FEBRUARY 1936

MECCANO MAGAZINE

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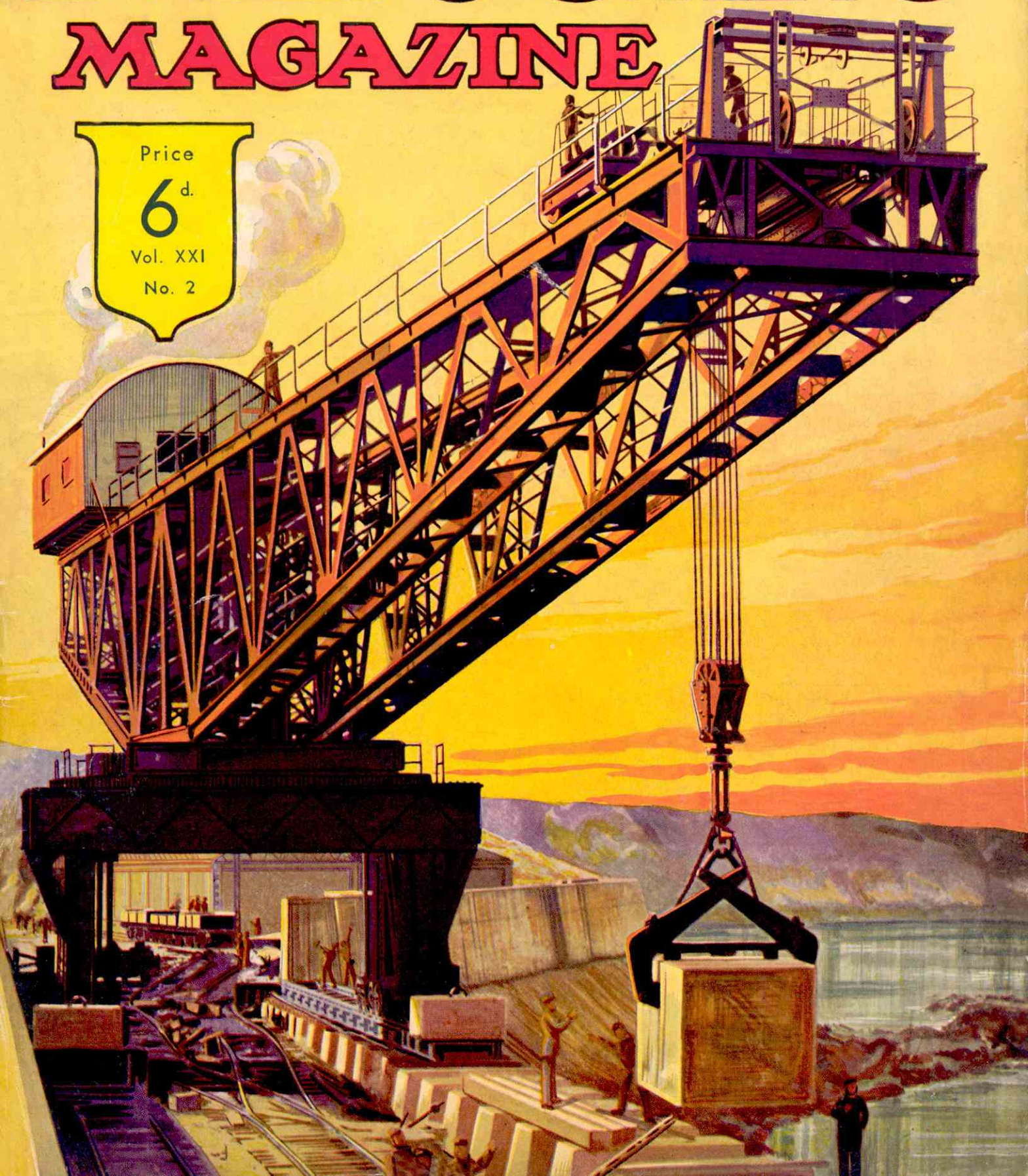
Vol. XXI
No. 2



HORNBY ELECTRIC & CLOCKWORK TRAINS

THESE are the famous Hornby Trains!

You have spent many happy hours watching real trains at work. Now start a railway of your own and enjoy the thrill of operating Engines, Coaches, Wagons, Signals and Points on actual railway principles. It's the most fascinating pastime in the world!

From the day of their introduction Hornby Trains have always represented the latest model railway practice. Designs are continually being improved and new items added so that the system is complete in practically every detail. There are Locomotives for all duties, driven by electric motors or by clockwork. There is Rolling Stock of all kinds including Pullman Cars, ordinary Coaches and Guard's Vans for passenger services, and numerous Wagons and Vans for freight working.

The Accessories are now better than ever before, while the Rails, Points and Crossings enable an endless variety of layouts to be constructed, both for Electric and Clockwork Trains.

Hornby Train Sets are available at prices ranging from **15**/– to **75**/– for Electric models and **4**/**11** to **65**/– for Clockwork models.

A selection from the range of
HORNBY LOCOMOTIVES

ELECTRIC MODELS

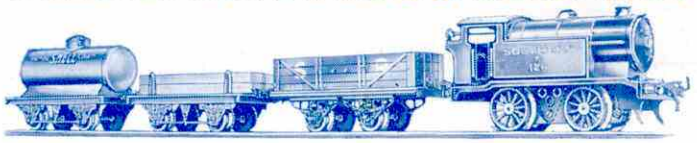
EM120 (20-volt) or EM16 (6-volt) Locomotive (non-reversing) Price **8**/**6**.
EO20 (20-volt) Locomotive (reversing) Price **22**/–.
E120 (20-volt) or E16 (6-volt) Tank Locomotive (reversing) Price **24**/–.
E120 (20-volt) Special Tank Locomotive (automatic reversing) Price **30**/–.
E220 (20-volt) Special Tank Locomotive (automatic reversing) Price **32**/**6**.
E220 (20-volt) Special Locomotive (automatic reversing) Price **37**/**6**.

CLOCKWORK MODELS

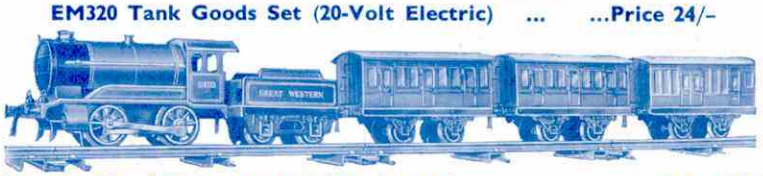
M1/2 Locomotive (reversing) Price **4**/**6**.
M3 Tank Locomotive (reversing) Price **7**/**6**.
No. O Locomotive (reversing) Price **10**/**6**.
No. 2 Special Locomotive (reversing) Price **27**/**6**.

MECCANO LIMITED
Binns Road
LIVERPOOL 13

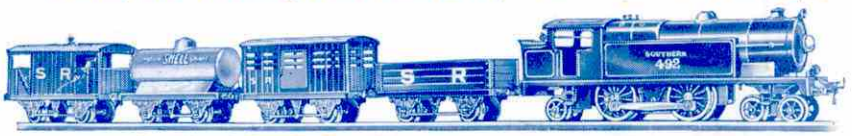
A SELECTION FROM THE RANGE OF HORNBY TRAINS



EM320 Tank Goods Set (20-Volt Electric) ... ...Price 24/–

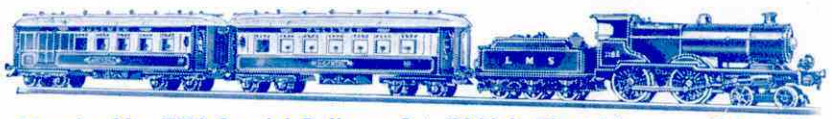


Hornby No. 1 Passenger Set (Clockwork) ... ... Price 25/–



Hornby E220 Mixed Goods Set (20-Volt Electric) ... ... Price 47/6

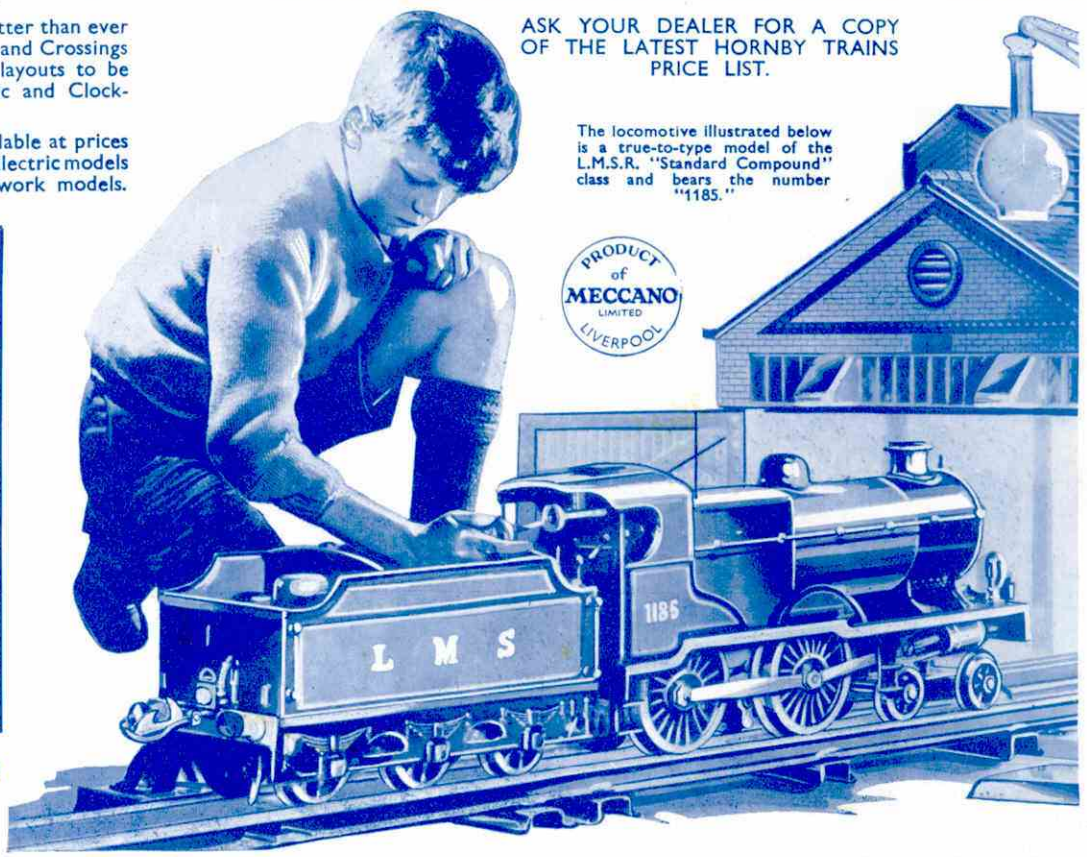
Hornby No. 3C Riviera "Blue" Passenger Train Set (Clockwork) ... Price 57/6



Hornby No. E220 Special Pullman Set (20-Volt Electric)... ...Price 75/–

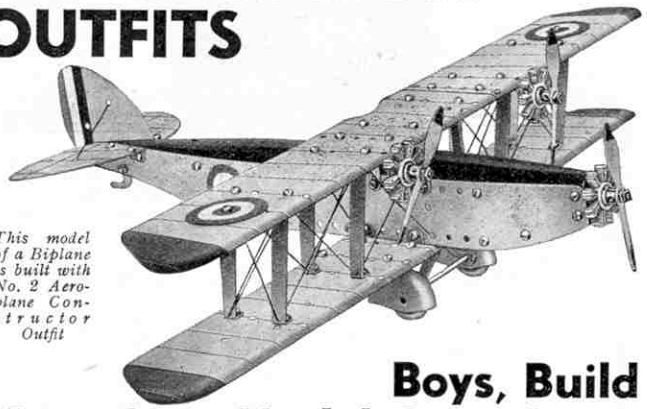
ASK YOUR DEALER FOR A COPY OF THE LATEST HORNBY TRAINS PRICE LIST.

The locomotive illustrated below is a true-to-type model of the L.M.S.R. "Standard Compound" class and bears the number "1185."



TOYS OF QUALITY MADE BY MECCANO LTD.

AEROPLANE CONSTRUCTOR OUTFITS



This model of a Biplane is built with No. 2 Aeroplane Constructor Outfit

Boys, Build Your Own Model Aeroplanes

No. 2 Aeroplane Outfit. Price **12/6**

Every boy should know how aeroplanes are designed and constructed, and should be able to recognise at a glance the different types of machines in order to understand the purposes for which they have been developed.

These fine Constructor Outfits contain a range of aeroplane parts by means of which boys are able to design and build their own Aeroplanes quite easily, for these parts make possible aeroplane construction on sound engineering lines. They are all interchangeable on the famous Meccano principle.

The illustrated Manual of Instructions included in each Outfit shows how to build wonderful models of high and low-wing Monoplanes, Biplanes, Seaplanes and giant amphibian machines. In fact, models of almost every type of aircraft can be made with these splendid Outfits.

PRICE LIST OF AEROPLANE OUTFITS

Standard Series.

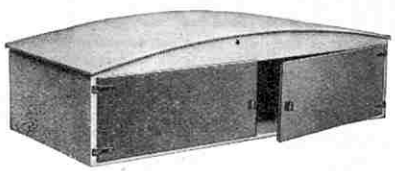
No. OO Outfit	**3/3**
No. O Outfit	**4/6**
No. 1 Outfit ...	**7/6**
No. 2 Outfit ...	**12/6**

Special Series.

No. 1 Special Outfit	**12/6**
No. 2 Special Outfit	**21/-**

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

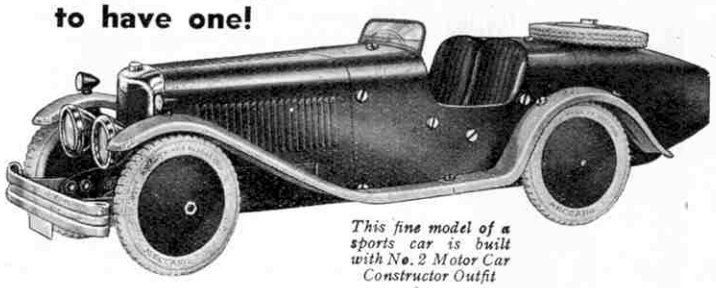
No. O2 AEROPLANE HANGAR



This splendid hangar has been specially designed to house model aeroplanes. It will accommodate two machines built with the No. OO or No. O Aeroplane Constructor Outfits. Length 21¾". Depth 11". Height 6¼". Price **5/11**

MOTOR CAR CONSTRUCTOR OUTFITS

You will be keen to have one!



This fine model of a sports car is built with No. 2 Motor Car Constructor Outfit

Boys, as soon as you see these fine Motor Car Constructor Outfits you will be keen to have one. The models they build are superb. Sports four-seaters, coupés, speed cars and other perfect miniature reproductions, each one a beautiful model of its prototype. All the models are driven by means of a powerful Clockwork Motor (included in the Outfit), giving a long, speedy and realistic run on each winding.

The motor car parts are finished in rich enamel, nickel-plate and chromium, the complete Outfits being masterpieces of miniature automobile craftsmanship.

No. 1 MOTOR CAR CONSTRUCTOR OUTFIT

The motor car models that can be built with this Outfit are the finest you ever saw. Think of the fine fun you could have building these wonderful models, each one of which faithfully resembles its prototype.

No. 1 Outfit is available in four different colour combinations and is supplied complete with powerful Clockwork Motor. Price **10/-**

No. 2 Motor Car Outfit. Price **20/-**

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 model illustrated above.

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 **20/-**

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**

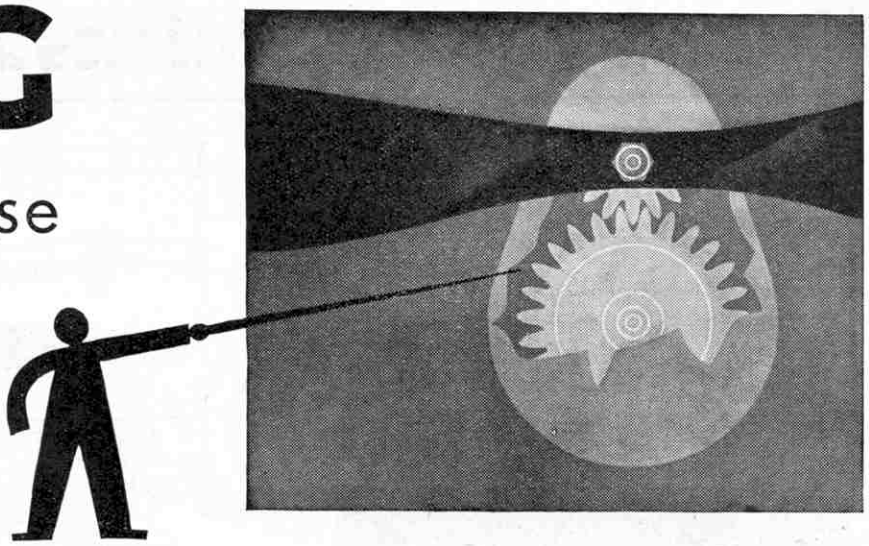
MOTOR CAR GARAGE

This realistic Motor Car Garage provides accommodation for any Meccano model motor car or other cars of suitable size. Inside dimensions: Length 13". Width 7¾". Height 5". Price **5/6**

MECCANO LIMITED
Binns Road
LIVERPOOL 13

FROG

aviation course



No. 2—PROPELLOR

The propellor or airscrew is, as its name implies, designed to propel the aircraft through the air with a screw action. If it is in front of the engine it is called a tractor: if behind, it is a pusher. The "Frog," like its prototype, has a tractor air screw.

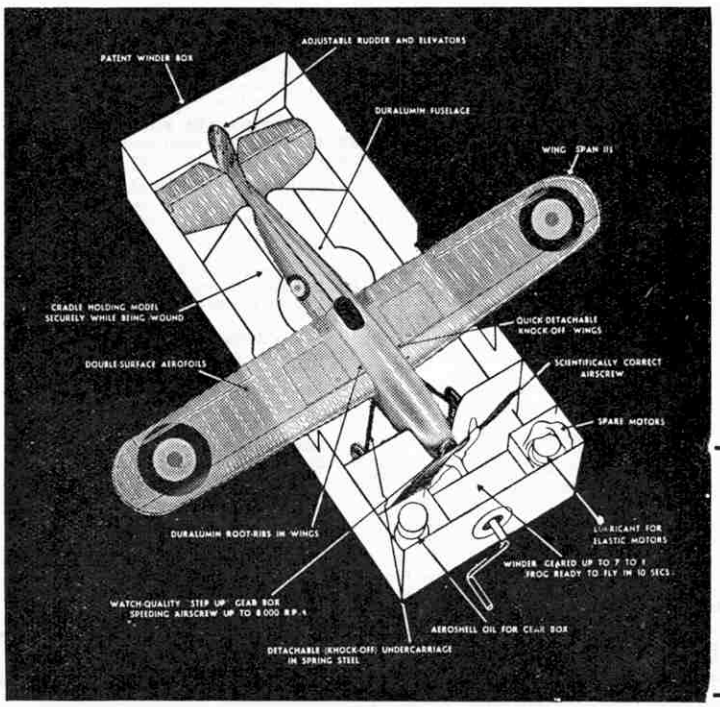
The diameter of the screw, and the "pitch" or angle which the blades make with the plane in which the screw revolves, are determined by the size of the motor and the speed at which the aircraft is designed to fly.

The pitch is important. If the blade is nearly flat to the plane in which it rotates, the screw has small pulling power, but increasing the pitch, to increase pulling power, beyond a certain point defeats its own end, as the screw merely "tears a hole in the air" and slips through without gripping. The pitch must, therefore, be very nicely adjusted to the power of the engine and the purpose for which the machine is to be put.

Moreover, the propellor must, in a *scale* model, be of a certain diameter, and, therefore, must revolve at a very high speed to take full advantage of its scientific design. To ensure this the FROG propellor is driven through a specially designed gear-box, made by a watchmaker, at the exact speed (4,200 r.p.m.) which the latest discoveries in aeronautical science have proved to be correct.

FREE FLIGHT INSTRUCTION

Lines Bros. will give free flight instruction by appointment on the Frog aerodrome at Merton. Telephone—Liberty 1041.



FROG SCALE MODEL INTERCEPTOR FIGHTER, MK. IV. NOW ONLY 5/-

The unique FROG patent winder box eliminates tedious winding and makes it possible to have six flights in the time of one.

Frog scale model aircraft. Designed and made by International Model Aircraft Ltd. Patented throughout the world. Sole concessionaires :—

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

"FROG" FLYING CLUB

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

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

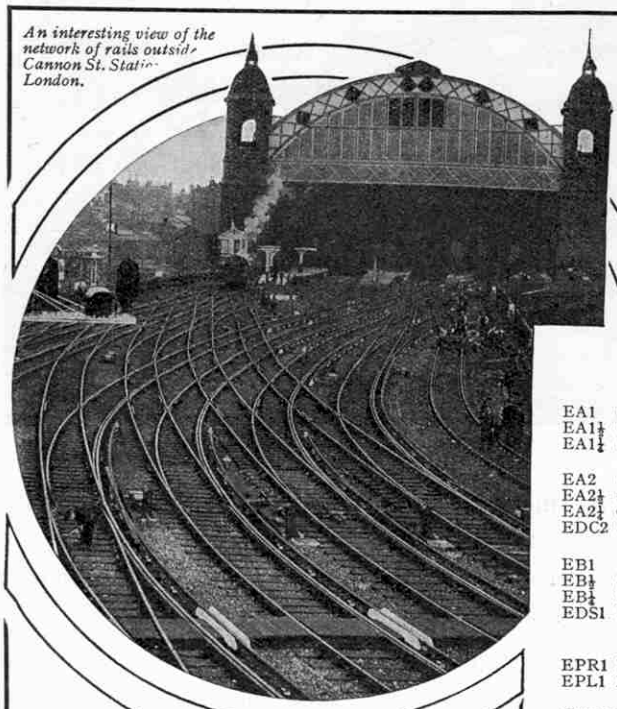
Please send me your "Frog" coloured leaflet with particulars of the "Frog" Flying Club and of how to obtain handsome enamelled Air Force pilot badges.

NAME .....

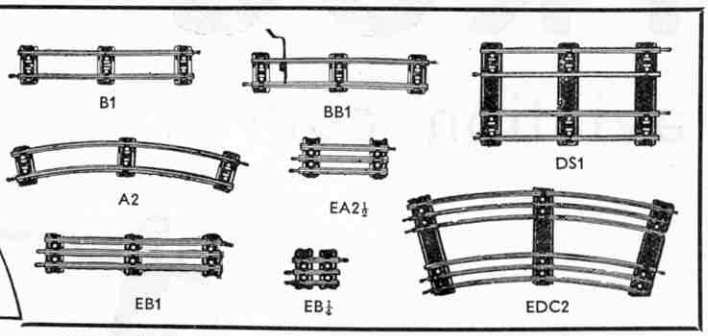
ADDRESS .....

Please write in block letters.

Hornby Rails, Points and Crossings



An interesting view of the network of rails outside Cannon St. Station, London.



Rails for Electric Trains, Gauge 0, 1¼"

CURVED RAILS

1-ft. Radius

EA1	Curved Rails ...	... per doz. 5/-
EA1½	Curved half rails	... „ 4/6
EA1¼	Curved quarter rails	... „ 4/-

2-ft. Radius

EA2	Curved rails ...	... per doz. 5/-
EA2½	Curved half rails	... „ 4/6
EA2¼	Curved quarter rails	... „ 4/-
EDC2	Curved rails, double track, ½ doz.	9/-

STRAIGHT RAILS

EB1	Straight rails ...	... per doz. 5/-
EB½	Straight half rails	... „ 4/6
EB¼	Straight quarter rails	... „ 4/-
EDS1	Straight rails, double track, ½ doz.	8/6

POINTS

For 1-ft. Radius Curves

EPR1	Right-hand points }	... per pair 5/9
EPL1	Left-hand points }	

For 2-ft. Radius Curves

ESPSR2	Right-hand points }	per pair 7/6
ESPSL2	Left-hand points }	

CROSSINGS

ECA	Acute-angle crossings ...	each 2/9
ECR	Right-angle crossings ...	„ 2/9

DOUBLE SYMMETRICAL POINTS

For 1-ft. Radius Curves

EDSR1	Double symmetrical points, right-hand }	... per pair 6/-
EDSL1	Double symmetrical points, left-hand }	

For 2-ft. Radius Curves

EDSR2	Double symmetrical points, right-hand }	... per pair 7/-
EDSL2	Double symmetrical points, left-hand }	

PARALLEL POINTS

EPPR2	Parallel points, right-hand }	per pair
EPPL2	Parallel points, left-hand }	7/-

CROSSOVER POINTS

ECOR2	Crossover points, right-hand }	per pair
ECOL2	Crossover points, left-hand }	24/-

EMC20	Switch rail (20-volt) ...	each 1/3
EMC6	Switch rail (6-volt) ...	„ 1/3
TCP20	Terminal Connecting Plates (20-volt)	„ 1/3
TCP6	Terminal Connecting Plates (6-volt)	„ 1/3

Rails for Clockwork and Steam Trains, Gauge 0, 1¼"

CURVED RAILS

9-in. Radius (for MO Trains)

M9	Curved rails ...	... per doz. 2/6
MB9	Curved brake rails	... each 3d.

1-ft. Radius

A1	Curved rails ...	... per doz. 3/6
A1½	Curved half rails	... „ 3/-
A1¼	Curved quarter rails	... „ 2/6
AB1	Curved brake rails	... each 4d.

2-ft. Radius

A2	Curved rails ...	... per doz. 3/6
A2½	Curved half-rails	... „ 3/-
A2¼	Curved quarter rails	... „ 2/6
AB2	Curved brake rails	... each 5d.
DC2	Curved rails, double track, ½ doz.	6/-

STRAIGHT RAILS

BM	Straight rails (for MO Trains),	per doz. 2/6
B1	Straight rails ...	... „ 3/6
B½	Straight half rails	... „ 3/-
B¼	Straight quarter rails	... „ 2/6
BB1	Straight brake rails	... each 4d.
BBR1	Straight brake and reverse rails,	each 1/6
DS1	Straight rails, double track, ½ doz.	5/3

CROSSINGS

CA1	Acute-angle crossings (for 1-ft. radius tracks)	each 1/9
CA2	Acute-angle crossings (for 2-ft. radius tracks)	„ 1/6
CR1	Right-angle crossings (for 1-ft. radius tracks)	„ 1/9
CR2	Right-angle crossings (for 2-ft. radius tracks)	„ 1/6

POINTS

9-in. Radius (for MO Trains)

MR9	Right-hand points }	... per pair 3/-
ML9	Left-hand points }	

For 1-ft. Radius Curves

PR1	Right-hand points }	... per pair 3/-
PL1	Left-hand points }	

For 2-ft. Radius Curves

PR2	Right-hand points }	... per pair 3/-
PL2	Left-hand points }	
PSR2	Points on solid base, right-hand ... ... }	per pair 8/6
PSL2	Points on solid base, left-hand ... ... }	

(Fitted for Hornby Control)

SPSR2	Points on solid base, right-hand }	per pair 5/-
SPSL2	Points on solid base, left-hand }	

These points are similar to Points PSR2 and PSL2 but they are not fitted with ground disc or for Hornby Control.

PARALLEL POINTS

PPR2	Parallel points, right-hand }	per pair 3/6
PPL2	Parallel points, left-hand }	

DOUBLE SYMMETRICAL POINTS

For 1-ft. Radius Curves

DSR1	Double symmetrical points, right-hand	
DSL1	Double symmetrical points, left-hand	per pair 3/6

For 2-ft. Radius Curves

DSR2	Double symmetrical points, right-hand	
DSL2	Double symmetrical points, left-hand	per pair 3/6

CROSSOVER POINTS

COR2	Crossover points, right-hand }	per pair
COL2	Crossover points, left-hand }	12/-
RCP	Rail Connecting Plates ...	½ doz. 2d.

Centre Rails for Converting Ordinary Track to Electrical

1-ft. Radius

AC1	Curved centre rails ...	per doz. 1/-
AC1½	Curved centre half rails	„ 9d.
AC1¼	Curved centre quarter rails	„ 6d.

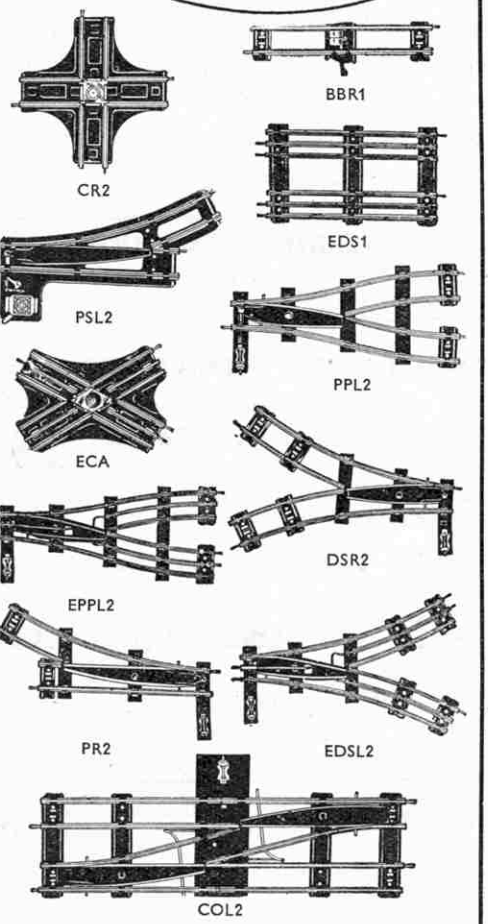
2-ft. Radius

AC2	Curved centre rails ...	per doz. 1/-
AC2½	Curved centre half rails	„ 9d.
AC2¼	Curved centre quarter rails	„ 6d.

BC1	Straight centre rails ...	per doz. 1/-
BC½	Straight centre half rails ...	„ 9d.
BC¼	Straight centre quarter rails	„ 6d.

ICR	Insulators for insulating centre rails ...	... per doz. 3d.
CCR	Clips for fixing centre rails	„ 6d.

Many interesting illustrations and much useful information regarding Hornby Railway layouts are given in the booklets entitled "How to plan your Hornby Railway," and "Hornby Layouts—One Hundred Suggestions." Each of these booklets is obtainable from your dealer, price 3d.



MECCANO
PARTS & ACCESSORIES

REAL ENGINEERING PARTS IN MINIATURE

Meccano parts, many of which are here illustrated, combine to form a complete miniature engineering system with which practically any movement known in mechanics can be correctly reproduced. New parts are always being introduced in order to keep Meccano model-building in line with the most modern engineering requirements. 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.

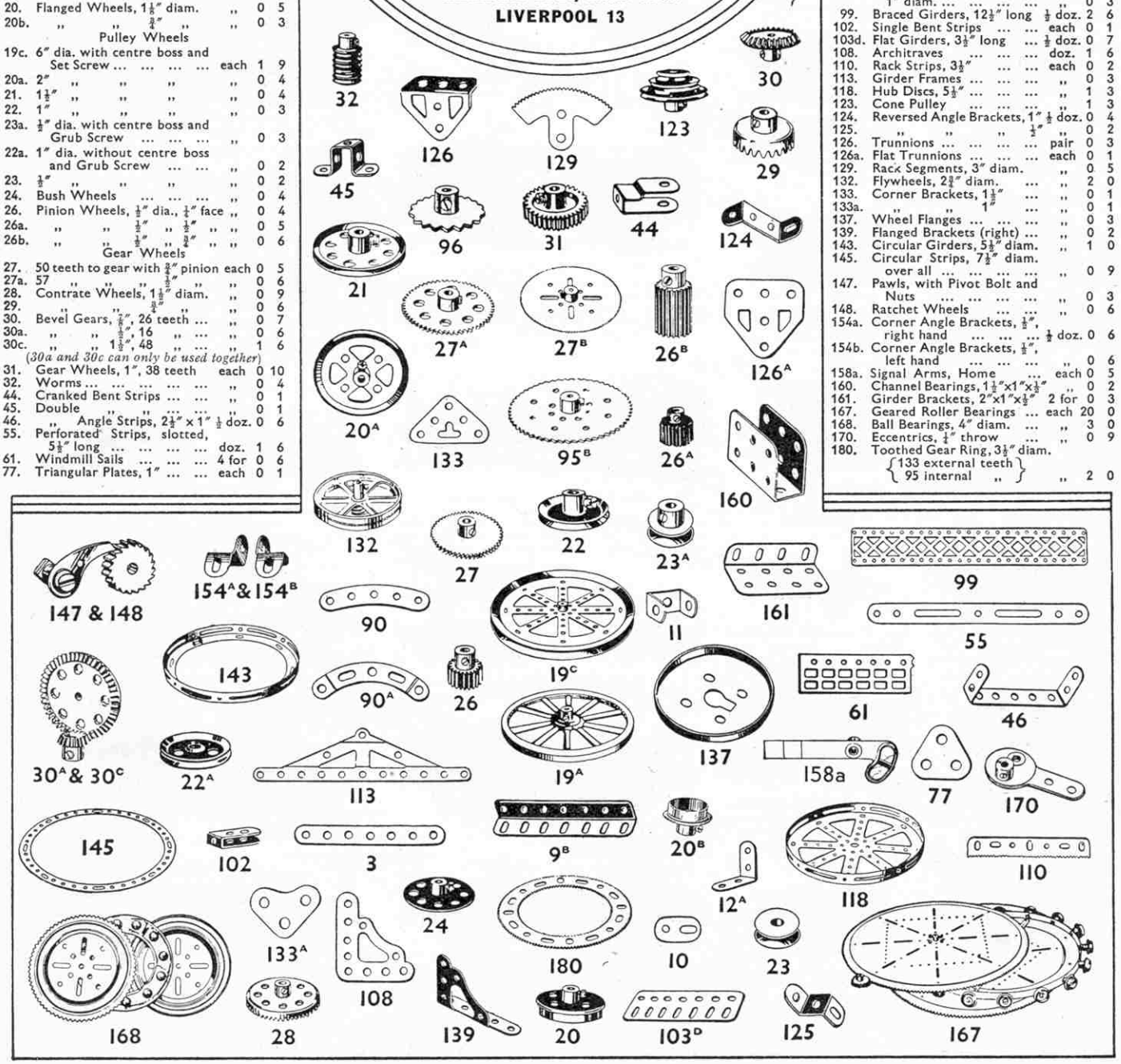
MECCANO LTD., Binns Road
LIVERPOOL 13

PRICES OF PARTS ILLUSTRATED

No.		s.	d.
3.	Perforated Strips, 3½" ... ½ doz.	0	4
9b.	Angle Girders, 3½" ... ... ,,	0	8
10.	Flat Brackets ... ... doz.	0	1
11.	Double Brackets ... ... ,,	0	3
12a.	Angle Brackets, 1" x 1" ... ,,	0	6
19a.	Wheels, 3" diam., with set screws ... ... each	0	6
20.	Flanged Wheels, 1½" diam. ,,	0	5
20b.	,, ,, ¾" ,, ,,	0	3
	Pulley Wheels		
19c.	6" dia. with centre boss and Set Screw ... ... each	1	9
20a.	2" ,, ,, ,, ,,	0	4
21.	1½" ,, ,, ,, ,,	0	4
22.	1" ,, ,, ,, ,,	0	3
23a.	½" dia. with centre boss and Grub Screw ... ... ,,	0	3
22a.	1" dia. without centre boss and Grub Screw ... ... ,,	0	2
23.	½" ,, ,, ,, ,,	0	2
24.	Bush Wheels ... ... ,,	0	4
26.	Pinion Wheels, ½" dia., ½" face ,,	0	4
26a.	,, ,, ½" ,, ½" ,, ,,	0	5
26b.	,, ,, ½" ,, ¾" ,, ,,	0	6
	Gear Wheels		
27.	50 teeth to gear with ¾" pinion each	0	5
27a.	57 ,, ,, ¾" ,, ,,	0	6
28.	Contrate Wheels, 1½" 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
	(30a and 30c can only be used together)		
31.	Gear Wheels, 1", 38 teeth each	0	10
32.	Worms ... ... ,,	0	4
44.	Cranked Bent Strips ... ... ,,	0	1
45.	Double ,, ,, ... ,,	0	1
46.	,, Angle Strips, 2½" x 1" ½ doz.	0	6
55.	Perforated Strips, slotted, 5½" long ... ... doz.	1	6
61.	Windmill Sails ... ... 4 for	0	6
77.	Triangular Plates, 1" ... ... each	0	1

PRICES OF PARTS ILLUSTRATED (Cont.)

No.		s.	d.
90.	2½" Curved Strips, 2⅜" radius ... ... each	0	1
90a.	2½" Curved Strips, cranked, 1⅜" radius, 4 to circle ... ,,	0	1
95b.	Sprocket Wheels, 56 teeth, 3" diam. ... ... ,,	0	6
96.	Sprocket Wheels, 18 teeth, 1" diam. ... ... ,,	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
108.	Architraves ... ... doz.	1	6
110.	Rack Strips, 3½" ... ... each	0	2
113.	Girder Frames ... ... ,,	0	3
118.	Hub Discs, 5½" ... ... ,,	1	3
123.	Cone Pulley ... ... ,,	1	3
124.	Reversed Angle Brackets, 1" ½ doz.	0	4
125.	,, ,, ½" ,,	0	2
126.	Trunnions ... ... pair	0	3
126a.	Flat Trunnions ... ... each	0	1
129.	Rack Segments, 3" diam. ,,	0	5
132.	Flywheels, 2⅜" diam. ... ,,	2	0
133.	Corner Brackets, 1½" ... ,,	0	1
133a.	,, ,, 1" ... ,,	0	1
137.	Wheel Flanges ... ... ,,	0	3
139.	Flanged Brackets (right) ... ,,	0	2
143.	Circular Girders, 5½" diam. ,,	1	0
145.	Circular Strips, 7½" diam. over all ... ... ,,	0	9
147.	Pawls, with Pivot Bolt and Nuts ... ... ,,	0	3
148.	Ratchet Wheels ... ... ,,	0	6
154a.	Corner Angle Brackets, ½", right hand ... ... ½ doz.	0	6
154b.	Corner Angle Brackets, ½", left hand ... ... ,,	0	6
158a.	Signal Arms, Home ... each	0	5
160.	Channel Bearings, 1½"x1"x½" ,,	0	2
161.	Girder Brackets, 2"x1"x½" 2 for	0	3
167.	Geared Roller Bearings ... each	20	0
168.	Ball Bearings, 4" diam. ... ,,	3	0
170.	Eccentrics, ½" throw ... ,,	0	9
180.	Toothed Gear Ring, 3½" diam. { 133 external teeth / 95 internal ,, } ,,	2	0



HORNBY SERIES

HORNBY ROLLING STOCK

GAUGE O

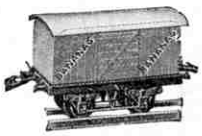
Now is the time to add to your Hornby Railway. Every boy knows that a real railway system is constantly expanding and developing. New rolling stock and new equipment are added; new tracks are laid; new stations, signal cabins and goods sheds are built; new tunnels and viaducts are constructed—every effort 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/-**

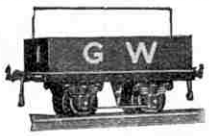
MO SIDE TIPPING WAGON
Finished in bright yellow and tips either side. Price **1/-**

BRAKE VAN (French Type)
Lettered "Nord." Beautifully finished in colours. Opening doors. Price **4/-**



No. 1 BANANA VAN "FYFFES"
An attractive model, finished in yellow and red. Price **2/9**

No. 1 MILK TRAFFIC VAN
Fitted with sliding doors. Complete with milk cans. Price **2/11**

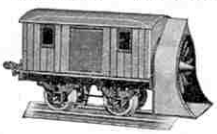


***OPEN WAGON "B"**
Similar to Hornby Wagon No. 1 but fitted with centre tarpaulin supporting rail. Price **2/-**

No. 1 SIDE TIPPING WAGON
Excellent design and finish. Lettered "Robert Hudson Ltd." Price **2/-**

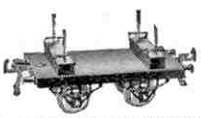
WINE WAGON DOUBLE BARREL
An attractive model artistically enamelled in red and green. Price **4/6**

No. 1 TIMBER WAGON
Beautifully enamelled in yellow and red. Price **1/6**



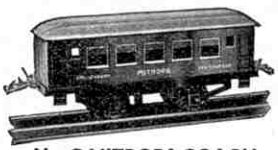
SNOW PLOUGH
With revolving plough. Price **3/9**

***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**

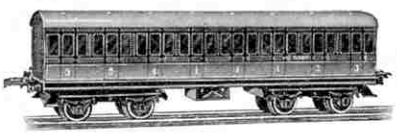
BITUMEN TANK WAGON "COLAS"
Finished in blue. Price **3/6**



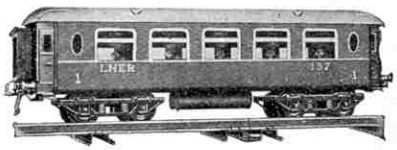
No. O MITROPA COACH
Finished in red with white roof. Lettered "Mitropa," with either "Speisewagen" or "Schlafwagen" in gold. Price **1/6**

No. O MILK TRAFFIC VAN
An attractive model. Available lettered G.W. only. Price **1/9**

COAL WAGON
This is similar to Hornby Wagon No. 1. It is fitted with embossed representation of coal. Price **2/3**



***No. 2 PASSENGER COACH**
Suitable for 2 ft. radius rails only. First-third, or Brake-third. Price **7/6**



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**

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**

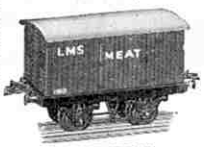
No. 2 TIMBER WAGON
Beautifully enamelled in green and red. Suitable for 2-ft. radius rails only. Price **2/6**

No. 2 LUMBER WAGON
Fitted with bolsters and stanchions for log transport. Suitable for 2-ft. radius rails only. Price **2/11**

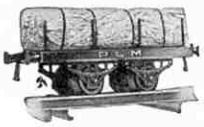
*In L.M.S., L.N.E.R., G.W. or S.R. lettering.

BRAKE VAN
Finished in grey, with opening doors. Obtainable with L.M.S. or G.W. lettering. Price **2/11**

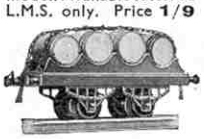
OIL TANK WAGON "CASTROL"
An attractive model. Enamelled green with lettering in red. Price **2/-**



MEAT VAN
This is a very realistic model. Available lettered L.M.S. only. Price **1/9**



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

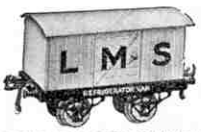


BARREL WAGON
This is another interesting model of a type of wagon used in France and other European countries. Price **2/6**

GAS CYLINDER WAGON
Finished in red, lettered gold. Price **1/11**

COVERED WAGON (French Type)
This wagon is fitted with frame and sheet. Lettered "Nord." Price **2/6**

No. 1 ROTARY TIPPING WAGON
Finished in orange. Price **2/6**

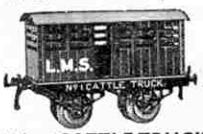


***REFRIGERATOR VAN**
Beautifully enamelled. Fitted with opening doors. Price **2/9**

CHOCOLATE VAN "CADBURY'S"
This van is beautifully enamelled in blue with white roof. Price **2/9**

No. 1 CRANE TRUCK
Finished in brown and blue. Price **2/11**

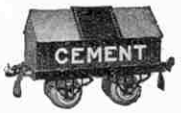
***HOPPER WAGON**
Mechanically unloaded. Finished in green. Price **3/6**



***No. 1 CATTLE TRUCK**
Fitted with sliding doors. Very realistic design. Price **2/9**

MILK TANK WAGON "UNITED DAIRIES"
A very realistic model, finished in blue and white. Price **4/6**

FISH VAN
This is a distinctive model. Available lettered N.E. only. Price **1/9**



CEMENT WAGON
The door at the top opens. Finished in bright red. Price **2/6**

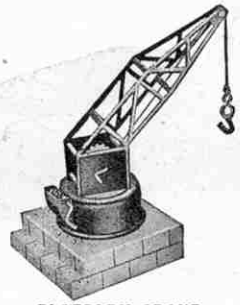
Manufactured by **MECCANO LIMITED, BINNS ROAD, LIVERPOOL 13**

HORNBY SERIES

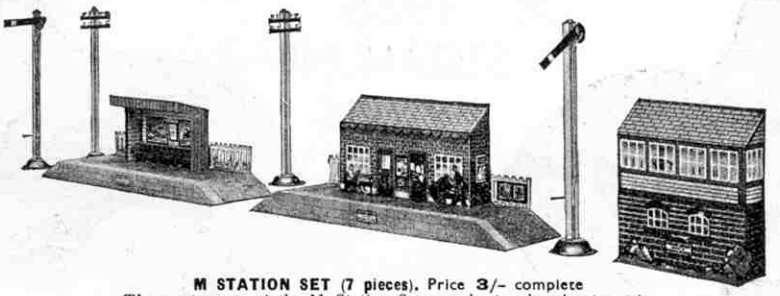
HORNBY ACCESSORIES

GAUGE 0

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.

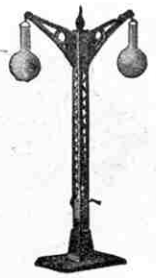


PLATFORM CRANE
Fitted with a crank handle and ratchet mechanism
Price **3/11**



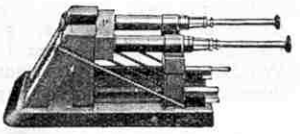
M STATION SET (7 pieces). Price **3/-** complete
The components of the M Station Set may be purchased separately.
M Signal Box. Price **4d.** M Signal. Price **4d.** M Station Price **1/-.** M Telegraph Pole No. 1. Price **3d.** M Wayside Station Price **9d.**

No. 1E LAMP STANDARD ELECTRICAL
(Single, as illustrated.)
Price **2/11**

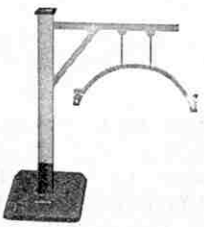


No. 1 LAMP STANDARD
(Single.)
Price **3/3**

STATION HOARDING
This is a realistic accessory, suitable for the station platform. Brightly coloured.
Price **6d.**



No. 2 BUFFER STOPS
(Hydraulic type.) Price **5/6**



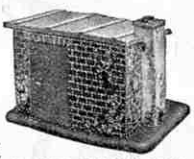
LOADING GAUGE
(Illustrated.)
Price **2/3**
M LOADING GAUGE
Price **1/-**

TUNNEL (Metal)
Price **3/11**

TUNNEL ENDS
Tunnels of varying lengths can be made with cardboard or other suitable material, and then fitted to the Tunnel Ends. Price, per pair 1/6

No. 2E LAMP STANDARD ELECTRICAL
(Double.)
Price **3/3**

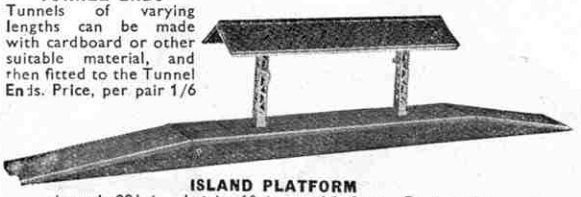
No. 2 LAMP STANDARD
(Double, as illustrated.)
Price **3/9**



PLATELAYER'S HUT
Price **1/-**

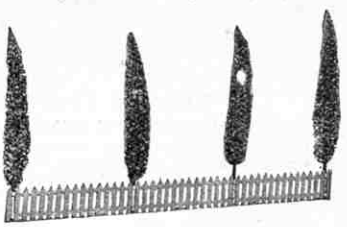
POSTERS IN MINIATURE
These Posters are reproductions of familiar national advertisements. They are intended to be pasted on the Station Hoarding or the Poster Boards.
No. 1 Series.
Packet of 51, Price 6d.
No. 2 Series.
Packet of 51, Price 6d.

No. 7 RAILWAY ACCESSORIES
Watchman's Hut, Brazier Shovel and Poker. Price **10d.**



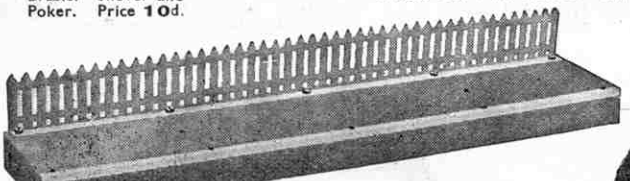
ISLAND PLATFORM
Length 32½ in., height 6¾ in., width 3 in. Price **5/6**
The ramps may be purchased separately. Price, per pair, **1/9**

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 **8/-**



FENCING WITH FOUR TREES
Length 16½ in. The miniature trees are detachable. Price, per pair, **2/6**

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/-**



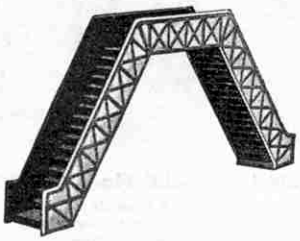
PASSENGER PLATFORM
Length 16½ in., width 3 in. This Platform may be connected to the main Station or used separately ... ... Price **2/-**
The white Paled Fencing may be purchased separately. Price per length **6d.**

All Hornby Accessories are richly finished.

No. 2 TURNTABLE
Price **3/9**

MECCANO LUBRICATING OIL
Specially prepared for the springs of Hornby Trains, Rolling Stock and Accessories.
Price, per bottle, **6d.**

MECCANO 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, **6d.**



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 16½ in., height 6¾ in., width 6 in.
The crane at the end of the platform revolves on its base. Price **10/6**

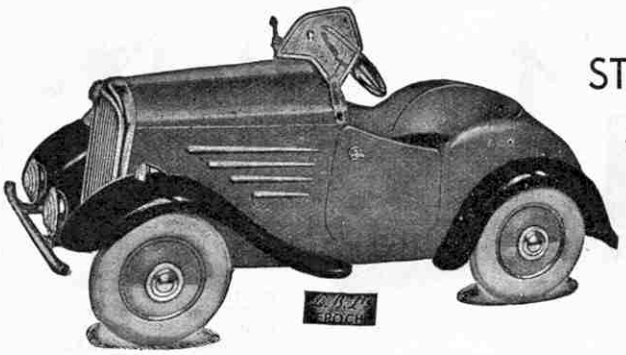
Manufactured by MECCANO LIMITED, BINNS ROAD, LIVERPOOL 13

Regd. Trade Mark

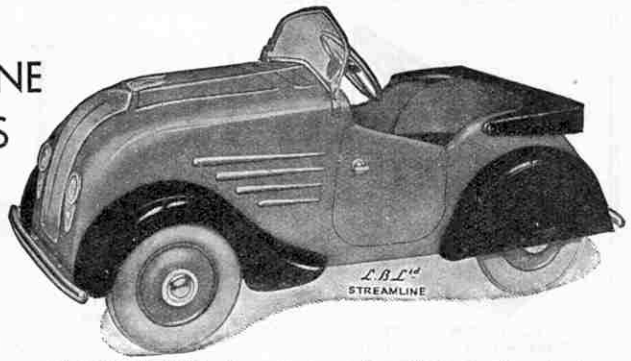
TRI-ANG

Regd. Trade Mark

1936 STREAMLINE MODELS



EPOCH. Latest type sports car, with all steel body. Crank drive on ball bearing back axle. Tubular bumper. Windscreen. Four dummy lamps. Balloon disc wheels with rubber tyres. Adjustable seats. Length 45 ins. **49/6**



STREAMLINE. A real streamline body made of steel. Crank drive on ball bearing back axle. Facsimile Airflow radiator. Four dummy lamps. Tubular bumpers back and front. Windscreen and direction indicator. Balloon disc wheels and rubber tyres. Length 45 ins. **55/-**

MANY NEW **TRI-ANG** MODELS WILL BE ON SHOW AT THE **B.I.F. OLYMPIA.** STAND J1101 FEB. 17th to 28th, 1936.

TRI-ANG TRICYCLE No. 5
FITTED WITH REAR MUDGUARDS

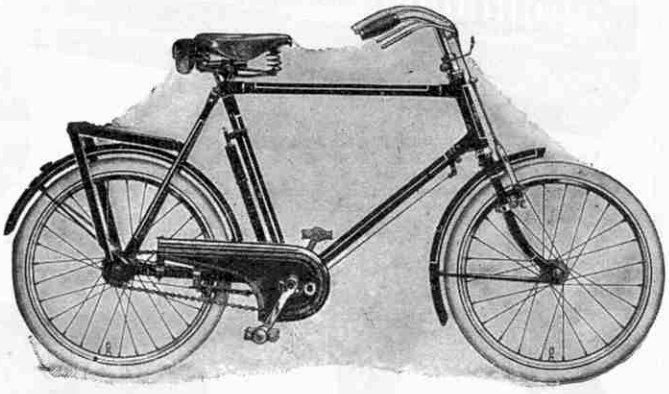
Cycle chain drive with free wheel. Frame of best quality weldless cycle tubing. 14 in. wheels with 1¾ in. sponge tyres. Rim brake. Ball bearing pedals. Coil spring saddle. Finished black or blue cycle enamel. Gold lines. CHROMIUM-PLATED FITTINGS. **59/6**

TRI-ANG "FAIRYCYCLE" (Regd.) MODEL No. 2

Tubular frame. 14 in. wheels. 1¾ in. grey imitation pneumatic tyres. Ball bearing pedals. Rim brake. Two coil saddle. Chain cover Stand. CHROMIUM-PLATED FITTINGS. Black or blue **39/6**

No. 3 TRI-ANG TIP CARRIER CYCLE

New Model with CHROMIUM-PLATED FITTINGS. Strongly made of best weldless steel cycle tubing, ball bearings throughout. Leather saddle. Tangent spoke wheels. Jointless sponge tyres. Fitted with box at rear and special tipping gear. Frame blue, handlebars, forks etc., CHROMIUM-PLATED Box finished red **79/6**



"TRI-ANG UNITY" JUVENILE CYCLE No. 9 (BOY'S)

Frame of best quality weldless steel cycle tubing. Adjustable ball bearings throughout. 16 in. x 1⅜ in. Dunlop pneumatic tyres on rustless tangent spoked wheels. Two rim brakes. Raised handlebars. ½ in. x ⅛ in. cycle roller chain. Three coil saddle. CHROMIUM-PLATED FITTINGS. Black or blue Girl's Model same price **57/6**

Made by

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

NEXT MONTH: "HOW A GREAT LINER IS LAUNCHED." PUBLISHING DATE: 29th FEBRUARY

MECCANO MAGAZINE

Editorial Office:
Binns Road, Liverpool 13
England

Vol. XXI. No. 2
February, 1936

With the Editor

Readers' Suggestions

The extent to which readers have responded to my invitation to express their opinion of the *"M.M"* and to suggest means for its improvement is a gratifying sign of their interest in its progress. In view of the widespread circulation of the Magazine, it is perhaps scarcely surprising to find that in certain instances the suggestions made cancel each other out. For instance, some of my correspondents are in favour of reducing the space allotted to railway matters, yet from others come insistent demands for still more articles of this kind. Similar differences of opinions are expressed in regard to stamp collecting and other regular features. These differences of course are due to the variations in the interests of readers themselves, and illustrate how difficult it is for me to satisfy everybody.

What Readers Are Asking For

Coming now to the actual comments of readers, I find that very few wish me to leave out any of the well-established features that have made the *"M.M"* by far the most popular of all boys' magazines of its kind. The tendency is rather to ask for more, but unfortunately there are limits to the size of the Magazine if its price is not to be increased, which I am sure would not be popular!

Special interest is shown by a large proportion of readers in articles dealing with ships and motor cars, and footplate trips. I already have in hand some interesting shipping articles, including more sea trips by Mr. O. S. Nock similar in character to those that appeared in the October and December issues last year, and proved so remarkably popular. I hope also to resume and extend the road and track notes that in previous years have aroused enthusiasm. I mention this for the special benefit of some correspondents who have indignantly complained of the non-appearance of these notes in recent issues. As for accounts of footplate trips, "Railway Engineer" will deal with further interesting runs during the year.

Other interesting letters have suggested articles on such varied subjects as natural history, photography, British lighthouses, woodworking, county coats-of-arms and rifle shooting! I cannot promise to include contributions dealing with every topic proposed by readers, but as far as is practicable I shall try to meet their wishes where these seem to represent a general desire. I hope therefore that those of my readers who have not already written to tell me what they think of the *"M.M."* will do so as soon as possible.

Tunnelling Triumphs

The news that a tunnel is to be driven under the Thames between Dartford, in Kent, and Purfleet, in Essex, is an interesting reminder of the comparative ease with which engineers to-day can overcome the difficulties that river estuaries present to communications. Whether a tunnel under one of these obstacles is to be driven through rock, clay or the soft mud in the bed of a river, the work can be carried out easily and safely, even when the bores are more than a mile in length and of such dimensions that the roadways in them can readily accommodate four lines of traffic.

Rock boring, such as was necessary in the case of the gigantic Mersey Tunnel, has been made easier by the introduction of electric and pneumatic boring tools, combined with the use of explosives to shatter large masses of rock into fragments. Tunnels of this kind are no longer bored by brute force, as was more or less the case when our earliest railways were constructed, and a wonderful gain in time and cost has followed the use of scientific methods.

Even more striking means of speeding up tunnelling and making greater enterprise possible have been invented for use in boring through river beds. The material in this case is soft and water percolates through it, threatening always to make its way into the workings. The modern engineer prevents this by the use of compressed air. The actual boring is carried out with the aid of the shield invented by Brunel and later improved by Greathead, and the pressure behind this is kept so high that the water is held at bay until the lining has been completed. This method in its turn introduced a second difficulty, for it was discovered that men working in compressed air were liable to a dangerous illness. Even for this a preventive has now been found in the air lock, in which normal pressure is gradually restored before the men leave the tunnel workings.

Penetrating Mountain Ranges

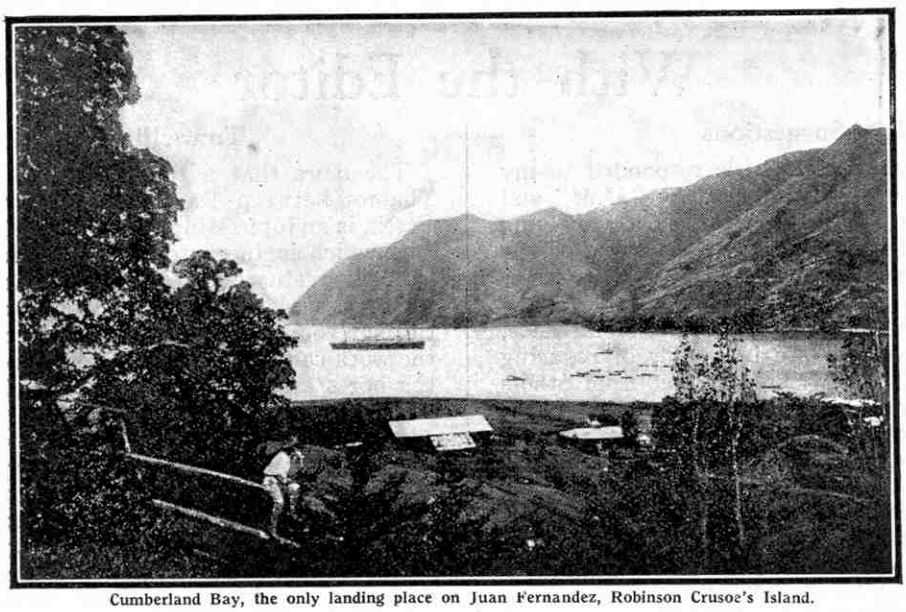
During recent years many wonderful tunnels have been driven under rivers and estuaries, notably under the Mersey in this country, and under the East and Hudson Rivers, New York, in the United States, and it is not difficult to realise that similar tunnels in other places would be a great advantage. For instance, it has been suggested that a tunnel should be constructed under the River Tyne. More tunnels also could be driven under great mountain ranges, and it is not surprising to learn that it is proposed to drive yet another tunnel under Mont Blanc.

