VOL. XXIII. Nº 4. APRIL 1938

MECCANO MAGAZINE

THE CRAFTSMAN

6D.

MECCANO

BOYS, HERE IS THE TOY YOU ARE LOOKING FOR!

Meccano, the world's greatest toy, is better than ever this season! New parts have been added to the System, and all the Outfits have been enlarged, so that bigger and more realistic models can be built with each one.

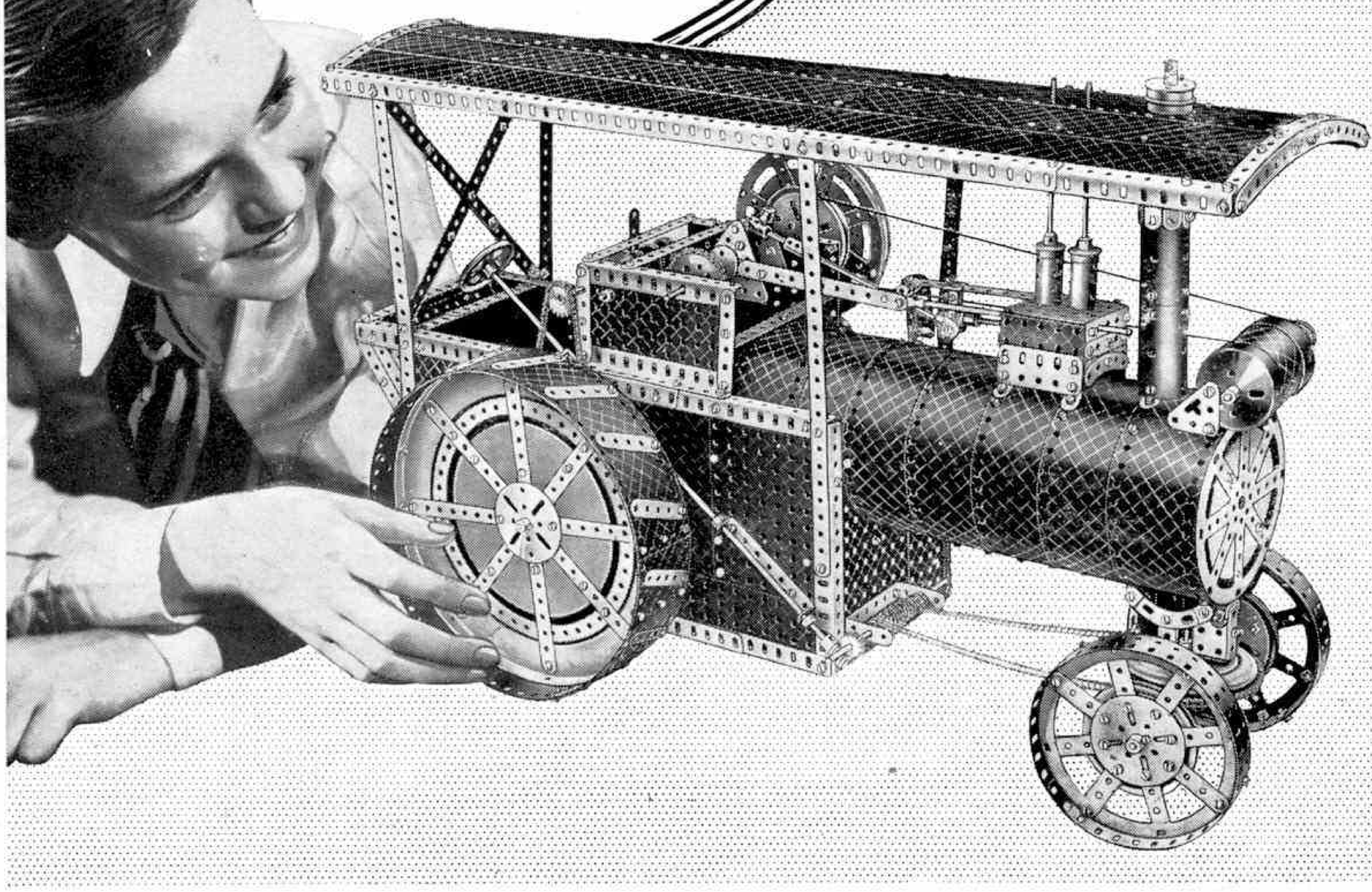
With a Meccano Outfit and a Meccano Clockwork or Electric Motor dull evenings are a thing of the past. There is no end to the number of playtime models that can be built.

Meccano Outfits from No. 8 upwards can be purchased also through the New Meccano Deferred Payments Scheme. Ask your dealer for full particulars. (Not available outside Great Britain and Northern Ireland.)

COMPLETE OUTFITS

	s.	d.
No. 0 Outfit	3	0
No. 1 „	4	6
No. 2 „	6	0
No. 3 „	9	0
No. 4 „	12	6
No. 5 „	18	0
No. 6 „	24	0
No. 7 „	35	0
No. 8 „	66	0
No. 9c „	95	0
No. 9w „	125	0
No. 10 „	255	0

Prices of Accessory Outfits from 1/9 to 120/-



MECCANO LIMITED, BINNS ROAD, LIVERPOOL 13

EXTRA LATE EDITION

ARE YOU AN AIRCRAFT MODELLER ?

Hamley's News

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TRAINS THAT STOP TO LET EACH OTHER PASS

No. 31 *April, 1938*

The Most Ingenious Toy Ever Constructed

The TRI-ANG GYRO CYCLE

The little man on the cycle can't overbalance. What amazing antics he can perform! He's more intriguing than any live trick cyclist. This ingenious scientific toy depends for its action on the well-known gyroscopic principle. The gyroscope is built into the front wheel and drives the latter through a chain of precision gears. It will astonish and fascinate your friends.

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

A 'WIZARD' PLANE

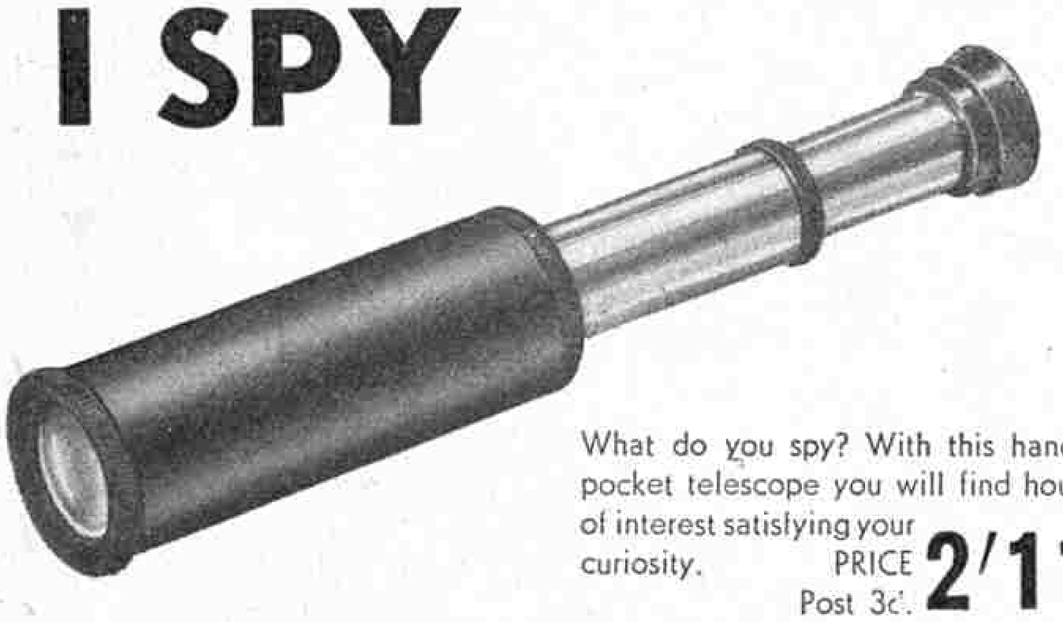
One sharp pull of the trigger and up the Pistol Plane will soar—cutting through the air at great speed for a considerable distance. Rubber-protected nose guards the plane against damage.

Wing span 11". PRICE Post 4d. **3/11**

(Foreign.)

Junior Model. Wing span 7¾". Price **2/-.**

I SPY



What do you spy? With this handy pocket telescope you will find hours of interest satisfying your curiosity.

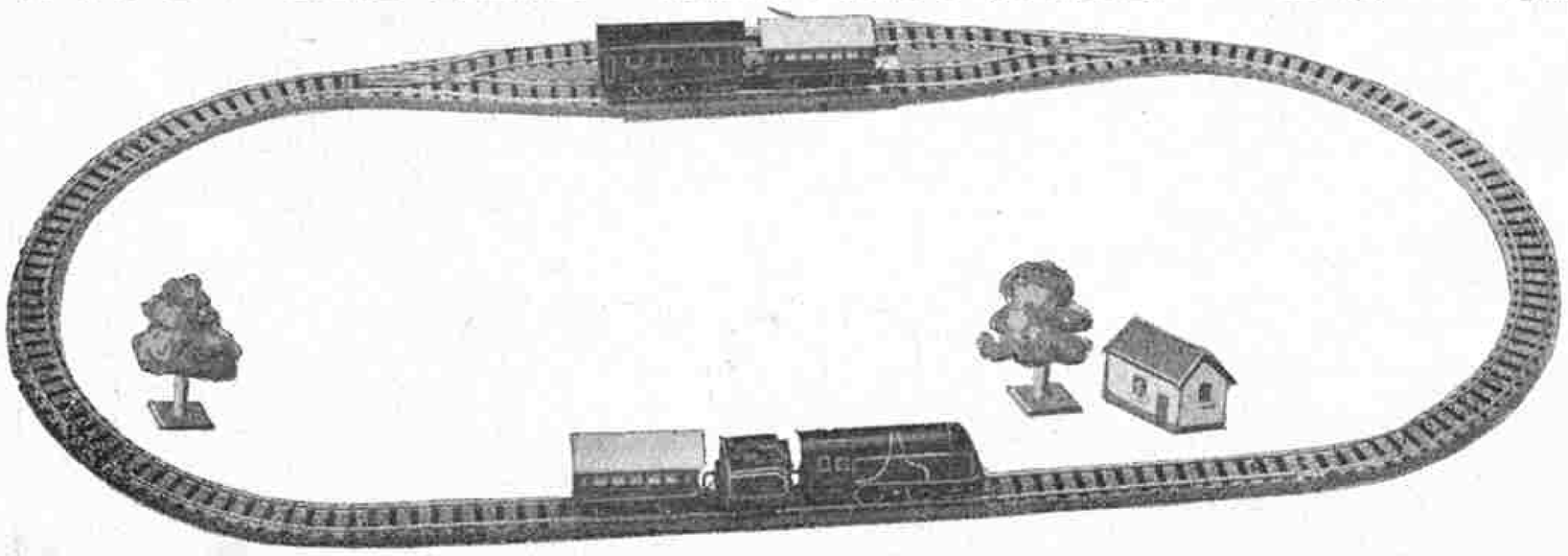
PRICE Post 3d. **2/11**

BUILD YOUR OWN AIRCRAFT

The Aircraft Modeller's Guide, Vol. III, by Howard Leigh is the most up-to-date and informative available. Profusely illustrated with detailed plans and drawings.

PRICE Post 4d. **2/6**

TWO NOVEL MINIATURE '00' GAUGE TRAINS



Two clockwork trains and automatic rails. Place the trains on the line facing in opposite directions. Set one in motion. When it draws level with the other it will stop automatically to allow its neighbour to move off. When the second one comes round again it will stop and allow the first one to move off, and so on. Most ingenious and very entertaining. Two trains and track.

PRICE *(Foreign.)* Post 9d. **12/6**

MECCANO
PARTS AND ACCESSORIES

Meccano parts, many of which are illustrated below, 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

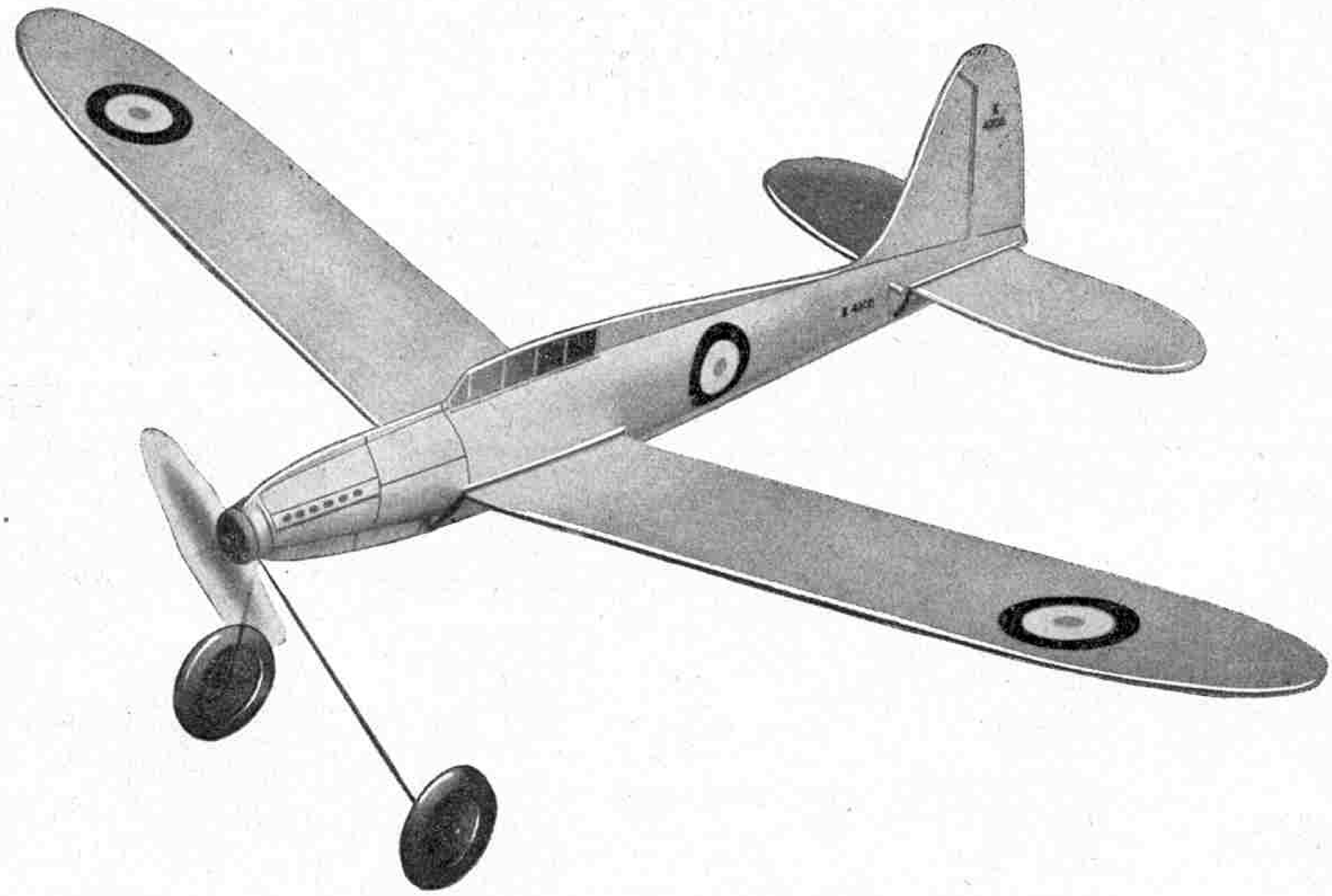
Prices of Parts Illustrated

No.			s.	d.
3	Perforated Strips, 3½"	½ doz.	0	5
9b	Angle Girders, 3½"	„	0	9
11	Double Brackets...	doz.	0	3
12	Angle Brackets, ½" × ½"...	„	0	2
17	Axle Rods, 2" ...	4 for	0	1
19a	Wheels, 3" diam.	each	0	6
20	Flanged Wheels, 1⅛" diam.	„	0	3½
20b	„ „ ¾" „	„	0	2½
	Pulley Wheels			
19c	6" diam., with centre boss and set screw ...	„	1	9
20a	2" diam., with centre boss and set screw ...	„	0	3½
22	1" diam., with centre boss and set screw ...	„	0	2
23a	½" diam., with centre boss and grub screw ...	„	0	2
22a	1" diam., without centre boss and grub screw...	„	0	1
24	Bush Wheels	„	0	2½
26b	Pinion Wheels, ½" diam., ¾" face	„	0	6
28	Contrate Wheels, 1½" diam.	„	0	6
29	„ „ ¾" „	„	0	4
30	Bevel Gears, ⅞", 26 teeth	„	0	6
*30a	„ „ ½", 16 „	„	0	4
*30c	„ „ 1½", 48 „	„	1	6
31	Gear Wheels, 1", 38 teeth	„	0	9
32	Worms	„	0	3½
44	Cranked Bent Strips ...	„	0	1
45	Double „ „ ...	„	0	1
55	Perforated Strips, slotted, 5½" long	doz.	1	3
61	Windmill Sails	4 for	0	9
62	Cranks	each	0	2½
65	Centre Forks	„	0	1
66	Weights, 50 grammes ...	„	0	9
67	„ 25 „ ...	„	0	6
76	Triangular Plates, 2½" ...	„	0	2
90	2½" Curved Strips, 2⅜" rad.	„	0	1
90a	2½" „ „ cranked, 1⅜" radius	„	0	1
94	Sprocket Chain, per 40" length		0	6
96	„ Wheels, 1" diam.	each	0	3
99	Braced Girders, 12½" long	½ doz.	3	0
102	Single Bent Strips ...	each	0	1
103d	Flat Girders, 3½" long ...	½ doz.	0	9
106a	Sand Rollers	each	1	3
108	Architraves	doz.	1	9
109	Face Plates, 2½" diam. ...	each	0	3½
110	Rack Strips, 3½"	„	0	2
113	Girder Frames	„	0	3
114	Hinges	„	0	3
116	Fork Pieces, Large ...	„	0	2½
118	Hub Discs, 5½" diam. ...	„	1	0
120	Buffers	„	0	2
120b	Compression Springs ...	„	0	1
121	Train Couplings	„	0	1
123	Cone Pulleys	„	1	0
124	Reversed Angle Brackets, 1"	½ doz.	0	4½
125	Reversed Angle Brackets, ½"	„	0	3
126	Trunnions	each	0	1½
126a	Flat Trunnions	„	0	1
127	Simple Bell Cranks ...	„	0	1
128	Boss Bell Cranks ...	„	0	3
129	Rack Segments, 3" diam.	„	0	5
130	Eccentrics, Triple throw	„	1	0
131	Dredger Buckets ...	„	0	2½
132	Flywheels, 2¾" diam. ...	„	2	0
133a	Corner Brackets, 1" ...	„	0	1
134	Crank Shafts, 1" stroke ...	„	0	1
136	Handrail Supports ...	„	0	3
†138a-z	Ships' Funnels, Raked ...	„	0	9
139	Flanged Brackets (right)	„	0	2
140	Universal Couplings ...	„	0	9
143	Circular Girders, 5½" diam.	„	0	10
145	Circular Strips, 7½" diam.	„	1	0
146	Circular Plates, 6" diam.	„	0	7
147	Pawls	„	0	3
148	Ratchet Wheels	„	0	4
149	Collecting Shoes ...	„	1	3
150	Crane Grabs	„	0	6
151	Pulley Blocks, Single Sheave	„	0	7
154a	Corner Angle Brackets, ½" (right hand) ...	½ doz.	0	3
154b	Corner Angle Brackets, ½" (left hand)	„	0	3
156	Pointers, 2½" overall ...	each	0	4
158a	Signal Arms, Home ...	„	0	5
160	Channel Bearings, 1½" × 1" × ½"	„	0	2
161	Girder Brackets, 2" × 1" × ½"	2 for	0	3
162	Boilers, Complete ...	each	0	11
167	Geared Roller Bearings...	„	20	0
168	Ball Bearings, 4" diam. ...	„	3	0
169	Digger Buckets	„	1	6
170	Eccentrics, ¼" throw ...	„	0	9
171	Socket Couplings ...	„	0	11
180	Toothed Gear Rings, 3½" diam. 133 teeth external, 95 teeth internal...	„	1	0
187	Road Wheels	„	0	4
*211a	Helical Gears, ½" ...	„	0	10
*211b	„ „ 1½" ...	„	2	3

*Can only be used together.

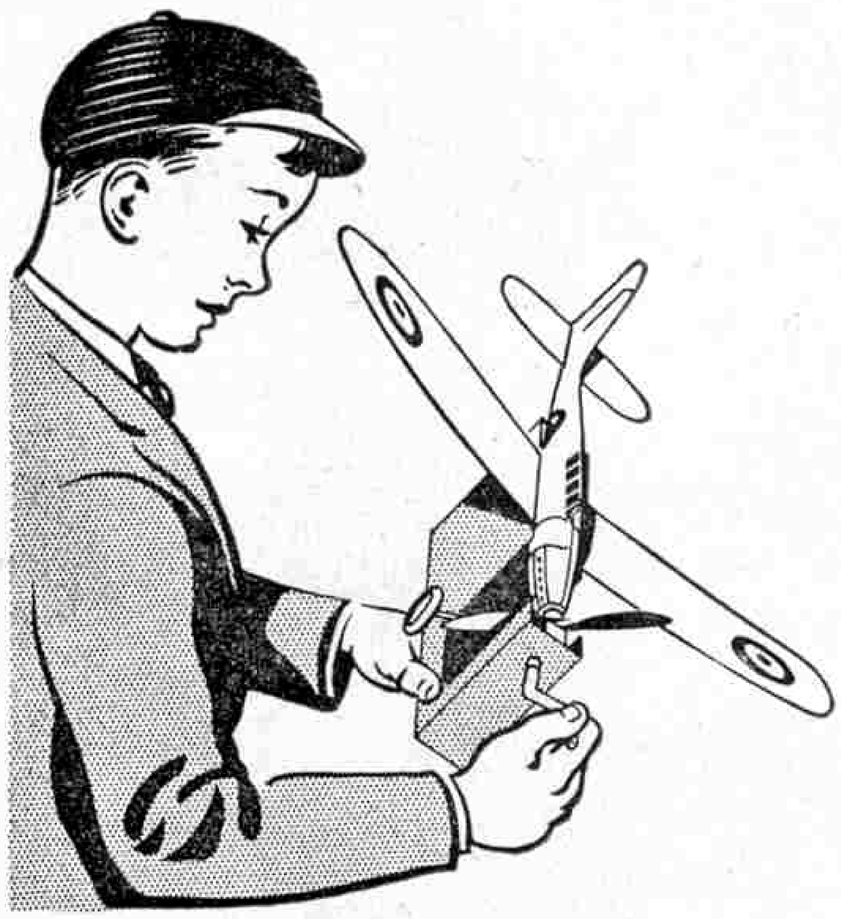
†The series includes 26 different Funnels.

WHY WATCH? . . . BUY A RAIDER



THE RAIDER wing span 13¼"— **1/11**

Complete with patent winder in specially constructed box **2/11**



Many boys watch with interest the flights of model aeroplanes in the parks. They all wish that they, too, could own these wonderful machines. But even if these super models are too expensive you can get the thrill of ownership for less than two shillings. Go to your local toyshop and see the "RAIDER." You will be amazed at its performance.

FROG MODEL AIRCRAFT

OBTAINABLE AT ALL GOOD TOYSHOPS AND STORES

Covered by world Patents granted and pending. Made in England by

International Model Aircraft Ltd. *Sole Concessionaires :*

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

Trade Mark Regd.

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

Please send me your "Frog" coloured leaflet with particulars of the "Frog" Flying Club and how to obtain handsome enamelled FROG Pilot Badges.

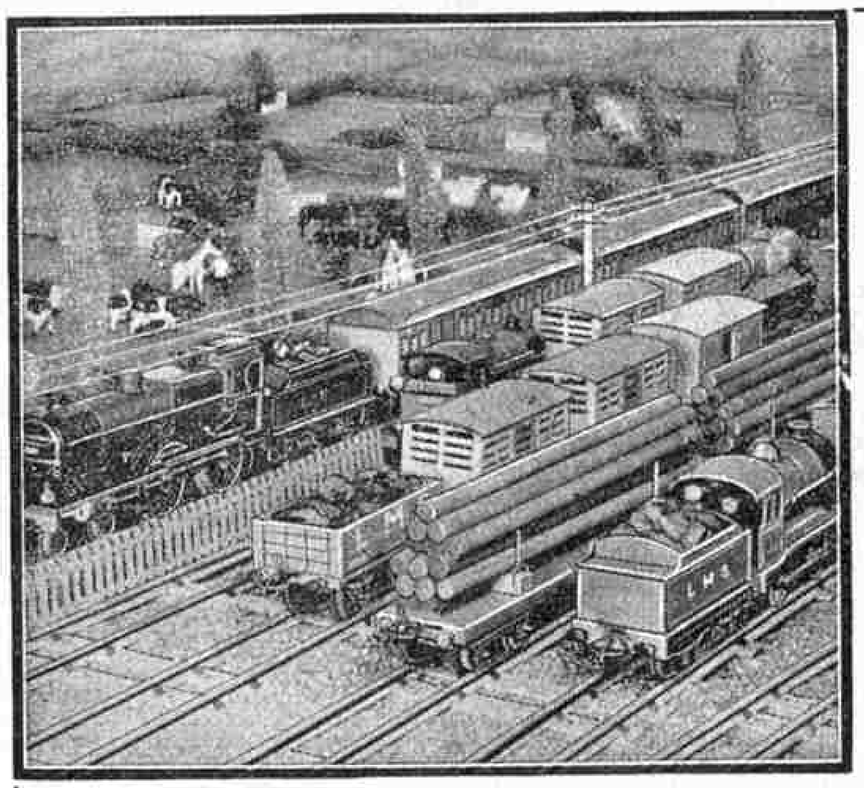
Name .....

Address .....

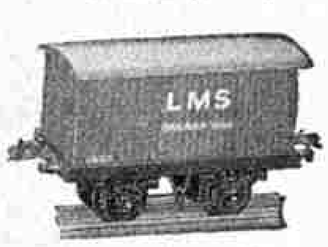
.....

Please write in block letters. 4/38

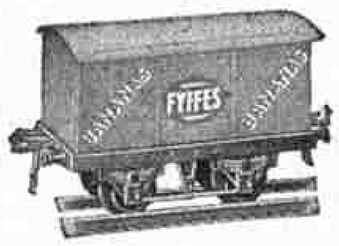
HORNBY ROLLING STOCK



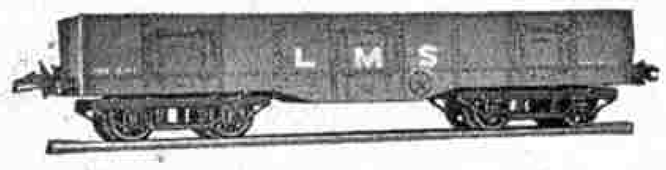
The Hornby Series includes a splendid range of realistic Rolling Stock. Each item is fitted with patented and exclusive automatic couplings, a special feature that places it in a class entirely of its own. There are Pullman Cars, Passenger Coaches, Guards' Vans, Tipping Wagons, Lumber Wagons, and many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



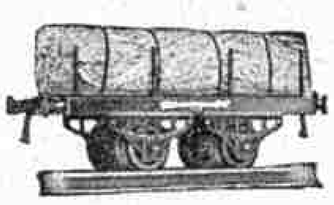
No. 0 BANANA VAN
Lettered L.M.S. only.
Price **1/6**



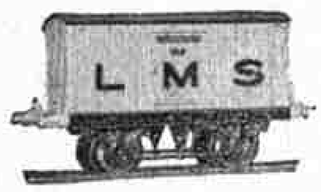
No. 1 BANANA VAN "FYFFES"
Sliding doors.
Price **2/3**



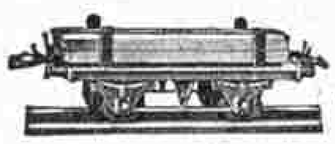
No. 2 HIGH CAPACITY WAGON
Finished in correct colours of G.W. and L.M.S. "Loco Coal" Wagons, or L.N.E.R. "Brick" Wagon. Not suitable for 1 ft. radius rails.
Price **4/-**



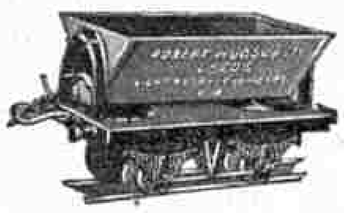
FIBRE WAGON
This is an interesting model of a type of wagon used in France and other European countries.
Price **1/3**



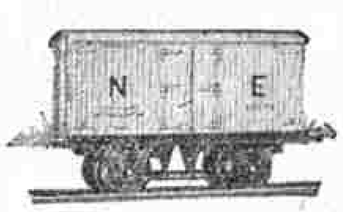
***REFRIGERATOR VAN No. 1**
Finished in white. With sliding doors.
Price **2/3**



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

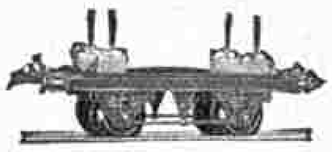


No. 1 SIDE TIPPING WAGON
Excellent design and finish. Lettered "Robert Hudson Ltd."
Price **2/-**

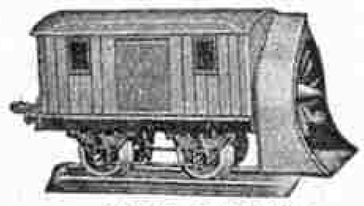


No. 0 REFRIGERATOR VAN
Lettered L.M.S., G.W., N.E. and S.R. Finished with the appropriate details.
Price **1/6**

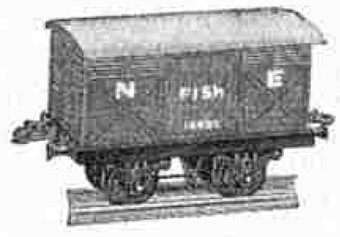
***OPEN WAGON "B"**
Fitted with centre tarpaulin-supporting rail.
Price **2/-**



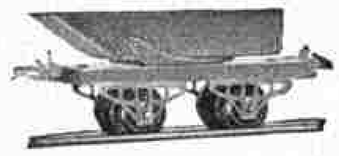
No. 1 LUMBER WAGON
Fitted with bolsters and stanchions for log transport.
Price **1/3**



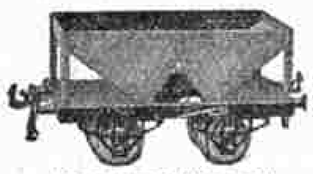
SNOW PLOUGH
With revolving plough
Price **3/11**



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

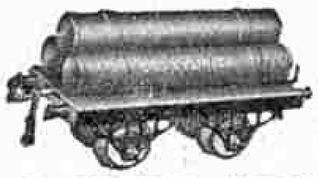


No. 0 ROTARY TIPPING WAGON
Container revolves and tips.
Price **1/6**



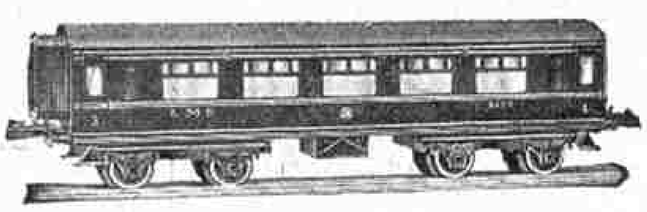
***HOPPER WAGON**
Mechanically unloaded.
Price **3/-**

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

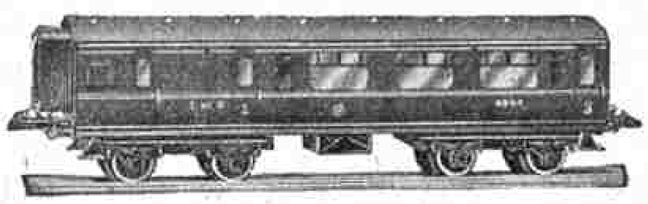


GAS CYLINDER WAGON
Finished in red, lettered gold.
Price **1/8**

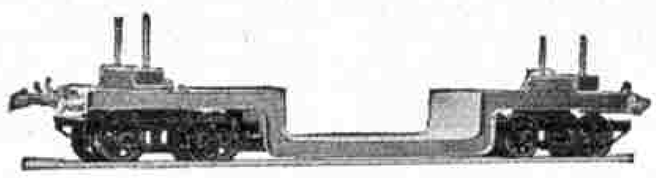
CEMENT WAGON
The door at the top opens. Finished in yellow. Lettered "Blue Circle" Portland Cement.
Price **1/11**



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

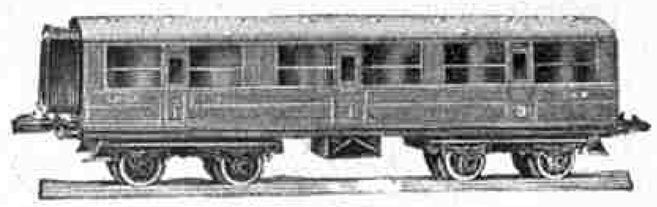


No. 2 CORRIDOR COACH
L.M.S. Brake-composite. Not suitable for 1 ft. radius rails.
Price **7/6**

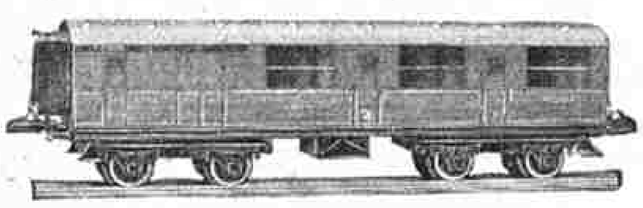


TROLLEY WAGON
Not suitable for 1 ft. radius rails.
Price **4/-**

TROLLEY WAGON
Fitted with two Cable Drums.
Price **4/6**



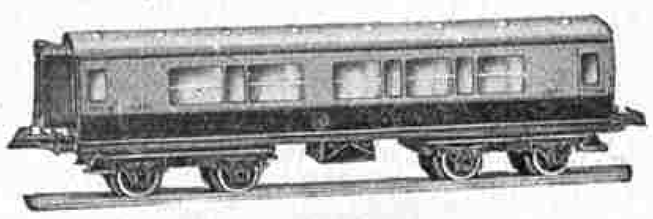
No. 2 CORRIDOR COACH
L.N.E.R. First-third. Not suitable for 1 ft. radius rails.
Price **7/6**



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

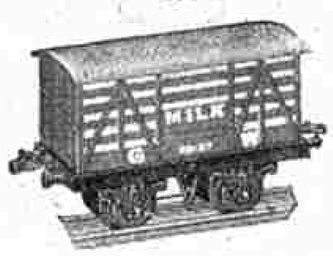
OIL TANK WAGON "MOBILOIL"
Finished in battleship grey.
Price **1/11**

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

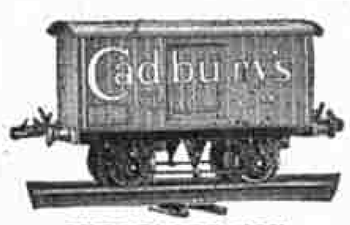


No. 2 CORRIDOR COACH
G.W. First-third. Not suitable for 1 ft. radius rails.
Price **7/6**

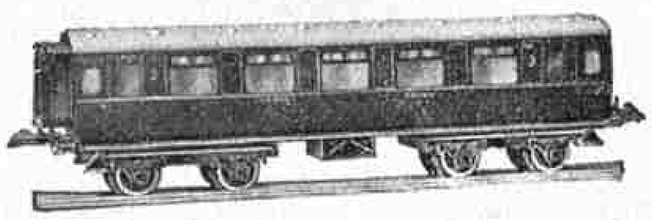
No. 2 CORRIDOR COACH
G.W. Brake-composite. Not suitable for 1 ft. radius rails.
Price **7/6**



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



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



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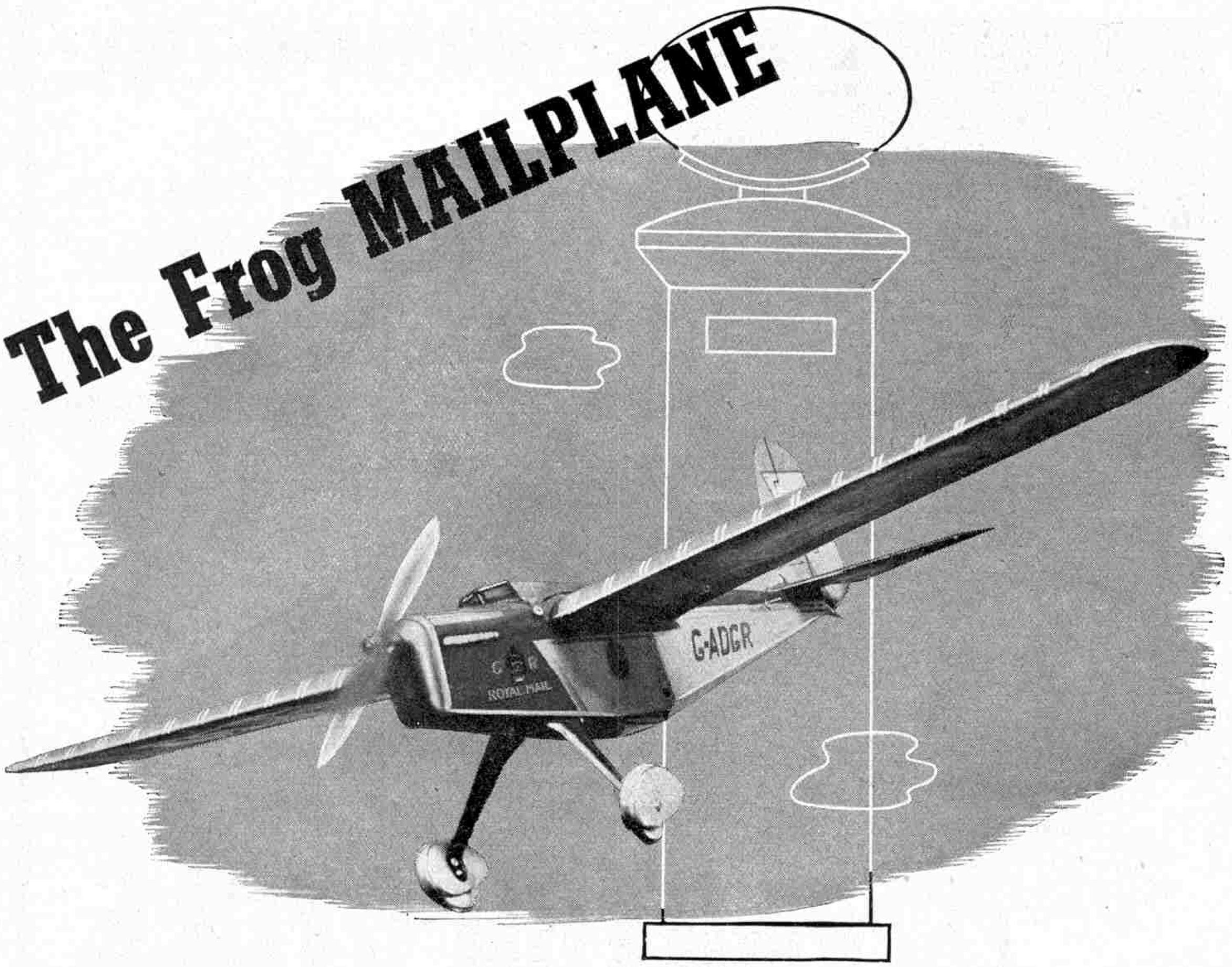

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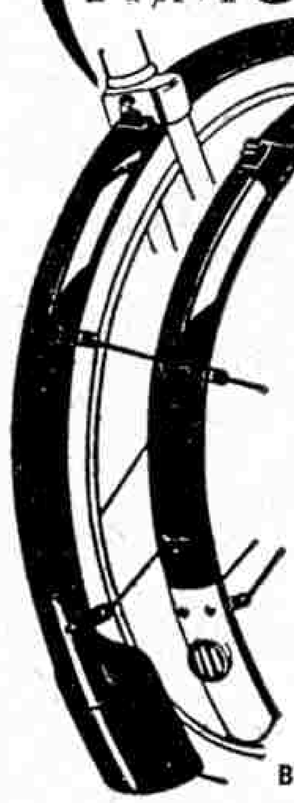

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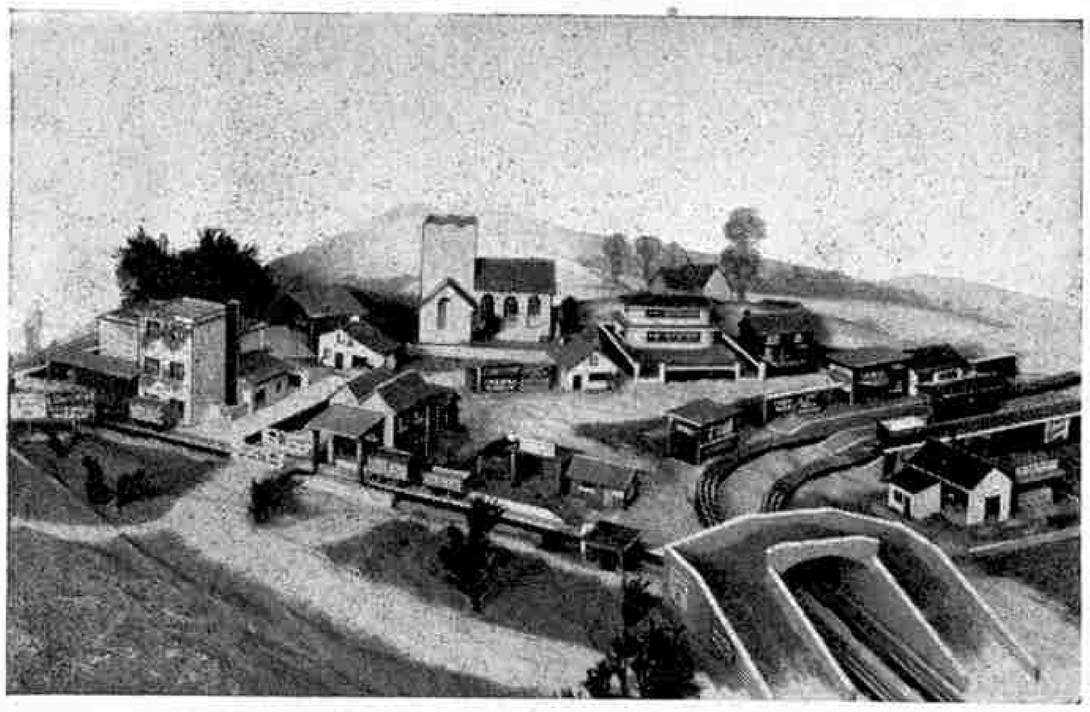

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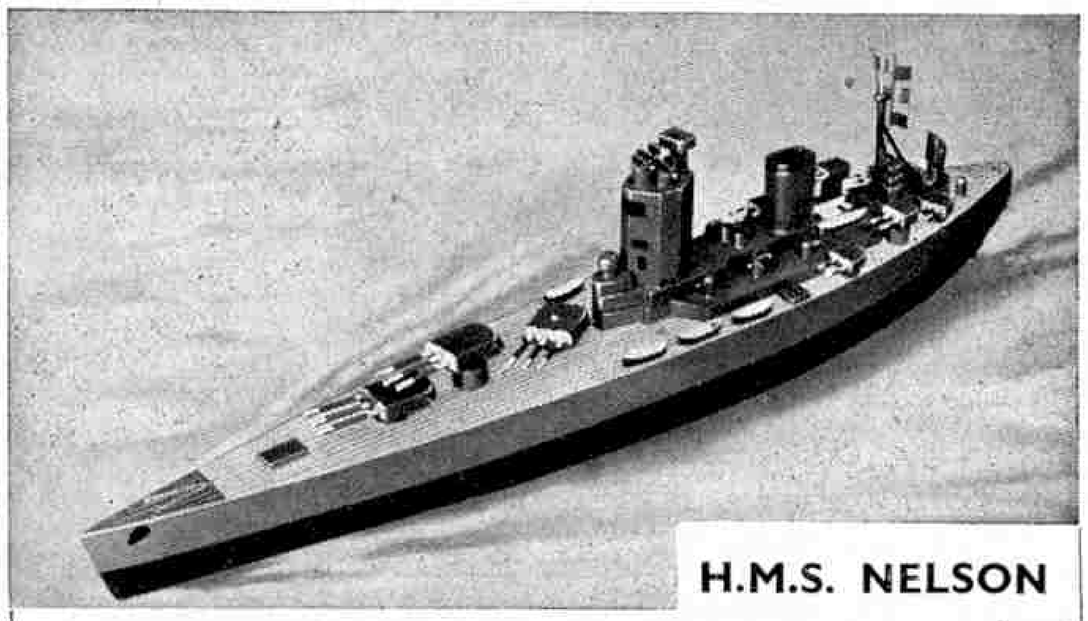

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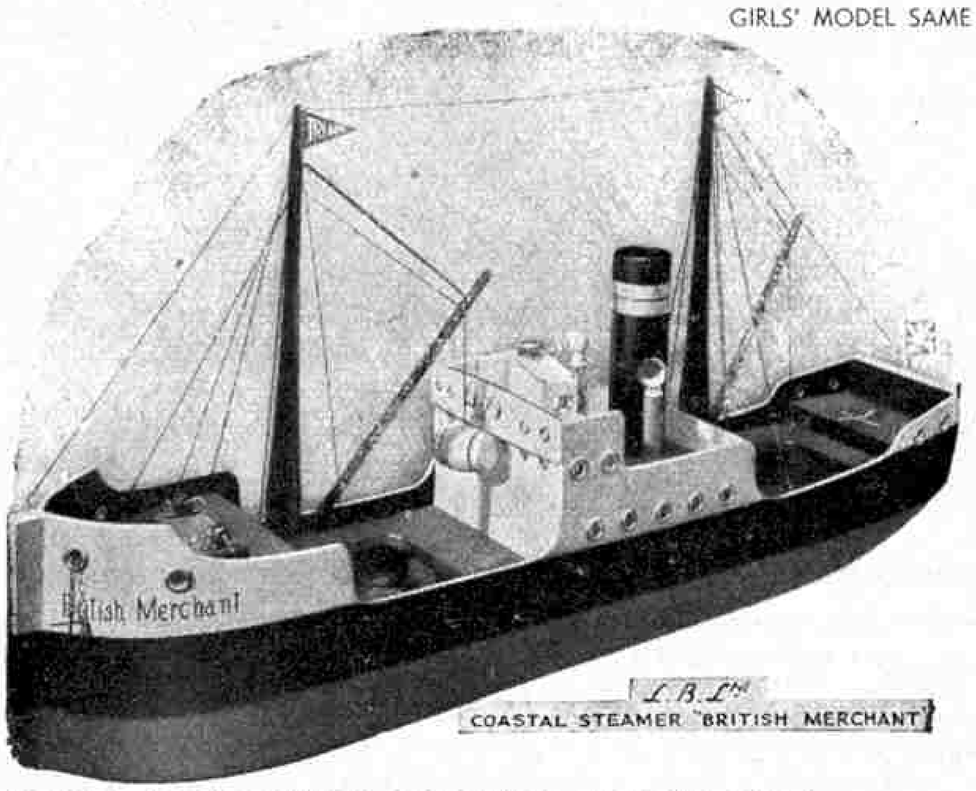

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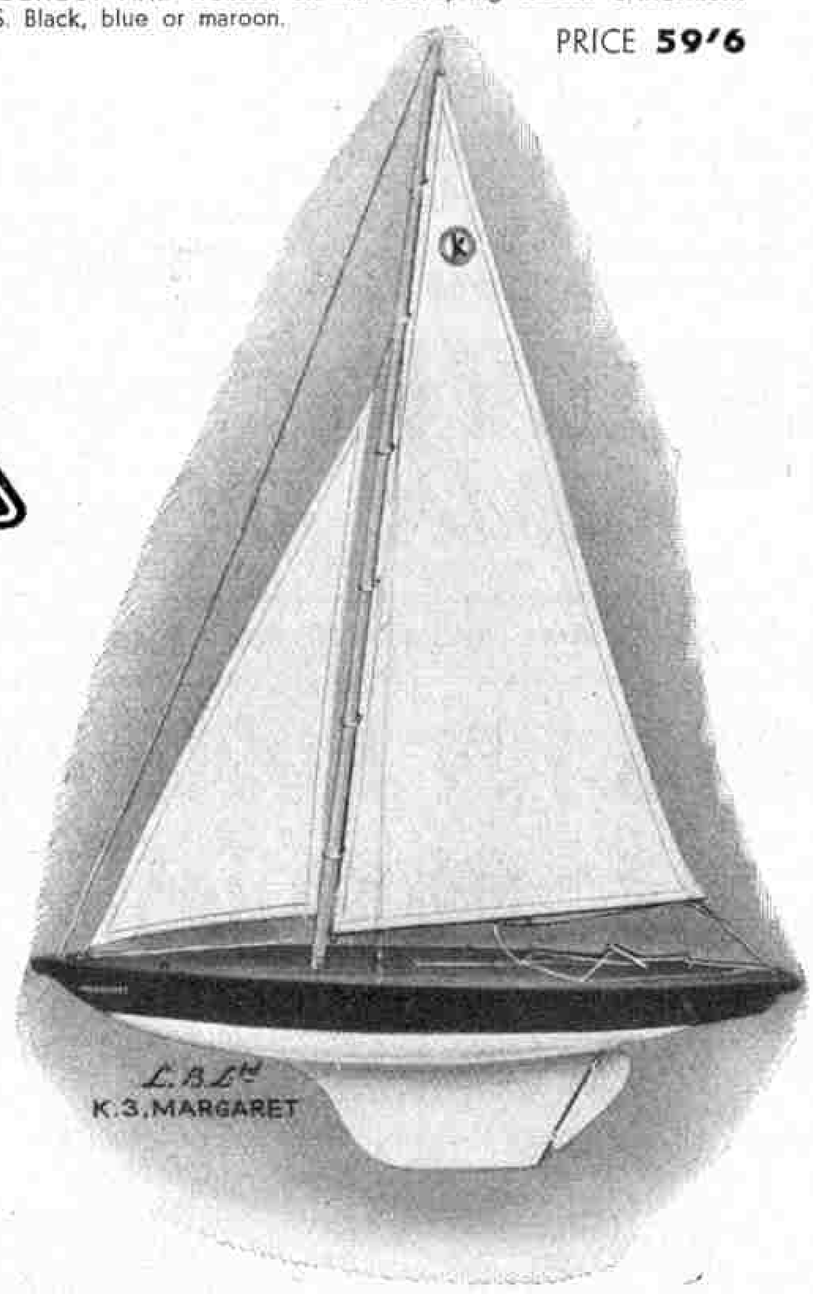

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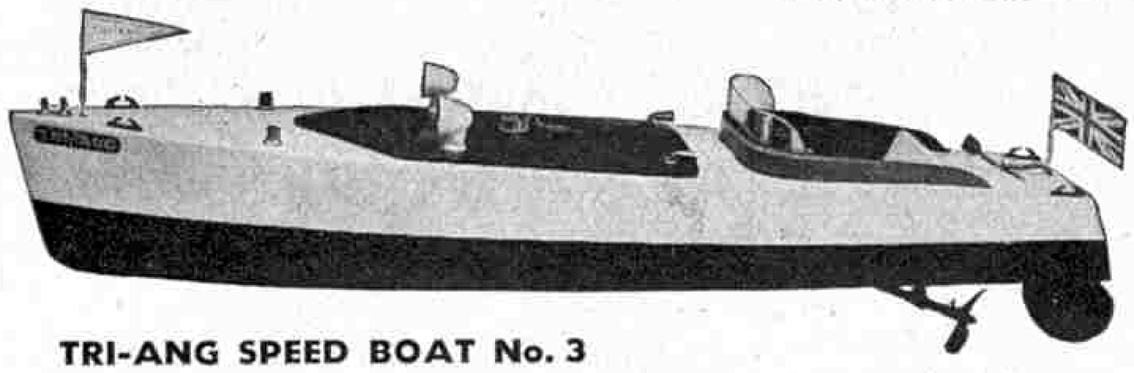

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MECCANO MAGAZINE

Editorial Office:
Binns Road, Liverpool 13
England

Vol. XXIII. No. 4
April 1938

With the Editor

Newspapers by Radio

We are all accustomed to listening to news bulletins by radio, and no longer regard it as a miracle that we are able to learn what is going on in the world so easily and quickly while sitting comfortably in our own homes. Now we seem to be on the point of making another great step forward, for in America trials are being made of a device by means of which complete newspapers, full of the latest news and pictures, can actually be printed in the home.

The new device is operated by radio, and works very simply. The type and pictures to be broadcast are converted at the transmitting station into electrical impulses by means of light from a tiny lamp that moves across the page, reflecting the light and dark shades of the print to a photo-electric cell. The varying electrical currents that pass through the cell are then amplified and transmitted by radio in the ordinary manner. In the receiver, which is no larger than an ordinary radio set, a stylus or pointer moving across a roll of carbon-backed paper reproduces the print of the original, and the home newspaper issues from the machine in the form of long roll. Sheets or pages of convenient size can be cut off by means of a knife blade fitted into the receiver.

In addition to newspapers, magazines and books also can be broadcast, and with the system in full swing owners of receivers will be able to get more printed matter than they will have time to read!

Recording Televised Scenes

Television is now an accomplished fact, and within a short time it should be generally available. I have just heard of an invention by means of which televised scenes can be recorded on discs similar to gramophone records. When such a disc is placed on the turntable of a gramophone and rotated in the ordinary manner the scene is reproduced on the screen of a television receiver. If this scheme proves practicable we shall be able to acquire a library of records of notable or exciting scenes that we can put on whenever we feel inclined.

The Captain of the *"Sirius"*

Many readers have written to me in connection with the article on the crossing of the Atlantic by the *"Sirius"* that appeared in last month's *"M.M."* One of these letters contained an interesting note on Lieut. R. Roberts, R.N., the commander of that vessel. Lieut. Roberts was a native of Passage West, County Cork, and in the churchyard there is a memorial that commemorates his pioneer voyage, which is described as "the greatest achievement of navigation since Columbus first revealed Europe and America to each other."

Lieut. Roberts served with great bravery in vessels engaged in suppressing the African slave traffic. After referring to this work, the memorial speaks of him as "unequalled for enterprise and consummate skill in all the details of his profession," which qualities led to his selection to command the first ship to attempt the Atlantic crossing entirely under steam. The result is described in these words. "In accomplishing it he surpassed not only the wildest visions of former days, but even the warmest anticipations of the present; gave to science triumphs she had not dared to hope, and created an epoch for ever memorable in the history of his country and of navigation. The thousands that shall follow in his track must not forget who it was that first taught to travel with such marvellous rapidity that highway of the ocean."

There is little doubt that the success of that comparatively small and overladen coasting steamer was due to Roberts' skill and iron determination. Later he became commander of the *"British Queen,"* and then of the *"President,"* both of which were planned and built for transatlantic voyages. He hoped to win further fame by commanding the first iron vessel to steam across the Atlantic Ocean, but this hope remained unrealised. In the *"President"* he met an untimely end, for in March 1841 she left New York and was never seen again.

Next Month

The cover of next month's *"M.M."* will be a particularly attractive one showing a great forging under a 7,000-ton press. How giant presses of this kind work will be explained in an interesting article. This issue will include also a splendid description of drainage work in the swamps and jungles of Malaya, where the engineers had not only to fight nature, but also to deal with elephants that crashed around their camps at night and a tiger that haunted their machines by day, to say nothing of the ever-present leeches and mosquitoes. An account also will be given of the Lincoln Tunnel, a new highway passing under the Hudson River at New York, and another fascinating contribution will show exactly what happens in the pits during a thrilling motor car race.

The issue will be on sale on Saturday, 30th April, and every reader should make sure of obtaining his copy by placing his order immediately with his dealer or newsagent.

A Great Canadian Gold Mine

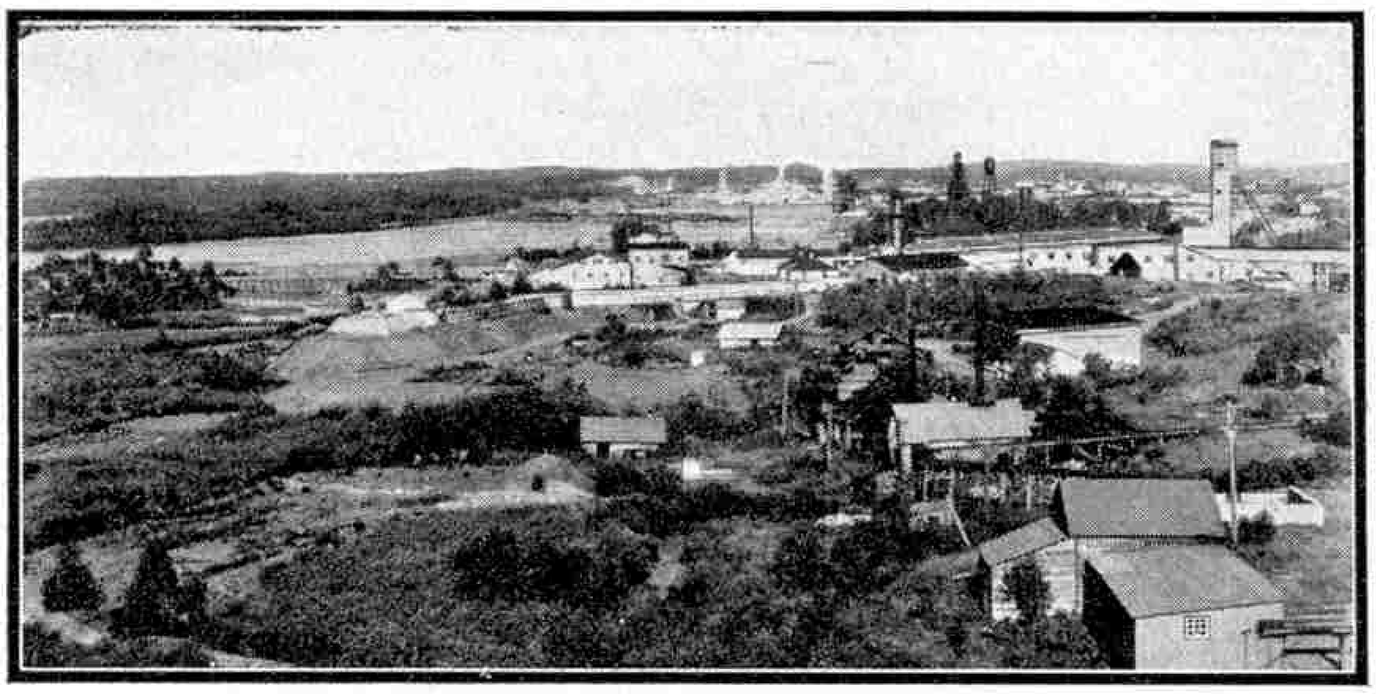
Producing 5,000 Tons of Ore a Day

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

WE are apt to look upon Canada as a great grain-producing country and little else. The Dominion is also a large producer of valuable metals, including gold, silver, copper, zinc, and lead, however. Among its famous mines the Hollinger, in the Porcupine district of Ontario, holds a unique place, for it is the largest gold mine on the American continent. Because of its rich veins of ore, model equipment and high organisation, many experts believe that it will ultimately prove to be the greatest gold mine the world has ever seen.

In 1937 the Hollinger produced just over £3,000,000 worth of gold. During its life of 28 years it has yielded £51,000,000 worth of the coveted metal, but this huge total was really achieved in the 16 years between 1921 and 1937. For the first 12 years of its history Fortune presided over the activities of the Hollinger with a twisted smile. Over and over again it looked as if the enterprise were not worth carrying on. Then suddenly, in 1921, this mammoth among gold mines began to boom, and since then it has set up a new production record one day to tear it down the next.

During 1937 over 5,000 tons of ore were hoisted up its centra shaft every 24 hours. From the beginning of mining operations until December 1937 there has been broken and hoisted from this single mine more than 40,000,000 tons of ore, but 3,000 men and £2,000,000 worth of machinery, pushed to the limit, will not be capable of draining the scores of veins in it during the active lifetime of the present generation of miners. The engineers of the mine have burrowed into the Earth's interior for almost a mile, but the gold goes still deeper, and at least one expert has declared that it may continue down far beyond human reach.



A general view of the surface workings of the Hollinger Gold Mine, Timmins, Ontario. This Canadian gold mine is the largest on the American continent.

Gold mining is always a gamble, but the gamble, as far as the Hollinger is concerned, seems to be how stupendous a total will be attained before the career of this great producer comes to an end. The present estimate is that it will yield gold to the value of £200,000,000 before that happens. Yet the site was going begging little more than a generation ago. True, mines had been staked all round it, for the district is rich in the precious metals. Then one day in 1909 two men, Benny Hollinger and Alex Gillies his partner, made their way laboriously into Timmins, at that time a mere patch of brush with a few wooden shanties, some 500 miles from the nearest city and 45 from the end of the railway. They wandered about, and looked over the ground already staked. Old-timers directed them, freely and casually, to the site of the present Hollinger mine under the impression that the choice locations had been taken up and that they were sending the newcomers to some of the second-rate property that was left.

Hollinger and Gillies staked 12 claims and decided ownership by tossing a coin. Unsuspectingly they flipped for millions. Hollinger took the west and Gillies the east. Both properties were eventually combined, but Benny Hollinger's six claims were the foundation of the record-breaking workings.

Rusty and forgotten, lying among the rocks that hid immense fortunes, was an abandoned prospector's forge. Beside it were some weed-grown workings. No other trace has ever been found of the unknown who had wealth within his fingers and let it slip. It is almost certain that he never knew what he tossed away. Nor was he the only one. Hundreds of others had worn a trail over the quartz veins. A portage crossed Hollinger Hill, and many a pack-laden woodsman going over it had enlarged upon the difficulties that the hill added to his enforced walk.

Having staked their claim the two pioneers started to develop their property. Roads had to be cut through bush and swamp to get machinery in, and 800 teams of horses and many yoke of oxen were kept moving during the entire summer of 1910, carting equipment and supplies. By 1911 erection of a 30-stamp mill was well under way when bush-fires swept the property clean. In 1912 a disastrous strike that lasted for six months tangled everything up again, and no sooner had the mine recovered than the War of 1914-18 broke out and swept it nearly clean of workers.

There were several times in the early history of the Hollinger mine when its backers were about to throw up the sponge. Fortunately they hung on, and by sheer grit and perseverance, backed by engineering skill, they built up an industry that is acknowledged as one of the wonders of the mining world. At Hollinger 2,700 men are now toiling continuously in a plant that cost £2,000,000 to create, and is turning out bullion with the same regularity that a factory might turn out axle-grease or pearl-headed pins.

The surface workings of this single mine sprawls over 1,000 acres. Underground, its tunnels have been cut backward and forward, up and down, through the Earth's interior, until levels, cross-cuts, shafts and the rest of its network of subways have reached such a length that they would run a distance of 250 miles if it were possible to straighten them all out into one.

There is no such thing as the end of the day's work. At the surface, the mill runs ceaselessly, staffed by nearly 900 men, working in eight-hour shifts. Below, there are more than twice that number, to be exact 1972. At the shafts, they split up and disappear in little gangs, a score or so in a group, dropping off at different levels and working as independent units. In the gloom of the levels, faces acquire a gray sameness that makes all miners look somewhat alike. This underground battalion, nevertheless, is a curious hodge-podge of nations, and in it are to be found MacDonalds, Manzinis, Ostojichs, O'Rourkes, Shulaks, Hawkins, Costellos, Belangers, Landowskis, Schneiders, Holgevacs and of course Smiths.

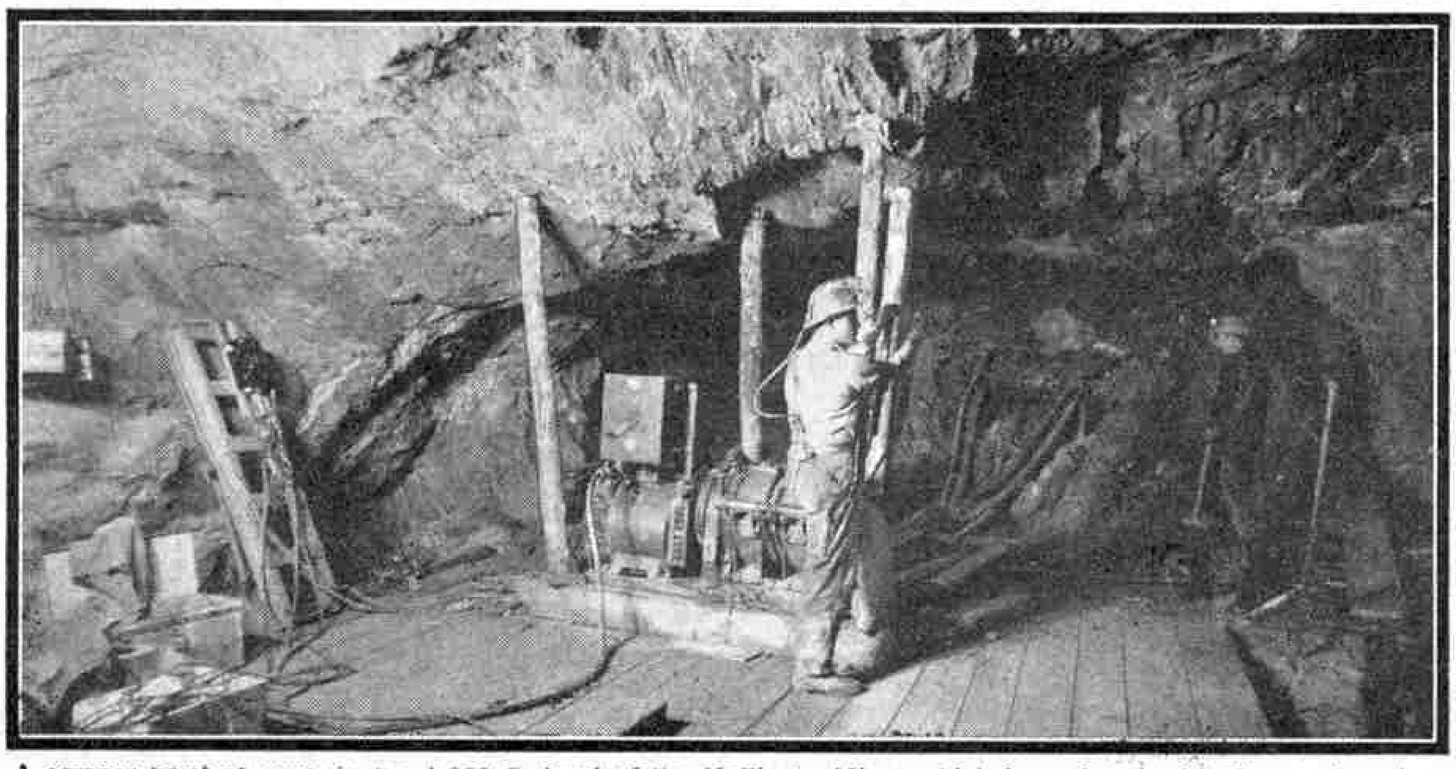
The men of this mixture of races have one particular trait in common, the desire to do more than a day's work in each eight hours. Much of the underground work at Hollinger is done on a contract basis, and time is not something to put in, but to work against. This contract system naturally is an added driving force, but Hollinger miners do not look like lazy men at any time. Nor do their homes resemble the houses of people inclined to tolerate any of the symptoms of indolence. They all have the incidental accessories, the odd trimmings and fixings of the man who gets enjoyment out of working with his hands.

Underground the men work rapidly and almost automatically. They have every sort of mechanical assistance. Pipe-lines carry compressed air to every vein where operations are proceeding. Drills 10 ft. to 12 ft. long bite viciously into the ore, and explosives finish the job. It takes 250 boxes of dynamite a day and thousands of cubic feet of compressed air a minute to keep things going. The rock, ripped out of the veins, is shovelled into cars, but if there were a more rapid, effective and efficient way of loading, the present method would be replaced.

A glimpse at the other processes in the business of extracting gold makes it obvious that every step in the job has been developed to eliminate all waste effort. Affairs underground are controlled as carefully and precisely as the moves in a chess tournament. They must be. Even a comparatively slight delay could seriously upset the smoothness and swiftness of the process. The mill, hundreds

of feet above the miners' heads, has a large and everlasting appetite, and it is being operated continuously.

Every 24 hrs. the staggering amount of 5,000 tons of raw ore is taken out. This quantity could not be removed with the methods in vogue a couple of decades ago, and even with the most advanced systems and the most modern mechanical aids it can be accomplished only with almost super-organization. There are no romantic and pathetic mine mules in this establishment. Everything is electrified and, where possible, made automatic. On every level where ore is being taken out, a dwarf of an electric railway runs from vein to shaft. There are more than 200 miles of track in this hidden transportation system, and an additional seven miles are operated above the surface.

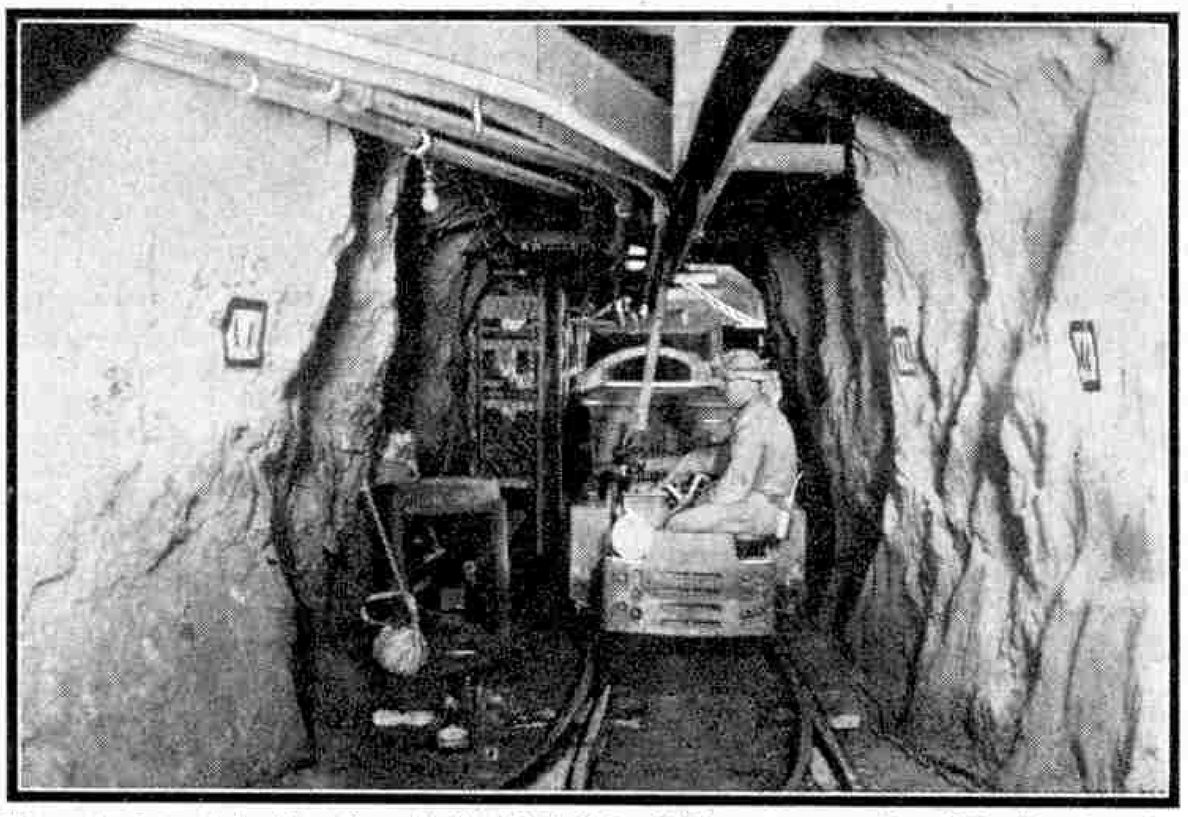


A scraper hoist at work in the 1,700-ft. level of the Hollinger Mine, which is equipped with the most modern machinery for winning the ore and transporting it to the crushers.

All the ore mined comes to the surface by the central shaft, but there are 23 shafts in all, sunk to different levels in the mine and having an aggregate length of over four miles. The levels that run from the shafts, one below the other like corridors in a tall office building, are at varying depths. Down to the 300-ft. level they are 100 ft. apart; thence down to the 800-ft. level the distance between them is 125 ft., and below that they are 150 ft. apart. The greatest depth reached by the shafts is 5,300 ft., or just over a mile.

As the gangs blast and drill at the face of the numerous workings, tests are made every few minutes, and 1,500 assays a day reveal the exact value almost to a cent of the ore that each little group of men is tearing loose. One of the most remarkable features of this large-scale drive for precious metal is the fact that the value of the ore per ton, as it is sent up, is practically constant. The veins vary in richness, but the orders are that the rock coming to the surface crushers must be worth approximately eight dollars, or about 33/– a ton. This is not high-grade ore. There are veins in Hollinger that run to three times its value, but by keeping steadily at the eight dollar mark, and mixing the output from different levels, the rich with the low-grade, almost all of it can be utilized.

On the 2,900-foot level, close to the central shaft, is the crushing plant. It is equipped with a 4 ft. by 6 ft. jaw crusher, driven by a 200-h.p. motor working at 120 r.p.m. Every bit of ore from every part of the mine goes there, either spilled down chutes from the upper levels, and hauled in from all parts of the workings. It is mixed for the mill by being pounded into nuggets the size of a man's closed fist, and is then ready for hoisting.



The underground electric railway in the 1,200-ft. level. There are more than 200 miles of track.

The ore reaches the surface in 6-ton skips, which dump their loads automatically into chutes that carry it to the crushers. From there it passes to the grinders, but as it does so limestone is added at the rate of 85 lb. of lime to every ton of ore. The grinder, or machine-age adaptation of the old mortar and pestle, crushes the rock endlessly. After the grinders come the rollers. The ore is crumbled to half-inch sizes between two steel cylinders, and dropped on an endless belt, ready for the mill. Hanging over the belt is a powerful electro-magnet, which snaps up every bit of iron or steel that may have tumbled into the ore, taking out nails, spikes, bolts, fragments of piping, and even tiny bits of metal the size of a pinhead.

The ore now passes to the 1,500-ton storage bin, 60 ft. below the surface. Although it is about to pass through the final processes, there is nothing of the precious metal about its appearance, for it is neither more nor less glittering than the crushed stone on our country roads. Cars carrying seven tons apiece operating on an incline carry it from the underground bin to the mill, where it is further ground by passing between rods, from which, after a solution of cyanide of potassium has been added, it emerges in the form of a thick liquid mud.

The cyanide performs a simple but important service. In it, the pure gold dissolves as sugar dissolves in water, and in order to give it every chance to do its work, the muddy mixture is poured into agitators consisting of steel tanks 50 ft. high, where blasts of compressed air are forced through and it bubbles steadily for 20 hrs.

By the end of that time the cyanide has dissolved all the gold worth getting. The sediment that remains is paste, and the sooner it is eliminated the better. The mixture is washed and rewashed till it is clear of mud, and gold-laden solution can be poured off into separate tanks. This solution is as clear as crystal, and to a casual onlooker looks as if it contained less gold than the waters of an ordinary river. For all its innocent appearance it is a deadly poison. A mere sip means death, and every part of the building is plastered with warning signs.

All that remains to be done in the mill is to recover the gold from the cyanide solution. For this purpose zinc dust is added, and the new mixture then flows into huge box-like filters, where it is squeezed through sheet after sheet of paper-covered canvas that retain the gold. Once a week the sheets are removed from the filters. On them is seven days' production of gold. Even yet it is far from recognizable, and perhaps the most accurate description of it is that it is a dirty sludge. The final product of the mill, it is carried to the refinery, where the process it undergoes, although complex, is a standard one. The mixture is smelted and the molten gold poured off to cool into bars of bullion. Exactly 96 per cent. of all the gold in the ore is secured by this process. To get the remaining 4 per cent. would cost more than it is worth.

As far as bulk is concerned the finished product of a day's operations might almost be wheeled off in a perambulator. Bulk means nothing, however. Each small brick is worth £5,000, and a week's production is valued at nearly £60,000.

The task of disposing of the waste mud from which the cyanide solution has been separated is a problem in itself. There are several thousand tons of it to throw away each day. To haul it off and dump it would involve tremendous expense. The whole lake which once sparkled beside the mine has now been filled with it. As traces of the deadly cyanide mixture may still remain in it, a year must pass before vegetation of any sort will grow in the mine waste. So it is again mixed up, this time with water, and forced by powerful pumps through three miles of pipe line to be poured off into some abandoned claims.

If the Hollinger Mine were to stop suddenly for good, the gold market of the world would doubtless feel the shock. Such a course is unlikely, for the Hollinger is continually adopting new ideas and methods. For instance, at the 1,100-ft. level it recently installed a repair shop, to which all machines that cannot be "doctored" on the job are brought for repairs. A factory at the surface is devoted exclusively to re-sharpening drills.

FAMOUS ENGINEERS:

John Ericsson

II.—The First Modern Warship Appears

LAST month we described Ericsson's early days in Sweden and England, and told the story of the "*Novelty*," the engine that he entered in the Rainhill trials, won by George Stephenson with the "*Rocket*." Although Ericsson was unsuccessful in this famous contest, the speed of his locomotive and its originality of design added considerably to his reputation as an engineer.

