JANUARY 1936

MECCANO MAGAZINE

Vol. XXI. No. 1

Coaling a Liner

(see page 16)

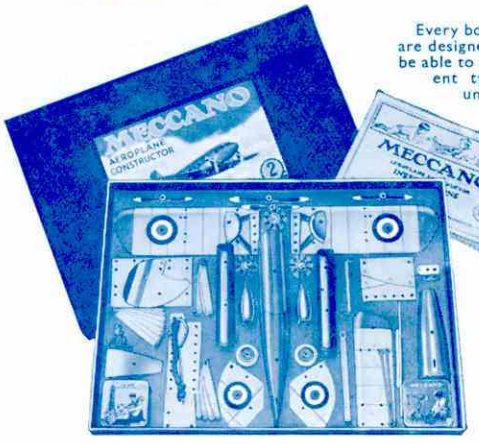
6D.

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. 00 Outfit	**3/3**
No. 0 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/-**

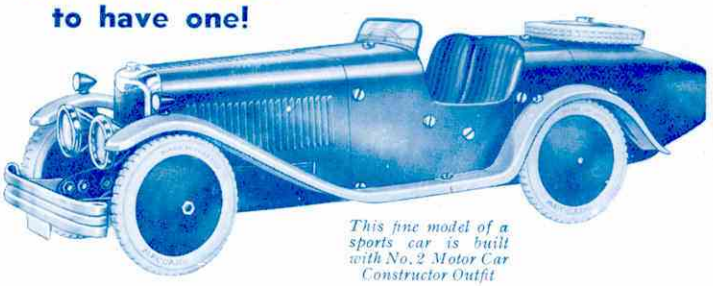
Note. The parts in the No. 00 and No. 0 Outfits are not intended for use with the larger Outfits.

No. 02 AEROPLANE HANGAR

This splendid hangar has been specially designed to house model aeroplanes. It will accommodate two machines built with the No. 00 or No. 0 Aeroplane Constructor Outfits. Length 21½". Depth 11". Height 6½". 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

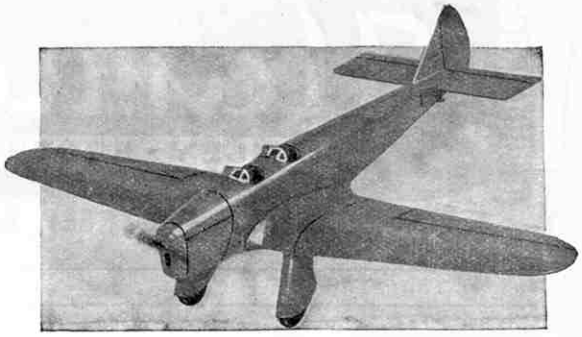
This Lighting Set enables the headlamps of Motor Car models built with the No. 2 Motor Car Outfit to be electrically lighted. Price **2/6**

MOTOR CAR GARAGE

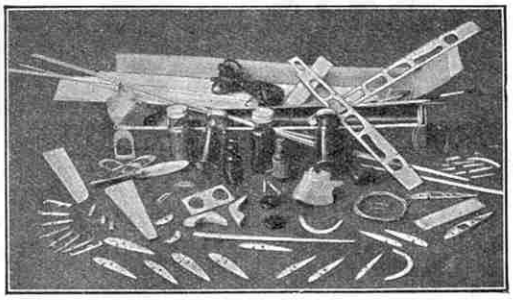
This realistic Motor Car Garage provides accommodation for any Meccano model motor car or other cars of suitable size. Inside dimensions: Height 5". Length 13". Width 7¾". Price **5/6**

MECCANO LIMITED
Binns Road
LIVERPOOL 13

The FROG range of model aircraft includes a Fine Constructional Kit for building a scale model of the MILES "HAWK MAJOR"



Actual photograph of finished model.



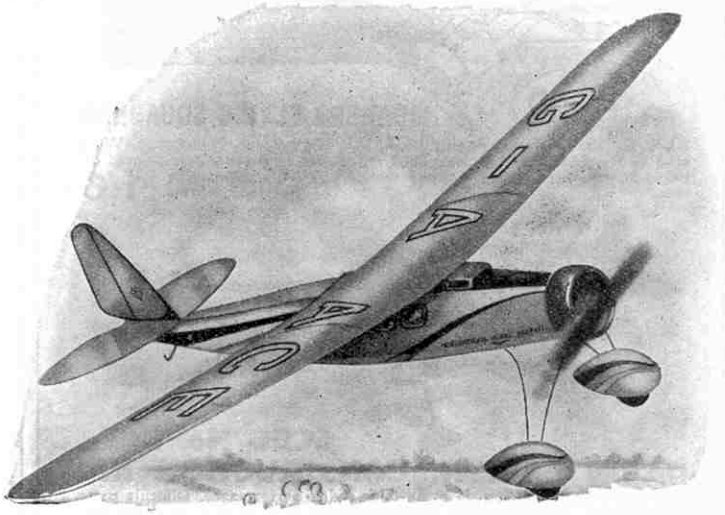
THE MILES "HAWK MAJOR" CONSTRUCTIONAL KIT

An easily assembled kit for constructing a flying scale model of this famous record breaking light Aeroplane SUPPLIED COMPLETE WITH ALL IMPORTANT PARTS BLANKED OUT. Full instructions with step by step instruction sheet. Finished airscrew and step up gear box, aluminium wheels and windshields. Wing span 16½ ins. With a little experience flights of 600 ft. are obtainable. **10/6**

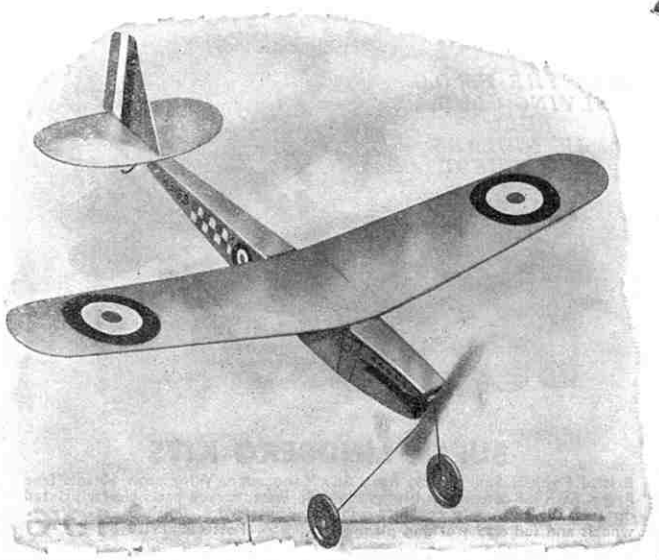
—and of course there are also these new non-scale models ready for flying—

THE "METEOR"

A fine new model with exceptional performance, robust construction and handsome appearance. Wings, fuselage and tail unit, aluminium finish. NOTE THE SIZE. WING SPAN 18½ ins. FLIES 300 ft. **5/-**



THE "MERCURY"



THE "METEOR"

THE "MERCURY"

Splendid model of latest type high wing passenger carrying monoplane. Tubular fuselage and spring undercarriage, landing wheels fitted with streamline spats. Imitation radial motor with Townend ring. Carved airscrew. The whole model is attractively finished in colours, and with practice, flights of 600 ft. can be obtained. WING SPAN 22 ins. **17/6**

Write to us for particulars of the FROG Club and handsome Coloured Folder showing the complete FROG Range.

Designed and made by International Model Aircraft Ltd., London, S.W.19. Patented all over the world.

SOLE CONCESSIONAIRES:

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

FROG TRADE MARK REGD.

MECCANO

ENGINEERING FOR BOYS

I'm Building a Crane Next—then a Motor Car and an Aeroplane!

Every boy is happiest when he is inventing, creating and building. That is the reason for the everlasting popularity of Meccano. It is the most fascinating hobby in the world, because it enables full scope to be given to all the inclinations and desires that are the natural heritage of boys.

The Meccano system is composed of approximately 350 different parts, each of which serves a definite mechanical purpose. These perfectly finished parts combine to form a complete miniature engineering system with which practically any mechanical movement can be reproduced in model form. More can be accomplished with Meccano than with any other constructional toy, for no other system has such possibilities. The genius is in the parts, and the youngest boy can begin to build Models as soon as he gets his Outfit home.

Run Your Models with a Meccano Motor

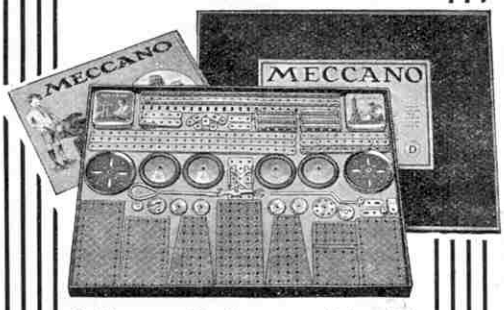
If you want to obtain the fullest enjoyment from the Meccano hobby you must operate your models by means of one of the Meccano Motors. Meccano Clockwork Motors are obtainable at prices ranging from 2/– to 9/– and Meccano Electric Motors from 9/– to 18/6.

THE MECCANO *MAGIC* MOTOR

The Meccano *Magic* Motor is a marvellous clockwork mechanism for driving the smaller models. It is capable of driving all the Meccano A and B Outfits models, and many of the lighter models illustrated in the Manuals for the C, D and E Outfits. It is non-reversing ... ... Price 2/–

The *Magic* Motor

B Meccano Outfit Price 7/6



D Meccano Outfit Price 15/–

H Meccano Outfit Price 72/6

Meccano model-building is the finest hobby in the world.

PRICES OF MECCANO OUTFITS

COMPLETE OUTFITS

A	Outfit	each	5/–
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

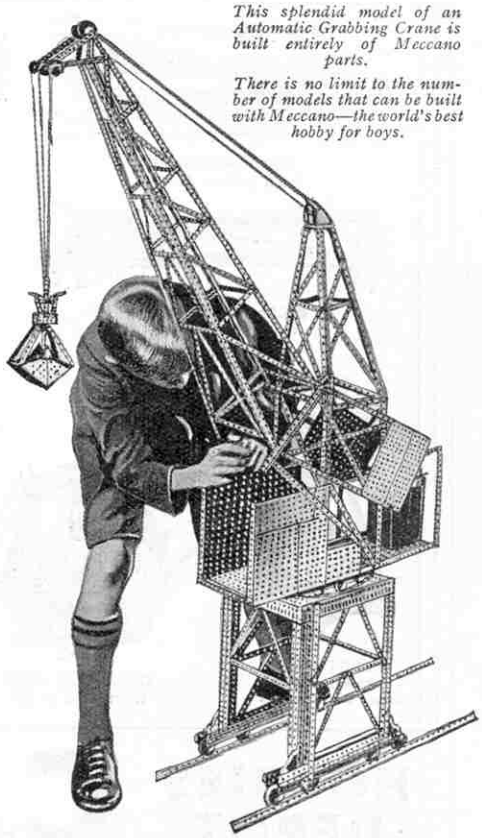
The purpose of Meccano Accessory Outfits is to connect the main Outfits from A to L. They are best described as the stepping stones to bigger and better models. Thus a B Outfit can be converted into a C by adding to it a Ba Accessory Outfit, and a Ca would then convert it into a D. No matter how small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

Aa	converts	A	Outfit	into	B	... each	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/–

MECCANO LTD.
BINNS ROAD
LIVERPOOL 13

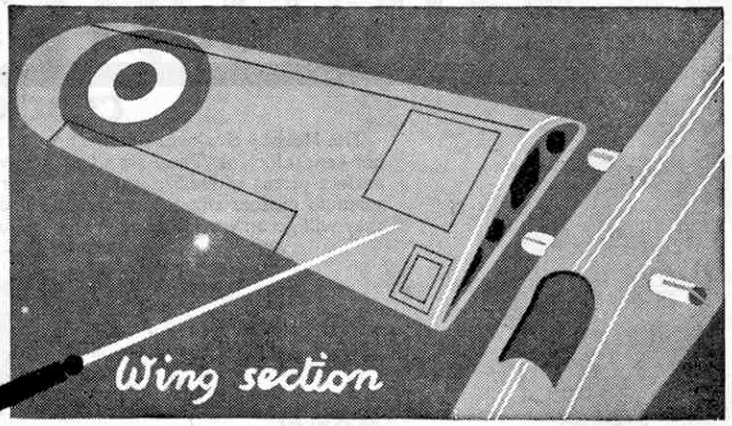
This splendid model of an Automatic Grabbing Crane is built entirely of Meccano parts.

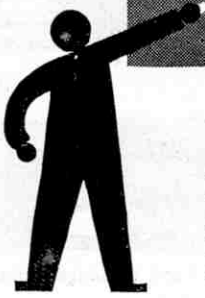
There is no limit to the number of models that can be built with Meccano—the world's best hobby for boys.



Real Engineering in Miniature

FROG AVIATION COURSE



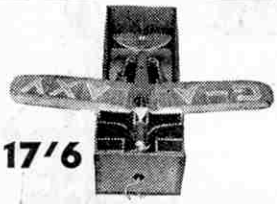


No. 1—THE WING

The sole purpose of the wing, or "aerofoil surface" as it is called in aerodynamics, is to lift the aeroplane, and keep it in the air. The lifting force, however, of every wing brings into being a corresponding force of "drag" which tends to slow up the progress of the aeroplane. Roughly therefore, the greater the "lift," the more force is needed to push the machine forward—but the amount of drag depends on the design of the wing. The skill therefore in wing design is to obtain the lift appropriate for the intended speed, with the minimum of drag. Plain flat inclined surfaces were first used, but when it was discovered that the lift was not due to pressure from underneath, so much as by a vacuum caused above the upper surface, a rounded or cambered shape was found the most effective, streamlined underneath as well as possible, for rigidity as well as for efficient shape. The FROG is the only model aeroplane with cambered wings constructed on the proper aerodynamic principles—it is the only one therefore on which the science of flight can be correctly illustrated and studied. The FROG wings are detachable and in the event of a crash fall off undamaged.

FREE FLIGHT INSTRUCTION

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



17/6

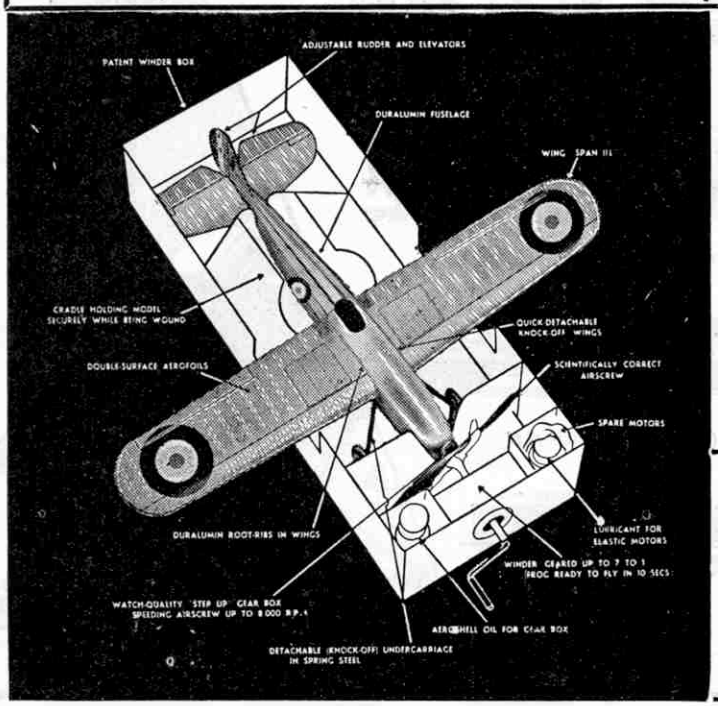
PUSS MOTH MONOPLANE

Wing Span — 18¼". Length — 13¼". Complete with **Patent High-Speed Winder-Box,** Spare Motors, Dual Insertor Rod, Motor Lubricant, Gear-box Oil and fully illustrated Instruction Manual. Flights of 600 ft. can be obtained under favourable conditions.

42/-

HAWKER HART MK. II.

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



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 TRAINS

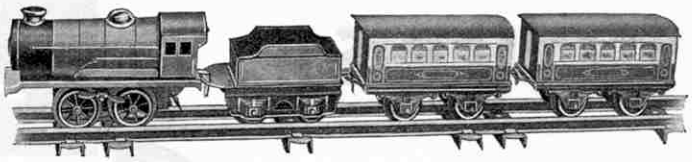
CLOCKWORK MODELS

The Hornby clockwork trains are prime favourites with boys all over the world because they are 100 per cent. efficient. **They stand up to every test.** The clockwork motors with which they are fitted are perfect pieces of mechanism, with accurately-cut gears that ensure smooth and steady running. These splendid motors combine speed and hauling power in a unique degree, and with reasonable treatment they will go on working and giving the fullest satisfaction for years.

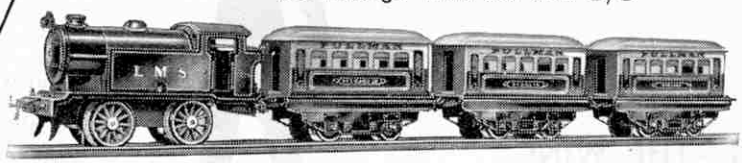
Boys! Running a Hornby Clockwork Railway is great fun!

The Hornby Railway System has been developed from small beginnings to its present wide range with the sole object of providing material for model railway working on the most realistic lines. The system now provides everything that is necessary for laying down and operating a perfect railway in miniature. Ask your dealer for the latest illustrated price list of Hornby Trains, rolling stock and accessories.

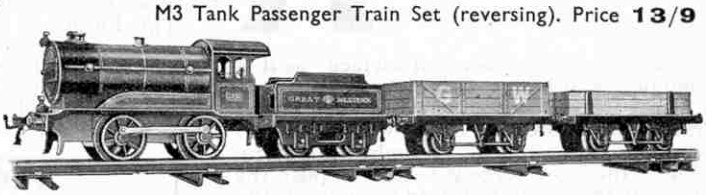
PRODUCT of MECCANO LIMITED LIVERPOOL



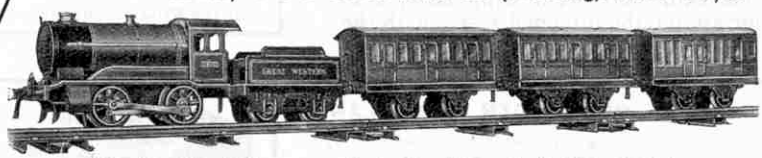
MO Passenger Train Set. Price **5/6**



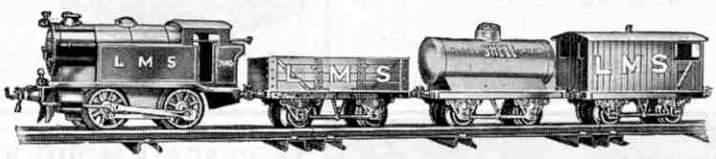
M3 Tank Passenger Train Set (reversing). Price **13/9**



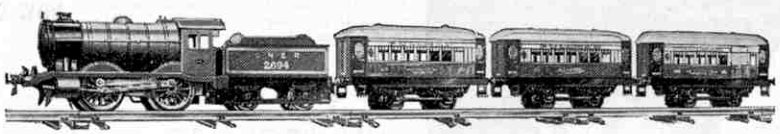
Hornby No. O Goods Train Set (reversing). Price **17/6**



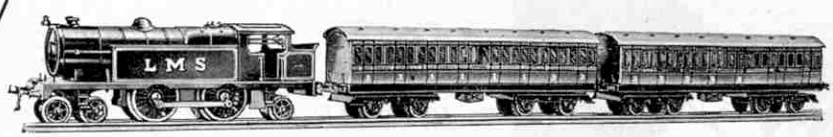
Hornby No. 1 Passenger Train Set (reversing). Price **25/-**



Hornby No. 1 Tank Goods Train Set (reversing). Price **22/6**

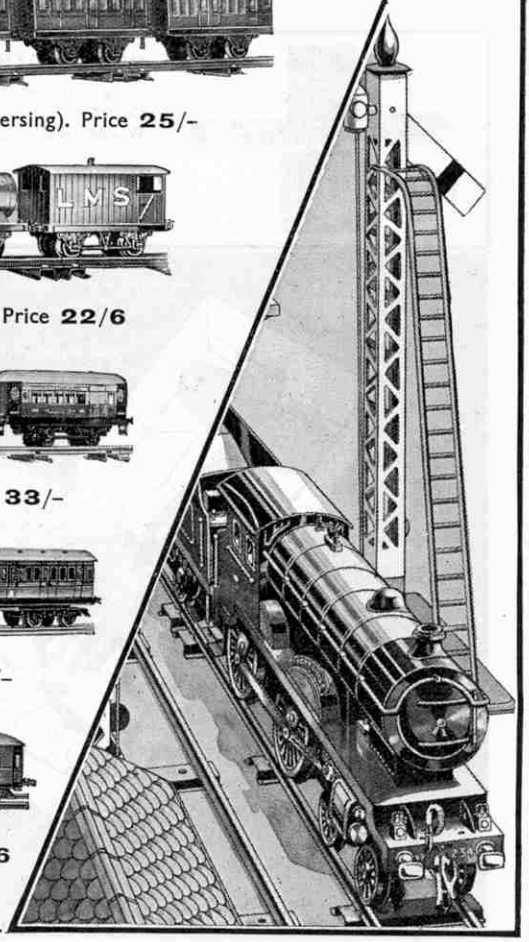


Hornby No. 1 Special Passenger Train Set (reversing). Price **33/-**



Hornby No. 2 Tank Passenger Train Set (reversing). Price **40/-**

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

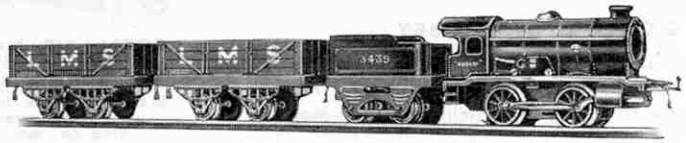


Manufactured by **MECCANO LTD., LIVERPOOL 13**

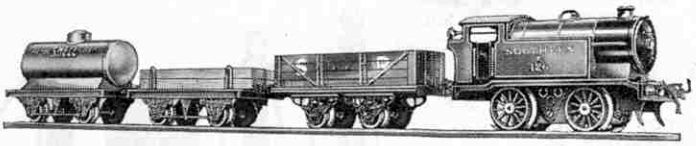
HORNBY TRAINS

ELECTRIC MODELS

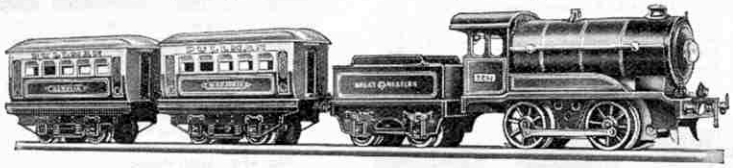
Boys! This is the dawn of the electric toy age, and the new Hornby Electric Trains reach the very pinnacle of electrical perfection. The locomotives are perfectly designed and strongly constructed, and are beautiful in appearance and finish. Many of them are fitted with patented and exclusive devices for starting, stopping, or reversing, at any part of the track, and for regulating their speed—**all from one control at the side of the line.** Nothing dangerous or complicated—everything safe and simple.



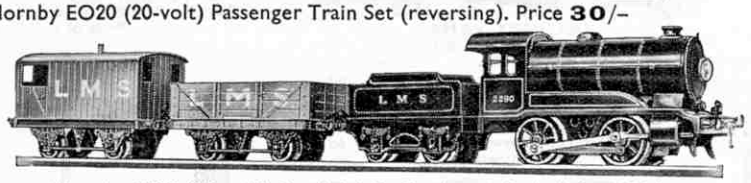
EM120 (20-volt) or EM16 (6-volt) Goods Train Set (non-reversing). Price **15/-**



EM320 (20-volt) or EM36 (6-volt) Tank Goods Train Set (reversing). Price **24/-**

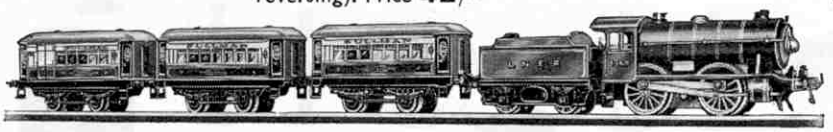


Hornby EO20 (20-volt) Passenger Train Set (reversing). Price **30/-**

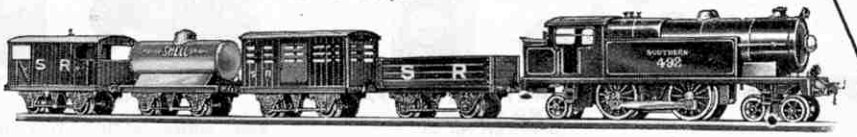


Hornby E120 (20-volt) Goods Train Set (reversing). Price **36/-**

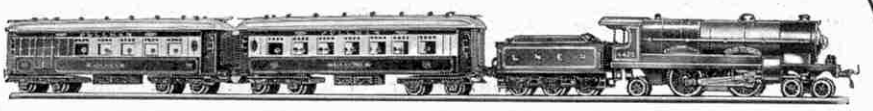
Hornby E120 Special Tank Goods Train Set (20-volt, automatic reversing). Price **42/-**



Hornby E120 Special Passenger Train Set (20-volt, automatic reversing). Price **47/6**

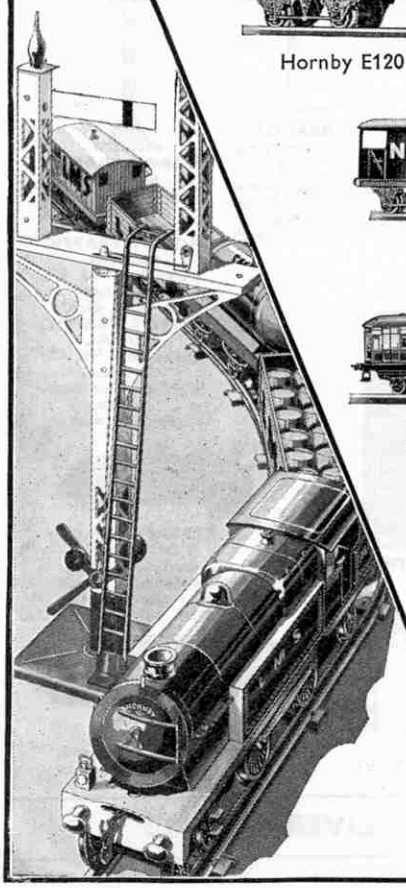


Hornby E220 Mixed Goods Train Set (20-volt, automatic reversing). Price **47/6**



Hornby E320 Pullman Train Set (20-volt, automatic reversing). Price **72/6**

Manufactured by **MECCANO LTD., LIVERPOOL 13**



I'm getting a new Hornby Electric Locomotive for my birthday!

All the Hornby Electric Locomotives have swift and powerful motors with the lowest possible consumption of current. There are two Hornby Electric Railway systems, one operating on 20 volts and the other on 6 volts. The 20-volt system is intended for those who have a mains alternating current supply in their homes, and the trains are run with perfect safety through a transformer. The 6-volt system is specially designed for those who either have a direct current mains supply, or have no mains current at all. Ask your dealer for the latest Hornby Trains price list.

PRODUCT of MECCANO LIMITED LIVERPOOL

TOYS OF QUALITY MADE BY MECCANO LTD.

DINKY TOYS

200 VARIETIES

A FASCINATING COLLECTING HOBBY

Dinky Toys are the most realistic and the most attractive models in miniature ever produced. They are unique in their perfection of finish, and their range is so wide as to appeal to all tastes. Start now to collect these delightful little models.

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

ROYAL AIR MAIL SERVICE CAR
Dinky Toys No. 34
In correct colours. Fitted with rubber tyres.
Price 6d. each

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

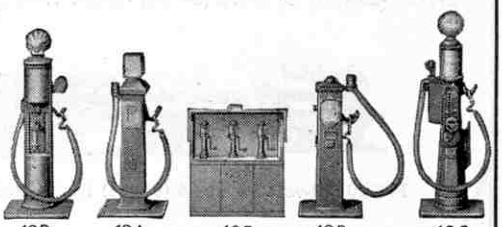
No. 33a	Mechanical Horse	... each	6d.
No. 33b	Flat Truck	,,	6d.
No. 33c	Open Wagon	,,	6d.
No. 33d	Box Van	,,	8d.
No. 33e	Dust Wagon	,,	8d.
No. 33f	Petrol Tank	,,	8d.

Price of complete set 3/6

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	Palethorpe's Sausage Van ...	,,	6d.
No. 28n	Atco Lawn Mowers Van ...	,,	6d.

Price of complete set 3/-

DELIVERY VANS
Dinky Toys No. 28/2

No. 28d	Oxo Van ...	... each	6d.
No. 28g	Kodak Cameras Van ...	,,	6d.
No. 28h	Dunlop Tyres Van ...	,,	6d.
No. 28k	Marsh and Baxter's Sausage Van... ...	,,	6d.
No. 28m	Wakefield's Castrol Oil Van,	,,	6d.
No. 28p	Crawford's Biscuit Van	,,	6d.

Price of complete set 3/-

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

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

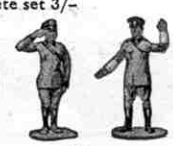
BEACON
Dinky Toys No. 47d
(Realistic models of the Belisha Safety Beacons).
Price 1d. each

ROBOT TRAFFIC SIGNAL
Dinky Toys No. 47a
(Four-face)
Price 3d. each

ROBOT TRAFFIC SIGNAL
Dinky Toys No. 47b
(Three-face)
Price 3d. each

ROBOT TRAFFIC SIGNAL
Dinky Toys No. 47c
(Two-face)
Right-angle or Back-to-back.
Price 3d. each

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



R.A.C. HUT, MOTOR CYCLE PATROL AND GUIDES
Dinky Toys No. 43
This set is representative of the familiar personnel and road hut of the R.A.C. Each item is finished in correct colours.

No. 43a	R.A.C. Hut	... each	6d.
No. 43b	R.A.C. Motor Cycle Patrol	,,	9d.
No. 43c	R.A.C. Guide directing traffic	,,	3d.
No. 43d	R.A.C. Guide at the salute	,,	3d.

Price of complete set 1/9

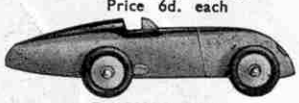
A.A. HUT, MOTOR CYCLE PATROL AND GUIDES
Dinky Toys No. 44
Every collector of Dinky Toys will find this new addition to the range of particular interest. Each item is finished in correct colours.

No. 44a	A.A. Hut ...	... each	8d.
No. 44b	A.A. Motor Cycle Patrol	,,	9d.
No. 44c	A.A. Guide directing traffic,	,,	3d.
No. 44d	A.A. Guide at the salute	,,	3d.

Price of complete set 1/11

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

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



RACING CAR
Dinky Toys No. 23a
Assorted colours. Fitted with rubber tyres. Price 4d. each

Ask your dealer for a complete illustrated list of Dinky Toys

MECCANO LIMITED – BINNS ROAD – LIVERPOOL 13

TOYS OF QUALITY MADE BY MECCANO LTD

DINKY TOYS

200 VARIETIES

A FASCINATING COLLECTING HOBBY

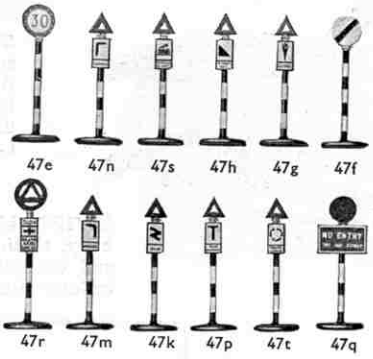
TRAM CAR
Dinky Toys No. 27
Assorted colours. Price 3d. each

MOTOR BUS
Dinky Toys No. 29
Assorted colours. Price 4d. each

MOTOR CARS
Dinky Toys No. 24
Fitted with detachable rubber tyres and silver-plated radiators

No. 24a	Ambulance	... ...	... each 9d.
No. 24b	Limousine	... ...	... ,, 9d.
No. 24c	Town Sedan	... ...	... ,, 9d.
No. 24d	Vogue Saloon	... ...	... ,, 9d.
No. 24e	Super Streamline Saloon	...	,, 9d.
No. 24f	Sportsman's Coupé	...	,, 9d.
No. 24g	Sports Tourer (4 seater)	...	,, 9d.
No. 24h	Sports Tourer (2 seater)	...	,, 9d.

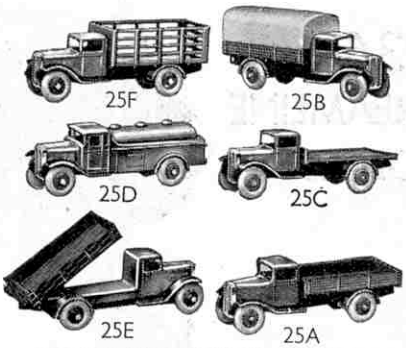
Price of complete set 6/–



ROAD SIGNS
Dinky Toys No. 47

No. 47e	"30 Mile Limit" Sign	... 2 for 3d.
No. 47f	"De-restriction" Sign	... ,, 3d.
No. 47g	"School" Sign	... ,, 3d.
No. 47h	"Steep Hill" Sign	... ,, 3d.
No. 47k	"Bend" Sign	... ,, 3d.
No. 47m	Left-hand "Corner" Sign	... ,, 3d.
No. 47n	Right-hand "Corner" Sign	,, 3d.
No. 47p	"Road Junction" Sign	... ,, 3d.
No. 47q	"No Entry" Sign	... ... ,, 3d.
No. 47r	"Major Road Ahead" Sign	... ,, 3d.
No. 47s	"Crossing, No Gates" Sign	,, 3d.
No. 47t	"Round-About" Sign	... ,, 3d.

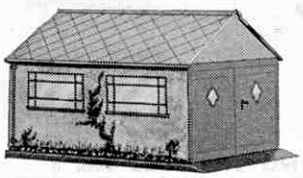
Price of complete set of twelve 1/6



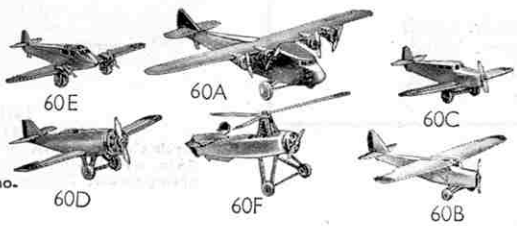
COMMERCIAL MOTOR VEHICLES
Dinky Toys No. 25
Fitted with detachable rubber tyres and silver-plated radiators

No. 25a	Wagon	... ... each 9d.
No. 25b	Covered Van	... ... ,, 9d.
No. 25c	Flat Truck	... ... ,, 9d.
No. 25d	Petrol Tank Wagon	... ,, 9d.
No. 25e	Tipping Wagon	... ... ,, 9d.
No. 25f	Market Gardener's Van	... ,, 9d.

Price of complete set 4/6



GARAGE
Dinky Toys No. 45
Fitted with opening double doors. Will accommodate any two Dinky Toy Motor Cars.
Price 1/6 each



AEROPLANES
Dinky Toys No. 60

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

Price of complete set 3/–

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

PASSENGER TRAIN SET
Dinky Toys No. 17

No. 17a	Locomotive	... ... each 9d.
No. 17b	Tender	... ... ,, 5d.
No. 20a	Coach	... ... ,, 7d.
No. 20b	Guard's Van	... ... ,, 7d.

Price of complete set 2/3

MIXED GOODS TRAIN SET
Dinky Toys No. 19

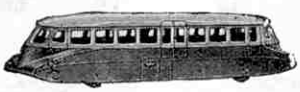
No. 21a	Tank Locomotive	... ... each 9d.
No. 21b	Wagon	... ... ,, 4d.
No. 21d	Petrol Tank Wagon	... ... ,, 6d.
No. 21e	Lumber Wagon	... ... ,, 5d.

Price of complete set 1/11

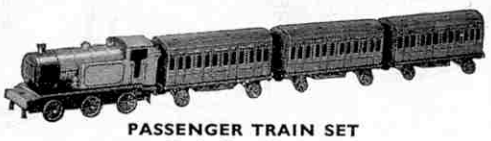
GOODS TRAIN SET
Dinky Toys No. 18

No. 21a	Tank Locomotive	... ... each 9d.
No. 21b	Wagons (3)	... ... ,, 4d.

Price of complete set 1/9



G.W.R. RAIL CAR
Dinky Toys No. 26
Assorted colours. Price 4d. each



PASSENGER TRAIN SET
Dinky Toys No. 20

No. 21a	Tank Locomotive	... ... each 9d.
No. 20a	Coaches (2)	... ... ,, 7d.
No. 20b	Guard's Van	... ... ,, 7d.

Price of complete set 2/6

Ask your dealer for a complete illustrated list of Dinky Toys

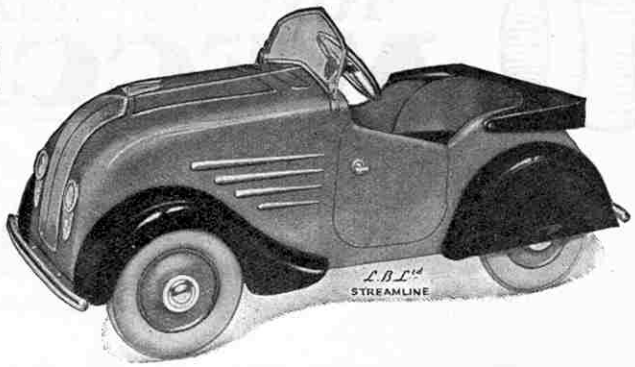
MECCANO LIMITED – BINNS ROAD – LIVERPOOL 13

TRI-ANG

THE FINEST TOYS FOR GIRLS AND BOYS

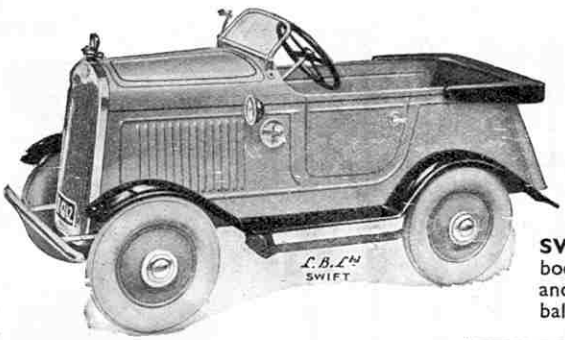
L. BROS. LTD. LONDON BROS ENGLAND

Regd. Trade Mark

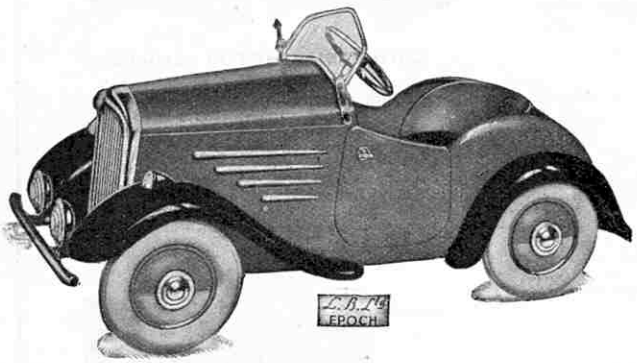


STREAMLINE. A real streamline body made of steel. Crank drive on ball bearing back axle. Facsimile Airflow radiator. Four dummy lamps. Tubular bumpers back and front. Windscreen and direction indicator. Balloon disc wheels and rubber tyres. Length 45 ins. **55/-**

1936 STREAMLINE MODELS



SWIFT. New design with rear streamline effect, pressed steel body, sloping radiator, tubular bumper, adjustable windscreen and direction indicator, dummy hood and lamps, balloon disc wheels and rubber tyres. Length 41 ins. **37/6**



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 seat. Length 45 ins. **49/6**

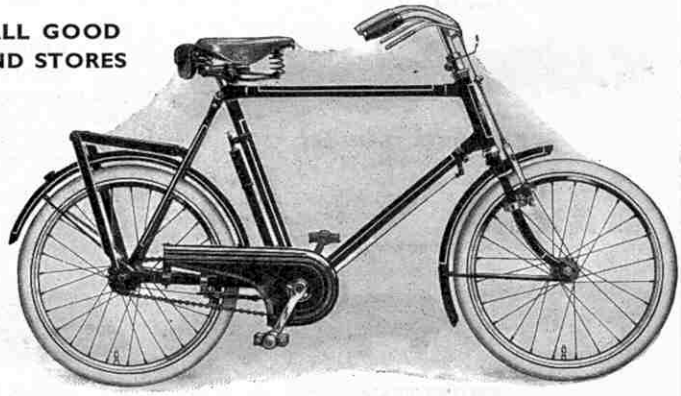
TRI-ANG TRICYCLE No. 5
NOW FITTED WITH REAR MUDGUARDS

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 FITTINGS. **59/6**

ON SALE AT ALL GOOD TOY SHOPS AND STORES

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**



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

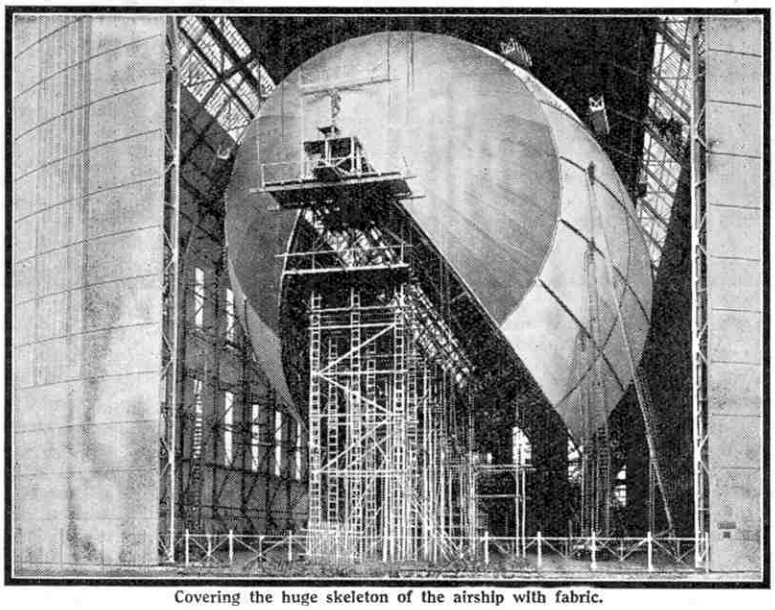
Frame of best quality weldless steel cycle tubing. Adjustable ball bearings throughout. 16 in. x 1⅜ in. Dunlop pneumatic tyres on rustless tangent spoked wheels. Two rim brakes. Raised Handlebars. ½ in. x ⅛ in. cycle roller chain. Three coil saddle. CHROMIUM PLATED FITTINGS. Black or blue. Girl's Model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

Made by

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

will enable the quantity of water taken on board prior to each trip to be greatly reduced.

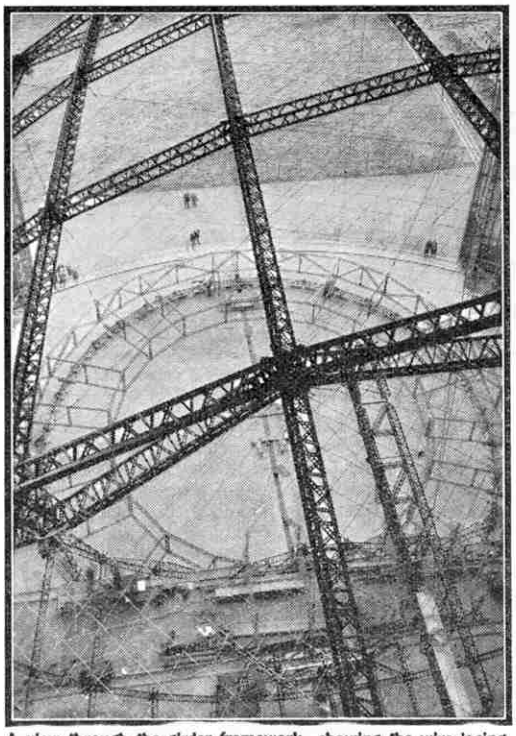
It is difficult for anybody who has not seen inside the *"Graf Zeppelin"* to appreciate the improvements made in space and in passenger accommodation on the LZ.129. In the older airship passengers and crew have to share the room afforded by a comparatively small gondola. There is only one saloon, doing duty as dining and recreation room combined. It has two doors at each end. The forward one leads to the small kitchen and the wireless room situated on either side of a narrow gangway, and beyond them are the chart room and the pilot house. The door aft of the saloon opens on to a similar passage, along the sides of which are 12 sleeping cabins, etc., and farther on are a store room and the crews' quarters within the hull.



Covering the huge skeleton of the airship with fabric.

On the LZ.129 all this has been changed, and there will be a feeling of spaciousness almost akin to that experienced on board a steamer. The pilot house, with the wireless room above, has been arranged to occupy a special gondola in the bow, and is quite separate from the passengers' part of the airship. This alteration will perhaps be most appreciated by members of the navigation staff, for on the *"Graf Zeppelin"* passengers have been known to trespass through to the "bridge" and amuse themselves by watching the officers at work, a trial the latter are said to have endured very patiently!

Behind the control gondola there will be a row of windows on each side of the hull to light two 45-ft. promenade sun decks. The upper (A) and lower (B) decks will be situated between the sun decks, as shown in the lower illustration on the previous page. Adjoining the starboard promenade on "A" deck there is to be a large dining room and entertainment hall and a combined writing room and library. Next amidships will be 25 sleeping cabins each containing two beds; which explains how accommodation has been provided for 50 passengers. In addition to being centrally heated, all cabins will have hot and cold running water, a wardrobe, table, service bell, etc., and of course the last row will be "outside" cabins, with windows abutting on to the port promenade. Coming down from above by way of a wide, very nautical staircase on to "B" deck, one will immediately be in the "works" of the airship, as here will be the kitchen with its electric stove and culinary equipment, the quarters of the 35 members of the crew, the chief steward's office, bathrooms, toilets, and a smoking room. This last might seem rather a daring introduction to an airship using chiefly hydrogen for buoyancy, but safety has been assured by an ingenious interlocking system of swing doors and special ventilation, effectually isolating the smoking room from the rest of the airship.

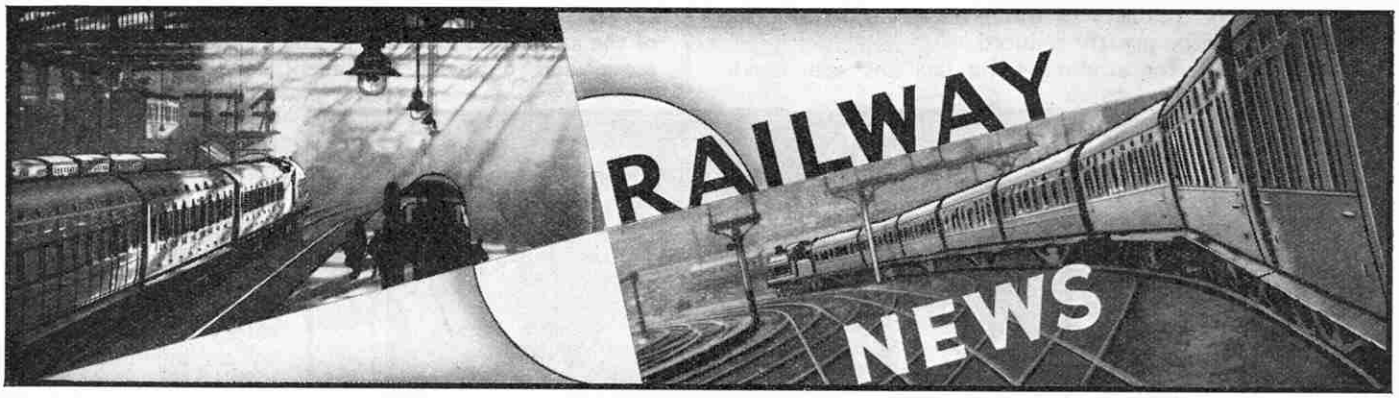


A view through the girder framework, showing the wire lacing, and one of the rings in course of construction on the ground.

Thus with typical thoroughness is being evolved a craft which Germany hopes will enable her to open up a new and unopposed trade route between Europe and North and South America. The historic *"Graf Zeppelin,"* with which Dr. Eckener made his name, is to be kept in commission, partly for reasons of national sentiment, but the years of pioneer adventure that it marks are now believed to be over. This is one of the reasons for the formation of the Luftschiff Zeppelin Reederei (Airship Traffic Company) who intend to exploit their new commercial venture to the full.

The *"Graf Zeppelin"* is much smaller than the LZ.129, her overall length being 772 ft., maximum diameter 100 ft. and maximum height 113 ft. Her propulsion machinery consists of five Maybach engines each carried in a separate gondola. Four of the gondolas are arranged in two pairs, staggered to avoid obstructing the slipstream, and the fifth one is placed centrally. The airship made her first flight on 28th September, 1928, and her first Atlantic crossing on 11th October the same year, when she flew to New York and back. During the past four years she has maintained a regular service between Germany and South America.

Airship development in this country ceased after the tragic loss of R.101 while on a flight to India on 5th October, 1930. The fateful journey was undertaken after the airship had been lengthened to provide room for an additional gasbag. When this alteration was completed the total capacity of the R.101 was 5,500,000 cu. ft. and her overall length was 800 ft. The R.100 was of slightly less capacity, being only 5,150,000 cu. ft. In the summer of 1930 she flew from Cardington to Montreal and back. She was broken up after the loss of the R.101.



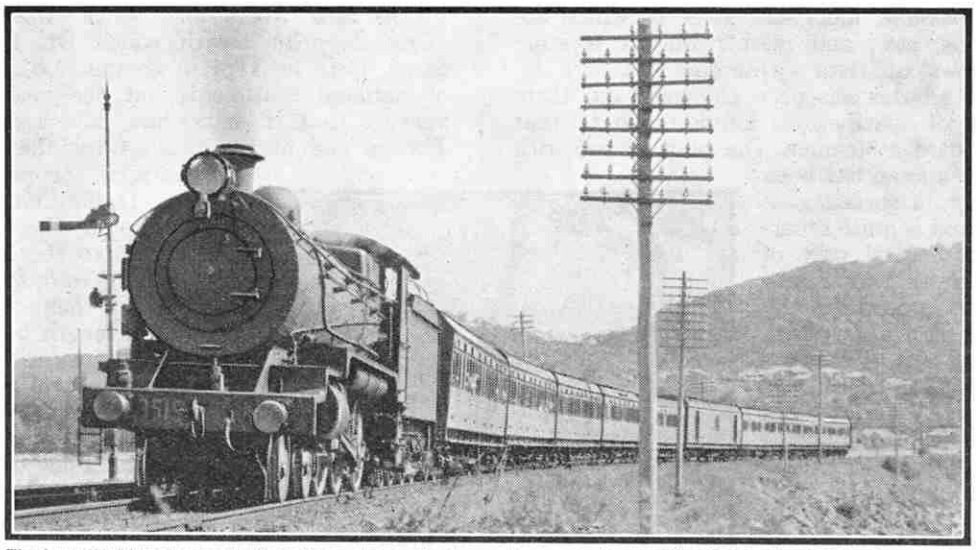
L.M.S.R. Locomotive Work

The latest L.M.S.R. "Princess" class 4–6–2s are doing magnificent work on the turns of duty on the Liverpool services mentioned in the *"M.M."* in November last. On a recent trip with the 6.5 p.m. *"Merseyside Express,"* the newest of the class, No. 6212, *"Duchess of Kent,"* had a load of 475 tons tare and 505 tons gross, and yet passed Rugby, 82.6 miles from Euston, in 81½ min. On the rise of 26.3 miles from Willesden to Tring speed averaged 60 m.p.h. throughout; the next 23 miles were covered at an average of 75 m.p.h., the maximum being 80½. In spite of the colliery slack at Polesworth and a bad signal check at Hademore crossing, Stafford, 133.6 miles, was passed in 134¼ min., and with a maximum of 81 m.p.h. down the Madeley bank the train was through Crewe, 158 miles, in 161 min. Fast running followed with a top speed of 75 m.p.h. near Weaver Junction, and Mossley Hill, 189.6 miles, was reached in 196 min., four minutes early; the net time being only 194 min. The net average speed was 58.8 m.p.h., a very notable figure, especially in view of the scrupulous care with which the various service slacks were observed. Copperwheat of Camden shed was the driver.

On the up *"Liverpool Flyer,"* No. 6208, *"Princess Helena Victoria,"* had the exceptional load of 438 tons tare and 470 tons gross, the train being packed. Starting brilliantly from Crewe, a speed of 51½ m.p.h. was sustained up the 1 in 177 of Madeley bank; and with a top speed of 80½ m.p.h. at Norton Bridge the train was through Stafford, 24½ miles, in 25½ min. Recovering very rapidly from the 40 m.p.h. slack there, speed was up to 74 at Rugeley and reached 80½ again at Hademore troughs. Thus Tamworth, 48 miles, was passed in 46¾ min. The Polesworth colliery slack followed, and then came another brilliant burst of speed. Nuneaton was passed at 70 m.p.h., the 1 in 320 rise to Bulkington was mounted at a sustained minimum of 64½ m.p.h., and with a long-sustained 75 beyond Brinklow, Rugby, 75.5 miles from Crewe, was passed in 71¼ min. The 46.2 miles from Milford to Rugby No. 7 Box had been covered at an average of 68.8 m.p.h.

At Weedon 80½ m.p.h. was touched for the third time, and after passing Roade, 98.2 miles in 91½ min., the engine was very slightly eased. Bletchley was passed nearly 3 min. early, however, but at Cheddington adverse signals brought the train practically to a stand. Up the 1 in 335 to Tring speed rose to 52½ m.p.h. in 4 miles—a remarkable feat; and with a swift descent towards London a punctual arrival was almost assured, despite the delay, but a final check outside Willesden made the total time 143¾ min. Net time was only 138 min. for the 152.6 miles, giving an average speed of 66.4 m.p.h. On the final descent speed averaged 75.7 over the 16.4 miles from Boxmoor to Wembley, the top speed being 79 m.p.h. We are indebted to Mr. O. S. Nock for these timings.

It is interesting to note that the speed restriction at Polesworth mentioned above, which is due to subsidence caused by mining operations, is to be eliminated by the purchase of the mineral rights of a section of one of the coal seams under the main line. The coal will be left undisturbed, and the removal of the restriction will allow trains to pass at 65–75 m.p.h. instead of slowing up as hitherto necessary. This will save about two minutes in running, and will be an important factor in punctual working and in possible future accelerations.



The down "Brisbane Express" at Hawkesbury River. The locomotive is a standard 4-6-0 of the New South Wales Government Railways. Photograph by R. B. McMillan, Victoria, Australia. (H.R.C. prize-winning entry.)

"The Yorkshire Pullman"

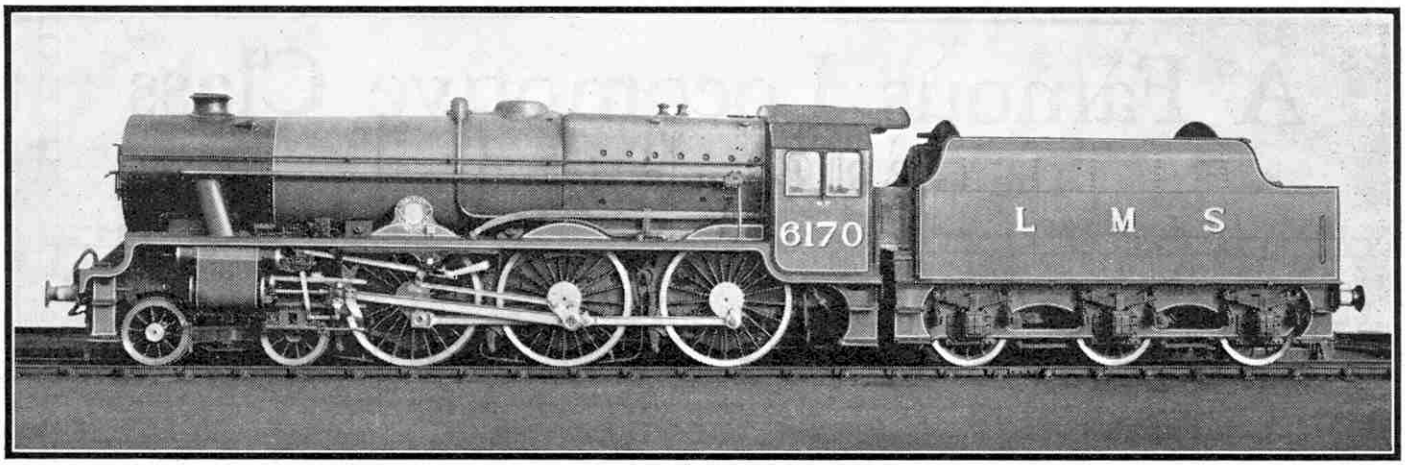
With the introduction of *"The Silver Jubilee"* Newcastle service last year, the former *"West Riding Pullman"* ceased to serve that city. Instead, Hull for the first time now enjoys Pullman facilities. Leeds, Bradford, and Harrogate are of course still served, and the name of the train is now appropriately *"The Yorkshire Pullman."* These revised workings terminated the connection of King's Cross enginemen with the Pullman trains, an association that has lasted ever since the service commenced in 1923. The drivers forming the "Pullman link" at King's Cross have enjoyed a wonderful reputation for punctual work, and the pages of the *"M.M."* have frequently borne witness to the time - regaining feats of various members of this link. Leeds men now work the *"Queen of Scots"* trains, and *"The Yorkshire Pullman"* is worked by Doncaster men, as stops are made at that place on account of the Hull portion.

An interesting incident recently was the working of *"The Silver Jubilee"* on its up journey by a standard "Super-Pacific." Owing to a slight mishap a streamlined "Pacific" was not available, but No. 2503, *"Firdaussi,"* brought the train into King's Cross one minute early, to the intense disappointment of those waiting in anticipation of seeing the streamlined *"Silver Link"* or *"Quicksilver"!*

A Locomotive Depot Removal

As part of the L.M.S.R. scheme for the modernisation of motive power depots on the system, the Western Division shed at Buxton has been provided with an improved track layout and with automatic coaling and ash plants. The locomotives and staff of the former Midland Division shed have been transferred to the Western Division shed.

The programme of improvements at various depots is proceeding, a recent step of importance being the installation of a new 70 ft. turntable of the articulated type at Camden.



The "*British Legion*"

The "Royal Scot" class locomotive No. 6170, that was mentioned in the "*M.M.*" of last October as being fitted with a tapered boiler, has now been in traffic for some time. For the first few days of its existence it was nameless, but on 12th November, in the presence of a distinguished company at Euston Station, No. 6170 was officially named "*British Legion.*" The late Earl Jellicoe performed the naming ceremony by breaking a bottle of champagne over the nameplate. This plate is not of the standard form, but is specially shaped and carries a replica of the lion's head surrounded by a ribbon carrying the words "British Legion" that is the emblem of that organisation. On this occasion the engine was manned by an ex-soldier driver and an ex-sailor fireman. The Union Jack, the White Ensign and the British Legion flag decorated the front of the locomotive.

The photograph on this page gives an excellent impression of the sturdy appearance of the engine. Apart from the provision of a tapered boiler it does not differ greatly in design from the other "Royal Scots," but the opportunity has been taken to incorporate various recent developments in design. As compared with the Stanier standard engines a dome is provided to act as a steam collector, and in addition it accommodates the regulator valve. Top-feed apparatus is retained, but in the form of a separate fitting on a manhole cover in front of the dome.

As the cylinder dimensions, driving wheel diameter and working pressure are unchanged, the tractive effort remains at 33,150 lb. A new feature is the provision of a continuous blow-down valve that allows a certain amount of water to escape from the boiler and assists in preventing the concentration of salts or mineral matter deposited by the evaporation of the water.

The cylinders are arranged as in the original "Royal Scots," but have been modified in order to provide a saddle to support the smokebox. This is set forward to some extent so that the outside steam pipes to the cylinders issue from it at an angle and slope backward, giving an impression of speediness to the engine when seen broadside-on. Except for minor alterations the motion is the same as for the original engines. The bogie is now arranged with side bolsters to transmit the load from the main frames.

A cab of the latest side-window type replaces that of the original "Royal Scot" design. Small glass windscreens are fitted on the outside of the cab between the two windows to protect the enginemen from draught when they are looking out. Steam sanding gear is fitted and grease-gun lubrication is applied to the brake gear and intermediate buffing gear, and also on the tender hand brake and water pick-up apparatus.

The tender is of the latest standard 4,000-gallon type carrying nine tons of coal. Its dimensions generally cause it to match the engine in a more satisfactory manner than do the older and smaller standard tenders fitted to the other "Royal Scots." The weight of the engine remains the same, 84 tons 18 cwt. in working order, but with the larger tender the combined weight becomes 139 tons 11 cwt. instead of 127 tons 12 cwt.

In the upper illustration is L.M.S.R. No. 6170 "British Legion" described on this page. Photograph by courtesy of the L.M.S.R. The lower photograph shows Ambleside station on the Furness Section of the L.M.S.R., with one of the large Furness "Baltic" tank locomotives at the platform. Photograph by Mr. J. Adams, Keighley.

Five-Year New Works Scheme

The recent announcement of the Government approval of a £30,000,000 scheme for railway development has no doubt been noticed by our readers. The programmes drawn up by each group are interesting in their variety and comprehensive nature. Work is to be begun as soon as possible and is expected to be completed within five years.

On the L.M.S.R. the long-debated electrification of the Wirral Section is to be effected, giving through working over the Mersey line into Liverpool. Euston Station is to be reconstructed, and other passenger and goods centres are to have improved facilities. Colour-light signalling is to be installed between Euston and Willesden and at other points of dense traffic. That the steam locomotive is expected to hold its own against competing forms of motive power in the future is shown by the construction of 369 new engines.

Main line electrification is a feature of the L.N.E.R. programme. This refers to the section between Manchester and Sheffield, which carries a heavy traffic in difficult country. Increased facilities for traffic operation, such as the provision of additional tracks, the doubling of single lines and the extension of colour-light signalling, are to be provided. Station and dock improvements are planned, and in addition to new locomotives and rolling stock the conversion of gas-lit vehicles to electric is to be accelerated. Track circuiting and automatic train control are to be extended.

The G.W.R. scheme similarly provides for the further extension of their automatic train control system, and other signalling, telephone and telegraph improvements. New lines are proposed, including a diversion between Dawlish and Newton Abbot and the doubling of single lines and improved facilities at various places. Diesel rail-cars will be provided for local branch services and a more extended use of heavier and powerful engines is to be made possible.

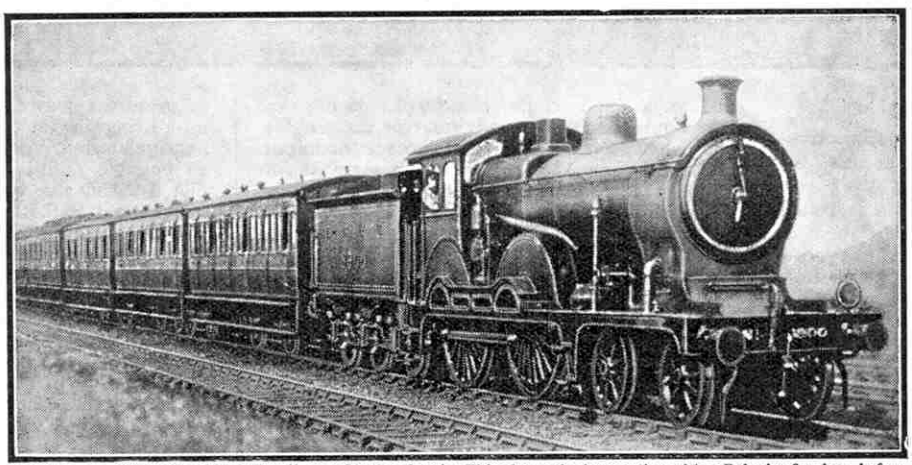
The S.R. electrification is to cover a still wider area, including the Portsmouth main line via Woking and Guildford. Extensions to the Central and Eastern Sections electrification systems also are proposed. A new line from Motspur Park to Leatherhead is to be constructed and various stations are to be rebuilt.