Romance of Robinson Crusoe's Island

The Eventful History of Juan Fernandez

By Harold J. Shepstone, F.R.G.S.

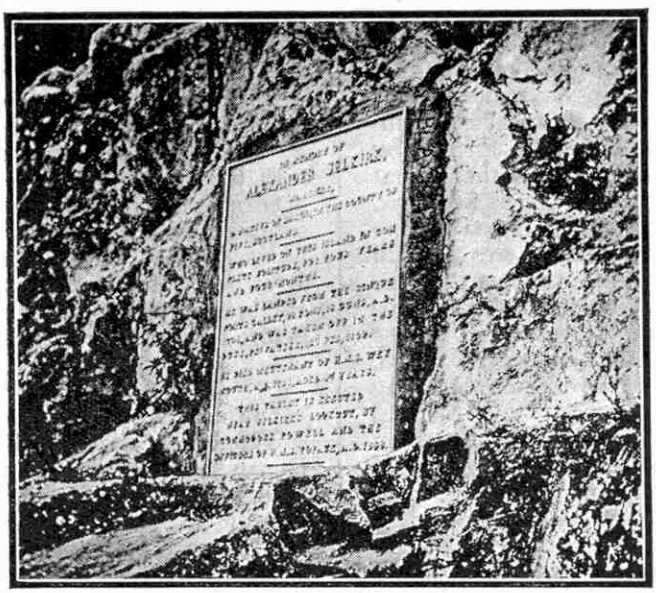
THE news from South America that an enterprising hotel proprietor is about to erect a hostel on Robinson Crusoe's island, Juan Fernandez, and that a regular steamboat service is to be maintained between it and Valparaiso with the idea of attracting visitors to the island, calls attention to its romantic history. It was only recently that the bi-centenary of the death of Alexander Selkirk was celebrated. It was the stirring narrative that this Scottish sailor told of his lonely life on the island that led Defoe to write that masterpiece of adventure, "*Robinson Crusoe.*"



Cumberland Bay, the only landing place on Juan Fernandez, Robinson Crusoe's Island.

Juan Fernandez, which was discovered by a Spanish sailor of that name in 1563, lies some 450 miles off the coast of Chili, to which it now belongs. It is famous, of course, because of the self-imposed residence here of Alexander Selkirk, though he was by no means the first sailor, or even the last, to "crusoe"—if one may use such a term as defining solitary habitation—on the island. After Fernandez had reported his "find" to his government he settled down on the island, saying that he would end his days there. He certainly lived there for a time, but he soon grew weary of the lonely life, and it was not long before he abandoned his kingdom, leaving behind him as a gift to posterity a herd of goats and pigs.

When next the curtain lifts, the island appears as a shelter of the bold buccaneers. It lay conveniently near to the Spanish settlements, for on Spain the buccaneers made war with savage ferocity. Those were the heroic days of filibustering—the days of Lolonnois the cruel; Montbars the exterminator; Sir Henry Morgan, pirate and knight; Sharpe, and Dampier. They took their ships to the island to obtain water, and also to replenish them with fresh meat. For instance, after Sharpe's unsuccessful attempt to surprise La Serena, he and his men anchored off Juan Fernandez. He tells us that he found the shore so thickly covered with seals that he had to shoot a number of them before a landing could be effected. The goats had evidently multiplied, for his sailors signalised Christmas Day by shooting 60. As for pigs, besides those slaughtered for present needs, 100 were salted down. The waters were alive with fish, so that a sailor with a bare hook caught in an hour or two enough for all the crew. Occasionally, at their own free will, or by accident, men from these ships were left behind on the island. The majority only remained a few months, though there is the case of one, an Indian, staying on the island alone for three years. He was accidentally left behind from one of Dampier's ships.



The tablet erected by officers of H.M.S. "Topaze" to Alexander Selkirk.

The real hero of Juan Fernandez, of course, is Alexander Selkirk, who was put ashore on the island in 1704. It was at his own request that he landed, for Selkirk had a grievance against his captain, and the two did not get on well together. Nevertheless, the self-marooned man's heart failed him when he saw the ship about to leave the bay, and he fell on his knees and begged his captain to take him on board again. But a deaf ear was turned to all his entreaties, and the vessel sailed away. It was lucky for him, too, that he was thus left behind, for the ship in which he came was captured by the Spaniards shortly afterwards.

Selkirk was by no means ill-provided for. He had a fair stock of clothes and boots, a tolerable amount of ammunition, a musket, a kettle, some pounds of tobacco, a Bible and other books, and a few mathematical instruments. He had vegetables, too, turnips, parsnips, cabbages, watercress, and parsley. Yet it took him eight months to reconcile himself in any degree to his lot, and when he did finally settle down he did not find life on his island kingdom so easy or so enjoyable as some writers have led us to believe.

Selkirk has told us that he found it extremely difficult at first to get any sleep owing to the multitudes of rats that swarmed over the island. They ate holes in his clothing and nibbled his toes whenever he laid down to rest. In the end he kept the vermin down by means of a band of tame cats. He grew by practice so fleet of foot as to keep his larder supplied with goat's flesh long after his ammunition failed.

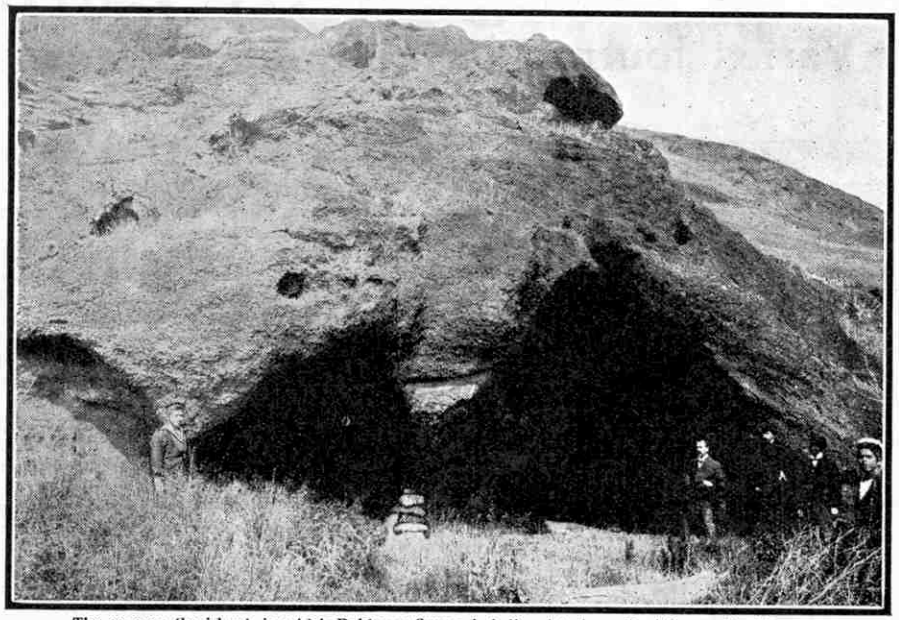
The pimento tree, which flourishes on the island, supplied him not only with pepper, but also with candles and sweet-smelling firewood. He reared a large number of kids to ensure plenty of food in case illness interfered with his hunting, and indeed he was once laid up for almost a fortnight by tumbling over a precipice while pursuing a goat. He beguiled his idle moments by teaching his kids and cats tricks. Clothes he provided out of goat-skins; but he could not manage to make new shoes, so he had to go barefooted when his old ones were worn out.

During his long abode on the island he saw many ships pass, but of these only two put into shore. From them some Spaniards

landed, who, perceiving Selkirk, gave chase. By this time, however, he had learned to run down a goat, and so had no difficulty in keeping his visitors at a safe distance. This was the only occasion on which the outer world invaded his solitude until the arrival of the ship in which he left Juan Fernandez for ever, after a stay of four years and four months.

Captain Rogers, who rescued Selkirk from his lonely kingdom, described him as "a man dressed in goats' skins, and wilder in appearance than the goats themselves." With him the glory of Juan Fernandez passed into fiction, and lives for ever in Defoe's pages. On his return to England, Selkirk met Defoe and told him of his adventures. They are supposed to have met at the Cock and Bottle Tavern in Bristol.

But Juan Fernandez had other castaways besides Selkirk and those already referred to.. Defoe's hero had not left his little kingdom ten years before it was occupied by four deserters from an English ship, but they remained two months only. Again, in 1720, the *"Speedwell"* was wrecked off its shores, and her crew remained there some months, until they built a boat in which they departed, leaving behind them a colony of 11 white men, 13 blacks, and some Indians. These were supposed to have surrendered to, or been massacred by, the Spaniards, for two years later, when the island was again visited, no trace remained of them.

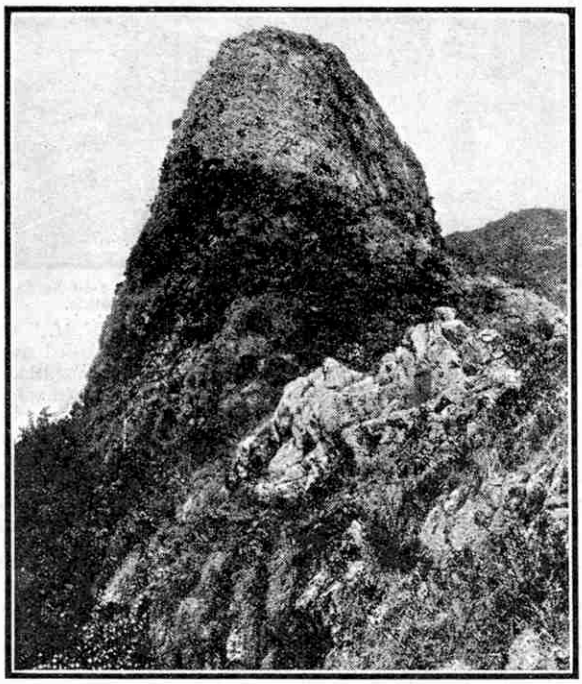


The cave on the island, in which Robinson Crusoe is believed to have lived for nearly 4½ years.

The only people who ever seem to have enjoyed their stay on the island were the members of Lord Anson's expedition in 1741. They had all been suffering terribly from scurvy, and the green food they found there afforded them welcome relief. Lord Anson stayed on the island for three months until his crews had thoroughly recruited. His chaplain has handed down to us an interesting description of the island as he found it at that time. There were plenty of goats and fish to be had in abundance; while radishes and turnips were growing wild in the sheltered valleys. Before they left, Anson planted a number of fruit stones, which soon added to the useful vegetation.

The first goat that was killed by Anson's men had its ears slit. It is well known that Selkirk, when he caught more goats than he wanted, sometimes marked their ears and let them go, and Anson's chaplain contends that this was one of the very goats that had passed through Selkirk's hands. He describes it as "an animal of a most venerable aspect, dignified, with an exceedingly majestic beard, and with many other symptoms of antiquity." Anson's chaplain was the first to apprise the world of a wonderful singing-bird, about as large as an English thrush, that is to be heard to this day on the island.

When Anson returned and wrote an account of his voyage he made many charming references to Juan Fernandez. As a result the Spanish Government became nervous, and fearing England meant to seize it they sent a military force to the island and officially occupied it. That was in 1750. A fort was erected and the place was used as a penal settlement. At that time the post of governor of the island was looked upon as one of the plums of the Spanish services.



Look-out Point, where Crusoe watched for passing ships.

But Spain did not occupy her possession long before the Chilians took it away from her and again turned the island into a penal settlement, and it was used as such for some twenty years during the early part of the last century. It has remained a possession of Chili ever since.

Since 1835 the Chilian Government have leased the island several times to private speculators. In 1868 it was let to Robert Wehrdan, a German engineer, who established a small but thriving colony there; and in the same year H.M.S. *"Topaze"* visited it and erected a tablet to the memory of Alexander Selkirk. In 1877 the island was let to an eccentric Swiss, who wished to taste the delights of seclusion. He took with him a small band of colonists who, from their manner of life, might have been styled the "Swiss Family Robinson," but they soon tired of the experience and came away.

Some 380 persons dwell on the island to-day, 180 of whom are under ten years of age. They are principally fishermen and whalers, and they reside in log bungalows around Cumberland Bay, many of which boast of beautiful gardens with cherry trees. Two schools, a small chapel, a cemetery, a post office, and the new wireless station are the only public buildings. The most noteworthy graves in the cemetery are those of two German sailors from the notorious cruiser *"Dresden,"* the wreck of which lies in Cumberland Bay, where it was sunk in 1915 by the *"Glasgow."*

The island can be reached from Valparaiso in 25 hours by boat, and if a regular service is organised, as at present proposed, and suitable hotel accommodation provided, Robinson Crusoe's island will no doubt attract many visitors. Naturally what will appeal to all tourists are the places associated with Alexander Selkirk. There is the cave, or grotto, which he used as his house, around the walls of which are still to be seen a number of rusty nails and rude shelves and cupboards. Then there is Look-out Point, a lofty pinnacle, over 2,000 ft. above the level of the sea. Selkirk is said to have climbed this very peak every day during his first eight months' stay on the island in the hope of attracting the attention of a passing ship. At the foot of this hill is the tablet erected to his memory.

Although it appears barren from the sea, the island, which is some 12 miles in length and five miles across at its widest part, is well wooded and has many springs. The wild goats are still there, as well as a few wild horses, and many birds of beautiful plumage are to be seen in the woods.

There are trails over the mountains and through the woods. As one clambers over the hills one catches charming glimpses of sea and wooded valleys. When cruising steamers visit the island, as they occasionally do, their passengers invariably spend three or four hours ashore. Such visitors are always welcome. One of the school teachers acts as guide and conducts the party to places of interest. Then there is a chat with the oldest inhabitant and before leaving the island postcards are sent to friends which will bear the mark Juan Fernandez.

Belfast to Glasgow by L.M.S.R.

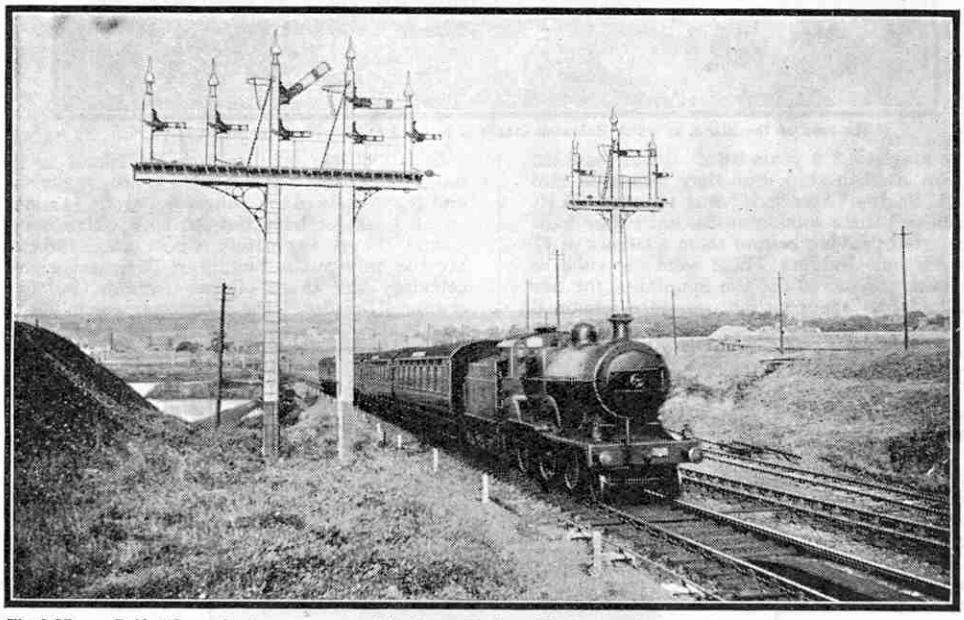
A Varied Journey by Train and Steamer

By a Railway Engineer

ONE could hardly imagine an inter-city journey that offers a greater variety either of scene, or of travel interest, than that from Belfast to Glasgow. First comes a dashing half-hour's run from Belfast to Larne by the N.C.C. boat "express"; then a sea passage of great charm; while it would be hard to find a route in the British Isles that makes more fluctuating demands on the locomotive than that covered in the Scottish portion of the journey, from Stranraer to Glasgow.

I made the trip by the 9.37 a.m. train from Belfast. This does not give quite such a fast overall time as the evening mail, which leaves at 6.25 p.m., but the running times are actually faster. This morning service is only operated during the summer months and reaches Glasgow at 3.16 p.m. The luxurious corridor stock of the *"North Atlantic Express"* is used, and as the latter only arrives from Portrush at 9.29 a.m., smart working is needed to get the boat train away at 9.37 a.m.

On this occasion, by the kindness of Major Malcolm Speir, Manager and Secretary of the L.M.S.R., N.C.C. Section, I rode down to Larne on the engine, and a more thrilling footplate trip I have never experienced. The engine was a superheated 4–4–0, No. 81, *"Carrickfergus Castle,"* which belongs to a class very similar to the L.M.S.R. standard Class 2P 4–4–0s but having 6 ft. diameter coupled wheels against 6 ft. 9 in. Our load was one of six coaches, 174 tons tare and 185 tons with passengers and luggage. The weather was rather doubtful at the start; a slight drizzle was falling and the rails were greasy in consequence.



The 9.37 a.m. Belfast-Larne boat express approaching Larne Harbour. The locomotive is 4-4-0 No. 81, "Carrickfergus Castle," on which was made the footplate trip described in this article.

The *"North Atlantic Express"* arrived on time almost to the second; No. 81 backed quickly down, and I joined Driver O'Neill and Fireman Kerr on the footplate. These engines have cabs which, though less commodious than those of the Moguls described last month, are considerably more roomy than most 4–4–0s on account of the wider gauge. The regulator is of the double port type as in the Moguls, but the reversing gear is operated by a notched lever. Although the booking of 30 minutes for a 24.3 mile run does not suggest anything very wonderful, this schedule actually involves some extremely smart locomotive work. The finish into Larne is made slowly on account of severe curves, while restrained running is needed also in the neighbourhood of Whitehead for the same reason.

Almost immediately, O'Neill opened on to the second regulator, using 42 per cent. cut-off; then, half-a-mile out, the gear was linked up one notch, to 32 per cent., and the regulator brought back slightly to about two-fifths open. In the meantime we were accelerating with tremendous rapidity along the shore of Belfast Lough, and were through Whitehouse, 3¼ miles, in 5½ minutes at 55 m.p.h. The regulator was now opened wider, and with the exhaust, already sharp, developing into a roaring tattoo, we tackled the rise to Greenisland. At Bleach Green Junction the Larne route diverges, and a moment later we dived under the graceful reinforced concrete viaduct carrying the main line, ourselves also on a high viaduct. The engine was going splendidly; except for a momentary drop to 49 as we passed Bleach Green, the speed was maintained at 51–52 m.p.h. all the way up the 1 in 136–157–97 rise to Greenisland, and we were through this junction, 6.7 miles, in 9½ minutes.

For 100 yards or so after we were over the top of the bank O'Neill let the engine accelerate rapidly without easing the regulator, but then he changed over to the first valve. Two-and-a-half minutes later we flew through Carrickfergus at 69 m.p.h., though speed was eased to 62 for the curves beyond. From this point the line is practically level all the way to Larne, such gradients as do occur being quite short. We were now once more running along the shores of the lough. Across the water were the rolling hills of County Down, terminating northward in Orlock Head and the Copeland Islands, while a brief backward glance towards Belfast showed the mellow ruined castle, after which our engine is named, standing in a commanding position right on the water's edge.

Once we were down on the level, harder going was needed than the first regulator, and on passing Downshire Park O'Neill opened out to three-fifths. The exhaust once again sharpened into a roar and we rocketed round the curves at an exhilarating 66 m.p.h., with high red cliffs on one side and the sea just below us on the right. The riding of *"Carrickfergus Castle"* on certain sections was decidedly reminiscent of that fiery L.N.E.R. "Atlantic" of whose exploits I wrote in the September *"M.M.,"* though in this case, owing to the wider gauge, the rolling died away much quicker.

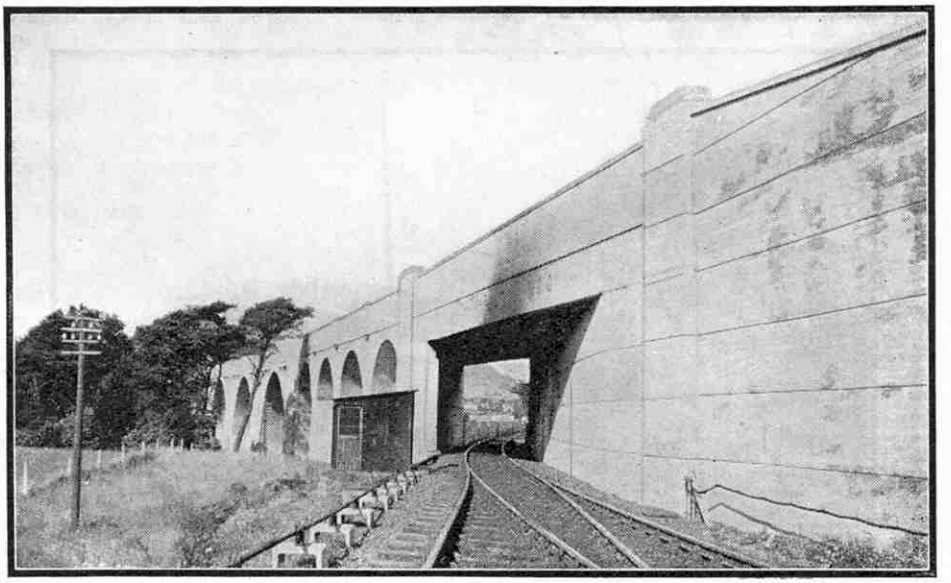
The striking bluff of Black Head now came in sight, but a moment later the view seaward was cut off as we turned sharply inland and dived through Whitehead tunnel. A severe permanent way slack was in force just beyond this station, and we slowed carefully to 25 m.p.h.; but the moment we were over the affected length the engine was fairly opened out. Single line working begins at Whitehead, so that tablet exchanging at speed was now added to the thrill of the journey. We regained full speed very quickly and were soon flying alongside the upper reaches of Larne Lough at 65 m.p.h. The pace was eased a little round the curves at Magheramorne, but going once again on half regulator and 32 per cent. cut-off we reached a final maximum of 66 m.p.h. through Glynn.

By now a magnificent scene had opened out. Far across the water on the right were the jetties and station of Larne Harbour. The lough is very narrow at its entrance, but almost immediately broadens out into a spacious basin. The town of Larne lies well back from the sea beneath lofty hills, and the railway swings round in a wide curve in order to reach the Harbour station. We slowed down to 25 m.p.h. to take the sharp curve through the town station—a curve so severe that the tablets have to be exchanged by hand—and then, although a bare mile from journey's end, full steam was put on again. Accelerating rapidly, we were up to 43 m.p.h. before the final slowing down commenced, and then we stopped at the Harbour station within 3 seconds of time—29 min. 57 sec. from Belfast. Allowing for the check at Whitehead, the net time was only

28½ min., a very smart piece of work for a 4-4-0 locomotive.

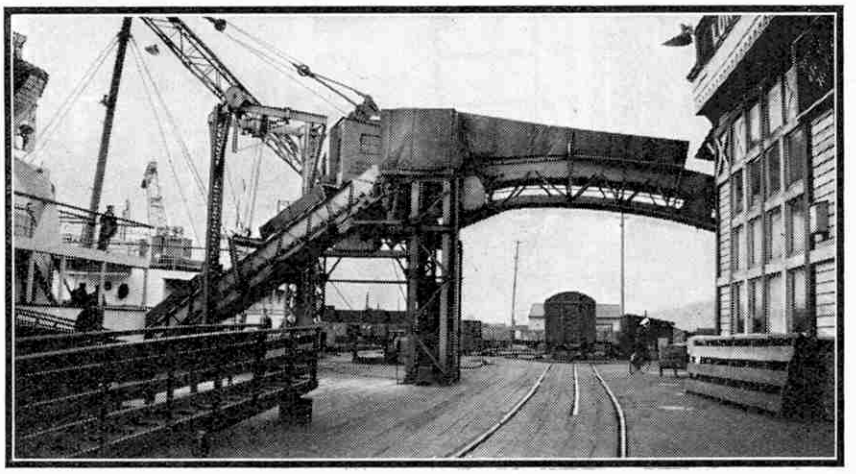
* * * * *

Hustle did not cease with our arrival at Larne, for precisely eight minutes after the train stopped, the *"Princess Maud"* steamed out for Stranraer. This, far from being a special feat, is the regular schedule time, and is made possible by transferring all luggage and mails from train to steamer by means of a belt conveyor. The principle of this belt is the same as that of those used in modern mass-production factories. At Larne it is carried alongside the track on which the boat trains arrive, level with the luggage van floors, so that it is only necessary to place each package on the moving belt just outside. The belt is carried high above the landing stage and then on to a movable arm like the jib of a crane. When a ship is being loaded or unloaded this arm is lowered on to the deck, and at other times when the belt is not in use it is hoisted up out of the way. The efficiency and economy of this method are obvious.



The Larne line passing beneath the ferro-concrete viaduct carrying the Portrush line at Greenisland. The Larne line is itself carried on a similar structure immediately after passing underneath.

Since we left Belfast the weather had cleared beautifully, and for the rest of the day we were treated to the marvellous visibility that follows rain on the west coast. As we came out of the lough, and were swinging round East North-East, there was a magnificent view of the Antrim coast stretching away northward. Just to the north of Larne is a group of dangerous rocks known as the Maidens, one of which is crowned with a fine lighthouse. And now, across a sea sparkling in the sunshine, was spread out a panorama of rare beauty. To the north lay the southernmost islands of that romantic archipelago that fringes the west coast of Scotland; far away on the north-west horizon was Islay, while a little to the east were the mountains of Jura, vague dim-blue shapes riding out at sea. Nearer at hand was the Mull of Kintyre, while still further east, in the Firth of Clyde, lay Arran with its tremendous array of wild peaks. The Scottish mainland was as yet a long line of rolling hills, as it was impossible at this distance to pick out much detail. Looking southward as we got further out, the Copeland Islands and the entrance to Belfast Lough came into the picture and completed a circle of enchanting seascape.



The belt conveyor at Larne Harbour. Its employment in transferring luggage and mails between train and steamer enables connections to be effected with the minimum of delay.

We got away from Larne with such speed that there was no time to pay much attention to the stately ship in which we are now travelling. In outward appearance the *"Princess Maud"* and her sister ship *"Princess Margaret"* are quite distinctive among L.M.S.R. cross-channel ships, having only one funnel and a cruiser stern. In both these respects, and also in their general dimensions, they bear a striking resemblance to the latest Southern Railway ship on the Dover-Calais service, the *"Canterbury."* The latter vessel, however, uses oil fuel, whereas these two L.M.S.R. ships are coal fired.

Although the crossing takes only two hours, the *"Princess Maud"* and *"Princess Margaret"* are most luxuriously appointed. One of the most delightful saloons is an observation lounge just beneath the bridge. From this, even in wet weather, passengers can have an uninterrupted view of the sea ahead. At first sight it seems strange that both ships should have a large number of sleeping berths. The reason is that in the case of the 8 p.m. night service from St. Enoch, *"The Irishman,"* passengers go on board on arrival at Stranraer at 10.52 p.m. but the steamer does not sail till 6.5 a.m. the next morning, and Belfast is reached at the convenient hour of 8.58 a.m.

The general lay-out of the main turbines is rather similar to that of the *"St. Briac,"* which was described in the December number of the *"M.M."* Each turbine develops 2,700 h.p. while running at 3,000 r.p.m., the speed being 20 knots. Steam is supplied by four water-tube boilers of the usual Babcock and Wilcox type, each being fired by a mechanical stoker. Killochan coal is used; this is very small, no piece being bigger than a half-inch cube, and is fed into the furnaces through cylindrical rams, the speed of which can be regulated to meet every demand for steam. The working pressure is 225 lb. per sq. in.

Interesting though the engine rooms were, especially in the contrast they provided with the footplate of *"Carrickfergus Castle,"* I was not sorry to leave their hot steaminess for the bracing air on deck. Familiar Irish landmarks were becoming vague in the distance and the heather-clad hills of Galloway were drawing steadily nearer. A brilliant white lighthouse marked the entrance to Loch Ryan up which we sailed to Stranraer, but the most striking object was now the rocky islet of Ailsa Craig, which rears itself up so dramatically in the Firth of Clyde. It somewhat resembles the Bass Rock, off the Lothian coast, but has a much more pointed summit. The heather was in full bloom on the Galloway hills, and as we entered Loch Ryan the gradations of purple were indescribably lovely.

The sail up Loch Ryan is typical of many Scottish sea lochs. Along the shore is a belt of prosperous farming country and above that the hills gradually rise to their heathery summits. Here and there a small mountain burn enters the loch, and up its glen there is a vista of wilder, more lonely hills beyond. On this occasion the King's Cup Air Race was in progress, and as Portpatrick, not many miles from Stranraer, was one of the turning points, many of the competitors flew over us as we sailed up the loch. Most of them were too high to be recognised, but one monoplane passed very close flying extremely fast.

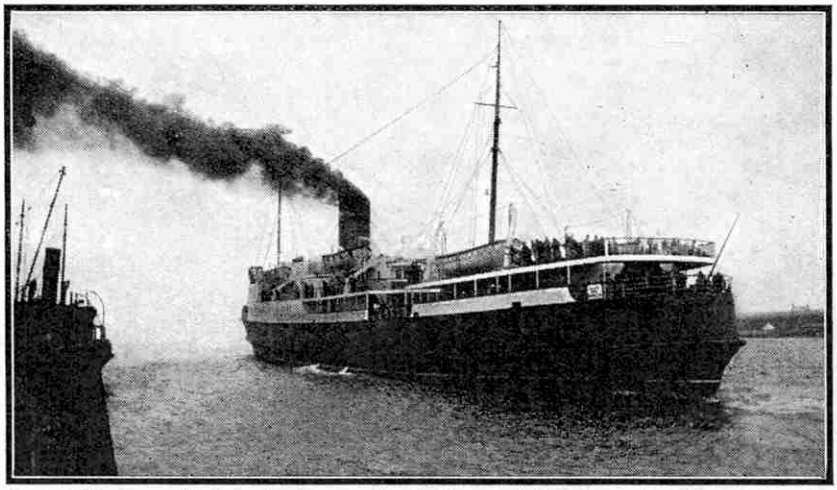
By now we were nearing Stranraer. Loch Ryan is very shallow at its head, and the railway is built on a narrow causeway that juts far out in the water. Even so, such big steamers as the *"Princess Maud,"* which has a gross tonnage of 2,800, approach the jetty at dead slow speed at low tide. The trains run right alongside the landing stages and, as at Larne, transhipment is carried out very smartly, though in this case there is no belt conveyor to assist. We berthed at 12.15 p.m.—two hours to the minute from Larne.

* * * * *

Two expresses run in connection with this steamer. At 12.25 p.m. a luncheon car express leaves for Dumfries and Carlisle. This carries

a through coach for London, Euston, which is attached to the up *"Mid-day Scot"* at Carlisle. On the occasion of my trip this train conveyed a heavy load of nearly 300 tons, and was hauled by two Standard 4–4–0s of Class 2P. The Glasgow train, which leaves at 12.35 p.m., is known as *"The Fast Belfast,"* and had a modest load of only four coaches, a total load of 140 tons; the engine was a Midland Compound, No. 914. These Glasgow-Stranraer boat trains were for many years known by the nickname of the *"Paddies,"* before they were given official names. As far as Ayr, however, the route is terribly severe, and even with this light train some really hard locomotive work was needed.

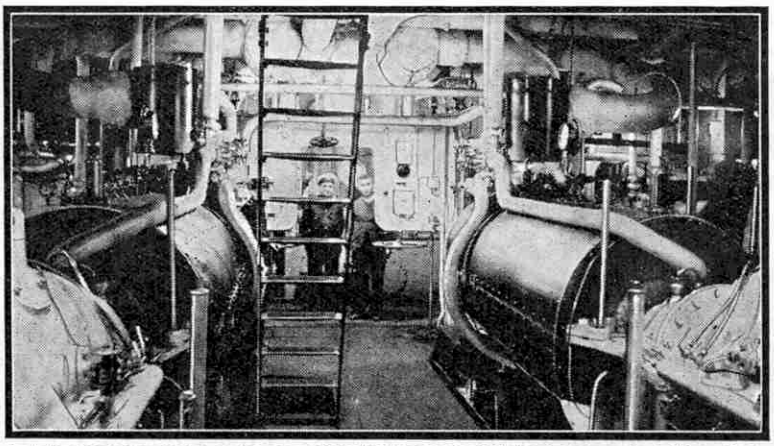
For the first seven miles Glasgow trains follow the Carlisle route, and over this section we were delayed somewhat by the train in front. The line is single throughout, and some difficulty was experienced at one of the passing loops, where a goods train had to be crossed, owing to the length of the train. So we left Dunragit six minutes late, but from here onward did some excellent work. At Challoch Junction, where we diverge from the Carlisle route, the line is right on the shore of Luce Bay and the prospect southward is delightful. Beyond golden sands the coast stretches away to the Mull of Galloway, while far out in the Irish Sea is the Isle of Man.



The L.M.S.R. steamer "Princess Maud" engaged on the Larne and Stranraer service. With her sister ship "Princess Margaret" she shares the distinction among L.M.S.R. ships of having one funnel and a cruiser stern.

From Challoch Junction follow 14 miles of very severe ascent to Chirmorie summit, 690 ft. above sea level. During this climb the line winds over the western spurs of the Galloway Highlands, and beyond New Luce especially is wild in the extreme. The climbing was made more difficult on this trip as we were stopped at the latter station in order to cross a down express. Thus we had to restart up the stiffest part of the whole climb. For three miles beyond this point the line rises at 1 in 57; No. 914 was evidently opened well out, for we maintained the excellent speed of 27 m.p.h. There is a slight dip through Glenwhilly, which cannot be taken advantage of for speed recovery, however, as a slack is necessary to exchange tablets—as always on this route, by hand. But up the subsequent 1 in 94 to the summit we maintained a steady 41 m.p.h., the engine roaring heartily all the way.

Chirmorie summit is a very lonely spot. A vast expanse of wind-swept moorland, rugged outcrops of rocks, snow fences to protect the railway, and a distant view of the Merrick range away to the east, make up a very austere picture. Eight and a half miles of steep descent at 1 in 70 now follow, but on account of the curves we did not get above 61 m.p.h. In the meantime the wild hill-country gives place to rough upland pasture. Below Barrhill the speed rose to 65 m.p.h., but we were soon slowing down again to take the loop through Pinwherry. The luxuriant vegetation here, the profusion of flowers, and the rich green of the meadows is the very opposite of the bleak country we passed through barely ten minutes ago.



An interesting view in the engine room of the "Princess Maud," showing the main turbines. Each develops 2,700 h.p. at 3,000 r.p.m., the speed of the vessel being 20 knots.

Hard climbing follows, at 1 in 70, up the valley of the River Stinchar. Here No. 914 steadily maintained 30 m.p.h. and had accelerated to nearly 35 ere we entered the summit tunnel. We emerge on the hillside high above Girvan with a prospect that almost takes one's breath away. Far below is the Firth of Clyde, alive with shipping and shimmering in the brilliant light; Arran lies behind, its peaks intense blue. What rivets the attention, however, is Ailsa Craig, a huge cone-shaped rock, standing grape-blue in the sea, its appearance at the same time majestic and sombre, for there is no fringe of sand or beach to relieve the stark rockyness of its shores.

The descent into Girvan is precipitous, at 1 in 54, and speed was not allowed to exceed 50 m.p.h.; but still we completed the 31¾ miles from Dunragit in 53 minutes, instead of the 54 minutes booked, in spite of the stop at New Luce. The net time of 49 minutes showed a gain of five minutes to engine, no mean performance over a route of such difficulty.

From Girvan onward the line is double tracked. Throughout the next 22 miles, to Ayr, the railway is a veritable switchback. Generally speaking we maintained an average of 35 to 40 m.p.h. uphill and 60-65 down, while the 21.4 miles from Girvan to Ayr were run in 32 minutes, including a brief halt of half a minute at Maybole. Schedule is 35 minutes, and we thus regained a further 3 minutes, reaching Ayr practically on time.

The last stage into Glasgow is one of the busiest stretches of line in Scotland, and throughout its 41½ miles it is practically dead level. This train is allowed 55 minutes, inclusive of a stop at Paisley, and with so light a load as 140 tons, it is of course a very easy task for a Compound.

Leaving Ayr the line quickly approaches the Firth of Clyde. Across the water the Isle of Arran looked magnificent with a mass of piled-up cumulus cloud hanging over the highest peaks. In the immediate foreground sunshine made brilliant play on the waters of the Firth. We bowled along past a string of famous golfing resorts, Prestwick, Troon, and Barassie, but after Irvine the line bears away from the coast and runs through a considerable coalfield. Beyond this comes a stretch of beautiful lowland country, the gem of which is the narrow Loch Winnoch lying in a shallow trough of the hills.

Soon, however, signs of industrialism crowd on all sides, but beyond Elderslie the really big mountains lying to the north of the Clyde can now be seen, with Ben Lomond soaring to a height of 3,192 ft. Soon we drew up at Gilmour St. station, Paisley, the 33¾ miles from Ayr having taken 41 minutes, as booked.

Immediately after leaving Paisley there is a fine view towards the Clyde. The river lies in a trough and cannot be seen from the train, but its course can be traced by an almost continuous succession of shipyards with their towering electric cranes. One yard, and one yard only, however, is the cynosure of all eyes, that of John Brown and Co. Ltd. at Clydebank. Even at this distance the Cunard White Star giant, *"Queen Mary,"* can be clearly seen, and at the time of my journey the first funnel was just in position.

Beyond this point the line runs through densely populated suburbs. From Shields Road inward, train movements are under the control of St. Enoch signal box; this is the largest all-electric signalling installation in Scotland. Three-aspect day colour-light signals are used, while all interlocking on the lever frame is carried out electrically without any mechanical locking.

Running very cautiously now we crossed the Clyde viaduct, getting a remarkable impression of Glasgow's river, and, passing the now disused St. Enoch engine shed, came slowly under the great arched roof of the terminus, dead on time, having run the 101 miles from Stranraer in 166 minutes.

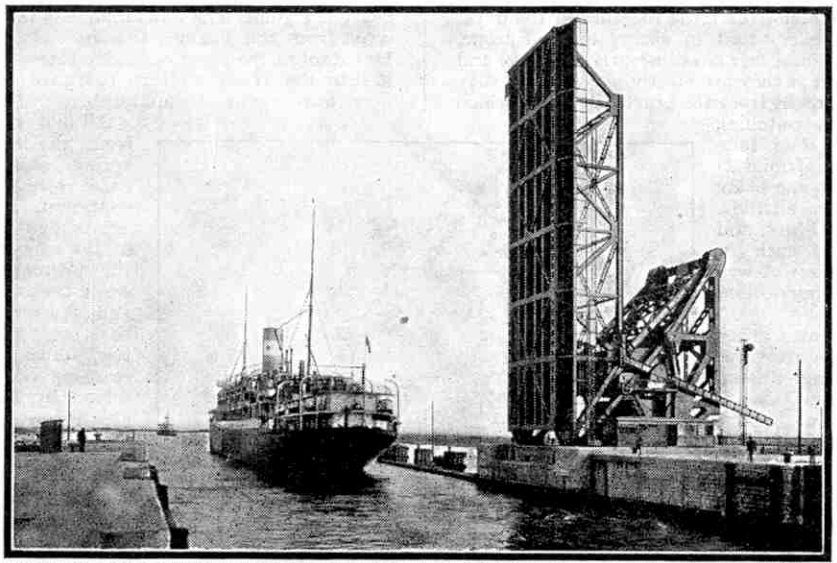
Europe's Greatest Bascule Bridges

Two Fine Structures at Antwerp Docks

By Hans F. Kutschbach

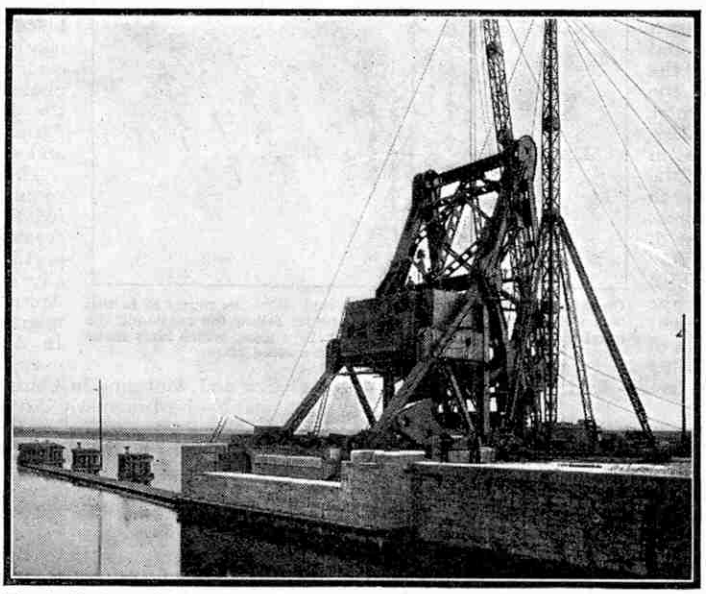
DURING the last few years extensive improvements have been carried out at the docks and harbours of Antwerp, including the construction of two giant bascule bridges to enable street and railway traffic to pass through the dock area. One of the bridges, which were built by Demag, Duisburg, Germany, is illustrated on this page.

The bascule type of bridge was chosen because a structure of this kind takes up little room, and can be opened and closed quickly so that traffic is interrupted for only short intervals of time. Also a bascule bridge can be erected without obstructing traffic on the waterway during the process. The leaf or bascule of the bridge illustrated on this page is 131 ft. in length, carries double line railway track and two footpaths, and has a total width of 44 ft. It weighs alone 360 tons and is provided with a counterweight that is attached to a lever mounted in a triangular frame about 36 ft. above the roadway. This frame can be moved in such a manner that as the bridge is raised or lowered the counterweight sinks or raises simultaneously and counterbalances the weight of the leaf, thus reducing the power required from the operating motors. The counterweight is made of concrete and scrap and weighs about 685 tons.



One of the two giant bascule bridges at Antwerp docks. The leaf is 131 ft. in length and weighs 360 tons.

The driving power is provided by two motors, each of which is capable of opening and closing the bridge at half maximum speed, so that the drive can still continue to function if one of the motors should fail. The power of the motors varies automatically during the movement of the leaf, in accordance with increases or decreases in the resistance due to wind pressure, which varies from time to time.



The double lever of the counterweight being built on to the supporting frame in which the engine house is located.

Electric brakes are provided, so that if the speed of the bascule tends to exceed that of the motors its movement is checked. The opening and closing of the bridge normally occupies about one minute, and all the movements, including opening and closing of the traffic barriers at the approaches, are controlled from a cabin situated close to the bridge.

The power plant is accommodated in an engine house 19 ft. above the ground, and in addition to the motors there are two hand-operated windlasses for operating the bridge in case of emergency. With the hand drive eight men can raise or lower the bridge in about one hour, against a wind pressure of 5 lb. per sq. ft.

When the bascule is in its fully raised position it is held by two automatic interlocking hooks, and these must be released before it can be lowered. This task is performed automatically by means of powerful electromagnets, which function when the main switch that controls the current to the driving motors is closed.

Shortly before the bascule reaches its fully lowered and raised positions the speed of the driving motors is automatically gradually reduced, and the motors are then brought to a stop by limit switches. In order to prevent the bascule from settling down too violently at the end of the lowering operation, liquid buffers are provided in the abutment.

Extensive safety devices are installed to ensure the smooth operation of the bascule, and the motors for the various drives are interlocked electrically with each other in such a way that they can be switched in only in the correct sequence. Signals at the approaches give warning to traffic as to whether the roadway is clear or not.

Marvels of Bird Migration

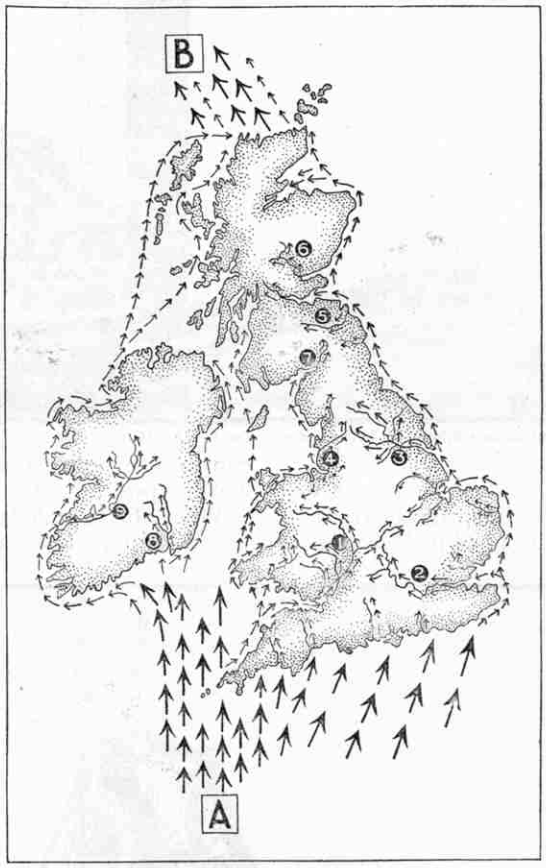
Striking Flights by our Spring Visitors

By Eric Hardy, F.Z.S.

MIGRATING birds mostly fly by night and rest and feed by day, and thus we seldom meet with big migration flocks in our rambles. At night, even in cities, a sudden thrush-like call from the darkness often can be overheard, however; this is the call of the leader of a migration flock keeping the birds together in the dark.

The millions of bird travellers that in spring enter Europe, chiefly from Africa and Asia Minor, use coastlines, river valleys and mountains as their guides, and as they are mostly long-sighted they can make out these forms at night from the great heights at which they often fly. Astronomers watching the skies at night through their telescopes sometimes see parties of migrating birds, those of duck and geese being as much as 1,000 ft. or more in altitude. On misty nights the birds fly lower, and turn towards bright lights, such as lighthouse lanterns or the glares of well lighted towns and cities, as if hypnotised or dazzled.

The great migration routes they follow from Africa to Europe are three in number. The first, serving Russia, Turkey, Roumania and Poland, that is Eastern Europe and a little of Central Europe, passes from the Nile Valley up the coast of Palestine and across Asia Minor and the Bosphorus. The second, probably the most crowded of the three, is followed by birds flying to Central Europe and by some of those travelling to Western Europe and the British Isles. It crosses the Mediterranean Sea round Malta to Italy and then passes over the Alps into Austria and Germany. The third stream of migrants, consisting of birds travelling to Western Europe, leaves Africa at Morocco and follows the coasts of Spain and France. On their way up the French coast some of these birds break off and travel overland, later crossing the English Channel to the Downs and the east coast of England. Others enter Cornwall, and the main stream of these migrants passes along the North Devon coast, where it breaks up, some of the birds going up the Severn valley to Wales and the Midlands, others across the Bristol Channel, along the coast of Pembrokeshire and over Cardigan Bay to North Wales, reaching the North of England and Lakeland by way of the Dee Estuary. A branch of this flight passes over the Irish Sea to the Isle of Man and thence to Scotland, and other birds reach Ireland directly from Land's End and there follow routes along the coast.



On this map the arrows show the spring migration routes of British bird visitors from the south. These routes follow the coast and the numbers indicate the principal river valleys along which birds make their way inland to their nesting places.

The map reproduced on this page shows the migration routes of the birds entering Great Britain. The large arrows marked A show how they arrive on our southern coasts and the smaller arrows indicate their subsequent courses to their summer quarters. It will be seen that the birds arrive earliest along our coasts. They work inland up the valleys, the most important routes in the British Isles being the courses of the Severn, the Thames, the Humber, the Dee, the Forth, the Tay, Solway Firth, the rivers entering Waterford Bay and the Shannon, which are numbered 1 to 9 on the accompanying map. Our spring migrants also arrive earlier in the west than in the east, the earliest making their appearance in Cornwall and Pembrokeshire and the latest district to receive visitors being north-east Scotland. The arrows at B show the routes followed by the birds that fly onward to nesting places farther north than the British Isles and by others that winter in this country and spend their summers nearer the Arctic Circle.

The general direction of migrating birds in spring of course is northward, but there is one part of our coast where the strange sight can be seen of spring migrants actually flying southward. This is on the Norfolk side of The Wash, and is due to their need for the coast as a guide. The birds following this route come up the Norfolk coast from the Thames Estuary, so far flying northward, but at Hunstanton the coast suddenly turns to the south and they follow it into the Wash, to turn eastward to Skegness and eventually northward again to the Humber.

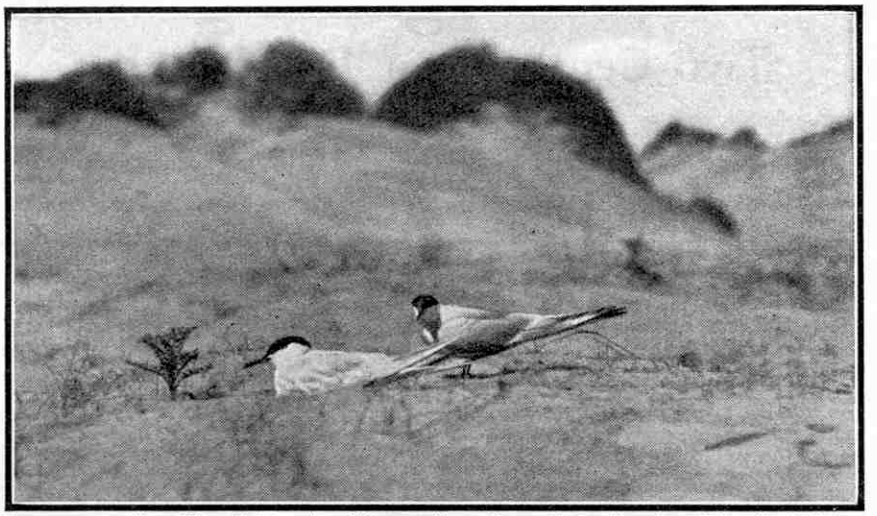
All our migrant birds do not come from the same winter quarters each spring. Most of our summer visitors come from Africa, but Africa is a large continent. For years naturalists could not understand why certain birds, such as the wheatear, the chiffchaff warbler, the yellow wagtail, the ring-ouzel or white-breasted blackbird of the moors, and the wryneck, arrive much earlier than other migrants, and why the swift, turtle-dove and nightjar are so tardy in reaching our shores. The problem was solved by fixing numbered aluminium identity rings to the legs of captured birds, which were then released, later captures revealing their African haunts. It was then realised that the wheatear arrives in England earlier than most birds because it has the least distance to travel, for it winters in North Africa. The nightjar, swift and other birds arriving late, winter in Central and South Africa, and take a month or more to make their home flight. Similarly the terns or sea-swallows of our sand-dunes, which are not true swallows but swallow-tailed gulls, puzzled the naturalists of the last generation, for the big, yellow-billed Sandwich tern arrives on our coasts nearly a month earlier than the red-billed common tern. We now know the explanation, for it has been discovered that the Sandwich tern winters in West Africa, and the common tern in Natal and other parts of South Africa.

The arctic tern, which unlike the common tern has a dark tip to its coral red beak, is believed to be the world's greatest migrant, for it nests farther north, and winters farther south than any other tern. Its range includes the Arctic and Antarctic Circles, so that its migration route may cover 20,000 miles. In America, the golden plover covers over 2,000 miles, nesting in North America and wintering in Central America or the north of South America. No bird regularly crosses the Atlantic from east to west, though the kittiwake and other birds occasionally do, for the migration routes lie nearly from south to north.

Our British swallows are famous for the homing instinct they display in returning year after year to the same nest in a barn or stable. In trials with marked swallows in Germany, birds caught after migrating home, and released more than 100 miles away from their nesting place, always found their way back to their nests. This wonderful homing instinct is now known to be general among most of our migrants, however, and is not the monopoly of the swallow. It is chiefly a habit of the older birds, for young birds a year old tend to disperse over a wider area, which of course is Nature's way of avoiding overcrowding. In Cheshire, marked turtle-doves have been proved to return seven and twelve years in succession to the wood in which they were born, although they spend their winters in Central or Southern Africa. Willow-warblers, terns, nightingales and other species also return approximately to the area they occupied the

previous year, a remarkable fact in view of the extensive journeys they make, and the vast amount of countryside their tiny eyes must see each year.

The size of a bird has nothing to do with the length of its migration journey. The heron is 3 ft. long and is the biggest common bird in our country, but it probably does not fly further than across the English Channel, or from Sussex to Northern Ireland, at the most, whereas many warblers only four or five inches long fly from Central Africa. The greatest flights usually are made by the terns, swallows and other birds with long narrow wings, and the shortest journeys by those with broad, rounded wings.



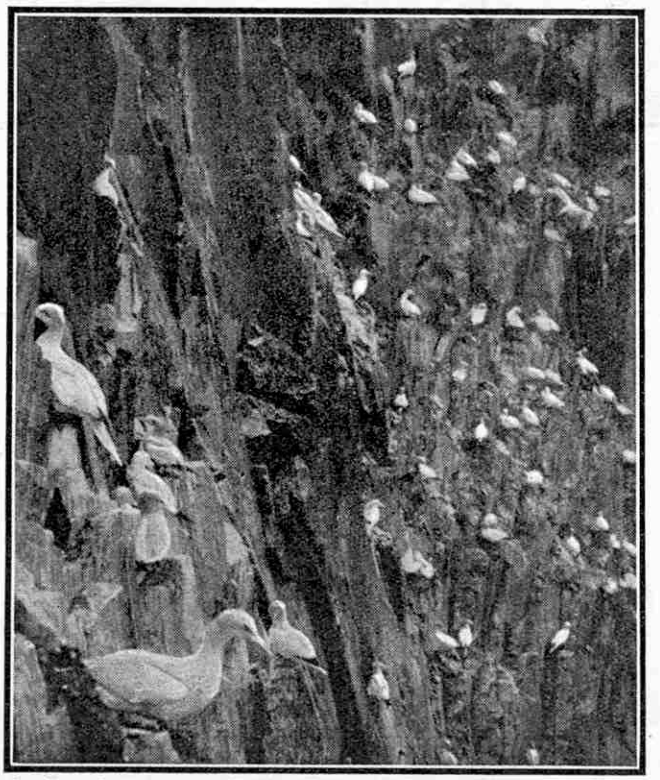
Terns, or sea-swallows. These birds haunt sand dunes on the seashore and are spring migrants from South Africa.

Birds closely related to one another differ greatly in regard to migration. Thus the partridge is a stay-at-home non-migrant, but the quail, another game-bird closely related to it, is a spring visitor from the African deserts. Similarly the water-rail remains all year with us, merely moving coastwise when winter frosts freeze up the lakes and brooks. On the other hand, its relative the land-rail, or corncrake, spends its winters in Africa. The corncrake is a meadow-bird of ventriloquial voice that is rarely if ever seen in flight in this country, for when it is followed it runs away through the grasses instead of taking wing. Yet when the urge to migrate comes, it can fly as far as other migrants, although it does not exercise its wings in summer. The swallow is a great contrast to the corncrake in this respect, for normally it flies 2,000 miles a week in its winnowings about after flies during its stay with us.

Most of our warblers come to us for the summer from Africa, but the Dartford warbler and the hedge-sparrow, which despite its name is a soft-billed warbler, not a true sparrow or finch, do not migrate at all. This is a matter of food, for the warblers, rails and other birds that must migrate for the winter to Africa need many more insects than our winters provide, and those that stay in Great Britain can feed on vegetable matter, such as fruits and seeds, as well as insects, and thus find sufficient food here in winter.

The need for food is one of the chief reasons for bird migration. Birds that cannot winter in Great Britain must migrate to warmer Africa, where insects are ever abundant. Why then do not the migrants stay in Africa and nest there, instead of coming north? The answer is that the average number of eggs in a nest is four or five. There may be as many as a dozen or more in the cases of tit-mice, ducks and partridges, and many birds have two, some three, broods in a year. All these broods mean hungry nestlings to be fed, and although Africa can produce a sufficient number of insects to feed its own birds and the winter visitors from Europe, it cannot feed also the offspring of all these birds. Some therefore must seek other quarters to avoid overcrowding, and the birds that are weakest or least vigorous in finding nesting places migrate when the north is becoming warmer and insects are becoming more numerous there.

It is interesting to consider how birds know that it is time to migrate. Careful studies have shown there are two main indications of this. Changes in light and temperature provide one of these. On keeping migrant birds in an aviary during the migrating season, and using artificial lights and heating apparatus to bring the light and temperature back to those normal during the nesting season, a Canadian scientist found they had no inclination to migrate when released. Other birds caught during the resident season, and put in an aviary where the hours of light were shortened and the temperature lowered, migrated when released, though it was not the normal time for them to do so, and other birds remained undisturbed. The second important indication that it is time to migrate is the urge to nest. Sometimes birds that should be migrating make no effort to go north, and specimens of these birds have been found to be immature when examined by experts.



A colony of gannets on a cliff. These birds spend their winters in Morocco or off Western Europe.

How fast do migrant birds travel? It is difficult to pace them by means of motor cars or aeroplanes, as can be done with birds at other seasons, but most of them then have flying speeds about 20 m.p.h. above their normal rate. For instance, the migrating swallow flies at speeds from 34 m.p.h. to 40 m.p.h., and sometimes touches 50 m.p.h. or more, although its normal speed after settling down in an area is from 23 m.p.h. to 28 m.p.h. Similarly, the speed of the lapwing plover when migrating is 37 m.p.h. to 50 m.p.h., but at other times is from 24 m.p.h. to 40 m.p.h. The migrating speed of the tern is 27-28 m.p.h., and the speeds of the sand-martin and the willow-warbler are 31 m.p.h. and 27 m.p.h. respectively. The golden plover achieves the much higher speed of 70 m.p.h., and other fairly high speeds include the 42-51 m.p.h. of the turtle-dove, the 32-38 of the wheatear and the 27-40 m.p.h. of the house-martin. The land-rail or corncrake when migrating flies at 34 m.p.h., the stone-curlew or Norfolk plover at 25-30 m.p.h., the wagtail at 30 m.p.h., the cuckoo at 27 m.p.h., and the black-headed gull at 21-30 m.p.h.

