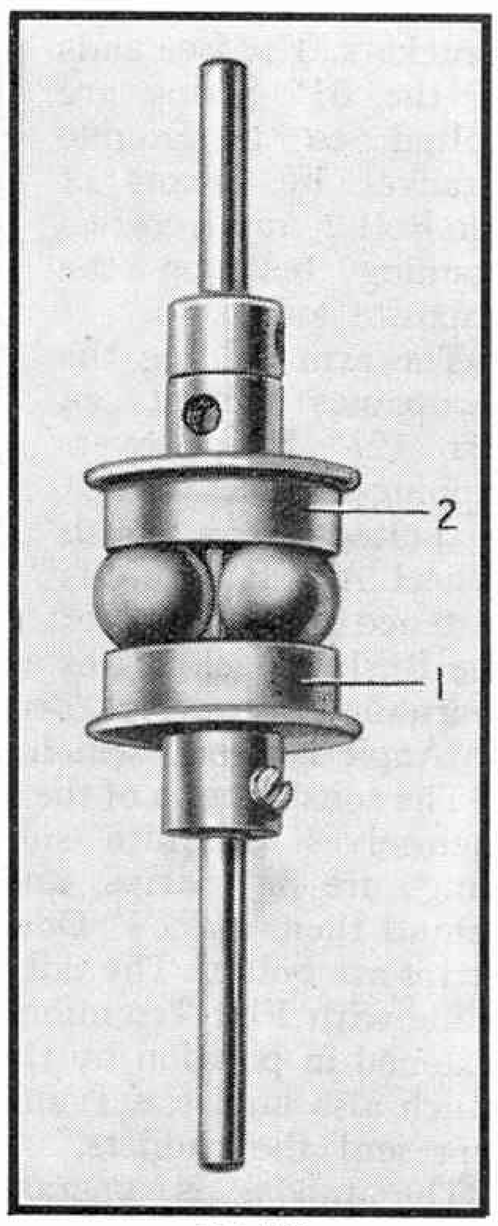


Fig. 398

When the bearing is used to support a rotating superstructure it is mounted in place by bolting Angle Brackets to Flanged Wheel 2 and attaching them to the frame of the model. Similar ball bearings can be made by placing five Steel Balls between two 1" Pulleys. The same method as before is used for mounting the ball bearings in a model.

A. Alister Inlay, Skene, has devised two ball bearing units that are not so compact as those previously described, but can be used in a variety of models and can be subjected to heavier loads without causing strain. The first consists of a Wheel Flange, to which is bolted a Bush Wheel, which is spaced from the inside of the Wheel Flange by two washers. There is sufficient space between the rim of the Bush Wheel and the flange to accommodate 14 Steel Balls. To complete the unit a 2" Pulley, a 2" Sprocket or a 2½" Gear is placed over the Steel Balls, and a Rod is fixed in the boss of the Bush Wheel. The second ball bearing unit is made from a 1⅛" Flanged Wheel. Five Steel Balls are placed inside the Flanged Wheel, and a 1" Pulley or a Sprocket Wheel is used to hold them in place.

The ball bearing made with a Wheel Flange will be found useful in small model cranes, or in any structure where the entire weight rests on the ball bearing.

Attractive New Models

Varied and Easily-Built Designs

MODEL-BUILDERS on the look-out for an interesting but simple working model that can be built with a few parts will find the aeroplane roundabout shown in Fig. 1 a pleasing subject. A $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate is used for the base, and four $5\frac{1}{2}''$ Strips are fastened to it by means of Angle Brackets. The free ends of the $5\frac{1}{2}''$ Strips are bolted to a Double Bracket by means of the Bolt 2, and a corresponding bolt on the opposite side.

The arm holding the aeroplanes consists of two $12\frac{1}{2}''$ Strips overlapping 17 holes, and it is bolted to a Bush Wheel. A 2" Rod that is fastened in the boss of the Bush Wheel carries also a 1" Pulley, and the Rod is journalled in bearings formed by the Double Bracket and an Angle Bracket, which is held in place by the Bolt 2.

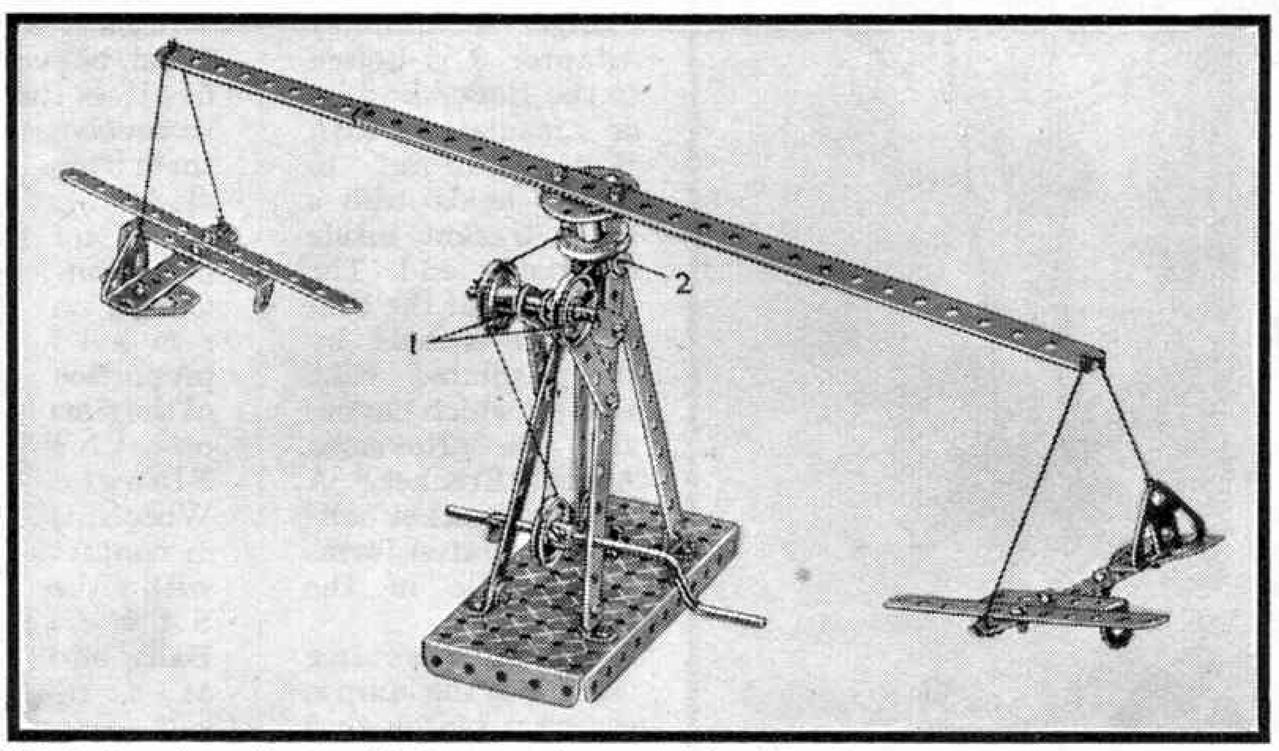


Fig. 1. A neat working model of an aeroplane roundabout that is operated by hand and requires only a few parts for its construction.

The construction of the aeroplanes themselves is quite simple. The wings are $5\frac{1}{2}''$ Strips, and directly behind them $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips are bolted. The tail planes are made with Flat Trunnions, and are fastened in position by the Bolts 7, which also hold the Trunnions that represent the rudders.

The model is operated by a Crank Handle journalled in two of the $5\frac{1}{2}''$ Strips. The Crank Handle carries at its centre a 1" Pulley, which is connected by Cord to the 1" Pulley on the shaft carrying the aeroplane beam. The Cord passes over two further 1" Pulleys 1, and the manner in which these are supported will be clear from the illustration.

Parts required to build aeroplane roundabout: 2 of No. 1; 6 of No. 2; 2 of No. 2a; 4 of No. 5; 1 of No. 11; 5 of No. 12; 2 of No. 17; 1 of No. 19s; 4 of No. 22; 1 of No. 24; 5 of No. 35; 24 of No. 37; 2 of No. 38; 2 of No. 48a; 1 of No. 52; 2 of No. 126; 2 of No. 126a.

The fine working model heavy oil engine illustrated in Fig. 2 is commenced by building up the base. This consists of three $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plates fastened together by their longer flanges. On it two $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plates are mounted vertically by means of Angle Brackets, and their flanges are joined by two $4\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plates. The E120 Electric Motor is bolted to the baseplate in the centre of the superstructure so formed. The Motor pinion meshes with a 57-teeth Gear fixed on a $1\frac{1}{2}''$ Rod journalled in the sideplate of the Motor and the left-hand $4\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plate. The Rod carries also a $\frac{1}{2}''$ Pulley, which is later connected by a Driving Band to a $1\frac{1}{2}''$ Pulley on the crankshaft.

The top of the structure containing the Motor is next partially covered by two compound plates, each comprising two $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates overlapped three holes at their ends. These plates are fastened by Angle Brackets in the positions shown, so that a space is left between them for the Driving Band operating the crankshaft.

Two $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plates are secured by $2\frac{1}{2}''$ Strips to the upper edges of the $4\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plates, so that they protrude upwards to form the ends of the crankcase. The back of the crankcase is filled by a further $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate, but the front is provided with an inspection door. This consists of a $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plate, to the centre of which a 2" Pulley is bolted, and its handle is formed by a 1" Rod fastened in a Handrail Support.

Two Hinges and Angle Brackets fasten the door to a frame, which is built by joining the ends of two $3\frac{1}{2}''$ Strips by two $2\frac{1}{2}''$ Strips. The frame is fastened by Angle Brackets to the two $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plates of the crankcase, and the top of the latter is covered by two $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flanged Plates, bolted in position by their flanges so that a space is left between them in which the piston can work.

The crankshaft is next built up as shown, and placed in the model. The connecting rod is a 2" Rod locked in the Coupling forming the "big end," and to it a $4\frac{1}{2}''$ Rod is pivotally secured by a Swivel Bearing to represent the piston rod. The webs are fastened on the ends of two 4" Rods which are journalled in the $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plates of the crankcase. These bearings are reinforced by Face Plates, as shown in the illustration.

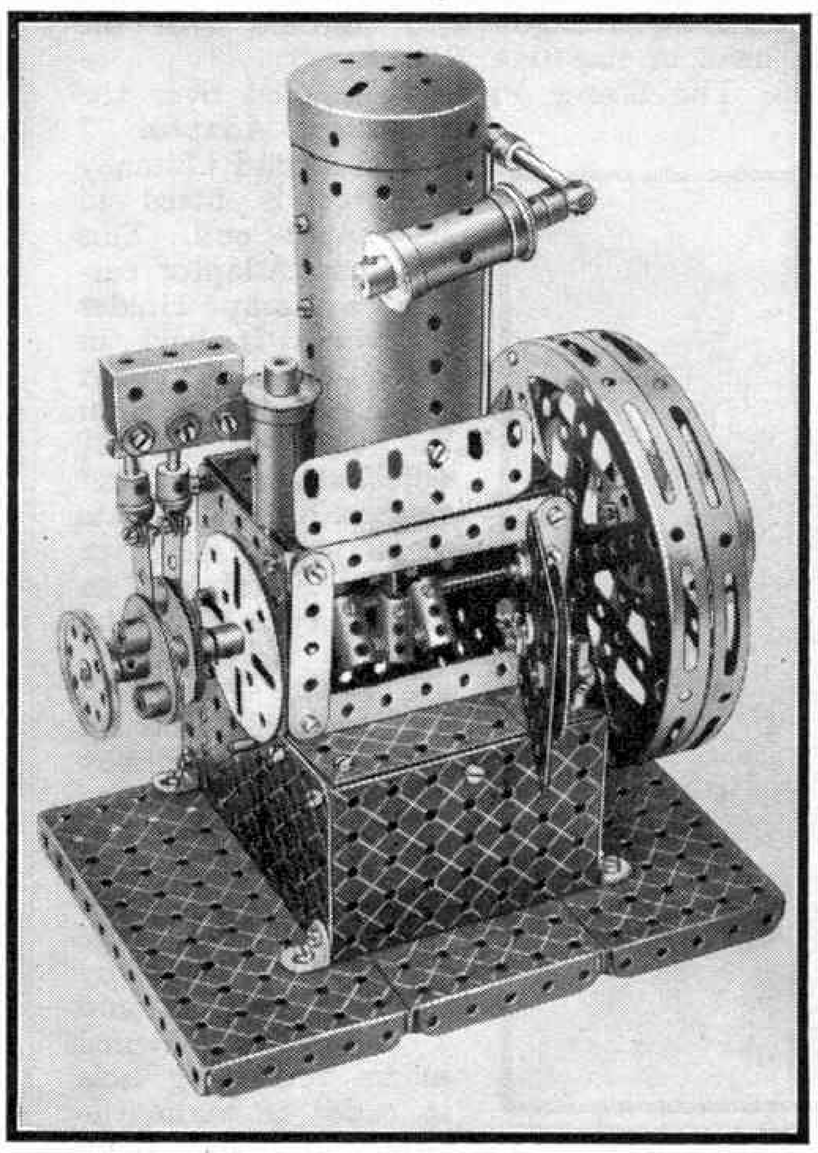


Fig. 2. This model heavy oil engine is driven by an Electric Motor concealed in the base. It is equipped with a built-up crankshaft, a working piston and oil pumping gear.

A Boiler, fastened by Angle Brackets to the top of the crankcase is used for the cylinder. The piston rod moves up and down in guides formed by the centre holes of two $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips placed inside the cylinder. These Double Angle Strips are secured to the sides of the Boiler by $\frac{1}{2}''$ Bolts, but spaced from them by Collars.

The oil pumping apparatus consists of two Triple Throw Eccentrics fastened on the end of the crankshaft. An End Bearing is bolted to the end of the arm of each Eccentric, and in its boss is locked a $1\frac{1}{2}''$ Rod. Other details of the apparatus are shown clearly in Fig. 2.

Parts required to build model oil engin :2 of No. 3; 4 of No. 5; 1 of No. 10; 19 of No. 12; 4 of No. 15a; 1 of No. 16; 1 of No. 17; 5 of No. 18a; 1 of No. 18b; 3 of No. 20b; 2 of No. 21; 1 of No. 22; 1 of No. 27a; 55 of No. 37a; 14 of No. 38; 2 of No. 48; 2 o) No. 51; 3 of No. 52; 3 of No. 53; 7 of No. 59; 3 of No. 63; 2 of No. 72; 1 of No. 103d; 2 of No. 109; 4 of No. 111a; 2 of No. 118; 2 of No. 130; 1 of No. 136; 2 of No. 136a; 1 of No. 160; 1 of No. 162; 1 of No. 162a; 2 of No. 163; 1 of No. 164; 1 of No. 165; 2 of No. 166; 1 of No. 186; 1 E120 Electric Motor.

The roadway of the simple model bridge shown in Fig. 3 is constructed by joining the ends of two compound girders, each comprising two $18\frac{1}{2}''$ Angle Girders overlapping two holes, by $4\frac{1}{2}''$ Strips. The space between the girders is filled by four $12\frac{1}{2}'' \times 2\frac{1}{2}''$ and four $9\frac{1}{2}'' \times 2\frac{1}{2}''$ Strip Plates.

The top of the main pier, which is next constructed, is formed of a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate, with its sides extended by a compound plate consisting of a $5\frac{1}{2}'' \times 1\frac{1}{2}''$ and a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate. At its ends are two $3\frac{1}{2}'' \times 2''$ Flanged Plates. The sides and ends of the pier are fastened together by two $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips. The bottom of the pier consists of a second $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate.

The steel work of the bridge is built up by bolting two $3\frac{1}{2}''$ Angle Girders to each end of the bridge. The upper ends of these Angle Girders are then joined by Curved Strips of various sizes to $3\frac{1}{2}''$ Strips, which are fastened to the sides of the roadway at the centre of the bridge.

The approach roadways are constructed as separate units and then fastened in position at each end. Each unit consists of two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Strip Plates bolted together, overlapping one hole along their sides. The sides of the compound plate so formed are strengthened by two $5\frac{1}{2}''$ Angle Girders, the vertical flanges of which are connected by $2\frac{1}{2}''$ and $3''$ Strips to two further $5\frac{1}{2}''$ Angle Girders. The latter Girders are bolted to the top of a small pier built up by extending the flanges of a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate downwards by $5\frac{1}{2}'' \times 1\frac{1}{2}''$ and $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates. When completed, the approach roadways are attached by Flat Brackets to the ends of the roadway of the bridge.

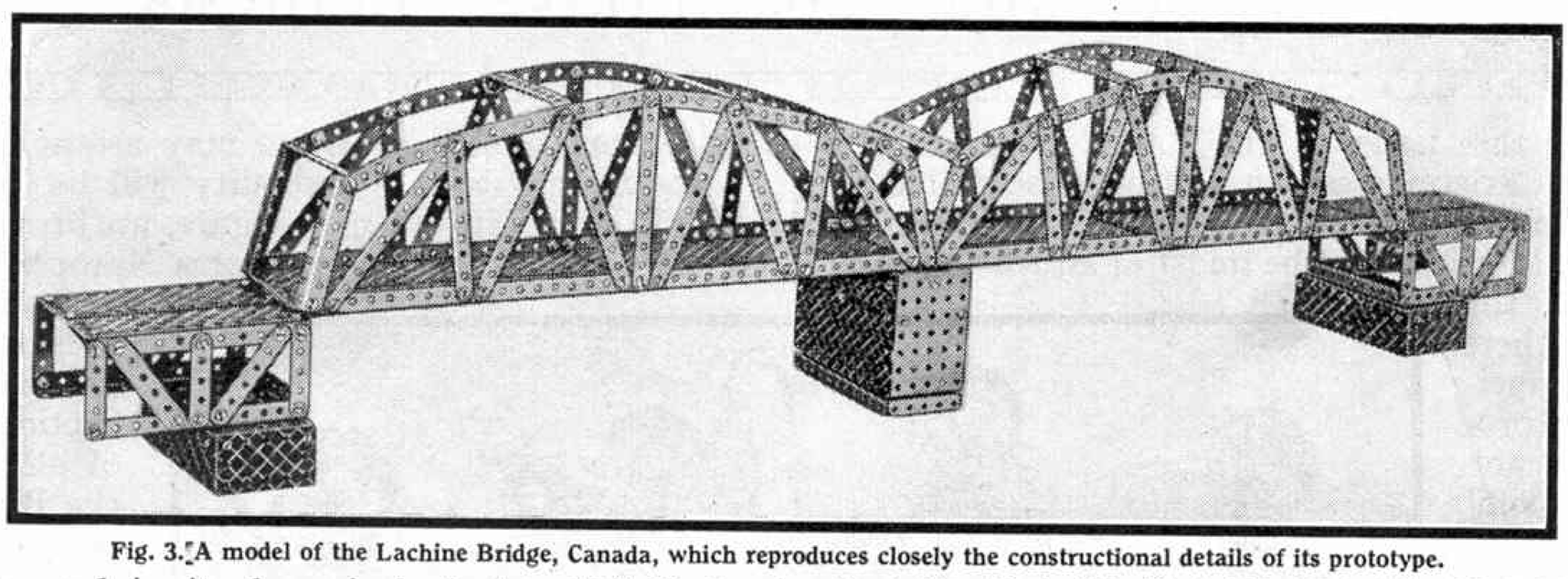


Fig. 3. A model of the Lachine Bridge, Canada, which reproduces closely the constructional details of its prototype.

To complete the bridge the $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate of the bottom of the pier is removed, when the pier and the roadway can be bolted together. The method of securing the $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate in position again, when the pier and roadway have been bolted together, is to fix a bolt on the lower flange of each $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate by a nut. The $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate can then be fitted on the bolts and secured by further nuts.

Parts required to build model bridge: 28 of No. 2; 10 of No. 2a; 4 of No. 3; 24 of No. 4; 12 of No. 5; 8 of No. 6a; 4 of No. 7a; 8 of No. 9; 4 of No. 9a; 4 of No. 9b; 2 of No. 48a; 8 of No. 48c; 4 of No. 52; 2 of No. 53; 4 of No. 89; 4 of No. 188; 6 of No. 189; 6 of No. 192; 4 of No. 196, 4 of No. 197.

Fig. 4 shows a model of a disc sander or wood smoothing machine, of a type sometimes used in joinery shops. If strongly constructed the model can be used for sandpapering small pieces of wood, and it also makes a handy pencil sharpener.

In making it two $3''$ Angle Girders are first bolted to a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate, as shown in the illustration. The ends of the Angle Girders are joined by two $5\frac{1}{2}''$ Strips. The sanding disc consists of a $4''$ Circular Plate, to the face of which is glued a sheet of sandpaper. A Bush Wheel is bolted to the centre of the Circular Plate, and by means of this the Plate is fastened on the end of $2\frac{1}{2}''$ Rod 1. This Rod carries a $\frac{1}{2}''$ Pinion, and is journalled in a $1'' \times 1''$ Angle Bracket and a $1\frac{1}{2}''$ Flat Girder. The Bolts holding the $1'' \times 1''$ Angle Bracket also carry beneath the $5\frac{1}{2}''$ Strips, a Coupling in which is journalled a $2''$ Rod. A $\frac{1}{2}''$ Pinion 2 and a 57-teeth Gear that meshes with the Pinion on Rod 1 are locked on this Rod. The $\frac{1}{2}''$ Pinion 2 meshes with a 57-teeth Gear 4 on a $2\frac{1}{2}''$ Rod, the bearing for which is provided by another Coupling bolted underneath the $5\frac{1}{2}''$ Strips. At its outer end, this Rod carries a Coupling 3, in the longitudinal bore of which is secured a $2''$ Rod. A second Coupling fixed on the other end of the Rod forms the operating handle.

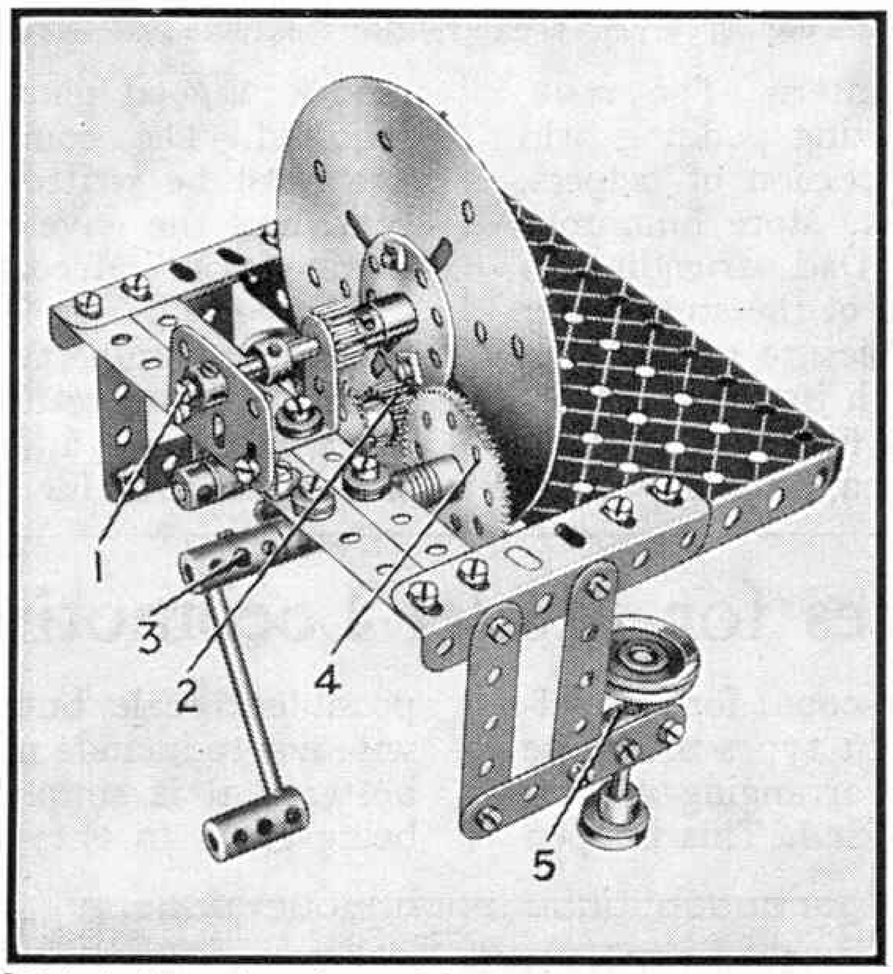


Fig. 4. A disc sandpapering machine that can be used for smoothing small pieces of wood, or for sharpening pencils.

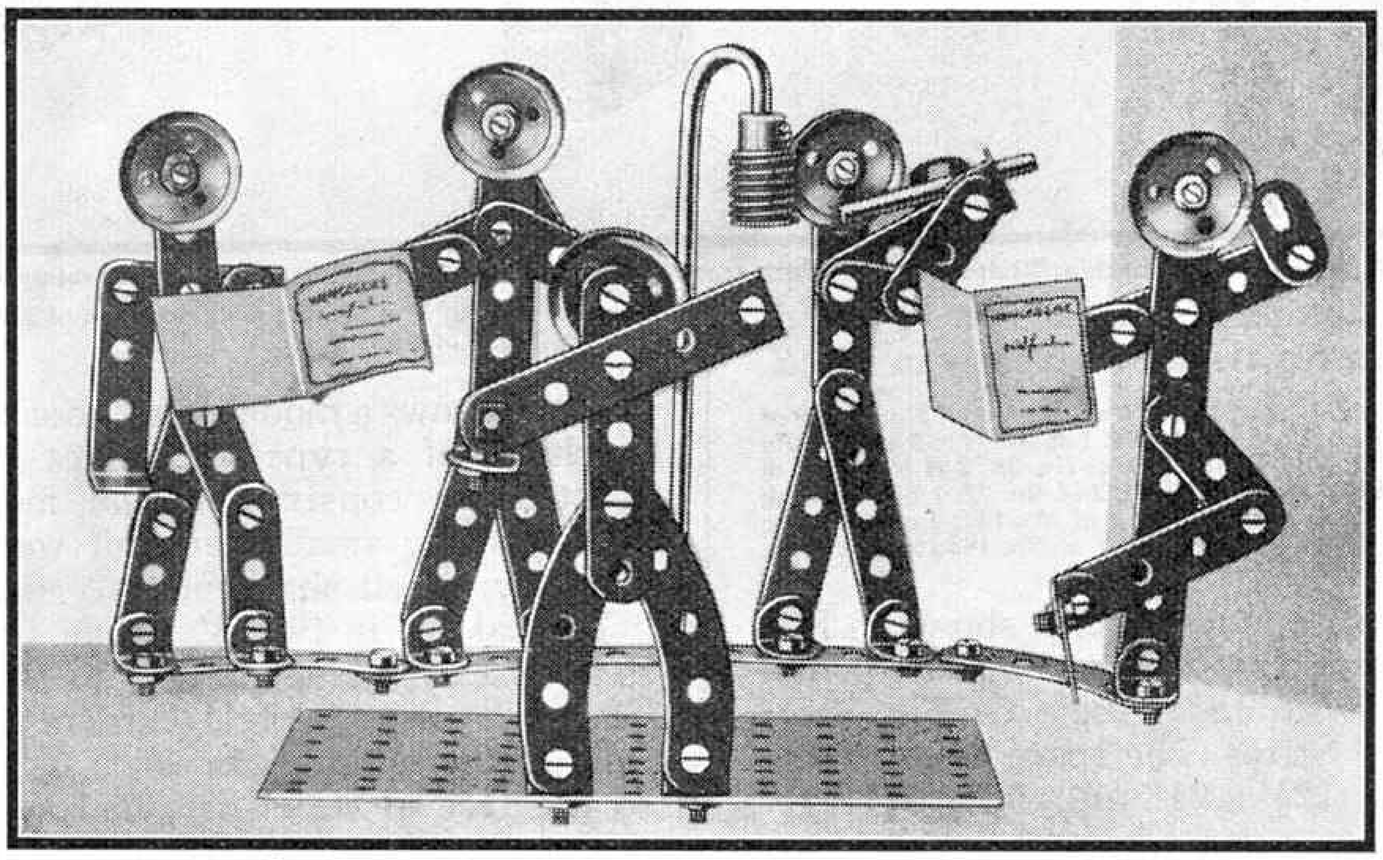
The model is fixed to a table or work bench by two clamps, each of which consists of two $2\frac{1}{2}''$ Strips bolted to one end of the base. The lower ends of these Strips are joined by a further $2\frac{1}{2}''$ Strip, to which a Coupling 5 is bolted. A $2''$ Screwed Rod is screwed through the central tapped hole of the Coupling and on it a $1''$ Pulley and a $\frac{1}{2}''$ Pulley are locked. The $\frac{1}{2}''$ Pulley forms a grip by which the clamp is operated.

Parts required to build model disc sander: 2 of No. 2; 6 of No. 5; 2 of No. 9c; 2 of No. 12; 1 of No. 12a; 3 of No. 16a; 1 of No. 17; 2 of No. 22; 2 of No. 23a; 1 of No. 24; 2 of No. 26; 2 of No. 27a; 30 of No. 37a; 18 of No. 38; 1 of No. 52; 6 of No. 59; 6 of No. 63; 2 of No. 81; 1 of No. 103h; 1 of No. 146a.

Grand Christmas Competitions

"Yuletide" and "Locomotive" Contests

By the time this issue of the "*M.M.*" makes its appearance the Christmas season will be close at hand, and everyone will be making preparations to celebrate this great annual festival. In the midst of all the fun and excitement of the celebrations there will be many incidents that will provide keen Meccano boys with fine subjects for humorous and easily built models. As there is great scope for really clever model-building in this direction we are organising a special "Yuletide" Competition.



"The Carol Singers!" This group of Meccano figures, designed by B. Plucknett, Devizes, is an example of the kind of models that will win prizes in the "Yuletide" competition announced on this page.

An excellent example of a Christmas model of the kind we have in mind is illustrated on this page, and shows a group of carol singers on their rounds, complete with lantern. The cook, entering the dining hall with the blazing pudding held aloft in triumph, followed by a procession of helpers, would make another suitable subject. More humorous models would show such events as Dad struggling to maintain his balance on the top rung of the step-ladder while he hitches decorations to the picture rail or tries to hang a big bunch of mistletoe high in the hall.

Models entered should consist of a figure, or a group of several figures, engaged in some occupation typical of Christmas, and competitors may use as many Meccano parts as they wish. Originality will be looked for, and simple models in which the figures are brought into action by means of strings, levers, or a Motor will be specially welcomed.

Entries will be grouped into two Sections. Competitors of all ages living in the British Isles will enter for Section A. Overseas competitors of all ages will enter for Section B. Section A will close on January 31st, 1938, but Section B will remain open until 31st March, 1938. A list of the prizes to be awarded in each Section is given in the panel at the foot of this page.

It is not necessary to send the actual model. A good photograph or a drawing is all that is required. The competitor's name, full address and age must be written on the back of each illustration sent, and the envelope should be addressed "Yuletide Competition," Meccano Ltd., Binns Road, Liverpool 13.

Photographs or drawings of prize-winning models become the property of Meccano Ltd., but unsuccessful entries will be returned to competitors provided that a stamped and addressed envelope of the necessary size is enclosed for that purpose.

Prizes for Model Locomotives

Locomotives provide plenty of scope for model-builders, as there are so many different types to choose from. This month, therefore, we are arranging a competition specially for models of this kind. This is open to every owner of a Meccano Outfit, and there are no entry fees. Simple models built with comparatively few parts will receive as much consideration as more elaborate ones, and as regard will be paid to the ages of competitors, there is no reason why every model-builder should not avail himself of this chance to win a prize. No difficulty will be found in choosing a suitable locomotive for reproduction, for many illustrations of various types have appeared in recent issues of the "*M.M.*"

Entries should be built as closely as possible to scale, but unless the model is a large one it is wise not to include much detail. A small model will look better if it is simply constructed, particular attention being given to obtaining a realistic outline.

Competitors are required to send in either a photograph or a drawing, of their model, a clear and sharp photograph being preferred.

The competition is open to readers living in any part of the world, and there will be one Section only. The closing date for entries from both Home and Overseas readers will be 31st March, 1938.

Entries should be addressed to "Locomotive Model-building Contest," Meccano Ltd., Binns Road, Liverpool 13, and each illustration must bear the sender's age, name and address.

Grand Christmas Competitions

THE PRIZES

"Yuletide" Contest

The following prizes will be awarded in each Section:
1st Prize, Meccano or Hornby Products value £2/2/–.
2nd Prize, Meccano or Hornby Products value £1/1/–.
3rd Prize, Meccano or Hornby Products value 10/6.
10 Prizes of Meccano or Hornby Products value 5/–.

"Locomotive" Contest

1st Prize, Meccano or Hornby Products value £3/3/–.
2nd Prize, Meccano or Hornby Products value £2/2/–.
3rd Prize, Meccano or Hornby Products value £1/1/–.
5 Prizes of Meccano or Hornby Products value 10/6.
5 Prizes of Meccano or Hornby Products value 5/–.

Model-Building Competition Results

By "Spanner"

"Crane" and "Aeroplane Constructor" Contests

Competitors in the May "Crane" Competition who have been awarded prizes are as follows:

Home Section

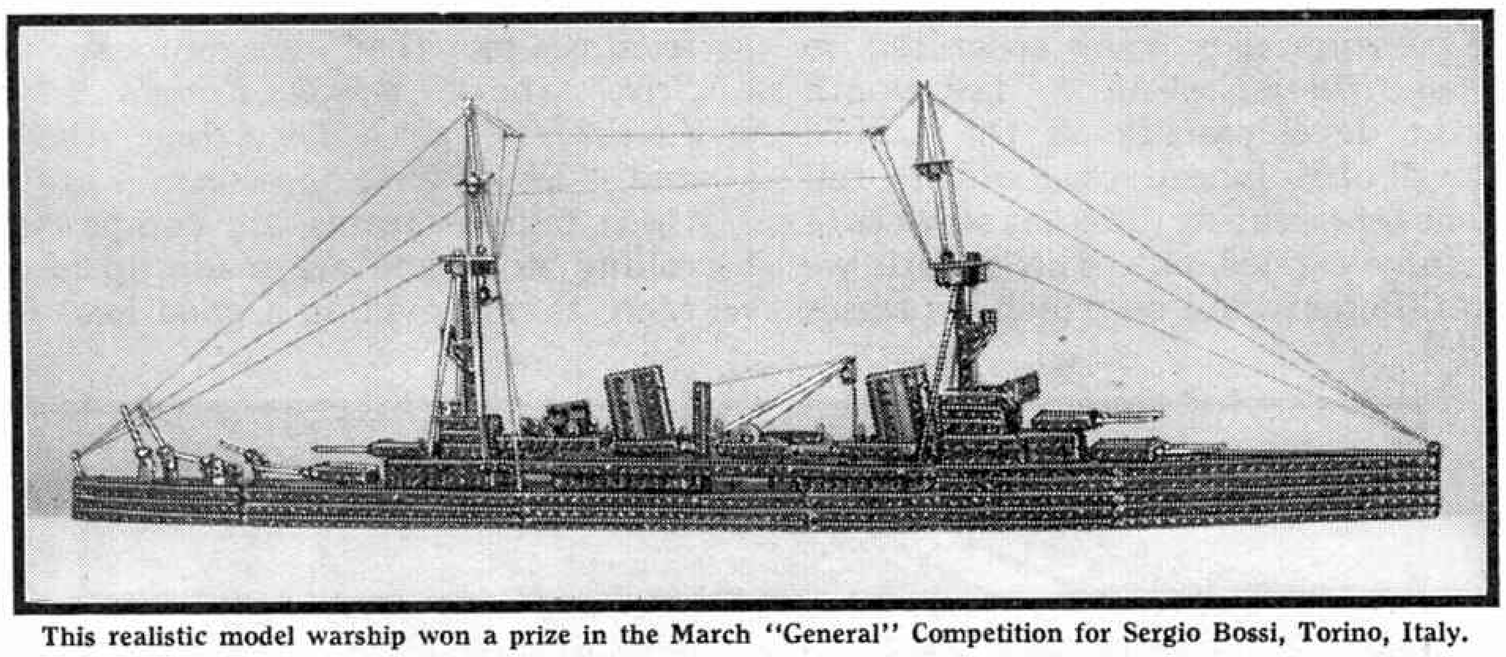
1st Prize, Meccano or Hornby products value £3/3/–: E. Crowson, Peterborough. 2nd, products value £2/2/–: L. Potts, Dover. 3rd, products value £1/1/–: F. Coltman, Loughborough.

Products value 5/–: R. Wheeler, London, N.W.1; P. Hands, Hillingdon; J. Matthews, Fillongley, nr. Coventry; R. Cooper, Ringmer; J. Davidson, Glasgow, W.3.

Overseas Section

1st Prize, Meccano or Hornby products value £3/3/–: J. Rowston, Orange, New South Wales. 2nd, products value £2/2/–: A. Pannenborg, The Hague. 3rd, products value £1/1/–: D. Munton, Johannesburg.

Products value 5/–: M. de Melleville, Paris; A. Turton, Ottawa; D. Davenport, Victoria, British Columbia; L. Linder, Stockholm; C. Laidlaw, Buenos Aires.



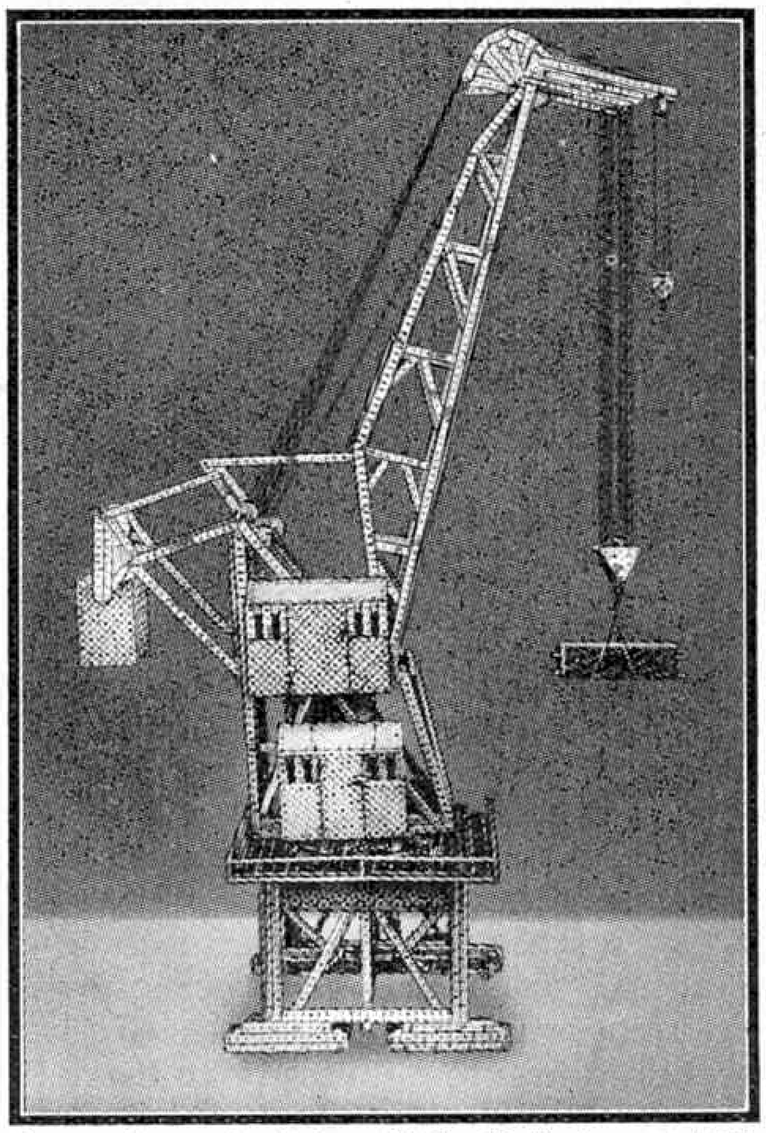
This realistic model warship won a prize in the March "General" Competition for Sergio Bossi, Torino, Italy.