After the trials Ericsson turned once more to marine engineering and soon became absorbed in the work with which his name will always be associated. This was the introduction of the screw propeller. As early as the 18th century this system of propulsion had been suggested by several scientists and engineers, including James Watt. The first man actually to use the screw with success was John Stevens, the American pioneer of steamships, whose story was briefly told last month by the Editor. A few years later Richard Trevithick, the famous Cornish engineer, proposed to use a screw driven by a steam engine to propel an iron vessel that he planned, but the credit of giving the screw propeller practical form and of bringing it into general use was reserved for Ericsson and F. Pettit Smith, an English farmer, who were at work on the problem independently.

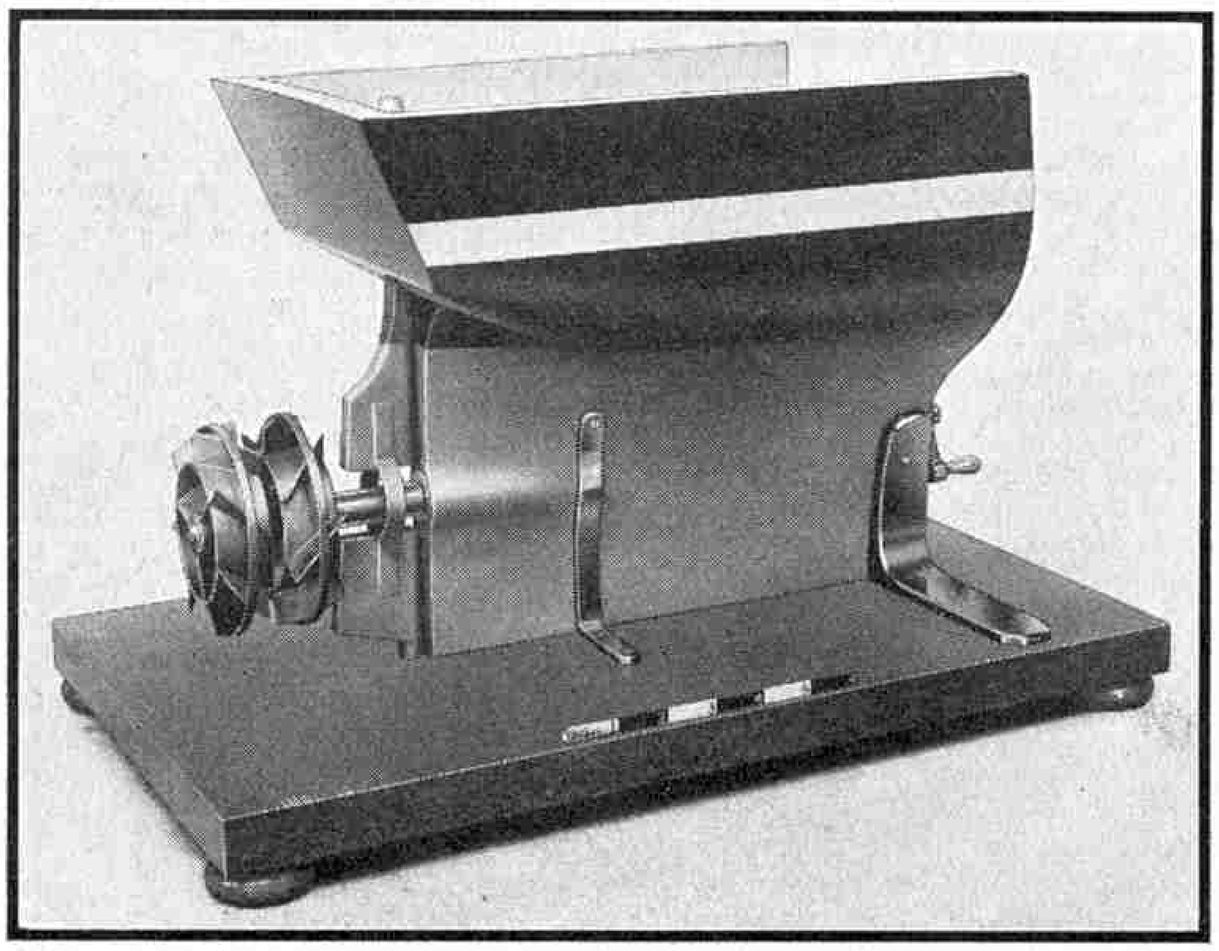
Ericsson first became interested in the problem in 1833, when he was engaged by a London carrier company to conduct experiments with submerged propellers on the London-Birmingham Canal. Later he made further experiments with a small boat 2 ft. in length in a large circular cistern, actually in one of the public baths of London. On its first trial the tiny vessel attained a speed of more than 3 m.p.h. on its voyage round the basin.

By 1836 Ericsson's experiments were so far advanced that he took out a patent for his propeller. This consisted of a double screw, with right and left handed blades mounted on two shafts, one of which was placed inside the other. This double form is shown in the illustration on this page. It was applied in the "*Francis B. Ogden*," a vessel 45 ft. long, with a beam of 8 ft. and a draught of 3 ft. This ship was specially built to test his invention, the funds for this purpose being supplied by Mr. F. B. Ogden, the American Consul at Liverpool, who was familiar with the steam engine and steam navigation and had faith in Ericsson's plans. The screws were 5 ft. 3 in. in diameter, and the vessel attained a speed of over 10 m.p.h. on her first run on the Thames. The vessel also towed with success a schooner of 140 tons, and a great impression was made when she towed the "*Toronto*," a large American sailing packet, at the rate of 5 m.p.h.

Ericsson then tried to interest the British Admiralty in his schemes. He succeeded in inducing the First Lord and other important officials to make an excursion on the river with him, and on this trial towed an Admiralty barge at a steady speed of 10 m.p.h. through the reaches of Southwark and London towards Limehouse, afterwards returning to Somerset House. To the inventor the trial seemed to be a complete success, but to his astonishment his distinguished passengers showed little interest in his plans and clearly were not impressed. A few days later he learned that the technical advisers of the Admiralty thought that a vessel to which power was applied on the stern could not possibly be steered accurately.

This opposition to new things, in spite of their apparent success, has been the experience of inventors of all ages. In Ericsson's case it led indirectly to his departure from this country for the United States, where he spent the rest of his life. F. P. Smith and other rival inventors of the screw propeller continued their experiments in England, but it was not until 1840-41 that the screw was adopted by the Royal Navy and introduced generally for British steamships.

About the time of Ericsson's disappointment with the Admiralty's reception of his ideas he came into contact with Captain Robert F. Stockton, of the United States Navy, who was then staying in England. Stockton was seeking funds to enable him to complete a canal in which he had invested his fortune. He was taken for a trip on that vessel, and was immediately convinced of the great value of the screw propeller. He at once ordered two iron boats for the United States to be fitted with Ericsson's machinery and propeller. The first of these was the "*Robert F. Stockton*," which was built by Laird Bros., Birkenhead. This steamship was 70 ft. long, with a beam of 10 ft., and drew only 3 ft. of water. Her engine was of 50 h.p. She was launched in the Mersey on 7th July, 1838. After being fitted out she was taken to London for trials on the Thames, and was so successful that "*The Times*" forecast "important changes in steam navigation" as the result of her appearance. The vessel was then sent out to the United States, making the Atlantic crossing under sail, and there under a new name she remained in service as a tug for over 25 years.



A model of the propeller invented by Ericsson in 1836. The two screws rotate in opposite directions. From a model in the Science Museum, South Kensington.

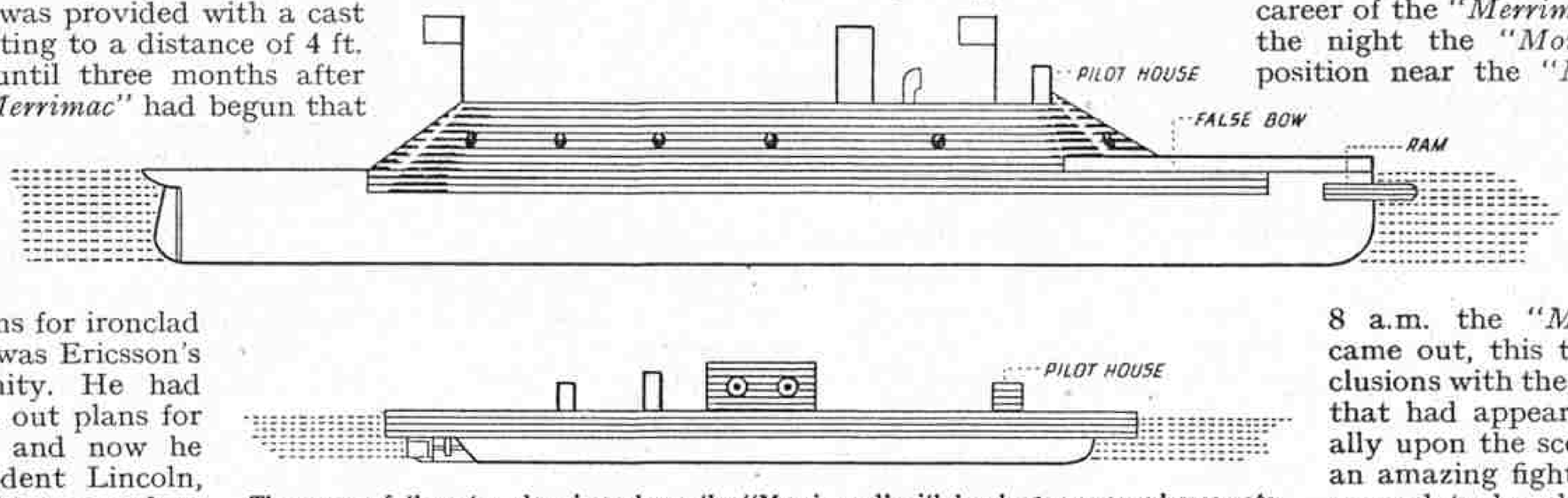
About the time of the Admiralty trial the engineering firm of Braithwaite and Ericsson failed, and for a short period Ericsson found himself in a debtors' prison. He secured his discharge from bankruptcy, and eventually did derive some benefit in England from his invention, for after fighting each other for several years, Ericsson, Smith and three others who claimed to have invented the screw propeller decided to act together, and they shared in an Admiralty award of £10,000 for the use of the screw.

In the meantime the inventor had been persuaded to cross the Atlantic Ocean, Captain Stockton assuring him that his work would be better appreciated in the United States. He sailed from London in the "*Great Western*" on 1st November, 1839, and after a stormy voyage arrived in New York on the 23rd. In his new home he immediately set to work to introduce his propeller, and by 1842 some 40 vessels had been equipped with it. His greatest triumph in this work was the building of the "*Princeton*," an iron screw steamship for the United States Navy that was the first battleship to be fitted with a screw propeller. This was of gun bronze and had six blades, its diameter being 14 ft. The engines of the vessel were much more compact and far lighter than those of British warships of the time and, in accordance with Ericsson's long cherished ideas, were placed entirely below the waterline. Another feature was the fitting of a telescopic funnel, which could be withdrawn into the hull when required, for instance on coming into action. The draught to the furnace was then supplied by an artificial blower worked by a small steam engine.

Ericsson continued to be busy for several years with a variety of projects, and then there came a stirring episode that won for him the greatest renown, not only in America but throughout the world. In 1861 civil war broke out between the Northern and Southern States. In the early days of the war the naval yards at Norfolk, Virginia, on the James River, were seized by the Southerners, who were known as Confederates, and several vessels discovered

there were burned or sunk. Among them was the *"Merrimac,"* a 40-gun frigate of 3,500 tons. This vessel was raised and found to be in good condition, and it was decided to convert her into a new type of ironclad in the hope that she would be able to break the blockade that had been established by the Federals, their opponents of the Northern States. Her deck was made level with the waterline, and a casemate 170 ft. long was constructed on her hull. This was strongly built of pine 20 in. thick, covered with 4 in. of oak, and over this were two layers of iron plating, each 2 in. thick. Its heavily armoured sides sloped outward at an angle of 35 deg., as shown in the upper illustration on this page. There were 14 ports, each provided with guns, and to make this monster even more formidable she was provided with a cast iron ram projecting to a distance of 4 ft.

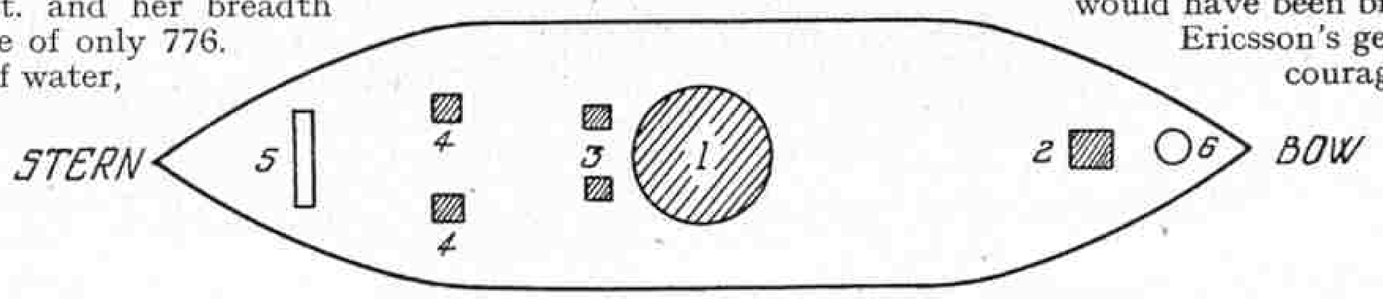
It was not until three months after work on the *"Merrimac"* had begun that Federal efforts to meet the threat were made, and then the authorities at Washington called for designs for ironclad warships. This was Ericsson's great opportunity. He had already worked out plans for such a vessel, and now he wrote to President Lincoln, offering to build a vessel to destroy the Confederate fleet. After many negotiations it was decided to construct an ironclad in accordance with Ericsson's plans, and work was commenced at once at the Continental Iron Works, Greenpoint, New York.



The upper of these two drawings shows the "Merrimac," with her huge armoured casemate. Below it is a similar drawing of the "Monitor." The famous battle between these vessels is described in this article.

Into the construction of the *"Monitor,"* as this vessel was named, Ericsson threw himself with characteristic energy. He spent long days in the shipyard, superintending every operation, and continued at his desk, drawing up plans and preparing specifications, until far into the night. The keel of the vessel was laid on 25th October, 1861. She was launched at the end of the following January, and in February was ready to be handed over to the Government just 100 days after work upon her commenced.

When the vessel appeared in public, the novelty of her construction aroused the greatest astonishment. By many authorities she came to be known as "Ericsson's Folly," and she was variously described as "a cheesebox on a raft" and "a tin can on a plank." She was almost flush with the water. Of the portions visible the largest was the revolving turret in which her guns were mounted. She had two small funnels, which could be removed for battle, and behind these were two ventilating tubes through which air was sucked. Forward of the turret was the pilot house. The vessel's extreme length was 172 ft. and her breadth 41 ft. 6 in., with a tonnage of only 776. She drew only 10 ft. 6 in. of water, and in this respect had a great advantage over her destined opponent, which could not follow her into shoal water on account of her greater draught.



A plan view of the "Monitor." Behind the gun turret 1 are the funnels 3 and the ventilator holes 4. Forward is the pilot house 2, while 5 and 6 are the propeller and anchor wells.

The turret, the central feature of the *"Monitor,"* was 20 ft. in diameter and 9 ft. in height, and was rotated on a central pivot by means of a steam engine. It was protected by eight layers of iron, each 1 in. thick. In it were two 11-in. smooth bore guns firing solid shot weighing 166 lb. each, and there were heavy iron stoppers to close the gun ports when the guns were run in. The deck was armoured with two thicknesses of $\frac{1}{2}$ in. plate, and there were five layers of 1 in. iron on the sides of the vessel. This armoured belt projected sideways in order to protect the hull from being rammed. The pilot house was covered with iron billets 9 in. thick, the officers in charge of the vessel looking out through side holes only $\frac{5}{8}$ in. in width.

The *"Monitor"* was a bad sea boat, and the volunteers who manned her underwent great hardships when she left New York, towed by a small tug, for the James River. The ventilation system broke down, and the engine room staff were nearly suffocated by fumes. Water poured into the vessel, on one occasion putting out the fires, and there was great risk of foundering. With a less resolute officer in charge than Lieut. J. L. Worden, her commander, she would never have reached her destination, but at last, on 8th March, she arrived in the James River.

The *"Monitor"* was not a moment too soon, for the day had been one of battle, and the guns of the *"Merrimac"* could be heard as the Northern vessel approached. The Confederate ironclad had steamed slowly down shortly before noon to attack the doomed wooden warships that alone were available to oppose her. She rammed one of them, which immediately began to sink, and set a second on fire in several places before the ebbing of the tide compelled her to return to Norfolk. The *"Merrimac"* suffered no serious injury beyond the loss of her ram, which remained wedged in the vessel she sank. The casualties on board were only two killed and eight wounded, and for this price she had inflicted a loss of 257 officers and men in addition to destroying two ships.

It was at this critical moment that the *"Monitor"* arrived. Orders had been given that she was to proceed to Washington, but the Federal commander in the James River realised that everything was lost unless she could check the all-conquering career of the *"Merrimac,"* and during the night the *"Monitor"* took up position near the *"Minnesota,"* the vessel that seemed destined to be the next victim of the *"Merrimac."*

Next day at 8 a.m. the *"Merrimac"* again came out, this time to try conclusions with the strange monster that had appeared so dramatically upon the scene. Then began an amazing fight. Neither vessel seemed to be able to injure the other seriously, and at length the *"Merrimac"* broke off to attack the *"Minnesota,"* but ran aground. When she once more floated the *"Monitor"* again attacked her, and her commander tried desperately to ram his persistent little opponent, but only succeeded in damaging the bow of his own vessel, which was deeply cut by the edge of the *"Monitor's"* armourplate.

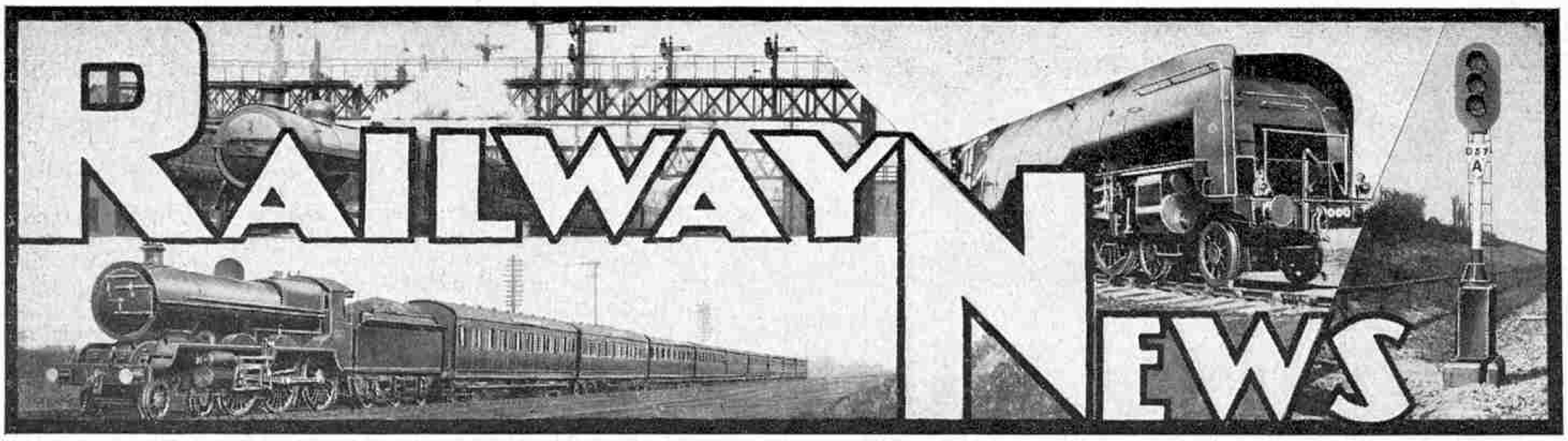
Then followed a lull in the battle, the *"Monitor"* returning to shoal water and hoisting in a fresh supply of munitions before resuming the action. The Southern gunners now concentrated their fire on the pilot house of the *"Monitor,"* with better results than in the first part of the conflict, for Lieut. Worden was stunned and temporarily blinded by a shell that burst outside one of the slits as he was looking through it. He had sufficient presence of mind to order the *"Monitor"* to sheer off, and she again retreated into shoal water.

This was the end of the battle. The encounter was drawn, for neither ship could seriously injure the other owing to lack of offensive power, but the *"Merrimac's"* career of destruction was checked. The *"Monitor"* had saved the Federals, for if she had not appeared on the scene at the critical moment the wooden ships would have been destroyed or driven away and the blockade of the South would have been broken. This result was due to Ericsson's genius backed by the skill and courage of Lieut. Worden.

The *"Monitor"* foundered at sea in the following autumn and 16 of her crew were drowned. During her short career she had saved the nation in a time of great peril, and had brought about a revolution in naval shipbuilding. From this time onward wooden ships were useless. Their place was taken by ironclads, and the turret that distinguished the *"Monitor"* was universally adopted.

After the war Ericsson continued to study and improve upon the steam engine, his most important pioneer work being accomplished in connection with the design of compound engines and the use of superheated steam. He was a prolific inventor in many directions, and up to the end of 1883 he had planned and constructed more than 1,000 different models and machines. He always had a preference for an engine using heat in a more direct manner than the steam engine, and this led him in his later years to spend much time experimenting with motors that would utilise directly the heat of the Sun. These took the form of large parabolic mirrors that concentrated the Sun's rays on boilers containing water, the steam raised in this manner being employed to drive a small engine.

He was full of energy to the end of his life. His home in New York was at once a workshop and a drawing office, where plans were worked out for his inventions with great care and thoroughness. He continued to work when he was seriously ill and even dying, and only a few days before the end was lively and active. He died on 8th March, 1889, at the age of 83, and with much ceremony his body was taken in the *"Baltimore,"* one of the newest United States cruisers, to his native land for burial.



Lively Running on the L.N.E.R. (G.E. Section)

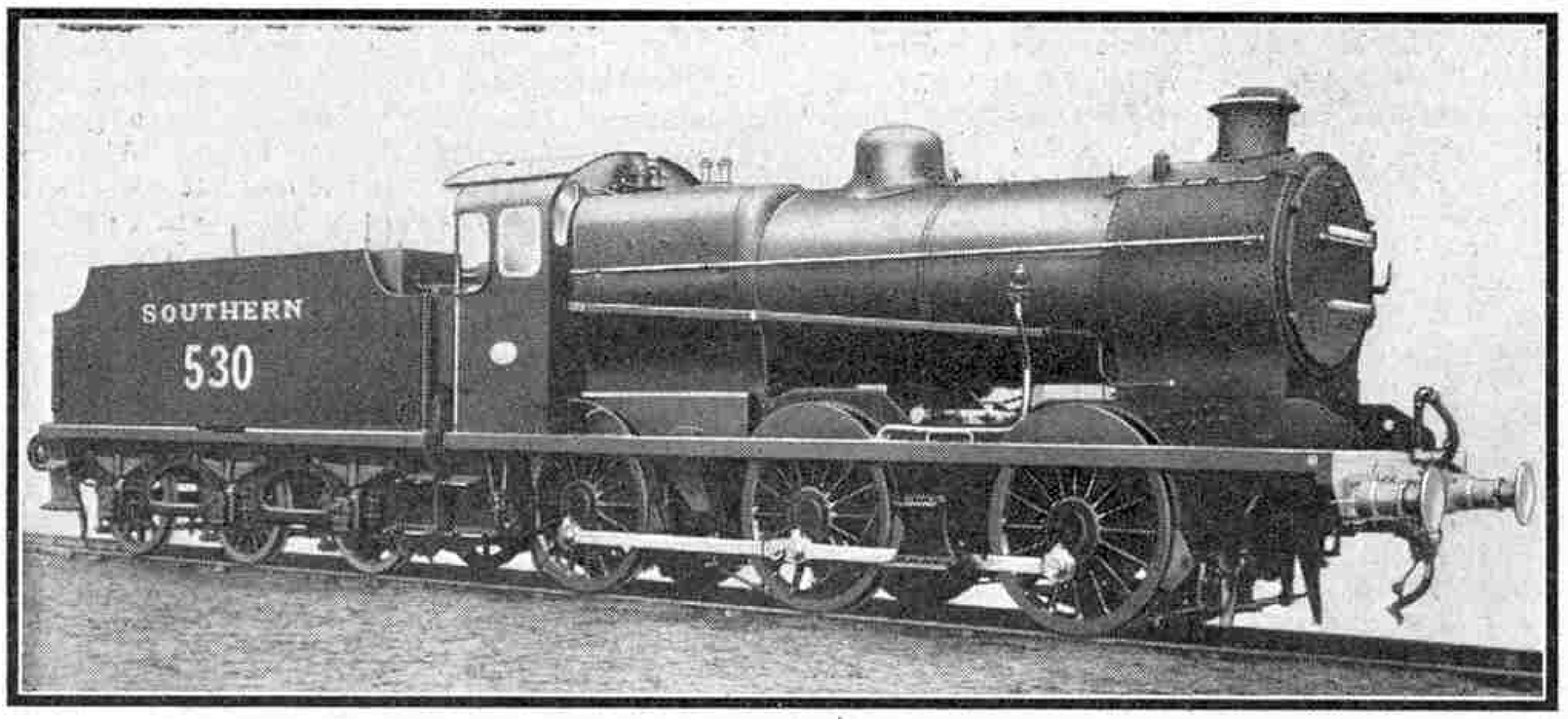
Sprightly locomotive performance is a marked characteristic of the new L.N.E.R. non-stop Buffet Car expresses that were introduced recently on the Great Eastern section between Liverpool Street and Cambridge. These perform the journey of 55.7 miles in 65 min., including necessarily slow running in the metropolitan area. Loads are usually about 165 tons gross, and are light in proportion to the engine power employed, which includes "Super-Claud" 4–4–0s, and 4–6–0s of Great Eastern origin and of the "Sandringham" class. In order to keep time, the 49.7 miles between Tottenham and Cambridge or vice versa have to be covered in a little over "even time," although north of Bishop's Stortford there are some quite heavy gradients.

We are indebted to Mr. D. S. Barrie for particulars of an enterprising run with 158 tons tare by No. 8547, a rebuilt 4–6–0 of the former Great Eastern "1500" series, on the 8.30 p.m. up express. The 55.7 miles were covered in 64 min. start-to-stop, a gain of a minute on booked time despite three severe slowings on account of permanent way operations and a signal check. The net time was 60 min. No. 8547 accelerated out of Cambridge to a maximum of 65 m.p.h. up two miles of 1 in 320 to Great Chesterford, and speed fell only to 58 m.p.h. on three miles averaging 1 in 150 up to Littlebury summit. Then came a p.w. slack at Newport, with a recovery from 30 m.p.h. to 55 m.p.h. up three miles averaging 1 in 270 to Elsenham. A slack was made from 65 m.p.h. to 30 m.p.h. through Bishop's Stortford, and there was a final acceleration to 76 m.p.h. along the gentle falling stretch from Stortford down to Tottenham. The 49.7 miles to passing the last-named station were run in 51 min. 22 sec. from Cambridge. There was a gain of nearly two minutes on booked time, despite the Newport slowing and two other checks between Cheshunt and Tottenham. This was a sound performance, even though the load was a light one for the engine concerned.

"The Silver Jubilee"

"The Silver Jubilee," the first of the L.N.E.R. streamlined trains, has proved so popular that an additional coach of the distinctive type used on this train has been specially constructed. It was added to the train last month. The number of passengers travelling between Tyneside and London has shown a considerable increase since the commencement of the "Jubilee" service in 1935, the figures for 1937 showing an advance of 40 per cent.

The original silver-coloured carriages of *"The Silver Jubilee"* train have just undergone their annual overhaul. While the regular train was undergoing the overhaul, the service was worked by a spare set of blue-painted coaches similar to those in service on the *"Coronation"* train.



S.R. 0-6-0 locomotive No. 530. This is one of the new class of 10 goods engines, constructed at the Eastleigh Works, that were described in these pages last month. Photograph by courtesy of the S.R.

The *"Locomotive Stock Book"*

The Railway Correspondence and Travel Society announce that it is not their intention to produce a complete new edition of their *"Locomotive Stock Book"* for 1938, but an appendix containing all alterations and additions to 31st December, 1937, in order to bring the 1937 edition up to date will be published.

The combined volume will provide a unique record for the years 1936 and 1937, with full details of locomotive stocks, engines built, rebuilt or withdrawn, and all named engines on the main line railways of Great Britain and Ireland. The appendix also will contain the usual analysis of locomotive types as at 31st December, 1937, a review of British locomotive practice for 1937 and illustrations of obsolete classes. Details of price and date of publication will be announced later.

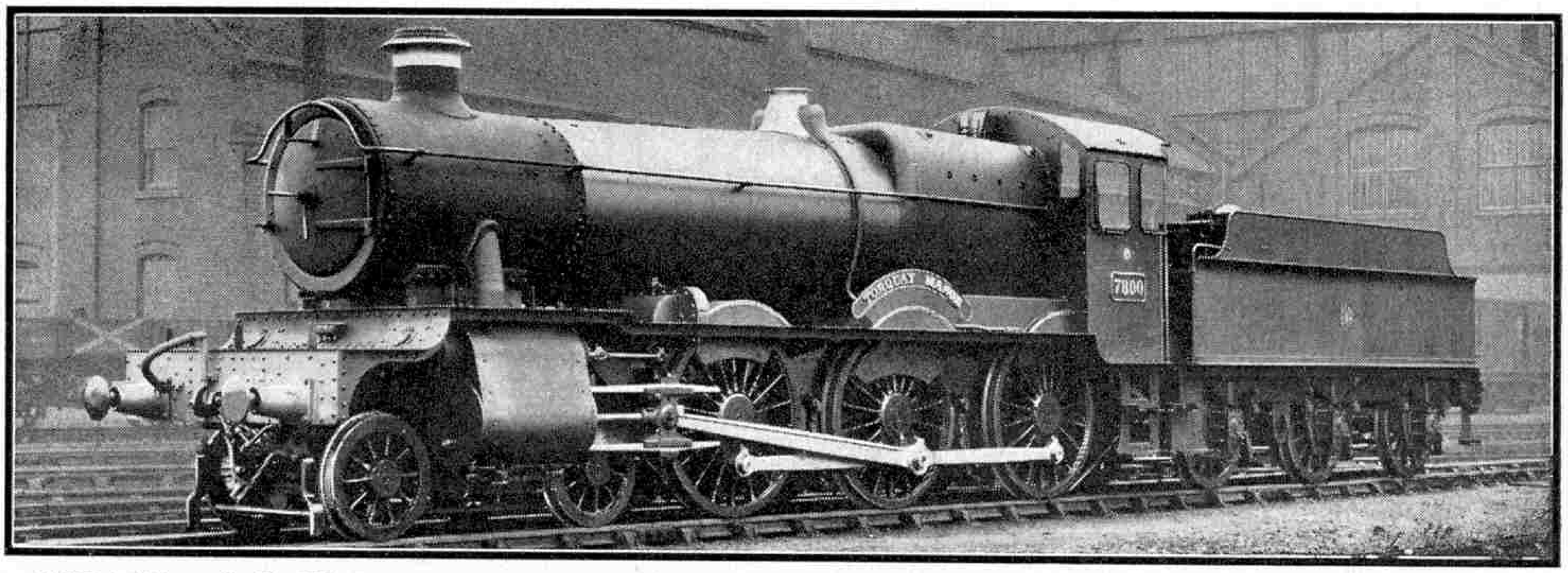
An Unusual Wheel Arrangement

On page 705 of the *"M.M."* last December we referred to the preparation by the Baltimore and Ohio Railroad of the design of a steam locomotive of an unusual kind having four driving axles, each operated by independent cylinders. We then described the engine as being of the 4–8–4 type, but the Baltimore and Ohio Company have pointed out that this is not really accurate. The engine will not be an eight-coupled one with leading and trailing bogies. Instead each driving axle with its cylinders will be a separate independent unit, and the pairs of driving wheels will not be coupled. To be strictly correct, therefore, it is necessary to use the very unusual combination 4–2–2–2–2–4 to describe the wheel arrangement, each "2" of course referring to a pair of driving wheels.

Engines having two pairs of uncoupled driving wheels, each pair driven by separate cylinders, were in service at one time on the former L.S.W.R. in this country, and were described as being of the 4–2–2–0 type. Even these four-figure descriptions seemed rather awkward in those days as compared with 4–4–0 or 2–4–0, but now when we have articulated locomotives with 2–8–0 : 0–8–2 wheel arrangements and so on they do not seem so bad. It is to be hoped that the Baltimore and Ohio design is not extended to cover engines having five or six pairs of driving wheels in addition to leading and trailing wheels!

From Sheffield to Italy

An interesting journey on the same railway wagon throughout was completed recently when a forged steel high-pressure converter manufactured by the English Steel Corporation Ltd. travelled through from Sheffield to Italy by way of the Harwich-Zeebrugge Train Ferry. The forging was 63 ft. 6 in. long and weighed about 70 tons. It was loaded at Vickers Works, Sheffield, on a 100-ton bogie wagon belonging to the Belgian National Railways, and special arrangements for its safe transport were made by the L.N.E.R. in conjunction with the Belgian National Railways.



G.W.R. 4-6-0 locomotive No. 7800 "Torquay Manor," the first of the new "Manor" class built at Swindon. These engines conform to the usual G.W.R. standards and replace as a general utility type some of the older and smaller 2-6-0s now withdrawn from service. Photograph by courtesy of the G.W.R.

L.M.S. Surplus Property

Surplus railway property arising from amalgamations, rationalisation schemes and the abandonment of certain projects, is being disposed of in novel ways by the Estate Department of the L.M.S.

Of sites formerly occupied for other purposes 10 are now let for such varied activities as a boxing stadium, furniture factory, miniature zoo, badminton club, and cinema. A disused railway tunnel has now been converted into a shooting range by a Glasgow rifle club. Engine sheds at Plaistow, Camden and Peterborough, instead of housing giants of the iron road, have become warehouses for toys, sugar beet and wine and spirits. The one at Camden, in north west London, was built by the London and Birmingham Railway, the centenary of the opening throughout of which is being celebrated this year by the L.M.S. Disused premises in South Wales are the meeting place of a religious body; and two redundant laundries have become a piggery and a furniture shop respectively.

Six stations, either entirely or partly closed to traffic, are being used for, among other things, an ornamental garden, a dwelling house, a mens' club and a merchants' showroom. Another disused station is a Boy Scouts' headquarters, and another a petrol-filling station. New uses have recently been found also for many waiting rooms. The majority of which are rented to various organisations as meeting rooms. One such waiting room is now used as a practice room by the local Silver Band.

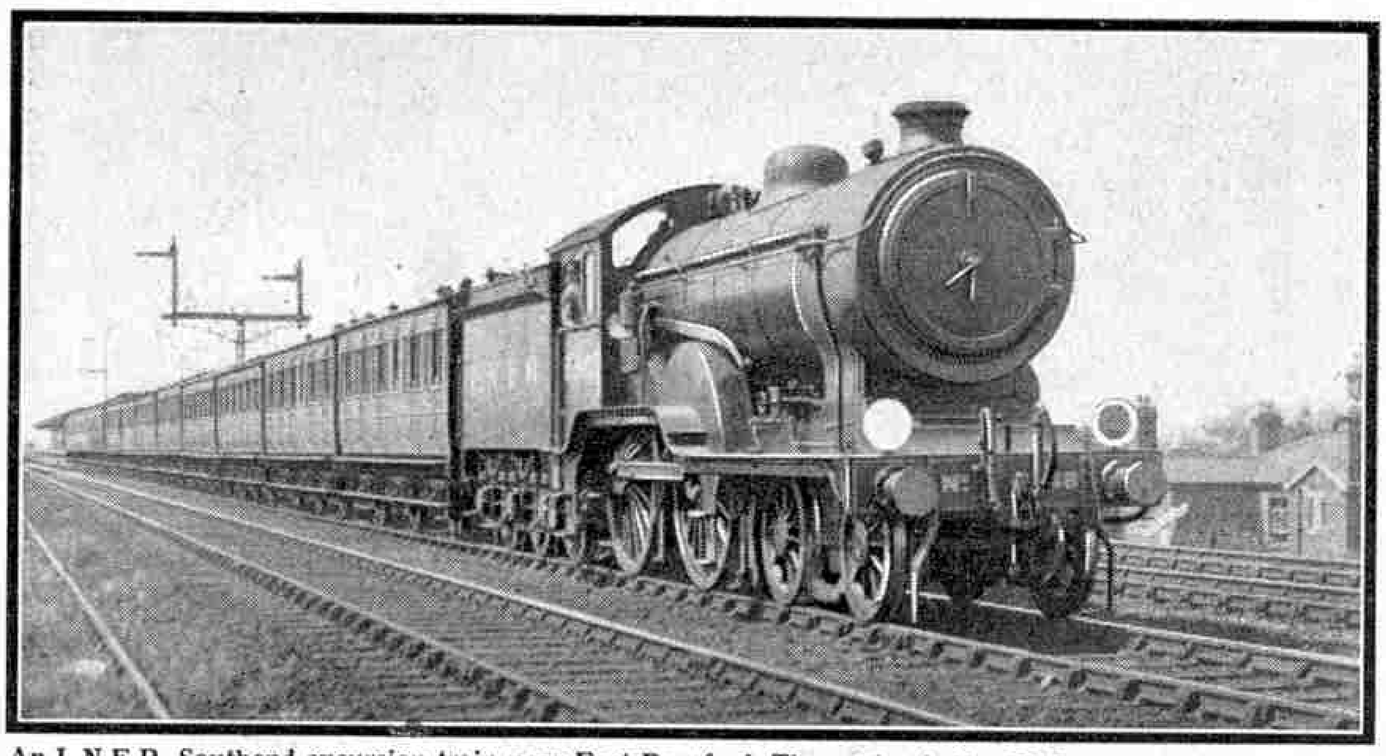
The L.M.S. Estate Department administers one of the largest estates in the country, extending from the River Thames to the extreme North of Scotland, and including Northern Ireland. It represents a rent roll of approximately £1,300,000 per annum. The total tenancies are about 90,000, including more than 23,000 houses and cottages, of which about 13,000 are tenanted by railway employees.

The G.W.R. "Manor" Class

The G.W.R. are constructing 20 general-utility 4–6–0 locomotives of a new class, known as the "Manor" class, for use on passenger and express freight train services. These will have 5 ft. 8 in. driving wheels, 18 in. by 30 in. cylinders, and a tractive effort of 27,340 lb., and they will weigh 109 tons in working order. The working pressure is 225 lb. per sq. in.

The new engines will be numbered 7800–19, and will be named after the following Manors: *"Torquay," "Anthony," "Bradley," "Barcote," "Baydon," "Broome," "Cockington," "Compton," "Cookham," "Childrey," "Draycott," "Dunley," "Erlestoke," "Freshford," "Fringford," "Fritwell," "Frilsham," "Garsington," "Granville"* and *"Hinton."*

The first of the class, No. 7800 *"Torquay Manor,"* illustrated above, is already in service on the Banbury-Swansea portion of the through service from Newcastle to South Wales.



An L.N.E.R. Southend excursion train near East Romford. The engine is No. 8848, one of the very capable 4-4-0s of the rebuilt "Claud Hamilton" class. Photograph by M. W. Earley, Reading.

Names for L.M.S. Midland Division Trains

Two of the accelerated express trains on the L.M.S. Midland route between St. Pancras and Manchester (Central) are to be named. The 10.30 a.m. down train and the 4.25 p.m. return from Manchester, will become *"The Peak Express."* The 10 a.m. from Manchester, and the 4.30 p.m. return train will be named *"The Palatine."*

More Streamlined Railcars for the G.W.R.

The G.W.R. are to double their existing fleet of streamlined railcars. It is just over four years ago since the first railcar was introduced on local services in the London area. In July, 1934, three other cars with a buffet compartment were brought into service on the Cardiff–Birmingham main line route. A year later, a further three cars were introduced on local services in the Oxford–Hereford, Princes Risborough–Didcot, Worcester and Malvern areas; and early in 1936 another nine cars in the Bristol–Weymouth, Swansea–Carmarthen–Tenby, Pontypool Road, Oxford–Banbury–Swindon, Bristol-Cardiff and the Worcester areas.

In the spring of 1936, the first parcels railcar made its appearance in the London area and speeded up the passenger trains by relieving them of parcels traffic.

Railcar No. 18 was introduced on the Lambourn Branch in April last. This car is constructed on the same principles as the latest passenger coaches, and is capable of taking an additional coach or horse-boxes and of performing light shunting operations. It is also used early each morning to carry mails from Reading to Basingstoke. This car was illustrated and described in the *"M.M."* for May last.

Model Railway Exhibition

For their Annual Exhibition, to be held from the 19th to 23rd of this month, the Model Railway Club have taken the whole of the ground floor of the Central Hall, Westminster, in addition to the basement. This year the non-working exhibits, passenger carrying track and trade stands will be staged on the ground floor. In the basement there will be many working track layouts and a cinema.

On the 19th the Exhibition will be open from 2 p.m. until 10 p.m.; on the remaining days the hours will be from 11 a.m. until 10 p.m. The admission charges are 1/3 for adults, and 6d. for children under 12 years of age.

HOW THINGS ARE MADE:

A Visit to a Famous Pottery Works

By The Editor

RECENTLY I spent an extremely interesting day at the pottery works of Pearson and Co. (Chesterfield) Ltd., at Whittington Moor, Chesterfield. This firm, which has been in existence for more than 127 years, produces all kinds of Bristol stoneware, fire-proof cooking ware, white and stoneware jars and bottles of every description, and a little art ware. I was taken in hand by the Works Manager, who proved to be not only an expert guide, but an extremely courteous and interesting companion.

The many and varied products of the firm include those manufactured from "stoneware" clay, which has a buff colour when fired, terra-cotta burning "red" clay, and "white" clay. The raw materials for the first two are obtained locally, the former by mining and the latter by digging; the white clay materials come chiefly from Cornwall and Devon. The earliest stages through which these raw materials pass give an impression of crudeness, but actually are extremely efficient in achieving the desired object, namely, the elimination of every unwanted ingredient.

To begin with, the hard lumpy raw materials are shovelled into a container known as a "blunge pan," in which they are swirled round incessantly with hot water for a period of from 30 to 60 minutes. During this time rotating paddle knives inside the pan are at work, and the final result is to reduce the clay to the consistency of a thick liquid, which is known as "slip." When this slip has reached the required condition a stop-cock below the pan is opened, and the contents are run out through a coarse sieve into a large container or well sunk into the ground. From here the slip is pumped up into a rotating sieve of very fine mesh, after passing through which it flows along a chute into a second well. The rejected matter is mainly bits of stone or very hard clay, and bits of coal—the clay seam in the mine immediately underlies a thin seam of coal. Once more the slip is pumped up and forced through a filter press, which consists of a number of iron trays with a cloth bag between each one, the series being pressed together by end plates. During this operation most of the superfluous water is eliminated through the edges of the press cloths. When the pressure is released the clay slabs are dropped out of the cloths and passed through a "pug mill" to render the clay uniform in stiffness, and from which it is extruded in a solid continuous billet about 12 in. square. Lengths are cut off with a thin copper wire as required for use.

Attaching handles to bottles. The illustrations to this article are by courtesy of Pearson and Co. (Chesterfield) Ltd.

The subsequent proceedings depend largely upon the nature of the article into which the clay is to be shaped. For instance, the tens of thousands of jars used by a very famous firm of jam manufacturers are made here. The process apparently is simplicity itself, but actually care, skill and experience are demanded. A lump of clay of the right size for a jar of a particular size is thrown into a plaster mould. A spectator is apt to wonder why the girls use what appears to be quite uncalled-for force in throwing the clay; but actually this seeming violence is necessary in order to force out air between the bottom of the lump of clay and the mould.

The next step is to place the mould in a kind of vertically revolving cup. The inside of the jar is then formed by means of a knife fixed to a lever arm that the girl pulls down to the required position, the outside taking its shape from the mould. The mould is now taken to a rotating cupboard that is heated by hot air, and in a short time the clay contracts, owing to loss of water to the hot air and to the plaster mould, to a sufficient extent to allow the jar to be removed. From here the jar goes to a hot stove, where it attains what might be described as a "leather-hard" condition. It is then turned and smoothed on a lathe, and if required a rim is cut in to take a string. Even at this stage the jar is far from dry, and it goes back to a stove that is heated by steam pipes to a temperature of from 80 to 110 degrees F. This drying operation naturally varies with the thickness of the jars. Thin jars will dry out completely overnight; those with thicker walls may take two days.

This process is known as "jollying." It is applied not only to the making of jars, pudding basins, bulb bowls, and similar circular articles, but also to oval dishes of various kinds. The oval shape is attained by the use of jolly machines that spin eccentrically.

Even more interesting is the potter's wheel. In its essentials this is the same to-day as it was thousands of years ago; the only important changes are the introduction of a power drive and an arrangement for securing variable speed control. A great variety of articles are produced on these wheels, and the craftsmanship displayed by the operators, who are known as "throwers," is very remarkable. The wheel is merely a flat circular table rotating on a vertical shaft. The thrower throws a lump of clay of the required size upon the centre of the wheel, and commences to manipulate it with his hands. With uncanny speed the formless clay begins to assume the general shape of the finished product. The outer dimensions are controlled by means of fixed gauges, but the inside, and the perfection of the product generally, depend to a very large extent on the skill of the thrower.

The production of a large jar or bottle by this process is extremely fascinating to watch; one almost gets the impression that the inert clay suddenly comes to life and shapes itself! Our cover this month shows an experienced thrower at work at the Whittington Moor potteries.

Many articles, such as cups, jugs, teapots, etc., require handles, spouts or tap-holes, and these are added separately when the pot is in the leather-hard condition. A handle consists of a strip of clay of the proper length placed by hand at the required point, moulded by the fingers to the correct shape, moistened slightly and pressed into place. The simplicity of this process causes one to have misgivings as to the adhering of the handle. As a matter of fact, however, the joint thus made is so strong as to survive any ill-treatment; the handle itself may be broken, but the joint remains sound.

The glazing of the various pots is a separate and extremely important process, carried out after drying. The interiors of such articles as 7 lb. jam-jars and bottles are glazed in a simple manner by pouring in a quantity of the milk-like liquid glaze, rinsing it round, and pouring it out into the next pot. Any lettering or other marking that is to appear on the outside of the jar is carried out at this stage. The process is a kind of stencilling, the ink used being of a special heat-resisting nature. For glazing the exterior of such jars the girl picks up the jar by placing her hand inside it, and then lowers it up to the shoulder into a vessel containing the glazing liquid. The bottom of the jar is carefully wiped clear of glaze to prevent it from sticking later while it is undergoing firing in the kiln.

At this stage there may come a surprise for the spectator; he may notice that the lettering so carefully put on has disappeared! All is well, however, because during the process of firing the glaze changes into the form of a transparent glass, through which the lettering shows quite clearly.

The glazing process is completed by turning the jar upside down,

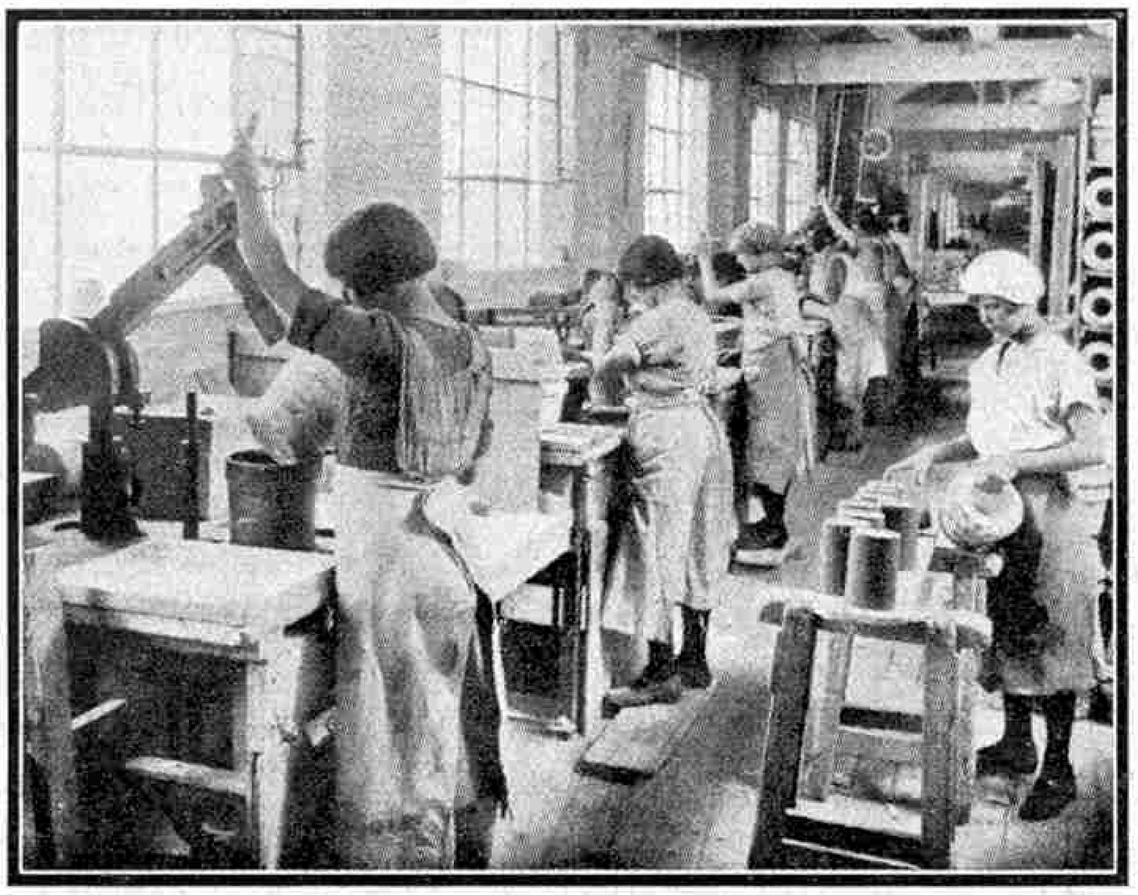
and dipping the top in a brown glaze.

Small jars and basins are glazed by submerging them completely in the glazing liquid.

Certain articles, particularly lidded ware, cannot be glazed in either of these manners, and for them the process is carried out by spraying the glaze on to them through nozzles by means of compressed air at a pressure of some 50 lb. per sq. in. There are also special glazes that produce a mottled or variegated effect, some with quite an opaque coloured finish, and still others that produce a matt or rough surface.

The glazes are based on Cornish stone and felspar, which are fusible materials, and are coloured usually by metallic oxides.

At one time the firing of clay goods was carried out entirely in the old intermittent kilns, with the characteristic shape of which most of us are familiar. At the Whittington Moor Works such down-draught kilns are still used, but mostly for large products with thick walls. The articles are placed in fire-clay boxes known as "saggars," and these are packed into the kiln, great skill being used to pack the greatest possible number into the space available. The filling of the kiln takes about two days, and when it is complete the door is bricked up and heat is applied for about 60 hours. A further 60 hours are then required for the kiln to cool down sufficiently for the saggars to be removed.



Jam-jar making on Jolly machines.

Most of the firing, however, is done in two tunnel kilns of the muffle type, which are very much quicker, and are smokeless. These kilns are fired by producer gas, and a white heat is attained in the flues in the hot zone. The actual temperatures reached in the kiln in this zone are very high, ranging up to about 1,280 deg. C.

The articles are loaded on cars of fire-brick bearing fire-brick supports and divisions. The cars move along a rail track and enter the kiln in succession, one car being drawn out at the far end at the same time as one is pushed in. They are pushed slowly through the kiln, reaching the centre, which is the hottest zone, and then passing on into the cooling zone, emerging finally from the kiln after a 300-ft. journey.

After the articles leave the kilns and have cooled completely they are inspected for faults and sounded for cracks. This latter process produces most extraordinary results. Each perfect product, when struck, gives out a ringing sound. Many of these sounds are really beautiful, and the effect of the combination when several girls are at work is that of a strange but fascinating musical instrument. Any article that by some mischance has become cracked and fails to produce a ringing note is ignominiously rejected.

Finally we come to the packing department. The products of the works are packed in straw, except when they are intended for export abroad or into Eire, when they must be packed in wood wool in conformity with the strict regulations in force to prevent the spread of foot and mouth disease. The articles are packed into crates made of ash poles and branches made pliable by soaking in water. The packers work at a quite surprising speed, and the skill with which they distribute and arrange the various products is very striking. A large proportion of the goods are loaded into railway containers on tracks running alongside the packing department on the firm's private siding connected with the L.M.S. Railway.

An old trade that is still carried on here is the wickering of bottles, and the making of baskets and hampers.

I came away from this famous pottery works feeling somewhat bewildered. I had never previously realised that there were so many jam-jars, teapots and pudding basins in the whole world; and as for the dog troughs—surely there must be more troughs than dogs! I found that the dog troughs were a mystery even to my guide. He told me that, although he felt certain they had supplied one to every dog in the country, the demand continued unabated!

The Migrations of the Godwits

ONE of the most remarkable journeys made by any living creature is the annual migration of a tiny bird, the godwit, between New Zealand and Siberia. Every year it travels twice with unerring accuracy over 8,000 miles of land and sea, arriving in Siberia from New Zealand in May and making the return journey in September and October.

The godwit is about the size of a pigeon, and its plumage is coloured grey and brown. It has a long bill, and very strong wings that have an almost imperceptible motion when the bird is in flight. It lives on the mud flats of the sea coast.

As the winter approaches in New Zealand thousands of godwits assemble on the northern beaches, as if by some prearranged plan. At a signal from their leaders they rise and take up a horse-shoe formation in the air, the stronger birds forming a tier at the rounded part of the horse-shoe. Thus these birds meet the first impact of the adverse winds encountered most of the way, and provide a shelter in which the weaker birds find the going easier.

The first hop of the northward flight is across 2,000 miles of the Pacific Ocean to northern Australia. Thence the godwits fly onward over the Philippine Islands, Japan and part of China until they reach the coasts of Siberia, and there on the barren stretches of land between the mountains and sea they lay their eggs and hatch out the young birds. When the northern nights begin to grow shorter and the young birds have gained sufficient strength, they set out on their return journey to New Zealand.

Many legends have grown up round the godwits. One old Maori explanation of their winter flight was that each bird was entrusted with the soul of a person who had died during the preceding year, and the journeys they made so regularly were for the purpose of taking these souls to Paradise.

Even stranger superstitions than this have been connected with bird migration in past centuries. At one time it was generally believed in some parts of England that birds went to the Moon for winter, each journey requiring 60 days! Another suggestion was that they did not really migrate at all, but hibernated in caves.

It is easy to laugh at these legends, but even to-day there are many mysteries in bird migration. The movements of most British migrants have become accurately known, but it is not certain why they migrate at all. One suggestion is that in winter they fly south in search of insects, which are then scarce in our northern climate, and they return because their winter haunts cannot support great hordes of visitors in addition to the native birds. For instance, the warblers, rails and other birds that must migrate for the winter to Africa need more insects than our winters provide. They return north to nest because the average number of eggs to each pair of birds is four or five. The number of eggs indeed may be a dozen or more with some birds, such as the ducks and partridges, and in certain cases there may be two or even three broods in a year. It will be realised that if the birds stayed in Africa to nest there would be serious overcrowding, and some of them therefore must seek other quarters.

A bird that travels as far as the godwit is the golden plover, which on the approach of winter leaves its home in the far north of America to fly southward over the forests of Brazil and other tropical countries to the wild and desolate regions of Patagonia, 8,000 miles away. There it remains two or three months before again flying northward.

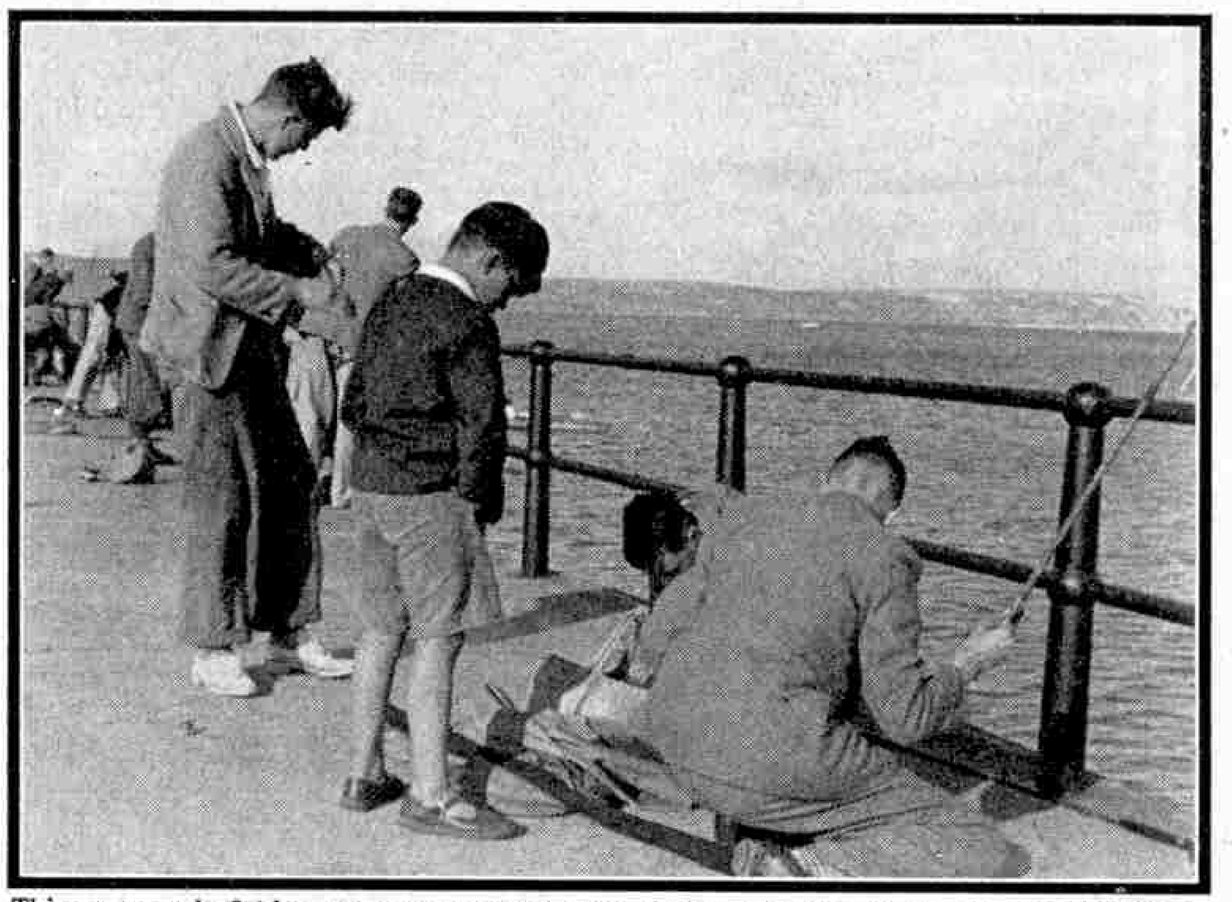
Neither the golden plover nor the godwit is the world's greatest bird traveller, however. This distinction seems to belong to the Arctic tern, a white-feathered bird with a black cap and forked tail that builds its nest on the shores of the islands to the north of Canada, apparently as near the North Pole as possible. There it spends the Arctic summer, and when the long dark winter approaches it flies southward to the Antarctic. There it finds a season that is exactly like the one it has left in the far north, and this seems to be more attractive than the more genial climates of the countries passed over on the way southward. The full journey is one of 11,000 miles, so that every year the tern travels 22,000 miles.

Our Photographic Pages

Planning the Season's Work

AT this time of the year, when the days begin to lengthen, large numbers of "*M.M.*" readers, probably the great majority, begin to think about photography. Easter may be regarded as marking the beginning of the photographic "season," if there can be said to be one; but this year Easter is so late that before it arrives many readers will have withdrawn their cameras from the hiding places in which they have lurked through the winter.

In response to widespread requests we have decided to devote space to photographic articles throughout the summer. These articles will be specially written for readers who wish to get really good results from their cameras, but who do not wish to be troubled too much with technicalities and, above all, are not prepared to spend a lot of money on their hobby. Here it must be emphasised that photography is not necessarily an expensive hobby. Any hobby can become costly if you allow it to do so; and in proportion to the fun and pleasure it provides, photography is a cheap hobby.



This promenade fishing scene won second prize in the A Section of the August 1937 Photo Contest for J. R. Tottle, Taunton.

This month's article will be confined mainly to a few preliminary hints for those who already possess cameras. Subsequent articles will deal with every important photographic topic, ranging from making the actual exposures to producing prints. Later in the year enlarging and other matters will be included in the scheme.

We hope that one result of these articles will be to persuade many readers who at present pass on their films to a local chemist to be developed and printed, to do this work for themselves. The fascination of carrying out the various photographic operations can be realised only by those who have experienced it; and few things can equal the thrill of producing a first-class print entirely by one's own unaided efforts. There is nothing difficult about developing and printing. The rules that lead to success are extremely simple, and all that is needed is a little care and commonsense.

"A Bit of Old England" by James Hampson, Edgware. This print gained second prize in the A Section of the June 1937 Photo Contest.

We are sure that readers who, as the result of taking our advice, experience for the first time the thrill of watching their films develop, or their gaslight prints spring to life, will want to sit down quickly and write to tell us of their enthusiasm and excitement!

And now for our first, and in many respects most important piece of advice for those who have sought out their cameras. This is: "Make sure your camera is in good working order before you set out with it on an outing or a holiday." Much solemn instruction has been written about how to test a camera that has been laid by for some time. Our advice is to ignore all this, and to resort to the simple plan of exposing a film or a few plates, developing these yourself, or having them dealt with by a photographic dealer, and examining the results for defects. This test will show clearly whether light is leaking into the camera, or the shutter is sticking, or whether anything else at all serious is wrong. The best plan then is to consult a photographic dealer and act on his advice as regards repairs or renewals.

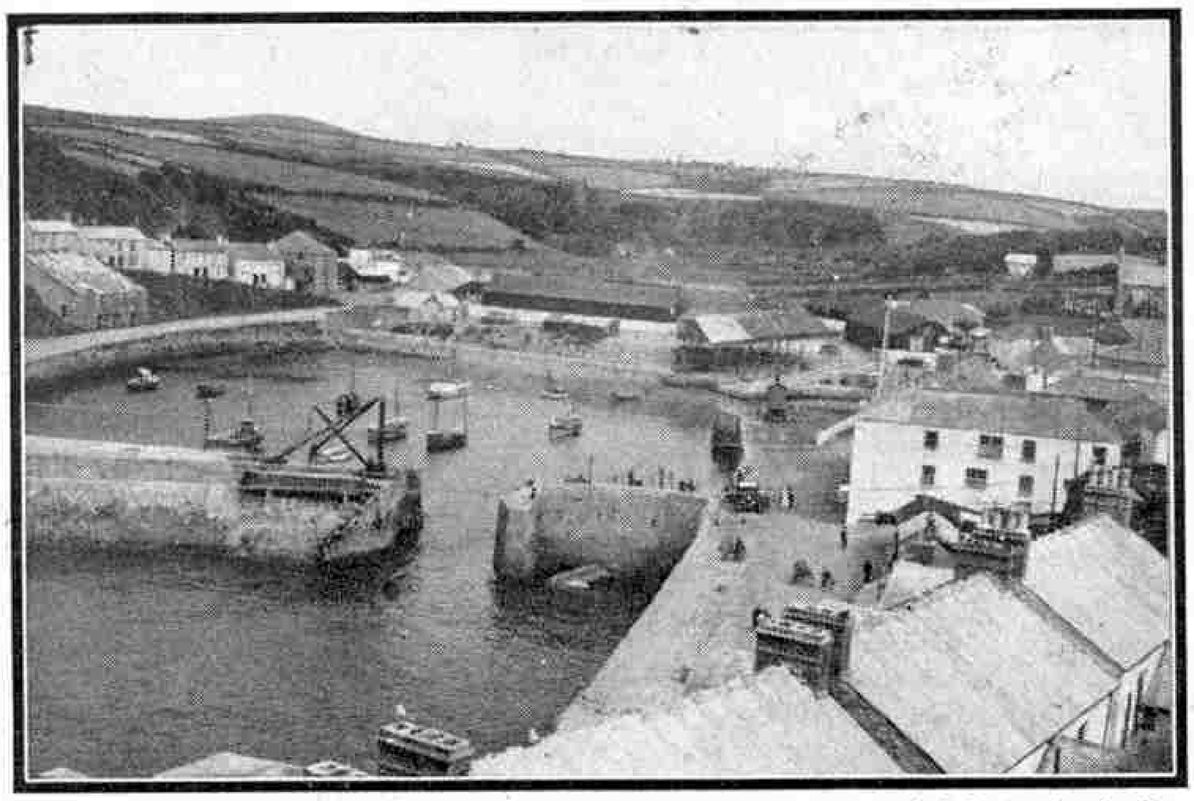
If there is nothing wrong, and your first film turns out successfully, then shout "Hooray" and look forward to many months of good photographic hunting!

For many years past readers who have been considering taking up photography as a hobby have written to the Editor for advice, and their letters have shown that they were greatly worried about the supposed great difficulty of calculating correct exposures. It is time that this exposure bogey was killed off. It is quite true that good photographs cannot be secured without reasonably correct exposure; but it is equally true that there is a wide margin of safety on each side of the line of absolute correctness.

The calculation of exposures for certain special kinds of work, and for unusual conditions, is admittedly difficult;

but for all the subjects that "*M.M.*" readers are likely to come across, the exposure can be determined quite easily with the aid of a calculator or an exposure meter. A calculator is simpler and quicker than a meter, the only requirement being a little commonsense.

For many years past the writer has depended entirely, and with complete success, on the exposure calculator contained in the Burroughs Wellcome Photographic Handbook, price 1/6 from any photographic dealer. The system is remarkably simple, and will be clear after a few minutes' examination of the tables and the revolving device at the back of the book. The speeds of practically all films and plates on the market are given; subjects are classified simply and with photographic illustrations; and extremely little is left to individual judgment. In addition to the exposure calculator, the handbook contains a surprising amount of information on all branches of photography. Next month it is hoped to deal further with the question of exposures for a variety of different subjects.



This typical holiday snapshot by D. Earle, Wembley Park, was awarded first prize in the B Section of the September 1937 Photo Contest.

Another point on which advice is often asked is in regard to the best type of film to be used. The very fastest films, and especially if they are panchromatic, that is sensitive to all colours, are unfortunately not quite so easy to use as those of a slower grade, and therefore are not recommended for the beginner. Generally speaking, it is a good plan to select not the fastest, but the fastest but one, of the films marketed by any particular manufacturer. In a later article advice will be given on panchromatic films and light filters and the wonderfully realistic results that can be obtained with them.

Photography, like all other hobbies, is apt to lose its interest after a while if it is not carried on in the right way. Many boys who have just bought or been presented with a camera, set to work at top speed to photograph their parents, uncles and aunts and other relations, and the domestic pets; and when these subjects have been exhausted—in more senses than one—lose interest in the hobby because there is no more obvious material close at hand. It will almost always be found that those who have been photographers for many years, and still retain their enthusiasm, have had some special subject to which they have devoted their main energies. There is quite a wide range of suitable subjects within the reach of every boy. It is not suggested of course that photography should be confined entirely to the special subject selected, but that this should be kept in the foreground to provide a continuous interest. Other miscellaneous subjects can then be tackled as they come along, to add variety.

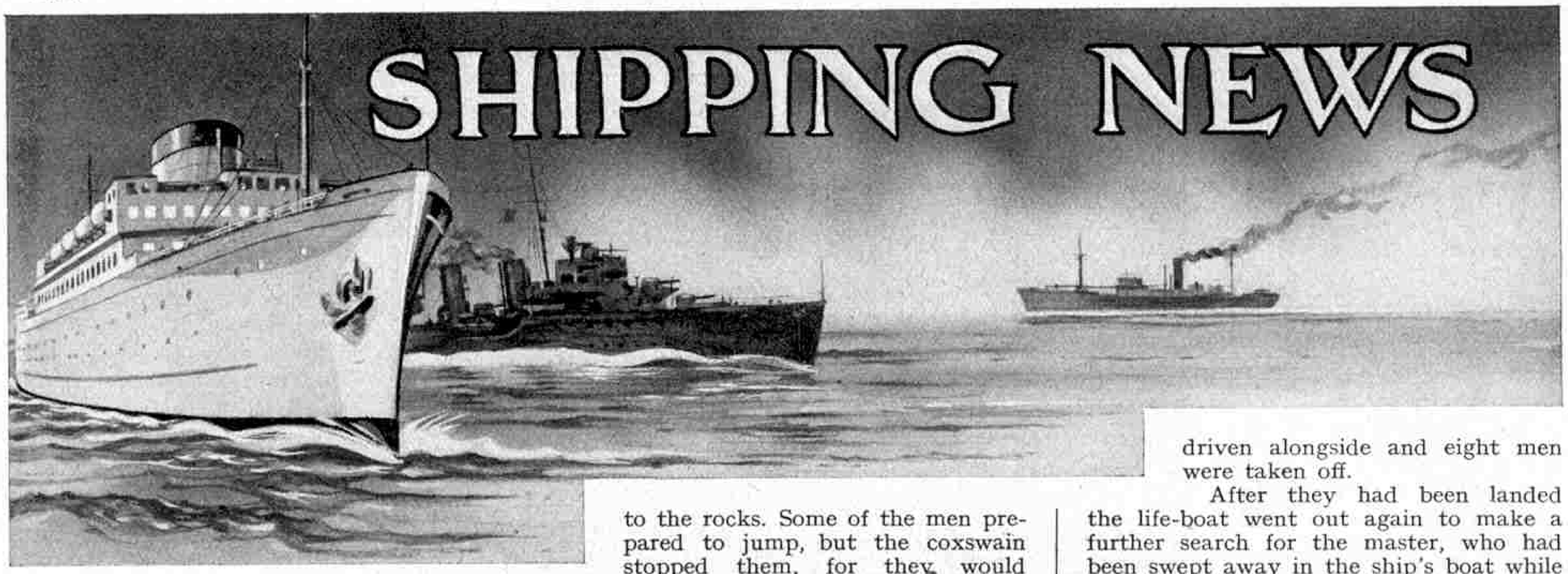
"Sunshine and Mischief." A charming picture by A. B. Bishop, Bristol. Another successful entry in the 1937 Photo Contest.

It is not easy to make really useful suggestions for special subjects, as the choice depends so largely on personal inclination. The main thing is to aim at a series of photographs that link up together to form an interesting connection. Such a series of photographs might be made of trees, flowers, farm animals, the sea and ships, trains, aeroplanes, motor cars, and other subjects too numerous to mention. The choice will of course to some extent be determined by locality. For instance, some boys may live far from the sea, so that ship subjects are difficult to secure; others live miles from the nearest aerodrome, where aeroplanes are seldom seen. Every photographer can find some practicable subject, however, and if he sticks to it he will be able to secure before the dark days return a series of photographs that will be of interest and real value. Some special subjects of this kind will be dealt with in later articles, and the Editor will always be pleased to help with advice on any difficulties that may crop up.

And now a few words about the illustrations to this article, which have been selected at random from our prize-winning photographs. The upper photograph on the previous page is one of a type that can be obtained at almost any seaside resort. Its special feature is that it is not posed; all the people included are quite unconscious that they are being photographed. Below it is a photograph of a particularly interesting group of thatched cottages, and it suggests the possibilities of a series of photographs of old-fashioned dwellings.

The upper photograph on this page has no special pictorial qualities, but it is a good example of a type of photograph that everybody takes during a holiday, to provide a memento of a scene that is associated with days of sunshine and happiness.

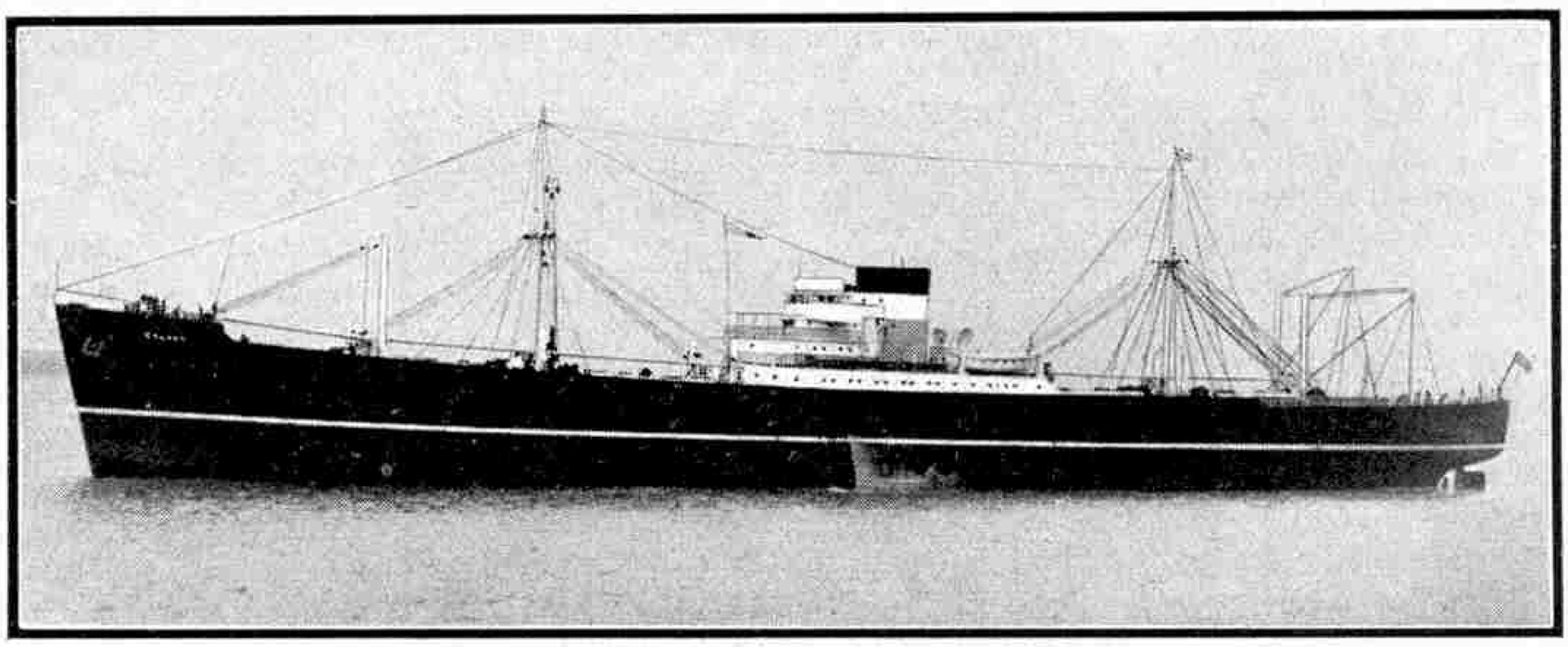
Our last photograph is one that might be taken on any sunny day in the country. It radiates fun and enjoyment, and is a souvenir of a type that gives pleasure to all who know the youngsters depicted.



A New Motorship for South American Trade

Successful trials were carried out in January of the single screw motorship *"Delane,"* and she was handed over by her builders, Harland and Wolff Ltd., of Belfast, to the Lamport and Holt Line Ltd., her owners. This vessel is a cargo and passenger vessel for the South American trade, and has a length of 456 ft., a beam of 62 ft., and a depth of 37 ft. 9 in. She is of about 6,000 tons gross, and her propelling machinery consists of a two-cycle, double-acting Harland-Burmeister and Wain Diesel engine.

The *"Delane"* is a sister of the *"Delius"* and the *"Devis,"* both built recently at Belfast. In design these new ships are considered to be among the most striking of recent years.



The motorship "Delane," built for the South American trade. Photograph by courtesy of Harland and Wolff Ltd., of Belfast.

Thrilling Life-boat Rescues

Until 31st January of this year no boat of the fleet of the Royal National Life-boat Institution had ever capsized in service. The boat at St. Ives, Cornwall, then overturned after taking off the 23 members of the crew of the steamer *"Alba,"* however. The great value of the boat's righting ability was proved, for she came upright again so quickly that three of her crew were still on board. T. Cocking, the coxswain, was among those thrown out. When he reached the surface he was nearer the shore than the life-boat, and could have got safely to land, but he swam back to the boat, as did the other members of the crew who were in the water. They then helped 18 of the rescued men back into the boat.

The engine of the life-boat was automatically switched off as soon as the boat capsized. Otherwise the boat would have gone on when she recovered, leaving the men in the water. Unfortunately the starting handle for the engine was lost overboard. It was therefore impossible to restart, and the life-boat was driven on to the rocks. Some of the men prepared to jump, but the coxswain stopped them, for they would probably have been crushed between the life-boat and the rocks. He kept all on board until, with help from ashore, they were landed safely.

The coxswain has been awarded the Silver Medal of the Institution in recognition of his courage and leadership. Each of the eight members of the crew has received the Bronze Medal for his gallantry and fine discipline, and the whole crew have received money awards.