This plan will render the railways better able to deal with a more generally speedy and comfortable service.

A Famous Locomotive Class

The G.E.R. "Claud Hamiltons"

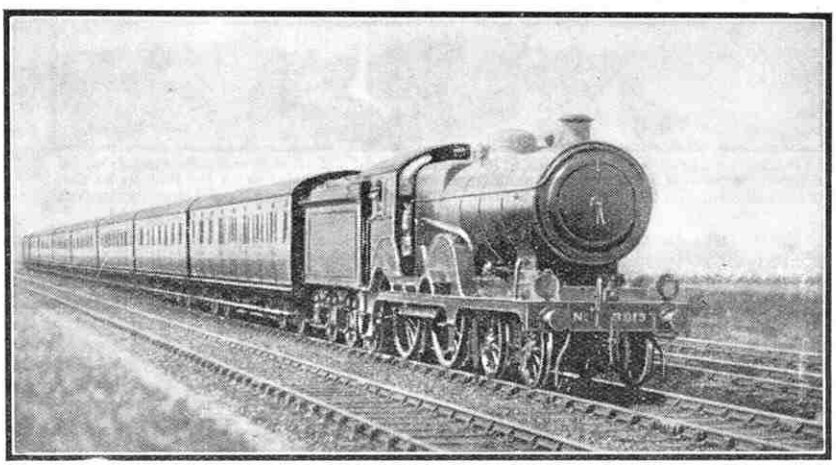
IN these days of locomotive standardisation the older types and classes of engines, with which we have been familiar for so many years, are disappearing more or less rapidly; in many cases they are being condemned as fast as their boilers and cylinders give out. In certain instances, however, it still appears possible to rebuild, or rather reconstruct, older locomotives in order to fit them for a further lease of life under modern conditions. A good example of this kind of renewal is found in the 4–4–0 locomotives of the "Claud Hamilton" class of the former Great Eastern Railway, now included in the L.N.E.R. group.



L.N.E.R. No. 8900 "Claud Hamilton" on a Southend train. This shows the locomotive with a Belpaire fire-box, before its recent reconstruction. This and the other illustrations to this article are by Real Photographs Co. of Liverpool.

The Great Eastern Railway served much of the East Anglian coast, and the increasing demands of the Cromer and other important main line traffic led to the introduction of the class in 1900. The first of them, from which the class gets its name, *"Claud Hamilton,"* then No. 1900, gained a gold medal at the Paris Exhibition of 1900. The *"Cromer Express"* had been steadily growing in weight since its introduction in 1897, and had been hauled successively by the 2–2–2 and 4–2–2 "single-wheelers" designed by Mr. J. Holden. The increasing weight, however, and the peculiar difficulties of the G.E.R. main line, made the coupled type of locomotive essential for the maintenance of the relatively fast schedule, and so the 4–4–0 engine with its larger boiler and adhesion weight, was adopted.

In appearance these locomotives were extremely ornamental, even for a period when great care was taken with the finish of locomotives and when engine-cleaning was almost a fine art. Possibly as a result of their designer's previous association with the Great Western Railway, the "Clauds," as they became known, had neat copper-capped chimneys. Brass caps were adopted later instead of copper. As was the case with many other British locomotives of that time, the edges of the driving wheel splashers were beaded with brass. The small raised splashers formed in the footplating for the accommodation of the coupling rods were very similar to the pattern used on many L.N.W.R. locomotives, and the openings in them, too, were provided with brass beading. The engines were finished in the blue livery of the Great Eastern Railway, with the elaborate lining out and the red-painted coupling rods that were popular years ago, and looked particularly handsome.



"Super-Claud" No. 8813 on a down express. This is a typical example of these engines with large boilers and extended smoke-boxes. The top-feed valves appear at the sides of the dome.

The increasing popularity of the *"Cromer Express"* led to the introduction, on 1st July, 1907, of new stock specially built for the service. The title of the train then became altered to *"Norfolk Coast Express."* The division of the train into portions for various destinations took place at North Walsham, to which point the 130 miles from Liverpool Street were run non-stop, at an average speed of 49.4 m.p.h., in 2 hours 38 minutes. As the chief express engines of that time, the "Claud Hamiltons" had to deal with this train, which was made up normally, including restaurant and kitchen cars, to 12 vehicles weighing altogether some 340 tons. Frequently at summer week-ends this load was increased, and the management of a load in the neighbourhood of 400 tons became a strenuous matter for a 51-ton 4–4–0 locomotive.

The "Claud Hamiltons" gained a special reputation in the working of these trains, and the remarkable running that was performed by them was stimulated considerably by the rivalry between the three locomotive depots that were jointly responsible for providing locomotive power for the train. These were Stratford, Norwich and Ipswich, and only picked locomotives with selected enginemen were assigned to this duty. The coal was of a special grade, and the trains ran only during the summer months, and thus mainly under favourable weather conditions. Even with these advantages the running conditions of the Great Eastern main line made the management of a locomotive of really moderate size, so heavily loaded, a task for "crack" enginemen only.

With fairly large driving wheels, 7 ft. in diameter, and of only 33 tons 7 cwt. adhesion, the acceleration by the "Claud Hamiltons" of such vast trains, not only at the start but after the numerous service slacks en route, most of them occurring awkwardly at the foot of inclines, is a source of wonder to us in these days of six-coupled engines with three and four cylinders. The boilers and cylinders were not of remarkable size, and superheaters were not experimented with until 1911, and then only on four engines. The steam-producing capacity of the "Claud Hamilton" boiler must have been extraordinary, and this, in conjunction with the conditions of maintenance and handling, probably furnishes an explanation of the amazing results.

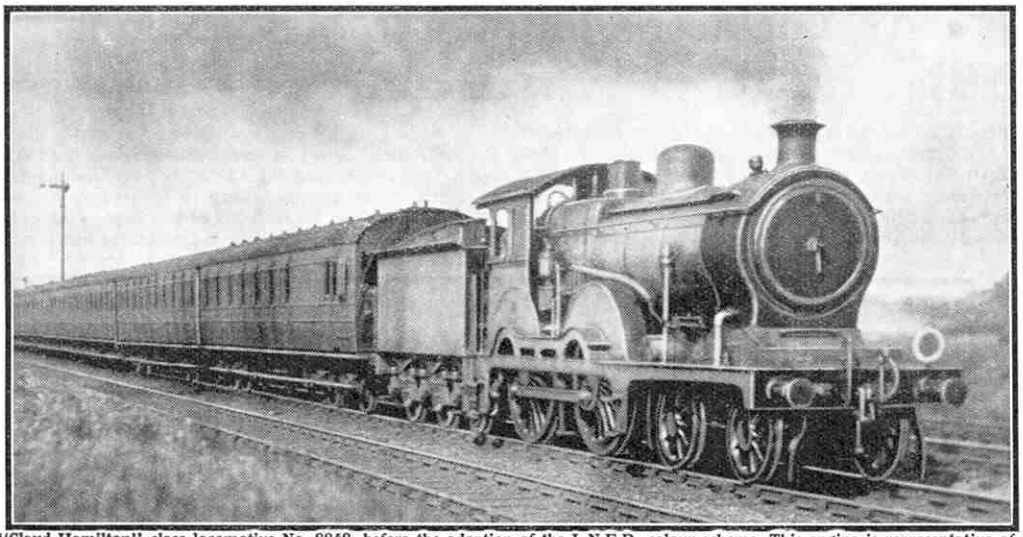
By 1911 the class numbered 111, and it is remarkable that each lot of them, as they had been built, received earlier numbers than those preceding them. As a result, although the first engine *"Claud Hamilton"* was No. 1900, the 1911 batch were Nos. 1790–1799, the numbers of the class thus being consecutive, but in the reverse order of building dates.

As is frequently the case with a class of engines turned out over a period of years, different batches varied in details although the

main features of the design remained the same. Those built from 1904 onward had fire-boxes of the Belpaire type, and boilers of these engines were pitched higher than those of the earlier ones with ordinary round-topped fire-boxes. Again, the leading sandboxes, which were situated above the footplate in front of the driving wheel splashers of the first engines, were on subsequent engines placed below.

There were numerous differences also in auxiliary equipment. Some engines had spark deflectors and special ash-ejecting blast pipes.

All of the class originally had power reversing gear. This and the tender water scoops were operated by compressed air. The Great Eastern was a "Westinghouse brake" line, so that the air compressor of the brake apparatus formed an obvious means of obtaining this auxiliary power.



"Claud Hamilton" class locomotive No. 8848, before the adoption of the L.N.E.R. colour scheme. This engine is representative of the class as superheated without increase in the size of the boilers.

Originally, Nos. 1860-1900 were oil fired on the Holden system, but the number so fitted was reduced to a mere handful after the system became no longer economical. Certain of the engines were again fitted for oil burning in 1921 and 1926, owing to coal strike difficulties, but the use of oil fuel has now been abandoned for some time and the fittings have been removed.

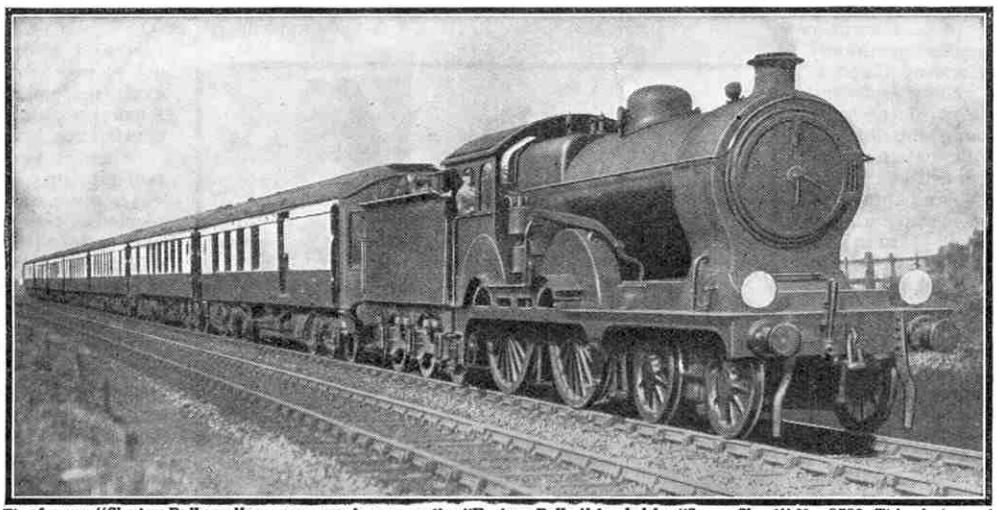
Apart from the experimental fitting of superheaters to four of the class in 1911, no further move was made in this direction until 1914. Since that time all of the class have been dealt with, retaining, until the more recent rebuilding of some of them, their ordinary slide valves. In addition since 1915 the fitting of Belpaire fire-boxes to the earlier locomotives has also taken place.

A further development was seen in 1923 when No. 1805 appeared fitted with a larger boiler than the original one. Its success apparently inspired the construction at Stratford in the same year of 10 further new "Super-Clauds," as they are called. These engines were turned out as L.N.E.R. products, and under the L.N.E.R. numbering scheme they are Nos. 8780-8789, thus conforming with the "numbering in reverse" followed for the rest of the class. In due course 29 more "Clauds" were provided with larger boilers, and so became "Super-Clauds," and an additional modification was the fitting of extended smoke-boxes. Extended smoke-boxes too were fitted to many of the engines with boilers of the original size.

All these locomotives were at first painted the L.N.E.R. green standardised for passenger engines. More recently, however, the adoption of black for locomotives for secondary duties has affected the "Claud Hamiltons" as a class. Exceptions to this are Nos. 8900, 8783 and 8787, which still retain the L.N.E.R. green, in view of their reservation for any Royal Train duties between London and Wolferton, the station for Sandringham.

The association of Great Eastern engines with "Royal" duties, dates back to 1861 when the late King Edward VII, then Prince of Wales, acquired the Sandringham estate. From the diminutive 2–2–2 single-wheeler locomotive that was specially decorated for the Royal Wedding journey to Wolferton on 10th March 1863 of the then Prince and his bride, afterwards Queen Alexandra, to the engines now used, a succession of types have been employed that form in themselves an interesting chapter in the history of locomotive development. With the advent of the "Claud Hamiltons" these special duties passed to them in their turn. As a general rule two of these engines have been recognised as "Royal" engines, although the individual locomotives sharing the honour have varied at different periods. The present "Royal" engines have, therefore, a distinguished band of predecessors. No. 8900 "*Claud Hamilton*" itself, in addition to the special interest attaching to it, is also notable as having been selected as a representative locomotive for the Stockton and Darlington Centenary Celebrations in 1925.

Alterations carried out in recent years by the L.N.E.R. which do away with much of the characteristic appearance of the "Claud Hamiltons" have been the fitting of a plain cast-iron chimney and the removal of the "open work" of the coupling rod splashers. In some cases the chimney resembles the G.N. pattern and, with the now plain raised footplate, these alterations bring the engines more into line with L.N.E.R. standard practice.



The former "Clacton Pullman" express, now known as the "Eastern Belle," hauled by "Super-Claud" No. 8783. This photograph shows the appearance of the engines with large boilers and top-feed apparatus, but with the short smoke-box.

The most drastic alteration in appearance, however, is seen in those engines, including the first of the class No. 8900, which have been completely reconstructed. In these, new frames have been provided, and new boilers having round-topped fire-boxes, an interesting reversion in this respect. The cab although still a double-windowed structure is of standard L.N.E.R. design. Some of these reconstructed engines are provided with new cylinders having piston valves with a long travel. Others retain the original cylinders and short-travel slide valves, also their power reverse gear. This, however, is removed from the piston-valve engines. All of them retain the power operation of the tender water scoops.

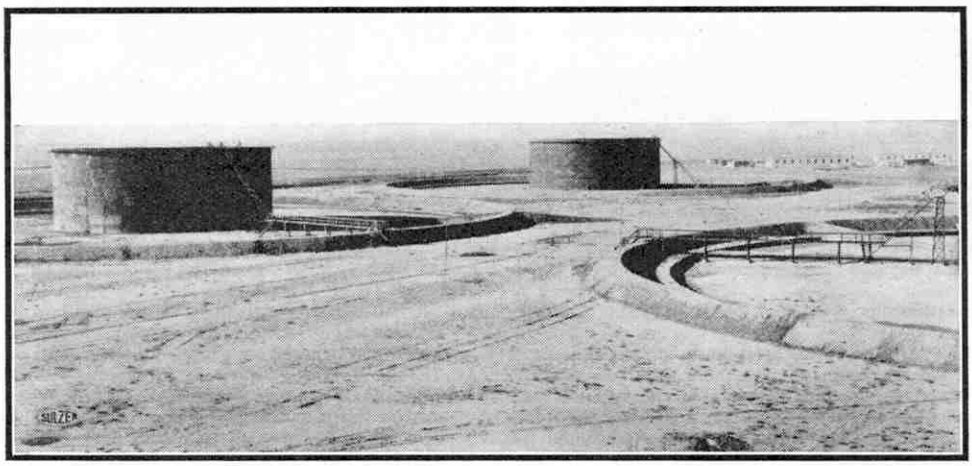
Whether the whole of the class will be dealt with in this way is uncertain. However this may be, the class has had an interesting history, and may be numbered among the various 4–4–0 engines, belonging to different British railways, that have consistently performed extremely good work, in spite of the theoretical limitations of their design.

Diesel Engines for the Iraq Pipeline

An Engineer's Journey to Mesopotamia

ON the point of departing from Haifa on the Mediterranean coast to reach the Mesopotamian oilfields by motor car through the desert, we left the Iraq Petroleum Company's administrative buildings certain that we should for a long time have to deny ourselves the ordinary comforts of civilisation. In our hands we held a small order form for our desert equipment, which we had to receive as the last preparation for our journey. On a fine December morning we packed the necessary provisions under the seats of our car. In order not to neglect any precautions, the engine and the tyres of our car were inspected once again.

Scarcely had we passed the last houses of Haifa and obtained a free view over the sea, when 16 gloomy gigantic steel erections came into sight on the side of the bay. These were the enormous oil tanks of the Iraq Petroleum Company, each with a capacity of 11,000 tons. We were not given much time to wonder at them, however; relentlessly our powerful eight-cylinder engine took us over the mountain chain of Nazareth, at an altitude of about 2,600 ft. In passing quickly through the little town there was not much to be noticed of its famous past.



Oil tanks at a pumping station, surrounded by safety trenches. The tanks have a capacity of about 11,000 tons each, and are fitted with floating covers. The illustrations to this article are by courtesy of Sulzer Bros. (London) Ltd.

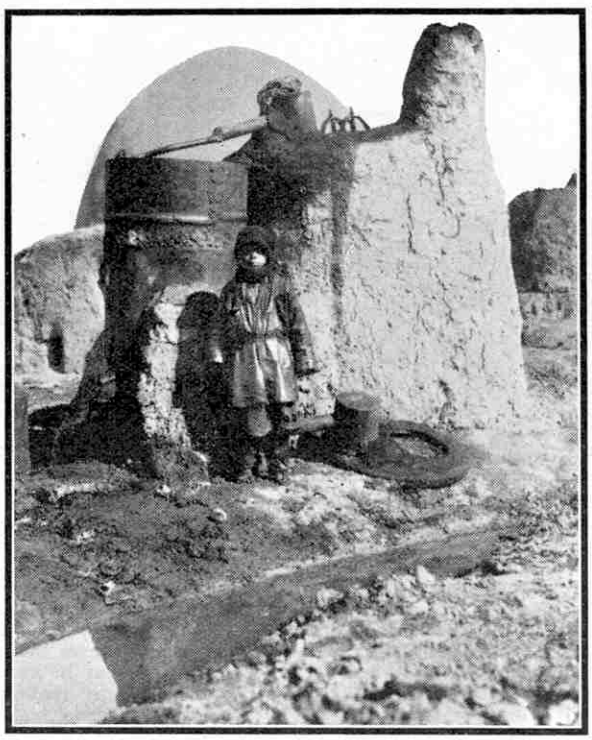
After another hour we suddenly caught sight of the lake of Tiberias, lying about 700 ft. below us, and could also see the town of the same name. We drove along the lake at about 45 miles an hour, passing neat-looking settlements, and then entered the valley of the Jordan and approached the frontier of Transjordania. Even the venerable old Jordan has not quite escaped the influence of this century of technical progress; its waters are being dammed in order to provide energy for a modern hydro-electric power station.

Leaving the fertile banks of the Jordan behind, we moved towards the last chain of hills. Scarcely had we reached the top when we had before us over the bonnet of the engine a free view of the valley in front, a view of an unending yellowy-brown surface—the desert. Here for the first time we came into touch with the Iraq pipeline. Of the line itself there was certainly no longer much to be seen, since the pipes had already been welded together electrically and lay buried some 3 ft. below the surface. Only a small line of earth and stones, and a row of telegraph poles running parallel to it, indicated the track of the pipe line.

Raising a huge cloud of dust behind us, we now ran alongside the telegraph line. After having gone some distance east, we could see the cooling-water tanks of the pumping station "H5" standing on the horizon. Soon afterwards the gleaming tents of the settlement could be seen, and shortly after that an Arab, armed with a Turkish scimitar and rifle, opened the entrance in the barbed wire fence encircling the camp to let us enter.

Besides the single tents of the Europeans, there were several rows of tents for four persons, intended for erectors and passing guests. A little apart from these stood the lines of tents for the Arabs. In addition to its own power station, which serves to generate electric current, a small refrigerating plant was also installed in the camp for making the very necessary ice. If we looked upward over the tents for a change, we saw the two high masts for the antennae of the wireless station reaching up into the sky. Great attention has been paid to the health of the staff as well as to their personal safety. The doctor at each station has in his hospital a well-equipped dispensary and a clinic, and a motor car is available for transporting sick people.

We set out again on our journey in a north-easterly direction, and the tents and buildings of pumping station H-5 soon disappeared in the hot shimmering air of the desert. About half-way between H-4 and H-5 the desert began to get stony. We were approaching an extensive volcanic region that was formerly about 150 miles in circumference.



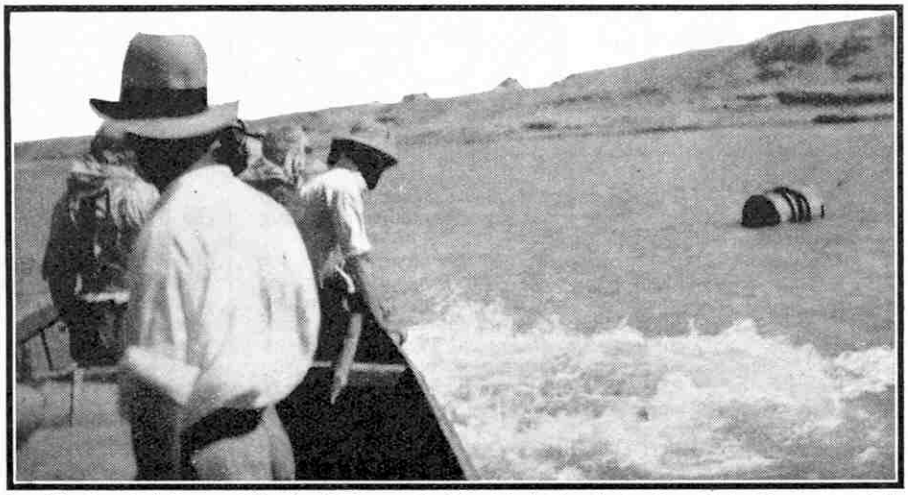
Old oil still, as used by the natives in Iraq territory. The vapours are condensed in the vessel at the left.

When it is remembered that the two pipelines were completed in one year, an approximate idea can be formed of the pace at which the work had to be carried out. The principal mechanical assistance in the work was given by the huge 40-ton lorries that had to be used for transporting the steel pipes from the railway stations at Baiji and Mafrak. After the pipes had been laid down ready in a line through the desert, the powerful trench-digging machines began their work, cutting a finished trench in the ground. A little behind them the pipes were hoisted up by small cranes fitted on caterpillar tractors; the ends of the pipes were held against each other while they were welded together by the erectors. The necessary electric current was generated on the spot in portable sets. When a certain length of pipe was ready welded, another "technical wonder" covered it with a layer of pitch and wound a kind of roofing paper over that. After the pipe thus prepared had been laid in the trench, a motor plough put the earth back into place and the work was finished.

There are no expansion joints provided in the whole length of the

pipeline. The only precaution taken to prevent too great heat stresses consisted in the length of pipe welded and buried in one day not being welded with the previous length of pipe until the following morning. The pipe lying in the earth had consequently time to cool down during the night to the same temperature as the ground surrounding it.

The journey through the desert was for the greater part very monotonous. The only variety introduced now and then was the appearance of a troup of gazelles, a desert wolf, a sand hare or a fox. Also there was much to see in the desert that had no actual connection with reality; for example the mirages, which now and again showed a beautiful lake with islands on it, the whole picture suddenly disappearing as we approached it, leaving only dry ground in the place where water had been seen a moment before.



Searching for a leak in one of the pipes laid across the River Tigris. The pipe has been filled with compressed air, and the bubbles indicate the position of the defect.

While we were still occupied observing such phenomena, the fertile banks of the Euphrates were approaching. The river flows past pump station K-3 to the Persian Gulf in a deep cut in the desert, and an island beautifully situated in the middle of the river gives the district a very idyllic appearance. We had hardly crossed the river when the bare desert started again.

In contrast to the Euphrates, the banks of the Tigris are almost completely bare. They show clear traces of pitch and tar, however, from which it can be concluded that the oilfields are no longer far distant. We crossed the Tigris at Fatha on an aerial railway. The pipeline here is simply laid in the river, and describes a bend directed upstream.

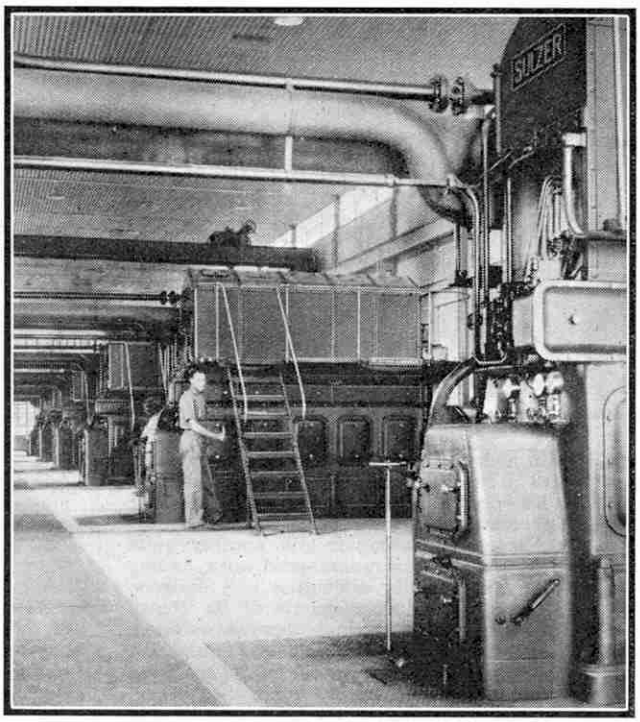
About half way between K-1 and K-2 the desert began to change into a steppe, and about 10 miles before Kirkuk extensive corn fields with growing grain greeted us. This fresh vegetation does not remain long in the neighbourhood of Kirkuk. As soon as the actual summer begins, the temperature in the shade never falls below 115-122°F., and all vegetation consequently disappears.

We were quickly approaching the end of our journey. Already in the distance we could discern the derricks of the oilfields, and soon afterwards the town of Kirkuk, which lies partly perched on a flat rock and partly in a deep hollow. A little later we were standing in front of our future "home." We regarded with mixed feelings the half-round corrugated iron shed, protected against the heat of the sun with a thick layer of clay; but we were agreeably surprised to find inside three nicely furnished rooms, and also a bathroom and a small kitchen. A native oil refinery was smoking in front of our windows, just to remind us that we were not in a week-end cottage but right in the middle of the rather unromantic oilfields of Mesopotamia. The presence of petroleum has been known to the natives in Iraq for several centuries; already for ages it has been used for heating.

We strolled along the bed of a small stream, and at once noticed big spots of oil floating on the water; and when we examined the stream somewhat more closely we saw that many small bubbles were rising up, giving off a strong smell of poisonous natural gas. After having climbed higher up the rocky sides we came on the gas again on the hill top, but there it was burning, countless small flames issuing from holes in the ground. This natural gas is said to have been burning as long as anyone can remember, and is known to the natives under the name of "eternal fire." We went up the stream to the place where the floating spots of oil started, and soon found that they originated in an oil well trickling out of a rock, the black substance flowing into the bed of the stream. Close to this spot a well of sulphur water sprang from a cleft in the rock, and this health-giving water is used by the Arabs for bathing.

Here is also the district where the natives obtain their petroleum. First of all they dig a small hollow, in which a pool of oil has collected by the following day. This is baled out, filled into cans and transported to the refinery, where the petroleum is heated in a still and evaporated. The gases collect in a small dome, and are then cooled in a spiral tube that is fitted beside the still in a water-cooled cask. The vapours condense and appear at the end of the cooling coil as petroleum ready for use, and this is filled direct into tin cans. The oil cakes remaining in the stills are taken out when the distilling process is finished and used as fuel for the next lot of oil. The petroleum obtained in this manner is transported by passing caravans into all parts of the desert, where it is used for heating and cooking.

The Iraq Petroleum Company obtain their oil by means of the same methods, the only difference being that their wells are boreholes, some of which reach to a depth of 4,000 ft. beneath the ground level. At present the Company have 32 serviceable wells, each of which is capable of yielding 1,300–2,000 tons daily. The oil issues from the boreholes at a pressure of about 3,000 lb. to the sq. in., and passes through a de-gasing plant before it is pumped through the desert. In that plant the natural gases are extracted from the oil and then led away and burned. After the first purifying process, the petroleum flows into the oil tanks of the pumping station. If one of the tanks leaks, any flooding of the surrounding ground is prevented by a trench and wall of earth surrounding the tank. In order that an explosive mixture of petrol and air may not accumulate over the petroleum in the tanks, the roofs of the tanks are designed as floating double covers, which rise and fall with the level of the petroleum in the tanks.



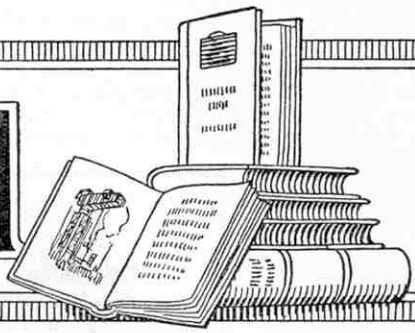
Power station on the Iraq pipeline, equipped with six Sulzer 5-cylinder 4-cycle Diesel engines, each developing 500 b.h.p. at 300 rev. per min.

We at last approached the buildings in which the machinery of the station was installed, and on entering the workshop our attention was called to the excellent Diesel-electric fire-extinguishing plant. Leaving this building, the engine house, constructed entirely of steel, was facing us. Along the outside of one of the walls are six small steam boilers used in the winter months for raising heating steam from the exhaust gases of the Diesel engines.

In the lofty hall of the engine house we saw 6 Sulzer Diesel engines that transmit their power to direct-coupled reciprocating pumps working in an adjoining room, separated from the engine room by a gastight partition. In order that there may be no risk of igniting the petroleum gases, all the electric plant is located away from the engine house.

For this interesting description we are indebted to Sulzer Bros. (London) Ltd.

Books to Read



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

"Motor Racing and Record Breaking"

By G. E. T. Eyston and B. Lyndon
(B. T. Batsford Ltd. 7/6 net)

As a book on motoring this breaks new ground by being devoted exclusively to racing and record breaking, and for this reason it will be welcomed by all motor enthusiasts. Captain Eyston's name needs no introduction to those who have watched the development of one of the most distinguished racing and record-breaking careers in the history of British motoring. With the aid of Mr. Barré Lyndon he has produced a book that not only contains a full account of the development of the sport from the very dawn of motoring, but also is packed with thrills.

What might be described as the world's first motor race of any importance started from Versailles on 11th June, 1895, and the course was to Bordeaux and back, a distance of 732 miles. The event was won by Emile Levassor in a 4 h.p. Panhard at an average speed of 14.9 m.p.h. One has only to contrast this with the speeds reached during the past year to realise the enormous progress that has been made by the automobile engineer. Motor racing is probably the most dangerous of all sports, and road racing is the most exacting of its many forms. The authors give us a vivid picture of what is involved in road racing, and the qualities demanded of the driver and all who are associated with him.

Track racing is entirely different in many respects, its special object being to develop machines in which everything is sacrificed to maximum speed. The driver's comfort is of minor importance, and effective brakes are often dispensed with, because normally they are not required until the end of the race, when there is usually plenty of room in which to stop the machine. The cars are more delicate than those built for the road, and a driver's greatest difficulty is to handle his machine with restraint. Only when the issue of a race becomes clear and he sees that victory may be gained by driving flat out dare he travel at full throttle, matching the chance of winning against the possibility of "blowing up" his engine. The chapter devoted to this topic gives a survey of track racing all over the world.

Pit work, that is the arrangements for fresh supplies of petrol, oil and water, for new tyres and the replacement of damaged or broken parts, is of enormous importance in long-distance races. We are given an excellent description of the extraordinarily efficient manner in which the necessary operations are carried out when a driver comes in to his pit. Another important part of the work of the pit is in signalling to a driver to inform him of his position in a race, and to let him know whether his speed is adequate or whether he must increase it if he is to win.

Record breaking is still another quite distinct phase of motor speed work, having its own peculiar difficulties and dangers. The splendid achievements of Sir Henry Segrave, John Cobb and others are outlined, culminating in Sir Malcolm Campbell's achievement in September last of his great ambition to surpass 300 m.p.h.

Other sections of the book are devoted to round-the-houses races, hill climbing, racing in America and endurance racing. Then follow two chapters that will be of special interest to all motor enthusiasts, dealing respectively with the risks of racing and with present-day personalities among the most famous drivers.

The book is remarkably well illustrated by some 130 photographs gathered from all countries, and providing perhaps the best pictorial record ever brought together.

Midget cars immediately after the start in an outdoor race, Los Angeles. (From "Motor Racing and Record Breaking" reviewed on this page.)

"How Wireless Came"

By John Langdon-Davies. (Routledge. 6/- net)

The aim of the author is not to help in the construction of a modern wireless circuit, but to describe the scientific history of wireless. He gives a full and clear account of the basic facts about electricity, which must be understood if a boy's wireless set is not to remain a mere box of tricks. By the time he has read the book, any boy will be able to understand diagrams of wireless circuits, and more important still, he will understand how science has gradually unravelled the secrets that made wireless practicable. To read this book is a delightful excursion into the realms of electrical application.

"Worlds In The Making"

By R. Barnard Way
(The Chatterbox Co. Ltd. 3/6 net)

This book is specially designed for those who, looking at the starlit sky on a clear night in winter, feel that they would very much like to know something about the stars—what they are made of, how far away they are, and how they came to be there. The great astronomers know a great deal about these things, but as a rule when they try to pass on their information they do so in a manner that is hard for us to understand. In *"Worlds In The Making"* the author has set down in the simplest possible language some of that tremendous story. The result is an absorbing narrative, which is greatly assisted by the author's own illustrations.

"Flying Dutchman"

By A. H. G. Fokker and B. Gould
(Routledge. 5/- net)

The interesting feature of this edition of *"Flying Dutchman"* is that the book has been re-written with all the technical terms put into simple language. In it Anthony Fokker, the famous inventor and airman, tells entertainingly the story of his life, from his very early days in Java, where his father was a wealthy coffee planter. To-day Fokker is a millionaire and head of an international aviation company that sells his machines throughout the world. Every boy who is interested in flying should read this book, for it relates the adventures of a very remarkable man and the great part he has played in the development of modern aircraft.

"Sciencc: A New Outline"

By J. W. N. Sullivan. (Nelson. 5/- net)

Science to-day has so many branches and covers such a wide field that it is difficult for ordinary people to form a satisfactory idea of its progress as a whole. Mr. Sullivan's survey of modern science helps to overcome this difficulty, for it is a successful effort to give in concise form the scientific knowledge that intelligent people of all ages now require. It is graphically and attractively written, and every explanation, even of the most complicated topic, is clear and well reasoned. A special feature is that the use of mathematics is avoided throughout the book.

The author begins his survey with the Earth, revealing what it is made of, how it is related to other bodies in space, and how it is supposed to have originated. This leads to a consideration of the matter of which the entire Universe is built up. The nature of the elements and the constitution of the atoms of which they are composed are explained, and a full account is given of the most recent developments in our ideas of the electron and other tiny constituents of the atoms themselves.

The author then turns from inanimate matter to the life that exists in the Earth. An amazing diversity of living forms have appeared during our planet's lifetime, and their history is traced in outline from the simplest forms of bygone ages to the more familiar creatures of to-day. The emergence of man himself is dealt with in a separate section, and the fascinating story is brought to a close with a description of the astonishing manner in which Nature preserves equilibrium among the various forms of life.

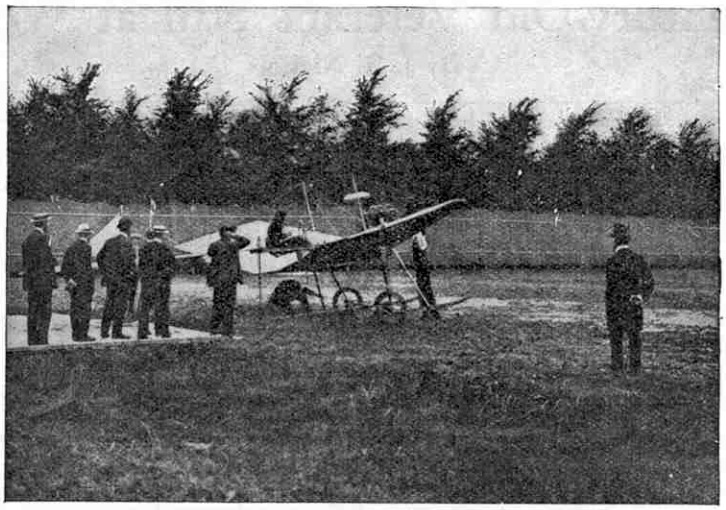
"The Boy's Romance of Aviation"

By Capt. A. O. Pollard, V.C. (Harrap. 7/6 net)

In this comprehensive book Capt. Pollard, whose history of the Royal Air Force is a standard work, traces the progress of aviation from the earliest legends to the present day. He describes the failures and successes of the more famous of the pioneers of aviation, and shows the part each has played in the development of balloons, airships, aeroplanes and gliders. He goes on to deal with the influence of the Great War on aircraft, and with the post-war development of civil aviation. The chapter on Atlantic crossings by air recalls the thrills of the first non-stop flight across that ocean by Capt. Alcock and Lieut. Whitten Brown, of the R.A.F., on 14th June, 1919, in a Vickers "Vimy" bomber. Other notable flights across the Atlantic and to other parts of the world by aeroplane and airship are also described.

The author then turns to the actual construction and equipment of aircraft, and explains the rigging of an aeroplane. Special chapters deal with the tendencies of aero-engine design, the testing of aeroplanes for flight, and the purposes and operation of air navigation instruments.

The book is illustrated with nearly 50 excellent half-tone photographs and numerous line drawings, and has a good index.

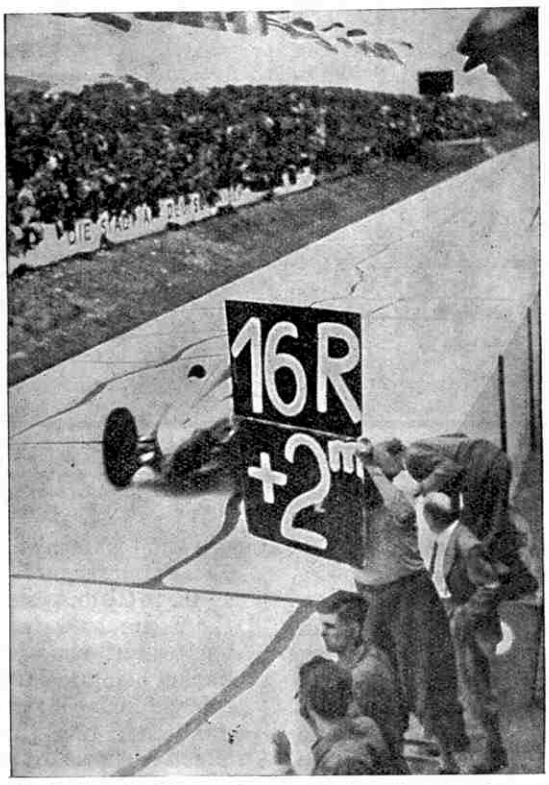


The first aeroplane produced by Anthony Fokker, at the start of a demonstration flight at Haarlem. (From "Flying Dutchman" reviewed on the previous page.)

"Useful Aspects of Geology"

By S. J. Shand, D.Sc.
(Thomas Murby and Co. 6/- net)

Professor Shand has the happy knack of describing even quite technical matters so simply and concisely that anyone can understand them. *"Useful Aspects of Geology,"* of which this is the second edition, was written mainly with the object of providing useful geological information for such people as landowners, prospectors, engineers, builders and farmers. It succeeds in this object, but at the same time it provides a remarkably interesting introduction to geology for the general reader. Theoretical matters are cut down to the minimum, and the information about different types of rocks and the changes that they undergo, and of the general geological structure of the Earth, leads up to practical information about the rocks as building materials. There are chapters on water finding and on oil, and a particularly interesting one on engineering problems, such as landslips, railway cuttings, reservoirs and underground works of all kinds. There are still many people in the world who ask: "What is the use of geology?" This volume provides a thoroughly satisfactory answer.



Pit signals to the driver, an important feature of any long-distance race. (See previous page.)

"Unsolved Problems of Science"

By A. W. Haslett
(Bell and Sons Ltd. 7/6 net)

One reads so much nowadays of the wonderful achievements of science that it is good sometimes to be reminded of the paths that still remain unexplored. Every new scientific discovery raises a new series of problems, and so the work of the scientist is never completed. This book may be described as an attempt at "stocktaking" in regard to the present extent of our knowledge. Commencing with an interesting chapter on the unending quest of science, the author passes on to review some of the great outstanding problems, such as the creation of the Universe, whether there is life on other worlds, and the strange risings and fallings of different parts of the Earth's crust. Then there are the so-called cosmic rays, many times more penetrating than the most powerful X-rays, that continually beat down on us from space, pass with ease through the thickest walls, slip through our bodies, and even reach to the bottom of the deepest lakes. In this connection an interesting account is given of the results of the wonderful flights into the stratosphere by Professor Piccard and others.

In subsequent chapters the author gives a fascinating account of the mysteries of the beginnings of civilisation, of Man as a machine, of Nature's building bricks, and of how the X-rays show weaknesses in materials that otherwise would be quite unknown to us. The final chapter deals with some of the interesting ways in which Nature still beats the scientist.

"The English Fairy Book"

By Ernest Rhys

"The Welsh Fairy Book"

By W. J. Thomas

"The Scottish Fairy Book"

By Elizabeth Grierson

"The Irish Fairy Book"

By A. P. Graves
(Philip Allan and Co. Ltd. 5/- net each)

The appeal of the fairy tale is universal, and year by year fresh collections of them are published. Most of these tales are of Continental origin, however, and therefore it is a pleasant change to come across four volumes devoted respectively to the fairy tales of England, Ireland, Scotland and Wales. The British Isles are rich in fairy tales and legends—far richer than most of us imagine; and in these books the best of them have been collected by authors who have done their work with keen enthusiasm as well as skill. Each volume has a coloured frontispiece and a number of interesting drawings.

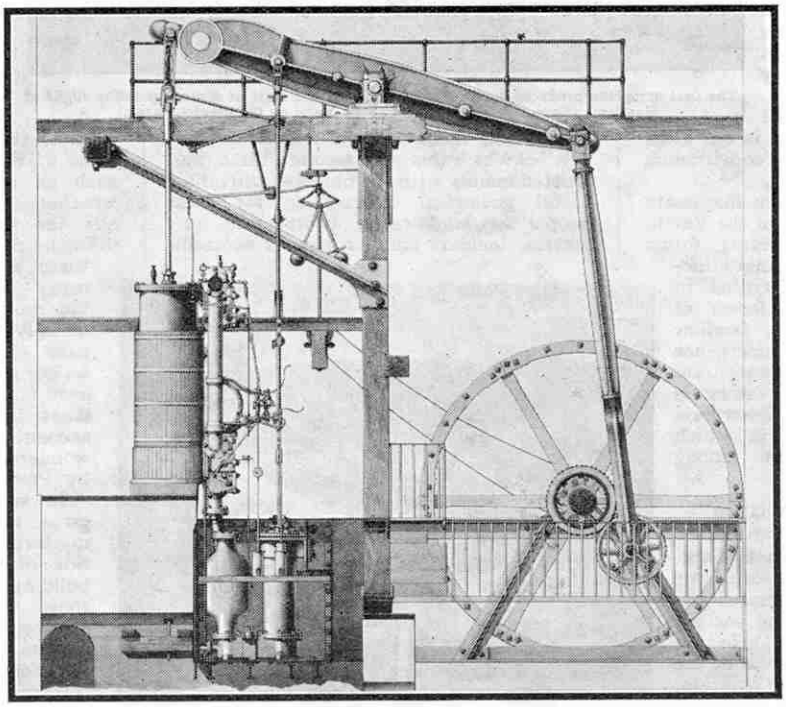
Historic Beam Engines

Century-Old Veterans Still at Work

By J. R. Nichols

ONE hears, at intervals and with regret, of the demolition of some veteran steam engine which, after it has rendered faithful service for a century or so, is to be replaced by an up-to-date type of engine. Nevertheless there are still to be found, plodding along quite serenely, engines that were built in the pioneer days of steam engineering, and it is with some of these, and others recently scrapped or now out of use, that the present article will deal.

One of the oldest engines still at work is at the Broseley Tileries clay mine, where the shaft was sunk between 150 and 200 years ago, and it is thought that the engine was installed at that time. It is now used as a winding engine, operating a cage carrying 12-cwt. loads of clay from a shaft 318 ft. deep. It is believed that this engine was made by John Wilkinson, who had a foundry at Broseley, and in these days of high pressures it will doubtless surprise many readers to learn that its steam pressure at full load is only 4 lb. per sq. in. The only alteration that has been made throughout its years of active work has been the fitting of a new piston some five years ago. When the time comes for this veteran to be superseded it certainly will have more than earned its rest.



The 30 h.p. steam engine referred to in this article, installed at Messrs. Whitbread's brewery, Chiswell Street, London in 1785. It was designed by James Watt and erected under the superintendence of John Rennie. In 1887 the engine was removed to a museum in Sydney, Australia, where it stands as a monument to Watt's genius. Photograph reproduced by courtesy of Whitbread and Company Ltd.

At the silk-printing works of David Evans and Co. Ltd., Crayford, Kent, are two ancient steam engines, both well over 100 years old, and both in full commission to-day. These are used for pumping water and driving washing machines, and were undoubtedly pioneer steam prime-movers in the silk-printing industry. The smaller engine bears a brass plate engraved with the name "OVID TOPHAM, ENGINEER, LONDON," but has no date. The normal steam pressure used is 20 lb. per sq. in., and the leading dimensions are: bore of cylinder 12 in., piston stroke 23 in., flywheel 9 ft. 8 in. in diameter, speed 40 r.p.m. The writer is indebted to Mr. P. T. Stewart, Manager, for having the interesting photographs on the opposite page specially taken.

There are several extremely old engines at the Cornish tin mines. At Levant, for example, is one built at Harvey's Foundry at Hayle in 1827, which worked, first as a pumping engine and later as a winding engine, until the mine was closed in 1929.

At the mining village of Elsecar, near Sheffield, is an old beam engine pumping plant erected in 1787, which was in more or less continuous use until 1923. In 1928, owing to the electric pumping plants being out of commission on account of heavy rains, the old engine was restarted, and is still in working order. The design of this ancient engine, whose maker is unknown, follows closely on that shown in a book of 1796, entitled *"The Coal Viewer's and Engine Builder's Companion,"* by John Carr, and it is possible that he was the consulting engineer.

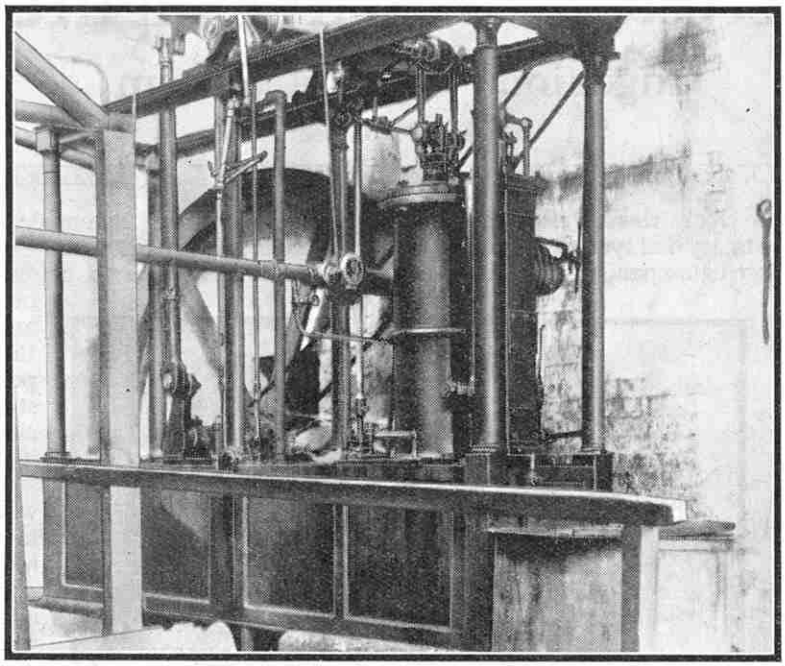
The cylinder of the Elsecar engine is 48 in. in diameter, and the stroke is 5 ft. The beam is made of cast iron in two sections, and is 24 ft. long by 4 ft. 4 in. deep, fitted with parallel motion at both ends. This beam was put in many years ago (by Grahams Foundry Co., of Elsecar, it is believed), replacing the original beam of wood, which was connected by chains to the piston rod and pump rod.

Actuation of the valves is by means of a plug-rod, which also works a 9-in. diameter pump for supplying the injection water. The present boilers are cylindrical, being 7 ft. diameter by 22 ft. long, and the working pressure is 1½ lb. to 2½ lb. per sq. in. A rod pivoted near the centre of the beam operates a plunger pump for supplying the feed-water. The water is lifted 129 ft. in a single lift, the bucket being 18 in. diameter; while the quantity delivered is 50 gallons per stroke, the engine making six strokes per minute. In 1928 the engine was indicated, and the mean effective pressure was then found to be 8 lb. per sq. in., with a water-horse-power of 11.4.

Hemp plaited spun yarn forms the packing for the piston, and is held in place by a junk ring. Any slight cylinder wear has been taken up by the packing, consequently it has never been necessary to re-bore the cylinder. This ancient engine was put under steam in 1931, on the occasion of the visit of members of the Newcomen Society, the object of this Society being to

encourage and foster the study of the history of engineering. The Elsecar engine is a development of Newcomen's atmospheric engine, based on Smeaton's designs, and incorporating certain improvements made after Newcomen's death.

Thomas Newcomen was born in 1663 at Dartmouth, where he became an ironmonger and blacksmith. Briefly stated, his engines derived their power from the atmospheric pressure acting on the top of a piston, after the creation of a vacuum underneath it. The cylinder was provided with an outer casing or jacket, and after steam had been admitted to the cylinder the jacket was filled with cold water, thereby condensing the steam and lowering the pressure in the cylinder. The atmospheric pressure acting on the open top of the piston then forced it down, after which the water was drained off from the jacket and steam again admitted, the cycle of operations being repeated.



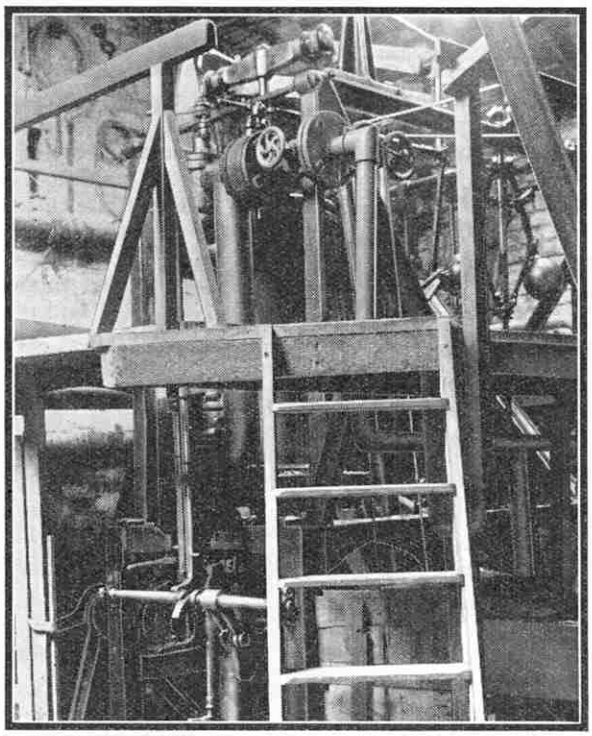
Old beam engine at Crayford. Photographs on this page by courtesy of David Evans and Co. Ltd.

Another old atmospheric pumping engine was at Westfield, near Rotherham, and it is believed that this was erected in 1823, probably by the firm of Walker, of Rotherham. This had a cylinder diameter of 4 ft. 6 in., with an average stroke of 5 ft. 9 in., and a maximum stroke of 7 ft. 6 in. The cast-iron beam was 25 ft. long, and 5 ft. 6 in. deep at the trunnions, with a weight of about 8 tons. The pit water was drawn in two lifts, the upper one of 37 yds. and the lower one of 22 yds., at 10 strokes per minute, lifting 48 gallons per stroke. After more than a century of work the engine was stopped in 1926, and scrapped in August, 1934.

Two other "old timers" recently scrapped were those at the Deptford Pumping Station of the Metropolitan Water Board. These were Boulton and Watt engines of 1812, and they worked until 1925. The order for the first engine was placed in 1810, and for the second in 1812, though most of the drawings are dated 1810. The original cylinders were 36 in. diameter by 8 ft. stroke, and drove four single-acting pumps. The horse-power was stated to be 55.2 nominal. The cast-iron beams were of an early type, probably made round about the time when it was considered preferable to use iron instead of wood. Cast-iron connecting rods were used, and the flywheel was secured to the square cast-iron crankshaft by light "wedges."

Some interesting photographs appeared in "*Engineering*" (May 27th, 1932, pp. 618-9) when partial dismantling had taken place. It is interesting to note that a use has been found for some of the parts, since some of the parallel motion links have been erected as lamp standards at the Kempton Park pumping station.

Beam engines have played an important part in fen drainage work, superseding to a large extent the earlier windmills; now the old beam engines are being gradually replaced by Diesel pumping plant. The earlier beam engines drove scoop-wheels, which dip into the water, and it is owing to the subsidence of the land that certain of the scoop-wheels have had to be abandoned, as the level of a number of drains has become too low to allow sufficient dip on the ladles of the wheels.



Another old beam engine at the Crayford Works.

At Southery there is a double-acting beam engine erected in 1842. This has a cylinder diameter of 42 in. and a stroke of 72 in., and runs at 24 revolutions per minute. It drives through 6 : 1 reduction gearing a 40 ft. diameter wheel, made in 1881, replacing the wheel installed with the engine. Another old beam engine, again double acting, belongs to the Mildenhall Fen Commission. This was made in 1844, and drives a scoop-wheel of 32 ft. diameter, which lifts the water from 5 to 12 ft.

One of the first engines to be constructed for a brewery by the old firm of Boulton and Watt, of Birmingham, was installed at Messrs. Whitbread's Brewery in Chiswell Street, London, in 1785. It was designed by Watt, its erection was superintended by Rennie, and the services of Smeaton were secured for designing six underground cisterns, the largest of which contained upwards of 3,600 barrels of beer! The engine remained at the brewery for over a century, being removed in 1887 to a museum in Sydney, Australia, where it stands as a monument to Watt's genius.

We should be glad to hear from readers who know of any other old engines of a similar type still in existence.—Editor.

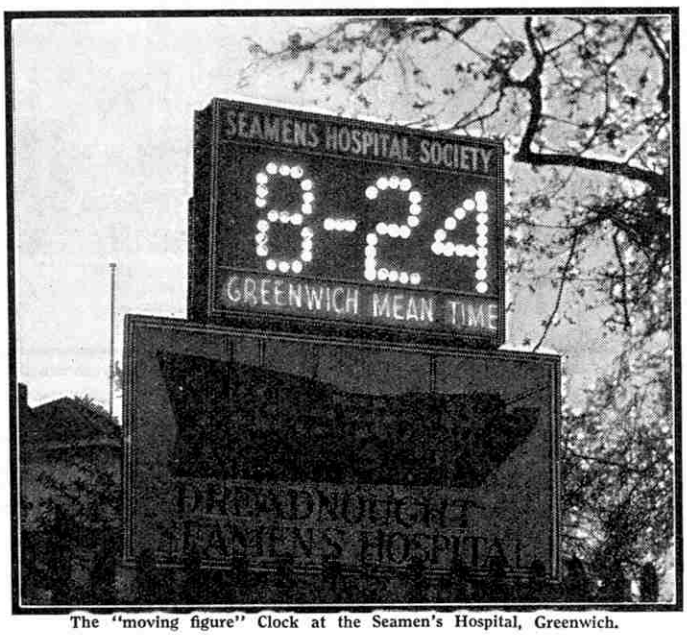
An Interesting Moving Figure Clock

Ingenious Control System

By T. R. Robinson

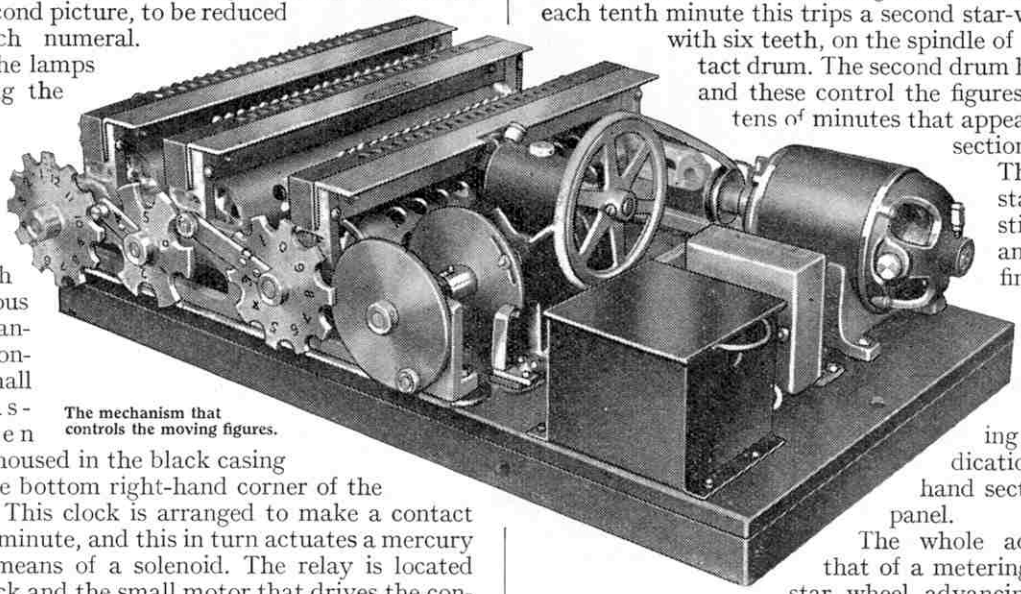
IN the design of large public clocks there is nowadays a tendency to eliminate the ordinary dial system of showing the time, and to substitute large figure panels, with numerals indicating the hours and minutes. A typical clock of this kind is installed at Paddington Station, London, which was described in the "*M.M.*" for December, 1934.

A cleverly made form of public timekeeper that adapts a form of electric sign into a "moving figure" clock has recently been made to draw attention to the Seamen's Hospital, Greenwich. The visible part is shown in the upper illustration on this page, and consists of a panel divided into three sections. In these sections are arranged numbers of 15-watt electric lamps, and by switching on groups of these lamps Arabic numerals can be built up to give the hour and the minute. Each section of the panel has 35 lamps, and these are so placed that any desired numeral can be formed; while careful grouping of those lamps that will always be illuminated together has enabled the circuits between the sign and the controller, shown in our second picture, to be reduced to 19 for each numeral.



The "moving figure" Clock at the Seamen's Hospital, Greenwich.

Apart from the lamps and their wiring the sign is quite simple, and the really interesting part of the installation is the controller, which is a most ingenious piece of mechanism. Its time control is by a small synchronous-motor-driven clock, which is housed in the black casing to be seen in the bottom right-hand corner of the controller case. This clock is arranged to make a contact every complete minute, and this in turn actuates a mercury tube relay by means of a solenoid. The relay is located between the clock and the small motor that drives the contact drums of the controller. When the relay makes contact it starts up the small motor, and this then drives through a totally enclosed worm reduction gear to a disc that carries a small ball bearing mounted near its edge.



The mechanism that controls the moving figures.

This disc is arranged to make one complete rotation each time the motor is started up, and as this is completed, it breaks the motor circuit automatically by tripping the relay back to the off position. The motor then stops until the synchronous clock movement again starts it up.

The small ball bearing, which has been mentioned as mounted on the disc, therefore makes one turn per minute. As it rotates it comes into contact with a star-wheel mounted on the spindle of the first contact drum, and trips this one tooth, just in the same way that a counter is tripped. The star wheel has 10 teeth or divisions, and its contact drum is, of course, equally spaced out. As the wheel and drum are tripped round they alter the connections to the lamps in the right-hand section of the panel of the sign, causing the figures "0" to "9" to appear in order at minute intervals.

The star wheel of the drum also carries a short arm that has a second small ball bearing mounted at its end, and at each tenth minute this trips a second star-wheel, this time with six teeth, on the spindle of the second contact drum. The second drum has six sections, and these control the figures indicating the tens of minutes that appear in the central section of the sign. The six-toothed star wheel carries still another arm, and this steps the final 12-toothed star wheel attached to the contact drum, which switches the lamps making up the hour indications in the left-hand section of the sign panel.

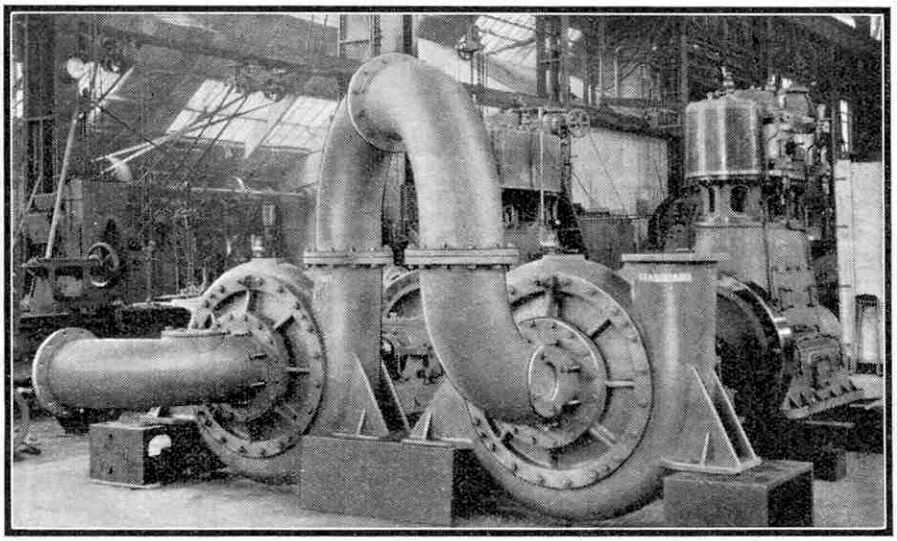
The whole action is really that of a metering counter, each star wheel advancing the next in order one space each time it completes one revolution.

The clock is a product of the Signs Construction Co. Ltd., London.

A Suction Dredger for East Africa

Shipped in Sections to Beira

DOCK and harbour engineers have to be constantly on the alert to keep the waterways in their care free from sand and mud, for the prosperity of a port depends upon the number of ships that visit it, and this in turn depends upon the navigability of its approaches. In order to ensure a sufficient depth of water dredging vessels of various kinds are employed for the excavation of material from the bottoms of harbours and rivers. They are used also to a great extent for the purpose of straightening rivers and for land reclamation work.



