VOL. XX. No. 8 AUGUST 1935

MECCANO MAGAZINE

A ZULU WARRIOR
(see page 442)

6D.

AHOY THERE, BOYS!.....

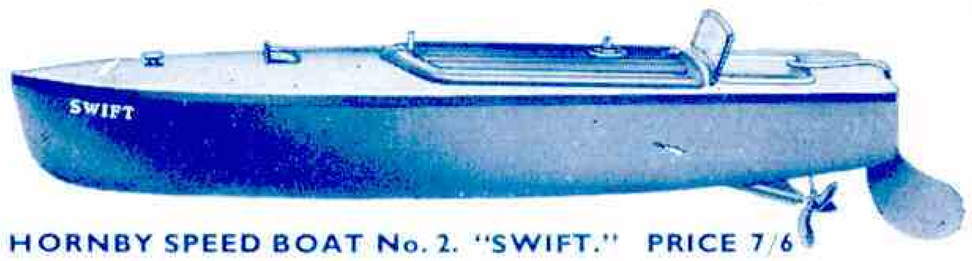
These are Hornby Speed Boat Days!

Model speed boat racing is one of the most thrilling hobbies you can have, brimful with excitement from start to finish. But the amount of fun you get depends on the kind of boat that flies your colours. That's why you'll be proud to own a Hornby—every inch a champion, sleek, smart and swift. A winner against all comers!

Hornby Speed and Racing Boats are built with the same precision and craftsmanship as the famous Hornby Trains. You will be amazed at their outstanding performance—the No. 3 Speed Boat does a snappy run of over 500 feet on one winding!

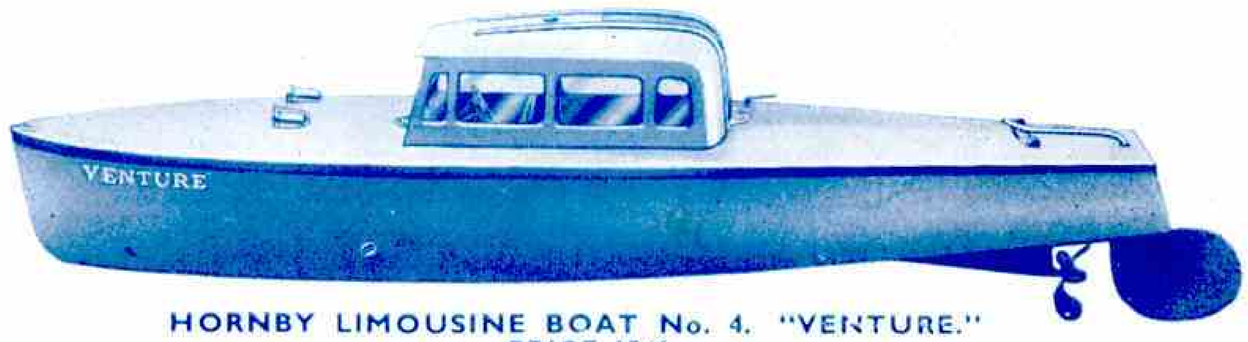
HORNBY SPEED BOAT No. 1. "HAWK." PRICE 2/11

HORNBY RACING BOAT No. 1. "RACER I." PRICE 4/6



HORNBY SPEED BOAT No. 2. "SWIFT." PRICE 7/6

HORNBY RACING BOAT No. 3. "RACER III."
PRICE 14/6



HORNBY LIMOUSINE BOAT No. 4. "VENTURE."
PRICE 15/6

Hornby Speed Boat Week August 2nd—9th

Visit your local dealer during Hornby Speed Boat Week and see the special displays of Hornby Speed Boats and Racing Boats. What a grand range for you to choose from. Remember, Hornby Boats are the best you can buy—best not only in appearance, but best in performance and reliability. That's why you'll get more fun out of a Hornby, designed just like big craft with realism in every line, feature and action!

HORNBY SPEED BOAT CLUB

If you buy a Hornby Boat during Hornby Speed Boat Week, you will be enrolled in the Hornby Speed Boat Club and presented with the beautifully enamelled Club Badge (illustrated here)—FREE!

Manufactured by
MECCANO LTD., BINNS ROAD, LIVERPOOL 13

HORNBY SPEED BOATS

Hamley's News

· HAMLEY · BROTHERS · LTD · ESTABLISHED · 1760 ·

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

Number Twenty-eight *August, 1935*

EVERYTHING FOR THE CYCLIST

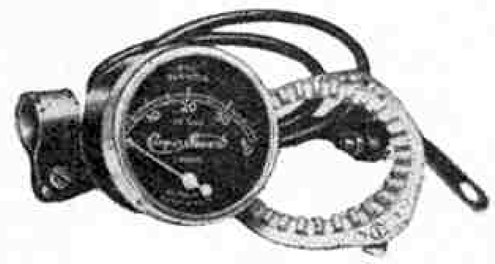
Here is a page of interesting accessories which will add greatly to the fun of cycling. It's lovely to know the exact distance you have covered and how fast you've been going. Then there are the wonderful new electric lamps—gone are the days when cycling at night was a bore because lighting lamps meant striking endless matches and an unpleasant smell. Now you just turn a switch and there you are lit up back and front. Study the bargains on this page—there's sure to be something you need.

Cycles and cycle accessories, Sports Department, second floor.

LUCAS CYCLOMETER

How many miles do you cycle in a year? Get one of these reliable cyclometers and you'll be able to tell exactly. They register accurately up to 10,000 miles and are very easily fitted. Price Post 3d. **3/6**

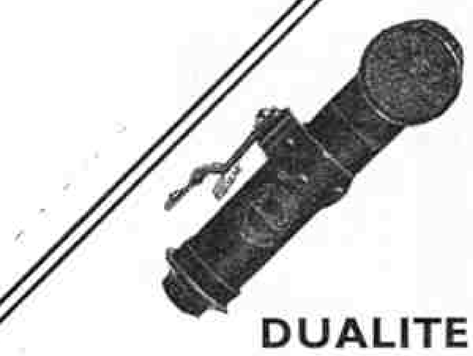
State whether for 26 in. or 28 in. wheel.



SPEEDOMETER

No danger in built-up areas with one of these on your cycle! This speedometer is very accurate and easy to fit on to your cycle. Price Post 6d. **12/6**

POST YOUR ORDER NOW, it will be promptly and accurately executed by our experienced post order staff.



DUALITE

A powerful electric rear lamp and reflector combined. It will last wonderfully for the body cannot rust, corrode or dent. Price Post 4d. **3/6**

No. 1 LITALITE ELECTRIC CYCLE LAMP

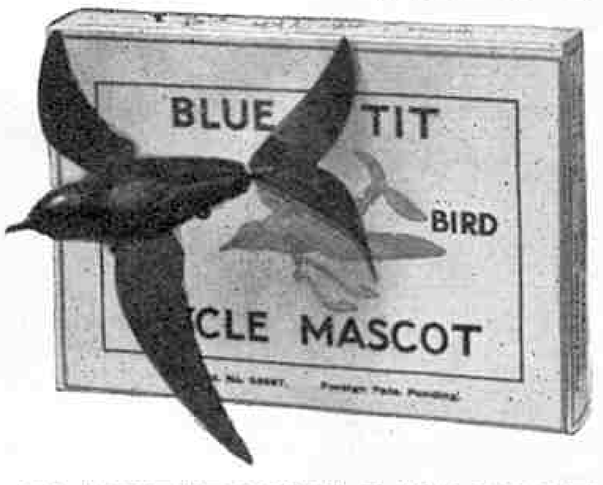
You'll have no more trouble over lights if you use one of these strong, reliable lamps. They are built for all weathers and cannot be dented like metal.

Price complete with battery Post 6d. **7/6**

PIFCO CYCLE SIGNAL

With this wonderful little indicator there will be no need for you to put out an arm to show which way you are going. Just press a switch and you can light up the reflector, the arrow to the left or to the right, or the stop sign.

Complete with battery it costs Post 6d. **6/4½**

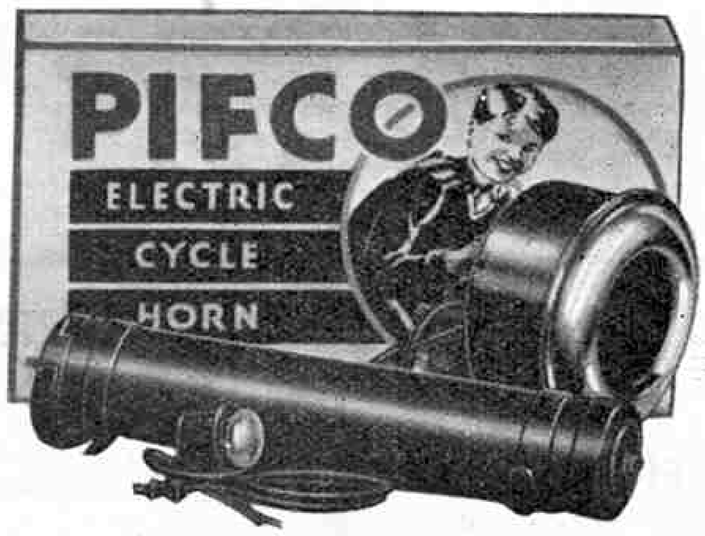


BLUE TIT CYCLE MASCOT

Here is a quite new idea for your cycle, a bird mascot whose wings move up and down and whose tail revolves. It costs only Post 3d. **1/3**

NO WEIGHT CELLULOID CYCLE HORN

This horn is made on entirely new lines. As it is celluloid, it is very light and cannot chip, dent or rust like metal. It is well polished and can be obtained in black or white. Price Post 4d. **3/6**



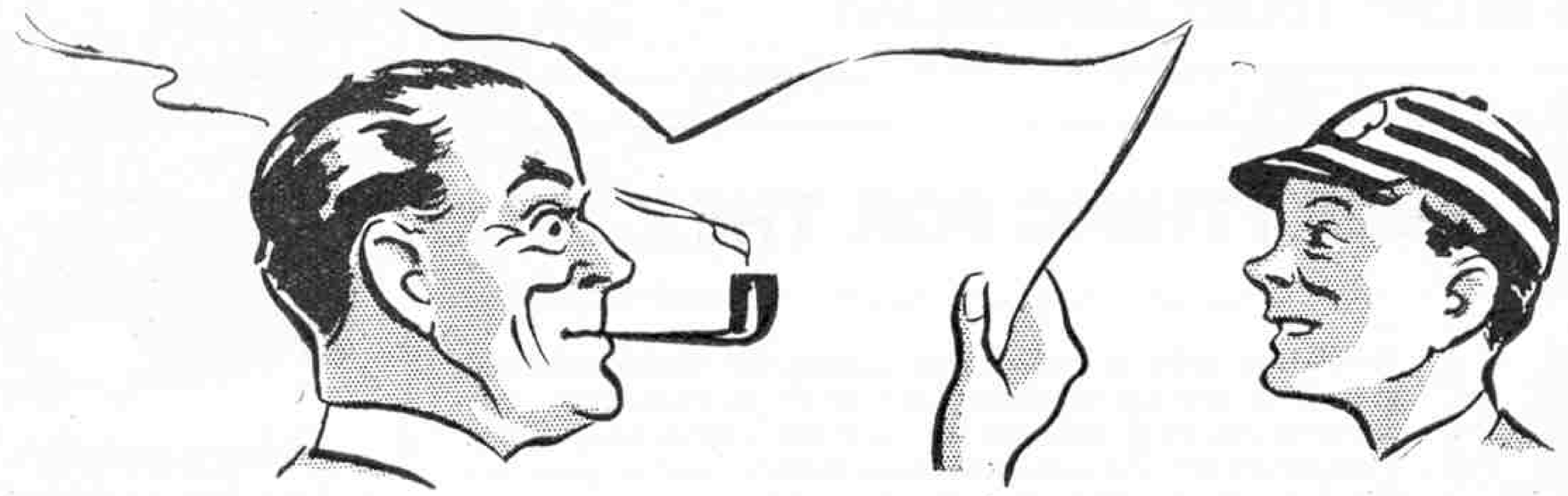
PIFCO ELECTRIC CYCLE HORN

This horn gives a very penetrating and effective note which can be heard clearly in traffic when a bell might not be noticed. Complete with battery it costs Post 6d. **7/8**

No. 3 LITALITE CYCLE LAMP

A very dependable electric lamp which gives a penetrating beam and makes cycling at night a pleasure. It has a long life battery and costs. Post 4d. **3/6**

This is FROG weather
–don't wait till Christmas–ask father NOW



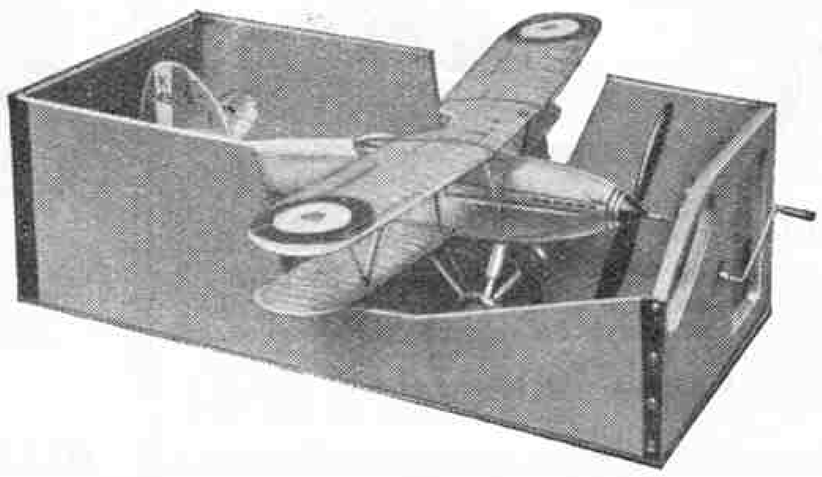
HOW TO GET A "FROG" OUT OF FATHER

"Dad, oughtn't I to know all about flying?"

"Certainly, my boy—our Empire's future lies in the air—I'll get you a book all about it."

"I know all about books—it's a model I want—one that really behaves like a real aeroplane, and looks like one—and there's only one kind like that, the 'FROG.' It can rise off the ground, loop the loop, do stunts, and all the principles of aerodynamics can be learnt. . . . . "

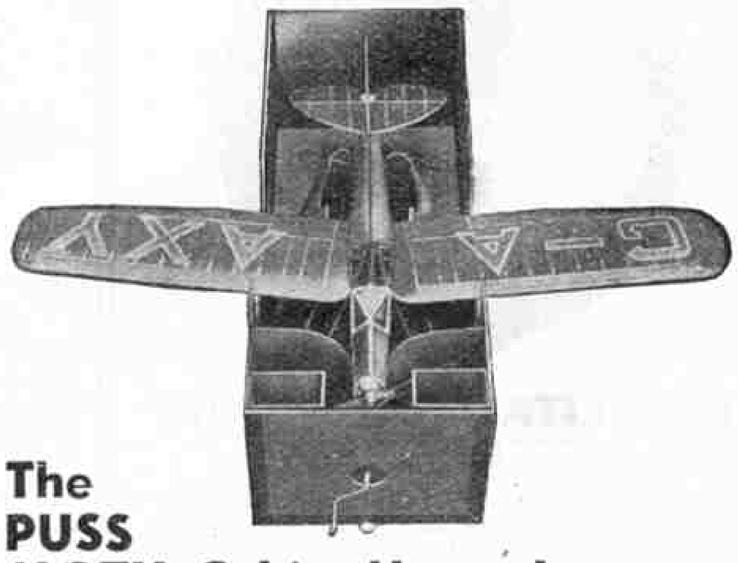
"I don't know where you learnt those big words from, but you have learnt how to get round your old father—here's five bob—no, I'll make it ten, and buy one for me."



HAWKER "HART"

Wing Span—19". Length 15½". An exact scale model of the world-famous R.A.F. High-Speed Day Bomber. Complete with extra strong **Patent High-Speed Winder-Box,** lubricant for gearbox and motors, triple insertor rod, spare motors and profusely illustrated flying manual. **Flies 700 feet** if handled skilfully.

42/-



The PUSS MOTH Cabin Monoplane

Wing Span—18½". Length—13½". Complete with **Patent High-Speed Winder-Box,** Spare Motors, Dual Insertor Rod, Motor Lubricant, Gearbox Oil and fully illustrated Instruction Manual. Flights of 600 ft. can be obtained under favourable conditions and heights of 50 ft. are readily obtainable with a little experience.

17/6

"Frog" Flying Club

Owners of "Frog" model aircraft are eligible for membership of the "Frog" Flying Club. The badges illustrated are obtainable by those members who pass proficiency tests. Price **6**d. each. Send Coupon for particulars.

POST COUPON FOR FREE COLOURED LEAFLET

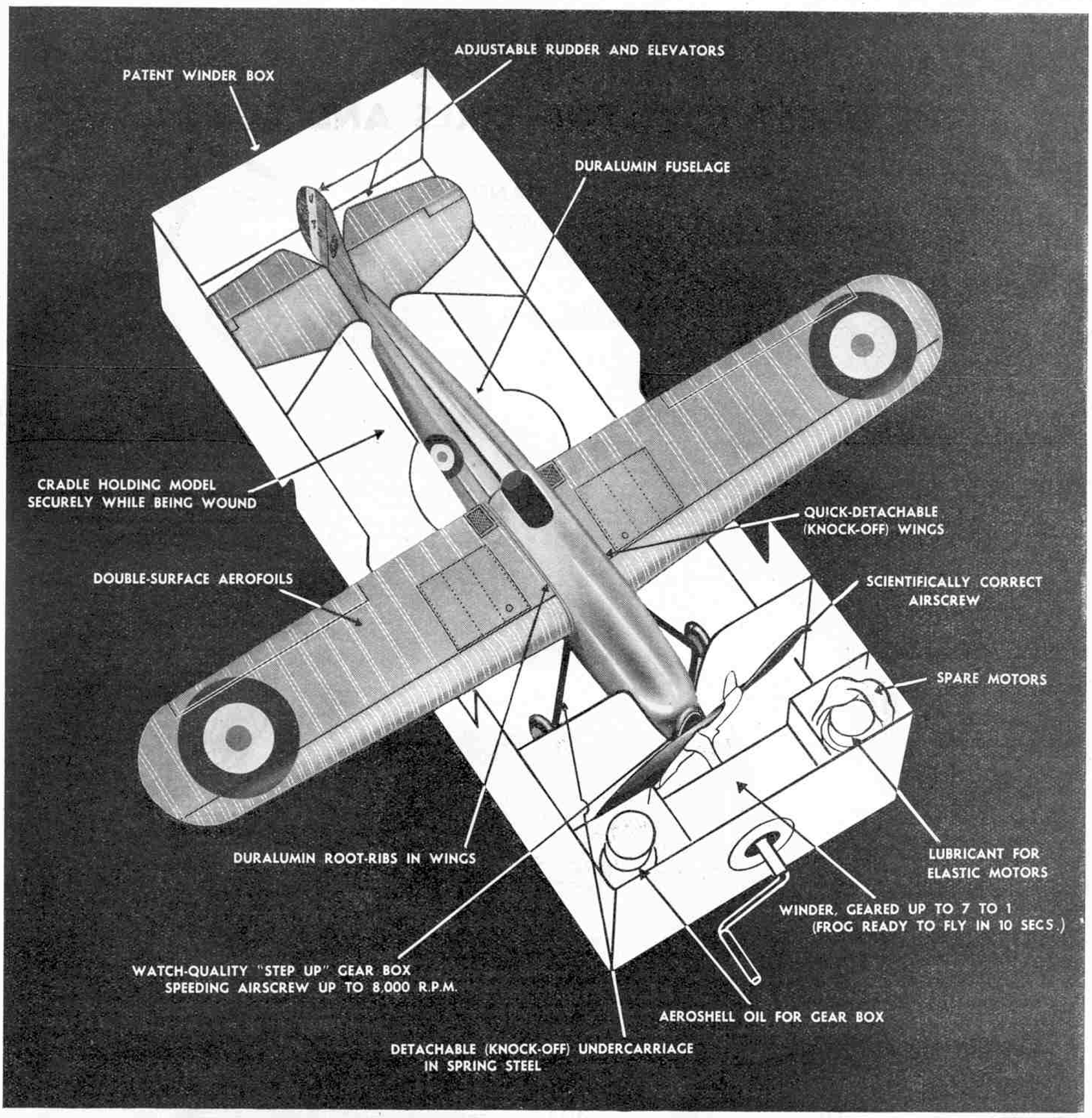
To Lines Bros. Ltd. (Dept. L),
Morden Road, London, S.W.19.

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

NAME .....

ADDRESS.....

.....



"FROG" INTERCEPTOR FIGHTER

Wing Span 11½". Correctly coloured with British Service markings and aluminium finish to Air Ministry specification. Also obtainable with the correct national markings of six other countries. Each model is flight tested before leaving the factory.

NOW ONLY 5/-

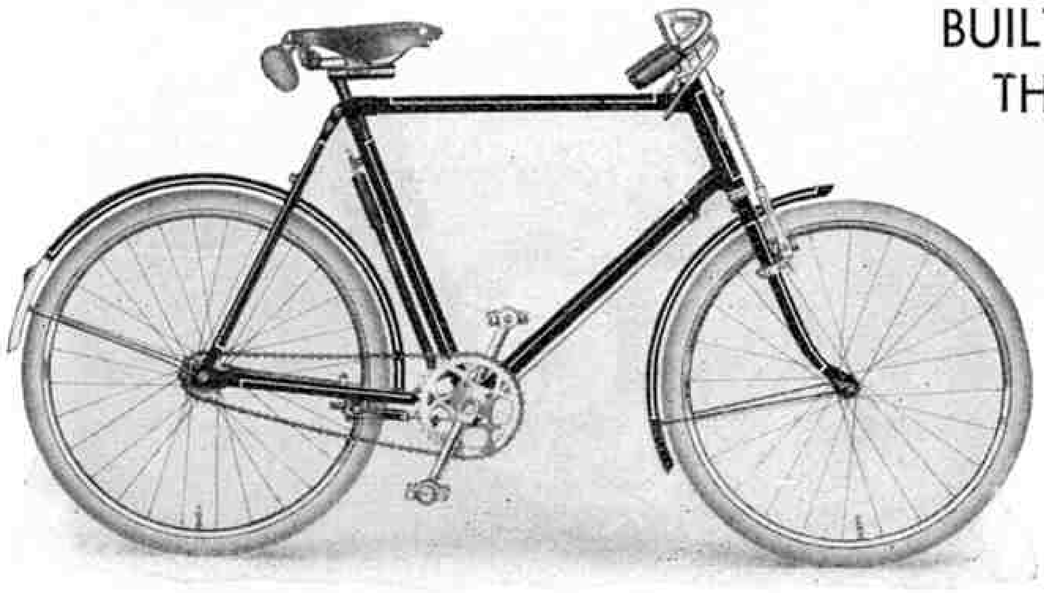
BRITISH MADE BY INTERNATIONAL MODEL AIRCRAFT LTD.

Sole Concessionaires:

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

TRI-ANG

THE FINEST TOYS FOR GIRLS AND BOYS



BUILT TO STAND
THE HARDEST
WEAR

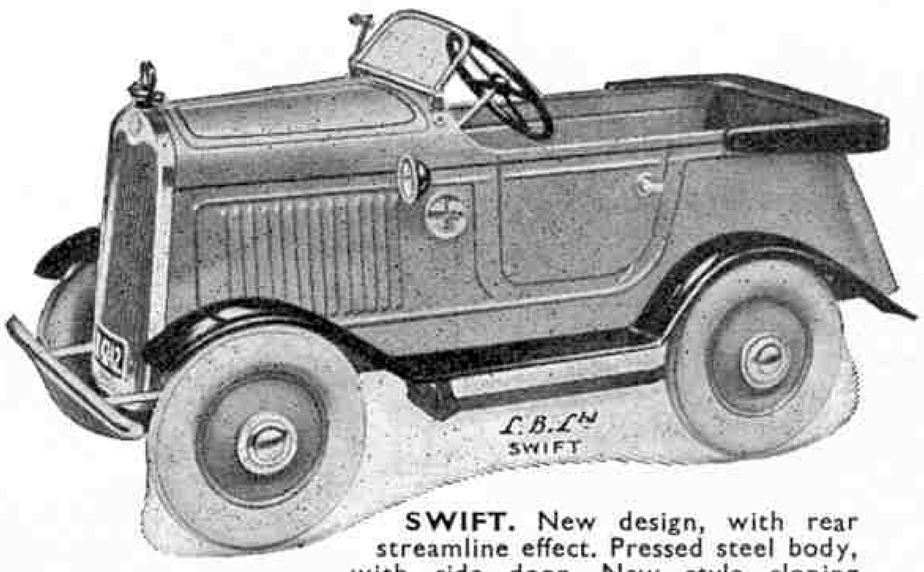
NOTE
Mudguards

UNITY "JS" SPORTS MODEL. Specially designed for boys and girls. 18″ frame, 20″ x 1⅜″ wheels. CHROMIUM-PLATED hubs and rims. Dunlop red sports pattern tyres. Shallow North Road drop handlebars. Roller lever pattern brakes. Three-coil leather saddle. Complete equipment. Finished in enamelled maroon with gold lines.
Girls same price. Price **62/6**

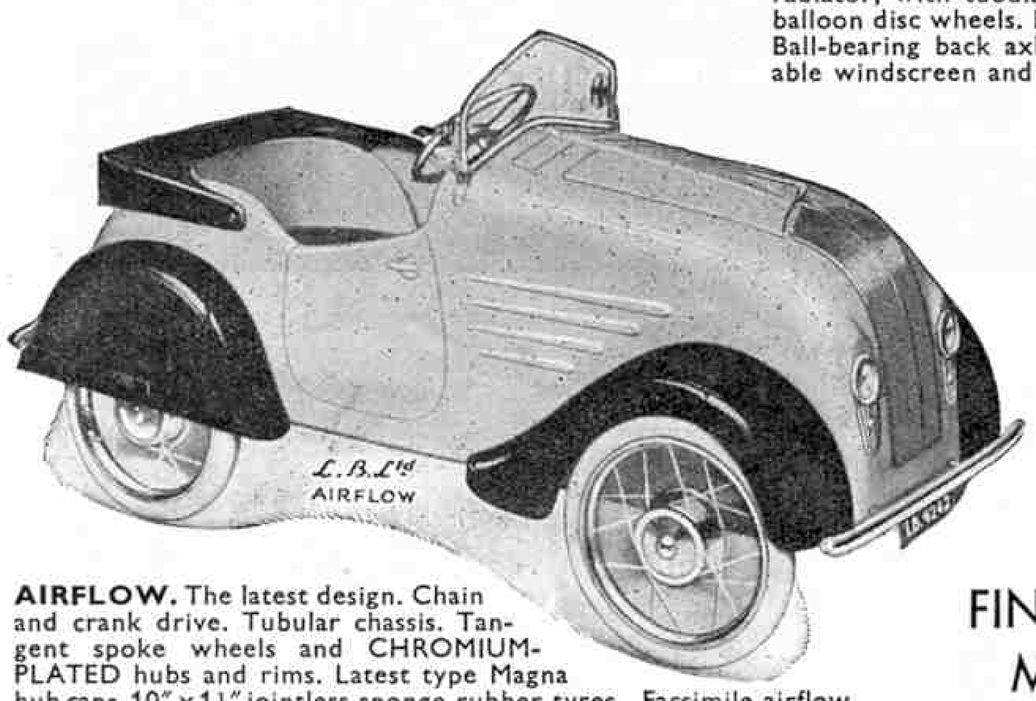
TRI-ANG TRICYCLE No. 5 (Regd. Trade Mark.) Now fitted with rear mudguards. Cycle chain drive with free wheel. Frame best quality weldless cycle tubing. 14″ wheels, 1⅛″ jointless sponge rubber tyres. Rim brake. Coil-spring saddle. CHROMIUM FITTINGS. Black or blue.
Price **59/6**

24/M DOLL'S PRAM. A handsome boat-shape with streamline effect. Well upholstered with piped arms. Leather-cloth head and apron. Celluloid-covered pump joints. Long CHROMIUM-PLATED levers. Tangent spoke wheels. Cushion tyres. CHROMIUM-PLATED hubs and rims. Two pair dress-guards.
Price **55/–**

22W DOLL'S PRAM. New boat-shape body with stylish design. Outside springs. 6″ spoke wheels. ⅝″ white tyres. Nicely upholstered. Laced hood. Apron with storm flap. Long black levers. Two pair dress-guards. Price **29/6**

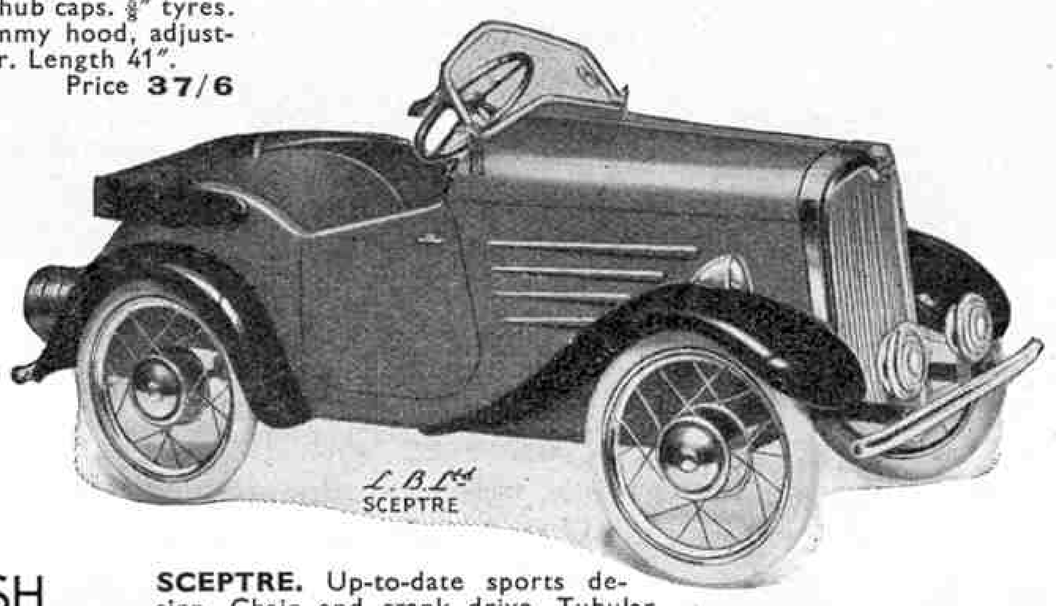


SWIFT. New design, with rear streamline effect. Pressed steel body, with side door. New style sloping radiator, with tubular bumper. Improved mudguards. 9″ balloon disc wheels. Latest type Magna hub caps. ⅝″ tyres. Ball-bearing back axle. Side lamps, dummy hood, adjustable windscreen and direction indicator. Length 41″.
Price **37/6**



AIRFLOW. The latest design. Chain and crank drive. Tubular chassis. Tangent spoke wheels and CHROMIUM-PLATED hubs and rims. Latest type Magna hub caps. 10″ x 1⅛″ jointless sponge rubber tyres. Facsimile airflow radiator with mascot. Two sunken ELECTRIC headlamps. Tubular bumpers back and front. Length 45″. Price **90/–**

YOUR
1936
MODELS



SCEPTRE. Up-to-date sports design. Chain and crank drive. Tubular chassis. Tangent spoke wheels fitted with latest type Magna hub caps. 10″ x 1⅛″ jointless sponge rubber tyres. CHROMIUM-PLATED hubs and rims. Modern type radiator with mascot. Two ELECTRIC side lamps embodied on wings. ELECTRIC STOP & GO and BUZZER HORN. Length 45″. Price **84/–**

FINEST BRITISH
MATERIALS

TRI-ANG TOYS ARE UNSURPASSED FOR REALISTIC DESIGN AND FINISH

CAN BE SEEN AT ALL GOOD TOY SHOPS AND STORES

MADE BY

LINES BROS. LTD., *Tri-ang Works, Morden Road, London, S.W.19*

THIS FINE TORCH IS FUN!

Out of doors or in—an Ever Ready electric torch is just what you want for games and rags after dark. Flick the switch and flash! . . . boy, **some beam!** You'll be glad you bought an Ever Ready —you can't do better for your money!

EVER READY
Regd. Trade Mark

ELECTRIC TORCHES

From a Fountain Pen Light 1/6, to Spotlights from 5/- to 15/-

MADE BY THE EVER READY CO. (GT. BRITAIN) LTD., HERCULES PLACE, LONDON, N.7

YOU CANNOT BUY BETTER ACCESSORIES

Bluemel's "Featherweight" Celluloid Mudguards

You cannot get better accessories than Bluemels no matter how much you pay. Of superb quality, they will outlast many bicycles. Light in weight, and do not rust.

A very popular low-priced guard with adjustable, quick-release fittings as illustrated below. The quality of neither materials nor workmanship has been sacrificed to attain this price. In Black **5**/– per pair.

Supplied in Green, Ivory White or Transparent, 9d. per pair extra.

The 15 inch by $\frac{7}{8}$ inch "Featherweight" Celluloid Inflator costs only **2**/–. Other models from **1/6**.

● Send postcard for complete new list of "Noweight" accessories—mudguards, reflectors, lamps, horns, etc.

Bluemel's

Bluemel Bros. Ltd., Dept. 27, Wolston, Coventry

A joy to drive with!

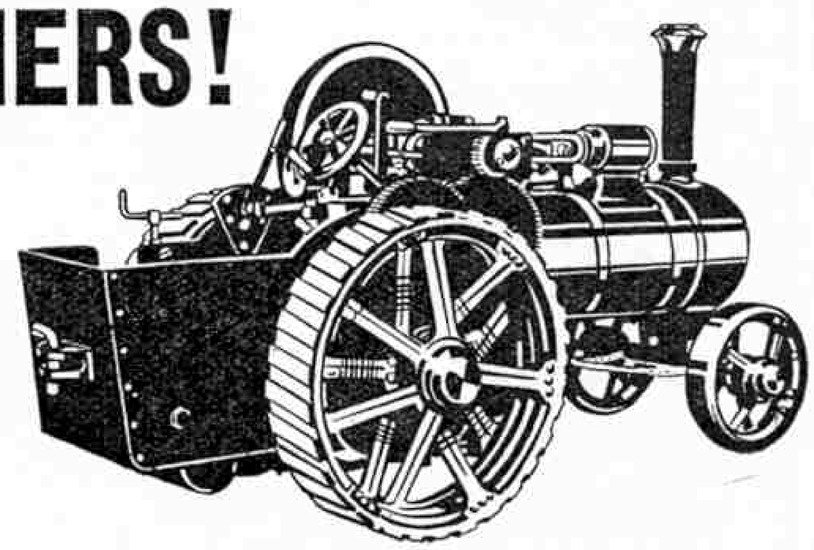
The new Esso petrols give you a new thrill in acceleration, more miles per gallon, and better climbing than ever. They are a revelation in anti-knock. Sold in three grades: Esso Ethyl, Esso High Test and Esso Benzol Mixture.

ESSO QUALITY PETROLS

ANGLO-AMERICAN OIL CO. LTD., WESTMINSTER, LONDON, S.W.1.

Established 1888.

TWO BASSETT-LOWKE WINNERS!



A line sketch of the fine working model Road Tractor described below.

This Burrell type Traction Engine has the most complete set of castings and is the most attractive model of its kind ever produced. Complete castings and drawings cost 12 gns. A new booklet on how to build this magnificent model, price 3d., can now be obtained from all BASSETT-LOWKE branches. Send for it and decide to build this engineering masterpiece now!

Then comes "STREAMLINIA"—the sensation of the Motor Boat world, the smartest design yet in metre models, has done 10 knots, fast, reliable, easy to manipulate, and exquisitely finished. Complete sets of parts, or just hull and machinery supplied. Finished model costs 9 gns.

Section "B" 17. Containing interesting particulars about Scale Model Engines, including the Traction, costs 6d., post free.

Section "S" 17. Gives details of all manner of ships as well as "STREAMLINIA." Price 6d.

BASSETT-LOWKE LTD.
NORTHAMPTON.

London: 112, High Holborn, W.C.1
Manchester: 28, Corporation Street

PRODUCT of MECCANO LIMITED LIVERPOOL

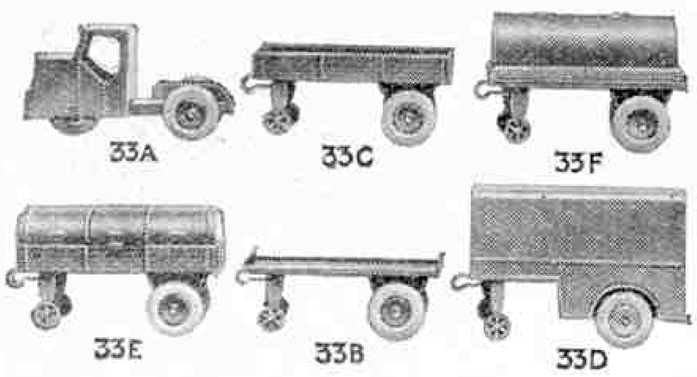
DINKY TOYS

200 VARIETIES

PRODUCT of MECCANO LIMITED LIVERPOOL

A FASCINATING COLLECTING HOBBY

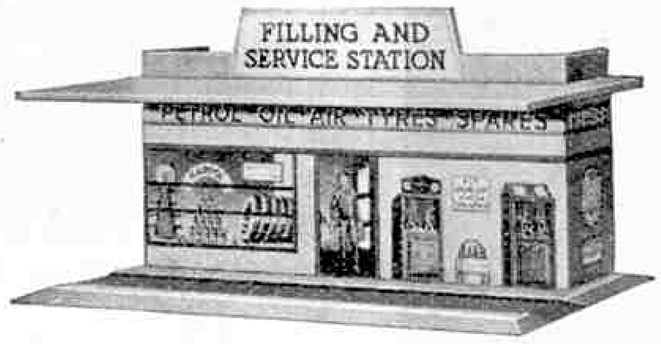
Dinky Toys are the most realistic and the most attractive models in miniature ever produced. These wonderful toys are unique in their perfection of finish, and their range is so wide as to appeal to all tastes. Already they include railway officials and passengers, farmyard animals, trains, motor vehicles of every well-known type, aeroplanes, warships and famous liners; and many other models of equal interest are in preparation. Start now to collect these delightful little models.



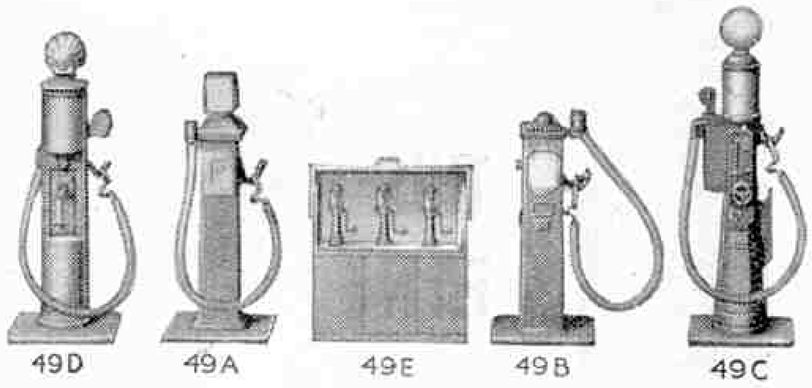
MECHANICAL HORSE AND FIVE ASSORTED TRAILERS
Dinky Toys No. 33
Fitted with rubber tyres

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

Price of complete set 3/6



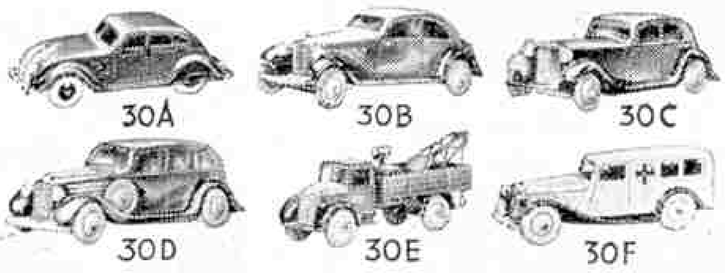
PETROL STATION
Dinky Toys No. 48
Accurate reproduction of a filling station. Tastefully finished in appropriate colours. Price 1/6 each



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

No. 49a	Bowser Pump	... each 4d.
No. 49b	Wayne Pump	... ,, 4d.
No. 49c	Theo Pump	... ,, 4d.
No. 49d	Shell Pump	... ,, 4d.
No. 49e	Oil Bin (Pratts)	... ,, 3d.

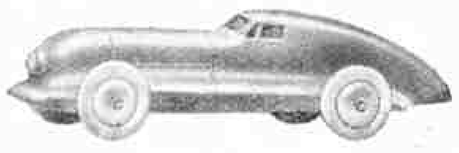
Price of complete set 1/6



MOTOR VEHICLES
Dinky Toys No. 30
Fitted with rubber tyres and silver-plated radiators

No. 30a	Chrysler "Airflow" Saloon	... each 9d.
No. 30b	Rolls-Royce Car	... ,, 9d.
No. 30c	Daimler Car...	... ,, 9d.
No. 30d	Vauxhall Car	... ,, 9d.
No. 30e	Breakdown Car	... ,, 9d.
No. 30f	Ambulance (grey and red)	... ,, 9d.

Price of complete set 4/6



HOTCHKISS RACING CAR
Dinky Toys No. 23b
Assorted colours. Fitted with rubber Tyres. Price 6d. each

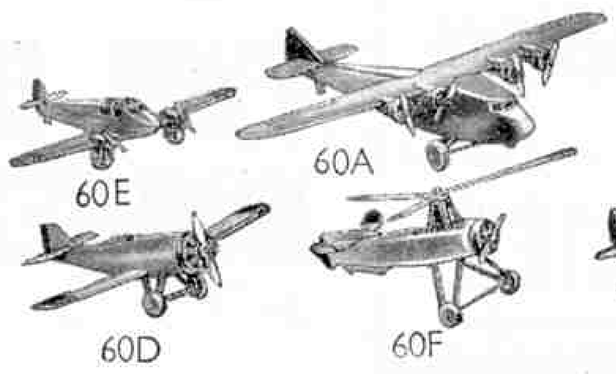
STREAMLINE TOURER
Dinky Toys No. 22g
Assorted Colours. Fitted with rubber tyres.
Price 6d. each

STREAMLINE SALOON
Dinky Toys No. 22h
Assorted Colours. Fitted with rubber tyres.
Price 6d. each

ROBOT TRAFFIC SIGNALS
(Four-way)
Dinky Toys No. 47a
Price 3d.

(Three-way)
Dinky Toys No. 47b
Price 3d.

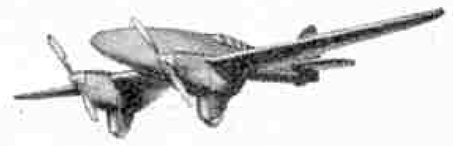
(Two-way)
Dinky Toys No. 47c
Price 3d.



AEROPLANES
Dinky Toys No. 60

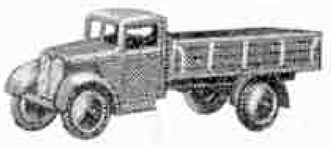
No. 60a	Imperial Airways Liner	... each 9d.
No. 60b	D.H. "Leopard Moth"	... ,, 6d.
No. 60c	Percival "Gull"	... ,, 6d.
No. 60d	Low Wing Monoplane	... ,, 6d.
No. 60e	General "Monospar"	... ,, 6d.
No. 60f	Cierva "Autogiro"	... ,, 6d.

Price of complete set 3/–

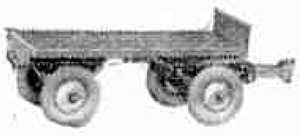


D.H. "COMET" AEROPLANE
Dinky Toys No. 60g
Scale model of plane used by C. W. A. Scott and T. C. Black in their Australian flight. Finished in assorted colours. Price 6d. each

BEACON
Dinky Toy
No. 47d
Realistic model of the Belisha Safety Beacon.
Price 1d. each

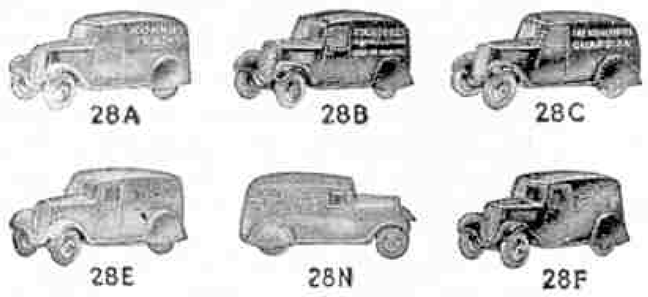


MOTOR TRUCK
Dinky Toys No. 22c
Assorted Colours. Fitted with rubber tyres.
Price 6d. each



TRAILER
Dinky Toys No. 25g
For use with Dinky Toys Commercial Motor Vehicles No. 25. Fitted with rubber tyres.
Price 7d. each

PILLAR LETTER BOX AIR MAIL
Dinky Toys
No. 12b
Price 3d. each



DELIVERY VANS
Dinky Toys No. 28/1

No. 28a	Hornby Trains Van ...	... each 6d.
No. 28b	Pickford's Removal Van	... ,, 6d.
No. 28c	Manchester Guardian Van	... ,, 6d.
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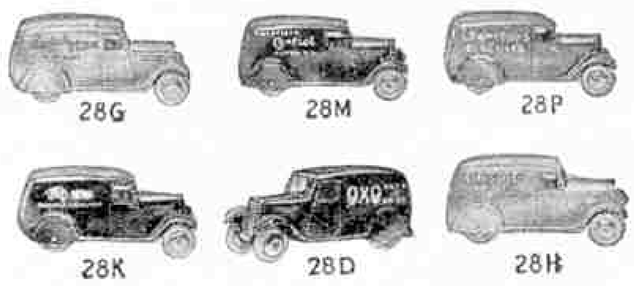
No. 28f	Palethorpe's Sausage Van	... ,, 6d.
No. 28n	Atco Lawn Mowers Van	... ,, 6d.

Price of complete set 3/–



DELIVERY VANS
Dinky Toys No. 28/2

No. 28d	Oxo Van	... each 6d.
No. 28g	Kodak Cameras' Van ...	... ,, 6d.
No. 28h	Dunlop Tyres Van ...	... ,, 6d.
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Price of complete set 3/–

PILLAR LETTER BOX G.P.O.
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No. 12a
Price 3d. each

Manufactured by

MECCANO LIMITED BINNS ROAD LIVERPOOL 13

BUILD BIGGER AND BETTER MODELS

MECCANO ACCESSORY OUTFITS

KEEP ADDING TO YOUR OUTFIT

Accessory Outfit Ba

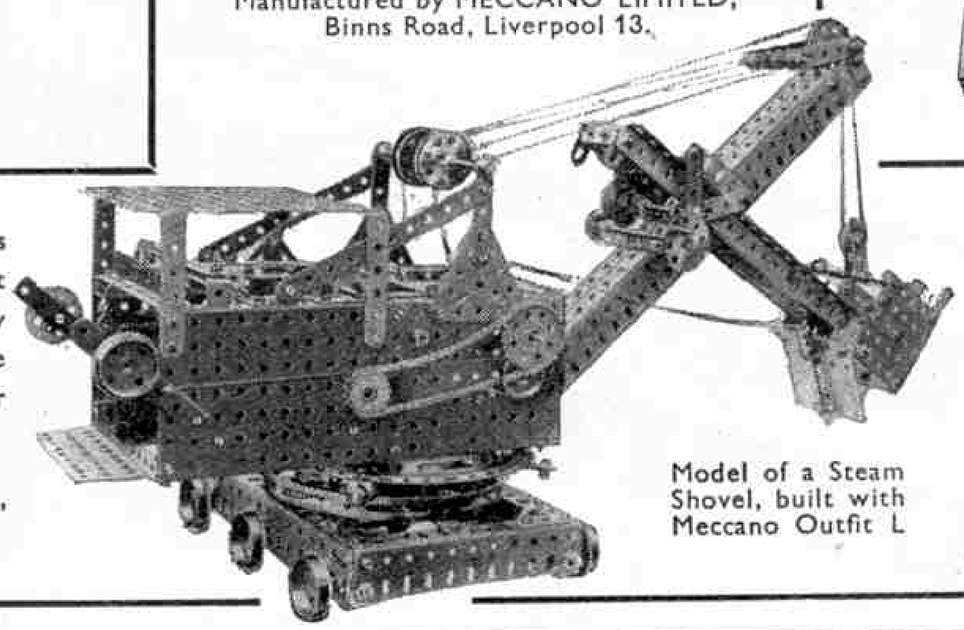
The purpose of Meccano Accessory Outfits is to connect the main Outfits from A to L. They are best described as the stepping stones to bigger and better models. A B Outfit may be converted into a C by adding to it a Ba Accessory Outfit, and a Ca would then convert it into a D. Thus, no matter how small the Outfit you commence with, you may build it up by degrees until you possess all the parts contained in the largest Outfit.

Manufactured by MECCANO LIMITED, Binns Road, Liverpool 13.

Accessory Outfit Ga

Think of the hundreds of additional models you could build if you converted your present Meccano Outfit into the one next higher by means of a Meccano Accessory Outfit. The enjoyment you already obtain from your hobby would increase tremendously.

Get the Accessory Outfit you want to-day, and have more fun!



Model of a Steam Shovel, built with Meccano Outfit L

PRICE LIST
MECCANO ACCESSORY OUTFITS

Aa	converts	A	Outfit into	B	...	Price	2/6
Ba	,,	B	,, ,,	C	...	,,	3/–
Ca	,,	C	,, ,,	D	...	,,	5/6
Da	,,	D	,, ,,	E	...	,,	5/6
Ea	,,	E	,, ,,	F	...	,,	11/–
Fa	,,	F	,, ,,	G	...	,,	26/6
Ga	,,	G	,, ,,	H	...	,,	17/6
Ha	,,	H	,, ,,	K	...	,,	60/–
*Ka	,,	K	,, ,,	L	...	,,	225/–

*Enamelled Cabinet.

1/6 ASTOUNDING VALUE! 1/6

SCALE FLYING MODEL KITS.

12″ to 15″ Wing Span—1/6 each, Post Free.

Guaranteed to Fly when completed. Everything necessary is included—Drawing, Printed-out Balsa, Cement, Paint, Tissue, Wheels, Elastic, etc.

PUSS MOTH	SOPWITH CAMEL	CURTIS GOSHAWK
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Also:

FAIRCHILD "22" 16″ Span **4/-** Post Free

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Kits for SCALE AEROPLANES, GALLEONS and HISTORIC SHIPS —over 70 Types. 10d., 2/9 and 10/6 per set, Post Free.

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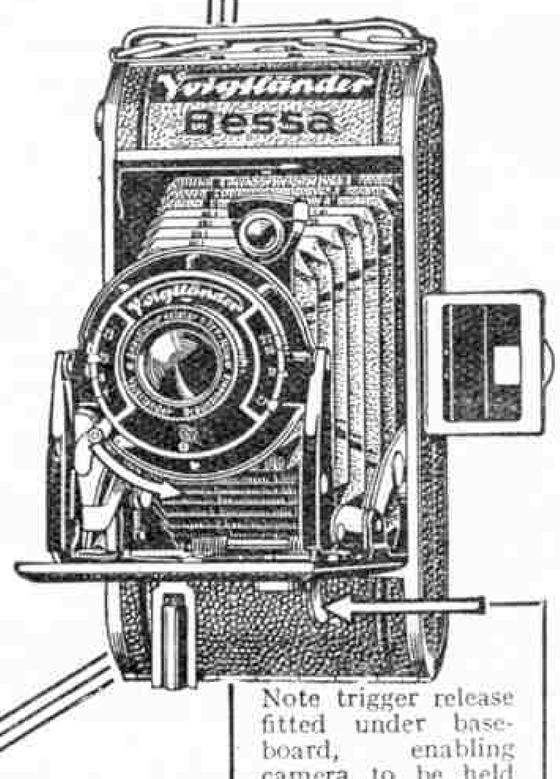
Catalogue—2d. Post Free.

Agents wanted for the U.K.

THIS camera takes TWO sizes of pictures at the best position— EYE LEVEL



Note trigger release fitted under base-board, enabling camera to be held rock-steady in both hands at eye-level.

Voigtlander BESSA

With F/7.7 Voigtlander Voigtar Anastigmat lens in speeded shutter **52/6**.

Other models from **£3/12/6** to **£9/8/–**.

Write for the Bessa brochure to

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Easy to open and close, the Voigtlander Bessa is held in BOTH hands and takes snaps as you *see* them—at eye level. With a standard 8 ex. 2¼ x 3¼ film you can take 16 half-size pictures if you prefer. The Bessa is the most original and competent camera ever sold at the price! See it at your dealers now.

BINDING THE "M.M."

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

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

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

"I'm building a Seaplane next!"

AEROPLANE CONSTRUCTOR OUTFITS

PRODUCT of MECCANO LIMITED LIVERPOOL

Boys, these Aeroplane Outfits are great! With the parts contained in them you can build wonderful models of aeroplanes—the most realistic you ever saw.

The illustrated Manual of Instructions included in each Outfit shows how to build high and low wing Monoplanes, Biplanes, Seaplanes and many other interesting models. Buy one of these fine Aeroplane Outfits to-day!

Price List

Standard Series

No. OO AEROPLANE OUTFIT

This splendid new Outfit contains a good selection of Aeroplane parts with which realistic Aeroplane models can be built. It is an ideal present for young boys who are keen on Aeroplanes. Price 3/6

No. O AEROPLANE OUTFIT

An interesting range of models can be built with this Outfit, including high and low wing monoplanes, seaplanes and standard light biplanes. All the parts are interchangeable. Price 5/–

No. O1P AEROPLANE HANGAR OUTFIT

This novel and attractive Outfit consists of the complete range of No. O Aeroplane Outfit parts packed in a No. O1 Aeroplane Hangar instead of in a carton. Price 9/6

No. 1 AEROPLANE OUTFIT

Magnificent models of high and low wing monoplanes, and interesting model biplanes representing standard types can be built with this fine Outfit. Price 9/–

Meccano Aeroplane Constructor Accessory Outfit No. 1a, costing 8/6, will convert a No. 1 Outfit into a No. 2.

No. 2 AEROPLANE OUTFIT

This Outfit enables a much wider range of models to be built, including triple-engined monoplanes and biplanes, and a racing seaplane of the type that was used in the Schneider Trophy Contests. Price 16/6

Note. The parts in the No. OO, No. O and No. O1P Aeroplane Outfits are smaller than those in the other Outfits in the series and are not intended for use with these Outfits.

Special Series

No. 1 SPECIAL AEROPLANE OUTFIT

The parts in this Super Aeroplane Outfit include mainplanes fitted with ailerons, tail planes with elevators, movable rudder, radial engine cowling, etc., and will build over 20 realistic models of different types of aircraft. Price 15/–

A No. 1a Special Aeroplane Accessory Outfit, Price 11/6, will convert a No. 1 Special Outfit into a No. 2 Special.

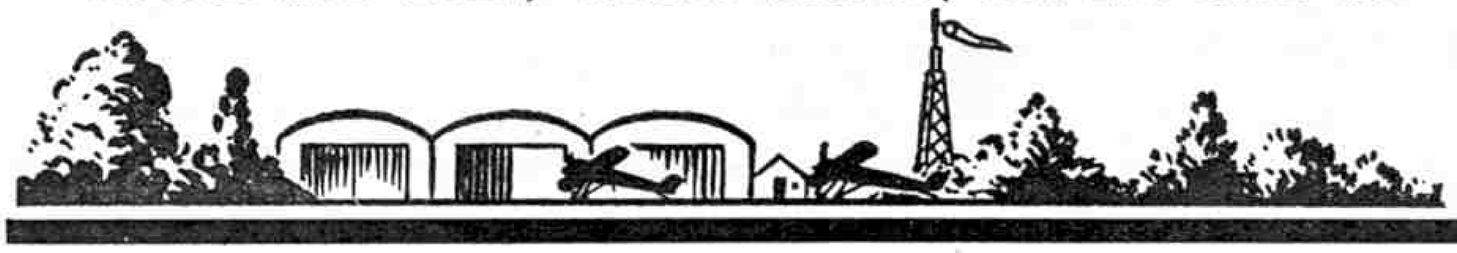
No. 2 SPECIAL AEROPLANE OUTFIT

This is the finest and most attractive Aeroplane Constructor Outfit on the market. It contains a big range of aircraft parts, with which numerous models of practically any type of machine may be built—44 examples are shown in the Manual of Instructions. All the parts that are special features of the No. 1 Special Outfit are included, also a number of other parts of special design. Price 25/–

Each Aeroplane Outfit is available in three different colour combinations

Manufactured by

MECCANO LTD., BINNS ROAD, LIVERPOOL 13



No. O Aeroplane Constructor Outfit

No. 1 Special Aeroplane Outfit

No. 2 Special Aeroplane Outfit

MOTOR CAR CONSTRUCTOR OUTFITS

MECCAUTO 538180

No. 1 Motor Car Constructor Outfit

No. 2 Motor Car Constructor Outfit

One of the most fascinating of all boys' hobbies, either indoor or outdoor, is model car operation with cars built with these Motor Car Constructor Outfits. Perfect miniature reproductions of many different types of car can be built, including sports four-seaters, speed cars, sports coupés and others.

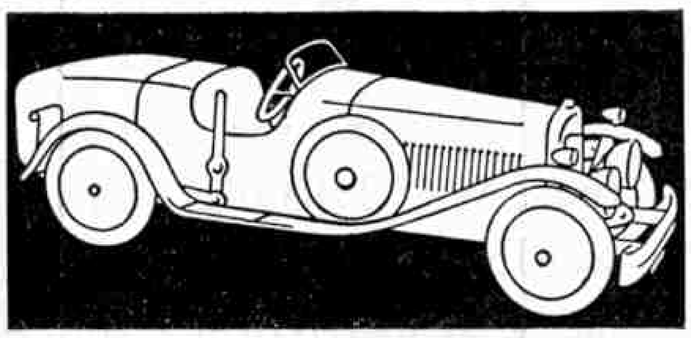
Now is the time to get a Motor Car Outfit. You will never grow tired of building and running the superb models that you will be able to construct.

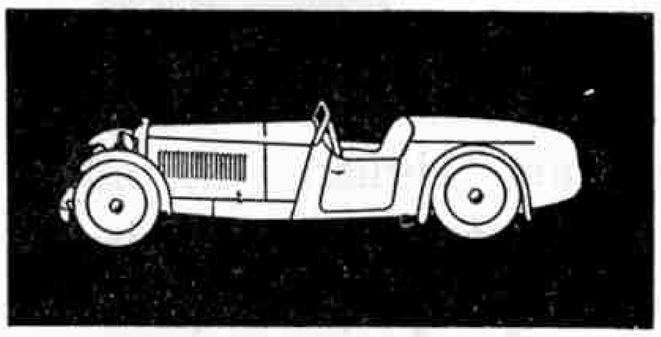
No. 1 Motor Car Constructor Outfit

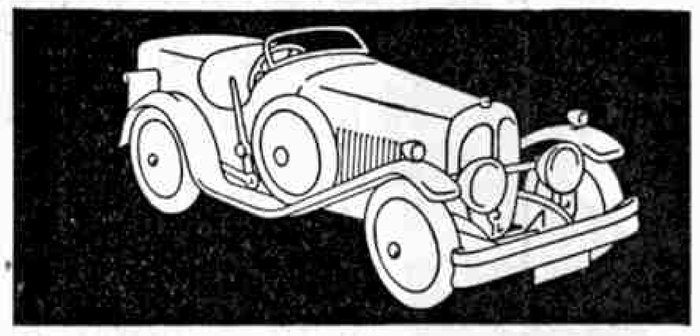
The motor car models that can be built with this Outfit are the finest you ever saw. Look at the examples illustrated at the left-hand side of this page and think of the fun you could have building these and other types equally graceful and realistic.

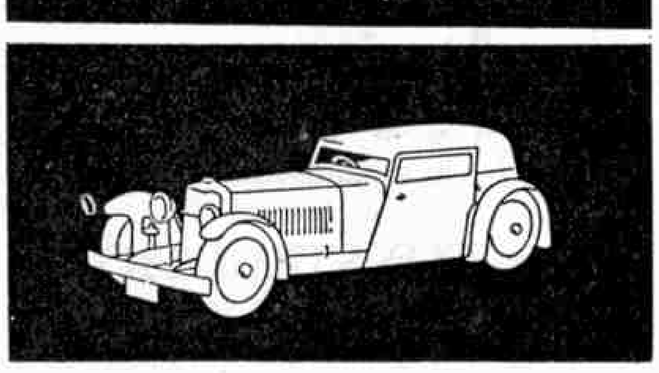
No. 1 Outfit is available in four different colour combinations and is supplied complete with powerful Clockwork Motor.

Price **13/6**





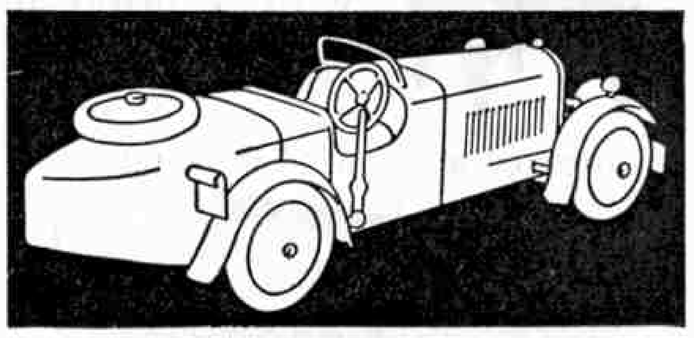




No. 2 Motor Car Constructor Outfit

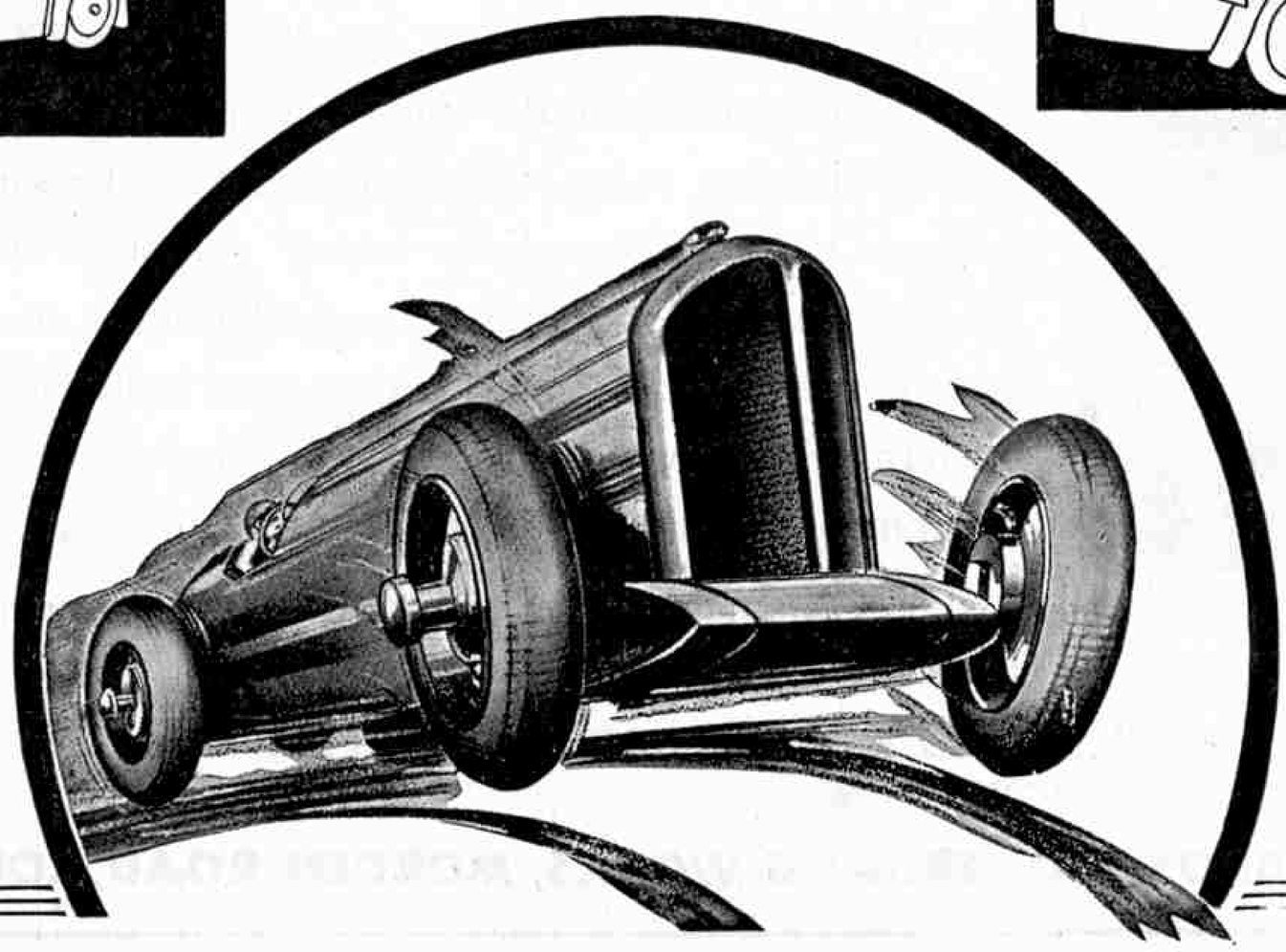
Larger models of a superior type can be built with No. 2 Outfit. Their handsome and realistic appearance may be judged from the illustrations at the right-hand side of this page.

No. 2 Outfit is available in four different colour combinations, and a powerful Clockwork Motor that gives a run of 150 feet on one winding is included. Price **25/-**



Manufactured by

Meccano Ltd., Binns Rd., Liverpool 13



Motor Car Lighting Set

With this Lighting Set the Headlamps of Motor Car models built with the No. 2 Motor Car Outfit can be electrically lighted.

Price **2/6**

Motor Car Garage

This Motor Car Garage provides accommodation for any model motor car of suitable size. It is strongly built, with imitation roughcast finish. Inside dimensions: Height 5 in. Length 13 in. Width $7\frac{3}{4}$ in. Price **5/6**

THE TRI-ANG PEOPLE GIVE SOME HELP ON THE BIRTHDAY PROBLEM

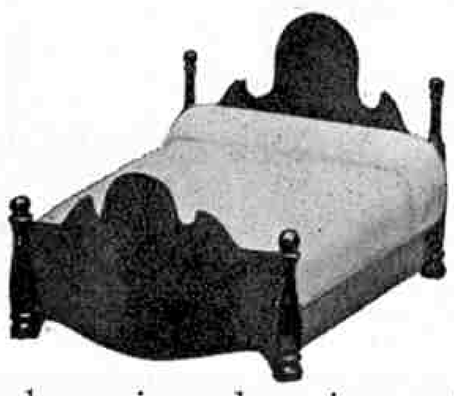
SCALE MODEL PERIOD DOLLS' FURNITURE FOR SISTERS AND COUSINS

TRADE MARK

WHEN YOUR SISTER'S BIRTHDAY COMES GIVE HER A PIECE OF THIS WONDERFUL **SCALE-MODEL PERIOD DOLLS' FURNITURE.** SHE WILL LOVE COLLECTING IT PIECE BY PIECE, AND THE PROBLEM OF PRESENTS FOR HER WILL BE SOLVED.

THE "QUEEN ANNE" BEDROOM SET

Both William and Mary were greatly interested in furniture and furnishing, and the period we call "Queen Anne" really started in their reign. Furniture took on a new elegance, and, instead of the solid oak of the Jacobean period, walnut was the wood most used. All the pieces in this bedroom set have the whorl-grain walnut markings.

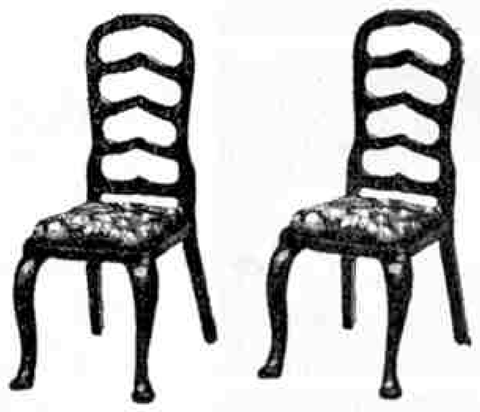


The BED has graceful shaped ends, after the manner of solid splats, and a peach-coloured velvet cover.

The bow-fronted CHEST OF DRAWERS stands on four short cabriole legs. It has two beautifully fitting long drawers and two small ones. On it stands a charming dressing mirror, which is made with a bevel-edged glass appearance.

It was during the "Queen Anne" period that the WARDROBE first came in as a piece of furniture. Hitherto the only wardrobes had been small closets opening off the bedrooms. This piece has a shaped cornice and double doors. It is fitted properly hinged inside with a hanging bar and three coat hangers.

The set is completed by two plain CHAIRS and a WINGED ARM CHAIR, covered with a floral material of early Petit-point pattern.



BEDSTEAD, QA17, **3/6**. CHEST OF DRAWERS, QA19, **6/6**. DRESSING MIRROR No. 1, QA18, **1/9**. WARDROBE, QA16, **4/–**. EASY CHAIR, QA8, **1/9**. CHAIR No. 2, QA4, **1/–**.

A complete set including all the above, also an Occasional Table, QA13, **9d.**, and Footstool, QA15, **1/–**, in a handsome box **22/6**.

We must tell you about the wonderful new CONSTRUCTION SET. How your sister will enjoy making her own **Period** Furniture, it will give her hours of pleasure and at the same time she will acquire a knowledge of the superb craftsmanship of the period. The set consists of Furniture parts delicately cut out and shaped, it is complete with stain, lacquer, and upholstery of Petit-point pattern. Step by step instruction sheet and all the necessary equipment for making Scale Model Furniture. Price **12/6**.

Obtainable from all good Toy Shops and Stores.

PERIOD SCALE MODEL DOLLS' FURNITURE

TRADE MARK

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

NEXT MONTH: "CASTING THE WORLD'S LARGEST GLASS DISC." READY: 31st AUGUST

MECCANO MAGAZINE

Editorial Office:
Binns Road, Liverpool 13
England

Volume XX. No. 8
August, 1935

With the Editor

A Great Scientific Mechanic

In reading about the scientific celebrities of the 17th and 18th centuries, the thing that strikes me most is the extraordinary amount and variety of work they got through. Take for instance Robert Hooke, who was born at Freshwater in the Isle of Wight 300 years ago last month. In due course he went to Westminster School, where he fairly astonished his masters and everybody else by learning the six books of Euclid in little more than a week, and by acquiring Greek and Latin with almost unbelievable rapidity. Later he was appointed Curator of Experiments, and subsequently Secretary, to the Royal Society, and Professor of Geometry in Gresham College. Almost up to the day of his death in 1703 he continued to work incessantly at physics, astronomy, architecture and mechanical inventions of all kinds. He described "thirty different ways of flying" which, if not altogether convincing, show real anticipation of the flying machine. He invented or applied various ingenious mechanisms for watches; improved the thermometer, the barometer, the air pump and the microscope; and anticipated to some extent Newton's theory of gravitation. He was probably the first to realise the true nature of fossils, and that they could be used as a clue to the relative ages of different geological formations—in other words to reveal the history of the Earth. Not content with all this, he put forward elaborate plans for the rebuilding of London after the Great Fire in 1666. His plans were not accepted, but they gained him the appointment of City Surveyor, in which capacity he superintended the design and reconstruction of many important buildings.

"A Grey Eie"

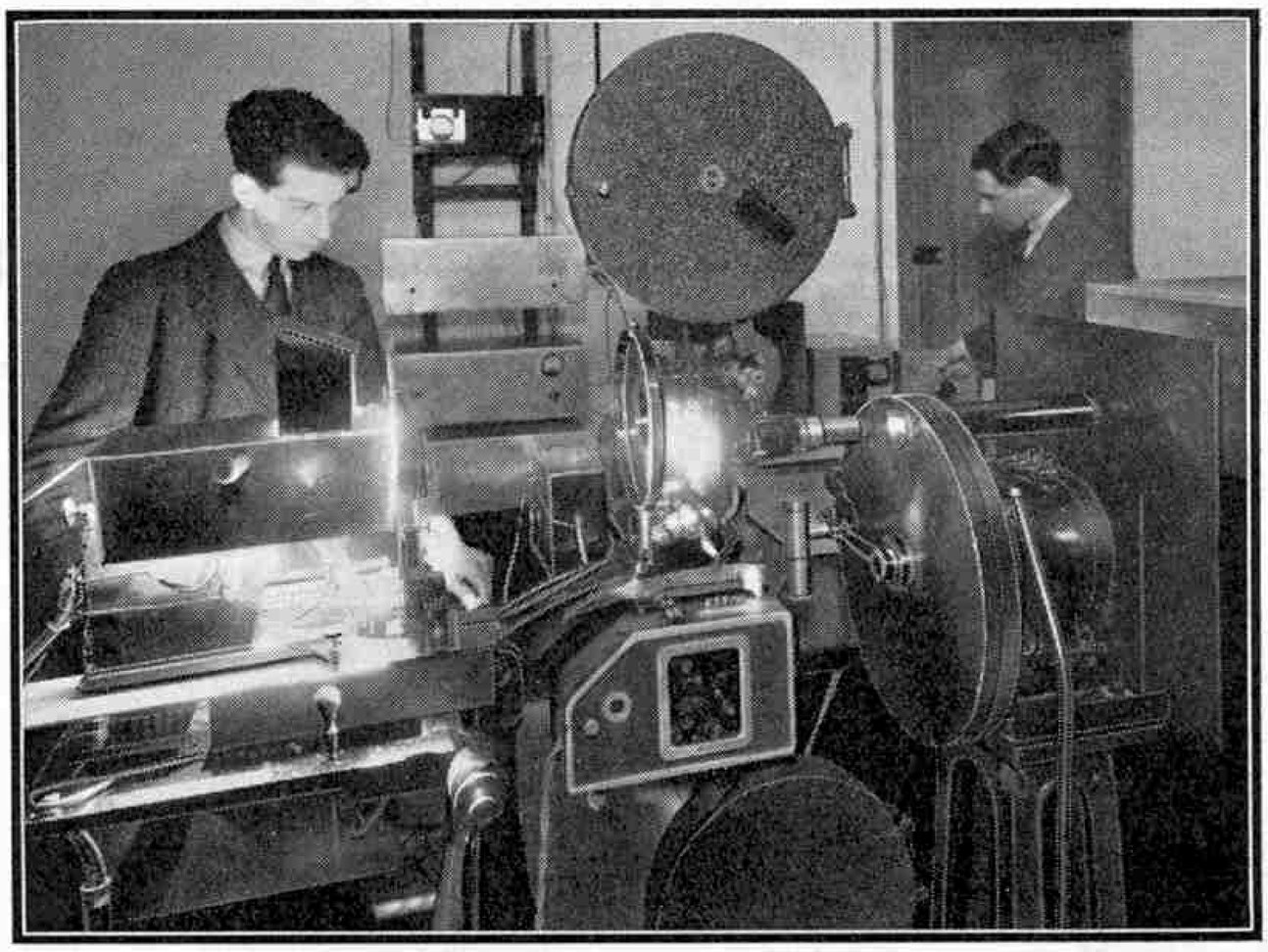
Hooke has been generally described as a disagreeable and cantankerous old bachelor, but probably he was only rather irritable and a little too fond of argument. No portrait of him exists, and the descriptions of his contemporaries are more quaint than useful. For instance, John Aubrey, a well-known antiquary of his day, describes him as "of middling stature, somewhat crooked, pale faced; and his face but little belowe, but his head is large; his eie is full and popping, and not quick; a grey eie. He has a delicate head of haire, browne and of an excellent moist curle." Pepys, the famous diarist, who met Hooke in February 1664 at Gresham College, was clearly impressed by him, for he writes . . "Mr. Hooke, who is the most, and promises the least, of any man in the world I ever saw." Pepys subsequently met Hooke on various occasions and was greatly struck by the range of his knowledge, hearing him lecture on subjects ranging from comets to felt-making.

Hooke seems to have been a bit of an old miser, for although he received several thousands of pounds for his work as City Surveyor, he lived on an almost poverty-stricken scale, and after his death his accumulated money was found in his safe.

A queer old stick, but the greatest scientific mechanic of his age.

Colour on the Films

The appearance of the film "Becky Sharp," the first full-length example of the new Technicolor process, has caused quite a lot of excitement in the cinema world. As a screen version of Thackeray's novel *"Vanity Fair,"* the film is not very striking; but as a demonstration of what the Technicolor process can do it is a triumphant success. From beginning to end it is a feast of colour, sometimes soft and delicate, at other times almost startling in its blazing brilliance. It is not wise to prophesy, but it seems to me that this film marks the beginning of an upheaval in the film industry as great as that which followed the appearance of the first talking picture, *"The Singing Fool."* Colour cinematography is now proved to be technically practicable, and film producers will have to set to work to solve the economic problem and supply the public demand, just as they did with talking pictures.



The Baird Telecine Disc Scanner for the transmission of talking films. Our photograph is reproduced by courtesy of Baird Television Ltd.

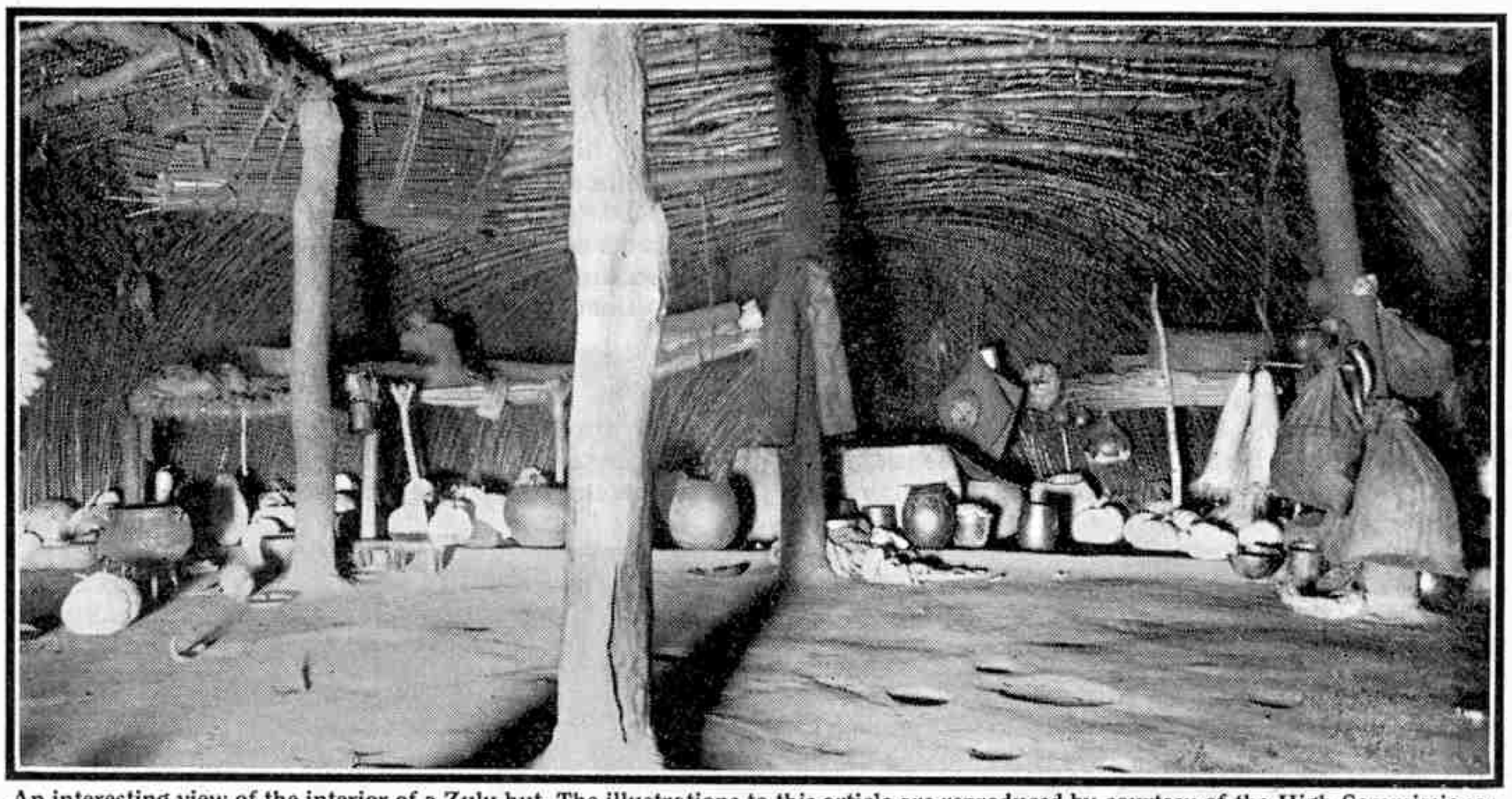
The Technicolor process made its appearance about nine years ago. At first it was a two-colour process, which suffered from the defect that certain colours at the extremes of the spectrum were weak in proportion to the remainder. The new process, it is claimed, utilises the three primary colours red, green and yellow in such a manner as to give equal strength to all colours. This process was first used by Walt Disney in his "Silly Symphonies."

There seems to be a widespread impression that the success of the colour film will set back the development of television. I sincerely hope that this will not prove to be the case, for television appears to have quite enough troubles already, and the promised broadcasts still seem far off. It looks as though the experts concerned shouted a little too soon, at any rate in this country. The outlook seems to be more promising in Germany. Free public demonstrations of broadcast television have been held regularly in Berlin for some time with the object of familiarising the public with television and showing them what to expect from the regular broadcasts. These demonstrations have proved very popular, showing that the public are genuinely interested. Commercial television receivers are expected to be available in Germany after the big radio exhibition that is to be held this month.

The Natives of Zululand

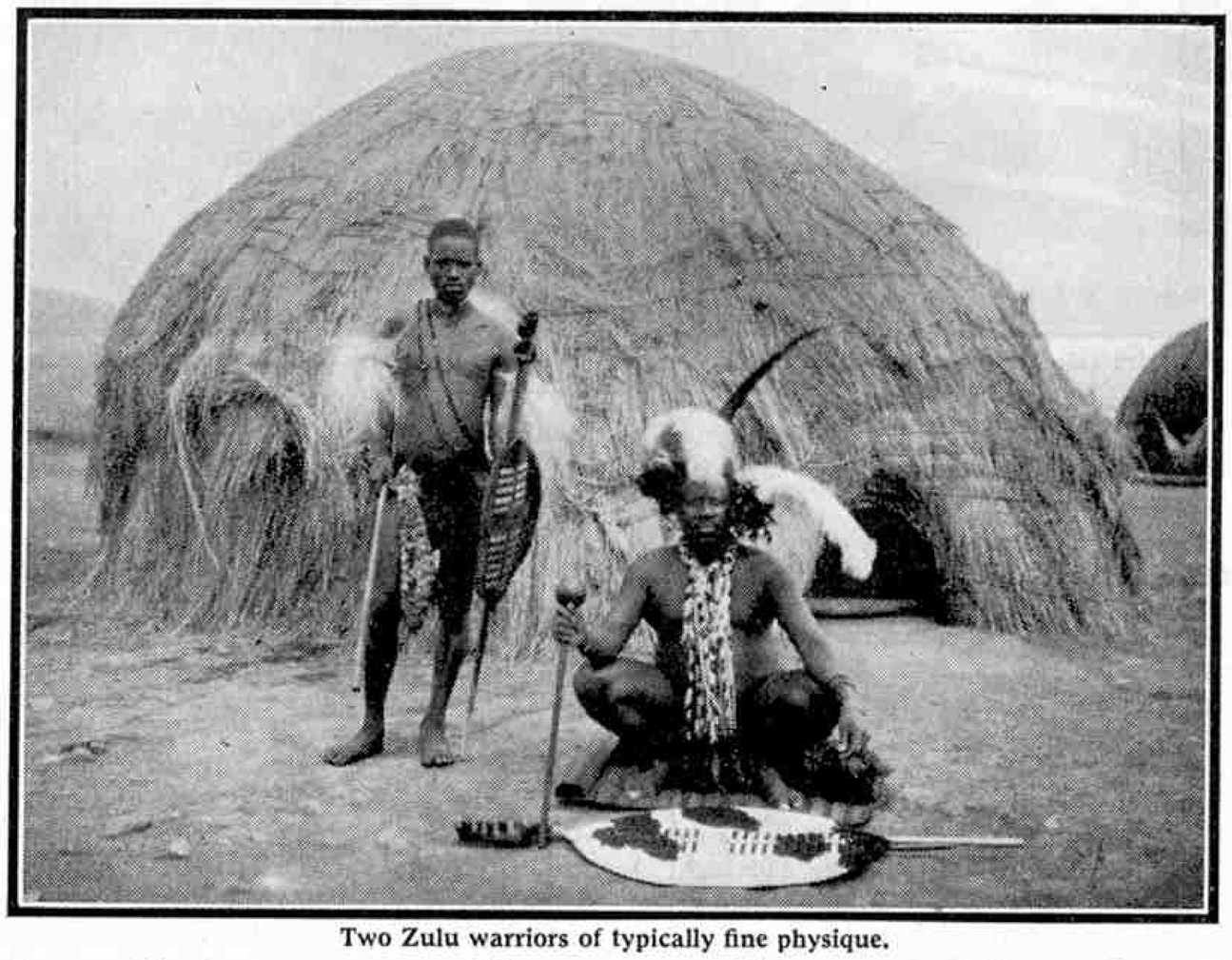
Warlike Tribes at Peace under British Rule

FEW countries equal Africa in the great number of peoples that make up the population. These fall into two great groups, the northern or Sudan tribes, and the Bantu tribes who originally lived in the northern and equatorial parts of the country but now inhabit southern Africa. The most powerful and warlike of the Bantu tribes are the Zulus, and our cover illustration this month is a fine study of a warrior of this tribe. The illustration is based on a photograph kindly loaned to us by the Editor of the *"South African Railways and Harbours Magazine."*



An interesting view of the interior of a Zulu hut. The illustrations to this article are reproduced by courtesy of the High Commissioner for the Union of South Africa.