One of the two motor life-boats stationed at Padstow was transferred to St. Ives to take the place of the wrecked life-boat.

The Institution has also awarded its Silver Medal for gallantry to J. Rees, the second coxswain, and the Bronze Medal to A. Cottam, motor mechanic, of the Tenby life-boat, for their splendid work in the rescue of eight men of the crew of the steamer *"Fermanagh,"* of Belfast. The seven other members of the crew have been given special recognition of their services on this occasion.

The weather at the time of the *"Fermanagh"* rescue was reported to have been the worst for 20 years, and the maximum force of the wind was estimated at 110 miles an hour, with a very rough sea. The *"Fermanagh"* had gone ashore on Woolhouse Rocks. With J. Rees in charge the life-boat circled her, and as she was not then showing distress signals, a search for any possible survivors was made. Soon afterwards the vessel was floated off the rocks and drifted in a northerly direction, sinking by the stern with her bows in the air and her decks awash. Then survivors were seen to be aboard. The life-boat was immediately driven alongside and eight men were taken off.

After they had been landed the life-boat went out again to make a further search for the master, who had been swept away in the ship's boat while fending it off to allow his men to get into it safely. Their efforts were in vain, however, and they returned after being out altogether for 5½ hours.

High Power Tugs for South Africa

The first of three powerful tugs to be built for the South African Government by Lobnitz and Co. Ltd. was launched early in December from their yard on the Clyde, and is now nearing completion. She is named *"F. Schermbrucker,"* and is for service at East London,. She has triple-expansion steam engines developing 3,250 h.p., and is thus considerably more powerful than the *"T. S. McEwen,"* the most powerful tug at Capetown, which has a designed output of 2,800 h.p.

The gross tonnage of the new tug is 601, and her length is about 150 ft. She is fitted with wireless direction-finding gear and in addition echo-sounding equipment is installed.

The remaining tugs to be constructed are for service at Table Bay and Durban respectively.

Eyston's Bid for Harmsworth Trophy

Captain G. E. T. Eyston, holder of the world land speed record, has decided to challenge for the Harmsworth Trophy in 1939. This Trophy, the blue riband of the motor-boat world, is offered for international competition, and has been held since 1920 by the American, Commodore Gar Wood.

During 1938 Capt. Eyston is continuing his motor car speed efforts, but as soon as possible he intends to give serious attention to the construction of a suitable boat, which probably will be built under his own direct supervision, and not at any well-known yard. The last challenge for the Trophy was made in 1933, when Mr. Hubert Scott-Paine took *"Miss Britain III"* to Detroit and put up a splendid losing fight with his small and relatively low-powered boat.

Diesel-Electric Ship for Lighthouse Inspection

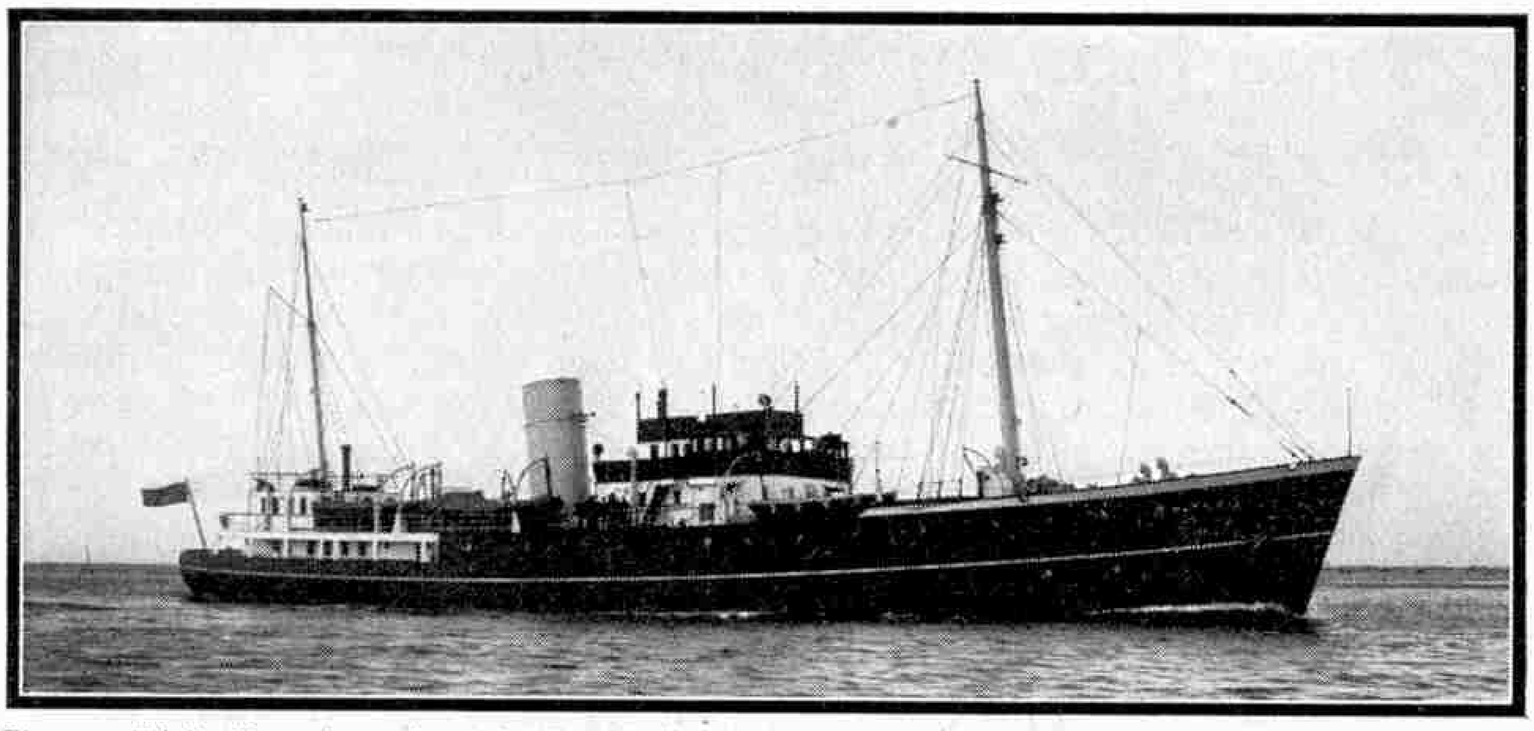
The upper illustration on this page shows the new twin screw Diesel-electric ship *"Patricia,"* built recently by Smith's Dock Co. Ltd., of Middlesbrough, for the Corporation of Trinity House. She will be used for the periodic inspection of lighthouses, lifebuoys and other navigational aids maintained by the Corporation.

The vessel has an overall length of 218ft., with a breadth of 35 ft. 6 in. and a depth of 16 ft. Extensive use was made of welding during constructional work.

The main propelling machinery consists of two Diesel engines of 755 b.h.p. each, operating at 375 r.p.m. Each is coupled to a D.C. generator of 518 kW output at 550 volts. There is independent control of each motor, and thus of each propeller, and six speeds ahead and four astern can be signalled by means of the telegraph on the bridge.

On the navigating bridge are the wheelhouse, the chartroom and the wireless room, and the navigating devices include radio direction finding equipment, an echo-sounding machine, submarine signalling apparatus and a searchlight. There is a large hold forward, with a heavy derrick capable of lifting 12 tons. An electric windlass is installed in the forward 'tween decks, with three capstan leads for lifting anchors, buoys and other equipment. A large winch is fitted in a house on the after deck for use when towing lightships and other craft.

The *"Patricia's"* trials were conducted over the measured mile at Whitley Bay, and were followed by tests at sea. The mean speed attained by the vessel was slightly over 14 knots.



The new Trinity House inspection ship "Patricia," which is equipped by Diesel-electric machinery. Photograph by courtesy of Smith's Dock Co. Ltd., of Middlesbrough, the builders of the vessel.

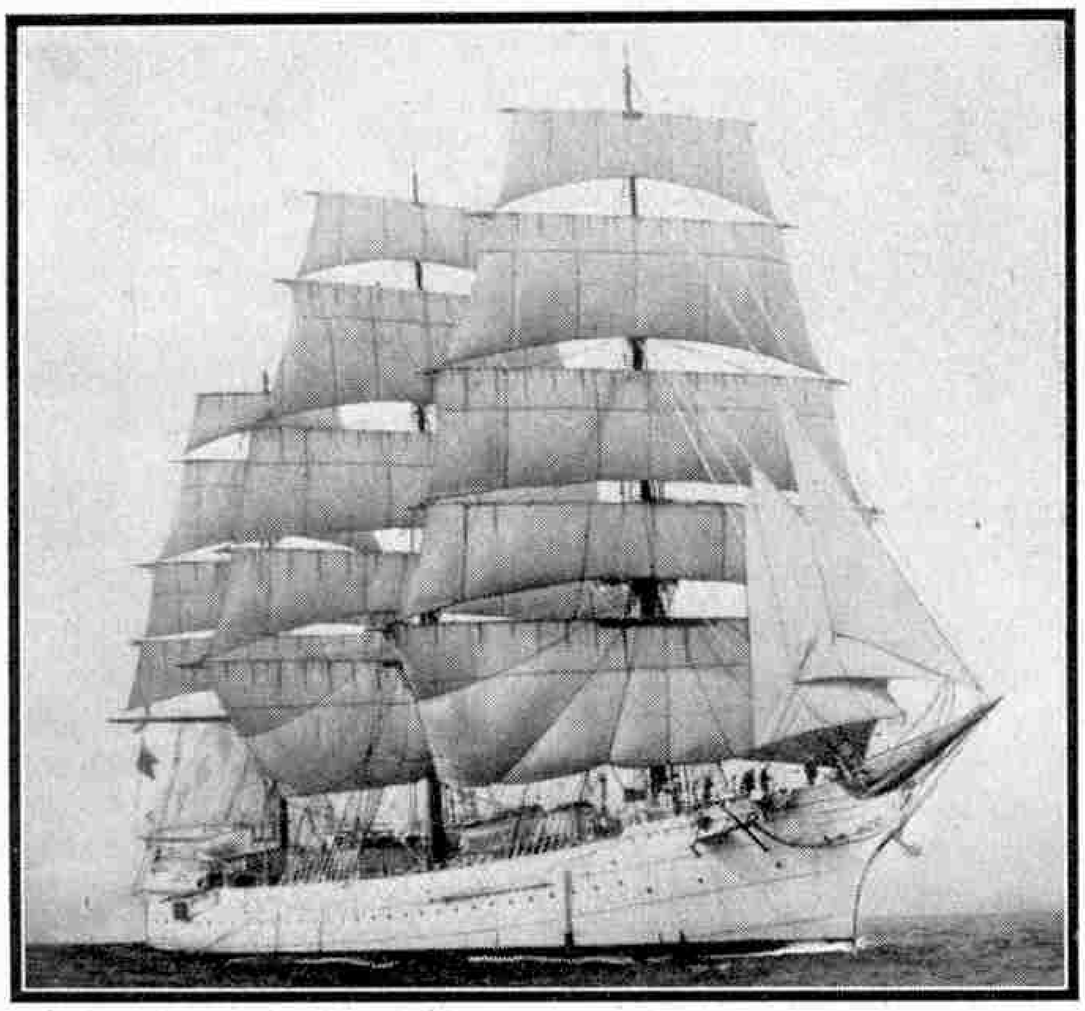
L.M.S. Vessels for Scottish Waters

The L.M.S. recently ordered three vessels from W. Denny and Bros. Ltd., of Dumbarton. These are designed for service in Scottish waters. Two of them are small motor vessels of similar design for the Clyde. Each will be about 60 ft. in length, and will carry about 100 passengers. They will maintain a passenger service between Broomielaw Wharf and Bowling, and those aboard will have an excellent view of shipbuilding activity on the banks of the river. The boats will pass the yard of John Brown and Co. Ltd. at Clydebank, where the new Cunard White Star liner "No. 552" is now being built.

The third boat is to operate a passenger and motor car ferry service across the North Channel between Stranraer and Larne, in Northern Ireland. She will be a twin-screw vessel capable of carrying over 70 vehicles on one deck, and her length between perpendiculars will be 308 ft.

Racing to a Race!

A great international yacht race over a 350-mile course will begin on 26th July at Warnemünde, a port on the Baltic coast of Germany. This will be preceded by a race from their home ports of the yachts taking part. Those of the Royal Ocean Racing Club will start on 14th July from Dover for Christiansand, on the south coast of Norway, where they will be joined by German yachts from Heligoland. From Christiansand the combined fleet will race south to Copenhagen on 19th July, and all the yachts will then go on to Warnemünde on 24th July, where they will begin the international race two days later.



The Swedish training ship "A. L. Chapman." Photograph by A. Lamsley, Southsea.

Launch of "No. 552"

The new Cunard White Star Liner "No. 552" at Clydebank will be launched on 27th September by Her Majesty the Queen, and will be named *"Queen Elizabeth."* The date and approximate time have been so arranged that the liner will enter the water in the most favourable tide conditions. High water is at 4.20 p.m. and it is expected that the hull of the vessel, 1,030 ft. in length, will glide into the river shortly after 2 p.m.

A Handsome Swedish Sailing Ship

The Swedish training ship *"A. L. Chapman,"* illustrated on this page, was built in 1888. She is of 3,000 tons displacement, and is constructed of steel. She has no auxiliary engines, the only machinery aboard being that used for the generation of electricity for the ship's various services.

The vessel carries 200 boys, who join between the ages of 14 and 17 years and are trained in sail to become seamen. The period of training varies from two to six years. The ship's full complement, including the captain, officers, crew and boys, is 267. Each year a world cruise of many thousands of miles is made, during which the boys have to work the ship.

"A. L. Chapman" is one of the most handsome sailing ships left in the world to-day. Her lines are clean and strong, and she is fitted out in every way to be a floating home without any pretence of luxury for the boys, who live simply and work hard.

The ship is named after A. L. Chapman, a famous Swedish naval architect.

A. T. LAMSLEY.

International Motor Boat Races at Torbay

International motor boat racing is to be revived in this country, and a meeting will be held in Torbay from 30th June to 2nd July of this year. There will be races for various classes of both inboard and outboard motor boats, and the principal event will be the race for the Duke of York's International Gold Trophy, the premier award for inboard motor boats in Great Britain.

The *"Normandie's"* Service

During 1937 the French liner *"Normandie"* made 36 Atlantic crossings between Havre and New York, covering a total of 122,400 miles at an average speed of 28.87 knots. Since entering service three years ago she has made altogether 42 round voyages, covering more than a quarter of a million miles and carrying a total of about 90,000 passengers.

New Attack on Water Speed Record

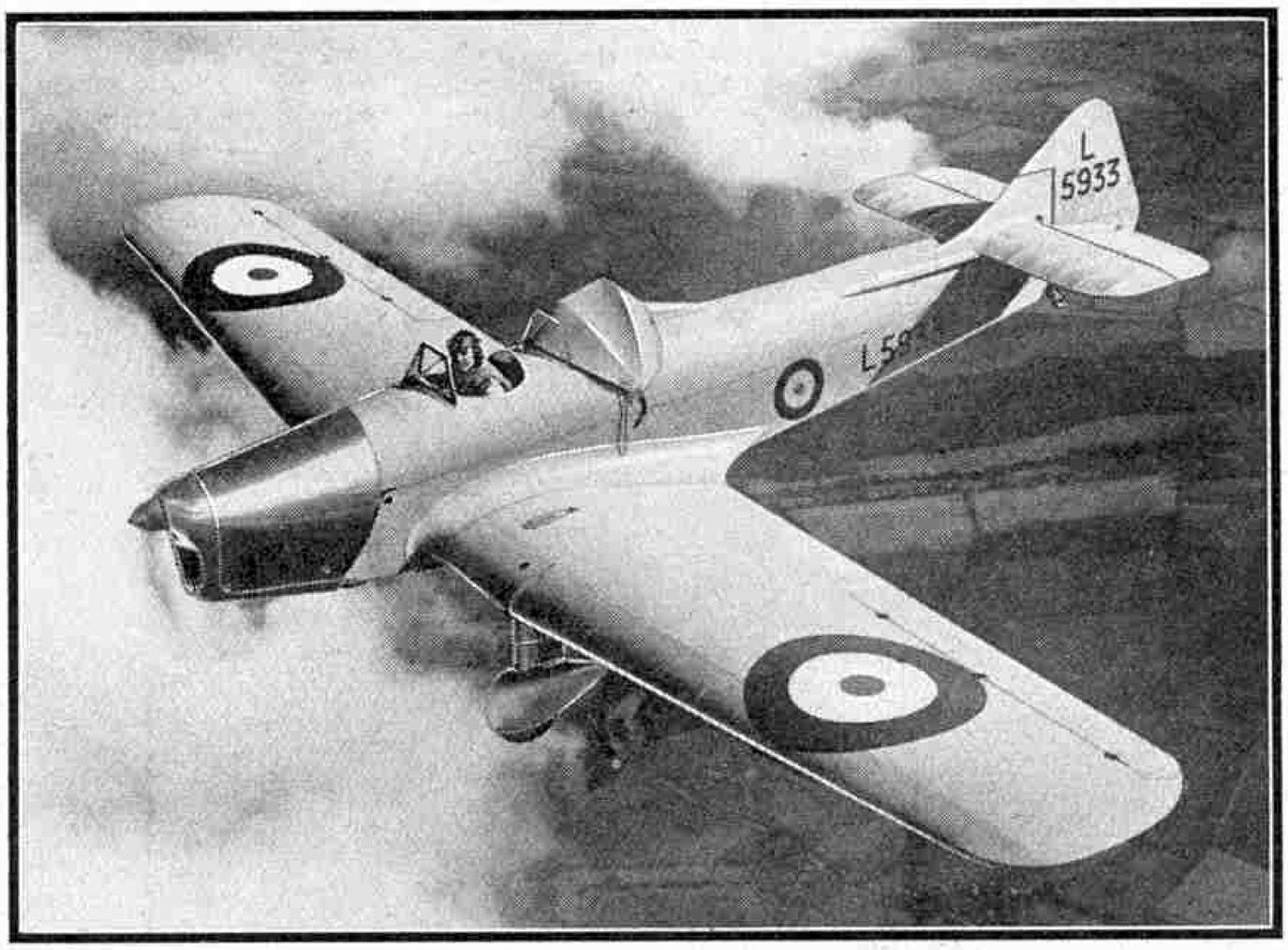
It is expected that Sir Malcolm Campbell will take *"Bluebird"* to Lake Maggiore again this year and will try to raise the water speed record from the 129.50 m.p.h. he achieved in 1937 to 140 m.p.h. If he does so the course over which the attempts are made will be slightly shorter than that marked out for his previous effort, as he found the acceleration of *"Bluebird"* so great that maximum speed could be attained within half a mile. The five-mile stretch of water used last year made it necessary to run the engine at full speed for longer than was really essential for covering the measured mile of the course.

Miles Low Wing Monoplanes

Some Interesting Two-Seater Types

THE great popularity attained during recent years by the monoplane is shown in the fact that to-day more than 50 different aircraft of this type are produced in this country, and about two-thirds of this total are low wing machines. Among the best known of the civil low wing monoplanes are the various Miles aircraft produced by Phillips and Powis Aircraft Ltd., of Reading. In this article we describe three of their current types, the Miles "Magister" and "Kestrel" trainers and the Whitney Straight light cabin monoplane; all are two-seaters and are built of wood.

The "Magister" is illustrated on this page. It is a development of the Miles "Hawk" trainer described and illustrated in the February 1935 *"M.M.,"* which gained second and third places in the King's Cup Air Race that year, and is of special interest as the only monoplane in this country approved by the Air Ministry for the initial instruction of R.A.F. pilots. It is used at the company's R.A.F. civil training school at Reading. This school is one of several owned and operated by aircraft companies under the supervision of the Air Ministry, to assist in training the very large number of pilots required under the R.A.F. expansion programme. The all-round efficiency of the "Magister" has also led to its adoption by other governments and flying schools.



Miles "Magister" trainer in the air. The blind-flying hood is drawn over the rear cockpit as the pupil there is learning to fly entirely by his instruments.

The span of the "Magister" is 33 ft. 10 in. The wings are attached to a separately constructed centre section, the spars of which fit into slots in the fuselage, where they are secured by metal fittings. The Miles patent split trailing edge flaps fitted to the wings give the aeroplane a steeper gliding angle when approaching a landing ground and also reduce the landing speed. A fixed type undercarriage of wide track is fitted, and the legs and the greater part of the wheels are enclosed in streamlined fairings that can be easily removed for inspection of the shock-absorbing mechanism.

The two cockpits are open and are arranged one behind the other with a complete set of controls and instruments in each. Normally the instructor occupies the front cockpit. When the pupil is being trained in flying entirely by his instruments, the rear cockpit in which he is seated is covered over with a blind-flying hood, as shown in our illustration. There is a large luggage locker behind this cockpit.

A 130 h.p. D.H. "Gipsy Major" engine is fitted, and enables a maximum speed of 145 m.p.h. to be attained. The aeroplane takes off after a run of 170 yd. and climbs at the rate of 1,200 ft. per min. It can climb to 22,000 ft., although the service ceiling is 18,000 ft. The fuel tanks are in the wing centre section, one on each side of the fuselage, and enough fuel can be carried for a non-stop flight of 400 miles.

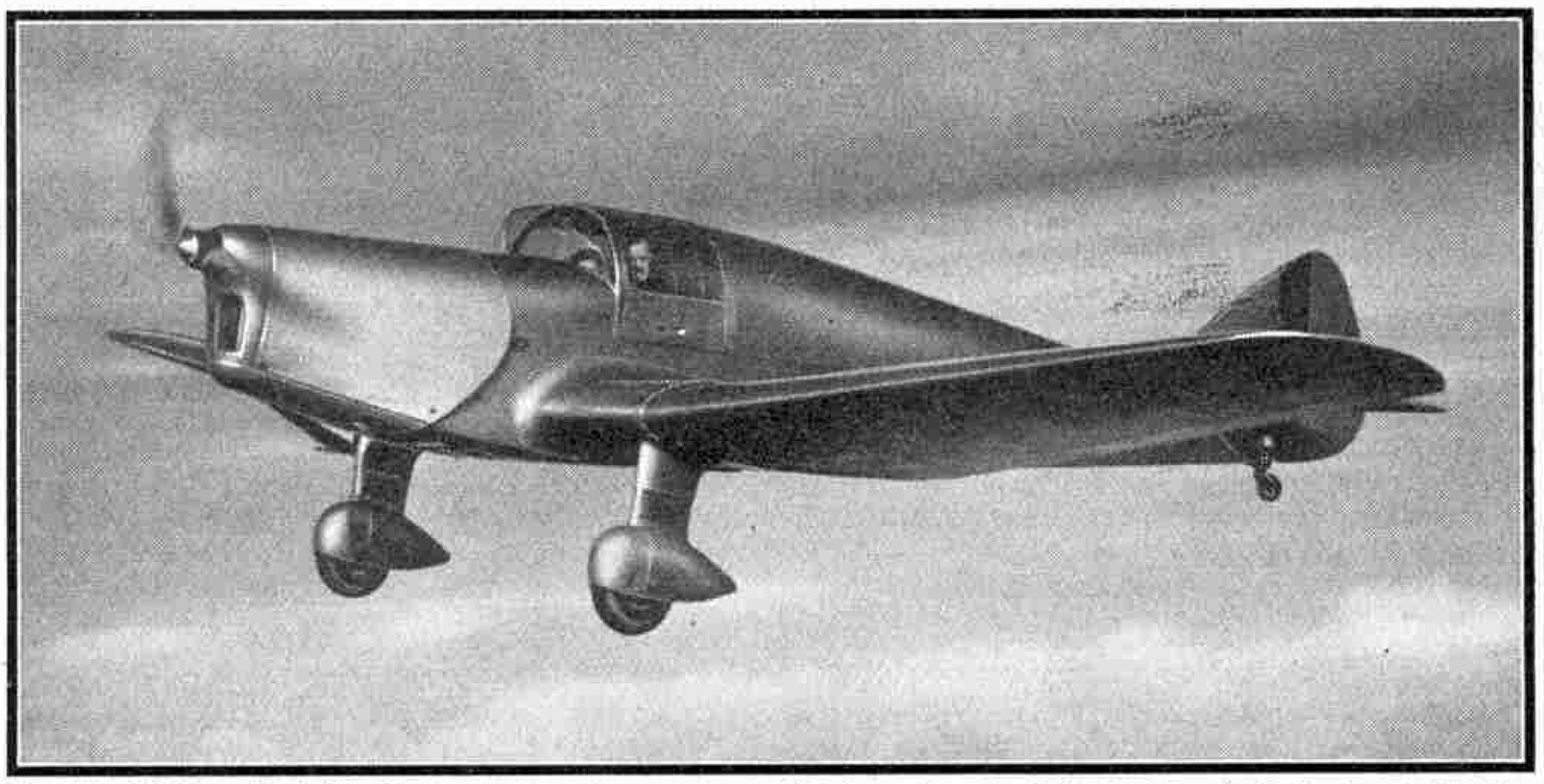
The Miles "Kestrel," shown in the lower illustration on the next page, is fitted with a far more powerful engine than the "Magister," and is much speedier. The engine is a Rolls-Royce "Kestrel XVI" of 690 h.p. and this gives the aeroplane an estimated top speed of 295 m.p.h. at a height of 16,500 ft.

The "Kestrel" is very modern in construction and has been designed for advance flying instruction, but can also be used for training in the work of a high performance two-seater fighter, multi-gun fighter, or general purpose aeroplane suitable for light bombing or reconnaissance. It is so designed that the equipment necessary for these various duties can be installed or removed rapidly. As a multi-gun single-seater fighter the aeroplane would have guns mounted in the wings and firing outside the radius of the airscrew. If required as a two-seater fighter it would be provided with a rear gun turret in the fuselage. The wing centre section has been made deep enough to accommodate bomb cradles in addition to the fuel tanks and retracted undercarriage, and hydraulically-operated doors for the bomb sight are fitted in the floor of the fuselage. This sight is attached to a movable mounting and can be lowered into position when the doors have been opened. The doors are large enough to permit a good view of the target before making use of the bomb sight, and a camera mounted forward of the sight photographs the target through the slot of this device.

If the "Kestrel" is used as a reconnaissance aeroplane, for wireless and photography work, the wireless operator faces aft with his sets mounted in a quickly removable frame. The camera is placed behind the sets and is within easy reach of the operator. The bomb sight doors are open

for photography, but the wireless operator is protected from draught by an extra flooring attached to the seat he occupies. The direction-finding aerial loop is fitted above and just behind the wireless sets.

The two cockpits of the "Kestrel" are arranged in tandem and are fitted with dual controls. In this instance the pupil occupies the front cockpit, as by this arrangement the flying conditions for him more closely resemble those of the aircraft he will eventually fly. This cockpit is provided with a blind-flying hood. Both cockpits are under one roof, and are adequately warmed by a controlled flow of warm air from the engine cooling duct. Entry is gained by opening the port side windows, and the windows on both sides are fitted with emergency catches so that the occupants can get out easily if the aeroplane should overturn when landing. The windscreen is of special shape and is flat in the region of the reflector sight so as to give an undistorted view forward on to the target. This screen has a small panel fitted for use when flying in bad weather. A fixed window behind the rear cockpit gives the pilot an excellent all-round view aft before he takes off.



The Miles Whitney Straight cabin monoplane. An aeroplane of this type, flown by Brig.-Gen. Lewin, finished second in the King's Cup Air Race last year.

The two Miles aircraft so far described are light training machines. The Miles Whitney Straight, the third illustrated and described in this article, is designed in particular for the owner-pilot, and is also an excellent aeroplane for instructional flying and general club use. This is not the limit of its usefulness, for it can readily be adapted for use as a light mail or goods carrier, as a special charter machine, or for various military purposes.

This light low wing monoplane was very prominent in the King's Cup Air Race of 1937. One of the many private owners of a Miles Whitney Straight is Brig.-Gen. Lewin, who is 63 years of age and lives in Kenya. He learned to fly six years ago, and his enthusiasm is such that last year he entered his machine in the King's Cup Air Race. The General himself acted as pilot, with Squadron Leader de St. Leger as navigator, and finished second, only 2 min. 27 sec. behind the winner.

The Miles Whitney Straight is a typical Miles light aeroplane. Its D.H. "Gipsy Major" engine gives it a top speed of 145 m.p.h. and at the normal cruising speed of 130 m.p.h. the engine is running well below full power. The cabin is entered through a large door on the port side, which is reached by a convenient walk-way on the wing. It is thoroughly soundproofed on all sides and is separated from the engine compartment by a special soundproof and fireproof bulkhead. Behind the two seats, which are side by side, there is sufficient room for several suitcases to be stowed. The wide streamlined windscreen is moulded in one piece of Perspex, a special glass substitute, and this gives an exceptionally good forward view, and there are large side windows, and one in the roof to provide a backward view. The various instruments are mounted on an aluminium-finished panel in the centre of the dashboard. Full dual control is fitted.

The wings are of the full cantilever type, that is they are supported only at their junction with the fuselage, and have the Miles patent flaps. The flaps are in three sections, one hinged to the trailing edge of each wing and one hinged to the rear edge of the wing centre section across the fuselage. The outer sections begin to operate before the fuselage one, which is so designed that when it comes into action air pressure forces it down and balances out the air resistance acting upon the other two sections.

The Miles "Kestrel" high speed trainer, in which the pupil occupies the front cockpit. It can be adapted for military training in air fighting, light bombing and reconnaissance.

Control is effected by means of a light three-position lever on the cabin dashboard, which operates a vacuum servomotor deriving its power from the induction system of the engine. In the cruising position of the lever all the flaps are streamlined into the wings and fuselage, and in the intermediate position they are partially depressed for take-off and for high-wind landings; in the normal position of the lever all the flaps are fully down. A great advantage of this patented system of flap control is that, in the event of a misjudged landing, the flaps can be easily and quickly returned to the up position for the aeroplane to make a fresh landing attempt. The aeroplane takes off after a run of 145 yards, and the landing run is 100 yards.

AIR NEWS

British Summer Air Services

Important additions are to be made to the many British internal air services that will operate this summer. Railway Air Services will introduce a direct service between London and Glasgow, and this will probably begin on 3rd May, the date of the opening of the Empire Exhibition at Glasgow. It will be very convenient for the company's London-Glasgow passengers, who at present have to travel on the air mail service via Belfast. The latter will be continued, of course, as also will the company's service between Glasgow and Belfast.

Some idea of the extensive activities of Railway Air Services is shown by the fact that this summer they will operate air lines between Liverpool, Birmingham, Cheltenham, Gloucester, Southampton and south coast resorts. Along the south coast there will be frequent R.A.S. services linking Brighton, Hove, Worthing and the Isle of Wight. In the west Bristol, Cardiff, Exeter and Plymouth will be connected by regular air services.

At the end of February last Jersey Airways Ltd., added to their air routes to the Channel Islands by re-opening their service between Portsmouth and Jersey. D.H.86 four-engined air liners flying at 145 m.p.h. are employed, and leave Jersey at 11.30 a.m. and Portsmouth at 2.5 p.m. During the past four years Jersey Airways Ltd. have carried more than 119,000 passengers, and of this total 33,300 were flown last year, together with nearly 1,000,000 lb. of mail and freight.

On the 11th of this month North Eastern Airways will introduce regular air services between Hull, Leeds, and Doncaster, to connect with the K.L.M. services to and from Amsterdam and other important European cities. The company will operate a regular air service this summer between Newcastle and Glasgow, where connections will be provided with the London-Perth air route. North Eastern Airways also operate the Humber Ferry service, between Hull and Grimsby, and five return trips each day will be made this summer.

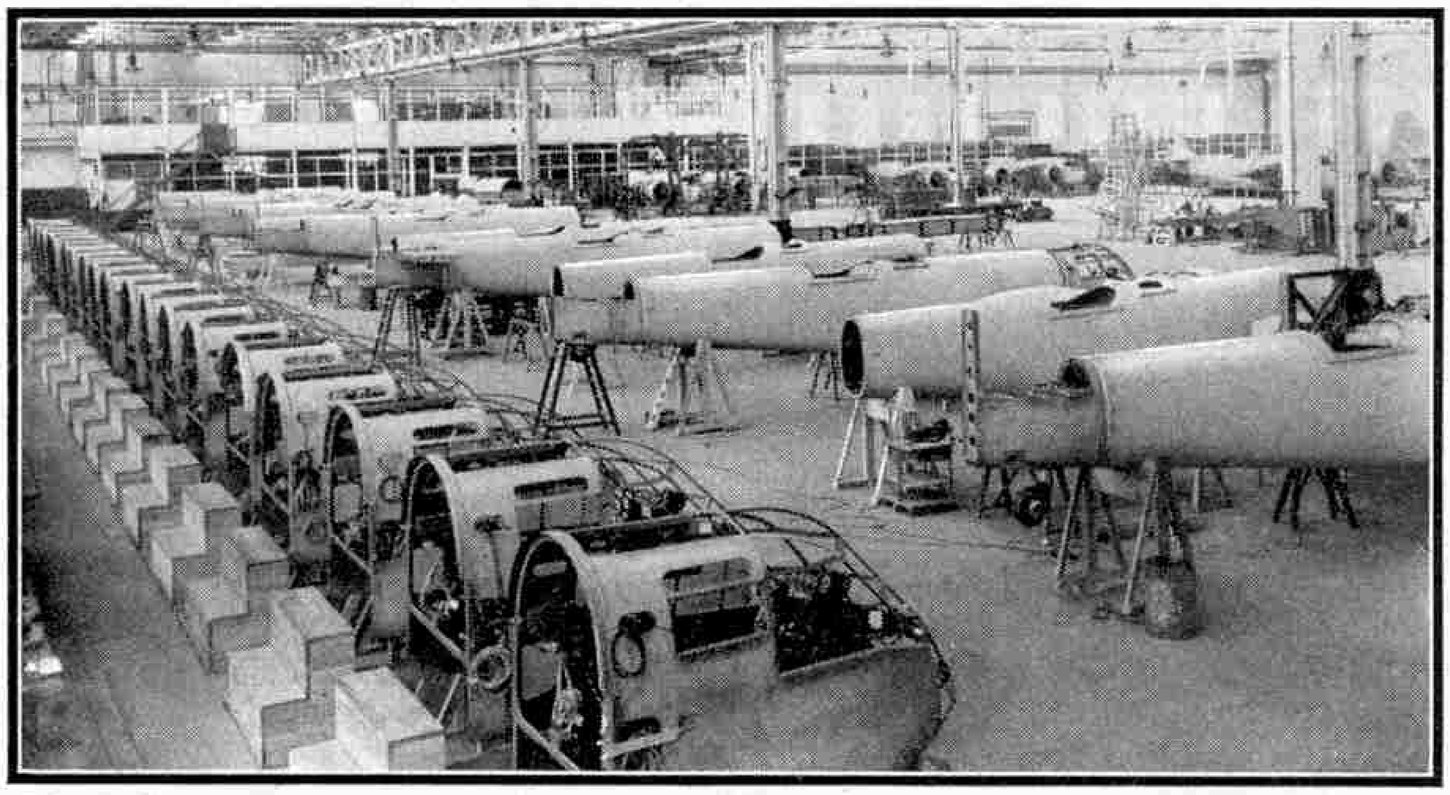
Awards for Outstanding Flights

The Segrave Trophy for 1937 has been awarded to Flying Officer A. E. Clouston for his record flights from England to Capetown and back last year. This Trophy is presented annually for the most meritorious transport achievement by land, sea, or air.

Miss Jean Batten has been awarded the Gold Medal of the Fédération Aéronautique Internationale for her record solo flight from Australia to England in October 1937.

Faster Aeroplanes for Air France

The summer timetable of Air France came into operation on 27th March, and with it Marcel Bloch 220 monoplanes replaced the Wibault "Golden Clippers" on the company's Paris-London service, reducing the flying time from 90 to 75 minutes. The new aircraft will enable the company to cope better with the heavy passenger traffic on this popular route, as the Marcel Bloch 220 seats 16 passengers, as against the 10 carried by the Wibault. It is a twin-engined all-metal monoplane with a top speed of 220 m.p.h., and its very complete equipment includes an automatic pilot. A crew of four is carried.



Bristol "Blenheim" Bombers in course of erection. The nose piece, the main hull, or rear fuselage, and the tail unit of each machine are built separately and are then assembled in the huge workshop shown above. Photograph by courtesy of the Bristol Aeroplane Co. Ltd.

In Trouble Again!

It is remarkable how the accidental omission of a word of four letters can lead to disaster! In the December *"Air News,"* under the heading "More Record Flights," the writer of the note intended to state that Miss Jean Batten holds the records for the fastest solo flights between England and Australia in both directions. Unfortunately his typist, in a moment of mental aberration, omitted the word "solo"—hence the deluge of protests from sharp-eyed readers!

Ancient Gold Mines to be Reached by Air

In regions behind the Andes in Bolivia, South America, are gold mines said to date back to the Inca period. These mines have been inactive for a long time owing to the great difficulty of getting men and equipment to them. A scheme is being completed for the construction of a jungle aerodrome near the mining area, however, so that modern mining machinery can be transported there by air from the nearest supply base. Engineers, technicians, and other personnel also will be flown to the jungle aerodrome. It is claimed that the undertaking will be one of the largest enterprises for the carriage of freight by air ever carried out.

Service Records of Bristol Aero Engines

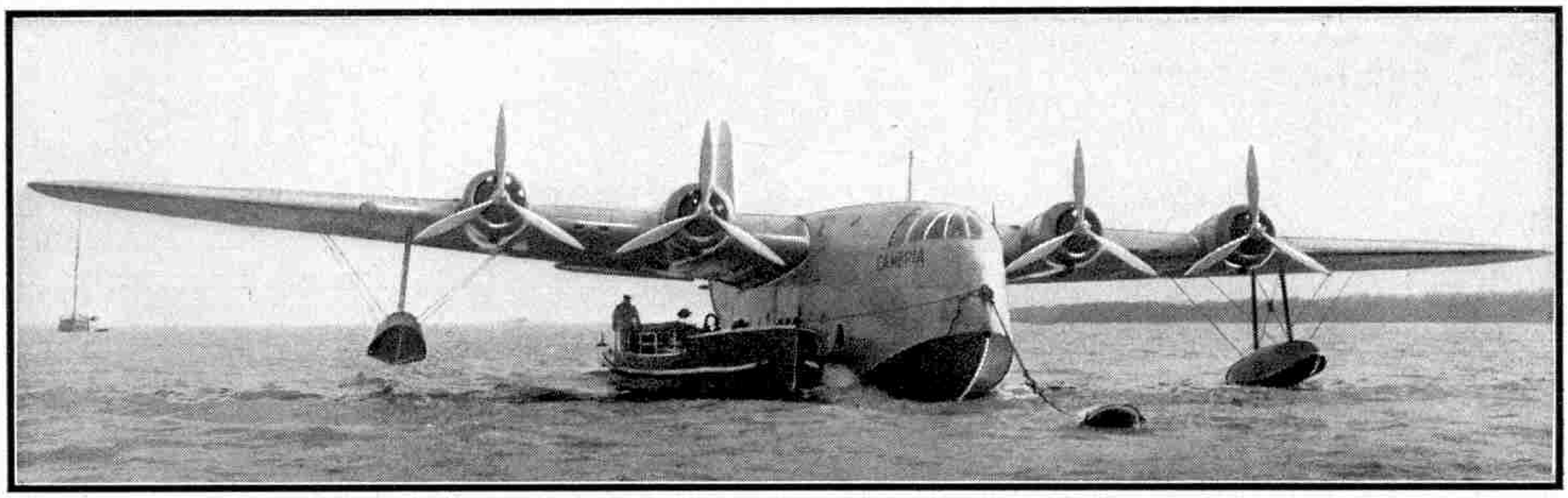
Bristol aero engines have been employed by Imperial Airways for their large air liners and flying boats during the past 11 years, and on 31st December, 1937, there were still 74 of the early type Bristol "Jupiters" in use by the company. Between them these 74 engines had then completed a total of 401,590 hrs. running. The average distance each had flown was 561,328 miles, and one had actually flown nearly 800,000 miles.

These remarkable records are now being rapidly added to by the Bristol "Pegasus X.c." engines of the Empire flying boats. The first of these aircraft was launched about 18 months ago, and already its engines have completed over 76,000 hrs. running. The fleet of Empire flying boats is at present operating at the rate of between 10,000 and 12,000 engine hours per month.

Bristol "Pegasus X.c." engines are also fitted in the lower component of the Short-Mayo Composite aircraft.

Growth of Imperial Airways Traffic

The continued growth of Imperial Airways services and of the traffic carried on them are shown by the 1937 traffic figures recently published by the company. In that year Imperial Airways carried 65,000 passengers, as compared with 35,000 in 1929, and 11,000 in 1924-5, the year in which they began operations. The total number of miles flown last year by the company's aircraft was 5,860,923, which is more than five times the distance flown in 1929, when the total was only 1,032,842 miles. In 1924-5 the total mileage flown was 835,525.



The long-range Empire flying boat "Cambria" which, with the similar aircraft "Caledonia," carried out a series of experimental flights across the North Atlantic last summer. The "Cambria" holds the record for the fastest crossings in both directions. The illustrations on this page are by courtesy of "Flight."

Second Separation Test of Short-Mayo Composite

The mid-air separation of the two components of the Short-Mayo Composite aircraft was publicly demonstrated at Rochester on 23rd February last, when the second separation test was carried out in the presence of a large crowd that included the employees of the builders of the aircraft, Short Bros. (Rochester and Bedford) Ltd. A party of press reporters and photographers were taken up in the Empire flying boat *"Corinna"* so that they might have the best possible view of the demonstration, and two of the port windows of the aircraft had been removed for the benefit of the photographers.

The Composite aircraft, with the seaplane *"Mercury"* locked to the back of the flying boat *"Maia,"* took off from the River Medway and after climbing to a height of about 1,000 ft. circled round for about 30 min. Then a Verey signal light was fired from the cabin of the flying boat, the pilots of the respective components pulled their release levers, and only 10 sec. after the signal had been given the two components separated. The seaplane rose smoothly and almost vertically from the flying boat and was soon ahead of the latter. The flying boat descended immediately and taxied to her moorings, but the seaplane made several circuits of the district before making a good landing on the river.

Names of New Empire Flying Boats

Six "C" class flying boats will be operated by Qantas Empire Airways, the Company in association with Imperial Airways, when the marine Empire air route is extended from Singapore to Australia, which it is hoped will take place in July.

These flying boats will bear the following names, chosen for them by Qantas Empire Airways: *"Carpentaria," "Coolangatta," "Coogee," "Corio," "Coolong,"* and *"Cooee."*

Empire Air Mail Record

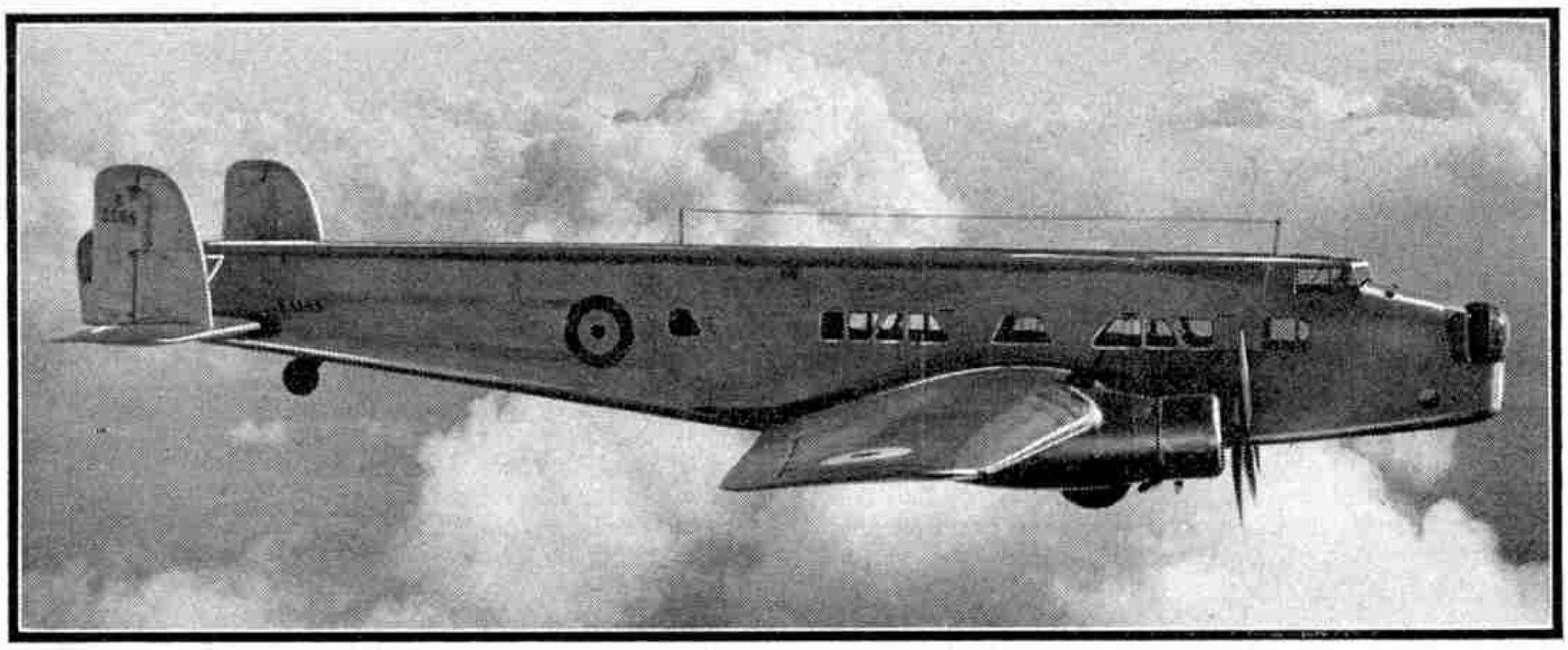
The Empire air mail scheme, by which letter-mails are carried without special fee, was carried a stage further on 23rd February, when the Imperial Airways flying boat *"Centurion"* left Southampton with the first load of non-surcharge air mails, totalling about five tons, for India, Burma and Malaya. In the reverse direction the first non-surcharge mails from those places were brought to England by the Empire flying boat *"Carpentaria,"* which reached Southampton on 6th March. All first-class mails are now carried over the England-Australia air route as far as Singapore for 1½d. per ½ oz.

This extension resulted in the heaviest air mail load on record, for it is estimated that during the week ended 6th March at least 8½ tons of mail were flown from Southampton to India and Singapore, and about 5½ tons to Africa, while the incoming mails totalled well over 5 tons. Thus approximately 19 tons of air mail, a weight equivalent to about 1,250,000 letters, were dealt with in a week.

Record U.S. Long-Distance Flight

A new unofficial world record for combined speed and range of flight in the large aeroplane class was set up recently by six U.S. Army Air Corps four-engined Boeing "Flying Fortresses." The aircraft took off from Miami, Florida, on 17th February, and with only one stop en route flew to Buenos Aires, Argentine, a distance of 5,260 miles. This mass flight was the longest ever carried out by the U.S. Army Air Corps, and was accomplished in a total flying time of 27 hr. 50 min. The first stage of the flight was to Lima, in Peru, and the six bombers covered the 2,695 miles at an average speed of 173 m.p.h. At Lima one of the aeroplanes was delayed by airscrew adjustments. The other five left before it on the second stage, a 2,565-mile "hop" from Lima over the towering snow-capped Andes to Buenos Aires. The sixth followed, and all reached their destination safely, the average speed for this flight being 209.5 miles per hour.

Lieut. Col. R. Olds, who was in command of the flight, had established two new non-stop U.S. coast-to-coast records for military aircraft during the previous month. He flew a Boeing "Flying Fortress" from Langley Field, Virginia, to March Field, California, a distance of 2,317 miles, and back to Langley Field. The double flight was accomplished in 24 hr. 28 min. flying time.



An Armstrong Whitworth A.W.23 Bomber Transport in the air. This twin-engined monoplane is designed chiefly for the transport of troops, stores and other equipment. When used as a bomber the bomb-load is carried internally.

The Survey Flight by *"Centaurus"*

Details are now available of the survey flight by the Imperial Airways *"Centaurus"* from England to Australia and New Zealand, and back, mentioned in the February 1938 *"Air News."* They provide a remarkable tribute to the staunchness and reliability of the "C" class flying boats, the skill and judgment of the crew, and the excellence of the technical equipment of the aircraft. The *"Centaurus"* returned to Southampton in perfect structural and mechanical condition, although it had to alight and take off in difficult conditions.

During the return flight to England, the *"Centaurus"* changed an engine at Alexandria because this particular unit had then become due for routine overhaul. The log of the flying boat mentions also such minor replacements as the changing of a valve by the radio operator. For all practical purposes, however, this memorable flight across the Empire and back was trouble-free.

The Electrified Wirral Lines

Official Opening of Regular Services

By The Editor

THE opening of the electrified lines of the former Wirral Railway on 14th March added another chapter to the story of the long connection of Liverpool with railways. This city may be regarded as the birthplace of the passenger railway system, for the Liverpool and Manchester Railway, opened in 1830, was the pioneer passenger line operated by steam locomotives. The Liverpool Overhead Railway was the first electrically operated system of its kind in the world. In 1903 the Mersey Railway, until then a steam operated line, mostly underground, instituted electric working; and in the following year the line from Liverpool to Southport, now L.M.S. property but originally belonging to the Lancashire and Yorkshire Railway, was similarly converted, being the first stretch of main line to be electrified in this country.

This latest development comprises the electrification by the L.M.S. of the lines of the former Wirral Railway and the establishment of through services between this section and Liverpool in conjunction with the Mersey Railway. Previously trains on the L.M.S. Wirral section were steam operated between West Kirby and New Brighton, and Birkenhead Park, where passengers had to change to make connections with the electric trains of the Mersey Railway; but this change is now eliminated.

One of the new three-car units for the through electrified services on the Wirral section of the L.M.S., and the Mersey Railway. For the photographs and the information in this article we are indebted to the courtesy of the L.M.S.

On the invitation of the L.M.S. I joined the official party presided over by Sir Josiah Stamp on the morning of 14th March at the Liverpool Central (Low Level) station of the Mersey Railway. Although a series of through electric trains had been running on the previous day as a kind of "dress rehearsal" to accustom passengers and staff to the new conditions, this was to be the occasion of the official farewell to the old order and of the inauguration of the new. So the first part of our tour of inspection took the same form as that of the journeys that such vast numbers of passengers have made between Liverpool and the Wirral line. A Mersey Railway electric train took us as far as Birkenhead Park, where a change was made into the last steam-operated passenger train to run between there and West Kirby.

On this part of the run I recalled various "ghosts" from the Wirral locomotive past before the L.M.S. organisation really got into its stride. All were tank engines, two of them of the rather rare 4–4–4 wheel arrangement and some of them second-hand products obtained from larger lines, notably Wirral Railway No. 6, which became L.M.S. No. 6762. This was a standard 2–4–2 tank of the former Lancashire and Yorkshire Horwich design, which for some time in the earlier grouping days proudly wore the red coat of the L.M.S. and was then perhaps the best engine on the Wirral line. The favourite engines latterly have been the Fowler 2–6–2 tanks of the L.M.S., the first few of which were drafted to the Wirral section when new in April 1930, and created quite a sensation among local travellers who up till then had been familiar with small-boilered long-chimneyed engines.

With a farewell to steam traction at West Kirby the party now boarded one of the new electric trains specially developed by the L.M.S. for this service. These are unique in that they combine the well-known features of the main line stock of the company with various characteristics peculiar to the vehicles used on suburban electric railways. As we glided along in the smooth-running well-sprung car, beautifully upholstered and appointed, I could not help comparing conditions with those on the several journeys that I had made in the old Wirral days in rather grim vehicles that jolted me about on their seats of a surprising degree of hardness!

On arrival at Birkenhead North, which may be termed the "nerve-centre" of the new electrified system, the party proceeded to inspect the electric sub-station and repair shops, and a description of the equipment is given later in this article. This done we again entrained, this time to ride over the other leg of the Wirral route to New Brighton. It was a strange experience to run alongside the sandhills between Wallasey and New Brighton in a purring electric train, where previously the fairly steep gradient up into New Brighton used to be "rushed" by the panting steam locomotives of the Wirral Railway. On the return journey too from New Brighton to Liverpool it was novel, after years of familiarity with the change from one train to another at Birkenhead Park, to be able to run through from the L.M.S. on the Mersey Railway metals. So we went back through the tunnels to Liverpool Central where the tour ended.

The Wirral electrification covers 24 single-track miles, including sidings, and faster and more frequent services are provided throughout the day between the Wirral district and Liverpool. The new standard timing of 29 min. from West Kirby to Liverpool, including stops at all stations, replaces the average schedule of 36 min. previously in force. On the New Brighton line the through journey now occupies 20 min. instead of the previous average of 27 min. Through services are worked from West Kirby and from New Brighton at ten-minute intervals in the morning and evening rush hours, and also for a short period at midday. During the slack hours a fifteen-minute service is provided.

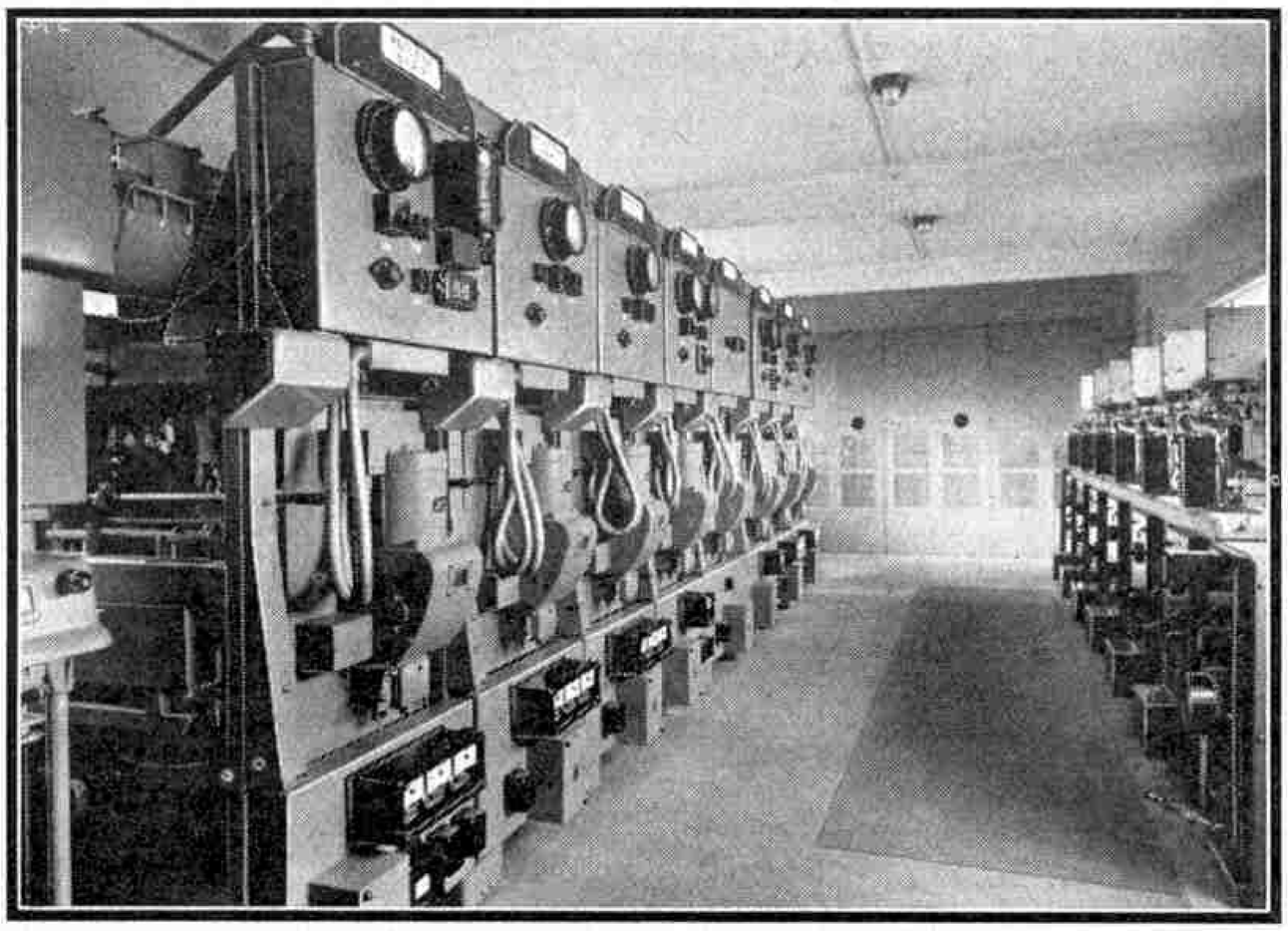
On the Wirral lines the conductor rail is laid at the side of the running rails and is of the flat-bottomed type, the normal rail length being 60 ft. At the joints bonding is effected by welded copper bonds and similar bonds are used for the running rails, the return path for the current. A considerable amount of engineering work has been necessary to prepare for electrification. On the permanent way, the relaying programme was extended so that bonding could be carried out on rails with long life. It was necessary to extend one side of the triangular layout at Bidston. As this is on an embankment a considerable amount of tipping had to be done and two culverts had to be extended. In addition a culvert near Birkenhead North had to be extended to allow of access to the new repair shop and new carriage shed.

The new trains provided by the L.M.S. comprise 19 three-car sets each consisting of a motor coach, a trailer and a driving trailer. The coaches are of the centre-gangway saloon type, and are of all-steel welded construction. The normal make-up of a train consists of a double unit of six coaches. The outer ends of each three-car unit are equipped with centre couplers of the buck-eye type, and are without side buffers. Such buffers are, however, provided between the individual coaches of each three-car set, and the couplings there consist of a single slotted link connected to drawbars pulling on rubber springs.

An important feature of the trains that makes for rapid handling at stations and also helps to reduce draughts in bad weather is the use of air-operated sliding doors. These are controlled by the guard, but push buttons are provided both inside and outside the cars, so

that the doors can be opened by passengers themselves. There are four doorways to each car. The trains are painted in the familiar L.M.S. red and with their flush-finished exterior surfaces they have a neat and handsome appearance. Under present arrangements these trains run on the West Kirby route only on week-days, the New Brighton service being provided by the trains of the Mersey Railway. On Sundays, however, the L.M.S. and Mersey trains are intermixed on the two services.

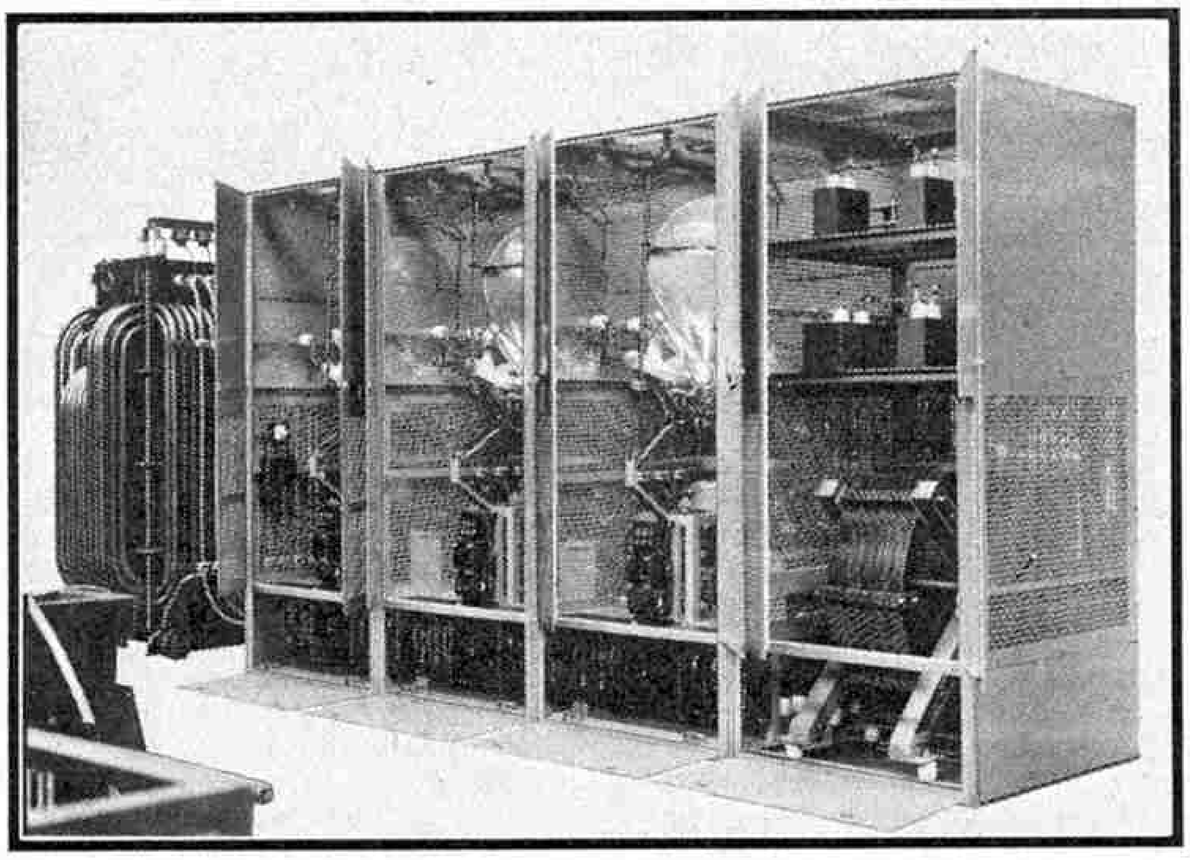
The Mersey Railway has had a considerable share in the preparation for the new services. A certain number of new coaches have been in use for some time, trains have been increased from five to six coaches, and in order to accommodate these the lengthening of some of the platforms on the Mersey system has been effected. Older vehicles have been refurnished throughout. Electric heaters have been installed in view of the use now of these trains in the open, such provision having been unnecessary when they were confined to their own route, which is almost exclusively in tunnels. In addition the storage reservoir system for providing compressed air for the Westinghouse brakes has given place to the use of motor-driven air compressors.



Part of the interior of the sub-station at Birkenhead North. At this station current is received from the Liverpool supply and is distributed to the other sub-stations.

As the Mersey Railway makes use of a side conductor rail with a centre rail return, while the equipment on the L.M.S. Wirral section involves only a side conductor rail with running rail return, it has been necessary to fit up the new trains and the existing Mersey trains with special switching arrangements to make them suitable for use on both systems. In the earlier stages of the work, too, the conductor rails on the Mersey Railway had to be altered in position to conform with the recognised modern standard adopted on the L.M.S. section. To facilitate the movement of passengers four high-speed lifts have been installed at James Street Station, Liverpool. They are reputed to be the largest electric lifts in the country, and they operate at a speed of 400 ft. per minute. The Mersey Railway also have been concerned with the alterations carried out at Birkenhead Park Station in order to provide for the through running of trains between the Mersey and the Wirral systems.

The Mersey Railway tunnel is made use of to carry the power cables from the supply of the Liverpool Corporation to the L.M.S. sub-station at Birkenhead North. Each of the two cables is about 5,800 yds. long, and for most of that length is laid on battens supported by brackets well up in the roof of the tunnel. The whole of the current distribution throughout the Wirral section is under the control of two men at Birkenhead North sub-station. This is the only staffed sub-station on the system, the others at Bidston, Wallasey, Moreton, Meols and Hoylake being remotely controlled from Birkenhead North. In the control room there is an illuminated chart showing the electrified area and from this any variation or failure of the power supply throughout the electrified area can be located.



An important part of sub-station equipment, the transformer and rectifier units. These reduce the high-voltage alternating current from the transmission lines to direct current at 650 volts for feeding to the track.

At the sub-stations alternating current at 11,000 volts is converted into direct current at 650 volts by means of transformers and rectifiers, and is fed out to the track through high-speed circuit breakers. For the most part the high-tension feeder wires are of the overhead type supported on wooden poles. In four places it has been necessary to interrupt the run of a section of overhead construction to avoid obscuring signals and to give clearance to anyone working on the signal posts. Except that Bidston and Birkenhead North have additional tracks to feed, all the sub-stations are alike as far as conversion and direct current distribution is concerned. The arrangement of high-tension switch gear and auxiliaries is exactly alike at Meols, Hoylake, Bidston and Wallasey, but Moreton and Birkenhead North stations have more high-tension switch gear than the other four.

A repair shop and carriage shed have been established at Birkenhead North. The repair shop is well equipped for all ordinary maintenance work with electric trains and it has three repair roads, each capable of accommodating a three-car unit. Two of these roads are provided with inspection pits. A 15-ton overhead electric travelling crane serves the whole length of the shop. An interesting part of the equipment is a universal machine tool that combines the functions of a lathe, drilling machine, sawing and planing machine. The carriage shed is adjacent to the repair shop and has four roads each capable of accommodating a six-car train. In this shed rolling stock is washed down and receives daily examination and attention. No conductor rails are laid in this shed, but to enable trains to run in and out under their own power special overhead trolleys with "jumper" cables have been installed.

Existing mechanical signalling arrangements and track circuits have been retained on the Wirral lines, with certain alterations and additions at various points to allow for the intensified service. Modifications to the triangular junction layout at Bidston and the alterations carried out at Birkenhead Park have involved the rebuilding of signal boxes. At Bidston one cabin has replaced two former boxes, and at Birkenhead Park a new central cabin with 60 levers has been erected.

The L.M.S. have taken the opportunity of the electrification to modernise the stations on the Wirral lines. In carrying out this work, reinforced concrete has largely been employed both for station buildings and foot-bridges, the result being a clear-cut appearance in which utility and simplicity of outline are happily combined. Considerable improvements have been made to the station lighting, waiting-room and booking-office accommodation. In anticipation of residential development and the increased traffic that it is expected will arise from electrification, a new passenger station is to be provided at Manor Road, between Meols and Hoylake.

The completion of this electrification scheme is a step towards the co-ordination of transport services in the Merseyside area.

It is an interesting coincidence that on the same day as the official inauguration of the Wirral services the L.N.E.R. commenced to operate electric trains between Newcastle and South Shields, a development of the original electrification in the Newcastle area that was opened in 1904. The newly-electrified line is 11 miles in length and is an important suburban route used by five million passengers during the course of a year. New rolling stock of modern design, brightly finished both inside and out, has been provided. I hope to include an article on this Tyneside development in an early issue of the "*M.M.*"

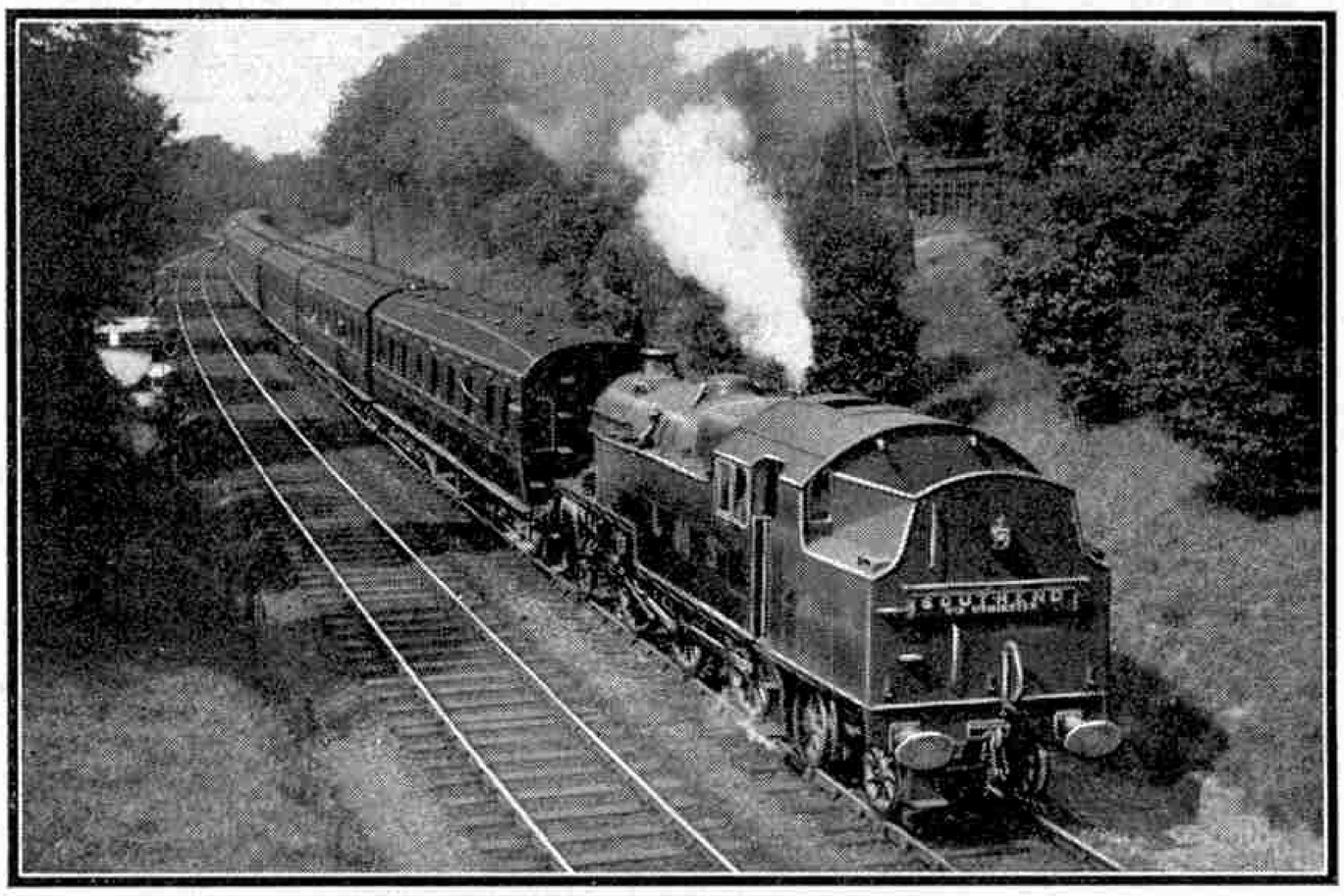
The Tilbury Section of the L.M.S.

Intense Railway Working

By a Railway Engineer

AMONG the minor railways of Great Britain that have long since lost their separate identity in one or other of the four great groups, there never was a busier line than the London, Tilbury and Southend. The "Tilbury" was indeed one of the earliest of such lines to disappear, for it was taken over by the Midland Railway in 1912. Yet although many of its outwardly distinctive features, such as the beautiful locomotive livery, are almost forgotten, and its operation is entirely on standard L.M.S. lines, the fundamental characteristics of the service remain unchanged to-day, and give the line a unique interest for railway enthusiasts.

Traffic during the rush hours has to be seen to be believed. The expeditious way it is handled at Fenchurch St. terminus is all the more remarkable in view of the fact that the station does not belong to the L.M.S. at all, but to the L.N.E.R., and that the owning company work a train service which, if not as dense as that of the L.M.S., certainly is very heavy. But the "Tilbury" has always worked under a disadvantage at the London end, and its vast business has grown up in a curiously indirect way. The original line, which ran to Tilbury only, was promoted jointly by the old Eastern Counties Railway, and the London and Blackwall Railway that ran from Fenchurch St., their object being to provide a short cut, by means of the Gravesend ferry, from towns lying south of the river, right into their own territory. The two promoting companies were ultimately merged in the Great Eastern Railway, and the first route to Tilbury was little more than a branch of the G.E.R. diverging from the Colchester main line at Forest Gate, and running thence in a direct line to Tilbury, via Barking.



A Southend express hauled by L.M.S. three-cylinder 2-6-4 tank locomotive No. 2534 near Westcliff. This photograph and the upper one on the next page are by Mr. E. R. Wethersett.

A fair proportion of the first trains used Bishopsgate as their London terminus, while others travelled via the spur from the Great Eastern main line, at Bow Junction, to the Blackwall line at Stepney, and so into Fenchurch St. This even at the best of times was a roundabout and congested route, and in 1858, four years after the opening of the Tilbury line, a short cut was brought into use so that the Great Eastern main line was avoided altogether. This new section branched off at Gas Factory Junction, just beyond Stepney, and then ran due east through Plaistow, where the "Tilbury" locomotive works were established, to Barking. But even this shortened line still constitutes a more difficult start out of London than that of any other railway. There is a slack to 5 m.p.h. through Stepney, and another to 20 m.p.h. over Gas Factory Junction; and it needs really good going if the first 7½ miles out to Barking are to be covered in 14 or 15 minutes.

Great Eastern influence was quite predominant in the early days. The locomotives and carriages came under the superintendency of Mr. Adams, the G.E.R. chief; and until 1880 the little company had no engines of their own. In that year Sharp Stewart and Company delivered some very fine 4–4–2 tank engines for the design of which Mr. Adams was certainly in part responsible, but with them from Manchester came Mr. Thomas Whitelegg, as supervising engineer, for their running in, and so on. With his arrival the individuality of the Tilbury really began, and after a short time he was appointed locomotive superintendent. Traffic was going up by leaps and bounds; the little seaboard towns of Leigh, Westcliff, Southend, and Thorpe Bay grew from summer resorts that had been popularised by the new pastime of sea-bathing into one vast dormitory for London workers, and something considerably faster was needed in the way of train services than was possible by the roundabout route via Tilbury.

So, some 35 years after the original railway was opened, the direct cut-off line was opened from Barking to Pitsea. The shortened route involves some stiff pulling over the Laindon hills, where the gradient is 1 in 110 for 3½ miles going east, and much the same for a slightly longer distance in the westbound direction. Strangely enough, too, the junctions at both ends were laid in such a manner as to necessitate severe speed restrictions by trains taking the cut-off line; these slacks are 30 m.p.h. at Barking, and 40 m.p.h. at Pitsea.

The next milestone in Tilbury history came in 1912, when the line was bought by the Midland Railway. The most noticeable change, and one greatly regretted by lovers of the distinctive in locomotive liveries, was the disappearance of the old colour—a bright apple green, set off by much beautiful lining out. And with the familiar Midland style of painting there came many attempts to work the line with Standard Derby engines. Some of these, and notably the "Class 2" 7 ft. 4–4–0 type, proved very efficient, but it is of course impracticable to work such a line regularly with tender engines, when at Fenchurch St. the time between incoming and outgoing turns is often as short as 12 minutes. The light engine movements before and after turning would in any case be a serious hindrance to traffic operation amid such dense occupation of the line as occurs outside the terminus. As indicating the pressure at which the service is worked, water columns are provided adjacent to the buffer stops so that incoming engines can be watered while unloading and re-loading of their trains is in progress. Then they back out into the engine siding just clear of the platform end, and in about five or six minutes they are "right-away" to Southend again on the next train.

The huge Baltic tank engines built in 1912 by Mr. R. H. Whitelegg, son of Thomas Whitelegg, were soon transferred to the Midland Railway proper, and the various classes of 4–4–2 tank turned out by the elder Whitelegg were left in sole possession. So they remained for over 20 years, until the standard L.M.S. 2–6–4 tanks arrived on the scene.

Nowadays, when the heaviest main line work is almost exclusively handled by the 3-cylinder Stanier 2–6–4 tanks, the old 4–4–2s are mostly to be found on stopping trains routed via Tilbury, where they are still doing excellent work. Tilbury itself has regained some of its old importance, since it has become a great port. The liner specials for Orient, P. and O., Cunard, and Union-Castle sailings are an important feature of modern traffic. They are operated from St. Pancras and worked by Midland main line engines such as the Class 2 4–4–0s or the standard Class 4 goods 0–6–0s. The Stanier 2–6–4 tanks, which on account of their sirens are sometimes referred to as the "Tug-boat Annies," are admirable engines for the Southend expresses, and with them full regulator and 15 per cent. cut-off is the usual order of the day. Even on the stiff ascent to Laindon very little more is needed with loads of 400 tons.

To illustrate the smart work needed with different classes of traffic I have chosen two runs, one with a fast residential train, and the

other on a smartly timed "intermediate" service with which several stops are made between the coast towns and the metropolis. The "Saturdays only" 2.8 p.m. from Fenchurch St. is a train the punctual running of which is dependent upon equally good work by all of the great procession of expresses leaving the terminus at four to five minute intervals between 12.30 and 2 p.m.

On a run with this train it was interesting to be hauled by one of the large Whitelegg 4-4-2 tanks, No. 2148. The tare weight of the train was 278 tons, but being of non-corridor stock and packed with passengers the gross load was at least 315, and possibly 320 tons. For the first 3 miles the line is carried on arches, and across a perfect sea of housetops there are glimpses of the Tower of London and of great warehouses lining the river. We called at Stepney, and then set out on our non-stop run to Benfleet, 27.4 miles.

L.M.S. 2-6-4 tank No. 2532 on an up express from Shoeburyness. The use of the destination board on the engine is a characteristic practice that has survived since the independent days of the Tilbury line.