From these figures of migration speeds it will be seen that birds do not fly as fast as many people assume. For instance, the idea that swallows rush through the air at 100 m.p.h. or even more appears to be a delusion due to the streamline effect of the swallow's body, which is built not for speed, but for rapid manœuvring on the wing. For comparison with the figures given above, it may be pointed out that the highest speed on record for the homing pigeon is 99.306 m.p.h. It is doubtful if any migrant exceeds 100 m.p.h. normally, but the swallow, the swift, the golden plover, the starling and others may sustain speeds of 50 m.p.h. or more for long periods, and swifts have circled with ease round aeroplanes travelling at not less than 100 m.p.h. Although most of the migrating birds fly in flocks, there are a few exceptions, like the cuckoo and corncrake. I have watched very carefully on the coast and around the lighthouses and have only met with odd cuckoos and odd corncrakes in both the spring and autumn migrations.

Modern Fire Fighting Machines

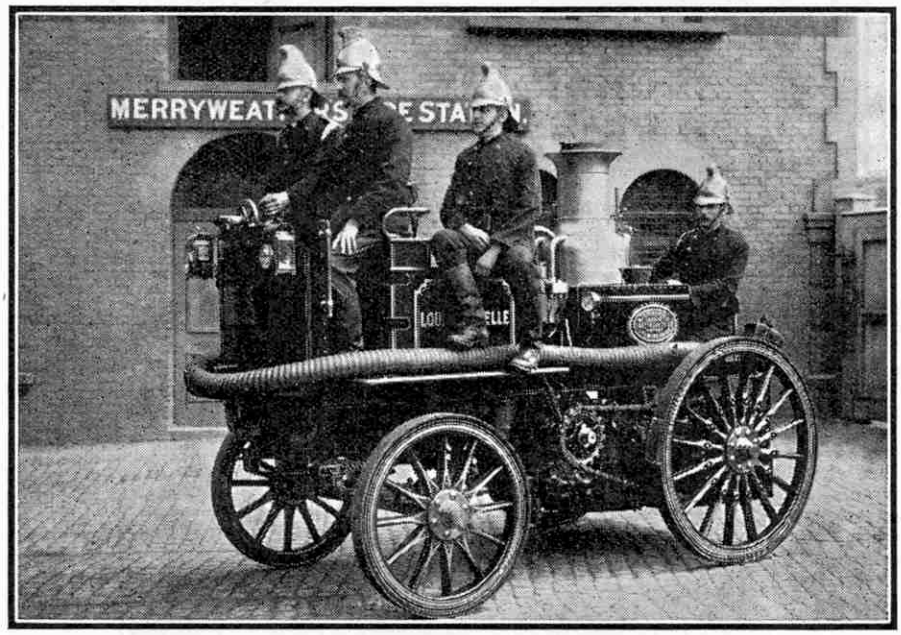
Two Centuries of Development

HISTORY is full of accounts of the devastation caused by fire to life and property. Villages, towns and cities in all parts of the world have suffered at some time or another from the destructive force of this disastrous element. We in this country have on many occasions witnessed terrific conflagrations, an outstanding instance that every reader will be aware of being the Great Fire of London in 1666. Another great fire occurred at Gateshead in 1854, when 50 persons lost their lives and over £1,000,000 damage was done. In recent years, however, there have been no fires of this magnitude, and this is due to the great improvements that have been made in the means employed for the prevention and extinction of fires.

In fighting fires, water is the chief agent employed; and in towns where the supply of water is abundant, and where there is a constant and high pressure in the public mains, the task of the firemen is much simplified. In such cases it is generally only necessary to attach the fire-hose to the hydrants, and the pressure in the mains is sufficient, without the aid of any pumping engine, to throw a jet over the whole burning mass. All districts, however, are not so favourably situated, and for the equipment of an ordinary fire brigade completely equipped fire engines with powerful pumps are required.

The high speed motor fire engines of to-day, which are capable of throwing powerful jets of water to heights of hundreds of feet, and which are often equipped with great telescopic escape ladders, have been developed from the early manual operated pumping carts, and in this article we are describing some of the many interesting stages in their history.

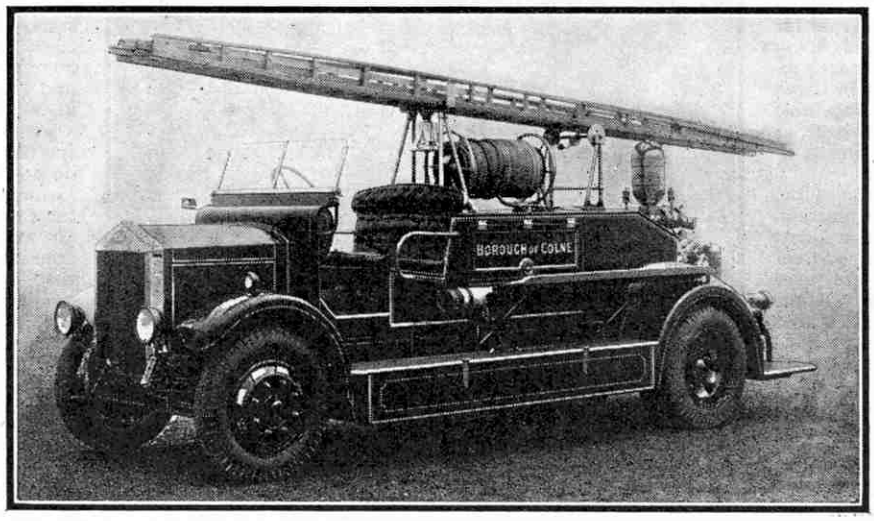
Probably the most famous name connected with the development of fire engines is that of Merryweather and Sons Ltd., London, the well known firm of fire appliance manufacturers. The firm of Merryweather has been in existence for over two centuries. Their oldest ledgers date back to the year 1799, and the firm has in its possession at their Greenwich works some of the ancient appliances that were used in the Great Fire of London in 1666.



The first modern steam motor fire engine. It was built by Merryweather and Sons Ltd., London, to whom we are indebted for our illustrations.

In 1792 a patent was granted to their predecessors for a fire engine pump. This pump may be said to be the forerunner of the manual pump as it stands to-day, for very few improvements have been found possible since that time. In 1829 John Braithwaite produced the first horse-drawn steam fire engine, but it was not until some 30 years later, when a Merryweather machine won the first prize against competing engines of other makes at the Crystal Palace, that these machines came into general use. This engine was subsequently purchased by the Admiralty and used for the protection of Devonport Dockyard. It remained in commission until 1905, and has now found its way back to the makers' works, where it will remain as a specimen of the earliest steam fire engine.

From the latter half of the last century onward progress in the construction of every description of fire appliance has been continuous and rapid. In 1899 a machine was built in which the steam engine that drove the pumps was also used to propel the vehicle along the ground, thus displacing horses. This engine was made for the municipality of Port Louis, Mauritius, and it was steered from the front by means of a handwheel. The engine drove the pumps direct, and a countershaft and gears were provided by means of which it could be disconnected from the fire pump and made to drive the two rear wheels through roller chains. The pumps delivered 300 gallons of water per minute, and could throw a single powerful jet to a height of 150 ft., or several jets to a somewhat lower height. Coal bunkers were provided on each side of the fire door, which was placed at the rear so that the fire could be regularly stoked while the engine was travelling to a fire.

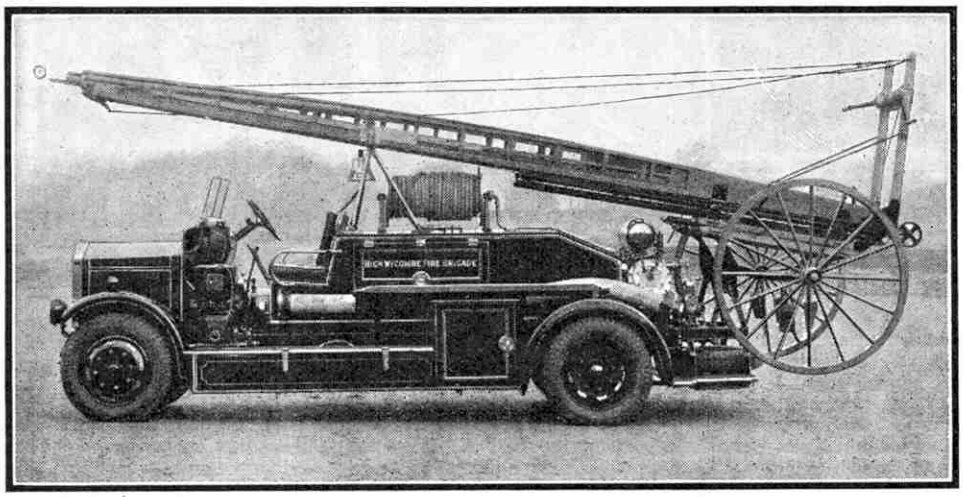


A fine "Greenwich Salamander" fire engine supplied recently to the Borough of Colne. It is driven by a 65 b.h.p. petrol motor and carries an extending escape that reaches to a height of 35 ft.

This machine was capable of climbing an ascent of 1 in 10 at 10 m.p.h., while on more or less level roads a speed of between 20 and 30 m.p.h. was reached. It proved so successful that others of the same kind were built, but most of these were provided with oil

fuel burners in place of coal fired furnaces.

With the introduction of the internal combustion engine Merryweathers turned their attention to the manufacture of petrol driven fire engines in place of the older horse drawn and steam propelled vehicles, and were the first British manufacturers to construct an engine of this type. In June 1903 a combination petrol motor chemical and fire escape was supplied to the Tottenham Fire Brigade. It was placed in service at Harringay, which incidentally, was to become the first all motor station in the world, and it was stated of this machine that for rapidity in starting, speed on the road, and efficiency in dealing with fires it was absolutely unparalleled by any other life saving appliance then in existence.



A modern Merryweather machine equipped with a "Hatfield" pump capable of delivering 400 gals. of water per minute, and a 50 ft. portable extending escape.

On April 30th 1904 a new type of engine, which was destined to revolutionise fire brigade practice, left the Merryweather Greenwich Works. This was the first motor "Hatfield" fire engine, which had been built for Baron A. de Rothschild for the protection of his French estates. This machine was fitted with the now well known "Hatfield" pump, which was originally introduced as an electrically-driven reciprocating pump for fire service at Hatfield House, the residence of the Marquess of Salisbury. The "Hatfield" pump was adapted to meet the requirements of fire engine service and the name was then given to the whole vehicle. The original "Hatfield" fire engine had a 30 h.p. petrol engine, a 300 gallon pump, chain drive to the road wheels and drive to the pump through a raw hide pinion and spur wheel. The engine had magneto ignition as well as an accumulator and coil.

At the latter end of 1904 the Finchley Fire Brigade took delivery of the first combination pump and first aid machine ever built. This motor also was fitted with a "Hatfield" type pump, with a capacity of 200 to 250 gallons per minute, and also a first aid cylinder which held 60 gallons. A 50 ft. sliding carriage fire escape completed the equipment.

Two years later a machine fitted with a centrifugal or turbine pump made its appearance. The pump was made of aluminium and was capable of delivering 600 gallons of water per minute, and in all essential features its design corresponded with the turbine motor fire engine of the present day.

The first station of the London Fire Brigade to be equipped entirely with motor driven appliances was opened in 1906 and was supplied with three Merryweather automobiles, large numbers being subsequently ordered to replace the horse drawn machines previously in use.

For many years continental manufacturers had been making machines fitted with turntable escapes, but there was no demand in this country for such equipment. In 1908, however, Merryweathers built the first British machine of this kind for service in the Shanghai Fire Department. This machine was also the first one to be made in which the engine that propelled the vehicle was used also for raising and extending the ladders. There were four ladders that together extended to a total height of 80 ft. In the travelling position they rested horizontally on the carriage, but on reaching the scene of operations the power of the propelling motor was transferred to the escape machinery, and the raising and extending of the ladders to their full extent was effected in less than a minute. These operations were carried out entirely by one man through two levers arranged side by side in the rear of the machine.

Although few radical changes have been made in the design of fire engines during recent years, continual improvements have been made to the chassis and engine unit and also to the pumps and other equipment in order to render the machines as efficient as possible. The lower illustration on the opposite page shows an up-to-date machine that embodies all the most modern improvements. It is in service with the Colne Fire Brigade and has a four cylinder petrol engine that develops 65 b.h.p., and is fitted with steel disc type wheels and pneumatic tyres. The rear wheels have twin tyres, and four wheel brakes are provided. The main fire pump is a 400 gallon "Hatfield" pump, and a 30 gallon first aid tank also is provided and takes its supply from the main pump. The machine is fitted with a two section Merryweather extension ladder that will reach a height of 35 ft. The equipment includes a five lamp dynamo lighting set, electric starter, carillon bell, mechanical tyre pump and a towing bar fitted at the rear of the chassis.

One of the most interesting fire engines now in service in this country is the streamlined Merryweather machine owned by the Lancaster Corporation, and which is shown in one of the accompanying illustrations. The superstructure of this machine is of special streamline design, the body being of the covered-in-type and constructed with steel panels. Longitudinal seats on each side of the interior provide accommodation for six to eight men, and they are hinged to open upwards to allow access to the hose lockers. Access to the lockers can also be obtained by means of doors on the outside of the body. Narrow boxes are provided at the back of the locker seats to house standpipes, etc.

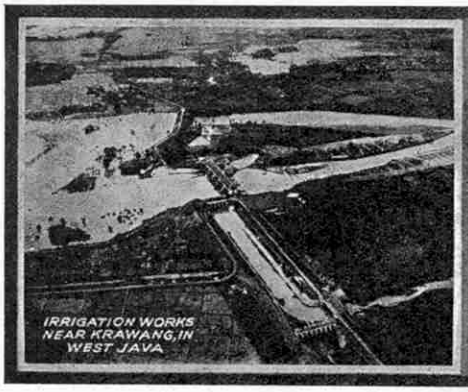
A streamlined fire engine owned by the Lancaster Corporation. It has a 65 b.h.p. petrol engine, "Hatfield" pump and an extending ladder, which is carried in a trough in the roof of the body.

The fire pump, which is arranged outside the body behind the back partition, is a Merryweather patent "Hatfield" of rustless metal, and will deliver 275 gallons of water per minute at a pressure of 170 lb. per sq. in. A 40-gallon first aid tank connected to the main pump also is provided.

A first aid hydraulic hose reel is mounted on the rear locker inside the body, and the first-aid hose can be paid out through a porthole at each side, fitted with suitable rollers. The hose reel carries 120 ft. of hose, branch pipe and shut-off nozzle.

At the rear is a towing bar for towing a trailer pump when desired and an aperture is provided in the back partition of the body to enable one of the firemen to operate the line controlling the brake of the trailer pump. Two towing hooks are also fitted at the front end of the chassis frame.

An extension ladder is carried in a trough in the roof of the body and is provided with suitable rollers and a locking device that can be operated from the front seat. Among the numerous fittings are an amber spotlight for use in fog, a powerful searchlight in a swivelling bracket complete with 150 ft. of cable and tripod for use off the machine, syren, four 7 ft. 6 in. lengths of rubber suction hose and one 10 ft. length of armoured section hose. The machine is painted vermilion, picked out in gold and fine-lined white.



ENGINEERING NEWS

Digging its Way to Work

The illustration on this page shows an unusual piece of excavator work that was carried out recently. A small ⅜ cub. yd. shovel excavator was delivered by Ruston-Bucyrus Ltd., of Lincoln, to Baylis Brickworks Ltd., Birmingham. On arrival at the brickworks the driver in charge of the machine found that there was no way down to the working face at the bottom of the quarry, where the machine was required. He therefore had to set to work to dig a zig-zag path down the 60-ft. sloping face, and this task he completed in three days. In the illustration the machine is shown about to run off the ramp on to the quarry bed.

Maiden Voyage Record

On her maiden voyage the new P. and O. liner "*Strathmore*," which was described in the "*Engineering News*" pages of the November, 1935, "*M.M.*," set up a new record for the passage from Marseilles to Bombay, which was accomplished in exactly 10 days. The previous record for this run was held by the Italian motor liner "*Victoria*" with a time of approximately 11 days for a voyage of about 102 miles less from Genoa. The "*Strathmore*" steamed at an average of 20.07 knots, and the actual speed from Suez after clearing the canal was 20.56 knots. As the P. and O. Company had not planned a special attempt on the record, the fine performance of the "*Strathmore*" is particularly interesting.

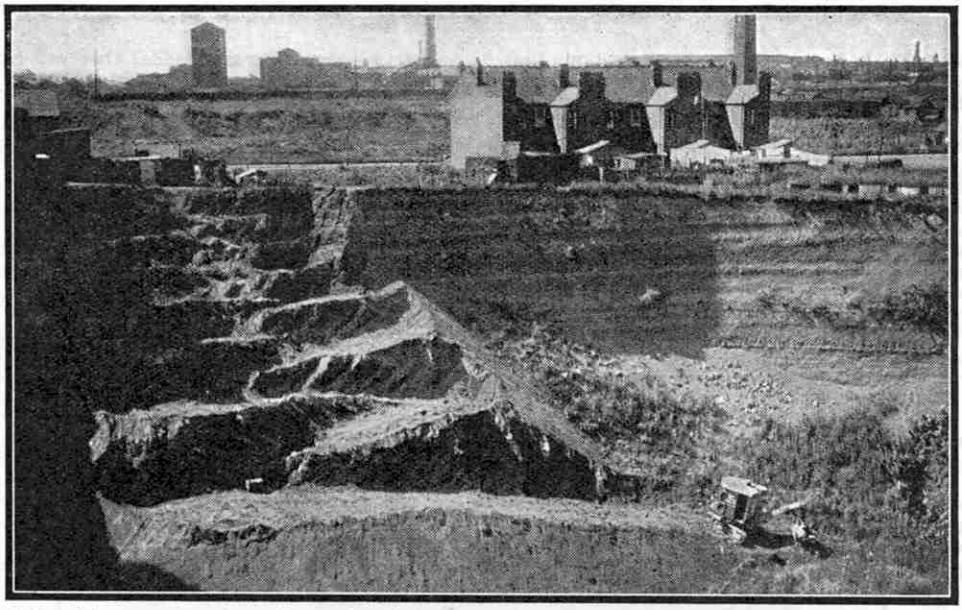
£20,000,000 London Tunnel Plan

A great tunnel scheme, estimated to cost £20,000,000, has been prepared by the surveyor to the Commissioners of Crown Lands, as a solution to traffic congestion in central London. The plan provides for a main tunnel 100 ft. wide under the Thames from Charing Cross, together with a series of branch tunnels 60 ft. wide at various points on each side of the river. The greatest depth of the tunnel below the surface would be 100 ft. If the plan were adopted there would be also seven radial sub-circuses, from which would lead branch tunnels.

A New Three-Wheeled Tractor

A new three-wheeled tractor, of the type known as a "mechanical horse," which is designed to handle a 2-ton load on any type of two or four-wheel trailer, has been introduced by the Ford Motor Co., Dagenham. The new machine is known as the "Tug," and is equipped with the standard four-cylinder engine used in the Ford 8 h.p. models, and which develops 22 b.h.p. at 3,500 r.p.m. The chassis has an overall length of 10 ft., an overall width of 5 ft. 9 in., and a wheelbase of 7 ft. 4½ in. The turning circle is 16 ft., or 21 ft. with a standard trailer.

A special articulated trailer is built for the "Tug," and when this is used the driver can back the "Tug" up to the trailer and couple up without leaving his cab. It is necessary to leave the cab in order to operate the uncoupling lever, which also applies the brake on the trailer. In addition to this special two-wheel trailer, a light four-wheel trailer, equipped with a normal type of towing bar, is also available for use. With a platform body this trailer, which is capable of carrying 30 to 50 cwt. loads, weighs no more than 17 cwt.



A view of the quarry where the novel excavation referred to on this page was carried out. For this illustration we are indebted to Ruston-Bucyrus Ltd., Lincoln.

New Cruiser for Australian Navy

H.M. Royal Australian Navy has recently been augmented by the addition of the new 7,000-ton cruiser "*Sydney*," built by Swan, Hunter and Wigham Richardson Ltd. The "*Sydney*" is 530 ft. in length and has a beam of 56 ft. 8 in., and in general design and equipment she belongs to the modified "Leander" class. She has two quadruple torpedo tube mountings, eight 6 in. guns in twin mountings, four 4 in. guns, and several other guns of smaller calibre, and carries amidships a catapult for launching seaplanes. She is propelled by four screws driven by geared turbines that have a total output of 72,000 s.h.p., and steam is raised in oil-fired water-tube boilers. The turbines and the boilers were constructed by the Wallsend Slipway and Engineering Co. Ltd.

A Giant Electro-Magnet

A giant electro-magnet that weighs 37 tons and has a force of attraction of 60 tons between its poles has been constructed for the experimental laboratory of the University of Upsala, Sweden. The magnet housing, fully assembled, has an outside diameter of 5 ft. 7 in., an inside diameter of 5 ft., and a length of about 7 ft. Each pole block with cores and pole pieces weighs about 5 tons. The magnet is mounted in a roller frame, which allows it to be turned into a horizontal or a vertical position and also rotated about a vertical axis.

Proposed Severn Bridge

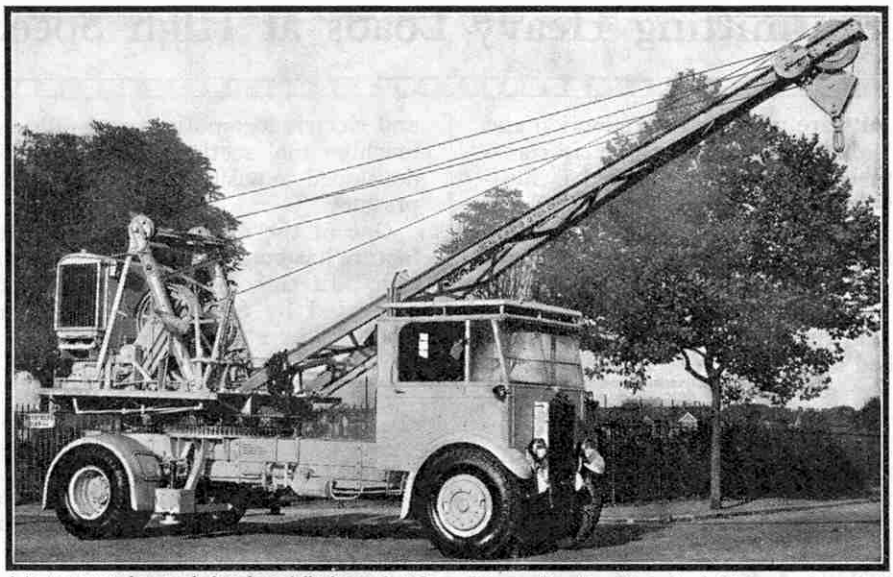
Monmouth County Council have decided to join with Gloucester County Council in seeking Parliamentary authority to construct a bridge over the River Severn at English Stones, together with the necessary approach roads on each side of the river. The line of the bridge would be nearly over the Severn Tunnel, and the cost of constructing it according to the engineers' preliminary estimates is £2,480,000.

Lorry-Mounted Crane for Persia

On this page is illustrated a mobile crane of a rather unusual type. It was made by R. H. Neal and Co. Ltd., of Ealing, for the Anglo-Iranian Oil Company, for work in Iran, and is capable of making a lift of two tons at a radius of 14 ft., or a lift of one ton at a maximum radius of 20 ft.

The crane is mounted on a lorry chassis of the standard Albion make, and is a standard 2-ton model, with slight modifications to meet the tropical conditions in which it has to work. It is supported on a reinforced superstructure, and is driven by a special power unit built up from a 24 h.p. engine, the drive from which is taken through a roller chain to the main shaft, and from there to the hoisting drum through machine-cut spur gearing. The engine is fitted with a large tropical radiator, and a Ferodo plate clutch for disengaging the engine when starting up or when the crane is not in use for short periods. Included in the hoisting mechanism is a load-sustaining safety device, which makes the crane foolproof in operation, and prevents any possibility of the load being accidentally dropped by an unskilled driver. Slewing, derricking and luffing of the jib are controlled by Ferodo reversing clutches, and the various motions are operated from a bank of levers, which can be seen in the front of the crane.

The underframe of the crane is fitted with screw jacks and special fittings for relieving the chassis of stresses when the crane is lifting across the frame



A lorry-mounted crane designed specially for work in Iran. It is capable of handling a load of 2 tons, and was built by R. H. Neal and Co. Ltd., of Ealing, to whom we are indebted for the illustration.

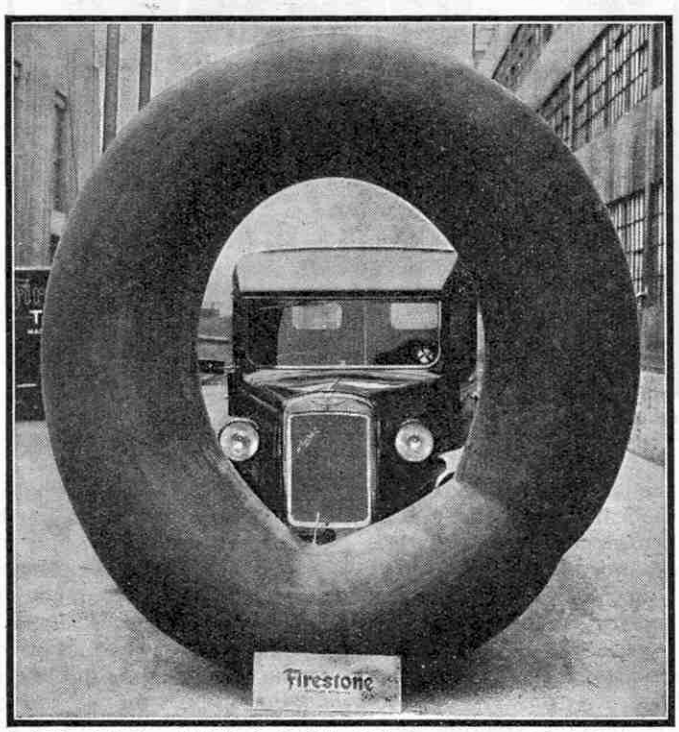
New Engines for H.M.S. "*Renown*"

An order for the construction of new machinery for the battle-cruiser "*Renown*," which was laid down in 1914 at the Fairfield Yard, Govan, has been placed with Cammell Laird and Co. Ltd., of Birkenhead. The machinery at present fitted comprises a quadruple-screw arrangement of Brown-Curtis direct-drive turbines, supplied with steam from 42 Babcock and Wilcox oil-fired boilers. After the Falkland Islands engagement in the Great War it was decided to lengthen "*Renown*'s" hull by 100 ft., and this, together with the fact that since the war the vessel has been fitted with bulges, with considerable increases in her side armour, has reduced her speed and necessitated higher powered machinery. It is expected that reconditioning of the hull will be carried out in one of H.M. Royal Dockyards simultaneously with the provision of new engines.

Moving a Road with Air

Compressed air is being used by the New Jersey State Highway Department to move an eight mile strip of concrete highway sideways a distance of 12 ft. The task is effected simply by placing a length of hose in a narrow space alongside the strip of concrete to be moved. The hose is then inflated with air, and as the pressure rises the hose expands and pushes the concrete sideways. The place it is to occupy is previously graded and the concrete simply slides over the ground surface, no rollers or other device being employed.

The concrete is 9 in. thick and is in slabs that each weigh about 30 tons. From 12 to 14 of these slabs are moved at each operation.



A striking test of quality! A standard 36×8 Firestone motor car tube inflated to a diameter of 8 ft. Photograph by courtesy of the Firestone Tyre and Rubber Co. Ltd.

Car Components Made from Farm Produce

At the River-Rouge plant of the Ford Motor Co., machinery is being installed for making certain motor car parts from a plastic material produced from Soy beans. The machinery includes giant mixers, storage tanks, presses and moulds, and when the installation is complete it will cover about 86,000 sq. ft. of floor space and will be the largest factory in the world devoted to turning farm produce into industrial articles. It is estimated that the factory will have an output of 100,000 parts a day.

A Unique Highway

A splendid express highway that will provide for five traffic lanes, and will be the only one of its kind outside New York City, is being constructed in St. Louis, U.S.A. The new road forms part of a super-highway 38 miles in length, and not a single street intersection at grade level will be encountered within St. Louis itself, a feat that is to be accomplished by carrying the highway through subways at some points, and at other points over cross roads by means of overpasses. Where the road passes through subways wide sloping banks will be provided, and these will be grassed and laid out as flower beds.

Great American Bridge Scheme

Work is proceeding rapidly on the new Triborough Bridge scheme across the East River, New York, which when completed will form a new arterial highway for vehicular and pedestrian traffic between the boroughs of Queens, Manhattan, and the Bronx. The bridge will connect also with Randall's and Ward's Islands over which it passes. The complete scheme will consist of a suspension bridge over the East River, a vertical lift bridge over the Harlem River, through truss spans over the Bronx Kills and an adjacent railroad yard, together with a section of girder viaduct approaches, and altogether will have a total length of 3½ miles. The suspension bridge will have a main span of 1,380 ft. and end spans of 705 ft. The deck will be suspended 135 ft. over water level and will be supported by two wire cables each 20¾ in. in diameter.

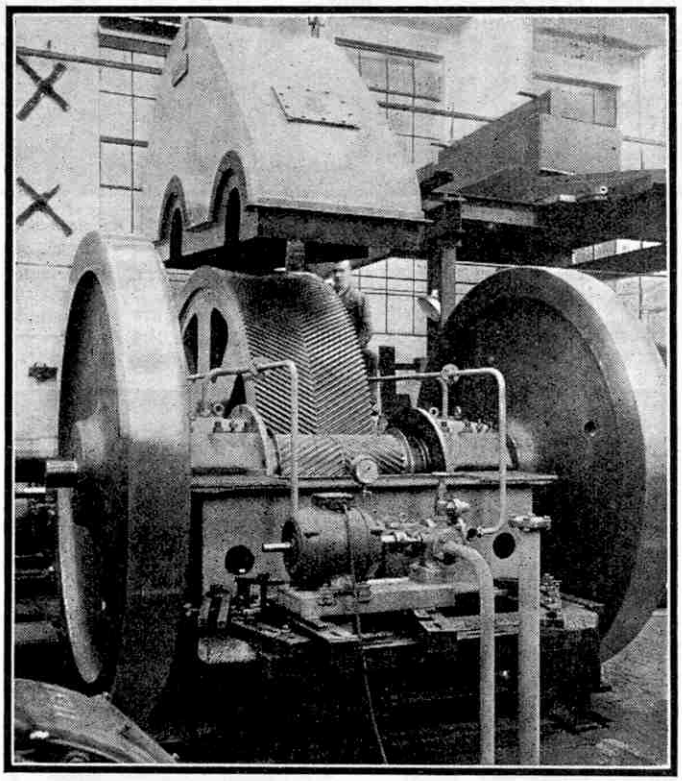
* * * *

A small motor tug equipped with two 350 h.p. gas engines that operate on suction gas made from small coke, is in use on the River Rhine. The vessel is very economical in fuel costs, and its performance is stated to be satisfactory.

How Gears and Gear Units are Made

Transmitting Heavy Loads at High Speed

GEARS and gear units are used for the reduction and increase of speed almost wherever power is transmitted. The extent to which they are applied is illustrated by the products manufactured at the Park Works of David Brown and Sons (Hudd) Ltd., at Huddersfield, which range from small speedometer gears to monster mine winding and similar gears 30 ft. in diameter. A large proportion of these gears are absorbed by the automobile industry, and the "DBS" patent worm drive of this firm is applied to more than 100 makes of motor vehicles. In this connection it is interesting to note that the gear box gears for Sir Malcolm Campbell's "Bluebird," in which the world's land speed record of 301.377 m.p.h. was created, were of "David Brown" manufacture. These gears were eight in number and were made of high nickel chrome molybdenum case hardening steel. Their teeth were generated and ground on machines of high accuracy, and they provided forward speeds to transmit no less than 2,500 h.p.



Heavy type single reduction gear unit for cogging mill at the works of Arthur Lee and Sons Ltd., Sheffield. The illustrations to this article are reproduced by courtesy of David Brown and Sons (Hudd) Ltd., Huddersfield.

The gears manufactured by David Brown and Sons (Hudd) Ltd. may be divided into four main sections. The first of these comprises general industrial gearing and includes a very large range of self-contained gears and geared motors of the helical, bevel and worm type for every class of speed reducing and increasing mechanism. Turbine reducing and increasing gears up to the largest sizes also come under this section as well as helical, worm and spiral bevel gears for the cement, paper, steel, rubber, mining, chemical and textile industries and for public utility work. In short, every piece of mechanism that can be rotated by means of toothed gearing comes within the scope of the firm's activities.

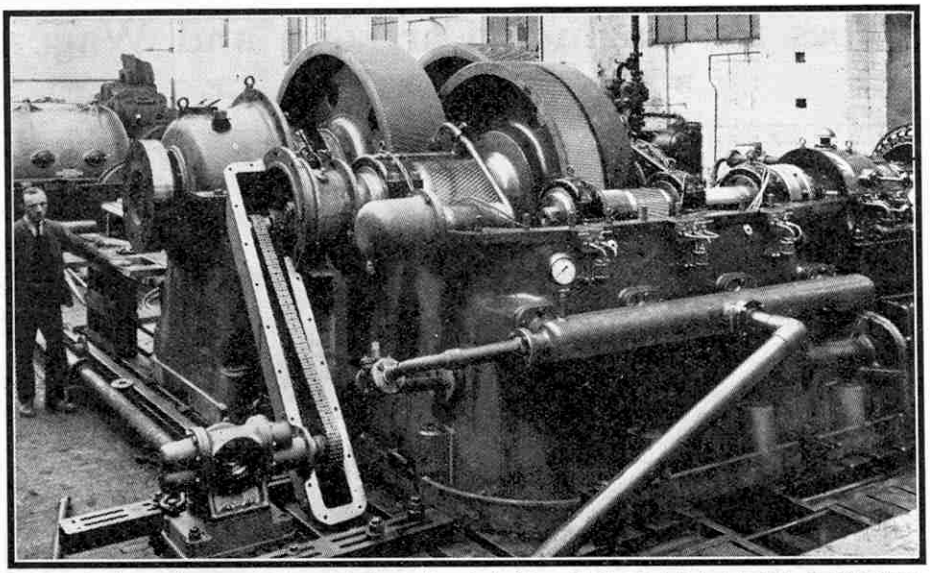
Marine gearing forms the second section. In this the principal demand is for helical gearing up to the largest sizes manufactured for ships' propulsion, steering and reversing gears and worm, helical and bevel gears for auxiliary machinery and shipyard plant. Traction gearing is included in the third section. The firm manufactures gear box gears, complete change-speed units, steering gears and units, clutches and worm gear differential units, and the "David Brown" patent worm gear is applied to motor vehicles and also to trolley buses, oil and electric locomotives and railcars. Finally comes the machine tool section, including a variety of machines developed to ensure the highest accuracy in the finished product.

One of the most important advances in gear manufacture has been made possible by the advent of "generation." In this, the gear tooth profile is automatically generated by a straight-sided cutter, hob or grinding wheel, or by a disc cutter where the profile is accurately ground to true involute form. This process is particularly valuable in the case of double helical gears, in the making of which reciprocating cutters are now largely used. Plano-generating is the name given to this method.

On account of the heavy stresses imposed upon modern gear drives, it is essential that only the highest grade materials shall be employed and the service of an up-to-date metallurgical department is necessary for proper control. In the metallurgical department at the David Brown Works all bars and billets are checked by analysis and tests of their physical properties and, more important still, concealed weaknesses are searched for, since only by continual vigilance in the selection of all raw materials can the necessary high standard and uniformity of composition be maintained. Working in conjunction with this department is a physical laboratory where further tests are made on materials for impact, hardness, tensile strength, resistance to compression and transverse or bending stresses, while in a separate mechanical research laboratory vigorous tests are made for running efficiencies, temperature rises, coefficients of friction between oils and metals, noise production and other features of every type of gear and complete unit.

For mine winding and colliery drives, paper, rubber and steel rolling mills, sewage and drainage plants and other high duty applications helical gears now have a widespread use, and their superiority over straight-toothed spur gears is an established fact. In the case of the spur gear the load is suddenly applied along the top edge of the tooth and is released as suddenly when engagement ceases. On the other hand, with a helical gear, contact is made at one corner of the tooth face and the load

traverses diagonally across the whole width of the face of the gear. In addition there are always more teeth in contact. The load therefore is more evenly distributed, and this contributes largely to quieter and smoother running, increased load capacity and long life.



Double reduction turbine gears for the coal hydrogenation plant of Imperial Chemical Industries Ltd., at Billingham. Each gear weighs 50 tons and transmits 3,250 h.p.

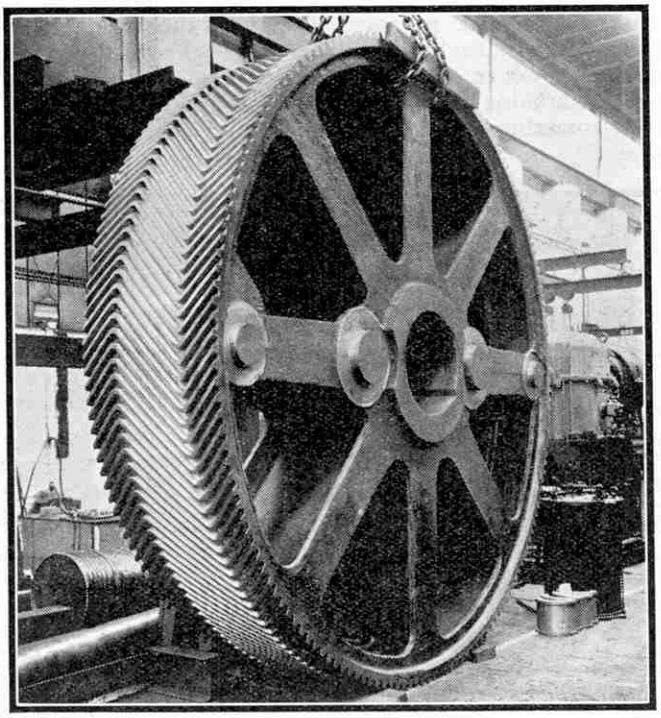
Helical pinions usually are made of high carbon forged steel, and alloy steels such as carbon-chrome or nickel-chrome may be used in the case of exceptionally heavy loading. The material for the wheel may be a cast iron of high tensile strength, or cast steel, or it may be comprised of carbon steel forged rings shrunk on to cast iron centres, the material used depending on the duties to be performed and the conditions of working. Wheels up to 8 ft. diameter usually are made solid; above this size the boss may be split to relieve contraction stresses and fitted with turned steel hoops, shrunk on after the slots have been filled.

Three methods are employed in the production of helical gears at David Browns, and the choice of the one to be used depends on the size of gear and the conditions in which it operates. The first method is known as plano-generating, in which the teeth are generated from the solid by means of profile-ground rack-type cutters operating from either side of the gear. Right and left hand helices are produced meeting at the centre of the face-width, thus affording maximum load carrying capacity. These gears are produced in sizes up to 15 ft. diameter by 2 ft. 6 in. face-width.

The illustration on the opposite page shows a 63.5 in. centres heavy type single reduction gear unit for cogging mill drive supplied to Arthur Lee and Sons Ltd., Sheffield. This gear is designed to transmit 1,500 h.p. normally, and a peak load of 8,000 h.p. when reducing from 600 r.p.m. to 80 r.p.m. The double helical gears employed were accurately generated by the plano-generating process and the unit was supplied complete with fly wheels to damp out fluctuations in the drive.

Form milling or end milling is the name given to the second method. This process is used chiefly for heavy gears of large pitch up to those with diameters of 19 ft. and face-width of 5 ft. that are suitable for such applications as mine winders and rolling mill plant. The right and left hand helices blend together at the centre, being milled from the solid by means of accurately ground cutters.

Triple helical gears with continuous teeth are produced in a similar manner. An example of this type is illustrated in the lower photograph on this page, which shows the wheel of a triple helical gear, 90 in. between centres, for electric winders supplied to Markham and Co. Ltd., of Chesterfield, for East Rand Proprietary Mines Ltd. Each set of these gears normally transmits 2,687 h.p., and a peak load of 5,579 h.p. when reducing from 200 r.p.m. to 31.5 r.p.m. of the winding drum. The wheels are of cast steel and were made in halves. They have 166 teeth and are 13 ft. in diameter and 34 in. in face-width. The pinions were forged solid with their shafts. They were made from forged steel and have 26 teeth, their overall length and diameter being 10 ft. 6½ in. and 26 in. respectively.



Triple helical gears for electric winders for East Rand Proprietary Mines Ltd. Each set transmits a peak load of 5,579 h.p.

The third gear cutting process used by David Brown is hobbing, the cutters employed being known as hobs. This usually is applied to wide faced gears of fine pitch, such as are embodied in high speed turbine gears of both land and marine types, but its use is not necessarily confined to this class of work. Special machines having accurate dividing and feed mechanisms are used, and the hob shields are ground after hardening in order to eliminate any errors due to distortion caused by the hardening process and also to ensure the preservation of exact tooth form during numerous re-sharpening operations. Gears up to 14 ft. in diameter and 7 ft. in face-width can be dealt with at Park Works.

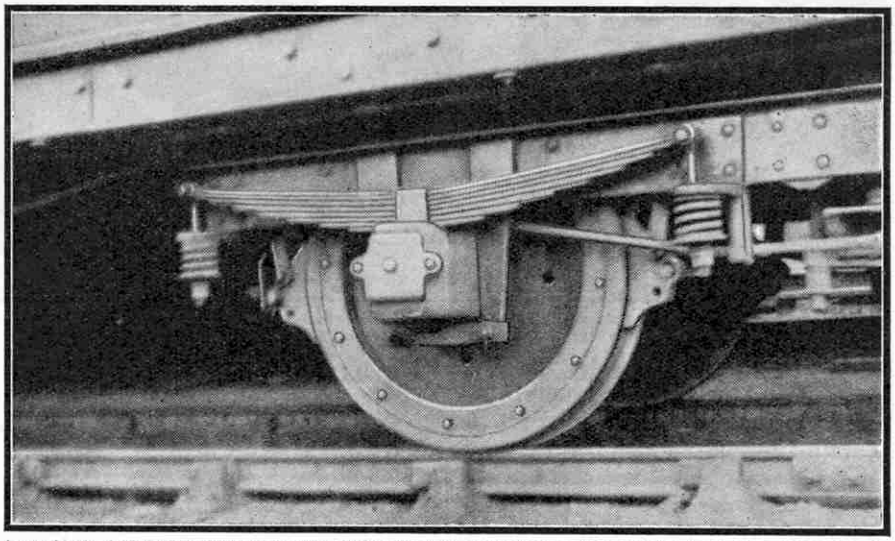
The upper photograph shows double reduction turbine gears for the I.C.I. (Fertiliser and Synthetic Products) Ltd. coal hydrogenation plant at Billingham.

Some Facts about Railway Wheels

Types for Engines, Carriages and Wagons

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

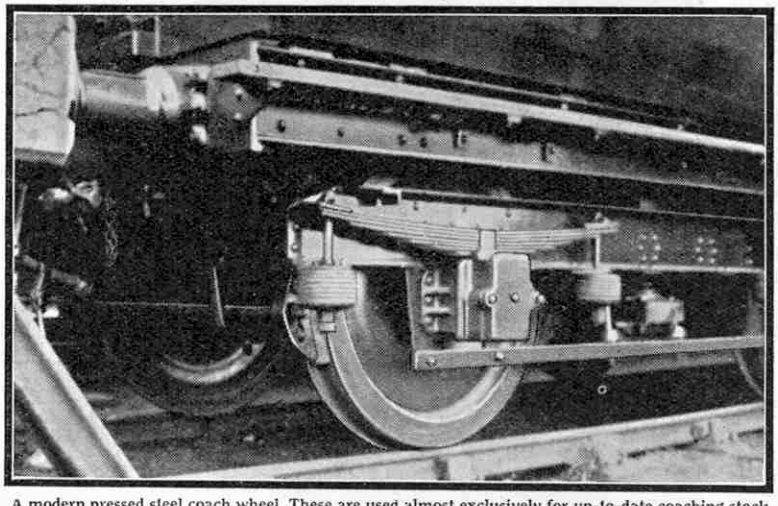
COMPARED with their humble origins about a hundred years ago, our railways are now colossal undertakings of the greatest complexity. They employ hundreds of thousands of people, receive and spend millions of pounds every year, and in addition to the line, rolling stock and stations, are owners of hotels, steamships, harbours and docks. The whole vast organisation has developed from the discovery that wheels running on rails were a great improvement on any transport system previously known, so that the wheel and the rail are the two primary devices on which the whole elaborate structure depends. Not only for this reason, however, but also because the wheel is itself a remarkable invention, it will be interesting to find out something about this very essential railway appliance.



A coach wheel of the Mansell type in which the centre between the boss and the rim is formed of hard wood blocks.

We are not here concerned with the kind of wheels used on luggage barrows, horse vans, and so on, although strictly speaking these also are railway wheels. We will confine our attention to the wheels that actually run on the rails, and which can be divided into the three main classes, engine, carriage and wagon wheels.

At one time engine wheels were made of cast iron, and at a later date of wrought iron; but nowadays practically all such wheels are made of cast steel. This refers to what is called the wheel centre, consisting of the hub, the spokes, and the rim. Outside the rim is the tyre, which takes the wear, and, by means of the flange, guides the wheel on the rail. The cast steel centre is toughened by an annealing process, and the hub or boss is bored to receive the axle, and also the crank pin if the wheel is a driving wheel. The boring is done in a lathe, and at the same setting the rim is turned to the correct size to receive the tyre.



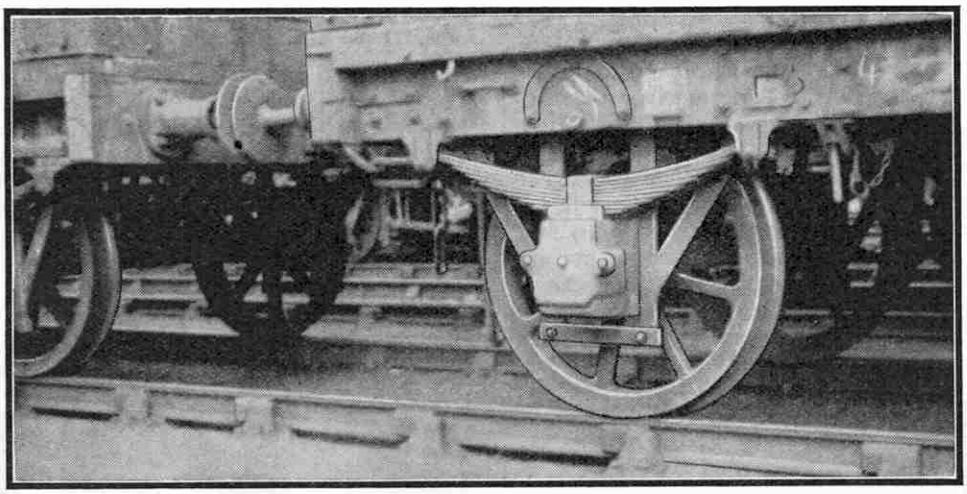
A modern pressed steel coach wheel. These are used almost exclusively for up-to-date coaching stock, although sleeping cars invariably retain the Mansell pattern of wheel, as it is less noisy.

The diameter of engine driving wheels varies considerably, according to the type of engine. For express passenger work we find such figures as 6 ft. 6 in. for the "Royal Scot" and L.M.S. Compounds; 6 ft. 8 in. for the L.N.E.R "Pacifics"; 6 ft. 7 in. for the "Lord Nelsons" and "King Arthurs" of the Southern; and 6 ft. 6 in. on the Great Western "Kings." In the days of the single-driver engines much bigger wheels were used, as for instance the 8 ft. drivers of the Great Northern engines. Goods and mixed traffic engines have smaller wheels, the 2-6-0 L.M.S.R. mixed traffic locomotives having a driving wheel diameter of 5 ft. 6 in. The wheels of tenders have diameters between 3 ft. and 4 ft. A very usual diameter for carriage wheels is 3 ft. 6 in., while for wagons 3 ft. 0 in. is a general figure. It may be mentioned here that the standard distance back to back of engine tyres in this country is 4 ft. $5\frac{5}{8}$ in. with tyres $5\frac{1}{2}$ in. wide, the corresponding dimensions for carriages and wagons being 4 ft. $5\frac{1}{2}$ in. and 5 in.

Wheels are pressed on to their axles by hydraulic pressure, which is at the rate of about eight to 10 tons for each inch of diameter of the wheel seat, that is, the hole in the boss of the wheel. For a usual example, say a 5 in. seat, the boss is bored 1/100 of an inch less in diameter than the axle, and 40 tons or more would be needed to force the axle home.

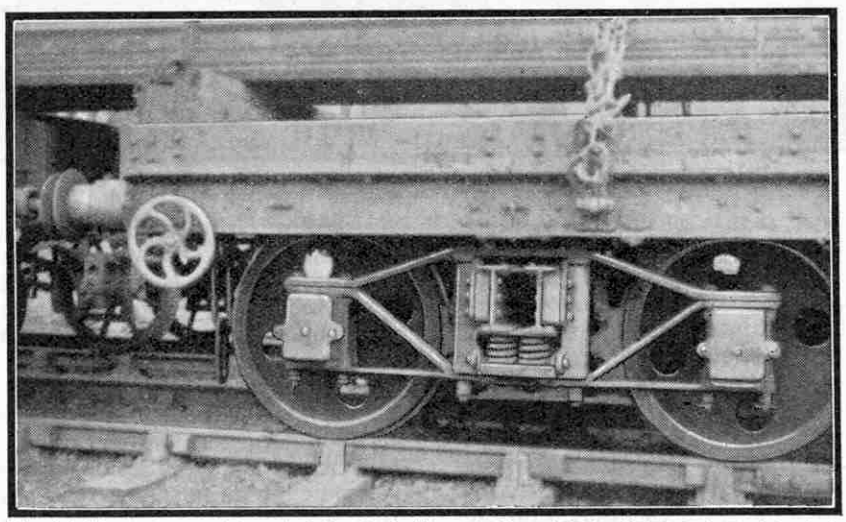
You will have noticed the crescent-shaped weights in engine driving wheels, which even in one set of wheels

have different sizes, and are fixed at different positions on the wheels, relative to the coupling rod. The object of these weights is to assist the internal balance of the engine, which without them would run very badly, and soon knock itself to pieces. On cast steel wheel centres the weights are sometimes solid, sometimes hollowed out to some extent to form pockets into which lead can be run, so as to get very exact results. Another design is that in which mild steel plates are riveted on to each side of the spokes, the spaces so formed being filled, or partly filled, with lead.



The ordinary spoked wagon wheel. This is commonly used on goods rolling stock, but is giving way to the modern steel disc wheel.

The tyres for locomotive wheels, both engine and tender, are made from a single piece of steel, rolled to the required size and shape in a special rolling mill, so that there is no join or weld in the tyre. When finished, it is bored out to a diameter slightly less than that to which the wheel centre has been turned. The difference, or shrinkage allowance as it is called, is usually 1/750 to 1/1000 of the diameter of the wheel centre. The tyre is heated in a furnace or over a ring of gas jets, until its temperature is about 250 degrees Fahrenheit. It is then placed flange upward in a shallow receptacle, usually of cast iron, and the wheel centre lowered into it. A fine spray of water is then played on to the tyre all round. But the grip of the tyre on the wheel centre so obtained is not considered sufficient for safety, and additional security is got in several ways. One method is to use $\frac{7}{8}$ in. or 1 in. studs spaced between each pair of spokes, and screwed through the edge of the wheel centre, entering the tyre about $1\frac{1}{4}$ in. to $1\frac{1}{2}$ in. Another very usual method is to use a retaining ring, which is a thin steel ring laid along the inside of the wheel, covering the joint between centre and tyre, and recessed into both, being riveted through the lip of the tyre by $\frac{5}{8}$ in. rivets.



A bogie bolster wagon running on steel disc wheels. These wheels are being applied to an increasing extent to modern freight stock.

New tyres are 3 in. thick, and after shrinking on to the centres are turned on the tread, with the correct angle of coning of 1 in 20. It is important that all driving wheels that are coupled together should be of exactly the same diameter, otherwise slipping will occur. The tyre tends to wear hollow, and is from time to time turned down in the lathe, until a minimum thickness of $1\frac{5}{8}$ in. is left after the last turning. It is scrapped when worn down to $1\frac{1}{2}$ in. but sometimes, for the largest driving wheels, less wear than this is allowed.

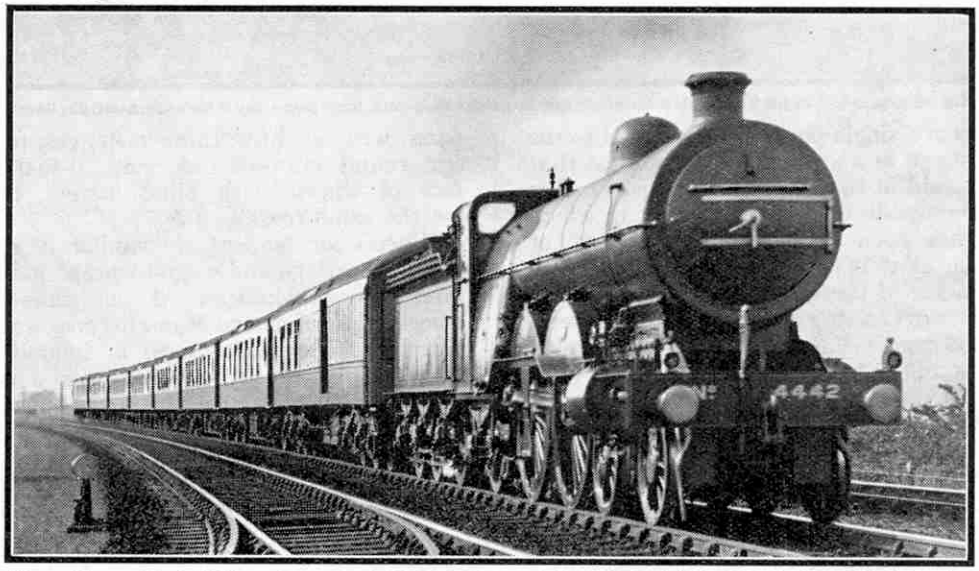
Some figures for the average life of engine tyres may be interesting. For driving wheels, 50,000 miles before returning is usual; 25,000 miles for leading bogie wheels, and 30,000 to 40,000 miles for tender wheels. It is worth noting that the 4–4–0 type of engine has been found the most economical in tyre wear. When several wheels are coupled together it is usual to make one or more pairs with slightly thinner flanges, to assist the passage round curves; and some 0–8–0 engines have a pair of wheels with blind flanges, that is flat rims, for the same reason.

Wheels for tenders are similar in design to driving wheels. Carriage and wagon wheels, however, show some interesting differences. At one time wooden centred wheels, known as the Mansell type, were much used for carriages. They introduced a difficulty for the signal engineer, because the wood was a sufficiently good insulator to prevent a carriage so equipped from operating the track circuits on the line. It was therefore necessary to bond the tyre to the steel boss of the wheel by a copper or metal strip, to carry the electric current. The tyres of such wheels are also shrunk on, with an allowance of about $\frac{3}{16}$ in., and retaining rings of the Gibson or Mansell pattern are used. Nowadays dished steel disc wheels are the commonest type for carriages, the tyres being also shrunk on to these, with an allowance of about $\frac{1}{16}$ in. All carriage wheels are carefully balanced in a special machine, any error being corrected by small metal plates fixed near the rim. Tyre steel for carriages is harder than that for wagons, as it is subjected to greater wear and tear by the power operated brakes. Carriage wheels are usually finished by varnishing, the tyres being painted white. A rough black lacquer or bituminous enamel is generally used for wagon wheels.

Long-Lived Express Locomotives

"Atlantics" of the L.N.E.R. (G.N. Section)

IT is a remarkable fact that certain high-speed expresses are hauled by some of the oldest locomotives that are still in service in this country on main line duties. These veterans are the L.N.E.R. 4–4–2 "Atlantic" engines of former Great Northern design employed in the working of the famous Newcastle and Edinburgh Pullman trains on the portion of their journey between King's Cross and Leeds. Although the loads conveyed by these trains are limited to eight cars or some 330 tons, it must be remembered that by the fastest train between these points, the *"Queen of Scots,"* an average speed of nearly 58 m.p.h. has to be maintained for almost 186 miles over a by no means easy road. At the time of the introduction of the class a load of 250 to 330 tons was held to be a heavy train. Indeed, the pre-War 2 p.m. up express from Leeds, which for many years made the longest run on the G.N.R., used to run from Wakefield to King's Cross at 56.4 m.p.h., but with a load averaging less than 200 tons.



The up "Queen of Scots" Pullman Express hauled by L.N.E.R. large-boilered "Atlantic" No. 4442, the "Royal Train" engine of the former G.N.R. The illustrations to this article are by courtesy of the L.N.E.R.

The G.N.R. "Atlantics" have had a long period on first-class duties. The type was introduced on the G.N.R. in view of the increasing weights of the chief expresses, with which the locomotives then existing were finding it difficult to deal. Bogie coaches were coming more into general use, and this, together with the introduction of corridor and restaurant stock, made necessary the development of greater power on the part of the locomotives.

