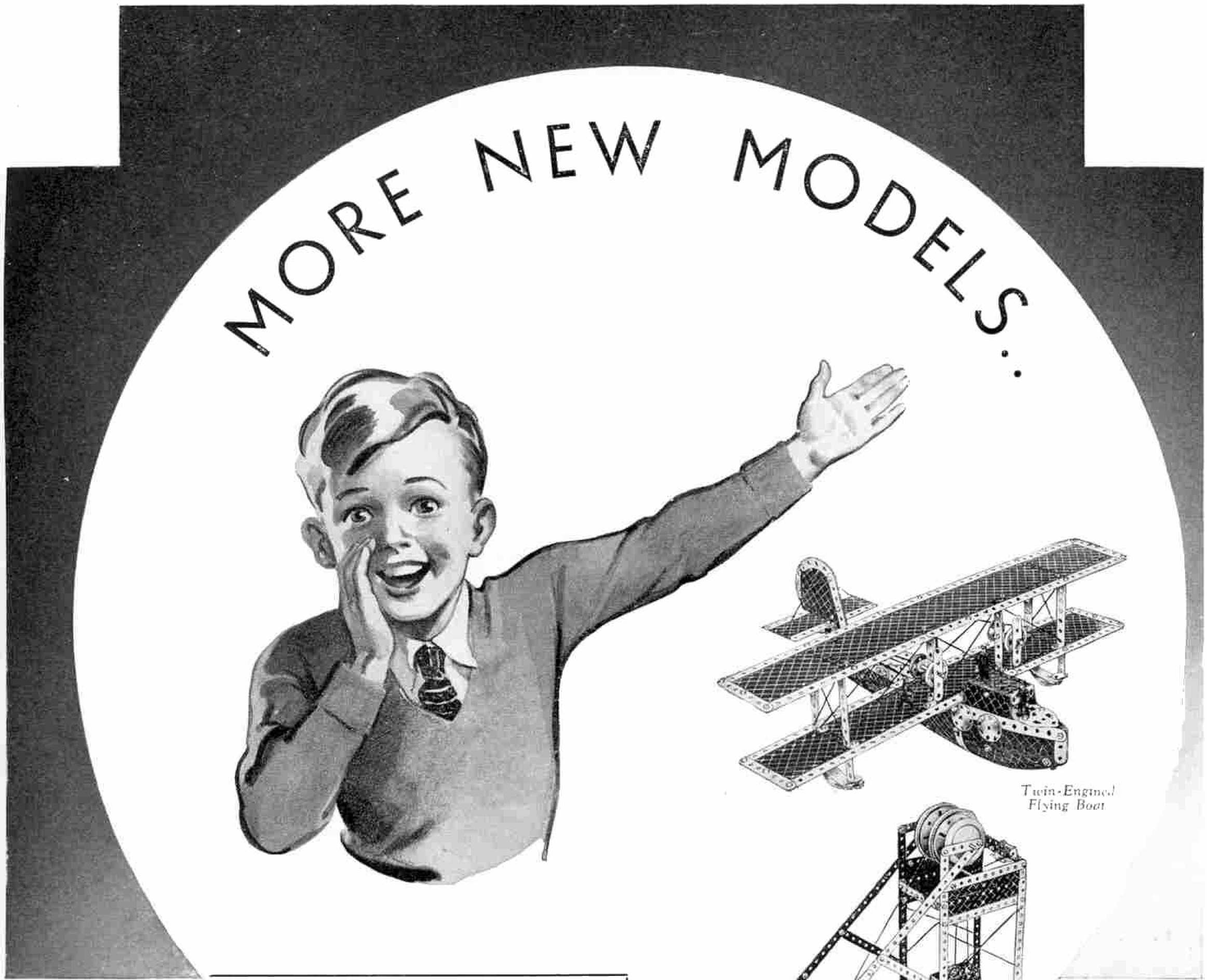
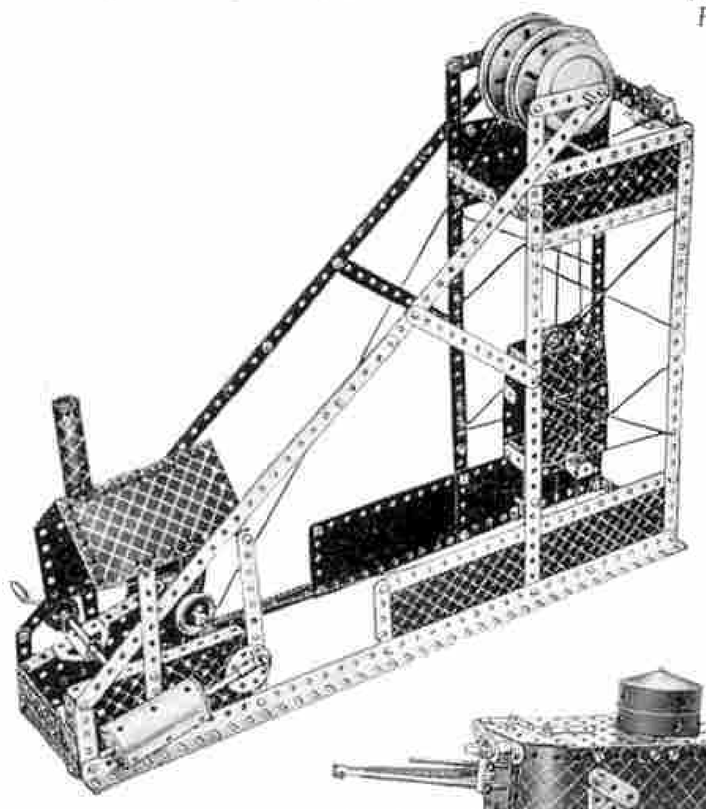
VOL. XXIV. No. 7. JULY 1939

MECCANO MAGAZINE

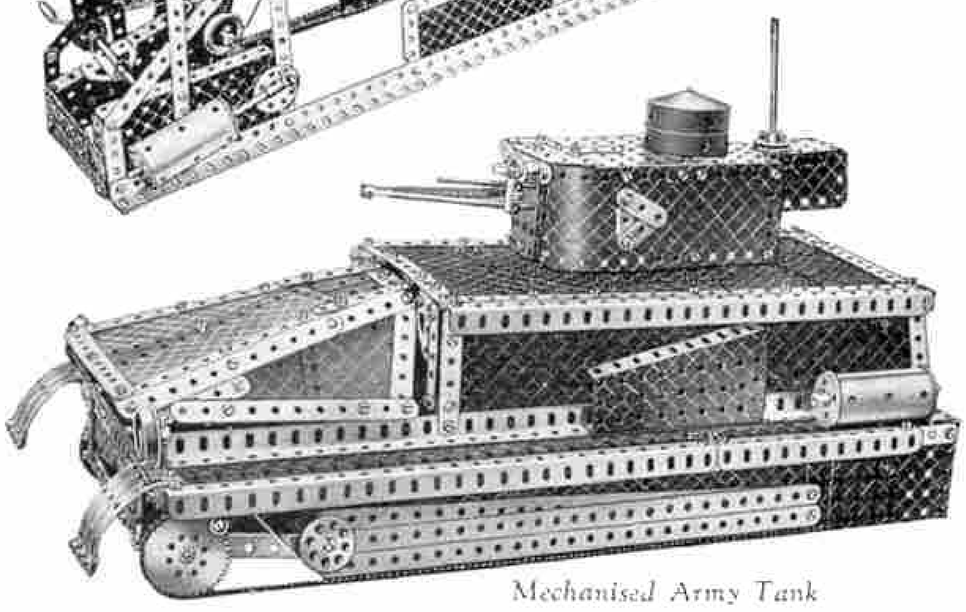
THE SAWTOOTH MOUNTAINS OF IDAHO



Twin-Engined Flying Boat



Pit Head Gear



Mechanised Army Tank

MECCANO

Boys! Meccano is better than ever!

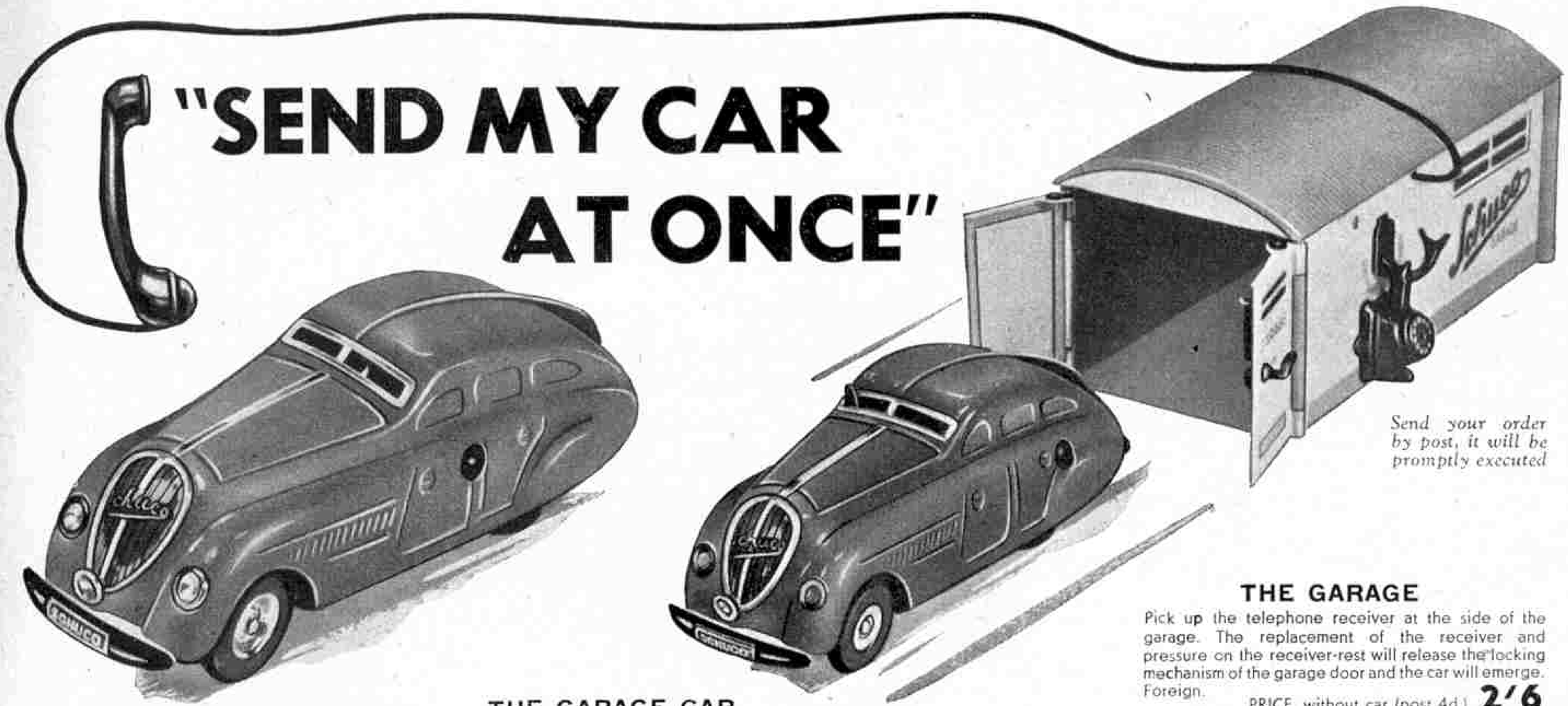
There are thrills all the time. The models are more fun to build, more exciting to play with. And they actually work just like the real thing!

Get an Outfit to-day and try it for yourself. You can get one for as little as three shillings!

MECCANO LIMITED, BINNS ROAD, LIVERPOOL 13

MECCANO

"SEND MY CAR AT ONCE"



Send your order by post, it will be promptly executed

THE GARAGE

Pick up the telephone receiver at the side of the garage. The replacement of the receiver and pressure on the receiver-rest will release the locking mechanism of the garage door and the car will emerge. Foreign.

PRICE, without car (post 4d.) **2′6**

THE FREE WHEEL CAR

Adjustable steering. Free wheeling device. Automatic stopping lever stops clockwork when car is lifted from the ground. Foreign.

PRICE (post 4d.) **2′-**

THE GARAGE CAR

Adjustable steering by manipulation of headlight. Fast forward and slow reverse gear. Automatic change to forward gear should car hit object while in reverse. Free wheeling device after clockwork has run down. Fitted with special hand-operated brake. Foreign.

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IT'S A MIRACLE

Put the **Miracle Car** on a small flat surface—a cigarette box for instance and see the remarkable way in which it avoids falling off the edge! Foreign.

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Here's a car with a **real** horn. And what's more it can be steered like a real car. It is so real that it has to be seen to be believed! Foreign.

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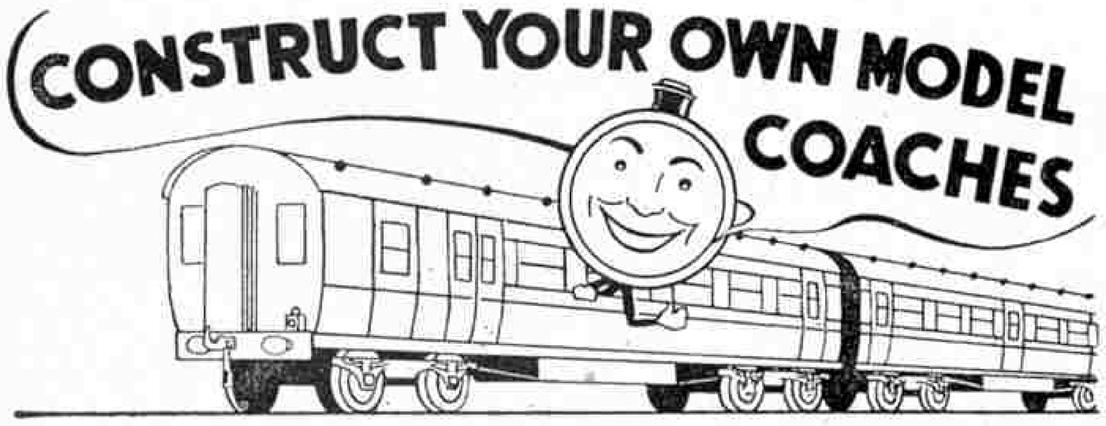
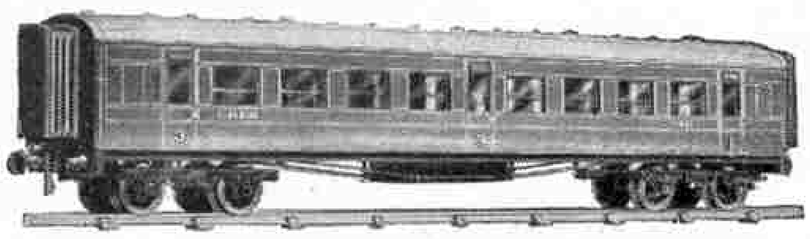


It's great fun to build up, part by part, true-to-scale replicas of real Railway Coaches for your model system.
Get Milbro Coach parts for building our standard world-famous coaches. Making is simplicity itself as all difficult machining is done. Parts are supplied for either sunk or the latest flush panelled coaches.

Send 6d. for 100-page Catalogue describing full range of Milbro products. Locos, Rolling Stock, Track parts etc.



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London Showrooms: 2, Victoria Colonnade, Victoria House, Southampton Row, W.C.1.

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Frog models fill the needs of everyone interested in model aeroplanes. Scale and non-scale, flying and non-flying, ready made and in kit form — each Frog model is designed by experts and is supreme in its class.