In the Home Section the First Prize was awarded to E. Crowson, Peterborough, for the fine model of a level luffing crane shown in the lower illustration on this page. The model is outstanding on account of its neatness and strong construction. It is equipped with three Electric Motors. One of these drives the travelling bogies, another operates the slewing and luffing movements, and the third is used for raising and lowering the two pulley blocks.

L. Potts, Dover, won Second Prize with a model of a radial travelling crane. The model is 9 ft. in height, and although comparatively few parts are used in its construction, it is strongly constructed and will lift considerable loads. An interesting feature of the model is that it is remote controlled from a switchboard placed some distance away, thus giving the effect of entirely automatic working.

One of the most interesting and unusual types of model cranes I have examined was the electric unloader, of the kind used at docks for transporting iron ore from ships to railway wagons, that was submitted by F. Coltman, Loughborough. This well deserved the Third Prize awarded to it. It is driven by a Clockwork Motor and carries out faithfully the essential actions of its prototype.

One of the smaller prizes was awarded to J. Matthews, Fillongley, nr. Coventry, for a model of a mobile crane. The crane is mounted on the platform of a lorry so that it can swivel in any direction. Careful attention has been paid to reproducing as much detail as possible in both the lorry and the crane. The lorry is fitted with a gear-box, clutch and differential, and a striking feature is its engine, which is fitted with three working pistons that can be seen actually in operation by raising one side of the bonnet.



A soundly constructed model level-luffing crane built by E. Crowson, Peterborough, which won First Prize in the Home Section of the May "Crane" Competition.

In the Overseas Section of the Contest J. Rowston, Orange, N.S.W., took chief honours with a splendid model of a railway breakdown crane. In design this follows the usual practice, but is outstanding on account of the skilful use that has been made of Meccano parts. The mechanism is driven by an Electric Motor, current for which is picked up from an insulated centre rail. The drive from the Motor is taken through a gear-box, which is arranged so that the four movements of travelling, luffing, slewing and raising of the load can be carried out either simultaneously or separately, as desired.

One of the largest and most imposing models entered in this Section of the Contest is a giant floating crane of an unusual type built by A. E. Pannenborg, The Hague. This has a very long jib in comparison with the area of the pontoon. In order to obtain the necessary lightness this part is made up of two separate narrow jibs, each of which is strongly braced by ties and struts. The two are tied together at their upper ends by steel girders, and are pivoted independently to the pontoon. The model is excellent but contains less detail than Rowston's model and is not so neatly constructed.

D. Munton chose for his subject the dockside crane illustrated on the cover of the January 1937 *"M.M."* It was awarded Third Prize, and its special merit is the close resemblance it bears to its prototype.

Among the models that won the smaller prizes probably the most novel was that submitted by A. Turton, Ottawa. This is a simplicity model of a mobile crane of a similar type to the model that won a prize for J. Matthews in the Home Section.

April "Aeroplane Constructor" Contest

The full lists of prize-winners in the Home and Overseas Sections of the April "Aeroplane Constructor" Contest are as follows:

Home Section

1st Prize, products value £2/2/–: J. Reicraft Purchase, Eaden Bridge. 2nd, products value £1/1/–: P. Harding, Corston, nr. Bristol. 3rd, products value 10/6: A. Smith, Inverurie.

Products value 7/6: F. Millett, Newtown Unthank, nr. Leicester; J. Swepstone, Chieveley, Newbury; J. Weston, Desford, nr. Leicester; R. Jebbett, Leicester; H. Jackson, Bramley, Leeds.

Products value 5/–: Master Lockhart, Glasgow; N. Ta'Bois, Woodford Green; Miss L. J. Slater, Portsmouth.

Overseas Section

1st Prize, products value £2/2/–: P. Swan, Rangoon. 2nd, products value £1/1/–: R. Latimer, Rangoon. 3rd, products value 10/6: A. Worthington, Vancouver, British Columbia.

Products value 7/6: R. Myburgh, Claremont, Cape Province, S. Africa; D. Hofsommer, The Hague, Holland.

J. Reicraft Purchase, winner of First Prize in the Home Section built an excellent model of the Mayo Composite aircraft. The flying boat *"Maia"* consists of an elongated fuselage fitted with double-width wings, and on it is mounted the seaplane *"Mercury."*

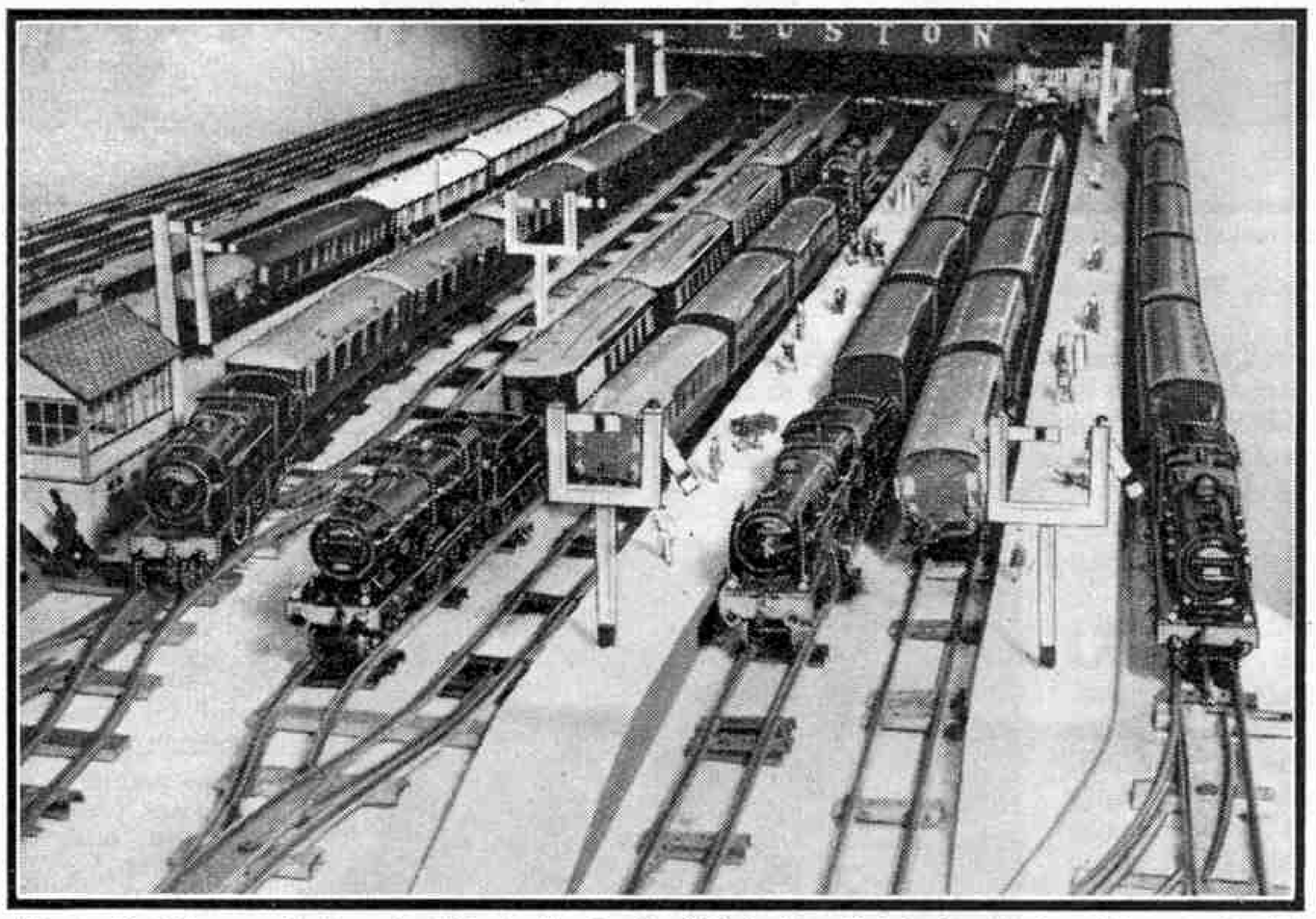
The entry that won First Prize in the Overseas Section is a model of a Sikorsky amphibian built by P. Swan, Rangoon, Burma. The model is fitted with a retractable undercarriage, and two air-cooled engines. This competitor submitted also a model of a Fokker Transport aeroplane. The interior of the model is fitted out with plywood chairs, and the pilot's apartment also contains two seats and a miniature instrument board. The cabins are lit electrically, current being supplied by a flashlamp battery concealed in the fuselage. Meccano Worms are used with good effect to represent the cylinders of the radial air-cooled engine of the actual machine.

Britain's Famous Trains in Miniature

The Hornby Railway of Mr. L. Trenberth

AN attractive feature of the miniature railway hobby is the way in which it appeals in different ways to different people. The underlying idea in the operation of a service of trains according to a set scheme of working may be the same, but the actual carrying out of the scheme and the method of operation may vary according to individual choice. On page 679 of the "*M.M.*" last month we described the latest developments on the L.M.S. layout of Mr. J. Southwell of Holyhead, over which a full programme of operations representing different services of real practice are carefully carried out. This month we describe a system of a different kind on which expresses of all four main line companies are run. Train operation on this line is a spectacular business, in which equipment representative of the "Big Four" is concentrated in a manner that permits of some very interesting comparisons of trains.

This layout is the work of Mr. L. Trenberth of Redruth, Cornwall, who is the owner of what is probably one of the largest model railways of its kind in this country. The system is laid indoors and covers a space of 80 ft. by 25 ft. It is of the non-continuous variety and is composed of about 2,000 ft. of track. It was originally an all-clockwork layout, but the electrification of the system was recently put in hand.



"Euston" station on the layout of Mr. L. Trenberth of Redruth, which is described on this page. In this photograph locomotives of the L.M.S. only are seen, but engines of all four groups are run.

Although trains of all four companies are operated, the L.M.S. is the most favoured railway, and the line therefore is divided into three districts, which for operating purposes have been called "Euston," "Willesden Junction," and "Glasgow." Thus all through expresses necessarily run from "London" to "Glasgow," whatever their owning company may be, and the districts have been named to provide some distinction, and to give a sense of distance, rather than to represent the actual places.

There are four sets of double tracks running out of "Euston." First come non-stopping through lines to "Glasgow," which are used exclusively by the electrically-driven expresses. Then there are the ordinary "fast" tracks, which take all the clockwork expresses to or from "Willesden Junction," and are used for main line trains generally, including those that work through to and from "Glasgow," but with intermediate stops. The third set of tracks form the "relief" lines, which handle "Glasgow" goods trains that are electrically hauled, and clockwork suburban trains between "Willesden Junction" and "Euston." The fourth double track goes as far as "Willesden Junction" only, and is used by all clockwork goods trains as far as the "Junction," where they are remarshalled if necessary and forwarded to their various destinations.

An idea of the extent of operations will be gained from the fact that such famous expresses as "*The Royal Scot*," the "*Cornish Riviera Limited*," the "*Torbay Limited*," "*The Golden Arrow*," the "*Bournemouth Belle*" and "*The Flying Scotsman*" are run continually. All these famous trains are composed entirely of Hornby rolling stock and are made up of five to seven coaches each, thus providing a good load for the Hornby No. 2 Special Locomotives or No. 3 Locomotives that are in use. As a train "*The Royal Scot*" takes pride of place and is now hauled throughout by the splendid Hornby 4-6-2 Locomotive "*Princess Elizabeth*," thus representing the latest practice of the L.M.S. This engine is doing excellent work, and is hauling heavier trains than any of the other locomotives.

An interesting feature of the usual programme is a speed contest between "*The Flying Scotsman*" and "*The Royal Scot*." This is an everyday occurrence and reproduces on the same system the friendly rivalry of the real East Coast and West Coast Routes.

It will be appreciated that the operation of the layout is far from being a "one-man job." The usual number of operators is four, two of whom are stationed at "Euston," one at "Willesden Junction" and the other at "Glasgow."

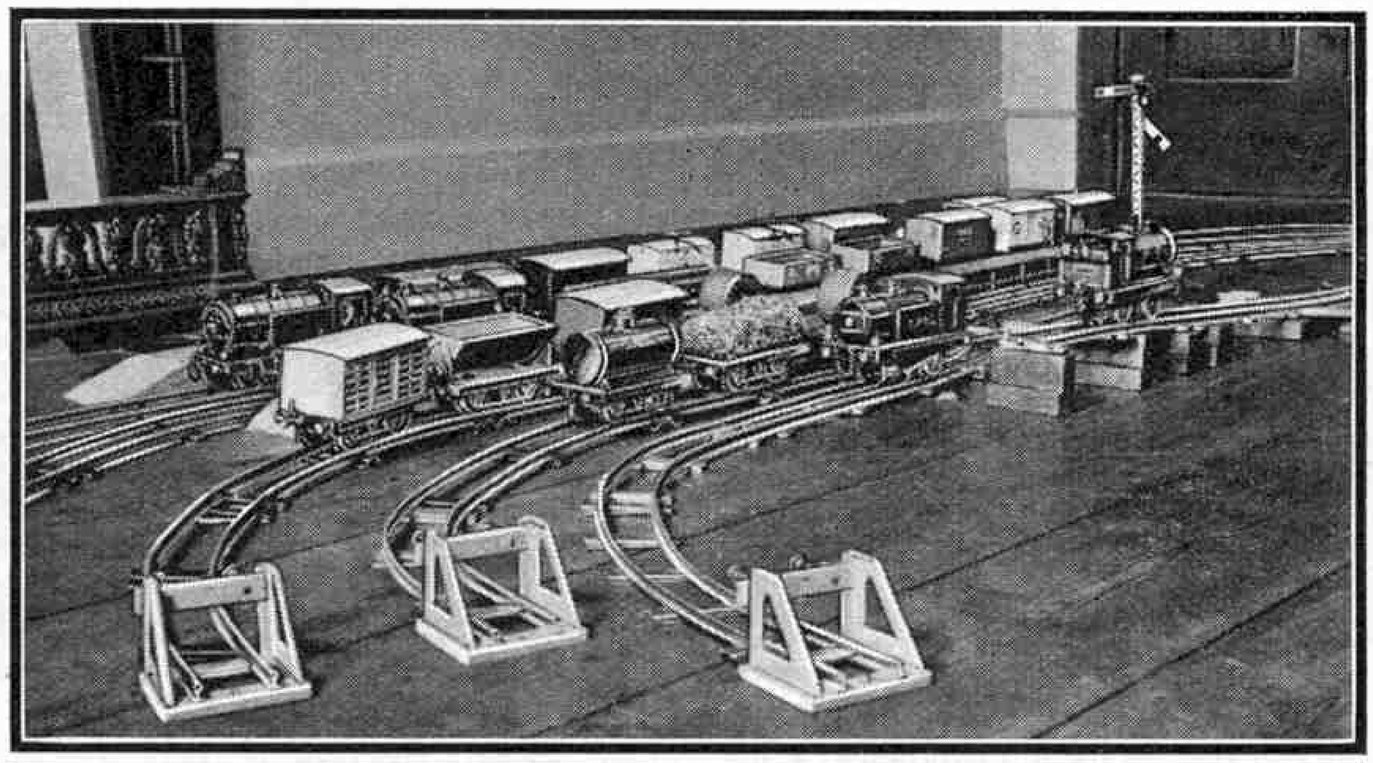
Trains are frequently run to a timetable, and it often happens that there are 12 trains in motion at the same time. With such intensive traffic as this it is very necessary to have some signalling apparatus for letting each operator know when a train is coming, and each district has been provided with indicating lights for this purpose. For instance, when "*The Royal Scot*" is ready to leave "Euston" for "Glasgow" on the through line, the "Euston" operator presses a switch that causes a green light to appear on a gantry at "Glasgow," thus telling the operator there that a train is coming to him on the through line. If the line is blocked he prevents the train from leaving "Euston" by pressing a switch that brings a red light into action on the "Euston" gantry. Thus each operator knows when a train is about to enter his section, and he is able to make any movements that may be necessary.

A G.W.R. Layout for Freight Traffic

Novel Working on a Continuous System

THE photographs reproduced on this page show parts of a Hornby Railway that is operated by B. Reynolds of Bridport, Dorset. The plan of the track is simple, the double main line following the usual oval formation, but there are several points in the operation of the system that render it of special interest.

Hornby tinplate Rails are used and they are secured to the floor, which improves the running qualities of the track and makes the line permanent to some extent. Although the main line is double, it is not made up of Hornby Double Track. Instead it follows the well-known scheme of employing two separate single tracks. As the curved portions are laid with rails of the same standard 2 ft. radius, these parts of the track are not parallel, but the introduction of straight rails in the outer track at the commencement, and in the centre of the curved lengths, reduces the uneven effect that is often observed to a minimum.



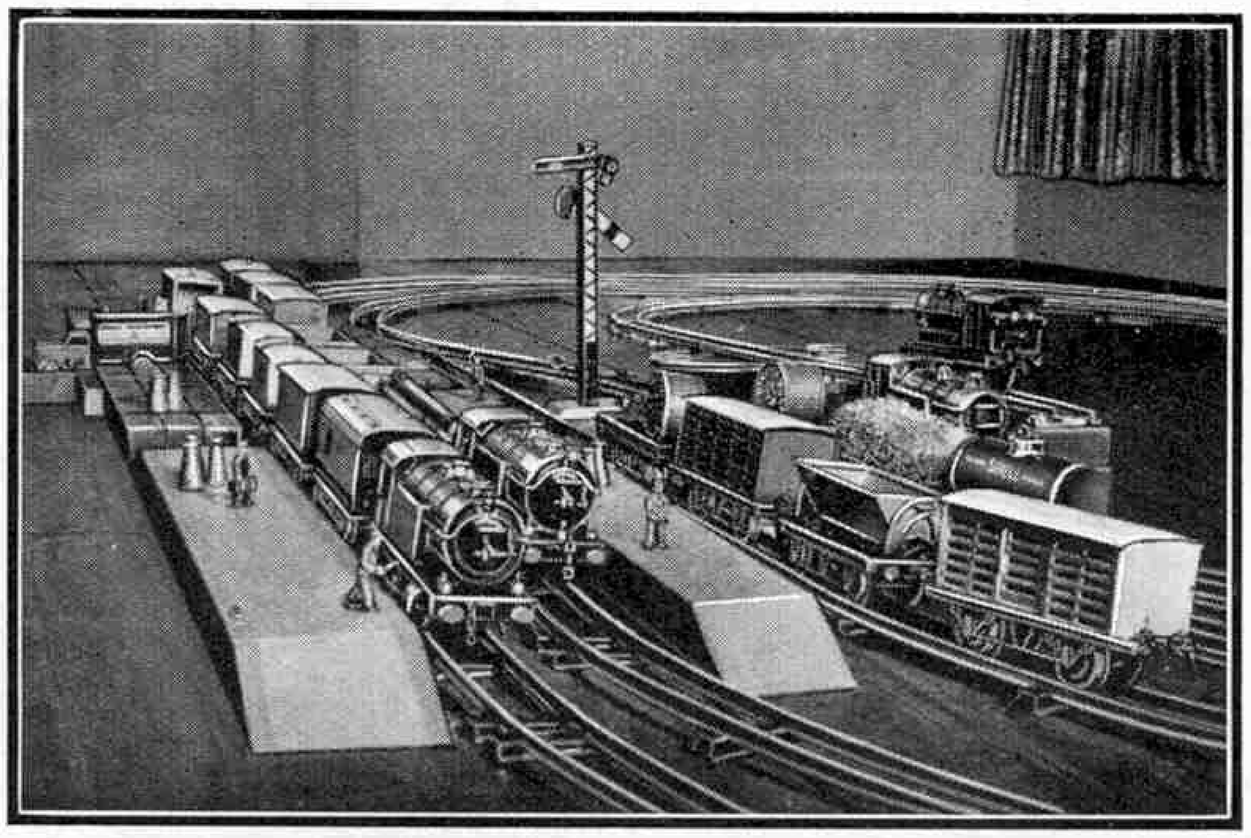
A general view of the sidings on the layout of B. Reynolds, of Bridport. A raised track for locomotive inspection appears on the right-hand side of the photograph.

Along one side of the main oval there are platforms for each of the tracks, and at the back of the inner platform there runs a series of goods sidings opening out from what may be termed a "reception road." This reception length is thrown off from the main inner track by points situated on the opposite side of the layout from the station, so that it runs on the inside of the main track and roughly parallel to it. Shortly after the reception road leaves the main line another track branches off inside it and turns sharply by means of 1 ft. radius curves to lead to a No. 1 Turntable.

Radiating from the Turntable are several short lengths of track, each terminating in a buffer stop. These roads are used for engine storage purposes, and the whole thus forms a locomotive yard. The longest runs parallel to the sidings referred to previously, and is made to slope by being packed up from the normal floor level. The idea of this is to give the effect of the inspection pits that are found in and around locomotive depots. This feature is seen in the upper illustration on this page.

Both facing and trailing crossover connections are provided on the opposite side to the platforms. These are made up of two right-hand and left-hand points instead of actual crossover points, and allow trains to and from either of the running tracks to be operated into and out of the sidings as required.

An unusual feature of the operation of the line is that the two main tracks are not often used as up and down roads, with trains running in opposite directions over them. Instead what may be termed "parallel working" is favoured, trains on adjacent tracks proceeding the same way round the oval. This provides some quite entertaining working, the loads of the trains being adjusted so that the two trains more or less keep pace with one another, in spite of the difference in length between the inner and outer circuits.



A busy scene at the station, showing a train on each of the main lines. The No. 1 Special Tanks shown perform the main line work and the No. 1 Tanks used for shunting appear in the yard.

When the trains are run in opposite directions an interesting operation is made possible by the crossover connections referred to previously. By careful timing the two trains can be made to exchange tracks, a thrilling performance that adds greatly to the fun of operations.

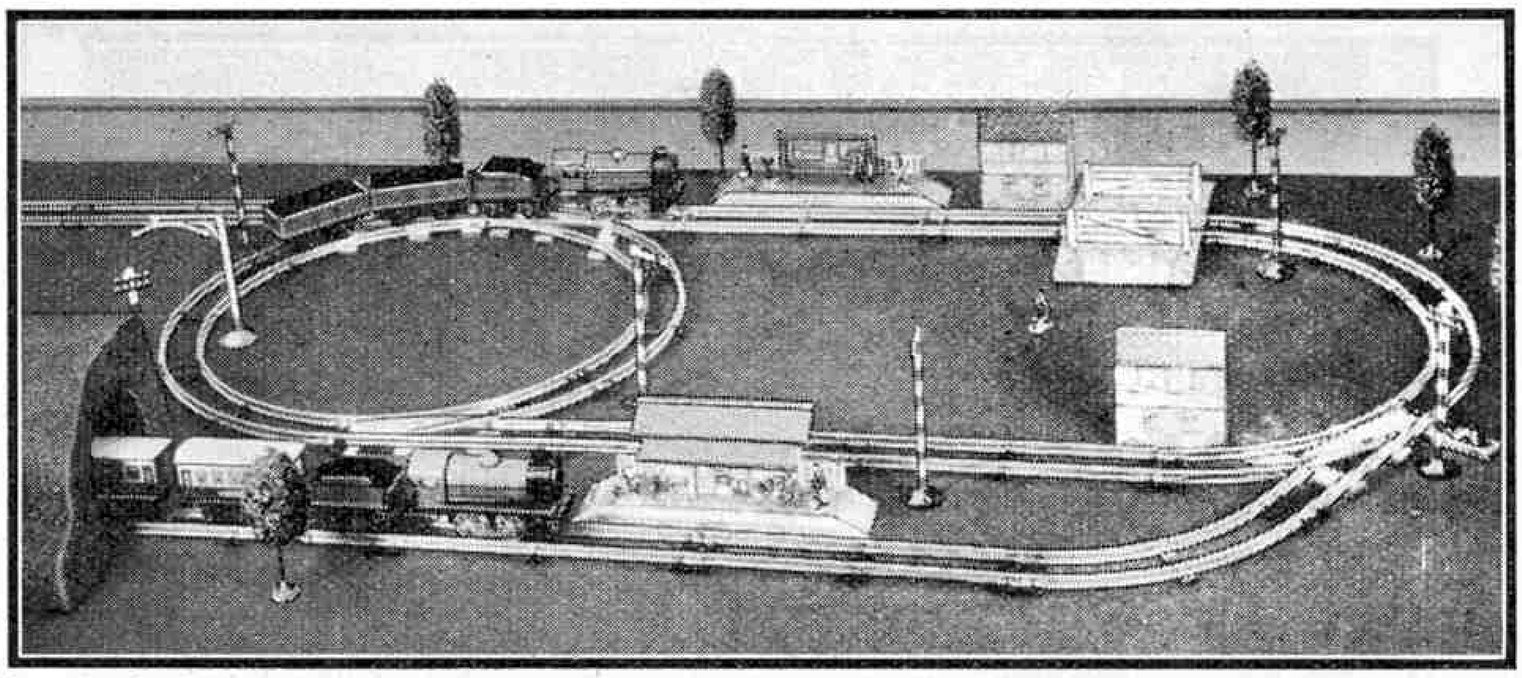
The layout is unusual also in dealing only with freight traffic. The whole of the rolling stock consists of goods vehicles of different types, and a good selection is available for different classes of traffic. An up-to-date touch is added by the use of Hornby G.W.R. Insulated Containers, which are carried on Flat Trucks. A Fibre Wagon and Side-tipping Wagon are to be seen, and there are also Milk, Refrigerator and Banana Vans.

The locomotives employed are four in number. There are two No. 1 Special Tanks for main line trains and two No. 1 Tank engines for shunting work.

Hornby Railways for the Beginner

Fun with the MO Sets

EVERY boy wishes to "play trains," and at this time of the year many are waiting impatiently for their first train sets. The younger model railway enthusiasts usually commence operations with the simplest and smallest trains, such as the MO Series of Hornby Train Sets. These trains have their own special rails, with curves of 9 in. radius. The clockwork engines have a surprising capacity for long running, combined with speed and haulage power, and the passenger coaches and goods wagons are very attractive. Altogether the MO Sets provide their owners with great fun, and this is increased by the addition of various accessories, of which a wide range is available. Interest deepens as the railway grows.



An attractive layout arranged with M Series components. Both goods and passenger trains are run, and the track has been developed from a plain circle to an interesting system by adding more rails and points.

There are several Train Sets of different types, and all include sufficient rails to form a complete circle or oval. In each case one of the rails is fitted with a special braking device that can be set to engage with the trip on the engine, and so to bring the train to a stop. This adds greatly to the fun of operations.

The smallest of these Sets are the MO Goods and MO Passenger Sets. Each contains a Locomotive and Tender, and the Goods Set includes two Open Wagons. In the Passenger Set these Wagons are replaced by two Pullman Coaches that are remarkably accurate in colour and in detail. With either of these Sets the train service of a fascinating little railway can be commenced. In the earlier stages of miniature railway activity the running of these trains on simple layouts forms the best possible practice in the handling of the vehicles and the management of the engine. A space measuring 2 ft. square is sufficient for the circle of rails included in these Sets. Thus the track can be laid out quite conveniently on a table, where the railway can be operated and the trains seen to the best advantage.

Different wagons and a larger number of rails are included in the MO Mixed Goods Set. The Locomotive and Tender are of the same design as in the preceding Sets, but the three Wagons are of various interesting types that are always popular with boys. There is first a Side-tipping Wagon, the body of which can be made to discharge its load to either side of the track as required. Next there is a Rotary Tipping Wagon, the container of which can be revolved and made to tip its load at almost any point round the Wagon. Finally there is a Tank Wagon, an attractive model of the real tank vehicles used by the "Shell-B.P." organisation.

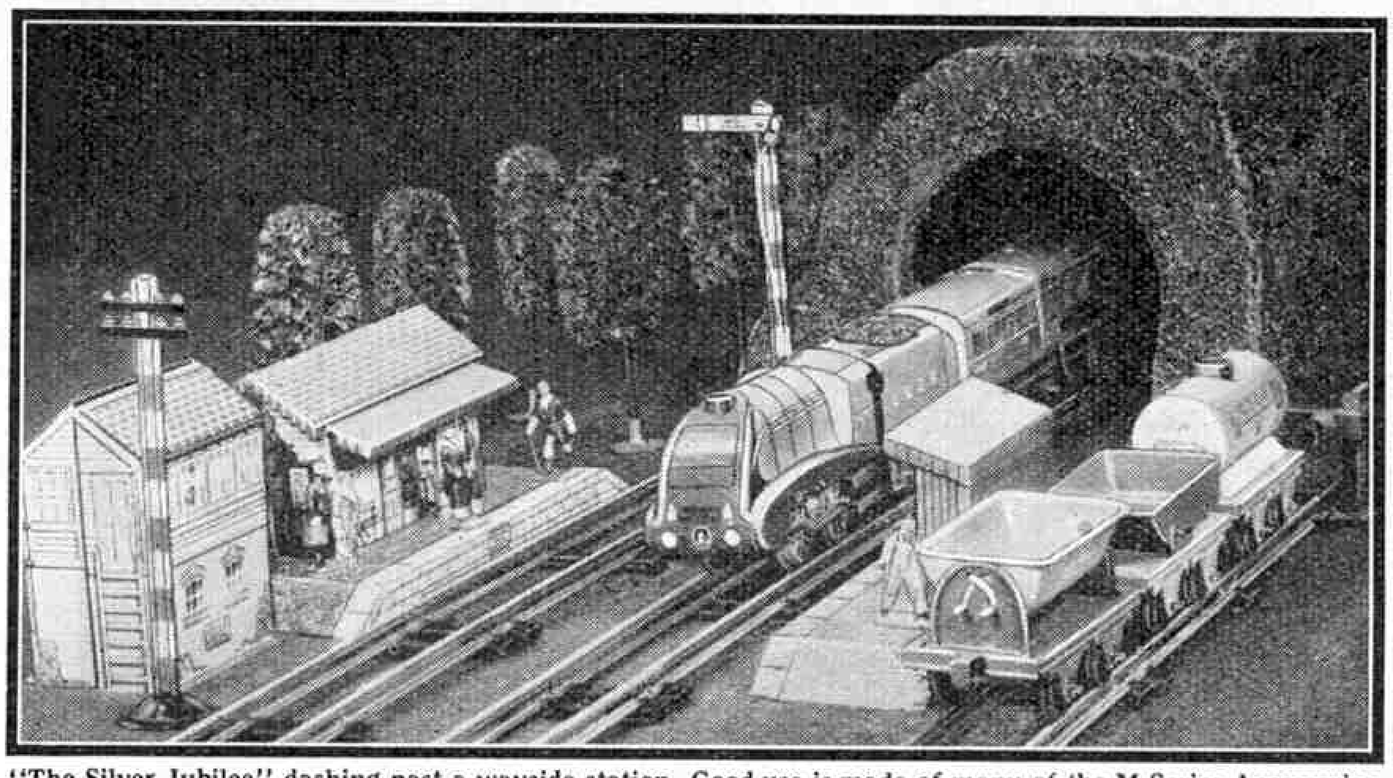
Although not included in any Train Set there is an attractive Crane Truck specially intended for use with MO stock. The crane can be revolved on its base, and in addition the jib can be lowered for travelling.

Streamline locomotives and trains are very fascinating, and those who wish to own miniatures of these modern developments will find their needs met by two Passenger Train Sets in the MO Series. The first represents the L.N.E.R. *"The Silver Jubilee,"* which has made such a reputation for punctuality and reliable service between London and Newcastle. The realistic Hornby representative of this train is known as the No. O *"Silver Jubilee"* Train Set, which in size and style is in keeping with the MO items and uses the same 9 in. radius rails. The lines of the Locomotive and Tender follow closely those of L.N.E.R. No. 2509 *"Silver Link,"* and a remarkable amount of detail for such a small engine is included in the design, even to the reproduction of the interior of the cab and tender. The train consists of a twin articulated Saloon Coach and also is complete in external detail.

The second of these splendid miniatures is the No. O Streamline Train Set, which resembles the *"Silver Jubilee"* Set in construction, but not in colouring. It is made in two different colour combinations, maroon and cream, and light green and dark green respectively.

With such a choice of engines and rolling stock some very interesting trains can be run. It is not necessary to keep to the arrangements of the Sets, and attractive services can be arranged by combining the components of different Sets in various ways.

Of course even beginners never allow their railways to remain mere tracks. They soon add stations, signals and the various other lineside accessories that make so much difference to the realism of the game. There is a splendid selection of accessories of different kinds, specially intended for use with the M type of trains, and the photographs reproduced on this page show how effectively they can be used. The M Station Set includes two Stations, two M Signals, two M Telegraph Poles and an M Signal Box. There are various separate accessories also, such as the M Level Crossing, the M Footbridge and the M Loading Gauge.



"The Silver Jubilee" dashing past a wayside station. Good use is made of many of the M Series Accessories. The signal box is formed of two MO Signal Boxes placed back-to-back.

In the design of the actual track, additions can be made to the rails contained in any of the Sets in order to produce very attractive layout designs. Some idea of the possibilities in this direction can be gathered from our upper illustration. Better still, the booklet *"Hornby Layouts—100 Suggestions"* contains diagrams showing various layouts arranged in Hornby Tinplate Track, and Nos. 1 to 24 of them can be arranged with 9 in. radius rails. All Meccano dealers stock this booklet, or it can be obtained direct from Meccano Ltd., Binns Road, Liverpool 13, at 4½d. post free. Everyone who wishes to make the best use of his rails should obtain a copy.

The Hornby Railway System in 1937

New Locomotives and Rolling Stock

THE present season has been remarkable for many splendid additions to the Hornby System, which have made possible more realistic working than ever and have greatly increased the fun. They include magnificent new locomotives, more attractive rolling stock and stations of attractive modern design. These have added to the completeness and accuracy of the range of Hornby Railway material, and have greatly widened the choice of equipment.

Taking the locomotives first, the most important step has been the introduction of a six-coupled engine, which has received an enthusiastic welcome. The prototype chosen, the L.M.S. 4–6–2 "*Princess Elizabeth*," is one of the best known and most popular engines of to-day. Just over 12 months ago it set up a record for long distance non-stop steam travel in covering the 401.4 miles from Glasgow to Euston at an average speed of 70 m.p.h. The amazing powers of speed and haulage power of the real engines are splendidly reproduced in the model. For Hornby Railway owners this is the ideal engine for the fastest and heaviest expresses.

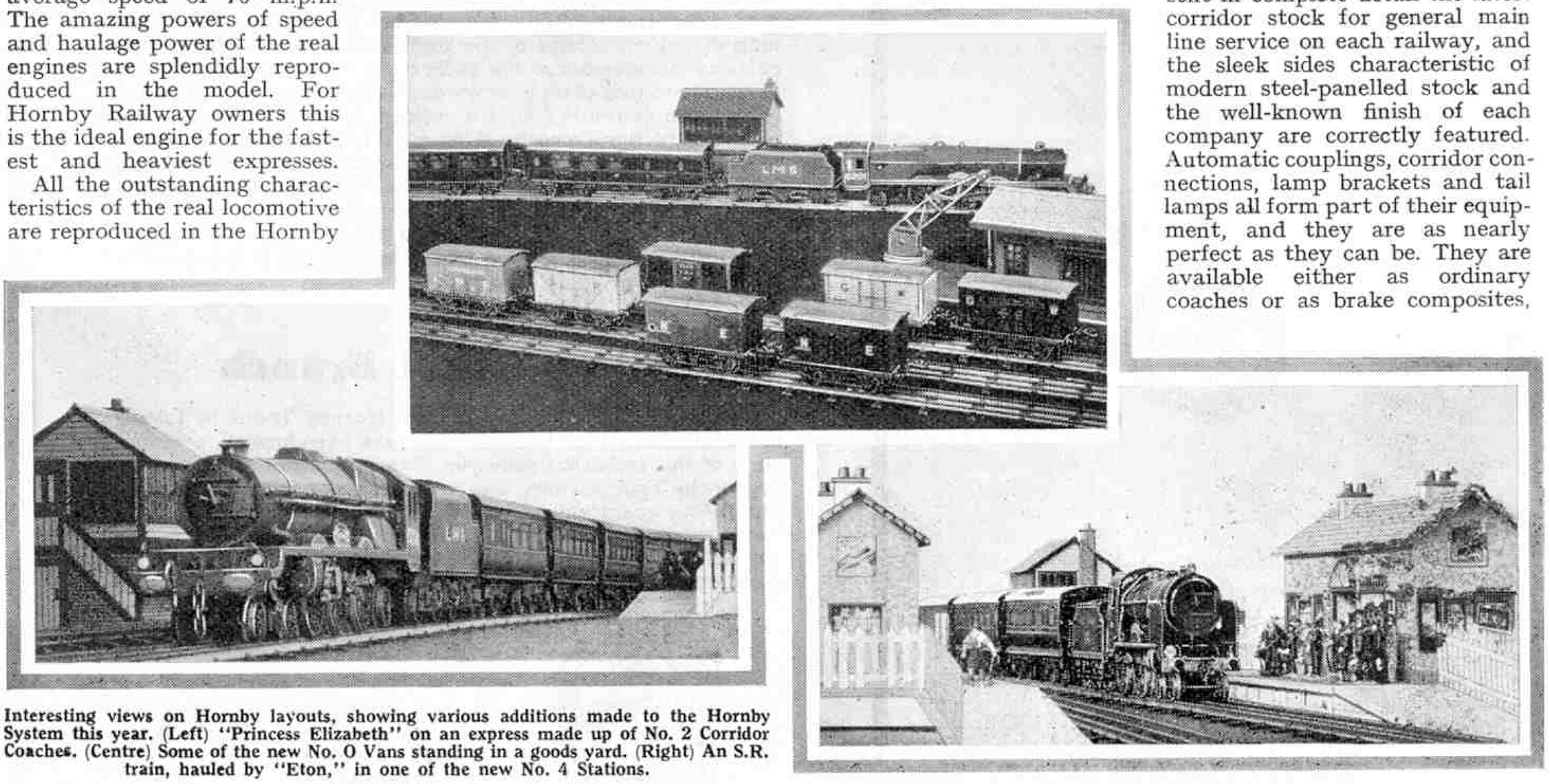
All the outstanding characteristics of the real locomotive are reproduced in the Hornby "*Princess Elizabeth*." The massive six-coupled driving wheels, the outside cylinders and motion, the long tapered boiler, sloping firebox and the Royal nameplate all combine to give exactly the impression in miniature of the massive and dignified "Princesses" of real practice. Driver T. J. Clarke, of Crewe, who was in charge of the real engine on the occasion of the record run, has examined the Hornby model very closely, and his verdict on it is "*It's fine*," a sure indication that the miniature locomotive successfully captures the outlines and details of the real one.

The motor of the new model is of course fitted with the wonderful Hornby Remote Control feature. This allows the engine to be completely controlled from the lineside, and even for reversing it is quite unnecessary to touch the locomotive by hand. In conjunction with the automatic couplings fitted to Hornby rolling stock this enables the operator to assemble a complete train without handling the components.

Another popular series of locomotives now represented in the Hornby System is the "Schools" class of the S.R., all of which are named after famous English schools. They are notable as the heaviest and most powerful 4–4–0 locomotives in the country. They were first introduced for use on the Hastings line and have made a special reputation for themselves on Eastern Section duties generally and, more recently, on the Western Section also.