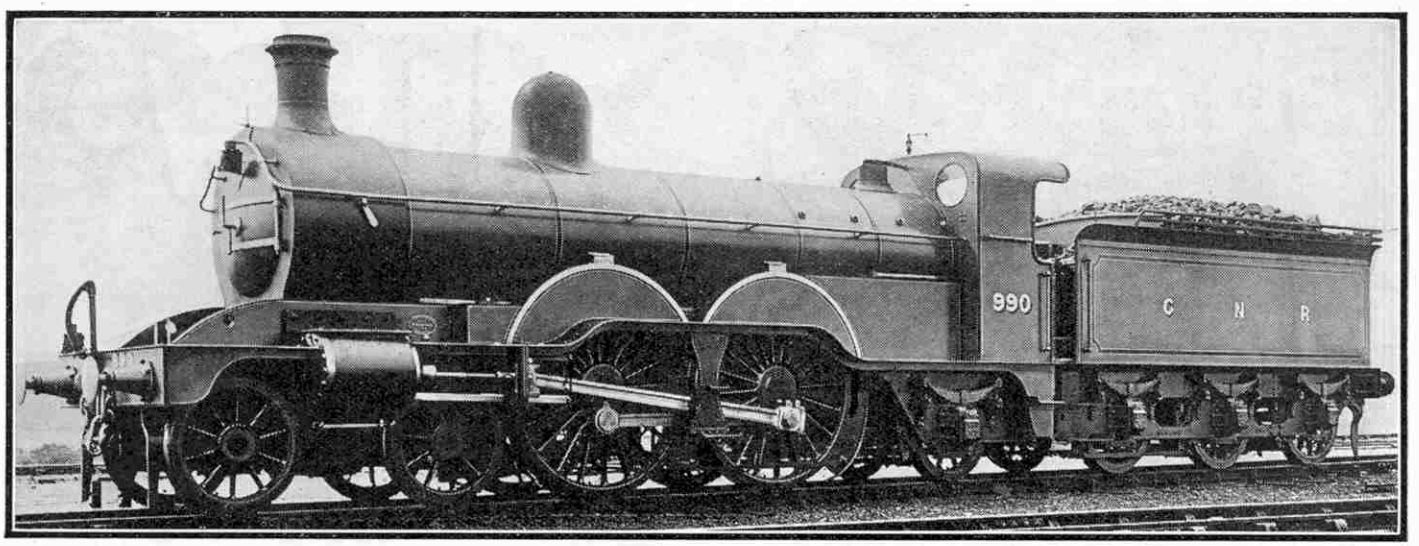
After bringing out two classes of 4–4–0 locomotives, Ivatt decided to produce an engine of a different type. About this time 4–4–2 locomotives had been recently introduced, and were making a name for themselves on the Atlantic Coast Line in the United States; hence the use of the term "Atlantic" to distinguish the type. This "Atlantic" wheel arrangement was adopted for the new G.N.R. design. The 4–4–2 type allows of a material increase in boiler capacity over the 4–4–0, and this no doubt was an important factor in its selection. The new engine was of the true "Atlantic" type, having a very short coupled wheel-base, with the driving wheels in front of the fire-box, and with outside cylinders connected to the rear pair of driving wheels. In spite of the opportunity afforded by the presence of small trailing wheels to provide a wide fire-box, unrestricted by the frames or the driving wheels, the first, or small-boilered, series of G.N.R. "Atlantics" retained the narrow fire-box common to British locomotive practice.

Although notable engines at the time, the well-known "Klondykes," as they were called, their advent having coincided with the famous Alaskan "Gold Rush" in 1898, appear to us to-day to be of quite moderate dimensions. They were quite successful, however, so that it was subsequently decided to apply a much larger boiler to the same design of engine. This resulted in the appearance of the famous No. 251; but further small-boilered engines, the "252" series, were built at the same time, the idea being, apparently, that if the gigantic boiler, for those days, of No. 251 proved successful, the small-boilered engines would be converted to the new arrangement. But this transformation has never been carried out.

Apart from the size of the boiler barrel, measuring 5 ft. 6 in. in diameter, perhaps the most striking feature of No. 251 was the employment of a wide fire-box of the "Wootten" type spread out across the frames behind the driving wheels, as commonly used in American practice. The combination of this large boiler and firebox, with their remarkable capacity for the generation of steam, together with comparatively moderate-sized cylinders resulted in an engine that could scarcely be run "out of breath."

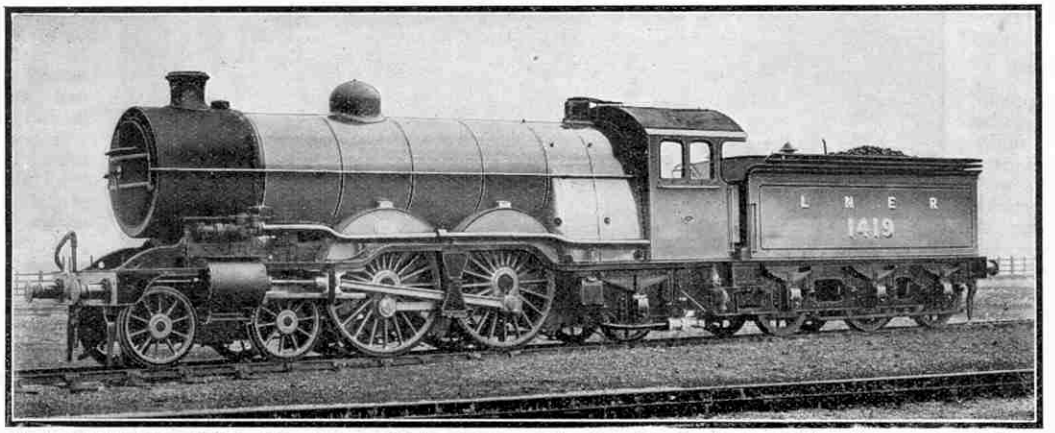
In spite of their remarkable capacity, however, the Ivatt "Atlantics" in their earlier days did not show up very well on fast and heavy duties. Although capable of continuous steaming for long stretches, and of rapid downhill running, they appeared to be deficient in tractive power for hill-climbing. As time went on, however, superheating was coming into vogue, and experiments were made with one of the small-boilered engines. As a result it was decided to incorporate superheaters and piston valves in the last 10 "Atlantics," Nos. 1452-1461, that came out from Doncaster in 1910.

The addition of superheating apparatus and the accompanying enlargement of the cylinders made a marked difference in the efficiency of the "Atlantics," and gradually its application was extended to small-boilered and large-boilered engines alike. By this time Mr. H. N. Gresley, the



present Chief Mechanical Engineer of the L.N.E.R. had taken the place of Mr. Ivatt, who had retired in 1911.

The years 1909 and 1910 were remarkable for the "locomotive exchanges" made between different pre-grouping companies, but the only one affecting the G.N.R. was the running of the L.N.W.R. 4–4–0 "Precursor" class engine, No. 412, "*Marquis*," on certain trains out of King's Cross in 1909. In return, G.N.R. No. 1449, a large-boilered "Atlantic," went over to the L.N.W.R. and worked on the main line out of Euston. From all reports the G.N.R. engine appears to have done quite well during its temporary service on the L.N.W.R. The second item of interest was the appearance of No. 1442 of the same class at Shepherd's Bush at the White City Exhibition.



The first G.N.R. "Atlantic" No. 990, of the small-boilered series, and the first of the type in Great Britain. It is now named "Henry Oakley" and bears the L.N.E.R. number 3990.
The booster-fitted "Atlantic," now L.N.E.R. No. 4419 and formerly No. 1419. It was the first locomotive in Great Britain to be fitted with a booster, and is the only G.N.R. "Atlantic" with a side-window cab.

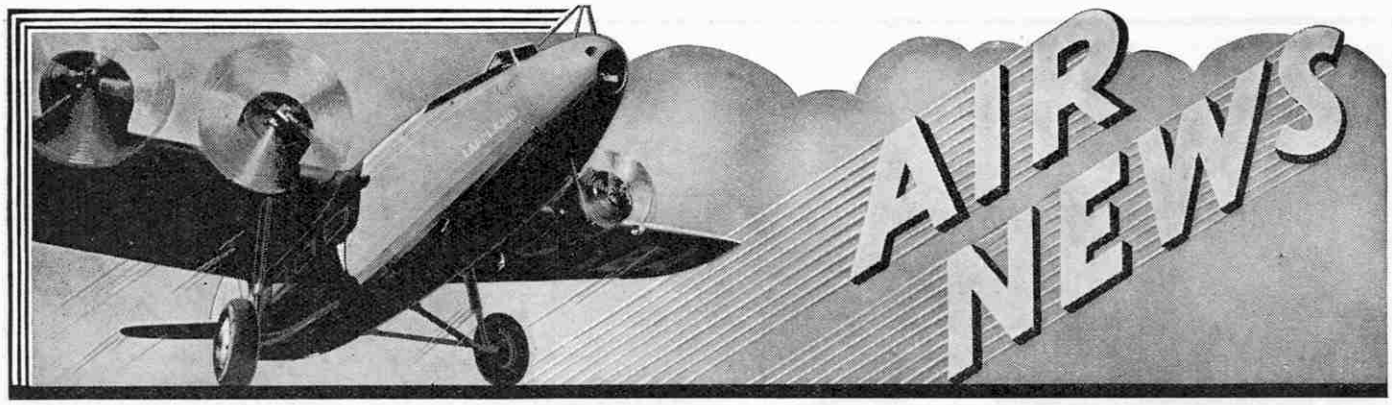
Ivatt was a keen experimenter and a four-cylinder variation of the original "Klondyke" design appeared in 1902 in the shape of No. 271. It was converted to the 2-cylinder arrangement in 1911, having been fitted with Walschaerts valve gear in 1904. It still remained unique when the outside cylinders were removed, for this left it as an inside-cylinder 4–4–2, the only example of the type on the line.

In the early years of this century the subject of compound locomotives was being given considerable attention. Ivatt built a large-boilered "Atlantic," No. 292, as a compound, the cylinders being four in number and disposed two inside and two outside the frames. Outside valve gear of the Walschaerts type was employed to operate the valves above the high-pressure cylinders. Another Doncaster compound was No. 1421. This engine, as well as No. 292, could be worked continuously as a simple or as a compound, as required by the work to be done, by the operation of a special change valve. No. 1421 was finally converted to the simple type in 1921. No. 292, however, finished its career as a compound.

It is interesting to note that a further experiment with 4-cylinder simple propulsion was made in 1915. Engine No. 279 was provided with four cylinders and outside Walschaerts gear. This conversion made No. 279 the most powerful express passenger locomotive then in the possession of the company.

During the War period, when train loads increased to gigantic proportions, the G.N.R. "Atlantics" performed some extraordinary work, even though the times of the principal expresses were greatly extended as compared with pre-War standards. With their relatively limited adhesion weight of only 36 tons and a tractive effort of 17,300 lb., the starting of heavy loads out of King's Cross sometimes proved difficult, and the climbing of the "Northern Heights" to Potter's Bar was necessarily slow. In view of this difficulty it is interesting that in 1923 a booster was fitted to the trailing axle of large-boilered "Atlantic" No. 1419. A booster is a small auxiliary steam engine that can be applied to a normally idle pair of wheels. Its power is transmitted by means of a movable pinion so that the booster can be cut in and cut out as required. Trials were carried out over heavy gradients with a train of 18 coaches, and the advantage of the booster was at once apparent. It was found that certain modifications were necessary, however, and the alterations that were undertaken resulted in the locomotive being capable of starting and re-starting a load of 535 tons on a gradient of 1 in 100.

With the multiplication of the Gresley "Pacific" design after grouping, however, it became possible to confine the "Atlantics" to more lightly-loaded fast trains, such as the "Harrogate Pullman" services and their developments.



Airspeed "Envoys" for South Africa

The South African Government have bought seven twin-engined Airspeed "Envoys" and they are to be delivered early this year. They will have 310 h.p. Armstrong Siddeley "Cheetah IX" engines, giving a top speed of 211 m.p.h., and their equipment will include Sperry blind-flying instruments. Three of the machines are for the South African Air Force, and each of these will have a Lewis gun mounted in a protected position on the top of the fuselage, and a Vickers gun for the pilot, and will carry a load of bombs. The other four machines will be used for commercial air transport, two being five-seaters and two six-seaters.

Zeppelin Progress

The new Zeppelin LZ.129 is expected to be ready for her first flight by the end of this month. During the spring and summer she will make several flights, one of which will take her across the North Atlantic to New Jersey; and in the autumn she will join the *"Graf Zeppelin"* in operating the regular air mail service to South America.

The *"Graf Zeppelin"* is now being overhauled in readiness for the resumption of this fortnightly service in the spring. She is still in good form, and this will be her eighth year of service on this important route. Her retirement from it is being considered, however, and the construction of a new airship, LZ.130, to replace her, will be begun at Friedrichshafen when the hangar has been vacated by the LZ.129. The Zeppelin works there are being extended so that the completion of LZ.129 and work on the third airship can be hastened.

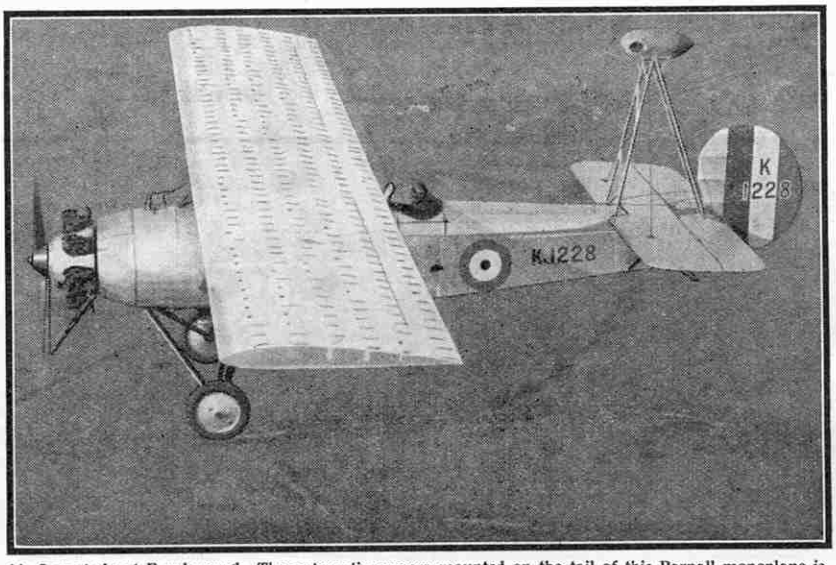
French Record Flight

A prize of £2,000 offered by the French Air Ministry for the fastest flight from Paris to Madagascar has been won by M. Genin and M. Robert, the holders of the previous record. They used a Cauldron-Simoun monoplane fitted with a 180 h.p. Renault engine, and flew from Le Bourget, Paris, to Antananarivo, Madagascar, in 57 hr. 32 min., averaging 110 m.p.h. This was 27 hr. 47 min. less than their previous record time for the journey.

The First *"Miles Merlin"*

The first *"Miles Merlin"* monoplane, described and illustrated on page 90, was purchased by Capt. G. Birkett of Birkett Air Services. He co-operated in the designing of the aeroplane, and since taking delivery of it he has flown it a great deal abroad, chiefly between Jibuti, in Abyssinia, and Cairo, a distance of about 2,000 miles, in connection with Press work.

Capt. Birkett flew back to this country in December, and the *"Miles Merlin"* has since been fitted with wireless telegraph transmitting and receiving apparatus. This equipment will help to get over the language difficulty when the aeroplane is chartered for Press work in countries where English is not spoken. It will be necessary to carry a wireless operator in addition to the pilot, but the latter will be relieved of wireless duties.



Air-flow study at Farnborough. The automatic camera mounted on the tail of this Parnall monoplane is filming the movements of tufts of wool attached to the wing. Photograph by courtesy of "Flight."

D.L.H. South Atlantic Service

When the two depot ships *"Westfalen"* and *"Schwabenland"* had to be overhauled last autumn, the D.L.H. South Atlantic air mails were carried by the *"Graf Zeppelin"* until the ships resumed their stations. This disorganisation will be avoided in future, as a third depot ship has been ordered by the D.L.H. It will be used to replace the *"Westfalen"* and *"Schwabenland"* in turn when they next require overhauling.

The new vessel will have a speed of 15 knots, and is expected to be ready this summer.

Vacancies in the R.A.F.

The Air Ministry announce that there are 300 vacancies in the R.A.F. this month for Boy Entrants for training as wireless operators, armourers and photographers, and those accepted will be given 12 to 16 months' training in the particular trade to which they are allotted.

Boys between 15¾ and 17¼ years on the first of this month are eligible, provided they have attended a secondary, junior technical or central school up to the age of 15½, or have attained an equivalent educational standard. There is no entrance examination, but candidates must be nominated by a recognised authority and present themselves for interview. Boys still at school can obtain full particulars and application forms from their headmasters, and boys who have left school can obtain them from the local Ministry of Labour advisory committee for juvenile employment, or the local education authority, or from the Air Ministry (Boy Entrants Dept.), London, W.C.2.

Proposed North Atlantic Air Mail Service

The first survey flights in connection with the proposed air mail service between this country and Canada and the United States will be carried out between 15th March and 15th May this year. If all goes well a regular air mail service will be introduced in 1937. It will be operated by a northern route, and there will be landing stations at London, Northern Ireland, Newfoundland, Montreal, New York and Washington.

Two wireless floating beacons will be established to guide the aircraft. The British Government have undertaken to maintain one beacon, which will be anchored in the Atlantic at a point about 600 miles west of Ireland; and the U.S. Government will have the other one placed a similar distance east of Newfoundland. The mails from this country will be flown by Imperial Airways, and those from America and Canada will be brought here by Pan-American Airways.

It is understood that the two companies will share the preliminary expenses of the undertaking.

Air Service Extensions

Every week brings forecasts and announcements of new or extended air services to be introduced this spring.

A contract has been signed between the Portuguese Government and Crilly Airways Ltd., for the conveyance by air of mails between Lisbon and London, and the new service is to be in full operation by the first of this month. Passengers will also be carried. As British aeroplanes cannot be delivered in time, Fokker F.XIIs will be used, and they are expected to make the trip in 9½ hr. These three-engined cabin monoplanes cruise at 151 m.p.h., and have seating for two pilots and 16 passengers. A Lisbon-Oporto service may be started this year.

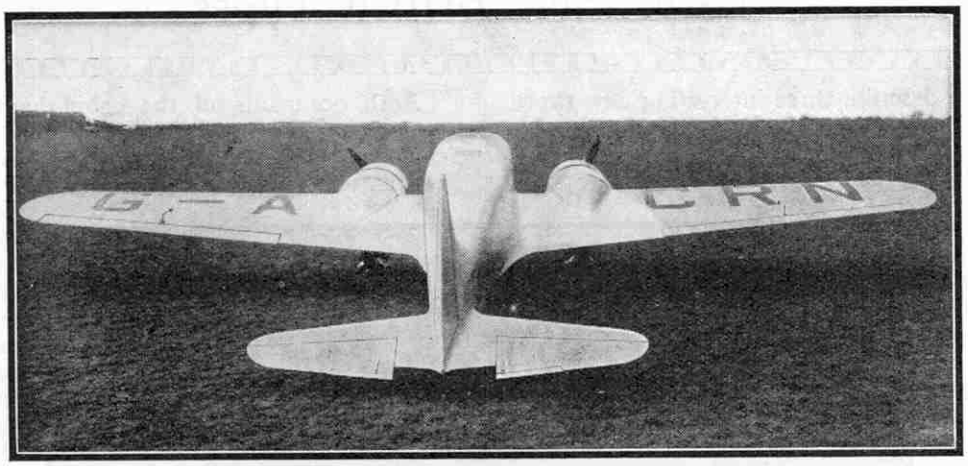
In Russia last year a freight service was operated between Moscow and Vladivostok, a distance of over 5,000 miles, and passengers were carried over part of the journey. This year a regular passenger service over the whole route will be introduced, and also two branch services linking up with it. Another important air service to begin this spring will operate between Moscow and Prague.

British Continental Airways' service to Amsterdam is to be extended to Copenhagen and Stockholm, by way of Hamburg and Malmo. The extended service will begin early in May, and new D.H.86 machines will be used.

High Speed Lockheed "Electras"

L.O.T., the chief Polish air transport company, have ordered four Lockheed "Electra" 10A monoplanes. These 12-seater twin engined aeroplanes have 400 h.p. Pratt and Whitney "Wasp-Junior" engines and can attain a top speed of 206 m.p.h. at 5,000 ft. When received from the makers they will be used on the company's internal air lines.

A more recent version of the Lockheed "Electra," called type 10E, is now being put into production, and three of them have been bought by Pan-American Airways for their services to Alaska, Mexico and Cuba. The "Electra" 10E has two Pratt and Whitney Wasp 83HI engines that give it a top speed of 215 m.p.h. and a cruising speed of 205 m.p.h., and make it the fastest cruising twin-engined aeroplane in the United States. It carries two pilots and 10 passengers, and 240 lb. of luggage or other freight. The undercarriage is retracted during a flight.



An Avro "652" monoplane viewed from the rear. The neat streamlining of this design is well brought out. Photograph by courtesy of A. V. Roe and Co. Ltd., Manchester.

Mass Parachuting in Russia

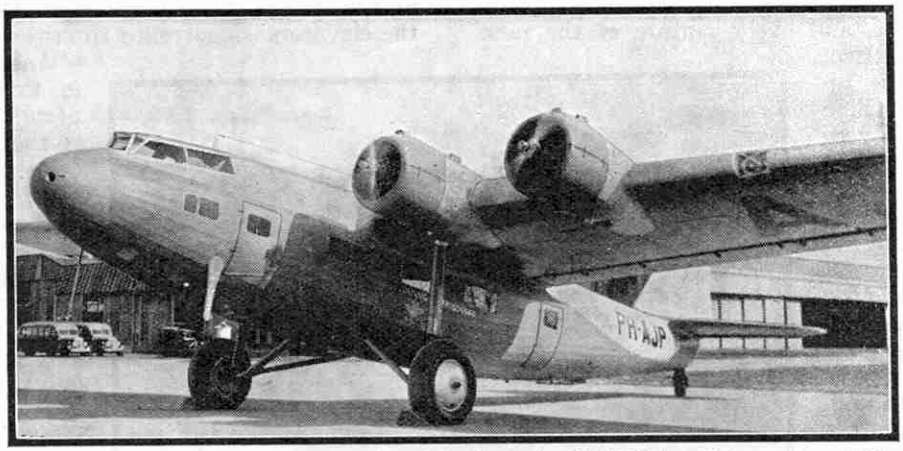
In Russia the military authorities attach great importance to ability to descend from aircraft by parachute. The necessary training is not yet compulsory in the Red Army, but according to General Voroshiloff, the Defence Commissar, so many of the men wish to be trained as parachutists that the demand greatly exceeds present facilities.

Some idea of the extent to which training has already been carried out is shown by the fact that at a demonstration during the autumn manœuvres last year 1,200 armed men landed by parachute at Kieff Aerodrome at the same time, and another 2,500 landed during the next 40 min. This mass descent of an army introduces a new factor into warfare on land.

Tata Air Lines Developments

The new coastal air mail service between Bombay and Trivandrum, the capital of the State of Travancore, mentioned in these pages last August, has now been in operation for just over three months. The southward flight is made on Tuesdays and takes just under nine hours, including two stops on the way. The return flight to Bombay is made on Fridays and in faster time, taking slightly less than seven hours, including two stops. Passengers are carried on these trips when the quantity of mail makes this possible.

The proposed coastal air service from Madras to Colombo still awaits the completion of the Colombo Airport.



One of the Fokker F.XXII 4-engined monoplanes belonging to the K.L.M. Photograph by courtesy of N.V. Nederlandsche Vliegtuigenfabriek.

New Aircraft for Imperial Airways

New equipment under construction for Imperial Airways includes 12 high-speed Armstrong Whitworth monoplanes, in addition to the 29 Short Empire flying boats mentioned in these pages last December. The monoplanes will be of the high wing type and will be driven by four Armstrong Siddeley "Tiger" engines each of 900 h.p. An advantage of high wing monoplanes for passenger work is that the occupants of the cabins have an unobstructed view from all the windows.

Each monoplane will seat 27 passengers by day, in three 9-passenger cabins situated one in front of the wing and two behind it and separated by doors. There will also be a freight and luggage compartment, a mail compartment and a kitchen. At night sleeping accommodation will be available for 20 passengers, four in the front cabin and eight in each of the two rear cabins. The bunks will be arranged in pairs, one above the other.

"The Star of India"

Under an agreement recently drawn up between Indian National Airways and the Government of India, the company will maintain and operate the Viceroy's Avro "642," *"The Star of India."* This machine was illustrated on page 341 of the *"M.M."* of June 1935.

Protecting Wooden Propellers

A new process patented in Germany is designed to preserve aeroplane propellers from changes due to atmospheric conditions. In this process, according to the aeronautical correspondent of the *"Daily Telegraph,"* the leading edge of each blade is reinforced with a narrow brass sheath soldered to a strip of gauze, and the propeller is then covered with a sheet of celluloid forced into the wood under pressure.

New Japanese Aircraft Carrier

A new Japanese aircraft carrier has been launched from the Kure Naval Dockyard. It is called *"Soryu,"* and is of 10,050 tons. It will have a speed of 30 knots, and will carry an armament of twelve 127 mm. guns, and will be the second largest Japanese aircraft carrier, the largest being the *"Akagi,"* of 26,900 tons. Other aircraft carriers are the *"Ruyjo,"* of 7,600 tons and the *"Hosho,"* 7,470 tons.

High-Speed Light Aeroplanes

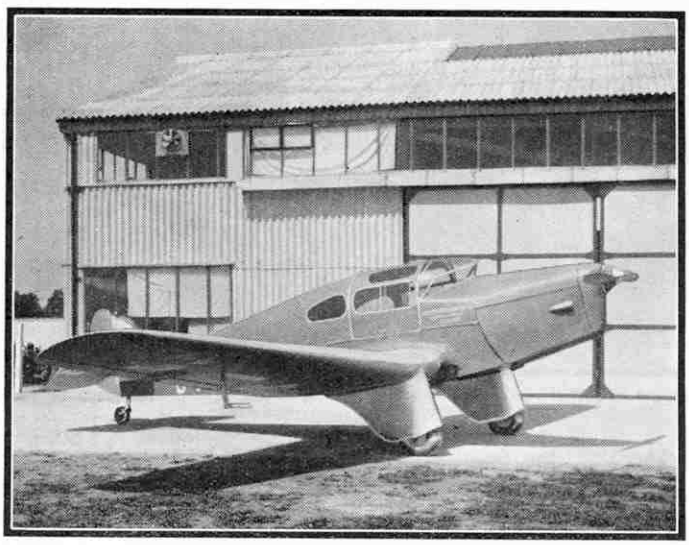
Three New British Types

THIS month we describe three interesting new types of British light aeroplanes, the D.H. *"Hornet Moth,"* the B.A. *"Swallow"* and the *"Miles Merlin."*

The *"Hornet Moth"* is the latest cabin light aeroplane produced by the de Havilland Aircraft Co. Ltd. It is the successor to the open cockpit biplanes known throughout the world under the general name of "Moth," and of which more than 4,000 have been sold. Many of these earlier types have been described and illustrated in the *"M.M."* The new machine is the company's 87th design, and incorporates all the knowledge gained since the first "Moth" was produced in 1925. It was introduced at the King's Cup Air Race, 1934, when it was flown by Capt. G. de Havilland. A year was then devoted to improving the design, and during that time two more experimental machines were built and many hundreds of hours of tests were carried out, and every feature of the new type was tried and retried.

The B.A. "Swallow" in flight. This illustration and those on opposite page are reproduced by courtesy of "Flight."

It is a sturdy little biplane, ideal for civilian flying schools and also very suitable for the private owner. The enclosed cabin gives ample and comfortable side-by-side seating for two occupants. By reason of being under cover, the learner, seated beside the instructor, is relieved of the paraphernalia of helmet, goggles, flying clothing, speaking tubes, and other gear necessary in a tandem-seated open cockpit aircraft. Conversation is possible in a normal pitch of voice, and of course the instructor, with such excellent contact with his pupil, can demonstrate and explain the movement and action of the controls and instruments in the most effective manner. Dual control is provided by a central "stick" fitted with two branches fixed at angles to which one's hands rest naturally. A second set of engine controls can be fitted on the starboard side of the cabin.



The first "Miles Merlin" light transport monoplane. Photograph reproduced by courtesy of Phillips and Powis Aircraft Ltd., Woodley.

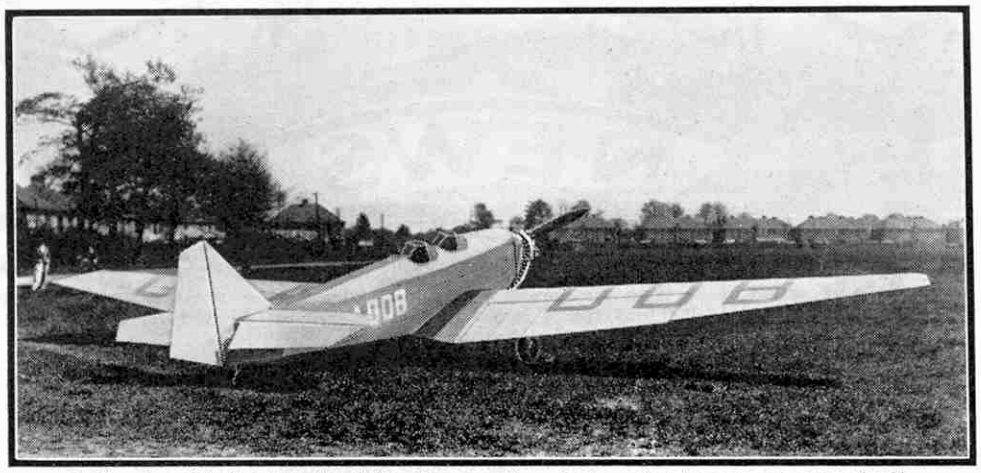
Both occupants of the cabin have an unrestricted outlook in all essential directions, and the view for landing could not be better. Sliding windows provide ample ventilation without creating annoying draughts. A large door on each side of the fuselage permits the easiest possible entrance and exit, and there is an emergency escape panel fitted in the transparent roof of the cabin. Beneath the seating in the cockpit is a space for keeping tools or other gear, and if necessary this space can be utilised for an extra petrol tank of 8½ gall. capacity.

The undercarriage is designed for rough ground and to withstand the harsh treatment to which a machine used for school work is subjected. When the machine is in flight the fairings of the undercarriage legs can be turned to present their broad side to the airstream and thus act as a powerful air brake. The tail unit is of the ordinary type, and the fore and aft trim of the elevators is controlled from the cockpit by the pilot.

Another important point in favour of the *"Hornet Moth"* as a training machine is that it is exceptionally easy to fly. Stability and control have been perfected in it to such an extent that a pilot can "cruise" indefinitely, execute all manœuvres and even land without touching the rudder bar, which need be used only for directional control when taking-off, and for ground manœuvrability. It is almost impossible to make the aeroplane spin, provided the rudder is not used; and this is very re-assuring to a pilot flying in all weathers. It means that when in cloud, fog, or rain all he has to do is to remove his feet from the rudder bar and control the machine entirely by movements of the stick. Provided he maintains sufficient altitude for the country over which he is passing, he should never get into trouble and he need never get the machine into a dangerous attitude.

The *"Hornet Moth"* has an overall length of 24 ft. 9½ in.,

and the wing span of 32 ft. 7½ in. is reduced to 9 ft. 6 in. when the wings are folded; the machine can then be housed easily in a garage little larger than most motor car lock-ups. The wings, fuselage and tail unit are of wood and covered with fabric. The engine is the standard 130 D.H. "Gipsy Major," and every part of it is easily accessible by reason of the low height of the engine "nose" and the quickly detachable cowling that forms the bonnet. This engine gives the aeroplane a top speed of 131 m.p.h., and a cruising speed of 111 m.p.h. at 1,000 ft. The rate of climb is 800 ft. per min. and the absolute ceiling, or greatest height to which the aeroplane can fly, is 17,800 ft. With a normal load of petrol the range is 376 miles. Extra fuel tanks can be fitted, and the fuel capacity is then 43½ gall. and the range 817 miles.

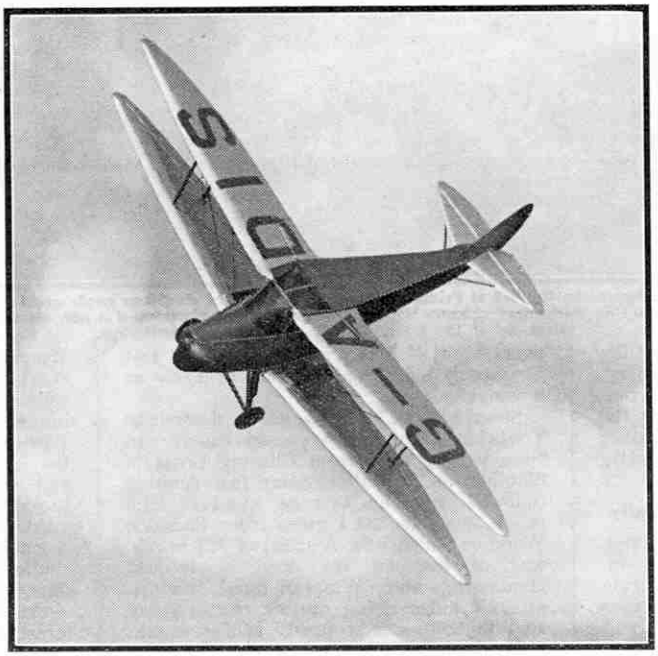


Another view of the B.A. "Swallow." The rather severe lines of this excellent two-seater are very noticeable.

The two other aeroplanes illustrated here are low wing monoplanes. The B.A. *"Swallow"* is a two-seater with open cockpits arranged one behind the other. There is no need for the occupants to wear goggles or special clothes on that account, however, as transparent curved screens in front protect them from bad weather. Dual control is fitted, of course. The forward part of the fuselage has double walls, and in the cockpits the inner wall is covered with plywood. A very clean design has been obtained by reducing external fittings to a minimum, and the straight lines of the machine give it a rather severe appearance.

The *"Swallow"* is produced by the British Aircraft Manufacturing Co. Ltd., and is an improved version of the British Klemm *"Swallow"* mentioned on page 13 of the *"M.M."* of January 1935. The wings and fuselage are of wood covered with plywood, and the elevator and rudder are also of wood and covered with fabric. The wings are 42 ft. 8¼ in. in span, and taper in plan and elevation. They are arranged so that they can be folded back, in which condition the overall width is only 15 ft. 1 in., or little more than one-third of their span when spread. The undercarriage is an improved non-retractable type and the legs are fitted with specially designed shock absorbers.

The machine is very easy to fly, and it is perfectly safe in the hands of an amateur pilot; indeed, the makers claim that it is the safest in the world to fly. The stalling speed, that is the speed at which the aeroplane ceases to maintain its height, is well below 30 m.p.h. It is worth noting that the *"Swallow"* achieves this low stalling speed without the use of wing flaps and slots. The aeroplane can be fitted with either a 70/75 h.p. British Salmson engine or a 75/76 h.p. Pobjoy "Cataract II." With the more powerful engine installed it has a maximum speed of 112 m.p.h. and cruises at 98 m.p.h. The fuel tanks are in the wings, and the fuel gravitates from them to a service tank immediately behind the engine. The take-off run, with full load, is only 50 yd., and the rate of climb is 800 ft. per min. The absolute ceiling is 17,000 ft.



This view of a D.H. "Hornet Moth" in the air gives a good idea of the excellent outlook from the cockpit.

Apart from being a low wing and single-engined aeroplane, the *"Miles Merlin"* has little in common with the B.A. *"Swallow."* It is a development of the *"Miles Falcon"* described and illustrated in the *"M.M."* of February 1935, and is produced by the same firm, Phillip and Powis Aircraft Ltd., of Reading aerodrome. It is the first 5-seater British commercial aeroplane designed to use a variable pitch propeller. The *"Merlin"* is produced as a private charter or feeder line aeroplane, and it can be used either as a mail carrier or as a comfortable miniature air liner. If required it can easily be converted into an aerial ambulance.

It is built of wood with plywood-covered wings and fuselage. The trailing edges of the wings are fitted with the Miles patent split flaps, which are operated hydraulically by a small pump in the cockpit and not only reduce the landing speed but make the approach and landing an easy matter. The cabin is 6 ft. 6 in. in length and averages 4 ft. in width, and is very similar to that of the *"Falcon."* The windscreen that forms the upper front of the cabin slopes forward like that of the older machine, and large side windows further help in making the cabin very light. The seats are arranged in two rows of two and three respectively, and behind the second row is a luggage locker large enough to take a stretcher when the aeroplane is used as an ambulance.

The *"Merlin"* has a 200 h.p. D.H. "Gipsy VI" engine, and attains a top speed of 155 m.p.h.

G.W.R. 1936 Programme

Quite apart from the works to be carried out under the Government loan scheme, announced in last month's "*M.M.*," the G.W.R. have planned the largest programme of renewals and additions that has been undertaken by them for some years. The "Castle" class is to be increased by 25 new engines, and in addition to 10 engines of the "Hall" class, 100 new locomotives of a similar type for general traffic purposes will be built. Ninety tank locomotives are included in the programme, 10 of these being fitted for auto-train or "pull-and-push" working.

Further end-vestibuled rolling stock, as put into service last year for the "*Cornish Riviera Limited*" will give increased comfort on long distance services. Special vehicles for pleasure parties and coaches affording a modern cafeteria service will be built. A further 1,250 freight vehicles completely fitted with the vacuum brake will be added to G.W.R. stock. The company already operate the highest proportion of fully brake-fitted freight stock in the country.

Over 400 miles of track are to be completely or partly renewed, in addition to the usual maintenance of stations and other structures. Some 50 bridges are to be partly or wholly reconstructed.

The "*Bournemouth Belle*" Runs Daily

The popularity of the all-Pullman "*Bournemouth Belle*" service has increased to such an extent that the train will continue to run daily during the year between Waterloo, Southampton, and Bournemouth. Until recently, daily running has been confined to Summer holiday periods, the train running on Sundays only during the Winter.

This modern service was commenced in 1931, although Pullmans were included in the Bournemouth services of the former L.S.W.R. many years ago, but were discontinued even before the War. The present "*Bournemouth Belle*," however, consists of first and third-class Pullmans, affording all the luxury and convenience of an up-to-date hotel.

S.R. "Schools" Class Performance

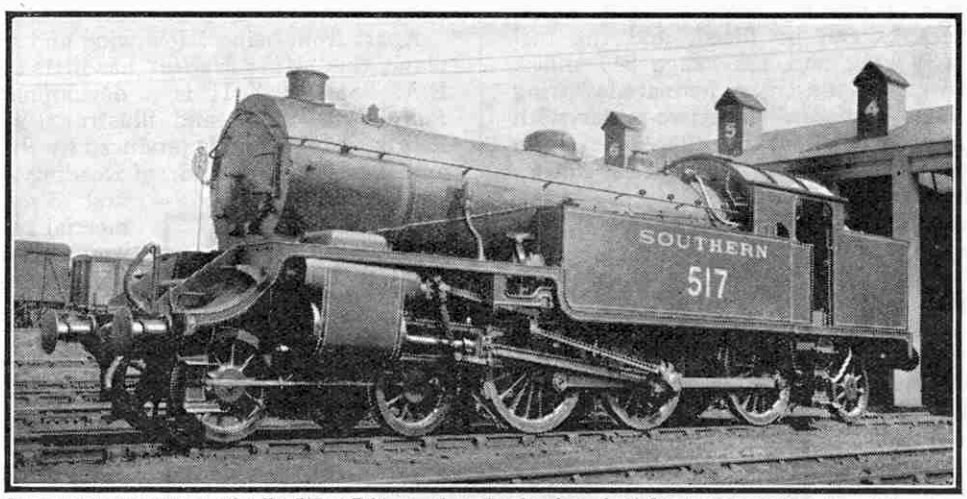
With the normal winter loads of about 300 tons, the "Schools" class 4–4–0 engines can usually be relied on to put up some sparkling performances on the 80-minute expresses between London and Folkestone. On a recent occasion No. 919, "*Harrow*," ably driven by A. W. Ely of Ramsgate shed, reached Folkestone in exactly 77 min. in spite of signal checks through the London suburban area. On the steeply-rising length from New Cross, the 9.4 miles from Hither Green to Knockholt summit were run at an average of 47.3 m.p.h., and 1½ min. lost by signals had been regained as early as Sevenoaks.

Speed rose to 74 m.p.h. on the descent to Tonbridge, which was passed exactly on time in 38½ min. from Charing Cross, a distance of 29½ miles. Some fast running followed, with an average speed of 65.3 m.p.h. over the 34.4 miles from Paddock Wood to Shorncliffe. A speed of 72½ m.p.h. was reached on the dead level near Headcorn, and Westenhanger summit, after 8 miles rising almost continuously at 1 in 266, was "topped" at 58½ m.p.h. Folkestone was reached 3 min. early.

The net time was not more than 75½ min., giving a start-to-stop average of 55.6 m.p.h. over this difficult route. The exact load was 288 tons tare and 305 tons with passengers and luggage. This run was recorded by Mr. O. S. Nock.

* * * *

Colour-light signalling is to be installed at Newcastle Central Station. The new system will be similar to that at present in operation between York (Poppleton Junction) and Northallerton.



Southern 4-6-2 tank locomotive No. 517 at Feltham, where the class is used chiefly on goods workings to and from the marshalling yard. The Urie "stovepipe" chimney is still retained on these engines, but it is now without the capuchon or raised lip at the front. (H.R.C. prize-winning photograph.)

Speedy Irish Railcars

Some rapid schedules are being operated by two railcars in service on the N.C.C. section of the L.M.S.R. The most noteworthy of these consists of running the 31 miles from Belfast to Ballymena in 45 minutes, inclusive of four stops. After some smart running between stops, the journey concludes with a non-stop run from Dunadry to Belfast, 15.9 miles in 22 minutes. On a recent trip on the service, Railcar No. 1 kept time without difficulty in spite of a furious head wind and driving rain. This car is fitted with two 140 h.p. Leyland petrol engines driving through a hydraulic torque-converter. The smartest run in the initial stages was from Antrim to Muckamore, 1.9 miles in 3 minutes, in spite of one mile rising at 1 in 196 from the start; the maximum speed was 46 m.p.h. On the final length, speed was sustained at 47 m.p.h. up the 1 in 180 grade to Kingsbog Junction, and rose to a maximum of 57 m.p.h. afterwards. For a railcar designed for short-distance work, and without any special aids to fast running such as streamlining, this is an excellent performance. The rough day provided a severe test of the efficiency of the windscreen wipers, and very well they emerged too, while the riding of the car at high speed was most comfortable. This particular car is covering a daily mileage of 300, including four of these fast runs in each direction between Belfast and Ballymena.

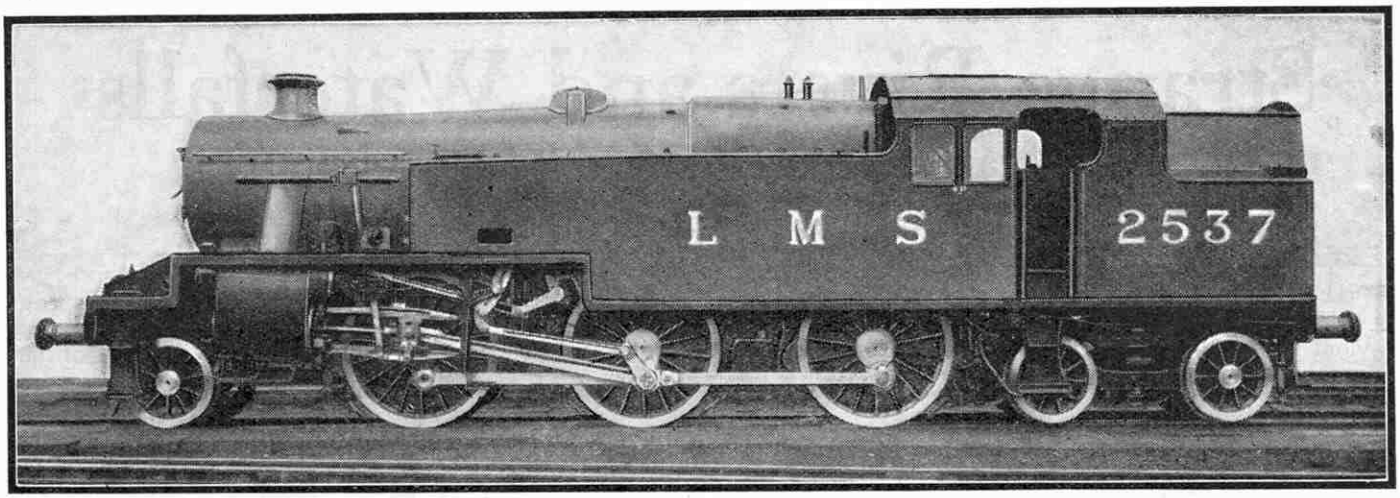
We are indebted to Mr. O. S. Nock for these timings.

* * * *

In the caption for the lower illustration on page 23 of last month's issue reference was incorrectly made to "Ambleside" station. This should have been "Arnside," the error having arisen through a mistake in copying. It did *not* escape the notice of our lynx-eyed readers!

* * * *

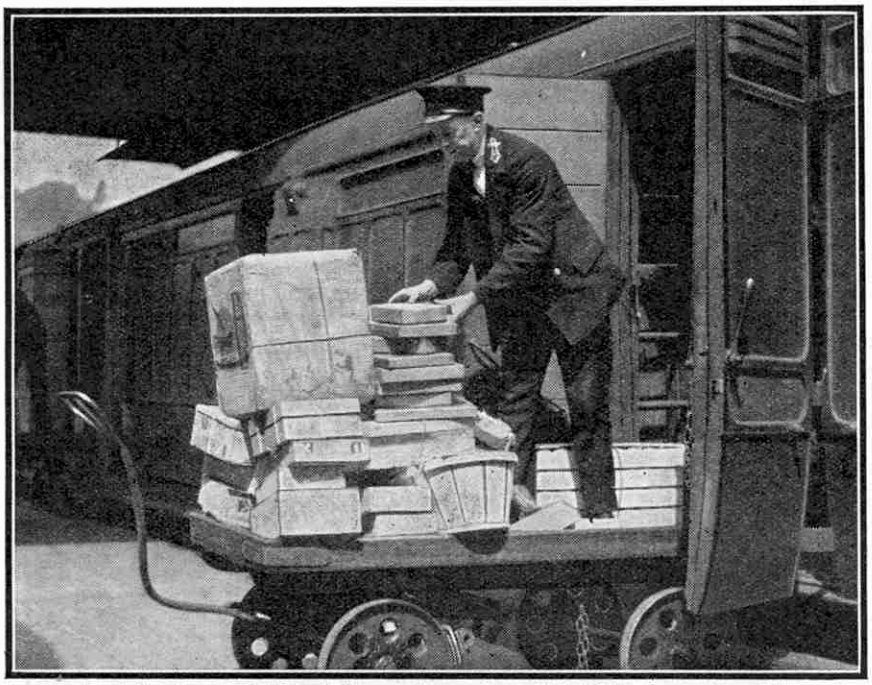
The L.M.S.R. "Turbomotive" is working between Liverpool and Euston. Leaving Liverpool at 8.15 a.m. it returns on the down "*Merseyside Express.*"



L.M.S.R. Locomotive and Rolling Stock Developments

During 1936 the L.M.S.R. plan to add to their stock 133 locomotives, 111 locomotive boilers, 687 carriages and 9,485 wagons. In addition 900 containers are to be built, and three steamers; and 600 miles of permanent way are to be renewed. The locomotives will be built in the Company's shops, and 48 of them will be similar to the existing 3-cylinder 4–6–0 "Jubilee" class. New passenger tank locomotives of the 2-cylinder 2–6–4 type, as shown in the photograph above, will be constructed to the number of 70, also 15 2–8–0 heavy freight locomotives.

The passenger coaches will afford increased comfort, and the bulk of them will be of the modern vestibuled and corridor type. The freight wagons will range from the 12-ton standard open wagon to 30-ton bogie timber trucks. The new containers are to be designed to meet the requirements of particular industries, and will increase the Company's total stock to 7,528. The road transport programme provides for over 300 motor vehicles.



The upper illustration shows L.M.S.R. No. 2537, one of the new two-cylinder 2-6-4 tanks recently put into service. Photograph by courtesy of the L.M.S.R. The lower illustration (H.R.C. prize-winning photograph) shows a typical station scene at Bangor, North Wales, where a varied consignment of parcels is being dealt with.

Contracts also have been placed to the value of £2,800,000 under the Government loan scheme for the construction of 369 steam locomotives and 270 passenger carriages. Sir W. G. Armstrong Whitworth and Co. Ltd., are to build 227 4–6–0 mixed traffic tender engines of class "5P.5F." The Vulcan Foundry Ltd., are to build 69 2–8–0 freight engines. The North British Locomotive Co. Ltd., have secured the contract for 73 2–6–4 suburban passenger tanks. All of these locomotives will be of the 2-cylinder type.

The construction of the passenger coaches has been allocated as follows: one hundred third-class vestibuled coaches are to be built each by the Metropolitan-Cammel Carriage and Wagon Co. Ltd., and by the Birmingham Railway Carriage and Wagon Co. Ltd.; fifty brake-thirds of similar construction are to be built by R. W. Pickering and Co. Ltd., and the Gloucester Railway Carriage and Wagon Co. Ltd., will be responsible for the construction of 20 new kitchen cars. Apart from the employment caused by the construction of these locomotives and rolling stock, the work will involve the use of some 40,000 tons of steel and 5,000 tons of non-ferrous metals, thus providing additional employment in the production of the raw and semi-manufactured materials required.

Euston Station to be Rebuilt

The most important of the schemes to be carried out by the London Midland and Scottish Railway under the Government loan arrangement is the rebuilding of Euston Station, including the hotel and offices. Many of the existing buildings were erected nearly a century ago to the designs of Hardwicke, and the reconstruction will involve a complete demolition of all buildings between the Station and Euston Road, and rebuilding within those limits.

Mr. Percy Thomas, the new President of the Royal Institute of British Architects, has been appointed as Consulting Architect, to co-operate with the Company's Architect, Mr. W. H. Hamlyn, F.R.I.B.A., and the Chief Civil Engineer, Mr. W. K. Wallace, in the preparation of plans and designs for the whole of the buildings embraced in the scheme. These include the railway station, hotel, and offices for the Company's staff.

The Procession to the Scrap Heap

With the passing of 1935 several classes of L.M.S.R. locomotives, well known and famous in their day, have become extinct as the result of the rapid progress of locomotive standardisation. The old 0–4–4 Kirtley well-tanks, so familiar on Midland lines in the London area, have now all gone. The class originated in 1869 and numbered 26 engines in all. The last survivor was No. 1219. Also obsolete now are the smallest of the 4–4–2 tanks of the L.T. and S. section, the last being No. 2073 built in 1884. So too have passed the L.N.W.R. 4–6–0 "Experiments," first built in 1905 chiefly for the Anglo-Scottish traffic. Again, the last two "Claughtons" with original small boilers, Nos. 5951 and 5984, have been withdrawn, and it is said that the large-boilered rebuilds are soon to follow. It is significant, too, that the superheated "Precursors" and "George the Fifths," hitherto unaffected by scrapping, have commenced to be reduced in numbers.

* * * *

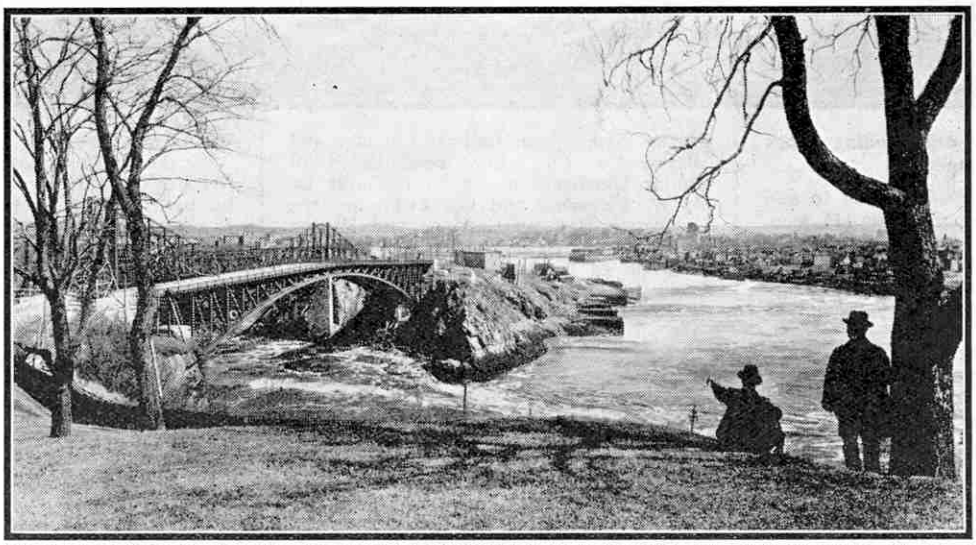
The 14 new L.N.E.R. locomotives of the "Sandringham" class will bear names of the following famous football clubs: *"Huddersfield Town," "Derby County," "Sunderland," "Middlesbrough," "Sheffield Wednesday," "Arsenal," "Manchester City," "Leeds United," "Grimsby Town," "Doncaster Rovers," "Newcastle United," "Sheffield United," "Norwich City"* and *"Hull City."*

Strange Rivers and Waterfalls

A Cataract that Changes its Direction

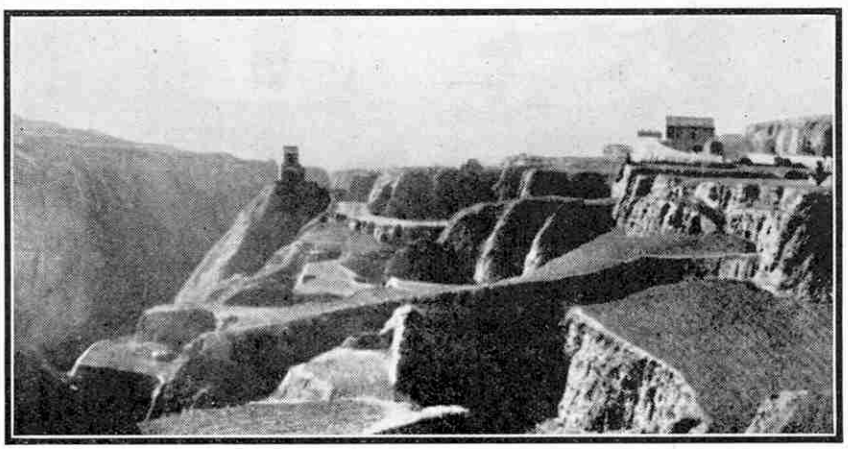
By H. E. M. Kensit, M.E.I.C., M.A.I.E.E.

THERE is perhaps nothing in nature that shows more striking extremes in its characteristics and behaviour than water in its numerous forms. It appears as dew, rain, snow and ice; it is found in springs, rivers, lakes and oceans, where it may carry with it an endless variety of its impurities, some actively beneficial, others harmless, and a few poisonous; and its effects are equally as varied, ranging from its life-giving properties as a drink to the immense power of a great waterfall and the destructive force of a raging sea.



The Reversing Falls at the junction of the Saint John River with the harbour of Saint John, New Brunswick. Photograph by courtesy of the Department of Trade and Commerce, Canada.

Water is the most ceaselessly restless of the elements. It travels by land, sea and air, it can rise far into the heavens or penetrate deep into the bowels of the earth, and when free is always in a state of motion. Even in the stillest of lakes it does not rest, although we cannot see it move, for it is being ever drawn to the heights above, to fall again as rain. When held as ice in a glacier it may move only a few inches in a year or in many years, but as vapour in the skies it may travel at vast speeds. After falling as rain, or snow, it eventually reaches the rivers, in which it may travel thousands of miles on its way back to the sea. Each drop may go through amazing adventures before it reaches the ocean, for in its course it may render many services to man, supplying his home needs, irrigating his fields, or generating vast amounts of power for use in his industries. Its arrival in the sea does not necessarily end its career, for it may again be evaporated by the wind and the Sun to become part of the clouds and fall once more as rain. It is not surprising, then, that water can furnish us with many strange sights, including great rivers that pour up "ready-made" from the depths of the earth, others that disappear entirely into cracks or fissures in its surface, or flow backward, and cataracts that reverse their direction of fall or play other astonishing tricks.



A village in the precipitous cliffs of the Yellow River. The entrances to cave dwellings can be distinguished on the upper terrace. Photograph reproduced from "Wandering in North China," by Harry A. Franck, reproduced by courtesy of the Appleton-Century Co., New York.

Most rivers start in a very small way, countless trickles of water from melting snow or rain meeting together to form a little stream that in its course is swelled by others that have originated in a similar manner. Some rivers start full-grown, however; that is they emerge suddenly in large volume from the ground at the outlet of a subterranean river, from water-bearing strata or a natural artesian well. A few form navigable rivers, operate a power plant or drive a factory at their very source.

Perhaps the most famous of these precocious streams is the Fontaine de Vaucluse, 40 miles from Avignon in the south of France, which is the source of the River Sorgue. There a subterranean river issues from a hole 60 ft. deep and 28 ft. wide at the foot of a circular ring of limestone cliffs over 650 ft. high. An underground passage gives it access to the Sorgue, but at times the water surges up above the crater with great force and discharges overland into the river below. The nature of the country is such that most of the snow and rain over an area of nearly 650 sq. miles then percolates below the surface and reappears at this outlet, to give an average flow of 800 cu. ft. per sec. The volume

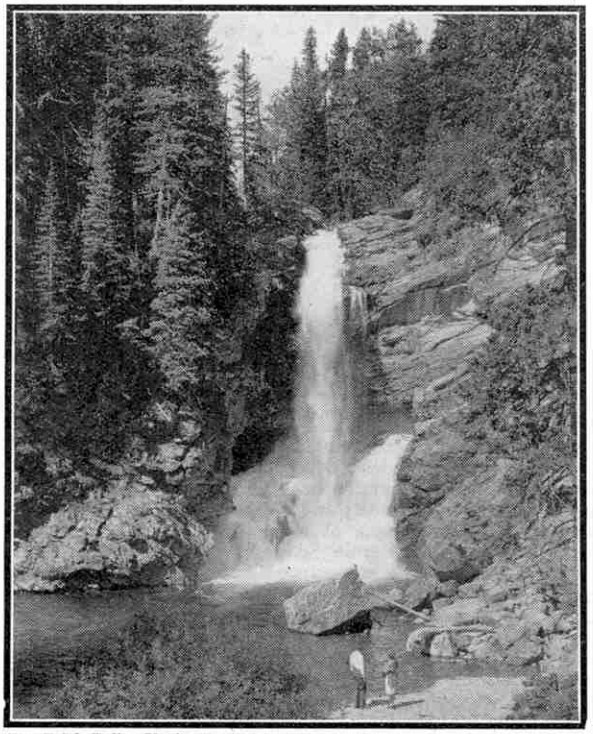
of this underground stream is sufficient to supply the needs of a city of five million people.

Another example is Silver Spring, Florida, where a stream with an average flow of 580 cu. ft. issues from the limestone into a pond or basin with a surface area of more than an acre and a depth of 35 ft. The cold water of the spring flows in great volume in the midst of a sub-tropical forest, and the basins and caverns from which it comes can be seen through windows in the bottoms of boats on the pond. The water is so clear that fishes swimming below the boats seem to be suspended in mid-air, and sunlight reflected from bright objects in the water creates truly magical effects.

An aerial view of the Victoria Falls, Rhodesia, where the Zambesi River plunges into a narrow fissure 400 ft. in depth in practically level country. Photograph by courtesy of "The Aeroplane."

In contrast to the rivers that spring from the earth are others that dive deeply into it. There are good examples of these lost rivers in the plains of Idaho in the United States, a nearly flat area of almost 20,000 sq. m. with the rugged Saw-Toothed Mountains rising in the north to a height of 6,000 ft. above the surrounding country. A large part of this area is covered by immense beds of volcanic lava, and through the centre flows the Snake River in a deep canyon that in places is bounded by sheer cliffs of lava 700 ft. high, and is surpassed in grandeur only by the Grand Canyon of the Colorado.

