VOL. XXII. No. 1

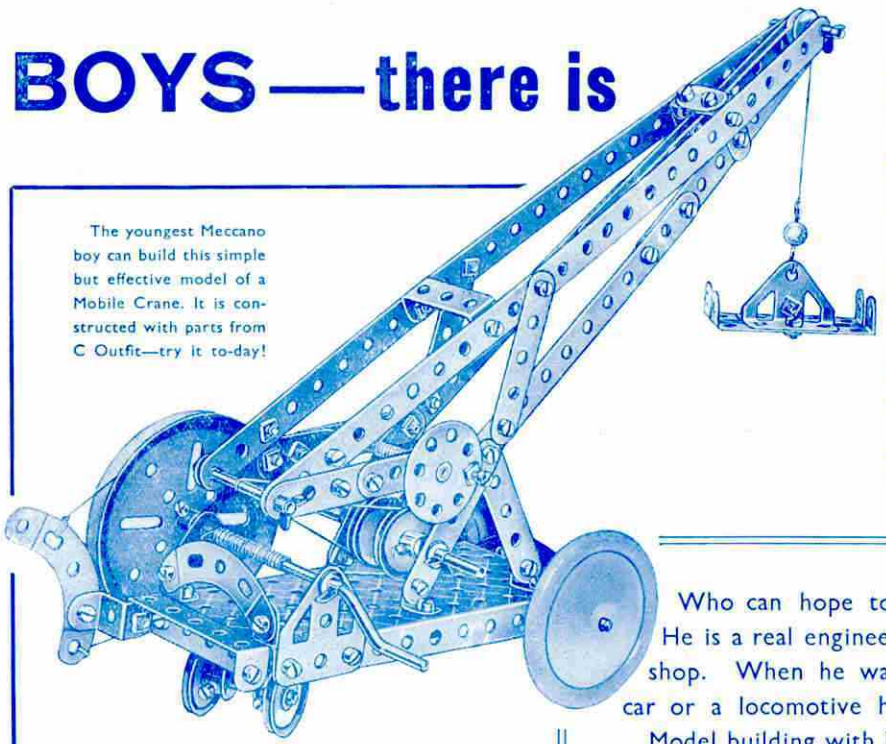
JANUARY 1937

MECCANO MAGAZINE

6D.

MECCANO

BOYS—there is no limit to the number of models you can build with Meccano!



The youngest Meccano boy can build this simple but effective model of a Mobile Crane. It is constructed with parts from C Outfit—try it to-day!

Who can hope to have as many toys as a Meccano boy? He is a real engineer—his playroom is an engineering workshop. When he wants a truck, a crane, a bridge, a motor car or a locomotive he builds one with his Meccano Outfit.

Model building with Meccano is the most thrilling hobby in the world for boys.

Prices of Meccano Outfits

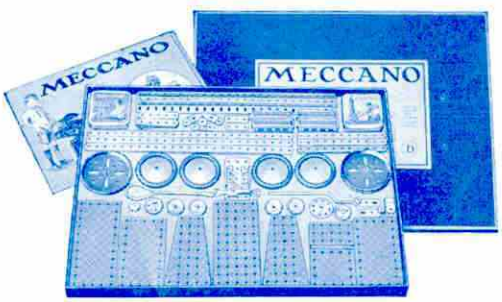
COMPLETE OUTFITS

O	Outfit	... each	3/6
A	,, ...	,,	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/–

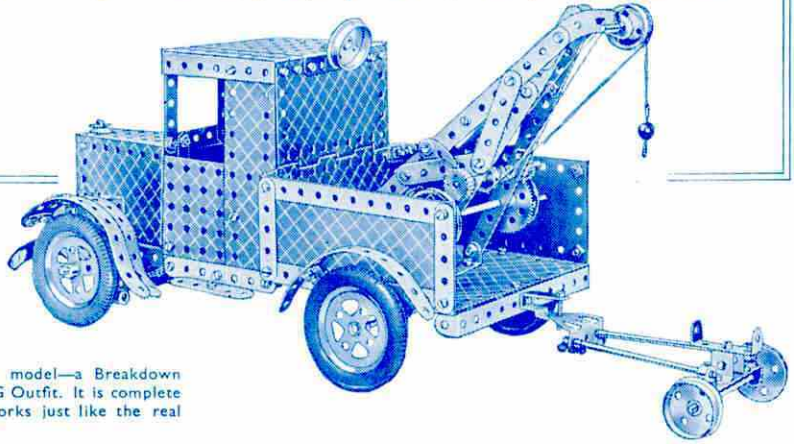
ACCESSORY OUTFITS

Oa	converts O Outfit into	A ...	each	1/6
Aa	,, A ,, ,,	B ...	,,	2/6
Ba	,, B ,, ,,	C ...	,,	3/–
Ca	,, C ,, ,,	D ...	,,	5/6
Da	,, D ,, ,,	E ...	,,	5/6
Ea	,, E ,, ,,	F ...	,,	11/–
Fa	,, F ,, ,,	G ...	,,	26/6
Ga	,, G ,, ,,	H ...	,,	17/6
Ha	,, H ,, ,,	K ...	,,	60/–
Ka	,, K ,, ,,	L ...	,,	225/–

A Meccano Outfit. Price 5/–



D Meccano Outfit. Price 15/–



Here is another interesting model—a Breakdown Lorry built with parts from G Outfit. It is complete with crane and bogie and works just like the real thing.

EXTRA SPECIAL EDITION

WORLD'S SMALLEST RADIO

Hamley's News

HAMLEY · BROTHERS · LTD · ESTABLISHED · 1760

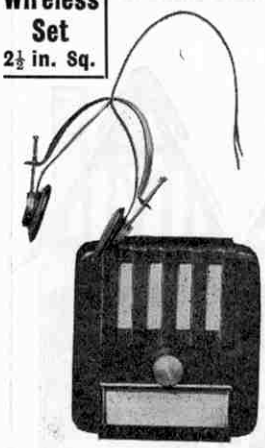
200-202, REGENT ST., LONDON, W.I. OUR ONLY ADDRESS

No. 16 *January, 1937*

True-to-Scale SEARCHLIGHT LORRY

Model Lorries, World's Smallest Radio, 3-wheel Skates, Construction Set and Wrist Watches at **HAMLEY'S** *this week!*

Wireless Set 2½ in. Sq.



A wonderful little receiver. No batteries or mains. Needs only an outdoor aerial and earth for perfect reception. Price complete with earphones Post 6d. **8/6**

TWO OF THE FAMOUS MINIC RANGE

MINIC BREAKDOWN LORRY

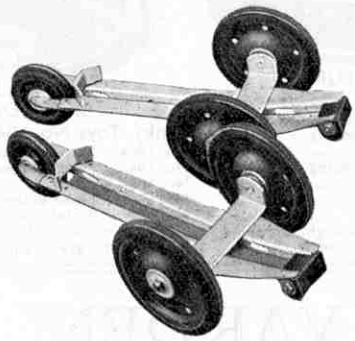
Complete with mechanical crane and powerful clockwork motor and brightly coloured. Length 5½ ins. Price **3/6** Post 3d.

MINIC SEARCHLIGHT LORRY

Fitted with electric searchlight and complete with battery. Powerful ray of light. Length 5¼ ins. Price **3/6** Post 3d.

Now BUILD YOUR OWN TOY CARS!

With this MINIC CONSTRUCTIONAL SET you can build six types of Minic all-to-scale clockwork toys. All parts, including powerful clockwork motor units are made with precision tools and machines, ensuring that each part is interchangeable. Each kit is complete with tools, brushes and enamel in various colours together with full instructions. Packed in a handsome oak finished cabinet 18 ins. by 9¾ ins. by 2½ ins. **15/-** Post 1/-.



The Continent's Latest and Greatest CRAZE

THREE-WHEEL SKATES

Vastly different from ordinary roller skates, this specially designed model has three big, ball-bearing mounted wheels, with rubber tyres. Now you can skate on any hard surface at greater speed and greater comfort. Solidly and strongly made with straps complete. Price **17/6** Post 6d.

TWO STRONG ACCURATE WATCHES

The Boy's Watch S.7. Entirely shock-proof, with a special lever movement, this watch is fitted with a luminous dial and has unbreakable glass. Price **7/6** Post 3d.

Swiss Movement Watch S.5. A watch that will stand up to any amount of rough wear. Fitted on a strong leather strap it has a good, clear face that can be easily read. Price **10/-** Post 3d.

SIR FRANCIS SHELMERDINE

(Director of Civil Aviation)

will open a Special

MODEL AEROPLANE EXHIBITION

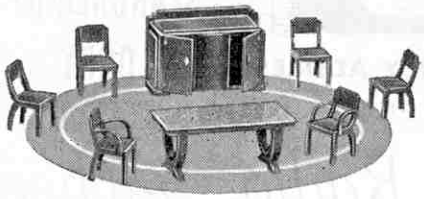
on the 4th floor, lasting from January 7th to 16th

At this Exhibition will be awarded the Trophies for Hamley's First Annual Model Aeroplane Construction Competition.

Dinky Toys

DOLL'S HOUSE FURNITURE

A WONDERFUL SERIES OF ACTUAL SCALE MODELS



DINING-ROOM FURNITURE

Dinky Toys No. 101 Price of complete set 2/3

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

Supplied in walnut brown finish only.

BEDROOM FURNITURE

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

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

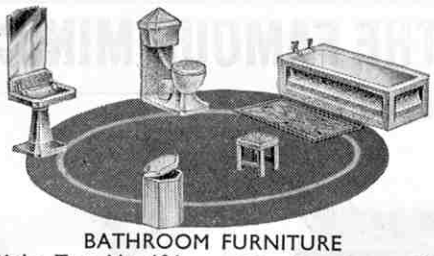
Supplied in colour or walnut brown finish.

KITCHEN FURNITURE

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

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

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



BATHROOM FURNITURE

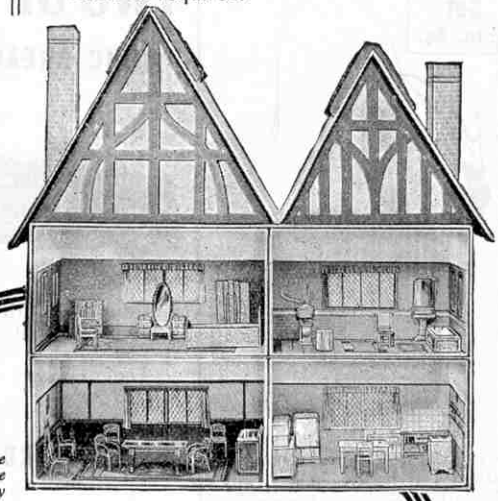
Dinky Toys No. 104 Price of complete set 2/–

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

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

The jolly Doll's House Furniture that forms a special exension of the range of Dinky Toys has gained wonderful popularity. Every piece is a perfect miniature scale model based on a typical example of modern design, and with a beauty of finish that must be seen to be appreciated. All are made to a scale of 7/16th of an inch to one foot, which is as nearly as possible 1/27th full size. The different items of the four complete suites—dining-room, bedroom, bathroom and kitchen—are fascinating to handle, and there is a real thrill in manipulating the tiny opening doors and drawers.

Each of the suites can be bought either as a complete set or in separate items. It is thus possible to increase the size of any one set by adding more chairs or other items as required.



This back view of the Doll's House shows the four suites of Dinky Toys Doll's House Furniture tastefully arranged in position.

"DOLLY VARDEN" DOLL'S HOUSE

FOR DINKY TOYS FURNITURE

THE IDEAL GIFT FOR GIRLS

The "Dolly Varden" Doll's House provides a perfect setting for the Dinky Toys Doll's House furniture.

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

Reinforced leather board is the material of which the house is constructed, and although it is collapsible it is as strong as a wood structure when set up. The container, which also is made of reinforced leather board, opens out to show a lovely garden with Tennis Lawn, Carriage Drive, and Rockery, providing an exquisite setting for play with Dinky Toys and Hornby Trees, Hedging, etc. The arrangement of the Dinky Toys Furniture, shown in the illustration on the right is intended only as a suggestion. Great fun is to be had from re-arranging the various items, perhaps on the lines of some familiar real rooms.

Price of "Dolly Varden" Doll's House—9/6

DIMENSIONS

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

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

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

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

MECCANO LTD. - BINNS ROAD - LIVERPOOL 13

FROG SCALE MODEL AIRCRAFT

TRADE MARK REGD.

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

NEW! The Frog "PENGUIN" Series of realistic non-flying scale models

Gloster "Gladiator." Represents the last word in single-seater fighters to come into production. Model has a wing span of 5⅜".

CONSTRUCTION KITS 3/-
MADE-UP MODEL 6/6

Hawker "Fury." Probably the best known fighting aeroplane in the world. Model has a wing span of 5".

CONSTRUCTION KITS 3/-
MADE-UP MODEL 6/6

Blackburn "Shark." Latest and largest Torpedo Bomber in the Fleet Air Arm. Model has a wing span of 7⅛".

CONSTRUCTION KITS 5/-
MADE-UP MODEL 12/6

These FROG models are designed as non-flying scale models and can therefore be made to a degree of accuracy and detail otherwise unobtainable. Even the cross-sections of the wings, struts, etc., are to scale so that the model would give accurate results if tested in a wind-tunnel. The single-seater fighters are available with the markings of any of the leading fighting Squadrons, while the Blackburn "Shark" carries the insignia of H.M. Aeroplane Carrier "Courageous." The completed models are finished in the correct colours while the kits include transfers, full-scale drawings, cements, etc. All parts are correctly shaped needing only to be assembled and the transfers added.

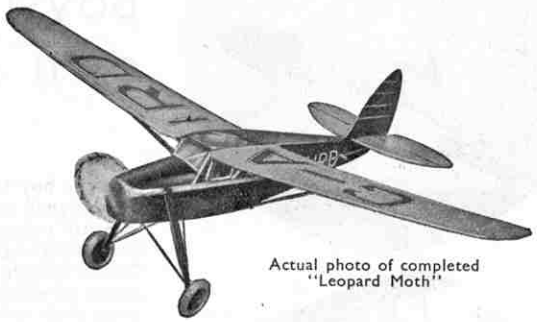
OBTAINABLE AT ALL GOOD TOYSHOPS AND STORES

Sole Concessionaires:

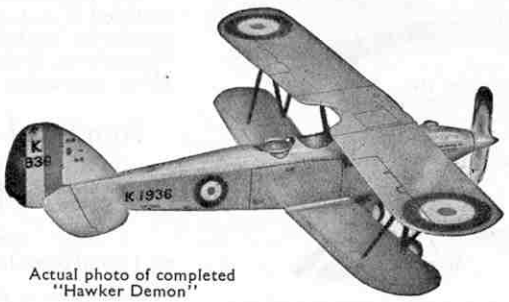
LINES BROTHERS LTD.,
Tri-ang Works, Morden Rd.,
Merton, London, S.W.19.

EASY TO BUILD—EASY TO FLY

FROG flying scale-model constructional kits



Actual photo of completed "Leopard Moth"



Actual photo of completed "Hawker Demon"

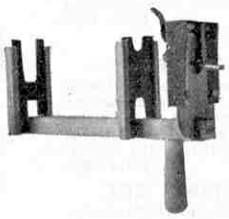
De Havilland "LEOPARD MOTH" 2'6
Wing Span 12¼ ins. Length 9½ ins.

De Havilland "HORNET MOTH" 3'6
Wing Span 11 ins. Length 9⅛ ins.
(Not illustrated.)

Hawker "DEMON" 2-seater fighter 4'6
Wing Span 12¼ ins. Length 11 ins.

These construction kits enable the enthusiast to build his own Flying Scale Models. They are easy to build and no tools are required. All parts are blanked out and fit together perfectly, only needing to be glued. (This is supplied.) Wire parts are already bent to shape. No paint is required, all coverings are printed in the correct colours. Supplied complete with motor lubricant and spare motor.

NO TOOLS REQUIRED—ALL PARTS CUT OUT



UNIVERSAL HAND WINDERS!

A Constructional Kit is now available for building a geared-up Universal Hand Winder for use with FROG Scale Model Construction Kits or any FROG Model with a propeller not exceeding 5½ ins. diameter. All parts are **cut ready to assemble** and only require gluing together. Price **1'-**

GEARED-UP WINDER MECHANISM IS COMPLETELY ASSEMBLED.

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

Please send me your new "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. .....

1/37

AEROPLANE CONSTRUCTOR OUTFITS

Boys! build your own model aircraft

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

The illustrated Manual of Instructions included in each Outfit shows how to build wonderful models of high and low wing Monoplanes, Biplanes, Seaplanes and many other interesting types.

Light Biplane (No. 2 Special Aeroplane Outfit)

Racing Seaplane (No. 2 Aeroplane Outfit)

Price List of Aeroplane Outfits

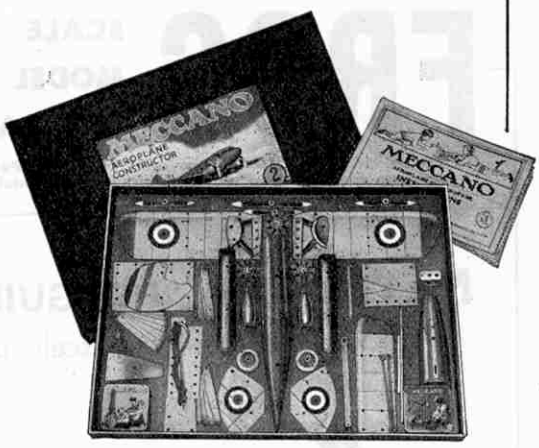
Standard Series.

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

Special Series.

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

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



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

No. 1 AERO CLOCKWORK MOTOR

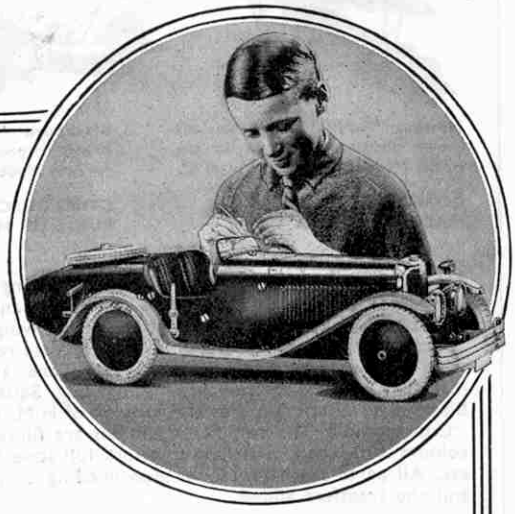
This Motor fits into the fuselage of models made with No. 1, No. 2, No. 1 Special or No. 2 Special Aeroplane Outfits. It will rotate the propeller at high speed, thus adding to the realism of the model. Price **1/9**

No. 2 AERO CLOCKWORK MOTOR

In addition to rotating the propeller, this Motor drives the landing wheels of No. 1, No. 2, No. 1 Special or No. 2 Special Aeroplane Outfit models, making the machines taxi along the floor in a most realistic manner. Price **3/6**

MOTOR CAR CONSTRUCTOR OUTFITS

You will be keen to have one!



No. 1 Motor Car Constructor Outfit. Price **10/-**

No. 1 MOTOR CAR CONSTRUCTOR OUTFIT

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

No. 1 Outfit is supplied complete with powerful Clockwork Motor. Price **10/-**

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 on the right.

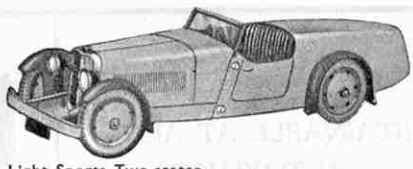
A powerful Clockwork Motor that gives a run of 150 feet on one winding is included in the Outfit. Price **20/-**

MOTOR CAR LIGHTING SET

With this Lighting Set the headlamps of Motor Car models built with the No. 2 Motor Car Outfits can be electrically lighted. Price **2/6**

MOTOR CAR GARAGE

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

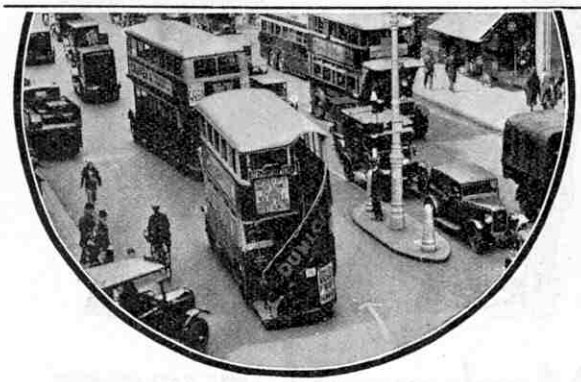


Light Sports Two-seater (No. 2 Outfit)

Saloon Coupé (No. 1 Outfit)

DINKY TOYS

A FASCINATING COLLECTING HOBBY



Dinky Toys are the most realistic and the most attractive models in miniature ever produced. These wonderful toys are unique in their perfection of finish, and their range is so wide as to appeal to all tastes. A selection is illustrated on these pages. As will be seen, trains, motor vehicles, aeroplanes, famous liners, etc., are already included in the range. Many other models of equal interest are in preparation.

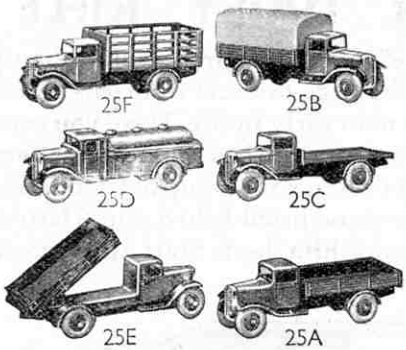
ASK YOUR DEALER FOR A COPY OF THE DINKY TOYS FOLDER, which gives illustrations and prices of the complete range.

STREAMLINE FIRE ENGINE
Dinky Toys No. 25h
Fitted with detachable rubber tyres Price **9d.** each

MOTOR VEHICLES Dinky Toys No. 30
Fitted with detachable 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.**

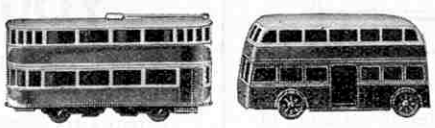
Price of complete set **4/6**



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

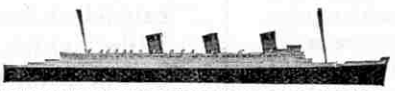
No. 25a	Wagon	each	**9d.**
No. 25b	Covered Van ...	,,	**9d.**
No. 25c	Flat Truck	,,	**9d.**
No. 25d	Petrol Tank Wagon	,,	**9d.**
No. 25e	Tipping Wagon ...	,,	**9d.**
No. 25f	Market Gardener's Van	,,	**9d.**

Price of complete set **4/6**



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

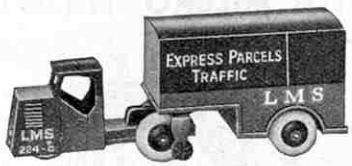
MOTOR BUS
Dinky Toys No. 29a
Assorted colours
Price **4d.** each



CUNARD WHITE STAR LINER "QUEEN MARY"
Dinky Toys No. 52a
Fitted with rollers and supplied in presentation box. Price **1/-** each

Dinky Toys No. 52m
Similar to No. 52a but not fitted with rollers, nor supplied in presentation box. Price **9d.** each

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

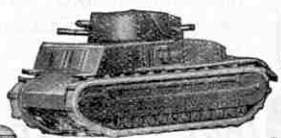


RAILWAY MECHANICAL HORSE AND TRAILER VAN
Dinky Toys No. 33R
Fitted with detachable rubber tyres

No. 33Ra	Railway Mechanical Horse	each	**8d.**
No. 33Rd	Trailer Van... ...	,,	**10d.**

Price, complete, L.M.S.R., L.N.E.R., G.W.R. or S.R., **1/6**

STRONGLY MADE UNBREAKABLE MODELS

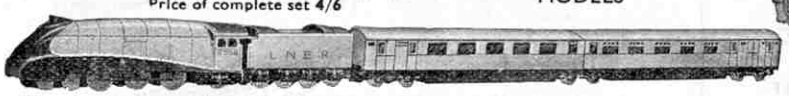


TANK
Dinky Toys No. 22f
Price **9d.** each

DELIVERY VANS
Dinky Toys No. 28/1
Fitted with detachable rubber tyres

No. 28a	Golden Shred Van ...	each	**6d.**
No. 28b	Seccotine Van	,,	**6d.**
No. 28c	Manchester Guardian Van	,,	**6d.**
No. 28e	Firestone's Tyres Van ...	,,	**6d.**
No. 28f	Palethorpe's Sausage Van	,,	**6d.**
No. 28n	Atco Lawn Mowers Van ...	,,	**6d.**

Price of complete set **3/**

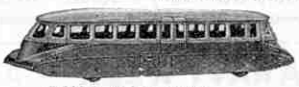


A realistic model of the latest type of streamline train

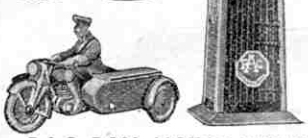
"SILVER JUBILEE" TRAIN SET
Dinky Toys No. 16
Price **1/6** each

TRACTOR
Dinky Toys No. 22e
Price **9d.** each

STREAMLINE SALOON
Dinky Toys No. 22h
Assorted colours. Fitted with detachable rubber tyres and silver-plated radiator. Price **6d.** each



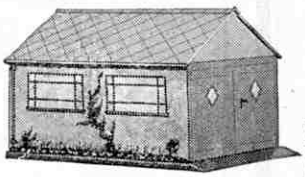
G.W.R. RAIL CAR
Dinky Toys No. 26
Assorted colours Price **4d.** each



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

No. 43a	R.A.C. Box	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**



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

ROBOT TRAFFIC SIGNAL
Dinky Toys No. 47a (Four face) Price **3d.** each
No. 47b (Three face) Price **3d.** each
No. 47c (Two face) Price **3d.** each

POLICE BOX, MOTOR CYCLE PATROL AND POLICEMEN
Dinky Toys No. 42

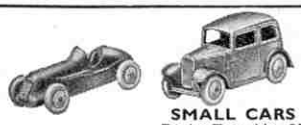
No. 42a	Police Box	each	**6d.**
No. 42b	Motor Cycle Patrol	,,	**10d.**
No. 42c	Point Duty Policeman (in White Coat)	,,	**3d.**
No. 42d	Point Duty Policeman	,,	**4d.**

Price of complete set **1/11**

MECCANO LTD. – BINNS ROAD – LIVERPOOL 13

FINISHED IN RICH COLOURS

DINKY TOYS

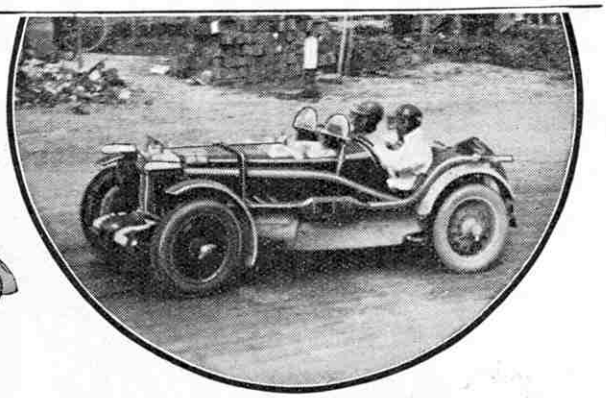


SMALL CARS
Dinky Toys No. 35
Fitted with rubber tyres

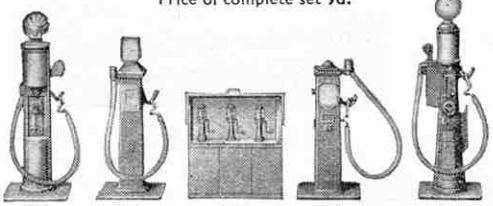
No. 35a	Saloon Car	each	3d.
No. 35b	Racer...	,,	3d.
No. 35c	"M.G." Sports Car	,,	3d.

Price of complete set **9d.**

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



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



49D 49A 49E 49B 49C

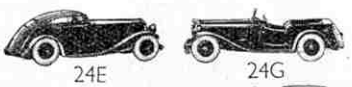
PETROL PUMPS Dinky Toys No. 49
Scale models fitted with rubber hose pipes. Realistically coloured.

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

Price of complete set **1/6**

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

23e



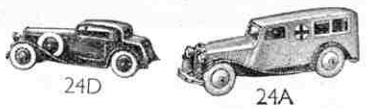
24E 24G 24F 24C

CARAVAN TRAILER
Dinky Toys No. 30g
For use with the Saloon Cars in Dinky Toys No. 24 and 30. Assorted colours. Fitted with detachable rubber tyres.
Price **6d.** each

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

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

23d



24D 24A

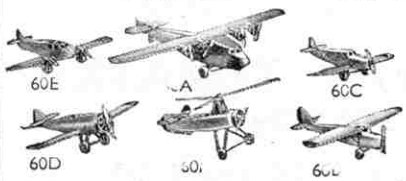
23c

24H 24B

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/-**



60E 60A 60C 60D 60I 60L

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/-**

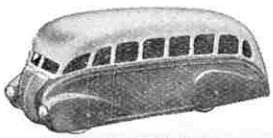
ROYAL AIR MAIL SERVICE CAR
Dinky Toys No. 34
In correct colours. Fitted with detachable rubber tyres.
Price **6d.** each

RACING CARS
Dinky Toys No. 23
Fitted with driver and detachable racing tyres. Assorted colours.

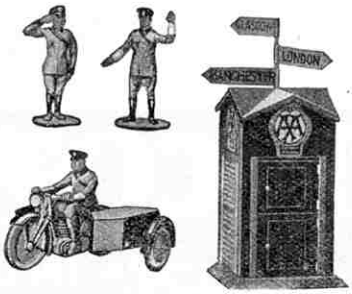
No. 23c	Mercedes-Benz Racing Car	each	8d.
No. 23d	Auto-Union Racing Car	,,	8d.
No. 23e	"Speed of the Wind" Racing Car	,,	8d.

Price of complete set **1/11**

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



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



33A 33C 33F

33E 33B 33D

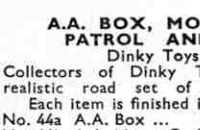
MECHANICAL HORSE AND FIVE ASSORTED TRAILERS
Dinky Toys No. 33
Fitted with detachable rubber tyres

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

Price of complete set **3/6**

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

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



A.A. BOX, MOTOR CYCLE PATROL AND GUIDES
Dinky Toys No. 44
Collectors of Dinky Toys will find this realistic road set of particular interest. Each item is finished in correct colours

No. 44a	A.A. Box	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

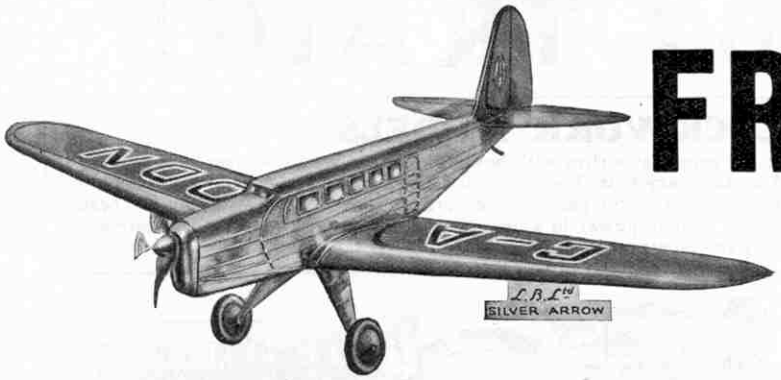
Price of complete set **1/11**

FROG

MODEL AIRCRAFT

All FROG model aircraft are covered by World Patents granted and pending. Made in England by International Model Aircraft Ltd.

FROG TRADE MARK REGD.

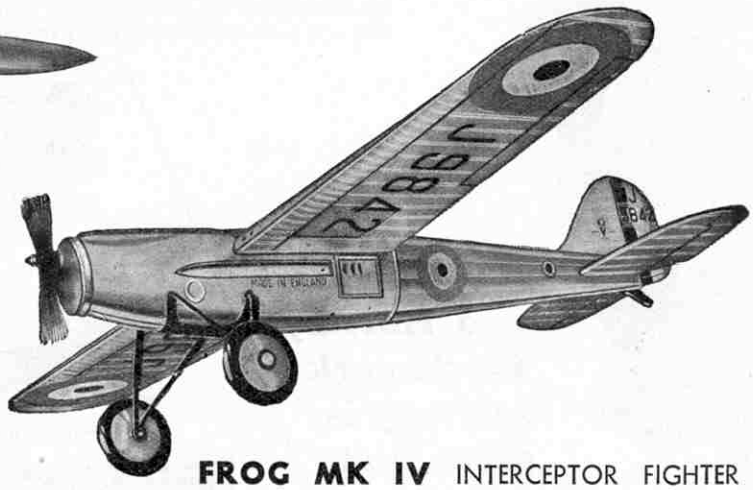


THE "SILVER ARROW"

LOW WING MONOPLANE AIR LINER

A ready-to-fly model specially designed and perfectly made by the famous "FROG" Aeronautical Engineers. It has an Aluminium Fuselage, Transparent Windows, Double Service Detachable Wings, correct pitch Airscrew, Adjustable Tail Unit. Wing span 16½", will fly approximately 120 feet. PRICE **2/6**

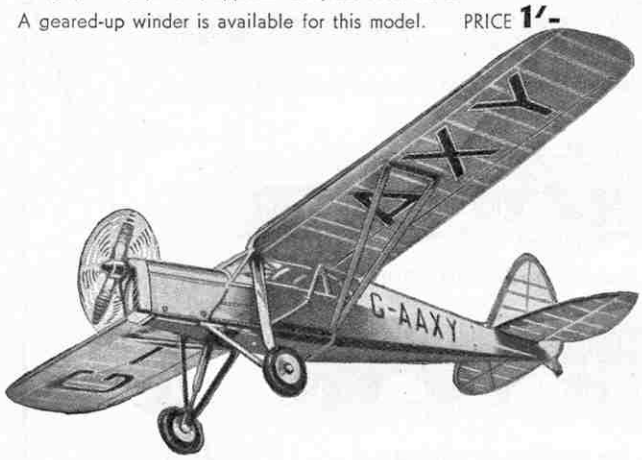
A geared-up winder is available for this model. PRICE **1/-**



FROG MK IV INTERCEPTOR FIGHTER

FLYING SCALE MODEL

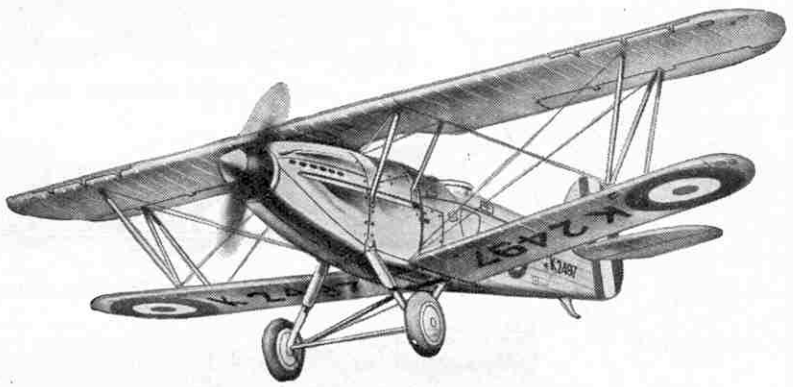
All-metal Fuselage of Tubular Construction, Patent Detachable Undercarriage, and Hollow Wings. Powerful Motor, coupled to a Precision-cut Gearbox, accurately carved Airscrew. Complete with Patent High-Speed Winder Box, Motor Lubricant, Gearbox Oil, two spare Motors and Inserter Rod, and fully illustrated Flying Manual. Wing span 11½". With practice it will fly 300 feet. PRICE ONLY **5/-**



PUSS MOTH MONOPLANE

FLYING SCALE MODEL

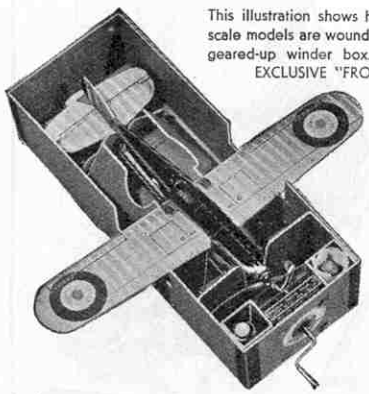
All-metal Tubular Fuselage with strengthening Bulkheads. Fitted with Transparent Windows. Quickly Detachable Hollow Wings with Internal Supporting Ribs and Streamlined Struts. Powerful Dual Motor with Step-up Gearbox. Adjustable Controls. Patent High-speed Winder Box, Motor Lubricant, Gearbox Oil, Spare Motors, Dual Inserter Rod and fully illustrated Flying Manual. Wing span 18½". With practice it will rise off the ground and fly 600 feet. PRICE **17/6**



HAWKER HART MK II DAY BOMBER

FLYING SCALE MODEL

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 Gearbox and Motors, Triple Inserter Rod, Spare Motors and profusely illustrated Flying Manual. Wing span 19". Length 15½". Flies 700 feet, if handled skilfully. PRICE **42/-**



This illustration shows how quickly the Frog scale models are wound up for flight with the geared-up winder box. A PATENT AND EXCLUSIVE "FROG" FEATURE.

Obtainable at all good Toyshops and Stores

Free Flight Instruction

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

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MORDEN RD., MERTON, LONDON, S.W.19

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

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

Name.....

Address.....

.....

Please write in block letters. 1-37

HORNBY TRAINS

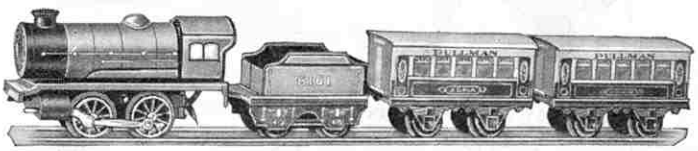
CLOCKWORK MODELS

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.

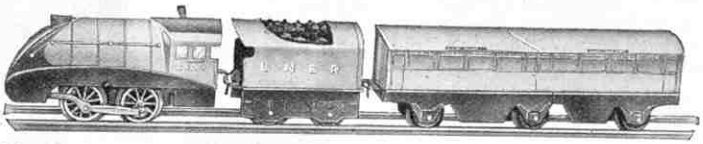
Boys! Running a Hornby Clockwork Railway is great fun!

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.

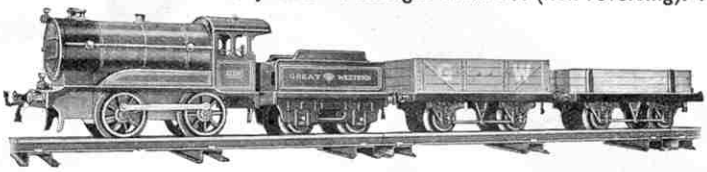
PRODUCT of MECCANO LIMITED LIVERPOOL



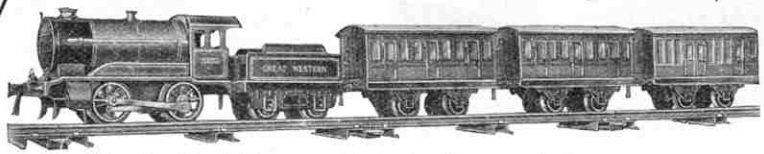
MO Passenger Train Set (non-reversing). Price **5/6**



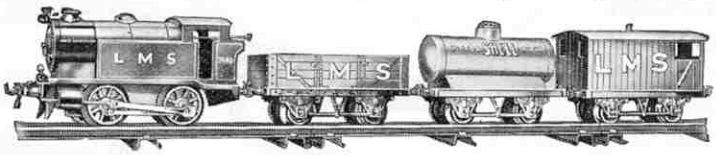
No. O "Silver Jubilee" Passenger Train Set (non-reversing). Price **7/6**



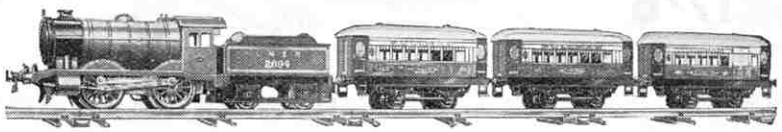
Hornby No. O Goods Train Set (reversing). Price **17/6**



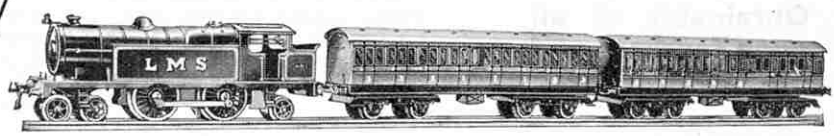
Hornby No. 1 Passenger Train Set (reversing). Price **25/-**



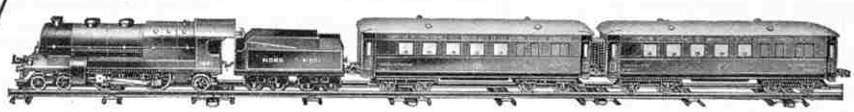
Hornby No. 1 Tank Goods Train Set (reversing). Price **22/6**



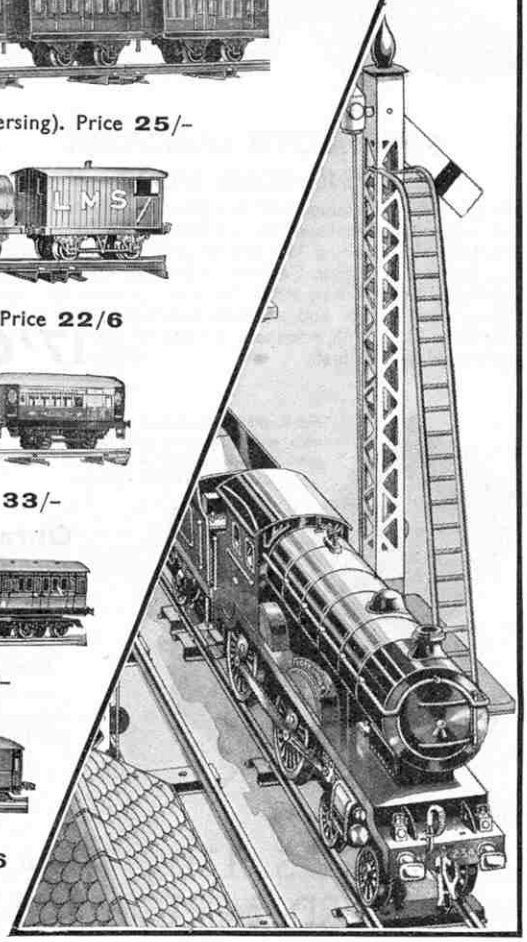
Hornby No. 1 Special Passenger Train Set (reversing). Price **33/-**



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



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

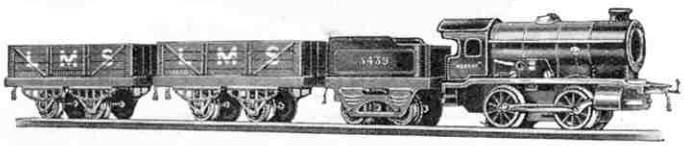


Manufactured by **MECCANO LTD., LIVERPOOL 13**

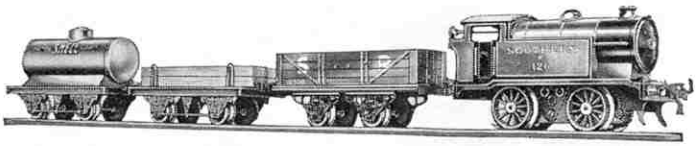
HORNBY TRAINS

ELECTRIC MODELS

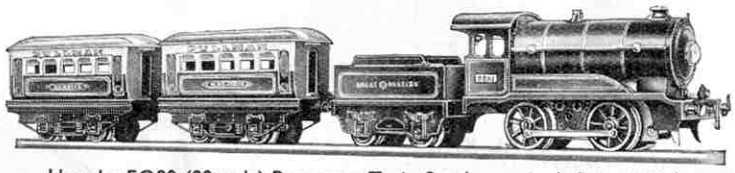
Boys! This is the dawn of the electric toy age, and the new Hornby Electric Trains reach the very pinnacle of electrical perfection. The locomotives are perfectly designed and strongly constructed, and are beautiful in appearance and finish. Many of them are fitted with patented and exclusive devices 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.



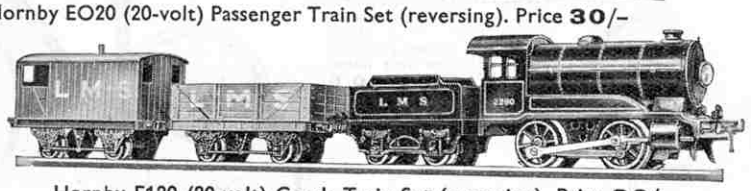
EM120 (20-volt) or EM16 (6-volt) Goods Train Set (non-reversing). Price **15/-**



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

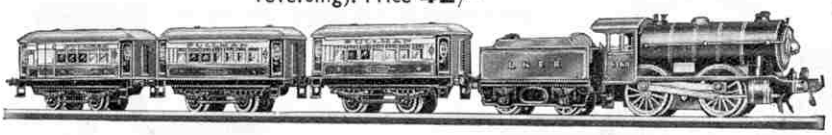


Hornby EO20 (20-volt) Passenger Train Set (reversing). Price **30/-**

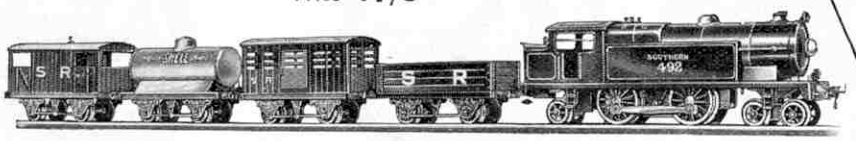


Hornby E120 (20-volt) Goods Train Set (reversing). Price **36/-**

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



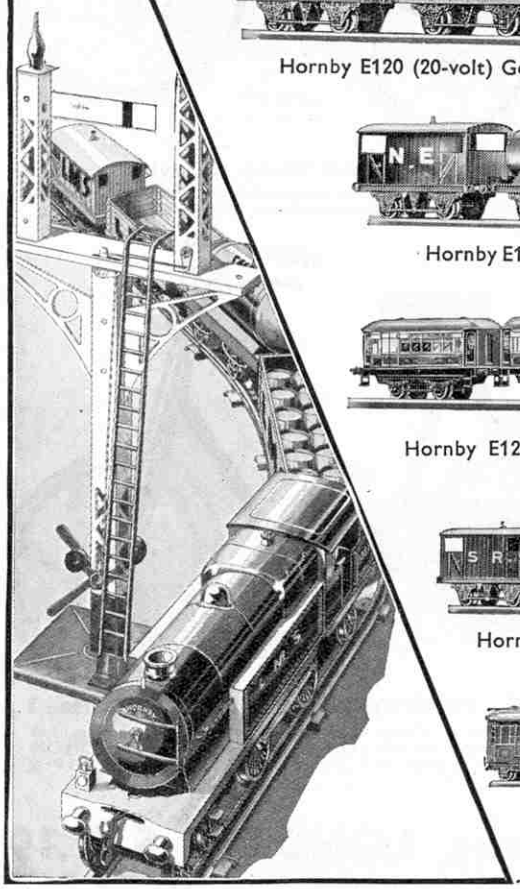
Hornby E120 Special Passenger Train Set (20-volt, automatic reversing). Price **47/6**



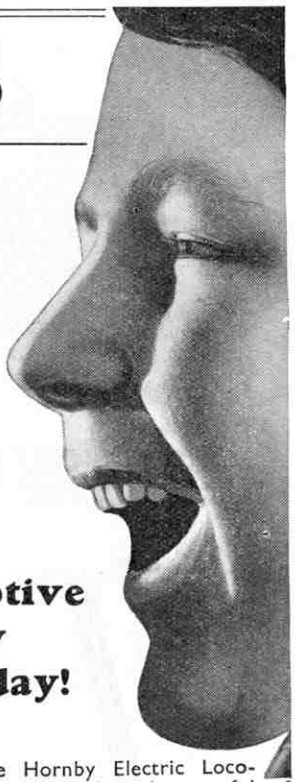
Hornby E220 Mixed Goods Train Set (20-volt, automatic reversing). Price **47/6**

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

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



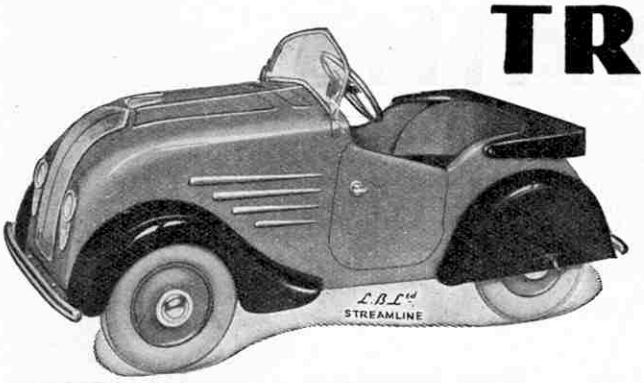
I'm getting a new Hornby Electric Locomotive for my birthday!



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 wit 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

TRI-ANG

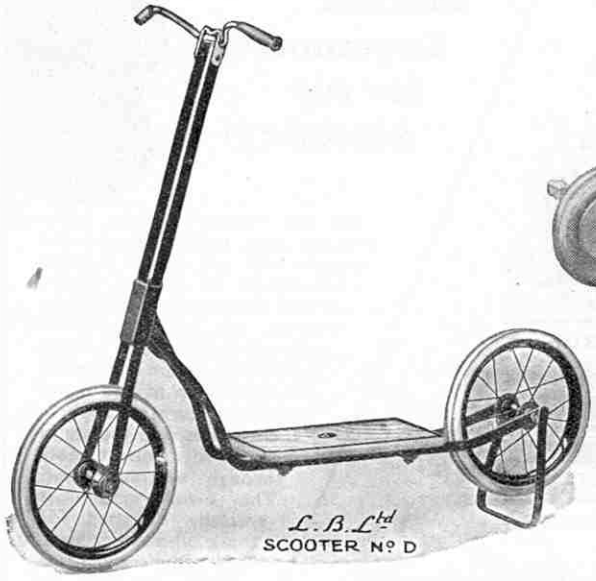


STREAMLINE

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 in. RETAIL PRICE **55/-**

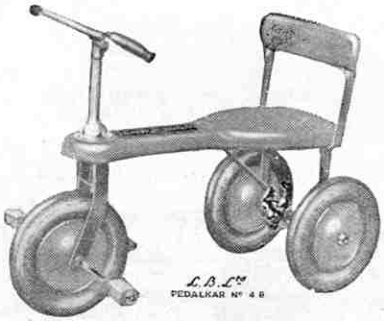
TRI-ANG SPORTS

Realistic streamlined model, with opening side door and luggage boot, 8 in. balloon disc wheels, ½ in. rubber tyres, plated bumper and streamlined dummy side lamps, windscreen, direction indicator and dummy hood. Length 41 ins. Price **32/6**



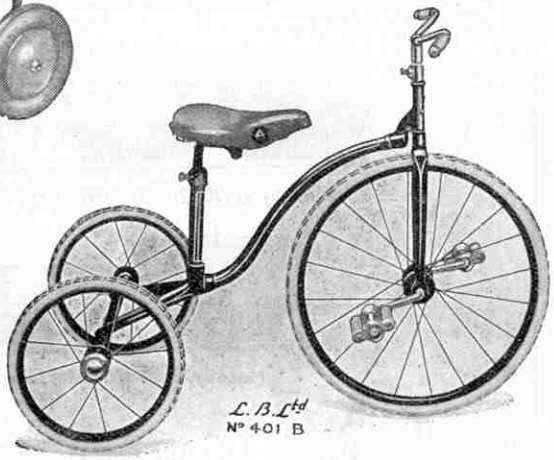
D SCOOTER

Strong steel frame with back rest, nickel-plated handles with rubber grips, 8½ in. dia. tangent spoke wheels, 1 in. cushion tyres, Hardwood step varnished, and frame enamelled red. Price **9/6**



4 B PEDAL KAR

Pressed steel seat and safety back rest, balloon discwheels, rubber tyres, nickel plated handlebars, rubber grips and pedals, Blue or Red finish. RETAIL PRICE **10/6**



TRI-ANG JUNIOR TRIKE No. 401B

Strong cycle tube frames, enamelled black, gold lines, adjustable saddle, thick white auto tread tyres. Nickel-plated fittings. Price **21/-**

L. BROOKS LTD. LONDON B.R.O.S. ENGLAND

REGD. TRADE MARK

OBTAINABLE AT ALL GOOD TOY SHOPS AND STORES

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

FITTED WITH REAR MUDGUARDS, cycle chain drive with free-wheel, frame best quality weldless cycle tubing, 14 in. wheels, 1¾ in. jointless sponge-rubber tyres, rim brake, coil-spring saddle, CHROMIUM FITTINGS. Black, blue or maroon. Price **59/6**

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

Tubular frame, 14 in. wheels, 1¾ in. grey imitation pneumatic tyres, ball-bearing pedals, rim brake, two-coil saddle, chain cover, stand, CHROMIUM-PLATED FITTINGS. Black, blue or maroon. Price **39/6**

Made by LINES BROS. LTD., Tri-ang Works, LONDON, S.W.19

BEST WISHES FOR 1937 TO ALL MY READERS—THE EDITOR

MECCANO MAGAZINE

Editorial Office:
Binns Road, Liverpool 13
England

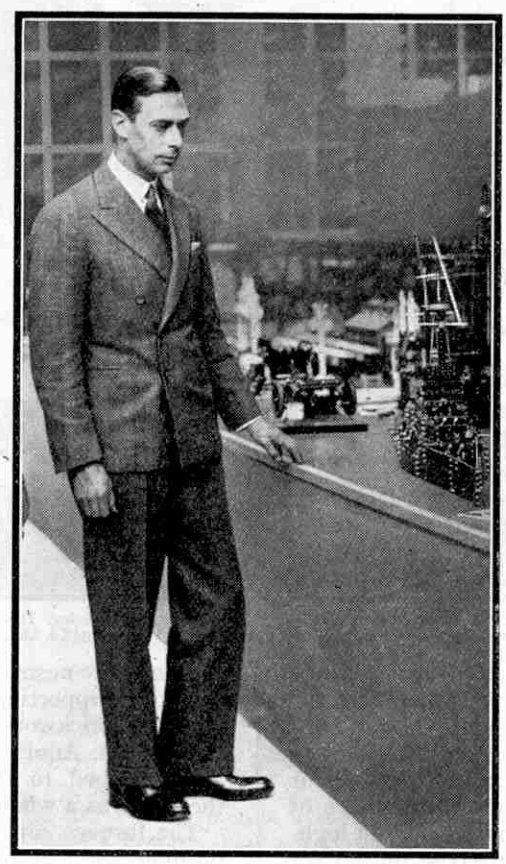
Vol. XXII. No. 1
January, 1937

With the Editor

The King

One of the most notable features of the career of our new King, as Duke of York, has been the keen interest he has displayed in British industries. Since the War he has visited large numbers of factories and works of all kinds, and each visit has been not merely a casual walk round, but an occasion for grasping the main features of the particular industry, and learning something of the normal working day of the employees. The accompanying photograph shows His Royal Highness watching a display of working models on the occasion of his visit to the Meccano factory in May 1930. All who had the privilege of accompanying him on his tour through the works were impressed by the real keenness displayed by the Duke. His questions probed to the heart of things, and frequently he stopped to watch some worker carrying out a particular operation, and showed his appreciation of the dexterity and speed displayed.

I know that all readers will join me in the national prayer: "God Save The King!"



His Majesty King George VI at the Meccano factory, which he visited as Duke of York in May 1930.

Great Britain's World Records

At this time of the year it is interesting to take stock of our national position. This process sometimes shows us what we lack rather than what we have achieved, but from an engineering standpoint there is not the slightest doubt that our position at present is excellent. The number of world records with an engineering basis held by Great Britain is a proof of this. I wonder how many records of this kind my readers can recall; I can think of eight without much trouble, and possibly there are others.

The first three of my world records are concerned with speed, on railways, on land and on the sea respectively. The most famous train in the world is "*The Flying Scotsman*," which makes the world's longest non-stop scheduled run; the most famous liner is "*Queen Mary*," which has won back the Blue Riband of the Atlantic for this country; and, lastly, the most famous motor car is Sir Malcolm Campbell's "*Blue Bird*," in which the land speed record was raised above 300 m.p.h.

Next on my list come three "largest evers." London, with more than eight million people, is the world's largest city; the largest dry dock is that at Southampton; and the largest warship is H.M.S. "*Hood*," the great battle cruiser of 42,100 tons.

Two other records held by Great Britain form an interesting contrast. The world's longest tunnel is the London tube from Edgware to Morden, which is more than 23 miles in length, and the greatest height ever reached above the Earth in an aeroplane is the 49,967 ft., or nearly 9½ miles, to which Squadron Leader Swain recently ascended in a machine of British make. It will be interesting to compare the position now with that of a year hence.

Old Clock Mechanisms

The ancient clock described on page 9 of this issue is proof that British craftsmen have always been capable of producing good things. Mr. T. R. Robinson, the author of the article, discovered the clock in the Clock Room of Salisbury Cathedral, tucked away in a corner and more or less forgotten. It is probably England's oldest mechanism, but in spite of its great age of 550 years it requires only a few minor repairs to put it into working order again.

There must be other old clock mechanisms lying hidden, waiting for the fortunate chance that will bring them to light. Possibly some of my readers can tell me of such clocks now lying idle or doomed to the scrap heap because no one realises how interesting they are. If so I should be pleased if they would write to give me as much information as possible, so that I can make enquiries. It is perhaps scarcely likely that such a wonderful find as that at Salisbury Cathedral will be made, but any clock of bygone days that can be discovered and preserved will add to our store of early mechanical achievements.

Raising High Pressure Steam

How the Yarrow Water-tube Boiler Works

THE heart of any steam power unit is the boiler, for the efficient working of the engines, whether they are reciprocating or turbine, depends on the provision of an ample supply of steam at the desired pressure. Ever since steam engines came into use, therefore, designers have striven to improve the boilers that play such an important part in developing power. To-day there are roughly two kinds of boilers in use. In one of these the hot gases from the furnace pass through tubes enclosed in a shell and surrounded by water. This is known as a fire-tube boiler. It is cheap to build owing to its simple construction, but is a comparatively slow steam raiser, and is suitable only for low pressures.

The second type is known as a water-tube boiler and in design is exactly the reverse of the fire-tube boiler, for it is the water that is inside tubes, which are surrounded by hot gases. The water therefore is divided into a number of small streams and a very large heating surface is thus exposed so that the water is quickly converted into steam. Boilers constructed on this principle are now generally installed where large volumes of steam at high pressure are required, such as in modern power stations or in ships.

There are several well-known forms of water-tube boilers, each possessing special features, and one of the most interesting of these is the Yarrow boiler, which was invented by the late Sir Alfred Yarrow. The Yarrow boiler not only generates high pressure very rapidly, but also maintains a very high output in relation to its size. These qualities make it particularly suitable for supplying steam for the immensely powerful engines of warships, where space and weight are limited, and for high-powered land installations, for which purpose units each capable of generating steam to drive a 20,000 h.p. engine are now being built. Some of these boilers work at pressures of 1,000 lb. per sq. in., and can evaporate 200,000 lb. of water per hour.

Three Yarrow boilers, which supply steam for driving a twin-screw turbine installation, form the propelling machinery of H.M.S. "*Tyrian*," the world's fastest warship. This vessel is a torpedo boat destroyer designed and built by Yarrow and Co. Ltd., and in the illustration at the top of the opposite page it is shown steaming at the high speed of 40 knots.

The Yarrow boiler consists of three or more circular steel drums arranged in triangular formation, as shown in the lower illustration on the opposite page. The lower drums are known as the water drums and the one at the top is the steam drum. Each of the water drums is connected to the steam drum by several rows of straight steel water tubes, which form the front and back walls of the furnace. The triangular space between the two nests of tubes is known as the combustion chamber, and this must be sufficiently large to ensure complete combustion of the fuel. The flames are thus restricted to this space, and it is the hot gases flowing past the water tubes that impart the heat to the water.

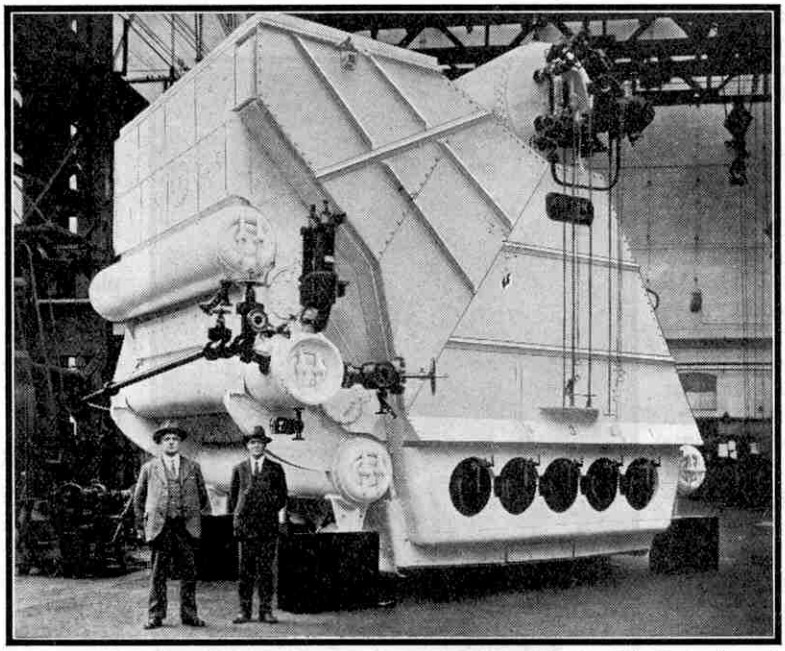
All metals expand when they are heated and this fact has to be taken into consideration in designing a boiler. Those parts of the structure that are nearest the fire, and therefore are subjected to the greatest heat, expand to a greater extent and more rapidly than the parts at some distance from the flames and hot gases. Unless proper allowance is made for this therefore there will be wrenching of joints and rivets and the possibility of serious fracture, with a resulting explosion.

In the Yarrow high pressure boiler the drums are seamless forgings entirely without rivets, and expansion is provided for by mounting the steam drum on a stout steel framework, in such a way that the water drums and the complete nests of tubes are freely suspended. The steel structure supporting the boiler is encased either with steel plates or brickwork, or both, according to individual requirements. Another method is to support the boiler by feet attached to the two lower water drums, allowing the boiler as a whole to expand freely upwards.

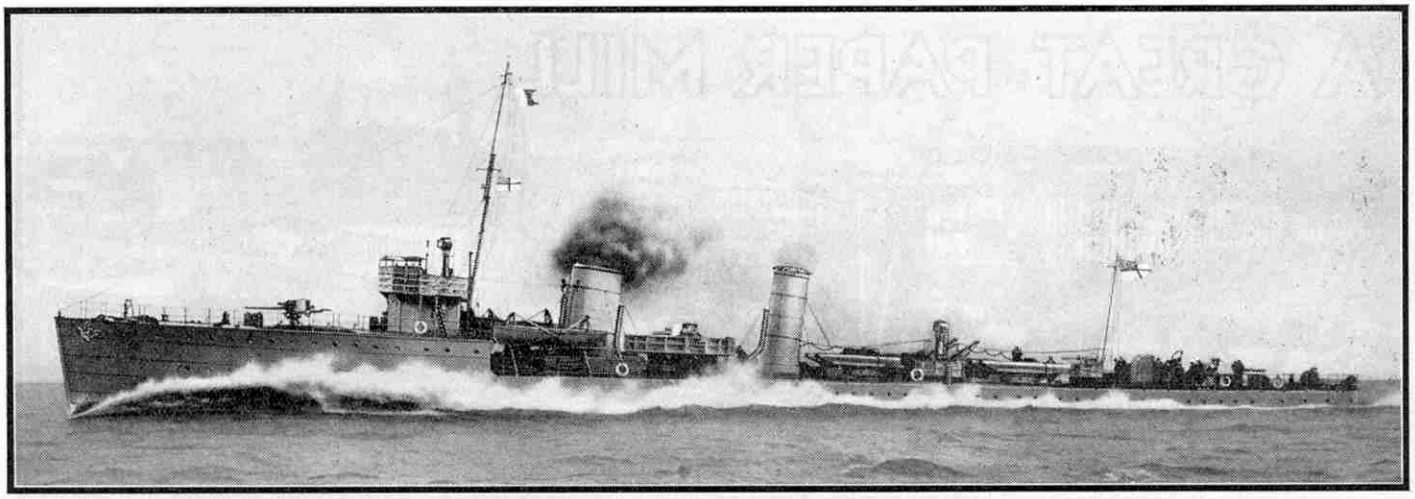
The furnace can be arranged for either coal or oil fuel burning, and mechanical stokers of any kind may be fitted as desired. The boiler also is particularly suitable for use with pulverised fuel. As the water tubes form the front and back walls of the furnace they absorb heat very rapidly, and in addition serve to prevent the brickwork lining of the furnace from becoming excessively heated and requiring constant renewal.