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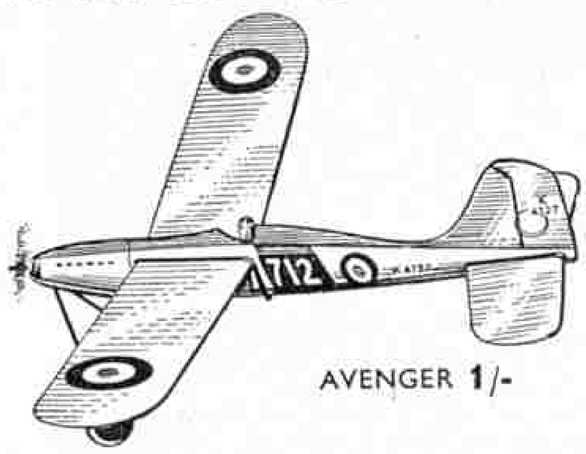
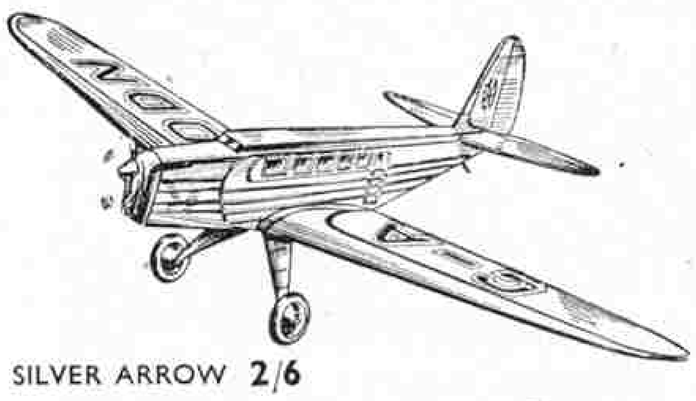
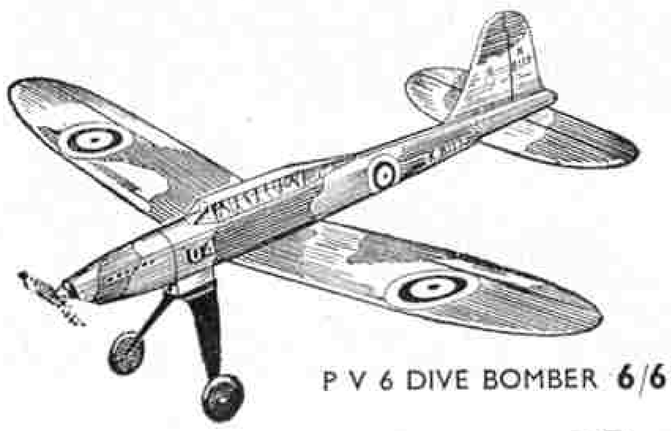


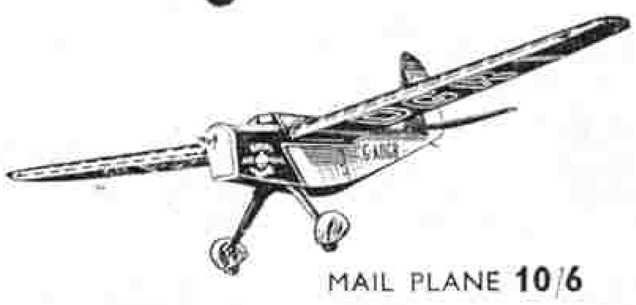
AVENGER **1/-**



SILVER ARROW **2/6**



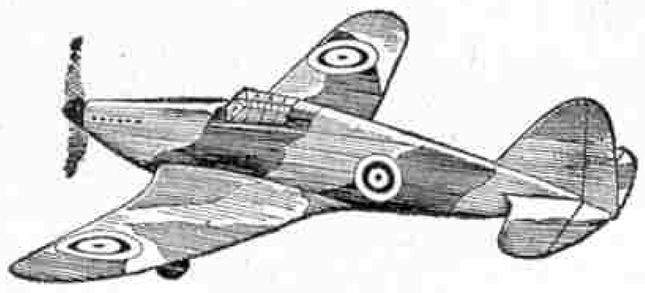
P V 6 DIVE BOMBER **6/6**



MAIL PLANE **10/6**

FLYING MODEL KITS—YOU CAN BUILD AND FLY THESE MODELS

No tools needed—all parts cut to shape



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also many others including:—

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VICKERS WELLESLEY 2/6

and models eligible for

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Many more models of all types to choose from. See them at your local toyshop or post coupon below for the new FROG catalogue

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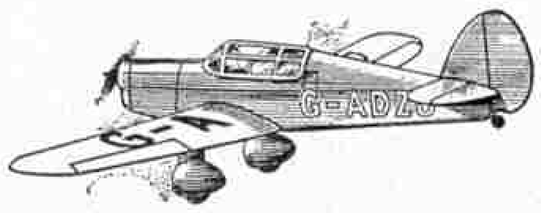
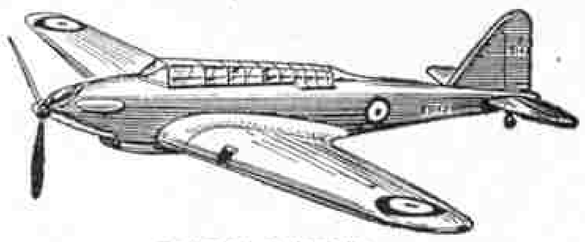
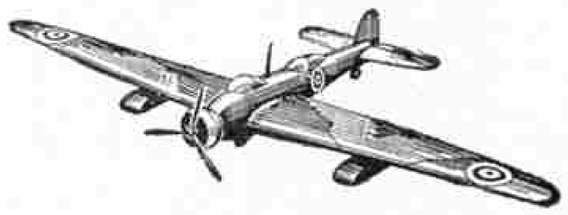


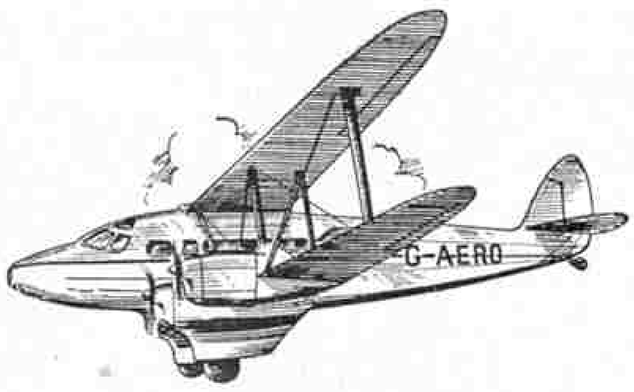
PERCIVAL GULL
KIT **2/6** MADE UP **5/-**



FAIREY BATTLE
KIT **5/-** MADE UP **8/6**



VICKERS WELLESLEY
KIT **7/6** MADE UP **15/-**



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FLYING-SCALE MODEL
complete with winder box
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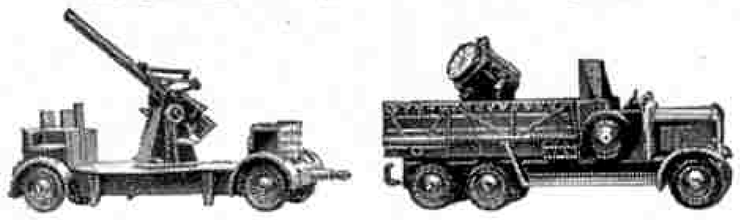
DINKY TOYS

PERFECT SCALE MODELS

Territorial Army Field Brigade in action with 18-Pounder Guns and (right) a 3-inch Anti-Aircraft Gun with crew.

MOBILE ANTI-AIRCRAFT UNIT



Dinky Toys No. 161

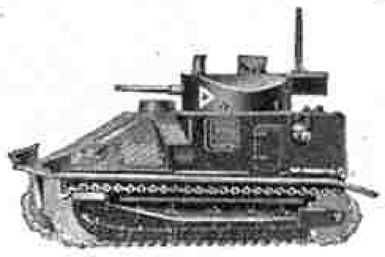
Comprises scale models of a quick-firing anti-aircraft Gun mounted on a mobile platform and a Searchlight mounted on a lorry. Both Gun and Searchlight have elevating and swivelling movements. Price **3/-** per set

18-POUNDER QUICK-FIRING FIELD GUN UNIT

Dinky Toys No. 162

Comprises scale models of an 18-pounder quick-firing Field Gun, Trailer and "Light Dragon" Motor Tractor. Price **2/-** per set

ROYAL TANK CORPS MEDIUM TANK SET



151a

151d

150d

151c

151b

Dinky Toys No. 151

No. 151a	Medium Tank	...	each	**1/6**	No. 151d	Water Tank Trailer	each	**6d.**
No. 151b	Transport Wagon	...	"	**1/1**	No. 150d	Driver ...	"	**3d.**
No. 151c	Cooker Trailer	...	"	**7d.**				

Price of complete set **3/11**

Nowadays everybody is interested in the Mechanised Units of the British Army. The Royal Tank Corps Sets have been great favourites since their introduction into the Dinky Toys range in 1937. The 18-Pounder Field Gun Unit and the Anti-Aircraft Unit that have just been added promise to enjoy even greater popularity.

ROYAL TANK CORPS LIGHT TANK SET

152a

150d

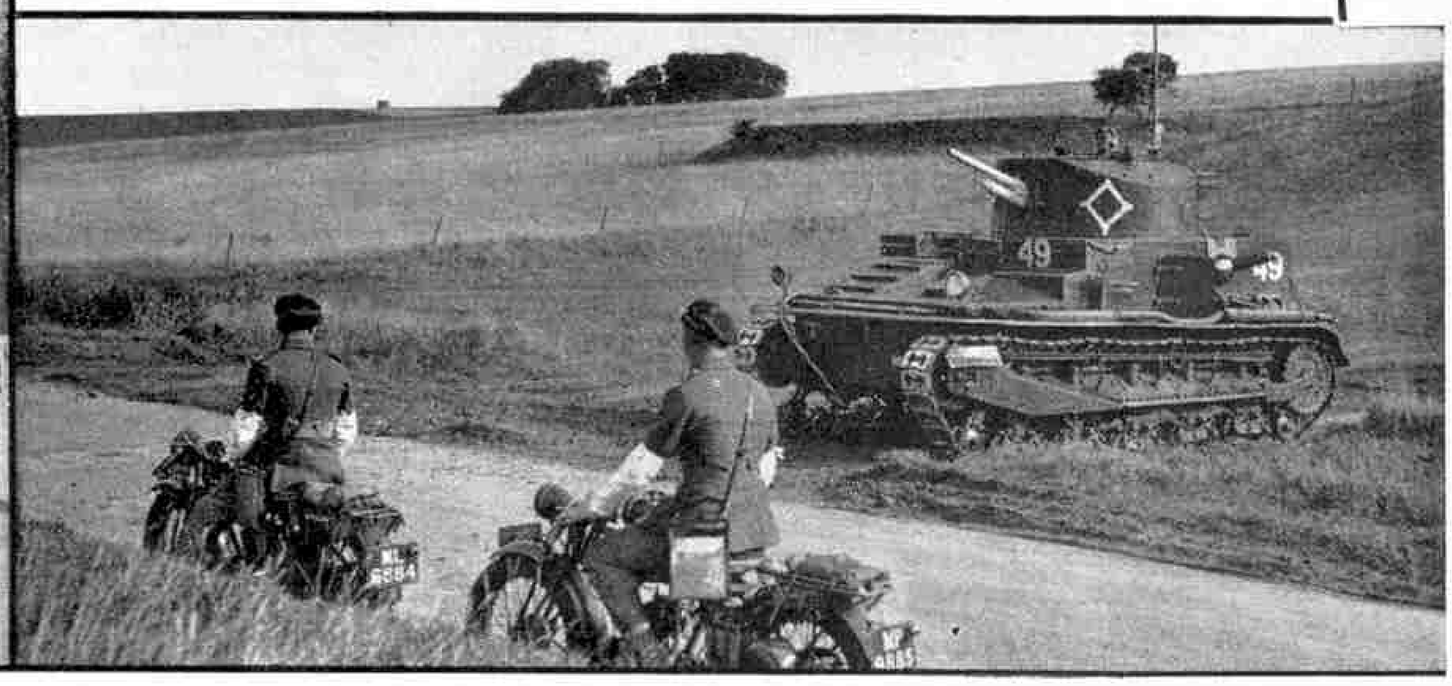
152b

152c

Dinky Toys No. 152

No. 152a	Light Tank	...	each	**1/2**	No. 152c	Austin Seven Car	each	**4d.**
No. 152b	Reconnaissance Car		"	**1/-**	No. 150d	Driver ...	"	**3d.**

Price of complete set **2/9**



A FASCINATING COLLECTING HOBBY

DINKY TOYS

OVER 300 VARIETIES

Collecting Dinky Toys is one of the most fascinating of all hobbies. These realistic miniatures are unique in their rich colouring and perfection of design and finish, and their range is so wide as to appeal to all tastes. This season many new items have been introduced including wonderful scale models of the latest types of Aeroplanes and Motor Cars, and many others.

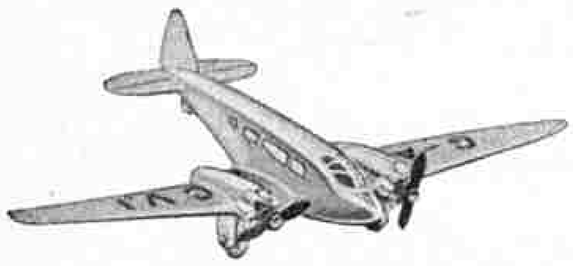
Every boy or girl who has not already done so should start this delightful collecting hobby to-day. All the models can be purchased either separately or in complete sets.

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

ARMSTRONG WHITWORTH "WHITLEY" BOMBER
(With Shadow Shading)
Dinky Toys No. 62t
Similar to Dinky Toys No. 60v but with Air Ministry Shadow Shading. Price **11d.** 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

IMPERIAL AIRWAYS "FROBISHER" CLASS LINER

Dinky Toys No. 62w
Scale models of the Imperial Airways "Frobisher" class liners. Three models available, named: *"Frobisher," "Falcon"* and *"Fortuna."*
Price **10d.** each

DE HAVILLAND "ALBATROSS" MAIL LINER
Dinky Toys No. 62r
Scale model of one of the "Albatross" mail liners built for the Air Ministry for experimental flights.
Price **10d.** each

NEW THIS MONTH!!