The lava beds extend almost to the mountains, from which issues rivers of considerable size, with such picturesque names as Big Lost River and Little Lost River. These disappear in the cellular and fissured lava and flow 50 miles or more underground before bursting through the precipitous lava walls of Snake River Canyon in great volume and at heights of 220 ft. and more above the level of the river. At the Thousand Springs there is a stretch of nearly half a mile in length from which numerous springs gush out between the permeable rock and the solid lava. The waters of these springs once fell in beautiful foaming falls up to 195 ft. in height, but now are collected in flumes and used to operate a hydro-electric power station.



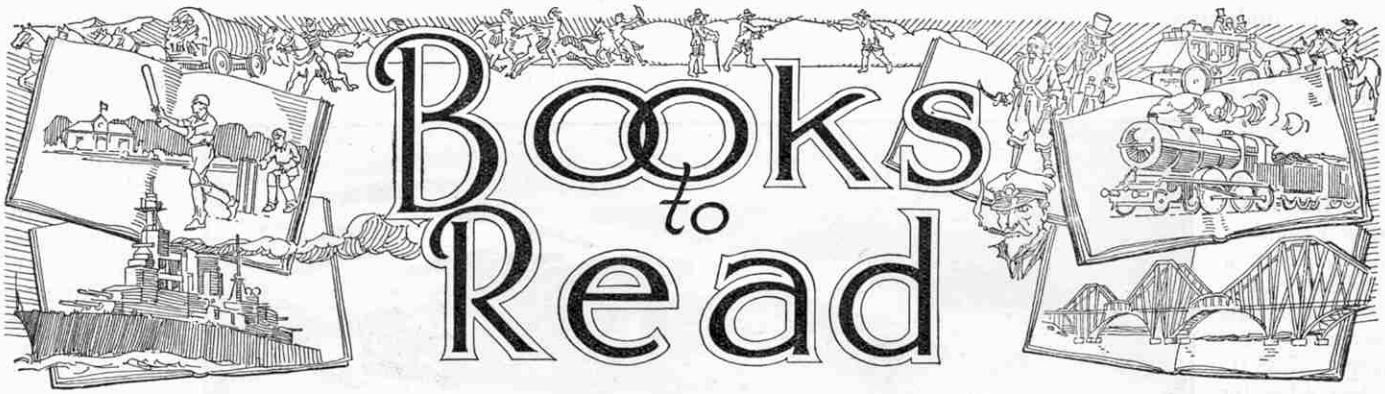
The Trick Falls, Glacier Park, Montana, during the spring floods. In dry periods the water pours out through a natural tunnel near the bottom. Photograph by courtesy of the United States National Park Service.

Another river that for part of its course becomes lost is the Guadiana in Southern Spain. This stream rises in the Sierra Morena, to disappear about 30 miles from its source and proceed by a subterranean channel about three miles in length to its junction with the Zancara River. It is lost in a flat country, in the centre of what has been described as an immense prairie, and does not re-appear on the surface of the earth until it has passed beneath the subterranean arch of what may be described as a great natural bridge.

The Hoang Ho, or Yellow River, in China, has the unenviable claim to distinction of being one of the world's greatest killers. It has changed its course 11 times in the last 2,500 years, and is subject to catastrophic floods at frequent intervals. It slaughtered more than a million people during a great outburst in 1897, and as recently as 1934 overflowed its banks to become 30 miles in width, covering farms and villages to a depth of 10 ft.

The Yellow River is about 2,700 miles in length. It rises in Tibet and winds across Northern China through the Yellow Valley to the Yellow Sea. It carries down immense quantities of yellow mud and this, together with the dust forming from it when it is deposited from the river, gives its hue to everything in its course. The water of the stream itself and of the sea into which it flows, roads, houses, fields and the clothes of the inhabitants of the valley all become yellow, and the former Emperors of China actually called themselves "Lords of the Yellow Earth." The river has carved its way through the immense deposits of sediment that it has produced.

Waterfalls may be no less mysterious or remarkable than rivers. For instance, the appearance of the Trick Falls on Two Medicine Creek, Glacier National Park, Montana, varies with the time of the year, and at the mouth of the St. John River, New Brunswick, Canada, there is a fall that actually reverses its direction every time the tide in the harbour rises and falls.



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

"The Story of Telford"

By Sir ALEXANDER GIBB
Alexander Maclehose and Co. 16/- net

It is surprising that we have had to wait so long for a really good account of the life of Telford. His period was the great age of engineering when civil engineers were playing an enormously important part in pushing forward civilisation. In canals, harbours, roads and bridges Telford exerted a world-wide influence on the civil engineering of his time, and as First President of the Institution of Civil Engineers he was a prominent figure in the birth and development of a great profession. The present book is of particular interest in being written by an eminent engineer whose great-grandfather was one of Telford's chief assistants.

Telford's life work was concerned almost entirely with the improvement of communications in one way or another. In all he constructed not far short of 2,000 bridges, large and small, and he planned, surveyed and constructed between 3,000 and 4,000 miles of roads. He lived to see the beginning of the railway era, but he took no part in its development.

He started life in a humble way in a small thatched cottage in Eskdale. His father died a few months after the boy was born, and the mother had barely sufficient means to keep herself and the child. It cannot be said, however, that this poverty in his childhood had any handicapping effect on Telford's career, and indeed in later life he often declared that in his opinion it was actually an advantage to be born poor. He received the usual excellent village education that was typical of Scotland at that time, and this proved a sufficient foundation for the vast technical knowledge he acquired steadily throughout his life.

In the course of his work as County Surveyor of Salop he built the first bridge to his own design, a three arch stone bridge across the Severn at Montford, some four miles from Shrewsbury. His next structure was the iron bridge at Buildwas, the second iron bridge built in Great Britain, and only a few miles away from Coalbrookdale, where was the first iron bridge in the country. The successful completion of these structures started him on his career and led to his selection as engineer of the Ellesmere Canal to join the Mersey, the Dee and the Severn. In connection with this scheme was the great aqueduct of Chirk that carried the canal over the valley of the Ceriog, and the Pont Cysyllтau aqueduct, in which the canal water was carried in an iron trough. It was this latter work that Sir Walter Scott described as "the most impressive work of art he had ever seen."

Telford's extensive highland surveys and his construction of the Caledonian Canal occupied a considerable period of his life. His letters written during this period show something of the difficulties with which he had to contend, and the dogged determination with which he pushed aside all obstacles, human or otherwise! He took life very seriously and was not gifted with a superabundance of humour; but some of these letters from Scotland show that he was capable of seeing the funny side of things, even in difficult circumstances. He was fortunate at this time in having a remarkably efficient and trustworthy staff of assistants. They were men who held strong views in regard to their work and everything else. One of them had an extraordinary belief that the only safe cure for all ills was a plunge in cold water; and his son, describing his father's cure of one of the servant maids suffering from all the symptoms of incipient fever, says: "Last night we threw two buckets of sea water over her; to-day she is going about her work as usual!"

Thomas Telford.

Telford's Menai Suspension Bridge and his London-Holyhead road may be said to have been the means of introducing a new era in communication between England and Ireland. He was the first to apply engineering principles to road making, in which respect he differed from his contemporary Macadam who, while claiming to have entirely revolutionised the art of road work, disclaimed all title to the name of engineer. Macadam preferred a soft and yielding foundation to one that was rigid and inelastic, and for constructional purposes he relied upon angular pieces of stone that could be passed easily through a ring 2½ in. in diameter. Telford insisted on having a foundation of large stones, and in principle his roads differ little from present-day practice in road-making for the heaviest traffic. His methods had the great drawback that they were too costly, however, except for the most important mail routes. Macadam's roads were simpler and cheaper and could be constructed more rapidly, and therefore came into far more widespread use than those of Telford, but there was some degree of superficiality in his work.

It is interesting to note Telford's attitude to railways. He was by no means unsympathetic towards the new means of transport, but he seems to have doubted whether the great enthusiasm of its pioneers would be justified. He was actually approached by the promoters of the Liverpool and Manchester Railway to be the engineer for that line, and his refusal appears to have been based on a feeling that to take on this work would make him guilty of disloyalty to the canals and the canal proprietors who had so fully relied upon him. Even if he had lived it is doubtful whether he would have come into prominence as a railway engineer.

Telford died on 2nd September 1834, in his 78th year, and was buried in Westminster Abbey. In the following paragraph Sir Alexander Gibb sums up the great man's career: "So at last the long life ended—fortunate perhaps above all that it had been rounded off and completed in a way that few achieve. . . . There were no loose ends, as there had never been any in his lifetime; and that is remarkable when one considers the immense list of his works. He was fortunate, too, in that his reputation had been established for many years before he died, and indeed in the last twelve years he had no rival. With him an age of engineering ended. His influence on engineering has not ended and never can."

This is a book that should certainly be read by all who are interested in civil engineering. It is well illustrated by a series of excellent photographs.

"The Wonder Book of Tell Me Why"

(Ward, Lock and Co. Ltd. 5/– net)

The "Wonder Books" Series is now too well known to require recommendation. This new addition tells in picture and story of some of the most wonderful —and sometimes also the most familiar—things in the world. It covers a very wide range of topics, including astronomy, botany, geology, machinery and engineering, and zoology, and many general subjects that do not come under any of these classifications. The answers to the many puzzling questions are by well-known experts, and the book is illustrated with eight colour plates and nearly 300 excellent reproductions from photographs. This is an ideal gift book.

"Creative Woodwork"

By W. T. James and J. H. Dixon
(Pitman. 8/6 net)

This is a book for all who are interested in the art and craft of woodwork. It is intended primarily for teachers, and describes a scheme that is well adapted to encourage boys to develop originality and artistic sense as well as to instruct them in the use of tools and the mechanical side of woodwork. It is full of suggestions for designs of great value, and its wide range and the practical character that results from the long experience of its authors as teachers of handicrafts make it equally valuable to students and to those who make artistic woodwork their hobby.

In a book of this kind drawings and illustrations play a very important part, and those included in the present volume are excellent in type and of great practical value. In addition to a very large number of drawings in the text there are 39 plates, and special interest is attached to a group of these that illustrate antique and modern examples of artistic craftsmanship.

"Through the Weather House"

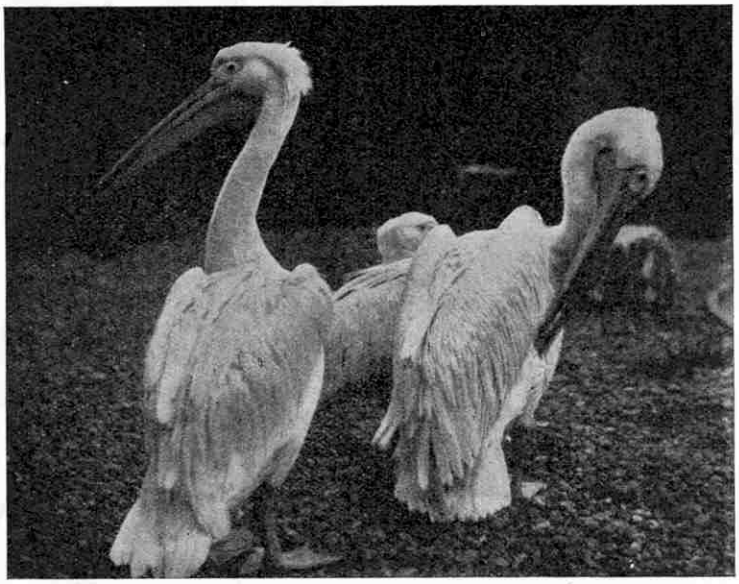
By R. A. Watson Watt
(Peter Davies. 7/6 net)

The weather is a subject of perpetual interest to all of us, and readers will welcome this story of modern weather forecasting, which is an amplification of a series of interesting talks broadcast by the author during 1934. Weather experts are concerned with the atmosphere, and the various strata of this, from the lowest layer, in which we live, to the stratosphere and the regions above it, constitute the floors of the "Weather House." How conditions in these layers affect our weather is explained in simple terms, and in doing so Mr. Watt reveals some of the mysteries of weather forecasting. He does not claim to teach his readers to become their own weather prophets, but shows how the evidence on which weather reports are based is collected and interpreted. The author's light and easy treatment of his subject is enjoyable, and his readers will obtain clear ideas of the causes of the various kinds of weather we experience. Excellent diagrams and delightful pictures of cloud effects add to the interest of the story.

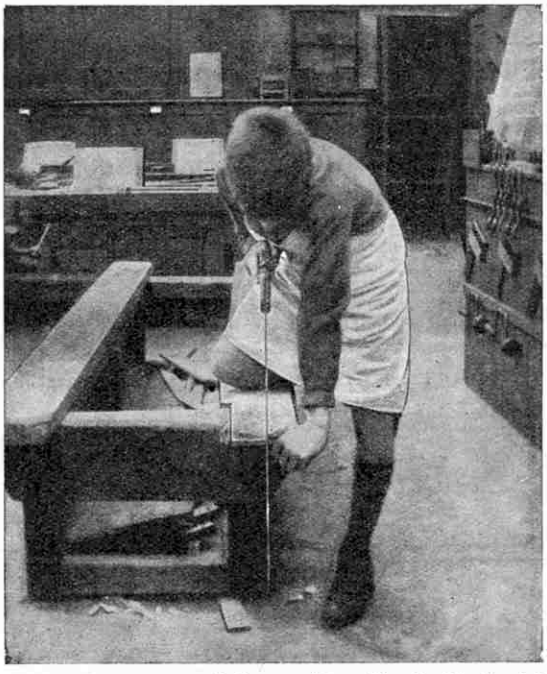
"Boy Scout Tests and How To Pass Them"

(Brown, Son and Ferguson Ltd. 4/6 net)

The new edition of this handbook will be welcomed by all keen Scouts. It has been compiled by Imperial Headquarters, Boy Scouts Association, London, and Mr. R. E. Young, and gives full instructions for the Tenderfoot Test, the Second-Class Test and the First-Class Test. In addition there are chapters on 68 different badges, ranging from the Airman Badge to the World Friendship Badge. It is not intended that Scouts should attempt to qualify for a badge merely by reading the appropriate section, however. As indicated in the preface, this should be supplemented by further reading and by practical work under competent instructors, and when used in this manner the book will prove an excellent guide.



Pelicans busily engaged in toilet operations. (From "The Wonder Book of Tell Me Why," reviewed on this page.)



The correct way to use a ripping saw. (From "Creative Woodwork," reviewed on this page.)

"Through My Telescope"

By W. T. Hay. (Murray. 3/6 net)

The announcement in 1933 of the discovery by Mr. Will Hay of a remarkable white spot on Saturn revealed this famous comedian as a keen and enthusiastic astronomer who spends his leisure hours in his own observatory. His telescope is to him a familiar companion, with the aid of which he watches the skies carefully and seriously, and he has now placed his knowledge and experience at the disposal of others who are interested in the heavens but cannot make use of elaborate equipment.

"Through My Telescope" is an admirable introduction to astronomy, telling the story of the Sun, Moon and stars and showing how their features can be studied and their movements followed with the simplest of instruments, and to a certain extent with the naked eye. The book is well illustrated by means of seven plates and many well-chosen diagrams.

"Street Fair"

By Marjorie Fischer
(Geo. Routledge & Sons Ltd. 6/– net)

It is not easy to describe this book, because it is quite out of the ordinary. John and Anna, who are on a visit to Paris with their mother and aunt, are dragged round sightseeing from this place to that until they become utterly bored. One night they slip away and visit a wonderful street fair, and a few days later, by accident rather than design, they find themselves in the train journeying to the south of France, alone and with very little money. Not in the least daunted, they succeed in having heaps of fun and getting into and out of all kinds of scrapes. They find the remarkable mongrel pup Bou, who joins wholeheartedly in any mischief that is afoot, and finally, after a marvellous fortnight, they return to mother and aunt. This is a book that should not be missed.

"Flight"

By Agnes Rogers
(Harper and Brothers. 7/6 net)

"Flight" tells the story of aviation in pictures, each with its appropriate text. It contains more than 175 photographs dealing with every branch of modern aviation, from the achievements of pioneers such as the Wrights and Bleriot, and the outstanding flights of Lindbergh and other famous figures, to the wonders of modern mail and passenger traffic, survey work and exploration by air. All who are "air-minded" will enjoy this compact and vivid record of the conquest of the air.

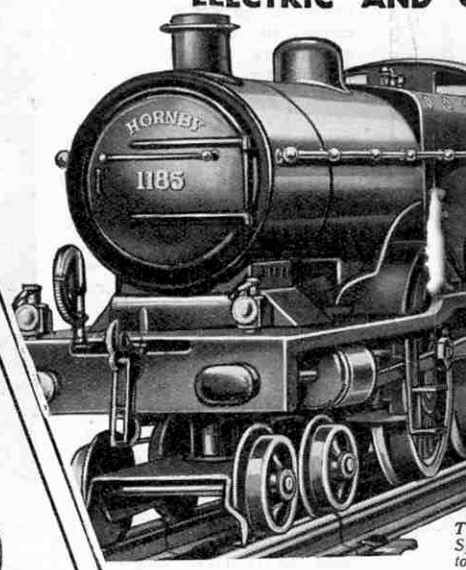
"Futility"

By Lieut.-Col. A. W. Ryland
(Arthur A. Stockwell Ltd. 3/6 net)

This is a story of modern piracy, full of exciting adventure on the high seas. The manner in which the diabolical schemes of villainous wreckers are foiled is well described, but the book would have been more satisfactory if the author had refrained from occasional short "lectures," for these interfere with the action.

HORNBY BRITIS GUARA

ELECTRIC AND



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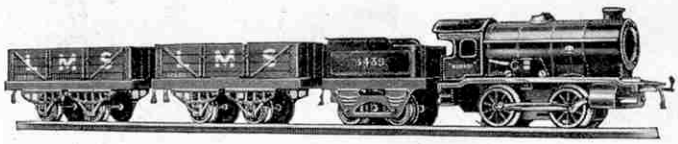

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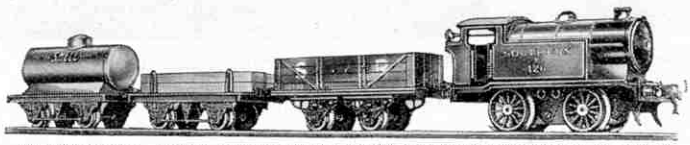

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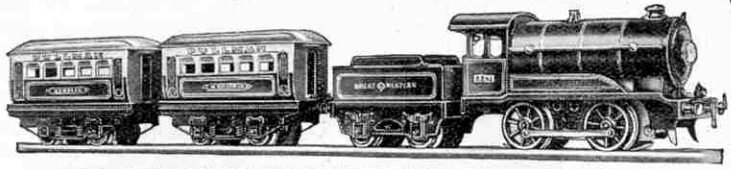

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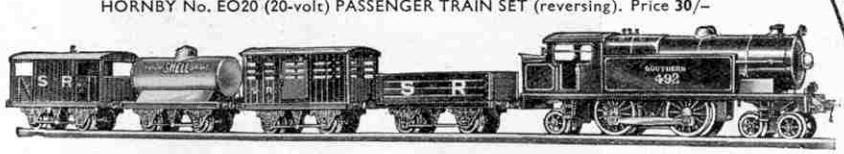

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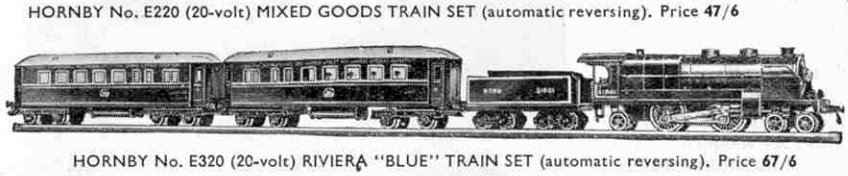

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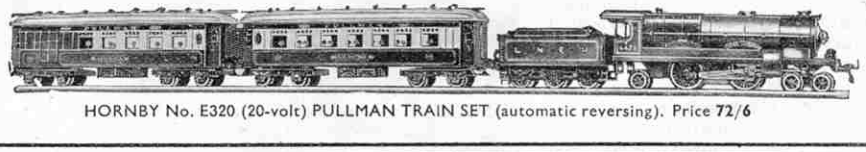

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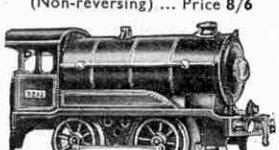
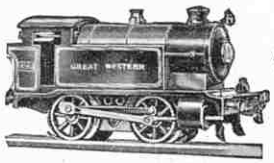


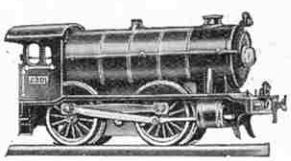
HORNBY No. EO20 (20-volt) LOCOMOTIVE (Reversing) ... Price **22/–**

EM320 (20-volt) or EM36 (6-volt)TANKLOCOMOTIVE (Reversing) ... Price **16/6**

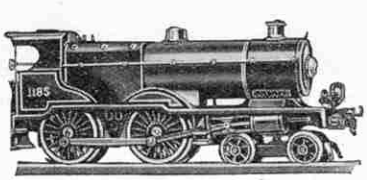
HORNBY No. E120 LOCOMOTIVE (20-volt) (Reversing) ... Price **24/–**



HORNBY No. E120 (20-volt) or E16 (6-volt) TANK LOCOMOTIVE (Reversing) ... Price **24/–**



HORNBY No. E120 SPECIAL LOCOMOTIVE (20-volt) (Automatic reversing). Price **30/–**



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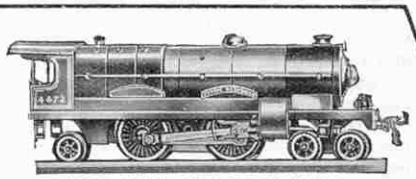

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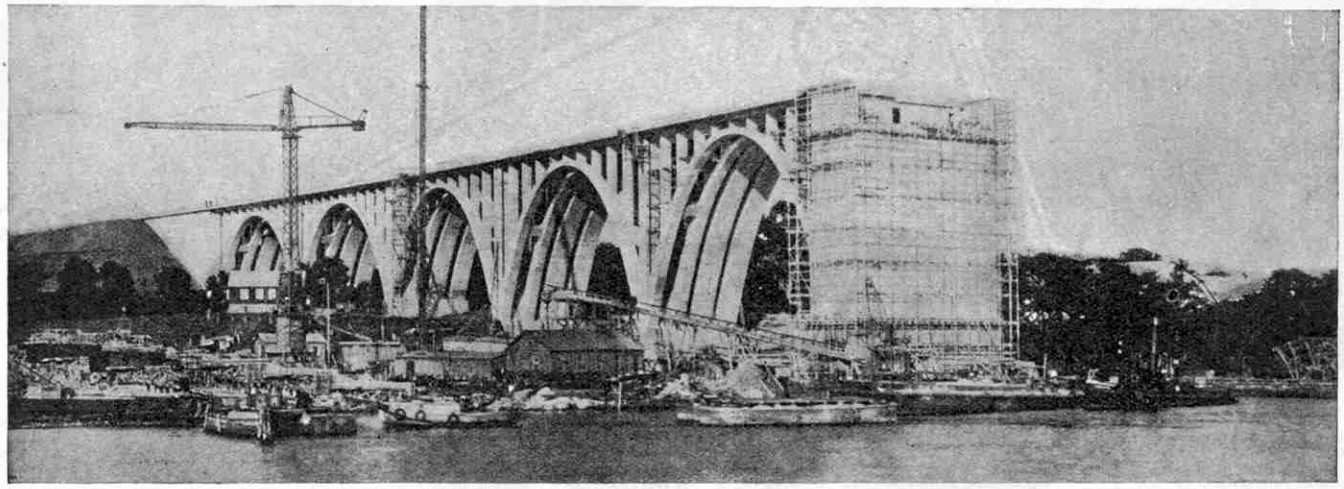
High-Level Bridge Across Little Belt

Novel Method of Construction



The Jutland approach spans of the Little Belt Bridge nearing completion. This illustration and the one on the opposite page are reproduced by courtesy of "The Railway Gazette."

ON the 14th May last King Christian X of Denmark officially opened the Little Belt Bridge, built across the strait after which the structure is named and connecting the peninsula of Jutland and the island of Funen. The bridge is the outcome of a decision in 1924 to replace the train ferry service across the strait by a more economical means of communication. The ferry had been operated since 1872, and in fair weather made the trip in about 15 min. At first a bridge wide enough to carry only the double track of the Danish State Railways was proposed, but as the volume of motor traffic using the ferry was increasing rapidly it was decided eventually that the bridge should also carry a roadway. In 1927 the construction of a combined railway and road bridge was sanctioned by the Danish Government, and in 1928 the work was entrusted to a Danish engineering company in co-operation with two German firms.

The bridge has a total length of 3,864 ft. 7½ in., of which 2,707 ft. is over the Little Belt at a height of 108 ft. above mean sea level, sufficient to enable the tallest masted steamers passing through the strait to clear the structure. This part of the bridge consists of five steel truss spans of unequal length and supported by four tall piers and two shore abutments. The southern approach is 452 ft. 1½ in. in length and includes three reinforced concrete arches, and the northern or Jutland approach, 703 ft. 6 in. in length, has five similar arches. The largest arch is 127 ft. in span and 86 ft. in height.

The construction and sinking of the caissons that form the foundation of the main piers was the most difficult part of the work. The Little Belt flows swiftly and there is 133 ft. of water in the deepest part of the channel. Preliminary borings showed that the bed of the strait is of clay to a great depth, and that for at least 15 ft. down it is impervious to water. These conditions were considered unsatisfactory for the employment of the usual type of caisson, in which the working chambers are filled with compressed air to keep the water out while the workmen excavate the earth beneath the caisson.

Novel methods were adopted to overcome these difficulties. The caissons were built on the Jutland shore, and were 147 ft. in length, 79 ft. in width and 50 to 60 ft. in depth. The outer wall of each of them consisted of two parallel sides joined by semi-circular ends, and was built of vertical reinforced concrete tubes of 3 ft. 11 in. internal diameter. The inner wall was of similar tubes ranged in pairs at regular intervals. The bed of the strait is very uneven, and on this account what were the tops of the tubes before the caisson was righted, but actually were the cutting edge, were shaped to correspond with the contour of the bed of the strait at the pier site. Another effect of building the caisson upside down was that the working chambers then occupied the upper part of the interior and the upper deck was at the bottom of the caisson! Thick concrete walls divided the intervening space into several compartments, for the reception of water ballast.

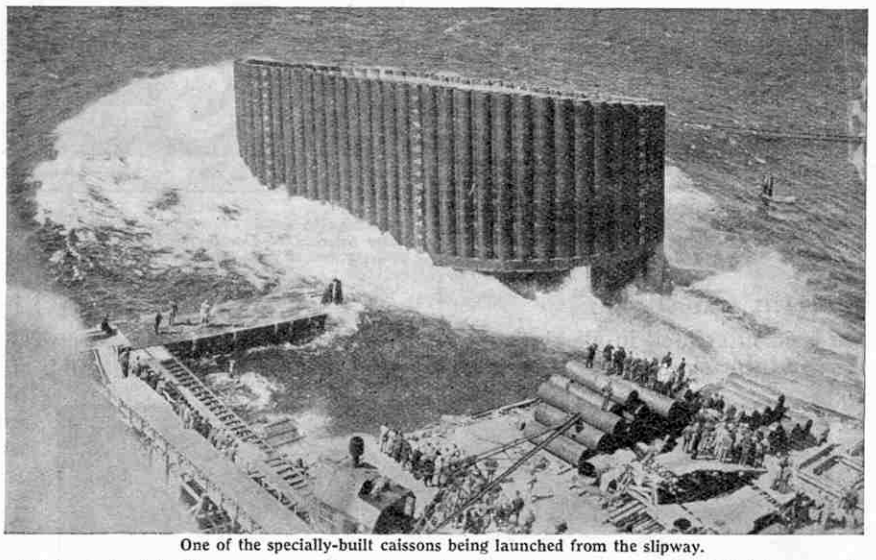
Map of Denmark, showing the situation of the bridge.

When the caisson was completed it was floated from the slipway, and was capsized by filling the wall tubes at one side with sand and flooding one of the interior compartments at that side with water. As it heeled over the ballast fell out of the tubes and the caisson floated right way up. It was brought to an even keel by admitting some of the water ballast to one of the compartments on the opposite side. It was then towed alongside a floating concreting plant, and the construction of the upper part was begun. As this work progressed the caisson became heavier and it was necessary to tow it into deeper water, and finally it was taken to the pier site where, owing to the specially-shaped cutting edge, it rested evenly upon the bed of the strait.

Preparations were made for sinking the caisson into the bed to the required depth. A temporary platform was erected across the top of the caisson to provide a base for two boring machines and two cranes with which to lower the rotary cutting tools down the tubes. The clay cut away by each tool was broken up by powerful jets of water pumped down the tube and was washed up the hollow shaft of the drill to the surface, where it was ejected. The tools slowly cut their way downward and as the cutting edge of the caisson bit deeper into the bed of the strait, that portion of the bed which was enclosed by the caisson walls rose higher in the working chambers. When it had been sunk in this way to a depth of 25 ft. boring was stopped, the tubes were filled with concrete and the arduous task of excavating the clay

that filled the working chambers was begun. This operation was greatly simplified by the fact that as the clay was impervious to water the workmen engaged in removing it were able to work under ordinary atmospherical conditions, instead of in compressed air. This was an immense advantage, and resulted in a considerable saving in plant and time. The clay was broken up, loaded into buckets and hoisted to the top of the caisson and dumped overboard. The chambers were excavated to a depth of 14 ft. and were then filled with concrete.

The piers erected upon the caissons are not solid throughout, as this would have imposed an excessive burden upon the underlying clay, but they are of cellular construction with some of the cells filled with water. They are 240 ft. in height from foundation level. The abutment piers are of reinforced concrete, and that on the Jutland shore is built upon a foundation of piles also of this material. The corresponding pier on the other shore has an ordinary foundation 50 ft. below mean sea level.



One of the specially-built caissons being launched from the slipway.

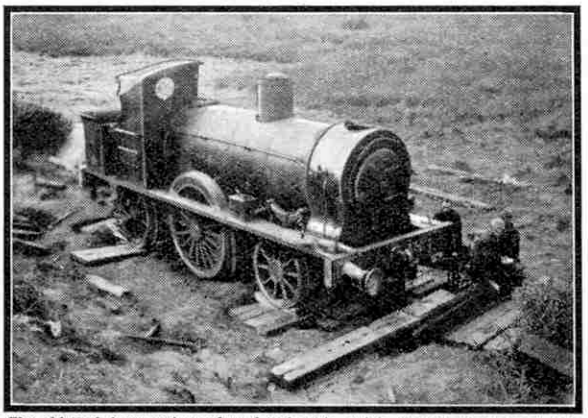
The superstructure of the bridge was erected on the cantilever principle, the girder work being built outward from each main pier, and falsework attached to the underside of the superstructure was used in assembling the decking. The lofty approach spans are a graceful feature of the structure as a whole. Each consists of four parallel reinforced concrete arches, two wide ones that carry the double line of railway and two narrow ones that carry the road and footwalk respectively. The Jutland approach spans are shown in the upper illustration on the previous page.

The ferry superseded by the bridge was a link in the Copenhagen–Esbjerg route of the Danish State Railways, and crossed the strait at a point approximately four miles northward of the bridge. The diversion of the route to include the bridge involved the construction of new stations and bridges at Middelfart on the Island of Funen, and at Fredericia, in Jutland. The new line has shortened the distance by rail between the capital and Esbjerg.

The opening of the bridge on the 14th May was also the occasion for the introduction of new express Diesel train services on the Danish State Railways and the double event was celebrated by special illuminations, fireworks and torchlight processions. The bridge was opened to the public shortly after the Royal party had travelled across it in two of the new streamlined trains, and by midnight at least 40,000 cars and 200,000 people had crossed it. The shortened route and the speedy travel of the new trains has reduced the time of the journey from London to Copenhagen from about 39 hrs. to 32 hrs. and the time for the journey from Copenhagen to some of the other important cities in Jutland has been almost halved.

An Ancient Irish "Single-Wheeler"

THE restoration of a derailed locomotive to the track may be a difficult process, or it may be comparatively easy, according to the situation of the mishap and the facilities available for dealing with it. The engine in the accompanying photograph left the track as the result of the derailment of a coach, and was hurled down a steep embankment. It turned completely round and came to rest on its side. The situation of the derailment was awkward enough, but in addition to this it was impossible to use a breakdown crane to assist in the work of salvage. This was because the Waterford and Tramore Railway on which the engine was working, although forming a section of the Great Southern Railways of Ireland, has not any actual connection with the main system and its terminus at Waterford is more than a mile from any other line.



The old tank locomotive referred to in this article. In this photograph it is shown raised up after falling down an embankment, but before being returned to the main line.

In such circumstances the raising of the engine to an upright position had to be performed by the aid of jacks and timber packing. This much being accomplished the elevation of the engine to the top of the embankment was the next problem. This was solved by arranging a special sloping track parallel with the actual permanent way, and up the "ramp" so formed the engine was hauled by means of winches! Having reached the top it was transferred by means of jacks over to the running lines and then towed away.

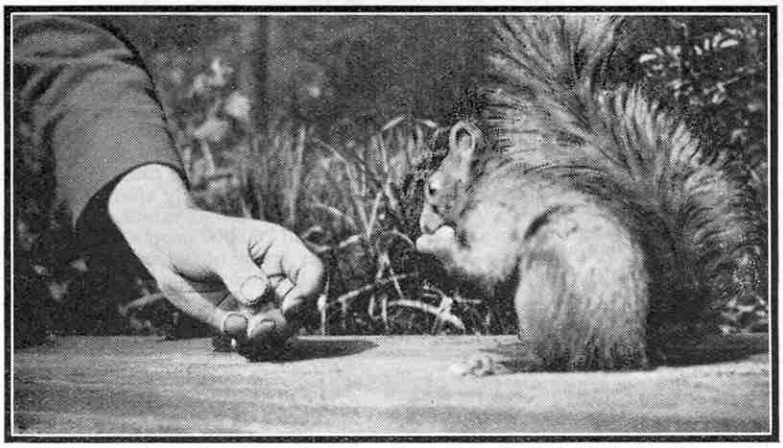
This locomotive, originally No. 1 of the Waterford and Tramore Railway, was built as long ago as 1855, but apart from its great age—80 years—its interest lies in its single-wheeler design. It was in fact the last of that type to be seen in Ireland. Of the old fashioned well-tank type in which the water is carried in a tank below the footplate, it represents a small type of engine commonly used years ago for local and branch services. Frequently tender engines were rebuilt as tanks when their period of usefulness on the main line was over. In spite of the extreme liability of single-wheelers to be affected by weather conditions, No. 1 has chiefly been employed in the winter months, the heavier summer traffic being dealt by two coupled engines of the 0–4–2 tank types.

Apart from its quite isolated character the Waterford and Tramore Railway is peculiar in having no intermediate station on its 7¼ mile run. Its passenger vehicles are of very miscellaneous character, and include 4-wheelers and 6-wheelers, which are however not fitted with continuous brakes. A curious feature also is that as the platforms at both stations are on the same side of the line the carriage doors open on that side only!

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.

Red Squirrels in Cheshire

For many years I have been interested in all kinds of wild life, but it has only been during the last 10 years that I have been able to study nature "in the raw." At present I live on the outskirts of the once enormous Delamere Forest, where there is now a large bird sanctuary on the shores of Oakmere, a picturesque stretch of water. This sanctuary has encouraged all kinds of wild animals and birds to frequent the district, for they seem to realise that in these parts man is their friend.



One of the red squirrels of Delamere Forest devouring nuts provided by a friend. The photograph by S. W. J. English, Delamere Forest.

About 18 months ago it was noticed that more red squirrels than usual were inhabiting the surrounding woodland, which consists mainly of pines. I began to leave Barcelona nuts and pieces of cake about for the tiny animals, which are very much smaller and prettier than their enemy, the grey squirrel. The nuts always disappeared soon after dawn, but it was a long time before I saw anything of the red squirrels. Gradually one of them lost his shyness, however, and appeared during the afternoon, and soon he would sit up and beg for more nuts. The next step was to make him eat from my hand, and I accomplished this in about six weeks. Afterwards progress was much more rapid, and soon he would climb up my leg and on to my shoulder. At first his nervous companions watched him enviously from the shelter of a tree, but in time they also lost their shyness. Now as many as eight are sometimes seen together in the open. Normally squirrels sleep throughout the winter, but in districts where people are in the habit of feeding them they appear all the year round, though their visits are fewer in winter than in summer.

S. W. J. ENGLISH (Delamere Forest).

Fixing groynes formed of old rails and timbering on the seashore in front of Dawlish Station. Photograph by H. M. Madgwick, Worthing.

Trevose Head Lighthouse

Trevose Head is a conspicuous promontory on the west coast of Cornwall, and is visible from places as far apart as Pendeen Watch, 39 miles away and just south of St. Ives, and Hartland Point, 40 miles away in North Devon. The lighthouse at the end of the promontory was erected to warn ships off the Quies, a dangerous reef of high rocks extending westward for about a mile. Visitors are not allowed into the lighthouse in misty weather, when the great fog horn is in operation. In such weather a double blast is sounded on the horn every minute, and can be heard 30 miles seaward. On the day I and a party of others visited the lighthouse the mist lifted soon after our arrival, and we were admitted.

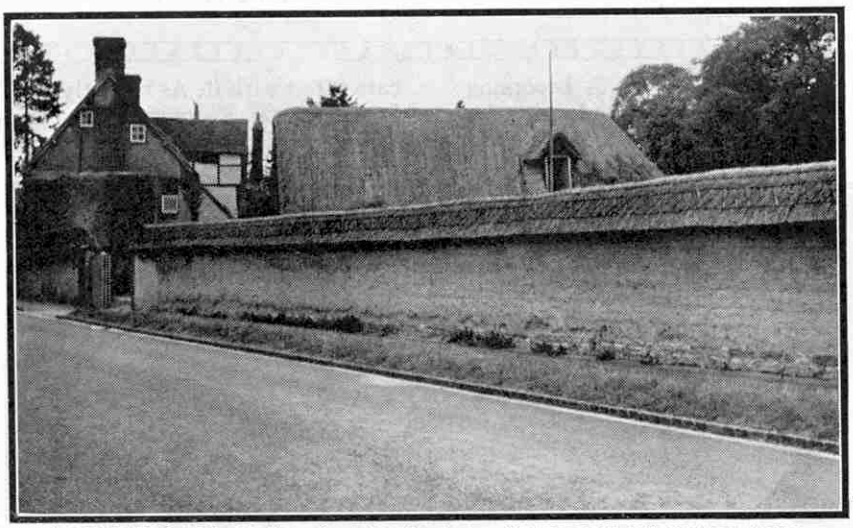
I was greatly interested in the power house, where two 25 h.p. oil engines, working in shifts, drive compressors supplying air at 25 lb. per sq. in. to the fog horn. The lantern is 210 ft. above sea level, and its three lenses and the steel superstructure carrying them have a total weight of three tons, and float in mercury. The lenses are set at 60 degrees to each other, and make four revolutions a minute, giving a single brief flash every five seconds. The lantern is rotated by a centrifugally-governed weight mechanism that has to be rewound every 40 min. The 1,500 c.p. light from the paraffin-vapour incandescent burner passes through the red glass surrounding the lamp and is transformed by each lens into a beam of 1,000,000 c.p., that is visible to ships 23 miles away. Along the coast the light can be seen over proportionately longer distances, and when the air is clear it can be seen from the cliffs of Lundy Island, over 50 miles away.

P. F. WOODMAN (Exeter).

Thatched Walls

In this age, when durable walls can be erected quickly and cheaply, we do not usually think it necessary to protect the boundary walls of our gardens with thatch, slates or tiles. In earlier times, however, when labour was cheap, builders often considered it worth while to thatch farmyard and garden walls. Not only cob, but flint and stone walls also were thatched.

Some of these thatched walls can still be seen in various parts of the country, and the one shown in the upper photograph on this page is an old wall beside the main road at Dorchester. The thatched barn that rises beyond the wall makes the scene even more picturesque. A few examples of thatched walls may also be seen in Berkshire, but they are most plentiful in Wiltshire. Some thatched walls date back to Saxon times, and it is interesting to note that the word "thatch" itself is derived from the Saxon "theccan," which meant "to cover."



An old thatched wall beside the main road at Dorchester. Photograph by J. D. U. Ward, Chelsea.

In many cases walls that were thatched originally are now protected by tiles, slates, or with the more modern and unsightly material, corrugated iron.

J. D. U. WARD (Chelsea).

A Fire at Sea

Some time ago while on the voyage home from Australia I had the rare experience of seeing a fire at sea. We were crossing the Bay of Biscay, which had its famous unbroken swell at the time, when we came upon a ship on fire from stem to stern! Our liner cruised round the blazing ship for some time, searching for lifeboats and for persons in the sea. It was obvious that no living person could be aboard her, for she resembled a raging inferno. We had no information as to whether her crew and any passengers had abandoned her, or were lost, and eventually we stopped our engines and stood by.

The experience was one of the most weird I have ever had. One minute our ship was lifted by the heavy swell, and we found ourselves gazing down upon the flaming mass, wallowing in the trough of the waves, and the next minute we in our turn were down in the abyss while the burning vessel glared beacon-like on the crest, seemingly ready to roll right down upon us.

The officers of our ship assured us that we were half a mile away from the fire, but we seemed to be much closer than that, and we could hear distinctly the roar and crackle of the flames. Our officers were almost as thrilled as ourselves by the sight, and told us that a man might go to sea for a lifetime and never encounter such a wonderful and dreadful spectacle.

No trace of the crew or lifeboats of the doomed ship was found, and when it became certain that there was no need for our assistance, we got under way again. Later a wireless message was received that her crew had been safely taken off by another ship two hours before we arrived on the scene. She was a Russian cargo boat laden with oil and timber. No wonder she blazed so furiously.

M. ATKINSON (Edinburgh 10).

Novel Use for Old Rails

When railway track is renewed the old rails are not scrapped, but are used for various kinds of maintenance work on the railway, such as signal posts and supports for wire fencing. At Dawlish, where the station is on the shore, a novel use has been found for old rails, and the lower photograph on the opposite page shows workmen of the G.W.R. Engineer's Department using them for constructing groynes to protect the station from the buffetings of the sea. The rails are bedded in a concrete foundation, and when the concrete has set timbering is fixed horizontally between them.

H. M. MADGWICK (Worthing).

Trevose Head Lighthouse, on the west coast of Cornwall. Photograph by P. F. Woodman, Exeter.

A Visit to Hamburg

A few years ago I spent a very interesting fortnight in Hamburg. The first thing that impressed me about the city was the cleanliness of the buildings, due probably to the extensive use of gas instead of coal. To ensure public safety many of the roads have separate tracks for bicycles and pedestrians, and there is a special strip of sand for horse riders. Each policeman carries a sword and a revolver instead of a truncheon.

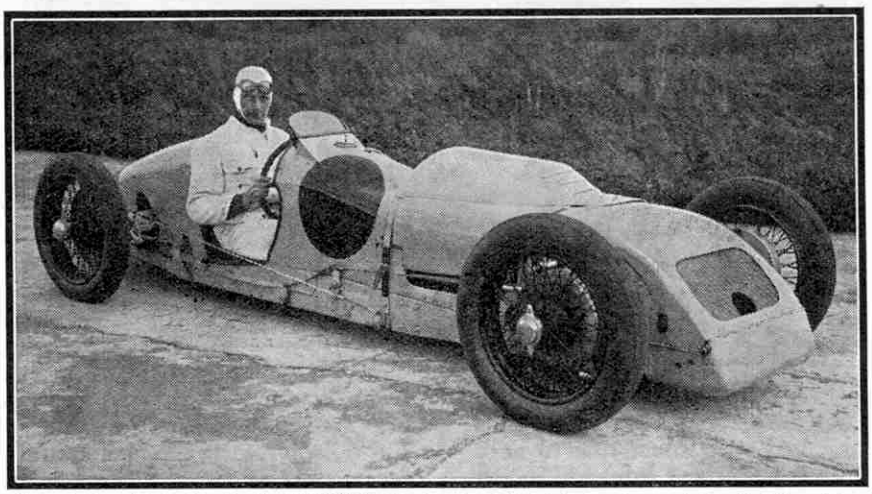
The chief of the many and varied means of transport in Hamburg is the "Hochbahn," or overhead railway. This name is hardly suitable, as in places the railway goes underground, and at others it runs on the surface. The coaches of the trains are similar to those of the London Underground Railways, and the system is worked by electricity. At the level crossings there are no swing gates as in England, but two long thick poles with chains hung from them that can be lowered to block the road. The poles are raised and lowered by means of winches at the sides of the road.

C. F. MIDGLEY (Keighley).

Diesel Engines for Racing Cars

First Speed Records in New Class

THE Diesel internal combustion engine is becoming familiar to everybody, for since its introduction by Dr. Rudolph Diesel, its inventor, about 1895, it has been developed to such an extent that it is now capable of many applications. Engines of this type differ from those using petrol in the absence of sparking plugs and magnetos, for the heavy oil employed in them is ignited as a result of the high temperature developed in their cylinders by the compression of the air necessary for combustion.



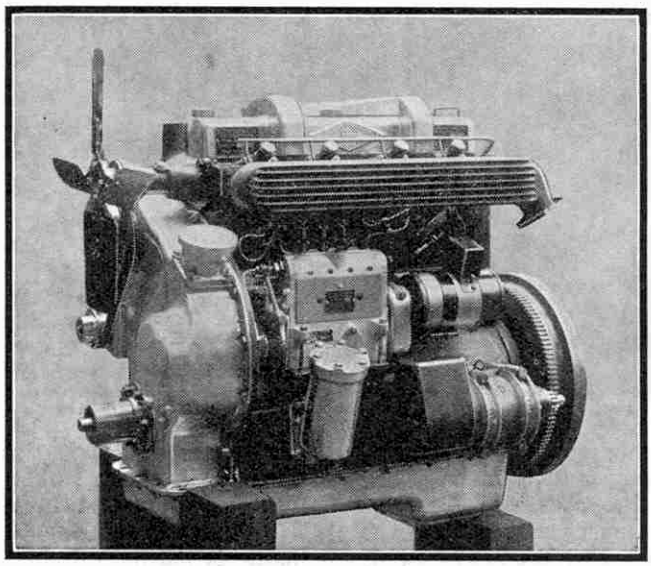
The racing car, fitted with a Perkins "Wolf" Diesel engine, in which Mr. R. Munday created the first Three-Litre Diesel Class Records. The illustrations to this article are reproduced by courtesy of F. Perkins Ltd., Peterborough.

A Diesel engine possesses many advantages as compared with a petrol engine. One of these is the comparative simplicity due to the absence of electrical means of firing the charge. In addition, the oil used is comparatively cheap and is practically non-inflammable, a feature that makes the engine much safer than one using petrol, which has a low ignition temperature, and has made the development of Diesel engines for use in motor cars and aeroplanes very desirable.

When the Diesel engine was introduced, and during its earliest stages of development, it was much heavier than a petrol engine of corresponding power, but continual improvements in design have resulted in considerable reductions in weight. Means also have been discovered of making it efficient over a greater range of speeds than formerly. Formerly it was expected to be most suitable for running at comparatively low speeds, such as those required for the engines of certain types of ships. Diesel engines are now used for motor lorries and even for ordinary motor cars, however, where high crankshaft speeds and flexibility are necessary.

Perhaps the most striking evidence of the great adaptability of the modern Diesel engine is the success that has been achieved in creating high speed records with racing cars fitted with it. As recently as 1934, the Association of International Recognised Automobile Clubs decided to admit speed records made by Diesel-engined cars, and the first attempt to achieve high speeds with racing cars of this kind was made at Brooklands in October 1935 by Mr. R. Munday, the well known racing driver, whose Parry Thomas special chassis was fitted with an 18 h.p. "Wolf" engine for this purpose. This engine is designed and manufactured by F. Perkins Ltd., Peterborough, and is a standard Diesel engine for use in motor lorries. It was specially tuned in order to give a racing performance, but the only other alteration from the standard "Wolf" commercial engine was the lightening of its reciprocating parts.

The records were made in the three-litre Diesel class, and the highest speed reached during this pioneer effort was 94.70 m.p.h. in a run over a kilometre with a flying start. This record was made with the aid of a supercharger that increased the pressure to about 8 lbs. per sq. in. above that of the atmosphere. The test was made in the usual manner, the record speed being the average for two runs in opposite directions over the measured distance.



The Perkins "Wolf" Diesel engine installed in the racing car shown in the upper illustration on this page.

The supercharger was disconnected when the attempt was made to set up other records, and official timings over distances of 50 miles and 100 miles then gave speeds of 88.44 m.p.h. and 88.13 m.p.h. respectively. Over distances of 50 kilometres and 100 kilometres the corresponding figures were 88.11 m.p.h. and 88.13 m.p.h., and during the trials a distance of 88.25 miles was covered in an hour.

The official rating of the "Wolf" engine is 18 h.p., and as prepared for use in motor lorries it develops 45 b.h.p. The engine that was specially tuned and prepared for use in Mr. Munday's Parry Thomas special car developed 65 b.h.p. at a crankshaft speed of about 3,000 r.p.m.

A New Model Electric Roundabout

Dinky Toys Used with Meccano

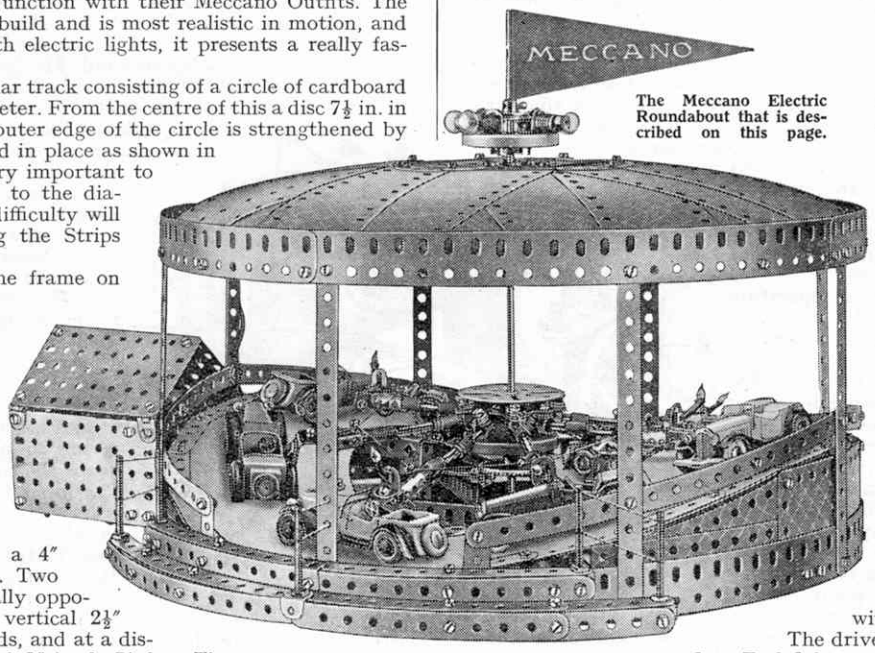
THE fine model electric roundabout illustrated on this page has been designed specially to enable owners of Dinky Toy Motor Cars to use them in conjunction with their Meccano Outfits. The model is quite simple to build and is most realistic in motion, and as the cars are fitted with electric lights, it presents a really fascinating appearance.

The cars run on a circular track consisting of a circle of cardboard or tinplate 15¾ in. in diameter. From the centre of this a disc 7½ in. in diameter is cut, and the outer edge of the circle is strengthened by means of 2½″ Strips bolted in place as shown in the illustrations. It is very important to cut the track accurately to the diameter stated, otherwise difficulty will be experienced in fitting the Strips round the outer edge.

The construction of the frame on which the track is mounted is shown in the lower illustration, and neither this portion nor the body of the model should present any difficulty. The track is mounted on a framework of Angle Girders, which is constructed on four 5½″ Angle Girders and four 4½″ Angle Girders that radiate from a 4″ Circular Plate as shown. Two Angle Girders diametrically opposite, are provided with vertical 2½″ Angle Girders at their ends, and at a distance of 4½″ from these with 2″ Angle Girders. These pairs of Angle Girders are connected across their upper ends by 4½″ Angle Girders, on which the highest portions of the track rest. At its lowest points the track is bolted to 4½″ Angle Girders that are secured direct to the radial girders, and at its intermediate levels to 4½″ Angle Girders secured to the radial girders by 1½″ Angle Girders at the outside and Flat Brackets at the inside. Four Dinky Toy Two-seater and four Four-seater Sports Cars are connected together in a ring which is assembled as follows. The centre of the ring is a Bush Wheel to which are bolted eight Hinges, each Hinge carrying a Collar in which is secured a 3″ Rod. The Cars are secured to the ends of the 3″ Rods by means of a Flat Bracket, which is pushed between the chassis of each Car and underneath the seat. A 1″×½″ Angle Bracket is then bolted to the Flat Bracket, and to the Angle Bracket is fixed a Hinge that carries two ½″×½″ Angle Brackets.

The upper Angle Brackets form supports for the Pea Lamps that are used to decorate the model, and ⅜″ Bolts are pushed through the lower ones and are secured to the ends of the 3″ Rods by means of grub screws in the longitudinal holes of the Couplings 1. Each Coupling is fitted with a bolt and these are linked together by cord as shown. The Pea Lamps are pushed tight against the Angle Brackets, and the wires are held close to the 3″ Rods by insulating tape or gummed paper. One wire from each lamp is connected to the bolt that holds its Hinge in place. The remaining wires from the lamps are connected together and the method of incorporating them in the general circuit will be explained later.

The Cars are made to revolve by means of a 6″ and a 5″ Rod connected together by a Coupling. This compound rod is journalled at its lower end in a Bush Wheel that forms the centre of the base, and at its upper end in a Face Plate. The Rod carries a 1½″ Bevel Gear 2, a slip-ring and the radial Rods to which the Cars are connected. The slip-ring is a Wheel Flange 3 secured to but insulated by Insulating Bushes and Washers from a Bush Wheel. The bunch of wires from the Pea Lamps are electrically connected to the Wheel Flange, and for the sake of neatness all the other connections are covered by a Face Plate 4. In the illustration at the foot of this page the Face Plate is raised to reveal the construction of the revolving unit.

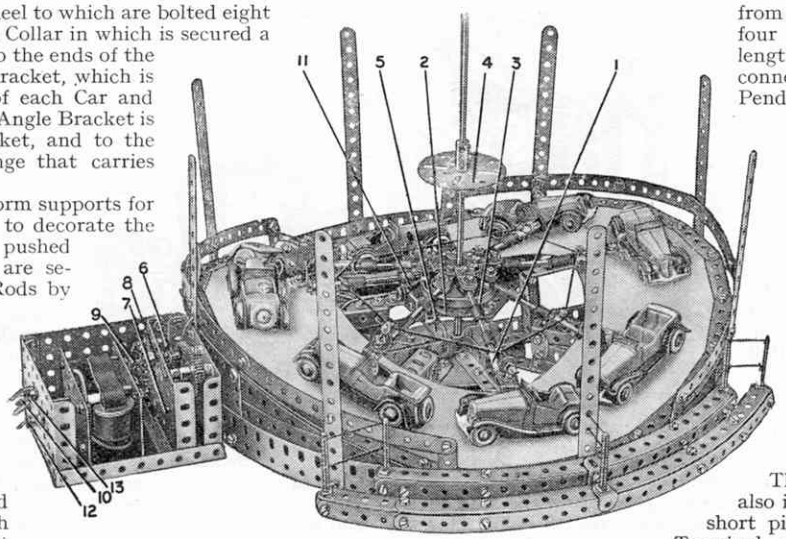


The Meccano Electric Roundabout that is described on this page.

The 1½″ Bevel Gear 2 meshes with a ½″ Bevel Gear 5, which is on the same Rod as the 57-teeth Gear Wheel 6. This Gear drives Rod 7 through two ½″ Pinions and a second 57-teeth Gear Wheel, and Rod 7 is provided with a 50-teeth Gear Wheel that meshes with a ¾″ Pinion on Rod 8. The drive is transmitted from Rod 8 to Rod 9 by means of a further 50-teeth Gear and a ¾″ Pinion. Rod 9 and the armature shaft of the E1 Electric Motor that drives the model carry ¾″ Sprockets, which are connected by Sprocket Chain.

Under the roof of the model are four 3.5 volt lamps, and the lighting circuit for these is as follows. The lamps are supported on 1½″×½″ Double Angle Strips, the 6 B.A. centre Screws of the Lamp Holders being carefully insulated from the Double Angle Strips. The four Screws are connected by a length of wire and one of them is connected also to an insulated Pendulum Connection that makes contact with the insulated Wheel Flange on top of the model. The outer cases of the four exterior Lamp Holders are in contact with the Wheel Flange, and the 6 B.A. Screws are electrically connected by contact with the rim of a 1″ fast Pulley Wheel. A wire is taken from the insulated Pendulum Connection down one of the vertical roof supports and to the insulated Terminal 10. Terminal 10 is also connected to the insulated Pendulum Connection 11 that makes contact with 3. The other Terminal, 12, which also is insulated, is connected by a short piece of wire to the insulated Terminal of the Motor. The third Terminal 13 is in electrical contact with the model.

The model Roundabout with the roof and part of the gear-box removed to show the interior arrangement.



The upper 6-volt controlled socket of a T6A Transformer should be connected to Terminal 12, and Terminal 10 to the upper 3.5-volt socket. The lower 6-volt controlled socket should be connected to Terminal 13, and the lower sockets of the 6-volt uncontrolled and the 3.5-volt tappings should be joined by a piece of wire.

Meccano Suggestions Section

Edited by "Spanner"

(345)—Controlling Electrical Apparatus from a Distance (F. Jenkins, Birmingham)

To switch on a wireless receiver from a distant point would at first seem to be the simple procedure of connecting a switch in series with the set and accumulator. Where the control switch is near the set this method is quite satisfactory, but with long connecting wires to the switch there is a perceptible resistance offered to the electric current, causing a marked reduction in the efficiency of the receiver. To cut out the resistance the accumulator and switch must be near the set, and so it is necessary to employ a special device to work the switch. The device is operated from the distant point by a second switch in a separate circuit, so that the long connections affect only the device operating the main switch, and in no way influence the set.

One of the essentials of an operating device for remote control of a switch is that it should be positive in action. It must be equally satisfactory for switching the current on or off, and must offer no appreciable resistance to the current supplied to the set. These requirements are fulfilled in the device illustrated, which has been designed for controlling any electrical apparatus requiring low-voltage current, and is specially suitable for operating a radio receiver from a remote point. Two views of the mechanism are shown in Figs. 345 and 345a, and to show the electrical connections a wiring diagram appears on the opposite page (Fig. 345b). If carefully constructed and adjusted with correct clearances the controller will function with positive action.