Where extremely high furnace temperatures are necessary, Yarrow Patent Water Side Walls, which form an extension of the ordinary water tube system, can be fitted, and the whole furnace is then entirely surrounded by water tubes.

For low pressures the steam and water drums are built up



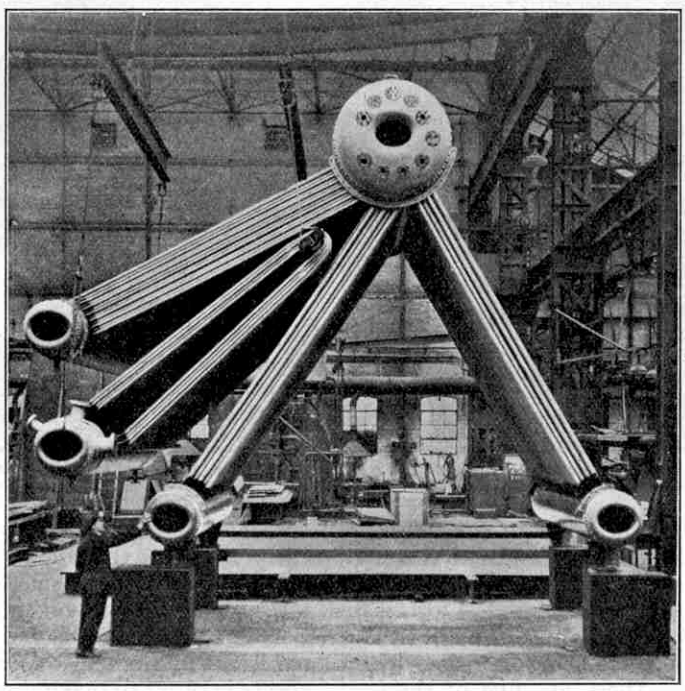
A Yarrow marine type high pressure water-tube boiler fitted for oil firing. This illustration and those on the facing page are reproduced by courtesy of Yarrow and Co. Ltd., Glasgow.



of pressed steel parts, the shell being in one length so that there is no intermediate circumferential joint. Hollow forged drums are used for very high pressure installations and riveted joints are entirely eliminated. The drum ends are pressed to spherical form, and the water tubes are expanded into the tube plates in the drums and are bell-mouthed at their ends. The bell-mouthing of the tube ends provides easy entrance and exit for the water, and facilitates the cleaning of the interior of the boiler.

The ability of the Yarrow boiler to raise steam extremely rapidly is due to the design and layout of the water tubes, which promotes rapid circulation of the water. Everyone has noticed a pan of water boiling over the fire and has observed how the fluid rises tumultuously around the edges and then turns towards the centre, where it descends. This movement is partly due to the fact that water is a very poor conductor of heat, and partly because it expands when heated. As the heated portion of the water nearest the hot bottom of the pan cannot transfer its heat to its neighbouring particles it remains expanded, and as hot water is lighter than cold it rises, the colder portions descending to take its place and become heated in turn.

On a larger scale a similar circulation is set up in the drums and tubes of the Yarrow boiler. As the tubes are straight and nearly vertical, the circulation is free and depends on the temperature difference between the gases entering and leaving the nests of tubes. In general the hot water, carrying with it a very large volume of steam, flows up the inner rows of tubes next to the combustion space and its place is taken by the colder water which is thus forced to flow down the outer rows of tubes. Thus fresh portions of cooler water are brought rapidly into contact with the hot tubes, with the result that the rate at which water is converted into steam is very high.



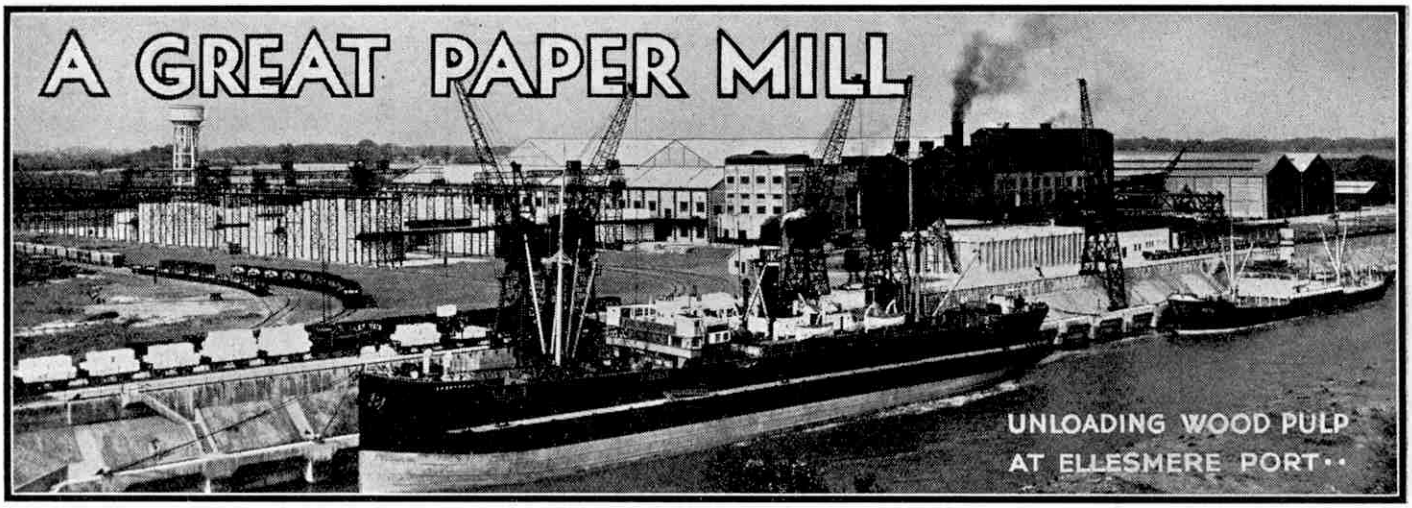
A Yarrow high pressure water-tube boiler and superheater in course of construction. The superheater is between the nests of water tubes on the left. The illustration at the top of the page shows H.M.S. "Tyrian," the world's fastest torpedo boat destroyer, steaming at 40 knots. It is equipped with three Yarrow boilers.

In order to prevent losses of steam such as those due to condensation in the pipes leading from the boiler to the engine, and also to compensate for heat lost by contact with the cooler cylinder walls in the engine itself, it is now usual to superheat the steam generated in the boiler. The Yarrow superheater consists of a set of tubes through which steam drawn from the steam drum is passed and again exposed to the heat of the combustion gases. When the superheater is fitted to a standard Yarrow Boiler the rows of water tubes at the front or at the back of the boiler are divided into two sections, with a separate water drum at the bottom of each section, and the superheater is placed between them at the required distance from the furnace. An arrangement of this kind is shown in the lower illustration on this page. The superheater consists of a single drum, which is hollow forged and is provided with internal divisions that cause the steam to pass several times through a number of "U" tubes placed in the path of the hot furnace gases.

One of the sources of waste in the generation of steam in any type of boiler is the escape of heat in the hot gases that pass up the flue, and except when mechanically induced draught is used a certain amount of heat is necessary to create a chimney draught. Even with the most expertly-fired boilers, however, the temperature of the waste gases is considerably higher than that actually required for the purpose of draught.

All good boiler plants therefore are fitted with apparatus to extract some of this surplus heat from the gases and utilise it in the economical working of the plant. This apparatus is known as an economiser, and it is used to preheat the boiler feed water before it is fed into the boiler drum. This is done partly to prevent the boiler tubes and plates from being cooled by the entrance of cold water, for then leaks might develop, and also because cold water fed in directly would reduce steam pressure.

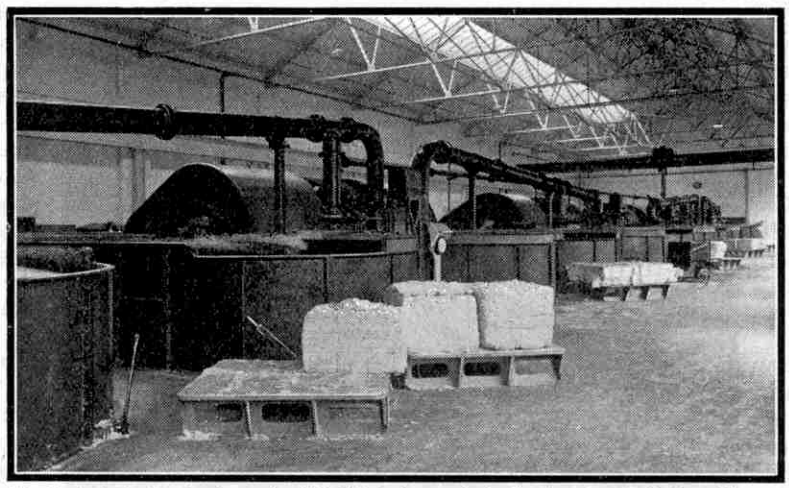
A GREAT PAPER MILL



UNLOADING WOOD PULP AT ELLESMERE PORT

OUR cover shows a busy scene at the wharf of Bowater's Mersey Paper Mills Limited on the Manchester Ship Canal. These Mills are about a mile and a half from the locks at Eastham, giving access to the Canal from the Mersey, and are the first works of any kind to be met with on entering the great waterway. Newsprint, or paper for the production of newspapers, is made in them, the greater part of the output being consumed in the North of England, although a considerable quantity is shipped to Australia and South Africa.

The Mills were constructed in 1930 for an output of 60,000 tons of newsprint per year, and were extended in 1933 to bring the total yearly output up to 130,000 tons. The site covers 52 acres. The main raw materials are wood pulp and a comparatively small amount of china clay, and both of these reach the Mills by water, the former chiefly from Scandinavia, and the latter from Cornwall. The vessels carrying them are accommodated in a lay-bye 80 ft. wide, and their cargoes are unloaded on the company's private wharf, which is 1,100 ft. long. The largest vessels entering the Canal can berth there.



Wood pulp in the breaker house, in which it is broken up by beating in water. At the top of the page is a panoramic view of the works at Ellesmere Port, Cheshire, of Bowater's Mersey Paper Mills Limited, to whom we are indebted for the illustrations to this article.

The boat shown on our cover is the s.s. *"Garryvale"* of the Nordenfjelske A.B.O.Y. Line, and this vessel also is seen in the panoramic view of the Mills at the head of this page. The wood pulp from its hold is being unloaded by means of electric luffing cranes. There are five of these cranes on the wharf, four of which are shown at work. They were installed by Stothert and Pitt Ltd., Bath, to whom we are indebted for the illustration on our cover. Each is capable of lifting 2½ tons at a radius of 50 ft. They work quickly, the speed of the hoisting motion being 30 ft. a minute and that of the luffing motion 150 ft. per minute. The total height of each crane is 122 ft., and they are capable of moving along their track of 15-ft. gauge at a speed of 15 ft. per minute.

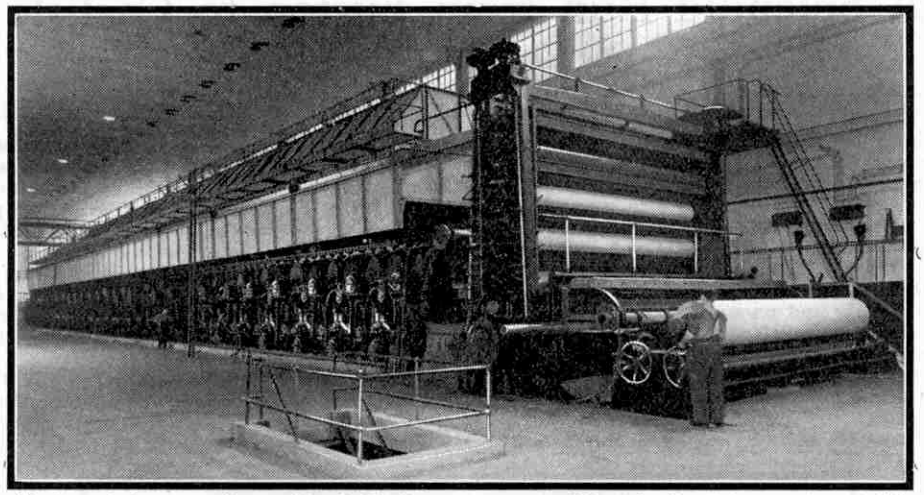
The wood pulp arrives packed in bales, and six of these at a time are raised in chain slings. The load is quickly hoisted out of the hold and swung round to be deposited on railway trucks on three tracks running along the wharf. As soon as each load of bales is in place, the crane swings back to raise another, several slings being in use so that the crane is always on the move and the task of unloading is speeded up as much as possible. The loaded trucks are then shunted into the storage ground where the bales of pulp are stacked. Fireless locomotives charged with steam from a central plant are used for this purpose, and the storage ground is traversed by three sets of tracks, giving easy access to every part. Overhead "Goliath" travelling cranes of 80 ft. span lift the bales into position. These cranes can be moved backward and forward over the site, and as the hoisting mechanism can be run in either cross direction, the bales can be placed directly in any position, or lifted with ease wherever they are placed.

The "Goliath" cranes are used also for removing the pulp from the stacks on to stillages or frames, each of which is capable of holding eight bales. These stillages are on the cross gantries or platforms leading directly into the Mill. They are conveyed along the platforms on electric trucks, which carry them into the breaker house, and deposit them alongside the breakers, or machines in which the pulp is disintegrated by beating it in water. The result of this operation is a fluid mass called "stuff," in which the pulp is reduced to fibre, and this is diluted with water in storage chests in order to make it easier to pump the liquid to the conical refiners through which it is passed.

Two kinds of wood pulp are used. One is known as Sulphite, which is made by digesting wood with chemicals; the other is manufactured by mechanical grinding treatment and is called groundwood. These are treated separately, the Sulphite pulp passing through beaters and an additional refiner, and the proportions of the two pulps in the mixture before being fed into the papermaking machines are automatically controlled by a regulating machine. China clay also is added in the proportioning machine. This is previously mixed with water in a separate building of reinforced concrete containing mixers, together with storage

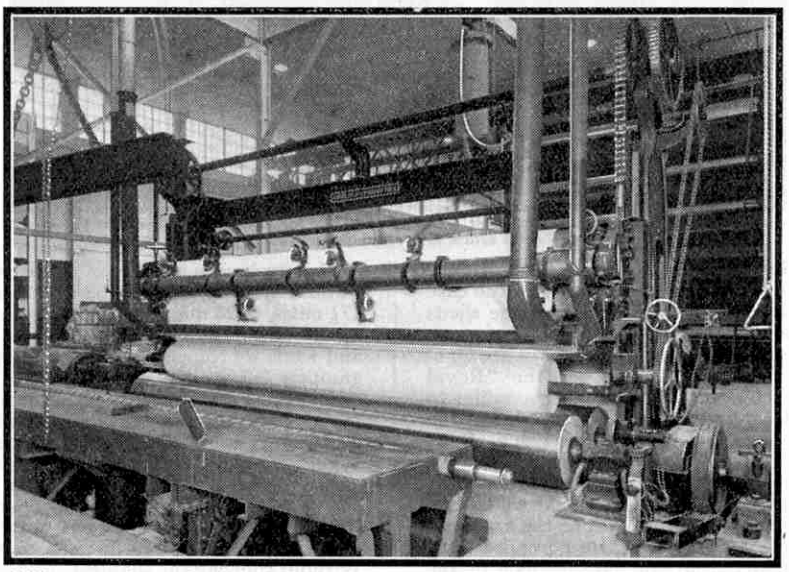
chests. There is storage accommodation for 1,200 tons.

There are four paper machines in the Mill, all of which were made by Walmsleys (Bury) Ltd. They are housed in two immense machine rooms, each 450 ft. long, 96 ft. wide and 80 ft. high. Three of them produce paper of 18 ft. finished width, and on the fourth paper 19 ft. 6 in. wide is made at speeds up to 1,250 ft. per minute. All are complicated and impressive pieces of machinery, each being 300 ft. in length and over 20 ft. wide. They run continuously from Monday morning until Saturday night, and are capable of producing over 2,500 tons each week. Throughout that time they work perfectly and regularly, and their unfailing efforts are a tribute alike to the skill with which they are made and the care with which their operation is supervised.



The dry end of a papermaking machine. In this the paper passes over 50 heated rollers that evaporate most of the water in it, and it is finished on the 10-roll calender stack before being wound on the reels.

The stuff passes through the mixing pumps and is diluted until the proportions are about 99½% water and only ½% wood fibre. The diluted stuff from the screens passes through a flow box designed to damp out eddies and so give an even flow of the liquid on to the papermaking machines. It pours out through a special adjustable mouthpiece, called a slice, on to a moving endless woven wire cloth 90 ft. in length. The top half of the wire forms a table on which the paper is formed as the stuff is carried away at great speed from the slice. The wire is supported for three-quarters of its length on the table rollers, which remove a considerable quantity of water by capillary attraction, and water also falls out as the stuff passes over the spaces between the rollers. The wire then runs over vacuum boxes, which remove a further large quantity of water by suction, the effect of which is to leave the fibres closely matted together in a continuous sheet.



Slitting paper into reels of size suitable for newspaper work. The paper is cut continuously by rotating circular knives.

The paper leaves the wire at this point. It still contains 80 per cent. of water, but is sufficiently strong to support its own weight for a few feet as it passes on to the press part of the machine. This consists of two suction press rolls. In each of these the lower roll consists of a bronze perforated shell, with internal suction boxes, and the top roll of granite, and there is also a third smoothing press. The first two presses have endless woollen felts which support the paper as it passes through them. The paper is automatically fed from the couch roll and through the presses by means of compressed air, and when it emerges it still contains about 70 per cent. of water.

Feeding ropes now carry the paper to the drying part of the machine. This consists of 50 huge drying cylinders of semi-steel. Each cylinder is 5 ft. in diameter and is heated internally by means of steam at a pressure of 10 lb. per sq. in. The cylinders form a double bank of dryers through which the paper is conveyed on cotton felts, while the proportion of water in it is reduced from 70 per cent., to about 10 per cent. This means that over 13 tons of water must be evaporated every hour on each machine, and removed to the atmosphere. A hood is arranged over the dry part of each machine, and connected to it are eight extraction fans, having a total capacity of 3,200 cu. ft. of air per minute, that take out the moisture-laden air.

From the dry part of the machine the paper passes through the finishing calender stack, which consists of 10 chilled iron rolls that give a glossy surface to the paper as it winds its way round them. The product is then wound on steel shells, 14 in. in diameter, on what is called the Pope reel, which is specially designed so that a full reel of paper can be removed and an empty reel inserted practically without losing any paper.

The machine reels are generally 42 in. in diameter, and from 218 in. to 236 in. in width. If an additional finish is required they are carried by an electric crane to the super-calender, which is a 10-roll stack, consisting of five chilled iron rolls and five bowls of compressed woollen paper. This runs at a maximum speed of 2,000 ft. per min., and the paper that has been treated in it is again reeled.

If machine-finished paper is required, the reels from the machine are taken direct to the winder. There it is wound on strawboard centres over a metal winding axis, and as it passes through the machine it is slit to the width required for the newspaper for which it is intended. The cutting is done by means of small circular knives rotating at high speed, and afterwards the wide roll of paper automatically separates into reels of the required width.

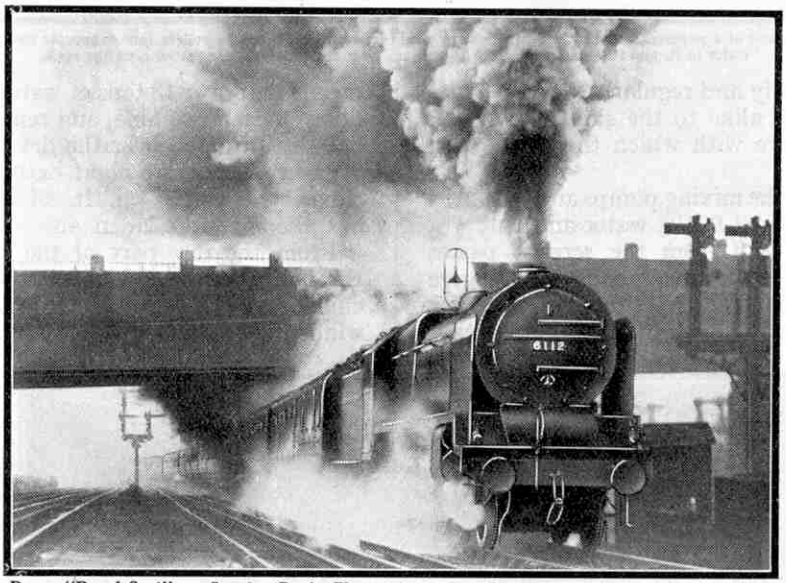
On the Footplate of "The Royal Scot"

A Splendid Run from Euston to Carlisle

By a Railway Engineer

THERE are perhaps no locomotives so widely known and admired, all over the world, than the L.M.S.R. "Royal Scots." The visit to America in 1933 of the pioneer engine, No. 6100, greatly enhanced the prestige of British railways in general and the L.M.S. in particular, and although when she returned it was to find a still mightier type at work on the West Coast route, the "Royal Scots" were anything but superseded. Even to-day, four years later, there are only 13 of Mr. Stanier's 4–6–2s at work, and the "Royal Scots" are regularly and unceasingly called upon for very heavy express duty. The *"Railway News"* pages of the *"M.M."* have frequently borne witness to their prowess, and a few months prior to the acceleration that has brought Glasgow within 7½ hours of London I was privileged to witness a magnificent performance from the footplate.

This run was, appropriately enough, on *"The Royal Scot"* express itself; a "Princess" was not available and so our engine was No. 6137, *"Vesta."* In accordance with the latest scheme of renaming, the title of this engine has since been changed to *"The Prince of Wales's Volunteers (South Lancashire)."* Driver Charlton and Fireman Baker of Upperby Bridge shed, Carlisle, were in charge. The load was made up to just the maximum tonnage, 475, permitted to the "Royal Scots" on Special Limit timings south of Crewe, and with a well-filled train the gross load was 505 tons behind the tender.



Down "Royal Scot" on Camden Bank. The engine is L.M.S.R. No. 6112 "Sherwood Forester." The illustrations to this article are reproduced by courtesy of the L.M.S.R.

The empty coaches had been drawn into Euston by an old L.N.W. 18-inch 0-6-0 goods engine, the type known almost universally as the "Cauliflowers," and this veteran gave us some useful banking assistance at the very start. I hasten to explain, however, that the "Royal Scots" can, and regularly do, take 500-ton trains out of Euston unassisted; it is only in the case of those trains that are brought in from Willesden carriage sheds that there is an engine at the rear at Euston. *"The Merseyside Express,"* for example, is never banked out of the terminus.

There is nothing very special to mention about the "Royal Scot" footplate arrangements; the general layout is very similar to that of the Class 5 4–6–0s that I described in the May issue of the *"M.M."* when writing of the Highland Mail, but in view of the enormous boiler, the look-out ahead is surprisingly good. The cab has been extended to the utmost width permitted by the loading gauge to achieve this result; incidentally this unusual width can give a very queer feeling to anyone riding in the seat on the fireman's side, for at the time of my trip *"Vesta"* was still equipped with the old narrow type of tender and from the extreme side of the cab you look back into an airy nothing!

Sharp at 10 a.m. came the right-away. Charlton waited a second to feel the push of the bank engine, before he opened the regulator, and then *"Vesta"* very quickly took the strain. The actual platforms at Euston are on a very slight falling gradient, but less than 50 yards from the start Camden banks begin in earnest, at 1 in 70. The maximum cut-off on these engines is 75 per cent., and once the train was well under way Charlton brought the reversing screw back one turn, and at the same time the regulator was opened a little wider, to about one-half. *"Vesta"* developed that characteristic deep booming exhaust, and by the time we crossed the flying junction over the empty carriage lines the "Scot" and the "Cauliflower" were fairly lifting the train.

The grade eases here, to 1 in 112. Charlton brought the reversing screw back another turn—cut-off was now about 50 per cent.—and in another minute we were breasting the top of the bank, just a mile out of Euston, in 3½ minutes. As we passed Camden engine-sheds several of the staff waved us a farewell, and with the regulator still wider open *"Vesta"* entered Primrose Hill tunnel in full cry. But we were not yet doing 40 m.p.h., and Charlton applied sand periodically to lessen the chance of a slip. There was no need. No. 6137 was getting hold of her 505-ton load in magnificent style, and we swung through Willesden Junction, 5.4 miles out, in 10¼ minutes at 56 m.p.h.

There are extraordinary differences in the riding qualities between one locomotive type and another; they may be almost equal in tractive power, but purely as vehicles they are totally unlike. The "Royal Scots" represent about the greatest concentration of power that has yet been produced in this country on so short a wheelbase, and I think it is this that gives them their particular riding characteristic. Although they are actually one of the swiftest types in Britain—one of them attained 98 m.p.h. on test—at any speed over about 45 m.p.h. they seem to be lumbering, and riding on them one loses all sense of speed.

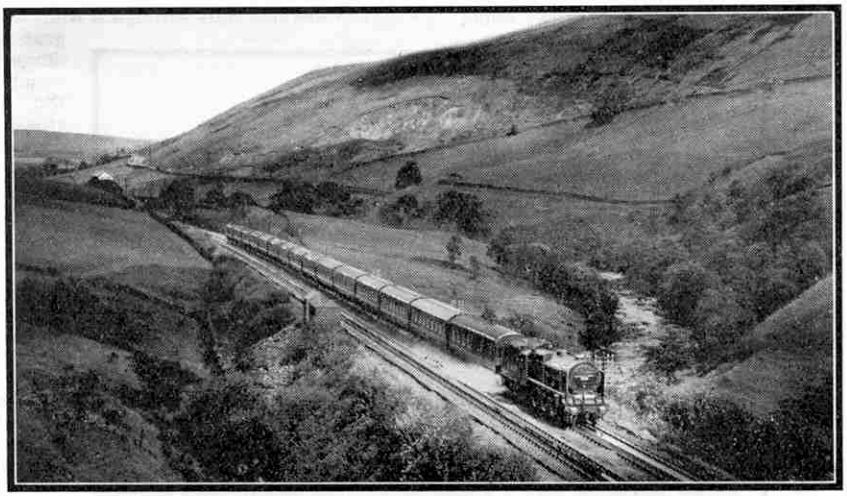
On the dead level beyond Willesden we reached 61 m.p.h. and then began the 24-mile climb to Tring, working on three-fifths regulator and about 40 per cent. cut-off. On the 1 in 339 grade speed fell off very gradually; Harrow was passed at 54 m.p.h., after 4½ miles of climbing, and at the top of the first stage, just before Bushey troughs are reached, we were doing a steady 53. No change in the controls was made for the very slight descent beyond here; *"Vesta"* quickly attained 62 m.p.h. and we were through Watford, 17½ miles, in 23 minutes. Through Watford tunnel and up the valley of the River Gade the rise is as gentle as 1 in 1038 and 1 in 508, and while we romped along at 60 m.p.h. there were some charming glimpses below of the Grand Union Canal. In this broad vale one can see long distances ahead from the footplate, and beyond Kings Langley the railway takes a gradual sweeping curve into the hills on the western side. Here the last and longest stage of the climb begins; for 8¾ miles the rise is continuous at 1 in 335.

Approaching Boxmoor, after two miles of it, we were still doing 57½ m.p.h., but then Charlton opened out to full regulator, still keeping at about 40 per cent. cut-off. For six miles I witnessed the rare spectacle of a big modern engine being worked really hard. Without showing the slightest shortage of steam, *"Vesta"* responded magnificently with a steady and unvarying 56 m.p.h. right up to Tring summit. The sense of effort was thrilling; there was no doubt about it, things were happening! The exhaust was a low roar, the engine bumped along just as heartily as ever, but what really surprised me was the very little coal burned during this strenuous period. So we came through Berkhamsted tunnel, under the slopes of Northchurch common, and the beautiful wooded hills of Aldbury came into view on the right; we were over the summit.

We passed Tring station, 31.7 miles out, in 38 minutes, dead on time, and here cut-off was brought back to 30 per cent. and the regulator closed to about two-fifths. Descending through the long deep chalk cutting we were soon going a fine pace. Nearing Cheddington the prospect opened out once more, and behind us now,

stretching east and west as far as the eye could see, were the northern escarpments of the Chiltern Hills—range upon range of chalky downs. The finest group lie east of the railway, where the great white lion cut in the chalk shows the whereabouts of Whipsnade Zoo, and the hills of Ivinghoe sweep down to the level plain below, a great expanse of green, smiling meadowland.

By now we were going 72 m.p.h.; we swept through Leighton Buzzard, and round the curve to Linslade tunnel. Here the down fast and the up slow lines are each carried through single-line tunnels on each side of the double line bore that takes the up fast and the down slow lines. The train so nearly fits the confined space that at the speed we were going it is just like hitting a solid wall of air. We all three covered our heads with cloths, for the first rush of air creates a whirlwind of coal-dust on the footplate; a few seconds of high pressure on our ear-drums, and then out into the sunshine once more. Right on past Bletchley and Wolverton we kept up a steady 67 to 72, and 56 miles were covered in the first hour from the start.

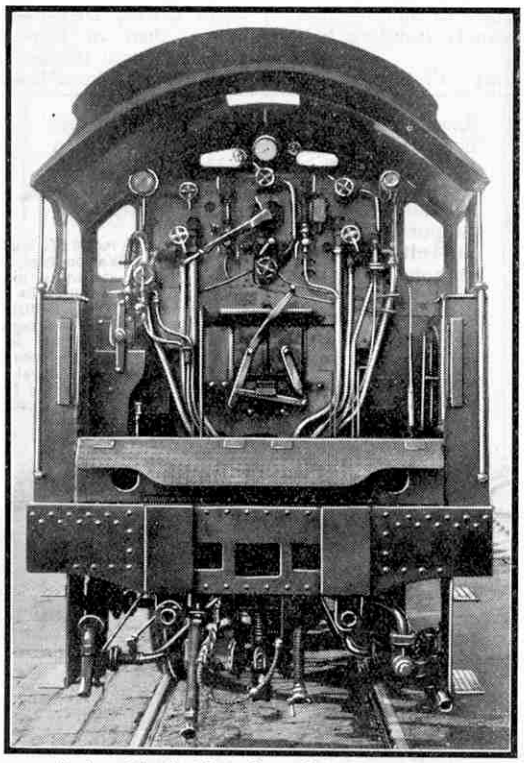


"The Royal Scot" passing over Tebay troughs. It is hauled by engine No. 6137, "Vesta," on the footplate of which the run described in this article was made.

After taking water at Castlethorpe troughs we came on to the 6-mile climb to Roade, mostly at 1 in 330. "*Vesta*" was going so well that Charlton had no need to open out at all, in fact we travelled for 45 miles after Tring without any change being made in the controls. It was very interesting to observe how, with an absolutely constant output of power from the engine, the rise and fall of the gradients affected the speed. On the 1 in 660 past Bletchley we were doing 68 m.p.h.; the steeper pitch near Loughton siding, at 1 in 440, brought us up to 72, and now on the ascent to Roade speed gradually fell off to 56 m.p.h. This of course does not compare with our 56 at Tring summit, because impetus played a big part in the high speed at which we passed Roade.

Half way through the very deep cutting beyond this station the summit is reached, and then we were soon doing 60 again. Blisworth, 62¾ miles, was passed in 66½ minutes, 1½ minutes early; there was a glimpse of the aerials of Daventry radio transmitting station away to the west as we swung through Weedon at 60 m.p.h., and once again speed settled down to a minimum of 56 m.p.h. on the rise to Kilsby tunnel. We had now covered the 43.6 miles from Tring to Welton in 40½ minutes at an average speed of 64.5 m.p.h., and were in good trim for an early arrival at Rugby when signals were against us at Kilsby Tunnel South Box. We had to slow up to 25 m.p.h., but they cleared in time to avoid a dead stand; and so we entered Kilsby Tunnel. This is 1 mile 666 yards long, and in addition to a number of small ventilating chimneys there are two shafts 59 ft. in diameter. Seen from the footplate these huge openings look inexpressibly weird: one comes out of one tunnel into a cold grey daylight, and without the usual entrance facings the next stage looks a forbidding hole of smoke-blackened bricks.

We emerged at well over 50 m.p.h., and after a brisk run down past the wireless station, under the L.N.E.R. (Great Central section) viaduct, and over a maze of junctions, we reached Rugby, 82.6 miles in 89¾ minutes, barely a minute late in spite of the check. Had it come a little earlier in the run the time could easily have been made up, for our net time was only 87 minutes. At Rugby I came off the footplate and, after scraping a coating of grime from my face and neck, enjoyed the next stage of the run in the luxury of the train.



A view of the footplate of one of the "Royal Scots."

When writing of one of my L.N.E.R. runs I described the odd feeling one gets on changing from the train to the footplate half way through a journey, but changing the opposite way round left a far more vivid impression. The stock used on "*The Royal Scot*" is most beautifully appointed, and once more there was a feeling of swift effortless travel; but even the preoccupation of a most excellent lunch failed to divert my thoughts from the engine at the head of the train. As it happened, this part of the journey was of less interest from the locomotive point of view, for we experienced a series of signal delays, and although none of them was serious in itself, they prevented us keeping time.

The 75.5 miles from Rugby to Crewe were covered in 82¼ minutes, instead of the 81 minutes booked, though after allowing for checks at Newbold and outside Stafford the net time was only 78 minutes. At Crewe I went back to the engine, but on the first stage of the non-stop run to Carlisle signals were again troublesome, and it was not until we had cleared the industrial districts of Lancashire that we really got going once more. As a matter of fact the schedule in force at that time was made fairly easy through this congested area so as to give scope for lost time recovery. At Crewe our load had been reduced to 12 coaches, 374 tons tare and 400 tons with passengers and luggage, and when Preston was left behind we were running about two minutes late.

The road was clear now, and "*Vesta*" got fully into her stride. We raced through Lancaster, over the Lune viaduct, and a few minutes later were bowling along the shores of Morecambe Bay at 70 m.p.h. Away to the north-west were the Lakeland mountains, only the outposts visible on this hazy afternoon, but an ample hint all the same of the strenuous hill-climbing ahead. We swept through Carnforth, junction for the Furness line, at 68 m.p.h. —dead on time now—and the climb to Shap had begun; in the next 31 miles the line rises nearly 900 ft. The regulator was pushed a bit wider open for the 2½-mile rise past Yealand; here the grade is 1 in 134 and speed fell off to 51 m.p.h., but we rallied splendidly to 65 again on the level before Milnthorpe.

Now the fell country was close at hand; bare outcrops of limestone showed on the hillsides, stone walls took the place of hedges, and we were fairly launched on the Grayrigg bank—13 miles of unbroken ascent. Charlton opened still further out, and after five miles of steep climbing we were still going merrily at 50 m.p.h.; but approaching Oxenholme the grade stiffens to 1 in 111 and the fall in speed became more pronounced. This fine running had gained four minutes in the last 30 miles, and we passed Oxenholme, 91.1 miles from Crewe, in 102 minutes, two minutes early; the 32.7 miles from Brock to Oxenholme had been covered at an average speed of 63 m.p.h.

So well was the engine going that no further opening out was necessary for the rest of the bank. On the 1 in 130 grade above Peat Lane "*Vesta*" boomed away at a steady 38 m.p.h.; lying far below in the valley was Kendal, and to the north the big mountains of the Lake District loomed out of the haze. Round the shoulder of Hay Fell the line swings due east, and we pounded on into what looks like a cul de sac formed of great hills. At Lambrigg viaduct, which crosses a ravine worn by a rushing moorland stream, the grade stiffens to 1 in 106, and on the last two miles up to Grayrigg summit speed fell to 34½ m.p.h.

The engine had now been at work for nearly five hours, but this long climb had made not the slightest difference; she was steaming as freely as from Willesden up to Tring. Once over Grayrigg summit cut-off was brought back to about 30 per cent. again, and Charlton changed over to the first port of the regulator for the slightly falling stretch on to Tebay. Soon we were galloping once more; rounding the double S-curve through Low Gill at 54 m.p.h., we entered the Lune valley, and with the fells rising steeply on both sides of the line, we worked up to 66 m.p.h. at Dillicar troughs. A long wild scream on the whistle, and we were through Tebay, 104.2 miles from Crewe, in 119½ minutes.

Shap incline proper really begins half a mile before Tebay is reached, but for the first 1¾ miles the grade is only 1 in 146; it is after one is through the rock cutting, and out on to the open moorland with Shap Fells away to the west, that the real tug-of-war on the 1 in 75 grade begins. Here one can see for miles, and right ahead was Scout Green "distant" at danger! There is no difficulty in stopping on such a grade as this, and Charlton kept full steam on until we were past the distant. It was of no avail, however, and in spite of frantic appeals on the whistle we were brought to a dead stand right in the middle of Shap incline!

Another photograph of "The Royal Scot" on Tebay troughs. The engine at the head of the train is L.M.S.R. No. 6136, "Goliath."

A more difficult place to restart could hardly be imagined. After half a minute standing the signal cleared, and then the regulator was opened a very small amount. "*Vesta*" took the strain without a sign of slipping, and as we slowly gathered speed Charlton pushed the regulator wider and wider open until she had "the lot," as drivers usually refer to full regulator working. Accelerating magnificently now we passed Shap summit at 24½ m.p.h., still half a minute early in spite of this stop. The 5½ miles from Tebay to Summit had taken only 11¼ minutes inclusive of 40 seconds standing half way up—a really wonderful achievement.

For the first mile after passing the summit "*Vesta*" was let go full tilt, and we swung through Shap station at 61 m.p.h.; but then Charlton practically closed the regulator and lengthened cut-off right out to 55 per cent. to give the cushioning action that I described when writing of the Highland Mail. In spite of this restraint the engine worked up to a steady 71–72 m.p.h. on the 1 in 125 descent, and one or two slight touches of the brake were necessary to prevent the speed from rising still higher.

The line descends through a wild, fascinating country, of rough grasslands, where the hillsides are seared by many a rushing mountain stream, and where the brawling River Leith is crossed and recrossed. Then, as we neared Clifton, the hills fell away and there opened out a glorious prospect of broad vales and wave upon wave of rolling moorland. Penrith Beacon crowned the westernmost flank of one ridge, and farther east the great backbone of the Pennines lay deep in snow. We raced across Clifton Moor, now going 75 m.p.h., but then speed was carefully checked for the curves at Eamont Junction and through Penrith.

The moment we were through the station Charlton opened out again, and soon we were flying through Plumpton at 77 m.p.h.; then came the final descent into Carlisle. We could have done well over 90 here if need be, but the train was before time and there was no necessity for haste. The regulator was practically closed and we spun merrily downhill at 70 to 72 m.p.h. till the Border city came in view. Finishing very quietly, the 141.1 miles from Crewe were completed in 160¾ minutes—4¼ minutes early. Carefully allowing for all delays the net time was only 153 minutes, 12 minutes inside schedule. Adding to this the 5 minutes net gain between Euston and Crewe, Driver Charlton had improved upon the schedule time then in force by no less than 17 minutes. On this splendid trip the net times give a running average as high as 56.6 m.p.h. from London to Carlisle.

Heroism in the Life-boat Service

The great gales that swept the British Isles in the closing weeks of 1936 provided the fleet of the Royal National Life-boat Institution with yet another opportunity of demonstrating its value, and of adding to the some 64,000 lives that it has saved since its beginning in 1824. Most of the life-boats stationed round our coasts were called out in heavy seas, and the crews of these vessels showed wonderful courage and endurance in effecting many thrilling rescues.

One of the most heroic feats of the year was the work of the crew of the Great Yarmouth and Gorleston motor life-boat. At the height of a gale in November, the crew were out on service five times in the course of 35 hours, nearly 18 of which were spent at sea. The first call was to the steamer "*Yewbank*," and while on the way to this vessel, the life-boat was struck by a very heavy sea. Her steering wheel was damaged, all her crew were knocked down, and two of the men were swept overboard. One of these two men had just taken off his left-belt, and would probably have been drowned if his companion in distress had not clutched him. The two men were supported by the one life-belt for a quarter of an hour before they were picked up.

By this time the life-boat had drifted near the breakers and was in danger of being capsized. The boat mechanic crawled along the after box, however, and detached the rudder from the damaged wheel while two men held his feet. This enabled the life-boat to be brought safely in under her hand-steering gear.

A motor life-boat of the 41 ft. Watson type, which is installed in many R.N.L.I. stations on the coast of the British Isles. Our photograph of this vessel is reproduced by courtesy of the Royal National Life-boat Institution.

Two hours later the crew again put out in answer to a signal, one of the two men who had been washed overboard being among them. They could not use their own damaged boat, so they manned the motor life-boat from Cromer, which had been unable to return to her own station after being out on service for 44 hours and had put into Gorleston. In this boat the Great Yarmouth and Gorleston crew went out in answer to four calls during the next 20 hours.

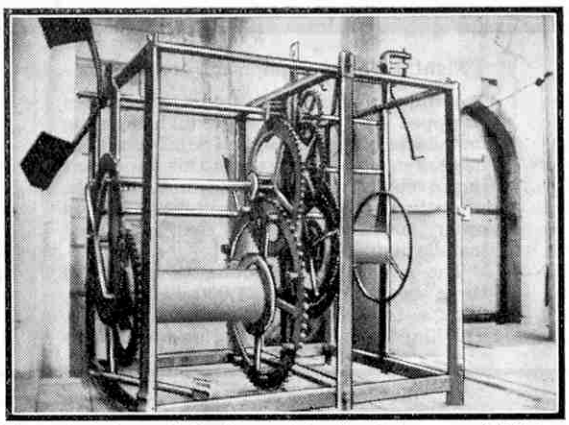
In recognition of their gallantry, the Institution made a money award to the whole crew, and a special award to the life-boatman who after being washed overboard held up his comrade in the sea. Letters of appreciation have been sent to the coxswain and the mechanic of the boat.

England's Oldest Clock

The Ancient Mechanism at Salisbury Cathedral

By T. R. Robinson

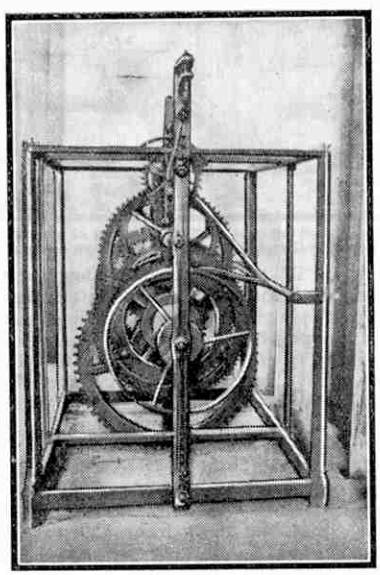
NEARLY everyone has heard of the four famous West Country clocks at Wells, Exeter, Ottery St. Mary and Wimborne respectively, and almost every visitor to the West of England tries to see at least one of these wonderful examples of the craftsmanship of past days. The four clocks must be among the earliest remaining machines in this country, but their historical records were long uncertain, and their correct dates have only been worked out recently, after very careful examination and research, by my friend Mr. R. P. Howgrave-Graham, F.S.A. In the list that he published the clock at Wells held pride of place as the oldest of the four, the date given for its construction being 1392.



The ancient tower clock discovered in the clock room of Salisbury Cathedral by our contributor, Mr. T. R. Robinson.

Soon after the publication of Mr. Howgrave-Graham's conclusions I was on holiday in Salisbury and decided to see the fine modern quarters-chiming clock in the central tower of the Cathedral. Upon entering the clock room I was astonished to see an old clock, standing derelict in a corner, that had a wonderful resemblance to the Wells movement. Enquiry revealed that it was the former clock of the Cathedral. It seemed to me of somewhat more primitive construction than that at Wells, and this led me to suspect that it was of earlier date. I at once took measurements and photographs, and informed Mr. Howgrave-Graham, who commenced investigations that eventually showed the clock to be the oldest yet known to exist in England. It dates from 1386 and thus is the senior of the Wells clock by six years.

The two clocks show an extraordinary similarity of constructional details and ornamentation that make it certain they came from the same workshop. The only real difference between them is that the Salisbury clock strikes the hours, while its brother at Wells also chimes the quarters. This difference is consistent with the fact that the Salisbury clock is an "earlier model." Other features, such as the wheel teeth, the castellated mouldings on the tops of the frame bars, and the buttress mouldings at the bases of the corner posts are practically identical in both clocks.



A side view of the mechanism of the Salisbury clock, the oldest in Great Britain.

The main frame of the Salisbury clock is of wrought iron, and consists of nine upright bars, tied together at the tops and bases by a system of cross members, the whole being wedged together without any screw fastenings whatever. The "going" or timekeeping train has been considerably modified, for the pendulum was unknown at the time when the clock was built, and the form of escapement employed was that of a verge or crown-wheel, controlled by a swinging bar with weights at each end. An example of this type of escapement is still to be seen on the Dover Castle clock at the Science Museum, London.

The swinging bar is known as a foliot-balance, and it was the usual form of controlling device used on clocks until the discovery of the pendulum. It is certain that the Salisbury clock had a foliot-balance, for the holes in the frame that were used to support the bearings and other parts are visible. Further proof is to be found in the fact that the present pallets are fitted to two short iron bars which are obviously later additions. All these things point to the fact that the clock was converted from the verge to the recoil escapement upon the introduction of the pendulum. The Wells clock also shows almost identical signs of conversion, and this leads one to the view that the alterations were made towards the end of the 17th century, when the superiority of the pendulum and recoil escapement became recognised, and it came into general use for clock movements.

The form of the teeth in the original wheels of these clocks is interesting. Little if anything was then known about the theory of toothed gearing, and the teeth were shaped up with chisel and file, the final form being arrived at by trial and error.

The pinions are of the form known as "lantern." They were built up by inserting the ends of iron bars through equally spaced circumferential holes in two iron plates. The ends of the bars were then riveted over to secure the whole pinion together and each bar formed a "tooth" of the resulting pinion. Although the method seems very crude to modern ideas, it produced good serviceable pinions. The central holes in the pinion end plates were squared and the pinion was mounted on a squared portion of its spindle, which was then burred over to secure it in position. The outer edges of the pinion endplates are octagonal, and this is another point of similarity with the clock at Wells. It is surprising to note how very smoothly these wheels and pinions act together.

The rims and spokes of the wheels are made separately and afterwards riveted together. The rim was given the form of an iron circle, while the spokes were forged from rod. The spokes were divided at the ends where they were attached to the rims, which were held in place by riveting the divided spoke ends. The difficulty of getting a true wheel by this method can be imagined, but despite this the wheels are all wonderfully accurate.

The striking train of the clock is apparently in its original condition, only repairs having been made to various parts. It consists of three wheels, the first or main of which carries eight pins that act as cams to raise the striking hammer. The second wheel carries a flange for locking the train at the conclusion of striking, a portion being cut away so that a detent or catch can fall and lock the wheel when a suitable notch in the locking-plate allows it to do so. The actual control of the number of blows struck at each hour is given by a locking-plate of exactly the same type as that used in turret clocks to-day. It is indeed strange to find that this mechanism has scarcely been altered from the time of the construction of the Salisbury clock to the present day. It makes one realise what excellent mechanics these ancient craftsmen were.

Both the winding barrels of the clock are of wood, and still bear the attachments for the old hemp ropes by which the weights drove the clock. Instead of winding ratchet wheels of the usual form, the barrels are provided with spring catches that lock against the spokes of the main wheels, a rather primitive, but very effective contrivance. The winding was carried out by means of a form of capstan device. The ends of the winding barrels were fitted with radial bars and these were grasped by the winder and pulled round. This arrangement remains on the timekeeping part of the clock, but heavy weights were necessary for the striking train and because of this it seems that the capstan there was replaced by a toothed wheel. A pinion meshed with this and gave a reduction gear that eased the labour of winding. That this was a later addition is indicated by the shape of the teeth, and by the fact that it has only three spokes, whereas the original wheels have four.

Apparently the clock had no dial, the striking of the hours alone denoting the time. This seems to have been quite good enough in the leisurely days of our forefathers, for many of the early clocks were similarly arranged. It is certainly the oldest *machine* left to us, and it is hoped that later on it will be set in motion.

The Imperial Airways Fleet

There are now 76 machines in the Imperial Airways fleet, including the new flying boats and landplanes under construction, and their engines develop a total of just over 170,000 h.p.

The new flying boats were fully described in the December 1936 *"M.M.,"* and on this page we publish a further illustration of *"Canopus,"* the first of them. This flying boat and *"Centaurus,"* the third one, are now in service in the Mediterranean. *"Caledonia,"* the second one completed, is to be employed at first on long range test flights to obtain data for the Atlantic service, and another of the machines also will be detailed for a similar purpose. The other 25 flying boats under construction by Short Bros. (Rochester and Bedford) Ltd. will be completed at intervals of less than a month, and will be put into service on different sections of the Empire air routes.

The 12 new landplanes are being built by Sir W. G. Armstrong Whitworth Aircraft Ltd., and delivery of the first is expected next month. These machines are of the high wing monoplane type, and each is to have four engines developing a total of just over 3,000 h.p. Several will be used on the company's Continental routes, and they will be equipped to carry up to 42 passengers. The remainder will be put into service on the main Empire routes.

An unusual view of the Empire flying boat "Canopus" lying at anchor. This machine is in service on the Mediterranean section of the Empire air routes. Photograph by courtesy of Imperial Airways Ltd.

Live Locusts Flown to London

A report recently issued by the London School of Hygiene and Tropical Medicine, in connection with researches into tropical diseases, indicates the value of air transport in the despatch of specimens required for urgent laboratory research. The high speed with which consignments can be brought to London from territories along the Empire air routes enables live specimens of insect pests, such as locusts and mosquitoes, to be packed in special containers and flown to London. Not long ago a box containing 300 live locusts was consigned by air to a laboratory in this country, and on arrival it was found that only a few of the insects had died during the journey.

The report mentions that plans are being made for the transport by air from Greece of certain specimens required in connection with the study of blackwater fever.

Night Lighting Equipment at Jodhpur

Jodhpur aerodrome, India, has been equipped with an up-to-date night lighting installation. The Maharajah Sahib Bahadur has taken a keen interest in this important improvement of the aerodrome, and he recently made a series of night flights in order to inspect fully the completed installation.

The two landing floodlights consist of three banks of three 1,000-watt lamps, with a total candle power of 1,200,000. The illuminated wind direction indicator is of the "T" type, and embodies a device that causes the lamps to flash intermittently when the wind velocity is negligible from the viewpoint of landing. The landing circle is 3,000 ft. in diameter and the lights arranged along its boundary are of the conical type, the whole of the cone, in addition to the globe, being flooded with orange light from one lamp.

The guiding beacon is mounted on the roof of the State Hotel that adjoins the aerodrome. It is fitted with a 1,000-watt lamp, and the light from this revolving beacon has been seen by airmen 100 miles from the aerodrome.

Monospar Ambulance for Roumania

The Roumanian Government have purchased a Monospar ambulance similar to *"Florence Nightingale,"* the ambulance used by the British Red Cross Society. The new ambulance is for use with the Roumanian Air Force, but will be available for civilian ambulance work in emergency.

Air Lines of the World

Recent statistics show that the total mileage of air routes in operation throughout the world is now almost 300,000. When the first commercial services were established 17 years ago the total of the world's air lines was not much more than 3,000 route miles, but in the following year it rose to nearly 10,000 miles, and by 1921 it had passed the 12,000-mile mark. A total of 20,000 miles was reached in 1924, and the figures given below show the great increase that has taken place since then:

1925	34,000	route miles
1926	48,500	,, ,,
1927	54,700	,, ,,
1928	90,700	,, ,,
1929	125,800	,, ,,
1930	156,800	,, ,,
1931	185,100	,, ,,
1932	190,200	,, ,,
1934	223,100	,, ,,
1935	278,200	,, ,,

During 1936 the total was further substantially increased.

Proposed New Airport for Melbourne

At present the chief airport for Melbourne, Australia, is situated seven miles from the city. It is proving inconveniently distant owing to the steady increase in commercial air transport to and from Melbourne, and a plan is being considered for constructing a new airport at Fishermen's Bend, a site only about two miles from the city.

A Douglas Flying Boat

The Douglas Company of America, makers of the well-known DC.2 air liners used extensively on air lines in both the United States and Europe, have turned their attention to the construction of flying boats, and have produced a high wing monoplane flying boat. It is fitted with two Wright "Cyclone" engines and can attain a top speed of 185 m.p.h. The machine is 95 ft. in span and 78 ft. in length, and can carry up to 36 people.

De Havilland Company Build a New Trainer

The de Havilland Aircraft Company are building a new type of low wing training aeroplane to the order of the Air Ministry. Full details are not available, but it is known that the machine will be fitted with side-by-side seating and dual control, and that it will be armed with front and rear guns.

American Base for Trans-Atlantic Service

Pan-American Airways, who are to co-operate with Imperial Airways in operating the trans-Atlantic air service, have chosen Baltimore as the western terminus of the service. The company will lease from the Baltimore authorities 10 acres of the city's new airport, now under construction. This airport is situated on the waterfront at Baltimore and is 360 acres in area.

Aerial Photography in Canada

During a recent period of 12 months the Survey Division of Canadian Airways photographed about 13,000 sq. miles of territory. A considerable amount of the work was carried out in connection with forestry and the study of various types of timber, and large areas of unexploited territory in the north-west of Canada were photographed. Among the problems solved by air photography were the best positions for erecting power stations and electricity pylons, and more than 2,000 miles of land were photographed for the Geographical Survey branch of the Canadian Department of Mines.

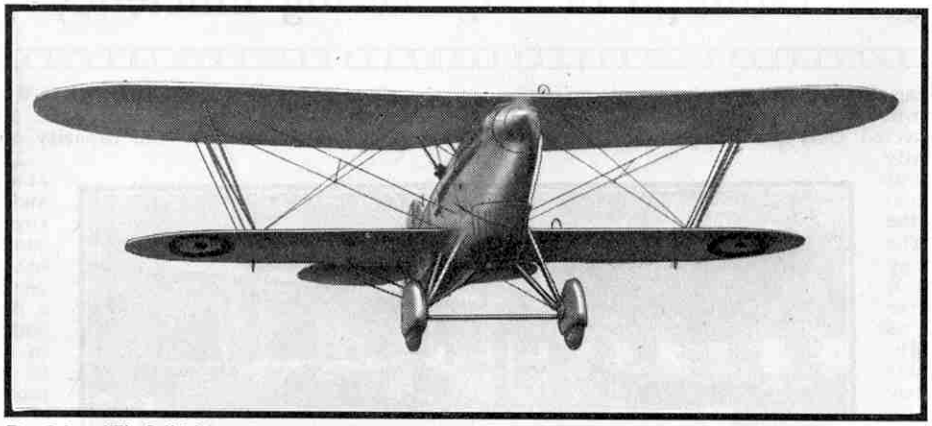
Long Life of Bristol "Jupiter" Engines

Some interesting information compiled by the Bristol Aeroplane Co. Ltd. reveal the remarkably long life of Bristol "Jupiter" engines in service. The 83 engines for which records are given have been employed regularly in a variety of climates, and in normal passenger and freight transport conditions.

The engine with the longest run had operated 6,750 hrs. under service conditions, which is far in excess of the total time attained by any other air line operated engine. Nearly one-third of the engines had been run between 4,500 and 5,000 hrs. Many of them are being replaced by the latest Bristol types, which give improved performance, and but for this fact the "Jupiters" probably would have continued in service much longer. The engines have also operated for much longer periods between overhauls than is the usual practice.

New Altitude Record

A new record altitude flight for aeroplanes other than the light type has been achieved by Major A. Yumashev, a Soviet airman. He used an A.N.T.6 aeroplane, and accompanied by his mechanic, ascended to a height of 29,462 ft., or 5½ miles. The A.N.T.6 is a large multi-engined machine, and each of its four AM-34 engines develops 800 h.p. The previous altitude record for heavy aircraft was also set up by Major Yumashev, when he flew to a height of 26,515 ft. in September 1936. The new record has yet to be confirmed by the Fédération Aéronautique Internationale.



The Fairey "Firefly" high performance single-seater fighter in flight. Many machines of this type are used by the Belgian Army. Photograph by courtesy of Fairey Aviation Co. Ltd.

The Inventor of the Autogiro

The worst air disaster in this country occurred on the 9th December last when a machine of Royal Dutch Air Lines crashed almost immediately after taking off from Croydon Airport in thick fog. Among the 15 people killed was Senor de la Cierva, the famous inventor of the Autogiro.

It is a strange coincidence that it was an aeroplane crash that led de la Cierva in 1919 to invent a machine that could descend slowly and safely to earth. This machine became known as the Autogiro. It differed completely from ordinary aeroplanes, chiefly in having the wings replaced by long articulated blades that were hinged at their root to a single upright rotor. For a long time the Autogiro was regarded more as a freak than as a practical solution of the problem of safe landing, but de la Cierva continued to work upon his invention. Since the formation of the British Cierva Autogiro Co. Ltd., 10 years ago, 18 different and improved types of Autogiro have been produced.

When the practicability of the Autogiro became generally recognised, the inventor was honoured by many countries, and in England the Royal Aeronautical Society awarded him a silver medal in 1932. Since that time de la Cierva has further perfected his invention, and last year he produced an Autogiro that could both rise and descend vertically. This "direct-lifting" machine was described in the October 1936 *"M.M."*

Overhauling one of the engines of "Jupiter," a de Havilland D.H.86 air liner of Railway Air Services, by whose courtesy the photograph is reproduced.

Where Air Liners are "Great White Birds"

Natives in the areas served by the Imperial Airways West Africa air mail are fascinated by the arrival and departure of the aircraft at the various halting places. Whole villages turn out to watch the machines, and some of the native chiefs and dignitaries arrive at the aerodromes in great state. On one occasion a tribal chief walked on to the flying ground complete with top hat and gilded umbrella, and with a number of his retainers forming a band to accompany him and playing a weird collection of instruments as he marched solemnly forward.

Many of the natives of Africa refer to the air liners as "the great white birds," and some actually regard the machines as a form of giant bird. Recently the inhabitants of a remote village came to an intermediate landing ground on one of the Empire routes, and stood watching with awe the descent of a huge four-engined monoplane. "Would you like to be carried up into the air by that big bird?" an aerodrome official asked them. "No," replied one of the natives, "but what we should like would be some of its eggs to take back to our village with us."

A Wireless Tele-Typewriter for Aircraft

The U.S. Secretary of Commerce has announced that a wireless tele-typewriter has been perfected that will produce written weather reports in the cockpit of an air liner. Aircraft equipped with this valuable device will therefore be able to receive simultaneously copies of weather reports broadcast from airports.

Polish Air Service Expansion

The Polish Air Transport Company have extended their Warsaw-Salonika air service to Athens. They employ Douglas air liners, and the 1,000 mile route is covered in 8 hrs.

The company have also carried out the first of a series of trial flights between Warsaw and Haifa, in Palestine, by way of Bucharest, Athens and Rhodes. These flights are a preliminary to a proposed regular service over that route. The initial flight was made with a Douglas D.C.2, and 100,000 letters were carried.

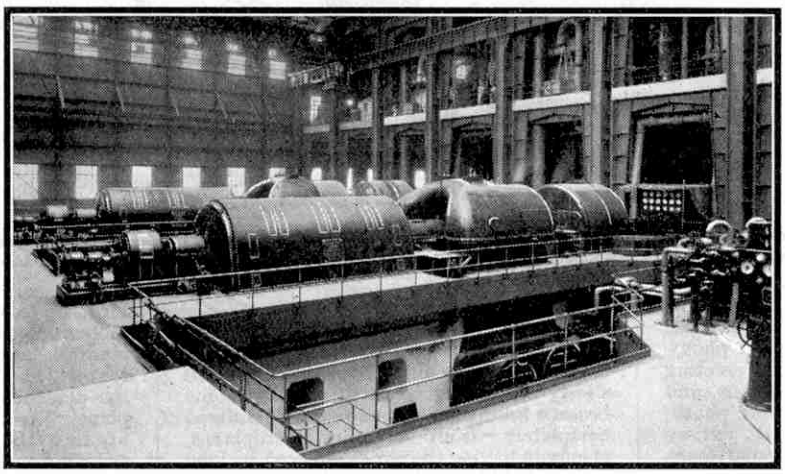
Filming Scenes on Empire Air Routes

An interesting film entitled *"The Future's in the Air"* is to be produced shortly by the Strand Film Company. It will show romantic scenes, and illustrate the life of the peoples, along the great air routes that connect this country with the Dominions, and the film unit entrusted with the task will fly at least 30,000 miles over those routes in the course of making the film.

The New Fulham Power Station

A Triumph of Engineering Efficiency

GREAT interest is being shown in the fine electric power station at Fulham, which will be the largest municipal electricity generating station yet erected. Only the first part has so far been erected and was recently opened. This alone cost £3,820,000, and forms a conspicuous landmark on the bank of the Thames. The complete station will occupy a site 15 acres in extent, with a frontage to the river of some 1,310 ft., and its equipment will be thoroughly modern and of the highest efficiency, as the part now completed shows. It will replace the old station, which was not sufficient for present requirements. This was kept in operation until the present instalment of the complete scheme was finished, and will now be dismantled and removed to make room for the completion of the new station.

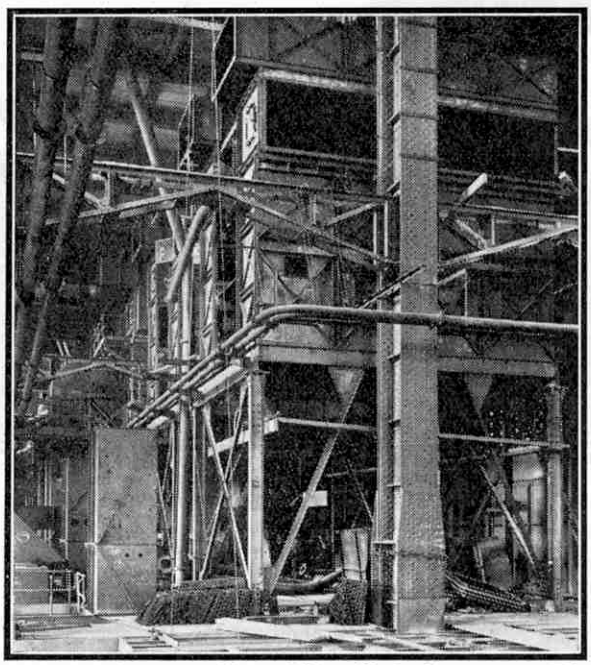


Two turbo-alternators, each generating 60,000 kW, in the new Fulham Power Station. Photograph by courtesy of Metropolitan Vickers Electrical Co. Ltd.

The site of the Fulham power station is in a residential borough only 3½ miles west from the Houses of Parliament, and there were fears that the erection of such a gigantic power plant would spoil the neighbouring areas and be injurious to health because of the smoke, grit and sulphur fumes that would result from the burning of over 2,000 tons of steam coal every day. These fears were removed by experiments at the old Fulham generating station, in which it was shown that the new station would eat its own smoke, and that objectionable products would be almost entirely removed from the gases before they entered the chimney.

Much difficulty had to be overcome in planning and constructing the new station while maintaining the full power output from the old station, which occupied a central position on the site. The total area of the site is roughly divided into two main plots. One covers half of the area and is to be used for fuel accommodation. The other is again divided, half being used for boiler houses and sulphur eliminating plant, and the remainder for the turbine room, transformers and switch houses.

The station is designed to have an ultimate generating capacity of 300,000 kW. The main generators will consist of five sets, each supplying 60,000 kW, and in addition there will be two house service generating sets supplying power for driving auxiliary machinery. Two of the five main sets are now in use, and the third is in course of erection. The first two turbo-generators are supplied with steam from six boilers, and there are also two spare boilers. It is intended to extend the boiler house to double its size in completing the station.



Constructing flue gas scrubbers, which purify the furnace gases. This photograph and those on the next page are by courtesy of James Howden and Co. (Land) Ltd.

Coal is brought up the river by a fleet of colliers, each with a capacity of 2,400 tons, and one shipload of coal per day is just enough to keep the station going. These vessels have been specially designed to meet the navigational conditions. They have an overall length of 245 ft. and a breadth of 48 ft. 3 in. They will pass under a bridge having a clearance of 22 ft. 10 in., and they have a draught when loaded to full capacity of 16 ft. 8 in.