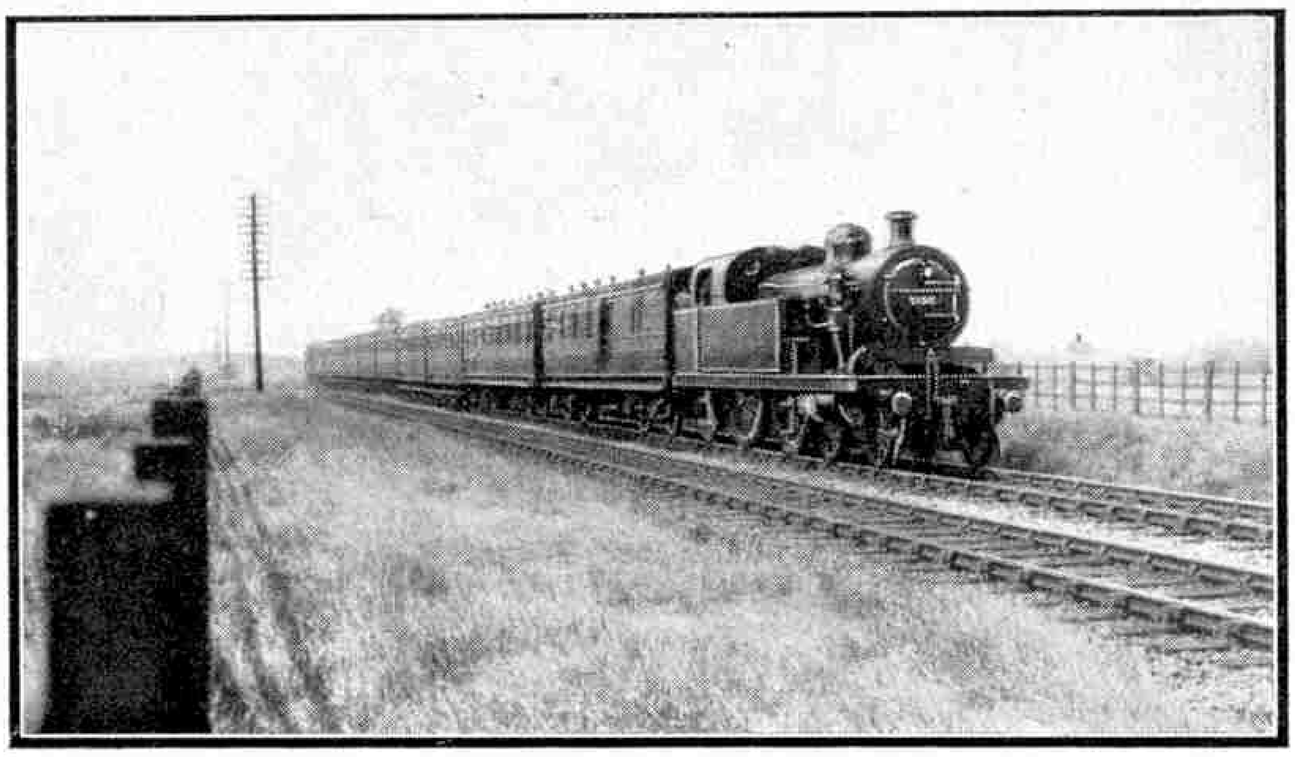
Close on the heels of an L.N.E.R. train we were brought practically to a stand by signals ere Gas Factory Junction was cleared, but once on to L.M.S. metals we got ahead in fine style. Touching 48 m.p.h. through Plaistow, only 2 miles beyond the slack that nearly stopped us, we then eased carefully to 40 m.p.h. over the Little Ilford curves, and still further to 30 m.p.h. through Barking; but in spite of this fine recovery the 4.9 miles from Stepney had taken 11½ minutes. The engine was now opened well out, and through the rapidly spreading suburbs of Becontree and Dagenham, where the line is level at first, we worked up to 47½ m.p.h. The grades begin beyond Dagenham, but with the regulator nearly full open No. 2148 maintained 42–43 m.p.h. steadily up the 1 in 150 past Hornchurch. On these engines there is rarely any adjustment of cut-off once the train is well on the move; 30 to 35 per cent. is about the usual figure, except at starting.

The town of Upminster, lying astride a range of low hills and itself crowned with a picturesque windmill, is the terminus of the London Transport electric trains, which run alongside the Tilbury line, and it forms a gateway to the real Essex country beyond. The 7.7 miles up the bank from Barking had taken 11 minutes, and then we were soon galloping down the gentle descent to East Horndon. Touching 58 m.p.h. through this station, we now had sufficient impetus to take the really hard climb to Laindon under fairly easy steam, and only in the last mile of 1 in 110 ascent was the exhaust of the engine audible from the second coach of the train. We came over the crest at exactly 30 m.p.h., good work for a non-superheater 4–4–2 tank hauling 315–320 tons.

We coasted down to Pitsea, not exceeding 55 m.p.h., and after the usual severe slowing over the junction there came a slack for permanent way repairs. We were now on that fascinating stretch of line between the hills and the sea, where the dormitory towns have grown up round quaint little ports, and the lovely old-world churches stand out as beacons among modern growth. So far the driver had managed to keep off the tail of the train in front, but now there were frequent whistlings for signals, and the last 2.6 miles from Pitsea to the Benfleet stop took 5½ minutes. Our total time from Stepney was exactly 43 minutes, and the net time 38 minutes.

In the opposite direction of running I found one of the Stanier 3-cylinder 2–6–4 tanks in great form with an almost identical load, 315 tons. Starting from Benfleet, speed was worked quickly up to 51 m.p.h. before the slack over Pitsea Junction; then we went up the 1 in 110-132 of Laindon bank at a steady 44–45 m.p.h., and the 6.3 miles from Benfleet to Laindon were completed in just 10 minutes, start to stop. Restarting, the engine was quickly into her stride; East Horndon was passed at 67 m.p.h. and up the subsequent rise speed had not fallen below 50 m.p.h. when steam was shut off for Upminster. The 7.5 miles from Laindon were run in the smart time of 9½ minutes. Here, passengers are set down for the underground line, and also for the single-line branch to Romford; the latter is worked by an old Midland 0–4–4 tank engine equipped for push-and-pull auto-train working. Some further smart running took place on the favourable run to Barking; 60 m.p.h. was reached in 2¼ miles from the start, and then No. 2524 went on through Dagenham and Becontree at a steady 65–66 m.p.h. In spite of a bad signal check at Barking East Junction the 7.7 mile run took only 12½ minutes, and we had passed Becontree, 5.7 miles, in 7¾ minutes from the start. The remaining 7½ miles into Fenchurch St. took 21 minutes inclusive of the regular stop at East Ham and a signal stop at Stepney; the only point of note was a lightning start from East Ham wherein 50 m.p.h. was attained in just a mile from rest.

Thus, although the bright engine livery has gone, and the "Tilbury" forms but a small part of Britain's greatest transportation concern, there is ample evidence that the expert handling and careful maintenance of engines that so characterised the old independent days is still well to the fore. The modern locomotives are kept beautifully clean, and however much we may regret the passing of the old colours it must be admitted that a black engine with its red lining, and lettering in red and gold, can look very smart, when really well groomed as on the "Tilbury."



A down stopping train headed by a large 4-4-2 tank locomotive of the former London, Tilbury and Southend Railway. This type of locomotive undertook the hardest duties on this line.

A detail of Tilbury practice that has survived until the present day is the use of destination boards carried at the front or the bunker end of the locomotives according to the direction in which they happen to be travelling. These indicate very plainly where the train is bound for and typical examples can be seen in two of the accompanying photographs. Mention of this recalls the practice in Tilbury days of placing on the lamp bracket in front of the engine chimney a small board bearing the letters "L.T.S.R." This together with the destination board, the screw jacks alongside the smoke-box and the Westinghouse brake pump, and on the buffer beam the rather prominent guard-irons and side coupling chains, gave Tilbury engines quite a complicated appearance when seen from the front end. Some of these features, except the "L.T.S.R." board, are still to be seen.

With the partial displacement of the "natives" from the Tilbury line owing to the introduction of L.M.S. standard types, some of the Tilbury tanks have wandered a long way from their own system. They have been at work in various districts on the Midland Division of the L.M.S., notably in the Birmingham area, although the last exile of this kind that I saw was at Sheffield! Some years ago too a Tilbury tank was tried on the Somerset and Dorset line.

ENGINEERING NEWS

A Giant Hydraulic Accumulator

Where a large number of hydraulically operated machines are installed it is usually necessary to have some reserve power in order to meet sudden or abnormal demands. This reserve is stored by means of a hydraulic accumulator, and the illustration on this page shows what is probably the largest hydraulic accumulator of its type. It was built by Glenfield and Kennedy Ltd., Kilmarnock, and is installed at Leith Docks.

The accumulator takes the form of an upright underground cylinder fitted with a close-fitting piston or ram, which is 24 in. in diameter and has a stroke of 36 ft. A large weighted ballast tank is fixed to the upper end of the ram, which is raised slowly by pumping water into the cylinder. When there is a sudden demand for power the weight is allowed to fall quickly, thus forcing out water into the supply pipes.

The ballast tank of the Leith installation is 10 ft. 6 in. in inside diameter and 34 ft. deep. It is loaded with discarded granite roadway sets, which with the tank itself give a total weight on the ram of 161 tons. The working pressure is 800 lb. per sq. in. The steel tower up and down which the ballast tank moves is 87 ft. 11 in. in height from ground level. The ram and cylinder are made of high grade cast iron. Each is in two parts. The sections of the ram are joined together by a threaded internal dowel, and those of the cylinder by external flanges and bolts.

Lamps for Film Work on the *"Lusitania"* Wreck

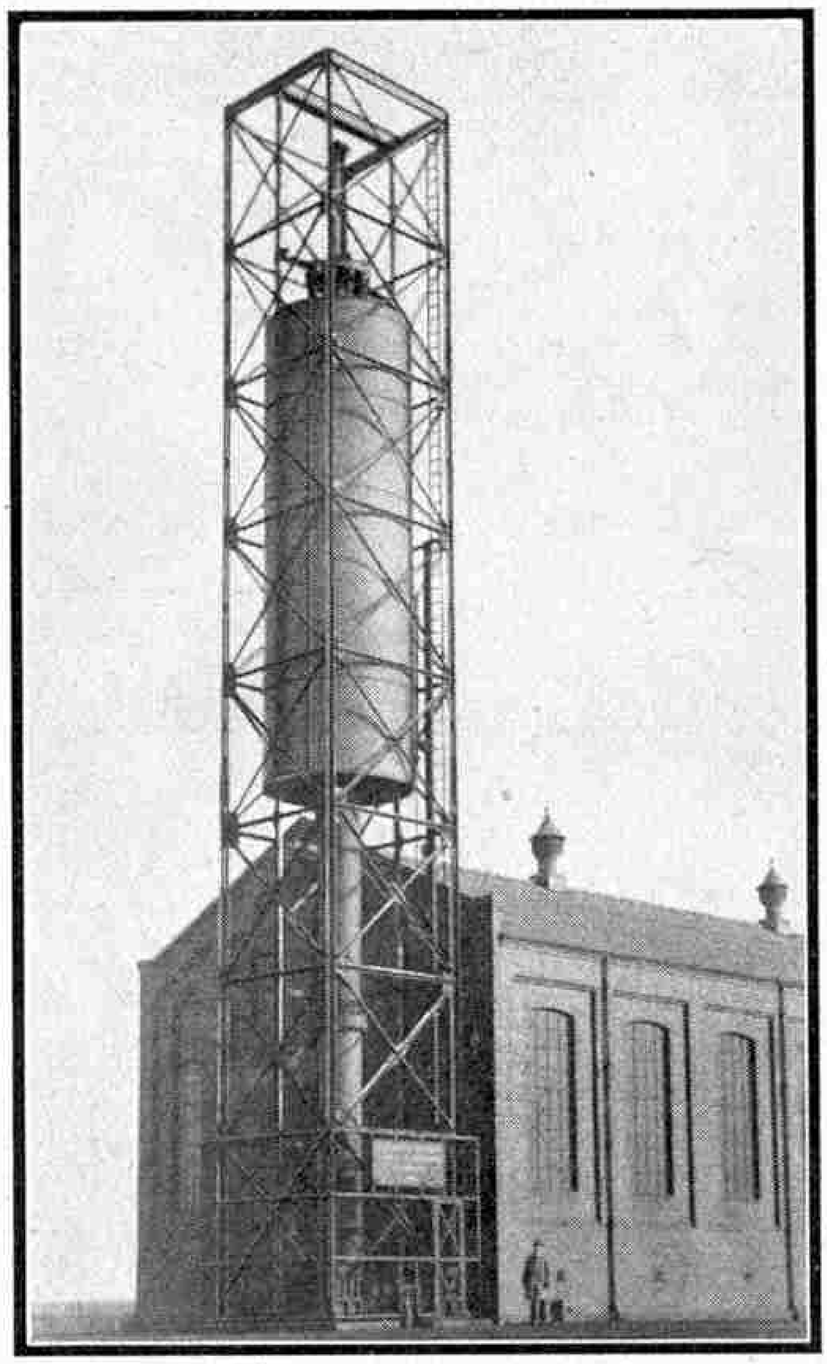
A battery of 12 of the most powerful lamps ever designed for deep sea work will form part of the equipment of Captain John D. Craig when he descends to film the salvage operations of R.M.S. *"Lusitania"* this year. The new lamps, which have been developed by engineers of the General Electric Co. Ltd., are built to withstand the water pressure encountered around the hull of the vessel as she lies in 312 ft. of water off the Irish Coast. They will be mounted on a special submarine stage to floodlight the scene.

The intense heat at which the lamps operate would cause them to fail in a few minutes if used in the open air. Owing to the cooling action of the water, however, their life on the sea bed will be about 25 hrs. The bulbs are made of special hard glass transmitting ultra-violet light in order to provide the best possible photographic light. They are filled with a mixture of nitrogen and argon, and are fitted with special rubber insulation to insure perfect waterproofing.

A Weir Across Niagara River

A great concrete weir 900 ft. in length has been constructed across the Niagara River, about half a mile above the Falls. It has been built by the Canadian Niagara Power Co. Ltd., and is adjacent to the intake of one of the Company's hydro-electric power stations. Its purpose is to restore the level of the river to that existing in 1905, when the power station was built. The fall that has taken place since that time is due partly to a long period of abnormally low water levels in the Great Lakes, and partly to the diversion of water from points upstream to other power plants. The weir also will help to preserve the scenic beauty of the Falls by giving a better distribution of water.

Many difficulties were met in building the weir, for the river bed is irregular and the water rushes past this point at a speed of 15 ft. per second.



A hydraulic accumulator at Leith Docks that is probably the largest of its kind in the world. Photograph by courtesy of Glenfield and Kennedy Ltd., Kilmarnock.

Rebuilding the Menai Bridge

Menai Bridge, built a little more than 100 years ago by the famous engineer Thomas Telford to connect the mainland of North Wales with Anglesey, is now to be rebuilt at an estimated cost of £228,000 in accordance with a scheme prepared by Sir Alexander Gibb and Partners, Westminster, consulting engineers. The masonry towers and viaducts of Telford's structure will be retained, but the wrought iron chains and the floor of the 580 ft. main span will be taken down and a new deck constructed. This deck will be carried by chains of a special high-tensile steel.

The present bridge has two carriageways, each 7 ft. 9 in. in width, and these will be replaced by a single one with a width of 23 ft. In addition, two footways, each 5 ft. wide, will run the whole length of the bridge, passing on the outside of the towers. The arched openings through the towers will be widened in order to allow for the passage of large vehicles.

The bridge will not be closed during reconstruction, except for short periods. Temporary steel towers will be built round the outsides of the permanent masonry towers, and wire ropes passing over their tops will give additional support to the existing deck while the old outside chains are taken down and the new ones erected. The new deck will then be erected underneath the old one. The final tasks will be the removal of the latter, the raising of the new deck to its proper level, and the removal of the temporary towers and cables.

Huge Press for Aeroplane Parts

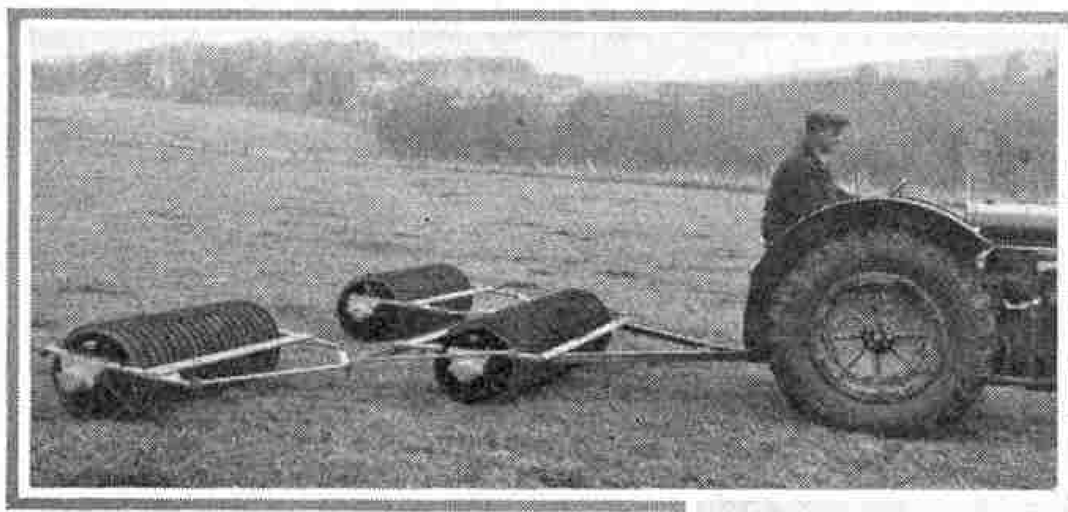
Aluminium alloy parts for Douglas aeroplanes are now being produced by what is claimed to be the world's largest hydraulic press, which was installed recently in the works of the Douglas Aircraft Company Inc., at Santa Monica, California. This great machine was built by the Hydraulic Press Manufacturing Company of America. Nine 12-wheel lorries were required to transport it in parts from the makers' works to California, and when erected it was as high as a four-storey building.

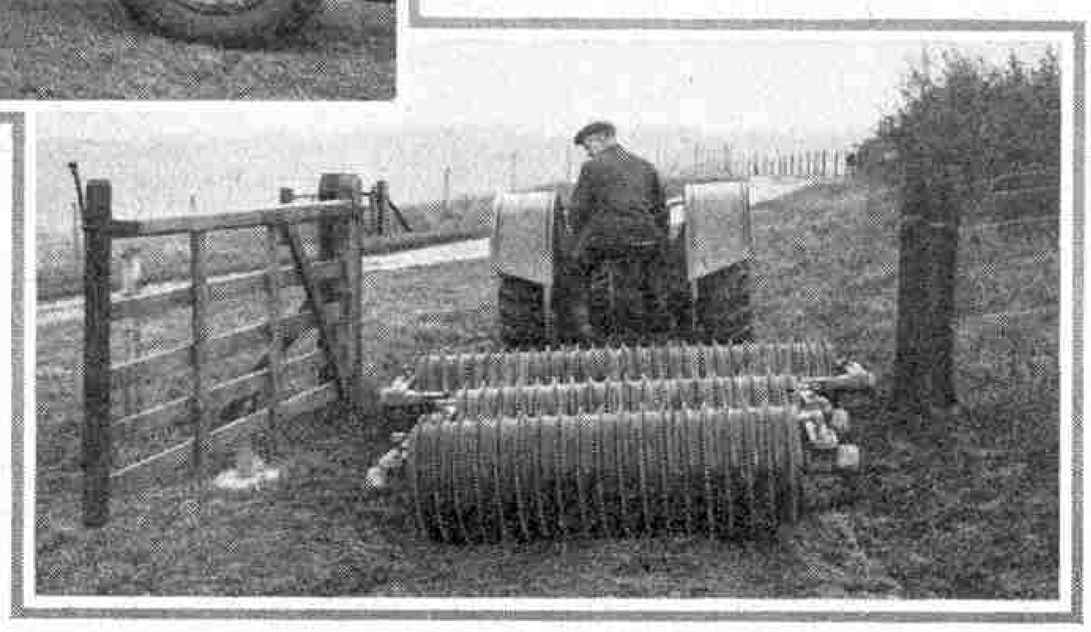
The giant ram of the press is operated by oil, which is pumped into the cylinder at a pressure of 2,500 lb. per sq. in. by a battery of centrifugal oil pumps, driven by two 150 h.p. electric motors. The total force exerted by the ram is said to be 10,000,000 lb. The oil is pumped directly into the cylinder without passing through any intervening valves. This results in rapid working and renders the operation of the press extremely simple. The press is used for forming over 3,000 different parts, all of aluminium alloy, several of which can be produced at a single pressing.

Three Rollers in One

The upper illustrations on this page show two views of the "Cambridge Roller," a new three-in-one machine that saves a considerable amount of time on the farm. The three rollers work in triangular formation. They have a total rolling width of 16ft. and their use enables the task of rolling land to be carried out far more rapidly than is possible with an ordinary single roller.

The three rollers can be arranged in tandem for transport from one part of a farm to another. In this formation the overall width is only 8 ft. 3 in., which allows the machine to pass through gates and narrow lanes.





A novel "three-in-one" tractor roller. It is seen in working formation above, and with the rollers in tandem on the right. Photograph by courtesy of R. A. Lister and Co. Ltd., Dursley.

Building the Albert Canal

Rapid progress is being made with the new Albert Canal in Belgium, which is being built to shorten the distance by boat between Liége and Antwerp. The canal is about 70 miles in length, and two adjoining sections are already in use.

The new waterway branches off the canalised River Meuse below Liége, and is divided into seven reaches. It is to have a minimum width of 85 ft. and a depth of 16½ ft. in the centre, and will be large enough to allow the passage of 2,000-ton Rhine boats. It will be crossed by 46 bridges, all of which will be stationary, except those giving access to the docks at Antwerp.

A New Element for Electric Furnaces

A new type of electric furnace element capable of operating at 3,000 deg. F. was recently shown at work in Pittsburgh, U.S.A. The makers claim that the element shows no signs of deterioration after 4,400 hours at this high temperature, and appears to be resistant to attack by hydrogen, oxygen, hydrocarbons, and sulphur and its combinations. If the new element possesses all the characteristics claimed for it, it will greatly increase the usefulness of electric furnaces in industry, and might lead to improvements in electric cookers.

Steel Alloy for Magneto Construction

A newly-discovered nickel-iron-aluminium-cobalt magnet steel known as "Alnico" is now being used in the making of magnetos that are claimed to develop hotter sparks than those incorporating magneto made of other steels. The new magneto is suitable for use with spark-ignition engines of all kinds.

A Coal-Oil Distillery for South Wales

A new works for the low-temperature carbonisation of coal is being constructed near Bridgend in South Wales. It will comprise three separate plants; a coal-oil distillery for the production of aviation petrol, Diesel oil and fuel oil, a carbonising plant, and a large plant for the making of tar acids and other chemicals.

Showcards Fixed by Magnets

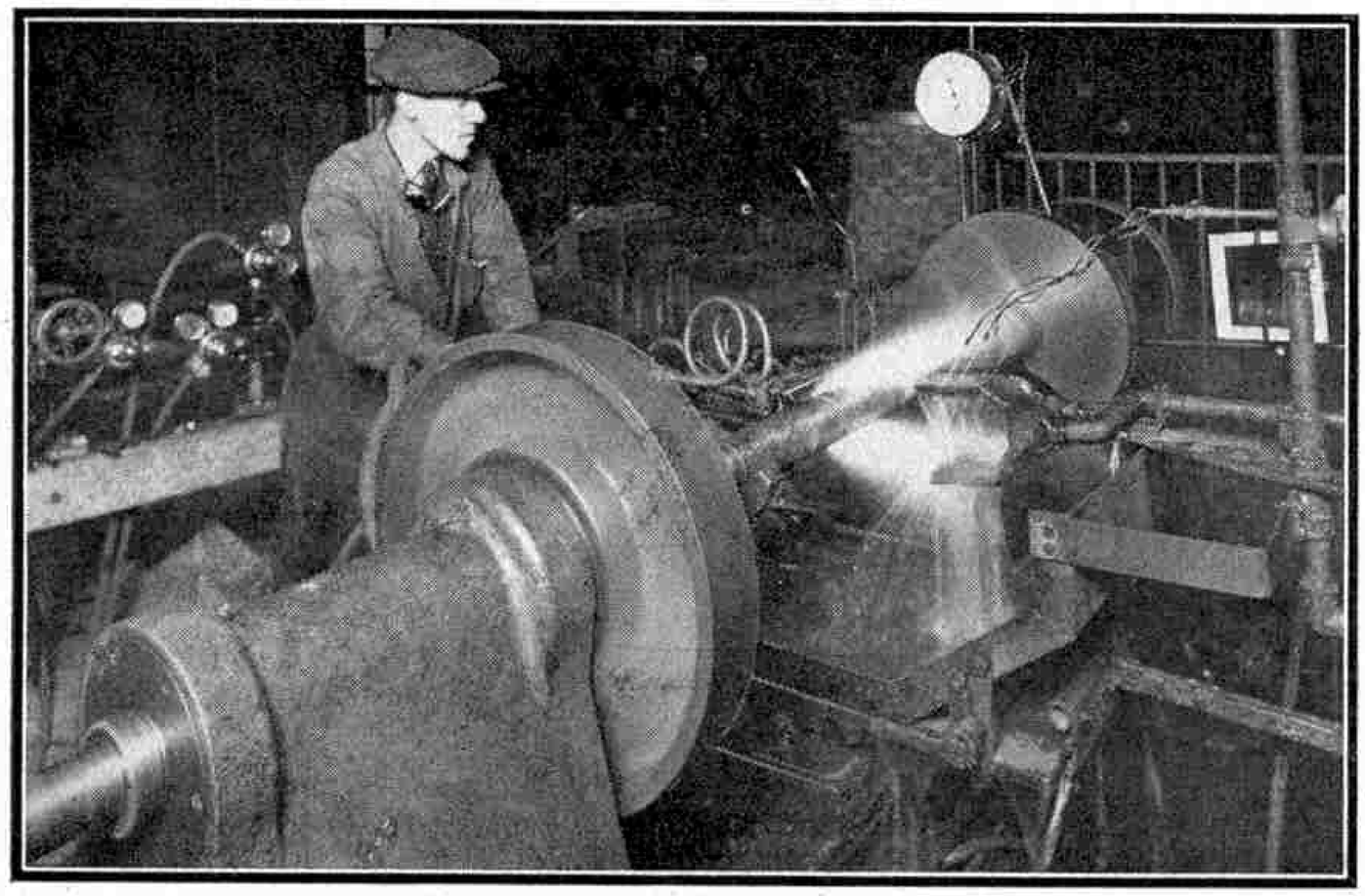
At recent exhibitions, a new type of descriptive showcard has been used by Edgar Allen and Co. Ltd., Sheffield, to explain their various exhibits. The cards are lettered in white on a dark blue board, and at the back of each card is a bar type permanent magnet of special cobalt steel, which is recessed to carry the screws that fix the card to it. The card can be attached firmly to any steel product or machine part. It is not readily dislodged, and can be placed in positions where an ordinary card could not be placed to stand erect.

The Shorter Surface Hardening Process

The lower illustration on this page shows a Shorter surface hardening machine at work on a nickel steel pinion shaft. In this machine the hardening is carried out by heating the surface with an oxy-acetylene blowpipe, followed by quenching at carefully controlled temperatures.

The oxy-acetylene blowpipe was first applied for this purpose in 1910. It was then used as a hand tool, however, and the results were somewhat haphazard because of lack of uniformity in temperature and quenching. The blowpipe only became a scientific tool for surface hardening when Mr. A. E. Shorter, M.B.E., M.I.Mech.E., devised precision machines to give complete control over the heating by the oxy-acetylene flame and the subsequent cooling. Machines have now been devised to deal with a large range of parts. These have heating units of various forms and capacities, according to the size and shape of the parts to be hardened, and this interesting development in burner design and construction has made it possible to harden perfectly the surfaces of large, irregular and intricate parts.

The quenching medium is guided along the path or area to be treated in an equally precise manner. Thus there is no necessity for heating the whole mass and plunging the parts into baths, as in ordinary case hardening, which invariably gives rise to changes in dimensions that make subsequent grinding or machining necessary. With the Shorter process distortion of the mass is usually negligible. Thus the hardening of parts such as gears, shafts, cams and dies can be made the last operation in their production, and they can be put into service immediately after treatment. The result of the two operations is a change in the constitution and structure of the iron or steel treated. This change takes place only in the surface layer, and there is a gradual transition from the hardened outer layer to the central mass, which retains the core properties of the material of which it is made.



Surface hardening a nickel steel pinion shaft in a Shorter process machine. Details of the process are given on this page. Photograph by courtesy of the Shorter Process Co. Ltd., Sheffield.

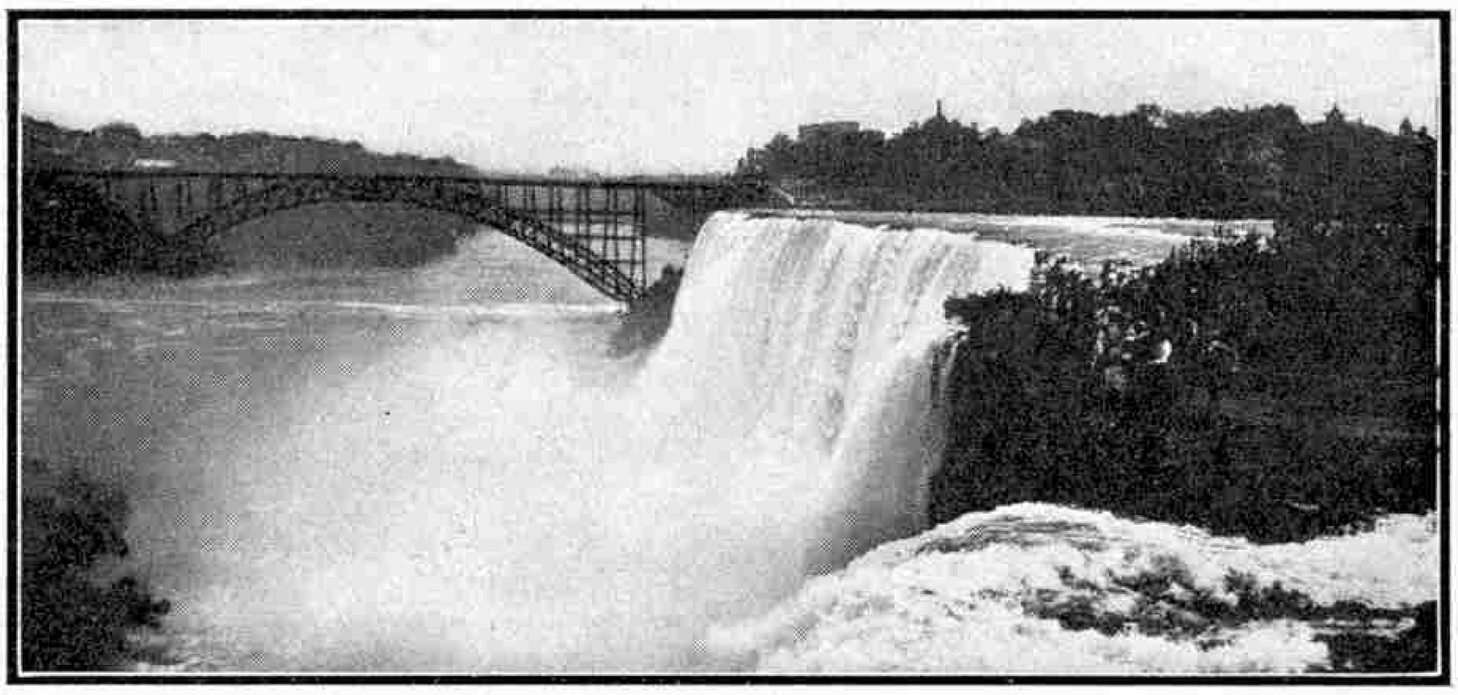
A New Asiatic Power Station

A great new hydro-electric power station, which is one of the largest in Central Asia, is now in operation on the river Varzob. It is built in a gorge 9½ miles from Stalinabad, and has an estimated annual output of 55 million kW-hrs.

Destruction of Famous Niagara Bridge

Vain Struggle with Ice Pack

LAST January the heaviest ice jam ever experienced at Niagara caused the collapse of the Falls View Bridge, from which millions of visitors have gazed at the famous cataract. Of the many bridges across the deep gorge below the Falls, this was the nearest, spanning the river only a little distance below the waterfall, as the upper illustration on this page shows. It was erected 42 years ago at a cost of £400,000. It was an arch structure, with a main span of 840 ft. and two approach spans, one of 190 ft. on the United States side, and one of 210 ft. at the Canadian end. The deck was 46 ft. wide and carried two tramway tracks, two carriageways and two footpaths. It is ironic that it should meet with disaster, for it was built to replace a suspension bridge that was blown down during a gale in 1889.



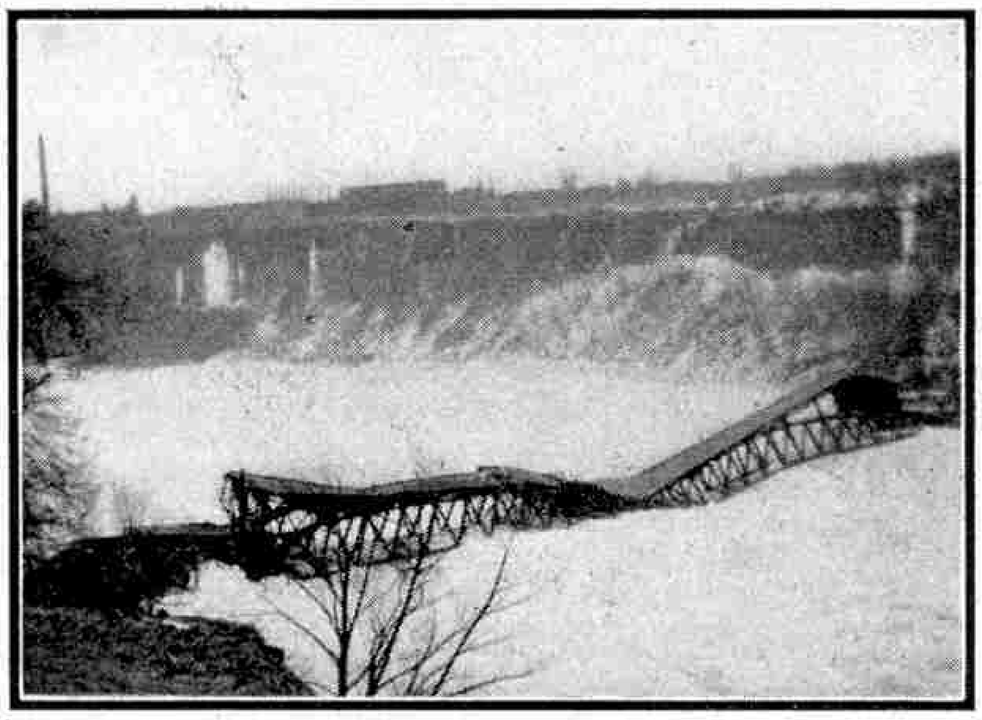
Looking across Niagara Falls to the Falls View Bridge, which was wrecked by ice pressure in January of this year. Photograph by H. J. Shepstone.

Conditions were extremely severe at Niagara at Christmas, and continued into the New Year. There were heavy snowstorms and an abnormal ice cap was formed on Lake Erie, from which the River Niagara flows. Danger came with the break-up of the ice, for the floes were swept down the river and over the crest of the Falls into the gorge. There they were piled up to a height of 50 ft., each succeeding floe being driven under the edge of the pack and so lifting it higher, and the jam became so great that severe stresses were imposed on the piers of the bridge by the remorseless pressure of the immense mass of ice.

Fears for the safety of the structure began to be entertained, and on 25th January it was closed to traffic. Next day the water in the gorge had risen 40 ft. above its normal level, and it was 15 ft. higher than it had ever been since 1909.

In the meantime men were hard at work trying to avert disaster, in spite of continued snowstorms. A rope ladder was let down to the base of the abutment at the United States side, where the signs of strain were greatest. Down this men went on to the ice itself, clearing round the foot of the abutment and passing the ice dug out with pick and shovel to the shore. Huge baulks of timber, 15 ft. to 18 ft. long and a foot square, were lowered by derricks and wedged against the steel girders of the arch close to the abutment in order to distribute the terrific pressure of the ice pack.

There was great satisfaction when it was discovered, early on the morning of 27th January, that the level of the water below the bridge had sunk 4 ft. In the meantime thousands of spectators had gathered on the banks of the gorge to watch the efforts of the engineers, who were constantly inspecting the points at which danger threatened. Shortly after 4 o'clock in the afternoon there was a sudden loud crack. The supporting steelwork of the bridge at the United States end slipped off its support, the deck buckled, and the centre rose upward until it seemed that the framework must snap. Then the Canadian end of the bridge collapsed, and with a low rumble the bridge sank to the ice nearly 200 ft. below.



The steelwork of the Falls View Bridge lying on the ice after its collapse. Photograph by R. G. Stott, Dundas, Ontario, Canada.

The collapse of the bridge was not the only disaster that the terrible ice jam had brought with it. Extensive damage had already been done to water power plants above and below the bridge site, and also above the Falls, and now there were new dangers to face. The fallen steelwork would have retarded the breaking up of the ice, and eventually this would have resulted in the sudden release of millions of tons of ice, which would have been carried downstream, probably to wreck the Queenston power station and thus to cut off the electricity supply for Eastern Ontario. Drastic measures therefore were taken. Dynamite was placed at various points in the tangled and twisted mass and exploded. This broke the steelwork into pieces that would not cause a serious obstruction to the ice, and thus safety was won at the cost of shattered windows for many miles around, for the 660 lb. of dynamite exploded did damage amounting to about £500.

It was soon decided to build a new bridge in place of the one that has collapsed. This will occupy the same site and will be of modern design, and construction will be commenced as soon as possible.

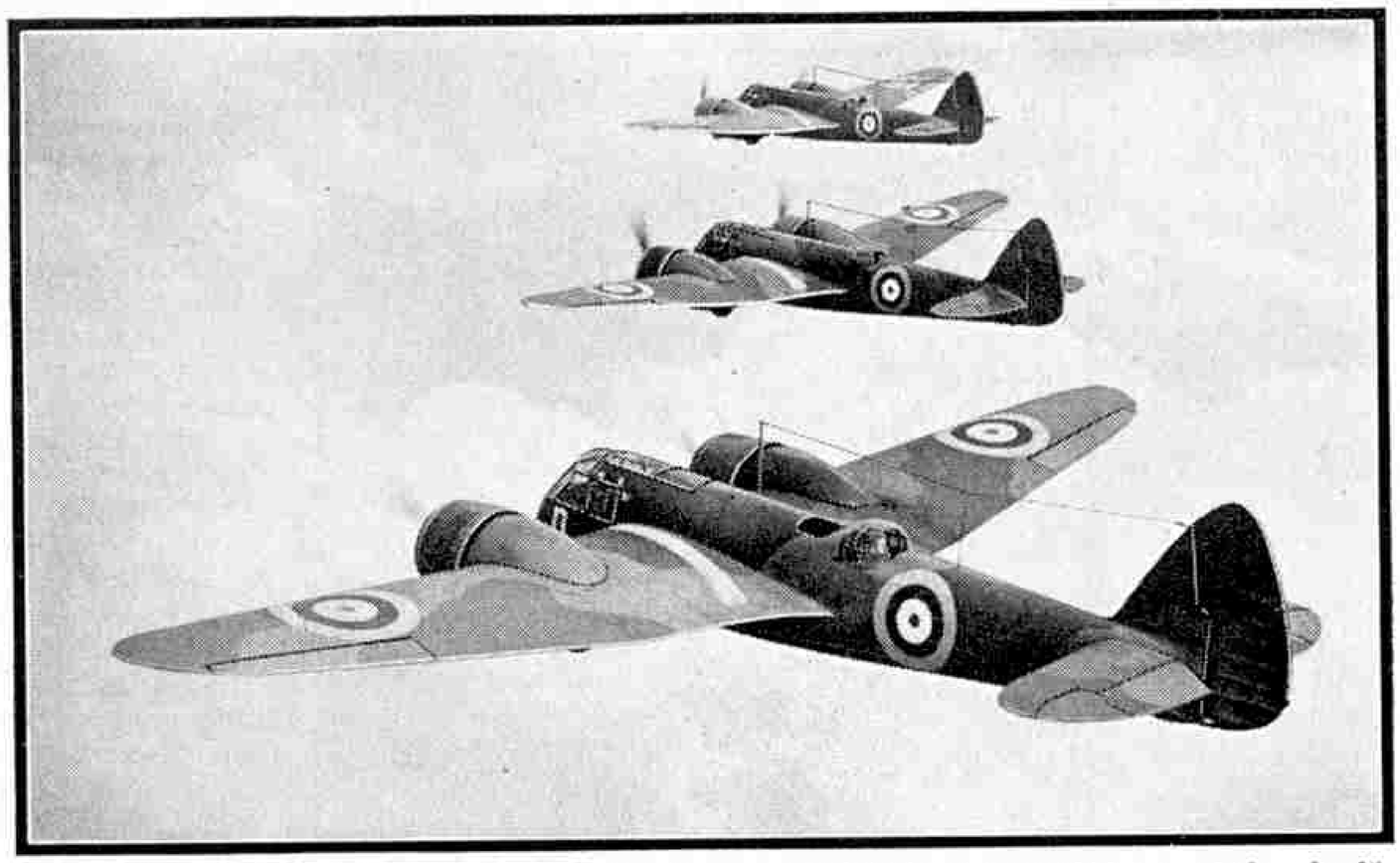
Careers in the R.A.F.

Splendid Openings for Keen Boys

THE expansion of the Royal Air Force that is now taking place is providing wonderful opportunities for boys who wish to take up a career connected with flying. These openings may be grouped under three main headings—aircraft apprentices, apprentice clerks, and short service commissions. This article is written to help readers who are interested in these splendid opportunities by summarising the requirements and giving some idea of the prospects that are opened up. It is specially important that the age limits in each case should be carefully noted. Readers who seriously contemplate taking up an R.A.F. career should write immediately for the pamphlets that are referred to in the course of the article.

Candidates for aircraft apprenticeship under the present Air Ministry scheme must be at least 15 years of age, but under 17 on 1st August of this year. No previous trade experience is necessary, but those wishing to enter must take a competitive examination, which will be held at numerous local centres on 31st May next, the subjects being mathematics, English and general knowledge, and science. Nominations for this examination must be received by Tuesday, 3rd May. Applicants who have an approved first School Certificate, with passes in mathematics and a specified science subject, may be excused the examination. The period of service of successful candidates will be 12 years from the date they attain the age of 18 years.

Readers who wish to know more about this apprenticeship scheme should write to the Inspector of Recruiting, Royal Air Force, Victory House, Kingsway, London, W.C.2, for a copy of Air Ministry Pamphlet 15, which gives details of conditions of service, etc., and will be sent free on request.



Bristol "Blenheim" Bombers flying in formation. They are one of the latest types of high-speed aircraft with which R.A.F. squadrons are being equipped. Photograph by courtesy of "Flight."

Apprentices receive efficient training in the trades of fitter, fitter (armourer), wireless operator mechanic, and instrument maker. These are among the most highly skilled and most highly paid trades in the Service. Another good point is that most of the trades have their counterparts in civil life. Thus the training gained by an apprentice will be of great value to him when he completes his career in the R.A.F. and returns to civil life. The course of instruction in the trades just mentioned extends over three years. It is given in a technical school, staffed by highly qualified technical instructors, and is exceedingly thorough and practical. Apprentices also continue their general education throughout this period, and they are always making good all-round progress.

Candidates sitting at the examination for whom apprenticeships are not available may, if of suitable age and standard of education, be offered enlistment as boy entrants. Full particulars of this scheme are given in Air Ministry Pamphlet 54, a copy of which can be obtained from the Inspector of Recruiting at the address already mentioned.

There are many boys attracted to Service life who have no inclination towards a mechanical trade, and the R.A.F. apprentice clerk scheme will appeal specially to them. Candidates for admission under this scheme must be between 15½ and 17¼ years of age on 1st of this month, and they must possess either an approved School Certificate or evidence that they have attained an approximately equivalent educational standard. Successful candidates undergo a thorough course of training in clerical duties during their first 18 months' service, and at the same time special attention is given to their general education and to physical training.

Apprentice clerks are attested for 12 years' regular Air Force service from the age of 18 years. They receive pay while under training, and at 18 years of age their commencing rate of pay as airmen clerks varies from 21/– to 31/6 per week, according to the degree of success they attained on passing out of training. The work on which they are employed in offices at Headquarters of commands and other formations at home and abroad is varied in character, covering administrative work and shorthand in the case of clerks (General Duties), and accounting for pay and equipment in the case of other clerks. A limited number of airmen clerks will be permitted to re-engage to complete 24 years' service, and so qualify for an R.A.F. pension. Those who return to civil life after completing 12 years' service will be given an opportunity of entering the R.A.F. Reserve, and of drawing a gratuity of £100.

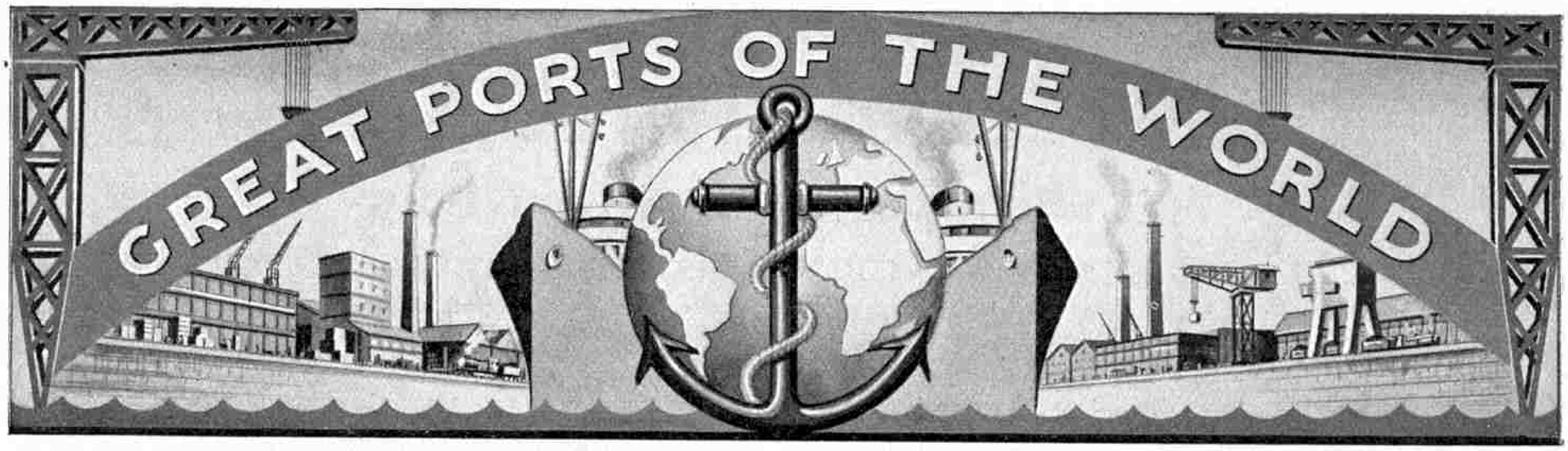
It should be mentioned that all apprentice clerks have an opportunity to volunteer for training as airman pilots, and those who are selected become sergeant pilots and are normally employed on flying duties for six years. Airman pilots who are specially qualified may be recommended for permanent commissions in the General Duties branch, and a limited number of permanent commissions may also be granted in the Accountant and Equipment Branches.

Full information concerning rates of pay, promotion, etc., is given in Air Ministry Pamphlet 9, a copy of which may be had on application to the Inspector of Recruiting at the address already given.

Now we come to the attractive Short Service Commission scheme. The record total of 1,750 pilots were required by the R.A.F. during the year ended 31st March, 1938, but so great was the response that this number was obtained by the end of January. About 1,300 of them were candidates from civil life, and the others were volunteers selected from airmen already in the R.A.F. The number of vacancies for Short Service officer pilots will be even greater during the year ending 31st March, 1939, and applications are now being received from candidates in civil occupations to enter the R.A.F. for training as pilots. The chief conditions are that candidates must be between 17½ and 25 years of age, be medically fit, and have been educated to about the standard of the School Certificate. Applications should be addressed to the Secretary (Dept. S.7/Y), Air Ministry, Kingsway, London, W.C.2, from whom full particulars can be obtained.

A Short Service commission in the R.A.F. offers many attractions to young men of mechanical bent who are interested in flying. Candidates accepted receive a complete training in flying that cannot be obtained elsewhere, and their life is full of interest. Successful candidates are entered as pupil pilots, and begin at once a two-month's course in elementary flying at a civil flying training school, where they receive 50 hrs. flying instruction in dual, solo, and instrument flying. They then become acting pilot officers on probation and undergo about seven months' instruction at a Service flying training school on Service type aircraft. This instruction includes formation and night flying, and a period at an armament training camp. Qualified pilots are then appointed to an R.A.F. unit, having already had at least 150 hrs. air experience.

Candidates accepted under this scheme are appointed for four years on the active list, followed by six on the Reserve, and a gratuity of £300 is paid at the end of their active list service. A limited number of permanent and medium Service commissions are given annually to Short Service officers.



BOMBAY: "THE GATEWAY OF INDIA"

THE Port of Bombay is a comparatively modern creation, standing upon an island about 25 sq. miles in extent off the west coast of India. It owes much of its importance to its possession of the only natural deep-water harbour on the west coast, and to its central position and accessibility by sea and land. The harbour is on the inner side of the island, facing the mainland. It is about 74 sq. miles in extent, and provides a secure shelter for shipping throughout the year, the Colaba Peninsula forming a natural breakwater that gives protection from the violence of the monsoon.

The site of Bombay originally consisted of a cluster of seven small islands, of volcanic origin, but successive reclamation schemes have united them into one. In ancient times the group was inhabited only by a few Koli fisherfolk, aborigines of Western India, and remained undeveloped long after places on the mainland had begun to grow and flourish. By the 10th century the west coast was thickly dotted with villages, and was extensively cultivated for rice and other crops. It is recorded that 200 years later the port of Chaul, a few miles south of the site of Bombay, had become the most prosperous in Hindustan, and carried on a large trade in ivory, precious stones, spices, and cotton fabrics with Egypt, Iraq and the Far East.

The development of the Bombay islands began about 1260, when Bhima Raja, ruler of the Northern Konkan, the strip of coastal land off the centre of which lies Bombay Harbour, retreated before a Moslem invasion from Delhi. He halted on Mahim, the most northerly of the group, and established a new capital there. His followers spread over the neighbouring islands, where they traded, prospered and increased, but by 1350 the group had come under Moslem influence, which persisted until the coming of the Portuguese in 1534.

Under Portuguese rule the islands were divided into manors, or fiefs, most of which were allocated to various religious orders. Dissensions followed that did great harm to the trade of the islands, and opened the way for other European powers attracted by the possibilities of profitable trading with India. The English took a prominent part in this. Their first venture was disastrous, however, for of an expedition financed by London merchants, which sailed in three ships from Plymouth for India by the Cape route on 10th April, 1591, only a few survivors managed to struggle back to Falmouth more than three years later.

A more satisfactory beginning was made in 1600, when the East India Company was formed under the authority of a Charter from Queen Elizabeth. During the next 15 years Portuguese opposition in India was overcome and factories established at Surat, Cambay, and other places. The Surat Council of the Company foresaw that Bombay, with its geographical advantages, was destined to become the "gateway of India" and in 1652 they urged its purchase from the Portuguese. This proved unnecessary, as on 22nd June, 1661, Bombay was given to Charles II on his marriage to the Infanta Catherine of Portugal, and seven years later it was transferred by Royal Charter from the Crown to the East India Company.

The "Resolute," of 19,703 tons, in the Hughes Dry Dock, Bombay. The illustrations to this article are reproduced by courtesy of the Bombay Port Trust.

The Company decided to make Bombay their headquarters and to develop it until it became the first port in India. A Customs House and a warehouse were built, and ships sailing to and from Madras and Bengal were advised to call there. A mole alongside which small ships could be berthed also was constructed, and a shipwright was sent from England to supervise the rapidly extending shipbuilding and repair operations.

Piracy was then a serious menace to merchant shipping. In the latter part of the 17th century Kanhoki Angria, a famous Mahratta pirate, appeared on the west coast, and for 50 years he and his sons were the terror of the surrounding seas. They had many fast, light-draught sailing vessels of from 100 to 400 tons, each mounting from 10 to 30 guns, together with rowing galleys of 40 or 50 oars, and in these they lay in wait in their fortified lairs along the coast, ready to pounce upon any unescorted trading ship that came within their reach.

One of the strongholds of the pirates was Kennery Island, off the mouth of Bombay Harbour and only 14 miles from Bombay Castle. Kanhoki Angria himself died about 1730, but his sons carried on his piratical enterprise, and it was not until 1756 that their power was finally broken. In that year they were attacked by a British fleet under Vice-Admiral Watson in combination with a military force under Clive. Their chief stronghold Gheria, about 170 miles south of Bombay, was captured and demolished and their fleet destroyed.

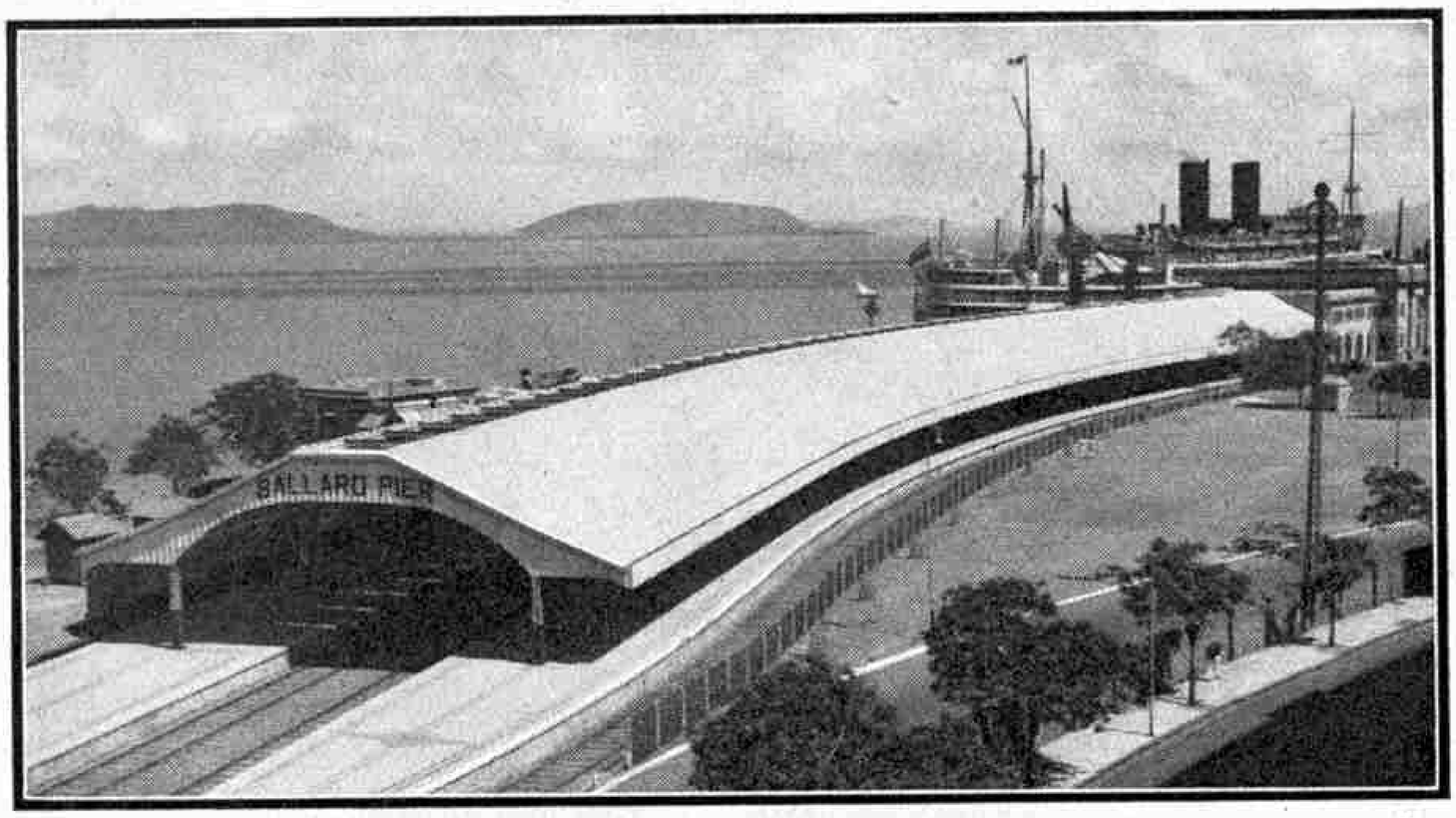
In spite of the activities of pirates the trade of Bombay steadily increased, and the port had to be enlarged. The exports consisted chiefly of cotton goods, pepper, silk, and precious stones, and rose in value from £493,000 in 1708 to an average of £758,000 about 20 years later. By the middle of the 18th century Bombay merchants had opened up regular trade communications with the principal seaports and inland trade centres of India, Arabia, Persia, and East Africa, in addition to carrying on a large trade with England.

From 1735 until the coming of steamships in the following century Bombay was also famous as a shipbuilding centre, and many vessels were built there for the East India Company. Plans for a dry dock had been completed in 1686, but its construction did not begin until 1748. It occupied the site of the present Government Dockyard. Its length was 209 ft., its width 47 ft., and its depth 15 ft., and it proved such a success that within 15 years two more dry docks were built.

Until 1813 the foreign trade of Bombay was in the hands of the East India Company, but in that year a Bill was passed in England that abolished the Company's commercial monopoly. This historic event opened the commerce of India to the merchants of British seaports other than London, and a great expansion of trade soon took place. Progress during the latter half of the last century was even more remarkable. There were many factors that helped in this growth. One was that railway communication with the interior was opened up in 1853. In addition the first Bombay cotton mill began working in 1854, and six more mills were opened during the

following five years. Steam coastal ferry services were inaugurated in 1866 and then, in 1869, came the opening of the Suez Canal, an event that revolutionised the trade of the port.

In the meantime the lack of adequate industrial and dock accommodation was proving a serious handicap, and private companies carried out reclamation schemes to wrest from the sea additional land on which to develop their properties. Among these was the Elphinstone Land and Press Company. This was founded in 1858, and carried out a series of extensive reclamations on the western foreshore of the harbour. The company indeed acquired so much harbour frontage that in 1869 the Government bought it up, and decided to place the administration of the port in the hands of a public trust. In June 1873 a corporation called the Bombay Port Trust was created for this purpose, and also took over control of the pilot service and the lighting of the harbour.

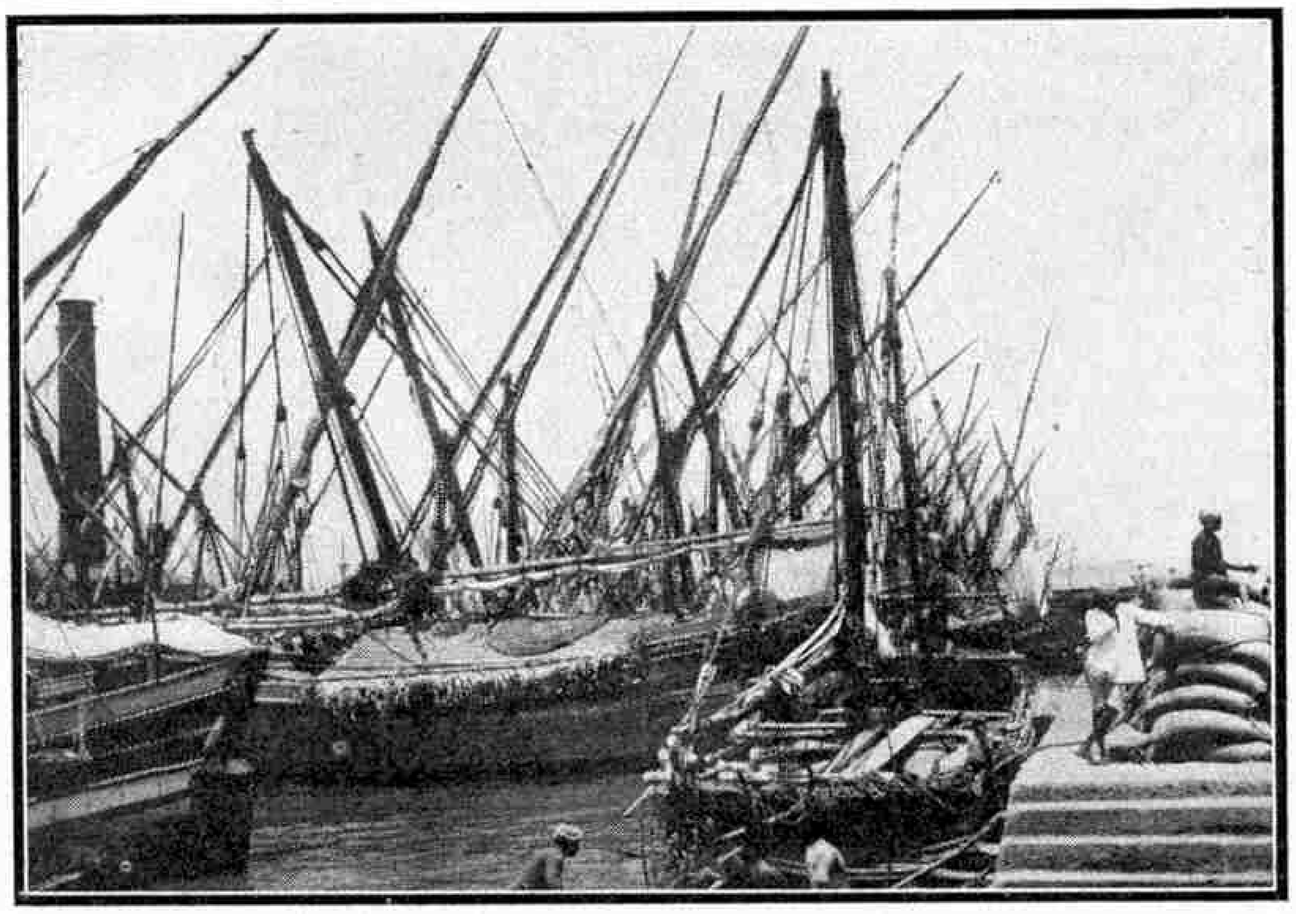


Ballard Pier Railway Station, from which the boat trains depart for Calcutta, Delhi and other important Indian centres. The P. and O. liner seen in the background is alongside the passenger berth.

The need for wet dock accommodation had been voiced as early as 1810, but it was not until 1875 that Bombay's first wet dock, built by a private company, was opened. This was the Sassoon Dock at Colaba, the narrow peninsula that forms the southern extremity of Bombay Island. This dock was hewn out of solid rock. It had a water area of only 3½ acres and an effective depth of about 18 ft., and was designed to accommodate up to five ships of about 1,000 tons net. It was purchased by the Government on behalf of the Port Trust in 1879, but for the past 20 years or so it has been used only for accommodating fishing boats and country craft.

One of the earliest tasks of the Port Trust was to provide more adequate wet dock accommodation, and the Prince's Dock was opened in 1880 and the Victoria Dock in 1888. The former has a depth of 25 ft., and the latter one of 27 ft., and there is a communication passage between the two. A third and larger dock was built in 1914. This is the Alexandra Dock, which has an entrance width of 100 ft., a depth of 37¼ ft. and a water area of 49½ acres. It is entered through a lock 750 ft. long.

Dry docks, in which the under-water parts of ships can be inspected, overhauled or repaired, are essential at all large ports, and the Port Trust have two of them. The oldest is the Mereweather Dry Dock, completed in 1891, which is 525 ft. long and 65 ft. wide. The second is the Hughes Dry Dock, opened in 1914. This is 1,000 ft. long and 100 ft. wide, and can be divided in the centre so that it can be converted into two docks for accommodating small vessels.



Native craft discharging cargo at one of the bunders, or open wharves.

Between 4,000,000 and 5,000,000 tons of cargo are handled annually over the dock quays. Two open berths are reserved for certain classes of bulk cargo, but each of the others has its own enclosed transit shed, fully equipped with hydraulic cranes and hoists, chutes for discharge of cargo in bags, and lock-ups for valuable goods. The total floor area of the sheds is about 2,500,000 sq. ft.

There are 209 movable hydraulic cranes in use at the docks. Those at the Prince's and Victoria Docks are of 30-cwt. lifting capacity, while the cranes at the Alexandra Dock are mostly of 35-cwt. capacity and of the luffing type, with a reach of 38 ft. from the quay wall. There are also several 5-ton and 6-ton quay cranes, two fixed cranes of 30 tons and 100 tons respectively, and a 60-ton floating crane, as well as several portable runabout cranes.

An interesting feature of the port is the "bunders," or open wharves and basins for native and coasting steamers. All are equipped with cranes, sheds, and other facilities for cargo handling, and in normal years deal with more than 1,250,000 tons of cargo, about one-fifth of the total tonnage of the port. The goods are extraordinarily varied, including cotton, grain and seeds, fruit and vegetables, sea-borne coal, bricks, tiles, iron and timber, and there are special bunders at which petrol and kerosene in tins are dealt with.

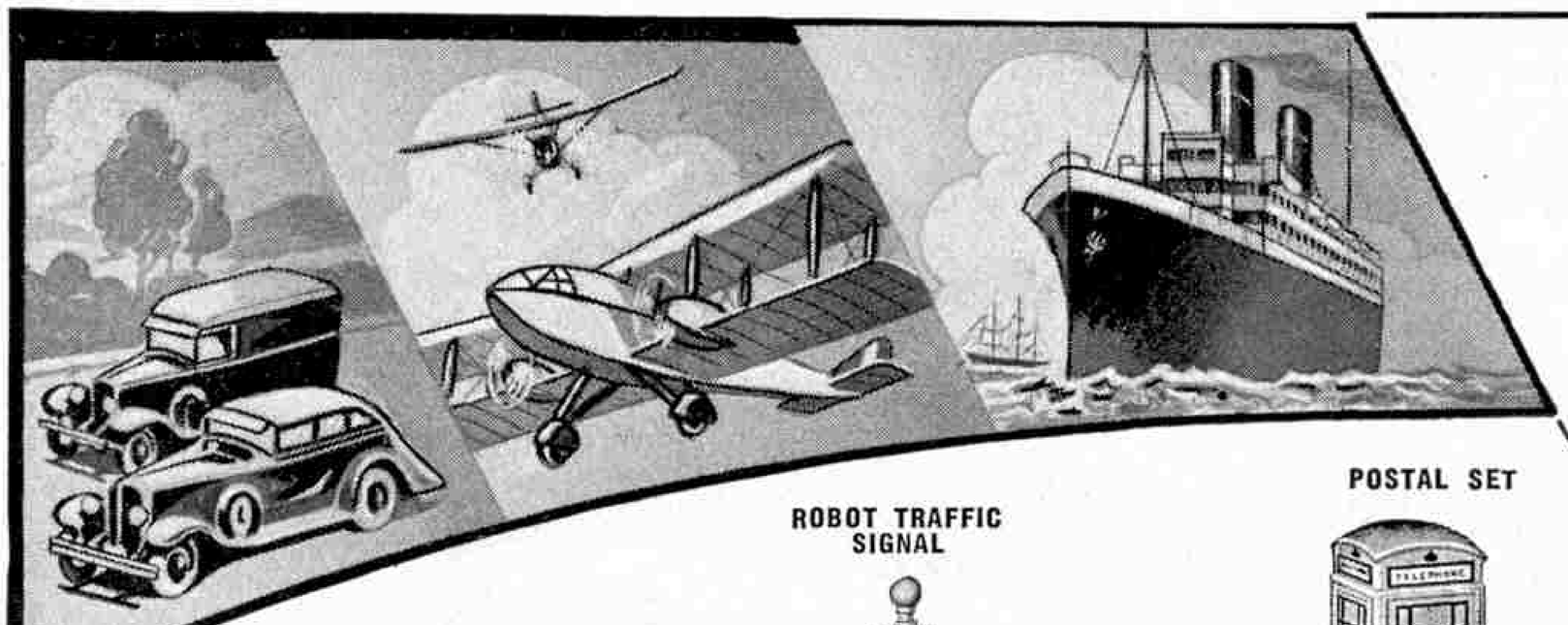
To-day the principal exports of Bombay are cotton, oils and oil-seeds, piece-goods, and manganese ore. Almost all the Indian cotton crop is grown in the western half of the continent. Thus Bombay is the natural channel for its distribution overseas, and at the port there is one of the largest cotton depots in the world. This cost over £1,000,000 to build and provides accommodation for 1,000,000 bales. There are 20 receiving and despatching stations on its east side, and a railway yard with eight miles of track. The depot is extensively equipped with sprinklers in case of fire, and has its own Fire Brigade and Salvage Corps station.

The trade in oil-seeds ranks second in importance to that of cotton. The chief of these are ground-nuts, a crop that does not require irrigation and has become very popular with cultivators, linseed, and cotton, castor and grape seeds. Rice, wheat, and other grain to the extent of about 200,000 tons a year are despatched from the port, mostly to East Africa, Aden and Arabia, and the depot in which all these are stored is more than 80 acres in extent.

On the import side first place is taken by fine quality cotton goods and other textiles, for although these have been manufactured on an increasing scale in India in recent years, considerable quantities are still imported from Great Britain and Japan. About 10 per cent. of Bombay's import trade consists of various metals, including fabricated iron and steel, brass, copper and aluminium. Next in importance comes machinery, which includes textile and railway plant.

During recent years there has been a large increase in the quantities of mineral oils imported in bulk, chiefly from Persia, Burma, Georgia, Borneo and the Straits Settlements. Petrol is the chief item, although large amounts of kerosene and liquid fuel are also brought to Bombay. There are separate depots for these different oils, and they have a total storage capacity of about 56,000,000 gallons.

Bombay is also an important passenger port. About 250,000 overseas passengers pass through it in a year, and the coastal and ferry services carry more than 1,000,000 people in the same period. Most of the ocean passenger traffic is dealt with at Ballard Pier, a 1,500-ft. extension of the harbour wall at Alexandra Dock. A large two-storey building facing the berth includes a reception hall, Customs examination hall, and a railway concourse linked with the adjoining railway station. This station is shown in the upper illustration on this page. It has four covered platforms from which special "through" trains run to Calcutta, Delhi, Peshawar, and other important Indian centres.



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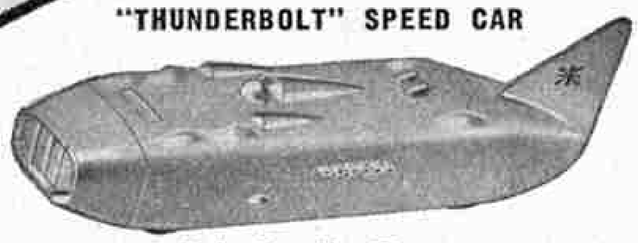

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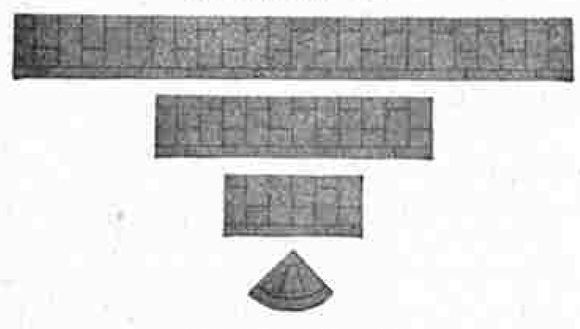

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Right-angle or back-to-back. Price **3d.** each

BEACON

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

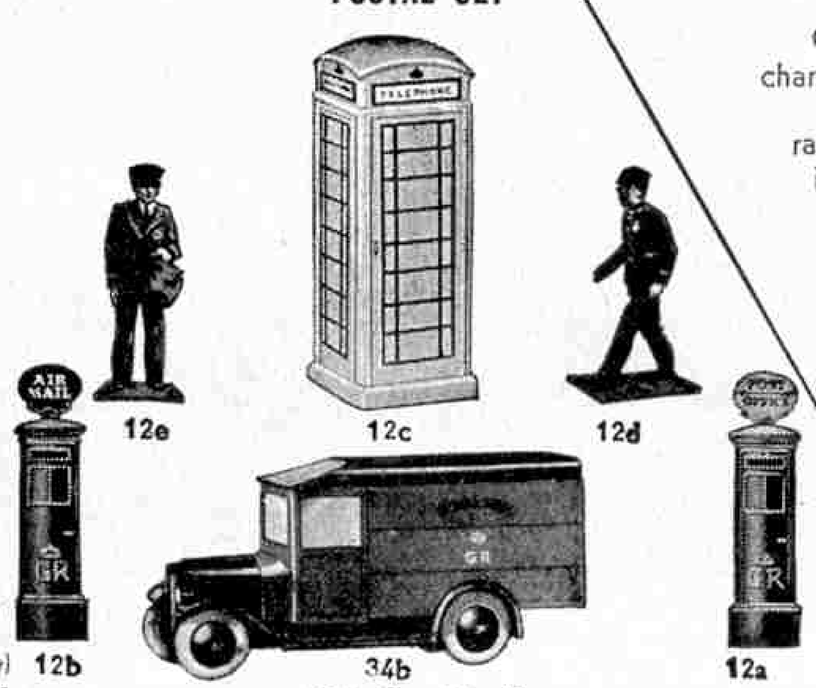
AIRSPEED "ENVOY" MONOPLANE

Dinky Toys No. 62m
Scale Model of the Airspeed "Envoy" twin-engined commercial monoplane. Assorted colours. Price **6d.** each

THE KING'S AEROPLANE

Dinky Toys No. 62k
Scale model of the Airspeed "Envoy" supplied to the Air Council for the King's Flight.
Price **8d.** each

POSTAL SET



12e 12c 12d 12b 34b 12a

Dinky Toys No. 12

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

Price of complete set **2/3**

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

ROYAL AIR MAIL SERVICE CAR

Dinky Toys No. 34a
In correct colours and fitted with detachable rubber tyres.
Price **6d.** each

R.A.C. BOX, MOTOR CYCLE PATROL AND GUIDES

Dinky Toys No. 43
This set is representative of the familiar personnel and road box of the R.A.C. Each item is finished in correct colours.

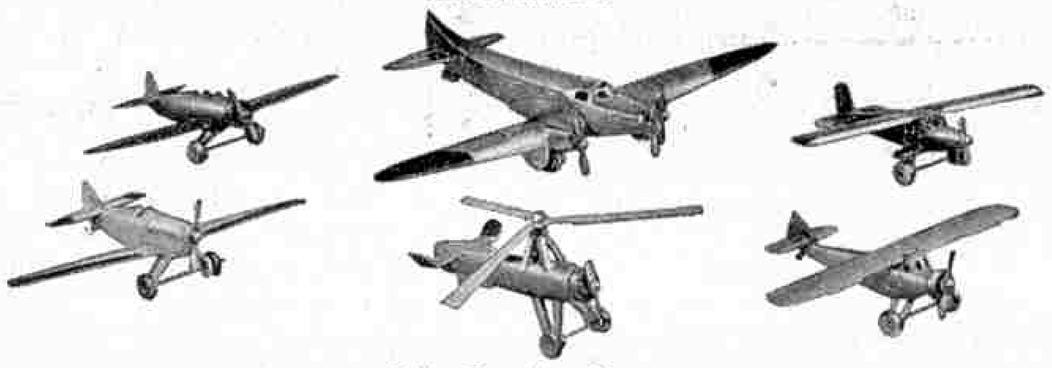
No. 43a	R.A.C. Box	each	**6d.**
No. 43b	R.A.C. Motor Cycle Patrol	"	**9d.**
No. 43c	R.A.C. Guide directing traffic	"	**3d.**
No. 43d	R.A.C. Guide at the salute	"	**3d.**

Price of complete set **1/9**

REFUELLING TENDER

Dinky Toys No. 60y
Realistic model of Thompson Bros. Tender used for refue ing aeroplanes at aerodromes.
Price **8d.** each

AEROPLANES.



Dinky Toys No. 60z
The set consists of six models of famous French aeroplanes—"Arc-en-Ciel." Potez 58, Hanriot HI80T, Breguet-Corsaire low wing monoplane, Dewoitine 500 and Cierva Autogiro. (Made in the Meccano Factory in Paris) Price **3/-**

MONOPLANE "ARC-EN-CIEL." Dinky Toys No. 60az
A Scale model of the famous French triple-engined monoplane "Arc-en-Ciel." (Made in the Meccano Factory in Paris) Price **9d.** each

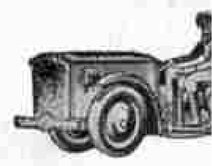
ARMSTRONG WHITWORTH "WHITLEY" BOMBER

Dinky Toys No. 60v
Scale model of the "Whitley" long-range heavy bomber adopted by the R.A.F.
Price **9d.** each

FLYING BOAT "CLIPPER III"

Dinky Toys No. 60w
Scale model of the Pan American Airways flying boat that took part in the transatlantic experimental flights in 1937.
Price **1/-** each

THREE-WHEEL DELIVERY VA



Dinky Toys No.
Fitted with openir
Price **10d.** ea
(Made in the Meccan in Paris)

MECCANO LTD.