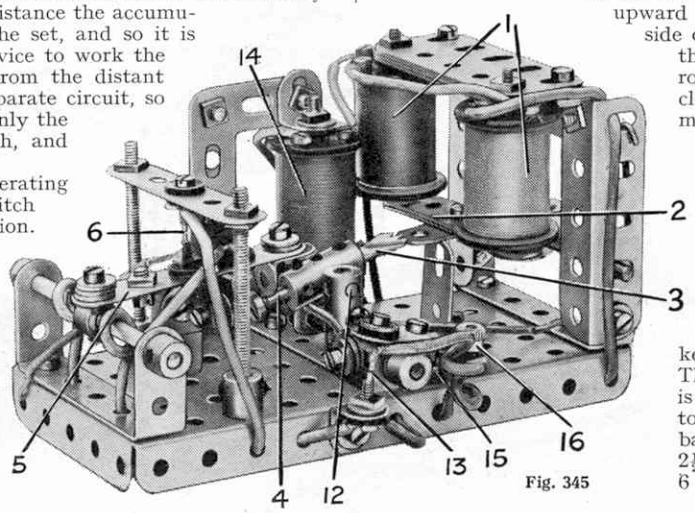


Fig. 345

Elektron parts are utilised in conjunction with Meccano parts for this model. The framework is built up on a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate, and two Magnet Coils 1, fitted with Cores, are fixed to four Flat Girders that are bolted to a $2\frac{1}{2}''$ Angle Girder secured to the tops of two vertical $2\frac{1}{2}''$ Girders. The latter are attached to a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip at the base and carry Flat Brackets, the round holes of which coincide with elongated holes in the Girders to form journals for a $3\frac{1}{2}''$ Axle Rod. A Collar on this Rod has a 2" Strip secured rigidly to it, and two $2\frac{1}{2}''$ Strips placed together are bolted to this Strip to form the armature 2. The $2\frac{1}{2}''$ Strips are immediately below the poles of the Magnets 1, and the Rod carrying the armature is free to pivot in the vertical Girders. A $1'' \times \frac{1}{2}''$ Angle Bracket serves as a stop for the downward movement of the armature. The Coil 14 is mounted by means of its Core to an Angle Bracket on the end of a Bell Crank secured to a vertical 3" Strip. As will be seen from Fig. 345a, the Strip is reinforced by a Corner Bracket.

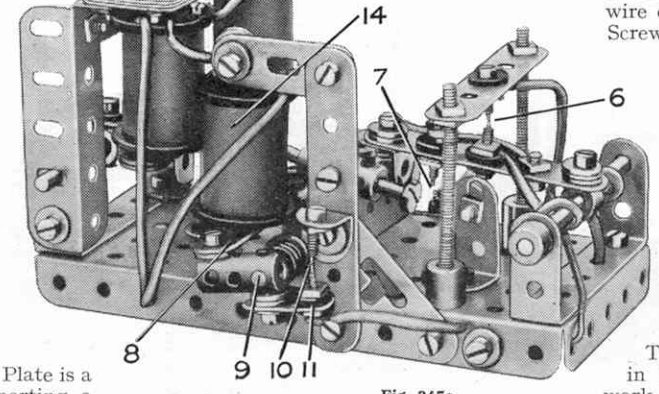


Fig. 345a

Across the centre of the Flanged Plate is a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip supporting a $3\frac{1}{2}''$ Rod 9. Two Couplings are fixed near the centre of the Rod to carry a 1" Rod 12, on which another Coupling is free to pivot. This pivoted Coupling is provided with a Centre Fork 3 and a Pivot Bolt 4. At one end of the Rod 9 (see Fig. 345a) is a further Coupling carrying two Flat Brackets at 8, secured together and spaced from the Coupling by a Washer. Another Flat Bracket 11 is fixed rigidly at the other end of the Coupling and carries a Contact Screw that is insulated from the Flat Bracket by Insulating Bushes and Washers. Fig. 345 shows the arrangement of the Flat Bracket at the other end of the Rod 9. In this case the Bracket is attached to a Collar and carries an insulated Contact Screw.

A further Collar on the Rod 9 is provided with a bolt fitted with Washers for securing Spring Cord. The Spring Cord is attached by a Hook at one end of the base plate and is clamped between Washers on the bolt. The end of the cord is brought upward so that it bears beneath the underside of the Coupling on the Rod 12. By this arrangement the Rod 9 tends to rotate, keeping the contact points 10 closed, and the Pivot Bolt 4 tends to move upward so that it remains in contact with the Angle Bracket on the Strip 5.

This Strip is secured to a Collar on a $3\frac{1}{2}''$ Rod journalled in a $2\frac{1}{2}'' \times 1''$ Double Angle Strip, bolted across one end of the Plate. Two Contact Screws are insulated from the Strip as shown in Fig. 345a, and a length of Spring Cord, tending to pull the Strip downward, keeps the contacts 7 normally closed. The lower Contact Screw of the pair is attached to an Angle Bracket bolted to a $1'' \times \frac{1}{2}''$ Angle Bracket on the base Plate. Screwed Rods support a $2\frac{1}{2}''$ Strip carrying the upper contact 6 that is insulated from the Strip. Flexible rubber-covered wire is used for wiring up the controller, and the method of connecting wire to the moving contacts should be noted. The wires to the insulated Contact Screws on the Strip 5 are each wound loosely once round the Rod carrying the Strip, and passed through holes in the base. By arranging the wires thus they do not interfere with the movement of the Strip 5, and are not likely to break on account of movement of the Strip. The wire to the upper contact 13 is coiled as shown in Fig. 345.

For electrical connections a careful study should be made of the diagram in Fig. 345b in conjunction with the two illustrations on this page. The Coils 1 are connected together in series, one of them being connected to the upper insulated Contact Screw 7. The other Coil is connected to one Terminal of the Coil 14 and also to the Terminal 16 on the base. The other wire of Coil 14 is led to the upper Contact Screw of the pair 6 and is extended for one of the connections to the set.

To simplify the wiring diagram the contacts 10 and 13 and their respective connections have been transposed; the connections to the points 10 in Fig. 345a being shown at 13 in the diagram, and those at 13 in Fig. 345 at 10 in the diagram. The operation of the device is unchanged by this alteration, which is only to avoid complicating the wiring diagram. Contacts 10 in the diagram (13 on the model) are wired in parallel with the contacts 6. The upper contact of the pair 13 (10 in Fig. 345a) is earthed to the framework, and the lower one is wired to the lower Contact Screw of the pair 6, and to the Terminal 15 on the base. The lower contact 7 is earthed to the Plate.

One terminal of the accumulator is wired to the Terminal 15, and the second terminal of the accumulator is connected to the set and also to the push-button switch, the other wire from which is attached to the Terminal 16. Any length of wire can be used for the push button, but it is essential that both accumulator and control device are placed close to the set and connected up with short wires.

The mechanical operation of the controller will be understood from Fig. 345. When the Magnet Coils 1 are energised the armature 2 is raised. It lifts the Centre Fork 3 which overlaps at its tip only and consequently clears the end of the armature as it is raised. The Spring Cord returns the Centre Fork to its original position as soon as it is released. When the current is cut off from the Coils 1 the armature drops, this time striking the upper surface of the Centre Fork 3, the weight of the armature causing the Pivot Bolt 4 to raise the Strip 5 against the action of the Spring Cord, and thus to close the contacts 6 and open contacts 7.

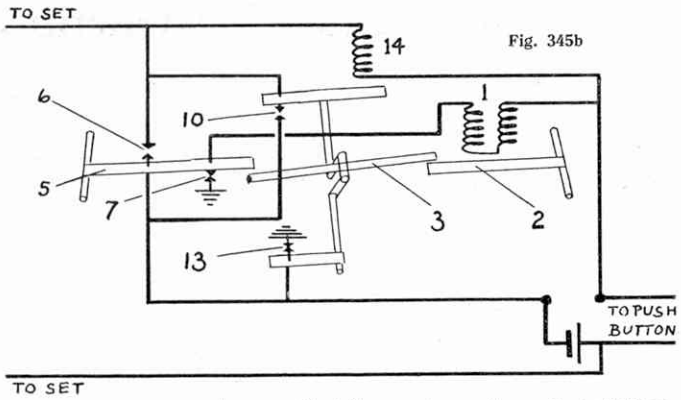


Fig. 345b

On passing current through Coil 14 the Flat Brackets 8 (Fig. 345a) are raised and the contacts 10 opened. The contacts 13 (Fig. 345) are closed. As the Rod 12 is moved away from the armature the Centre Fork 3 is released, thus allowing the contact arm 5 to drop. This movement raises the Centre Fork above the level of the armature again, and when the current is cut off from Coil 14 the device returns to its original setting.

By now referring to Fig. 345b the electrical operation of the device will be understood. As shown it is in the "off" position, and is ready to be energised for switching on the set. Contacts 6 and 10 are open, and contacts 7 and 13 are closed. When the push button is depressed the current flows through the Coils 1 and contacts 7 and 13 back to the accumulator. The armature 2 is raised, but the contacts are not altered until the push button is released and the armature allowed to drop on the arm 3. This action opens the contacts 7 and closes contacts 6, switching on the current for the set.

While the contacts 7 are open the Coils 1 are not in circuit with the push button. On again pressing the button the current flows to Coil 14 and through contacts 6. This Magnet Coil closes the points 10 and opens those at 13, and at the same time withdraws the arm 3 from beneath the armature 2. As soon as the arm 3 is released the switch arm 5 returns to its former position, but the current still flows to the set as the contacts 10 are closed. The Coils 1 remain out of circuit as contacts 13 are broken. On releasing the push button the contacts 10 open and 13 close, and the device is once again ready to be switched on the next time the button is pressed.

After the controller is completed minor adjustments will probably be necessary to secure efficiency. In particular the Centre Fork 3 must be carefully placed so that it swings clear of the armature 2 as the latter is raised, but projects sufficiently for the armature to catch it as it drops down again. Moving parts should be quite free, and the most suitable tension for the Spring Cord will be found by experiment.

It will be clear that this device, when used for wireless control, is suitable for battery-operated sets only and cannot be used with mains-operated receivers. It may be installed inside the wireless cabinet, and screwed down to the baseboard, so that it is kept free from dust and is not likely to be put out of order.

(346)—Simple Remote Control

(E. Thomas, Exeter)

The simple remote control device shown in Fig. 346 is not so reliable as the more elaborate one described on the opposite page, but it operates quite well, and those who do not wish to build the more complicated device will find this quite a good substitute.

Two Magnet Coils are attached by the Cores to a $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plate. The Coils are wired in series and are connected to the insulated Terminals 6, which are wired to the push-button controller and the accumulator for energising the Coils.

The armature 1 is made up of three $4\frac{1}{2}''$ Strips and is provided with six $1\frac{1}{2}''$ Strips at the shorter end, the other end being fitted with a Pawl (without Boss) 2 that is pivotally mounted and held by a light wire spring. The Pawl engages between two Bush Wheels bolted together with their bosses outermost. Nuts and bolts are secured to one of the Wheels so that the nuts occur between the two, the second Wheel being held to the first by two additional nuts. Four Angle Brackets 3 are bolted to the first Bush Wheel to form a square. To prevent the Wheels from rotating too freely the wire 4 is arranged to press lightly on the nuts between them.

When the Magnets are energised the armature 1 is raised and the Pawl engages one of the nuts between the two Bush Wheels, which are thus rotated for 1/8th of a complete revolution. The Pendulum Connection 5 is so arranged that for alternate impulses of the armature it makes or breaks contact with one of the Angle Brackets 3.

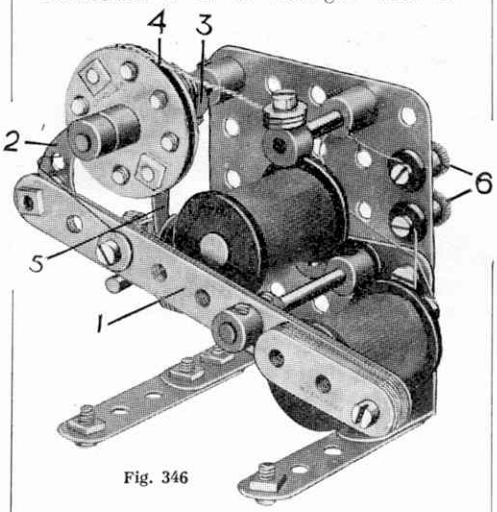


Fig. 346

Connections to the set are made from the Pendulum Connection and the frame.

Which are the Most Interesting Suggestions?

Readers' opinions on suggestions published in this section are a great help when new ideas are under consideration. Once again readers are asked to assist in the future selection of ideas by stating which of the suggestions published during the last year they consider the most interesting.

During 1935 twenty-five ideas appeared in the "Suggestions Section" (Nos. 320-344), and readers are asked to write down on a postcard the four that they consider the most interesting. The four suggestions should be placed in order of merit, and in writing them down it is only necessary to put the numbers under which they appeared. Below these the reader's full name and address should be given.

It is quite likely that readers living Overseas will show preference for different ideas from those preferred by Home readers, and in order to find out their true opinions, postcards received from Overseas will be treated entirely separately from those received from the British Isles. Every vote will be recorded according to its position on the list, and in this way the suggestions may be classified in their order of popularity.

In both sections senders of the lists most nearly corresponding to the final result of the voting will be presented with a cheque for £1-1s., and the next nearest to the general opinion of the voters will be awarded a cheque for 10/6. In addition the 12 runners-up in each section will receive consolation prizes.

The contributor whose suggestion is thus shown to be the most popular with Home or Overseas readers, or both, will receive a cheque for 10/6; and the other contributors whose ideas appear in the final results will be presented with consolation prizes.

Postcards should be addressed to "Spanner," "Meccano Magazine," Binns Road, Liverpool 13, and should be posted so that they are received before 31st March, except in the case of Overseas readers, whose postcards should be received not later than 30th April.

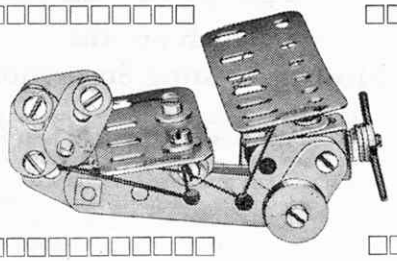
Cash Prizes for New Ideas

Cash prizes are awarded for all ideas published in the "Suggestions Section," except those appearing under "Miscellaneous Suggestions," and readers are invited to submit details of any new ideas that occur to them. Contributions should be original and should, if necessary, be illustrated with photographs or sketches.

Contributors are invited to send particulars of any ingenious mechanism that has not already been dealt with on these pages, and of new uses they find for Meccano parts. A mechanism need not be a complete model but perhaps part of a large model in which it serves some definite function. Practical uses for Meccano also will be considered for publication.

Model builders who are keen on inventing new mechanisms should consider which of their recent efforts are suitable for publication, and send details of the devices. Here is a good opportunity to earn some extra pocket money and at the same time to be of real help to other readers.

Ideas should be submitted to "Spanner," and some of those that cannot be dealt with fully will appear under "Miscellaneous Suggestions." Small prizes are awarded for these contributions.



In Search of New Models

Aeroplane Construction

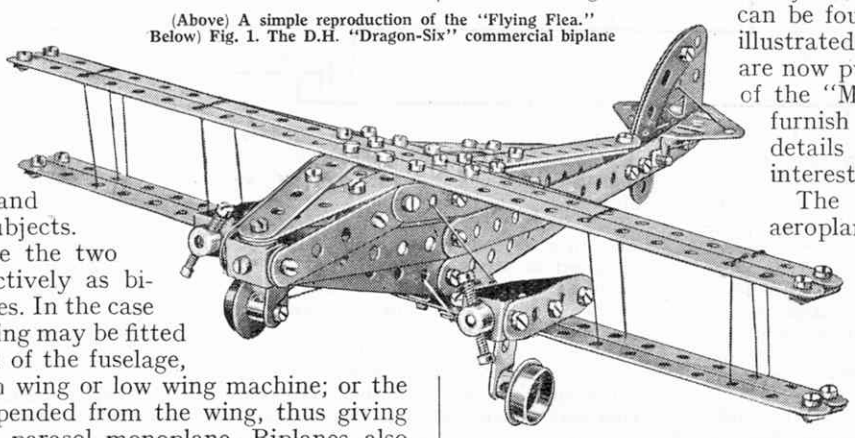
AEROPLANES offer a fine range of subjects for Meccano models. During recent years the tendency in design has been increasingly towards streamlining. To reproduce these streamlined forms in Meccano is not so difficult as the beginner might imagine, and after one or two attempts it will soon be found how best to obtain the curves that characterise most aeroplanes of modern design.

The great diversity of aeroplane designs provides model-builders with a large and splendid range of subjects. First of all there are the two classes known respectively as biplanes and monoplanes. In the case of monoplanes, the wing may be fitted at the top or bottom of the fuselage, forming either a high wing or low wing machine; or the fuselage may be suspended from the wing, thus giving what is known as a parasol monoplane. Biplanes also show variations in design. In some cases the wings have a pronounced "stagger," that is the upper wing is mounted farther forward than the lower wing; and in others the spans of the two wings are unequal. Where the planes are unequal in span the lower wing usually is the shorter, and a machine in which the difference is large is known as a sesquiplane, the name simply meaning that it has one and a half planes.

There are also great differences between machines intended to be employed over land and those for use over water. Land planes have wheeled undercarriages, and in many cases these are retractable, that is they can be pulled up or otherwise moved into such a position that they offer no resistance during flight. On the other hand machines for use over water either have floats instead of wheels, or the fuselage is built in the form of the hull of a boat. Machines of the first kind are known as seaplanes, and those of the second kind as flying boats. Some machines can be used on both land or water. These amphibians, as they are called, have special mountings for the wheels in order that they can be raised clear of the floats or flying boat hull when alighting on water. Still other machines that are not amphibious can readily be adapted for use either as land planes or seaplanes by fitting the appropriate undercarriage.

It will be seen that the constructor who sets out to build aeroplane models has a great field before him, and the fact that the designs of different manufacturing firms for any one type vary greatly adds further to his range. How closely it is possible to reproduce the features of machines of all types and makes is shown in the many remarkable models that are submitted by competitors for entry in Meccano Model-building Contests. Five entirely new models are shown on this and the opposite page. No difficulty should be experienced in selecting further new subjects, for suitable prototypes can be found in any of the well-illustrated books on aircraft that are now published, and the pages of the "Meccano Magazine" also furnish illustrations and full details of machines of special interest and novelty.

(Above) A simple reproduction of the "Flying Flea."
Below) Fig. 1. The D.H. "Dragon-Six" commercial biplane



The building of models of aeroplanes of unorthodox design is very attractive, for many of these can be built up in Meccano to make excellent models. An example of a very queer machine is shown in Fig. 2. This is of the Italian Stipa Monoplane, the fuselage of which actually forms a Venturi tube. The airscrew is placed at the front of the tube, inside which the engine is mounted, and the slipstream therefore is directed through the centre of the fuselage. Among the advantages claimed for this fuselage construction are increases in airscrew thrust and lifting effect. The Stipa Monoplane is an experimental two-seater, the two cockpits being arranged above the top of the fuselage.

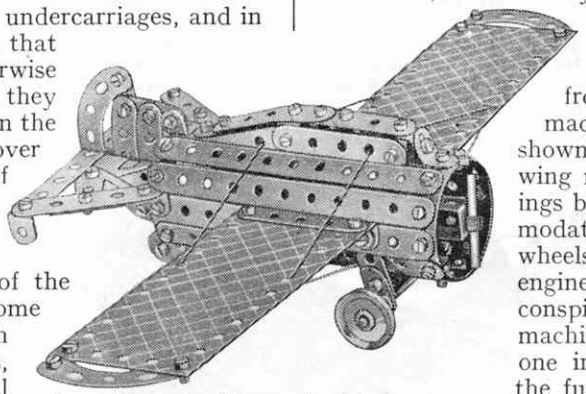


Fig. 2. The peculiar Stipa experimental monoplane.

Although the Fairey "Hendon" Bomber is not quite so unorthodox as the Stipa Monoplane, it is of unique design and is easily recognisable from almost any viewpoint. This machine is reproduced in the model shown in Fig. 3. It is a twin-engined low wing monoplane with streamlined fairings built beneath the wings for accommodating the landing wheels. The wheels are immediately beneath the engine nacelles. Twin rudders are a conspicuous feature, and the actual machine has three gunner's cockpits, one in the tail, one in the centre of the fuselage, and one at the nose. The pilot's cockpit is just in front of the wing.

Another long-range night bomber of unusual design is the Handley Page "Heyford," a twin-engined biplane of the raised fuselage type. The fuselage is not placed directly above the lower wing, as is usual in biplanes, but is suspended beneath the upper wing and the wheels are situated immediately beneath the lower wing and are not provided with any undercarriage struts of the usual type. Twin rudders are fitted.

The Cierva "Autogiro" is well known to readers, and those who have not already modelled this strange

flying machine will find its construction particularly interesting. The absence of wings, and the revolving vanes mounted above the fuselage give the "Autogiro" a weird appearance when in flight. Another remarkable aeroplane is the Westland-Hill "Pterodactyl," a sesquiplane with a very short fuselage and a large upper wing that is swept back in the form of a wide V. There is no tail to the fuselage, the rudders being fitted at the tapered ends of the upper wings.

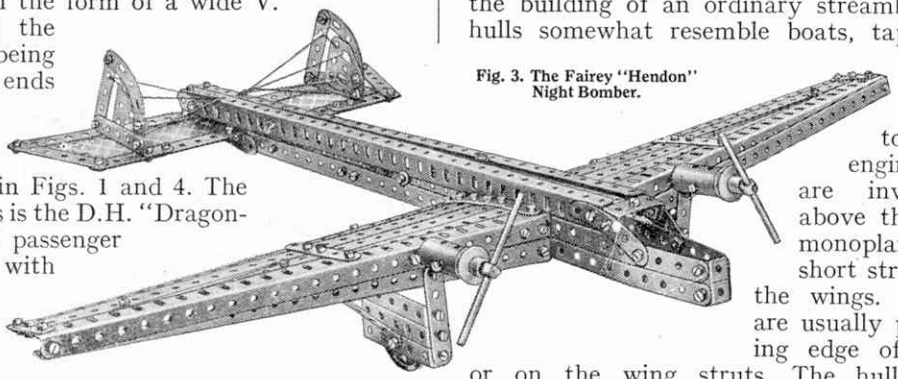


Fig. 3. The Fairey "Hendon" Night Bomber.

Models of two typical commercial machines are shown in Figs. 1 and 4. The first of these machines is the D.H. "Dragon-Six," a twin-engined passenger or freight carrier with seating accommodation and freight space that can be adapted to suit requirements. The shape of the fuselage is well reproduced in the model, and as in the actual machines of this type both upper and lower wings are attached direct to the fuselage.

The B.A. "Eagle" (Fig. 4) is a smaller machine of the cabin monoplane type, having accommodation for three. When in flight the undercarriage is drawn up to reduce the wind resistance, the wheels folding outwards to fit into receptacles beneath the wings. On fairly large models the retractable undercarriage can be made to work in a similar manner to those in actual practice, but it is not advisable to try to achieve this result on small models where there is insufficient space for the mechanism. When enough parts are available elaborate models can be built up, including all the refinements and necessary mechanism of the original machine. Movable ailerons, elevators and rudder can be made to operate from controls in the cockpit.

Racing machines give the constructor splendid opportunities for showing his skill and ingenuity. The D.H. "Comet" is an outstanding example of this class. It is a two-seater long-range monoplane of the cabin type with a very slender streamlined fuselage and twin engines mounted in front of the wing. The landing wheels are mounted beneath the engine nacelles, and when the monoplane is in flight they are drawn up into the nacelles, fairing caps fitting over the holes through which they pass. With careful selection of parts, the graceful lines of this machine can readily be reproduced, and Strips will be found most useful in the construction of a model of this famous machine.

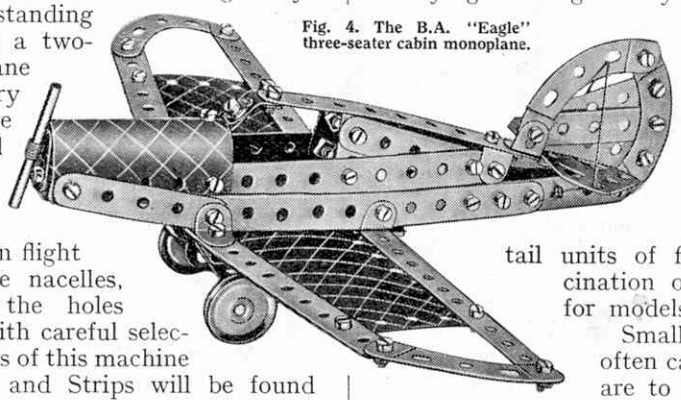


Fig. 4. The B.A. "Eagle" three-seater cabin monoplane.

A single-engined single-seater racing monoplane can be built on the lines of the Percival "Mew Gull." This is a small low wing cabin monoplane and has rather a short fuselage. The engine is totally enclosed, and streamlined fairings almost cover the wheels. The famous Supermarine S.6B that finally won the Schneider Trophy for Great Britain is a splendid example of a single-seater racing seaplane, and a particularly fine model of this is illustrated in the Instruction Manual for Outfits F to L. The model is a good example of the use of Strips for forming a streamlined fuselage, and a study of the method of construction adopted in this case will be very helpful to those who are building similar models.

Perhaps more skill is required for forming a flying boat hull from Meccano parts than is necessary in the building of an ordinary streamlined fuselage. The hulls somewhat resemble boats, tapering off towards the stern and sweeping upwards in a graceful curve to the tail unit. The engines of flying boats are invariably mounted above the fuselage and on monoplanes are fitted on short struts mounted above the wings. On biplanes they are usually placed at the leading edge of the upper wing or on the wing struts. The hull forms the cabin and is provided with a separate small cabin near the nose for the pilot. In the making of flying boat hulls Strips usually will be found most suitable for modelling the curves, but Strip Plates or Flexible Plates will prove useful for the sides. Features that must not be overlooked are the small floats placed beneath the wings to act as stabilisers. In most cases Strips will be found to be the most suitable parts for making the wing floats.

Most amphibian aircraft are flying boats fitted with landing gear that can be raised or lowered as required. The undercarriage is usually arranged to swing outwards so that the wheels are raised clear of the water, and sometimes the wheels fit into sockets beneath the wings when not in use. The mechanism for raising and lowering the wheels should if possible be reproduced in Meccano. As flying boat hulls are comparatively large it should not be difficult to arrange for this, but the constructor's opportunities in this direction of course will depend upon the size of the model. The tail units of flying boats generally differ considerably from the tail units of landplanes. The tailplane is often mounted on the rudder and braced by struts, and is usually in a direct line with the engines, so that the full effect of the slipstream is utilised. Other variations in the arrangement of the tail units of flying boats add to the fascination of these machines as subjects for models.

Small details on aeroplane models often call for careful attention if they are to be reproduced approximately to scale. The use of parts that are too large for the purpose makes the model look clumsy, rather spoiling its appearance, and it is frequently better to omit the details entirely than to make them too large. On three of the models illustrated Axle Rods are used for airscrews, and on the D.H. Dragon-Six $\frac{3}{8}$" Bolts are used. The diminutive Flying Flea shown in the heading on the opposite page requires yet a neater air screw, Spring Cord being used in this case. Wing struts can be made from Spring Cord and in small models ordinary cord must be used for the struts as well as for bracing wires if these are fitted.

Quayside Unloader in Meccano

An Interesting H Outfit Model

THE loading and unloading at the quayside of coarse loose materials such as coal and iron ore has always presented a difficult problem. Until comparatively recent times it was carried out by hand, the usual unloading scheme being to fill a number of tubs in the hold of the ship and hoist them up to elevated wooden platforms on the quayside by means of the vessel's own derricks. As the volume of freight of this nature increased, some quicker and cheaper method of handling became urgently necessary. In 1880 a move in this direction was made by the invention in America of the Industrial Brownhoist tramway type of unloader, and it is from this early machine that present-day bridge cranes have been developed. Unlike modern machines of this type the early unloaders resembled short cable railways on which ran small self-emptying tubs. These tubs were filled by men stationed in the hold of the ship that was being unloaded, and when full were hoisted out and their contents discharged on to the ground between the two end columns of the unloader.

An interesting working model of an up-to-date Brownhoist bridge crane is shown in Fig. 1. Its prototype, which is stationed at the port of Rotterdam, Holland, is a little over 150 ft. in length and is fitted with a grab capable of lifting 10 tons at a time. The model is built to a scale of 1/3 in. to 1 ft., and its overall measurements are length 4 ft., and height 2 ft. 3 in. It is fitted with crane hooks in place of a grab, owing to lack of the necessary parts in the H Outfit with which it is designed to be built. A suitable grab could easily be constructed with a few extra parts, however. Further realism would be secured by mounting the model on $\frac{3}{4}$" Flanged Wheels and arranging it to run on rails built up from Angle Girders. These girders might be screwed down to a baseboard painted to represent a quayside.

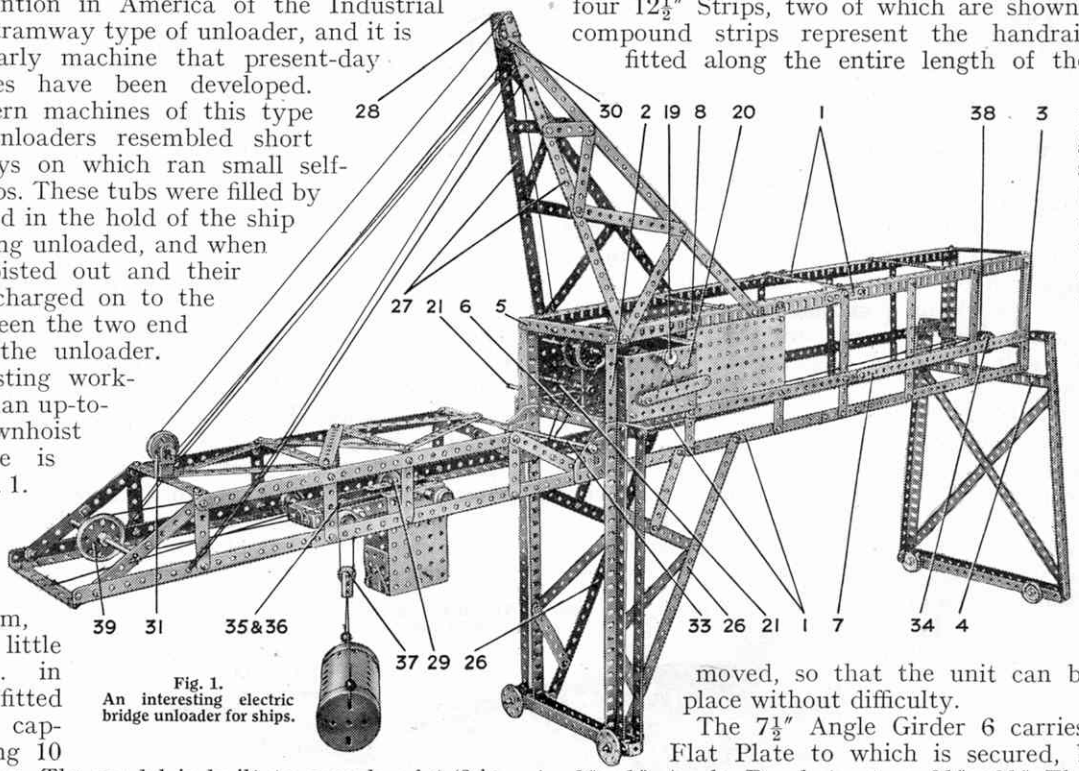


Fig. 1. An interesting electric bridge unloader for ships.

The model is commenced by building up the four main girders 1, each of these being composed of two 12½" Angle Girders connected together by means of two 2½" Strips as shown in Fig. 1. When the four girders are complete they are secured together in pairs, each pair having two 5½" Angle Girders 2 and 3, and five 5½" Strips. The two pairs of long girders, when secured together in this manner, form the side members of the bridge section of the machine, and they are both connected together to form a long box girder by a series of Angle Girders and Strips.

At the rear end is fitted a 7½" Angle Girder 4, and at the front end a 5½" Strip 5 is used together with a second 7½" Angle Girder 6. The Girder 6 forms part of the gear-box, as will be described later.

The top edges of the side members of the bridge are connected by four 4½" Strips, one of which consists of two 2½" Strips bolted together and overlapped one hole each. This section of the model is completed by the addition of four 12½" Strips, two of which are shown at 7. These compound strips represent the handrails that are fitted along the entire length of the prototype.

At this point the gear-box should be built and fitted, as this will be more difficult when the remainder of the model is built. Before fitting the complete gear-box, however, the two 5½" Strips 8 and 9 must be temporarily removed, so that the unit can be secured in place without difficulty.

The 7½" Angle Girder 6 carries a 5½" × 3½" Flat Plate to which is secured, by means of ½" × ½" Angle Brackets, two 3½" × 2½" Flanged Plates. An E6 or E20b Electric Motor is also bolted in place as shown in Fig. 2. One of the 3½" × 2½" Flanged Plates is fixed to the Motor side plate by means of a 2½" × ½" Double Angle Strip 10, and this part forms a bearing for one of the shafts in the gear-box.

A Worm on the armature shaft of the Electric Motor engages with a 57-teeth Gear 11 that is locked on a vertical 2" Rod journalled in the Double Angle Strip and one of the holes in the 5½" × 3½" Flat Plate. The 2" Rod carries at its upper end a 1½" Contrate that drives a sliding 4" Rod by means of a ½" Pinion 12. Two Washers are placed on the Rod, between the ½" Pinion and end plate, for spacing purposes.

Two Collars, one of which is shown at 13, are secured on the end of the sliding Rod, and these accommodate the shank of a bolt 14, between them. This bolt is carried in the centre of a 3½" Strip, fitted with a Threaded Pin, forming the gear change lever.

The sliding Rod carries a second ½" Pinion 15 and ¾"

Contrate 16, the Pinion being in engagement with a 57-teeth Gear when the gear lever is in its outer position. The 57-teeth Gear rotates a 1½" Pulley 17, the purpose of which will be described later. When the gear lever is at its inner position the ¾" Contrate 16 engages with a second similar part mounted on the hoisting barrel 18. A length of cord is shown wound on this Rod in Fig. 2. The ½" Pulley 19 forms a brake drum, the arrangement of which is shown in Fig. 1. The ⅜" Bolt 20 forms a stop for the brake lever.

The Crank Handle 21, Figs. 1 and 2, carries the hoisting cord for raising and lowering the bridge extension. As will be seen from Fig. 1, the Crank Handle is journalled in one of the side Flanged Plates and one side plate of the Electric Motor. On the outside of the side Flanged Plate, the Crank Handle carries a 1" fast Pulley 22, Fig. 3, and round this is passed a brake cord. The cord is secured at one end to the frame of the model and at the other end to one arm of a Boss Bell Crank 23. This Crank, which is mounted pivotally on a Pivot Bolt 24, carries on its horizontal arm a 3½" Strip fitted with the weight 25, a Coupling.

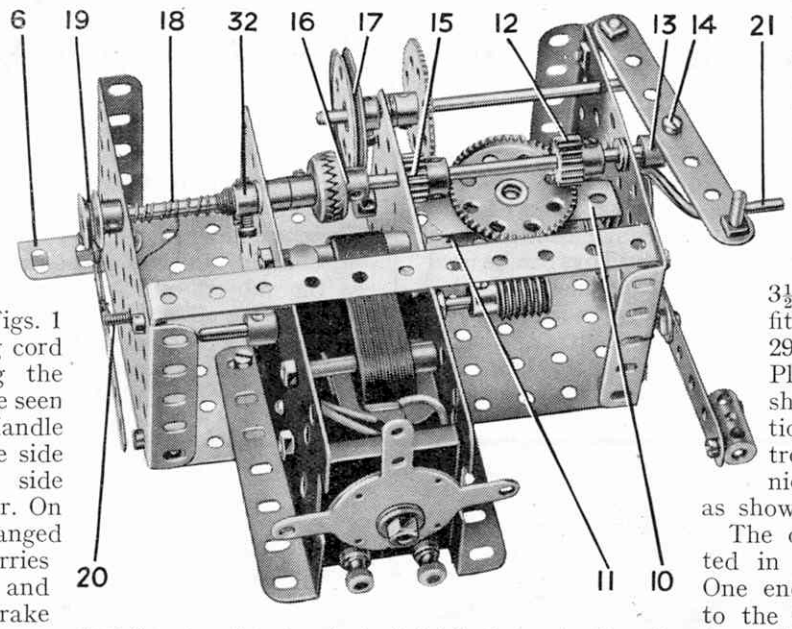


Fig. 2. The motor and gear-box, showing the hoisting drums and racking pulley.

The gear-box can now be fitted in position as shown in Fig. 1, and the construction of the model continued. The complete bridge and gear-box are elevated on four 12½" Angle Girders, the rear two being bolted, five holes from their upper ends, to the Girder 4. At the lower end the 12½" Angle Girders are joined together by means of two 9½" Angle Girders that are bolted together to form a channel section girder. This girder carries two 1½" Rods on which are secured two travelling wheels. For bracing members, 2" and 12½" Strips are used as shown.

At the front end of the bridge the two 12½" Angle Girders are bolted to the end 5½" Angle Girders 2 and are overlapped four holes. The end of the Girder 6 is fitted with two 12½" Strips, and the lower ends of these, together with the ends of the 12½" Angle Girders, are secured together by means of two 7½" Strips. The next-to-end holes of these two Strips form bearings for the axles of the remaining pair of travelling wheels.

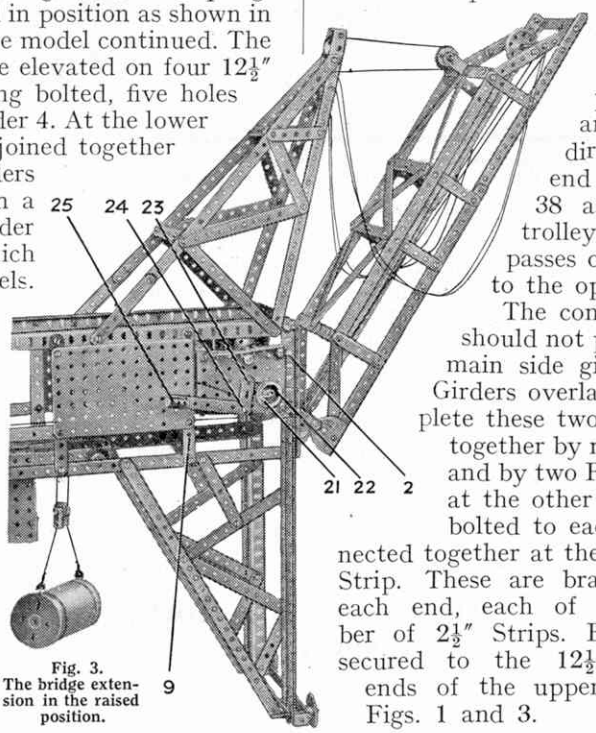


Fig. 3. The bridge extension in the raised position.

Two 12½" Strips 26 are now fitted to the lower set of girders 1, and these Strips are attached at their lower ends to ½"×½" Angle Brackets bolted to the 7½" Strips of the front legs. These 12½" Strips are braced as shown in Figs. 1 and 3.

The structure surmounting the bridge can now be fitted. This consists of two 12½" Strips 27 connected together at their upper ends by a Double Bracket 28. The two rear members of the structure are each built up from a 12½" Strip and a 3½" Strip, each overlapping the other two holes. Bracing is fitted as shown.

The construction of the trolley for carrying the load, that runs along the bridge and bridge extension, can now be proceeded with. The frame is composed of two 5½"×½" Double Angle Strips secured together at one end by two Flat Brackets. At the other end the Double Angle Strips carry two 3½"×2½" Flanged Plates fitted with a 1½" Strip 29 and a 2½"×1½" Flanged Plate at the bottom, not shown in the illustrations. At the bottom the trolley also carries a Trunnion and Flat Trunnion as shown.

The operating cords are fitted in the following manner. One end of a cord is secured to the Crank Handle 21, and from here it is taken over the Pulley 30, round the Pulley 31, and then secured to the top of the superstructure.

A second cord is secured to the Collar 32 and passed round the pivot Rod 33, round the Pulleys 34, 35, 36 and 37, and finally tied to the Strip at the end of the bridge extension. A third cord passes round the 1½" Pulley 17, and both ends pass in opposite directions round the Rod 33. One end is then taken round the Pulley 38 and secured to one end of the trolley. The other end of the cord passes over the Pulley 39 and is fastened to the opposite end of the trolley.

The construction of the bridge extension should not present any great difficulties. Each main side girder consists of two 12½" Angle Girders overlapping nine holes, and when complete these two compound girders are connected together by means of two 2½" Strips at one end, and by two Flat Trunnions carrying the Rod 33 at the other end. Four vertical 2½" Strips are bolted to each side girder and these are connected together at their upper ends by means of a 12½" Strip. These are braced by means of 4½" Strips at each end, each of which is composed of a number of 2½" Strips. Eight ½"×½" Angle Brackets are secured to the 12½" Strips and these carry the ends of the upper bracing members as shown in Figs. 1 and 3.

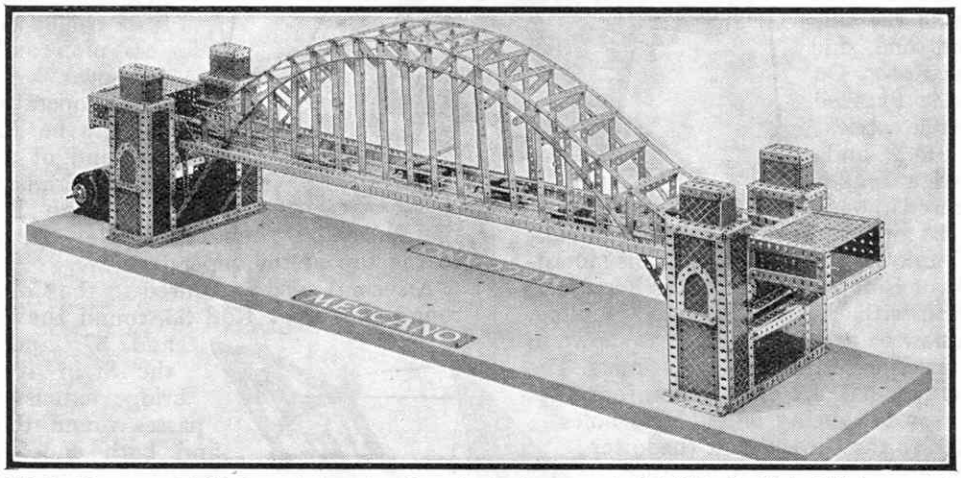
List of parts required to build the model:

16 of No. 1; 2 of No. 1b; 25 of No. 2; 4 of No. 2a; 12 of No. 3; 2 of No. 4; 36 of No. 5; 2 of No. 6; 3 of No. 6a; 14 of No. 8; 4 of No. 8a; 2 of No. 8b; 4 of No. 9; 2 of No. 10; 3 of No. 11; 19 of No. 12; 1 of No. 12a; 5 of No. 15; 1 of No. 15b; 3 of No. 16; 2 of No. 16a; 5 of No. 17; 3 of No. 18a; 1 of No. 19s; 4 of No. 20b; 2 of No. 21; 4 of No. 22; 3 of No. 22a; 3 of No. 23; 1 of No. 23a; 2 of No. 24; 1 of No. 26; 2 of No. 27a; 1 of No. 28; 2 of No. 29; 1 of No. 32; 10 of No. 35; 200 of No. 37; 6 of No. 37a; 24 of No. 38; 1 of No. 43; 1 of No. 48a; 3 of No. 48d; 3 of No. 52a; 4 of No. 53; 2 of No. 57c; 18 of No. 59; 3 of No. 63; 1 of No. 73; 6 of No. 111c; 1 of No. 115; 1 of No. 126; 5 of No. 126a; 1 of No. 128; 1 of No. 147b; 1 of No. 162; 1 of No. 176; Electric Motor (not included in Outfit).

Novel Model-Building Competition

Using Dinky Toys in Conjunction with Meccano

On this page is illustrated a fine model of an arch bridge built up from Meccano parts. On the roadway several Dinky Toys are arranged to travel to and fro by means of a simple automatic mechanism. This model is a good example of the way in which Dinky Toys can be used to add the finishing touches to Meccano models, and a further example is shown in the fine roundabout illustrated on page 105. We believe that readers will have plenty of ideas for building other models of this kind, and therefore we announce a special competition in order to encourage them to put their ideas into practical form.



This fine Meccano arch bridge incorporates automatic mechanism by means of which Dinky Toy Motor Vehicles are made to travel to and fro along the roadway. A competition for novel models of this kind is announced on this page.

To enter this contest it is only necessary to build a model that incorporates standard Meccano parts and any of the Dinky Toys. Models may be of any kind whatever, and any quantity of Meccano parts and any kind and number of Dinky Toys may be used as desired.

The Dinky Toy Motor Vehicles, Aeroplanes, and Ships will be found especially useful in this respect. They can be used in a great variety of models, so that there should be no difficulty in selecting a suitable subject. It should be clearly understood, however, that models made entirely from Meccano, and which do not incorporate any of the Dinky Toys, are not eligible for this contest.

Models that can be set to work will stand the greatest chance of success, and these may be driven by any form of Meccano power unit such as an Electric or Clockwork Motor or a Steam Engine.

A little thought will supply plenty of ideas for models suitable for entry in this contest, and as the competition provides model-builders with a welcome change from ordinary Meccano model-building we look forward to receiving a large number of entries.

It must not be thought that because the models illustrated on this page and on page 105 are large and complicated that it is necessary to have a large Outfit and a big variety of Dinky Toys to compete successfully in this contest. This is not the case. It is possible to build quite simple models with which one or more Dinky Toys can be used, and such models will be given every consideration by the judges.

The contest is open to every owner of a Meccano Outfit. There are no entrance fees to be paid or forms to be filled in. Competitors may choose any type of model they like as the subject of their entry, and the more vivid the imaginative effort shown in designing models the better the chance of gaining a prize.

Actual models must not be sent. It is only necessary to submit either clear photographs or, if this is not possible, good drawings of models, together with a brief explanation of any structural or mechanical features that are not clear from the photos or drawings. Neither photographs nor drawings need be the competitor's own handiwork, but it is absolutely essential that the model itself is his own unaided work.

Entries will be divided into two sections: Section A, for readers of all ages living in the British Isles, and Section B, for readers of all ages living Overseas. Age will be taken into consideration when judging.

The competitor's name, address, and age must be written clearly on the back of each photograph or drawing sent in, together with the letter (A or B) indicating the Section for which the entry is eligible. Envelopes containing entries should be addressed "Meccano—Dinky Toy" Competition, Meccano Ltd., Binns Road, Liverpool 13. Photographs of prize-winning models become the property of Meccano Ltd., but unsuccessful entries will be returned to the senders provided that a stamped addressed envelope of the necessary size is enclosed with the entry.

31st March, 1936, is the last day on which entries can be received in the Home Section. Overseas readers must forward their entries so that they reach Liverpool not later than 30th May, 1936.

Competitors are advised to start work on their models immediately so as to have ample time to make any necessary alterations.

"Meccano—Dinky Toy" Competition

The Prizes

A complete and separate set of prizes as follows will be awarded in each of the Sections A and B.

First Prize, Meccano or Hornby Goods value £3-3s.

Second Prize, Meccano or Hornby Goods value £2-2s.

Third Prize, Meccano or Hornby Goods value £1-1s.

Five Prizes of Meccano or Hornby Goods value 10/6.

Five Prizes of Meccano or Hornby Goods value 5/-.

Certificates of Merit also will be awarded in each Section.

Model-Building Competition Results

By Frank Hornby

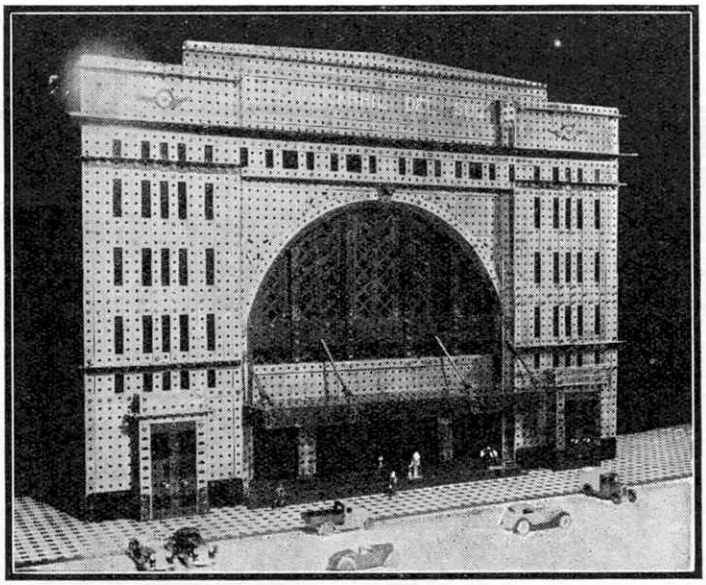
"Architectural" Contest (Overseas Section)

The full list of prizewinners in the Overseas Section of the "Architectural' Contest is as follows:

Three competitors obtained over 75 points and therefore share goods value £8 in proportion to the points gained: Miss Ana Rivarola, Buenos Aires, Argentine (87 points) £2/18/–; K. Orams, Christchurch, N.1, New Zealand (80 points) £2/13/–; J. Watson, Regina, Canada (75 points) £2/10/–.

The following competitors obtained between 65 and 74 points and receive proportionate shares of Meccano or Hornby goods value £4: P. Giese, Buenos Aires, S. America (72 points) 15/–; J. Capelli, Buenos Aires (69 points) 14/–; N. Soderberg, Falun, Sweden (69 points) 14/–; A. Casaretto, Buenos Aires (66 points) 13/6; A. Bacon, Deolali, India (66 points) 13/6; R. Begg, Hamilton, Canada (66 points) 13/6.

A pleasing feature of this contest is the success of Miss Ana Rivarola in winning the chief prize. I congratulate this young lady on her fine achievement and hope that she will continue to send in entries for these monthly contests. Her model is a particularly fine example of miniature architecture, and represents the facade of a Gothic church. The building includes three arched doorways surmounted by twin towers and spires. The doorways are each made from two Flat Plates converging at the top, and inside the triangle so formed are bolted curved Braced Girders. Much of the decorative work is done with 2½" Curved Strips and a Wheel Flange, and several Pulley Wheels of various sizes also are used. The towers on which the spires are built are provided with ornamental pointed windows, and above these is a balcony surrounded with Braced Girders to represent railings. The spires themselves are built on frameworks of Angle Girders, and the gaps are filled in with 2½" × 2½" Flat Plates and Strips. The apex of each spire is fitted with a cross, which is made by bolting two 2½" Strips by their centre holes to a Collar mounted on a Rod that protrudes from the spires. Clocks represented by Bush Wheels provide additional decoration to the towers.



An interesting prize-winning model representing an Argentine railway station at night. It is the work of P. Giese, Buenos Aires.

K. J. Orams also sent a model of a church, the main portion of which is constructed on a frame of Angle Girders 18" long, 14" wide and 7½" high to the gutters. The walls and roof are covered in with Flat Plates and Flat Girders, gaps being left in the walls at intervals for windows, and Curved Strips and Strips are used for the window frames. As in the case of Miss Rivarola's model, the spires are built on a short tower, and this is placed centrally in the front of the model, its lower part forming the bell-ringer's room and the porch. A small room off the porch represents a vestry. The spire is built on a pyramid of Angle Girders, but as the entire structure is considerably smaller than Miss Rivarola's model only one 5½" Flat Girder is needed to fill in each side.

The other principal prizewinner, J. Watson, built a model of Parliament Buildings at Regina, Saskatchewan. The model is built on a considerably larger scale than either of the models already described, and is 12 ft. 6 in. long and 4 ft. high, but although so large it does not contain as much detail as I should like to see in a model of this kind, and also certain portions are built from non-Meccano parts. It is, however, a neat piece of work and a good reproduction of the actual building. In the actual building there are several ornamental pillars and for these cylinders of wood were used. The roof is made from corrugated cardboard, and the numerous windows are filled in with cellophane.

Six models submitted by P. Giese, N. Soderberg, J. Capelli, R. A. Begg, A. R. Bacon and A. A. Casaretto respectively, shared a prize of £4. P. Giese's model, which is illustrated on this page, represents the front of a modern railway station. In my opinion the best work has been done in the construction of the veranda over the entrance. The use of Dinky Toys adds a touch of realism to the model, which was greatly appreciated by the competition judges.

A ranch house forms the subject of J. Capelli's model, and it is evident that Capelli has a considerable knowledge of his subject. The front of the house is provided with a garden surrounded by low railings, which are represented by Braced Girders, and in the railings is a wicket gate, which actually moves on Hinges. Cardboard is used for the roof of the model, but this is the only non-Meccano part employed.

N. Soderberg's entry comprised two models representing a sports pavilion and a tower and aerial of the type used for transmitting television waves. The greater part of the sports pavilion is made from Strips, and Flat Plates are used for the walls. The television transmitting tower is constructed on four pillars, each made from two Angle Girders bolted together to form tubular girders. The upper part of the tower resembles the lantern house of a lighthouse in design, and is made from Flat and Triangular Plates. An aerial, represented by Meccano Cord, is supported on Rods that protrude radially from the top of the tower. Cord is also used throughout the model for bracing purposes.

R. A. Begg's model is an excellent example of a modern departmental store. The most conspicuous parts of it are a skyscraper structure at one end and a great arched main entrance. The model is quite simple in construction, however, and is built chiefly of Strips, and from the photographs it appears that it is intended to give a vague impression of the size and design of structures of this type rather than to show the details of their construction.

A. R. Bacon's model also is a very simple reproduction of the house in which John Bunyan was born. Although it is made entirely from Strips it is extremely neat, and the only portions that are not made from Meccano are the window frames.

The model sent by A. A. Casaretto is a church with twin bell towers, and as in the case of P. Giese's model, Dinky Toys are used to obtain a realistic effect.

Results of the August "Errors" Contest (Home Section)

First Prize, Meccano or Hornby Goods value £2/2/–: G. Sinclair, Canterbury. The Second and Third Prizes were combined and the total (£1/11/6) divided equally between R. Upton, London, E.4, and G. Dilworth, Stretford, each receiving Goods value 15/9.

Goods value 5/–: D. Brooks, Alveston, Nr. Bristol; J. Dobinson, Bromley; N. Chessells, Birmingham; P. Haddock, London, S.W.16; I. Kirkbride, Minehead.

Goods value 2/6: M. Capel, Oxford; J. Capon, Hadleigh; J. Geake, Manchester; D. Morris, Greenhithe; C. Trimmer, Gillingham.

"Holiday" Contest (Home and Overseas)

First Prize, Meccano or Hornby Goods value £1/1/–: A. Tarry, Harpenden. Second Prize, Goods value 15/–: G. Colwell, Gosport. Third Prize, Goods value 10/6: R. Myburgh, Claremont, S. Africa.

"Humorous Models" Competition (Home)

First Prize, Meccano or Hornby Goods value £1/1/–: T. Barron, Sollom Tarleton, Nr. Preston. Second Prize, Goods value 15/–: N. Wilsdon, Darlington. Third Prize, Goods value 10/6: R. Fautley, North Cheam, Surrey.

Enfield Grammar School M.C.—The club held its first Exhibition on the School Speech Day, and the display occupied two rooms. The chief models in the first room were a Meccanograph built and worked by a senior member and a model workshop loaned from Headquarters. The outstanding models in the second room were a reproduction of Watt's Beam Engine and of the Eiffel Tower. Part of the club's railway track was laid round the Tower. The first Games Night was very successful. A system of scoring was arranged, and at the end of the evening the Leader presented four prizes of Meccano products. Club roll: 32. *Secretary:* J. H. Pettifer, 31, Goat Lane, Forty Hill, Enfield.

Well Hall and District M.C.—A visit was paid to the Lightweight Cycle Show, in London, where members were very interested in the latest types of light bicycles. It is probable that a Cycling section will be formed this spring. Attendance at meetings continues to be good. Club roll: 8. *Secretary:* E. W. Quinton, 48, Beaconsfield Road, Mottingham, Kent.

Kendal M.C.—Several interesting visits were paid to the Lancaster H.R.C. Branch in connection with the recent Exhibition. Meetings continue to be held regularly although members are still without a clubroom. Plans are being made for a mock trial, debates, and a visit to Headquarters. Club roll: 10. *Leader:* Mr. L. Haslam, Middleton, Kirkby Lonsdale, Carnforth.

Bristol Grammar School M.C.—The club has been divided into Senior and Junior Sections, each having 20 boys. Model-building has been the chief activity, and a very successful Exhibition was held at the close of the last school term. Club roll: 40. *Secretary:* N. E. Ricketts, 10, Belgrave Road, Clifton, Bristol, 8.

Old Charlton M.C.—Some fine model motor cars and excavators have been constructed at recent meetings. Debates continue to be very popular, and have included one on the topical subject of whether pedestrians, cyclists or motorists have prior right to the road. A Stamp section has been formed, and a talk by the Leader on stamp collecting was listened to with interest. Arrangements are being made for visits to Croydon Airport, a local power station, and a local preserving factory. Members are busy rehearsing for a social to be held this month. Club roll: 22. *Secretary:* W. Jaques, 60, Gurdon Road, London, S.E.7.

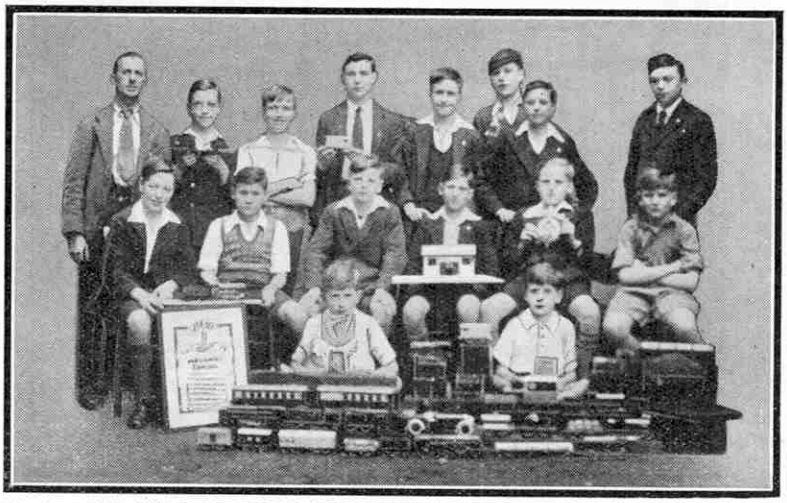
Mallow M.C.—A talk on "*Gramophone versus Wireless*" was followed by a lively debate that ended in favour of wireless. A debate on "*Rail versus Road*" also proved very entertaining. A further visit has been paid to the local sugar beet factory, in connection with the elaborate model being constructed by members. Recent additions to this model include a fully-equipped garage, an automatic weighing machine, and extensive sidings. The model is lit by electricity, and will be the chief feature at the club's forthcoming Exhibition. A model of a local viaduct has also been constructed for the Exhibition. Club roll: 10. *Secretary:* D. Hickey, 42, Ballydaheen, Mallow, Co. Cork, I.F.S.