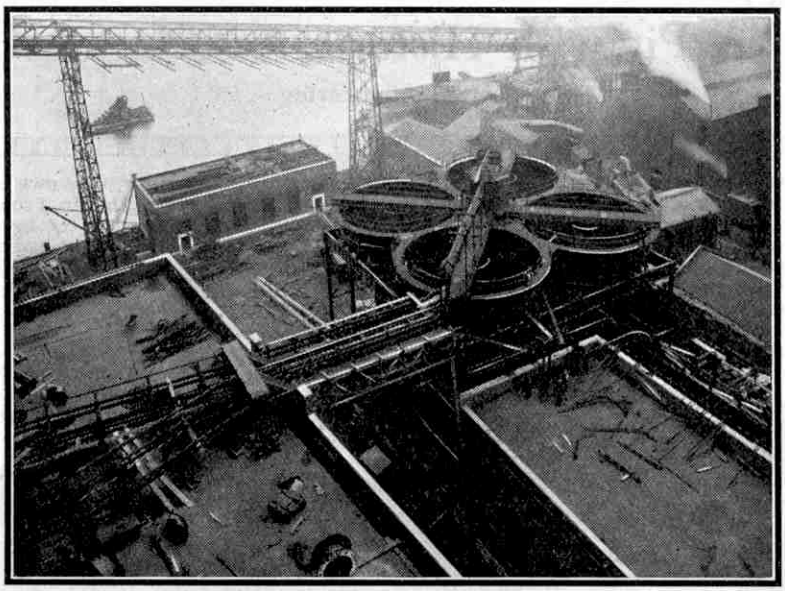
The colliers are unloaded at a jetty that is 360 ft. long and is capable of berthing two of the colliers. To accommodate the jetty the navigation channel had to be diverted and dredged for a distance of 700 yds. In addition an area of 100,000 sq. ft. was dredged in order to give an adequate approach. The jetty was constructed on caisson foundations that support two rows of cast iron cylinders filled with reinforced concrete. These carry the main beams and the reinforced concrete decking.

On the jetty there are three portal type travelling cranes, each capable of handling 200 tons of coal an hour. Each crane has its own movable weigher and this automatically checks the quantity of coal it handles. The coal is discharged from the crane into the automatic weighing machine, which empties it on to two conveyors 36 in. wide. It then passes on to a system of other conveyors, each at right angles to the one before it, that carry it at the rate of 600 tons an hour either to the boiler house bunkers, or to the main coal store. Above each boiler there is a separate bunker to hold 800 tons of coal, and in addition there is the main coal store, with a capacity of 25,000 tons, built in the form of a silo covering an area of 57,500 sq. ft., with retaining walls 5 ft. high. When the silo and the bunkers are full there is sufficient coal in the station to last a fortnight, and the storage capacity will be more than doubled when the old station is removed. The coal can be moved from the silo to the bunkers above the boilers at high speed with great ease. Across the silo is a transporter bridge with a span of 178 ft. This carries two travelling cranes, which lift the coal on to two belt conveyors that carry it to the bunkers at a speed of 300 ft. a minute.

The boiler house is built upon clay foundations 20 ft. below the surface. It is a huge building containing about 9,000 tons of steelwork erected by Dorman, Long and Co. Ltd., and it is interesting to learn that some of the cranes employed in its construction had previously been used in the building of Sydney Harbour Bridge. The largest pieces of steelwork are girders carrying eight coal bunkers. Each of these is 55 ft. long and 10 ft. deep, and weighs 60 tons. Much of the steelwork is bolted together, but even then the number of rivets used in the constructional work is estimated at a quarter of a million.

The boiler house is roughly 150 ft. tall. The boilers occupy the lowest 50 ft. of height, and the bunkers account for approximately another 50 ft. The remaining space contains a variety of components,

including coal conveyors, some of the electrical switch gear and transformers used for service in the station and huge electric fans used to induce draught for the boilers. In addition there are liquor tanks and scrubbers used in connection with the sulphur eliminating plant, and chimney flues that take the cleaned gases from the scrubbers to the two chimneys. The chimneys are of imposing size and height. Each is 150 ft. tall, but their bases are 150 ft. above the ground, and they reach a height of 300 ft. They rise from the roof of the boiler house and are supported on the main steel structure of the building, which has heavy steel grillages in the foundation raft. They are built of concrete reinforced vertically and spirally, and each weigh 800 tons. In the lower part of each chimney, just above the roof of the boiler house, is a platform giving access to chambers in which samples of gas can be taken for analysis, so as to provide a check on the continuous automatic recorder in the boiler house.



Aerial view of the settling plant. In the background is the River Thames and an overhead conveyor carrying coal from the jetty to the boiler bunkers also can be seen.

The station is equipped with Stirling water-tube boilers. In boilers of this type the water is heated in tubes passing through the combustion space, and connecting water drums below with steam drums above. There are two steam drums in each of the boilers in the Fulham Power Station. The front drum is 42 in. in diameter and weighs 28 tons. The rear drum is larger, being 54 in. in diameter and weighing 52 tons, while the water drum is of the same diameter, but weighs 42 tons. All the drums are placed horizontally across the boiler, and the two steam drums on top and the water drum lower down are interconnected by water tubes arranged in 19 rows from front to back, each row containing 60 tubes.

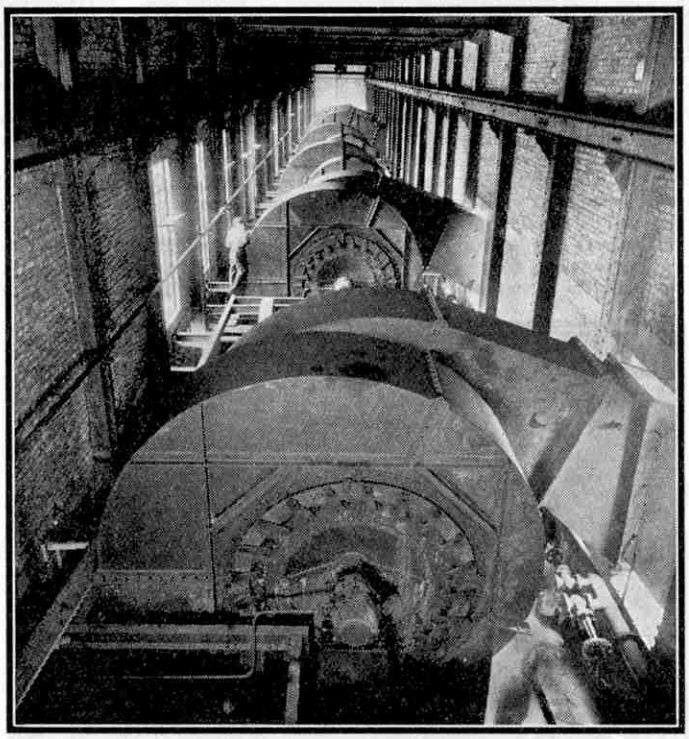
Coal is supplied by a Taylor retort stoker. The total width of the furnace between the walls at the stoker level is over 31 ft., and each stoker consists of 18 retorts, from which the coal is pushed into the furnace by means of plungers. Normally each boiler generates 260,000 lb. of steam per hour. This means that every hour it evaporates 116 tons of water, or a sufficient quantity to fill a house of average size.

We have already referred to the need for preventing grit and sulphur fumes from passing up through the chimney to contaminate the atmosphere. Although the coal used in the boilers of the station contains only a very small proportion of sulphur, about 30 tons of this element are burned every day in the furnaces. This forms a gas, the name of which is sulphur dioxide, that fortunately is readily absorbed by lime and chalk. It is removed therefore by passing the products of burning through scrubbers in which it meets water containing these chemicals.

In order to bring the gases into intimate contact with the washing liquor, the flue gases from each boiler pass through a separate scrubber. This consists of a steel chamber in which is a series of wooden laths piled on top of one another in criss-cross formation to a depth of 4 ft. Thus they form a deep grid or network. The lime and chalk liquor flows over them and such a large surface of this liquid is exposed that practically all the sulphur dioxide is absorbed. Every scrubber is divided into two sections, each of which can be in use while the other is being cleaned or repaired.

The washing liquor is pumped into head tanks above the scrubbers, and falls by gravity over the grids to the bottom before being pumped up again. Fresh lime or chalk is constantly added, and an equivalent quantity of the sludge formed is removed, the liquor being kept in continuous circulation all the time. The products are eventually allowed to settle out of the liquor in a series of conical steel settling tanks. There the excess solid matter is deposited in the form of a sludge, which is withdrawn and filled into barges to be taken away for disposal.

The sulphur eliminating plant removes 98 per cent. of the sulphur contained in the gases leaving the boilers. At the same time any dust or grit is washed out in passing through the scrubbers, and is removed with other solids to the settling tank. The cleaned gases leave the scrubber near the roof of the boiler house, and pass through flues into the base of the chimney. They are forced along these flues by a battery of immense fans that draw them through both the boiler furnace and the scrubbers. The flue gases passing through the scrubber are saturated with moisture when they enter the chimney, and appear at the top in the form of a white vapour, which is quickly absorbed in the atmosphere. The vapour is harmless and does not constitute smoke.



A view down one of the induced draught fan houses, showing the fans that draw gases upwards from the scrubbers or washers and discharge them to the chimneys.

Steam for the boilers passes on to the turbines that drive the generators. The main turbines are of the two-cylinder type, designed to operate with steam at a pressure of 600 lb. per sq. in. and a temperature of 800 deg. F. They run at a speed of 1,500 r.p.m., and this speed is kept constant, no matter how the load varies, by means of governors.

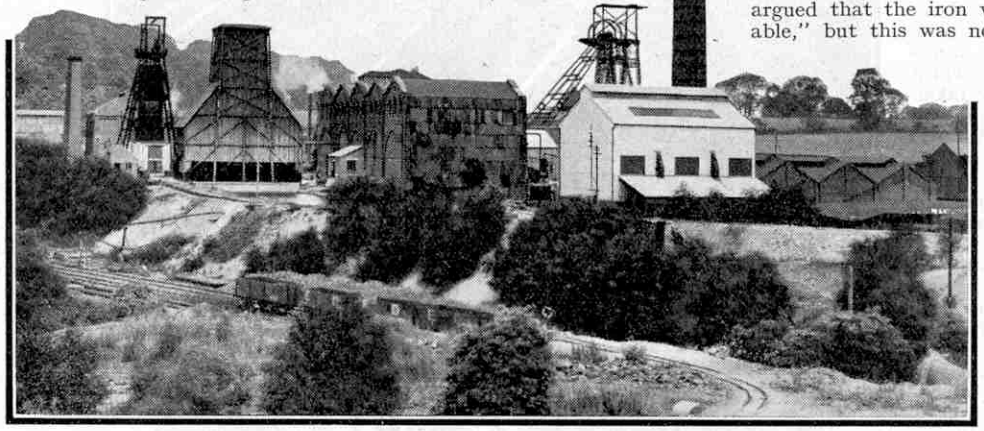
The turbines are mounted in line with the alternators they drive. These are wound for the generation of three-phase current at a frequency of 50 cycles per sec. and a pressure of 11,000 volts. They have yokes of welded steel construction and the rotors are built from solid steel forgings. Heat is developed in their windings when they are at work, and in order to keep the temperature from rising above a specified limit they are continually cooled by blowing air through them by means of fans mounted at the ends of the rotors. The oil for the lubricating and governing systems of each main turbo-alternator is supplied under pressure. This is in continuous circulation, and also is specially cooled by passing through tubes surrounded by water taken from the circulating water system. The oil is circulated by pumps from large tanks below the turbines, in which it is continuously filtered and purified. Each turbine has its own condenser plant. The condensers for the main turbines are among the largest single condensers yet constructed.

Underground in a Modern Colliery

A Pit with Historic Associations

By S. Chatterley

THERE is a very close relation between coal and iron. They lie near together in the earth, and iron ore is so often encountered when coal is mined that it almost seems like a thoughtful and providential arrangement of Nature to suggest the use of coal for smelting the ore. Yet in prehistoric ages, and for centuries afterwards, freshly-felled timber was used to provide the heat for refining the iron, and to yield the charcoal that reduced the ore to metal. The world's supplies of timber were not inexhaustible, however, and the rate at which it could be replaced was limited. It is calculated that four tons of wood were required to produce the charcoal necessary to smelt a ton of iron, and if all the iron in the world to-day had been produced with the aid of the old fuel, there would have been very little wood left. If therefore some other method of smelting iron had not been developed, engineering as we know it to-day could scarcely have existed.



The Baggeridge Colliery, near Dudley. We are indebted to the Earl of Dudley's Baggeridge Colliery Ltd. for our illustrations.

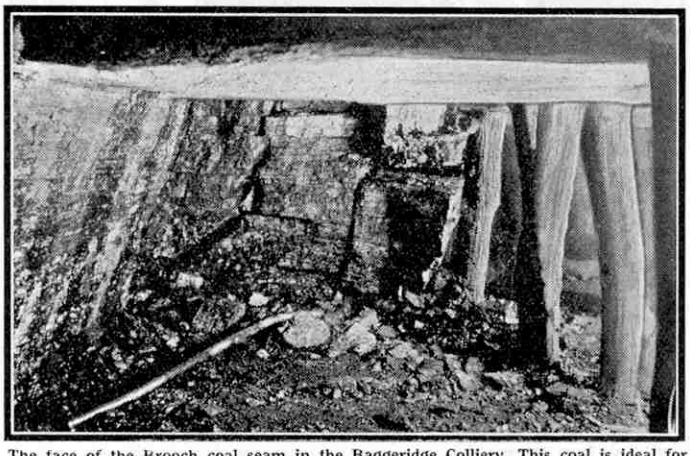
Strange to say, the application of coal to the smelting of iron aroused strenuous opposition when it was first suggested. This is not surprising, for in mediæval times the use of coal for any purpose led to indignant protests because of the smoke and dirt it caused. In 1306 Edward I prohibited the use of "sea-coal," a name that was given to the strange fuel dug out of the earth because it was carried by water from Newcastle to London and other places. The prohibition was strictly enforced, and a man actually was hanged for burning sea-coal in the city of London. The restriction had to be removed when the huge demand for wood threatened the destruction of our forests. Timber was required also for ship-building, the erection of houses and many other purposes, and it became so scarce that people were glad to make use of coal who previously had been so prejudiced against it that they would not enter a room in which it had been burned, or eat meat that had been roasted with a coal fire.

Coal-mining slowly developed during the 17th century, when a considerable export trade was built up, and about this time it was first used for the smelting of iron. The pioneer in this work was Lord Dudley, or Dud-Dudley as he is usually called, a Staffordshire man who made "good merchantable iron" in his father's ironworks in the Chase of Pensnett, Staffordshire. In 1619 Dud-Dudley was granted a patent by King James I to use coal for smelting, extracting and reducing minerals and metals, and specimens of the ironwork that he produced by this novel means were sent to King James for his examination. An interesting story shows that Dud-Dudley's iron must have been of excellent quality. One of the samples was a fowling gun made of his metal, and it is recorded that this was "taken by a Colonel Levison, a Governor of Dudley Castle, who never restored it." Presumably the Colonel found the gun so good that he determined to keep it for his own use and enjoyment.

Dud-Dudley showed that iron could be smelted successfully with coal, and also proved that the new process was cheaper. Perhaps this was one reason for the opposition that he encountered. This rose to a head when the inventor's works were washed away in a great flood on May Day in 1620. Those who disliked the new method then petitioned the King to annul the patent he had granted, and to forbid Dud-Dudley to build new furnaces. They argued that the iron was "not merchantable," but this was not sufficient for the King, who commanded that further samples should be submitted.

The Royal artists and smiths pronounced the iron excellent, and so Dud-Dudley was allowed to continue smelting and refining iron by means of coal without hindrance until four years later, when Parliament abolished all monopolies. Even then he was able to carry on his work, but his patent was limited to 14 years. Later King Charles I also granted him a patent to "smelt, extract, refine and reduce all kinds of metals, pit-cole, sea-cole, peat and turf." Unfortunately the outbreak of the Civil War prevented the inventor from extending his work and caused the patent to become extinct.

This was the beginning of the close association between coal and iron that has contributed so much to the industrial success of Great Britain. Coal mining became a necessity, and the search for coal became more intensive as the demand for iron increased. The South Staffordshire area was the scene of Dud-Dudley's early activities. At that time mining there, and indeed everywhere, was confined chiefly to seams that lay at the surface or near it, but these were soon exhausted and it became necessary to burrow deeper into the earth. To-day there stand near the scene of Dud-Dudley's labours the surface buildings of Baggeridge Colliery, a large mine equipped throughout with the most modern plant, and employing about 1,500 men, that owes its existence to the energy and courage of one of his descendants. The seams worked in it are at varying depths up to 1,800 or 2,100 ft., and include one yielding "Brooch" coal, an ideal household fuel, and another that is 30 ft. thick and is appropriately known as the "Thick Coal" seam.



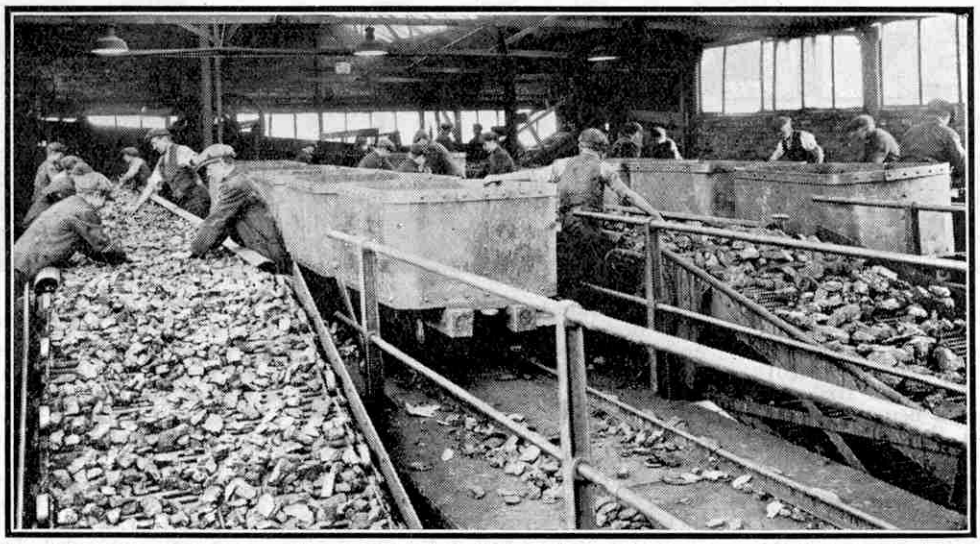
The face of the Brooch coal seam in the Baggeridge Colliery. This coal is ideal for household use. Another seam in this pit is 10 yds. in thickness.

When visiting the Baggeridge Colliery, I was shown first the boiler house and engine rooms. In the former are Babcock and Wilcox water-tube boilers generating steam at a pressure of 250 lb. per sq. in. Each is capable of raising 25,000 lb. of steam per hour for use in the two winding engine houses and in the power house. No risk of breakdown is taken, a battery of Lancashire boilers standing by in readiness to take over the duty of supplying steam in emergency.

The winding engines interested me greatly, as I was later to go

down the shaft. The main engine is of the twin tandem compound type, and was made by Fraser and Chalmers Ltd. It has 28 in. high pressure and 45 in. low pressure cylinders, with valve gear of the Corliss type, and is designed to lift 7½ tons from a depth of 1,800 ft. and to raise and lower 100 men at a time. The operator sits with the controls within easy reach, and the signals guiding him are both audible and visible.

Men were being lowered and raised while I watched him, a lighted dial indicating this by showing the word "MEN." Presently a bell rang and, as the operator commenced winding, a white finger began to move round a black dial on which the stopping places were plainly marked. These places were also indicated on the winding drum. The bell rang to give warning that the cages were near their appointed stopping places, and the great drum on which the cable was wound was gently brought to rest in the correct position. The engines are equipped with the latest safety devices, and the cages are provided with safety hooks.



At work in a section of the picking beds in the screening plant. All the coal is hand picked, passing on belts in front of the pickers.

Then came the most thrilling part of the visit. With other members of the party I lined up for my lamp. This burned oil, but electric lamps also are used in the mine, and all of course are of the safety type. We next went to the shaft head, and there packed ourselves into the top deck of the cage; the gate was shut and bolted, the signal was given and down we went.

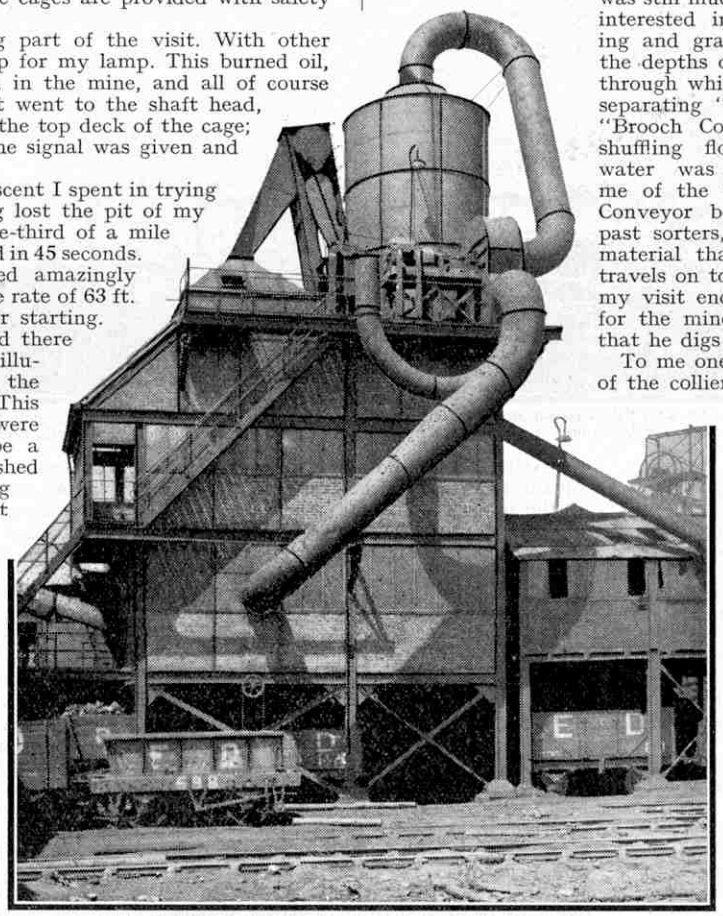
The first few seconds of the descent I spent in trying to resist the sensation of having lost the pit of my stomach. We had more than one-third of a mile to go, but the distance was covered in 45 seconds. Speed in the shaft is developed amazingly quickly, the cage travelling at the rate of 63 ft. per sec. only seven seconds after starting. The wind whistled round us, and there was some excitement over the illusion that we were ascending the shaft instead of descending it. This did not last long, and soon we were staring into what seemed to be a well lighted and freshly white-washed cellar, with haulage lads staring back at us. We had arrived at the foot of the shaft.

Our guide led us through an air lock, a portion of the underground roadway divided off by doors to form a compartment that would hold about 200 men. This and other locks control the air in the mine in the same manner that canal locks control water. Fresh air is forced along each road, and we were made aware of the ventilation system by the breeze and by the force required to open the doors of the locks against it. Only one door at a time is allowed open.

Along the main road we presently came to an electric winding engine set back in an alcove. The operator could not see the wagons that his engine hauled, for the haulage cable passes under the doors of an air lock, which the wagons do not enter. In the lighted road beyond we watched for several minutes, with a haulage cable racing past us, and presently saw the bright lights of a train approaching us. This train had seats with backs to the centre on which we sat while we were carried forward towards the workings. These are at a considerable distance from the pit bottom, and the underground cable railway has been built out of consideration for the men, who otherwise would have had to walk a long way to and from work.

On alighting we passed through more stables and walked on, mostly with bent backs to avoid low roof timbers. At length we arrived at the coal face at a point that our guide told us was under a place on the surface about a mile and a half from the pithead. We collected in a gallery, where there was a short lecture and a discussion on coal getting, and then chatted with individual miners. The heat seemed appalling to me, and I envied the miners, who wore only trousers, clogs and caps.

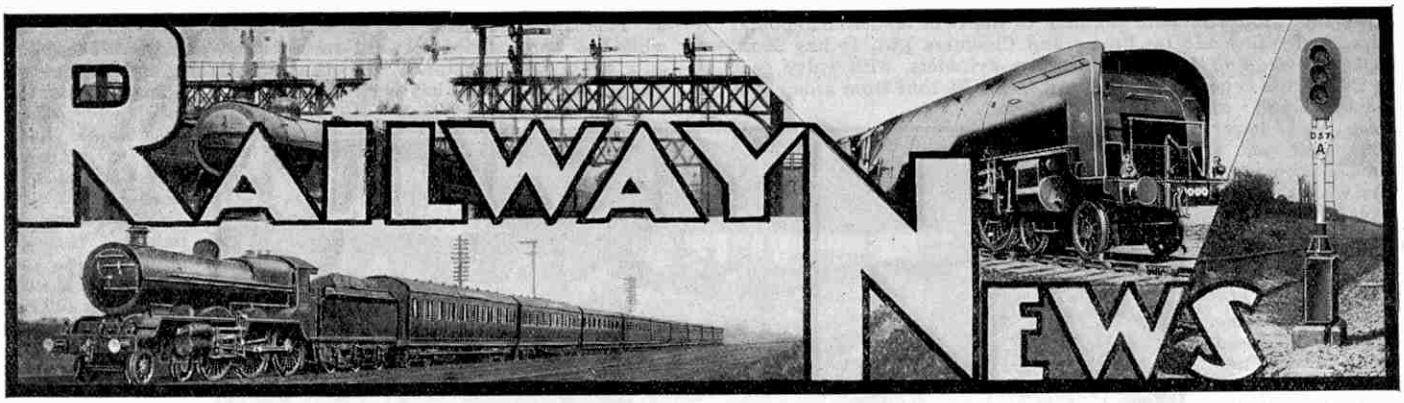
We returned to the shaft, travelling again on the miners' railway, and eventually found ourselves at the pithead once more. There was still much to see there, and I was greatly interested in the care employed in cleaning and grading the coal brought up from the depths of the mine. The screening plant through which it passes is of modern design, separating "Thick Coal" into six sizes and "Brooch Coal" into five, and its gigantic shuffling floors and riddles, over which water was constantly flushed, reminded me of the action of a threshing machine. Conveyor belts carry the washed product past sorters, who pick out shale and other material that will not burn, and the coal travels on to fall into waiting wagons. When my visit ended I had gained a new respect for the miner, and for the black diamonds that he digs out of the earth.



The pneumatic coal cleaning plant at the Baggeridge Colliery.

To me one of the most interesting features of the colliery was the provision for bathing and changing their clothes that is afforded to the miners. When the men arrive at work they remove their clean clothes and hang them in a locker to await their return, donning their pit clothes, which they keep in a separate locker, only when ready to go down the shaft. On returning from work the men first clean their boots and grease them, using electrical apparatus for this purpose, and then remove their working clothes before passing on to the cubicles in which they bathe. These are splendidly fitted and provided with an ample supply of hot and cold water, and the clothes left behind on entering them are dried and aired. The layout of the building is so arranged that the progress of the miners through it in each direction is direct, the men leaving at the opposite side to that at which they enter. A splendid canteen and an ambulance station are included.

The baths were erected by the Miners' Welfare Committee. They were opened in 1931 and are controlled by a committee representing both the owners and the workpeople.



L.M.S.R. World Speed Record

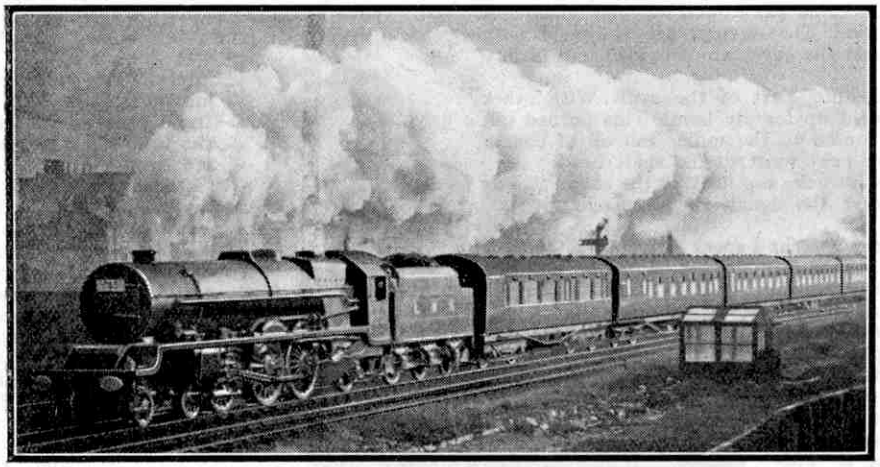
A magnificent performance was put up by L.M.S.R. 4–6–2 locomotive No. 6201, "*Princess Elizabeth*," in special trial runs on the West Coast route between Euston and Glasgow and back. For the purpose of the trials an experimental schedule of 6 hrs. was laid down, but on the down journey the train reached Glasgow in just over 5 hrs. 53 min., 6½ min. ahead of time, and on the return journey with an added coach Euston was reached in just over 5 hrs. 44 min. The average speed from London to Glasgow was 68.1 m.p.h., and that of the return journey was 70 m.p.h., a record for long-distance non-stop steam travel.

Favourable weather prevailed on the journey to Glasgow and the test train accelerated with such rapidity that the 7½ miles rising gradient of 1 in 339 from Wembley to Hatch End was breasted at 73.5 m.p.h. On the drop to Leighton Buzzard speed reached 95.7 m.p.h., and descending to Hartford the maximum speed was 93.7 m.p.h. The most magnificent performances were, however, attained on Shap Fell and Beattock. The 31.4 miles from Carnforth to Shap Summit were covered at an average speed of 70.5 m.p.h., and the 10 miles climb to Beattock Summit, with an average gradient of 1 in 75, were covered in 9½ min., speed never falling below 56 m.p.h.

The return run to Euston the next day was even more meritorious. The train lost 1½ min. on schedule to Carstairs, but by an astonishingly rapid climb to Beattock Summit this loss was converted into a gain of 3 min. The lowest speed on the 13.5 miles gradient from Lamington to the summit was 66.5 m.p.h.

The six miles between Winsford Junction and Coppenhall Junction were covered at an average speed of 90 m.p.h., with a maximum of 95 m.p.h., and a sustained speed of 90 m.p.h. was attained between Lichfield and Tamworth, and again near Castlethorpe and Hemel Hempstead. Between Bletchley and Tring the average speed was 81.7 m.p.h., with a minimum of 77.6 m.p.h. at the summit of the Chiltern Hills.

The coaching stock used for both journeys was of the latest standard L.M.S. design, the train consisting of dynamometer car, composite brake, corridor first, vestibule first, kitchen car, vestibule third, and brake third. For the return journey an additional vestibule third was added.



L.M.S. 4-6-2 No. 6201 "Princess Elizabeth" near Preston during the record run from Euston to Glasgow described on this page. The dynamometer car can be seen next to the engine. Photograph by W. S. Garth, Preston.

Streamlined London Tube Trains

The L.P.T.B. has ordered from the Metropolitan-Cammel Carriage and Wagon Co. Ltd., of Birmingham, four six-car tube trains of an experimental character for use on the outer suburban railways. In the new trains the driver's seat in the motor compartment is situated in the centre and the controls are conveniently placed close at hand. The seat can be reversed for use by the guard when the train is travelling in the opposite direction.

In view of the exacting service conditions the rate of acceleration has been increased, while the braking rate has also been increased. This is an important factor, especially in peak periods.

The bogies for these new tube trains are of all-welded construction, and are fitted with wheels that have a diameter of 2 ft. 7 in. only instead of the 3 ft. diameter wheels usual on London tube trains.

Russian High Pressure Locomotive Boiler

A locomotive with a new type of flash boiler with condenser is to be constructed at the Kolomensk Locomotive Works near Moscow. The steam pressure in this boiler will be 1,400 lb. per sq. in., and it is said that the consumption of fuel will be less than in existing boilers. The engine will be able to travel 7,000 miles without having to take water.

A striking feature of the new engine will be the cab, which will be arranged at the front of the engine, thus affording the driver a clear view ahead.

Station Improvements on G.W.R.

At Criccieth, Ashton Gate, Horfield, Truro, Kidderminster, and St. Agnes stations, general improvements are to be carried out. At Criccieth, Ashton Gate, and Horfield the station buildings are to be modernised, while those at Ashton Gate are to be entirely rebuilt. At Criccieth, the platforms are to be raised to the standard height above rail level and a verandah roof covering provided. The sidings at Kidderminster are to be remodelled and new goods loop lines are to be added to facilitate the working of trains between there and Worcester.

At St. Agnes station, the existing station platform is to be replaced by an island platform 300 ft. in length. A verandah will be provided to the station buildings and access to the island platforms will be by means of a footbridge. In addition a new signal cabin will be constructed.

Engine shed improvements are to be carried out at Aberystwyth and Glyn Neath. The former shed is to be reconstructed and extended to 210 ft. in length. The work will include the provision of new workshops and boiler house and bigger engine cleaning pits. Glyn Neath shed is to be enlarged and an additional siding and a new coal stage are to be provided.

New L.M.S.R. Main Line Bridge over the River Clyde

Rapid progress is being made with the new viaduct that is to carry the L.M.S.R. main line over the River Clyde at Lamington. The viaduct will permit much higher speeds than are now allowed over the existing bridge, where there is a speed restriction of 40 m.p.h., and speeds of about 75 or 80 m.p.h. will be permissible at this point when it is brought into use.

The old viaduct, comprising four spans of bowstring lattice girders, is being replaced by steel plate girders with a concrete-covered, steel-beam floor supported partly by the masonry piers of the old bridge, and partly by new mass concrete pier extensions which are sunk 11 ft. below the bed of the Clyde. Four pumps, removing 100,000 gallons of water an hour, have been required to keep the working spaces dry while the piers were being sunk.

Repairs to Summit Tunnel

For over six years, Littleborough (Summit) Tunnel has been undergoing heavy repairs and over a million bricks have already been used. The tunnel is on the main line of the former Lancashire and Yorkshire Railway between Manchester and Yorkshire, and was built in 1839 to the design of George Stephenson. It is 2,885 yds., or more than a mile and a half in length.

A feature of the repairs is that they are being carried out without any interference to traffic, except for temporary speed restrictions, although on busy days as many as 500 or 600 trains pass through the tunnel. In order to protect the workmen a special system of warning bells is in use. They are operated by a lookout man from a position at the mouth of the tunnel. Another lookout man is also stationed near the working party, and he repeats the warning to each man, who must acknowledge it. Gongs, automatically worked by the wheels of the trains, warn the enginemen to slow down at the site at which work is in progress.

G.W.R. to Build 286 Engines in 1937

This year 286 new locomotives are to be constructed by the G.W.R. at their Swindon Works. These will include 25 "Castles," 10 "Halls," 20 "Earls," 20 "Manors." In addition 294 passenger steel coaches are to be built, of which 174 will be of the new end vestibule type. Two new trains consisting of coaches with centre vestibules, designed specially for pleasure parties also to be built.

The programme also includes the construction of 150 horse boxes, 50 eight-wheeled trucks and 6 eight-wheeled Kitchen Cars, making a total of 500 passenger train vehicles.

For freight services the G.W.R. are to build 3,940 new wagons and 750 of these will be vacuum fitted for use on express freight services. At the present time the G.W.R. stock of containers is 1,680 and during the coming year a further 200 are to be constructed. These will consist of four types including Insulated, Bicycle, Large Covered and Furniture Removal.

A Record Through Run

Officers and over 500 men of the 1st Batt. Highland Light Infantry who recently arrived back in this country after serving in Egypt made what is probably a record through run for a British railway. They travelled from Southampton to Fort George, Scotland. Two trains were required, the first of which left at 6 o'clock on a Saturday evening and arrived at Fort George over 600 miles away in 17 hours.

The trains consisted of S.R. vestibuled stock labelled "Waterloo-Southampton Docks" and on their long journeys passed through Birmingham, Carlisle and Perth.

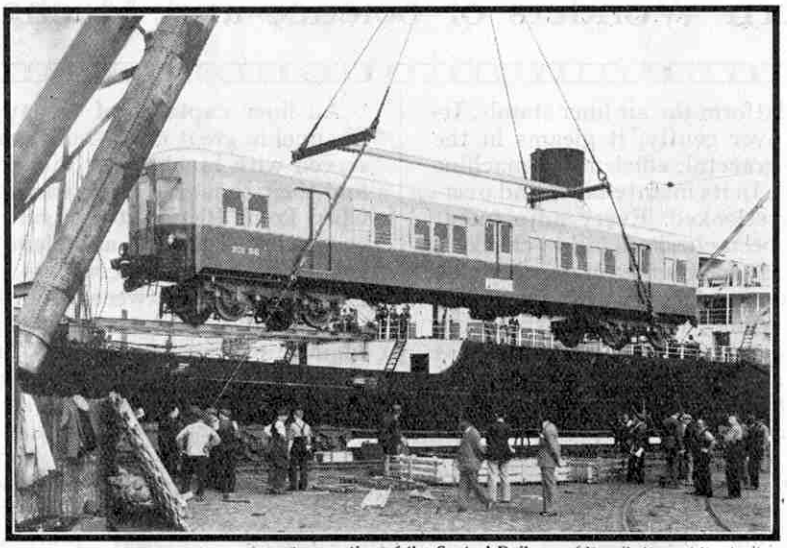
Progress of Wirral Electrification Scheme

Rapid progress is being made with the electrification of the Wirrall Railway. A considerable amount of the permanent way is being relaid, and a new embankment is being constructed between Bidston Station and Seacombe Junction in order to increase track capacity between these two points. Other improvements that are being carried out include the raising and extending of the platforms to meet modern requirements and the provision of new station buildings and electric lighting is being installed at all stations. A new station is to be built at Manor Road, Hoylake.

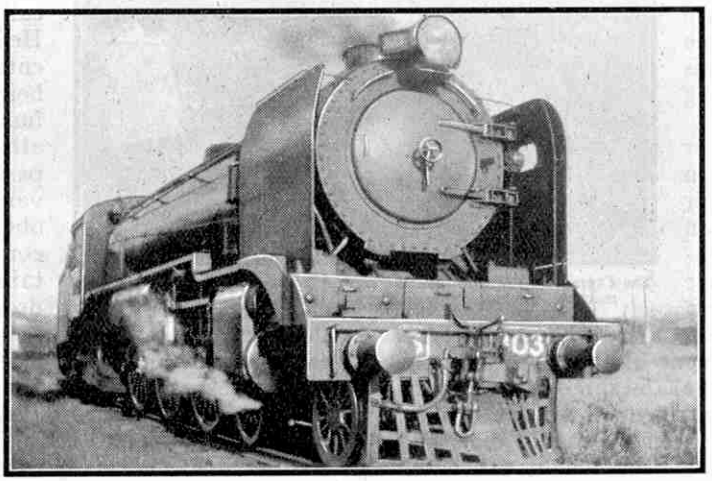
A feature of the track contact system, which is on the "third rail" system, is that the bonds for the conductor rails and running rails and the preparation for cable connections will be welded to the rails.

* * * *

The G.W.R. announce that during this year approximately 400 miles of track are to be completely relayed or partially renewed. The greater part of the work, especially that on the main line routes, will be carried out in the early months, so as to avoid any dislocation of summer traffic.



New coaches for the electrified suburban section of the Central Railway of Brazil. One of the trailer coaches is seen being lifted aboard the "Bonheur" at Birkenhead ready for shipment. Photograph by courtesy of Metropolitan-Vickers Electrical Company Ltd., Manchester.



This illustration shows a Victorian Government Railway "Pacific," fitted with smoke deflectors similar to those used by the L.M.S.R. and S.R. in this country. Photograph by R. Watson, Australia.

Modernising L.N.E.R. Branch Lines

Plans for the improvement and modernisation of two important L.N.E.R. branch lines have now been completed. Traffic on the Ipswich to Felixstowe branch has increased considerably during the last two years, and in order to modernise the line and provide for future development it is proposed to double it between Derby Road and Felixstowe Town, a distance of 9½ miles. At Westerfield the down platform is to be extended and a loop line provided; at Derby Road additional platform and siding accommodation is to be laid down; and the platforms at Trimley are to be extended. At Felixstowe Town an additional island platform is to be built, and a loop and an additional carriage siding are to be provided. A new 60 ft. turntable also is to be installed in place of the existing 50 ft. table.

A section of the six miles stretch of single track between Soham and Snailwell Junction, Newmarket, also is to be doubled in order to speed up traffic. Improvements are to be made at Fordham, including the provision of a new reception goods line.

Air-Conditioned Coaches for Malaya

The Birmingham Railway Carriage and Wagon Company have recently completed two first-class carriages with electro-mechanical air-conditioning equipment for the Federated Malay States Railways. The coaches are over 60 ft. in length and the bodies and underframes are of all-steel construction. They are divided into two open saloons having accommodation for 12 and 8 passengers respectively.

The air-conditioning equipment provides an ample supply of fresh air, free from dust, and automatically maintains the correct temperature and degree of humidity inside the compartments. The air is drawn through louvres in the vestibule doors and passes through a grille in the ceiling. The dust is removed by passing through viscous oil filters. The air is finally drawn into twin centrifugal fans and then distributed evenly without draught throughout the vehicle.

70 ft. Turntable for Southend

A new 70 ft. articulated locomotive turntable is to be installed at the L.N.E.R. Southend Locomotive Depot. This will be supplied by Messrs. Cowans Sheldon and Co. Ltd., who have recently supplied many new turntables including the large one installed at Euston.

* * * *

The L.N.E.R. propose to construct this year 652 new coaches of various descriptions. Of these, 484 will be of the vestibuled corridor type for main line services. Only 84 non-vestibuled passenger coaches are to be constructed, and these are for use on the suburban services of the L.N.E.R. system.

In the Control Cabin of an Air Liner

Modern Wonders of Science and Mechanics

OUT on the departure platform the air liner stands. Its four big engines tick over gently; it gleams in the summer sun, looking slim, graceful, efficient—a machine of beauty as well as of speed. In its maintenance and overhaul no detail has been overlooked. Every adjustment made by the engineers has been checked and re-checked, and before it stands here ready for another of its scheduled flights it has been signed out as "airworthy" by an Air Ministry Inspector. The whole system—construction, operation, maintenance, overhaul—is as infallible as human brains can make it.

The air liner's First Officer goes aboard before the arrival of the Captain. He looks over everything with an expert eye; he runs up the engines and listens to their smooth rhythm. Now passengers, mails, and freight are coming aboard, and the Captain himself appears and enters the control cabin. The hands of the clock on the control tower point to the minute of departure. Promptly, on receiving the necessary signal, the big aircraft taxies away and faces into wind. The Captain opens up his engines. Forward the air liner surges, faster and yet faster. Now its big wheels are just skimming the aerodrome surface, and a moment later it is fully air-borne and climbing steadily.

The Captain at the wheel, in the control cabin of an Imperial Airways machine. Photograph by courtesy of Jarche & Weekly Illustrated.

The Captain and First Officer settle themselves comfortably in their control cabin. From their outlook windows they have an excellent view, while the instruments on the dashboard are grouped so as to make them easy for inspection. The Captain grasps a hand-wheel, his feet rest on pedals. A movement of the wheel governs ascent and descent, and also the lateral movement of the air liner; while the pedal control operates the rudder.

The instrument-board presents an array of dials and gauges. One registers air speed, another height; others tell their story of the running of the engines—revolutions, temperatures, etc. An ingenious piece of mechanism is the "artificial horizon," which is a gyroscopic apparatus. When an air liner is flying in cloud or fog, and those controlling it can see no ordinary horizon by which to judge the angle or inclination of their machine in relation to the surface of land or sea, this "artificial horizon" comes infallibly into play. By keeping his eye on a dial or small screen, and by watching the position of a tiny aircraft in relation to an artificial horizon-line, the pilot can maintain his machine on just as even a keel as though he has the full power of normal vision.

Air-liner captains of to-day, passing out above the Channel in great metal-built craft, with passengers being served with luncheon or dinner in luxury saloons, often find their thoughts going back to that day, 27 years ago, when Louis Blériot steered out over this same stretch of water on the first aeroplane flight from France to England. Not even a compass had that pioneer. Wireless communication between aircraft and the ground was not to come till years later; and, as a contrast to the four big engines of present-day air liners, giving a total of thousands of horse-power, Blériot had to rely on one tiny motor developing only about 25 horse-power.

Air voyages of to-day proceed with the smooth precision of a journey by ocean liner or long-distance train. Wireless signals report the passage of an aircraft from point to point along its route. The Captain, whenever he decides to walk back through the saloons to see that his passengers are comfortable, relinquishes the handling of the air liner to his First Officer, who has a duplicate set of controls in front of him.

The First Officer is methodically busy throughout the flight. He has his log-book to attend to, entering in it details as to height and speed, and as to the functioning of the engines and other mechanical equipment. He passes wireless messages to the various air-stations en route; he obtains weather reports and communicates these to his Captain. All the time the air liner drones along a mile or so above the earth, maintaining its schedule to the minute, and eating up the miles with a precision which, in itself, illustrates the progress that has been made in air transport since those early stages when one pilot took three days to make the 250 miles' trip from London to Paris, and another had as many as 18 forced landings while endeavouring to complete a similar journey!

Instruments in an air liner's cockpit, and on the ground, make modern landings as smooth and effortless as is the passage of the aircraft through the air. Sensitive height recorders can be brought into play when an air liner nears the earth. There are wireless "lighthouses" and guiding rays, also wonderful floodlights and fog-piercing beacons. Science and mechanics between them have wrought wonders in the air. They have replaced human vision with forms of artificial vision. They have annihilated distance by enabling men far above the clouds to converse easily with those below in ground stations.

Westland Army Co-operation Monoplane

New High Speed Type Adopted by R.A.F.

MOST types of military aeroplanes are designed for a particular class of work, such as reconnaissance, bombing, or fighting. It is becoming increasingly common for such aeroplanes to be made adaptable for carrying out more than one of these duties, and this applies especially to machines designed for work in co-operation with the Army.

The work of the Army Co-operation pilot is far more individual than that of any other fighting unit. In modern aerial warfare mass formation tactics are extensively employed, as exemplified by bomber and fighter squadrons, but the Army Co-operation pilot does most of his work single - handed. His responsibilities are therefore very great, and it is of first-rate importance that his machine should be easy to fly at all speeds. It is also essential that it should have a wide range of speed, that is low speed for spotting and reconnaissance work and high speed so that the information obtained can be brought back to the Army Commander with great rapidity.

The new Westland Army Co-operation monoplane, which has been adopted as standard equipment for the R.A.F. Photograph by courtesy of Westland Aircraft Limited.

The Westland Army Co-operation aeroplane recently adopted as standard equipment for the R.A.F., and illustrated on this page, is the latest example of this important type of military aeroplane. It was designed and built within a year, and made its first public appearance at the R.A.F. Display at Hendon last June, but it was not flown on that occasion. The aeroplane is a high wing, single-engined monoplane, with an overall length of 30 ft. and a wing span of 50 ft. The wings are tapered toward the tips, and are fitted with Handley Page automatic slots and flaps to enable the aeroplane to land slowly and to ascend from small fields, an essential ability in a machine of this type as during a war it often has to operate from improvised landing grounds near the front line. Each wing is braced by long inclined "V" struts extending from the underside of the wing to the sloping fairing that encloses a leg of the undercarriage.

The enclosed cabin for the pilot is in the upper part of the deep fuselage and well in front of the wings, so that the pilot has an exceptionally fine outlook. The gunner occupies an enclosed cockpit aft of the wings where he is able to defend the aeroplane from attack, and at the same time has a view that enables him to co-operate with the pilot to the maximum efficiency.

Power is supplied by a Bristol "Mercury" supercharged air-cooled, radial engine, which drives a controllable-pitch airscrew. Around the engine is an adjustable cowling fitted with controllable devices to assist cooling and to reduce drag, or wind resistance. The performance figures of the aeroplane cannot be published, but it is known to be much faster than any Army Co-operation aircraft yet produced.

The machine is also of interest as being the first newly designed production of Westland Aircraft Ltd., the company which was formed to take over the aircraft branch of Petters Ltd. This branch came into existence in 1915, and during its early years it was concerned chiefly with the construction of various war types of aircraft to other firms' designs. It began with the Short Seaplane and went on to produce Sopwith 1½-Strutters, then the standard two-seater fighter. The D.H.4, D.H.9, and the improved type D.H.9A designed by the Westland company, were extensively produced in large quantities, and two interesting types in production at the end of the War were the Westland "Wagtail" and "Weasel," single-seater and two-seater machines respectively. All these types were biplanes.

In 1927 the Company produced the "Wapiti," a two-seater general purpose biplane designed to replace the D.H.9A. The new type became so popular that at one time there were more R.A.F. squadrons provided with it than with any other make. It was also adopted by the South African and South Australian Air Forces.

Research work on monoplanes had been begun in 1923, and a thick wing cantilever transport monoplane produced in 1924. It was damaged during its first test flight, however, and work on it was discontinued. The production of an interesting series of low and high wing aeroplanes began soon afterwards. One of the most successful of the high wing type has been the "Wessex," and several of these monoplanes were supplied to Imperial Airways and to internal air line companies, Railway Air Services inaugurating their line with them.

An interesting variant of the high wing monoplane type was the Pterodactyl IV, an experimental tail-less, single-seater machine. The Mark V Pterodactyl was the first attempt at producing a serious war weapon of this type. Later a two-seater version was built. The design has been left in abeyance for the present.

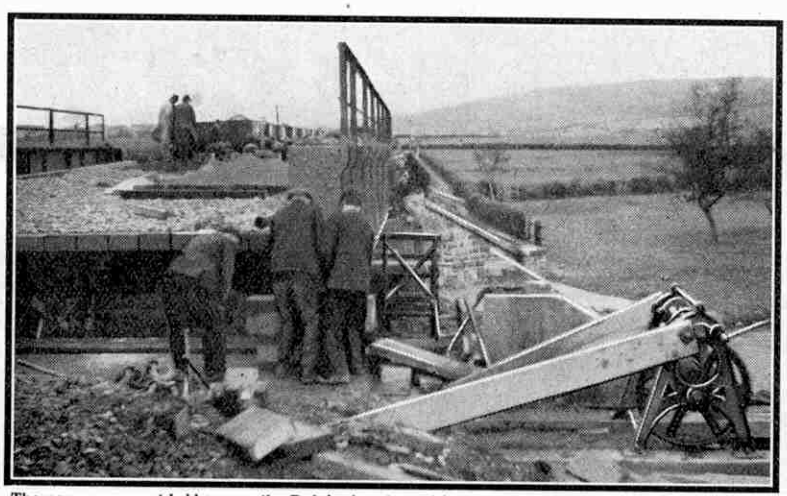
Notable Bridge Reconstruction on the G.W.R.

Emergency Work after Storm Havoc

By a Railway Engineer

A RAPID bridge reconstruction was carried out on the Aberystwyth main line of the Great Western Railway in November last, when a single-line viaduct of three spans was dismantled and a new bridge having a single span of 50 ft. brought into service, all within a space of 24 hours. But this operation, interesting though it was, provided only the closing chapters of a story wilder and more improbable than much fiction; a tale of extraordinary havoc wrought by storms, and of simple country people who showed wonderful presence of mind in the face of danger.

During the week-end of 20th and 21st June, 1936, in the Newtown district of Montgomeryshire, events moved more like the scenario of an American screen melodrama than happenings on a British railway. The whole of England was swept by storms of great violence, but in these Welsh hills both rain and thunder were of an almost tropical intensity. Conditions were bad enough on the Saturday when the river Severn overflowed and Newtown itself was flooded to an unparalleled extent, but so far the railway had suffered no harm. Through this district the main line of the one-time Cambrian Railways, now part of the G.W.R., follows the Severn valley, and it carries a large proportion of the holiday traffic to the Cambrian Coast resorts.



The new permanent bridge over the Dulais river in position. The men in the foreground are at work at the jacks. Photographs by courtesy of the G.W.R.

Late on the Sunday afternoon things were beginning to look ugly at Scafell, a hamlet some two miles west of Newtown. The tiny station here is one of the few in charge of a stationmistress, and the lady in question is the wife of a retired permanent way man, ex-Ganger Haynes. At 6 p.m. the thunderstorms culminated in a terrific cloudburst in the hills south of the Severn valley, which caused the rivers to rise so rapidly that Haynes feared for the safety of the railway. It was not the Severn that seemed the most potential source of danger, but the Dulais river, which comes down from the very hills where the cloudburst had taken place. So, at the height of the storm, Haynes and his daughter went out to keep watch at the bridge.

Just at the point where the Dulais enters the Severn it is crossed by the railway, running on a 20-ft. embankment the foot of which is washed on the north side by the waters of the Severn. At that time the bridge over the Dulais river was a solid masonry structure with an arch of 25 ft. span. When Haynes and his daughter arrived on the scene the neighbouring fields were already flooded, and the little river, normally nothing more than a turbulent mountain stream, was a really terrifying sight. An incredible volume of water was sweeping down, carrying all before it; bushes along the banks were being torn up as if they were tender seedlings, and the force of this onrush was scouring out the banks and bringing great pressure on the abutments of the railway bridge.

Dulais farmhouse, just on the Newtown side of the river, was completely marooned, the ground floor rooms being flooded to a depth of five or six feet; and in the hope of being able to help the unfortunate people there Haynes and his daughter crossed the railway bridge. They were hardly over when a still more unexpected thing happened. On the Scafell side of the Dulais river was a group of huge venerable elms; under the tremendous wind these were waving like so many reeds, when suddenly one of them was completely uprooted by the rush of water. By some extraordinary freak of wind and water it was borne downstream in a perfectly upright position, and a few seconds later had crashed into the railway bridge. It struck the parapet, which was at once destroyed; the tree rebounded, and was then dragged under the arch by the force of the current. Its passage ripped away the brickwork at the crown of the arch, and immediately the whole bridge collapsed. A curious point noted by Haynes was that the downstream side of the arch fell in first.

The telegraph wires were undamaged, and at once Haynes thought of the up mail, which had already left Aberystwyth. Between them and the telephone at Scafell station was a breach in the line 60 ft. long across which the tracks were suspended in mid-air. The only thing to do was to go to Newtown and send warning from there. The storm was now if possible worse than ever, and yet, amid darkness almost of night, in torrents of rain and incessant thunder, Miss Haynes set out to walk two miles down the line to give the alarm. It was by no means certain that she could get through. The way might easily be barred by floods or another washaway; so Haynes attempted to get back to his home by way of the road, which runs parallel to the railway and about a quarter of a mile away.

By going a short distance from the course of the river he was able to wade across the flooded fields, and eventually he got to the road. This also was under water, but he managed to cross the river. He was hardly over when this bridge too was swept away. All the time the mail train was getting nearer. There are no signals at Scafell, and the bridge is approached on a curve from a deep cutting; speed is usually 50 to 55 m.p.h. at this point, and travelling thus on a day of poor visibility the driver would never be able to see the breach in time. But when at last Haynes reached his home and telephoned through to Caersws, the next station open, he learned that his daughter had been in time and the train was stopped.

But even now that tragedy was averted the task of these plucky folk was not ended. Sunday evening is proverbially a bad time to find people in a hurry, but Haynes managed to get into telephone communication with the Bridge Foreman at Caersws, and from his own railway experience was able to tell him the exact nature of the washaway. This was of no little help later in the evening when plans were made for bridging the gap. And then, as if he had not rendered enough service, Haynes went out on to the main road to warn motorists of the broken bridge, and continued to do so until 2 o'clock next morning!

The scene now moved to Divisional Headquarters at Oswestry, 30 miles away to the north. Late that evening the Bridge Foreman at Caersws was able to get into touch with the Divisional Engineer by telephone, and largely due to Haynes' report he was able to describe very clearly what had happened. A breach in the main line called for very rapid action, especially as the full summer service was due to come into operation in a fortnight's time. So that very night a little conference of three, hastily summoned, prepared a scheme for a new bridge, and before midnight the necessary material had been ordered by wire.

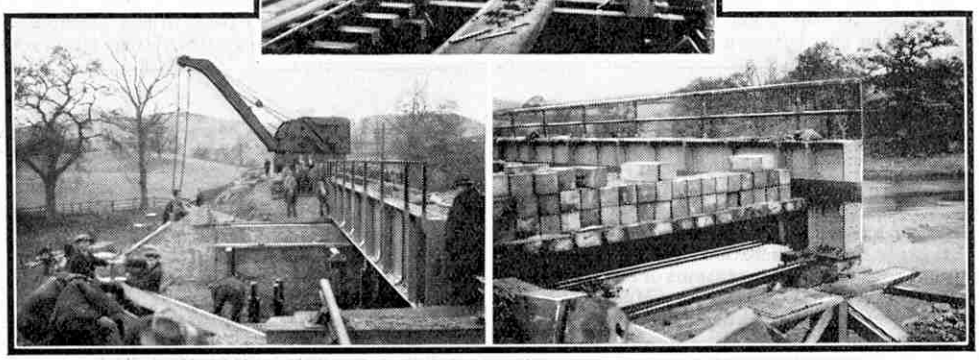
To have constructed a new permanent bridge to deal with traffic at normal speed would have meant delaying the reopening of the line for many weeks, and so a temporary structure was decided upon. This would carry a single line of rails and necessitate all trains crossing at dead slow speed; but after all the great thing was to get the line open again.

On the morning after the storm the country was an unforgettable sight. The course of the Dulais river was one continuous trail of destruction; what remained of the railway bridge was lying out in

the Severn; a filling station on the main road had been completely smashed up, and petrol pumps, a tea shelter, and other debris lay all over the surrounding fields. In order that the railway service could be restored, arrangements were made for a fleet of buses to operate between Newtown and Caersws, and on the Tuesday after the washaway, in spite of delay in getting the requisite material at such short notice, reconstruction work on the bridge began.

Two piers were first of all erected, each consisting of eight timber piles. These piles were 12 in. square, and were driven into the bed of the river, deeper and deeper, until at each blow of the pile driver they sank only half an inch. In both piers the piles were arranged in two rows of four, with the rows at right angles to the line of the railway; then each row was surmounted by a horizontal timber, or cap beam as it is called, and the uprights were strongly cross-braced. Finally, on each pier were fixed two short longitudinal timbers, known as corbels, to support the main girders of the temporary bridge. Six second-hand girders, each about 30 ft. long, had been obtained for the temporary bridge; the centre span however was only 25 ft. and this necessitated cutting two of the girders by an oxy-acetylene flame. The original arch was only 25 ft. span, but the new structure was thus 85 ft. long. In the meantime other gangs were busy on the approach tracks. Crossover roads had to be laid in on both sides of the bridge. As I mentioned earlier, there were no signals at Scafell station, and two temporary signal boxes had therefore to be put in, to control the points leading to the single-line section over the bridge. This meant alterations to the block working between Newtown and Caersws, and single-line token working over the bridge itself. But by Sunday, 28th June, the whole job was finished, and that afternoon the line was restored to the Traffic Department at 4.30 p.m. in time for the up Welsh Coast Express to pass safely over the breach.

From that time until mid-November, this rough and ready though tremendously strong bridge carried the whole of the traffic, though every train had to slow down to 5 m.p.h. In the meantime the new permanent bridge was being built alongside. Then, at 9.45 p.m. on Saturday, 14th November, the Engineering Department were given absolute possession of the line between Newtown and Moat Lane Junction and by 6.45 p.m. the following day the temporary structure had been dismantled, the new bridge placed in position, and a double-line of railway restored. By the kindness of the G.W.R. authorities I was privileged to watch this very interesting changeover work.



(Top.) Laying the track across the temporary bridge. The plank-way on the left is laid along the suspended track of the old bridge. (Bottom, left.) Rolling in the new bridge. The men can be seen tugging at the winches. (Bottom, right.) The new bridge before being rolled into position, with concrete blocks for the ballast wall piled on its deck.

About 9.30 p.m. on the Saturday, in company with one of the engineers, I set off from Newtown in the direction of the bridge. We had not gone far when a shrill whistle echoed through the night; in the still air came the loud exhaust of a heavy train slowly gathering speed. It was the 6.30 p.m. up goods from Aberystwyth, the last train to pass over the temporary bridge. As soon as she was clear of Newtown, an Engineering Department special would leave Moat Lane for Dulais bridge. As we walked to the site my friend told me something of the traffic working arrangements.

For getting the various gangs to and from the site no less than six special trains were being run, and by these trains were brought materials, equipment, and a 15-ton steam crane. Arrangements had to be made for the relief of the various engine crews and guards, and every single detail of the traffic working schemed out beforehand right down to such small but important items as the watering of engines. Then, in addition to all these specials, there was the ordinary traffic to be considered, though normally there is only one regular train during the time that the line would be occupied, the 6.15 on Sunday morning, from Oswestry to Aberystwyth. It had been arranged for this to terminate at Newtown, and for buses to convey its passengers, luggage and newspapers to Caersws, where another train would be waiting.

When we got to the bridge the special from Caersws had already arrived and the night gang were fairly getting down to it. It was an enthralling scene. Resting on two temporary stages built out towards the river Severn, the new superstructure lay alongside the old; across it a battery of acetylene flares were lined up throwing a fierce vivid light over the whole scene. From the Newtown bank of the Dulais river a powerful carbide floodlight lit up the timber piers and upstream side of the temporary bridge.

Dismantling began at the Newtown end. First of all the permanent way was taken up from the first span, and at the end of the central span a heavy baulk of timber was lashed across the rails to act as a skotch block. Then the crane was brought on to the central span ready to lift out the first two main girders. In the temporary bridge the track had been carried on stout timber cross beams, 12 in. square, resting on the inner flanges of the main girders. The girders themselves were held together by means of steel ties very similar to the kind used in the permanent way for preserving the gauge at points and crossings.

Getting the cross beams out was no light task, for the timbers had settled very slightly into the steelwork and this made their sawing off much more difficult. But to an onlooker the most hazardous feature of the whole business was that there was no solid deck to the bridge. Standing on the central span and watching the work in progress, one looked down straight through to the river beneath, glistening in the glare of the lights. Yet on this open framework men moved about in the semi-dark with a sure-footedness that was extraordinary to watch, and when occasion demanded a man would swing himself down on to one of the lower beams, and then up again, with the agility of a gymnast. Just before midnight I left the bridge and made my way back to Newtown.

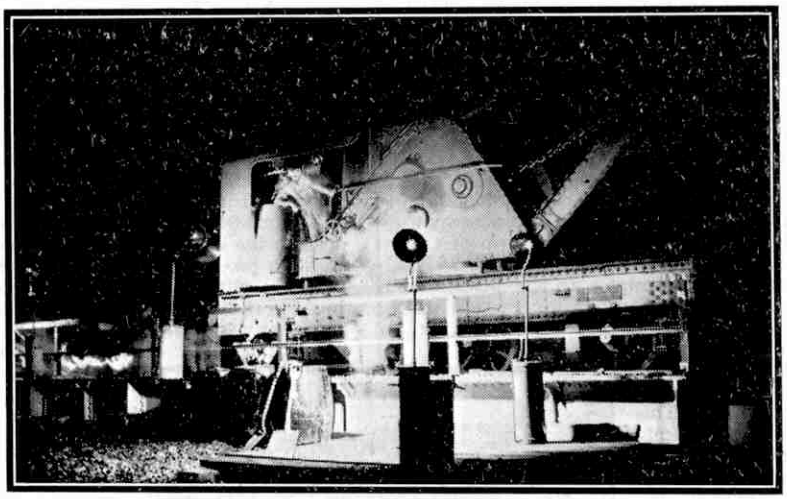
* * * *

At 7.15 next morning I got to Newtown station a few minutes after the 6.15 Mail train from Oswestry had arrived, and joined a bus-load of sleepy and thoroughly mystified passengers. Heavy luggage and newspapers were loaded on to lorries, and we were quickly away. A swift run brought us to Dulais bridge in about five minutes; here my friend of the night before and I got out, leaving the improvised "Mail" to continue to Caersws. At first sight it did not appear as though they had made very rapid progress during the night; all six girders were removed, but nearly all the piles comprising the piers were standing, and the gang were engaged on the slow and arduous job of sawing them off. They were hoping to roll in the new bridge at 9 a.m., but quite an amount remained to be done before the major operation could be carried out.

Now that the temporary girders were removed the design of the new bridge could be studied easily. At the time of the storm, when the old masonry arch was demolished, the abutment on the Newtown side stood firm. From this foundation a new brick facing was built on to the abutment, extending upward from the point of springing of the old arch, and two massive concrete blocks each weighing 30 cwt. were let into the brickwork to form the bedstones for the new girders. On the Caersws side of the river an entirely new abutment had to be built. A very substantial foundation was made, well below river-bed level; consisting of a strongly reinforced concrete footing resting on 12 timber piles. On to this footing the abutment proper was built, in mass concrete, containing a number of large stones about 7 ft. cube, known as "plums." On the outward side the concrete was faced with brick, and bedstones were let in as on the opposite abutment.

The new steel superstructure, riveted up complete, was resting on four carriages each having a small roller running on ball bearings. A track had been provided for each of these rollers by laying a couple of rails across the top of each abutment; each rail was laid on its side so that the rollers could run in the wide groove between the two flanges. Two winches were fixed on the upstream side of the embankment, and a steel wire was passed round a pulley on the far side of the new bridge. The superstructure itself is of conventional type; there are 12 cross girders, resting on the inner flanges of the two main girders, and on these cross girders is laid a creosoted timber deck that carries the permanent way. The track is ballasted across the bridge in the usual way for a cross sleeper road.