The first of the class, No. 900 "*Eton*," is the engine reproduced in miniature, and it is available either with a 20-volt automatic reversing motor for Hornby electric railways, or with the powerful and long-running Hornby No. 2 Special clockwork mechanism. The Hornby "Schools" class locomotive has a remarkably realistic appearance. It has the characteristic S.R. smoke deflectors or down-draught plates at the front end, together with the smart nameplate, polished pipe-work and fittings that are to be seen on the real engine. The introduction of this new model has coincided with the appearance of the "Schools" class engines on the Bournemouth main line of the S.R., thus adding to the scope of the duties that can be undertaken by the model.

Turning to the new rolling stock, the No. 2 Corridor Coaches are a most important addition. These are splendid vehicles, which reproduce with extraordinary faithfulness the typical products of the Derby, Doncaster, Swindon and Eastleigh works of the four great railway companies. They represent in complete detail the latest corridor stock for general main line service on each railway, and the sleek sides characteristic of modern steel-panelled stock and the well-known finish of each company are correctly featured. Automatic couplings, corridor connections, lamp brackets and tail lamps all form part of their equipment, and they are as nearly perfect as they can be. They are available either as ordinary coaches or as brake composites, and add greatly to the possibilities of realistic train working on a miniature railway. Any of the standard long-distance expresses can be represented correctly with them, including such famous trains as "*The Royal Scot*," "*The Flying Scotsman*," the "*Cornish Riviera Limited*" and the "*Bournemouth Limited*."



Interesting views on Hornby layouts, showing various additions made to the Hornby System this year. (Left) "Princess Elizabeth" on an express made up of No. 2 Corridor Coaches. (Centre) Some of the new No. O Vans standing in a goods yard. (Right) An S.R. train, hauled by "Eton," in one of the new No. 4 Stations.

The introduction of these Coaches has led to a revision of some of the Train Sets in the Hornby range, with the result that their true-to-type character has been considerably improved. Thus the new vehicles are included in the No. 3 Sets, both electric and clockwork, with the exception of the S.R. "*Golden Arrow*" Set, which includes Pullmans. They are also employed to make up the E220 and No. 2 Special Sets, and an interesting development has been the naming of the Sets. Thus the L.M.S. Sets represent "*The Yorkshireman*," and the L.N.E.R. "*The Scarborough Flier*." "*The Bristolian*" is the title of the G.W.R. Set, and "*Folkestone Flyer*" that of the S.R. one.

Striking additions also have been made to the goods rolling stock of the Hornby System. The popular series of No. O tinprinted Vans has been increased in number and variety. There are four new Refrigerator Vans, two new Meat Vans and two new Fish Vans and all of them include a wonderful amount of detail. Each Refrigerator Van is representative of the style and finish employed for these vehicles by the four main line companies. The new Meat Vans are models of L.N.E.R. and G.W.R. stock respectively, and the Fish Vans reproduce those of the L.M.S. and the G.W.R. The numerous freight flyers of actual practice, speeding nightly to the market centres with their cargo of foodstuffs, can thus be run.

HORNBY RAILWAY COMPANY

The Hornby Railway Company is a world-wide fellowship of Hornby Train owners, and was formed to enable members to get as much fun as possible from their miniature railways. Its President is Mr. Roland G. Hornby, son of the inventor of Meccano.

A REAL RAILWAY COMPANY WITH BOY DIRECTORS AND OFFICIALS

How to Become a Member of the Hornby Railway Company

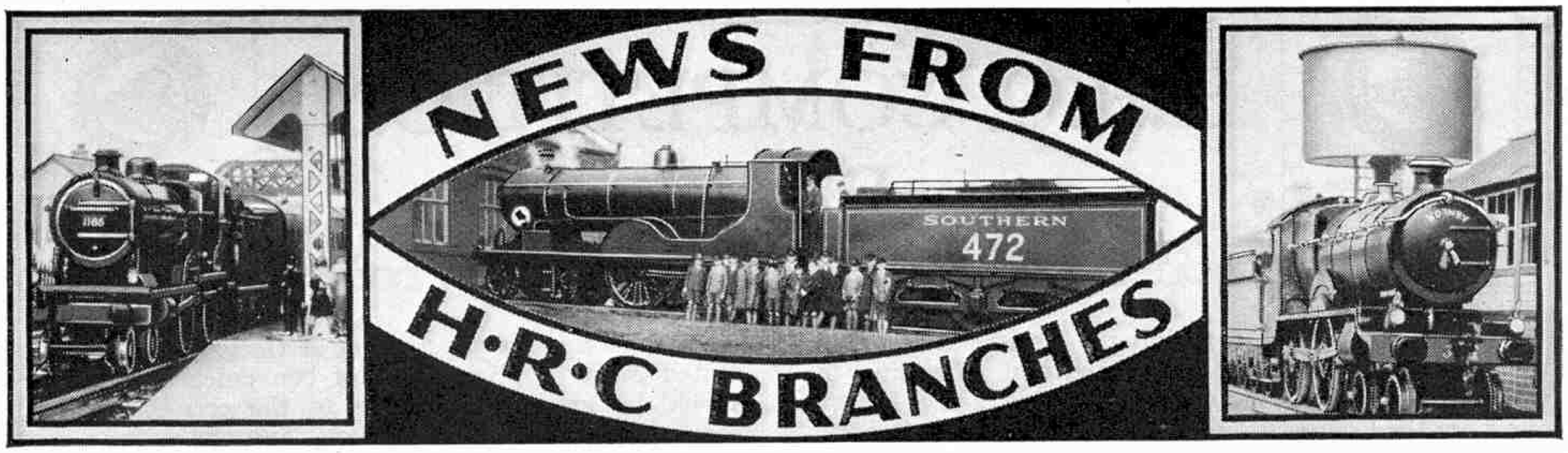
Every boy who possesses a Hornby Train Set should join the H.R.C. and thus become entitled to wear the badge of membership, which is beautifully enamelled in colours and has as its central feature a tiny representation of a train. All that he has to do is to fill in the application form—a copy of which is enclosed in every Train Set, or may be obtained from the Secretary of the H.R.C., Liverpool—and to return this together with a remittance of 6d. (overseas 10d.) to pay for the badge. Immediately on receipt of the completed form the applicant is enrolled as a member of this great organisation, and a handsome certificate to that effect is forwarded to him along with his badge.

Members of the H.R.C. are entitled to many privileges. The chief aim of the Company is to enable its members to get as much fun as possible from their miniature railways. This can best be done by helping them to make their layouts and operations as realistic as possible, and competent railway experts on the staff at Headquarters therefore are continuously engaged in advising members how to make the best use of the material at their disposal.

Join a Local Branch

The greatest fun is obtained from Hornby Trains by joining one of the many local Branches that have been formed in various parts of this and other countries. These Branches are composed of Hornby Train owners who meet together in order to carry out railway operations on a more extensive scale than is possible for a single individual. Every member should join a Branch immediately, or if one does not exist in his neighbourhood, he should try to induce other enthusiasts to help him to found one.

Write for full details to the Secretary, Hornby Railway Company, Binns Road, Liverpool 13.



Branch News

BURY ST. EDMUNDS.—A timetable has been drawn up, and services run on the Branch layout in accordance with these have proved very realistic. "*The Cheltenham Flyer*" was the subject of a recent Lecture, and further variety was introduced to the programme by a Table Tennis Tournament. Arrangements are being made for a visit to a local engine shed. Secretary: T. S. West, 10, Crown Street, Bury St. Edmunds.

ST. STEPHENS (SALTASH).—The first track meetings of the new Session have been outstanding for the keenness of members. Trains have been run with much greater efficiency and accuracy than previously. Games are enjoyed at all meetings. Secretary: B. Braund, 9, Homer Park, Saltash.

COTTESMORE SCHOOL (NOTTINGHAM)—At the first meeting of the Winter Session, held shortly after school was resumed, several new members were enrolled and "shown the ropes" of track operations. The Branch now has an extensive layout, and timetable services are being run. The work of wiring up the electric signalling installation is progressing steadily. Secretary: C. A. G. Anderson, 11, Ramsdale Crescent, Sherwood, Nottingham.

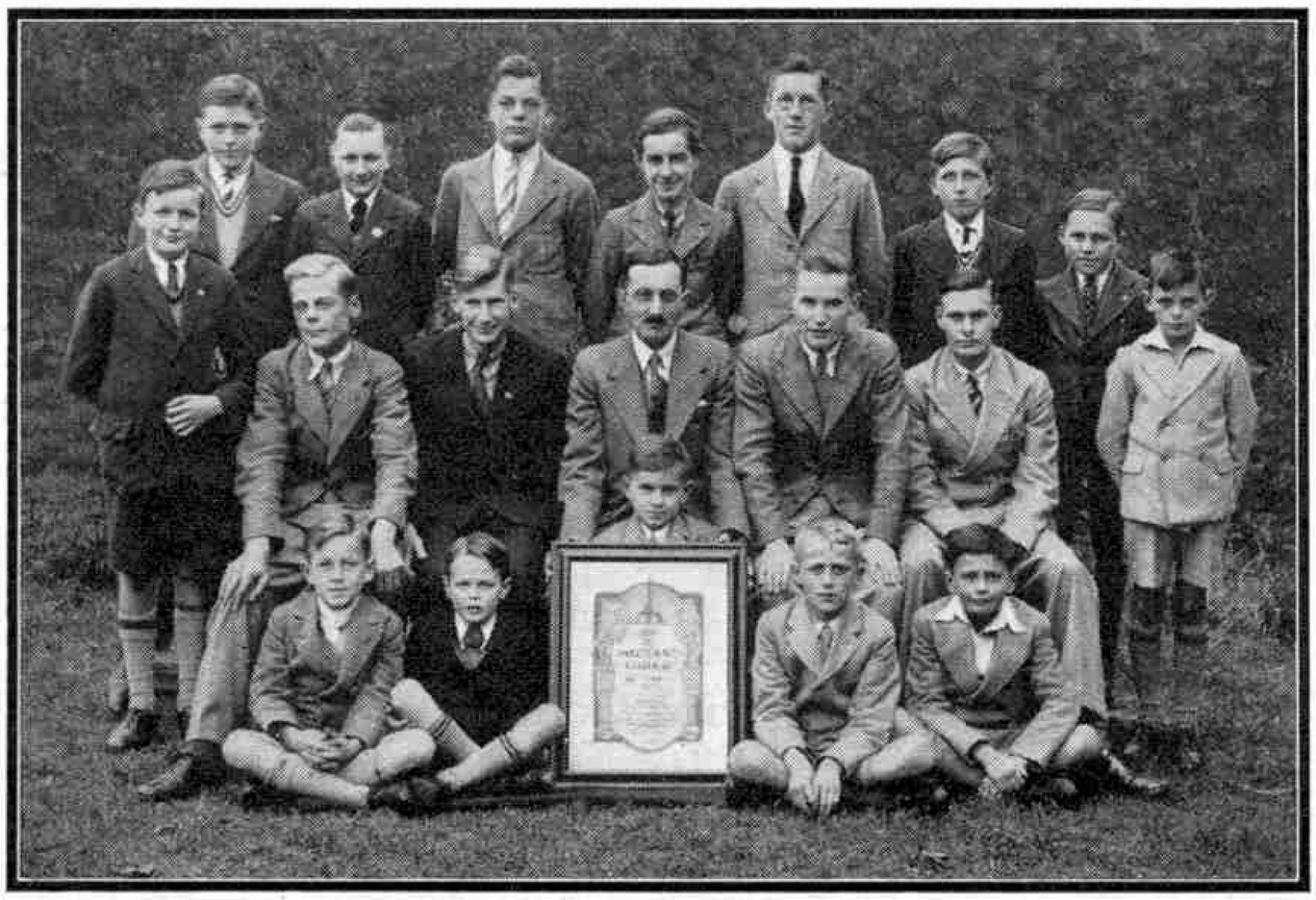
PLYMOUTH.—Track working has continued to provide very enjoyable evenings. Experimental layouts were operated to enable a good design to be discovered for a permanent layout, and the one chosen is now in use. Mr. Dingle, of the St. Stephens (Saltash) Branch, visited the Branch and gave a Talk on "*The Running of a Hornby Railway Company Branch.*" Secretary: R. G. Symons, 47, Lisson Grove, Plymouth.

ISLINGTON.—Prospects are excellent, as the recruiting campaign has been very successful. A high standard of enthusiasm was shown when preparations were being made for the Branch Exhibition. Members can insure their personal Hornby equipment against damage at Branch meetings for the sum of ½d. a week. A Library that has been started has quickly proved popular. Members displayed great interest in a collection of railway postcards exhibited by means of a mirrorscope. Secretary: A. D. Straker, 48, Onslow Gardens, Muswell Hill, N.10.

FISHPONDS (BRISTOL).—The Branch layout has been redesigned, and Hornby Solid Steel Track brought into use for the main lines. A new programme of Winter services is being operated and L.M.S. trains play a greater part in this than in previous sessions. Secretary: A. N. Ewing, 154, Thingwall Road, Fishponds, Bristol.

SWAN (KIDDERMINSTER).—The Branch track was relaid to a more suitable design during the Summer, and early track meetings of the present Session saw improved running. Full advantage has been taken of the wide range of the Dinky Toys Series in adding scenic effects to the layout. One member has built a signal cabin, and this is now being fitted out. The same member brought along cinematograph equipment and gave a show of films of general interest, ending with one showing the launch of the "*Queen Mary.*" A special night has been set aside for Table Tennis. Secretary: A. D. Hamblin, Black Bull Hotel, Swan Street, Kidderminster.

LOSTOCK GRALAM.—Extensive preparations were made for the Winter Session. All equipment was carefully inspected, and locomotives and rolling stock were thoroughly overhauled. Finally the track was tested and "trued up." Operations on the layout are now carried out with unusual smoothness. Express passenger trains have been run with all the regularity of their speedy and comfortable prototypes. Several "perishable goods" trains have been run, following the acquisition of new No. O Vans. The lighting system is being completed. An interesting suggestion is under consideration with the object of making the club room ceiling look like the sky. The secretary has designed a coach to be constructed by members. Secretary: A. Milligan, Wincham Hall, Northwich.



Officials and members of the Hornsea Branch, No. 190. Mr. R. W. Shooter, Chairman, is in the centre, with F. Myers, treasurer, on his right, P. Richardson, secretary and engineer, behind him, and Mr. E. Thom, secretary of the associated Meccano club, on his left. The Branch was incorporated in 1931, and the chief feature of its programme is the running of special trains.

Branches in Course of Formation

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

ALFRETON—C. Weston, 6, Limes Avenue.

CAMBRIDGE—J. E. Gray, 25, Rustat Road.

CHARD—R. A. Batstone, 7, Holyrood Street.

COLCHESTER—K. C. Crook, 41, Ipswich Road.

CROYDON—F. J. Lee, 136, Stafford Road.

LINCOLN—R. A. Picken, 56, Maple Street, Bracebridge.

LIVERPOOL—A. Catherwood, 32, Dryburgh Street.

NORMANTON—G. Preston, 2, Ashfield Street.

ROCHDALE—G. Brierley, 119, Spotland Road.

SOUTH AFRICA—R. M. Brown, "Dirleton," Avenue le Sueur, Sea Point, Capetown.

Branches Recently Incorporated

328. ALTRINCHAM—K. N. Dixon, "Norence," Hale Road, Hale.
329. MEXBOROUGH—R. A. Agascar, "Woodleigh," Lower Dolcliffe Road, Mexborough, nr. Rotherham.
330. ABERGAVENNY—J. C. Baker, "White House," Llanfoist, nr. Abergavenny.
331. BURY ST. EDMUNDS—T. S. West, 10, Crown Street.
332. ABERDEEN—A. Philip, 27, Camperdown Road.
333. WEST HADDON—D. G. Bush, "Stonelea," West Haddon, nr. Rugby.
334. LEATHERHEAD—L. G. Lamden, "Coveham," Fir Tree Road.

H.R.C. COMPETITION PAGE

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

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

ENGINE NAME-BUILDING CONTEST

This month we are combining a Christmas greeting with an easy and interesting competition. The panel in the centre of this page conveys the greeting, a very hearty one from the Competition Editor to all H.R.C. members, and from the letters in it competitors are invited to make up as many locomotive names as possible. Familiar names that can be built up in this manner will occur to competitors at once, and from time to time during the holiday season they will think of others to add to them, so that they should have formidable lists ready by the time the contest closes.

Cordial Christmas Greetings from the Competition Editor

The rules governing this contest are quite simple. Every letter used in making up each name must be contained in the accompanying message. Any letter that appears twice in the greeting may be used twice in forming a locomotive name, but in no case must a letter be included more often than in the words in the panel. Only the names of locomotives at present run by the four main line companies are admissible, and the names of private owners' engines and of those preserved in museums or elsewhere will not be accepted by the judges.

With each name the number of the locomotive represented must be given, and for convenience the names should be grouped according to the classes to which the engines bearing them belong, and the railway companies owning them. Entries must be written only on one side of the paper, and the back of each sheet used must have on it the name, address and H.R.C. number of the competitor.

The contest will be divided into the usual two sections, Home and Overseas, and to the three competitors in each section who submit the longest list of correct names and numbers will be awarded prizes consisting of any products manufactured by Meccano Ltd., to the value of 21/–, 15/– and 10/6 respectively. In addition several consolation prizes will be awarded.

Envelopes containing entries must be marked "*H.R.C. Christmas Names Contest*" in the top left-hand corner. Those submitted in the Home Section must be posted to reach Headquarters at Meccano Ltd., Binns Road, Liverpool 13, on or before 31st December. The closing date is 31st March, 1938 for receiving entries in the Overseas Section.

Railway Joke Contest

The Christmas season is the jolliest time of the whole year, with everyone in the best of spirits, ready to enter into any fun that is going on and to share to the full in the pleasures associated with it. We know that H.R.C. members will enjoy themselves thoroughly, and in order to enable them to give us some idea of the good times they have we are asking them to tell us the best railway jokes or stories they hear during the month at home, in the Branch room, or on a visit to a station or engine shed.

Each competitor may send in as many jokes as he likes in this contest, but can only win one prize. The chief aim should be to submit stories that are original and snappy as well as funny.

There will be the usual two sections, Home and Overseas, and in each will be awarded three main 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 to competitors whose efforts are deserving of recognition, but not quite of the standard of the chief prize-winners.

Envelopes containing entries should be marked "*H.R.C. Christmas Joke Contest*" in the top left-hand corner and posted to reach Meccano Ltd., Binns Road, Liverpool 13, on or before 31st December. Overseas closing date, 31st March, 1938.

Drawing Contest

The October "*My Favourite Locomotive*" Drawing Contest was so well received, and the entries were of such a high standard, that we feel that a further competition of this type will be welcomed by H.R.C. members. We therefore announce this month another Drawing Contest, and in order to give every competitor a good opportunity of showing what he can do we are making no restrictions in regard to the subject, except that it must be connected with railways. Locomotives, trains at interesting points on the line, and scenes in stations, signal cabins or engine sheds are typical subjects.

Competitors may send in either pencil, ink or coloured drawings as desired. Those who cannot use colour need not hesitate to send in their entries, as awards will depend on originality and merit. The Contest will be divided into the usual sections for Home and Overseas members, and in each there will be prizes consisting of any products manufactured by Meccano Ltd. to the value of 21/–, 15/– and 10/6 respectively. Several consolation prizes will be awarded in addition to the main prizes.

Entries should be marked "*H.R.C. December Drawing Contest*" and posted to reach Meccano Ltd., Binns Road, Liverpool 13, on or before 31st December. The latest date on which entries in the Overseas Section can be received is 31st March, 1938.

COMPETITION RESULTS

HOME

September "Mystery Stations Contest."—First: H. R. Hondelink (25394), Holt, Norfolk. Second: F. Mills (31), Kearsley, Nr. Bolton. Third: G. Johnston (38784), Southall. Consolation Prizes: V. Knill (26118), Thorpe Bay; A. F. Milburn (16322), London, E.4; A. Sims (49214), Bristol, 3; G. H. Gill (36093), Manchester 21; B. Rankin (3361), Manchester 13; R. H. Soar (54468), London, W.3; D. H. Earle (41617), Wembley Park; J. Watts (48256), Ilford; P. J. Gandon (12351), Leicester; F. O. J. Otway (48585), Farnham; R. J. Beale (43965), Barnet; D. R. Harris (54331), Chelmsford; J. C. Button (10335), Crewe; M. D. Lloyd (31586), London, N.10; N. Harrall (46304), Sidcup; D. H. Wakely (17486), Cheam; W. J. Walker (54306), Havant.

September "Railway Photographic Contest No. 6."—First: L. Hollyoak (3310), Coventry. Second: S. Garbutt (30122), Timperley. Third: D. Frar (18477), Taunton. Consolation Prizes: I. Macfarlane (24732), West Hartlepool; E. W. Oglethorpe (46851), Harrow; J. Habart (53869), London, N.W.11; J. T. Cosgrove (30917) High Wycombe; P. Fleming (41663), Kildary.

OVERSEAS

May "Voting Contest."—First: R. A. Wragg (7913), India. Second: A. R. Bacon (38242), India. Third: E. Kewney (49052), S. Africa. Consolation Prizes: A. McIntyre (30925), Canada; J. C. Williams (48397), New Zealand; A. A. Shawky (53749), Egypt; J. Jasper (42664), Australia; J. A. Rodriguez (3647), Canada; R. Myburgh (37538), South Africa.

May "Railway Photographic Contest No. 2."—First: I. Brough (9112), Australia. Second: H. Bennett (10615), New Zealand. Third: J. A. Rodriguez (3647), Canada. Consolation Prizes: J. McIntyre (31781), Canada; W. S. Eagle (31779), India; P. Chapman (24873), New Zealand.

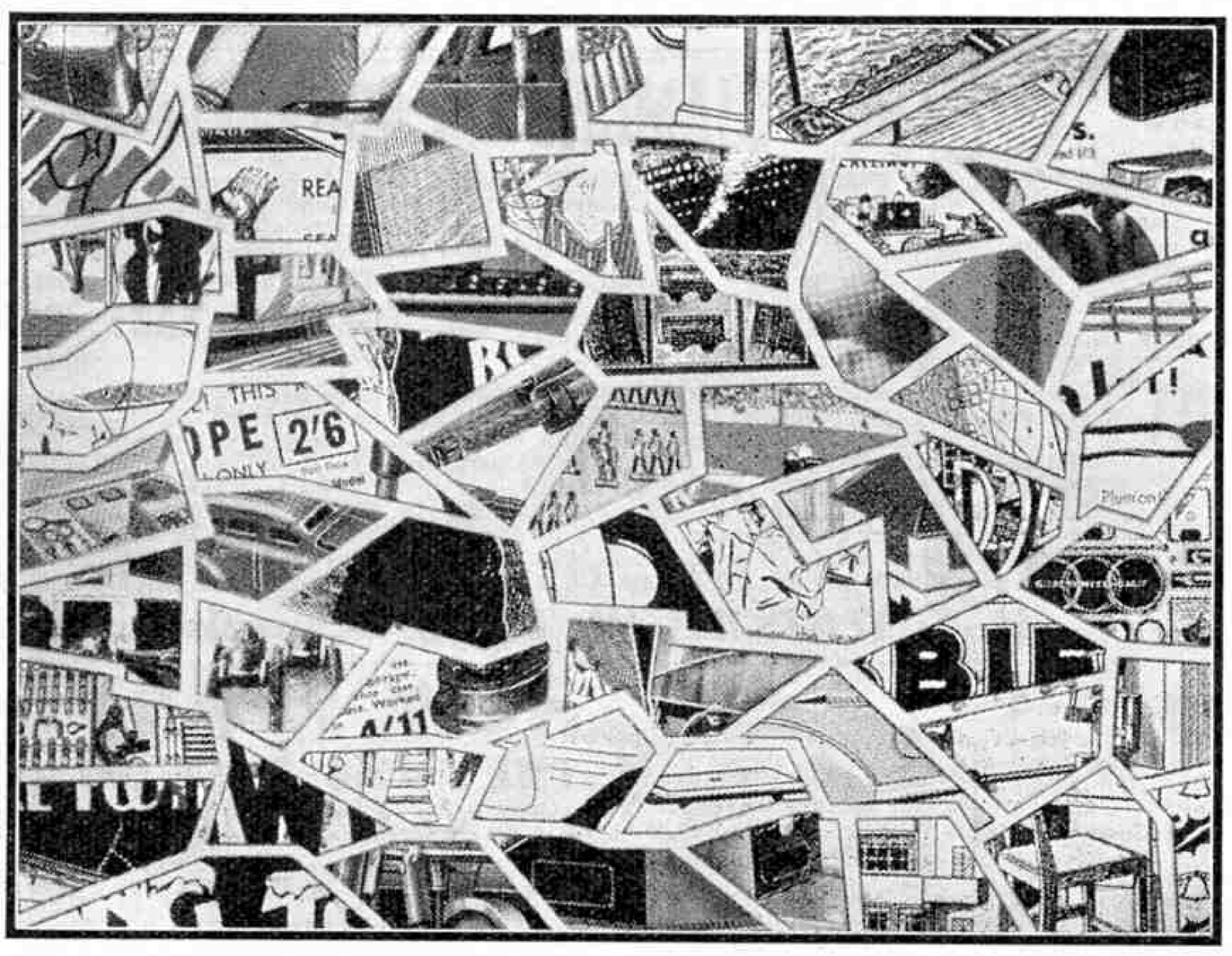
June "Mutilated Names Contest."—First: I. Brough (9112), Australia. Second: W. B. Moore (20918), Canada. Third: A. A. Shawky (53749), Egypt.

June "Railway Photographic Contest No. 3."—First: W. S. Eagle (31779), India. Second: R. B. McMillan (9592), Australia. Third: T. Watson (18065), Australia.

Competition Corner

ANOTHER ADVERTISEMENT "JIG-SAW" CONTEST

The advertisement pages of the December "*M.M.*" are so eagerly read in the hunt for Christmas gifts, that we feel sure the majority of our readers will welcome another Advertisement "Jig-Saw" Competition. The problem of sorting out the advertisements represented in the picture in the centre of this page will prove a most amusing and interesting occupation that for a lucky few also will be profitable.



The picture consists of 58 fragments that have been cut from advertisements appearing in this issue, and readers are invited to discover the names of the advertisers from whose advertisements the fragments have been taken. It will be a simple matter to trace some of the pieces, but others will prove not quite so simple and will tease the most lynx-eyed competitors. It is one of our secret ambitions to set a fair competition that will baffle all our readers! Time and again we have cherished a belief that we have succeeded, only to find a number of readers pop up smilingly to prove that their wits are no less sharp than ours.

In their solutions competitors must give the names of the advertisers concerned, and where an advertiser has more than one advertisement in this issue, the number of the page from which the fragment is taken must be stated. Prizes of Meccano products to the value of 21/–, 15/–, 10/6 and 5/– respectively will be awarded to the senders of the four most accurate lists in order of merit, and in addition there will be a number of consolation prizes.

Entries for the competition must be addressed to "*Jig-Saw Advertisement Contest, Meccano Magazine, Binns Road, Liverpool 13,*" and must be forwarded to reach this office not later than Monday, 20th December. The prize-winners will be advised by post on 21st December, and their prizes will be despatched to arrive on Christmas Day.

Another set of prizes, of the same value and to be awarded in similar conditions, will be reserved for the Overseas Section, open to readers living outside Great Britain, Northern Ireland, the Irish Free State and the Channel Islands. Overseas. Closing date 31st March, 1938.

December Drawing Contest

Each month throughout this winter we are holding a series of Drawing Competitions that are open to readers of all ages. No special subjects are set, the monthly prizes being offered simply for the best drawings or paintings submitted during the month. The entries may be of any size to suit the competitor's preference.

The entries each month will be divided into the usual two sections, A for readers aged 16 and over, B for those under 16; and prizes of Meccano products to the value of 21/– and 10/6 will be awarded in each section. Entries in the December competition must be addressed "*December Drawing Contest, Meccano Magazine, Binns Road, Liverpool 13,*" and must arrive not later than Monday, 20th December. The prize-winners will be advised by post on 21st December and their prizes will be despatched to arrive on Christmas Day. There will be special sections for Overseas readers, in which prizes of the same value as in the Home Sections will be awarded. Overseas closing date 31st March, 1938.

Competition Closing Dates

HOME

Advertisement "Jig-Saw" Contest	20th December
Stamp Voting Contest	20th December
December Drawing Contest	20th December

OVERSEAS

September Photo Contest	31st December
"Point Words" Contest	31st December
Hidden Advertisements Contest	31st January, 1938
October Drawing Contest	31st January, 1938
"Hidden Proverbs" Contest	28th February, 1938
November Drawing Contest	28th February, 1938
Advertisement "Jig-Saw" Contest	31st March, 1938
Stamp Voting Contest	31st March, 1938
December Drawing Contest	31st March, 1938

Watch the Closing Dates:

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

In sending entries to competitions that are divided into age groups, competitors should take particular care to mark their ages clearly on the back of the entry.

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

COMPETITION RESULTS

HOME

Hidden Advertisements Contest.—1. R. J. Biggs (Bristol, 6). 2. L. V. T. Medlin (Par). 3. A. New (New Barnet). 4. G. W. Jamieson (Dublin, N.E.2). Consolation Prizes: G. G. Brebner (Aberdeen); P. Brown (Malton); L. W. Chitty (London, S.W.20); J. McGregor (Ardrossan); D. Morley Davies (Maesteg); R. P. and J. C. Walford (Newton Abbot); R. A. Wood (Hemlington).

October Drawing Contest.—First Prizes: Section A, R. A. Stephenson (Hull); Section B, L. R. Pool (Weymouth). Second Prizes: Section A, J. E. A. Burley (Birmingham, 6); Section B, S. Jones (Chester). Consolation Prizes: S. Bowles (Grimsby); R. Bradshaw (Manchester, 14); R. Buxton (Southampton); R. K. Clark (Alnwick); J. Laing (Dunstable); S. Marshall (Hyde).

OVERSEAS

"Sketchograms" Contest.—First Prizes: Section A, C. C. Corleo (St. Julians, Malta); Section B, R. W. Lockie (Edmonton). Second Prizes: Section A, A. R. Bacon (Bombay); Section B, S. Talaat (Cairo). Consolation Prizes: C. R. Anderson (Timaru, N.Z.); A. Dionne (Montreal); M. D. Patel (Karamsar, India); A. G. Turton (Ottawa).

July Photo Contest.—First Prizes: Section A, L. W. Humm (Geraldine, N.Z.); Section B, R. Myburgh (Claremont). Second Prizes: Section A, A. A. Shawky (Orman, Egypt); Section B, J. Zammit (Valletta).

SETS (Postage Extra)

5	Malta ...	2d.	10	New Zealand ...	2d.
10	,, ...	5d.	15	,, ,, ...	4d.
15	,, ...	8d.	20	,, ,, ...	6d.
20	,, ...	1/-	25	,, ,, ...	8d.
25	,, ...	1/4	30	,, ,, ...	10d.
1	,, Jubilee ...	2d.	35	,, ,, ...	1/-
3	,, Coron. ...	8d.	40	,, ,, ...	1/3
5	Mauritius	3d.	1	,, ,, Cor.	2d.
3	,, Coron.	1/-	5	Nigeria	3d.
11	Morocco Agencies	1/6	10	,, ...	6d.
5	Natal	3d.	1	,, Jub. ...	3d.
5	Newfoundland ...	2d.	3	,, Cor. ...	10d.
10	,, ,, ...	5d.	5	Nyassaland ...	4d.
15	,, ,, ...	8d.	3	,, ,, Cor.	8d.
20	,, ,, ...	1/-	5	North Borneo ...	3d.
3	,, ,, Cor.	9d.	4	North Rhodesia	3d.
4	Negri Sembilan ...	3d.	3	,, ,, Cor.	10d.
5	New South Wales	2d.	5	Orange River ...	4d.

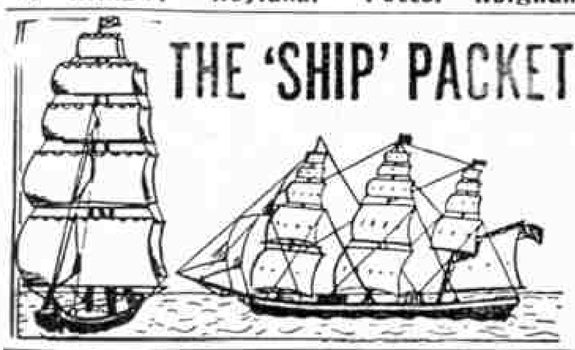
J. RUSSELL,
23. SHANKLIN DRIVE, WESTCLIFF-ON-SEA.

SUPER BRITISH COLONIAL STAMPS. 5/- PACKETS.
A. Woolf, 138, Blandford Road, Hamworthy, Dorset.

ONE THOUSAND STAMPS ON APPROVAL

From which you may select any 100 for 3/-.
This selection is not made up of the very commonest varieties, but contains stamps catalogued at 1/- each or more. (I do not sell less than 100.)
During this month I will include a stamp cat. at least 3/-. Can you find it?
A returnable deposit of £1 is required from overseas applicants.
H. HARDY. "Hoyland." Potter Heigham. Norfolk.

THE 'SHIP' PACKET



This marvellous packet is offered under cost as an advertisement, **45 different stamps each with a ship on it.** A regular armada. **KOUANG-TCHEOU**, new, **SENEGAL** (Canoe), wonderful flotilla of caravels from **DENMARK** (complete set), **NEW CALEDONIA, UKRAINE, COSTA RICA**, a fleet of **7 CHINESE** junks usually sold at 10d., **TRINIDAD & TOBAGO, MAURITIUS, KENYA-TANGANYIKA, NEWFOUNDLAND, U.S.A., B. GUIANA**, set of **S. AFRICA, GREECE, POLAND, INDO CHINA, FRENCH OCEANIA, WALLIS & FUTUNA ISLANDS**, etc. Price 4½d., postage 1½d. (abroad 3d. extra). Purchasers of this packet asking for approvals receive **FREE** set of **3 SPAIN** (Columbus, each with his ship on it). Senders of addresses of stamp collectors receive **FREE** set of **6 VENEZUELA or 6 PERSIA. 100 BRITISH COLONIALS 1/-. 20 AIRPOST 6d.. 6 TRIANGULARS 7d.. 50 PERSIA 4/-. 9 POLAND New Pictorials 8d.. VOLUMES OF B.O.P. CHEAP.**

H. C. WATKINS (M. Dept.), Granville Road, BARNET

THE FIRST STAMP Ever Issued

(British 1840 Penny Black) for P.O. **3/6.** It is guaranteed genuine in every respect. Its companion stamp (1840, 2d. blue) for a further **5/9** (cat. 17/6)! Other "Classics" which every Collector should have are the **Cape of Good Hope Triangulars:** we offer 1d. rose (cat. 40/-) for **12/6;** 4d. blue (cat. 15/-) for **5/-;** and 6d. pale lilac (cat. 40/-) at **15/-.** Superb approvals of any country against approved English References or a deposit. **Full Lists Free.**
NORRIS & CO. (Dept. M), Norwood, London, S.E.19.

OUTSTANDING!

Our Special FREE OFFER this month is certainly the GREATEST and MOST GENEROUS ever made to stamp Collectors. We are presenting ENTIRELY FREE a Special Packet of 50 Different Stamps EVERY ONE from a Different Country. There are MANY HARD TO FIND and SCARCE STAMPS included from such places as Bulgaria, Chile, Danzig, Egypt, Finland, Greece, Hungary, Liechtenstein, etc., and also LARGE PICTORIALS, COLONIALS and NOVELTIES. The Value of this packet is TWO SHILLINGS, but it is being GIVEN ABSOLUTELY FREE to ALL Applicants for our World Famous Approvals.
Please send 2d. (in stamps) for Postage. Abroad 6d.
N. MOSELEY (Dept. M.A.4),
Central Market, CARDIFF.

REALLY GOOD PACKETS FOR CHRISTMAS

500 British Empire	15/-	300 Portuguese Cols.	10/6
200 Balkans	2/6	135 Mint Coron. ...	30/-
40 Triangular Stamps for	6/6;	75 ditto	18/6
200 Indian Native States for	7/6;	300 ditto ...	18/-
50 Jubilee used and mint,	10/6;	75 ditto	30/-
100 Airmail Stamps for	6/-;	200 ditto	21/-
100 Queen Victoria Heads for	5/-;	200 ditto ...	24/-
50 Used Coronation Stamps for	7/6;	75 ditto	12/-
50 Mint Colonial Pictorials,	3/9;	75 ditto... ...	7/-
50 Mint British Atlantic Is., Many Pictorials ...			4/6
2,000 British Colonial and Fgn.,	12/-;	3,000 ditto	26/-
100 K. Edward Heads	7/6	200 K. George Heads	10/6
200 Asiatic	6/6	200 Australasian ...	15/-

Cash with Order. Postage Extra.
EDWARD SANDELL,
10, Evelyn Grove, Southall, Mddx.

STAMP COLLECTOR'S OUTFIT FREE!

Whether you are a new collector or a seasoned Philatelist, you will find the contents of this wonderful advertising offer of great use. They include: Ruled Duplicate book, in which is incorporated a millimetre perforation measurer, 34 all different stamps (no common Germans), pkt. of stamp mounts, metal watermark finder, 100 Titles of Countries. Amongst the fine stamps are sets of Colonials, Philippines, Bohemia, Hungary, old Canadians (King George), Indians and Australians, and Swiss. Finally, two splendid sets, 5 LATVIA and 5 ESTHONIA. Complete parcel, including 1937 Catalogue, absolutely free. Just send 2d. postage requesting approvals and list of further gifts.

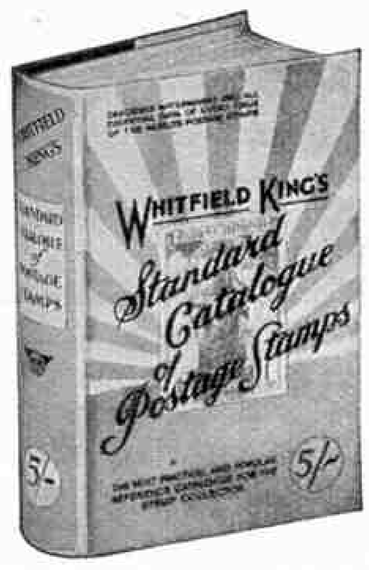
LISBURN & TOWNSEND LTD. (Dept. M.M.), LIVERPOOL 3

FREE 4 CORONATION COLONIALS

To all stamp collectors sending **2½d.** postage (abroad **6d.**) Limited supply.
G. P. KEEF, Willingdon, Eastbourne

THE "DIAMOND" PACKET IS THE ONLY PACKET

OF UNSORTED STAMPS ON THE MARKET with 15 years' reputation behind it. It contains approx. **1,000 UNSORTED STAMPS** from Convents abroad. **MANY RARE STAMPS** have been found in it. 1 pkt., **1/6;** 3 pkts., **3/9;** 5 pkts., **6/-.** All post free inland. Postage to Colonies 3d. per pkt. extra. Foreign, 6d. extra.
Ask your stationer for the "Diamond" packet.
SPECIAL TURKS ISLANDS JUBILEES complete set: used or unused, 5/6.
O. NERUSH (Dept. A), 68, TURNPIKE LANE, HORNSEY, LONDON, N.8.



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THE 1938 EDITION OF THE STANDARD CATALOGUE OF POSTAGE STAMPS OF THE WORLD

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This new edition includes quotations for the Jubilee and Coronation stamps, as well as those of the Spanish Revolutionary Government, and all other new issues received up to the time of going to press.