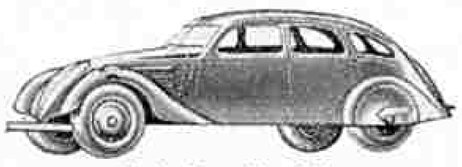
AMIOT 370

Dinky Toys No. 64az
This French monoplane has been developed from the Amiot 340 long-range bomber. It is fitted with two 860 h.p. Hispano-Suiza liquid-cooled engines and is capable of the high speed of 310.5 m.p.h. When flying at 248.4 m.p.h., it has a maximum range of 4,350 miles. Price **7d.** each

BLOCH 220

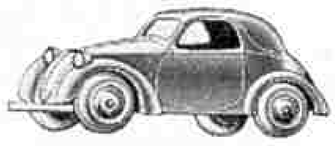
Dinky Toys No. 64bz
The Bloch 220 is one of the fastest modern air liners. It has a top speed of 220 m.p.h. and carries 16 passengers and a crew of four. Air France have many of these twin-engined low wing monoplanes in regular service. Price **8d.** each

PEUGEOT CAR



Dinky Toys No. 24kz
Scale model of the new Peugeot saloon. Fitted with detachable rubber tyres.
Price **6d.** each

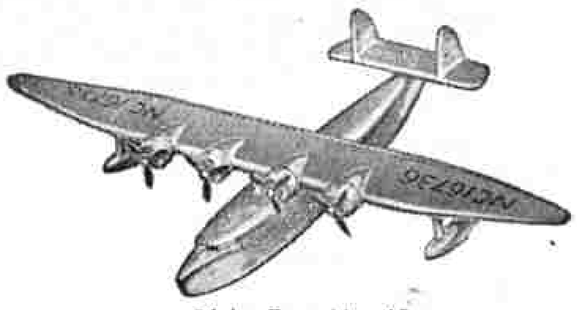
FIAT TWO-SEATER SALOON



Dinky Toys No. 35az
Scale model of a popular French baby car.
Price **4d.** each

All the above are made in the Meccano Factory in Paris

FLYING BOAT "CLIPPER III"



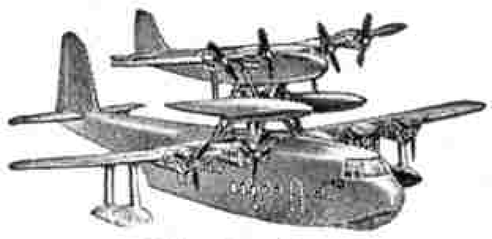
Dinky Toys No. 60w
Scale model of the Pan American Airways flying boat that took part in the transatlantic experimental flights in 1937. Price **1/-** each

ARMSTRONG WHITWORTH "ENSIGN" AIR LINER

Dinky Toys No. 62p
Scale model of the largest British air liner. Six models available, named *"Ensign," "Elsinore," "Explorer," "Echo," "Ettrick"* and *"Elysian."* Price **1/-** each

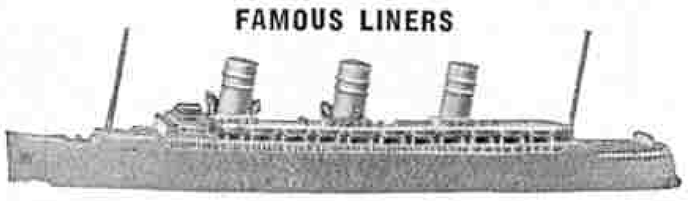
BRITISH 40-SEATER AIR LINER
Dinky Toys No. 62x
Similar in type to the Armstrong Whitworth "Ensign" air liner. Assorted colours.
Price **1/-** each

MAYO COMPOSITE AIRCRAFT



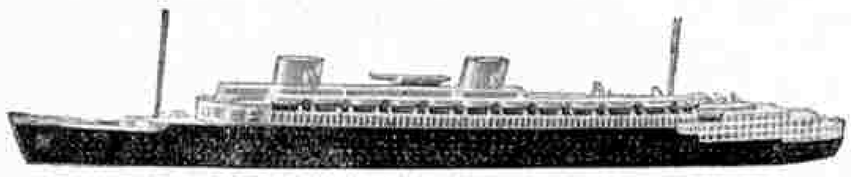
Dinky Toys No. 63
Scale model of the Mayo Composite Aircraft.
Price **2/-** each
The components of the above can be purchased separately.
No. 63a Flying Boat *"Maia"* ... **1/3** each
No. 63b Seaplane *"Mercury"* ... **9d.** each

FAMOUS LINERS

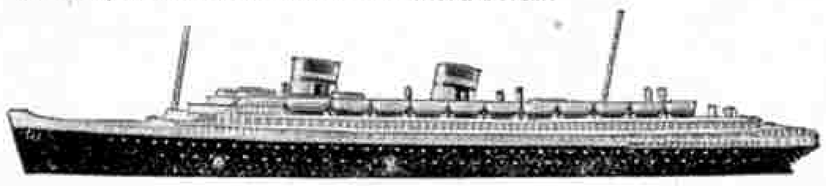


51D

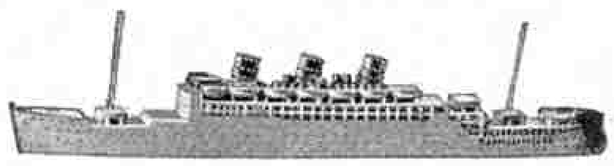
Dinky Toys No. 51D
THE ROYAL LINER. A splendid scale model of the "Empress of Britain," the liner in which the King and Queen returned from Canada after their recent tour. Price **6d.**
The components of this fine set are listed below.



51B



51C

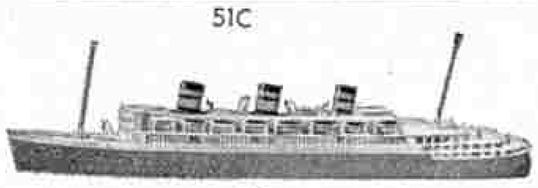


51E

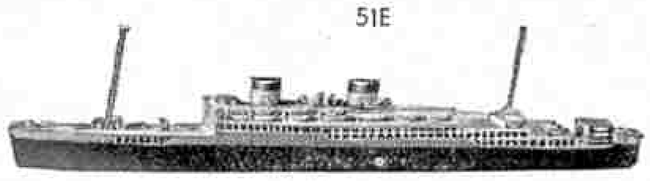
Dinky Toys No. 51

No. 51b "Europa"	each **6d.**	No. 51e "Strathaird"... ...	each **6d.**
No. 51c "Rex"	„ **6d.**	No. 51f "Queen of Bermuda"	„ **6d.**
No. 51d "Empress of Britain"	„ **6d.**	No. 51g "Britannic"	„ **6d.**

Price of complete set **2/11**



51F



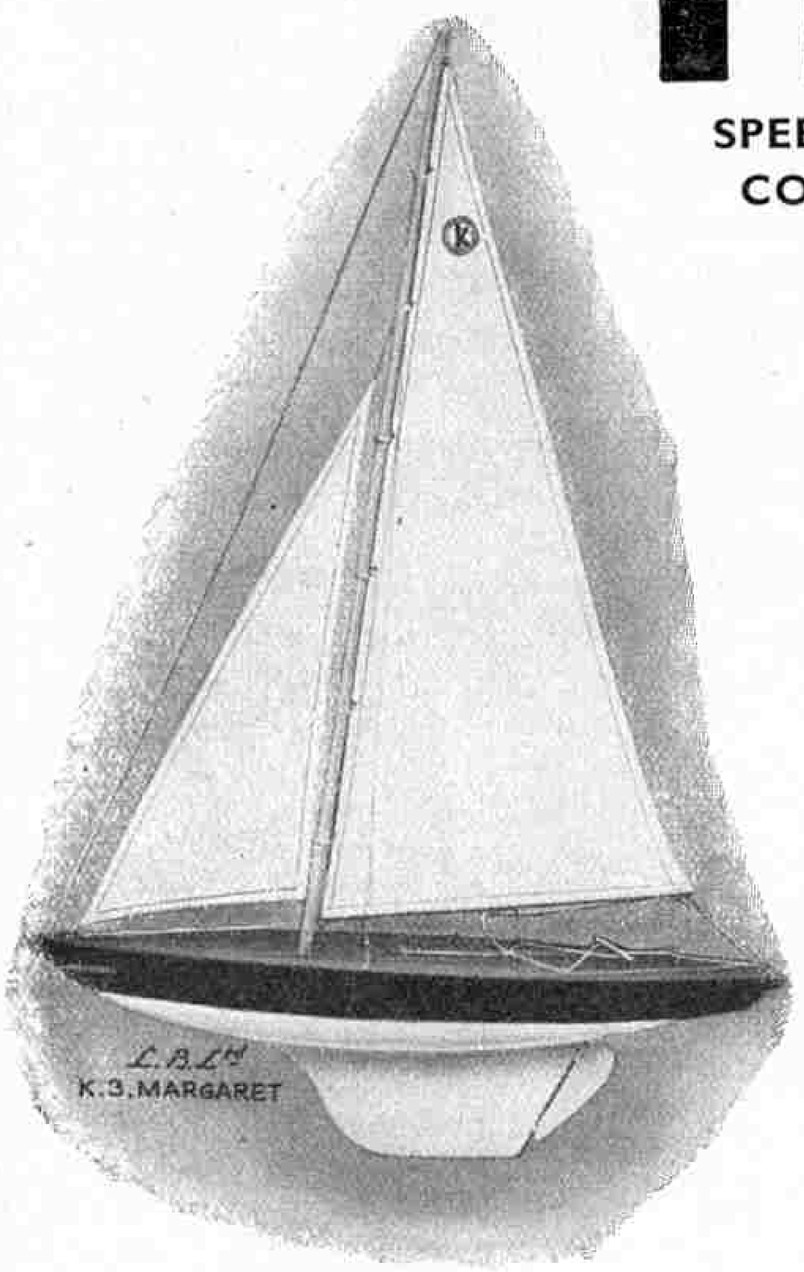
51G

MECCANO LIMITED — BINNS ROAD — LIVERPOOL 13

TRI-ANG

SPEED BOATS, ELECTRIC CABIN CRUISERS
COASTAL STEAMERS, FISHING SMACKS
CLOCKWORK STEAM DRIFTERS
AND

YACHTS



"K" YACHT "MARGARET"

Magnificent craft with AUTOMATIC STEERING. Patent light-weight weather resisting hull. Solid mahogany polished deck. Mast and boom made from finest selected material, best quality sails, fully adjustable. Beautifully finished in blue and white. Length of hull, 26 in. **Price 21/-**

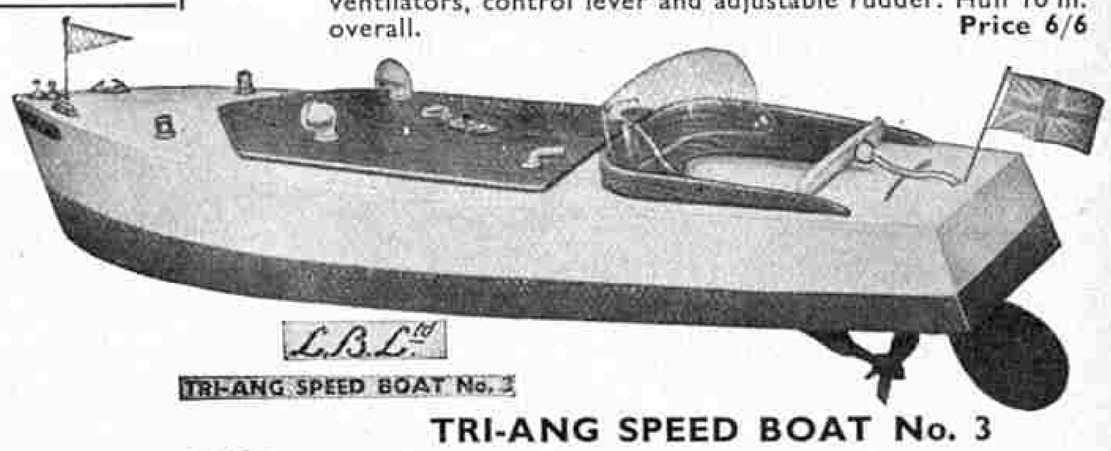
CLOCKWORK STEAM DRIFTER

Realistic model with strong, long running clockwork mechanism, adjustable mizzen sail and rudder, dummy ventilators, etc. Length of hull, 16½ ins. **Price 17/6**

NEW ! !
Tugboat Construction Kit
Price 3/11.
No Tools. All Parts to Shape.
Clockwork Motor included.

K SPEED BOAT No. 1

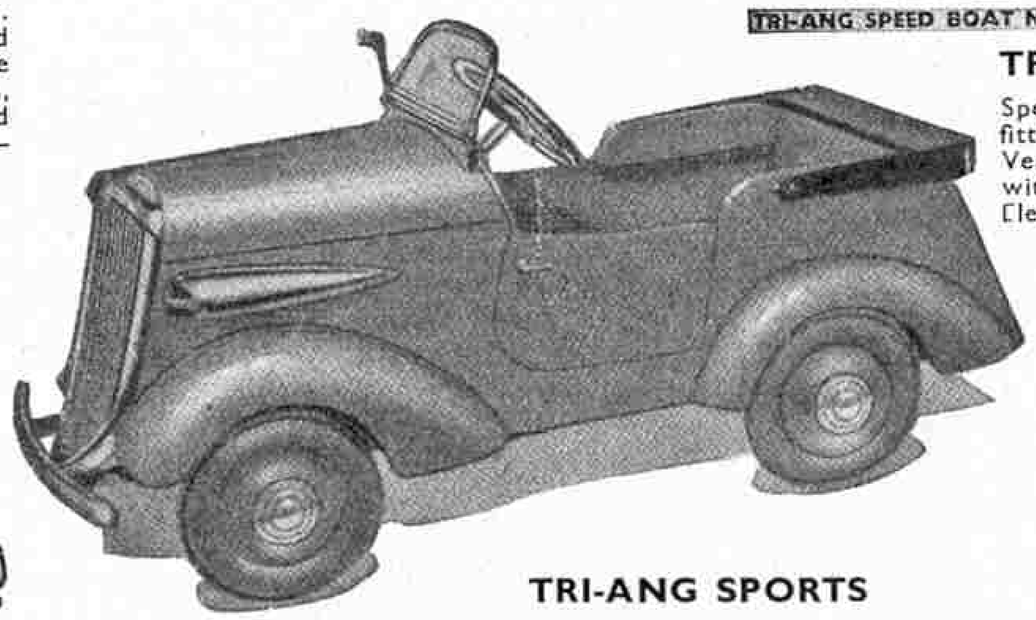
Fitted with powerful mechanism, windscreen, dummy ventilators, control lever and adjustable rudder. Hull 16 in. overall. **Price 6/6**



TRI-ANG SPEED BOAT No. 3

Specially designed hull with mahogany deck, brass fittings, ventilators and detachable motor cover. Very powerful clockwork mechanism. Complete with bow pennant and stern flag. Hull 20½ in. overall. Electric Motor 22/6. **Price 21/-**

TRI-ANG CHILDREN'S MOTORS



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MECCANO MAGAZINE

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July 1939

With the Editor

Captain A. T. Brown of the "*Mauretania*"

We are glad to be able to reproduce the accompanying splendid portrait of Captain A. T. Brown, who commands the new "*Mauretania*." Captain Brown, who is a Scarborough man, has had forty-seven years at sea, beginning in sail. His service with the Cunard Company commenced in 1905 with his appointment as fourth officer of the "*Carpathia*." In 1919 he became chief officer of the "*Carmania*," and in the same year was given command of the freight steamer "*Pavia*." Since that time he has commanded many famous ships, including the "*Saxonia*," "*Lancastria*," "*Franconia*," "*Aquitania*" and "*Britannic*."

Captain Brown is everything that one would expect the commander of a great liner to be. He can spin a first-class yarn about his experiences at sea, and many of these were decidedly thrilling. He jokes about his first ship the "*Arabella*," a tiny barque of 600 tons, but one soon realises his intense love of sailing ships. His great hobby is the construction of models of old-time vessels, and he is now engaged in finishing a splendid model of a sixteenth century line-of-battle ship.

We are sure all readers will join us in wishing the best of good fortune to Captain Brown and his fine ship, which is described and illustrated on page 392 of this issue.

Captain A. T. Brown, who commands the new "Mauretania." Photograph by T. C. L. Hutchinson, Liverpool.