Rapid progress had been made during the last hour with sawing off the piles, the roller tracks were carefully brushed out so as to make the going as smooth as possible, and at 8.45 a.m. all was ready to roll in the new steelwork. The centre line of the railway was then marked on each abutment, and on the centre line of the bridge proper a plumb line was fixed at each end of the span. Then, with six men on each winch, the new structure was slowly hauled into position. The whole operation was most impressive in its quiet efficiency. An occasional whistle from the inspector in charge; a few short periods when the men were tugging at the winch handles with all their might, and several stops so that the inspector could measure that both ends were being pulled over equally. In 18 minutes the new bridge, weighing 78 tons, had been hauled into its final resting place. Numerous checks were then made, and its position was found to be dead true to within one-sixteenth of an inch.



The 15-ton steam crane seen in the light of powerful acetylene lamps during the night operations.

The roller carriages had now to be removed from the under side of the girders. At each of the four bedstones the girders were raised up by means of hydraulic jacks, and then, after the carriages had been unbolted and taken away, the girders were gently lowered into position. Finally, on top of each abutment, a ballast wall had to be built to fill the gap between the top of the abutment and the deck of the bridge. This wall was constructed of pre-cast concrete blocks. Once this was finished, the gap between the bridge and the embankment could be filled in and the track laid across the bridge. But all this part of the job takes a good deal longer than might be imagined, and although the rolling-in was completed at about 9.10 a.m. it was not until well after mid-day that the ballast walls were finished and a start could be made with filling in the gap.

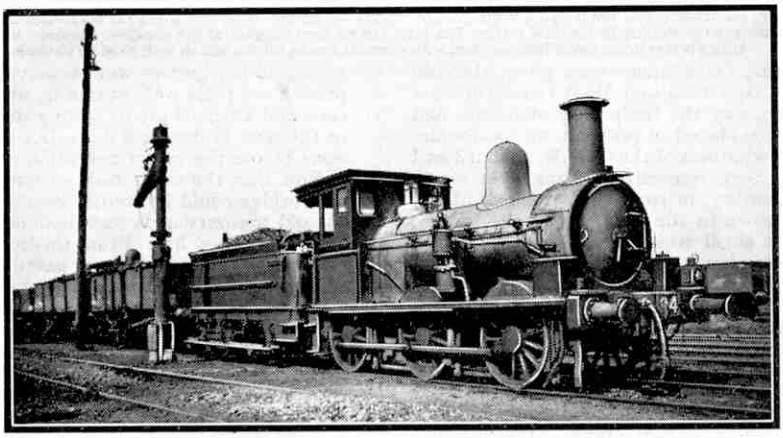
At the same time the less spectacular parts of the job were progressing fast. One permanent way gang were busy taking out the cross-over at Dulais, and restoring the two straight roads; another gang were doing a similar job at the Scafell end. Signal Department men were dismantling the temporary signal boxes, and taking up point rodding, facing point locks, signal wire, wheels, and all the other paraphernalia involved.

Shortly after mid-day a steady cold rain began, and getting heavier and heavier continued without a break throughout the afternoon till everyone was soaked to the skin. This greatly impeded the progress of the job, but nevertheless it was finished well ahead of programme time, and at 6.45 p.m. the line was handed back to the Traffic Department. At 8 o'clock, in murk and blinding rain, the up mail crossed the new bridge.

A Veteran Australian Locomotive

FROM time to time we learn with regret of the disappearance of some fine old locomotive that in its prime was a great favourite with railway enthusiasts, or has been in service for so long a time that it has come to be regarded with veneration. A few locomotives of this kind find permanent resting places in stations or engine sheds, and some are carefully preserved in York Railway Museum. Most necessarily are scrapped, however, and the knowledge that this fate probably awaits the veterans now at work increases our interest in them during their last days of usefulness.

A long-service locomotive of this type is shown in the illustration accompanying this article. This is an Australian veteran that can still be seen at work on the Victorian Government Railways after service of more than 53 years. It is No. 94 of the 0–6–0 "T" class and was built in 1884 at the Phoenix Foundry, in Ballarat, Victoria. It was not the only member of the class that was built at the time, and there actually is another still at work. This is No. 92, which is distinguished by the possession of a stove-pipe funnel.



A veteran Australian locomotive, No. 94 of Class "T" of the Victorian Government Railways. Prize-winning photograph by R. Pearson, Richmond, E.1, Victoria. (H.R.C. No. 29199.)

These two remaining engines of "T" class are among the oldest locomotives to be found in service in Australia. They were originally built for main line goods traffic, and had a very hard life of it while engaged in this work. The continual increase in weight of freight trains, and the modern demand for faster schedules, made it necessary to introduce engines of considerably more power than these veterans could produce, and this, together with their advancing years, led to the withdrawal of the old 0–6–0s. They were still capable of giving good service, however, and lighter duties were found for them.

The two locomotives are now engaged in shunting in and around North Melbourne Locomotive Sheds. They work mainly between the docks and the coal heaps, where they spend their days in pushing loaded trucks up the ramp to the locomotive coaling plant, and in carrying out any odd duties that may arise. They are specially suitable for this type of work, as with their short six-coupled wheelbase they are able to negotiate satisfactorily the sharp curves that often are a feature of the tracks round docks and engine sheds. In addition they are able to run without difficulty on rails that are not provided with the firm bed required on main lines.

An interesting feature of No. 94 is a light stain on its otherwise sombre exterior. This has an amusing origin, for it is a memento of an occasion when an employee of a local flour mill shot the contents of a bag of flour over the locomotive.

Modern conditions in Australia are greatly different from those of the time when Class "T" engines were in their prime. Exceptionally heavy freight trains are now common, and more powerful locomotives have had to be built to deal with them. The chief locomotives employed on goods traffic on the Victorian Government Railways are of the 2–8–0 and 2–8–2 or "Mikado" type. The 2–8–0 locomotives form what is known as "C" class. They have cylinders measuring 22 in. by 28 in., and driving wheels of 5 ft. diameter. Their boiler pressure is 200 lb. per sq. in., and at 80 per cent. of this they exert a tractive effort of 36,138 lb. The total weight of the engine and tender in working order is 128 tons 4 cwt.

The "Mikado" engines, or "Class X" as they are known, are even larger, the engine and tender weighing together 185 tons 6 cwt. They have cylinders and driving wheels of the same sizes as those of the "C" class, but their boiler pressure is 205 lb. per sq. in., and their tractive effort 46,040 lb. A booster that adds 9,000 lb. to the tractive effort is fitted to each.

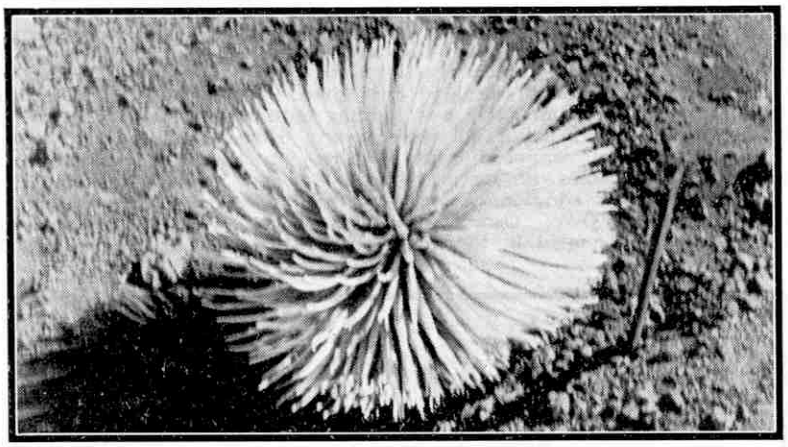
Plants that Grow in a Volcanic Crater

The Silverswords of Hawaii

By Dr. David D. Keck

FOR their size, the Hawaiian Islands represent the most isolated land area in the world. In consequence of this extreme isolation, the plant and animal life upon them is highly specialised and unique, about 90 per cent. of the plant species being peculiar to the islands. Probably no other region has so high a proportion of species confined to it alone.

The origin of this flora and fauna has long been a biological puzzle, for the early ancestors of the species which now inhabit the islands must have come from without. This is necessarily so if, as is generally believed, the islands are of oceanic origin, that is, if they arose from the depths of the ocean. It is commonly accepted that the present archipelago has been built up entirely through volcanic action, and even to the present day two of its volcanoes remain active.



A rosette of the large silversword, a rare plant that grows only in the Hawaiian Islands. The plant gets its name from its sword-like leaves. The illustrations to this article are reproduced by courtesy of the Carnegie Institution of Washington.

Some scientists oppose the view of their oceanic origin and substitute the idea that the Islands have not always been so isolated as at present, but may even be of continental origin. These believe that the present chain of islands represents only the tips of volcanic mountain masses superimposed upon a large block of land that has gradually subsided into the sea.

It has long been suspected that the Antarctic Continent, which at present is a forbidding waste of snow and ice with no land available for the growth of flowering plants, must have supported a flourishing flora in prehistoric times, as recently as early Tertiary time at least, and was probably connected both with Australia and South America.

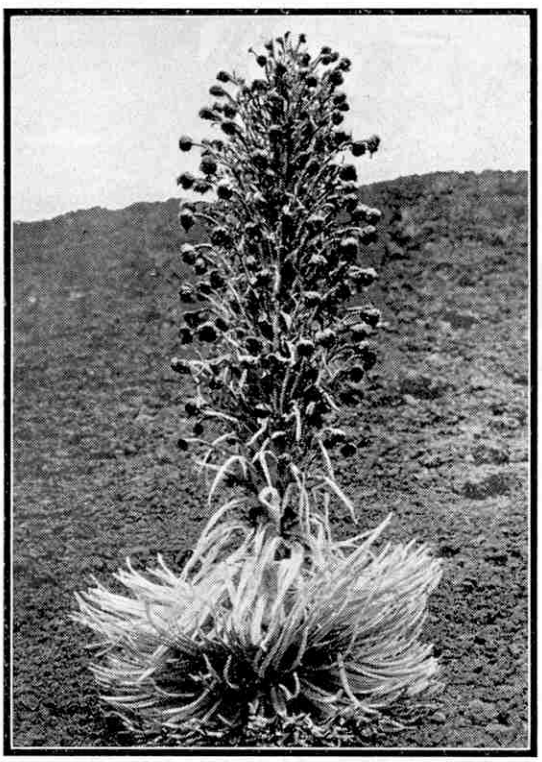
Botanists explain the obvious similarities and relationships between the floras of southern South America and Australia and New Zealand on the assumption that a migration route between them was available to plants for a long period of time. Supposed remnants of that early flora are found at several points in the Southern Hemisphere and it is a possibility that the ancestors of the older elements in the Pacific flora emigrated from that southern region, among them the forerunners of the aborescent or tree-like members of the Compositae known as the silverswords. These are for the most part native in the high mountains of Hawaii. The large silversword is an alpine plant in a tropical land, for it is confined to the slopes above 7,000 ft. on Mauna Loa, Mauna Kea and Hualalai, on the Island of Hawaii, and to Haleakala, on Maui, the four highest peaks on the Islands. The first two peaks mentioned rise to an elevation of nearly 14,000 feet.

The Crater of Haleakala, home of the large silversword, is a most awe-inspiring sight. It is familiar to geologists as being the largest crater in the world, with a circumference approaching 20 miles. One climbs a mountain nearly 10,000 ft. high to look into the immense crater itself, of which the floor and precipitate walls 2,000 ft. deep, are composed of blackest lava.

Within it are several lesser cinder cones that show practically no sign of erosion. These cones are not old, geologically speaking, although the peak has shown no volcanic activity since about 1750. Their remarkable preservation is due not only to their comparative youth but also to the fact that scarcely any rain falls within the crater, and its cinder fields are a virtual desert. The silversword is among the very few plant inhabitants of this arid lava bed.

Among plants with a popular interest, the Hawaiian silversword is one of the world's rarest species. On none of the four peaks is it abundant, and it is possible that the recent eruption of Mauna Loa, in November 1935, killed off stretches of this rarity. It is exceptionally beautiful in all stages of growth, from the young silvery spheres two ft. in diameter to the flowering forms that shoot up with their hundreds of heads to a height of three to six ft.

The plant gets its name of silversword from the rapier-like leaves that are densely coated with a lustrous white wool. The young rosettes of the plant are composed of hundreds of these gracefully curved but rigid leaves that form a dense, silvery sphere. The woolly covering reflects part of the intense sunlight under which the plants live. The rosettes grow for a number of years before sending up a single flowering stalk, after which they die.



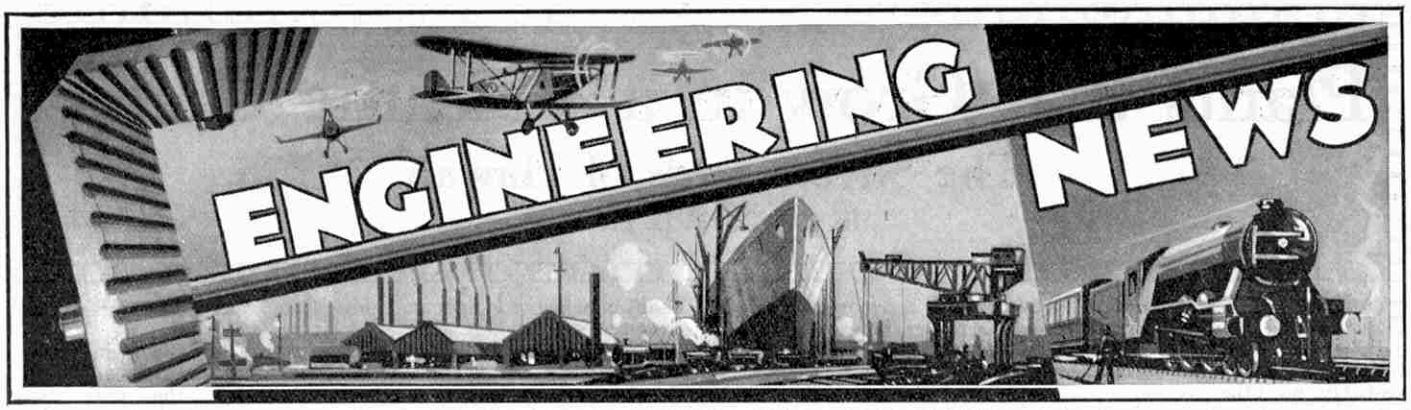
The large silversword in flower. The flowering stalk shoots up to a height of from three to six feet.

Flowering occurs from June until October. The nodding heads themselves add little to the colour of the plant, with their small yellowish disk-flowers and rather inconspicuous purplish ray-flowers. The native Hawaiians knew the plant and called it "ahinahina," which may be translated "grey-headed."

In the early days the tourists who visited the Crater of Haleakala were accustomed to uproot the largest specimens merely to watch them roll down the slopes like huge snowballs. Quantities also were ruthlessly gathered and shipped to the Orient as ornaments. These practices have long since been stopped and the plants are now under protection, as the species was facing extinction. Several insects are injurious to these plants, in particular a moth and a grey fly.

Both Haleakala and Mauna Loa are now included in Hawaii National Park and the park authorities have taken measures to conserve the silversword. Flowering specimens have been protected by cheesecloth coverings from attack by insect enemies, and seed has been gathered and resown.

We are indebted to the Carnegie Institution of Washington, for the information in this article.



Protecting Electric Transmission Line from Elephants

An important electrification scheme is now in course of completion in the State of Travancore, India. Electricity is to be generated by the fall of water taken from the Munnar River at High Range, 4,750 ft. above sea level, and led to the power station through an inclined tunnel nearly two miles long that has been blasted through a mountain. The tunnel is 9 ft. high and 8 ft. in breadth, and feeds the water into two steel pipe lines, each 30 in. in diameter, that carry it to two 6,000 b.h.p. Pelton wheels direct coupled to 5,000 kVA alternators. Two transformers have been installed. One has an output at 66 kV for distant distribution, while the other has an output at 11 kV, and supplies local tea growing estates and factories.

In erecting the transmission lines and supporting towers great difficulties had to be overcome owing to the wild nature of the country to be traversed. At one part of the route parties of coolies had to hack a passage through a dense virgin jungle of bamboo and great trees, many of which were over 100 ft. in height. The materials required were taken inland in small vessels up many miles of river. They were then landed and transported by lorries for 50 miles up a road that is often blocked by landslides and fallen trees, and finally were carried to the actual tower cable sites on the heads of coolies.

Raids by wild elephants and other creatures had to be guarded against. In order to protect the cable towers against elephants each has been surrounded by a deep trench dug in the form of a square. Where the ground is rocky stout iron spikes have been driven in to form a fence. The spikes have had to be made so large that the elephants cannot step over them, and they are set close enough to prevent these creatures from treading between them.

Lighting 133 Miles of Streets

The lighting equipment in 133 miles of the streets of Birmingham is being modernised at a cost of £100,000. When the scheme is completed the city will possess one of the finest and most up-to-date public lighting systems in the country, and the order for the necessary materials is said to be one of the largest of the kind ever given.

About 4,000 new lighting units are to be installed. Of these, nearly 3,000 will be equipped with "Osira" discharge lamps in special G.E.C. lanterns, and in addition, several hundred 300-W and 500-W "Osram" gas-filled lamps will be used in the direct current areas. At present the electricity supply in some parts of Birmingham is in process of being changed over from direct to alternating current, and in the direct current areas the lanterns housing the lamps will be so designed that discharge lamps can be used in them as soon as alternating current supply is available.

Nearly 3,000 new steel lamp standards will be needed, but some of the new lights will be mounted on existing tramway standards. The lamps will be mounted 25 ft. above the roadways. The work is to be completed in six months.

* * * *

Sunbeam trolley buses with B.T.H. electrical equipment have been placed in service in Rangoon and Johannesburg. The vehicles for Burma are of special lightweight type with single deck bodies.

The dredger "Panurgic" at work in the River Trent. It is equipped with a Priestman Diesel-engined dredging crane. Photograph by courtesy of Priestman Bros. Ltd., Hull.

Roads Made from Old Tins

Old tin cans from the city refuse destructor are being used in an American city for the surfacing of roads. A dirt road is first carefully graded, and burned tin cans are then dumped along it to a depth of from 18 in. to 20 in. They are then thoroughly crushed and rolled, and a surface covering of coarse sand or soil is applied. This covering is then enough to allow easy access of rain water and air, so that the metal under the surface is converted to rust, which acts as a binder. The surface of a road made in this manner is very hard in both wet and dry weather, and costs little to maintain.

A New Diesel-Electric Omnibus Transmission

A new electric transmission unit that can be used on Diesel-engined buses has been developed by the General Electric Company of New York. With it the maximum efficiency of a Diesel engine can be obtained, since it permits the engine to run at a practically constant rate, whatever the speed of the vehicle may be.

The unit consists of a single electric generator connected directly to the Diesel engine, and a motor that drives the rear axle through a spiral bevel gear with single reduction. It weighs about 1,600 lb., which is only three quarters of the weight of previous electric drives of similar size used in oil-electric buses.

A number of 36-passenger vehicles fitted with the new transmission have been ordered for use on important public services in America.

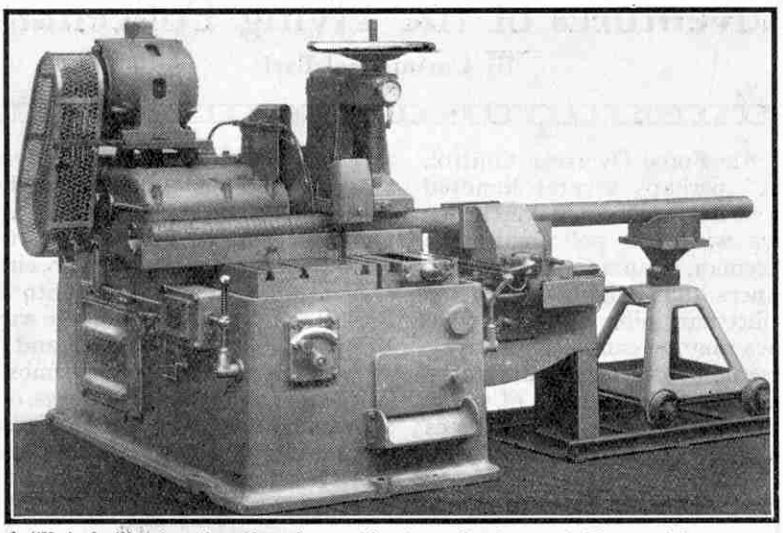
Extensible Trailers for Lengthy Loads

Two extensible trailers for transporting exceptionally long loads have recently been completed by Cranes (Dereham) Ltd., Dereham, Norfolk, to the order of the Admiralty. They are 6-ton pole trailers, which are intended for carrying loads up to 40 ft. long, and the range of lengths than can be dealt with is considerable, as the bolsters can be extended from 14 ft. to 28 ft. centres. The trailers will be hauled by Scammell 6-ton mechanical horse tractors.

The manner in which the extensible trailer can be used for loads of different lengths makes it of great value.

An Automatic Machine for Sawing Metals

The upper illustration on this page shows a machine that automatically saws bars of steel and other metals into lengths while cold. The bar to be cut is carried between two jaws, which automatically close and grip the material. The jaws are mounted on a travelling carriage, and this travels towards the saw up to a stop provided on the slides on which the carriage moves, and which can be adjusted to suit the length of metal it is desired to cut off. The movement feeds the bar into a vice that automatically closes upon it and grips it firmly while it is being cut. Other mechanism then comes into operation and feeds the saw towards the bar, and at the same time the jaw carriage is released and returns along its slides in readiness to push the rod along for the next cut. Upon completion of the cut the saddle carrying the saw is automatically withdrawn at high speed, the vice opens, and the bar is again fed forward to the required distance, pushing the severed portion before it.



A "Hydrofeed" automatic cold sawing machine for sawing bar metal. Photograph by courtesy of S. Russell and Sons Ltd., Leicester.

The saw is driven by an electric motor of from 7½ to 10 h.p. according to the size of the machine. The hydraulic power for operating the clamping and feeding device is provided by a pump unit housed on the main bed and driven by its own electric motor. Two pumps are employed, one of which delivers an accurate and definitely regulated supply of oil for feeding purposes, while the other is used to operate the quick return movement of the saw saddle, the vice gripping mechanism and the feed cylinder counter pressure.

A Huge Electrostatic Generator

A giant electrostatic generator is to be shown at the great Paris Exhibition this year. In this apparatus current will be generated by the friction of a band of rubberised cotton travelling at a speed of 91 ft. per second. The discharge will take place between two huge brass spheres, each 9 ft. 10 in. in diameter, which will be mounted on two insulating columns 32 ft. in height and spaced 10 ft. apart. The columns will be enclosed in a cage 82 ft. diameter and 82 ft. high, and the sparks generated will be at a tension of about five million volts. The control gear will be situated in one of the brass spheres.

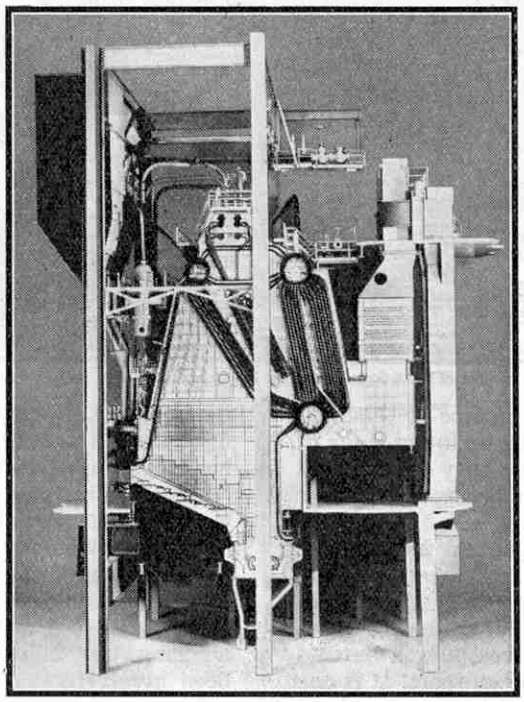
The largest electrostatic generator of this type that has yet been built appears to be one at the Massachusetts Institute of Technology, in the United States. It is understood that the columns of this are 43 ft. in height and they are surmounted by spheres 15 ft. in diameter. It has been announced that sparks with a tension of 7,000,000 volts have been obtained with this machine, which is to be used in efforts to break up atoms by bombarding them with high speed particles.

* * * *

At one of the Ford Motor Company's plants work is in hand on what is thought will be the world's largest gas holder. This is of welded construction, and will be 220 ft. in diameter and 344 ft. high.

London's 1,000,000 Telephones

The Mansion House, London, was the scene of a celebration recently when London's millionth telephone was installed there. It is now 57 years since London's first telephone exchange was opened, and in that time the telephone has passed from a scientific novelty to an everyday necessity. In addition to the ordinary domestic and business installations there are now 4,700 street kiosks in London, and altogether over 20,000,000 calls are made each week, many of these being to the most remote parts of the world. During a recent week the record number of 21,667,898 calls was registered in London. The total number of telephone subscribers in the world is now well over 34 million, and it is possible for every subscriber in England to communicate with 95 per cent. of the telephone subscribers in foreign countries.



A scale model of one of the Stirling high pressure boilers installed at the great Fulham Power Station. Photograph by courtesy of The Stirling Boiler Co. Ltd., London.

Welded Vessels X-rayed 1,200 Times

Four huge evaporators made for use in the new sugar refinery of Tate and Lyle Ltd., Silvertown, London, are claimed to be the largest welded pressure vessels of their class yet to be made. Each is 26 ft. 9 in. in height and has an internal diameter of 11 ft., and when the main seams of the generators were X-rayed in order to discover any faulty welds it was necessary to take 1,200 X-ray photographs.

Each evaporator consists of two shells, both 10 ft. 4 in. high, with domed top and bottom. The bottom shell is built up of steel plate nearly 1½ in. thick, and 1,792 tubes are welded into its two tube plates. Each of these tubes is 1½ in. in bore. After this section was completed it was tested at the high pressure of 375 lb. per sq. in., and the upper shell was subject to a pressure of 285 lb. per sq. in. in a similar trial.

Modernising a Roman Road

During the next few months part of the Fosse Way, the ancient Roman highway between South Devon and Lincoln, will be converted into a modern highway with dual carriageways and cycle-tracks. The Fosse Way is over 200 miles long and at no place is it more than six miles out of a straight line between its ends.

The portion to be modernised extends from the northern boundary of Leicestershire to a point about a mile and a half south. At present this section has a carriageway only 20 ft. wide, and is quite inadequate for the 5,000 tons of traffic that passes over it daily. It is therefore proposed to widen the road to 100 ft. Each of the dual carriageways will be 20 ft. wide and constructed of reinforced concrete. At this stage only one footpath will be provided, but provision is being made for another path and also for cycle tracks.

A Portable Smelting Works

A complete nickel-smelting plant, which can be moved from place to place and is said to be the first of its kind, is being completed at a large nickel deposit near Sverdlovsk in the Ural Mountains. The buildings, furnaces, machinery, electric power installation, and even the workers' dwellings, are so constructed that they can be dismantled within a month, and transported and reassembled in another place in six months ready for work. The plant has been built on this system because it is expected that the ore deposits at Sverdlovsk will be exhausted in a few years' time.

Europe's "Highest" Road

The opening took place recently of the "Route Nationale 202," which is claimed to be the highest road in Europe. This road forms part of the famous Route Des Alpes now under construction, linking Val D'Isere with Bonneval Sur Arc in Savoy. It crosses the top of the Iseran Pass at an altitude of 9,088 ft.

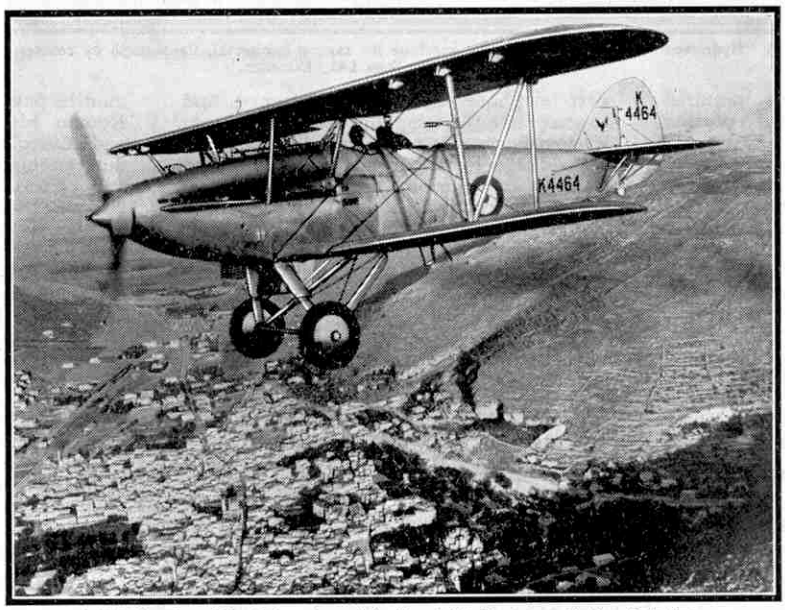
The "Route Nationale 202" rises 888 ft. higher than the Gross-Glockner Highway in Austria, which was formerly Europe's highest road.

The R.A.F. Overseas Control

Adventures of the Flying Policeman

By Carmichael Earl

A PILOT of the Royal Air Force Overseas Control, having for his "beat" perhaps several hundred square miles of untamed wilderness, is nevertheless comparable in many ways with the policeman who patrols our streets. Our policeman, in an unobtrusive way 'nips in the bud' disturbances that might shatter the public peace. The aerial policeman fulfils the same duty over lands where disturbance may be caused by natives; by dealing swiftly with these he averts small wars of the kind that in the past have led to insurrections of whole countries. Again, our familiar "Gentleman in Blue" does not spend all his time arresting people; he is there to help, advise, and act for us in emergencies. The patrol pilot does exactly the same thing, only in a more extensive way. Subsequent stories will illustrate this, and show that far from being an instrument of terrorism, the military airman abroad is rather the messenger of security and mercy.



A light bomber of No. 6 Squadron of the Royal Air Force over Nablus, Palestine.

First it is worth while noting some of the more interesting districts over which the R.A.F. Overseas Arm holds control. For the purpose of this article three such areas will be sufficient, namely Iraq, India, and The Middle East. The third of these areas is subdivided into Egypt, the Sudan, Palestine and Transjordan. A glance at the atlas will show that in these countries are to be found some of the wildest places on Earth. Not only do they comprise all types of inhospitable regions, but in or near them are fierce peoples of every colour and religion.

For example, Iraq, which roughly speaking includes the basin in which flow those famous rivers, the Tigris and the Euphrates, is a land of sun-parched clay and stretches of barren rock. There is practically no life, animal or vegetation, except near the rivers themselves, where natives live on what few crops the country will support. It is one of the flying policeman's many duties to protect these native farmers from the ravages of their age-old foes, the Kurds. These fierce hillmen normally live in their mountain fastnesses of the north and north west. Since the dawn of time, harvest in the valleys has been the signal for them to swoop down upon the unfortunate plainsmen. For countless thousands of years they pillaged their victims with impunity, but at last justice has found them out. Mountains offer no barrier to aircraft, and racing camels and desert ponies, fleet though they may be, are easily outstripped by the flying policeman. Thus these raids are growing fewer, and less destructive every year.

In the Sahara desert and similar regions, apart from keeping peace between the tribes, the R.A.F. Control must protect travellers who, either for business or pleasure, venture from civilisation into these realms where might is still right. At one time these wayfarers, usually merchants, were liable to be set upon and plundered. Thanks to military aircraft, this is now almost a forgotten story. To-day the Arabs realise that news of any outrage will quickly become known at the Air Force base. They have learned to expect before very long the drone of aero engines that heralds the flying policemen. Moreover, behind the avenging wings always follows a convoy of armoured cars. The airmen single out the village that is giving refuge to disturbers of the peace, brigands, rebels, or whatever they may be, and quickly subdue the latter with threats of punishment.

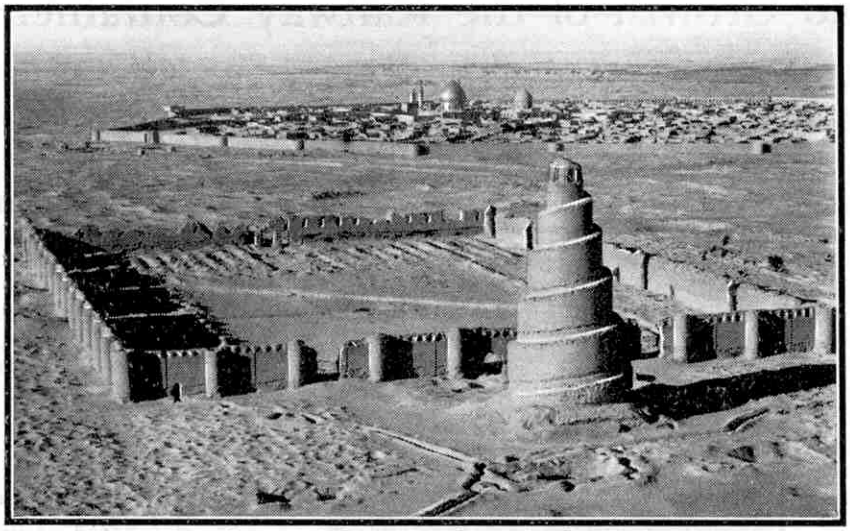
Only in extreme cases are the inhabitants attacked with machine-gun fire and bombs. The armoured cars, following up behind, then take prisoners to be brought back for trial, pick up the wounded, or rescue any pilots who may have been forced down. Thus in a few hours may be quashed a petty rising that in former times might have spread through many villages before troops could have been mustered to the spot.

Apart from these advantages, air control is by far the most humane way of administering a savage country. The speed with which aircraft can reach any given spot, and their general demoralising effect upon hostile tribesmen, make it often unnecessary for a bomb to be dropped. The airmen can pick out the offending village and punish it, ignoring the innocent ones which before must have been involved.

Here is an incident, taken at random from hundreds on record, that will illustrate the above remarks. In 1924, Sheik Salim began to encourage the disobedience of certain Syrian tribes. His stronghold was in the heart of the Hamah Lake district, an almost inaccessible swampy region. The nearest Air Patrol immediately went out, bombed the offending Sheik's house and guest house, without damaging any other part of the surrounding village, and effectually frightened him into submission.

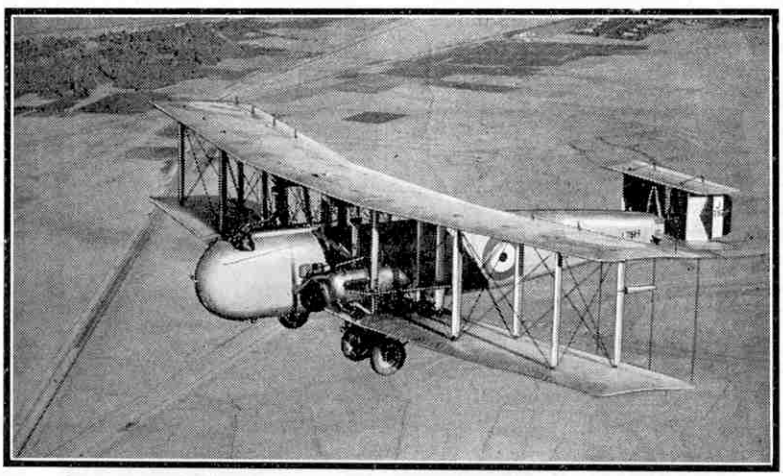
The following stories show the aerial policeman in a

rather different role. Times out of number the R.A.F. has been responsible for checking the disastrous spread of diseases that previous to the advent of our medical science often wiped out thousands of natives in a few weeks. In one case a patrolling R.A.F. Officer noted a strange inaction which seemed to have turned into clay a village over which he was flying. Sensing that something was amiss, he landed to investigate further. His keenness was well rewarded, for he found himself just in time to help the inhabitants, who were rapidly succumbing to an epidemic of typhus. By flying back to the nearest patrol base for a doctor and supplies of vaccine, he not only saved many lives in that particular village, but proved instrumental in checking a plague that might have swept through many more homesteads.



Samarrah, in Iraq, as seen by the air policeman.

In a village of central Arabia, a white man's life is not worth very much. Yet one day, not so long ago, a two-seater military aeroplane landed before the home of a hostile native chief. The pilot stepped out, followed by a doctor. The chief's son was dangerously ill, so the father, forgetting that he was practically at war with the British, had trekked to the nearest government administrative centre and asked for help. This was at once granted, in the shape of the flying doctor. After an examination of the chief's son, the doctor pronounced that the boy would die if an operation were not performed. When this report reached headquarters, the officials there were faced with a serious problem. If they ordered an operation, and anything went wrong, they might be accused of carelessness, and even murder. Yet if they did nothing, the case was hopeless, and they would have the death on their consciences. Deciding that the first course was the lesser of two evils they sent an ambulance aeroplane to transport the boy to hospital at Aden. There white doctors not only performed a successful operation, but soon had the patient well enough to be flown back to his father's village. The chief's gratitude overcame his previous hatred of the British, and he is now their friend.



A Vickers twin-engined troop carrier flying over Iraq.

Here is another instance. Kurds succeeded in making a devastating raid upon the unhappy farmers in a district north of Mosul, in Iraq, which is the most northerly R.A.F. base. Many natives, including women and children, were left homeless. They were stranded in the desert, without food or water, and no means of obtaining either, and most of them would have perished but for the vigilance of an R.A.F. pilot. Chancing to see them while on his patrol flight, he immediately wirelessed an S.O.S. message to Mosul, whence the officials ordered out a squadron of Vickers "Victoria" troop carriers. These were soon on the scene of the raid, where they picked up the destitutes and transported them to Baghdad. There shelter was found for them in various disused hangars. Meanwhile the attacking Kurds were punished and dispersed. The victims in due course were flown back from Baghdad and reinstated in their own territory. Naturally they bear a debt of gratitude to their deliverers.

The R.A.F. in the Sudan, like many other of its outposts, is supplemented by native soldiers. The following gives an example, not only of British courage, but also of the staunchness to be found among these Askaris, as they are called. A commercial pilot was long overdue at a certain aerodrome, and it became evident that he must have been forced down in the boulder-strewn desert over which his route lay. An R.A.F. pilot was sent out to make investigations. He found the other airman, who, as it was feared, had crashed in an area where scattered rocks and stones made a safe landing almost impossible. Obviously the air policeman could not risk putting himself in the same position as the pilot he had come to rescue, so he noted the location of the crash and returned to his base, proposing to load a two-seater 'plane with provisions, fly back, and land near the stranded civilian. In the almost certain event of the machine also being wrecked, there would be enough food and water to enable both men to complete the 300 miles journey home on foot.

There was one difficulty, however. Only a native could be certain of finding his way back through the wilderness. The officials called up the local Askaris and asked for a volunteer to go with the pilot. One was immediately forthcoming, although this brave soldier had never been up in an aeroplane before.

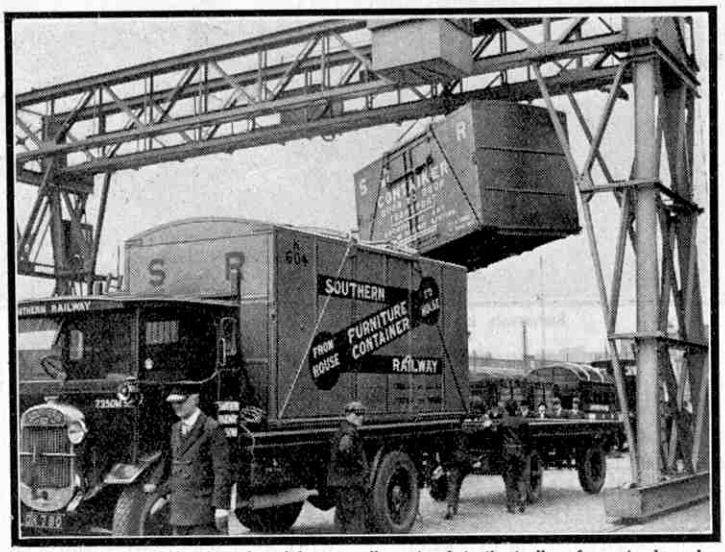
By good luck, combined with what must have been brilliant airmanship, a safe landing was made near the marooned man. To his horror, the pilot found that the man he had come to rescue had broken a leg and was helpless. The aeroplane could only carry two passengers, but the Askari volunteered to walk back; while the pilot flew the injured man to the base.

Door-to-Door Transport

The Rapid Growth of the Railway Container System

ALTHOUGH the railway container system has only been developed into its present huge proportions in recent years, it was actually in use in this country before the War, when closed horse-drawn cars were loaded on specially arranged platform rail trucks. The system did not develop to any great extent until 1926, however, when the possibilities of a container transport system were fully realised. In 1928 there were only 1,574 containers in use on British railways, but to-day there are nearly 11,000 in service.

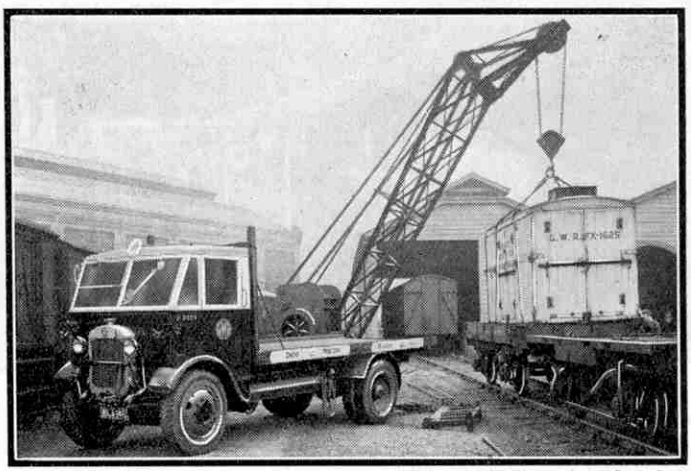
The container has been appropriately christened "*The Suitcase of Commerce*," and there are many kinds in use to-day. The most popular is the "B" type, which is of the covered variety. This is approximately 14 ft. long, 6 ft. 6 in. wide, and 6 ft. 8 in. in height, and it has a capacity of four tons.



A loaded container being transferred from a railway truck to the trailer of a motor lorry by means of an overhead crane. A Furniture Container is already in position on the motor lorry platform. Photographs by courtesy of the Railway Press Bureau.

The "A" type are covered containers of 2½ tons capacity, and are used mostly for groceries, confectionery, paper, books, and shoes, etc. These particular containers have been tried by a glass manufacturing firm for the conveyance in bulk of glass tumblers, with so much success that this method of transport is being used more and more for this particular commodity.

The "C" type container is slightly larger and has a capacity of 3 tons. It is used for the rapid transport of stoves, grates, ranges, heaters, glass bottles and small machinery. The "D" type is an open container with a carrying capacity of 4 tons, and is used for similar goods to those carried in the "C" type in addition to machinery, glassware, baths, castings, asbestos, sheets and slates, stoneware and accumulators.



This illustration shows a ground crane at Penzance lifting a G.W.R. Insulated Container loaded with bulbs, from the lorry on to the low-sided wagon.

For the conveyance of frozen and chilled meat, frozen fish and food stuffs, insulated containers of up to four tons capacity are used, some of which have hanging facilities. Special ventilated containers are largely used for the conveyance of the extensive fresh meat traffic both from Scotland and the West of England to London. As the journeys from these districts are long ones, good air circulation is an essential feature, and the containers used for this traffic have ventilators in the sides and air extractors in the roofs in order to ensure this.

The rapid increase in popularity of the bicycle during the last few years has warranted the introduction of a special bicycle container with a holding capacity of 70 machines in two tiers. Each bicycle fits into felted wheel slots and felted cross bars are provided to separate each cycle from its neighbour. Thus damage by scratching is eliminated.

To meet the demands of the building trades small open containers, or "Travelling Hods" as they are called, of 1½ to 2½ tons capacity are used for such loads as bricks, tiles, slates and stonework. These containers are taken to the site, either by rail or road, whichever is most convenient, and then hoisted to the upper floor of the building in course of construction. The time saved is considerable, as the necessity for unloading the building material on the ground and then hauling it to its working site is avoided. This type of container was once used for the conveyance of 3,000,000 bricks from Hencoat to Swansea, where sewage tunnels were under construction. As the containers arrived at the site of the work they were lowered by crane into a tunnel shaft, and conveyed to the point of construction as the progress of the work demanded.

Containers are now used for the conveyance of grain in bulk. The "G" container, capable of carrying 2½ tons, has been built for this purpose and has a special loading door.

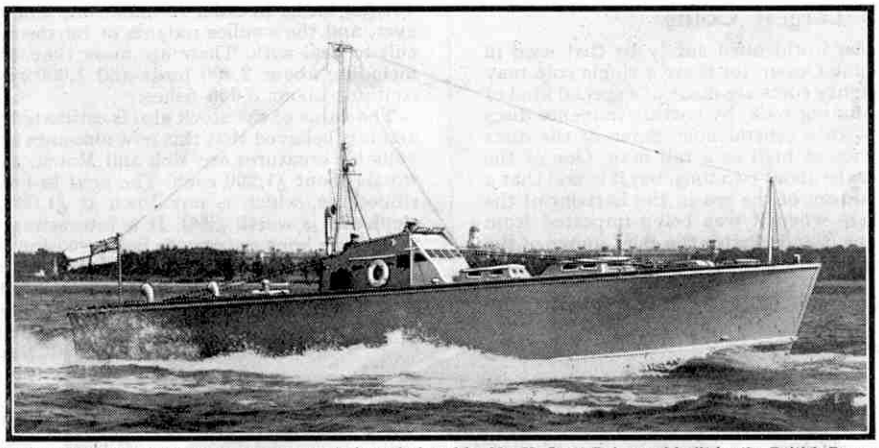
Among the most important containers are those built for the removal of furniture and other household effects. The risk of damage to furniture is reduced to a minimum when containers are used, because once the goods are packed in them, they are not handled again until they are ready to be moved into the new residence.

Containers are specially valuable for large-scale removals, such as those of factories and farms.

Motor Torpedo Boat in Rough Weather

Wonderful Performance in Heavy Seas

THE weather during the first week-end in November 1936 has been described as the worst of last Autumn, and a report in the daily Press attributed to the captain of a very large liner the statement that it was the most severe in a decade. In these circumstances it was decided to carry out the rough weather trials of one of the new motor torpedo boats built for the Royal Navy to the designs of Mr. Hubert Scott-Paine by The British Power Boat Company. These trials took place on Monday, 9th November, after it had already been blowing a full gale for three whole days. Two vessels took part in them. These were H.M. Motor Torpedo Boat No. 1, which was in fact the first vessel of his Fleet in which King Edward embarked after his accession, and H.M. Destroyer, "*Amazon*," and a number of officers witnessed the trials on behalf of the Admiralty.



A broadside view of the 60-ft. motor torpedo boat designed by Mr. H. Scott-Paine and built by the British Power Boat Company, Hythe, Southampton, to whom we are indebted for the illustrations to this article.

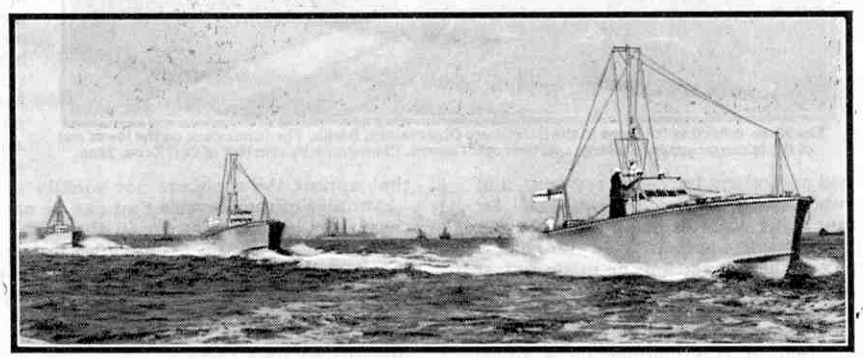
Motor Torpedo Boat No. 1 was under the command of Mr. Hubert Scott-Paine, with a crew from The British Power Boat Company, and sailed in company with the "*Amazon*" from Portsmouth at 11.30 a.m. The two vessels went out by way of Spithead towards the open Channel, and at the eastern entrance to Spithead passed some eight or nine vessels of up to 5,000 tons lying at anchor, sheltering from the very heavy weather outside.

The motor torpedo boat was running considerably faster than the "*Amazon*" and worked out into the open sea some time before the destroyer. While still under the lee of the land to the eastward of the Isle of Wight the sea conditions, resulting from the gale which had been blowing, were a short swell and a moderately rough sea. As a greater offing was gained south of Culver Cliff, and a more exposed position was reached, the swell reached an average height of 10 to 12 ft. Some individual waves were at least 18 ft. from trough to crest, the wind during the whole of this time blowing between 35 and 40 m.p.h., with gusts of up to 45 m.p.h. or more.

The motor torpedo boat's performance in this sea, which could be justly described as very heavy, was at once startling and convincing. It was seen that she could not only face this weather with safety, but could maintain a very high speed. Speeds of from 20 to 30 knots were employed at different times, when working both into the sea and across it. At this time the destroyer was holding close into the shore and it was reported by an officer in that vessel that the motor torpedo boat, then four miles away, was for the greater part of the time indiscernible and was certainly an impossible target for gunnery purposes. On the other hand, the destroyer could be seen clearly from the motor torpedo boat.

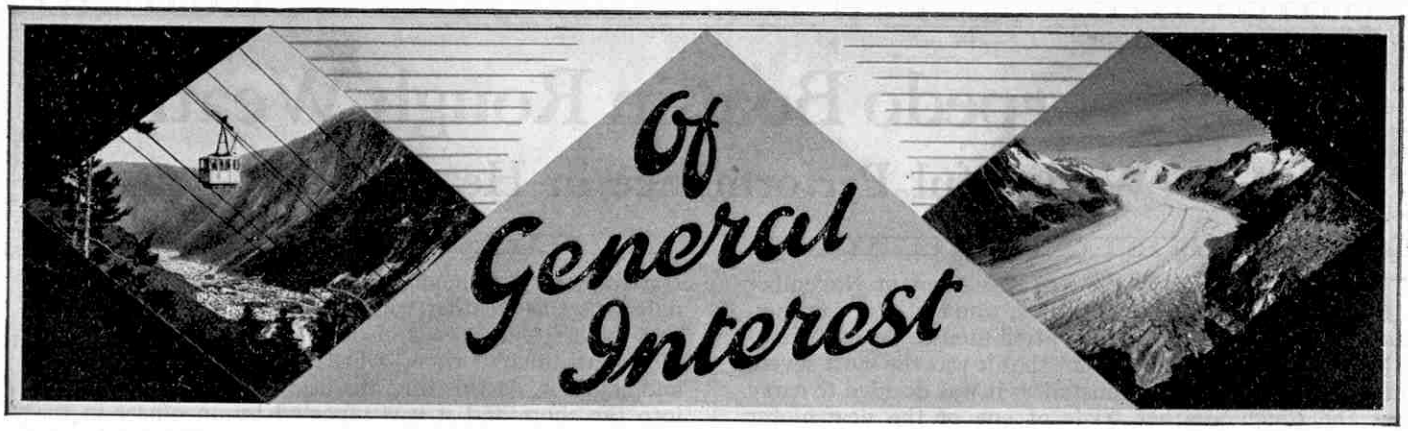
In the course of a series of trials at different speeds, and on different courses with relation to wind and sea, a point was reached some eight miles south of St. Catherines where the weather conditions were at their worst; and it was most remarkable that while the destroyer was rolling heavily, the motor torpedo boat was able to proceed at very high speed without discomfort to her personnel.

The seas were of such a size that from time to time, when the two ships closed on one another, nothing but the funnels and the upper works of the destroyer were visible to the motor torpedo boat. On returning to harbour the latter proceeded at 30 knots, while the destroyer followed astern at between 20 and 26 knots.



First Division of 60-ft. motor torpedo boats, built by the British Power Boat Company, on manœuvres.

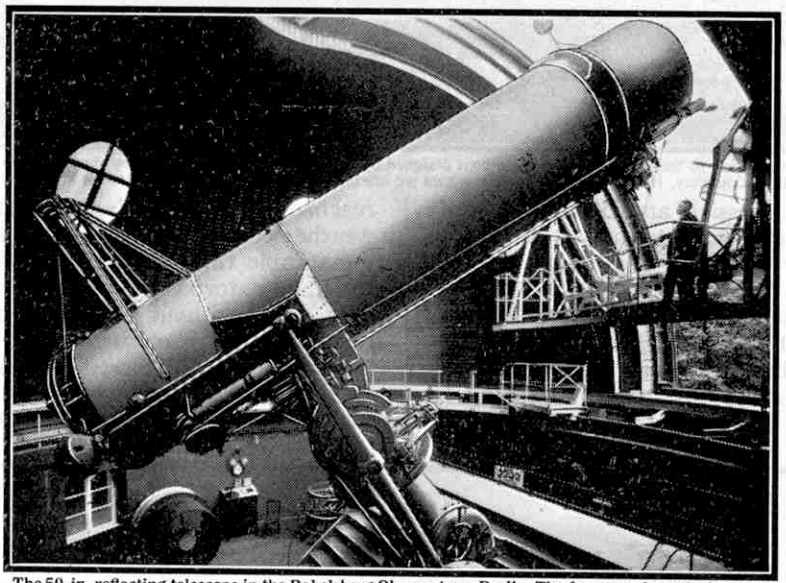
The upshot of the trials was unquestionable proof that The British Power Boat Company's motor torpedo boats are capable of withstanding the worst weather conditions that are likely to be encountered in the Channel or North Sea and, more than that, can maintain a very high speed in these circumstances. It is reasonable to deduce that this latest addition to the fighting forces of the Navy is seaworthy in bad weather conditions, and that the boats can face with absolute safety any sea condition in which they are ever likely to have to operate. This impressive performance is a triumph of British design, and gives striking evidence of the great value of these modern vessels.



World's Largest Coins

The strangest money in the world must surely be that used in the island of Yap in the Pacific Ocean, for there a single coin may weigh several tons. These weighty coins are made of a special kind of stone, known as calcite, or shining rock, by cutting immense discs from it and piercing them with a central hole. Some of the discs when placed on edge are twice as high as a tall man. One of the largest is 12 ft. across and weighs about two tons, but it is said that a still larger coin lies at the bottom of the sea in the harbour of the island. It found its way there when it was being imported from Palau, a group of neighbouring islands that is the chief source of the coinage, for Yap itself has no calcite on it. This coin fell in the water when it was being transferred from the schooner's deck to a raft in order to be taken ashore. Other coins came from Guam, 400 miles away, and many canoes have been lost in storms when returning heavily laden with huge stone discs.

The value of the stone to the islanders is simply due to the fact that it is rare. When a huge disc has to be paid over in some business transaction among the islanders, a tree is thrust through the central hole, and the stone is partly dragged and partly lifted along the jungle trails to the seller. It is only in the jungles that this astonishing coinage now circulates, for Japanese money is current in the port of the island.



The 50-in. reflecting telescope in the Babelsberg Observatory, Berlin. The framework on the lower end of the telescope supports a large spectroscopic camera. Photograph by courtesy of Carl Zeiss, Jena.

Heating Up the Atmosphere

Millions of tons of coal and immense quantities of wood and oil are burned every year, and a contributor to the September issue of the *"Compressed Air Magazine"* raised an interesting point when he suggested that this might be making the air round the Earth appreciably hotter than it otherwise would be. The results of the calculations he made to test this suggestion are very interesting, for he finds that in spite of the stupendous amount of heat generated by fires and in the cylinders of petrol and oil engines, the atmosphere is so extensive that its temperature would only be raised in this manner by a single degree in 54 years.

In practice this means that all the burning that goes on has no real effect on the temperature of the air, for the heat produced is dissipated quickly. Thus the best efforts of heating engineers produce merely local effects that persist for only a brief period.

Counting Heads at the Zoo

The London Zoo is the largest in the world in the sense that it has the greatest collection of animals. It covers an area of 37 acres and has about 2,000,000 visitors a year.

Every year the birds, beasts and fishes in the Zoo are counted. This is not a very easy task. It is simple to check the number of large creatures, such as elephants, bears, lions and tigers. More than one count is necessary in the aviaries, especially those occupied by the smaller birds, in order to make sure that the total is correct, however, and the smaller rodents or burrowing creatures also are difficult to deal with. There are more than 4,000 creatures in the Zoo, including about 2,400 birds and 1,000 reptiles, and the Aquarium contains about 3,000 fishes.

The value of the stock also is estimated when the census is taken, and it is believed that this now amounts to about £40,000. The most valuable creatures are Mok and Moina, the two gorillas, which are worth about £1,200 each. The next in order of value is the Indian rhinoceros, which is put down at £1,000, and each of the riding elephants is worth £600. It is interesting to find that the value of menagerie lions appears to be decreasing because so many cubs are born in captivity. For this reason a lion that was formerly worth £100 is now valued at £20. The oldest inhabitant is a pigmy hippopotamus that has been in the Zoo for 23 years.

Individual birds and reptiles are not as valuable as the larger creatures. Here the King penguin leads the way with a value of £75, and the giant tortoises, which are now 100 years old, are worth £59 each.

Seeing in the Dark

One of the most astonishing uses that has been found for infra-red rays is in reading written or printed words on burned papers. These appear black in ordinary light, but when examined by means of the invisible infra-red rays the ash left by the ink has a different tone from that of the paper itself. Alterations in ordinary documents and forgeries often are readily revealed in the same manner, for inks that appear the same are not equally black in infra-red light.

Another of the marvels that can be accomplished with the aid of these rays is that of seeing in the dark. A hot body gives out the rays, and as these affect the emulsion of a photographic plate, objects in a dark room that are hot but invisible because their temperature is below red heat can readily be photographed. For instance, photographs of a hot iron have been taken in this manner, and objects have actually been photographed in the invisible "light" of a hot iron placed near them.

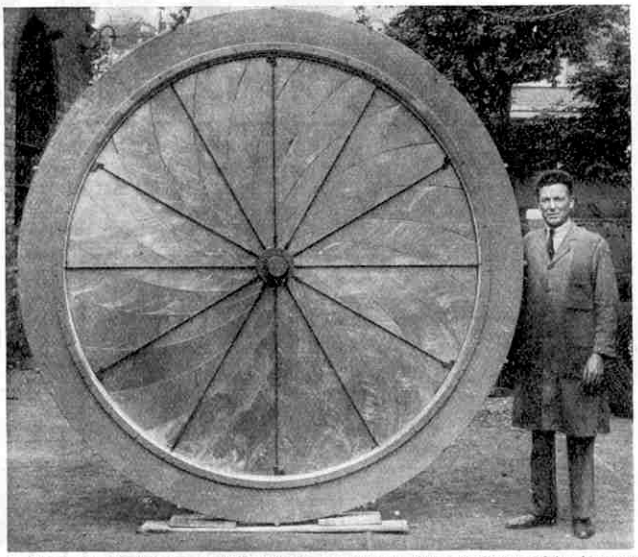
Seeing in the dark in this manner has been developed even further to give visible images instead of photographs. In this process what is known as the electron lens is used. Infra-red light from the invisible scene is focussed on the cathode, or negative electrode, of a cathode ray tube, which is similar in general construction to that used in television. The cathode is coated with a layer of a material that gives out electrons immediately the light falls upon it; and as these are ejected in proportion to the intensity of the light producing them, they would give us a reproduction of the original picture, if we could see them. We cannot do this, of course, but the electrons can be focussed by a system of high voltage rings in exactly the same manner as light rays are by an ordinary lens. By this means they are made to bombard a sensitive screen on the wide end of the cathode tube and this becomes luminous, reproducing the invisible scene for the eye.

A Giant Iris Diaphragm

Every amateur photographer is familiar with the iris diaphragm, which can readily be adjusted to give apertures of various diameters in the cameras to which it is fitted. Perhaps he has been surprised at the ease with which the opening has been changed in size, while remaining almost perfectly round, as he turned the controlling ring. The diaphragms to which he is accustomed are comparatively small, but larger diaphragms are made for other purposes, and one with an opening nearly 7 ft. in diameter has been constructed for use in a searchlight.

This giant diaphragm is illustrated on this page. Its vanes move in a similar manner to those of the diaphragms of ordinary photographic cameras. Much more refined and accurate mechanism is necessary in order to move them, however. The vanes run on ball-bearing rollers and the driving ring that operates them can be turned if necessary by means of an electric motor, which can be controlled from a distance. A direct current motor is used, and is provided with a reversing switch, as it is required both to open and to close the vanes.

The driving ring can be turned by hand when desired, and a signal lamp with a special trip switch can be fitted in order to show whether the shutter is closed or not. Special dampers prevent the vanes from being jarred as the shutter opens and closes.



A giant iris diaphragm designed for a searchlight. The diameter of its largest opening is 6 ft. 8 in. Photograph by courtesy of the London Electric Firm.

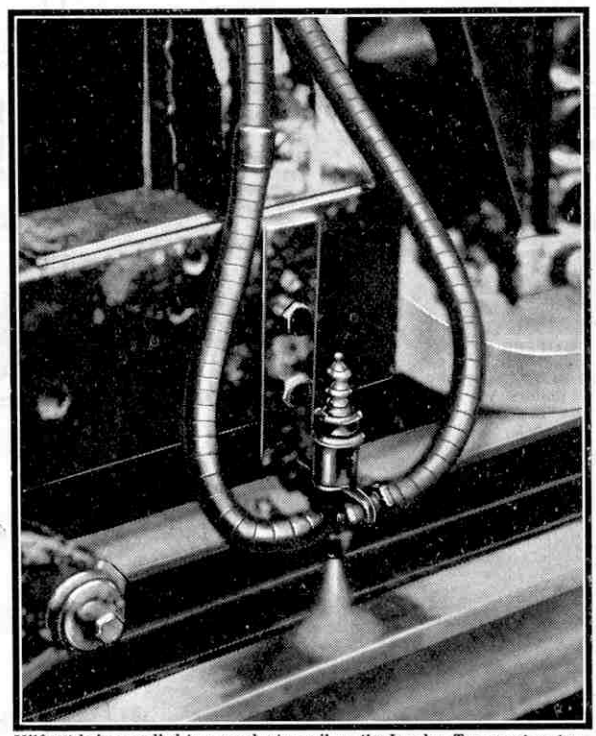
Fighting Snow and Ice on Railways

Snow and ice can be dangerous enemies in many different spheres, and some of the effects they produce are unexpected in character. For instance ice congealing on the third rail of an electric railway may effectually insulate it and so prevent the collector shoes from obtaining current to drive them. A liquid that is designed to prevent this, and is known by the appropriate name of "Kilfrost," has now been introduced. It is applied to the conductor rail through pipes leading from a reservoir in a vehicle travelling along the track. Two solutions are available, one for temperatures that do not fall more than five degrees below zero, and one for more severe conditions. In each case the material covers the rail and keeps it clear from ice so that the collector shoes of the electric locomotives can make good contact.

The Kilfrost Manufacturing Co. Ltd., which has introduced this liquid, has made a special study of the problems of ice formation and deposit, particularly in connection with refrigerators used for cold storage. In a large cold storage plant, the metal pipes through which the refrigerating liquid flows become covered with ice and snow, and it is necessary from time to time to remove these accumulations. This is done by chipping and hammering the ice from the pipes, a process that involves considerable trouble and expense. The application of Kilfrost to the pipes avoids this.

One of the products that have been introduced for use in refrigerating chambers is a paste that is applied to the pipes when these are dry. The paste contains chemicals that prevent the light snow first deposited on the pipes from congealing to ice, so that even when a heavy coating of snow has been formed on a pipe treated with the paste, it can be removed instantly by the hand. The chemicals in the paste actually help in the refrigerating process by forming with the snow a mixture that lowers the temperature.

In addition to the paste, a liquid is available that can be used for loosening ice and snow already on pipes. For this purpose it is pumped into saw cuts made in the ice, and then makes its way along the pipes, which are afterwards more easily freed from their unwanted load.



Kilfrost being applied to a conductor rail on the London Transport system. Photograph by courtesy of the Kilfrost Manufacturing Co. Ltd.

There are other Kilfrost products that are particularly useful on railways. These are applied to signals, points and crossings, and other railway appliances in order to keep the working parts clear of ice and snow, and so to enable them to continue in operation, whatever the weather conditions may be.

Gardens Without Soil

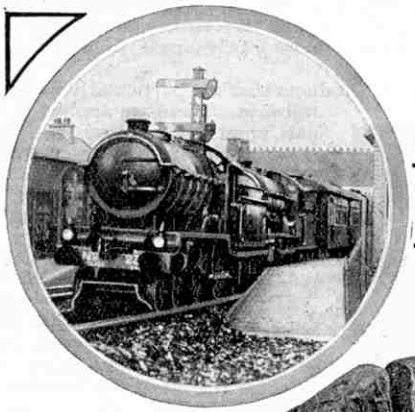
The gardener who is not fond of the spade work necessary to clear and prepare the ground for the crops he intends to grow no doubt will welcome the latest development of gardening, which makes no use of soil at all. Plant growing without soil is an innovation that comes from the University of California, where tobacco, cucumbers and many flowering plants have been grown in basins containing water in which electric heating cables are immersed. The necessary plant food is supplied by dissolving suitable chemicals in the water and the most advantageous temperature is maintained by means of the heating cable.