The South African territory to which the Zulus have given their name forms the north-east part of the province of Natal, but at what period the people first settled there is uncertain. In 1756 a ship named *"Doddington"* was wrecked on the coast of Natal, and the survivors, who were Europeans, fell into the hands of the Zulus, but were treated kindly. The Europeans described the natives as "very proud and haughty, careful in the preparation of their food, very cleanly in their person . . ."



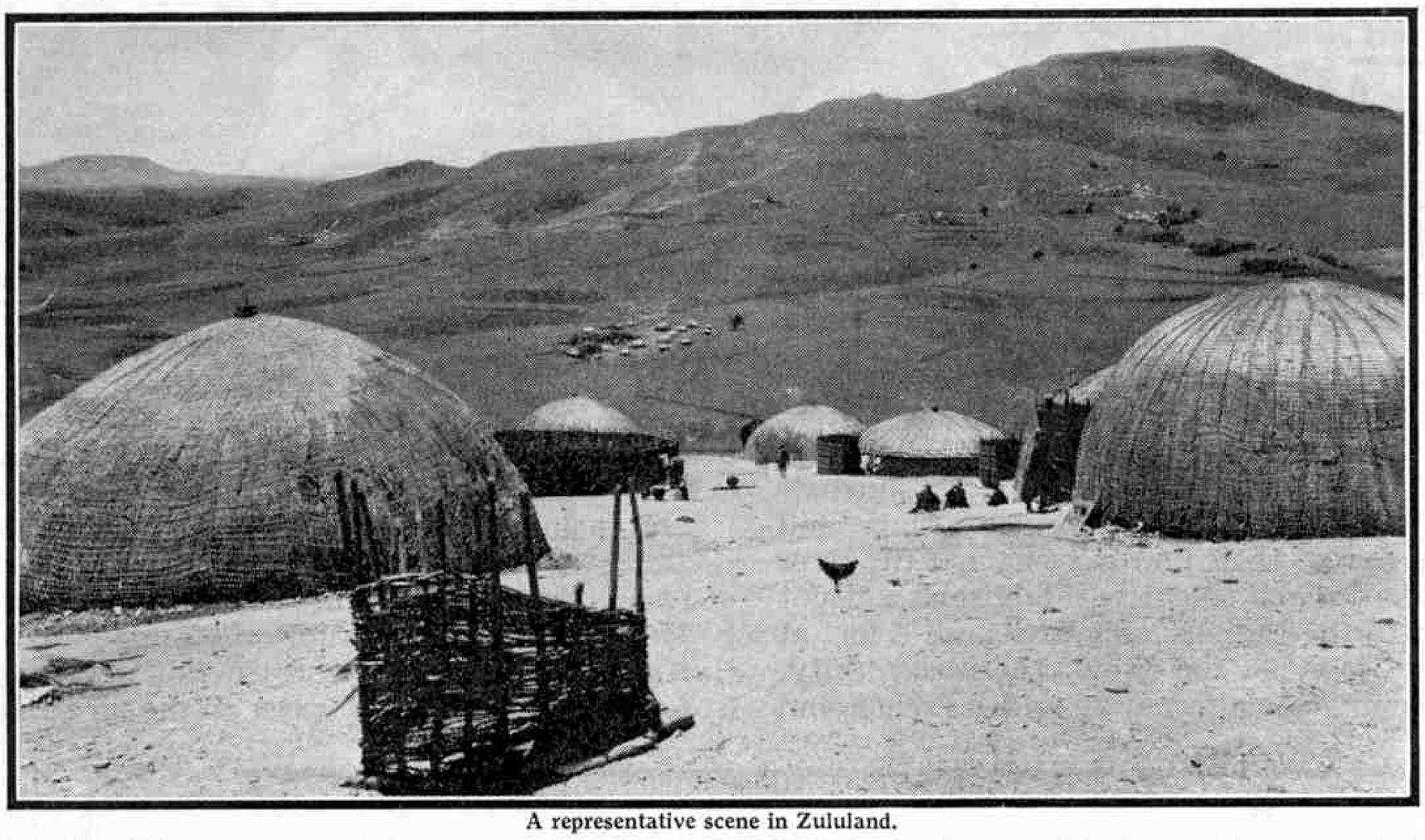
Two Zulu warriors of typically fine physique.

At the close of the 18th century the Zulus totalled only a few thousand and inhabited the valley of the White Umfolosi River, under a chieftain named Senzangakona. He in turn was subject to the paramount chief Dingiswayo, ruler of the neighbouring Tetwa tribe who inhabited the country to the north-east of the Tugela River. Dingiswayo was an intelligent man, and opened up a trade with the Portuguese in East Africa, bartering oxen and ivory for beads and brass. He was also very warlike, and trained his warriors so effectively that they conquered many of their neighbours, including the Zulus. The Zulu chief's son, Tshaka, was an alert young man and a good fighter, and after the defeat he was appointed an officer in Dingiswayo's army. When Senzangakona died Tshaka succeeded him as chieftain of the Zulus. This was a momentous event for the Zulus, as Tshaka had great military ambitions, and these were further strengthened when Dingiswayo was killed in battle, and his tribe sought the protection of Tshaka.

The Zulu chief introduced a new method of attack, in which his warriors were massed in crescent formation and were armed with short stabbing assegais that compelled them to attack at close quarters. In battle nothing could withstand the solid advance of the Zulu army, and they were soon master of almost all south-east Africa, including what are now the provinces of Natal and Basutoland, the Transvaal Republic and much of the Orange Free State.

In 1825 Tshaka made the acquaintance of Europeans, when a small party led by a Naval officer, Lieut. Farewell, sought his permission to establish a settlement where Port Natal now stands. He received them kindly, and granted them some land in that locality.

There was a great deal of tribal warfare among the Zulus in those days, much of it arising out of the rival claims to the chieftainship. On 23rd September, 1828, Tshaka was killed by Mhlangana, a jealous half-brother, who in turn was killed a few days later by Dingaan, another half-brother. Dingaan was cruel and bloodthirsty and the period of his rule was one of almost continual aggression. In 1838 a party of emigrant Dutch Boers entered Natal, and endeavoured to establish friendly relations with him with a view to settling down in the district. Dingaan was intensely suspicious of the newcomers, and when 70 of the leading Boers innocently accepted an invitation to his kraal he massacred the lot. All the members of their families, left behind in Natal, were then attacked, and either killed or taken to fortified camps. This dreadful outrage was avenged by other Boers in December 1838, when they defeated the Zulus in a battle fought on the banks of a river which, in commemoration of the event, was named Blood River. Dingaan fled to the neighbouring province of Swaziland, where he was shortly afterwards murdered by the natives.



A representative scene in Zululand.

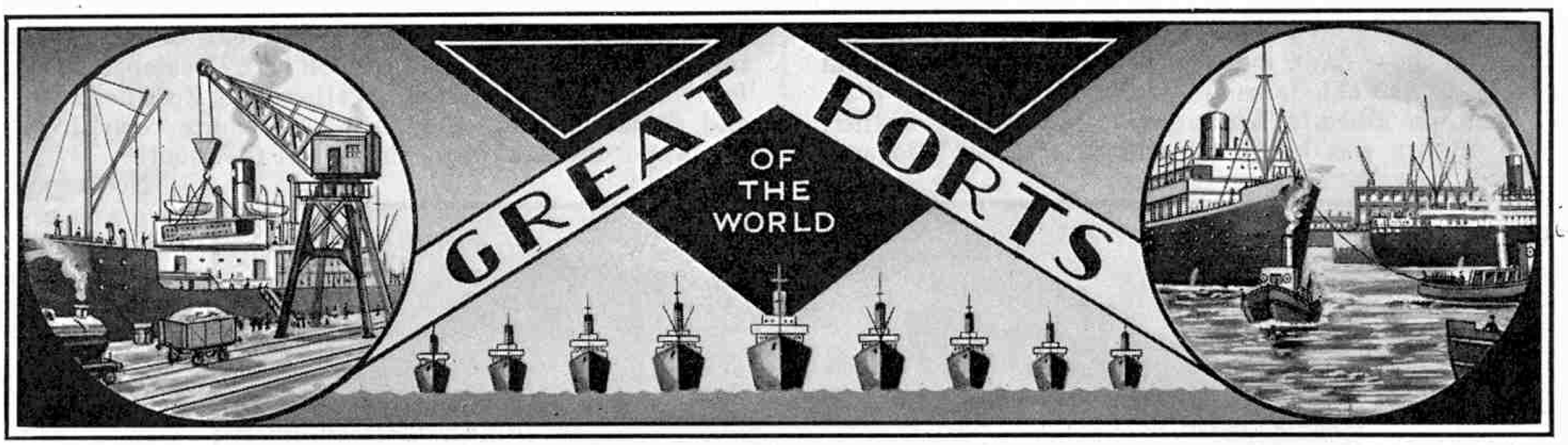
During the next 40 years there were many boundary disputes between the Zulus and Transvaal Boers who encroached upon Zululand, and when Great Britain annexed the Transvaal in 1877 these disputes became the concern of this country. The Government of Natal succeeded in persuading the Boers to submit the disputes to arbitration, and a committee consisting of three British officers was appointed. In June 1878 the committee gave their decision in favour of the Zulus, but Sir Bartle Frere, the High Commissioner, took the opposite view, possibly because he hoped to remodel Zululand in accordance with a plan he had evolved for confederating all the colonies and states of South Africa into a single British Dominion. The plan necessitated the appointment of a British resident officer in Zululand, and on 11th December, 1878, Frere explained this fact to a gathering of Zulu deputies, and demanded that they bring a definite reply from Cetewayo, their ruler, by the end of the month.

No reply was received, and in January 1879 a British force totalling 5,000 Europeans and 8,200 natives invaded Zululand, and later was reinforced by 10,000 soldiers from England. Cetewayo rallied a Zulu army of 40,000 strong, and many conflicts took place, with heavy losses on both sides, before the complete defeat of the Zulus. Cetewayo was captured and was conveyed to Capetown.

The administration of Zululand was divided among 11 Zulu chiefs, a white adventurer and a Basuto chief who had served the British force well during the war. This re-organisation broke up the Zulu military system, but it did not quell the warlike instincts of the people. Blood feuds between rival chiefs developed, and led to so much tribal warfare that eventually the British Government restored Cetewayo to power on condition that he did not indulge in military enterprises. The fighting continued, however, and it became evident that peace between the Zulus could only be maintained by the direct exercise of authority. In 1887, three years after the death of Cetewayo, England annexed Zululand and placed it under a Commissioner responsible to the Government of Natal. Under this form of government the Zulus in time became reconciled to British rule, and to-day they are a peaceful nation.

A sick Zulu receiving treatment from a Witch Doctor,

The Zulus are of splendid physique, as might be expected of a race with so militant a past; and although no longer conquerors they still possess a certain pride of bearing. The men have intelligent faces, and the women, though rather coarse featured have (*Continued on page 500*)



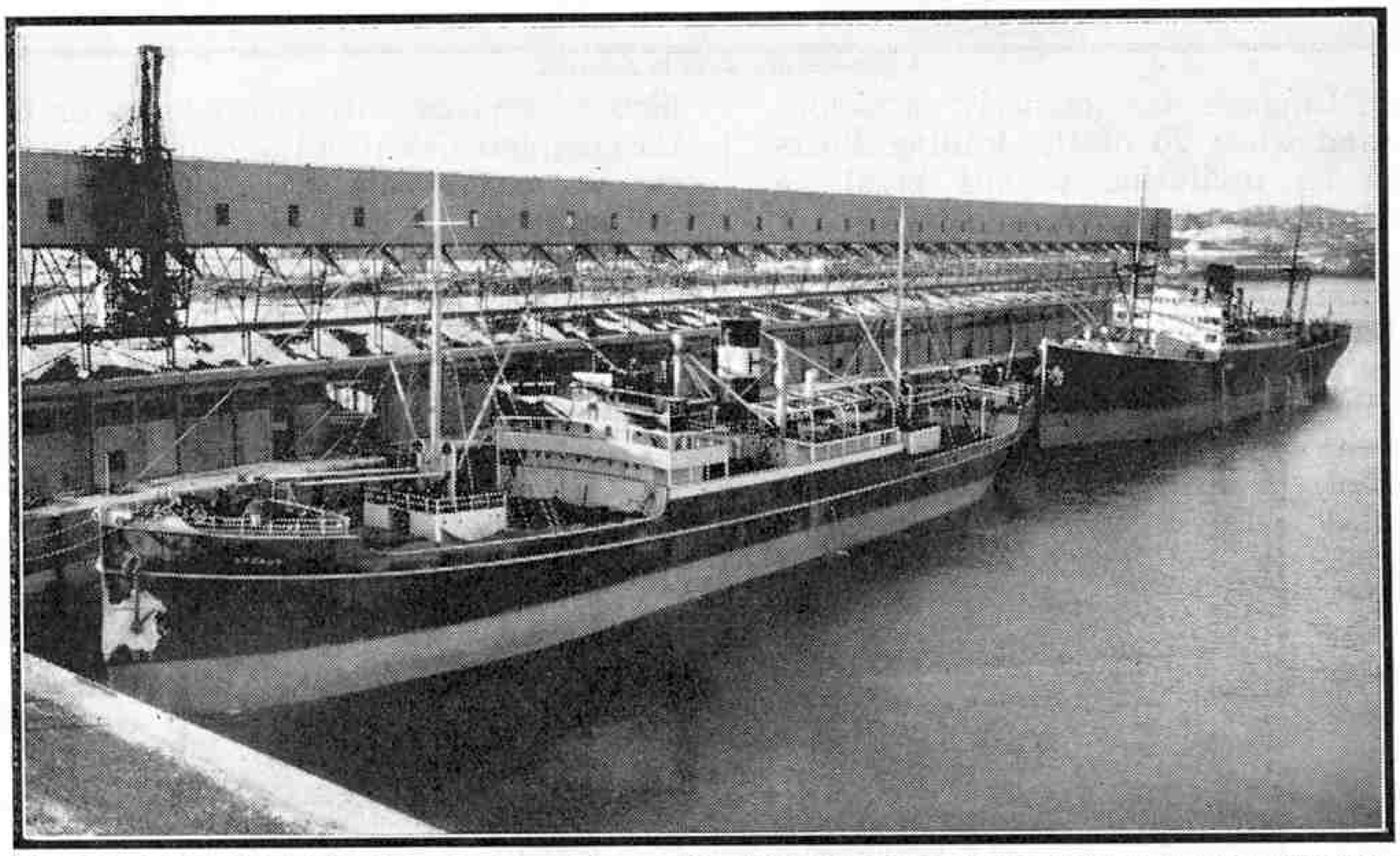
No. XV.—SAINT JOHN

THE harbour of Saint John is one of the oldest in Canada, and its history dates back to 1604. In that year a party of French adventurers led by Samuel de Champlain discovered and entered the river estuary, and in honour of the day of their find they named the river "Saint John." The French colonists established a depot for fur trading with the Indians, and later built a fort at the mouth of the river, on the site of the present city. Until 1758 the colony was alternately under French and British rule, but in that year British supremacy was finally established. The first considerable settlement at Saint John took place on 18th May, 1783, when 8,000 United Empire Loyalists landed there.

The wooden ship building industry was gradually developed, and between the years 1871 and 1875 Saint John ranked as the fourth largest shipowning port in the world, over 900 ships, totalling 400,000 tons, being registered there. After 1875 the industry gradually declined, owing to the introduction of iron ships.

Toward the close of last century the city authorities developed the port facilities by constructing wharves along both sides of the river. The eastern side was developed first, and consequently the wharves there are much older and not so well adapted to present-day conditions. The greater part of the trade of the port, however, is dealt with at the western side. The Dominion Government gave a helping hand by erecting a breakwater and by dredging the entrance channel and alongside the wharves.

The port prospered, and by 1911 additional accommodation for shipping had become necessary. The Government undertook to build and equip deep-water wharves, and to dredge the entrance channel to a depth of 32 ft. below low water. Two schemes for the development of the port were initiated. One scheme was at West Saint John, from berth 15 westward towards the harbour entrance, and included the construction of berths Nos. 16 and 17; these were completed about 1917. The other scheme was at Courtenay Bay to the east of the city, intended to be a terminus for what is now the Canadian National Railways. It included the construction of a drydock 1,150 ft. long and with 42 ft. of water on the sill at high water, and a rubble mound breakwater 7,070 ft. long. An entrance channel 7,310 ft. long and 500 ft. wide, leading to the drydock, was dredged.

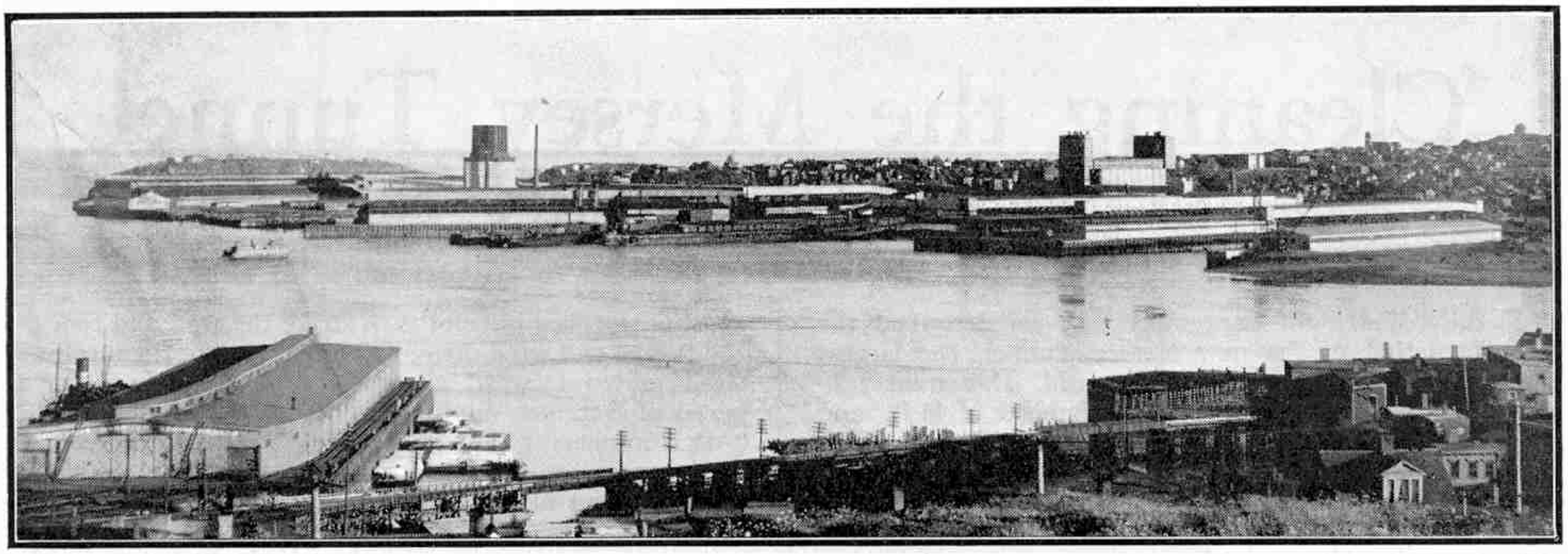


Navy Island Quay, Saint John. In the background is a portion of the extensive conveyor galleries that connect the grain elevator and the ships' berths, and at the left is one of the travelling grain ship-loaders. The illustrations to this article are reproduced by courtesy of the Harbour Commissioners of Saint John.

The commerce of the port continued to increase so rapidly that in 1927 the Government purchased the city's rights in the port, and placed the control under a Commission known as the "Saint John Harbour Commissioners," in turn controlled by the Department of Marine.

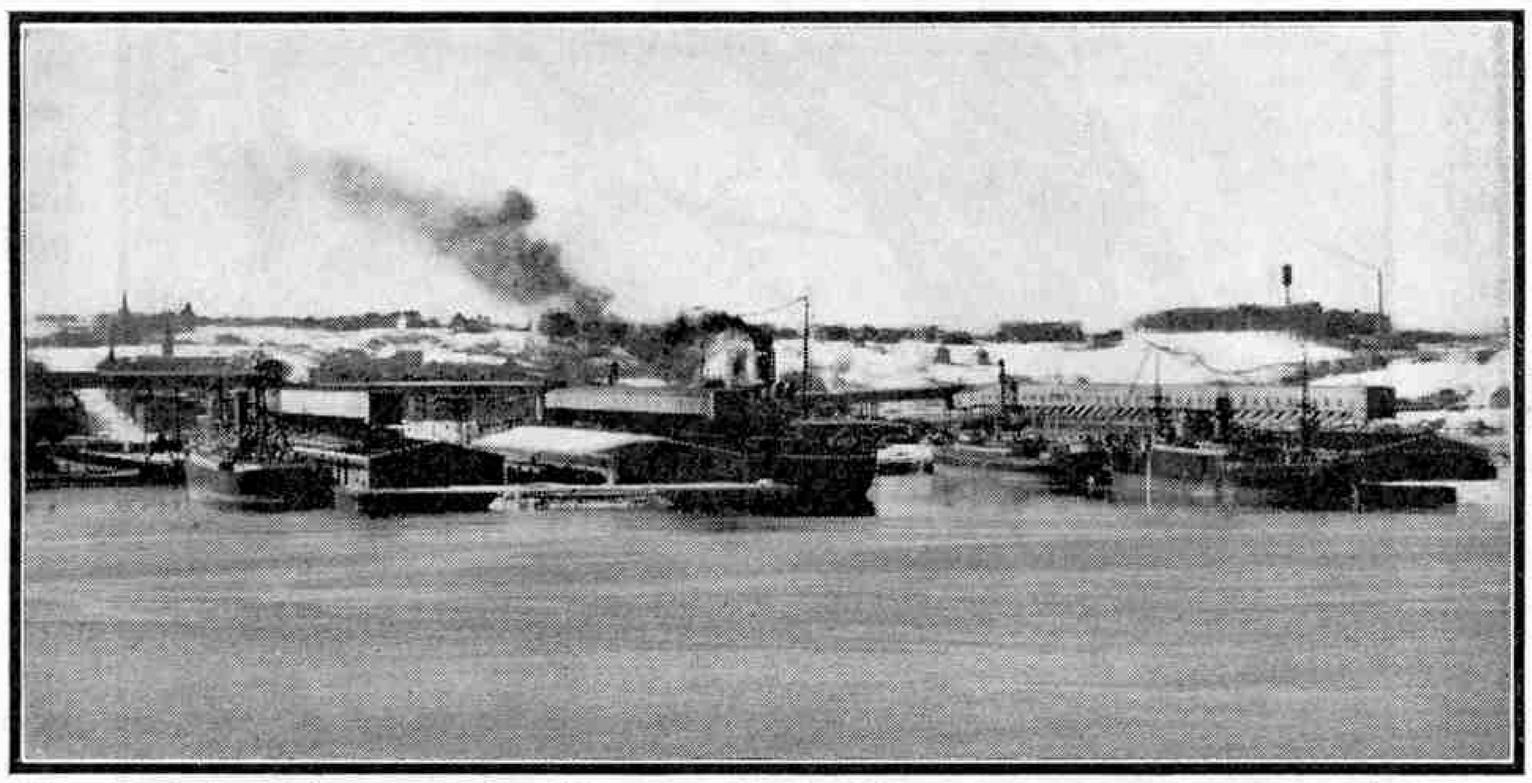
The Commissioners at once made a thorough study of the port requirements. It was decided not to develop further Courtenay Bay as it is isolated from the rest of the port, and the West Saint John area known as the Navy Island section was chosen as the site for extensions to the port. Plans were prepared for the construction of a quay and two piers each 1,250 ft. long, single storey transit sheds, a grain elevator of 3,000,000 bushels capacity, and overhead conveyor galleries from it to the ships' berths.

Work on the scheme was begun in 1928, the first tasks being the construction of 700 ft. of pier, 857 ft. 6 in. of the quay, and the erection of a grain elevator of 1,500,000 bushels and the necessary overhead galleries. The harbour bed consists of a thick layer of silt, with a thin bed of sand and gravel overlying the rock. As much as possible of the



soft material was removed from the site of the pier by dredging, and afterwards the rock was excavated inside a cofferdam.

The task of excavating the pier site was well in hand when a serious disaster occurred in the adjoining section of the port. On 22nd June, 1931, fire broke out on No. 7 wharf, which was then the innermost wharf at West Saint John. The timber structure burned swiftly, and the fire rapidly spread outward to the other wharves. In a few hours all the port facilities at West Saint John, with the exception of a concrete grain elevator, were destroyed. The wharves burned down to a few feet below high water level, and their destruction represented the loss of 11 deep-water steamship berths.



The upper photograph is a general view of the port, and on the right can be seen the modern extensions in the Navy Island area. The lower photograph gives a closer view of these developments.

The Commissioners realised that unless the wharves were available by the beginning of December of that year the winter steamship business that had been gradually built up during the previous 40 years would be lost. The situation was put before the Dominion Government, and they provided $5,000,000 so that reconstruction work could be put in hand immediately. About 5,000 ft. of burned wharves was rebuilt, from an average of about 6 ft. below high-water level, with creosoted timber; thick floors of reinforced concrete were laid on them, and new warehouses and 6,500 ft. of grain conveyor galleries was erected.

In the meantime work on the Navy Island scheme progressed steadily. A steam shovel and three draglines were employed to excavate the material within the cofferdam. A total of 925,000 cu. yd. of silt, sand and gravel was removed, and was utilised to fill up an area known as the Mill Pond, where afterward a railway yard serving the new docks extension was laid down. The rock excavated amounted to 500,000 cu. yd., and this was deposited to fill in the centre of the new pier and the shore behind the new quay wall. The pier and quay wall were built entirely of concrete. The placing of the concrete was begun in August 1931 and continued during the winter, in spite of the fact that the minimum temperature at Saint John during extreme winter conditions is 21 deg. below zero; and particular attention was given to protecting the concrete from the effects of this intense cold. The work was completed by October 1932.

Two single-storey transit sheds, each 600 ft. long and 95 ft. wide, were built on the new pier, a similar shed 740 ft. long and 95 ft. wide was built upon the quay wall, and the new grain elevator was erected. This elevator is of reinforced concrete and contains 60 storage bins with a total capacity of 1,577,000 bushels; and provision has been made for increasing the accommodation up to 3,000,000 bushels at some future date. Overhead conveyor galleries extending the full length of the transit sheds connect the elevator to the ships' berths at the new pier and at the adjacent reconstructed wharves. Each berth is equipped with a travelling grain ship-loader capable of delivering 20,000 bushels per hr.

The commerce of Saint John is very varied. The chief exports are grain, lumber and flour, of which 175,399 tons, 140,692 tons, and 63,898 tons respectively were despatched through the port during 1934. Considerable quantities of refined sugar, paper and wood pulp, and copper matte are also exported. On the import side, coal is the chief commodity received, and 230,376 tons reached the port during 1934. Other important items imported are raw sugar, oil and bananas. The total imports amounted to 633,042 tons, and the exports to 832,782 tons, for the year 1934. In addition to its varied freight traffic, Saint John is of importance also as a passenger port, for it has the advantage of being open to shipping throughout the year.

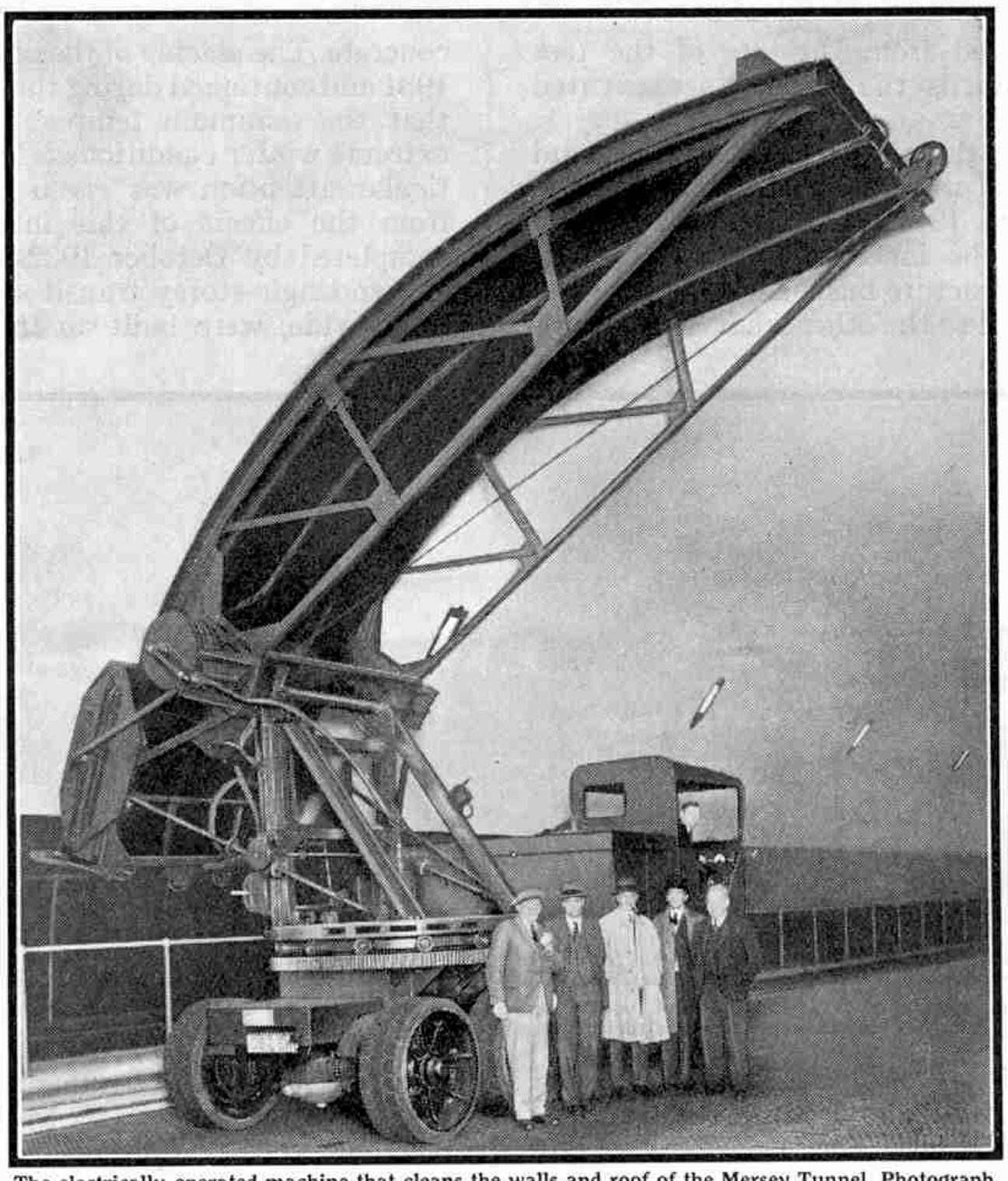
We are indebted to the Harbour Commissioners of Saint John for the information contained in this article.

Cleaning the Mersey Tunnel

Interesting Machine Operated at Night

IN the "*M.M.*" of September last we described the construction of the new Mersey Tunnel, the largest under-water road tunnel in the world. This great subterranean passage has an internal diameter of 44 ft., and with its approaches, a total length of 11,254 ft. A dado consisting of sheets of black glass supported by a network of stainless steel rails protects the walls to a height of 6 ft. 3 in. The glass forms a durable and easily cleaned lining that helps to give a finished and attractive appearance to the interior of the tunnel. Above the dado the walls and roof are finished in white plaster.

During the first six weeks that the tunnel was in use over 500,000 vehicles passed through it, and even to-day, when the traffic has settled down to normal proportions, an average of 5,000 vehicles daily pass under the River Mersey by this means. One result of such a great volume of traffic is that the lining of the tunnel would quickly become very dirty if large scale cleaning operations were not continually carried out. The total area of the plaster work in the main and approach tunnels is about 20 acres, and the task of keeping this considerable surface free from dirt is accomplished with the aid of the interesting machine illustrated on this page.



The electrically-operated machine that cleans the walls and roof of the Mersey Tunnel. Photograph by Stewart Bale, and reproduced by courtesy of the Mersey Tunnel Joint Committee.

The machine was designed and built by Walker Brothers (Wigan) Ltd., to whom we are indebted for our information, and the electrical equipment was supplied by the British Thomson-Houston Co. Ltd., Rugby. The Diesel-engined six-wheeled chassis carries a turntable on which is mounted an "A" shaped framework built up of girders. A huge steel arm curved to the contour of the tunnel wall is fixed in trunnions at the top of this framework. The arm forms a steel track for a trolley that is pulled up and down it by means of wire ropes attached to an electrically operated drum. The trolley is equipped with two horizontal spindles each provided with several cloth flaps. The spindles rotate in opposite directions at 120 r.p.m. as the trolley is pulled up and down the track, causing the cleaning cloths to strike the wall and roof of the tunnel and wipe them. At the same time the machine itself moves forward along the tunnel roadway at a speed of 6 ft. per minute.

It is important that the rotating cloths should not be too near or too far away from the tunnel surface, and they are kept at the correct distance by means of four pneumatic tyred guide wheels, two at each side of the machine. The wheels are mounted on hinged protecting arms the movement of which actuates a switch that lights up red and green lamps in the driver's cabin. The switching on of certain of the lamps indicates to the driver that the machine is too close to the tunnel wall, and of others that it is too far away, and he immediately corrects its position.

The rotating of the spindles carrying the cleaning cloths is effected by a worm geared motor unit mounted at one side of the curved arm, and current is fed to the motor through a cable coiled round a spring-operated drum that pays out and takes in the cable according to the position of the trolley. At the same time that the cloths are rotating a flexible hosepipe sprays them with a cleansing solution obtained from two large storage tanks situated immediately behind the driver's cab. A motor-driven pump mounted on the chassis of the machine draws the solution from the tanks and sends it upward through the centre column of the turntable to a spring-operated drum at one side of the arm. The hosepipe is connected at one end to this drum, and at the other end to the trolley, and is automatically paid out or coiled round the drum according to the position of the trolley.

The machine is designed to clean about 20 acres of tunnel surface in 90 hrs., and as it is used nightly from about midnight until 5 a.m., it takes almost three weeks to clean the walls and roof of the tunnel, at the end of which time the work is begun over again. Only two men are required, one to drive the machine and the other to attend to the filling of the tanks.

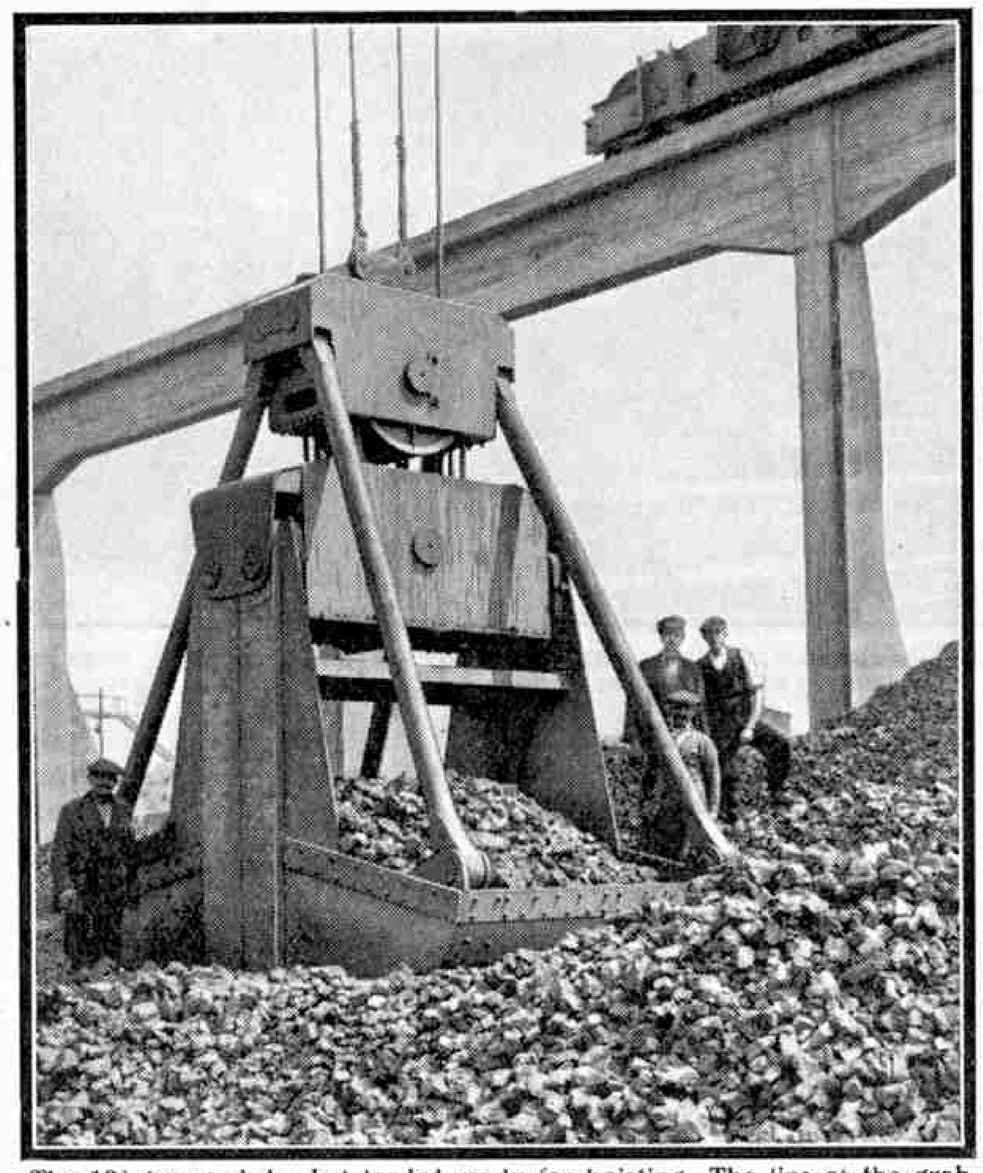
A 25-Ton Electric Ore Transporter

Interesting Machine at Corby Steelworks

THE illustrations on this page show a 25-ton electric overhead transporter that has been installed for feeding the huge blast furnaces with iron ore at the steelworks of Stuarts and Lloyds, Corby. The transporter is designed to hoist 12½ tons of ore 80 ft. in the air at a speed of 130 ft. per minute, and to traverse the ore stock space at the rate of 460 ft. per minute. The entire structure is capable of travelling longitudinally at 65 ft. per minute.

A front view of the 25-ton electric ore transporter and the ore stock space described on this page. For our illustrations we are indebted to the makers, Thomas Broadbent and Sons Ltd., Huddersfield.

The machine consists essentially of a main girder span that supports the running track for the grab trolley, and which itself is supported on two legs placed at 140 ft. rail centres. One of these legs is fixed, with a spacious raking strut for taking the end thrusts due to working; while the other leg is of the pendulum type and is hinged at the top to allow for any temperature variation in the length of the main girders. Both legs are so designed that the grab trolley is enabled to pass through them and work on the cantilever extensions provided at each end of the transporter. The gantry track on which the transporter travels is approximately 38 ft. above the ground level of the ore stock space, and the legs of the transporter give a clear height of 44 ft. from the rail level to the underside of the main girders, making a total clear height of 82 ft. from ground level.



The 12½-ton grab bucket loaded ready for hoisting. The lips of the grab are edged with manganese steel to take the wear.

The main girders of the transporter are of the lattice arch formation, and are 256 ft. in length, the track for the trolley being carried on rail girders. The transporter travels on 16 wheels fitted with rolled steel tyres, which are shrunk and pinned on to cast steel centres. The wheels are arranged in special compensating bogies, in four sets of four each, and the bogies are so designed that the loads on the wheels are equalised. The power for travelling the transporter longitudinally along the track is provided by an electric motor situated near the centre of the main girder.

The bucket trolley consists of a strongly built steel framework, and it carries the mechanism for opening, closing and hoisting the grab, and for cross-traversing the trolley, all these operations being controlled from a cabin suspended from the underside of the trolley. Platforms are provided along each side of the main girders, and ladders and landing stages on each leg of the trolley; and these give easy access to the various parts of the machine.

The giant grab is of the bucket type and has a capacity of 12½ tons of iron ore. It is operated from the trolley by means of four ropes, two of which are used for suspension and two for the opening motion. The lips of the grab are fitted with manganese steel straps to take the wear, and it can be opened at any height and hoisted in either the open or closed position.

The grab is 15 ft. 9 in. in height, 12 ft. 1 in. in length and 7 ft. 9 in. wide when it is closed. When in the open position it measures 17 ft. 9 in. by 18 ft. 9 in. by 7 ft. 9 in. The total weight of the grab is 12¼ tons.

In addition to a solenoid brake on the longitudinal travelling motor shaft, an automatic storm brake is fitted. This consists of massive shoes that bear directly on each track rail, and are operated by means of weights that run on inclined planes. The brake is interlocked with the motor that drives the transporter along the track so that it is applied and released entirely automatically every time the motor is stopped and started. The total weight of the transporter is 313 tons.

A New Dredging Vessel

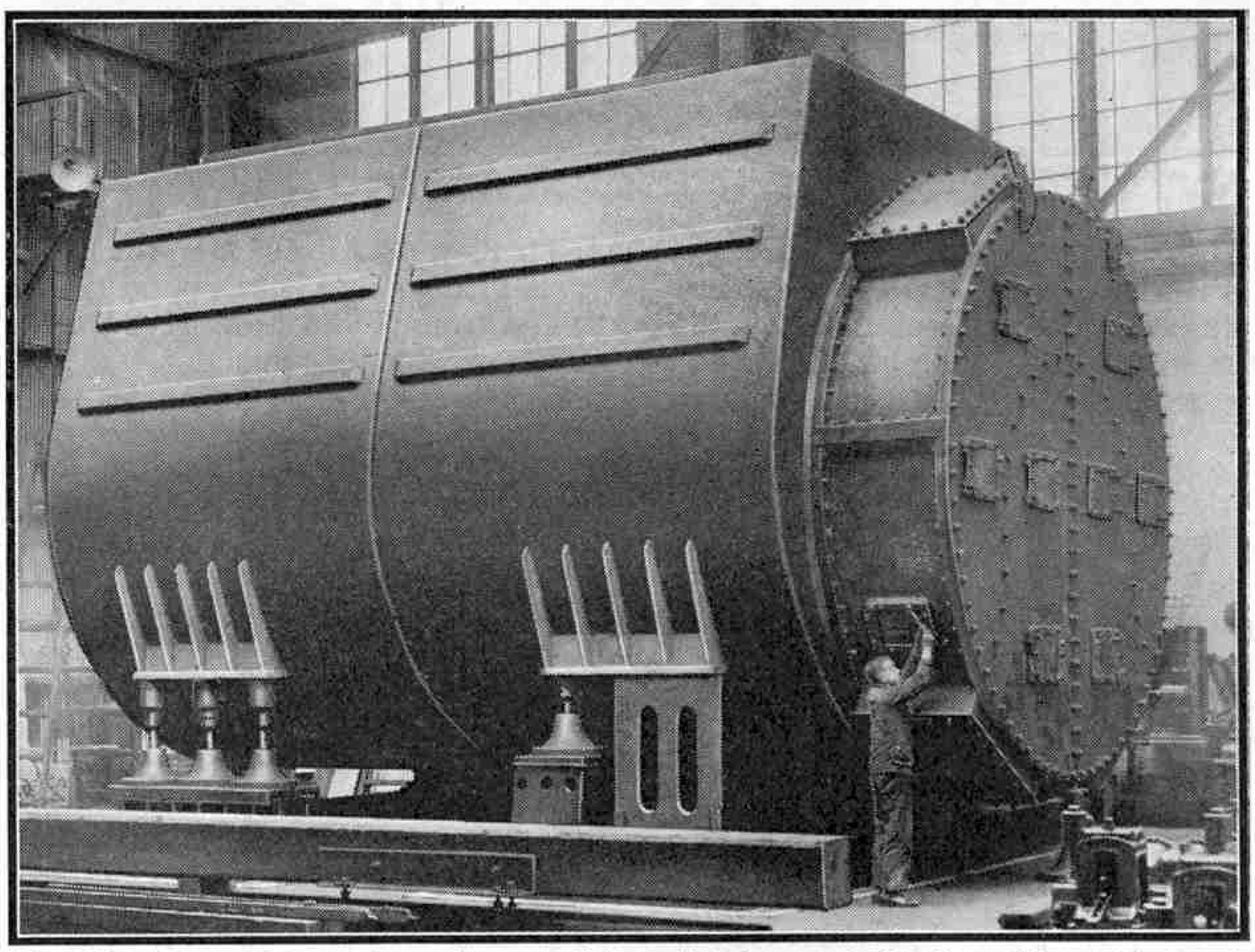
The lower illustration on the next page shows an interesting drag and cutter suction hopper dredger built for service at Basrah, Iraq. The vessel is named the "*Onger*," and was launched with steam up and ready to sail. She is fitted with two sets of triple-expansion surface-condensing engines, steam for which is supplied by three oil-fired cylindrical multitubular boilers working under forced draught.

The dredging equipment consists of a set of triple-expansion engines driving a centrifugal pump coupled to a suction pipe. The suction pipe is fitted in a frame carrying a drag head, and has a dredging capacity of 2,000 tons of solids per hour. For dealing with compact material, a spiral cutter driven by machine-cut steel gearing from a separate set of engines is fitted to the frame, which is designed to dredge to a depth of 45 ft. under water.

The hopper is of the dry-bottom type, and is fitted for discharging by the suction pump through suitable ducts, with very extensive flushing and sluicing arrangements. If necessary, however, the dredged material may be discharged ashore or through a floating pipeline. The engine-room plant includes also independent condensers, automatic feed pumps, bilge pumps, service pumps, fresh-water pumps, filter and evaporator. The vessel was built by Wm. Simons and Co. Ltd., Renfrew, and the illustration shows the ship immediately after her launch.

New Union Castle Liners

The fleet of the Union Castle Line has recently been augmented by the addition of two new refrigerated motor vessels, the "*Roslin Castle*" and the "*Rothesay Castle*." The new ships have a length of 443 ft., a beam of 61 ft. 3½ in., and a depth to the upper deck of 36 ft. 9 in. There are five cargo holds with 'tween decks, all of which are insulated for the carriage of fruit, with special provision in one of the holds for the carriage of meat if required. All the deck auxiliary machinery is electrically operated. The propelling machinery comprises an eight-cylinder two-stroke double-acting engine with a designed output of 7,000 b.h.p. at 93 r.p.m. The engine has a cylinder diameter of 620 mm., or 23.4 in., and a stroke of 1,400 mm., or 55 in. The vessels were built by Harland and Wolff Ltd., Belfast, and have a speed of 16 knots fully laden.



A large Metrovick central flow surface condenser supplied recently to Japan, and referred to on this page. Photograph by courtesy of Metropolitan-Vickers Electrical Co. Ltd., Manchester.

A Large Condenser for Japan

The illustration on this page shows a Metrovick central flow surface condenser with a cooling surface of 58,500 sq. ft., built for use in conjunction with a 53,000 kW. Metrovick turbo alternator plant at a large power station in Japan. The condenser was shipped to Japan from the Birkenhead Docks, and owing to its great size special arrangements had to be made to facilitate the journey from the makers' works at Manchester to Birkenhead. The width of the load was nearly 18 ft., and the journey was made at night with a police escort throughout to ensure a clear road.

Water Power in Canadian Industry

Hydro-electric power continues to play a great part in Canadian industry, and during 1934 there was a considerable increase in the amount generated for lighting and other purposes. Out of a potential turbine installation of 43,700,000 h.p., calculated on the basis of known water power sources, Canada's total installation on 1st January, 1935, was 7,547,035 h.p., which represents only about 17¼ per cent. of the total resources available. Of this total 6,589,941 h.p. was used in central electric stations, and 605,346 h.p. in pulp and paper mills. Hydro-electric power installations for other purposes, such as mines, electro-chemical plants, saw, and grinding mills, machine shops, pumping plants, and for electric railway operation, last year produced a total of 351,748 h.p.

The pulp and paper industry is the largest individual consumer of industrial power in Canada, and its outstanding position is due largely to the fact that there are enormous supplies of growing pulpwood in close proximity to readily developable power. The hydraulic installations in use for supplying motive power to the industry total more than 1,636,000 h.p., or about 90 per cent. of its total consumption.

£3,000,000 Land Tunnel Scheme

As a result of the success of Queensway, the £8,000,000 tunnel roadway under the River Mersey, a subterranean roadway beneath two miles of the most congested parts of the city of Liverpool is proposed. The idea is to link the Mersey Tunnel with the East Lancashire road, and the scheme is part of a five-year plan that the Liverpool Corporation have submitted for the consideration of the Government. The cost of constructing the tunnel, which would be known as the Everton Tunnel, would be about £3,000,000.

An Interesting New Boiler

An interesting boiler, which embodies distinct departures from usual practice, has been installed at the Northampton Polytechnic Institute, Clerkenwell. It is known as the W. Yorath Lewis "U" water-tube boiler, and is fired by means of marine type oil fuel burners, but if desired may be converted to almost any type of firing.

At the top of the boiler is a duplex drum comprising an inner and an outer drum. The outer drum forms the steam chest, and from it hang a number of U tubes, placed at an angle of 45 deg. to each side of the drum. The tubes are built up from standard size boiler tubes, the lower ends of which are joined in pairs by welding to form a U with its legs spaced apart about one tube diameter. There is no water drum at the bottom of the banks of tubes as is usual in a water-tube boiler, and the U ends are supported in racks on the firebox walls.

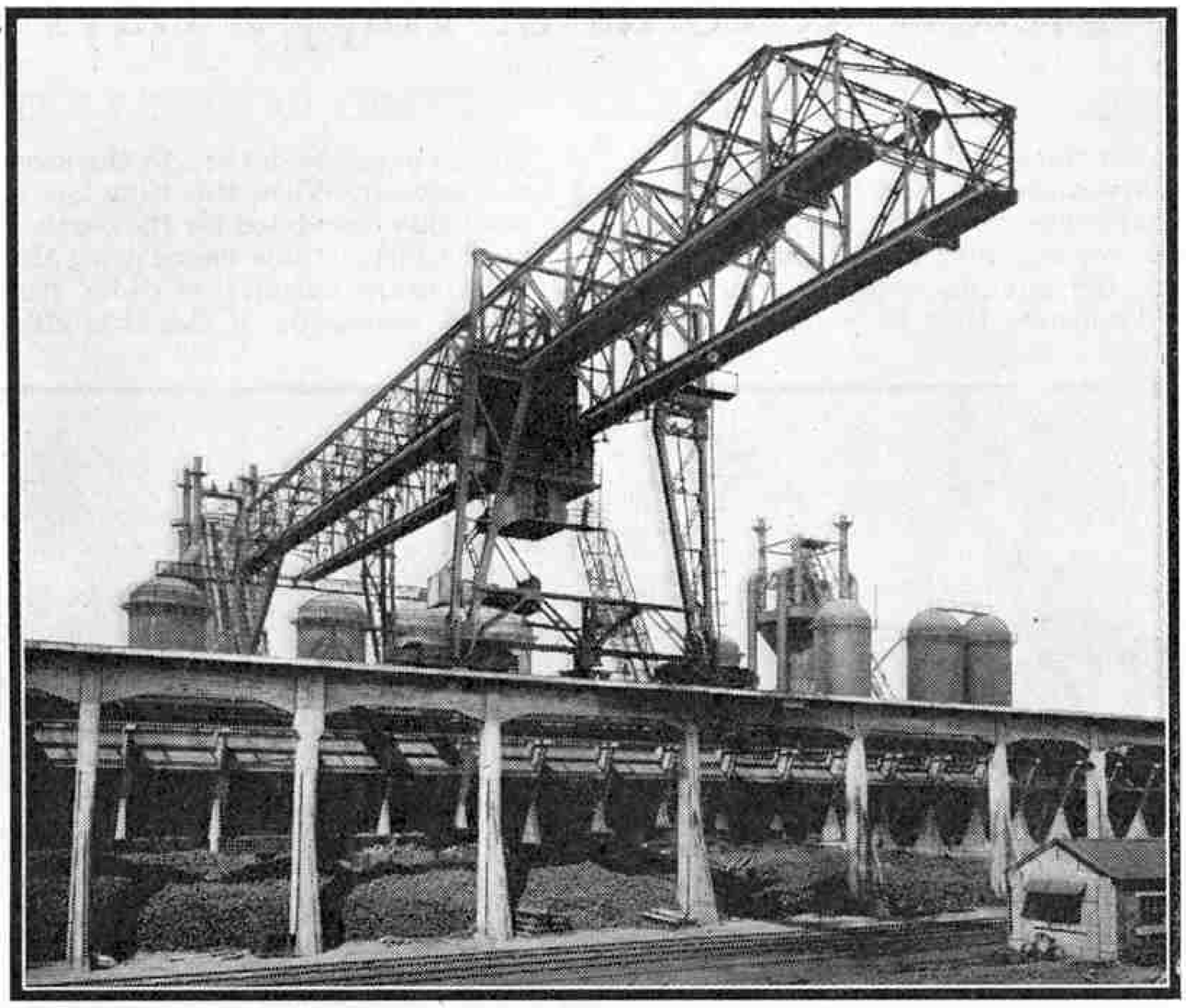
Inside the header drum is a half drum that forms a water trough, and from it hang small pipes that pass right down inside the U tubes, their ends being crossed in such a manner that a water stream from the pipe in one leg of the U tube is fed into the opposite outer tube, where it is evaporated, thus ensuring uninterrupted flow of water and steam, and even heat distribution. Among the advantages claimed for the new boiler are quick steam raising, easy accessibility to the tubes for repair and examination, and low cost due to the elimination of the usual bottom water drums.

Bridge News

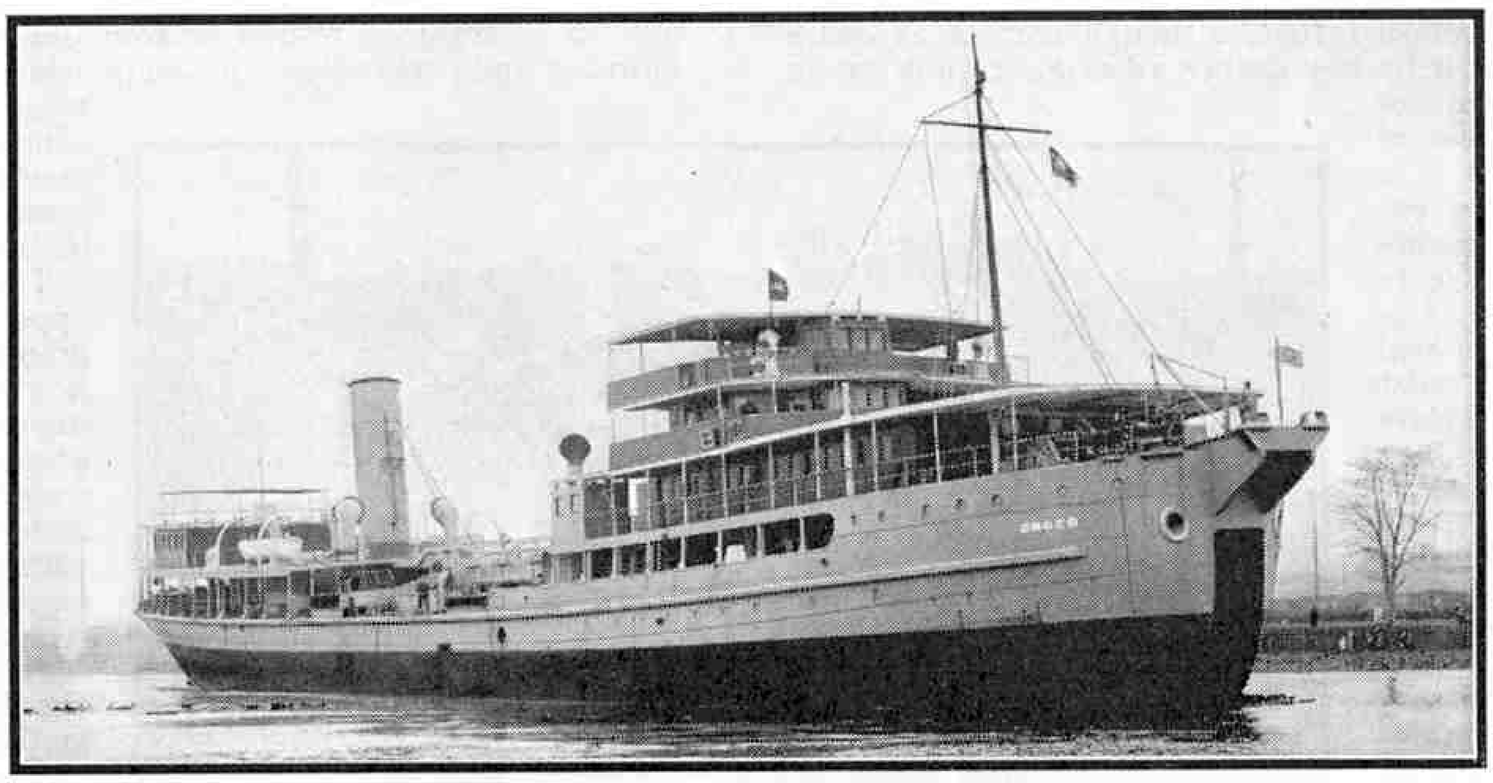
In order to make the famous Brooklyn Bridge in New York suitable for present-day traffic requirements, a plan of reconstruction has been drawn up by a consulting engineer and the Aluminium Company of America. Under the proposed scheme the present anchorages, towers and main cables would be retained, and from them new stiffening trusses and a new floor fabricated from structural aluminium plates would be suspended. The existing structure accommodates two rapid-transit tracks, two tramway tracks, and two vehicle lanes, and all commercial traffic, with the exception of mail vans, is barred from the bridge. The new plan allows for unrestricted use of the bridge by vehicles up to 25 tons deadweight, and provides for twelve 10 ft. lanes for vehicular traffic on two decks. The estimated cost of the reconstruction, together with the approaches, is 8,250,000 dollars.

The task of demolishing the old Waterloo Bridge over the Thames is now well in hand, and if all goes well it should be possible to commence construction of the new bridge about the middle of next year. Owing to the difficult nature of the present demolition operations, however, work is necessarily slow, and it is not possible to forecast exactly when it will be sufficiently advanced to enable the new bridge to be started.

A private company is to be formed for the purpose of constructing a road bridge across the River Severn near Chepstow. At present there is a ferry service at this point, and although the new bridge will be a toll bridge, it is expected that the charges will be considerably lower than those of the ferry. For those who do not use the ferry but now go round by road, the bridge will save 13 miles on the London road.



A side view of the 25-ton electric ore transporter described in detail on page 447. Photograph by courtesy of Thomas Broadbent and Sons Ltd., Huddersfield.



The drag and cutter suction hopper dredger "Onger," which was built recently for service in Iraq. The photograph was taken immediately after the launch and shows the vessel with steam up and ready to sail. Photograph by courtesy of Wm. Simons and Co. Ltd., Renfrew.

Huge Durham Reservoir Almost Completed

Burnhope, once an isolated hamlet in the Wear Valley, Co. Durham, is now the scene of vigorous activity, for it is the site of a gigantic new reservoir intended to supply water to the whole of Durham County.

The reservoir will have a capacity of 14,000,000,000 gallons and will cover 105 acres. When completed and flooded it will wipe out of existence a farmstead, numerous cottages, a bridge, and an extensive stretch of beautiful heather moorland. The farm and cottages will be demolished, but the bridge will be submerged 40 to 50 ft. below the huge lake.

While the construction work was at its height, employment for more than 1,000 men was found. Work is now so far advanced that it is hoped to flood the reservoir before Christmas of this year, and then the village of Burnhope will regain its air of bleak loneliness, for the workmen's houses, a dance hall and a picture hall, which were built when the scheme started, are to be demolished and sold.

An Ingenious Method of Making Sandpaper

A new process of making sandpaper has been developed by a firm in the Midlands. The backing material, which may be either paper or cloth, is first given a coating of glue by passing it between two driven rollers, the lower of which revolves in a trough of glue. It is then passed between electrodes charged with electricity at 100,000 volts, the abrasive grains being fed between the electrodes simultaneously with the passage of the backing material. The grains, becoming electrified, are driven into the glue in such a manner that the sharpest points and edges are left projecting outward, and at the same time they repel each other with equal force and become evenly spaced. The result is a perfectly uniform coating of abrasive all over the backing.

New Ferry for Sweden-Denmark Service

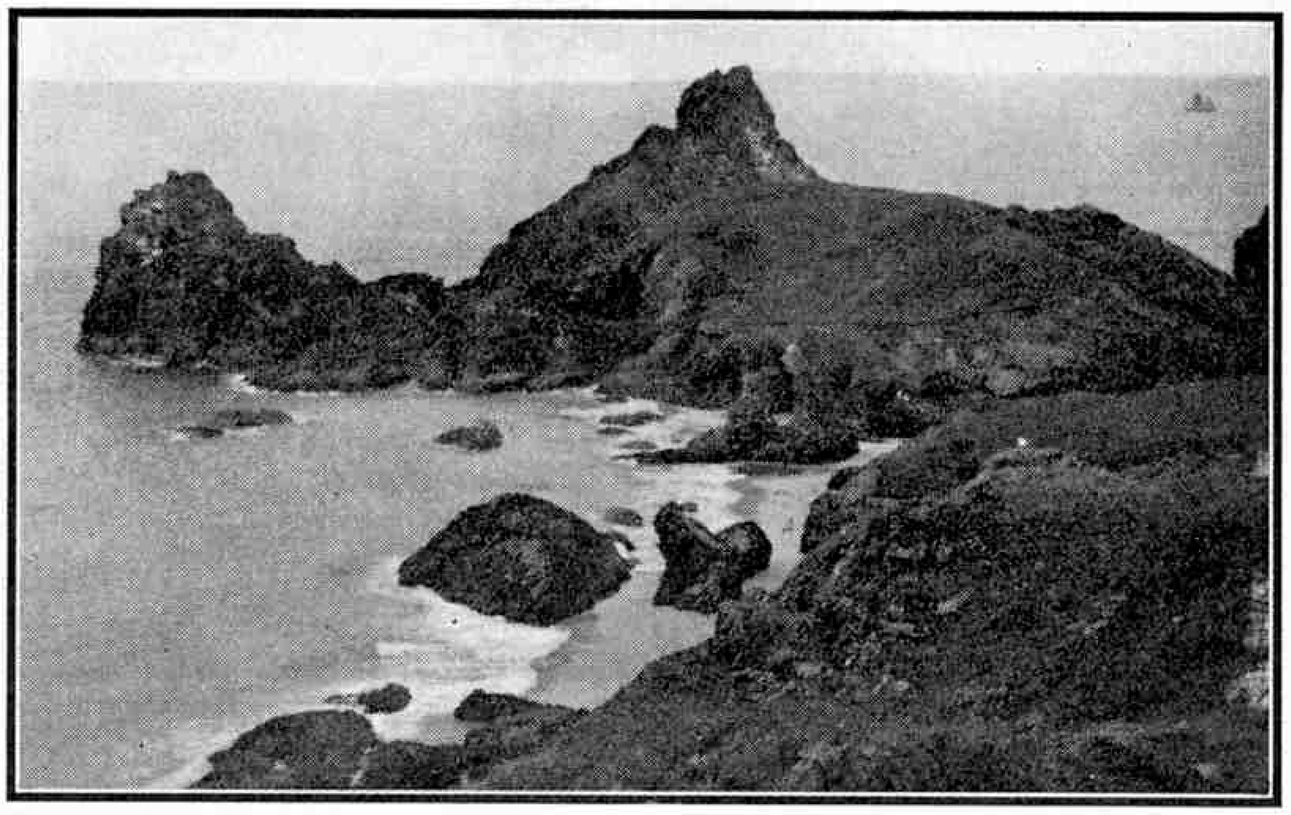
A new passenger and motor car vessel has been acquired by the Danish and Swedish State Railways, which maintain the ferry between Helsingoer and Helsingborg. The new ship, which has been named the *"Kronborg,"* was built by the Nakskov shipyard, and has accommodation for 26 cars and 600 passengers. She is 148 ft. long and 36 ft. broad, and her machinery consists of a four-stroke Diesel engine capable of giving her a speed of 11 knots.

The Amateur Photographer on Holiday

Picture Records of Happy Days

NO holiday, whether it is spent at the seaside or in the country, is complete without a camera. Even the cheapest form of camera, if used with reasonable care, enables us to secure mementoes of a happy carefree period, to which we can turn in the dull days of winter and recall with pleasure the circumstances in which the pictures were made and the adventures that they record.

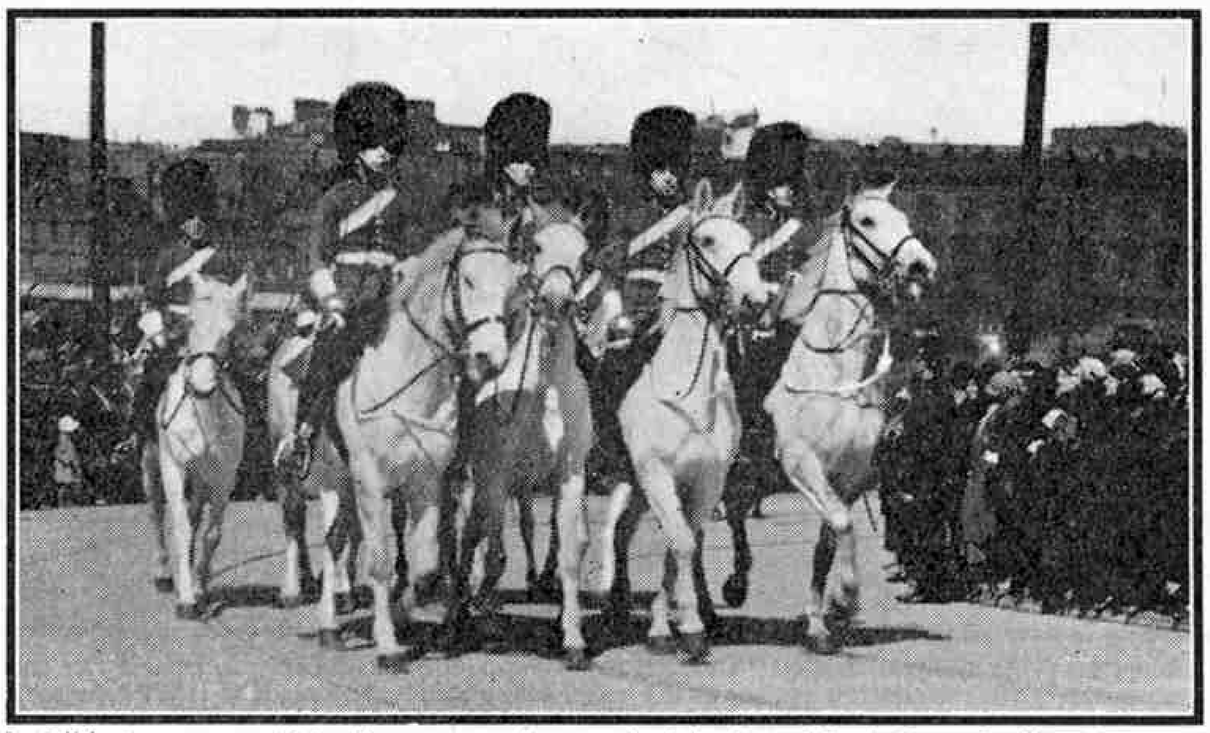
The first step to be taken by the holiday photographer is obvious, but often neglected. It is to make sure that the camera is in good order. Few things can be more annoying than the discovery when the holiday has actually commenced that there is something wrong with the camera. In many cases the instrument has been put away for some time, perhaps for many months; and it is asking too much to expect it to operate perfectly without a little attention. The only really satisfactory method of making certain that all is well is to expose a spool of film or a few plates and have these developed. Defects in the shutter, pinholes in the bellows of the camera, or other defects will then reveal themselves, and the trouble can be remedied in time. The lens is almost certain to be dirty, and it should be cleaned gently with a piece of soft silk, such as a silk handkerchief that has been washed several times.



Kynance Cove, Cornwall. The illustrations to this article are reproduced from entries in "M.M." Photographic Contests.

Photography with modern cameras is so simple that even the beginner can take good photographs if he pays attention to one or two points of special importance. With all cameras, cheap or costly, the secret of success lies mainly in correct exposure. At one time it was generally believed that, although correct exposure was highly desirable, yet if by any chance an exposure was wrong it could be compensated for in the subsequent process of development. Nowadays it is realised that unless the exposure is reasonably accurate it is practically impossible to produce a good negative. Unless the subject is one of real importance it is best to resist the temptation to waste a plate or film on it if the light is bad.

The exposure problem is now made comparatively simple by means of exposure meters or exposure calculators. In order to estimate exposures accurately by either of these means it is obviously necessary that the speeds of the various brands of plates or films should be known, and therefore the makers of the best exposure meters and calculators issue lists of plates giving definite and accurate speed numbers, which are obtained by actual tests, without reference to the speed numbers given to the plates by their manufacturers.



A striking scene caught by the camera. An escort of the Royal Scots Greys leading the coach of the Duke and Duchess of Kent in a ceremonial procession in Edinburgh.

An exposure meter consists essentially of some kind of a case containing a strip of sensitized paper that darkens when exposed to light in accordance with the photographic strength of that light. A tiny piece of this paper is exposed to the light falling upon the subject to be photographed, and a note is made of the time taken by the paper to darken to the same shade as that of a sample tint alongside it. When this time has been found, the correct exposure is quickly calculated for the particular plate or film in use according to the instructions issued with the meter.

Exposure calculators differ from meters in that there is no actual measuring of the strength of the light. Simple tables are provided for each month of the year, the time of day, and the general weather conditions. One of the most reliable calculators of this type is that incorporated in the Photographic Handbook published by Messrs. Burroughs Wellcome & Co. This calculator is remarkably simple to use, and will save many times its cost in plates or films in the course of a season.

In using a calculator judgment is really only required in regard to the subject. This is made a perfectly simple matter with the Wellcome calculator, for the various types of subject are illustrated so clearly by a series of small photographs that it is almost impossible to go wrong.

Generally speaking a beginner is much more successful with photography at the seaside than in the town, and this is due to the difference in the strength of the light. The intense brilliance of the light at the seaside, which is often very trying to the eyes until one becomes used to it, is due to the clearness of the air and the large amount of light reflected from sea and sky. On this account seaside photography is comparatively easy as regards the exposure problem, and even those with the cheapest types of camera are able to secure good results without difficulty. Indeed, in the late morning and early afternoon hours, when the sun is blazing down from a cloudless sky, it becomes really difficult to underexpose on such subjects as open beach scenes or ships in the open.

The sea offers boundless opportunities to a keen photographer, but it is remarkable how seldom it is really well depicted. Attempts to photograph a wide expanse of open sea always result in disappointment. The same holds good with photographs of stretches of open country, and the reason is that the camera cannot deal adequately with big distances. The eye automatically adapts itself to observing objects at different distances, but the camera lens is unable to do this. Distant objects, therefore, appear in a photograph so dwarfed as to be quite without interest. Special lenses are made to overcome this difficulty to a great extent, but few readers are likely to use them. The most effective seascapes are those that have some object such as a boat or rocks in the foreground.

In photographing breaking waves the secret of success is to hold the camera low down, the lower the better. Waves photographed from a high viewpoint become flattened and appear insignificant in size, whereas they may be made to appear larger than they

actually are by utilising the lowest possible position for a camera. In photographing breaking waves the camera should not be pointed straight out to sea, but should take the waves at an angle. Many of the most striking seaside photographs are those of a combination of sea and rocks, and if a really rough sea occurs during one's holidays the chance of making striking pictures should be seized immediately.

The range of photographic objects at the seaside is practically unlimited. If the coast round about is wild and rocky, with high cliffs towering upward from the water's edge, there will be ample scope for many striking pictures. If the coast is low and sandy its beauties are not so obvious, but such a coastline affords compensations in regard to animated beach scenes with their great variety of amusements, and the constant coming and going of small boats taking passengers for a sail or for fishing.

Fishing, even with home-made tackle is a serious pursuit, demanding intense concentration.

Yachts or sailing boats are excellent subjects for the camera and as a rule are not difficult to take. Sometimes they may be photographed from a pier, but a better result is obtained by snapping them from the shore or from a small boat. A broadside view of a sailing boat, or one directly bow or stern on, is usually unsatisfactory, and a three-quarters view gives the best result. The position of the boat on the print is of importance in regard to producing the effect of movement. If the boat is travelling slowly, it looks best just entering the picture, as if it were moving slowly across. If it is sailing fast, however, it should be past the centre of the print. Sailing boats at anchor make very effective pictures, and the arrivals and departures of pleasure steamers provide interesting and often amusing material for photographs.

Many thousands of snapshots are taken every summer along the crowded beaches of our popular resorts, but a large proportion of these pictures are not successful because the photographer has made the mistake of including too much in the view. A snapshot of a big expanse of sand crowded with people is almost always unsatisfactory, because it has no centre of interest. The best pictures are those that have a small group of people in the near foreground, so that they appear in the print of sufficient size to stand out well from the general beach background. Among the most attractive beach subjects may be mentioned bathing scenes, children playing on the sands, the inevitable donkeys, and model yacht sailing. If opportunity occurs, a few snapshots of the beach should be taken from a small boat close in shore.

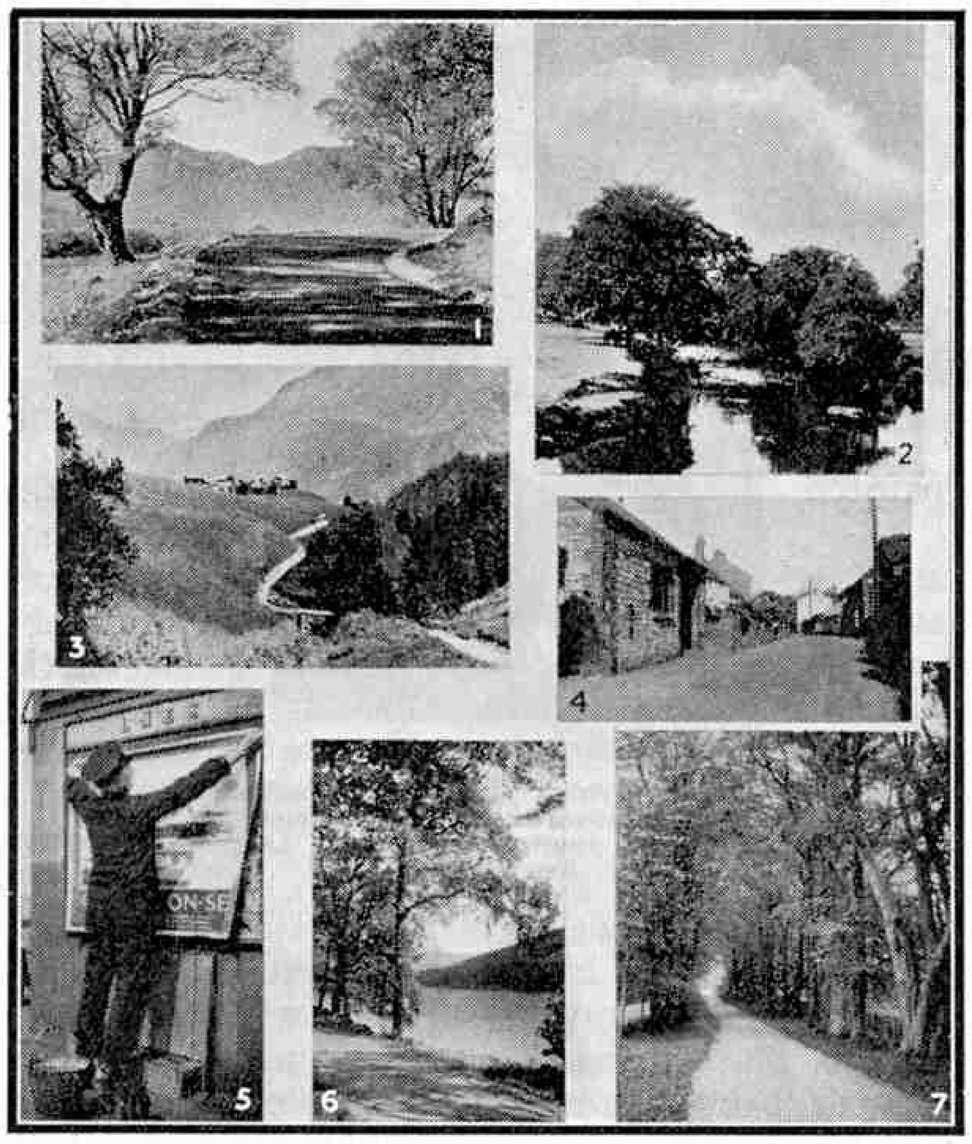
The light in open country inland is also quite good, and under-exposure should not occur in reasonably bright weather. Holidaymakers in the country are often disappointed, however, with their efforts at photographing woodland scenes. Such scenes are very tempting, particularly if streams and waterfalls are present, but they are difficult subjects on account of the extent to which the trees cut off the light. The decrease in the strength of the light is actually much greater than it appears to be, and it is in conditions such as these that the exposure calculator is most valuable.

Among the entries in our photographic contests are many photographs of buildings, which are quite good in every respect except that the building appears to be falling over backward! This fault, which quite ruins the picture, is the result of pointing the camera upward in the endeavour to include the top of the building. It is impossible to obtain a satisfactory result by tilting the camera in this manner, and the only alternative, if the top of the building is not in the picture when the camera is held level, is to move farther away until the whole is included.

When changing films out-of-doors this should, if possible, be done in the shade in order to avoid any danger of "fogging" a film. If no other shade is available the body should be kept between the camera and the sun. Another important point that is sometimes overlooked until too late is that the covering paper must be loaded into the empty winding spool so that it is perfectly level and will wind on freely.

We frequently receive inquiries as to the cause of mysterious horizontal lines running across photographs taken with folding film cameras. These lines are very unsightly, and spoil the effect of an otherwise good picture. The defect is usually the result of winding on films with the camera bellows closed instead of extended. When a camera is shut there is a danger that the bellows may be pressing against the film, and if this is wound on while in this condition bad markings are almost certain to be caused.

The photographer in camp has a wonderful opportunity of securing a splendid collection of photographs. The most ordinary scenes of camp life make excellent pictures, and apart from the interest they will recall in later days, there is always the opportunity of selling prints to assist in defraying the expenses of the holiday. For this kind of photography a small pocket camera is really the best, as it can always be carried ready for immediate use when a good opportunity arises.



Typical holiday photographs of stream, lake, mountain and woodland subjects, with an attractive railway station scene.

The most successful photographs are those taken when the subject is quite unaware of the fact that he is being immortalised! There is always a touch of life in snapshots taken unawares that is absent from a carefully posed picture. This is particularly the case with little groups busily engaged on some task such as preparing the mid-day meal. One thing should always be borne in mind, however, and that is no one should ever be photographed in circumstances that would cause him annoyance.

There is one carefully posed photograph that should be taken, and that is a group of members of the camp. Such a photograph provides a splendid memento, and is of interest to everybody concerned. There is no particular difficulty about taking a group of this kind, except that with a very small camera care should be taken to stand far enough back to bring every member of the group well within the boundaries of the picture.

One piece of advice that concerns every owner of a roll film camera may be given here—wind on the film immediately after each exposure has been made. If the winding-on is delayed for even a few minutes it is surprising how difficult it is to remember with certainty whether it has been done or not!

Life-Like Models in Papier Maché

How They Are Produced

READERS must often have noticed in the windows of large shops extraordinarily life-like replicas of famous advertising personalities, and they may have wondered what these fascinating models are made of and how they are produced. Probably it will come as a surprise to many readers to learn that these models are made of papier maché which, in spite of the many plastic substances that have been evolved by modern science, still remains the most suitable material for the production of models in commercial quantities and at economic prices.

Any experienced sculptor will produce at any time a single bust or figure in marble or bronze, or possibly in carved wood; but it is no use asking him to turn out such products in quantities ranging from, say, 1,000 upward. Each one would have to be sculptured individually, and the time required for the production of a large quantity would be as excessive as their cost would be prohibitive. It would of course be possible to cast them in plaster, but plaster is heavy and brittle, and will not stand up to the wear and tear involved in transport and handling. Apart from this, the porous surface of plaster does not allow it to be painted successfully.

The first step in the production of a papier maché model is, nevertheless, just the same as that taken by a sculptor who is commissioned to produce a portrait likeness, except that the Pytram sculptor works in clay instead of in bronze or marble. The degree of artistic skill required is equally high, and as a matter of fact the work of the head sculptor of Pytram is at least as well known in artistic circles as it is in commerce. Some of his original work has been exhibited at the Royal Academy.

When the first clay model is complete, plaster piece moulds are taken from it, their number being determined by the size of the order and the time allowed for its production. These moulds give, of course, the reverse of the clay model, and from them can be turned out in unlimited numbers exact replicas of the original.

The moulds are next passed over to highly-trained girls, who line them with layers of special paper impregnated with suitable adhesive by pasting one sheet on top of another until the requisite thickness is reached. In this manner a hollow model composed of laminated paper is obtained, and after it has been taken out of the mould it is sent to the drying room to harden.

Typical "Pytram" papier maché models. The illustrations to this article are reproduced by courtesy of Pytram Ltd., New Malden.

It may be remarked here that papier maché, like the camel hair brush and the tortoiseshell comb, is a misnomer. It is not mashed paper as its name implies, but laminated paper, which is a very different substance indeed. Its history is none the less venerable, however, for the early Egyptians made their parchment by laminating strips of the papyrus reed together into sheets, which can still be seen, and even read by a few scholars, in the British Museum. Papyrus as a writing material was widespread throughout the ancient world, and its importance among the Greeks and the Romans was very great. Pliny, in his *"Natural History,"* gives a description of the preparation of writing material from the papyrus plant. The details of his description are a little confused, but he makes it clear that the stem of the plant was cut into longitudinal strips by means of a sharp instrument. These strips were then laid on a board, side by side, until the desired width was attained. In this manner the first layer was formed, and across this was laid at right-angles another layer of strips. The two layers were then soaked in the water of the Nile, which caused the two layers to stick together. The sheet thus formed was then pressed and dried in the sun, and polished as required by a piece of ivory or a smooth shell. These sheets were formed into a roll by joining them together with paste, the best and strongest sheets being used to form the outside of the roll to withstand the wear and tear of use.