Start the season well by placing your order now, or ask for descriptive leaflet and free copies of our interesting price lists.

PRICE 5s.
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WHITFIELD KING & CO., IPSWICH, SUFFOLK. Est. 1869.

FREE 25 COMMEMORATIVES CAT. 6/-

This marvellous packet contains stamps commemorating **PARLIAMENT, VICTORY & INDEPENDENCE, REVOLUTION, POSTAL HISTORY, DICTATORS, POETS & AUTHORS,** etc. In addition the **FIRST** and **EVERY TENTH APPLICANT** will receive an **AMERICAN** stamp **CATALOGUED AT LEAST 10/-.**

This is my **SPECIAL XMAS OFFER** to all genuine applicants for my approvals, which contain only perfect stamps at very low prices, thus enabling you to buy **TWO** stamps instead of one. Just send 1½d. postage and I will reply **BY RETURN.**

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

CHRISTMAS PRESENTS

25 MOROCCO, 3 reigns, including K.E. VIII, K.G.VI and Coronation sets, complete. SPECIAL. **2/6**
5 NEW ZEALAND 'C. of C.' Complete mint **3/-**
15 JUBILEES (No G.B.), all diff., **1/3;** 20 at **2/-**
3 CORONATION. N.ZEALAND, COOKS or **NIUE** at **1/2**

Free **MY CHRISTMAS PRESENT TO YOU.** Offered to all purchasers of 2/6 from the above, or to genuine approval applicants—**8 BRITISH COLONIAL MINT NEW ISSUES.**

T. R. HUGHES (P.T.S.).
'IBIS COTTAGE,' LONG PARK, AMERSHAM.

MINT CORONATIONS—YOUR LAST CHANCE

Aden	1/-	Br. Solom'ns	1/3	Hong Kong	11d.
Antigua ...	8d.	Cayman Is.	6d.	Jamaica ...	8d.
Ascension	9d.	Ceylon ...	11d.	Malta... ...	7d.
Bahamas ...	7d.	Cook Is. ...	1/6	Mauritius ...	1/-
Barbados ...	8d.	Cyprus ...	10d.	Newf'ndl'd	8d.
Basutoland	9d.	Falklands ...	6d.	N. Zealand	1/4
Bechuanal'd	9d.	Fiji	10d.	Nauru... ...	2/3
Bermuda ...	8d.	Gibraltar ...	8d.	Nyasaland	6d.
Br. Guiana	9d.	Gold Coast	9d.	Niue	1/6
Br. Hond'ras	9d.	Cash with Order—Postage Extra.			

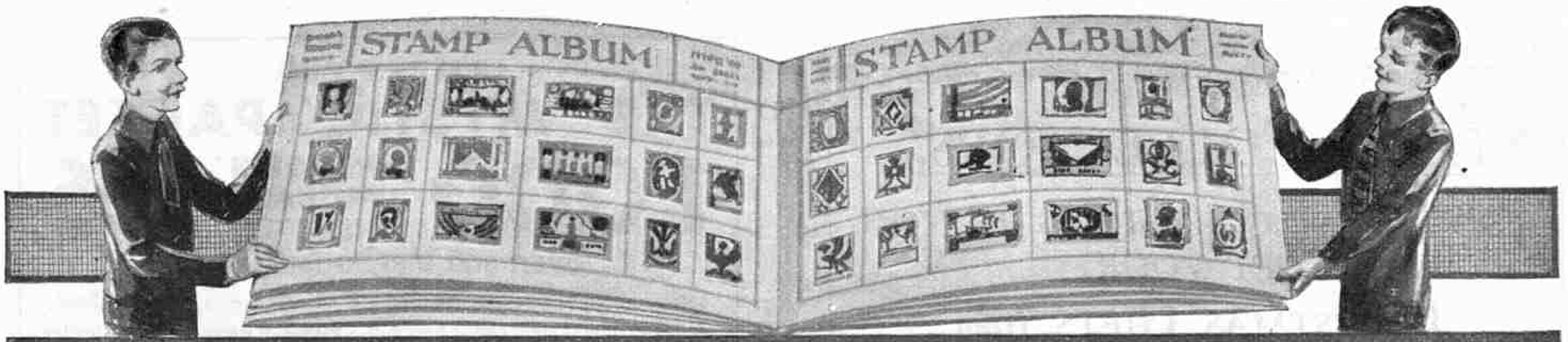
H. L. GOMM, 41, Upper Cranbrook Road, BRISTOL, 6.

BRITISH COLONIAL APPROVALS

British Colonial Pictorial Sets of **GAMBIA** and **GRENADA** New Issue.

FREE

to collectors sending 2d. stamp for postage, etc., and requesting **BRITISH COLONIAL APPROVALS** containing **CORONATION, PICTORIAL** and **JUBILEE ISSUES.** (No stamps sent abroad.)
C. H. SHAW (Dept. M.12), 95, CHRISTCHURCH AVENUE, KENTON, HARROW.



STAMP COLLECTING

WHAT A STAMP COLLECTOR NEEDS

IT is probable that the majority of boys who have taken up stamp collecting this winter are looking forward to at least one or two Christmas gifts associated with their hobby. It is timely this month, therefore, to discuss stamp collecting equipment, the possession or absence of which makes so much difference to the collector's enjoyment.

The album in which the stamps are displayed is the most important item in the equipment. Most young collectors start with a fixed leaf album, but as time passes they find that the stamps of some countries tend to overflow the space allotted to them, while the pages devoted to others remain entirely bare. It becomes a serious temptation to use this unoccupied space to accommodate the overflow from the filled countries, and in the end the effort to preserve a reasonably neat display has to be sacrificed to the sheer necessity for making room somewhere.

One remedy lies in the use of a loose leaf album. Its first cost may be slightly greater than that of a fixed leaf album, but it has the overwhelming advantage that it permits a perfect display of every stamp. Additional leaves can be inserted as required to give well-represented countries all the space they need, and there is no waste of space on countries that are not represented in the collection by even a single specimen.

The choice of album is important, and it will prove a sound maxim to buy the best that can be afforded. The collector cannot go wrong if he confines his choice to albums marketed by reputable firms, such as Stanley Gibbons Ltd., for their albums have been produced after careful study of the requirements of collectors of all types.

Many young collectors who buy a really good album make the mistake of trying to economise on stamp mounts. The difference in cost between first-class peelable mounts and cheap nasty bits of gummed paper is only a copper or two at most. There is a great difference in practice, however. The peelable mount can be removed from the back of the stamp or the album page without leaving a trace, while the removal of the cheap mount is an operation involving considerable risk of damage to both stamp and album page. If only one or two stamps are ruined the point of the economy is lost.

Albums and mounts are the bare necessities of stamp collecting, but the boy who takes the hobby seriously will find that he cannot go far without a catalogue. Approximately 65,000 stamps have been issued to date, and a catalogue is essential if the individual members of this huge family are to be correctly placed.

A catalogue is much more than a price list of stamps. It is the means of identifying stamps with curious inscriptions, and of distinguishing between common and scarce varieties of similar issues. In addition it reveals the significance of perforations and watermarks, which may have so important a bearing on values that the collector without a catalogue simply cannot work on definite lines. Not until he has studied stamps with the aid of a stamp catalogue can the young collector be said to have realised the full interest of his collection. We recommend either the Gibbons "Simplified" or the Whitfield King "Standard" catalogue for younger collectors; for older ones, and those who have had some years' experience of the hobby, only the large Stanley Gibbons *"Catalogue of the Stamps of the World"* will suffice.

It follows from what we have just said that a perforation gauge and a watermark detector are other important essentials.

The perforation of a stamp is stated at so many perforation holes in a space of two centimetres, the figure for the top and bottom being given before that for the sides. For example, the current stamps of Great Britain are stated to be perforated $14\frac{3}{4} \times 14$. This means that along the tops and bottoms there are $14\frac{3}{4}$ holes to every two centimetres, and down the sides there are 14. The perforation gauge consists of a series of rows of black dots, each row representing a particular spacing of perforation teeth. The stamp is placed on the gauge and the edge to be examined is moved from one row to another until one is found in which the dots exactly fit the spaces between the perforation teeth of the stamp. A reading at the side of the gauge then indicates the perforation standard.

Most boys know that watermarks in paper are intended to serve as a guard against forgery. Usually the watermark can be seen clearly if the stamp is held up against the light, but if not it will almost certainly show up when the stamp is placed face downward on a black surface. For this reason a watermark detector is a very useful accessory, and usually it can be purchased in the form of a little black tray for a copper or two from any stamp dealer.

Finally we urge every young collector to obtain a pair of tweezers for use when handling his stamps. Usually it is the last piece of equipment that the young collector considers essential, but in fact it ranks next to the album itself. Stamps are so easily soiled by finger-marking, which decreases their value, that the use of tweezers is the only sure way of guarding against dirtiness. Handling stamps with tweezers is a little awkward at first, but the knack can be acquired with only a very little practice.

The illustrations on this page have been chosen, not to link up with any particular subject, but to reveal something of the extreme beauty and fascination that is to be found in the designs of many modern stamps. The object of our stamp articles is to help our stamp collecting readers to enjoy that beauty and fascination to the full. We are always glad to be of assistance to any individual reader in solving any personal problem he may have encountered, and any reader desiring our help is cordially invited to write to the Editor.

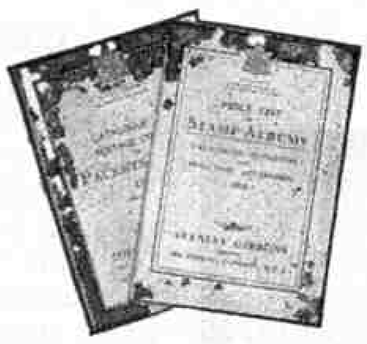
STAMP COLLECTORS!

YOU CAN'T GO WRONG IF YOU GET YOUR

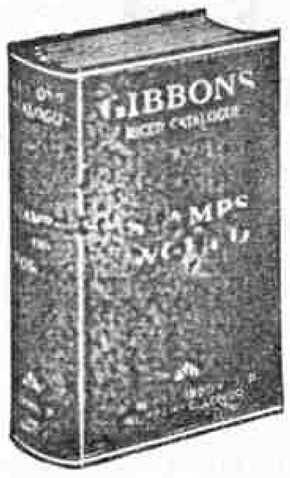
CHRISTMAS GIFTS *from*

STANLEY GIBBONS

TO HELP YOU CHOOSE WHAT YOU WANT, WRITE TO-DAY FOR OUR TWO **FREE** LISTS

104 pages giving full details of all Stanley Gibbons' Stamp Albums, Catalogues, Books and Accessories, and particulars of hundreds of fine Stamp Bargains.

Three Gift Suggestions:

GIBBONS' PRICED CATALOGUE, 1938



Best and most detailed catalogue—essential to every keen collector who wishes to keep right up-to-date with his collecting. 1,868 pages, and 2,049 new issues added with 25,191 price alterations in this new edition. Price **16s.**

Postage extra, U.K. 6d., abroad 1/3

STANLEY GIBBONS' SIMPLIFIED CATALOGUE, 1938

Wonderful catalogue listing all the world's stamps in simpler form. 1,085 pages with 7,301 full-size illustrations for only **5s.**

Postage extra, U.K. 6d., abroad, 1/1

CORONATION STAMPS

Get these historic stamps from us **now,** at our remarkably cheap prices.

CROWN COLONIES (Complete)	**27/6**
DOMINIONS (Complete)	**40/-**
Representative Set of 45 Crown Colonies' stamps	**5/-**

Above prices are "post free" for the two Complete sets; add 2d. for postage on the Representative Set. The stamps will all be obsolete soon and above prices must be quoted subject to alteration without notice, but if you order **now** you will get them as cheaply as possible.

STANLEY GIBBONS LTD.

Dept. S.15, 391, STRAND, LONDON, W.C.2

IMPROVED

THE "MYSTIC" PACKET

1,000 UNKNOWN UNUSUAL UNSORTED **1/6**

(OVER 200 DIFF. GUARANTEED)

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CONTAINS 515 all different Foreign and Colonial Stamps and includes Coronations, Jubilees, Pictorials. One Colonial alone is catalogued at 5/-. Price **2/6** post free; abroad **3/-. CORONATION STAMPS** (no Great Britain). 16 different for **1/6.** 24 for **2/6.** 30 for **3/6.** 45 for **5/-.**

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Crown Colonies and Dominions, Mint and Used. Large stock of First Day covers. Prices on application.

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A really high-class mixture of British Colonials and better class Foreign. Guaranteed unsorted and as received from the various Colonies.

MIXED. 100 for **1/-.** 250 for **2/-.** 500 for **3/9.** 1,000 for **7/3.**

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J. H. WALLACE, 1 & 2, YORK ROAD, BOGNOR REGIS, SUSSEX.

Stamp Gossip

and Notes on New Issues

A Greek Art Series

On 1st November, Greece issued a complete new general series of pictorial designs with each design based upon an ancient Greek work of art. We hope to illustrate some of the designs next month, but in the meantime readers will be interested to note the general details, as follows: 5 lepta, "The Bull Fight," based on the famous fresco in the ancient Cretan palace of Knossos, which dates back to the period 2000–1400 B.C.; 10 lepta, A "Lady of the Court" from a fresco at Tirynthe (1600–1000 B.C.); 20 lepta, "Jupiter the Destroyer" from a bronze statuette now in the Berlin Museum; 40 lepta, coin of the Union Amphictro-Ligue, an ancient forerunner of the present League of Nations; 50 lepta, "Diagoras of Rhodes"; 80 lepta, "Venus de Milo"; 2 dr., the victorious Greek fleet at Salamis (480 B.C.), based on a picture by the Greek artist, M. Volonakis; 5 drs., festive chariot of the Pan-Athenic fêtes; 6 drs., Alexander the Great; 7 drs., St. Paul preaching from the summit of the Mount Arios Pagos (54 A.D.); 10 drs., the Byzantine Temple of St. Demetrius at Salonica; 15 drs., the Arabs defeated before the walls of Constantinople by the Byzantine Emperor Leon III; 25 drs., "Glory" based on a picture by the Greek artist Chyzis; 1 dr., 3 drs. and 8 drs., portrait of H.M. King George II.

French Motor Road Commemorative

We illustrate this month the French stamp issued on 14th October to commemorate the opening of the new motor road over the Col de L'Iseran by President Lebrun on 11th July. The stamp shows a section of the road, which links Nice with Evian on Lake Geneva. It is the highest mountain motor road in Europe and at one point reaches a height of 9,088 ft. above sea level.

* * * *

We illustrate above the striking Swiss stamp issued recently to commemorate

the introduction of a mobile post office service. The design shows the mobile post office van, from which alone can the special stamps be purchased.

The Emperor Augustus Commemorated

The 2,000th anniversary of the birth of the Roman Emperor Augustus has been commemorated in Italy by the issue of a striking series of 10 postal and five air mail stamps, from which we illustrate the 75c. postal issue and the 5L and 1L air stamp.

An interesting feature of the designs is that 10 of them are based on personal references made by Augustus in a diary placed in his mausoleum after his death. One of the chosen references is to the great census that took the parents of Christ to Bethlehem, and the Star of Bethlehem is shown in the stamp design. St. Luke's gospel (Ch. 2, v. 1) refers to the incident with the words "And it came to pass in those days that there went out a decree from Cæsar Augustus that all the world should be taxed." This design is on the 25c. stamp.

The designs of the other five stamps are inspired by verses from Horace and Virgil singing the glories of the Augustan age. It should be noted that the 10 postal stamps are in the upright form shown, while the five air stamps take the horizontal format.

Esperanto Jubilee Commemorative

The Golden Jubilee of the introduction of Esperanto as an international language has been celebrated in Brazil by the issue of the special commemorative stamp illustrated on this page. The design shows a globe encircled by a streamer bearing the words "Ora Jubileo de Esperanto."

Airways are Mailways

Since we compiled the list in our last issue of the countries to which the "all up" air service for first class mail had been applied, the scheme has been extended to cover the weekday despatches to Belgium, France and Italy. Thus practically the whole of Europe is now served by air mail without extra fee.

New South Wales Sesqui-Centenary

We are indebted to our reader, Mr. Kenneth Allen of Oatley, New South Wales, for a first-day cover bearing specimens of the stamps issued on 1st October to commemorate the Sesqui-Centenary of the founding of that state. There are three stamps in the series, 2d., 3d., and 9d. values, each bearing the same design, showing the scene at the landing of Capt. Arthur Phillip at Sydney Cove on 21st January, 1788. We hope to illustrate and give the full story of this series in our next issue.

A Fiery Frontier Dispute

The recently issued Nicaragua air mail stamp, illustrated on this page, makes another addition to the list of map stamps that have created diplomatic incidents.

In this stamp Nicaragua seems to have annexed to herself a considerable part of the Mosquita province, which was, in fact, given to Honduras in an arbitration by ex-King Alfonso of Spain in 1906. The Honduras Post Office has refused to deliver letters bearing these stamps, and feeling has run so high that troop movements have taken place on both sides of the frontier. The fear of war has led to diplomatic intervention by the United States Government, and the two governments have accepted the offer of the United States, Venezuela and Costa Rica to hold a court of enquiry, at which it is hoped a peaceful solution will be reached.

An Exclusive Stamp Club

What is probably the most extraordinary stamp club in existence is one that has its headquarters in the famous U.S. prison at Sing Sing. All its members are convicts, and apparently the prison authorities in seeking to give its temporary "guests" a new grip on life have introduced them to the fascinations of philately. A group collection from the convict collectors was on show at a recent national stamp exhibition.

German Winter Relief Stamps

The designs of the 1937 issue of German "Winter Relief" stamps will make a special appeal to those of our readers who are compiling collections of ship stamps. Each of the nine designs shows a type of German shipping as follows: 3+2 rpf., life-boat; 4+3 rpf., lightship *"Elbe I"*; 5+3 rpf., fishing smacks; 6+4 rpf., pleasure cruiser *"Madeira"*; 8+4 rpf., a windjammer; 12+6 rpf., S.S. *"Tannenberg"*; 14+10 rpf., mail steamer; 25+15 rpf., *"Hamburg"* of the Hamburg-Amerika line; and 40+35 rpf., the North German Lloyd liner *"Bremen."*

The whole series is most attractively produced and since the designs cover a wide range of German shipping types, it will make a very strong appeal to the general public as well as to stamp collectors.

FREE **THE WONDER PACKET.** Ask for my approval sheets and new lists and enclose 1½d. postage and I will send you the following packet absolutely **FREE—50 FINE STAMPS** including new **IVORY COAST**, a handsome stamp, two **CORONATION COLONIALS**, **BRAZIL** airpost (curious looking stamp), **GREEK**, Red Cross, **DENMARK (SILVER JUBILEE)**, 2 new **POLISH** Pictorials (fine), **2 NEW ZEALAND** (Zoological Pictorials, new), **PALESTINE**, etc. **STAMP BARGAINS.** 10 Persia 3d., 10 Peru 4d., 100 different British Colonials 1/-, 6 Triangular 7d., 1,000 different 3/11, 45 Coronation (one from each Crown Colony) 5/-, 20 Brazil 10d. My new large list of 700 Bargains, post free 1½d. Send addresses of stamp-collecting friends and receive 6 Venezuela or 3 Ichang. **H. C. WATKINS (M. Dept.), GRANVILLE ROAD, BARNET.**

? XMAS ?

As a special Christmas offer we give you **ABSOLUTELY FREE** this colossal packet of over 61 different first-class stamps including a rare **AFGHANISTAN;** Triangular **LIBERIA** commemorating First Air Mail Service and depicting Mail-plane landing; fine **VATICAN CITY** showing Papal arms, tiara and keys; stamps from Far Eastern War Zone—**MANCHURIA** (Hsinking State Council Bldgs.), **JAPAN** (Nagoya Castle) and **CHINA** (River Boat); unusual issues from **LATVIA** (Lettland), **ESTHONIA** (Pres. Konstantin Pats) and **BAVARIA** (Ploughman); a set from **CZECHOSLOVAKIA** showing the late President Masaryk with Sahara scene from **ALGERIA** and view of Basse Pointe Village from **MARTINIQUE.** Also sets from **POLAND** commemorative of peace with Russia and Jubilee from **AUSTRIA** together with another large **POLISH** item showing ancient Slav God, 'Swiatowit' and very many others including stamps from disturbed **SPAIN** (temporary ovpd. Republica issue) and **PALESTINE** (Citadel at Jerusalem). All can be yours **FREE** by requesting approvals and enclosing 2d. stamps (abroad 6d.). Price without approvals 3/-. Price Lists also **FREE** on request.

WINDSOR STAMP CO.
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This month we offer FREE to approval applicants enclosing 2d. for postage.

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Ecuador, 1909 Exhibition, 1c. and 10c., mint.

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MOROCCO	8d.	CAYMANS	9d.
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Post extra under 5/-. Cash with order. All Coronation covers in stock. Send want list for my quotation.

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

STAMP ALBUM. Holds 3,000, 9d. post free. Approvals. Godwin, 110, Felbridge Av., Stanmore, Middlesex.

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5 CORONATION STAMPS FREE. Post 2d. Sanders, 90, Newlands Avenue, Southampton.

FREE CORONATION PACKET to all genuine applicants for my approvals sending 2d. postage. A. Brock, 26, High Road, Potters Bar, Middlesex.

"SLAIN DRAGON" stamp (catalogue value 2/6), absolutely free to all genuine applicants for my approval sheets. Fawcett, 36, Flaxley Road, Selby.

Breaking up collection of foreign stamps. Write for approvals. Gordon, 66, Eastbury Road, Northwood, Mddx.

MINT CORONATION. 30 British Colonials and watermark detector free to genuine approval applicants. Postage 2d. P. R. Lincoln, 60, High Road, Potters Bar.

FREE. Magnificent Stamp Album. Particulars to genuine approval applicants sending 1½d. stamp. L. O. Ludgate, 76, Canterbury Road, North Harrow, Mddx.

FREE pocket knife to all requests for our approvals. Send 3d. postage. Ideal for beginners. G. Norman, 33, Chipstead Avenue, Thornton Heath, Surrey.

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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. Apply now while supplies are available.

Mention "Meccano Magazine."

R. D. HARRISON, Roydon, Ware.

STAMP COLLECTORS *Would you like* **2 New Issues FREE** *REGULARLY* EVERY MONTH?

Send a postcard and be kept up-to-date with 2 fine New Issues FREE MONTHLY. Request Approvals. **V. Bancroft, Matlock.**

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Canada (Coronation), Ivory Coast, New Zealand (Pictorial), Guadeloupe (Pictorial), Canada (Silver Jubilee), and 50 different others, all post free for 3d. and in addition, all buyers of this packet **WHO ASK TO SEE MY APPROVAL SHEETS** receive a **SET OF NIGER TERRITORY (Pictorial) FREE.** Ask for my **NEW APPROVAL SHEETS.** Great variety. Good discount. Write to-day and ask for a selection. Exchange desired with all Colonies and Dominions.

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AIR MAILS—25, 1/-; **50,** 2/3; **75,** 4/-; **100,** 7/6; **200,** 21/-; **300,** 40/-. **ALL WORLD—300,** 1/-; **500,** 1/9; **1,000,** 4/-; **2,000,** 12/-; **3,000,** 27/6. **BRITISH COLONIALS—100,** 1/-; **200,** 3/6; **300,** 5/-; **500,** 12/6; **1,000,** 45/-. **CORONATIONS all fine used—20,** 2/6; **50,** 10/6. **JUBILEES—25,** 3/6. **FRENCH COLONIALS—100,** 1/6; **200,** 4/-; **500,** 17/6. **TRIANGULAR STAMPS—10,** 1/6; **15,** 2/-; **20,** 3/-; **50,** 5/6. **100 HOLLAND,** 2/6. **200 BELGIUM,** 2/6; **300,** 5/-. **SPANISH CIVIL WAR STAMPS**—25 different, 2/6.

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Representative Crown Colonies 5/-
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1000 ALL DIFFERENT ,, ,, ,, ... 3/-

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10 CORONATION USED. 7d. **20** ditto 1/9
8 MOROCCO King George VI mint ... ... 8d.
11 do. King Edward VIII mint 1/2
4 BELGIUM Prince Baudouin mint ... ... 5d.

Postage 1½d. extra. Selections if desired.

J. R. MORRIS, 9, AUDLEY ROAD, FOLKESTONE, KENT.

IRISH FREE STATE ENDS!

On the 29th December, 1937, the Irish Free State will officially end, with the coming into force of the New Constitution. Wise collectors will buy their Irish stamps now, before prices rise. Here is a splendid collection of 40 Irish stamps (over thirty varieties), including scarce 1922 Provisionals, printed under shellfire. Handsome Commemoratives, Postage Dues, Pictorial issue complete to 1/-, etc. Also fine flown Ireland-Vatican City tricolour aircover. Complete collection post free 4/-. Every order franked with Commemorative stamps.

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I specialise in Brit. Col. approvals and will send you an absolute bargain selection of pictorial (Coronations if required). Do you want current, recent or what issues?
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GIVE yourself and friends **STAMPS** for **CHRISTMAS.** To applicants for Approvals from ½d. sending 1½d. postage **FREE XMAS BUMPER PACKET** with **TRIANGULAR. 15 USED CORONATIONS,** picked specimens, all different (no G.B.) 2/6, cash with order.

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HELP YOURSELF! To my new stock at bargain prices. Collectors invited to send particulars of their requirements. My exceptional "Big Value Appros." are this season's best offer to medium and advanced collectors. Something for everyone from ½ to ¼ S.G. **Campbell, Haldon Av., Teignm'th, Devon**

This Space is set to ½ inch s.c. and costs 8/- per month. The sum is the 50th of £20, the price of a whole page advertisement. Over 60,000 copies of the November issue were sold in various parts of the world. Your advertisement therefore reaches this exclusive public for approximately 1½d. per 1000.

WHEN WRITING TO ADVERTISERS

Readers are urged to observe the following points when writing to advertisers:

1. **Mention the "M.M." and any special reference number quoted in the advertisement. This helps the advertisers to give prompt attention.**
2. **See that the full amount of the price and any postage is included. It is unfair to expect advertisers to fulfil their undertakings promptly if short remittances are sent.**
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THE ADVERTISEMENT MANAGER
MECCANO MAGAZINE, Binns Road, LIVERPOOL 13

New King George VI Issues

A further series of Colonies has announced its intention to issue new stamps for King George's reign. In the Bahamas the existing designs are to be retained, except in the 4d. and 6d. values, but the portrait of King George VI will be substituted for that of King George V and the word "postage" will be omitted from all values except the 8d. The design for the 4d. stamp will show a view of the sea garden of Nassau, while that for the 6d. will bear a view of Fort Charlotte.

Three new issues are announced for Bermuda. These are 1d. and 1½d. values, each showing a view of a liner and a schooner lying alongside the wharves at Hamilton, and a 3d. value showing St. David's lighthouse. An entirely new series of 12 values will be issued in the Cayman Islands. The ¼d., 1½d. and 2s. will show a beach view of Grand Cayman; the 1d. and 3d. will show a map of the Cayman Islands, and the 2½d. and 5s. a Cayman schooner.

In Cyprus most of the existing designs will be retained after the substitution of the portrait of King George VI for that of King George V. The 4½ p. stamp will show a map of the Island of Cyprus, however, while the 9 p. will display a view of Othello's tower at Famagusta. Dominica will have a complete new series consisting of four new designs. The ½d., 6d. and 2s. 6d. values will show a view of Fresh Water Lake; the 1d., 3d. and 5s. a view of Layou River. The 1½d. and 2½d. will show an agricultural scene, and the 2d. and 1s. values a view of the Boiling Lake. Falkland Islands also will have a completely new series with designs as follows: ½d., whale's jawbone; 1d., black-necked swan; 2d. and 2½d., battle memorials; 4d., upland goose; 6d., R.R.S. "*Discovery II*"; 9d., R.R.S. "*Wm. Scoresby.*"

Gibraltar will retain the existing design for its 1d. and 1½d. values with the substitution of the new King's portrait and the introduction of the Colony's Coat of Arms in the top right corner. For the remaining designs pictorial views are to be shown, in each case embodying a portrait of King George VI in the left upper corner and the Coat of Arms in the right upper corner. The views will be as follows: 2d., The Rock, North Side; 3d., Europa Point; 6d., Moorish Castle; 1s., Southport Gate; 2s., Eliott Memorial; 5s., Government House; 10s., Catalan Bay.

Both Hong-Kong and the Leeward Is. will retain the old style portrait type with the effigy of King George VI in place of that of King George V. Nigeria will issue a complete new series with one standard design consisting of the portrait of King George VI flanked on each side by coconut palms. St. Kitts will retain the existing designs with the substitution of the effigy of King George VI for that of King George V.

* * * *

As from 1st January next the pre-Union issues of South African stamps are to be demonetised. It is more than 27 years since the Union of South Africa commenced issuing stamps, but all the pre-Union issues have remained valid until the present time.

A Stamp Voting Contest

In the composite illustration in the centre of this page we show reproductions of 10 of the most interesting stamp designs that have been produced this year, and we invite our readers to place them in their order of merit. The points to be considered are the beauty of the design as well as the interest of the issue.

Readers are asked to state on a postcard, A, the stamp they like best, and, B, their forecast of the order of popularity in which the stamps will be placed by the massed votes of all taking part in the competition.

Prizes of stamps, or stamp collecting accessories to the value of 21/–, 15/–, 10/6 and 5/– respectively, to be chosen by the winners from the lists published by stamp dealers advertising in this issue of the "*M.M.*," will be awarded to the four readers whose lists most nearly forecast the order of popularity decided by our readers' votes. In addition there will be a number of consolation prizes, value 2/6 each, for the next best entries.

It is not necessary to refer to the stamps by name; they may be identified by numbering them from left to right, thus, Nos. 1 and 2 in the top row, 3, 4 and 5 in the second row, 6, 7 and 8 in the third row and 9 and 10 in the bottom row.

Entries should be addressed "*Stamp Voting Contest, Meccano Magazine, Binns Road, Liverpool 13*" and should be sent to reach this office not later than Monday, 20th December. The prize winners will be notified by letter, sent to reach them on Christmas morning.

There will be a separate competition for Overseas readers, with prizes of the same amounts to be awarded in exactly similar conditions. Overseas entries must arrive not later than 31st March.

The Passing of the I.F.S.

The outstanding event in British history this month undoubtedly is the passing of the Irish Free State. On the 29th of this month the I.F.S. officially ceases to exist, for on that date the New Irish Constitution comes into operation, and the country henceforth will be known as Eire, or, in English, Ireland.

The new Constitution is an extremely interesting document and must be unique for the simple language used in both the Irish and English versions. It avoids all the usual legal phrases and is easily understandable by the ordinary reader.

Article 2 defines the territory of Eire as consisting of the whole of Ireland, its islands and the territorial seas, but in Article 3 it is stated that "pending the re-integration of the national territory" the Constitution will operate over the same area as formerly comprised the I.F.S. Briefly, this means that until such time as the six northern counties agree to re-unite with the rest of the country, the Constitution will be in force only in the former Free State.

From a stamp collecting viewpoint the change will have many repercussions. The stamp designs almost certainly will be altered, although the words "Irish Free State" have never been used upon the stamps except in the overprints on the stamps of Great Britain. The name Eire has been used throughout.

Possibly the map stamp design in use since 1922 will be retained. This depicts the whole country and ignores the Ulster border, a proceeding which, as we have shown in connection with another stamp this month, might lead to complications, but which has come to be accepted as a matter of course in Ireland.

The new pictorial high values showing St. Patrick, Ireland's Patron Saint, which were issued in September this year to replace the overprinted G.B. 2/6, 5/– and 10/– values, may be regarded as the last stamp issue of the I.F.S. We understand that the Free State Post Office is considering the issue of a commemorative stamp to celebrate the coming of the Constitution, but details of such an issue are not yet available.

We are indebted to Mr. C. F. Bourke of Waterford for a copy of the new Constitution from which many of the points in this note have been taken.

Coronation Stamp Profits

In our October issue we mentioned the exceptional profit derived from Coronation stamp sales by the Government of New Guinea. We learn now that South-West Africa's gross profit from the Coronation stamps is even greater, amounting to £112,541!

The total sales amounted to £121,426, and the costs of issue were £8,885. The largest sales of any of the eight denominations in the issue was 450,000.

1937 N.Z. Health Stamp

The design of this year's N.Z. Health stamp will show a very striking view of a young mountaineer in full climbing kit standing on the pinnacle of a mountain peak.

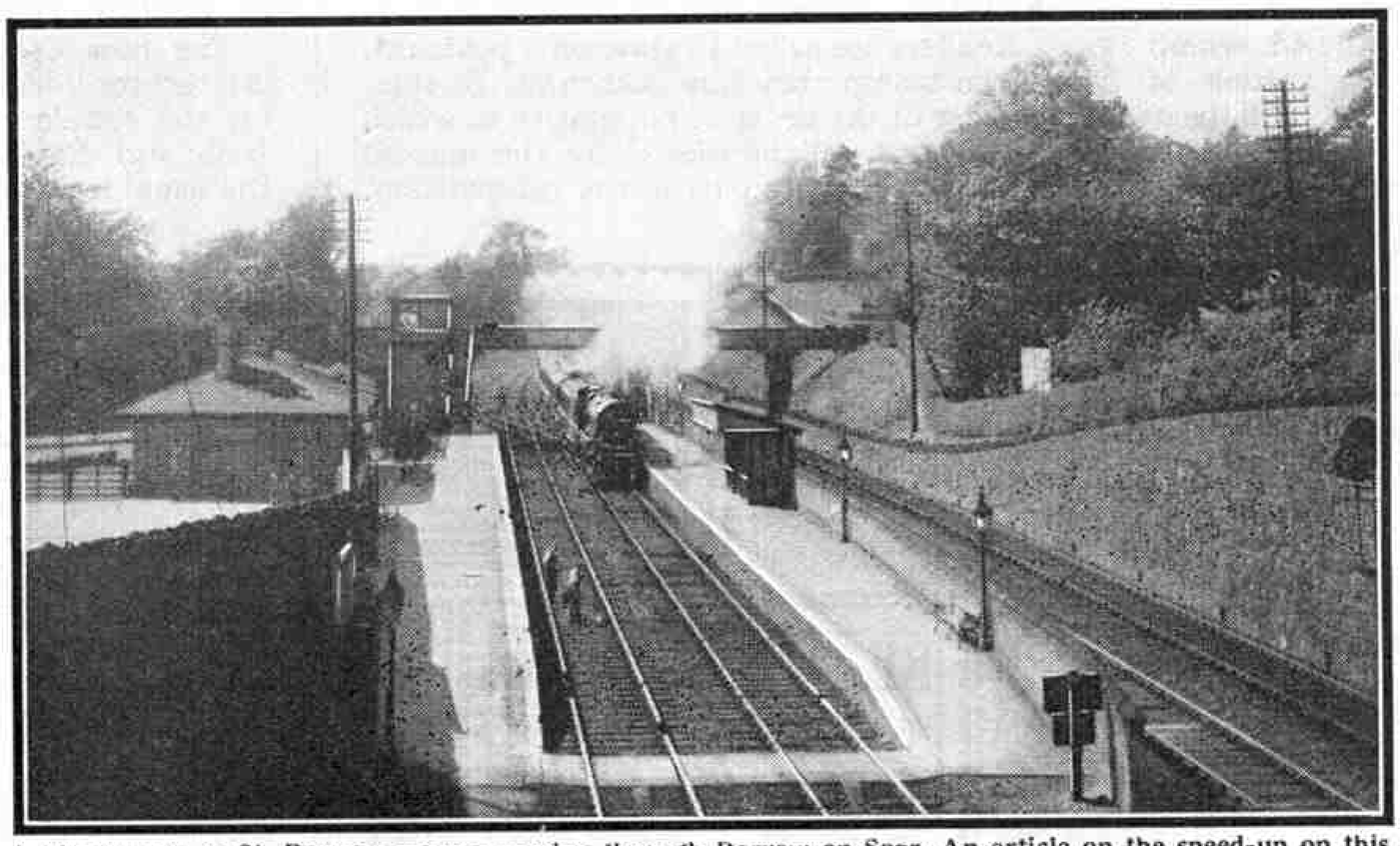
Gem Mining in Ceylon

By W. MOLAMURE

Ceylon still produces some of the finest gems in the world. The villager who is concerned with this branch of mining can detect suitable ground at a glance. He makes sure of the presence of the gravel that may contain gems by probing with a thin rod of steel, and the mine is then dug.

The land is usually boggy, and a wooden framework has to be constructed to keep the banks in place. The digging continues until the precious gravel is reached. The miner then cautiously digs this out and heaps it up on the surface. Below it may appear clay, which is useless, and tunnelling along the bed of gravel, 60 or 70 ft. below the surface of a marsh, is then undertaken. A saw, hammer and spade are the only tools used, and a candle gives light. Occasionally the tunnel collapses, burying the miner, but the men are skilful and such accidents are rare.

Finally the gravel is washed, and the washing-trough inspected for gems, which are heavy and collect at the bottom.



A Manchester to St. Pancras express passing through Barrow-on-Soar. An article on the speed-up on this route appears on page 698. Photograph by courtesy of the L.M.S.

The Railway Cats of Paddington

Paddington has a famous tabby cat named Jim, who is well-known to passengers and staff alike. Jim has his home in the restaurant-car department, but considers it his duty to make a daily tour of the station. He may be seen strolling along No. 1 platform, in the booking office, refreshment rooms, head office corridors or subways, or watching the taxis arrive.

He is normally an orderly cat, but after office hours he has a vice, for he prefers beer to milk, tea or any other beverage, and contrives to be on his last lap as time is called.

Jim is not the only cat at Paddington. There is Joe, who lives in the linen room of the hotel. He likes to ride on a barrow or hamper of linen, and never tires of watching the spinning wheels and bobbing needles of the sewing machines used to carry out repairs.

Another cat is Smokey, a blue Persian who lives in the Refreshment Room Girls' Hostel. He is the aristocrat of the Paddington cats and prefers to watch the trains from the roof, high above the lines, although he is not averse from descending in the lift for a stroll along the big parcels platform.

The goods shed cats are shy of publicity. They are busy cats, the terrors of rats and mice, and confine their friendship to one member of the staff.

In direct contrast to Jim is Tibby, the baby son of two cats in the Mint Stables, built on the site of an old public house. Tibby is being brought up on the strictest of teetotal lines. Like his parents he refuses even the milk supplied by the company and drinks only water. He is growing up to be a great favourite with the 450 horses in the stables. He visits them in the stalls and mangers, and greets them when they come in from work for a drink—of water.

A River that Flows Two Ways

The Cassiquiare River in South America is one of the most remarkable in the world, for at different times of the year it flows in different directions. It is a short stream that runs across almost level country between the headwaters of rivers flowing into the Amazon and the Orinoco respectively, and it flows one way or the other according to the levels of the rivers that it connects.

The Night Freight from Vancouver

By E. WORTHINGTON

I live near the Fraser River and at night, when an east wind is blowing, I hear the night freight pass on the combined tracks of the Canadian National Railway and the Great Northern Railway, an American line.

The approach of the train is signalled by a loud coughing blast from the engine, so loud that it seems as though it were just outside my window. The first cough is followed at slow but steady intervals by others. Then the driving wheels slip as the train climbs a gradient to the bridge on which the river is crossed. After a succession of short quick puffs, the wheels again take hold and the deep blasts of the exhaust quicken; another slip, and again the wheels grip, and she runs steadily. Then comes the signal, consisting of two long and two short blasts on the whistle, that throughout North America must be given on approaching a level crossing. Night or day that signal blast must be blown whenever at the side of the track the engineer, or driver, of a train sees the board on which are the letters "X W." The meaning of this sign is *"Crossing—Whistle."*

The exhaust has now settled to a steady quick note, and the rumble of the train comes down the river valley with the wind, with the blast of the whistle at the crossing signals. The rumble soon fades, slowly the puff of the exhaust fades too, but still loud and clear through the night comes the two long and two short blasts of the crossing signal. Finally even that becomes faint and eventually it also ceases.