The plants are grown in this strange manner from the very beginning of their career, for a seed bed is formed by spreading sawdust or suitable litter on wire of fine mesh placed over the vats containing the solution. As the plants grow their roots enter the liquid below and from it obtain all the nourishment they need. Dr. Gericke, the originator of this remarkable scheme, claims to have produced tomatoes of unusually high quality at an earlier date than market gardeners growing their crops in soil, and his experiments have been so successful that vegetables and berries are now being grown by the same system by Californian nurserymen.

Drinking Water from the Sea

Sea water contains so many salts dissolved in it that either complicated chemical processes or costly distillation would be thought necessary in order to produce drinkable water from it. Yet salt water has been transformed into good fresh water by simply filtering it through a train of four tubes containing synthetic resins. This miracle was seen in progress at demonstrations organised by the Department of Scientific and Industrial Research. The resins in the first two tubes were prepared from tannin materials, and those in the remaining tubes from aniline. During the passage of the sea water through the first and third tubes the metallic constituents of the salts in it were removed and the acidic components were taken out by the resins in the third and fourth tubes.

The resins cease to be effective after a period of use, but can be regenerated. They cost little to produce and it seems likely that there is a great future for water purifying plants making use of their strange properties. Similar changes that can be carried out with them include the softening of hard water by passing it through the tannin resin after soaking this in salt water, and the purification of industrial waste liquids, from which many valuable products can be recovered. The special value of the resins used is that they do not get rid of impurities in the same manner as passing water through filter paper removes any solid particles in it. Instead they bring about changes that lead to the separation of substances dissolved in the water, and their effect is not merely mechanical.



HORNBY

ELECT
AN
CLOCKW

ROLLING STOCK A

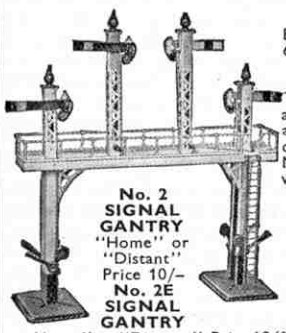
You have spent many happy hours watching real trains at work. Now start a railway of your own and enjoy the thrill of operating Engines, Coaches, Wagons, Signals and Points on actual railway principles. It's the most fascinating pastime in the world!

Hornby Trains have always represented the latest model railway practice.

Two No. 1 and one No. 2 Cuttings are illustrated above.

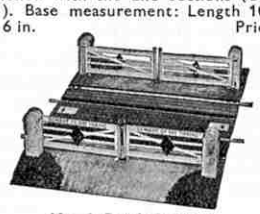
No. 1 CUTTING (END SECTION)
Base measurement: Length 7 11/16 in., width 6 in. Price, per pair 3/-

No. 2 CUTTING (CENTRE SECTION, STRAIGHT)
The addition of these Centre Sections enables a Hornby Railway Cutting to be extended to any length. They are intended to be used in conjunction with the End Sections (Cutting No. 1). Base measurement: Length 10¼ in., width 6 in. Price 2/-



No. 2 SIGNAL GANTRY
"Home" or "Distant"
Price 10/-

No. 2E SIGNAL GANTRY
"Home" or "Distant." Price 12/9

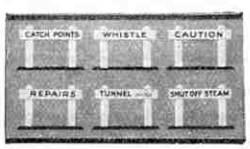


No. 2 Level Crossing

No. 2 LEVEL CROSSING
Measures 13⅛x10¼ 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

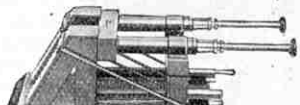
No. E2E LEVEL CROSSING
Similar to No. E2 Level Crossing but suitably fitted for electric lighting. Price 9/-



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

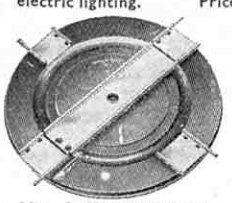
No. 1 BUFFER STOPS
(Spring type). Price 1/-

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/-



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

No. 2 TURNTABLE
Price 3/9

No. E2 TURNTABLE (Electrical)
Similar to No. 2 Turntable, but fitted with electrical rails. Price 5/6

No. 1 GOODS PLATFORM
Length 13 in., height 6⅜ in., width 6 in. Price 5/11

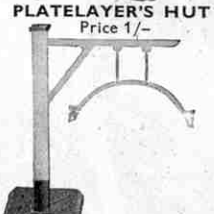
No. 2 STATION
Built up with three detachable sections. Named "Brighton," "Wembley," "Ripon," or "Bristol." Length 2 ft. 9 in., breadth 6 in., height 7 in. Price 8/-

STATION OR FIELD HOARDING
This realistic accessory is suitable for the station platform. Price 6d.

No. 4 Tunnel

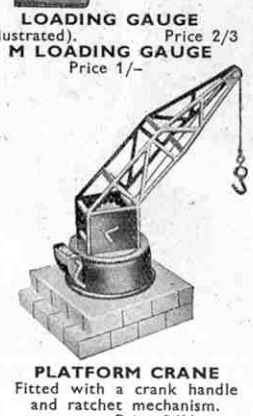
No. 4 TUNNEL (CURVED)
Base measurement: Length 20 in. Width 9½ in. For 2 ft. radius track only. Price 4/9

PLATELAYER'S HUT
Price 1/-



LOADING GAUGE
(Illustrated). Price 2/3

M LOADING GAUGE
Price 1/-



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

CRAWFORD'S BISCUIT VAN
Finished in red, with opening doors. Price 2/9

No. 1 LUMBER WAGON
Fitted with bolsters and stanchions. Price 1/6

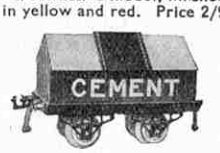
***No. 1 CATTLE TRUCK**
Fitted with sliding doors. Price 2/9

BARREL WAGON
An interesting model of a type of wagon used on Continental railways. Price 2/6

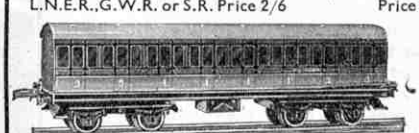
FIBRE WAGON
This is an interesting model of a type of wagon used in France and other Continental countries. Price 1/3

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

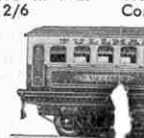
GUARD'S VAN
In colours to represent L.M.S.R., L.N.E.R., G.W.R. or S.R. Price 2/6



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



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



COACH, N

No. 1 SIDE TIPPING WAGON
"Robert Hudson Ltd., Leeds." Price 2/-

WINE WAGON DOUBLE BARREL
Price 4/6

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

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

** In L.M.S., N.E., G.W*

MECCANO LIMITED, BINN

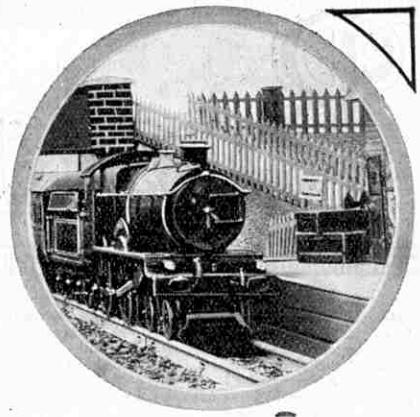
CTRIC
ND
KWORK

TRAINS

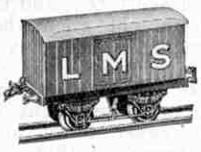
AND ACCESSORIES

Designs are continually being improved and new items added so that the system is complete in practically every detail.

A selection of items from the splendid range of Rolling Stock and Accessories is shown below. Take Dad with you to your dealer's to-day to see these and all the others available—they must be seen to be appreciated.



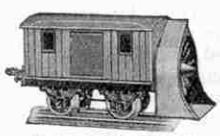
OIL TANK WAGON "CASTROL"
Enamelled green with lettering in red. Price 2/-



***No. 1 LUGGAGE VAN**
With opening doors. Price 2/9

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

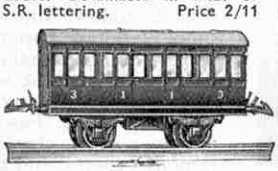
***HOPPER WAGON**
Mechanically unloaded. Finished in green. Price 3/6



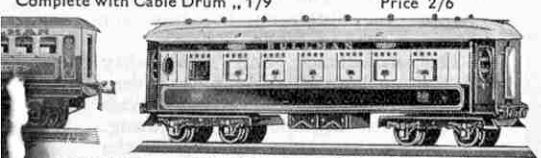
SNOW PLOUGH
With revolving plough. Price 3/9

BRAKE VAN
Finished in brown, with opening doors. Obtainable in N.E. or S.R. lettering. Price 2/11

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

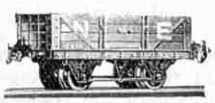


***COACH**
No. 1 PASSENGER
Price 2/6



PULLMAN
COACH, No. 2 SPECIAL PULLMAN
Suitable for 2 ft. radius rails only. Price 13/-

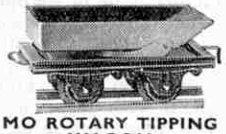
GAS CYLINDER WAGON
Finished in blue and red, lettered gold. Price 1/11



***No. O WAGON, HORNBY**
Price 1/6

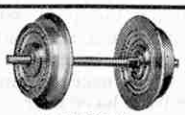
***No. 1 WAGON, HORNBY**
(Illustrated). Price 1/9

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



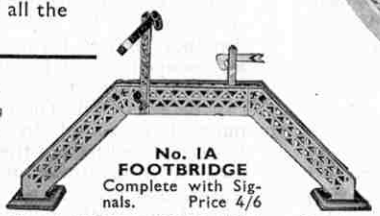
MO ROTARY TIPPING WAGON
Finished in green. Container revolves and tips at any angle. Price 1/-

G.W. or S.R. lettering.



MANSELL WHEELS
These solid die-cast Wheels can be fitted to Hornby Coaches, Vans, etc.
Price per pair 3d.

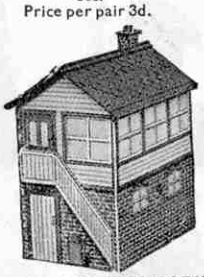
DIE-CAST SPOKED WHEELS
As fitted to Hornby Tenders, and for Wagons etc.
Price per pair 3d.



No. 1A FOOTBRIDGE
Complete with Signals. Price 4/6

No. 1 FOOTBRIDGE. Without Signals. Price 2/11

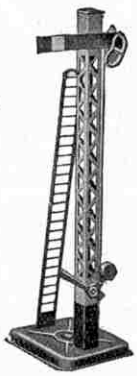
No. 1 RAILWAY ACCESSORIES
Miniature Luggage and Truck. Price 1/-



No. 2 RAILWAY ACCESSORIES
Milk Cans and Truck. Price 1/3

No. 1 SIGNAL CABIN
Price 2/6

No. 3 RAILWAY ACCESSORIES
Platform Machines. etc. Price 1/6

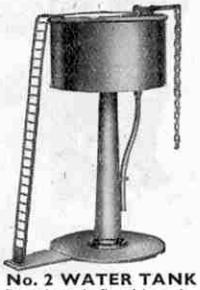


No. 2 SIGNAL
"Home" or "Distant."
Price 2/-

No. 2E SIGNAL
Similar to No. 2 Signal, but suitably wired for electric lighting.
Price 2/9

No. 2 JUNCTION SIGNAL
"Home" or "Distant." Price 4/9

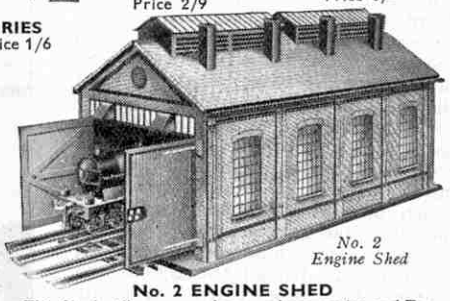
No. 2E JUNCTION SIGNAL
Similar to No. 2 Junction Signal, but suitably wired for electric lighting.
Price 6/-



No. 2 WATER TANK
Fitted with flexible tube and valve lever. Stands 8½ in. high. Price 5/9

No. 2E WATER TANK
Similar to No. 2 Water Tank, but suitably fitted for electric lighting.
Price 6/6

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

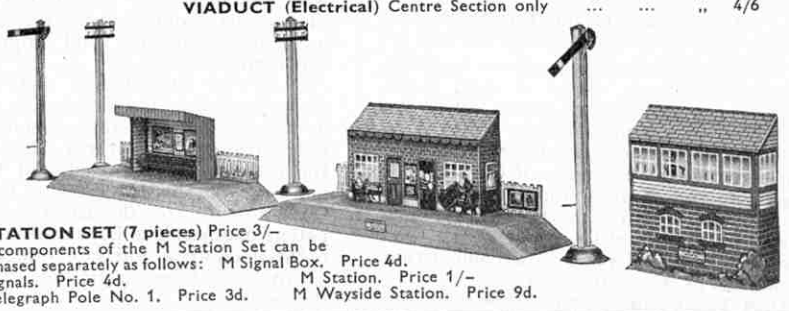


No. 2 Engine Shed

No. 2 ENGINE SHED
This Shed will accommodate any Locomotive and Tender with an overall length not exceeding 17½ in.
Price 22/6

No. E2E ENGINE SHED
Similar to No. 2 Engine Shed but suitably fitted for electric lighting. Provided with electrical track.
Price 23/-

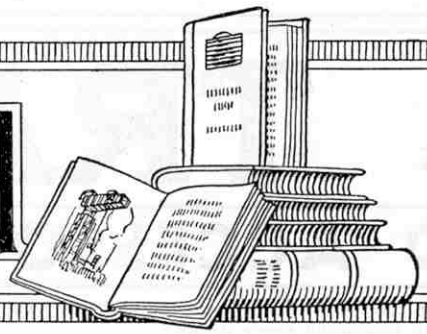
VIADUCT Price 6/6 **VIADUCT (Electrical)** Price 7/6
VIADUCT Centre Section only ... ... ,, 4/-
VIADUCT (Electrical) Centre Section only ... ... ,, 4/6



M STATION SET (7 pieces) Price 3/-
The components of the M Station Set can be purchased separately as follows: M Signal Box. Price 4d.
M Signals. Price 4d. M Station. Price 1/-
M Telegraph Pole No. 1. Price 3d. M Wayside Station. Price 9d.

NNS ROAD, LIVERPOOL 13.

Books to Read



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

"Trap-Lines North"

By S. W. MEADER. (Harrap. 7/6 net)

Life in the Thunder Bay District of Ontario, setting trap-lines for capturing the furred creatures of the North, is the subject of this absorbingly interesting book. Winter there is long and bitter. The work that has to be done requires both experience and courage, and the true story related by Mr. Meader of the successes and disappointments of his heroes will thrill his readers.

Jim Vanderbeck and his younger brother are called upon to take the place of their father, who is in hospital, on the trap-lines on which they depend. Each is left entirely to his own resources in coping with the blizzards and other dangers, and how they fared is described so realistically that the reader is virtually in their company as they make their way on foot from one camp to another along their lines, travelling by canoe until the great winter frost sets in and then transporting their belongings by dog sledge. They sleep in rough lean-to sheds, and have narrow escapes from death when the ice of frozen lakes breaks and they plunge into the water beneath, but all the time they are cheerful and courageous, and get on with the work they have in hand. Both are thoroughly at home in the woods, and we get fascinating pictures of many wild creatures, which include not only the animals they trap, but also moose, caribou and wolves. A giant lone grey killer wolf terrorises the district throughout the winter. Many stories are told of its strength, cunning and ferocity, and a primitive drama of Eskimo witchcraft is woven into them. Finally Jim succeeds in slaying the killer after a long and dangerous trail.

This is a book that all boys will thoroughly enjoy. It is illustrated by 23 real photographs and many excellent drawings, chiefly of furred and other creatures of the Canadian wilds.

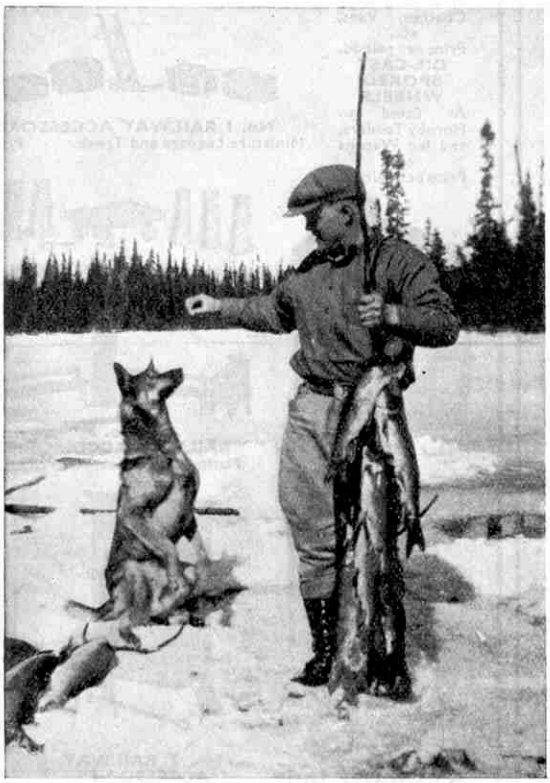
"The Menace of the Terribore"

By JOHN MACKWORTH. (Harrap. 5/– net)

The Terribore is a marvellous tank-like machine that can travel at high speed both above and below ground. It is the invention of a foreigner who brings it to England for the purpose of boring his way underground to the vaults of the Bank of England, and stealing the bullion stored up there. Around this the author has woven an interesting story that was awarded the £300 prize in a competition organised by the publishers.

Dick Trant and George Bassett are the first to see the Terribore, and they themselves are in the Bank vaults when the Terribore bursts through the ground and an escaped convict named Perry is set to work to force the locks so that the gold can be extracted. The convict is treacherously left behind by the unscrupulous foreigner, and he and the boys have narrow escapes from drowning when the flood waters that protect the vaults are released. The three boldly follow in the tracks of the monster, which defies the efforts of the police and troops to prevent its progress to the east coast, from which to burrow its way under the North Sea to Europe. The two boys and the resourceful Perry, who becomes their friend, foil the plot at the last moment, however, after they have been captured and imprisoned in the Terribore itself.

Perry is an original and attractive character who is thoroughly at home in the most desperate situations, and the thrilling adventures that lead to the recovery of the gold and the handing over of the machine to the British Government are described in a competent manner. The boys also take a share in this good work, and the excitement is well maintained from beginning to end of the book.



Netting fish through the ice during a winter in northern Ontario. From "Trap-lines North," reviewed on this page.

"Maskelyne's Book of Magic"

By J. MASKELYNE. (Harrap. 7/6 net)

Conjuring has the greatest fascination for every boy, and there must be few who have not tried their hands at simple tricks, while many have had ambitions to become famous conjurers. For all these Mr. Maskelyne's book will be a source of immense delight. It deals with conjuring in every form, and gives advice and information that will be of the greatest value to amateur conjurers as well as to those who take the profession more seriously. The book also is attractive to the general reader who is not specially interested in the practical side of conjuring, for it is pleasantly written and contains many stories of famous illusionists.

In accordance with the author's scheme for covering every phase of conjuring, he begins with advice on starting in magic. Then he explains how and where material for tricks can be obtained, and shows how many great magicians have succeeded by specialising on sensational feats. Chapters on tricks with cards, coins, handkerchiefs, pieces of paper, rope and other common objects follow. Illusions that require more elaborate apparatus and depend largely on stage management are then dealt with, and the scope of the work also includes thought reading and chemical tricks. Fascinating accounts are given of the showmanship of many famous experts, and the art of making up and of arranging stage effects also is dealt with. The book ends with a chapter on obtaining bookings for shows of various kinds.

The experience and personality of the author is evident on every page of his book, and in the advice he gives to beginners in conjuring. He emphasises time and again the need for practice, and shows that his own success is due partly to this and partly also to his persistence in inventing new methods of puzzling his audiences. There are 16 excellent plates and 60 line drawings in the text help to explain the tricks described.

"The Picture Book of Ships" (1/6 net)
"The Picture Book of Trains" and "The Picture Book of Aeroplanes" (each 1/– net)

(Ward, Lock and Co. Ltd.)

These books are intended for younger readers who are interested in the world about them. The first deals in graphic fashion with ships of all kinds, including liners, merchant ships, the Navy and lifeboats, and 24 excellent colour plates and many illustrations enable the reader to picture the way in which these are built and navigated. The books on trains and aeroplanes are equally interesting and well illustrated, the splendid colour plates again being outstanding features.

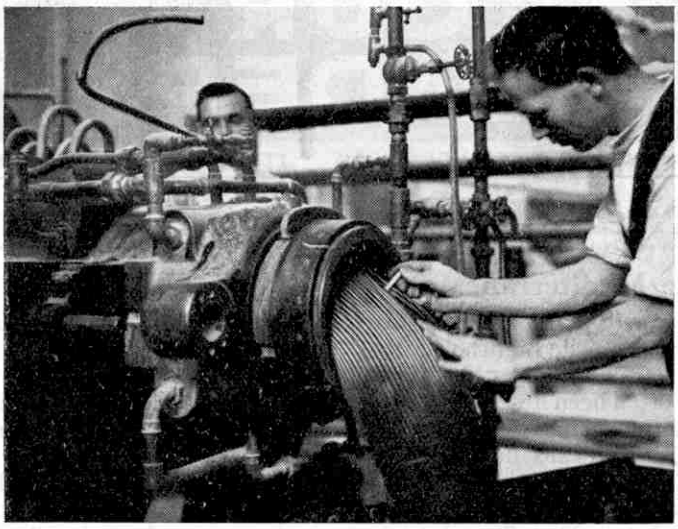
"The Wonder Book of How It's Done"

(Ward, Lock and Co. Ltd. 5/- net)

Modern boys, and modern girls too, are full of praiseworthy curiosity, and wish to know just how everything is done. The curiosity is not confined to such wonders as wireless and aeroplanes, but extends to practically everything met with in daily life. It can only be satisfied with full and precise information, and the wonder books of Ward, Lock and Co. Ltd. are well calculated to meet it. They are brightly written and lavishly illustrated, and will add largely to the store of interesting knowledge of their readers.

The present volume in the series is concerned chiefly with the interesting things that can be seen during the course of an ordinary day. It begins with an account of the production of a morning newspaper, and among other subjects dealt with are the cinematograph, photography, omnibuses, motor cars, engines and ships. Interest in games is recognised by accounts of the making of bats and rackets, cricket, tennis and golf balls, and other articles of a similar kind, and we read also how air liners are navigated and how a great city obtains its food. The making of maps, the building of roads, the production of books and the erection of houses are among the other everyday topics that are dealt with, and all who read the book will acquire a surprising amount of useful knowledge on how things work, where they come from, and how they are made.

There are eight colour plates and nearly 300 illustrations, which with the text make up a book of wonderful value for younger boys and girls eager to know and understand things that many people take for granted.



Tube rubber leaving the refining machine in which the material, in a plastic state, is forced through a gauze having 2,500 openings per sq. in. From "The Wonder Book of How It's Done," reviewed on this page.

"Understand Your Car"

By H. A. Hazell. (Pitman. 2/6)

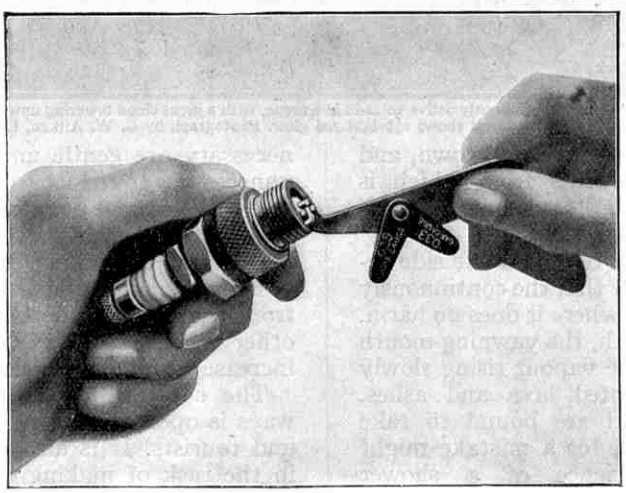
This clever and informative little book, the latest addition to Pitman's Motorists' Library, really lives up to its title. The author approaches the subject with the experience gained in the instruction of many new motorists. He knows just the things that puzzle them, and explains these in a clear and attractive manner. His book therefore is particularly suitable for new drivers who want to understand the way in which their cars work, but experienced motorists also will find it well worth reading.

Beginning with the power unit, the author shows how the petrol engine develops useful power, and explains the chief features of modern engines. Chapters on cooling and lubrication of the engine follow, and valuable and much needed advice is given on oil supply and the care of a cold engine. Carburetters, fuel pumps, air-cleaners, and other parts of a modern fuel supply system are next described, and a particularly good chapter deals with the clutch and gear-box, considerable space being given to the synchromesh mechanism now so largely used.

The power is traced through the transmission to the rear axle, the need for such things as universal joints, differentials, final drives and so on being explained. Then comes a section on steering and braking, in which much useful ground is covered. Chassis upkeep is next dealt with, and the comment is made that this is "often passed over by the inexperienced motorist." It is similarly treated by many old hands, as manufacturers know to their sorrow. The hints given are valuable, and the section on tyres is worthy of careful reading.

The longest chapter is devoted to electrical systems. These often are mysteries to car owners, but here they are dealt with in a way that shows them to be easy to master if the basic principles are understood. Decarbonising and the finer points of motoring are treated practically in the final chapters, and many road users could read with distinct advantage the author's words on the evils of selfish driving.

The book has a useful index, and is well illustrated with photographs and diagrams. T. J. Robinson.



Adjusting the points of a sparking plug. From "Understand Your Car," reviewed on this page.

"Sky Gipsy"

By Claudia Cranston. (Harrap. 10/6 net)

"Sky Gipsy" is an appropriate name for a book that describes the wanderings in flying clipper ships in Central and South America that are described in this very attractive book. In travelling from place to place the author covered more than 25,000 miles, and visited in turn the islands of the West Indies, the Guineas, Brazil, Uruguay and the Argentine before crossing the Andes to the countries on the west coast of South America, and returning to Florida by way of Mexico.

The book is described as an account of the gayest, jolliest aeroplane vacation. Its interest is not confined to the air, although the descriptions of views from the machines and of experiences during the flights are vivid and attractive, for Miss Cranston explored many curious corners of the countries visited during her long trip, and her comments on the people she met and the things she saw are original and often delightfully humorous. The book is well illustrated by means of magnificent photographs, chiefly of South American scenes from the air.

"The New Chemistry"

By E. N. Da C. Andrade (Bell. 3/6 net)

The old chemistry, the one that the schoolboy meets in his early years of science, is concerned with the building up of the chemical compounds from atoms, which long were thought of as the smallest possible invisible particles of the chemical elements. Now we know that the atoms themselves are built up of still smaller particles, and we have learned how to carry out changes in which these are involved. This is the "new chemistry" dealt with in Professor Andrade's book, and the changes he describes have at last accomplished the transmutation of the elements, for centuries the dream of the alchemist.

The book is not an easy one for the beginner in chemistry, but will arouse the interest of all who already know something of the science. It details the various constituents of the atoms, the bricks of which they are built, and describes how one element can be transformed into another by high speed bombardments with certain of these particles. The changes take place on a very minute scale, and the author gives interesting details of the complicated and highly ingenious apparatus that has been devised for bombardments of this kind. Throughout he deals with his fascinating subject with the clearness of the practised writer, and the book contains many illustrations of apparatus that have not previously been published in England.

"Simple Home Electricity"

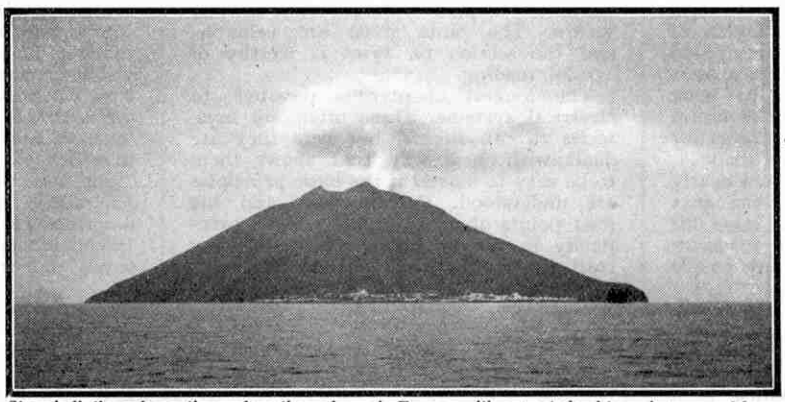
By Mary Gilbert. (Pitman. 2/6 net)

Electricity is now used not only for lighting and heating, but also for cleaning, washing and water heating, and for operating refrigerators, clocks, sewing machines and other appliances. Everybody should know something of the best means of making use of these in order to brighten up their homes and to reduce labour. Miss Gilbert's book forms an admirable guide, for it describes modern fittings in a way that will be appreciated by those who know nothing of electricity, and gives practical advice in regard to their choice and use.

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 Lighthouse of the Mediterranean"

Stromboli is the only continuously active volcano in Europe, and is known to all sailors as "The Lighthouse of the Mediterranean." The red glow from its crater is visible at night for many miles, and has often been described, but as a spectacle it cannot surpass the picture the volcano presents on a fine clear day. A northward bound ship sights Stromboli within an hour of passing through the Straits of Messina, and if conditions are favourable the summit of the dormant volcano Etna, 60 to 70 miles to the south, is still visible. The island volcano then appears as a peak rising from the sea, with a great cloud towering upward from the summit and spreading out into a white plume under the influence of the breeze.



Stromboli, the only continuously active volcano in Europe, with a great cloud towering upward from its crater. At night its summit shows a bright red glow. Photograph by G. W. Aitken, Liverpool.

Other islands of the Lipari group appear, but attention is held by the imposing sight of the active Stromboli. From the glittering sea, its steep slopes rise rapidly to the summit 3,090 ft. high. Clustered near the shore are enough houses and buildings to form a small town, and above and around are the vineyards from which is obtained a famous wine known as "Lacrimae Christi," a name that means "the tears of Christ."

The lip of the crater has broken down on the side remote from the town, with the result that the continuously emptying lava flows in a direction where it does no harm. As the ship draws away to the north, the yawning mouth of the crater can be seen, with the vapour rising slowly from it and from recently erupted lava and ashes. Ships passing close to the island are bound to take note of the direction of the wind, for a mistake might lead to the unpleasant experience of a shower of hot ashes.

Stromboli is an unforgettable sight to passengers on ships passing close to the island, and travellers in the flying boats that maintain the service between Naples and Messina are even more fortunate in their view of the famous volcano.

Vulcano, one of the smaller islands of the Lipari group, also is a volcano and in early times was very active, while 10 islets in the group are the remains of a great central volcano that is now submerged.

G. W. Aitken (Liverpool).

The New Motor Roads of Germany

While staying in Hamburg last summer I was given interesting glimpses of the new national motor roads of Germany. I drove along the completed road from Hamburg to Bremen with one of the surveyors, and also saw the road under construction between Hamburg and Lubeck.

On these roads cars travelling in opposite directions are separated by a strip, about 9 ft. wide, that is covered with grass or planted with shrubs. Each roadway is about 22 ft. in width and usually has a concrete surface. A narrow strip of asphalt down the middle marks each into two sections. Drivers normally keep to the right of this dividing line, crossing it only in order to pass other cars. They swing to the left when overtaking because the rule of the road in Germany is to drive on the right, and not on the left, as in this country.

As far as possible the roads are straight, and any curves that are necessary are gentle and are well banked so that it is unnecessary to reduce speed greatly when rounding them. The roads cannot be crossed on foot, and bridges are provided at intervals for this purpose. Where two main roads cross a bridge is built, together with an intricate system of smaller connecting roads so that cars can move from one road to another without crossing the paths of other vehicles. Features of this kind have resulted in an increase in travelling speed to three times the former limit.

The construction of this network of modern highways is opening up new stretches of country to visitors and tourists. It is also providing work. Those engaged in the task of making the roads live in encampments, each accommodating about 200 men, and special care is given to the conditions in which they live in order to make them feel as much at home as possible.

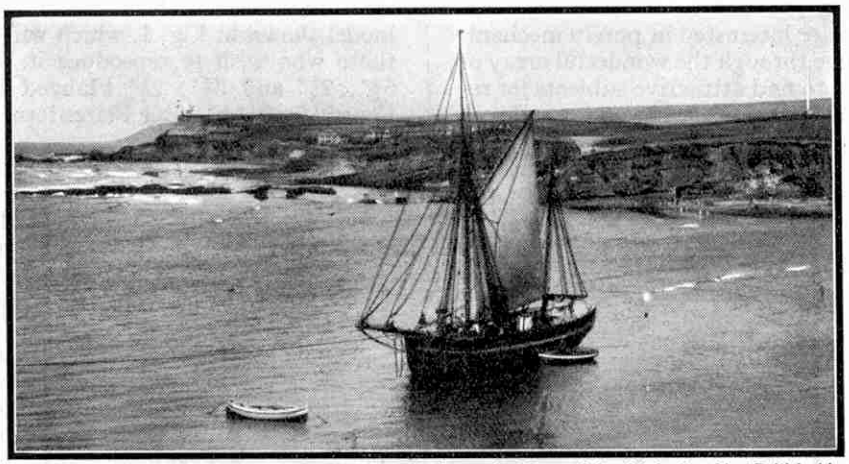
The scheme marks the beginning of a new era in motor traffic, and already cars specially designed for use on these splendid arterial roads are making their appearance. The routes followed by the roads have been carefully planned as it is intended that the beauty of the countryside shall be in no way impaired, but rather enhanced.

A. Pidgeon (Eltham, S.E.9).

The End of an Historic British Ketch

When on a visit to Bude, Cornwall, recently I saw the *"Ceres,"* the 54-ton ketch that was built at Salcombe nearly 126 years ago, and was claimed to be the oldest ship then sailing from British ports. The vessel sank in Barnstaple Bay on 25th November of last year, thus bringing to an end a long and remarkable career.

The *"Ceres"* began by taking supplies to Spain during the Napoleonic Wars, and was several times chased by French privateers. Some time ago she was cut in two, and an additional section was added. Later still a Diesel engine was fitted to help her negotiate the difficult passage into Bude harbour. She has sailed from Bude since 1815, and all through the War continued to ply between that port and South Wales, making the trip regularly in spite of submarines, which took heavy toll of shipping on her route. She usually brought cement or coal from Wales, and went back in ballast.



The "Ceres" in Bude Harbour, waiting for the tide. This famous ketch was claimed to be the oldest British ship in service when it was sunk in Barnstaple Bay in last November. Photograph by S. Denham, London.

On her last voyage the *"Ceres"* was bringing slag from Swansea to Bude, when she sprang a leak during dense fog. The engine room rapidly filled with water, which the pumps could not keep under, and rockets were fired as distress signals, but the vessel had to be abandoned before the Appledore life-boat arrived. The *"Ceres"* was then too far submerged to be towed ashore, and she sank in the Bay.

Bude formerly was an important port. Many years ago construction was begun of a canal leading to the middle of Cornwall, but only a mile or two had been cut when the coming of the railways changed the position. Until she was sunk the *"Ceres"* was the only vessel of any size to use the "port," which has become a holiday resort.

S. DENHAM (London, S.W.20).

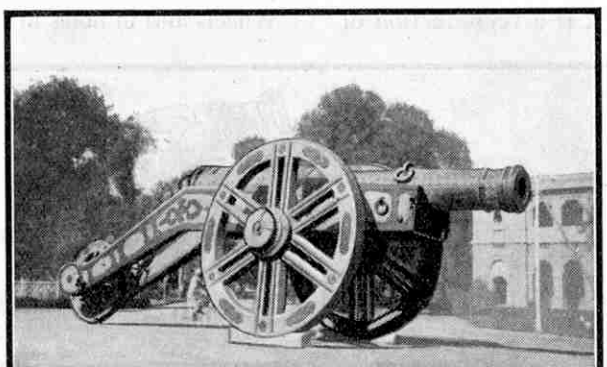
A Famous Indian Gun

The gun shown in the lower illustration on this page stands on a platform on the Mall, in Lahore, where it is sandwiched between the Mayo School of Arts and the University Chemical Laboratory. It is known as the "Bhanyian Ki Tope," which means the "Sweeper's Gun." Kipling mentions it in the opening pages of *"Kim,"* in which he refers to boys playing around it.

The gun has an interesting history. It was constructed in 1757 by order of Ahamad Shah Abdali, an invader from the north who then held the Punjab, and a brass or copper vessel was taken from each Hindu household to provide the metal from which it was cast. It was the largest gun of its time. Ahamad Shah regarded it as a dragon, a mountain, a destroyer even of the stronghold of heaven, and its possession was an emblem of sovereignty.

The gun was first used in the battle of Panipat, fought in 1761 against the Mahrattas, who were completely defeated. In 1772 it was captured by robbers who sacked one of the suburbs of Lahore, but after passing through other hands it was recovered by Rangit Singh, the famous ruler who united the Punjab. It was taken to Amritsar, and then used in the campaign in which Rangit Singh captured Multan. There it became unfit for further use, and was brought back to Lahore in the year 1818.

N. R. BERY (Lahore).



The "Bhanyian Ki Tope," or "Sweeper's Gun," on its platform on the Mall, Lahore. Photograph by N. R. Bery, Lahore.

The World's Loneliest Island

I was born in Tristan da Cunha, a lonely island in the South Atlantic about half way between Capetown, in South Africa, and Buenos Aires, in South America. Tristan da Cunha is really a group of three small islands. The largest, and the only one that is inhabited, is known as Tristan. It has an area of 16 square miles and is almost circular in form, with an old volcanic cone in its centre rising to a height of 7,640 ft.

The islands were taken over by the British in 1816, and a garrison was posted there. It was withdrawn in the following year, but a few men were then allowed to remain behind to form a small colony. Their descendants, with others who have arrived on the island, now make up a population of over 170.

The islanders live on a flat stretch of land in the north west of Tristan. They are skilful fishermen, and also keep cows, sheep and pigs. Their sole crop is the potato, and each family has its potato patch. They only receive visitors about once a year, when a passing ship calls at the island, and depend on friends in England and South Africa to send them stores. Such things as butter and sugar are luxuries.

The boats in which the men go to sea are made of canvas, and I was particularly interested to see a picture, showing some of them in one of their boats, in the *"Books to Read"* pages of the *"M.M."* for September 1933, for in it my father can be seen seated in the stern of the boat. He was then living on the island as its clergyman, and also acted as postmaster, magistrate and teacher.

Tristan da Cunha can boast of legends of hidden gold. It is said that a former pirate named Corri, who landed with booty won in many wild affrays on the Spanish main in 1810, hid a copper pot containing treasure under the island's waterfall, and died without revealing his secret.

E. L. B. ROGERS (West Horsham).

In Search of New Models

Coaches of Bygone Days

MOST model-builders are interested in purely mechanical subjects, and range through the wonderful array of modern machines in order to find attractive subjects for reproduction in Meccano. Motor cars, coaches and omnibuses are especially popular, but few carry their search back beyond the pioneer days of motor transport, although there is a wealth of material awaiting them in the methods of transport of bygone ages.

The models described and illustrated in this article give some idea of what can be done in this direction. They are reproductions of state coaches of various times and countries, and illustrate the development of these vehicles from the cumbersome coaches first used to the lighter and more comfortable vehicles of comparatively modern times. As their originals were drawn by horses the mechanical side of their construction is simple, and their chief attractions are their quaintness to modern eyes and their elaborate coachwork, which is admirably reproduced in Meccano. They form an excellent set of what might be called ornamental models.

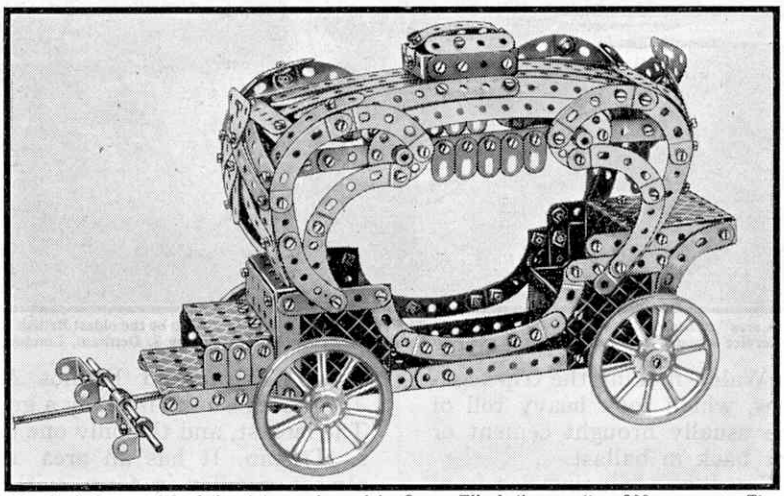


Fig. 1. A fine model of the state coach used by Queen Elizabeth more than 300 years ago. The original was more remarkable for ornament than for comfort, for it had no springs.

The first model, shown in Fig. 1, is a reproduction of Queen Elizabeth's state coach. Craftsmen and designers of the 16th century favoured coaches of massive design, but seem to have attached little importance to comfort, judging at least by modern standards, for their products had no springs. The occupants of this coach must have been severely jolted even at walking speed on the rough roads of the times in which they lived, but in compensation they were able to admire a massive ornamented roof. Unless the coach was only used in fine weather, this could have given them little satisfaction, however, for it had low sides and there was no glass to give them protection.

The general construction of models of this kind usually is simple, and even the beginner would have little difficulty in producing a satisfactory reproduction from drawings and descriptions. This plan has been followed in building the model shown in Fig. 1, which will be a sufficient guide to those who wish to reproduce it. The base is built up of $5\frac{1}{2}'' \times 2\frac{1}{2}''$ and $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plates bolted together. Four $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates form the low sides, and when these have been added, the elaborate overhead structure can be built up. This of course is the most striking feature of the model and its construction illustrates how Curved Strips can be used with success to represent complicated ornamental work. The intricate wood carving of such a subject as the bodywork of this coach of course cannot be reproduced in fine detail, but the general effect is excellent. In this case extensive use is made of $2\frac{1}{2}''$ Curved Strips, Plain and Cranked, and the row of Flat Brackets above the entrance to the coach is an example of skilful use of simple parts.

Another interesting feature of the model is the use of Bush Wheels in building up the supports of the roof. The Curved Strips forming the ornamental sides of the coach are attached to the Bush Wheels, and support is provided for the roof by journalling Axle Rods in the bosses of Bush Wheels and in holes in $7\frac{1}{2}''$ Strips forming the sides of the roof framework. The front and rear of this framework are formed of $3\frac{1}{2}''$ Strips, and a handsome appearance is given to the model by carefully bending the various Strips of the top of the roof to a pleasing shape.

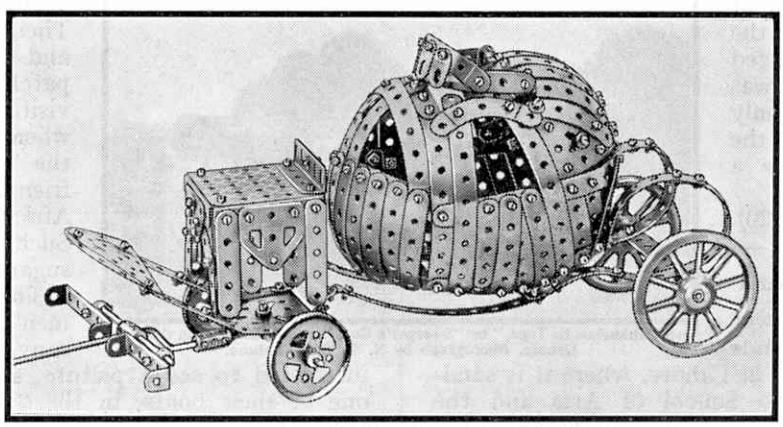


Fig. 2. A coach in which Napoleon refused to ride was the original of this unusual model.

This model is fairly easy to construct, but coaches of later date have more elaborate springing and other features that call for greater efforts on the part of the model-builder. This of course is the right type of model to choose, for it gives opportunities for the exercise of real model-building ability. Owners of even small Outfits will have no difficulty in illustrating transport in bygone ages, however, for they can construct excellent miniatures of simpler vehicles, such as the stage coaches that are so familiar to us from pictures. These coaches were of light but strong construction, and were intended for carrying mail as well as passengers. They were hauled by

six horses, and represented the speediest method of travelling available before the introduction of the steam locomotive. In building models of them it is not necessary to make extensive use of Curved Strips, for the coachwork was mainly square in outline, and good use can be made of Strip and Flexible Plates. There is no trouble in regard to wheels. These can be represented by 3" Wheels, or by 2" Fixed Pulleys if smaller wheels are required; for larger models wheels can readily be built up from Bush Wheels and Strips.

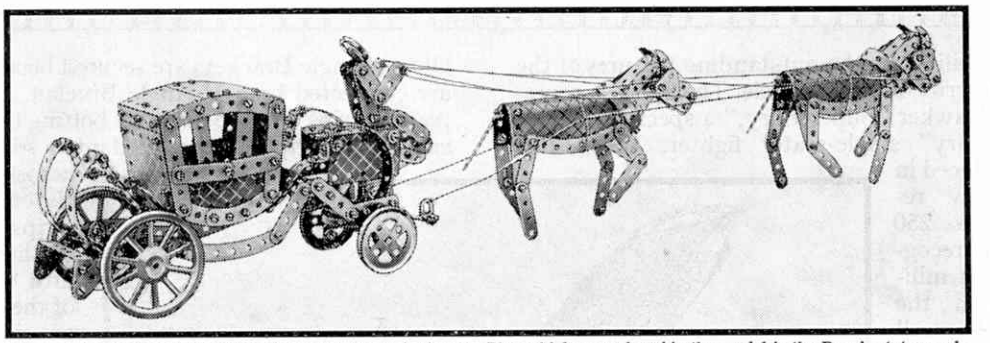


Fig. 3. A life-like representation of a coach drawn by horses. The vehicle reproduced in the model is the Pope's state coach.

Fig. 2 shows an example of a very ornate coach. It is a reproduction of a vehicle built in 1808 by order of Duke Augustus of Saxe-Gotha for the entry of Napoleon into Gotha in 1808. The extraordinary shape of the body of the coach perhaps represents an early idea of streamlining. Whatever its origin, it did not please Napoleon, who refused to use the coach, greatly to the disappointment of the Duke, although it had a comfortable interior and was well sprung.

Building the body of this coach calls for a little care, but is the kind of constructional work that will appeal to those looking for opportunities of showing real originality. The framework is made from $5\frac{1}{2}$" Strips, joined at the bottom by 4" Curved Strips. The Strips forming the sides of the coach are then bolted in position, and a $4\frac{1}{2}" \times 2\frac{1}{2}"$ Flexible Plate is used in the rear. How the upper part of the coach is fitted is evident from the illustration.

One part of the actual coach that at first appeared to be beyond the scope of Meccano parts was the hammercloth decorating the driver's seat, for the complicated designs woven into it cannot be reproduced exactly in full detail. An excellent effect was obtained by the use of Strips and Flat Trunnions, however. The shafts of the model are represented by Rods, joined by means of Couplings, but no doubt many model-builders will be able to improve upon this arrangement. On large models the shafts can be built up Strips, or of Rods on which Washers have been threaded. The front wheels are 2" Pulleys, and 3" Wheels serve admirably at the rear.

The model shown in Fig. 4 also is connected with Napoleon, but represents a coach that did please him. This vehicle was used at his coronation. It is plain, but of excellent proportions, and makes a good subject for straightforward model-building. The coachwork is well reproduced by means of Curved Strips and Flexible Plates. The rear springs are of the leaf type and are attached to the rear axle. Double steel springs represented by $5\frac{1}{2}$" Strips extend under the body to the driver's seat, and the body is suspended from the springs by means of straps. In the model the straps are represented by Strips. Those who wish to be more realistic in construction can use cords instead, but considerable strengthening of the steel parts of the springs will then be necessary. The driver's seat is constructed of Double Angle Strips, and is covered with Strip and Flexible Plates to represent the hammercloth.

A touch of realism can be given to models of this kind by adding miniatures of the horses that draw them. A Meccano "horse" is easily built by bending a Flexible Plate to form the body and fitting Strips to represent legs. A life-like effect can be obtained without difficulty by using short Strips bolted together at angles to suggest movement. A Cranked Bent Strip makes an excellent head for small models, and for large ones heads built up from parts are easy to design and have previously been described in the *"M.M."*

How the addition of horses livens up a coach model is shown in Fig. 3. This represents the state coach of the Pope, which is seen only on rare ceremonial occasions. The coach itself is similar in general form to that shown in Fig. 4, but it has two different sizes of wheels, and the shape of the cab lends itself better to Meccano construction without bending or mutilating parts, always an undesirable plan. When in use the coach is drawn by three pairs of white horses. In the model only two horses are represented, but the effect is strikingly realistic, especially as care has been taken to add a coachman sitting up on the box with the dignified air that is expected of him. Those who build the other coaches described in this article, or follow out the suggestion to find other interesting vehicles of a similar kind, should keep this in mind. The time and trouble devoted to building miniatures of horses will be well spent, for they not only give life to models of this kind, but actually seem necessary to complete them.

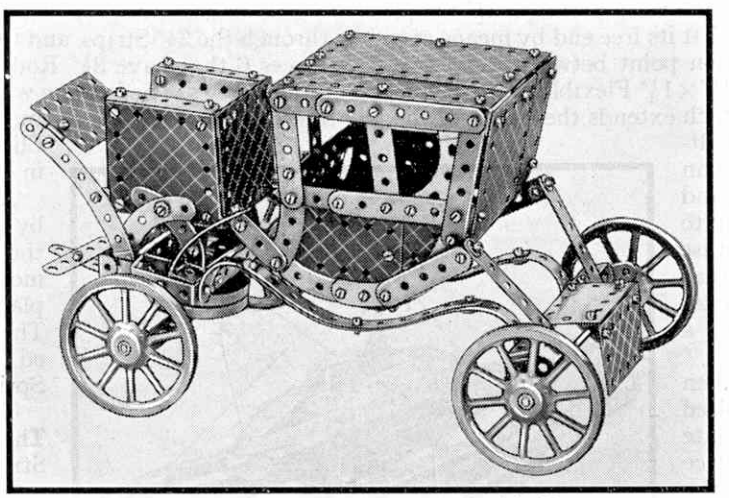


Fig. 4. Napoleon's coronation coach reproduced in Meccano.

Another possibility that is worth consideration is that of fitting coaches or other horse-drawn vehicles with the Meccano Magic Motor. This could easily be concealed somewhere within the coach, and yet made to drive the back axle. If at the same time horses in front of the coach were made to move ahead of it, and apparently to make use of their legs as if really walking, there would result a very fascinating model, and one that would well repay any trouble devoted to designing it. This can be done by attaching wires operated from the coach to the tops of the horses' legs.

New Outfit Models

Speed in the Air, on Land and on Water

SPEED and mobility are the outstanding features of the four models described in this article. The first is a representation of the Hawker "Super-Fury," a special development of the "Fury" single-seater fighter. When this machine was produced in 1933, its officially recorded speed was 250 m.p.h. and it was recognised as the fastest military aeroplane in the world. The model well suggests the high speed and clean appearance of its original. The remaining models include an unusual hydroplane, the prototype of which skims along on the surface of the water, a finely built racing motor car and a mobile crane.

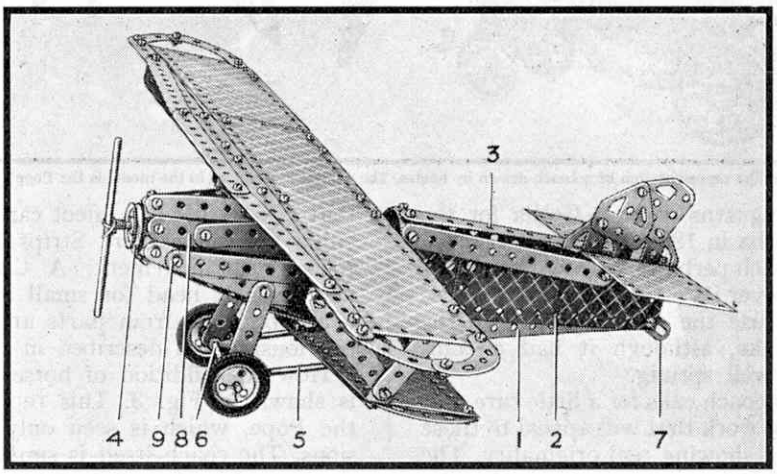


Fig. 1. A splendid model, built with Outfit F, of the Hawker "Super-Fury," a single-seater fighter famous for its high speed. The fine lines of this aeroplane are well reproduced in the model.

The model of the Hawker "Super-Fury" is shown in Fig. 1, and is built with Outfit F. Construction is commenced by first bolting a $5\frac{1}{2}$" Strip 1 to one corner of a $5\frac{1}{2}" \times 1\frac{1}{2}"$ Flexible Plate 2, and to the free end of the Strip bolting a $3\frac{1}{2}$" Strip. The Flexible Plate 2 is secured at its free end by means of a Flat Bracket to the connection point between these two Strips, and is extended by a $2\frac{1}{2}" \times 1\frac{1}{2}"$ Flexible Plate held in position by a $12\frac{1}{2}$" Strip 8, which extends the length of the model. A second $5\frac{1}{2}$" Strip is bolted through its second hole half an inch from the end of Strip 1, and this is connected at its free end to the Strip 8 by means of an Obtuse Angle Bracket. The bolt that holds the Obtuse Angle Bracket to the $5\frac{1}{2}$" Strip secures also a $\frac{1}{2}" \times \frac{1}{2}"$ Angle Bracket.

The engine cowling is then completed. A $2\frac{1}{2}$" Strip is bolted to the $2\frac{1}{2}" \times 1\frac{1}{2}"$ Flexible Plate and its other end is held in place by the bolt that supports the undercarriage. A $5\frac{1}{2}$" Strip is bolted to the $5\frac{1}{2}$" Strip 9, and a $3\frac{1}{2}$" Strip, which also is bolted to the $2\frac{1}{2}" \times 1\frac{1}{2}"$ Flexible Plate, is bolted one inch from the end of the $12\frac{1}{2}$" Strip 8. The free end of the $3\frac{1}{2}$" Strip is fastened by means of a Flat Bracket, and the bolt holding the Flat Bracket carries also a $1" \times 1"$ Angle Bracket, which will be referred to again later.

The opposite side of the fuselage is constructed in the same manner, and the two sides are connected at the tail by bolts and at the nose by means of Angle Brackets. A Flat Bracket 7 on one of the tail bolts forms the tail-skid. Obtuse Angle Brackets are secured beneath Strips 8. These are connected by a $\frac{1}{2}$" Angle Bracket, and carry $4\frac{1}{2}$" compound Strips that are made by bolting two $2\frac{1}{2}$" Strips end to end. A $3\frac{1}{2}$" Strip is next curved into a semi-circle and bolted across the machine, and the ends of the compound strips are bolted to it. A further 3" Strip is bolted into the remaining hole of the curved Strip and is provided with a Double Bent Strip that forms the support for the upper wing. The top of the fuselage is carried on a curved 3" Strip, and is composed of four $5\frac{1}{2}$" Strips, as shown in the illustration. Strips 3 are bolted together through their second holes and the bolt passes also through a Trunnion and the tailplane, which consists of two $4\frac{1}{2}" \times 2\frac{1}{2}"$ Flexible Plates. The fin is built up from a further Trunnion and two Flat Trunnions as shown.

The undercarriage is next built. A $3\frac{1}{2}$" Rod is pushed through the $2\frac{1}{2}$" Strips, and this Rod carries also small Fork Pieces 6 that have $3\frac{1}{2}$" Rods 5 secured in their bosses by Grub Screws. The landing wheels are spaced from the Fork Pieces by two Washers and are held in place by Spring Clips. The Rods 5 are fastened in place by Collars.

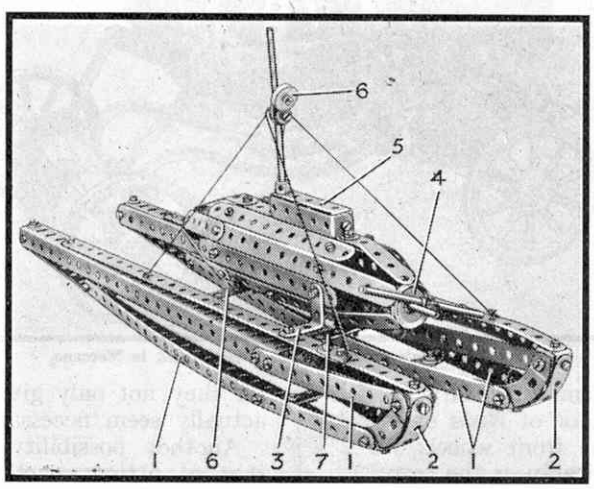


Fig. 2. A Meccano hydroplane, an attractive Outfit E model of an unusual vessel that skims over the surface of the water on its pontoons.

A $3\frac{1}{2}$" and a 5" Rod connected by a Coupling are pushed through the opening in the nose of the model, and a 1" fast Pulley is placed on it to fill in the opening. The propeller is a $3\frac{1}{2}$" Rod fastened by cord to an Anchoring Spring on the Rod.

The wings are now constructed. The lower wing has two $12\frac{1}{2}$" Strips for its main longitudinal members and the leading Strip is bolted to the centre one of three $5\frac{1}{2}$" Strips, which form the base of the fuselage and are bolted together at the nose and to a $1\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strip that spans the fuselage. The covering of the wing is represented by two $5\frac{1}{2}" \times 2\frac{1}{2}"$ Strip Plates and the second $12\frac{1}{2}$" Strip forms the trailing edge, which is strengthened by a $5\frac{1}{2}$" Strip held in place at the wing tips by one of the bolts that hold the Curved Strips, and at the fuselage end by an Angle Bracket. The construction of the mainplane should be clear from the illustration, in which the only feature not shown is the method of securing it to the fuselage. This is done by

bolting it to the Double Bent Strip already mentioned, and to the 1″×1″ Angle Brackets that were bolted to the fuselage when the engine cowling was being built. The inter-plane struts are also shown.

Parts required to build the model Hawker "Super-Fury": 8 of No. 1; 18 of No. 2; 7 of No. 3; 2 of No. 4; 12 of No. 5; 2 of No. 6a; 7 of No. 10; 1 of No. 11; 12 of No. 12; 2 of No. 12a; 4 of No. 12c; 1 of No. 15; 4 of No. 16; 1 of No. 22; 2 of No. 22a; 2 of No. 35; 101 of No. 37; 8 of No. 38; 1 of No. 45; 1 of No. 48; 3 of No. 59; 1 of No. 63; 2 of No. 90; 4 of No. 90a, 1 of No. 111c; 1 of No. 116a; 2 of No. 126; 2 of No. 126a; 2 of No. 142c, not included in Outfit; 1 of No. 165; 1 of No. 176; 2 of No. 188; 2 of No. 189; 2 of No. 191; 2 of No. 195; 2 of No. 197.

The attractive model hydroplane built with Outfit E, and shown in Fig. 2, is interesting because of the novel construction of its prototype. In building the model the pontoons should first be constructed.

Two 12½″ Angle Girders are bolted together through their end holes and are extended by 5½″ Strips, which are overlapped two holes. At their free ends the 5½″ Strips are bolted to 2½″ Curved Strips and the bolt holding them together carries also a Double Bracket, by means of which the two sides of the pontoon are connected. Two 12½″ Strips 1 are now fastened to the 2½″ Curved Strips, as shown in Fig. 2, and at their opposite ends are secured by Angle Brackets to a 12½″ Strip that forms the keel. The keel Strip is extended by a 3½″ Strip and a 3″ Strip 2 that is curved until it can be secured by an Angle Bracket in the bows. The connection point between the 12½″ and 3½″ Strip is provided by a 1½″ Strip that bridges the Strips 1 and is fixed by Angle Brackets. A 15″ compound strip is finally bolted to the top of the pontoon, and is provided with a 1″×1″ Angle Bracket 3.

The second pontoon is similar in construction, and the two are connected by 2½″×½″ Double Angle Strips 6 and 7.

The cylinder, which in the actual vessel houses the power unit and living-quarters, is built round two 5½″ Strips that are bent into circles, and the method of securing the Strips that form its shell can be seen clearly in the illustration. A 1″ fast Pulley 4 at each end is clamped in place by the ends of the longitudinal Strips, and the Wheels have a compound rod pushed through their bosses. The compound rod is made from a 4½″ and a 5″ Rod connected by a Coupling.

The conning tower 5 is made from three 2½″×½″ Double Angle Strips, and is held in place by an Angle Bracket and a 5″ Rod that forms the mast. This carries a searchlight, made from a ½″ loose Pulley 6 that is bolted to a Flat Bracket held in place by a Collar. At the stern the cylinder is bolted to one of the 2½″×½″ Double Angle Strips that connect the pontoons and at the bows to the Angle Brackets 3.

Parts required to build the model hydroplane: 8 of No. 1; 14 of No. 2; 4 of No. 3; 2 of No. 4; 11 of No. 5; 2 of No. 6a; 4 of No. 8; 1 of No. 10; 4 of No. 11; 10 of No. 12; 2 of No. 12a; 4 of No. 12c; 2 of No. 15; 1 of No. 15a; 1 of No. 16; 2 of No. 22; 1 of No. 23; 2 of No. 35; 86 of No. 37; 5 of No. 38; 1 of No. 45; 5 of No. 48a; 3 of No. 59; 1 of No. 63; 4 of No. 90a; 1 of No. 111c; 2 of No. 200.

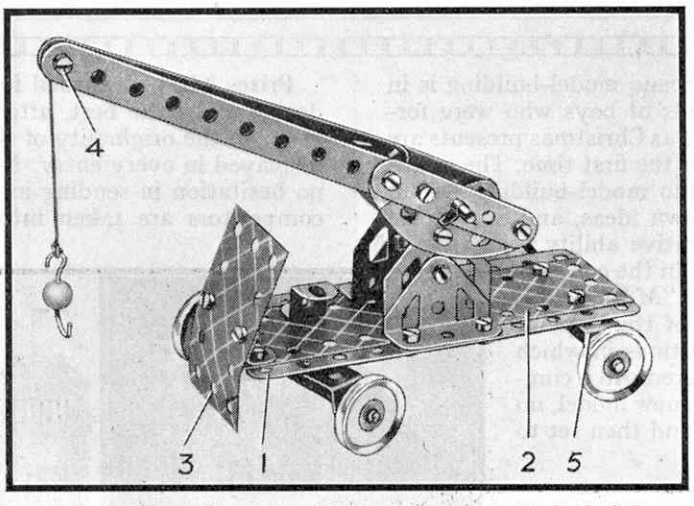


Fig. 3. A simple and ingenious model of a mobile crane, built with Outfit B.

A simple model of a mobile crane built with Outfit B is shown in Fig. 3. A 5½″×1½″ Flexible Plate 2 is bolted to a 2½″×½″ Double Angle Strip 5 by means of two bolts, and clamps the two 5½″ Strips 1 in place. At the opposite end the Strips are clamped under the nuts on bolts that hold in place two Angle Brackets, which carry a 2½″×1½″ Flexible Plate 3 that forms a windscreen for the driver. The driver's seat is represented by a ½″ reversed Angle Bracket. A ⅜″ bolt is pushed through the centre hole of the front end of the Flexible Plate 2 and is held in place by two nuts. A Flat Bracket is secured on its shank by a nut, and at the opposite end it carries a 2½″×½″ Double Angle Strip, which is mounted on a lock-nutted bolt. Two 3½″ Rods form the axles and after being pushed through the Double Angle Strips are provided with 1″ fast Pulleys.

Trunnions are bolted in the middle of the 5½″ Strips 1, and to them are connected Flat Trunnions, each of which carries a 2½″ Curved Strip to which a 5½″ and a 2½″ Strip are bolted to form the jib. The winding drum is a 2″ Rod pushed through the centre holes of the 2½″ Strips and held in place by Spring Clips, and a short length of cord is secured to it by a third Spring Clip. The pulley at the jib-head is represented by a Spring Clip mounted on a ⅜″ Bolt 4.

Parts required to build the model mobile crane: 4 of No. 2; 2 of No. 5; 1 of No. 10; 2 of No. 12; 2 of No. 16; 1 of No. 17; 4 of No. 22; 4 of No. 35; 20 of No. 37; 5 of No. 37a; 1 of No. 40; 2 of No. 48a; 1 of No. 57a; 2 of No. 90a; 3 of No. 111c; 1 of No. 125; 1 of No. 126; 2 of No. 126a; 1 of No. 188; 1 of No. 189.