The name "papier maché" came from the French, who at one time produced in large quantity decorative mouldings in mashed paper pressed into moulds like putty. It was left to an Englishman, Henry Clay, a native of Birmingham, to revert to the original process of lamination. Clay was granted a patent for his method of preparing the material, and he used it with great success for the panels of doors, in coach building, and for many purposes connected with furniture and interior decoration.

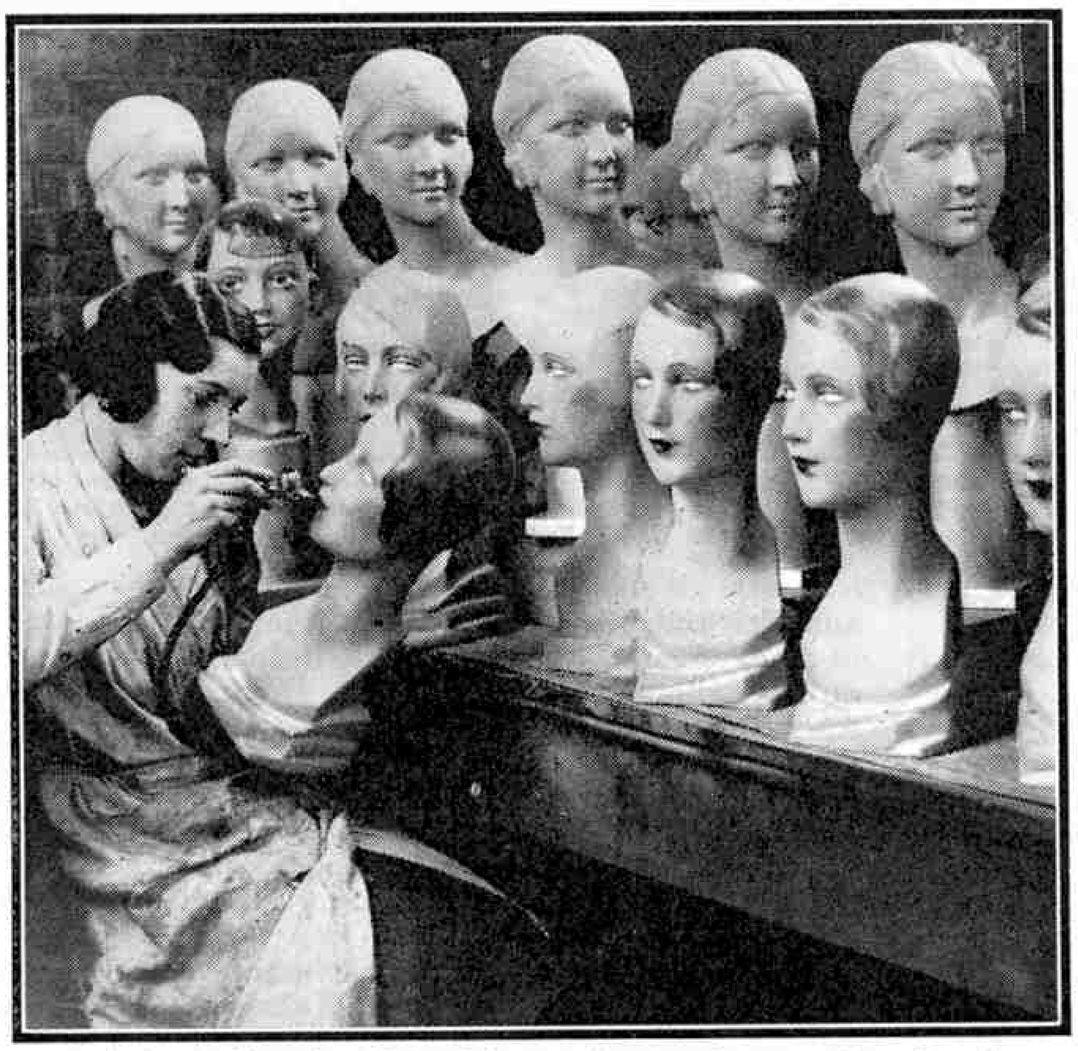
When the model is completely dry it is "finished" with a special composition that removes all irregularities and gives it a surface as smooth as porcelain.

The model is then passed to the painting shop to be hand-painted by highly-skilled operatives. This work is carried out to approved colour patterns, in order to ensure that all the models are identical in every respect. The models are not only painted in natural colours, but also may be finished in bronze, oxidised silver, or gilt. At the British Industries Fair of 1934 was exhibited a life-size bust of the Marchese Marconi finished in bronze. This bust looked so exactly like real metal that, when one of the staff lifted it up with one hand and held it aloft, the crowd thought he was a professional strong man giving an impromptu turn!

An artist's brush is used for fine work such as painting the eyes, as shown in this photograph.

In spite of their lightness, papier maché models have quite remarkable strength and durability. Their average life is somewhere about five years, a period that no other form of display material can equal. Even after as long as seven years models have been returned to the factory for repainting and sent out again in every respect as good as new. Many articles, apart from advertising models, are made in papier maché, for this material is almost without limitations in regard to either design or dimensions. Among miscellaneous articles for which it is used may be mentioned collecting boxes for hospitals, miners' helmets, polo posts, trolley covers and friction pulleys.

This year's Chelsea Arts Ball was notable for the exhibition of a 40-ft. model symbolising "Speed"—the largest papier maché model in the world. Such was its size that none of the entrances to the Albert Hall was large enough to allow it to be taken in complete; and therefore it was brought in in sections and erected in the centre of the floor. Although it remained only one night, it was so firmly constructed that if left undisturbed it might well have stood for a century.



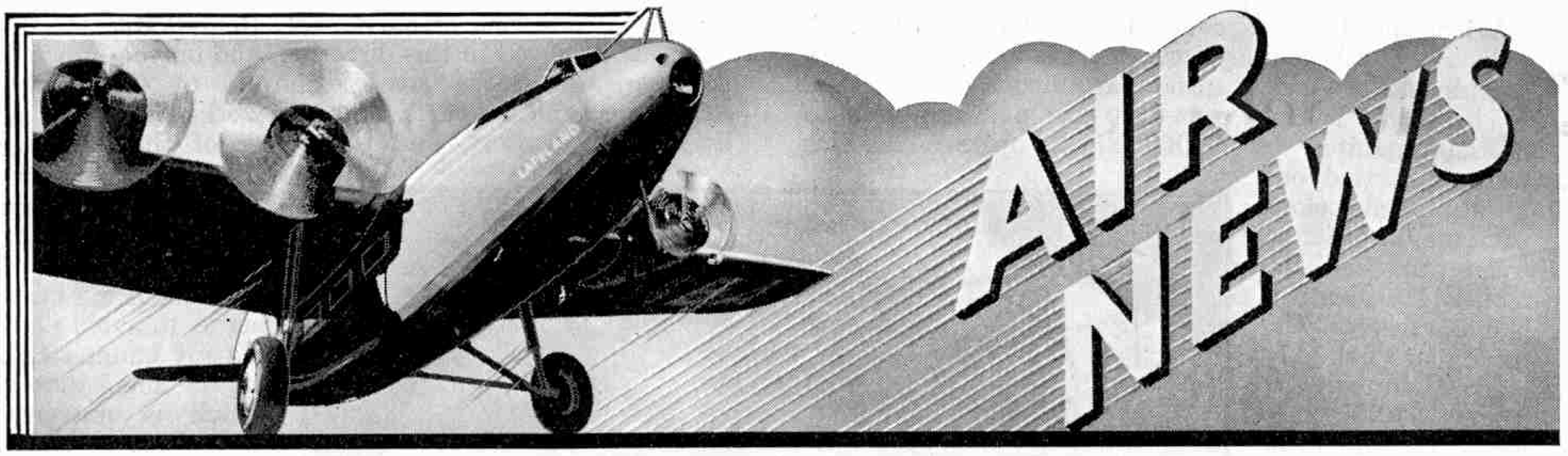
Painting the lips of model heads by spraying the colour on with a "gun."

The successful production of models that in themselves were so life-like naturally suggested the possibility of providing an even greater degree of realism by the introduction of movement. Remarkable success has been achieved in this direction, and on the previous page are illustrated some examples of electrically-driven mechanical models. These are worked by fractional horse-power motors, and the secret of their realism and perfect reliability in operation lies in the planning of the mechanical parts in such a manner as to avoid placing any undue strain on the small motor, which is universal and works on either A.C. or D.C. current.

The coal mine model, which is about 39 in. in height, is of particular interest because it contains a much greater number of individual movements than is usually found in models of this type. The winding gear wheels revolve rapidly, and the trucks on the surface move slowly round. In the top gallery men are actually at work. One of them is using a pneumatic coal cutter, and immediately in front of him are two men busily shovelling coal on to a conveyor belt, which moves. A fourth man is in charge of a working mechanical coal cutter that appears to be cutting its way into the seam. In the bottom gallery there is a continuous procession of steel trucks heaped up with coal. The galleries are illuminated from the inside, and by careful arrangement of electric lamps, miniature miners' lamps are to be seen glowing at the side of each worker. The top of the mine is floodlit, so that the display is equally effective by night and by day.

The "Cow and Gate" model is particularly ingenious and amusing. The fully-modelled figure of a baby disappears into the tin at intervals and then comes up again, pushing up the lid with his head. The front panel is illuminated from behind to show up the transparent lettering, and as the figure of the baby rises out of the tin it is floodlit from underneath and appears in a halo of light.

Another interesting model, which we have not been able to reproduce, is known as the Kicking Baby model. The legs kick realistically; the arms move in a natural manner; and when in operation the model is always a great attraction.



The New Zeppelin Airship

The construction of the new giant Zeppelin, LZ.129, at Friedrichshafen, Germany, is now well advanced, and the day when she will set out on her first trial trip is being anticipated eagerly in that country. The airship will be 813 ft. in length and 135 ft. in diameter, and her 16 huge gasbags will have a total capacity of 6,720,000 cu. ft. They will be made of a special material patented by the Goodyear-Zeppelin Corporation, of America. The propelling machinery will consist of four Diesel engines totalling 4,400 h.p. and each driving an airscrew. The gondolas in which they will be housed will be large enough to enable repairs and adjustments to the engines to be carried out while the airship is in flight. The keel of the vessel will be used as a service gangway, and from it the mechanics will enter the engine gondolas through special entrances.

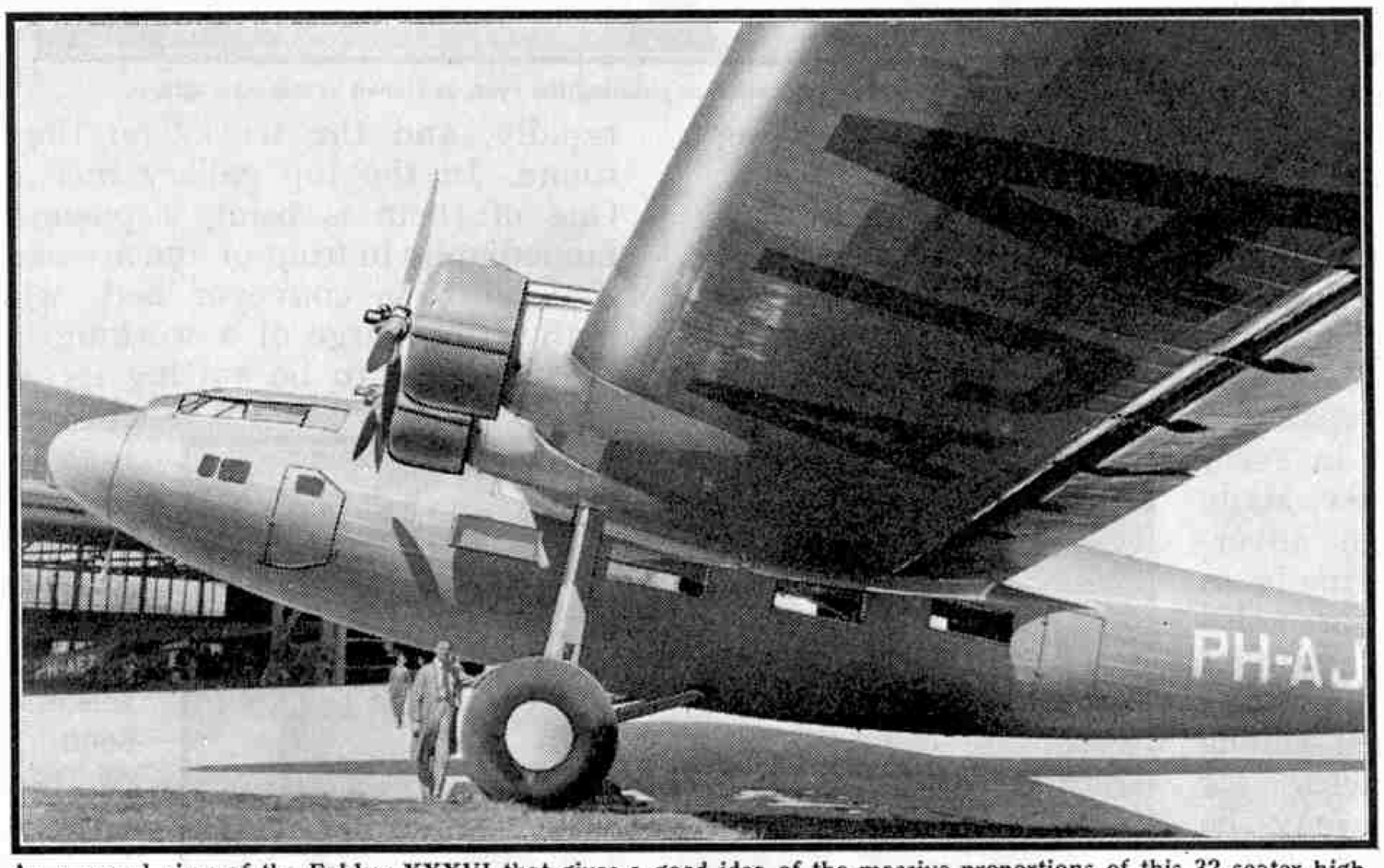
The LZ.129 will have double the carrying capacity of the "*Graf Zeppelin*," formerly LZ.127, and as it is intended that she shall transport chiefly mails and freight, provision is being made for only about 50 passengers. The passenger accommodation will be on a generous scale, however, and will occupy 45,000 sq. ft. of the deck space. It will be distributed over two decks; the staterooms, dining room and reading and writing room being on the upper deck, and the smoking room and stewards' office on the lower deck, which will accommodate also the kitchen and the officers' and crews' quarters. The airship will be navigated and controlled from a forward gondola above which will be the wireless cabin.

Foreign Internal Air Services

Numerous references have been made in these pages to the rapid growth of internal air services in this country. Similar developments are taking place in many other parts of the world. In Canada a scheme for a transcontinental air route, which was taken up by the Canadian Government eight years ago but eventually lapsed, has been revived. The proposed route is from Halifax to Vancouver, a distance of 3,108 miles, and it will make use of aerodromes and equipment constructed in 1929 for an air mail service between Winnipeg and Lethbridge. This service was inaugurated in 1930 and included a branch line northward to Calgary, Regina and Edmonton, but it closed down when the mail contract was cancelled about a year later.

In India plans are almost completed for a coastal air mail service between Bombay and Trivandrum, the capital of the State of Travancore, which at present has no direct communication with Bombay. About two days will be saved in the transmission of letters to the Southern Indian States by this service, and it is probable that ultimately it will be extended to Trichinopoly. Another proposed coastal air service in India will connect Madras with Colombo, the capital of Ceylon. An aerodrome is being constructed at Colombo, and it is anticipated that the service will be in operation before the end of this year.

In Japan the Minister of Communications has introduced an ambitious scheme for the development of civil aviation during the next 10 years, at a cost of over £10,000,000. The scheme includes the establishment of a regular air service between the islands of Hokkaido, in the north of the Japanese Empire, and Formosa in the south.



An unusual view of the Fokker XXXVI that gives a good idea of the massive proportions of this 32-seater high wing monoplane. It is 110 ft. in span and 78 ft. 8 in. in length, and when loaded weighs nearly 15 tons. Photograph by courtesy of N. V. Nederlandsche Vliegtuigenfabriek.

Internal air services in China are being speeded up by the introduction of faster machines, and additional air lines are being established. The American Stinson machines in use on the Shanghai-Peiping route of the China National Aviation Corporation are to be replaced by Douglas D.C.2s. The Loening amphibians flying on the Shanghai-Hankow and Hankow-Chungking services are to be superseded by Fairchild amphibian machines which, it is anticipated, will accomplish the flight from Shanghai to Chungking in a little over half the present time. A new service to be inaugurated this year will connect Chungking with Yunnan, 500 miles distant, and trial flights have been made over the proposed route.

United States Autogiro Mail Service

Autogiros are being used for a regular air mail service between the new Post Office at Philadelphia, U.S.A., and Camden airport, New Jersey, an important clearing centre for air mail. The machines take off from and land on the flat roof of the Post Office, which is about 400 ft. long and 275 ft. wide. It is probable that similar Autogiro services will be inaugurated in the near future to transport mail between Philadelphia and the head Post Offices at New York, Boston, Chicago, St. Louis and Pittsburgh.

Air Taxis Meeting the "*Normandie*"

An air taxi service between Croydon and Plymouth has been inaugurated by Imperial Airways, in connection with the regular calls at Plymouth of the French liner "*Normandie*." By this service passengers disembarking at the port fly to Croydon, where they are able to join air services for all parts of Europe.

The Avro "Prefect"

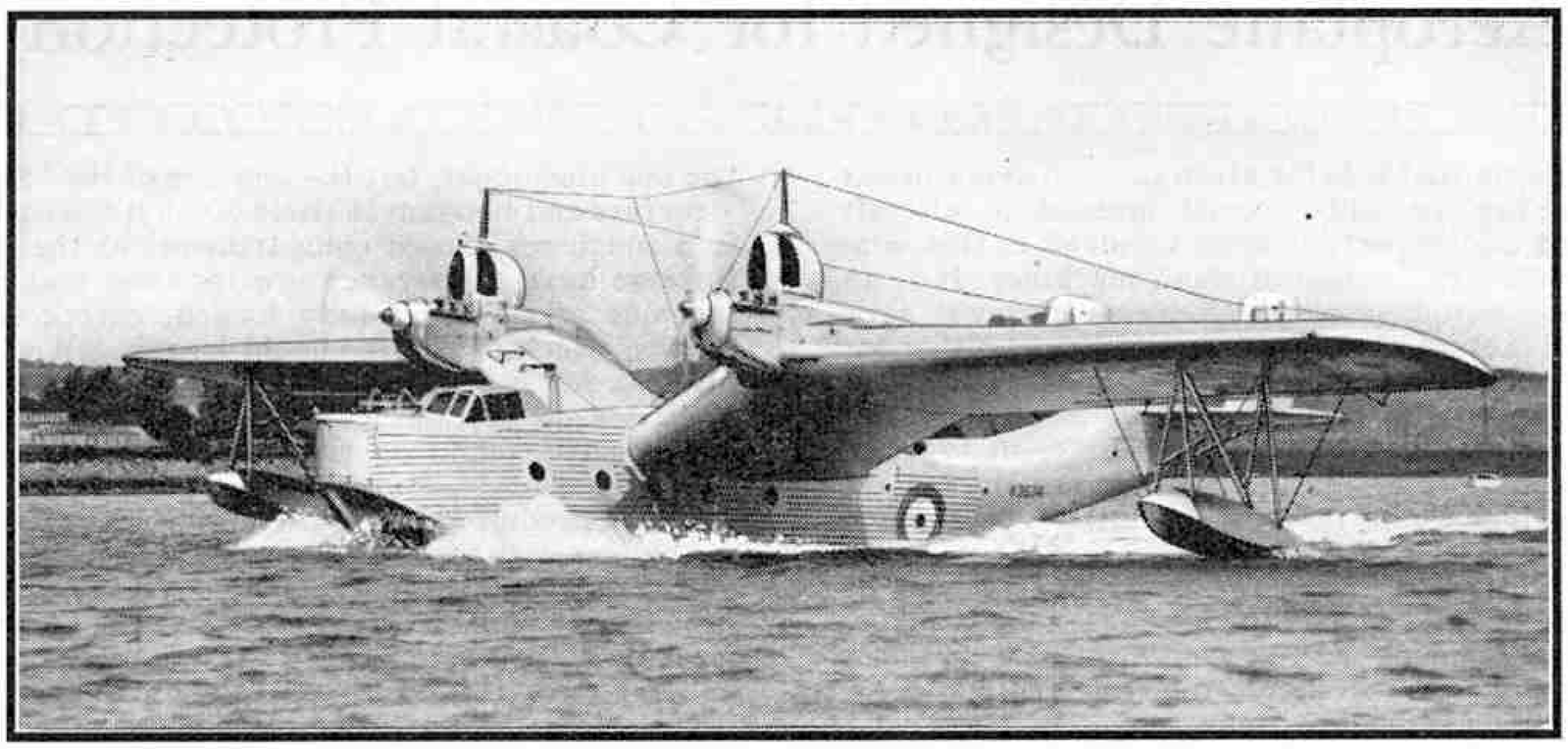
A special version of the Avro "626" training machine has been produced by A. V. Roe and Co. Ltd., for the Air Ministry, who have since ordered several more aeroplanes of the same type. The new machine is called the Avro "Prefect," and has a Siddeley "Lynx" engine.

"Short" R.24/31 Flying Boat

The upper illustration on this page is of the "Short" R.24/31 Flying Boat produced by Short Brothers (Rochester and Bedford) Ltd. It is a more recent production than the "Singapore III" described and illustrated in the *"M.M."* of May last, and is the first monoplane type of flying boat built by this firm.

The R.24/31 has a span of 90 ft. and an overall length of 63 ft. 3 in. It is of the high wing monoplane type, with the engines mounted above and forward of the leading edge. The wing is of cantilever form, and the spars used in its construction are of special design and possess great torsional stiffness. The portion of the wing between the hull and each engine nacelle is inclined upward at a sharp angle so as to provide adequate water clearance for the airscrews, which are of large diameter. The top of the outer portion of the wing is horizontal. The power units are two Rolls-Royce experimental engines of the "Kestrel" type.

The machine is entirely of metal construction, Alclad being chiefly used on account of its high resistance to corrosion. The excellent performance of the R.24/31 when in the water is extremely good, and is attributed to the new form of hull bottom developed by the builders.



The Short R.24/31 twin-engined Flying Boat. The wing is inclined upward between the hull and engine nacelles to provide the necessary water clearance for the large airscrews. Photograph by courtesy of Short Bros. (Rochester and Bedford) Ltd.

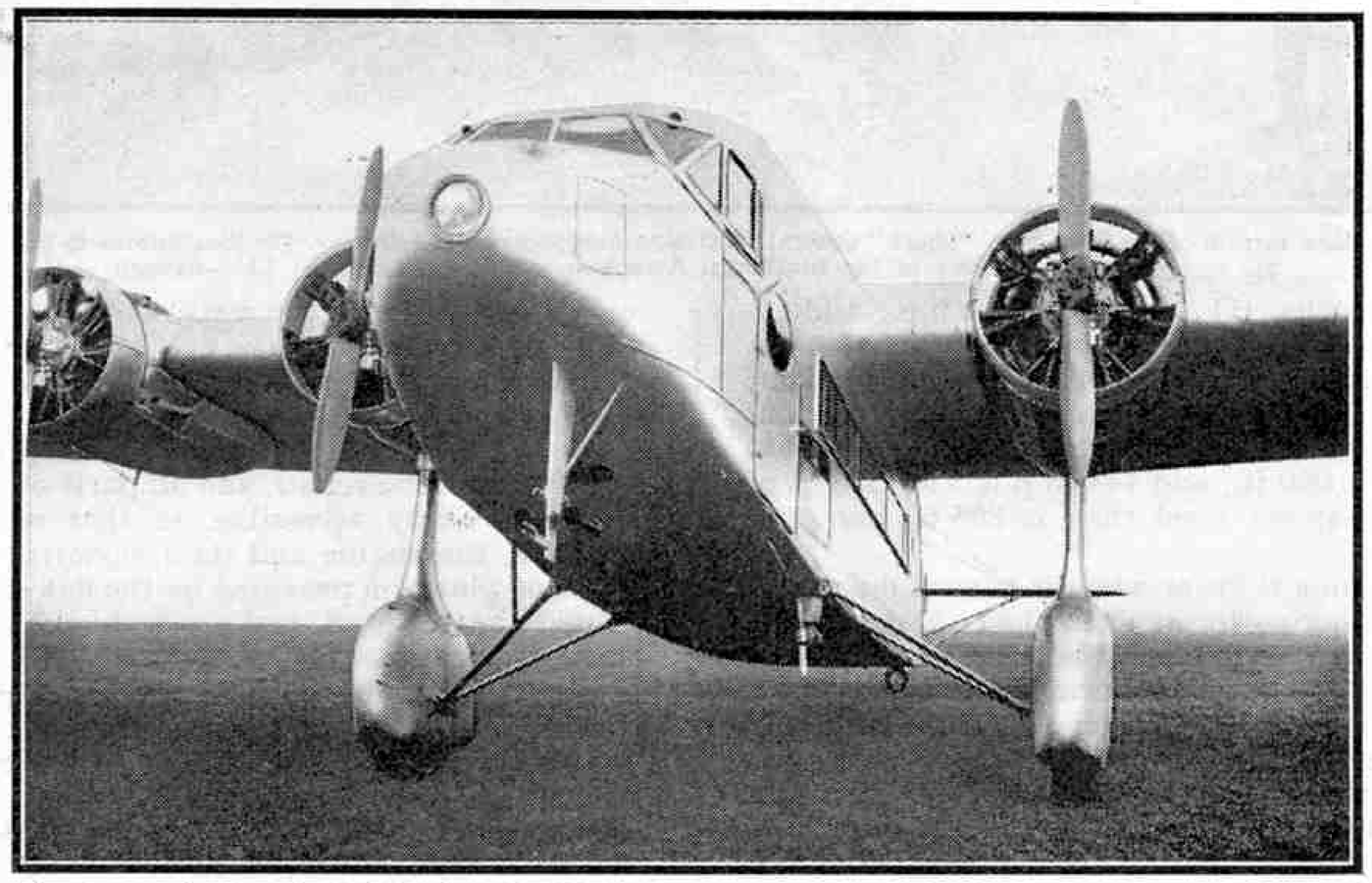
Royal Air Force Expansion

The extensive and rapid expansion of the Royal Air Force decided upon by the Government has created vacancies for about 2,500 pilots and about 20,000 tradesmen and unskilled men. Half of this personnel are required by April of next year, and the remainder during the following 12 months. Most of the pilots will be admitted as officers on Short Service Commission, but there are also openings for young men between the ages of 18 and 23, of secondary school education, and those accepted will be trained to become qualified pilots. Applicants should apply in writing to the Air Ministry (S.7E), Adastral House, Kingsway, London, W.C.2.

The number of aircraft in the R.A.F. will also be greatly increased, and about 1,300 more men will be needed every three months for duties connected with the maintenance of the machines. Some practical knowledge of the trade of fitter will be an advantage to applicants, who will have to pass a trade test. The age limit is 42 years, and applicants should apply in writing to the R.A.F. Recruiting Depot, Victoria House, Kingsway, W.C.2.

Young men of 18 to 32 years of age will be considered for training as mates, flight mechanics or flight riggers. In addition about 400 men between the ages of 17 and 32, and of secondary school education, will be required every three months for training as wireless operators, photographers or armourers. Many unskilled men between the ages of 18 and 26 will be enlisted as aircraft hands, and after they have been in service for one year they will be considered as to suitability for training in one of the trades. In all these cases applicants should apply in writing to the Recruiting Depot mentioned in the previous paragraph.

The vacancies mentioned above are in addition to those for aircraft apprentices and boys that occur periodically.



The four-engined version of the Avro 642 high wing commercial monoplane. Photograph by courtesy of A. V. Roe and Co. Ltd., Manchester.

An Interesting Light Aeroplane

An interesting small light aeroplane has been built by Mr. E. O. Tips, the representative in Belgium of The Fairey Aviation Company Ltd. It is a single-seater low wing monoplane, and is only 18 ft. 9 in. in length and 24 ft. 6 in. in span. It has a wing area of 100 sq. ft., and the power unit is a Douglass 600 c.c. engine that gives it a speed of 80 m.p.h.

Air Survey in New Guinea

The great advantages of surveying large tracts of unexplored territory by aerial methods are now generally recognised. An important project of this kind is to be carried out in Papua, New Guinea, by H. Hemming and Partners Ltd., a London firm of air surveyors, for Papuan Concessions Ltd., a company interested in the gold-bearing properties of the country.

The area to be explored from the air is about 35,000 square miles in extent and is situated on the southern slopes of the New Guinea mountain range. The territory is practically unexplored, and the valleys are extensive stretches of jungle. Gold has been discovered in the waters of the River Fly, and the first task of the surveyors will be to locate the source of the waterway. The aeroplane will be used for reconnaisance and for guiding the ground parties, and by providing information as to the character of the territory it will enable them to reach the gold-bearing areas in much less time than otherwise would be the case. The work will be of a hazardous nature, and the few prospectors who have penetrated the area concerned have reported the presence of head-hunting native tribes.

A Short "Scion" equipped with floats is to be used for the preliminary exploration and aerial photographic work, which is expected to take about six months to complete.

D.H. "Moth" with Enclosed Cabin

During the past 10 years about 4,000 D.H. "Moth" aeroplanes have been sold, and these open cockpit light machines are familiar sights in many parts of the world. With the exception of the "Tiger Moth," manufacture of these machines has now ceased, and the de Havilland Aircraft Co. Ltd. are preparing to produce a new type of "Moth" that will be equipped with side-by-side seats in an enclosed cabin.

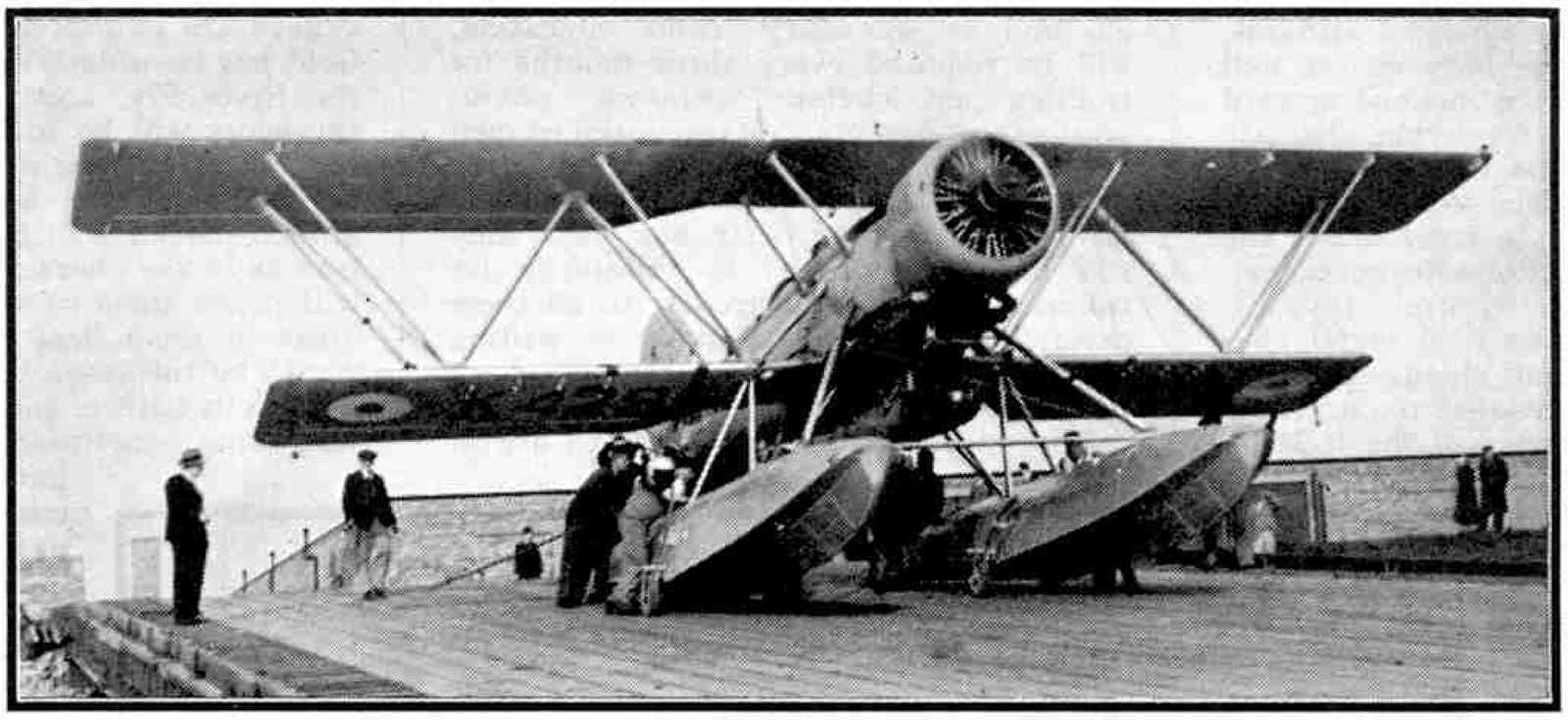
The new machine is called the "Hornet Moth," and is 24 ft. 9½ in. in length and 32 ft. 7½ in. in span, and when the wings are folded is only 9½ ft. in width. The wings are tapered and the lower one is provided with ailerons. A 130 h.p. "Gipsy Major" engine is installed and gives the machine a maximum speed of 131 m.p.h. The rate of climb is 800 ft. per min. and the service ceiling is 15,600 ft. With a fuel load of 35 gall., the machine has a range of 658 miles.

The Blackburn "Shark"

Aeroplane Designed for Coastal Protection

THE increasing attention that is being given to the defence of our shores from attack by air adds special interest to aircraft designed for the varied and important tasks involved in this vital work. The Blackburn "Shark" is one of these machines. It is an all-metal single-engined aeroplane of the "General Purpose" type and has the special advantage that it can be employed either for bombing work and torpedo operation, or for fleet gunnery spotting and reconnaissance. Thus the machine is capable of carrying out duties that formerly required two or even three different types of aircraft, and it is claimed to achieve better performance and greater all round efficiency for these duties than the machines it is designed to replace.

An additional feature of interest is that the "Shark" can be obtained fitted with the wheels and landing carriage of a landplane, or with the floats of a seaplane, and in each form it is designed with folding wings for use as a ship-plane. When it is intended for carrying in a ship, provision is made for launching it by means of a catapult and the necessary fittings can be supplied for arresting it in the usual manner when it is landed on the deck of an aircraft carrier, or for slinging it overboard for launching purposes, or taking it on board again, by means of a derrick when it is employed in seaplane form.



The seaplane version of the Blackburn "Shark" Coastal Protection Aeroplane on the slipway. The illustrations to this article are reproduced by courtesy of the Blackburn Aeroplane and Motor Company Ltd., Brough.

High performance is required from a machine intended for work of the kind for which the "Shark" is designed. The machine can be fitted with a 700 b.h.p. Armstrong Siddeley "Tiger IV" or with a Bristol "Pegasus III" of 665/690 b.h.p., and its performance depends on the power unit employed as well as on the purpose for which it is equipped. As a landplane torpedo-bomber, carrying a load of bombs weighing 1,500 lb., or two-thirds of a ton, in addition to a crew of two and the necessary fuel, it has a top speed of 150 m.p.h. at a height of 6,000 ft., and 144 m.p.h. at a height of 10,000 ft. Its rate of climb at sea level then is 895 ft. per min. and its ceiling is 16,000 ft.

The total load of the machine is lower when it is used for reconnaissance purposes and a higher performance is then obtained. The "Shark's" maximum speed as a landplane fitted for this purpose is 157 m.p.h. at a height of 6,000 ft. In this form the machine has a rate of climb of 1,230 ft. per min. at sea level and its ceiling is 20,400 ft. These particulars apply to the "Shark" equipped with the "Tiger IV" and similar performance is obtained when the "Pegasus III" is substituted.

The range of the machine as a fleet spotter or reconnaissance aeroplane also is greater than that of the torpedo-bomber, for although the total load then is less, a larger quantity of fuel is carried. This is illustrated by a comparison of the ranges of the landplane forms of the "Shark" when equipped for these two purposes, the reconnaissance machine carrying 171 gallons, giving it a range of 792 miles, while the torpedo-bomber has a fuel load of 158 gallons and a range of 625 miles. The corresponding ranges of the "Shark" seaplanes are 690 miles and 548 miles. The reconnaissance aeroplane can be fitted with an extra tank when it is required for special long distance operation. This is slung under the torpedo carriers and has a capacity of 150 gallons, extending the ranges of the landplane to 1,250 miles, and of the seaplane to 1,100 miles.

As the machine is intended for use at sea, special precautions have been taken to ensure the safety of the crew in the event of a forced descent. The method usually followed is to employ an air bag to keep the machine afloat, but the fuselage of the "Shark" is a watertight structure and buoyant in itself. Even if the cockpits become flooded in a rough sea, closed compartments at the front and rear of the fuselage have a buoyancy greater than that required to keep the machine afloat when fully loaded, except for the torpedoes or bombs, which of course should be released when a forced descent into the sea becomes necessary. An inflatable dinghy is provided to enable the crew to leave their machine if necessary after being compelled to alight on the water. This is stowed aft of the rear cockpit.

As the accompanying illustrations show, the Blackburn "Shark" is a biplane with the top wing longer and wider than the one below it. The span of the top wing actually is 46 ft., while that of the bottom wing is only 36 ft. One effect of this is to give the occupants of the machine a good field of view, an important point in the design of military aircraft, and indeed of aeroplanes of all types.

A machine that in its flight is exposed to sea spray, and in certain circumstances must alight on the water, is particularly liable to corrosion. For this reason, stainless steel and a special aluminium alloy known as Alclad are used to a large extent in the construction of the "Shark," since they have the great advantage that they need no special protective treatment. The stainless steel is used for parts that are highly stressed, and Alclad is employed in the fuselage, the floats and the fairings. Other materials required are protected by various means, such as plating with the metal cadmium and covering with enamels and oil varnishes.

The employment of these metals helps to reduce the time and cost of maintenance work, a point to which special attention has been given throughout. The form of construction employed is simple to manufacture and repair, and all parts of the structure and its equipment are easily accessible, so that renewal is not difficult. For instance, the engine and its accessories are easily reached from a standing platform provided by the flat corrugated top surface of the exhaust heater muff, and access to the controls is obtained readily through conveniently placed manholes and detachable panels.

The wings of the "Shark" are built up on spars of stainless steel and ribs made of light alloy sections riveted together. They are rigidly braced and there is no necessity for rigging adjustment. Handley Page automatic slots are fitted to the top wing. Balanced ailerons are employed and the wing flaps can be adjusted by means of a small handle fitted to the control stick as required when landing or taking off. The tail unit consists of a single plane with interconnected balanced elevators, a fin adjustable when on the ground, and a balanced rudder.

The different types of wheel and float carriages designed for this machine are quickly interchangeable. The wheel undercarriage is in two separate units, each equipped with Dunlop roller bearing wheels and fitted with pneumatic brakes operated by compressed air from a small metal cylinder, known as the air bottle, that is stowed under the fuselage decking, forward of the dashboard in the pilot's cockpit. Constant air pressure is maintained in the bottle during flight by an engine-driven compressor.

The float undercarriage fitted to the "Shark" when the machine is employed as a seaplane is built up of steel tubes with twin Alclad floats. The floats themselves are specially designed for rough weather operation and are interchangeable with each other. They carry water

rudders pivoted on large bearings on their sternposts, and the rudders are arranged to hinge upward when the machine is ashore or when it is struck by a submerged object in the water. They are operated by means of the air bottle already mentioned and can be set as desired by movement of the rudder bar when pressure is introduced into the operating system by means of a hand grip on the control column. Until pressure is introduced the water rudders remain in the neutral position, and if they are damaged or jammed the pilot retains independent control of his air rudder by simply releasing pressure on the hand grip.

Broadside view of the landplane version of the machine. The deep cowling of special design that encloses the engine is a conspicuous feature, and the rigid "N" wing bracing system also can be seen.

The engine of the "Shark," whether it is the Armstrong Siddeley "Tiger IV" or the Bristol "Pegasus III," is supported in a ring mounting that can be detached after the removal of only five bolts. It is enclosed by a ring cowl of special design and the exhaust is led away from a collector ring, fitted behind the cylinders, through stainless steel tail pipes that extend downward on each side of the fuselage and under the bottom wing. Each tail pipe is fitted with a muff through which circulates air that is heated and led to the pilot's cockpit. There a butterfly valve enables the pilot to admit the hot air, or to divert it outside the machine if it is not required for heating purposes.

Normally the engine is started by means of a gas pressure system that derives the necessary supply of compressed air from the air bottle. When the aeroplane is on land or water for any length of time with the engine running, the constant use of any part of the pneumatic equipment would soon exhaust the compressed air in the bottle, but it usually has sufficient capacity for all ordinary purposes, and is soon recharged when the engine is running at normal speed in the air.

A fuel atomiser is incorporated and when this has been given its priming charge and the starting magneto has been switched on, the pilot presses a cock that admits compressed air into the starting system. Fuel gas then is forced into the engine cylinders through a distributor and the engine is turned and started. A crank handle is fitted through the port side of the engine cowling for use in starting in emergencies, and this is operated from the platform on top of the exhaust heater muff.

The "Shark" is a single-engined biplane, and as this photograph shows, the span of the top wing is greater than that of the bottom wing.

The petrol supply is carried in three tanks. The main tanks are two in number and hold 108 gallons and 43 gallons respectively. They are mounted vertically in forward watertight compartments in the fuselage and petrol is pumped from them to the engine, supplies being drawn from one or both tanks as desired. The third tank is a reserve, of 20 gallons capacity. It is mounted in the forward portion of the fuselage top decking and the fuel it carries reaches the engine by gravity, thus ensuring a supply that is independent of the engine pump system.

The two cockpits of the machine are placed close together so that the members of the crew can communicate readily with each other and work together in all circumstances. That occupied by the pilot contains a fixed machine gun mounted on the port side, together with an ammunition box holding 600 rounds and the necessary synchronising gear and tools. In addition it is arranged for torpedo sights and the controls for operating the torpedoes, which are placed in a Blackburn Patent Torpedo Carrier mounted under the fuselage between the units of the undercarriage. This carrier incorporates the gear required for adjusting the depth of the torpedo in the water, along with other necessary mechanisms, and is readily removed as a unit.

Immediately behind the pilot's cockpit is a second that accommodates one man in the case of the torpedo-bomber, but is large enough for two men in the reconnaissance machine. The forward portion of this cockpit is arranged for navigation, bombing and photography, and the rear is devoted to machine gunnery and wireless operation. Its equipment is carefully planned in order to enable its occupants to carry out their tasks comfortably and with as little interference as possible, and while so engaged they can be protected from excessive air pressure by a special hinged metal hood that in the up position completely screens the navigator and when down is a normal type of windscreen.

The machine gun in the rear cockpit is carried on a high speed mounting. When not in use it is stowed away in a recess in the top decking and its mounting then hinges backward below the level of the decking. Platforms above the floor level are provided on each side of the cockpit for use when firing downward and a hinged cross strut can be secured across the fuselage between the stations of the navigator and gunner in order to form a back rest for the latter when he is firing upward. Stowage is provided for six ammunition drums.

Bombing operations are carried out from a station beneath the floor of the pilot's cockpit. There the member of the crew performing these duties lies prone while he takes aim through a hatch fitted with a watertight door that can be closed quickly if the machine is forced to descend. A folding windscreen protects him while sighting and releasing the bombs, which are loaded in six patent carriers, four for bombs up to 250 lb. in weight and two for bombs weighing up to 500 lb. In addition there are two light racks for practice bombs.

Provision is made for the installation of complete electrical services for navigation lights, cockpit and instrument lights, and the heating of clothing and machine guns in addition to landing flares, signalling lamps and other devices. The necessary fittings for the wireless outfit include a swivelling crate for the wireless set and a fixed aerial in addition to stowage for accumulator, batteries, instruments and other requirements. The wireless operator's seat in the rear cockpit swings on a vertical pillar on the port side, enabling him to change his position at will to attend to his transmitter and receiver, or the electrical dashboard.

A target winch can be fitted in the rear cockpit in order that the "Shark" can be employed for towing behind it a flag target for machine gun practice from other aircraft.

Making Refrigerating Machinery

Interesting Processes at a Lancashire Works

THE artificial production of cold, or refrigeration, plays a very important part in everyday life, and is widely resorted to in the frozen and chilled meat trades, and in the dairying, margarine and other industries, for the preservation of foodstuffs. An efficient refrigeration equipment is an essential feature also of all ocean-going liners. There are still a few cold storage plants in which natural ice is used, but mechanical refrigeration is now almost universally adopted, as this not only gives temperatures that are lower and can be controlled as desired, but also in many cases is more economical than the natural ice processes.

There are several methods of producing intense cold by artificial means, and a description of some of these processes was given on page 270 of the "*M.M.*" for May last, in connection with a description of the great ice-making factory at Hull, which is the largest in Great Britain. This factory has recently been modernised with equipment designed and constructed by the Liverpool Refrigeration Co. Ltd., Liverpool, one of the largest manufacturers of refrigerating machinery in this country. At their "Polar" Works, near Warrington, they construct complete refrigerating equipment, from large capacity land and marine installations to small portable refrigerators for domestic use. Many interesting manufacturing processes are involved in the making of refrigeration machinery, and in this article we describe some of the operations carried out at the "Polar" Works.

A view of the erecting shop at the "Polar" Refrigeration Works, Sankey, near Warrington. In the right foreground is a partly completed horizontal compressor for a large marine installation. The illustrations to this article are reproduced by courtesy of The Liverpool Refrigeration Co. Ltd.

A tour of these works, which lie alongside the Liverpool-Manchester line of the L.M.S.R., provides much to interest a visitor. They consist of several big buildings that cover a total of $6\frac{1}{2}$ acres, and include heavy engineering bays and assembly shops, tank and coil making departments, machine and tool shops, and galvanising, sand-blasting, welding and several other equally important but smaller departments. The machine shop, tool room, erecting and joinery shops are housed in three main bays, and adjoining these is a smaller building used for sand-blasting and metallising processes. Railway sidings run into the main buildings, so that heavy castings can be transported to any required point of the works or loaded into wagons and shunted directly on to the railway.

The works are devoted entirely to the production of refrigeration plant and accessories. High-speed compressors for use with ammonia and carbon dioxide gas are made, together with auxiliary equipment such as evaporators, condensers, cooling grids and a variety of intricate pipe work. Many of the machine tools in use are of considerable interest, and they range from a large horizontal milling machine with a 28 ft. bed, to small high-speed drilling machines, and hand tools used in a finishing process known as metallisation.

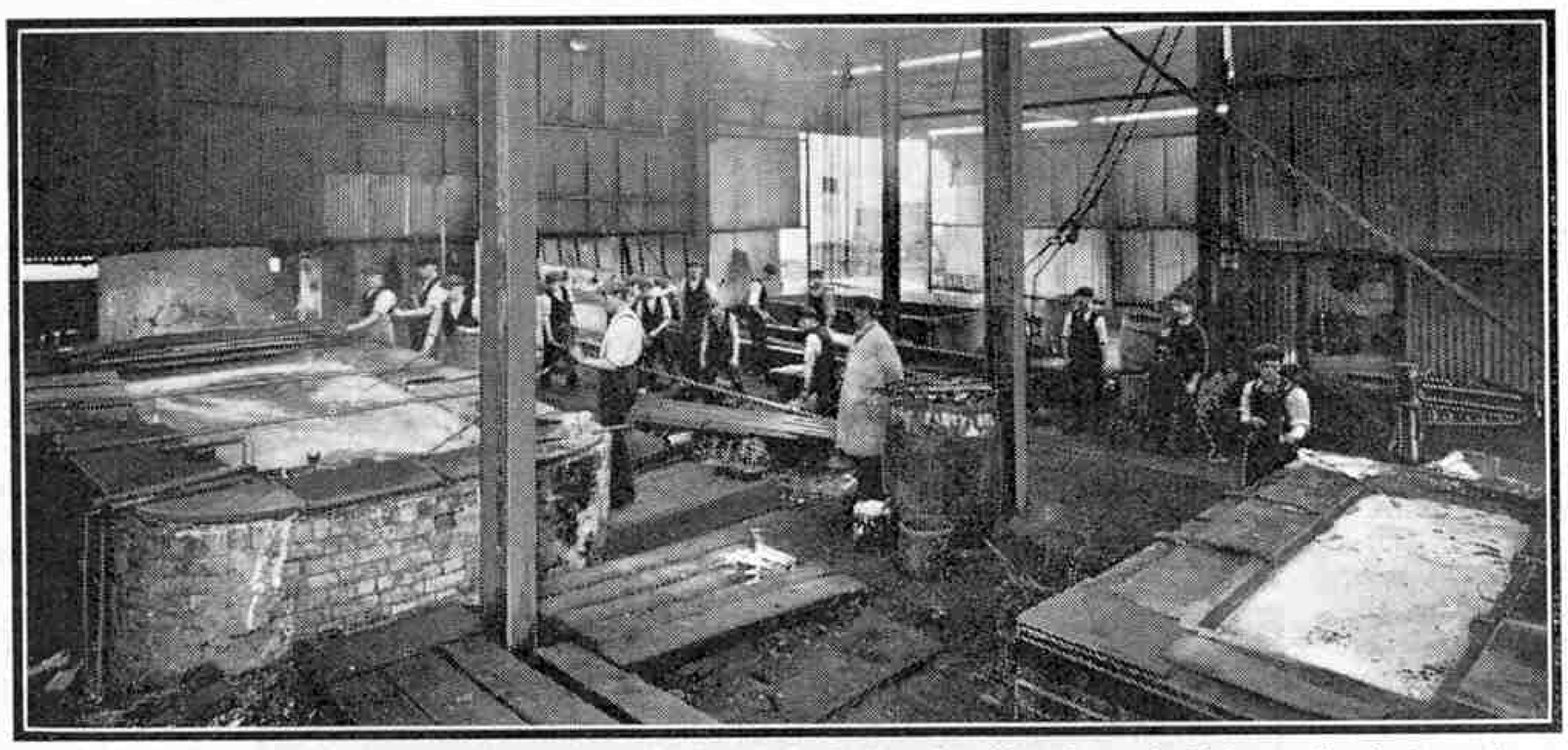
Modern refrigeration machines operate at high pressures, and on this account all the castings and fittings used in their construction are submitted to very rigorous tests to ensure their reliability and safety in use. In the machine shop a fully equipped testing plant is provided, and all castings, valves, and other fittings must pass through the test plant successfully before they can be accepted in the stores. Component parts for ammonia compressors have to pass a hydraulic test of 600 lb. per sq. in., followed by an air pressure test carried out under water at a pressure of 400 lb. per sq. in. In the case of components and fittings to be used in carbon dioxide compressors the test pressures are considerably higher, the hydraulic test being carried out at 3,000 lb., and the air test at 1,500 lb. per sq. in.

For the purpose of the tests several water tanks sunk in the floor of the shop are provided, some of which measure 20 ft. long by 7 ft. wide and 10 ft. deep. There is also a brine tank, which measures 30 ft. by 4 ft. by 5 ft. deep, and is used in carrying out tests on completely assembled installations. After the parts have passed the hydraulic test they are subjected to a careful visual inspection, and if they pass this successfully they go into the stores, where they remain until required in the assembly shop.

One of the more spectacular processes carried out at these works is that of sand-blasting castings. The process consists in projecting particles of sand on to the casting at high velocity from the nozzle of a machine, by means of compressed air. The operation is carried out in an enclosed chamber, and the operator wears a special helmet through which he is provided with fresh air from

outside the chamber. The abrasive action of the sand cleanses and smooths the surface of the metal and prepares it for a finishing process known as metallisation.

In this process the surface of the casting is bombarded with a shower of molten metal in the form of a fine spray, which is generated and carried by compressed air. A special appliance similar to an ordinary paint-spraying pistol is employed for the work, and through it a wire of the metal or alloy to be sprayed on the casting is fed at a steady speed. Inside the pistol there is a small air-driven motor that feeds the wire by means of rollers, the rate of feed being automatic and constant. The wire is fed into the flame of an oxygen coal gas blowpipe, and as it melts a jet of compressed air breaks it up into very tiny particles, which are driven forward at the rate of 3,000 ft. a second, and impinge with considerable force on the surface of the metal. The process produces a very fine permanent finish, and is most fascinating to watch in operation.



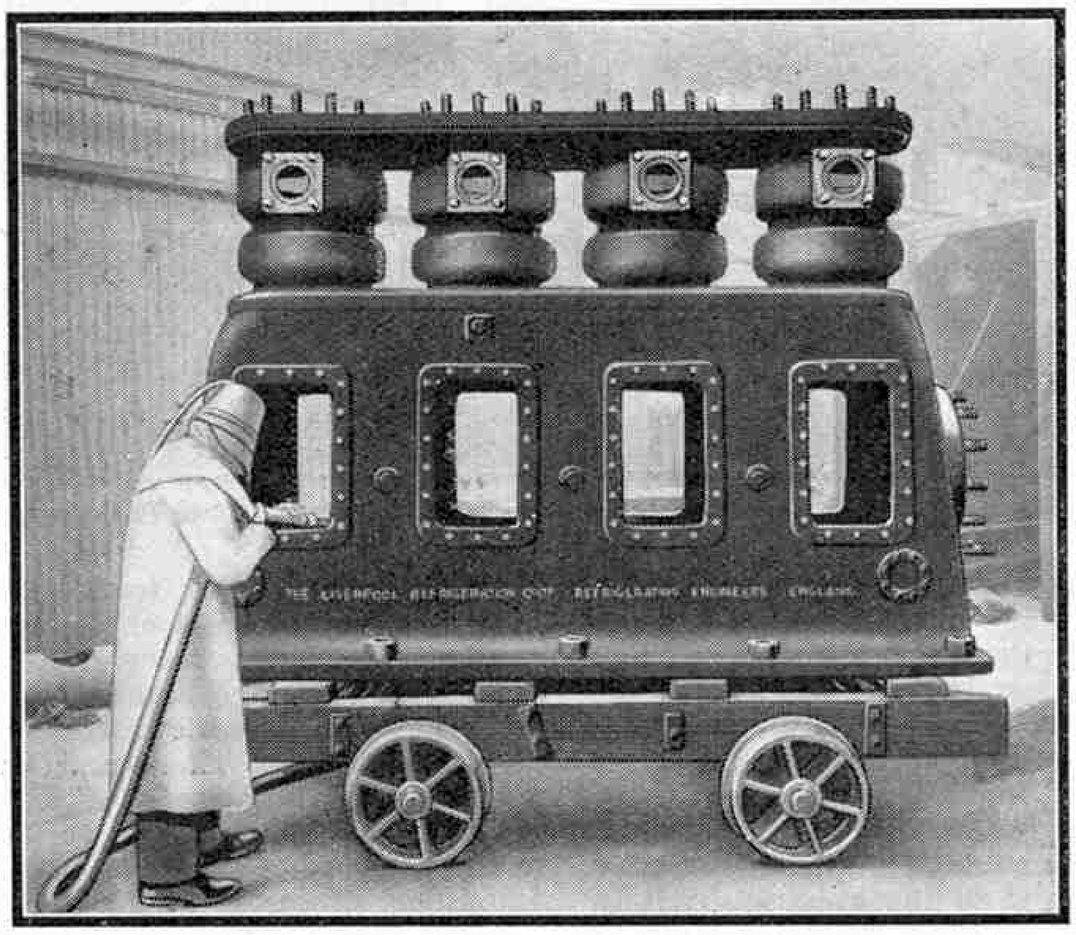
One of the most interesting departments at the "Polar" Works is the galvanising shop, of which a section is shown here. Two of the huge spelter tanks referred to on this page appear in the illustration.

In the construction of a complete refrigeration system a great amount of intricate coiled pipe work is involved, particularly in the making of condensers and cooling grids. At the "Polar" Works coiled and hairpin tube constructions of all kinds are built up, and one of the three main bays is given over entirely to work of this type. The building is equipped with tube coiling and bending machines that operate under oil pressure, acetylene and electric welding plants, gas furnaces, and hydraulic machines that can punch holes in $\frac{1}{2}$ in. mild steel almost as easily as if it were paper.

In order to build up a complete cooling grid, long lengths of straight steel tube are bent into the form of a U, which is gauged to ensure that the legs are parallel. The butt ends of the tubes are then placed in juxtaposition in a special vice and slowly welded together by means of electricity. Acetylene welding is employed for very delicate operations, as it enables the operator to exercise a greater degree of control over the process than is possible with electric welding. The vices in which the tubes are held during welding are fitted with water-cooled jaws, and are capable of accommodating steel tubes up to $3\frac{1}{2}$ in. diameter. Most of the machines in the coiling shop have been specially designed by the engineers of the company, and are capable of coiling iron pipes up to 6 in. diameter in the cold state.

In order to protect the pipe structures from rust and other chemical action when in use, they are galvanised by dipping in molten spelter. A typical scene in the galvanising department is shown on this page. The most conspicuous object in the building is a large tank sunk into the floor. This tank is about 30 ft. in length, 8 ft. in width and 5 ft. deep, and it holds approximately 120 tons of spelter. It is made of special heat-resisting bricks, and is heated from below by means of a pulverised fuel plant. Travelling gantry cranes are provided for handling the pipes during the galvanising process.

The parts to be galvanised are first "pickled" in a bath of hydrochloric acid, and are then hoisted by a crane and carried over the galvanising tank. Then, very slowly, the crane hook is lowered so that the pipes dip into the molten spelter and gradually become completely submerged. This is a highly dangerous operation and has to be carried out with the greatest care, for as the cold pipes gradually sink in the liquid metal, showers of molten spelter are thrown up from the tank. All the workmen take good care therefore to stand well clear when the foreman gives the signal for the operation to commence. After a few minutes the crane hook is raised and the pipes are withdrawn from the spelter, and as they are hoisted out of the tank workmen throw in handfuls of ammonium chloride, which sends up a cloud of thick white vapour that envelops the pipes and acts very much like the flux used in soldering. In addition to the main tank there are several similar but smaller tanks, so that metallic parts weighing from half-a-pound to several tons in weight can be treated.



An operator sand-blasting the interior of a large compressor case casting.

Land refrigerating installations and ice-making machinery built at the "Polar" Works are in use in practically every country, including China, Japan, India and the United States. Among important ship equipments supplied by the firm are installations of 560,000 cu. ft., insulated capacity on the "*Highland Monarch*" and other vessels of the Nelson Line, and installations of 440,000 cu. ft. insulated capacity on the "*Almeda Star*," "*Arandora Star*" and "*Andalucia Star*." The firm also built most of the refrigerating machinery in the ships of the Cunard Line.

The Grey Squirrel

An Invader From North America

By J. D. U. Ward

DURING 1934 the number of American grey squirrels in Great Britain increased substantially and the creatures spread to places where previously they were unknown. Unless measures are taken for their control there is a serious danger that eventually they will colonise the greater part of the country, to the detriment of agriculture and fruit growing; and the Ministry of Agriculture and Fisheries have expressed the hope that every effort will be made to encourage their destruction, and particularly to prevent them from spreading into districts that hitherto have been free from them. A similar warning was issued in 1931, but in that year the grey squirrel population in England and Wales was greatly reduced by an epidemic disease, and remained comparatively low during 1932 and 1933. Last year the creatures recovered from the check they had received, however, and again threaten to overrun the country.

Grey squirrels are aliens that reached this country comparatively recently. A few were introduced from North America, their native place, about a century ago, but it was not until 1889 and 1890, when many more were imported and liberated in Bedfordshire, Dumbartonshire and elsewhere, that they began to increase in numbers and to spread rapidly. Their ranks were strengthened as the result of more liberations in 1905, the newcomers being welcomed generally as charming and harmless additions to our animal life; and by 1925 they had become far more numerous in many places than our native red squirrels, which they had attacked and killed.

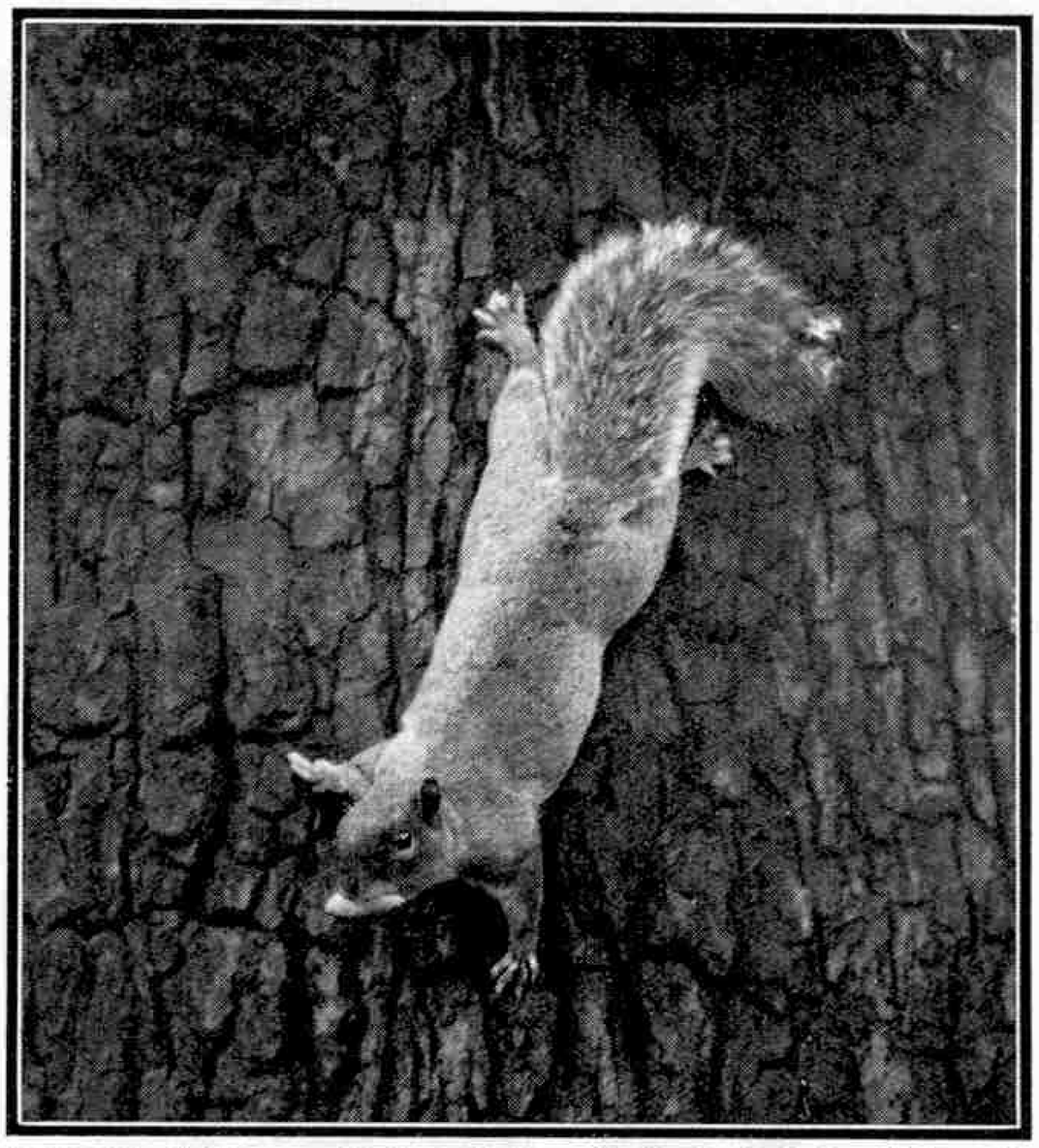
Although the alien squirrel has driven out the red native in certain parts of the country, this has not been the case elsewhere, and there are places where the two live together, apparently on fairly friendly terms. In thick woods where pine trees, firs and other evergreens predominate, the red squirrel is not seriously challenged by its rival, which prefers more open country or woodlands in which flourish deciduous trees such as the beech and the oak.

The grey squirrel is a little larger than the red squirrel, and has rat-like ears in place of the long ear tufts of the latter. The invader is much bolder than the native animal, and has made itself at home in suburbs and parks where the red squirrel rarely if ever ventures. There it is often fed and encouraged by people who find its antics amusing, and do not realise its capacity for destruction. This artificial feeding occasionally appears to have good results, however, for when several of the grey squirrels in Regents Park, London, died, it was reported that the cause of death had been found to be too much chocolate!

Grey squirrels are born blind and without fur, in litters of from three to six, in large untidy nests, or dreys as they are called, built high in the trees.

The pests inflict serious damage on various trees. They steal the eggs of song and game birds, have proved themselves able to catch and kill adult wild birds, and certainly have stolen small chickens from faulty runs. Many kinds of human foods also are attacked by grey squirrels, which devour wheat set up in stocks to dry in the fields, and eat nearly every kind of cultivated fruit and nut. They show a great liking for the buds of fruit trees and flowers; in London even window boxes have been raided, and there is at least one record of a grey squirrel entering a bedroom and tearing the pillow cases and sheets, apparently in sheer destructiveness.

The injury to fruit caused by the grey squirrels is of a particularly exasperating kind. The animals do not merely devour sufficient to satisfy their appetites, but spoil far more than they eat. For instance, a grey squirrel will take one small bite out of each of a score of strawberries. If on a marauding expedition he becomes entangled in the nets that cover the growing fruit, those who try to seize him must be careful, for he can inflict nasty wounds on their fingers with his sharp teeth. Cultivated nuts usually are stolen long before they are ripe enough to be of use to human beings. Apples and pears are spoiled rather than eaten, for the pips appear to be more attractive than the flesh of the fruit, and this applies also to plums and cherries, the stones of which often are cracked for the sake of their kernels.



A grey squirrel with a peanut in its mouth descending the trunk of a tree. Photograph by J. H. Vickers, Headington.

Although grey squirrels are more active than red squirrels during the winter, in the autumn they collect much greater stores of food, most of which is wasted, for they seldom remember to devour it. They usually bury their hoards in the ground, and the grey squirrels in Regents Park often industriously hide most of the nuts given them by visitors, only to leave their treasures to decay. Chestnuts are a favourite food for storage, but in one case maize somehow had been obtained and it was found that the germ of every single grain had been bitten through, as if to prevent it from sprouting in the moist soil. It may be added that our own British red squirrel hibernates to a less extent than most people suppose, and grey squirrels only become dormant for a very short period during weather of exceptional severity.

One fact in connection with grey squirrels that is not sufficiently stressed is that they are excellent to eat. Each weighs about 1½ lb., and their flesh is white and similar to that of young rabbits, or even superior. They can be cooked in many different ways and are always delicious. This is recognised in North America, where grey squirrel is a common and highly appreciated dish.

Since the coming of the destructive grey squirrel it has become the fashion to think and write of red squirrels as pretty little innocents, threatened with extermination by an unpleasant invader. Unfortunately this view will not stand critical examination. Red squirrels often cause grave damage by eating the young shoots of trees and removing bark from their trunks, and to a lesser extent are guilty of robbing birds' nests. They are essentially countrymen, however, and their record is mild in comparison with the list of the crimes of grey squirrels. They have even good deeds to their credit, for many an English oak has grown from an acorn stored away by a squirrel and left unheeded, to sprout and grow into a large tree.

Some of the squirrels in other parts of the world are much larger than either our own English red squirrel or the American grey squirrel. For instance, the Indian giant squirrel is no less than a foot long and his heavy bushy tail sometimes is twice this length. The woolly flying squirrel is even larger, its body usually being about 6 in. longer than that of the Indian giant squirrel. On the other hand there is a pygmy squirrel that is only about 3 in. long.

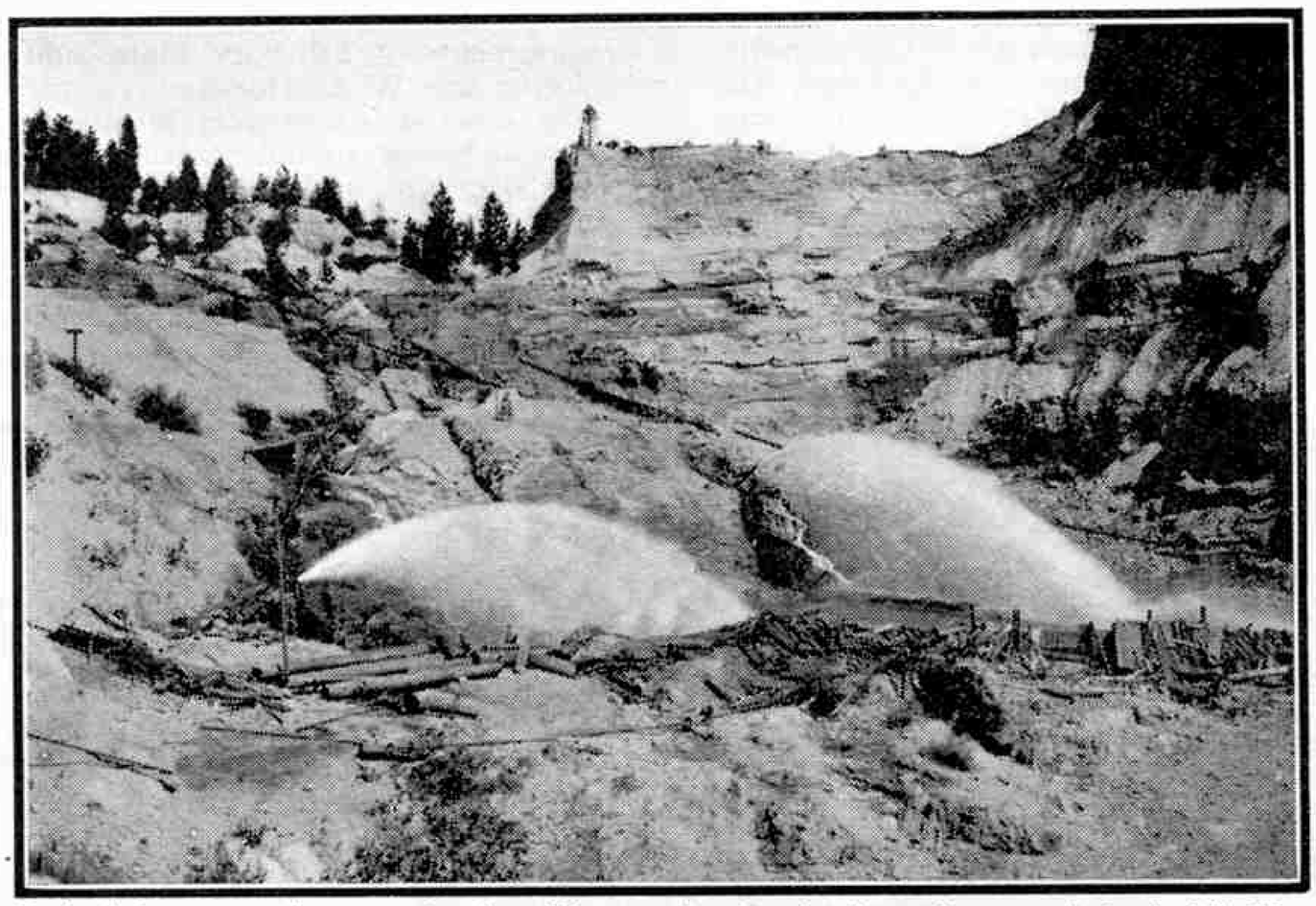
Renewing the Gold Rush Days

Early Chapters of Earth History

By Dr. Ralph W. Chaney

CONDITIONS that cause factories to stand idle in many parts of the world, and which result in widespread unemployment, are themselves responsible for the opening in California of gold mines that have been deserted for decades. With the opening of the mines there are uncovered not only the nuggets and dust of precious yellow metal, but ledges of rock containing fossil leaves, fruits, and wood—less valuable in the markets of the world, but of incalculable significance to the students of the Earth's history.

When gold was discovered in California in 1849, the foothills east of the Sierra Nevada became the objective of the pioneer band that made fortunes and romance, and laid the foundations for the development of this westernmost unit of the United States. Hither came men from all parts of America, and the names they gave to their "diggings" reflect the localities from which they came—Iowa Hill, Michigan Bluff, Philadelphia, and Chicago Park. The names of some of the Forty-niners have been immortalised at Sutter Creek, Webber Hill, and Yankee Jim.



During last year more than a quarter of a million cu. yds. of sand and gravel were washed out of the You Bet diggings by spouting streams of water under enormous pressure. The illustrations on this page are reproduced by courtesy of the Carnegie Institution of Washington.

Certain episodes and conditions of the frontier are also reflected in such names as Brandy City, Hangtown, Poverty Hill, and Independence Hill. An area in Nevada County, 10 miles east of the present city of Grass Valley, came to be known as You Bet, and its neighbouring gold camp was called Red Dog.

Fortunes were made—and lost—during these early days when by crude mining methods the yellow metal was readily washed from the gravels bordering the Sierra Nevada. Then followed more pretentious mining known as hydraulicking; by the use of huge, spouting streams of water the sands and gravels were washed away, leaving behind fragments of gold.

When the white man had taken all he could from these diggings, the Chinese, who were always awaiting their chance, took over the task of squeezing from the earth the last of the golden grist. As recently as 1908, there was recovered three quarters of a million dollars in gold by Chinese miners almost at the centre of the diggings at You Bet. The place is still called Tai Flat in honour of the Chinese foreman under whose direction it was mined, after the white miners had decided that all of the gold had been removed.

During these later years, the low price of gold has made it unprofitable to carry on extensive mining operations. Tom Brady has continued to remain as custodian of the properties of the You Bet Mining Company, but the question must have arisen many times before him, and before the many others were left behind in these hills after the flood of the gold boom had ebbed, as to whether there would ever again arise the tented cities of the miners, and whether great streams of water would cut once more into the gravel cliffs, seeking the yellow fragments that Man has always valued.

Then came a change in gold values as a direct result of unsettled money conditions throughout the world. From $22.67 an ounce, the price of gold shot up to $37—almost overnight. Again it became profitable to work the California placer mines, and to-day they are filled with men, with streams of water, with excitement. Another gold rush is under way.

During the early days of mining at You Bet, and at many other diggings in California, large pieces of petrified wood were uncovered in the gravels. So numerous were these that they were stacked in great piles; Tom Brady's house has its foundation built of them. Annoyance the miners may have felt at having to move this petrified wood, some pieces of which weigh many tons, was more than balanced by the fact that around these fossil trees the gravel was exceptionally rich in gold. Washed along the channels of ancient streams and deposited as drift wood, these tree trunks formed catchment basins where fragments of gold were lodged. Without realising that they were contributing to science, the Forty-niners became collectors of fossil plants—involuntary palæobotanists.

This photograph shows a leaf of Aralia (Devil's Club) discovered; one of the most common trees of the California fossil forest. Living specimens exist in the warmer parts of America.

During the long ages since drift-wood and gold were deposited together along the west front of the Sierras, the gravels and sands have been compacted into rock, and the tree trunks have been turned to stone. Here and there, where fine sediments were deposited, leaves and seeds were buried, and their impressions have been left—printed into the record of history—a chapter written before Man came to live upon the Earth.

In the early days of mining activity, fossil plants were collected near You Bet, from the high ridge of gravels and clays known as Chalk Bluffs; these have been studied by palæobotanists, and important conclusions have been reached. With the closing of the mines, discoveries of fossils became less frequent, and for many years there has been no addition to our knowledge of the ancient forests of this part of California. With the revival of mining activity, new fossil-bearing layers have been discovered by the miners, and by Harry D. MacGinitie who is studying the history of plant life at the University of California. (*Continued on page 500*)

Westward Ho! to Cornwall

A Run with the "*Cornish Riviera Express*"

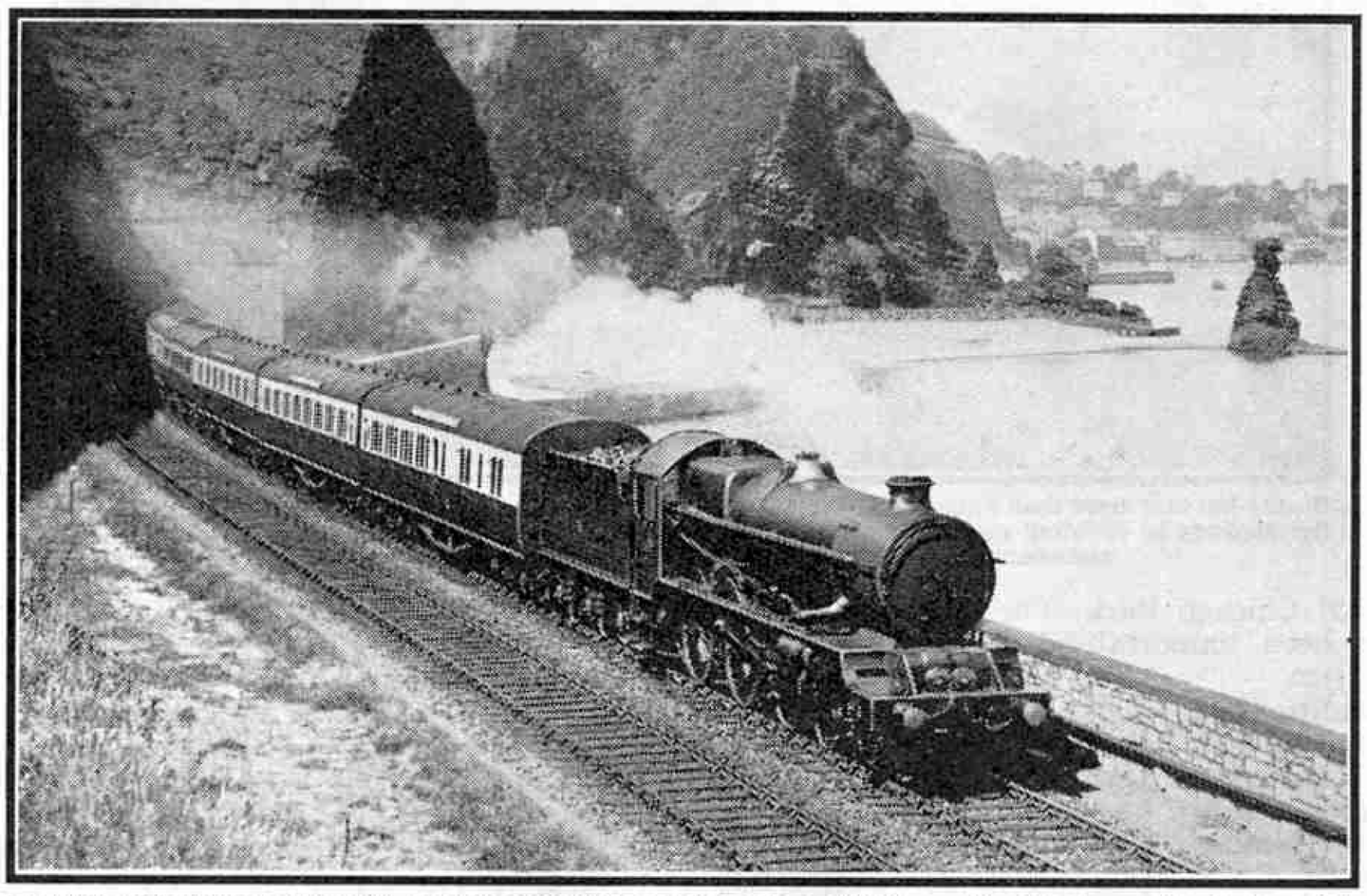
By a Railway Engineer

THIS famous train needs no introduction to "*M.M.*" readers. In recent years successive accelerations have gradually increased the effort demanded from the locomotives until, at the present time, the London-Exeter run of 173½ miles in 170 minutes is the fastest schedule in Great Britain over so long a distance.

I travelled down to Penzance on a busy Saturday in early Spring, and the locomotive work was throughout of the very first class. The train normally carries two slip portions; one is detached at Westbury and serves the Weymouth line, while the second consists of through carriages for Minehead and Ilfracombe and is slipped at Taunton. On this occasion, however, the train was divided, the first part carrying coaches for Exeter and beyond, and the second consisting of the Westbury and Taunton slip portions. The first part was made up to 12 coaches, a gross load of 440 tons behind the tender, and hauled by engine No. 6016, "*King Edward V*," in charge of Driver Emery of Laira shed, Plymouth.

The Great Western route to the West is the only main line out of London that does not involve some hard climbing in the first 30 miles. As far as Reading the Thames Valley is followed, and to this point the line is dead level.

The start was most brilliant. At Ealing, 5¾ miles out, the speed was already a mile a minute; 10 miles out we were doing 70, and by Slough the pace had risen to a steady 75 m.p.h., on the dead level! There was a fine view of Windsor Castle away to the south just after passing Slough, and a few minutes later a glimpse of a charming reach of the river as we swept across Maidenhead bridge. In the meantime "*King Edward V*" was simply eating up the miles. Twyford, 31 miles, was passed in 30¼ minutes, and soon we were easing up for the junctions at Reading, which station, 36 miles, was passed in 35½ minutes at 45 m.p.h.



The "Cornish Riviera Express" on the sea wall between Dawlish and Teignmouth. The locomotive is No. 6018, "King Henry VI." This and the upper photograph on the next page are reproduced by courtesy of the G.W.R.

The line now follows the Kennet Valley, and from Southcote Junction, two miles beyond Reading, there is a continuous rise for 32 miles. For the first 29 of these the slope is only gradual, averaging about 1 in 500, but the final pull up to Savernake summit is quite steep, at 1 in 180, and 1 in 140 for the last ¾ mile. The complete climb from Southcote Junction, 32.2 miles, was run in the fast time of 30¼ minutes; up the easier length speed was maintained throughout at 64 to 68 m.p.h., and it was only right at the summit that speed fell to 53. Thus Savernake, 70 miles from Paddington, was passed in 68 minutes.

So far the engine had been driven with full open regulator and a very early cut-off, mostly about 17 per cent. and never more than 20. But now, for the descent to Westbury, the main regulator was closed altogether. To enable them to run freely under light steaming conditions, Great Western engines are fitted with an auxiliary regulator called a jockey valve. Even when this is full open the merest breath of steam is being used, but in conjunction with a cut-off of about 15 per cent. it is sufficient to produce some high speeds downhill. We flew through Pewsey, only five miles beyond Savernake, at 75 m.p.h.; kept up 71 to 74 over the slight rises and falls on to Patney; and then on the 1 in 222 descent to Lavington speed rose to a sustained 77½ m.p.h.—and with hardly any steam on!

This stretch leads through some fascinating country. To the north of the line are the rolling ridges of the Marlborough Downs; there is a spirited White Horse cut in the chalk near Pewsey; while beyond Patney, away to the north-west, is the striking bluff of Roundway Down, scene of a Royalist victory in the Civil War. For a considerable distance the line is running under the northern escarpments of Salisbury Plain, and on Bratton Down there is another fine White Horse.

By now we are nearing Westbury. Through this junction and again at Frome, six miles farther on, the main line is sharply curved and 30 m.p.h. slacks are in force; but two years ago "avoiding lines" were opened by which non-stopping trains could take a straight, well-aligned course skirting these two towns, and thus avoid having to slow down. We passed Heywood Road Junction, the beginning of the Westbury avoiding line and 94½ miles from Paddington, in the remarkable time of 88¾ minutes. The rising grades to Brewham summit were mounted at a minimum of 45 m.p.h., and then time was so well in hand that on the steep descent to Castle Cary the driver shut off steam altogether, not even using the jockey valve. Yet we ran down this 1 in 100 bank at a steady 65 m.p.h. and passed Castle Cary, 115 miles, in 111¾ minutes.