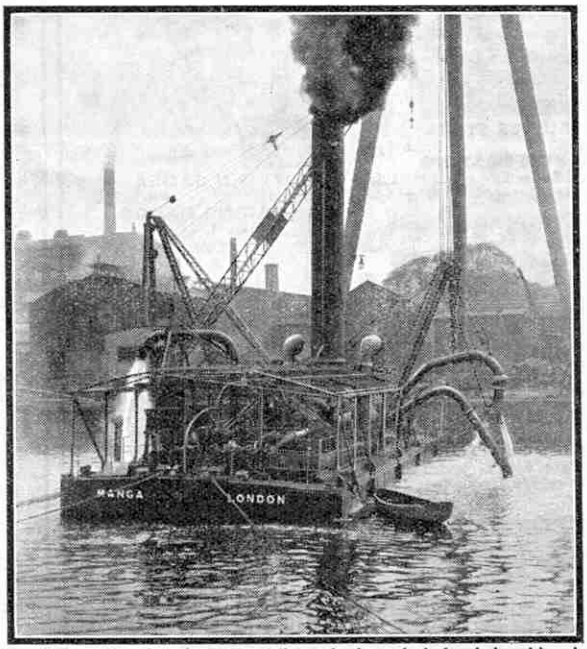
The centrifugal pumping plant of the dredger "Manga" erected in the builders' workshops.

Dredgers may be described as machines for removing material from one place and depositing it elsewhere, the exact manner in which this is done depending on the nature of the material to be removed. Soft, sandy material will require an entirely different type of machine from that required for handling a hard rocky material.

Modern dredgers are operated either mechanically or hydraulically. The former type dredge up the spoil by means of buckets fixed to travelling chains, while the latter type suck up a mixture of soil and water, and deposit it either in hoppers provided in its hull or in separate barges moored alongside the dredger. The lower illustration on this page shows the dredger *"Manga,"* a suction dredger of this kind built by Fleming and Ferguson Ltd., Paisley, for use in land reclamation work at the port of Beira in Portugese East Africa. This vessel dredges the sand and mud from the harbour bottom and deposits it into separate barges. When the barges are full they are towed to the required place and the material is then pumped out and deposited on the land.

The upper illustration shows the two large centrifugal dredging pumps fitted in the *"Manga."* These are connected together in series, that is to say the discharge pipe of one pump is connected to the suction inlet of the other. The main suction inlet of the pumping plant is connected to a long flexible dredging pipe arranged so that it can be lowered into the water to the required depth, and the pumps are protected from damage that would be caused by the ingress of solid matter such as rock, etc., by gratings fitted over the outboard end. The outlet side of the pump plant is connected to pipes that lead over the side of the dredger and discharge into the hopper barges moored alongside.

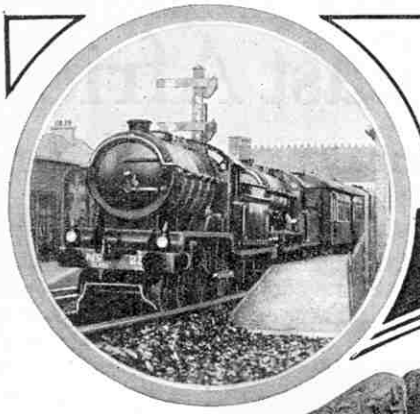
As soil cannot be pumped without the admixture of water to transport it, the *"Manga"* is fitted also with a centrifugal diluting pump, which discharges sea water into the barges while the soil is being pumped out. The pumping plant is driven by means of steam engines of the totally-enclosed forced lubricated type.



The "Manga" undergoing tests at the maker's works before being shipped in separate sections to Beira. For our illustrations we are indebted to Fleming and Ferguson Ltd., Paisley.

An interesting feature in connection with the construction of the *"Manga"* is that after the vessel had been fully completed and tested in the builders' works she was dismantled and then shipped abroad on a large cargo vessel, in separate floatable sections. When the sections reached Beira they were lowered by the ship's derricks into the harbour and then bolted together. The machinery also was assembled in England, tested, and then taken to pieces and separately shipped to its destination.

Suction type dredgers are not common in England, but in the northern European ports vessels of this kind are constantly at work maintaining the navigability of rivers and estuaries.



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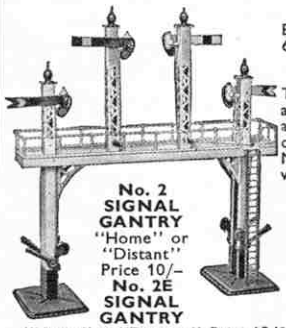

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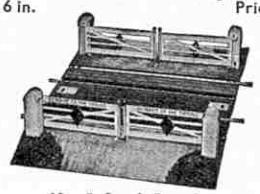


No. 2 Level Crossing

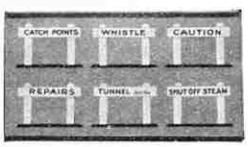
No. 2 LEVEL CROSSING
Measures 13½x10½ in., with two gauge O tracks in position. Price 5/6

No. E2 LEVEL CROSSING (Electrical). Similar to Level Crossing No. 2, but fitted with two electrical tracks. Price 7/6

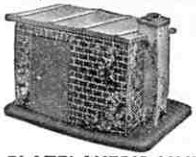
No. E2E LEVEL CROSSING
Similar to No. E2 Level Crossing but suitably fitted for electric lighting. Price 9/–

No. 4 Tunnel

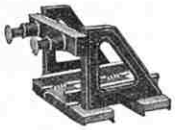
No. 4 TUNNEL (CURVED)
Base measurement: Length 20 in. Width 9½ in. For 2 ft. radius track only. Price 4/9



No. 8 RAILWAY ACCESSORIES
Notice Boards. Price 1/9

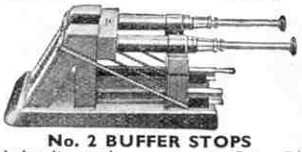


PLATELAYER'S HUT
Price 1/–



No. 1 BUFFER STOPS
(Spring type). Price 1/–

No. 1E BUFFER STOPS
as No. 1, but suitably fitted for electric lighting. Price 1/6



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

No. 2E BUFFER STOPS
Similar to No. 2 Buffer Stops, but suitably fitted for electric lighting. Price 6/–

LOADING GAUGE
(Illustrated). Price 2/3

M LOADING GAUGE
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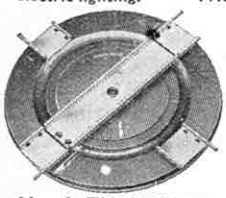

No. 1 TURNTABLE
(Illustrated). Price 2/6

No. 2 TURNTABLE
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No. E2 TURNTABLE (Electrical)
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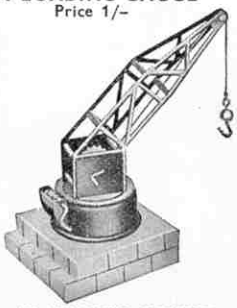
Length 13 in., height 6⅝ in., width 6 in. Price 7/6



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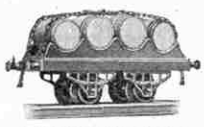

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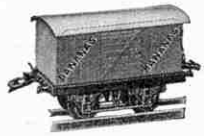

No. 1 BANANA VAN
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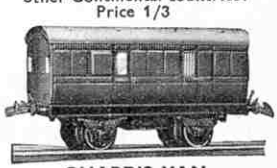

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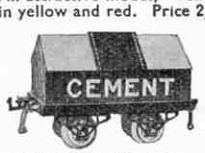

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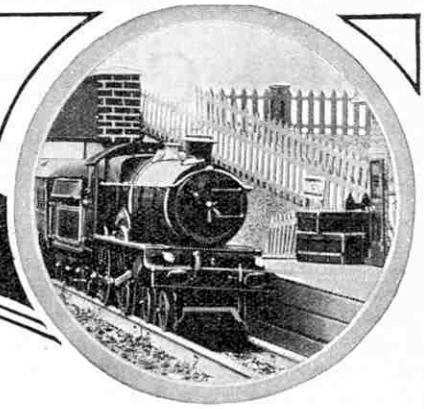

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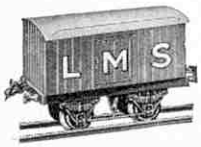

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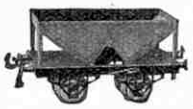

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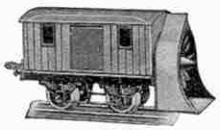

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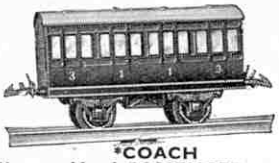

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No. 1 PASSENGER
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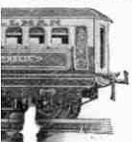

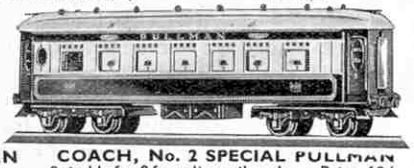

PULLMAN
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GAS CYLINDER WAGON
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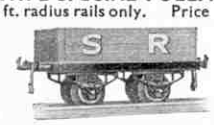

***No. O WAGON, HORNBY**
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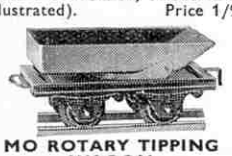
***No. 1 WAGON, HORNBY**
(Illustrated). Price 1/9

No. 1 CRANE TRUCK
Finished in gold and blue.
The Crane revolves on
its base. Price 2/11



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Finished in green. Container
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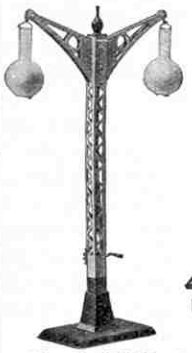

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(Double, as illus-
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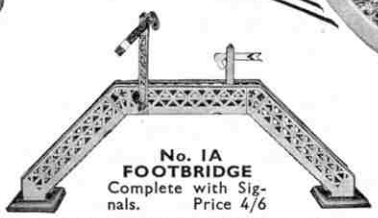

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Complete with Sig-
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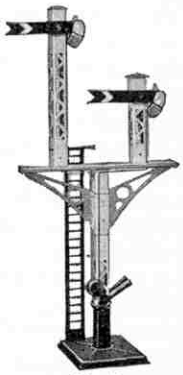

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Milk Cans and Truck. Price 1/3

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Similar to No. 2
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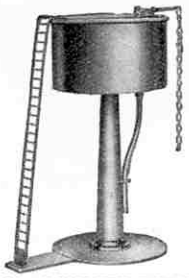

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Fitted with flexible tube
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8½ in. high. Price 5/9
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Watchman's Hut,
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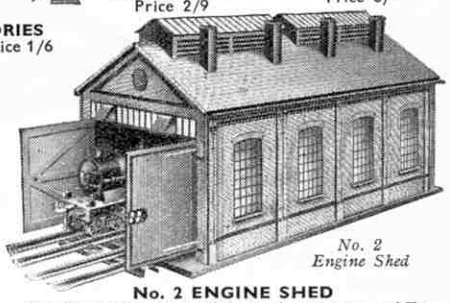

No. 2 Engine Shed

No. 2 ENGINE SHED
This Shed will accommodate any Locomotive and Ten-
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Price 22/6
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Similar to No. 2 Engine Shed but suitably fitted for
electric lighting. Provided with electrical track.
Price 23/-

VIADUCT Price 6/6 **VIADUCT (Electrical)** Price 7/6
VIADUCT Centre Section only ... ... „ 4/-
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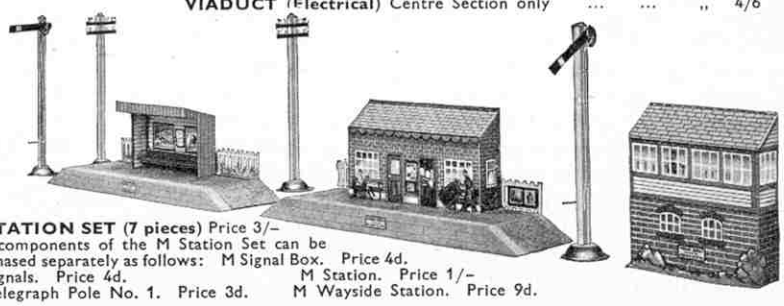

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The components of the M Station Set can be
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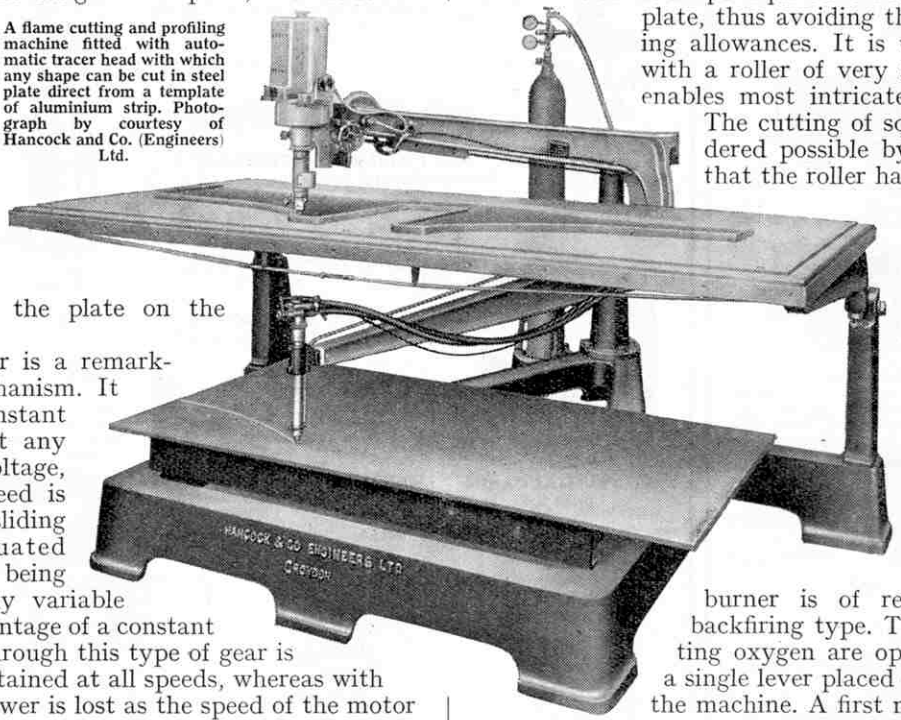
M Signals. Price 4d. M Station. Price 1/-
M Telegraph Pole No. 1. Price 3d. M Wayside Station. Price 9d.

Flame Cutting and Profiling Machines

An Ingenious Electric Tracer

THE cutting of steel plate by means of an oxygen flame is one of the most interesting and important engineering processes developed during recent years. As compared with the older methods of cutting it is simple and results in a great saving of time, especially where intricate shapes have to be dealt with.

The accompanying illustration shows one of a series of oxygen cutting machines designed and produced by Hancock & Co. (Engineers) Ltd. This machine consists essentially of two tables coinciding exactly in plan. The upper table carries the design or template, and the lower one supports the plate or other work that is to be cut. By means of an arrangement known as an electric tracer, any outline traced on the upper table is followed exactly by the cutting flame moving over the plate on the lower table.



A flame cutting and profiling machine fitted with automatic tracer head with which any shape can be cut in steel plate direct from a template of aluminium strip. Photograph by courtesy of Hancock and Co. (Engineers) Ltd.

The electric tracer is a remarkably ingenious mechanism. It is fitted with a constant speed motor to suit any particular lighting voltage, and the cutting speed is set by means of a sliding pointer and graduated scale, the drive being through an infinitely variable gear. The great advantage of a constant speed motor drive through this type of gear is that full power is obtained at all speeds, whereas with resistance control power is lost as the speed of the motor is reduced.

The electric tracer head can be fitted with any one of three forms of drive. The first is guided by hand over the line of a drawing or blue print, enabling the operator to produce any required shape in the plate without the use of a template. The advantage of working direct from a drawing in this manner is very great, for there are many thousands of operations in which only one or two off are required, so that the making of a template would be a relatively expensive proceeding. The second form of drive is for automatic operation or repetition work. It consists of two rollers, differentially geared, which grip each side of a strip of aluminium that forms the template. The aluminium strip is either mounted in special chairs that are readily fixed in or removed from the table of the machine, or is screwed round the edge of a wooden template, thus forming a permanent template. This aluminium strip template is bent to the shape by hand, and it is estimated that 2,000 cuts can be made from it without renewal. The actual cost of this form of template is only twopence per foot length.

The third form of drive operates from a wooden template, which is usually cut with a Hobbies fret-saw. The method of operating is by means of a single serrated roller $\frac{1}{8}$ in. in diameter, which is held by hand against the edge of the wooden template. The roller is electrically driven, and passes along the edge of the template, guiding in turn the cutting burner below over the steel plate, and so producing the actual shape required. Several outstanding features are gained by this form of template. It is made from plywood, which is easily cut, and it is made to the exact size of the shape required to be produced in the steel plate, thus avoiding the necessity of making allowances. It is used in conjunction with a roller of very small diameter that enables most intricate shapes to be cut. The cutting of square corners is rendered possible by reason of the fact that the roller has the same diameter as the flame. No other drive incorporates such useful features. A further interesting point is that this single roller drive is provided also with a cone so that it will operate automatically by means of a channel template that forms a positive guide.

The cutting burner is of remote control non-backfiring type. The heating and cutting oxygen are operated by means of a single lever placed on the upper arm of the machine. A first movement opens the heating oxygen valve, and a second the cutting oxygen valve. The burner is usually supplied for use with oxy-coal-gas, the coal-gas being taken direct from the ordinary town gas supply.

The illustration shows how the burner is made to follow the movements of the tracer. It will be seen that the tracer and the burner are placed at the extremities of a U-shaped arm, hinged on links that in turn are hinged to a pillar. This combined hinging of the links and the U-shaped arm allows the tracer to be traversed anywhere over the surface of the table, and the burner follows its movements exactly. This type of machine is capable of cutting not only commercial mild steel and cast steel, but also most of the higher grades, such as those used in the making of dies. It will also cut manganese steel.

An important feature of the work produced by these machines is that it is sharp and clean at all edges of the cut. No cleaning is necessary, except where a machined surface is required.

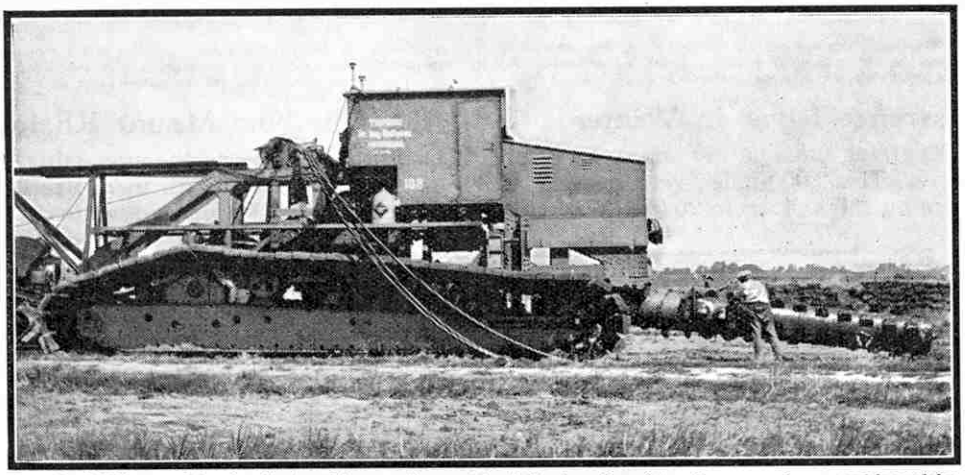
For the information contained in this article we are indebted to Hancock & Co. (Engineers) Ltd., Croydon.

Making Marshland Fit for Farming

Ingenious Subsoil Lifting Machine

By Hans F. Kutschbach

AGRICULTURE has been practised since the late Stone Age, but more progress has been made during the last 200 years than in all the centuries preceding. If a farmer of the 17th century could visit a large modern farm he would be surprised by many things; but above all he would be amazed at the extraordinary extent to which machinery has been introduced to speed-up cultivation and lessen labour.

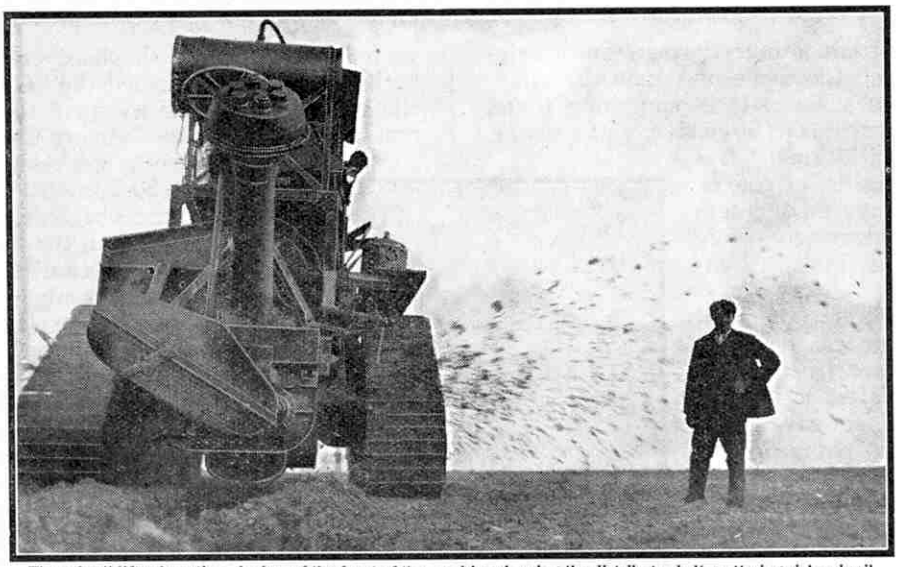


The subsoil lifting machine described on this page. The machine is the invention of two German engineers, and is used for preparing barren land for farming purposes.

Unless the soil is properly cared for it very soon loses its fertility, and especially is this the case with marshy land. In its early stages marshland is generally very fertile, but in a comparatively short space of time this fertility is lost owing to the fact that the nutritious substances that form plant food, sink and are absorbed into the subsoil, or earthy matter beneath the surface soil, where they collect to form a rich layer. Usually, however, this layer is too far down for the roots of crops to reach it.

With the object of overcoming this difficulty and effectively gaining access to this layer of highly fertile ground, two German engineers, Herr Max Jaeger and Dr. Rathjens, have devised the ingenious machine shown in the two illustrations on this page. This apparatus is said to be very effective in preparing barren marshy regions for farming purposes, and an important feature of the machine is that its use does not necessitate removal of the earth above the subsoil.

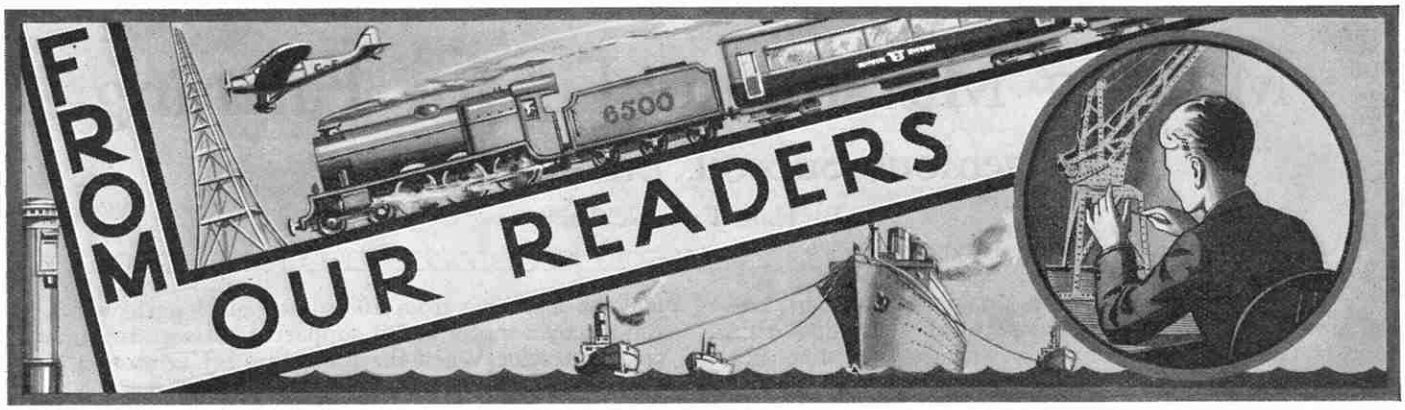
Essentially the machine consists of a long pipe that may be anything from 10 to 30 ft. in length, which is rotated by a motor and is supported between two driven creeper tracks. When the tracks are set in motion they carry the pipe forward, and as the pipe is mounted at an angle to the horizontal, this movement causes it to dig into the ground. The pipe is connected to the chassis of the machine through a universal coupling, and its lower end is provided with peculiarly shaped knives and intake openings. As the pipe rotates, the surrounding subsoil is loosened by the knives and falls through the intake slots into the interior of the pipe and on to a belt conveyer, which carries it to the top and deposits it on to a rapidly driven belt. This belt is fitted with vanes, and by its rapid action it scatters the rich subsoil right and left over the ground.



The subsoil lifter in action. A view of the front of the machine showing the distributor belt scattering rich subsoil.

With the aid of this machine heavy unproductive marshland can be turned into highly fertile soil suited for growing all kinds of crops; while sandy ground that is too light for agricultural purposes can be improved by lifting the marshy subsoil from below, distributing it over the surface, and then ploughing in the usual way.

Another application of the machine is in preparing the foundations for roads over boggy ground. Usually in work of this kind the marshy soil has to be removed and replaced by sand, a procedure that is not only expensive, but in the case of deep marshes, impracticable. The subsoil lifter is used to make a series of ditches, which are then filled with sand and act as drains.



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.

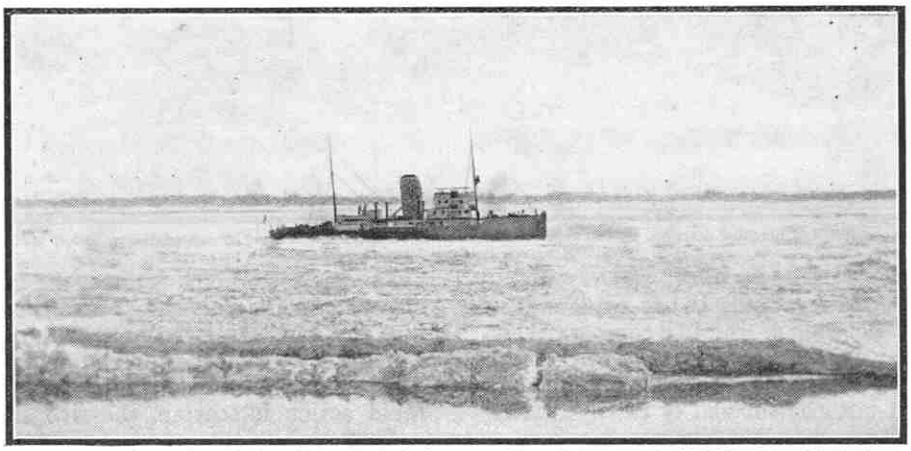
The St. Lawrence River in Winter

When I lived in Montreal, Canada, my home was near the St. Lawrence River. This 2,000-mile river is navigable for half that distance by ships of up to 20,000 tons, but the Lachine Rapids above Montreal prevent them from proceeding higher.

At Montreal the St. Lawrence is almost two miles wide, but in spite of this it becomes blocked by ice about the end of November. Ice-breakers are used to keep the river open as long as possible, but these sturdy boats often get frozen in themselves. The strong current brings downstream newly-formed pieces of ice and these pile one upon the other, forming a very uneven surface. It is sometimes found possible to run traffic across the frozen river and a road is then marked out with small tree branches. A close watch is, of course, kept upon the ice for any sign of cracking. One winter many years ago, before the Victoria Bridge was built, an engineer operated a light railway across the ice, from Montreal to Longneuil on the opposite shore. It was very successful while the ice was frozen hard and deep, but when, after a spell of warmer weather, the ice gave way, the engine and track plunged into the water.

When spring comes the ice begins to break and then the ice-breakers get to work again to smash a channel through as speedily as they can. The first ocean liner to arrive at Montreal after the re-opening of the river is decorated with flags and streamers, and the Mayor of the city presents the captain with a gold-handled walking-stick as a souvenir of the occasion.

N. C. MEACHEM (Birmingham).



Ice-breaker cutting a channel through the frozen St. Lawrence River. Photograph by N. C. Meachem, Birmingham.

Climbing Mount Rheinwaldhorn

Last summer I had the interesting experience of climbing Mt. Rheinwaldhorn, in Switzerland. It is far from being one of the highest mountains in that country, but it is of special interest, chiefly because one of its several glaciers is the source of the River Hinterrhein that later becomes the Rhine.

Our party totalled eight climbers and two guides, and we started from the village of Hinterrhein about 3 p.m. The weather was rather sultry, but we made good progress. At 5 p.m. we halted for tea at a shepherd's one-roomed hut, which he had humorously named the "Grand Hotel." Further climbing followed, and we spent the night, or rather the first part of it, at the Zapport Club Hut. Our upward journey was resumed by lantern light at 3.30 a.m. About an hour later the darkness began to give way to daylight, and we had the thrill of seeing the sun rise, in a beautiful golden glow, above a distant peak.

By the time we stopped for breakfast we had climbed to a considerable height, and the air was very cold. We soon began to feel the warmth of the sun's rays, however, and our journey across the final stretch of snowfield was very pleasant. The snow gave firm foothold, and around us wonderful views gradually unfolded as we got higher. We reached the summit at 8.15 p.m., and signed our names in a little book that is kept under a boulder there.

From the summit of the Rheinwaldhorn there is a magnificent panorama of mountain scenery that extends from Monte Rosa, 70 miles to the west, to Piz Bernina, 50 miles to the east.

W. S. GOODBODY (Bristol).

Nearing the summit of Mt. Rheinwaldhorn, Switzerland. Photograph by W. S. Goodbody, Bristol.

Ancient Britons' Cemetery

Dunstable has been the scene of many archæological discoveries. The upper photograph on this page shows students from the London University College and Hospital Anthropological Society carrying out excavations on a knoll at the top of Dunstable Downs. They had been closely examining the ground when one of the lady members of the party discovered a human skeleton at the foot of the knoll.

Students of Anthropology unearthing skeletons of ancient Britons, on Dunstable Downs. Photograph by A. M. Johnstone, Dunstable.

The students immediately concentrated their investigation upon that place, and on carefully removing a large area of turf they beheld many skeletons. It was evident from the various positions of the remains that some had been buried in separate graves, but others were huddled together in confusion. In one case there was a huge gash in the skull, possibly inflicted by a sword or an axe, and the arms of another were in a position that indicated they had been tied behind the back when the body was buried. An interesting relic of ancient superstition was seen in the fact that stones had been placed on the chests of some of the skeletons, presumably to keep down their ghosts!

Working with brushes and small pointed trowels, the students gradually cleared the chalky earth from the fragile bones until 40 skeletons lay exposed, whitening in the sunlight. It was found difficult to decide the exact period to which they belonged, but they were estimated to date from about 600 B.C.

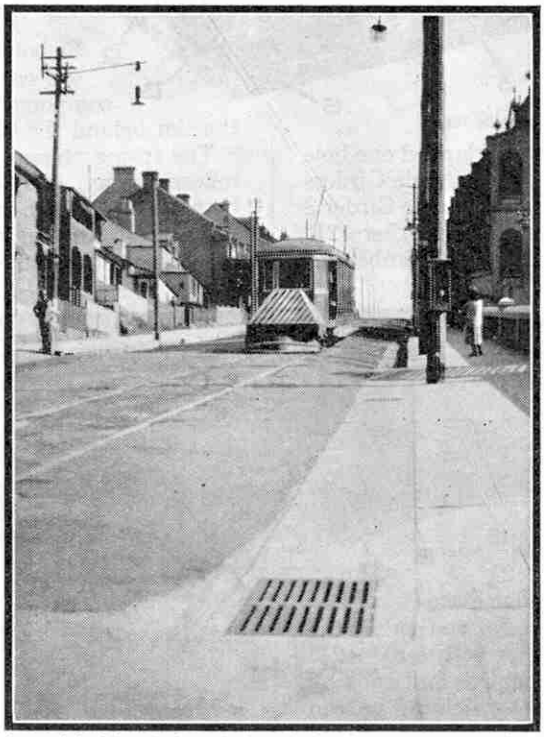
When the students had numbered, photographed, sketched and thoroughly examined the remains they wrapped up some of the bones and packed them in crates for removal to London, for anthropological purposes.

A. M. JOHNSTONE (Dunstable).

Novel Braking System

At Balmain, a suburb of Sydney, the wharf of the ferry service to the city lies at the foot of a steep hill that reaches to the edge of Darling Harbour. An electric tramway from this busy point serves a large area of the western suburbs, and the trams easily climb the steep hill under their own power. Special precautions against accident are taken when they are descending it, and their wheel brakes are then supplemented by a device called a "donkey." This is a four-wheeled trolley, heavily weighted and fitted with large lifeguards, and painted with silver and black stripes so as not to be a danger at night.

The "donkey" stands on the track at the top of the hill, awaiting the arrival of trams from Balmain. When a tram arrives it halts with its buffer against the rear of the "donkey," and an arm projecting from this is connected to a cable running in a groove parallel with, and midway between, the two rails of the track. The cable passes over a pulley at the top of the hill, and its other end is attached to a counterweight that consists of a 15-ton trolley in a special tunnel under the road. As the "donkey" and tram descend the hill, the counterweight travels up the tunnel. When a tram ascends the hill, the "donkey" follows behind and halts at the summit in readiness to escort the next tram downhill. This system has been in use for many years and ensures safety at a very small maintenance cost in proportion to its usage—every 10 minutes in normal hours and every five minutes during the morning and evening rush periods.



A novel braking device called a "donkey" attached to the front of a tramcar descending a steep hill at Balmain, near Sydney, Australia. Photograph by MacLeod Morgan, Cremorne.

MACLEOD MORGAN (Cremorne).

Some Famous Oak Trees

The many famous oak trees in Nottinghamshire include the Major Oak, the Seven Sisters, and the hollow oak tree that is said to have served as Robin Hood's larder. The most famous is the Major Oak, which stands in an open space about half-a-mile to the north of the village of Edwinstowe. It is probably 1,000 years old, and the massive proportions of its gnarled weather-beaten trunk make it a striking picture in winter, as then it is not hidden by a mass of foliage. The trunk is 30 ft. in circumference 5 ft. above ground, and its branches have a circumference of about 700 ft. The most remarkable thing about it is that it is quite hollow to a height of 15 ft., and there is standing room inside for a dozen persons. It is on record that seven persons have dined together in it.

In the same district, and near Welbeck Abbey, are the remnants of the Seven Sisters, an oak tree that once had seven trunks. They were from 80 ft. to 112 ft. in height, and the tallest was known as the "Duke's Walking Stick," the person referred to being the Duke of Portland.

F. CORNER (Bulwell).

The Lighter Side of Model-Building

Two Amusing Meccano Games

THIS month we make an interesting departure from the usual types of Meccano engineering subjects, and it is hoped that the following two examples will give model-builders some ideas for models of a similar nature. The first model to be described, a Bagatelle Table, is built with Outfit H; and the second, a Shooting Game, with Outfit G. The Meccano Steel Balls used with each model are not included in either of these Outfits but may be purchased separately.

The Bagatelle Table shown in Figs. 1 and 2 is similar to many found in amusement parks. Although the model is not entirely automatic it is extremely interesting, and will prove absorbing even to the oldest Meccano enthusiasts.

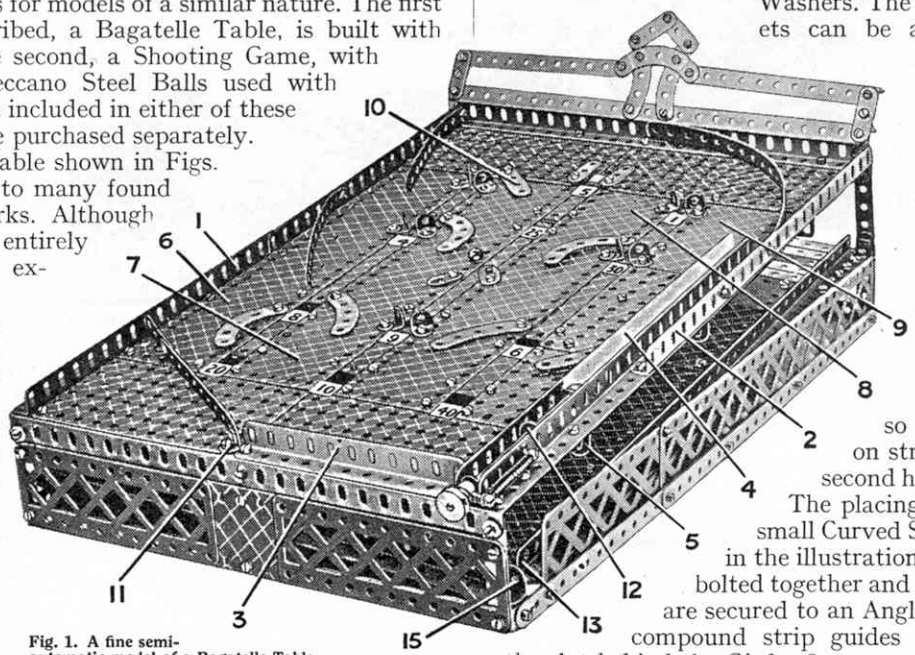


Fig. 1. A fine semi-automatic model of a Bagatelle Table.

Commence the model by building a board as shown in Fig. 1. Each end of this consists of a $12\frac{1}{2}$" Angle Girder and these are joined together by two side members 1 and 2. The member 1 consists of two $9\frac{1}{2}$" Angle Girders overlapped one hole and the member 2 is formed from two $12\frac{1}{2}$" Angle Girders arranged as shown in the illustration. A $5\frac{1}{2}$" Angle Girder 3 is secured to the bottom of the board and a further $12\frac{1}{2}$" Angle Girder 4 is bolted parallel to the side members as shown.

A slot is formed immediately in front of the Girder 3 by bolting in place a $5\frac{1}{2}" \times 2\frac{1}{2}"$ Flat Plate to one end of which is fitted a $5\frac{1}{2}" \times 3\frac{1}{2}"$ Flat Plate. A $12\frac{1}{2}$" Angle Girder 5 supports the inner ends of these Plates and also one end of three $12\frac{1}{2}" \times 2\frac{1}{2}"$ Strip Plates 6, 7 and 8. Two $4\frac{1}{2}" \times 2\frac{1}{2}"$ Flat Plates, overlapping two holes, are also supported at one end by the Girder 5. The Plates 6, 7 and 8, together with a $5\frac{1}{2}" \times 2\frac{1}{2}"$ Strip Plate 9, are supported at their centres and ends by two more $12\frac{1}{2}$" Angle Girders, portions of which can be seen in Fig. 1. The upper end of the board consists of two $5\frac{1}{2}" \times 3\frac{1}{2}"$ Flat Plates and one $2\frac{1}{2}" \times 2\frac{1}{2}"$ Strip Plate.

The positions of the 12 holes are shown in the photograph and the spaces between these are filled in by means of $5\frac{1}{2}" \times 2\frac{1}{2}"$, $2\frac{1}{2}" \times 1\frac{1}{2}"$ and $2\frac{1}{2}" \times 2\frac{1}{2}"$ Flexible Plates. Small squares of paper are pasted below the holes and on these suitable scores are printed.

The two top holes on each side of the board are "backed" with pairs of $\frac{1}{2}" \times \frac{1}{2}"$ Angle Brackets, the centre third hole down being similarly fitted. In the centre of the board two Flat Brackets are fitted and raised slightly by means of Washers. The angle of these Brackets can be arranged to suit individual ideas as also can the various Curved Strips and bolt heads. By altering these Strips, etc., certain holes can be made very difficult to enter and the scores raised accordingly.

A 2" Strip 10 is attached to one of the upper $5\frac{1}{2}" \times 3\frac{1}{2}"$ Flat Plates and this is so arranged that a ball on striking it rolls into the second hole down in the centre. The placing of the $2\frac{1}{2}$" large and small Curved Strips is shown clearly in the illustration. A $5\frac{1}{2}$" and $2\frac{1}{2}$" Strip, bolted together and overlapped two holes, are secured to an Angle Bracket 11 and this compound strip guides the Steel Balls into the slot behind the Girder 3.

The spring plunger for firing the Balls is built up in the following way. A $2\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strip 12 is fitted between the side member 2 and Girder 4, and it carries a sliding Rod, on the inner end of which is locked a Collar. The outer end of the Rod carries a Collar and $\frac{1}{2}$" fast Pulley, the Collar being fitted with a $\frac{3}{8}$" Bolt carrying one end of a Spring. The opposite end of this Spring is bolted to the side member 2.

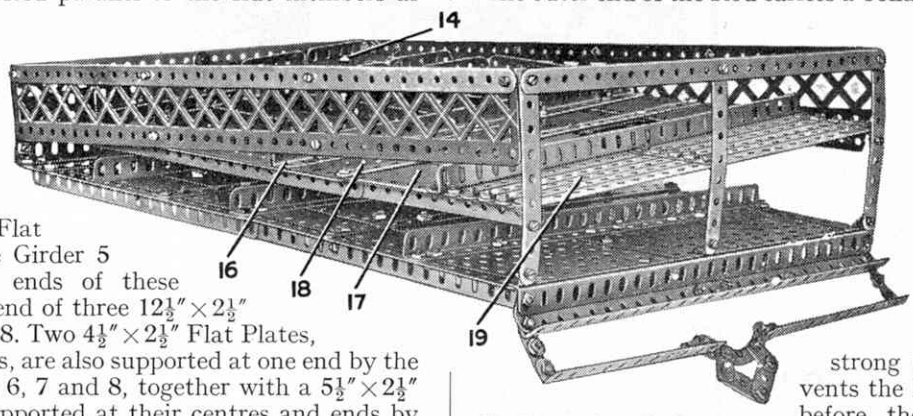


Fig. 2. An underneath view of the Bagatelle Table showing the sloping return surface.

It is a good plan to line the inside of the channel, carrying the spring plunger, with strong paper, as this prevents the Balls from stopping before they reach the end of the channel.

Below the board is fitted a sloping surface by means of which the Steel Balls are returned to the opening 13 ready for being used again. An underneath view of this sloping surface is shown in Fig. 2. Each side member consists of a $12\frac{1}{2}$" and a $7\frac{1}{2}$" Angle Girder. The Girders of the near side member in Fig. 2 are overlapped four holes, but those forming the other member are overlapped five holes. This extra overlap of one side member

is necessary in order to form the opening 13.

The end of the sloping surface nearest the operating end of the model consists of five $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plates 14 secured edge to edge by a $12\frac{1}{2}''$ Angle Girder 15, Fig. 1. The other edges of these Plates are bolted to a $12\frac{1}{2}'' \times 2\frac{1}{2}''$ Strip Plate that is in turn secured to four $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plates and one $5\frac{1}{2}'' \times 3\frac{1}{2}''$ Flat Plate. The end flanges of these last mentioned Flanged Plates are secured to a $12\frac{1}{2}''$ Angle Girder 16, and the unoccupied flange of this is then fitted with five $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Strip Plates 17. A $12\frac{1}{2}''$ Strip 18 prevents these Plates from buckling. The sloping surface is completed by the addition of a $12\frac{1}{2}''$ Angle Girder and five $12\frac{1}{2}''$ Strips 19.

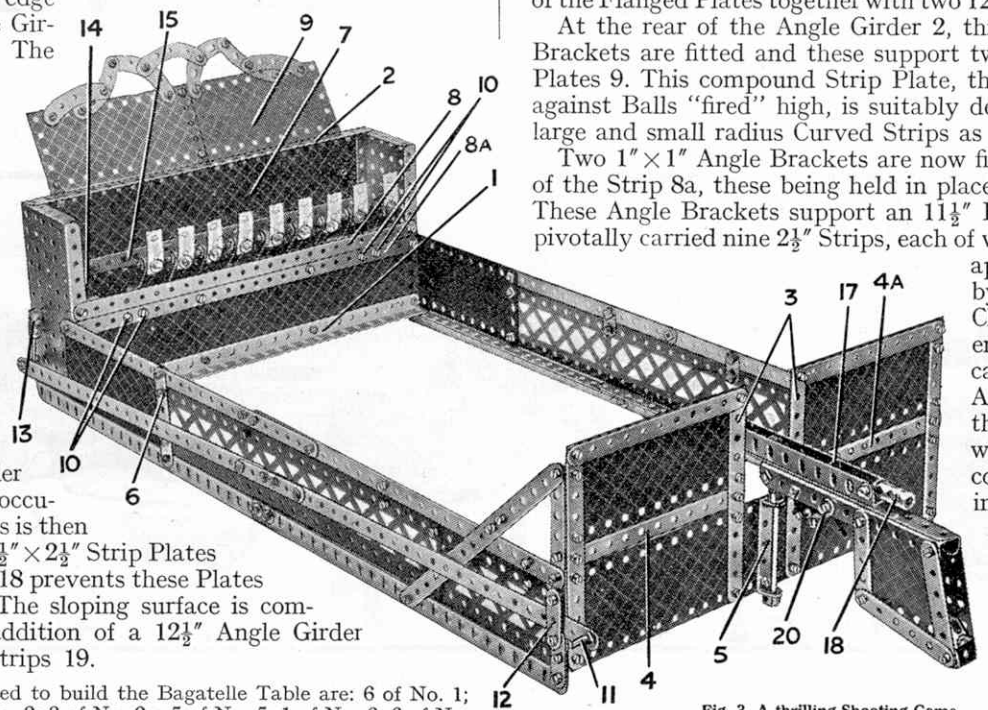


Fig. 3. A thrilling Shooting Game built with Outfit G.

The parts required to build the Bagatelle Table are: 6 of No. 1; 1 of No. 1b; 3 of No. 2; 3 of No. 2a; 5 of No. 5; 1 of No. 6; 6 of No. 6a; 14 of No. 8; 2 of No. 8a; 2 of No. 8b; 3 of No. 9; 2 of No. 10; 21 of No. 12; 2 of No. 12c; 1 of No. 15; 1 of No. 23a; 200 of No. 37; 5 of No. 37a; 24 of No. 38; 1 of No. 43; 1 of No. 48a; 4 of No. 52; 4 of No. 52a; 5 of No. 53; 2 of No. 53a; 2 of No. 59; 1 of No. 70; 5 of No. 90; 4 of No. 90a; 4 of No. 99; 2 of No. 100; 5 of No. 111c; 2 of No. 188; 1 of No. 189; 3 of No. 190; 2 of No. 191; 1 of No. 193; 6 of No. 195; 4 of No. 197.

The construction of the Meccano Shooting Game should prove easy if the instructions are followed carefully. Each side of the base is built up from two $12\frac{1}{2}''$ Angle Girders overlapping two holes. At one end the upturned flange of each compound girder carries a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate connected together top and bottom by means of $12\frac{1}{2}''$ Angle Girders 1 and 2, Fig. 3.

At the opposite end the sidemembers are secured together by a $12\frac{1}{2}''$ Angle Girder and at each end of this are fitted two $5\frac{1}{2}''$ Strips. One of these Strips is arranged to extend $\frac{1}{2}''$ above the other as shown. A $12\frac{1}{2}'' \times 2\frac{1}{2}''$ Strip Plate is now fitted to the firing end of the model together with two $5\frac{1}{2}''$ Strips 3 and two similar Strips 4 and 4a. The centre of the long Strip Plate supports a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip 5, that will be used later for supporting the gun.

This structure of Strips and Strip Plates is strengthened by means of two bracing members, each of which consists of a $5\frac{1}{2}''$ and $3\frac{1}{2}''$ Strip. The sides of the shooting space are each filled in by means of two $12\frac{1}{2}''$ Braced Girders and one $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Strip Plate. Two $12\frac{1}{2}''$ Strips bolted together and overlapping six holes are held in place above the Braced Girders and secured to them by Flat Brackets and a $3\frac{1}{2}''$ Strip 6.

A $12\frac{1}{2}''$ Strip is now bolted across the bottom of the rear flanges of the $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plates already mentioned and above this is fitted two $12\frac{1}{2}'' \times 2\frac{1}{2}''$ Strip Plates 7. A further similar Strip Plate is attached to the front flanges of the Flanged Plates together with two $12\frac{1}{2}''$ Strips 8 and 8a.

At the rear of the Angle Girder 2, three Obtuse Angle Brackets are fitted and these support two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Strip Plates 9. This compound Strip Plate, that forms a guard against Balls "fired" high, is suitably decorated with $2\frac{1}{2}''$ large and small radius Curved Strips as shown.

Two $1'' \times 1''$ Angle Brackets are now fitted to the inside of the Strip 8a, these being held in place by the Bolts 10. These Angle Brackets support an $11\frac{1}{2}''$ Rod on which are pivotally carried nine $2\frac{1}{2}''$ Strips, each of which is held in its appointed position by two Spring Clips. The upper end of each Strip carries a $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Bracket in the slotted hole of which a bolt is accommodated carrying a Washer. A small piece of card, on which a cat or other animal is drawn, is clamped in place between the Angle Bracket and Washer.

When a shot is fired and one of the "dummies" is knocked backwards, it is brought back into line at the end of a "shoot" by means of the Threaded Pin 11. This Threaded Pin is locked in the end hole of a long Strip that is held in position behind a $1\frac{1}{2}''$ Strip 12, as shown. The other end of the long Strip is pivotally attached by a bolt and Collars to a short Rod that is carried in the longitudinal bore of a Coupling 13. This Coupling is accommodated on the outer end of a long Rod formed from an $11\frac{1}{2}''$ and a $2''$ Rod. On this Rod two Cranks are carried, one of which is shown at 14. Each Crank carries a $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Bracket at its upper end, and these two parts are joined together by means of two $5\frac{1}{2}''$ Strips 15.

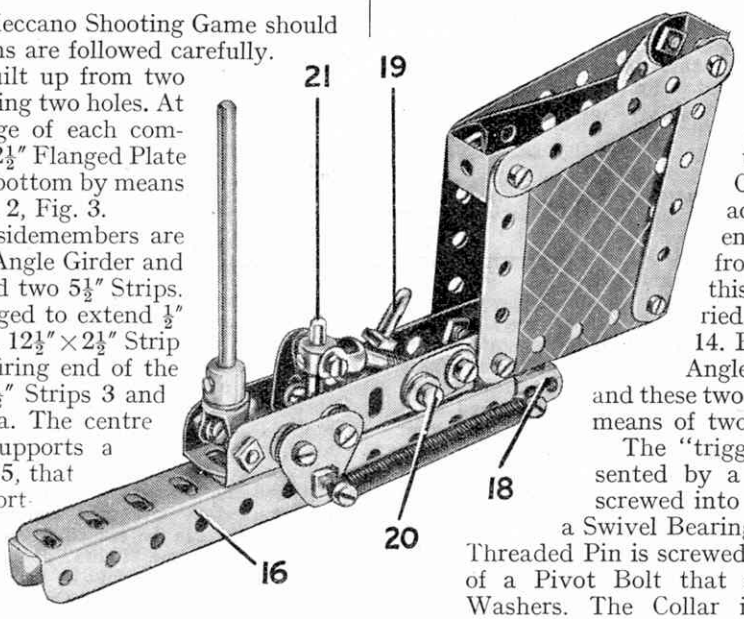


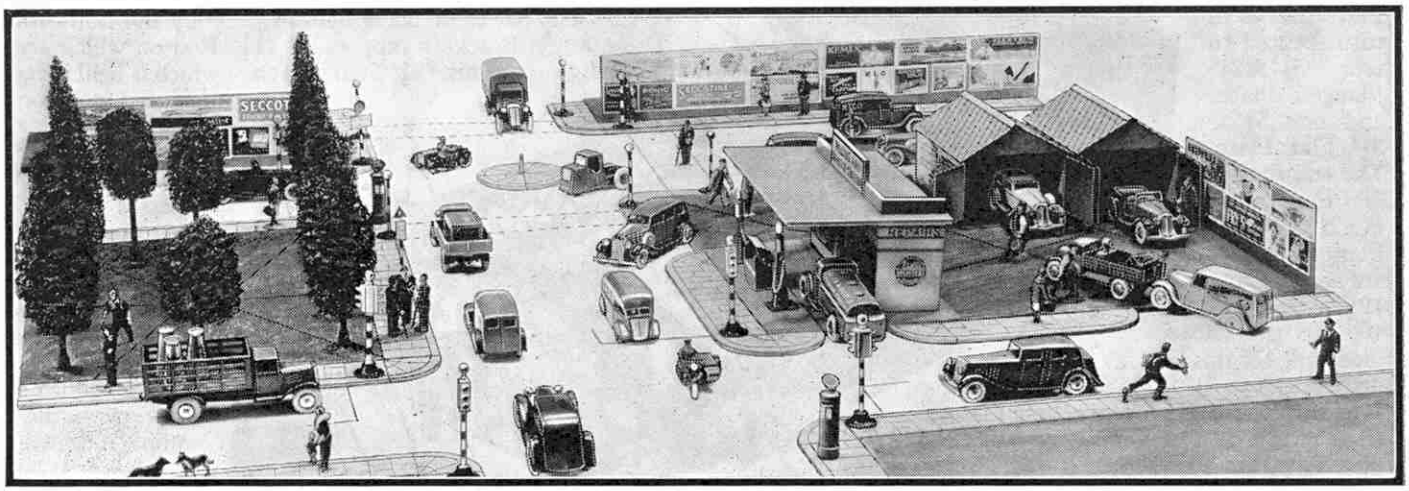
Fig. 4. The gun that is used for firing the steel balls in the Shooting Game. It is shown upside down to make the construction clear

The "trigger" of the pistol is represented by a Threaded Pin 19 that is screwed into one of the tapped holes of a Swivel Bearing carrying the Rod 21. The Threaded Pin is screwed in tight against the shank of a Pivot Bolt that carries a Collar and four Washers. The Collar is pivotally connected to the gun by two $\frac{3}{8}''$ Bolts 20.

The parts required to build the Shooting Game are as follows: 9 of No. 1; 16 of No. 2; 3 of No. 3; 6 of No. 4; 11 of No. 5; 1 of No. 6a; 8 of No. 8; 4 of No. 9; 9 of No. 10; 2 of No. 11; 17 of No. 12; 2 of No. 12a; 3 of No. 12c; 2 of No. 13; 1 of No. 15b; 1 of No 16; 3 of No. 18a; 18 of No. 35; 156 of No. 37; 24 of No. 38; 1 of No. 43; 1 of No. 48; 1 of No. 48a; 2 of No. 52; 7 of No. 59; 2 of No. 62; 3 of No. 63; 1 of No. 77; 4 of No. 90; 3 of No. 90a; 4 of No. 99; 4 of No. 111c; 2 of No. 115; 1 of No. 116a; 1 of No. 147b; 1 of No. 165; 2 of No. 190; 6 of No. 195; 4 of No 197

Fun with Meccano Dinky Toys

Making a Table-Top Layout



NOWADAYS everybody is talking about traffic problems, robots, Belisha beacons, and the like. These problems can be studied on the road, but it is much greater fun—and much safer!—to carry out operations on the table at home. With the wide range of vehicles of all kinds, petrol station and pumps, robots, traffic signs, etc., now available in the Meccano Dinky Toys series, street and road layouts of the most fascinating realism can be produced quickly and easily, and playing with them is fun of real interest. We know that many readers are already enthusiastic about such layouts, but for the benefit of those who have not yet tried a scheme of this kind we will describe the layout shown above.

The only materials required to make such a layout are a sheet of white or grey paper about 3 ft. square, some smooth cardboard about $\frac{1}{8}$ in. thick, and some grey and white water colour paint. The grey paper serves as a base for the layout, and on it the exact positions of the kerbs are drawn in in pencil. The areas of the layout that represent pavements, parks and buildings are then covered with a piece of cardboard cut to the necessary shape, a border $1\frac{1}{2}$ in. wide being left all round the cardboard to allow room for pavements.

A road layout for use with Meccano Dinky Toys. This will provide hours of fun and unlimited scope for experiment, and can be assembled easily by any boy or girl.

The pavements are made from strips of cardboard about $1\frac{1}{2}$ in. wide, painted grey and lined in with black ink to represent slabs. It is a good idea to cut the large pieces of cardboard enclosed by the pavements into triangles, squares and oblongs, as when this is done it is easy to re-arrange them quickly and so make up another and quite different layout when desired. In cutting the pieces, geometrical shapes should be adhered to as far as possible. Right-angled triangles, for example, can either be used separately, or two can be placed together to form an oblong; while three such pieces will make a trapezium-shaped area. One or two of the larger rectangular pieces should be divided diagonally with a curved cut, so that if the pieces are moved away from each other curved roads are obtained.

When the pavements have been arranged and the roads planned out, the vehicles, buildings and pedestrians are placed in position. In doing this care should be taken not to overcrowd the layout, for if too many models are included a great deal of the realism will be lost.

The layout on this page includes a Dinky Toy Petrol Station and two Garages. The pavement is omitted at several points round the Petrol Station in order to provide the necessary approaches to it and the Garages. The hoardings used to finish off the edges of the layout are simply pieces of cardboard with Miniature Posters gummed to them, and any number of these may be made as required. The road island seen in the rear is a circular piece of cardboard painted grey and provided with a centre post, on the top of which is a red warning signal. A match will serve excellently for the post, and the red head makes an admirable danger lamp!

Two different types of crossings are shown, one being a roundabout while the other is controlled by traffic lights. Pedestrian crossings are placed in judicious positions and the road studs for these are marked on the base paper with black ink.

At the robot-controlled crossing four two-face Dinky Toy Traffic Signals are used, two of these showing red and the other two green. In the illustration the signals are showing "green" to traffic proceeding along the main road past the front of the Petrol Station, and the Market Gardener's Van and the Daimler Car on the crossroad therefore are held up waiting for right of way.

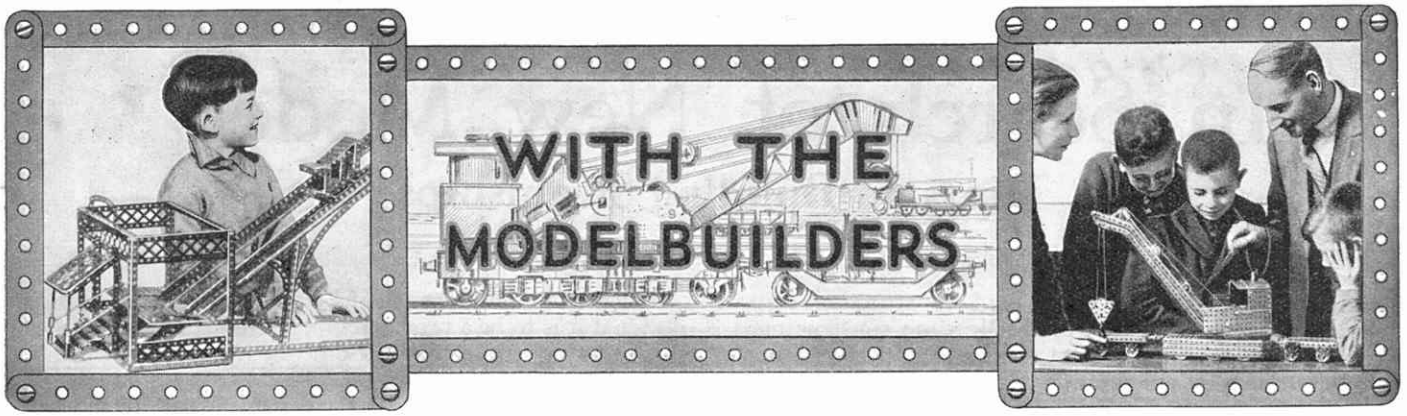
At the roundabout the traffic is circuiting the island, and on the right-hand road a Dinky Toy Van, and the Sportsman's Coupé, that are visible behind the Filling Station, are seen waiting to allow the Businessman to cross the road via the pedestrian crossing, which is indicated by Beacons and dotted lines.

The vicinity of the garage is a particularly realistic portion of the layout. Here good use is made of a Breakdown Car, a Petrol Tank Wagon, and one or two figures from the Hornby Engineering Staff and Passenger Sets. Two men at the rear of the garage are busy repairing and cleaning cars, and the Breakdown Car is just towing in a broken-down Van, an operation that is watched with interest by a woman standing near. Further realism is added by the Man beckoning to a Newsboy, who is shown running towards him in answer to his call.

On the other side of the layout, in the main road, a group of three Businessmen are in earnest conversation, and a Woman and a Child are walking in the foreground. Two Dogs—which look as though they are just about to start an argument—are another feature of this section of the layout.

When the layout has been completed a great deal of fun can be obtained by arranging various traffic conditions. For example an accident can be staged. This might be caused by a motorist trying to beat the "lights" at the controlled crossing, or alternatively a pedestrian could be knocked over by a negligent motorist disregarding the Belisha Crossing. In either of these cases the Dinky Toy Ambulance could be introduced with good effect.

In making a layout on these lines success depends largely on the choice of a suitable scene. An actual busy crossing with which one is familiar is the best type to tackle first of all, but when some experience of the work has been gained added interest can be obtained by making up realistic road scenes to one's own ideas. To obtain the utmost realism, however, care should be taken to see that everything is in accordance with real life. For instance motor vehicles must not be shown on road crossings while the Traffic Robots are against them, and vehicles must also be placed behind the white lines at the crossings and on the correct side of the road.



ARCHITECTURAL MODELS

Model-builders seeking original applications for Meccano might well try building architectural models. The possibilities offered by these subjects are not fully realised, and although models of famous cathedrals and other structures of masonry have occasionally been illustrated in the "*M.M.*," it is clear that the majority of readers devote most of their energies to the building of mechanical models. The chief objection that is generally put forward against building models of architectural subjects is that once they are built there is no further pleasure to be had from them except as models of beauty and ornament.

It is not always so, however, as some models can be used in connection with Meccano Motor Cars, Aeroplanes or Dinky Toys, or with a Hornby railway, to provide realistic surroundings. For these purposes models of garages, aeroplane hangars, railway stations, and signal cabins immediately suggest themselves, and there are many others that will occur to readers. When the models are finished they may be photographed with appropriate accessories in position to represent scenes from real life. For the purpose of a photograph, only a section of a building need be built, sections of several structures being arranged in a similar manner to the scenery of a theatre, so that a limited number of parts can be used for obtaining imposing photographic effects.

The interest to be had from building architectural models quite counterbalances their lack of utility when completed. Original subjects for models are always interesting as they call for new ideas and new uses for parts. To reproduce a structure of masonry might at first seem to be quite a simple task, but if all the small details are to be brought out in the model it will be found that original ideas and a knowledge of how to use parts to the best advantage are necessary, if the best results are to be obtained. Many interesting hours can be spent building up reproductions of the world's most famous examples of architecture.

THE ARC DE TRIOMPHE

A particularly fine model of the Arc de Triomphe is shown on this page, and in it several Meccano parts have been applied to unusual purposes for incorporating as much detail work as possible in the model. The size of this model may cause readers to form the opinion that structures of this type can be built only with an extensive range of parts. Of course with a large Outfit many elaborate models can be built, but the subjects are not excluded from the possibilities of small Outfits, although the builders must naturally confine their activities to less ambitious models. As there is such a great range of subjects from which the constructor can choose a prototype for his model it is not difficult to find one that can be reproduced to advantage with a small Outfit. When comparatively few parts are available it is advisable to select structures that do not incorporate much small detail work.

Strip Plates and Flexible Plates prove their utility for models of masonry on account of the fairly large surfaces to be filled in, and as the Plates are perforated at the edges only, they produce a more solid appearance than do the perforated Flat Plates and Flanged Plates. The advantages of using these parts are evident from the illustration. They suggest smooth unbroken surfaces of stone that are not easily represented by other Plates or parts.