An "M.M." Prophecy Fulfilled

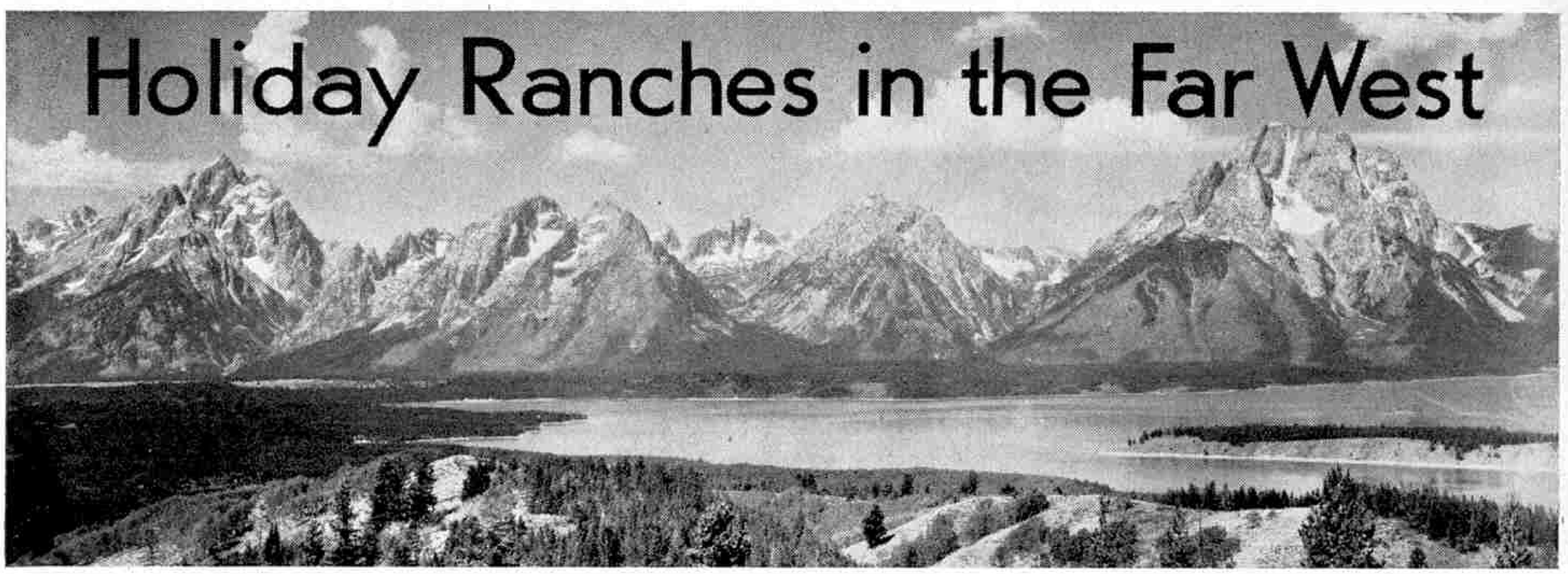
I read the other day of a wonderful machine now in use in New York that weighs and stamps letters and then posts them. Anyone who wishes to post a letter simply places it in a slot, when it is weighed automatically and the amount of postage is shown. He then puts the necessary coins in the machine, and drops the letter itself in what is called the posting slot, where it is franked ready for collection and despatch. All letters seem to come alike to this machine, which will weigh and stamp them correctly whatever the charge, between the limits of 1 cent and 60 cents, that is ½d. and 2/6.

The ingenuity of the machine would have interested me in any case, but what specially aroused my attention was the sudden recollection of a prophecy that appeared in the "*M.M.*" more than eight years ago. The "*Stamp Collecting*" page in the issue for April 1931 dealt with franking machines, which were then comparatively new, and on turning back to this article I read: "The day is perhaps very near when every pillar box will be an automatic post office. The insertion of coins to prepay the postage will open a slot to admit the correspondence, which will be franked automatically as it drops into the box." Here is the fulfilment of the forecast, and I can certainly claim that in this instance the "*M.M.*" has looked ahead and prepared its readers for an interesting development.

Motor Torpedo Boat's Channel Record

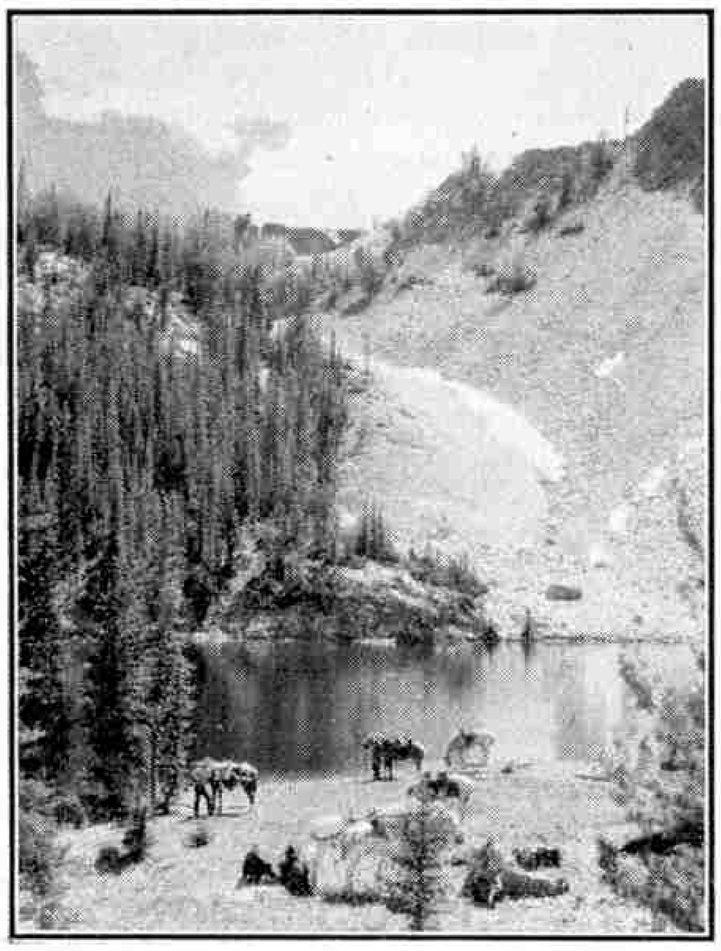
The 70-ft. motor torpedo boat built by the British Power Boat Co. Ltd., to the design of Mr. Hubert Scott-Paine, described in the May "*M.M.*," made a remarkable run across the Channel later in that month. The vessel left Hythe, Southampton Water, at about 3 p.m. on 18th May with Mr. Scott-Paine at the helm. She was carrying a full "war load," including 16 people, and weather conditions were good. Running out into the Channel, the Rolls-Royce-Power Merlin engines of about 3,300 h.p. were set at a speed of 2,750 r.p.m., considerably below their maximum of 3,000 r.p.m., and the French coast was sighted 80 minutes after passing the Needles. A minute or two later the vessel had run into Cherbourg Harbour, to complete the crossing in the remarkable time of 86 minutes, giving an average speed of 42 knots, or about 48 m.p.h. On the following day the boat returned to Hythe in 87½ minutes, an average of 41.2 knots.

Holiday Ranches in the Far West



EVERY reader of the "*M.M.*" must have revelled in stories of life on the great cattle ranches of the Far West, where cowboy and rustler fought out their battles, with sheriff's posses joining in to represent the law. To-day the Rockies and the West generally are peaceful, and they form a vast holiday ground in which thousands of visitors spend carefree days on what are known as "dude ranches."

In the West every farm is a ranch, whether it is a small one or whether it extends to 10,000 acres or even more, as do some of the great cattle-rearing and grain-growing concerns. Many of the ranches are set in scenes of great beauty, with mountains, lakes and streams almost in their yards and corrals, and as many customs and the traditional hospitality of frontier days still survive, the ranchhouses that are run as holiday homes form ideal centres for those who enjoy sport and a novel kind of open-air life. The "dudes" who visit them are not fops or dandies, as the English meaning of the word suggests, but people from the cities who are interested in country life in the romantic West. The owners of the ranches are "dude wranglers," and each of these, with his cowboys and associates, makes up an "outfit," to use a term that is familiar to readers of Western romances.



Pack trippers resting on the shore of Norton Lake, in the Smoky Range of Idaho.

Although the atmosphere of the Wild West still prevails in the modern dude ranch, this is by no means a primitive and comfortless place, for every effort has been made to provide good accommodation. The movement has not gone so far as to make luxurious hotels of the ranchhouses. Some of these have large dining pavilions, with white-coated coloured waiters, but there are others where guests dine at a large table in the old family style of the west, and have to be content with portable bath tubs and water carried in pitchers instead of laid on. Visitors to ranches of this type may miss some of the comforts of city life, but they can take pride in the fact that, to some extent at least, they are roughing it in the wide open spaces.

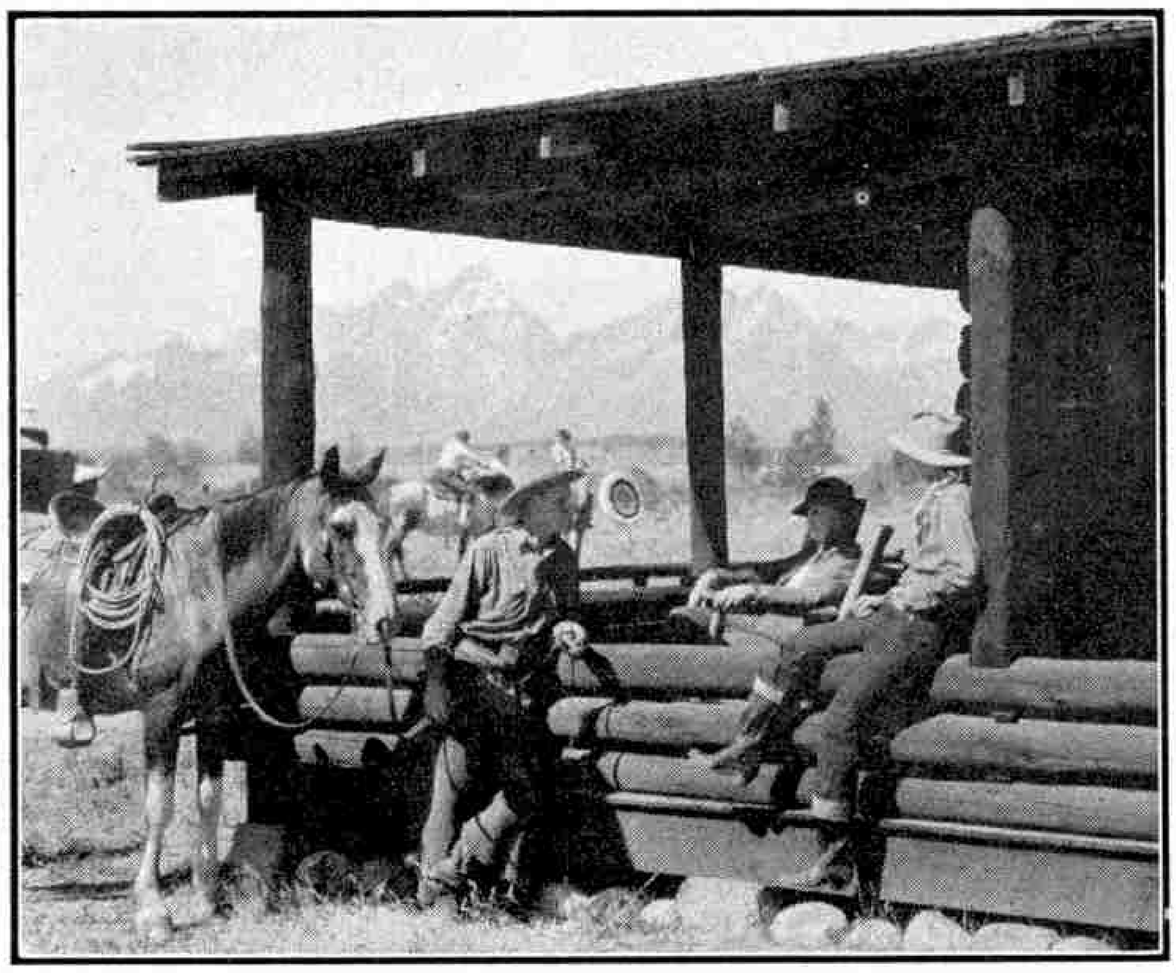
Every western ranch has its own brand, which is a sign of some kind, or a combination of letters, often the initials of the owner, burned into all the stock it carries. Branding was once necessary to baffle cattle rustlers and horse stealers, who even developed the art of changing or disguising brands in their warfare with ranch owners and cowboys. To-day it simply distinguishes the stock of one ranch roaming the open ranges from that of another, and is used as a mark with which to stamp appliances of all kinds on the ranch itself.

The names of the ranches bring with them the spirit of the West as it is known to us from stories of its wilder days. Among them are picturesque titles such as "Diamond D," "Bear Paw," "T Cross," "Eagle Valley," "Drowsy Water" and "Elkhorn." Some of the names refer to the situation of the ranch, or of characteristic features of the surroundings, while others are simply the names of the brands of their owners. Thus the "Circle S" ranch is the one distinguished by a brand having a capital letter S in a circle. The "Flying A" in the brand of a ranch of that name is a capital letter A with the horizontal bar extended on each side by curved lines that with a little imagination can be regarded as wings. "Lazy" letters have always figured prominently in the names of ranches of story books, and examples of these are to be found among the brands of the due ranches. For instance, a lazy D is one that has fallen over on its back and stayed there, and the brand of the "A Lazy D" ranch is simply a capital letter A above a D in that curious position. The "Lazy T" ranch probably traces its name to the drooping of the ends of the horizontal line on the top of the capital letter T in its brand, which has the further distinction that it stands on curved stilts in the form of an inverted U.

Dude ranches are scattered over the entire West from Montana and Wyoming to California. Most of them are among the hills and valleys of the Rocky Mountains region, in places that 60 years or so ago were the scenes of many stirring events and romantic exploits. For instance,

there are many in Jackson Hole, as the Snake River valley was called in Wild West days, a scene in which is shown in our heading illustration. This is to the south of the well-known Yellowstone National Park. At one time it was notorious as the refuge of outlaws and cattle rustlers, and even to-day it is a strip of semi-wilderness, 65 miles long and from 10 to 20 miles wide, fringed by huge forests and hemmed in by mountains. Much of the old frontier atmosphere is still retained in it. Fine ranches are located in the rugged mountain country of central Idaho, and our cover shows a typical scene there with two peaks of the Sawtooth Mountains in the background.

There are other ranches in the wilder portions of the Colorado mountain country and in Nevada, which is full of "ghost towns," the deserted wooden buildings of which seethed with life in the great days when every new gold strike brought with it invasion by hordes of eager fortune hunters. Nevada indeed has retained more of the exciting habits of the old Wild West than other states. Across the border in California there are dude ranches in the valleys on the western slopes of the mountains. This state has one of the most remarkable of all in the aptly-named "Furnace Creek" in the heart of the mysterious "Death Valley," an alkali sink about 200 ft. below sea level in which many pioneers perished from lack of water under the burning glare of the Sun. At times the temperature in this forbidding basin rises to 140 deg. F., and rocks and pieces of iron become so hot in the rays of the Sun that when touched they scorch the naked hand like live coal. Death Valley is a vast reservoir of borax, and the company that works the deposits has made conditions there bearable for those who live in it. Furnace Creek is the only place in it where there is a supply of water, but the season at this ranch extends from the beginning of November to the end of April, when the Sun's rays are not so overpowering in the dry and dusty atmosphere of the sink.