Here the Weymouth line goes off and the main route strikes due west across Somersetshire. Just beyond Castle Cary there is a glimpse of Glastonbury Tor with its tiny ruined chapel on the summit.

The jockey valve was now opened again and on the generally favourable grades we romped along in fine style. Before Somerton we were doing 69 m.p.h., the two mile rise at 1 in 264 to Long Sutton tunnel did not bring speed below 62, and a moment later we were sweeping down to the Athelney marshes at 76 m.p.h. Much of this low-lying country was under water, but Athelney church, built on the very top of an isolated conical hill, stood out as a striking landmark. So we came to Cogload Junction where the old main line, via Bristol, is rejoined; this point, 138 miles from Paddington, was passed in 132¼ minutes, at 66 m.p.h.

Now comes the stiffest bit of running between London and Exeter, the climb over the Blackdown Hills. For the first seven miles the rise is very gradual, but beyond Norton Fitzwarren it gradually steepens until the final three miles average 1 in 90. At Cogload the driver changed from the jockey valve to full regulator and we accelerated rapidly to 69 at Creech Junction; Taunton, 142¾, was passed in the splendid time of 136½ minutes, and at Norton Fitzwarren, two miles farther on, speed was still as high as 66 m.p.h. At Wellington, where the 1 in 90 begins, speed was 55 m.p.h., but after that the pace fell off rapidly and we breasted Whiteball summit at 30 m.p.h. The complete climb of 16 miles from Cogload had taken only 16¾ minutes—a remarkable piece of work.

We were so well on time that the 20-mile descent of the Exe Valley was taken under very easy steam. For miles on end we were coasting with no steam on at all, and with a maximum speed of 72 m.p.h. we reached Exeter, 173½ miles, in 168¾ minutes, 1¼ minutes early. Here the through carriage for Kingsbridge was detached, leaving a load of 376 tons empty and 405 tons full to be taken forward.

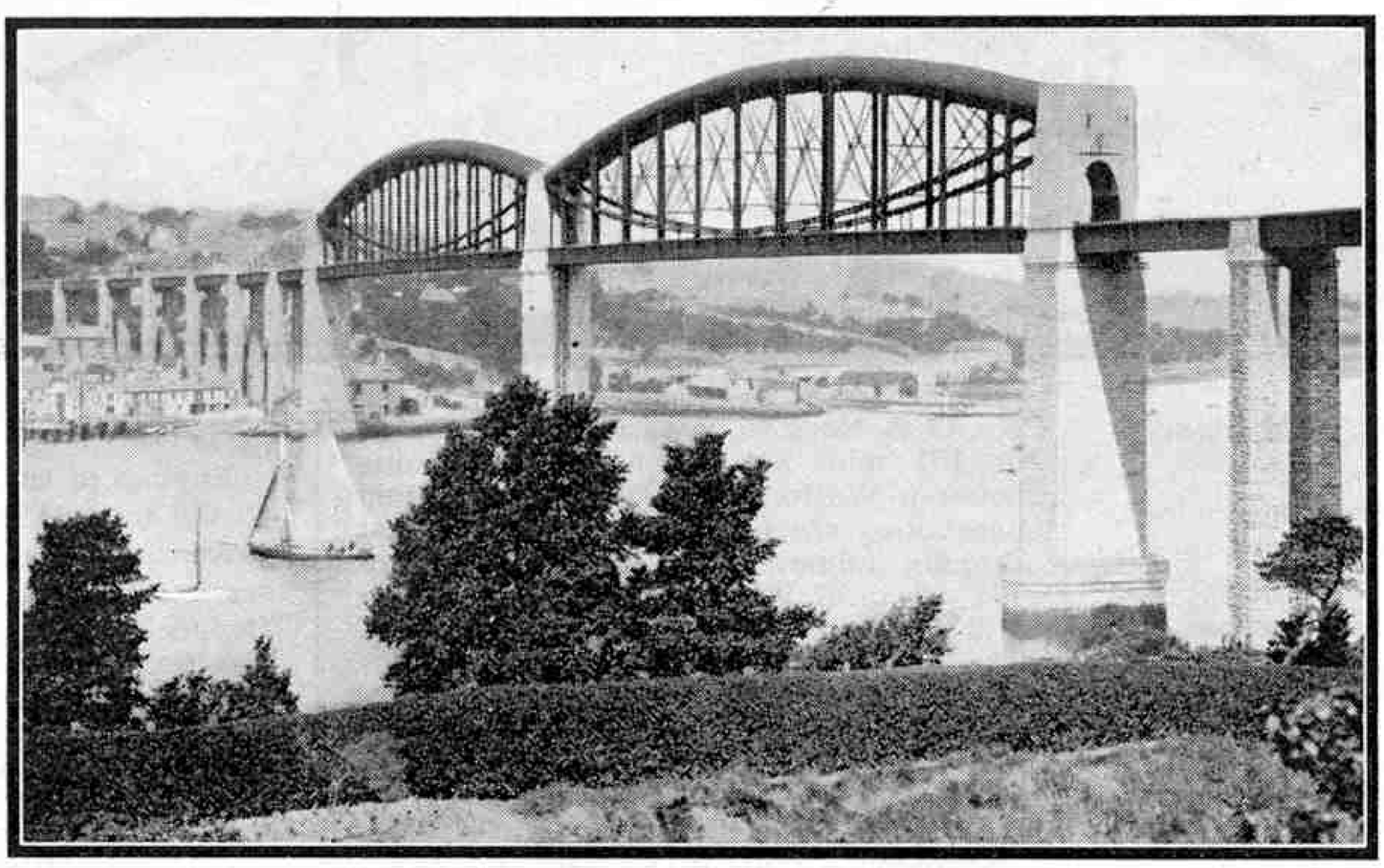
We got away in good style on the dead level, getting a fine view of Exeter Cathedral as the city was left behind, and speed was up to 65 at Exminster. Now the Exe had widened out into a shining estuary, the pace was eased a little round the Starcross curves, where the line is right on the water's edge, and across on the opposite shore lay Exmouth. Then we were through the sandhills of Dawlish Warren, and so on to one of the most delightful pieces of railway in Britain. From Dawlish to Teignmouth the line is carried right on the sea wall beneath lofty red cliffs whose exact colour is quaintly but most accurately described in the *"Ingoldsby Legends"*:

"It is certainly odd
that this part of
the coast
"While neighbouring
Dorset gleams
white as a ghost,
"Should look like
Anchovy Sauce
spread upon
toast."

Brilliant sunshine between showers and a wild tossing sea made the prospect an entrancing one. Along this winding stretch speed was kept at about 50 m.p.h., but after we passed Teignmouth and turned inland up the Teign Valley the pace was worked rapidly up to a mile a minute.

As we approached Newton Abbot the foothills of Dartmoor came into view, and the rugged granite outcrops of Hay Tor showed on the skyline. Excellent though the locomotive work had been up to this point, I was quite expecting the driver to stop at Newton for pilot assistance. Over the tremendous banks of the South Devon line even the "Kings" are not permitted to take more than 360 tons tare unaided; we had 376, only a slight excess it is true, but frequent rainstorms had made the rails slippery and there was a rough blustering wind. But as we approached the station a long imperious blast on the whistle clearly meant *"Stand back"*! We were going through to Plymouth unassisted!

We passed through Newton Abbot, 20¼ miles from Exeter, in 23¾ minutes, and then came some simply thrilling locomotive work. After a mile of level track comes the terrific Dainton bank, only three miles long, but for 2½ miles the grade averages 1 in 42! As we accelerated from the service slack the beat of the engine developed into a tremendous roar, speed rose rapidly to 48 m.p.h., and then came the climb. Among lovely wooded country the line winds about in serpentine fashion, and the sight of the engine rounding the curves was thrilling indeed with the exhaust shooting straight up fully 40 ft. in the air. With full regulator, cut-off was finally advanced to over 50 per cent., and we breasted the summit at 21 m.p.h. Down the equally steep fall to Totnes we coasted the whole way; the curves are so sharp that speed was never allowed to exceed 55 m.p.h. Then came the ascent of Rattery bank; this is not so steep as Dainton, but is much longer. Over the first 2¾ miles, from Totnes station to Tigley Box, the grade averages 1 in 50, but in the last two miles it eases to 1 in 90. Beyond Rattery climbing continues, but at such comparatively easy grades as 1 in 380, 1 in 243, and 1 in 117, through South Brent to Wrangaton summit.



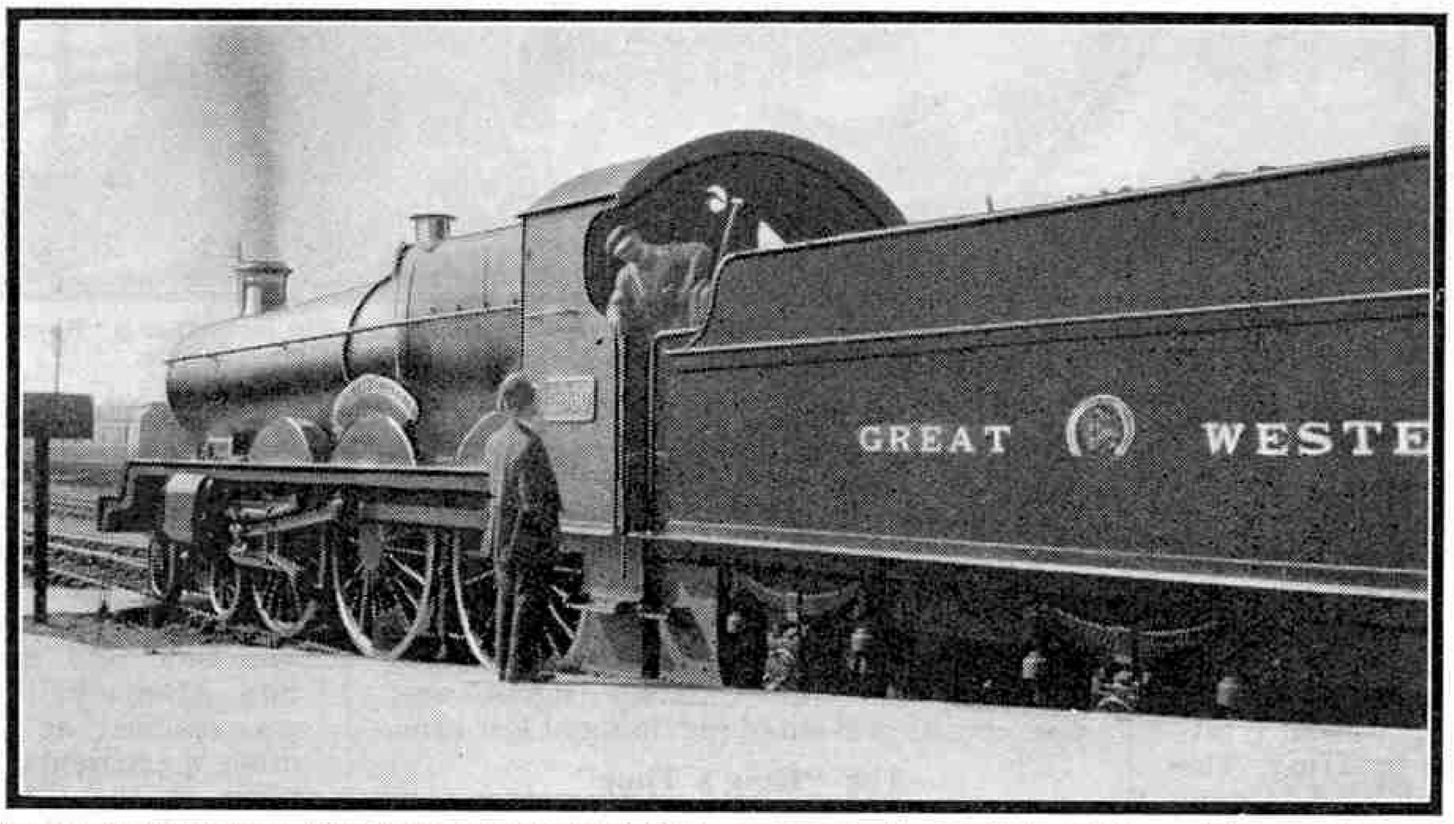
The remarkable Saltash Viaduct over the river Tamar, joining Devon with Cornwall. It was designed by the famous G.W.R. engineer Brunel and was completed in 1859.

At Brent the line is right on the fringe of Dartmoor, and wild lonely hills sweep down to the valley along which we are running.

Rattery bank was climbed in remarkable fashion. Passing Totnes at 53 m.p.h., speed fell to 23½ at Tigley. The engine was again going very hard, and we accelerated to 31 at Rattery Box, passed Brent at 50, and fell off to a minimum of 46 m.p.h. at Wrangaton. The nine miles from Totnes to the summit had taken only 14¾ minutes—an average speed of 37 m.p.h. From Wrangaton we ran down to Plymouth without steam for most of the way. There was a brief maximum of 72 m.p.h. before Plympton, signals were momentarily against us at Lipson Vale, but we reached Plymouth, 52 miles from Exeter, in 69½ minutes, 1½ minutes early. The 227½ miles from Paddington had taken 243½ minutes, including 5¼ minutes standing at Exeter; which gives a running average speed of 57 m.p.h.

Here we changed engines, No. 5028, *"Llantilio Castle,"* coming on for the run to Penzance, while the load was slightly increased to 410 tons. The Cornish main line is a constant succession of steep banks, none quite so severe as Dainton, but formidable enough with a load of 410 tons. Driver Watts of Penzance was in charge and he got some excellent work out of his engine.

We left Plymouth in a storm of wind and rain, touched 53 m.p.h. beyond Devonport, and then slowed up to 10 m.p.h. for the crossing of the famous Saltash Viaduct over the River Tamar. From this high elevation there was an interesting view down the river. A giant battleship and several smaller naval vessels were anchored off Devonport, while farther away, Plymouth Sound lost none of its charm through being only vaguely seen in the mist. So we passed into Cornwall, and once clear of the Saltash curves picked up speed rapidly. At Lynher viaduct we were doing 55½ m.p.h., and then came the climb to Doublebois. Beyond St. Germans the line rises at 1 in 68; here speed fell to 26. On two miles of level to Menheniot, No. 5028 picked up to 52 m.p.h., while the 1 in 74 past Treviddo was mounted at a minimum of 30 m.p.h. There is a sharp descent through Liskeard, but unfortunately a sharp curve too, so that speed was not allowed to exceed 52; and on the final 1 in 60 ascent the minimum speed was 28 m.p.h. Doublebois, 21 miles from Plymouth, was passed in 35½ minutes.



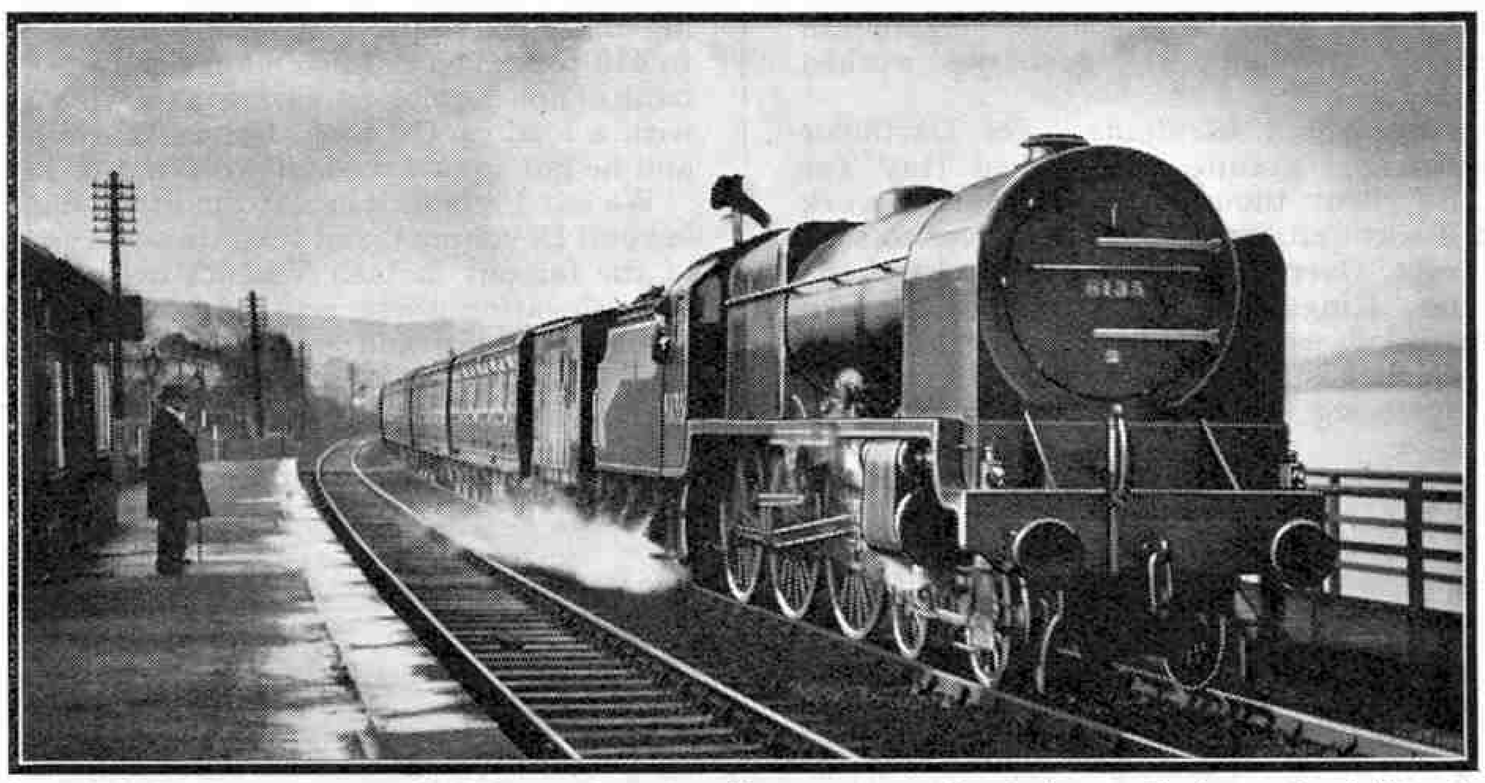
Waiting for the "Right Away"! G.W.R. No. 4060, "Princess Eugenie," a 4-cylinder 4-6-0, ready to leave Plymouth with the down "Cornish Riviera Express."

A very steep descent now follows to Lostwithiel, but high speed is out of the question on account of the curves. We never exceeded 54 m.p.h. After Lostwithiel comes a stiff two miles at 1 in 70 up to Treverrin tunnel; here speed fell to 26, and a few minutes later we reached Par, 34¾ miles in 54¾ minutes—a very hard run indeed. Here the Newquay through coach was detached, leaving a load of 375 tons to take forward. After a short easy length alongside Par harbour, a tremendous ascent follows, four miles continuously at 1 in 60. A maximum of 41 m.p.h. was attained in a little less than a mile and then speed steadily fell. The weather had cleared, and as we mounted there was a glorious view of

(*Continued on page 500*)

High-Speed Test Run with *"The Princess Royal"*

On the 27th June last a heavy-load, high-speed test run was made with the L.M.S.R. 4–6–2 locomotive No. 6200, *"The Princess Royal."* For this purpose the 5.25 p.m. from Liverpool to Euston, booked at an average speed of 64.5 m.p.h. from Crewe to Willesden Junction and the fastest train on the system, was made up to a load of 475 tons, the 15 vehicles including a dynamometer car. The 152.7 miles from Crewe to Willesden were covered in 129 min. 33 secs. start to stop, at an average speed of 70.7 m.p.h. Speeds of 80 m.p.h. or over were obtained at eight different points, the highest actually being 86.6 m.p.h. between Hemel Hempsted and King's Langley while 85.4 m.p.h. was obtained twice. The climbing too was exceptional. The 10.5 miles of adverse grades out of Crewe were covered in 12 min. 33 secs., the minimum on the 1 in 177 of Madeley Bank being 57.7 m.p.h. At Tring Summit 67.2 m.p.h. was recorded after running the 15 miles, mostly adverse, from Bletchley in 12 min. 33 secs.



An up L.M.S.R. express passing Old Colwyn, where the railway runs very close to the sea. The locomotive is "Royal Scot" No. 6135, "Lancashire Witch." Photograph by Mr. J. G. Muir of West Kirby, Cheshire.

Driver Smith and Fireman Pile of Camden were in charge of the engine, which had worked down to Liverpool earlier in the day and had not been specially prepared. It was driven with a full open regulator and with the cut-off in the neighbourhood of 15 to 18 per cent., except for 30 per cent. when climbing up to Whitmore, and 25 per cent. up to Tring. The arrival at Euston showed a gain of 14 min. on the scheduled time of 3 hrs. 20 min., with the observance of severe slacks at Stafford, Polesworth and Rugby, and a less severe slack at Norton Bridge.

On a previous test run on this train last year the same engine averaged 68 m.p.h. with 380 tons.

Good Work by "Royal Scots"

Performance by the "Royal Scot" engines of the L.M.S.R. is being maintained at a very high level. On one occasion recently No. 6142 *"Lion"* hauling 473 tons tare and 505 tons gross on the down *"Merseyside Express"* was timed by Mr. O. S. Nock to pass Crewe in 164 min., or 161 min. net, despite easy running between Watford and Bletchley to avoid overtaking the 6.0 p.m. down. Very fast running followed with a top speed of 77½ m.p.h. at Winsford Junction. Mossley Hill was reached in 198½ min. or 195½ net. The driver was F. Brooker of Camden.

A few days later the up *"Midday Scot"* was 12 min. late away from Carlisle, but with a tare load of 498 tons, 535 tons gross, no less than 7 minutes had been regained by Lancaster. The engine was No. 6126, *"Sanspareil"* with Driver Steele of Crewe, piloted up to Shap by No. 5640 of class "5X." Shap summit was reached in 39 min. 55 secs. After a halt of 2 minutes to detach the pilot No. 6126 passed Carnforth, 31.3 miles in 29 min.! 85 m.p.h. was reached twice on the descent. From Lancaster speed was gradually worked up to 72 m.p.h. on the dead level towards Preston, but unfortunately signal and p.w. checks prevented regaining of lost time.

The "King's Time"

An old established custom that is still carried out in connection with *"The Irish Mail"* is the handing of the "King's Time" to the Overseer of the Travelling Post Office. In 1837 a messenger from the Admiralty used to gallop into Euston Station and hand to the guard of the train a watch set to correct Greenwich time. At Holyhead the time was given to the Kingstown boat and then the watch was returned by the "Up Mail" to be readjusted. The procedure is still carried out and the watch is conveyed to Holyhead, where it is received by an official and then returned on the "Up Night Mail."

The S.R. "Schools" Class

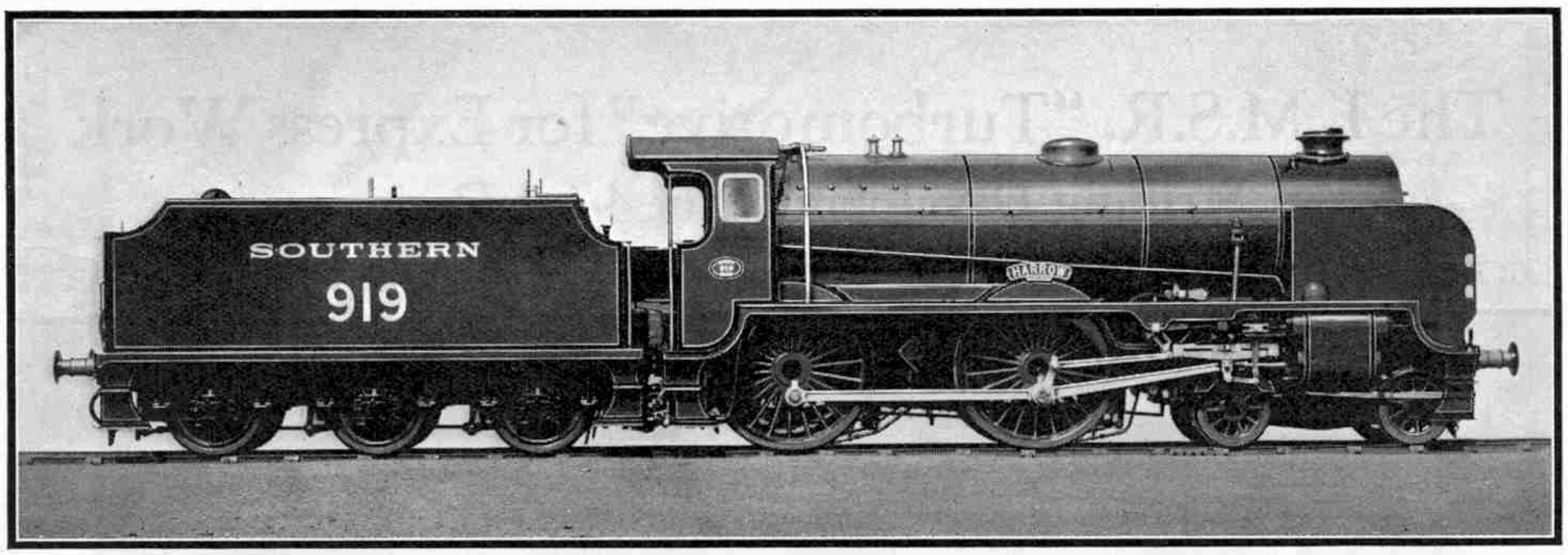
Engines of the "Schools" class continue to add to their laurels. On a recent trip to Dover and back on the 80 min. Folkestone service, No. 912, *"Downside,"* with Driver Ovenden of Ramsgate in charge in each direction, performed some remarkable work. On the down journey with a load of 415 tons severe checks in the suburban area resulted in a loss of 2¾ min. to New Cross. Following some good hill-climbing to Knockholt and smart running down to Tonbridge, with maximum speeds of 71 m.p.h. at Dunton Green and 77 below Hildenborough, the arrival at Folkestone was almost dead on time. The 34.4 miles from Paddock Wood to Shorncliffe were run at an average of 61.6 m.p.h., with the gradients against, rather than in favour of the engine.

On the return journey with 390 tons a remarkable start was made, speed rising to 52 m.p.h. at Westenhanger Summit. With a maximum speed of 75 m.p.h. at both Ashford and Headcorn an average of 71.1 m.p.h. was made over the 25.6 miles from Smeeth to Paddock Wood. Actually Tonbridge, 40.5 miles from the start, was passed in 39¾ min. or in less than "even time." The minimum on the 1 in 122 ascent to Sevenoaks tunnel was 37 m.p.h. With no higher speed than 72 m.p.h., and the rare experience of a clear road through the electrified area, Waterloo Junction, 69.1 miles, was reached in 75½ min. After a halt of 1¼ min., Charing Cross was reached as scheduled, in exactly 80 min., a particularly smart performance in view of the intermediate stop. We are indebted to Mr. O. S. Nock for these timings.

Eastleigh and Ashford Activities

Another of the former L.B.S.C. 4–6–4 tanks, No. 2327, has been converted at Eastleigh to a 4–6–0 tender engine and is now named *"Trevithick."* It was the first of the "Baltics" to appear and was built at Brighton Works in 1914, being then named *"Charles C. Macrae."*

Two further 2–6–4 goods tank locomotives of class "W," Nos. 1916 and 1917, have been put into service from Ashford Works.



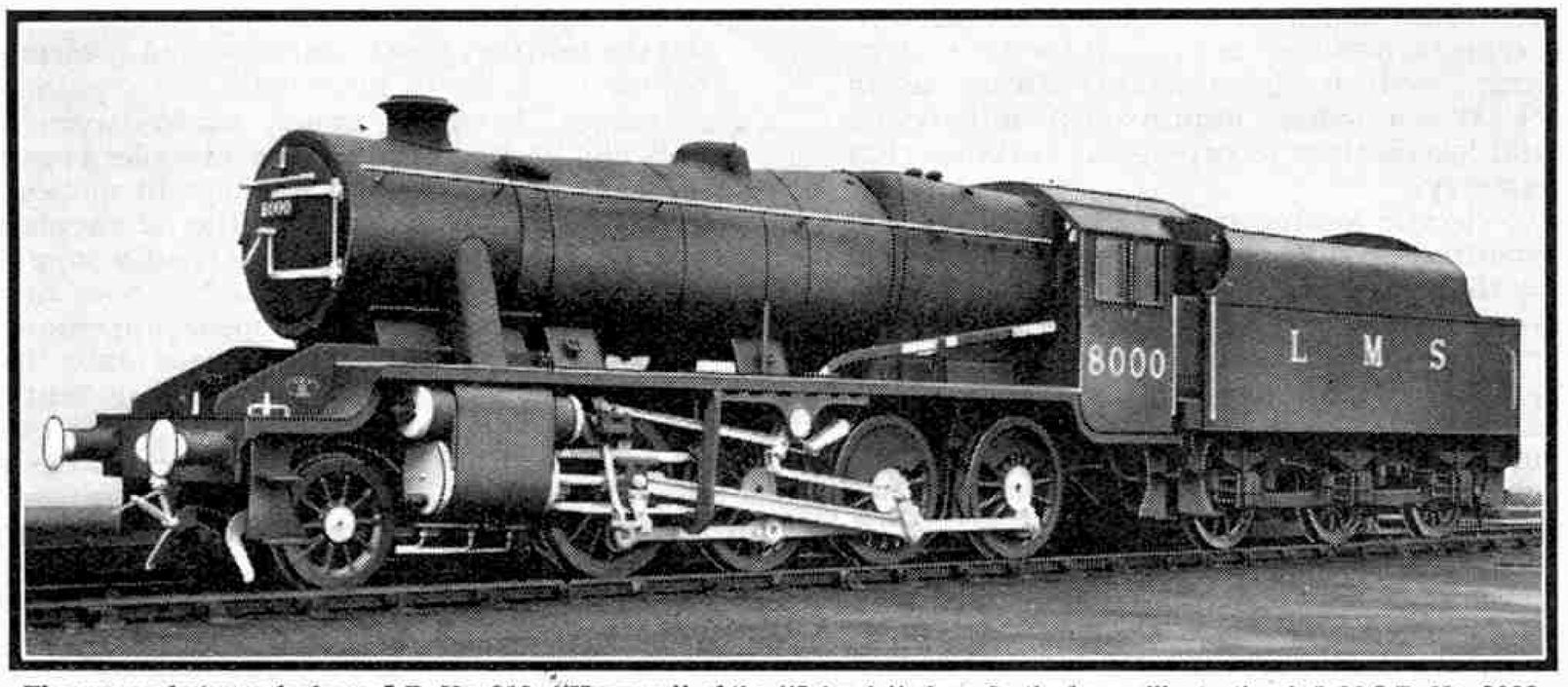
New L.M.S.R. Locomotives

The L.M.S.R. turbine-driven locomotive No. 6202, forming the third of the 4–6–2 "Princess Royal" class, has now been completed at Crewe Works. A photograph and description will be found on page 466 of this issue. No. 6203, *"Princess Margaret Rose,"* the first of the engines of the 4–6–2 class included in this year's programme, also is in traffic and others probably will be in service by the time this issue is published. Further 4–6–0 mixed traffic locomotives of class "5P5F" continue to be placed in service from outside builders.

The 2–8–0 heavy freight design of locomotive has now appeared from Crewe Works. The first of them is illustrated on this page, and was exhibited at Euston recently, together with No. 6202, the turbine locomotive. The new engines have been designed to be suitable for working over the whole of the L.M.S.R. main line freight routes, and they are numbered in series from 8000 to 8011. They have two outside cylinders, slightly inclined, 18½ in. in diameter and with a piston stroke of 28 in. The long-travel piston valves are operated by outside Walschaerts valve motion. In general the design and equipment are similar to those of previous Stanier productions.

The engines are designed to traverse curves with a radius of six chains or more at normal speed, but they can get round a 4½-chain curve when running dead slow. The leading wheels are 3 ft. 3½ in. in diameter and the eight coupled wheels are 4 ft. 8½ in. in diameter. The boiler with a tapered barrel and a total heating surface of 1,463 sq. ft. is pressed at 225 lb. per sq. in. and is relieved by two "pop" safety valves mounted on top of the fire-box. The superheater header in the smoke-box incorporates the main regulator, so that the dome-shaped cover on the boiler barrel simply houses the top-feed apparatus. The steam supply for auxiliary purposes is taken from a manifold, with a main shut-off valve, situated on top of the fire-box doorplate in the cab.

The cab is well laid out for the convenience of the enginemen and tip-up seats are fitted. On each side of the cab there are two sliding windows and outside there is a small glass windscreen projecting between them. There is a steam brake acting on all the coupled wheels of the locomotive and on the tender wheels. Sand pipes are fitted to the front of the leading coupled wheels and to the front and rear of the driving wheels. The sanding gear is controlled by three small steam cylinders.



The upper photograph shows S.R. No. 919, "Harrow," of the "Schools" class. In the lower illustration is L.M.S.R. No. 8000, a new standard 2-8-0 locomotive for heavy freight traffic. Photograph reproduced by courtesy of the L.M.S.R.

There is also a de-sanding apparatus to clean the rails automatically after the passage of the wheels in order to prevent interference with the track circuits.

The self-trimming tenders are of the latest L.M.S.R. high-sided pattern carrying 9 tons of coal and 4,000 gallons of water. Water pick-up apparatus is fitted. Each locomotive weighs 70 tons 10 cwt. in working order and has a tractive effort of 32,438 lb. The tenders weigh 54 tons 2 cwt. loaded, so that the total weight of engine and tender is 124 tons 12 cwt.

New Boilers for Great Eastern Engines

Two more of the "B12" class 4–6–0 locomotives of the former G.E.R., Nos. 8509 and 8556, have been provided with new and larger boilers. At Stratford further locomotives of the 4–4–0 "Claud Hamilton" class have been provided with new boilers with round-topped fire-boxes. The reboilering scheme has also been extended to include G.E.R. 0–6–0 engines of class J.13, and their appearance is considerably improved as a result.

New "Castle" Class Locomotives

The 10 locomotives of the "Castle" class constructed this year by the G.W.R. are Nos. 5033 to 5042 and are named as follows: *"Broughton Castle"; "Corfe Castle"; "Coity Castle"; "Lyonshall Castle"; "Monmouth Castle"; "Morlais Castle"; "Rhuddlan Castle"; "Stokesay Castle"; "Tiverton Castle";* and *"Winchester Castle."* Further 0–4–2 tank locomotives of the improved "48" class have been put into service. Old locomotives recently condemned include No. 3225, a 2–4–0 of the "Barnum" class, and No. 3321, *"Brasenose,"* of the 4–4–0 "Bulldog" class.

Pigeon Specials

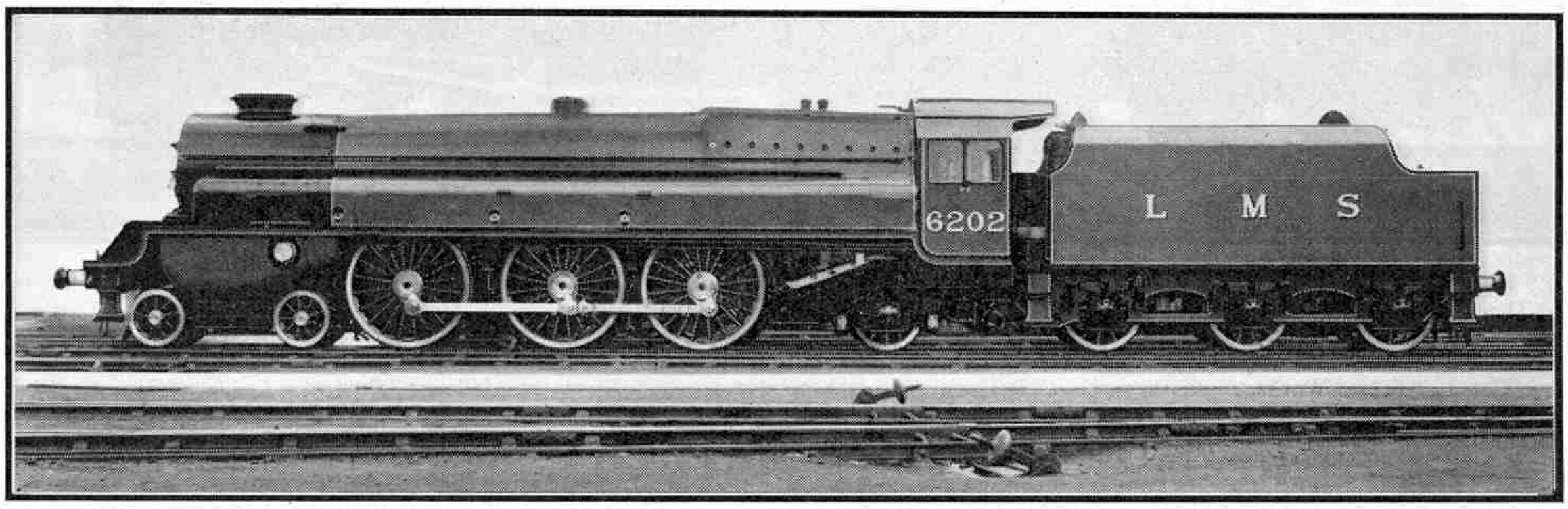
It has been estimated that between May and September more than 10,000,000 rail journeys will have been made by pigeons. Apart from baskets of birds conveyed by ordinary trains, special trains are provided exclusively for pigeon traffic in connection with the more important races. On these trains the birds are in charge of officials appointed by the racing organisations themselves, but where only a few are being carried railwaymen, many of whom are themselves expert pigeon fanciers, act as official starters. The pigeons are unloaded alongside the line and there released, the time of release being recorded. Care is taken that there is no risk of their colliding with telegraph wires.

G.W.R. Runs with "*Normandie*" Specials

After the record breaking Atlantic crossing from New York by the French Liner *"Normandie,"* the G.W.R. ran two specials from Plymouth to Paddington for passengers, their baggage and the mails. The first of these was hauled by No. 4094, *"Dynevor Castle,"* and reached Paddington in 3 hrs. 38 min., having run from Plymouth Docks, a distance of slightly more than 226 miles, at an average of 62.4 m.p.h. with a load of 247 tons. The second special completed the journey in 3 hrs. 56 min.

The L.M.S.R. "Turbomotive" for Express Work

Striking Development of 4-6-2 Design



The photograph above shows the L.M.S.R. 4-6-2 "Turbomotive" No. 6202, with its double chimney, turbine and control gear casings as prominent features. Its weight in working order, complete with tender, is 163 tons 13 cwt. Photograph by courtesy of the L.M.S.R.

L.M.S.R. No. 6202, the third engine of the 4–6–2 class, has made its appearance, and as foretold in the *"M.M."* it is turbine driven. In this respect it differs from the first two of the class, its turbine machinery and transmission replacing the cylinders of the other engines with their valves and pistons, valve gear and connecting rods. In other respects, however, in spite of its novel character, the engine conforms closely to the standards already set in recent L.M.S.R. practice. It is a definite improvement in looks on the previous experimental locomotives incorporating turbines that have been seen in this country.

An experimental turbo-electric locomotive was built in 1911 by the North British Locomotive Co. Ltd., and was tried on the then N.B.R. Another built by the same firm, the "Reid-Macleod" steam turbine locomotive, was exhibited at the British Empire Exhibition at Wembley. There were also the "Ramsay" turbo-electric locomotive built in 1921 by Sir W. G. Armstrong Whitworth and Co. Ltd., and the Beyer Peacock "Ljungström" turbo-condensing locomotive that worked some trips over the L.M.S.R. in 1927. All these engines, it will be noted, were products of locomotive building firms and not of the locomotive department of any of the railways. No. 6202 therefore creates a record as being the first turbine-driven locomotive in British practice to be introduced by a railway company.

In view of the proved capacity of the 4–6–2 "Princess Royal" engines with reciprocating motion, readers may wonder what is the object of incorporating turbine propulsion. Briefly the advantages claimed for turbine drive are the even torque, giving smooth starting and stopping, and the rapid acceleration. A reduction in maintenance in both engine and track should result from the absence of the vibration and "hammer blow" inseparable from engines incorporating the usual reciprocating motion. It is anticipated also that the turbine arrangement will realise a saving of fuel to the extent of 15 per cent.

In planning the turbine equipment it was decided, in view of the fact that this locomotive would be required to work through trains of 500 tons weight between Euston and Glasgow, that the turbine should be of 2,000 horse-power, non-condensing, and using steam at the same boiler pressure—250 lb. per sq. in.—as the existing 4–6–2s. Actually there are two separate turbines, one for forward and one for backward running, and occupying with the transmission the same place as the cylinders and motion, etc., of an ordinary locomotive. The turbines are of the Metropolitan-Vickers-Lysholm-Turbomotive type, and they were manufactured and fitted to the frames of the locomotive, sent to Trafford Park Works, Manchester, for the purpose, by the Metropolitan-Vickers Electrical Co. Ltd. The main motive power unit consists of a multi-stage turbine fitted on the left-hand side of the engine frame. Treble reduction gear transmits the drive and is completely enclosed in a fabricated gear case suspended from supports on the frames. The separate turbine for reverse running is situated on the right-hand side of the engine frame. There is a single additional reduction gear for reversing purposes. The turbines are shrouded in metal casings which, with the absence of the now usual outside cylinders and motion, tend to give the engine a mysterious appearance.

All the bearings for the turbines and transmission gears are lubricated mechanically by means of a geared pump at the rear end of the gear casing. A second pump, steam-driven, supplements the oil supply and passes it through an oil cooler between the frames at the front end. This pump can be kept in motion when the engine is standing, in order to maintain the oil circulation until the engine starts to move. The oil cooler incidently supplies the reason for the grid-like fitting under the smoke-box door that resembles a motor car radiator, and adds to the unusual appearance of this locomotive.

The steam supply to the turbines is taken through the main regulator valve, which is kept open all the time the engine is in motion; and then to the regulators or control valves on the steam nozzles of the two turbines. There are six nozzles on the forward turbine and three on the reverse, and these control valves are situated inside the casing above the running plates at the sides of the smoke-box. They are hand operated from the cab and are opened progressively in accelerating the turbines. The exhaust steam passes through the smoke-box and emerges from the double chimney in a continuous stream, so that the locomotive travels without the rhythmic puffing that is so marked a characteristic of the ordinary type of railway engine. The double chimney was made necessary in view of the modifications made in the smoke-box arrangements due to the low exhaust pressure.

The forward turbine is permanently connected to the locomotive drive, and when it is necessary to reverse the engine the steam supply to this turbine is cut off. A safety device ensures that reversing can only be effected when the locomotive is stationary. When the drive to the reverse turbine is engaged by means of a dog clutch, steam can then be admitted to the reverse turbine. As the forward one is permanently connected to the drive, it necessarily revolves backward when the engine is moving tender first. A steam feed to the forward turbine ensures its cooling under these conditions.

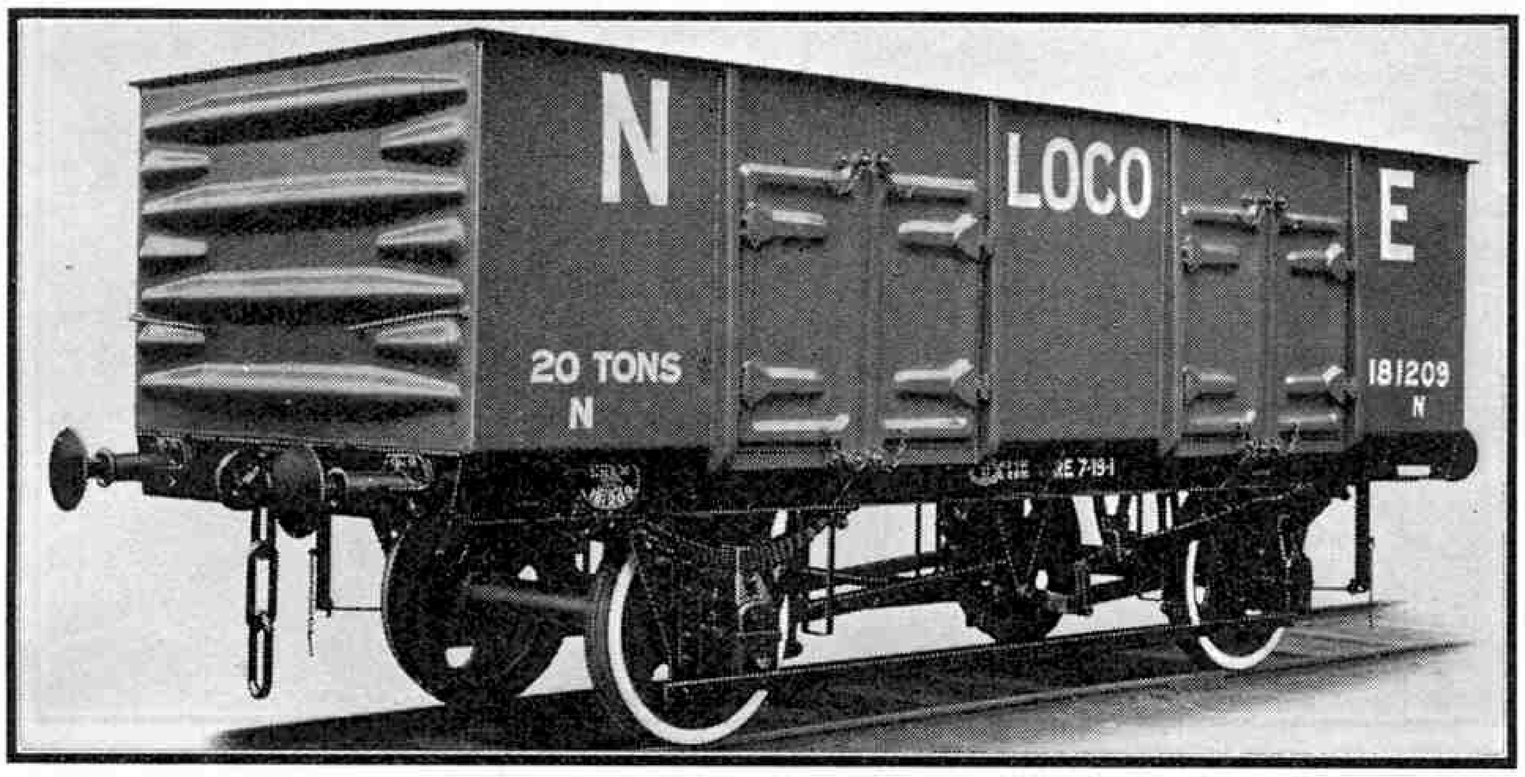
A special flexible drive is arranged between the final gear wheel and the leading driving axle and springs between the rim and the boss of the gear wheel protect the high-speed parts of the transmission from shocks. The design of the wheels and the running gear generally is similar to that of the existing standard 4–6–2s. A notable introduction, however, is that all the axle journals are provided with "Timken" roller bearings.

The boiler is of the tapered domeless pattern with top-feed as fitted to all Stanier engines. It works at a pressure of 250 lb. per sq. in. and is relieved by four "pop" safety valves. The Belpaire fire-box incorporates a new feature in that the inner fire-box projects into the boiler barrel to form a combustion chamber.

Welded Wagons for Coal Traffic

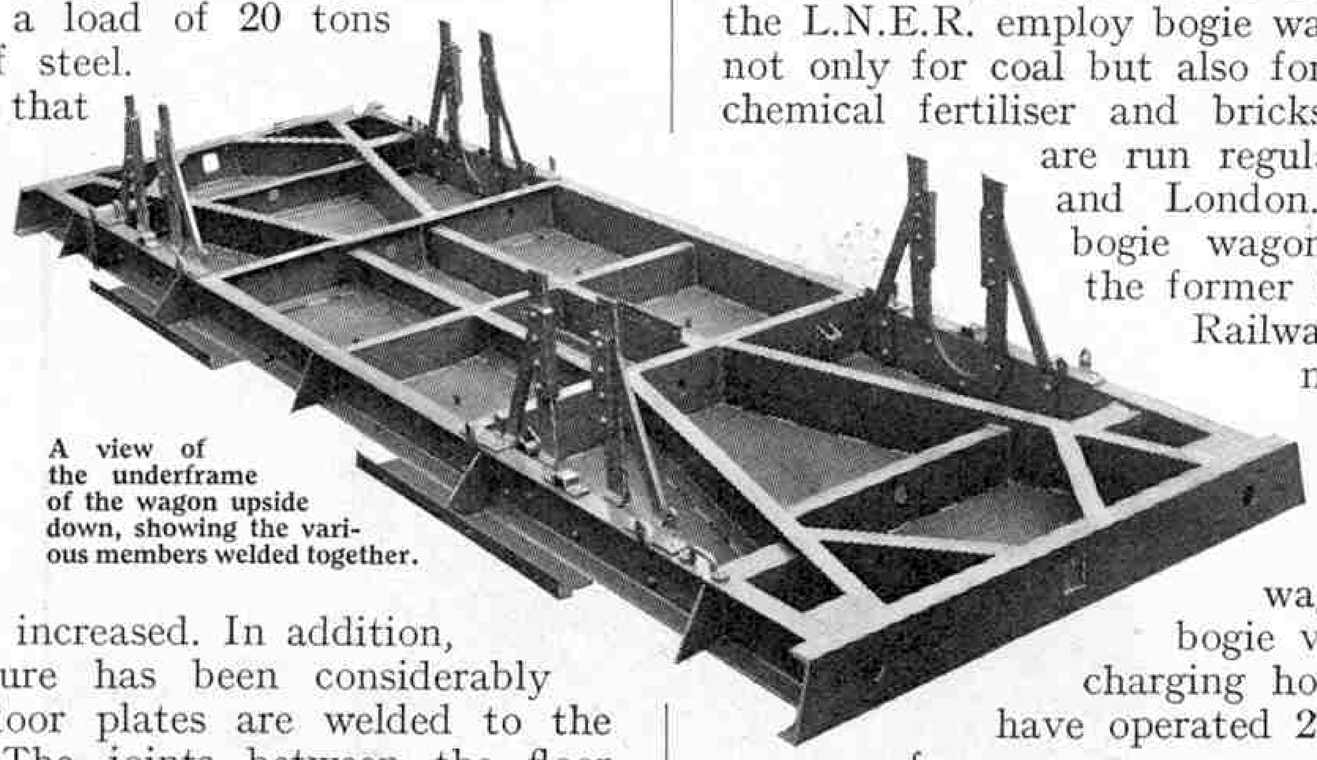
Interesting L.N.E.R. Development

DURING the course of a year the railways of Great Britain convey some 167,842,000 tons of coal, coke and patent fuel. Of this vast quantity nearly 14,000,000 tons are required for locomotive purposes, for railway steamships, and for railway hotels, works and offices. In order to carry the fuel required for their own purposes railways invariably employ wagons that are allocated to this duty alone. In the neighbourhood of coaling stages one often sees wagons used for carrying locomotive coal, prominently marked *"For Loco Coal Only," "Loco Coal,"* or perhaps merely *"Loco,"* in order to distinguish them from general traffic vehicles. The L.N.E.R. have recently added to their stock of such vehicles 100 locomotive coal wagons, built to the requirements of the Chief Mechanical Engineer, Mr. H. N. Gresley, by the Metropolitan-Cammel Carriage and Wagon Company Ltd. These are designed to carry a load of 20 tons each and are made of steel.



One of the new 20-ton steel coal wagons recently put into service by the L.N.E.R. Welding has been used extensively in their construction. Our illustrations are reproduced by courtesy of the L.N.E.R.

An interesting point is that welding has been extensively employed in the construction of these vehicles, only a few details being secured by rivets. This enables the tare or empty weight of the wagons to be reduced considerably, and also has the advantage that the cubic capacity of the body is increased. In addition, the underframe structure has been considerably strengthened, as the floor plates are welded to the underframe members. The joints between the floor plates themselves also are welded, so that water is prevented from passing through the floor of the wagon on to the underframe members and causing these to corrode. In order to prevent water from collecting in the body of the wagon drainage holes are provided in the floor, suitably spaced clear of the underframe members. The wagons run on four steel disc wheels and are provided with hand brakes that can be operated from either side.



A view of the underframe of the wagon upside down, showing the various members welded together.

The body sides, ends and floors are of steel, also the underframes on which the bodies are mounted. These underframes comply with the standard dimensions laid down by the Railway Clearing House. The running gear, buffing and draw gear also conform to these specifications and india-rubber springs are employed. Two pairs of vertically hinged doors are provided on each side. The height of the wagon sides is less than that of the standard 20-ton mineral wagon in order to permit of the vehicles passing colliery screens and coaling stages where clearances are restricted. This necessity for conforming with fixed plant is frequently overlooked by those who maintain that British 4-wheeled goods stock is obsolete, and that bogie wagons of high capacity should be used to reduce the proportion of non-paying load hauled by an engine.

The railways actually do employ high-capacity wagons where circumstances are favourable to their use. Thus the L.N.E.R. employ bogie wagons in various districts not only for coal but also for such special traffics as chemical fertiliser and bricks. Express brick trains are run regularly between Peterboro' and London. The L.M.S.R. employ bogie wagons for locomotive coal, the former Caledonian and Midland Railways having been prominent in their introduction. For the fuel required for the L.M.S.R. electric power station at Stonebridge Park, the wagons employed are special bogie vehicles of the side-discharging hopper type. The G.W.R. have operated 20-ton 4-wheeled wagons for some years, particularly in connection with the South Wales coal traffic; and there are high-capacity bogie wagons of various types also in use.

Actually the bogie high-capacity wagon is not by any means a new introduction in this country, for the former North Eastern Railway built a number of them more than 30 years ago. Wagons of 32 tons and 40 tons capacity were built, the latter being of patent double hopper design. Local difficulties prevented the adoption of these for general use, however, so in 1903 it was decided to adopt as standard the 20-ton four-wheeled type.

Facts about British Railways

Some Notable Records

FROM long familiarity we have come to regard railways as an accepted feature of our lives; but in spite of the interest we take in their locomotives, rolling stock and equipment, and in their performances and services generally, we are apt to overlook the extraordinary extent of railway activities as a whole. It is remarkable, indeed, to reflect that although they are private concerns, in that they are financed out of private capital as opposed to any state assistance, British Railways take first place among the public services in Great Britain. Actually the capital invested in railways, making them the largest private undertaking in the country, amounts to £1,091,938,000.

The "Brighton Belle" of the Southern Railway, the most famous train of the world's greatest suburban electric system. Photograph by courtesy of the Southern Railway.

British railways hold the proud record of being the world's safest form of transport, in spite of their tremendous volume of business. Last year 1,123,600,000 passengers were carried by rail, so that this safety record is in no way due to the infrequency of services. Rather is it due to the fact that the reliability and efficiency of their staff and equipment have always been maintained at a high level. The character of the railwayman himself also is a most important factor that is too often not appreciated.

British railways form the largest hotel group in the world. Above is the L.M.S.R. St. Pancras Hotel. Photograph by courtesy of the L.M.S.R.

The highest authentically recorded speed that has yet been attained by a steam locomotive in Great Britain is the 108 m.p.h. of the L.N.E.R. engine *"Papyrus"* during a run from Newcastle to King's Cross on 5th March last. Again, the fastest regular steam-operated service in Britain is that afforded by the G.W.R. *"Cheltenham Flyer,"* which makes a start-to-stop run at an average speed of 71.3 m.p.h. over the 77.25 miles from Swindon to Paddington. During the summer the longest non-stop run in the world is made by the famous *"Flying Scotsman"* trains between King's Cross and Edinburgh, a distance of 392.7 miles. The longest non-stop run made all the year round is that of the L.M.S.R. up *"Royal Scot"* between Carlisle and Euston, a distance of 299 miles.

The vehicles forming such trains as these are unsurpassed in comfort by any others elsewhere. Although the maximum perfection in smoothness of running, comfortable furnishing, and efficient lighting, heating and ventilation, may appear to have been reached, extensive scientific researches are constantly undertaken with a view to further improvements. Facilities undreamed of a few years ago are now regularly provided on certain services, such as the provision of shower baths on sleeping cars, hairdressing saloons, and radio facilities.

It has been truly said that railways are the life-blood of commerce. Road transport certainly has its special advantages. Railways themselves recognise this fact and make use of it, but the rail is unsurpassed as a carrier of traffic in bulk over long distances in a speedy manner. Some 570 express braked freight trains run daily and nightly between great centres such as London, Glasgow, Newcastle, Manchester, Liverpool, Plymouth and the West

generally. Thousands of ordinary fast goods trains are also run daily. In addition to providing transport on an extensive scale in this manner, the railway companies offer warehousing facilities to traders and they will undertake the entire distribution and marketing of products from the railhead centre.

The general merchandise carried in the course of the year amounts to 43,240,000 tons, of minerals to 49,308,000 tons. Coal, coke and patent fuel make up a total tonnage of 167,842,000. The total freight train mileage amounts to 128,683,000. In order to carry this traffic there are 619,070 railway-owned freight wagons, and there are 17,772 miscellaneous vehicles such as parcel and mail vans, horse and carriage trucks, etc.

Thousands of trucks of market produce are carried by rail annually and special arrangements are made for the transport of perishable and seasonal commodities that require speedy transit and prompt delivery to early morning markets. At Hull 253,700 tons of fish are landed every year for transport to all parts of the country, 173,900 tons at Grimsby, 52,926 tons at Fleetwood, 9,000 tons at Swansea, and 7,000 tons at Cardiff. Fish landed at the various ports, even as far away as Aberdeen, in the morning or early afternoon, is carried by special trains at express speeds and delivered direct to Billingsgate for sale and distribution in London in time for breakfast next morning. Similarly, meat despatched in the morning from Aberdeen is on sale the following morning in Smithfield Market. Special express trains composed of refrigerator vans are run at frequent intervals, and considerable use is made also of ventilated and insulated containers. Milk forms an important part of railway traffic, and nearly 174,000,000 gallons of fresh milk are conveyed by rail annually. Fast trains of special ventilated milk vans and glass-lined tanks are run daily from the producing areas.

British railways are the largest dock owners in the world. Swansea docks shown above belong to the G.W.R. Photograph by courtesy of the G.W.R.

British railways are the largest dock owners in the world, and their extensive accommodation includes the world's largest graving dock. The latest mechanical appliances have been installed at all the docks so that vessels can be loaded or unloaded, and their cargoes transferred direct to rail, or warehoused, by modern plant. The coal export trade of Great Britain has been built up through the medium of railway-owned docks.

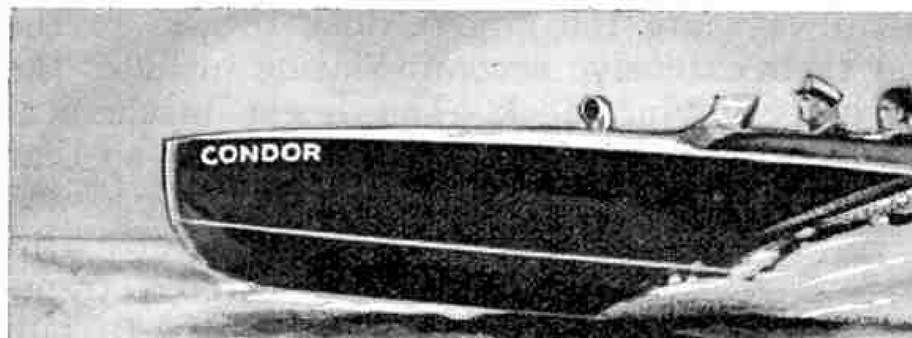
Railway-owned steamships total 143, and the passenger vessels on the various cross-channel services may be truly described as liners in miniature. Specially designed steamers are engaged in the Irish cattle trade. Other special vessels include ferry boats, tenders and train ferries, and a vessel specially built for the carriage of motor cars between Dover and Calais.

In addition to being the largest owners of motor vehicles in this country, the railways are associated also with all the important omnibus undertakings, and with certain air services within the British Isles.

The largest group of hotels in the world are those owned and controlled by British railways, and are 79 in number. Big schemes of hotel enlargement and modernisation have recently been carried out. An important part of the catering business conducted by the railways is the operation of a fleet of 666 restaurant cars, and the provision of refreshment and dining rooms at all the principal stations. Buffet cars are provided on many secondary passenger trains and also on excursion trains. The meals served in the course of a year in restaurant cars number more than 8,000,000, and require some 1,300 tons of meat, 800 tons of fish and 750 tons of bread.

The longest non-stop run in the world is performed, during the summer months, by the L.N.E.R. "Flying Scotsman" between London and Edinburgh. This covers the 392.7 miles at an average speed of 52.4 m.p.h.

The interesting items mentioned in this article, and many others, are included in the booklet "*Facts About British Railways*" (1935), which is obtainable free on application from the British Railways Press Bureau, 35, Parliament Street, London, S.W.1.



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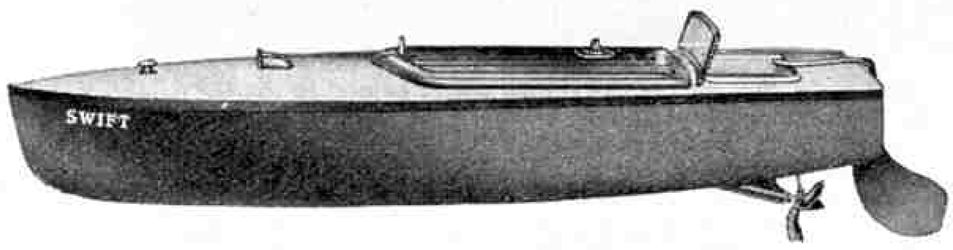

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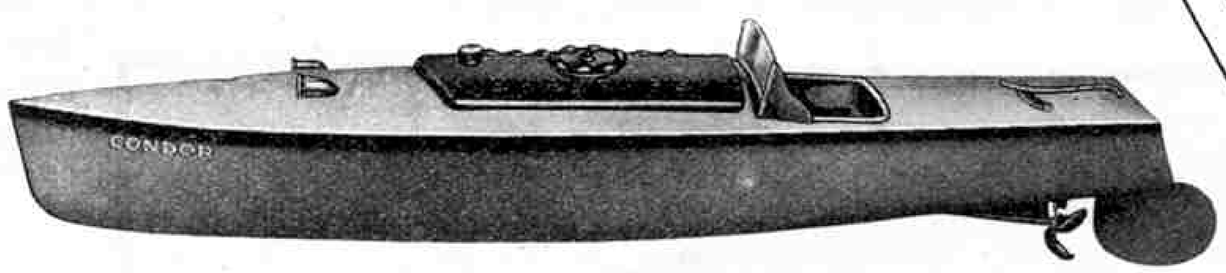

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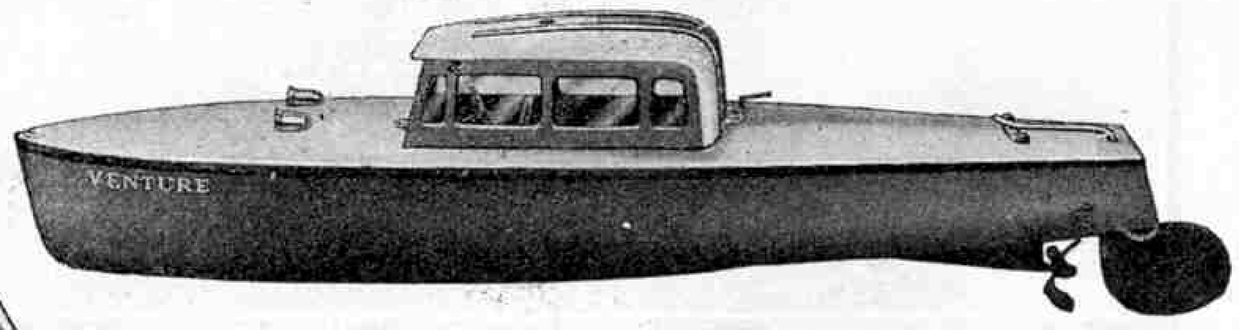

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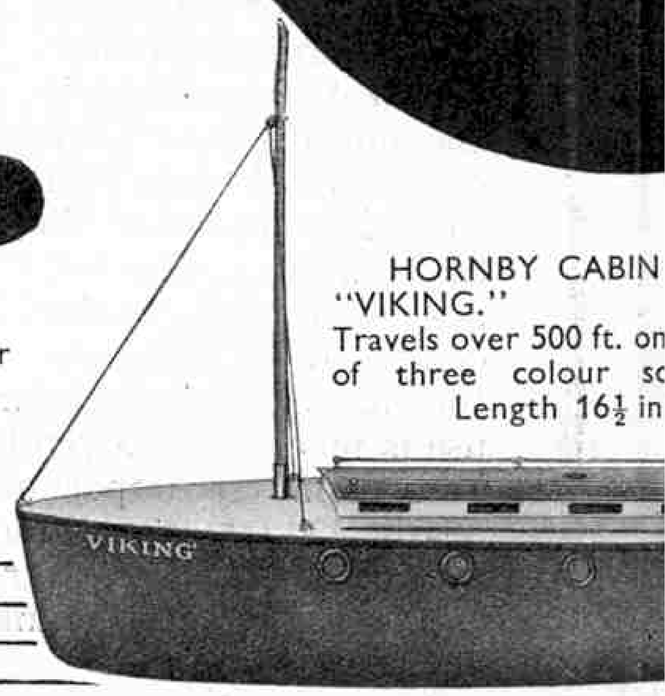

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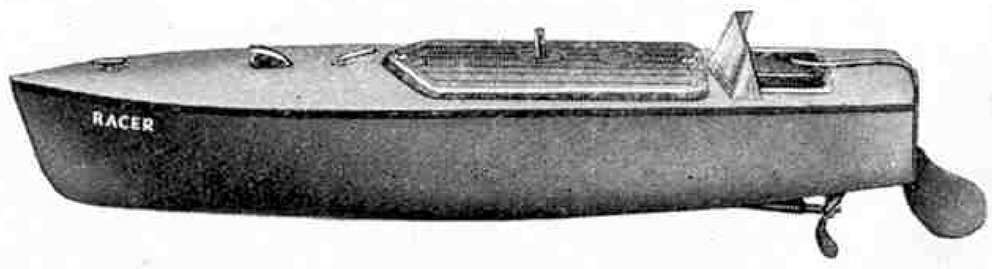

HORNBY RACING BOAT No. 2. "RACER II." Price **8/6**
Travels over 200 ft. at high speed on one winding. Finished in Blue and Cream. Dimensions: Length 12½ in. Beam 3 in.

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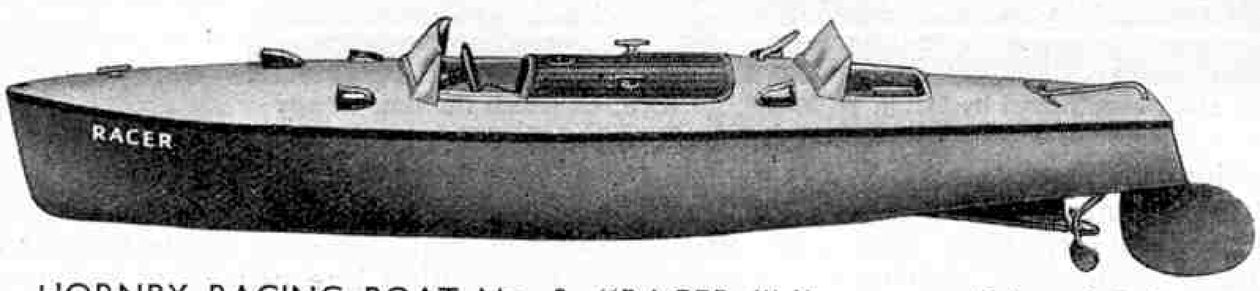
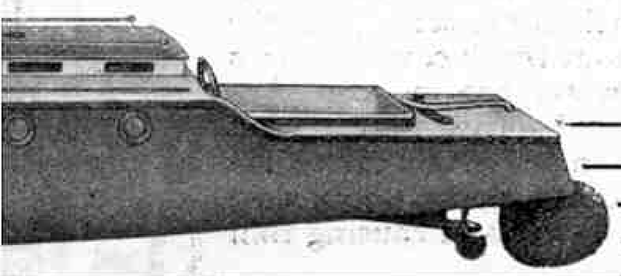


HORNBY RACING BOAT No. 3. "RACER III." Price **14/6**
Travels over 300 ft. at high speed on one winding. Finished in Red and Cream. Dimensions: Length 16½ in. Beam 3½ in.



CABIN CRUISER No. 5. Price **16/6**
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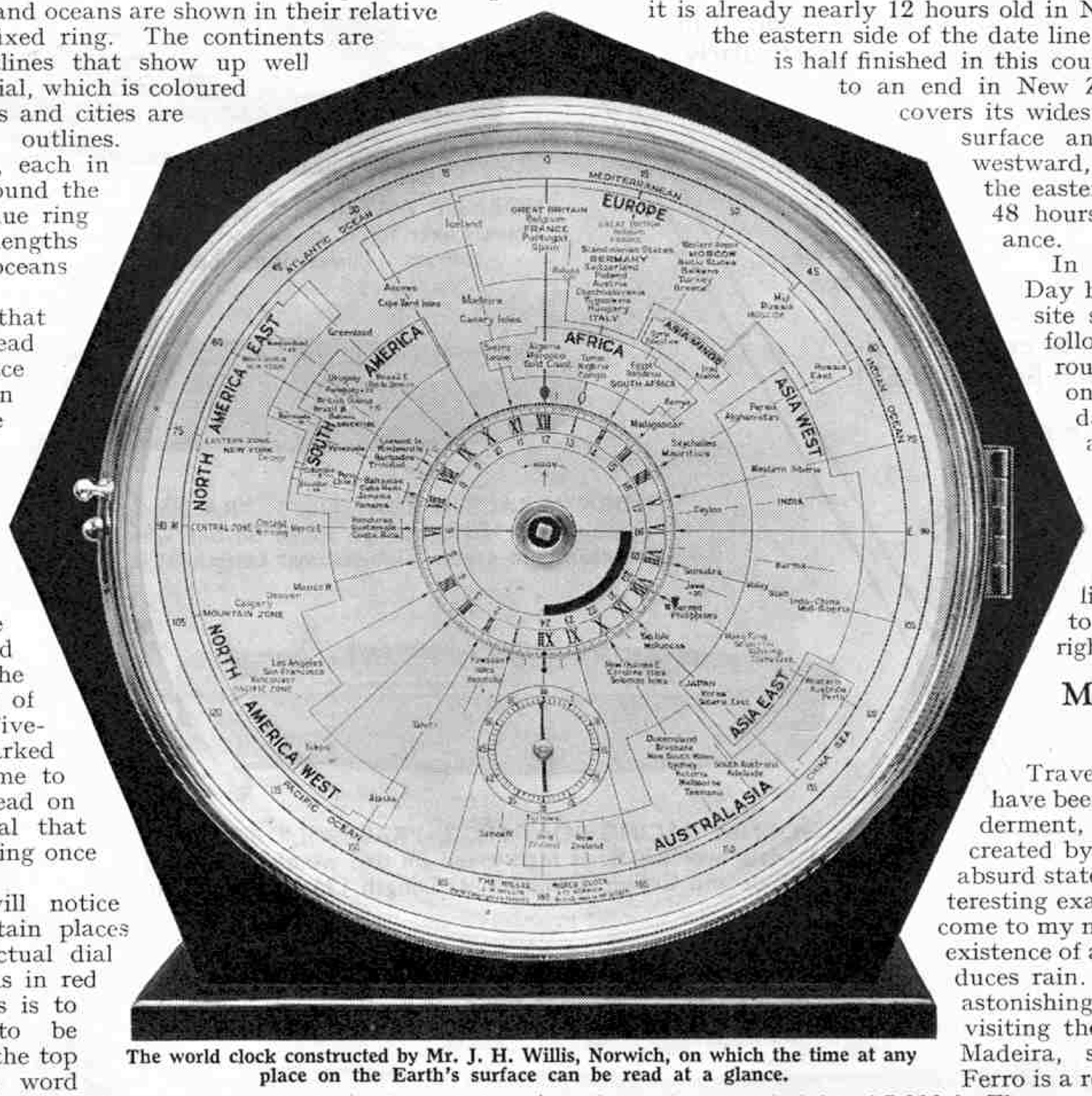
A Novel World Clock

The timekeeper with the strange dial that is illustrated on this page has been designed by Mr. J. H. Willis, Norwich, and shows at a glance what time it is at any place on the Earth's surface. It has no hands in the ordinary sense of the word. Instead the dial itself rotates in the counter-clockwise direction and the times are indicated by means of arrow heads marked on a white fixed ring surrounding it. The main continents and oceans are shown in their relative time positions on the fixed ring. The continents are indicated in white outlines that show up well against the rest of the dial, which is coloured light blue, and countries and cities are marked inside these outlines. Islands also are shown, each in its true position, and round the edge of the dial is a blue ring correctly divided into lengths representing the chief oceans and seas.

With this clock, all that is necessary in order to read the time at any given place is to trace the line drawn from its position on the outer dial towards the centre of the face of the clock. Thus in the position shown in the photograph, representing noon in Great Britain, the time at San Francisco is seen to be 4.0 a.m., and in India and Ceylon it is 5.30 in the afternoon. The clock is of the 24-hour type. Five-minute divisions are marked on its dial, and the time to the nearest minute is read on an additional small dial that has a small hand revolving once every hour.

Readers probably will notice that the names of certain places occur twice. On the actual dial one of the two names is in red and the purpose of this is to enable summer-time to be found. For instance, at the top of the fixed dial the word "Great Britain" appears at "O" on the longitude scale and is repeated in red at "15E," the second reading being for use when summer-time is in force; and at the bottom winter-time and summer-time in New Zealand are similarly indicated. Special provision also is made for local peculiarities.

It is interesting to learn that Mr. Willis developed his world clock in connection with radio work, and it was not until he had used it for some time that he realised its commercial possibilities. It promises to be very useful in these days of international telephones, air lines and radio, and has already attracted the attention of the British Broadcasting Corporation, the Post Office and several shipping lines. The clock illustrated is driven by a spring with a lever escapement, and the spindle for the winding key can be seen in the centre of the dial, but electrical world clocks also are to be made.



The world clock constructed by Mr. J. H. Willis, Norwich, on which the time at any place on the Earth's surface can be read at a glance.

How Long is a Day?

I wonder how many of my readers have realised that every day spreads over 48 hours, although its actual duration at any point is only 24 hours. For instance, Christmas Day begins on the western side of the international date line, which passes southward from Bering Strait across the Pacific Ocean, and gradually spreads across the world so that it is just beginning in Great Britain when it is already nearly 12 hours old in New Zealand. It reaches the eastern side of the date line 12 hours later, when it is half finished in this country and is just coming to an end in New Zealand. The day then covers its widest extent on the earth's surface and gradually contracts westward, finally to die away on the eastern side of the date line 48 hours after its first appearance.

In the meantime Boxing Day has begun on the opposite side of the line and is following Christmas Day round the world. Thus on one side of the line the date is 26th December and on the other it is still the 25th, and vessels crossing it must lose a day on eastward journeys and gain a day when travelling westward in order to keep their calendars right.

Mythical Trees that Produce Rain

Travellers' tales in the past have been a source of great wonderment, and many legends created by what now seems to be absurd statements die hard. An interesting example that has recently come to my notice is the belief in the existence of a tree that actually produces rain. The first news of this astonishing tree came from sailors visiting the island of Ferro, near Madeira, several centuries ago. Ferro is a rocky mass that in some places rises to a height of 5,000 ft. There are no springs or rivers on it and rain has never been known to fall, but it was alleged to obtain water from the branches of a single tree and old prints show the precious liquid falling like rain from its leaves in such quantities that the ground beneath it is converted into a swamp.

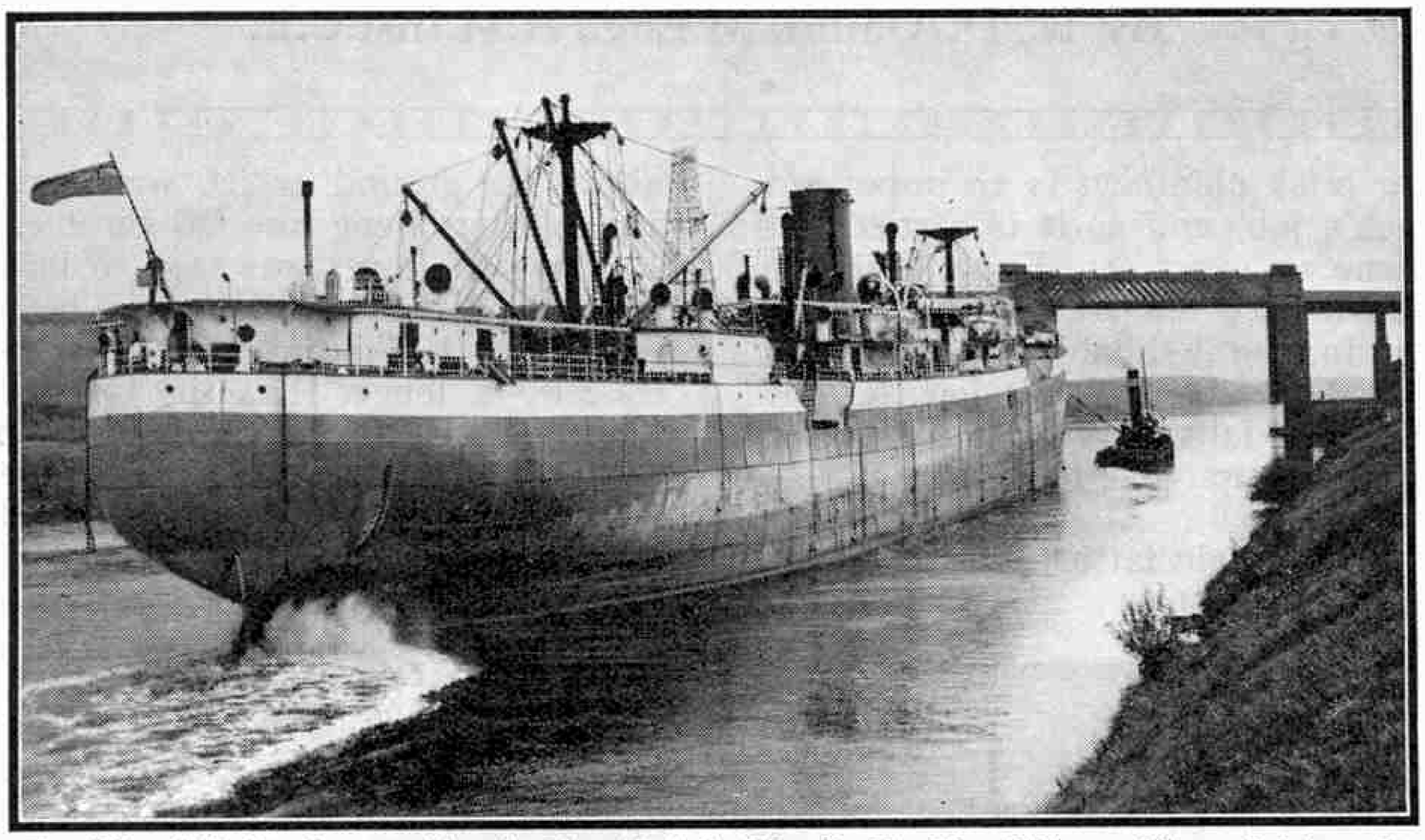
This wonderful tree next appeared in South America. This time it proved to be fairly common, especially in Peru, and in consequence it came to be known as the Peruvian rain tree. Its real name is the saman tree, and it is remarkable enough, for in some cases the immense crown of leaves at the top of its stout trunk covers half an acre of ground. It is not the wonderful water bearing tree that legend makes of it, however, and the only explanation that has yet been given of the origin of the story is that on occasion a multitude of cicada, insects popularly known as locusts, descend upon it, sucking the juices of young branches and leaves and causing thin

streams of the fluid to fall like rain on the ground below.

This explanation of course does not account for the magic rain production of the famous tree of Ferro. Probably the sailors who first encountered this saw it during a dense Atlantic mist, when its leaves were bathed in moisture to such an extent that liquid dripped from them.

Imitating the Glow Worm

Another natural marvel, this time an authentic one, that has long caused wonder and admiration is the light of the glow worm, for this tiny creature appears to have attained the ideal of the electrical engineer by producing light without heat. The best of the many forms of electric lamp yet invented lags considerably behind the glow worm in this respect, for a large proportion of the electrical energy put into it is wasted in the production of heat.



The "City of Hankow" approaching the Irlam Viaduct of the Cheshire Lines Railway while passing down the Manchester Ship Canal on her way to Glasgow. Photograph by A. R. Prince, Manchester.

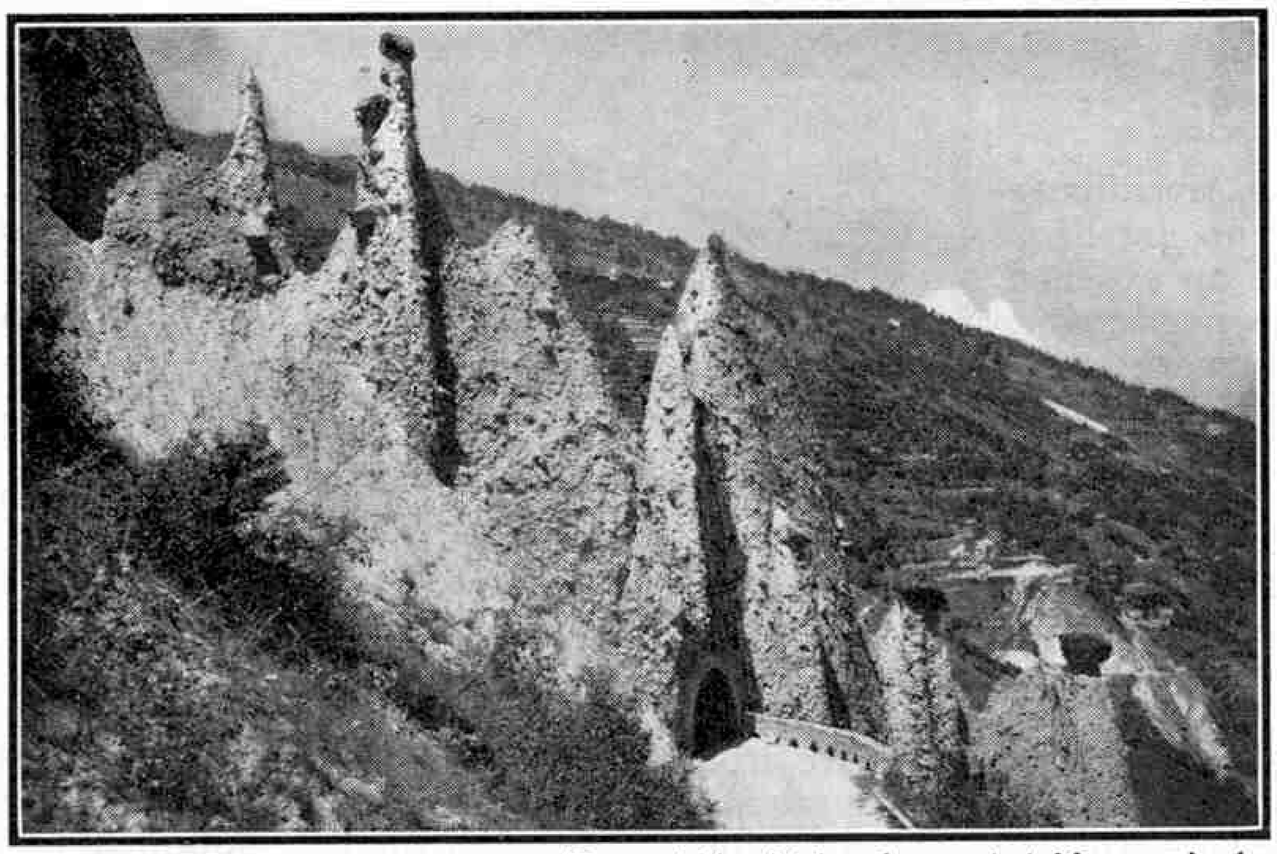
The steady, cold natural light of the glow worm is the result of a chemical action that has now been imitated in the laboratories of the General Electric Co., of New York. There a glass tube was partially filled with a mixture of a chemical known as luminol and sodium hydroxide, to which water was added. A mixture of hydrogen peroxide and potassium ferrocyanide was then allowed to run into the liquid through a funnel and a luminous blue-green glow appeared that lasted for several minutes. The addition of the second liquid mixture caused a slow oxidation process to take place and this corresponds exactly to that employed by the glow worm to produce its strange light.