Y TOYS

Varieties

COLLECTING HOBBY

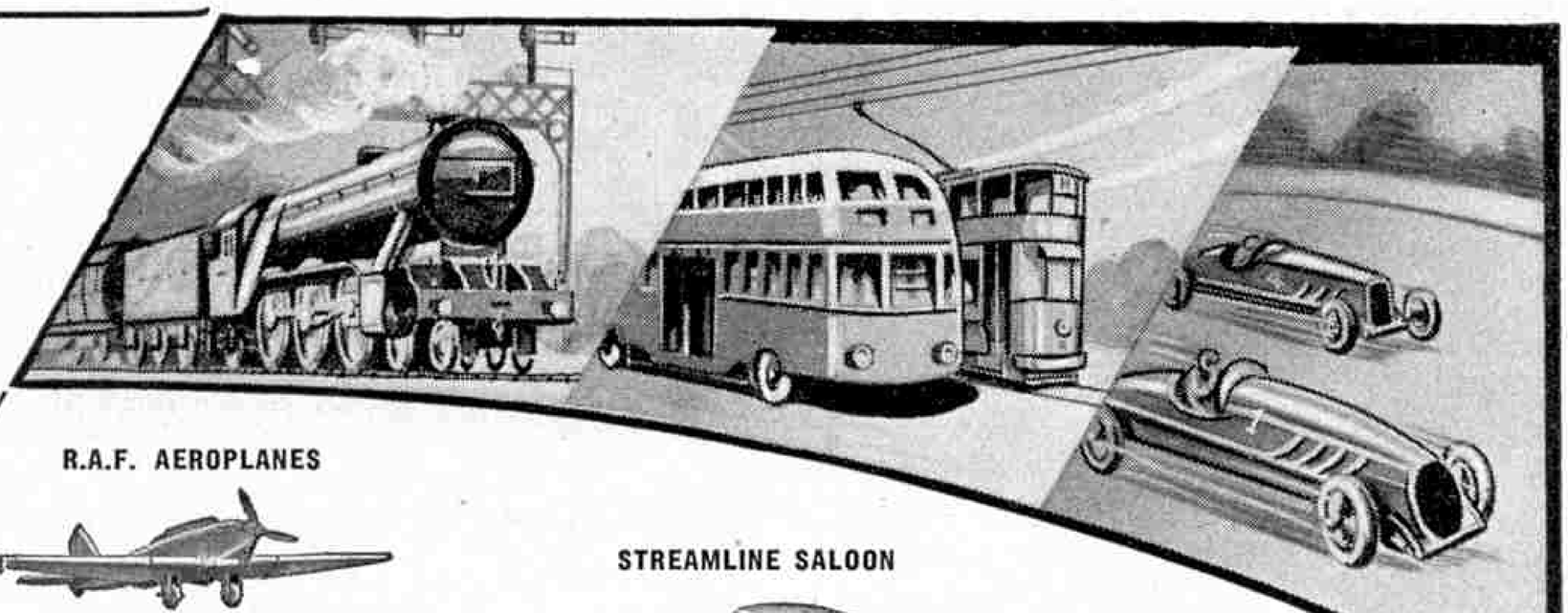
nobbies is that of Dinky Toys collecting. These eir rich colouring and perfection of finish. en made to the series, and in the splendid than 300 models, there are items that will

e specially useful for adding finishing uts; while others, such as the Traffic icles, and Petrol Pumps, are ideal for road scenes. There are also reproduc- liners, including Britain's wonder " and famous ships of the British be used with realistic effect in

be had in playing with these e table or on the floor, and such as the Sports Cars can be devised. nd girl should start this ing hobby to-day. All purchased separately, be obtained in com-

our Meccano and ealer for a price ng details of plete range of Toys.

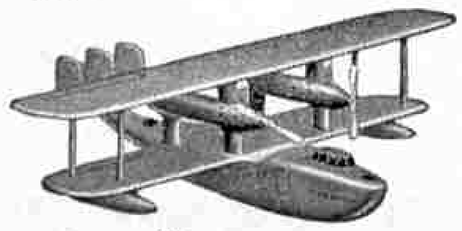
PRODUCT of MECCANO LIMITED LIVERPOOL



R.A.F. AEROPLANES

60n

60p

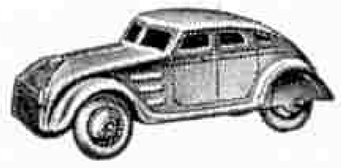


60h

Dinky Toys No. 61

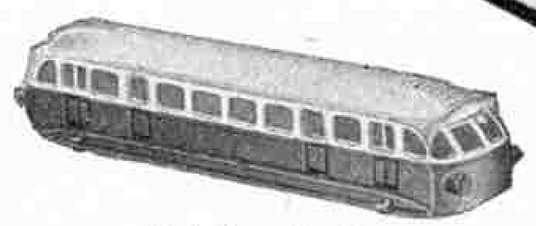
No. 60h "Singapore" Flying Boat ... ... each **1/-**
No. 60n Fairey "Battle" Bomber (2)... ... „ **4½d.**
No. 60p Gloster "Gladiator" Biplane (2) ... „ **6d.**
Price of complete set **2/9**

STREAMLINE SALOON



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

DIESEL RAIL CAR



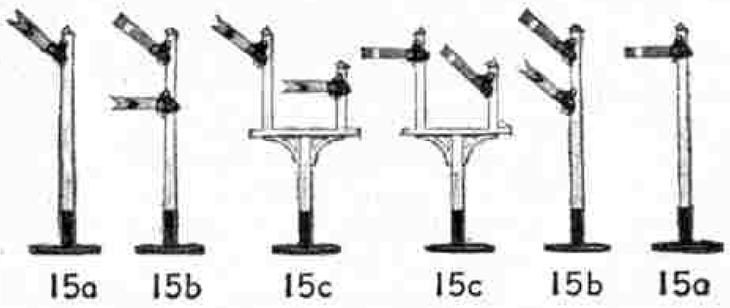
Dinky Toys No. 26z
A realistic model of a modern Diesel-engined rail car. Price **5d.** each
(Made in the Meccano Factory in Paris)

MOTOR TRUCK

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

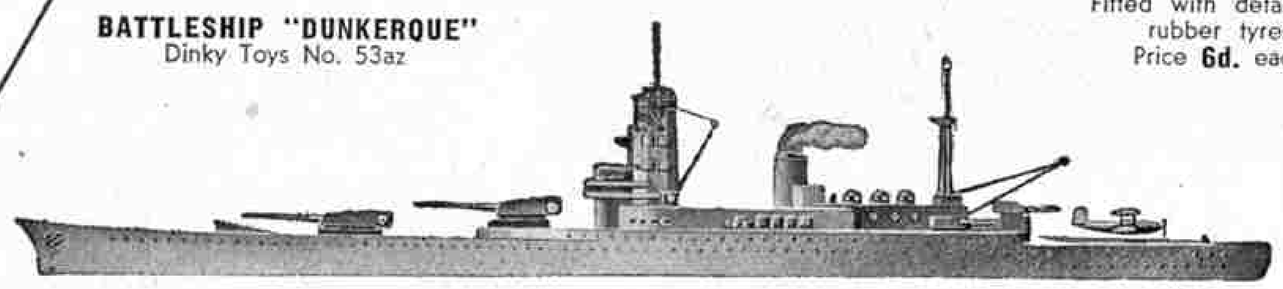
MEDIUM BOMBER
Dinky Toys No. 60s
Similar to Fairey "Battle" Bomber (No. 60n), but with new Air Ministry Shadow Shading. Price **6d.** each

RAILWAY SIGNALS



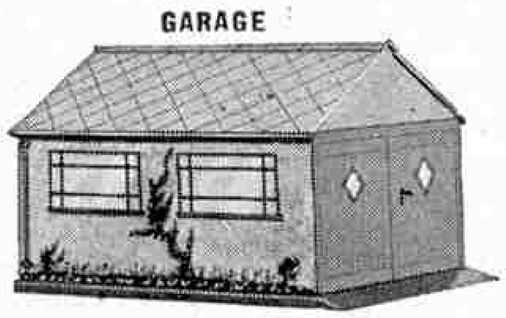
Dinky Toys No. 15
No. 15a Single Arm Signals ("Home" and "Distant") each **2d.**
No. 15b Double Arm Signals (two in set) ... ... „ **3d.**
No. 15c Junction Signals ("Home" and "Distant") ... „ **4d.**
Price of complete set **1/6**

BATTLESHIP "DUNKERQUE"
Dinky Toys No. 53az

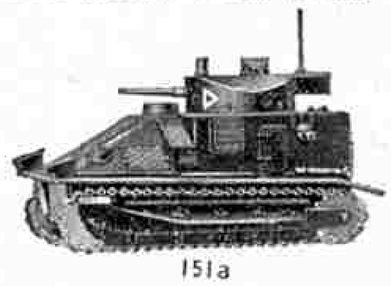


Scale model of the French 26,500 ton Battleship *"Dunkerque,"* which has an overall length of 702 ft. 9 in., and a main armament of eight 13 in. guns. Price **9d.** each
(Made in the Meccano Factory in Paris)

GARAGE



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



151a

ROYAL TANK CORPS MEDIUM TANK SET

151d

150d

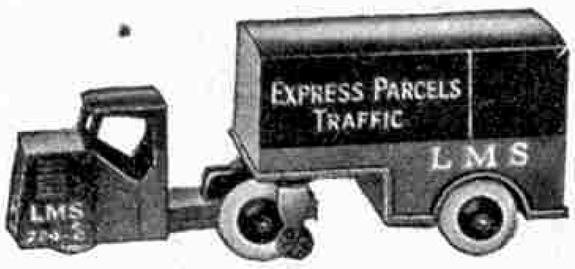
151c

151b

Dinky Toys No. 151

No. 151a Medium Tank (12 tons, 90 h.p.) ... ... each **1/6**
No. 151b Three-ton Transport Wagon ... ... „ **1/1**
No. 151c Cooker Trailer with jack stand ... ... each **7d.**
No. 151d Water Tank Trailer ... „ **6d.**
No. 150d Driver ... ... „ **3d.**
Price of complete set **3/11**

RAILWAY MECHANICAL HORSE AND TRAILER VAN

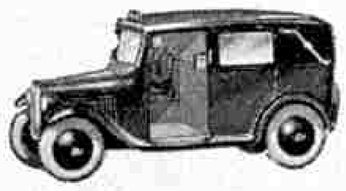


Dinky Toys No. 33R
Fitted with detachable rubber tyres.
No. 33Ra Railway Mechanical Horse ... ... each **8d.**
No. 33Rd Trailer Van ... ... „ **10d.**
Price, complete, L.M.S.R., L.N.E.R., G.W.R. or S.R. ... **1/6**

SIX WHEELED WAGON

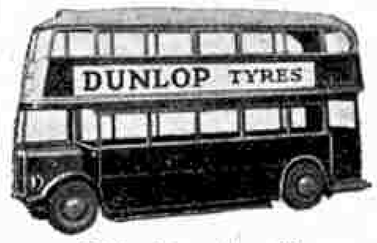
Dinky Toys No. 25s
An interesting model of a modern three-ton wagon. In assorted colours.
Price **1/-** each

TAXI WITH DRIVER



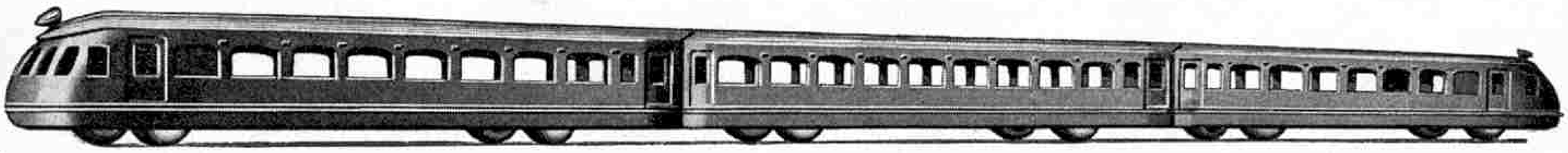
Dinky Toys No. 36g
Fitted with detachable rubber tyres.
Price **11d.** each.

DOUBLE DECKER BUS



Dinky Toys No. 29c
Assorted colours. Fitted with detachable rubber tyres.
Price **1/-** each

STREAMLINE DIESEL ARTICULATED TRAIN



Dinky Toys No. 16z Price **1/6** each
(Made in the Meccano Factory in Paris)

ENDER

60y
Thompson
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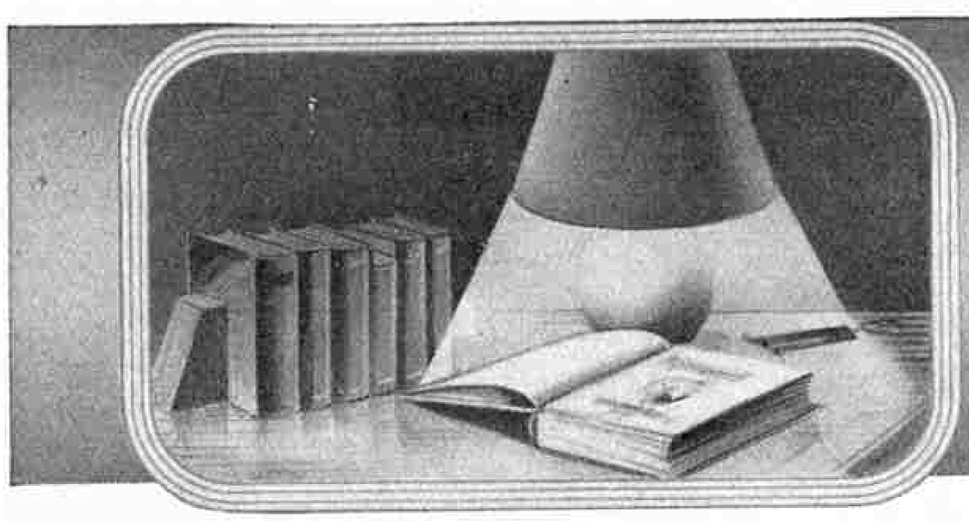
E-WHEELED IVERY VAN

Toys No. 14z
ith opening lid.
e **10d.** each
he Meccano Factory
in Paris)

D., LIVERPOOL 13



BOOKS to READ

"Look and Find Out"

By W. P. Westall, F.L.S., and Kate Harvey, M.Sc.
(Macmillan. Six volumes, 2/6 each)

The six volumes of this excellent nature series deal with various aspects of animal and plant life. They are intended for boys and girls who wish to find out for themselves the most interesting things about the plants and animals they see around them. They do this largely from pictures and drawings, and the volumes form valuable guides for identifying plant and creatures seen in the woods, in ponds and streams, or elsewhere in the outdoor world.

The first two volumes deal with trees and wild flowers. The trees described are well illustrated, and their flowers and fruits, and their appearances in summer and winter, are fully described and explained. The volume on wild flowers is equally attractive and comprehensive. It groups its subjects together according to the kind of situation in which they are found, and traces the unfolding of their leaves and flowers month by month.

Birds are dealt with in the third volume, and pond life and butterflies and moths are the subjects of the two following it. Each of these covers the ground well, and opens up many delightful secrets of nature that to many readers will be unsuspected.

The sixth volume is particularly interesting. Its subject is the wild life of the garden, and it tells the stories of a series of interesting creatures from squirrels and hedgehogs to birds and tiny insects, distinguishing between friends and foes of the gardener. In addition it describes the many wild flowers that persist in growing in gardens, where they are looked upon as weeds.

Each volume is illustrated by many reproductions of interesting photographs, together with drawings and picture tables designed to help in the recognition of the living things dealt with.

"Patents for Inventions"

By R. Haddan. (Pitman. 3/6 net)

This book is described as a concise guide for inventors and patentees. It is written by an experienced patent agent, who knows from his own practice that guidance is required through the intricacies of patent law. The author has set down in brief but adequate form exactly what a patent is, and how proceedings should be taken to obtain one and maintain it. Full details are given of every step, together with the stamp duties to be paid and other charges. The scope of the book includes patents in Dominions and Colonies and in foreign countries, and the registration of trade marks and designs; and older readers with a practical interest in invention will find in it exactly the information and advice they need.

"The Secrets of Trick Photography"

By A. R. Croy
(Sands, Hunter and Co. Ltd. 7/6 net)

When amateur photographers acquire experience and skill in the use of their cameras, they become interested in the deeper secrets of photographic practice. Those who have reached this stage will welcome Mr. Croy's book, which will open

A barn owl stretching its wings. The illustrations on this page are from Book VI of "Look and Find Out," reviewed on this page.

to them a new world of ideas, methods and effects, few of which are described in ordinary books on photography. The book is not confined to mere tricks, however, as its title implies, for it not only shows how the camera can be made to lie, but also explains many ways of making attractive pictures and of treating them in order to provide unusual effects. A double page is

The grey squirrel, an introduction from America that is larger than its red English cousin.

allotted to each trick. On one side is a concise but adequate account of the methods to be followed to produce certain effects, and on the other a magnificent example of work of the kind described.

Altogether 100 tricks are dealt with. They include "freak" effects such as double exposures and the introduction into scenes of figures photographed separately on a different scale. How to photograph such elusive subjects as lightning, smoke rings and sunbeams, the production of pen and pencil drawings from photographs, and printing on silk are dealt with, and there are many tricks of lighting, relief, shading and masking of special value in advertising and commercial photography. The tricks described are of great interest in themselves, and to be able to carry them out well is to be a master of the photographic art. This splendid book will be an excellent guide to those who aim at such a distinction.

"Civil Engineering To-day"

By Edward Cressy
(Oxford University Press. 3/6 net)

A civil engineer originally was simply one whose work had no connection with warfare and fortifications. The wonderful advance of engineering of all kinds led to further distinctions, and to-day the civil engineer is the man who designs and constructs great bridges, docks and harbours, builds dams and reservoirs, bores tunnels and makes canals. He is indeed the maker of modern civilisation, and such a book as this by Mr. Cressy shows in striking manner to what extent we depend on him. It gives full accounts of magnificent works of all kinds, and provides a feast of knowledge that will appeal particularly to readers of the *"M.M."*

At the outset Mr. Cressy explains concisely and simply the wide range of work for which the civil engineer is responsible, and tells his readers something of the general methods they use. Then he turns to the construction of bridges, showing how the engineer designs his structures and how he sets about building them. A special chapter is devoted to accounts of the wonderful bridges of recent years, including the magnificent structures spanning Sydney Harbour in Australia, and the Golden Gate and San Francisco Bay in America.

Underground work comes next. This is a particularly interesting branch of civil engineering, and the skill of the engineers concerned is well illustrated by an excellent account of Queensway, the great road tunnel under the Mersey at Liverpool.

The story is continued with sections on the construction of canals, such as the Panama and Welland Canals, and the provision of safe harbours. An account of the construction of dams then leads naturally to the stories of the great hydro-electric power plants. These have been prominent features of recent engineering, particularly in the United States, and the details given of Boulder Dam. The Grand Coulee Dam and others erected there give a good idea of the stupendous nature of engineering works.

The provision of adequate supplies of water, the irrigation of deserts and the recovery of land from the sea are the remaining subjects dealt with, and the accounts given of the engineer's efforts to accomplish these aims complete a fascinating story. There are 38 well-chosen photographs and 57 drawings.

"Hard Liberty"

By FRED BLAKELEY. (Harrap. 10/6 net)

Stories of pioneers in remote and undeveloped parts of the Earth are always attractive, and this account of the Australian wilds is no exception. Mr. Blakeley was one of three men who crossed Central Australia from south to north on bicycles 30 years ago. Before that time he had been a miner in various districts, some of them in very remote quarters. Of his experiences in these circumstances he writes interestingly and sincerely, and gives many wonderful pictures of rough but enjoyable life in a difficult country.

Mr. Blakeley began by running away from school, and at the age of 13 was working his own claim in the opal fields. He was big and strong, and in spite of his youth held his own well among the rough but straightforward men with whom he mixed. He moved about from one mining district to another, and then the desire to wander farther afield seized him. With two companions he set off on the long trail for Port Darwin in the far North. There was a fourth member of the party, who indeed proved to be one of the most important, and certainly the one who attracted most notice among the many people who greeted the adventurers on their way north and on their arrival. This was Jethro, a dog of uncertain breed whose greatest vice was killing goats. Jethro had no difficulty in keeping pace with his human companions, and survived hardships that might well have been expected to end the career of any normal dog.

Many adventures befell the party on their 2,200-mile journey, which they accomplished in 2½ months. They almost came to grief when crossing the treacherous salt beds of Lake Eyre, and struggled almost in vain to overcome difficulties presented by the shifting sand dunes of Central Australia. On several occasions they encountered natives, including the dreaded "Night Tribes" of the interior who one night examined their camp without disturbing even Jethro. These mysterious beings were generally hostile. They moved about only by night, killing and scaring cattle, and were seldom seen or tracked by white men. Then the adventurous cyclists made the acquaintance of the dreaded crocodiles that haunt streams and pools in the north, and many tales are told of the unusual birds and other creatures met with on the journey.

Throughout the story readers have their fill of adventure generally, for the author introduces many exciting reminiscences of later days of hairbreadth escapes from death by starvation and at the hands of natives.

The book is well illustrated by means of 28 reproductions of photographs.

The three men whose crossing of Central Australia on bicycles is described in "Hard Liberty," reviewed on this page. Mr. Fred Blakeley, the author, is on the left and alongside him is Jethro, the dog who made the 2,200-mile journey to Port Darwin with the adventurers.

"Indoor Model Railways"

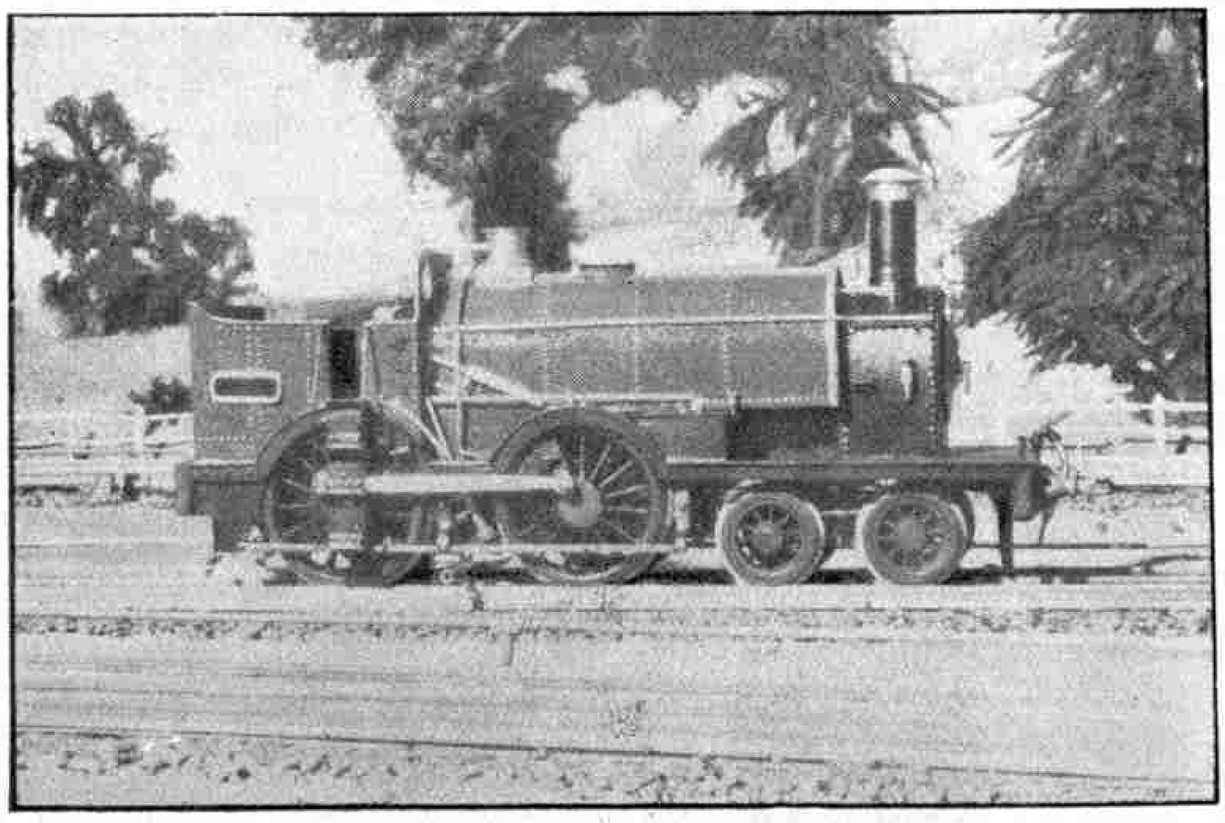
By E. W. TWINING. (Newnes. 5/-)

The author of this book is well known in model-making circles, and in the foreword to the book is described as one of the most versatile engineers and model makers in the country. This is well borne out by examination of the book itself, which is devoted to small-scale model railways of HO and OO gauge.

To begin with Mr. Twining explains how miniature railways of these small scales came into existence, and discusses the relative merits of the 3.5 mm. scale, or HO gauge, and the 4 mm. scale, or OO gauge. This is followed by a section on electric motors for miniature engines, and then comes a particularly interesting talk, illustrated by a valuable series of scale drawings, on locomotives old and new that are suitable for modelling, with details of colouring before and after railway grouping.

The author next turns to practical miniature work. He deals first with motor mechanisms and their adaption to models of a variety of engines, and his experience enables him to make a number of very useful suggestions. Automatic couplings, track, layout planning, signalling and rolling stock come in for a full share of attention, and there are particularly valuable hints on scenic effects and the methods and materials to employ in obtaining them. Here Mr. Twining is at his best, for in this sphere he is an acknowledged expert. The book concludes with a chapter on architectural features generally, in which are pointed out some of the pitfalls for the unwary in the construction of model buildings.

"Indoor Model Railways" will appeal particularly to railway owners of the more advanced kind who specialise largely in the construction of their own models. Although the book deals primarily with the HO and OO gauges it can be read with profit by miniature railway enthusiasts whose interests are not confined to the smaller scales. There are more than 126 illustrations, mostly valuable scale drawings, but including also half-tone illustrations of model railway subjects.



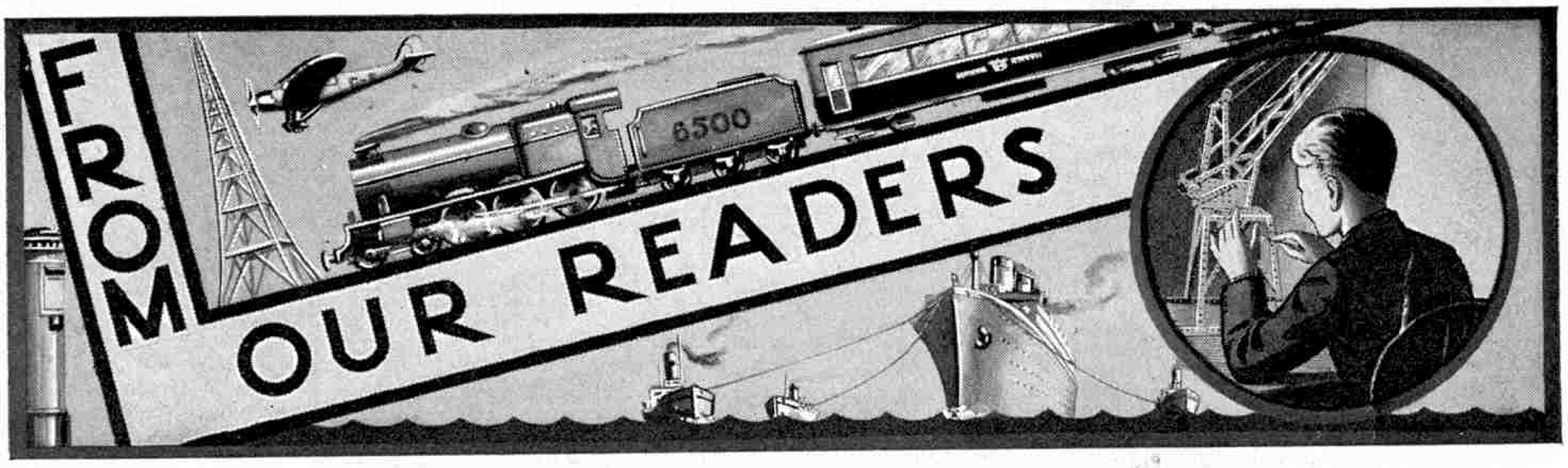
A model of an old-time locomotive in realistic surroundings. It represents a G.W.R. 4-4-0 saddle tank of the Broad Gauge period. From "Indoor Model Railways," reviewed on this page.

"Learn to Drive"

By OLIVER STEWART (Pitman. 2/- net)

Those who set out to become drivers could have no better guide than Mr. Stewart, whose expressed aim is to help people to learn to drive a motor car in the least possible time with the greatest possible safety, and with the least possible strain. In this he has succeeded admirably. He writes concisely but fully on every topic connected with his subject, and makes good use of an excellent series of diagrams designed to give information in rapid and certain manner. His book will be valuable to many who think they already know how to drive, as well as to the learner.

Mr. Stewart wisely starts with the car, insisting on learners mastering the controls and becoming at ease in the driving seat before going on to the road. Only when they are sufficiently practised in all the movements, and understand what each does, are they shown how to start away from rest, how to change speeds up and down and how to reverse. Sound methods are encouraged throughout the section dealing with ordinary running and manœuvring, so that the driver will do the best thing automatically when some unusual circumstance or emergency occurs. The remaining chapters show what to do when a car skids, how to drive with good manners at night and in traffic, and with an adequate margin of safety. Good advice is given on the development of the road sense that marks the really capable and constrained driver, and a useful glossary of terms completes a very valuable little book. There are three full page half-tone illustrations in addition to the many useful diagrams already referred to, all of which will play a part in helping readers to become good drivers.

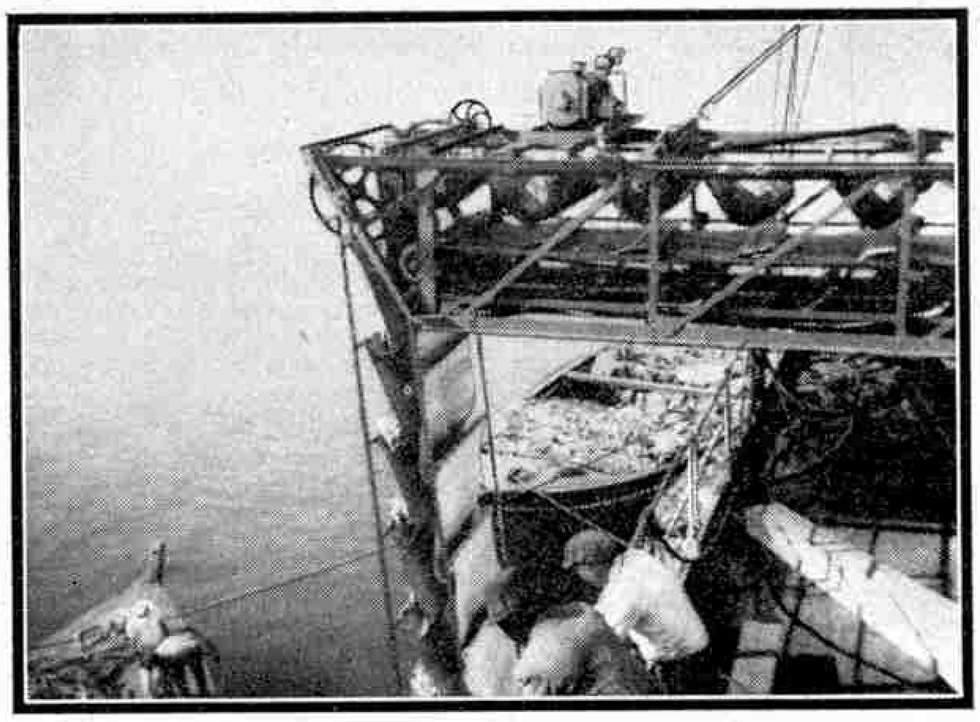


These pages are reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of which the writer has special knowledge or experience. These should be written neatly on one side of the paper only, and should be accompanied if possible by original photographs for use as illustrations. Articles published will be paid for. Statements in articles submitted are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

Loading Bananas by Conveyor

During a recent voyage to Brazil on a 12,000-ton fruit vessel, we put in at a small place called São Sebastião to pick up a cargo of bananas. São Sebastião possesses no proper quay, and we had to anchor some little distance from the shore. Our cargo was brought out to us in big barges towed by a powerful little motor tug, and the bunches were transferred to our holds by means of a conveyor.

This conveyor was brought from the mainland on a special barge and hoisted on board by the ship's derricks. It consisted of an iron frame, about 30 ft. long, with a large roll of canvas belting at each end. These rolls were let down, and by means of an ingenious arrangement of rollers their lengths were so adjusted that one end just reached the barge, whilst the other hung down into the hold. The belting was double, forming an endless conveyor. Its width was about 3 ft., and on one side of it were pouches in which the bunches of bananas were placed. In these they were carried up to deck level, along the iron framework, and down into the hold, where they were removed and stored by hand.



A conveyor loading bananas from barge to ship at São Sebastião, a small island off the coast of Brazil. Photograph by A. C. Gee, Southend-on-Sea.

An ingenious device counted the number of bunches loaded. This consisted of a short lever, weighted at one end, against which each pouch pressed in passing. The weight of a pouch containing a bunch of bananas was sufficient to depress the lever, which then actuated the counting mechanism, but an empty pouch slipped by without any effect of this kind.

The conveyor was worked by a powerful electric motor run from the ship's power supply, and the bananas were loaded in far less time than would have been required if they had been placed in cradles hoisted aboard by the ship's winches.

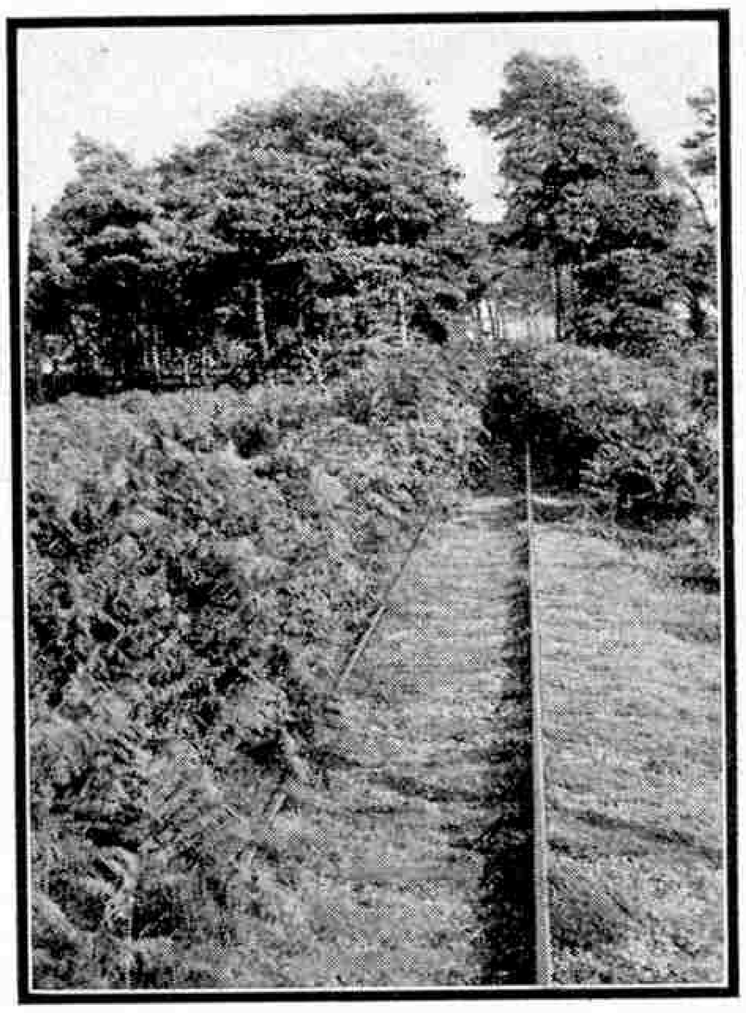
A. C. Gee (Southend-on-Sea).

The Southwold Railway

The Southwold Railway, a line in Suffolk that is now derelict, was opened in 1879 to connect Southwold with Halesworth, a distance of just under nine miles. The gauge was 3 ft., and there were three stations on the line in addition to the two termini.

The line was closed in 1929, 50 years after its opening. Since then it has become overgrown in many places with grass, heather and bracken, and several trees have fallen across the rails. The bordering fences are broken and the stations are in a state of semi-ruin.

Much of the rolling stock formerly used on the railway can be seen at Halesworth, near the L.N.E.R. station. The long and probably costly bridge built at Walberswick to carry the line across the River Blyth still stands, and is supposed to be "swung" once a year, as the river for a mile or two above the bridge is tidal.



Part of the track of the Southwold Railway, which was closed in 1929. Photograph by J. D. U. Ward, Oxford.

It seems a pity that the service has not been continued, even if it is not economical to replace the engines. The use of motor coaches fitted with suitable wheels might have proved an admirable solution. The country through which the line runs is very pleasing, and at one point there is a heronry within 100 yds. of the track. Since the line was closed a road service has been maintained between Southwold and Halesworth.

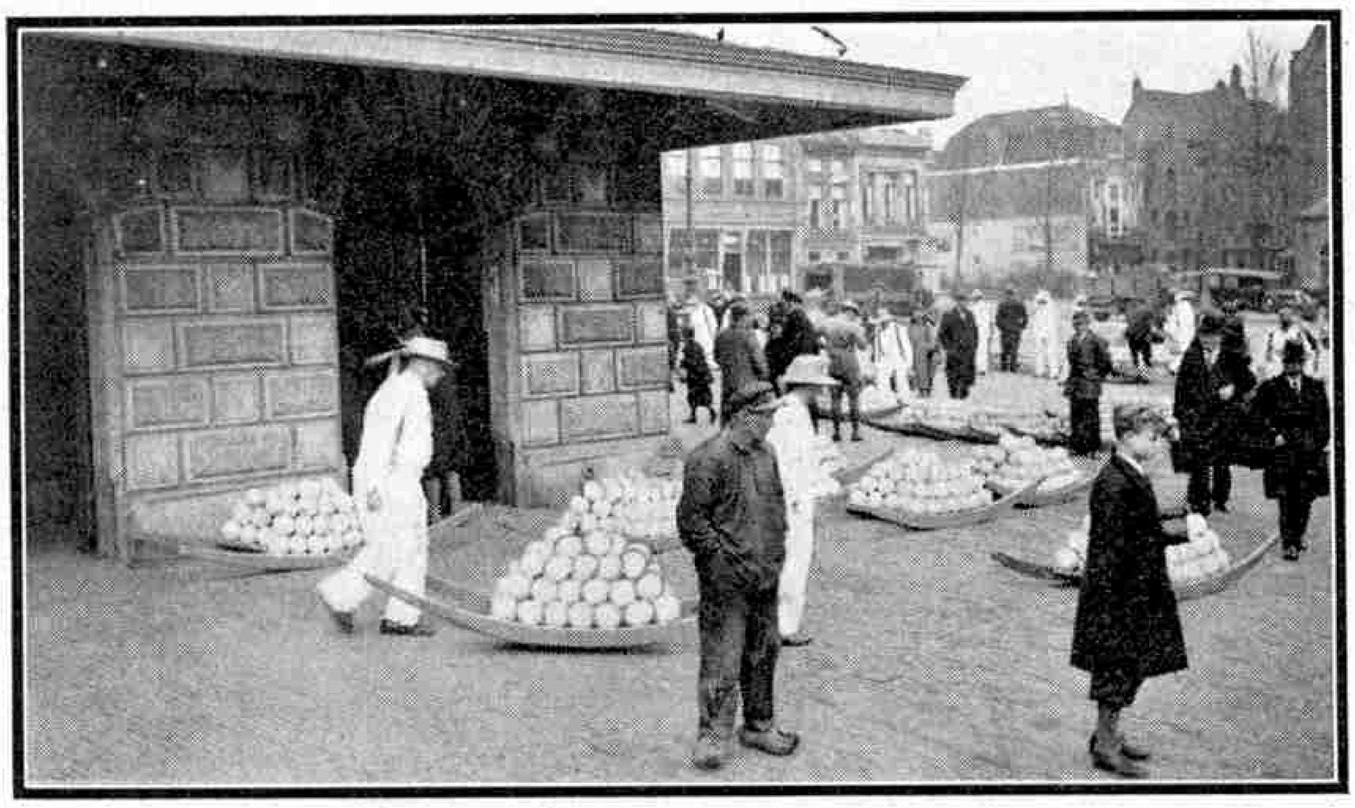
The engineer engaged on the construction of the line was a Mr. W. G. Jackson, who drove the first passenger train on the Southwold Railway. On this occasion the train had to negotiate floods caused by heavy rains. He had previously been engineer in charge of the construction of the first railway in China in 1875-6, and had actually driven the first train to run there on the Shanghai-Woosung Railway.

J. D. U. Ward (Oxford).

A Fortnight in Holland

I recently spent a most enjoyable holiday in Holland, and there saw many interesting scenes that are only to be found in "the land of the windmill." I travelled from London to Rotterdam by Harwich and the Hook of Holland, and spent a week exploring Rotterdam and surrounding districts.

As I am interested in ships I visited the yards of Van P. Smit Jr., of the Rotterdam Dry Dock Co., where I went over the "*Nieuw Amsterdam*," the largest ship ever built in Holland, and Wiltons, at Schiedam, where the floating docks were of special interest. I also visited the recently completed Feyenoord Stadium, which seats 65,000 people.



A scene in the cheese market at Alkmaar in Holland. Photograph by C. Rebbeck, Belfast.

A day was spent on the Rhine in a Diesel-engined boat. The barge traffic on the river is very heavy, and I saw more activity in coal-handling than I had ever thought possible. There was coal coming down the river from Germany and general freight going up river, the barges seldom being empty. I timed one coal-handling plant with my stop-watch, and was greatly impressed to see the grab pick up seven tons of coal, convey it from barge to ship, discharge it and return empty in 45 seconds.

In a very modern electric train I then travelled to Amsterdam. There I inspected the yards of the Nederland Shipbuilding Co., visited the municipal airport at Schiphol, and went round the city's very fine Rijko museum.

A day was spent motoring along the new enclosing dyke at the Zuider Zee, and also over large tracts of reclaimed land now under cultivation. The picturesque cheese market at Alkmaar interested me greatly, as did an old fishing village at Volendam. I was surprised to find at Cruquis an old steam pumping engine built in Cornwall in 1849. I was told that this remained in regular use until 1933! The Hague proved equally attractive both as a place of historic interest and as a modern city.

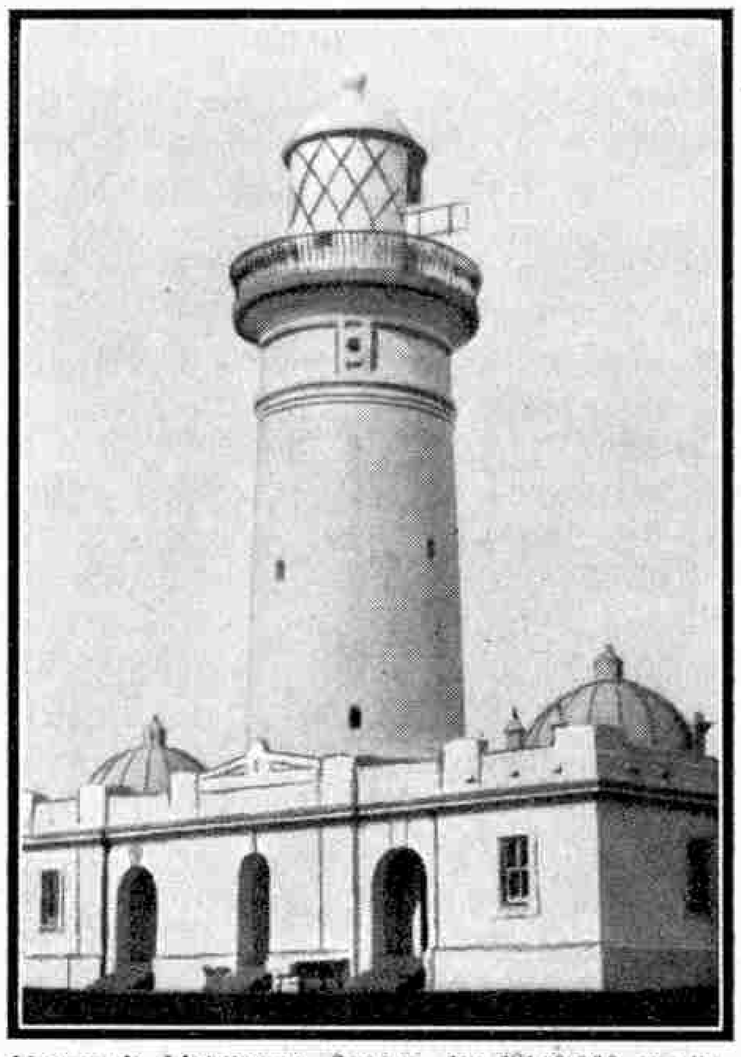
All the main roads I saw were very good, with four lanes for traffic and separate lanes for cyclists. Before leaving, I visited the modern and very efficient Phillips factory at Eindhoven, in the south of Holland. There intricate operations of all kinds from glass blowing to making television sets were explained and demonstrated to me. Some 20,000 men are employed in these works, which cover many acres.

C. REBBECK (Belfast).

Australia's Most Powerful Light

Lachlan Macquarie, Governor of New South Wales from 1810 to 1821, was responsible for the erection of the first lighthouse in Australia and it is named after him. For it he chose an advantageous site overlooking the Pacific Ocean at the Outer South Head, Port Jackson, Sydney, and he laid the foundation stone on 11th June, 1816. The tower was designed by Capt. John Gill, Acting Colonial Engineer, and Francis Greenaway. It was 76 ft. high, and the lantern was 277 ft. above sea-level. Its light could be seen from ships at a distance of about 22 miles. As the cost of maintaining it was very high, ships entering the harbour were taxed 2d. a ton to keep it in operation.

In 1879 the Marine Department of the Australian Colonies decided to demolish the original Macquarie Tower, and to erect another slightly to the west. The Government granted £15,000 towards the cost of the work, and the foundation stone of the new lighthouse was laid on 2nd March, 1880. The building was completed in 1881, but did not come into use until two years later. Its total cost was £19,620, nearly half of which was spent on the light itself.



Macquarie Lighthouse, Sydney. Its 1,140,000 candle-power light is the most powerful in Australia. Photograph by K. E. Allen, Oatley, N.S.W.

The second Macquarie Tower is still in operation, and is shown in the lower illustration on this page. It is circular in shape, with a height of 87 ft. and a base 24 ft. in diameter. In January 1933 the light was converted into one of 1,140,000 c.p., making it the most powerful in Australia, and on a clear night it is visible at a distance of over 60 miles. It is electric and semi-automatic, a second lamp being switched on and automatically brought into focus if the one in use burns out. A bell rings in the keeper's house to warn him of any failure. Power is taken from the city supply, but separate generating machinery is provided, and is automatically switched on and connected to the light if the normal supply fails. Even a breakdown in the electric equipment in the lighthouse is allowed for. In that event an acetylene lamp would automatically come into operation.

Lower down on the South Head, nearer the mouth of the harbour, stands another lighthouse, known as the Hornby Light. This was constructed in 1858, under the supervision of Sir William T. Denison. The Hornby Light is smaller than the Macquarie Tower, and its light is much less powerful.

K. E. ALLEN (Oatley, N.S.W.).

In Search of New Models

Conveyors, Hoists and Trucks

MODERN factories and warehouses provide a variety of attractive subjects for the model-builder. Their efficient working depends largely on the ease and rapidity with which materials of all kinds can be transported from one department to another. Many interesting appliances are used for this work, and most of these possess features that make them fine subjects for models.

The most familiar transportation devices are the various types of conveyors, hoists and mechanical trucks. In addition there are machines designed for handling special kinds of goods. Examples of all of these have been described and illustrated from time to time in the *"M.M."* so that readers who wish to experiment with models of this kind will have no difficulty in obtaining information to guide them.

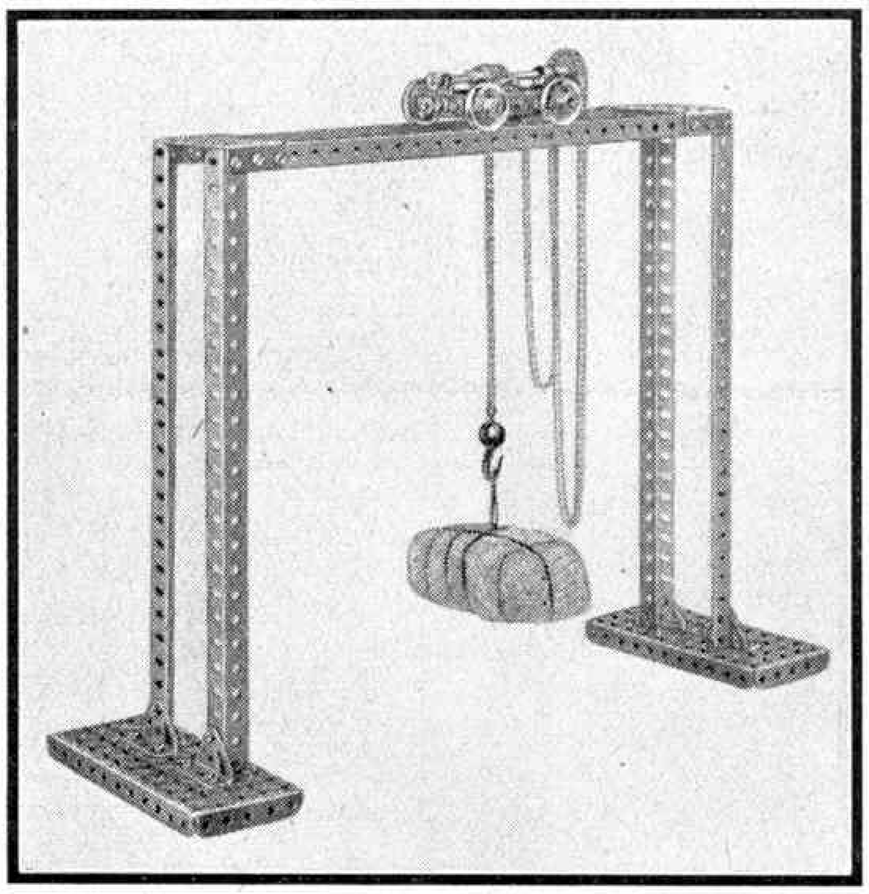


Fig. 1. A model of a manually operated hoist of the type used in workshops for lifting light castings and parts of machinery.

Conveyors are attractive subjects because of their movement and variety. One of the best types for modelling in Meccano consists of a travelling chain carrying small trays or buckets, which are used for transporting loose materials and small packeted goods. Small Flanged Plates can be used for the trays and can be representing Strips from an endless suspended by of Sprocket Chain. travelling belt made

Model-builders who possess a large Outfit can attempt some of the more elaborate conveyors, such as the scraper types used in power stations and gasworks for carrying coal from the storage hoppers to the chutes that feed the furnaces. These consist of scraper plates attached to a driven endless chain which hauls the plates along a V-shaped or rectangular metal trough. The coal is fed into the trough at one end, and is dragged along by the scraper until it reaches the mouth of the delivery chute. In a model of one of these devices the scrapers can be built up from Triangular Plates and fitted to a belt of Sprocket Chain. It is necessary to construct the trough in such a manner that no bolt heads protrude inwards to obstruct the scrapers in their movement, and a little ingenuity will overcome this difficulty.

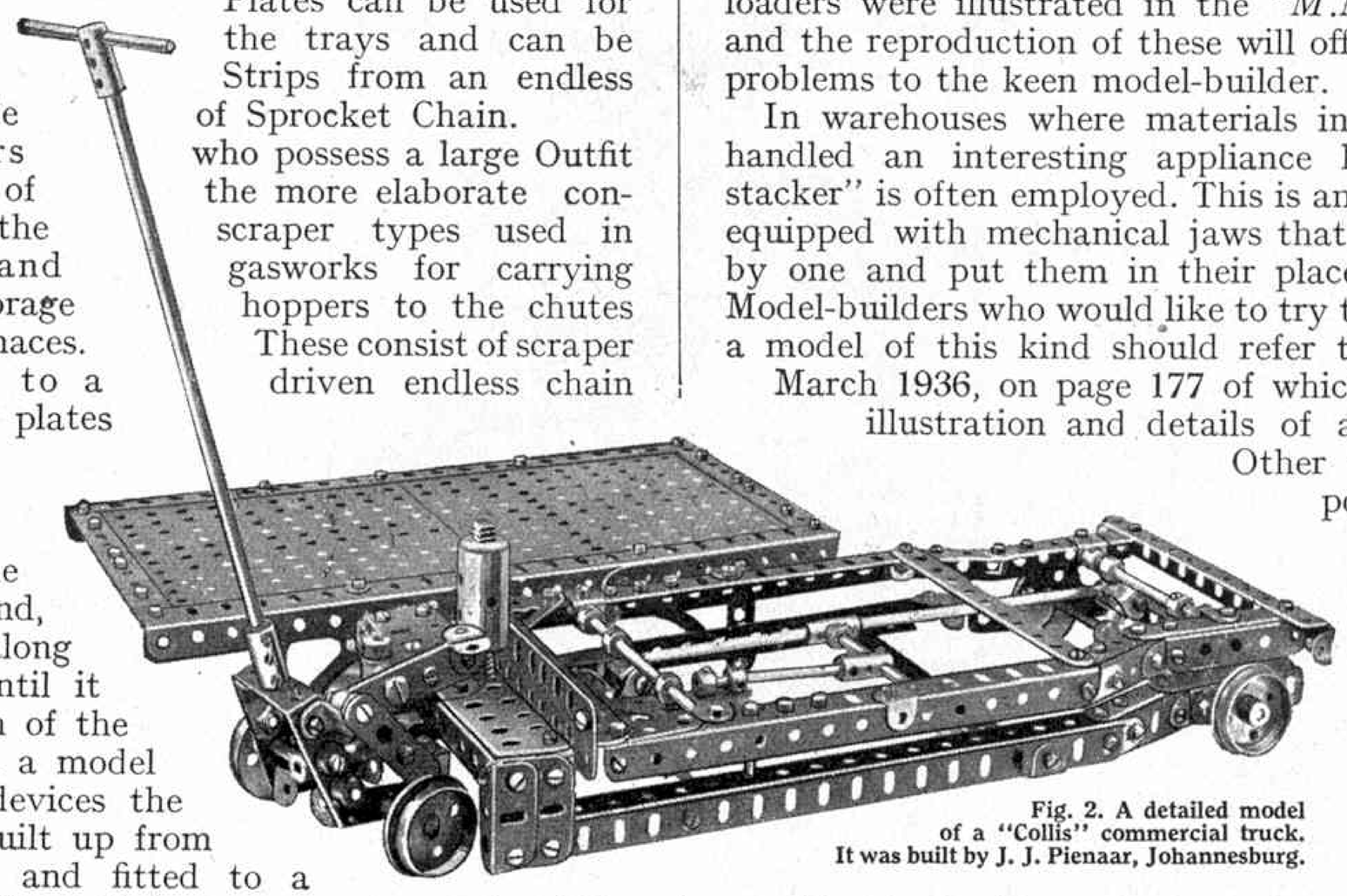


Fig. 2. A detailed model of a "Collis" commercial truck. It was built by J. J. Pienaar, Johannesburg.

In addition to the fixed types, there are various kinds of a factory to another as required. These are usually employed for removing bulk material, such as grain, and loading it into wagons or bins, and an example of a model conveyor of this kind is shown in Fig. 3. The conveyor works at an angle of about 45 deg. to the ground, and the material is lifted on to it by means of a mechanical scoop at the lower end. The trucks into which the material is to be loaded are run under the elevated end of the conveyor.

It will be seen from the illustration that the constructional details of such a model as this are quite simple. Although in this instance the conveyor is of the ordinary plain belt type it can be replaced by a bucket conveyor or one of the scraper type, so that there is plenty of scope for interesting experiment. The model is operated by an Electric Motor, but if a power unit of this type is not available a Clockwork Motor can be used quite successfully.

Another interesting type of conveyor is that used for loading or unloading bananas. An illustration of one of these appears on page 224 of this issue. Other banana loaders were illustrated in the *"M.M"* for June 1936, and the reproduction of these will offer some interesting problems to the keen model-builder.

In warehouses where materials in sacks have to be handled an interesting appliance known as a "bag stacker" is often employed. This is an ingenious machine equipped with mechanical jaws that grip the sacks one by one and put them in their places in a neat stack. Model-builders who would like to try their skill in making a model of this kind should refer to the *"M.M."* for March 1936, on page 177 of which they will find an illustration and details of an actual machine.

Other very useful transport devices used in factories and warehouses are mechanically or electrically propelled trucks of various kinds. These are made in such a wide variety of types that they provide ideal subjects for both large and small Outfits. Here again there is no difficulty in obtaining information, for illustrations and descriptions of such trucks have appeared in the *"M.M."*

Small models can be driven by a *Magic* Motor and a very neat example of the use of this was illustrated on

page 174 of the "*M.M.*" for March last. Where a sufficient stock of parts is available it would be interesting to build a similar model on a large scale, and to drive it by means of a 6-volt Electric Motor, which can be mounted on a Ball Bearing unit or a small Roller Bearing. A 6-volt accumulator can readily be mounted on a model of this kind to supply current, and thus to make it fully self-contained.

Fig. 2 shows a model of a well-known commercial truck of a very different type. This consists of a platform, mounted on wheels, which can be raised from the ground to a distance of several inches simply by depressing the handle by which the truck is hauled. The goods to be moved are stacked on trays supported by runners, so that there is sufficient space between them and the ground to allow the truck to be run under them. The handle is then pushed downward and the platform rises, thus lifting the tray and its load, and the latter is deposited on arrival in its new position by simply reversing the movement. It is not difficult to build a model of this truck, as the raising gear consists simply of an arrangement of levers and links. Model-builders who are interested will be able to obtain all the guidance they need on this point from Fig. 2, and there is room for experiment in devising the best means of carrying out the movements.

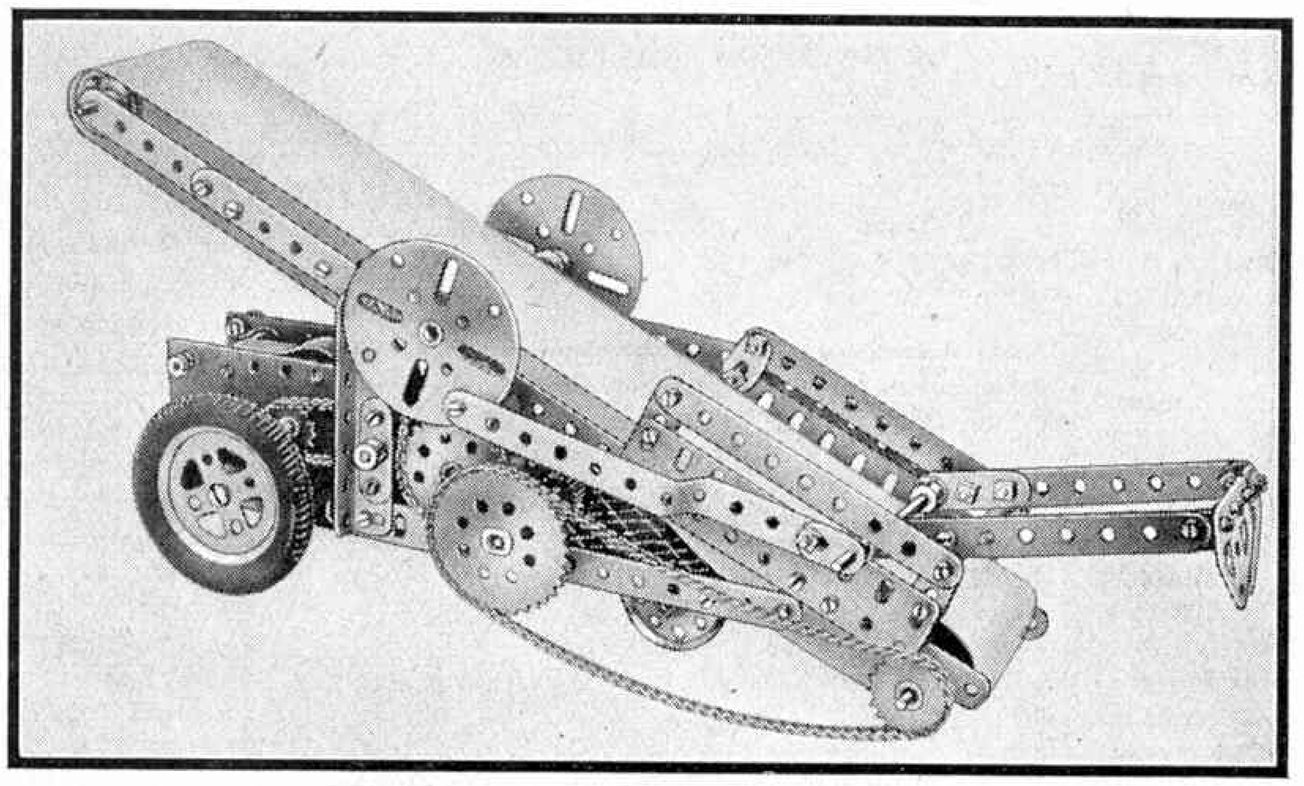


Fig. 3. A novel working model of a portable conveyor-loader designed for loading loose material into trucks. Although simple to build it works in the same manner as its prototype.

Interesting subjects for models of a very different type from those already mentioned are the hoists used for lifting castings and machine parts. The simplest kind is the manually-operated hoist, which consists usually of two chain wheels of different diameters and is suspended from a gantry along which it can travel. The lower sheave consists of one chain wheel to which the hoisting hook is attached. The chain by which the hoist is operated is an endless one passing first round the large upper wheel, then round the lower sheave and finally over the smaller upper wheel, the rest of the chain hanging down in a loop. The load is hoisted simply by pulling on the loose chain. Meccano Sprocket Chain and Sprocket Wheels are ideal for use in modelling such an appliance and the only other parts required are a few Strips, Rods and Pulleys.

Hoists of the kind described suffer from the disadvantages that when a load is raised it is maintained in position only by the friction on the spindles of the sheaves, so that it is suitable only for light loads. This difficulty is overcome in another kind of manual hoist, a model of which is shown in Fig. 1. In this the chain drive is transferred to the hoisting wheel through worm and pinion gearing so that there is no danger of the load falling when the chain is released. As will be seen from the illustration a very neat model of this can be built.

Model-builders who possess an Electric Motor will find an electrically-operated hoist a good subject for their attention, as such models allow scope for experiment with different methods of control. A model of this kind is shown in Fig. 4. This is based on an actual Royce hoist designed for lifting loads up to 5 tons, and it is very simple to assemble and operate. Two chains hang from one side of the hoist and these form the sole controls, the pulley block being raised by pulling on one chain, and lowered by pulling on the other. Current for the Electric Motor is collected from an overhead conductor wire by a ½" Pulley, fitted above the neat trolley. The Motor is covered by a casing of Flexible Plates.

Sometimes electric hoists are fitted with powerful electro-magnets instead of ordinary lifting hooks. Hoists of this type are used in metal stockyards for lifting and transporting steel plates, and they are often to be seen in scrap metal warehouses, where they are used to lift a heavy iron ball known as a "skull cracker." This is dropped from a height of several feet onto scrap metal to break it into pieces of a size suitable for the melting furnaces. A typical hoist of this kind was illustrated on the cover of the "*M.M.*" for May 1936, and this would make an ideal subject for an interesting and unusual model. The mechanism of the hoist itself is very similar to that of an ordinary mechanical hoist, and no difficulty should be experienced in building up a magnet of sufficient power to carry out actual lifting operations. For this purpose the Magnet Coils included in the Elektron series of parts will prove useful, and by using two or more of these together a really powerful unit can be assembled. Meccano Bobbins (Part No. 181) wound with wire, also can be used.

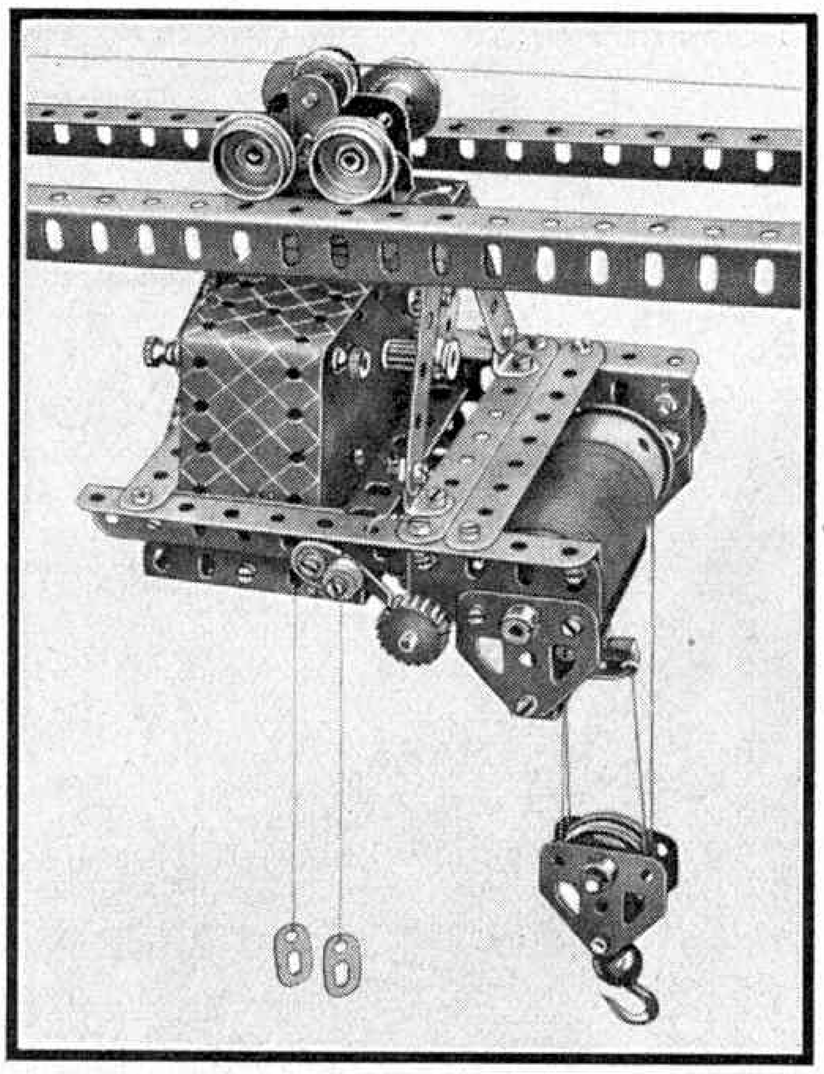


Fig. 4. Electric hoists provide plenty of scope for variety in design and methods of control. The model shown above incorporates a novel reversing mechanism.

Many factories are equipped with goods elevators or lifts. Model-builders with the necessary parts will find plenty to interest them in constructing working models of this kind, as there is ample scope for introducing various automatic starting, stopping and safety devices. Safety devices usually consist of catches fitted to the roof of the lift cage. If the hoisting cable breaks, the catches spring outward and jam the lift in its shaft.

Meccano Suggestions Section

By "Spanner"

(403) Synchronous Motor for Electric Clocks

Model-builders who experiment in the construction of electric clocks will be interested in the synchronous motor shown in Fig. 403. The special feature of a motor of this kind is that its speed depends on the frequency of the alternating current supply to which its windings are connected. It is therefore suitable for driving clock mechanisms.

The motor is built from Meccano parts, with the addition of certain Elektron parts, and is not difficult to construct. Each side of the stator, or stationary part of the motor, consists of a Circular Strip 1, and between these are eight Magnet Coils 2, fitted with Magnet Cores. The Circular Strips are clamped together by fastening a Threaded Boss 3 between each pair of Magnet Coils, the Boss being spaced from the Circular Strip by means of four washers. The other Circular Strip is then assembled in position by screwing $\frac{1}{2}$" Bolts into the Threaded Bosses.

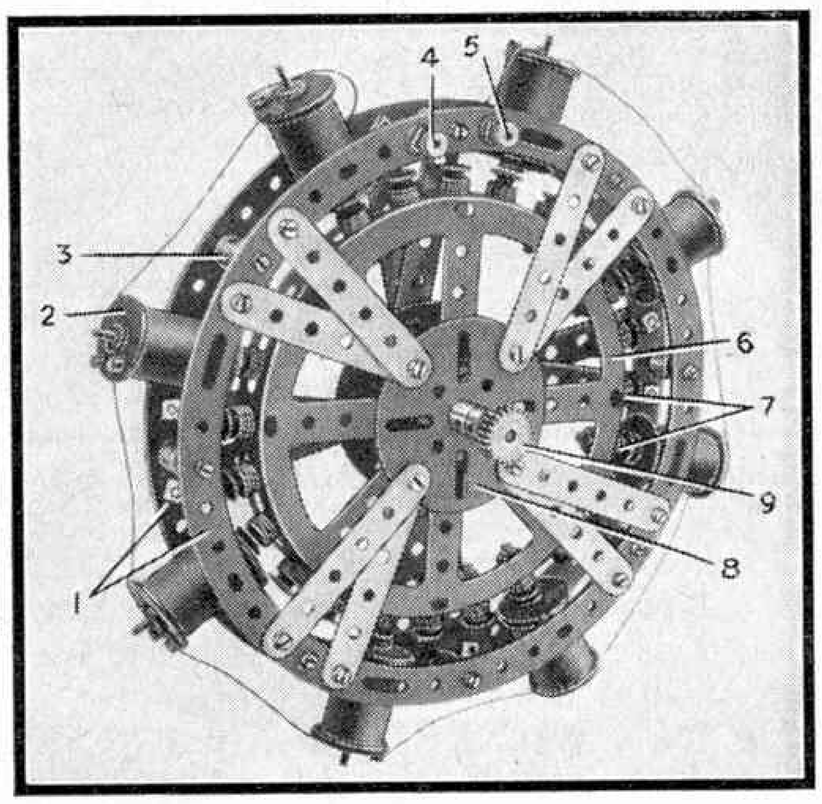


Fig. 403

The rotating part of the motor consists of a Hub Disc 6, around the rim of which are bolted 24 buffers 7, removed from Spring Buffers (Part No. 120a). Each of the buffers carries nine washers, four below its head and five on its shank, the whole being fixed to the Hub Disc by means of a nut. The buffers form the poles of the rotor, and care should be taken to space them at equal distances apart around the rim of the Disc. A Bush Wheel is bolted at the centre of the Hub Disc and in its boss is fastened a $3\frac{1}{2}$" Rod. The rotor is now ready to be fitted in the housing.

Bearings for the rotor shaft are provided by two Face Plates 8, each of which is supported by eight 3" Strips arranged in the manner shown. Two Collars secured on the rotor shaft ensure that the poles of the rotor are maintained in alignment with the Cores of the Magnet Coils. The $\frac{3}{4}$" Pinion 9 serves as a grip to facilitate spinning the rotor when starting up the motor.

The Magnet Coils are connected together in series, that is the inner terminal of each Coil is connected to the outer terminal of the next. When the last Coil is reached its free terminal and that of the first are connected by leads to the Terminals 4 and 5 bolted to the Circular Strip 1. As a final adjustment, the Core of each Magnet Coil is moved as close to the poles of the rotor as possible without coming into actual contact with them.

The motor is designed to operate from any of the Meccano T6 series Transformers, and on a frequency of 50 cycles the rotor has a speed of 250 r.p.m. If the motor is required to work on frequencies other than 50 the speed of the rotor can be ascertained by multiplying the frequency of the mains supply by 120 and dividing the product by the number of poles on the rotor.

To start the motor it is necessary to spin the rotor at a rate slightly higher than its normal working speed, and a little practice is all that is necessary to ensure a quick start-up.

(404) Interesting Screw Mechanisms

(W. Howard, Burnley, and I. Cutts, Goldthorpe)

W. Howard, Burnley, has submitted an interesting suggestion for a hoisting mechanism that can be used in model cranes as an alternative to the usual method of winding the hoisting cord around a driven drum. The mechanism he suggests is shown in model form in Fig. 404. It is based on that used in hydraulic cranes, in which the hoisting cord is passed around a system of pulleys, one set of which are fixed, while another set is arranged on the end of the piston of a hydraulic ram. As the piston moves outward the two sets of pulleys move apart and thus draw in the hoisting cord, which is attached to the load.

Howard's mechanism reproduces this system of working very closely. The framework carrying it consists of two $2\frac{1}{2}" \times 1\frac{1}{2}"$ Flanged Plates, which are joined by $7\frac{1}{2}"$ Strips and are mounted on a base composed of Angle Girders. Four 1" Pulleys are mounted on a 3" Rod 4 and are spaced by a Coupling and Washers. The pulleys on the movable set are mounted on 1" Rods fixed in the longitudinal bore of a Coupling 2. An 8" Screwed Rod 3 passes through the threaded transverse bore of the Coupling, and is journalled at one end in a Rod Socket and at its other end in a $2\frac{1}{2}" \times 1\frac{1}{2}"$ Flanged Plate. The other ends of the 1" Rods are fixed in the bosses of Eye Pieces 1 working on the $7\frac{1}{2}"$ Strips.

A 1" loose Pulley 7 is fixed by lock-nuts to the end of the Screwed Rod and is connected by a Driving Band to the $\frac{1}{2}"$ Pulley geared to the Electric Motor. Cord 5 is tied at 6. It is passed first round a Pulley in the fixed block, then round a Pulley in the movable block, and so on, finally being passed over the Pulley at the jib-head. The effect of this arrangement is that a small movement of the movable pulley block results in a considerably larger movement of the load hook. For example, when the movable pulleys move through a distance of 3 in. along the Screwed Rod the load hook is raised through a distance of 24 in.

I. Cutts, Goldthorpe, sent me details of a screw mechanism he has used for luffing the jib of a model crane. An advantage of this system over the ordinary method is that it does away with luffing cords, which are liable to slip off the Pulleys and become entangled. His idea is to pivot a Coupling halfway down the jib of the model and connect it by a Rod of suitable length to a large Fork Piece that is pivoted to an Octagonal Coupling. The latter works on a horizontal Screwed Rod that can be rotated by a Bush Wheel, or through a gear train coupled to a Clockwork or Electric Motor if the model is driven by this means. When the Screwed Rod is rotated, the jib is either raised or lowered as the Octagonal Coupling traverses the Rod. Another type of screw operated luffing gear was described in "*Suggestions Section*" for December 1934, and consists of a lever, one end of which is connected by links to the jib while the other end is attached to a Coupling that traverses a Screwed Rod. When the Screwed Rod is rotated the Coupling moves downward, and its motion is transmitted through the links to the jib. A feature of this system is that the pull is applied almost at right angles to the jib, irrespective of its position.

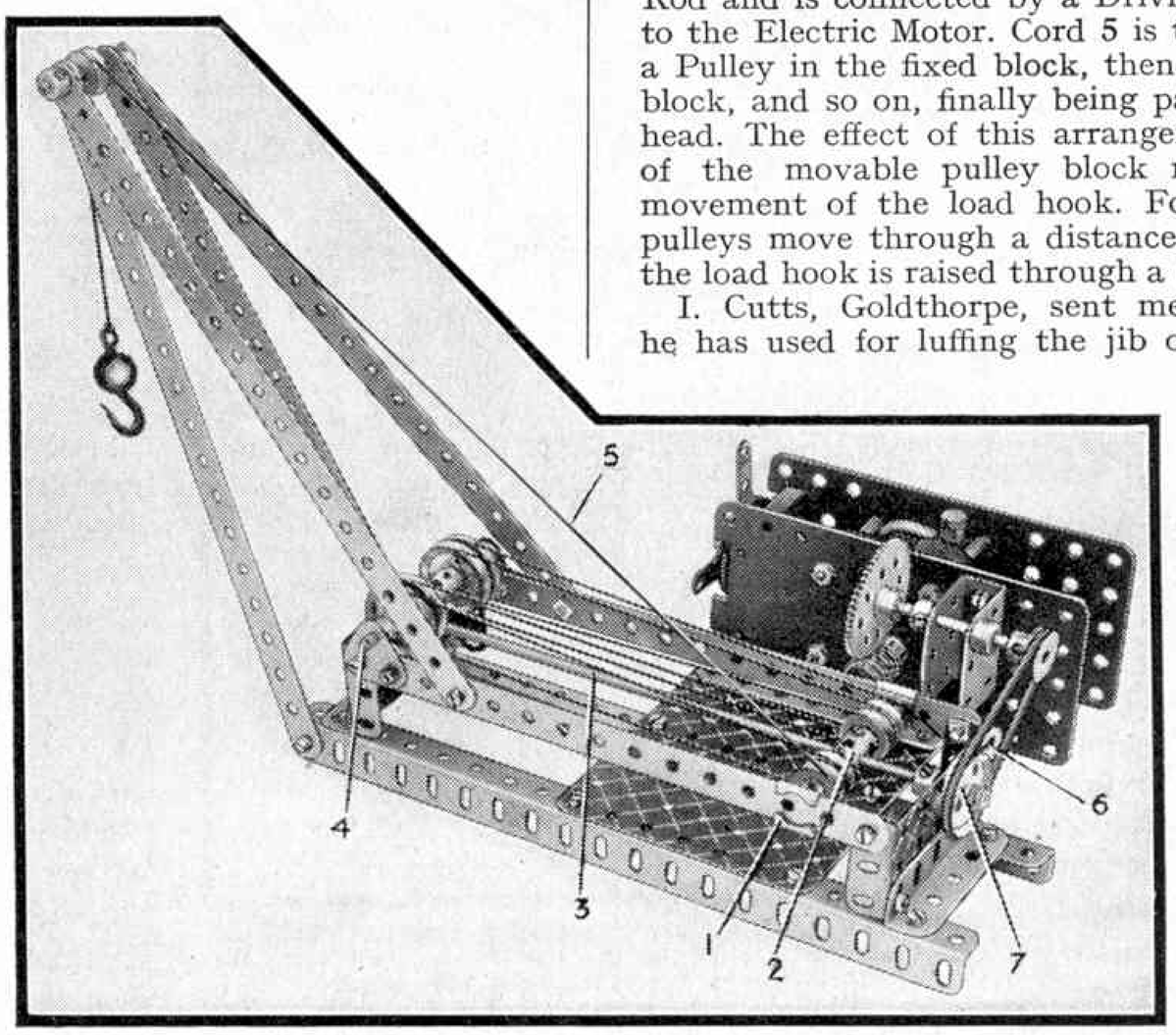


Fig. 404

(405) A Gearless Speed Reducing Mechanism (R. Simpson, Hull)

R. Simpson, Hull, required a simple device for transmitting a drive from one shaft to another in such a manner that the driven shaft would rotate always in the same direction, no matter in which direction the driving shaft were rotating. He also wished to make the driven shaft rotate at one twentieth of the speed of the driving shaft. He solved the problem by the device shown in Fig. 405, an interesting feature of which is that it does not incorporate any gears or pinions.