Architraves can be used for ornamental work, and such parts as Trunnions, Corner Brackets and Triangular Plates have their uses for special purposes. It will be noticed that a 2½" Triangular Plate is used to form the keystone of the arch illustrated, and Chimney Adaptors, Boiler Ends and Handrail Supports are used for ornamental work on the upper structure of the arch.

Different ornamental effects are produced according to the arrangement of the coloured parts. In the case of the Strip Plates and Flexible Plates, it is surprising how a different effect is obtained by turning the plain side outward instead of the striped side. The colour combinations on the model illustrated can readily be visualised.

ANCIENT AND MODERN

Many modern buildings have large flat surfaces and angular corners, the complete absence of curves being conspicuous. As the modern tendency is to make all corners right-angles, and the roofs flat, these subjects are excellent for reproducing in Meccano. The chief difficulty is to avoid making a model look too much like a square box, but the judicious use of coloured parts for window frames and doors will be found to make a wonderful difference to the appearance of a model.

An imposing model of the Arc de Triomphe showing how architectural subjects can be reproduced in Meccano.

The older styles of architecture are more varied and give the model-builder plenty of scope, although the models are not quite so simple to build. A little difficulty generally adds to the interest of model-building, however, by giving opportunities for original work. Parts can be applied to new uses, and there is always greater satisfaction to be derived from the completion of a model that has not been all "plain sailing" than of a simple one. It is often necessary to modify some of the decoration, or to omit it entirely from the model, if it cannot be reproduced with realism. On the Arc de Triomphe model the sculptural work on the side panels has not been represented owing to the difficulty of using Meccano parts to obtain anything like a true reproduction of the original.

IDEAS FOR FANCY DRESS

This heading might seem out of place on this page, but actually it has a definite Meccano interest for model builders who are now thinking out original schemes for fancy dresses. About this time of the year many readers are attending carnivals and parties where fancy dresses are popular, and most of them will be wondering how to attire themselves in an original manner. Here all difficulties are smoothed away for the Meccano enthusiast who takes his hobby seriously, for how better could he appear than as a Meccano Robot? His costume is sure to arouse interest, and will stand a very good chance of carrying off the chief prize for originality. Even if someone else hits upon the idea, which is unlikely, there are sure to be big differences between the costumes so that each will retain much of its originality. In the past many Meccano boys have tried out fancy dresses on these lines and have received prizes for their ingenuity.

There are various ways of making Meccano costumes. Some of them can be built up on a framework of Strips and Girders and worn like a suit of armour, but for obvious reasons Meccano is not used throughout for the construction. The framework can be filled in with cardboard or cloth, suitably coloured, and perhaps spotted to represent perforations. If legs and arms are to be encased in such a suit, ingenuity will be called for to devise satisfactory joints to allow a reasonable amount of movement.

Readers who can persuade their mothers or sisters to make garments for them can select cloth in Meccano colours and have it made up to represent Strips on the arms and legs, and Plates on the body. Small circular black patches can be sewn on to represent holes, and golden-yellow ones for the bolts. Model builders will be able to suggest different effects that can be achieved on similar lines.

Meccano parts are useful for many fancy costumes for adding finishing touches, and for accessories. They can be used for helmets and other head dress; and for swords, shields, fire-axes, etc., to properly equip the wearer.

LARGE CIRCULAR PLATE.—A circular plate for use with the Ring Frame to make a large flanged wheel could be used in some cases for locomotive driving wheels, but otherwise its applications would be very limited. In most cases where a large circular plate is required the Roller Race (No. 167a) can be used, and consequently there would be insufficient demand for a new part to warrant its manufacture. (*Reply to T. W. Pease, Lostwithiel.*)

SUBSTITUTE FOR SOCKET COUPLING.—The Socket Coupling provides a convenient way of joining together two wheel bosses, and is particularly useful for connecting Gears and Pinions in gearbox construction. This suggestion is that the Pinions should be drilled for inserting screws for attaching them to Gears. It is novel, but the objection to the arrangement is the small diameter of the Pinions. On the ½" Pinions there is not sufficient width between the teeth and the boss to allow for the insertion of a screw, and even on the ¾" Pinions the screw would have to be of smaller diameter than the standard bolts. It would also be necessary for all Gears to be similarly drilled for use with the Pinions. Although the idea is quite good, it is scarcely practicable for these reasons. (*Reply to A. R. Wright, Stamford, Northants.*)

A SYNCHRONOUS MASTER CLOCK

J. Thomas, Bristol, has succeeded in building the synchronous motor used in the clock described in the November, 1935, "*M.M.*," into the Master Clock featured in the September, 1935, Magazine. By doing this he claims to have made a clock that combines elegant appearance and absolute reliability.

To do this the pendulum movement from the Master Clock was removed and the motor then fitted in the position occupied previously by the impulse coils. A Worm on the armature shaft of the motor drives a 50-teeth Gear Wheel on a vertical shaft and this carries a Worm at its upper end. The Worm drives a 50-teeth Gear Wheel on a Rod journalled in the side plates of the clock. By fitting two further gear reductions of 3 : 1 and 2 : 1 a total reduction in speed of 15,000 : 1 between the motor and the minute hand is obtained. The minute hand therefore makes one revolution every hour.

In Search of New Models

Hints on Building Steamships

THERE is much fun to be had constructing ship models of all types, but many Meccano constructors seem to overlook these most interesting subjects for models. Once they try reproducing ships in model form they will realise that a most fascinating new field for constructional work has been opened to them, and will be eager to build different types. In a previous article in this series sailing ships were dealt with as subjects for attractive models, and readers who have built models of the old-timers, or of modern yachts, will now be keen to try ships of a different type.

On these pages some of the possibilities offered by steamships are investigated. Constructors taking a really keen interest in shipping will realise that under the heading of steamships enough model material will be found to provide interesting work for several years, but as the average model builder likes variation of his subjects we will deal here with only a few of the interesting types that can be built.

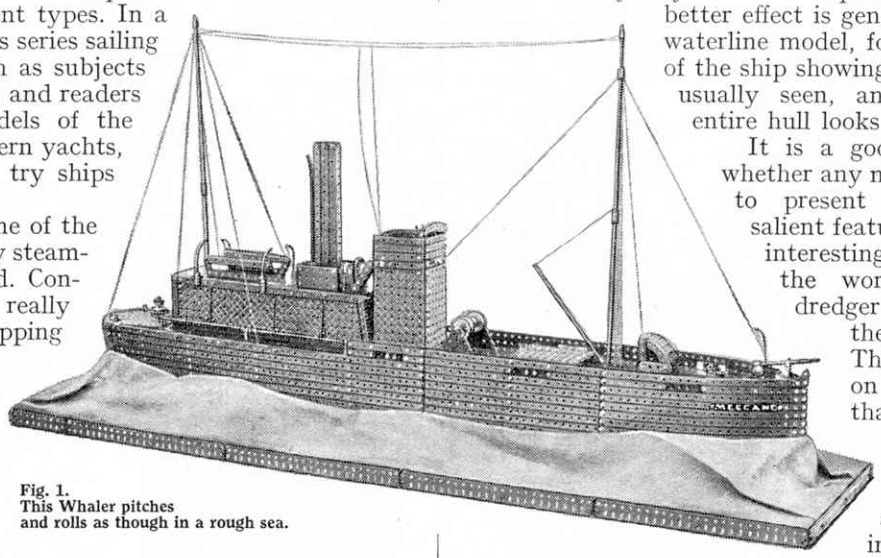


Fig. 1.
This Whaler pitches and rolls as though in a rough sea.

In the article on sailing ships mention was made of historic vessels as model subjects, and although a later period of history is covered by steamships there are many historic vessels that have particular interest, making them worth while building in Meccano. The interest in reproducing an old-time ship, or in fact any engineering structure of years ago, is largely due to the strangeness of the original compared with similar structures of the present day. The early steamships had paddles and sails and are in no way comparable with our present-day steamers. Boats intended for short distances were of even stranger appearance, particularly those built for experimental purposes.

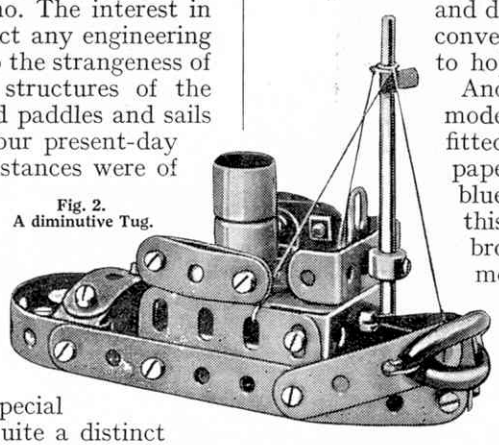


Fig. 2.
A diminutive Tug.

The great increase in sea trading during the steamship era has been responsible for the development of numerous specialised types of vessel to meet the requirements of particular trades or for some definite service. Among the vessels for carrying special cargoes we find oil tankers forming quite a distinct class. The characteristic feature of these ships is their great length. The superstructure and bridge are placed at the stern and the engines also are mounted at the stern, below decks, so that the entire forward part of the vessel is devoted to the carrying of oil. Some cargo vessels, particularly those in service on inland waterways, are built on similar lines to oil tankers, but are provided with holds for cargo instead of the tanks. These ships can be reproduced quite easily in Meccano.

Before building the model the constructor should decide if it is to be a reproduction of only that part of the ship showing above the waterline, or if it is to represent the entire vessel. The four models shown on these pages are all waterline models, but where sufficient parts are available they may be built to represent the entire ship. A better effect is generally produced by a waterline model, for it is only the part of the ship showing above water that is usually seen, and a model of the entire hull looks rather unfamiliar.

It is a good plan to consider whether any means can be adopted to present to advantage the salient features of the vessel. An interesting way of showing off the working of a bucket dredger has been adopted in the model in Fig. 3. This model is mounted on suitable supports so that the bucket arm can be seen projecting from the bottom of the boat. The bucket arm operates in a slot in the centre of the vessel, and is raised above the keel when the dredger is under way, but on arrival at the place of operation the arm is lowered for the buckets to scoop up sand or mud, known as "spoil," from the bed of a river or harbour. The particular method adopted for displaying the model dredger shows the buckets operating, scooping up the spoil and depositing it at the top of a chute that conveys it over the side of the vessel to hopper barges alongside.

Another interesting way of mounting a model is shown in Fig. 1. The Whaler is fitted on a suitable baseboard with cloth or paper arranged to represent water. Dark blue or green material should be used, and this can be flecked with white to suggest broken waves and spray. The vessel is mounted at its centre on a pivot allowing universal movement so that the ship can be made to rock from side to side, and from stem to stern. In this way a most realistic pitching and rolling movement can be obtained, giving the ship the appearance of being in a rough sea; and if the coloured material representing the sea is attached to the sides of the ship, this also will move up and down with a motion like that of the waves.

At one end of the baseboard a Motor is mounted—an Electric Motor being most suitable for this purpose—and geared to give a very slow drive to a Crank. The Crank is connected by a pivoted Rod to one end of the ship, so that as the Crank rotates the ship rocks up and down and

from side to side. The movement is best applied to fairly long models; and in the case of the ship shown the Motor can be mounted behind the model without being seen from the front. With small models it will be necessary to mount the ship on a raised baseboard to conceal the Motor beneath the board, a slot being cut to accommodate the connecting rod actuating the movement of the vessel.

Other ways of displaying model ships to show them up to advantage will occur to builders, and different methods will be adopted for different types of vessel. It is a good plan to construct several small tugs of proportionate size to a large model ship and to arrange them alongside, or connect them to towing hawsers. In this way the actual size of the real ship is suggested, as the comparison between the size of the ship and that of the tugs is immediately apparent.

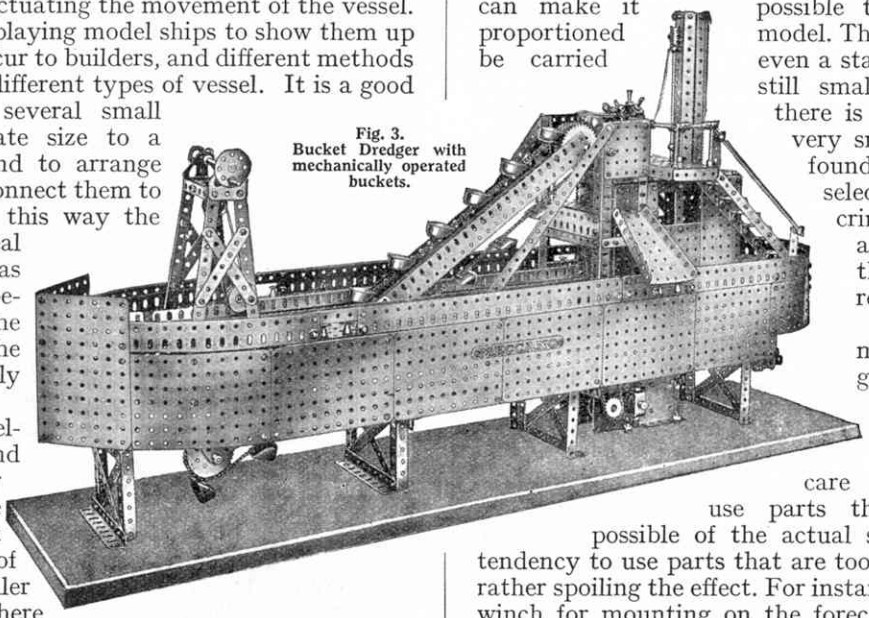


Fig. 3. Bucket Dredger with mechanically operated buckets.

When the model-builder sets out to find subject matter for steamship models he will be surprised at the great diversity of types. Among smaller passenger vessels there are the river ferries and lake steamers, with screw or paddle propulsion. Some of the American paddle steamers have many decks, giving them rather an unusual appearance, and making good subjects for model-builders who like to incorporate much detail work in their models.

The larger sea-going and ocean-going passenger vessels do not vary greatly in the essential points of their design, the most noticeable differences being in their size and the number of their decks and funnels. In building a model liner the constructor should seek out individual features and reproduce these with fidelity so that there can be no doubt concerning the actual vessel represented by the model.

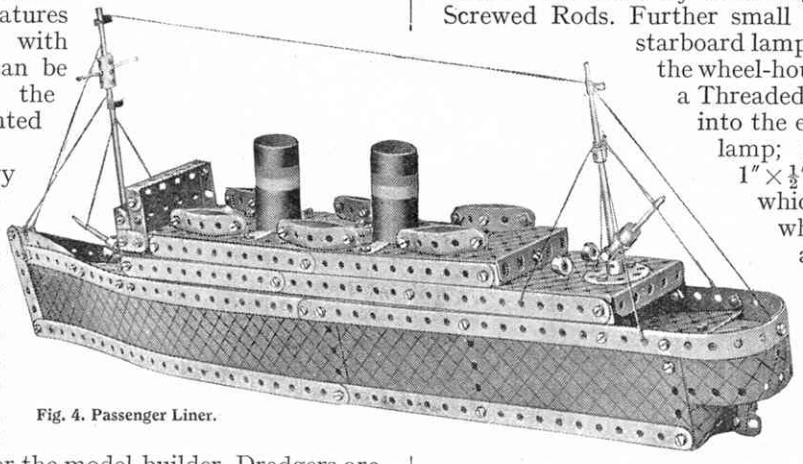


Fig. 4. Passenger Liner.

Cargo vessels vary greatly in design according to the cargo they carry and to the conditions under which they operate. In addition to general cargo ships there are vessels designed to fulfil some special purpose, and these are probably the most interesting of all for the model-builder. Dredgers are included in this class, and in addition to the type illustrated there are suction dredgers—perhaps not so interesting as models—and grab dredgers. Bucket dredgers and grab dredgers provide interest not only as ship subjects but also as mechanical models.

The size of a model is obviously governed by the range of parts available for it, but even when large numbers of parts are available good fun can be had building small models. It is often the case that a small model built with a limited number of parts calls for more skill in the use of the parts than does a large model, if the most realistic results are to be obtained. The little tug in Fig. 2 is an example of the results that can be achieved with a small number of parts. In a small model such as this, correct proportions of the different parts must be sacrificed a little, but the tug proves that careful selection of parts can make it possible to build a very well proportioned model. The idea of simplicity can be carried even a stage further by building still smaller models in which there is less detail work. For very small models it will be found that parts must be selected with much discrimination if the models are to resemble the ships they are intended to represent.

Detail work on ship models of any size greatly influences their finished appearance. In reproducing small details, however, care should be taken to use parts that are as near as possible of the actual scale size. There is a tendency to use parts that are too large for the purpose, rather spoiling the effect. For instance, in making a model winch for mounting on the forecastle head, some constructors are tempted to make a model that actually works, when it would be far too large to be in keeping with the remainder of the ship. In such a case a dummy winch should be fitted and made to look like the actual mechanism.

On the Whaler and Dredger it will be noticed that bollards are mounted in appropriate positions, gaps being left in the sides of the vessels to expose them, as in actual practice. Buffers are used for the bollards. Ventilators fitted immediately in front of the funnel on the Whaler are made by mounting $\frac{3}{4}$" Flanged Wheels on Screwed Rods. Further small details are the port and starboard lamps mounted on the sides of the wheel-house. Each lamp consists of a Threaded Boss with a bolt screwed into the end to form the top of the lamp; and is secured to two $1" \times \frac{1}{2}"$ Angle Brackets, one of which is attached to the wheel-house, the other being arranged beneath the Threaded Boss. On the small Tug a noticeable feature is the fender on the bows; used in actual practice to prevent the tugs from damaging the sides of a vessel with which they come in contact. A $\frac{5}{8}$" Rubber Ring is tied in position to represent the fender.

An important feature of any steamer is the funnel, and several ways of making funnels are shown on these pages. Strips are useful for the purpose, as they can be used for making a funnel of any diameter and height; and with Strips it is easy to form funnels of oval or round section. The Strips can be bolted to further Strips bent to form a circle or oval, or to Obtuse Angle Brackets. Two Chimney Adaptors are used for the funnel of the Tug.

Meccano Bucket Dredger

A Fascinating Meccano Model

A COMMON sight at great ports is the fleet of dredgers employed in keeping the docks and entrance channel navigable for shipping. Dredgers are not attractive in appearance, but their importance entitles them to more attention from Meccano model-builders than is usually given to them. The varied types of these vessels and their extensive mechanical equipment provide plenty of scope for enterprising model-builders, and miniature reproductions of suction, cutter-suction and bucket type dredgers are very interesting to construct.

The Meccano model shown in Figs. 1 and 2 is not a reproduction of any particular dredger, but it embodies all the main characteristics of a typical treble type dredger produced by the well-known crane makers, Priestman Brothers Limited, London. The hulls of these vessels are usually constructed by various Clyde dredger and hopper builders, and fitted with cranes and grabs made by the Priestman Company. The model is nearly 4 ft. in length and has a 9½ in. beam, and the three cranes with their grabs are operated automatically from a 6-volt or 20-volt Meccano Electric Motor.

The hull is commenced by building a framework of Angle Girders to form an oblong 31″×9½″. Each long side of this frame is composed of an 18½″ and a 12½″ Angle Girder joined together end to end by means of a 7½″ Angle Girder. The two complete side members are connected together by a series of 9½″ Angle Girders, and these are braced by a number of 5½″ Strips. When the frame is complete it is fitted at each side with four 12½″×2½″ Strip Plates, as shown in Fig. 2. The front ends of these Plates are forced together to form the bow of the model, and secured to ½″×½″ Angle Brackets. Two 2½″ and two 2″ Strips are bolted to this part of the hull, as illustrated, to form the stem.

The upward sweep of the forward part of the ship is reproduced by two 12½″×2½″ Strip Plates, the top forward corners of these being bolted to the 2½″ Strips of the stem. A similar arrangement will be seen at the stern. The upper curve of this part of the model consists of three 5½″×1½″ Flexible Plates bolted to two 12½″ Strips curved to the correct shape, and 12½″ Strips are also used for strengthening the topsides of the bulwarks, both at the stern and at the bow.

The deck at bow and stern is fitted to several ½″×½″ Angle Brackets secured to the inside of the hull, but amidships it is attached to Angle Girders as shown in Fig. 1. The after deck is composed of 9½″×2½″ and 12½″×2½″ Strip Plates, and two 5½″×2½″ Strip Plates which are indicated at 1 and 1A, Fig. 1. These two Plates are set at an angle in order to fill in part of the curved portion of the deck. The entire deck is edged with a number of straight and curved Strips, which serve the dual purpose of hiding unsightly corners of Strip Plates and also filling in any small gaps existing at the ends of the Plates. Beneath each side crane, 2 and 3, a 2½″×2½″ Flat Plate is fitted, to carry the upper ends of the pivot and driving shafts.

The fore deck is built similarly to the deck just described, but a 4½″×2½″ Flat Plate 4 and a 5½″×2½″ Flat Plate 5 are fitted as shown. This deck is also secured to the hull by means of ½″×½″ Angle Brackets, and Strips are used along its edge. The narrow deck along each side of the hopper is constructed from 5½″×1½″ Flexible Plates, strengthened by 1½″ Strips. Angle Girders form coamings round the hopper, and they are secured together at the corners by ½″×½″ Angle Brackets.

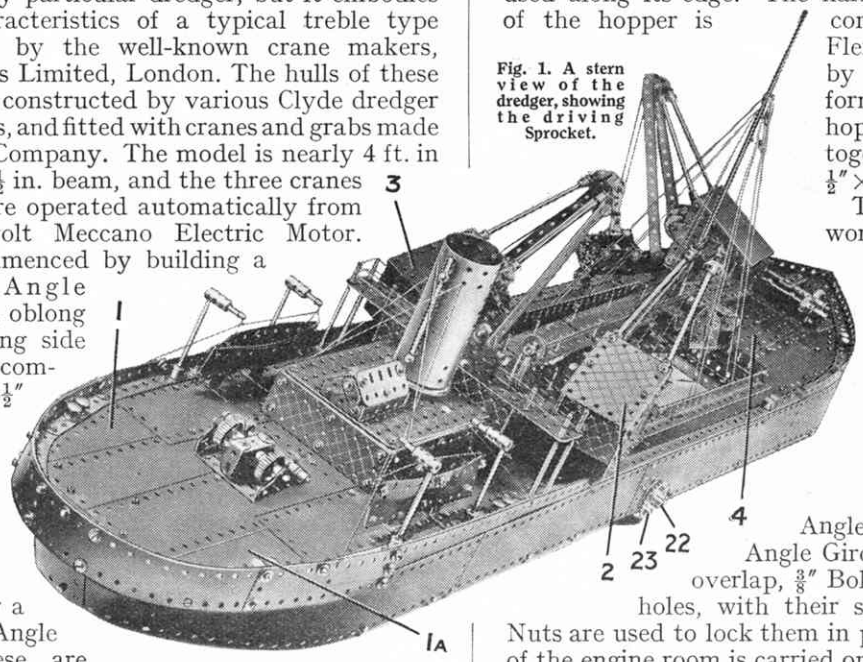


Fig. 1. A stern view of the dredger, showing the driving Sprocket.

The engine room upper works and bridge are built next. An oblong of Angle Girders, 4½″×5½″, is first laid down on the after deck and two 5½″×1½″ and two 4½″×1½″ Flexible Plates are fastened to it. These are strengthened internally with 1½″ Strips and carry at their upper edges two 5½″ Angle Girders and two 4½″ Angle Girders. Where these Girders overlap, ⅜″ Bolts are passed through the holes, with their shanks pointing upwards. Nuts are used to lock them in position, and later the top of the engine room is carried on the four shanks and held in place by nuts. This engine room top consists of two 5½″×3½″ Flat Plates fastened by nuts, and it carries the funnel and skylight.

The base of the skylight consists of two 2½″×½″ Double Angle Strips and two 1½″ Strips. They are surmounted by two 2½″ Flat Girders set at an angle, the triangular gap at each end of these being filled in by means of two Flat Brackets secured to ½″×½″ Angle Brackets. The funnel is represented by a Boiler, minus Ends, the two edges of which are overlapped two holes. The escape steam pipe is fastened to the Boiler by two Handrail Supports, the lower Support of which secures a 1″×½″ Angle Bracket to the inside of the funnel. This is in turn bolted to a 2″ Pulley that is attached to a Wheel Flange by means of two ¾″ Bolts. These Bolts pass through the Wheel Flange and into the top of the engine room, where two nuts hold them in place. The method of bracing the funnel is shown in Fig. 1.

The bridge is supported on a structure built up of two 5½″×2½″ Flat Plates and two 2½″×1½″ Flexible Plates. The structure is secured to the deck by means of 4½″ and 1½″ Angle Girders and to the bridge by means of ½″×½″

Angle Brackets. The bridge consists of one $5\frac{1}{2}'' \times 2\frac{1}{2}''$ and two $3'' \times 1\frac{1}{2}''$ Flat Plates, round the edges of which are arranged a series of 1" Threaded Rods. The Rods support lengths of copper wire, which represent handrails. The two end pairs of supports for the handrails are $4\frac{1}{2}''$ Threaded Rods and these pass through the deck.

The arched structure across the hopper consists of two side members joined together by Double Brackets. Each side member is built up from a $5\frac{1}{2}''$ Curved Strip, to the ends of which are bolted $5\frac{1}{2}''$ Strips overlapping two holes. The centre of the $5\frac{1}{2}''$ Curved Strip carries a Flat Trunnion that is attached to the side of the hopper by two 3" Strips, held in place by $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Brackets. The purpose of the arch is to support four $\frac{1}{2}''$ Pulleys, over each of which passes a length of chain. This chain can be purchased, in nickel or black finish, from this office price 3d. per yard. One end of each chain is secured to a Girder in the bottom of the model, and the other end is linked up by a length of cord to a windlass. Part of one of these windlasses is shown at 7, Fig. 3. In actual practice each chain is connected at its lower end to a big flap in the bottom of the boat, that is let down when a cargo of silt is being discharged.

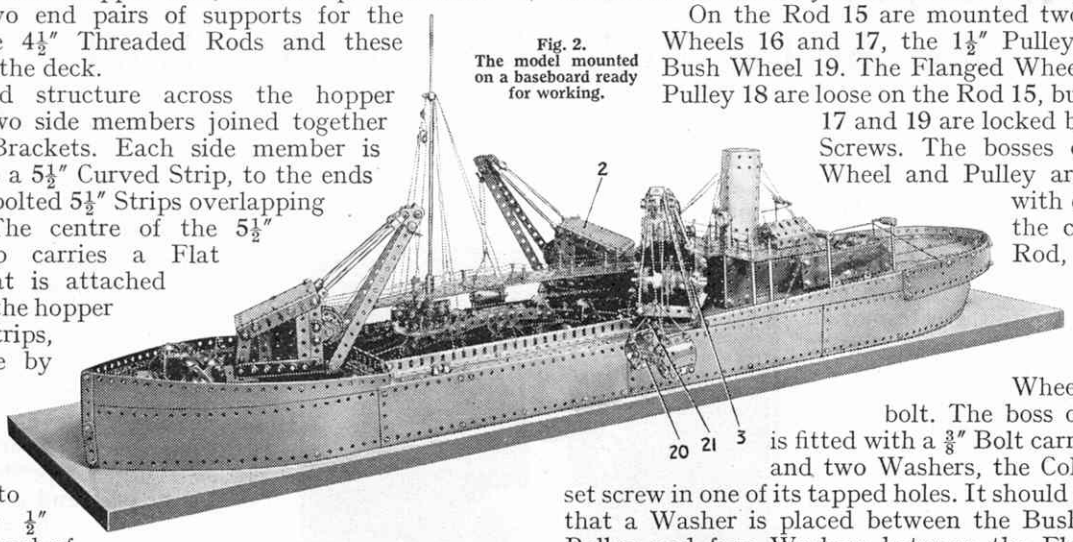


Fig. 2. The model mounted on a baseboard ready for working.

The forward crane is shown in Fig. 3, and a description of this will serve for cranes 2 and 3, which are identical with it in every respect. A $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate, fitted at each side with a $3\frac{1}{2}''$ Angle Girder, forms the crane platform. Each Angle Girder carries two 3", two $2\frac{1}{2}''$ and three 2" Strips and they pass behind a second $3\frac{1}{2}''$ Angle Girder at their upper ends. Where possible the Strips are bolted to this $3\frac{1}{2}''$ Girder. The back of the crane consists of a $1\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate 8. The roof is a $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Strip Plate, but this is not fitted until the operating mechanism for the grab has been installed.

A 5" Rod is passed through a hole in the base plate, $1\frac{1}{2}''$ from the front edge, and it is journalled at its upper end in the $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip 9. A $1\frac{1}{2}''$ Contrate 10, a Coupling 11 and a Collar are mounted on the 5" Rod, the Coupling being spaced away from the Contrate by three Washers. One end of the Coupling accommodates the inner end of a $1\frac{1}{2}''$ Rod that carries a $\frac{1}{2}''$ Pinion, meshing with the Contrate 10 and the 57-teeth Gear 12. The Gear 12 is in engagement with a second $\frac{1}{2}''$ Pinion on the Rod 13, the other end of which is fitted with a $1\frac{1}{2}''$ Sprocket Wheel. A length of Sprocket Chain couples up this Wheel with a 1" Sprocket 14 that is locked on a Rod 15 journalled in 1" Triangular Plates.

On the Rod 15 are mounted two $\frac{3}{4}''$ Flanged Wheels 16 and 17, the $1\frac{1}{2}''$ Pulley 18 and the Bush Wheel 19. The Flanged Wheel 16 and $1\frac{1}{2}''$ Pulley 18 are loose on the Rod 15, but the Wheels 17 and 19 are locked by their Grub Screws. The bosses of the Bush Wheel and Pulley are in contact with each other in the centre of the Rod, and one of the tapped holes in the boss of the Bush Wheel carries a bolt. The boss of the Pulley is fitted with a $\frac{3}{8}''$ Bolt carrying a Collar and two Washers, the Collar having a set screw in one of its tapped holes. It should be noted here that a Washer is placed between the Bush Wheel and Pulley and four Washers between the Flanged Wheel 16 and Sprocket 14.

The Pivot Rod of the crane, already mentioned, is now passed through one of the holes in the deck of the dredger, and the lower end is locked in the boss of a Double Arm Crank. This Crank is bolted to one of the transverse $9\frac{1}{2}''$ Girders of the hull. As the crane is rotated by hand, the Contrate 10 remains stationary and the Gears rotate. The mechanism is completed by fitting a very delicate band brake to the $1\frac{1}{2}''$ Pulley 18 as shown.

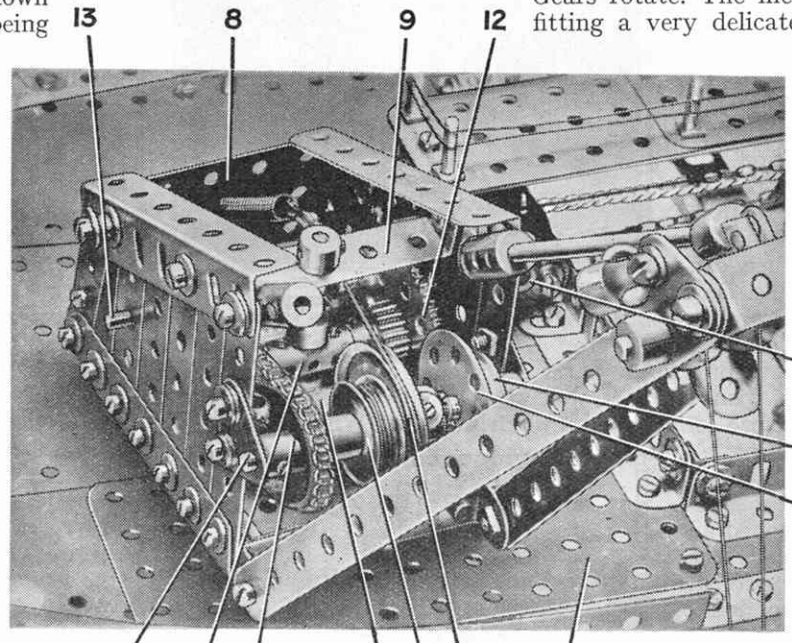


Fig. 3. A sectional view of one of the cranes in which the roof has been removed.

The grab is connected to the hoisting barrel in the following way. A cord from the Flanged Wheel 17 is attached to the centre Rod of the grab, as shown at 20 in Fig. 2. A second cord from the Wheel 16 is attached by four short cords to the upper corners of the grab and secured in place underneath Washers. When the cords are correctly adjusted for length and the crane is turned, the grab will not only be raised and lowered but also opened and shut in a manner suggesting real dredging.

The crane is rotated from a $\frac{3}{4}''$ Pinion 21, Fig. 2, and the vertical shafts carrying the two Pinions for cranes 2 and 3 are connected together by a horizontal shaft and $1\frac{1}{2}''$ and $\frac{1}{2}''$ Bevels. A horizontal shaft is also connected to the vertical driving rod of the forward crane. Lengths of Sprocket Chain connect the two horizontal shafts to the Rod 22 carrying the driving Sprocket 23 for the model. This Sprocket is connected by Sprocket Chain, through a slip clutch, to a reversing gear similar to S.M. No. 63, and this in turn is linked up with a 6-volt or 20-volt Meccano Motor.

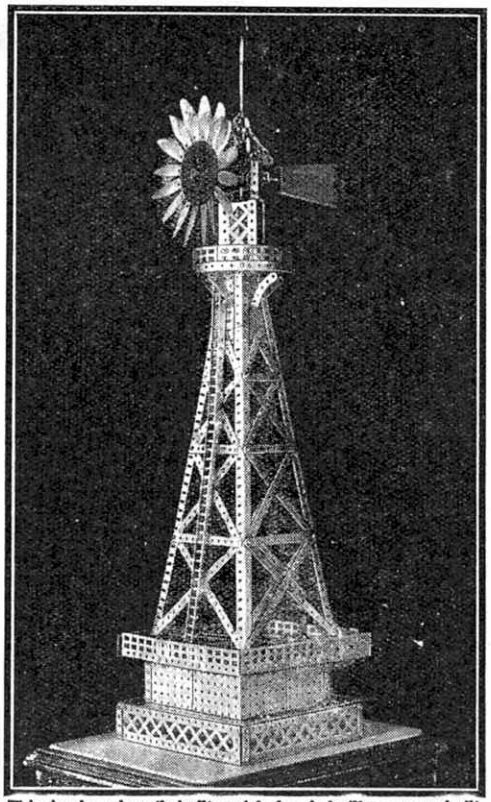
Prizes for Meccano Model-Builders!

For the Best-Built Models of Any Kind

MECCANO activities are now at their height, for the ranks of this world-wide band of happy model-builders have recently been swelled by thousands of boys and girls who received Meccano Outfits as Christmas presents and are now experiencing for the first time the joys of this greatest of all hobbies. Most of these newcomers to Meccanoland will no doubt be busy building the various models shown in the Instruction Manuals, but few of them will be content merely to copy models once they have obtained some experience. From the time a boy first uses Meccano, he has before him a constant encouragement to make slight changes in the construction of the various Manual models, and thus he is led on to build models from his own ideas.

There is nothing in the world to be compared with the joy and satisfaction of creating something new, and in order to ensure that every model-builder shall have ample opportunity to exercise his skill in designing his own models we are organising the competition announced on this page.

Every competitor has an equal chance in this competition, no matter what Outfit he may possess. All it is necessary to do is to think of a new model of any kind, no matter how simple, and then construct it as neatly as possible. Boys and girls of any age may compete and there are no fees to be paid.



This simple and neatly built model of a windmill pump was built by Renè Hosse, Antwerp, and is a good example of the kind of models that win prizes in Meccano competitions.

Competitors may use any number of parts in constructing the models they wish to enter, but it is a mistake to think that the more complicated a model is, the better the chance it will have of winning a prize. Very often indeed the reverse is the case and a simple model that is well proportioned and displays sound constructional features secures a prize in preference to a model in the construction of which the chief aim has been to produce an intricate piece of mechanism without any regard either to proportion or correct principles.

In entering this contest competitors should try to be as original as possible in their choice of subjects, for in making the awards the judges will pay special attention to models showing initiative and which are not simply variations of models included in the Meccano Instruction Manuals.

There are thousands of original subjects to choose from, but competitors who cannot think of a really unusual model should try to incorporate in their car, aeroplane, loco or other such model a new use for a Meccano part or a little detail work in order to make the finished model as realistic and interesting as possible.

Entries will be divided into three Sections as follows: Section A for competitors living in the British Isles and over 14 years of age. Section B for competitors living in the British Isles and under 14 years of age. Section C for readers of all ages living overseas. A fine range of prizes consisting of cheques and Meccano and Hornby goods will be awarded in each Section and full details of these appear in the panel on this page.

We wish to remind intending competitors that it is not necessary to send the actual model; a good photograph or a clear drawing is all that is required. Each competitor should take special care to see that his or her age, name and address appear on the back of each photograph or sheet of paper used, together with the letter A, B or C, indicating the Section in which the model is entered, and the name of the competition, i.e. "Winter" Model-Building Contest.

Photographs or drawings need not be the competitor's own work, but it is absolutely necessary that the model itself is his or her own unaided work.

Envelopes containing entries should be addressed to "Winter" Model-Building Contest, Meccano Ltd., Binns Road, Liverpool 13. It should be noted that drawings or photographs of prize-winning models become the property of Meccano Ltd., but unsuccessful entries will be returned to the senders if a stamped addressed envelope of suitable size is enclosed for that purpose.

Readers living in Great Britain and Ireland must forward their entries not later than 29th February, 1936. In order to give Overseas entrants plenty of time in which to build their models we have extended the closing date for Section C to 30th April, 1936.

The full lists of prize-winners will be published in the *"M.M."* as soon after the closing dates as possible.

THE PRIZES

Cheques, Meccano and Hornby Goods

The prizes in Sections A and C are as follows:
1st Prize, Cheque for £3-3s.
2nd Prize, Cheque for £2-2s.
3rd. Prize, Meccano or Hornby Goods value £1-1s.
Six Prizes of Meccano or Hornby Goods value 10/6.
Six Prizes of Meccano or Hornby Goods value 5/-.

In Section B the prizes to be awarded are:
1st Prize, Cheque for £2-2s.
2nd Prize, Cheque for £1-1s.
3rd Prize, Meccano or Hornby Goods value 15/-.
Six Prizes of Meccano or Hornby Goods value 10/6.
Six Prizes of Meccano or Hornby Goods value 5/-.
A number of Certificates will also be awarded in each Section.

Model-Building Competition Results

By Frank Hornby

"September Contest" (Home Section)

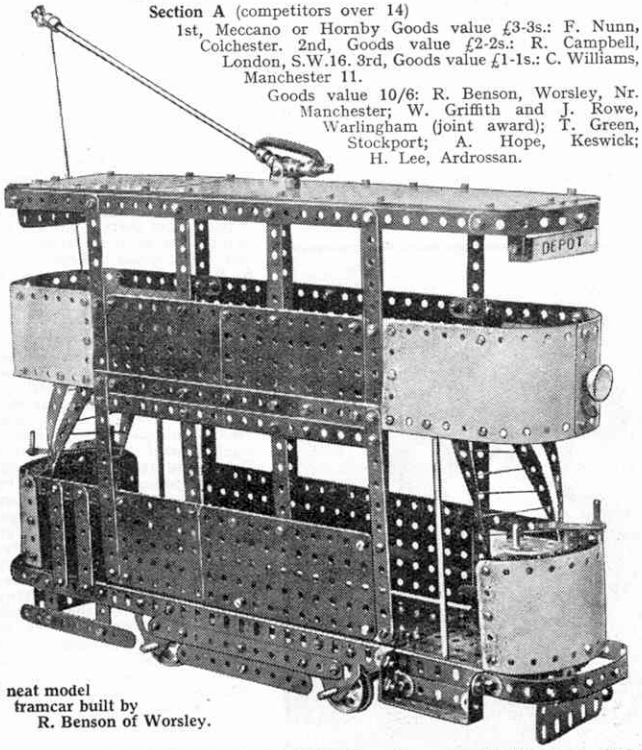
In examining the entries in the "September" Contest I was particularly glad to find a large increase in the number of models submitted by boys under 14. Many of their models are really excellent pieces of work and quite equal to some of the models built by older boys entering in Section A.

The full lists of awards in the Home Sections of the Competition are as follows:

Section A (competitors over 14)

1st, Meccano or Hornby Goods value £3-3s.: F. Nunn, Colchester. 2nd, Goods value £2-2s.: R. Campbell, London, S.W.16. 3rd, Goods value £1-1s.: C. Williams, Manchester 11.

Goods value 10/6: R. Benson, Worsley, Nr. Manchester; W. Griffith and J. Rowe, Warlingham (joint award); T. Green, Stockport; A. Hope, Keswick; H. Lee, Ardrossan.



A neat model tramcar built by R. Benson of Worsley.

Goods value 5/–: W. Bowley, Derby; P. Bradley, Stanmore, Middlesex; G. Peek, Colchester; R. Walford, Newton Abbot; E. Whitehouse, Bristol 8.

Section B (competitors under 14)

1st, Meccano or Hornby Goods value £2-2s.: J. Cooley, Wisbech, Lincs. 2nd, Goods value £1-1s.: J. Driscoll, Perranwell, Cornwall. 3rd, Goods value 10/6: E. Jones, Newcastle Emlyn, Carmarthen.

Goods value 5/–: O. Arnold, Wolverhampton; M. Bryant, Skipton; F. Haynes, Wallasey; R. Johnson, Leigh-on-Sea; B. Mallinson, S. Ascot, Berks.; D. Middleton, Northampton; T. Smith, Exeter; R. Stevens, Bradford; J. Weir, Emsworth. Hampshire; H. Whitehouse, Bristol 8.

I am constantly advising competitors to find original subjects for their competition models, and I am glad to say that at least one competitor in this contest acted on my advice, and was awarded a First Prize for his efforts. The competitor concerned is F. E. R. Nunn, and his model is a representation of a studio camera crane such as is used in film studios for supporting the camera above the scene, to enable high angle pictures to be taken.

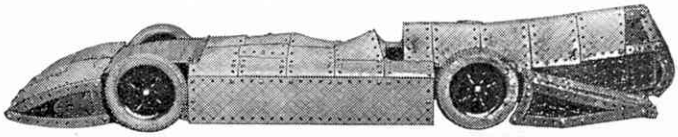
The model consists of a small travelling carriage on which is a pedestal carrying the jib and platform for the camera. The carriage is provided with 3" Pulley Wheels fitted with Rubber Tyres and Ackermann steering gear, and the pedestal is made from two triangular frames of Strips, the apex of the frames forming the pivot for the jib. The jib is tubular in section and is 2½" square at one end and tapers to 1½" square at the other. It is pivoted a short distance from the wider end, which is loaded with weights to counterbalance the weight of the camera, operator and platform. The jib is moved up and down see-saw fashion by means of Screwed Rods rotated in Threaded Bosses fixed to the jib. The camera platform is in two pieces, the lower one pivoted to the end of the jib, while the second forms a turntable so that the camera can be turned round to face in any direction. A compensating Rod attached to the pedestal and the platform ensures that the platform remains horizontal no matter what position the jib is in. The model is quite simple in construction and owes its success mainly to its originality.

A large model of a universal type bucket excavator won Second Prize in Section A for R. O. Campbell. The model is sturdily constructed and will actually perform light work. One Meccano Electric Motor working through a special gear-box is used to drive the various mechanisms, including travelling, swivelling, raising and lowering of the bucket arms and the movement of the buckets themselves, each of the movements being independently controlled by a separate lever.

C. Williams submitted a fine model of an old galleon of the Elizabethan period. The model incorporates a large amount of detail and no trouble has been spared to make it a truthful representation of one of these interesting ships. I have compared the model with a photograph of an Elizabethan galleon and I am glad to say that there is very little that I can find to criticise.

The model tramcar illustrated on this page was built by R. Benson and won one of the smaller prizes in Section A. The main feature of the model is its simplicity, and this, coupled with neat construction, accounts for its success in this contest. The model is lacking in originality, however, and that is why it failed to win one of the principal prizes. The body is carried on a chassis consisting of two 12½" Angle Girders fitted with bent 5½" Strips at each end for bumpers. The model runs on Flanged Wheels that are secured on Rods journalled in Flat Trunnions. The curved ends of the car are made from Strip Plates, and the floor and the straight parts of the roof and sides are built up with Flat Plates. The stair treads are made with cord and the model is fitted with Lanterns from the Meccano Lighting Set. A finishing touch is provided by a destination board made from a 2½" × ½" Double Angle Strip held in place near the roof by 1" × 1" Angle Brackets.

Section B contains quite a number of interesting entries, chief of them being a model of the destroyer "*Viceroy*," which was built by J. E. Cooley, and won First Prize. The model is not an elaborate piece of work, but it is very neatly built and incorporates all the main features of the actual vessel. The hull is made from Strips, and Strips and Plates form the deck. The turret for the for'ard gun is a Bush Wheel, and the gun itself is a Rod held in a Sleeve Piece by two Collars and Chimney Adaptors. Just aft of this is the bridge, which is provided with another similar gun. A Plate fixed to the bridge and projecting under the barrel of the gun protects the crew of the latter from the fire of the gun above. The vessel has two funnels, the for'ard one being made from 5½" Strips, and the other, which is rather shorter as in the actual destroyer, is a Boiler slightly compressed to make it oval in section. The ship is complete with anti-aircraft guns, torpedo-tubes and a searchlight, the last consisting of a Chimney Adaptor secured by means of a Hinge to a Wheel Flange. This in turn is bolted to a 2" Pulley Wheel mounted on a vertical Rod. A length of Sprocket Chain makes an excellent ladder to enable the searchlight operators to reach the platform. Rubber Tyres held in place on the model by cord represent the Harley Floats or rafts.



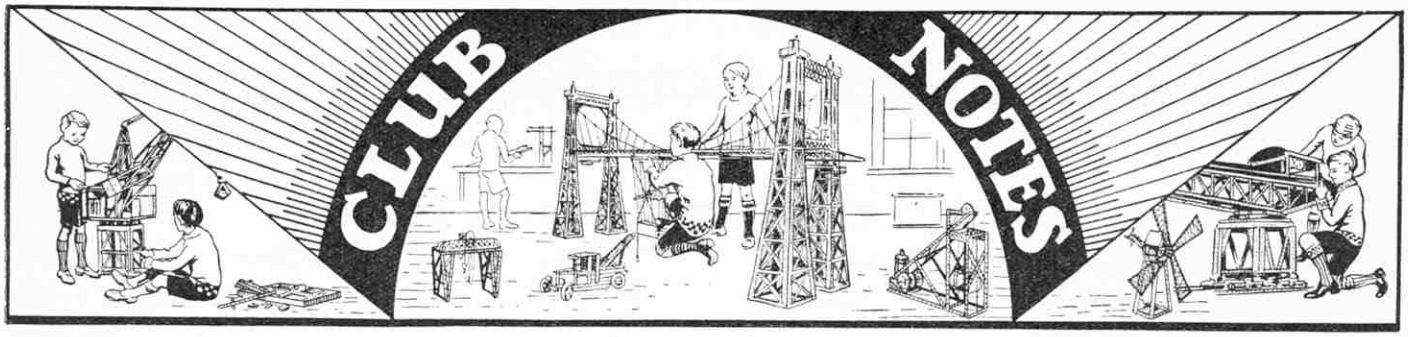
This model of Sir Malcolm Campbell's racing car "Bluebird" demonstrates the use of Meccano Flexible Plates. It was built by E. Jones, Newcastle Emlyn.

June "Lynx Eye" Competition (Overseas)

Section B

First Prize, Meccano or Hornby Goods value £2-2s.: K. Ho, Hong Kong. Second Prize, Goods value £1-1s.: C. Keekok, Singapore, S.S. Third Prize, Goods value 10/6: W. Kenny, Cloncurry, Australia.

Meccano or Hornby Goods value 2/6: R. Begg, Hamilton, Ontario; F. Mathers, Trochu, Alberta; H. Skelton, Ottawa, Ontario; P. Sevestre, Fecamp, France; R. Wragg, Rajputana, India; E. Meek, Wellington, New Zealand; L. Orsmond Muldersdrift, Transvaal; E. Fusslein, Zululand, S. Africa.



Dagenham M.C.—Recent model-building activities have included the construction of a locomotive and of a large crane. Talks and Games continue to be very popular. Club roll: 15. *Secretary:* J. Dobinson, 17, Freshwater Road, Dagenham.

St. Stephens (Saltash) M.C.—Two new Sections have been formed, one devoted to photography and the other to model-building in wood and cardboard. Electric light has been installed in the clubroom and is a great improvement. An electric motor operated off the mains supply is used for working the models. The invitation of the Plymouth M.C. to stage a display at their Exhibition was accepted. Model-building has been given a novel turn by the construction of a mechanised army. Several successful dances have been held. Club roll: 16. *Secretary:* A. Jackson, 5, Jubilee Cottages, St. Stephens-by-Saltash, Cornwall.

Hornsea M.C.—Recent lectures have dealt with many subjects, including "*Ancient Manuscripts*," "*Chemistry*" and "*The Peoples of Africa.*" The lectures for this session are equally varied, and range from "*Science and Gardening*" to "*The League of Nations.*" Club roll: 18. *Secretary:* P. Thom, 5, Alexandra Road, Hornsea.

Sid Vale (Sidmouth) M.C.—A Motor Lorry Contest attracted some very good models, many of which were of the latest types of vehicle. A display of models at a Sale of Work in connection with the Congregational Church won much praise from visitors. Another Model Illuminated Carnival Procession has been held in the schoolroom. It was headed by a tractor and included a well-made model of a Meccano Fire Brigade, built by H. Woodford. Many of the models were in the form of illuminated tableaux, and had striking lighting effects. A small charge for admission was made, and the club funds benefited by £1 7s. 6d. Club roll: 25. *Secretary:* L. R. J. Gliddon, Sheffield House, Sidmouth.

Plymouth M.C.—Several visits have been paid to the St. Stephens (Saltash) M.C., where some very happy evenings have been spent. Both Model-Building and Hornby Train operations continue to be very popular. A mock trial has been held and created so much merriment that the judge nearly lost his dignity! A vote after a debate on "*Electricity or Steam for Railway Motive Power?*" showed a large majority of the members present to be in favour of steam. The Woodwork Section, which was so successful last winter, has been re-opened, and the members are busy making models for the Hornby and other Sections of the club. The Annual Exhibition, held on 7th December, was opened by Sir William Munday and was a great success. The display included a working model railway, a complete fleet of miniature Plymouth tramcars, model steam engines and locomotives. Club roll: 69. *Secretary:* R. G. Symons, 47, Lisson Grove, Mutley, Plymouth.

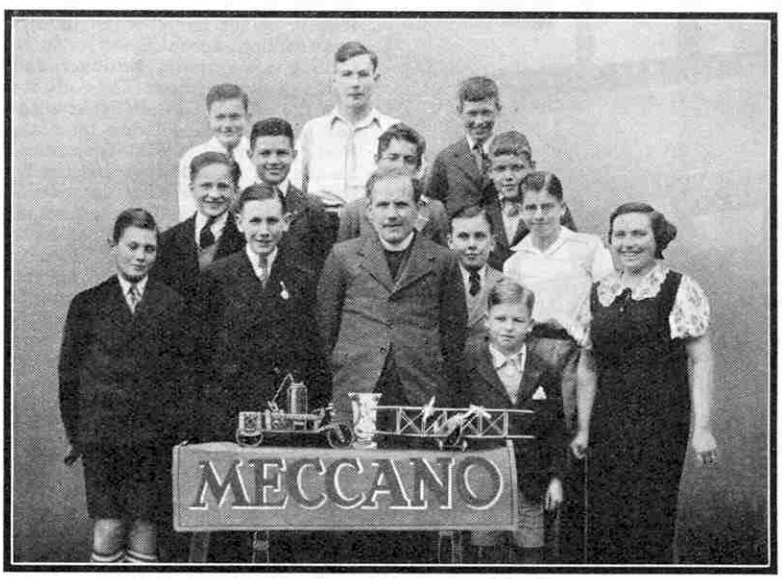
Exeter M.C.—There is great activity in model-building, and nearly 30 models have been built in a month. A model Motor Olympia is being organised, and many different types of cars are being constructed for it. If it is a success other special shows, each devoted to some type of engineering model, will be held. A Dinky Toy Section is to be formed. Club roll: 36. *Secretary:* T. W. A. Smith, 98, Ladysmith Road, Exeter.

St. Columba's (Sunderland) M.C.—Meccano Nights continue to be the most popular feature of the club programme. They are attracting so many non-members, who come to get an idea of club life, that it is probable a waiting list will be compiled, and the applicants admitted in rotation. The club staged a fine Meccano and Hornby Train display at a recent Church Bazaar. The President has most generously presented the Hornby Section of the club with new rolling stock and equipment to the total value of £5. A Visitor's Night was the occasion for a most interesting lantern lecture on "*The Railways of Great Britain*," and there was a record attendance of members, together with their parents and numerous friends. Club roll: 30. *Secretary:* R. Howe, Fulwell, Sunderland.

Wednesbury and District M.C.—This club is in need of new members to replace boys who have left Wednesbury. Any boy in the district who is interested in Meccano and would like to join the club will be cordially welcomed by the secretary at the address given at the end of this report. Club roll: 4. *Secretary:* A. L. Morgan, 17, Cobden Street, Falling's Heath, Wednesbury.

Whitgift School M.C.—Visits to places of interest are being continued during the winter session. Model-building is not being neglected, however, and members have been busy constructing a model breakdown crane. Club roll: 54. *Secretary:* J. A. Watson, 23, Addiscombe Avenue, Croydon.

Hutton School M.C.—A very interesting visit has been paid to Yeadon Airport. Model-building activities have been relieved by lectures and novel events such as an "Experience" evening, when each member present is asked to relate some strange experience of his own. A Meccano "Humanity" Night greatly exercised the ingenuity of model-builders, as it took the form of a competition for the most realistic robot. Club roll 12. *Secretary:* W. Holdsworth, 44, Victoria Road, Eccleshill, Bradford.



A happy group of members of the Fraserburgh M.C. The Rev. R. I. Mitchell, M.A., Leader, is in the centre of the front row, and next on his right is Master G. Smythe, secretary. The club was affiliated in October 1935. The older members meet in a room at Rathen West Manse, and the newly-formed Junior Section meets in the High Church Manse. Each clubroom is equipped with a library.

Sutton Valence Council School M.C.—In addition to the usual model-building meetings there have been several novel events, including a Firework Celebration, which was held on the appropriate day. A Detective Competition aroused great enthusiasm, and an Aeroplane Night did much to make all members "air-minded." Mention must also be made of a Treasure Hunt and of the jolly breaking-up party held at the end of last month. Club roll: 18. *Secretary:* James Chandler, "Herriard," Chart Sutton, Nr. Maidstone, Kent.

SOUTH AFRICA

Pioneer (Pietermaritzburg) M.C.—A model display by the members was included in an Exhibition held in the City Hall. The models were arranged in two classes and the Leader won the prize in the first class with his model of a Thornycroft motor vehicle. The prize in the second class was won by Sidney Coleman, with a model of an anti-aircraft gun. Several members correspond with Guild members in other countries. Club roll: 12. *Secretary:* A. H. Alley, 461, Burger Street, Pietermaritzburg, Natal.

Malvern M.C.—A most interesting visit has been paid to the offices of the "Star" newspaper, and members saw an afternoon edition of the paper being printed. They were shown all the processes, from the receipt of the huge reels of blank paper to the delivery by the printing presses of finished and folded copies of the newspaper. The members were given tea at the offices before leaving. The visit has been declared one of the best outings the club have had. An imposing display of models by members was shown at the "Star" Radio and Engineering Exhibition, held at the Selborne Hall. The display was the subject of many favourable comments by visitors and by the local Press. Club roll: 76. *Secretary:* B. H. Saunders, P.O. Box 8, Cleveland, Johannesburg.

AUSTRALIA

Melbourne M.C.—Model-building and Hornby Train Evenings are the chief features of the programme, and variety is introduced by occasional Reading Nights, when members bring back numbers of the "*M.M.*", books on model-building, etc. Interesting competitions are arranged to test the ability of members to carry out intricate railway operations correctly and quickly, and there is always great enthusiasm at these events. Club roll: 10. *Secretary:* Leonard Ison, 8, Hayes Street, Northcote, Melbourne, N.16.

NEW ZEALAND

Christchurch M.C.—Several new members have been enrolled. A lantern lecture on "*The Building of the Mersey Tunnel*" was much enjoyed. On a recent Model-building Evening a "Surprise Packet" competition was arranged. Each packet contained Meccano Parts, and the member to whom it was presented had to build a motor car or motor lorry, using every part contained in the package. The competition was a great success. Games Nights are always very popular, and like those devoted to competitions, always provoke a good deal of friendly rivalry between the members taking part. The club is open to boys over 10 years of age who have a Meccano or a Hornby Train Set, and new members will be welcomed. Club roll: 22. *Secretary:* L. W. Best, 28, Circuit Street, Strowan, Christchurch, N.Z.

CANADA

Rosemount (Regina) M.C.—The winter programme has included a short trip to Moose Jaw under the guidance of the Leader, and an interesting account of the outing appeared in a local newspaper. One of the most enjoyable events of the day was a pre-arranged visit to the Wireless Station CHAB, where the intricate apparatus by which the station programmes are broadcast was explained in a simple and interesting manner by an official. The club has recently moved to new quarters. Club roll: 16. *Secretary:* J. Watson, 974, Athol Street, Regina, Sask.

INDIA

Kognolkar (Nowgong) India.—Members are very enthusiastic and there are full attendances at all meetings. A club magazine is published regularly. Recent model-building has centred upon a Crane Exhibition, and some excellent models have been built for it. A visit to a local factory has been arranged. Club roll: 15. *Secretary:* R. M. Kognolker, Nowgong C.I., India.

EGYPT

Cairo M.C.—The club continues to progress satisfactorily, and meetings are held almost every night. The chief activity is Model-building, and members have recently concentrated their energies in constructing a large model monoplane. Club roll: 25. *Secretary:* Mohed Kamel Salem, 12, Bibars Street, Cairo, Egypt.

ITALY

Milan M.C.—The Draughts Competition proved so popular that a second one has been held. The President, Mr. C. Vigo, has left on military service. A Sports Section has been formed. Club roll: 14. *Secretary:* E. Vigo, Corso Genova 19, Milan.

New Year Greetings

This month I have the pleasure of wishing "A Very Happy New Year" to all members of the Guild and of Meccano Clubs. Many of them have already written to me to convey their good wishes for the coming year, and their accounts of the good times enjoyed during the Christmas season make delightful reading. In many clubs Christmas parties to which relatives and friends of the members were invited added to the general gaiety.

During the past year the Guild has continued to progress, both at home and abroad, and this is a striking testimony to the universal appeal that Meccano makes to boys. In addition to the many new recruits, there has been a gratifying increase in the number of clubs formed. I look forward to the time when these numerous new clubs have become thoroughly established and affiliated with the Guild. The older clubs have become stronger both in membership and in the club spirit, and their activities now cover a remarkably wide range of healthy pursuits. This fact is borne out by the excellent reports published in the "Club Notes" pages during last year. To-day Meccano clubs in all parts of the world are recognised institutions, and their Exhibitions and Concerts rank high among the social events of their districts.

Two Good Resolutions

This is the season for good resolutions. I should like every club member to resolve to do his utmost, not only to carry out the chief aims and objects of the Guild, but also to introduce his friends to the delights of membership. This would be a fine resolution to live up to, as it would mean that every member is helping somebody to get the best out of the world's greatest hobby, and at the same time "doing his bit" toward greatly strengthening the position held by the Guild.

Another good resolution that may be made by a Guild member is to write more regularly to the Secretary. The receipt of letters from friends in all parts of the world is a daily happy experience. The number of these letters seems astonishingly large until I compare it with the enormous membership of the Guild. This comparison brings home the solemn fact that in this respect I am not as fully in touch with my members as I desire to be, and I hope that during this year my mail bag will increase greatly in weight.

A New Film

Leaders of clubs possessing equipment for the exhibition of cinema films will be interested to hear that a 16 mm. silent film dealing with electric arc welding has been produced by Murex Welding Processes Ltd. It is divided into two parts, each comprising two reels of film. The first part deals with the various applications to which Murex electrodes are put, and includes "shots" taken at various works typical of the industries to which they belong and which use these electrodes. The second part of the film shows in detail the manufacture of Murex plant and electrodes at the company's works at Walthamstow, and the construction of motor generator sets at the Glasgow works of the Macfarlane Engineering Co. Ltd. A written commentary for use with the film is available.

A standard-size (35 mm.) talking film of the same scenes has also been made, and in this of course the commentary is recorded in the film. This is believed to be the first talking film relating to electrical arc welding to be made in the English language.

Either the talking or silent film version is available for hire to Meccano clubs able to show them, and application should be made by Leaders interested to the Publicity Department, Murex Welding Processes Ltd., Ferry Lane Works, Walthamstow, London, E.17. The film has already proved very popular, and the company ask that notice should be given as early as possible of the lecture date, so as to ensure that a copy of the film will be available in time.

Lantern lectures and the exhibition of cinematograph films provide very effective means of giving variety to club programmes, and I shall be glad to send to any Leader or secretary a list of lectures and films dealing with railway and industrial operations that have been prepared for the use of Meccano clubs. For the benefit of the officials of clubs in which lantern lectures and film displays have not so far been included in the programmes, I should like to point out that this list gives the names of firms and railway companies willing to loan films and lantern lectures for exhibition, and also explains the conditions attached to the loan.

Meccano Club Secretaries

No. 35. E. H. Speers

E. H. Speers is secretary of the Boys' Institute (Wellington) M.C., which was affiliated in July 1931. An excellent programme is followed, and variety is provided by lectures, cinematograph exhibitions and excursions. An interesting club magazine is produced.

Photographs of Clubs at Work

I have recently received some excellent photographs of club Leaders and club secretaries. In addition to these I am anxious to obtain some good photographs of club groups and of clubs actually at work, and I shall be very glad if Leaders will consider the possibility of having such photographs taken. There are of course difficulties in the way of obtaining successful photographs of interiors, especially by artificial light, but first-class results can be obtained with a little care and preparation. I feel sure that a series of photographs of this nature would be of interest to all members of Meccano Clubs.

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:

MORDEN—M. Mullen, 24, Hillcross Avenue.
ROCHDALE—L. R. Wardley, 60, Canal Street, Castleton.
SOUTH AFRICA—R. H. Moodley, 10, Stirling Street, Capetown.
THORNTON HEATH—R. H. Smart, 14, Kensington Avenue.
TRALEE—J. Wilson, Caherina, Tralee, I.F.S.
UPTON—H. Davis, 49, School Street, Upton, Nr. Pontefract.
YSTRAD MYNACH—F. Davies, 8, The Square.

"LADY LUCK"

By Herbert S. Morton, Engineer

JIMMY got a job as fireman, and had a rough time. He told some of the boys about it.

"Was there a horseshoe on her?" they asked.

"I don't know," replied Jimmy. "What's that got to do with an engine steaming, anyway?"

"Why, everything," they told him, and laughed at his foolishness. "That's been your whole trouble."

Of course it sounded like boloney to Jimmy, but as he thought about it, there seemed to be some truth in it. Down town he saw a neat horseshoe tie pin, bought it and stuck it in his tie. Well, he thought, I'll try this do-funny out anyway, and see what happens.