The cost of the necessary chemicals will have to be reduced considerably before we can imitate the glow worm on a practical scale, however, for it is calculated that this chemical light without heat costs about £5 an hour! This compares badly with the expense of running a sodium vapour lamp of the most recent type, for this would produce the same amount of light for a minute fraction of a farthing.

Queer Collections

The instinct to collect something seems to be ingrained in all of us. There are few boys who do not collect stamps more or less seriously, and this hobby of course has attained enormous proportions, high prices being given for rare and interesting specimens. It is said that the collection of cigarette cards promises to rival that of stamps in popularity, and other subjects of the collecting passion include pictures, china, old silver and glass, and even match box labels, police truncheons, orange wrappers and old bottles. One enthusiast collects spiders' webs, and has hundreds of specimens, each carefully preserved between glass plates.

Some of these hobbies are not as ridiculous as may be thought. For instance, many orange wrappers are of high artistic value, and the old wine bottles often are works of art and some of them are very rare. Other articles are collected because of their historic interest, and good reasons for their hobbies no doubt could be given by people who are satisfied to accumulate such ordinary things as puzzles and detective stories!



Earth pillars in Switzerland. These strange pillars are believed to have been protected from erosion by rain by stones on their summits. The stones mark the original ground level and diverted surface water into channels between them.

An interesting and little-known collecting hobby is concerned with what are known as "fire marks." These date from the days when fire brigades were maintained by insurance companies, and the firemen wore top hats and made great use of buckets and squirts. It has always been a mystery to me that their feeble efforts should be of any value in fire fighting, for even when hand pumps were invented and brought into use, their capacity for dealing with serious fires must have been very limited.

Naturally each company was interested only in its own fires, and fire marks were plates, bearing the names of the companies, that were fixed to buildings as guides to the fire brigades. If the members of one of these found on arrival at a fire that the burning building bore the plate of a rival company they made no effort to extinguish it, but returned to their headquarters grumbling because they had wasted their time on a rival company's fire, unless of course they preferred to stop and enjoy the fun!

At one time fire plates were very numerous, but the coming of the official fire fighting forces so familiar to-day and the disbanding of the private brigades made them of no further use and few now remain in their original positions. Some are to be found in museums and a specially fine collection is preserved by the Chartered Insurance Institute. From time to time some of these relics come on the market and there is keen competition among collectors to obtain rare and early specimens. The highest price realised at a sale held a short time ago was £19 for an early lead mark of the Royal Exchange Assurance Company that was in perfect condition, and £18 was given for a similar mark, while prices of £11, £10, £7 and so on were by no means uncommon.

Photographing a Meteor

When an astronomer wishes to take a photograph of the stars, he makes his camera follow their apparent movement by means of clockwork. Otherwise all that would be recorded on his plate would be streaks representing their apparent paths. Dr. W. T. Whitney, a Californian astronomer, has accomplished the even greater feat of keeping pace with a meteor, or so-called "shooting star." Those of my readers who have seen meteors flash through the sky will know that they move with great speed. They appear unexpectedly and burn out so rapidly that they cannot be photographed by any ordinary means. Dr. Whitney solved the problem by mounting four cameras on a horizontal shaft round which they were whirled at an angular speed corresponding to that of the fall of a meteor. The apparatus was fixed up in such a position that the cameras pointed during their downward sweep towards a part of the sky likely to reveal meteors, and the experimenter then waited to see what he could catch. His plan was successful, and his whirling cameras have now caught more than 30 of these visitors from space.

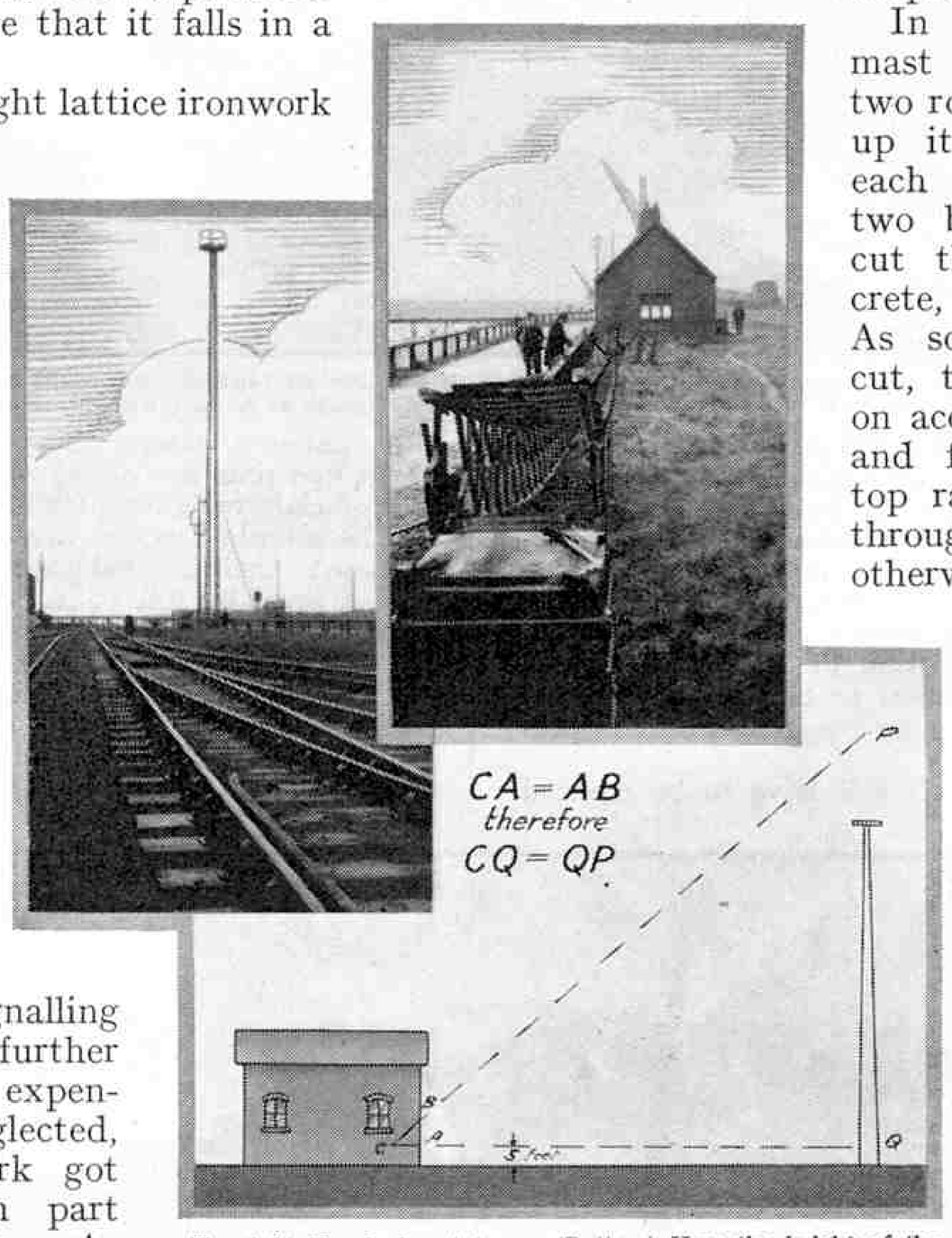
Another photographic achievement of a different kind that I have noted recently is the production of the world's smallest camera, which is of the box type and is little longer than the thumb nail.

Felling a Look-out Tower

By R. D. Gauld, M.Eng., A.M.Inst.C.E.

THE work of felling brick chimneys is an important part of a steeplejack's job, and as it is carried out frequently it has become an exact art. Experts at this work can gauge within a very few feet what length a chimney requires to fall in, and it should be remembered that a brick chimney does not fall full length, but breaks above its middle and falls in two portions. It is also possible to make sure that it falls in a particular direction.

To fell a tall tower made of light lattice ironwork is a more unusual job. This tower was believed to be 94 ft. high, but the drawing of it was a very old one, and it was unsafe for anyone to go right to the top to get a check measurement. The tower was originally designed as a look-out post to enable an early sight to be obtained of ships approaching the dock at which it was built. The mast itself was of light ironwork to a lattice design, like a magnified signal post; and there was a ladder, arranged like a signal ladder, to enable a man to get to the circular wooden platform at the top of the mast. This platform had a railing round it.



(Top left) The look-out tower. (Bottom) How the height of the tower was measured. (Top right) The tower after felling.

The advent of wireless signalling had made the tower of no further use, and as painting it was an expensive matter, this work was neglected, so that in time the ironwork got badly corroded. The bottom part of the ladder also went missing. As there was a risk that in a gale the tower might be blown down, with danger to life and property, it was decided to remove it. On account of the bad condition of the iron at the top of the mast, cutting it down in pieces was not possible, and felling was the only alternative.

In plan the tower was square, with a square iron bar at each corner; and for about 2 ft. above the ground it was cased in concrete. There was only one direction in which it could be felled safely, and that was parallel to the dock wall, alongside an old wooden fence.

The only object in the line of fall of the tower, and at all likely to be struck, was a small hut used as an office; and as there was some uncertainty about the true height of the tower it was necessary to be sure that it would fall short of the hut. This was done in a very simple manner as shown in the sketch. A triangle was marked out on the side of the hut, with side AB equal to side AC, and both 9 in. long. Any other length would have done as well. A was 5 ft. above the ground, which was level towards the tower. By sighting along line CB by eye, an imaginary point P above the mast was seen to be at least 30 ft. above the top of it, as near as could be judged. From simple geometry this meant that distance QA would be at least 30 ft. longer than the tower, so that there would be plenty of room for it to fall.

In order to make sure that the mast fell in the right direction, two ropes were fixed about half way up it, and three men pulled on each rope. At the same time the two back legs of the tower were cut through, just above the concrete, by the oxy-acetylene burner. As soon as the second one was cut, the tower began to heel over on account of the pull of the ropes, and fell with a great crash. The top rail of the old fence was cut through by the wooden platform, otherwise the only damage was to the mast itself. It was cut up into small lengths by the oxy-acetylene burner, and loaded into a wagon for sale as scrap.

Including the small quantity of oxygen and acetylene used, the whole job cost about thirty shillings.

The oxy-acetylene burner is a most useful appliance for cutting up old iron and steelwork, where the leaving of a good edge on the plates cut through is not important. It is therefore an essential tool for those engaged in scrapping machinery, boilers, tanks and such like. When necessary, however, a good operator can cut structural steelwork to an edge good enough for most purposes, and can even put a chamfer on a mild steel plate.

Before old ironwork can be cut up with the burner, the part on which the flame will act must be freed from rust, scale and paint as far as possible, otherwise good results cannot be obtained.

Cast iron is much more difficult to cut with the oxy-acetylene flame than steel or wrought iron, as it sputters and burns unevenly, and considerable skill is required to get good results.

It was mentioned that for about 2 ft. above the ground the tower was filled in with concrete. As the tower was cut off above the concrete, a 2 ft. high stump was of course left sticking out of the ground. As it would have cost a good deal more than the rest of the job to remove it, and it was not so placed as to be an obstruction, it was left standing.

Stinging Plants and Insects

Wonderful Mechanism of Natural Weapons

By J. F. Stirling, M.Sc., A.I.C.

WHEN Julius Cæsar invaded this country in the autumn of the year 55 B.C. many of his soldiers are said to have brought with them seeds from which to grow plants that could be used to rub and chafe their limbs. The Romans expected to find Britain a colder and damper country than sunny Italy, and felt that they would be in need of some means of warming their blood and preventing their limbs from becoming stiff and numb. The hairy leaves of the plants the Romans cultivated for this purpose had an irritating effect upon the skin, blistering it and making it red.

The blistering plants introduced into Britain by the Romans were a species of nettle. Puny kinds of nettle no doubt grew in this country much earlier, but it is to the Roman conquerors that we owe the large stinging nettles that now flourish throughout the length and breadth of the British Isles.

It is interesting to examine a nettle leaf with the aid of a small hand lens. When inspected in this manner the leaf and its stalk are seen to be covered with innumerable tiny hairs, greenish-yellow in colour, that start from a conical base and end in a very fine point. These hairs are the stings, and examination through a microscope reveals the marvellous structure shown in one of the accompanying illustrations. Each sting is a perfectly formed tube mounted on a bulbous base, and tapers along its length until at its extremity it becomes almost a point. Perched on its point is a tiny bulb, the purpose of which is to seal the end of the tube so that its contents are unable to escape. A large proportion of silica in the bulb makes it very brittle and it snaps off at the slightest touch with the hand.

It is now easy to understand how the nettle stings. When the skin makes contact with a leaf, hundreds of the bulbs are snapped off and the sharp points of the tiny hairs pierce the skin. Immediately a pungent, acrid and poisonous fluid flows along the tube of the stings and into the flesh beneath the skin, giving rise to the well-known burning and itching feeling.

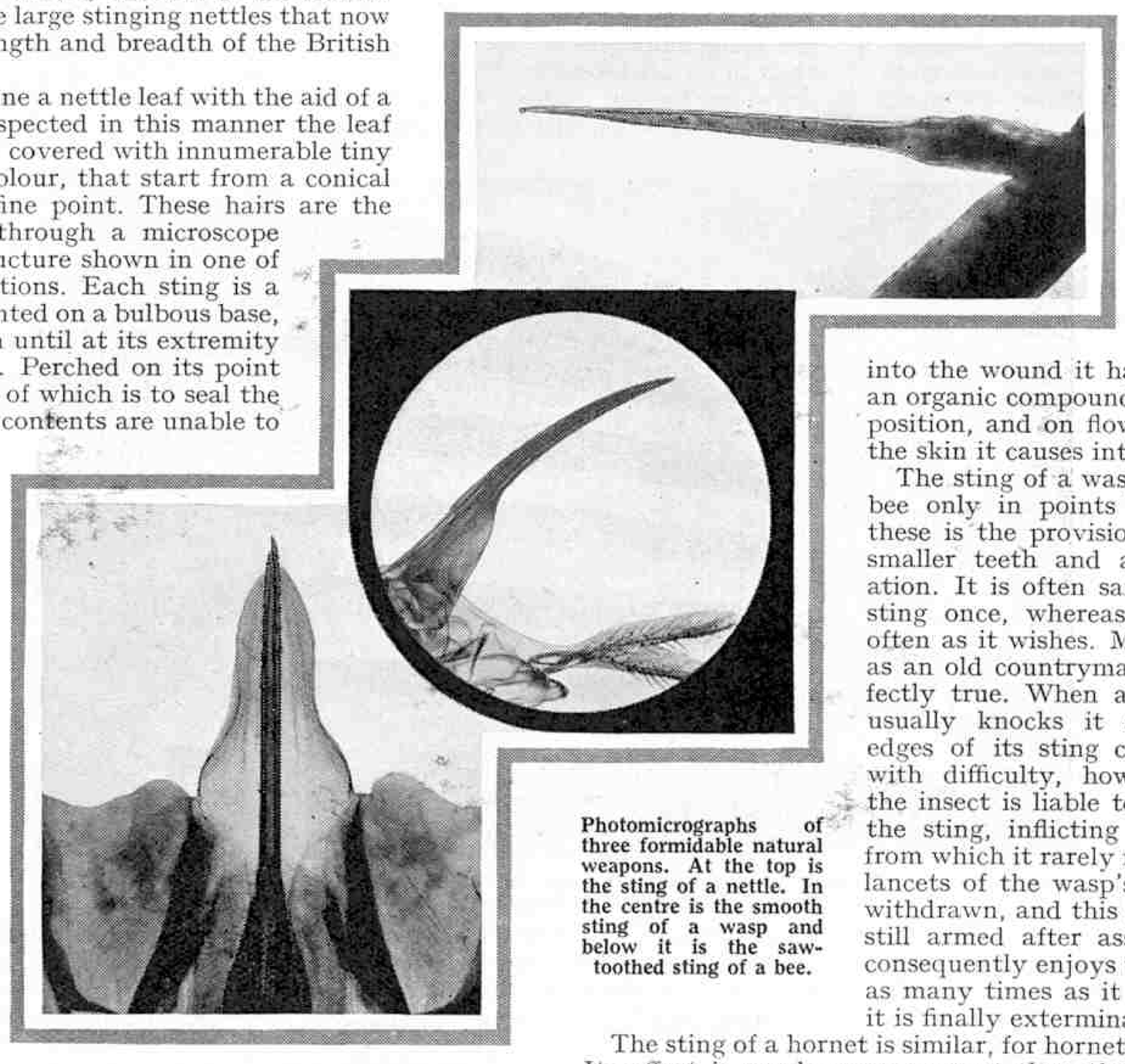
Everybody knows that a nettle leaf does not sting if it is grasped firmly, and the expression "grasp your nettle" has become proverbial. There is good reason for this. The firm pressure of the fingers snaps off the bulbs on the points of the hairs, and also crushes and disintegrates the stings themselves, making them ineffective.

In Great Britain the sting of a nettle fortunately inflicts no more than a faint unpleasant irritation, and there are no other plants that have a similar effect. In the tropics there are many stinging nettle-like plants, however, and some of them are far more effective than the nettle with which we are familiar, and at times sting so severely as to produce fatal effects.

There are a few British caterpillers that possess stinging hairs similar to those of the nettle, but the effect of these hairs is so feeble that anybody with a skin of average toughness can handle a hairy caterpillar with impunity. Those who have peculiarly sensitive skins are unable to touch these creatures without being stung, however, and "caterpillar rash," a prickly redness of the skin, usually is the result.

Anybody who has been stung by a bee or a wasp will agree that it is a decidedly unpleasant experience, and naturally will be interested to know how it was done. Let us examine a bee's sting that has been used for its natural purpose and remains in the flesh of the victim. To the unaided eye it appears to be nothing more than a small thorn, but it exhibits an amazing structure when properly mounted and examined through a microscope, as the accompanying photomicrograph shows. It consists of two small darts that normally are enclosed in a relatively large muscular sheath. One of these darts has a keen, knife-like edge, but the other is furnished with teeth like those of a saw. Between the two darts is a tube along which runs a highly poisonous fluid from a poison bag at the rear.

An apparatus better adapted for penetrating the flesh of an enemy can scarcely be imagined. The two darts, one sharp-edged and the other saw-toothed, work up and down very rapidly, moving alternately and digging deeper and deeper until they have bored to a sufficient depth. The darts, or "lancets" as they are called, do their work with astonishing speed and efficiency and the bee then injects its store of poison, wholly or in part, into the wound it has made. This liquid is an organic compound of undetermined composition, and on flowing into the tissues of the skin it causes intense pain.



Photomicrographs of three formidable natural weapons. At the top is the sting of a nettle. In the centre is the smooth sting of a wasp and below it is the saw-toothed sting of a bee.

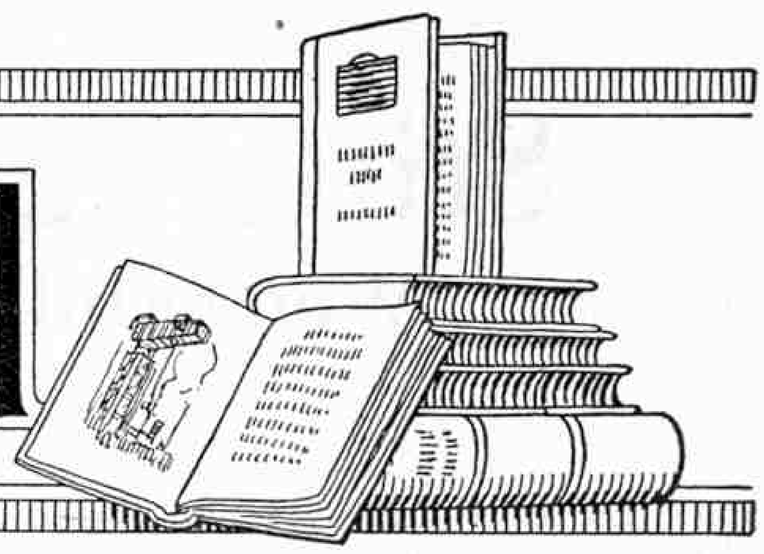
The sting of a wasp differs from that of a bee only in points of detail, and one of these is the provision of lancets that have smaller teeth and are razor-like in operation. It is often said that a bee can only sting once, whereas a wasp can sting as often as it wishes. Many people regard this as an old countryman's yarn, but it is perfectly true. When a bee stings, its victim usually knocks it away. As the barbed edges of its sting can be withdrawn only with difficulty, however, in its struggles the insect is liable to tear itself away from the sting, inflicting upon itself an injury from which it rarely recovers. The smoother lancets of the wasp's sting are more easily withdrawn, and this insect is able to retreat still armed after assailing its victim, and consequently enjoys the pleasure of stinging as many times as it needs, or wishes, until it is finally exterminated.

The sting of a hornet is similar, for hornets are really large wasps. Its effect is much more pungent than that of the more familiar insect, however, and so venomous is the poison it injects under the skin that a hornet's sting may become really dangerous.

In this country there are several classes of flies that are capable of puncturing the skins of their victims and of setting up highly irritant spots. The common gnat is a well known example. Creatures of this kind do not sting, in the strict sense of the word, but bite a tiny wound in the flesh and then suck their victim's blood through an exceedingly small tube that they project into the wound. Many species of stinging insects abound in foreign countries. For instance, the scorpion, which abounds in all warm climates, is capable of inflicting a very dangerous sting, and the wasps and hornets found in large numbers in tropical climates also are formidable.

Stings are given to insects not merely for defensive purposes, but also as a means of attack. The sting of a wasp produces immediate paralysis in an insect enemy, which can then readily be carried away to its attacker's nest, and the scorpion and other tropical stinging insects also paralyse their victims by injecting poison into them through their stings before finally settling down to make a meal of them.

Books to Read



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

"A History of Everyday Things in England"

By M. and C. H. B. QUENNELL
(B. T. Batsford Ltd. 8/6)

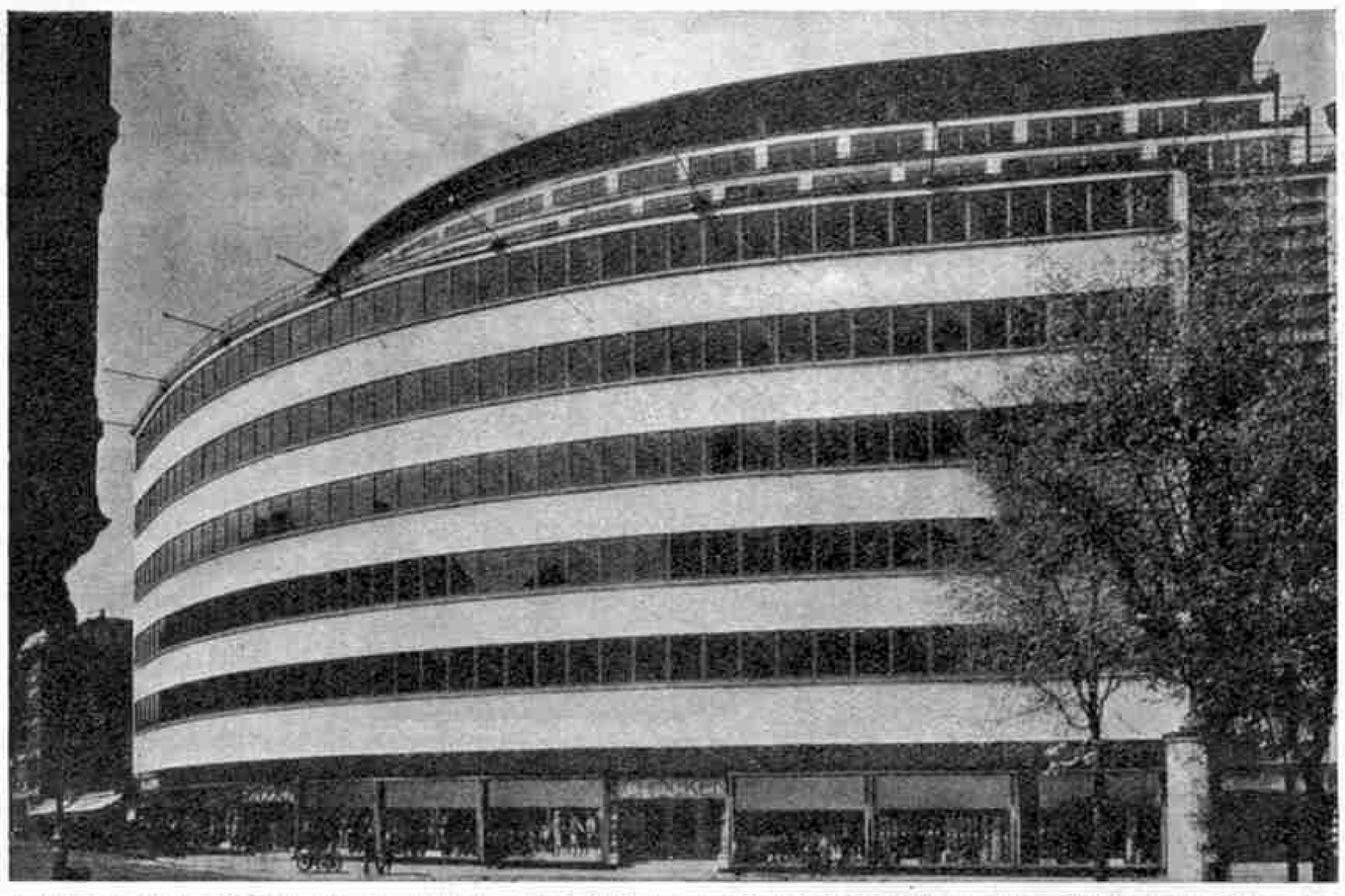
This is the fourth and last of a series of volumes tracing the story of everyday life in England since the coming of William the Conqueror in 1066. The earlier volumes, previously reviewed in these columns, brought the story down to the year 1851, when industrialism had taken firm root. The latest volume carries it on to the present day and, like its predecessors, is in a sense a history book. Instead of giving a record of Kings, governments and wars, however, it explains how people ate, clothed themselves, worked and played. It reads like a story book, and yet gives a remarkably complete picture of our country throughout the age of production, as the authors call the period now dealt with.

The story begins with the farmer, for his task is food production, the most important of the trades by which Man lives. In 1851 British agriculture was still a great and profitable industry, but nowadays we no longer rely upon our own soil for the food that we eat, and the village life of former times that is so well described in the book has largely disappeared. How the change was brought about is carefully explained, and the old style farming and milling is well contrasted with the immense modern wheat growing and cattle raising industries in overseas countries.

While the countryside was slowly losing its population, our towns were growing at amazing speed, and in this section we can trace the change from the ugly crowded towns of the 19th century to the better planned cities of to-day. The use of reinforced concrete, with the introduction of rustless steel and chromium plating, has brought new ideas into architecture, and an example of the work of the modern architect, employing new materials, is illustrated on this page.

One of the most interesting chapters in the book contrasts the industrial methods of 80 years ago with those employed to-day, when standardisation prevails everywhere and the machine has largely displaced the craftsmen. The remaining sections deal in a lively and attractive manner with such topics as public health and changes in transport, and a lighter note is struck in a chapter on developments in social life as reflected in the many interesting changes in costume that have taken place during the comparatively short period dealt with.

One of the greatest charms of this series is the extensive use made of illustrations. Photographic plates of course are more numerous in the present volume than in its predecessors, but the delightful drawings by the authors themselves, and the reproductions of contemporary prints and paintings that form the greater part of the illustrations, are as lively and revealing as those of the earlier books.



Modern shop architecture. A German type that has influenced English design. (From "A History of Everyday Things in England," Part IV of which is reviewed on this page.)

"Jock and Colette on the Seashore"

By VERA BARCLAY. (Burns Oates. 3/6)

This is the story of the exciting stay of a group of children in the Isle of Wight, where they encounter adventures of the kind that may occur on any good seashore holiday. It is really a fairly complete introduction to marine natural history, the interesting information about crabs, starfish and other seaside creatures contained in it being conveyed in snatches of conversation, or in longer speeches by an old gentleman and his daughter, an expert zoologist, who explain things so nicely, and themselves enjoy the telling so much, that their youthful listeners cannot fail to be attracted. The creatures described actually are caught, among them rarer specimens such as a baby octopus; and every capture calls forth new and astonishing facts about the sea and its teeming life, or about the earth and its making. The book is illustrated by line drawings, and forms an excellent guide to the things that can be done at the seaside.

"The Countryman"

Edited by J. W. Robertson Scott
Volume II, No. 2. 2/6

The current issue of this well-known quarterly review of rural life and industry is larger and better than ever. Mr. R. M. Lockley continues his tour of British islands with a description of Grassholm, off the Pembrokeshire coast, in which he tells of the remarkable changes that have occurred in the bird life of the island during the last 45 years. Lord Tavistock explains how to build an aviary in the garden, and a young Herefordshire farmer gives an account of his successful efforts to build an astronomical telescope. In addition there are the usual fascinating glimpses of farm and country life in various parts of the country, and discussions on farming, gardening, fruit growing, and indeed practically every topic of interest to country dwellers.

"The Brighter Side of Cricket"

By R. C. ROBERTSON-GLASGOW
(Arthur Barker Ltd. 2/6 net)

Mr. Robertson-Glasgow is a cricketer of considerable ability, who plays the game in the real spirit of fun and enjoyment, and does not regard it necessary to introduce the mimic warfare that sometimes tends to spoil Test Match cricket. He has at the same time the happy capacity for writing descriptions of humorous episodes of the game in a manner that conveys the real outdoor spirit. This book is a collection of articles on the lighter side of cricket, dedicated to "All those who love cricket." For the most part the stories deal with cricket of the village green order rather than with the more serious County cricket, and the various incidents are irresistibly funny. One story deals with the tendency of the schoolboy on hot days to allow his mind to wander during lessons to imaginary games in which he bowls Sutcliffe for a duck and scores 381 not out! The humour of the book is increased by many delightful drawings by A. Savory.

"Hints on Running and Race-Planning"

By T. HAMPSON. (Chatterbox Co. Ltd. 1/– net)

As an Olympic winner and 800 metres record holder, the author is well qualified to speak on this subject, and in his book every boy interested in athletics will find practical information of the greatest value on style, pace and other essential features of running. Useful notes on public school athletics and amateur records also are included.

"Everyday Customs in China"

By Mrs. J. G. Cormack. (Moray Press. 8/6 net)

China is a country of never-ending interest to us, largely because the habits and customs of its people contrast so strangely with ours. The author of this book lived in China for 36 years, and during that time she travelled widely and came into close touch with the people themselves. She is therefore well qualified to describe and explain how the Chinese live and work.

The earlier part of the book deals with the elaborate ceremony with which weddings and funerals are celebrated, and it is curious to learn that a good Chinese son buys coffins for his parents while they are still in good health, in order to please and comfort them! To most readers of the "*M.M.*" the later chapters will be more attractive. These deal with customs connected with food, the New Year and other festivals, and the legends associated with special days. Finally we are given examples of the influence of the spirit world on the daily life of the Chinese, who are great believers in spectres and, like westerners, whistle in the dark in order to keep up their courage, but in their case for the special purpose of keeping off devils!

The book is written with a sympathetic touch by one who has learnt to appreciate the Chinese and their thoughts and ways, and its interest is increased by the numerous plates of characteristic Chinese scenes.

Chinese shops and their signs. (From "Everyday Customs in China" reviewed on this page.)

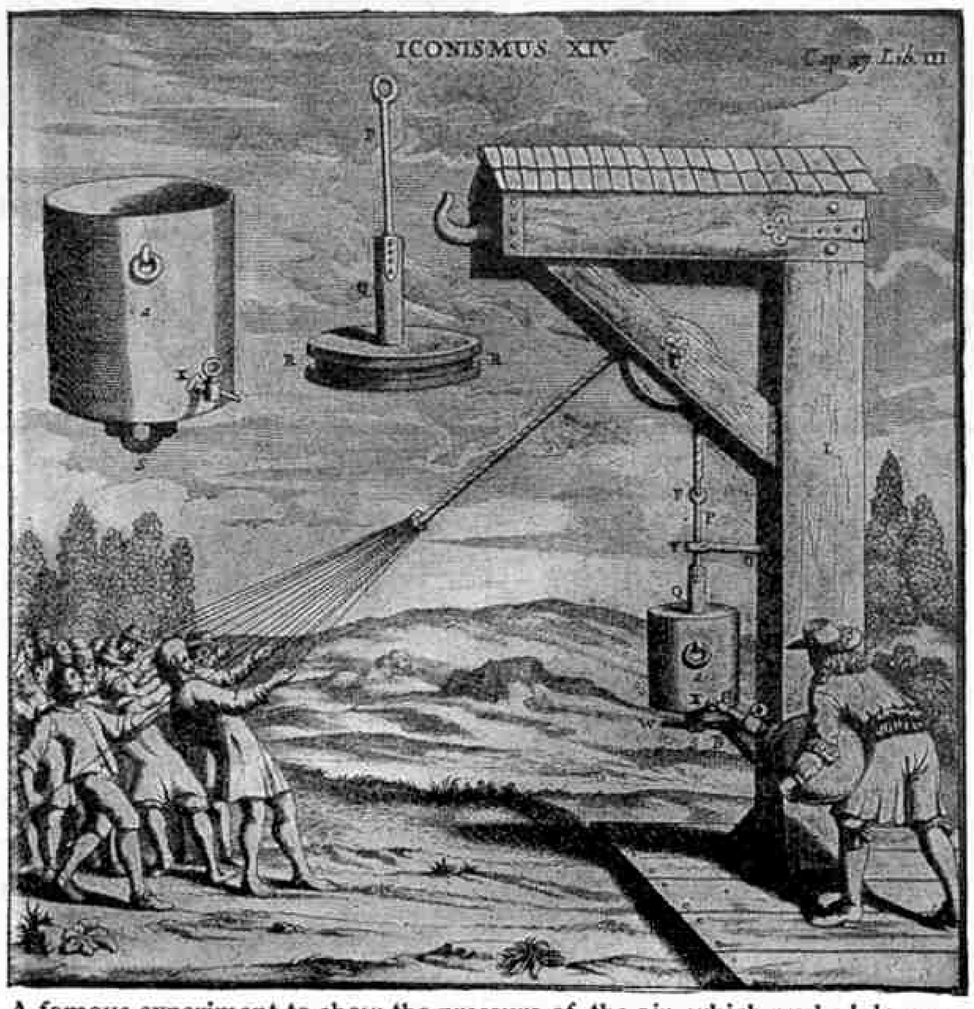
"The Road to Modern Science"

By H. A. Reason, B.Sc. (Bell. 6/- net)

Now that science plays such an important part in everyday life every boy or girl should have an intelligent idea of its achievements. In the past its story was to be found only in school books, or in difficult works written chiefly for older people, but to-day efforts are being made to tell it simply and easily in order to appeal to younger readers. Mr. Reason's book is an excellent example of what can be done in this respect, and the author weaves interesting accounts of famous scientists, and how they made their discoveries, into a carefully thought out scheme that tells the story of science itself as a whole.

There is intense fascination in the first part of the book, which deals with the scanty science of the ancient world and the dark ages, and the dawn of the new era in science that came when Copernicus, Kepler and Galileo taught us to look at the Universe in an entirely different way. The second part is concerned with progress along the many roads first opened up by the genius of Newton, and in it the author deals in turn with chemistry, magnetism and electricity, waves in the air and in ether, and the development of steam and petrol engines and other sources of power, in each case showing how famous experiments have given us new insight into each of the sciences dealt with.

Finally he comes to biology, the science of life; and readers will be delighted with his accounts of the experiments by means of which Harvey discovered the circulation of the blood about 300 years ago; and of the astonishing developments that followed the invention of the microscope. This brings us to the modern road, a broad highway divided into many separate tracks; and the directions in which science is travelling along it are indicated.



A famous experiment to show the pressure of the air, which pushed down a piston in a cylinder with such force when most of the air below the piston was removed that the men holding it were jerked off their feet. (From "The Road to Modern Science," reviewed on this page.)

Although the book is definitely intended for young people, it will be found attractive also by grown ups, to whom it will give an attractive bird's eye view of the history of science. It contains 24 plates reproducing portraits of great scientists and pictures of famous experiments, such as that illustrated on this page, and many diagrams.

"Scouting and Nature"

By Martin Baker

(Brown, Son and Ferguson Ltd. 1/6 net)

One of the most attractive features of Scouting is that it introduces boys to woodcraft and encourages them to develop their powers of observation in natural surroundings. This training also should arouse their interest in nature itself, and the purpose of this book is to give its readers some understanding of the lives of birds, beasts, fishes, trees and plants.

The author follows the natural course of a typical English river, and at each stage of its progress to the sea he describes the forces that have shaped and decided the natural features of the surrounding country and shows how in turn these influence wild life. His story is enlivened by anecdotes from his own experiences, and he ends with practical hints on the best manner in which to make a pilgrimage of the kind he describes. The book can be strongly recommended as a nature guide, not only to Scouts, but to all boys who love the countryside.

"Elements of Practical Flying"

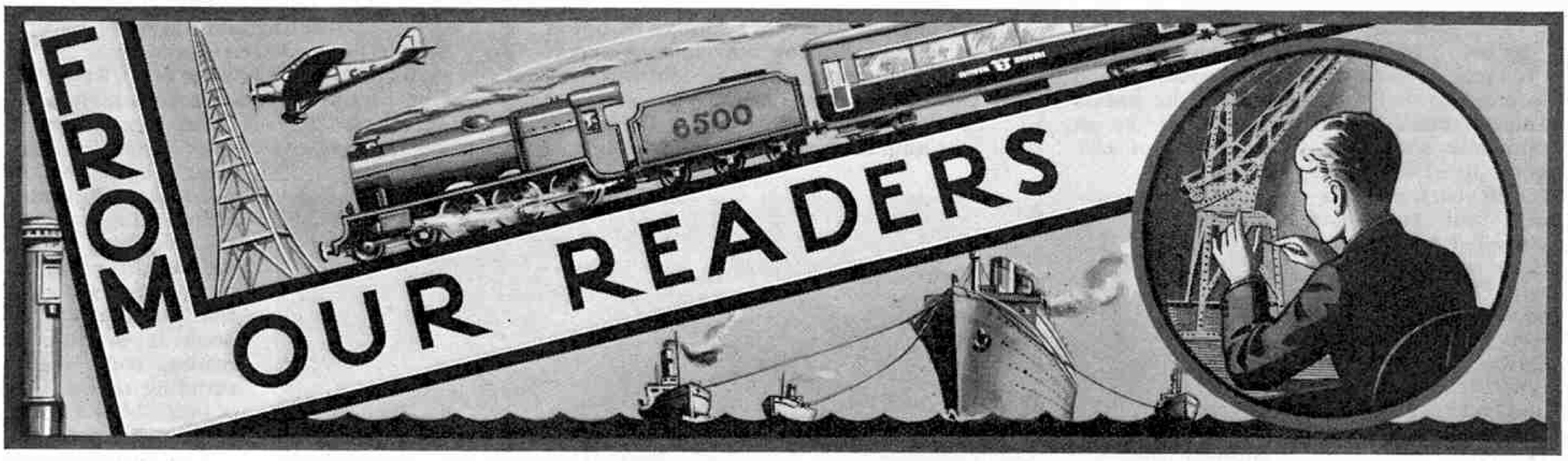
By P. W. F. Mills. (Technical Press Ltd. 4/6 net)

Readers of the "*M.M.*" who are genuinely interested in aviation will read this account of the theory and practice of flying with close attention, especially if they are thinking of learning to fly. It deals simply but clearly with the principles of flight, and explains how machines are controlled and how their design contributes to stability. This is done with an eye to the application of the knowledge gained, and finally taking-off, turning and landing are fully dealt with, the best methods being explained and the pitfalls that await the beginner indicated. A final interesting chapter suggests how the personal confidence that is so necessary to an airman can best be acquired.

"Television for You"

By E. G. Osborn. (Practical Press Ltd. 2/- net)

The nearer approach of a regular television service has led to increased interest in the manner in which this modern miracle is achieved. Its mysteries are simply explained in this little book, and in addition special attention is given to the practical details of the subject. Interesting television receivers, among them several incorporating cathode ray tubes, are well described and an account is given of an inexpensive outfit that enables the keen amateur to adapt his wireless receiver to the receipt of the programmes now being broadcast. The illustrations include attractive photographs and useful diagrams, and a summary of the recent report of the Government Committee on television is given in an appendix.



These pages are reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of general interest. These should be written neatly on one side of the paper only, and they may be accompanied by photographs or sketches for use as illustrations. Articles that are published will be paid for at our usual rates. Statements contained in articles submitted for these pages are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

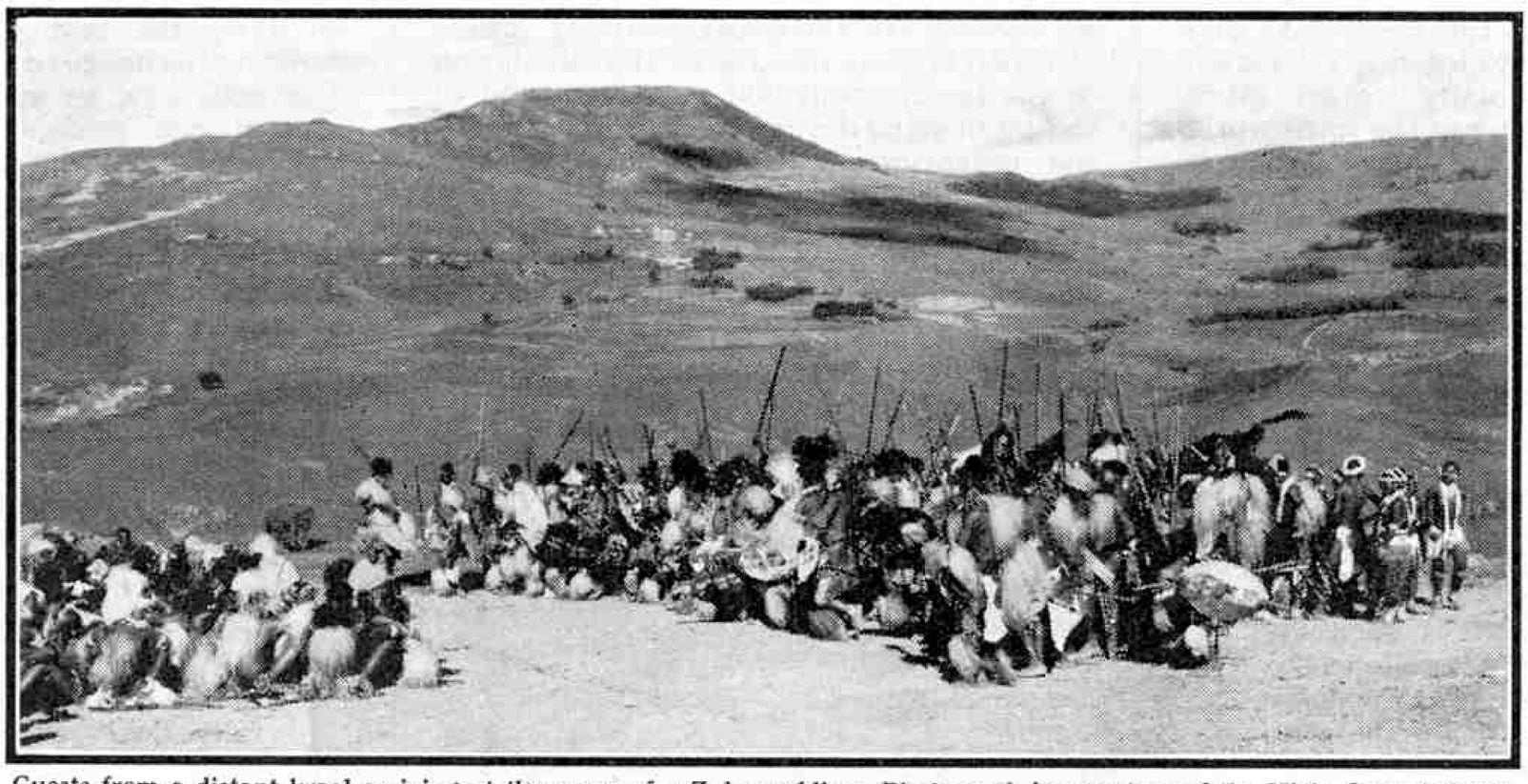
A Zulu Wedding

Recently I was an interested spectator at a Zulu wedding feast, one of the most important ceremonies in the tribal life of the Zulus. The scene was a group of huts at the top of the valley in which the bride lived and the guests from neighbouring kraals began to arrive about two o'clock in the afternoon. Some were on horseback and others on foot, but all were arrayed in wedding and ceremonial finery. The bridegroom came from over a distant hill, but he did not appear on the scene until the feasting was almost at an end.

The guests first paid homage to the head man of the group of families giving the feast and then made themselves at home in the krall and began to prepare for the dances. Soon afterwards the sacred ox was slaughtered and dancing began. It was started by the women of the tribe, whose antics were accompanied by loud shouts from the men. When the women tired, their men folk took up the lead and in their turn danced and chanted while the women rested and refreshed themselves.

As the dancing continued, the men and women alternatively sang, danced, fought and rested. In the meantime the horns of the ox were placed over the doorway of the hut to be occupied by the newly-married couple. This is an old Zulu custom and the number of horns over the entrance of a hut shows how many wives its owner possesses. After several hours I began to grow weary of the celebrations, and as it was getting dark I departed. Ceremonies and dancing went on throughout the night, however, and only on the following morning, when the couple were considered finally man and wife, did the exhausted guests troop home, to spend the rest of the week recovering from the effects of their exertions.

M. C. LUPTON (Natal).



Guests from a distant kraal arriving at the scene of a Zulu wedding. Photograph by courtesy of the High Commissioner for the Union of South Africa.

A Moroccan Excursion

When my brother and I were at Casablanca, Morocco, we travelled one day to Rabat by rail. The railway is electrified and runs alongside a magnificent highway, and all its equipment is of modern French design. The countryside through which it passes is covered with scrub, broken by occasional fields under crops, and the villages we saw consisted of groups of tents made of sticks covered with rags and even paper, and were surrounded by cactus hedges.

The villas in the European quarter of Rabat are of the "Riviera" type, and from them we passed through the ancient Bar Er Rouah, a Moorish gate, into the Sultan's Palace, known as the Dar-el-Makchzeu, which is a large group of white-washed red-roofed Moorish buildings. We were even more interested in Hassan's Tower. This is a magnificent monument, 104 ft. in height, that was erected as a memento of victory centuries ago and round it are the extensive ruins of the largest mosque ever built in Morocco. There are no stairways in the tower, and we climbed to its summit up a series of gentle slopes, to obtain a magnificent view of the town.

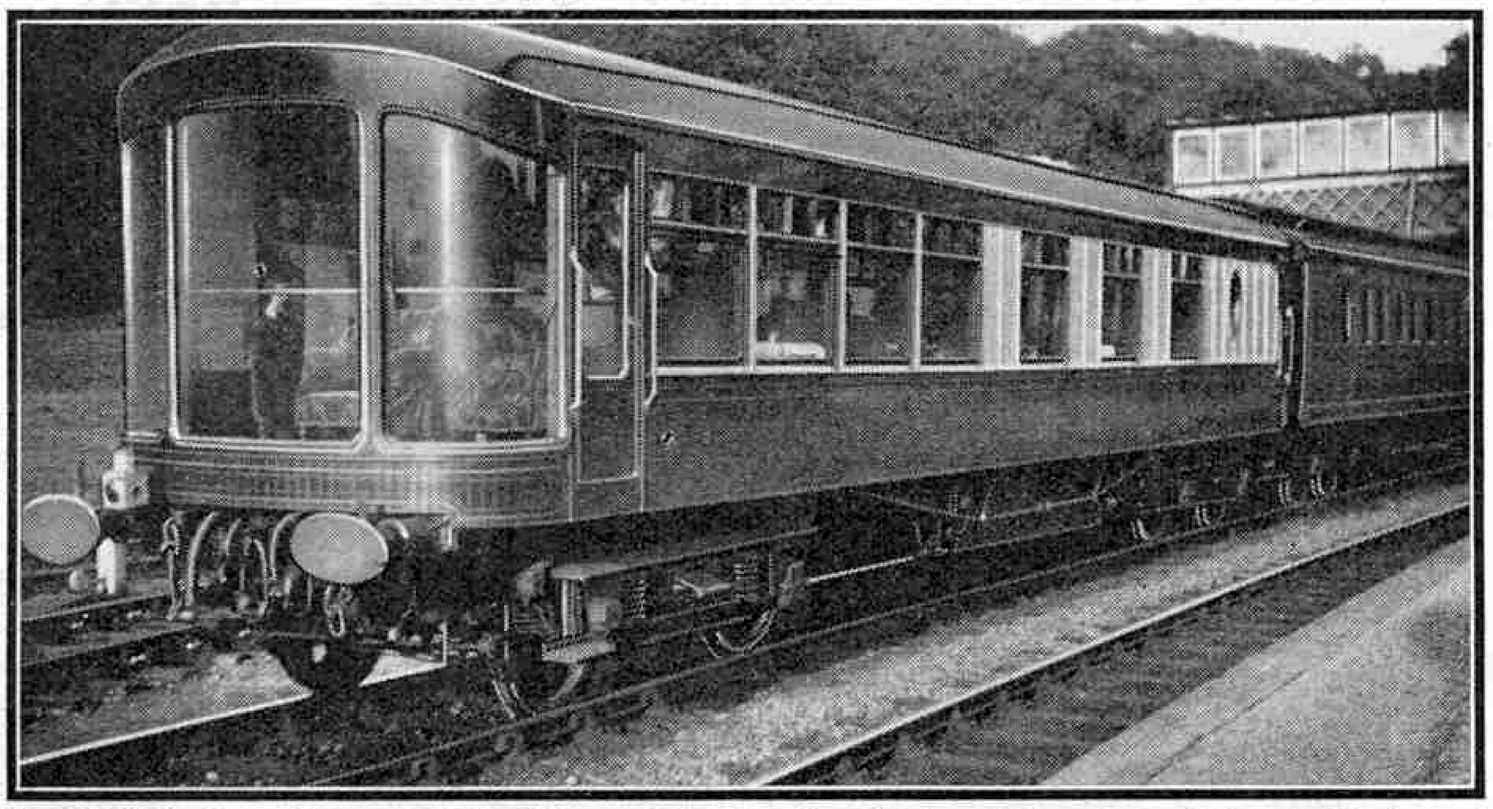
Other places we visited were ancient Roman ruins, with tame storks and vultures resting on them, and the Souks, or native markets. The Souks are honeycombed with tiny streets where traders of all nationalities squat alongside their wares exposed for sale. Some of these men had only a few beans or nails, or a piece of unattractive meat for sale, but seemed quite content to pass the day waiting to get rid of their scanty merchandise. The smell in this market place was by no means pleasant.

After climbing the pavements to obtain a good view of the Souks from the outside, we made our way to gardens where we sampled curious sweetmeats, mint tea and tiny cups of semi-solid toffee.

J. T. BENT (Oxford).

A Run in the *"Maid of Morven"*

The *"Maid of Morven"* is a luxurious coach employed on the Glasgow, Callander and Oban route of the Caledonian section of the L.M.S.R. to enable passengers to enjoy the scenery through which this route passes. Its windows are long and low, and pass right round the back of the car, where they extend downward to the floor. Within it are two compartments. One of these is a dining room and the other may be described as an observation room, for it is fitted with comfortable chairs that enable its occupants to look out in comfort. A glass partition divides the two sections and a large mirror in the dining room enables passengers seated with their faces to the engine to see the surrounding country without turning round.



The L.M.S.R. observation car "Maid of Morven," showing the extensive windows from which splendid views of lineside scenery are obtained by passengers. Photograph by H. H. Hetherington, Holt, Norfolk.

The car has accommodation for 23 first class passengers and in summer is attached to the rear of the 9.45 a.m. train from Buchanan Street Station, Glasgow, to Oban, returning in the evening. When I made this trip I greatly enjoyed the run. The first part of the route passes through industrial districts, in which there is intensive train working of exceptional interest to railway enthusiasts, and from the observation car I saw more of every type of railway activity than I could have seen from an ordinary coach. Most of the journey lies in the heart of the Scottish mountains and provided wonderful views. I was particularly impressed by the glimpse I obtained of Loch Earn, surrounded by great mountains, and I realised why this view is supposed to be the finest that can be seen in Great Britain from a train.

When I reached Glasgow in the evening I had spent nine hours in the *"Maid of Morven"* on one of the most picturesque railways in the country.

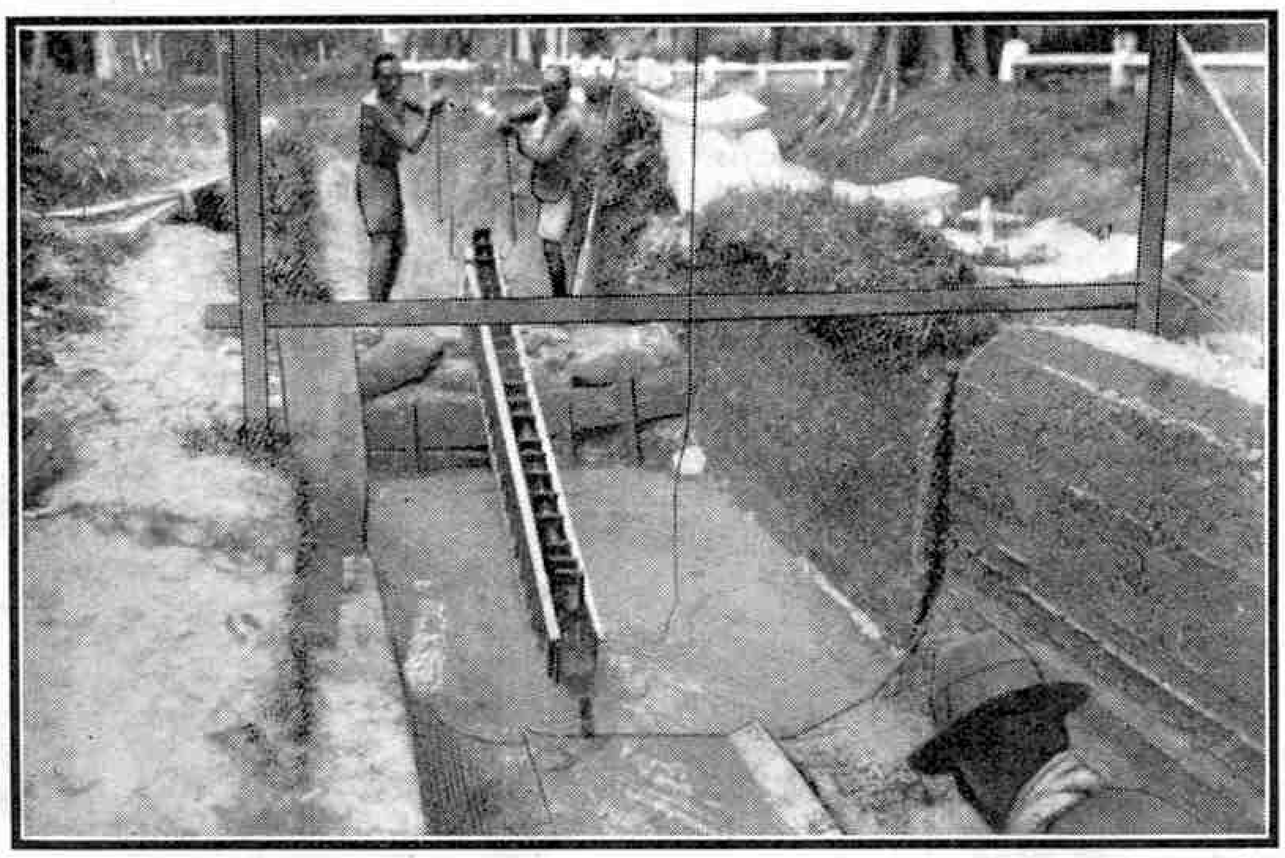
H. H. HETHERINGTON (Holt, Norfolk).

Impromptu Engineering in the East

I saw an interesting example of human ingenuity when I had occasion to construct a deep land drain in an eastern town. The site was slightly above sea level and at the foot of a precipitous mountain range, and the narrow trenches were filled with sticky mud whenever a rainstorm broke in the hills. The mud was too soft to shovel and not sufficiently liquid to be pumped out with the means available, and greatly hindered my work.

At this stage my Chinese contractor produced the interesting machine shown in the accompanying photograph. This was built up of two long ladders placed on edge and parallel to each other, resting on a plank that kept them about six inches apart. The ladders were filled in at their ends with timber through which holes were bored to form bearings for axles made of round bar iron. Rough wooden wheels with vanes projecting from their rims were mounted on both axles, and the ends of the upper axle were twisted to form cranks.

An endless conveyor belt was built up of wooden plates connected by hard wood links and this was fitted to the ladder framework. The simple machine thus completed was driven by man power, the natives seen in the photograph pushing downward on wooden levers fitted over the cranks. The endless belt travelled at high speed and made an appalling clatter, but it lifted a remarkably large quantity of mud and water from the trenches. This was discharged into wickerware baskets, in which the greater part of the mud was trapped, ready to be carried away. The device worked well and solved the problem that was worrying me.



An ingenious machine devised by a Chinese contractor for removing thick mud from a deep trench. Photograph by D. M. Cameron, Birmingham.

D. M. CAMERON (Birmingham).

How Briar Pipes are Made

During a holiday in France I stayed at St. Claude, near the Swiss border. Pipe making is the chief industry of that town and I was able to visit a factory.

Briar wood is grown in the south of France, Corsica and Sicily and other places, and reaches the factory in sacks containing about 60 dozen blocks. These are cut to shape with the aid of a circular saw and lathes, and I was interested to see that the men and women engaged in this task wear glasses to protect their eyes. Each bowl was carefully examined for blemishes, and flaws were corrected by means of wood cement. The bowls then were filed to shape and fitted with turned ebonite mouthpieces, ready for polishing and varnishing. D. ELDRIDGE (Stowmarket).

Modern Transport in Meccano

A Fine Eight-Wheeled Steam Wagon

THIS month we describe a realistic working scale model of an eight-wheeled steam wagon fitted with a four-wheel compensating steering arrangement. The advantages of distributing a heavy load over a number of wheels are many, especially if the ground to be negotiated is rough. These advantages are made still more evident if all the wheels are compensating, thereby enabling them to be continually in contact with the ground.

The Meccano model is a miniature replica of a D.G.8 type steam wagon, and all the main features of the original have been incorporated. The model is commenced by building the main frames, each side member of which consists of two 24½″ Angle Girders joined together to form a channel section girder. These two complete channel section girders are bolted together, parallel to each other, by a 4½″ Angle Girder 2 at the front and three 7½″ Strips at the rear, as shown in Fig. 4. The two girders are made rigid by the addition of the 4½″ Strip 30A and also a 3½″ Strip.

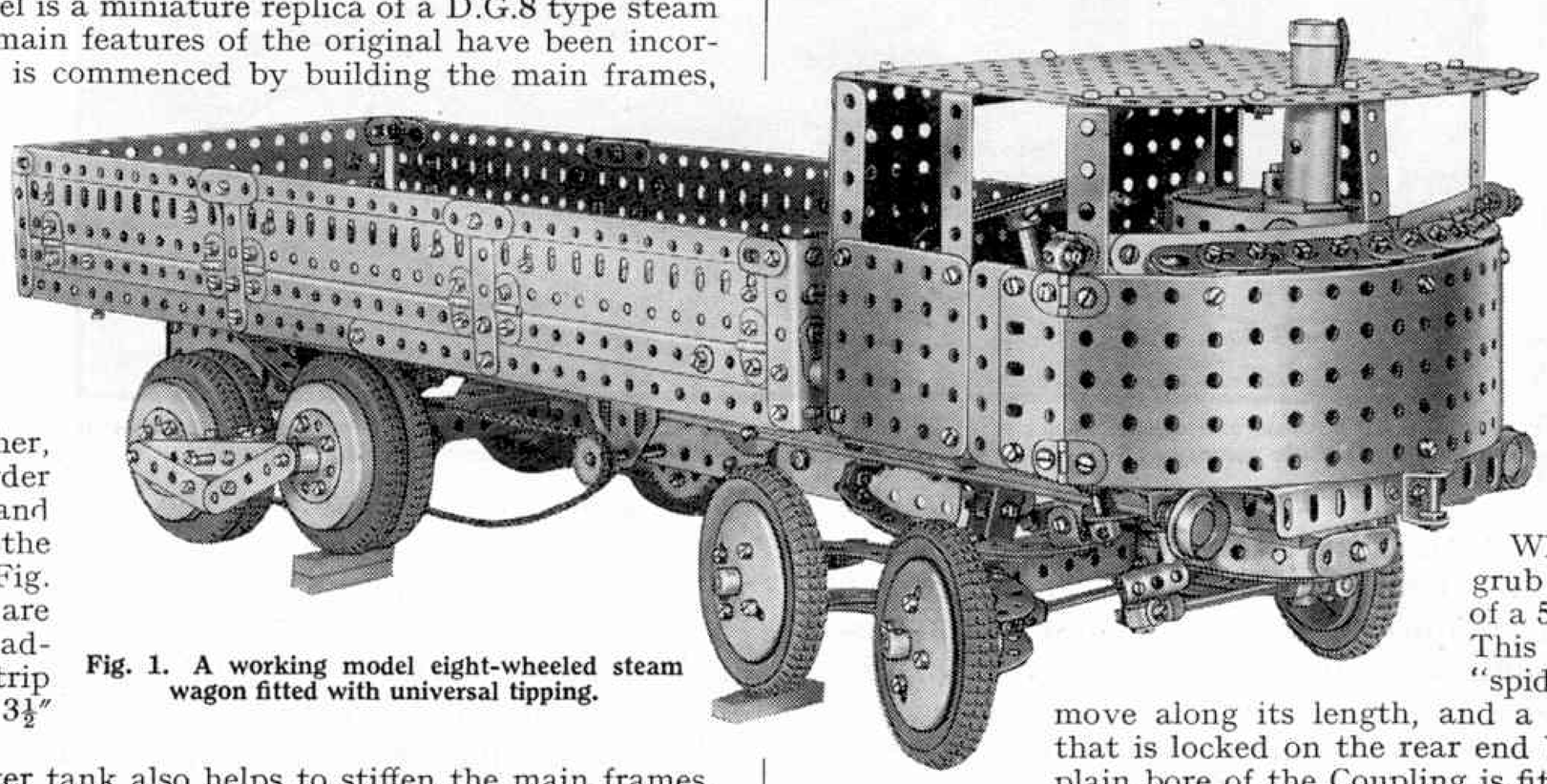


Fig. 1. A working model eight-wheeled steam wagon fitted with universal tipping.

The imitation water tank also helps to stiffen the main frames. This is composed of a 3½″×2½″ Flanged Plate 36, secured to the underside of the frames by two 3½″ Angle Girders, two 3½″ and two 2½″ Flat Girders and four ½″×½″ Angle Brackets. The 3½″ Angle Girders are bolted to the rear of the main frames, as shown in Fig. 4, and to them are attached the 3½″ Flat Girders. The bottom corners of these Flat Girders carry the ½″×½″ Angle Brackets, to which are secured the 2½″ Flat Girders forming the ends of the dummy water tank. These Flat Girders are also bolted to the flanges of the 3½″×2½″ Flanged Plate 36. An imitation hose is added at 35, and this consists of a length of Spring Cord clamped in a coil behind a Flat Bracket attached to the tank by means of two ½″ Bolts.

The power unit, an E6 Electric Motor, and the transmission are next fitted to the main frame. The Motor is bolted to the upper flanges of the main girders of the frame by two 3½″ reversed girders 7, and it carries a ½″ Pinion on its armature shaft. This meshes with a 57-teeth Gear carried on a 2″ Rod journalled in the side plates of the Motor, and also in two 2½″×2½″ Flat Plates. These Plates are held in place by ⅜″ Bolts, each shank of which carries five Washers as shown in Fig. 2.

The Rod carrying the 57-teeth Gear also carries a ½″ Pinion 8 that is in engagement with another 57-teeth Gear carried, together with a ½″ Pinion 9 and 50-teeth Gear 10, on a sliding Rod. The movement of this Rod is controlled by a 1″ loose Pulley, free to rotate on a ⅜″ Bolt that is locked to the lower extremity of a Crank 16. A 6½″ Rod, on which this Crank is locked, is journalled at one end in the centre hole of a Coupling 15 and is prevented from moving longitudinally by means of a Collar as shown in Fig. 4. The end of the 6½″ Rod that enters the cab is fitted with a second Collar that carries a 2½″ Threaded Rod forming a gear change lever. The upper end of the Threaded Rod is fitted with a Handrail Support 14.

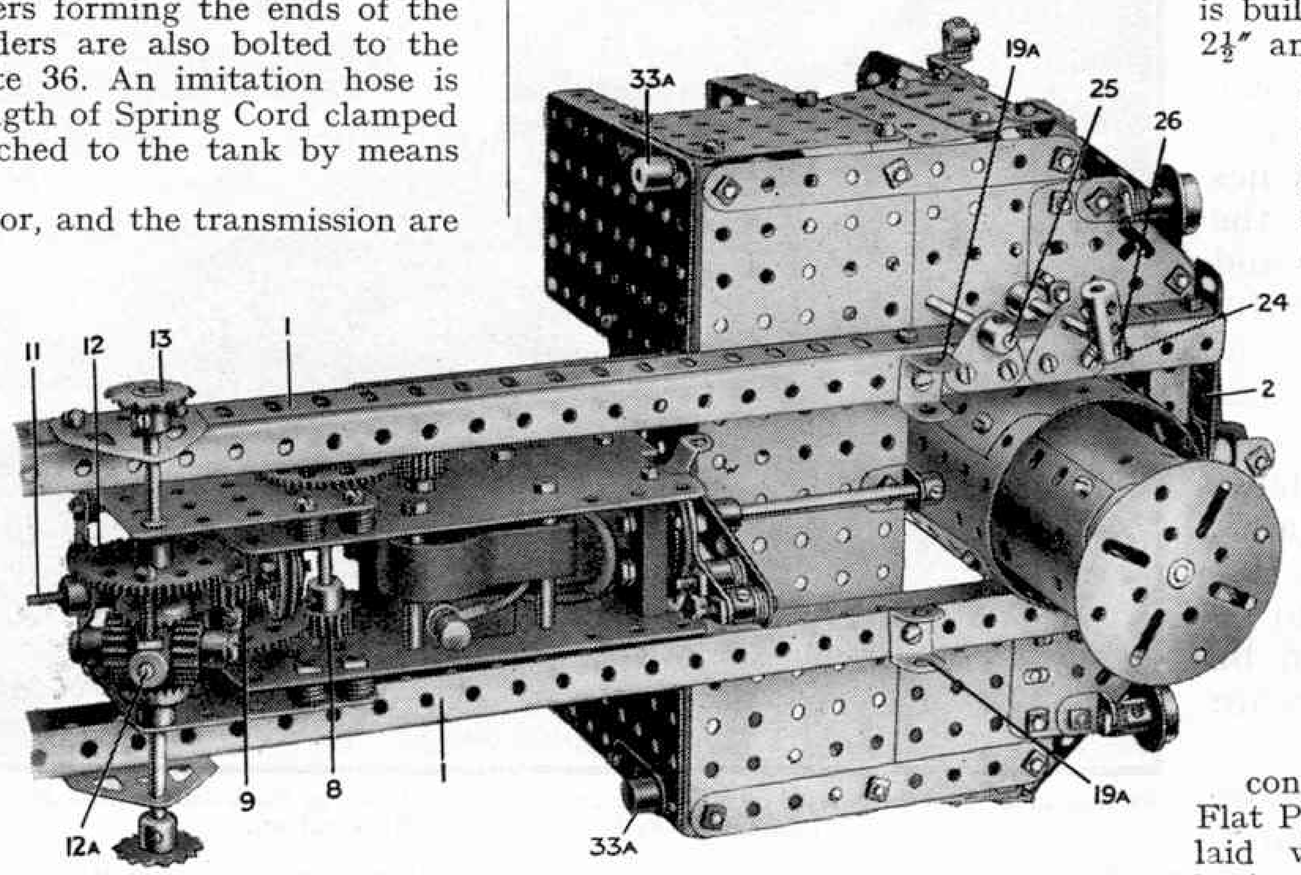


Fig. 2. An underneath view showing the power unit and boiler.

When the gear lever is in the position shown in Fig. 4, the 50-teeth Gear 10 meshes with a 57-teeth Gear 12 forming the differential crown wheel. This latter Gear is free to rotate on one side of a split shaft, both inner ends of which are journalled in a Coupling. This side of the shaft carries also a ¾″ Contrate Wheel that is caused to transmit its movement to a second similar part by means of two ¾″ Pinions. These Pinions are free to rotate on Pivot Bolts that are screwed into the centre tapped hole of the middle Coupling so that they grip a 1½″ Rod 12A. Two Collars and two ¾″ Bolts secure the Rod 12A to the crown wheel. Each side of the split shaft, carrying the differential just described, has a ¾″ Sprocket Wheel locked on its extremity.

When the gear lever is moved into the opposite position shown in Fig. 4, the ½″ Pinion 9 engages with a ¾″ Contrate Wheel secured by two grub screws to one end of a 5″ Threaded Rod 11. This Rod carries a "spider" 34A, free to move along its length, and a Threaded Coupling that is locked on the rear end by a lock nut. The plain bore of the Coupling is fitted with a 1½″ Rod journalled in a Handrail Support secured to a transverse 3½″ Strip. The inner end of the Rod 11 is journalled in the lower hole of a 1″ Triangular Plate attached to the two 2½″×2½″ Flat Plates by a 2″ Strip and two ½″×½″ Angle Brackets.

Before proceeding further with the transmission it is advisable to construct and fit the cab. The floor of this section of the model is built up from two 5½″×2½″ and two 2½″×2½″ Flat Plates as shown in Figs. 2 and 4. The front edges of the smaller Plates are fitted with 1½″ Flat Girders and a 1½″ Corner Bracket, the protruding corners of this latter part being bolted to the ends of the 4½″ Angle Girder 2. The ½″×½″ Angle Brackets, forming supports for the imitation headlight, are fitted at this stage. The back of the cab consists of three 4½″×2½″ Flat Plates, one of which is laid with its long edge horizontal. The two remaining Plates are secured to this in a vertical position, and their outer edges support two 4½″ Angle Girders to which are bolted the Cranks 33A and also two 2½″×2½″ Flat Plates forming the sides of the cab. The free edge of these Plates are bolted to the 4½″×½″ Double Angle Strips shown in the illustration.

Three further 4½″×½″ Double Angle Strips 4 are now bolted in place, and these carry the front of the cab, which is composed of two 5½″×2½″ Flat Plates curved to the shape shown in Fig. 1. The three Double Angle Strips 4 are joined together by two 3½″ Strips and four Flat Brackets, and the space between these parts

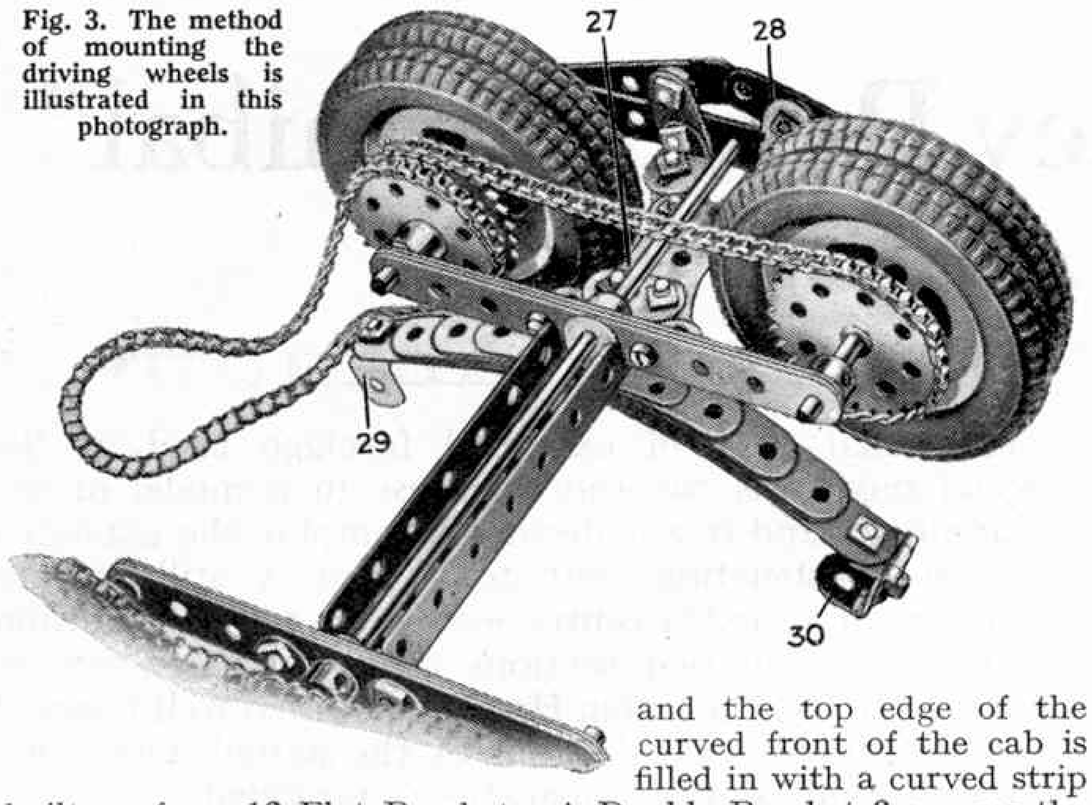


Fig. 3. The method of mounting the driving wheels is illustrated in this photograph.

and the top edge of the curved front of the cab is filled in with a curved strip built up from 12 Flat Brackets. A Double Bracket 3 secures the bottom of the cab front to the centre Double Angle Strip 4. Side lights consist of Collars fitted with bolts and fixed to the cab sides by means of bent $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Brackets. Doors are represented by bolting two $2\frac{1}{2}''$ Flat Girders together as shown in Fig. 1 and attaching them to the cab by Hinges. Two Hinges are allotted to each door. The draw-bar hook is built up from a Large Fork Piece fitted with a Threaded Pin and attached to the centre of the Girder 2 by a $\frac{1}{2}''$ Bolt.

The outer casing of the boiler consists of two Boilers, without Ends, bolted together to form a tube $2\frac{1}{2}''$ in diameter. This tube is attached to the main frames by two Trunnions, and the top is covered in by a Face Plate secured between four nuts and the upper flanges of four $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Brackets. The inner Boiler is fitted at its upper end with a Boiler End and at its lower end with a Face Plate and a Boiler End. A Rod passes through the centre of this complete boiler, and its upper end is gripped in the boss of the Face Plate forming top of the boiler casing. When it is desired to release the boiler from its casing all that is necessary is to unscrew the set screw of the upper Face Plate. The lower edge of the boiler casing carries the number plate as shown in Fig. 1.

The lower portion of the chimney is shown in Figs. 1 and 4. It is built up round a 2″ Threaded Rod and consists of a Sleeve Piece and two Chimney Adaptors, one of which is shown at 6. Both of these Adaptors are locked in place by means of two nuts each. The upper end of the Threaded Rod protrudes above the cab roof and is fitted with a Chimney Adaptor and $\frac{3}{4}''$ Flanged Wheel. The escape steam pipe is represented by a short length of Spring Cord.

The cab roof is built up from two $5\frac{1}{2}'' \times 3\frac{1}{2}''$ Flat Plates, and the curved front edge is represented by a number of Curved Strips of different sizes. The sides of the roof are extended by $4\frac{1}{2}''$ Strips.

The steering wheel, a 2″ Pulley, is mounted on the upper end of a $4\frac{1}{2}''$ Rod 25 forming the steering column. This Rod passes through a hole in the floor of the cab and is journalled at its lower extremity in a 1″ Triangular Plate. A $\frac{3}{4}''$ Pinion on the steering column meshes with a 50-teeth Gear on the 2″ Rod 26 that is journalled as shown in Fig. 2. A Coupling 24 is carried on the 2″ Rod, and this forms the crank for operating the four front steering wheels.

The framework for carrying the steering wheels is shown in Fig. 5, and it is attached to the main frames of the wagons by the spring shackles. In the illustration one of the springs have been removed. A Rod 18, secured by a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip to the centre beam of the unit, carries the two curved compensating frames, the points of attachment being the Double Arm Cranks 17 and two Double Brackets, one of which is shown on the near side of the illustration. The Double Arm Cranks 17 are held in place by means of Double Brackets. In securing the springs to the main frames the Hinges forming the pivoted shackles are bolted in place and the Double Brackets 19 are pivotally secured to the Double Brackets 19A, Fig. 2.

The Coupling 24 is coupled up, as shown in Fig. 5, by the Threaded Boss 22 and Swivel Bearing 23 to the Coupling 20 that is mounted together with a Crank on the stub axle pivot 20A. The Crank is linked up with a second Crank by a Rod and two End Bearings, and this second Crank is locked on a stub axle pivot connected to a third pivot by a $3\frac{1}{2}''$ Threaded Rod and two Threaded Bosses 22. These Threaded Bosses are secured pivotally to their respective Couplings carrying the stub axles by means of Swivel Bearings and 1″ Rods. It should be noted that a Flat Bracket is bolted to the underside of each of the Cranks in order to prevent play in their slotted holes. The two Couplings 20 are connected together in a similar manner to that already described.

The four driving wheels shown in Figs. 1 and 3 are represented by pairs of 2″ Pulleys and Dunlop tyres, fitted outside with a Wheel Flange mounted on a 3″ Rod, together with single or double $1\frac{1}{2}''$ Sprocket Wheels, as illustrated. The 3″ Rods are carried in compensating beams. One of these is shown in Fig. 3, and from this it will be seen that $4\frac{1}{2}''$ Strips are used for the sides of the beam. One side of the beam carries two extra Strips 28 and both complete sides are joined together by a built-up curved member 27. The link shackles 30 of the springs are bolted to the underside of the main frames, and the Double Brackets 29 are mounted on the Rods 29A Fig. 4.

The last part of the model to be constructed is the body. As will be seen from Fig. 1, this consists of a number of $5\frac{1}{2}'' \times 3\frac{1}{2}''$ and $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plates bolted to four longitudinal Angle Girders. The hinged plates of the body are held in a vertical position by means of the $1\frac{1}{2}''$ Strips and Flat Brackets. The operation of the movable pivot points is shown in this illustration.

Tipping is carried out in the following manner. The spider 34A is secured by two locknutted bolts to a Single Bent Strip connected to the underside of the tipping body by a $3\frac{1}{2}''$ Threaded Rod and Collar. The Collar carries two set screws, the shanks of which pass through two $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Brackets bolted to the body.

When the Electric Motor is running and the shaft 11 is being driven, the spider 34A moves towards the rear of the model. This action causes the Single Bent Strip and its attendant Threaded Rod to assume a vertical position. If, for example, a pivot bolt is engaging with the Crank 33A and a similar bolt with the Angle Bracket mounted on the rear of the main frames, the body will tip sideways. Two pivot bolts similarly control the end tipping movement. The construction of these special pivot bolts is shown in Fig. 1.

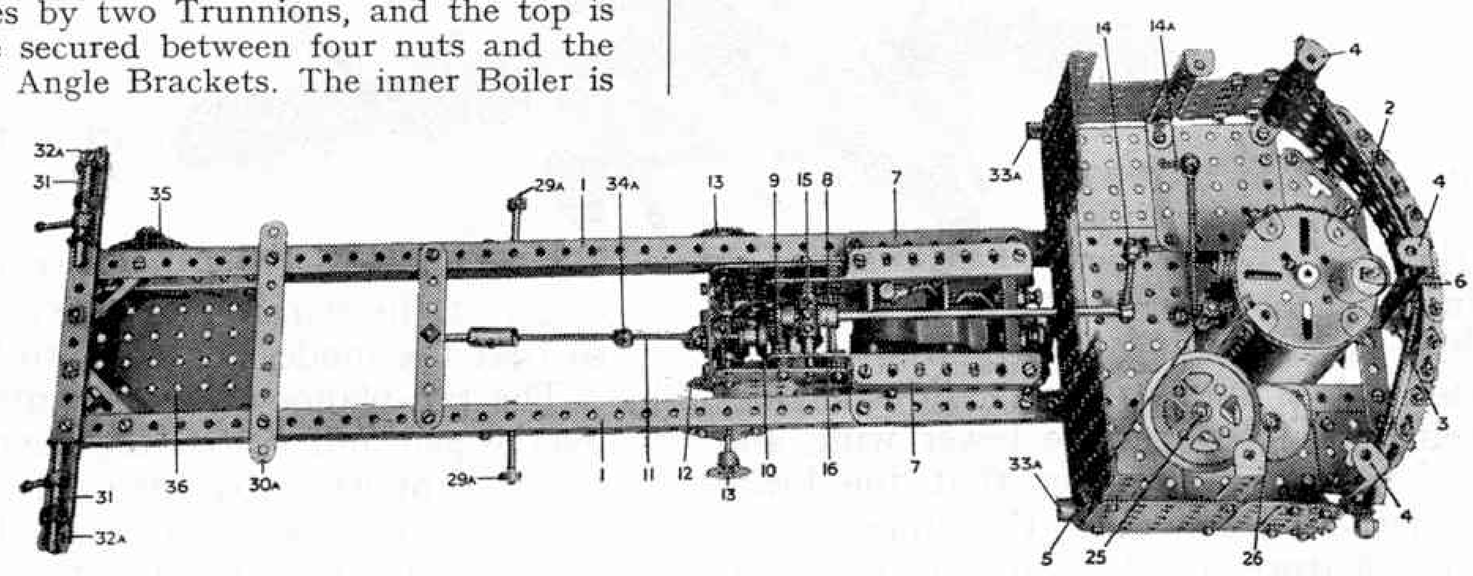


Fig. 4. A plan view of the model showing the cab and tipping mechanism.

When the body is tipped to the left, for example, the catches holding the hinged flaps on the left-hand side are turned into a vertical position. This allows the flaps to fall and the load may then be deposited on the ground.

The control for the Electric Motor is situated at 14A. This Handrail Support is mounted on the upper end of a $3\frac{1}{2}''$ Threaded Rod that is secured by a Collar to a $2\frac{1}{2}''$ Rod shown in Fig. 2. The free end of this Rod is journalled in a 2″ Strip that is bolted to the reversing lever of the Motor by means of two $\frac{1}{2}''$ Bolts. Collars and Washers are used for spacing purposes between the Strip and the reversing lever.

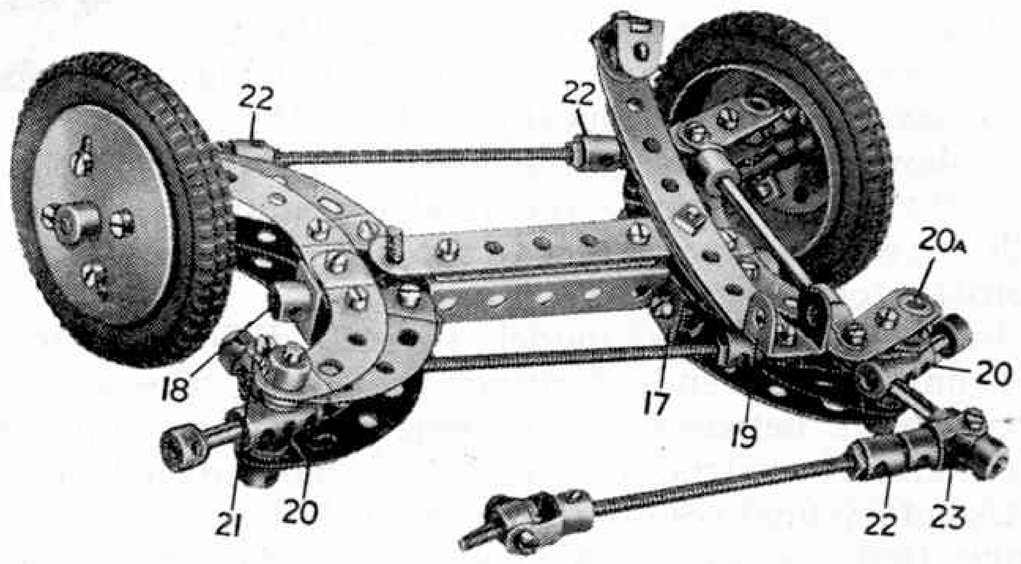


Fig. 5. The steering mechanism with two wheels removed to show the construction.