Skybirds at the Schoolboys' Exhibition

A complete range of Skybird scale model aeroplanes will be shown at the Schoolboys' Own Exhibition, which is to be held at The Imperial Institute, South Kensington, London, from 27th December until 8th January. Full particulars of the activities of the Skybird League, an organisation for Skybird model enthusiasts, will be obtainable from a member of the League Headquarters staff at the Exhibition.

Tool Sets for Boys

Every model-building enthusiast is a craftsman, and most of our readers therefore will be interested in the range of Tool Sets that are advertised in our pages this month by John Hall (Tools) Ltd. These are not toy sets. They contain only practical and useful tools such as carpenters use, and even in the smallest there is a range that will enable its owner to carry out a variety of household and other repairs.

Readers who would like further details of these outfits should write to John Hall (Tools) Ltd., 22 and 24, Morgan Arcade, Cardiff, for their illustrated leaflet of tool chests, mentioning the *"M.M."*

A Model Railway Display in Manchester

Readers of the *"Meccano Magazine"* who live in or around Manchester will find many attractions at the Annual Exhibition of the Manchester Model Railway Society. This is to be held from 15th to 18th December in the Albert Hall, Peter Street, Manchester. On the first three days it will be open from 2 p.m. to 10 p.m., but on the final day, Saturday, 18th December, it will be opened at 10 o'clock in the morning, and will continue until 9 p.m.

The Society was founded in 1925, and with lengthy experience behind them the members can be depended on to make a fascinating display.

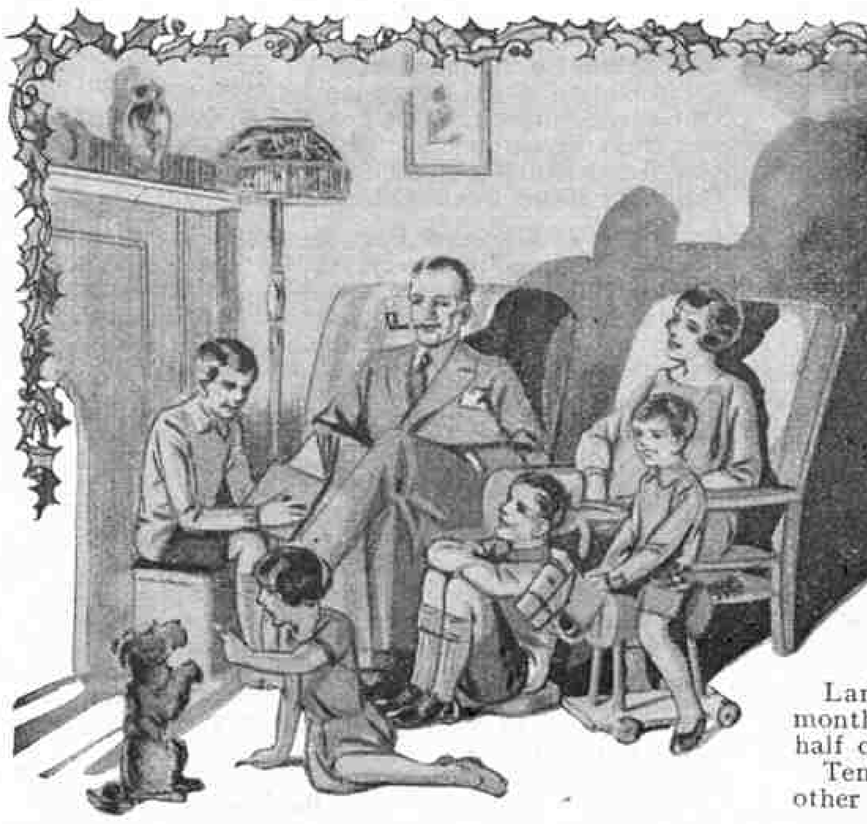
How they sent the News

J. WALKER McSPADDEN

Illus. 7'6 *net*

A book for readers aged 13-16, telling how messages have been sent through space—about the drums of Africa, booming out their code messages, and the early American Indians with their smoke signals; lighthouses and lightships, the semaphore, the telegraph, telephone, radio, and television.

HARRAP



Fireside Fun

"I've an invention at last that will mean a fortune!"
"What is it this time?"
"It's an extra key for a typewriter. When you don't know how to spell a word you hit that key and it makes a blur that might be an 'e,' an 'a' or almost anything else you like."

* * * *

Small Girl: "Oh, Mummy, I'm so sleepy; couldn't you let me off my bath and just dust me?"

* * * *

Customer: "You said this was a splendid car on hills."
Salesman: "Yes, sir, it will go downhill as fast as cars costing twice as much."

* * * *

Waiter: "How did you find that steak, sir?"
Diner: "Oh, quite accidentally. I moved that piece of potato, and there it was, underneath."

* * * *

American (to captain of English ship): "In America our ships are so large that the captain has to go round the deck in a Rolls-Royce to command the crew."
English Captain: "That's nothing. On our ship the cook has to go down in the soup in a submarine to see if the 'spuds' are done."

* * * *

"Shine, please, boy," said the six-foot-five soldier to the shoeblack.
The boy looked down at the expanse of boot before him. "Bert," he called to a pal, "Gimme an 'and—I've got an army contract."

* *

NO BONES ABOUT IT

Diner: "Waiter! This chicken has no wishbone."
Waiter: "He was a happy and contented chicken, sir, and had nothing to wish for."

* * * *

Motorist: "The car isn't going too well. The engine seems to be missing."
Motorist's Wife (from back seat): "That's just like you. You'd leave your head behind if it were loose."

* * * *

Tom: "Bill Jones' body has been recovered."
John: "Why, I didn't know he had drowned."
Tom: "He hasn't. He merely put on a new suit of clothes."

* * * *

Mother (to small son, who has been to a party in her absence): "I hope you washed your hands before tea."
Son: "I hadn't time to wash both, but I kept the other one in my pocket."

* * * *

GRATITUDE

"You're getting extravagant. Why did you tip the waiter two shillings?"
"Be quiet. He gave me 10/- too much change. I can't be mean!"

SPORTING

Landlord: "Look here, you haven't paid the three months' rent you owe me. I'll be a sport and forget half of it."
Tenant: "O.K. I'll be a sport, too, and forget the other half."

* * * *

Visitor: "What a lot of freckles you have, Tommy."
Tommy: "They ain't freckles. That's my iron constitution going rusty."

* * * *

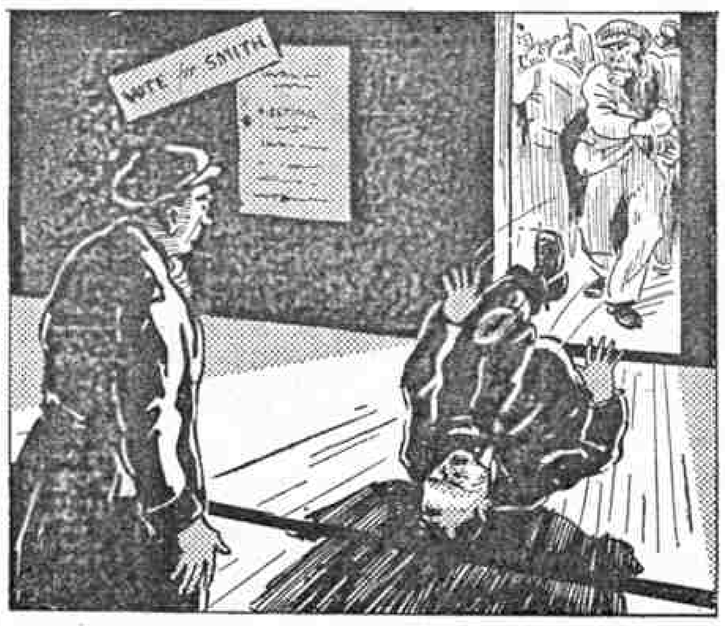
Sword-swallower (as soldiers march past): "Those bayonets don't half make me hungry!"

* * * *

Young Customer (to salesman in store): "I want a pennyworth of floor wax."
Salesman: "I'm sorry, sonny, but we only sell sealing wax."

* * * *

ONE IN ADVANCE



A village tough got a job as a thrower out at a political meeting. He invited a friend to stand outside the hall and count as he threw out. After a lot of noise, out came someone on his head.
"One," said the friend loudly.
"Hush, Garge," came a feeble voice, "It's me."

* * * *

Departing Guest: "You've got a pretty place here, Frank, but it looks a bit bare yet."
Host: "Oh, it's because the trees are a bit young. I hope they'll have grown to a good size before you come again."

* * * *

"Well," said the Englishman to the Scot, as he alighted from the London-Glasgow express, "it's been a long tiring journey."
"Aye," replied the Scot, "an' so it ought to be for the money."

* * * *

Jones leaned over the garden fence and beckoned to his neighbour.
"I say, old man," he said, "I understand that you have Brown's rake?"
The neighbour nodded.
"Good," said Jones. "If you'll let me borrow that occasionally, I'll let you use his roller whenever you want it."

* * * *

An American car suddenly stopped in a Warwickshire road, opposite an old countryman.
"Say," said the driver, "kin you tell me if I am right for W. Shakespeare's house?"
"Yessir," replied the yokel, "but there bain't no need to hurry—he's dead!"

* * * *

"Have you any complaints to make?" asked the prison governor.
"Yes," replied the prisoner; "the prison walls are not built to scale."

* * * *

THIS MONTH'S HOWLER

"Dead-heat" is the fire when it is out.

Mistress: "You say you have no references as a cook. How is that?"
Maid: "Well, you see, Mam, I've always stayed in one place until the people died."

* * * *

Doctor (to woman patient): "What did your husband die of?"
Patient: "I can't remember the name of the disease doctor, but I know it was nothing serious."

* * * *

A teacher asked her class to state the difference between the words "result" and "consequences."
A bright boy replied: "Results are what you expect and consequences are what you get."

* * * *

"I gave the referee £10 to see I won my big fight the other night."
"But the papers say that you lost."
"Yes—the referee was crooked."

* * * *

Football Referee: "Don't forget—I can get you suspended."
Player: "Yah! I can get you lynched."

* * * *

Teacher: "Now children, who can tell me what a lake is?"
Jimmie McFadden: "Plaze, Miss, it do be a howl in the bottom of a tay-kittle."

* * * *

Innkeeper: "Why hast piece of glass in thi pipe, Jarge?"
Rustic: "Well, t'parson said that if I smoked glass I should see t'eclipse, but there ain't no getting it to light!"

* * * *

A NARROW ESCAPE!

"Mrs. Briggs," said the boarder, "who owns those ferry-boats I tripped over on the stairs?"
The landlady shot him a fierce look. "Ferry-boats, indeed! I'll have you understand they are my shoes."
The boarder gulped uneasily. "I didn't say ferry-boats," he replied. "I said fairy boots."

* * * *

Patient: "How ever can I repay you for your kindness to me?"
Doctor: "By cheque, postal order, or cash."

* * * *

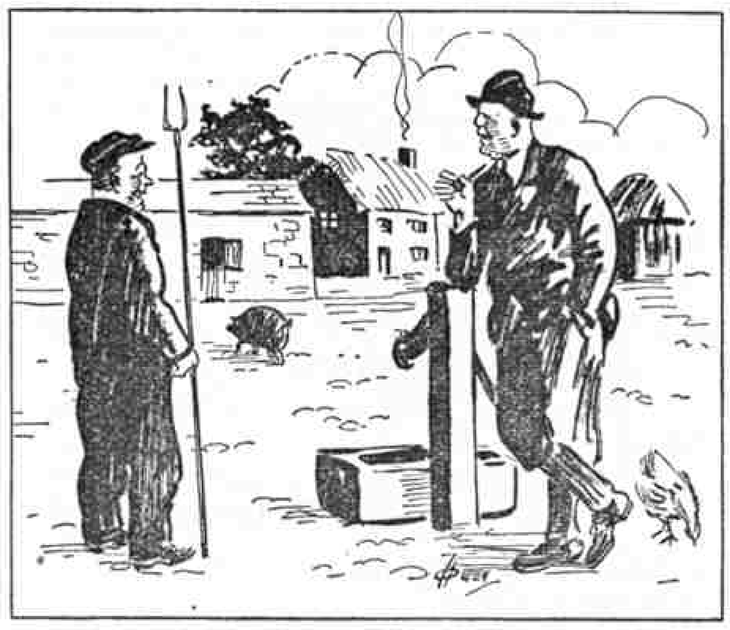
"Two pennyworth of bicarbonate of soda for indigestion at this time of night," cried the infuriated druggist, who had been aroused at 2 a.m., "when a glass of hot water would have done just as well!"
"Weel, weel," returned MacDougal, "I thank ye for the advice, and I'll not bother ye after all. Goodnight."

* * * *

A sawyer ordered a new saw, and when it arrived he tested it and found that it worked splendidly. "Well," he said, "of all the saws that ever I saw saw, I never saw a saw saw as this saw saws."

* * * *

LEAKY



Farmer Giles: "I guess I'll call that little black pig 'Ink'."
William: "Why?"
Farmer Giles: "Well, seeing that he's always running out of the pen, I reckon it suits him."

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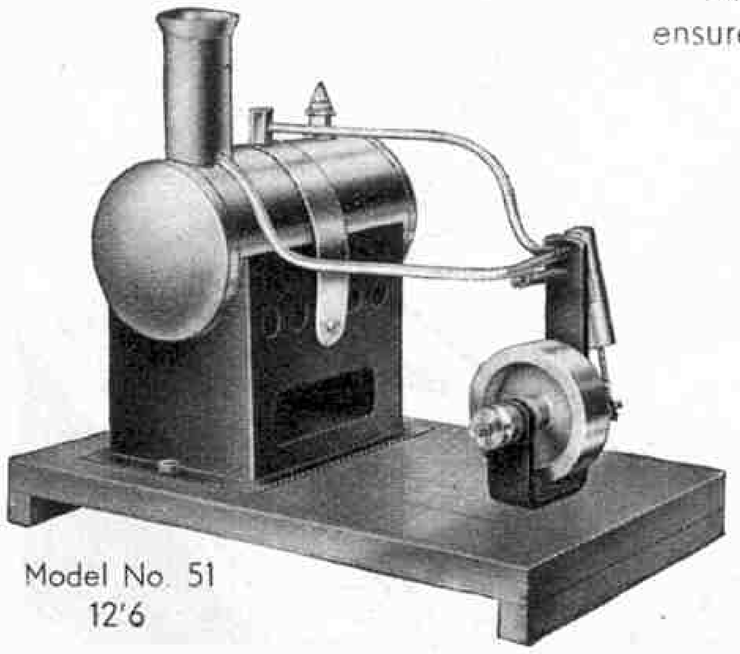

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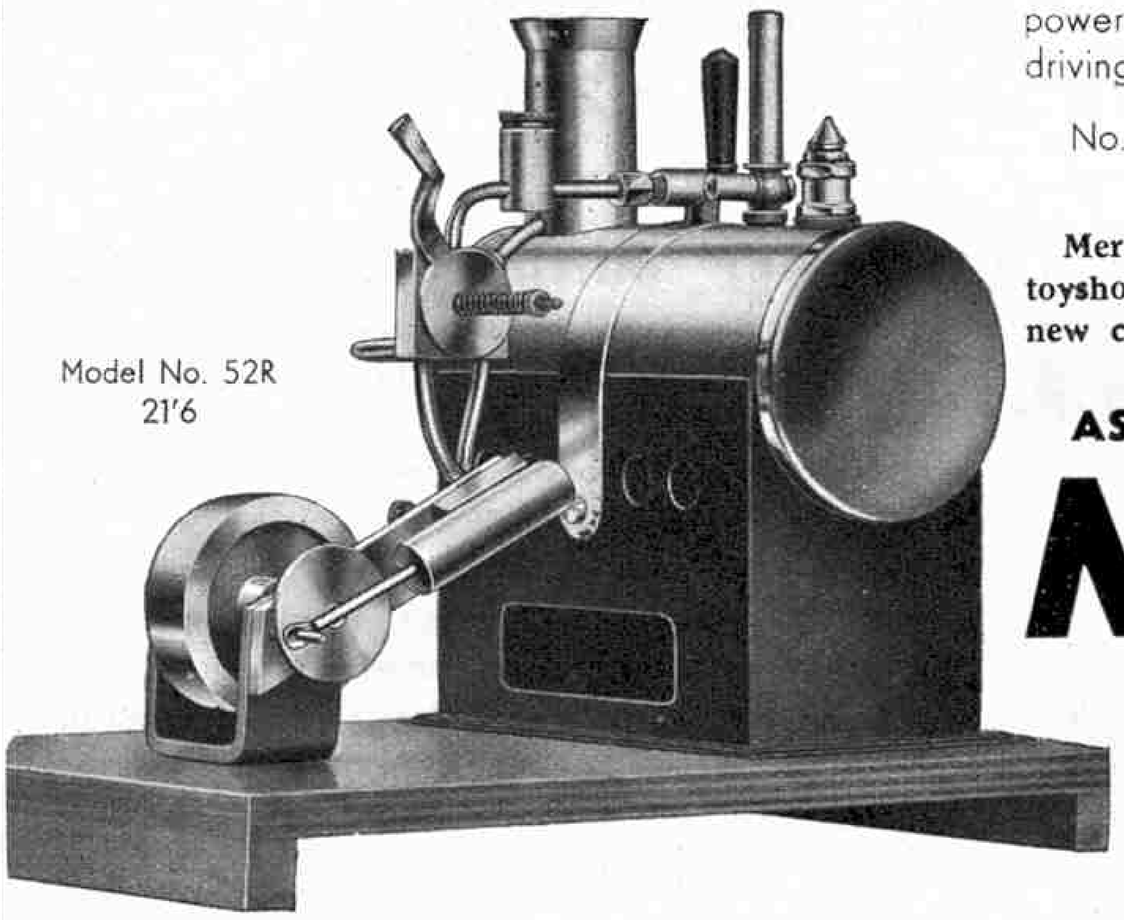

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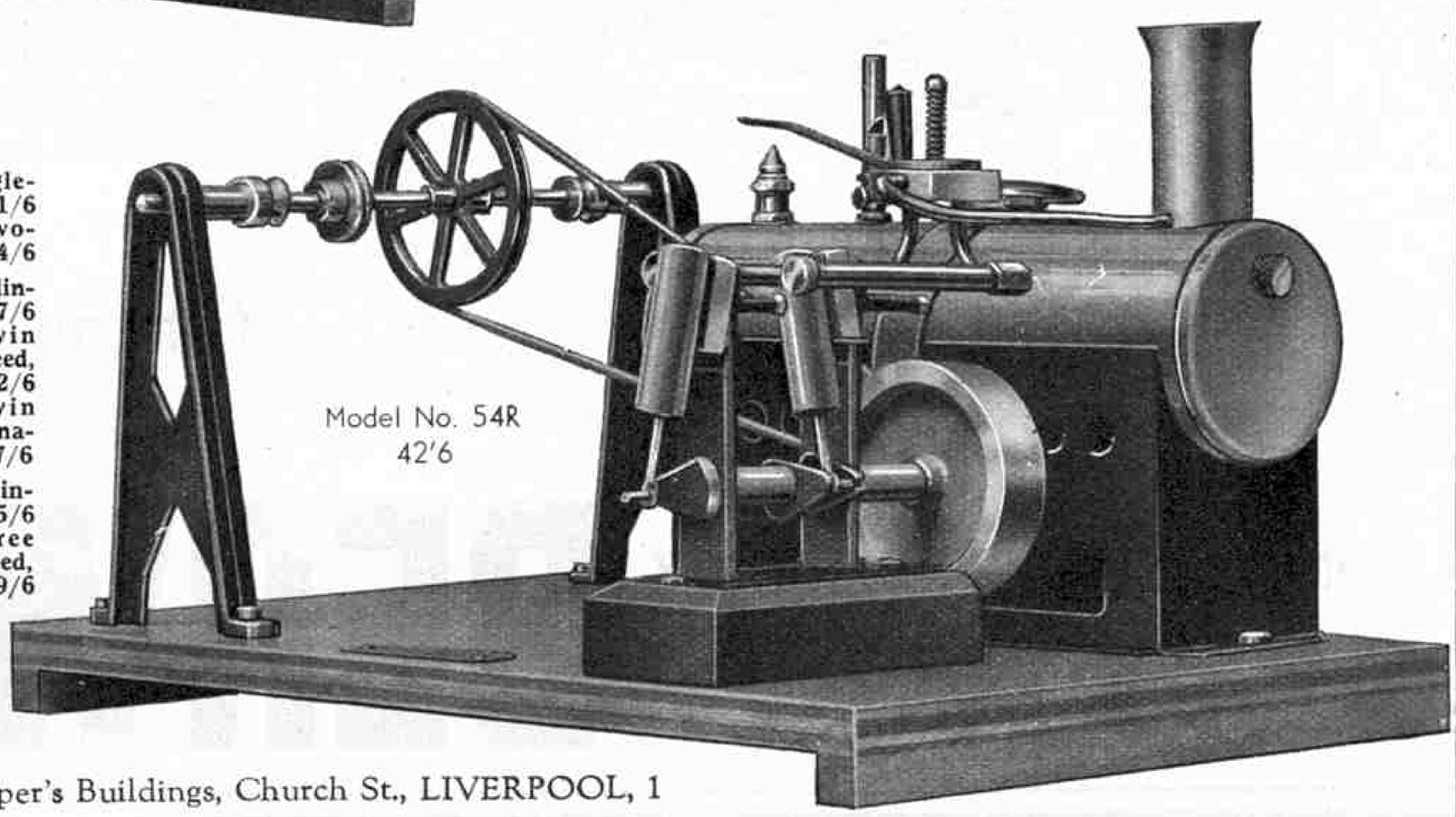

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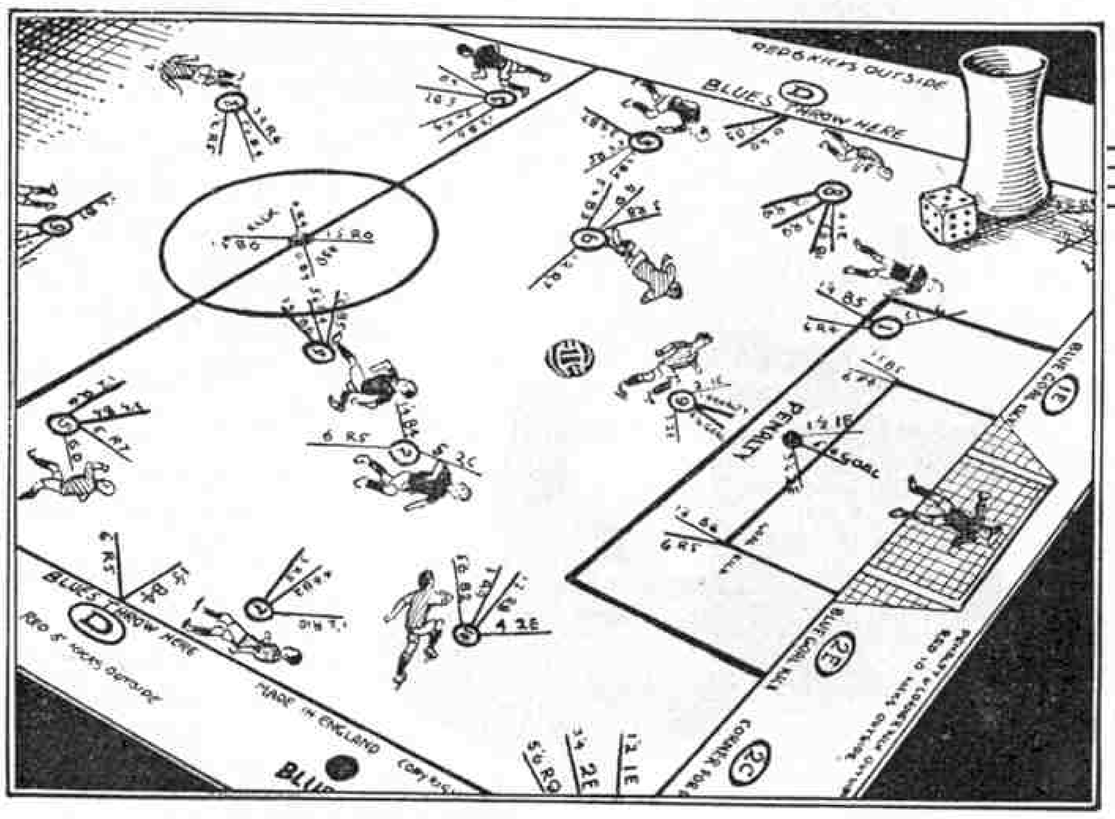

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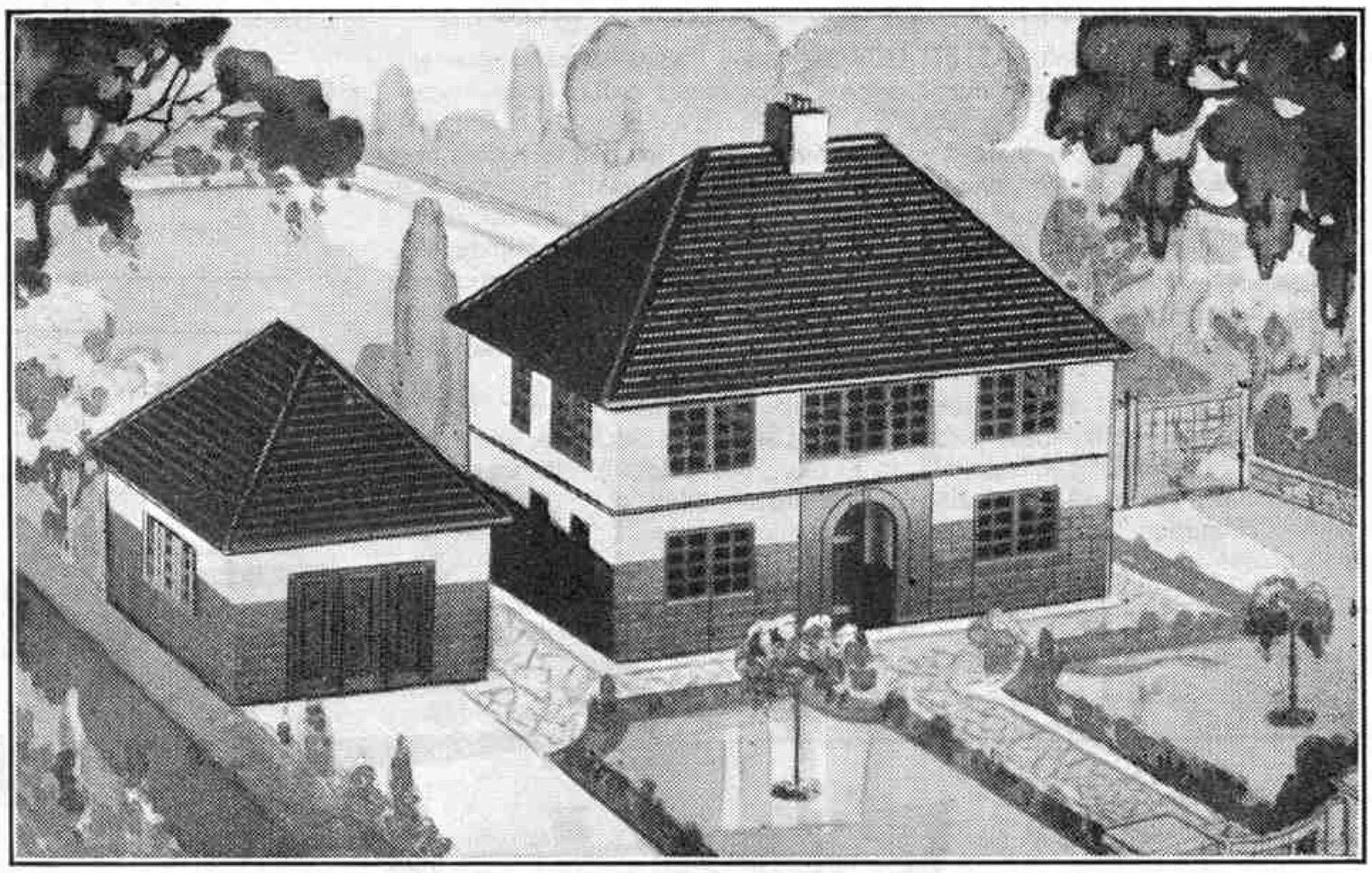

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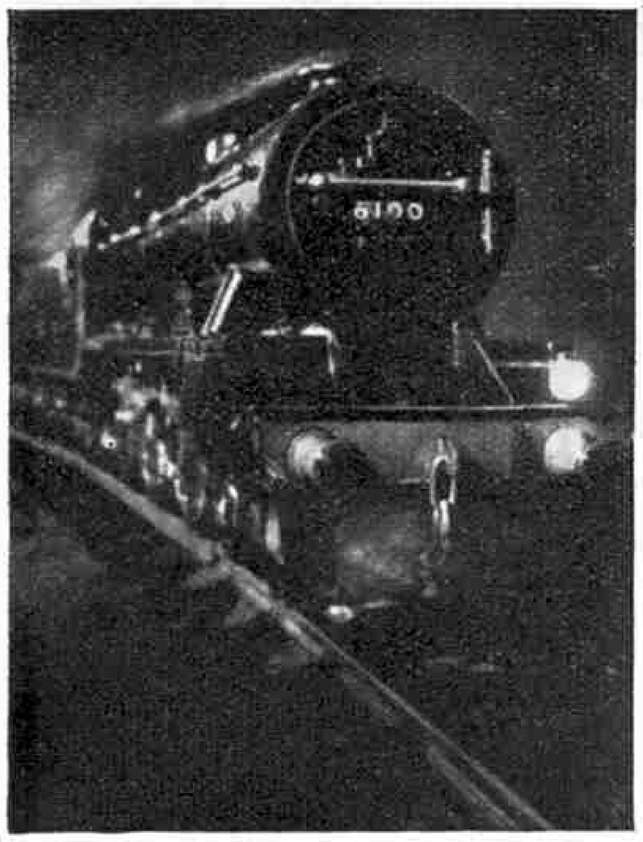

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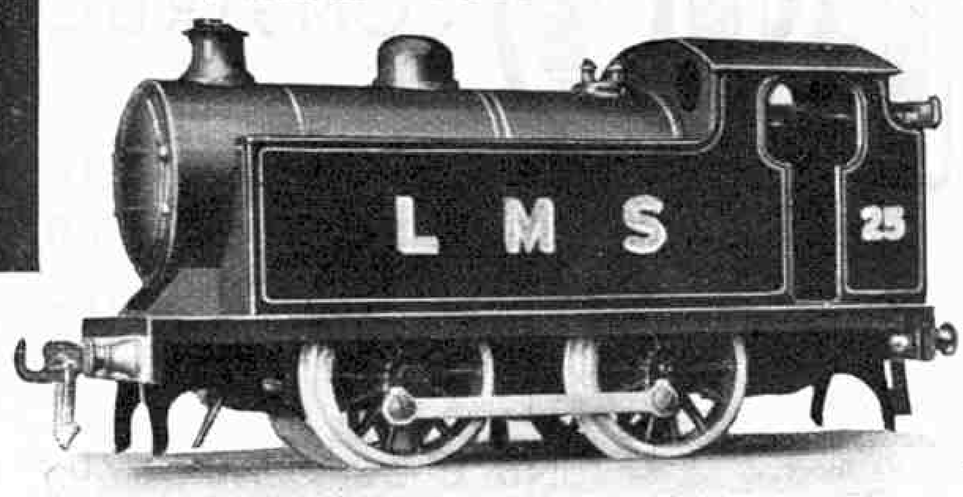

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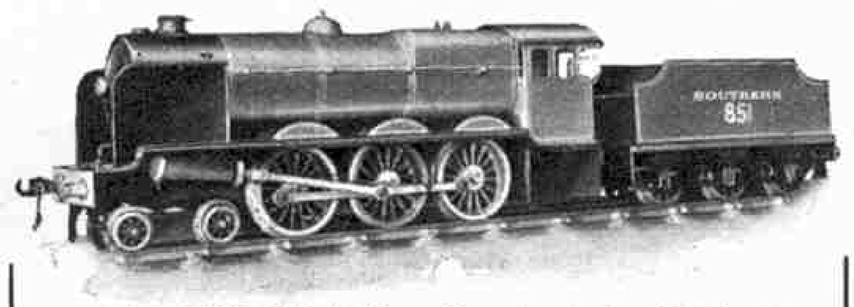

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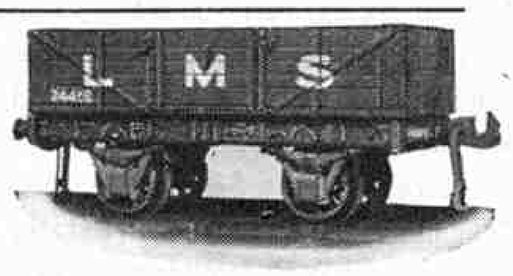

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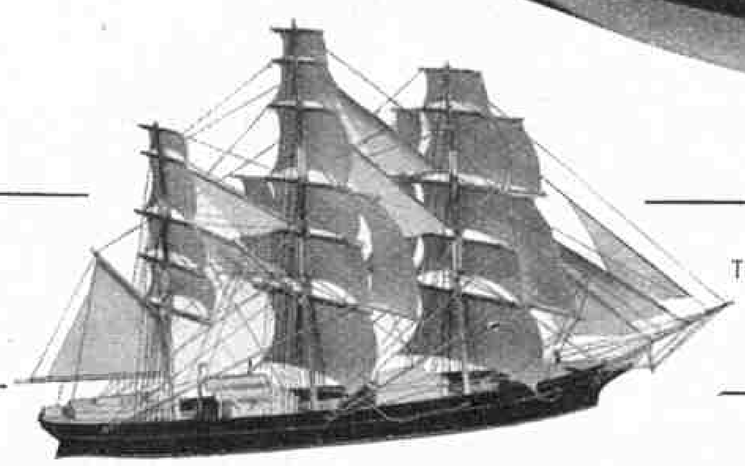

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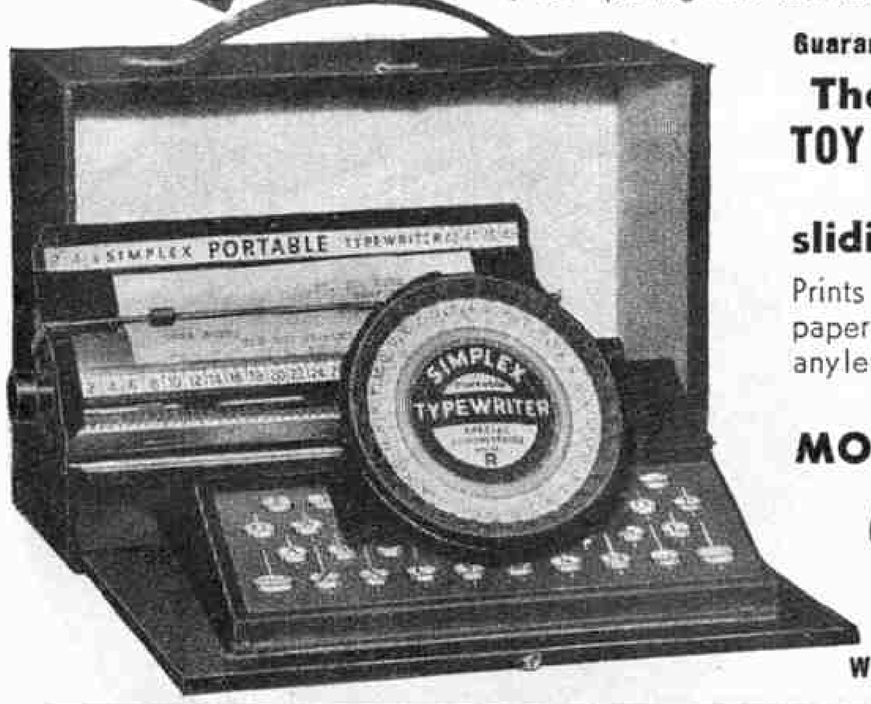

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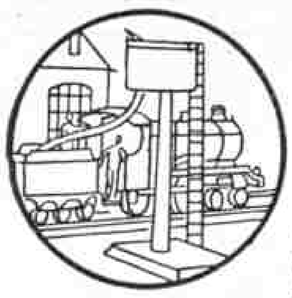

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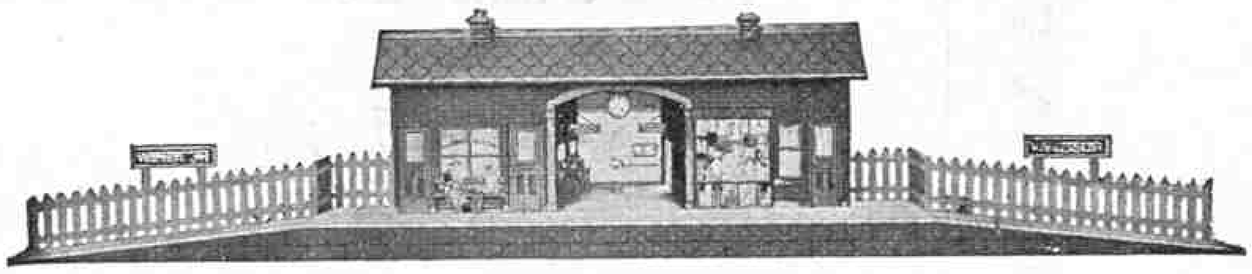

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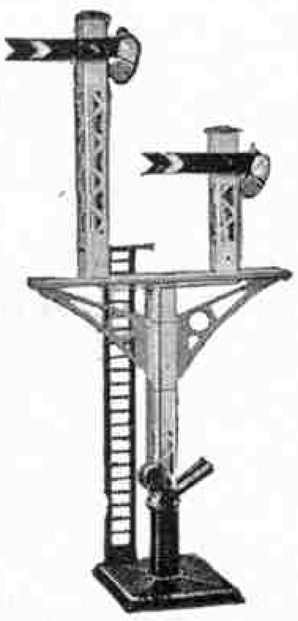

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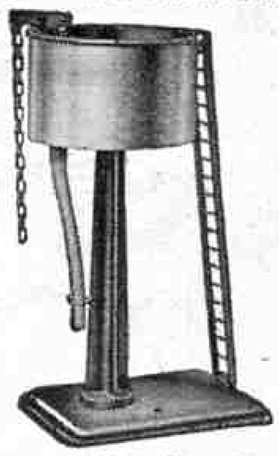

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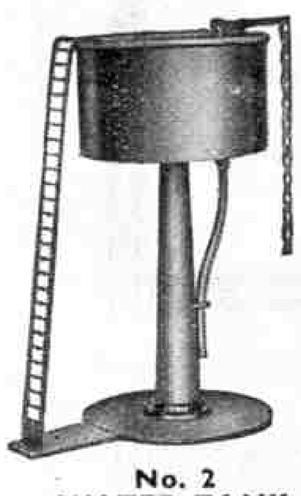

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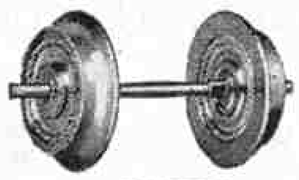