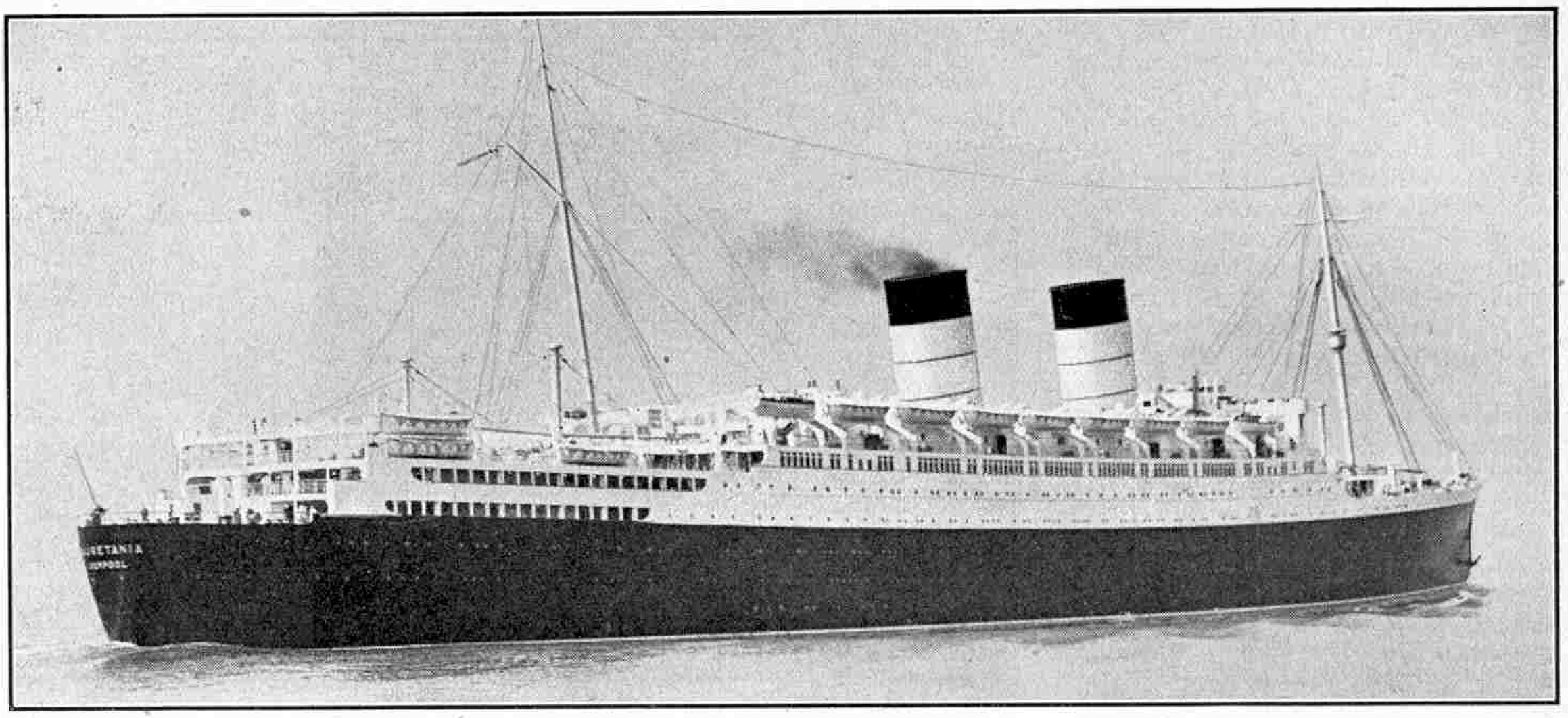
Planning new trails to ride in Jackson Hole, Wyoming.

Rugged outdoor exercise and quiet relaxation in beautiful country are the chief attractions that the ranches have to offer. Most of them are regular stock farms, where cattle are run on the open range and horse breaking is carried on in the corrals. Visitors to these may join in rounding up horses and cattle along with real cowboys who bust broncs, rope and brand calves, and do all the other things that are expected in ranch life. At some of them a special feature is made of genuine western rodeos, and private shows supplement the public ones. Certain Oregon ranches have reservations of the Arapahoe and Shoshone Indians near them, and there dudes can join in the excitement of tribal dances and have the privilege of seeing for themselves many of the strange and age-old customs and ceremonies of the original inhabitants of the West. Everywhere there is shooting and hunting. One Oregon dude ranch, the "Lazy T," on which cattle, race horses and polo ponies are raised, tells prospective dudes of a plentiful supply of elk, deer, bear, cougar, and wildcat as well as ducks, geese and pheasant, and those who wish to go back to the good old times in real earnest, should stay at this ranch, for it is within a short distance of a preserve 200 square miles in area where hunting is limited to the bow and arrow!

There are many cabin camps and lodges as well as dude ranches in the Far West. In these a real open air life can be followed in the healthiest of surroundings. Many of these camps are run specially for boys and girls, who are helped by experts in riding, nature study, camp-craft and sports of all kinds that they favour. For a really keen and interested boy or girl a holiday in such a camp is absolutely ideal. There are never any dull moments, for apart from all these activities in the camp itself there are the attractions of fishing, mountain-climbing, pack trips and camping.

We are indebted to the Union Pacific Railroad Company for the information in this article and our illustrations, and also for the photograph on which our cover is based.

Camping out on the banks of Stanley Lake, in the Sawtooth Mountain wilderness of central Idaho.



The "Mauretania" steaming down the Mersey.

The "*Mauretania*" in Service

Details of Liner's Wonderful Machinery

ON 17th June the new Cunard White Star liner "*Mauretania*" left Princes Landing Stage, Liverpool, on her maiden voyage to New York. She steamed slowly down the Mersey, tugs, ferry boats and other vessels in the river saluting her with a chorus of cheerful hoots on their sirens; and the eyes of an admiring crowd from the Lancashire and New Brighton shores followed her as she made her way down the fairway of the channel leading to the Bar, and thence to the open sea. After a brief call at Queenstown she rounded the southern coast of Ireland and soon commenced to eat up the 3,000 miles that separated her from the coast of America.

The "*Mauretania*" was built by Cammell Laird and Co. Ltd., at Birkenhead, and although she is the biggest ship that has ever come out of an English shipyard, she was completed in the record time of two years. She was launched in July of last year, and left the fitting-out basin, where her engines and funnels were installed and her equipment completed, on 14th May. Her first trip was a short one, made without a rudder, across the Mersey to the Gladstone Graving Dock, and the lower illustration on the opposite page shows her attended by tugs as she was taken slowly down the river on this occasion. Some 44,000,000 gallons of water had to be pumped out of the dock to leave the ship high and dry. A gang of men then set to work cleaning the underwater parts of her massive hull, after which she was painted. The two giant propellers also were carefully inspected, and the 50-ton rudder was fitted.

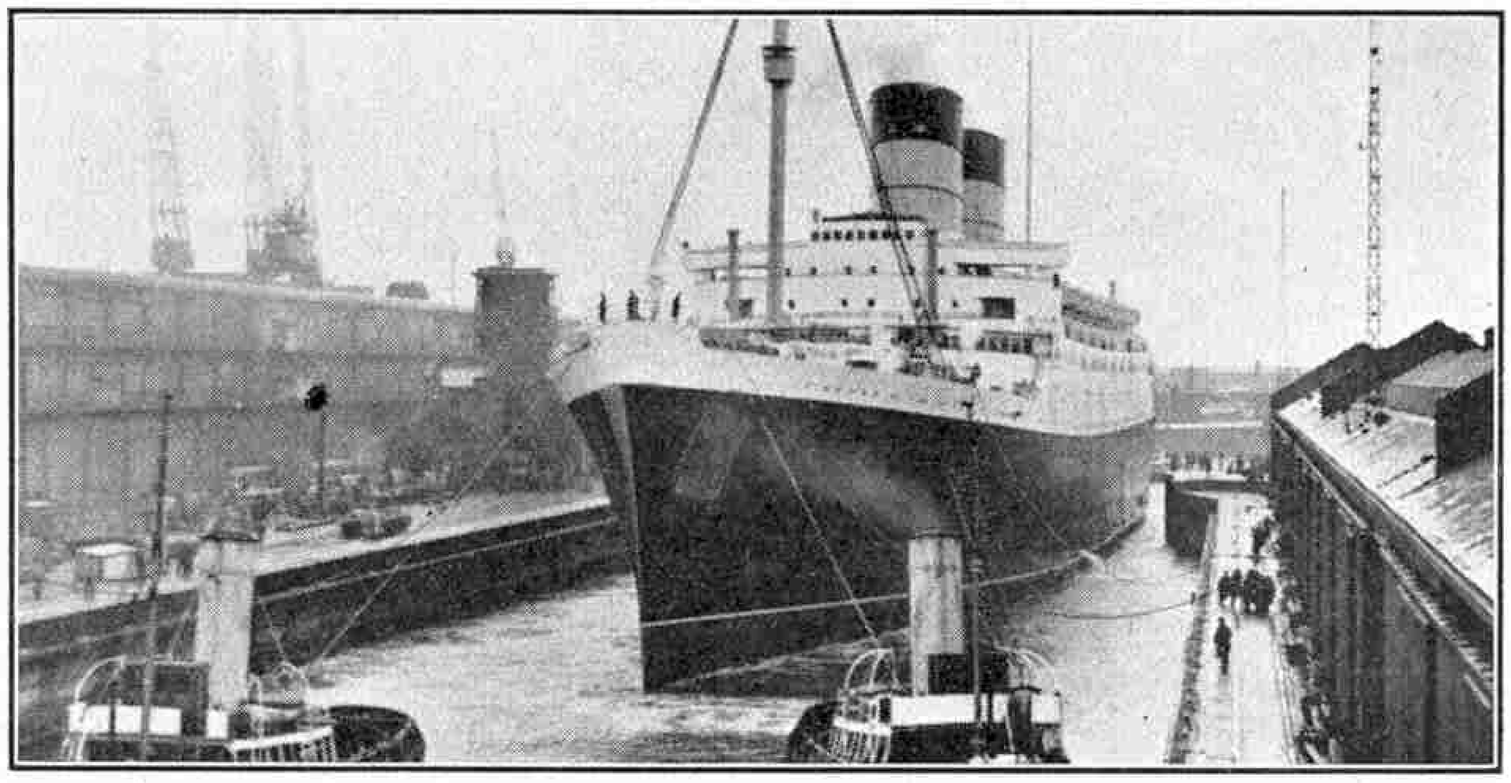
Next came the new vessel's trials. She left Liverpool on 31st May for the Firth of Clyde, with some 500 technical experts and picked men from Cammell Laird's on board. She was still flying the builder's flag, and on her bridge was Captain A. T. Brown, her future commander, who was in charge of the old "*Mauretania*" on her last voyage to Rosyth before breaking up in April 1935. Before leaving the Mersey, compasses were "swung," and every piece of apparatus, wireless, navigation, and other equipment, together with her machinery, was tested. The actual trials took place on the well-known Skelmorlie Mile, off the coast of Arran, and extended over two days, during which time she was in charge of Captain John Summers, who is said to know the Firth of Clyde as well as any man living. The vessel performed splendidly; her contract speed is 23 knots, but her trials showed that she has an ample reserve of power and is capable of 26 knots.

The "*Mauretania*" returned to the Mersey in the early hours of 3rd June and final preparations for her maiden voyage were then made. The staff went aboard to become generally acquainted with their new home, and all her crew spent several days getting the run of the ship. Two days before she sailed she was open for inspection, and hundreds of people paid a small charge to inspect her splendid accommodation and luxurious fittings, the proceeds being devoted to the "*Thetis*" relief fund.

In general external appearance the "*Mauretania*" resembles the "*Queen Mary*," the present flagship of the Cunard White Star fleet and holder of the Blue Riband of the North Atlantic; but of course is considerably smaller as well as slower, as she is intended for the intermediate transatlantic passenger service. She is 772 ft. in overall length with an extreme breadth of 89 ft. 6 in., and her gross tonnage is about 34,000. The illustrations on these pages give an excellent idea of her graceful appearance and splendid proportions. Her two raked funnels are of elliptical section, each extending about 56 ft. above the sports deck, and the two widely-placed masts also are well raked, the masthead being 221 ft. above the keel. The stem is curved and raked to give very fine bow lines, and the main bower anchors are neatly accommodated

in two recesses. The hull is well rounded off by the cruiser stern, and the attractive appearance of the vessel is accentuated by the curved bridge and well-designed superstructure.

Twin screws each weighing about 24 tons are fitted. These are equal in size to those of the *"Queen Mary,"* which has four, and each is so carefully balanced that it can be moved by the pressure of one finger. The surfaces of the blades have been well ground to produce a high polish, an essential quality in view of the fact that the tips of the blades revolve at speeds approaching 100 m.p.h. when the liner is steaming at full speed. Power for the propellers is provided by two sets of Parsons single-reduction geared turbines. The two main gear-wheels of the driving machinery are the largest ever constructed for a liner. Each weighs 85 tons, and has about 500 teeth that have been cut to an accuracy of one hundred-thousandth of an inch. Steam is supplied by six Yarrow water-tube boilers, with a working pressure of 425 lb. per sq. in., and a final steam temperature of 725 deg. F. Oil fuel is used.

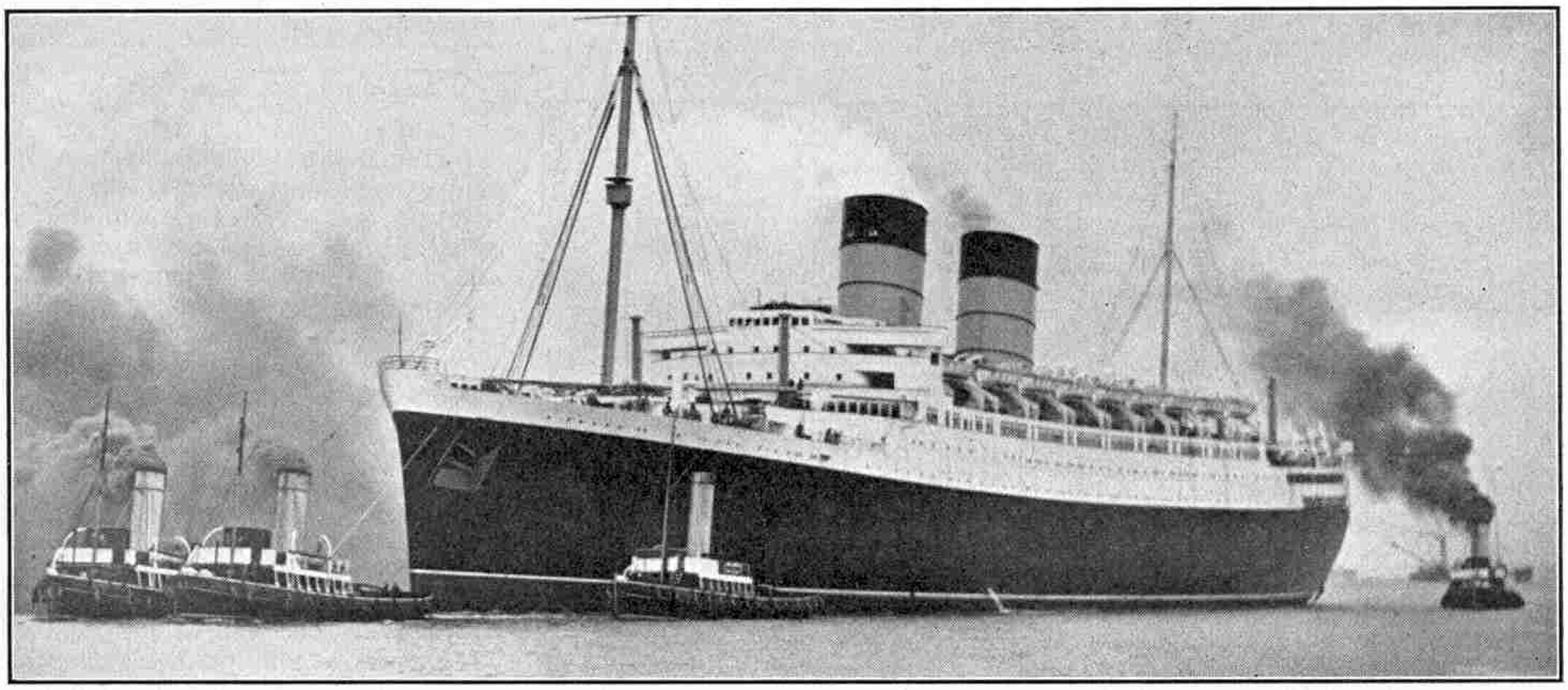


The "Mauretania" entering the Gladstone Graving Dock for painting, and to have her rudder fitted, in readiness for her trials over the Skelmorlie Mile in the Firth of Clyde.

The electrical installation is very elaborate, electricity being supplied by a power station having four 800-kW 225-volt turbo-generators. The main switchboard is over 53 ft. long, and there are 24 auxiliary switchboards, 12 to port and 12 to starboard. There are about 300 miles of electric cable and 15,000 lamps in the vessel, in addition to electric heaters, fans, 11 lifts, loudspeakers, cinema and broadcasting apparatus, all of which are electrically operated. The funnels and sports deck can be floodlighted, and the vessel will present a striking appearance at night.