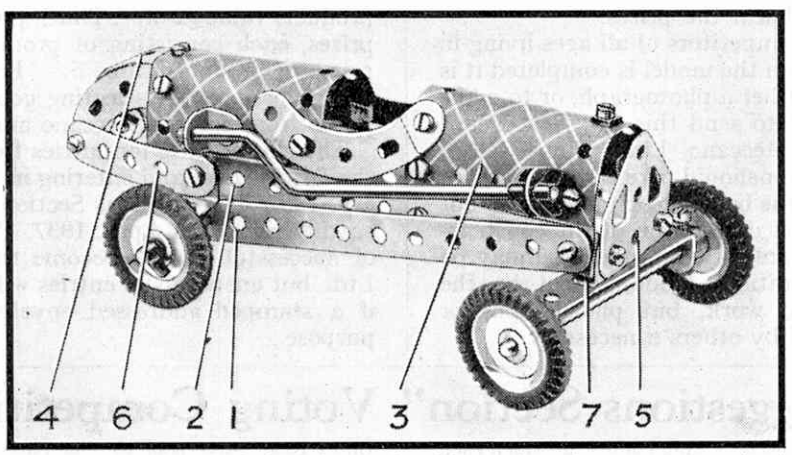


Fig. 4. The appearance of this simple but effective miniature of a racing car suggests speed and power. It is built with parts included in Outfit B, and is easy to construct.

The chassis of the Outfit B racing car shown in Fig. 4 consists of two 5½″ Strips 1 and 2, which are bolted together at one end, and secured to a "U" section Flexible Plate by means of a Flat Bracket. The bolt through the rear end of Strip 2 carries a 2½″ Strip and a ½″ Reversed Angle Bracket. A 4″ Rod, pushed through the Reversed Angle Brackets and the end holes of Strips 1, forms the rear axle and carries two 1″ fast Pulleys, fitted with 1″ Rubber Tyres and held in place by Spring Clips. Two 2½″ Curved Strips are bolted to the Flexible Plate 3 and to a second "U" section Flexible Plate as shown, and at the rear the second Flexible Plate is provided with two 2½″ Curved Strips and a bent 2½″ Strip 4, which are connected to the 2½″ Strip 6 by a Double Bracket.

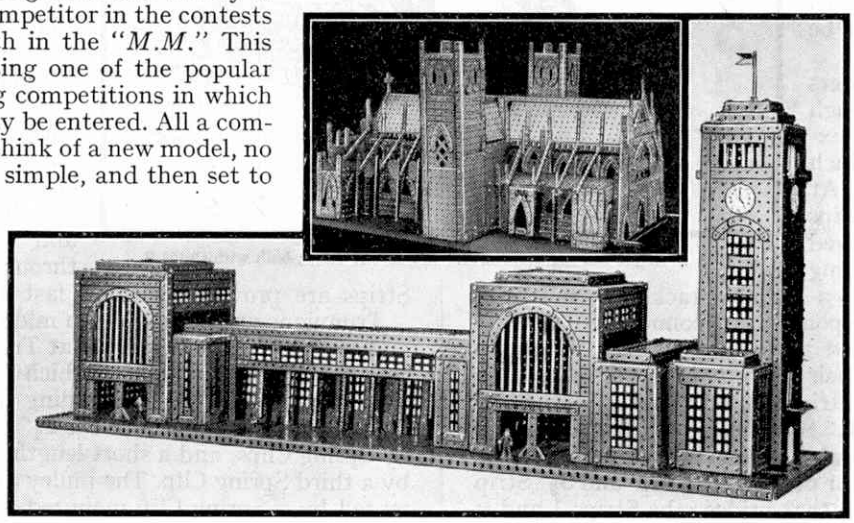
The radiator is a Flat Trunnion secured by two Angle Brackets, and a Trunnion 7 secured by the same Angle Brackets provides a support for the 2½″ Double Angle Strip

Parts required to build the model racing car: 4 of No. 2; 3 of No. 5; 4 of No. 10; 1 of No. 11; 4 of No. 12; 1 of No. 15b; 1 of No. 16; 1 of No. 19s; 4 of No. 22; 4 of No. 35; 25 of No. 37; 1 of No. 48a; 4 of No. 90a; 1 of No. 111c; 2 of No. 125; 1 of No. 126; 1 of No. 126a 2 of No. 199; four 1″ Tyres not included in Outfit.

Prizes for Meccano Model-Builders

A Grand "New Year" Contest

At this time of the year Meccano model-building is in full swing, and many thousands of boys who were fortunate enough to receive Outfits as Christmas presents are busily engaged in the hobby for the first time. The greatest fun and pleasure in Meccano model-building lies in constructing models to one's own ideas, and one of the best means of developing inventive ability is to become a regular competitor in the contests announced each month in the "*M.M.*" This month we are organising one of the popular general model-building competitions in which models of any kind may be entered. All a competitor has to do is to think of a new model, no matter how small and simple, and then set to work and build it as neatly as possible with Meccano parts. The model may represent any kind of subject and may be built with any size of Outfit, but models that really work or which may be put to some practical use, will stand the best chance of success. It is not necessarily the largest and most elaborate models that will win the prizes.



Two entries in a recent Meccano "Architectural" Competition. The upper model of Exeter Cathedral is the work of Mr. M. C. Hodder, Leader of the Exeter Meccano Club, and below is a fine model of a modern station building by Marcel de Wilde, Antwerp.

The contest is open to competitors of all ages living in any part of the world. When the model is completed it is only necessary to obtain either a photograph, or to make a good drawing of it, and to send this to "New Year" Model-Building Contest, Meccano Ltd., Binns Road, Liverpool 13. The competitor should take care to write his age, name and address on the back of each photograph or drawing submitted. A short description of the constructional and mechanical features of the model also may be enclosed with the illustration. Models must be the competitor's own unaided work, but photographs or drawings may be prepared by others if necessary.

Prizes will be awarded for the models that the judges decide to be the best, after due consideration has been given to the originality of thought and constructive skill displayed in every entry. New model-builders need have no hesitation in sending in their entries, for the ages of competitors are taken into account when judging the models submitted. Prizewinning models possessing points of exceptional interest will be described in the Magazine when the results of the competition are announced.

Entries will be divided into two sections: A for competitors of all ages living in the British Isles; B, for competitors of all ages living overseas.

Prizes will be awarded for the best entries from each section as follows: First, Meccano or Hornby products value £3/3/–. Second, products value £2/2/–. Third, products value £1/1/–. Six prizes, each consisting of products value 10/6 and six prizes of products value 5/–. Prizewinners will be given the opportunity of selecting goods to the value of their prizes from current Meccano and Hornby catalogues.

The closing date for entries from competitors living in the British Isles and entering in Section A is 27th February, 1937. The Overseas Section B, will remain open for entries until 30th April, 1937. Photographs or drawings of successful models become the property of Meccano Ltd., but unsuccessful entries will be returned to senders if a stamped addressed envelope is enclosed for that purpose.

"Suggestions Section" Voting Competition

This month we announce a special voting contest in which each competitor is asked to name, A, the most interesting and useful suggestion described or illustrated in the "*Suggestions Section*" pages of the "*M.M.*" during the twelve months of 1936, and, B, the six suggestions he believes will prove the most popular as decided by the votes of the competitors in the first section of this contest.

Entries must be written on postcards and it is only necessary for the competitor to write the numbers of the suggestions he selects; the full title of the suggestion is not required. The competitor's name and address must be given on his postcard, which should be addressed to "Suggestions Voting Competition," Meccano Ltd., Binns Road, Liverpool 13. One entry only will be accepted from each competitor. There will be one Section only, and competitors of any age may compete. The closing date is 31st March, 1937.

The three competitors whose entries are found to coincide most nearly with the list of six best suggestions as decided by the massed "A" votes of all competitors in the Contest will be awarded prizes as follows, in order of merit. First, Meccano or Hornby products value £2/2/–; Second, products value £1/1/–; Third, products value 10/6. A special prize of products to the value of 5/– will be awarded to the readers who contributed the suggestions judged to be the six best submitted during 1936.

Christmas "Architectural" Contest

We are taking this opportunity to remind readers that there is still time to send in entries in the Christmas "Architectural" Competition, full details of which were announced on page 730 of the December 1936 issue of the "*M.M.*" The closing date in both Home and Overseas sections is 27th February, 1937.

Model-Building Competition Results

By "Spanner"

"August" Contest (Home Section)

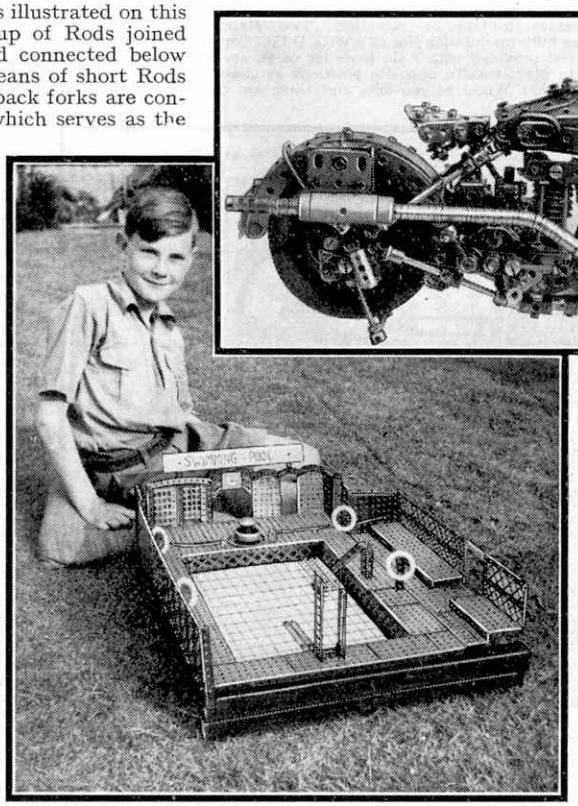
The successful competitors in the "August" General Model-Building Contest are as follows:

1st Prize, Meccano or Hornby products value £3/3/–: H. Renyard, London, S.E.13. 2nd, products value £2/2/–: D. Large, Wembley. 3rd, products value £1/1/–: J. Nowlan, London, S.E.14.

Products value 10/6: J. Brereton, Saffron Walden; G. King, London, S.W.17; J. Driscoll, Truro; M. Duffus, Aberdeen; N. Batchelor, Westcliff-on-Sea.

Products value 5/–: C. Owen, Hale; R. Brown, Hereford; E. Clements, Farnborough; R. Hilling, Ipswich; L. Dew, W. Harrow.

The outstanding feature of the model that won First Prize is the great amount of detail that is included in a comparatively small space. The model represents a B.S.A. *"Blue Star"* motor cycle, and although I have seen a great many fine models of this kind I cannot recall any that possessed more detail. It was built by H. Renyard, and is illustrated on this page. The frame is built up of Rods joined together by Couplings, and connected below the engine mounting by means of short Rods and Swivel Bearings. The back forks are connected to a Bush Wheel, which serves as the drum of an internal expanding brake. A saddle tank, built from Strips and small radius Curved Strips, is joined to the frame by means of Swivel Bearings at the rear, and Handrail Supports and Angle Brackets at the front. Knee pads consisting of Flat Brackets bolted face to face, and surrounded by a Rubber Ring, are fitted to the sides of the tank. The front forks are 3" Strips bolted to Cranks, and the latter are connected to the steering column by means of Screwed Rods. Handlebars are made from a Rod bent to shape and fitted at its ends with Couplings to represent rubber grips. Pawls are used as levers to operate internal expanding brakes on both the front and the rear wheel.



Two prize-winning models from the "August" Competition. The motor cycle was built by H. Renyard, London, and on the left is a swimming pool and its builder, D. Large, of Wembley.

A realistic engine crankcase is made from four 2" Angle Girders, and is secured to the frame by Couplings. The cylinder consists of a Chimney Adaptor and five 1" Pulleys placed on a Screwed Rod. Overhead valve casings are represented by Angle Brackets joined by a 1½" Strip, while the valve stems consist of nuts on Screwed Rods. I was greatly pleased with the manner in which the exhaust pipes were made. For these two 11½" Rods were suitably curved, and about 200 Washers were pushed over them so as to produce a pipe of the required diameter. At the rear end of each exhaust is a silencer, which consists of two Chimney Adaptors joined by a Sleeve Piece.

D. Large was awarded Second Prize for his efforts to find an unusual subject, and the skill and ingenuity he displayed in carrying his idea into practice. He submitted a carefully designed model of an open-air swimming pool, and he will no doubt be pleased to know that this is the first model of this kind that I have seen. The walls of the pool consist of four 12½" Braced Girders, and the bottom is made of Flanged Plates covered with squared paper to represent tiles. The attractive entrance is ornamented by small radius Curved Strips and surmounted by a clock, and seats for spectators are bolted to the walls surrounding the pool. At one end of the pool is a fountain, which consists of a 3" Pulley and a Boiler End in which is placed a rose from a watering can. The pool is surrounded by chains supported by 1"×1" Angle Brackets, and lifebelts represented by Motor Tyres painted white are provided. Diving boards and a water chute complete this realistic and pleasing model.

Third Prize was awarded to Mr. J. Nowlan for an exceptionally fine model of a Mallet articulated locomotive. The model has a wheelbase of 9 ft. 7 in. and is built to scale with the real locomotive. The frame is made of Angle Girders and Plates, and is fitted with springs and equalising gear. The low-pressure cylinders are built up of Ring Frames joined by 4½" Strips, and their ends are filled in with 4" Circular Plates and 2½" Curved Strips. Each cylinder is provided with slide bars consisting of two 7½" Angle Girders. The rear high pressure cylinders are built up as one unit, and both low and high pressure cylinders are fitted with Walschaerts valve gear. The boiler is constructed entirely from Strips and the firebox from Plates, and the low pressure steam pipe and the exhaust pipes are represented by Boilers.

The cab is elaborately equipped with gauges and control gear, and has glazed windows. The gauges are ¾" Flanged Wheels, in which paper discs marked with pointers and figures are inserted. Seats for the driver and fireman and a representation of a mechanical stoker are other features of the cab interior. Each gauge is a ¾" Flanged Wheel inside which is a disc of paper inscribed with figures and a pointer. Celluloid is used to represent glass.

July "Aeroplane Constructor" Contest

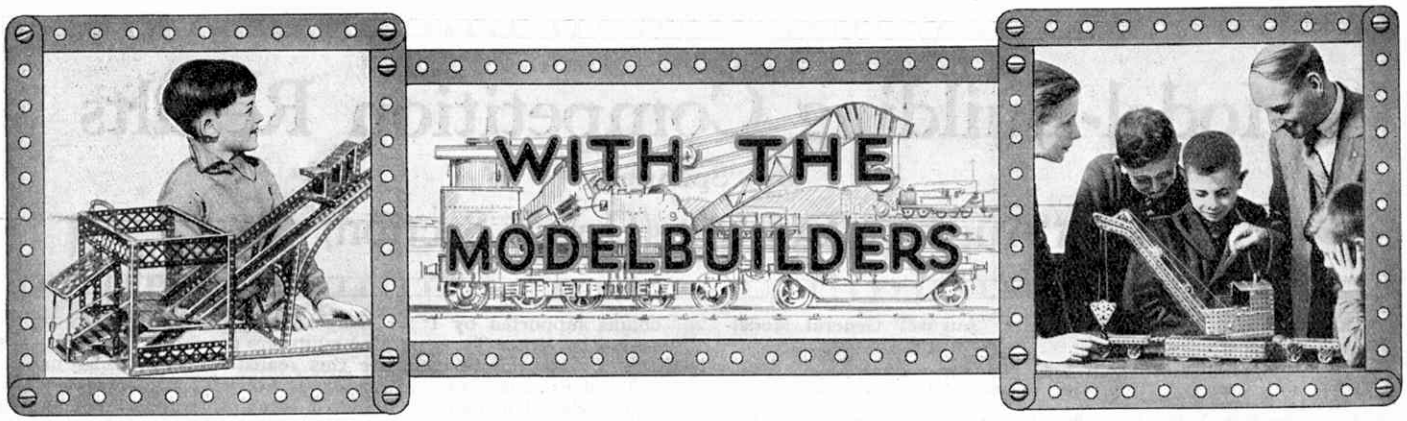
The principal prize-winners in the July "Aeroplane Constructor" Competition are as follows:

1st Prize, Meccano or Hornby products value £2/2/–: A. Spring, Cainscross, Nr. Stroud. 2nd, products value £1/1/–: T. Cheong, Kuala Lumpur, F.M.S. 3rd, products value 10/6: H. Mawson, Toronto.

First prize was awarded to A. Spring for a group of models. One represents a Gloster "Gauntlet" single-seater fighter. An interesting feature of this model is that it is easily convertible into a model of a Gloster "Gladiator" fighter merely by fitting cantilever landing gear and removing the two inner pairs of Interplane Struts. The wings are fully braced with Cord, and a wireless aerial is fitted between the wing tips and the tail plane, but the lead-in wires to the cockpit have been omitted. Two other models included in the group sent by this competitor are a high-wing monoplane and a Cierva Autogiro. A good feature of the Autogiro is the use of a Wheel Shield as a streamlined cover for the tilting mechanism of the rotor.

A neat model of a Miles "Hawk Major" was awarded Second Prize. It was built by T. C. Cheong from a No. 1 Special Aeroplane Constructor Outfit. The undercarriage fairings are formed by curving two Fuselage Sides round the undercarriage legs, the two edges being bolted together. Each wheel is held between two Centre Section Struts, which are bolted to the Wing. A slight defect in the model is that the fin and the tailplane are rather large compared with the fuselage.

Model Autogiros were built by several competitors and one of the best of these was sent by H. Mawson, who was awarded Third Prize. The main portions of the model are built from a No. 2 Aeroplane Constructor Outfit, but the rotor consists of four 12½" Meccano Strips bolted to a Bush Wheel.



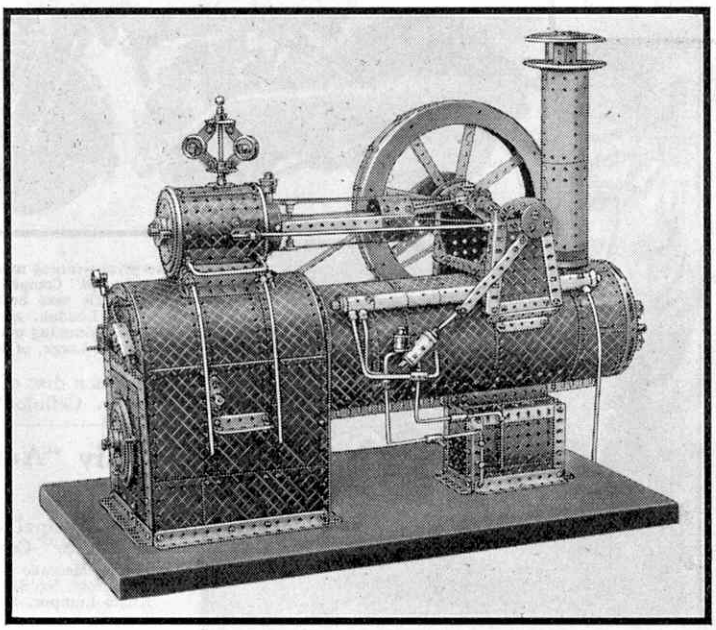
MECCANO STATIONARY STEAM ENGINE

A particularly fascinating model of a stationary steam engine is shown in the illustration on this page. The model owes its appeal to the simplicity of its design and the neat manner in which it has been built.

The model is all the more interesting because a stationary steam engine has not before been attempted in such detail, and this is probably due to the fact that hitherto the complicated nature of machines of this kind has made it impossible to build the model in Meccano without mutilating several parts. The introduction of Strip Plates and Flexible Plates, however, has made it easy to reproduce faithfully such structures as this, and as will be seen from the illustration, extensive use has been made of them in the model.

Interesting features of the model are the contrivance at the top of the chimney to catch flying sparks, an eccentric-operated water-feed pump and valve gear, the latter not being shown in the illustration, and the centrifugal governor mounted on top of the cylinder. The pedestal on which the forward end of the boiler is mounted forms the reserve water tank in the actual engine, and this use is suggested in the Meccano model by the provision of Rods to represent pipes.

The firebox door opens on hinges to disclose an Electric Motor, and this drives a countershaft, journalled in reinforced bearings, by means of Sprocket Chain. A double Sprocket Chain drive is taken from 1" Sprockets on the countershaft to 3" Sprockets on the crankshaft, and a belt drive from a Pulley on the crankshaft is taken to a second countershaft journalled transversely in the cylinder. This countershaft drives the governor through a 1½" and a ½" Bevel Gear.



This model of a stationary steam engine is remarkable for the skilful use of Strip Plates and Flexible Plates, and also for the amount of detail introduced.

CALICO PRINTING MACHINE

Some time ago J. C. Crompton, Manchester, submitted details of an interesting calico printing machine that he designed and constructed with the aid of Meccano parts. The following details of his machine no doubt will be of interest to those who have attempted to build similar models.

As far as the actual printing is concerned, the most important part of course is the roller that applies the pattern to the ribbon of calico. The model-builder made the roller himself in the following way. He first of all obtained a strip of copper about 6 in. long and 2½ in. wide, and after heating this he spread a thin layer of wax evenly over its surface. The wax was allowed to harden and the required pattern was then scratched on it, the wax being removed from parts where the colour was not required in the pattern. The next operation was to pour nitric acid carefully over the surface of the copper, which was eaten away where it was not protected by wax, and on scraping off the wax, the pattern was left in bold relief. The strip of copper was next bent round a cylinder of wood and secured in place by small panel pins, care being taken to see that the pattern registered correctly where the ends of the copper sheet met.

Construction of the model is commenced by erecting four 12½" Angle Girders vertically on a stout baseboard, and connecting their upper ends by means of compound angle girders made of two 12½" Angle Girders overlapping three holes. This frame is suitably braced and forms a support for the printing mechanism, which consists of a Wood Roller, over which the strip of calico passes, and the printing roller, which is pressed upon the material by means of a weighted arm. Inking is carried out by a third roller covered with felt that is soaked with ink of the requisite colour and presses on the printing roller.

The calico is fed to the printing rollers from a special system of feed rollers mounted in a frame on the baseboard. The arrangement of the feed rollers is such that the tension and rate of feed are constant. The drive for the printing rollers is taken from the feed rollers by means of belts.

A SIMPLE SYNCHRONOUS ELECTRIC MOTOR

A Meccano Model Synchronous Motor suitable for operation from a 6-volt Transformer was illustrated in the February 1935 "*M.M.*" Other model-builders have attempted to produce synchronous motors of their own design, and one of the simplest of these was submitted by Mr. R. L. Mansi, Orpington, Kent. Mr. Mansi's model has a 28-teeth Sprocket Wheel for the armature, or rotor, as it is usually called, and this revolves in bearings that are carefully aligned to avoid unnecessary friction or vibration. Two Meccano Bobbins fully wound with No. 22 S.W.G. D.C.C. Copper Wire, and provided with Axle Rods for cores, are secured in diametrically opposite positions as close to the Sprocket Wheel as possible, and these are connected in series, that is, the end of one coil is connected to the beginning of the other and the remaining wires of each coil are connected to the terminals of a Transformer.

Magnet Coils, Meccano Elektron Part No. 1538, could be used instead of Meccano Bobbins wound with wire. The inner terminal of one Magnet Coil should be connected to the outer terminal of the second, and the remaining terminals should be joined to those of the Transformer.

The use of different Sprocket Wheels gives a wide range of speeds. A synchronous motor using a 28-teeth Sprocket rotates at a constant speed of just over 214 r.p.m. and by using other sizes of Sprockets it is possible to make a motor suitable for driving a simple clock, or as Mr. Mansi suggests, for experiments in television, a field as yet scarcely explored by Meccano model-builders.

NOVEL IDEA FOR A 24-HOUR CLOCK

A few months ago attempts to introduce the 24-hour clock system were made by various authorities, but for various reasons, chief of which was the general reluctance of the public to break away from lifelong custom, the attempt was not successful. W. D. Butler, Redditch, suggests that the failure was largely due to the confusion caused by the use of an ordinary 12-hour clock dial marked with the figures 13 to 24 in smaller characters outside the normal circle of figures. In order to overcome this difficulty he suggests the use of a special cam and an hour hand made in two portions. One of the two sections of the hour hand is secured to the spindle, as in actual practice, and the second slides along the first so that it can be extended to indicate directly the figures 13 to 24 on the outer circle.

The cam is concentric with the hour hand spindle and rotates in the same direction as the hour hand, but at the rate of one revolution in 24 hours. It gives a rise equal to the amount the hand is intended to extend and the sliding portion is held in contact with the cam face by means of a light spring. The cam is shaped to have a moderately quick rise, pushing the sliding part of the hour hand outward at 12.0 midnight, and a sharp drop brings the hand back to the inner circle of figures 12 hours later. The change in the position of the finger is instantaneous at mid-day and the alteration in its length at midnight extends over a period of about 10 minutes, which at that time of the night passes unnoticed.

The above mechanism is perhaps an unnecessary refinement in the general sense, but model-builders who have constructed the Meccano Master Clock will probably find it of interest.

FIBRE GEARS

A novel suggestion for the introduction of special fibre gears for the purpose of obtaining silent and vibrationless drives has been submitted by L. Howe, Peterborough. In real engineering, fibre gears and couplings are invaluable for preventing annoying vibrations, and the model-builder who suggests their introduction into the Meccano system quotes a case in which he required to reduce the speed of a Meccano Electric Motor to 80 r.p.m. for the purpose of driving a gramophone turntable. Ordinary Meccano gearing of course could not be used, as a silent drive was necessary, and he did not favour the use of belt or Spring Cord drives, as they were not sufficiently positive for his purpose. He therefore manufactured one or two gears of his own from hard leather and the results were entirely satisfactory.

The chief objection to the introduction of fibre gears is that they would be costly to produce. Where noise is a consideration, Meccano Helical Gears can be used. These gears have teeth that slide easily into mesh and form a more or less silent drive, and usually can be used for the same purpose as the suggested fibre gears.

DIFFUSED LIGHTING

The Glass Rods included in the Kemex range form an excellent means of obtaining novel lighting effects. For instance, screens made of Glass Rods laid side by side and clamped at their ends between pairs of Angle Girders produce a corrugated effect, when an electric lamp is placed behind them.

If a similar screen is laid across the first, with the Rods in the two screens at right angles to each other, the light is further subdivided and seems to form a number of pin points of light. No doubt model-builders who try this novel method of lighting will find other ways of obtaining novel effects, and we shall be glad to hear of ingenious schemes of this kind.

A SPECIAL BIG END BEARING

Several interesting suggestions have been submitted recently for special parts to represent big end bearings in models of steam and internal combustion engines. Most of these have the disadvantage that they serve only the one purpose for which they are designed, but in one of them provision is made for using it either as a big end bearing, or as a plummer-block. None of the parts suggested possess the adaptability looked for in Meccano parts, and for this reason they are not suitable for introduction into the Meccano system. Satisfactory representations of big end bearings can usually be constructed from Cranks where Strips are used as connecting rods, and Couplings can be used similarly in connection with Rods. (*Reply to J. Williams, Cardiff, A. C. Lewis, Hull, and others.*)

BOYS! JOIN THE MECCANO GUILD

President:
MR. ROLAND HORNBY

The Meccano Guild is an organisation for boys started at the request of boys and conducted as far as possible by boys. At its head—guiding and controlling, and taking a personal interest in it—is the President, Mr. Roland G. Hornby, son of the inventor of Meccano, and it is ready to be of service to each individual member, and to help or give advice whenever requested. Membership of the Guild enables Meccano boys to get the best out of life.

The three great objects of the Guild are to make every boy's life brighter and happier; to foster clean-mindedness, truthfulness, ambition and initiative; and to encourage boys in the pursuit of their studies and hobbies and especially in the development of their knowledge of mechanical and engineering principles. Every boy undertakes to promote these objects.

A Meccano boy who joins the Guild becomes a member of a great brotherhood of world-wide extent, every member of which has promised to observe its great objects; wherever he happens to be, even in strange countries he will know that he has met a friend whenever he sees the little triangular badge. Thus the Guild brings together Meccano boys all over the world.

THE GUILD BADGE

Membership of the Guild is open to every boy possessing a Meccano Outfit or Hornby Train Set who satisfactorily fills in the application form. The only conditions are that members shall promise to observe the objects of the Guild and to wear their badges on all possible occasions.

The Meccano Guild badge is beautifully enamelled in blue and white. The ordinary form is made for wearing in the lapel of the coat, but brooch badges are issued to members who prefer to pin them in position, and applicants who wish to have this form of badge should indicate this when sending in their forms. In addition to the badge, each member receives a handsome Membership Certificate printed in orange and black.

HOW TO BECOME A MEMBER

In order to join the Guild all that is necessary is to fill up the form of application, and to forward it to the Secretary of the Meccano Guild, Binns Road, Liverpool 13, from whom an application form may be obtained if desired. A remittance to pay for the membership badge should be sent along with the completed form of application. The price of the badge is 7d. post free in the United Kingdom and 1/- post free overseas (25 cents Canada). The applicant is then duly enrolled as a member of the Guild and his badge of membership is sent to him. Each member has the personal interest of the President and is entitled to the friendly advice and assistance of the Secretary.

Boys living overseas should write to one of the Meccano agents at the following addresses: CANADA: Meccano Ltd., 187-189, Church St., Toronto. AUSTRALIA: Messrs. E. G. Page & Co., 52, Clarence Street, Sydney, N.S.W. NEW ZEALAND: Models Ltd., Third Floor, Paykel's Buildings, 9, Anzac Avenue (P.O. Box 129), Auckland, C.1. SOUTH AFRICA: Mr. A. E. Harris (P.O. Box 1199), 142, Market Street, Johannesburg.

MECCANO CLUBS

Meccano Clubs are founded and established by enthusiastic Meccano boys under the guidance of the Guild Secretary at Headquarters. At the present time there are over 150 affiliated clubs in various towns and villages in this country and overseas, together with many others not yet affiliated. Each club has its Leader, Secretary, Treasurer and other Officials, all of whom, with the exception of the Leader, are boys.

Every Guild member should join a club if possible, for only in association with other Meccano boys is he able to obtain the greatest fun from his hobby. If the nearest club is too far away for him to join, or if he is unable to join it for any other reason, he should consider the possibility of forming a new club in his own district. A special booklet entitled "How to run a Meccano Club" is now ready, and will be sent to any reader (post free) on receipt of 2d. in stamps.

When a Meccano Club has been successfully launched and good progress is being made, affiliation with the Guild is granted. A beautiful club certificate, suitable for framing and hanging in the club-room, is presented, and the club becomes entitled to such privileges as the loan of interesting lectures and large models built at Headquarters.

THE CORRESPONDENCE CLUB

Members of the Guild are eligible to join the Correspondence Club, by which they are placed in communication with other Guild members in some other part of the country or abroad. To those boys who are interested in foreign languages the Correspondence Club presents a splendid opportunity of obtaining a correspondent in the particular country in the 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

"A Happy New Year!"

It gives me much pleasure to wish all members of the Meccano Guild a very happy and prosperous New Year. Many of them have sent me their good wishes for 1937, and at the same time have given me most interesting accounts of the good time they have spent during the Christmas season, both at home and in the club rooms. I wish to thank all who have written, and also to express the hope that others will not hesitate to tell me about their Christmas festivities. I should particularly welcome letters from new members of the Guild, or from Meccano enthusiasts who wish to become members, and assure all of these that a hearty welcome awaits them, not only in the Guild, but also in the club movement. If there is a club near enough for them to join, they should immediately write to the Leader or secretary, and I will give them full details if they let me know. Members who cannot find a suitable club should immediately try to form one, for it is in club meetings, in the company of others who are equally keen on the hobby, that Meccano model-building and all that it means can be best enjoyed. I am looking forward to great expansion during 1937, both in regard to the Guild and Meccano clubs throughout the world.

Suggestions for New Guild Members

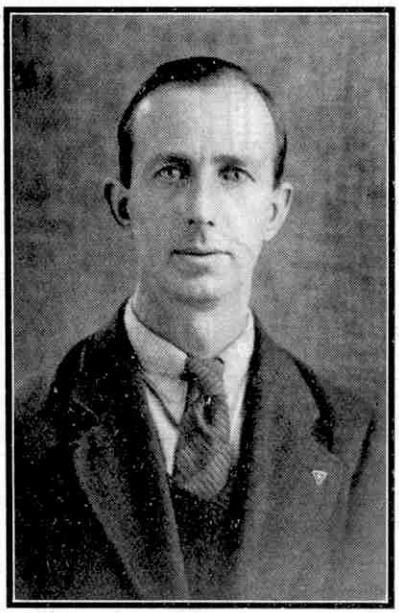
Even if a Meccano club boy finds it impossible to enter into Meccano club life, he need not consider himself cut off from other enthusiasts. To begin with he can write to me, and nothing pleases myself or the members of my staff more than to receive shoals of letters telling us something of the lives that the members we know so well are leading. We share in all their pleasures, and sympathise with them in all their disappointments, and our interest is not confined to model-building queries or suggestions.

Another suggestion for the lone Meccano Guild member is that he should find a friend through the Guild Correspondence Club. Through this organisation many thousands of members in all parts of the world have formed cordial pen friendships that have existed for almost incredibly long periods, and in many cases have led to meetings that have strengthened the bonds of friendship. Joining the Correspondence Club is very simple. All that is necessary is to fill in the special entry form, a copy of which will be sent to any member who writes to tell me he would like one, and then as soon as possible he is put in touch with a member in some other country, or in his own country if he wishes, who shares his tastes and is eager to enter into correspondence with him. There is plenty of room for new members, and at the moment I am particularly in need of correspondents in Canada and South Africa. Any Meccano boy in these countries who wishes to have a friend in Great Britain can be provided with one immediately.

I should like to take this opportunity of mentioning that a similar club exists for the benefit of members of the Hornby Railway Company, and application forms in connection with it may be obtained from the Secretary of the Company.

Meccano Club Leaders

No. 87. Mr. V. Miller



Mr. V. Miller has been the Leader of the Islington M.C. since its affiliation in January 1935. Considerable model-building is carried out, and two very successful Exhibitions have been held. Other activities of the club are Fretwork, Chemistry, Lectures and Games.

Enjoyable Meccano Club Exhibitions

Very few new clubs allow many months to pass before holding an Exhibition or display of some kind. This is as it should be, for when a good thing has been started it is a wise plan to tell everybody about it, and there could be no better way of introducing a Meccano club to the notice of possible members than by showing them what splendid things they make at meetings. The method has the further advantage of giving the original members something to work for, and they put their best efforts forward in order to make their Exhibition a success.

An interesting Exhibition organised by a newly formed club was that of the Maylands M.C., Perth, Western Australia. The main feature was a Meccano Harbour, complete with wharves, warehouses, cranes and railways. In such a display it is essential to include some shipping, and several fine models of Australian coastal vessels were featured. The realistic appearance of the harbour was enhanced by the use of blue cellophane and cotton wool to represent the sea. A lighthouse was built for the occasion, and special "sessions" were arranged, when the lights of the room were put out and the only illumination came from the flashing beam of the lighthouse, with wonderfully realistic results. The Exhibition was open on six evenings, and during that time was visited by 224 people.

The practical result of such splendid publicity is seen in the fact that there is now a waiting list of 15 boys who are anxious to become members of the Maylands M.C. Another interesting sequel is that the club have been asked to stage an Exhibition in a suburb that is 12 miles from the clubroom.

Another recent Exhibition by a new club was that of the Fraserburgh M.C., of Scotland. It was opened by Mr. A. Farquhar, the Corporation Gas Manager, and the hall was equipped with amplifiers so that Mr. Farquhar's speech, and announcements made at intervals during the Exhibition, could be heard by all present. An attractive Hornby layout at one end of the hall included about 60 ft. of double track, and a similar length of single branch line, and over 20 points were incorporated. Colour light signalling was employed, and scenic effects made by the members added to the realism of the layout. A wide range of really interesting models was included, and another feature that attracted much attention was a large display of model aircraft.

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:

ABERDEEN—R. N. Beveridge, 25, Ferryhill Place, Aberdeen.
LAHORE, INDIA—N. R. Bery, 1423, Kucha Babian, Lahore.
LIVERPOOL—L. Crump, 195, Bedford Road, Bootle, Liverpool 20.
NELSON, NEW ZEALAND—W. Wilson, 32, Milton Street, Nelson.
OXTED—W. Robinson, "Beecroft," 6, Cordons Way, Oxted.

Wednesbury M.C.—A recruiting campaign has considerably increased the membership. The winter attractions include Talks, Lantern Lectures and Games. The Meccano Section has acquired many more Parts, and a model Workshop and a large model Transporter Bridge are being built for the Exhibition. A Model Railway Section has been started, and members of the Carpentry section have erected the trestles and other fixtures for the layout. A Social has been held, and the visitors included a small party from the Kidderminster Model Railway Club. A return visit was paid to that club on the occasion of their Annual Exhibition. Club roll: 28. *Secretary:* A. L. Morgan, 17, Cobden Street, Fallings Heath, Wednesbury.

Breich M.C.—Model-building is the chief activity of this recently-affiliated club. Variation is given to the programme by occasional Games Evenings, and these are very popular. Club roll: 8. *Secretary:* M. Anderson, 36, Breich Terrace, West Calder, Midlothian.

Wheelwright Grammar School (Dewsbury) M.C.—At one meeting Morse Code signalling was carried out, and it proved so fascinating that a further meeting was spent in the same way. An Exhibition and a film display are to be held in order to swell the club funds. Club roll: 11. *Secretary:* T. McDonald, 180, Staincliffe Road, Dewsbury, Yorks.

St. Giles' Cathedral (Edinburgh) M.C.—Increasing interest is being taken in model-building, and members of the Model Aeroplane Section have built excellent models in a military aeroplane construction competition. The Leader of this section has given an interesting Lecture on "*Automatic Air Defence Weapons*." The activities of the club have been favourably commented upon in the local press. A monthly General Meeting of all members is to be held in the Y.M.C.A. Lecture Hall, and is expected to prove a valuable means of both bringing the whole club together and of drawing public attention to it. Each meeting will take the form of a film display of railway and engineering topics. Club roll: 100. *Leader:* Mr. R. Croall, 16, Bangholm Avenue, Edinburgh, 5.

Old Charlton M.C.—On one Model-building Evening excellent models of tipping wagons were brought by members. A wagon built by one of the younger members of the club was specially praised by the Leader for its neatness and strength, and was awarded full marks. "Progressive Games" are popular, members being awarded marks according to their successes, the totals being worked out at the end of each series. Interesting talks have been given on "*Metalwork*" and "*Domestic Electricity*." Club roll: 22. *Secretary:* W. Bailey, 63, Rectory Grove, Woolwich, S.E.18.

Fraserburgh M.C.—A successful Exhibition has been held. While some members were engaged in dismantling the models after the event, others took part in model aeroplane flights. Future arrangements include a presentation to the Leader, and the resumption of Junior meetings. The production of a club magazine is also contemplated, and the club have been offered the loan of a typewriter and a duplicator for this purpose. It is hoped to pay a visit to the local gasworks. Club roll: 26. *Secretary:* W. J. Dawson, Phingask, Fraserburgh.

Mall School (Twickenham) M.C.—A Mock Trial was followed with keen interest, and resulted in the prisoner being acquitted. Model-building and other ordinary meetings are concluded with a short period devoted to games. A Treasure Hunt proved very popular. Club roll: 30. *Secretary:* D. Rubin, 33, Clifton Road, Twickenham.

Regent Street Central School (Heywood) M.C.—An interesting Lecture has been given by Supt. Edgerly on "*Fire Fighting*," during which many appliances belonging to the local fire brigade were exhibited. A Lecture by the Leader on "*A Holiday in Suffolk*" was much enjoyed. An intensive recruiting campaign has resulted in a very considerable increase in membership. It is proposed to organise a Model-building competition and a Concert. Club roll: 150. *Secretary:* R. Lunn, 14, Pickup Street, Heywood.

St. Stephens (Saltash) M.C.—Keen interest is maintained in model-building, and models completed include aeroplanes, a waterline model of a destroyer, and several cranes. The model of Millbay Station mentioned in earlier reports is ready for painting. Two members are busy constructing a model of the famous sailing ship "*Cutty Sark*." A portion of each meeting is devoted to games. Club roll: 15. *Secretary:* B. Braund, 9, Homer Park, Saltash.

Hornsea M.C.—Lectures continue to figure prominently in the club programme, and in the "*Electricity*" series the Leader has shown how the telegraph and the automatic telephone work. A lecture has also been given on "*Chemistry in the Canning Industry*." Film shows are very popular, and Games Evenings are a further variation to the more serious activities of the club. Club roll: 14. *Secretary:* P. Thom, 5, Alexandra Road, Hornsea.

Queen Elizabeth's Grammar School (Barnet) M.C.—An interesting and varied programme is being carried out. Lectures are again a prominent feature, and subjects already dealt with include "*Cathedrals, Abbeys, and Historical Places*" and "*Some Famous Villages*." The club library continues to flourish, and several monthly periodicals are obtained for it. Arrangements have been made for visits to the works of the Associated Equipment Co. Ltd., and to the tobacco factory of Carreras Ltd. Club roll: 90. *Secretary:* E. J. Mansfield, 25, Hillside Gardens, Barnet.

Members of the Wednesbury M.C. Mr. W. Haughton, Vice-President, is third from the right in the back row, and Mr. L. Morgan, Leader, is fifth from the left in that row. On the extreme left is Mr. A. L. Morgan, secretary. This club was affiliated in March 1934. Model-building and Fretwork are popular activities, and a Model Railway section has been formed.

Plymouth M.C.—The membership continues to increase, and everybody is very enthusiastic. Two concerts in which members played a prominent part have been held, and Devonshire dialect "speeches" by the Leader were much enjoyed. Model-building activity is increasing, and preparations are in hand for the annual Exhibition. Cardboard models for scenic effects are being made to incorporate in a dockside display. Club roll: 62. *Secretary:* A. Symons, 47, Lisson Grove, Mutley, Plymouth.

Burnley Grammar School M.C.—Model-building competitions have produced some excellent and original models. Novel subjects have been chosen, and on one occasion members were invited to construct a model of a person carrying out some action. On another occasion they were invited to build models illustrating modern means of transport. Special models built recently have included a meccanograph, breakdown crane and stiff-legged derrick. Mr. Whitehead has given a very interesting Lecture on "*Sailing*," in which he described in detail the method of rigging both model yachts and their prototypes. Club roll: 20. *Secretary:* J. S. Keighley, Grammar School, Burnley.

Bryntirion M.C.—This club is making good progress, and members have been busily engaged preparing for an Exhibition. The models being built for the event include a travelling jib crane, mechanical shovel, anti-aircraft gun, and ships. Operations with Dinky Toys have become popular. Club roll: 13. *Secretary:* P. Parry, Ar-y-bryn, Penllwyn Park, Carmarthen.

St. Columba's (Southwick) M.C.—Model-building Evenings are spent at the Leader's house, and Hornby Train meetings are held in the schoolroom. Members recently have been concentrating on building the super model Block-setting Crane. Club roll: 10. *Secretary:* R. Brooks, 72, Edward Burdis Street, Southwick, Sunderland.

Exeter M.C.—The past year has been notable for the extensive model-building carried out, and the 1935 total of 200 models has been considerably exceeded. Previous achievements in all other branches of the club's activities were also surpassed. Models recently built have covered a large variety of subjects, ranging from bridges and motor vehicles to an ash tray and a Meccano football team. Club roll: 42. *Secretary:* E. Ashwood, 188, Pinhoe Road, Exeter.

St. James' (Grimsby) M.C.—A large model of a battleship of the "Revenge" class has been built. It is nearly 6 ft. in length, and is equipped with eight large and eight small guns, and has three searchlights mounted on the bridge. Small models of a battle cruiser, a naval tug and a submarine have also been completed. These and other models will be displayed at a Naval Exhibition at the school. Club roll: 6. *Secretary:* A. N. Dixon, 65, Yarborough Road, Grimsby.

Barnard Castle School M.C.—Several new members have been enrolled, and the membership is now greater than at any time in the club's history. The Wireless Section has closed down, and it is probable that it will be succeeded by a Dinky Toys Section, as increasing interest is being taken in operations with these attractive miniatures. There has been much activity in the Hornby Train Section. It is hoped to hold an Exhibition shortly. Club roll: 18. *Secretary:* S. W. Telfer, The School, Barnard Castle, Co. Durham.

AUSTRALIA

Maylands M.C.—Interesting visits "behind the scenes" have included one to the studios of Western Australia Broadcasting Ltd. The engineer-in-charge demonstrated the control panel, and the party were privileged to witness the testing of a new transmitter. Later in the day the party visited a factory where barbed wire is made. On another occasion members attended a local cinema, where they were privileged to see the talkie projectors and other plant. A very successful Exhibition has been held, and the many visitors included members of the Perth H.R.C. Branch. Shortly afterward the club paid a return visit to the Perth Branch to inspect their splendid model railway layout, and were allowed to carry out interesting railway operations. The club has been divided into two groups, and the friendly rivalry thus created will culminate in a competition for a Shield to be presented by the Leader. Club roll: 32. *Secretary:* M. Thomson, 16, Kennedy Street, Maylands.

HOLLAND

Maastricht M.C.—Meetings have been well attended, and a varied programme is being carried out. A lecture by the Leader on "*Meccano*" was listened to with keen interest. Club roll: 29. *Secretary:* L. Mulders, Houthemerweg No. 20, By Maastricht.

NEW ZEALAND

Ashburton M.C.—The membership is increasing, and good progress is being made in the various activities of the club. Meccano Parts competitions are a very popular feature of Model-building evenings, and occasionally meetings are devoted to games or film shows. Club roll: 20. *Secretary:* Miss M. Kruse, 83, Eton Street, Ashburton.

SOUTH AFRICA

Continental (Capetown) M.C.—Meetings have been well attended. Keen interest is taken in Model-building, and models of locomotives, aeroplanes and many other subjects have been completed. The members visited a "Safety First" Exhibition. A Table Tennis Section has been formed. Club roll: 6. *Secretary:* A. Jansen, 5, Robinson Street, Capetown.

A Simple Meccano Motor Chassis

An Example of Compact Model Building

SINCE the introduction of the driving test for motorists there has been a greater demand than ever for some means of explaining simply and clearly how a motor car works. The standard Meccano Motor Chassis described in Super Model Instruction Leaflet No. 1A is ideal for this purpose. This model is largely used in driving schools, and generally for instructional purposes in engineering schools and colleges, and has given the greatest satisfaction, for it reproduces every important mechanism of a car in a realistic manner. Recently we have been asked to design a simpler chassis suitable for more elementary instruction, however, and the new model illustrated on this page is the result. It is well suited for its purpose, for it is complete in essential details, and it also is of the greatest interest as an example of neat and compact model-building that will appeal strongly to all Meccano enthusiasts. We are therefore giving a full description of its construction in order to enable model-builders to reproduce it.

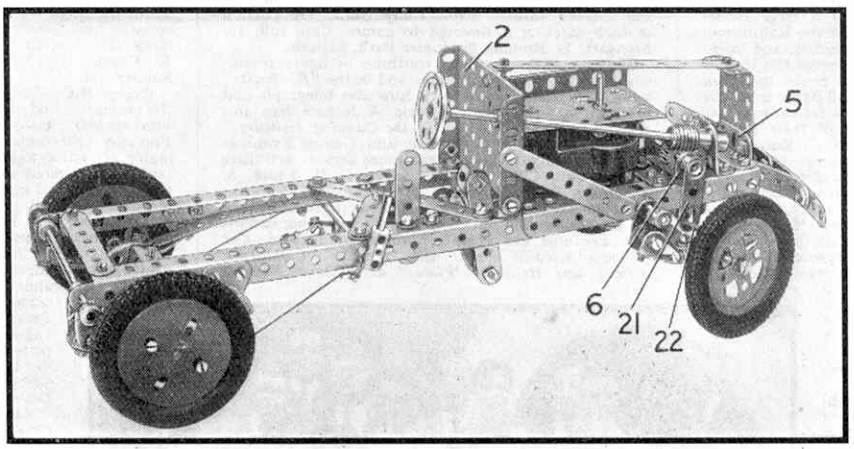


Fig. 1. A Motor Chassis that is simple but complete in all main details.

Each main chassis member consists of one 9½" and one 5½" Angle Girder overlapping two holes. These side members are joined together at their centres and rear ends by means of 3½" Strips, and in front the ends of the 5½" Angle Girders are pulled towards each other until the gap between them can be spanned by a 2½" Strip. A second Strip 1 is also bolted across the model as shown. A 3½" × 2½" Flanged Plate 2 is attached to the main frames in the position shown by means of two ½" × ½" Angle Brackets, and is braced to the frame by means of two 3½" Strips. The E1 Motor is next fitted. This is clamped at its rear end, as shown in Fig. 2, between the central 3½" Strip and 1" × 1" Angle Brackets 3 and 4. At its front end the Motor is bolted to a 3" Strip attached to the frame.

The front 2½" Strip of the frame has secured to it one 1½" Angle Girder 5 that forms a point of connection for the radiator, represented by a 2½" × 1½" Flanged Plate. The upper end of this Flanged Plate is connected to the Plate 2 by a 5½" Strip and a ½" × ½" Angle Bracket. A Double Angle Strip 6 is bolted to the side frame by a ⅜" Bolt and spaced from it by three Washers. The purpose of this part will be described later.

A Worm on the motor armature shaft meshes with a ½" Pinion 7 that drives a 57-teeth Gear 8 through a second ½" Pinion. The two longitudinal Rods carrying the ½" Pinions and the 57-teeth Gear 8 respectively are journalled at one end in the Angle Brackets 3 and 4, and at the other end in 1" × ½" Angle Brackets and Flat Brackets. The Gear 8 is locked on the Rod 9, on the rear end of which is mounted the driving member of the clutch. This consists of a large Flanged Wheel with two Flat Brackets attached on opposite sides of its boss. The slotted holes of the Flat Brackets accommodate two set-screws screwed into the Collar 10. Half a Compression Spring is fitted between the Collar 10 and the large Flanged Wheel, and a Rubber Ring, for 1" Pulleys, is fitted inside the flange of the latter.

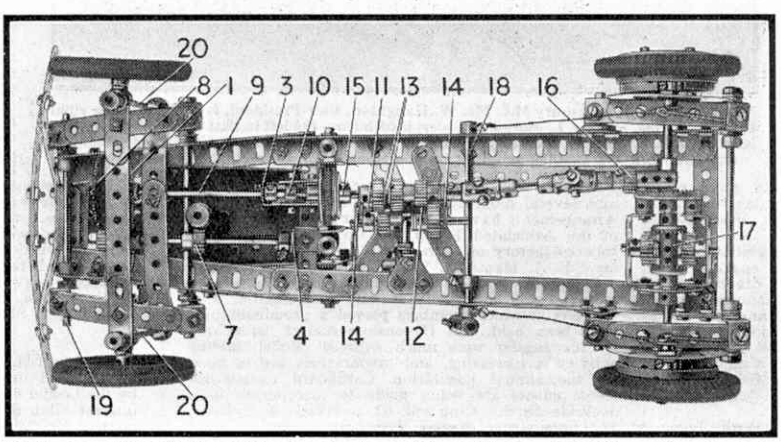


Fig. 2. An underneath view of the chassis, showing the clutch, gear-box, differential and springs.

The gear-box is next built and this is formed from a 2" Screwed Rod 11 carrying a Coupling 12. Two 2½" and two 2" Strips are attached to the Screwed Rod by means of this Coupling and as will be seen, the ends of these Strips are bolted to the main frames. The Screwed Rod carries two Flat Brackets 13 and also two pairs of Flat Brackets 14. In every case the Screwed Rod passes through the outer ends of the elongated holes of the Flat Brackets. The arrangement of the Rods and Gears of the gear-box will be understood on reference to Fig. 2. The gear lever, a 2½" Strip, is pivotally mounted on a ½" × ½" Angle Bracket and carries at its lower end a Threaded Pin. This part is accommodated between the two Pinions of the sliding shaft of the gear-box.

The driving shaft of the gear-box carries a 1" fast Pulley 15 that is held in contact with the Rubber Ring already mentioned by means of the half Compression Spring. The driven shaft of the gear-box is coupled by means of two Universal Couplings and a 1½" Rod to a short Rod carrying the ½" Pinion 16.

The Pinion 16 is in constant mesh with a 1½" Contrate Wheel forming part of the differential, and the construction of this mechanism is the next step in building the model. Two 1½" × ½" Double Angle Strips are fitted to the 1½" Contrate Wheel by means of ⅜" Bolts and spaced as shown by Collars and Washers. The opposite ends of the Double Angle Strips are bolted to a Bush Wheel, and Washers are used at this point for spacing. A Coupling 17 carries a 2" Rod in its centre hole, and this Rod has mounted on it, at each end, two Washers and a ¾" Pinion. These Pinions mesh with ¾" Contrate Wheels, each of which is locked on a Rod forming one side of the rear axle. The outer ends of these Rods are journalled in the bosses of Face Plates that are bolted to the Springs.

Each rear Spring is formed from a 3½" and 2½" Strip, curved to the correct shape. Each end of the 3½" Strip has mounted on it a Double Bracket, the one at the rear end being linked to the frame by two pivotally connected Flat Brackets. The other Double Bracket has a ¾" Bolt passed through the holes in its upturned ends, the bolts being lock-nutted to a 1" Triangular Plate on the main frame. The Face Plate is fitted as already described, and this carries internal expanding brakes similar to those described in S.M. 117. The brake cables are secured to ⅜" Bolts screwed into the tapped holes of Collars, and these are locked on a transverse Rod 18. The brake lever is clamped to this Rod by means of a Coupling.

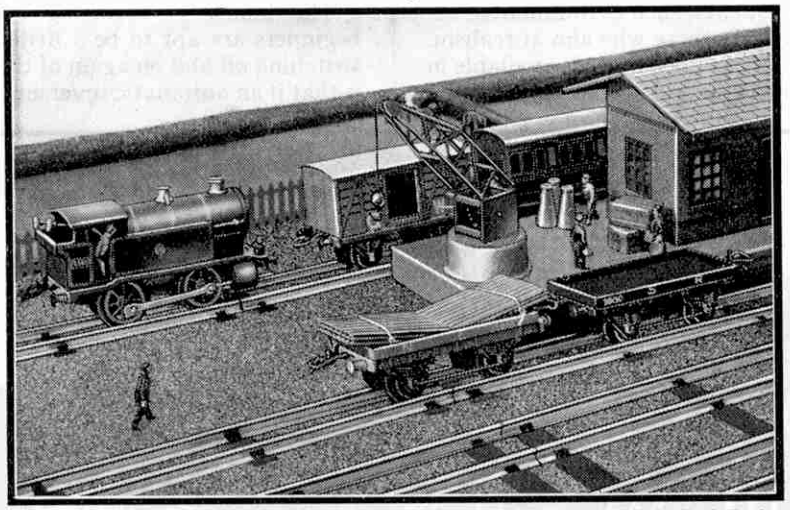
The front springs are built up and fitted in a similar manner to the rear springs, but the ¾" Bolts are replaced by the Rod 19. The front axle, a 4½" Strip, is now fitted, and Cranks are secured to each end of this. The boss of each Crank forms a bearing for a short vertical Rod free to rotate, and Collars are fitted to each end of this. The ¾" Bolts 20 are screwed into the tapped holes of these Collars, and further Collars are mounted on their shanks to carry the track rod.

Hints for Hornby Clockwork Train Owners

The "Running-In" Process

LARGE numbers of readers will recently have become for the first time the proud owners of Hornby Train Sets, and will now be busy finding out what loads their locomotives will haul and how fast they will run. 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.

We are so accustomed to find that brand new things are in perfect order, that it will be surprising to many to learn that Hornby Trains are by no means at their best when they are taken out of the boxes in which they are packed. This applies particularly to the locomotive, which is inclined to be stiff in running when it is new. A Hornby locomotive is not the only mechanism of which this can be said, however, for practically every mechanism has to be "run in" before it becomes really efficient. For example, motor car engines must at first be run at low speeds, and are only allowed to develop their full power when they have been at work for some time; they may indeed receive serious damage if they are run too fast when they are new. Ships' engines also must pass through a "running-in" period, and on real railways new locomotives are used to pull slow local trains, or even for hauling goods trains or for shunting purposes, until their mechanism is capable of undertaking the work for which it was designed.



A simple goods yard arrangement for a small layout. The No. 1 Clockwork G.W.R. Tank Engine is seen marshalling a goods train in readiness for departure.

With regular use, the capacity of a new Hornby locomotive will be found to improve steadily until it becomes "run in" and capable of the heaviest duties. Lubrication is a great help during this period, and should not be neglected, for the working parts of an engine 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 may follow 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 then gives rise to slipping. It also attracts dust and dirt. Meccano Oil is the most suitable for the purpose. It is of exactly the right consistency for the general lubrication of Hornby locomotives, and the Instruction Leaflets explain at what points it should be applied.

Hornby Rolling Stock also is apt to run stiffly when new, and here again "running-in" can be helped greatly by careful lubrication. Each axle bearing 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. The frames should then be bent gently outward so that the wheels have just sufficient play for easy running.

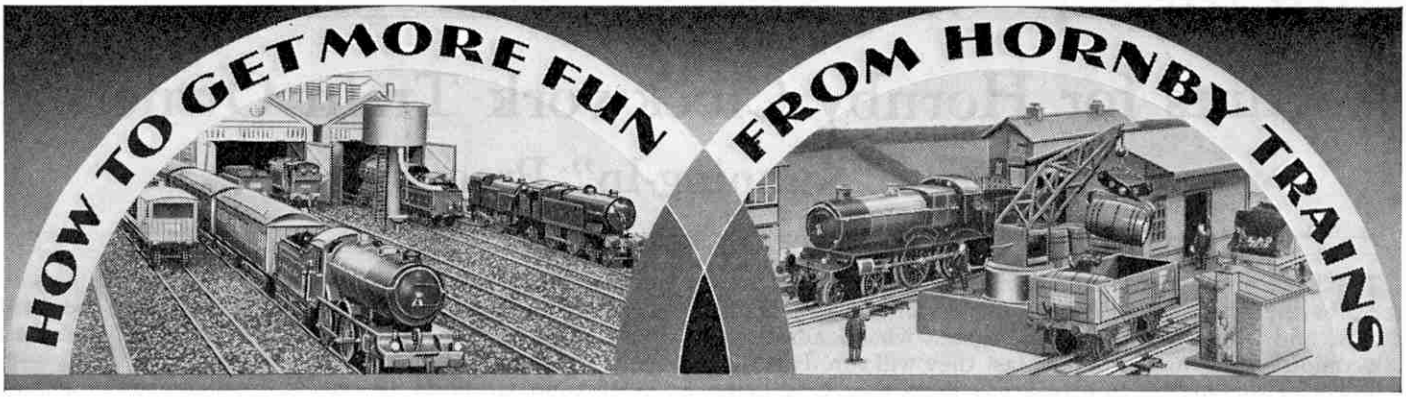
Meccano Graphite Grease is specially recommended for springs, and is available in handy tubes. It can be squeezed from the nozzle of the tube on the parts that are easily reached, and can be applied by means of a small paint brush to those that are difficult to get at.

The working parts of all accessories should be given a drop of oil, but 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. Oiling them causes them to become too free and liable to move and thus to bring about derailments.

A locomotive can only show its paces to advantage when it is given a perfect track to run upon. Close attention is given to the track of a real railway, and this example should be followed by Hornby Train owners. When new track is laid down for the first time the rails, especially the curves, do not always settle down flat on the floor or table. This is due to the natural springiness of tinplate track. In order to get over the trouble each rail in turn should be twisted over gently with the fingers towards the centre of the circle.

When the track has been laid down successfully it is advisable to test it. In Clockwork Train Sets the back of the handle of the Locomotive Winding Key is shaped to form a rail gauge. This means that it is made to fit exactly between the rails, and any tight places will be quickly discovered if it is slid along the track. The rails are eased gently apart at any points where the gauge cannot be slid along comfortably.

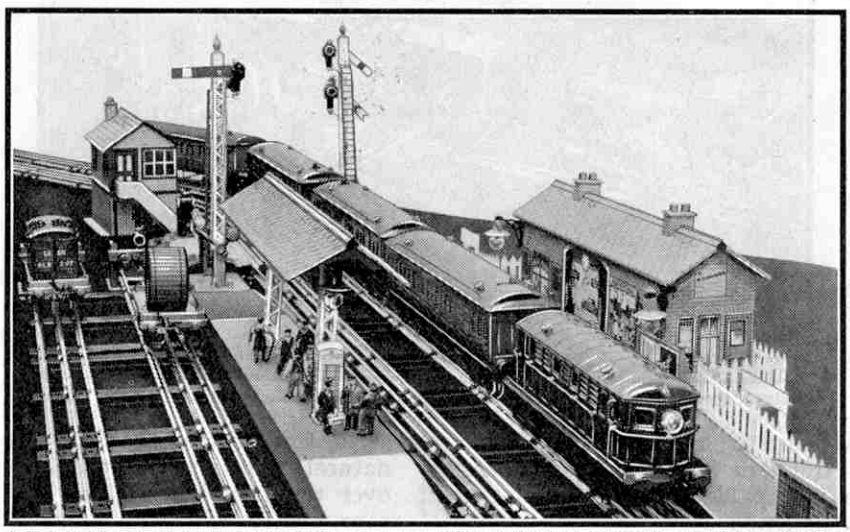
The question often asked by the owners of Hornby Clockwork Trains is "How many turns of the key may safely be given in winding up the clockwork motor of a locomotive?" There is no need for anxiety on this point, as the clockwork motors of Hornby Locomotives are very stoutly built and the danger of damaging them by over winding is remote. It is a perfectly safe plan to turn the key as far as it will go without forcing. Enthusiasts will then be able to tell when to stop turning by the "feel" of the spring as its tension increases as it is wound up.



RUNNING AN ELECTRIC RAILWAY

THIS month thousands of new Hornby electric railways are laid down for the first time, and their eager owners, with the help of interested fathers and uncles, are operating them with keen enthusiasm. The rapidly increasing popularity of electrically-operated miniature railways is easy to understand, for they can be readily controlled and it is possible to incorporate refinements, such as illuminated accessories, that appeal strongly to those who aim at realism.

The extensive range of Electric Locomotives available in the Hornby System gives owners a wide choice and enables them to realise the full delights of this easy control of operations. Very little attention is required to keep Hornby Electric Locomotives in good running order, but the instructions with regard to lubrication and general upkeep, packed with each Locomotive and Train Set, should be carefully followed.



A Hornby Metropolitan Train entering a station. The lamps of the Stations, Signals and Buffer-Stops are illuminated from the 3½-volt circuit of the T6A Transformer.

Another advantage of electric locomotives is that there is no winding to be done. Electric trains continue to run as long as the current is switched on. Thus they are not likely to end their journeys somewhat suddenly when nowhere near a station. This can happen on a clockwork system, unless the capabilities of the engines are well-known and their management is arranged accordingly.

The greatest advantages are realised in the degree of control that it is possible to exercise over the movements of electric locomotives. A much more realistic effect is obtained when the engine can be started or stopped, speeded up, slowed down or reversed as required, by the movement of a lineside switch than when the giant hand of the model railway operator is constantly thrust across the miniature "sky." Some hand-work of course is necessary, even on the most elaborate systems, but there is far less than is required when a clockwork layout is being operated.

The maximum degree of control can be exercised over the larger 20-volt Hornby Electric Locomotives that have automatic reversing mechanism. Reversing is effected by switching off the current and switching it on again, and the speed regulator thus governs the starting, stopping, reversing, and speed control of the locomotive. This reduces the control apparatus to a minimum, and is a great advantage in securing ease of operation. To make the reversing movement as rapid and smooth as possible the "off" and "maximum" positions of the speed regulator handle are adjacent to one another.

The knack of reversing is soon acquired, although beginners are apt to be a little awkward at first with the switching off and on again of the current. A point to notice is that if an automatic reversing engine is run into a station with its train and is stopped, it will start up in the reverse direction if the current is simply switched on again by the speed regulator. This is because the automatic reversing mechanism will have been actuated by the switching off and subsequent switching on of the current. In order to avoid this reversal the current should be switched off, as though to stop the train, and then on and off again rapidly before the train comes to rest. This causes the automatic reversing mechanism to operate twice, so that no alteration in direction is effected on again switching on. The train therefore starts in a realistic manner in the correct direction.