Rusty the engineer was a man of gigantic stature, strong, and a hard hitter if ever there was one. He had a reputation for being hard-boiled too. No fireman would stay with him. Their explanation was that he trimmed his engine so hard that they could not keep a fire in her. Well, he had to, for he was on the most important mail train on the division. It was always heavy, and had a tight schedule. This same Rusty was no fool. He knew what an engine could do, and set out to do business. The roundhouse staff never left anything to chance on 231, his particular engine. It was in great shape, and had lots of speed. Rusty did not believe in luck. Plain horse-sense was more to his idea.

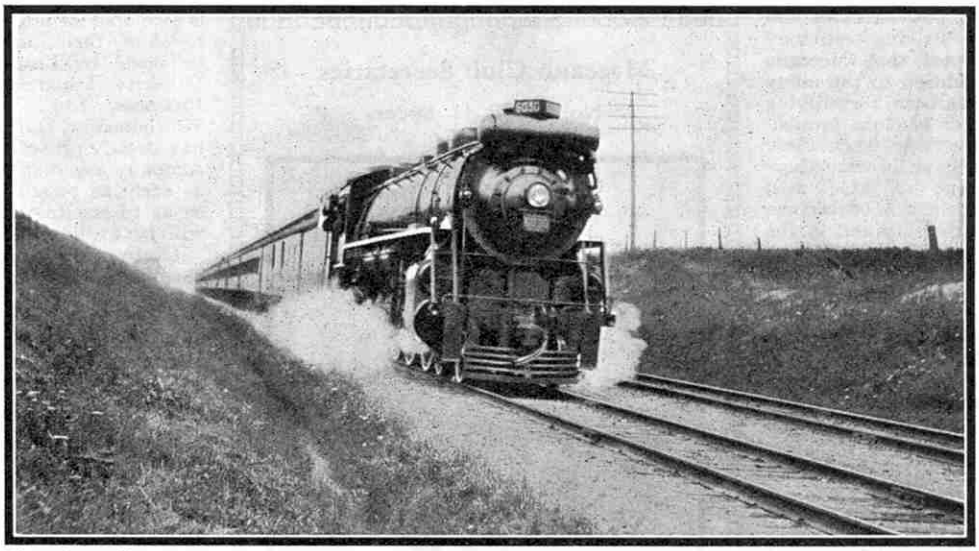


Photo: Courtesy [*Canadian National Railways.*

A Canadian Nationa mail train at speed.

A spring saddle bolt on Rusty's engine had broken, and it was booked to be replaced. Rusty went to see if it was done, and found a mechanic working on it. The man did not see him, and as Rusty watched, he saw the mechanic making an imitation one out of hard grease. The tool he used was a penknife. My, was Rusty mad? With curses enough to scare the devil he went for that mechanic. Threatened to break his neck, and then some. Then he chased the man clean out of the roundhouse. The next scene took place in the boss's office. He tore around, swore, threatened to report the matter to the M.M., and made the foreman go with him to see the work of art. Oh, yes, there was a new one in place when Rusty took her out next time.

Rusty's fireman had quit, and a spare man had to take his place. No one wanted the job, but it fell to Jimmy, his name being first on the list to go out. When he took the call he thought this would be his last trip. He had heard so much about Rusty and how tough he was. Knowing the train he ran, it looked like the end for him. However there was no good thinking about what might happen. He had to go. The tie pin got an extra shine before Jimmy put it in his tie. "If ever I needed Lady Luck it's on this trip," thought Jimmy.

Jimmy arrived at the roundhouse early, signed on, and went out to look the engine over. With extra care he looked over supplies. Most times he had to beg, borrow or steal something, but on Rusty's engine he found everything in place. Soon Rusty arrived.

"Hello, son. How's things this morning?" was his greeting. Then he saw the tie pin all shined up. "What's the horseshoe for? Luck?" he asked.

"Yes," replied Jimmy. "I'm new to this game, and sure need luck. 'Specially on this run."

Rusty asked his name. "You'll get on O.K. Jimmy," he said. "I guess no one has really showed you how to fire? Eh?"

"If you can show me I'll only be too glad to learn," answered Jimmy.

"When I've oiled up, I'll just do that, mate." Rusty told him. "See that the tender is full of water, and look at the sand."

Jimmy did as he was told and soon Rusty was back on deck.

"What kind of a fire do you use?" he asked Jimmy.

"What kind?" queried the fireman. "No particular kind. I've tried every way I know, and always had bad luck."

"There ain't any such thing as bad luck in firing. Horse-sense is what you want. I'll show you a kind of fire that can't be beat. If you catch on, Jimmy, you'll have all the steam we want."

Jimmy was pleased. He watched Rusty line the fire. Up both sides, and under the door.

"There now, what do you think of that?" asked Rusty. "Don't forget, none in the front, the blast will draw all you want there. That's the horseshoe fire. Never mind what I do, you just keep on making a horseshoe in the firebox, and see what happens."

Time was up. They pulled out of the roundhouse, and backed on to No. 20. Right on time they were away. Rusty certainly knocked the can off her, and Jimmy felt sure he would fall down. He kept on feeding her the way Rusty had showed him, and for once had the pleasure of seeing the steam gauge stay up. As speed increased Rusty hooked her up, and Jimmy got the fire banked. She went back five pounds, so Jimmy got the poker and cleaned the fire. Up she went again, and opened the pops.

"That's the stuff, kid," shouted Rusty. Jimmy usually got a calling down for letting an engine pop, and was expecting his mate to let out a roar when she went up. Faster, and faster, they went. Speed increased until it seemed the limit was reached. 231 rolled, shimmied, jumped, shook, and Jimmy found it hard to stay on his feet. When he went to swing a scoop of coal into the firebox, the door would be somewhere else than where he expected it to be, and the coal would fall on deck. It was hard work, but with a difference. Jimmy had steam on the mail, something he couldn't get on a freight run.

Rusty asked cheerily, "How'r' you doing kid?"

"The best I can," said Jimmy.

"And it's all right," shouted Rusty. Jimmy had a quiet laugh. He thought of what the boys had told him about the horseshoe. He would have some fun with them.

Everything went well. What Rusty had told him was true. With the system of draughting locomotives in that day, they would steam with this kind of fire, and Jimmy became Rusty's regular mate. Twenty arrived on time, and the return trip on twenty-one, was O.K. The boys were curious when they saw Jimmy staying on with Rusty. Several had been out with him, and swore that sooner than go again they would quit.

"How did you make out?" they asked Jimmy.

"Fine," he replied.

"How'd you do it, Jimmy?" They were interested.

"With a horseshoe" he said, and laughed quietly.

Reprinted from The Canadian National Railways Magazine, by permission.

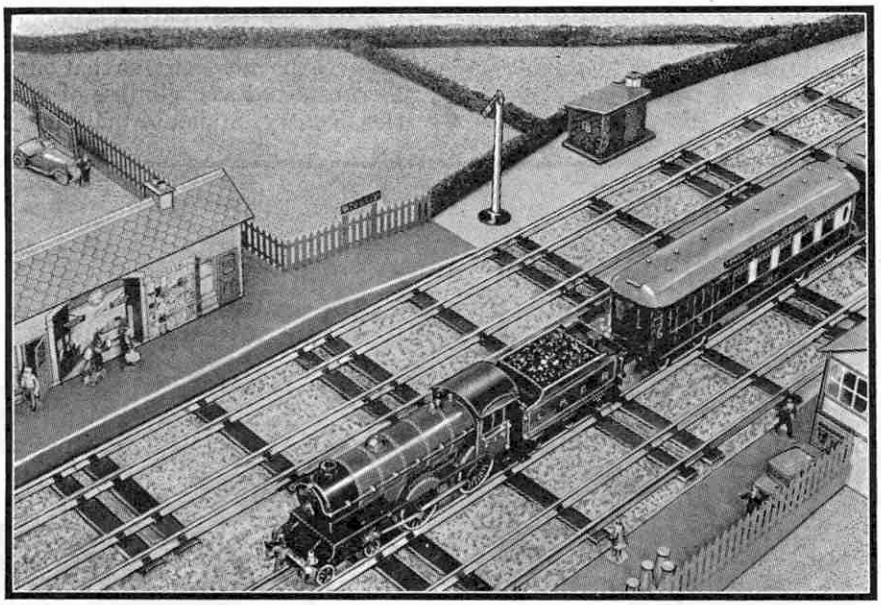
Commencing the Miniature Railway Hobby

Hints for Hornby Train Owners

MANY readers will recently have become for the first time the proud owners of Hornby Train Sets and will be busy finding out how fast their locomotives will run and what loads they will pull. It is the object of this article to give a few hints that may help them to obtain the greatest possible fun from their new hobby.

The first step is to lay the track. This is quickly and easily done by joining the rails together by inserting the projecting pins of each rail section into the corresponding rail heads of the next. The pins must be pushed fully home so as to bring the rails close together. Except for the rails intended for MO Trains, all Hornby Rails are provided with special connecting plates, the object of which is to grip the sleepers adjacent to the rail joints and prevent the rails from moving apart and causing derailments.

When new track is laid down for the first time it is sometimes found that the rails, especially the curves, do not settle down flat on the table or floor. This is due to the natural springiness, common to all kinds of tinplate track. To get over the trouble, each rail in turn should be twisted over gently with the fingers towards the centre of the circle.



An interesting view of a passing station. On this section of miniature railway the inner tracks are for fast trains, the platforms of the station being served by the outer loop lines.

After performing this operation it is advisable to test the track. For this purpose there is packed with each Hornby Electric Train Set a Combined Rail Gauge, Screwdriver and Spanner. On one side of the centre portion of this, between the screwdriver blade and the spanner jaws, is a projection that is shaped to form a rail gauge. This part is made to fit exactly between the rails, and if it is slid along the track any tight places will be quickly discovered. In Clockwork Train Sets the back of the handle of the Locomotive winding key is shaped to form a gauge and is used in the same manner. At any tight places on the track the rails should be eased gently apart.

When using a Hornby Electric Railway it is important to see that the connections from the power supply to the track are correctly made according to the instructions packed in the Sets. A fuse is included to prevent damage in the event of an accidental short circuit. It consists of a length of special wire that melts with the excessive current when a short circuit occurs. A small amount of the correct wire is included with each Terminal Connecting Plate or Combined Switch Rail, and further supplies can be obtained from any Meccano dealer. The correct kind of wire is stated in the instructions, and it is very important that this should be used.

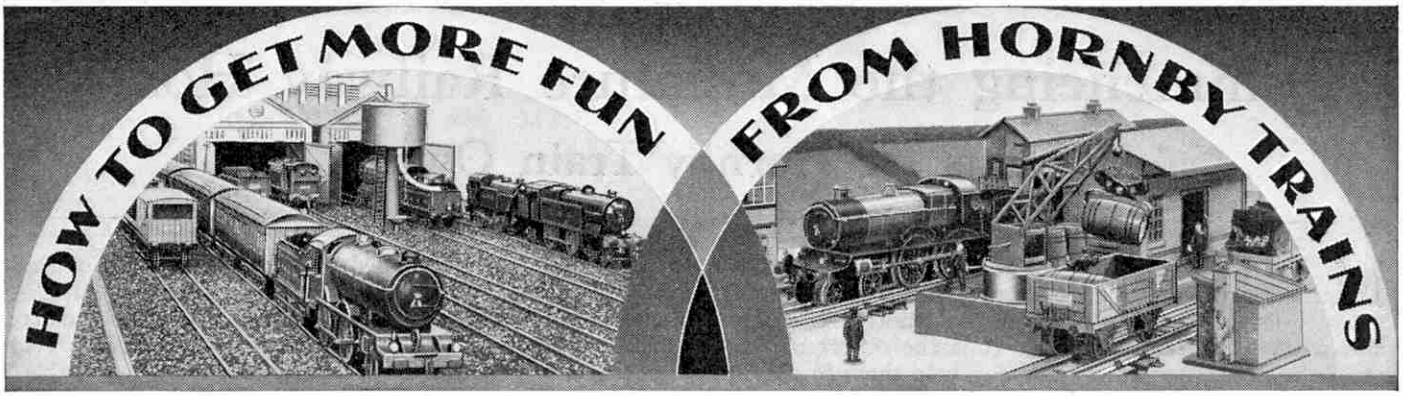
Lubrication is a subject that is often neglected. The working parts of Hornby Locomotives and Rolling Stock cannot be expected to work correctly and keep on doing so if they are run dry. On the other hand, they do not work any better for being flooded with oil, which is an extreme that is liable to be reached when boys get an oil can in their hands! Any excess of oil should be avoided, for it invariably finds its way on to the track and gives rise to slipping. It also attracts dust and dirt. Meccano Oil is of just the right consistency for the general lubrication of Hornby Locomotives and Rolling Stock, and details of the points requiring attention are given on the instruction leaflets.

Each axle bearing of the rolling stock should have just a drop of oil, and the wheels should be spun round to see that they are free. It sometimes happens that, in course of packing, the wheel frames become pressed against the wheels and so tend to prevent their free rotation. The frames should then be bent gently outward so that the wheels have just sufficient play for easy running.

For springs Meccano Graphite Grease is specially recommended and is available in handy tubes. It can be squeezed from the nozzle of the tube on the parts that can easily be reached. For those parts that are difficult to get at, the grease can be applied by means of a small paint brush.

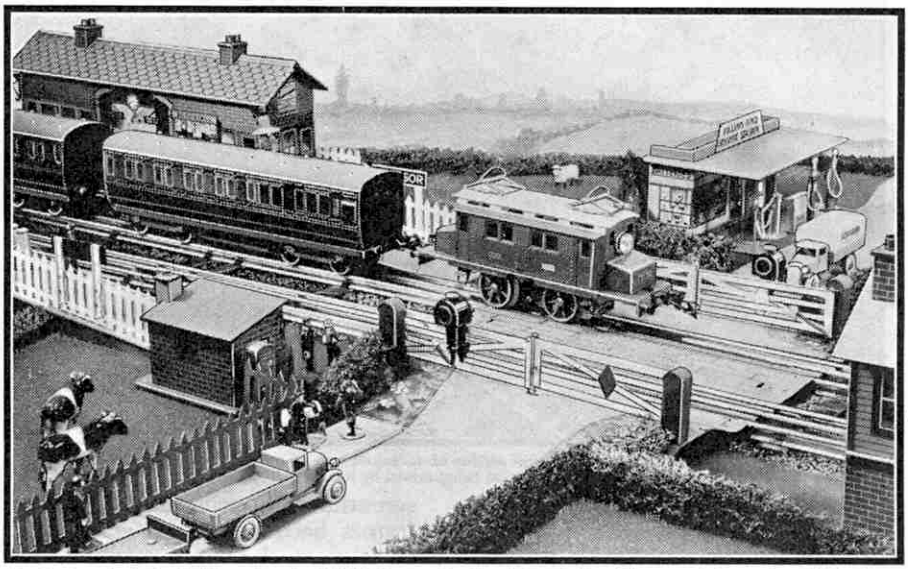
A Locomotive, or indeed any mechanism, is inclined to be stiff in running when new. With careful attention to lubrication, and with regular use, the capacity of a new engine will be found to improve steadily until it becomes "run in" and capable of the heaviest duties.

Although the working parts of Accessories should be lubricated, it is not advisable to oil the mechanism of Hornby Points. The switch rails may be stiff when new but soon become easy to operate. If they are oiled, however, they become too free and liable to move and so cause derailments.



ELECTRIC RAILWAY OPERATION

THE interest in Hornby electrically-operated miniature railway systems continues to increase rapidly. Not only are existing clockwork lines undergoing conversion, but new systems, electrically-worked from the beginning, are daily springing into existence. The degree of control available and the possibility of incorporating such refinements as illuminated accessories appeal strongly to those who aim at the utmost realism. Although in most cases miniature electrically operated lines represent steam systems of actual practice and "steam-outline" locomotives are used, there is a growing interest in completely electric systems or those on which the locomotives in use are of the true electric type. For this reason a few words in regard to the possibilities of such schemes will be of interest to our readers. Let us assume therefore that our line is to be operated solely by electric-type engines and that the 20-volt system has been adopted for the power supply. With regard to the layout and accessories, etc., such a line will not differ greatly from the usual style of system operated by steam-type locomotives. We will deal first with motive power and rolling stock.



A suburban train hauled by a Hornby LE120 Locomotive leaving a station. The use of the various Dinky Toys components adds considerably to the realism of the illustration.

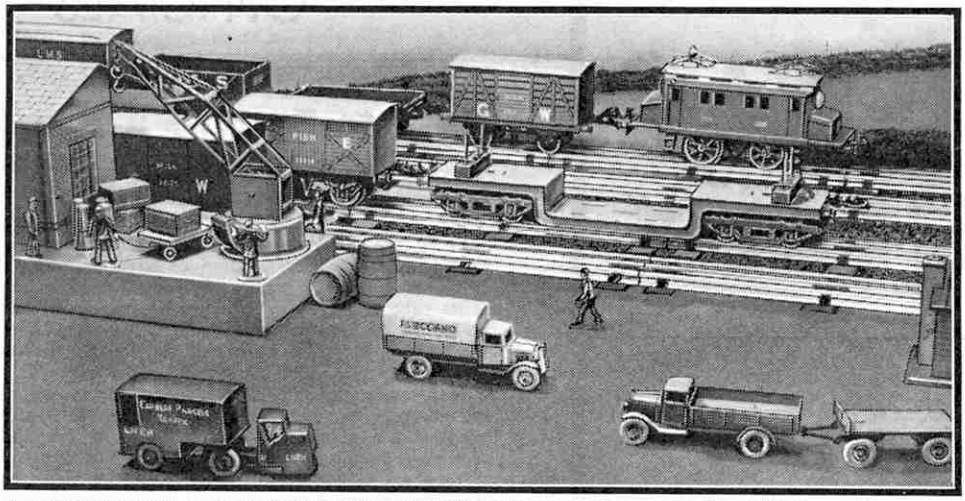
In the Hornby range of 20-volt Locomotives there is an important electric-type express engine, the LE220, which is an ideal unit for fast and heavy traffic on a miniature "all-electric" system. It is fitted for automatic reversing and among its characteristic details there are two dummy current collectors of the pantagraph type on the roof. These can be raised or lowered as required according to the conditions that are supposed to exist on the line. Hornby Electric Railways operate on the third rail system; some real lines have locomotives arranged for both conductor rail and overhead current collection so that the presence of the pantagraph on a model adds to the completeness and interest of the locomotive. A Hornby Locomotive supposed to be operating on a overhead wire section should have the pantagraphs raised to their normal position. If however the conductor rail section is being negotiated the pantagraphs should be lowered until they settle down on the roof.

With the LE220 Locomotive we can operate long-distance express trains as is done on the Continent and in America; but our equipment will probably be English in type for the most part, so that our miniature railway must be considered as a glimpse of possible future practice in this country. Standard main line trains of Hornby Pullman Coaches can be assembled much after the style of the famous *"Brighton Belle"* of the Southern Railway, except for the use of a separate locomotive. If we have a leaning to Continental traffic of a special nature, the Riviera "Blue" Coaches could also be employed with advantage. International services of an interesting character could be represented by the inclusion of British-type Pullmans with the "Blue" vehicles of the International Sleeping Car Co. The wide interests of this concern are suggested by the title that appears on the Hornby "Blue" Coaches, *"Compagnie Internationale des Wagons-Lits et des Grands Express Europeens."* In addition, for those who plan their systems on broad lines there are the "Mitropa" Cars that represent the vehicles now so familiar on main line service in Germany.

The British-type Pullmans are intended for ordinary day use only, in that they do not represent vehicles with facilities for night travel. On the other hand the Riviera "Blue" Coaches are available in two types, either as sleeping cars or dining cars, and the same also applies to the "Mitropa" vehicles. The corresponding German titles on the "Mitropa" Coaches are "Speisewagen" for the dining car and "Schlafwagen" for the sleeping car. The French vehicles show the international character of the service on which they run by being lettered both in English and in French, *"Voiture-Restaurant"* for the dining car, or *"Voiture-Lits"* for sleeping car.

Although separate electric locomotives are used to a small extent in this country it is possible that their use will increase in future as electrification systems become more "long-distance" in character.

Another famous type that is represented in the Hornby Series is the Metropolitan electric locomotive of the London Passenger Transport Board. This is of special interest in that it is included in the realistic Hornby Metropolitan Train Sets, accompanied by appropriate Coaches of the compartment type that are used on the real trains running on the service from the country districts through to the City. The locomotive is finished in the familiar red-brown livery and has quite an imposing appearance. Like all the Hornby Electric Locomotives that represent actual electric prototypes, it has headlights that light up from the train-driving current.



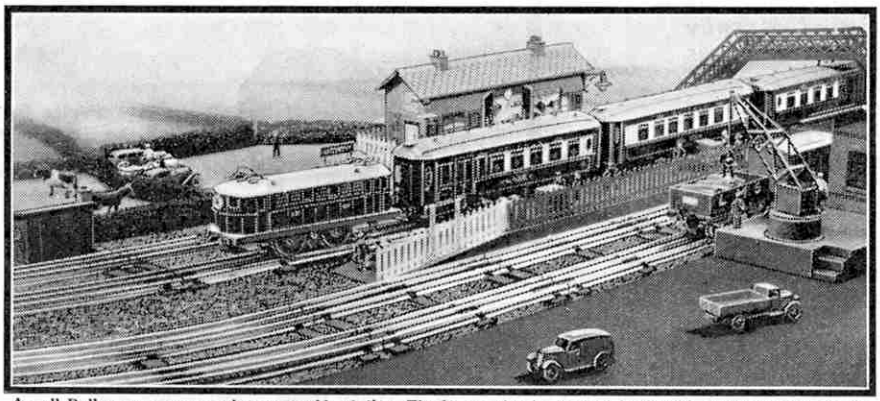
A goods yard scene on a Hornby Railway operated entirely by electric-type locomotives. The LE120 Locomotive shown is suitable for local passenger or goods work as required.

The Metropolitan Coaches are of two kinds, one a first class vehicle and the other a composite brake-third with guard's and luggage compartments at one end. Each of them is fitted for electric lighting and has a switch for putting the lights on and off as required. The current supply is taken direct to the lamps in the coaches from the third rail by means of roller collectors mounted on the bogies. The complete train has a most effective appearance, especially if operated after dark. It can be used to deal with the through traffic that its prototype carries on layouts representing the Metropolitan section of the London Transport organisation, or it can be used for the suburban services of an electric layout where main line traffic is operated by steam-type engines.

Interesting schemes of working requiring electric and steam type locomotives can be developed in miniature. In actual practice steam locomotives owned by the former Metropolitan Railway work the trains previously mentioned to Rickmansworth, where the change-over from steam to electric traction, and vice versa, takes place. Here the electric type engine represented by the Hornby model comes on and hauls the train over the remainder of the journey on the surface lines and then underground. In the opposite direction of course the process is reversed. This working in itself is a scheme worthy of development by owners of Hornby Electric Railways.

In addition, the close association of the Great Central Section of the L.N.E.R. with the Metropolitan surface lines suggests still further possibilities in the matter of the variety of stock that can be used at once on the same layout. The running of Hornby L.N.E.R. Locomotives, No. 2 Coaches on local trains and No. 2 Saloons on express trains, on the same track as the Metropolitan Train will thus give a good representation of actual practice. As a point of interest it may be mentioned that a Pullman car is run on certain through trains on the Metropolitan service, so that a Hornby Pullman Coach will not be out of place on a composite layout of the kind we have been considering.

On systems that do not represent any particular prototype the LE120 Locomotive can be used very appropriately. Smaller than the LE220, and without the automatic reversing mechanism of the latter, the LE120 is of useful design and of characteristic "electric" outlines. It is fitted with dummy pantagraph collectors so that the same conditions of operation as described for the LE220 Locomotive will have to be assumed. The character of the engine renders it suitable for short-distance traffic, and of course for freight service. When it is used with the Hornby No. 1 or No. 2 Coaches quite an effective-looking train is the result. In this country the true suburban traffic of electric railways is operated by trains of the motor-coach type, as for instance those of the Southern Railway. This type of unit is not yet represented in the Hornby Series, but some readers may be interested in the scheme that is employed by one or two enthusiasts. This involves the making up a train of No. 2 Coaches, with brake-third vehicles at each end, a Metropolitan or LE120 Locomotive placed in the centre of the train providing the motive power. The train then can be propelled in either direction as required, just as a real multiple-unit train, thus avoiding the "running round" of the engine at terminal points. This arrangement allows the rail layout at terminal stations to be simplified, as no cross-over roads are required for "running round" purposes.



An all-Pullman express passing a wayside station. The locomotive is the Hornby LE220, which is intended for the operation of long-distance express trains on electrically-operated layouts.

The LE120 Locomotive is very well suited for goods work, and as it is comparatively short it does not occupy much space in the sidings. Goods traffic over the electrified lines in the Newcastle area of the L.N.E.R. is handled by electric locomotives, and the Metropolitan type also can sometimes be seen on goods duties.

HORNBY RAILWAY COMPANY

A REAL RAILWAY COMPANY WITH BOY DIRECTORS AND OFFICIALS

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.

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

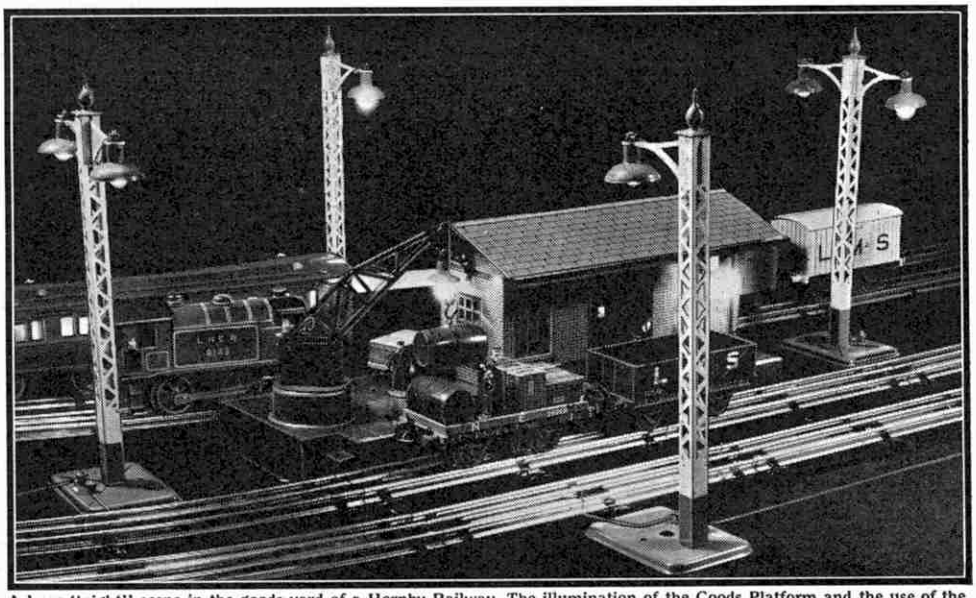
The greatest fun is obtained from Hornby Trains by joining one of the many local Branches that have been formed in various parts of this and other countries. These Branches are composed of Hornby Train owners who meet together in order to carry out railway operations on a more extensive scale than is 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.

New Lighting System for Hornby Accessories

By "Tommy Dodd"

FOR some years a feature of the Hornby Series has been provision for the electric lighting of suitable Accessories. When illuminated they add greatly to the realism and charm of a miniature railway system and their fascinating effect naturally renders them very popular with Hornby Train owners. This season an important alteration has been made in the actual details of the lighting system. Under the original scheme the current is led from the 3.5 volt circuit of the T20A or T6A Transformer to a Distribution Box, by means of special connecting leads with plug and socket fittings, and from the Distribution Box similar leads radiate to the Accessories. Accessories for use in this way are still available for the benefit of those who already have extensive installations.



A busy "night" scene in the goods yard of a Hornby Railway. The illumination of the Goods Platform and the use of the Lamp Standards gives a realistic representation of actual practice.

The new system, which is known as the Single-Pole Lighting System, eliminates the Distribution Box and the somewhat cumbersome method of wiring necessary with it. Instead of twin leads with plugs and sockets being required for each individual connection, the new wiring scheme is much more simple and when installed looks far neater than the old one. The wires and fittings are quite unobtrusive and do not tend to fill up the often restricted space available within the area served by the line.

We will examine a typical Accessory wired up for the new system, say for example a Signal No. 2E. We find that instead of the plug fittings previously used there are two terminals on the base. One of these has a red washer beneath it and is wired to the lamp holder mounted on the signal post. This is the "live" terminal. The other has no washer and is the "earthing" terminal. The principle of the single-pole scheme is that as the Accessories are all connected to a common earth, their live terminals can be connected one after another, up to the capacity of the Transformer lighting circuit, and without the necessity for any special fittings such as a Distribution Box. The common earth in this case is the track itself, special clips to fix to the sleepers providing a convenient means of connection. A leaflet of instructions is packed with each Accessory.

The actual installation of a lighting system should of course commence with the Transformer, of which the third pair of sockets serves the lighting circuit. With the Transformers are packed two plug fittings, a special Earthing Clip and, as usual, a Fuse Unit. There is also a coil of wire for the purpose of making the lighting connections. A piece of wire is cut from the coil of a sufficient length to reach from the Transformer to the track. This forms the earthing wire, and one end of it is secured to an Earthing Clip by means of the terminal provided on these fittings. The Clip is then attached to one of the sleepers of the track. The other end of the wire is fitted into one of the plugs and secured by the set screw. The Fuse Unit is now plugged into the lower of the two Transformer sockets serving the lighting circuit, and the plug we have connected to the earthing wire is inserted in the socket end of the Fuse Unit.

The first Accessory to be connected will be the one that is nearest to the Transformer and a second piece of wire should now be cut of sufficient length to reach from it to the Transformer. One end of this wire is secured to the second plug and this is plugged into the upper socket of the third pair on the Transformer. The other end of the wire is taken to the live terminal of the Accessory, the one that has the red washer, and the terminal nut is then screwed up tightly.

We must now provide for an earth connection to the Accessory. Each Accessory has packed with it an Earthing Clip. This is attached to a convenient sleeper on the track and a piece of wire is then cut to reach from it to the earthing terminal of the Accessory. As soon as the final connection is made the lamp of the Accessory will now light up, provided that the wiring has been correctly carried out.

The foregoing description relates to a single Accessory. Where there are others to be lit up also, it is a simple matter to make the remaining connections. The live terminal of the second Accessory is connected to the live terminal of the first and so on in succession with the remaining Accessories up to the number that can be illuminated by the Transformer. This varies from 14 in the case of the T20A, to 18 for the T6A. Each additional Accessory has its earthing terminal connected to an Earthing Clip attached to the track at a convenient point near the Accessory.

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

H.R.C. COMPETITION PAGE

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

A MISSING WORDS CONTEST

H.R.C. members continue to show keen interest in the railway problems that are set before them each month on this page. On looking through the records for last year we find that among the most popular contests are those that afford the competitor an opportunity for displaying his knowledge of railway operations and practice, together with general knowledge and keenness in observation. Among the most successful of these have been those involving word-building or word-finding problems of railway interest, and this month we announce another contest of this type.

In the centre of this page is a panel containing four short paragraphs dealing with platelayers and their duties in the maintenance of Britain's railways. Certain words have been omitted from these paragraphs, and the place of each one is represented by a series of four dots. It should be noted that the number of dots bears no relation to the number of letters in the missing words.

Competitors are required to find the missing words, and write them down on a sheet of paper in the order in which they would appear in the paragraphs. It is not necessary to copy out the whole of the paragraphs. All the missing words are quite simple and straightforward, and there is no "catch" or anything unusual in the manner in which they are used.

Can You Find the Missing Words?

The . . . . and the men under his charge, known as platelayers, perform duties every day which, if neglected, might result in . . . . to our fast expresses. They have to . . . . their allotted length of . . . ., which is usually about . . . . miles in length, and replace any missing . . . . and tighten up any loose . . . ..

In the . . . . when great variations in temperature are usual with . . . . days and . . . . nights, it is the custom to remove the . . . . a pair at a time, oil or . . . . them, and then replace them. This assists the . . . . and . . . . of the rails and helps to prevent the closing up of the . . . . spaces between the rails, an . . . . that may cause . . . . up of the track on a . . . day.

A good . . . . on the rails is absolutely essential for smooth running, and the . . . . spends a great deal of his time on his . . . . with his eyes at . . . . level, in which position even the smallest bumps and hollows in the . . . . are easily seen.

On the L.M.S.R. gangers are each supplied with a quantity of . . . . chippings, kept in a wooden bin at the side of the . . . . at a convenient place in the length under his control. The . . . ., when carefully packed under the . . . . by means of a . . . ., enable the rails to be raised to their normal . . . . in places where . . . . occur.

The competition will be divided into two Sections—Home and Overseas. Prizes consisting of any products manufactured by Meccano Ltd., to the value of 21/–, 15/–, 10/6 and 5/– respectively will be awarded to the four competitors in each Section who submit the most correct and complete lists. In the event of a tie for any prize, neatness or novelty of presentation will be taken into consideration.

When as many as possible of the missing words have been found the competitor's name, address and H.R.C. membership number should be written plainly in the top right-hand corner of the sheet. This should then be enclosed in an envelope marked *"H.R.C. January Missing Words Contest"* and addressed to Meccano Ltd., Binns Road, Liverpool 13. The closing date for Home entries is 31st January and for Overseas entries 31st March. Entries received after these dates cannot be entertained.

Railway Photographic Contest

Since announcing the last Photographic Contest we have decided to continue the series during the winter months. Therefore we again offer prizes this month for the best photograph of *"Any Railway Subject."* Members may submit photographs that have been taken during the summer season, or prints of typical winter scenes. Entrants may send as many prints as they desire, but no competitor can receive more than one prize in the one contest. On the back of each entry submitted must be given the sender's name, age, full address and his H.R.C. membership number.

It is important also to include a brief reference to the subject of the photograph, giving in addition the place where the exposure was made.

The contest will be divided as usual into two sections, Home and Overseas. 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 best entries submitted in each section.

Envelopes containing entries must be marked *"H.R.C. January Photographic Contest"* in the top left-hand corner and posted to reach Headquarters at Meccano Ltd., Binns Road, Liverpool 13, on or before 31st January. The closing date for the Overseas Section is 31st March.

Voting Contest

The competitions put forward on this page last year were immensely popular, and the response by H.R.C. members suggested that all subjects were favourites. In order to help us to decide what particular type of contest is most popular we are announcing this month a Voting Competition on this point. It will be interesting to see how the comparative popularity of the different kinds of contests is shown by the votes accorded to them by competitors.

Every entrant is required to state:

(1) Which of the 12 main H.R.C. Contests of 1935 was his favourite.

(2) What he considers are the eight most popular of these Contests in order of their popularity.

Prizes of any product manufactured by Meccano Ltd., to the value of 21/–, 15/–, 10/6 and 5/– respectively will be awarded to the four competitors in each section, Home and Overseas, who forecast the final order of voting most accurately. A number of consolation prizes also will be awarded.

Envelopes containing entries should be marked *"H.R.C. January Voting Contest"* and posted to reach Headquarters at Meccano Ltd., Binns Road, Liverpool 13, on or before 31st January. Overseas closing date 31st March. Membership numbers must not be omitted from entries.

COMPETITION RESULTS

HOME

October "Missing Links Contest."—First: R. Lumley (20253), Plymouth. Second: E. Beven (35158), Sheffield. Third: G. H. Gill (36093), Chorlton-cum-Hardy. Fourth: G. Snook (30716), Plymouth. Consolation Prizes: R. Sutton (34561), Wolverhampton; D. V. C. Bentley (24591), Loughborough; J. B. Sheldon (2311), Sutton Coldfield; C. E. Wrayford (6039), Moretonhampstead; K. E. Milburn (26029), London, E.4; S. D. Williams (33832), Dartmouth.

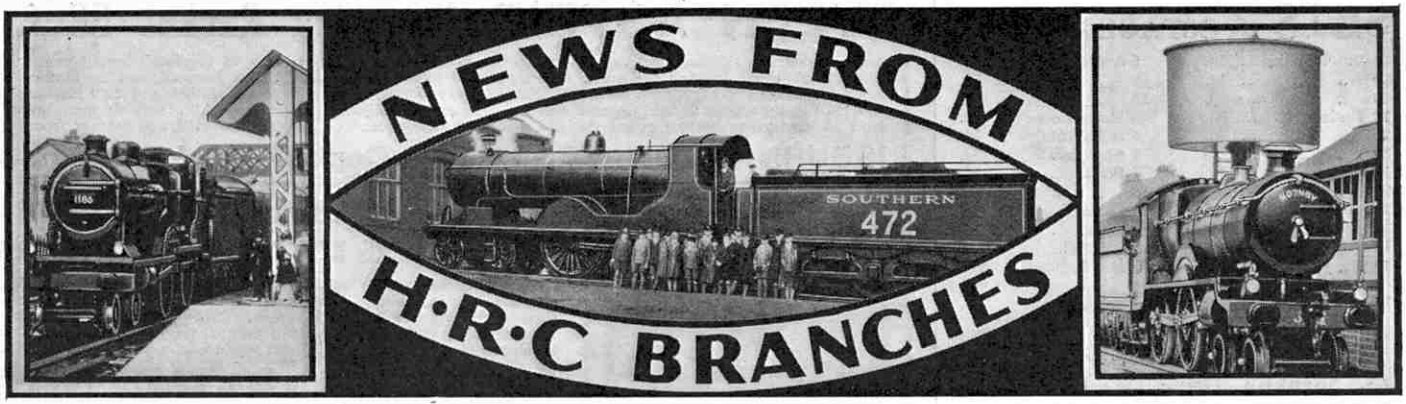
October "Railway Photo Contest."—First: D. Kelk (28579), Staplehurst, Kent. Second: E. C. Morgan (10735), London, S.W.18. Third: V. L. Breeze (2134), Lewes. Fourth: G. L. Wilson (2478), Wormit-on-Tay. Consolation Prizes: G. H. Mahy (26134), London, S.W.19; D. Newton (38775), London, N.21; H. West (99), Newport, Mon.; H. Sutton (32476), Leeds 6; J. Norris (18622), Worcester; J. R. W. Kirkby (5954), Belmont, Surrey.

October "Articles Suggestions Contest."—First: J. F. Sharpe (35752), Leeds 6. Second: D. T. White (42549), Knebworth, Herts. Third: B. Hardie (6792), Bristol 9. Fourth: R. W. Goodfellow (3593), Longbenton. Consolation Prizes: L. Parish (18054), Coventry; J. L. Makin (30933), Preston; E. H. Frewin (25098), Birmingham; J. B. Sheldon (2311), Sutton Coldfield.

OVERSEAS

July "Silhouettes Contest."—First: I. Brough (9112), Preston, Australia. Second: W. B. Moore (20918), Toronto. Third: R. A. Wragg (7913), Bandikui, India. Fourth: P. Galdes (14183), Malta. Consolation Prizes: D. E. Yockney (39969), Auckland, New Zealand; W. Jack (8958), Ballarat East, Australia.

July "Railway Photo Contest."—First: M. Conly (24290), Dunedin, New Zealand. Second: J. A. Coates (23863), St. Lambert, Canada. Third: H. Goodison (42769), B.C., Canada. Fourth: K. F. Caldwell (17284), S. Brisbane, Australia.



Branch News

PATRICROFT.—A new development has been the institution of a regular Social Evening each week. A Cup has been presented by an enthusiastic member, and it will be competed for monthly in indoor games. A Branch Library has been started, and the walls of the Branch Room have been decorated appropriately with railway posters. Discussions on railway topics have been held. Various improvements have been made, including the installation of electricity on the Branch track. A visit has been paid to the local engine sheds. It is hoped that a trip to the works of Nasmyth Wilson & Co. Ltd., will shortly be arranged. Secretary: A. Howarth, 42, Nelson Street, Patricroft, Nr. Manchester.

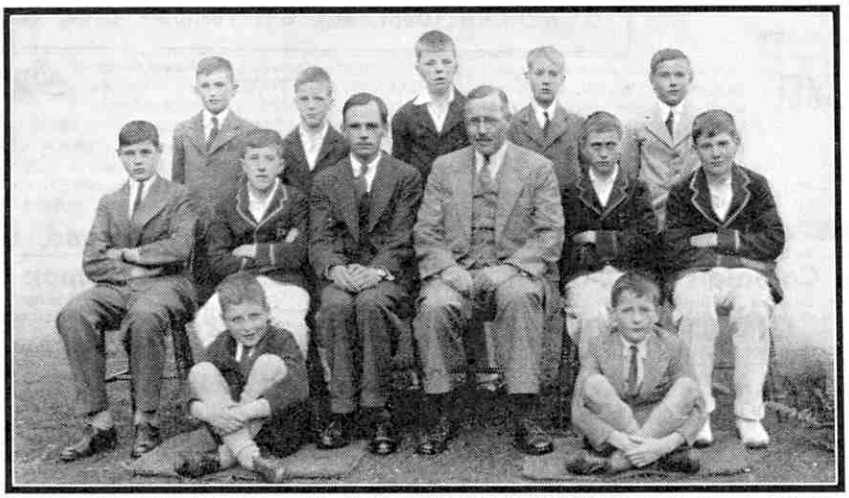
KIDDERMINSTER.—The Sixth Annual Exhibition has been a great success and the proceeds have been devoted to the installation of a new heating system in the Branch premises. Various developments have been taking place on the track, including the ballasting of a large portion. At each meeting from 40 to 50 boys can be employed on the line, and each is allotted specific duties. Practical tests are held from time to time and promotion is decided on the results. The bell code is used for signalling trains, and an unusual development has been the formation of an overhead goods yard, rendering one of the stations in effect a "low-level" one. A special campaign has been launched to increase the membership of the Branch. Regular visits are exchanged with neighbouring H.R.C. Branches and with Meccano Clubs. Secretary: E. Haines, "Yeoland," Stourport Road, Bewdley.

ST. THOMAS (EXETER).—A move has been made to a new Branch Room that is more central in situation than the former one. Before removal, however, train services were run at several meetings with great success. The track has been relaid in the new room, on a much longer table. The Branch continues to flourish, and visits are exchanged with the neighbouring Elmside (Exeter) Branch. The two Branches collaborated successfully in a "Meccano Motor Show" held last month, the proceeds being divided between the two Branches. Secretary: L. J. Robinson, 9, Union Street, St. Thomas, Exeter.

WARDEN HOUSE (UPPER DEAL).—Experimental running has been carried out with various layouts, and the advantages and disadvantages of different formations have been noted with a view to producing a perfect track. An exciting feature has been the holding of locomotive tests over layouts having several parallel tracks. The accommodation of the Branch Room is somewhat restricted, and arrangements are to be made for members to operate the layout in groups at different times. Secretary: H. M. Anderson, Warden House, Upper Deal.

NORTHAMPTON.—A Branch library has been instituted, and regular games nights are held. As a result of tests and some experimental working, timetable operation is now carried out regularly, and very few mishaps are experienced. It is proposed to elevate the Branch track to a raised foundation. One of the members gave the first part of an interesting talk on the "*Severn Tunnel*," which was greatly enjoyed. Debates on various subjects, also an exhibition, are being arranged. Secretary: D. K. Adams, 8, Cedar Road, Northampton.

NEW SOUTHGATE.—Members have visited Paddington Station, and were allowed to observe all the more important features of working. Special interest was taken in the signalling arrangements, although entrance to the signal cabins was not permitted.



Members of the Sedbergh Preparatory School Branch, No. 289. President, Mr. A. L. Gladstone; Chairman, Mr. F. C. Bazett-Jones. This Branch was incorporated in May, 1935; special attention has been given to the development of the Branch layout, including the provision of lighting for Hornby Accessories.

EXHIBITION AT NEW SOUTHGATE, N.11.

An interesting exhibition organised by the New Southgate Branch of the Hornby Railway Company will be held on the 11th of this month at the Friends Meeting House, Waterfall Road, New Southgate. It will be opened from 3 p.m. to 7-30 p.m., and the charge for admission will be: Adults 3d. Children 2d.

Track meetings continue to be a success, and a new departure was made recently when an evening was devoted to the examining and testing of miniature steam locomotives. The Second Exhibition of the Branch is to be held this month, as announced at the foot of this page. Secretary: A. R. Wardle, 25, Limes Avenue, London, N.11.

FIRST SHEFFIELD.—Pressure of traffic has resulted in the permanent division of the fastest train on the Branch layout into two sections. These are respectively "*The Norseman Limited*" and "*The Northerner.*" General rules for the conduct of Branch affairs have been formulated and a special set of rules now govern track operations. Constructional work on the part of members is encouraged and, in addition to the repainting of several locomotives in the special Branch livery, the building of coaches is to be undertaken. A visit has been paid to Retford to see "*The Silver Jubilee*" and "*The Yorkshire Pullman*" expresses. Secretary: W. B. Hutchinson, 35, Linden Avenue, Sheffield, 8.

KING'S ROAD SCHOOL.—Track layouts and operations have been given chief attention recently. Members of the Branch have been specially instructed in the care of locomotives and rolling stock, also in the laying down of different rail formations. Secretary: H. A. Argent, 15, Park Avenue, Chelmsford, Essex.

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.

ALTON—G.A.Eady, 5, Old Acre Road, Alton.
BIRMINGHAM—R. W. Hunt, 37, Weatheroak Road, Sparkhill.
DURHAM—R. Straughan, "Ancroft," Geoffrey Avenue, Neville's Cross.
SHIPLEY—Mr. R. T. Hopkinson, 14, Victoria Road, Saltaire.

Branches Recently Incorporated

294. SOUTHPORT—D. B. Moss, 141, Forest Road, Southport.
295. DUBLIN—Mr. S. B. Carse, 38 Oakley Road, Ranelagh, Dublin.

SETS (POSTAGE EXTRA)

10 Dutch Indies ...	2d.	5 Azores	2d.
20 „ „ ...	4d.	10 „	5d.
30 „ „ ...	8d.	15 „	8d.
10 Tunis ...	3d.	5 Sierra Leone ...	3d.
20 „	7d.	4 India Jubilee ...	6d.
30 „	1/–	4 Abyssinia ...	3d.
10 Ceylon ...	2d.	5 Persia	2d.
20 „ ...	6d.	10 „	4d.
30 „ ...	10d.	10 China	2d.
5 Syria ...	2d.	10 Japan	2d.
10 „	5d.	4 Borneo... ...	3d.
15 „	8d.	5 Mozambique ...	2d.
5 Gold Coast ...	3d.	10 „ ...	5d.
10 „ „ ...	6d.	5 Colombia ...	2d.

J. RUSSELL

23, Shanklin Drive, Westcliff-on-Sea

QUEEN ASTRID Mourning Packet FREE!

Actually contains the beautiful portrait stamp issued to perpetuate the memory of Belgium's lovely Queen, whose tragic death shocked the world. Also a stamp depicting her husband, King Leopold, and the famous mourning stamp of King Albert. Nearly 60 different, including old Belgium, British Colonials and mint Russian stamps. Finally a large unused Colonial and the popular and unique Balloon stamp. All absolutely free. Just send 2d. postage requesting approvals, and new 1936 Catalogue. You get the best gifts and stamps from:

LISBURN & TOWNSEND LTD. (Dept. M.M.), Liverpool, 3

FREE WONDERFUL 1936 OFFER 25 NEW ISSUES AND NOVELTIES

Including **Andorra** (1935), fine new **Cayman Islands** (map of the Islands), obsolete Austria, China, Denmark, **Gwalior** Service, Hungary (Statesman Szechenyi), **new Kenya** (Kavirondo Cranes), **Roumania** (new portrait of King Carol), and many others. I will send this collection **absolutely free** to all stamp collectors sending 2d. postage (abroad 4d.).

G. P. KEEF, Willingdon, EASTBOURNE

NYASSA TRIANGLES! EGYPT AIR MAILS!! PICTORIALS!!! 124 STAMPS 6d.

Including set of unused **Nyassa Triangles.** Set of **Egypt 1933 Air Mails** showing aeroplane flying over Pyramids. **15 Canada** including **Jubilee** and **Ottawa Conference** issues. Interesting **Brazil 1933 Airport Fund** stamp. **Roumania 1931 Aviation** stamps showing monoplane. Other stamps include unused air mails, surcharged issues and pictorials. All different. **Price 6d.** Other offers: **23** different **Jubilee** stamps, **2/–. 110** different **British Colonials** (Cat. value 15/–). **9d. (Postage 1½d. extra on all orders.)** Money and all postage will be returned if not satisfactory. We have numerous other offers at low prices. Hundreds of unsolicited testimonials have been received.

W. BENNETT
53, MARLBOROUGH ROAD, LONDON, E.8

FREE!

No stamp collector should miss the opportunity of securing a free copy of **Whitfield King's Price List of Sets and Packets,** 1936 Edition, just published. 156 pages absolutely up to date and contains, amongst other interesting features, an immense number of bargain offers at prices from a few pence. Make sure of your copy by sending a postcard now to:

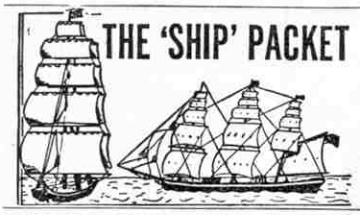
WHITFIELD KING & CO., IPSWICH, SUFFOLK Established 1869

"DIAMONDS" ARE TRUMPS!

Thousands of "*M.M.*" readers have discovered this. **WHY NOT YOU?**

The **"DIAMOND" PACKET** contains approx. **1,000 UNSORTED STAMPS** from Convents abroad, and **MANY RARE STAMPS** have been found in it. 1 pkt., **1/6;** 3 pkts., **3/9;** 5 pkts., **6/–.** All post free inland. (Colonies 3d. per pkt. extra. Foreign, 6d.)

O. NERUSH (Dept. M.), 68, Turnpike Lane, Hornsey, LONDON, N.8



This marvellous packet is offered under cost as an advertisement, **45 different stamps each with a ship on it.** A regular armada. **GABOON,** a rare **FOOCHOW** (War Canoe), wonderful flotilla of caravels from **DENMARK** (completeset), **ITALY** (Naval Academy), **NEW CALEDONIA, IVORY COAST, COSTA RICA,** a fleet of **7 CHINESE** junks usually sold at 10d., **TRINIDAD & TOBAGO, MAURITIUS, SOUTH WEST AFRICA, NEWFOUNDLAND, U.S.A., B. GUIANA,** set of **S. AFRICA, GREECE, POLAND, INDO-CHINA,** etc. Price 4½d., postage 1½d. (abroad 3d. extra). Purchasers of this packet asking for approvals receive **FREE** set of **4 SPAIN** (Columbus, each with his ship on it). Senders of addresses of stamp collectors receive **FREE** set of **6 VENEZUELA** or **6 PERSIA, 100 BRITISH COLONIALS 1/–, 20 AIRPORT 6d., 6 TRIANGULARS 6d. VOLUMES OF B.O.P. CHEAP.**

H. C. WATKINS (M. Dept.), Granville Road, BARNET

FREE! 100 British Colonials

Don't miss this wonderful gift offer. Detailed list impossible. Send and see for yourself. To all genuine applicants for cheap attractive approvals, enclosing 1½d. post. **R. KIPPEN, 52, Cowley Road, Leytonstone, E.11.**

100 **DIFFERENT STAMPS FREE** to applicants for ½d. approvals.—Cox, 21, Dennis Mansions, Westcliff.

SEND FOR FINE SELECTION, foreign or colonial stamps on approval, from ½d. Free packet to purchasers. —Sellick, Forde, Newton Abbot.

Common and Rare Stamps

Bargain Hunters' Approvals. Pick attractive space-fillers or rare items from ¼ to ¼ S. G. Cat. **You will come again!**

CAMPBELL, Halden Avenue, Teignmouth.

ONE THOUSAND STAMPS ON APPROVAL

From which you may select any 100 for 3/–.

This selection is not made up of the very commonest varieties, but contains stamps catalogued at 1/– each or more. (I do not sell less than 100.)

Special offer: 10 fine used PERAK, SELANGOR and SUNJEI UJONG, Cat. 5/6, for 1/–, post free.

H. HARDY, "Hoyland," Potter Heigham, Norfolk.

"BLUE MURDER" PACKET FREE!!

This interesting packet contains a number of stamps bringing to mind world-famous assassinations. The high value **ITALY** Ferrucci commem. (from which the packet takes its name), the complete set of **BOSNIA** (commemorative of the assassination of Archduke Ferdinand), **JUGO-SLAVIA** (King Alexander), **U.S.A.** (President Lincoln), **ITALY** (Julius Cæsar). Included also is a selection of mint stamps from **MOZAMBIQUE, SYRIA** (pictorial), **FINLAND, TURKEY** (surcharged), etc., and used British Colonials including a **SILVER JUBILEE.** The packet is free **only** to those who request approvals and send 2d. postage (abroad 1/–). **Hely. Hutchinson (M.5), Hurrock Wood, Kents Bank, Grange-over-Sands.**

ALL BRITISH COLONIAL APPROVALS

Fine **BRITISH COLONIAL PICTORIAL SETS OF CAYMAN ISLANDS & GAMBIA FREE** to all Collectors sending 1½d. stamp and requesting **ALL BRITISH COLONIAL APPROVALS, BRITISH COLONIALS ONLY** on approval at bargain prices, including Jubilee issues, West Indians, East and West Africa, Cyprus, Gibraltar, Iraq, Samoa, and many other fine Colonials. (No stamps sent abroad.)

C. H. SHAW (Dept. M1), 95, CHRISTCHURCH AVENUE, KENTON, HARROW.

FREE!! "LOCO" SET AND ENGINEERING PACKET

Many different stamps, showing Aeroplanes, Engines, Pyramids, Palaces, Ruins, Castles, Ships, Steamers, Windjammers, Junks, Statues, Schools, Mosques and Churches from Brazil, Egypt, **Turkey, Morocco, Greece,** China, **U.S.A.** (Statue of Liberty), **Algeria,** Set of **3 Charkhari, Martinique, Caledonia, Niger, Tunis,** etc. **ALSO** a fine packet of **50 all different stamps. ALL ABSOLUTELY FREE.** Just enclose 2d. postage, **requesting Approvals.**

SHOWELL BROS., 42, Vanbrugh Hill, LONDON, S.E.3.

SPECIAL OFFERS

6 MONGOLIA (Cat. 3/4) ... ... **7d.**
3 GREAT BRITAIN, K.G., 2/6, 5/– & 10/– ... 1/6
JUBILEES—(Few only), all different:
Mint and Used: 15 **1/3;** 25 **2/4;** 40 **4/9**
Mint ... 10 **1/–;** 20 **2/6;** 30 **4/6**
Mint Sets: Antigua, Barbados, Bermuda **2/6,** Ascension, Jamaica, Gibraltar **2/11**
NEW ISSUE APPROVALS—A SPECIALITY. Cash with order. Post extra.

T. R. HUGHES, 7, WINCHESTER ROAD, N.W.3.

EVERY COLLECTOR NEEDS THIS ILLUSTRATED BOOK

Zoo in a Stamp Album—Ship Stamps—Watermarks—The Aerodrome—Single Country Collections—Olympic Games—Loose-Leaf Albums—Earthquake Stamps—Washing Day in the Stamp World—Three-cornered Market Place—British Empire Albums—Rare Stamps—Overprints and Surcharges—To Correspondents Abroad—Treasure Trove—Triangular Packets—Packets of British, French, Italian, Portuguese Spanish and German Colonials—Building a Collection—West Indian Packets—Triangular Stamps—Philately Royal—Albums for Beginners—Penny Sets—English Men on Foreign Stamps—Emergency Papers—Shilling Sets—Advertising Stamps—Strip Pocket Books—Glossary—Stamp Tongs—Punctured Officials—etc., etc., etc. These are only a few Headings out of my **NEW SIXTY-PAGE BOOK,** which is **WELL ILLUSTRATED THROUGHOUT** and so full of the right sort of useful and interesting Philatelic information that **EVERY STAMP COLLECTOR MUST HAVE THIS BOOK,** FREE and POST FREE from

EDWARD SANDELL, 10, EVELYN GROVE, SOUTHALL, MIDDLESEX, ENGLAND.

For other stamp advertisements see pages 64 and xx

BRIDGES ON STAMPS

IN our article last month we dealt with the interest to be derived from forming collections of stamps dealing with particular subjects, and we promised to deal in detail with one or two such subjects to illustrate the possibilities in greater detail.

Engineering topics naturally lie closest to the hearts of Meccano boy stamp collectors and we have chosen "Bridges" as a typical engineering subject, providing ample scope for forming a special collection.

There are altogether approximately 100 stamps illustrating bridges—none of them expensive—and with these it is possible to build up a fairly complete story of the development of the art of bridge building from the primitive suspension bridge, constructed of logs bound by ropes of fibre, used by native tribes to cross forest streams, up to giant modern engineering achievements such as the Sydney Harbour Bridge.

As we have commented, the stamp story will only be fairly complete. Obviously the great bulk of the stamps available are representative of modern types and there are no stamps at all to show the earliest forms, consisting of simple slabs of rock, or logs, rolled into position across narrow streams.

This type of bridge was the forerunner of the modern girder bridge, laid on stone piers, such as that spanning the Kizil Irmak in Asia Minor, shown on the Turkish postal dues issues of 1926. One of the largest bridges of this type spans the Hawkesbury River in New South Wales. This has seven spans, each approximately 416 ft. in length.

The pontoon bridge illustrated on the 5 lei value of Roumania's 1914 issue is another type of bridge that has been widely used since early times. The design shows a Roumanian force crossing the Danube in the course of their victorious campaign against Bulgaria. It will be seen that the bridge has been formed by anchoring boats in the river and laying planking across from boat to boat. The principle employed is a very old one, and there exist records of the passage of the army of Darius Hystapes, 600,000 strong, across the Bosphorus about 530 B.C. The pontoon bridge in that instance was 3,000 ft. in length! An even earlier instance is recorded by Homer, who tells of a pontoon bridge constructed in 800 B.C. by Cyrus, King of the Persians. In this instance stuffed skins were used as floats.

The 1 franc denomination of the French Somali Coast issue of 1915 illustrates a typical modern trestle bridge, a type used for short spans in country where difficulties of transporting other material make it impossible to construct more modern types of bridges. An abundant supply of big timber, a natural bridge-building material, being easily accessible, the popularity of the trestle bridge in Canada and the United States is readily understood. Indeed, the frequency with which such bridges are encountered makes them a feature of the North American Continent.

One of the most striking bridges on the North American Continent is the steel over-arch bridge spanning the River Niagara, 1,000 ft. below the famous Falls. This bridge is shown on the 5 cent. value of the U.S.A. 1901 issue, which we illustrated with our stamp article last month, commemorating the Pan-American Exhibition at Buffalo. The bridge crosses the gorge at a height of 190 ft. above water, and has a roadway 47 ft. in width and a total span of 1,240 ft. It is the third bridge to occupy this site, and was opened in August, 1893, to replace a suspension bridge that had stood for 40 years.

The most striking arch bridge in our collection, however, is the famous Sydney Harbour Bridge, to commemorate the opening of which Australia issued a special stamp in 1932. It took eight years to build, and its total cost was approximately £9,000,000. With a main span of 1,650 ft. and a clearance above high water of 172 ft., it is indeed the mightiest over-arch bridge in the world.

Another great Empire bridge that must be accorded a prominent place in the collection is the cantilever bridge crossing the St. Lawrence river at Quebec in Canada. Its main spans have a total length of 1,800ft., while the weight of the centre span is over 5,500 tons. This bridge was featured on Canada's 12 cent. stamp of 1928, one of the most popular pictorial stamps ever produced.

The appearance of rugged strength that this bridge gives hides an almost incredible story of disaster in its construction. In 1907, when construction was first nearing completion, the centre span tore loose as it was being hoisted into position and 100 steel workers were pitched into the river. In 1916, after modifications of the design had been carried out, another section failed, and it was not until September, 1917, that the centre span was safely bolted into position.

The $2 value of the U.S.A. trans-Mississippi Exhibition series of 1896, shows the St. Louis Bridge spanning the Mississippi. This bridge has a special claim to fame in that its construction marked what might be termed the commencement of the era of the steel bridge. Prior to 1867, the year in which the St. Louis Bridge was commenced, steel had been used in bridge building only to a very small extent. The total span of this bridge is 1,700 ft., and it has three main arches crossing the river, the centre one being 520 ft. in length and those on either side 502 ft.

Another interesting bridge is on the 5c. value of Uruguay's issue of 1930

(Continued on page 63)

Stamp Gossip

and Notes on New Issues

Queen Astrid Mourning Stamp

The poignant feelings of the Belgian people at the tragic death of their beautiful young Queen Astrid, who, our readers will remember, was killed in a motoring accident in August last, are most strikingly symbolised in the beautiful special mourning stamp illustrated here.

The stamp is printed in black by the photogravure process, and is taken direct from a recent portrait of the Queen. It bears a premium of 5c. on its face value, 70c., this being devoted to anti-tuberculosis campaign funds.

Boulder Dam Commemorative

Among the many subjects that have been chosen for commemoration in the flow of special stamps from the U.S.A. in recent years, few have possessed the interest attaching to the Boulder or Hoover Dam in the Black Canyon on the Colorado River, shown on the U.S. 3c. stamp issued in September last to celebrate the opening of the dam by President Roosevelt.

The Boulder Dam must rank with the greatest of the world's engineering feats, and the quickest appreciation of its importance can be gained from the following facts of its size. At the base it is 650 ft. in thickness and at the top 45 ft. Its weight is estimated to be 6½ million tons and it will raise the level of the river backing up behind to a height of 590 ft. The impounded water will form a lake stretching back 113 miles from the dam and having a depth of 120 ft. outside the Black Canyon.

Jubilee Stamps

The demand for the Silver Jubilee stamps issued by the Crown Colonies, which remained on sale up to the end of last month, was so very heavy—in Singapore alone more than 1,600,000 of the 5 cent. Malayan issue were sold—that it was found necessary to make reprints of the whole series for 13 of the Colonies, and to make reprints of different values for another 23 Colonies.

All Jubilee stamps are obsolete now.

The 1935 Pro Juventute Issue

The annual Swiss *Pro Juventute* issue this year features portraits of typical girls from the Basel, Lucerne and Geneva cantons on the three low values, 5c., 10c. and 20c. respectively, and, in accordance with custom, the high value, 30c., is devoted to an eminent savant. This year Stefano Franscini (1796-1857) is chosen.

The 10c. and 20c. values are illustrated at the head of this page.

* * * *

A special stamp issue appeared last month to celebrate the Silver Jubilee of H.E.H. the Nizam of Hyderabad. The issue contains four stamps with designs as follows: 4pi., Unani Hospital; 8pi., Osmani General Hospital; 1a., University Building; 2a., Jubilee Hall.

* * * *

Poland's new 15 gr. stamp provides an attractive addition to the list of shipping stamps. It was issued to celebrate the commencement of the maiden voyage of the motor ship *"Pilsudski,"* of the Gdynia-America Shipping Company, operating between Poland and the United States.

The *"Pilsudski"* is one of two vessels ordered by the Company from the Monfalcone shipyards in Italy, but the second ship has been commandeered by the Italian Government for war service.

Whitfield King 1936 List

Every keen stamp collector should possess himself of a copy of Messrs. Whitfield King and Company's 1936 price list. Like the firm's annual catalogue this price list is growing rapidly in size, and the 1936 edition—the 67th annual list, by the way—contains over 150 pages, of which more than 130 are devoted to listing a remarkably complete range of long and short sets of interest to all collectors.

In addition to sets and packets of individual countries, Messrs. Whitfield King this year have introduced a range of new pictorial packets that will be of special interest to readers who are considering the compilation of a subject collection on the lines suggested in our stamp article last month.

Messrs. Whitfield King and Company, of Ipswich, tell us they will be glad to send a copy of this list, free of charge, to any *"M.M."* reader who applies for one.