One of the most interesting features in modern shipbuilding is the reduction in the number of funnels compared with those in use 20 or more years ago. The old *"Mauretania"* had four funnels, the new one has only two; and as a result many uptakes and ventilators have been abolished, leaving more deck room for passengers and increased cargo space. There are 10 steel decks. The two highest are in the superstructure and are known as the sun and promenade decks, below which comes the main deck, stretching almost the whole length of the ship. Passengers are accommodated in three classes, cabin, tourist and third, and all the 21 public rooms and passenger quarters have been planned on modern lines. Each class has its own cinema and other general rooms.

The ship's giant castings were made in various parts of the country. The 90-ton rudder and stock and the 45-ton shaft-brackets were brought from Darlington; from Sheffield came the steel tail-shafts each weighing 25 tons; and the three 10-ton anchors were designed and made at Birkenhead by Cammell Laird and Co. Ltd. themselves. A full-size wooden model was made of one side of the bows of the vessel, complete with anchor recess, hawse pipe, anchor and chain, and tests were carried out on this in order to decide upon the final design. A similar course was followed in designing the liner's accommodation. Full-size staterooms were erected on land, with all furniture and lighting in position so that the general effect could be studied.



Attended by six powerful tugs, the new liner is towed down river to the Gladstone Graving Dock. The photographs on these pages are by T. C. L. Hutchinson, Liverpool.

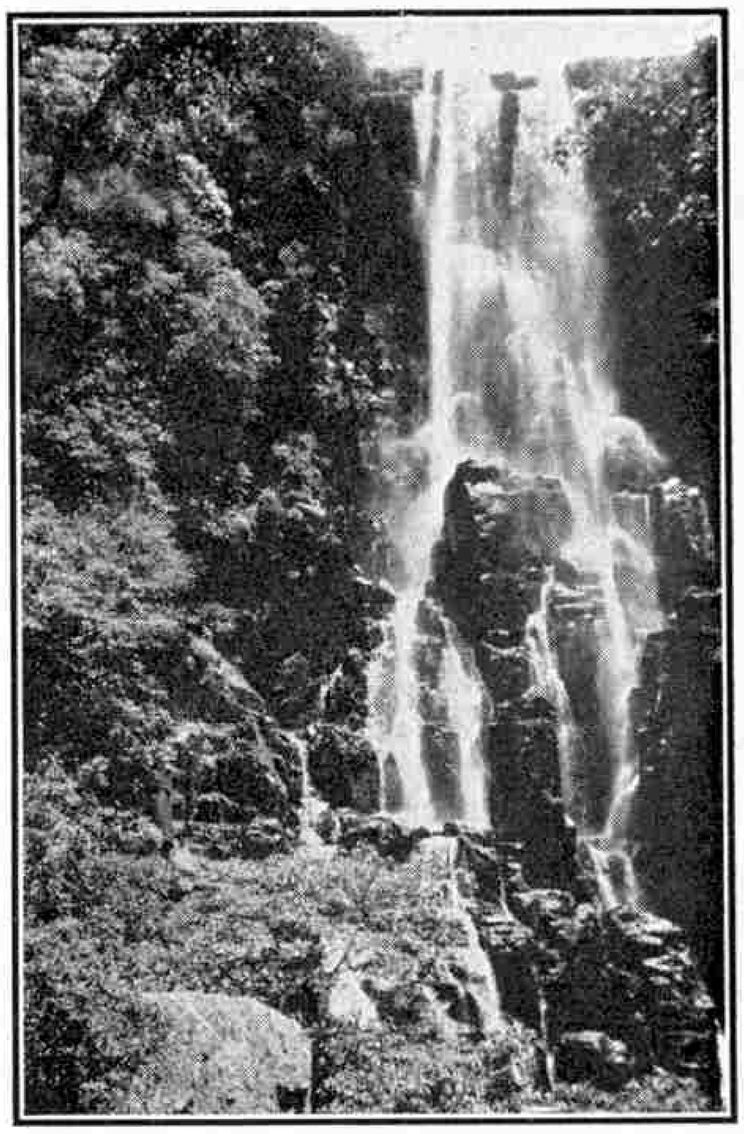
On Holiday

I.—Hints on Countryside Snapshots

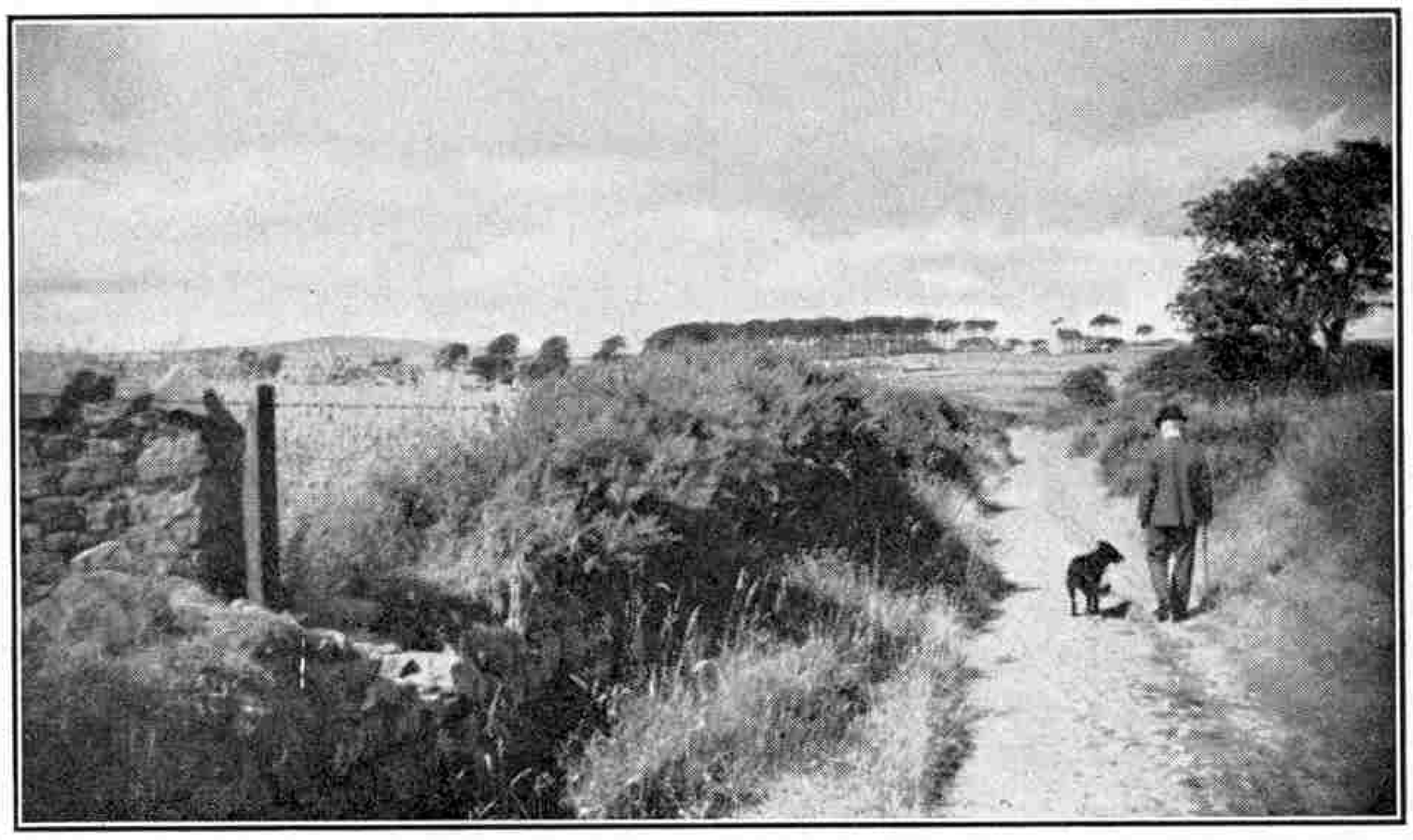
DURING the next few weeks the holiday season will be in full swing. Many readers will be going to the seaside, while others will be spending their holidays inland; but no matter where the holiday is spent, countless opportunities will be provided for using a camera. Indeed, a holiday without a camera is always to some extent wasted, because a collection of snapshots provides a permanent record that enables its owner to recall in years to come the pleasures and excitements of a happy and carefree time. This month we will deal particularly with holidays spent in the countryside, leaving seaside photography until next month.

It should not be necessary to remind readers that it is very foolish to start off on a holiday with a camera without making sure that the instrument is in working order. The simplest and most satisfactory way of making sure that all is well is to expose a roll of film, develop and print it, or have this done for you, and examine the prints for defects. If anything appears to be wrong, consult your photographic dealer and have the trouble remedied at once. Before actually setting off on holiday make sure you have everything that is required; for instance, if you use a colour screen, or a supplementary lens for near objects, make sure you have these with you. But above all, take a sufficient supply of films or plates to last throughout the holiday; do not rely on obtaining these on arrival at your destination.

Readers who live in large towns and cities, where the atmosphere is usually more or less smoky, are likely to over-expose in the brighter conditions that exist in the country, and a Burroughs Welcome Handbook with its exposure calculator, or an exposure meter of some kind, should be taken and used regularly.



"Nongwaan Falls, Natal." A difficult subject well taken by D. G. Tees, Durban, South Africa.



Countryside scenes are improved by figures of people or animals. This example is by E. C. Haywood, Carlton.

Beginners are often inclined to be impatient about advice of this kind, but sooner or later they will realise that an exposure calculator or meter soon saves its cost in films and prevents many bitter disappointments.

As to the subjects to be photographed, these obviously must depend very largely upon where one stays, and the nature of the neighbourhood. Readers who have the great good luck to stay at a farm will need little advice; almost everything around them is of interest, and at the same time suitable for photography. The best plan is to prowl around during the first day or two, taking snapshots as suitable subjects crop up, and at the same time making mental notes of things to be done

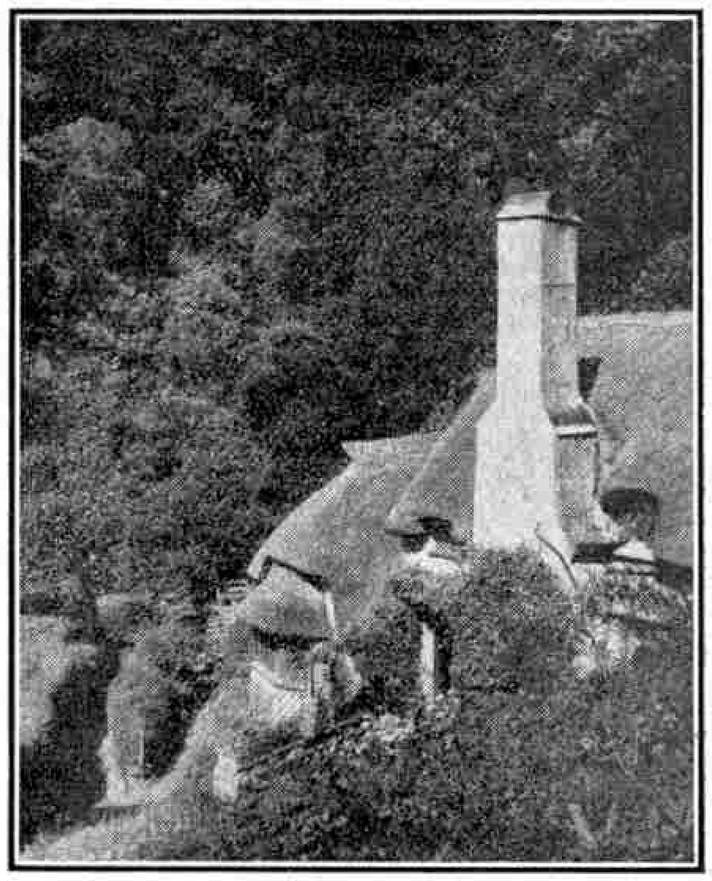
A good subject "framed" by photographing it through an arch. Photograph by N. G. Tudor, Birkenhead.

later and with a certain amount of preparation. The farm hands are almost always friendly and willing to help to secure interesting photographs, and they always like to receive prints showing them at their work. This brings us to a very important point. Whenever prints are promised to anyone met on holiday, this promise must be faithfully kept. If, as may happen, the photographs are a failure, the person to whom prints have been promised should be sent a few lines to explain matters. Almost the only people the writer has come across on holiday who declined to help in securing photographs have at some time been promised prints and never received them.

A river usually can be relied on to provide some interesting pictures, provided that the country on each side is not too flat. A fascinating scheme is to follow the course of a small stream, ignoring rough going and perhaps wet feet; from time to time, as the stream winds in and out, many opportunities for interesting pictures are sure to occur. The most disappointing photographs are usually those of an open landscape, with perhaps hills in the distance and nothing prominent in the foreground. This kind of picture simply cannot be made with success with a small camera.

Many really delightful scenes are to be found in woods, but unfortunately they are not easy to photograph. The light under trees is greatly reduced—far more so than the eye indicates—and the exposure calculator is more necessary here than ever. Woodland waterfalls are always delightful, but they are not easy to deal with because an exposure long enough for the surrounding rocks and trees is too long to give the effect of moving water. However, such waterfalls are so fascinating that even a moderately successful photograph is well worth having.

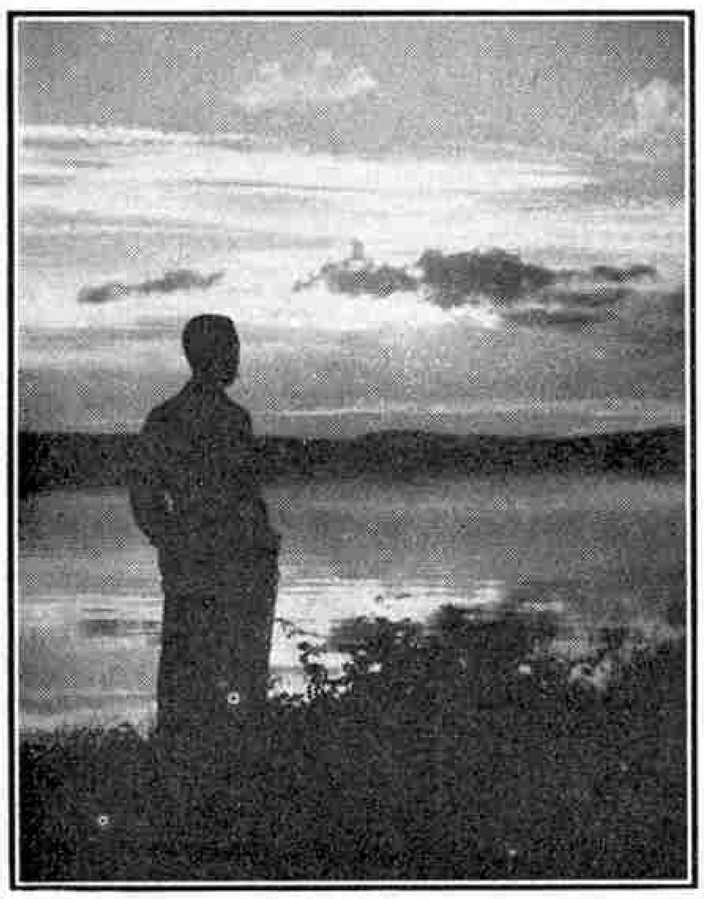
Many readers do not spend their holidays all in one district, but wander on from place to place by train, bus or cycle, or on foot. A roving holiday of this kind brings one into contact with many interesting things along the road. For instance, a very attractive collection of pictures could be made of old-fashioned wayside cottages. There is usually something of historic interest among the buildings of villages and small towns, and these also provide splendid photographic material. The wise photographer will read up beforehand something of the history of the places through which he is to pass, and so will avoid missing good things and wasting time over others of less interest, both in themselves and from a pictorial point of view.