Fine Model of Handley Page "Hannibal"

Built with Special Aeroplane Parts

AMONG the most interesting of British air liners are those of the Handley Page "Hannibal" type in service for Imperial Airways. This type and a similar type known as the "Heracles" are the largest machines operated by Imperial Airways. The two differ only in internal details, the "Hannibal" being equipped for service on the African and Indian air routes, while the "Heracles" is intended for use on European services. The latter machine has the greater passenger accommodation, being capable of carrying 38 passengers in addition to two pilots. The "Hannibal" has accommodation for only 24 passengers owing to the necessity for extra space to ensure comfort in tropical countries, and to allow for more mails to be carried.

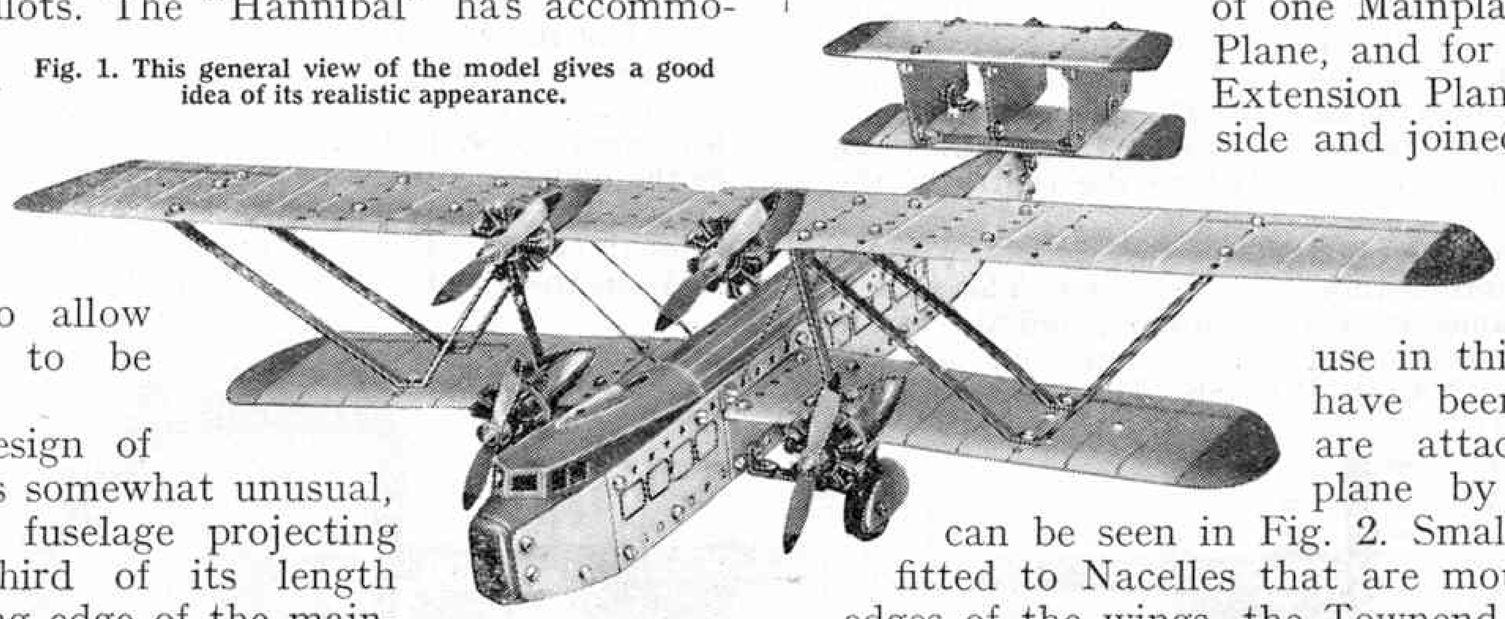


Fig. 1. This general view of the model gives a good idea of its realistic appearance.

The general design of the "Hannibal" is somewhat unusual, the nose of the fuselage projecting for about one-third of its length beyond the leading edge of the mainplanes. The machine is a biplane of unequal span with the fuselage situated below the lower wing. Four engines are fitted, two being mounted on the lower wing and two on the upper, in such a manner that the lower ones are spaced farther apart than the upper ones. Another interesting feature is the biplane tail unit carrying three rudders and fins.

Owing to this unusual design the "Hannibal" forms a most interesting subject for reproducing with the Meccano Aeroplane Parts. It is best built with the Special Aeroplane Parts, as these make it possible to represent faithfully such features as the pilot's cabin, radial engines and streamlined nacelles. The illustrations show a particularly fine model that follows closely the lines of this distinctive type, and comparison of the two views with illustrations of the actual machine that have previously appeared in the *"M.M."* will show that the essential features have been well brought out. To build the model a number of parts will be required in addition to a No. 2 Special Aeroplane Constructor Outfit.

In designing this model several difficulties were encountered in endeavouring to obtain the correct proportions between the various parts, and different methods of construction were tried and rejected before satisfactory final results were obtained. The illustrations show that careful work devoted to the preliminary planning of a new model is well repaid by the finished results.

The usual type of extended fuselage used in the Special models is too short for use in a model of the "Hannibal," and it was decided to employ the extended fuselage construction, but to extend it still further by means of an extra centre section, so that in addition to the front and rear sections there are three sets of centre sections. The Cabin Head is mounted well forward to represent the pilots' cabin of the actual aeroplane, in which dual control apparatus is provided.

Each of the lower wings consists of one Mainplane and an Extension Plane, and for the upper wings two Extension Planes are fitted at each side and joined at the centre to a Centre Section Plane. As the standard Struts are too short for use in this model, Wing Stays have been used instead, and are attached to the upper plane by Angle Brackets as can be seen in Fig. 2. Small Radial Engines are fitted to Nacelles that are mounted on the leading edges of the wings, the Townend Rings being omitted so that the model conforms to the prototype.

The tail-planes are represented by small Mainplanes, overlapped and bolted together in pairs, the lower one being supported by two Float Struts. Each of the rudders and fins is represented by two Fuselage Sides Front that are bolted together to form an oblong. The outer pairs of parts are attached in position by Angle Brackets and the inner pair is secured to Centre Section Struts as shown. An Adjustable Tail Wheel replaces the usual Tail Skid as in the actual machine. In practice this is necessary to facilitate handling the machine on the ground and to avoid damaging the surface of the landing ground.

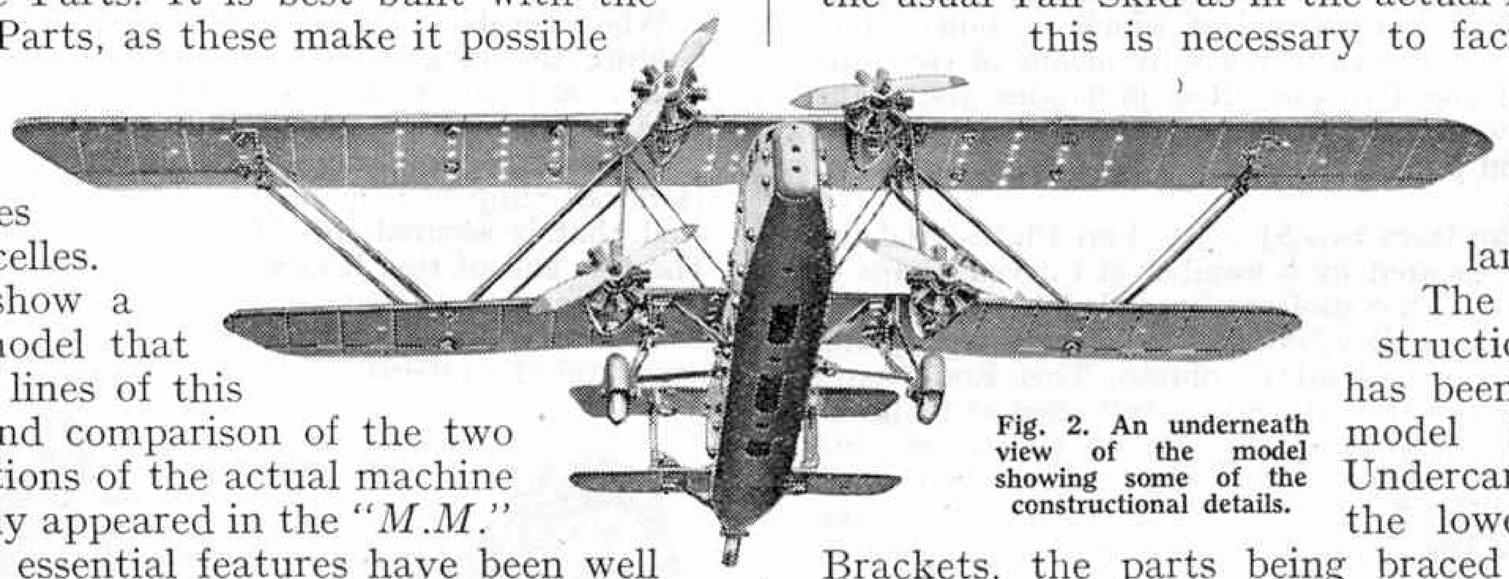


Fig. 2. An underneath view of the model showing some of the constructional details.

The undercarriage construction of the "Hannibal" has been reproduced in the model by attaching the Undercarriage "V" Struts to the lower wings by Angle Brackets, the parts being braced by Centre Section Struts and Float Struts.

Angle Brackets are again used at this point in order to secure the inner ends of the Centre Section Struts to the fuselage. The bolts holding these Angle Brackets in place also support the lower ends of the short bracing members fitted under the lower wings. These are shown in Fig. 2. The underside of the fuselage is fitted when the wings, tail unit, etc., have been attached. This is arranged at the ends similarly to the Special models, but an extra Fuselage Underside Middle Section is used.

New Motor Car Models

Two No. 1 Outfit Models of a Drop Head Coupé

MOTOR car design has changed to a remarkable extent during recent years, and the latest cars embody great improvements in construction, performance and appearance. With the development of engine and chassis details, bodywork also has received the attention of designers, so that now there is great variety in the types of body that are produced. The Meccano Motor Car Outfits make it possible to build exceedingly realistic models of motor cars without difficulty, and with the No. 1 Outfit it is possible to build open and closed cars of several different types. Five different models typifying modern sports cars are shown in the Instruction Leaflet, but these do not by any means limit the possibilities of the Outfit.

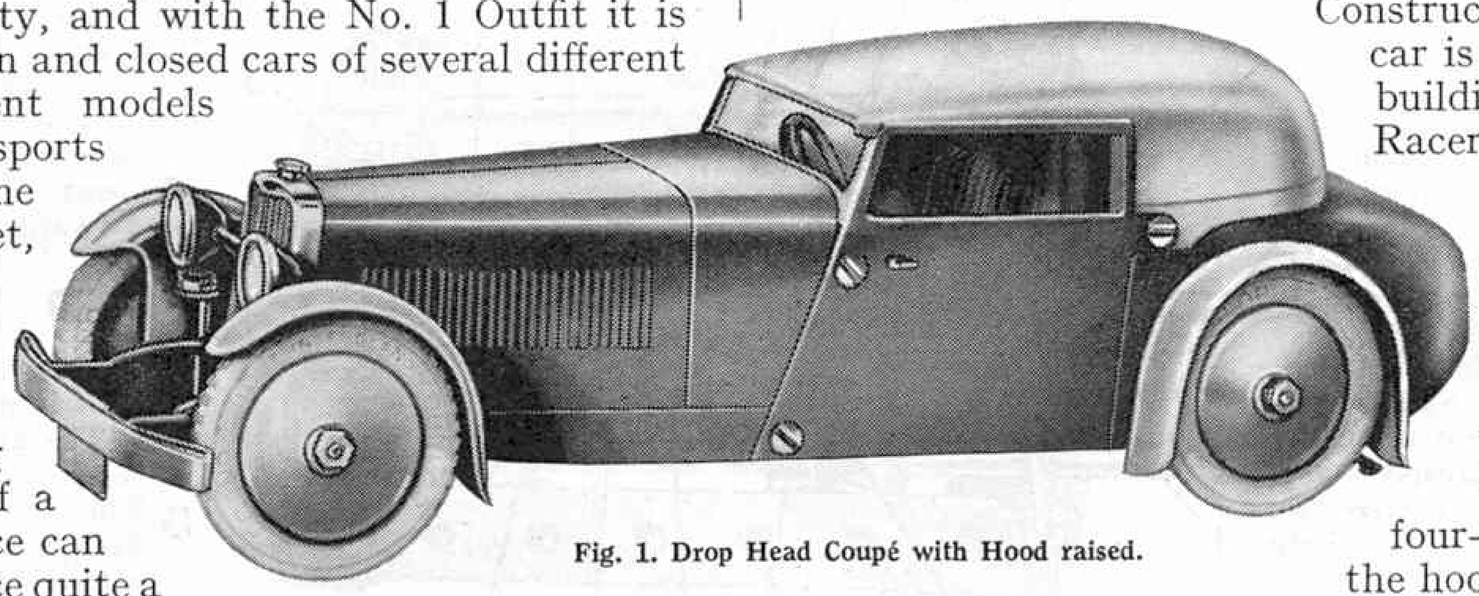


Fig. 1. Drop Head Coupé with Hood raised.

Without altering the actual design of a model, its appearance can be changed to produce quite a different effect by using new parts of different colours, thus giving new colour combinations. Some very attractive results can be obtained in this way, as the parts are available in a wide choice of colours. Even such a slight alteration as fitting a new set of Mudguards in a different colour will make a big difference to the appearance of a model. In a similar manner different coloured Saloon Roofs or Body Sections can be used to add interest to the models.

Several interesting models in addition to those shown in the Leaflet can be built without the addition of extra parts to the Outfit. The two illustrations on this page show new models that have very pleasing lines. They represent a popular type of car generally known as a drop head coupé, having bodywork designed so that the car can be used as a coupé to give complete weather protection, but when required can be used as an open car by folding back the head. A car of this type provides two interesting subjects for a model—one with the hood up, and the other with the hood down—as shown in the illustrations. An original method of construction has been adopted so that the models have a streamlined tail and so conform to latest practice.

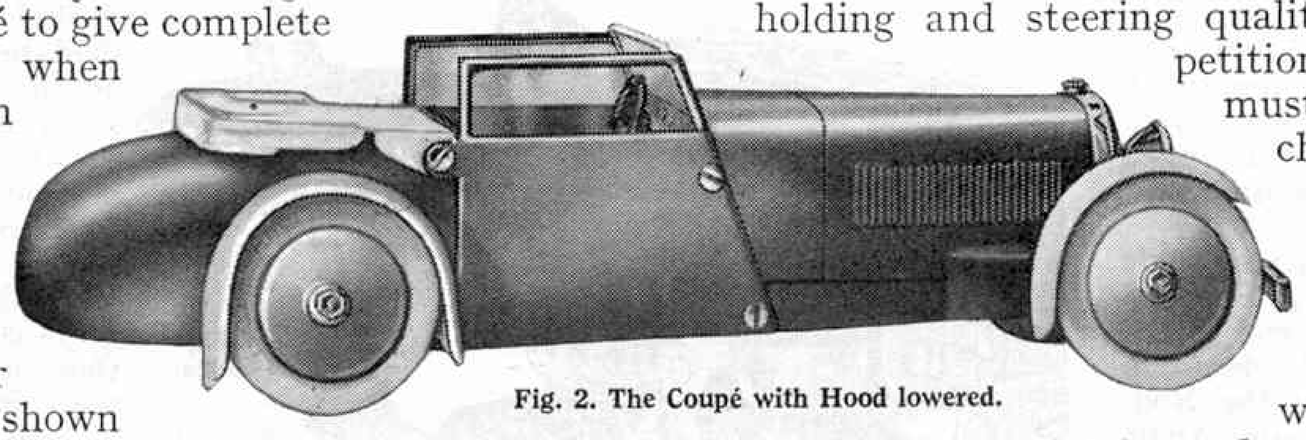


Fig. 2. The Coupé with Hood lowered.

The construction of these models does not differ very greatly from that of the models illustrated in the Instruction Leaflet, both models being built on similar lines to the Road Racer. To build the saloon, Model No. 3 Road Racer is built exactly as shown in the Instruction Leaflet, but the four bolts that hold the Sports Body to the Bonnet are omitted until the remainder of the model is completed. When this stage is reached the fixing bolts are inserted, but are first passed through the Doors to hold them in position. The Saloon Roof is then fitted in place by inserting bolts through the rear lugs of the doors and screwing them into the holes on each side of the Saloon Roof. The Saloon Roof is a little wider than the Sports Body, so that when the model is completed it overhangs the sides slightly. This detracts little from its appearance, however, and its graceful lines may be judged from the illustration.

Construction of the open car is similarly started by building up the Road Racer and fitting Doors in position as for the closed car. In this case, instead of the Saloon Roof, a Tonneau Cover is fitted to the rear lugs of the Doors, thus representing a four-seater coupé with the hood folded back and a cover fitted over the rear seats.

Keen model-builders will try designing other new models on similar lines, and will find that a number of variations can be made by using different combinations of Body Sections, Doors and Hoods. An alternative design of open car of the type shown in Fig. 2 can be made by fitting Doors to the Sports Tourer (Model No. 4), each door being secured to the Body by three bolts. Yet another variation is effected by using the Cover for Folded Hood in place of the Tonneau Cover on this model. In this way, and by trying different combinations of colours, the fascination of model car building is greatly increased.

When the cars are finished they can be raced against other model motor cars and can be tested for road-holding and steering qualities by arranging competitions in which the cars must be set to travel between chalk marks or miniature sand bags placed for this purpose. All owners of motor car models should have a garage for their cars if they wish to get the maximum fun from their models, and models of filling stations and other accessories can be made with Meccano parts. The Meccano Garage is specially designed for housing any of the Meccano Cars or other car of similar size. It is attractively finished in imitation rough cast with red roof, and has hinged double doors. The great advantage of having a Garage for the model cars is that there is always somewhere for them to be put away to be kept free from dust.

The two cars illustrated on this page are from ideas submitted by J. R. Goff, King's Lynn, J. Charley, London, N.5, and J. Clark, Southampton.

Suggestions Section

Edited by "Spanner"

(332)—Four-speed and Reverse Gear-box

Many interesting features are incorporated in the new Meccano Motor Chassis (Super Model No. 1a), and one of the most fascinating is the gear-box giving four forward speeds and a reverse. Much ingenuity is displayed in the design of this mechanism, which is built up in a very compact form, and is fitted with an E1 Motor in a housing representing the engine and gear-box unit complete. Fig. 332 illustrates the gear-box, and Fig. 332a shows the end of the complete unit and the method of selecting the gears.

Two 3½″ Angle Girders at the sides of the gear-box are connected together by two pairs of 2½″ Strips bolted to Angle Brackets to form angle girders. In this way a rectangle is formed, and a 3½″ Strip is bolted to the centre holes of the built-up girders at each end. This Strip provides the support for two 1½″×½″ Double Angle Strips that form the bearings for the driving and driven shafts 7 and 10 respectively. Each built-up end girder carries two 1½″ Strips that support a 2½″ Strip and a 2½″ Angle Girder.

The layshaft guides and supports are now fitted. The layshaft for third and top gears is seen in Fig. 332. A 4½″ Rod 1 slides in holes in the end of the gear-box. It carries a Collar 2, and also two Couplings the upper holes of which form the bearings for the layshaft 3. The Collar 2 is fitted with a Flat Bracket that is held in place by a ⅜″ Bolt, under the head of which are placed two Washers. Two more Washers are placed for spacing purposes between the Flat Bracket and the Collar 2, the Bolt passing through the slotted hole of the Bracket. The Flat Bracket will now be found to rest on the upper surfaces of the 3½″ Angle Girder at the side of the gear-box and the 3½″ Strip along the centre. If necessary the ends of the Bracket must be bent slightly until they press lightly against these two parts. By this means the Rod 1 is prevented from turning, but is able to slide horizontally. Its movement is limited by a bolt head at 4 and the securing bolt of one of the Double Angle Strips.

The slide on the other side of the gear-box must be fitted before proceeding further with the construction. This is built up and fitted in a similar manner to that already described, with the exception that the two Couplings carrying the layshaft are arranged in different positions, which are indicated at 5 and 6.

A 2½″ Rod is used for the driving shaft 7, and it carries a Collar and ¾″ Pinion 8 between the 2½″ Strip at the end of the gear-box and the Double Angle Strip forming a second bearing for the Rod. On the opposite side of the Double Angle Strip a ½″ Pinion 9 is fitted. It should be noted that this Pinion is occupied for only half its length by the Rod 7, the remaining portion of the hole forming a support for the inner end of the Rod 10. This Rod is 3½″ in length, and is fitted with a ½″ Pinion 11 and ¾″ Pinion 12, which are secured on the Rod between the second Double Angle Strip and Pinion 9. Between the Double Angle Strip and the end of the gear-box a 1″ Gear 13 is locked in place on the Rod, being secured as near to the end of the gear-box as possible without actually touching. The boss of this Gear faces the centre of the gear-box in order to give the pinion 14 sufficient clearance. This pinion 14 is the special 10-teeth pinion taken from an E1 Electric Motor, but it can be obtained separately if required. A Collar is now secured outside the gear-box on the Rod 10 to prevent that Rod from moving laterally.

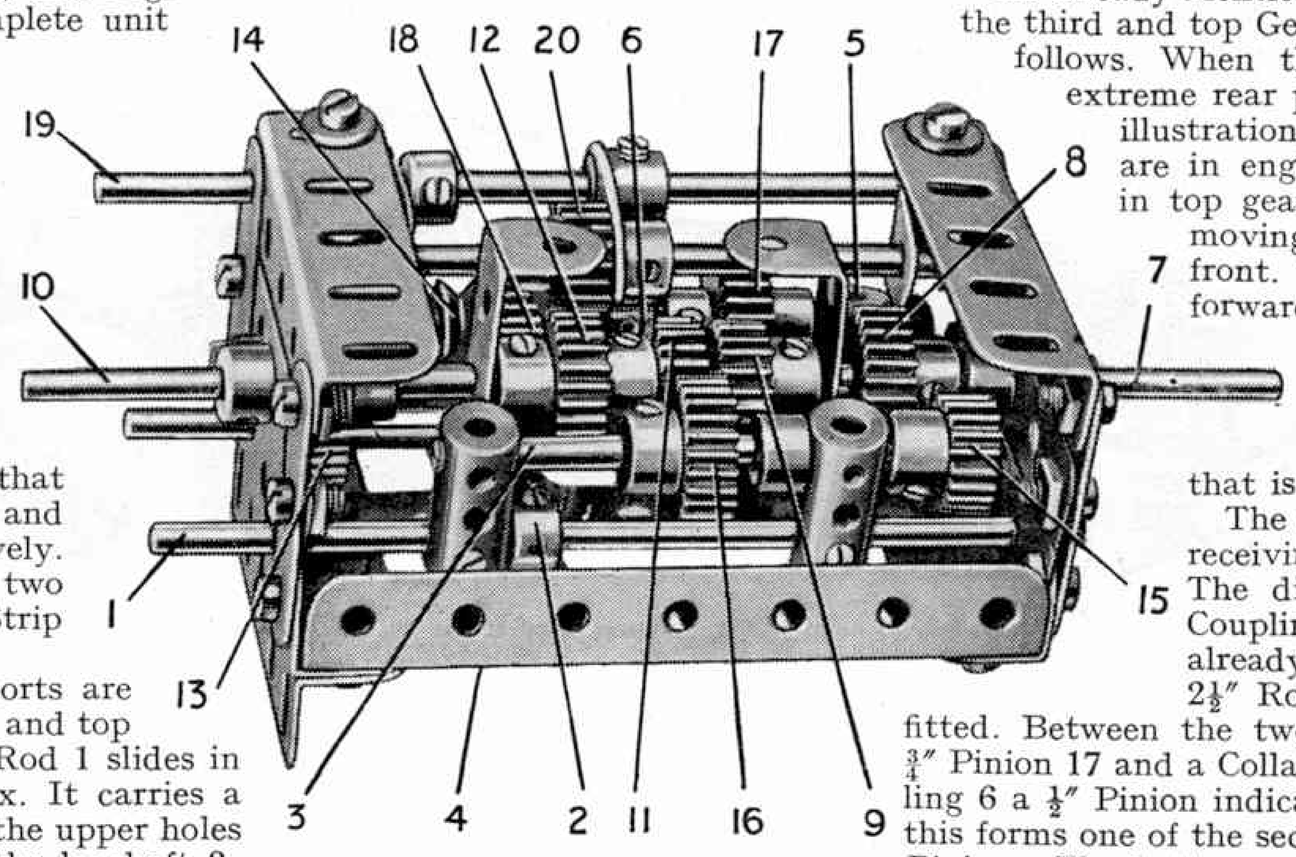


Fig. 332

The layshaft 3 is next fitted, and is journalled in the upper plain holes of the two Couplings secured to the Rod 1. It consists of a 2½″ Rod, and is fitted with a ½″ Pinion 15 and ¾″ Pinion 6. The boss of the Pinion 15 and a Collar prevent the Rod from moving laterally, independently of the Rod 1.

As already mentioned, this layshaft operates the third and top Gears, which are arranged as follows. When the Rod is moved to its extreme rear position, to the left in the illustration, Pinions 8, 15, 16 and 11 are in engagement, and this results in top gear. Neutral is obtained by moving the layshaft partly to the front. When the Rod is in the forward position the two Pinions 9 and 11 are locked together by the Pinion 16, thus resulting in a straight-through drive that is used for third gear.

The gear-box is now ready for receiving the second layshaft. The disposition of each of the Couplings supporting this has already been described, and the 2½″ Rod forming the layshaft is fitted. Between the two Couplings are placed a ¾″ Pinion 17 and a Collar. To the left of the Coupling 6 a ½″ Pinion indicated at 18 is secured, and this forms one of the second gear and reverse gear Pinions. The bottom gear pinion 14, taken from an E1 Electric Motor, will be found to mesh accurately with the 1″ Gear 13 when the layshaft is adjusted properly. First and second gears are obtained in the following manner. When the layshaft is slid to the rear of the gear-box, the Pinions 9 and 17 are in mesh together with the pinion 14 and 1″ Gear 13. Slight movement forward results in the pinion 14 and Gear 13 being thrown out of mesh, and gives neutral gear. Further forward movement brings the Pinions 12 and 18 into mesh, while Pinions 9 and 17 remain in mesh.

Two corner angle brackets formed from ½″ Angle Brackets are now fitted, and the inner flanges of these two parts form bearings for a 3″ Rod carrying a ½″ Pinion 20 and a Collar. The two parts are spaced slightly apart in order to accommodate the end of a Pawl secured on the Rod 19 that is journalled in holes at the ends of the gear-box as shown. A Collar limits the backward movement of the Rod 19. The Pinion 20 is normally held in the position shown, and is thrown into gear only when the layshaft for first and second gears is in the neutral position. It is then moved to the rear and engages with Pinions 12 and 18. Thus the drive for reverse gear is taken through Pinions 9, 17, 18, 20 and 12, and the resulting gear ratio is midway between second and third gears of the forward speeds. A 3½″ Strip can now be fitted along the top of the gear-box to brace the ends and to form a support for the two 1½″×½″ Double Angle Strips.

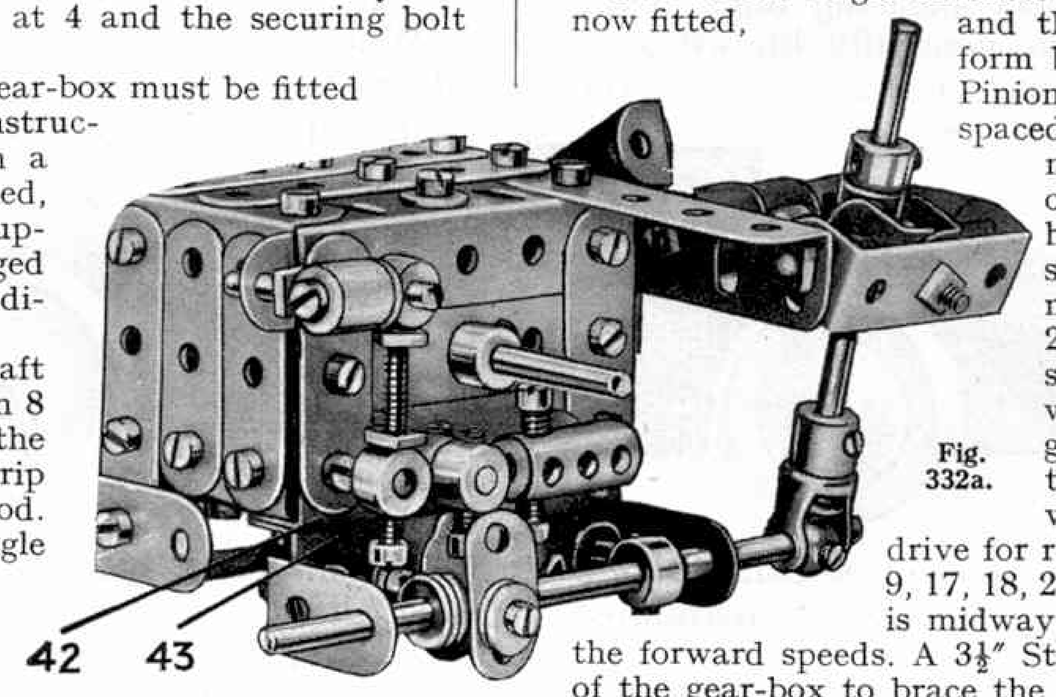


Fig. 332a.

Close scrutiny of Fig. 332a in conjunction with Fig. 332 will show the method of selecting the different gears. The lower illustration shows the end of the gear-box when it is incorporated in the engine unit. The Rod 1 controlling the layshaft 3 can be seen towards the right, and is fitted with a Coupling carrying bolts as shown. The Rod operating the other layshaft carries a Collar that is fitted also with a bolt, and another Collar is attached to the Rod 19 by a 1″ Screwed Rod inserted in a "spider" on the end of the Rod. To prevent the Pawl on the Rod 19 from disengaging with its Pinion and Collar the Rod is prevented from rotating.

(333)—Speedometer (J. Hart, West Kirby)

The ingenious device shown in Fig. 333 can be used for comparing the speeds of Clockwork or Electric Motors, and if fitted with a calibrated dial can be used as a speed indicator. The 57-teeth Gear 1 is free to rotate on the Rod 2 carrying a Coupling and weighted arm 3. The Gear is driven from a ½″ Pinion on the Motor armature, and is retained in place on the Rod by a Collar and the ½″ Pulley 4. The Pulley is spaced from the Gear by means of three Washers. Two Handrail Supports are pivotally attached to the Gear Wheel in opposite holes, each being provided with two nuts that are locked together on its shank. A 1½″ Rod is carried in each Handrail Support, and the shorter projections of the Rods are provided with Handrail Couplings that serve as weights.

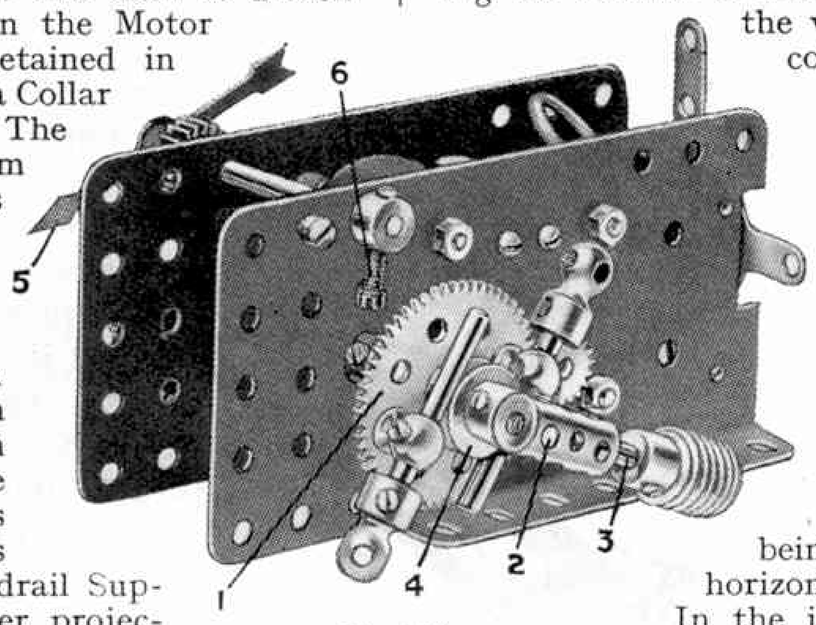


Fig. 333

The Worm on the end of Rod 3 normally hangs perpendicularly, and tends to take up the position shown when the device is in operation. When the Gear 1 rotates slowly, the Handrail Couplings tend to fly outward under the influence of centrifugal force, and the 1½″ Axle Rods press lightly in the groove of the ½″ Pulley 4. As the speed increases the friction between the Rods and the Pulley is increased, so that the Pulley tends to turn against the influence of the weighted arm 3. The other end of the Rod 2 carries a 57-teeth Gear Wheel that engages a ½″ Pinion on the Rod carrying the Pointer 5. Thus the movement of the weighted arm is recorded by the Pointer, which moves almost completely round the dial, not shown, for a quarter of a revolution of the Rod 2. The ⅜″ Bolt 6 strikes a bolt screwed into the Motor side plate to limit the movement of the weighted arm, and prevent it from being raised above the horizontal position.

In the illustration the mechanism is shown mounted on an E6 Electric Motor, but any suitable framework can be used according to requirements. To calibrate the dial, reduction gearing should be arranged between the driving shaft and a Rod that is made to rotate sufficiently slowly to enable the number of revolutions per minute to be counted. The speed of this shaft should then be multiplied by the reduction ratio, and the position of the Pointer on the dial marked accordingly.

(334)—Laboratory Apparatus
(K. J. Wilson, Warwick)

Kemex experimenters will find that Meccano can be used for making up useful apparatus for the home laboratory. Various types of stands and supports can be made to suit almost all requirements. Test tube stands can be constructed from any Meccano Outfit, and varying from simple frames to more elaborate structures such as those suggested by our contributor. The base of one type is made from two Angle Girders of suitable length bolted to Double Brackets to which a Strip is attached to fit between the two Girders. Corner Brackets support vertical Strips at the ends of the Girders and further Angle Girders are bolted to the tops of the Strips and spaced apart by Double Brackets. Sleeve Pieces are clamped between the upper Girders by ¾″ Bolts, and the Test Tubes are inserted in the Sleeve Pieces, their lower ends resting on the Strip between the lower Girders.

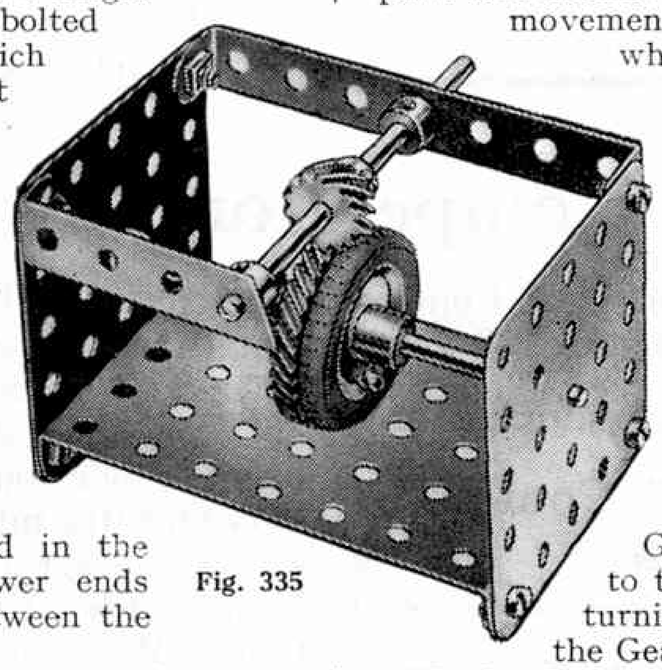


Fig. 335

Another stand is made by using two 3½″ × ½″ Double Angle Strips for each end support, the Strips being bolted to Double Brackets. The lower Brackets are connected by a Strip carrying Chimney Adaptors for supporting the Test Tubes, which are inserted between Strips attached to the upper ends of the Double Angle Strips. To hold the Test Tubes in position ¾″ Bolts are passed through alternate holes in the side Strips.

Tripods of different sizes can be made from Screwed Rods used as legs, and Strips forming the triangle top. For extra strength the Strips at the top should be duplicated.

(335)—Silent Free Wheel
(P. Duncan, Shrewsbury)

An interesting application of the new Helical Gears is shown in Fig. 335. These parts (Nos. 211a and 211b) provide a right-angle drive between two shafts placed 1″ apart. The great advantage of this type of gearing is that the drive is reversible, so that the parts can be used for providing a 3 : 1 reduction or step-up ratio.

The device illustrated can be used as a pawl and ratchet for preventing backward movement of a Rod, or as a free wheel. A 1½″ Helical Gear is free on its Rod, which carries a Collar and a 1″ Pulley fitted with a Dunlop Tyre. The Collar holds the Gear in position, but should allow a little play on the Rod so that the Gear is not pressed into contact with the Tyre. The ½″ Helical Gear engages the 1½″ Gear in the manner shown. The small Gear imparts an end thrust to the large Gear, and when turning in the one direction the Gear is brought into contact with the Tyre on the Pulley Wheel. The reverse rotation of the driving Gear disengages the large Gear, and the thrust is taken by the Collar. The friction between Gear and Tyre is sufficient to provide a light drive, or alternatively the Rod carrying the Pulley can be held stationary so that the driving Rod will rotate in one direction only, backward movement being prevented by the friction clutch.

If slip occurs between the Gear and the Tyre, the 1″ Pulley, complete with Tyre, should be removed and rubbed lightly on a sheet of sandpaper laid on a flat surface.

Results of Suggestions Voting Contest

In previous Suggestions Voting competitions gear-boxes have always ranked among the most popular contributions, so it is not surprising that the two outstanding examples of gear-boxes published during 1934 have been proclaimed, by both Home and Overseas readers, to be the best contributions published during the year. The entries received for the competition were divided into separate sections for Home and Overseas readers, and each section was treated entirely independently. All the votes received for each suggestion were recorded according to their positions on the competitors' lists, and at the close of the contest the votes were totalled up to show which suggestions are foremost in popularity.

The results of the voting in both sections correspond, the same four suggestions appearing in identical order in both final lists. The Pre-selector Self-changing Gear-box (No. 304) is by far the most popular suggestion with both Home and Overseas readers, and the second position is taken by the Four-speed and Reverse Planetary Gear-box (No. 300). The Variable Pitch Propeller (No. 316) occupies third position, and the Automatic Reversing Gear (No. 312) is fourth on the list.

Entries were judged by allotting a maximum number of points for each suggestion placed in the correct position on the competitor's list, and a reduced number of points according to the extent of the misplacement.

Home Section

In the Home Section five competitors submitted lists corresponding with the final list of most popular suggestions. The first and second prizes of cheques for £1-1s. and 10/6 respectively have been combined, and each of the following competitors will receive 6/6: J. Dobinson, Newport; C. E. Wrayford, Moretonhampstead, Devon; S. E. Smith, Enfield, Middlesex; R. Taylor, York; T. W. Green, Mapperley, Notts.

The following 12 competitors each receive a prize of 2/6: C. Ayles, Irvine; J. Franklin Anderson, Glasgow, W.2; V. M. Lewitt, Earsdon, Northumberland; V. Knill, Thorpe Bay, Essex; S. M. Clarke, Lisburn, Co. Antrim; W. Farrar, Leicester; D. Morley Davies, Maesteg, Glam.; B. Hardie, Bristol, 9; C. J. B. Brett, Great Coates, Lincs.; W. Thomas, Gorseinon, Nr. Swansea; H. Davies, Manselton, Swansea; W. Hudson, Weymouth.

Overseas Section

The First Prize of a cheque for £1-1s. in the Overseas Section goes to W. Thompson, Palmerston North, N.Z., the only competitor who submitted an all-correct list. The Second Prize of a cheque for 10/6 has been awarded to C. Keekok, Singapore, S.S.

Each of the following 12 competitors receives a prize of 2/6: A. McLoughlin, N'dola, N. Rhodesia; C. W. Wadham, Garterton, N.Z.; D. Murison, Buenos Aires; C. J. McCain, Sydney, N.S.W.; D. Atkinson, Woonona, N.S.W.; N. A. Burt, Murchison, N.Z.; J. Rodriguez, Montreal; P. Giese, Buenos Aires; E. Brown, Cambridge, N.Z.; R. Russell, Whangarei, N.Z.; J. Jasper, Manly, Australia; J. C. Woeke, Capetown, S.A.

A cheque for 10/6 has been awarded to S. Jones, Cardiff, who submitted Suggestion No. 304, and the contributors of Suggestions Nos. 300, 316 and 312 will each receive a consolation prize.

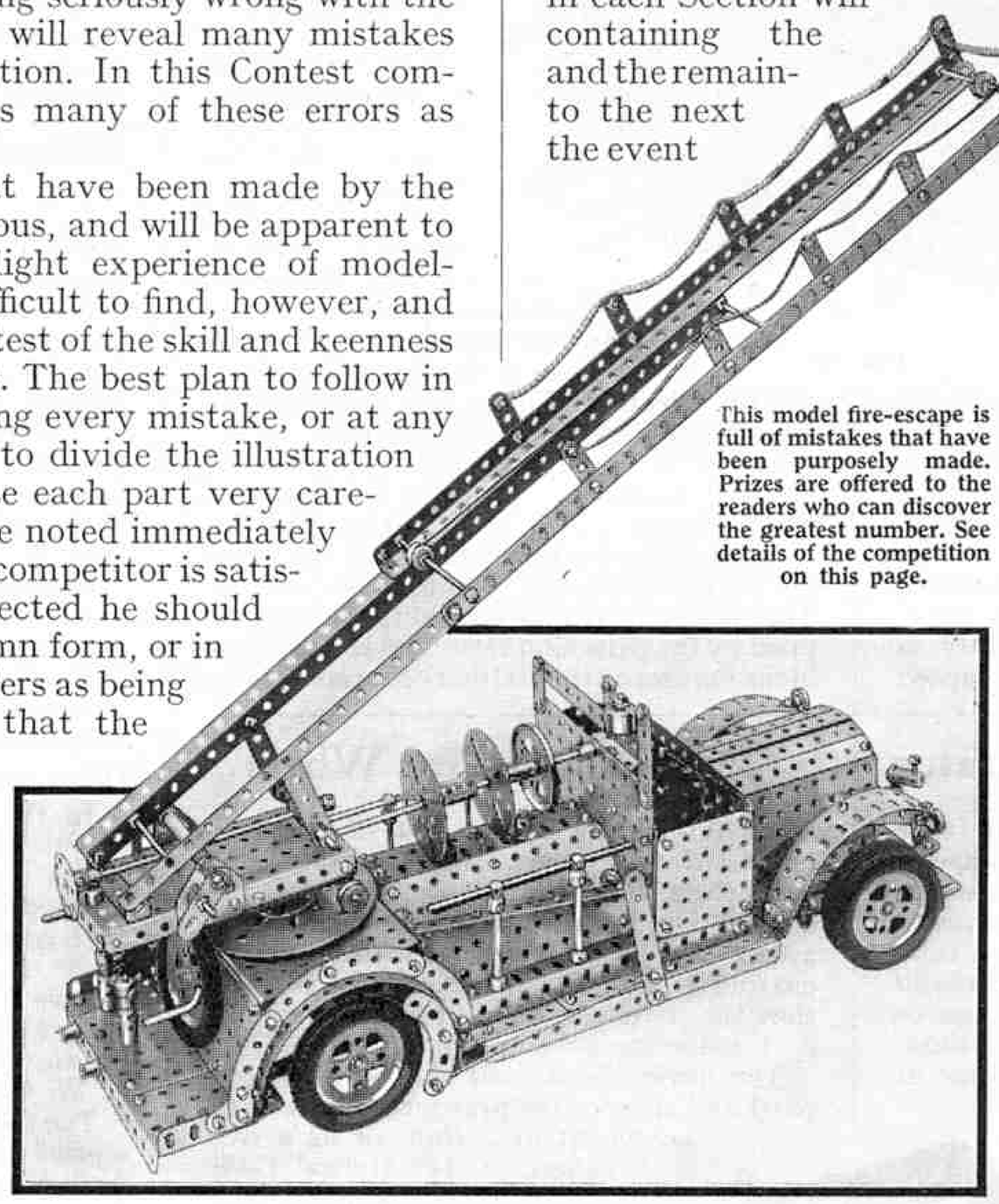
What is Wrong with this Fire Escape?

Prizes for Detecting Errors

The illustration on this page shows a Meccano Model Fire Escape. A very brief examination will be sufficient to show that there is something seriously wrong with the model, and closer inspection will reveal many mistakes both in design and construction. In this Contest competitors are asked to find as many of these errors as possible.

Some of the mistakes that have been made by the builder of the model are obvious, and will be apparent to readers who have only a slight experience of model-building. Others are more difficult to find, however, and their detection will provide a test of the skill and keenness of the most alert competitors. The best plan to follow in order to make sure of including every mistake, or at any rate, as many as possible, is to divide the illustration into sections and to scrutinise each part very carefully in turn. Errors should be noted immediately they are found, and when the competitor is satisfied that none remain undetected he should compile a list of them in column form, or in any other manner that he prefers as being more impressive, providing that the number and character of the mistakes found can easily be seen by the judges.

Entries will be divided into two sections: Section A, for competitors of any age who live in the British Isles; and Section B, for competitors whose homes are overseas; and the prizes to be awarded in each Section are given in detail in the panel at the foot of the page. If no competitor succeeds in detecting every mistake in the model, the First Prize in each Section will be awarded to the entry containing the largest number of errors, and the remaining prizes will be awarded to the next best in order of merit. In the event of a tie for any prize the final decision of the judges will be made after careful consideration of the degree of neatness and originality shown by the competitors concerned.



This model fire-escape is full of mistakes that have been purposely made. Prizes are offered to the readers who can discover the greatest number. See details of the competition on this page.

Competitors must write on one side of the paper only, and their names, ages and addresses must appear on the back of each sheet of their entries, together with the name of the Contest (August "Errors" Contest) and the letter A or B to indicate the Section of the entry.

Entries should be forwarded to "August Errors Contest," Meccano Ltd., Binns Road, Liverpool 13, and those in Section A must reach Liverpool not later than 31st August, 1935. The closing date in the Overseas or B Section is 30th November, 1935.

A Novel Holiday Competition

August is the great holiday month, and many regular entrants in *"M.M."* Model-Building Contests are now enjoying themselves at the seaside or in the country, and in many cases far away from their Meccano Outfits. If the weather is fine they usually have little time to spare from outdoor pursuits and for this reason we have arranged a competition for which entries can be prepared as easily on holiday as at home.

The railway journey to a holiday resort, and excursions made when staying there, provide splendid opportunities for seeing machines and engineering structures that would make suitable subjects for Meccano Models, and in this Contest we offer prizes to those readers who make the most attractive discoveries of this kind. All that is necessary to enter the Contest is to write a brief description, not exceeding 100 words in length, of the subject chosen, stating when and where it was seen, and also explaining its special attractions from a model-building point of view.

Each entry must bear the competitor's name, age and address, and must be forwarded to "Holiday Competition," Meccano Ltd., Binns Road, Liverpool 13. There will be only one section, and overseas competitors in the southern hemisphere, where it is now winter, can enter descriptions of subjects seen during any recent holiday. The closing date is 30th September, 1935, for home entrants and 30th November, 1935, for overseas competitors, and the three prizes shown in the panel at the foot of this page will be awarded to the senders of the best three entries.

August "Errors" Contest

The Prizes

The following prizes will be awarded in each of the Sections A and B.

First Prize: Meccano or Hornby Goods value £2-2s.
Second Prize: Meccano or Hornby Goods value £1-1s.
Third Prize: Meccano or Hornby Goods value 10/6.
Five Prizes of Meccano or Hornby Goods value 5/–.
Five Prizes of Meccano or Hornby Goods value 2/6.

Closing Dates: Section A, 31st August, 1935. Section B, 30th November, 1935.

"Holiday" Competition

The Prizes

First Prize: Meccano or Hornby Goods value £1-1s.
Second Prize: Meccano or Hornby Goods value 15/–.
Third Prize: Meccano or Hornby Goods value 10/6.

Closing date for Home entries: 30th September, 1935; for Overseas entries: 30th November, 1935.

Model-Building Competition Results

By Frank Hornby

"Christmas" Contest (Overseas Section)

The competitions announced in the December issues of the "*M.M.*" always attract a large number of entries, as model-building is at its height at that period of the year; and I am glad to say that the entries for the "Christmas" Contest, announced in the December 1934 "*M.M.*" were fully up to the average. I was particularly pleased with the response in the Overseas Section of the Contest, and I had a most interesting time examining the many fine entries submitted. Before describing one or two of these I give the complete list of prizewinners, which is as follows:

Section C

1, Meccano or Hornby Goods value £3-3s.: T. C. Chew, Kuala Lumpur, F.M.S. 2, Goods value £2-2s.: V. Butcher, Canterbury, N.Z. 3, Goods value £1-1s.: K. Orams, Christchurch, N.Z. 4, Goods value 15/–: S. Bossi, Turin, Italy.

Goods value 10/6: M. de Wilde, Antwerp; J. Dyke, Toronto; V. Stewart, Lefroy, Ontario; K. McCullough, Dargaville, N.Z.; D. Murison, Buenos Aires.

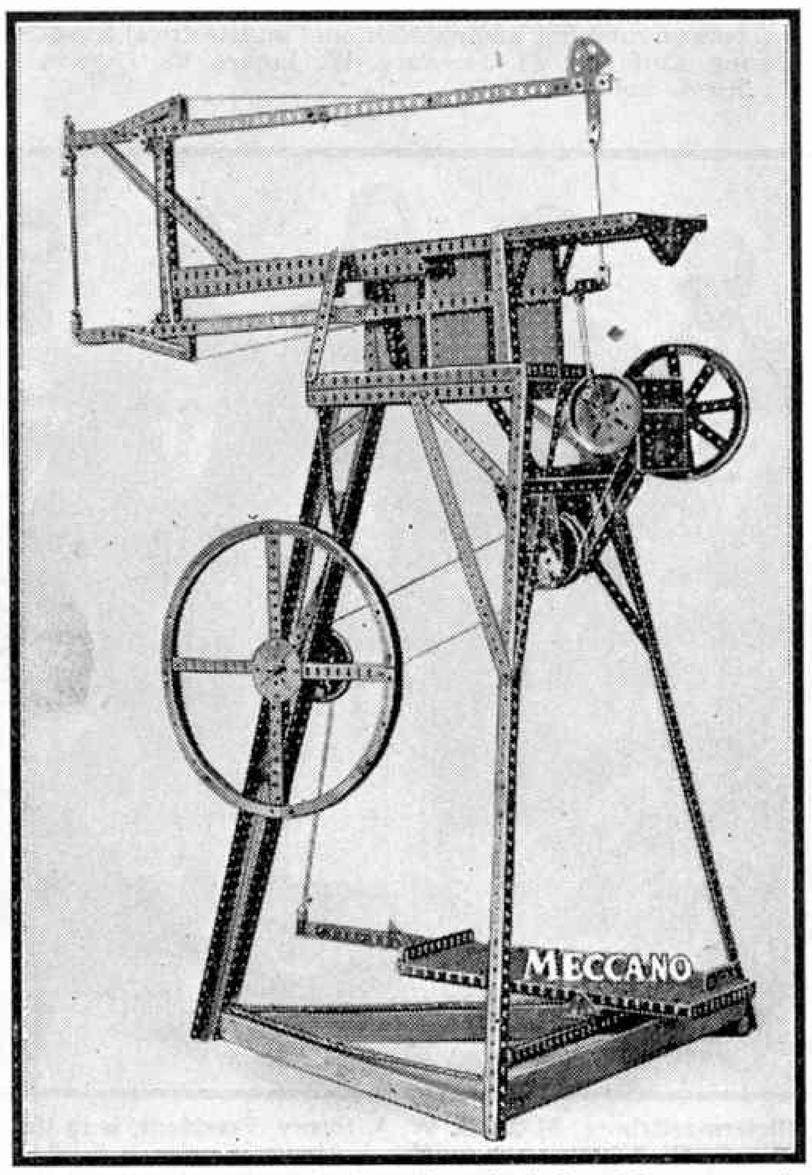
Goods value 5/–: F. Hinbest, Toronto; H. Dressler, Breslau, Germany; J. Browning, Palmerston North, N.Z.; V. Burlando, Buenos Aires; R. Thompson, Johannesburg.

I often wish that readers could examine the entries that are sent in for each "*M.M.*" competition, for they come from all parts of the world and represent the work of Meccano boys and girls of all nationalities. In the present contest, for example, a boy living in far off Malaya sent in an entry and won the First Prize, while two New Zealanders and an Italian boy won the Second, Third and Fourth Prizes respectively. Canadian and New Zealand competitors also figure largely among the smaller prizewinners. The "Christmas" Contest was therefore a truly international event, and the First Prize winner may justly be proud of his success.

T. Chew submitted a full-size Meccano treadle fret-sawing machine that is capable of doing really good work. I describe this model in detail as I think many readers will wish to copy it. The front legs of the machine are made from $12\frac{1}{2}''$ and $5\frac{1}{2}''$ Angle Girders bolted together to form a rigid channel section girder $27\frac{1}{2}''$ in length. The rear leg is made considerably stronger than the front legs, as it has to support the flywheel. It is composed of two built-up T girders, bolted at their tops to the base of the working unit and converging at the bottom, and provided with lattice bracing. For the purpose of strengthening and adding weight to the lower part of the model pieces of wood are fixed between the legs.

The base of the working unit is $9\frac{1}{2}''$ long and $5\frac{1}{2}''$ wide, and it consists of an oblong frame of T-shaped girders filled in with $5\frac{1}{2}'' \times 3\frac{1}{2}''$ and $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plates. The front legs are bolted to the corners of the frame and are braced by means of $12\frac{1}{2}''$ Strips. The rim of the flywheel is made from Channel Segments and is fitted with Angle Girders for spokes, a Face Plate for a hub, and a spindle, which is journalled in the bosses of two Face Plates bolted on each side of the rear leg. At the end opposite to the flywheel the spindle carries a 3″ Pulley. A serviceable treadle $12\frac{1}{2}''$ long and $5\frac{1}{2}''$ wide is made from Angle Girders and Flat Plates. It pivots on a Rod journalled in Trunnions bolted to an Angle Girder that spans the front legs, and an extension on one side is connected by a Rod to a crank-pin on the 3″ Pulley.

Four inches from their tops the front legs are connected by a Flat Girder, to which are bolted two Flanged Sector Plates with their flanges projecting outward. The Plates are spaced $2\frac{1}{2}''$ apart and are strengthened across their upper corners by means of a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip. A Rod passes through the Sector Plates and carries two 3″ Pulleys, one of which is connected by cord to the 3″ Pulley on the flywheel shaft.



This fine fretwork machine is made entirely from Meccano parts and will cut wood up to 3/16 in. in thickness. It was built by T. C. Chew, Kuala Lumpur, F.M.S., and won First Prize in the "Christmas" Competition.

A strong box made from $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plates and Angle Girders is bolted to the Flat Girder of the Flanged Sector Plates, and is braced to the main frame by Strips. The box forms the bearings for a Rod that carries a small flywheel made from two Hub Discs and a 3″ Pulley. This Pulley is connected by cord to the 3″ Pulley between the Sector Plates, and forms the final driving wheel to the saw frame.

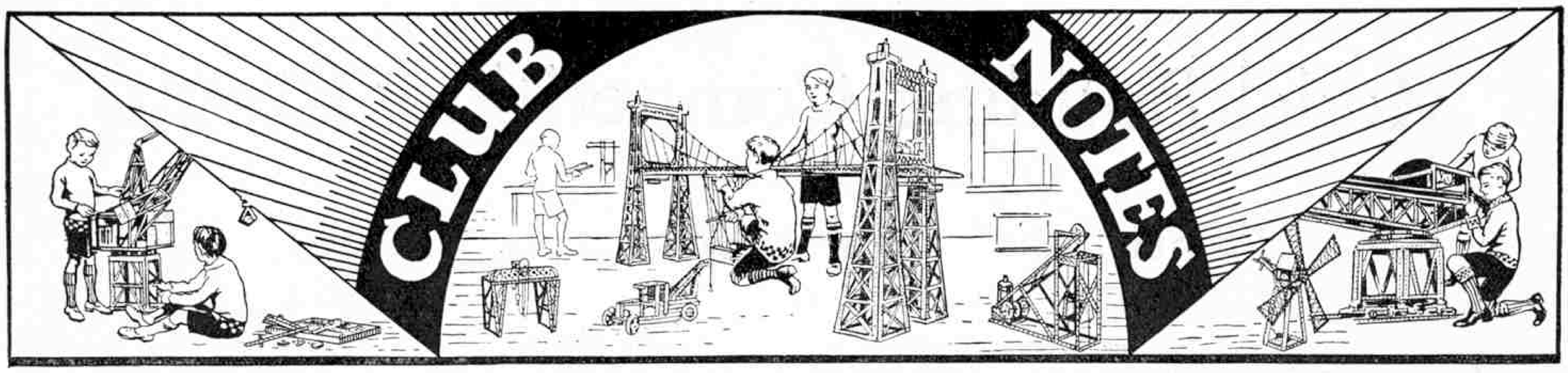
Three $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plates are bolted on edge and $\frac{1}{2}''$ apart to the centre of the base, and to their upper edges is bolted a $22\frac{1}{2}''$ channel girder. This is strengthened by a $12\frac{1}{2}''$ channel section girder, and at the back and at right angles to it a $7\frac{1}{2}''$ channel girder is fixed. The latter girder is braced by Strips and projects $5\frac{1}{2}''$ and 2″ above and below the main horizontal girder. The arms that form the saw frame are $25\frac{1}{2}''$ channel girders, and they are pivoted 5″ from their rear ends to the upright $7\frac{1}{2}''$ girders. A $1\frac{1}{2}''$ Angle Girder is bolted perpendicularly to each of these $25\frac{1}{2}''$ Girders near the pivot point as shown, and short bracing Strips are fitted to the Angle Girders in order to make everything rigid and prevent bending. The arms are connected at their ends by means of Swivel Bearings and Rods, and an adjustable tension device for regulating the tension on the blade is provided by a Screwed Rod and a Threaded Boss.

The lower arm of the saw frame is actuated from the final driving Pulley by a connecting Rod, and is fitted at its extreme ends with two Flat Brackets. The device for gripping the saw blade is made as follows. The upper arm of the saw frame is extended by two $1\frac{1}{2}''$ Strips, between which slides a 3″ Strip, bolted loosely at the top to a Flat Trunnion, and carrying at the bottom two Flat Brackets that form clamps for holding the saw blades. The Flat Trunnion is a quick release device for relieving the tension from the blade when the machine is not in use. The sawing table is made of Flat Plates.

Second Prize was won by V. Butcher, whose entry represents a gold dredger of a type familiar in New Zealand. The model is 5 ft. long, $18\frac{1}{2}$ in. high and $17\frac{1}{2}$ in. wide. An E6 Electric Motor drives the bucket chain through Worm reduction gear and Sprocket Chain drive, and also an endless belt conveyor, which is used to carry the dredged material into a separator, represented by a Boiler rotated by the Motor. The fine material falls through the holes in the Boiler on to conveyors driven by a second E6 Electric Motor and is carried into sluice washing boxes while the larger pieces of material fall on to a separate conveyor and are discharged at the rear of the machine. The dredger is propelled by winches driven from the Motors and geared to be driven independently or simultaneously. A Clockwork Motor is installed for raising and lowering the gangway. Illumination for the model is provided by six 6-volt Bulbs placed in corresponding positions to the lamps in the prototype.

An unusual model secured second prize for K. J. Orams, who has certainly shown originality in his choice of subject. His model of an A.B.C. electric ironing machine is quite a novelty and incorporates several ingenious features. It is of neat yet robust construction and is driven by an Electric Motor.

The fourth prize was awarded for an exceedingly well designed saloon motor car by S. Bossi. Skilful work is shown in the construction of the body, the graceful lines of which have been obtained by the judicious use of Curved Strips and by carefully bending Strips to reproduce the flared front mudguards. The roof sweeps down in a gentle curve to the rear bumper.



South Parade Modern School (Cleckheaton) M.C.—Open Nights, Model-building Competitions and Boxing Contests have been enjoyed by members. Gymnastic Evenings have been added to the programme. A visit has been paid to a large model railway in Bradford, and other excursions arranged include one to York, to visit the station and Railway Museum, and cycling runs. Members took part in the School Sports held as part of the Silver Jubilee celebrations and were prominent among prize-winners. Club roll: 20. *Secretary:* K. Walker, 12, George Street, Cleckheaton, Yorks.

Sid Vale M.C.—The club's No. 7 Meccano Outfit was used in constructing a super model of the Royal State Coach. Each member built a portion of this model, which was illuminated with red, white and blue miniature electric lamps. The subjects for Model-building Contests have included searchlights, fire engines and bridges, and in a competition that aroused special interest entrants were given 20 parts, out of which a model had to be constructed. A Model Illuminated Carnival Procession was organised by the club. There was a large attendance of parents and friends and the models entered by members were so numerous and meritorious that the judges had difficulty in deciding the prize winners. An excellent report appeared in the local press. Club roll: 20. *Secretary:* S. R. J. Gliddon, Sheffield House, Sidmouth.

Islington M.C.—Evenings are devoted regularly to model-building, and other events have included demonstrations of aeroplane and engineering photographs by means of the Mirrorscope, a Debate on "*Railway v. Road*," Hobbies Evenings and a Lantern Lecture on "*London's Underground Railways*." Games bring each meeting to an end, and special interest is now being taken in swimming. A Hornby Railway Section is being formed and it is expected that this will develop into a Branch of the H.R.C. Club roll: 15. *Secretary:* M. Thorpe, 59, Onasburgh Street, London, W.C.

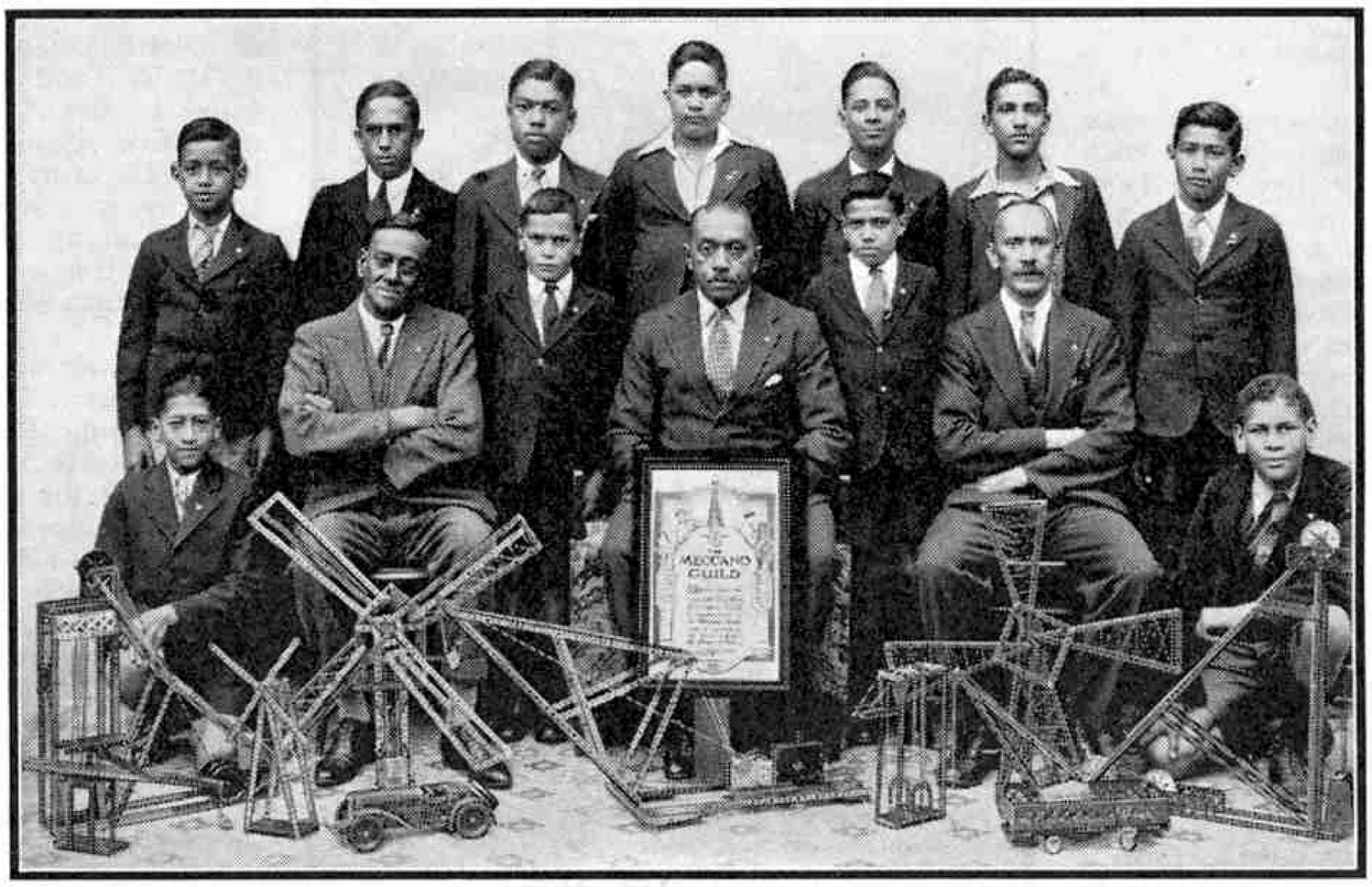
Claremont Avenue (Kenton) M.C.—Mr. A. G. Davy has kindly agreed to become President of the club. Chemical demonstrations and the production of wooden aeroplane models have provided interesting evenings, and at other meetings members have been engaged in the construction of models for their Exhibition and in rehearsing a play. Club roll: 22. *Secretary:* G. Furton, 5, Brookfield Crescent, Kenton.

Holy Trinity (Barnsbury) M.C.—Meetings are being conducted on the usual lines. Interesting models constructed on Meccano evenings have included ships and elevators, and the system now introduced of comparing and criticising models is attractive to members and promises to raise the standard of model-building. Interesting talks on branches of cable making have kindly been given by Mr. Stock, Chief Engineer, and Mr. Fry, Chief Draughtsman, both of W. T. Henley's Telegraph Works Co. Ltd. A Social Evening also has been held, at which new members were welcomed. Club roll: 32. *Secretary:* A. F. G. Dines, 70, Thornhill Road, Barnsbury, London, N.1.

St. Giles' Cathedral (Edinburgh) M.C.—Excellent progress continues to be made and great interest is displayed in the proceedings of the club by the many visitors who see members at work. An excellent Concert given in association with the St. Giles' Cathedral Branch of the H.R.C. attracted an audience of 225. There has been a notable increase in Model-building activities and attractive visits have been paid to the headquarters of the Edinburgh Police Force, where the fingerprint system was explained in detail, to various factories and to the Edinburgh City Chambers. Club roll: 177. *Secretary:* H. W. Govan, 18, Ravelston Park, Edinburgh, 4.

Morison Memorial (Clydebank) M.C.—Members worked hard to complete the model Aerodrome built for display at the club's Exhibition. A large hangar and 16 aeroplane models were constructed and other models on view at the Exhibition included a Workshop and a Meccanograph. A Hornby Train layout was in operation throughout, and the display was very successful. Club roll: 25. *Secretary:* J. Glassford, 347, Kilbowie Road, Clydebank.

Old Charlton M.C.—A Cricket Team has been formed and Rambles and Cycling Runs figure prominently in the summer programme. The Nine Elms Depot of the S.R. has been visited and members have enjoyed one of the Port of London Authority Cruises from Tower Pier. Ordinary meetings have included talks by members on rambling and goldfish, and an Electrical Evening. Club roll: 23. *Secretary:* W. Jaques, 60, Gurdon Road, London, S.E.7.



Members of the Pioneer (Pietermaritzburg) M.C. Mr. W. J. Henry, President, is in the centre of the front row and next but one on his left is Mr. A. H. Alley, secretary. Mr. A. Henry, Leader, is third from the left in the back row. The club was affiliated in July 1931, and an excellent display of models at a recent Horticultural Show was highly appreciated by many visitors.

Bexleyheath Boys' Central School M.C.—Model-building has been pursued successfully and the best models constructed have been photographed. The selection of models for this purpose was made by popular vote, and great interest was displayed in discussions on the best means of improving models that fell short of the high standard laid down. Aeroplane building with the Meccano Aeroplane Constructor Outfits has now been taken up and models remarkable for their strength and realism have been devised. Club roll: 37. *Secretary:* D. Hicks, 4, St. Audrey Avenue, Long Lane, Bexleyheath, Kent.

Hayes (Kent) M.C.—Model-building Evenings have centred chiefly round the Crane loaned from Headquarters, the construction of which has been closely studied. Keen interest also has been taken in the club's Hornby Train layout, which incorporates many sidings, a Meccano bridge and an excellent supply of Meccano Dinky Toys. Cricket has been adopted as the chief outdoor recreation for the summer. Croydon Aerodrome has been visited and members were fortunate to see the departure of the Imperial Airways liner "*Heracles*." Club roll: 24. *Secretary:* T. A. Steer, 54, Bourne Way, Hayes, Kent.

Regis (Corsham) M.C.—In addition to Model-building Contests, Meccano Evenings have included one to which members brought models of bridges of various kinds constructed at home. A Musical Evening has been held, and other attractions have included Lantern Lectures on "*The Port of Bristol*," "*Wonders of Physics*" and "*Egypt*," the last named being given by Mr. W. D. Carter, President. Club roll: 20. *Secretary:* R. Bidmead, High Street, Corsham.

CANADA

West End Y.M.C.A. (Toronto) M.C.—News of the affiliation of the club with the Meccano Guild was received with great enthusiasm and new members are steadily being recruited. A large Meccano Outfit has been purchased for club use and a model Oil Well Driller has been built from the parts contained in it, groups of members constructing the various sections under the guidance of Mr. K. E. Spencer, Leader. Many models were built for inclusion in the Meccano Section of the Annual Hobby Show of the Central Y.M.C.A. in Toronto. Gymnastics and swimming are enjoyed regularly and the C.P.R. Repair Shops and Round House, or Engine Shed, have been visited. Club roll: 25. *Secretary:* A. Yates, 232, Benson Avenue, Toronto, Ontario, Canada.

Toronto Central Y.M.C.A. M.C.—Steady progress has been made, and models constructed by members for the club's Exhibition included a large Jib Crane and a Steam Shovel with a novel gear box. Among other models built by members and demonstrated at ordinary meetings were a Level Luffing Crane and a reproduction of Stephenson's "*Rocket*." A special meeting was devoted to a display of Chemical Conjuring by Mr. A. Schawlow, President. Games are played at the close of every meeting. Club roll: 12. *Secretary:* W. B. Moore, 141, Albertus Avenue, Toronto, 12.

NEW ZEALAND

Christchurch M.C.—Members are now enjoying the winter meetings. As far as possible outdoor events are being kept up, and Cycle Runs, Treasure Hunts, Obstacle Races and Picnics have been held when the weather was favourable. A Social Evening was devoted to bright games. The Christchurch Fire Station was visited during Fire Prevention Week, and members were invited to be present at one of the weekly fire drills. The club celebrated its sixth Birthday by a special meeting for Model-building and Hornby Train Contests in which members of the Ashburton and Sumner clubs were invited to take part. A talk on "*The Lifeboat*" by Mr. R. A. Handisides, President, also formed part of the proceedings. Club roll: 25. *Secretary:* L. W. Best, 28, Circuit Street, Elmwood, Christchurch, New Zealand.

SOUTH AFRICA

Malvern M.C.—Outdoor events have included a visit to the Gas Works, and a long ramble that ended with a visit to the home of Mr. E. Sykes, Leader, where Mrs. Sykes kindly provided tea and cake. Indoor meetings have been devoted to Model-building and to short papers by members of both sections. Club roll: 80. *Secretary:* A. Hubbard, P.O. Box 8, Cleveland, Johannesburg, South Africa.

Clubs Not Yet Affiliated

Fraserburgh M.C.—Many enjoyable meetings have been held and excellent models have been built for an Exhibition that the club proposes to hold. A visit was paid to the Consolidated Pneumatic Tool Works. There members autographed two steel sleeves with the aid of an electric pencil, and these are to be kept in the club room as mementos. Club roll: 10. *Secretary:* G. Smythe, Central Schoolhouse, Fraserburgh.

Tudor (Hanworth) M.C.—Meetings are held weekly in a hut that provides excellent facilities for model-building work. Membership is increasing steadily, but recruits are still required. An excellent programme is being arranged and it is hoped that affiliation will be secured shortly. *Secretary:* R. H. M. Vere, "Lynton," 12a, Queensway, Hanworth, Middx.

A Meccano Club Record

I was greatly impressed when reading the most recent reports sent me by the secretary of the newly-formed Meccano club at Fraserburgh to learn that not a single member lives within four miles of the club's headquarters, which nevertheless are centrally situated. The home of one member is five miles away, and another travels eight miles in each direction every time he attends a meeting. There is no doubt of the keenness and enthusiasm of Meccano boys who take so much trouble to enjoy their hobby in the best way, and I am sure their enterprise will be successful and that their club shortly will become a well-established affiliated organisation.

Similar situations are of course more common overseas than in Great Britain. The Melbourne M.C. presents an excellent example, for several members travel many miles on club nights, and the distance record of the club movement appears to be held by one of them who travels 46 miles by rail in order to be present at each meeting. The double journey occupies 2½ hours, and yet this member finds time to take part in the official work of his club!

There must be club members in various parts of the world who travel great distances, or have to surmount serious obstacles of some kind, in order to join their fellow enthusiasts, and I should like to hear of similar records or outstanding instances of determination to enjoy Meccano club life.

A World-Wide Meccano Club

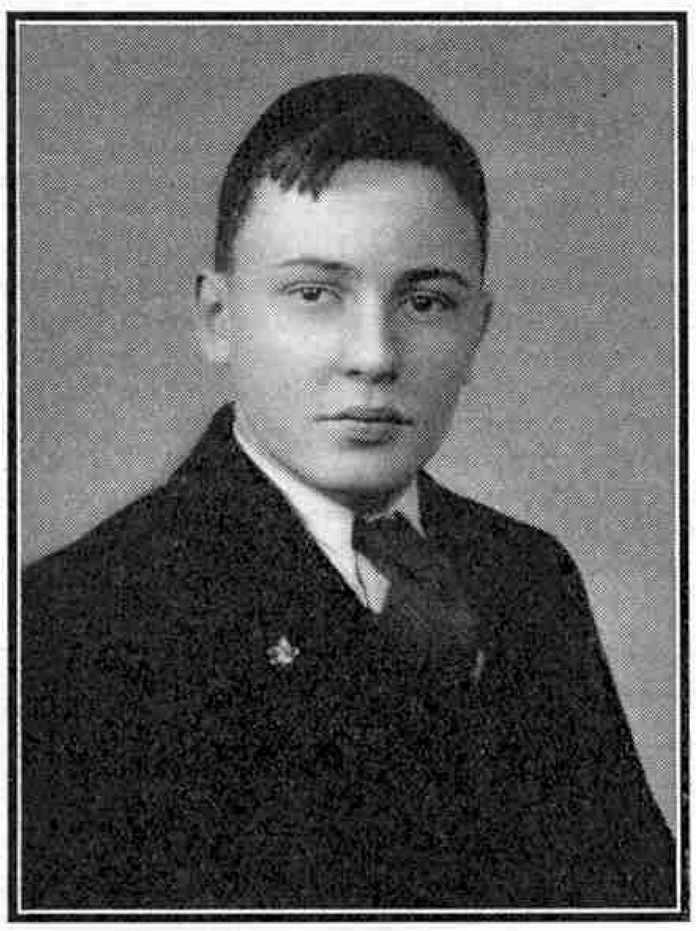
In some places, especially in scattered districts at home and overseas, it is physically impossible for Meccano boys to join clubs, however willing they may be to follow the examples set by the enthusiasts I have mentioned. There is no need for lone members to regard themselves as outside club life, however, for they can join the Meccano Guild, which itself can be looked upon as a gigantic Meccano club conducted by correspondence, as is the Correspondence School (Wellington) M.C., the New Zealand club I mentioned last month.

Those who join the Guild can write to me at Headquarters for advice and guidance in model-building, and indeed in any subject in which they are interested; and they can look upon the Model-building Contests announced in the "*M.M.*" as those of their own club. Nothing would please me more than to hear regularly from every member of the Guild, in any part of the world, who for any reason cannot be a member of an ordinary club, and I want every enthusiast in this position to make up his mind to keep in touch with me by correspondence and to show his interest in this normal form of club life by entering as many as possible of the "*M.M.*" contests.

This applies also to existing members of the Guild, even if they already are members of local clubs. The greatest fun certainly is obtained from the social opportunities that ordinary clubs provide, but the pleasure derived from their meetings can be increased by active membership of the world-wide Meccano club that the Guild itself constitutes.

Meccano Club Presidents

No. 11. Mr. A. Schawlow



Mr. A. Schawlow is President of the Central Y.M.C.A. (Toronto) M.C. This successful Canadian club was affiliated in September, 1934. It owes its existence largely to the enthusiastic pioneer efforts of Mr. Schawlow, who has occupied several official positions since its formation and takes an active part in all club proceedings.

Adding Interest to Contractor's Evenings

An excellent scheme to extend the usefulness of Contractor's Evenings has been introduced at meetings of the Exeter M.C. The usual practice is to ask for tenders for designs for the bridge, crane, or whatever structure is to be erected, and to award the contract to the group of members, or section of the club, that produces the most suitable scheme. The central feature of contracting is price, and the scheme introduced at Exeter is to include in the tender estimates of the cost of a model before construction is begun.

The great advantage of the scheme is that it ensures forethought in planning, for if a model-building scheme on which a tender is based proves unsatisfactory in practice, the extra parts that have to be used in making good any deficiences will increase the price above the contract figure.

A further improvement on the usual plan would be to take into account the time required for model-building purposes, charging for this at rates of pay appropriate to the skill and experience of those engaged in it. The inclusion of labour costs in the tender will put the "workmen" fulfilling a contract on their mettle, for if they exceed the estimated time, the cost will be above that given in the tender and the contractor's profit may be turned into a loss! The fun is increased by the introduction of penalties for late completion, and bonuses for finishing ahead of scheduled time, payment being made in points counting in sessional contests or whatever form of competition is organised. New ideas of this kind add life to a series of Contractor's Evenings, but of course officials of clubs introducing such schemes should try them out first with comparatively simple models.

* * * *

The Transvaal Meccano Clubs Union is arranging a special display of Meccano models at the Exhibition organised by "*The Star*," Johannesburg, which is to be held from 16th to 26th October. All Meccano enthusiasts in the district are urged to enter working models and Mr. E. W. Sykes, P.O. Box 8, Cleveland, Johannesburg, will be pleased to supply the necessary entry forms and to provide any further information in connection with the event.

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:

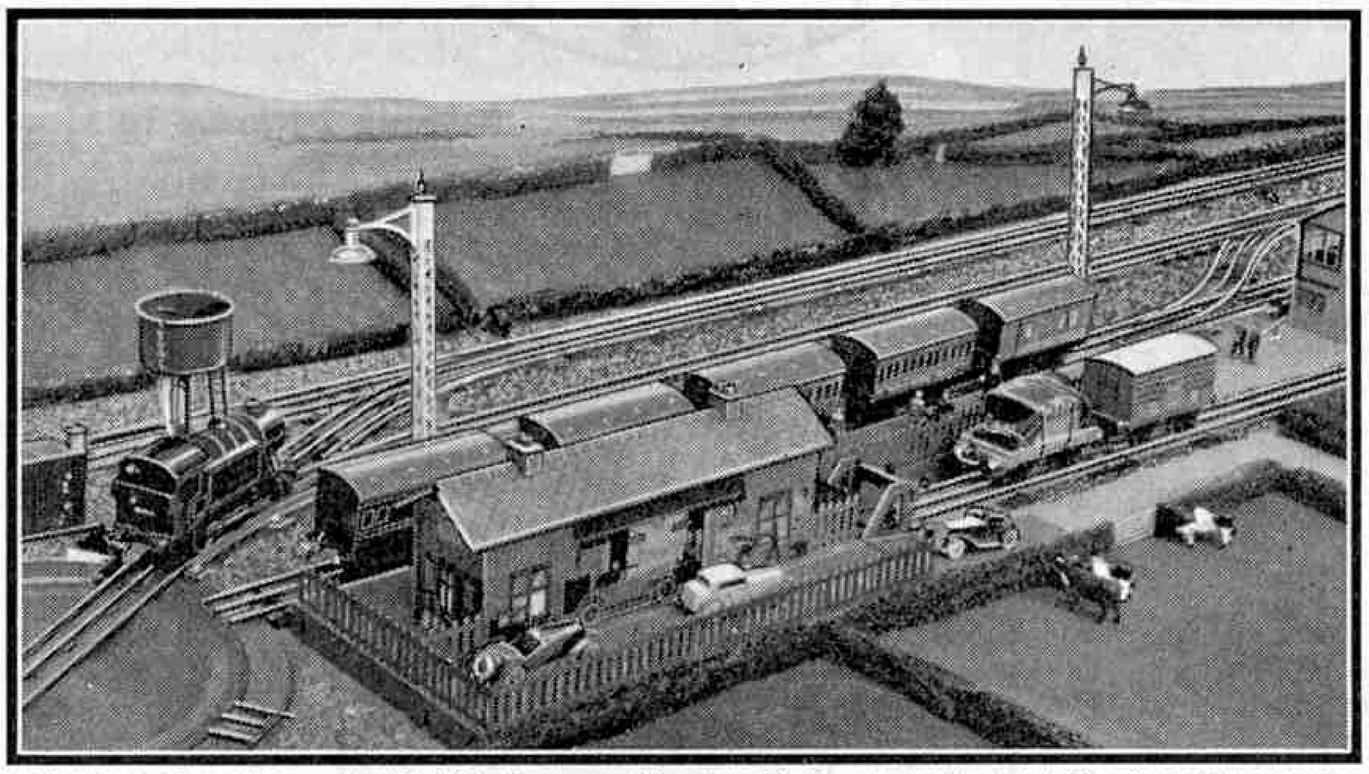
BERWICK-ON-TWEED—Mr. W. Joures, 2 & 4, Hide Hill.
MELTON MOWBRAY—G. Roper, 7, Mayfield Street.
MEXICO—R. Camargo, Dinamarca 50-1, Mexico.
SOUTH AFRICA—R. Myburgh, "Bexcourt," School Road, Claremont, Capetown.
SOUTH AFRICA—R. Williams, 131, Blackburn Road, Red Hill, Nr. Durban, Natal.

An Interesting Layout Design

Combined Terminal and Continuous Plan

THE majority of Hornby railways are of the plain continuous type, developed as a rule from the circular or oval system that almost invariably forms the first track when a Train Set is purchased. Before long, however, most miniature railway owners want to incorporate in their layout a terminal station to form an appropriate place for their trains to commence and end their journeys. If the space available is very restricted it is sometimes difficult to accommodate a terminal station. The difficulty is not so great as is generally supposed, however, and a great deal can be done in a small space by the use of a little ingenuity in planning. Notable examples of the way in which an interesting system can be arranged in a surprisingly small space have appeared from time to time in these pages.