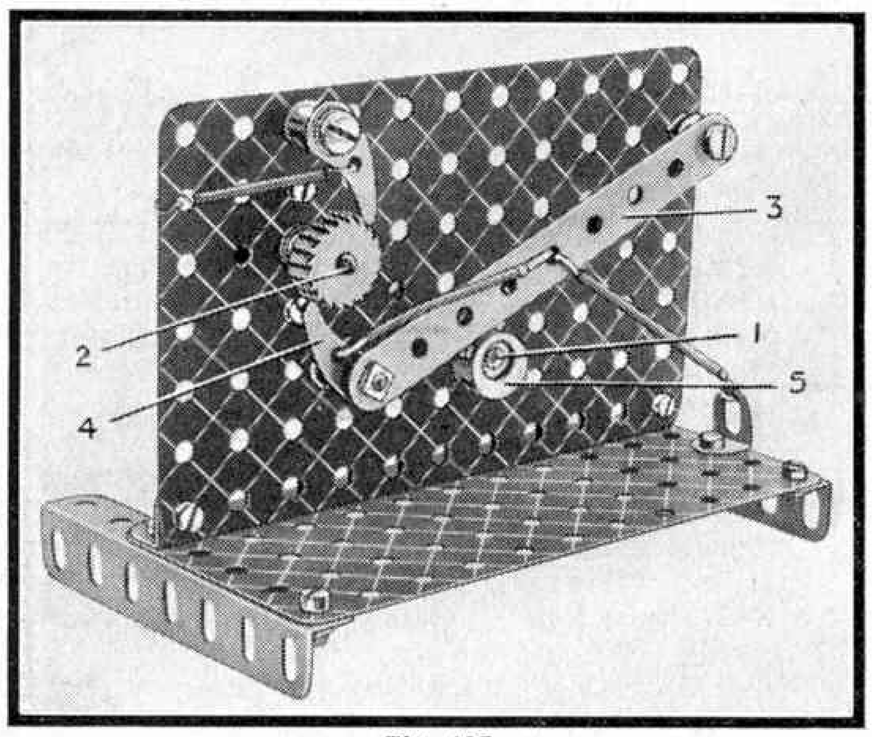


Fig. 405

The driving and driven shafts 1 and 2 respectively are mounted in the positions shown, the former carrying a cam 5 formed from a Kemex Universal Stand Clamp (Part No. K31) and the latter a Ratchet Wheel. A 5½″ Strip 3 is fitted at one end with a Pawl, which is carried on a Pivot Bolt and is tensioned by a short length of Spring Cord. The other end of the 5½″ Strip is held against the head of a Pivot Bolt lock-nutted in the position shown. The Strip is held in contact with the cam by a second length of Spring Cord. It will be seen that for each revolution of the cam 5 the Ratchet Wheel is advanced one tooth by the Pawl 4, the second Pawl being arranged to prevent the Ratchet Wheel from rotating in the reverse direction on the return stroke of the Pawl 4.

This device is particularly suitable for operating feed mechanisms, and can be used in clock gear trains. It should be noted that other ratios than 20 : 1 can be obtained by suitable arrangement of the 5½″ Strip and cam, and by replacing the Ratchet Wheel with a Sprocket Wheel of suitable diameter.

(406) A Useful Woodworker's Clamp (J. Usher, Dundee)

From time to time I have described in *"Suggestions Section"* several tools and miscellaneous gadgets that can be put to practical use in the home workshop. A further addition to this series is the woodworker's picture-framing clamp shown in Fig. 406. This was designed by J. Usher, Dundee, and is a practical tool for small work.

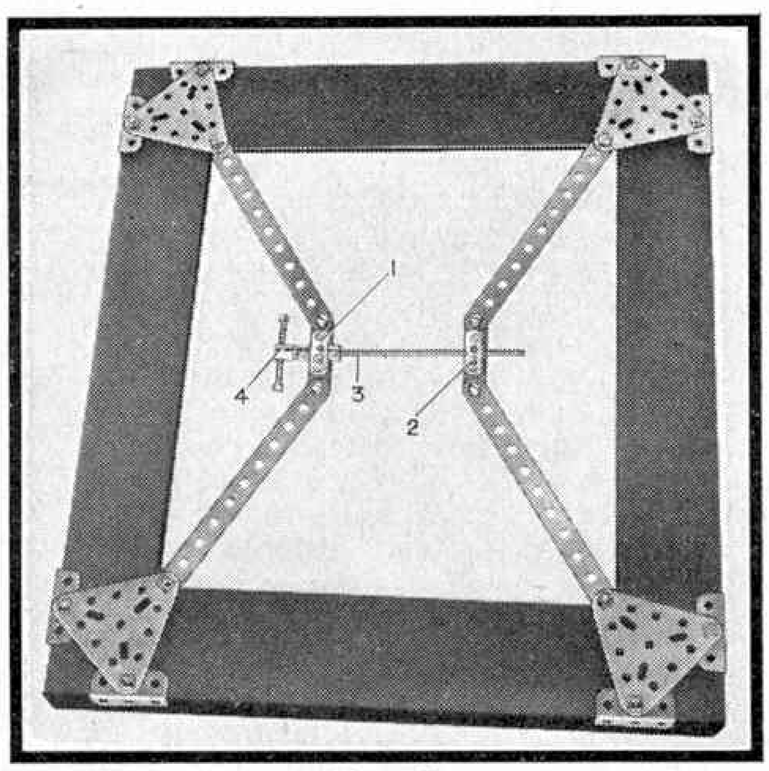


Fig. 406

The device consists of four arms composed of 5½″ Strips, to one end of each of which is lock-nutted a 2½″ Triangular Plate. Two 1½″ Angle Girders at right angles to each other are bolted to each Triangular Plate. The arms are then lock-nutted in pairs to a 2″ Strip, each of which carries a Coupling. The 5″ Screwed Rod 3 passes through the centre plain transverse bore of Coupling 1, but is prevented from moving longitudinally by two Collars. One end of the Screwed Rod is fitted with a handle consisting of two ¾″ Bolts screwed into a Threaded Boss 4, which is held on the Rod by a nut. The other end of the Screwed Rod works in the centre transverse threaded bore of the second Coupling 2. The clamp is set up as shown, and is tensioned by rotating the Screwed Rod. The pivoted joints make the clamp suitable for use with either oblong or square frames.

(407) Creeper Track for Model Excavators (J. Wilson. Milford-on-Sea)

Many types of excavating machines and tractors, as well as army tanks, are mounted on creeper tracks, and in building models of these machines the problem arises as to the best means of making satisfactory creepers with as few parts as possible. Several methods of constructing creepers have been described from time to time on these pages, and this month I am giving details of a further method that is put forward by J. Wilson, Milford-on-Sea. A track built up on the lines suggested by Wilson is shown in Fig. 407. It is constructed from short Strips and Sprocket Chain, and rides quite freely over ground irregularities.

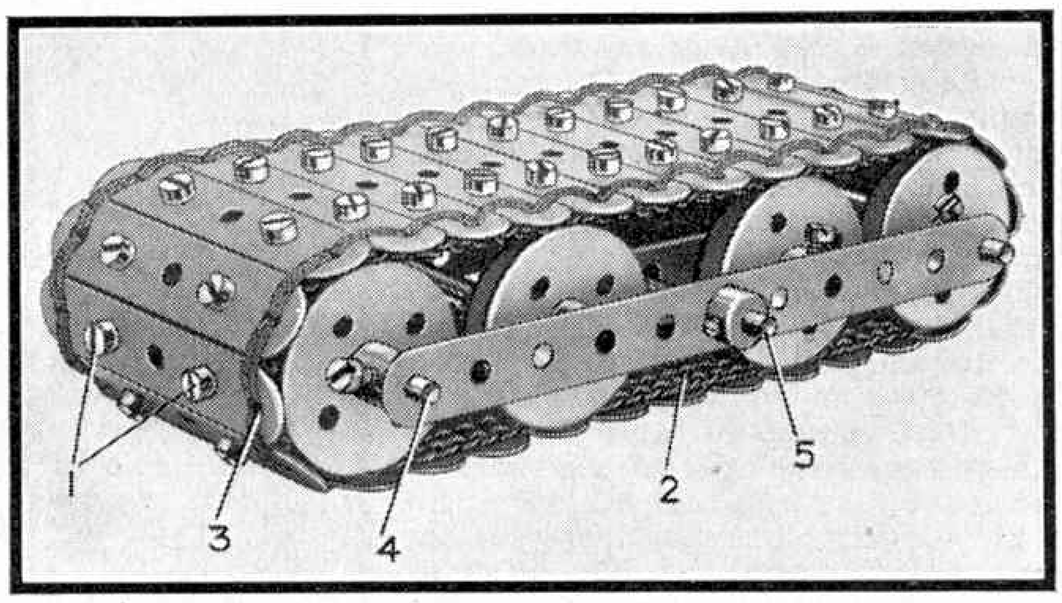


Fig. 407

The flexible belt consists of 28 2½″ Strips, each of which is fitted with two bolts 1. The nuts on the shanks of the bolts are tightened up with sides parallel to the edges of the Strip. The Strips are then laid side by side, touching each other, with the nuts upwards, and a length of Sprocket Chain 2 is laid over the end holes of the Strips. Cord 3 is then threaded through them. It is passed through the hole in the first Strip, round one of the links in the Sprocket Chain, and then back through the hole in the same Strip. This process is repeated with each Strip, until all are threaded to the Sprocket Chain. The other ends of the Strips are then threaded similarly. It will be found quite easy to pass the Cord through the Sprocket Chain and Strips if a large darning needle is used for the purpose. The ends of the Sprocket Chain are then joined together in the normal way, and the free ends of the Cord are tied together.

The band is carried on eight 1⅛″ Flanged Wheels, and is driven by means of Bush Wheels mounted on Rod 4. There are two Bush Wheels on this Rod and each carries eight bolts, the shanks of which are on the same side as the boss. The shanks of the bolts act as teeth and engage the bolts of the 2½″ Strips. The four centre Flanged Wheels are mounted on a bogie consisting of two 2½″ Angle Girders bolted to a 2½″ × 1½″ Flexible Plate. The Flanged Wheels are fastened on 3″ Rods journalled in the elongated holes of the Angle Girders. A 4″ Rod 5 passes through the centre holes of the Angle Girders and is journalled in the 5½″ Strips as shown.

To mount the tracks in a model long Rods are journalled in the base or chassis of the model and on them are fastened the front and rear pairs of Flanged Wheels. In some cases the bogie can be pivoted to the chassis, and the 5½″ Strips can then be dispensed with.

The track illustrated is intended for use with shafts 5 in. apart, but tracks of any length can be built if desired. The width of the track also can be varied and if 1½″ Strips are used, it is necessary to fix a bolt only in the centre hole of each Strip. The Cord is threaded through the end holes of the Strips as before.

Miscellaneous Suggestions

Under this heading "Spanner" replies to readers who submit interesting suggestions regarding new Meccano models or movements that he is unable to deal with more fully elsewhere. On occasion he offers comments and technical criticisms that, he trusts, will be accepted in the same spirit of mutual help in which they are advanced.

(**M.203.**) The Helical Gears (Parts Nos. 211a and 211b) are designed for use in all kinds of mechanisms where it is required to transmit a reversible right-angle drive from one shaft to another when the two are not in line. J. Walsh, Cardiff, suggests that the adaptability of these parts for other purposes could be greatly increased by drilling holes in the 1½″ Helical Gear in similar positions to those in the 1½″ Bevel Gear or Bush Wheel. The part could then be used in much the same way as the 1½″ Bevel Gear is used in differentials and other mechanisms. The suggestion is one that will be given careful consideration.

New Outfit Models

Good Subjects for Large and Small Outfits

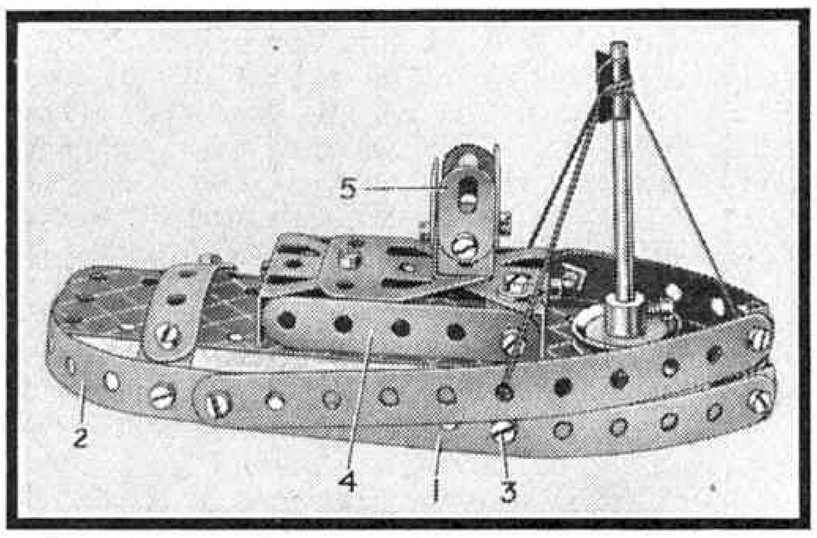


Fig. 1. A model steam tug built from Outfit No. 1.

THE five new models described this month differ so widely in type and size that every Meccano model-builder, whatever his Outfit, will find one or more that he will be delighted to construct. They include a scooter and a steam tug, built from the contents of Outfits Nos. O and 1 respectively. Then comes a trench digger that is capable of real work, and for which Outfit No. 4 is required. Finally the needs of owners of larger Outfits are met with fine working models of a horizontal steam engine and a swing bridge, each of which can be built from the contents of Outfit No. 7.

The steam tug shown in Fig. 1 is the first model to be described. This is very effective and it is very easy to assemble. Construction is commenced with the hull, which consists of two $5\frac{1}{2}''$ Strips 1 joined at the bows by an Angle Bracket and at the stern by a second $5\frac{1}{2}''$ Strip 2. A $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip is then fixed in place by the bolt 5. The deck is a $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate, extended at the front by a Flat Trunnion, and it is held in place by a $1''$ Pulley and a Spring Clip fixed on the $3\frac{1}{2}''$ Rod forming the mast. The sides are made to slope upward at the bows by the use at each side of a $5\frac{1}{2}''$ Strip and a $4\frac{1}{2}''$ strip made from two $2\frac{1}{2}''$ Strips. The Strips are joined at the bows by an Angle Bracket.

The deck cabin is formed with two Trunnions, which are joined together by a Flat Trunnion and a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip. The bolt that holds the funnel is $\frac{3}{8}''$ long, and it passes through four Angle Brackets, each of which is fitted with a Flat Bracket 5. The $2\frac{1}{2}''$ Strip 4 is fixed in place by a Reversed Angle Bracket that serves to hold the deck cabin to the deck.

The model is completed by the addition of the towing beam, which consists of a $2\frac{1}{2}''$ Strip that is joined to the sides of the hull by Angle Brackets.

Parts required to build the model steam tug: 4 of No. 2; 4 of No. 5; 4 of No. 10; 8 of No. 12; 1 of No. 16; 1 of No. 22; 3 of No. 35; 24 of No. 37; 3 of No. 37a; 1 of No. 38; 3 of No. 111c; 1 of No. 125; 2 of No. 126; 2 of No. 126a; 1 of No. 189.

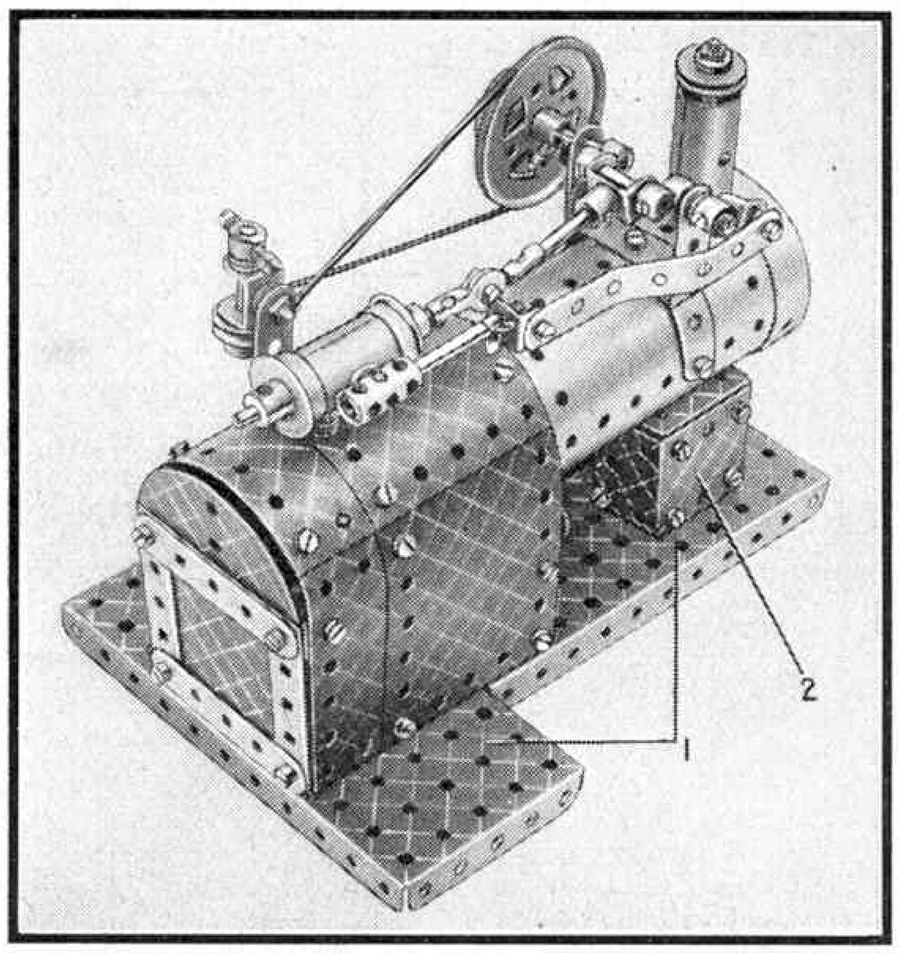


Fig. 2. A model overtype stationary steam engine and boiler, which forms an unusual subject for Outfit No. 7.

Fig. 2 shows a small but interesting model of a horizontal steam engine built with Outfit No. 7. The fire-box of this is formed of two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ and two $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates, which are curved to the required shape and then overlap five holes. They are bolted together as shown in the illustration. The lower ends of the sides of the fire-box are joined by a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip.

The boiler of the engine is represented by a Meccano Boiler, which is fixed to the top of the fire-box. The fire-box is next secured to the base, which consists of two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plates 1 bolted together, by the $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip joining its sides. The forward end of the fire-box is filled in by a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flanged Plate, and the rear end by a compound plate formed by a $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate and a Semi-Circular Plate. The compound plate is secured in position by Angle Brackets.

The water supply tank 2, which forms also a support for the forward end of the Boiler, is built up by bending a $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate to form a square tube, and fastening it to the base plate by a $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip. The top of the tank consists of two overlapping $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates.

The supports for the crankshaft are provided by two $2\frac{1}{2}''$ Strips, bolted to the sides of the Boiler, the lower ends of the Strips being curved slightly to conform with the contour of the Boiler. Each web of the crank consists of two Collars. These are joined by unscrewing the Grub Screw of one of them so that it projects about $\frac{1}{8}''$, and screwing the second Collar over the projecting portion. A $1''$ Rod is used for the crank pin. One of the webs is fastened on the end of a $1\frac{1}{2}''$ Rod and the other on the end of a $\frac{3}{4}''$ Bolt, both the Rod and the Bolt being journalled in the upper holes of the $2\frac{1}{2}''$ Strips.

The "big end" is formed by a large Fork Piece fitted on the crank pin. A $1\frac{1}{2}''$ Rod is locked in the boss of the Fork Piece to form the connecting rod, and to its free end a $2''$ Rod is pivotally secured by two Rod and Strip Connectors. The $2''$ Rod represents the piston rod, and it slides in a cylinder consisting of a Sleeve Piece, which is fastened to the top of the fire-box by a $\frac{1}{2}''$ Bolt, but spaced from it by six washers. A $\frac{3}{4}''$ Flanged Wheel is pressed on each end of the Sleeve Piece.

The valve chest is a Coupling, which is bolted to the side of the cylinder, and carries a $2''$ Rod that is connected by a $3\frac{1}{2}''$ Strip and an Angle Bracket to a Collar on the end of the crankshaft. To make the centrifugal governor two bolts are screwed into the tapped holes of a Collar, which is mounted on the upper end of a $1\frac{1}{2}''$ Rod journalled in a Double Bracket. The Double Bracket is supported by a $1\frac{1}{2}''$ Strip and an Obtuse Angle Bracket from the top of the fire-box. At its lower end the $1\frac{1}{2}''$ Rod carries a $\frac{1}{2}''$ Pulley, which is connected by a Driving Band to the flywheel.

Parts required to build model steam engine: 1 of No. 3; 6 of No. 5; 1 of No. 6a; 1 of No. 11; 1 of No. 16; 1 of No. 17; 3 of No. 18a; 1 of No. 18b; 1 of No. 20a; 2 of No. 20b; 1 of No. 22; 1 of No. 23a; 56 of No. 37a; 48 of No. 37b; 22 of No. 38; 2 of No. 48; 2 of No. 48a; 1 of No. 51; 2 of No. 52; 6 of No. 59; 1 of No. 63; 1 of No. 80c; 1 of No. 111; 1 of No. 111a; 1 of No. 116; 1 of No. 162a; 1 of No. 162b; 2 of No. 163; 1 of No. 164; 1 of No. 186a; 2 of No. 188; 3 of No. 189; 1 of No. 190; 2 of No. 192; 2 of No. 212; 1 of No. 214; 2 of No. 217b.

The scooter is illustrated in Fig. 3. It is best to commence construction by bending a $5\frac{1}{2}''$ Strip 1 to the shape shown, and then fitting it with a Bush Wheel 2 and two Flat Trunnions. Two Angle Brackets are next bolted to the rear end of Strip 1 in the form of a reversed angle bracket, and to them are fastened two Trunnions. The rear wheel revolves between the latter on the shanks of two bolts, which are bolted in each Trunnion as shown.

The wheel at the front is supported on two bolts 5 between two $5\frac{1}{2}''$ Strips 4, arranged in a similar manner to the supports for the rear wheel. The Strips 4

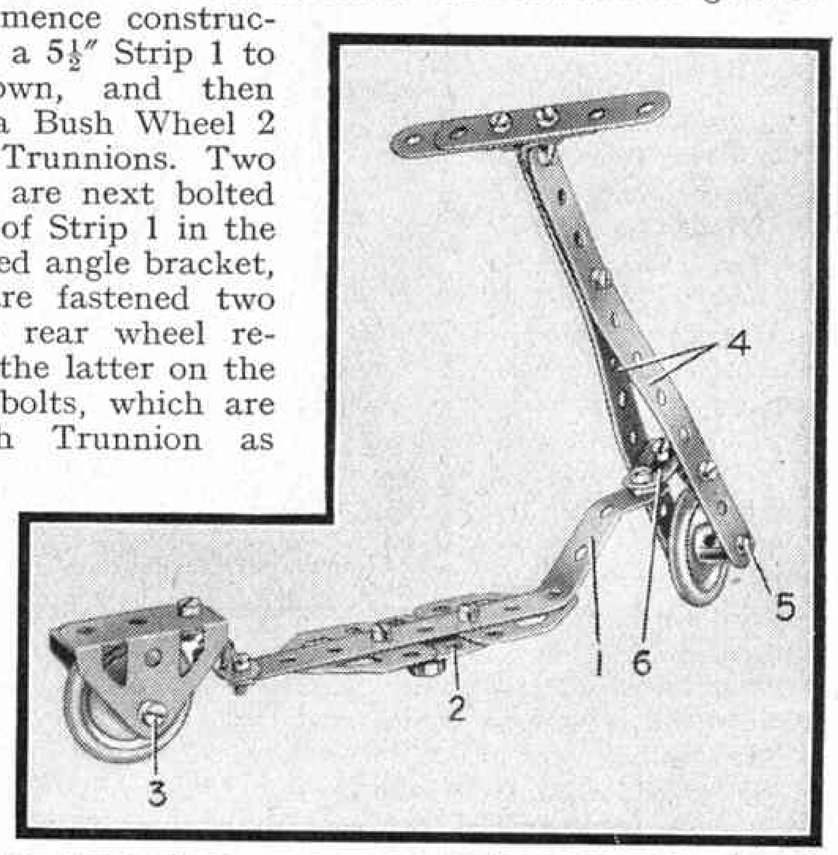


Fig. 3. The simple scooter constructed as shown above is made with parts from Outfit No. O.

are joined by two Angle Brackets, and one of the bolts that fixes the Angle Brackets is place carries also a Flat Bracket 6, which is attached by a lock-nutted bolt to the 5½″ Strip 1. The model is completed with the addition of handle-bars made from two 2½″ Strips overlapped four holes and joined to the Strips 4 by Angle Brackets.

Parts required to build the model scooter: 3 of No. 2; 2 of No. 5; 1 of No. 10; 6 of No. 12; 2 of No. 22; 1 of No. 24; 17 of No. 37; 1 of No. 37a; 1 of No. 38; 2 of No. 126; 2 of No. 126a; 2 of No. 155a.

The model swing bridge shown in Fig. 4 is built with Outfit No. 7. Only one fixed span is illustrated, but that at the opposite end of the swing span is constructed in exactly the same manner. The swing span is opened and closed by turning a Crank Handle.

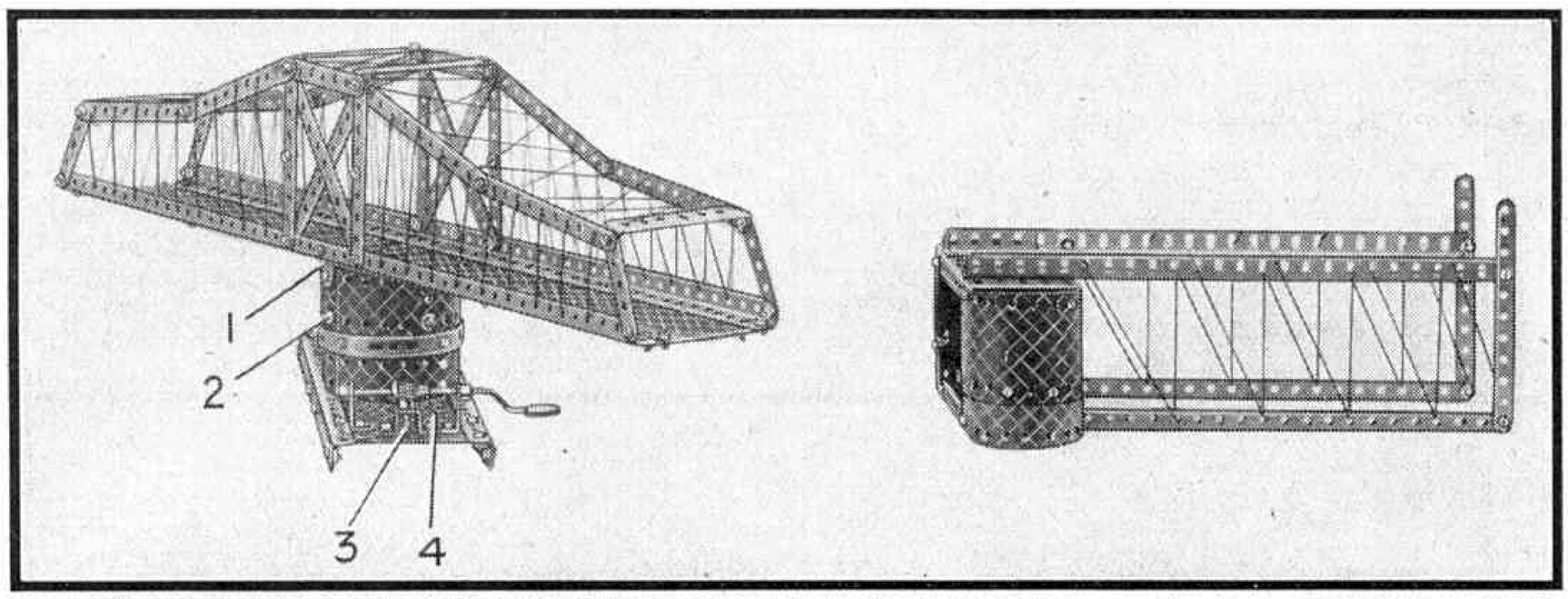


Fig. 4. This neat model swing bridge is built from the contents of Outfit No. 7. The model has two fixed end spans, only one of which is shown in the illustration, and a moving one that is operated by turning a crank handle.

In making the model the swing span is built first. Its roadway is made from two 12½″ × 2½″ Strip Plates, which are supported between compound angle girders, each 24″ long and made from two 12½″ Angle Girders, by means of four Flat Brackets and a 3½″ × ½″ Double Angle Strip. A Crank is next bolted at the centre of the roadway. Its boss later will take the Rod on which the swing span turns. The sides of the span are then built up in the manner shown, and two are joined by means of a 3½″ × ½″ Double Angle Strip, three 3½″ Strips and three Angle Brackets.

Two 5½″ × 1½″ Flexible Plates are now bent to form a cylinder and this is fixed to the underside of the span at the centre. To the interior of the cylinder a 3″ Pulley is attached by 1″ × 1″ Angle Brackets, which are spaced from the cylinder by three washers. Four bolts indicated at 2, engage with the groove in the Pulley. This unit is then attached to the 3½″ × ½″ Double Angle Strip 1.

The base for the span consists of three 3½″ × 2½″ Flanged Plates, connected by four 12½″ Strips and the halves of a Hinged Flat Plate 4. On the centre Flanged Plate is built a cylinder of Flexible Plates similar to the one attached to the span, and this is fixed to the Plate by 1″ × 1″ Angle Brackets. The bolts that hold the 3″ Formed Slotted Strips support also a 3″ Pulley by engaging in its rim. A 4″ Rod is then locked in the boss of the Crank at the centre of the span, and after being fitted with nine washers it is inserted in the boss of the lower 3″ Pulley. It is held in place below the 3½″ × 2½″ Flanged Plate by a 1″ Pulley. The latter Pulley is connected by a Driving Band to a similar Pulley fastened on the 1½″ Rod 3, the upper end of which carries a ½″ Pinion that meshes with a Worm.

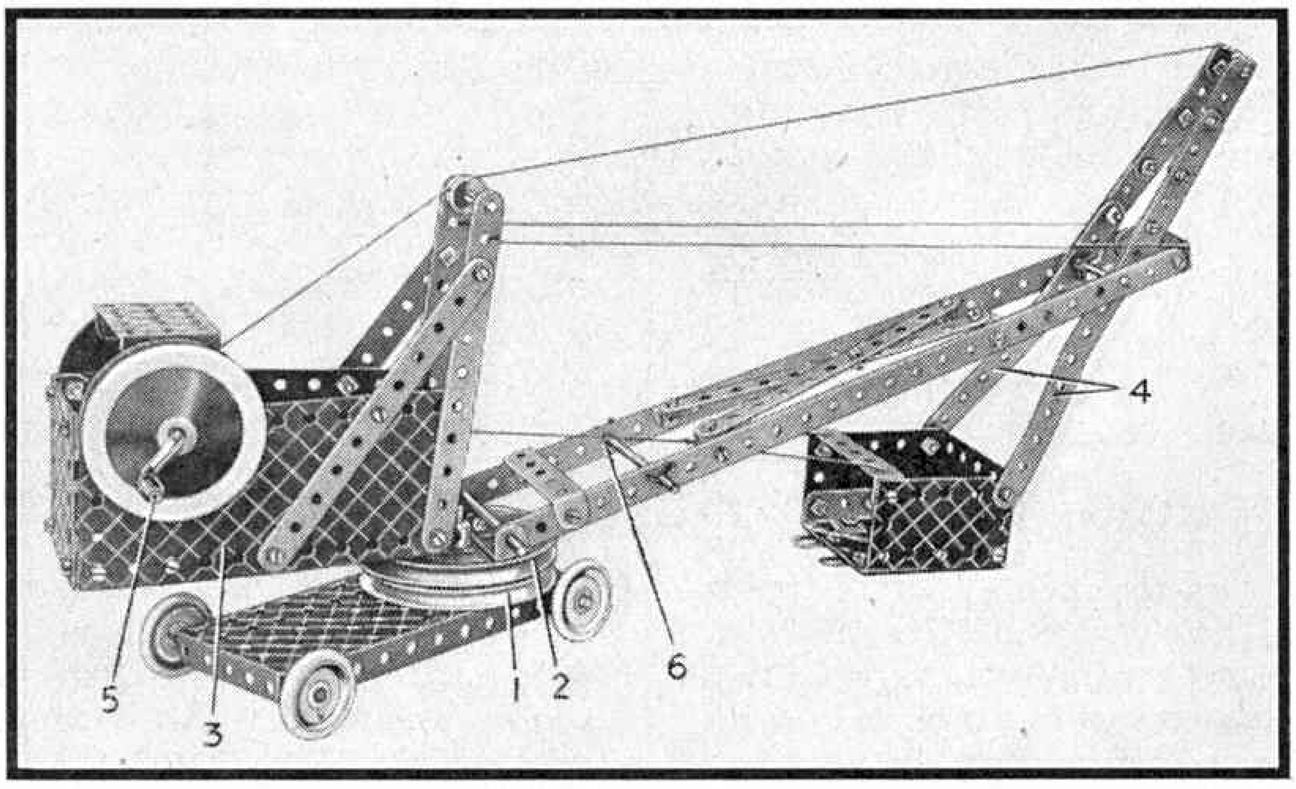


Fig. 5. A model digging machine that can be made to dig real trenches in soft sand or gravel. The digging motion is controlled from the cab.

The two end spans, one of which is shown in Fig. 4, are identical in construction, so that a description of one of them will suffice. Construction of the pier is commenced by bolting two 5½″ × 2½″ Flexible Plates to a 5½″ × 2½″ Flanged Plate, the Flexible Plates overlapping the Flanged Plate two holes. One of the Flexible Plates is extended downwards by a 5½″ × 1½″ Flexible Plate and the other by three 2½″ × 1½″ Flexible Plates.

Two 12½″ Angle Girders are bolted to the Flanged Plate to form the sides of the roadway, and between them is a 12½″ Strip. To this Strip are bolted a 5½″ × 2½″ and a 4½″ × 2½″ Flexible Plate, the plate at the end remote from the pier being supported by a 3½″ Strip. At the foot of the pier are bolted four Angle Brackets, to which are attached two 12½″ Strips. The free ends of the latter are connected to the end of the roadway by 5½″ Strips. The swing span and both fixed spans are braced with Cord, which is threaded through their side members in the manner shown.

With a few simple modifications the bridge can be adapted for driving by a Clockwork Motor. In this case a 3 : 1 ratio reduction gear should be fitted to the Motor sideplates and the drive should be taken to a 1″ Pulley fastened on the shaft of the Crank Handle. The Motor of course should be bolted in a flat position to the base of the swing span.

Parts required to build the model swing bridge; 10 of No. 1; 18 of No. 2; 6 of No. 3; 12 of No. 5; 8 of No. 8; 10 of No. 10; 14 of No. 12; 4 of No. 12a; 1 of No. 15b; 1 of No. 18a; 2 of No. 19b; 1 of No. 19g; 2 of No. 22; 1 of No. 26; 1 of No. 32; 150 of No. 37; 160 of No. 37a; 26 of No. 38; 1 of No. 45; 1 of No. 46; 2 of No. 48b; 2 of No. 52; 3 of No. 53; 2 of No. 59; 1 of No. 62; 2 of No. 111; 2 of No. 111a; 6 of No. 111c; 1 of No. 186; 6 of No. 188; 6 of No. 189; 2 of No. 191; 4 of No. 192; 2 of No. 195; 2 of No. 197; 1 of No. 198; 2 of No. 214; 4 of No. 215.

The fifth model to be described is a trench digging machine that can be built with Outfit No. 4. The superstructure is mounted on a travelling base consisting of a 5½″ × 2½″ Flanged Plate fitted with a 3″ Pulley 1. A Flanged Sector Plate is bolted in the slotted holes of a similar Pulley 2, but is spaced from the latter by washers. The unit forms the base of the cab, and the sides are built up from two 5½″ × 2½″ Flexible Plates 3. An A-frame consisting of 5½″ Strips also is bolted to the Sector Plate as shown. The two Flexible Plates 3 are joined at the rear by two 2½″ × ½″ Double Angle Strips, to which are bolted a 2½″ × 2½″ Flexible Plate, the sides at this point being extended upwards by two Semi-Circular Plates joined by a 2½″ × 1½″ Flanged Plate. A small Crank Handle 5 is journalled in the sides of the cab and is fitted with two Road Wheels to prevent side movement.

The boom is pivoted on a 3½″ Rod, bearings for which are provided by the ends of a 2½″ × ½″ Double Angle Strip bolted to the Pulley 2. At this stage the superstructure can be fixed to the travelling base, and this is effected by locking a 1½″ Rod in the boss of Pulley 1, fitting Pulley 2 loosely on the Rod and holding it in place with a Cord Anchoring Spring.

The sides of the boom are 12½″ Strips, and these are joined at their ends by a 1½″ × ½″ and a 2½″ × ½″ Double Angle Strip. In addition the boom is cross-braced by 5½″ Strips attached by Angle Brackets to the 12½″ Strips. Near the lower end of the boom is a 3½″ Rod that supports one of the operating cords. Two 5½″ Strips 4, each lengthened by a 3½″ and a 2½″ Strip, comprise the bucket arm, and are joined at their upper ends by a Double Bracket.

The sides of the bucket are built up from two 2½″ × 1½″ Flexible Plates, and are joined by a 5½″ × 1½″ Flexible Plate that forms the back end by a 2½″ × ½″ Double Angle Strip. The bottom is a 2½″ × 2½″ Flexible Plate supported by two Trunnions and an Angle Bracket. Flat Brackets represent the tines on the cutting edge. The bucket is pivotally attached to the bucket arm by lock-nutted bolts. Cord 6 is tied to the Double Angle Strip of the bucket, then wound several times around Crank Handle 5, and taken over the Pulley at the top of the A-frame. It is then tied to the bucket arm.

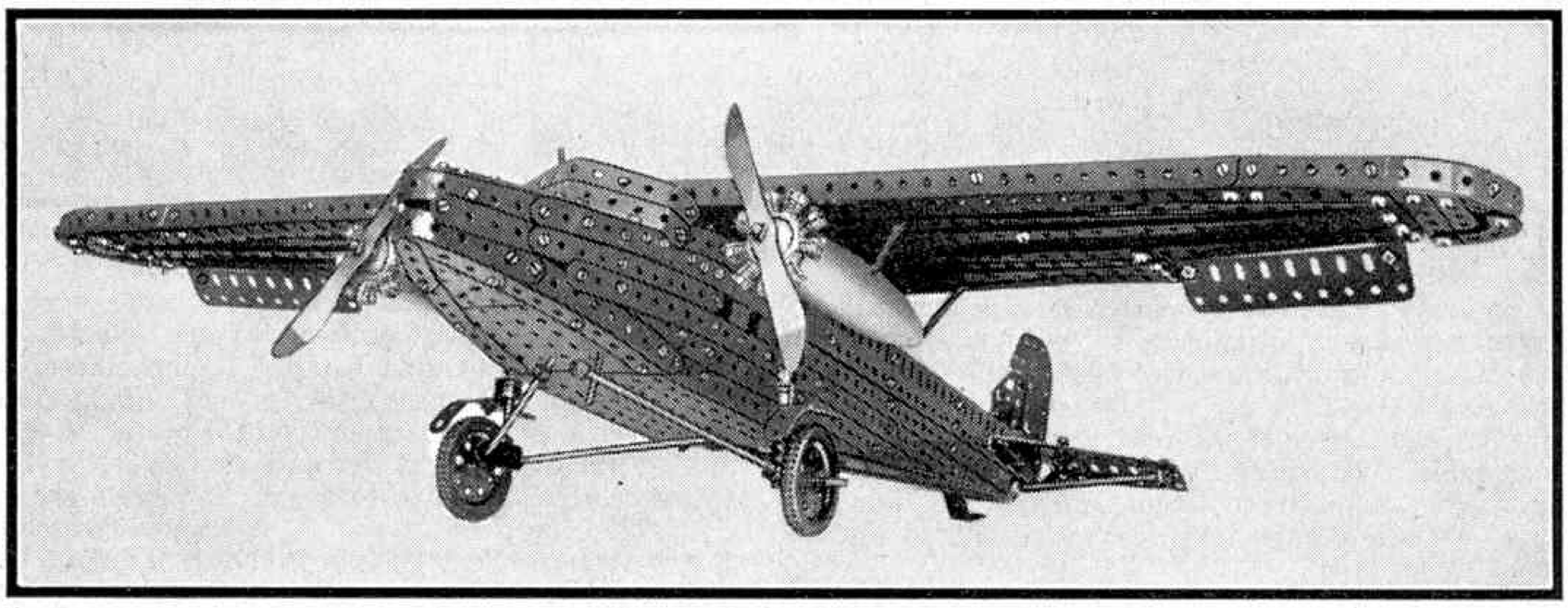
Parts required to build the model trench digging machine: 2 of No. 1; 8 of No. 2; 2 of No. 3; 2 of No. 5; 2 of No. 10; 1 of No. 11; 5 of No. 12; 4 of No. 16; 1 of No. 17; 2 of No. 18a; 2 of No. 19b; 1 of No. 19g; 4 of No. 22; 1 of No. 23; 8 of No. 35; 66 of No. 37; 2 of No. 37a; 5 of No. 38; 1 of No. 48; 5 of No. 48a; 1 of No. 51; 1 of No. 52; 1 of No. 54a; 4 of No. 155a; 1 of No. 176; 2 of No. 187; 2 of No. 188; 1 of No. 189; 2 of No. 190; 2 of No. 192; 2 of No. 214.

Model-Building Contests for all "M.M." Readers

Meccano "Aircraft" Competition

Aircraft of various kinds are always popular subjects for Meccano models. They include a great variety of designs that are attractive in themselves, and can be reproduced with remarkable accuracy and realism with small Outfits as well as with large ones.

With a view to encouraging enterprise, and exploiting to the full this field of Meccano construction, we are this month announcing a special competition in which prizes will be awarded for the best Meccano models of any type of aircraft. This term covers aeroplanes of all kinds, including seaplanes, flying boats and helicopters, together with airships and gliders.



A Meccano model of a high wing monoplane, in the construction of which a few Aeroplane Constructor parts have been used. The model won a prize in an International Model-Building Competition for L. van der Broek, The Hague, Holland.

Competitors may build their models from any Outfit or number of parts, and those who possess Aeroplane Constructor Outfits may include a few of the parts from these Outfits, provided that they build the main portions of the models from ordinary Meccano parts. It is absolutely essential that every entry should be the unaided work of the competitor submitting it. Reproductions of models described or illustrated in any of the Meccano publications are not eligible for entry in this contest, and any such models submitted will be disqualified.

The contest is open to Meccano model-builders of all ages, no matter whether they live in the British Isles or Overseas; and there are no fees to pay or forms to fill in. 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. The age of each competitor will be taken into consideration in assessing the merits of his work.

The following prizes will be awarded in each section. First, Meccano or Hornby products value £3/3/–. Second, products value £2/2/–. Third, products value £1/1/–. There will be also five prizes of products value 10/6, and a number of consolation awards.

Competitors should send in either photographs or good drawings of their models, together with a brief explanation of any interesting feature that may be present, although the latter should be made as short as possible. The competitor's age, name and address should be written clearly on the back of each sheet of paper or photograph sent, together with the letter A or B indicating the Section in which the model is entered. Envelopes should be addressed *"Aircraft Competition,"* Meccano Ltd., Binns Road, Liverpool 13. The closing date for section A is 31st May, 1938, and for Section B, 30th July, 1938.

Special Dinky Builder Competition

Owners of Dinky Builder Outfits have a special opportunity this month of showing their skill in planning and constructing new models. The parts contained in their Outfits can be used to build a great variety of fine models in addition to those illustrated in their Instructions Manuals, and in order to encourage them to look out for new subjects to reproduce we are offering special prizes for original models.

Readers of any age living in any part of the world are eligible for this competition, and there is no limit to the number of parts that may be used. Indeed there is no restriction except that entries must be built entirely of Dinky Builder parts, and all competitors will have equal chances, for their ages will be taken into consideration in judging their models.

It is not necessary to send the actual model. A good drawing or a clear photograph is all that is required. Each competitor must write his name, address and age on the back of each photograph or drawing submitted, and the envelope containing his entry should be addressed *"Dinky Builder Competition,"* Meccano Ltd., Binns Road, Liverpool 13.

A competitor may submit more than one model if he wishes, and in that case his models will be judged on their joint merits. No competitor will be awarded more than one prize.

The prizes offered are as follows. First, Meccano or Hornby products value £2/2/–; Second, products value £1/1/–; Third, products value 10/6. In addition there will be other prizes of products value 5/–, and consolation awards consisting of Dinky Builder "A" packets of parts. The competition will remain open until 30th June, 1938, and all entries must reach Liverpool on or before that date.

Competitors who wish to have their photographs or drawings returned to them must enclose with their entry a stamped and addressed envelope for this purpose. It should be noted, however, that photographs or drawings of models that win prizes become the property of Meccano Ltd., and will not be returned.

Model-Building Competition Results

By "Spanner"

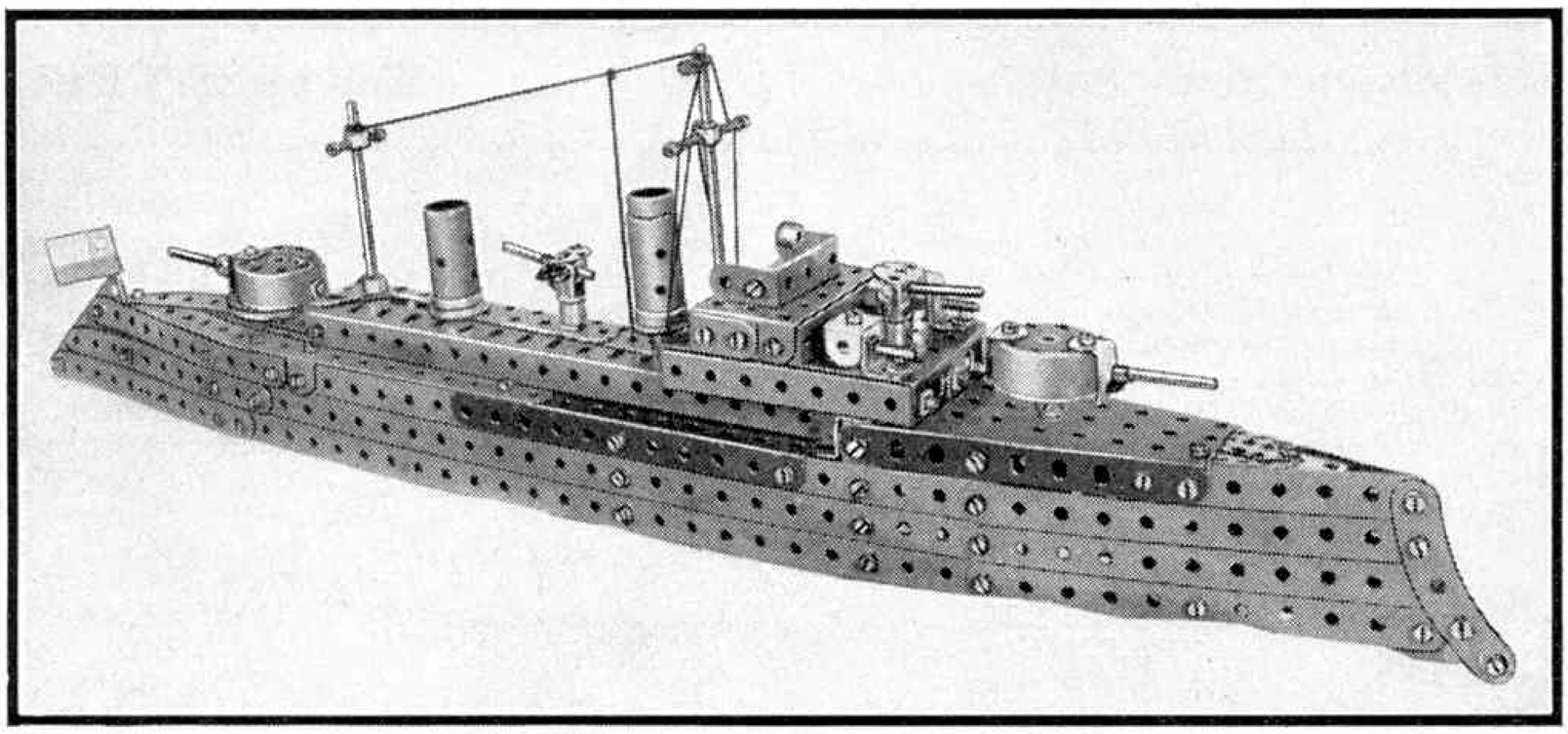
"Autumn" General Contest (Overseas Section)

The complete list of prize-winners in the Overseas Section of the "Autumn" General Model-Building Competition is as follows:

1st Prize, Meccano or Hornby products value £3/3/–: J. Giese, Buenos Aires. 2nd, products value £2/2/–: E. Bourgault, T'ao Nan, Manchoukuo. 3rd, products value £1/1/–: F. Schorrewegen, Lierre, Belgium.

Products value 10/6: J. Rowston, Orange, Australia; S. Gibbons, Temuco, Chile; L. Linder, Stockholm; D. Weily, Orange, Australia; W. Deacon, Sydney.

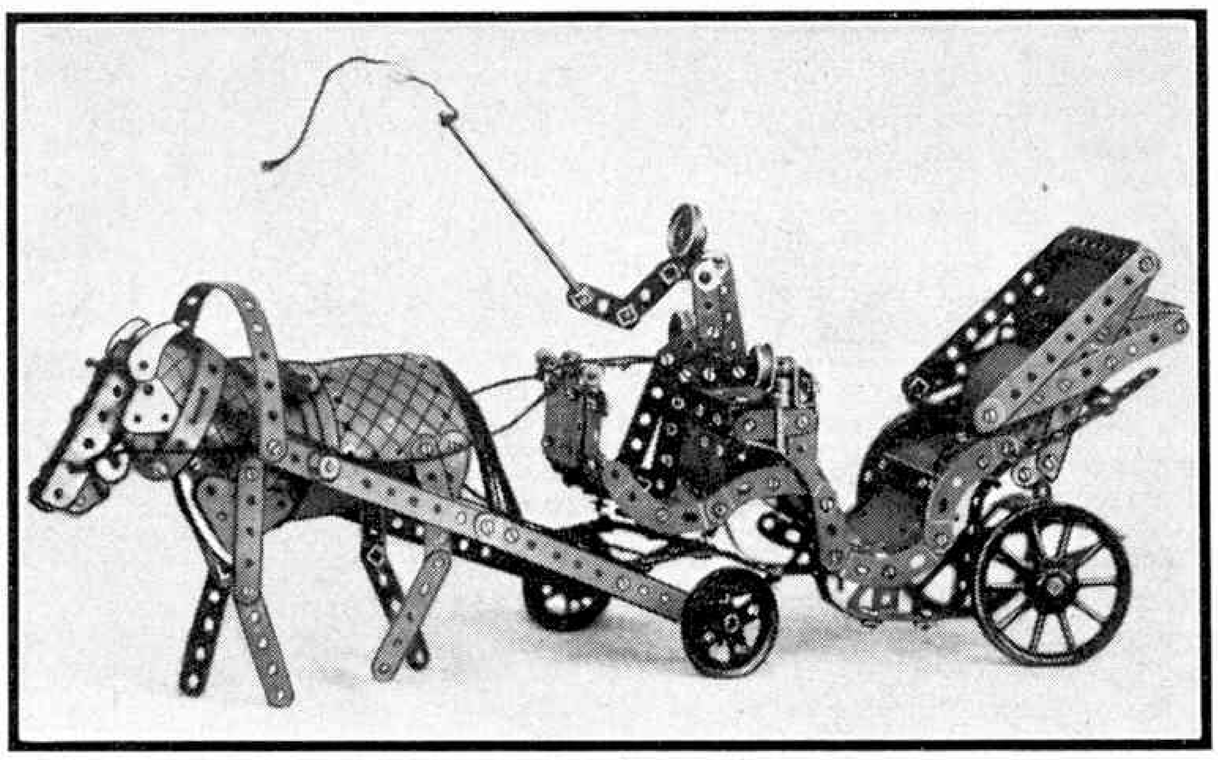
Products value 5/–: R. Myburgh, Claremont, S. Africa; G. Myburgh, Claremont, S. Africa; A. Moresco, Buenos Aires; C. Pearce, Regina, Canada; M. Minai, Sitapur, India; W. van dar Bos, Johannesburg; N. Kalligeris, Athens; R. Thomas, Shanghai; S. Roberts, Bombay; P. Clark, Calcutta.



The realistic appearance of this model cruiser is due to the skilful manner in which the few parts used are assembled. The model won a prize in the "August" Model-Building Competition for S. Gibbons, Temuco, Chile.

The First Prize was awarded to Julio Giese, Buenos Aires, for a very pleasing architectural model representing the facade of a modern theatre. Although only Angle Girders, Strips and Plates, have been used in its construction, the model is remarkably realistic. A fine effect is produced by Dinky Toys miniature figures and Motor Cars, which are placed at suitable points on the pavement and roadway in front of the building.

The model that was awarded Second Prize is shown in the lower illustration on this page. It was built by Chinese boys of the Catholic Mission at T'ao Nan, Manchoukuo, under the guidance of E. Bourgault, and represents a Chinese horse buggy. Two of the most pleasing features of this model are the good work that has been done in modelling the horse, and the realistic attitude of the driver. I like the use of Pawls to represent the horse's ears. This is the first time that I have seen these parts employed for such a purpose. I congratulate E. Bourgault on his ingenuity, and hope that the boys of the Mission will continue to send in entries for the *"M.M."* Contests.



An interesting model of a refreshingly original subject, a Chinese horse buggy, built by the boys of the T'ao Nan Mission, Manchoukuo. The constructional details of the horse contain many points of interest to model-builders.

F. Schorrewegen submitted an apparatus for copying photographic prints and other pictures that was awarded Third Prize. It consists of a horizontal stand carrying at one end a platform on which a camera can be mounted. The object glass from an old pair of field glasses is fixed in a frame in front of the lens of the camera, and the frame is provided with an adjusting screw so that it can be raised or lowered to suit cameras of various types and sizes. The purpose of the additional lens is to give a combination of shorter focal length than that of the camera lens, and so to produce a large sharply-focussed image on the film. At the end of the stand opposite the camera is a vertical easel, to which the photograph to be copied is fastened. The easel is mounted in runners so that it can be moved towards or away from the camera as required for focusing. Two lamps, which are mounted on arms pivotally attached to each side of the easel, illuminate the subject while it is being photographed. The apparatus can be used also for viewing small photographs and stamps.

J. Rowston won his prize with a very good model of a drop head coupé. The model is driven by an Electric Motor, and the body is built almost entirely from Strips, which are assembled so skilfully that it has not been necessary to bend any of them. The Motor is mounted under the bonnet, and the drive to the rear axle is taken through a two-speed gearbox. As the Motor is of the reversing type, the model actually has two forward and two reverse speeds, and any one of these can be chosen by operating two levers placed beside the driver's seat. The car is also fitted with headlights, celluloid windscreen, opening doors and a hood. The latter is made of cloth braced by Strips, and it folds back exactly as does the hood of a real car.

Rowston apparently has a great deal of fun operating his model. He says that he starts it off in "bottom" gear and when it attains a fair speed knocks over the gear lever into "top." The car then bounds forward at so great a speed that the "driver" finds it difficult to keep up with it!

In advising competitors regarding subjects for their models I have frequently referred to the advantage of choosing a subject that can be reproduced realistically with the parts available, even if it is something quite simple. It is much better to build a small model properly than to attempt a big structure without the necessary parts to make a good job of it. Provided that a boy possesses the necessary skill in using Meccano parts, however, it is possible to tackle a complicated subject with only a small Outfit, and a typical example of what I mean by this is the fine model battleship shown in the upper illustration on this page. It will be seen that the very few parts used in this model are assembled together in such a manner that the greatest possible effect is obtained from each piece. The model is the work of S. Gibbons, Temuco, Chile.

A small model of a heavy bomber monoplane, which shows a surprising amount of detail work, won a prize for D. Weily. This is the first time that Weily has taken part in a Meccano model-building competition and his early success is very pleasing. His model attracted attention chiefly on account of the neat manner in which a mass of detail has been incorporated in so small a space. Even such little items as engine exhausts and the wireless aerial are faithfully reproduced. I hope to see more of Weily's work in future contests.

An Exhibition Hint

Officials and members of Meccano Clubs take the greatest pains to design and construct good models, and to arrange these to the best advantage for display purposes. All this good work is largely thrown away, however, if steps are not taken to ensure that visitors are really at home and see everything that has been done for their entertainment. There are several ways of doing this. One is to distribute programmes explaining the exhibits and, if possible, giving a plan of the display. In matters of this kind I prefer personal efforts, however, and suggest that at all exhibitions members who are free of model-building or display activities should act as hosts or guides.

An Australian Example

This plan is put into force with splendid effect by the officials and members of the Maylands M.C., the headquarters of which are in Perth, Western Australia. At this club's last Exhibition a great impression was made by the splendid work of members as escorts, and their extensive knowledge of the outstanding features of the models displayed. Those who earned this high opinion volunteered for the work.

The Exhibition of this enterprising Australian club was noteworthy in many respects. A large stock of Meccano parts has been acquired with the aid of club funds built up to a high level by previous efforts of this kind, and this material was used in the preparation of what were described as communal models for the Exhibition. In addition members showed models built from their own Outfits, and thus individual enterprise and co-operation were both strongly encouraged.

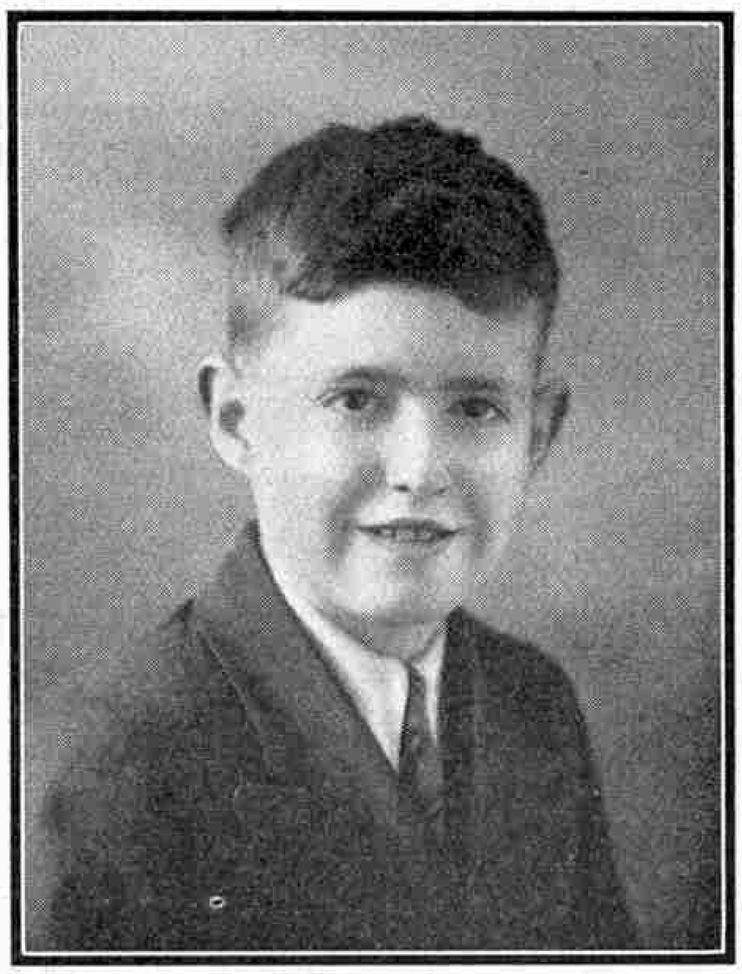
There is always a definite idea behind a Maylands Exhibition. On this occasion the hall was transformed into a gigantic model motor show, which was christened *"Meccanolympia."* The name was thoroughly deserved, for there were on view motor cars of all kinds, from crude early models to modern streamline saloons, omnibuses, and lorries. In addition there were special models to demonstrate the mysteries of the gear-box, the differential, and clutch and steering gear. The Exhibition was open for six nights, and was very largely attended at each. There is no doubt that a display of this kind is far more attractive than one at which an indiscriminate selection of models built in accordance with members' own fancies are shown, and this example is one that could well be followed by other clubs.

Funds for Summer Outings

With this month it may be said that the season for outings commences, and the problem of raising funds for these will soon have to be faced. The best plan undoubtedly is to start an Outings Fund now. Members pay small sums weekly to the Leader, or some official specially appointed for the purpose, and withdraw money as they need it for excursions and visits.

Meccano Club Secretaries

No. 44. J. Cronin



J. Cronin is secretary of the Islington M.C., and also of the associated Branch No. 290 of the H.R.C. Under the able guidance of Mr. V. Miller, their founder, these two organisations have made steady progress in the face of many difficulties. Successful Exhibitions have attracted many interested visitors, and the displays have been given great praise in the local press.

This Month's Events

Below I give details of interesting Exhibitions arranged for this month and strongly urge all readers of the *"M.M."* who live within reach of the places in which they are to be held to visit them in order to see what members of Meccano clubs can do. I hope that many who see such displays for the first time will make up their minds to join in the fun of club work.

Details of the 7th Annual Exhibition of the Old Charlton M.C., to be held on 2nd April, were given in last month's issue, but I should like to remind readers that it will be open from 4 p.m. to 9 p.m. in the Assembly Rooms, Charlton Village. The charge for admission will be 3d. for adults, 1d. for others.

The Mall School M.C. will hold their Annual Exhibition on Wednesday, 6th April, in the School Gymnasium. The display will be open continuously from 2.45 p.m. to 7 p.m. There will be no charge for admission, but there will be a box for voluntary subscriptions from visitors.

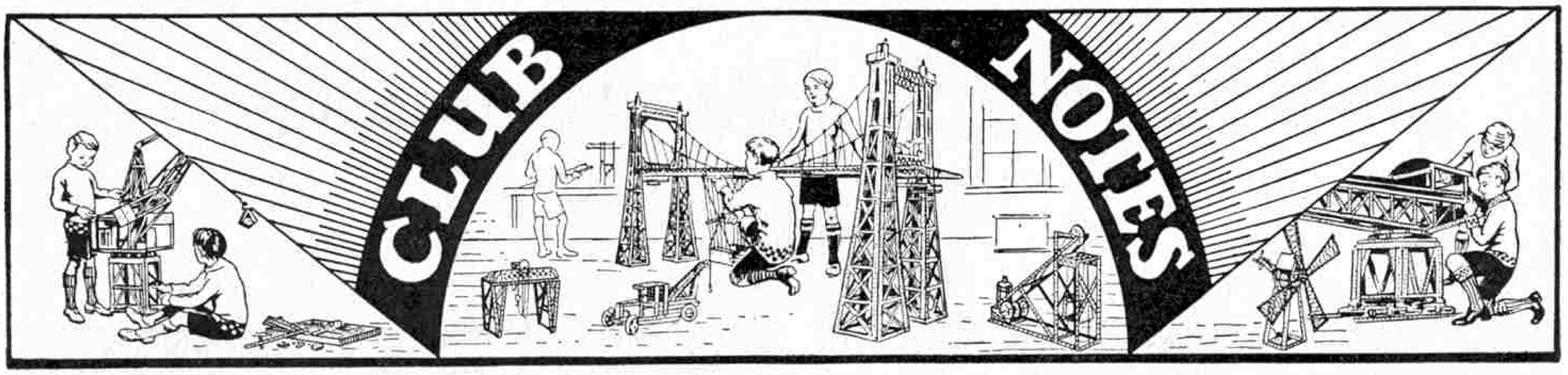
An Exhibition also has been organised by the St. Oswald's M.C. for 23rd April. This will be open from 4.30 p.m. to 9.30 p.m. in the Quest Hall, Beulah Road, Thornton Heath. The admission charges will be 3d. for adults and 1d. for children.

I should like also to draw attention to an Exhibition arranged by the Maidstone Branch of the H.R.C., which is associated with the Maidstone Model Railway and Engineering Club. This will be held in the Hollingworth Hall, Union Street, Maidstone, on 28th, 29th and 30th April. On the first two days it will be open from 6.30 to 9.30 p.m., and on the third, Saturday, 30th April, from 3 p.m. to 9.30 p.m. All types of models will be on show, including working Meccano super models, and special model-building competitions have been arranged, details of which can be obtained from the secretary, W. R. C. Hills, The Orchard, Romney Hill. The price of admission is 6d.

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:

SEVEN KINGS—C. Boddington, 32, Mitcham Road, Seven Kings, Essex.
THURLES—R. Molloy, Ballingarry, Thurles, Co. Tipperary, Ireland.
WHITBY—A. Cook, The Haven, 32, Castle Road, Whitby.
WORTHING—H. Turner, 23, Pavilion Road, Worthing, Sussex.
NORWICH—K. Fanthorpe, 132, Magdalen Street, Norwich.
POTTERS BAR–K. Lansdowne, 63, Hatfield Road, Potters Bar, Middx.
LEAMINGTON SPA—D. S. McLusky, 9, York Road, Leamington Spa.
WOKINGHAM—F. Weight, "San Remo," 92, Barkham Road, Wokingham.
CEYLON—P. T. A. Fernando, Sri Sumungala College, Panadure, Ceylon.



Bearsted M.C.—Membership has increased satisfactorily and successful meetings are being held. An epidiascope is being built in the club room. Photography is a new hobby taken up at special Camera Meetings, and visits are being made to local engineering centres. Club roll: 11. *Secretary:* Mr. R. A. McKeough, Ware Street, Bearsted, Nr. Maidstone.

Breich M.C.—The Annual Exhibition increased the funds of the club by more than £1. The models on show included a pithead gear, an articulated lorry, a wire making machine and a ship's crane. As usual, the club's Hornby Railway attracted interested attention, and the Exhibition closed with a Lantern Lecture, given by Mr. Cartwright, on "*A Day with the Rod.*" Club roll: 10. *Secretary:* M. Anderson, 36, Breich Terrace, West Calder.

Bryntirion M.C.—The club's 1st Birthday was celebrated by a Social Evening, the attractions of which included a Lantern Lecture, Games and Refreshments, and the presentation of prizes won by members. A Hornby Railway Section has been formed, and is making excellent progress. Model-building, in preparation for the Exhibition, and Lantern Lectures have been the chief pursuits, and the Stamp Section also has begun operations. Club roll: 18. *Secretary:* P. Parry, Ar-y-Bryn, Pennllwyn Park, Carmarthen.

Burnley Grammar School M.C.—Mr. Bennett, Senior History Master, gave an interesting Lecture on "*Brass Rubbings*," illustrating his talk with examples. Other meetings have been devoted to model-building, in which steady progress is being made. Club roll: 25. *Secretary:* J. Harrison, 5, Arbories Avenue, Padiham, Burnley, Lancs.

Colchester M.C.—Members are interested in the "Keep Fit" movement, and all meetings now include a short spell of physical training. A Cycling Section also is in prospect. For Model-building two groups have been formed. Members of one group have built a model of Watt's beam engine incorporating a "Penny-in-the-slot" mechanism. The juniors have become proficient in building large models, and have constructed an excellent reproduction of an electric locomotive. Several model escalators also have been made. A third group has been formed for Hornby Train operation. Club roll: 35. *Secretary:* F. D. Cole, 8, Priory Street, Colchester, Essex.

Islandmagee M.C.—Affiliation was secured in January, and keen enthusiasm is being shown. Most meetings are devoted to Model-building, but a Hornby Railway also has been installed and a Library has been established. Interesting Lectures have been given by Mr. A. Storey, President, and by the secretary and treasurer. Arrangements are being made for the production of a magazine. Club roll: 8. *Secretary:* S. McCready, "Hillmount," Islandmagee, Co. Antrim.

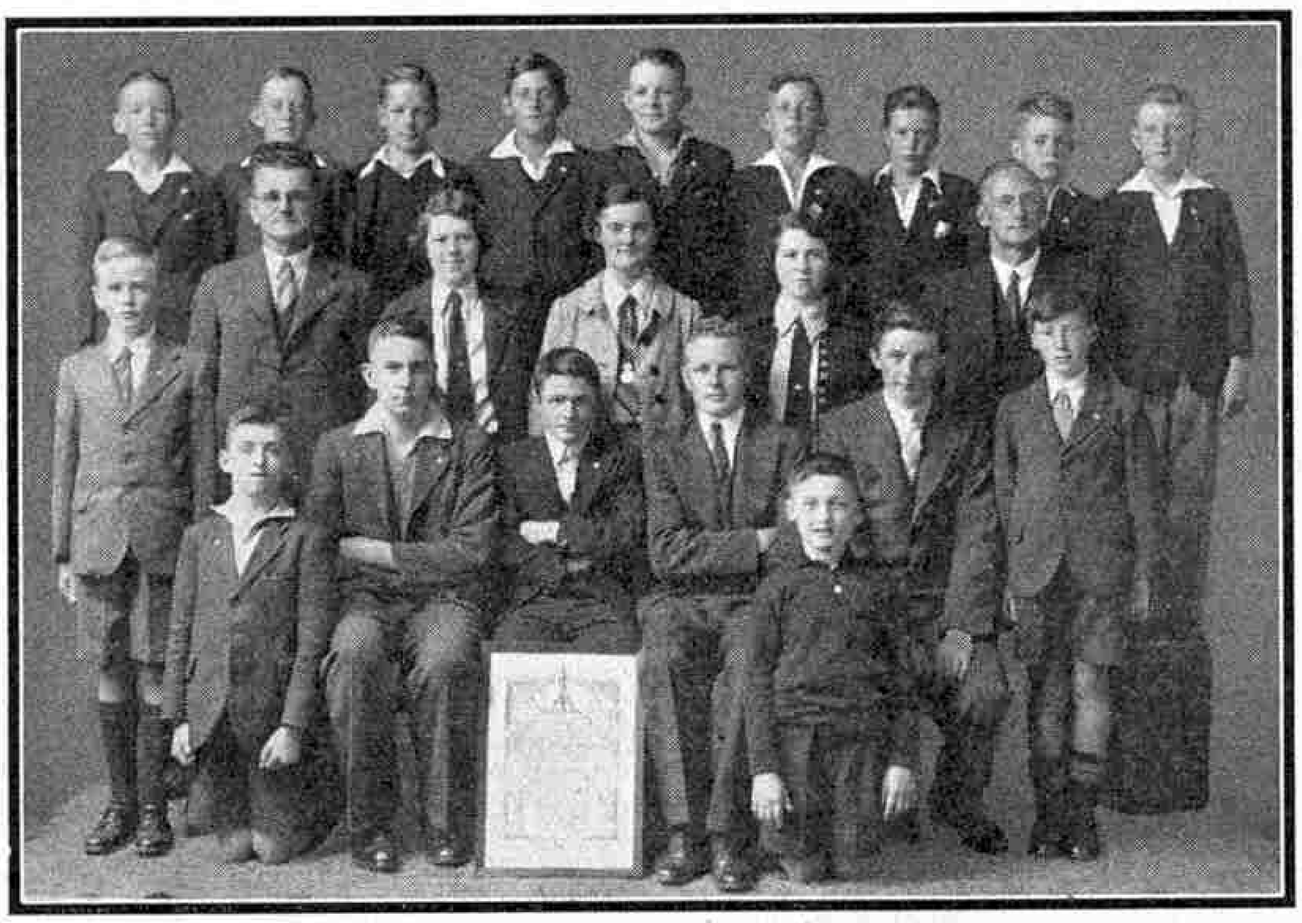
Islington M.C.—Recent meetings have been devoted to Model-building and members' hobbies, and at each there has been a talk on some subject of interest, such as the equipment of a fire station and the making of steel tubes. On one evening a member gave a talk on his stamp collection, and on another there was a wireless demonstration. Club roll: 5. *Leader:* Mr. V. Miller, 25, Bewdley Street, London, N.1.

Mall School M.C.—Treasure Hunts are greatly enjoyed by members, and two of these interesting events have been held. Other meetings have included a Cinematograph Show and Model-building Nights, one of which took the form of a competition. Special preparations have been made for the club's Exhibition, to be held this month. Club roll: 30. *Secretary:* A. C. James, 45, Popes Grove, Twickenham, Middlesex.

Sid Vale M.C.—The usual programme of attractive and carefully planned Model-building Contests has been continued. The subjects have included "Aircraft," "Bridges," "Household Utensils" and "Lighthouses," and in each there were many excellent entries fully maintaining the high standard attained in this club. Table Tennis continues to be played, and Lantern Lectures and Photography provide other interests. A Special Party was held early in the New Year. Members were asked to bring friends with them, and music and refreshments helped to make a very enjoyable evening. Club roll: 25. *Secretary:* L. R. I. Gliddon, Sheffield House, Sidmouth.

St. James' (Grimsby) M.C.—A splendid Exhibition has been held. This attracted a large number of visitors and earned an appreciative report in the local press. The receipts were more than £3/10/–, constituting a record for the club. Models on view were again seen at the Grimsby and District Model Engineers' Society Exhibition. Club roll: 12. *Secretary:* P. Jackson, 99, St. Peter's Avenue, Cleethorpes.

St. Oswalds M.C.—Recent events of special interest have included Birthday Celebrations, marked by a well-attended Social and a Cinema Show kindly given by Mr. Pearce. Model-building has been continued, marks being awarded to models by members of the committee. The programme also includes Billiards and Table Tennis. Club roll: 30. *Secretary:* J. F. Jaques, 5, Ingram Road, Thornton Heath, Surrey.



A fine group of members of the Ashburton M.C., with Mr. Bishop, President, on the right, and Mr. W. C. Taylor, Leader, second from the left in the middle row. This New Zealand club was affiliated in January 1931, and enjoyed a record year during 1937. A special feature of the programme is the exchanges of visits with the Christchurch M.C.

Stretford Public Libraries M.C.—Many splendid models have been built by members, including a heavy motor and trailer, a mechanical drill, a ship, and a loading crane, the working of which aroused keen interest among members. A special display to which visitors were invited also was arranged. A Lantern Lecture entitled "*Across Canada*" attracted an audience of 76 members and friends. The Stamp Club is making good progress. Many excellent stamps have been presented to the club and shared among members. A Lantern Lecture on "*Stamp Collecting*" proved very popular, members bringing friends to share in its enjoyment. Club roll: 33. *Secretary:* Miss F. Scattergood, Public Library, Technical Institute, Stretford Road, Old Trafford, Manchester 16.

Sutton Valence M.C.—Talks are given on simple machines and mechanisms, and models are now being built to serve as illustrations. The younger members are engaged in a scheme for building models of machines used in every-day life, including the Motor Bus, the Tractor and the Plough. A Football Match has been played against a School team, the result being a goalless draw. Club roll: 21. *Secretary:* C. Austin, East Sutton Park, Sutton Valence, Maidstone, Kent.