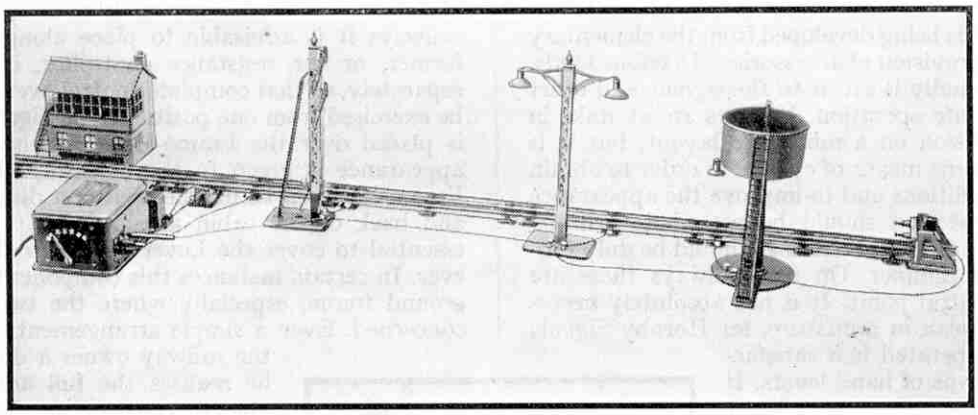
In addition to the automatic reversing mechanism, these locomotives are fitted with a cut-out lever in the cab. When this is pushed in the automatic reversing gear is thrown out of action. If the lever is pushed in and again pulled out, the engine is reversed. Thus the lever provides a method of reversing by hand if required.

Where automatic reversing locomotives are employed, the assembly of vehicles to form a train can be carried out in a most realistic manner, for the movements of the engine to and fro are governed entirely by remote control. In conjunction with the use of the automatic couplings fitted to Hornby Rolling Stock, this enables the train to be made up without being touched by hand.

With the exception of the smallest electric engines that do not reverse and the EPM16 Special Tank Locomotive, the remaining Hornby Electric Locomotives, both 20-volt

and 6-volt, have to be reversed by manipulation of a lever in the cab. Speed control however is still effected without touching the engine.

Of the 6-volt Hornby Electric Locomotives, the EPM16 Special Tank is exceptional in that it can be completely controlled from the lineside, both for speed and reversing. It requires special equipment, however, for it is reversed by reversing the direction of the current passing through the motor. The Reverse and Resistance Control Switch therefore is made for use with this Locomotive. This has separate levers for controlling the speed and the reversing movements. It must be used to control the locomotive, whether the Hornby Transformer-Rectifier or an accumulator is used as the source of power. The Transformer-Rectifier is a composite instrument that reduces the voltage of the alternating current mains supply, and then converts it to direct current suitable for the Permanent Magnet motor of the EPM16 Special Tank. It cannot be used to operate any of the other 6-volt Hornby Electric Locomotives.



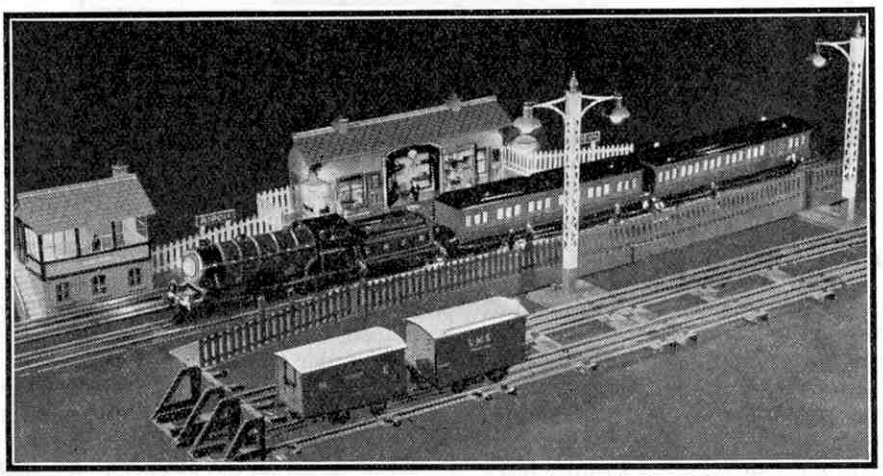
This illustration shows how Hornby Accessories fitted for Electric Lighting are connected. The earth terminal of the accessory is connected to a sleeper of the track by means of Flexible Wire attached by a Bonding Clip. The other terminal is connected to the Transformer.

The controllability of this engine makes it ideal for shunting work on a 6-volt layout, for local passenger and goods service, and for all the miscellaneous "runabout" jobs that fall to the lot of small tank engines in actual practice.

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 not a "steam-outline" locomotive, but is of the true electric type used on complete electric railway systems. 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.

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.

One of the greatest advantages of operating a Hornby electric layout is that it can easily be supplied with current for lighting accessories. The introduction of Hornby Accessories wired up for electric lighting increases the realism of a miniature railway to a wonderful extent. Nothing could be more satisfactory than to see Stations, Engine Sheds, Signal Cabins and Goods Platforms brilliantly illuminated. In addition miniature railway enthusiasts can enjoy the thrills of seeing Hornby Signals actually showing their red, orange or green lights, exactly as do those of the signals on real railways. The twinkling "ruby and emerald" effect seen after dark on real railways can be attractively reproduced in miniature, and it is great fun to run a Hornby Electric Railway fitted with illuminated accessories when the lights of the room in which it is laid are switched off. The red lamps fitted to Buffer Stops and Level Crossing gates can be made to give their warnings as in actual practice, and shunting yards and railway premises generally also can be effectively lighted by installing in them Single and Double Lamp Standards, which produce a very fascinating effect.



An interesting night scene on a Hornby electric layout. The accessories are illuminated from the Transformer, and the Metropolitan Electric Coaches are illuminated from the track circuit. The Coaches are fitted with electric pick-up apparatus.

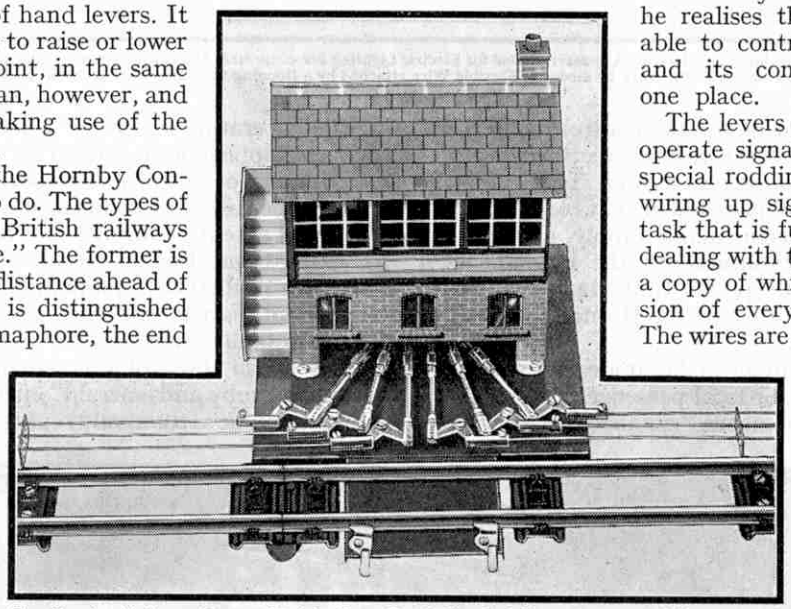
These accessories are connected in a very simple manner by means of the single wire system shown in the upper illustration on this page. Each of the T6A and T20A Transformers includes a special lighting circuit giving current at $3\frac{1}{2}$ volts in addition to, and independent of, the train-driving circuit. Thus the brilliancy of the lamps of illuminated accessories is constant and does not vary with the position of the speed regulator. The use of $3\frac{1}{2}$ volts for the lighting circuit was decided upon to enable Hornby Electric Railway owners to make use of ordinary flashlamp bulbs.

The Fascination of the Hornby Control System

By "Tommy Dodd"

WHEN a layout is being developed from the elementary stage by the provision of accessories of various kinds, special attention usually is given to the signals and other items required for safe operation. No lives are at stake in the event of a collision on a miniature layout, but it is necessary to have some means of control in order to obtain correct running conditions and to improve the appearance of the line. Each station should be provided with the necessary signals, and points or sidings should be duly protected in a similar manner. On real railways these are operated from a central point. It is not absolutely necessary to follow this plan in miniature, for Hornby Signals and Points can be operated in a satisfactory manner by means of hand levers. It is much more fascinating to raise or lower a signal, or to move a point, in the same manner as a real signalman, however, and this can be done by making use of the Hornby Control System.

Let us see first what the Hornby Control System is required to do. The types of signals chiefly used on British railways are "distant" and "home." The former is placed at a considerable distance ahead of the "home" signal, and is distinguished by having a fishtailed semaphore, the end of the semaphore of the "home" signal being square. The signals are usually placed on the left-hand side of the track, in accordance with the rule generally followed in real railways in this country. Besides the signals giving important indications to traffic on the main line, there are others controlling entrances to branches or sidings. The Hornby Control System provides for the operation of these and also for the working of the points leading to branch lines or sidings, by means of wires moved by centrally placed levers.



The Hornby Six-Lever Frame fitted inside a No. 2 Signal Cabin and connected by means of special control wire to the Signals and Points. The Guide Brackets fastened to the sleepers by means of nuts and bolts keep the wire in position.

The first and most important item in the Control System is the Lever Frame, by means of which the points and signals can be operated from a Hornby No. 2 Signal Cabin. Three sizes of frames are now available, having two, four and six levers respectively. The smaller sized Frames have been introduced for use in situations where the Six-Lever Frame is unnecessarily large. For instance, the one with two levers can be used to control a small halt provided with "home" signals, one for each direction. Similarly the Four-Lever Frame can be employed at a small station of this kind if both "home" signals are provided with "distant" signals in accordance with the regular railway practice. A further advantage of the smaller Frames is that they may be used to extend the signalling arrangements of a terminal station where a Six-Lever Frame is used, if the station is enlarged or extra sidings are laid down.

The most suitable place for the Lever Frame usually is alongside a station, as in real practice, and on electric railways it is advisable to place alongside it the transformer, or the resistance controller, if this is provided separately, so that complete control over all operations can be exercised from one position. The Signal Cabin of course is placed over the Frame itself, so that a very realistic appearance is given to the assembly. The levers of the Frame can then be handled without difficulty, as the roof and back of the cabin are hinged. It is not absolutely essential to cover the Lever Frame in this manner, however. In certain instances this component can be used as a ground frame, especially where the two-Lever Frame is concerned. Even a simple arrangement such as this gives the railway owner a distinct thrill when he realises the full advantage of being able to control two signals, or a point and its controlling signal, from the one place.

The levers of the Frames are made to operate signals and points by means of special rodding. There is no difficulty in wiring up signals or points, a pleasant task that is fully dealt with in the leaflet dealing with the Hornby Control System, a copy of which should be in the possession of every Hornby train enthusiast. The wires are fitted in the Guide Brackets if their length makes this necessary, and then lie alongside the track in positions similar to those of the points, rods and signal wires used in actual railway practice. Further realism is given by the inclusion of the Rodding Compensator, by means of which a pull given to a signal or points wire can be changed into a push, or vice versa, or by the introduction of the Rodding Traverse. The latter is designed to carry the control wire from one side of the track to the other, so that all signals and points, wherever they may be placed, can be controlled from the Lever Frame.

In order to obtain the best results from the use of the Control System it is desirable to screw the rails down to the baseboard, so as to supply the rigidity necessary to withstand the pull and push of the wires. It is not necessary to screw down all the sleepers, and choice can be made from those to be screwed down and those to which the Guide Brackets shall be attached.

An effort should be made to plan the wiring on neat lines. There are two good reasons for this. One is that the system will work best when the various wires are kept as straight as possible and as parallel to each other as circumstances allow. Buckled and twisted wires do not make the use of the System easy. The second is that the general appearance of the layout will be improved.

If the component parts of the Control System are carefully lubricated they will work smoothly and easily, so that signals and points at a considerable distance from the Lever Frame can be operated without difficulty.

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.

MIXED NAMES CONTEST

Competitions in which jumbled names are to be deciphered have always attracted large entries, and our correspondence shows that H.R.C. members continue to be as keen as ever on this type of contest. This month therefore we are giving them a further opportunity of this kind of showing their skill.

In the panel in the centre of this page are 18 words, the letters of which have been so jumbled up as to make them appear almost undecipherable. The words formed when these extraordinary collections of letters are re-arranged are the names of certain stations, well-known locomotives and famous trains, and competitors are asked to discover these names, or at least as many of them as possible. The stations represented must be further identified by giving the names of the company or companies on whose lines they are situated. The companies owning the engines and trains in the list also must be given, together with the wheel arrangements and classes of the locomotives, and the places between which the trains travel.

When the puzzling collections of letters have been deciphered, a list should be drawn up in correct order, with the additional information required placed after each name. Every member should send in his list, even if it is not complete, for all will encounter equal difficulties, and an entry that is not correct in every detail may win one of the many prizes offered.

OAPLHSWALOD	YREEPXDIMTSESSEESHRE
YOGLAVDAID	WAICSWNK
REYCRKFOR	FONECHDESTKUS
REGHETLONAWRDO	CQFOUHEETNEOSTS
WANROBJCK	LAISTTHENACRAN
CRASROSTS	HUIKBEYREMLOES
MARTITYILDEBO	YBOMNERETP
GIUETCDEPEHRK	VORLUSTEN
MOTHEETC	MASGIRSARROE

The competition will be divided as usual into two sections, Home and Overseas, and prizes consisting of any product manufactured by Meccano Ltd. to the respective values of 21/–, 15/– and 10/6 will be awarded to the senders of the three best solutions received in each section. In addition a number of consolation prizes will be given to competitors whose entries do not quite reach the standard attained by the winners of the major awards, but are nevertheless meritorious efforts. Entries should be written out on one sheet of paper only, on the back of which must be written the competitor's name and full address and H.R.C. membership number.

Envelopes containing entries should be marked *"H.R.C. January Mixed Names Contest"* in the top left-hand corner and posted to reach Meccano Ltd., Binns Road, Liverpool 13, on or before 30th January. The latest date on which entries from competitors in the Overseas Section can be received is 30th April.

Voting Contest

In order to help us to decide which type of competition is the most popular with members, this month we announce a voting contest on those held during 1936. Only the main contest in each month's issue of the *"M.M."* is to be taken into consideration, and entrants are asked to say which of these 12 contests they liked best. In addition they are required to give a list of what they consider were the eight most attractive contests in order of popularity.

Prizes of any product manufactured by Meccano Ltd. to the value of 21/–, 15/– and 10/6 respectively will be awarded to the three competitors in each section, Home and Overseas, who forecast the final order of voting most accurately. In the case of a tie for any prize, the prize money will be equally divided.

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 30th January. The latest date on which entries from Overseas competitors can be received is 30th April.

COMPETITION SOLUTIONS

"September Photo Voting Contest"

The entries received in this contest show that all the model railway photographs reproduced on the H.R.C. Competition Page of the September *"M.M."* appealed strongly to members. No. 9 proved the most popular, but No. 2 received almost as many votes, and only 78 votes separated No. 5, the third in the list, from No. 1, which was last but one.

The order in which the photographs were placed by the massed votes of competitors was as follows: No. 9; No. 2; No. 5; No. 8; No. 3; No. 11; No. 4; No. 10; No. 7; No. 12; No. 1; No. 6.

"Summer Puzzle Contest"

The three mysterious objects illustrated in these pages in the July, August and September issues of the *"M.M."* were respectively a Hornby Milk Can, seen from above, and end views of a Switch Sleeper with tumble type Lever and a Hornby Rail Gauge Screwdriver and Spanner.

COMPETITION RESULTS

HOME

November "Layout Planning Contest."—First: C. E. Wrayford (6039), Moretonhampstead, Devon. Second: J. E. Murrell (45368), London, S.E.24. Third: W. B. Hudson (1733), Weymouth, Dorset. Consolation Prizes: C. Pemberton (39049), Dublin, I.F.S.; N. C. Ferry (47001), Timperley, Cheshire; K. Gandy (7571), Sheffield, 8; D. Foster (48290), Chester-le-Street, Co. Durham; L. J. Slater (49094), Cosham, Portsmouth.

November "Word-Building Contest."—First: L. H. C. Hawkins (43494), Burnley, Lancs. Second: C. J. Lynch (43333), Clifton, York. Third: J. F. O. Mitchell (5603), Edinburgh, 10. Consolation Prizes: J. Harrison (45301), Padiham, Burnley; D. M. Davies (40035), Maesteg, Glam.; W. B. Wilkie (11419), Aigburth, Liverpool, 17; B. Hardie (6792), Bristol, 9; J. Gale (19235), Lyndhurst, Hampshire; J. C. Smith (28291), Bolton, Lancs.

OVERSEAS

August "Mystery Stations Contest."—First: I. Brough (9112), Preston, N.18, Victoria, Australia. Second: R. Pearson (29199), Richmond, E.1, Victoria, Australia. Third: G. Yule (34970), Balwyn E.8, Melbourne, Australia.

August "Railway Photographic Contest."—First: R. B. McMillan (9592), Melbourne, S.C.3, Victoria, Australia. Second: G. E. Schulz (15425), Coromby, Victoria, Australia. Third: H. Bennett (10615), Auckland, S.W.2, New Zealand. Consolation Prizes: D. Parker (38595), Ontario, Canada; M. De Lima (34925), Bombay 7, India.

HORNBY RAILWAY COMPANY

A REAL RAILWAY COMPANY WITH BOY DIRECTORS AND OFFICIALS

How to Become a Member of the Hornby Railway Company

Every boy who possesses a Hornby Train Set should join the H.R.C. and thus become entitled to wear the badge of membership, which is beautifully enamelled in colours and has as its central feature a tiny representation of a train. All that he has to do is to fill in the application form—a copy of which is enclosed in every Train Set, or may be obtained from the Secretary of the H.R.C., Liverpool—and to return this together with a remittance of 6d. (overseas 10d.) to pay for the badge. Immediately on receipt of the completed form the applicant is enrolled as a member of this great organisation, and a handsome certificate to that effect is forwarded to him along with his badge.

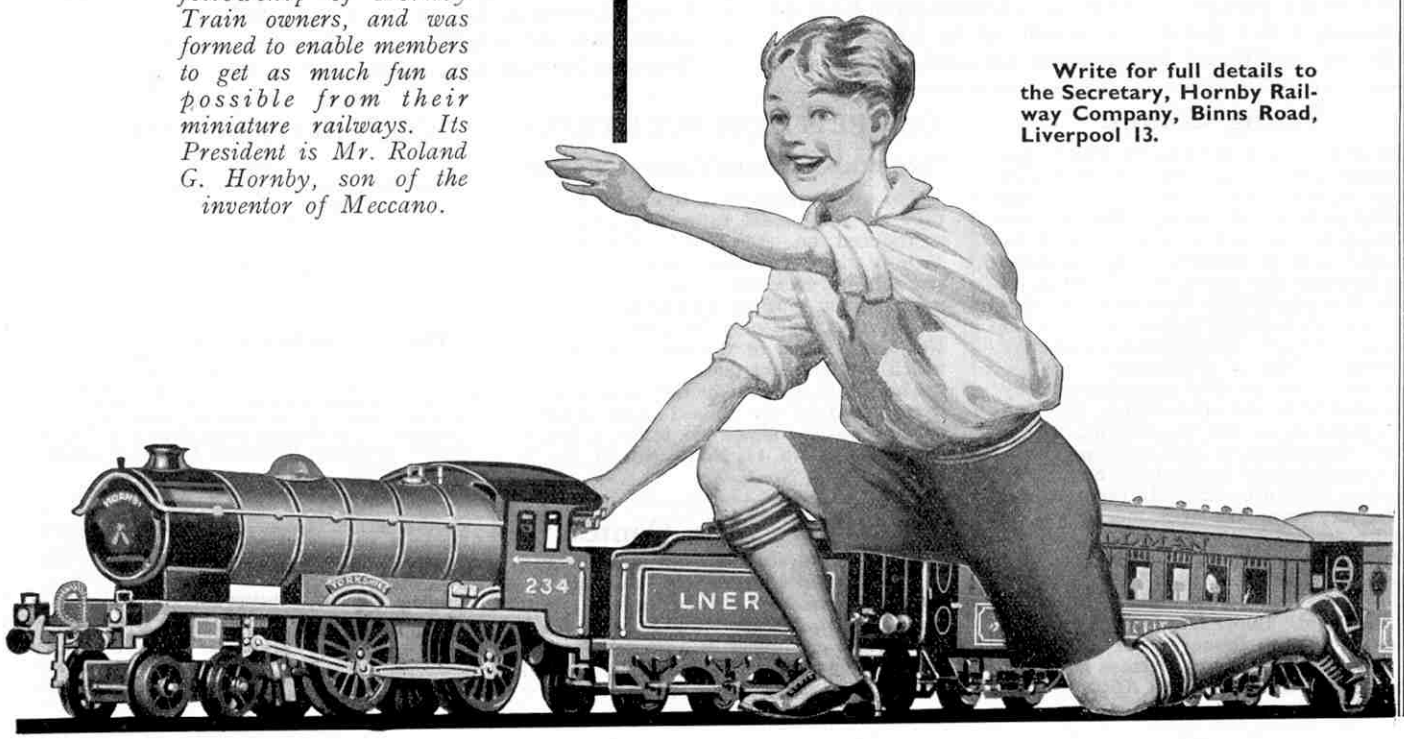
Members of the H.R.C. are entitled to many privileges. The chief aim of the Company is to enable its members to get as much fun as possible from their miniature railways. This can best be done by helping them to make their layouts and operations as realistic as possible, and competent railway experts on the staff at Headquarters therefore are continuously engaged in advising members how to make the best use of the material at their disposal.

Join a Local Branch

The greatest fun is obtained from Hornby Trains by joining one of the many local Branches that have been formed in various parts of this and other countries. These Branches are composed of Hornby Train owners who meet together in order to carry out railway operations on a more extensive scale than is possible for a single individual. Every member should join a Branch immediately, or if one does not exist in his neighbourhood, he should try to induce other enthusiasts to help him to found one.

The Hornby Railway Company is a world-wide fellowship of Hornby Train owners, and was formed to enable members to get as much fun as possible from their miniature railways. Its President is Mr. Roland G. Hornby, son of the inventor of Meccano.

Write for full details to the Secretary, Hornby Railway Company, Binns Road, Liverpool 13.



Branch News

LOSTOCK GRALAM.—This recently incorporated Branch is making steady progress. An attractive layout has been laid down and tested, with satisfactory results, and members are engaged in running experimental trains so that timetables can be worked out. Helpful suggestions have been made by visitors who have been entertained at the club-room. Secretary: A. Milligan, Wincham Hall, Northwich.

BEDFORD SCHOOL.—The relaying and electrifying of the Branch layout is nearing completion. The track has been fastened to boards mounted on trestles, chicken grit being used as ballast, and a viaduct built of Meccano parts, with a deck of three-ply wood, has been incorporated. The line between Leicester and St. Pancras has been completed. Leicester Station, built of wood, is almost complete and has been painted stone yellow. A visit has been paid to the Northampton Motive Power Depot and Goods Yard, where members enjoyed a run on the footplate of a Standard "Mogul." Members frequently observe railway operations from local stations and signal cabins. Plans for the future include visits to the Wolverton Carriage Works, and the Motive Power Depots at Rugby and Willesden. Secretary: J. E. D. Rothwell, 6, Kimbolton Avenue, Bedford.

NORTHAMPTON.—Timetable running is the main feature of track meetings, at which attendances continue to be excellent. On Games Nights members are allotted a station, and inter-station competitions are held. Interesting talks have been given on *"A Day in a Running Shed,"* by the Chairman, and *"Twice Round the Clock,"* by D. Rushton. The sale of chocolate at meetings has benefited Branch funds. Secretary: D. K. Adams, 8, Cedar Road, Northampton.

PLYMOUTH.—The Branch Exhibition was held shortly before Christmas in the Upper Abbey Hall. The chief feature was a demonstration model railway layout. Operations at track meetings continue to be very successful, and some interesting layouts have been evolved. Concerts have been held as a variation, the entertainment being provided by various members and the Leader, who has contributed some very amusing Devonshire dialect sketches. Secretary: R. G. Symons, 47, Lisson Grove, Mutley, Plymouth.

SUTTON COLDFIELD.—Every effort is being made to obtain a permanent club-room; meetings at present are held at members' homes. Track operations have been the chief feature of meetings, and various layouts have been tried. A competition has been held in which members were invited to plan a layout suitable for Branch use. Secretary: G. C. Low, 272, Boldmere Road, Erdington, Birmingham.

SWAN (KIDDERMINSTER).—The track has been relaid on boards raised from the floor, and converted from a single to a double line. Train operations have improved as a result of these alterations. Additions to the layout have included two Hornby stations, a goods platform, a signal box, a loading gauge, a colour light signal and a locomotive. These have been lent by Mr. B. Oakley, a new member, who owns an extensive model electric layout. Mr. Oakley also owns a passenger carrying garden locomotive, and members are looking forward to visiting this. An enjoyable day has been spent at the Wolverhampton G.W.R. Sheds. There members examined locomotives of many classes, including "Castles," "Saints," "Halls," "Bulldogs," "Dukes," "Kings" and the new "Granges." Secretary: A. Hamblin, Black Bull Hotel, Swan Street, Kidderminster.

ARDSLEY.—Members have been very busy relaying the Branch track and constructing a viaduct, with a span of 10 ft., for incorporation in the layout. After several experiments, timetable services on the new track are now being run successfully. Each signalman has been supplied with a clock, checked with those of other officials, so that trains can be run exactly to time. A Library is to be formed for the use of members. Secretary: G. Etherington, 3, Oxford Street, Ardsley, Barnsley, Yorks.

Members of the H.R.C. Section of the Maylands (Perth) M.C., photographed while on a recent outing. Leader: Mr. V. Malmgreen; Secretary: M. Thomson. Excursions and visits to places of interest are included in the varied programme of the club, which was incorporated in February 1936.

WATERLOO (DUBLIN).—At track meetings main and branch line services are run, and a new layout has been planned for the main line. All the Branch locomotives are in operation, with the exception of three, which are at present being overhauled. Secretary: S. B. Carse, 38, Oakley Road, Dublin.

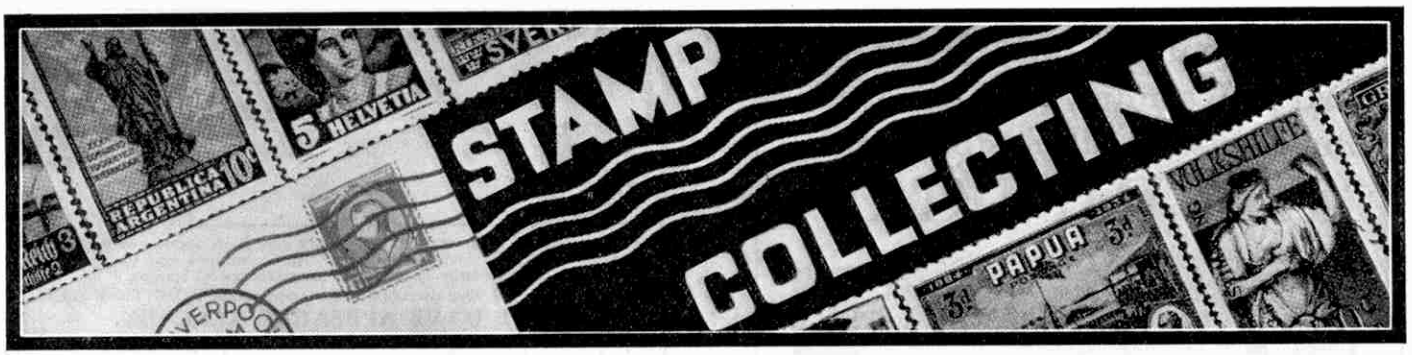
ISLINGTON.—Members have been very busy preparing for the Exhibition, which was recently held at the club-room. The Branch layout, incorporating a new cross-over, was carefully arranged, after which members rehearsed train operations until a high degree of efficiency was attained. The Exhibition was a great success, and in addition to the layout, a scale model "Mountain" class tender locomotive and a scale model aerodrome were on view. A Cinematograph Show was held, and chemical demonstrations were given. Much amusement was caused by a mock "art gallery." Models built by the Meccano section also were a prominent feature of the display. A detailed report of the Exhibition was published in the *"Islington Gazette,"* comment being made upon "the impressive technical skill and knowledge of the members." An enjoyable visit has been paid to the L.M.S.R. Motive Power Depot at Camden. Secretary: S. W. Gardiner, 3, Tiverton House, Pleasant Place, Canonbury, London, N.1.

AUSTRALIA

SYDNEY.—With a full-time Secretary, the Branch rooms are now open daily. The layout has been thoroughly overhauled in preparation for the heavy summer traffic, and many improvements have been effected. Automatic electric signalling has been installed throughout, and stations with terminal facilities have been provided, with distant control from the next signal box, as well as local control. New carriages have been constructed in the Branch workshops, and certain station layouts are being remodelled. The possibilities of an electric layout are being investigated, but clockwork trains are at present found to give better service, in addition to providing occupation for more members. The erection of a new club building is under consideration, and the Branch has at present collected about £4,000 towards its cost. Interest in railway photography is increasing. Secretary: T. Watson, Box 1749 J J. P.O. Sydney, N.S.W.

Branch Recently Incorporated

315. BURNLEY GRAMMAR SCHOOL.—J. N. Leedam, 9, Redlion Street, Burnley.



HOW POSTAGE STAMPS ARE MADE

IN a recent stamp article we made a very strong point that the young stamp collector should not content himself with merely hoarding stamps, but should seek to discover for himself their whole story. This month, therefore, we intend to deal briefly with some of the manufacturing processes through which a stamp passes, a subject that has a far greater importance than may be realised at first sight.

The British Colonial Silver Jubilee design. Perf. 11×12. Recess printed.

Most of the great stamp rarities owe their distinction to some slight freak of chance that occurred in production, and a knowledge of the production processes will help readers to understand how those rarities occurred. Such variations occur frequently among modern issues, and this knowledge therefore will make it easier to recognise modern stamps that may become rarities.

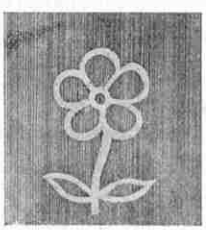
We need to turn only to the British Silver Jubilee stamps issued in 1935 to illustrate this point. As can be seen in our illustration of the Colonial Jubilee design, in which the principal feature is a view of Windsor Castle, the castle flagstaff is represented by a line projecting from the central tower. Additional lines have been found here and there projecting from the battlements on several of the stamps in the series, and these have come to be known as "additional flagstaffs." Some of these lines are secret marks put in by the printers, others are accidental, and according to their individual importance the prices of the stamps on which they appear range higher and higher above those of normal stamps.

N.Z. Empire Chambers of Commerce 1936 Congress Commemorative. Perf. 11½. Recess printed.

A more striking variety occurred among the Silver Jubilee issues of Great Britain itself. Several different shades of colour were tried out for the various stamps, including a Prussian blue and a simple blue for the 2½d. value. Ultimately the simple blue was decided upon, but by mischance a quantity of stamps in the Prussian blue trial colour was issued. A stamp collector who bought two or three of these stamps at a North London post office noted the distinct difference between the stamps he was given and the normal stamps. He immediately returned to the post office and bought up a big block of the stamps, which later he sold to a dealer. To-day these specimens are commanding £40 each instead of 1/–, the catalogue value of ordinary specimens.

Swedish Parliamentary Commemorative 1935. Imperf. x Perf. 10. Issued for use in stamp vending machines. Recess printed.

The principal features of a stamp, apart from its design, are the paper on which it is printed, the watermark in the paper, the printing process adopted for its production, the colour of the ink, and the system adopted for separating the individual stamps. A variation of any of these will create an important variety, although not necessarily a scarce one. Scarcity can only arise when very few stamps are issued showing a particular variation.



Rose spray single watermark used for various G.B. issues 1867/1880.

It is only on very rare occasions that a scarce variety springs from the purely mechanical production processes. Strangely enough, however, the first important variety among the new King Edward stamps arises from the printing process. This error was recorded and described at length in the December issue of *"Gibbons Stamp Monthly."* Eight sheets of the King Edward ½d. value, overprinted 5 centimes for use in the Morocco Agencies, bear a thick black bar running through the word "postage" on three stamps on the third row from the bottom of each sheet. Examination suggests that a printers' rule dividing up the rows of plates used in overprinting has dropped slightly, picked up ink and registered itself on the sheet of stamps. On the first sheet the line is faint and short, and it grows longer and longer and more definite on each succeeding sheet. Gibbons offer strips of three stamps showing the error on one at £10, although the list price of a normal stamp is only 1d.

The G.B. Silver Jubilee 2½d. Perf. 14¼×14. Photogravure.

The commonest varieties of paper that are used in stamp printing are known as "wove" and "laid." Wove paper, which may be identified by the evenness of its texture, is very similar to the paper employed in the printing of the *"M.M."* Laid paper can be distinguished by parallel watermark lines running across the paper. Other papers are "granite," which derives its name from tiny flecks of coloured fibre, "pelure," a thin semi-transparent paper of exceptional strength, and "quadrille," which is distinguished by a network of watermark lines forming a pattern of squares or rectangles.

The paper used for most modern stamp issues bears a watermark device in its texture with the object of rendering forgery of the stamp difficult. In some cases the watermarks are so arranged in the sheet of paper that only a single watermark appears in each stamp. That method involves extreme caution in the registration of the paper and the printing plates, however, and to-day multiple watermarks are more commonly employed. In such cases the device, in whole or in part, appears several times in one stamp. Typical instances of the multiple watermark are the "multiple script C.A." and the "multiple E.S.R." that are used in the current British Colonial and G.B. stamps.

Most watermarks are easily visible when the stamps are held up to the light, but it should be remembered that the mark reads from left to right. A watermark therefore is seen in reverse when it is examined from the back of a stamp.

The paper used in stamp printing usually is specially prepared to give a good printing surface, and to prevent the removal of postmarks from used stamps. The three commonest surfaces are chalky, enamelled and tinted. It is difficult to distinguish between chalky and enamelled papers by merely looking at them, but the difference can be seen on rubbing their surfaces with the edge of a silver coin. On a chalky specimen a fine pencil line is produced by this test, but no line is formed on the enamelled paper. The so-called silver coins of Britain to-day are useless for the purpose of this test, and it is better to use a well worn but clean coin of early date.

The Multiple Script C.A. watermark introduced in 1921 for various British Colonial issues.

Tinted surface papers at one time were used quite commonly among British Colonial stamps. The adoption (*Continued on page 59*)

Stamp Collecting—(*Continued from page 57*)

of pictorial designs has led to their gradual disappearance, however, and "whitebacks," as such stamps were known, are found only infrequently nowadays.

Our references to watermarks and special surfaced papers will have made it plain that elaborate precautions are taken to defeat attempts at forgery. The biggest safeguard in this direction, however, is in the use of

what are known as "fugitive" printing inks. These inks are affected very badly by moisture, which makes them lose their brilliance and tend to "run," and attempts to remove postmarks therefore are rendered abortive. For this reason, collectors who attempt to free the backs of their stamps from paper by floating off in water, should be very careful to prevent the water from finding its way onto the front of the stamp.

The majority of varieties arise in the printing of stamps, and amazing precautions are taken in the printing works to endeavour to maintain absolutely standard working conditions, so that a consistently high standard of production may be maintained. There are several distinctive methods of printing however, and it is not possible to deal with them in detail in this article. Readers who wish to know more about these processes will find a helpful article in the "*M.M.*" for March, 1934, copies of which can be obtained from the Publishing Department, price 8d. post free.

The principal processes are photogravure, which is now used for G.B. stamps; line engraving (sometimes known as intaglio or recess printing), which is commonly employed for British Colonial stamps; ordinary typography and lithography.

In the early days of stamps the sheets were issued to post offices without the provision of any means of separating the stamps from one another except by cutting with scissors. Such stamps were known as imperforate. This was a very inconvenient arrangement and is only rarely adopted.

The commonest system of separating stamps is to punch a series of holes, known as perforations, along the sides of the stamps, and these perforations are of great importance to the stamp collector. A variation in the gauge of the perforation holes often indicates the introduction of a new machine, and thus assists in putting a date on the appearance of a stamp that has been in use over a long period.

Perforations are gauged by the number of holes that appears in a space of two centimetres. Thus the description Perf. 12 means that the stamp is perforated all round its sides with 12 perforations to every two centimetres. If the spacing of the holes at the top and sides varies, it is customary to indicate the top figure first.

Stamp Gossip
and Notes on New Issues

Shipping Designs

Those of our readers who are forming collections of shipping stamps will find several new issues to interest them this month. Three of the illustrations on this page bear shipping designs drawn from parts of the world so wide apart as New Zealand, China and Roumania.

The New Zealand stamp is the 6d. value from the Chamber of Commerce Conference commemorative series to which we referred in "*Stamp Gossip*" in the November "*M.M.*" The view on the stamp shows a cargo steamer loading at the wharves at Wellington, and in the top left corner there is a tiny medallion symbolising the old time trade galleons.

The Chinese stamp is the 5c. value from the recent commemorative issue celebrating the 40th anniversary of the establishment of the Chinese Postal Service. The design shows a mailboat lying in harbour, presumably at Shanghai, and in the background are two tiny junks, a battleship and a cruiser. A mailplane is shown flying across the harbour. The 2c. value of this Chinese series also would make a suitable inclusion in a shipping collection, although the central motif of its design is a circular panel showing a camel train crossing a mountain range. The panel is flanked by views of a modern liner and an old auxiliary sail and steam paddle boat.

The Roumanian stamp is the 1 L value from a commemorative series issued in connection with the Marine Exhibition held at Bucharest in October last. The design shows the Rumanian submarine "*Delfinul*" and, if our memory serves aright, this is the first submarine stamp design.

The other stamps in the series were 3 L and 6 L values, showing respectively the naval cadet training ship "*Mircea*" and the mail steamer "*Regele Carole.*"

* * * *

This month we are able to illustrate four of the five stamps comprising the set issued by New Zealand to commemorate the Empire Conference of Chambers of Commerce held in Wellington in October last, and referred to in the preceding paragraph.

The series has proved to be one of the most popular British Colonial commemoratives of recent years, and supplies of several of the values were completely exhausted within a very few days of their appearance.

Christmas Charity Issues

The usual flood of Christmas charity issues was forthcoming early in December, the principal issues, in addition to those from Austria, Germany and Luxemburg, to which we referred in the December "*M.M.*," being from Belgium and Switzerland.

The Belgian issue was a set of eight stamps ranging in value from 10c. to 2f.45, each bearing a premium in aid of the national anti-tuberculosis funds. The design showed a portrait of Prince Baudouin, the six-year-old heir-apparent to the Belgian throne.

The Swiss Pro Juventute series consisted of the usual four stamps, a 5c. value, showing a portrait of Hans Georg Nageli, a Swiss musician, and 10c., 20c. and 30c. stamps showing typical girls from the provinces of Neuchatel, Schwyz and Zurich respectively in local costume. The portraits are superimposed upon scenery that is typical of the provinces.

* * *

The 1936 New Zealand Health stamp was issued on 2nd November and is to remain on sale until the end of next month. The principal feature of the design is the head of a smiling young girl ringed by a ship's lifebelt. The wording "Safeguard Health" is lettered around the belt. We hope to illustrate this design next month.

Egyptian Treaty Commemorative

The recently concluded Anglo-Egyptian treaty is to be celebrated in Egypt by the issue of a series of commemorative stamps. There will be three values, 5m., 15m. and 20m., each bearing a design showing the scene at the signing of the treaty in the Locarno Hall of the British Foreign Office on 26th August last.

The fact that Mr. Anthony Eden, the British Minister for Foreign Affairs, is one of the group of delegates shown in the design has led the press to make much of the idea that Mr. Eden would thus become the only living British commoner to appear on a stamp.

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

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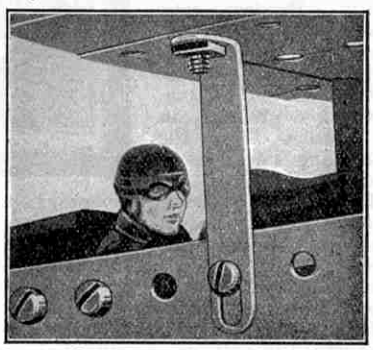

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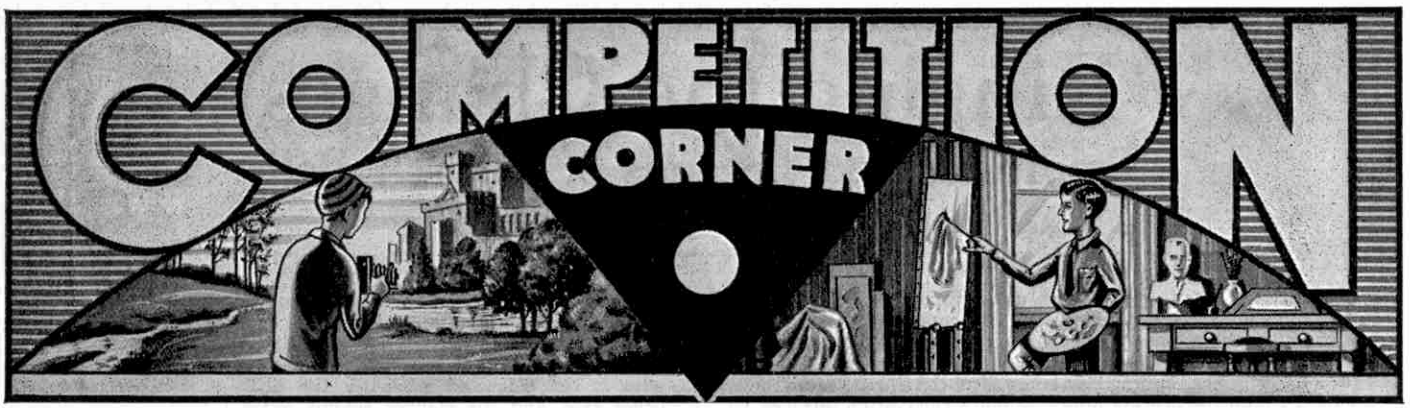


ANIMALESQUES

Pawl, the famous Meccano office boy, celebrated Christmas rather too well this year. At one party he tucked away so many mince pies and other good things that he was visited by a harrowing nightmare, in which he was attacked by extraordinary creatures that looked, as he described them, "half like animals and half like goodness-knows-what!"

When he had recovered sufficiently to return to the office we questioned him carefully about the so-called "animals" that he saw, and from his descriptions we have been able to classify these terrifying monsters and give them names. We now invite our readers to find these names from the clues in the panel.

Each name is divided into two parts, the first the name of a well-known animal, bird, insect or reptile, and the second a common English word which may or may not be the name of such a creature. The last three letters of the first part of each name are also the first three letters of the second part. The clues indicate the two parts.

Clue to first part	Clue to second part
1. Ruminating marsupial found in Australia.	Place where rooks congregate.
2. An African mammal of aquatic habits.	An edible fungus.
3. An ass or mule.	Stone that binds the work of an arch or vault.
4. Animal that spins webs.	An abandoned ship.
5. Horned mammal.	Pulpit or elevated platform.
6. A large African bird that cannot fly.	An extinct marine reptile.
7. A species of grouse with feathered toes.	The male of the goose.
8. A large animal carrying its own trunk.	Sofa covering.
9. Fabulous animal possessing one horn.	Decoration.
10. Game bird.	Branch of a stag's horn.
11. A tusked sea mammal.	Illusion.
12. Half-tamed polecat.	A dog trained to find.
13. A humped quadruped.	The "hump."
14. Striped quadruped.	Wild prickly fruit-bearing shrub.
15. Burrowing nocturnal animal.	Popular plant.
16. An aquatic animal.	Small dog.
17. A species of deer.	Action or movement.
18. A ruminant, used for transport in the Andes.	One of ancient people of Biblical lands.
19. A furred quadruped, often addicted to honey.	Telephone instrument.
20. Tiny hibernating rodents.	Ice mountain.
21. A great African ape.	See 18, 1st clue.
22. A long-necked African animal.	Place where bees are kept.
23. North American aquatic rodent.	Clattering noise.
24. Peruvian sheep.	Prickly plant.

To make this explanation clear, let us take the first name on our list. The first clue is, "A ruminating marsupial found in Australia." The clue of the second part is, "Place where rooks congregate." These clues indicate "kangaroo" and "rookery" respectively. The last three letters of "kangaroo" are also the first three letters of "rookery," and thus our animal stands revealed as "kangarookery."

Prizes of Meccano products—this expression covers all articles listed in the current Meccano and Hornby Train catalogue—value 21/–, 15/–, 10/6 and 5/– are offered to the four readers who submit the best attempts to name the full set of 24 "animalesques," in each of the two sections, Home and Overseas.

In the event of no one succeeding in solving the complete list of names the prizes will be awarded to the next best entries. There will be a number of consolation prizes and in the event of a tie for any or all of the prizes the judges will take into account neatness and novelty of presentation.

Entries should be addressed to "Animalesques," Meccano Magazine, Binns Road, Liverpool 13," and must reach this office not later than 30th January. Overseas closing date 30th April.

Broken Resolutions Contest

New Year resolutions have long been a subject for joking. This is not surprising, for most of them are soon forgotten, but they usually give us many amusing moments before they come to an untimely end. This month therefore we are holding a competition in which readers are invited to tell us the funniest way in which they have known a New Year's resolution to be broken.

There will be two sections—Home and Overseas—and prizes of Meccano products value 21/–, 15/–, 10/6 and 5/– will be awarded in each to the senders of the four most amusing stories. Entries should be addressed to "Broken Resolutions Contest, Meccano Magazine, Binns Road, Liverpool 13." The closing dates are 30th January in the Home Section, and 30th April for Overseas entries.

Above we give the solution to the August Crossword Puzzle Contest.

January Drawing Contest

This month we announce the second of the monthly drawing and painting competitions that we are holding throughout the winter. Competitors may select any subject they like for their entries in this contest and full details of the conditions and the prizes offered were given on page 607 of our October 1936 issue.

Entries in this month's competition must be addressed "January Drawing Contest, Meccano Magazine, Binns Road, Liverpool 13." Closing date, 30th January. Overseas, 30th April.

COMPETITION RESULTS

HOME

"Modern Inventions" Voting Contest.—1. D. F. HIGH (London, S.W.19). 2. G. WILLIAMS (London, N.3). 3. M. CLEMENTS (Rotherham). 4. R. HODGKISS (Farnworth). Consolation Prizes: L. W. CHITTY (London, S.W.20); E. DAVIS (Colsterworth); D. V. W. FRANCIS (Oxford); M. ROBERSON (Bearsted); W. STEAD (Holt, Norfolk); G. R. WEBSTER (Oxford).

November Drawing Contest.—First Prizes: Section A, A. MARSH (Coventry); Section B, L. F. SHELTON (Bushey, Herts.). Second Prizes: Section A, G. TAYLOR (Hampton Hill); Section B, K. CLARK (Alnwick).

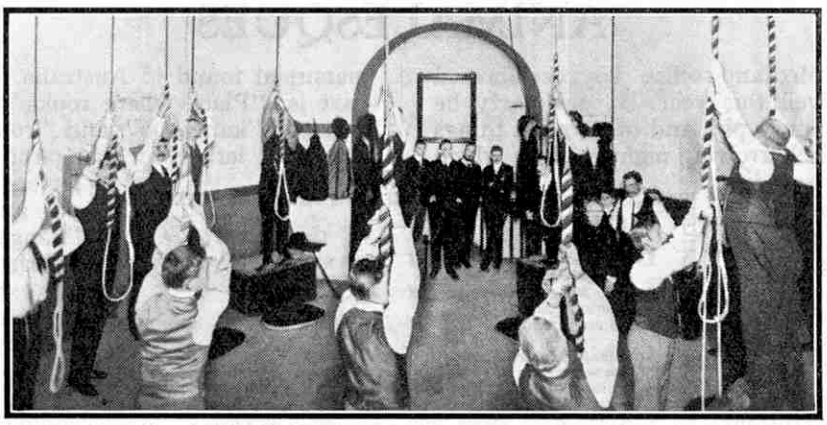
Ringing the Changes

Traditions and Legends of Church Bells

By E. Morris

THROUGHOUT all ages of men, at all times and in all climes, bells have played a prominent part. Their uses have been legion, and many of them have been quaint and picturesque. All the ancient classical writers mention bells and their many uses. As time went on and churches sprang into being after the Christian era, bells were used to toll the fleeting hours, to mark the church services, to herald victories on land and sea, and to proclaim glad tidings as well as to mourn lost people. They were bound up in the daily round and common task of mankind.

In the early days, large church bells were rung by the "treadle" or "plank" system. Each bell required a large number of men, who treadled in seasaw fashion on each side of it, and some of the larger Continental bells are still rung in this manner. The smaller bells were rung by means of a lever. Later, when more modern methods of hangings and fittings became the rule, whole wheels were adapted, and then inharmonious clashings gave place to changes in which all the bells are rung in orderly rhythm. These changes are all worked out by figures and not by music, and the art of bell-ringing, besides being one of health giving exercise of body, thus becomes an ingenious and fascinating study.

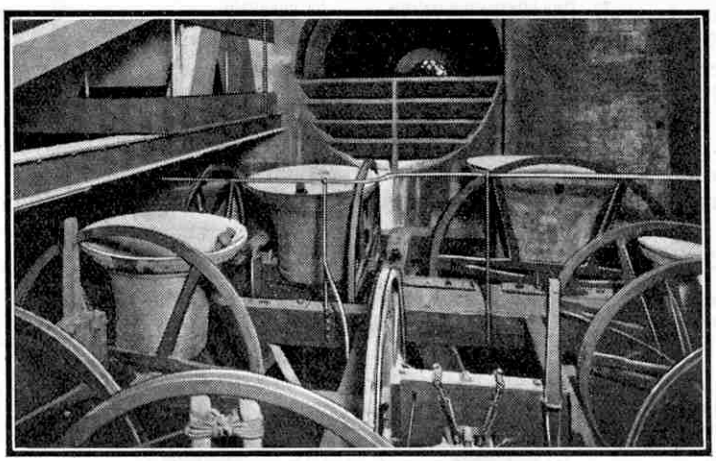


Ringers in the belfry of St. Paul's Cathedral. The illustrations to this article are from the author's "History and Art of Change Ringing" by courtesy of Chapman & Hall Ltd.

The ringer's art came into vogue early in the 17th century. The earliest book on the subject was called "*Tintinnalogia*" and was issued in 1668 by Fabian Stedman of Cambridge. From that time the art has flourished until to-day it has some 46,000 followers in England who are attached to many Guilds and Societies, while there are many thousands more who are not connected with any official Guild.

We rarely read a true account of bellringing. To the "outsider" it appears a fathomless mystery, and many vague and distorted descriptions have appeared regarding it. Charles Dickens was more observant than most people, as is shown by his account of a visit in 1869 to the ringer's room in St. Saviour's Cathedral, Southwark. There, he says, "The ropes pass through holes in the ceiling and reach to the floor. Under each is a little raised platform for the ringer to stand on, with a strap for his foot to help him get a good purchase, and each rope half-way up is covered for some four feet with a fluffy, woolly-looking covering, technically called a 'sally' and intended to afford a good hold to the ringer as he checks his bell on the pull-down.

"A glance round from the conductor, who, with two assistants, rings the tenor, 'go' and they start. The tower rocks, the bells clash, tenor booms at appointed intervals. After some little time, one gets used to the noise, which is not so great as might be expected, and begins to pick out the rhythm of the chime. The ringers all have an earnest, fixed expression; attention is written on every face. . . . The work is severe, especially on the arms and muscles of the back, but is done with an ease derived from long practice. The rope is pulled down to the sally, and falls in a loop on the floor: as it begins to fly up again, the ringer checks it, the bell is balanced against a wooden stay that prevents it falling over, and the clapper falls: then he lets it run up, round goes the wheel above, and with it the bell, and presently the bell's mouth comes up the other side, and the clapper sounds again. . . . ."



The bells of St. Paul's ready for ringing.

In olden times the ringing of the bells was a priestly office, and in A.D. 1310 the Council of Cologne ordained that those "whose office it is to ring the church bells shall know how to read, in order that they may be able to make the responses, and also shall wear the alb during divine service." Again in 1551 payments were made at Ludlow to "the dekyns for ringinge of the day belle."

As long ago as the days of Edward the Confessor a Guild of ringers was formed to ring "the great bells of Westminster," and in the time of Richard I the "Guild of Saddlers" were granted the right to ring the bells of St. Martin-le-Grand, London. With the introduction of change-ringing, societies of "Youths" and "Scholars" came into vogue, and those familiar with "*The Ingoldsby Legends*" will remember this reference:

"The blythe College Youths—rather old stagers—
Accustomed for years to pull bell-ropes for wagers,
Rang faster than ever their triple bob majors."

Many too, are the legends and traditions attached to the bells of travellers guided home by the familiar sound of their own village bells, or of mariners reaching port safely by the same means. Often in gratitude the benighted travellers bequeathed sums of money or land to ensure the annual perpetuation of the ringing that possibly saved their lives, and such bequests survive to-day. At Saffron-Walden on June 27th each year, a "great ringing day" is still continued in fulfilment of a legacy left to the ringers there by a merchant who had lost his way in the woods over a century ago, and who had reached his home safely by hearing these same bells.

There also are legends of mysterious ringings, when bells sounded of their own accord. Thus an old ballad records that at the funeral of the little Hugh of Lincoln,

"... a' the bells o' merrie Lincoln
Without men's hands were rung."

A similar occurrence is said to have happened at the death in 1253 of Robert Grossetete, then Bishop of Lincoln, and many other strange tales are recounted. The sound of bells was reputed to be able to drive away pestilence, disperse storms, break up tempests and the like. Many are the folk tales of bells of neighbouring villages holding pleasant little conversations with each other. When all are chiming together something like this is said to take place: "Who rings best?" asks Sygwell. "We do!" says Overstone; but Moulton in pride of superior numbers exclaims, "No you don't, for we do." Similar tales are still told in almost every country village.

L.N.E.R. Miniature Posters

Every member of the Hornby Railway Company will be familiar with the large and attractive posters issued in recent years by the L.N.E.R., for their pictures of famous cities and towns, the districts covered by that railway, and of seaside resorts on the east coast have appeared on hoardings and have been exhibited at many L.N.E.R. centres. Very attractive miniatures of these posters also have been produced, and three of these are now available free to Hornby Railway Company members. The first shows a view of York Minster, and the second and third display the attractions of Cleethorpes and Lowestoft, the well-known holiday resorts. All are attractively coloured and miniature railway owners, especially those using locomotives and rolling stock in L.N.E.R. colours, will be able to give a typical L.N.E.R. appearance to their layouts by displaying the posters.

The posters measure 1 11/16″ by 1 5/16″ and are gummed on the back. They are too large for use on Hornby Poster Boards, but it is simple to make a suitable support for them from fairly stout cardboard or from thin wood, and this can then be attached to Hornby Paled Fencing or to the fencing of the No. 2 Station by means of loops of cotton fixed at the back by means of adhesive tape, or even gummed paper.

Hornby Railway Company members who wish to take advantage of this offer should write to the Secretary, the Hornby Railway Company, Binns Road, Liverpool 13, giving their H.R.C. numbers. A set of four of each of the three posters, making 12 in all, will be sent to them immediately free of charge.

Answers to December Puzzles

No. 1. The solution to this puzzle is:

l n m t b d b u s r
a o i i a a e s p o
N O T T I N G H A M
c s r l r c a e i a
e e e e n e n r n n

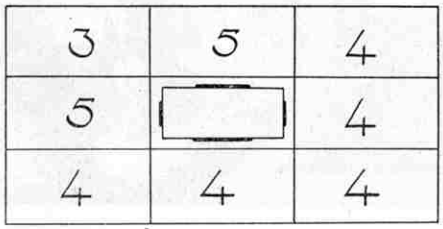


Fig. 1

No. 2. The places are 1. Leeds. 2. Cardiff. 3. Preston. 4. Nuneaton. 5. Newcastle. 6. Blackpool. 7. Westmorland. 8. Cork. 9. Belfast, Peel, Eastchurch. 10. Stockport.

No. 3. The paper is cut as shown in Fig. 3.

No. 5. The King is George IV, born in 1762.

No. 6. There were still three rungs under water, as the ship and ladder rose on the surface of the water, at the same rate.

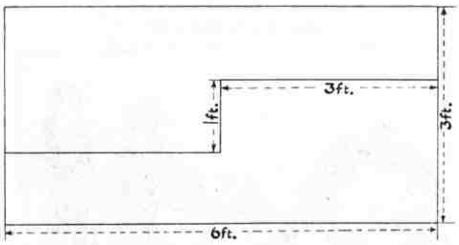


Fig. 2

No. 8. The number of triangles is 114.

No. 9. The address was: Warner, 25 (5 under 30), Overton Street, Ashton-under-Lyne.

No. 10. It is necessary to light the match first.

No. 11. The linoleum was cut as shown in Fig. 2.

No. 12. Many people immediately answer "Father." The answer is "Mother."

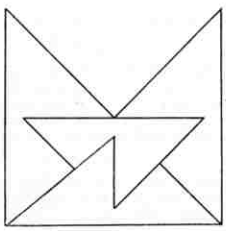


Fig. 3

No. 13. Fig. 4 shows the positions in which the extra trees were planted.

No. 14. By taking the last letter of each word, the message "STEAM SLOWER" is obtained.

No. 15. The man is aged 24 and his young brother is 15.

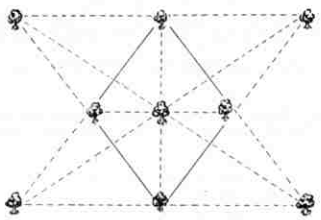


Fig. 4

No. 16. Fig. 1 shows how the farmer re-arranges his men. He takes one man from the corner field and places him in the adjoining field on one side, and the new man goes in to the adjoining field on the other side. If the work increases, the farmer can take on a total of 16 more men while retaining his curious requirement. To do this, he continues the process until there are no men in the corner field. He then repeats the process in the other three corners, and eventually has 12 men at work in each of the fields in the centre of each side.

Rio de Janeiro

By J. F. McLauchlan

The first thing to be seen on approaching Rio de Janeiro by ship is the narrow entrance to the bay. This is guarded on the left by the "Sugar Loaf" mountain, which rises straight out of the water to a height of about 1,200 ft. Further on the two forts of Sao Joao and Santa Cruz can be seen, and beyond them, as the bay widens out considerably, the city of Rio de Janeiro comes into view on the left.

The bay is about 20 miles long and 12 miles broad in the widest part. It contains a large number of islands, and at its head the range known as the Organ Mountains stands out on a clear day. The name comes from their likeness to the pipes of an organ. Their peaks rise to a height of about 3,500 to 4,000 ft. and are mostly bare rock.

The city of Rio stretches partly along the shores of the bay and partly along the Atlantic front. From one end of it to the other is about 20 miles and it also straggles away into the valleys of the surrounding hills. It has a population of about 2,000,000.

There is a statue of Christ on the peak of the "Corcovado," a mountain which rises from behind the city to a height of about 2,200 ft. At night the statue is floodlit, and, if there is a cloud encircling the top of the mountain, it appears that the statue is floating on it. An electric rack railway takes the would-be sightseers to the very base of the statue. The city is sometimes called the "Necklace of Pearls" because of its brilliant lighting.

Ngoro-Ngoro, the Game-Filled Crater

By B. A. Soltau

A short time ago, during a holiday in Tanganyika, I spent a week camping on the edge of the Ngoro-Ngoro crater, one of the most interesting places in Africa. This crater is over 40 miles in circumference and its steep and unbroken sides are about 2,000 ft. high. The whole of the interior of the crater is a game reserve and is inhabited by vast herds of zebra and buck of every description, and also by several families of lions. It has been estimated that more than 100,000 head of game live in it, and during the dry season thousands more flock in from the surrounding country to find water in its lakes.

I spent many interesting hours watching these creatures through glasses from our camp on the edge of the crater and walking amongst them in the crater itself. No guns are allowed in the Ngoro-Ngoro, and not even a camera can be taken into it, lest visitors should run into danger by getting too close to the more ferocious beasts in their eagerness to obtain good snaps. No more beautiful and natural game reserve could be imagined and it is to be hoped that eventually the few approaches to the crater will be blocked, and the whole place transformed into a gigantic reserve, in which the elephants and buffalo that at present live in the surrounding forest also will find a place.

"Buckies' Bears"

Our London readers, and many of those in the provinces, will be interested to learn that "Buckies' Bears," one of the most popular childrens' Christmas plays ever produced, has been revived for the sixth time and is now playing twice daily, at 2.30 p.m. and 5.30 p.m., at the Kingsway Theatre, London.

"Buckies' Bears" has a special interest for Meccano boys, for "Buffkins," the pen-name adopted by a part author of the play, hides the identity of a regular reader of the "*M.M.*" who has won prizes in model-building competitions.

NOT BERRY GOOD

Waitress: "Here's your shortcake, sir."
Customer: "You call that shortcake? Take it out and bury it!"

* * * *

"Have ye paid yer rates yet, Pat?"
"No, and I'm very glad Oi haven't."
"How's that?"
"Well, now, Oi got a form to-day that sez, 'Final Application,' so it looks as if they've given it up as a bad job."

* * * *

An unwary pedestrian would have gone to his last account had not a bus driver jammed on his brakes and pulled up inches short of the startled jay-walker.
The driver looked at the constable in his white waterproof coat and said "'Owzat, umpire?"

* * * *

Two men were talking about racing. "I think I witnessed the closest race ever run," said one. "The two leading horses ran neck-and-neck all through the stretch, and just as the wire was reached one of the horses put out its tongue and won by exactly that margin. I don't think you ever knew a closer race than that."
"Yes, I did," said the other. "I lived in Scotland two years."

* * * *

Small Boy (to sexton of church): "Please could you lend me some cricket bats?"
Sexton: "Why should I have any cricket bats?"
Boy: "Well, the boy down the road said you'd got bats in the belfry."

* * * *

Actor: "Did you hear the audience weeping when I died in the last act?"
Manager: "Can you blame them? They knew you were only acting."

* * * *

A commercial traveller, held up in the Orkneys by a storm, telegraphed to his firm in Aberdeen: "Marooned here by storm. Wire instructions."
The reply came: "Start summer holidays as from yesterday."

* * * *

Boasting Boxer: "The last time I hit a man he went up so high that when he came down again his clothes were out of date."

* * * *

Mistress (giving new cook instructions): "I am getting a new griller for the kitchen."
Cook: "Then I don't want the job. I won't have one of those big hairy monkeys jumping around in my kitchen."

* * * *

Examiner: "Name three bodies that contain starch."
Candidate: "Two cuffs and a shirt front."

* * * *

Teacher: "Tommy, come here and give me what you have in your mouth."
Tommy: "I wish I could teacher. It is toothache."

* * * *

MAKING SURE!

He (several times nicked by the razor): "Hey, barber, gimme a glass of water."
Barber: "What's the matter, sir,hair in your mouth?"
He: "No, I wanna see if my neck leaks."

POOR OLD FATHER

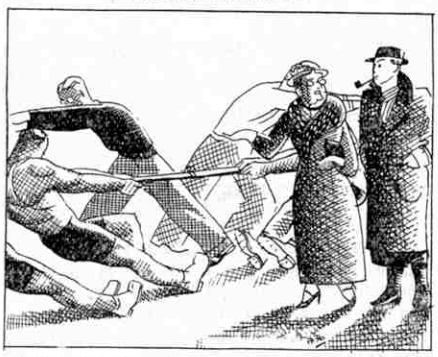
Johnny: "Oh, mummy, the ladder has fallen in the yard. We knocked it down and . . ."
Mother: "Run along at once and tell daddy."
Johnny: "But daddy knows. He's hanging from the upstairs window ledge."

* * * *

"So you had cherries to eat in the cinema?" said mother. "I hope you did not throw the stones on the floor?"
"Oh, no, mummy," answered Tommy. "I put them in the hat on the seat beside me."

* * * *

MUCH EASIER!



Old Lady (witnessing tug-of-war for the first time): "Wouldn't it be easier for them to get a knife and cut it?"

* * * *

An Irishman from the country, who had returned from a visit to the city, was telling a friend of the sights that had impressed him.
"But the funniest of all is their little tilyphone," he said. "'Tis a quare little insthrument that ye put up to your face, wan end to your ear and wan to your mouth, and then yer say 'Are you there?' and the fellow at the other end answers yes or no—as the case may be."

* * * *

Say this quickly: Fifty-five fat flies flew far from Fido. If fifty-five fat flies flew far from Fido, why didn't Fido fly after the fifty-five fat flies.

* * * *

Clerk: "I am taking a correspondence course to get more money, sir."
Boss: "Ah, too bad! I'm taking one to reduce expenses."

* * * *

Son: "The other day a boy at school said I was like you."
Father: "Well, and what did you say?"
Son: "Nothing. He is bigger than I am."

* * * *

Sea Captain to his little niece: "This, my dear, is my old friend, Captain Smith, who lives in the Canary Islands."
Little niece (rapturously): "Oh! Will you please sing?"

* * * *

Grocer: "I want a lad who's not afraid of early hours."
Boy: "That's me, sir. I don't mind how early you close."

* * * *

There was an old lady named Carr,
Who would take the 3.3 to Forfar;
"For," she said, " I believe,
That the 3.3 will leave
Before the 4.4 for Forfar."

* * * *

David (aged nine) was struggling with physics. "Tell me, Daddy," he asked, "what makes the world go round? Is it the force of gratitude?"