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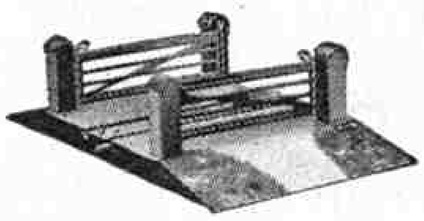

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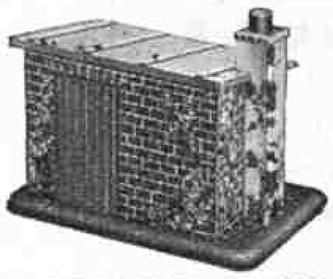
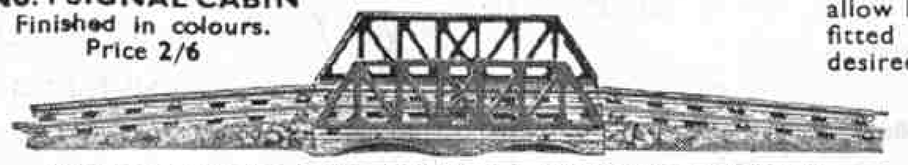
Finished in colours.
Price **2/6**



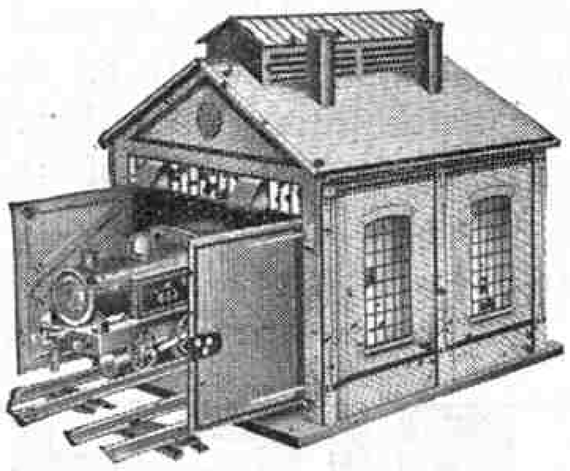
PLATELAYER'S HUT
Price **1/–**

No. 2 SIGNAL CABIN
Dimensions: Height 6½ in., width 3½ in., length 6½ in. Roof and back open to allow Lever Frame to be fitted inside cabin if desired. Price **3/6**

No. 1 TURNTABLE
Price **1/11**



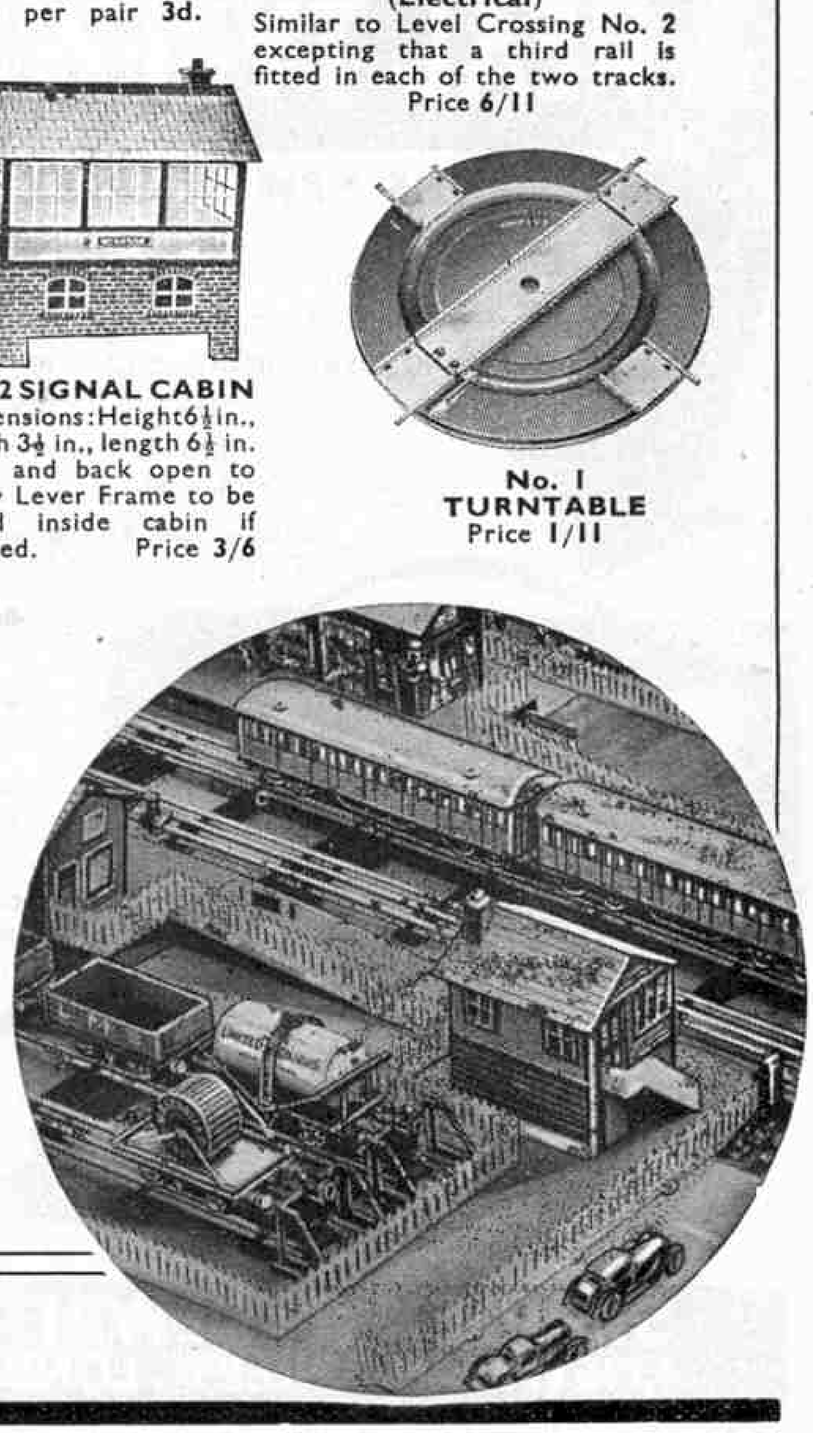
VIADUCT Price **5/11** **VIADUCT (Electrical)** Price **7/6**
VIADUCT Centre Section only ... ... Price **4/–**
VIADUCT (Electrical) Centre Section only ... Price **4/6**



No. 1 ENGINE SHED
This Shed will accommodate any Locomotive and Tender with an overall length not exceeding 8¾ in. Price **13/9**

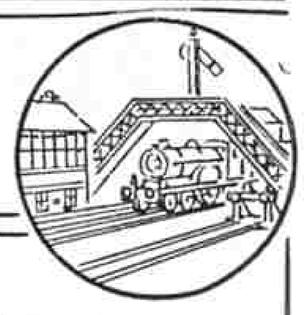
No. 1 STATION
Length 16¾ in., width 6 in., height 6 in. ... ... Price **4/6**

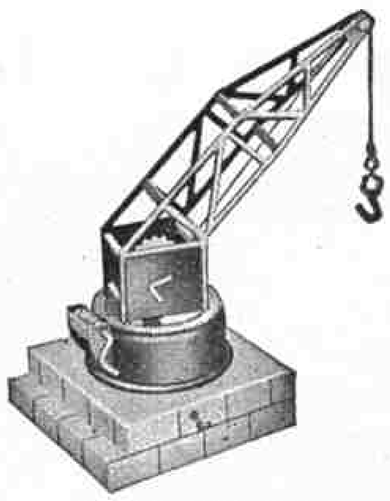
No. 3 STATION
Similar to No. 1 Station for dimensions and style, but of an improved design, more strikingly coloured. Price **5/6**



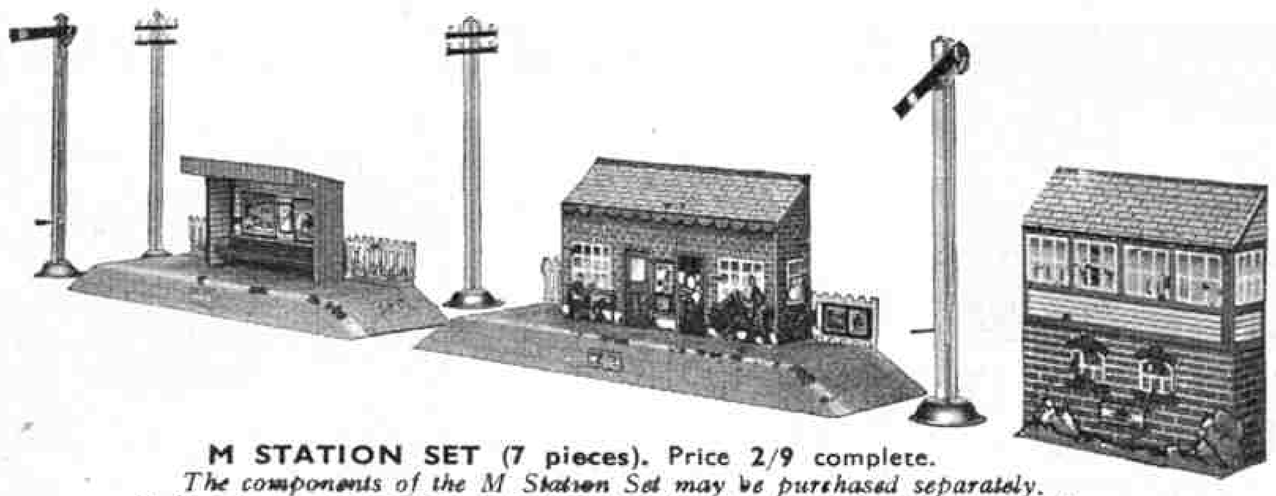
MECCANO LTD., LIVERPOOL 13

HORNBY ACCESSORIES



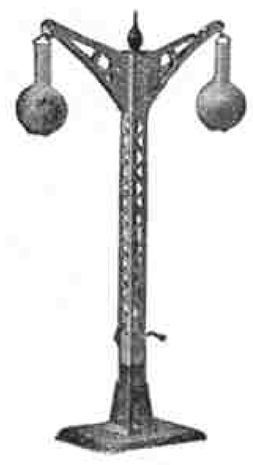


PLATFORM CRANE
Fitted with a crank handle and ratchet mechanism.
Price 3/3



M STATION SET (7 pieces). Price 2/9 complete.
The components of the M Station Set may be purchased separately.
M Signal Box. Price 4d. M Signal Price 3d. M Station. Price 1/–.
M Telegraph Pole No. 1. Price 3d. M Wayside Station. Price 8d.

No. 1E LAMP STANDARD ELECTRICAL
(Single, as Illustrated.)
Price 2/9

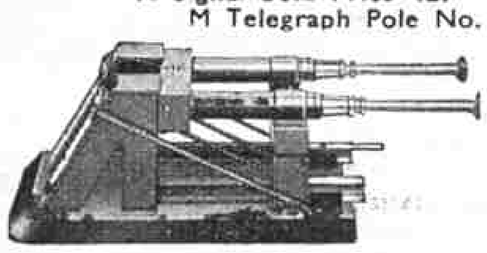


No. 1 LAMP STANDARD
(Single.)
Price 3/3

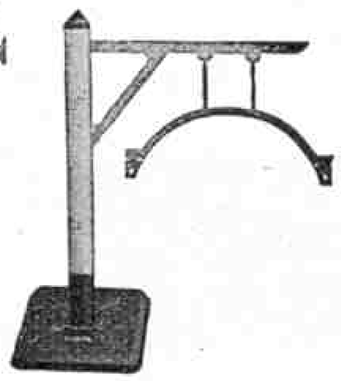
No. 2E LAMP STANDARD ELECTRICAL
(Double.)
Price 3/3

No. 2 LAMP STANDARD
(Double, as illustrated.)
Price 3/9

STATION HOARDING
This is a realistic accessory, suitable for the station platform. Brightly coloured.
Price 3d.



No. 2 BUFFER STOPS
(Hydraulic type.) Price 4/11



LOADING GAUGE
(Illustrated.)
Price 1/11

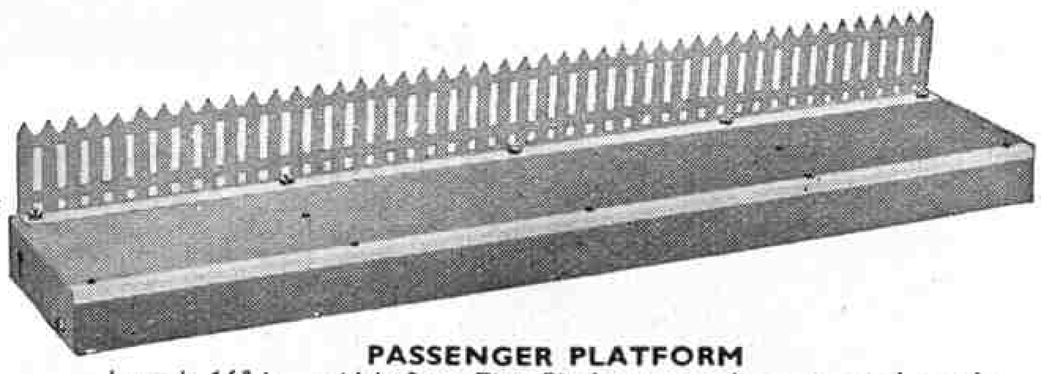
M LOADING GAUGE
Price 10d.

TUNNEL ENDS
Tunnels of varying lengths can be made with cardboard or other material, and then completed with the Tunnel Ends.
Price per pair, 1/6

No. 1A FOOTBRIDGE
Complete with Signals. Price 4/6

No. 1 FOOTBRIDGE
Without Signals. Price 2/11

MECCANO LUBRICATING OIL
Price per bottle 6d.

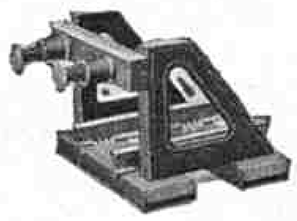


PASSENGER PLATFORM
Length 16⅝ in., width 3 in. This Platform may be connected to the main Station or used separately. Price 2/–
The white Paled Fencing may be purchased separately. Price per length, 6d.

No. 7 RAILWAY ACCESSORIES
Watchman's Hut, Brazier, Shovel and Poker. Price 10d.

No. 1 BUFFER STOPS
(Spring type).
Price 1/–

No. 1E BUFFER STOPS
As No. 1, but wired for electric lighting.
Price 1/3



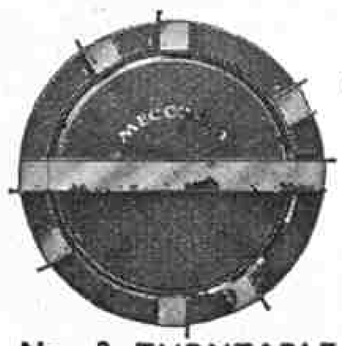
BRICKS FOR No. 2 HIGH CAPACITY WAGON
A realistic load for Hornby Wagons. They are packed in a box, the lid of which fits inside the No. 2 High Capacity L.N.E.R. Brick Wagon to form a base for the load. Price, per box of 100, 10d.

COAL FOR HORNBY WAGONS
Imitation coal for loading into Hornby Wagons. It is packed in a box the lid of which fits inside the L.M.S.R. and G.W.R. No. 2 High Capacity Wagons to provide a base for the load. Price, per box, 6d.

POSTERS IN MINIATURE
These Posters are beautifully printed in full colours.
No. 1 Series. Packet of 51 Price 6d.
„ 2 Series. Packet of 51 „ 6d.

POSTER BOARDS
Designed to carry Hornby Posters. Provided with lugs for attachment to Paled Fencing, etc.
Packet of 6 (3 large and 3 small).
Price 4d.

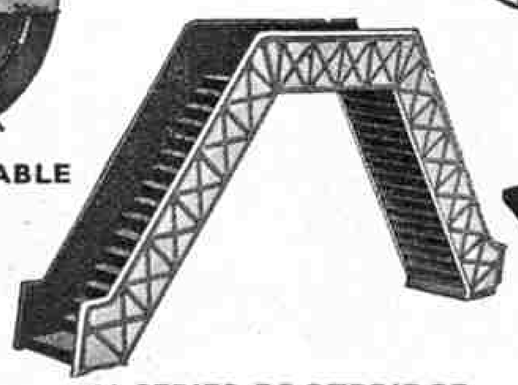
No. 2 OILCAN
("K" Type.) The oil is ejected drop by drop by depressing the valve. Polished copper. Price 3/6

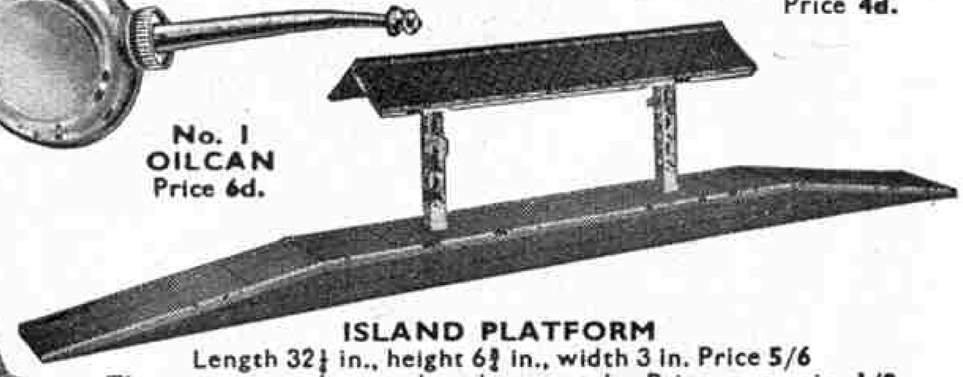


No. 2 TURNTABLE
Price 3/9

DIE-CAST SPOKED WHEELS
As fitted to Hornby Wagons, etc.
Price per pair 3d.

No. 1 OILCAN
Price 6d.

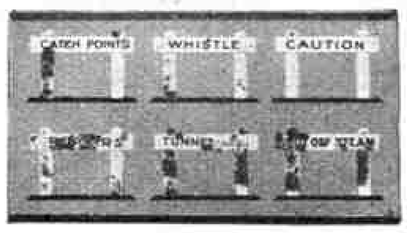




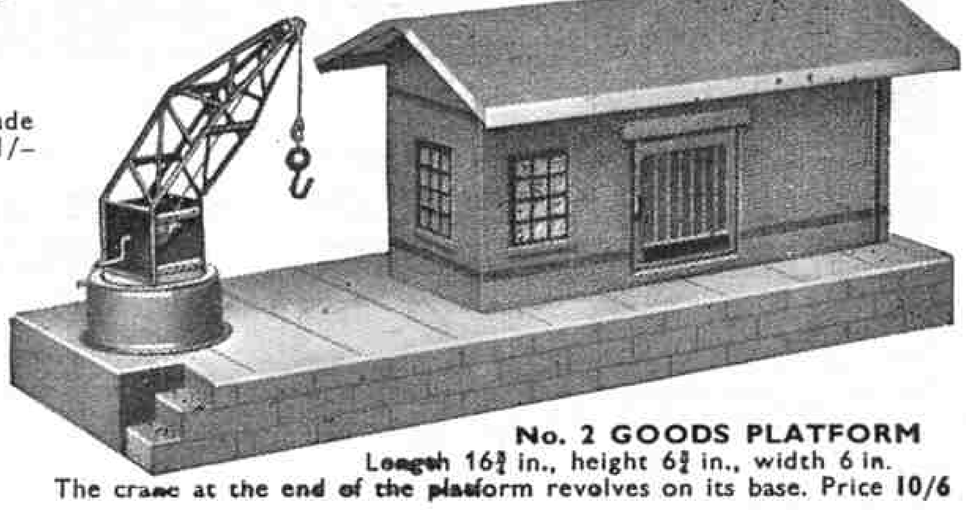
ISLAND PLATFORM
Length 32½ in., height 6¾ in., width 3 in. Price 5/6
The ramps may be purchased separately. Price per pair 1/9

M SERIES FOOTBRIDGE
This strongly-built Footbridge is made to span a single track. Price 1/–

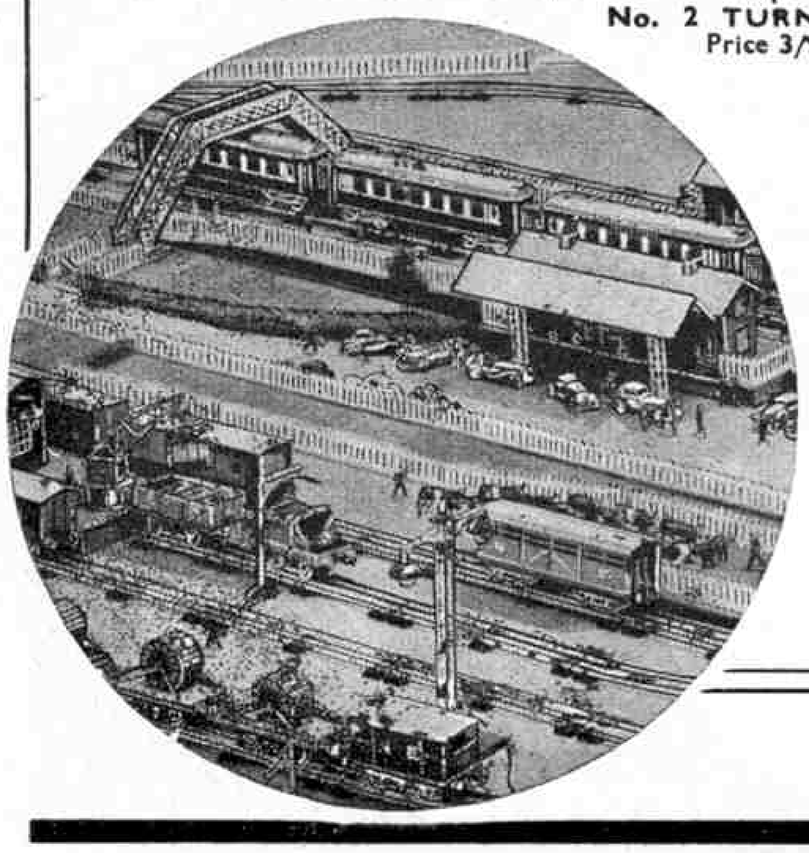
No. 8 RAILWAY ACCESSORIES



Notice Boards. Price 1/9



No. 2 GOODS PLATFORM
Length 16⅝ in., height 6¾ in., width 6 in.
The crane at the end of the platform revolves on its base. Price 10/6



MECCANO LTD., LIVERPOOL 13

BUILD one of these fine flying model planes THIS CHRISTMAS!

SPECIAL LEARNER'S KIT BRISTOL BULLDOG

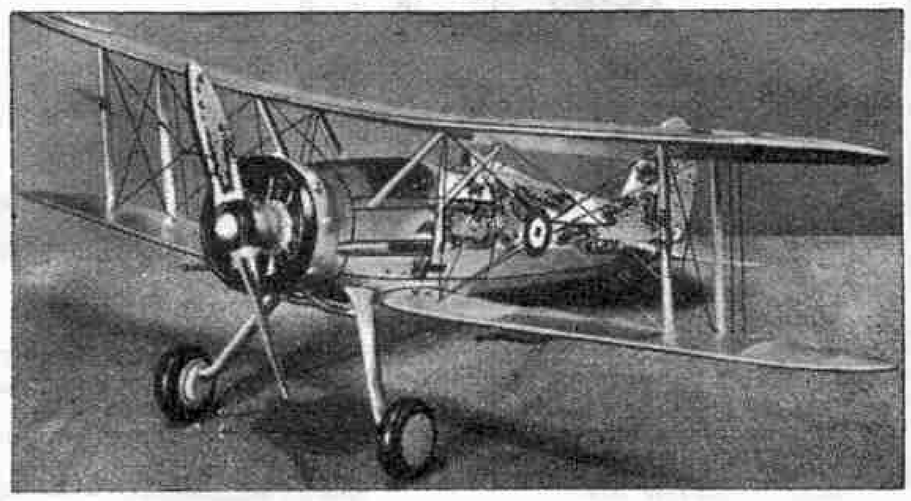
This kit has eight pages of special instructions and illustrations which explain every action and make it impossible to go wrong. It is a very fine exact scale model of the favourite R.A.F. fighter and shows every detail of the real plane, machine guns, petrol tanks, insignia, etc., etc. Wingspan 18 in. Kit is complete with everything needed, carriage paid **4/9**

Easy and fascinating to build

GLOSTER GLADIATOR

Wingspan 18 in. Length 14 in. A real beauty. Auto-line-up fuselage, shock absorbing undercarriage, wingbase formers, very large clear plan with all scale details and many working drawings. Absolutely complete kit of parts, quick-drying cement, shrinking dope, silver Japanese tissue, shaped balsa flying prop, wheels, silver lacquer, and all balsa needed. Some experience in building is needed.

Carriage paid **5/-**



HESTON PHOENIX—Very Good Flyer

Wing 18 in. Length 13½ in. Retractable landing gear with locking control. Very clear full-size plan. Comet Auto-line-up fuselage. Kit is absolutely complete.

Carriage paid **3/11**

PUSS MOTH

Wing 16 in. Mollison's famous East-to-West Transatlantic flight plane—attractive appearance and fine flyer. An easy model for a beginner. Kit has all parts needed.

Post free **2/6**

Illustrated Catalogue of 24 pages showing biggest range in England, send 3d. in stamps. Abroad kits 2/- extra postage.

MONOCOUPE

Wingspan 15½ in. Splendid flyer and very easy to build with simple undercarriage. Scale model of favourite American sports plane. Complete kit of parts has everything needed, balsa, quick-drying cement, hand carved flying prop, tissue, rubber, etc.

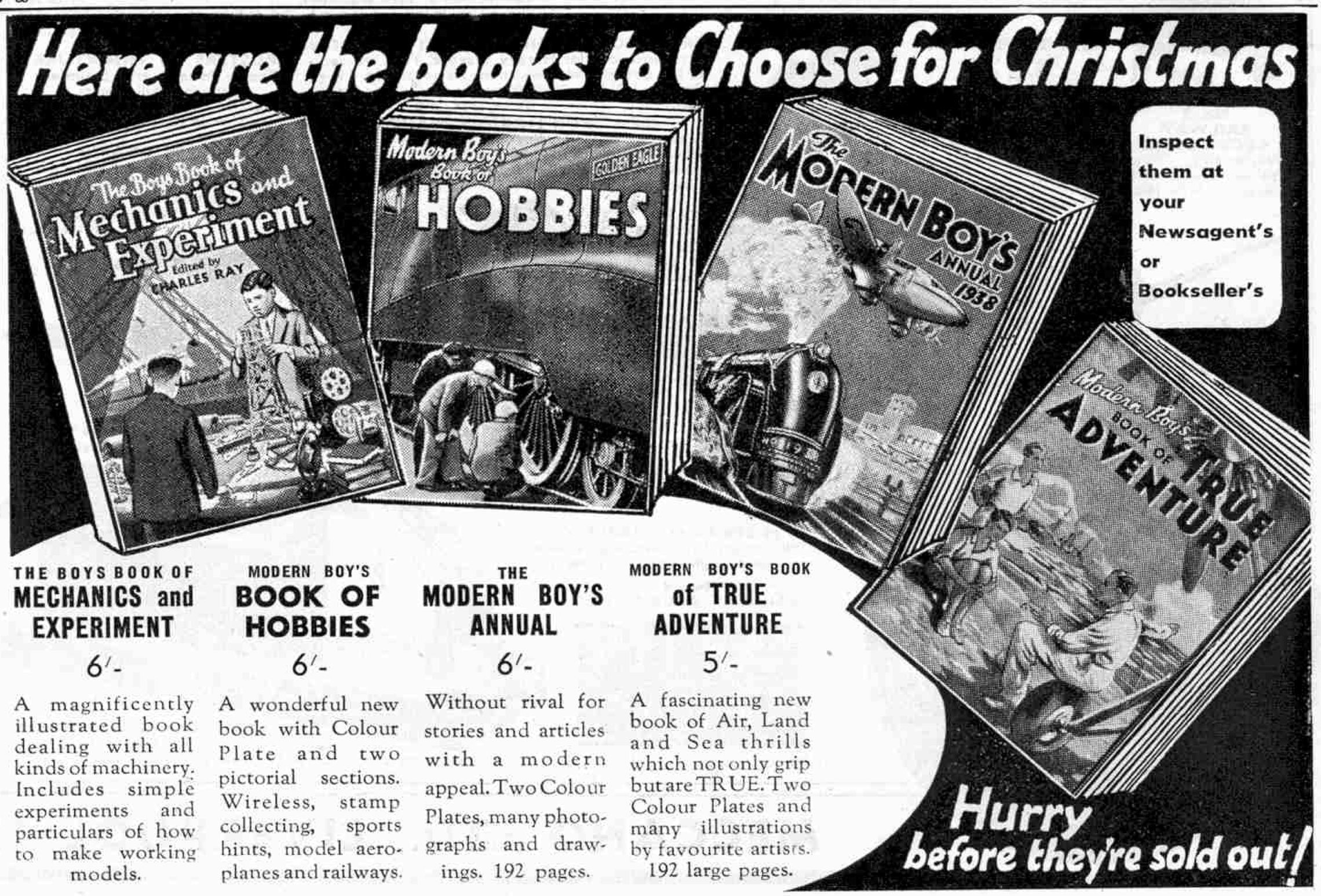
Post free for **2/6**

★Give Kits this Xmas and SEND YOUR P.O. NOW

M. SWEETEN LTD.

BANK HEY STREET, BLACKPOOL

Here are the books to Choose for Christmas



Inspect them at your Newsagent's or Bookseller's

THE BOYS BOOK OF MECHANICS and EXPERIMENT

6/-

A magnificently illustrated book dealing with all kinds of machinery. Includes simple experiments and particulars of how to make working models.

MODERN BOY'S BOOK OF HOBBIES

6/-

A wonderful new book with Colour Plate and two pictorial sections. Wireless, stamp collecting, sports hints, model aeroplanes and railways.

THE MODERN BOY'S ANNUAL

6/-

Without rival for stories and articles with a modern appeal. Two Colour Plates, many photographs and drawings. 192 pages.

MODERN BOY'S BOOK of TRUE ADVENTURE

5/-

A fascinating new book of Air, Land and Sea thrills which not only grip but are TRUE. Two Colour Plates and many illustrations by favourite artists. 192 large pages.

Hurry before they're sold out!

Tell Dad which of these you'd like for Christmas

LOTT'S CHEMISTRY To build and equip a good Chemical Laboratory is a very expensive matter. In Lott's Chemistry Sets, however, an attempt is made to show a variety of experiments which are both striking and instructive, and can be carried out with quite simple apparatus. They will open up a new world of possibilities to their young possessors.

Each set is complete with chemicals, apparatus, and Books of Experiments. These books are written by a Doctor of Science, and are fully illustrated.

PRICES

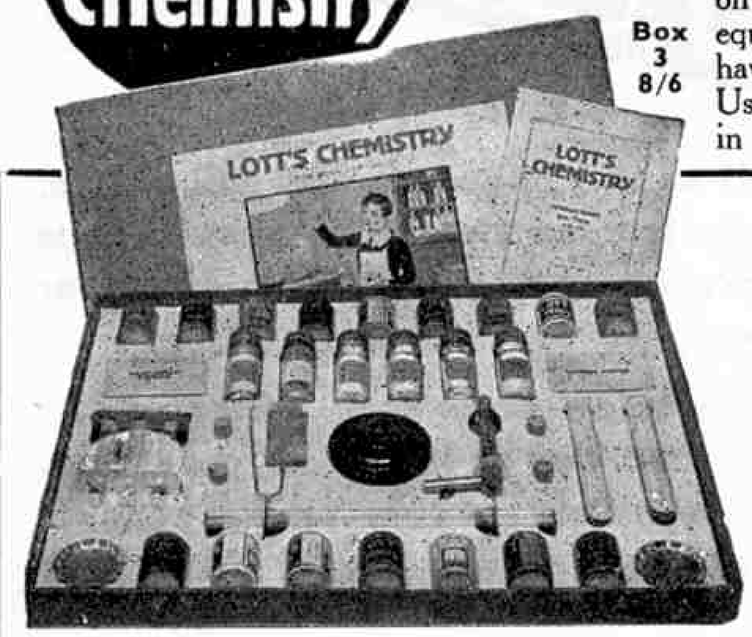
Box 1	...	**3/6**	**Box 2**	...	**5/-**	**Box 3**	...	**8/6**
Box 4	...	**12/6**	**Box 5**	...	**21/-**	**Box 6**	...	**27/6**

and up to 105/-

LOTT'S Chemistry

To get the most out of your Chemistry Hobby you need the extra apparatus shown on the Spares list which is sent FREE on request. With this extra equipment you can enlarge the range of your experiments and have a laboratory fitted out like the real thing.

Useful selection of spares containing assorted glassware, etc., in three sizes at **2/6** each.



Box 3 8/6

LOTT'S BRICKS AND TUDOR BLOCKS

It is the imaginative love of BUILDING inherent in young and old alike that has made LOTT'S BRICKS—the British-Made Stone Toy Building Bricks—so great a universal favourite. A fascinating, clean and durable toy.

The possibilities of Lott's Bricks are not exhausted by the purchase of one box. Indeed, they have then only just begun; for the more you have of these building bricks, the more you can do, and the more fascinating becomes the pastime.

Prices 1/6; 3/-; 4/11; 8/11 to 30/-

Tudor Blocks, for building models of Old English half-timbered houses, prices **3/-; 5/6; 7/6 to 21/-**.

LOTT'S BRICKS

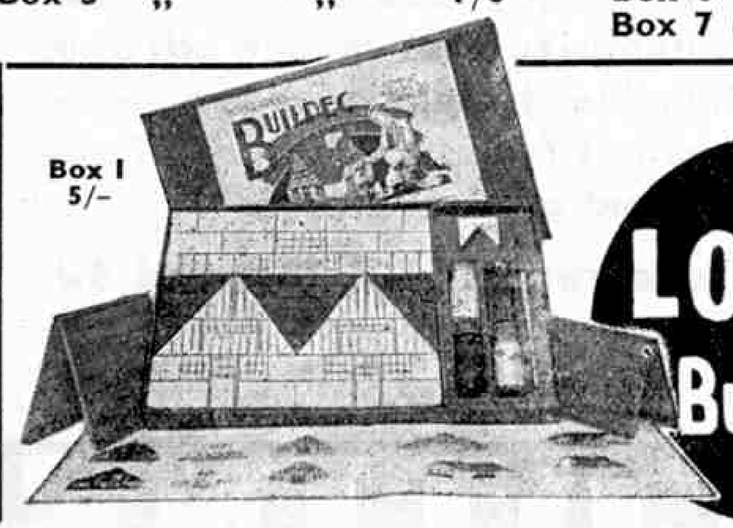
LOTT'S ELECTRICITY The great value of Lott's Electricity Sets lies in the ingenuity with which simple equipment is employed to demonstrate the most fascinating things in the science of Electricity. This fact cannot be fully realised by a casual look at one of the sets, but it is none the less true to say that numbers of books and elaborate apparatus would ordinarily be required to do all the experiments covered by these inexpensive sets.

With them it is now possible to floodlight and illuminate all sorts of models.

Box 1	**Model Lighting**	**2/6**	**Box 4**	**Model Lighting**	**10/6**
Box 2	**,,**	**5/-**	**Box 5**	**and**	**15/-**
Box 3	**,,**	**7/6**	**Box 6**	**Experimental**	**21/-**
			Box 7	**(Cabinet de Luxe)**	**30/-**

LOTT'S Electricity

Box 6 21/-



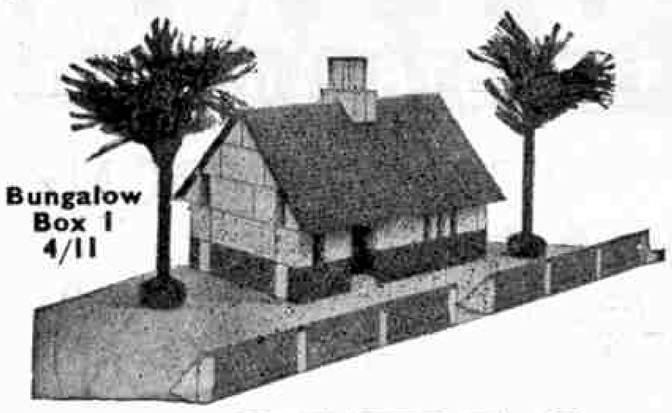
Box 1 5/-

LOTT'S Buildec

LOTT'S BUILDEC

An entirely new and fascinating pastime. The bricks, which are of stone, are supplied uncoloured, together with Roofs, bottles of special "Buildec" paint, brush and illustrated instructions for building numerous models, and decorating them in many combinations of colours, which may be washed off when it is desired to repaint the houses. Buildec will bring hours and hours of absorbing interest and fun—there is always something new and exciting to build.

Box 0	...	**12 models**	...	**3/6**	**Box 2**	...	**36 models**	...	**7/6**
Box 1	...	**24 models**	...	**5/-**	**Box 3**	...	**48 models**	...	**12/6**



Bungalow Box 1 4/11

Whichever you choose, Dad will be glad. He'll say: "Now that's what I call sensible." Fathers don't like being asked for useless things. But they know that Lott's Bricks Products are really worth-while toys from which you can **learn** something.

So choose what interests you most—then talk it over with Dad.

Ask your dealer for full particulars or write to the manufacturers for illustrated lists of all products. (1d. stamp on p.c. or 1½d. stamp on letters, please.) Dept. M.M.

LOTT'S BRICKS LTD. WATFORD HERTS.

Since 1884 . . . . *the World has witnessed many stirring* EVENTS

Glance to the left of this page and you will notice, illustrated, just a few of the many momentous events which have occurred since 1884—the year that Seccotine was first introduced.

Seccotine is the world's strongest adhesive—its formula is the same to-day as it was 53 years ago. Test after test has proved that this famous product is infinitely better in every way than its next best imitator.

You can place complete trust in Seccotine; it will never "let you down"—it mends articles of almost any surface from glass to metal—from china to wood, safer, stronger and better than any glue.

Seccotine is sold in every quarter of the globe—from the most isolated districts to the busiest cities. It is known and recognised everywhere as the most efficient adhesive that money can buy. Seccotine is obtainable in pin stopper tubes complete with directions for use at all good ironmongers, stationers and general stores.

Seccotine is sold everywhere 4½d., 6d. and 9d. Look for the name on carton and tube and refuse imitations.