Tilehurst and District M.C.—Recent meetings have been devoted to the construction of models for the forthcoming Exhibition. Free play is given to members' own ideas of construction, and the result is keenness and enthusiasm. One member has entertained the club with a Film Show. Talks have been given on various subjects by Mr. S. C. Fortune, Leader. Club roll: 18. *Secretary:* K. Rushent, Westwood Road, Tilehurst, Reading.

Todmorden Road Central School M.C.—The Winter Exhibition attracted the attention of many visitors, who were greatly interested in the Model Dockyard designed and constructed by members for the event. This included cranes, ships and bridges displayed along with an excellent Hornby Train layout. A feature of the layout was a large lift bridge, and coloured lights and illuminated buildings added to the attractiveness of the display. Club roll: 20. *Secretary:* L. Lang, 26, Colville Street, Burnley.

Moston M.C.—The club is making excellent progress. The stock of Hornby material has been greatly increased, and six locomotives are now available. Competitions are a special feature of the programme, each member in turn devising a contest in which the others take part. Club roll: 7. *Secretary:* J. Roberts, 20, Worsley Avenue, Moston, Manchester 10.

AUSTRALIA

Melbourne M.C.—A splendid series of club meetings and competitions has been held, visitors being entertained at some of these. Trial runs have been made with several locomotives, which were tested on uphill grades. Great interest was displayed in a sound record of an American train in movement. Discussions on railway matters, Film Shows and Visits have completed the programme. Club roll: 10. *Secretary:* L. Ison, 8, Hayes Street, Northcote N.16, Victoria, Australia.

CANADA

Rosemount (Regina) M.C.—An Exhibition has been planned for Easter. This will include many new and interesting models that have been planned and built by members. Among them will be a remarkably realistic grain separator with a tractor, a working model of a river dredger with pontoon tenders, and a large cement mixer. Members continue to be keen and are producing models of very high standard. *Secretary:* J. Watson, 974, Athol Street, Regina.

NEW ZEALAND

Ashburton M.C.—The report for 1937 just received shows that year to have been of intense activity, especially in competition for the cups awarded annually. One of these is for recruiting, and its presentation to the club by Miss M. Kruse has led to the introduction of many new members. Parents' Night was particularly successful. There were nearly 120 visitors, who were welcomed by Mr. Bishop, President, and afterwards inspected the models, some of which were contributed by members of the Christchurch M.C. An enjoyable evening was then spent with games and refreshments, including a birthday cake kindly presented by Mrs. Kruse. Club roll: 33. *Leader:* Mr. C. H. Taylor, 14, Grey Street, Ashburton, New Zealand.

SOUTH AFRICA

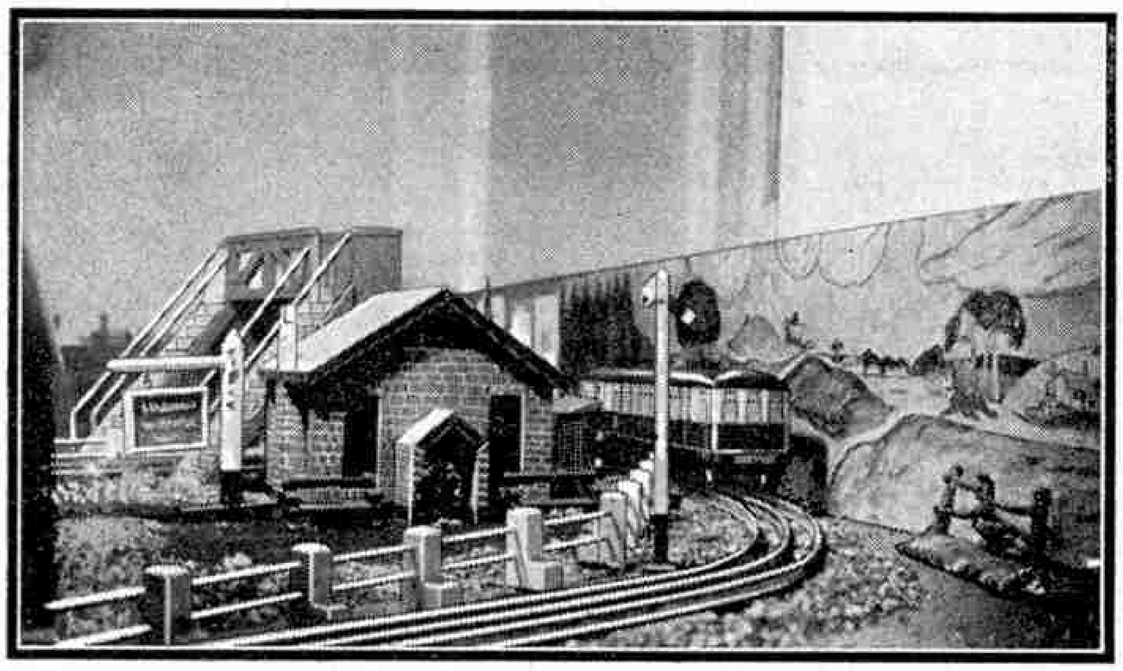
Alexandra M.C.—A special meeting to which visitors were invited was arranged for the Exhibition of models built by members. These included a very original reproduction of a maize mill, a fire brigade van, a swivelling crane, a clock dial and a reproduction of the Cunard White Star liner "*Queen Mary.*" Miniature Cups were presented to the winners of the Model Engineering Trophy, and engineering badges were presented to other members who distinguished themselves in model-building. *Secretary:* K. Bowman, "The Rest," Alexandra Institute, Koeberg Road, Maitland, South Africa.

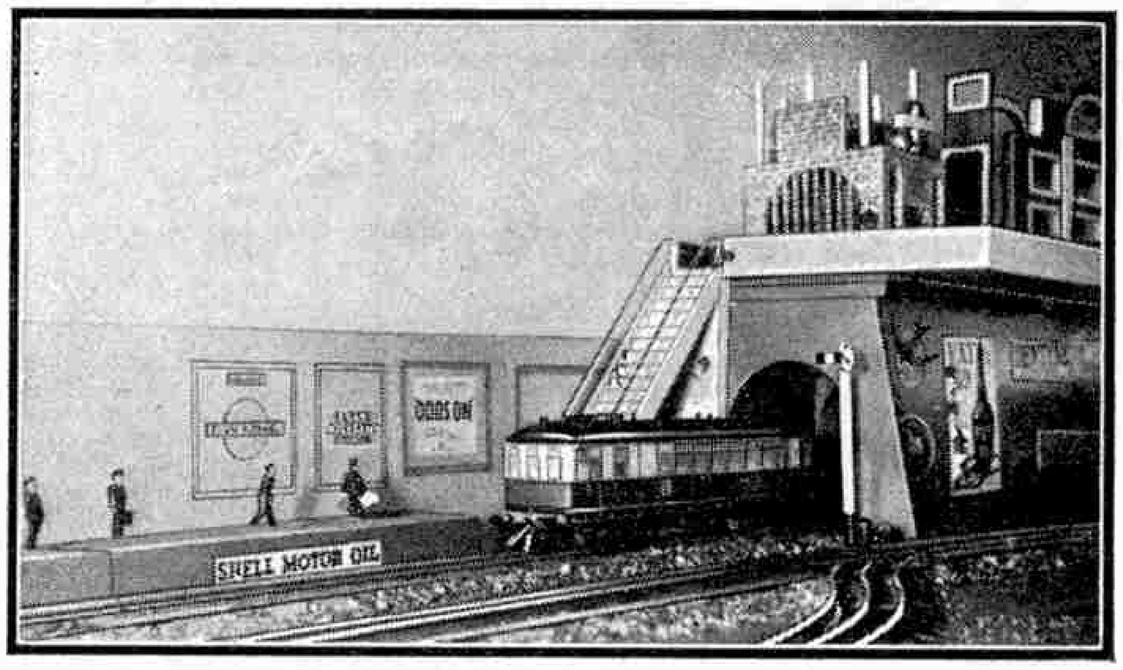
Southern (Capetown) M.C.—Excellent progress is being made in all branches of club activity. A special event was a summer holiday in Stellenbosch, 30 miles from Capetown. Fishing, swimming and mountaineering were enjoyed, but Meccano was not forgotten and a model was built of an interesting bridge seen on the way to Stellenbosch. Lectures and Stamp Collecting are other regular interests. Club roll: 16. *Secretary:* R. H. Moodley, 10, Stirling Street, Capetown, S.A.

The Back Bay Railway

A Novel Layout Designed for Suburban Traffic

By H. C. Towers

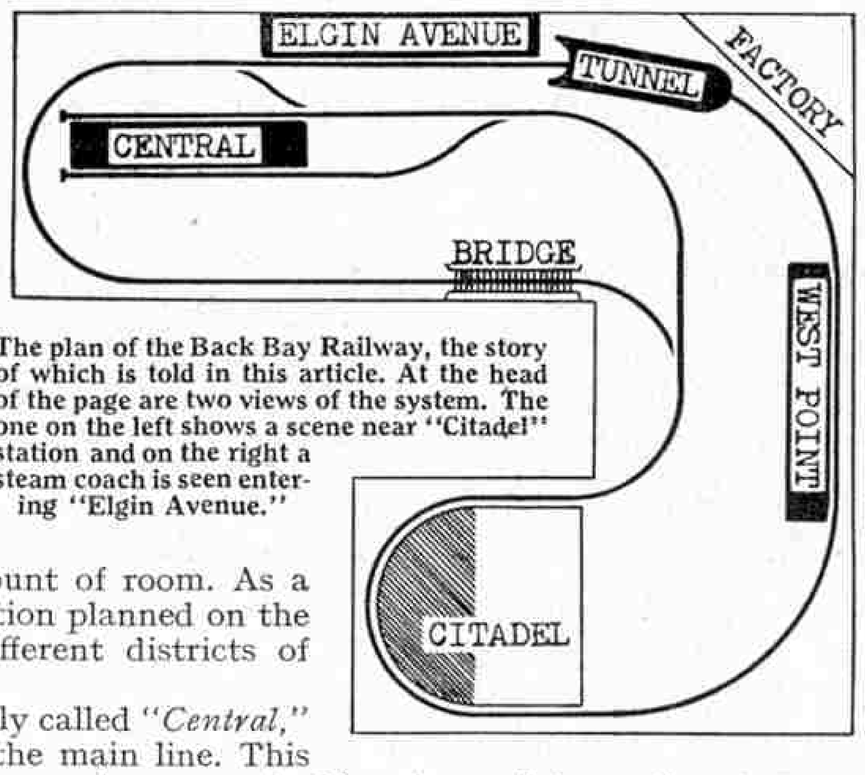




THE Back Bay Railway is a miniature line that commenced its existence in Bombay in December 1936, when my son found that two Hornby Train Sets were among his Christmas gifts. Extra rails, points and accessories were obtained with the idea of combining the contents of the two Sets in order to form one system, and a line was laid down running from one room along a verandah, and then into an adjoining room.

This layout was quite a success. It was so extensive that it took a considerable time to put down, however, and after some experience it was decided to build a raised baseboard on which to lay the line permanently. When the necessary trestles and tables had been completed, various layout designs were tried, and it was only after the rejection of many plans that one was finally adopted. This is shown in the diagram on this page.

As the diagram shows, the track was of the favourite continuous type, and was single line throughout, with a branch line running to a terminal station. In effect it was a long oval track that had been doubled back on itself, so that in shape it resembled the letter "J." There was a terminal branch and a useful connection by means of points between the terminal section and the main track on the upper side of the layout. Although small stations were possible the limits of space prevented any attempt at modelling features such as engine sheds or even a goods yard, for these take up a fair amount of room. As a result the railway was laid out and its operation planned on the lines of a metropolitan system serving different districts of a city.



The plan of the Back Bay Railway, the story of which is told in this article. At the head of the page are two views of the system. The one on the left shows a scene near "Citadel" station and on the right a steam coach is seen entering "Elgin Avenue."

The main terminal station was appropriately called *"Central,"* being situated inside the area enclosed by the main line. This consisted of an island platform with a track running on each side of it. The main through station was named *"Elgin Avenue,"* and represented a station actually in the city. Here a flight of steps led from the platform to the station building, which was carved out of wood, glued together and painted to represent red brick. Outside the station was arranged a main street with suitable background showing various city buildings.

Beyond *"Elgin Avenue"* was a short tunnel, and near to this a model factory. The latter was also constructed of wood, a "roughcast" surface being obtained by covering the sides of the building with hot glue and sprinkling it evenly with crushed coal. When this was dry a coat of red paint completed it. At *"West Point"* the line passed from commercial and industrial surroundings and entered the suburbs, the scenery here representing typical countryside features and also a small residential estate. The wayside halt in this charming neighbourhood consisted of a standard Hornby Passenger Platform. The line then swept in a half circle round the base of a large model fort, the station serving this being known as *"Citadel."* The presence of the fort and of the miniature military figures in and around it gave an interesting and unusual aspect to this part of the system.

Passing round another curve the railway ran over a small single-span lattice girder bridge. Before reaching the bridge, however, the main line gave off the terminal branch serving *"Central,"* and connecting also with the main line again near *"Elgin Avenue."* The "circle" or main continuous route completed its course to the latter place, from the bridge previously referred to, by running parallel to the terminal branch and then swinging round behind *"Central."*

There were thus four stations altogether on the line, and three of them were built of solid teak and painted grey. At each end of these the station name was prominently displayed on nameplates of the style used on many city and suburban stations, the actual name appearing in a panel across a circular background or "target." As the line was a "city" one, retaining walls were fairly frequent, and for these plywood painted red or grey was used. Advertisements of a suitable size for posters were then cut from various journals and fixed to the walls by Seccotine. The display of these, together with the type of station nameplates adopted, gave the line an appearance very suggestive of a suburban system.

The rails were screwed down to the baseboard, and the track was ballasted with a mixture of sand and very small pebbles picked up on the seashore. Special care was taken in this, as in the station and retaining wall decoration, to preserve the neat and tidy appearance characteristic of an efficient concern. Train services were operated by four Hornby Locomotives, two M3 Tanks and two No. O 0–4–0 tender engines. The rolling stock consisted of three No. 1 compartment-type Coaches and a Guard's Van. There were also two Pullman Coaches, all these vehicles being of Hornby manufacture. Additional services were worked also by an interesting model of a "Sentinel-Cammell" steam coach of the type widely used on the L.N.E.R. This is a useful unit for traffic of the kind represented on the layout as it incorporates its own motive power and can be made to run either forward or backward as required by the operations of the moment.

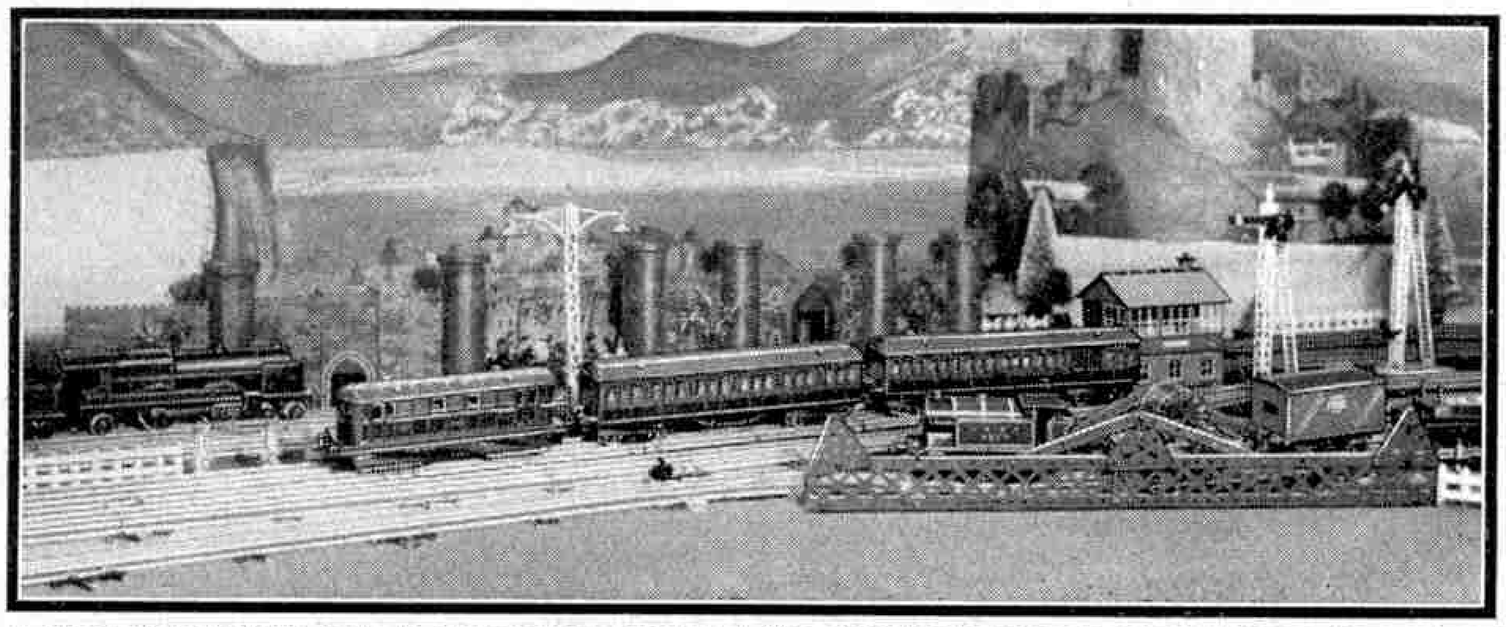
The layout was operated in this manner for some time, but removal to England and the commencement of school by the owner caused the temporary closing down of the system. It is now being laid down again. There is space for fuller development and eventually a track differing considerably from the original no doubt will be evolved.

A Unique Merseyside Line

Scenic Effects a Prominent Feature

A REMARKABLE feature of the miniature railway hobby is the manner in which layouts in the course of their expansion from a simple train set quickly develop individual characteristics. These naturally vary according to the ideas of the respective railway owners, the space at their disposal and sometimes the practice on the real railway that is being followed in miniature.

The layout shown in the two illustrations on this page has various features that render it of interest. It is operated by E. R. Summerfield, Litherland, an "*M.M.*" reader, and began with the purchase of a small clockwork Hornby Train Set. In the course of nine years it has developed to such an extent that the track is 256 ft. long. Thus it is in striking contrast with the small oval layout from which it started.

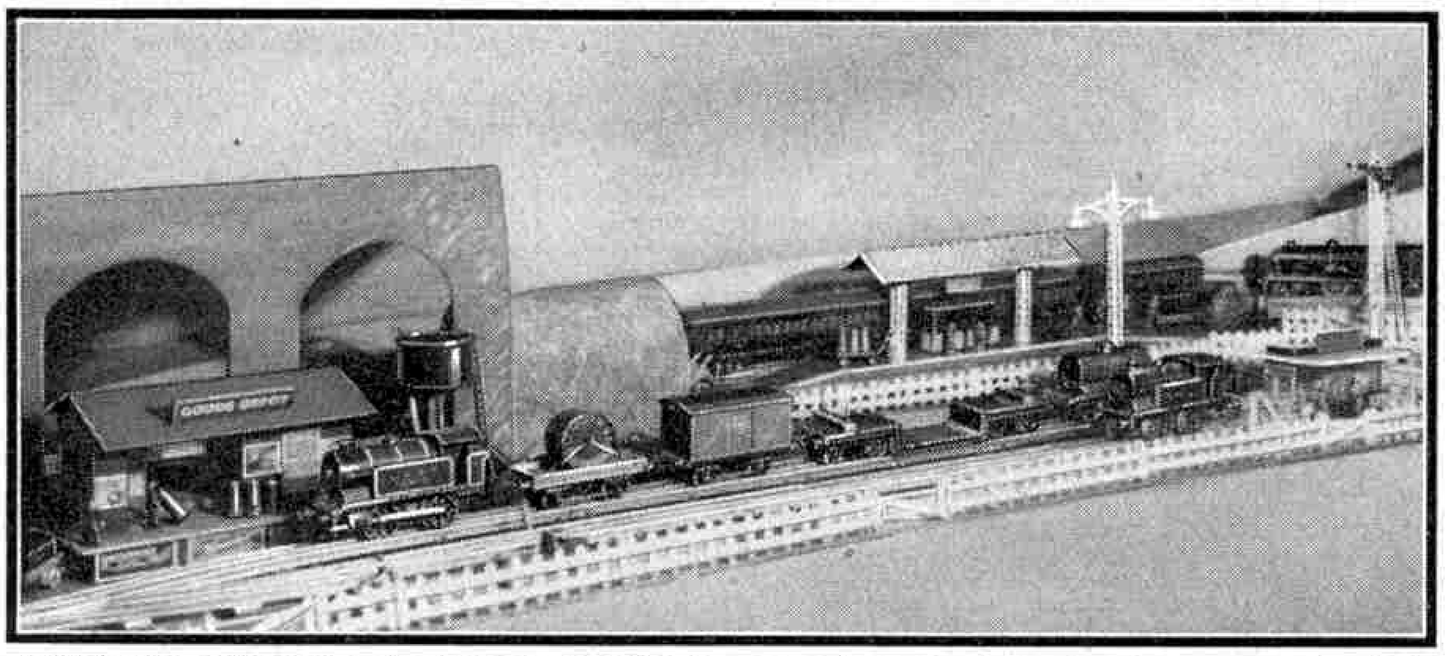


A corner on the layout of E. R. Summerfield, Litherland. The girder bridge in the foreground crosses from one part of the baseboard to the other. Behind the line is a picturesque scenic background.

The very position of the railway is unusual. The track is laid down permanently on a raised baseboard in the space between the roof of its owner's home and the ceilings of the rooms on the top floor. A considerable area is thus available and, although there are certain limitations, the railway is not hampered by the house walls as it would be if arranged in the ordinary way in a room on the lower floor.

The operation of trains on the layout is particularly interesting and involves the use of a wide range of Hornby material. The system is of the continuous type, and consists of an outer double track main line with an inner single line running parallel to it. Along the single line are two running loops that branch off from it at one point and rejoin it further on. These loops are of considerable value in the continuous type of working that is practised on the system. From the inner one branches a line that ultimately resolves itself into two sidings serving a goods depot. There are two stations for passenger traffic. One of these consists of a single platform structure, and the other is in the form of an island between the inner single line and the inside double track.

Across two of the inner corners of the baseboard viaducts built of Meccano parts are arranged to carry the track that is nearest to the edge of the baseboard at each of these points. This is an interesting method of avoiding difficulties at corners where the track sometimes is awkwardly placed. Exactly how these are overcome on this interesting layout can be seen in the lower illustration on this page.



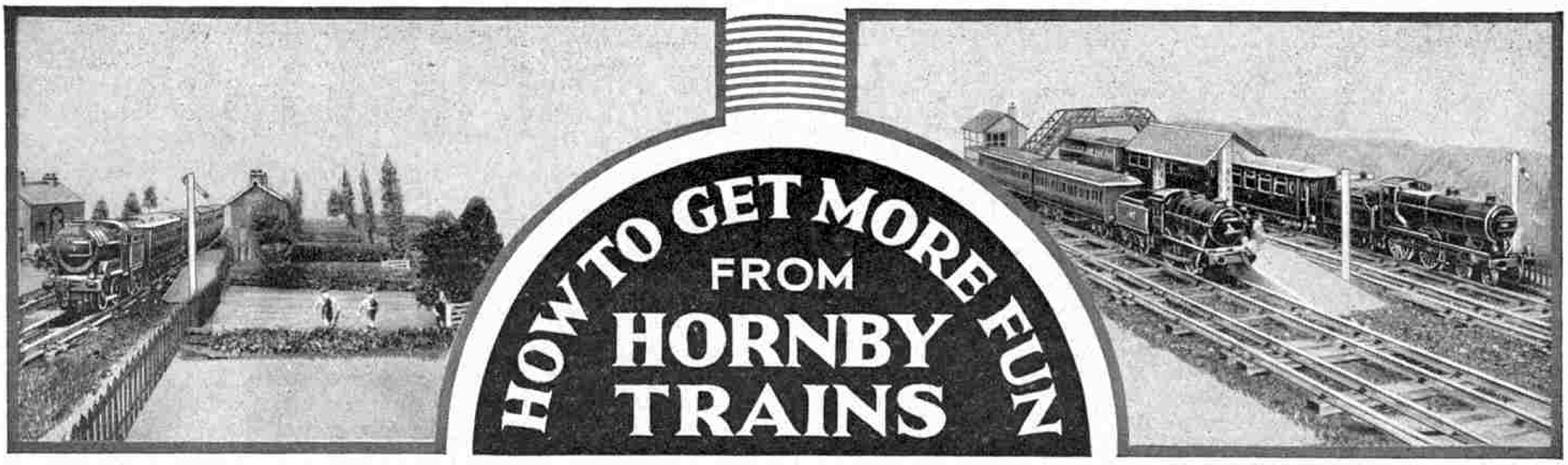
Another part of the layout, showing a passenger station and a goods depot. A splendid appearance of activity is given by the use of Dinky Toy figures and various accessories on the platforms.

The corners of the baseboard indeed frequently present problems to the miniature railway engineer. It is difficult to conceal the fact that there the curves of the track are proportionally much sharper than they would be in real practice, and as a result it is not easy to arrange the lineside features in a satisfactory manner. On this system, however, the corners of the layout have all received special treatment. As the baseboard is roughly rectangular there are four corners to be dealt with. The viaduct scheme already described is adopted at two of them and suitable lineside effects are arranged for the others, a miniature town being set up in the one case and a model village in the other. In addition, a farm is situated between one of the viaducts previously referred to and the inner single track loop line. All of these are peopled with Dinky Toys figures, and miniature road vehicles and animals of the Dinky Toys Series are also in evidence. These help to give an aspect of life and bustle that covers up defects of the type pointed out.

Scenic effects play an important part in the realism of the line. Care has been taken to supplement the various accessories and features that are near the line by means of background scenes, which are painted on plywood and form as it were a series of "sets," to use a film expression, practically the whole way round the line. At one end the views are of mountain and river scenes. Then the line curves and passes through a tunnel, and when it emerges the scenery has become wilder and more rugged, for mountains alone are in the background along this length. As the line curves the country descends to the sea, for mountain and marine views are the feature of this end of the system. Along the remaining side of the layout the scenery is of a more general character. The lineside effects there include a fort and a reproduction of Windsor Castle, both of which look very picturesque and give a distinctly interesting appearance to this part of the line.

The railway is electrically operated, and the locomotive stud includes a Hornby "*Royal Scot*," No. 1 L.M.S. Locomotive and tender, an L.N.E.R. E220 Tank Locomotive and a Metropolitan Electric Locomotive. The "*Royal Scot*" of course is used to haul the express passenger trains that run long distances non-stop. The Metropolitan Locomotive is used for hauling most of the local passenger trains. The L.N.E.R. Tank engine alone is responsible for goods traffic, and is used to haul all the express goods trains operated on the line. The No. 1 Locomotive performs a wide variety of miscellaneous duties.

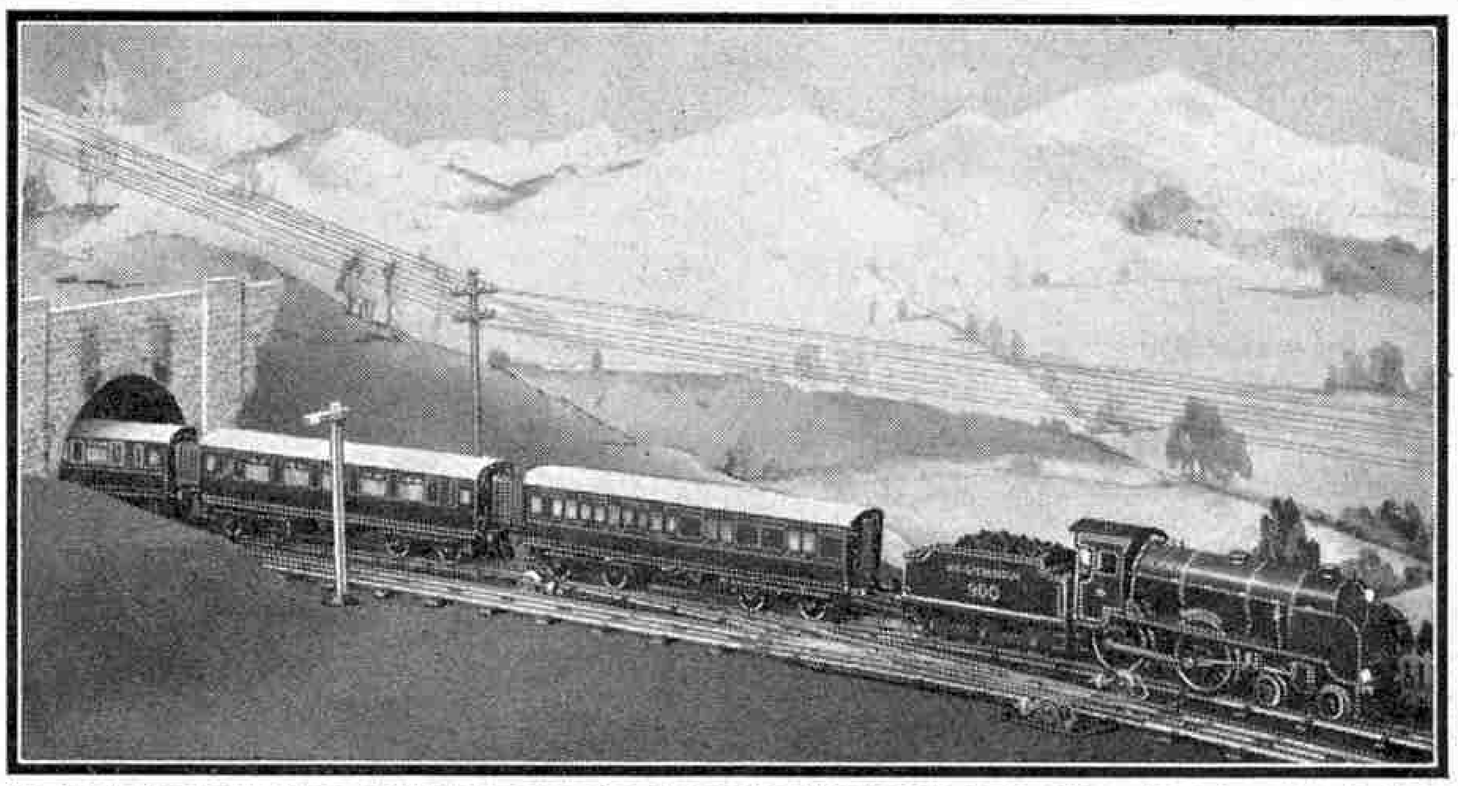
The rolling stock in use is varied, and well chosen for the different services. A unique character is given to some of the main line trains by the use of L.M.S. stock along with vehicles of the International Sleeping Car Company. These are represented by Hornby No. 2 Corridor Coaches and the well-known Riviera "Blue" components respectively. For stopping and intermediate services No. 1 Rolling Stock is largely employed, No. 1 Pullmans being included in the composition of the more important of these trains. For local passenger and suburban work Metropolitan stock is chiefly in use, along with the Metropolitan Locomotive.



THE SETTING OF A HORNBY RAILWAY LAYOUT

A MINIATURE railway layout that consists only of track is not completely realistic. Such a layout may be of the greatest interest as regards planning and operation, yet it will not look like a real railway unless some attention has been given to the setting and general surroundings of the line. Rather will it have the appearance of being situated "nowhere in particular," for the natural lineside features that are seen on any railway journey are absent.

The first and simplest step in the improvement of a layout is to enclose the railway property by means of fencing, the immediate effect of which is to give a better and more orderly appearance to the line. The provision of fencing or some other boundary is an important matter, as the real companies are bound to enclose their property. Hornby Paled Fencing is very useful and effective for lineside use, and for setting boundaries to the railway premises generally. It possesses the valuable feature that it can be curved readily to conform with the sweep of the track, and also can be bent at an angle if necessary.



An interesting photograpn snowing the use of a painted background in conjunction with a tunnel and other actual features. The tunnel face is of cardboard, arranged as described in the article.

Then there are natural features such as hedges, trees and banks at the side of the line. Such items are included in the range of Hornby Accessories. Hornby Hedging can be used to border the railway property, and it can also be used to divide fields or placed along the sides of roads. It is mounted on a wooden base, so that it is easy to put down or take up, and as the standard length is $10\frac{1}{4}$ in., or the same as that of a Hornby Tinplate Straight Rail, it is a simple matter to find how many lengths are required alongside a given piece of track. It also can be cut if required to fit in a particular position, scissors being used on the "hedge" itself and a saw on the base.

Hedging alone is not enough to give complete realism. Trees also are necessary, and splendid miniature trees are available in the Hornby Series. These are manufactured in two kinds, representing Oaks and Poplars respectively, and both kinds are very realistic in appearance.

On miniature railways, particularly those of the kind that have to be put down when required and taken up again when finished with, the inclusion of cuttings used to be a matter of some difficulty. With Hornby Cuttings, however, any temporary layout can have such features arranged in as realistic a manner as on a permanent model railway. The cutting banks of fabric material are formed to a realistic shape, and the colours used give them a very desirable appearance. As in the case of the Hedging, the Cuttings are made to a standard length of $10\frac{1}{4}$ in. They can be employed effectively in conjunction with one or other of the Hornby Tunnels, which are made of similar material and given the same finish.

Sometimes tunnels of special shape or size to fit in special positions are necessary. It is not difficult to make these at home. The "body" of the tunnels may be made up of wood, or even from a strong cardboard box, and crumpled brown paper that has previously been soaked in paste should be arranged over this. Any particular contours that may be required can easily be obtained by laying the covering surface over "hills" consisting of masses of brown paper crumpled to the desired shape.

Cardboard can be used very effectively in the reproduction of the mouth or face of a tunnel. There is a great deal of choice in the matter of the architectural features of the tunnel mouth, and the type to be adopted can be settled according to the taste of the model railway owner. A simple but effective design is that shown in the illustration on this page. This represents a plain brick-built tunnel face having a slightly oval bore or mouth to accommodate double track, and there is a projecting buttress at each side of the opening. It was constructed from cardboard, and finished by pasting on it printed brick paper of the kind that is sold for dolls' houses and similar purposes.

An interesting feature about the face of this tunnel is

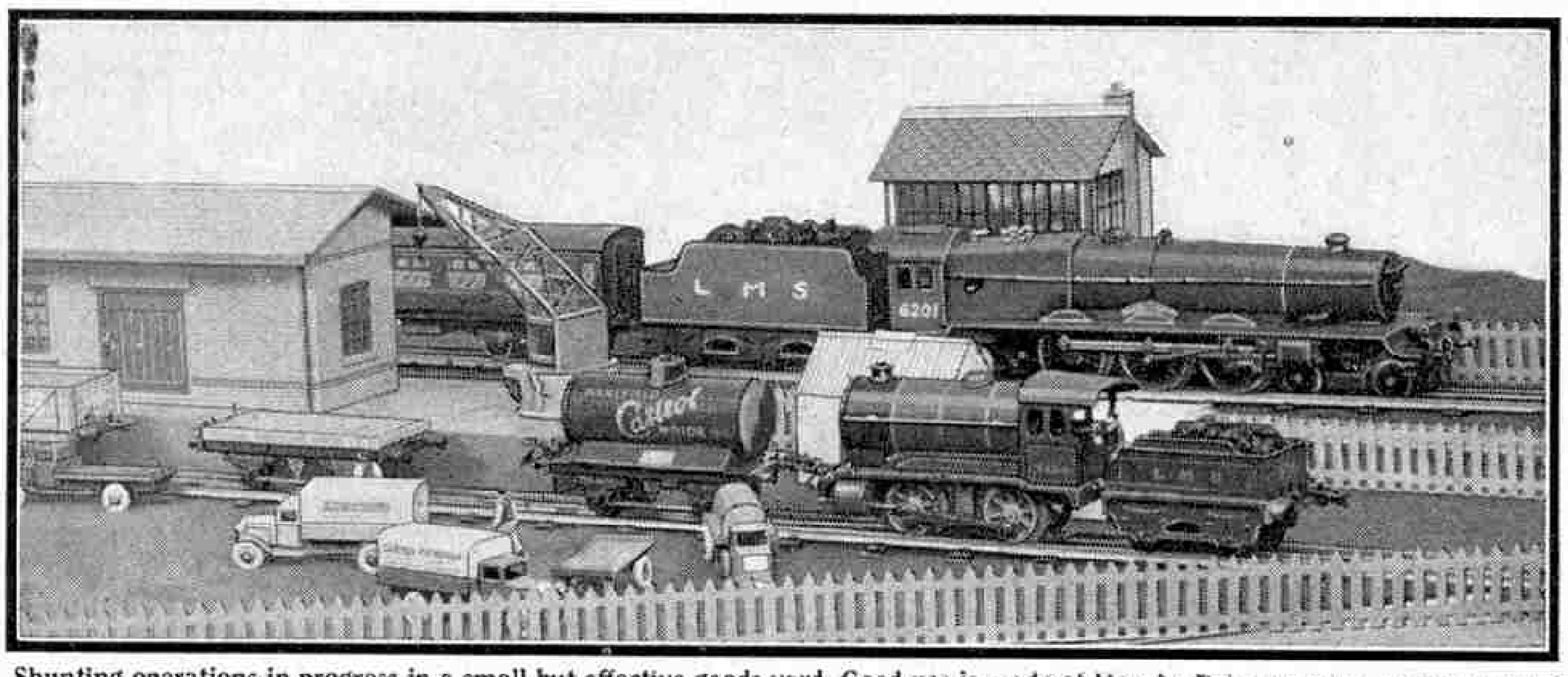
that there are two marks near the crown of the arch where the "smoke" of the passing trains has dirtied the bricks. This is a characteristic feature of tunnel faces and overbridges on a steam-operated railway, and its reproduction in miniature is a neat touch of realism. The smoky marks can be painted, or they can be "smudged" on with a finger on which there is just the smallest trace of soot.

When part of the railway cuts across, say, a river or stream, a suitable bridge or viaduct is necessary. The Hornby Series Viaduct is of an interesting design and can be used to bridge any real or imaginary waterways. It is so designed that it is higher than the rail level, as it usually is difficult, particularly on a temporary layout, to arrange any suitable depression for the Viaduct to cross. For this reason it is provided with sloping approaches at each end.

As the Viaduct will accommodate single track only, a special system of single track working has to be put into operation for trains passing over it when it is incorporated in a double track line. Such arrangements are found in real practice, and even such a famous train as the "*Cornish Riviera Limited*" has to pass over a single-track section when crossing from Devon into Cornwall by means of Brunel's Saltash Bridge. If the single span of the Viaduct is not sufficient additional centre sections can be used to extend it. Meccano Parts are ideal for constructing special bridges or viaducts, and they are widely used for this purpose.

Stations are important lineside objects. The necessity for them is clear, but an article dealing with Hornby stations appeared in the February "*M.M.*" so that they need not be specially considered here. Goods Platforms and Signal Cabins are other accessory buildings of importance, each for its own particular purpose. It is often found, however, that some special building or structure is required. This may be a hut, a house, or even a factory. For the construction of these cardboard is very useful. It requires some little care in its management, but if trouble is taken no difficulties should arise.

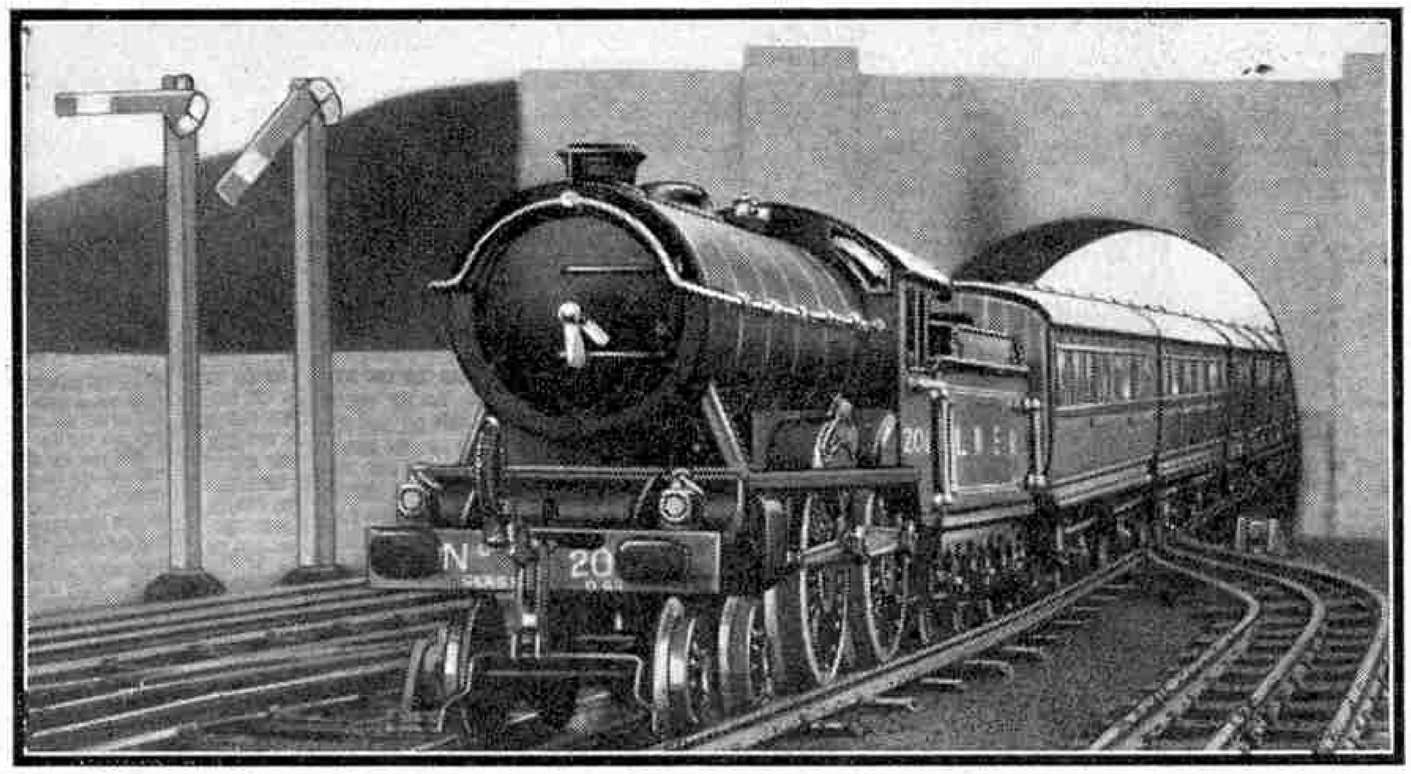
A well-built cardboard structure has a surprisingly long life. When making one it is important to mark out the cardboard carefully, according to the measurements and the design of the accessory to be constructed. Parts are then cut out with the aid of a sharp pen-knife, guided by a steel rule or a Meccano Girder, and they are assembled with the aid of Seccotine or glue. A good plan where broad flat surfaces are in use is to stiffen these by sticking a strip of wood on the inside of them.



Shunting operations in progress in a small but effective goods yard. Good use is made of Hornby Palea Fencing, which encloses the railway property and may be considered as forming the simplest type of scenery.

Passing now from items on or about the line to the more remote detail, we have to consider the provision of background scenery. It is the background that completes the setting of the layout and adds the finishing touch to the effects nearer the line. Coloured papers with scenic designs on them can be used with advantage, but such papers are rather rare in these days. The alternative, which is really the better method, is to make a background that suits the requirements of the layout. An effective way is by painting the required scene on strips of plywood, which are then erected at the edge of the layout.

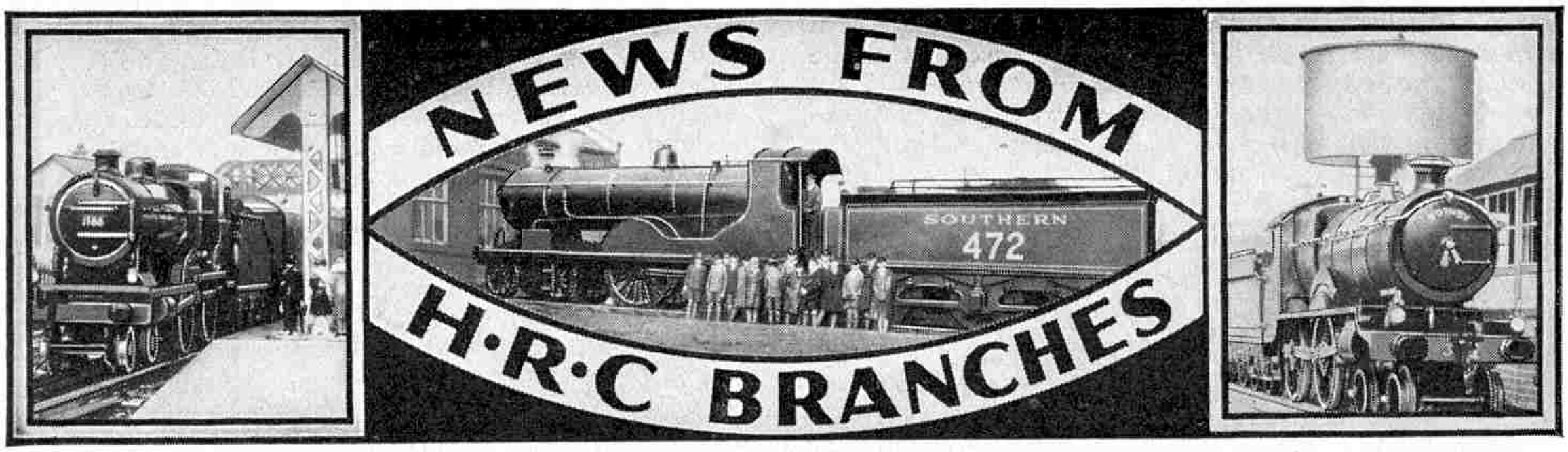
This scheme makes it possible for the scenery to follow the course of the track round curves and so on, if necessary. A very good idea of what can be done in this way can be seen from the description of the layout on page 237 of this issue, where plywood has been used most successfully as a background material. Even portable railways can be provided with scenery in this way if the lengths of plywood are provided with suitable supports at the back.



The miniature road overbridge, retaining wall and bank give a realistic air to this photograph. The train dashing under the bridge is headed by a Hornby L.N.E.R. locomotive of the "Hunt" class.

A favourite scheme on permanent layouts is to use plain blue wallpaper, which gives a good "sky" background, and to use paints or coloured chalks to indicate what is required. It is not necessary to have any great artistic ability to obtain satisfactory results, but as much care should be taken in this as in any other work on a miniature railway. Too much detail is not required. Sufficient to suggest the main features it is desired to show is all that is necessary and broad effects such as are seen on many present-day posters should be aimed at.

If the scenery is arranged in the form of a strip running lengthways round the layout, it is necessary to make this sufficiently deep to give the effect of distance when required. For good results the height of the strip should be at least twice that of the trains, and it may be three or even four times that height with advantage.



Branch News

WHITGIFT SCHOOL.—The majority of meetings have been devoted to Hornby Train operation. A Lecture on *"The Industrial Railways of Great Britain"* was given by one of the members. Various Competitions have proved an attractive feature of the Branch programme, and it is hoped shortly to arrange for a party to visit one of the many factories in the district. Secretary: C. P. Dear, 36, Spring Park Road, Shirley, Surrey.

ST. STEPHENS (SALTASH).—The recent joint Exhibition of the Branch and the associated Meccano club was very successful. The Branch's share of the proceeds has been used for the purchase of additional rails and points in connection with the electrification scheme. The steel track is to be altered slightly so that a model of Millbay Station built by members may be brought into use. A novel event was a visit from Mr. W. J. Ellis, of the Plymouth Branch, who described his own visit to the Elmside Branch, Exeter. Secretary: B. Braund, 9, Homer Park, Saltash.

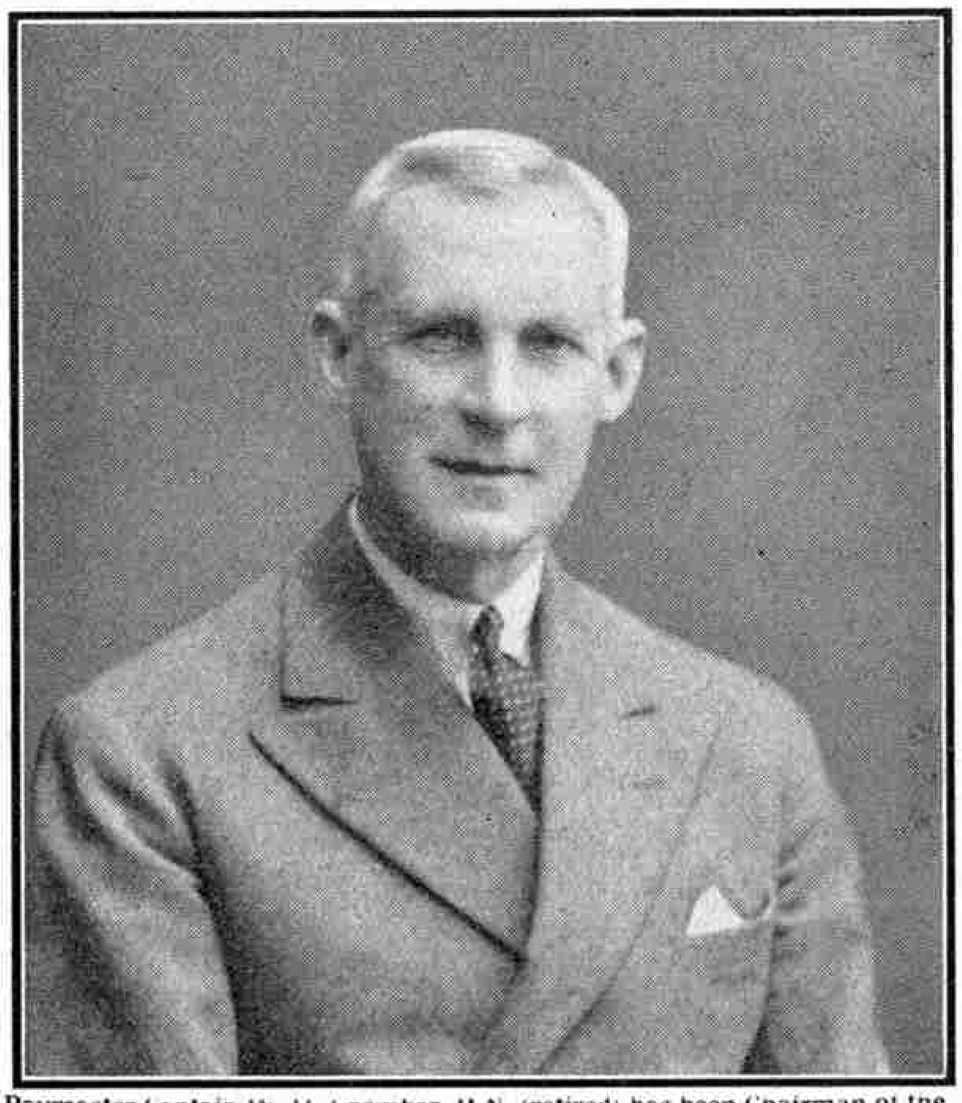
ABERGAVENNY.—Visitors to the recent Exhibition greatly enjoyed train operations, especially at night, when stations and trains were electrically lighted. More locomotives and coaches have been purchased, and new timetables have been tried out with excellent results. Arrangements are now being made for a larger Branch room in which the track can be extended. Secretary: J. C. Baker, White House, Llanfoist, Nr. Abergavenny, Mon.

PLYMOUTH.—Members were kept extremely busy preparing for the successful Annual Exhibition held in December. Some of the members exhibited models at the St. Stephen's (Saltash) Branch Exhibition. A Lantern Lecture on *"York Railway Museum"* was greatly enjoyed, the slides for this purpose being kindly loaned by the L.N.E.R. A new permanent track is being constructed, without interruption to operations on the temporary tracks. Experiments are being made in which two trains are run simultaneously on the same length of track. Secretary: R. G. Symons, 8, Glendower Road, Peverell, Plymouth.

WEST HADDON DISTRICT.—Constructional work has been commenced on the L.M.S. "Rugby" Station on the Branch layout, and it is hoped that running to timetable will commence shortly. The L.M.S. and L.N.E.R. Sections have decided to electrify their tracks. This is to be done in sections. More stations are to be built, and a lift bridge is being constructed on the L.N.E.R. track. A visit was paid to an Exhibition held at Castle Station, Northampton, where members inspected L.M.S. locomotives No. 20002 and No. 6147, *"The Northamptonshire Regiment,"* and a train of modern stock. Secretary: D. G. Bush, "Stonelea," West Haddon, Nr. Rugby.

MEXBOROUGH SECONDARY SCHOOL.—The Branch track has been re-arranged each week by different members, and alterations in timetables have been to provide services suitable for different seasons. Good use is made of Meccano Dinky Toys and Pavement Sets, and the running of buses to fit in with train services is a great attraction. Great interest was shown in a model of the world's largest lorry, which was constructed by one of the members. A scheme for electrification is being considered. Secretary: R. A. Agascar, "Woodleigh," Lower Dolcliffe Road, Mexborough, Yorks.

ST. ANDREW'S (MONTPELIER).—Members have had busy times in the marshalling yard and on the main and suburban passenger lines. Timetable operations now proceed normally, and are being extended as the track is enlarged. Film Shows are given every month. A visit to the Central Fire Station has been arranged. Secretary: K. W. J. Bartlett, 33, Bath Buildings, Montpelier, Bristol 6.



Paymaster Captain W. H. Coomber, R.N. (retired) has been Chairman of the Bedford School Branch No. 310 since its incorporation in July 1936. The Branch has an unusually extensive and interesting track, well provided with accessories, on which timetable operations are carried out.

ITALY

MILAN. — Track operations continue, regular services being organised and the greatest importance being paid to punctuality. Delays are rare, but an event that gave rise to keen discussions and a searching enquiry was a collision caused by a goods train running on to a section of track already occupied by a Pullman express. The Christmas Social was very enjoyable. Violin selections were contributed by Mr. A. Sacchi, and Mr. C. Vigo, President, presented prizes won by members of the Branch and the associated Meccano club. Secretary: E. Vigo, Corso Genova 19, Milan, Italy.

Branches in Course of Formation

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

ALVASTON—E. A. Fetherston, Holkirk, 2, Field Drive, Alvaston, Derby.
BIRMINGHAM—G. Cassidy, 113, Oxford Road, Acocks Green, Birmingham 27.
BRADFORD—G. Hewitt, 13, Barraclough Buildings, Greengates, Bradford.
BRADFORD—G. Spurr, 45, Ryan Street, West Bowling, Bradford.
BURY ST. EDMUNDS—M. D. Forster, 2, Crown Street, Bury St. Edmunds.
COWLEY—Capt. D. E. Rowe, 4, The Avenue, Cowley, Middlesex.
ENFIELD—J. H. Pettifer, 31, Goat Lane, Forty Hill, Enfield.
HALIFAX — D. G. Helliwell, 202, Queens Road, Halifax.
ILFRACOMBE—E. Readwin, 29, Greenclose Road, Ilfracombe.
ISLEWORTH—D. Manser, 24, Elmer Gardens, Isleworth, Middlesex.
KEIGHLEY—Mr. N. Birtwhistle, 9, Bronte Street, Keighley, Yorks.
LEEDS—M. J. Briggs, 22, Langdale Avenue, Headingley, Leeds, 6.
MANCHESTER—N. Luckman, 12, Mossbray Avenue, Kingsway, Levenshulme, Manchester 19.
ROMFORD—E. Marais, 31, Kenilworth Avenue, Harold Park, Romford, Essex.
STOCKPORT—T. Bolland, 23, Kilburn Road, Edgeley, Stockport.

Branch Recently Incorporated

340. THORNTON HEATH—Mr. W. T. Jaques, 5, Ingram Road, Thornton Heath, Surrey.

H.R.C. COMPETITION PAGE

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

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

A NOVEL NAME CONTEST

Competitions dealing with the names of locomotives, famous trains and stations have always been very popular with members, and for this month we have devised one of a novel type. The panel in the centre of the page contains 16 short sentences or phrases that refer to names of this kind. These the competitors are asked to find, using the phrases in much the same way as clues in a crossword puzzle.

As an example of what is required we may take the first of the clues. The "three capitals" forming the engine's name clearly suggest letters and initials, and there cannot be many engine names consisting only of these. A little consideration, together with the knowledge of engine names that all H.R.C. members possess, will point to *"H.L.I.,"* the name of L.M.S. No. 6121 of the "Royal Scot" class, as the solution. A quick glance over the names of other famous engines will show that there is no other formed of initials, so that the first of these interesting puzzles is solved.

In addition to the name, the owning company, class, number and wheel arrangement of engines in the list must be given. In the case of a station, the company or companies on that line must be stated, and trains must be identified completely by adding the names of the places between which they run. This information should be summarised in a neat list and forwarded in envelopes marked *"H.R.C. Names Contest"* in the top left-hand corner to Headquarters, Meccano Ltd., Binns Road, Liverpool 13. Before sealing their envelopes competitors should make sure that they have written their H.R.C. membership numbers on their entries.

The contest will be divided into two sections, Home and Overseas, and prizes of any products 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 in each section. A number of consolation prizes will also be awarded. In the case of a tie for any of the prizes, the award will be made to the competitor whose entry, in the opinion of the judges, is neatest and is presented in the most novel manner. The closing date in the Home Section is 30th April, and that in the Overseas Section is 30th July. Entries should be posted so that they do not arrive after the closing dates published.

Name Contest Clues

1. **Three capitals form this engine's name.**
2. **Part of the train is blue, but the engine is always green.**
3. **A station where trains run in the roof.**
4. **Between north and south; the name includes trees of the forest.**
5. **An engine appears to be a Royal possession.**
6. **An animal and a building are seen in a station name.**
7. **This streamlined locomotive is named after its designer.**
8. **A port in the Midlands.**
9. **A lion that joined the army.**
10. **One black in a class of "reds."**
11. **A steam locomotive, yet has no cylinders.**
12. **Joint station. Clearly not all-steel.**
13. **Cross a river in two ways and get a station.**
14. **Cake and marmalade will suggest the name.**
15. **Wearer of the red rose.**
16. **The name of this place forms part of a ship.**

Railway Photographic Contest No. 1

This month we commence our annual series of Photographic Contests, which will continue until September next. In these contests members are given full scope for originality and enterprise, as they are not restricted to special subjects. Instead the prizes are offered for the best photographs of any railway subjects submitted during each month.

There is no limit to the number of prints that competitors may submit in these contests, but no competitor can win more than one prize in one contest. The only condition laid down is that the photographs themselves must have been taken by the competitors. Development and printing may be the work of professionals.

The contest will be divided as usual into two sections, Home and Overseas, and the prizes to be awarded in each will consist of Hornby Train or Meccano products to the respective values of 21/–, 15/– and 10/6. Any prize-winner who would prefer photographic material may choose this instead of Meccano products. A number of consolation prizes will also be awarded.

Envelopes containing entries must be marked *"Photo Contest No. 1,"* and posted to reach headquarters at Meccano Ltd., Binns Road, Liverpool 13, on or before 30th April. The Overseas closing date is 30th July.

Competitors in this contest who desire their photographs to be returned if not successful in gaining an award, should enclose with their entries an addressed envelope of suitable size sufficiently stamped. It should be noted, however, that prize-winning prints become the property of Meccano Ltd., and are therefore not returnable.

COMPETITION SOLUTIONS

November Photograph Voting Contest

Entries received in this contest show that all the railway photographs reproduced in the H.R.C. competition page of the November issue of the *"M.M."* appealed strongly to members. No. 1 proved the most popular, but No. 6 received almost as many votes, and there was strong support for each of the others. The actual order was as follows: No. 1, No. 6, No. 4, No. 9, No. 5, No. 2, No. 7, No. 3, No. 8.

COMPETITION RESULTS

HOME

January "Voting Contest."—First: J. L. MAKIN (30933), Allestree, Derby. Second: E. G. CHANDLER (53624), Tring, Herts. Third: L. J. SLATER (49094), Cosham, Portsmouth, Hants. Consolation Prizes: K. COSTAIN (5108), Bolton, Lancs.; E. C. PEART (50953), Hollinwood, Oldham; M. COLSON (30227), Bassett Green, Southampton; D. H. TOMKINSON (43681), Wells Green, Nr. Crewe.

January "Locomotive Features Contest."—First: D. D'ARCY (34560), Padiham, Nr. Burnley. Second: F. MILLS (31), Kearsley, Nr. Bolton. Third: J. L. MAKIN (30933), Allestree, Derby. Consolation Prizes: F. GREENBANK (26666), Chorlton-cum-Hardy, Manchester 21; P. ZIMMERMANN (57091), Enfield, Middlesex.

OVERSEAS

October "Drawing Contest."—First: Jos. M. DEMANUELE (44225), Valletta, Malta. Second: P. F. SMITH (54173), South Australia, Australia. Third: T. P. MORRIS (55944), Southern Rhodesia, South Africa. Consolation Prize: K. R. CASSELLS (39510), Wellington, New Zealand.

October "Missing Words Contest."—First: J. A. GNANADURAI (33344), Trichinopoly, S. India. Second: W. S. EAGLE (31779), Bombay, India. Third: I. BROUGH (9112), Balwyn, E.8, Victoria, Australia. Consolation Prizes: S. D. KURLAWALLA (28724), Bombay, India; D. PARKER (38595), Ontario, Canada; W. CARPINTER (42509), Christchurch, New Zealand.

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A returnable deposit of £1 is required from overseas applicants.

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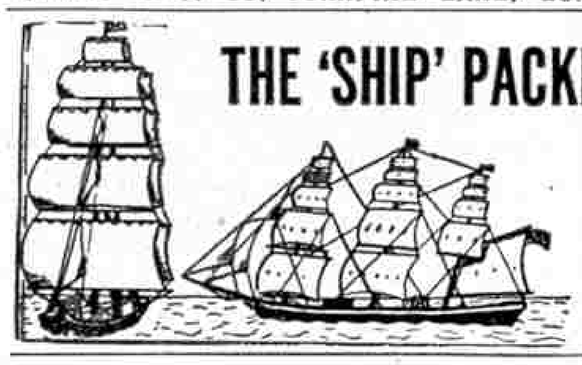

THE 'SHIP' PACKET

This marvellous packet is offered under cost as an advertisement, **45 different stamps each with a ship on it.** A regular armada. **KOUANG-TCHEOU,** new, **SENEGAL** (Canoe), wonderful flotilla of caravels from **DENMARK** (complete set), **NEW CALEDONIA, UKRAINE,** a fleet of **7 CHINESE** junks usually sold at 10d., **TRINIDAD & TOBAGO, MAURITIUS, KENYA-TANGANYIKA, NEWFOUNDLAND, U.S.A., B. GUIANA,** set of **S. AFRICA, GREECE, POLAND, INDO-CHINA, FRENCH OCEANIA, WALLIS & FUTUNA ISLANDS,** etc. Price **4½d.,** postage 1½d. (abroad 3d. extra). Purchasers of this packet asking for approvals receive **FREE** set of **3 SPAIN** (Columbus, each with his ship on it). Senders of addresses of stamp collectors receive **FREE** set of **6 VENEZUELA or 6 PERSIA, 100 BRITISH COLONIALS 1/-, 20 AIRPOST 6d., 6 TRIANGULARS 7d., 50 PERSIA 4/-, 9 POLAND New Pictorials 8d., VOLUMES OF B.O.P. CHEAP.**

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Montserrat	... 9d.		Seychelles	... 1/-	
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(DEPT. M), 59, LEE ROAD, BLACKHEATH, S.E.3.

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'IBIS COTTAGE,' AMERSHAM, BUCKS.

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THREE JUBILEE FREE to applicants for ½d. approvals. Cox, 14, Broadmead Av., Worcester Park.

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A tin box found in an attic—chock full of every conceivable kind of stamp, many of great value! The owner—not a dealer—decides to dispose of them in 5/- bags—absolutely untouched and without being sorted. You may be fortunate enough to make a really good find. We know that included are such well-known stamps as Cape Triangulars and Pence Ceylons, also other rare specimens. The whole valuable collection to be broken up and sold in parcels of 5/-. Every lot guaranteed good value, with a chance that you may find some exceedingly valuable specimens. *Given Free* with every order, Klimax Drop-Action Pencil, rolled gold. Money refunded if not completely satisfied. Take immediate advantage of this unusual offer by sending Cheque or P.O. 5/3 (including 3d. postage and packing).

R.D.M.G. POSTAL DISTRIBUTORS,
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FREE. 50 stamps and pictorial set to approval applicants. Gosling, 21, Powling Road, Ipswich.

Stamps on approval from ½d. upwards. Good value given. Rogers, 30, Watling Street, E.C.4.

BARGAINS FOR COLLECTORS
Have you seen my Bargains? Large Colonial and Foreign stock selling from ¼ to ½ Gibbons. All grades supplied from ½d. to £1 each and over.
FINE ATTRACTIVE SELECTIONS.
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Algeria (Anniversary), Cyprus, Inini,

Barbados, Oceana, **CANADA (CORONATION),** Chile (Columbus), Trans-Jordan and 50 different others, all post free for 3d. and in addition all buyers of this packet who

ASK TO SEE MY APPROVAL SHEETS

receive 5 Pictorial stamps **FREE.** Palace—Temple—Ship—Kraal—Waterfall. Ask for my new approval sheets. Great variety and good discount. Exchange desired with all Colonies and Dominions.

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MALAY TIGERS

Fine set of Federated Malay States in the well-known Springing Tiger design, including the scarce 10c. purple on yellow. These twelve stamps, now obsolete, are sent free to all genuine applicants for approvals enclosing 2d. postage. (Overseas 4½d.)

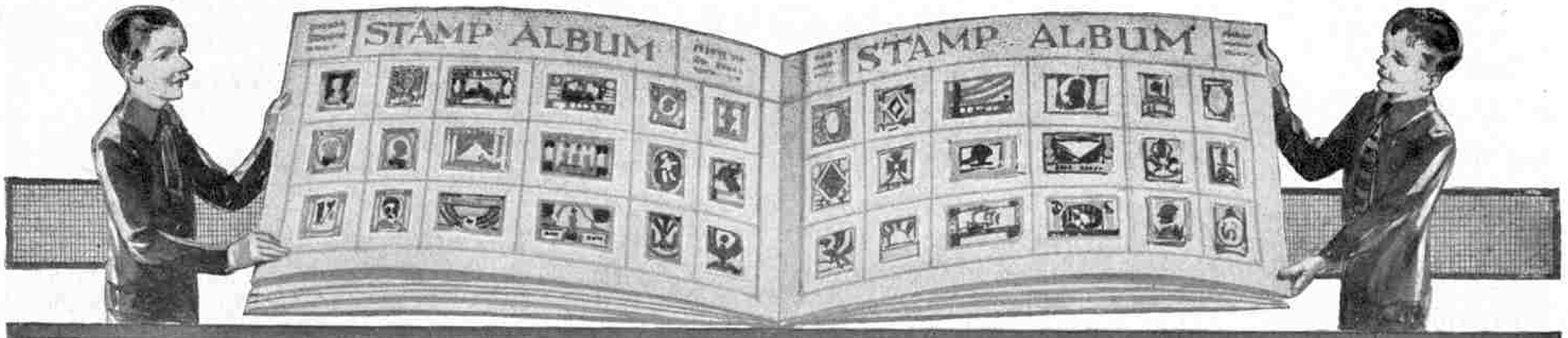
THREEPENNY SETS

4 Kenya 1935, 4 Siam, ex-King, 5 Canada 1935, 4 Canada 1937, including Coronation, 4 Mozambique 1937 pictorials, unused, 6 Greece 1937 pictorials, unused, 3 U.S.A. Army, 3 U.S.A. Navy, 2 Roumania 1936 Air. All at 3d. each. The lot for 2/-. Postage extra.

Mention Meccano Magazine

R. D. HARRISON - ROYDON - WARE

Postage is Extra



STAMP COLLECTING

THE KING GEORGE VI COLONIAL ISSUES

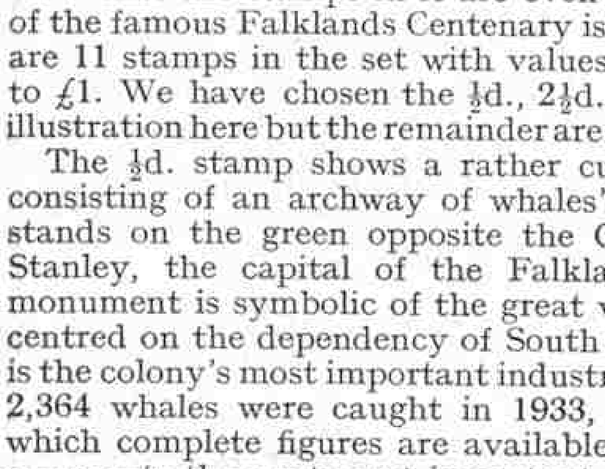
FOR British boys the outstanding recent feature of stamp collecting has been the swift succession of colonial issues of the new reign. Already many of the colonies have brought complete series into use. Others have introduced odd values, with more to follow soon, and in the remainder preparations are rapidly approaching the point of issue.

Without exception, the new stamps are gems of design and printing, and every collector who loves stamps for themselves will wish to possess the complete series. The average boy may find it difficult to provide funds to buy all the new issues immediately they appear. That need not cause any worry, however. Each of the new stamps is intended to be permanent, and it will be possible to acquire them gradually over a period without fear of missing something, or of having to pay an inflated price.

The Falklands series is probably the best of the new issues so far, and some idea of its excellence may be gauged from our view that the stamps in it are even better than those of the famous Falklands Centenary issue of 1933. There are 11 stamps in the set with values ranging from ½d. to £1. We have chosen the ½d., 2½d. and 6d. issues for illustration here but the remainder are equally attractive.

The ½d. stamp shows a rather curious monument, consisting of an archway of whales' jaw-bones, which stands on the green opposite the Cathedral at Port Stanley, the capital of the Falkland Islands. This monument is symbolic of the great whaling enterprise centred on the dependency of South Georgia. Whaling is the colony's most important industry and no less than 2,364 whales were caught in 1933, the last year for which complete figures are available. The 2½d. stamp represents the next most important occupation in the islands, sheep farming. In 1935 there were 615,000 sheep in the islands, the total area devoted to the industry being 2,875,500 acres. The annual output of wool exceeds 4,000,000 lb.

The design of the 6d. stamp is probably the most interesting of the series. It shows the famous Royal Research Ship *"Discovery II,"* built in Glasgow in 1930 for the study of the habits of whales and for Antarctic research generally. The ship is the property of the Falklands Government, and has a displacement of 1,036 tons, with a maximum cruising range of about 10,000 miles. The 9d. stamp shows the older R.R.S. *"William Scoresby,"* which also is the property of the Government of the Falkland Islands. This ship was a smaller vessel of 324 tons displacement, and was specially designed to carry out experiments in the marking of whales.



The designs for the 1d. stamp show the black-necked swan, which is specially interesting for its possession of a bright red nasal knob and a black neck, although the rest of its plumage is pure white. It breeds only in the remote parts of the islands. The 2d. stamp shows the memorial at Port Stanley erected to commemorate the battle of Falkland Islands, fought on 8th December, 1914, in which a German fleet under Graf von Spee was destroyed by the British under the command of Sir Doveton Sturdee.

The 4d. stamp depicts the upland goose, which is used extensively as food in the Islands. The species is rather smaller than the British domestic goose. It has the striking peculiarity that the male bird is coloured black and white and the female brown and white, whereas the male and female of other geese are of the same colour. The curiously-named "Mount Sugar Top" is shown on the 1s. value. This mountain is situated near Grytviken, South Georgia, the oldest whaling station in the islands, and derives its nickname from its perpetual cap of ice and snow, which gives it the appearance of being coated with sugar icing.

The higher values, 2s. 6d., 5s., 10s. and £1, show respectively a group of Gentoo penguins, a sea lion, the beautiful Deception Island and the arms of the colony. Deception Island is specially interesting to stamp collectors for the fact that its post office is the most southerly in the world.

The Seychelles George VI issue is another very striking set. This consists of a full range of 15 values, sharing the three designs illustrated here. The simple "photographic" designs, with the superimposed framed portrait of the King as their only embellishment, provide an unusually pleasing note that is novel in British Colonials. The 2c., 9c., 25c., 50c. and 1 r. 50 values show the coco-de-mer palm tree, a curious tree that produces for its fruit a unique double coconut weighing approximately 40 lb. The important Seychelles tortoise-shell industry provides the design for the 3c., 12c., 30c., 75c. and 2 r. 25c. values, which have on them a picture of the big land tortoise that is found on the island of Aldabra. The third design, on the 6c., 20c., 45c., 1 r. and 5 r. stamps, shows the famous *pirogue*, an open-decked boat commonly used among the islands for fishing.

The Seychelles Islands—there are 92 of them in all—lie in the Indian Ocean just south of the (*Continued on page 245*)

THREE FINE STAMP PACKETS

CORONATION STAMPS

You probably have unused "Coronations," but have you got them used? They're scarcer this way. Here are two special offers of USED "CORONATIONS":

Packet A 100
10 different King George VI Coronation stamps **1/-**

Packet A 97
20 different King George VI Coronation stamps **2/6**

—o—

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100 ALL DIFFERENT EMPIRE PICTORIALS, used and unused. The finest Empire Packet of its kind yet offered. Including "Silver Jubilees" and "Coronations." **10/6**

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LOTT'S BRICKS LTD., WATFORD HERTS.

BOAT RACE

You may see or listen-in to the Boat Race on April 2nd, but you must obtain our wonderful APRIL FREE GIFT consisting of many newly issued stamps together with many very old issues. It contains a special rare **SHANGHAI** stamp (showing the Union Jack and flags of eleven other Powers); **HOLLAND** (Wilhelmina); new **EGYPT** (newly crowned King Farouk); scarce obsolete **SAMOA** (Express); new pictorial **JAPAN** (Rice Harvesting); beautiful **AUSTRALIA** (1/- Lyre Stamp); new **HUNGARY** (St. Stephen); **AUSTRIA** (Peasants); **GREECE** (Bull Fight); **GERMANY** (Eagle); **ITALY** (Julius Cæsar). These are only some of the stamps included in this generous April Gift which will be sent you absolutely **FREE** by requesting approvals and enclosing 2d. stamps (abroad 6d.) We will also send you in addition a Perforation Gauge and Rule Free.

WINDSOR STAMP CO. (Dept. M), 59, LEE ROAD, BLACKHEATH, S.E.3.

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THE "MYSTIC" PACKET
1000 UNKNOWN UNUSUAL UNSORTED **1/6**
(over 200 diff. guaranteed.)

Stamps on paper, etc., just as received from Convents, Missions, Banks, etc. Guaranteed unpicked. Chance of a **FIND** in every lot. Send to-day for your treasure hunt to-morrow. 3 for **4/3**, 6 for **8/-**. Abroad, extra postage. **FREE!** 25 Br. Cols. including **CORONATIONS,** to Approval applicants. Also **FREE EXCHANGE.** Enclose ptge. Overseas 3d. Dealers Supplied.

ASTLEY & CO. (M.2), NEWBOLDS, WOLVERHAMPTON

KINGSMILL STAMP CLUB

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There is NO entrance fee, and NO subscription to the KINGSMILL STAMP CLUB, but there are many advantages, including a free packet of attractive stamps every month, with special approvals made up to suit members' requirements. Every type is catered for, whether you are a beginner, medium, or advanced. Apply for membership now, sending 1½d. stamp to:
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MALTA
MAGNIFICENT NEW PICTORIALS

We offer a mint set of 4 of the wonderful new set, one stamp showing the fortress that ranks as a Man-of-War at the Admiralty, another showing possibly the oldest Neolithic Monument in the world, for only 6d. post free to all serious applicants for our Famous Westminster Blue Books containing Pictorials, Jubilees, Coronations, stamps you will be proud to own.

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GOLDMINE PACKETS. 1,000 unsorted stamps from banks, missions, etc., abroad 1/6. J. D. Cowie, 35, Branksome Drive, Nab Wood, Shipley.

KING GEORGE VI PACKET FREE!!

This large free gift parcel contains **509 UNSORTED FOREIGN STAMPS,** many scarce from **MALTA** (K.G. VI new issue Pictorial), **AUSTRALIA** (K.G. VI new issue), **JAPANESE** (1899), **HUNGARY** (Pictorial), **JUGO-SLAVIA** (assassinated King Alexander), **CHARKHARI** (Native Scene), **NEW ZEALAND** (K.G. V), etc., etc. **ALL FREE!!** Just send 2d. postage and request my **FAMOUS EXTRA-LARGE-DISCOUNT APPROVAL SHEETS.** (Abrd. 1/- P.O.)
E. EASTICK, 22, BANKSIDE ROAD, BOURNEMOUTH.

BRITISH COLONIALS FREE. To applicants for ½d. and 1d. approvals. Many excellent bargains. Good discount. J. Norris, Chilton, Aylesbury, Bucks.

PERSIA CORONATION, Lithuania Anniversary. Pictorials from Guinea, Madagascar, Senegal, Jamaica, Ceylon, Niger, etc. Brit. Col. cat. 2/6, etc. Over 200 stamps, all different.
This splendid collection for 6d. only, to applicants for my All Pictorial Approvals at ½d. and 1d. Advanced selections also available at 2d. upwards per stamp.
M. COURT, 76, WILLOWDALE RD., LIVERPOOL, 9.