Selworthy. By J. R. Tottle, Taunton.

It is inevitable that a large number of the photographs taken during a holiday will be snapshots of unconnected subjects. It is well worth while, however, to try to secure at least one series of photographs of subjects of a similar type. When the time comes to prepare the holiday album, a connected series of photographs will provide material of special interest.

Finally, do not forget to make a brief note at the time of each subject you take, to avoid all possibility of confusion later.

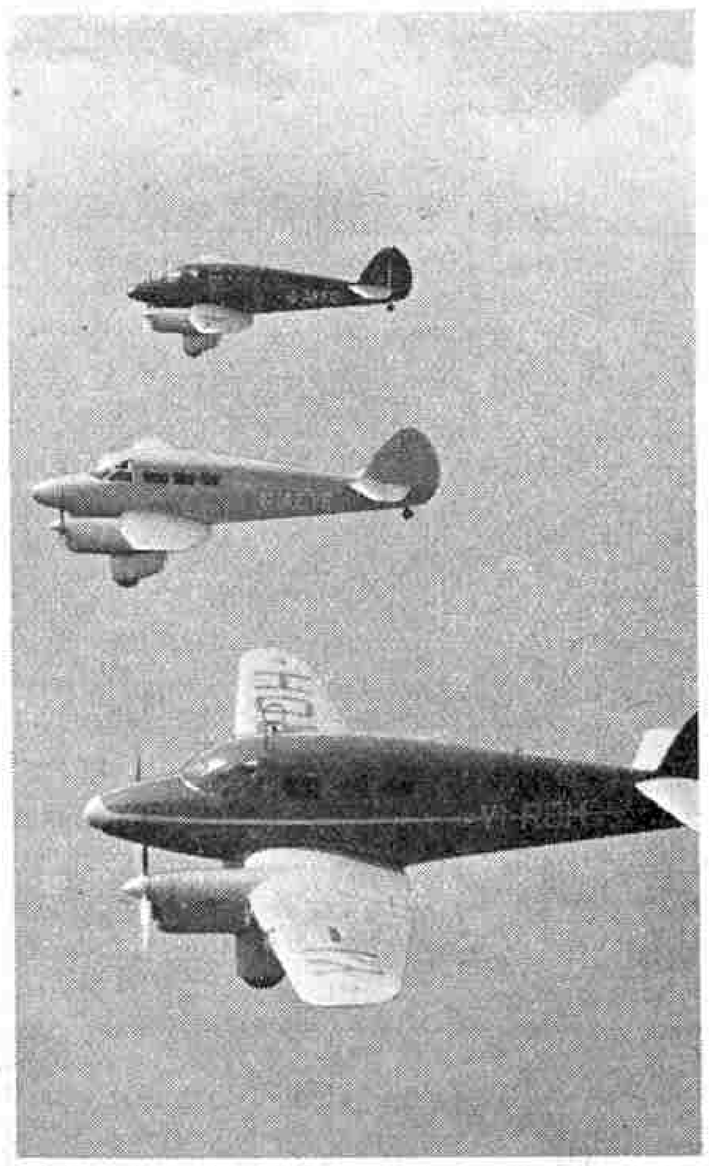


"Sunset Silhouette." An unusual snap by N. Soderberg, Falun, Sweden.

Beautiful old cottages nestling among trees make charming subjects for the camera. This fine example is by F. H. Culverhouse, Sheffield.

Transatlantic Air Service

The Pan American Airways flying boat "*Yankee Clipper*," which carried out a transatlantic survey flight in March last, inaugurated an air service over this route on 20th May, when she took off from Port Washington, Long Island, with nearly a ton of mail on board. Calls were made and mails delivered at the Azores, Lisbon, and Marseilles, and the flying boat then continued to Southampton, where she arrived on 23rd May. The total flying time for the full journey was just under 32½ hrs.



A trio of Percival Q.6 monoplanes. Photograph by courtesy of "Flight."

After an overnight stay at Southampton the "*Yankee Clipper*" set off on the return trip, and reached Port Washington on 27th May. On the same day the sister aircraft "*Atlantic Clipper*" began the second of the transatlantic mail flights to Marseilles, and she arrived back at Port Washington on 3rd June.

The certificate authorising this service and granted to Pan American Airways by the U.S. Civil Aeronautics Authority prohibits the transport of passengers over the route until five return mail flights have been accomplished. There are heavy bookings for the passenger flights.

R.A.F. Vacancies for Apprentice Clerks

The Air Ministry announce that a substantial number of boys of School Certificate or approximately equivalent educational standard will be required this month to fill vacancies for apprentice clerks under the Royal Air Force new recruiting programme.

Candidates must be between 15½ and 17¼ years of age on 1st July, and those who are successful will undergo a thorough course of training in clerical duties during their first 18 months' service. They will be attested for 12 years' regular Air Force service from the age of 18 years. The work on which Service Clerks are employed is varied, and includes administrative duties, shorthand, and accounting for pay and equipment.

A limited number 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 only the first period of 12 years' service will be given an opportunity of entering the R.A.F. Reserve and of drawing a gratuity of £100.

All Apprentice Clerks have an opportunity to volunteer for training as airman pilots, and those who are selected become Sergeant Pilots when they have completed their training, and are 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 be granted also in the Accountant and Equipment Branches to ex-apprentice clerks.

The conditions of entry are given in A.M. Pamphlet 9, a copy of which may be had upon application from The Inspector of Recruiting, Royal Air Force, Victory House, Kingsway, London W.C.2.

New American Flying Boat

The lower illustration on this page shows an interesting new twin-engined flying boat built by the Consolidated Aircraft Corporation, of San Diego, California. It is known as Model 31 and can be produced either as a civil or military aircraft. As a commercial air liner it will have a capacity of 52 passengers for day flying and sleeper accommodation for 28 at night. On transatlantic service it would be equipped to seat 28 passengers.

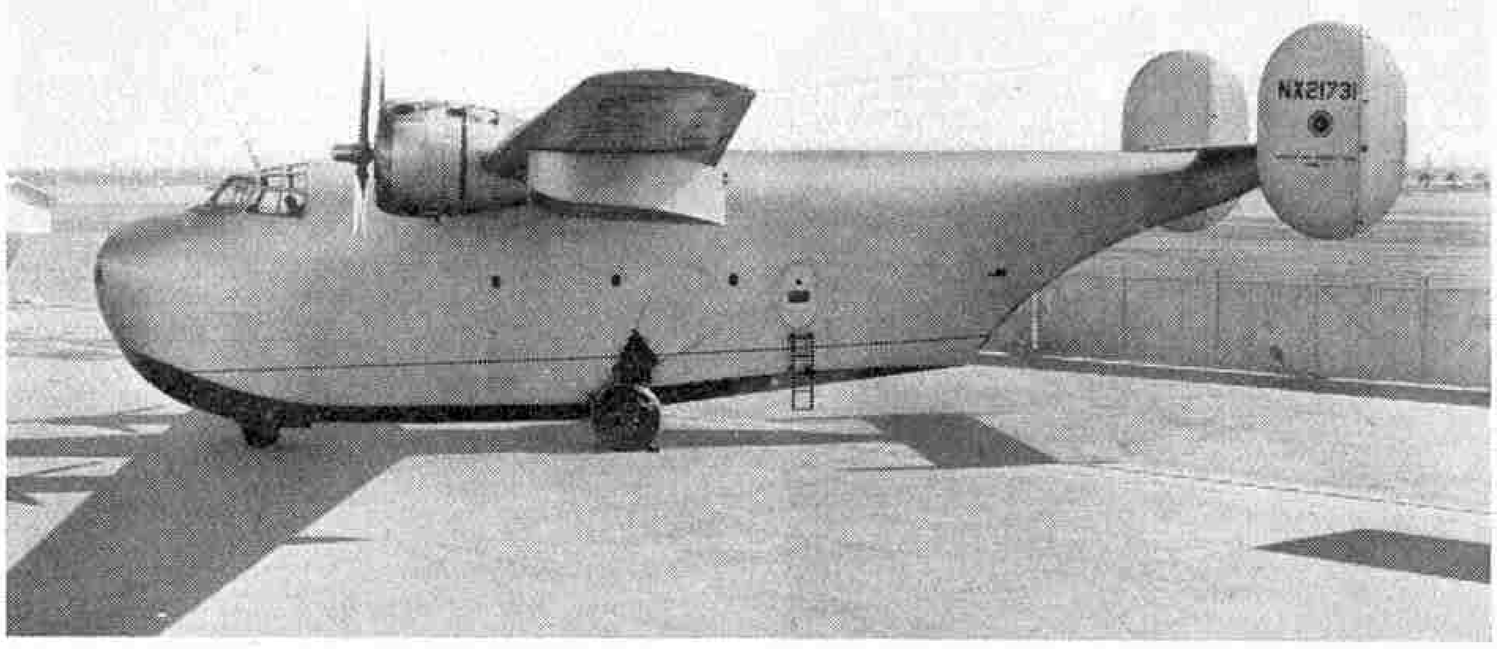
Model 31 was designed and built in 10 months, something of a record for an aircraft of this class. It is of metal construction, and has a wing span of 110 ft. Outboard floats, one on each side of the hull, help to steady the flying boat on the water, and they are drawn up to the underside of the wing during flight. The deep hull has two decks, and the control cabin is in the front part of the upper one. An interesting feature is the hydraulically operated beaching gear. When not in use the nose wheel is retracted into a recess in the underside of the hull and the two side wheels are drawn up into recesses in the sides of the hull. The openings are then closed by doors.

The two engines of this flying boat are of a new Wright type called the "Duplex-Cyclone" and rated at 2,000 h.p. They are said to give the aircraft a top speed of about 300 m.p.h.

Australia-Africa Survey Flight

A possible alternative to the present England-Australia Empire air route through Karachi, Calcutta, and Singapore, is being investigated by the Australian Commonwealth Government. The route under consideration is from western Australia to Mombasa, in Kenya, by way of the Cocos Islands, Diego Garcia, in the Chagos Islands, and Mahe, in the Seychelles, and involves flying across the Indian Ocean.

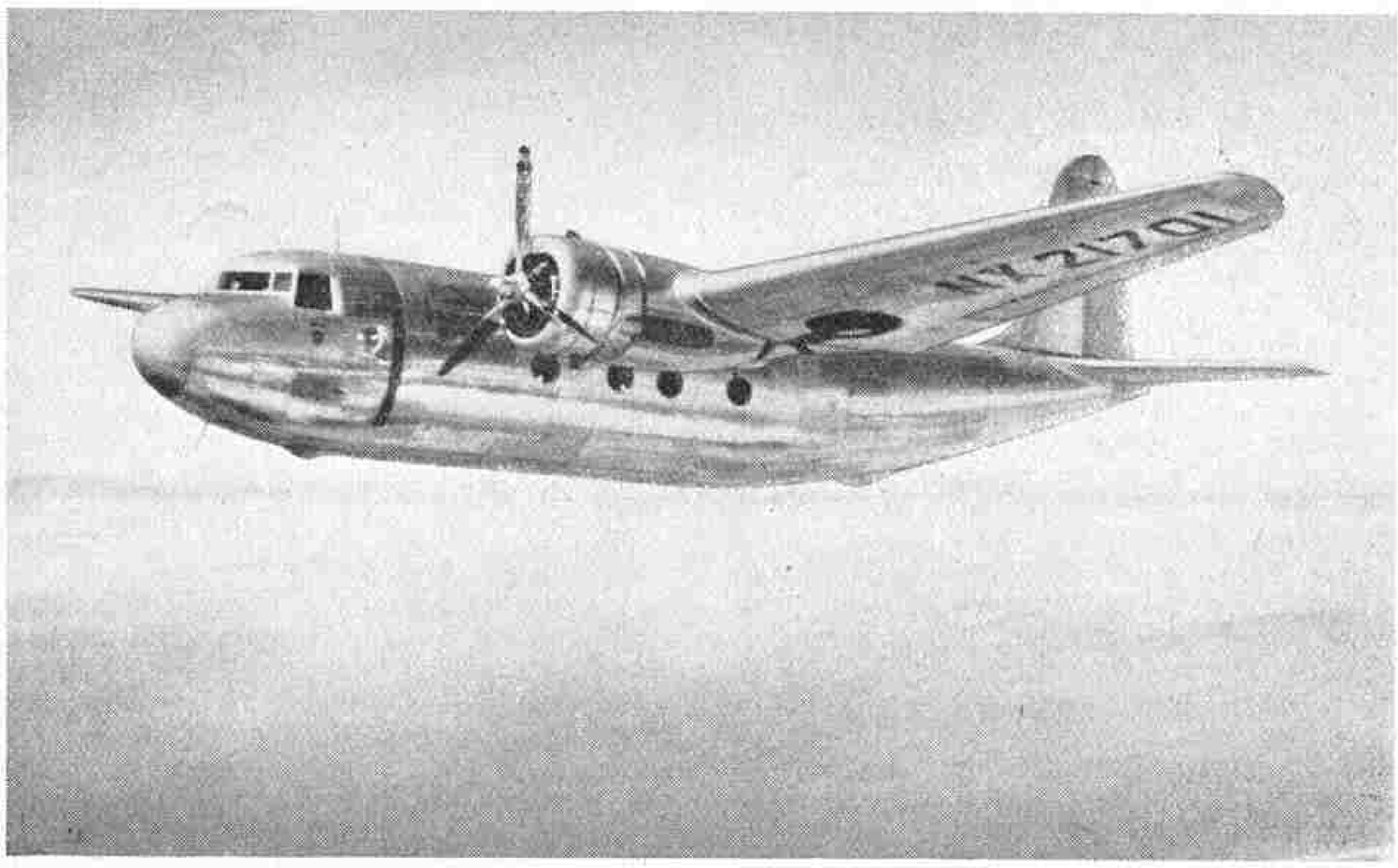
A 4,670-miles survey flight over this proposed route began on the 4th June. The twin-engined long-range flying boat "*Guba*," used by Professor Archbold on a recent scientific expedition to New Guinea, was chartered for the survey by the Government, and it took off from Port Hedland, in Western Australia, on the first stage of the flight, a 1,230-miles "hop" to the Cocos Islands. It was piloted by Capt. P. G. Taylor, who was navigator to the late Sir Charles Kingsford-Smith on one of that famous airman's long flights. The crew of nine includes Professor Archbold.



This broadside view of the Consolidated Model 31 flying boat shows the unusual "cut" of the deep hull, and one of the outboard floats drawn up to the wing. Photograph by courtesy of Consolidated Aircraft Corporation, U.S.A.

Douglas DC-5 Flight Tested

Flight tests of the first Douglas DC-5 twin-engined monoplane have proved very satisfactory. Based on data obtained during these trials, the production model will have a top speed of 230 m.p.h., an initial rate of climb of 1,625 ft. per min., and a service ceiling of 24,600 ft. Performance on one engine also is very good.



The first Douglas DC-5 air liner at the start of its single-engine flight tests. Photograph by courtesy of Douglas Aircraft Company Inc., U.S.A.

The DC-5 has been designed primarily for "feeder" line air services, and can seat 16 to 22 passengers and a crew of three. It is provided with a three-wheel undercarriage, and oversized wheels and brakes for safer landings and quicker stopping. A sturdy fuselage keel is built into the body as extra protection in the event of emergency landings.

Isle of Man Air Races

The Isle of Man Air Races this year were favoured with good weather, in contrast to the 1937 and 1938 events. The London to Isle of Man Race from Hatfield aerodrome to Ronaldsway airport, near Douglas, was held on Saturday 27th May, and there were 19 competitors. An almost continuous headwind gave the fast machines an advantage, and this handicap race was won by Flying Officer Geoffrey de Havilland, in a de Havilland T.K.2. His net flying time was 1 hr. 31 min. 13 sec. Mr. Alex. Henshaw finished second and Capt. E. W. Percival third, both flying Percival "Mew Gulls."