* * * *

"I am sorry, madam," said the butcher, "but I can't give you further credit. Your bill is bigger now than it should be."
"Yes, I know that. If you will make it out for what it should be, I'll pay it."

UNFAIR TREATMENT

Little Freddie was at Willie's Christmas party, and they were having tea. Willie's mother noticed that Freddie was not eating, so she asked:
"Won't you have some bread and butter, Freddie?"
"No," said the boy, brusquely.
"No, what?" asked the mother reprovingly.
"No fear, when all the others are eating buns," was the reply.

* * * *

An accident had occurred in Aberdeen and the injured were still lying about in the road. Along came a native of the city and said to a man lying on his back: "Has the insurance man been roon' yet?"
"No," was the reply.
"Ah, weel, I'll just lie doon aside ye," said the Aberdonian.

* * * *

First lady (viewing pompous gentleman): "He's a baronet, eh? How did he get his baronetcy?"
Second lady: "Oh, tobacco!"
First lady: "How many coupons?"

* * * *

Dear Old Village Lady (to Motor Bus Conductor): "You go to London, don't you?"
Conductor: "Yes, ma'am."
"Thank you. Will you be sure to put me down at the second turning past the pillar-box?"

* * * *

"Doctor, is there any danger of the operation proving fatal?"
"Really, my good man, considering that we are experimenting on you free of charge, your curiosity is hardly good form."

* * * *

Judge: "It is the sentence of this court that the prisoner be confined to prison for the remainder of his natural life."
Prisoner: "This is rank injustice."
Judge: "Silence! Two more years for contempt of court!"

* * * *

A little girl was explaining to her younger brother that it was wrong to work on Sundays.
"Well, policemen work on Sundays," said the boy. "Don't they go to heaven?"
"No," she replied, "they don't need policemen up there."

* * * *

Peddler: "Any teapot spouts, pencils, pens, plates, or baskets to-day, mum?"
Lady of the House: "If you don't go away I'll call the police."
Peddler: "'Ere you are mum—whistles, sixpence each."

* * * *

Nit: "How does that clock go that you won at the fair?"
Wit: "Fine! It does an hour in less than forty-five minutes."

* * * *

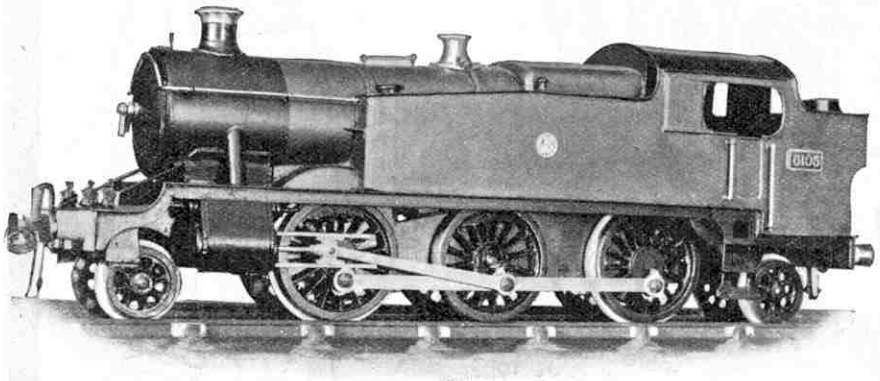
"How would you classify a telephone girl? Is her's a business or a profession?"
"Neither: it's a calling."

* * * *

NERVE-RACKING

Workman (using pneumatic road drill): "I wish you'd stop humming, Harold. You get on my nerves."

REALISM IN MINIATURE



G.W.R. 2-6-2 Tank Locomotive No. 6105.

A fine super-detail model for the Great Western enthusiast of the "6100" type tank. The large boiler and large diameter chimney, the sweeping taper of the boiler barrel, the high firebox and arch of the cab roof, are all faithfully recaptured in the model, which in clockwork or electric costs **£8/-/-.**

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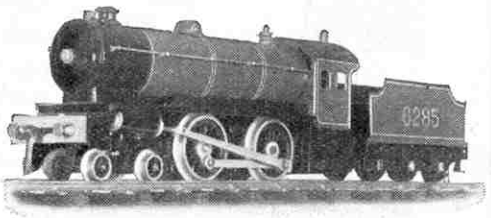

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On a 4ft. dia. circle, hauling 5 long bogie coaches, **"Enterprise"** has made a 50 minute non-stop run. That is what she will do! Bassett-Lowke's inexpensive gauge "O" steam locomotive. Price **50/-**

Described with other popular locomotives in FB.17 the Bassett-Lowke free folder.

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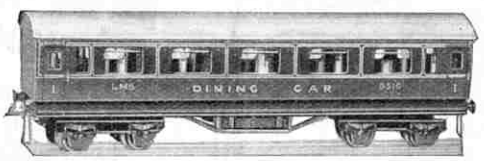
2. **The Goods Set** with Engine, Tender, 4 Wagons, Oval Track and Controller. Price **42/-**

3. **The Suburban Set** with Tank Locomotive, 2 Suburban Coaches, Guard's Van, Oval Track and Controller. Price **35/-**

For full details get TT.17, the TWIN TRAIN free folder.



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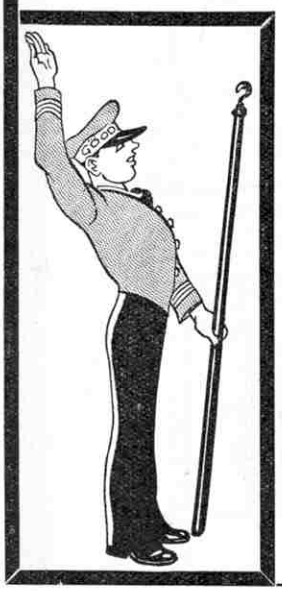
in correct colours, lining and lettering with realistic celastoid windows. 6¾ inches long. Price **3/-**



SCALE MODEL SHIPS

This is **BASSETT-LOWKE'S** Catalogue devoted entirely to marine model matters and within its fascinating pages are details of every type of ship model imaginable—sailing yachts, motor boats, cruisers, battleships, and other powerful craft. And also for the keen modeller are parts—engines, boilers, propellers, shafts, steering gear and thousands of minute scale model fittings.

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Have you seen the popular 12/6 Scale Model Sets of parts for building the **"Queen Mary," "Normandie," "Cutty Sark,"** and **"Great Britain"**? Wonderful value! Build one during the holidays.

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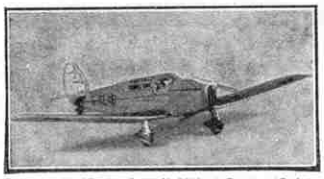
MODEL AIRCRAFT CONSTRUCTION SETS $\frac{1}{48}$th Full Size

LATEST MODEL. AEROMINOR No. 4

PERCIVAL VEGA GULL. Price 2/6 (Postage Abroad 1/- extra.)

(Winner of King's Cup 1936. Also Johannesburg Race.)



Percival "Vega Gull." Wing Span 9⅞ ins.

The wing surfaces, fuselage coverings, etc., are accurately designed and printed on sheets of special quality card of varying grades, selected to suit the special purposes they have to fulfil. All internal stiffening is of balsa wood.

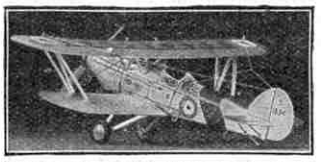
Wheels, propeller parts, nose-pieces, etc., are supplied ready shaped in wood. Tailplanes, also rudders and fins, are made from thin plywood. Struts and undercarriages are constructed of wire. Glue pins, cane, thread for rigging, celluloid, plywood, balsa wood, printed shapes, etc., are all supplied. A very complete illustrated Instruction Sheet is supplied. No special tools or skill are required for making these perfect little scale models.

De Havilland "Moth Major." Wing Span 7½ ins.

AEROMINOR No. 1.
Any one of the following types can be made from this kit—"Hart," "Hind," "Demon," "Audax" or "Osprey." **Price 3/-.** (Postage abroad 1/- extra.)

AEROMINOR No. 2 Either De Havilland "Tiger Moth" or "Moth Major." **Price 2/6.** (Postage abroad 1/- extra.)

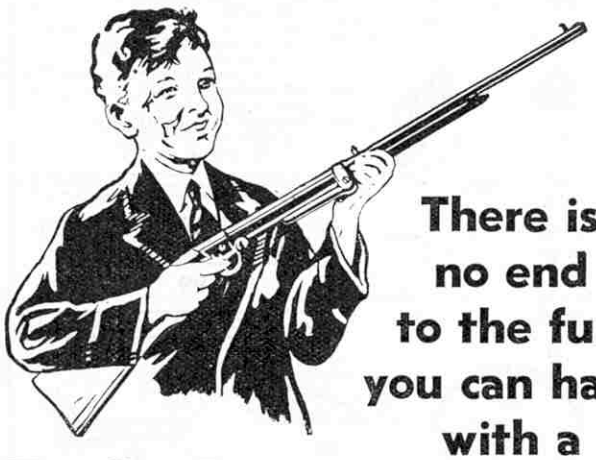
AEROMINOR No. 3. Either Hawker "Fury" or "Nimrod." **Price 2/6.** (Postage abroad 1/- extra.)



Hawker "Nimrod." Wing Span 8¼ ins.

Send 1½d. stamp for literature describing Aerominors, also our well-known large scale Aeromodel Kits (1/24th Scale), etc. If you cannot obtain Aerominors from your local dealer send Postal Order direct to:

AEROMODELS LTD., No. 5 First Floor, Wellington Buildings, Liverpool, 2.



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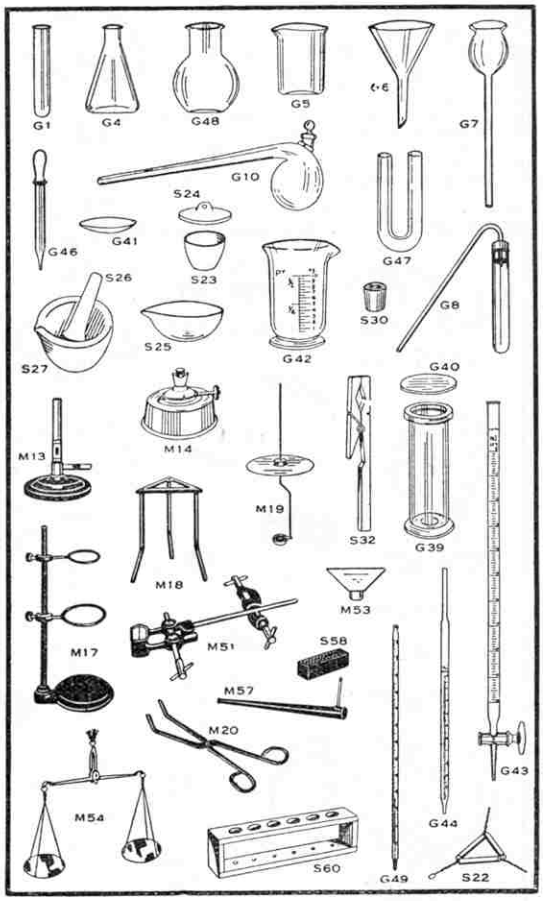

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PARTS & ACCESSORIES

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Meccano parts, many of which are here illustrated, combine to form a complete miniature engineering system with which practically any movement known in mechanics can be correctly reproduced. New parts are always being introduced in order to keep Meccano model-building in line with the most modern engineering requirements. The greatest care is taken in the designing of these parts to ensure that they function exactly as their counterparts in actual engineering practice. Ask your dealer for the latest complete illustrated price list.

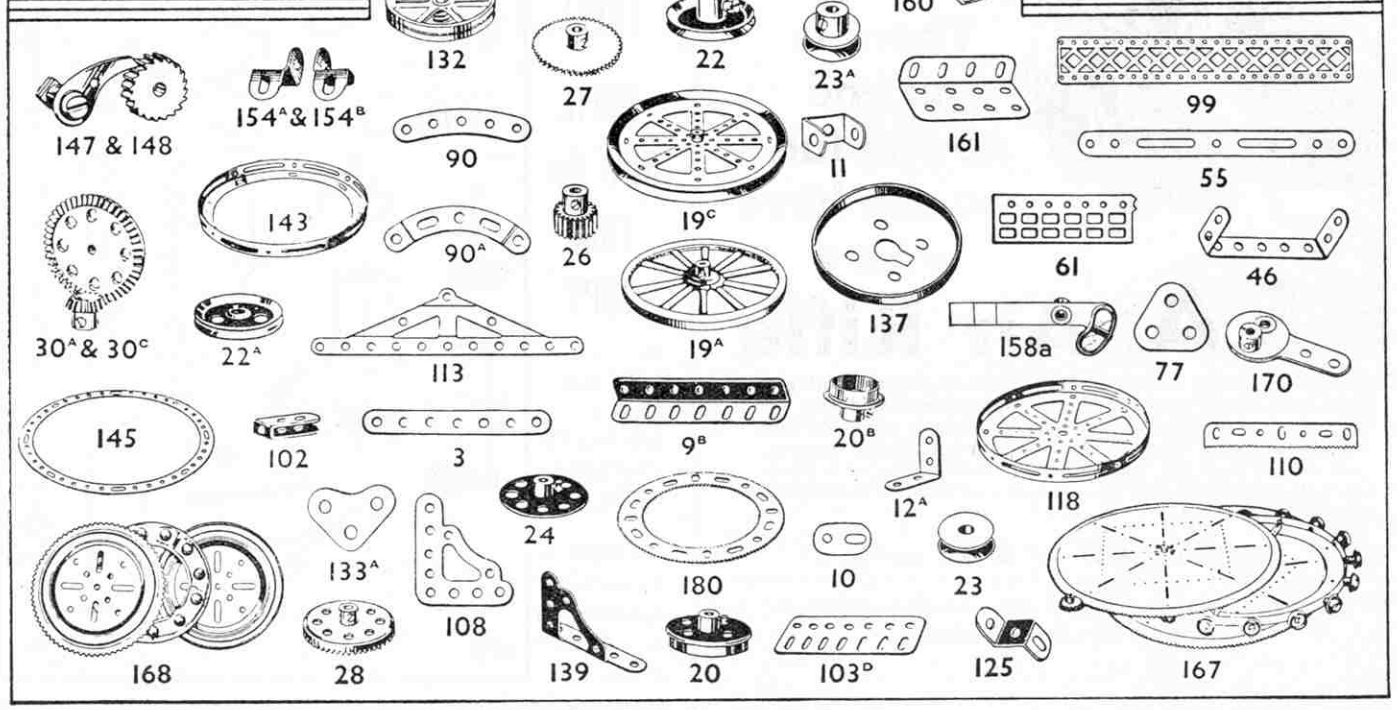
MECCANO LTD., Binns Road
LIVERPOOL 13

PRICES OF PARTS ILLUSTRATED

No.			s.	d.
3.	Perforated Strips, 3½"	½ doz.	0	4
9b.	Angle Girders, 3½"	„	0	8
10.	Flat Brackets	doz.	0	1
11.	Double Brackets	„	0	3
12a.	Angle Brackets, 1" x 1"	„	0	6
19a.	Wheels, 3" diam., with set screws	each	0	6
20.	Flanged Wheels, 1⅝" diam.	„	0	5
20b.	„ „ ⅝" „ Pulley Wheels	„	0	3
19c.	6" dia. with centre boss and Set Screw	each	1	9
20a.	2" „ „ „	„	0	4
21.	1½" „ „ „	„	0	4
22.	1" „ „ „	„	0	3
23a.	½" dia. with centre boss and Grub Screw	„	0	3
22a.	1" dia. without centre boss and Grub Screw	„	0	2
23.	½" „ „ „	„	0	2
24.	Bush Wheels	„	0	4
26.	Pinion Wheels, ½" dia., ¼" face	„	0	4
26a.	„ „ ½" „ ½" „	„	0	5
26b.	„ „ ½" „ ⅝" „ Gear Wheels	„	0	6
27.	50 teeth to gear with ¾" pinion	each	0	5
27a.	57 „ „ „ ⅝"	„	0	6
28.	Contrate Wheels, 1½" diam.	„	0	9
29.	„ „ ⅝"	„	0	6
30.	Bevel Gears, ¾", 26 teeth	„	0	7
30a.	„ „ 1½", 16 „	„	0	6
30c.	„ „ 1½", 48 „	„	1	6
	(30a and 30c can only be used together)			
31.	Gear Wheels, 1", 38 teeth	each	0	10
32.	Worms	„	0	4
44.	Cranked Bent Strips	„	0	1
45.	Double „ „	„	0	1
46.	„ Angle Strips, 2½" x 1"	½ doz.	0	6
55.	Perforated Strips, slotted, 5½" long	doz.	1	6
61.	Windmill Sails	4 for	0	6
77.	Triangular Plates, 1"	each	0	1

PRICES OF PARTS ILLUSTRATED (Cont.)

No.			s.	d.
90.	2½" Curved Strips, 2⅜" radius	each	0	1
90a.	2½" Curved Strips, cranked, 1⅜" radius, 4 to circle	„	0	1
95b.	Sprocket Wheels, 56 teeth, 3" diam.	„	0	6
96.	Sprocket Wheels, 18 teeth, 1" diam.	„	0	3
99.	Braced Girders, 12½" long	½ doz.	2	6
102.	Single Bent Strips	each	0	1
103d.	Flat Girders, 3½" long	½ doz.	0	7
108.	Architraves	doz.	1	6
110.	Rack Strips, 3½"	each	0	2
113.	Girder Frames	„	0	3
118.	Hub Discs, 5½"	„	1	3
123.	Cone Pulley	„	1	3
124.	Reversed Angle Brackets, 1"	½ doz.	0	4
125.	„ „ „ ½"	„	0	2
126.	Trunnions	pair	0	3
126a.	Flat Trunnions	each	0	1
129.	Rack Segments, 3" diam.	„	0	5
132.	Flywheels, 2⅜" diam.	„	2	0
133.	Corner Brackets, 1½"	„	0	1
133a.	„ „ 1"	„	0	1
137.	Wheel Flanges	„	0	3
139.	Flanged Brackets (right)	„	0	2
143.	Circular Girders, 5½" diam.	„	1	0
145.	Circular Strips, 7½" diam. over all	„	0	9
147.	Pawls, with Pivot Bolt and Nuts	„	0	3
148.	Ratchet Wheels	„	0	6
154a.	Corner Angle Brackets, ½", right hand	½ doz.	0	6
154b.	Corner Angle Brackets, ½", left hand	„	0	6
158a.	Signal Arms, Home	each	0	5
160.	Channel Bearings, 1½"x1"x½"	„	0	2
161.	Girder Brackets, 2"x1"x½"	2 for	0	3
167.	Geared Roller Bearings	each	20	0
168.	Ball Bearings, 4" diam.	„	3	0
170.	Eccentrics, ½" throw	„	0	9
180.	Toothed Gear Ring, 3½" diam. { 133 external teeth / 95 internal „ }	„	2	0



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This farmhouse is one of many realistic models built with Minibrix Set No. 4.

WOULDN'T you like to build the fine model of a farmhouse like the boy in the picture.

Then make sure you get a MINIBRIX. In next to no time you'll be having endless fun building not only this farmhouse, but scores of other grand models, such as houses, castles, bridges, factories, schools, etc.—in fact every kind of building you can think of.

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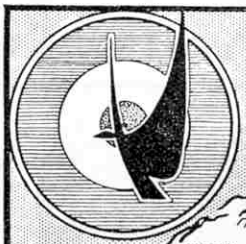
WITH *Allrubber* SELF LOCKING BRICKS



ANNOUNCING!

Percival "Vega Gull"

Constructive Set, 2/-

THE VERY LATEST in this series of accurate Scale Models of the most famous aeroplanes in the world. In its first year of life this machine has won the King's Cup and the Jo'burg races, and has also flown the Atlantic. One of the best light aeroplanes of to-day and just the model to possess!

WE RECOMMEND SKYBIRDS to all intelligent persons who are interested in modelling. If you make a SKYBIRD it will mean more to you than a mere shop-made replica for it will represent a *personal triumph.*

A COMPLETE description of each aeroplane modelled in our series appears in "The Aero-Modeller" (price 7d., post free), in which there is also published each month a full and up-to-date Price List of models and accessories. Write to us for the name of your nearest SKYBIRD Agent, or for "The Aero-Modeller," and for particulars of the SKYBIRD LEAGUE which helps all air-minded modellers.

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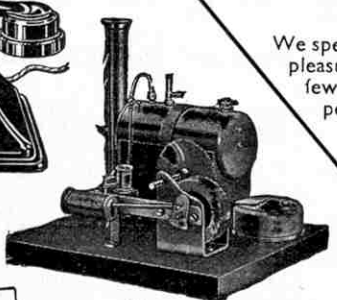
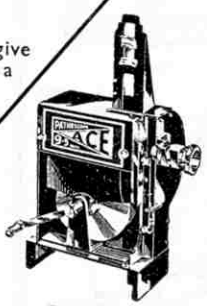
New Year Gifts that will be appreciated

We specialise in things which give pleasure to Boys and offer a few suggestions of inexpensive presents, selected from our large and varied stocks.

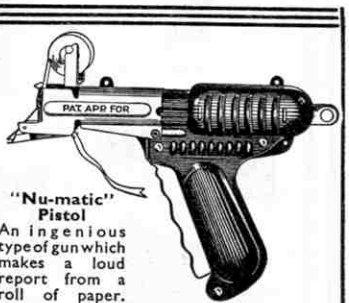
Table Telephones
A real working model beautifully finished in Bakelite, 25/-



Steam Engines
of superior quality and efficiency, from 10/6 to 50/-.



Pathe Ace Projectors
The perfect Home Movie, 37/6 (other makes from 12/6).



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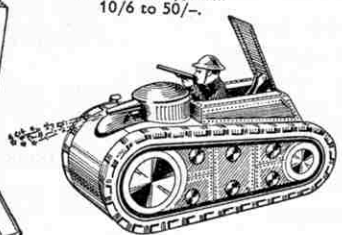
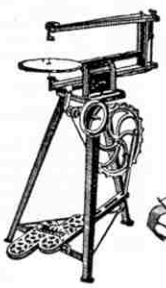


Mechanical Tank
A model Army Tank which dodges hither and thither emitting a fusilade of sparks. 7/6 each.



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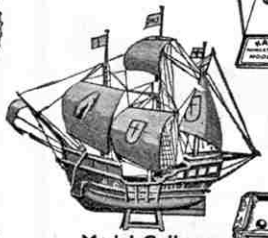
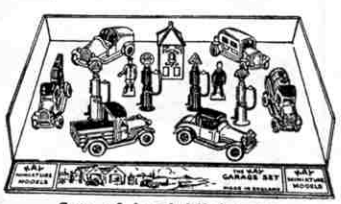
The machine with 101 uses, from 30/- to 75/-.



Model Galleon Kits
Complete sets of parts for building, from 12/6 to £5.



Sets of Lead Miniatures
12 varieties in 3 sizes. 2/6, 5/- and 7/6.

Billiard Tables
The most amazing value ever offered at the price. 4 ft. long, 15/6 each.

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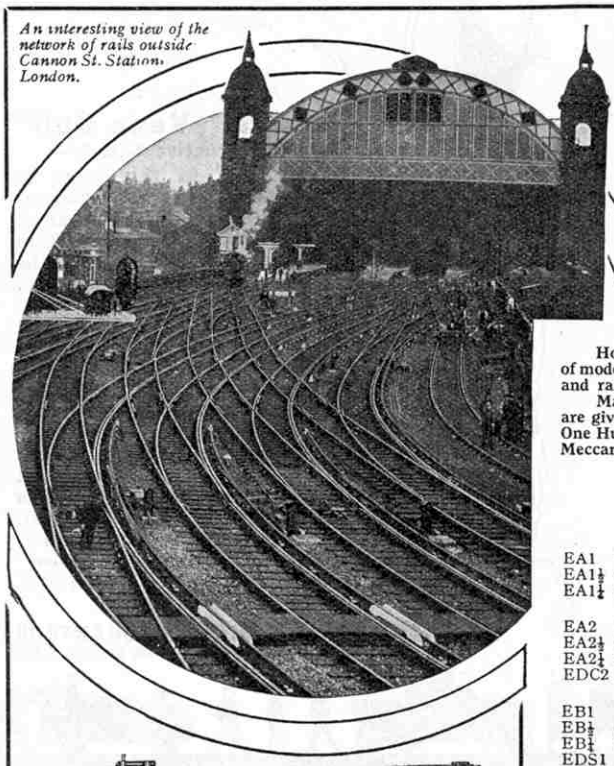
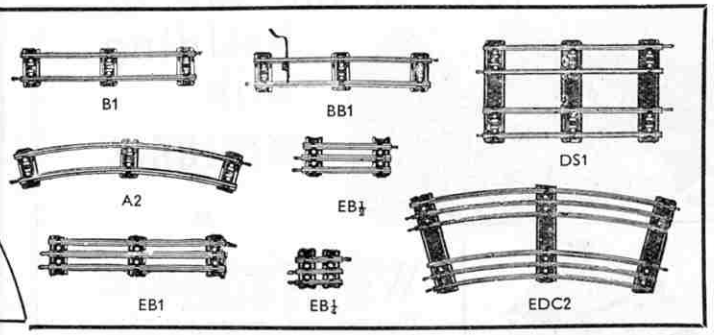
The Boys' Arcadia 17, HOUGHTON ST., CLAYTON SQUARE, LIVERPOOL, 1 *Hobbies Depôt*

Hornby Rails, Points and Crossings



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



Hornby Rails, Points and Crossings are designed to meet the most exacting requirements of model railway enthusiasts. They make it possible to construct an almost endless variety of attractive and railwaylike layouts, for both Electric and Clockwork trains.

Many interesting illustrations and much useful information regarding Hornby Railway layouts are given in the booklets entitled "How to plan your Hornby Railway," and "Hornby Layouts—One Hundred Suggestions." Each of these booklets is obtainable from any dealer, price 3d., or from Meccano Ltd., Binns Road, Liverpool 13, price 4d. post free.

Rails for Electric Trains, Gauge 0, 1¼"

CURVED RAILS

1-ft. Radius

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

2-ft. Radius

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

STRAIGHT RAILS

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

POINTS

For 1-ft. Radius Curves

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

For 2-ft. Radius Curves

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

CROSSINGS

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

DOUBLE SYMMETRICAL POINTS

1-ft. Radius

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

2-ft. Radius

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

PARALLEL POINTS

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

CROSSOVER POINTS

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

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

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

CURVED RAILS

9-in. Radius (for MO Trains)

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

1-ft. Radius

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

2-ft. Radius

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

STRAIGHT RAILS

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

CROSSINGS

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

POINTS

9-in. Radius (for MO Trains)

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

1-ft. Radius

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

2-ft. Radius

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

(Fitted for Hornby Control)

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

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

PARALLEL POINTS

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

The above Parallel Points can be used with either 1 ft. or 2 ft. radius track.

DOUBLE SYMMETRICAL POINTS

For 1-ft. Radius Curves

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

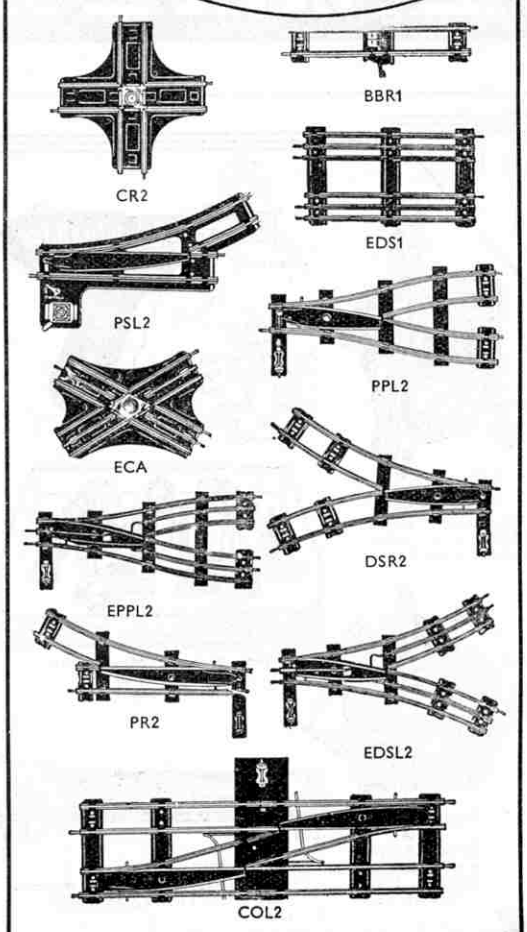
For 2-ft. Radius Curves

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

CROSSOVER POINTS

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

PART EXCHANGE. You can exchange Hornby Clockwork Rails, Points and Crossings for Electric on a piece-for-piece basis, the allowance being half the current price of Clockwork Rails returned.



KEMEX
CHEMICAL OUTFITS

Conduct Fascinating Chemical Experiments

The contents of the Kemex Chemical Outfits will provide many hours of fascinating fun. With the apparatus and materials contained in them a boy can make inks and soaps; dye wool, cotton and silk, and bleach fabrics that are already dyed; test foodstuffs for impurities; analyse air and water; grow crystals; make invisible inks and a chemical garden, and perform a host of other interesting chemical experiments.

No. O Kemex Outfit
75 Experiments

This Outfit includes a supply of specially selected chemicals, sufficient to perform 75 attractive and varied experiments. The apparatus provided includes Test Tubes, Test Tube Brush, Delivery Tubes and Corks, and a simple and highly efficient Spirit Lamp that makes the Outfit completely self-contained.
Price 5/-

No. 1 Kemex Outfit
130 Experiments

This Outfit includes the whole of the contents of the No. O Outfit, together with further chemicals that increase the number of experiments that can be performed to 130. The additional apparatus includes a Test Tube Holder, Glass Stirring Rod, Funnel and Filter Papers.
Price 7/6

No. 1 Kemex Outfit

No. 2L Kemex Outfit
250 Experiments

This Outfit includes the contents of the No. 1 Outfit, and further chemicals that increase the range of experiments up to 250. The additional apparatus includes a porcelain Evaporating Dish, Special Test Tubes, a handsome Test Tube Stand, and an Evaporating Stand including a Ring, with Wire Gauze.
Price 15/-

No. 2B Kemex Outfit

This is exactly the same as the No. 2L Kemex Outfit, except that a highly efficient Bunsen Burner, with the necessary length of rubber tubing, is included in place of the Spirit Lamp.
Price 15/-

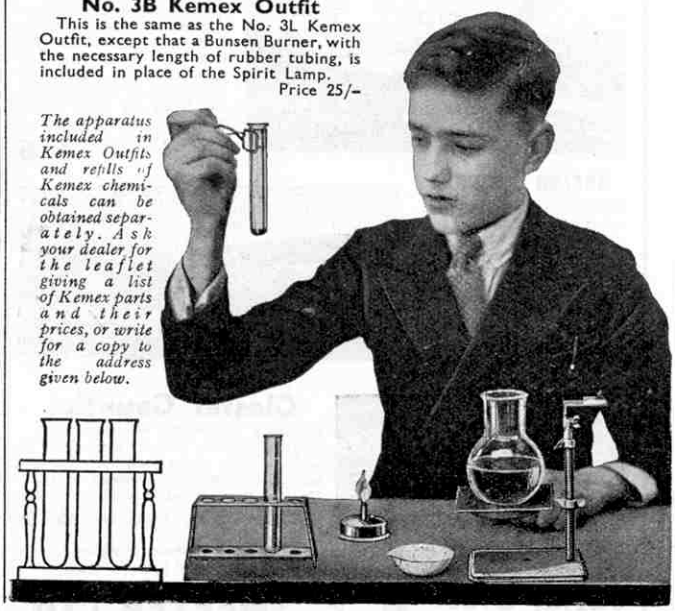
No. 3L Kemex Outfit
350-400 Experiments

This splendid Outfit enables a boy to carry out between 350 and 400 experiments. It includes the contents of the No. 2 Outfit, with additional chemicals and apparatus including a gas-generating apparatus, consisting of a large Wide-necked Flask with Thistle Funnel and Delivery Tubes, and a Blowpipe and a Charcoal Block.
Price 25/-

No. 3B Kemex Outfit

This is the same as the No. 3L Kemex Outfit, except that a Bunsen Burner, with the necessary length of rubber tubing, is included in place of the Spirit Lamp.
Price 25/-

The apparatus included in Kemex Outfits and refills of Kemex chemicals can be obtained separately. Ask your dealer for the leaflet giving a list of Kemex parts and their prices, or write for a copy to the address given below.



ELEKTRON
ELECTRICAL OUTFITS

The Most Wonderful Force of the Age!

In these days of radio, X-rays and electric trams and trains every boy should have a knowledge of electricity. The only way to gain this knowledge is by means of experiments, and the Elektron Outfits have been produced specially for this purpose. They provide the necessary material for carrying out a series of fascinating experiments in magnetism, frictional electricity and current electricity.

Each Outfit is packed in a handsome box, and includes a Manual, splendidly illustrated, giving full directions and explaining every experiment in simple language.


In the above illustration is shown an electric bell being made with the contents of Elektron Outfit No. 2.

No. 1 Elektron Outfit Price 6/6

No. 1 Elektron Outfit
Magnetism and Static Electricity

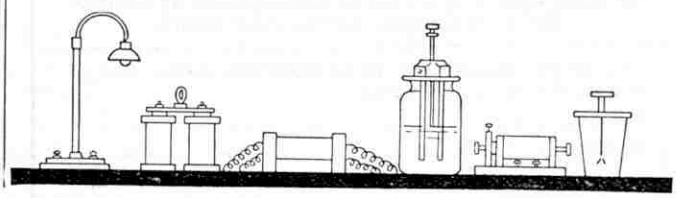
The No. 1 Outfit contains two powerful Bar Magnets, a Horseshoe Magnet, and a reliable Magnetic Compass, together with everything necessary for the carrying out of a series of fascinating magnetic experiments. In addition there are materials for experiments in frictional or static electricity, and for the construction of an Electric Compass, two forms of Electroscope, and an Electrophorus.
Price 6/6

No. 2 Elektron Outfit
Current Electricity

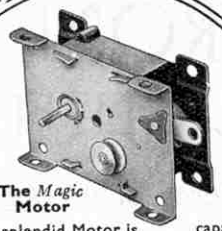
The reduced price of this splendid Outfit will make it more popular than ever. Everything that is necessary for a series of experiments with electric currents is included in the Outfit. It contains the parts required to make a Bichromate Cell, and to build a wide range of electrical devices, including Electro-Magnets, an Electric Bell, and a Buzzer for use in an electric telegraph system. A Shocking Coil that will give hours of fun, and two types of working Electric Motors also can be constructed from the contents of this Outfit.
Price 17/6

No. 2 Elektron Outfit Price 17/6

The parts contained in the Elektron Outfits can be obtained separately. Ask your dealer for the leaflet giving a complete list of Elektron parts, or write for a copy to the address below.



MECCANO LTD. — BINNS ROAD — LIVERPOOL 13



The *Magic* Motor

This splendid Motor is capable of driving models made with Meccano Outfits A, B and C. It costs only 2/–.

MECCANO MOTORS FOR DRIVING MODELS

If you want to obtain the fullest enjoyment from the Meccano hobby you must operate your models by means of one of the Meccano Clockwork or Electric Motors listed below.

CLOCKWORK MOTORS

The *Magic* Motor (non-reversing) ... ... Price 2/–
No. 1 Clockwork Motor (non-reversing) ... ,, 5/–
No. 1a Clockwork Motor (reversing) ... ,, 7/6
No. 2 Clockwork Motor (reversing) ... ,, 9/–

ELECTRIC MOTORS

No. E1 Electric Motor (6-volt). Non-reversing Price 9/–
No. E6 Electric Motor (6-volt). Reversing ... ,, 15/6
No. E120 Electric Motor (20-volt). Non-reversing ,, 10/–
No. E20B Electric Motor (20-volt). Reversing ,, 18/6

TRANSFORMERS

The Transformers made by Meccano Limited provide a convenient and safe means of driving 6-volt or 20-volt Electric Motors and Train Sets from the mains supply where this is alternating current.

When ordering a Transformer or a Transformer-Rectifier the voltage and frequency of the supply must be stated. These particulars are given on the supply meter.

No. T6A Transformer (Output 40 VA at 9/3½ volts) for 6-volt Electric Motors or 6-volt Trains. Fitted with speed regulator and separate circuit for supplying current for eighteen 3½-volt lamps ... ... Price 22/6

No. T6 Transformer (Output 25 VA at 9 volts) for 6-volt Electric Motors or 6-volt Trains. Fitted with speed regulator ... ... Price 17/6

No. T6M Transformer (Output 25 VA at 9 volts) for 6-volt Electric Motors or 6-volt Trains. This is similar to No. T6, but is not fitted with a speed regulator... Price 12/6

No. T26M Transformer (Output 50 VA at 9 volts) for 6-volt Electric Motors or 6-volt Trains. Not fitted with speed regulator. Will operate two trains at the same time, either on the same track or on two separate tracks. In the latter case two Resistance Controllers are necessary to give independent control ... ... Price 13/6

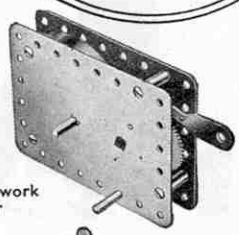
No. TR6 Transformer-Rectifier (Output 6 volts at 1½ Amps.) for use with Hornby No. EPM16 Special Tank Locomotive (6-volt, Permanent Magnet) ... ... Price 29/6

No. T20A Transformer (Output 25 VA at 20/3½ volts) for 20-volt Electric Motors or 20-volt Trains. Fitted with speed regulator and output sockets for lighting lamps. Price 22/6

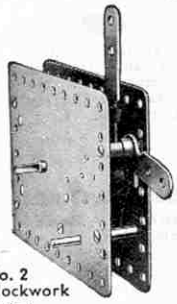
No. T20 Transformer (Output 20 VA at 20 volts) for 20-volt Electric Motors or 20-volt Trains. Fitted with speed regulator ... ... Price 17/6

No. T20M Transformer (Output 20VA at 20 volts) for 20-volt Electric Motors or 20-volt Trains. This is similar to No. T20 but is not fitted with speed regulator ... Price 12/6

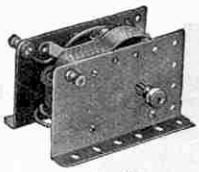
No. T22M Transformer (Output 50 VA at 20 volts) for 20-volt Electric Motors or 20-volt Trains. Not fitted with speed regulator. Will operate two trains at the same time, either on the same track or on two separate tracks. In the latter case two Resistance Controllers are necessary to give independent control ... ... Price 13/6



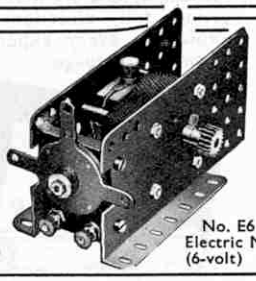
No. 1 Clockwork Motor



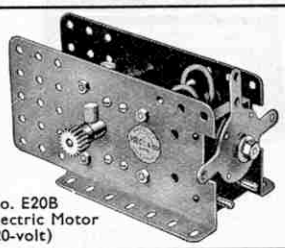
No. 2 Clockwork Motor



No. E1 Electric Motor (6-volt)

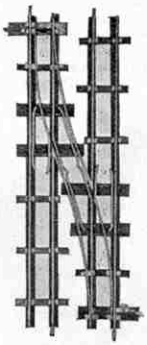


No. E6 Electric Motor (6-volt)



No. E20B Electric Motor (20-volt)

No. T20 Transformer



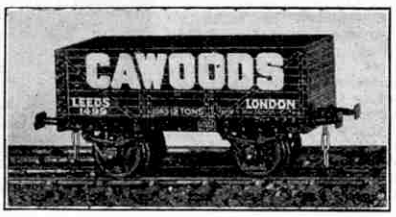
METALWAY

THE PERFECT TRACK

built from steel rails, wood sleepers and battens, cast chairs, brass fishplates.

STRAIGHTS & CURVES, 18″ long **7½d.**

POINTS & CROSSOVERS, from **4′9**



Scale **WAGONS**

Wood construction with perfect lithographic details. Will run on any gauge O railway. L.M.S., L.N.E.R., G.W.R., Cawoods, Manchester Collieries, Whitaker, Warrens, Brentnall and Cleland, etc. All **2′9** each

All orders per post should be accompanied by a Postal Order or Cheque. Delivery per return.

This coupon entitles you to an illustrated leaflet, free of charge. Fill in and post to-day.

Name .....

Address .....

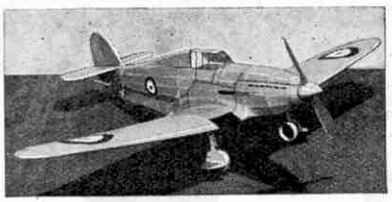
.....

THE LEEDS MODEL CO. LTD.
POTTERDALE MILLS, DEWSBURY RD., LEEDS, 11

FASCINATING TO BUILD?

THEY CERTAINLY ARE!

There is real pleasure in working with balsa wood and our special quick-drying cement is a joy. Once start and you will be fascinated.



Hawker Hurricane

Wingspan 20 inches. Length 15 inches. Movable controls. This peerless kit makes a beautiful model with a superb flying performance. Special condensed instructions, four pages with many drawings. Special shrinking dope for silver tissue. Previous experience required. Complete kit, carriage paid. **4′6**

Heston Phoenix

Wingspan 18 inches. Length 13½ inches. Retractable landing gear with locking control. The plan is so well laid out and illustrated that you feel you can start right in. The Fuselage is built on Comet's Auto-line-up principle — the best. It is absolutely complete. The model requires a little experience. Carriage Paid **3′6**

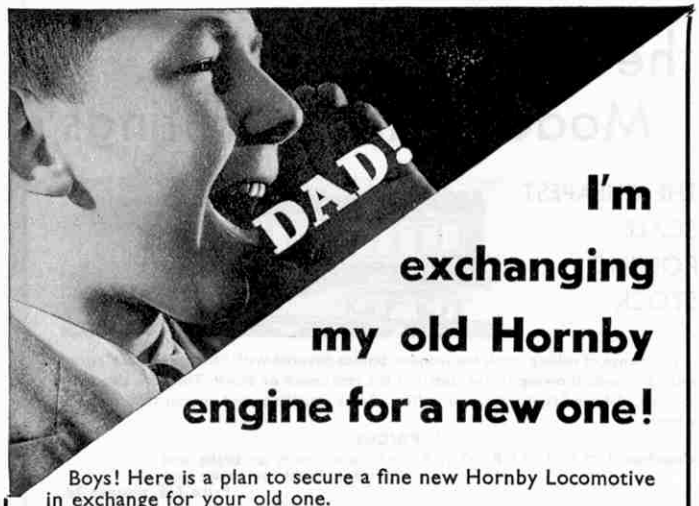
Gloster Gauntlet

An exact ⅜″ scale model. Wingspan 21 inches. Length 14½ inches. Very detailed plan. This model is sturdy and a good flyer. Fuselage built up on Comet's Auto-line-up principle. Clear full size plan with special instructions. Complete kit, carriage paid **6′6**

SEND YOUR Postal Order NOW to:

● Send two penny stamps for illustrated catalogue showing biggest range of scale model flyers in England.

M. E. SWEETEN LTD.
Bank Hey St., BLACKPOOL



I'm exchanging my old Hornby engine for a new one!

Boys! Here is a plan to secure a fine new Hornby Locomotive in exchange for your old one.

First of all, study carefully the latest Hornby Train Catalogue, and select from it the new up-to-date Hornby Locomotive you want. Then pack up your old Hornby Locomotive and send it to us addressed "Special Service Department," Meccano Ltd., Binns Rd., Liverpool 13. Your order for the new Locomotive and the necessary remittance should be enclosed. You can easily ascertain how much to send by deducting the part exchange allowance indicated in the list given below from the price of the new Locomotive, and adding 1/- for postage on the new model you purchase. It is important to note that the catalogue price of the new Hornby Locomotive you purchase **must not be less than double the Part Exchange allowance made for your old Locomotive.**

If you prefer to do so, you can effect the exchange through your dealer, who will be very pleased to give you any information you require.

Part Exchange allowances for Hornby Locomotives

CLOCKWORK MODELS	
M2930 Locomotive	1/-
MO Locomotive...	1/4
M1/2 Locomotive	2/3
*George V Locomotive ...	3/3
*No. OO Locomotive	3/3
M3 Tank Locomotive	3/9
M3 Locomotive	4/3
Zulu Locomotive	5/3
No. O Locomotive	5/3
LEC 1 Locomotive (Swiss Type)	5/3
Zulu Tank Locomotive... ...	6/3
No. 1 Tank Locomotive ...	6/3
No. 1 Locomotive	6/3
No. 1 Locomotive, fitted for Hornby Control	7/6
No. 1 Tank Locomotive, fitted for Hornby Control	7/6
No. 1 Special Locomotive ...	8/3
No. 1 Special Tank Locomotive	8/3
No. 2 Locomotive	10/-
No. 2 Tank Locomotive ...	10/6
No. 2 Special Tank Locomotive	10/6
Metropolitan C Locomotive ...	10/6
No. 2 Special Locomotive ...	11/3
No. 2 Locomotive, fitted for Hornby Control	11/3
No. 2 Tank Locomotive, fitted for Hornby Control	11/9
No. 3C Locomotive	12/-
No. 3C Riviera "Blue" Locomotive	12/-

*These models were identical.

ELECTRIC MODELS	
EM16 or EM120 Locomotive ...	4/3
No. 1 Electric Tank Locomotive, Permanent Magnet	7/6
EM36 or EM320 Tank Locomotive	8/3
LST M3/20 Tank Loco (20-volt)	8/3
LE 120 Locomotive	10/-
LE1/20 Loco (Swiss Type) 20-volt	10/-
E06 or E020 Locomotive ...	11/-
E16 or E120 Locomotive ...	12/-
E16 or E120 Tank Locomotive	12/-
LST 1/20 Tank Locomotive (20-volt)	12/-
LST 2/20 Tank Locomotive ...	12/6
E3/20 Locomotive	12/6
E3/20 Riviera Locomotive ...	12/6
EPM16 Special Tank Locomotive	13/9
Metropolitan L.V. Locomotive	15/-
E26 Special Tank Locomotive ...	15/-
E36 Metropolitan Locomotive...	15/-
E120 Special Locomotive (automatic reverse)	15/-
No. 2 Electric Tank Locomotive	15/-
E120 Special Tank Locomotive (automatic reverse)	15/-
E36 Locomotive	16/3
E36 Riviera "Blue" Locomotive	16/3
E220 Special Tank Locomotive (automatic reverse)	16/3
LE2/20 Locomotive	16/6
LE220 Locomotive (automatic reverse)	16/6
E320 Locomotive (automatic reverse)	17/6
E320 Riviera Locomotive (automatic reverse)	17/6
E220 Special Locomotive (automatic reverse)	18/9
Metropolitan H.V. Locomotive	18/9

HORNBY TRAINS

BRITISH AND GUARANTEED

Manufactured by

MECCANO LTD. - LIVERPOOL 13

You can model 'Big Chief Plasticine'....

An actual model in "Plasticine"

This fine Red Indian's Head is but one of the many wonderful models you could make if you had a box of "Plasticine." Ask your Dad or Mother to give you a special treat—a "Plasticine" Outfit! Tell them there is a really large range to choose from. All good stationers sell them at prices from 1d. to one guinea.

★

Build a Village (series of six), **6d.** *each, post free 9d.*

★

Elfin Wonderland, 2'6 *each, post free 3/-*

★

Designer, 5'6 *and* **12'6,** *post free 6/1 and 13/5*

★

Complete Modeller, 4/-, *post free 4/6*

Post free rates for Great Britain; abroad extra

H A R B U T T ' S

Plasticine

Write for illustrated price lists to—

HARBUTT'S PLASTICINE LTD., 99, BATHAMPTON, BATH

READERS' SALES

Readers should note that all advertisements of Hornby Trains and other Meccano products included in this column relate to items no longer featured in the catalogue. Advertisements of current products cannot be accepted for this column.

Album, 1,200 different stamps, also three bound "Chums," 25/-.—Barnwell, 130, Manor Road, Stechford, Birmingham.

Spark Coil ⅝ inches, £1/10/-; another smaller, £1.—4, Kettlebaston Road, London, E.10.

"M.M.'s," Jan.-Sept. 1935, Jan.-Dec. 1934, Apr.-Dec. 1930, 3/6 plus postage.—Bateman, Fairleigh, Draughton, Skipton.

Sale. 37/6 Bowman Steam Locomotive, Tender and 18 Rails. Good condition, 15/-.—Harding, 45, Wilton Grove, Wimbledon, London, S.W.19.

"M.M.'s," 1929-1936 inclusive. Good condition. Lot 12/6 or separate, 2/- per year. Gauge O Rails and Points. Write list.—Dean, 20, South Park Road, Wimbledon, S.W.19.

Sale. Gauge O Trains, Accessories, Air Rifle. List.—Ross, 16, Clarence Drive, Glasgow.

Exchange .177 B.S.A. Air Rifle, fine condition, cost 45/-, for good Cinematograph and Films.—Bedford, 36, Tomson Avenue, Coundon, Coventry.

What offers for 14/6 Ukelele; 12/6 Roller Skates; 28/6 Adana Printing Machine; No. 10 Construments Set; 25/- Telephone Set; 4-valve Portable Wireless; £5 Moving Coil Speaker; "Lissen" Speaker Unit and many Wireless Parts.—C. B. Leek, Greywoods, Birchall, Leek, Staffs.

Wanted. "Magnets," Nos. 1440, 1441, 1438, 1436, 1435, 1434, and any preceding, except Nos. 1430, 1433. State terms.—22, The View, Alwoodley, Leeds.

Sale. B.T.H. Pezolectric Pickup with volume control; 12 months old, good condition, cost 44/9. Offers?—42, The Triangle, Timperley, Cheshire.

"M.M.'s," Jan.-Apr. 1924, Sept. 1925-Dec. 1929, for sale in volumes or parts, excellent condition. What offers?—Brewis, Didsbury College, Manchester.

26 inch Destroyer, Stuart Turner Electric Motor, cost 35/-. Offers?—Brisbye, 4, Kirklee Road, Glasgow.

200 "Magnets," 1931-5. Offers? 2,000 Colonials, 5/6. —113, Arcadian Gardens, London, N.22.

Books and Magazines going cheap. Write for list.—Cowdry, Fovant, Salisbury.

Lott's Bricks for sale. Good condition. Worth £3. Take 15/-.—Messenger, 14, Lewes Crescent, Brighton.

250 Canadian Stamps cat. £8, in new loose leaf Album with room for 2,000 stamps for sale, £2. Stamp for particulars from—Conroy, 158, Knowle Road, Birmingham 11.

For Sale. Bowman Stationary Steam Engine, 12/6; Meccano Parts, value 51/6, including largest Clockwork Motor; Elastolin Soldiers; Hornby Rolling Stock. Stamp for list.—Grant, Rockfield Street, Dundee.

High Fidelity Studio Microphone. Mesh case table stand. Cost £14. Sacrifice 40/-. Write—Bockner, 10, Linthorpe Road, N.16.

Sale. Bassett-Lowke Mail Coach and Ground Apparatus, 15/-; "Marklin" Pullman Car, 7/-. Both excellent condition. Also Bassett-Lowke "Lowko" Track, 4d. per length. All Gauge "O."—White, Victoria Street, Wolverton, Bucks.

Sale. "Duke of York" Loco (Electric), 8 volts, 4 Scale Model Trucks, Station, Signal Box, scarcely used, 35/- or offer.—Garbutt, 44, Milton Road, Clapham, Bedford.

Sale. "Meccano Magazines," Jan. 1922 to May 1930 inclusive. Cheap. What offers?—Dorling, Lapford, Devon.

Nice Collection of 1,020 British Colonials, including 30 Different Jubilees, 12/6.—Burditt, 4, Nuthall Gardens, Western Boulevard, Nottingham.

Electric Rolling Stock, 22 Curves, 20 Straights, 2 Locos, Control Rail, Crossover, 3 Junctions 2 ft. Stamp for list.—Waddell, 48, Stirling Street, Airdrie, Lanarkshire.

Sale. Set Bassett-Lowke Clockwork Trains. Complete Passenger and Goods Trains, 2 Shunting Engines, large quantity of Lines and other Accessories. Good condition. £3 for quick sale.—Bussey, 1, Helena Road, Norwich.

Bowman Stationary Steam Engine M135; Cinematograph and Films; Meccanos, 1 and 2. Good condition. What offers?—Bowen, 55, Lodge Road, West Bromwich.

Bowman Locomotive and Tender, 17/6. Cost 37/6, little used; Frame Rucsack, 12/6. Cost 21/-, used once. Books suitable age 12-16, list.—Price, Deanfield, Londonderry.

For Sale. ¼ h.p. Compound Motor, 240 v., 1,725 r.p.m., 1.05 amps. Good running order.—Wells, 75, Nowell Road, Barnes, London, S.W.13.

Sale. Train Set cheap, £2.—D. Watson, 2, Whitefields Road, Solihull.

Second-hand Pathescope Kid or Imp, hand cranked, mains projector wanted, must be cheap.—Thiele, 1, Rustic Place, Dundee.

Large collection "Britain's" Soldiers, Farm Toys, "Constructments' 100 set. List.—Geoghegan, "Normanhurst," Basingstoke.

Surplus Pathe 9.5 Films—30's, 1/9; 60's, 3/6; Supers from 8/-. Send for list.—85, Killinghall Road, Bradford.

Cinematographs and "Meccano Magazines" for sale. Stamp list.—A. Inshaw, 27, Key Hill, Hockley, Birmingham.

Wanted. Bassett-Lowke Rolling Stock and Accessories. L.M.S. or G.W.R. preferred.—83, Penarth Road, Cardiff.

(Continued in Column 3)

This Month's Special Articles

MECCANO MAGAZINE

Registered at G.P.O., London, for transmission by Canadian Magazine Post.

EDITORIAL AND ADVERTISING OFFICE:—
LIVERPOOL 13, ENGLAND.
Telegrams: "Meccano, Liverpool."

Publication Date. The "*M.M.*" is published on the 1st of each month and may be ordered from any Meccano dealer, or from any bookstall or newsagent, price 6d. per copy. It will be mailed direct from this office, 4/- for six issues and 8/- for twelve issues.

To Contributors. The Editor will consider articles and photographs of general interest and payment will be made for those published. Whilst every care will be taken of articles, etc., submitted, the Editor cannot accept responsibility for any loss or damage. A stamped addressed envelope of the requisite size should be sent where the contribution is to be returned if unacceptable.

Readers' Sales and Wants. Private advertisements (i.e., not trade) are charged 1d. per word, minimum 1/-. Cash with order. Editorial and Advertising matters should not be dealt with on the same sheet of paper.

Small Advertisements. 1/6 per line (average seven words to the line), or 16/- per inch (average 12 lines to the inch). Cash with order.

Display. Quotations for space bookings, and latest net sale figures, will be sent on request.

Press Day, etc. Copy should be sent as early in the month as possible for insertion in following issue. We usually close for press on or before 6th of each month for following issue. Half-tone blocks up to 100 screen.

Proofs of advertisements will be sent when possible for space bookings of not less than half-an-inch.

Voucher copies. Sent free to advertisers booking one inch or over. Other advertisers desiring vouchers should add 8d. to their remittance and should order voucher copy at same time.

Remittances. Postal Orders and Cheques should be made payable to Meccano Ltd.

Ordering the "M.M." Overseas

Readers Overseas and in foreign countries may order the "*Meccano Magazine*" from regular Meccano dealers or direct from this office. The price and subscription rates are as above, except in the cases of Australia, where the price is 1/2 per copy (postage extra), and the subscription rates 8/- for six months and 16/- for 12 months (post free); Canada, where the price is 10c. per copy, and the subscription rates 65c. for six months, and $1.25 for 12 months (post paid).

The U.S.A. price is 15c. per copy, and the subscription rates $1 and $2 for 6 and 12 months respectively (post free).

READERS' SALES—*Continued from Col. 1*

Bing 6-coupled Mech. 10/6. G.W.R. Twin Coaches (wooden), 15/6. L.H. Junction, 12/6, R.H., 10/6. Single Slip Layout, 10/6, steel. Modern Station, electric light, 15/-.—140, Dodworth Road, Barnsley.

50/- Red-Green Meccano. Nearly £7 worth, including 2 Motors. Carriage paid.—Wiltshire, Metherell, Beaworthy, Devon.

For Sale. Large collection Britain's Soldiers, Infantry, Cavalry and Guns. Many Regiments and Nationalities. Good condition. Half list price, or reduction for quantity.—Bantock, 182, Soho Road, Handsworth, Birmingham.

Sale. 3 Gauge O Clockwork Locomotives, excellent condition and hauling power. Stamp particulars.—R. Brown, 2, Braidburn Terrace, Edinburgh 1.

Good collection nearly 2,000 Stamps in Album. What offers? Would exchange for Typewriter.—N. Cann, 23, St. Paul's Road, St. Leonard's-on-Sea.

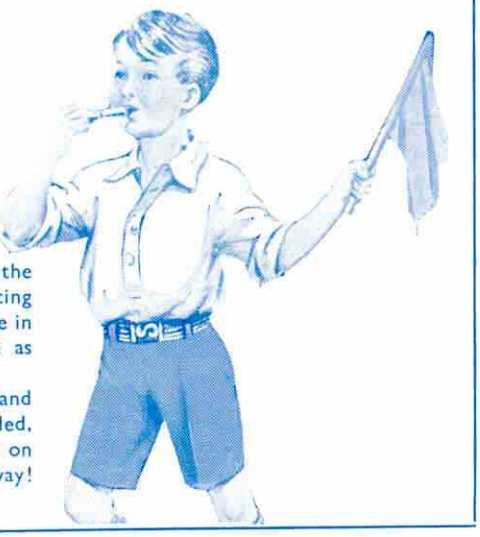
"M.M.'s" 1927-1928, beautifully bound, perfect condition. 1929-32 complete, mostly new, unbound. "Modern Railway Working," 8 vols., new condition. Offers.—North, Regnal House, London, S.W.1.

Sale. Bowman Steam Engine, complete, as new. Cost 37/6. What offers?—Steel, Cocklaw, Ayton, Berwickshire.

No. 6 Red-Green Meccano, No. 2 Clockwork Motor, also other accessories all enclosed in two strong cabinets, £3/10/-.—S. Smithson, 238, Lr. Broughton Road, Salford 7.

COMPLETE MODEL RAILWAY SETS

Right away for Happy Days!



These fine Model Railway Sets provide the simplest way of beginning the fascinating Hornby Railway hobby. Each Set is complete in itself; everything is there, ready for use as soon as you get it home.

Unpack the box, then lay out the rails and accessories as shown in the illustration provided, put the locomotive and coaches or wagons on the track, and begin to run your own railway! It's the greatest fun in the world!

M8 Complete Model Railway Set

M8 Complete Model Railway

Consists of a fine non-reversing Locomotive that can be braked from the track, Tender, two Goods Wagons and Set of Rails; Wayside Station, Footbridge, a Signal and Signal Cabin, two Trees with Stands, and Tunnel. Packed in a strong carton as illustrated. Price 9/6

M9 Complete Model Railway Set

M9 Complete Model Railway

This Set includes a non-reversing Locomotive that can be braked from the track, Tender, two Passenger Coaches and Set of Rails; Station, Footbridge, Signal and Signal Cabin, Level Crossing, Guard, Porter, two Trees with Stands and two Hikers. Packed in a strong carton as illustrated. Price 12/6

M10 Complete Model Railway

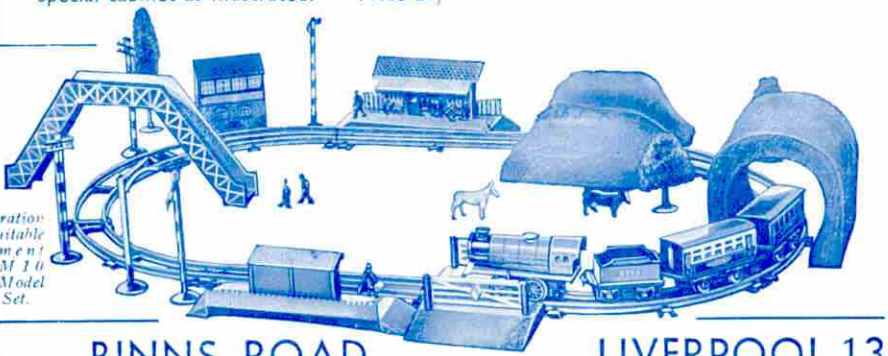
A larger Set containing a non-reversing Locomotive that can be braked from the track, Tender, two Pullman Coaches and Set of Rails; Footbridge, two Stations, Signal Cabin and two Signals, two Telegraph Poles, Loading Gauge, Tunnel, Cutting, Level Crossing, three Trees with Stands, two Porters, two Hikers, Horse and Cow. The Set is packed in an attractive special cabinet as illustrated. Price 19/6

M11 Complete Model Railway Set

M11 Complete Model Railway

This is the largest and best of the Complete Model Railway Sets. It includes a powerful reversing Tank Locomotive that can be braked from the track, Fibre Wagon, Timber Wagon, Open Wagon and Set of Rails and Points; Tunnel, Station, Signal and Signal Cabin, Level Crossing, Footbridge, two Trees with Stands, Guard, one Cow and one Horse. The Set is packed in a strong special cabinet as illustrated. Price 25/-

M10 Complete Model Railway Set



This illustration shows a suitable arrangement of the M10 Complete Model Railway Set.

MECCANO LIMITED — BINNS ROAD LIVERPOOL 13

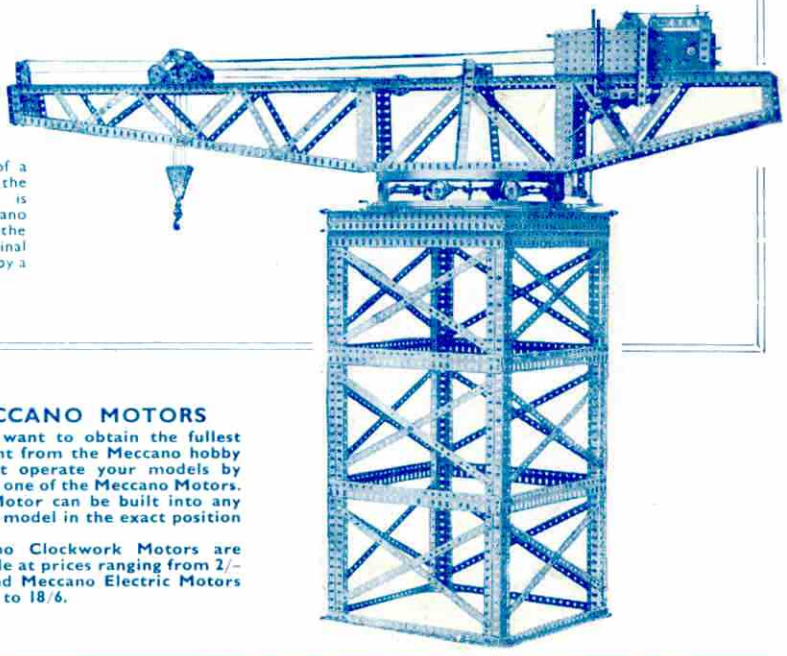
MECCANO

E Meccano Outfit. Price 20/-

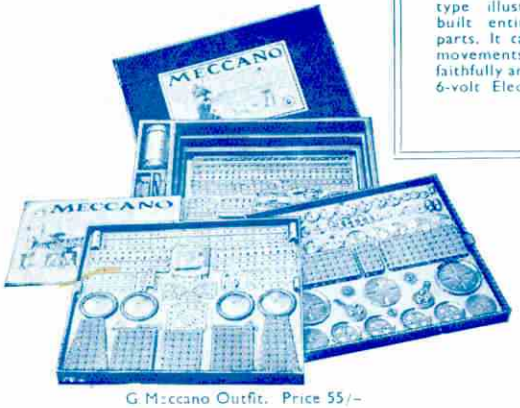
BOYS! Build Real Engineering Models like this

If you want to have the happiest possible boyhood—be a Meccano Boy. If you want to be imaginative and resourceful—if you want your days to be full of thrills—be a Meccano Boy. There is no other hobby in the world so wonderful or so fascinating. With a Meccano Outfit you will be able to build hundreds of working models of the world's greatest engineering masterpieces. All Meccano parts are standardised and interchangeable and can be used to make hundreds of different working models.

There is no need to pretend or make-believe for Meccano is real engineering in miniature.



This splendid model of a Hammerhead Crane of the type illustrated above, is built entirely of Meccano parts. It carries out all the movements of the original faithfully and is operated by a 6-volt Electric Motor.



G Meccano Outfit. Price 55/-

MECCANO MOTORS

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.

Each Motor can be built into any Meccano model in the exact position required.

Meccano Clockwork Motors are obtainable at prices ranging from 2/- to 9/- and Meccano Electric Motors from 9/- to 18/6.

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