40 STAMPS FREE. Send 2d. postage and request approvals. C. Gasson, Partridge Green, Sussex.

ABSOLUTELY FREE

1. **100 all different, 2 Indian Silver Jubilees and 1 Mozambique Triangular Air Mail.**
2. **Greece 1937. Set of 6 Classic Pictorials.**
3. **Kenya 1935. Set of 5 Pictorials to 20c.**
4. **U.S.A. 1936. Set of 6 Army and Navy.**

Any ONE of the above gifts to applicants requesting my low-priced approvals containing stamps from ½d. Liberal discount is also given. Let me know your wants, and send 2d. for postage.
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FREE THE WONDER PACKET. Ask for my approval sheets and new lists and enclose 1½d. postage and I will send you the following packet absolutely **FREE—50 FINE STAMPS** including new **IVORY COAST,** a handsome stamp, two **CORONATION COLONIALS, BRAZIL** airpost (curious looking stamp), **GREEK,** Red Cross, **DENMARK (SILVER JUBILEE),** 2 new **POLISH** Pictorials (fine), **2 NEW ZEALAND** (Zoological Pictorials, new), **PALESTINE,** etc. **STAMP BARGAINS.** 10 Persia 3d., 10 Peru 4d., 100 different British Colonials 1/-, 6 Triangular 7d., 1,000 different 3/11, 45 Coronation (one from each Crown Colony) 5/-, 20 Brazil 10d. My new large list of 700 Bargains, post free 1½d. Send addresses of stamp-collecting friends and receive 6 Venezuela or 3 Ichang.
H. C. WATKINS (M. Dept.), GRANVILLE ROAD, BARNET.

Stamp Collecting—(*Cont. from page 243*)

equator. Their total land area is only slightly more than 1,500 square miles, but the administrative area is a big one. The outlying Aldabra group is 680 miles south west of the chief island Mahé, on which stands the capital Victoria.

British Honduras also includes a palm tree among the designs of its three new stamps. This is the Cohune palm shown on the 3c. stamp, illustrated here. The tree grows wild on the marshlands lying inland, and bears a nut that is rich in oil but difficult to crush, a point that has so far prevented extensive commercial development. The 4c. stamp also has a most attractive design, the King's head being flanked by streamered panels showing the names and specimens of important local products. Reading down the left-hand panel the first item is chicle, the basis of most chewing gums, followed by grape-fruit, bananas and sugar. In the right-hand panel the references are to mahogany logs, coconuts, cohune nuts and rice. The grape-fruit industry of British Honduras is rapidly growing, and it is fitting that the 5c. value should show a group of fruit trees with natives picking fruit.

Bermuda issued five new stamps in January, and these are worthy specimens. The 1d. and 2½d. values are reproduced here. The design of the 1d. stamp is used also for the 1½d. value, and shows an old-time four-masted sailing ship and a modern liner in Hamilton Harbour. The 2½d. and 1s. values show a view of the Great Bay. This is one of the designs retained from a previous issue, the only alteration being the substitution of the portrait of King George VI for that of King George V. The 3d. value depicts St. David's lighthouse, the first landmark visible to travellers approaching Bermuda from the east.

Ceylon has issued nine of its new stamps, and from these we have chosen the 10c. stamp for illustration here. This shows an exceptionally fine picture of Sigiriya, or the Lion Rock, one of the most romantic spots in the history of Ceylon. It derives its name from a series of carved figures of lions on the rock walls, 400 ft. in height, that bound the spiral path leading to the top of the rock. An artificial lake at its foot is set in forests of exceptional beauty. Rather more than 1,400 years ago the rock was a fortress that was almost unassailable. Great rooms, staircases and galleries were hewn out of the rock and adorned with sculptures, carvings and frescoes of remarkable brilliance that are still to be seen in almost pristine glory.

The 2 r. stamp depicts a guard stone, a carved stone found at the entrances of most of the ancient temples of Ceylon, frequently on the first of a flight of steps. The carvings commonly represented ancient gods who, presumably, watched over the glories of the temples.

The remaining stamps of this series bear the same designs as in the King George V pictorial series, the only differences being the substitution of the new King's portrait and the omission of the words "postage and revenue." The 9c. stamp has been withdrawn, as it has become a redundant value in consequence of the introduction of the "all-up" air mail service at the end of February. The 3c. and 6c. values will now serve on the few occasions when a postal charge of 9c. has to be paid.

British Guiana has issued seven new stamps. Except for the 4c. stamp, which shows a simple map of the South American Continent with the country marked in black, the designs are precisely as in the last issue, except for the substitution of the portrait of King George VI.

Malta has issued its complete new series of 15 values, ranging from ¼d. to 10s. in denomination, of which three are illustrated here. The ¼d. value gives a charming panoramic view of the Grand Harbour. A specially interesting point in this stamp is the omission of the King's portrait and the inclusion of the Royal Cypher. The reason is that the stamp is in a miniature format and the King's portrait could not have been included on a reasonable scale without cutting badly into the picture. The remaining designs are as follows: ½d., H.M.S. St. Angelo, the only fort in the British Empire that has official rank as a man-of-war; 1d. (illustrated), Verdala Palace; 1½d., a neolithic hypogeum, or underground chamber, a unique monument reputed to date back to 4000 B.C.; 2d., the citadel of Victoria Gozo, 2½d., the Grand Master de L'Isle Adam, the first of the Grand Masters of the Order of St. John to rule in Malta, entering Mdina; 3d., St. John's Co-Cathedral, the conventual church of the Knights of St. John; 4½d., Mnajdra temple; 6d., Grand Master Manoel De Vilhena; 1s. (illustrated) Maltese girl wearing the faldetta, a combined hood and cape traditional in Malta; 1s. 6d., St. Publius, the first Bishop of Malta, mentioned in Acts xxviii; 2s., Mdina; 2s. 6d., a view of the Harbour with the famous bronze statue of Neptune in the foreground; 5s., Palace Square, showing on the right the Governor's Palace, formerly the Palace of the Grand Masters; 10s., St. Paul, the story of whose shipwreck and sojourn at Malta is told in Acts xxvii and xxviii. The stamps are much larger than previous Maltese issues, and the series is an unusually attractive one.

The Cook Islands is to issue three new stamps at the end of this month. These will consist of a 1s. value, showing a three-quarter head and shoulders portrait of King George VI, set in a framing of Maori carving; 2s., depicting a typical native village scene; and 3s., a coastal scene with a native outrigger canoe. The same designs and values will be issued in the Niue Islands simultaneously, the only difference being that they will be inscribed "Niue-Cook Islands" and that minor alterations will be made to the framing of the 2s. stamp.

Montserrat, one of five presidencies constituting the Leeward Islands, also is to issue a new series with a profile portrait of the King in the top left-hand corner and the badge of the presidency in the top right corner. The ½d., 3d., 1s., and 5s. values will show a view of Carr's Bay; the 1d., 1½d., and 2½d. values, a cotton field; and the 2d., 6d., and 2s. 6d. value a view of the Botanic Gardens.

St. Lucia will issue a single design for the ½d. to 3d. values showing a portrait of the King in the centre, with a framing of roses and fleurs de lis, surmounted by a crown. There will also be a 10s. issue with a design consisting of the badge of the colony surmounted by a crown imposed on a background of the imperial cypher.

Nearer home, Gibraltar has just released five new stamps with the following designs: ½d., King's Head; 1d., 1½d., 2d. and 3d., views of the Rock from different viewpoints. The design of the 1½d. stamp is the same as in the previous issue, the only difference being that the King's head is moved from the right to the left-hand top corner and the badge of the colony from the left to the right corner. This new arrangement of the head and badge applies in each of the stamps.

We wonder how many readers have observed an important omission from the designs reproduced this month, except those for Bermuda. The hitherto inevitable inscriptions "Postage" or "Postage and Revenue" have disappeared. Their omission from the Colonial Coronation stamps last year was noted, but no significance was attached to the point. It seems obvious now, however, that a new policy has been adopted.

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

Competition Corner

GOLFWORDS

CLUES

HOLE No. 1
Strange
Selfishness
Knock
Awful
Offering

HOLE No. 2
Move round

HOLE No. 3
Proportion
Poison

HOLE No. 4
Created
Regulate
Small portion
Standard

HOLE No. 5
Bitter
Undulating

HOLE No. 6
Colour

HOLE No. 7
Possess
Faithlessness

HOLE No. 8
Music
Boundary

HOLE No. 9
Nickname

CLUES

HOLE No. 10
Reprimand
Frame of steps
Group of stars

HOLE No. 11
Greeted

HOLE No. 12
Juicy fruits
Magnificence
Measure

HOLE No. 13
Rope-walker
Field hospital unit
Gaiety

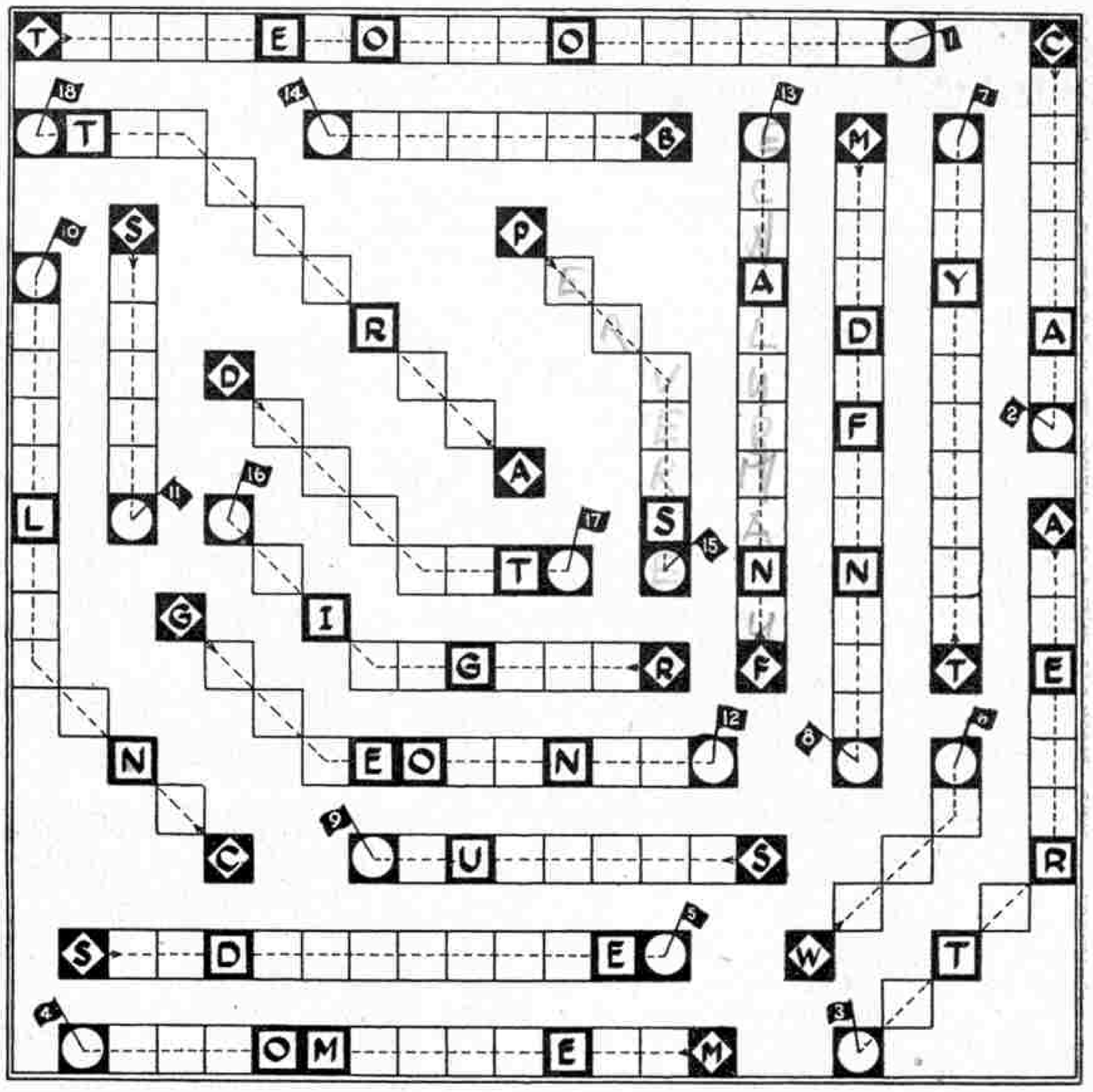
HOLE No. 14
Mysterious

HOLE No. 15
Obstinate

HOLE No. 16
Symbol
Dismissal
Devastate

HOLE No. 17
Govern

HOLE No. 18
Separate
Nearly correct
Tell



Our readers so greatly enjoy *"M.M."* Crossword Puzzles that this month we are setting them a novel form of word puzzle developed from them. To this we have given the name "Golfwords."

The illustration on this page represents an 18-hole golf course. The tees are suggested by lettered diamonds, the greens by numbered circles, and the fairways by dotted lines passing through squares. The idea of the contest is to start in the top left hand corner, and to go round the course by filling in the squares with the letters of words to be found from the accompanying clues. The competitor who goes round in the smallest number of complete words is the winner.

The first word for any hole must start with the letter indicated on the tee. Some holes are short, and may be done in one word, but others may require two or more. Only words derived from the given clues may be used, and the letters marked in certain squares must be used in the words passing over them.

In order to make the idea clear, let us take the short Hole No. 15. The clue indicates that there is only one word. This must start with the letter "P," and the seventh letter is required to be "S." The word "Perverse" fits this, and therefore is the solution.

Where several clues are given to a hole, the words they lead to may be used in any order, but may not all be wanted. Thus for Hole No. 13 there are three clues, which suggests that the hole can be done either in three or two words, or perhaps in one. With the letters indicated as guides, the clue "gaiety" immediately suggests "Fun" as one of the words, and "field hospital unit" must be "Ambulance." Between them these words have the necessary 12 letters, so that the hole can be done in two "strokes." But there is a third clue. This is a hint that the hole might be done in one word, and a little search will lead to the better solution "Funambulator."

When the course has been completed competitors should add up the number of words taken, and mark that number in the top right corner of their entries. Prizes of Meccano products value 21/–, 15/–, 10/6 and 5/– respectively, will be awarded to the senders of the four best entries in order of merit, and there will be a number of consolation prizes. In the event of a tie for any prize, preference will be given to the neatest or most novel arrangement.

Readers who do not wish to cut up their Magazines may make a copy of the "golf course" illustrated on this page, or may even submit a numbered list of words used.

Entries should be addressed *"Golfwords,"* Meccano Magazine, Binns Road, Liverpool 13, and must reach this office not later than 30th April. There will be a separate section for Overseas readers with similar prizes. Overseas entries must arrive by 30th July.

The 1938 Photographic Contests

This month we announce the first of our 1938 series of photographic competitions, which will continue until September at least. The same easy conditions as in previous years will apply throughout. Each month prizes will be offered for the best photographs submitted during the month, without any restrictions as to the subject or the size of the picture, or the make of camera, plate, film or printing paper. The only requirements are that the exposure must have been made by the competitor, and that the print must bear a title. The developing and printing may have been done professionally, but entrants who have done this part of the work themselves are asked to write the words "own work throughout" on the backs of their entries. In the event of a tie for any prize, preference will be given to a print that is solely the work of the competitor.

Each month's entries will be divided into two sections, A for readers aged 16 and over, B for those under 16, and prizes of Meccano products or photographic materials, as chosen by the winners, to the value of 21/– and 10/6 will be awarded in each section. There will be a number of consolation prizes in addition.

Entries to this month's competition should be addressed *"April Photo Contest,* Meccano Magazine, Binns Road, Liverpool 13," and must reach this office not later than 30th April.

There will be separate sections, with prizes of the same values, open to Overseas readers. Overseas entries must arrive not later than 30th July.

A MOVABLE FEAST

Tommy was meandering homeward much later than his usual suppertime. A friend of the family who happened to meet him said:

"Why, Tommy, aren't you afraid you will be late for supper?"

"No," replied Tommy. "I've got the food."

* * * *

Farm Labourer: "Ah, no, there be no money in farming these days. Now look at that horse. You wouldn't believe the amount he eats."

Tourist: "What's he kept for?"

Farm Labourer: "Farmer has to have him for cutting the hay."

Tourist: "Hay for what?"

Farm Labourer: "Why, for his feed, of course."

* * * *

Convict No. 123: "It's no good taking any notice of those advertising slogans. I followed the advice of one, and here I am."

Convict No. 321: "Which one was it?"

Convict No. 123: "Make money at home."

* * * *

First Motorist: "Have you tried that new atomiser which they say reduces your petrol consumption by half?"

Second Motorist: "Rather. It saved 50 per cent. of my petrol. Then I bought a new carburetter, that saved 30 per cent., got another brand of petrol that saved 20 per cent., and some special sparking plugs which saved another 10 per cent. I then took out the car for a test run and, believe me, the petrol tank was overflowing before I'd gone five miles!"

* * * *

"Jones has got the softest job in town."

"What does he do?"

"He's a tester in a feather-bed factory."

* * * *

Doctor: "Was the sleeping powder effective?"

Patient: "No. I scattered it over the whole bed, but it did no good."

* * * *

Bobbie: "Mother, may I have a penny for the old man who is crying outside?"

Mother: "Yes, dear, but what is the old man crying about?"

Bobbie: "He's crying 'Peanuts, a penny a bag'."

* * * *

Tim: "Why are an engine and an elephant alike?"

Buck: "I don't know."

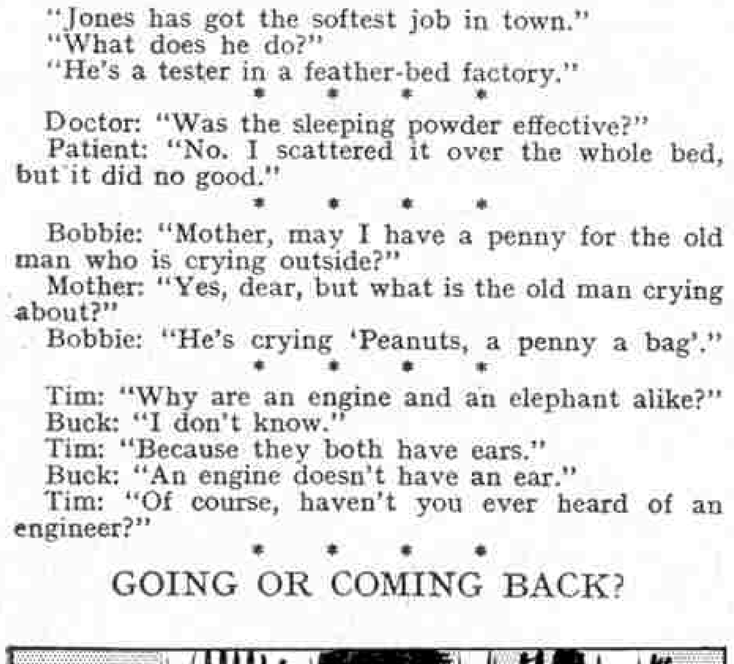
Tim: "Because they both have ears."

Buck: "An engine doesn't have an ear."

Tim: "Of course, haven't you ever heard of an engineer?"

* * * *

GOING OR COMING BACK?



Old Lady: "Guard, will you help me off the train?"

Guard: "Sure."

Old Lady: "You see I'm so stout I have to get off backward. The porters think I'm getting on, and shove me in again. I'm five stations past my destination already."

ILLUMINATING

Customer: "Any four-volt two-watt lamps?"

Electrician: "For what?"

Customer: "No, two."

Electrician: "Two what?"

Customer: "Yes."

* * * *

Levy: "Give me a penny to see the sea serpent."

Isaac: "Don't be vasteful, my boy. Here's a magnifying glass. Go and find a vorm!"

* * * *

A SHOCK COMING!

Burglar: "Shine yer light a little higher, Bill!"

* * * *

Rude Youth: "Do you sell dog biscuits in this rotten little shop?"

Assistant: "Yes, sir, Will you eat them here, or shall I send them round to your kennel?"

* * * *

"I say, waiter, the flowers on this table are artificial, aren't they?"

"Yes, sir. That's the worst of running a vegetarian restaurant—if we use real flowers, the customers eat them."

* * * *

A customer sent this note to his grocer: "Please send six dozen eggs; if good, I will send cheque."

The grocer replied: "Send cheque; if good, I will send six dozen eggs."

* * * *

The prison chaplain was paying his weekly visit to the convicts. In one cell he found a man looking very miserable.

"What's the matter?" he asked sympathetically.

"Bad news from home, sir."

"I'm sorry to hear that. What's the matter?"

"It's me brother, sir. He's gone into the workhouse, the first of our family to disgrace us."

* * * *

"What is the difference between an oak tree and a tight-fitting shoe?"

"I'll buy it."

"One makes acorns, and the other makes corns ache!"

* * * *

Tom: "Why is the church bell more obedient than the organ?"

Jack: "The bell sounds when it's told, but the organ says 'I'll be blowed first'."

* * * *

Teacher: "Can you give me a sentence with the word 'loquacious' in it?"

Charlie: "Yes. My sister was run over by a motor car because she didn't loquacious going."

* * * *

Bus Inspector: "Are you aware that none of the passengers on the top deck has a ticket?"

New Conductor: "Bless my soul! That's what comes of living in a bungalow."

* * * *

THIS MONTH'S HOWLER

The three highest mountains in Scotland are Ben Nevis, Ben Lomond and Ben Jonson.

LOST IN THE VOID

Albert: "Yes, the bullet struck my head and went careering into space."

Cecil: "How terrible! Did they get it out?"

* * * *

Alf: "My brother had a big scare yesterday. A lizard ran up his stocking."

Bert: "That's nothing, my brother had the sewing-machine run up the seam of his pants."

* * * *

"You can't stop here," protested the policeman to the motorist whose car stopped at the street junction.

"You don't know this car," replied the owner with a sad smile.

* * * *

"Did that crate of chickens reach you safely?"

"Well, yes, but you didn't pack 'em properly. After searching the neighbourhood I only found 12."

"You did pretty well. I only sent eight."

* * * *

"And what are you going to be when you grow up, Freddy?"

"I'm going to be a philanthropist: those people always seem to have such a lot of money."

* * * *

Hostess: "Are you sure you won't have another slice of cake, Tommy?"

Tommy (politely): "No, thank you. I'll be having a proper tea when I get home."

* * * *

"Is ink very expensive, father?"

"Why, no, what makes you think so?"

"Well, mother seems quite disturbed because I spilled some on the hall carpet."

* * * *

Lady in Post Office: "I want a wireless licence."

Clerk: "Yes, what name please?"

Lady: "Oh it hasn't a name, it's one my husband made himself."

* * * *

Tommy (at the Zoo): "I wonder what that tiger would say if it could speak?"

Dad: "It would probably say 'Pardon me, sonny, but I am a leopard!' "

* * * *

"When I looked out of the window, John, I was glad to see you playing with Bill."

"I wasn't playing with Bill, mother. We had a fight, and I was helping him to find his teeth."

* * * *

Lady in Restaurant: "Please bring me some fresh oranges with soda water."

Chinese Waiter: "Velly sorry, madam, ve have no oranges, but plenty lemonges."

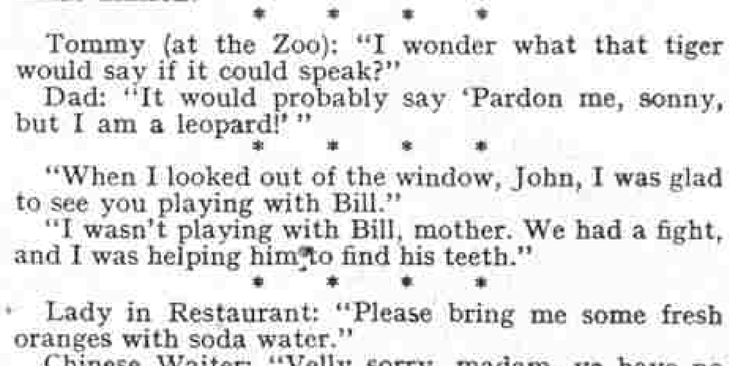
* * * *

Boss (as Jenkins comes in half an hour late): "Late again!"

Jenkins: "So am I."

* * * *

EVIDENCE AGAINST HIM

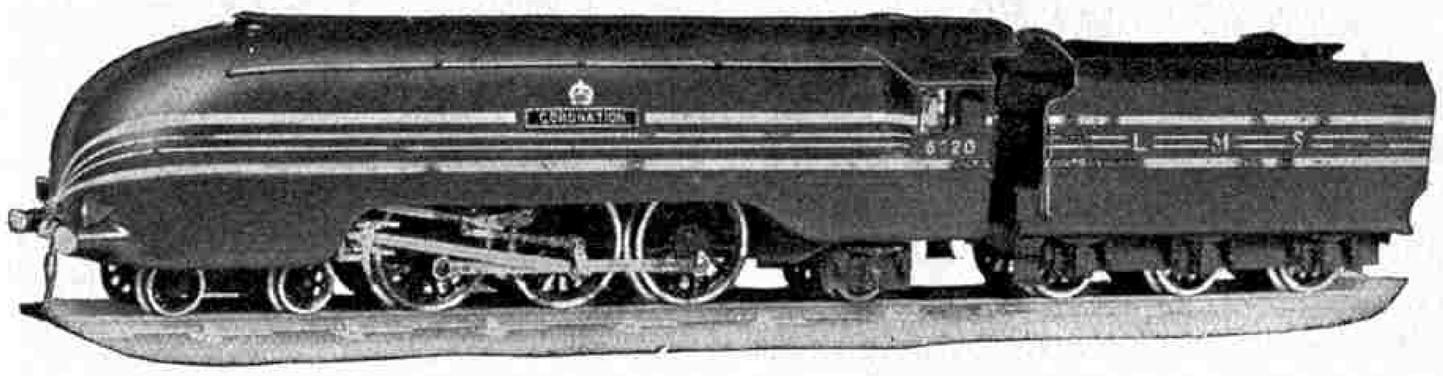


Village boys, trying to coax Ernie into the pond for a swim: "Come on, Ernie, the water's grand."

Ernie: "Can't. Mother'll find out. To-night's my bath-night."

"HIGH SPOTS" for a "MODEL" EASTER

Buy a BASSETT-LOWKE Model and let your motto be "on time!"



Here is the "CORONATION SCOT" model of the blue and silver L.M.S. steam driven world record breaker which touched 114 m.p.h. on her test run last June. **The same day** she left Crewe works to enter service, BASSETT-LOWKE'S had a model of her on view at London Branch—the same super-detail model shown here! Hand made throughout.

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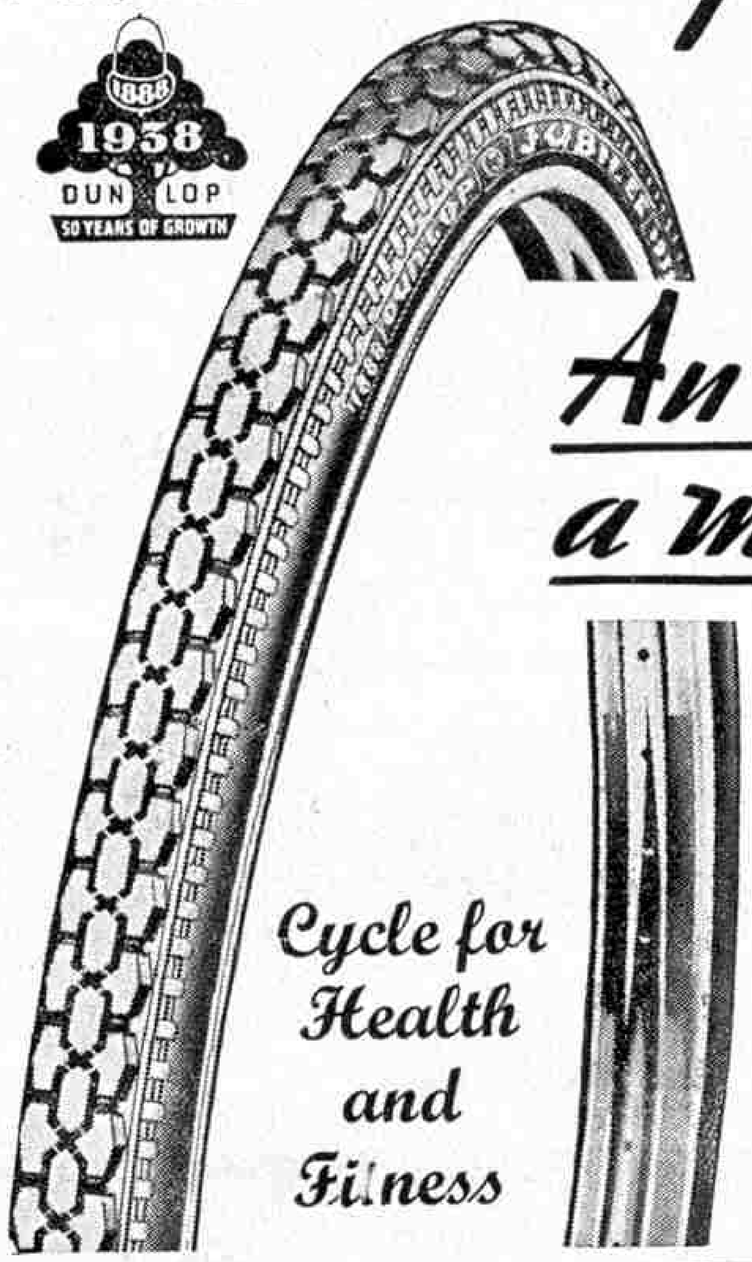

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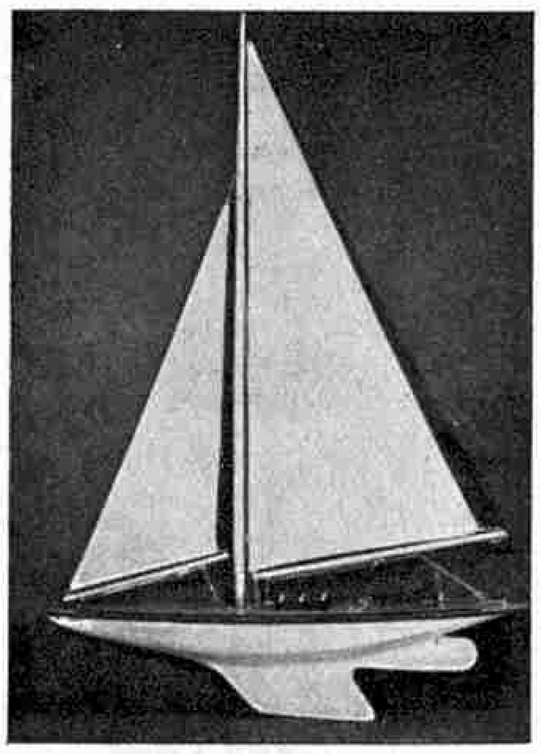
COVER 3/9

TUBE 1/6

C.F.H.

8H/310



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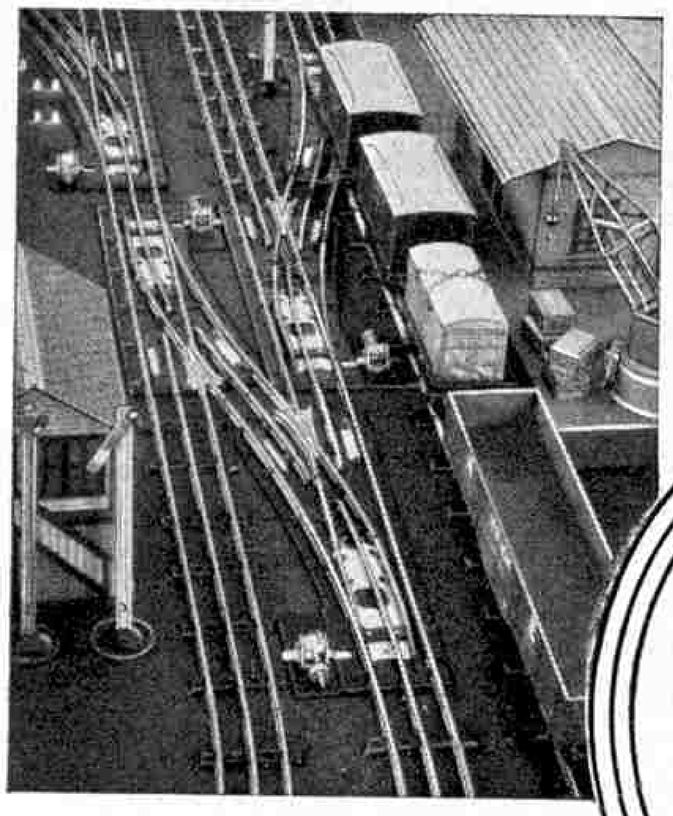

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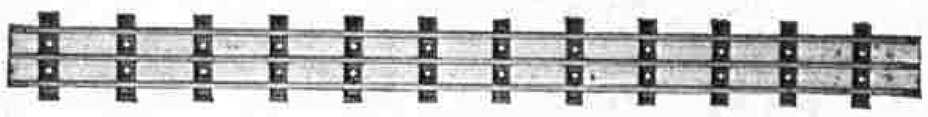

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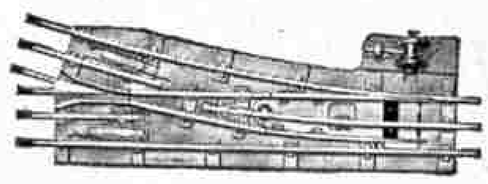

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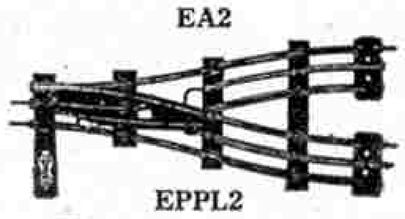
EB1

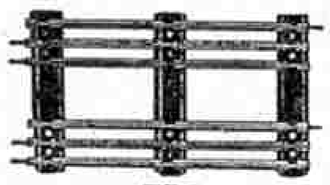
ECR

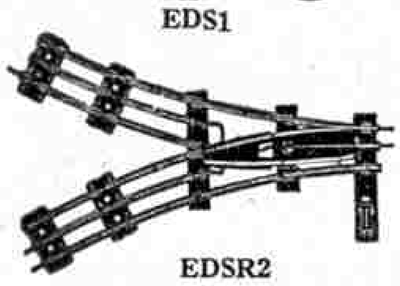
EA2½

EB½

EA2


EPPL2


EDS1


EDSR2

A SELECTION OF RAILS, POINTS AND CROSSINGS FOR ELECTRIC TRAINS

EB1 Straight rails	per doz.	6/–	
EB½ „ half rails ...	„ „	5/–	
EA2¼ Curved quarter rails (2 ft. radius)	„ „	4/6	
EA2 Curved rails (2 ft. radius)	„ „	6/–	
EPPR2 Parallel points, right-hand	per pair	7/–	
EPPL2 Parallel points, left-hand ... ... These points can be used with either 1 ft. or 2 ft. radius track.			
EPR2 Right-hand points (2 ft. radius)	per pair	8/–	
EPL2 Left-hand points (2 ft. radius)			
EPR1 Right-hand points (1 ft. radius)	per pair	6/6	
EPL1 Left-hand points (1 ft. radius)			
EDS1 Straight rails, double track	½ doz.	8/6	
EDSR2 Double symmetrical points, right-hand (2 ft. radius)	per pair	7/–	
EDSL2 Double symmetrical points, left-hand (2 ft. radius)			
EDSR1 Double symmetrical points, right-hand (1 ft. radius)	per pair	7/–	
EDSL1 Double symmetrical points, left-hand (1 ft. radius)			

FOR CLOCKWORK TRAINS

B1 Straight rails	per doz.	4/–	
A1 Curved rails (1 ft. radius)	„ „	4/–	
PR1 Right-hand points (1 ft. radius)	per pair	3/6	
PL1 Left-hand points (1 ft. radius)			
PR2 Right-hand points (2 ft. radius)	per pair	3/6	
PL2 Left-hand points (2 ft. radius)			
CA2 Acute-angle crossings (for 2 ft. radius track) ...	each	1/6	
PPR2 Parallel points, right-hand	per pair	4/–	
PPL2 Parallel points, left-hand ... ... These points can be used for either 1 ft. or 2 ft. radius track.			
DC2 Curved rails, double track, 2 ft. radius only ...	½ doz.	6/–	

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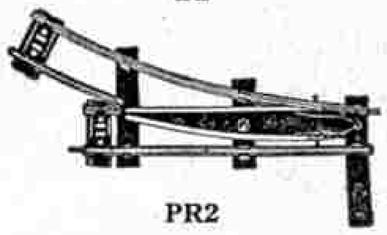
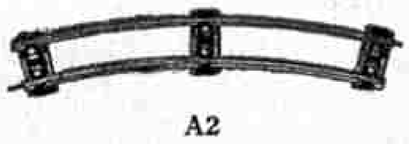
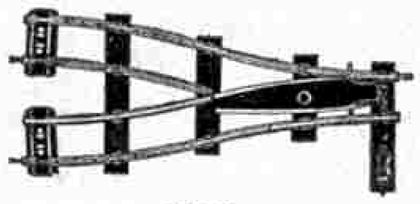
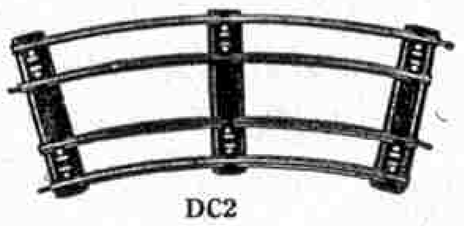
B1


PR2


A2

CA2


PPR2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"HOLDING"

All over the world, the British Bulldog is noted for his strength and tenacity.
So it is with Seccotine. Seccotine is used all over the world by people in every walk of life FOR STICKING ARTICLES.
Because Seccotine is so very strong and *lasting* in its results—it has many imitators; but it is an established fact that since 1884, when it was first made, it is infinitely superior in every way to its "next best."
The question of surfaces presents no obstacles to Seccotine—metal, wood, cardboard, etc., can be treated with equal success.
Sold everywhere in pin-stopper tubes, complete with directions for use, 4½d., 6d., and 9d.

SECCOTINE REGD.

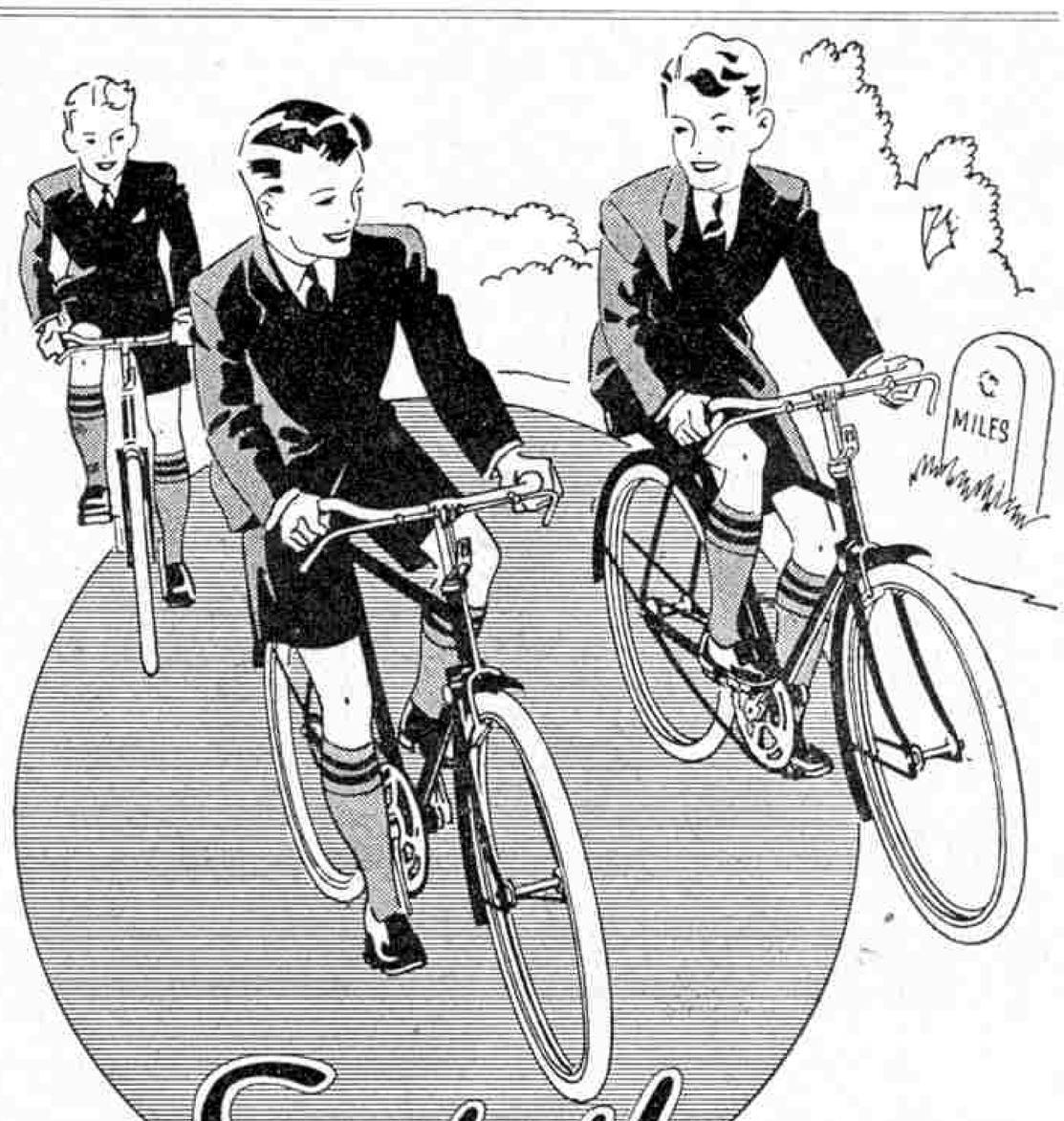
The Double Strength ADHESIVE

POST THIS COUPON to Dept. M
M'CAW, STEVENSON & ORR LTD., BELFAST

I should like to have, post free, copies of your Free Booklets which describe the many uses for Seccotine.

Name .....

Address .....



Spot the

RALEIGH

Their cycles are miles ahead because of easy-running

Tom, Dick and Sam *know* the Raleigh must be the world's finest cycle. They know that the Raleigh runs easily and sweetly—that it will stand up to hard knocks and schoolboy treatment. Dad knows it too. You'll find it much easier to get a cycle if you tell him you want a Raleigh.

Send for "The Book of the Raleigh" and address of nearest dealer. The Raleigh Cycle Co. Ltd., Nottingham (Depots and Agents Everywhere.)

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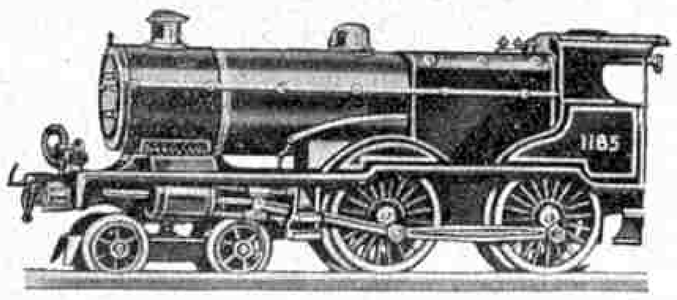
From **£4:16:6** *cash (Sturmey Archer 3-speed gear 21/- extra, cash). Deferred Terms from* **5/-** *down and 12 equal monthly payments (from 9/3). Sturmey-Archer 3-speed gear 2/1 extra monthly. Dunlop tyres and the best of everything.*

RALEIGH

THE ALL-STEEL BICYCLE

Fit the Sturmey-Archer 3-speed gear—the gear that "makes cycling easy

PART-EXCHANGE SCHEMES FOR MECCANO PRODUCTS



Hornby Locomotives

No matter what the age or condition of your old Locomotive, you can exchange it under our "Part-Exchange" Scheme.

The allowance that will be made for your old Locomotive is shown in a list of Part-Exchange allowances for Hornby Locomotives that is obtainable from any Meccano or Hornby Train dealer, or direct from Meccano Ltd. Please note that the price of the new Hornby Locomotive you purchase **must not be less than double the Part-Exchange allowance** made for your old Locomotive.

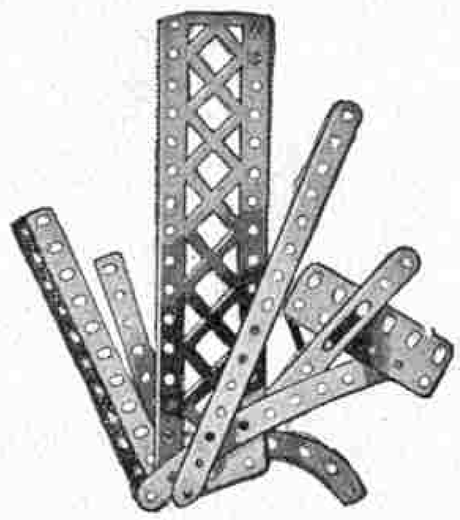
HOW THE SCHEME WORKS

Suppose you have a No. 1 Tank Locomotive that you wish to exchange. You see from the list that its exchange allowance is 5/9. You then look at the Hornby Train catalogue and choose one of the new Locomotives, the cost of which is not less than 11/6—that is, not less than double the Part-Exchange allowance we make for your No. 1 Tank Locomotive.

You decide to have, say, a No. 2 Special Tank Locomotive, the price of which is 21/–. Pack up your old No. 1 Tank, take it to your dealer, with 15/3, and he will exchange it for the new model that you require.

If it is more convenient you can send your old No. 1 Tank to us for exchange. In this case you deduct 5/9 from 21/– (the price of the new No. 2 Special Tank), and enclose 16/3, that is 15/3 plus 1/– for carriage on the new locomotive. Address your parcel to Meccano Limited, Special Service Department, Binns Road, Liverpool 13.

We cannot accept more than one old Locomotive in exchange for a new Locomotive. Tenders cannot be exchanged.



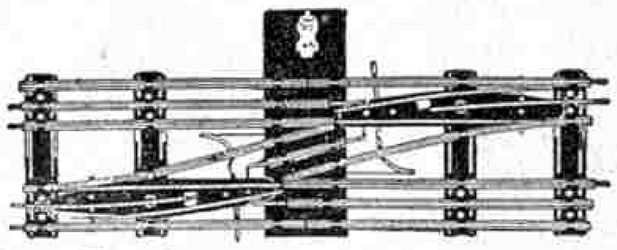
MECCANO PARTS

We undertake to exchange any damaged Meccano parts for similar new parts at half the current list price, no matter how old or how much damaged the parts.

Send them to Meccano Limited, Special Service Department, Binns Road, Liverpool 13, together with half the cost of the new parts, plus the return postage, which will be exactly the same as that you paid on the parcel of old parts.

Parts cannot be taken in exchange for Outfits.

The part-exchange scheme cannot be applied to any other Meccano products.

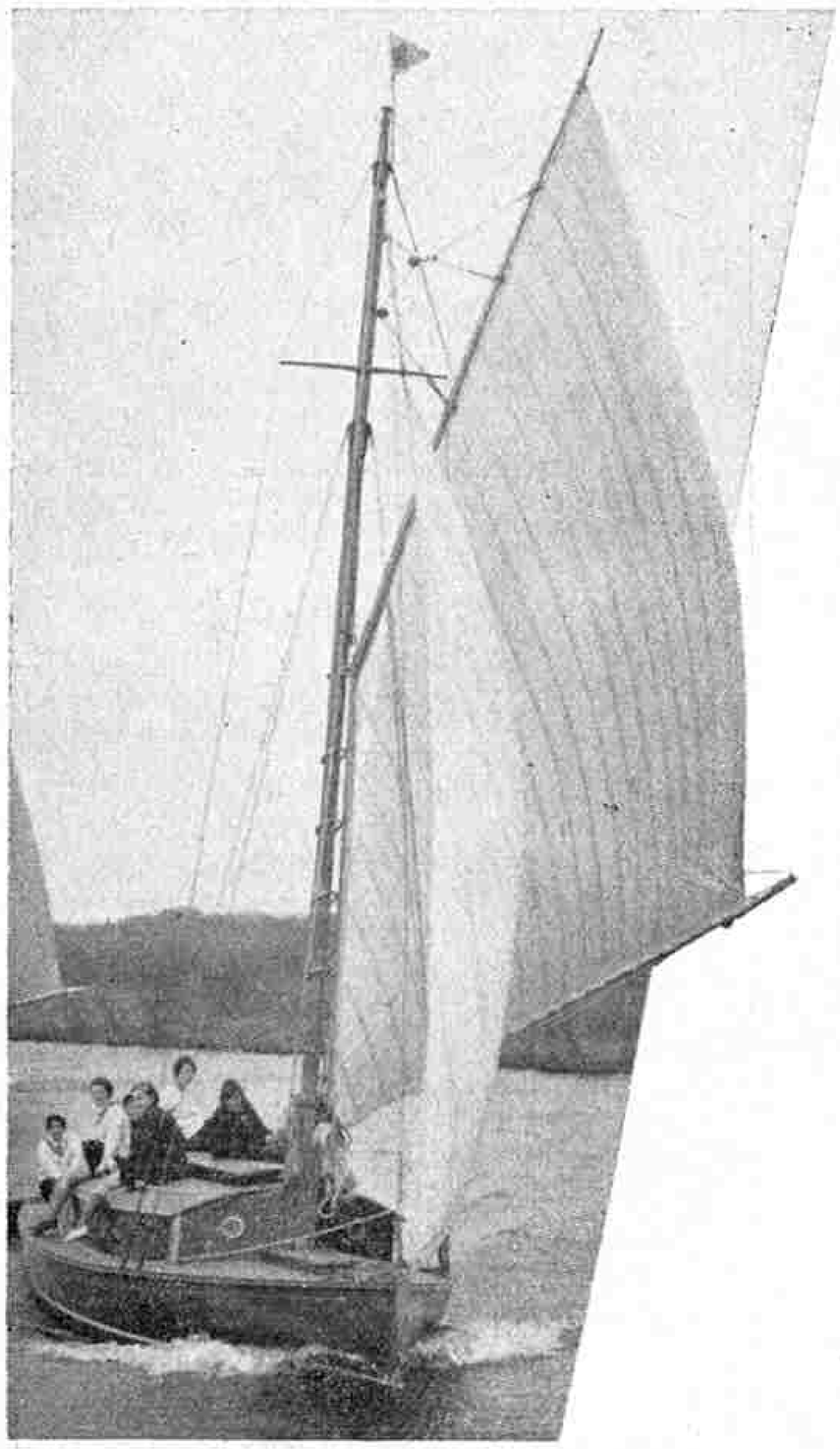


HORNBY TRACK

Hornby Clockwork Rails, Points and Crossings can be exchanged for Electric, on a piece-for-piece basis, the allowance being half the current list price of the Clockwork track returned.

Send your Clockwork track to Meccano Limited, Special Service Department, Binns Road, Liverpool 13, together with the cost of the new track less half the price of the old track, plus the return postage, which will be exactly the same as that you paid on the parcel of old track.

This applies to Hornby Track only, not to Hornby Accessories fitted with rails.



Negative: Chas. E. Brown

SELOCHROME *excels*

for snaps like this

With full sails and flag a-flutter this lively craft makes a fine snap for Selochrome Roll Film. A good test for the speed of Selochrome in poor light, this picture proves that Selochrome is fast enough to yield vigorous negatives of moving objects, even in dull weather.

Use Selochrome for uniform success with your camera—and for the beautiful true-to-Nature tone gradation which its sensitivity to yellows and greens gives you.

SELOchrome
Extra Fast **ROLL FILM**

FITS ALL CAMERAS, INCLUDING MINIATURE SIZES

Made in England by
ILFORD LIMITED, ILFORD, LONDON

OPTICAL CRAFTSMEN SINCE 1756

YOU CAN'T OVERWIND THE FILM
YOU CAN'T BREAK THE BODY . . .

You can't help but get good pictures with the V.6!

Even if you've never used a camera before the Brilliant V.6 will get perfect pictures for you. The hooded finder shows you the picture almost full-size while you take it and for speed work there's the sports-finder which lets you "shoot" from eye-level. An automatic brake stops you from overwinding the film. A hold-all built into the side carries light filters, etc. The body is unbreakable. You get 12 pictures 2¼" square on standard 8 exposure 3¼" x 2¼" film. You get perfect lens and shutter equipment. You get, in short, a luxury camera for as little as £3-12-6! See the V.6 at your dealer's or write below for details.

The BRILLIANT V.6
Six models ranging from £3-12-6 with F/7.7 Voigtar lens to £9 with F/3.5 Voigtar lens in Compur-Rapid shutter.

Voigtländer

SCHERING LTD. (Voigtlander Dept. 7)
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Build your own engine

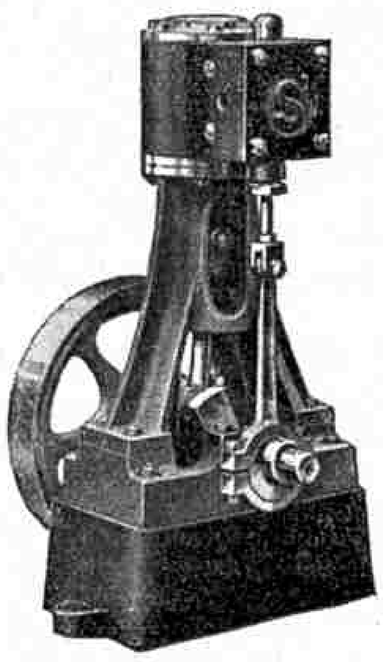
Only a few hand tools required.

Stuart No. 10.
Completely machined set with full instructions:
from **18/6** post free.

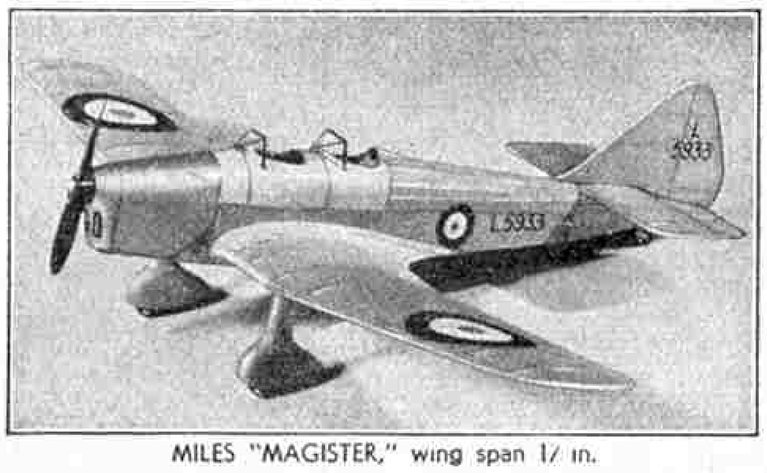
All our sets from 5/- upwards, illustrated and described in our No. 2 catalogue, 6d. post free.

72 pages fully illustrated.

STUART TURNER LTD.
Henley-on-Thames



SCALE MODELS *that* FLY!



MILES "MAGISTER," wing span 1/ in.

By Aeromodels Ltd.
(1/24th full size)

We stock these splendid models, the very finest of their kind. The Kits are absolutely complete, with full instructions, while the finished models are really excellent flyers.

Prices
"TIGER" or "LEOPARD" MOTH and MILES "MAGISTER," Complete Kit **3/6.**
HAWKER "FURY," **4/-.**
Postage 6d. extra.

LUCAS'S THE BOYS' ARCADIA
17, HOUGHTON ST., CLAYTON SQ.
LIVERPOOL 1 Tel. Royal 562

Here is a means of obtaining a really brilliant light, using no more current. "TRE VITA" Double Reflector Bulbs ensures that the hitherto wasted forward rays are trapped by the special built-in reflector (actually part of bulb) and are thrown back on to the main reflector and projected forward with main beam—resulting in a "Light of Amazing Brilliancy."

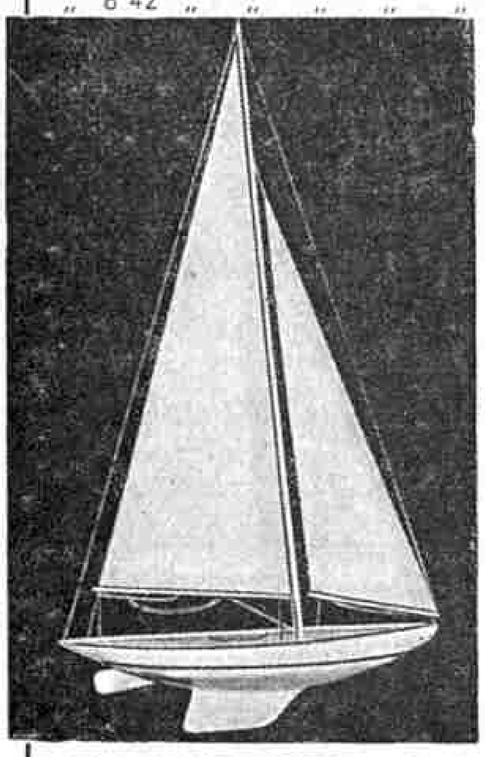
For use with one large Twin Cell Battery.

Ref. 140, 11¼ mm. Balloon, **6d.** Ref 141, 15 mm. Balloon, **6d.** Obtainable from your dealer, or direct, post free, **6d.** each. Catalogue free. **VITALITY BULBS.**

Imperial Works (MM), Ryland Road, London, N.W.5.

Model Racing Yachts

No. 1	18	ins.	long	(with	auto-steering	gear)	...	30/-
,, 2	22	,,	,,	,,	,,	,,	...	45/-
,, 3	26	,,	,,	,,	,,	,,	...	57/6
,, 4	30	,,	,,	,,	,,	,,	...	92/6
,, 5	36	,,	,,	,,	,,	,,	...	132/6
,, 6	42	,,	,,	,,	,,	,,	...	9-9-0



If it's a winner you want —we have it. For after all "it's the finish that counts."

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Bermuda Rig

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Union Silk Sails

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Hollow Metal Spars

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Automatic Steering Gear

—

Hollow Yellow Pine Hull

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Plated Fittings

LUCAS'S

THE BOYS' ARCADIA,

17, Houghton Street, Clayton Square, LIVERPOOL 1. Tel. Royal 652.

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STOP-WATCHES

Actual Size

Originally sold by us for 15/- each.

NOW ONLY

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Post and Box 6d.

ACCURATE READINGS TO ONE-FIFTH SECOND.

NEW MODEL. Without doubt the finest watch value obtainable to-day.

Accurate timekeepers. **Fully guaranteed.**

Write, call or 'phone Holborn 0276.

Luminous Dials 6d. extra. Officers' Adjustable Solid Leather Straps, only 1/- extra. Officers' Adjustable Chrome Chains, 2/- extra.

Satisfaction guaranteed or money instantly returned.

MARINE & OVERSEAS SERVICES LTD. (Dept. 190), 16, SILVER ST., HIGH HOLBORN, LONDON, W.C.1.

Hornby Railway Company Forms

EJ5 ENGINEMAN'S JOB CARD

These forms are useful in arranging the various duties of the engines on a Hornby railway layout. Supplied in pads of 50 sheets. Price 7½d. each, post free.

Meccano Limited, Binns Road, Liverpool 13.

Go Canoeing . .

It's a grand sport and you can enjoy it wherever there's enough water to float a canoe, and that's only about four inches.

Catalogues of all leading makes will be sent you on receipt of a post-card.

FEDERATION OF FOLDING CANOE AND BOAT MANUFACTURERS

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MECCANO ENAMEL

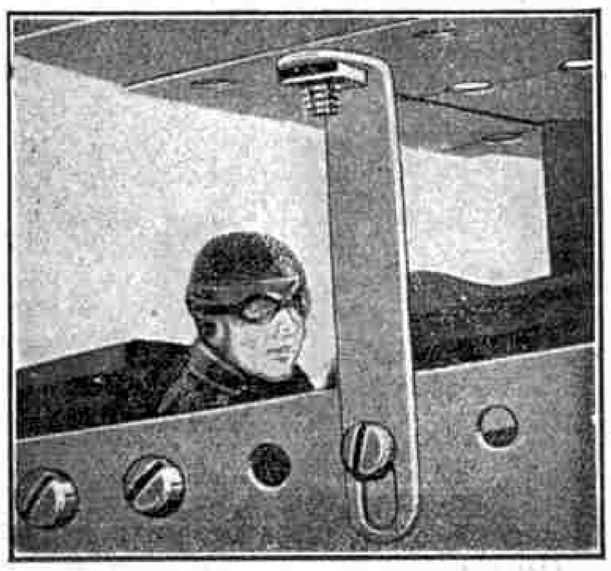
Meccano enamel has been introduced to enable model-builders to convert nickel parts to colour or to touch up coloured parts should such treatment become necessary through mishandling. It is available in red, blue or green, each colour being identical in shade with the enamels used in the Meccano Meccano parts.

Factory for spraying Price per tin 8d.

Meccano Ltd., Binns Road, Liverpool 13.

MINIATURE AEROPLANE PILOTS

Aeroplane Parts Nos. P99 and P100



Miniature Pilots are now available for fitting to all open cockpit machines built with the Nos. 00, 0, 1, 2, 1 Special and 2 Special Aeroplane Constructor Outfits. These attractive little figures, which add a wonderful touch of realism, are supplied with green coat and orange cap, blue coat and red cap, or red coat and green cap. Aero Part No. P99, which is suitable for fitting to the Nos. OO and O Outfit models, is fixed to a special bracket that takes the place of the Propeller Shaft Bracket in the Outfit. The special bracket is secured by passing bolts through the sides of the fuselage into the threaded holes in the bracket. The Propeller Shaft rests in the bearing socket formed in the Pilot's body.

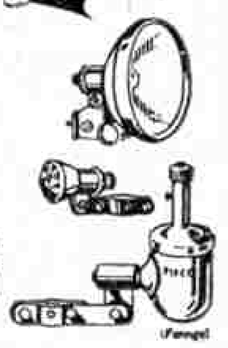
Part No. P100 (illustrated above) is used in Nos. 1, 2, 1 Special and 2 Special Outfit models. The Pilot is fixed to a double angle bracket ready for bolting to the sides of the fuselage.

Prices:

P99	Aeroplane Pilot	...	...	each 4d.
P100	,, ,,	...	...	,, 4d.

Meccano Ltd., Binns Road, Liverpool 13

Pity Peter's painful plight
Plodding homeward pushing bike,
Cannot ride, has to hike,
Lamp expired, will not light.
Peter! Ponder! Why not get
A Pifco Dynamo Lighting Set?



Unfailing brilliant light generated as you ride. 100 ft. headlight beam, red rear light. Silent running. Quickly fitted. Saves money. Guaranteed.

PIFCO

DYNAMO LIGHTING SET

AVOID AND REFUSE SUBSTITUTES

FREE. Write for Catalogue of Britain's Best Cycle Lamps.

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

10/6

From all Cycle Shops

PIFCO LTD., Watling St., Manchester, *and at: 58, City Road, London, E.C.1.*

THE 1938 MODEL RAILWAY EXHIBITION

Locomotives, Coaches, Wagons, etc. Working Models and Antiques.

● Free Rides ● Free Cinema

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WESTMINSTER

APRIL 19th — 23rd

Tuesday, 2 p.m. to 10 p.m.
Other days, 11 a.m. to 10 p.m.

ADMISSION:

Adults 1/3 (Incl. Tax) **Children 6d.** (under 12)

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Special rates for parties, apply Hon. Sec., 85, Wood Vale, London, N.10.

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TEST TUBE SET

which consists of 3 nests, each containing the following sizes:

4" × ½" 4½" × ⅝" 4¾" × ¾"
5" × ⅞" 5½" × 1" 6" × 1⅛"

2/6 CARR. PAID.

Together with a brush for cleaning.
Booklet of tested experiments 6d. post free.
Catalogue sent free on request.

BECK (Scientific Dept. G), 60, High St., Stoke Newington, London, N.16.

MECCANO LUBRICATING OIL

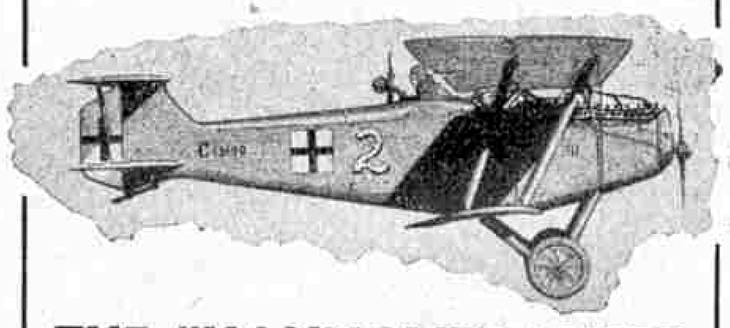
Before commencing to operate a Meccano model, or to run a Hornby Train, all gears and bearings should be oiled thoroughly with Meccano Lubricating Oil. This oil is specially prepared and is of the right consistency for the purpose. Price per bottle 6d.

Meccano Ltd., Binns Road, Liverpool 13.

SKYBIRDS

First and Best in 1/72nd Scale Modelling

LATEST PRODUCTION



THE "HANNOVERANER"
Constructive Set, price **2/6**

Wonderfully Realistic Accessories

A.A. Gun and Crew . . . . price **2/-**
Trailer for A.A. Gun . . . . „ **1/-**
Service Lorry with Two Figures . . . . . „ **1/3**
Sound Locator Unit . . . . „ **9d.**
Electric Flood Lights for Model Airports, each Light . . . . . „ **6d.**

Accurate Models—All British Made

SKYBIRD Models make a most fascinating hobby—there is a complete range of accessories for making War Scenes, Civil Airports or Modern Service Aerodromes.

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Write for FREE illustrated leaflet, Price List and Membership Form.

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OIL IS ALWAYS HANDY WHEN KEPT IN A MODERN

"Valvespout"

LEAKPROOF OILCAN

Ask your Dealer to show them to you, or write to us for a coloured brochure.

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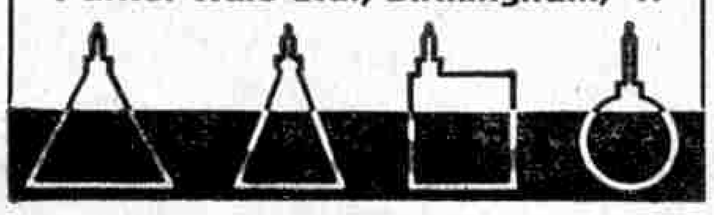

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HANDBOOK AND DIARY
1938 EDITION

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Price 1/6 from Photographic Dealers

Write for descriptive literature

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SNOW HILL BUILDINGS, LONDON E.C.1

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Double Cotton Covered.	Double Silk Covered.
104 lbs. 25 SWG **1/8** per lb.	**37** lbs. 26 SWG **3/-** per lb.
125 lbs. 28 SWG **2/2** per lb.	**172** lbs. 28 SWG **3/3** per lb.
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32 lbs. 32 SWG **3/2** per lb.	**60** lbs. 32 SWG **4/-** per lb.
43 lbs. 34 SWG **3/9** per lb.	**56** lbs. 34 SWG **4/9** per lb.
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Enamelled and DDC.	**39** lbs. 40 SWG **9/-** per lb.
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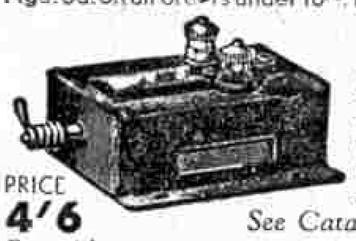
Ptge. 6d. on all orders under 10/-. Reels free. Any quantity supplied.



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A highly efficient 4-volt Motor of surprising power with Laminated Armature. Permanent Magnet, very low current consumption. Practical results obtained from a flash lamp battery.

See Catalogue for other Models, **4d.** *post free.*

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Your Height increased in 14 days or money back! 3-5 inches rapidly gained. Amazing Complete Course sent for 5/- P.O., or details free. Write **Stebbing System, Dept. M. 28. Dean Road, London, N.W.2.**

THE WEBLEY SERVICE AIR RIFLE MkII

NO LICENSE REQUIRED TO PURCHASE

WRITE FOR DESCRIPTIVE FOLDER

This extremely accurate and powerful Air Rifle is ideal for Target Practice in the garden or for exterminating Rats and similar vermin.

Calibre 22 or 177. With leafsight and peepsight.

Webley & Scott Ltd., 87, Weaman St., Birmingham 4

This Space is set to ½ inch s.c. and costs 8/- per month. The sum is the 50th of £20, the price of a whole page advertisement. Over 200,000 boys and parents read the "*Meccano Magazine*" each month. You can therefore reach this exclusive public for less than a half-penny a thousand.

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There is no better way of keeping your Magazines clean and tidy than by binding them in one of the special binders we supply.

These binders have strong stiff backs, covered with black imitation leather, tastefully tooled, and are lettered in gold. The large binder holds 12 Magazines — price 3/6 post free. The small binder holds 6 Magazines — price 2/6 post free.

Meccano Ltd., Binns Rd., Liverpool 13

Don't

be a subordinate all your life

What you put into your head while still young decides what sort of a position you will occupy later on. Brain, *trained* brain, is the power that wins a position of responsibility and a good income. You must be systematically trained in the work of your choice, and that, usually, is only possible in spare time. "Tell me how a young man spends his evening hours," a great industrial leader has said, "and I'll tell you whether he will achieve success or remain a subordinate."

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EXAMINATIONS:
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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.

Sale. Chromatic Accordion (£1/10/6), 19/–; Microscope, 7/6; Pathescope Motor, 12/6; Kodak 620, 15/–; Wireless Parts; Ensign Camera (£6-10/–), 32/6. Write for list of bargains.—P. R. Lincoln, 60, High Road, Potters Bar.

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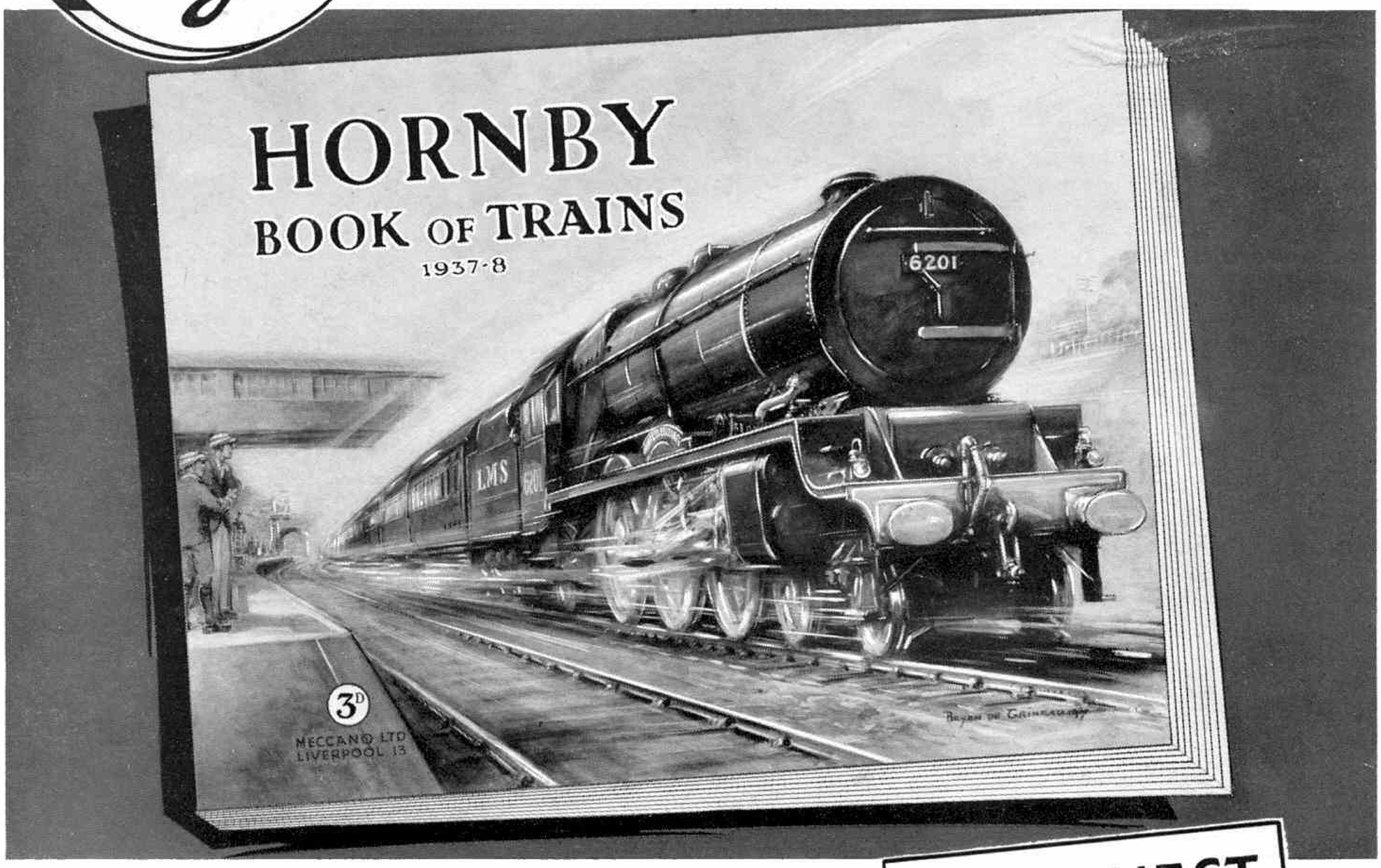

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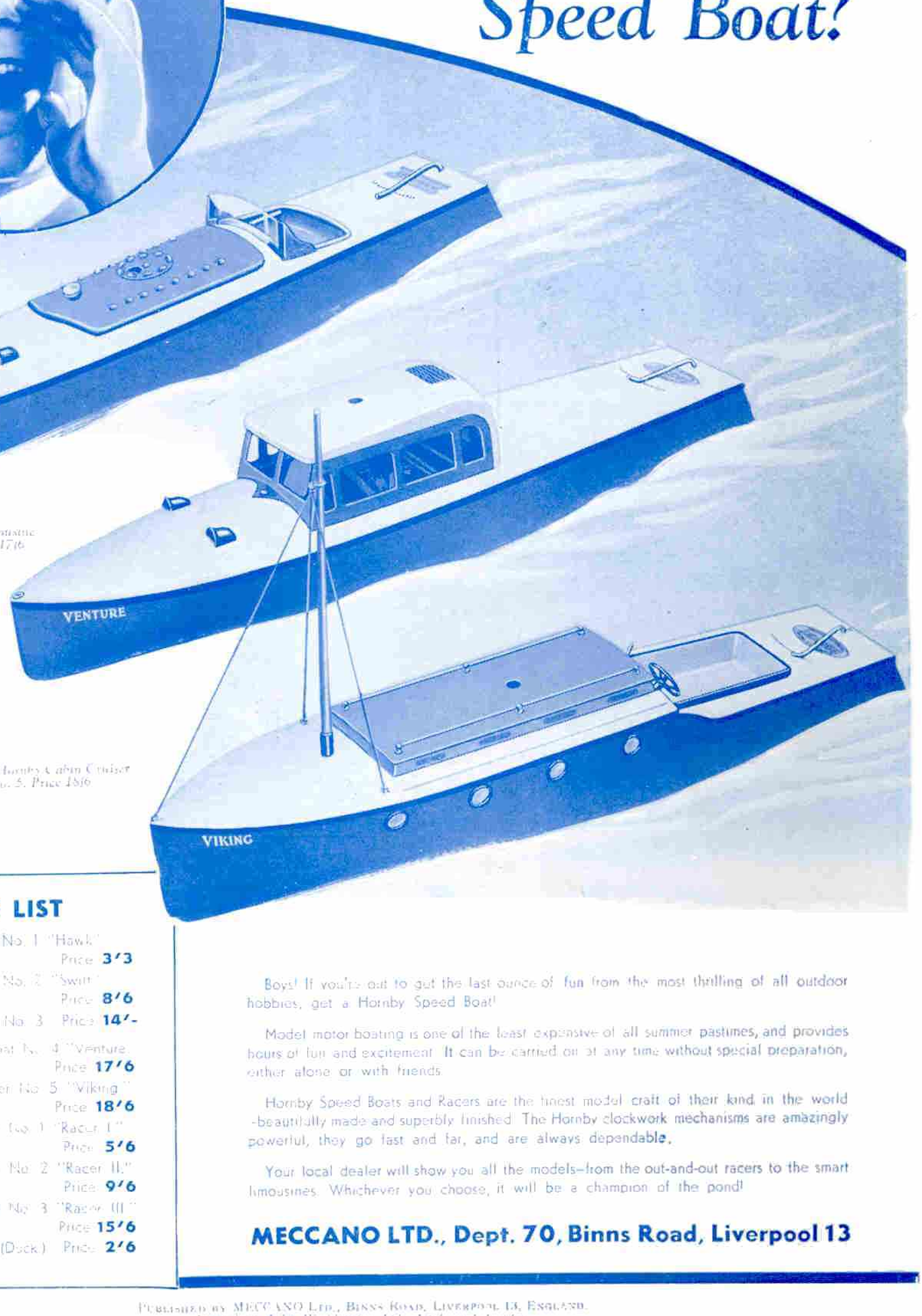

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