The accompanying diagram shows how our reader E. Rayner, of Heaton Mersey, has solved the problem without exceeding the space limits of approximately 11 ft. by 6 ft. In general the design may be described as a development of the plain oval track, including a "return loop" that cuts diagonally across the centre of the layout, and with terminal tracks directly connecting to the main line. An interesting point is that although the actual terminal tracks form an independent section of the line, yet the whole has been so planned that, in addition to the station acting as a terminus, one platform is arranged to serve part of the continuous track also. Once a train has left the terminal platform, therefore, it can continue to call at the through platform at each circuit of the main track, or as often as required by working arrangements. It is possible also, as we shall see, to alter the route of a train and divert it so that it can conclude its journey in a fitting manner at either of the terminal platforms.



This illustration shows a terminal station on a Hornby railway where the turntable, in addition to its ordinary use, gives access to a "running-round" loop.

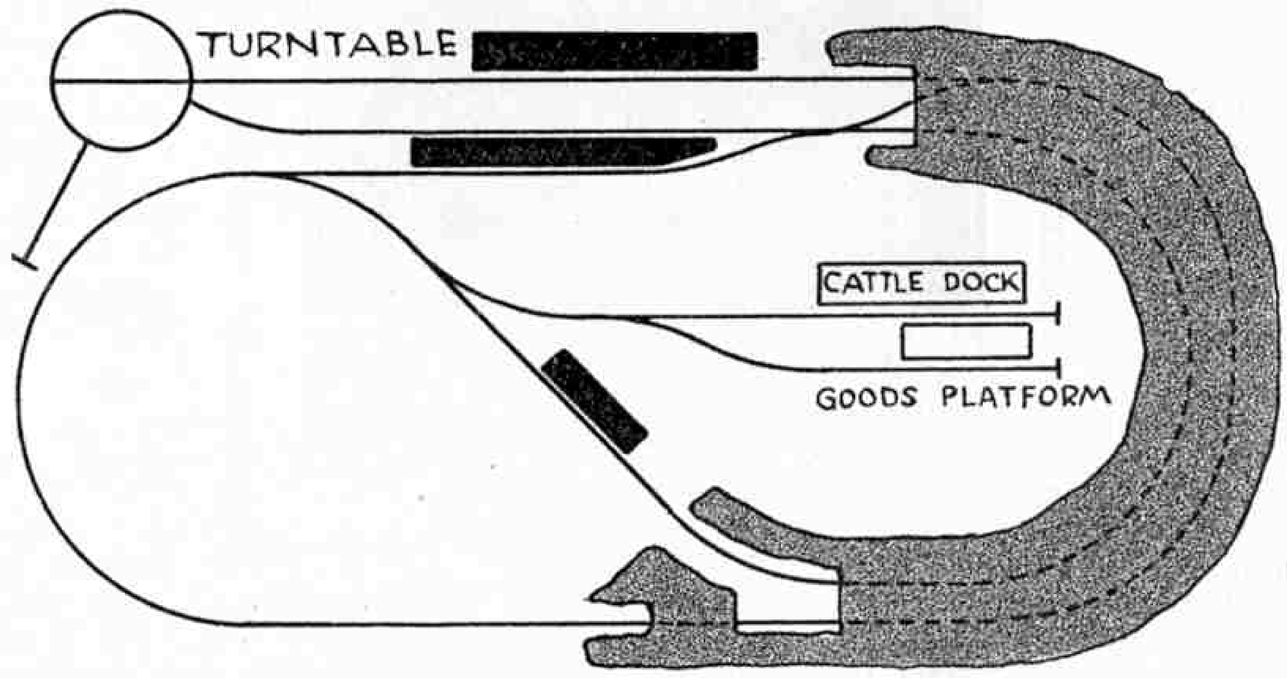


Diagram of the layout of E. Rayner, of Heaton Mersey, as described on this page.

The best way to follow the working of the line and its possibilities for interesting operations is to imagine we are making a journey by a train leaving the "down" or left-hand platform of the terminus, that is, on the upper track in the diagram. On receiving the "right away" we leave the platform, and we notice the points connecting the through and terminal lines, and also the crossover points that connect the two terminal roads. Immediately we plunge into a fairly long tunnel, through which the line curves its way round one end of the system. We emerge from the tunnel, and then, before traversing a second but much shorter tunnel, we notice that the "up" track, which has run alongside us up to this point, bears away through a cutting, which splits the outlying edges of the hill under which our line is now carried.

According to the gradient posts we are still climbing the ascent that commenced in the first tunnel shortly after we entered it. Soon, we gain the "summit," just before we cross the road bridge that passes beneath us; and coasting easily down and round the curve that follows we catch sight of a junction signal. This signal indicates that the points ahead are set for our train to keep to the straight track, and as we pass over the points by the signal cabin we discover that we are running alongside the through platform of the main station. As ours is a local train, we stop. During our halt, and as the train moves slowly away again, we notice that there is a goods yard in the centre of the layout, provided with a cattle dock and a goods platform. We now traverse the crossover points in a facing direction and regain our original line through the long tunnel.

As many circuits as required can be made in this manner, but let us see how we proceed when our train is required to conclude its journey at a terminal platform. Approaching the junction signal that we noticed before, we now see that it indicates that the points are set for the curved branch; so that we swing to the right past the signal box, over the connections leading to the goods yard, and cross a viaduct that spans the road leading to the yard. Next we come to a small halt or wayside station, and immediately after this we thread our way through the short cutting that brings us alongside the down main track before entering the long tunnel once again. When we reach the other end of the tunnel our train proceeds straight into the terminus. It can be diverted to the continuous road alongside the through platform, however, but in the opposite direction to that in which we were travelling before. If the latter course is followed further circuits of the main track can be made until we finally conclude our trip alongside one or other of the terminal platforms, as convenient. This is made possible by the crossover points that we noticed when first commencing our journey.

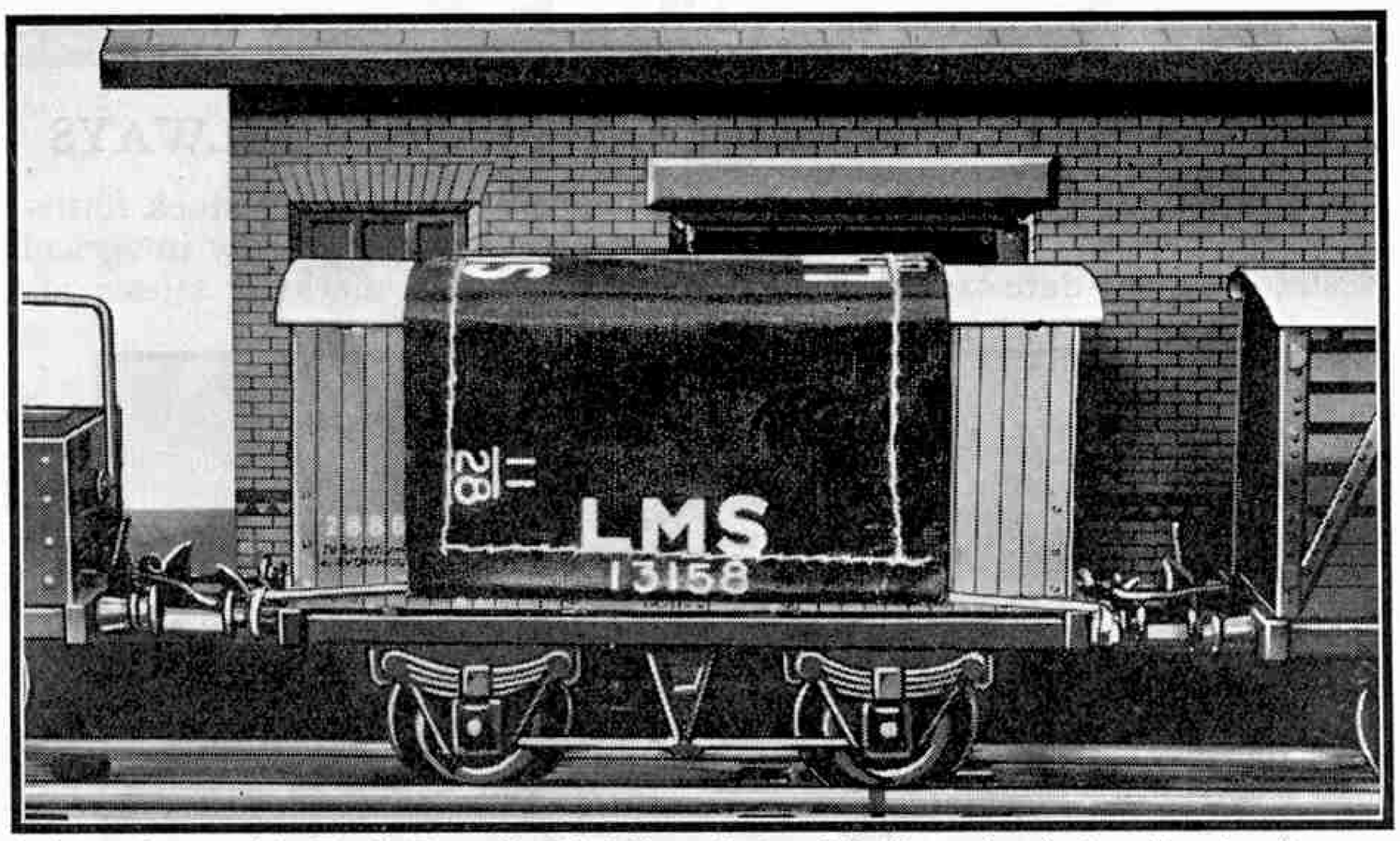
Having arrived alongside a terminal platform we make our way to the end of the station and note that the two tracks converge on to the turntable. Off this again is a short engine spur where locomotives waiting for their next turn of duty are accommodated. The provision of the turntable enables arriving engines not only to be run round their trains, but also to be turned in the process, if required to run "chimney first" in each direction. The turntable therefore acts both as a traverser and a turntable, and as used in this way saves space. If not in its present position it would have to be accommodated somewhere, perhaps in an awkward corner where its utility would be limited. Its use in the manner shown in the diagram results in a saving in length at the end of the two terminal roads, as compared with the usual equipment of crossover points and the additional track required beyond them in order to provide running-round facilities.

The layout is made very attractive by the provision of accessories such as signals, signal cabins, a water tank, a crane in the goods yard, a platelayer's hut and a watchman's hut.

Hornby Wagon Tarpaulins

Some Suggestions for their Use

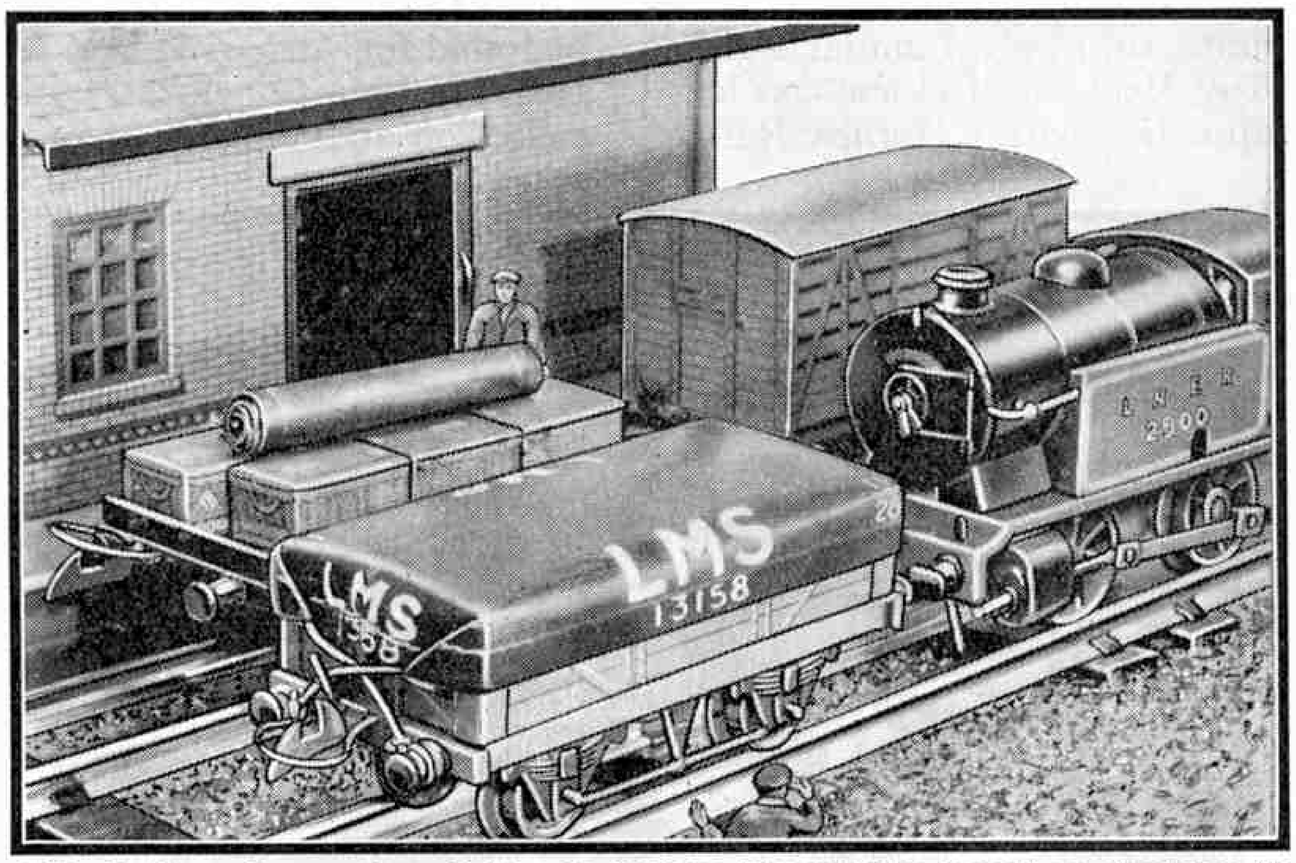
RAILWAY goods vehicles may be divided roughly into two main classes, open wagons and covered vans. Open wagons are largely used for coal and mineral traffic, and for the conveyance of loads that are not affected by exposure to the weather. Covered vans are used for goods that require to be protected, and large numbers of vans of special design are used for the conveyance of perishable freight, such as foodstuffs. Frequently, however, it is necessary to provide protection for freight that is loaded in open wagons, and for this purpose large waterproof tarpaulin sheets are used. These are laid over the top of the load on the wagon and are brought down over the wagon sides and secured by stout ropes, so that the load is completely covered.



An interesting use of the Hornby Tarpaulin. It is laid over the top of the Van, as in actual practice when there are openings in the roof, in order to protect a load of perishable goods.

The bulk of certain loads gives peculiar shapes to the tarpaulins covering them, and a goods train including several tarpaulin-fitted wagons often has a very fantastic appearance. This is particularly the case at night when a long train of this kind is seen passing rapidly through a dimly-lit wayside station. All readers will have seen these wagon sheets in use, sometimes glistening with wet, at other times covered with snow, but always keeping their loads perfectly dry.

Keen railway enthusiasts naturally wish to reproduce the use of these wagon sheets on their own miniature railways, and Hornby Wagon Tarpaulins are available to enable this to be done. These useful accessories are strongly made in a suitable black material that imitates very well the stout canvas specially coated with black, of which the real wagon sheets are made. As in actual practice, the Hornby Tarpaulins are marked with the initials of the owning company and are available lettered for each of the four groups. The Tarpaulins are provided with suitable miniature "ropes" to enable them to be secured effectively to the wagon on which they are used.



A Hornby Tarpaulin correctly applied to a No. 1 Wagon. The miniature "ropes" are attached to the buffers opposite to them, thus bringing the edges of the Tarpaulin close to the Wagon body.

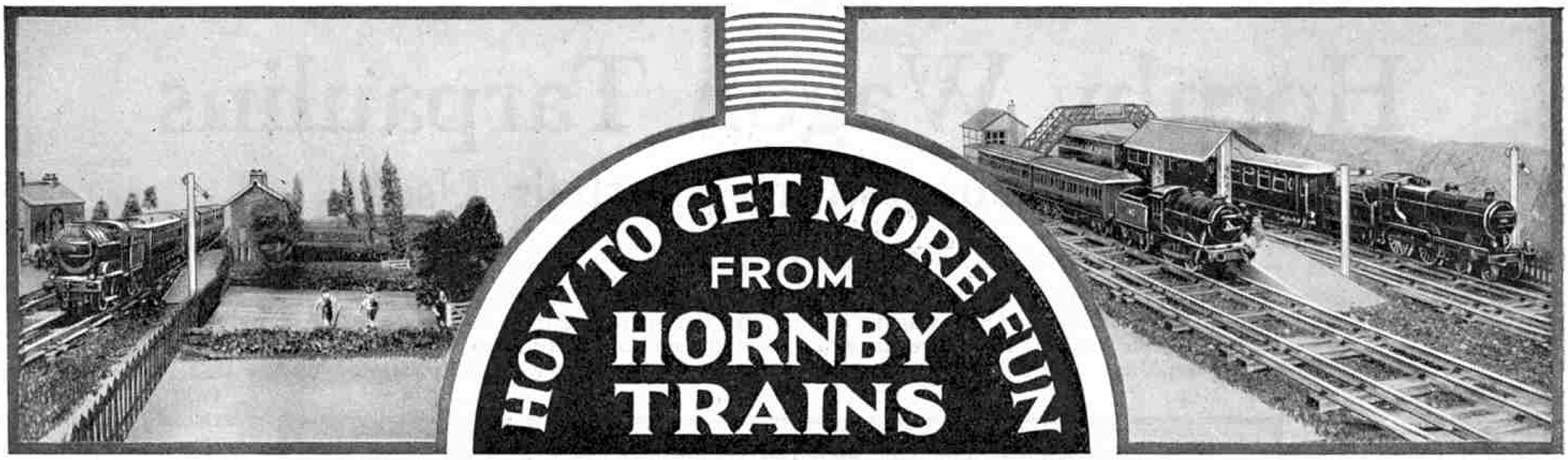
Sometimes when boys are fixing the Tarpaulin over the load they experience difficulty in securing a neat effect. This is because they invariably attempt to attach each of the "ropes" of the Tarpaulin to the stock of the buffer that is nearest. This prevents the edges of the Tarpaulin along the wagon sides from being brought tight, so that they stand away from the sides of the vehicle and look untidy. It can be prevented by overlapping round the ends of the Wagon sides the ends of the Tarpaulin that project beyond the sides, and securing the ropes to the opposite, rather than to the nearest, buffer. The edges of the Tarpaulin are thus drawn tight all round, and the wagon and its load look as if they had been properly and carefully sheeted by the loaders.

One never sees a carelessly - secured tarpaulin in actual practice, and miniature railway owners should see to it that their "Goods Department" imitates the real thing in this respect. While the load in a Hornby Wagon would not "spoil," the difference in appearance between the correct and the incorrect fitting of a Tarpaulin is very noticeable.

A Hornby Wagon that is specially suited to the use of a Tarpaulin is the familiar Open Wagon "B." This is provided with a raised bar attached to the ends of the vehicle and running lengthways between them. It is pivoted at the ends to enable it to be swung out of the way when not required, and then it rests along the top of the Wagon side. Wagons so fitted are commonly seen in actual practice, especially on the G.W.R. and the S.R. and the purpose of the bar is to provide a support for a tarpaulin, thus assisting in the sheeting of the load in an efficient manner. In actual practice the slope given to the tarpaulin on each side of the bar ensures that rain is quickly thrown off.

Occasionally on real railways we see covered vans which, in addition to having the usual doors in the sides, are provided also with openings in their roofs. These openings enable loading to be carried out from above, as for example from an upper storey of a warehouse or depot. They are often covered over with a sheet of tarpaulin specially made for the purpose and attached to the van roof, but sometimes for further security of loads such as grain, etc., additional tarpaulin sheets are stretched over the tops of the vans, reaching downward over portions of the sides.

This interesting practice can be reproduced on a Hornby railway by means of the standard Tarpaulin. It should be laid down over the middle of the Van where the roof doors would be. The "ropes" are attached to the buffer stocks as before, but in this case to the nearest ones, thus pulling the Tarpaulin tightly into place over the upper part of the Van. On a Hornby railway a vehicle so fitted has an unusual and interesting appearance.

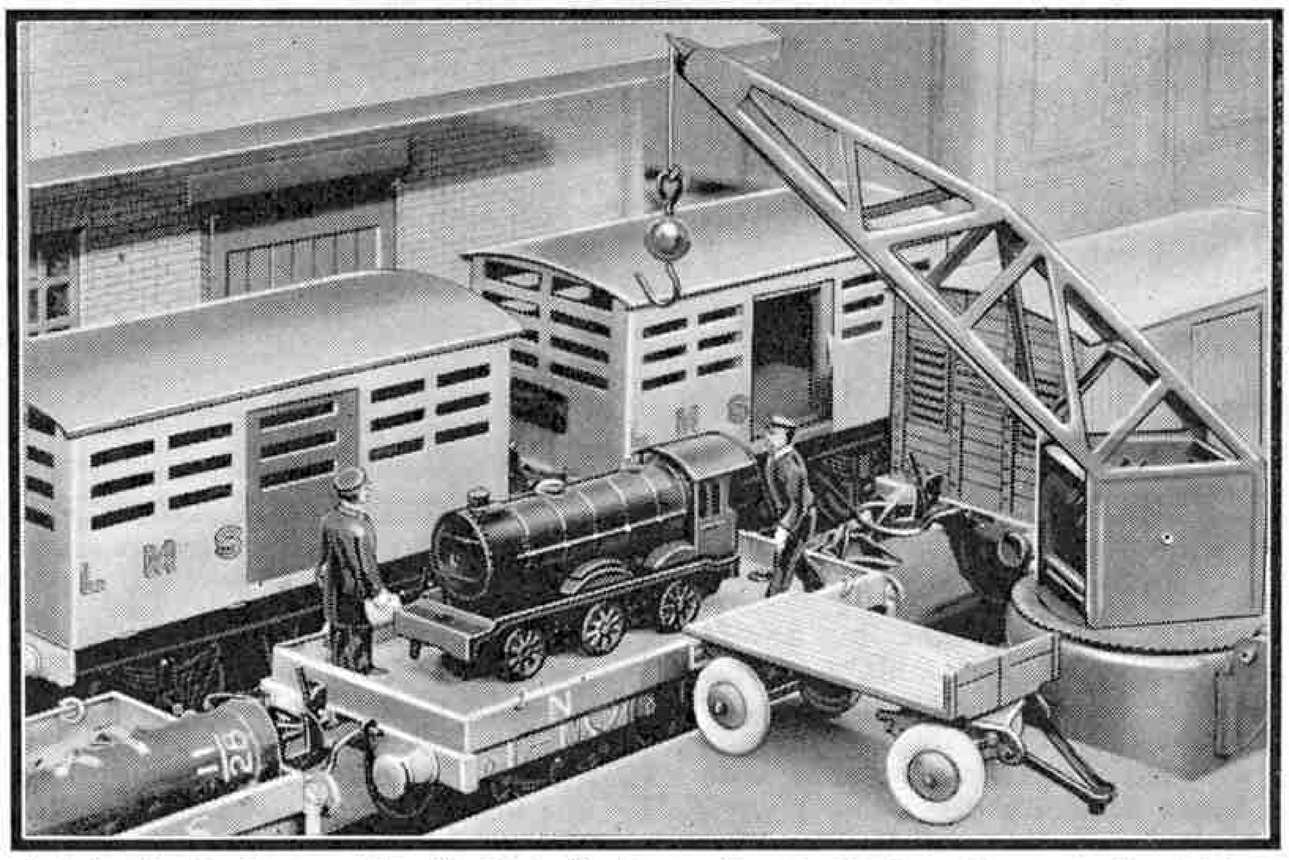


ROAD-RAIL SERVICES ON HORNBY RAILWAYS

THE association of British railways with road services is a notable feature of the present time, and Hornby Railway owners who wish to be up-to-date cannot neglect this side of railway activities. As a result of various introductions into the range of Meccano Dinky Toys, it is easy to follow actual practice in the matter of road-rail transport for freight.

An up-to-date Dinky Toy item is the now familiar Mechanical Horse. This type of specialised motor vehicle was initiated in 1930 as the "Karrier Cob," its name suggesting its purpose in replacing the horse as a haulage agent. Special trailers are used in conjunction with these mechanical horses, and the complete units are now a familiar sight on the roads. The Dinky Toy Mechanical Horse can be used most effectively in conjunction with a Hornby Railway system, and two or three units should be attached to any freight yard of importance. For use also as part of the "scenery" rather than as railway accessories they are useful, and they give an essentially modern touch to the surroundings of a miniature railway.

Another motor vehicle of the Dinky Toys series is the Covered Van No. 25b, of the No. 25 Set of Commercial Motor Vehicles, available lettered with the well-known name "*Carter Paterson.*" This cartage undertaking has now been absorbed by the railway companies, so that the Van is particularly appropriate for railway parcels collection and delivery services in miniature.

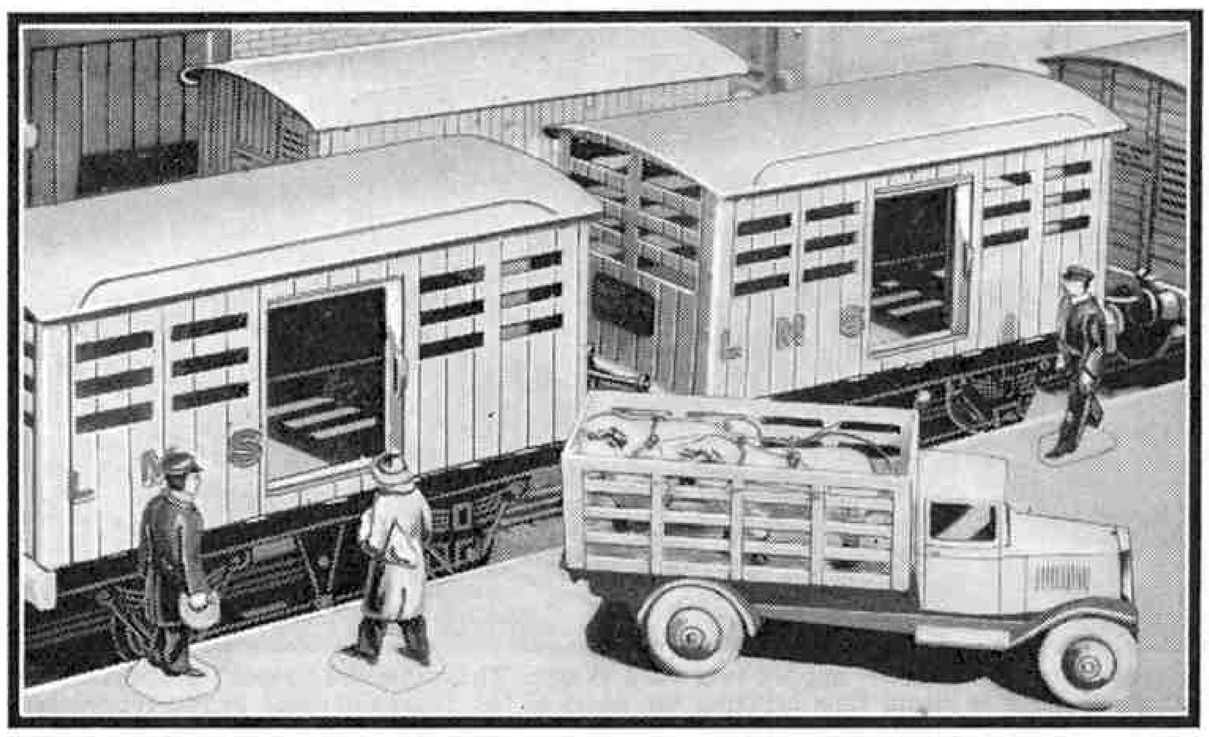


An interesting loading operation. The Dinky Toy Locomotive, No. 17a, is used to represent a miniature narrow-gauge engine being transferred from the road Trailer No. 25g to the railway Flat Truck.

The carriage of livestock forms an important part of railway work, especially in agricultural districts, in connection with markets, sales and shows. Nowadays, in order to provide a "door-to-door" service for this kind of traffic, and to obviate the weary driving of the beasts between the farm and the local railway station, a capacious motor vehicle is specially adapted for the purpose. In construction the Market Gardener's Van, No. 25f, reproduces fairly closely the characteristics of a railway livestock float, and its use for this purpose would be an interesting variation of the ordinary work performed by this vehicle.

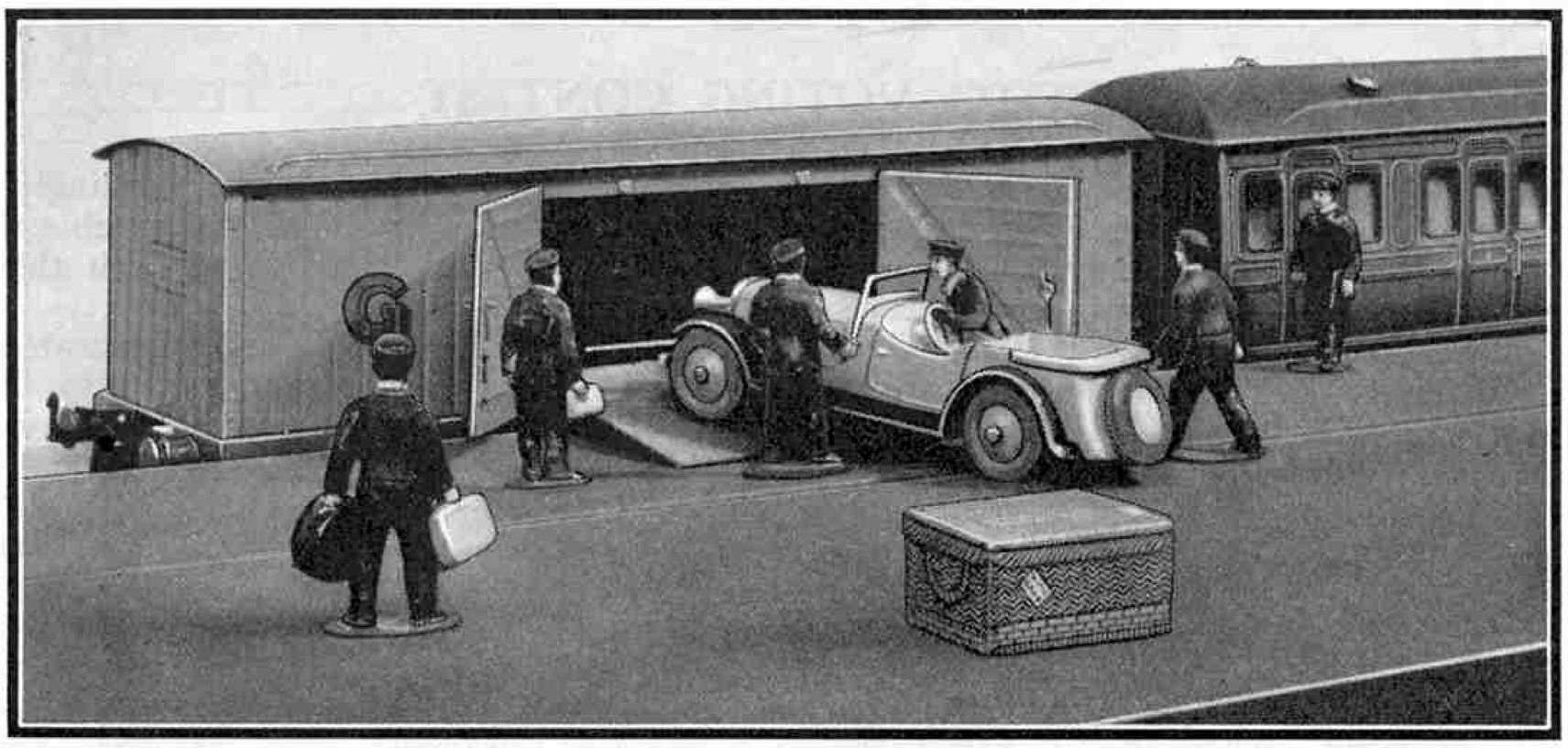
Many other uses can be found for various Dinky Toys components. The small Delivery Vans of Sets 28/1 and 28/2 may be used for the collection and delivery of ordinary parcels consigned by passenger train, as opposed to merchandise. They may be adapted also for railway advertising and publicity services, and decorated with wording drawing attention to the advantages of the particular routes served by their owning company.

Readers who own one of the Dinky Toy Tractors, No. 22e, may find a use for this as a shunting unit for light yard services. It may be used instead of an engine for this work, which may be very light in character or carried on in a restricted space. The yard should be made up level with the tops of the rails. For this purpose cardboard may be used, suitably painted to imitate the stone setts or other sur-



Hornby road-rail service for livestock. The Market Gardener's Van, Dinky Toy No. 25f, here represents a livestock float and is provided with a net of Meccano Cord.

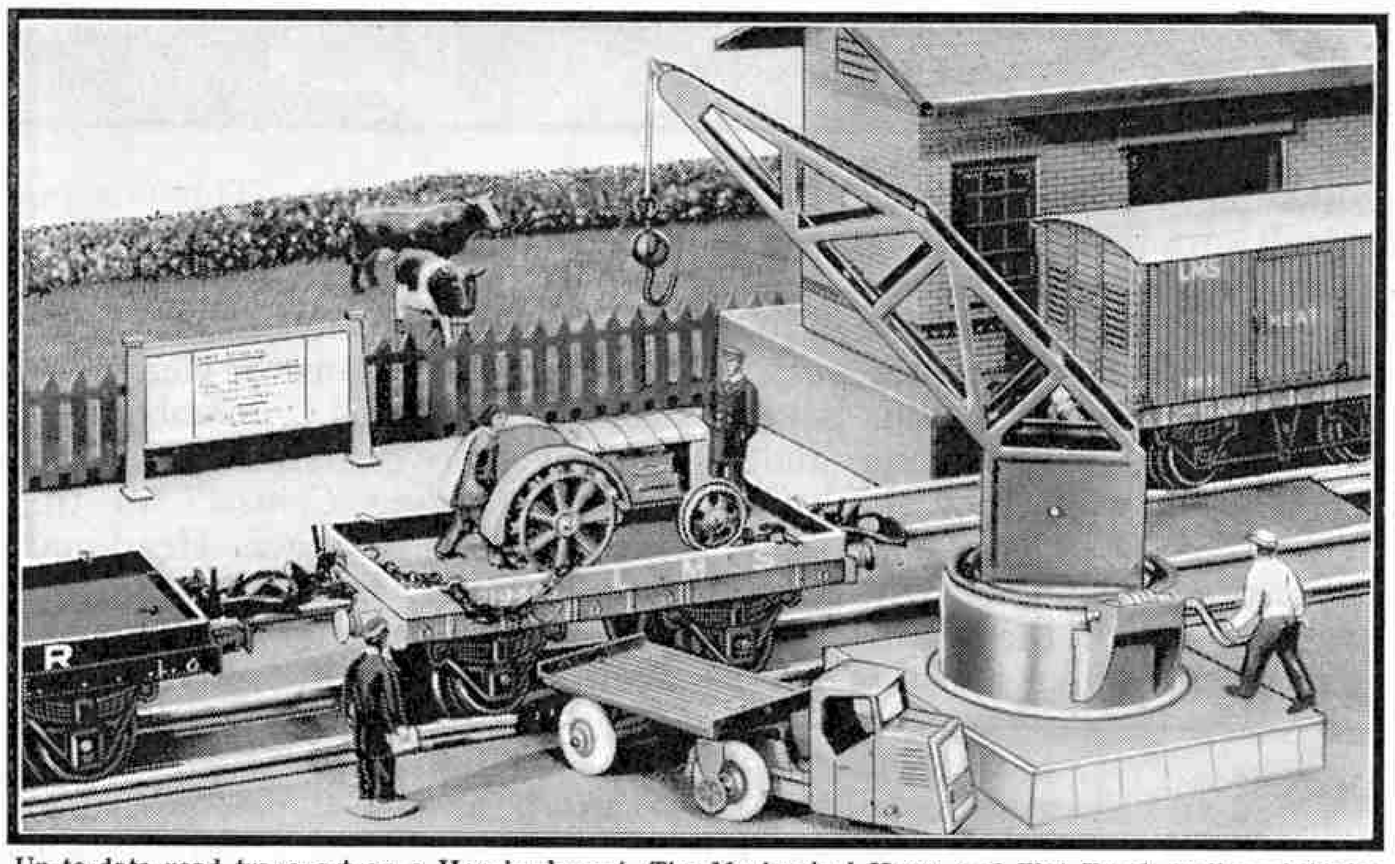
faces commonly found in large yards. A point that should not be overlooked is that the treads of the wheels will require modification in order to make them suitable for this service. As supplied the Tractors are intended for agricultural purposes, and the driving wheels therefore have special treads in order to ensure a grip on heavy soil. These may be concealed by the judicious use of Plasticine to imitate the solid rubber tyres that would be fitted for ordinary use. The steering wheels, which are of the flanged pattern, also should be dealt with in this way. The "tyres" so formed should be enamelled in order to make them permanent and of suitable colour.



Loading a private car, Dinky Toy No. 24g, into a Hornby No. 2 Luggage Van. The large doors of this vehicle make it very suitable for the accommodation of miniature motor cars.

Similar tractors are used also for heavy road haulage, and for this purpose one of the Dinky Toy Tractors could be employed in conjunction with the useful Trailer No. 25g. Although no provision is made for the attachment of a load to the standard Tractors, readers will probably not experience any difficulty in devising a suitable coupling of fine wire or cord to enable the Trailer to be attached in order to handle any particularly heavy load.

Where several road motor vehicles are in use and are attached to particular goods yards, provision will have to be made for their stabling and accommodation generally. Developments of this kind should not be overlooked, for they add considerably to the interesting effect of the line as a whole. In this connection the new Garage can be made use of for the accommodation of the various road motor units. Their fuelling is an important question, and suggests the use of one or more of the various Petrol Pumps of Meccano Dinky Toys No. 49, together with the necessary Oil Bin contained in the same set.



Up-to-date road transport on a Hornby layout. The Mechanical Horse and Flat Truck trailer of Dinky Toy Set No. 33 are waiting to convey the Tractor, No. 22e, to its destination.

In addition to their use "on the road," most of the Dinky Toy motor vehicles are also very effective as miniature loads. The carriage of motor vehicles by rail is quite an important feature of railway traffic. Private cars are frequently conveyed over long distances so that their owners, also proceeding by rail, may have their cars available for use in the locality chosen for their holidays, without having to make a long road journey.

When the carriage of motor vehicles is to be undertaken on a miniature railway, the "Rolling Stock Department" will have to provide suitable vans or wagons. Cars can be carried, as frequently suggested in these pages, in the large bogie No. 2 Luggage Van. This has wide double doors that facilitate the loading of the vehicles from the platform. It is necessary to provide a loading ramp or "gangway," however, to enable cars to be run up off the platform on to the floor of the Luggage Van. This ramp may be just a piece of sheet metal, or even cardboard, cut to the right size. Two cars can be accommodated in the No. 2 Luggage Van without difficulty.

Although the employment of this Van has its advantages and is realistic, it is more particularly suitable for the transport of private cars. For commercial vans and lorries the Flat Truck can be used, with a Hornby Wagon Tarpaulin covering its load. Where a Tractor is being conveyed the Tarpaulin can be omitted, but a Car or Van supposed to be in course of delivery should really be sheeted over.

For loading on to the Flat Truck a crane will be required, even where the operation is taking place at a loading platform, as the necessary turning of the vehicle could not be accomplished otherwise owing to the limited length of the 4-wheeled Flat Truck. Suitable slings therefore must be brought into use in order to enable the crane to pick up its load properly. Meccano Cord is ideal for this purpose, and where small hooks are required it is not difficult to bend these up out of thin wire.

A development of interest is the transport of racing cars proceeding to the Continent, to the Isle of Man or to Northern Ireland for one or other of the popular road racing events. For the reproduction of these vehicles on a miniature railway system the Dinky Toy No. 23, Racing Car, is very suitable. It looks very business-like in its gay colours, with racing numbers painted on.

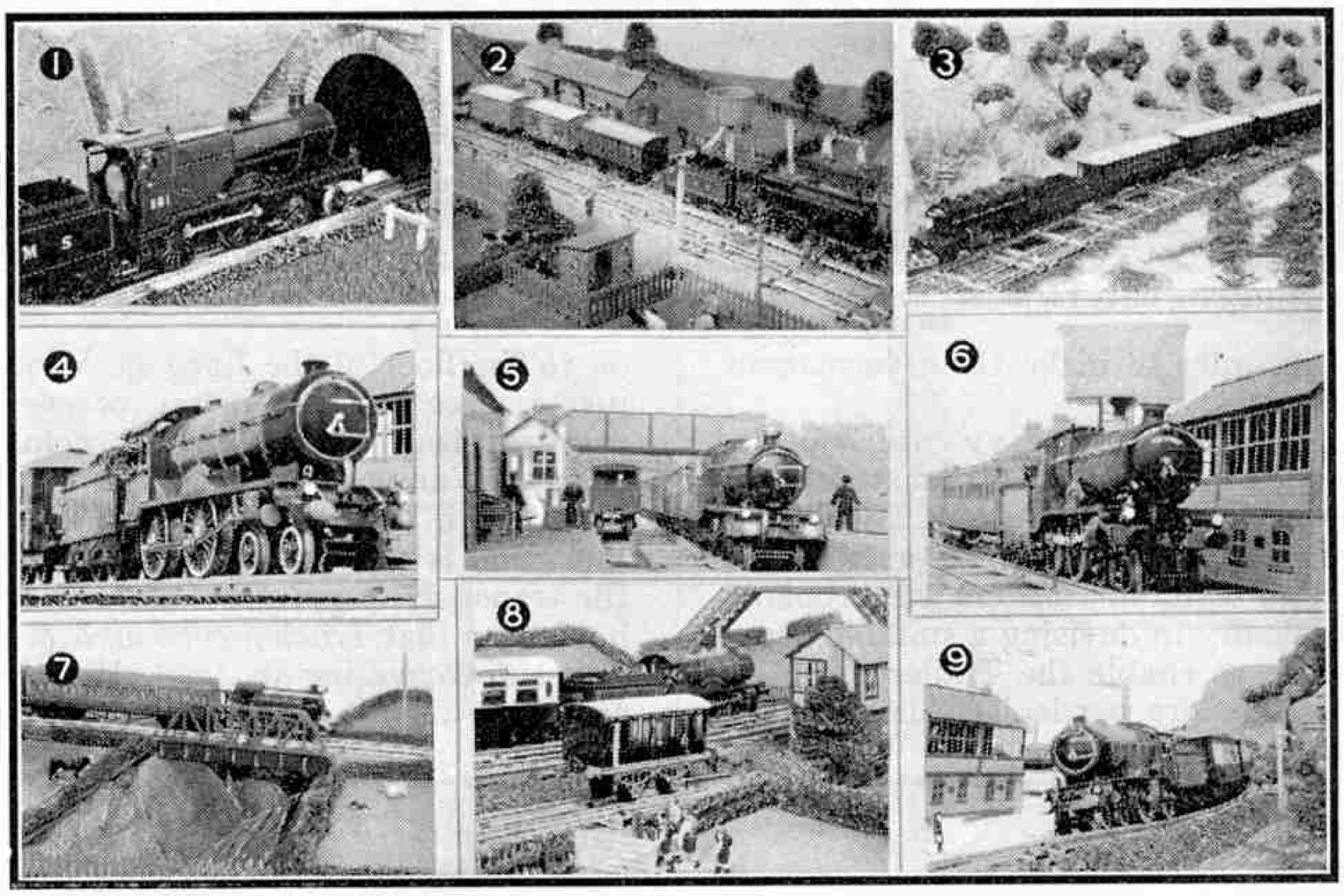
Join the Hornby Railway Company and become eligible for the competitions announced on this page.

H.R.C. COMPETITION PAGE

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

PHOTO VOTING CONTEST

The model railway photographs published in the "*M.M.*" each month represent as closely as possible actual railway scenes, and are carefully selected to enable Hornby railway enthusiasts to arrange and operate their miniature railways in the most realistic manner possible. Generally speaking, these illustrations may be divided into two classes. The first consists of those in which the actual formation is the chief point of interest, and little or no scenery is shown, the idea itself being thus kept clear and easy to follow. The second class includes illustrations in which the general realistic appearance is the outstanding feature, and where the disposition of the trains, accessories and surroundings combine to form a complete and railway-like picture.



The individual subjects dealt with in these photographs are very varied, and to enable us to continue to publish the most popular type of photographs we are interested to know which are considered by our readers to be the best. In order to decide this point we reproduce on this page typical examples of Hornby railway photographs, and we invite readers to place these in what they think is the order of merit.

Competitors are required to do two things. First, they must decide upon the order in which they think the photographs should be placed, and make a list of the numbers representing them accordingly. Second, they must state in as few words as possible their reason for selecting the particular photograph they have placed at the head of the list.

To the competitor who most accurately forecasts the total vote of all the competitors, a prize of Hornby Train goods (or any Meccano products) to the value of 21/– will be awarded. To the senders of the three entries next in order of accuracy will be awarded similar goods to the value of 15/–, 10/6 and 5/– respectively. A duplicate set of prizes will be reserved for competitors in the Overseas Section. In the event of a tie for any prize, the award will be made to the competitor whose entry is presented in the neatest or most novel manner. This is a point worth remembering, as it sometimes happens that a really good entry is displaced from the prizewinning list on account of its untidy presentation. On the back of each entry submitted to this contest must be clearly written the sender's name, address and H.R.C. membership number.

Envelopes containing entries must be marked "*H.R.C. August Voting Contest*" in the top left-hand corner and posted to reach Headquarters at Meccano Ltd., Binns Road, Liverpool 13, on or before 31st August. The latest date on which entries from Overseas competitors can be accepted is 30th November.

Photographic Contest

The wide range of subjects submitted in the summer series of photographic contests shows that many interesting photographs would have been lost to us if competitors had been tied down to one definite subject. We therefore announce this month another photographic contest in which members may enter photographs of any railway subject. Each exposure must have been made by the competitor.

The competitor may submit as many prints as he desires, but he cannot win more than one prize in one contest. It is important that each print sent in should have on the back a description in a few words of the railway scene shown, the age, name and address of the sender, and his H.R.C. membership number.

The contest will be divided as usual into two sections, Home and Overseas, and prizes of Hornby Train goods or any other Meccano products, or photographic material if preferred, to the value of 21/–, 15/–, 10/6 and 5/– respectively, will be awarded to the senders of the best photographs submitted in each section.

Envelopes containing prints must be marked "*H.R.C. August Photo Contest*" in the top left-hand corner and posted to reach Headquarters at Meccano Ltd., Binns Road, Liverpool 13, by 31st August. Overseas closing date, 30th November.

COMPETITION RESULTS

HOME

May "Famous Trains Contest."—First: F. J. BURGE (2044), Wakefield, Yorks. Second: H. S. G. DARKE (4461), Hampstead, London, N.W.6. Third: R. F. EMBLEY (41047), St. Annes-on-Sea. Fourth: C. E. WRAYFORD (6039), Moretonhampstead, Devon.

May "Railway Photographic Contest."—First: A. F. PEGLER (15624), Lound, Nr. Retford, Notts. Second: F. G. H. KENNEDY (25074), Tonge Moor, Bolton. Third: V. L. BREEZE (2134), Kingston, Lewes, Sussex. Fourth: F. HODSON (9430), Bolton.

OVERSEAS

February "Word-Building" Contest."—First: H. C. KEY (24764), Park Circus, Calcutta, India. Second: E. A. BUNT (24651), Capetown, S. Africa. Third: J. A. RODRIGUEZ (3647), Montreal, P.Q., Canada. Fourth: D. J. WHITE (9333), Christchurch, New Zealand.

February "Railway Photo Contest."—First: J. A. COATES (23863), Canada. Second: M. DE LIMA (34925), India. Third: F. L. BINGEN (28995), Holland.

Branch News

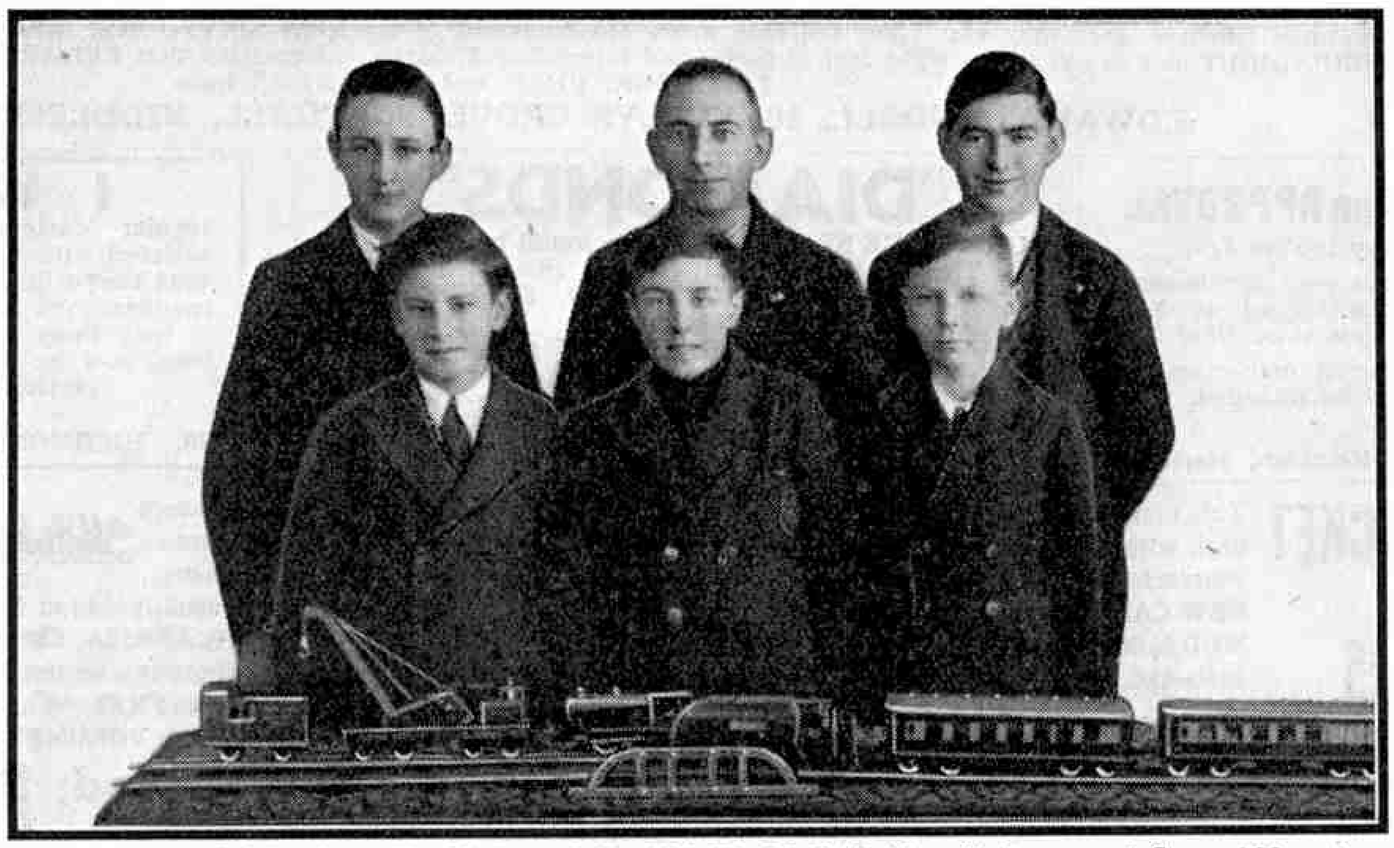
NORTHAMPTON.—Experimental timetables have been in operation on the Branch track, and excellent general running resulted from the use of one that extended over an hour. From time to time the track is relaid in order to give varied practice. Great fun has been obtained from a "Corinthian" Bagatelle Competition. An interesting lecture on *"London Railway Stations"* was given by the secretary, and railway photographs have been exhibited with the aid of a reflectoscope. Saturday afternoons are now being devoted to visits of railway interest. Secretary: D. K. Adams, 8, Cedar Road, Northampton.

BOWERHAM (LANCASTER).—Each member brings Hornby Train material to Branch meetings, and an extensive track is laid round the room. Eventually an adequate track that is the property of the Branch will be available. Two sections have been formed and a trophy is being presented for competition between them in track working. Meccano model-building is an additional activity, members taking turns to provide a model of railway interest for use on the track. As far as possible meetings end with visits to the L.M.S.R. line, where many interesting train working operations are seen. Secretary: G. Fairweather, 44, Palatine Avenue, Bowerham, Lancaster.

ST. GILES' CATHEDRAL (EDINBURGH).—A new railway room has been fitted out, after keen discussion among members, and an excellent track is now available. The chief attraction at a successful Sketch-Concert that attracted 225 visitors was a miniature Fairy Pantomime *"Cinderella."* All those taking part in the ingenious and original sketches and other items presented were members of the Branch or of the associated Meccano club. Ball games are carried on in the large hall available to members and recent meetings have been remarkable for enthusiasm and keenness. Secretary: H. W. Govan, 18, Ravelston Park, Edinburgh, 4.

ELMSIDE (EXETER).—Intense interest continues to be taken in the running of passenger and goods services. The famous trains already in regular operation have been reinforced by Jubilee excursions and a special *"Jubilee Express."* During the Silver Jubilee period the *"Cornish Riviera Express"* was transformed into a Royal train by equipping it with a special crown badge, and all stations and trains were decorated with flags. Secretary: T. Smith, 98, Ladysmith Road, Exeter.

KINGS ROAD (CHEMLSFORD).—Affiliation has now been secured and Junior and Senior Sections have been formed. Trials of locomotives have been carried out by both sections, and working timetables have been prepared. Members of the Junior Sections have drawn a large map on the floor of the club room, and on it have marked the main lines of British railways. The Senior Section programme has included a Lecture on *"Signalling"* by Mr. D. E. Rowe, Chairman, and the construction of an extensive goods yard on which complicated shunting operations are carried out. Secretary: H. A. Argent, 15, Park Avenue, Chelmsford, Essex.



Directors and officials of the Elmside Branch No. 192. Mr. M. C. Hodder, Chairman and General Manager, is in the centre of the back row, with Mr. J. R. G. Blaker, his assistant, on his left. The directors are elected by members of the Branch and are responsible for the general working of the Branch layout.

DAGENHAM.—A new club room has now been secured and members are taking the opportunity of making a new and improved layout, which will include the best features of previous railways laid down. Several evenings have been devoted to railway talks. A Library has been established and preparations for an Exhibition in the club's new premises have been forwarded. Secretary: P. Bush, 121, Church Elm Lane, Dagenham, Essex.

WIMBORNE GRAMMAR SCHOOL.—Many track meetings have been held and at all there were splendid attendances. The track has been completed and exciting and interesting operations have been carried out. In these junior members have played a particularly important part and have earned the commendation of the officials. The Track Engineer has many ambitious schemes and special efforts are being made to design an efficient lighting system. Secretary: D. V. J. Gibbs, Queen Elizabeth's Grammar School, Wimborne.

HOLYWELL (OXFORD).—Operations on the Branch track have included the working of "stiff" timetables, and members are becoming so skilful that trains run well up to time. A Lantern Lecture has been given by Rev. L. A. Garrard on the Drummond 4–4–0's of the L.S.W.R., and members voted this the best meeting of the session. The second issue of the Branch magazine has appeared. Secretary: J. Spicer, 28, Holywell, Oxford.

THE PRIORY (HIGH WYCOMBE).—Great interest has been taken in the construction of a garden railway, but operations are being continued indoors on the Branch track, for which difficult timetables have been drawn up. Visits have been paid to Snow Hill Station (Birmingham), Rugeley, on the main line of the L.M.S.R., and other places of railway interest. Paddington and Marylebone stations also have been visited. Secretary: J. T. Cosgrove, 54, Priory Road, High Wycombe, Bucks.

AUSTRALIA

SYDNEY.—There has been a definite improvement in membership and in interest in miniature railway working generally. The Branch has an excellent balance in hand, and an ample supply of railway material. Red and green have been adopted as Branch colours. A permanent room has not yet been secured, but regular timetable operations continue to be carried out on a layout representing a suburban track with an intensive service. Excursions have been made to the Bunnerong Power House, Blackheath, and an important goods line. Secretary: W. J. T. Watson, 595, Parramatta Road, West Leichhardt, N.S.W.

Branches Recently Incorporated

288. MAASTRICHT—Mr. F. L. Bingen, Mathias Wijnandstraat 6, Wijk Maastricht, Holland.
289. PREPARATORY SCHOOL (SEDBERGH)—D. B. L. Smith, Underfell, Barbon.

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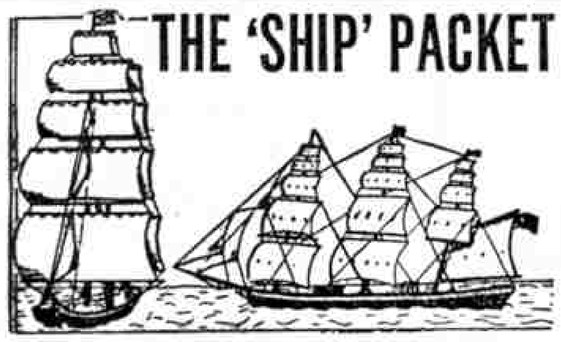

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7 INDIA–JUBILEE Set, Complete, Used **1/3**
10 JUBILEE COLONIALS, Mint, diff. ... **1/–**
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The Stamp Story of CANADA

IN recent *"M.M."* stamp articles attention has been directed to the considerable amount of enjoyment and interest to be derived from compiling collections of stamps illustrating one particular subject. Canada offers considerable scope and there are subjects ready made in the History, Development and Natural Features of the Dominion. The story need not be confined to Canadian stamps alone, for France, Newfoundland and the United States have issued a number of stamps that could be utilised with very good effect in illustrating this fascinating subject.

The history of Canada starts with its discovery in 1534 by Jacques Cartier, the St. Malo fisherman who took possession "in the name of France and Christ." Stamps to celebrate the quadri-centenary of this incident have been issued recently by Canada and France and illustrated in the *"M.M."*

After Cartier's discoveries nothing was done to develop and settle the country until Samuel de Champlain founded the city of Quebec in 1608. An interesting link with this stage of Canada's history is provided by the series of stamps issued in 1908 to commemorate the tercentenary of Quebec's foundation. Portraits of Champlain and Cartier are given on the 1c. stamp; Champlain's home in Quebec is shown on the 5c. value; a composite portrait of Generals Montcalm and Wolfe, the opposing commanders in the battle on the Heights of Abraham in 1759 that resulted in the capture by the British of the French citadel at Quebec, is given on the 7c. stamp; a view of Quebec in 1708 appears on the 10c., while the arrival of Cartier's fleet on the Jaspé coast of Quebec is shown on the 20c.

It is not our intention here to recount the ebb and flow of the inter-provincial struggles that led to the conclusion of the Act of Union in 1867, whereby the Provinces of Canada, Nova Scotia and New Brunswick became united as the Dominion of Canada, but in writing up the story in the stamp album, the principal events leading up to the Confederation should be briefly outlined. The Diamond Jubilee of the Confederation was celebrated in 1927 and the series of stamps then issued provides portraits of leading statesmen who guided the Dominion through its troublous early days, and also provides further helpful material, including a view of the scene at the Confederation Conference at Quebec in 1867 (2c.); a view of Parliament Buildings at Ottawa (3c.); and a map showing the extent of the Dominion in 1867 and 1927 (12c.).

In recent years Canada has given the world a range of pictorial stamps that stand unsurpassed for the beauty of their designs and the quality of their printing. Among these stamps there are several that can be used to display the natural features of the Dominion and its industries.

The 10c. value of the 1928 issue shows Mount Hurd and the $1 value of the 1930 series Mount Edith Cavell as worthy representatives of the great mountain ranges. River scenery is represented by the 2c. value of 1928 showing the Quebec Bridge over the St. Lawrence, while the 12c. of 1920 gives another view on the St. Lawrence with the ancient Quebec Citadel in the background. A third river view is on the Universal Postal Union Congress commemorative issue of 1933. This shows the Parliament Buildings, Ottawa, as seen from the Ottawa River.

The Quebec Bridge design on the 1928 12c. stamp is also a worthy representative of the engineering activities of Canada, for the bridge is one of the mightiest pieces of bridge building in the world. Its main span is 1,800 ft. in length and its length is 3,240 ft. Over 66,000 tons of steel and 106,000 cubic feet of masonry were used in its construction, and at high water it provides a clearance of 150 ft. above water level.

The agricultural activities on the prairies are well represented by the 20c. stamps from the 1928 and 1930 series, both of which show harvesting scenes with mechanical reapers and binders in action. Our illustration is from the 1930 issue.

Canada's valuable fishing industry can be covered by featuring the fishing schooner *"Bluenose"* illustrated on the 50c. stamp in the 1928 series, while the inclusion of one or more of the many "fish" stamps from Newfoundland would be a happy way of amplifying the story. The 8c. from the Cabot commemorative series of 1897 shows a hand net being drawn between two fishing boats, while the 1c. and 10c. of the 1932 issue provide links with cod and salmon fishing.

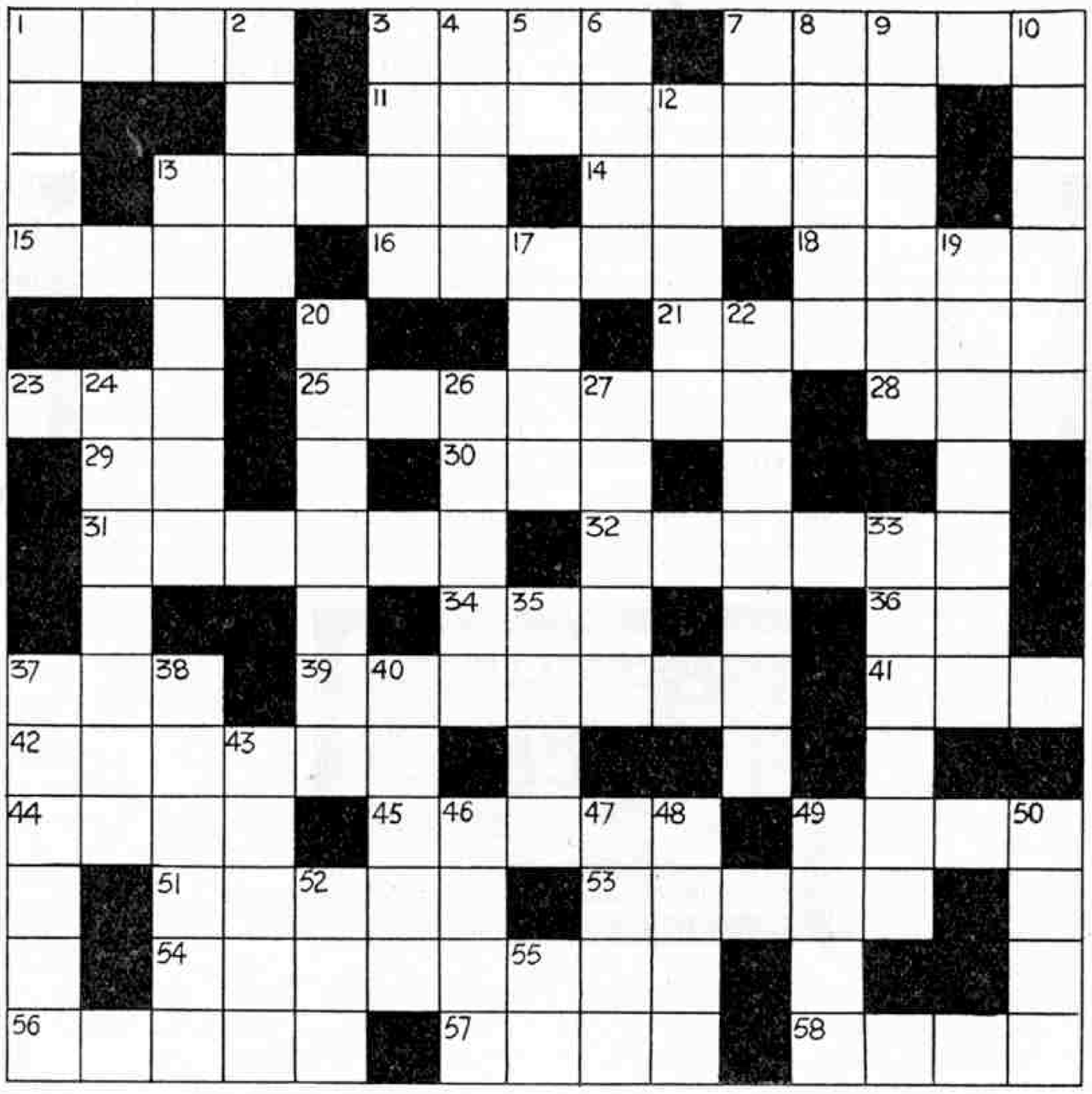
Newfoundland also could provide a number of interesting views depicting the timber industry, notably logging in the forests (8c., 1897 issue); sawmills (9c., 1910); and the Corner Brook paper mills (8c., 1932).

In any vast country yet in the developing stage, the provision of adequate means of transport is the most important problem to be faced, and the story of the growth of transport facilities in Canada is of absorbing interest. There are two splendid stamps to illustrate this side of the story, the 5c. of 1933 showing the famous steam auxiliary *"Royal William,"* the first steamer to cross the Atlantic, and the 20c. special express issue in the Confederation commemorative series of 1927. This is a composite picture symbolising the development of mail carrying. It features the dog team, the pony rider, the lake steamer, the mail train and finally the aeroplane.

A collection such as has been briefly outlined here is well within the compass of any young collector, for most of the necessary stamps can be obtained from any stamp dealer at very small cost. Alternatively, the Canadian stamps—in fact, most Canadian King George issues—can be purchased at face value from the Philatelic Section of the Post Office Department at Ottawa.

Competition Corner

AUGUST CROSSWORD PUZZLE



CLUES ACROSS

1. Assistance
3. Public vehicle
7. Ridiculous
11. Determined
13. Wearies
14. Pointed weapons
15. Peer
16. Clear air
18. The aerial prefix
21. Seed
23. Instigate
25. Acquaint
28. Boy's name
29. Ejaculation
30. Curious
31. Hoards
32. Isolate
34. Beverage
36. Instead of
37. A dove's song
39. A chess move
41. Request
42. Indian coins
44. Worn
45. Rips
49. Imprisoned
51. African river
53. Animal
54. Immortalise
56. Grove
57. Pursue
58. The last part

CLUES DOWN

1. Call
2. Jab
3. Large plant
4. Repose
5. Because
6. Style
7. Fine hair
8. Essence
9. Dislike
10. Embrace
12. Song birds
13. Shining
17. Firm
19. Midshipmen
20. Mould
22. Weirdest
24. Gassy
26. Pillars
27. Perfect
33. Idler
35. A volcano
37. Crush
38. One who opens up
40. Flower
43. Compiles
46. Eagle
47. Ascended
48. Simmer
49. Nuisance
50. Tax
52. Obtain
55. Arrived

Our series of crossword puzzles have enjoyed remarkable popularity, largely because they are set for our readers' amusement instead of strenuous competitive effort. This month's puzzle will be found to follow the lines of the previous ones in that every effort has been made to provide a fair and interesting puzzle. The clues are all perfectly straightforward, and every word used can be found in Chambers' or any other standard dictionary. The rules that govern the solution of crossword puzzles are by now so well known that it is unnecessary to give any further explanation of the requirements of the competition.

The prizes will consist of Meccano or Hornby Train goods (to be chosen by the winners from the current catalogues) to the value of 21/-, 15/-, 10/6 and 5/- respectively, to be awarded to the senders of the four neatest or most novelly-prepared correct solutions, in order of merit. The prizes will be duplicated for the Overseas section, which is open to all readers living outside Great Britain, Ireland, and the Channel Islands.

Entries should be addressed "July Crossword Puzzle, Meccano Magazine, Binns Road, Liverpool 13," and must be sent to reach this office not later than 31st August. Overseas closing date 30th November.

Competitors should not mutilate their magazines by cutting out the crossword illustration. Instead they should make a copy of the square on the same scale, or larger, and use that in submitting their entries for the contest. Readers who desire to have their entries returned, must forward a stamped addressed envelope for the purpose.

August Photo Contest

As announced in the April *"M.M.,"* throughout the summer we are offering prizes for the best and most interesting photographs submitted each month. The photographs may be of any subject, and may be made with any make of camera, plate, film or paper. Each photograph must bear on its back the reader's name, age and address, and a title, and the exposure must have been made by the competitor.

The entries each month will be divided into two sections, A for those aged 16 and over, B for those under 16; and prizes of Meccano Products or Photographic Materials, to be chosen by the winners, to the value of 21/- and 10/6 will be awarded in each section. A separate set of prizes, to be awarded in similar conditions, will be reserved for Overseas entries.

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

Prizewinning photographs are retained by the Editor, but other entries will be returned if a stamped addressed cover is sent for the purpose with the entries.

Competition Results—*(Con. from Column 3)*

N.W 2); Section B, P. PEACH (Kingussie).

OVERSEAS

Dog Contest.—1. E. CHAPMAN (Palmerston, N.Z.); 2. J. A. MALLIA (Malta); 3. M. BEDLINGTON (Auckland, N.Z.); 4. R. H. STUART (Ohakune, N.Z.).

December Drawing Contest.—First Prizes: Section A W. FIGGINS (Wellington, N.Z.). Section B, N. SODERBERG (Falun, Sweden). Second Prizes: Section A, D. E. YOCKNEY (Auckland, N.Z.); Section B, R. LAWSON (Caledon, Cape Province). Consolation Prize: M. W. WICKHAM (Kenya Colony).

COMPETITION RESULTS

HOME

June Advertising Competition.—1. J. K. ROBINSON (Rugby); 2. W. K. COCKING (Redruth); 3. C. P. RICKETTS (Bristol); 4. D. ODABASHIAN (Styal, Ches.).

Advertising Competition Series.—Special consolation prizes value 5/- each have been awarded to the following competitors in accordance with the conditions announced in the April Advertisement Contest: L. J. ANTHONY (Manchester); S. W. BUSH (London, E.12); B. D. DAGNALL (Sturry); D. MORLEY DAVIES (Maesteg); D. F. ECCLESTONE (Bungay); H. FARRELL (Dublin); G. E. GAUNT (Chesterfield); J. E. GEAKE (Manchester); A. HAIGH (Manchester); R. E. HICKS (Doncaster); J. KERR (Glasgow); G. A. KIMBERLEY (Birmingham); M. KING (Brighton); V. KNILL (Thorpe Bay); K. MASSEY (Stoke-on-Trent); B. W. METCALF (Ilford); J. MITCHELL (Edinburgh); R. OSMAN (Southampton); D. RATCLIFFE (Tarporley); W. F. STUART (London, S.E.20); S. TAYLOR (Grimsby); I. THOMPSON (Portavogie); J. S. WHITE (London, N.W.9), P. WIGGS (London, S.E.24).

June Photo Contest.—First Prizes: Section A, G. WOOD Halifax); Section B, P. BURGIN (Harrogaden; Second Prizes: Section A, I. D. MOGGACH (London)

NOT SO INTERESTED

The vicar was taking tea with Mrs. Bludgeon when the drawing room door opened, and little Jim made his appearance. "Please, mummy," he said, "can I take the volumes of Shakespeare?"

The vicar beamed at the small boy. "I'm glad to see you are interested in the works of the great bard, Jimmy," he said. "Which of Shakespeare's plays do you like best?"

Jimmy looked a trifle confused. "P-please, sir," he replied, "I'm getting them for father—he wants to press his trousers."

* * * *

Mrs. Newrich (to visitor): "Yes, our little son Adolphus is learning French and algebra, you know. Adolphus, tell the lady how to say 'Good morning' in algebra."

* * * *

Father: "Everything I say to you goes in one ear and out of the other."

Youngster (thoughtfully): "Is that what we have two ears for, father?"

* * * *

"How did you make your neighbour keep his hens in his own yard?" "One night I hid half-a-dozen eggs under a bush in my own garden, and next day I let him see me gather them. I wasn't bothered after that."

* * * *

Two Spaniards quarrelled and decided to fight a duel. In order to do this without attracting too much attention, they took a train into the country. The first Spaniard booked a return ticket, but his opponent took only a single.

"Ha ha!" exclaimed the first. "You expect not to come back—eh, my friend? I always get a return."

"I never do," answered the other quite calmly. "I always take the return half from my adversary."

* * * *

The neighbours were having a party in their garden, and a little girl had been watching the proceedings from her door. Suddenly she rushed into the house exclaiming excitedly: "Mummy, there's a man outside without pants, cleaning the grass with a vacuum cleaner."

Mother, on looking out to see this strange sight, found a Scot in his kilt playing the bagpipe.

* * * *

ALL FOR SIXPENCE!

A Scotsman lost 6d. in the Strand and reported the matter to Scotland Yard, where he was assured that "no stone would be left unturned to find it." Passing the scene of the loss the next day he was gratified to note a gang of workmen with pneumatic drills taking up the road. Said he to himself "Ay, I didna ken they'd go to all that trouble!"

DEPENDS

Father: "Hullo! Where's Alfred gone to?"

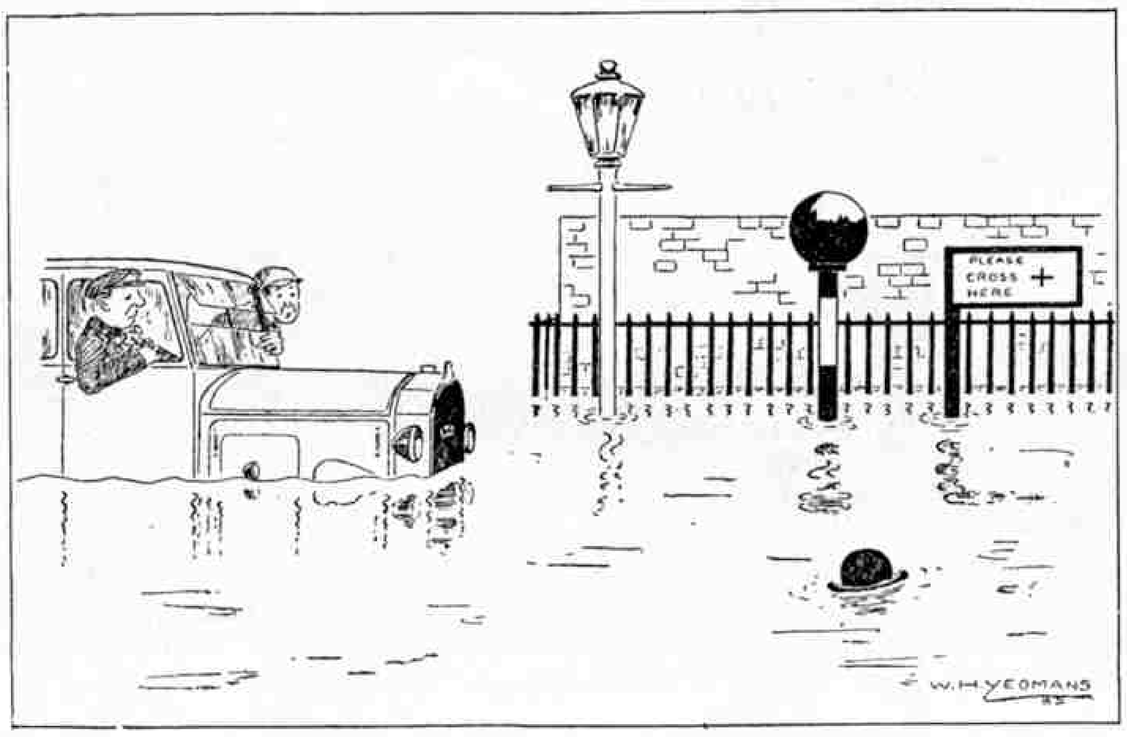
Mother: "If the ice is as thick as he thinks it is, he's gone skating, but if it is as thin as I think it is, he's gone bathing."

* * * *

A little girl who was asked by her teacher what she thought the word "nonsense" meant, said: "Nonsense is when an elephant is hanging over a cliff with its tail tied to a daisy."

* * * *

SAFETY FIRST!



Lorry man to Driver: "Half a mo' mate, I believe there's someone crossing!"
Courtesy "The Commercial Motor."

Townsman: "I suppose you are very pleased with the rain and hope it will keep up?"

Farmer: "Not at all. I hope it will come down."

* * * *

Enthusiastic tourist: "Where did those big rocks come from?"

Guide (fed up with questions): "Glaciers brought them down from the mountains."

Tourist: "Then where have the glaciers gone?"

Guide: "Back for a few more rocks, I expect."

* * * *

The tramp eyed the joints displayed in the butcher's shop. "You have meat to suit all purses, I presume?" he said.

"Yes," snapped the butcher.

"What have you to suit an empty purse?"

"The cold shoulder."

* * * *

The flying instructor had given a lecture on parachute work, and he concluded with the following: "And if it doesn't open—well, gentlemen, that's what is known as 'jumping to a conclusion'."

* * * *

"Father," said Johnny, rushing into the lounge, "there's a big black cat in the dining room."

"Never mind, Johnny," said his father, "black cats generally are lucky."

"Yes," was the reply, "this one certainly is; he's had your dinner!"

* * * *

A boy stopped a well-known cricketer and asked him for his autograph.

"But I've signed your book before, sonny," he replied although secretly flattered.

"Yes, I know, sir; but when I get ten of yours I can swap them for one of Jack Hobbs."

* * * *

Higson: "I am sorry to have to mention it, Mrs. Wrinkles, but your husband owed me ten shillings when he died."

Widow: "Really! Oh, well, I know you're glad now that you have something to remember him by."

NO IMPEDIMENT

Employer (to applicant for situation): "Yes, your testimonials are excellent; but do you always stutter in that unfortunate way?"

Applicant: "N-n-n-n-o, Sir. Only when I t-t-t-t-alk!"

* * * *

Rastus: "Is dat new mule ob yours much help wid your work?"

Pete: "Not yet. I always hab to watch where he goes and den follow him, just to make him think I is de driver."

* * * *

Johnny had been to a concert with his father. It was the first he had heard, and his mother was eager to learn how he liked it.

"Daddy thinks it was a good concert," she said. "The band played very well. What do you think, Johnny?"

"Oh it was pretty good," said the boy offhandedly. "They played well because they had to."

"What ever do you mean?" asked mother, mystified.

"Well, they had a man in front of them all the time threatening them with a stick," explained the boy.

* * * *

Visitor: "And how old are you, my little boy?"

Baby Boy: "I'm not old at all, I'm nearly new."

* * * *

Waiter (looking tired): "You say there is a feather in the soup, sir." "Yes, so there is." "Sorry, but I was charging you for clear soup, and it's evident you have chicken broth. That's another ninepence."

* * * *

Mother: "You appear to be eating jam again."

Charlie: "Don't go by appearances, mum, go by disappearances."

* * * *

Uncle: "Well, Percy, how are you getting on with the bugle I gave you for Christmas?"

Percy: "Fine, thanks, Uncle; it was the best present I had."

Uncle: "How was that?"

Percy: "Well, every time I play it, Daddy gives me twopence to stop!"

* * * *

THE OPEN DOOR

"Have you an opening for a man who is intelligent, bright, enterprising, and full of ideas?" breezily enquired a confident young man as he entered the managing director's room.

"Yes, I have," was the reply. "And please close it as you go out."

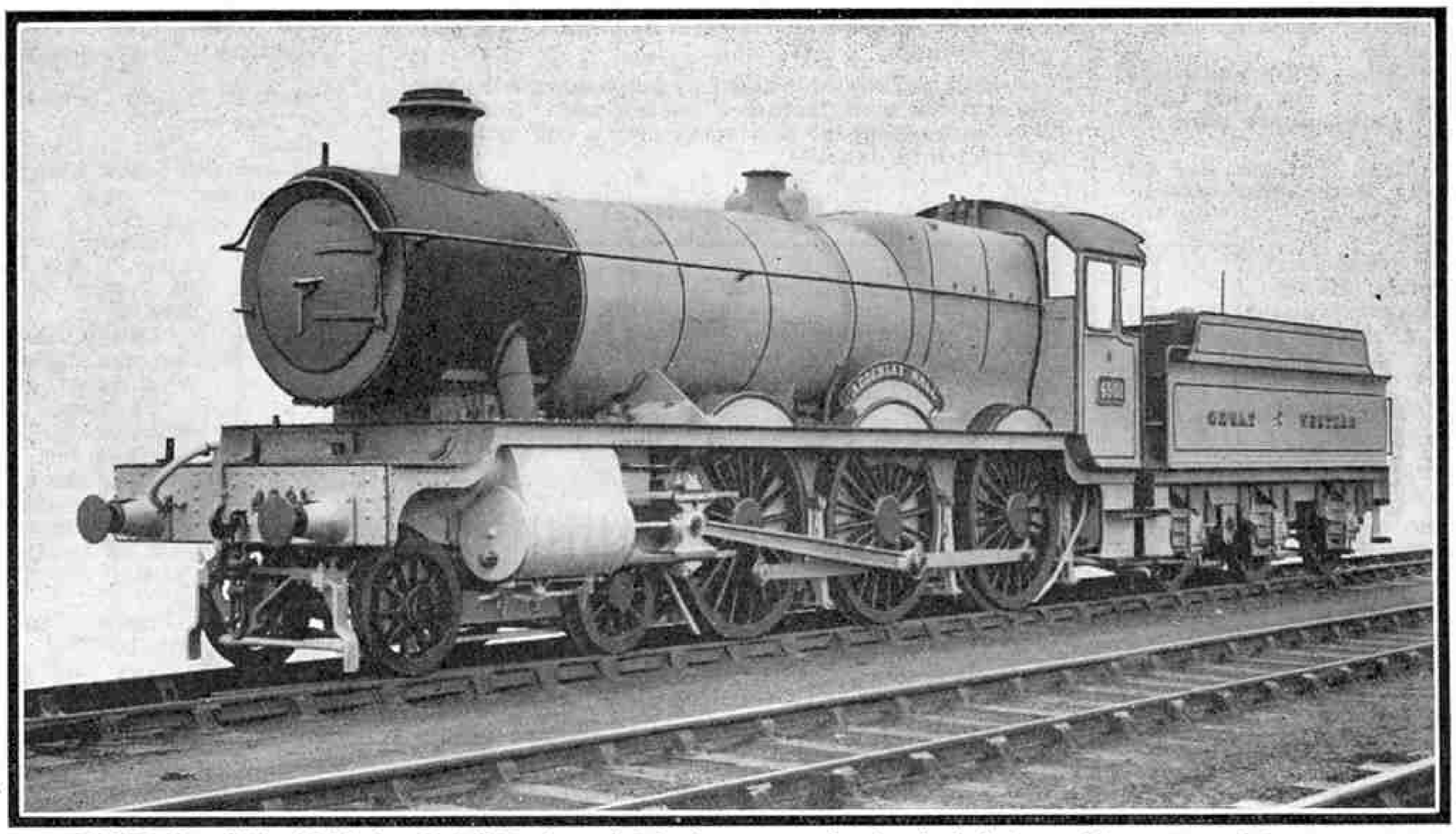
Westward Ho! to Cornwall—(*Cont. from p. 463*)

Carlyon Bay with a dashingly wild sea racing in. On the landward side the queer-looking white cones of the China clay workings, for which this district is famous, came into view.

Meanwhile the engine was going magnificently. The "Castles" are usually associated with the lightning speed of the "*Cheltenham Flyer*," but here was No. 5028 taking 375 tons unpiloted over a road as severe as any in the Highlands of Scotland. The exhaust was certainly awakening all the echoes around, and speed gradually fell to a minimum of 22 m.p.h. We passed St. Austell, 4½ miles from Par, in 11¼ minutes, a fine effort up such a bank. The summit is reached at Burngullow, where speed had recovered up the 1 in 115 grade to 35 m.p.h. From here on to Truro the line is a steeply graded switchback, yet we covered this 12 miles in 14¾ minutes; and our total time of 30¾ minutes for the 19 miles from Par to Truro showed a gain of 2¼ minutes on schedule.