SECCOTINE REGD.
THE DOUBLE STRENGTH ADHESIVE

POST THIS COUPON TO-DAY to DEPT. M

M'Caw, Stevenson & Orr Ltd., Belfast

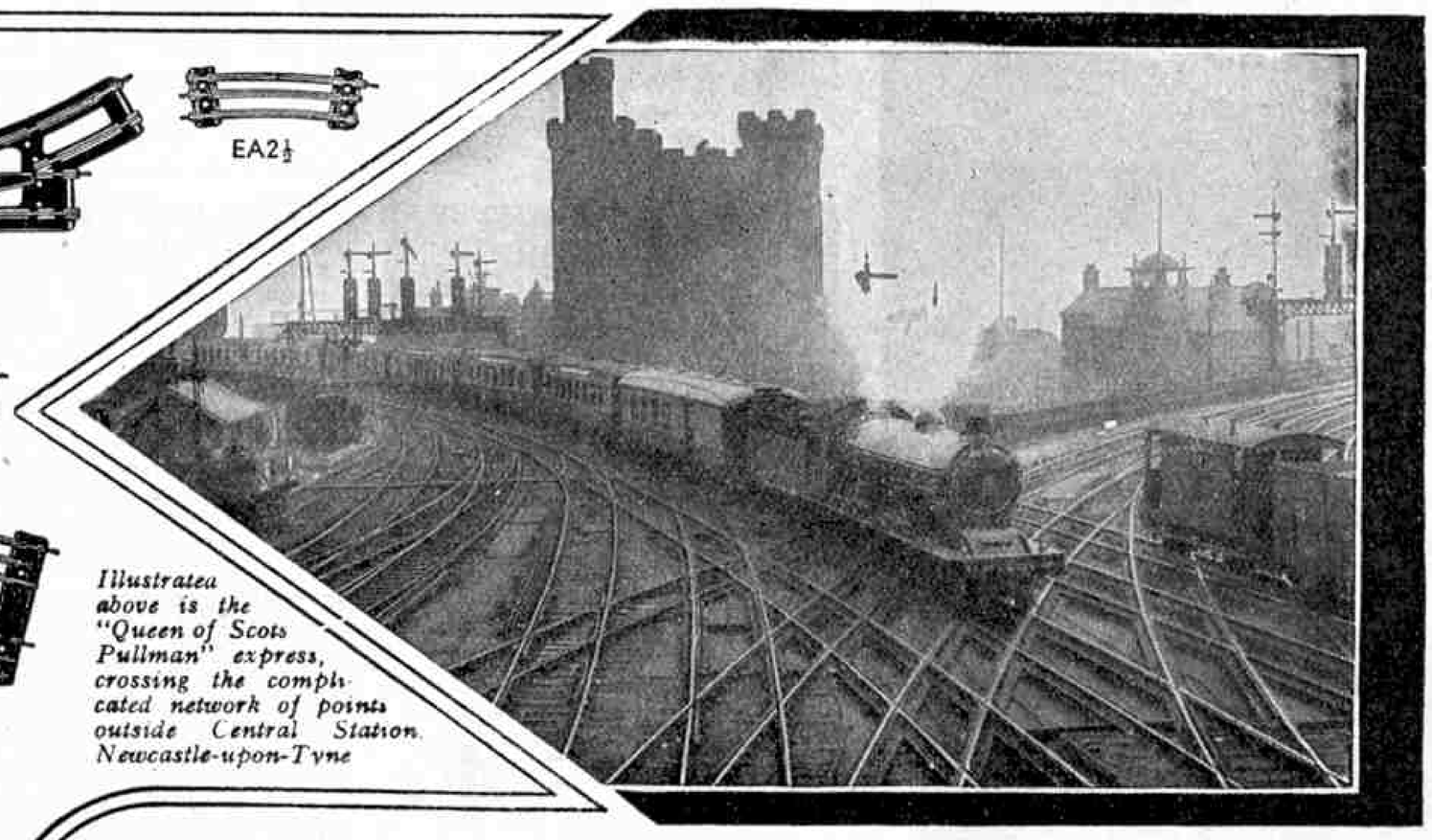
I should like to have, post free, copies of your free booklets which describe the many uses for Seccotine.

NAME.....

ADDRESS.....

.....

HORNBY RAILS, POINTS AND CROSSINGS



Illustrated above is the "Queen of Scots Pullman" express, crossing the complicated network of points outside Central Station, Newcastle-upon-Tyne

There is practically no limit to the number of rail formations that can be built with Hornby Rails, Points and Crossings. A supply of Rails is included in every Hornby Train Set, but the owner is certainly not getting the best out of his set if he is satisfied with merely running it round a simple oval track. The addition of extra Rails and of Points and Crossings to his equipment lends a delightful realism to the game and greatly enhances the fun.

Rails for Electric Trains, Gauge 0, 1¼"

CURVED RAILS

1-ft. Radius

EA1	Curved rails	per doz.	5/–
EA1½	Curved half rails	,,	4/6
EA1¼	Curved quarter rails	,,	4/–

2-ft. Radius

EA2	Curved rails	per doz.	5/–
EA2½	Curved half rails	,,	4/6
EA2¼	Curved quarter rails	,,	4/–
EDC2	Curved rails, double track	½ doz.	9/–

STRAIGHT RAILS

EB1	Straight rails	per doz.	5/–
EB½	Straight half rails	,,	4/6
EB¼	Straight quarter rails	,,	4/–
EDS1	Straight rails, double track	½ doz.	8/6

POINTS

For 1-ft. Radius Curves

EPR1	Right-hand points	per pair	5/9
EPL1	Left-hand points		

For 2-ft. Radius Curves

EPR2	Right-hand points	per pair	7/6
EFL2	Left-hand points		

CROSSINGS

ECA	Acute-angle crossings	each	2/6
ECR	Right-angle crossings	,,	2/6

DOUBLE SYMMETRICAL POINTS

For 1-ft. Radius Curves

EDSR1	Double symmetrical points, right-hand,	
EDSL1	Double symmetrical points, left-hand,	per pair 6/–

For 2-ft. Radius Curves

EDSR2	Double symmetrical points, right-hand,	
EDSL2	Double symmetrical points, left-hand,	per pair 7/–

PARALLEL POINTS

EPPR2	Parallel points, right-hand	per pair 7/–
EPPL2	Parallel points, left-hand	

CROSSOVER POINTS

ECOR2	Crossover points, right-hand	per pair 24/–
ECOL2	Crossover points, left-hand	

EMC20	Switch rails (20-volt)	each	1/3
EMC6	Switch rails (6-volt)	,,	1/3
TCP20	Terminal connecting plates (20-volt)	,,	1/–
TCP6	Terminal connecting plates (6-volt)	,,	1/–

Rails for Clockwork and Steam Trains, Gauge 0, 1¼"

CURVED RAILS

M9	Curved rails	(9-in. Radius)	per doz.	2/6
MB9	Curved brake rails	,,	each	3d.
A1	Curved rails	(1-ft. Radius)	per doz.	3/6
A1½	Curved half rails	,,	,,	3/–
A1¼	Curved quarter rails	,,	,,	2/6
AB1	Curved brake rails	,,	each	4d.
A2	Curved rails	(2-ft. Radius)	per doz.	3/6
A2½	Curved half rails	,,	,,	3/–
A2¼	Curved quarter rails	,,	,,	2/6
AB2	Curved brake rails	,,	each	5d.
DC2	Curved rails, double track	,,	½ doz.	6/–

STRAIGHT RAILS

BM	Straight rails (for MO Trains)	per doz.	2/6
B1	Straight rails	,,	3/6
B½	Straight half rails	,,	3/–
B¼	Straight quarter rails	,,	2/6
BB1	Straight brake rails	each	4d.
BBR1	Straight brake and reverse rails	,,	1/3
DS1	Straight rails, double track	½ doz.	5/3

CROSSINGS

CA1	Acute-angle crossings (for 1-ft. radius track)	each	1/9
CA2	Acute-angle crossings (for 2-ft. radius track)	,,	1/6
CR1	Right-angle crossings (for 1-ft. radius track)	,,	1/9
CR2	Right-angle crossings (for 2-ft. radius track)	,,	1/6

POINTS

9-in. Radius (for MO Trains)

MR9	Right-hand points	per pair	3/–
ML9	Left-hand points		

For 1-ft. Radius Curves

PR1	Right-hand points	per pair	3/–
PL1	Left-hand points		

For 2-ft. Radius Curves

PR2	Right-hand points	per pair	3/–
PL2	Left-hand points		
PSR2	Points on solid base, right-hand	per pair	8/6
PSL2	Points on solid base, left-hand		
SPSR2	Points on solid base, right-hand	per pair	5/–
SPSL2	Points on solid base, left-hand		

These points are similar to Points PSR2 and PSL2 but they are not fitted with ground disc or for Hornby Control.

PARALLEL POINTS

PPR2	Parallel points, right-hand	per pair	3/6
PPL2	Parallel points, left-hand		

DOUBLE SYMMETRICAL POINTS

For 1-ft. Radius Curves

DSR1	Double sym. points, right-hand	per pair	3/6
DSL1	Double sym. points, left-hand		

For 2-ft. Radius Curves

DSR2	Double sym. points, right-hand	per pair	3/6
DSL2	Double sym. points, left-hand		

CROSSOVER POINTS

COR2	Crossover points, right-hand	per pair	12/–
COL2	Crossover points, left-hand		
RCP	Rail connecting plates	½ doz.	2d.

Many interesting illustrations and much useful information regarding Hornby Railway layouts are given in the booklets "How to plan your Hornby Railway," and "Hornby Layouts—100 Suggestions." Each of these booklets is obtainable from your dealer, price 3d., or from Meccano Ltd., Binns Road, Liverpool 13, price 4d. post free.

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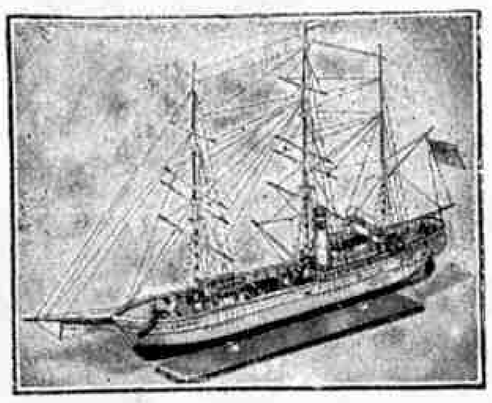

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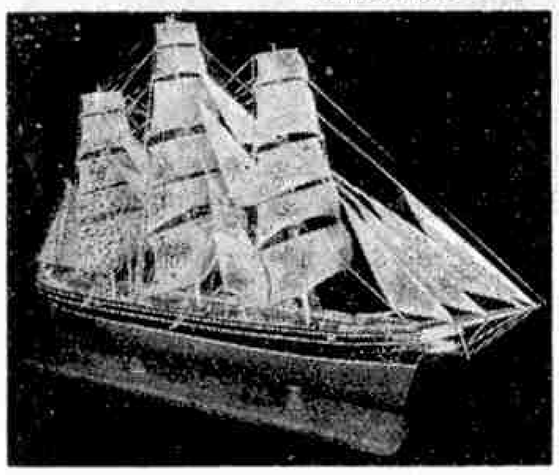

CUTTY SARK (*left*)
Length 14 in. Very detailed model of famous clipper ship. Very clear full-size plan; kit has all parts needed, balsa wood, lacquer, two cast metal ship's boats, anchors, wheel, two capstans, spars for masts. Carriage paid **4/-**

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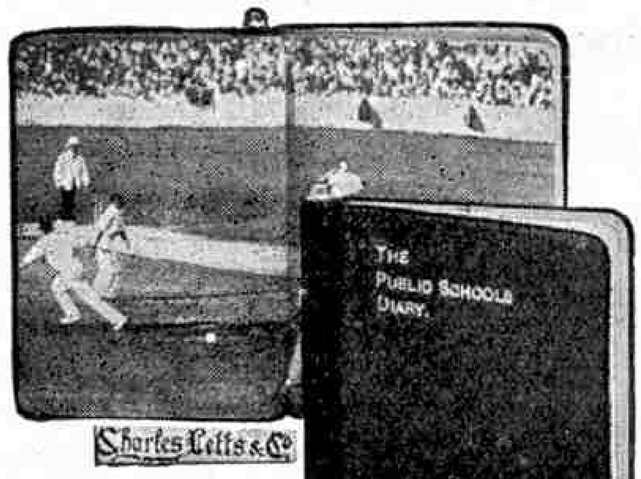

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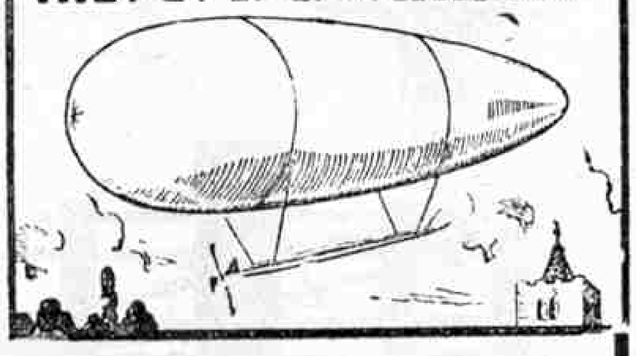

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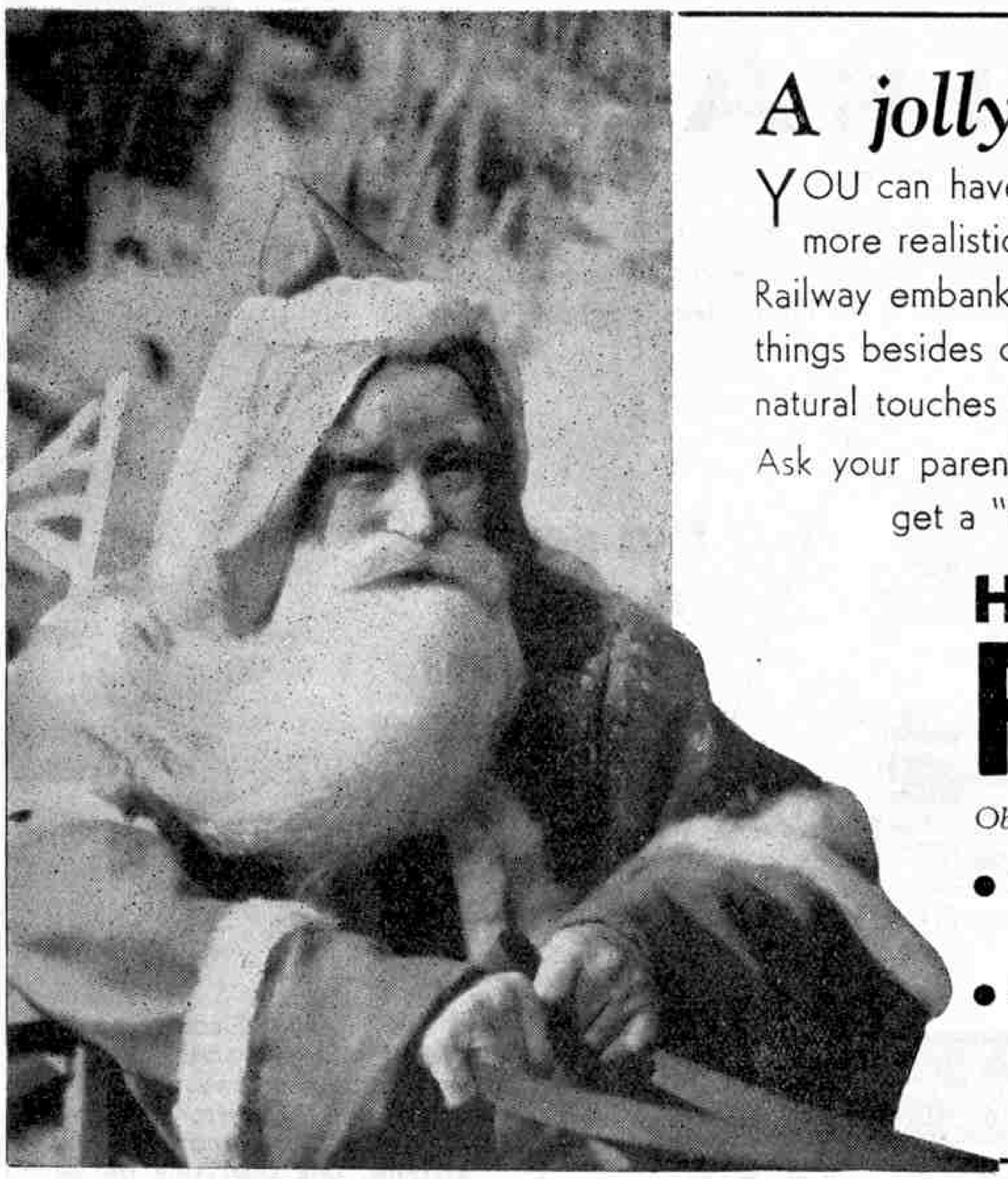

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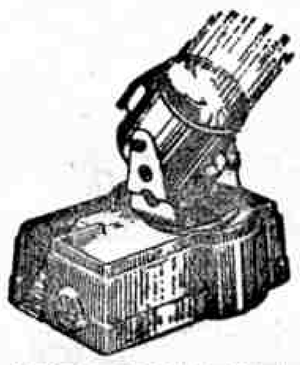

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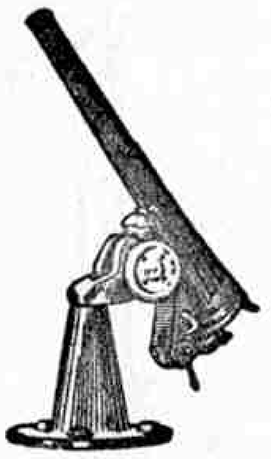

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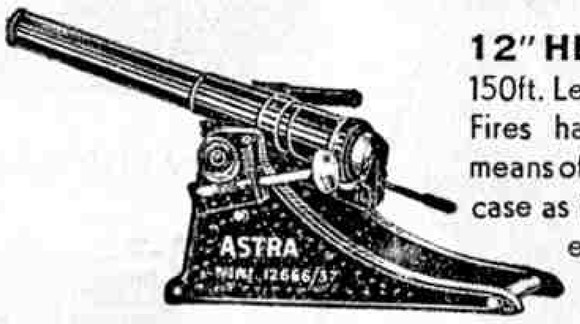

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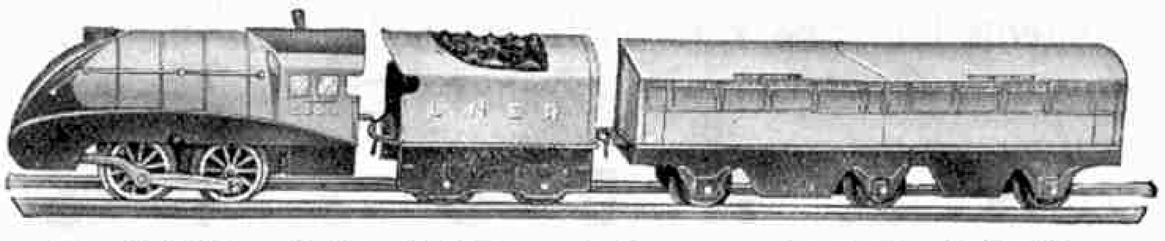
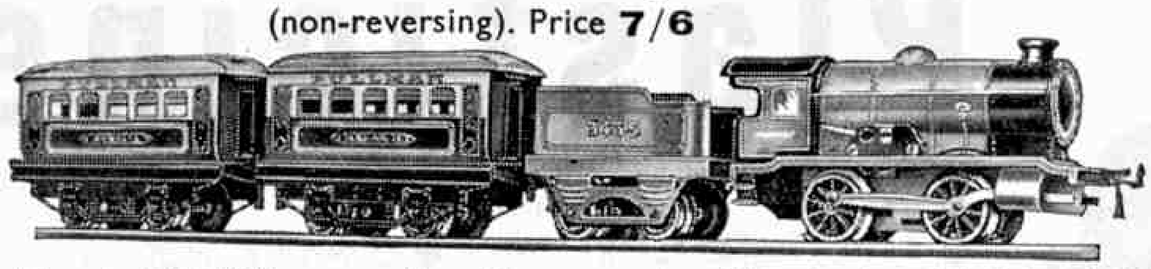


No. O "Silver Jubilee" Clockwork Passenger Train Set, L.N.E.R. (non-reversing). Price **7/6**



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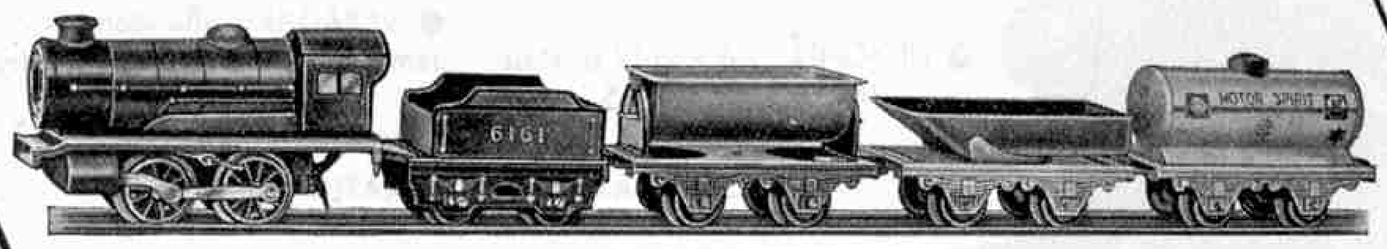
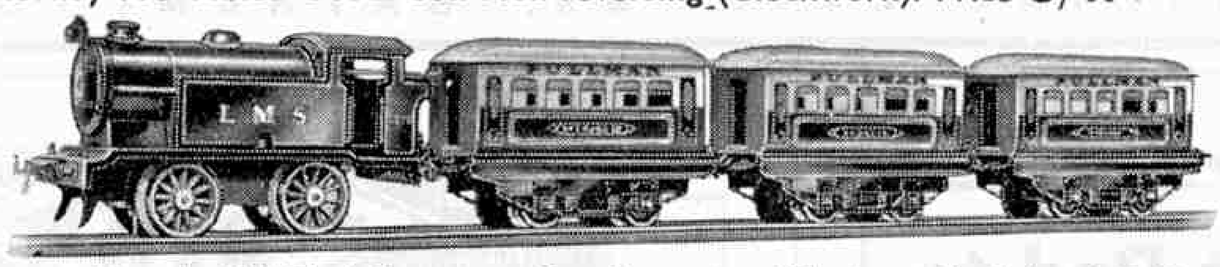


Hornby MO Mixed Goods Set. Non-reversing (Clockwork). Price **6/11**



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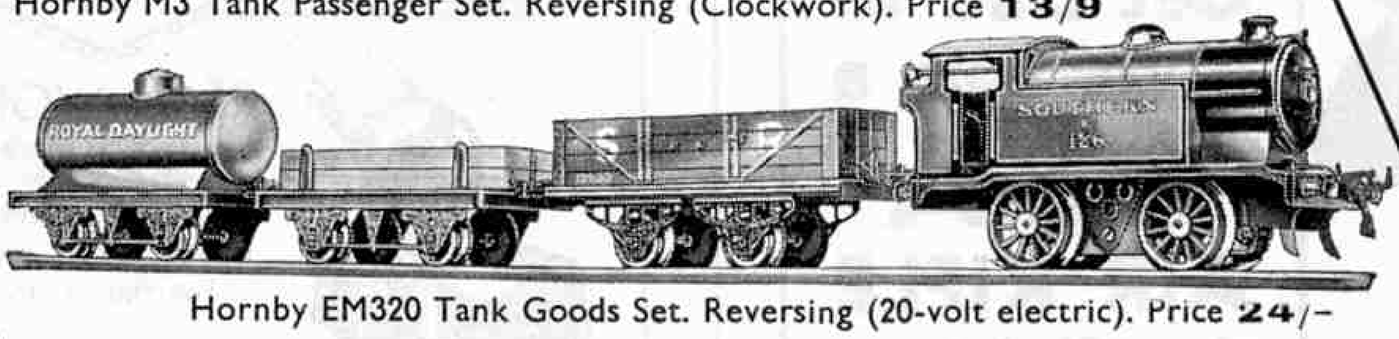

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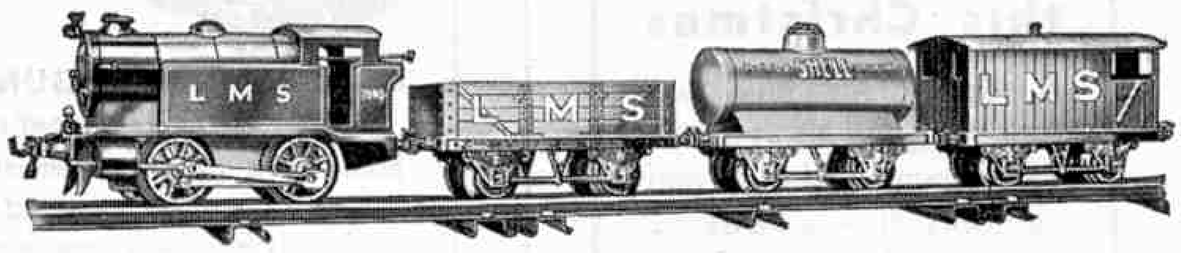

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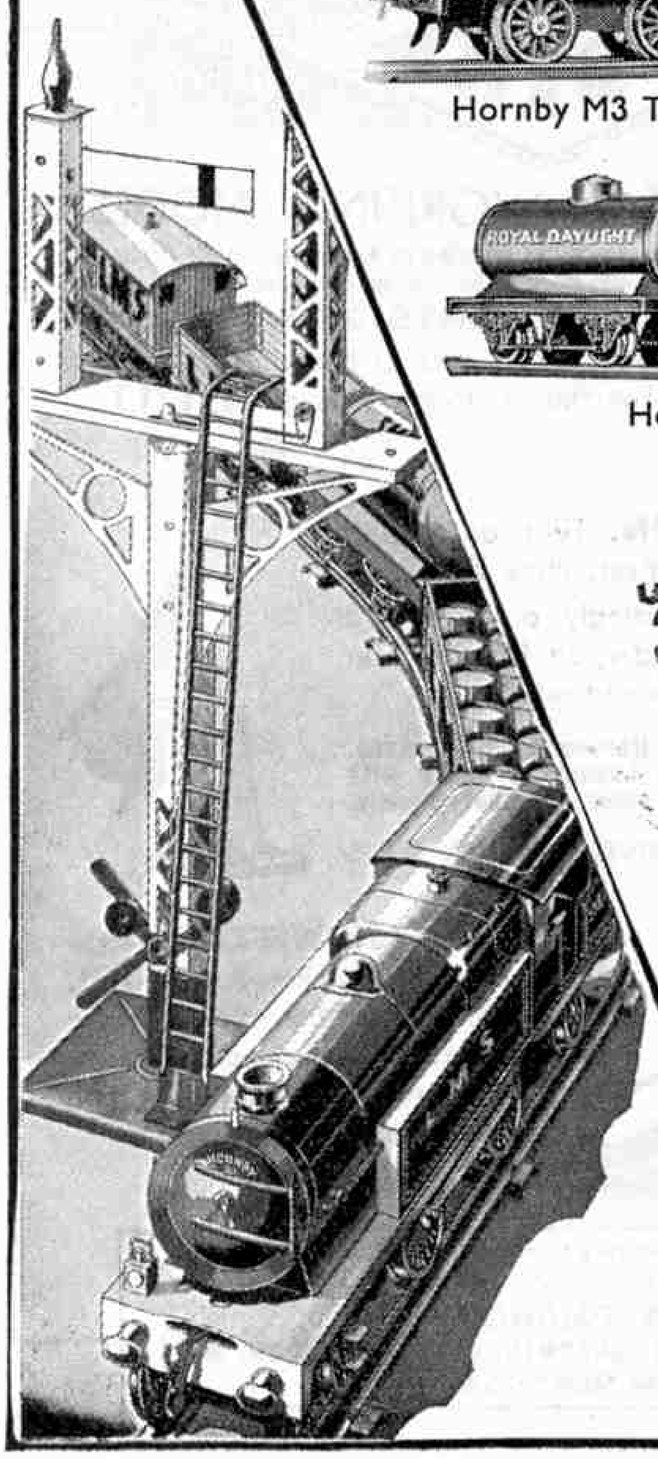

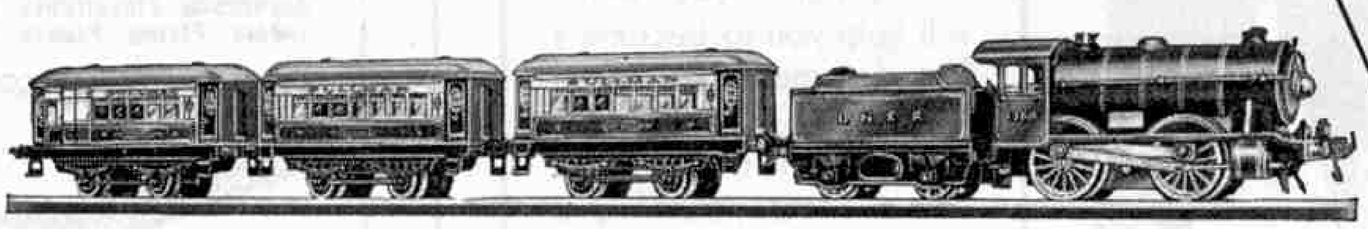

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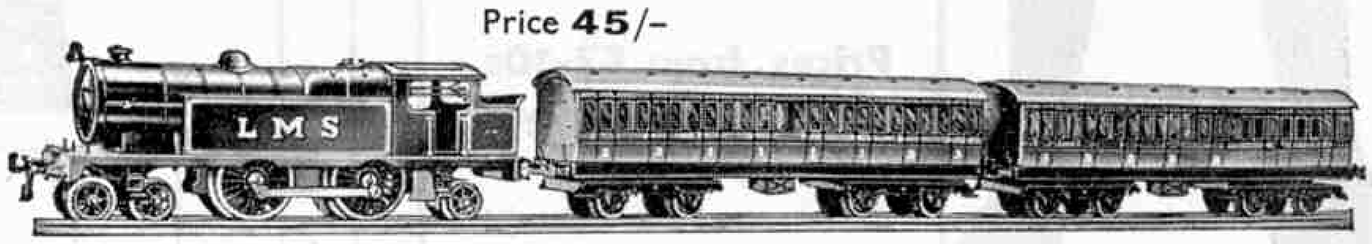

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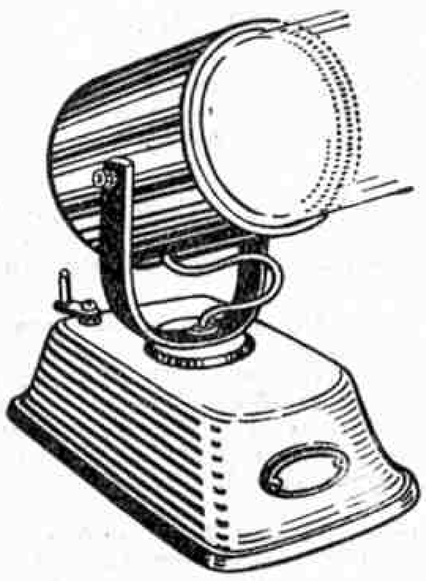

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Mounted on square platform, a realistic model throwing a very powerful beam for a considerable distance. Complete with switch, bulb and battery. Finished army brown.

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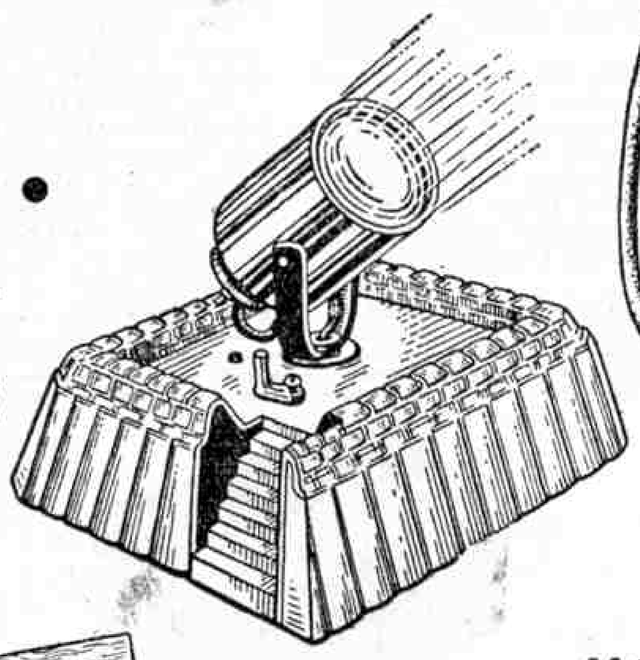

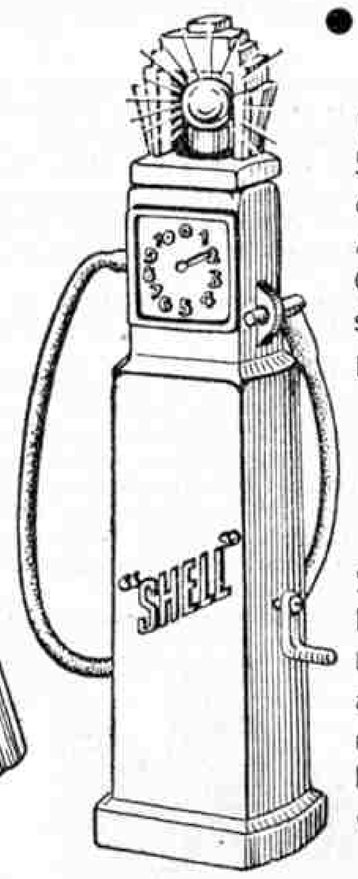

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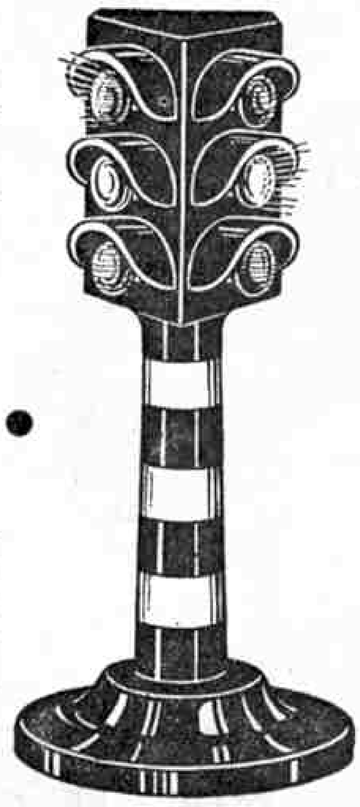

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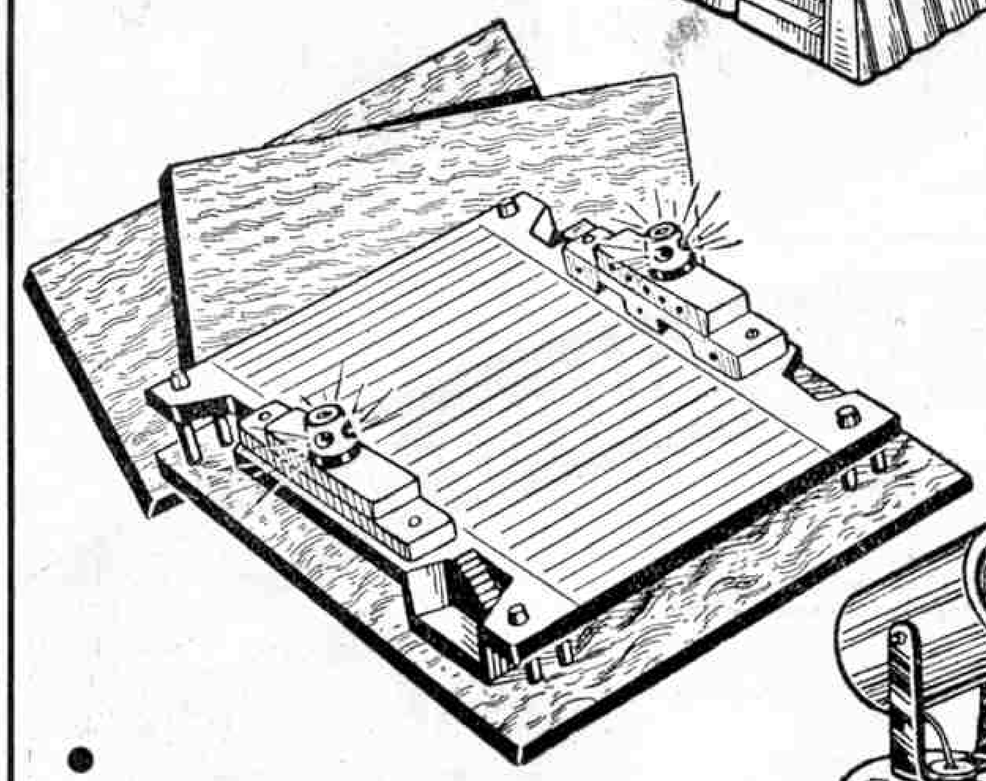

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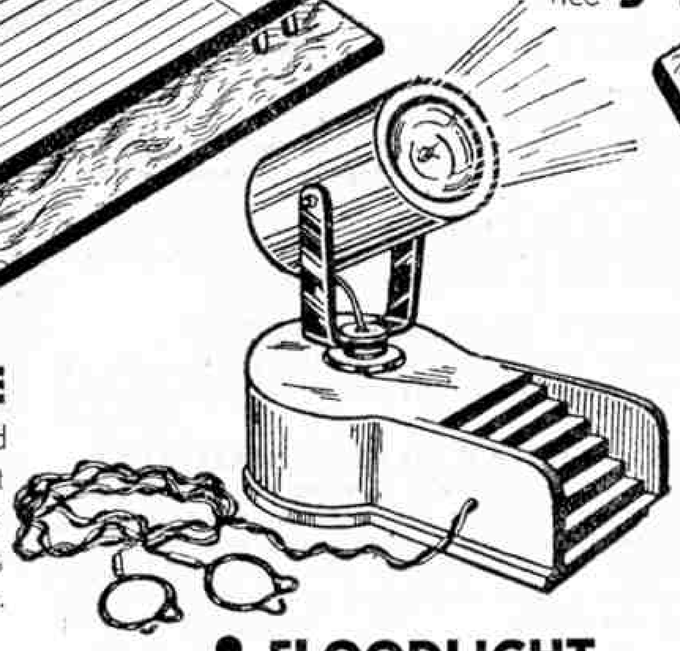

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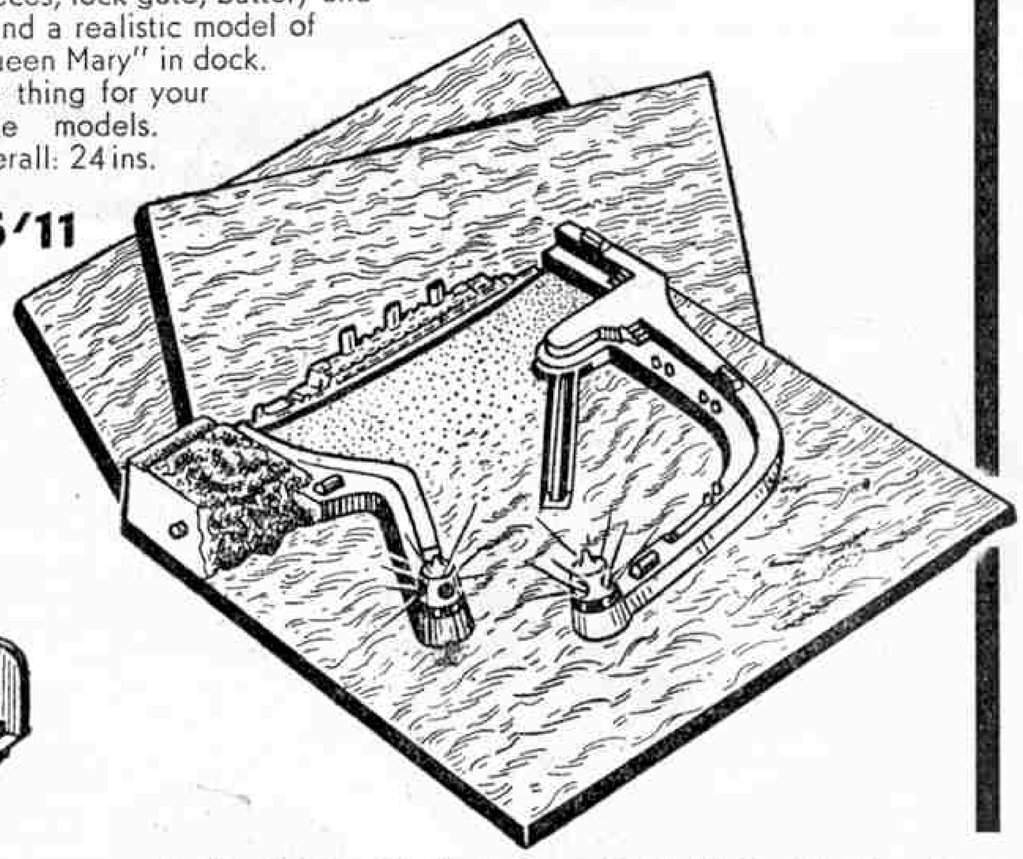

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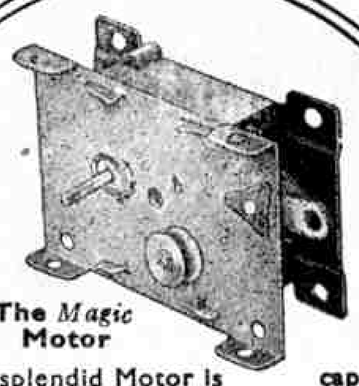

The *Magic* Motor

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No. E6 Electric Motor (6-volt). Reversing ... ,, 12/9
No. E120 Electric Motor (20-volt). Non-reversing ,, 7/6
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When ordering a Transformer or a Transformer-Rectifier the voltage and frequency of the supply must be stated. These particulars are given on the supply meter.