Humour in Stamp Designs

The designer of New Zealand's Health Charity stamps is clearly a humorist. Only a year or two ago he perpetrated a stamp pun in using the slogan "Help Stamp out Tuberculosis" on an anti-tuberculosis fund issue. This year he shows us sunshine, the Key to Health, through a key-hole—and provides an unusually attractive design.

Incidentally, the portrait is an actual photograph taken on the beach at Paraparaumu.

Stamp Collecting—

(Continued from page 61)

marking the centenary of independence. This features a modern multi-span bridge across the Rio Negro. Uruguay is so proud of this bridge that when it was decided to issue this series of commemorative stamps, the Rio Negro bridge was an almost automatic choice for the first design.

The best example of communal pride in bridges comes from the Dominican Republic, where the completion of the building of a series of bridges was marked by three distinct issues of stamps, two in 1934 and one in 1935. Each of the 1934 issues contained three stamps, the first series featuring the San Rafael Suspension bridge, the largest in the West Indies. The ½c. value is illustrated here. The second series showed the Trujillo bridge, a trussed girder bridge across the Rio Yuna. The 1935 issue commemorated the opening of the Ramfis Suspension bridge across the Rio Higuamo.

In a short article such as this it is, of course, impossible to describe in detail all the bridges that appear on stamps, or indeed to mention more than a few of the stamps that are worthy of special attention, but readers who are desirous of forming a collection of bridge stamps, and who wish to secure more details, are invited to get in touch with the Editor, who will be happy to help them further.

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

THE JUBILEE PACKET

contains 100 different Superior stamps only (**NO** unused German); here are just a few of the fine stamps included: **SILVER JUBILEES** from **Jamaica, Canada,** King and Queen, **Ceylon,** 2 **Indian** and **Australia,** Anzac; also **NEW CEYLON** 2c. and 3c. pictorials: a large **Mozambique AIR MAIL;** ½d. and 1d. New Zealand **pictorials; EGYPTIAN AIR MAIL; New TANGANYIKA** unused; Br. **NYASALAND** ½d. and 1d. pictorials; **Scarce BR. GUIANA Centenary;** Belgium **Centenary;** Set of 5 **IRAQ,** pictorials and **King Ghazi,** etc.; China **Sun Yat Sen;** Swiss **Disarmament** and many other attractive stamps. Price 1/–, postage 1½d. Money refunded if dissatisfied. **THE PUKKA STAMP CO., 27, Normandy Avenue, BARNET.**

The "TRANSPORT" Packet

contains a wonderful assortment of 44 all different Foreign and Colonial stamps and includes the following which depict various means of transportation: **TUNIS** (Water Carrier), **JAMAICA** (Troopship), **MADAGASCAR** (Native Transport), **GREECE** (Steamer), **INDO-CHINA** (Boat), **MAURITANIA** (Crossing Desert), **TRANSVAAL** (Waggon), **BRAZIL** (Aeroplanes), **MIDDLE-CONGO** (Train), **SUDAN** (Camel), **FRANCE** (Horsewoman), **DUTCH INDIES** (Steam-boat), **AUSTRALIA** (Aeroplane), **GABOON** (Raft), **COLOMBIA** (Natives with Panniers), **SOUTH AFRICA** (Ship), **FRENCH GUIANA** (Native Carriers), **GERMANY** (Aeroplane), and **BELGIUM** (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

THE MYSTIC PACKET

1000 UNKNOWN UNUSUAL UNSORTED 1/3

Stamps on paper, etc., just as received from Convents, Missions, Bankers, etc. Guaranteed unpicked. Chance of a **FIND** in every lot. Send to-day for your treasure hunt to-morrow, **3** for **3/6, 6** for **6/6.** Abroad, **1/6** packet. **FREE!** 25 Br. Cols., including Jubilees, to approval Applicants, also **FREE EXCHANGE.** Send postage only. Overseas **3d.**

ASTLEY & CO.
(M25), Lowhill, WOLVERHAMPTON

333 STAMPS FOR 4½d.

GUARANTEED UNPICKED

As received from Convents, Missions, Bankers, etc., all over the world. Special offer to applicants for approval selections only. Postage 1½d.

EDWARD LORD
GRAFTON ROAD, KEIGHLEY

MOURNING STAMPS FREE

Get this fine collection of stamps issued in memory of famous Kings and Presidents, free. It includes **Belgium** (King Albert); **U.S.A.** (Pres. Harding); **Jugo Slavia** (the assassinated King Alexander), and **Germany** (Hindenburg). Sent absolutely free, to all genuine applicants asking for one of our famous "Grey" booklets of stamps on approval and enclosing 2d. postage. Price of this packet without approvals, 1/–. Just issued: The handsome **Belgium Queen Astrid** Mourning Stamps. Complete set of 8 unused, 1/9. Separate values, 10c.+5c., 1d.; 70c.+5c., 3d.

THE WINDSOR STAMP CO., 59, Lee Road, BLACKHEATH, S.E.3.

SENT BY AIR MAIL

Celebrated Richemont 6d. and 1/– packets sent on approval by Swiss Air Mail, as also sets and singles. Complete set Pro Juventute mint, 1935, 1/6. Latest Swiss pictorial set, used, 4d.

A. M. PHILLIPS
Richemont, St. Légier, sur Vevey, Switzerland.

FREE **MOZAMBIQUE CO., AIR MAIL, CEYLON** (native tapping rubber), **KENYA-UGANDA-TANGANYIKA, ROUMANIA, MOROCCO AGENCIES,** and other interesting new issues, **all unused.** Send postcard for approvals, postage paid both ways. (None sent abroad.)

T. F. WILLIAMS
7, Islington Rd., Towcester, Northants.

FREE PACKET—500 STAMPS

This splendid New Year Gift is Free to all approval applicants—if you add 2d. for postage I will include 2 Fine Sets. (Abroad 6d. extra.)

CHAS. A. HILL, 51, MONINS ROAD, DOVER.

"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.

All these new stamps free to genuine applicants for our Approval Sheets, who enclose 2d. for postage.

SHIRLEY STAMP CO., 19, SANDRINGHAM AVENUE, LONDON, S.W.20.

24 AIR STAMPS FREE

THIS FINE PACKET OF 24 ALL DIFFERENT AIR STAMPS FREE TO APPROVAL APPLICANTS ENCLOSING 3d. (in stamps) FOR POSTAGE AND PACKING.

A. B. LEWIS (Dept. C.22)
16, CRICKLEWOOD LANE, LONDON, N.W.2

"WORTH WHILE" 10 COLONIAL JUBILEES FREE

To approval applicants only. Everyone wants these elusive issues, and there are not enough to go round. I have managed to secure a good supply which I am circulating with my **"Worth While"** approval sheets. Send 3d. (Abroad 1/–) to cover postage, etc., ask to see some of these famous selections and you will make sure of having at least 10 of these beautiful **Used** stamps. Remember, **"Worth While"** sheets contain only worth while stamps, at prices which make them **Worth While.**

JOS. H. GAZE, DIDSBURY, MANCHESTER.

AFREE FREEF

We are presenting this month the first packet of our new alphabetical series, the greatest gifts ever offered. This month's packet contains stamps of countries from A to F and includes many beautiful pictorials. You cannot afford to miss this magnificent offer.

SEND A POST CARD TO-DAY FOR APPROVALS

THE UNIVERSITY STAMP CO., OXFORD

SENSATIONAL OFFER TO YOU

FREE QUEEN ASTRID MOURNING STAMP and **6 Large Italian Commemoratives, also 50** other varieties—send 1½d. postage for "Globe-trotter" Approval Selections—amazing value ¼d., ½d., 1d. upwards—and particulars of how you can have **FREE Stamps every 14 days!!** Write now—**there's a stamp treat in store for you. Special Offers** "GLOBE-TROTTER" **Mystery Mixture**—world-wide collected—Old and New Issues, Airmails, etc., 1,000 unsorted, unbeatable, 1/3. 25 Large Italian Commemorative Pictorials, 1/–. 10 Jubilee, 1/–. 50 Persia, 1/3. 100 British Colonials, 1/–. French Colonials, 25, 6d., 50, 1/–, 100, 1/9. 50 Airmails, 2/–.

GLOBE-TROTTER, 17, WINCHESTER ROAD, BIRCHFIELD, BIRMINGHAM.

APPROVALS

COLONIAL OR FOREIGN
From ½d. each, with discount.
REAL GOOD VALUE.

H. KEELEY
9, Market Buildings, Maidstone

COLONIAL JUBILEE STAMPS ARE NOW OBSOLETE

I have a few MINT Sets as follows:

Antigua ...	2/9	**Malta** ...	3/6
Basutoland ...	2/–	**Montserrat** ...	2/9
Cyprus ...	3/–	**Newfoundland** ...	3/3
Gibraltar ...	3/9	**S. Rhodesia** ...	2/6
Grenada ...	2/6	**Tangier** ...	1/–

Bargain Packets, 50 different British Colonials (containing stamps cat. up to 9d. each), **1/3.**

CASH WITH ORDER—**POSTAGE EXTRA.**

H. L. GOMM, 41, Upper Cranbrook Rd., Redland, Bristol 6.

I WANT 500

regular customers. Collectors who are so satisfied with the value offered in my selections that they will come to me for all their philatelic requirements. AND I have a scheme which will pay them to become **regular** customers. Send now for my **4-a-penny selections** and full particulars of the new scheme.

L. D. MAYNARD,
78, RICHMOND ST., SOUTHEND-ON-SEA.

Monster 500 Packet FREE!

This huge gift parcel contains 500 Unsorted FOREIGN and COLONIAL STAMPS, many scarce from **St. Pierre** and **Miquelon, Malay** (Tiger), **China, PORTUGAL,** GWALIOR, CHILI, BR. S. AFRICA, etc., etc. Just send 2d. stamp and request my famous EXTRA-LARGE-DISCOUNT APPROVAL SHEETS (Abroad 6d. P.O.).

E. EASTICK, 22, Bankside Road, BOURNEMOUTH.

10 MINT ABYSSINIA CAT. 4/4 FREE

Includes the following scarce stamps: 1917 ¼ guerche **(Throne of Solomon),** overprinted; Complete short set of 1919 Pictorial Issue, ½g. **(Antelope);** ½g. **(Giraffes);** ½g. **(Spotted Leopard);** 1g. **(Ras Taffari** now **Haile Selassie, Emperor of Abyssinia);** 2g. **(ditto but different view);** 4g. **(ditto but different again);** 6g. **(St. George's Cathedral, Addis Ababa);** 8g. **(Rhinoceros;** 12g. **(Ostriches),** and 1928, 2m. **(Haile Selassie).** This fine packet will be sent free to all genuine applicants for approvals enclosing 2d. for postage. **M. HUMPHRIES, East Wittering Rd., East Wittering, Chichester, Sussex.**

FREE — NATIVE LIFE PACKET — FREE

This wonderful collection contains stamps from all corners of the globe, showing native life and industries, and contains: Madagascar (Bara chief), Mozambique (Native village), French Guiana (Carib archer), **obsolete** Martinique (Native beauty), Indo-China (Native ploughman), Sudan (Arab postman), and many other interesting designs. This splendid gift will be sent FREE to all genuine applicants for my popular approvals enclosing 1½d. postage (abroad 6d.).

MICHAEL HERBERT,
58, Larkswood Road, Chingford, London, E.4.

SILVER JUBILEE, mint, 25 British cols. and 25 Foreign free to approval applicants. Postage 2d. P. R. Lincoln, 60, High Road, Potters Bar.

STAMPS: 50 FREE to all selecting 1/– worth or over from my approval sheets. Enclose 1½d. for selection.—Burley, 21, Jardine Road, Aston Manor, Birmingham.

U.S. Boulder Dam, Mozambique Air, Ceylon and Australia Jubilee, Tanganyika (Pict.), Belgium Queen Astrid, Roumania (large), with Colonials, Pictorials, 4d. free with Selection, 6d. without. 6 Mongolia Pict. 6d. 23 Russia 5d.

J. R. MORRIS, 9, Audley Road, Folkestone, Kent.

FREE—50 STAMPS!!!

and perforation gauge.

Contains: Silver Jubilee Colonials and **NYASSA TRIANGULAR.** This fine packet is given free to all genuine applicants for my cheap approvals. Price list free.

D. T. CADOGAN,
61, South Main Street, Wexford, I.F.S.

"1,000 PACKET" A WONDERFUL OFFER FOR 6D.

Postage 2½d. ex. Abroad 6d. ex.

The "1,000 Packet" contains 500 excellently assorted Stamps; **a complete Sheet of 100 Unused** (very useful for exchange purposes); a neat 12-page booklet for duplicates; 25 British Colonials usually sold at ½d. to 1d. each, including new issues; 375 Magic "Strip" mounts, very quick for mounting stamps, and list of stamp bargains. Free sets will be sent to those who send addresses of stamp-collecting friends. *Ask for Approvals.* 100 B. Colonials 1/–. 20 Air Post 6d. 10 Abyssinia 1/6. 10 Mozambique Triangulars (just out) 1/6. "B.O.P." and "Captain" monthly parts cheap.

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

For other stamp advertisements see pages 60 and xx

Competition Corner

WHICH WERE THE MOST POPULAR COVERS IN 1935?

The Cover Voting Contest that we have held each year for several years past, to decide the order of popularity of the coloured covers of the previous year's issues, has retained a remarkable degree of popularity, and even before last December's issue was published we had received letters from readers expressing the hope that we would again feature this contest.

In the above illustration the splendid covers that appeared on the various issues of the "*M.M.*" during 1935 are reproduced in a reduced form in their order of publication—January to June in the upper row, and July to December in the lower. The reproductions are intended for reference purposes only. They convey nothing of the brilliancy of the colour of the originals, but new readers will find them of great assistance in forming their judgment. Those readers who possess copies of the 1935 issues, or are able to obtain them, should make a careful study of the originals before completing their entries.

Referring to each cover by its month of issue, each competitor is asked to state on a postcard:

A. The 1935 cover he likes best of all.

B. His idea of the order of popularity of the covers as decided by the massed votes of all the competitors.

This list must cover the whole year, every month being included. The name of the month must be given, and its number in the volume. Competitors need not place their own favourite cover at the head of list B, unless they believe that it will prove to be the popular choice of the remaining competitors. They should place it in the position in which they anticipate it will be placed by the massed votes.

The entrant's name and address must be added to the card, which should be addressed "Cover Voting Competition, Meccano Magazine, Binns Road, Liverpool 13." No competitor may submit more than one entry.

Cash prizes of 21/–, 15/–, 10/6 and 5/– respectively will be awarded to the four competitors whose lists most accurately forecast the final result. In the event of a tie for any of the prizes, preference will be given to the entry displaying the neatest or most novel presentation. Closing date, 31st January.

A separate set of prizes, to be awarded in precisely similar conditions, will be awarded in the Overseas Section which is reserved for readers living outside Great Britain, Northern Ireland, the Irish Free State and the Channel Islands. The Overseas closing date will be 30th April.

January 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 January competition must be addressed "January Drawing Contest, Meccano Magazine, Binns Road, Liverpool 13," and must arrive not later than 31st January. Overseas closing date, 30th April.

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

H	E	L	P	■	T	R	A	M	■	F	A	R	C	E
A	■	■	R	■	R	E	S	O	L	U	T	E	■	N
I	■	B	O	R	E	S	■	D	A	R	T	S	■	F
L	O	R	D	■	E	T	H	E	R	■	A	E	R	O
■	■	I	■	M	■	■	A	■	K	E	R	N	E	L
E	G	G	■	A	P	P	R	I	S	E	■	T	E	D
■	A	H	■	T	■	O	D	D	■	R	■	■	F	■
■	S	T	O	R	E	S	■	E	N	I	S	L	E	■
■	E	■	■	I	■	T	E	A	■	E	■	O	R	■
C	O	O	■	C	A	S	T	L	E	S	■	A	S	K
R	U	P	E	E	S	■	N	■	■	T	■	F	■	■
U	S	E	D	■	T	E	A	R	S	■	P	E	N	T
N	■	N	I	G	E	R	■	O	T	T	E	R	■	O
C	■	E	T	E	R	N	I	S	E	■	S	■	■	L
H	U	R	S	T	■	E	N	E	W	■	T	A	I	L

We give above the solution to the August Crossword Puzzle, the Overseas section now having closed.

COMPETITION RESULTS

HOME

November Sketchograms.—First Prizes: Section A, G. Burgess (London, N.12); Section B, G. D. Hay (Peterborough). Second Prizes: Section A, C. Weatherbed (Sheffield); Section B, K. Aston (Dorking). Consolation Prizes: F. H. Bailey (Luddington); H. G. Blake (London, S.E.20); G. A. Fox (Bournemouth); M. Tucker (Reigate).

Firework Story.—1. D. J. Chubb (Brighton); 2. W. G. Tweedale (Bury); 3. F. G. Oldfield (North Staffs.); 4. J. Finch (Hounslow).

November Drawing.—First Prizes: Section A, A. Symonds (Coventry); Section B, H. Shacklady (Bolton). Second Prizes: Section A, N. S. Griffiths (Gidea Park); Section B, J. Macken (Bromley).

OVERSEAS

August Crossword.—1. C. Keekok (Singapore); 2. R. Lewis (Masterton, N.Z.); 3. J. M. Demanuele (Valletta, Malta); 4. G. E. McKinnon (North Sydney, N.S.W.).

August Photo.—First Prizes: Section A, Miss N. Milne (Hawkes Bay, N.Z.); Section B, R. Sampson, (Sydney, N.S.W.). Second Prizes: Section A, C. J. Mallia (Cospicua, Malta); Section B, B. R. Masters (Paris). Special Prize: Section A, B. bin Silan (Perak, F.M.S.).

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

ORDER OF MERIT

Traveller: "They threw me out of the side-door."
Sales Manager: "What did you say?"
Traveller: "I told them I came from a very important firm; so they took me inside again and threw me out of the main entrance."

* * * *

"Waiter, this menu is five days old."
"That does not matter, sir—we still have all the food."

* * * *

TWO INTO ONE WON'T GO

Fat Gent.: "What! Sixpence for a shave! Your sign says threepence."
Hairdresser: "Yes, threepence for one chin. You've got two!"

* * * *

Betty (at seaside): "Mummy, what would happen to me if I swallowed a crab?"
Mother: "Something dreadful, darling. It would probably kill you."
Betty: "Well, it hasn't."

* * * *

First Castaway: "Good heavens, cannibals!"
Second Castaway: "Now, now, don't get in a stew."

* * * *

Little Boy: "Mummy, if you show me which foot this shoe goes on I can guess the other."

* * * *

Two youths went to see a billiards match between well-known professionals. They watched one of the players pile up a huge break, and then one whispered to the other: "What do they call this game, Bert?"
"Why, billiards, of course," replied Bert.
"Well, what do they call the game we play at our club?"

* * * *

Sam: "Have any big men been born in this town?"
John: "Oh no, only babies."

* * * *

Pilot: "I suppose you have heard people say 'See Naples and die?' "
Passenger: "Yes, why do you ask?"
Pilot: "Well, we are over Naples now, and something's gone wrong with the engine."

* * * *

"Did you know the French drink their coffee out of bowls?"
"That's nothing; the Chinese drink their tea out-of-doors."

* * * *

The teacher had been trying to interest her class in the intriguing problem of Noah's hobby during the time of the flood.
"I think," she said, "that Noah must have spent his time fishing."
"No fear, Miss," broke in a young lad at the back, "he couldn't catch much with only two worms!"

* * * *

Prospective Lodger: "But you advertised this as a bed-sitting room."
Landlady: "That's right, sir."
Prospective Lodger: "Well I can see the bed, but where is the sitting room?"
Landlady: "On the bed, sir."

ALL THE SAME TO HER

New Lodger: "I am a journalist, and I use a nom-de-plume."
Landlady: "That's quite all right, sir, as long as it don't disturb me."

* * * *

Little Girl: "Did Santa Claus come down your chimney?"
Boy: "Well, Santa Claus didn't—we're economising this year—so father did it."

* * * *

Customer: "How much d'ye charge to press a pair of trousers?"
Dry Cleaner: "One shilling."
Customer: "All right, just press one leg for saxpense, and I'll have my photy taken side view."

* * * *

The tramp sidled up to the landlady of "The George and Dragon." "I haven't had a bite all day, mum," he said. "Can you spare a crust?"
"Certainly not," snapped the lady, and slammed the door in his face.
Another knock a few minutes later brought her back to the door. To her surprise it was the tramp again.
"What is it now?" she demanded.
"Please, mum, could I 'ave a few words with George?"

* * * *

Hunter: "Leaping towards me was a fierce lion."
Friend: "What did you do?"
Hunter: "Why, I beat it up."
Friend: "What! The lion?"
Hunter: "No, a tree."

* * * *

Mother (to naughty child): "Richard, you will try to be a good boy to-morrow, won't you?"
Richard: "Yes, mother. But please remind me in the morning."

* * * *

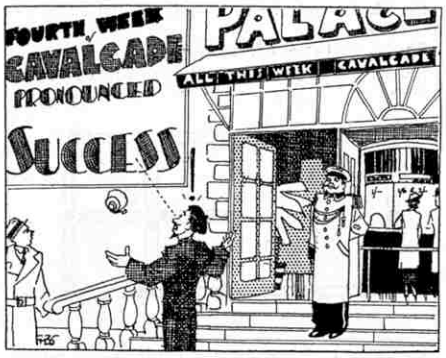
Two lads were gazing at a Zebra at the Zoo. "What a funny animal," said one. "What is it?"
"I don't know," replied the other. "A sports model donkey, I should think."

* * * *

"Now," said the teacher at the end of her talk on music, "What is harmonising, Percy?"
"The stuff you put on the top of cakes, miss."

* * * *

KING'S ENGLISH



The foreigner was trying hard to learn English. He struggled bravely when he came to "bough," "cough" and "though," but while passing a cinema one day he noticed on the board, "'Cavalcade,' pronounced success."
"Zis ees too much!" he groaned. "I geeve it up!"

* * * *

"Remember," said the employer, "that politeness costs nothing."
"I'm not so sure, sir," returned the youth. "Did you ever try putting 'Very respectfully yours,' at the end of a telegram?"

* * * *

Policeman: "What's the trouble, sonny?"
Small Boy: "Please, sir, have you seen a lady without a little boy who looks like me?"

QUITE CLEAR

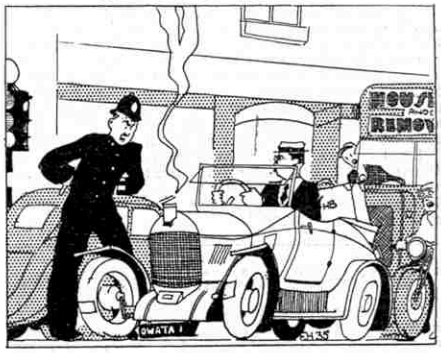
Pat: "That was a foine sintiment Casey expressed at the dinner last noight."
Mike: "What was it?"
Pat: "He said that the swatest mimories in loife are the ricollections of things forgotten!"

* * * *

Old Gentleman: "I see that a man in London is run over every half hour."
Old Lady: "Poor fellow!"

* * * *

HE KNEW BETTER



Officer: "You can't stop here."
Motorist: "I can't, eh? Well, officer, maybe I shouldn't stop here, but you don't know this car as well as I do."

* * * *

Mr. Cork: "I planted some potatoes in my garden and what do you think came up?"
Mr. Stopper: "Potatoes?"
Mr. Cork: "No; fifteen pigs and ate them all."

* * * *

Gent.: "May I have some stationery?"
Clerk: "Are you a guest at this hotel?"
Gent.: "Certainly not; I pay two guineas a day."

* * * *

The popular actor was being interviewed.
"And what do you consider the highest praise you can get in the theatre?" he was asked.
"Applause from the gallery," he replied.

* * * *

Extracts from recent advertise:emnts:
"Mr. ——, Furrier, begs to announce that he will make up gowns, coats, etc., for customers out of their own skins."
"TO LET, Bed-sitting room for gent. 22 ft. long and 11 ft. wide."

* * * *

Pat: "Why wud ye always be usin' them safety matches?"
Mike: "Och, shure! In case the gas be lakin'."

* * * *

Overheard at a cinema as a picture of a famous racing craft was flashed on the screen in a pictorial item:
First Lady: "A yacht?"
Second Lady: "No, dear. Are you?"

* * * *

The mighty engines of the liner throbbed ceaselessly. The chief engineer wiped a perspiring forehead and scowled at the young man with the oil-can. "Look here," he growled, "you aren't helping me much with these engines, yet you said you knew something about the game."
"So I do," replied the other, "but on a smaller scale, you know."
"Well, what's your usual job?"
"Watch repairing!"

* * * *

"You might at least have kept up with the other jockeys," grumbled the owner of the last horse in the race.
"What, and leave the horse behind?" replied the jockey.

Diaries for 1936

The great popularity of the Charles Letts's "*School-Boy's Diary*" is easy to understand, as in addition to the usual diary portion it contains an excellent atlas and more than 50 pages of text covering a remarkable variety of subjects. There are helpful notes concerning professions and qualifying examinations, grammar and arithmetical tables, and a comprehensive list of sports records. The diary is published in cloth at 1/- and can also be obtained in leather cloth with pencil and maps at 1/6, and in leather with pencil, maps and pocket at 2/6.

The 1936 edition of "*Brown's Boy Scout Diary*" (Brown, Son and Ferguson Ltd., 1/- net) contains as usual much information of value to Boy Scouts, Rover Scouts, Wolf Cubs and Sea Scouts. The many articles deal with Scout law, proficiency badges, knots and their uses, Indian signs, camping hints, weather lore and many other interesting topics.

The "*Young Airman's Diary*" (Letts Quickref Diaries Ltd.) is certain to make a definite appeal to boys who are interested in Aviation. The literary pages of the diary are a store of information, and contain, in addition to lists of flying clubs and schools, types of aero engines and aircraft, internal air lines and notable flights, a short history of Imperial Airways and an interesting article on how an aeroplane is controlled. Other sections deal with air photography and air survey, distances from London by air, and explanations of aeronautical terms. The end papers have maps showing the situation of the principal aerodromes in the British Isles and the chief airports abroad. The diary is published at 1/-, 1/6 and 2/6.

Tables for Home Billiards

Few winter games are so attractive as billiards, and the small tables manufactured by E. J. Riley Ltd., make this fine game available for even the smallest rooms. The Riley home billiard tables are not toys. Every model is a perfect replica of a full-size table, including a slate bed, scientifically constructed cushions, durable covering and all necessary accessories. A specially interesting point of the Riley service is that all models can be obtained on seven days' free trial.

E. J. Riley Ltd., Deal Works, Accrington, or Department 3, 147, Aldersgate Street, London, E.C.1, will be glad to send an attractive art list of Riley Billiard Tables to any reader who writes to them mentioning the "*M.M.*"

"Goldtone" Bakelite Rear Lamp

Our cycling readers will be interested in the recently-introduced "Goldtone" battery rear lamp. The case of this lamp is entirely unaffected by rain, and will not rust or corrode; and owing to its high insulating properties the full life of the battery is assured. The switch and contact strips are strongly made of brass, and the sliding back enables a new battery to be inserted in a couple of minutes when necessary. The screw-on front gives access to the bulb. The light given is adequate for all purposes.

The price of the lamp, complete with bulb, battery and the necessary fittings, is 1/9. A descriptive leaflet will be sent free to any reader who writes for one, mentioning the "*M.M.*" to Ward and Goldstone Ltd., Pendleton, Manchester 6.

Safeguards for Night Riding

Bluemel Brothers Ltd., have just sent to us a copy of their new leaflet listing their several white "Safeguards" for cycle use. Readers who indulge in riding after dark would find this list of special interest, for it details a series of most efficient and reasonably-priced safeguards, several of which incorporate a prismatic reflector.

Bluemel Brothers Ltd., of Wolston, Nr. Coventry, will be glad to send a copy of this leaflet to any interested "*M.M.*" reader.

Fine Grain Development

The vogue of the miniature camera has brought in its train a problem for manufacturers of photographic materials—the production of a developer that will facilitate the making of large scale pictures from tiny negatives. Messrs. Burroughs Wellcome and Company have met the problem in characteristic manner. They have produced a "Fine Grain Developer" that has all the convenience and reliability of their other "Tabloid" brand developers and yet embodies all the qualities necessary to produce negatives fit for high-degree enlargement.

Every owner of a miniature camera, indeed, all who are interested in enlarging their own negatives, should secure a copy of Messrs. Burroughs Wellcome's latest pamphlet "Fine Grain Development." It deals with many interesting practical points in addition to demonstrating pictorially the excellent qualities of their "Fine Grain Developer."

Messrs. Burroughs Wellcome and Co., Snow Hill Buildings, London, E.C.1, will send a copy of the booklet free of charge to any "*M.M.*" reader who applies for one.

Answers to December Puzzles

No. 1. Houses to Letter (let or) For Sale.

No. 2. The answer is not 11 but none. Elephants cannot speak.

No. 3. Keyword: Exhaustion
1234567890

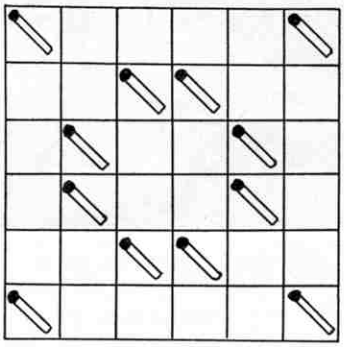


Fig. 1

No. 4. (1) Birds of a feather flock together.
(2) A rolling stone gathers no moss.

No. 5. Only three persons shared in the gift, related to each other as son, father, and grandfather. Each is therefore a son of somebody, while the two elder are fathers only.

No. 6. The window was diamond-shaped. By enlarging it to a square its area is exactly doubled. A window shaped as an isosceles or right-angled triangle will answer equally the conditions of the puzzle.

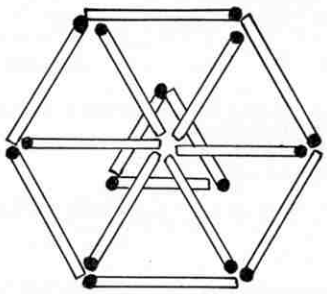


Fig. 2

No. 7. The matches are arranged as in Fig. 2.

No. 8. The paper should be cut and arranged as in Fig. 4.

No. 9. When the door is open.

No. 10. Wrong.

No. 11. Six weights: 1, 2, 4, 8, 16, and 32 lb. respectively.

No. 12. "What Am I?": Blockhead.

No. 13. Salmon, Mackerel, Oyster, Winkle, Plaice, Roach.

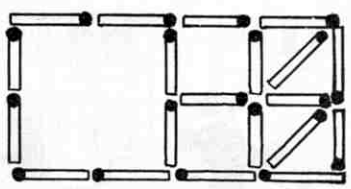


Fig. 3

No. 14. The coster originally had seven whole oranges. He gave four to the first keeper, two to the second keeper, and one to the third.

No. 15. The 12 matches should be rearranged as in Fig. 1.

No. 16. To rearrange the coins, place a finger on each of the second and fourth coins of the bottom row (heads), and with one movement withdraw them from the bottom row and move them round to a position immediately above the second and fourth coins in the top row (tails). Then, without stopping, but by firm pressure, the second and fourth rows are pushed down to allow the two heads to take up their positions in the top row. The effect of this is to push the second and fourth coins in each row into the row below.

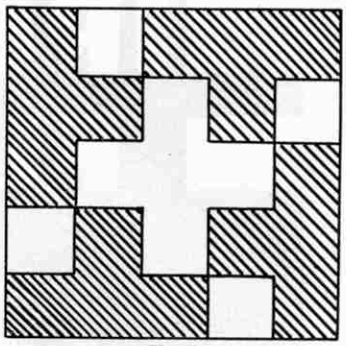


Fig. 4

No. 17. The 20 matches are arranged as in Fig. 3. The two diagonal matches are removed to form six squares but no triangles.

No. 18. John Underwood, Andover, Hants.

No. 19. Sir, you will understand that in the year 1877 France was divided, laws were set aside, religion was upside down, and rebellion in every corner.

No. 20. Bill is still living with Jim Smith in this big city.

No. 21. Red Root Put Up To Order.

No. 22. The word is "Meccano."

"Cross-Sums"

By DAVID WHITELAW. (Geoffrey Bles Ltd. 2/- net)

The popularity of the crossword puzzle continues undiminished. The original form has been retained, but made enormously more difficult in regard to clues. A new form has now been produced in which numbers are used instead of words, giving this kind of puzzle a new fascination, particularly for those who have no aversion to arithmetic as a form of entertainment. "*Cross-Sums*" contains 25 diagrams, and facing them, blanks to be used in working out the problems, which are arranged in increasing difficulty and are intended to be solved in the order given. The solutions to the problems are given at the end of the book, but they should be forgotten until the problems have been worked out. A pencil is provided with the book.

BEST WISHES FOR 1936 TO ALL MY READERS—THE EDITOR

MECCANO MAGAZINE

Editorial Office:
Binns Road, Liverpool 13
England

Vol. XXI. No. 1
January, 1936

With the Editor

Thanks to Readers

My first task this month is the pleasant one of thanking readers for their Christmas messages of greeting and good wishes for the New Year. These messages have come from all parts of the world and have been a source of great pleasure to me and to my staff. An interesting feature has been the large number of letters sent by Air Mail, showing that, as always, "*M.M.*" readers are thoroughly up to date.

In response to my invitation last month, large numbers of readers have already written to express their opinion of the "*M.M.*" and to make suggestions for improvements. Some of these suggestions are impracticable, but others are quite interesting, and I hope to refer to them next month.

British Railways During the Past Year

Great railway activity took place during the year. On the L.N.E.R. Britain's first streamlined train "*The Silver Jubilee*" commenced to run on the fastest schedule in the world over more than 200 miles, at 67.07 m.p.h. On a demonstration run the very high maximum of 112½ m.p.h. was recorded twice. It will be interesting to see whether the other groups will adopt streamlining. The G.W.R. made tentative experiments in this direction with two locomotives, but up to the present no developments seem to have resulted.

To commemorate the centenary of the G.W.R. a new express, "*The Bristolian*," with up and down averages of 67.6 and 67.1 m.p.h., was inaugurated to improve the service from Bristol to London. Another advance which may have important results was the putting into service by the L.M.S.R. of the first turbine-driven locomotive to be constructed by a British railway company. This nameless No. 6202 has worked with success on most of the important trains. The longest through engine working in Britain, from London to Aberdeen and back, 1,079½ miles in 36 hours, has been inaugurated by the L.M.S.R.

Still further developments are to be expected in the future. In our "*Railway News*" pages this month are given details of the £30,000,000 scheme of reconstruction and improvement that is to be carried out during the next five years. This will have important results, and will make the railways more capable than ever of dealing with the increasing demands of the public for all classes of traffic. At the same time even greater safety will be ensured by the improved signalling arrangements and by the extension of track circuiting and automatic train control. As far as possible all plant, machinery and materials will be products of the United Kingdom, so that the scheme will help to reduce unemployment.

Steady Progress in Aviation

In aviation the year was one of steady progress, particularly in the development of commercial air services, and both in this country and on the Continent more passengers and air mail were carried than ever before. There was no great international event such as the MacRobertson Races of 1934 or the earlier Schneider Trophy Contests, but during the year some notable long-distance flights were accomplished, two of them by well-known airwomen. In January last Mrs. George Putnam, better known as Miss Amelia Earheart, flew across the Pacific Ocean, from Honolulu to Oakland, California, and covered the 2,408 miles in 18 hr. 15 min.; and during a recent flight from Lympne, Kent to Port Natal, Brazil, Miss Jean Batten crossed the South Atlantic Ocean, 1,700 miles, in the record time of 13 hr. 15 min. The latest record for a solo flight from this country to Australia was set up in September last by H. F. Broadbent, who covered the distance in 6 days 21 hr. 19 min.

Ascents into the stratosphere continued to attract airmen and scientists. In November last two officers of the United States Army Air Corps, using a helium-filled balloon, ascended to the record height of 74,000 ft., or nearly 14 miles. At the maximum height the temperature was intensely cold both inside and outside the gondola, and the sky had become black, probably due to the absence of dust in that part of the stratosphere.

There are many indications that 1936 will be a very eventful one in aviation. The new Zeppelin airship is to be launched shortly, and her first trans-Atlantic flight will be watched with much interest. Another important event will be experimental flights across the North Atlantic by British and American aircraft of new design and great power. These flights are a necessary preliminary to the introduction, not later than 1938, of regular trans-Atlantic air services.

Petrol from Coal

One of the most wonderful recent achievements of chemical engineering has been the production of petrol from coal on a commercial basis. This success follows eight years of extensive research at a cost of £1,000,000, for which the credit is mainly due to Imperial Chemical Industries Ltd. The opening of their new plant at Billingham on the Durham coalfield last year marked the start of a completely new British industry.

This plant is the first to make petrol on a commercial scale. It occupies about 40 acres among a collection of other chemical plant covering 800 acres, forming the second largest chemical works in the world.

A Great Viaduct Road

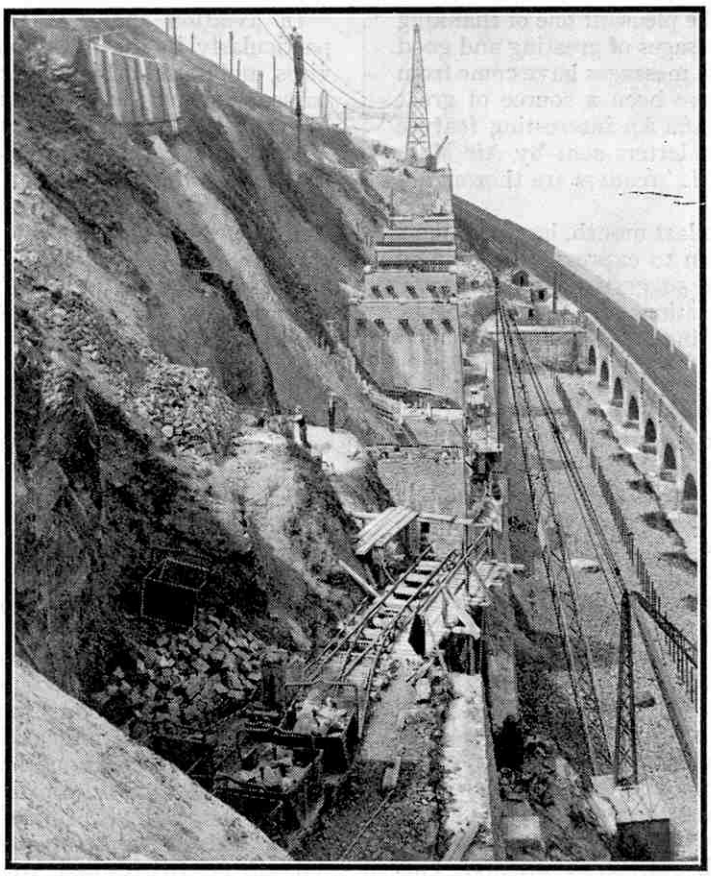
Historic Welsh Highway Reconstructed

ONE of the most striking modern feats of engineering was completed recently when a magnificent new viaduct road built on the fringe of the sea between Penmaenmawr and Llanfairfechan, North Wales, was opened to traffic. This stretch of highway, which forms part of the main Chester-Holyhead road, is cut from the side of Penmaenmawr Mountain, and although it is only 3,000 ft. in length its construction represents a remarkable achievement of engineering skill. At one point the road is carried 100 ft. above the sea on a beautiful viaduct 600 ft. in length, and at another point it passes through Penyclip headland by means of two tunnels. Tremendous difficulties had to be overcome in constructing the viaduct and tunnels, and the work, which has taken more than four years to complete, has cost about £66 per foot.

The road along the rocky coast of North Wales has for centuries provided one of the principal links between England and Wales, and the section that lies between Penmaenmawr and Llanfairfechan has always been a source of great difficulty to traffic. The history of the road goes back to the sixth century. In the time of Charles I it was the only passage available for the transport of mails to and from Ireland, and although in some places it was a mere track scarcely a yard in width it was designated the "Kinges Highway." This state of affairs was due probably to the fact that the road was in the charge of and maintained by an old hermit, whose only recompense for his labour was the charity of well-disposed passengers. In 1720 the then Lord Lieutenant of Ireland, the Duke of Ormond, made another road lower down the mountain side. This road does not appear to have been any better maintained than the earlier track, however, for travellers frequently fell down the precipitous sides and were killed. The famous Dr. Johnson, recording in his Diary a journey he made along the road, says: "I was much relieved when my journey past this point was over."

The road seems to have remained in this unsatisfactory condition for many years after that time, but with the gradual increase in traffic it became imperative to carry out considerable reconstruction in order to make the passage reasonably safe and free from obstruction at all times of the year. In 1811 therefore Thomas Telford, the famous bridge and road builder, was commissioned by the Government to improve and reconstruct the road round the Penyclip headland. This Telford undertook to do, and he built the fifth of the succession of roads of which traces still remain on the hillside.

In 1846, when Robert Stephenson was engaged in the construction of the railway from Chester to Holyhead, the Penyclip headland again came into prominence, for a storm washed away a massive sea wall that was being built on the edge of the sea to enclose what is now called Viaduct Bay at the foot of Penyclip, across which the railway had to pass. As a result of this disaster the wall scheme was abandoned, and the railway was carried over the Bay on a viaduct supported on open arched piers. This viaduct was the forerunner of that which carries the L.M.S.R. main Chester-Holyhead line to-day.



A view of work in progress on the piers of the Penyclip viaduct. The telegraph poles in the top left corner of the illustration indicate the line of the old Chester-Holyhead road. For the illustrations to this article we are indebted to Howard Humphreys and Sons, London.

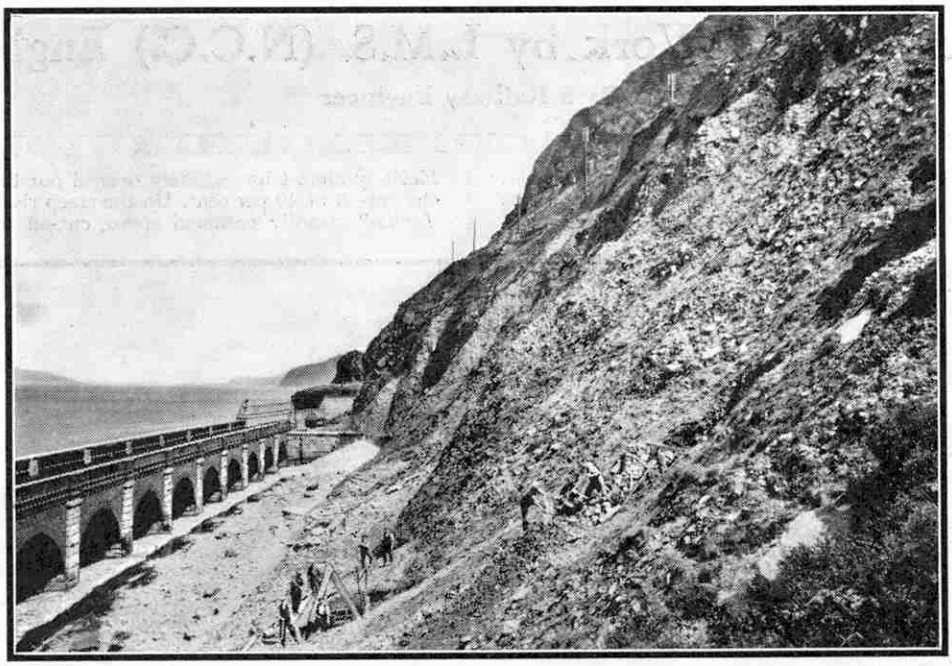
Unfortunately for Telford's road, however, the sea washed between the piers of the viaduct, and in time did such considerable damage by undercutting the hillside that landslides occurred and the road collapsed on several occasions. Each time it was rebuilt higher and higher up the face of the mountain. In 1899 Sir Benjamin Baker, the English engineer who designed the special vessel that carried Cleopatra's Needle to London and who was actively concerned in the construction of the Forth Bridge and other big engineering works of his time, was asked to examine the road, and as a result of his report it was decided to build a sea wall at the foot of the hill and to erect other massive stone ramparts to protect the hillside.

The continual rebuilding of the road up the side of the mountain had gradually increased its gradient until eventually the limit of reasonable steepness was reached. In that state the old road remained until the magnificent new viaduct road was completed recently. It had a gradient of 1 in 11, and in places a width between its walls of only 14 ft. With the great increase in traffic during recent years these narrow sections caused considerable hindrance, and at times, the very heavy holiday traffic that uses the road during the summer was held up for considerable periods.

The Caernarvon County Council therefore decided to carry out an elaborate scheme of reconstruction in order to make the road capable of accommodating all kinds of modern traffic. With the assistance of the Government this scheme has now been successfully completed.

The new road begins at Gerizim Chapel on the Llanfairfechan side of Penyclip headland, and some idea of its principal features may be gained from the accompanying illustrations. The first section consists of a widening of the old road for a distance of about 450 ft. to a width of 27 ft. To enable this to be done a strong retaining wall had to be built as a support to hold the soft mountain rock in place and prevent landslides. At the end of the 450 ft. stretch of widened road the new road leaves the line of the old road, and for a distance of 500 ft. is supported by massive retaining walls both on the north or sea side and on the south. The wall on the sea side has in one place a height of 64 ft. from the foundation to the level of the coping, and it has a base width of 25 ft. This section forms the approach to what is probably the most interesting part of the whole scheme, a 600ft. viaduct, the construction of which may be gathered from the lower illustration on this page. The viaduct carries the road over an inlet in the coast, known as Viaduct Bay, and consists of seven 80 ft. spans, the deck being 70 ft. above the deck of the other and smaller viaduct that carries the main Chester-Holyhead line of the London, Midland and Scottish Railway. The railway viaduct can be seen in the illustration at the top of this page and the line of the old road that has now been abandoned is indicated by telegraph poles. Higher up the mountain traces of the earlier roads are still visible.

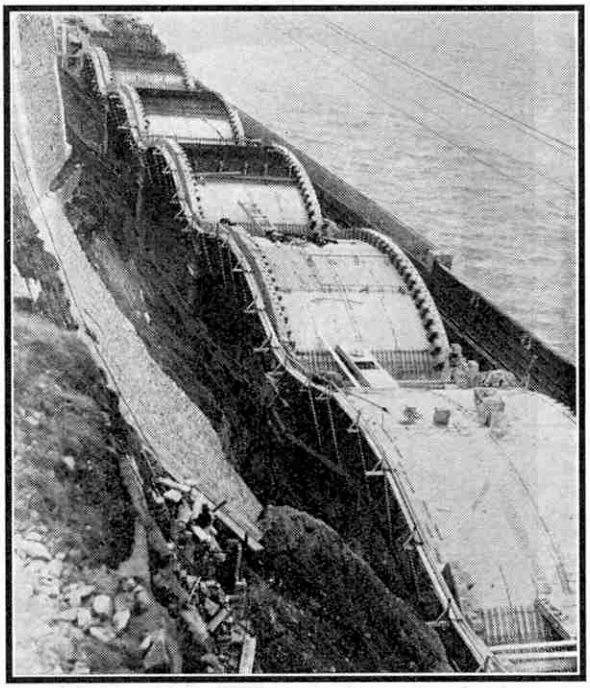
The piers of the new road viaduct are 90 ft. in height from foundation to road level, and are built of concrete faced with blue-grey stone from the Penmaenmawr quarries. The arches also are made of reinforced concrete. The road itself is supported by a reinforced concrete deck and is surfaced with tar macadam and provided with kerbs of granite. At the eastern end of the viaduct the road is carried on reinforced-concrete beams, which on the sea side are supported by a stout wall, while on the land side they rest on the natural ground.



Workmen clearing the site for the viaduct foundations. The L.M.S.R. railway viaduct is shown on the left.

At the end of this section the road again passes on to the natural rock and is taken through a tunnel 115 ft. in length, in which it passes through Penyclip headland almost under the old road. The tunnel is followed by about 500 ft. of open road, which is cut from the mountain side and is protected from falling rock from the heights above by extensive facing work. This open section runs into a second tunnel, which is 180 ft. in length and passes directly under the old road at a sharp corner known locally as the "Clip," Each of the tunnels has an elliptical arch with a major axis of 34 ft.

The last section of the work is that which joins the new road to the old. At this point considerable difficulties were encountered, and a great retaining wall, 74 ft. in height from the foundation level to the coping, had to be built in order to fill in a very deep gulley. The ground behind the wall was then made up to road level and the junction with the old road was effected, the traffic being diverted on to the new road to enable this to be done.



The viaduct during construction, showing steel plating in position.

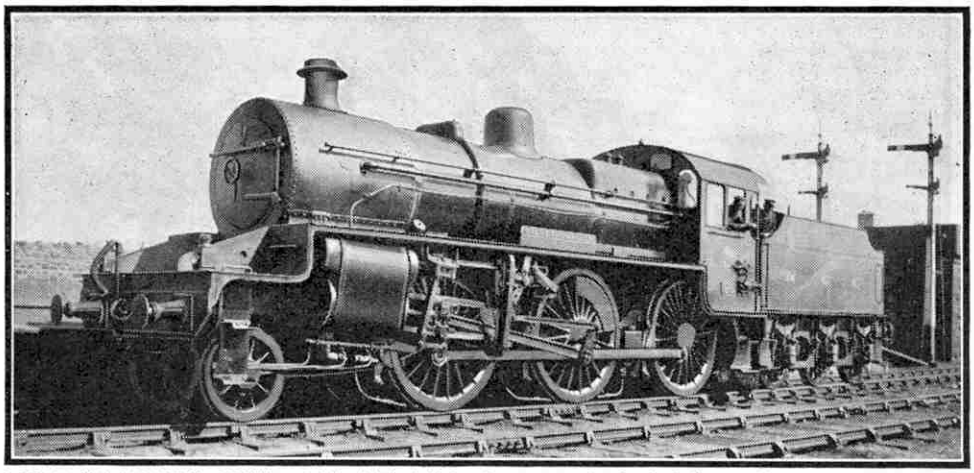
In addition to the splendid new road at Penyclip another portion of the old Chester-Holyhead road at Penmaenbach 3½ miles away has been modernised and made safe for all classes of traffic. This part of the scheme was completed at the end of 1933. At Penmaenbach the road originally ran round a blind bend on a wind-swept headland known as Giant's Thumb, and was frequently blocked by falls of rock from the steep mountain side. That road has now been replaced by a concrete lined tunnel that has a maximum headroom of 21 ft. and a minimum of 16 ft. at the kerb line. The excavations for this work necessitated the removal of 9,000 cubic yards of rock for the entrances and about 17,000 cubic yards in the tunnel itself. The tunnel is traversed by a 27 ft. carriageway and a 4 ft. 9 in. path with a guard verge on one side as in the tunnels at Penyclip.

Footplate Runs on Irish 2-6-0s

Remarkable Work by L.M.S. (N.C.C.) Engines

By a Railway Engineer

UNTIL comparatively recent times the Northern Counties Committee line of the L.M.S.R. had a very roundabout route to the north-west of Ireland. At Greenisland, six miles out of Belfast, all trains for the Londonderry line had to reverse direction, and as a consequence overall times of even the principal expresses were slow. In January 1934 a new loop line was opened, giving a direct line to the north and saving 2½ miles on the journey. Very shortly afterwards some remarkable accelerations took place, and the 65.2 miles from Belfast to Portrush was scheduled to be run in 80 minutes, inclusive of one stop, of two minutes' duration, at Ballymena.

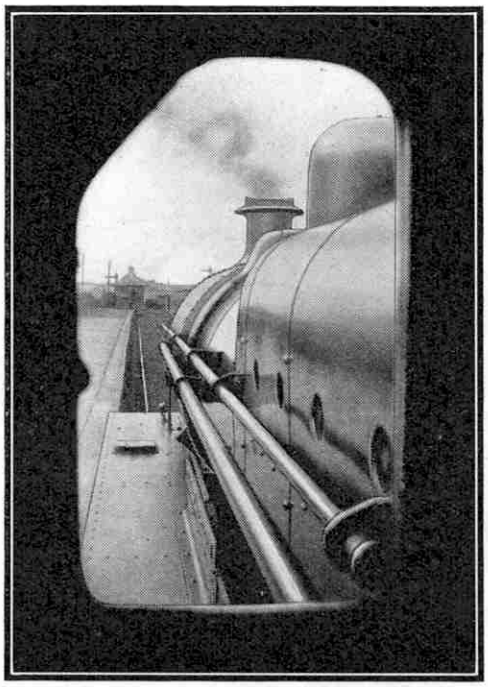


L.M.S.R. (N.C.C.) 2-6-0 No. 96 "Silver Jubilee." The tablet exchange apparatus for single line working is a prominent feature on the side of the cab.

The new loop line includes a gradient of 1 in 76½, three miles long, that occurs in the middle of a bank 4¾ miles long on which the grade is nowhere easier than 1 in 102. To be good enough for this, under the heaviest loading conditions, some fine new locomotives of the 2–6–0 type were introduced. The coupled wheels are 6 ft. in diameter. The cylinders are 19 in. in diameter with a piston stroke of 26 in., and have piston valves operated by Walschaerts valve gear. The first four of the new type were put into traffic in July 1933, and since then four further engines have been added to the class.

By the kindness of Major Malcolm Speir, Manager and Secretary of the N.C.C., I have been privileged to make a number of footplate journeys on these engines, during which I witnessed feats of locomotive performance that to my knowledge are quite unique. The first run to be described was made on the up *"Portrush Flyer."* This express makes three intermediate stops and is allowed 90 minutes for the journey of 65.2 miles. The load was, for an engine of such moderate dimensions, the very heavy one of 10 corridor bogies, 298 tons tare and 315 tons with passengers and luggage. The engine was one of the newest of the class, No. 96 *"Silver Jubilee,"* and was manned by Driver McNally and Fireman Graham of Belfast shed.

The Irish gauge is 5 ft. 3 in. and the extra width over the English standard makes possible a very roomy cab and gives a splendid look-out past the straight-sided Belpaire fire-box. Like all N.C.C. engines, these 2–6–0s are equipped for left-hand drive, the reversing gear being of the screw type. The regulator has two ports rather similar to that of the Midland Compounds. It has this difference; the small port, usually referred to as the "first regulator," is used for light steaming, while the second or main regulator is used for ordinary fast running on the level or uphill.



The driver's lookout on one of the N.C.C. "Moguls," showing the good view ahead that is afforded.

Getting the "right away" dead on time, 7.15 p.m., Driver McNally almost immediately opened out to full regulator and set the cut-off at 40 per cent. Up the steep rise at 1 in 76–122 *"Silver Jubilee"* steadily gathered speed, cut-off was reduced by 2 and 3 per cent. to 30, and a mile and a half from the start we were doing 26 m.p.h. As we mounted on to the cliffs, there was a magnificent view seawards; from the entrance to Lough Foyle, the Inishowen peninsular stretched out into the Atlantic, and behind its rolling ridges could be seen the wilder peaks of the Donegal Highlands.

By now we were running into Portstewart our first stop, 2.7 miles of steep grades covered in exactly 8 minutes. From here there is a more favourable start; cut-off was quickly back to 20 per cent. and the *"Flyer"* was soon into its stride. The line ran southward now, the Londonderry line converged on our right, there was a sharp crash as the single-line tablets were exchanged, and we swept through Coleraine at 60 m.p.h. For half the distance from Portrush to Belfast the main line is single, but the passing loops are laid out so that expresses can go through at full speed. Locomotives are fitted with an automatic "catcher" for the tablet, which consists of a pair of steel jaws. The tablet, a leather pouch, is suspended on a standard at the lineside and as the engine passes is caught in the jaws. With the train going at 60 m.p.h., the tablet was often wedged so tightly that the driver or I had to help the fireman dislodge it. It is then set ready to be given up at the next station, but it is not swung out until the station is being approached.

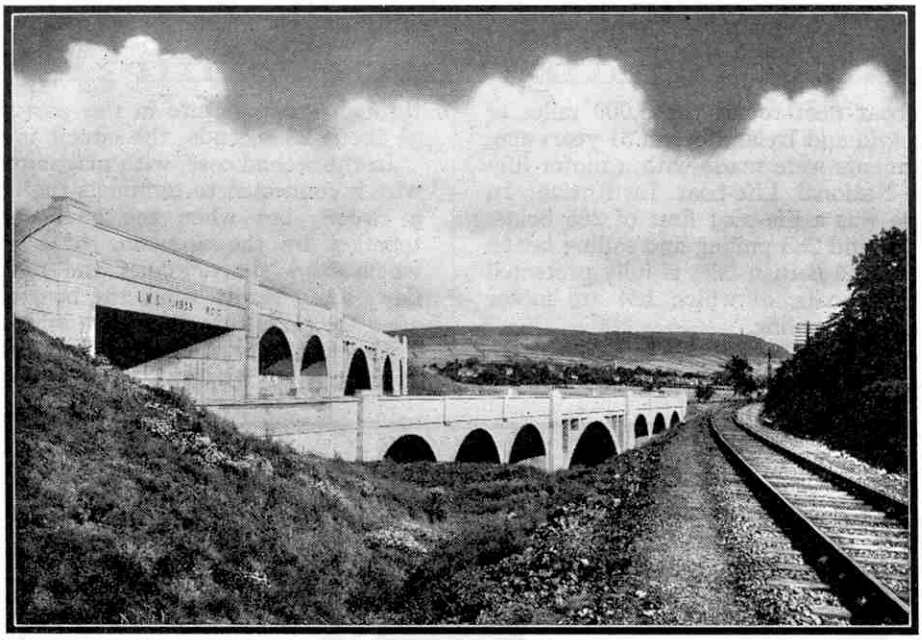
By this time, we had passed Macfin and soon reached Ballymoney, our second stop, 11.6 miles from Portstewart in 16 minutes, dead on time. This station is the junction for the Ballycastle branch. In addition to its 5 ft. 3 in. gauge main lines, the N.C.C. have a considerable mileage of narrow gauge line, only 3 ft. gauge, of which the section from Ballymoney to Ballycastle forms part.

The restart from Ballymoney is severe. For 5½ miles the line rises at grades varying between 1 in 114 and 1 in 150, with some very short strips less steeply. We got away in great style and with cut-off varying between 35 and 40 per cent., kept up a steady 38 to 40 m.p.h. all the way up. Once over the top, cut-off was reduced to 15 per cent., and on faintly falling grades, we got up to 60 m.p.h. at Glarryford. This part of the line runs through very sparsely populated country, of isolated farms and extensive peat mosses; the gradients change constantly, though the general tendency is downhill, and there is much reverse curvature. Away to the east are the Antrim mountains. On this undulating stretch, Driver

McNally changed the cut-off to suit every rise and fall of the line; often the gear was notched up as early as 12 per cent., but full regulator was used throughout. We kept up a fine pace, speed rising to a maximum of 62 at Cullybackey, and reached Ballymena, our last stop, in 26¾ minutes from Ballymoney, 20 miles, again almost exactly to time. From here into Belfast, the line is double-tracked.

The restart is grand for speed exhibitions, for the line falls gradually to the low country round Antrim and passes quite close to the northern shores of that vast inland lake, Lough Neagh. This cannot actually be seen from the main line as it is surrounded by a belt of trees. To get the train on the move quickly, McNally used 40 per cent. cut-off at first, then back to 25, 20 and finally 15 per cent. "*Silver Jubilee*" got away in dashing style, and we were through Antrim 11.7 miles in 13¼ minutes at 69 m.p.h.

From here follow 10½ miles of continuous climbing to the summit of the line at Kingsbog Junction. The grades gradually steepen until the last four miles are at 1 in 180. This ascent was taken in splendid fashion, cut-off being advanced step by step until it was 30 per cent., for the final two miles. Here speed fell to a sustained 48 m.p.h., while the complete 10½ miles were run at an average rate of 53.7 m.p.h.



The remarkable ferro-concrete Greenisland Viaducts. These form part of a flying junction layout, and the new loop line to Londonderry and Portrush passes over the down Larne line. Photograph by courtesy of the L.M.S.R.

Now McNally changed over to the first regulator for the steep descent over the Greenisland loop. We approached the new line at 67 m.p.h., but the engine was carefully eased over Monkstown Junction to 50 m.p.h. In the meantime a wonderful panorama had opened out. Far below was Belfast Lough; the City with its shipyards and docks was spread out like a map, while across the water County Down appeared more brilliantly green than ever in the sunset light. We coasted smoothly over the graceful viaduct at Bleach Green, a remarkable structure of reinforced concrete, and joined the line from Larne harbour just before Whiteabbey. Over the loop line and right into Belfast, "Searchlight" signals are used.

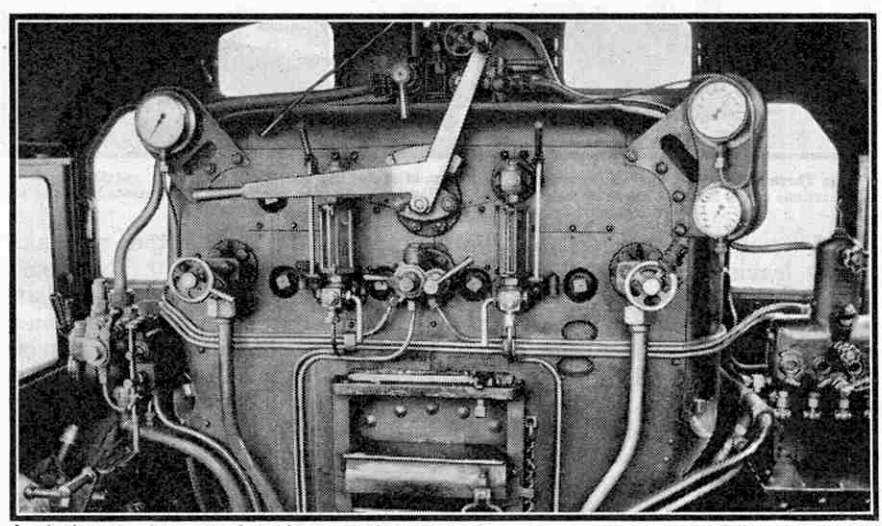
We touched 60 again at Whitehouse, and were now running along the shore of Belfast Lough. With Cave Hill towering above us on the right we were soon on the outskirts of the city and with a cautious run in, we stopped at York Road Station two minutes inside schedule, the 31 miles from Ballymena having been covered in 36 minutes, instead of the 38 booked. This was an excellent performance. The long periods at which the engine had been working at 15 per cent. cut-off, or less, made possible a very low coal consumption; to keep up full boiler pressure Fireman Graham never had to put on more than four shovelfuls at one firing and the average consumption on the journey was less than 30 lb. per mile.

In the reverse direction, I rode on the footplate of the 5.15 p.m. "*North Atlantic Express.*" The load was one of only six coaches, making a total load, with passengers and luggage, of 190 tons behind the tender, the engine being the pioneer of the class, No. 90, "*Duke of Abercorn.*" Another Belfast crew, Driver John Young and Fireman Fitzpatrick, were in charge.

Along the shore of Belfast Lough, we got away in great style, passing Whitehouse, 3.3 miles in a shade over 5 minutes, at 54 m.p.h. and then came the heavy ascent over the loop line. With full regulator and 40 per cent. cut-off, this bank, as steep as the southern ascent to Shap, was mounted at a sustained 36½ m.p.h. and we passed the summit at Ballyclare Junction, 8.2 miles from Belfast, in 12¼ minutes.