At Truro our load was further lightened, to 335 tons, by the detaching of the Falmouth coach; but as at Par, a steep ascent is encountered almost immediately after starting. We attained 36 m.p.h. at Penwithers Junction, ½ mile out, and then tackled the 3¾ miles of continuous 1 in 80 to Chacewater. This was actually mounted without speed falling below 30 m.p.h.! Now the line runs through the heart of the tin-mining country, through Redruth and Camborne, the country where Richard Trevithick made his first locomotive, running it without rails on the highway. But the signs of industrialism are soon left behind, and we drew up at Gwinear Road, 15¼ miles from Truro, in 23½ minutes. The maximum speed on this section was 59 m.p.h. down the Camborne bank.

From Gwinear Road a branch line runs south to Helston, famous for the Cornish Floral dance, and from there a road motor service takes passengers to the Lizard. A brisk downhill run takes us through Hayle, where there is a picturesque sandy estuary on the north coast, and we reached St. Erth, five miles from Gwinear Road, in 7½ minutes.



G.W.R. No. 4901, "Adderley Hall." Engines of this class are used extensively between Plymouth and Penzance.

This is our last stop. The St. Ives through carriage is detached, leaving a load of 295 tons to go forward to Penzance. We are now in the Cornish Riviera indeed; all the gardens are a riot of flowers, and on the station palm trees are tossing bravely in the wind. Now for the last time comes the "right-away"; in a few minutes we have crossed from north to south coast, and we swing round thro gh Marazion on to the shores of Mount's Bay. One could not wish for a more exquisite scene at the end of a long journey. Flying clouds, the sea racing in, quaint fishing villages on the western shore; but it is the Mount itself, rising from the sea and crowned with its ancient castle, that makes this one of the most notable views in all England.

Little remains to tell. We ran briskly along above the shore past Ponsandane engine sheds—most of the Cornish services are worked by "Hall" class 4–6–0 engines, and several of these were raising steam outside—and reached Penzance nearly two minutes before time, a fitting conclusion to an excellent run. The 79¼ miles from Plymouth to Penzance had been run in 2 hours 18¼ minutes, inclusive of four stops, a performance of very great interest as showing that the "Castles" are just as efficient on heavy "collar work" as in high-speed running.

"Gold Rush" Days—(*Continued from page 461*)

Mr. MacGinitie reports the finding of more than 40 kinds of leaves, including figs, magnolias, palms, sycamores, and avocados. Of these none have lived down to the present in the region of You Bet, although palms and sycamores occur in warmer parts of California, and some of the others grow under cultivation. These hills are now occupied by pines and oaks, constituting a forest similar to that found in many of the temperate areas of the northern hemisphere.

The occurrence of trees in the fossil forest that are confined to warmer parts of the world at the present time suggests that the climate of central California has not always been as we know it. There is abundant evidence from the fossil plants here and in other parts of western America that the Pacific coast once had a climate similar to that of Mexico and Central America.

Nothing is known of the animal life at this time, but it may be supposed that mammals like those now occurring in the forests to the south may have lived here. It was long before the day of Man upon the Earth—certainly many tens of millions of years ago—that there lived in California the trees whose fossil remains are found in the auriferous gravels.

The fact of change is apparent in any study of history. Human history is now in a period of change; there is even a suggestion, in the resumption of gold mining in the You Bet region, that this change is cyclic in character, involving the return of conditions, after a gap of many years, that make profitable the washing of the gravels for gold.

Climatic changes may also occur in cycles. The present epoch of relatively cold climate may be followed by one in which the air is sufficiently warm and humid to permit the return of forest trees that lived in California long ago, and whose fossil remains, buried in the gold-bearing gravels, tell us of this early chapter of Earth history.

We are indebted to the courtesy of the Carnegie Institution of Washington for the information contained in this article.

Natives of Zululand—(*Continued from page 443*)

sweet voices. In their native environment the Zulus do not trouble much about clothing, a small beaded or hide apron being their sole apparel. The women share the universal love of their sex for ornaments, and in addition to bangles on their arms and just below their knees, they wear beads and bone around their neck. Their hair also receives much attention, and is twisted into a high top-knot held together by a skilful plastering of mud, or is screwed into innumerable hanging curls "set" with mud.

The chief occupation of the male Zulus is cattle rearing. All other work, including the cultivation of maize and other foodstuffs, is done by the women. The ripening of the maize crop is the occasion for an important Zulu festival appropriately called the Feast of the First Fruits.

A Zulu village or kraal looks rather like a group of giant mushrooms, as the native huts are large dome-shaped structures. The huts are constructed of a framework of saplings or long branches set firmly in the ground and arched over to form hoops, with the highest point at the centre of the hut. Long twigs or plaited grasses are interlaced horizontally with the saplings, and the whole is then thickly covered with grasses tied in place by ropes of vegetable fibre. The huts are rain-proof and wind-proof, and the only aperture is an arched entrance, which is so low that the occupants have to pass through it on their hands and knees. It is screened on the outside by a tall curved palisade. Inside the huts are lofty and spacious, and are furnished with a few low stools, one or two skins and perhaps some matting. The cooking utensils are simple, and consist chiefly of tripod iron pots and earthenware jars.

A Useful Catalogue for Model Engineers

Bond's O'Euston Road are well known to all miniature railway enthusiasts, model engineers and boat builders, who will find the 1935 edition of their catalogue invaluable. This is the largest yet produced by the firm, and contains 176 pages giving full details, with illustrations, of their extensive range of rolling stock and other railway material, including a wide selection of parts and fittings for use by constructors, together with details of model boats and aeroplanes, electric fittings, and tools and materials for the constructor and model engineer.

Many new items are included, such as motors for operating points, steam fittings, additional constructional materials, and an extended range of the working drawings for which this firm is famous. Additions have been made also to the petrol engines available. Those who are interested in ships will find attractions in the new kits of parts for building models of H.M.S. "*Victory*," "*The Golden Hind*," and other famous old sailing vessels; and there is a complete new range of ships' fittings, including propellers with either two or three blades.

Everything required for constructional hobbies of all kinds indeed is to be found in the catalogue, and reference to any item is made easy by the inclusion of a very full index. The price of the catalogue is 6d. post free, and it can be obtained from Bond's O'Euston Road Ltd., 254, Euston Road, London, N.W.1.

Kite Flying—A Fascinating Hobby

Kite flying is no longer the haphazard occupation for small boys that it was a few years ago; it has, indeed, become a fascinating branch of model aviation. A modern kite, scientifically designed and constructed, is under complete control during its flight, and can be made to loop, roll or fly like a real aeroplane. A tiny model of an airman can even be made to float downward from it in a miniature parachute. The Vidor Kiteplane, which performs all these evolutions, is claimed to be the most perfect toy of the air. Flying it certainly is great fun, and any reader who is interested can obtain full details free of charge on writing to Vidor Ltd., Erith, Kent, and mentioning the "*M.M.*"

March "Dog" Contest

Most of our readers, including those who did not take part in the actual contest, will be interested to see the solution to the March Dog Contest, the Overseas result of which is published on the Competition Page this month.

The dogs featured in the competition were as follows: Top row, reading from left to right: Cocker Spaniel; Wire Haired Fox Terrier; Alsatian; Smooth Coated Fox Terrier; English Springer Spaniel. Second row: Bedlington Terrier; Irish Setter; Scotch Terrier; Foxhound. Third row: Pointer; Dandy Dinmont Terrier; Irish Terrier; West Highland White Terrier; Golden Retriever. Bottom row: Labrador Retriever; Sealyham Terrier; Cairn Terrier; Airedale Terrier; Clumber Spaniel.

Model Gliders Free for "M.M." Readers

A realistic glider that flies, banks and loops is now being distributed by Quaker Oats Ltd., from whom it can be obtained free. All that is necessary to secure one is to write to Quaker Oats Ltd., 11, Finsbury Square, London, E.C.2, giving your name and address and mentioning the "*Meccano Magazine*," and enclosing two tops from packets of Puffed Wheat or Puffed Rice. It is great fun to arrange races or contests between two or more gliders, and any reader who would like to have more than one glider, or to obtain gliders for his friends, can do so by forwarding two packet tops for each glider required.

"Great Ship Builders"

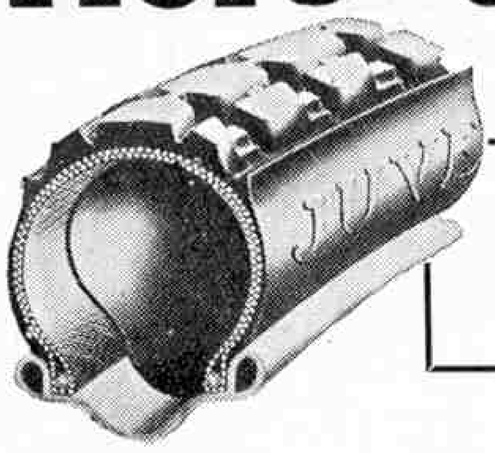
By J. Gordon Peirson
(Arthur H. Stockwell Ltd. 1/6 net)

There is romance in the history of most of our great shipbuilding firms, and particularly so in that of Harland and Wolff Ltd., of Belfast, a company with which some of our greatest shipbuilders and ship authorities have been associated. This interesting handbook gives a detailed account of the early history of this famous concern and shows how by enterprise and initiative it has attained its present eminent position.

Mr., later Sir E. J., Harland, was only 28 when, in 1859, he purchased the shipbuilding business of Robert Hickson and Company, Belfast, and founded the firm that bears his name. Later he took into partnership his chief draughtsman, J. W. Wolff, and changed the title of the firm to Harland and Wolff. Then William James Pirrie, afterward Lord Pirrie, who in less than 12 years' service with the company had become a brilliant designer, was received into partnership, and although his name does not appear in its title he became the controlling mind of the company.

The author gives interesting details of many of the early sailing ships and steamships built at the Belfast yard, and refers also to some of the notable vessels built there in more recent times. The handbook is illustrated with numerous excellent half-tone plates.

Here are 3 great tyres for boys' cycles



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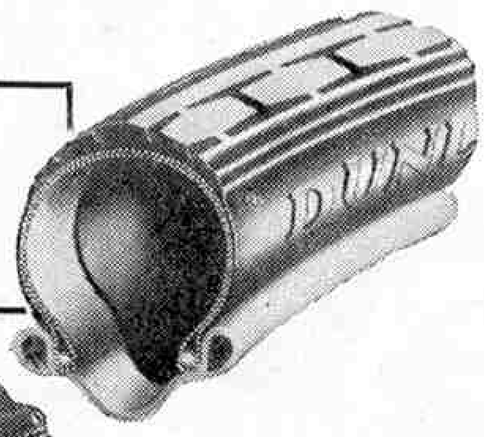

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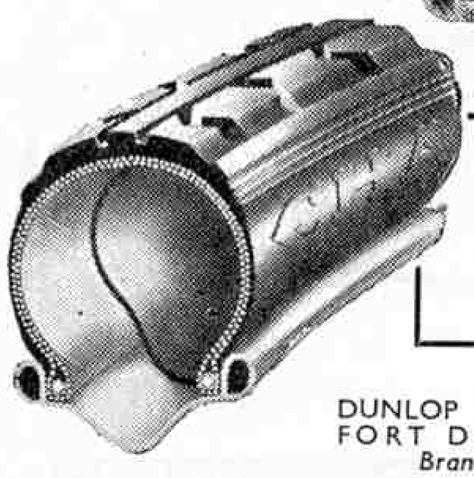

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have designed and made these tyres to meet every possible need. The Juvenile and Champion Juvenile are for general touring and the Sports Juvenile is made specially for fast road work.

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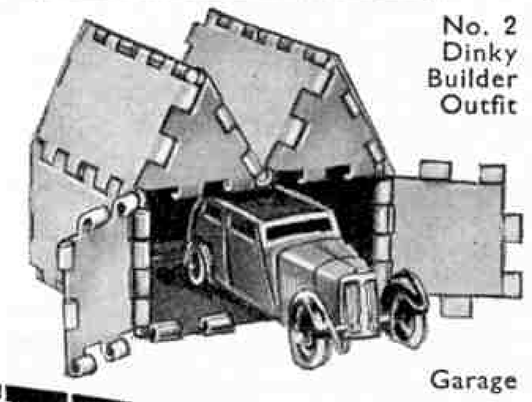
This Outfit contains a good selection of parts with which a large number of models can be made. The beautifully coloured instruction leaflet included illustrates a total of 44 that any boy or girl can build. Price **5/-**



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No. 2 DINKY BUILDER OUTFIT

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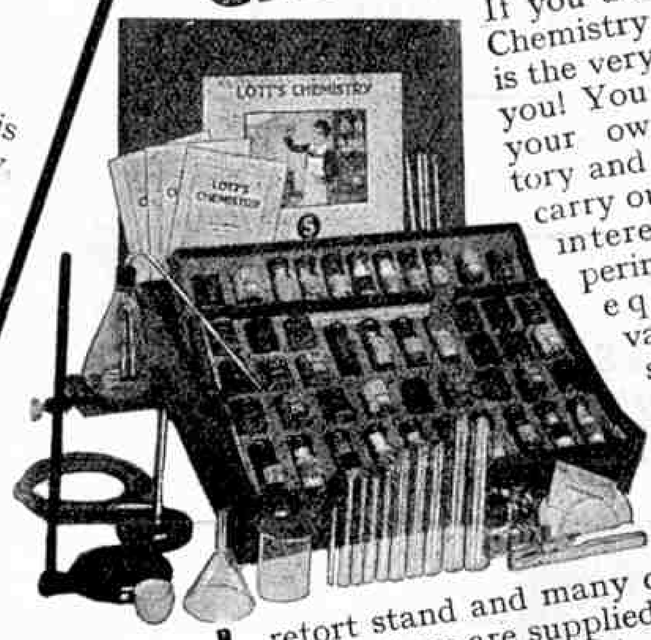

If you are keen on Chemistry, this set is the very thing for you! You will have your own laboratory and be able to carry out scores of interesting experiments. The equipment varies with the size of the set, and includes test tubes, crucibles, Bunsen burner, retort stand and many chemicals. Full instructions are supplied with each set.

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Actual Photograph of Bristol "Bulldog." Wing Span 17 ins.

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Making scale model aircraft is an engrossing hobby. Aeromodel Kits have been specially designed to enable YOU to build Perfect Detailed Scale Models of Exhibition Standard without special tools or skill. Aeromodels are "Built Up" with double surfaced correctly cambered wings on spars and ribs, and cabin types have opening doors, transparent windows and interior seats.

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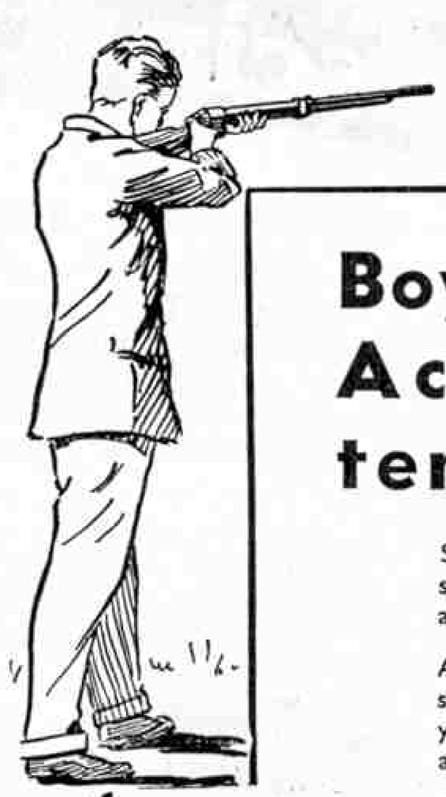

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Shot after shot squarely in the "bull"—that's the shooting you will enjoy after a little practice with a B.S.A. Air Rifle.

As a change from the fixed target you can try your skill in the garden killing rats and other pests. Or you can test your marksmanship on a swinging tin, at say twenty yards.

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See B.S.A. Air Rifles and Accessories at your local dealer's, or complete the coupon below and post to-day for the B.S.A. Air Rifle leaflet to B.S.A. Guns Ltd., 92, Armoury Road, Birmingham, 11.

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HAVE YOU TRIED MODEL-GLIDING ... THE LATEST SPORT?

start with this splendid newest-type glider . . .

it's FREE!

It measures 14 ins. from wing-tip to wing-tip.

Send in PUFFED WHEAT or PUFFED RICE packet tops and get it by return!

Here's a wonderful chance to start model-gliding with a realistic model that will do all kinds of stunts exactly like an aeroplane—straight flying, banking, *yes, and even looping!* It looks just like real, is solidly made of wood, not cardboard, and has a specially powerful sling motor.

And you get it—by return of post—simply by sending in two packet tops from Puffed Wheat or Puffed Rice!

Next best to flying the glider you'll enjoy eating what's *in* the packets! Just get Mother to serve them for breakfast (they're ready-to-eat) you'll find them the nicest breakfast you've ever had the luck to strike!

Mother can get them at any grocer's. They're the famous "foods shot from guns," and that's what gives them their particular, irresistible freshness and crispness!

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I enclose two packet tops from Puffed Wheat *or* Puffed Rice or one from each. Please send me the Special Quaker Glider with full particulars on assembly and flying.

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(This offer applies in the United Kingdom only.)

P90C

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

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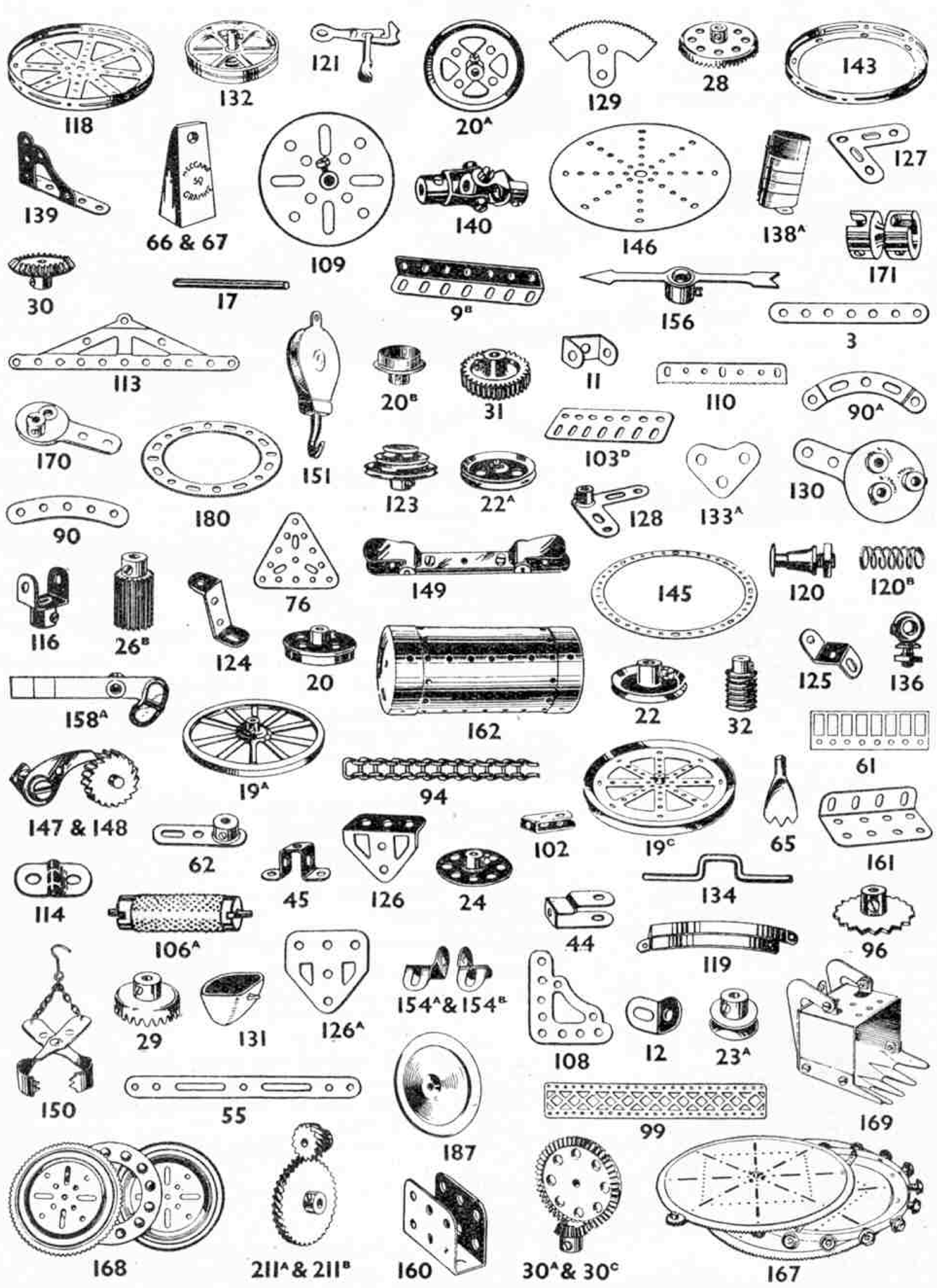

Prices of Parts Illustrated

No.			s.	d.
3	Perforated Strips, 3½" ...	½ doz.	0	4
9b	Angle Girders, 3½" ...	„	0	8
11	Double Brackets	doz.	0	6
12	Angle Brackets, ½" × ½" ...	„	0	3
17	Axle Rods, 2"	3 for	0	1
19a	Wheels, 3" diam. ...	each	0	6
20	Flanged Wheels, 1¼" diam.	„	0	5
20b	„ „ ¾" „	„	0	3
	Pulley Wheels			
19c	6" diam., with centre boss and set screw... ...	„	1	9
20a	2" diam., with centre boss and set screw... ...	„	0	4
22	1" diam., with centre boss and set screw... ...	„	0	3
23a	½" diam., with centre boss and grub screw ...	„	0	3
22a	1" diam., without centre boss and grub screw...	„	0	2
24	Bush Wheels	„	0	4
26b	Pinion Wheels, ½" diam., ¾" face...	„	0	6
28	Contrate Wheels, 1¼" diam.	„	0	9
29	„ „ ¾" „	„	0	6
30	Bevel Gears, ¾", 26 teeth	„	0	7
*30a	„ „ ½", 16 „	„	0	6
*30c	„ „ 1½", 48 „	„	1	6
31	Gear Wheels, 1", 38 teeth	„	0	10
32	Worms	„	0	4
44	Cranked Bent Strips ...	„	0	1
45	Double „ „ ...	„	0	1
55	Perforated Strips, slotted, 5½" long	doz.	1	6
61	Windmill Sails	4 for	0	6
62	Cranks	each	0	3
65	Centre Forks	„	0	1
66	Weights, 50 grammes ...	„	0	9
67	„ 25 „ ...	„	0	6
76	Triangular Plates, 2½" ...	„	0	2
90	2½" Curved Strips, 2⅜" rad.	„	0	1
90a	2½" „ „ cranked, 1⅜" rad.	„	0	1
94	Sprocket Chain, per 40" length		0	6
96	„ Wheels, 1" diam. each		0	3
99	Braced Girders, 12½" long	½ doz.	2	6
102	Single Bent Strips ...	each	0	1
103d	Flat Girders, 3½" long ...	½ doz.	0	7
106a	Sand Rollers	each	1	9
108	Architraves	doz.	1	6
109	Face Plates, 2½" diam. ...	each	0	4
110	Rack Strips, 3½"	„	0	2
113	Girder Frames	„	0	3
114	Hinges	pair	0	4
116	Fork Pieces, Large ...	each	0	3
118	Hub Discs, 5½"	„	1	3
119	Channel Segments ...	„	0	4
120	Buffers	„	0	2
120b	Compression Springs ...	„	0	1
121	Train Couplings	„	0	1
123	Cone Pulley	„	1	3
124	Reversed Angle Brackets, 1"	½ doz.	0	4
125	Reversed Angle Brackets, ½"	„	0	3
126	Trunnions...	pair	0	3
126a	Flat Trunnions	each	0	1
127	Simple Bell Cranks ...	„	0	1
128	Boss Bell Cranks... ...	„	0	3
129	Rack Segments, 3" diam.	„	0	5
130	Eccentrics, Triple throw	„	1	0
131	Dredger Buckets... ...	½ doz.	1	0
132	Flywheels, 2¾" diam. ...	each	2	0
133a	Corner Brackets, 1" ...	„	0	1
134	Crank Shafts, 1" stroke ...	„	0	2
136	Handrail Supports ...	„	0	3
†138a-z	Ships' Funnels, Raked ...	„	0	9
139	Flanged Brackets (right)	„	0	2
140	Universal Couplings ...	„	0	10
143	Circular Girders, 5½ diam.	„	1	0
145	Circular Strips, 7½" diam.	„	0	9
146	Circular Plates, 6" diam.	„	1	0
147	Pawls	„	0	3
148	Ratchet Wheels	„	0	6
149	Collecting Shoes	„	1	3
150	Crane Grabs	„	0	7
151	Pulley Blocks, Single Sheave	„	0	8
154a	Corner Angle Brackets, ½" (right hand) ...	½ doz.	0	6
154b	Corner Angle Brackets, ½" (left hand)... ...	„	0	6
156	Pointers, 2½" over all ...	each	0	4
158a	Signal Arms, Home ...	„	0	5
160	Channel Bearings, 1½" × 1" × ½"...	„	0	2
161	Girder Brackets, 2" × 1" × ½"	2 for	0	3
162	Boiler, Complete ...	each	1	0
167	Geared Roller Bearings ...	„	20	0
168	Ball Bearing, 4" diam. ...	„	3	0
169	Digger Buckets	„	1	6
170	Eccentrics, ½" throw ...	„	0	9
171	Socket Couplings ...	„	0	9
180	Toothed Gear Rings, 3½" diam. 133 teeth external, 95 teeth internal...	„	2	0
187	Road Wheels	„	0	6
*211a	Helical Gear, ½" ...	„	0	9
*211b	„ „ 1½" ...	„	2	0

**Can only be used together.*

†The series includes 26 different Funnels.

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First of all, study carefully the latest Hornby Train Catalogue, and select from it the new up-to-date Hornby Locomotive you want. Then pack up your old Hornby Locomotive and send it to us addressed "Special Service Department," Meccano Ltd., Binns Rd., Liverpool 13. Your order for the new Locomotive and the necessary remittance should be enclosed. You can easily ascertain how much to send by deducting the part exchange allowance indicated in the list given below from the price of the new Locomotive, and adding 1/– for postage on the new model you purchase. It is important to note that the catalogue price of the new Hornby Locomotive you purchase **must not be less than double the Part Exchange allowance made for your old Locomotive.**

If you prefer to do so, you can effect the exchange through your dealer, who will be very pleased to give you any information you require.

Part Exchange allowances for Hornby Locomotives

CLOCKWORK MODELS	
M2930 Locomotive	1/–
MO Locomotive	1/4
M1/2 Locomotive	2/3
*George V Locomotive	3/3
*No. OO Locomotive	3/3
M3 Tank Locomotive	3/9
M3 Locomotive	4/3
Zulu Locomotive	5/3
No. O Locomotive	5/3
Zulu Tank Locomotive	6/3
No. 1 Tank Locomotive	6/3
No. 1 Locomotive	6/3
LEC 1 Locomotive (Swiss Type)	6/3
No. 1 Locomotive, fitted for Hornby Control	7/6
No. 1 Tank Locomotive, fitted for Hornby Control	7/6
No. 1 Special Locomotive	8/3
No. 1 Special Tank Locomotive	8/3
No. 2 Locomotive	10/–
No. 2 Tank Locomotive	10/6
No. 2 Special Tank Locomotive	10/6
Metropolitan C Locomotive	10/6
No. 2 Special Locomotive	11/3
No. 2 Locomotive, fitted for Hornby Control	11/3
No. 2 Tank Locomotive, fitted for Hornby Control	11/9
No. 3C Locomotive	12/–
No. 3C Riviera "Blue" Locomotive	12/–

*These models were identical.

ELECTRIC MODELS	
EM16 or EM120 Locomotive	4/3
No. 1 Electric Tank Locomotive, Permanent Magnet	7/6
EM36 or EM320 Tank Locomotive	8/3
LST M3/20 Tank Loco (20 volt)	8/3
E06 or E020 Locomotive	11/–
E16 or E120 Locomotive	12/–
E16 or E120 Tank Locomotive	12/–
LST 1/20 Tank Locomotive (20-volt)	12/–
LE 1/20 Loco (Swiss Type), 20-volt	12/6
LST 2/20 Tank Locomotive	12/6
E3/20 Locomotive	12/6
E3/20 Riviera Locomotive	12/6
LE 120 Locomotive	12/6
EPM16 Special Tank Locomotive	13/9
Metropolitan L.V. Locomotive	15/–
E26 Special Tank Locomotive	15/–
E36 Metropolitan Locomotive	15/–
E120 Special Locomotive (automatic reverse)	15/–
No. 2 Electric Tank Locomotive	15/–
E120 Special Tank Locomotive (automatic reverse)	15/–
E36 Locomotive	16/3
E36 Riviera "Blue" Locomotive	16/3
E220 Special Tank Locomotive (automatic reverse)	16/3
LE2/20 Locomotive	16/6
LE220 Locomotive (automatic reverse)	16/6
E320 Locomotive (automatic reverse)	17/6
E320 Riviera Locomotive (automatic reverse)	17/6
E220 Special Locomotive (automatic reverse)	18/9
Metropolitan H.V. Locomotive	20/–

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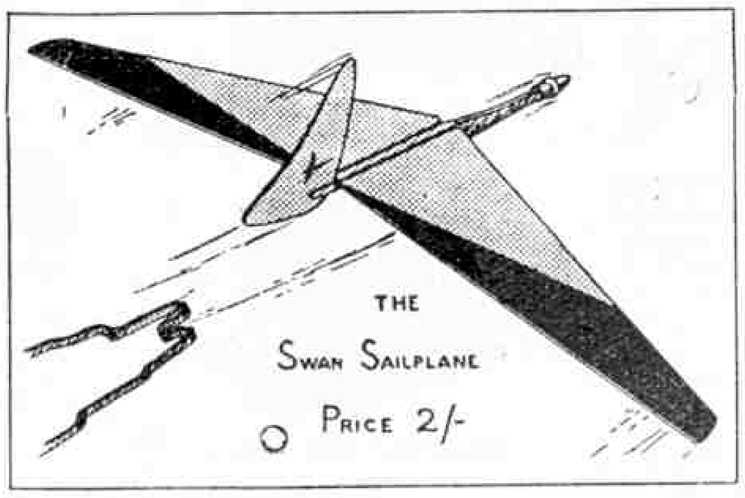
The SWAN SAILPLANE



A GLIDER that BANKS! ROLLS! LOOPS!

CLIMBING TURNS

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See "THE SKYBIRD" Magazine, August issue, for Swan Sailplane modifications.

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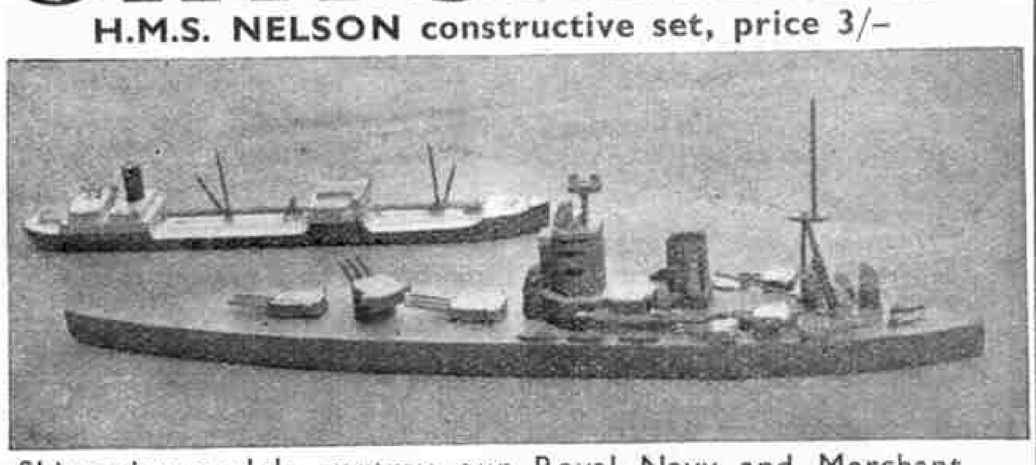

Shipseries models portray our Royal Navy and Merchant Shipping. Our scale model Docks, Cliffs and Accessories lend great realism to these models.

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HORNBY SERIES

HORNBY ACCESSORIES

GAUGE O

There is a splendid range of Railway Accessories in the Hornby Series, built in perfect proportion and beautifully finished. With these realistic accessories the most elaborate model railway may be constructed and operated in exactly the same manner as a real railway. A selection of Hornby Accessories is shown on this page. Ask your dealer to show you the full range.

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Price **3/11**

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The components of the M Station Set may be purchased separately.
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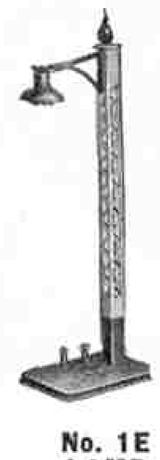

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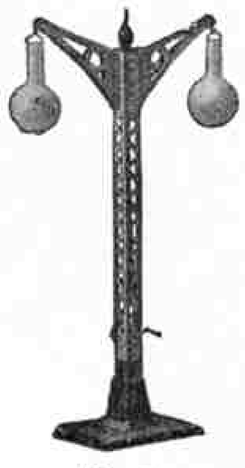

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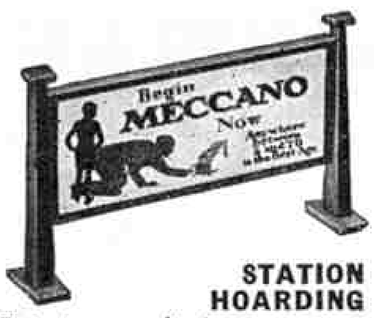
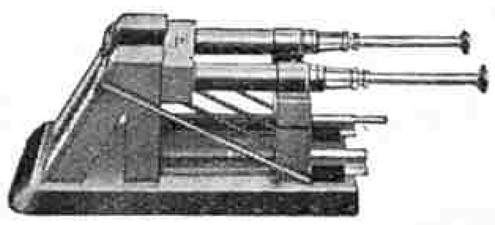
(Double.)
Price **4/3**

No. 2 LAMP STANDARD
(Double, as illustrated.)
Price **4/6**



STATION HOARDING
This is a realistic accessory, suitable for the station platform. Brightly coloured.
Price **6**d.

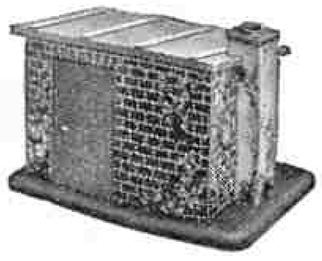


No. 2 BUFFER STOPS
(Hydraulic type.) Price **5/6**

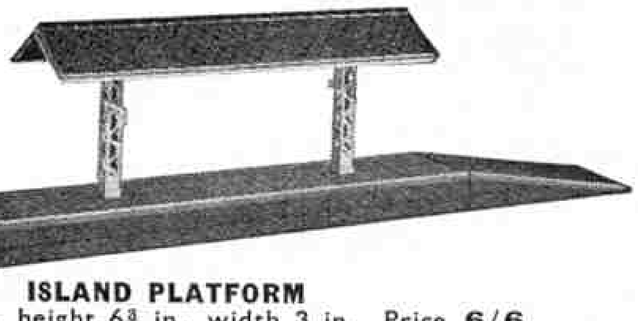
LOADING GAUGE
(Illustrated.)
Price **2/3**
M LOADING GAUGE
Price **1/-**

TUNNEL (Metal)
Price **3/11**

POSTERS IN MINIATURE
These Posters are beautifully printed in full colours.
No. 1 Series. Packet of 51 Price **6**d.
No. 2 Series. Packet of 51 ,, **6**d.



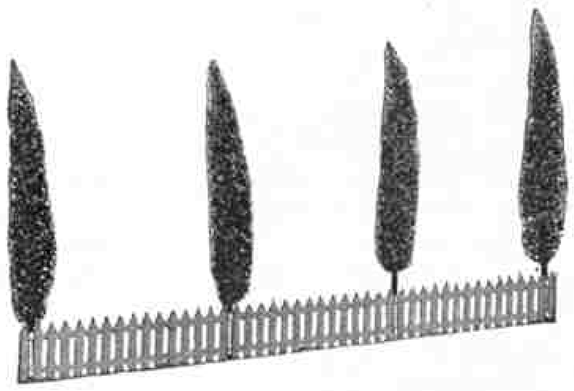
PLATELAYER'S HUT
Price **1/-**



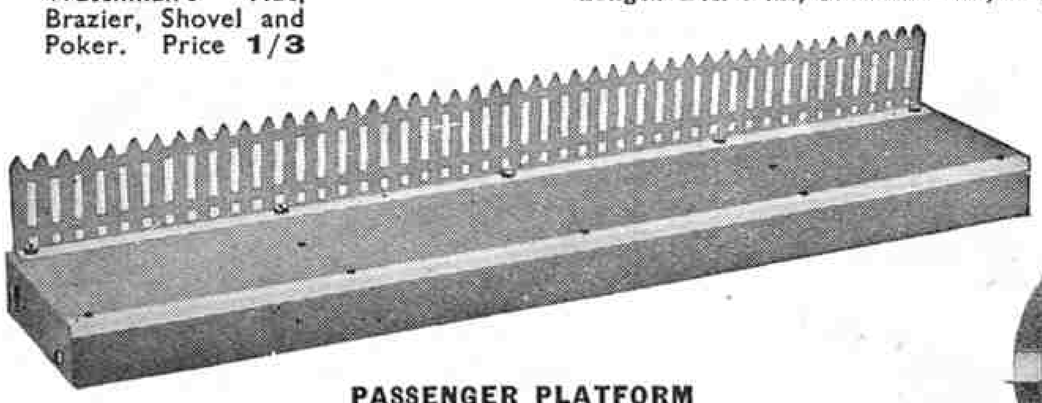
ISLAND PLATFORM
Length 32¼ in., height 6¾ in., width 3 in. Price **6/6**
The ramps may be purchased separately. Price, per pair, **1/9**

No. 7 RAILWAY ACCESSORIES
Watchman's Hut, Brazier, Shovel and Poker. Price **1/3**

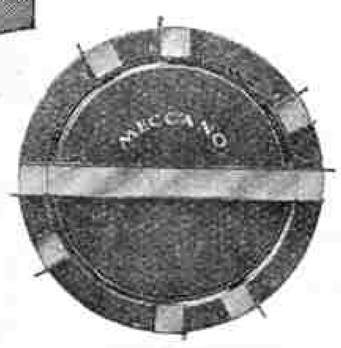
No. 2 STATION
Excellent model, beautifully designed. Built up in three detachable sections.
Length 2 ft. 9 in., breadth 6 in., height 7 in. Price **9/6**



FENCING WITH FOUR TREES
Length 16½ in. The miniature trees are detachable. Price, per pair, **2/6**



PASSENGER PLATFORM
Length 16¾ in., width 3 in. This Platform may be connected to the main Station or used separately ... ... Price **2/6**
The white Paled Fencing may be purchased separately. Price per length **6**d.

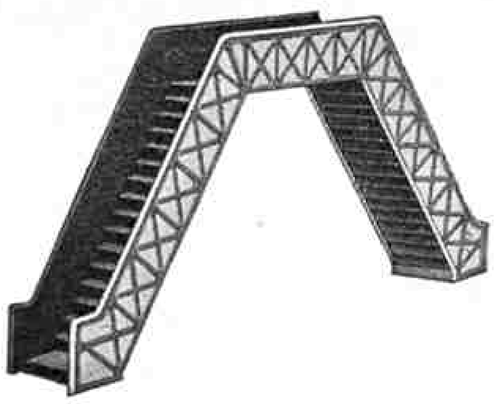


No. 2 TURNTABLE
Price **3/9**

LUBRICATING OIL
Specially prepared for Hornby Trains, Rolling Stock and Accessories.
Price, per bottle, **6**d.

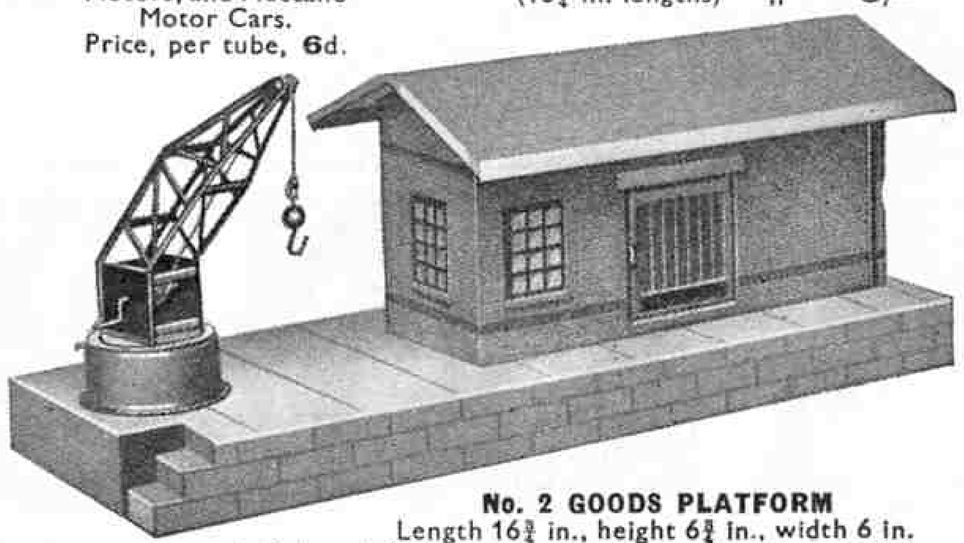
GRAPHITE GREASE
An ideal lubricant for the springs of Hornby Locomotives and Hornby Speed Boats, Meccano and Aero Clockwork Motors, and Meccano Motor Cars.
Price, per tube, **6**d.

TREES
Trees with Stands, assorted per doz. **3/-**
Trees, Oak ... ,, **2/6**
Trees, Poplar ... ,, **2/-**
Stands for Trees ,, **1/-**
Hedging on Base (10½ in. lengths) ,, **3/-**



M SERIES FOOTBRIDGE
This strongly-built Footbridge is made to span a single track. Price **1/3**

No. 1 GOODS PLATFORM
Length 13 in., height 6¾ in., width 6 in. Price **7/6**



No. 2 GOODS PLATFORM
Length 16¾ in., height 6¾ in., width 6 in.
The crane at the end of the platform revolves on its base. Price **12/6**

MECCANO LIMITED — BINNS ROAD — LIVERPOOL 13

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HORNBY ROLLING STOCK

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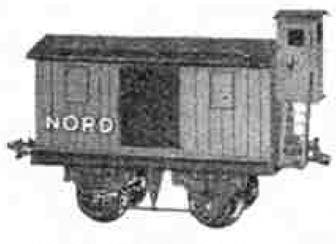
Now is the time to add to your Hornby Railway. Every boy knows that a real railway system is constantly expanding and developing. New rolling stock and new equipment are added; new tracks are laid; new stations, signal cabins and goods sheds are built; new tunnels and viaducts are constructed—every effort is made to cater for modern requirements. Your Hornby railway, too, can be run in the same progressive manner. One by one you can add Coaches, Trucks, Wagons and Vans of the latest types; and Stations, Signals, Bridges, Turntables and Engine Sheds that will gradually convert your present Hornby railway into a really fine model railway system.

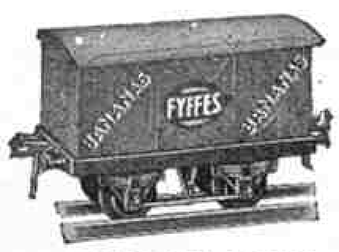
Ask your dealer to show you the full range of Hornby Rolling Stock and Accessories.

OIL TANK WAGON "MOBILOIL"
Finished in battleship grey. Price **2/–**

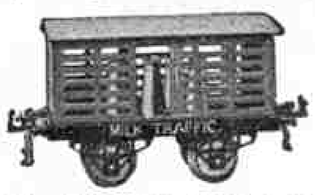
PETROL TANK WAGON "B.P."
Finished in yellow. Price **2/–**



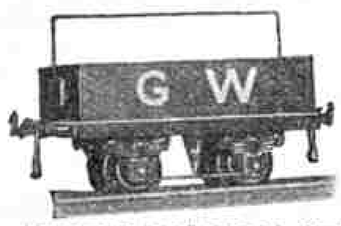
BRAKE VAN (French Type)
Lettered "Nord." Beautifully finished in colours. Opening doors. Price **4/–**



BANANA VAN
An attractive model, finished in yellow and green. Price **2/9**

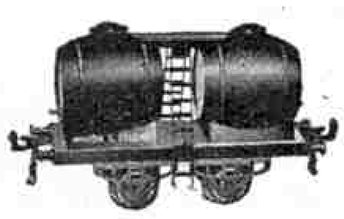


No. 1 MILK TRAFFIC VAN
Fitted with sliding doors. Complete with milk cans. Price **2/11**



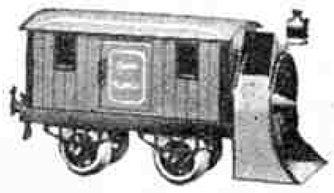
***OPEN WAGON "B"**
Similar to Hornby Wagon No. 1 but fitted with centre tarpaulin supporting rail. Price **2/–**

SIDE TIPPING WAGON
Excellent design and finish. Lettered "Robert Hudson Ltd." Price **2/–**



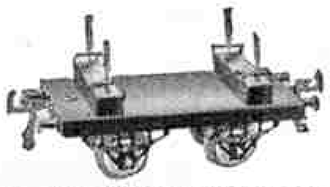
WINE WAGON DOUBLE BARREL
An attractive model artistically enamelled in red and green. Price **4/6**

No. 1 TIMBER WAGON
Beautifully enamelled in yellow and red. Price **1/6**



SNOW PLOUGH
With revolving plough driven from front axle. Price **3/9**

***GUNPOWDER VAN**
Finished in red. With opening doors. Price **2/9**



No. 1 LUMBER WAGON
Fitted with bolsters and stanchions for log transport. Price **1/6**

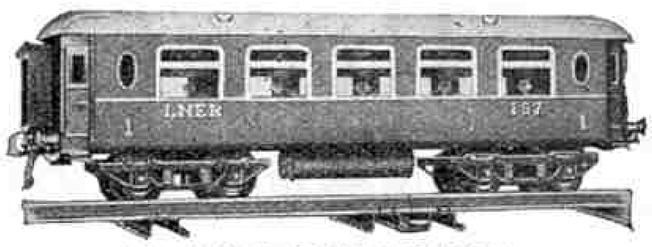
BITUMEN TANK WAGON "COLAS"
Finished in blue. Price **3/6**

No. O MITROPA COACH
Finished in red with white roof. Lettered "Mitropa," with either "Spiesewagen" or "Schlafwagen" in gold. Price **1/6**

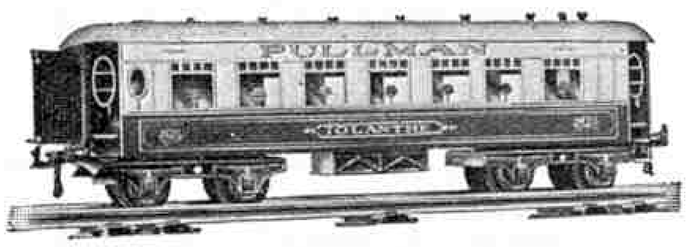
No. O MILK TRAFFIC VAN
An attractive model. Available lettered G.W. only. Price **1/11**

COAL WAGON
This is similar to Hornby Wagon No. 1. It is fitted with embossed representation of coal. Price **2/3**

No. 3 MITROPA COACH
Lettered "Mitropa," with either "Speisewagen" or "Schlafwagen" in gold. Beautifully finished in red enamel with white roof. Price **12/6**

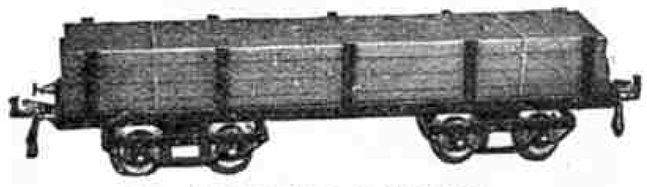


No. 2 SALOON COACH
Realistic in design and beautifully finished. Two types are available: L.N.E.R. (as illustrated) enamelled brown, and L.M.S. enamelled maroon. Suitable for 2-ft. radius rails only. Price **9/6**

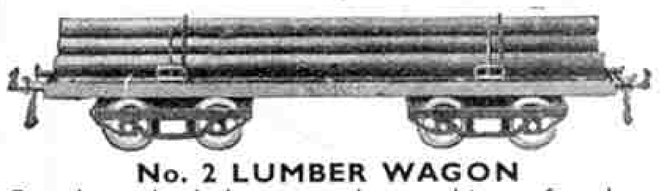


HORNBY No. 2 SPECIAL PULLMAN COACH
As supplied with No. 2 Special and No. 3 Pullman Train Sets. This splendid coach is perfect in detail and finish. Suitable for 2-ft. radius rails only. Price **13/–**

TROLLEY WAGON
Finished in brown and blue. Suitable for 2-ft. radius rails only. Price **3/11**



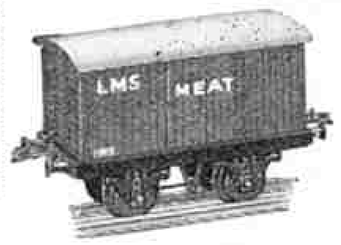
No. 2 TIMBER WAGON
Beautifully enamelled in green and red. Suitable for 2-ft. radius rails only. Price **2/6**



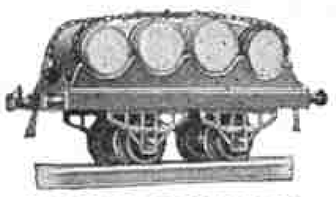
No. 2 LUMBER WAGON
Fitted with bolsters and stanchions for log transport. Suitable for 2-ft. radius rails only. Price **2/11**

In L.M.S., L.N.E.R., G.W. or S.R. lettering.

PETROL TANK WAGON "SHELL"
Finished in red. Price **2/–**

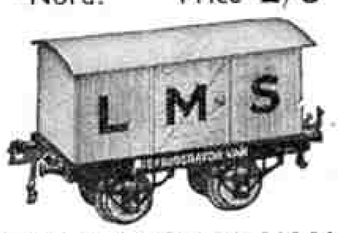


MEAT VAN
This is a very realistic model. Available lettered L.M.S. only. Price **1/11**

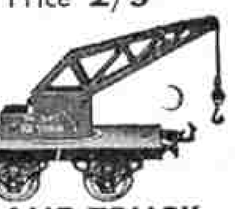


BARREL WAGON
This is another interesting model of a type of wagon used in France and other European countries. Price **2/6**

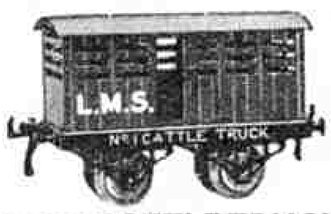
COVERED WAGON (French Type)
This wagon is fitted with frame and sheet. French type lettered "Nord." Price **2/6**



***REFRIGERATOR VAN**
Beautifully enamelled. Fitted with opening doors. Price **2/9**



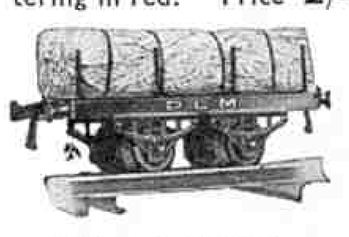
CRANE TRUCK
Finished in brown and blue. Price **2/11**



***No. 1 CATTLE TRUCK**
Fitted with sliding doors. Very realistic design. Price **2/9**

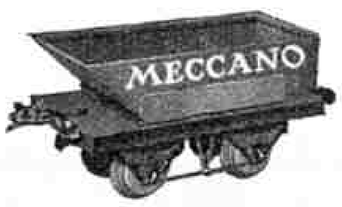
FISH VAN
This is a distinctive model. Available lettered N.E. only. Price **1/11**

OIL TANK WAGON "CASTROL"
An attractive model. Enamelled green with lettering in red. Price **2/–**

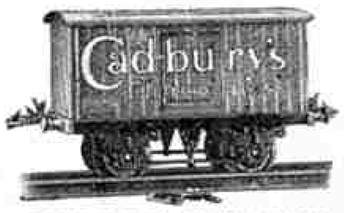


FIBRE WAGON
This is an interesting model of a type of wagon used in France and other European countries. Price **1/3**

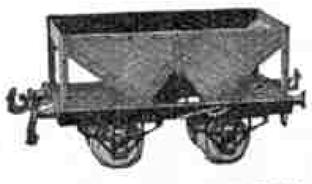
GAS CYLINDER WAGON
Finished in red, lettered gold. Price **1/11**



No. 1 ROTARY TIPPING WAGON
Finished in orange. Price **2/6**

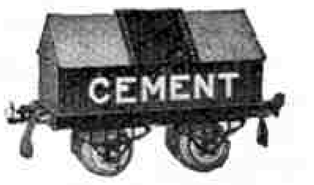


CHOCOLATE VAN "CADBURY'S"
This van is beautifully enamelled in blue with orange roof. Price **2/9**



***HOPPER WAGON**
Mechanically unloaded. Finished in green. Price **3/6**

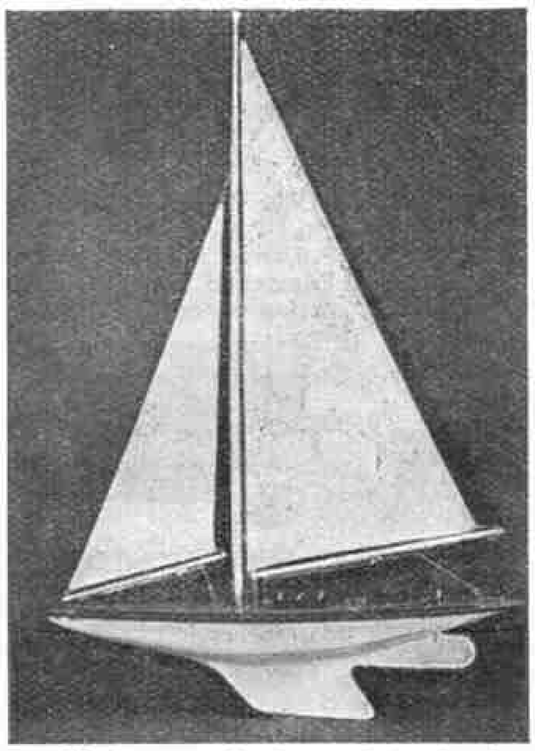
MILK TANK WAGON "UNITED DAIRIES"
A very realistic model, finished in blue and white. Price **4/6**



CEMENT WAGON
The door at the top opens. Finished in bright red. Price **2/6**

Manufactured by **MECCANO LIMITED, BINNS ROAD, LIVERPOOL 13**

BOND'S
THE "ENDEAVOUR" YACHT



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

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17" Yacht with automatic rudder ...	... 11/-
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27" Yacht with Braine type steering ...	... 37/6
36" Yacht with Braine type steering ...	... 69/-

Carriage extra.

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complete with Buzzer, Flying String Tail and illustrated instructions.

KITES (Folding)	18"	30"	36"
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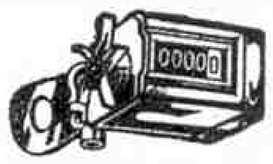

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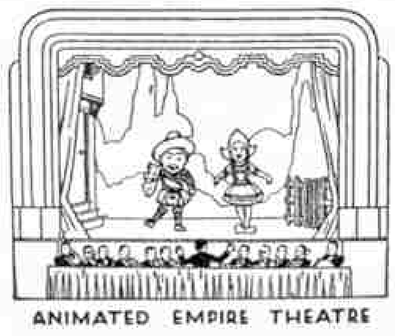

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1 Flask, flat bottom, 150 c.c.; 1 Beaker, spouted, 100 c.c.; 3 Test Tubes, 4 in. x ⅝ in.; 1 Thistle Funnel, 20 cm.; 3 ft. Glass Tubing; 1 Rubber Cork, 2 holes; 4 inches Rubber Connection Tubing; 1 Glass Stirring Rod. **2/6** Post Free

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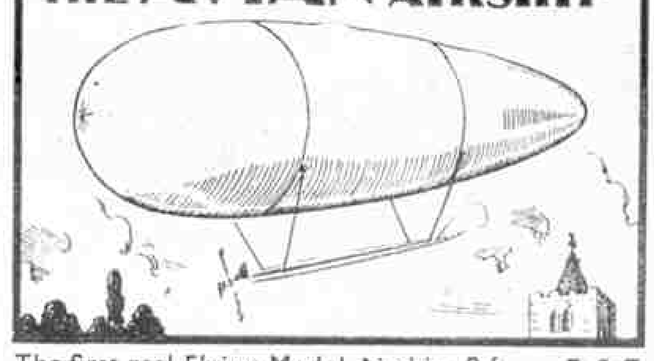

The first real Flying Model Airship. 3 ft. long; 12 in. dia. inflated. Self-lifting. Elastic Motor propulsion. Controllable for flying height and direction. **4/6** *Post 6d. extra*

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CASTING MOULDS for Soldiers, Cowboys, etc. Catalogue free.—Industries, 13, Gordon Ave., Twickenham.

5,000–6,000 Good Clean Cigarette Cards (many sets and about 1,000 transfers). The lot 20/-. Write—Box 2165, Scripps's, South Molton St., London, W.1.

WEBLEY AIR PISTOLS

Marvellously accurate for target practice.
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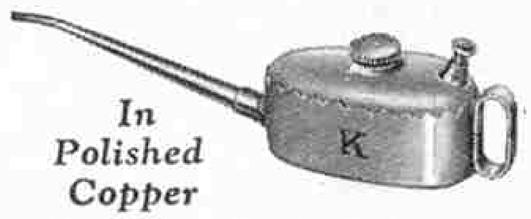
Senior 45/-, Mark 1 30/-, Junior 20/-,
Write for List. WEBLEY & SCOTT LTD., 87, WEAMAN STREET, BIRMINGHAM, ENG.

"MECCANO MAGAZINE" BINDERS

There is no better way of keeping your Magazines clean and tidy than by binding them in one of the special binders we supply.

These binders have strong stiff backs, covered with black imitation leather, tastefully tooled, and are lettered in gold. The large binder holds 12 Magazines—price 3/6 post free. The small binder holds 6 Magazines—price 2/6 post free. Meccano Ltd., Binns Road, Liverpool 13.

OIL CAN No. 2 ("K" Type)



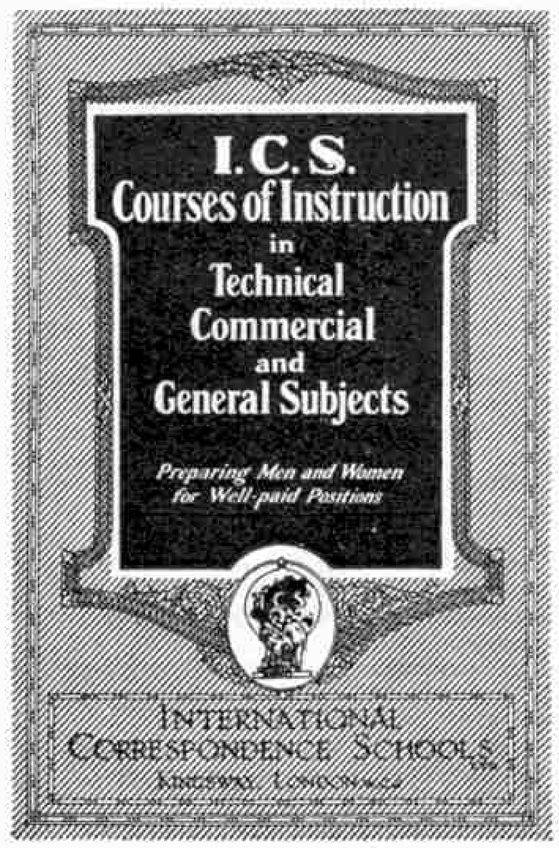
In Polished Copper

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

One of the oil cans was sent to H.R.H. the Prince of Wales, and a gracious letter of acknowledgment was received expressing H.R.H.'s admiration of the beautiful lines and perfect finish of this model. Price 3/6

Meccano Ltd., Binns Road, Liverpool 13.

A FREE I.C.S. BOOKLET
THAT CONCERNS YOUR FUTURE



Most young men make a slow start in life, and have to wait a long time for promotion, because they have no special knowledge of the sphere of work in which they are engaged.

There is only one way to avoid that; the way of spare-time specialised vocational training. The International Correspondence Schools have been giving such training for 44 years and have enrolled more than 4,500,000 students, hundreds of thousands of whom have won substantial success.

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Chemical Engineering	Railway Equipment and Running
Commercial Training	Salesmanship and Window Dressing
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36, Strand, London, W.C.2 (P.O. Box 126).
'Phone: Temple Bar 9451. **Full Catalogue Post Free**

Patentee novel electric finger lamp, No. 414,438, desires arrangement with reputable firm for the manufacture and sale under licence. Distribution arranged for New Zealand.—M. Richardson, Electrical Engineer, Wolverhampton.

Boys! Here's the thrill of a lifetime! THE NEW KITE-PLANE

Boys! To-day for the first time you can buy a kite that looks and flies like an aeroplane. **Anybody** can fly it—**anybody** can get it up to great heights—make it loop—make it dive—make it roll. Model parachute with airman automatically released to drop to earth. Packs flat to carry.

If your Toy Shop does not yet sell this new Vidor Kite Plane, you can order direct from factory. Price 3/6 Post Free.

3/6 COMPLETE WITH PARACHUTE

THE MOST PERFECT TOY OF THE AIR

VIDOR KITE-PLANE
VIDOR LTD. ERITH, KENT.

By Appointment

ASK FOR

Crawford's Rover Assorted

A CHOICE SELECTION
- OF SWEET AND -
SEMI-SWEET BISCUITS
FOR GENERAL USE

SOLD EVERYWHERE
ASK FOR THEM!

CINEMATOGRAPHS British Made from 37/6
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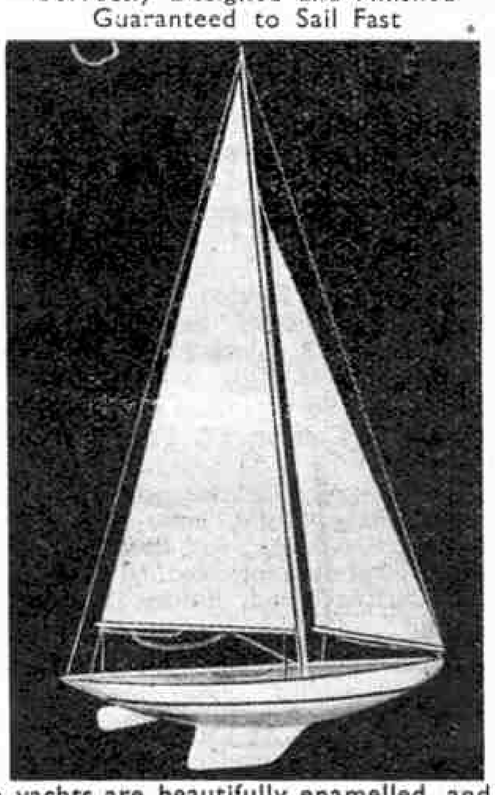
THE VERY LAST WORD IN YACHTS
Correctly Designed and Finished
Guaranteed to Sail Fast



These yachts are beautifully enamelled, and each is fitted with hollow metal spars which are rust resisting.

R.2. "White Elf," 22" long ...	...	£1 10 0
R.3. "White Foam," 26" long...	...	£2 2 0
R.4. "White Spray," 30" long	...	£4 4 0
R.5. "White Heather," 36" long	...	£6 6 0
R.6. "White Heather II," 42" long	...	£8 17 6

Models R.4, 5 and 6 are fitted with Automatic Steering Gear and Removable Hatch.

C. LUCAS (Hobbies Depot)
17, Houghton Street, Clayton Square, Liverpool, 1

READERS' SALES

Fine full-rigged model ship (Macquarie), £20 or near offer.—Slatter, "Grange," Churchfield Road, Walton-on-Thames.

Camera, Kodak Brownie II, 7/6, postage extra.—Mr. Carnegy, Rectory, Ledbury, Herefordshire.

Beautiful finger-tame budgerigar, whistles and mimics, ideal pet for teaching to talk, 12/–; with new drawing-room cage, carr. paid.—T. Glover, 99, Portland Crescent, Leeds, 1.

For sale or exchange anything. Gent.'s nice 3-speed cycle, also 3-valve wireless set.—Knowles, 79a, Montague Street, Blackburn.

Wanted, small, pre-war stamp collection, cheap; also a general collection 3,000/4,000, or loose lot; no dealers; also Windsor-London air postcard or envelopes.—R. C. Tombs, 31, Frances Road, Windsor.

Sale. "M.M.'s," 1929–32, good condition, unbound, would separate. Offers?—Lane, "Courtrai," Lansdown Road, Cheltenham.

Excellent condition, four bound vols. "M.M.," 1930–1931. What offers for lot or separately?—Blackett, Huckleberry, Barton-on-Sea, Hants.

"Meccano Magazines" 1926–1932 (inclusive). Three large spring-back binders. 50 "Hobbies Weekly" between October 1930 and February 1932. 12 "Blanco Y Negro" (Spanish magazine), May–July 1934. All excellent condition. Offers?—37, Park Grove, Edgware.

For sale. Baby Adana printing press and type, new roller, £2/15/0. Over 300 stamps, suitable beginner, 1/6.—Baker, Asphodele, Lankhurst Oak, Blackboys, Sussex.

Guitar and case, new, cost £4. £3 or offer.—Shelley, 114, Ansty Road, Wyken, Coventry.

Sale. Stamp collection. Send for price list.—Perkins, "Green Man," Shatterling, Wingham, Kent.

Wanted. 98 c.c. Two-Stroke Motor Bike. State price.—Sayer, Grosvenor Hotel, Hornsea.

Book, 3,000 stamps, hundreds mounted, high values, 3/3.—Cathcart, 3, Davidson Street, Glasgow.

Sale. 3 h.p. Petrol Engine. Exchange 1 h.p. Engine or Electric Motor (200 v., a.c.).—54, Stoughton Street, Leicester.

Lott's 5 Chemistry with additions, 12/6. Projecting Lens (Particulars), 8/–. Frog Interceptor, 2/6.—Adams, Moira Road, Woodville, Derbyshire.

Stamp Collection with catalogue books, two albums, accessories, 15/–, or exchange anything.—28, Warren Road, N.W.2.

Wanted. Foreign and Old English Coins. Send your lists to—R. Glencross, High Street, Merthyr Tydfil.

For sale. "Railway and Travel Monthly." Eleven bound volumes, 1910 to December 1915. Good condition. Best offer accepted.—BM/TKFV, London, W.C.1.

Wood carving tools (21), perfect condition. £1.—Forden, Ashcott, Somerset.

4 boxes rare butterflies, Assam. Perfect condition. 7/6 a box.—Henderson, 5, Carlton Rd., Ealing. W.5.

Large Chemistry Outfit, cost 50/-, take 30/-. Railway set, cost £3, accept £1. Stamps in album and catalogue, 15/–. Lots of 100 stamps, 4½d.—Hardy, 51, Carholme Rd., Lincoln.

Pram Dinghy, 7 ft. x 3 ft. 6 in, built by Salter, Oxford, £4.—Dryland, 25, Beaufort Mansions, S.W.3.

Sale. Quantity Chemicals and apparatus. Cheap. Stamp brings list.—Webb, Avalon, Longfield Drive, Amersham.

"Meccano Magazines," May 1925–June 1934, whole or part. What offers?—Andrews, Battleton Lodge, Evesham.

2 in. Naval Telescope, Ottway, Case, Accessories, Night-sight, 25/–.—Andrews, Battleton Lodge, Evesham.

Sale. Bowman Stationery Engine. Cost 37/6. Almost new. Also Model Lathe, Drill, Saw and Shafting. Accept 17/6.—Darrell, 23, Deramore Street, Manchester, 14.

Wanted. Used Jubilee Stamps from readers overseas. Buy or exchange.—K. Cooper, 17, Preston Gardens, Ilford, England.

Electric Model Railway (Marklin and other), 3 Engines, extensive Rolling Stock, large Rail Layout, hand made Stations, Sheds, etc., full Electrical Equipment, Transformers, Cut-outs included. £6 or near offer.—Henderson, 5, Carlton Road, Ealing, W.5.

MECCANO LUBRICATING OIL

Before commencing to operate a Meccano model, or to run a Hornby Train, all gears and bearings should be oiled thoroughly with Meccano Lubricating Oil. This oil is specially prepared and is of the right consistency for the purpose. Price per bottle 6d.

Meccano Ltd., Binns Road, Liverpool 13.

This Month's Special Articles

	Page
A 25-Ton Electric Ore Transporter ...	447
Air News	454
Amateur Photographer on Holiday ...	450
American Grey Squirrel	460
Blackburn "Shark" Aeroplane ...	456
Books to Read	476
Cleaning the Mersey Tunnel	446
Competition Corner	498
Engineering News	448
Facts about British Railways	468
Felling a Look-Out Tower	474
Fireside Fun	499
Footplate Trip on the *"Cornish Riviera Express"*	462
From Our Readers	478
Great Ports. XVI—St. John, N.B. ...	444
Guild Pages	488–9
Hornby Railway Company Pages ...	490–495
Life-Like Models in Papier Maché ...	452
L.M.S.R. "Turbomotive"	466
L.N.E.R. Welded 20-ton Coal Wagons	467
Making Refrigerating Machinery ...	458
Model-Building Contest	486
Model-Building Contest Results ...	487
Modern Transport in Meccano ...	480
Natives of Zululand	442
New Meccano Motor Car Outfit Models	483
Of General Interest	472
Railway News	464
Renewing the Gold Rush Days ...	461
Stamp Collecting	497
Stinging Plants and Insects	475
Suggestions Section	484

Stamp Advertisement (Continued from page 496)

ABYSSINIA

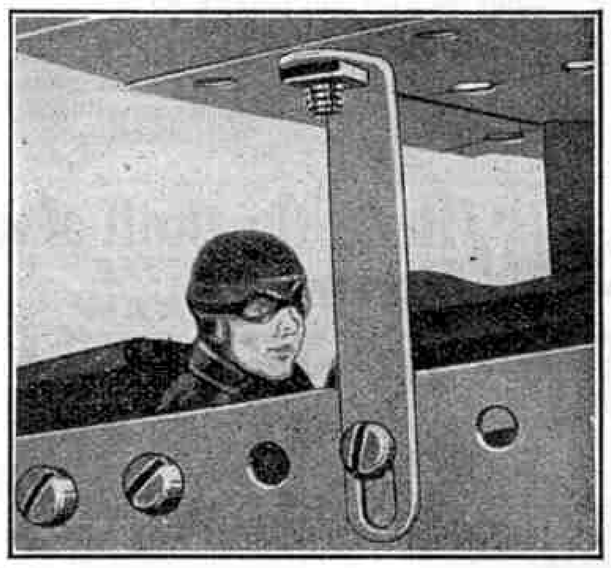
A timely offer, which should not be missed, of a superb **MINT** set of 30 diff. stamps from this mysterious country, mostly 1917–31 issues (cat. over £1), with scarce **AIR STAMPS, COMMEMORATIVES, PICTORIALS, ETC.** Price 5/– only, secure them while you can. We offer superb collections of any country at bargain prices. Full lists FREE.

NORRIS & CO. (Dept. M), NORWOOD, LONDON, S.E.19

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 90,000 copies of the December number were distributed all over the world. You therefore reach this exclusive public for approximately one penny a thousand.

Miniature Aeroplane Pilots

Aeroplane Parts Nos. P99 and P100



Miniature Pilots are now available for fitting to all open cockpit machines built with the Nos. 0, 1 and 2 Meccano Aeroplane Constructor Outfits. These attractive little figures, which add a wonderful touch of realism, are supplied with green coat and orange cap, blue coat and red cap, or red coat and green cap. Aero Part No. P99, which is suitable for fitting to the No. O Outfit models, is fixed to a special bracket that takes the place of the Propeller Shaft Bracket in the Outfit. The special bracket is secured by passing bolts through the sides of the fuselage into the threaded holes in the bracket. The Propeller Shaft rests in the bearing socket formed in the Pilot's body.

Part No. P100 (illustrated above) is used in No. 1 and No. 2 Outfit models. The Pilot is fixed to a double angle bracket ready for bolting to the sides of the fuselage.

Prices:

P99 Aeroplane Pilot ... ... each **5d.**
P100 ,, ,, ... ,, **5d.**

Meccano Ltd., Binns Road, Liverpool 13

MECCANO MAGAZINE

Registered at G.P.O., London, for transmission by Canadian Magazine Post.

EDITORIAL AND ADVERTISING OFFICE :—
LIVERPOOL 13, ENGLAND.

Telegrams : " Meccano, Liverpool."

Publication Date. The *"M.M."* is published on the 1st of each month and may be ordered from any Meccano dealer, or from any bookstall or newsagent, price 6d. per copy. It will be mailed direct from this office, 4/– for six issues and 8/– for twelve issues.

To Contributors. The Editor will consider articles and photographs of general interest and payment will be made for those published. Whilst every care will be taken of articles, etc., submitted, the Editor cannot accept responsibility for any loss or damage. A stamped addressed envelope of the requisite size should be sent where the contribution is to be returned if unacceptable.

Readers' Sales and Wants. Private advertisements (i.e., not trade) are charged 1d. per word, minimum 1/–. Cash with order. Editorial and Advertising matters should not be dealt with on the same sheet of paper.

Advertisers are asked to note that private advertisements of goods manufactured by Meccano Limited cannot be accepted.

Small Advertisements. 1/6 per line (average seven words to the line), or 16/– per inch (average 12 lines to the inch). Cash with order.

Display. Quotations for space bookings, and latest net sale figures, will be sent on request.

Press Day, etc. Copy should be sent as early in the month as possible for insertion in following issue. We usually close for press on or before 6th of each month for following issue. Half-tone blocks up to 100 screen.

Proofs of advertisements will be sent when possible for space bookings of not less than half-an-inch.

Voucher copies. Sent free to advertisers booking one inch or over. Other advertisers desiring vouchers should add 8d. to their remittance and should order voucher copy at same time.

Remittances. Postal Orders and Cheques should be made payable to Meccano Ltd.

Ordering the "M.M." Overseas

Readers Overseas and in foreign countries may order the *"Meccano Magazine"* from regular Meccano dealers or direct from this office. The price and subscription rates are as above, except in the cases of Australia, where the price is 1/2 per copy (postage extra), and the subscription rates 8/– for six months and 16/– for 12 months (post free); Canada, where the price is 10c. per copy, and the subscription rates 65c. for six months, and $1.25 for 12 months (post paid).

The U.S.A. price is 15c. per copy, and the subscription rates $1 and $2 for 6 and 12 months respectively (post free).

Overseas readers are reminded that the prices shown throughout the *"M.M."* are those relating to the United Kingdom and Northern Ireland. Current Overseas Price Lists of Meccano Products will be mailed free on request to any of the undermentioned agencies. Prices of other goods advertised may be obtained direct from the firms concerned.

CANADA: Meccano Ltd., 187-189, Church St., Toronto.
UNITED STATES: Meccano Co. of America Inc., New Haven, Conn., Meccano Co. of America Inc., 200, Fifth Av., New York.
AUSTRALIA: Messrs. E. G. Page & Co., 52, Clarence Street, Sydney, N.S.W.
NEW ZEALAND: Models Limited, Third Floor, Paykel's Buildings, 9, Anzac Avenue (P.O. Box 129), Auckland, C.1.
SOUTH AFRICA: Mr. A. E. Harris (P.O. Box 1199), 142, Market Street, Johannesburg.
INDIA: Karachi: Daryanamal and Bros., Elphinstone Street, Bombay; Bombay Sports Depot, Dhobi Talao. Calcutta: Bombay Sports Depot, 2, Lindsay Street.

The Editor wishes to make known the fact that it is not necessary for any reader to pay more than the published price. Anyone who is being overcharged should lodge a complaint with the Meccano agent in his country or write direct to the Editor.

MECCANO WRITING PADS

These Writing Pads are just the thing to use when writing to your friends or to the Editor.

They are supplied in two sizes, each consisting of 50 printed sheets of tinted bank paper with cover. Prices—Large, 1/– each (post free); Small, 6d. each (post free).

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Special envelopes, attractively printed and matching the writing paper in colour, are also available. These are suitable for both the large and the small sheets of writing paper.

Price, per packet of 50, 8d. post free.

Meccano Ltd., Binns Road, Liverpool 13.

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MECCANO IS

The Best Hobby in the World for Boys

Every boy is happiest when he is inventing, creating and building. That is the reason for the everlasting popularity of Meccano. It is the most wonderful and the most fascinating hobby in the world, because it enables full scope to be given to all the inclinations and desires that are the natural heritage of boys.

There is no limit to the number of models that can be built with Meccano—Cranes, Clocks, Motor Cars, Ship-Coalers, Machine Tools, Locomotives—in fact everything that interests boys. The most wonderful thing about Meccano is that it is real engineering; it is fascinating and delightful and yet so simple that even an inexperienced boy can join in the fun of building models without having to learn anything. A beautifully illustrated Book of Instructions is included with every Outfit, and a screwdriver and a spanner are the only tools required.

Make friends with your dealer—he can help you.

A Meccano Outfit. Price 5/-

O Meccano Outfit. Price 15/-

F Meccano Outht. Price 30 -

Prices of Meccano Outfits

COMPLETE OUTFITS			ACCESSORY OUTFITS		
A Outfit ... ... each	5/-		Aa converts A Outfit into B each	2/6	
B " ... ... "	7/6		Ba " B " C "	3/-	
C " ... ... "	10/-		Ca " C " D "	5/6	
D " ... ... "	15/-		Da " D " E "	5/6	
E " ... ... "	20/-		Ea " E " F "	11/-	
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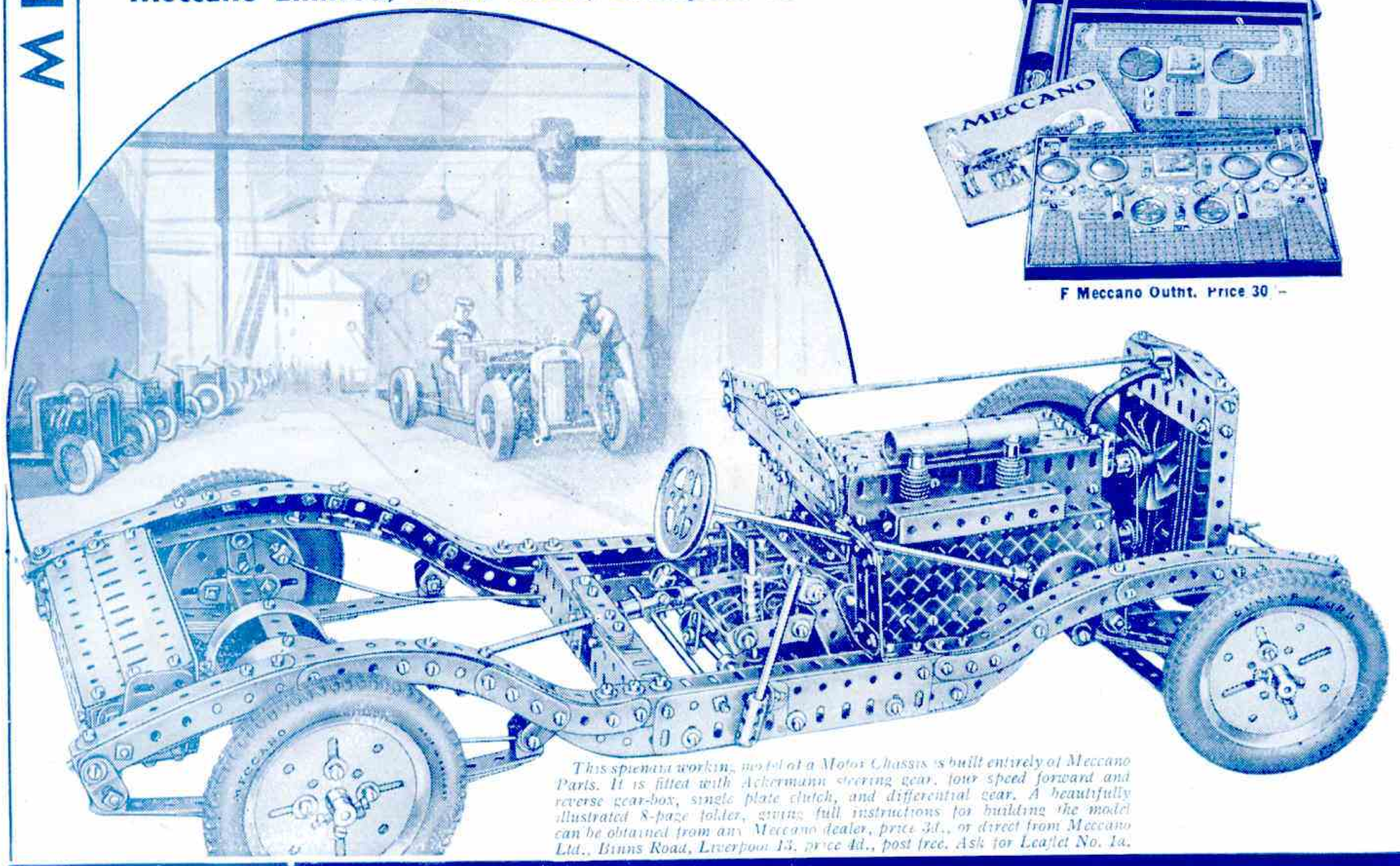

This splendid working model of a Motor Chassis is built entirely of Meccano Parts. It is fitted with Ackermann steering gear, four speed forward and reverse gear-box, single plate clutch, and differential gear. A beautifully illustrated 8-page folder, giving full instructions for building the model can be obtained from any Meccano dealer, price 3d., or direct from Meccano Ltd., Binns Road, Liverpool 13, price 4d., post free. Ask for Leaflet No. 1a.

MECCANO

Boys! Hornby Trains are Real Trains

PRODUCT of MECCANO LIMITED LIVERPOOL

The illustration above shows Hornby No. 2 Special Train Set, hauled by a Hornby No. 2 Special Locomotive. This Locomotive is a true-to-type model of the real L.M.S.R. Standard Compound Locomotive shown in the illustration below.

A Perfect Miniature Railway

Hornby Electric and Clockwork Trains are such great favourites with boys because they enable almost every operation in real railway practice to be carried out accurately and realistically.

Hornby Locomotives are 100 per cent. efficient. No others run so smoothly. No others pull such heavy loads.

Hornby Rolling Stock is smooth-running and is fitted with automatic couplings. The range includes almost every type seen on the big railways.

Hornby Accessories are realistic and in correct proportion. They provide everything a boy could wish for to make his railway a complete representation of the real thing.

Get a copy of the Hornby Book of Trains, which may be obtained from any Meccano dealer, price 3d., or direct from Meccano Ltd. (Dept. A.M.), Binns Road, Liverpool 13, price 4½d. post free, and make your choice now. If you prefer to have ordinary price lists you may obtain copies of Folder No. 6 (Clockwork) and Folder No. 7 (Electric) from your dealer, free of charge, or direct from Meccano Limited, price 1d. each, post free. Write to Department A.M.

Prices of Hornby Electric Train Sets from 15/- to 75/-
Prices of Hornby Clockwork Train Sets from 4/11 to 65/-

HORNBY TRAINS

BRITISH AND GUARANTEED

Manufactured by
MECCANO LIMITED
Binns Road
LIVERPOOL
13

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Printed by John Waddington Ltd. Leeds and London