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No. T20A Transformer (Output 35 VA at 20/3½ volts) for 20-volt Electric Motors or 20-volt Trains. Fitted with speed regulator and output sockets for lighting lamps. Price 22/6

No. T20 Transformer (Output 20 VA at 20 volts) for 20-volt Electric Motors or 20-volt Trains. Fitted with speed regulator ... ... Price 17/6

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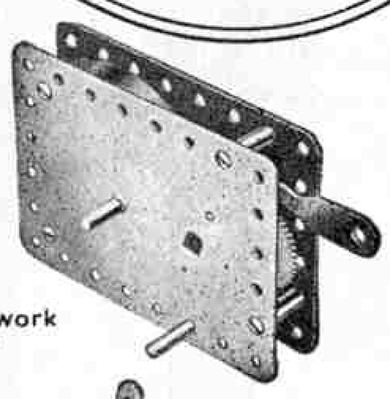
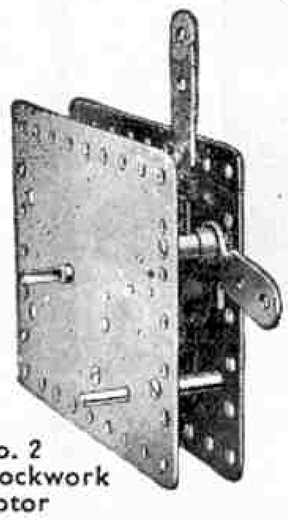
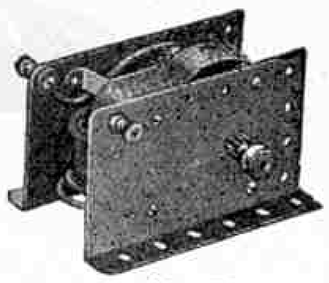
No. T22M Transformer (Output 50 VA at 20 volts) for 20-volt Electric Motors or 20-volt Trains. Not fitted with speed regulator. Will operate two trains at the same time, either on the same track or on two separate tracks. In the latter case two Resistance Controllers are necessary to give independent control ... ... Price 13/6



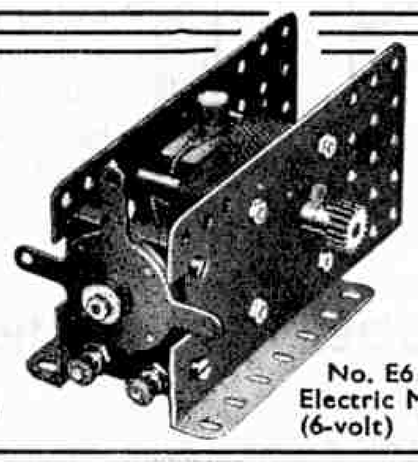
No. 1 Clockwork Motor



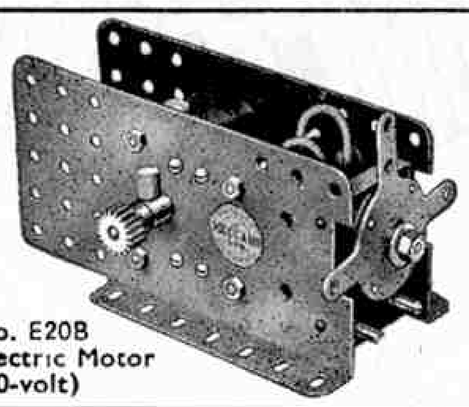
No. 2 Clockwork Motor



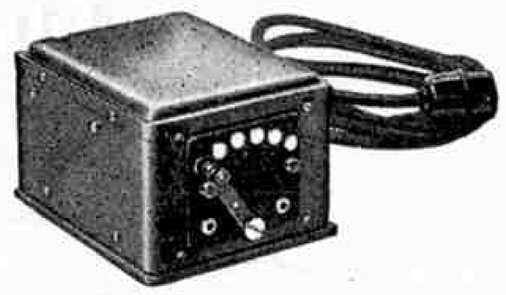
No. E1 Electric Motor (6-volt)



No. E6 Electric Motor (6-volt)



No. E20B Electric Motor (20-volt)



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FOR BOYS AND GIRLS

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

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

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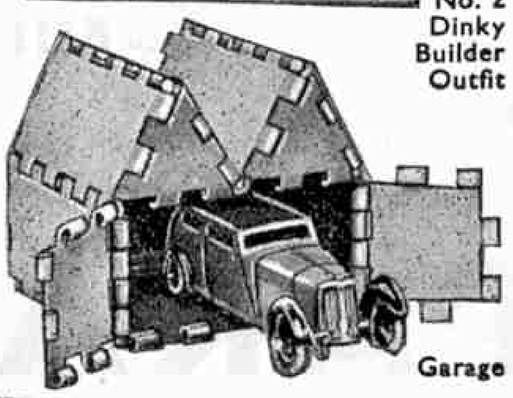
The Dinky Builder "A" packet contains a useful assortment of Dinky Builder Parts with which Outfits No. O, No. 1, No. 2 and No. 3 may be supplemented. Price 1/-

No. 2 Dinky Builder Outfit



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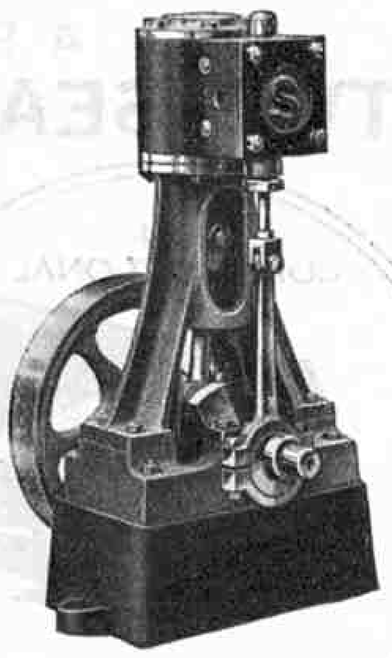

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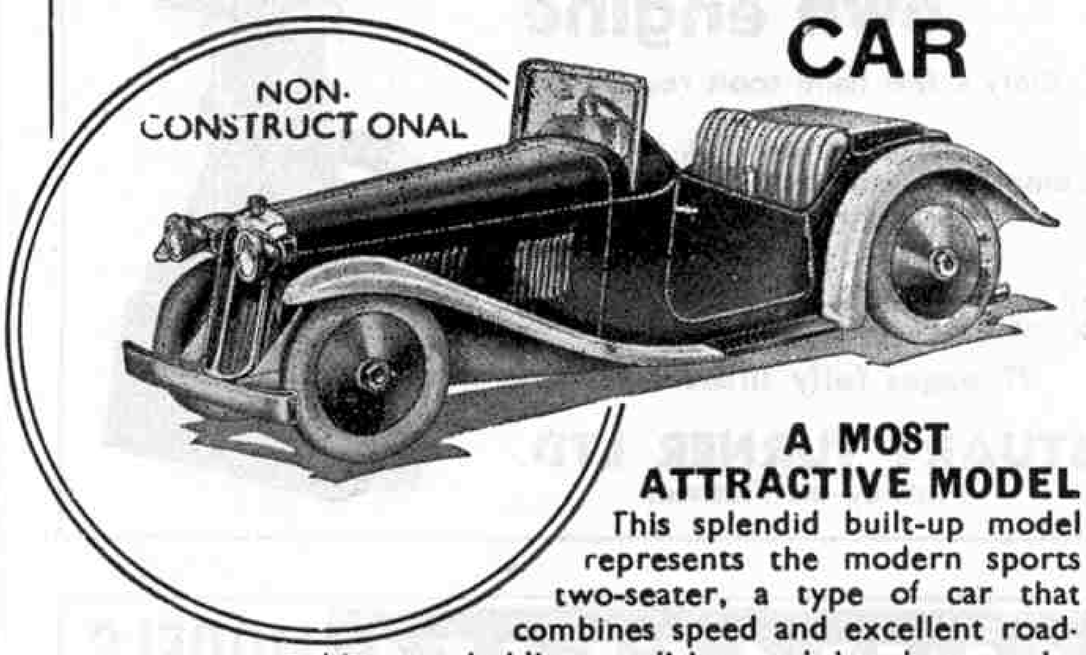

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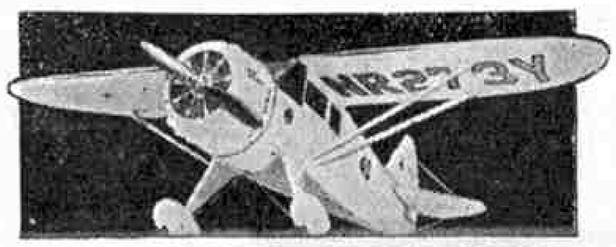

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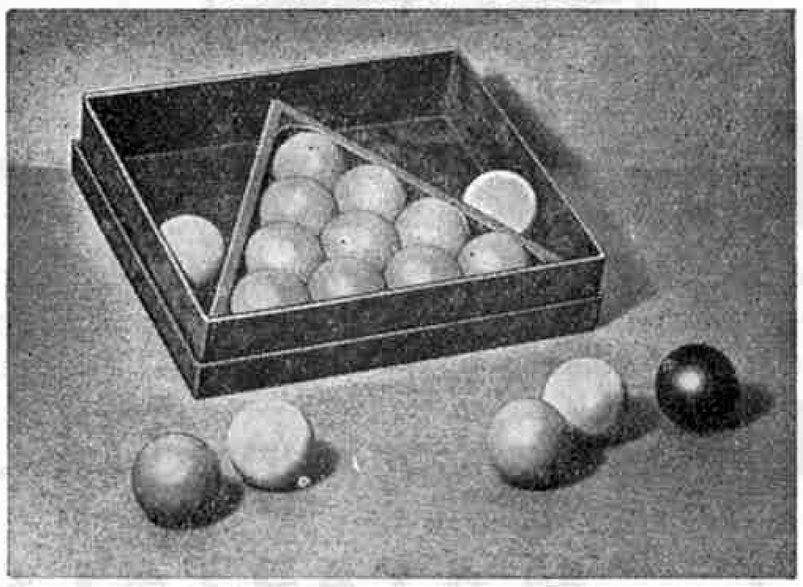

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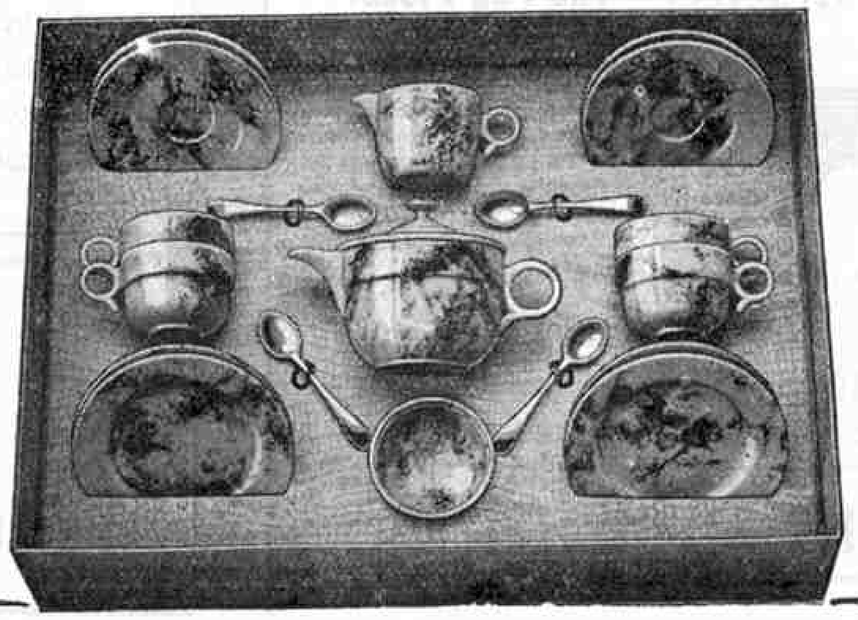

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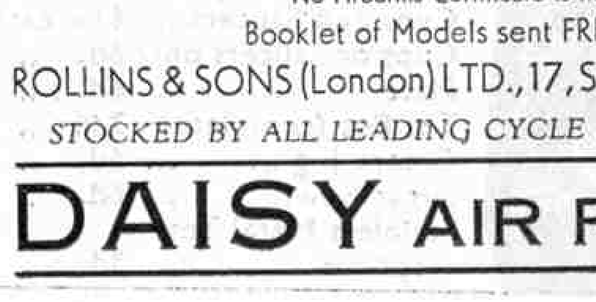

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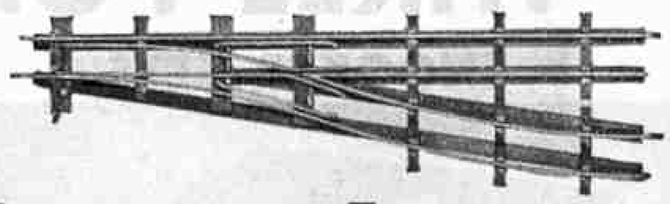

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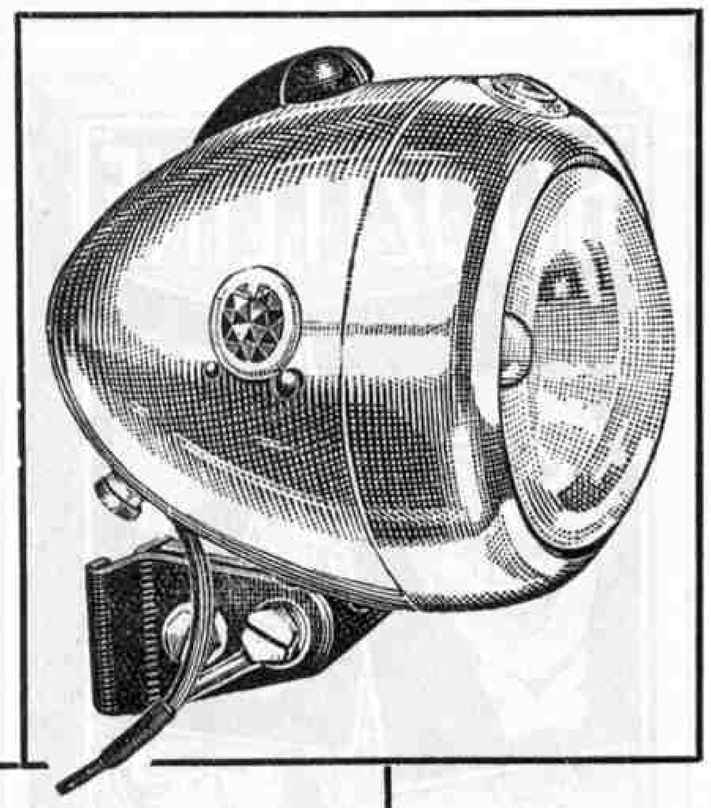

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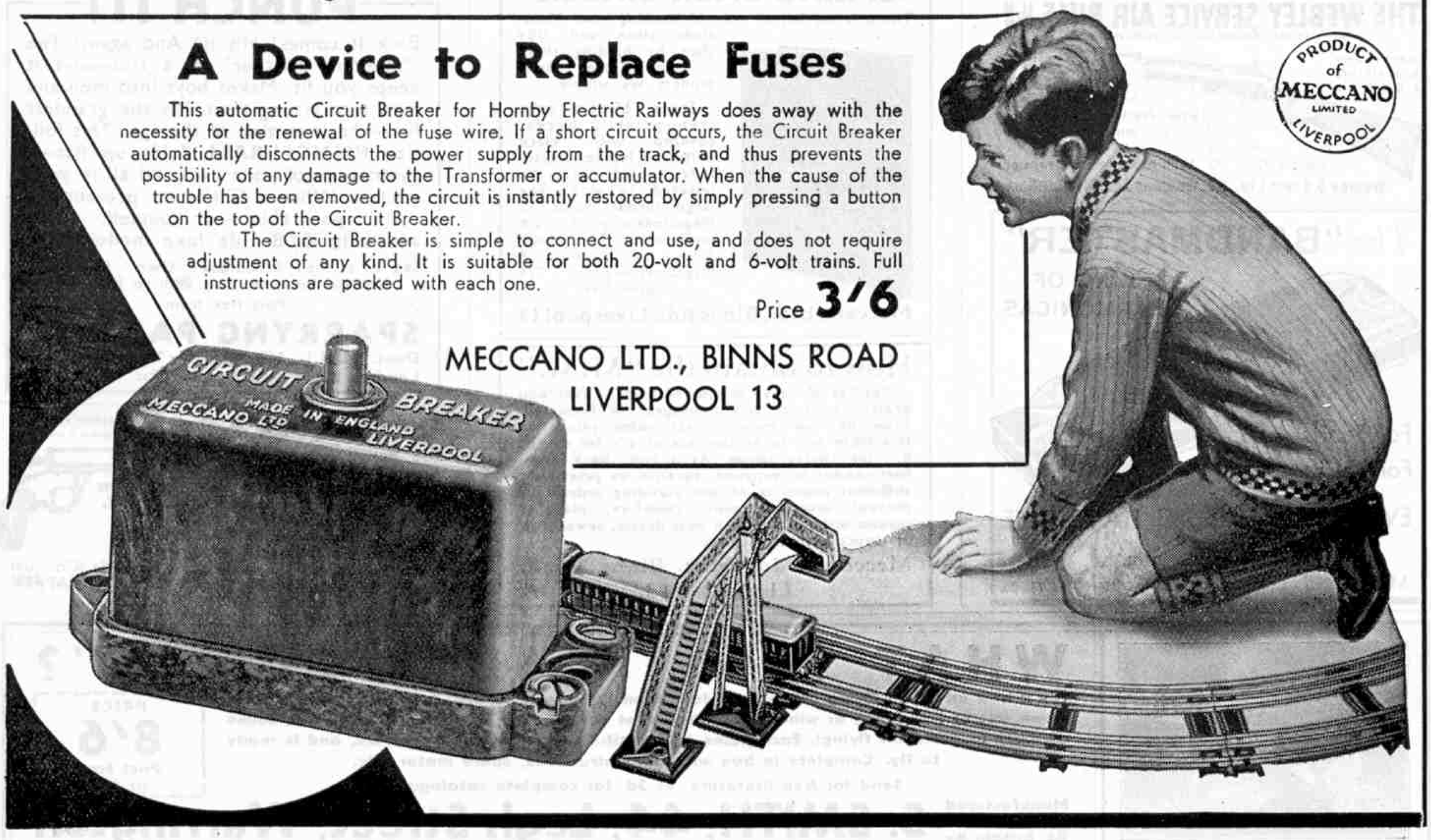

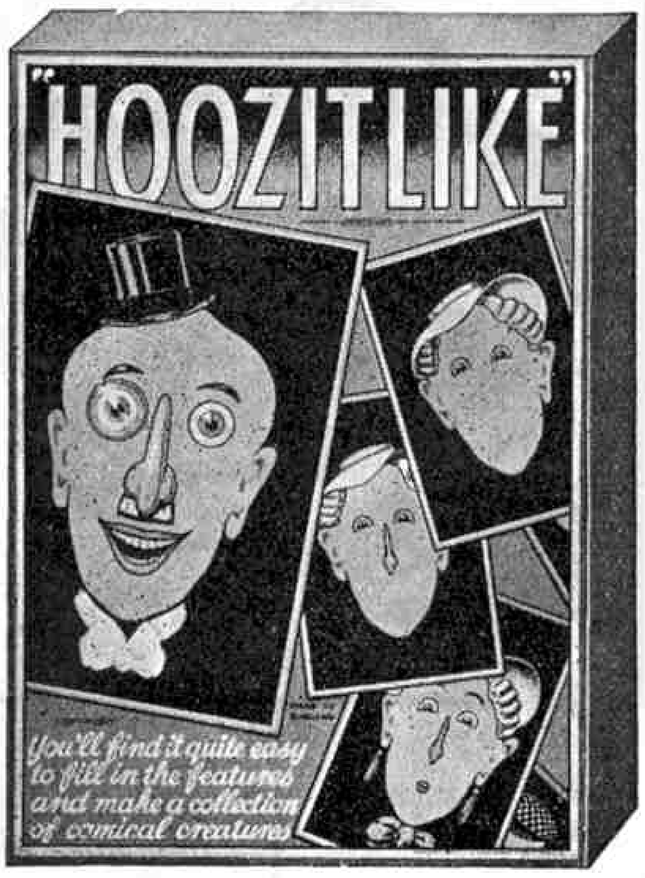

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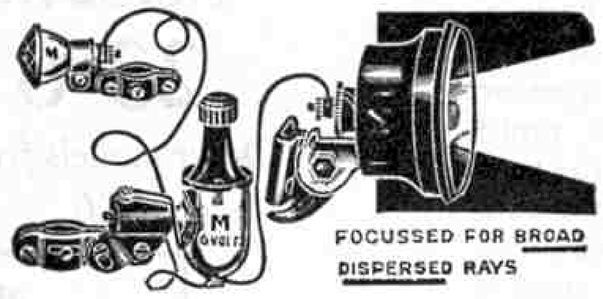

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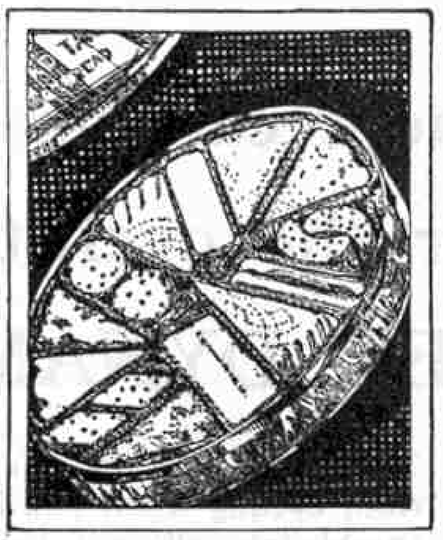

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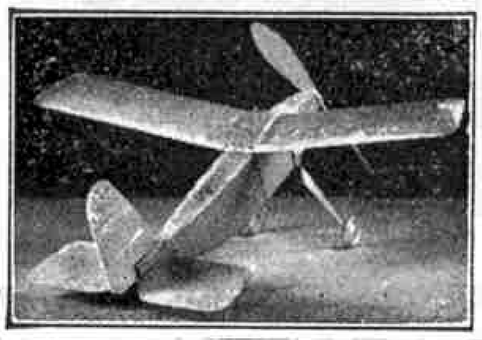

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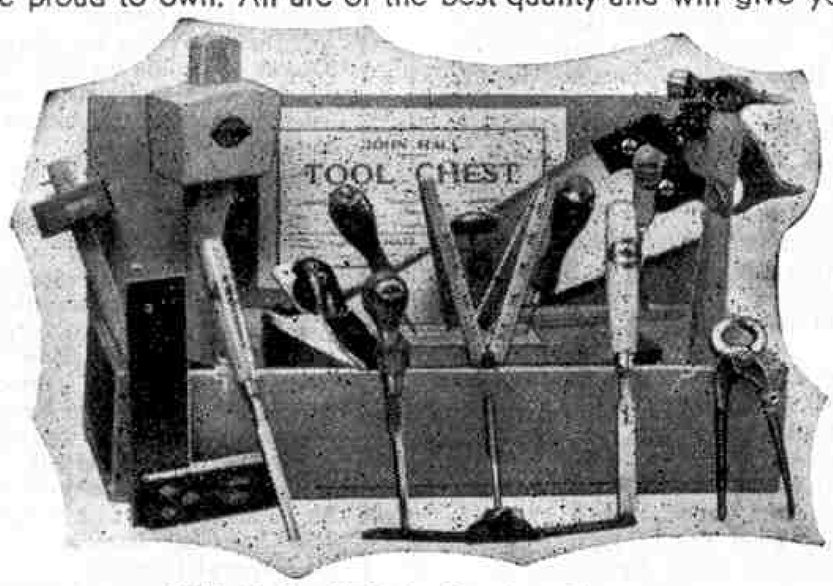

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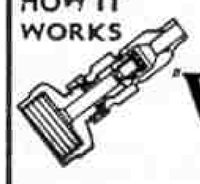

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Readers should note that all advertisements of Hornby Trains and other Meccano products included in this column relate to items no longer featured in the catalogue. Advertisements of current products cannot be accepted for this column.

Sale. Gauge O Model Railway (Clockwork), Locomotives, Coaches, 80 ft. Scale Track. Excellent condition, £3/10/–, or nearest offer. "Meccano Magazines," 1930-6 (inclusive), 10/–. Two-spring Gramophone Motor, as new, 7/6.—Brook, Whitehorse Street, Hereford.

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Sale. Junior Typewriter, Cinematograph and Films, Bowman Steam Engine M135. What offers?—Bowen, 55, Lodge Road, West Bromwich.

Sale. 50/– worth Red-Green Meccano. 100/– worth O Gauge Trains, Rails, Rolling Stock. £3 or offers.—Cardell, 1, Aberdeen Terrace, London, S.E.3.

Sale. Red-Green Meccano. Cost 116/–. Accept 50/–, or offers.—Clements, 5, Everton Road, Croydon.

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Wanted. Electric Train, complete, 230v. A.C., cheap.—"Hillside," Willington, Maidstone.

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Sale. 750 British and Colonial Stamps in loose leaf album. Also 5/– Catalogue. Lot 20/–.—Armstrong, 15, Kent Street, Whitstable.

Pathe surplus Films, Supers, 60's and 30's, good condition. Write for lists.—85, Killinghall Road, Bradford.

Sale. "Meccano Magazines," bound, July 1931–June 1933, complete four volumes, perfect condition, offers.—Powell, "Wychwood," Kidlington, Oxford.

Sale. £2/10/– worth Meccano (Red-Green), 10/–. Meccano Steam Engine, 7/6. In good condition.—Ward, 21, Orchard Street, Peterborough.

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Sale. Tank for Model Sea Liner. Gauge "O" Bowman Steam Engine, 0–6–4 "Flying Fox." Railway Magazines. Raleigh Bicycle. Wireless Parts. Stamp details.—B. Woodman, 11, Lyndhurst Road, N.W.3.

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Wanted. Railway Photographs, postcard size. Good condition essential.—286, Southampton Road, Eastleigh, Hants.

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Publication Date. The "*M.M.*" is published on the 1st of each month and may be ordered from any Meccano dealer, or from any bookstall or newsagent, price 6d. per copy. It will be mailed direct from this office, 4/– for six issues and 8/– for twelve issues.

To Contributors. The Editor will consider articles and photographs of general interest and payment will be made for those published. Whilst every care will be taken of articles, etc., submitted, the Editor cannot accept responsibility for any loss or damage. A stamped addressed envelope of the requisite size should be sent where the contribution is to be returned if unacceptable.

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Readers Overseas and in foreign countries may order the "*Meccano Magazine*" from regular Meccano dealers or direct from this office. The price and subscription rates are as above, except in the cases of Australia, where the price is 1/2 per copy (postage extra), and the subscription rates 8/– for six months and 16/– for 12 months (post free); Canada, where the price is 10c. per copy, and the subscription rates 65c. for six months, and $1.25 for 12 months (post paid).

The U.S.A. price is 15c. per copy, and the subscription rates $1 and $2 for 6 and 12 months respectively (post free).

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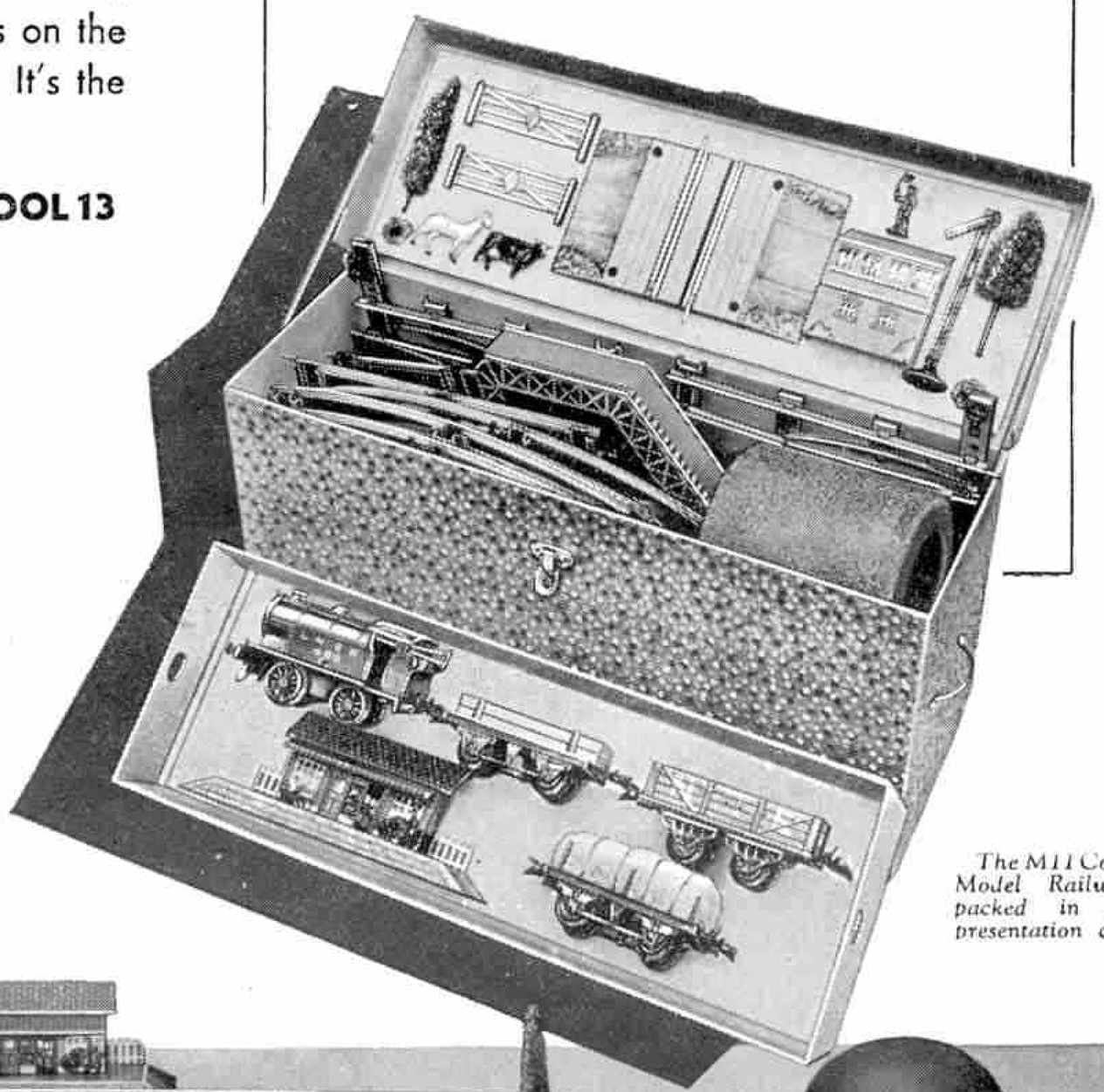

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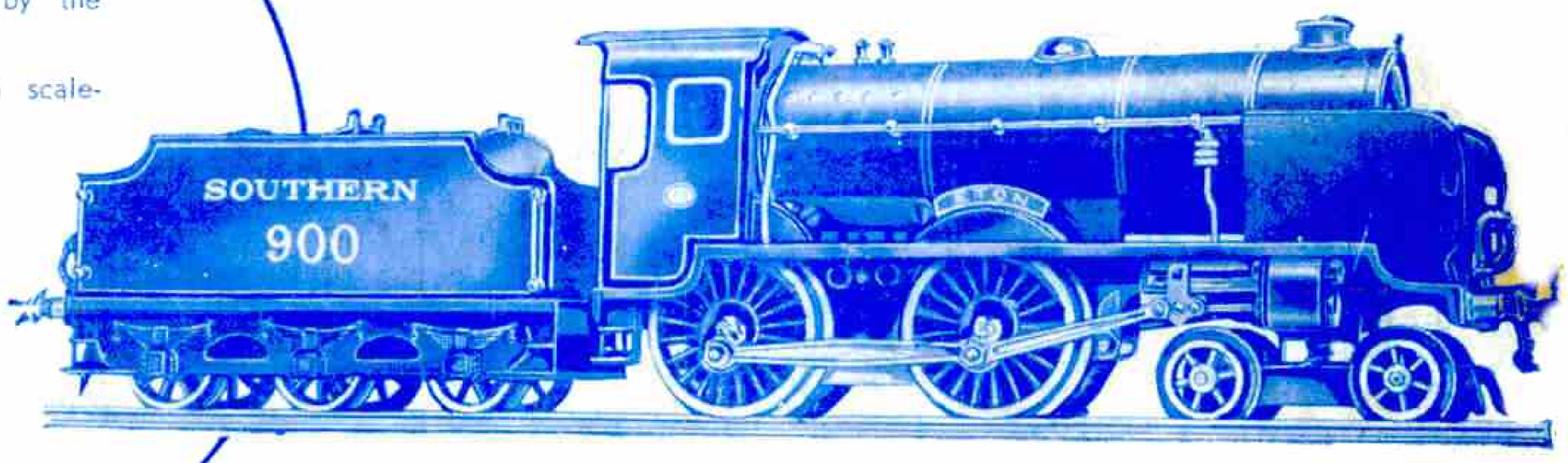

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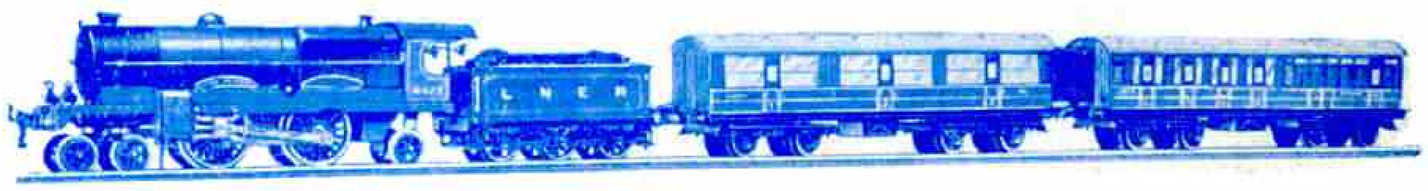

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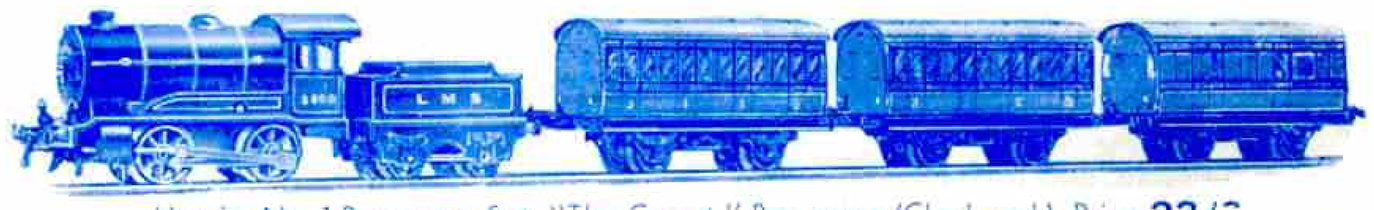

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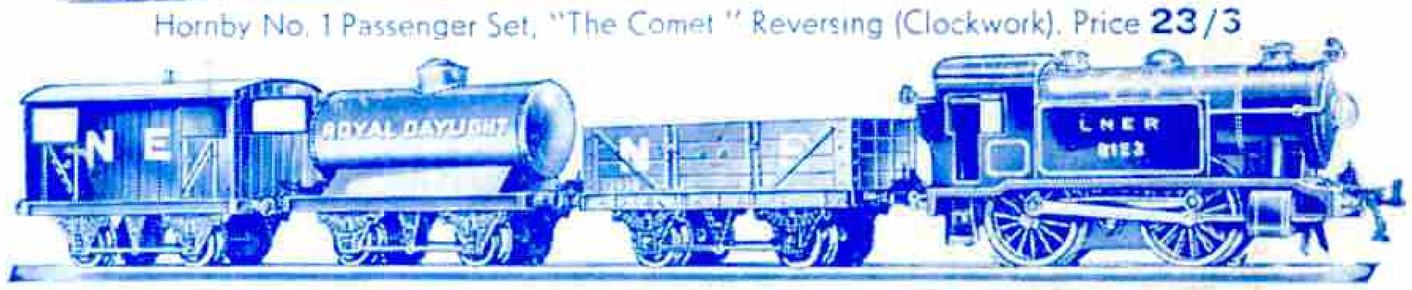

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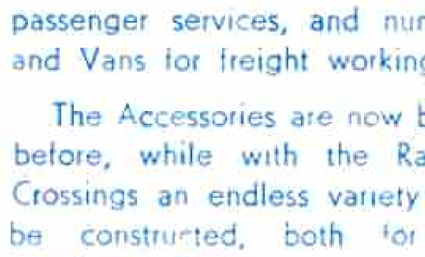
A SELECTION FROM THE RANGE OF HORNBY LOCOMOTIVES

Electric Models

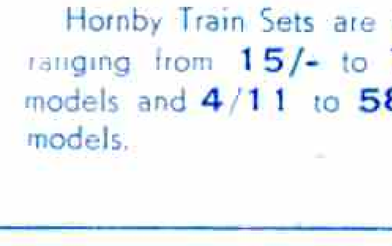


EM120 (20-volt) or EM16 (6-volt) ELECTRIC LOCOMOTIVE

EO20 (20-volt) ELECTRIC LOCOMOTIVE

E220 (20-volt) SPECIAL ELECTRIC LOCOMOTIVE

Clockwork Models



No. O "SILVER LINK" LOCOMOTIVE

No. 1 SPECIAL LOCOMOTIVE

No. 2 SPECIAL TANK LOCOMOTIVE

Electric Models

EM120 (20-volt) or EM16 (6-volt) Locomotive (non-reversing). Price **8/6**

EO20 (20-volt) Locomotive (reversing). Price **19/-**

E220 (20-volt) Special Locomotive (automatic reversing). Price **37/6**

Clockwork Models

No. O "Silver Link" (reversing) Price **3/6**

No. 1 Special Locomotive (reversing). Price **15/9**

No. 2 Special Tank Locomotive (reversing) Price **19/6**

PRODUCT OF
MECCANO LIMITED — BINNS ROAD — LIVERPOOL 13

PUBLISHED BY MECCANO LTD., BINNS ROAD, LIVERPOOL 13, ENGLAND.
Printed by John Waddington Ltd., Leeds and London