For the long descent to Antrim, cut-off was first of all shortened to 10 per cent.; then, as soon as we had attained 60 m.p.h., Young changed over to the first regulator. As we approached Templepatrick, as if this were not easy enough steaming, the engine was still further notched up, to 7 per cent. cut-off. The speed steadily rose, until approaching the foot of the incline near Muckamore, we were doing 71½ m.p.h. Even with a load of only 190 tons this was wonderful going with only 7 per cent. cut-off; it should be remembered too that only the first port of the regulator was being used.

At Antrim, the driver changed over to full regulator, and at Cookstown Junction in readiness for the gradually rising grades to Ballymena, cut-off was advanced to 10 per cent. Even this was easy working for uphill running, yet the 2 miles at 1 in 214 beyond Kellswater were mounted at a minimum speed of 52½ m.p.h. and we reached Ballymena, our only stop, in exactly the 35 minutes allowed.



A cab view, showing most of the important fittings, except the screw reverse gear. Well-lighted and commodious cabs are a feature of the N.C.C. "Moguls."

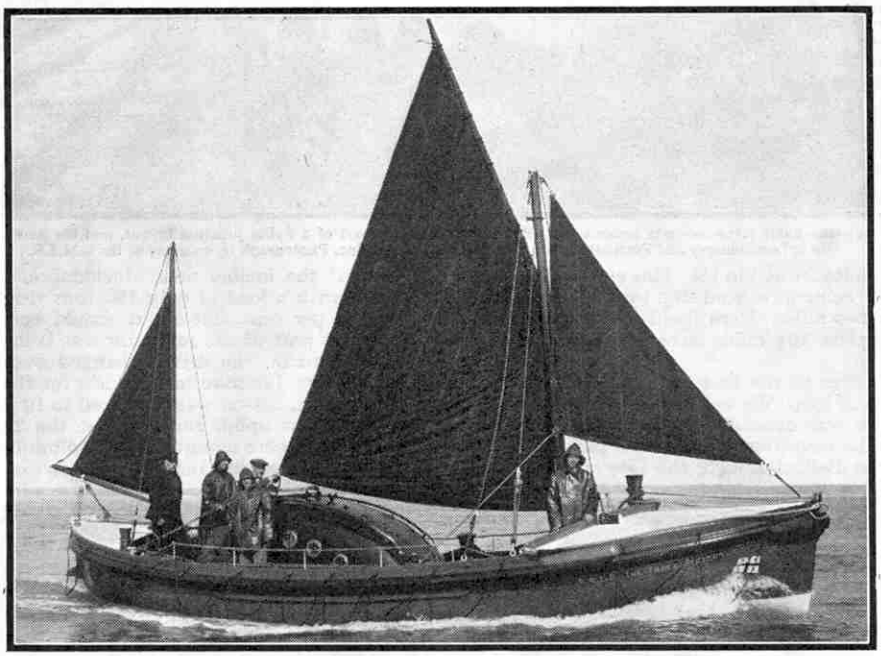
Although such very early cut-offs were the general order of the day, Driver Young did not spare the engine when occasion demanded, and we fairly roared up the 1 in 100 rise out of Ballymena on full regulator and no less than 50 per cent. cut-off. As might be imagined, this produced an astonishing acceleration, speed rising to 43 m.p.h. in one mile from the start. A stretch of undulating line follows, the tendency of which is definitely "against the collar," but nevertheless cut-off was brought back to 10 per cent. We passed Cullybackey, 2.9 miles from the restart, in exactly 5 minutes, at 56½ m.p.h., and then approaching Glarryford, advantage was taken of a short length of falling grade to notch up to the amazing figure of 5 per cent. Never in the whole of my experience have I noted such a short cut-off. The regulator remained absolutely full open and speed mounted to 61 m.p.h. Down the steep bank to Ballymoney the first regulator only was used, but with this exception, and a brief spell at 10 per cent. after Coleraine, 5 per cent. with a full open regulator was used throughout from Glarryford to Portrush, and sufficed to maintain an average speed of 52 m.p.h. Thus the run from Belfast was completed in 78 minutes.

Motor Life-Boats Round British Coasts

The Splendid Fleet of the R.N.L.I.

THE modern life-boat fleet round the 5,000 miles of coast of Great Britain and Ireland began 31 years ago, when the first experiments were made with a motor life-boat by the Royal National Life-boat Institution. In that year, 1904, there was a life-boat fleet of 285 boats, two being steam boats, and 283 pulling and sailing boats. To-day the coastline of the British Isles is fully protected with a fleet of 170 life-boats, of which 124 are motor boats, and 45 pulling and sailing.

It is interesting to look back and see how the problem presented itself to the experimenters in the early days of the internal combustion engine. The engine must be water-tight but not air-tight. It must be as automatic as possible and very simple to control. It must not interfere with the rowing or sailing qualities of the life-boat, for she would depend on oars and sails if the engine were to fail; and it must not interfere with her self-righting qualities. It must be able to work smoothly with the boat standing on end or with a heavy list. At the same time, if the boat should heel over to capsizing point the engine must cut off automatically, or else, when the boat righted herself some seconds later, the engine would carry her away, leaving her crew in the water.



"The Three Sisters" life-boat at Coverack. A light type of motor life-boat 35 ft. 6 in. long, specially designed for stations where the boat has to be launched off a carriage over the open beach. The illustrations to this article are by courtesy of the Royal National Life-Boat Institution.

These were difficult problems, but they were solved. It is worth while to describe the ingenious way in which the last problem, that of cutting off the engine, was solved. There are two ways of cutting off the engine, one for engines with battery and coil ignition, and the other for those with magneto ignition. In both cases the object is to switch off the ignition when the boat lists to 60 degrees or 70 degrees, and prevent the circuit being operative for 25 to 30 seconds. In the first case the low-tension circuit is made by two terminals in a glass tube formed into an oval ring containing a small quantity of mercury. The two terminals are at the bottom of the ring, separated by a glass partition in the tube through which a small hole is punctured; and through this hole the circuit is completed in the mercury. When the boat reaches a list of 60 degrees or 70 degrees the mercury runs round the top of the ring and is all on one side of the partition, so that there is no circuit between the terminals. When the boat rights herself the mercury slowly trickles through the puncture in the partition until, at the end of about 25 seconds, the circuit is restored.

In the second case, with magneto ignition, the earthing wire is connected to terminals that normally do not form a circuit, but when the boat capsizes are connected together by the upsetting of a quantity of mercury, which thus short-circuits the magneto. This mercury flows away slowly when the boat rights herself, and so, after the necessary delay, the ignition circuit is restored.

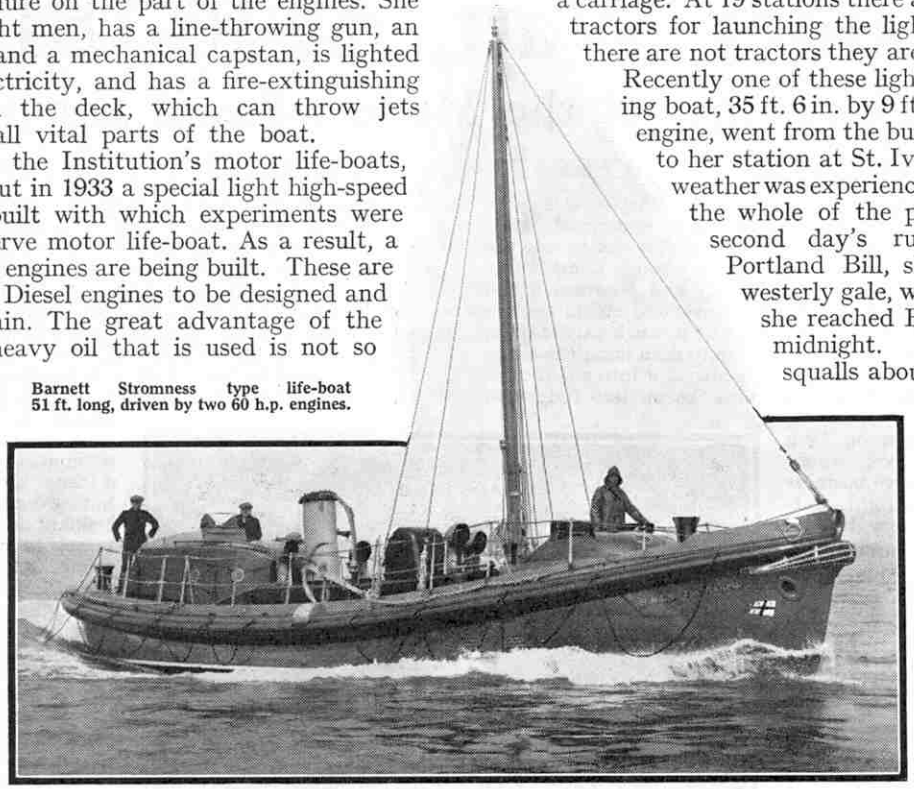
The first experimental installation was a 12 h.p. two-cycle motor. The most powerful type to-day, the 60-ft. Barnett motor life-boat, is driven by two six-cylinder 80 h.p. engines, This, the largest type, can only be placed at stations where it can lie afloat.

The standard type, the Watson cabin, is 46 ft. 8 in. by 12 ft. 9 in. Her displacement in service conditions is 19¾ tons, and she has a mean draft of 3 ft. 8 in. She is divided into seven water-tight compartments, and is fitted with 142 air-cases and 10 relieving scuppers. She has a forward and an after cockpit, both fitted with shelters, with room in them for 12 people, and a cabin that will take 20 people, with sitting accommodation for 10. The cabin is fitted with an electric fan, which can be used to ventilate the hold as well as the cabin. In rough weather she can take 95 people on board.

She is built with a double skin of mahogany, keel of teak, ribs of Canadian rock-elm, and stem and stern posts of English oak. She is driven by two four-cylinder 40 h.p. engines. They are in a water-tight compartment, and each engine is itself water-tight, so that they would continue running even if the engine-room were flooded and the engines themselves entirely submerged, for the air-intakes are well above the water-line, even when the boat herself is water-logged. The exhausts are carried up a funnel amidships. Her maximum speed is 8¼ knots. As with all the Institution's motor life-boats, there is a great reserve of power, so that the maximum speed can be maintained even in very severe weather. This type carries 108 gallons of petrol, and the engines' consumption is 7½ gallons an hour at full speed, so that she can travel 116 miles at full speed without refuelling.

She carries a staysail and a trysail, which can be used either with the engine running or as an auxiliary power in the event of any failure on the part of the engines. She carries a crew of eight men, has a line-throwing gun, an electric searchlight, and a mechanical capstan, is lighted throughout with electricity, and has a fire-extinguishing plant, worked from the deck, which can throw jets of Pyrene fluid to all vital parts of the boat.

This type, like all the Institution's motor life-boats, uses petrol as fuel, but in 1933 a special light high-speed Diesel engine was built with which experiments were carried out in a reserve motor life-boat. As a result, a pair of 40 h.p. Diesel engines are being built. These are the first submersible Diesel engines to be designed and built in Great Britain. The great advantage of the Diesel is that the heavy oil that is used is not so inflammable as petrol, and the risk of fire is very much less; but the ordinary Diesel engines, with their low speed of revolution, have been too heavy for life-boats. During recent years Diesel engines have been so developed that it has been found possible greatly to increase the speed of the revolutions, and by so doing to reduce the weight of the engines to little more than the weight of petrol engines of the same horse-power. Until recently this light high-speed Diesel was not sufficiently reliable for the exacting conditions of the Life-boat Service, but the improvements made in it decided the Institution that the time had now come to see if it could be successfully adapted for life-boat work.

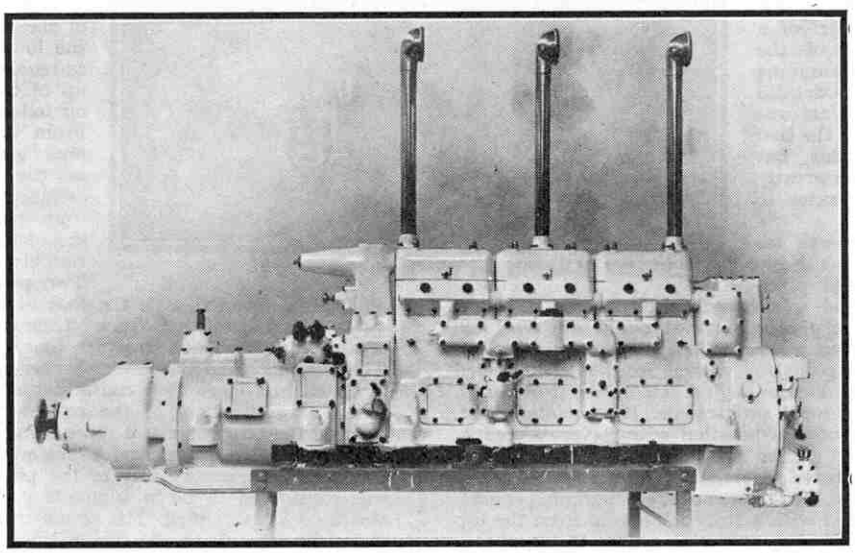


Barnett Stromness type life-boat 51 ft. long, driven by two 60 h.p. engines.

The motor life-boat described is one of five types that the Institution is now building, suitable to different parts of the coast. The heavier types must either lie afloat or be launched down a slipway—built usually of concrete. This means that their use is confined to stations where there is anchorage, or where there is sufficient depth of water inshore for it to be possible to launch down a slipway at any state of the tide. This has meant until recently that it was impossible to use motor power at a great many stations, because the heavier types of motor boat could not be launched. The most important developments of the last few years have been the design of two new types that can be launched without a slipway. One is the beach type, weighing 16¼ tons, which is launched on a semi-permanent slipway of rollers laid on the beach; the other is a still lighter type, weighing only 7 tons, that is launched off a carriage. At 19 stations there are motor caterpillar tractors for launching the light boats; and where there are not tractors they are launched by hand.

Recently one of these light boats, a self-righting boat, 35 ft. 6 in. by 9 ft. 3 in., with a 35 h.p. engine, went from the building yard at Cowes to her station at St. Ives, Cornwall. Rough weather was experienced during practically the whole of the passage, and on the second day's run, after rounding Portland Bill, she ran into a full westerly gale, which continued until she reached Brixham, just before midnight. There were rain squalls about every 20 minutes, and at these times, with the seas washing over the boat, the spray came over with such force that it was very difficult to keep the eyes open to steer a compass course. From midday till about 10 p.m. heavy green seas were frequently shipped, and everyone was surprised to see how quickly the boat freed herself of this water.

The crew were wet through, and all spare clothing, which was in suit cases, which were again inside double canvas bags and all covered by a large canvas sheet, was also wet. The total distance run was 236 miles. The boat was at sea 42 hours and 20 minutes, and the average speed for the trip was 5.6 knots. As the maximum speed in calm water on trials at Cowes was 7½ knots, this was a very good average for such weather, and shows the reserve of power that is possessed by all the motor life-boats.



Starboard side of CE6 type life-boat engine, developing 60 b.h.p. at 1,200 r.p.m. with reverse and reduction gear to 600 r.p.m.

A large number of these light motor life-boats have been built in the last few years, but the Institution is still not at the end of its experiments with light types. Two motor life-boats of a new and much lighter type are now being built. This type is 32 ft. long and weighs only 3½ tons, and will be driven by two 12 h.p. engines. One of the two boats will be fitted with Gill propellers, like other motor life-boats; the other will have a Hotchkiss internal cone propeller. Experiments will be carried out with these two boats before it is decided which of these methods of propulsion to adopt for the new light type.

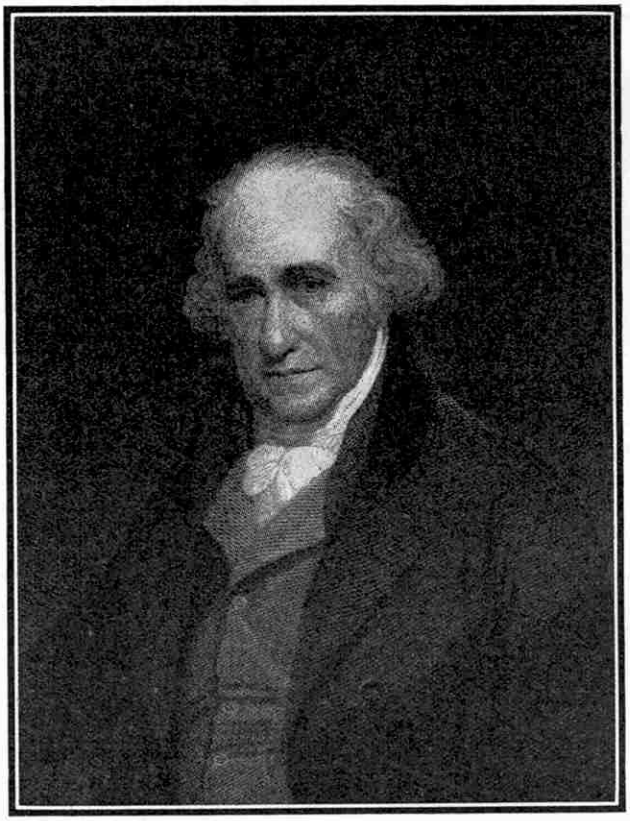
James Watt, 1736-1819

The Father of the Modern Steam Engine

ONE useful feature about centenaries is that they enable us to refresh our knowledge of the great men concerned. Most people, if asked about James Watt, would probably say he was the inventor of the steam engine. This is quite wrong. Long before Watt turned his attention to steam, Savery and Newcomen had produced engines that came into practical use; and steam engines of a sort were invented by various people at a much earlier date. Watt's claim to fame lies in the fact that he took in hand the crude and wasteful steam engine of his day and turned it into an efficient source of power that was to revolutionise the modern industrial world.

James Watt was born on 19th January 1736 at Greenock, where his father carried on a large business as a carpenter and shipwright. During boyhood Watt was very delicate and he received most of his education from his parents at home. When not busy with his studies he spent many happy hours becoming proficient in the use of a set of carpenter's tools from his father's workshop, and in assisting in repairing nautical instruments. At 18 he was apprenticed to the trade of instrument maker, first with a Glasgow mechanic and later in London with a skilled maker of mathematical instruments. In London the working hours were very long, and after a few months Watt's health began to give way again and he therefore returned to Scotland.

Back in Glasgow he obtained an appointment as resident mathematical instrument maker to the University, and was provided with a workshop in the college buildings. The University had a model of a Newcomen steam engine, of the type then largely used for pumping water out of mines. This model did not work at all well, and Watt was asked to put it in order. He had little difficulty in doing this, but in the process he became greatly impressed with the deficiencies of the engine.



James Watt (1736-1819).

The Newcomen engine was invented in 1705 by Thomas Newcomen, a blacksmith and ironmonger, of Dartmouth, and was based partly upon an earlier invention by Thomas Savery, which was brought out in 1698. Savery's pumping engine, as it was called, was very imperfect, but it provided a starting point for various inventors interested in the possibilities of the steam engine. Of these, Newcomen appears to have been the most progressive. It is related that, having by some means become acquainted with Savery's engine, he built a model of it in his garden and in studying its operation quickly perceived its many faults. After long experiment and many failures Newcomen finally evolved his atmospheric pumping engine.

In this engine a pipe fitted with a stopcock led up from the top of the boiler to a vertical cylinder containing a close-fitting piston. The piston rod was connected by a chain to one end of a beam overhead, which functioned see-saw fashion upon a central axis. From the other end of the beam hung a long weight, the bottom of which was attached to a pump rod. Steam was generated in the boiler and passed upwards into the cylinder at a pressure slightly greater than that of the atmosphere, thereby raising the piston. As the piston end of the beam was thus lifted, the other end was correspondingly lowered and the pump rod depressed. This motion was aided and steadied by the balance weight.

The stopcock was then turned to shut off steam. Cold water was passed down a narrow pipe from a cistern above the cylinder, entering the latter at the bottom in the form of a jet, and this, condensing the steam, created a vacuum. The cylinder was open at the top and atmospheric pressure upon the piston immediately forced the latter down, thereby re-canting the beam to its original position and raising the pump rod. The descending piston forced out the injected water and condensed steam through an escape valve into a pipe leading down to an adjoining well. Steam was then re-admitted to the cylinder and the cycle of operations repeated.

It was clear to Watt that a tremendous wastage of steam took place in the Newcomen engine, and he determined to find some means of preventing this. His problem was to condense the steam without cooling the cylinder. For a time the solution evaded him, but eventually there came the brilliant idea of having a separate vessel in which to condense the steam. After doing its work the steam could then be passed from the cylinder into the independent chamber and there condensed by the injection of cold water. By this method the cold water would not be brought into contact with the cylinder at all, and the latter could be kept dry and hot during the brief period pending admittance of more steam.

Watt promptly set to work to put his idea to the test. A large brass syringe some ten inches in length and one inch and a third in diameter was borrowed and rigged up as a vertical cylinder. To prevent leakage of steam from this the exit of the piston rod was protected with leather packing. A hole was drilled down the stem of the piston and a valve fitted at the lower end, so that such steam as condensed on the first filling up of the cylinder could be drawn off independently of the condenser. From the roof of a small boiler a pipe led off and was connected to the top and bottom of the cylinder. A third pipe extended from the top of the cylinder to the new condenser, which had been roughly fashioned out of tinplate. Two pipes leading down from this chamber connected with the foot of a small air-pump, an innovation Watt installed to draw off the injected water and condensed steam, together with any air that gathered in the condenser. The two pipes and the lower portion of the air pump were accommodated in a large tank containing sufficient cold water to reach just above the base of the condenser chamber. This reservoir ensured the condenser and pipes being kept cold.

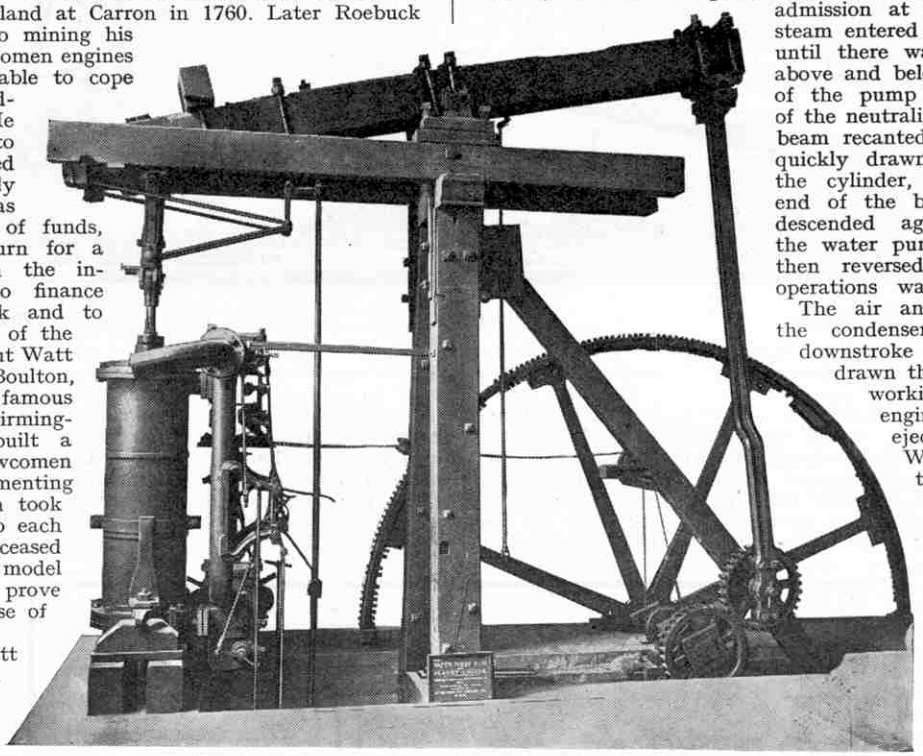
Steam was generated and admitted to the cylinder, the air thus displaced escaping by way of the piston valve. When the steam was considered to be in complete possession of the cylinder the steam cock was closed. The piston rod of the air pump was then pulled up, the air in the condenser chamber and the pipes being drawn after it, leaving a vacuum. Upon the condenser cock then being opened the steam rushed in from the cylinder to be immediately condensed. The pressure upon the cylinder piston being thus removed, the latter at once rose, lifting an 18 lb. weight suspended from its lower end. The condenser cock was then shut and steam re-admitted at the top of the cylinder, forcing the piston down again, after which the process was repeated.

In the Newcomen engine, in which the downward stroke of the piston was the working stroke, resulting in the lifting of the pump-rod, atmospheric pressure was used to effect this important motion. Watt had now performed this function successfully

solely by steam pressure, and thus brought into being the first true steam engine.

It was at this time that Watt became acquainted with Dr. Roebuck, of Bo'ness, a medical man who had turned engineer, and in partnership with a man named Cadell had started the first ironworks in Scotland at Carron in 1760. Later Roebuck turned his attention to mining his own coal, but the Newcomen engines in his mines were unable to cope with the constant flooding of the workings. He therefore urged Watt to perfect his improved steam engine as quickly as possible. Watt was handicapped by lack of funds, and Roebuck, in return for a two-thirds interest in the invention, undertook to finance the experimental work and to pay for the patenting of the engine. Roebuck also put Watt in touch with Matthew Boulton, the founder of the famous Soho metal works at Birmingham. Boulton had built a model on lines of a Newcomen engine, and was experimenting with it. The two men took an immediate liking to each other, and Boulton ceased experimenting with his model until events should prove the success or otherwise of Watt's efforts.

In January 1769 Watt patented his steam engine, and a full size trial model was then erected in an outhouse behind Dr. Roebuck's residence. It took six months to build and included the largest cylinder Watt had so far used. This was made at Carron and was 18 in. in diameter and of 5 ft. stroke. When tried out the engine proved disappointing, however, leakages of steam and faulty construction of the cylinder being the chief troubles. Early in 1770 various modifications were made to the engine, but they failed to improve its performance, and in disgust Watt christened it "*Beelzebub*!"



An early Watt double-acting engine, erected at Soho in 1788.

In 1772 Roebuck became a bankrupt. He owed Boulton £1,200, and rather than take legal proceedings against his friend Boulton agreed to accept as payment the former's two-thirds share in the engine patent. "*Beelzebub*" was dismantled and sent to the Soho works, and later was re-erected with various important changes made in its construction. These changes brought about a great improvement, and when the engine was once more in working order it accomplished 2,000 strokes with 1 cwt. of coal. This performance was considered good enough to justify the manufacture of similar engines for sale, and before long the Soho works became the scene of great activity. Watt went to live at Birmingham, and thus commenced an active partnership with Boulton that continued for more than 25 years and brought them fame and prosperity.

This engine was single acting; that is to say, the steam pressure was on one side of the piston all the time, and worked as follows. The downstroke of the piston was effected by steam admitted to the cylinder from above by way of a valve that also admitted steam into the steam jacket cloaking the cylinder. During this stroke any steam remaining beneath the piston from a previous stroke was allowed to escape through a valve to a separate condenser. As the cylinder end of the engine beam was drawn down by the descending piston, the opposite end of the beam canted up proportionately, thereby lifting the pump rods and allowing the pumps to fill with water.

The top valve through which steam had been admitted and the bottom valve leading to the separate condenser then closed, and a second valve at the foot of the cylinder opened and admitted beneath the piston steam available from the earliest admission at the top. The excess steam entered and lifted the piston until there was an equal pressure above and below, when, the weight of the pump rods exceeding that of the neutralised piston, the engine beam recanted and the piston was quickly drawn up to the top of the cylinder, while at the other end of the beam the pump rods descended again and discharged the water pumped up. The valves then reversed and the cycle of operations was repeated.

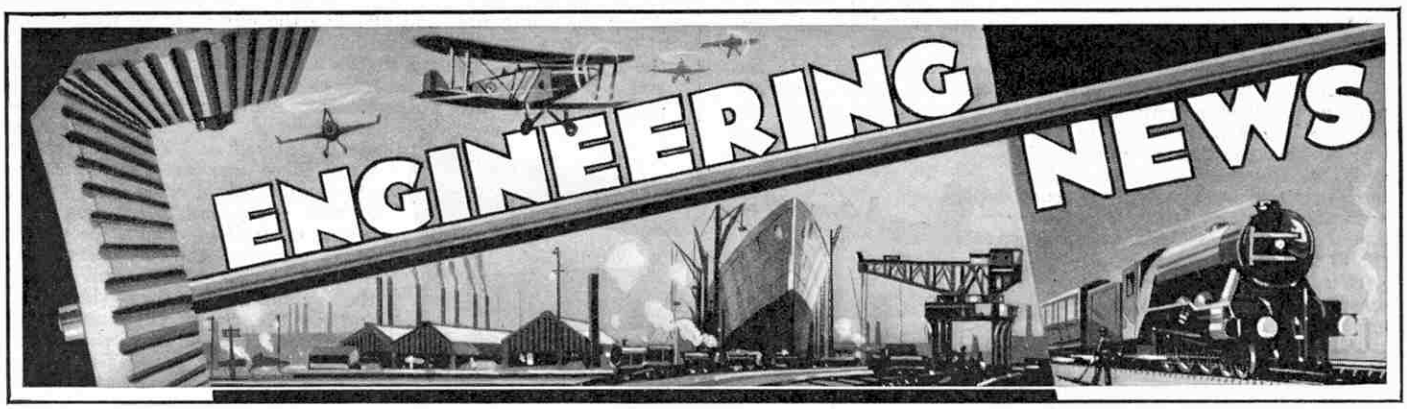
The air and water forced into the condenser chamber at each downstroke of the piston were drawn thence by an air pump working from the same engine beam, and were ejected into a "hot well." Water was drawn from the hot well by a feed pump also actuated by the beam, and passed along a pipe back to the boiler.

Subsequently Watt made a great step forward by the production of his double-acting engine, in which the steam pushed first on one side of the piston and then on the other. The two earliest large engines of this kind were erected in the Albion flour mill, near Blackfriars Bridge, London in 1786, but were destroyed when the mill was burnt down in 1791. Finally he obtained still further efficiency by making use of the expansive power of the steam.

In 1800 Watt retired from business and went to live at Heathfield Hall. A large attic at the top of the house was fitted up as a workshop and became known as his Garret, and there he spent many happy days going over his old experiments in search of possible mistakes and in inventing new contrivances. When deeply engrossed upon some particular problem he would confine himself to his workshop for days at a time, even cooking his own meals on the attic stove rather than tear himself away from his hobby long enough to dine downstairs. The attic, with its contents much as Watt left them, is now in the Science Museum, South Kensington, London. Late in 1819 he was taken ill, and passed away peacefully on 19th August, at the age of 83. He was interred close to Boulton in a side aisle of Handsworth Church, where later a beautiful monument, carved by the famous sculptor Chantrey, was erected in his memory. Chantrey also executed the magnificent statue of Watt placed in Westminster Abbey.

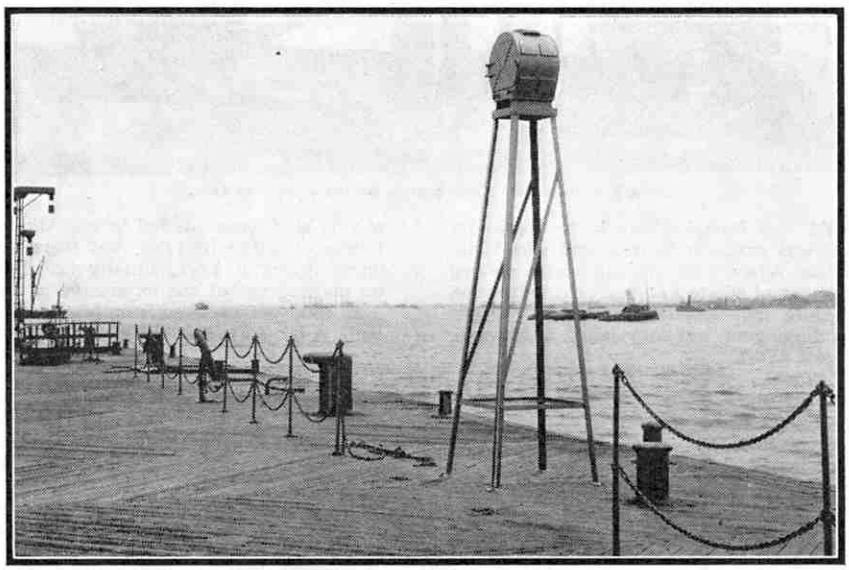
Watt's house in Deltfield Lane, Glasgow.

Few pioneers in science and engineering have lived a life so remarkably full in years and achievement. Labouring for many years under the disability of almost constant ill-health, Watt nevertheless brought his steam engine to a state of efficiency that enabled it to usher in the age of modern mill machinery, to pave the way for the birth of steam locomotion, and to find employment for nearly 1,000,000 people. Many honours were conferred upon him during his lifetime by learned societies. He was also offered a baronetcy, but this he modestly declined.



An Interesting Fog Beacon

The illustration on this page shows a novel type of fog beacon that has been erected recently at Tilbury landing stage. The apparatus, which is known as a "Sinterae" fog beacon, makes use of two powerful electric lamps placed very close together and energised in rapid alternation, so that a vibrating beam of light is emitted. Compared with the steady light obtained from a single lamp of the same candlepower as one of the Sinterae flashing lamps, the power of the vibrating beam to penetrate a foggy atmosphere is considerably greater. When visibility is about 700 ft. the increased penetration of the vibratory beam over a steady light is not more than 50 ft.; but when the fog thickens and visibility falls to about 300 ft. the increased penetration of the vibratory light is approximately 200 ft.



The "Sinterae" Beacon at Tilbury landing stage, which is referred to on this page. Photograph by courtesy of Sinterae Ltd., London.

The Moscow-Volga Canal

Earth nearly equal to the amount removed in making the Panama Canal is being dug out at express speed to make the Moscow-Volga Canal that is now under construction in Russia. Work on the canal was begun in 1932, and in three years the engineers have excavated as much material as was taken out during the 10 years in which the Suez Canal was being built. When the new waterway is completed, water from the Volga will raise the level of Moscow River, thus making it navigable for large boats, and will supply Moscow with millions of gallons of drinking water and generate electric power.

A New Holland-Amerika Liner

The Holland-Amerika Line is to be augmented by the addition of a luxurious 33,250 ton vessel that is to be built in Holland. The new ship will be named either *"Prinsendam"* or *"Nieuw Amsterdam,"* and will have a length of 750 ft. and a breadth of 88 ft. She will be equipped with propelling machinery of 34,000 s.h.p. and will have two funnels, one of which will be a dummy and will serve as a ventilator. There will be 10 decks, excluding boat, promenade and sun decks. Construction will commence shortly.

Moving a River

To move a river in order that an aerodrome may be built seems a fantastic task, yet such a scheme is to be carried out near Nice, France. The mouth of the River Var is to be completely diverted in order that an aerodrome can be built where its waters have flowed out to the sea for hundreds of years. The mouth of the river has been gradually silting up, and a delta has been forming beneath the surface of the water. Under the scheme that is now to be carried out the river bed is to be moved 200 yds. so as to leave as dry land the ground that at present forms the delta. On this land the aerodrome will be built.

A Novel Use for Aero Engines

A novel method of preventing frost from damaging their orange groves has been adopted by a group of fruit growers in California. It is known that frost needs cold air in order to settle, and the aim of the fruit growers therefore is to keep the air in motion. The equipment used for the purpose consists of a 450-h.p. aeroplane engine fitted with an 8 ft. propeller, mounted on a tower 40 ft. in height, the platform of which revolves when the engine is running. The propeller blade creates a wind that circulates the cold air before it can settle close to the ground, and it has been found that one engine can keep an area of from 40 to 50 acres quite clear of frost.

Bridge News

The beautiful suspension bridge over the river Conway, North Wales, which was constructed in 1826 by Thomas Telford, has been condemned by the Ministry of Transport. The bridge is not in any immediate danger, but it is unsuitable to bear the enormous burden to which it has been subjected during recent years, for it only allows one-way traffic. It is therefore proposed to build another bridge that will provide for two lines of traffic, and to widen the main road through the town.

The Conway Bridge has a span between towers of 327 ft. and is supported by four chains on each side, each of the chains being composed of links 3½ in. by 1 in. and 9 ft. long. The chains lie vertically above one another, but are not connected.

Many new and interesting features are embodied in a lifting bridge recently completed across the canal at Glasgow. The bridge, the first of its kind in Britain, is balanced on trunnion bearings round which it revolves. These bearings are situated on the top of one of the abutments, and when the bridge opens the tail end, which is counterbalanced, drops into a pit situated below roadway level. The bridge was constructed by Sir William Arrol and Co. Ltd., who, in conjunction with a Continental firm of engineers, have been responsible for developing this type of bridge.

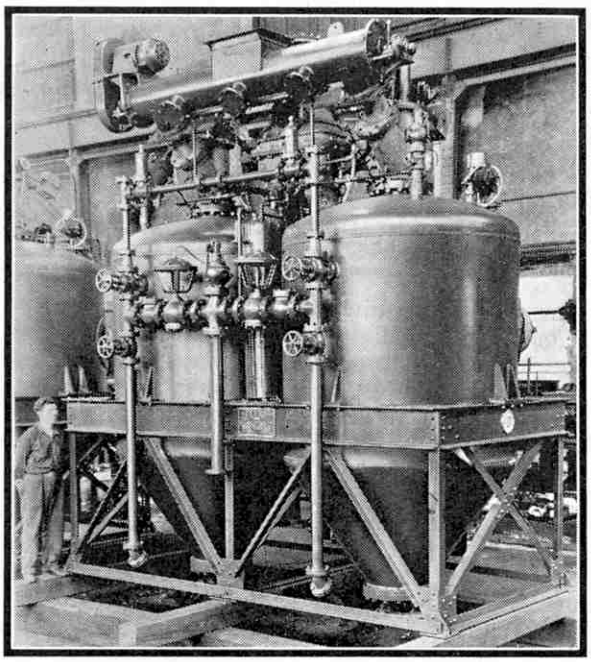
Rapid progress is being made in the construction of the cantilever bridge in the East Bay crossing of the San Francisco-Oakland Bridge in the United States. When completed this will be the longest cantilever bridge in the country, while its deck, which accommodates six lanes of vehicles on an upper level and three lanes of vehicles and two rapid transit tracks on a lower level, will give it a greater weight capacity than any cantilever in the United States. Only two existing cantilever bridges, the Quebec Bridge in Canada and the Forth Bridge in Scotland, exceed it in size.

A new road bridge that is being built across the Firth of Forth at Kincardine is now nearing completion. It is half a mile in length, with twelve 50 ft. spans and two central spans of 150 ft.

Pneumatic Cement Pumps at Boulder Dam

The lower illustration on this page shows a "Fluxo" cement pump that is being used in the construction of Boulder Dam across the Black Canyon of Colorado River, U.S.A., an account of which appeared in the February and March 1934 issues of the *"M.M."* In building the Dam a total of about 4,000,000 cu. yds. of concrete will be required and about 755,360 tons of cement. The cement is brought to the site from different cement works and stored in eight circular silos. After blending, the material is delivered by a pneumatic conveyor to two concrete - mixing plants, one of which is about 100 ft. from the blending silos, while the other is on the Nevada bank of the river, and about a mile distant from the silos. The cement therefore has to be conveyed over a distance of some 5,600 ft., and it is for this purpose that the "Fluxo" pneumatic pumping plant illustrated on this page has been installed.

The apparatus makes use of a pair of cylindrical iron tanks with conical bottoms placed side by side. These are connected at the top by a horizontal trunk coupled by inclined branches and having a rectangular opening in the centre, into which the cement flows from a tank above. The trunk contains a rotating agitating device, and suitable gate valves feed the cement into each tank alternately. The tanks are filled by gravity and emptied under air pressure in a regularly alternating sequence, so that a steady flow of cement passes through the pipeline.

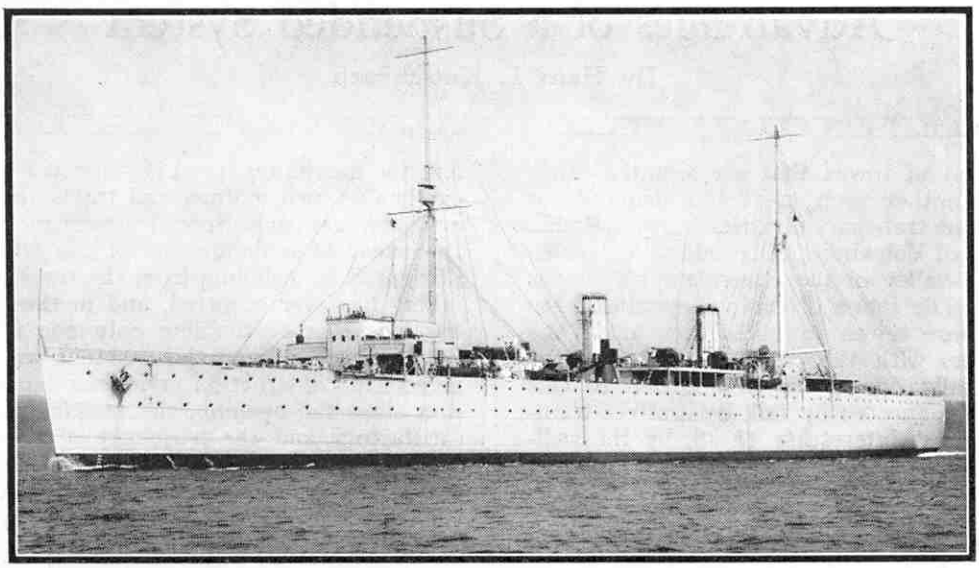


A "Fluxo" Pump used for pumping cement to the mixing machine at Boulder Dam, U.S.A. Photograph by courtesy of F. L. Smidth and Co. Ltd., London.

Sound Reproduction on Newsprint

A method of printing sound records on ordinary paper or newsprint was demonstrated in London recently. The records are made by wrapping a photographic film, measuring about 17 in. by 20 in., round a rotating cylinder. As the cylinder rotates, a narrow strip of the film is exposed to the light from a photo-electric cell, the illumination being controlled by the sounds transmitted to a microphone connected in the circuit through an amplifier. This beam of light is arranged to move along the axis of the cylinder, so that a series of lines of records of the sound variations are obtained on the film. The negative thus obtained is used to make a printer's block, and this block in turn is employed to obtain reproductions on separate sheets of paper, or on one or more pages of a newspaper.

To reproduce the sounds the paper record is wrapped round a similar cylinder in the receiving apparatus and is exposed to a narrow and highly-concentrated light beam from any convenient source. This light in turn is reflected from the record on to a photo-electric cell or cathode-ray oscillograph, the intensity of the reflection being controlled by the lines on the record that are exposed to the light as the beam traverses and the cylinder revolves. The variations in current thus obtained are then amplified and used to operate an ordinary loud speaker. It is claimed that there is no difficulty in obtaining good reproduction from an ordinary sheet of newsprint, provided that the surface of the cylinder is highly polished. Creases do not seriously affect the quality of the reproduction, and the records can also be printed on any paper, though their life is, of course, determined by the quality of the latter.



The geared-turbine depot ship "Woolwich." The vessel has a displacement of 10,600 tons and was built by the Fairfield Shipbuilding and Engineering Co. Ltd., Govan, Glasgow, to whom we are indebted for our illustration.

New Depot Ship for the British Navy

The Admiralty recently took delivery of H.M.S. *"Woolwich,"* a new depot ship for destroyers, which is illustrated on this page. Although the vessel is not a fighting craft it possesses features of unusual interest. It was built by the Fairfield Shipbuilding and Engineering Company Ltd., of Govan, Glasgow, and has a length of 575 ft. and a displacement of 10,600 tons. The propelling machinery consists of 6,500 s.h.p. twin-screw single reduction geared turbines designed for a speed of 15 knots. Large workshops equipped with machine tools of the latest type are provided to deal quickly with every repair that is likely to be required in a flotilla fleet.

A "Radium Hen"

In spite of extreme care hospitals occasionally lose or mislay radium "seeds," the tiny gold needle-like radium containers that are inserted in the body in the treatment of cancer. In future when a seed is lost all a hospital needs to do is bring in the "Radium Hen," a new instrument that has been devised in the National Physical Laboratory, and which gets its name from the clucking sound it emits when placed near radium. The nearer it approaches the valuable element the more rapidly and excitedly it clucks. The apparatus consists of a neon glow-lamp enclosed in a light-tight chamber and supplied with a voltage just lower than that at which the discharge of the lamp normally commences. In the presence of radium radiations the discharge voltage of a neon lamp is rather lower than normal, so that the lamp glows more readily when near radium. The voltage to operate the lamp is supplied by a condenser charged through a suitable resistance by means of a dry battery, with the result that each time the lamp glows the exciting voltage falls and the glow is then extinguished. A pair of headphones in series with the lamp thus records each discharge as a quiet click. In use the glow lamp is mounted on a long handle suitable for exploring in any holes and corners where the needles are likely to be, and the presence of the radium is revealed by a rapid increase in the rate of clicking. Most needles or "seeds" get lost down sink pipes, and the apparatus is particularly useful in detecting the exact points in the pipes where the needles are lodged.

The Barmen-Elberfeld Overhead Railway

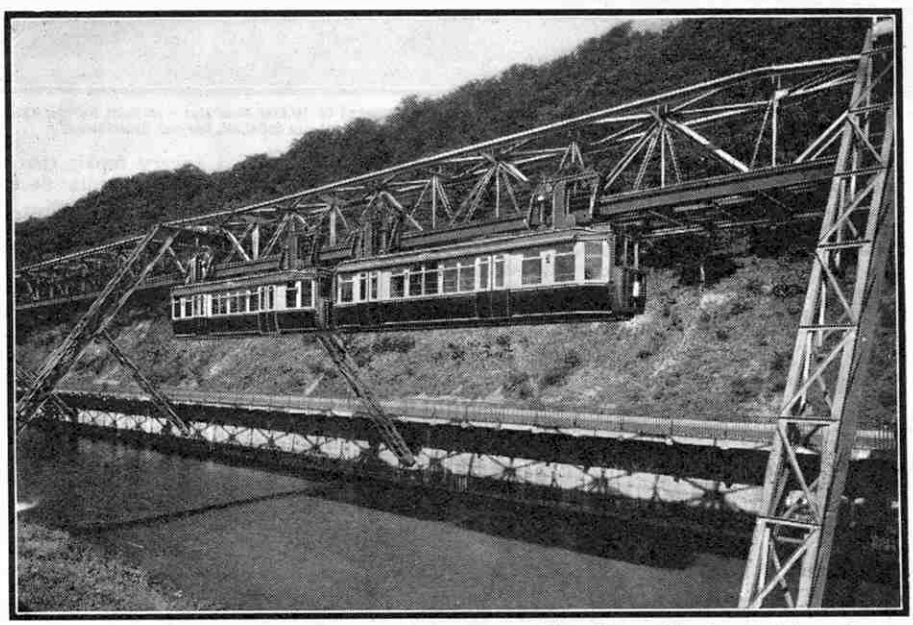
Advantages of a Suspended System

By Hans F. Kutschbach

THE development of towns that are situated fairly close to one another soon creates a demand for rapid and convenient transport facilities between them. The German towns of Vohwinkel, Elberfeld and Barmen are situated in the valley of the River Wupper to the east of the Rhine. The shape of this valley caused the development of these towns to take place along the course of the river, with the result that to-day the three form practically one town. In addition to this waterway they are connected by rail, by a street tramway system and, most interesting of all, by the well-known overhead Barmen-Elberfeld Railway.

During the last years of the 19th century the rapid growth of the three towns towards one another resulted in a great deal of street traffic congestion. With a view to relieving this an elevated electric railway providing rapid transit was proposed, and ultimately it was decided to adopt the system, then recently designed by an engineer named Eugen Langen, of a mono-rail suspended railway. This particular type was especially suited to the conditions to be met, for the only route available was above the river flowing through the three towns, and the numerous sharp curves at frequent intervals would have made the building of an ordinary surface railway a matter of great difficulty. Work was started in 1898 and the section of the line between Elberfeld and Vohwinkel was opened three years later. The completed system was finally opened in 1903 and is 8.3 miles long. Along the part of the line that follows the course of the river, the rails from which the cars are suspended form part of a triangulated framework, supported at intervals by "legs" that straddle the river banks. Elsewhere the framework is supported by "U"-shaped plate girder erections that remind one of giant croquet hoops.

The car bodies are suspended below the running rails. On their roofs are mounted two strong frames of special construction in which are arranged the running wheels and the electric motors for propelling the train. The power supply is direct current at a pressure of 600 volts, and the maximum speed is restricted to 25 m.p.h. Each car has its own motors, and trains are made up of two or three cars each. Special arrangements ensure that in the event of a derailment of the wheels the cars are prevented from falling from the track. No case of a car falling has ever occurred, and in the 30 years or so of the existence of the line only one fatal accident has been recorded. Even this instance was not due to any defects in construction or in maintenance, and in fact, ever since the opening, the working has been perfectly satisfactory and the frequency of the service afforded remarkable. The 20 stations are spaced at an average of 765 yards apart, and during rush hours the trains follow each other at intervals of less than two minutes.



A two-car train on the Barmen-Elberfeld Railway system over the River Wupper. The characteristic construction of the framework and the suspension arrangements are shown in this illustration.

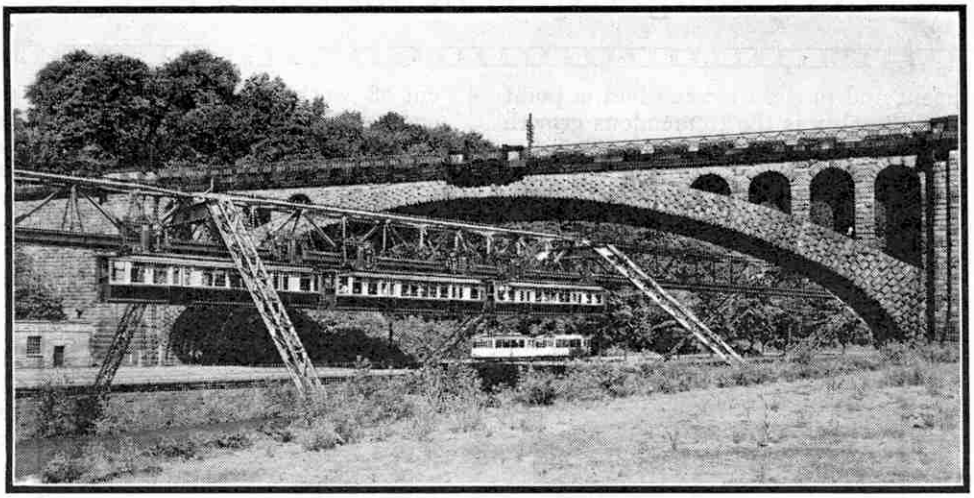
The safety of operation, when the frequency of the service is borne in mind, is a striking feature of the system, and this, together with the punctual running and general trustworthiness of service, is no doubt largely accounted for by the soundness of the signalling system. In view of signalling developments during recent years on ordinary surface and underground railways it is interesting that train movements on the Barmen-Elberfeld line have always been controlled by automatic colour-light signals arranged on the "approach lighting" system. This means that the signal lights are illuminated only on the approach of a train within a certain distance of the signal, and that the lights go out when it has passed. Although various alterations have been made as a result of experience in operation, the main principles of the system are as embodied in the original apparatus.

The signalling sections extend from station to station. Entrance to a section is governed by a two-aspect starting signal with the usual red and green indications. There is in addition a special yellow light that can be illuminated, together with the red light, when permission has been obtained, by telephone from the station in advance, for a waiting train to proceed with caution into an obstructed section.

The station master at each station has under his care

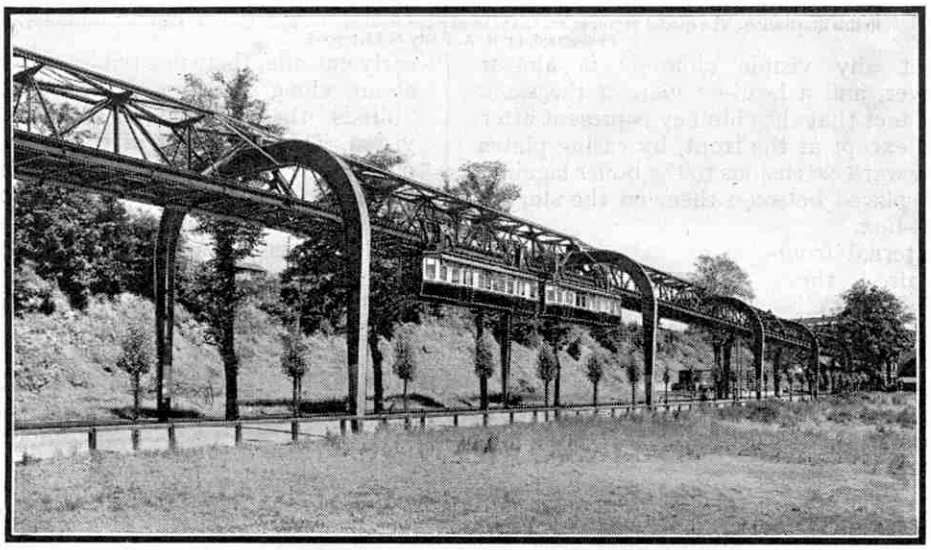
the signalling apparatus, such as the operating relays, pilot lights and emergency switch gear for that section; and he has to take any special steps necessary for dealing with any emergency that may arise. He can keep a signal at danger independently of the automatic arrangements, if this should be necessary for any reason.

The automatic operation of the signals makes use of the 600-volt power current, and short lengths of special rail form contacts for the collector shoes on the cars. When one shoe on a car makes contact with one of these special lengths, the other is still on the live rail; and as the shoes are connected in parallel, current is then supplied to the signal circuit. Only the shoes on the first car of a train affect the clearing of a section; but if a train stops after only part of it has passed the contact rail, and then proceeds, or if one is backed on to a contact rail, there is no irregular clearing of the signal in the rear.



An interesting photograph showing the suspended Railway, the River, and the roadway alongside. The bridge that crosses them all carries a railway line of normal type.

In view of the success of this overhead railway it is surprising perhaps that similar systems have not been adopted more widely as the means of transport. Possibly the day of schemes of this kind has yet to come, when existing surface or underground systems are found incapable of dealing with more traffic. A great advantage of the overhead form of construction is that its framework is said to cost only half as much as a tramway, and of course it does not in any way obstruct the street or other surface traffic, but is carried along completely above it. A disadvantage that it shares with other railways of such a special nature is that the arrangement of points and crossings is a difficult matter.



How the line is suspended along the road. Bearers of plate construction replace the lattice form used elsewhere.

Special switch rails are used on the Barmen-Elberfeld Railway that have the effect of lifting the double flanged wheels of the cars clear of the main rail, and of diverting them as required, the main rail itself remaining unbroken. The operation of such switches is naturally somewhat slow and more complicated than that of corresponding main line equipment. In the latter case it is only necessary to move the switch rails a few inches, but on the suspended line a portion of the whole track has to be moved some feet in order to allow sufficient clearance for the cars and their suspending frames. The reversing of the trains at the terminal points is effected by running them round a loop line. A loop is also situated intermediately.

It may be that the experimental installation of the Railplane system at Milngavie near Glasgow shows a possible future development. This involves a trestle-like structure carrying overhead rail tracks from which are suspended cars whose bodywork is designed on the lines of airships. In addition to the running rail above each car there is a rigid guide rail to prevent any swaying of the car while in motion. The important point about this system is that it involves a non-adhesion drive. The propulsion of the car is effected by means of airscrews at the front and the rear, driven by electric motors that obtain their current from a live rail. The design of the bogies from which the cars are suspended is such as to check the tendency for the cars to rise in the air when in motion, to a greater extent than is required to relieve the weight on the laminated springs of the bogies. Two bogies of short wheelbase are used for each car, this two-point suspension being flexible enough to allow the trestle structure to follow largely the contours of the land.

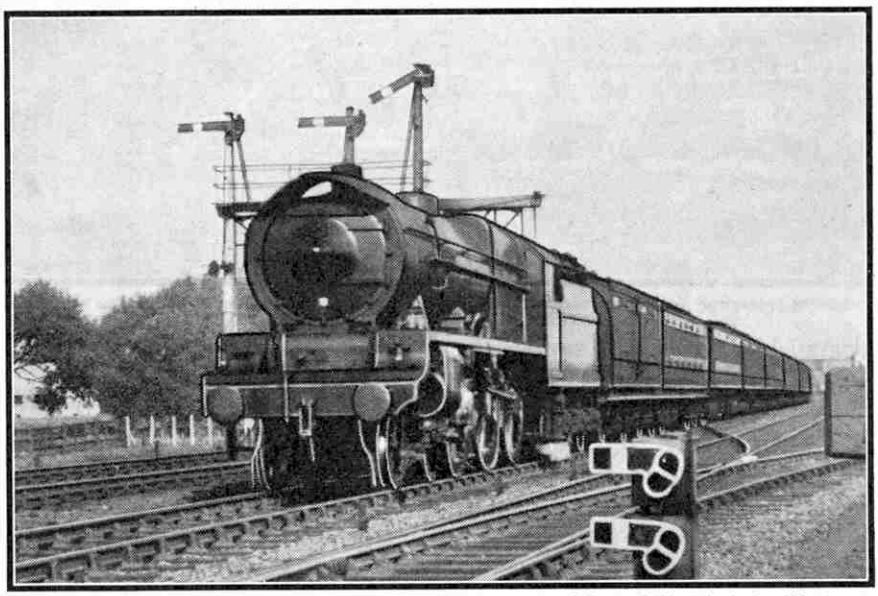
Interesting details of the design are the measures adopted to promote rapid and silent running. Ball and roller-bearings are freely used, and combined with the shape of the cars they tend to reduce resistance to a minimum. For silence a patented steel wheel construction is adopted. A ring of rubber is placed between the wheel centre and the tyre, and it also acts as a shock absorber.

A full description of the Railplane system, together with illustrations, appeared in the August 1930 issue of the *"M.M."*

The Development of Smoke Deflectors

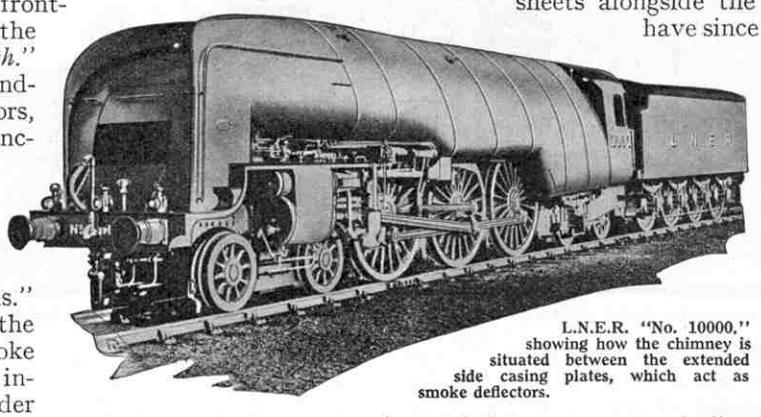
Interesting Experiments and Fittings

IN comparing ancient and modern locomotives, a point that strikes us very forcibly is the tremendous growth that has taken place in the size of the boiler. This has occurred of necessity, as heavier loads and higher speeds have required the development of greater power, and therefore increased steaming capacity. As a result of this growth of the boiler the chimney, which was the most prominent fitting of early engines, has so diminished in height as to be almost in danger of disappearing! In fact it appears to have done so completely when one is looking at a broadside view of "*No. 10000*," the remarkable L.N.E.R. high-pressure 4-6-4 design. A steam locomotive without any visible chimney is almost unthinkable, however, and a head-on view of the same engine discloses the fact that the chimney is present after all. It is concealed, except at the front, by casing plates that are found as forward extensions to the boiler lagging, the chimney being placed between them on the sloping top of the smoke-box.



The ugly experimental smoke-deflecting apparatus formerly fitted to L.M.S.R. No. 6161 "King's Own" is shown in this illustration. The special arrangement of the smoke-box front and the plain chimney show up prominently. Photograph by R. A. Batty of Liverpool.

This unusual external front-end design is seen also in the 2-8-2 "*Cock o' The North.*" The casing plates are intended to act as smoke deflectors, and they fulfil the same function as the separate side sheets fitted to engines of more familiar design, such as the L.M.S.R. "Royal Scots" or S.R. "Lord Nelsons." Readers may ask what is the actual purpose of smoke deflectors. It will be of interest, therefore, to consider the subject generally and some of the various experiments made in connection with it.



L.N.E.R. "No. 10000," showing how the chimney is situated between the extended side casing plates, which act as smoke deflectors.

In the moderate-pressure locomotive of normal 2-cylinder design, such as was standard for many years, the design of the valve gear is usually such that it is impossible to operate the engine in the same manner as those of modern design, with long-travel valves for short cut-off working. Thus most of the work in these older engines is performed with the valves cutting off fairly late and with a partly-closed regulator. The effect of this late cut-off is to give the exhaust steam a fairly high terminal pressure, with the result that it escapes from the blast-pipe with considerable violence. Such engines have little difficulty in lifting their exhaust steam and smoke well clear of the train.

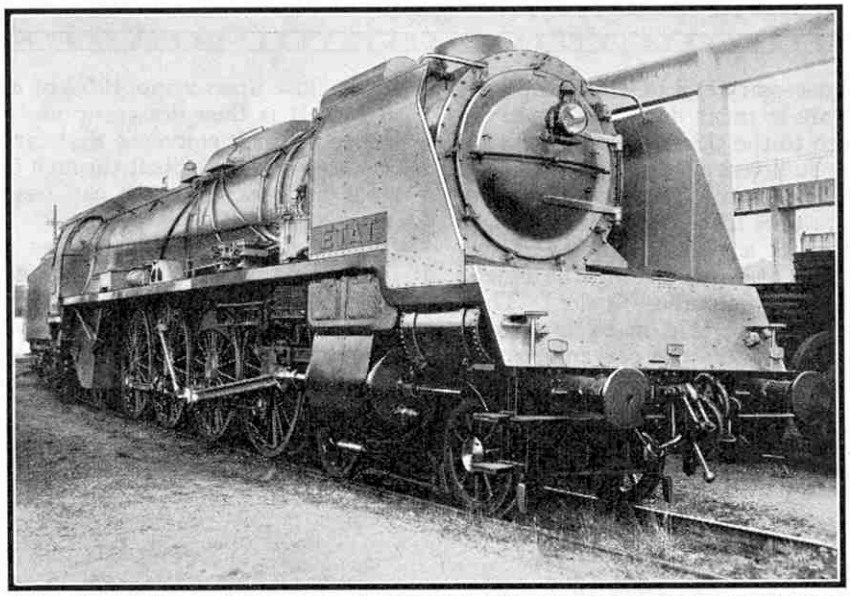
During the period when engines of this type were generally employed more or less tall chimneys were in use. With the dwarfed boiler mountings common on the locomotives of to-day, however, and with modern methods of design and operation with early cut-offs, there is a tendency for the exhaust to hang about along the top of the locomotive boiler. This "blinds" the cab windows and thus impedes the driver's vision. This obscuring of the view is dangerous in that observation of the signals is made very difficult.

A solution to this problem developed in Germany about 10 or 12 years ago was the fitting of smoke-deflecting sheets alongside the smoke-box. These fittings have since been provided on numerous Continental locomotives, and have been adopted also in this country by the L.M.S.R. and the S.R. for certain classes of locomotives. On the S.R. various experiments were made before the decision to fit side sheets was reached. Engine No. 450, "*Sir Kay*," was provided with a curious fitting to the rear of the chimney that was apparently intended to act on an air "scoop" and create an upward draught behind the chimney. Another engine, No. 755, "*The Red Knight*," had what might be termed a modern short version of the louvred chimney of the "Jones" period on the Highland Railway. But apparently neither of these was found as satisfactory as the side sheets.