Islington M.C.—A very varied programme is being followed, and all meetings are well attended. Fretwork, games and talks are almost as popular as model-building. Recent talks have dealt with "*Life on an Arctic Trawler*," "*The Cinema Organ*," and "*The Testing of Aeroplanes in a Wind Tunnel*." Members have been busy getting ready for the club's first Exhibition. Club roll: 21. *Secretary:* S. Ryden, 54, Thornhill Road, Islington, London, N.1.

Todmordon Road Central School (Burnley) M.C.—The enthusiastic preparations for the Christmas Exhibition ensured its success. The models displayed included motor cars, aeroplanes and railways. Interesting lantern lectures have been held, one on "*America*" by Miss Yeadon, one of the school mistresses; another on "*The Railway Museum, York*," the slides being lent by the L.N.E.R. A club magazine entitled "*The Rota*" has been started, and the first issue was quickly sold out. A visit to the Rosegrove Engine Sheds has been arranged. Club roll: 31. *Secretary:* F. Smith, 80a, Master Street, Burnley, Lancs.

Middlesbrough M.C.—Owing to unforeseen circumstances the Leader, Mr. H. Richardson, has had to resign. The secretary is deputising until a new Leader can be found and he will be pleased to hear from any adult who would like to become the Leader of this club. Club roll: 40. *Secretary:* Mr. L. Shepherd, 29, High Street, North Ormesby, Middlesbrough.

Preparatory School (Sedbergh) M.C.—Most meetings are devoted to model-building, and a fine model of a Whaler has been constructed. It contains most of the features of an actual whaling ship, including the slipway in the stern, up which the captured whales are hauled to the deck. Other successful models have included an Overhead Railway and a Gantry Crane. The club is co-operating with the H.R.C. Branch at the school in preparing for an Exhibition in July, and members are very enthusiastic. Club roll: 11. *Leader:* M. B. Pearson, Preparatory School, Sedbergh, Yorks.



Members of the Islington M.C. Mr. V. Miller, Leader of the club, is on the left of the top row, and S. Ryden, secretary, is the seventh from the left on the same row. The club was affiliated in January 1935. Model-building and Fretwork are the most popular of its many activities.

Bridport Grammar School M.C.—The new lantern lecture "*A Trip Round the Post Office*," mentioned by the Guild Secretary in the November 1935 "*M.M.*" has been given by a local post office official, and was greatly enjoyed. The club library has been overhauled and extended, several new books being purchased out of club funds and others presented by members. Club roll: 28. *Secretary:* H. Dommett, West Allington, Bridport, Dorset.

St. Oswald's M.C.—This newly-affiliated club is making good progress, and has been divided into two sections, named "Nuts" and "Bolts" respectively. Members are enthusiastic model-builders, and some excellent models have been completed. A lecture on "*The Steam Engine*" by the Leader was much appreciated, and a lantern lecture on "*The Motor Car*" was also very interesting. The club football team continues to be successful. Club roll: 15. *Secretary:* R. H. Smart, 14, Kensington Avenue, Thornton Heath, Surrey.

Wheelwright Grammar School M.C.—This club was affiliated in November last, and three more members have since been enrolled. Model-building is the chief feature of the meetings, but occasional diversion is provided by evenings devoted to games or lantern lectures. At one meeting a mock trial was held and proved a very amusing affair. Club roll: 13. *Secretary:* D. G. Thackrah, 2, High Road, Northfields, Dewsbury, Yorks.

Sutton Valence Council School M.C.—Members are showing increasing skill and ingenuity in their model building, and a Super Model Competition held recently produced some fine work. An Inventors' Competition also proved very popular. The first winter session was concluded with a Christmas Celebration, and during tea the President, Mr. C. R. Boswell, visited the club. Afterward games were played and everybody had a great time. An interesting programme is being carried out this session. Club roll: 23. *Secretary:* J. Chandler, "Herriard," Chart Sutton, Nr. Maidstone, Kent.

St. Stephens (Saltash) M.C.—An invitation to exhibit models at the Plymouth M.C. Exhibition was accepted and an effective display was arranged. Prizes were given for the best models, and the first prize was awarded for a model of a traction engine. The club's own Exhibition was held later, in conjunction with the St. Stephens (Saltash) Branch of the H.R.C., and was very successful. The best models on view were the traction engine already referred to and a huge crane 4 ft. 6 in. in height which was worked by a stationary steam engine. A concert has been held, for which a stage complete with footlights was erected in the club room. Club roll: 16. *Secretary:* B. Braund, 9, Homer Park, Saltash, Cornwall.

EGYPT

Zagazig M.C.—This well organised club includes many different sections, and such matters as club management, the arranging of excursions and sports and the production of a club magazine are in the hands of special committees. The Leader would be pleased to receive copies of other club magazines as he feels sure they would be very helpful to him in showing what kind of articles to obtain for the Zagazig paper. The club hope to have an interesting display of models at a forthcoming Exhibition of Egyptian Industry, in Zagazig. Club roll: 20. *Leader:* Abdel Moneim Mangourie, 39,B, Gannabiet Sikka Hadid Street, Fagarig.

BRITISH WEST INDIES

Munro College M.C.—Many interesting lectures have been given, and the subjects dealt with have included "*The World's Most Dangerous Job*"; "*Byrd's Adventure to the South Pole*," and "*100 m.p.h. in the 'Flying Scotsman'*." A Fretwork section has been started, and the model railway layout has been reduced in size to make room for the new section. Bookbinding continues to be a popular hobby, and eight books have been completed. The "B" football team has suffered two defeats recently. Club roll: 26. *Secretary:* H. G. Maxwell, Munro College, Munro P.O., Jamaica, B.W.I.

NEW ZEALAND

Christchurch M.C.—The social on the club Birthday Night was so successful that another has been held, and there was again a good attendance of members, their parents and friends. Meccano and Hornby Competitions are arranged frequently as they are greatly enjoyed. The club has been visited by Mr. E. H. Spears, secretary of the Wellington Boys' Institute M.C. Club roll: 23. *Secretary:* L. W. Best, 28, Circuit Street, Strowan, Christchurch, New Zealand.

Clubs Not Yet Affiliated

Tudor M.C.—A Draughts Competition demanded much concentration on the part of those taking part. An extensive railway track has been laid and interesting railway operations carried out. It is proposed to stage a play, and as soon as one has been chosen rehearsals will be commenced. Club roll: 6. *Secretary:* D. Mathieson, 5, Kempton Avenue, Sunbury, Middlesex.

St. Michaels M.C.—Father Goddard, the assistant priest in the parish and Leader of the club, is allowing the members to meet in his study until a clubroom can be found. The club's equipment has been enriched by the generous gift of a Meccano Outfit by Mr. Rainforth, the local Meccano dealer, and the gift is much appreciated. Members are very enthusiastic, and it is hoped to obtain affiliation with the Guild at an early date. *Secretary:* H. Davis, 49, School Street, Upton, Nr. Pontefract.

Merit Medallion Awards in 1935

My list of the names of members of Meccano clubs at home and overseas who have been awarded special Merit Medallions during last year is published on this page. It is a representative list, and is striking evidence of the enthusiasm with which Meccano boys pursue their hobby and join in the Guild and club movements. A very pleasing feature is the record number of overseas members who have gained the award.

There are many clubs omitted that I would like to see mentioned in this list, and I cannot help feeling that their Leaders do not yet make sufficient use of Merit Medallions. I am not suggesting that the Meccano boy needs any artificial encouragement to do his best on behalf of the club to which he belongs, but it is only right that the enthusiasm and energy displayed should be recognised. The award of a Merit Medallion is a proof of such recognition, and is always greatly appreciated by the member concerned. I hope therefore that during this year the Leaders of clubs omitted or only briefly mentioned in the list on this page will take greater advantage of this practical means of rewarding good work. By doing so they will also make it possible for me to publish a list of record length in February 1937.

Two Merit Medallions are available for presentation each session in every club, and they are awarded on the recommendation of the Leader. No conditions are laid down in regard to the nature of the work by which they can be earned. They may be awarded for energetic recruiting, constructive ideas for improving the club programmes, conduct that sets a good example to more boisterous members, outstanding excellence in model-building, and in fact any activity that helps to increase the reputation of the Guild and of the club movement.

Merit Medallions Awarded in 1935

CHIPPENHAM—G. Dench. CLECKHEATON—K. Walker, D. Clay, J. Crowther, E. Nutter. CROYDON (Whitgift Middle School)—H. D. MacDonald. DAGENHAM—P. A. Bush, P. Tucker, J. Dobinson, F. Lyon, N. Snazel, R. Stokes. EDINBURGH (St. Giles' Cathedral)—I. M. Browne, D. C. Simpson, C. Baxter, W. Williamson. (28th Edinburgh)—N. Pratt, T. Meldrum. EXETER—C. Seamark, A. Fear, G. Turner, T. Smith, E. Shapland, J. Bell, W. Bradford, K. G. Sercombe. GLASGOW (Morison Memorial)—A. Gillies, A. Fraser, J. Glassford. HARROW (Claremont Avenue School)—G. Turton, A. Little. LONDON (Old Charlton)—H. Crosby, H. Cook. (Holborn Senior Boys' School)—L. Phillips, H. Sadler, F. Clark. MAIDSTONE (Sutton Valence)—B. Johnes, D. Price, D. Cleave. MALLOW—S. Lombard, D. Lehane. MIDDLESBROUGH—J. Byers, J. Jackson, G. Richardson, H. Wood. PLYMOUTH—S. Holloway, R. Symons, P. Liddicoat R. Tubb. SIDMOUTH (Sid Vale)—M. H. Mortimore. WEDNESBURY—A. L. Morgan, F. Danks.

OVERSEAS CLUB MEMBERS

AUSTRALIA (Thebarton Technical School)—M. Campbell, R. Brown. CANADA (Rosemount, Regina)—J. Watson, J. Favelle. EGYPT (Cairo)—M. F. Awad. FRANCE (Dunkerque)—J. Gamblin. (Villefranche)—J. Chambion. HOLLAND (Hilversum)—E. v. d. Vorst, F. Eisenberger, J. Noordra, J. Weinburg. ITALY (Milan)—G. de Corrado, L. Tagliabue, C. Ponzo, A. Viola. NEW ZEALAND (Ashburton)—T. Taylor, B. Furniss, E. Osborne, P. Kruse. (Christchurch)—J. Ancall, D. McKenzie. SOUTH AFRICA (Berea)—F. J. Metter, L. Michelow. (Malvern)—C. Curtis, B. Saunders, D. Stephen, B. Branch, C. Smyth. (Observatory)—D. Matthews, J. Liston. (Pioneer)—L. Alley, A. Henry. SWITZERLAND (Neuchatel)—R. Lanz, A. Garcin.

Correspondents Wanted

The Correspondence Club records show a long waiting list of boys in France and Egypt who desire to write to members in this country. In the majority of cases the correspondence is desired in English, and there is no need therefore for any Guild member who would like to write to members in those countries to hold back on account of language difficulties. For the benefit of newcomers I may point out that membership is open to all members of the Guild, and care is taken to bring together correspondents of similar tastes, who find great pleasure in the discussion of problems connected with the hobbies and other interests they have in common. Forms of application may be obtained from Headquarters, and I advise those who have not yet joined the club to consider doing so at once. I assure them that they will not regret having taken the opportunity of learning something of the interesting lives of Meccano boys whose homes are in other countries.

Running a Club Library

I have been pleased to note in recent club reports the increasing popularity of club libraries, and the adoption of this excellent idea by many clubs hitherto without their own supply of reading matter. Club libraries are very desirable, and it is not difficult to get together an attractive collection of books. The usual method of beginning is to invite each member to contribute a few books, and these gifts form the basis of the library. A small monthly subscription, or a charge of, say, 1d. per book loaned enables a fund to be built up with which books of engineering or general interests, in demand by the subscribers, can be purchased.

A library committee should be formed to fix the subscription rates and times of borrowing, to appoint a librarian and to decide on the books to be purchased. In this latter connection the "Books to Read" pages of the *"M.M."* are a reliable guide to the latest books likely to interest club members. An excellent list of suitable books is also given on the inside back cover page of the booklet "How to Run a Meccano Club," a copy of which is, or should be, in the possession of every Leader.

An occasional Reading Night provides a pleasant diversion from model-building and games. A club library will be found very useful in the summer, as in this country at any rate it often happens that some outdoor excursion or other fixture has to be cancelled on account of rain. If the weather is very sultry the members are not likely to feel energetic enough for model-building or indoor sports, and the club library then provides a welcome source of restful recreation. Now is the time therefore to start building up a good library to meet just such an emergency.

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:

EASINGTON VILLAGE—E. S. English, 3, Manor Cottages, Easington Village, Co. Durham.

INDIA—A. Singh, Bhagwan Bazar, Gowal Mandi, Lahore.

STAFFORD—Master D. J. Griffiths, 12, Call Avenue, Littleworth.

WALTON-ON-THAMES—M. Walsh, West Lodge, Burvale Hersham.

WEST CALDER—M. Anderson, 36, Breich Terrace.

* * * *

The Hutton M.C., formed among the pupils of Hutton Modern School, Eccleshill, Bradford, lapsed last year owing to the secretary, W. Holdsworth, and many of the members leaving the school. Mr. Holdsworth, who is now in business, is endeavouring to restart the club, which will not, however, be associated with the school. Any Guild member living in Bradford and district who would like to join the club, should write to him at 44, Victoria Road, Eccleshill, Bradford.

Lineside Effects in Miniature

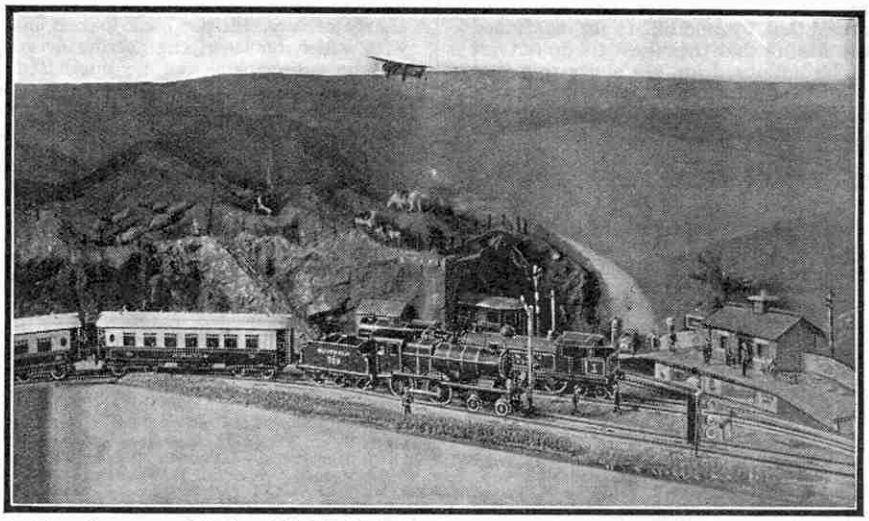
The Development of a Realistic Railway

By L. T. A. Bern

THE railway described in this article was commenced about ten years ago in about the same way as the railways of most boys start; just a small locomotive, a few carriages, and a circular track of 1 ft. radius curves. Up to about eighteen months ago the track, now 2 ft. radius, which had been steadily increasing in size, was accommodated on the floor of a spare room. It had then reached such proportions that it was felt that a raised baseboard would be the next important improvement to be made, for a railway thus supported has great possibilities with regard to scenery and general realism, and of course has the very decided advantage of permanence and neatness. This was accomplished and the baseboard was constructed at a suitable height round the walls. The portions by the window and door were made removable for general convenience. Ample space is afforded underneath for spare parts, articles under construction, books, etc.

The track was now the first consideration, of course; and this was carefully laid for correct and practical working. Briefly it consists of a main oval, doubled at convenient points; two loop lines, carriage siding, engine siding with shed and works and goods yard. Then, after the placing of the stations in position came the scenic effects.

A start was made in one corner where the available space was greater than elsewhere, owing to the presence of a recess. It was decided that a tunnel, suitably constructed, would be the best means of disguising this awkward situation. One was constructed therefore by building first a light wooden framework, then moulding the external features in plaster of Paris. When quite dry this was suitably coloured. Steps were hewn from solid plaster, and a wooden handrail constructed and embedded in it to form a means of approach to the uplands over the tunnel. Here, to prevent cattle, and perhaps venturesome people, from wandering too near the edge with possibly serious results, a wire fence was erected a few scale feet in, and a stile constructed at the top of the steps. Most of this can be seen in the accompanying illustration, the stile being occupied at the moment the photograph was taken by a little girl, who seems greatly interested in the railway operations going on below. A background of hills was painted directly on to the wallpaper, and a roadway was included in the scheme of things to serve the little station just by.



An interesting corner of the layout described on this page. This shows how the scenic background is made to fit in with the tunnel and other actual features in the foreground.

Particular mention must be made of the aeroplane in the photograph, as it adds considerably to the realistic effect of the whole. This is one of the planes in regular service, and it is on its way to the landing ground, which actually is situated to the left of the tunnel and on the movable section directly in front of the window. Here the height of the background has had to be reduced considerably, and owing to the ground space being rather limited the major portion of the landing field has been painted on the background, including the hangar, marker, aeroplane and two of the windsocks. The control tower is built directly on to the scene, and is actually only about $\frac{1}{4}$ in. "deep."

Adjacent to the aerodrome is situated another corner section, but here no attempt has been made to hide the angle of the walls, as a small wayside garage serves the purpose quite effectively. This includes Petrol Pumps and Oil Bin, of the Dinky Toy Series which together with other items seem to bring the scene to life.

The outstanding items on this section of railway are the colour-light signals. These were home made and each fitted with red, yellow and green flashlamp bulbs, each bulb being wired to a control panel. These bulbs are lit by a large capacity 4-volt accumulator for correct working, and although all the old semaphore signals have not yet been supplanted, the work is going on apace. It is also intended to wire the telegraph poles to carry current to light the four stations.

A goods yard of convenient proportions adjoins, and forms a very busy little section indeed. It is equipped with a staff of handy little workers chosen again from the Dinky Toy Series, with plenty of home-made merchandise for them to handle. There is a crane for handling the heavier items in the goods yard. The usual large gates, giving access to the yard are shown, or at least the "yard" side of them is! Numerous road vans and wagons are employed for the prompt and easy conveyance of freight. On the opposite side of the room is the engine shed and works building. This structure was built over and around a mantle shelf, and successfully disguises any unsightliness it would have caused.

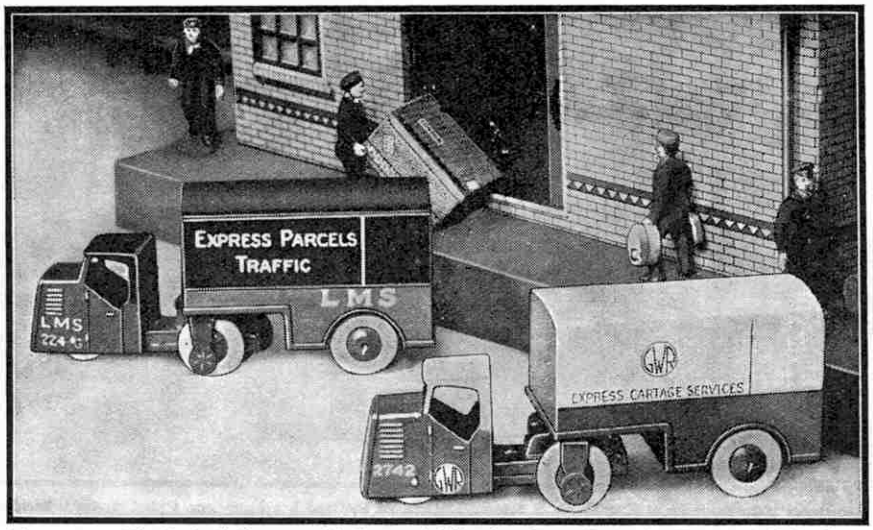
At first sight the coal trucks on the line present a rather heavy load for the locomotive; but, as frequently suggested in the "*M.M.*," the wagons have been provided with a false bottom of cardboard, coloured black, and covered with just a single layer of suitable pieces of washed coals.

Road-Rail Services for Hornby Railways

By "Tommy Dodd"

THE various miniature motor vehicles of the Meccano Dinky Toys Series have made possible the splendid fun of operating road services in conjunction with the trains running on Hornby railways. This month I am dealing with a recent introduction that is of special interest; that is the Mechanical Horses and Trailer Vans included in No. 33R of the Series of Meccano Dinky Toys. These realistic little vehicles are finished in the colours of the four British railway groups, and therefore whichever real group is followed as the prototype of the miniature railway, the appropriate road vehicles can be used.

Just as the real ones do, the Meccano Dinky Toy Mechanical Horses and Trailers form together an articulated unit, the front end of the Trailer being supported on, and coupled to, the tail of the power unit. This articulation renders the whole unit extremely flexible, and capable of manœuvring readily within close restrictions of space.



A busy scene at the Goods Platform on a jointly-operated Hornby railway. Mechanical Horses and Trailer Vans in L.M.S.R. and G.W.R. colours are shown backed up to the platform.

The whole idea in introducing into real practice the so-called "mechanical horse" was to produce a motor unit occupying no more space than the four-legged horse used for railway cartage work almost exclusively until recent years. And of course the mechanical horse on wheels had to be as easily persuaded this way or that as the real horse on legs. This was not an easy thing to attempt, as anyone will realise who has seen a carter getting his horse to back a van in a confined space between various obstructions. However, the problem was solved by the three-wheeled units, articulated with their trailers, that have become such familiar sights during the past few years.

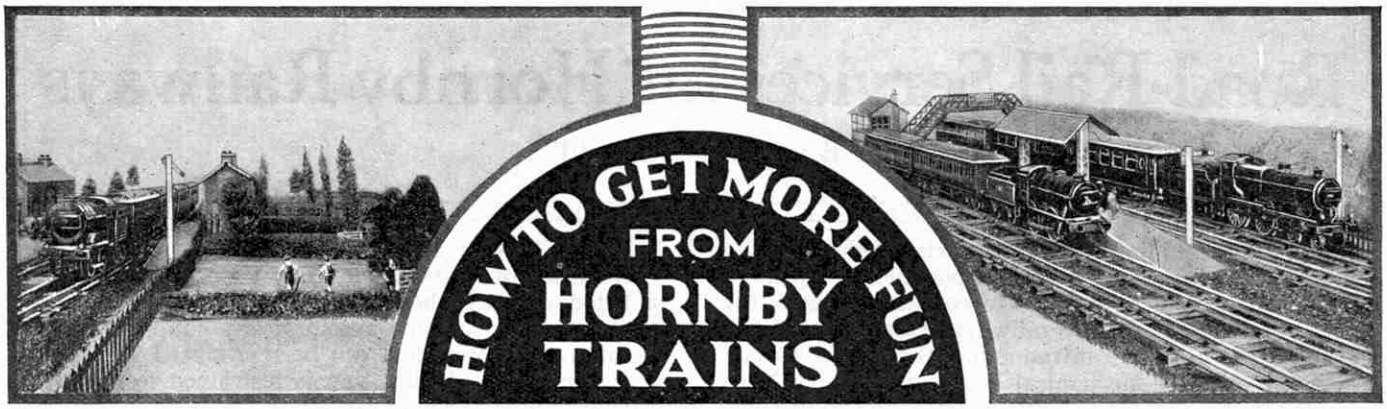
Naturally the Meccano Dinky Toy reproductions—No. 33R—are very similar to the originals, both in details of construction and finish. The horse unit is a three-wheeler as in actual practice, and is fitted as usual with rubber tyres. The bonnet of the vehicle has the radiator represented in relief on the front, and there is also the registration number plate and a spotlight. At the sides of the bonnet are represented the usual louvred openings. Behind the cab the frame narrows, and on it between the rear wheels is mounted what we may term a coupling block. This has a slot pierced in it in the centre, into which the tongue of the tow-bar of the Trailer fits. The coupling block widens towards the rear, and its surface gradually slopes down rearwards. The reason for this construction will soon become apparent.

A feature of the real units is that special coupling gear is fitted, so that when the "horse" is backed on to the trailer the two become automatically coupled together. Similarly this operation can be reproduced with miniature ones if the Trailer Van is restrained from moving backwards, as it would be, for instance, when standing against a Goods Platform. The swivelling coupling and unit and dummy supporting wheels at the front of the van must be set straight, then if the Horse unit is backed up carefully, square with the Van, the coupling tongue on the latter will ride up the slot of the coupling block on the Horse and will settle in the slot. It is restrained from wandering by the raised edges of the coupling block, which guide it safely into the slot. Very young "drivers" of these vehicles may need a little practice before they are able to do this correctly each time, but the older boys will have no difficulty at all. The ability to couple Horse and Van in this manner adds greatly to the fun of operating them.

The Trailer Vans are attractive vehicles. All have the swivelling coupling and supporting unit at the front end, and the rear runs on the usual rubber-tyred wheels. Large opening doors are represented at the rear. The floor level at this end is conveniently low for loading and unloading purposes.

The L.M.S.R. units are finished in the familiar Midland red of that company, except that the upper part of the van body and the cab roof of the Horse are finished in black. The initials "L.M.S." decorate each component of the unit, and the words "Express Parcels Traffic" stand out boldly on the upper surface of the Van sides. Similar decoration schemes are used for the L.N.E.R. and S.R. units, with the L.N.E.R. dark blue and the familiar Southern green taking the place of the red of the L.M.S.R. vehicles. An interesting variation also is that the full title "Southern Railway" appears on the Trailer Vans of that company, and not merely the initials.

The G.W.R. units are finished in an extremely attractive manner. The standard brown and cream used for the company's coaching stock and road motors is employed, brown being used for the Horse and Van lower bodywork. The upper parts of the Horse cab and the Van body are cream. Each component of the unit carries the new G.W.R. monogram, and below this on the Van sides appear the words "Express Cartage Services."

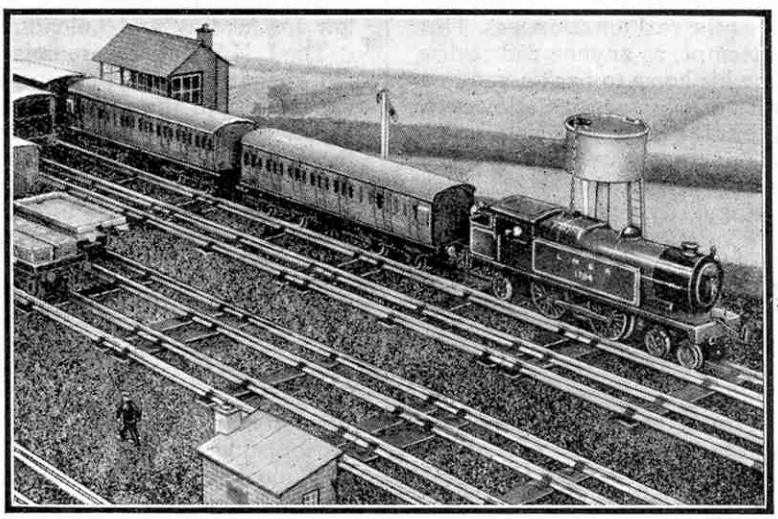


PASSENGER TRAIN FORMATION

THE correct assembly of the trains on a miniature railway system adds considerably to the interest and effect of operations. Let us consider the various kinds of passenger trains that we can make up with Hornby railway components. Goods train formation is of course equally important, but it forms such a wide subject that it will be necessary to deal with it separately in a later issue. As the rolling stock contained in the Hornby Train Sets is naturally restricted to the barest requirements, mistakes can scarcely be made when the Train Set is first purchased and operated, unless a Guard's Van or composite vehicle is arranged elsewhere than at the tail of the train! It is when the Set is expanded into a more elaborate system that train formation becomes of special importance. The smaller passenger vehicles of the Hornby Series are quite suitable for their particular purpose, and where several of them are used together to form a complete train the assembly will be quite realistic.

A long-distance train made up of Hornby No. 2 Saloon Coaches. As the load is a heavy one a pilot engine is backing down to assist the train engine that is already coupled up.

The No. 1 Coaches are vehicles of greater possibilities. They can be used to form the express trains on smaller layouts, and they are also particularly useful for local and branch work on more elaborate systems. With them are associated the No. 1 Guard's Vans, which are similar in construction and finish, and enable complete passenger trains to be made up with the appropriate Guard's and luggage accommodation. In the case of suburban trains where return journeys are usually commenced very soon after the arrival of the train at a terminus, the make-up of the train should be such that it is capable of running correctly in either direction without any alteration in the formation. Thus, if sufficient equipment is available and the space afforded at the stations is sufficient, Guard's Vans should be placed at each end of suburban trains made up of No. 1 Coaches.

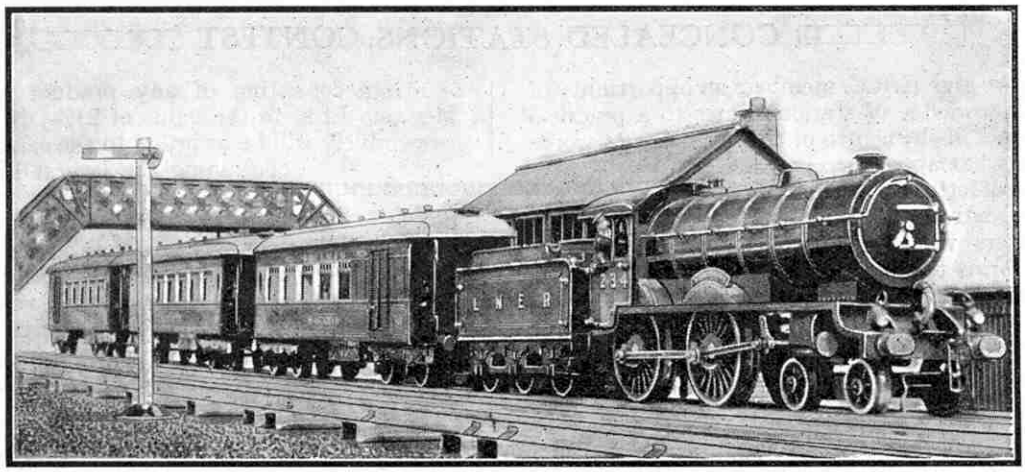


A short suburban train of No. 2 Coaches. Two Brake-Thirds are used together, as suggested in this article, so that Guard's and luggage accommodation are available at each end of the train without the train being of excessive length.

The new No. 2 Coaches are particularly suited for longer-distance suburban or "residential" services. Very realistic trains can be made up using the First-Third Coaches in the centre of the train, and with the Brake-Thirds placed appropriately at each end. On layouts where trains have to be restricted with respect to length a favourite scheme with some readers is to use

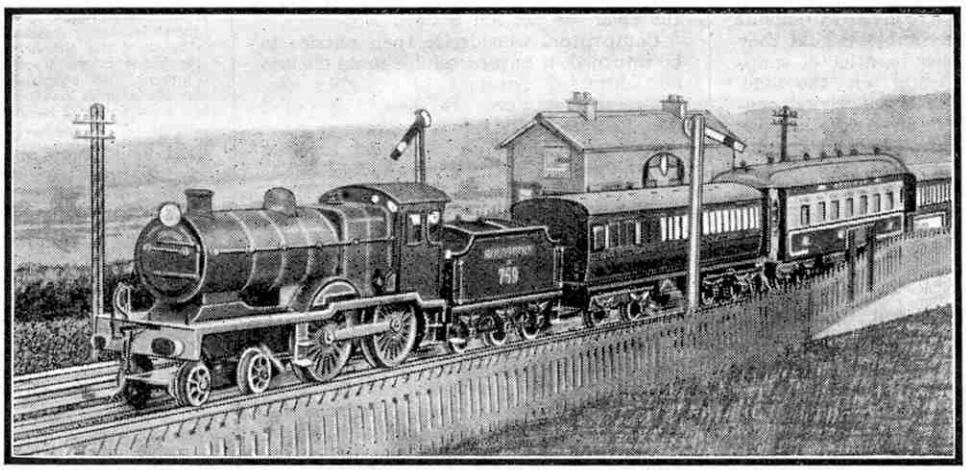
two of the composite vehicles together to form a train. This is an interesting arrangement, and certainly obtains the required results within the least possible space.

The Hornby No. 2 Saloon Coaches are particularly useful vehicles for the making up of main line expresses. They are of the favourite modern end-vestibuled type, and they can be correctly gangwayed together by means of the standard Corridor Connections. Details of this kind add considerably to the "long-distance" character of miniature trains, and give them quite an air of importance. In connection with these Coaches accessories that should not be overlooked are the Train Name Boards that are available. The roofs of the Saloon Coaches are not fitted as standard with holders for the Name Boards, but suitable Clips can be obtained that can easily be attached for the purpose. These Clips are available in two types, No. 2 for No. 2 Saloon and No. 2 Pullman Coaches, and No. 2S for the No. 2 Special Pullman Coaches.



An all-Pullman express on a Hornby railway. The No. 2 Special Pullmans closely follow in their details and finish the actual vehicles used on many famous expresses.

While dealing with Roof Clips it will be interesting to mention that the No. 2 Roof Clips are suitable also for use in connection with Metropolitan Coaches. These latter vehicles are used by many Hornby Railway owners for main line work, particularly by those whose layouts represent the L.N.E.R. Complete trains can be made up exclusively of Metropolitan vehicles, or they can be used in conjunction with the popular Saloon Coaches. They cannot, however, be gangwayed to the latter with Corridor Connections, as the Metropolitan Coaches are not adapted to the use of these fittings.



A main line train of No. 2 Coaches that includes a No. 2 Special Pullman in its composition. The provision of Pullman facilities in a train of ordinary stock is characteristic of S.R. practice.

The most luxurious coaches in the Hornby Series are the No. 2 Special Pullmans. These are available in two types—as ordinary Pullman Coaches and as Composite vehicles with guard's and luggage accommodation. They have end vestibules and straight sides, and as the window mouldings are neatly embossed the characteristic "squareness" of Pullman sides is reproduced. The vestibules are arranged with steps and opening doors, and communication with adjacent vehicles is possible by means of realistic corridor connections very similar to the actual Pullman gangways. Special bogies with equalised side frames and Mansell wheels ensure smooth running.

The distinctive pattern of roof with domed ends sloping down to the vestibules is copied, and neat miniature ventilators provide the finishing touch. The fascia or top rail of the coach above the windows is painted umber, as are the lower panels, the vestibules and the luggage ends, cream being used for the panels at window level only.

A characteristic feature is the provision of names as in actual practice. The Pullman Coach is available named *"Loraine," "Zenobia"* or *"Grosvenor,"* and the Composite vehicle can be obtained named either *"Alberta," "Verona"* or *"Montana."* The grey shade of the roof was adopted on the recommendation of the Pullman Car Company, as representing the average condition of car roofs in service, though these are white when fresh from the shops. Automatic couplings and destination board brackets are further refinements.

The internal decorations and appointments of real Pullman cars are a notable feature, and of these the neat table lamps give a characteristic appearance when the car is seen from the outside. In the Hornby vehicles the transparent window strip imitation glass has representations of these lamps printed on it at intervals at the appropriate height to give a realistic effect.

These splendid vehicles offer great possibilities in the way of train formation. Famous all-Pullman expresses, such as *"The Golden Arrow," "The Queen of Scots,"* or *"The Yorkshire Pullman"* can be represented correctly on Hornby railways. Again there is the *"Bournemouth Belle,"* which now runs regularly throughout the year thus showing the popularity of Pullman facilities. In addition to these trains there are the All-Pullman specials operated in connection with important race meetings such as the Grand National.

H.R.C. COMPETITION PAGE

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

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

CONCEALED STATIONS CONTEST

This month we give H.R.C. members an opportunity of putting their knowledge of station names to a practical test. In the panel in the centre of this page are 24 words made up from what appears to be a selection at random of letters from the alphabet. Each of these extraordinary-looking collection of letters when rearranged into correct order forms the name of a British railway station. There is no catch in any of the words; in spite of appearances, each will be found to be the name of a railway station on one of the four group companies' systems. Some of the stations are on main lines, others are less well known; but all are to be found without difficulty in "Bradshaw" which, if not available at home, may be seen at most local libraries or reading rooms.

Byancourn	Gipnertsi
Meowlcit	Hamaxy
Sidneseen	Burflod
Wagneyd	Dosfenherd
Tetwopckors	Gerpswneeee
Fontorwefo	Goinslh
Yothymlordm	Lislagheas
Fleksellu	Bootleodwe
Stoxtho	Bentorsog
Yekaloh	Tywolhshor
Ransau	Fofnirddm
Doryoef	Urtascelloc

When competitors have discovered all the correct stations, or as many of them as they can find, they must make a list of them in the order in which they appear in the panel. Alongside each station must be written the initials of the railway company on whose lines it lies. If any station belongs jointly to two companies, the initials of both companies also must be given.

Prizes consisting of any product manufactured by Meccano Ltd., to the value of 21/–, 15/–, 10/6 and 5/– respectively will be awarded to the senders of the entries containing the largest number of correct solutions. In the case of a tie for any prize, preference will be given to the entry that is neatest or presented in the most novel manner. In addition to the main prizes a number of consolation prizes will be awarded to the entries which, while below prizewinning standard, are at the same time praiseworthy efforts to tackle the contest.

Envelopes containing entries must be marked *"H.R.C. Concealed Stations Contest"* in the top left-hand corner and posted to reach Headquarters at Meccano Ltd., Binns Road, Liverpool 13, on or before 29th February. The closing date for competitors in the Overseas Section is 30th May.

Every entry submitted for this contest must be clearly marked with the sender's name, full address and H.R.C. membership number. In recent competitions several entries have been received from which either the name or the address of the competitor has been omitted.

Railway Photographic Contest

Last month we announced a winter series of Railway Photographic Contests in which competitors were invited to submit photographs of railway subjects that they took during the summer months, or snaps of typical winter scenes on the line. This month we announce the second contest of the series. There are no restrictions with regard to the railway subject chosen, and competitors may send as many prints as they desire, but no competitor can win more than one prize. The photographs submitted must have been taken by the competitors themselves, but the developing and printing may be the work of professionals.

On the back of each print submitted must be written the competitor's age, name and full address, and his H.R.C. membership number. In addition to these a short description of the scene of the picture must be given.

The contest will be divided as usual into two Sections, Home and Overseas, and prizes of any product manufactured by Meccano Ltd., to the value of 21/–, 15/–, 10/6 and 5/– respectively will be awarded to the senders of the four best entries submitted in each section. In the case of a tie for any prize, the prize money will be equally divided. In addition to the main prizes a number of consolation prizes will be awarded to those entries which, although they have not reached the standard required to qualify for one of the main awards, are nevertheless praiseworthy efforts and are deserving of some acknowledgment.

Envelopes containing entries must be marked *"H.R.C. February Photographic Contest"* in the top left-hand corner and posted to reach Headquarters at Meccano Ltd., Binns Road, Liverpool 13, on or before 29th February. The closing date for the Overseas Section is 30th May.

Competitors who desire their entries to be returned, if unsuccessful, should enclose an addressed envelope of suitable size, sufficiently stamped. It should be noted that prizewinning prints become the property of Meccano Ltd., and are not returnable.

Questions Contest No. 7

This month we announce the seventh Contest of this very popular series. To the senders of the four best sets of answers to the following 12 questions will be awarded any product manufactured by Meccano Ltd. to the value of 21/–, 15/–, 10/6 and 5/– respectively. In addition consolation prizes will be awarded.

Competitors should endeavour to write their answers on one sheet of paper only, on the back of which must be written the sender's age, name and full address, and his H.R.C. membership number.

Entrants in this contest who find themselves unable to answer all the questions should nevertheless send in their entries. In the event of more than one competitor sending an all-correct set of answers, the awards will be made to the competitors whose entries are submitted in the neatest or most novel manner. When answering these questions it is not necessary to go to any great detail and, provided that the conditions are satisfied, the shorter the answers are the better.

(1) Where is the L.M.S.R. Headquarters? (2) What is the average speed of the world's fastest newspaper train? (3) About how much coal do the four railway companies burn in a year? (4) What is the weight per yard of a standard main line rail? (5) How many sleepers are there to the mile? (6) At which station may locomotives of all four groups be observed? (7) Which is the fastest train in the world? (8) Which is the largest passenger station in Great Britain? (9) Where is most of the timber and banana traffic handled? (10) What is the standard rail length? (11) Which company first operated streamlined heavy-oil rail cars on express services? (12) Which is the largest and most powerful locomotive in Great Britain?

The Contest will be divided into two Sections, Home and Overseas. Envelopes containing entries must be marked *"H.R.C. February Questions Contest No. 7"* in the top left-hand corner and posted to reach Headquarters at Meccano Ltd., Binns Road, Liverpool 13, on or before 29th February. The closing date for the Overseas Section is 30th May.

COMPETITION RESULTS

HOME

December "Hidden Locomotives Contest." The very high standard of the entries submitted in this contest made it very difficult for the judges to decide upon the winners, but the final votes were cast in favour of the following competitors.—First: K. COSTAIN (5108), Bolton, Lancs. Second: L. PARISH (18054), Coventry. Third: C. E. WRAYFORD (6039), Moretonhampstead, Devon. Consolation Prizes: R. LUMLEY (20253), Plymouth; J. C. BUTTON (10335), Crewe, Ches.; R. L. MARTIN (4283), Cheltenham, Glos.; R. G. WATSON (24608), Small Heath, Birmingham 9; R. BARBARY (5580), St. Ewe, Mevagissey, Cornwall; G. H. GILL (36093), Chorlton-cum-Hardy, Manchester.

December "My Favourite Locomotive Contest."—First: V. C. KAILE (17559), Mayford, Nr. Woking. Second: G. JONES (10143), Llanarth, Cards. Third: F. B. ASTLEY (32874), Edenfield, Nr. Ramsbottom. Consolation Prize: V. R. YOUNG (44359), Widnes, Lancs.

December "Shunting Puzzle." This contest produced many hundreds of entries, and the three following competitors sent in the first correct entries opened. They were awarded cash prizes of 5/– each.—D. FEAR (18477), Taunton, Somerset; J. C. BUTTON (10335), Crewe, Cheshire; G. HEPWORTH (18553), West Hartlepool, Co. Durham.

Branch News

WHITGIFT SCHOOL (CROYDON).—A track competition resulted in some excellent layouts being designed. The winning one was laid down at the next meeting and proved ideal for timetable working. During a very interesting tour of the works of the Quaisi Arc Welding Company members had the thrill of trying their hand at a welding job. In the company's own cinema theatre they watched films illustrating welding work. Secretary: J. A. Watson, 23, Addiscombe Avenue, Croydon.

ADDISCOMBE.—A Branch room has been obtained, and the Opening Night was made the occasion for a fine display of models built by the members. A lecture on the *"Railway Museum, York,"* was given by permission of the L.N.E.R. All the members were present and also many of their parents, and everybody greatly enjoyed the meeting. The Leader has given lectures on *"Famous Bridges"* and *"Railway Disasters."* The Branch library has started in flourishing style, 102 books being in stock. Secretary: G. Chandler, 62, Ashburton Avenue, Addiscombe, Croydon.

COTTESMORE.—The members now meet on Monday evenings instead of Wednesdays, and there is a full attendance at practically all meetings. Frequent changes of layout have done much to prevent track operations from becoming stale, and members have found that each new layout brings its own interesting problems of railway operation. Film shows run by the members and open to the rest of the school for a small admission charge are benefiting the Branch funds, and it is hoped to raise enough cash to purchase four new locomotives. Secretary: D. Woodburn, Cottesmore Central School, Lenton, Nottingham.

DAGENHAM.—A novel turn was given to a recent track meeting by running a Meccano locomotive built by one of the members. One meeting has been devoted to a discussion on *"How to improve the Branch Layout,"* and some very useful suggestions were put forward. Occasional Games, Reading or Model-building Evenings are popular. Secretary: P. Bush, 212, Church Elm Lane, Dagenham.

GLENGORSE (BATTLE).—Track meetings and film shows have been the chief items in the programme recently. A correspondence has been opened with the Elmside (Exeter) Branch, and the letters received from the latter are read with great interest. Secretary: K. J. Attwell, Glengorse, Telham Court, Battle, Sussex.

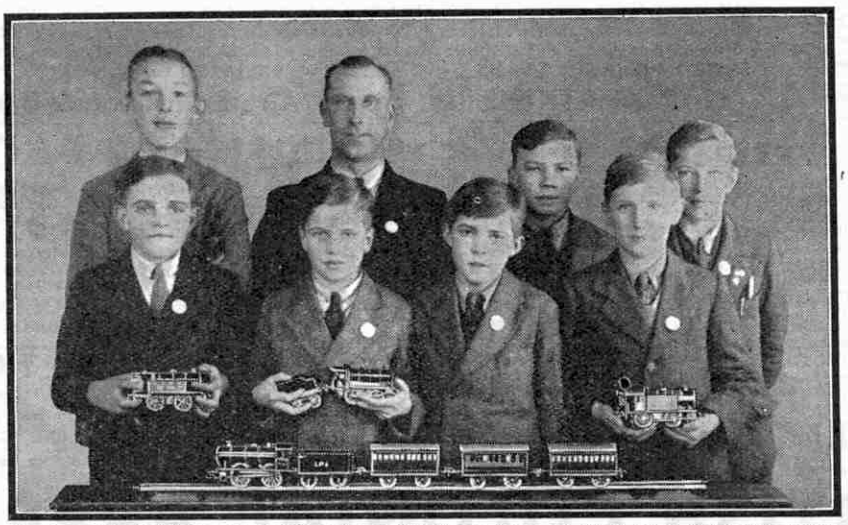
WIMBORNE GRAMMAR SCHOOL.—Several masters have joined the Branch and they are as enthusiastic as the younger members, and everybody is keenly interested in the track operations carried out. Meetings lasting half-an-hour are held during the school lunch hour on three days of the week for the benefit of members who are day or weekly pupils, and two meetings are held on Saturday evenings for those who are resident pupils. The Branch track is to be overhauled and relaid, and the opportunity will be taken to renew certain sections of it. Secretary: E. S. How, Wimborne Grammar School, Wimborne, Dorset.

ISLINGTON.—Members have been busy preparing for the Exhibition to be held this month at Unity Hall, Upper Street. An interesting diversion from ordinary railway operations has been provided by constructing model railway buildings with which to make the Branch layout more realistic. Recent talks have dealt with *"Life on an Arctic Trawler"; "The Cinema Organ,"* and *"The Testing of Aeroplanes."* Secretary: E. Muxlow, 7, Regents Park, London, N.W.1.

CHORLTON-CUM-HARDY.—Several new members have been enrolled and they are already quite expert in track operations. The Chairman has built a splendid terminal station, which has five platforms. The Branch track has been ballasted and miniature water troughs laid down. Other improvements include the construction of an L.M.S. locomotive depot, complete with carriage sidings. Secretary: G. H. Gill, 56, Highfield Road, Chorlton-cum-Hardy.

WATERLOO (DUBLIN).—A new layout has been made, representing the L.M.S.R. main line from London (Euston) to Crewe. Several new locomotives have been obtained, and the Branch equipment now totals 19 locomotives, 20 carriages and 30 wagons. Plans for improving the layout include the installing of colourlight signals between Euston and Willesden Junction. Secretary: S. B. Carse, 38, Oakfield Road, Ranelagh, Dublin, I.F.S.

ELMSIDE (EXETER).—In reviewing club activities during 1935 the secretary writes: "Our railway services have been a great improvement on previous years." Secretary: T. W. A. Smith, 98, Ladysmith Road, Exeter.



Members of the St. Thomas (Exeter) Branch, No. 269. The chairman, Mr. W. A. Blake, is the second from the left on the back row, and the secretary, L. Robinson, is next on his left. This Branch was incorporated in June 1934, and has a steadily increasing membership. Visits are exchanged with the Elmside (Exeter) Branch.

ITALY

MILAN.—In conjunction with the Milan M.C. the Branch members took part in a Table Tennis Tournament, which proved so popular that the event will be repeated. Visits have been paid to important engineering works in the district. Secretary: E. Vigo, Gorso Genova 19, Milan, Italy.

Branches in Course of Formation

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

NOTTINGHAM—R. Ingham, 132, Mansfield Road.

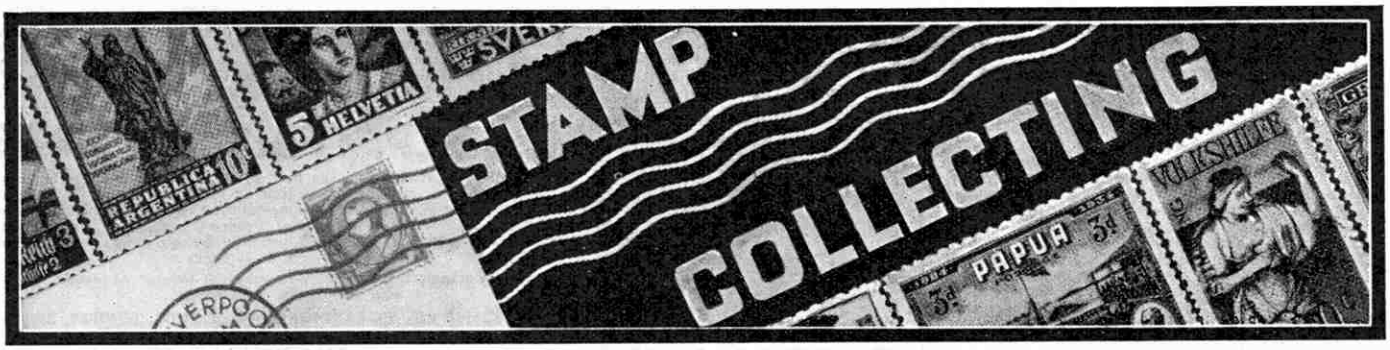
SMETHWICK—R. M. Jones, 181, Rosefield Road.

INDIA—A. A. Khand, 170, Napier Road, Karachi-City.

Branches Recently Incorporated

296. FOREST SCHOOL—H. J. Pye, Forest School, Nr. Snaresbrook, London, E.17.

297. ST. STEPHENS (SALTASH)—R. Saunders, The Bungalow, St. Stephens.



SHIPS ON STAMPS

THE stamp collector who has the sea in his blood, a description that applies to most British boys, would find a congenial task in building up a collection of maritime stamps.

The field, or should we say ocean, is one of tremendously interesting possibilities and almost unlimited scope. So big is the scope, indeed, that after only a preliminary survey we realised that it was impossible to deal with the subject in one article. We found stamps picturing ancient native dugouts and mammoth ocean liners, oldtime caravels and modern men-of-war, lifeboats and whalers, docks, canals and harbours, wireless stations and lighthouses; and therefore in this article we must content ourselves with dealing with one section of the subject, the development of the mercantile vessel.

It is difficult to say when the possibilities of transport by river and sea were first realised. Possibly some prehistoric brave had his imagination stirred by the sight of a floating log. Travelling by log no doubt quickly became a fashionable game until the idea of digging out a seat was tried. The successive stages of development from "dug out" to the paddle-propelled canoe are short, but thus no doubt was born the science of navigation. A good specimen of a paddle-propelled canoe is to be seen on several of the values in the French Guiana 1929 series.

Later, although it is impossible to say when, sails were introduced. The illustration used for the design of the Egyptian Navigation Congress issue of 1926, based on a piece of ancient statuary found in the ruined temple of Deir-el-Bahari, depicting one of the earliest Egyptian galleys fitted with a crude mainsail on a central mast, suggests that sails were known long before the Flood. In this particular vessel the sail was merely an auxiliary, however, the principal form of propulsion being oars manipulated by a gang of slaves.

Less imposing among early sailing boats are the Maori war canoes illustrated on the Cook Islands issue of 1932, the Fijian pirogues illustrated in Fiji's 1891 issue, and the laquatois shown on various Papuan issues.

The best illustration of an early galley is that shown on the 1 Fr. denomination of the Tunis 1926 issue, illustrated here. This shows a typical Carthaginian galley engaged in the Mediterranean trade. It is fitted with a mainsail and a topsail, but again the principal form of propulsion is the oars. Many of the early Mediterranean galleys were of great size, and it is on record that the royal galley of the Emperor Caligua required the combined efforts of no less than 1,600 oarsmen to drive it through the water!

The Viking ships illustrated on the Danish issue of 1927 and on the U.S.A. Norse Centennial 5c. issue of 1925 are much later in date than the galleys just described, but nevertheless there is a remarkable resemblance between these vessels and the early Mediterranean craft, a point that will be noted on inspection of the Viking galleys shown on the higher values of Esthonia's 1919 issue.

The Viking ships were among the first ocean-going craft, and from these it is but a short stage to the tiny craft used by the early navigators, such as Columbus, Vasco da Gama, Jean Cabot and Sir Humphrey Gilbert. Columbus's flagship, the "*Santa Maria,*" is probably the most commonly depicted ship in our stamp collection. The best picture of it is on the Spanish 1930 Columbus commemorative issue, the 2c. value of which is illustrated here. Vasco da Gama's fleet of caravels is shown on various Portuguese issues; Jean Cabot's "*Matthew*" is shown on Newfoundland's 10c. commemorative issue of 1897; while the 1933 issue shows a view of Sir Humphrey Gilbert on the deck of the "*Squirrel.*" The "*Mayflower,*" in which the Pilgrim Fathers reached America, is shown on the U.S.A. 1920 issue.

In contrast with these tiny vessels, which virtually drifted about the world, it is interesting to show the Canadian ship "*Royal William,*" which is credited with having made the first transatlantic steamboat crossing in August, 1833. This is taken from the Canadian commemorative issue of 1933, celebrating the centenary of the "*Royal William's*" voyage.

Modern types of mercantile vessel are represented by the French liner "*Normandie,*" shown on a stamp issued by France in 1935 to commemorate the liner's maiden voyage; but a more interesting picture of modern steamships is to be found on the 1f.75c. stamp from Belgium's anti-tuberculosis charity issue of 1931, illustrated here. This shows Antwerp Harbour thronged with shipping. Quite a score of other liner pictures are available, principal among them being Poland's 1935 15gr. stamp showing the "*Pilsudski,*" a motor ship recently placed in service by the Gdynia-America Shipping Company; and a very unusual view of the two crack Italian liners, "*Rex*" and "*Conte di Savoia,*" on the 1L. value of the Italian issue commemorating the 10th anniversary of the commencement of the Fascist regime.

Ocean greyhounds provide spectacular subjects, but the most beautiful of all shipping stamps depicts nothing greater than a humble whaling ship shown on the 1½d. value of the Falkland Islands issue of 1933. We illustrate the stamp here, and we think our readers will agree that it is one of the most beautiful stamps ever printed, and deserving of a place in every collection.

The story of shipping stamps would not be complete without reference to the two extremes of modern vessels, tramp steamers and pleasure craft. The former are represented by the 30c. value of the St. Pierre and Miquelon issue of 1932; while one of the most famous yachts of all time, H.M. King George's racing yacht "*Britannia*" is to be found in Canada's Silver Jubilee issue.

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H. C. WATKINS, M. DEPT., GRANVILLE ROAD, BARNET.

The "ENGINEERING" Packet

contains an excellent assortment of 44 all different Foreign and Colonial stamps and includes the following which show various engineering feats and masterpieces of ancient and modern times, **Newfoundland** (Ship), **San Marino** (Fortress), **Greece** (Bridge and Liner), **Indo-China** (Plough), **Niger Territory** (Native Wells), **Saar** (Mine), **Turkey** (Cruiser), (Fortress), (Trains), **Ireland** (Barrage), **St. Pierre and Miquelon** (Trawler), **Palestine** (Fortress), **Egypt** (Pyramid), (Sphinx), **Guadeloupe** (Sugar refinery). **Brazil** (Aeroplanes), **Belgium** (Train), **Middle Congo** (Bridge and Train). Price 6d. (abroad extra). All purchasers of this packet asking for approval sheets will be presented with **India** Silver Jubilee stamps.

BURDOCK & FLURY,
4, Marlborough Road, London, S.W.19.

"R.C.M.P." Packet — FREE

This splendid packet contains the new **10 cent Canada** (Royal Canadian Mounted Policeman, as illustration), **New Ceylon** Pictorial (Native tapping rubber tree), Australia and Gold Coast Pictorials, New Zealand **1935, New Belgium** (train drawn by Diesel engine), France (Paris exhibition), Uganda Pictorial 1935 and 10 different Canada including the above and **Canada Jubilee** and the new 1935 issue.

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FREE STAMP WALLET

(size 3½" × 5½") fitted with Perforation Gauge, etc., and containing

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BRITISH COLONIALS INCLUDING JUBILEES. Covering Gold Coast Pictorials, ¼d., 1d., 1½d., 2d.; Northern Rhodesia, Nigeria, ½d., 1d., 1½d., 2d., 3d.; Mauritius, 2c., 4c., 5c.; Iraq, ½, 1, 3 annas; N. Zealand, ½d., 1d., 1½d., 2d., 3d., 4d., 6d., 1/–; Newfoundland; Palestine; Fiji; Bahamas, etc., etc. Finest Packet you have ever had. **Money Back** if not satisfied. With **"Worth While"** Approval Sheets **only.**

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G FREE M

We are presenting this month the second packet of our new alphabetical series, the greatest gifts ever offered.

This month's packet contains stamps of countries from G to M and includes many beautiful pictorials. You must not miss this magnificent offer.

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— 1935 —

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This **Wonderful** packet contains a Large **JAMAICA JUBILEE PICTORIAL;** a **Large PERSIAN AIR MAIL** overprinted **"Iran";** French **Peace; SUDAN** Pictorial; **Nigeria; New Caledonia** mint Pictorial; **U.S.A. Bicentenary; OUBANGUICHARI** Pictorial and superb set of **8 INDIAN** including **New Issue. ALL FREE!** Just send 1½d. postage requesting our **High-Class** approvals containing **JUBILEE** stamps and latest **New Issue Pictorials,** etc. (Jubilee stamps bought).

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4 Egypt Military Stamps...	...	8d.
4 Tanna Touva, Zoological, 2 Triangles	...	3d
2 Queen Astrid, Belgium, Mourning ...	...	3d.

Post 1½d. extra. Selections from 4 a 1d. (30 for 6d.)

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These Writing Pads are just the thing to use when writing to your friends or to the Editor.

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Special envelopes, attractively printed and matching the writing paper in colour, are also available. Price, per packet of 50, 8d. post free.

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WHEN WRITING TO ADVERTISERS

Readers are urged to observe the following points when writing to advertisers:

1. **Mention the "M.M." and any special reference number quoted in the advertisement. This helps the advertisers to identify their offers and to give prompt attention.**
2. **See that the full amount of the price and any postage is included. It is unfair to expect advertisers to fulfil their undertakings promptly if short remittances are sent.**
3. **Give your full address.**
4. **Enquiries concerning advertisements or advertisers should be addressed to:**

THE ADVERTISEMENT MANAGER
MECCANO MAGAZINE, Binns Road, LIVERPOOL 13

Stamp Gossip

and Notes on New Issues

A Complete Collection

In a stamp article recently we commented that most boy collectors set out with the idea of filling space quickly, in effect trying to collect all the stamps in the world.

The comment provokes the question, "What would a complete stamp collection cost?" An answer to this question was given in a recent issue of *Gibbons Stamp Monthly*, which said: "This question can never be accurately answered as many stamps listed in the big Gibbons Catalogue are absolutely unobtainable, but for those who like figures I may say that the prices given for used and unused stamps together in the big Gibbons Catalogue total something like three-quarters of a million pounds, about £300,000 of which is attributable to the British Empire section. In spite of the magnitude of the task, there are always at least two or three collectors in the world who are trying to build up complete collections of stamps on the basis of the lists given in the Gibbons Catalogue."

New Greek Air Mails

A set of striking mythological designs is employed for the new series of Greek air mail stamps, specimens of which we hope to reproduce next month. The stamps and designs are as follows: 1 dr., chariot of the Sun; 2 dr., Iris, the messenger of the gods; 5 dr., Daedalus and Icarus; 7 dr., Pallas Athenæ; 10 dr., Hermes; 25 dr., Ganamede and Jupiter; 30 dr., Celestrial chariot; 50 dr., Bellerophon and Pegasus; 100 dr., Phryxos and Helle on the flying ram of the Golden Fleece.

The Rarest Stamp

Bidding for the 1c. 1856 British Guiana stamp failed to reach the reserve price at the recent auction in London.

After starting at £3,500 the bids were carried by steps of £250 up to a figure of £7,500. The bidding stopped there, and the auctioneer declared that the stamp must be withdrawn from the sale as the offer was slightly below the reserve price fixed by Mrs. Arthur Hind, whose late husband bought the stamp at the Ferrari sales in 1922 at the then record price for a stamp of £7,350.

Following the withdrawal of the stamp, private negotiations were set on foot.

Air Mail by the Ton

The amazing growth of air mail operations is revealed in the 1934 statistics recently issued. These figures show that 251,000 tons of air mail matter were carried on the British lines, 279,000 tons by Canadian and 3½ million tons by U.S.A. lines, 216,000 tons by French, 759,000 tons by German and 200,000 tons by Dutch lines.

It will be some months before the 1935 figures are known, but it is certain that the British figures will show a tremendous increase as a result of the duplication of the services over the British Imperial trunk lines and the constantly increasing diversion of first-class mail matter to air mail carriage.

* * * *

In the philatelic press recently, in a comment on interesting postmarks, a correspondent drew attention to one postmark "Hell," this being from the post office of a little village in Norway.

One is carried quite to the other extreme by the discovery of a postmark "Equator, Kenya." This comes from Equator Station, a halt on the Kenya and Uganda Railway some 500 miles from Mombasa.

A New Dutch Air Stamp

The design of the recently issued Dutch air stamp, issued under a premium to aid the National Air Mail subsidy funds, shows an aerial map of Holland overshadowed by passing mail planes. The stamp, which bears a face value of 6c. and a premium of 4c., is to remain on sale throughout this year.

* * * *

The Mozambique Company has been busy with a minor flood of new issues in recent months. There have been a variety of commemorative issues in addition to a new air set.

Our readers probably will find the stamp illustrated here to be the most interesting. It commemorates the opening of a new railway bridge across the River Zambesi.

* * *

An important development in air mail history was opened up on 22nd November last by Pan-American Airways in the inauguration of the first trans-Pacific air service between San Francisco and Manila in the Philippine Islands, via Hawaii

The service is to be extended to Canton in China in the near future, thus linking up Asia with America.

French West Indian Tercentenary

The French West Indian Colonies, Guadeloupe, Guiana, and Martinique, have each issued a series of commemorative stamps to mark the celebration of the

tercentenary of the foundation of the French West Indies.

Each series contains six stamps and employs two designs, as follows: Guadeloupe, 40c., 50c. and 1f.50, Cardinal Richelieu at the foundation meeting of the French West India Company in Paris in 1635; 1f.75, 5fr. and 10fr., Victor Hugues and his corsairs. Hugues was a close friend of Robespierre, and was responsible for what is known as the Brigands War, an attempt to extend the French West Indian possessions. He captured Guadeloupe from the British and used it as his headquarters in a very determined effort to capture Grenada, Dominica and St. Lucia. He succeeded in taking the last-named island but later was compelled to abandon his prize.

Guiana: 40c., 50c. and 1f.50, showing the capture of Cayenne from the Dutch in 1676. The three higher values use a symbolical design.

Martinique: the three low values show a portrait of Pierre Belain d'Esnambuc, who was the first French coloniser of the West Indies. The higher values show a portrait of Victor Schoelcher, who abolished slavery in the Colonies.

A Stamp Essay Contest

Our advertisers, The Windsor Stamp Company, are offering prizes in a simple essay competition entitled "My Favourite Country for Stamp Collecting."

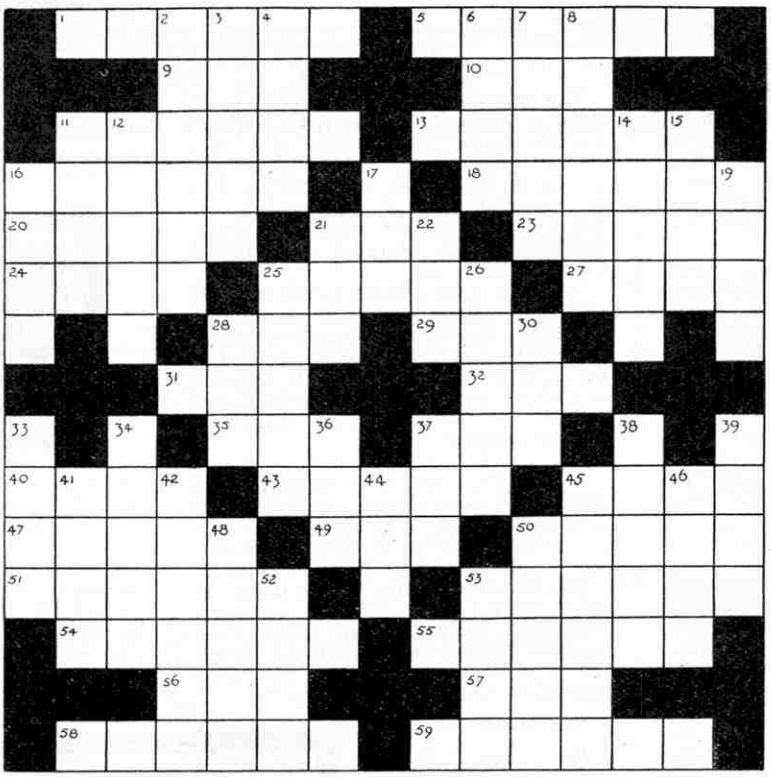
Essays may not exceed 300 words in length, and must be the unaided work of the competitor. Any "*M.M.*" reader may compete, but anyone who is not a customer of the firm will be required to pay an entrance fee of 6d.

Full details may be obtained direct from The Windsor Stamp Company, 59, Lee Road, Blackheath, London, S.E.3.

We thank Stanley Gibbons Ltd. for their courtesy in loaning the stamps from which the illustrations on this page have been made.

Competition Corner

FEBRUARY CROSSWORD PUZZLE



ACROSS

1. Departure
5. Preserve
9. Period
10. Spike
11. Rails
13. Property
16. Travelling Bag
18. Legislative Body
20. Harden
21. Evil
23. Summer Dish
24. Yield
25. Spill
27. Wounded
28. Pin
29. A Card Game
31. Limp
32. Tank
35. Bind
37. Colour
40. Useless
43. Filter
45. Sleeveless Cloak
47. Thong
49. Tree
50. Dislikes
51. Tenacity
53. Retaliate
54. Trader
55. Father
56. Number
57. Hill
58. Summits
59. Understood

DOWN

2. Retreat
3. Obliterate
4. Auction
6. Untidy
7. Stations
8. Battlegrounds
11. Hair
12. Baffle
14. Claw
15. Leader
16. Evil
17. Lick
19. Paradise
21. Pouch
22. Lair
25. Lukewarm
26. Bird
28. Kitchen Utensil
30. Cushion
33. Account
34. Carpenter's Tool
36. Before
37. Brim
38. Staff
39. Ease
41. Exploit
42. Rank
44. Everything
45. Provides
46. Forward
48. Cavities
50. Bird
52. Tear
53. Scold

Our series of crossword puzzles have enjoyed remarkable popularity, largely because they are set for our readers' amusement instead of for strenuous competitive effort. This month's puzzle will be found to follow the lines of the previous ones in that it provides 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.

Cash prizes of 21/–, 15/–, 10/6 and 5/– respectively will 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 "February Crossword Puzzle, Meccano Magazine, Binns Road, Liverpool 13," and must be sent to reach this office not later than 29th February. Overseas closing date 30th May.

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 enclose a stamped addressed envelope.

February Drawing Contest

Each month throughout this winter we are offering prizes for the best drawings or paintings submitted during the month. There are no restrictions as to subject or to size.

The entries each month will be divided into the usual two sections, A for readers aged 16 and over, B for those under 16, and cash prizes of 21/– and 10/6 will be awarded for the best entries in each section.

A separate set of prizes, to be awarded in similar conditions, will be reserved for competitors in the Overseas section.

Entries to the February competition must be addressed "February Drawing Contest, Meccano Magazine, Binns Road, Liverpool 13," and must arrive not later than 29th February. Overseas closing date, 30th May.

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

Competition Closing Dates

HOME

February Crossword Puzzle ...	29th February
February Drawing Contest ...	29th February

OVERSEAS

November Sketchograms Contest	29th February
True Firework Story	29th February
November Drawing Competition	29th February
Jig-Saw Advertisement Contest	31st March
Christmas Letter Contest ...	31st March
December Drawing Contest ...	31st March
Cover Voting Contest	30th April
January Drawing Contest ...	30th April
February Crossword Puzzle ...	30th May
February Drawing Contest ...	30th May

Watch the Closing Dates:

Competitors, both Home and Overseas, are particularly requested to make a careful note of the closing dates of the competitions.

In sending entries to competitions that are divided into age groups, competitors should take particular care to mark their ages clearly on the back of the entry. It is not sufficient merely to indicate the age group, as age allowances are given to ensure equality of opportunity for the younger competitors.

COMPETITION RESULTS

HOME

Jig-Saw Advertisement Contest.—1. S. J. Davis (Bristol); 2. R. P. and J. C. Walford (Newton Abbot); 3. W. K. Cocking (Redruth); 4. D. Morley Davies (Maesteg). Consolation Prizes: E. J. Boardman (Exeter); J. A. Pedler (London, N.14).

Christmas Letter Contest.—1. B. J. Powell (Misterton); 2. D. T. White (Knebworth); 3. E. P. W. Scott (Clapton, E.5); 4. E. N. Banner (Plumstead, S.E.18).

December Drawing Contest.—First Prizes: Section A, K. Dyson (Tadcaster); Section B, J. S. Taylor (Burnley). Second Prizes: Section A, J. C. Prendergast (Dublin); Section B, E. Buckman (Redhill).

OVERSEAS

September Photo Contest.—First Prizes: Section A, F. van Bulck (Brussels); Section B, F. H. A. Damant (Johannesburg). Second Prizes: Section A, A. A. Shawky (Giza); Section B, A. C. Das Gupta (Bengal). Special Prize: R. H. Warr (Cairo).

September Sketchograms Contest.—First Prizes: Section A, Nils Soderberg (Falun, Sweden); Section B, I. C. Dickison (Dunedin, N.Z.). Second Prizes: Section A, M. Stanley (Edmonton, Alta.); Section B, C. Cali (Malta).

Holiday Story Contest.—1. E. Azzopardi (Malta), 2. C. J. Mallia (Malta); 3. J. Gandy (Vancouver), 4. J. Robertson (Sydney, N.S.W.).

SAFETY FIRST

Squadron Leader: "And what would you do if a squadron of enemy 'planes were after you?"
Pilot: "Go into an air pocket and hide, sir."

* * * *

Customer: "But I don't want a cake of soap. I said stamps."
Village Shopkeeper: "Well, you'll 'ave to 'ave the soap too. Stamps be stuck to it."

* * * *

Stout Person: "Any use trying to borrow a fiver off you?"
Tight Person: "Ay, the exercise will do ye guid."

* * * *

Bob: "Yes, Dad, I'm quite a big gun at school."
Dad: "Well, then why don't I hear better reports?"

* * * *

Pavement Artist (to housewife): "Would you please keep your cat indoors, mum? Everytime I sketch a fish it comes along and licks it out."

* * * *

Teacher: "How many seasons are there?"
Tom (whose father keeps a shop): "Two."
Teacher: "What are they?"
Tom: "Slack and Busy."

* * * *

An Irishman was one day employed by an old lady in the country. At tea time she laid a small morsel of honey on his plate.
"Begorra, ma'am" said the labourer. "I see you keep a bee."

* * * *

A negro was charged in a country town with stealing. The magistrate, being doubtful if he understood the meaning of an oath, decided to examine him on the point.
"Rastus," he said, "you know what will happen to you if you tell a lie?"
"Yes, boss," replied Rastus, "me go down below—burn long time."
"Quite right," replied the magistrate. "And do you know what will happen if you tell the truth?"
"Yes, boss. I lose the case."

* * * *

Doctor: "What is your profession?"
Patient (pompously): "I'm a gentleman."
Doctor: "Well, you'll have to try something else, t doesn't agree with you."

* * * *

The baby pulled her brother's hair until he yelled. The mother soothed the boy. "Baby doesn't know how badly it hurts," she said, and left the room.
Presently frantic squeals came from the baby, and mother rushed in. "What is the matter with her?" she asked her son anxiously.
"Nothing," he replied. "Only now she knows."

* * * *

NASTY!

Indulgent Mother (to street trader): "How much are your balloons? My little boy would like to prick them with a pin."

LOST!

The absent-minded professor drove up to his garage, looked inside, returned to his car and drove to the nearest police station.
"Inspector," he gasped, "my garage is empty, my car's been stolen."

* * * *

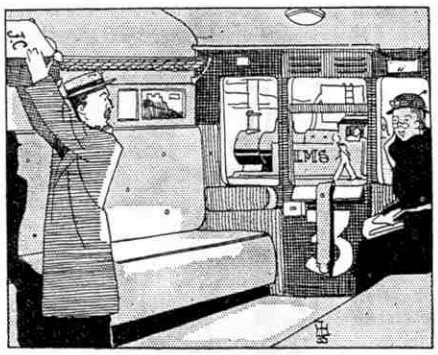
He: "I'll have to scrap this razor, it won't cut anything."
She: "Why, Charles, you don't mean to say that your beard is tougher than the kitchen linoleum!"

* * * *

Black: "Has he changed much?"
Blue: "He thinks he has."
Black: "How's that?"
Blue: "He's always telling people what a fool he used to be."

* * * *

WARNING HIM



Nervous Lady (to fellow passenger who is politely placing her bag in the rack): "Thank you; I'll have it this end, please, over my seat. I always like to be near the communication cord, in case I'm shut in with a homicidal maniac."

* * * *

Annoyed at mistakes in his letters, the employer summoned his new typist.
"Don't you know the King's English?" he snapped.
"Of course I know he's English," she indignantly replied.

* * * *

Sergeant (addressing a dense recruit): "How many times must I tell you never to approach horses from the rear without speaking to them? One of these days, you know, you'll get kicked on the head and then I shall have a lame horse on my hands!"

* * * *

Customer: "This hair restorer you sold me has made my hair fall out worse than ever."
Hair Specialist: "That's because you put on too much. You've made yours come right out instead of stopping half-way."

* * * *

The plumber was working and his new boy assistant was looking on. The latter was learning the trade, and this was his first day. After a while the boy said: "Do you charge for my time?"
"Certainly," came the reply.
"But I haven't done anything," said the boy.
The plumber had been inspecting the finished job with a lighted candle, which he handed to his helper. "If you must be so conscientious," he said, "blow that out!"

* * *

A weary traveller had already moved along the crowded tramcar three times, and again he could hear the conductor calling: "Pass along the car, please." Two minutes later the conductor came for the fare. "Fare," said the traveller, "why I'm walking it!"

* * * *

"I'm buying a lawn mower for my husband's birthday."
"A surprise?"
"Rather, he thinks I'm giving him an easy chair."

WELL RECOMMENDED

Foreman: "Do you think you are fit for really hard labour?"
Applicant: "Well, some of the best judges in the country have thought so."

* * * *

Mrs. Peach: "I'll take a pound of these sausages. Are they British?"
Butcher: "Yes, madam—the good old bulldog breed!"

* * * *

Student: "What is the date, please?"
Teacher: "Never mind the date; get on with the examination paper."
Student: "Well sir, I want to have something correct on it."

* * * *

Passenger (in an airplane for first time): "I understand that I must sit still, but what if I fall out?"
Pilot: "That's easy. Just grab anything you see and hold on."

* * * *

Mike had just returned from a visit to the United States, and was telling his friends all about it
"Did you meet with much hospitality in America?" he was asked.
"Sure," was the reply. "I was in hospital nearly all the time."

* * * *

Ted: "What's a quire of paper?"
Tim: "Choir of paper? Oh, it must be one of those music rolls for a player piano."

* * * *

Priest (addressing invalid): "I'm going to pray that you may forgive Casey for having thrown that brick at you."
O'Leary: "Maybe yer Riv'rence 'ud be saving toime if ye'd just wait till Oi get well, and thin pray for Casey."

* * * *

Neighbour: "Where's your brother Freddie?"
Boy: "He's in the house playing in a duet. I finished first."

* * * *

Mother (at circus): "Isn't he clever, darling? He's juggling with three pieces of sugar."
Modern Child: "Ask him to do it with three handfuls of granulated."

* * * *

Dentist: "How long has the tooth been troubling you?"
McDonald: "Twenty years."

* * * *

Professor: "I forgot my umbrella this morning.
Wife: "How did you remember that you had forgotten it?"
Professor: "Well, I missed it when I raised my hand to close it after the rain stopped."

* * * *

TACTLESS

Convict: "Yus, lady, I've done nearly twenty years."
Visitor: "Twenty wasted years! How it must make you wish to have your time over again!"

BOYS! JOIN THE MECCANO GUILD

President:
MR. FRANK HORNBY

The Meccano Guild is an organisation for boys started at the request of boys and conducted as far as possible by boys. At its head—guiding and controlling, and taking a personal interest in it—is the President, Mr. Frank Hornby, inventor of Meccano and Managing Director of Meccano Limited, and it is ready to be of service to each individual member, and to help or give advice whenever requested. Membership of the Guild enables Meccano boys to get the best out of life.

The three great objects of the Guild are to make every boy's life brighter and happier; to foster clean-mindedness, truthfulness, ambition and initiative; and to encourage boys in the pursuit of their studies and hobbies. and especially in the development of their knowledge of mechanical and engineering principles. Every boy undertakes to promote these objects.

A Meccano boy who joins the Guild becomes a member of a great brotherhood of world-wide extent, every member of which has promised to observe its great objects; wherever he happens to be, even in strange countries he will know that he has met a friend whenever he sees the little triangular badge. Thus the Guild brings together Meccano boys all over the world.

THE GUILD BADGE

Membership of the Guild is open to every boy possessing a Meccano Outfit or Hornby Train Set who satisfactorily fills in the application form. The only conditions are that members shall promise to observe the objects of the Guild and to wear their badges on all possible occasions.

The Meccano Guild badge is beautifully enamelled in blue and white. The ordinary form is made for wearing in the lapel of the coat, but brooch badges are issued to members who prefer to pin them in position, and applicants who wish to have this form of badge should indicate this when sending in their forms. In addition to the badge, each member receives a handsome Membership Certificate printed in orange and black.

HOW TO BECOME A MEMBER

In order to join the Guild all that is necessary is to fill up the form of application, and to forward it to the Secretary of the Meccano Guild, Binns Road, Liverpool 13, from whom an application form may be obtained if desired. A remittance to pay for the membership badge should be sent along with the completed form of application. The price of the badge is 7d. post free in the United Kingdom and 1/- post free overseas (25 cents Canada). The applicant is then duly enrolled as a member of the Guild and his badge of membership is sent to him. Each member has the personal interest of the President and is entitled to the friendly advice and assistance of the Secretary.

Boys living overseas should write to one of the Meccano agents at the following addresses: CANADA: Meccano Ltd., 187-189, Church St., Toronto. AUSTRALIA: Messrs. E. G. Page & Co., 52, Clarence Street, Sydney, N.S.W. NEW ZEALAND: Models Ltd., Third Floor, Paykel's Buildings, 9, Anzac Avenue (P.O. Box 129), Auckland, C.1. SOUTH AFRICA: Mr. A. E. Harris (P.O. Box 1199), 142, Market Street, Johannesburg.

MECCANO CLUBS

Meccano Clubs are founded and established by enthusiastic Meccano boys under the guidance of the Guild Secretary at Headquarters. At the present time there are over 150 affiliated clubs in various towns and villages in this country and overseas, together with many others not yet affiliated. Each club has its Leader, Secretary, Treasurer and other Officials, all of whom, with the exception of the Leader, are boys.

Every Guild member should join a club if possible, for only in association with other Meccano boys is he able to obtain the greatest fun from his hobby. If the nearest club is too far away for him to join, or if he is unable to join it for any other reason, he should consider the possibility of forming a new club in his own district. A special booklet entitled "How to run a Meccano Club" is now ready, and will be sent to any reader (post free) on receipt of 2d. in stamps.

When a Meccano Club has been successfully launched and good progress is being made, affiliation with the Guild is granted. A beautiful club certificate, suitable for framing and hanging in the club-room, is presented, and the club becomes entitled to such privileges as the loan of interesting lectures and large models built at Headquarters.

THE CORRESPONDENCE CLUB

Members of the Guild are eligible to join the Correspondence Club, by which they are placed in communication with other Guild members in some other part of the country or abroad. To those boys who are interested in foreign languages the Correspondence Club presents a splendid opportunity of obtaining a correspondent in the particular country in the language of which they are interested. Stamp collectors also find the club of value. Full particulars and enrolment form will be sent on application to the Guild Headquarters.

THE SUN NEVER SETS ON THE MECCANO GUILD

NEXT MONTH: "GUIDING THE NIGHT PILOT." PUBLISHING DATE: 1st APRIL

MECCANO MAGAZINE

Editorial Office:
Binns Road, Liverpool 13
England

Vol. XXI. No. 3
March, 1936

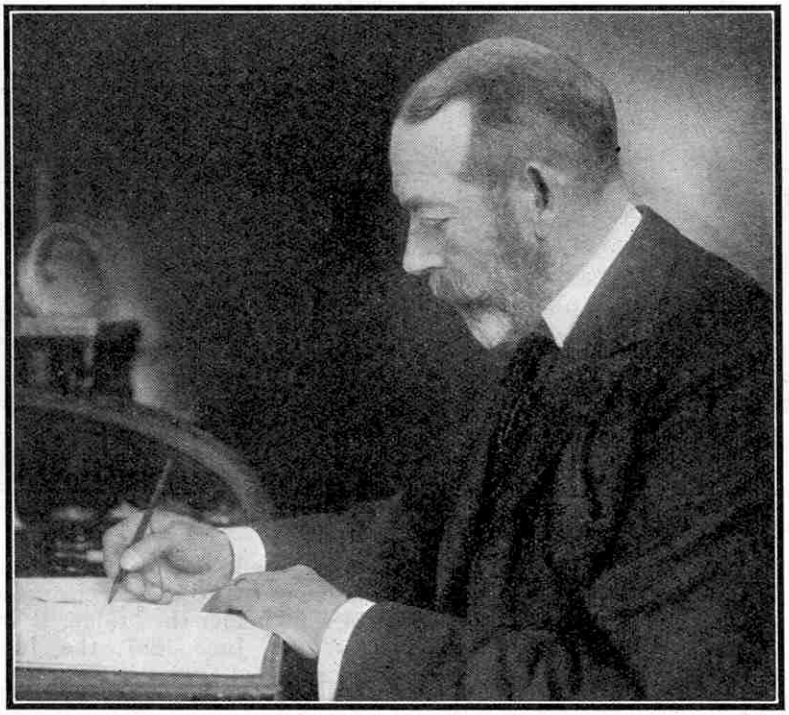
With the Editor

The Passing of King George V

The death of his late Majesty King George V occurred too late for me to make reference to it in the February issue of the *"M.M."* I cannot allow the event to pass by without comment, however, and I am sure that every reader of the *"M.M."* at home and overseas will desire to join me in this expression of regret, belated though it necessarily is.

The late King came nearer to the hearts of his people than any of his predecessors, and the loyalty and affection of his subjects continually increased during the 25 years of his reign.

King Edward VIII undoubtedly will maintain the splendid tradition created by his father. He has visited almost every part of the Empire and has come into intimate contact with people of all ranks and conditions of life. More than this, he has travelled in many European countries, in the United States, the Argentine and other lands, and everywhere has aroused the greatest enthusiasm by his fine personal qualities and his keen interest in everything he saw around him.



His late Majesty King George V. *Hoppé*

Britain's Great New Liner

We are all looking forward eagerly to the appearance in service of Britain's new giant liner, *"Queen Mary."* The great interest she has aroused is scarcely surprising in view of her size and our expectations of great achievements on the historic North Atlantic route. The capabilities of her engines and her speed will not be known until towards the end of the present month, when she will be taken down the Clyde for her official speed trials.

I am now making the necessary preparations to provide my readers with full information and interesting illustrations of this fine vessel.

Across the Atlantic by Air

By a strange coincidence, *"Queen Mary"* will make her maiden voyage at about the time when the new German airship will be completed. As my readers know from the article published on page 20 of the January issue, this vessel is intended for the service between Germany and South America that has been maintained regularly for the past four years by the *"Graf Zeppelin"* alone. Her builders are confident that the years of pioneer adventure in the airship world are now over, and that we are now on the eve of the establishment of regular trans-atlantic airship services.

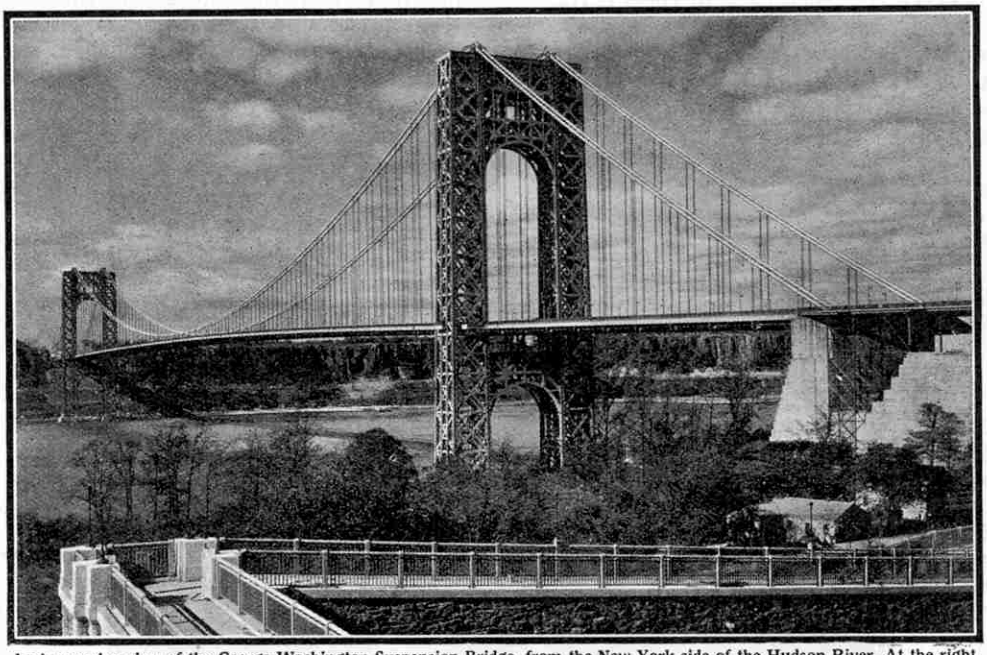
This of course is an entirely new development, and further changes must be looked for when the plans now under consideration by Imperial Airways for aeroplane services between England and America take practical form. It seems to me that before many years have passed those who wish to cross the Atlantic will have the choice of travelling by sea or by air. It is difficult to forecast what the future will bring. Many difficulties have to be faced before regular air services will be available, and for a time at least the accommodation available in the flying boats and airships that will be used will be comparatively limited. The Martin flying boats designed for American trans-oceanic services carry 48 passengers. The new German airship will provide quarters for 50 passengers and 35 members of the crew, but the great Cunarder will carry over 4,000 people, including a crew of about 1,500. There is no doubt therefore that great ships such as the *"Queen Mary"* will find ample scope for the work for which they are designed, in spite of the greater speeds of which aircraft are capable.

Famous Bridges of the World

Steel Structures combine Strength and Beauty

THE bridge is perhaps the oldest of engineering structures, and probably the idea originated in a tree uprooted by the wind and drawn across a stream, or in a more or less regular series of boulders occurring naturally across the bed of a river. The great modern phase of bridge building, however, can be said to date back to the coming of cheap steel. Even in the construction of the simplest type of bridge, steel has points of superiority over masonry, but this superiority is most striking in the spanning of long distances at great heights and in the building of bridges in difficult situations.

Many of the most famous steel bridges combine strength and beauty of design to a remarkable degree. Perhaps the most beautiful of all types is the arch bridge, of which the largest and the most famous example is the Sydney Harbour Bridge, Australia. It took eight years to build and was opened on 19th March 1932, and is one of the greatest engineering feats of recent years. The bridge has an overall length of 3,770 ft. and its huge arch, springing from granite abutments on each side of the harbour, crosses the water in a single span 1,650 ft. long, and at its crown it has a clear height of 170 ft. above high water. The arch rests on four main bearings each weighing 296 tons and sustaining a load of 19,700 tons, and the thrilling story of its construction was told in the "*M.M.*" of October last. The four pylon towers, two at each end of the arch, are 285 ft. in height, and their erection involved the quarrying of 20,000 cu. yd. of granite, which was brought 100 miles by sea from Moruya on the south coast of New South Wales.



An impressive view of the George Washington Suspension Bridge, from the New York side of the Hudson River. At the right the main cables can be seen extending into the massive concrete anchorage. Photograph reproduced by courtesy of the Port of New York Authority.

The deck of the bridge carries a roadway 57 ft. in width, providing for six lines of the heaviest vehicular traffic, two lines of main electric railway on each side of the roadway, and two 10 ft.-wide footpaths on the outside of the permanent way, making a total width of 159 ft. 6 in.—the heaviest deck ever constructed.

In extreme contrast to the bold sweeping line of the Sydney Harbour Bridge is the severe horizontal line of the girder bridge across the Firth of Tay at Dundee. In spite of its severity it has a beauty of its own, as the accompanying illustration shows. The present Tay Bridge is actually the second to bear that name. The first one was a lattice girder bridge designed by Sir Thomas Bouch and built during the years 1870-6 at a cost of £350,000. It consisted of 85 spans, with a total length of 10,700 ft., and carried a single line of railway. During a gale on the night of 28th December 1879, 18 months after the bridge was opened, its 13 central spans, each 245 ft. long, were blown down while a mail train was crossing. The train was precipitated into the water 90 ft. below and 75 people perished.

The collapsed portion of the bridge was not rebuilt, but a new bridge of greater width and lower elevation was built about 60 ft. from the first one. Much of the material in the old bridge was utilised in this work. The present Tay Bridge is just over two miles long and carries a double railway track. Over most of the spans the lines are carried on the tops of the girders, but across the 13 centre spans they are laid between the main girders so as to allow a clearance of 79 ft. for the passage of ships under the bridge. It was opened for public use on 20th June 1887, the Jubilee anniversary of the accession of Queen Victoria.

It is an interesting fact that the disaster to the old Tay Bridge led to the erection of one of the most striking structures in the world, the cantilever bridge across the Firth of Forth. Originally it was planned to erect a suspension bridge designed by Sir Thomas Bouch. It was to have two spans of 1,600 ft. each, a clear headway of 150 ft., and towers 550 ft. above high water on the island of Inchgarvie and on the two shores. A start had been made on the foundation of the main pier on Inchgarvie island, but the appalling calamity to the Tay Bridge destroyed all confidence in Sir Thomas Bouch and work on the new bridge was stopped immediately. Various other means of crossing the Forth were then considered, and finally a bridge on the cantilever system was built. It was opened on the 8th March 1890 by King Edward VII, then Prince of Wales. The ceremony took place during a fierce gale,

HORNBY RAILWAY COMPANY

A REAL RAILWAY COMPANY WITH BOY DIRECTORS AND OFFICIALS

How to Become a Member of the Hornby Railway Company

Every boy who possesses a Hornby Train Set should join the H.R.C. and thus become entitled to wear the badge of membership, which is beautifully enamelled in colours and has as its central feature a tiny representation of a train. All that he has to do is to fill in the application form—a copy of which is enclosed in every Train Set, or may be obtained from the Secretary of the H.R.C., Liverpool—and to return this together with a remittance of 6d. (overseas 10d.) to pay for the badge. Immediately on receipt of the completed form the applicant is enrolled as a member of this great organisation, and a handsome certificate to that effect is forwarded to him along with his badge.

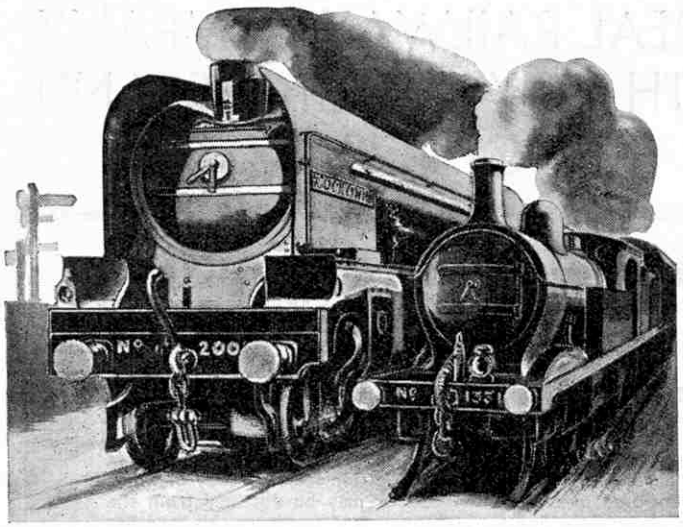
Members of the H.R.C. are entitled to many privileges. The chief aim of the Company is to enable its members to get as much fun as possible from their miniature railways. This can best be done by helping them to make their layouts and operations as realistic as possible, and competent railway experts on the staff at Headquarters therefore are continuously engaged in advising members how to make the best use of the material at their disposal.

Join a Local Branch

The greatest fun is obtained from Hornby Trains by joining one of the many local Branches that have been formed in various parts of this and other countries. These Branches are composed of Hornby Train owners who meet together in order to carry out railway operations on a more extensive scale than is possible for a single individual. Every member should join a Branch immediately, or if one does not exist in his neighbourhood, he should try to induce other enthusiasts to help him to found one.

Write for full details to the Secretary, Hornby Railway Company, Binns Road, Liverpool, 13.

The Hornby Railway Company is a world-wide fellowship of Hornby Train owners, and was formed to enable members to get as much fun as possible from their miniature railways. Its President is Mr. Frank Hornby, inventor of Meccano, and Managing Director of Meccano Limited.



TWICE as STRONG

It's easy to see which is stronger, the giant modern loco or the little "puffer" from the goods sidings! But it isn't always so easy to judge strength. Take Seccotine . . . . . looks the same as other adhesives, but it's proved twice as strong by laboratory tests. And you know it, too, when you use it for model making and mending things about the home.

It sticks wood, metal, china, glass—everything that can be stuck. But it must be real Seccotine, as chosen by the Navy and the Air Force. Look for the name on the tube. And don't forget when you buy Seccotine that your dad and grand-dad bought it years before you were born!

Obtainable in tubes, **4½**d., **6**d. and **9**d., from all good Stationers, Ironmongers and General Stores.

MADE BY BRITISH WORKPEOPLE.

SECCOTINE REGD

THE DOUBLE STRENGTH ADHESIVE

STICKS EVERYTHING

POST THIS COUPON to: Dept. M.,

M'Caw, Stevenson & Orr Ltd., Belfast.

NAME.....

ADDRESS.....

.....

I should like to have, post free, a copy of your Free Booklet.

I'm exchanging my old Hornby engine for a new one!

Boys! Here is a plan to secure a fine new Hornby Locomotive in exchange for your old one.

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)	5/3
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/–
LE1/20 Loco (Swiss Type), 20-volt	10/–
LST 2/20 Tank Locomotive ...	12/6
E3/20 Locomotive	12/6
E3/20 Riviera Locomotive ...	12/6
LE 120 Locomotive	10/–
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	18/9

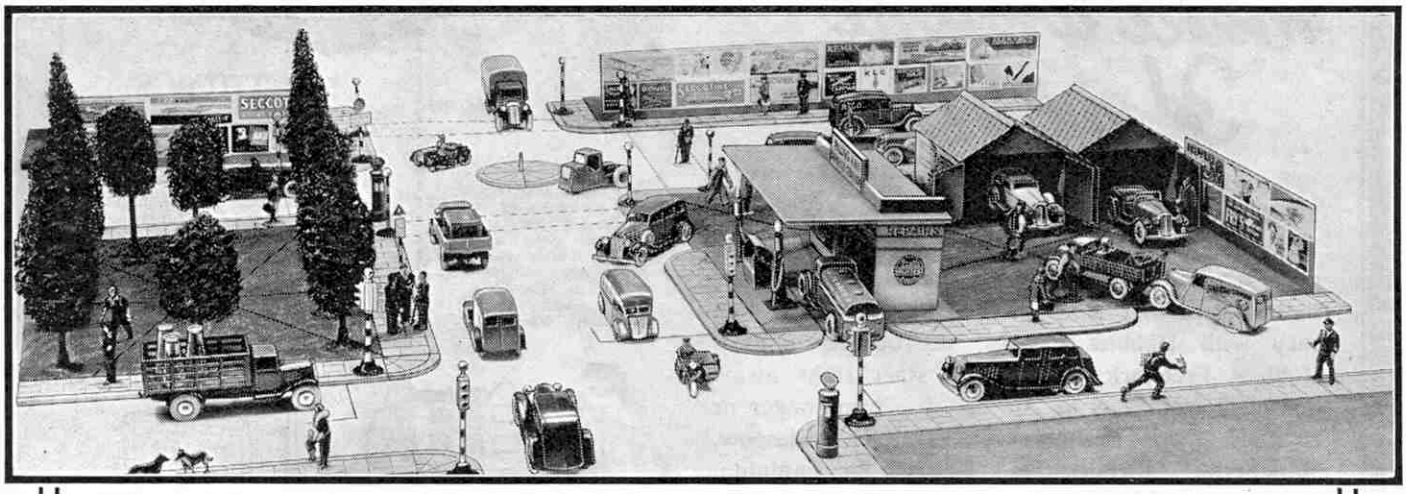
HORNBY TRAINS

BRITISH AND GUARANTEED

Manufactured by

MECCANO LTD. - LIVERPOOL 13

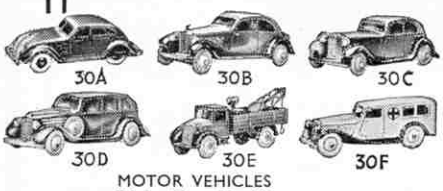
TOYS OF QUALITY MADE BY MECCANO LTD.



The above illustration shows in a striking manner the realistic effects that may be obtained with Dinky Toys. The components used are listed below, excepting the pavements and hoardings which are quite easily made of cardboard or plywood.

Pillar Letter Box. G.P.O. ...	Dinky Toys	No. 12a ...	Price each	3d.	Sportsman's Coupé	Dinky Toys	No. 24f ...	Price each	9d.
Pillar Letter Box. Air Mail ...	" "	No. 12b ...	" "	3d.	Sports Tourer (four seater) ...	" "	No. 24g ...	" "	9d.
Robot Traffic Signals. Two-way (4)	" "	No. 47c ...	" "	3d.	Vogue Saloon	" "	No. 24d ...	" "	9d.
Belisha Beacons (6)	" "	No. 47d ...	" "	1d.	Vauxhall Car	" "	No. 30d ...	" "	9d.
Road Signs "Roundabout" (2)	" "	No. 47r ...	" "	1½d.	Petrol Tank Wagon "Texaco"	" "	No. 25d ...	" "	9d.
Road Sign "No Entry"... ...	" "	No. 47q ...	" "	1½d.	Wagon	" "	No. 25a ...	" "	9d.
Petrol Station	" "	No. 48 ...	" "	1/6	Daimler Car	" "	No. 30c ...	" "	9d.
"Theo" Petrol Pump	" "	No. 49c ...	" "	4d.	Atco Lawn Mowers Van	" "	No. 28n ...	" "	6d.
"Shell" Petrol Pump	" "	No. 49d ...	" "	4d.	Newsboy	" "	No. 3l ...	" "	3d.
Oil Bin (Pratts)	" "	No. 49e ...	" "	3d.	Woman and Child	" "	No. 3a ...	" "	3d.
Garages (2)	" "	No. 45 ...	" "	1/6	Storekeeper	" "	No. 4c ...	" "	3d.
Market Gardener's Van	" "	No. 25f ...	" "	9d.	Business Men (7)	" "	No. 3b ...	" "	3d.
Covered Van	" "	No. 25b ...	" "	9d.	Women (3)	" "	No. 3f ...	" "	3d.
Mechanical Horse	" "	No. 33a ...	" "	6d.	Electricians (2)...	" "	No. 4a ...	" "	3d.
R.A.C. Motor Cycle Patrol ...	" "	No. 43b ...	" "	9d.	Male Hiker	" "	No. 3c ...	" "	3d.
A.A. Motor Cycle Patrol ...	" "	No. 44b ...	" "	9d.	Dogs (2)	" "	No. 6b ...	" "	2d.
Breakdown Car	" "	No. 30e ...	" "	9d.	Fitter	" "	No. 4b ...	" "	3d.
Palethorpes Sausage Van ...	" "	No. 28f ...	" "	6d.	Greaser	" "	No. 4d ...	" "	3d.
"Manchester Guardian" Van	" "	No. 28c ...	" "	6d.	Guard	" "	No. 1b ...	" "	3d.
"Kodak" Cameras Van	" "	No. 28g ...	" "	6d.					

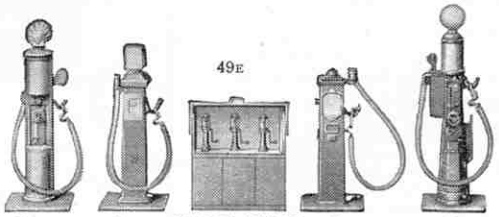
HORNBY ACCESSORIES: Trees, with Stands, assorted, per doz. **3/-**. Miniature Posters, **6d.** per packet of 51. Milk Cans (3), 2 for **3d.**



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	"	9d.

Price of complete set **4/6**



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

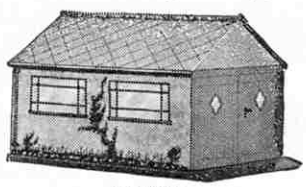
No. 49a	Bowser Pump	each	4d.
No. 49b	Wayne Pump	"	4d.
No. 49c	Theo Pump	"	4d.
No. 49d	Shell Pump	"	4d.
No. 49e	Oil Bin (Pratts)	"	3d.

Price of complete set **1/6**

DELIVERY VANS
Dinky Toys No. 28/1

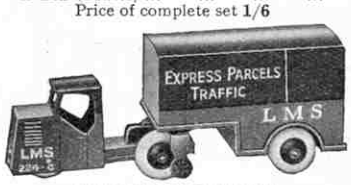
No. 28a	Hornby Train Van ...	each	6d.
No. 28b	Seccotine Van	"	6d.
No. 28c	"Manchester Guardian" Van	"	6d.
No. 28e	Firestone Tyres Van ...	"	6d.
No. 28f	Palethorpes Sausage Van	"	6d.
No. 28n	Atco Lawn Mowers Van ...	"	6d.

Price of complete set **3/-**



GARAGE
Dinky Toys No. 45
Fitted with opening double doors. Will accommodate any two Dinky Toy Motor Cars.
Price **1/6** each

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



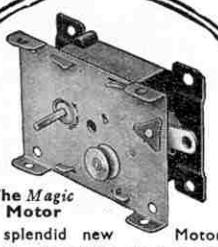
RAILWAY MECHANICAL HORSE AND TRAILER VAN
Dinky Toys No. 33R
Price complete, L.M.S.R., L.N.E.R., G.W.R., or S.R., **1/6**

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

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

A Charming Collecting Hobby **DINKY** *200 VARIETIES* **TOYS** **The Best that you can buy**

Manufactured by • MECCANO LTD. • BINNS ROAD • LIVERPOOL 13



The *Magic* Motor

This splendid new Motor is capable of driving models made with Meccano Outfits A, B and C. It costs only 2/–.

MECCANO

MOTORS FOR DRIVING MODELS

If you want to obtain the fullest enjoyment from the Meccano hobby you must operate your models by means of one of the Meccano Clockwork or Electric Motors listed below.

CLOCKWORK MOTORS

The *Magic* Motor (non-reversing) ...	Price	2/–
X Series Motor (non-reversing)... ...	,,	2/–
No. 1 Clockwork Motor (non-reversing)	,,	5/–
No. 1a Clockwork Motor (reversing) ...	,,	7/6
No. 2 Clockwork Motor (reversing) ...	,,	9/–

ELECTRIC MOTORS

No. E1 Electric Motor (6-volt). Non-reversing	Price	9/–
No. E6 Electric Motor (6-volt). Reversing ...	,,	15/6
No. E120 Electric Motor (20-volt). Non-reversing	,,	10/–
No. E20B Electric Motor (20-volt). Reversing	,,	18/6

TRANSFORMERS

The Transformers made by Meccano Limited provide a convenient and safe means of driving 6-volt or 20-volt Electric Motors and Train Sets from the mains supply where this is alternating current.

When ordering a Transformer or a Transformer-Rectifier the voltage and frequency of the supply must be stated. These particulars are given on the supply meter.

No. T6A Transformer (Output 40 VA at 9/3½ volts) for 6-volt Electric Motors or 6-volt Trains. Fitted with speed regulator and separate circuit for supplying current for eighteen 3½-volt lamps ... ... Price 22/6

No. T6 Transformer (Output 25 VA at 9 volts) for 6-volt Electric Motors or 6-volt Trains. Fitted with speed regulator ... ... Price 17/6

No. T6M Transformer (Output 25 VA at 9 volts) for 6-volt Electric Motors or 6-volt Trains. This is similar to No. T6, but is not fitted with a speed regulator ... Price 12/6

No. TR6 Transformer-Rectifier (Output 6 volts at 1½ Amps.) for use with Hornby No. EPM16 Special Tank Locomotive (6-volt, Permanent Magnet) ... ... Price 29/6

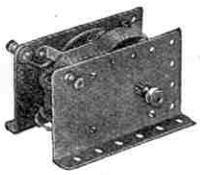
No. T20A Transformer (Output 25 VA at 20/3½ volts) for 20-volt Electric Motors or 20-volt Trains. Fitted with speed regulator and sockets for lighting fourteen lamps. Price 22/6

No. T20 Transformer (Output 20 VA at 20 volts) for 20-volt Electric Motors or 20-volt Trains. Fitted with speed regulator ... ... Price 17/6

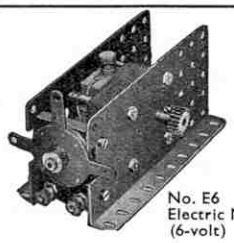
No. T20M Transformer (Output 20 VA at 20 volts) for 20-volt Electric Motors or 20-volt Trains. This is similar to No. T20 but is not fitted with speed regulator... Price 12/6

No. 1 Clockwork Motor

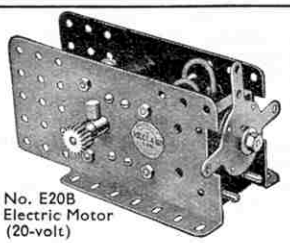
No. 2 Clockwork Motor



No. E1 Electric Motor (6-volt)



No. E6 Electric Motor (6-volt)



No. E20B Electric Motor (20-volt)

No. T20 Transformer

A NEW ELECTRIC LIGHTING SYSTEM

FOR HORNBY ACCESSORIES

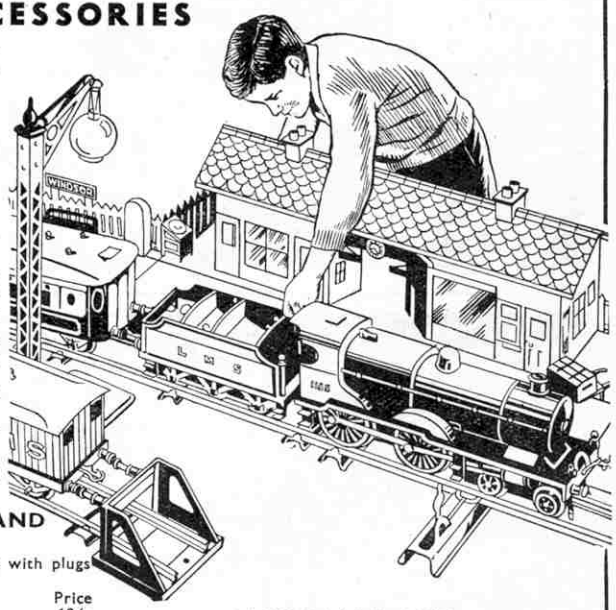
BRILLIANT, SAFE AND INEXPENSIVE

The following is a complete list of the Hornby Accessories available fitted for electric lighting on the simplified system recently adopted. These accessories are specially designed for lighting from the 3½-volt circuit of a Meccano T20A or T6A Transformer, and with each of these Transformers are packed for the purpose a pair of Plugs, an Earthing Clip and a coil of Wire, together with full instructions. The Accessories can also be lighted from an accumulator. Each Accessory is accompanied by an Earthing Clip and a Leaflet giving full instructions for use. Lamp bulbs are not provided with the Accessories.

No. E1E Engine Shed	Price 15/6	No. 2E Signal Gantry	Price 12/9
No. E2E Engine Shed	,, 23/–	No. E1E Level Crossing ...	,, 5/3
No. 2E Station	,, 9/3	No. E2E Level Crossing ...	,, 9/–
Island Platform E	,, 6/3	No. 1E Buffer Stops	,, 1/6
No. 2E Goods Platform... ...	,, 11/6	No. 2E Buffer Stops	,, 6/–
No. 2E Signal Cabin	,, 4/3	No. 2E Water Tank	,, 6/6
No. 2E Signal	,, 2/9	No. 1E Lamp Standard	,, 2/11
No. 2E Double Arm Signal ...	,, 3/11	No. 2E Lamp Standard	,, 3/3
No. 2E Junction Signal	,, 6/–		

The following items used in connection with the new system of Accessories lighting are available:

Plugs for sockets of Transformers T20A and T6A ... ... Price per pair 6d.
Earthing Clips ... ... each 3d. Connecting Wire ... Price per coil 4d.



ACCESSORIES FOR LIGHTING WITH DISTRIBUTION BOX AND FLEXIBLE LEADS

The old type Accessories fitted for lighting by means of a Distribution Box and Flexible Leads with plugs and sockets are still available at the following prices:

	Price		Price		Price
No. E1E Engine Shed ...	18/6	No. 2E Double Arm Signal	6/6	No. 2E Water Tank ...	10/–
No. E2E Engine Shed ...	26/–	No. 2E Junction Signal ...	9/–	No. 1E Lamp Standard ...	3/6
No. 2E Station	11/6	No. 2E Signal Gantry ...	18/–	No. 2E Lamp Standard ...	4/3
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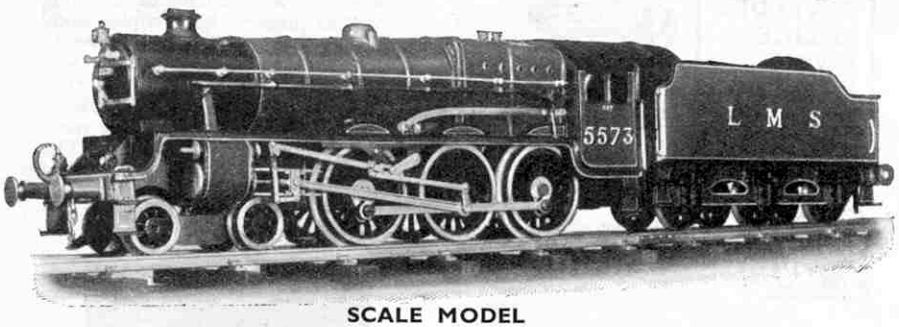

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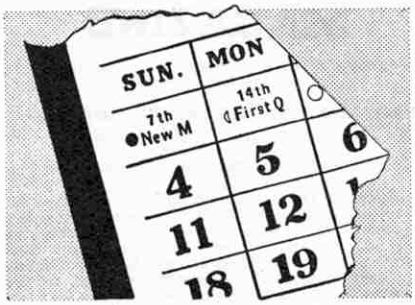

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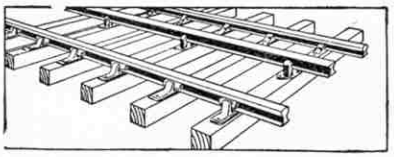

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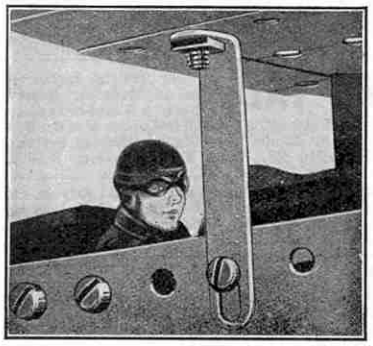

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EDITORIAL AND ADVERTISING OFFICE:—
LIVERPOOL 13, ENGLAND.

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.

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NEW ZEALAND: Models Limited, Third Floor, Paykel's Buildings, 9, Anzac Avenue (P.O. Box 129), Auckland, C.1.
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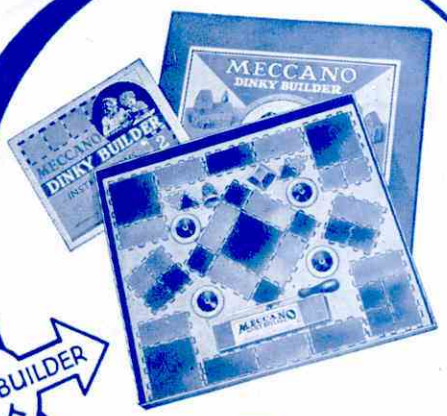

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No. O DINKY BUILDER OUTFIT

This is an excellent Outfit, containing a good assortment of Dinky Builder parts (including two road wheels), with which a splendid range of models can be built. The Instruction Folder included gives examples of 40 models, but many others of an original character can be constructed by the inventive boy or girl. Price 2/6

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THE MECCANO MAGAZINE

MECCANO

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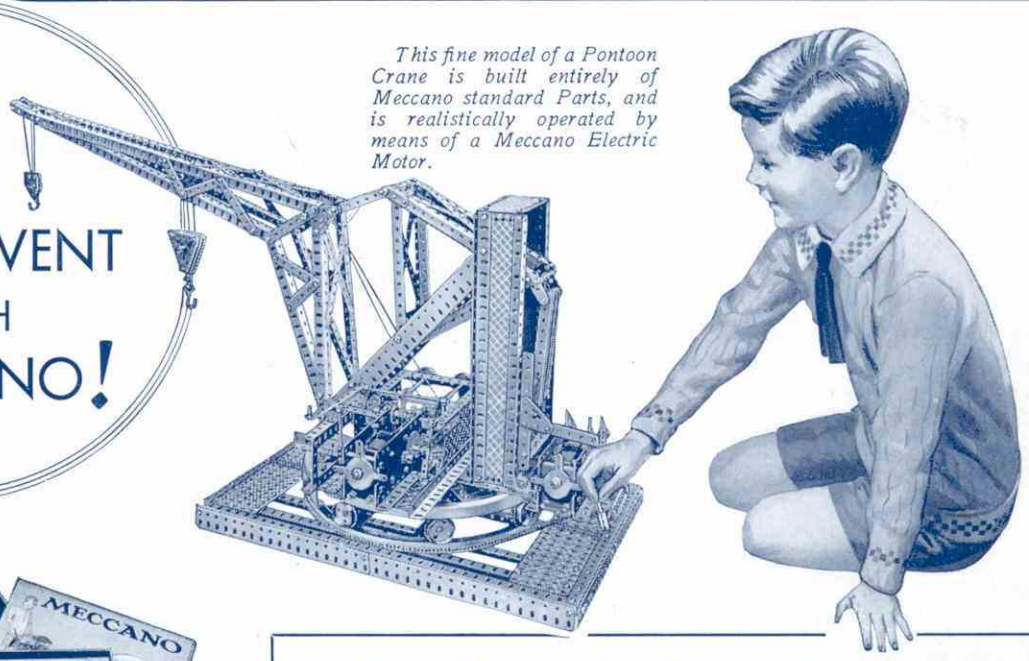
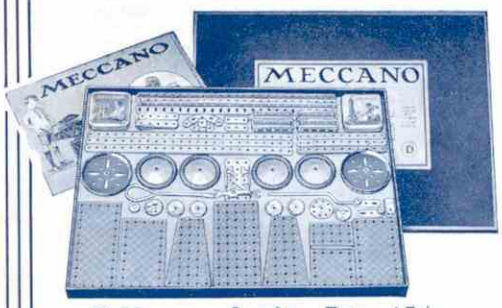


This fine model of a Pontoon Crane is built entirely of Meccano standard Parts, and is realistically operated by means of a Meccano Electric Motor.

B Meccano Outfit. Price 7/6



D Meccano Outfit. Price 15/-

H Meccano Outfit. Price 72/6

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B	,,	,,	7/6
C	,,	,,	10/-
D	,,	,,	15/-
E	,,	,,	20/-
F	,,	,,	30/-
G	,,	,,	55/-
H	,, (Carton)	,,	72/6
Hw	,, (Cabinet)	,,	97/6
K	,, (Carton)	,,	132/6
Kw	,, (Cabinet)	,,	157/6
L	,, (,,)	,,	400/-

ACCESSORY OUTFITS

The purpose of Meccano Accessory Outfits is to connect the main Outfits from A to L.

					each
Aa	converts	A	Outfit into	B	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/-

Run Your Models with a Meccano Motor

If you want to obtain the fullest enjoyment from the Meccano hobby you must operate your models by means of one of the Meccano Motors. Meccano Clockwork Motors are obtainable at prices ranging from 2/- to 9/- and Meccano Electric Motors from 9/- to 18/6.

MECCANO LTD., BINNS ROAD, LIVERPOOL

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