The necessity for efficient smoke deflection, in order to

ensure a clear view ahead for the driver, led to the fitting of side sheets to the L.M.S.R. "Royal Scots" and the large-boilered "Claughtons," and subsequently also to the "Baby Scots." As on the Southern Railway experiments were carried out with cowl arrangements behind the chimney of certain of the "Royal Scots," including No. 6100, *"Royal Scot"* itself.

Remarkable modifications were made experimentally to the front end appearance of No. 6161, *"King's Own."* The front top portion of the smoke-box appeared to have been sliced off at an angle and left flat. The standard chimney was removed, and a plain "stove-pipe" of forbidding appearance was mounted on the sloping surface of the modified smoke-box. In addition a "hood" or covering plate following the normal curve of the smoke-box was fitted in front of the chimney, over the flat sloping surface, in order to cause currents of air to deflect the exhaust steam and smoke well up out of the way. To assist in this the smoke-box door was made conical in the centre. The engine is now running with the standard deflectors.

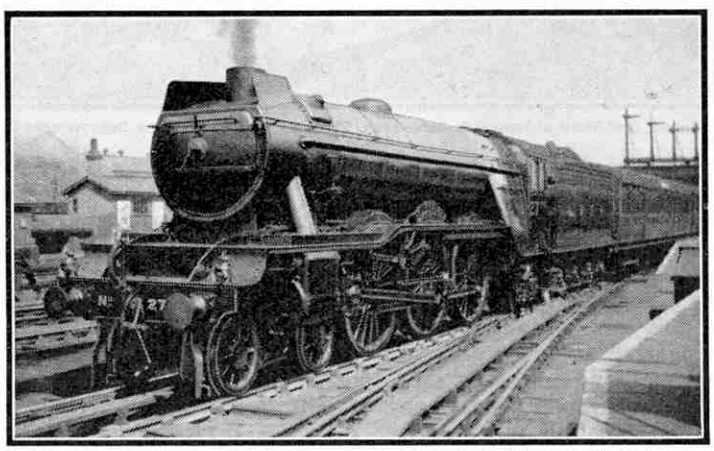


A French State Railways 4-8-2 locomotive of notable design fitted with smoke deflectors at the side of the smoke-box. Photograph reproduced by courtesy of the French State Railways.

A similar scheme, but without the conical smoke-box door, was applied also to one of the L.N.E.R. "Super-Pacifics," No. 2747, *"Coronach,"* but this engine retained its original chimney. An additional modification is found on No. 2751, *"Humorist,"* shown in the lower illustration on this page. Here the chimney is flanked by two small side sheets so that the upper part of the smoke-box, which is flattened and sloping, resembles the arrangement found on *"No. 10000"* or *"Cock o' the North."*

The ordinary "Pacific" locomotives with boilers pressed at 180 lb. per sq. in., appeared, in their early days particularly, to find little difficulty in getting their exhaust steam and smoke well out of the way. Since the provision of shorter chimneys for general service working, however, and the subsequent development of the "Super-Pacific" design, the problem of smoke deflection seems to have appeared. Owing to the short cut-off working made possible by the adoption of the higher pressure of 220 lb. per sq. in., and alterations to the valve motion, the exhaust is not lifted to any great extent under certain conditions. It is quite probable, however, that the tapered boiler fitted to these engines is of advantage in carrying away from the cab window, whatever steam tends to hang about the boiler top; and possibly this accounts for the absence of deflectors from the "Pacifics" as a class.

The G.W.R. alone appear to have no use for smoke-deflecting devices, yet strangely enough Swindon for the last 30 years has led the way in the matter of short cut-off working with steam at relatively high pressures. The use of tapered boilers, however, which on the G.W.R. are not of extremely large diameter at the smoke-box end, enables chimneys of reasonable heights to be provided. This, in conjunction with the probable effect of the tapered boiler in keeping the smoke away from the cab, may explain the continued absence of special smoke-deflecting fittings on G.W.R. engines. In this connection the free exhaust of Swindon products must not be forgotten. The "jumper" blast pipe used on G.W.R. engines enables the steam to escape as quickly as possible, and in conjunction with the other features mentioned assists in throwing the smoke and steam well up. It is significant, too, that since the adoption of these various G.W.R. features on the more recent standard locomotives of the L.M.S.R. the use of smoke-deflecting side sheets as fitted to the "Royal Scots" and "Baby Scots" has been abandoned.



An interesting view of an L.N.E.R. "Super-Pacific," No. 2751, "Humorist," fitted with a plain stove-pipe chimney on the sloping smoke-box. The chimney is flanked by small deflecting plates. Photograph by H. M. Madgwick of Worthing.

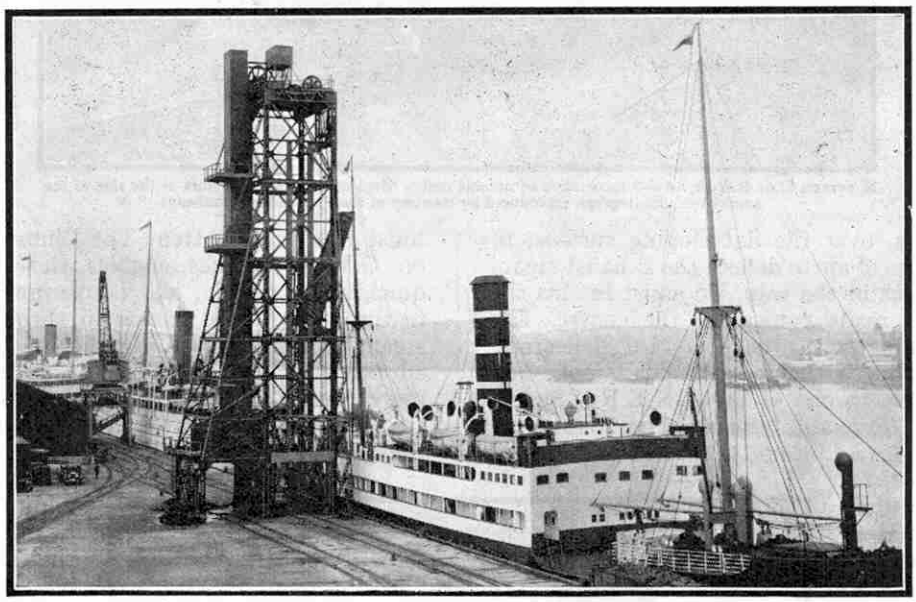
In France recently, in addition to the provision of deflecting plates at the side of the smoke-box, the problem of securing a clear view for the driver has been approached in another manner. To keep the cab look-out windows clear of smoke, steam and cinders, a device known as the "Pottier deflector" has been developed. With this the look-out window is a plain unglazed opening, and the column of air that tends to enter this when the engine is in motion is opposed by another column acting in the reverse direction. This effect is obtained automatically as a result of aerodynamic screening by special deflecting plates. Other plates remove the whole of the air concerned, so that balanced air pressure is maintained inside and outside the cab window opening.

The apparatus is located in front of the cab spectacle plate, the cab roof being extended forward at this point, forming a "visor" or hood, as it were, for the deflecting plates themselves.

Coaling Large Steamships

Ancient and Modern Methods

COALING a ship is a necessary evil to which all hands object, because it means so much dirt, not only to the officers and crew, but also to the ship itself. A liner on a long cruise cannot carry sufficient coal to serve the full length of the voyage out and home, and must therefore call at a series of ports to take more fuel on board. Our cover, enlarged from part of a photograph sent to us by a reader, shows natives at work coaling the Orient liner R.M.S. *"Ormonde"* at Colombo, Ceylon. They load 6,000 tons of coal into the ship in 8½ hrs., each native carrying half a hundredweight of coal in a basket on his shoulders. The baskets are emptied into chutes in the side of the ship, to the accompaniment of singing and a chanting of native songs. By the time coaling is finished everything is covered with coal-dust, and as this is always the case with this method of coaling by hand it is no wonder that the operation is regarded as being a most objectionable proceeding. In addition this method is laborious and slow.



33-Ton Hydraulic Coal Hoist at Newcastle-upon-Tyne. Photo courtesy of the Tyne Improvement Commission.

When steamships were small and required little coal these drawbacks were not serious, but as the size of steamships and the length of their voyages increased the coaling problem became more and more acute. By degrees various mechanical appliances were brought into use to speed up the operations. These have been improved and developed until to-day coaling by hand has been almost entirely abandoned and is now only economically possible at ports where ample and cheap native labour is available. The actual methods and plant employed in mechanical coaling vary in different ports according to local conditions and the number and size of the ships to be supplied. Naturally the most elaborate and most interesting machinery is to be found at the larger ports.

At Liverpool, for instance, the equipment available for shipping includes a whole fleet of floating coaling machines. These machines are of two types, one operated by a grab in conjunction with a belt conveyor, and the other by means of a bucket elevator and chute.

In the case of the former type the machine is moored alongside the vessel to be coaled and a barge laden with coal is brought alongside the machine. The grab then descends swiftly into the barge and its great steel jaws close upon a mouthful of coal weighing more than a ton. It is then drawn up and releases its coal upon a travelling belt conveyor that carries it across the deck of the ship and deposits it through the open hatchway of the coal bunker. The grab can coal a ship at the rate of more than 100 tons per hr.

In the case of the machines operated by bucket elevator and chute, the coal is carried on the machines themselves, some of which can accommodate 1,100 tons. It is made to fall in regulated quantities through a false bottom on to a travelling chain of buckets that hoist it to the top of the machine and discharge it down chutes extending over the decks into hatchways, or alternatively into the side ports of the ship's bunkers. These machines are capable of coaling a vessel at the rate of about 300 tons per hr.

An interesting coaling plant of much greater output is in use at Sandusky, Ohio, U.S.A. It is owned by the Pennsylvania Railroad. The plant is designed to handle 120-ton wagons fully loaded, but it has sufficient reserve capacity to deal with 150-ton wagons when necessary.

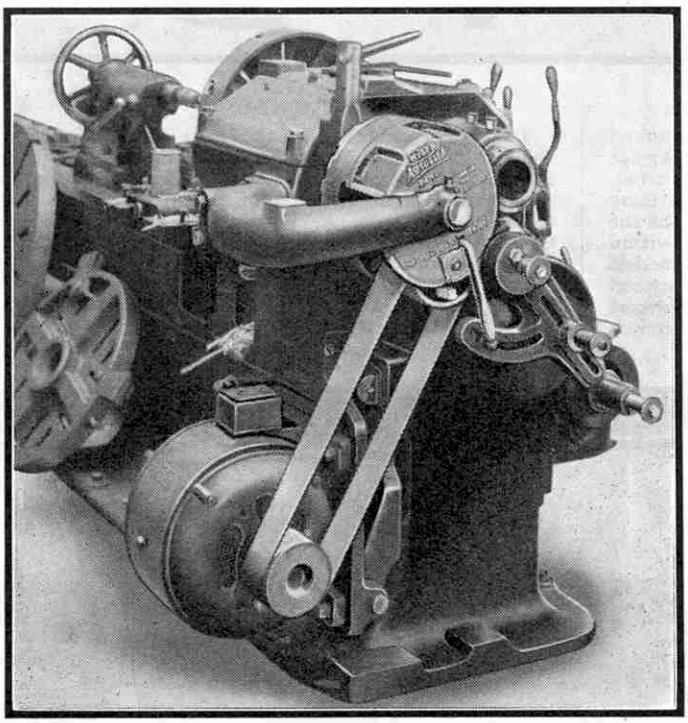
When the plant is in operation the loaded wagons are shunted to a point conveniently near, and pushed one at a time towards an inclined gangway that leads up to the "cradle" or platform of the hoist. At the foot of the incline each wagon passes over a pit, from which immediately appears a small contrivance known as the "barney-car." This consists of a mechanical arm attached to a small trolley running on a narrow-gauge track placed inside the track for the coal wagons, and it pushes each wagon up the incline to the cradle, where it is brought to rest ready for the next wagon.

The hoist carries the loaded wagon upward for a distance of about 30 ft., and then the tipping mechanism comes into operation and the wagon is slowly tilted on to its side. With a roar the 100 or more tons of coal are dumped into a great pan, from which the coal gravitates down a long tapering chute lowered into the hold of the ship. Before the noise of the descending coal has ceased, the tipping mechanism has righted the wagon and the hoist has returned it to the top of the incline. The wagon then descends a gangway to the "empties" siding.

A Novel Power Transmission Unit

The Autoflex Drive

ONE of the most important problems in any engineering workshop is that of transmitting the power of motors or engines to the machines it is desired to drive. Usually this is done by means of shafts, pulleys and belts, and before electricity came into general use it was customary to erect a line of shafting along the centre or sides of the workshop and drive it by means of one large prime mover such as a steam or gas engine. This method is still adopted by some engineering firms, but in the more modern shops the various machine tools are driven separately or in groups by means of electric motors. The largest type of machine tools are generally provided with a special motor, in many cases bolted down directly on to the machine bed, but the smaller machines usually are driven by means of belts from a motor fixed in a convenient place to drive a number of machines in a special group. By this means, groups or series of machine tools can be run independent of the remainder of the shop, and therefore, in the event of certain machines not being required, a saving of power can be effected.



An Autoflex Drive Unit arranged to drive a lathe. For the illustrations on this page we are indebted to Wearn's Autoflex Drives Ltd., London.

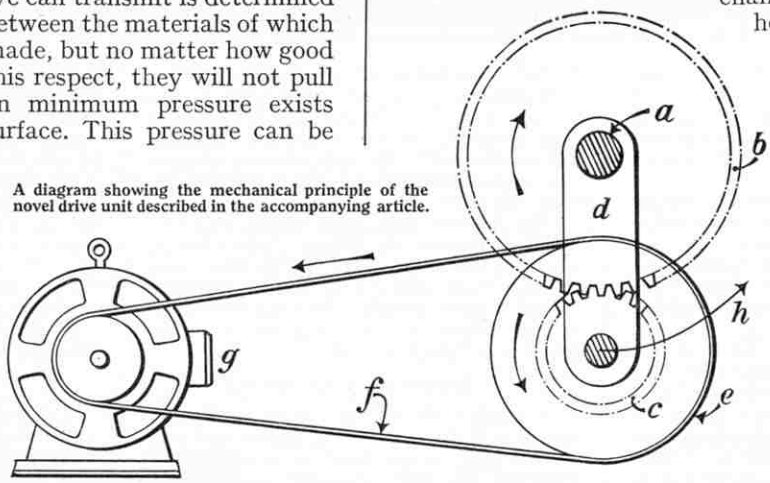
The power that a belt drive can transmit is determined largely by the natural grip between the materials of which the pulley and the belt are made, but no matter how good the pulley and belt are in this respect, they will not pull their load unless a certain minimum pressure exists between belt and pulley surface. This pressure can be maintained only by keeping a corresponding tension in the belt. Some means must, therefore, be provided for maintaining tension.

Various means of providing proper tension in the belts have been devised, some of which have sought to decrease the amount and rapidity of belt stretch, to provide automatic means for taking up stretch and to increase the grip between belt and pulley so that less pressure is necessary.

The most satisfactory method however is to use some automatic means to maintain the desired belt tension, in spite of stretch, and on this page we illustrate a novel device that has been designed for this purpose. It is known as the Wearn's Autoflex Drive and is based on a very simple principle of mechanics. Whilst the drive possesses the properties of an automatic belt tensioning device and reduction gear, it also functions as an efficient shock absorber and safety measure.

The principle of the drive will be clear from an examination of the diagram at the foot of this page. The motor pulley drives through the medium of a single flat belt F on to the driven pulley E, and if the direction of rotation is as indicated by the arrow, the resistance to driving of the driven shaft A will tend to cause the pinion C to climb round the gear wheel B in the direction of arrow H, thus tightening the belt, which, of course, it is free to do, because it is mounted in the floating housing indicated by D.

The gear wheel B and the driven shaft A commence to rotate as soon as the torque due to the belt tension overcomes the torque created by the load, and thus any change in the load, no matter how small, is always accompanied by a corresponding change in the belt tension and a change in the position of pinion C around gear wheel B.



A diagram showing the mechanical principle of the novel drive unit described in the accompanying article.

When a machine is fitted with the Wearn's Autoflex drive, any sudden increase in the load is automatically met by the provision of adequate belt tension, and in consequence, the belt is absolutely free from any tendency to slip, and this freedom from slip has been shown to be operative under the most exacting conditions arising from damp, oil or dust.

An Autoflex unit tested by the National Physical Laboratory showed a transmission efficiency of 95 per cent.

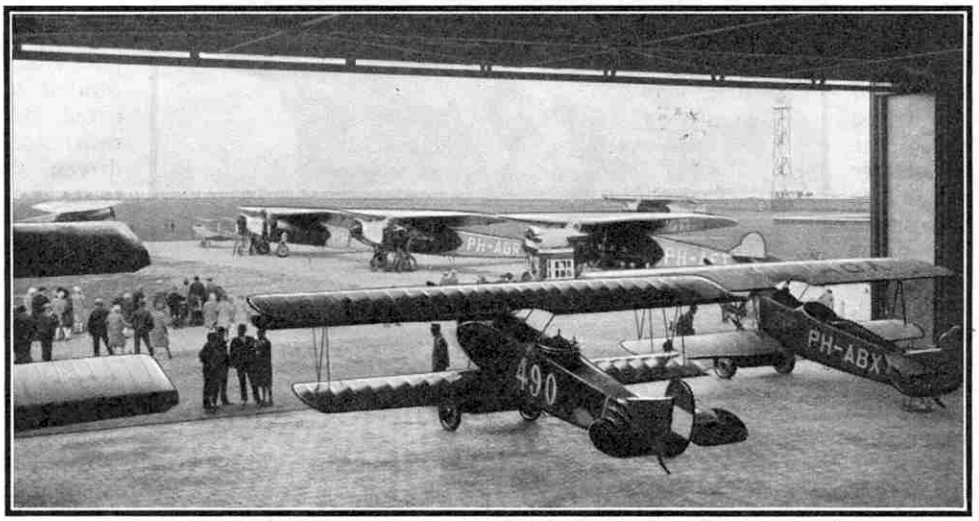
Empire Air Routes Exhibition

A most interesting exhibition organised by Imperial Airways is open at the Science Museum, South Kensington, London, S.W.7. It illustrates by means of striking models, charts, maps and photographs the development of air communication within the Empire. The exhibits include models of all types of aeroplane ever owned by the company, and of especial interest are the sectional models of new aircraft now being built for them.

Part of the Exhibition deals with the design of airports, and includes a large model of a modern airport and dioramas of three famous Empire ones. Fascinating working models show how wireless is used to control aircraft when they are flying in fog and above cloud, and the visitor by pressing a button can hear the voice of the pilot in the air calling for his position and the reply from wireless stations on the ground. Other attractive sections deal with the building of a flying boat, an aeroplane and aero engines. Models of a wind tunnel and a testing tank, that can be set working by the visitor, enable him to understand the important part they play in the design of aircraft.

The Exhibition shows more clearly than any written article the remarkable developments that have taken place in air transport during recent years, and this can be even better appreciated if the visitor first inspects the museum gallery where models of pioneer types of aircraft are permanently displayed. All "*M.M.*" readers interested in aviation, who can manage to visit the Exhibition, will find that it well repays the time spent. It is open free daily until the end of this month, on Sundays from 2.30 to 6 p.m. and on weekdays from 10 a.m. to 6 p.m.

An illustrated handbook giving the history of aeroplanes and a detailed list of the Science Museum's exhibits of these machines has just been published. A review of it will appear in next month's "*M.M.*"



A view from the hangar at Waalhaven Aerodrome. Photograph by courtesy of Royal Dutch Air Lines.

Record Stratosphere Ascent

The most enthusiasm for ascents into the stratosphere is shown by the United States and Russia. The latest record ascent has been made from American territory by Capts. A. W. Stevens and O. A. Anderson, of the U.S. Army Corps. They ascended from Rapid City in the stratosphere balloon "*Explorer II*," and soaring upward at an average speed of 600 ft. per min. they reached a height of 20,000 ft. in just over half-an-hour. As the balloon rose higher its rate of climb gradually decreased to about half the figure just given, and the greatest height reached was 74,000 ft. At that immense distance above the earth the temperature outside the gondola suspended beneath the balloon was –55 deg.

The descent took eight hours, and the balloon landed at White Lake, South Dakota, 240 miles from Rapid City. One of the most interesting things reported by the officers is that during the last stage of the ascent the sky appeared to them like a vast black awning.

A Trans-Pacific Air Service

A regular air service across the Pacific Ocean will be established before the end of this year, as the result of an agreement between the New Zealand Government and Pan-American Airways. No details have been announced concerning the type or size of aircraft that will be employed or as to the frequency of the service.

New Record Flights

Several interesting record flights have been made during the past three months. Miss Jean Batten, in her Percival "Gull" flew from Lympne, Kent to Port Natal, Brazil in 61 hrs. The first stage of her flight was to Casablanca, a distance of 1,400 miles, and was accomplished non-stop. From there she flew to Dakar, on the coast of West Africa, where she took off for the 1,700 miles flight across the South Atlantic to Brazil. On this stage of her journey she set up a new record by crossing the ocean in 13 hr. 15 min. This was 3 hr. 25 min. less than the previous record, made by Senor Pombo in a B.A. "Eagle," in May 1935.

A Percival "Gull" was also used by H. F. Broadbent when he flew from Croydon to Port Darwin, Australia in the record time of 6 days 21 hr. 19 min. The previous record for this flight was made by Sir Charles Kingsford Smith in 1933 when he accomplished the journey in 7 days 4 hr. 47 min. Broadbent followed up his success by flying from Port Darwin to Sydney in 18 hr., and being the first man to cross Australia in one day.

The flight from Capetown to England has been accomplished in 6 days 8 hr. 27 min. by D. Llewellyn, the instructor at Hanworth, who was accompanied by Mrs. J. Wyndham, a well-known airwoman. They flew a Hendy "Heck" light aeroplane. The previous fastest time for this trip was 7 days 7 hr. 5 min., and was made by Mrs. Mollison in December 1932.

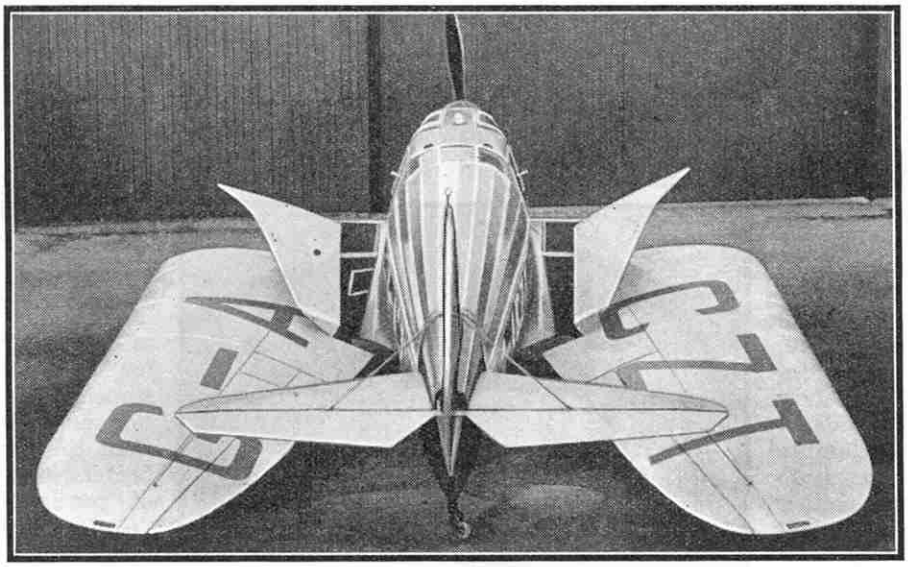
Air France Progress

Air France, in common with many other chief air transport companies, carried more traffic last summer than previously. The total number of passengers carried was 42,076, an increase of 9,748, and 780 tons of freight was conveyed by air, an increase of 69 tons. The quantity of air mail carried was also slightly greater than during previous summers.

Imperial Airways Notes

The twice weekly service between Croydon and Brindisi has been suspended indefinitely. It was operated with the Avro 652 low wing monoplanes purchased last year.

In addition to the new Short type flying boats mentioned last month the company have ordered a composite form of aircraft invented by Major R. H. Mayo and named after him. It is being built by Short Bros. (Rochester and Bedford) Ltd., and consists of a huge flying boat with a twin-float seaplane carried on the centre section of the wing. At the beginning of a flight the two machines will be locked together by special catches, and when they have risen to a sufficient height the catches will be released and the seaplane will fly off the flying boat and continue the journey alone, while the flying boat returns to its base.



An unusual view of the B.A. "Eagle" 3-seater monoplane, showing the wings folded back. Photograph reproduced by courtesy of "The Aeroplane."

The idea is that an aeroplane loaded too heavily to be able to take off unaided can be lifted into the air by a lightly loaded machine. It is claimed that the Mayo Composite Aircraft will enable a bigger payload to be carried for less engine power and at a lower cost than is possible with fully loaded aircraft ascending alone. Both the seaplane and the flying boat will have four engines, and when the two machines are locked together in flight the composite aircraft will resemble a huge eight-engined biplane with wings of unequal span.

Capt. W. Rogers, one of the company's pilots, recently completed 10,000 hrs. of cross-Channel flying, during the whole of which he has piloted passenger-carrying civil aircraft.

New Zealand Air Services

Important purchases of new aircraft for developing New Zealand internal air lines were mentioned in the October 1935 "*M.M.*" Union Airways hope to introduce a daily air mail service between Palmerston and Dunedin this month, and they will use one of their new D.H. 86s for the work.

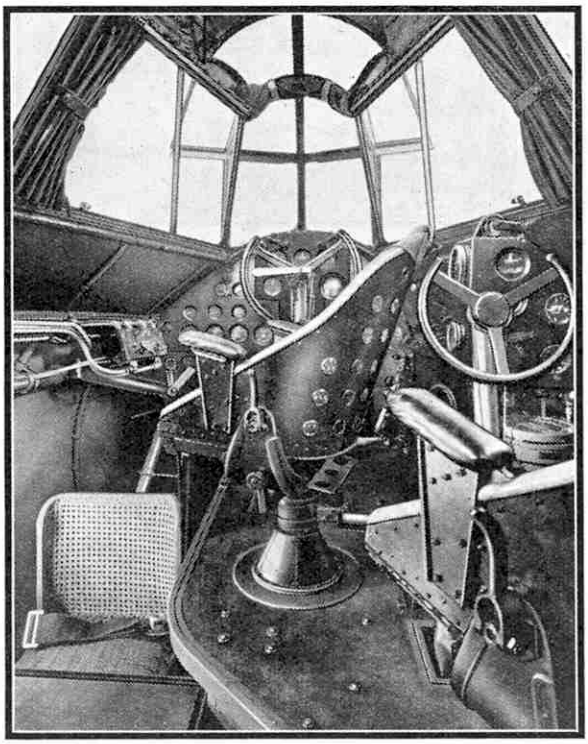
Another company, Great Pacific Airways (N.Z.) Ltd., have ordered three Avro 652 monoplanes. It is expected that the machines will be delivered in time for the company to begin an air service between Auckland and Dunedin in June or July this year.

Larger South African Air Force

The South African Air Force is to be increased under a five-year scheme that will raise the total number of pilots and mechanics on the active list to 150 and 1,300 respectively. There will also be 1,000 pilots and 1,700 mechanics on the Reserve. Many of the new pilots will be trained at the Central Flying School, Pretoria and others will receive their instruction at the hands of new squadrons to be formed at Capetown, Natal and Bloemfontein. Light aeroplane clubs in South Africa may also train some of the pilots.

Improved Fokker FXXXVI

An improved version of the four-engined Fokker FXXXVI high wing monoplane has been designed by the Fokker Company. It is the same size as the FXXXVI which was described in the October 1934 "*M.M.*" but differs structurally, has a retractible undercarriage and is capable of carrying a greater load.



The pilot's cockpit in the Fokker F.XXII. Photograph by courtesy of the N.V. Nederlandsche Vliegtuigenfabriek.

New Russian Amphibian

Unfavourable weather conditions have made it impossible to maintain a regular air service between Moscow and Leningrad, and the railway continues to be the only reliable means of communication. The Experimental Institute of the U.S.S.R. hopes to remedy this state of affairs, however, with a large amphibian that has been designed by Grokhorski, the Russian inventor who is also Director of the Institute.

An experimental two-seater amphibian is to be built first, and if it is successful in operation a full size machine of the same design will be built. This will be able to carry 25 passengers and a crew of five, and it will have two engines powerful enough to give it a cruising speed of 125 m.p.h. The amphibian is to be of the monoplane type with a short and very deep wing, and with the engines projecting from the leading edge. Two long floats will be attached to the underside of the wing and it will be possible to use them either for landing on water or as skis for landing on ice. When required they can be replaced by an undercarriage provided with pneumatically-tyred wheels, so that the amphibian can travel across sands and fields. It is intended that it shall fly at high speed a few feet above the ground, and rise to a height of about 150 ft. when rivers, streams or other obstacles are approached.

Flashlight Aerial Photography

Aerial photography has been practised in the daytime for many years, and recently in America it was carried out at night with the aid of what are called "flashlight" bombs. At San Diago, California, an officer and a technical sergeant of the 23rd Photo Section, U.S. Army Air Corps., ascended late one evening to a height of 1,500 ft. in a Fairchild aeroplane equipped for aerial photography. They obtained an excellent photograph of the International California Pacific Exposition then being held at San Diago. The flashlight bombs used had a total candle-power of 500,000,000, and when in use lit up the scene below with great brilliance.

Gloster "Gladiators" for R.A.F.

New equipment for the R.A.F. includes Gloster "Gladiator" single-seater fighters, and some of these machines are being supplied to the recently re-formed No. 74 (Fighter) Squadron. This type of machine is a development of the Gloster "Gauntlet" in use by the R.A.F. and just added to the extensive equipment of the Danish Air Force. It is fitted with a Bristol "Mercury" Mk.IX engine rated at 615-715 h.p.

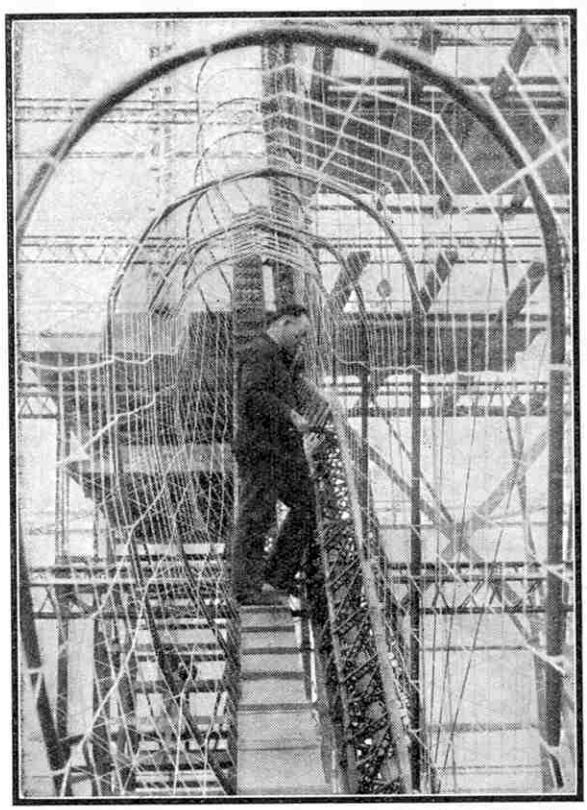
World's Largest Airship

New German Zeppelin Nearly Completed

By B. T. Denne

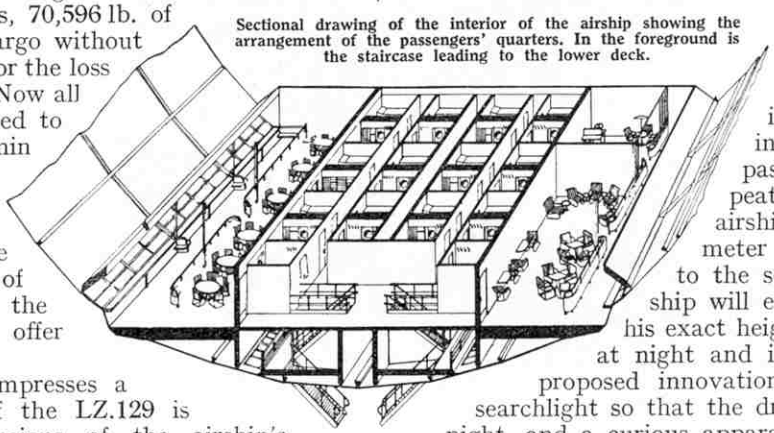
VERY soon, if all goes according to plan, Dr. Hugo Eckener hopes to launch his challenge to the airship critics of the world. This is the new giant Zeppelin, LZ.129, now nearing completion at Friedrichshafen, beside Lake Constance.

Dr. Eckener is a young man of modest, retiring disposition, difficult to get to know intimately, with no desire to show off his capabilities. Records of reliability and endurance achieved by ordinary aircraft do not greatly interest him, neither does he fear any very serious rivalry from the flying boat in trans-ocean air service. In accord with most advocates of lighter-than-air aircraft, he willingly gives the palm for speedy transit to aeroplanes, but he vigorously maintains that the airship, with its long range, great lifting capacity and suitability for night flying, comes into its own when oceans have to be crossed. This theory seems amply borne out in practice, as so far not even the largest flying boat has attempted to beat the *"Graf Zeppelin's"* record of 70 trans-Atlantic flights with passengers, freight and mail.



The corridor through the hull of the new Zeppelin, LZ.129. The illustrations to this article are by courtesy of the Deutsche Zeppelin Reederei.

For the past seven years Dr. Eckener has been experimenting with the *"Graf Zeppelin,"* which during that time has flown something like 702,120 miles and carried 16,940 passengers, 70,596 lb. of mail and 102,094 lb. of cargo without mishap to a single person or the loss of even a postal circular. Now all his thought is being turned to the vast new duralumin structure suspended in its hangar at Friedrichshafen, and in which, through Ludwig Duerr the designer, all the fruits of pioneer experience and the latest that science has to offer are being embodied.



Sectional drawing of the interior of the airship showing the arrangement of the passengers' quarters. In the foreground is the staircase leading to the lower deck.

The first thing that impresses a visitor to the hangar of the LZ.129 is the cathedral-like dimensions of the airship's skeleton, which towers 145 ft. and extends to a length of 812 ft. There are 15 main rings, the largest being 67 ft. in diameter, supporting the maze of braced girders, and 32 auxiliary ones form compartments for the 16 gasbags or balloonets. Much attention has been given to a new system of wire lacing for firmly holding the outer fabric, thus obviating the "billowing" effect often noticeable on the *"Graf Zeppelin."* Another improvement is the introduction of a new leak-proof material for the balloonets. This substance is of the gelatinoid formation, and is incomparably better than the very expensive goldbeaters'-skin, which was a source of continual trouble on the *"Graf Zeppelin"* and during each trip made it necessary for a member of the crew to spend his time going round smelling for escapes of hydrogen —an unpleasant occupation, considering the explosive nature of that gas.

The four engine gondolas of the LZ.129, each of which is as large as an aeroplane fuselage, are being suspended from the hull, and will house 16-cylinder Daimler Benz Diesel motors. Each motor develops 1,200 h.p. at full throttle, or 900 h.p. at half when the airship will be cruising at 80 m.p.h. The motors are the last word in workmanship and design. Their crude oil supply will be carried in the keel of the airship.

The list of ideas and inventions being incorporated in the LZ.129 is almost endless, and among the more important items are undoubtedly those concerning navigation and control. The instruments in the pilot house will include a large gyro-compass, with synchronising repeaters in other parts of the airship. A "whistling" altimeter that functions similarly to the sounding apparatus on a ship will enable the pilot to know his exact height above earth or ocean at night and in foggy weather. Other proposed innovations are a 5,500,000 c.p. searchlight so that the driftmeter can be used at night, and a curious apparatus, weighing two tons, by means of which a chemical called "Gel" (silicon dioxide) extracts pure water from the atmosphere. This water will be used in the kitchen, etc., and its availability

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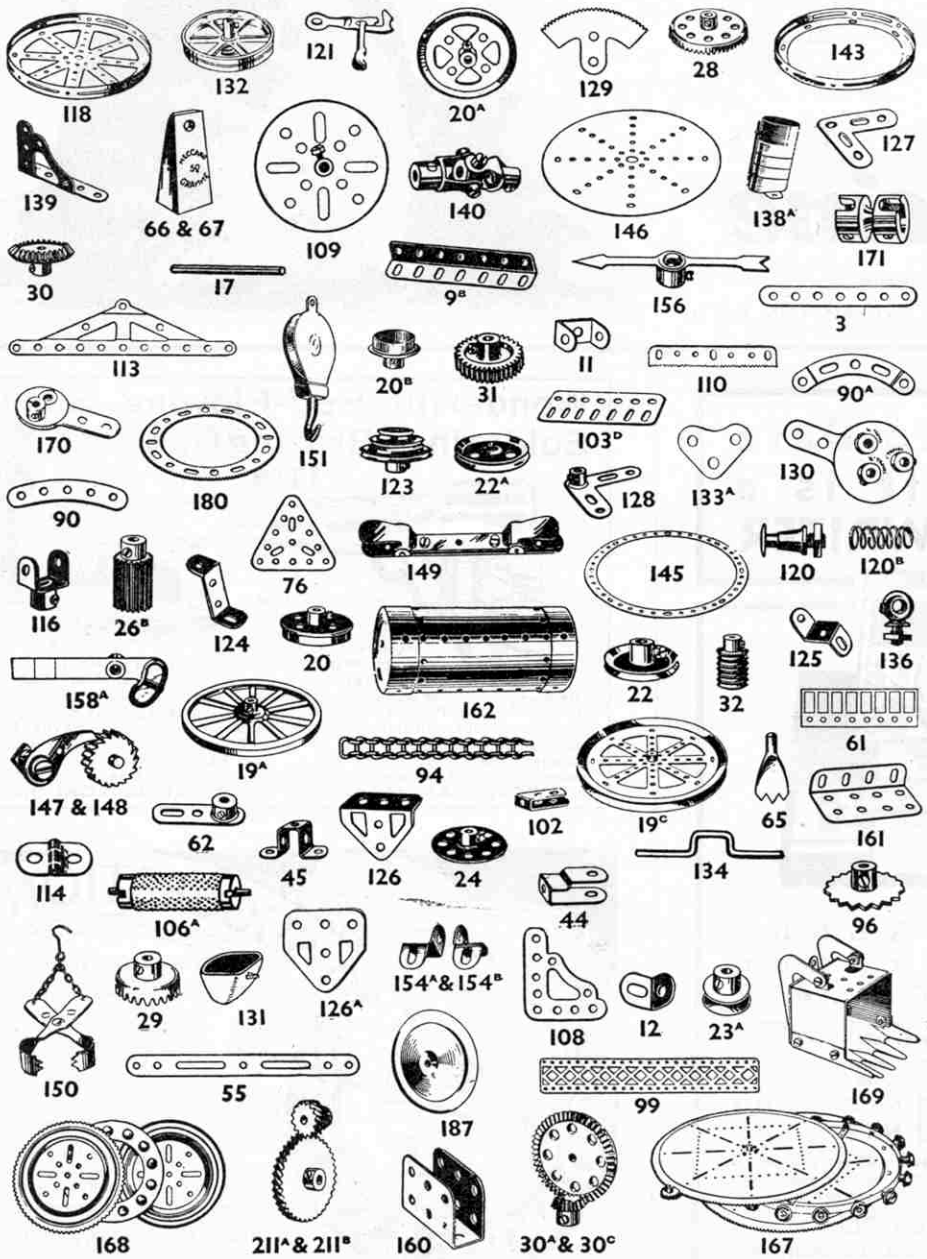

Prices of Parts Illustrated

No.			s.	d.
3	Perforated Strips, 3½"	½ doz.	0	4
9b	Angle Girders, 3½"	"	0	8
11	Double Brackets	doz.	0	3
12	Angle Brackets, ½" x ½"	"	0	2
17	Axle Rods, 2"	3 for	0	1
19a	Wheels, 3" diam.	each	0	6
20	Flanged Wheels, 1¼" diam.	"	0	5
20b	" " ¾" " Pulley Wheels	"	0	3
19c	6" diam., with centre boss and set screw	"	1	9
20a	2" diam., with centre boss and set screw	"	0	4
22	1" diam., with centre boss and set screw	"	0	3
23a	½" diam., with centre boss and grub screw	"	0	3
22a	1" diam., without centre boss and grub screw	"	0	2
24	Bush Wheels	"	0	4
26b	Pinion Wheels, ½" diam., ¾" face	"	0	6
28	Contrate Wheels, 1½" diam.	"	0	9
29	" " ¾" "	"	0	6
30	Bevel Gears, ¾", 26 teeth	"	0	7
*30a	" " ¾", 16 "	"	0	6
*30c	" " 1½", 48 "	"	1	6
31	Gear Wheels, 1", 38 teeth	"	0	10
32	Worms	"	0	4
44	Cranked Bent Strips	"	0	1
45	Double " "	"	0	1
55	Perforated Strips, slotted, 5½" long	doz.	1	6
61	Windmill Sails	4 for	0	6
62	Cranks	each	0	3
65	Centre Forks	"	0	1
66	Weights, 50 grammes	"	0	9
67	" 25 "	"	0	6
76	Triangular Plates, 2½"	"	0	2
90	2½" Curved Strips, 2⅜" rad.	"	0	1
90a	2½" " " cranked, 1⅜" rad.	"	0	1
94	Sprocket Chain, per 40" length		0	6
96	" Wheels, 1" diam.	each	0	3
99	Braced Girders, 12½" long	½ doz.	2	6
102	Single Bent Strips	each	0	1
103d	Flat Girders, 3½" long	½ doz.	0	7
106a	Sand Rollers	each	1	9
108	Architraves	doz.	1	6
109	Face Plates, 2½" diam.	each	0	4
110	Rack Strips, 3½"	"	0	2
113	Girder Frames	"	0	3
114	Hinges	pair	0	4
116	Fork Pieces, Large	each	0	3
118	Hub Discs, 5½"	"	1	3
120	Buffers	"	0	2
120b	Compression Springs	"	0	1
121	Train Couplings	"	0	1
123	Cone Pulley	"	1	3
124	Reversed Angle Brackets, 1"	½ doz.	0	4
125	Reversed Angle Brackets, ½"	"	0	2
126	Trunnions	pair	0	3
126a	Flat Trunnions	each	0	1
127	Simple Bell Cranks	"	0	1
128	Boss Bell Cranks	"	0	3
129	Rack Segments, 3" diam.	"	0	5
130	Eccentrics, Triple throw	"	1	0
131	Dredger Buckets	½ doz.	1	0
132	Flywheels, 2½" diam.	each	2	0
133a	Corner Brackets, 1"	"	0	1
134	Crank Shafts, 1" stroke	"	0	2
136	Handrail Supports	"	0	3
†138a-z	Ships' Funnels, Raked	"	0	9
139	Flanged Brackets (right)	"	0	2
140	Universal Couplings	"	0	10
143	Circular Girders, 5½ diam.	"	1	0
145	Circular Strips, 7½" diam.	"	0	9
146	Circular Plates, 6" diam.	"	1	0
147	Pawls	"	0	3
148	Ratchet Wheels	"	0	6
149	Collecting Shoes	"	1	3
150	Crane Grabs	"	0	7
151	Pulley Blocks, Single Sheave	"	0	8
154a	Corner Angle Brackets, ½" (right hand)	½ doz.	0	6
154b	Corner Angle Brackets, ½" (left hand)	"	0	6
156	Pointers, 2½" over all	each	0	4
158a	Signal Arms, Home	"	0	5
160	Channel Bearings, 1½" x 1" x ½"	"	0	2
161	Girder Brackets, 2" x 1" x ½"	2 for	0	3
162	Boiler, Complete	each	1	0
167	Geared Roller Bearings	"	20	0
168	Ball Bearing, 4" diam.	"	3	0
169	Digger Buckets	"	1	6
170	Eccentrics, ½" throw	"	0	9
171	Socket Couplings	"	0	9
180	Toothed Gear Rings, 3½" diam. 133 teeth external. 95 teeth internal	"	2	0
187	Road Wheels	"	0	3
*211a	Helical Gear, ½"	"	0	9
*211b	" " 1½"	"	2	0

*Can only be used together.

†The series includes 26 different Funnels.

I'm exchanging my old Hornby engine for a new one!

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First of all, study carefully the latest Hornby Train Catalogue, and select from it the new up-to-date Hornby Locomotive you want. Then pack up your old Hornby Locomotive and send it to us addressed "Special Service Department," Meccano Ltd., Binns Rd., Liverpool 13. Your order for the new Locomotive and the necessary remittance should be enclosed. You can easily ascertain how much to send by deducting the part exchange allowance indicated in the list given below from the price of the new Locomotive, and adding 1/– for postage on the new model you purchase. It is important to note that the catalogue price of the new Hornby Locomotive you purchase **must not be less than double the Part Exchange allowance made for your old Locomotive.**

If you prefer to do so, you can effect the exchange through your dealer, who will be very pleased to give you any information you require.

Part Exchange allowances for Hornby Locomotives

CLOCKWORK MODELS	
M2930 Locomotive	1/–
MO Locomotive...	1/4
M1/2 Locomotive	2/3
*George V Locomotive ...	3/3
*No. OO Locomotive	3/3
M3 Tank Locomotive	3/9
M3 Locomotive	4/3
Zulu Locomotive	5/3
No. O Locomotive	5/3
Zulu Tank Locomotive... ...	6/3
No. 1 Tank Locomotive ...	6/3
No. 1 Locomotive	6/3
LEC 1 Locomotive (Swiss Type)	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
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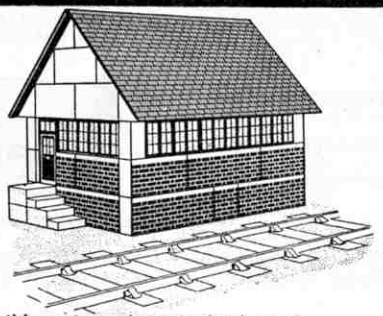

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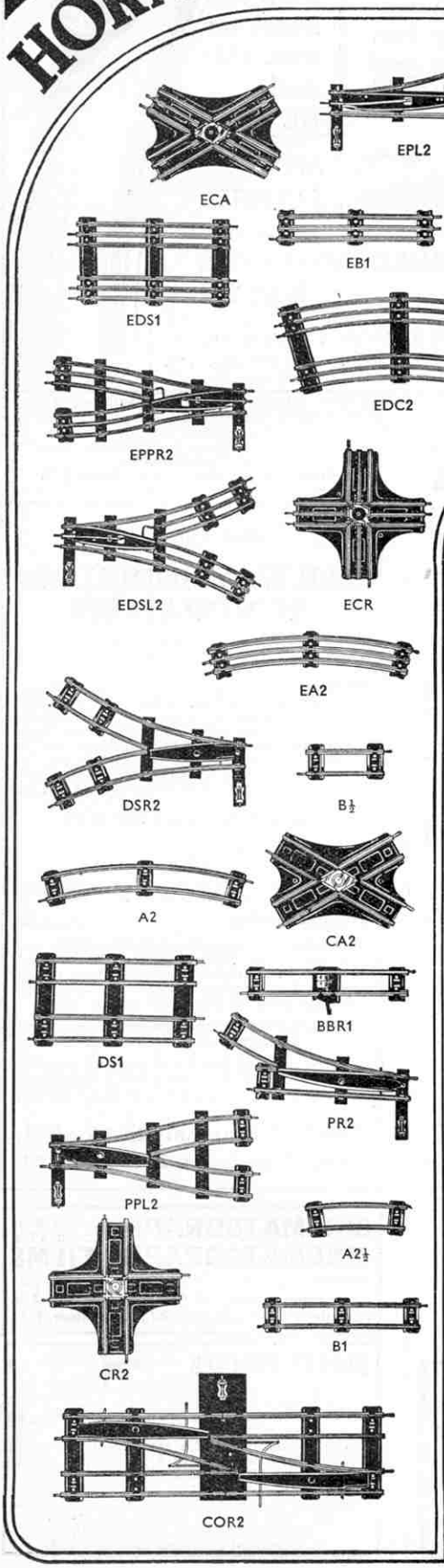

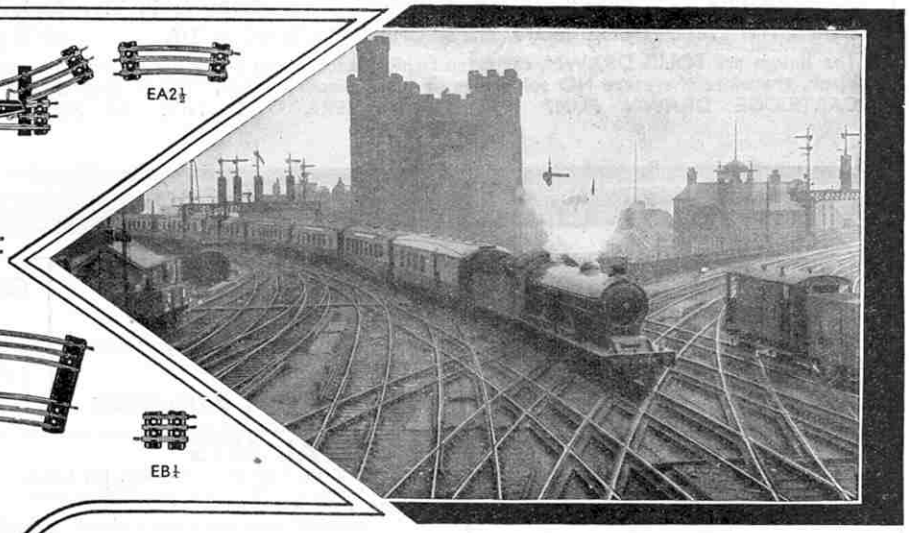

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CURVED RAILS

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,	
EDSL1	Double symmetrical points, left-hand,	per pair 6/–

For 2-ft. Radius Curves

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

PARALLEL POINTS

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

CROSSOVER POINTS

ECOR2	Crossover points, right-hand	per pair 24/–
ECOL2	Crossover points, left-hand	
EMC20	Switch 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

M9	Curved rails (9-in. Radius)	...	per doz. 2/6
MB9	Curved brake rails	...	each 3d.
A1	Curved rails (1-ft. Radius)	...	per doz. 3/6
A1½	Curved half rails	,, ...	,, 3/–
A1¼	Curved quarter rails	,, ...	,, 2/6
AB1	Curved brake rails	,, ...	each 4d.
A2	Curved rails (2-ft. Radius)	...	per doz. 3/6
A2½	Curved half rails	,, ...	,, 3/–
A2¼	Curved quarter rails	,, ...	,, 2/6
AB2	Curved brake rails	,, ...	each 5d.
DC2	Curved rails, double track	,, ...	½ doz. 6/–

STRAIGHT RAILS

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

CROSSINGS

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

POINTS

9-in. Radius (for MO Trains)

MR9	Right-hand points	per pair 3/–
ML9	Left-hand points	

For 1-ft. Radius Curves

PR1	Right-hand points	per pair 3/–
PL1	Left-hand points	

For 2-ft. Radius Curves

PR2	Right-hand points	per pair 3/–
PL2	Left-hand points	
PSR2	Points on solid base, right-hand	per pair 8/6
PSL2	Points on solid base, left-hand	
SPSR2	Points on solid base, right-hand	per pair 5/–
SPSL2	Points on solid base, left-hand	

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

PARALLEL POINTS

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

DOUBLE SYMMETRICAL POINTS

For 1-ft. Radius Curves

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

For 2-ft. Radius Curves

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

CROSSOVER POINTS

COR2	Crossover points, right-hand	per pair 12/–
COL2	Crossover points, left-hand	
RCP	Rail connecting plates ...	... ½ doz. 2d.

Many interesting illustrations and much useful information regarding Hornby Railway layouts are given in the booklets "How to plan your Hornby Railway," and "Hornby Layouts—100 Suggestions." Each of these booklets is obtainable from your dealer, price 3d., or from Meccano Ltd., Binns Road, Liverpool 13, price 4d. post free.

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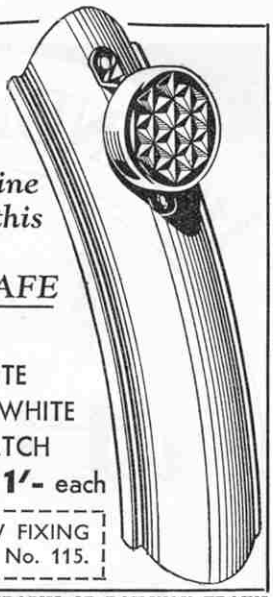

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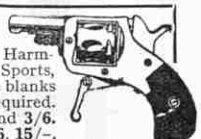

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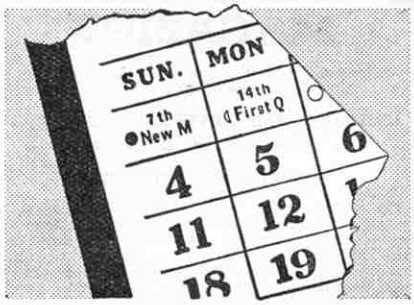

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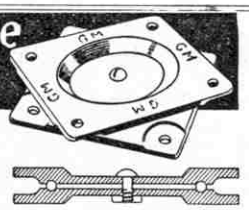

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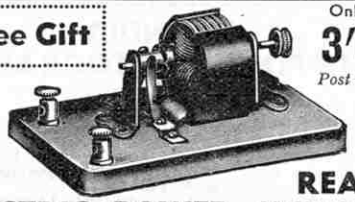

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Registered at G.P.O., London, for transmission by Canadian Magazine Post.

EDITORIAL AND ADVERTISING OFFICE:—
LIVERPOOL 13, ENGLAND.

Telegrams: "Meccano, Liverpool."

Publication Date. The "*M.M.*" is published on the 1st of each month and may be ordered from any Meccano dealer, or from any bookstall or newsagent, price 6d. per copy. It will be mailed direct from this office, 4/- for six issues and 8/- for twelve issues.

To Contributors. The Editor will consider articles and photographs of general interest and payment will be made for those published. Whilst every care will be taken of articles, etc., submitted, the Editor cannot accept responsibility for any loss or damage. A stamped addressed envelope of the requisite size should be sent where the contribution is to be returned if unacceptable.

Readers' Sales and Wants. Private advertisements (i.e., not trade) are charged 1d. per word, minimum 1/-. Cash with order. Editorial and Advertising matters should not be dealt with on the same sheet of paper.

Advertisers are asked to note that private advertisements of goods manufactured by Meccano Limited cannot be accepted.

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Press Day, etc. Copy should be sent as early in the month as possible for insertion in following issue. We usually close for press on or before 6th of each month for following issue. Half-tone blocks up to 100 screen.

Proofs of advertisements will be sent when possible for space bookings of not less than half-an-inch.

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Readers Overseas and in foreign countries may order the "*Meccano Magazine*" from regular Meccano dealers or direct from this office. The price and subscription rates are as above, except in the cases of Australia, where the price is 1/2 per copy (postage extra), and the subscription rates 8/- for six months and 16/- for 12 months (post free); Canada, where the price is 10c. per copy, and the subscription rates 65c. for six months, and $1.25 for 12 months (post paid).

The U.S.A. price is 15c. per copy, and the subscription rates $1 and $2 for 6 and 12 months respectively (post free).

Overseas readers are reminded that the prices shown throughout the "*M.M.*" are those relating to the United Kingdom and Northern Ireland. Current Overseas Price Lists of Meccano Products will be mailed free on request to any of the undermentioned agencies. Prices of other goods advertised may be obtained direct from the firms concerned.

CANADA: Meccano Ltd., 187-189, Church St., Toronto.
UNITED STATES: Meccano Co. of America Inc., New Haven, Conn., Meccano Co. of America Inc., 200, Fifth Av., New York.
AUSTRALIA: Messrs. E. G. Page & Co., 52, Clarence Street, Sydney, N.S.W.
NEW ZEALAND: Models Limited, Third Floor, Paykel's Buildings, 9, Anzac Avenue (P.O. Box 129), Auckland, C.1.
SOUTH AFRICA: Mr. A. E. Harris (P.O. Box 1199), 142, Market Street, Johannesburg.
INDIA: Karachi: Daryanamal and Bros., Elphinstone Street, Bombay; Bombay Sports Depot, Dhobi Talao. Calcutta: Bombay Sports Depot, 2, Lindsay Street.

The Editor wishes to make known the fact that it is not necessary for any reader to pay more than the published price. Anyone who is being overcharged should lodge a complaint with the Meccano agent in his country or write direct to the Editor.

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Marvellously accurate for target practice.
No license required to purchase.

Senior 45/-, Mark 1 30/-, Junior 20/-, Webley Air Rifle 80/-
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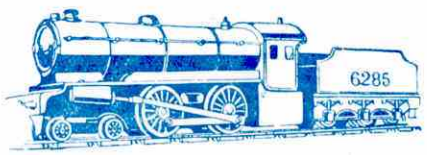
Steam Express Locomotive "ENTERPRISE," Gauge "O." Price 50/-



A well-known model railway owner said of this locomotive of ours:

"I consider she is by far better value than many a 5 guinea locomotive on the market . . . She has a great claim to be the first steam locomotive given to a boy . . . A thoroughly praiseworthy effort and deserving of her name ENTERPRISE."

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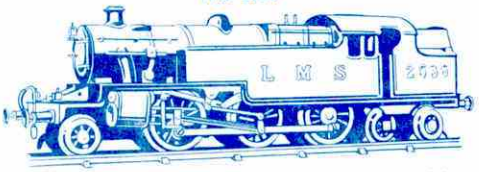
Scale Model L.M.S. 4-6-4 Tank Locomotive, No. 2536



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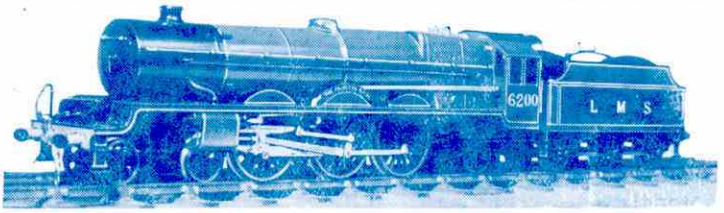

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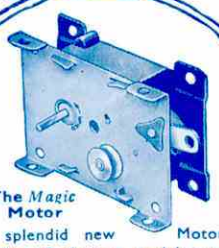

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This splendid new Motor is capable of driving models made with Meccano Outfits A, B and C. It costs only 2/-.

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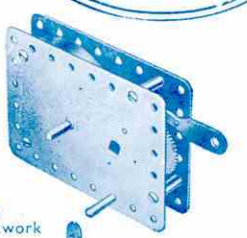
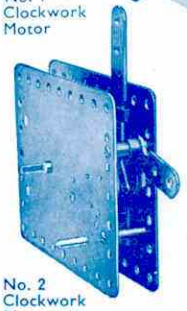
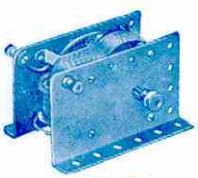


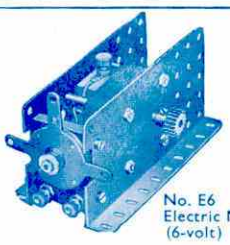
No. 1 Clockwork Motor



No. 2 Clockwork Motor



No. E1 Electric Motor (6-volt)



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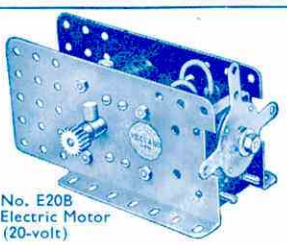

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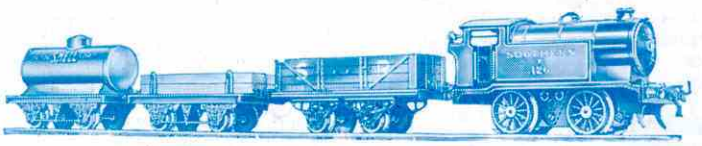

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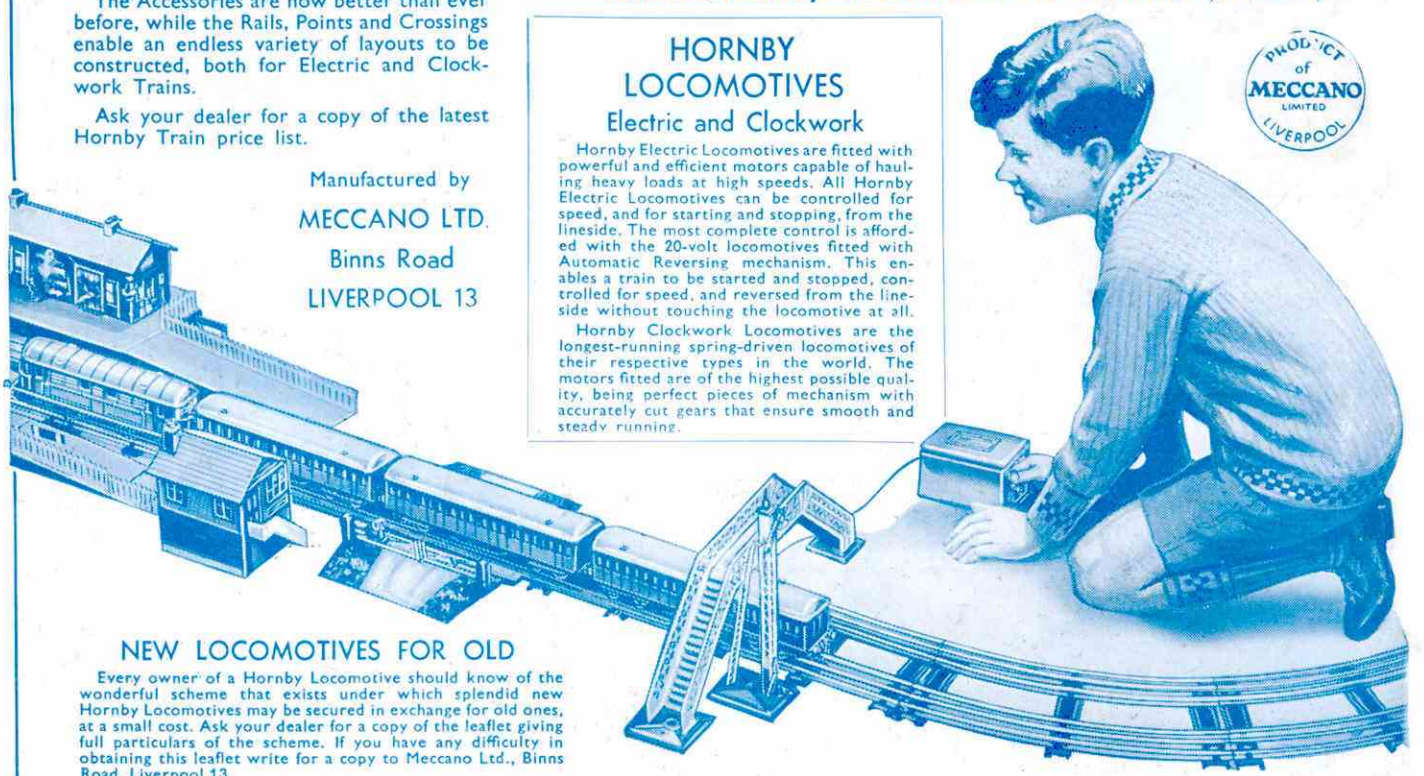

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