The Tynwald Air Race for aircraft of 120 h.p. or under was flown on Monday 29th May, and only four of the seven competitors finished the course. The winner was Squad. Ldr. H. R. A. Edwards, who averaged 106.5 m.p.h. in his ancient but fast Sports Avro "Avian" biplane. R. L. Porteous in a Chilton monoplane was second, his average being 105 m.p.h., and E. Mole in a Tipsy monoplane was third.

The third event, also carried out on the 29th, was the Manx Air Derby. All the nine competitors completed the 156-miles course and there was a very exciting finish. The winner was Mr. Albert Henshaw, in a Percival "Vega Gull," with his son Alex. as co-pilot. The second to finish was Flight Lieut. T. Rose in a Miles "Hawk Six," and he was only 33 sec. behind the winner. The third arrival, 13 sec. later, was Capt. Percival in his "Mew Gull."

Vickers "Wellington" Bomber Performance

Official figures just released show that the Vickers "Wellington" bomber fitted with two 1,000 h.p. Bristol "Pegasus" XVIII engines has a top speed of 257 m.p.h., and a cruising speed of 213 m.p.h. With a full load of just over two tons of bombs the aeroplane has a range of 3,240 miles.

British Overseas Airways Corporation

The British Overseas Airways Bill introduced last month provides for the establishment of a "British Overseas Airways Corporation" to acquire and operate Imperial Airways Limited and British Airways Limited. The statutory duty of the new Corporation will be to secure the fullest development, consistent with economy, of efficient overseas air transport services to be operated by the Corporation at reasonable charges. The Corporation will have a monopoly of subsidy as regards British overseas air services, but it will have no monopoly of flying. Other enterprises will be able to operate and there will remain competition with the unified and heavily subsidised national airlines of other countries.

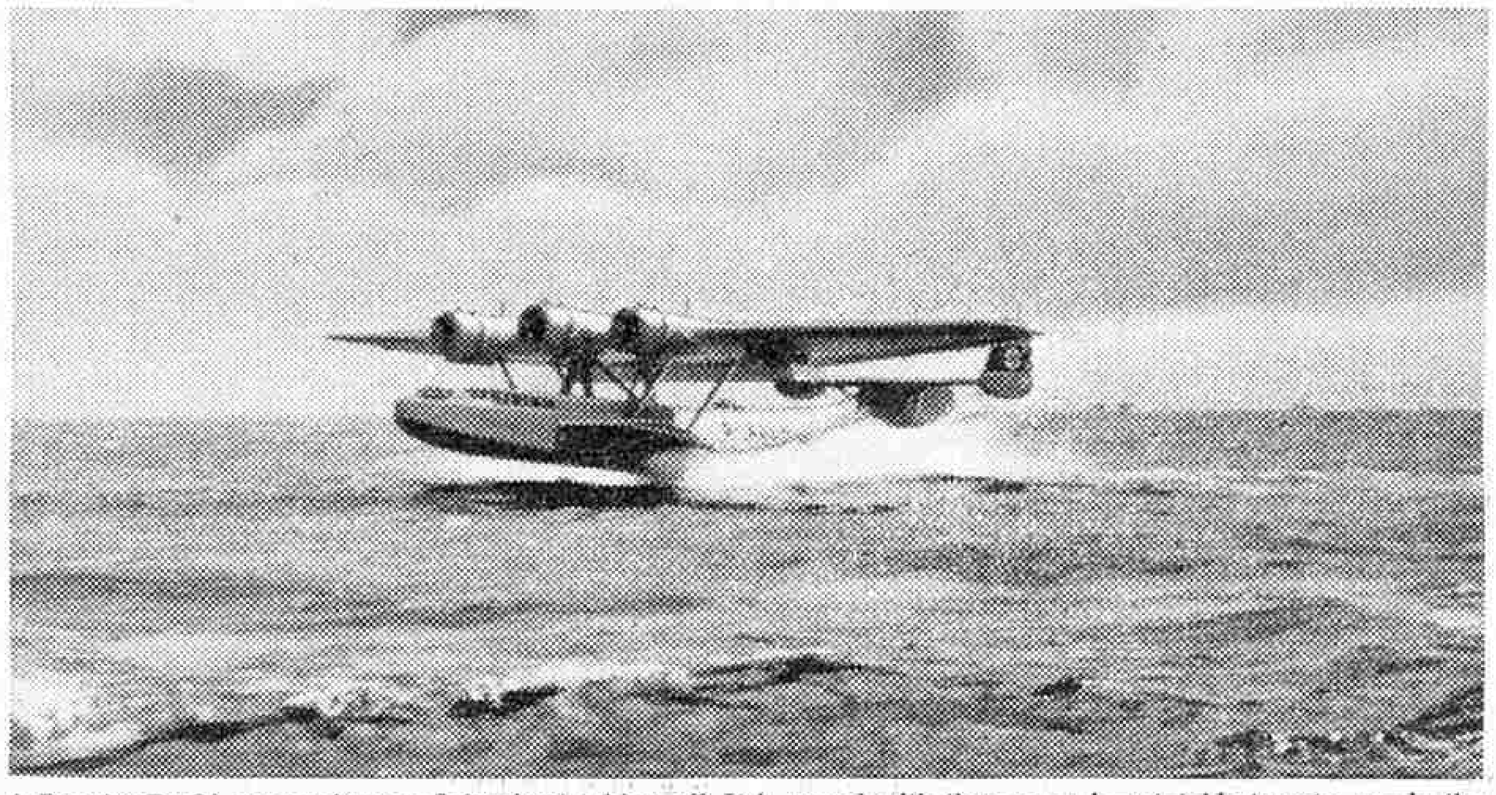
Empire Air Day

Empire Air Day was held on 20th May last and was an even greater success than last year. The larger number of R.A.F. stations open to the public, and the fine weather, helped to create new attendance records, and the 63 R.A.F. stations concerned were visited by a total of nearly 850,000 people, compared with 421,000 on Empire Air Day 1938. About 150,000 people visited the few civil aerodromes that were open, so that the total attendance was approximately 1,000,000. The R.A.F. station at Northolt, Middlesex, was visited by 56,000 people, double last year's figure, and an even higher percentage increase was recorded at Hornchurch R.A.F. station, Essex, which was visited by nearly 44,000 people, compared with 13,000 last year.

Second Boeing "Stratoliner" Begins Tests

The flight testing of the second Boeing 307 "Stratoliner" was begun on the 19th May last. This four-engined low wing monoplane was piloted by Mr. E. T. Allen, until recently an independent test pilot and consulting engineer and now director of aerodynamics and flight research with the Boeing Aircraft Company. The first "Stratoliner" was wrecked during a test flight on 18th March this year, when the aeroplane was over-stressed and broken in an extremely severe "pull-out." A report concerning the manœuvres that led to this pull-out has not yet been released by the Civil Aeronautics Authority. Boeing officials point out that the manœuvres of experimental test flying may give rise to situations that would never occur in normal service operations, however, as the testing of an important new aeroplane involves experimenting to the extreme margins of safety.

The test programme suspended by the loss of the first "Stratoliner" will be continued with the second one until all details have been thoroughly covered. The programme includes the testing of the high-altitude conditioning system that gives the "Stratoliner" its name, and which had not been connected or flight-tested in the original aeroplane either before or at the time of the accident. When this series of manufacturer's flight tests is completed, the "Stratoliner" will be released to the Civil Aeronautics Authority for the further exacting tests required by the government before licencing the air liner for commercial service.



A Dornier Do.24 reconnaissance flying boat taking-off. It is armed with three guns in rotatable turrets, one in the forepart of the fuselage, the second just behind the wing, and the third one in the stern. Photograph by courtesy of Dornier-Werke G.m.b.H., Friedrichshafen.

The Blast Pipe and Locomotive Speeds

Some Interesting Recent Experiments

By a Railway Engineer

IN the article *"How The Locomotive Works,"* which was published in the *"M.M."* for November 1938, I referred to the action of the blast pipe in the smoke-box, and described how the exhaust steam passing from the blast pipe to the chimney creates the draught necessary for rapid combustion in the firebox. In recent years many locomotives at home and overseas have been fitted with special types of blast pipes. The Kylchap, developed on the former P.O.-Midi Railway in France, is a case in point; this pattern has since been fitted to the "Mikados" and certain streamlined "Pacifics" of the L.N.E.R. Another French design, the Lemaître, is being tried extensively on the Southern Railway. Some striking improvements in locomotive performance have been effected by the use of these special blast pipes, so striking indeed that the results might well seem like a "fairy tale," when it is considered how small a part of the complete locomotive equipment the blast pipe is.

Small though it may be, the blast pipe is in some ways the most vital part of the whole machine; and a clear understanding of its function is necessary in order to appreciate to the full the advantages of the special types now coming rapidly into vogue. The principal function of the blast pipe is to create draught, and it does so in a rather peculiar way. To take a simple and homely illustration, the smoke-box gases can be likened to a cloud of smoke rising slowly from a smouldering garden bonfire, and the steam exhausting rapidly through the blast pipe may be represented by the water shooting through the nozzle of a garden hose. If the jet is shot through the smoke of the bonfire the whole cloud of smoke is not deflected, but only the smoke immediately surrounding the jet of water is subject to strong suction. Smoke farther away is affected, but not to the same extent.

Exactly the same happens in the smoke-box of a locomotive, and unless the arrangement is carefully designed the draught is very unevenly distributed through the whole nest of flue tubes. Over 40 years ago this trouble of uneven distribution of the draught was the subject of some experiments carried out on the former London and North Western Railway. The smoke-box was divided into two by a horizontal partition, and each half had its own blast pipe, exhausting through a separate chimney. On the particular engines fitted, a 2–4–0 of the famous "Precedent" class and a couple of the 4-cylinder compound 4–4–0s, the two chimneys were contained in one oblong casing, and with chimneys of the height then usual the effect was hideous.

A weak draught causes the engine to steam poorly, and in former days it was often the practice to reduce the diameter of the blast pipe nozzle to counteract this trouble. The smaller orifice causes the exhaust steam to flow very much quicker, and the jet passing through the smoke-box creates a fiercer blast, so fierce indeed through the tubes under the direct influence of the blast pipe that coal is lifted from the grate, drawn through the tubes, and hurled out of the chimney as red-hot cinders. On bad-steaming engines drivers often used to fix—surreptitiously of course! —a hook, or bolt in the blast pipe nozzle to sharpen the blast.

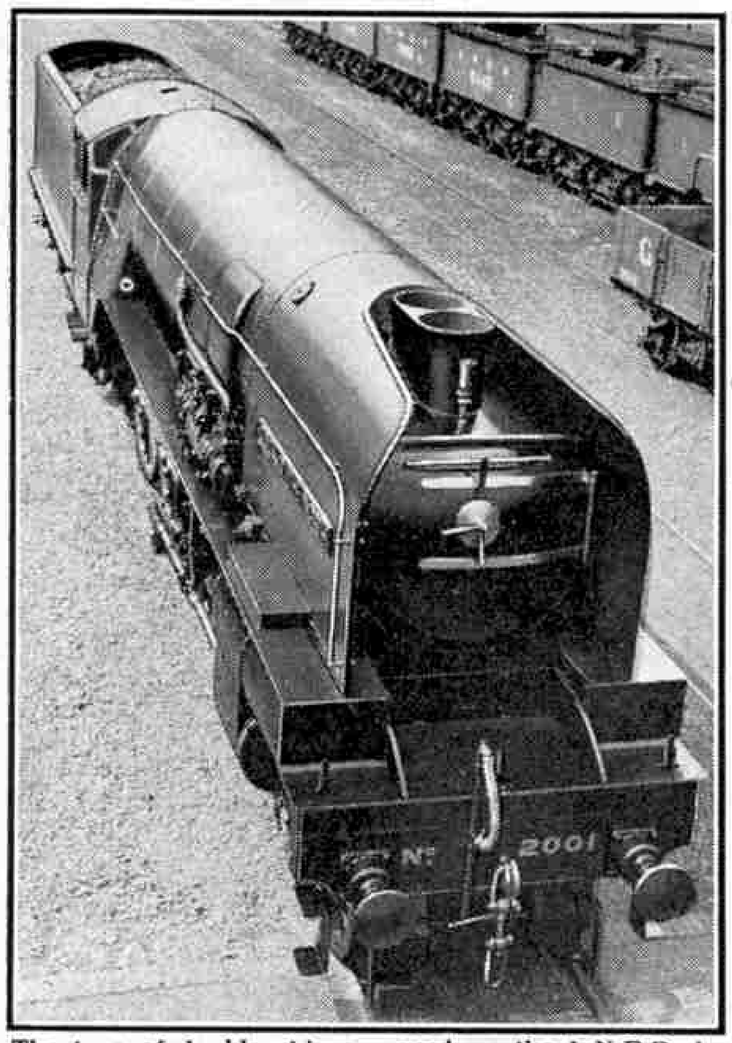
But in addition to causing an engine to throw fire, a restricted blast pipe orifice also creates a considerable back-pressure in the cylinders. The steam cannot exhaust freely and has a cushioning effect on the piston. This is not very serious at low speeds, but at 60 m.p.h. or over it chokes the engine and absolutely prevents any speed much above 75 m.p.h. It will now be appreciated that in most engines the blast pipe orifice holds the scales; if it is too big, though a free runner the engine will not steam; if too small, she will steam alright, but will be somewhat of a sluggard, and heavy on coal into the bargain! In a new design the size of the blast pipe orifice is almost always determined solely by experiment with the new engine in actual service. Thus with an ordinary blast pipe having a single circular orifice one cannot, to use a colloquialism, have it both ways; there are of course types of engines running nowadays in which the balance between the various factors has been so skillfully struck as to make them very efficient for all normal work.

S.R. locomotive "Sir Richard Grenville," showing the large diameter of the chimney that is required by the Lemaître multiple-jet blast pipe arrangement fitted to this and several other S.R. locomotives.

It is in order to get the freest possible exhaust, without impairing the steaming capacity of the boiler, that these special types of blast pipe have been designed. The Kylchap arrangement, as fitted to the L.N.E.R. *"Cock O' The North"* type 2–8–2s, and certain of the streamlined "Pacifics," includes an exhaust system in which the steam flow divides into two passages and exhausts through two separate blast pipe orifices, one behind the other.

The actual figures relating to the *"Cock O' The North"* class will make clear the underlying principle. Each blast pipe orifice is $5\frac{3}{16}$ in. in diameter. To provide an equally free exhaust with a single orifice the diameter would have to be slightly over $7\frac{1}{4}$ in., the area of the hole being in proportion to the square of the diameter. Now the power of the jet to produce suction is proportional to the distance round its circumference, for that is the only part of the exhaust jet that actually comes in contact with the smoke-box gases. Thus in *"Cock O' The North"* the two exhaust jets, each of which measures $16\frac{1}{4}$ in. round the circumference, creates a far greater suction in the smoke-box than if a single blast pipe had been fitted. The circumference of the jet in the latter case would be 23 in. compared to the $32\frac{1}{2}$ in. of the two smaller jets combined. The exhaust would be equally free in both cases, but the suction created by the double blast pipe is nearly 50 per cent. stronger!

The practical effect of the Kylchap blast pipe could scarcely have been better shown than on the record-breaking trial run of the L.N.E.R. streamlined "Pacific" *"Mallard"* in July 1938. It was a demonstration not only of amazingly free running, but also of the engine's ability to steam at a truly extraordinary rate. Normally the streamlined "Pacifics" of the L.N.E.R. are worked at 15 per cent. cut-off when running at high speed, or about 20 to 22 per cent. in the most severe conditions of ordinary service. *"Mallard,"* on her sensational flight, was working at 40 per cent. cut-off, and therefore was using roughly twice as much steam



The type of double chimney used on the L.N.E.R. is shown in this illustration of "Cock O' The North."

at every stroke of the pistons as in ordinary service. But she was also travelling at 125 m.p.h.—very nearly 50 per cent. faster than normal top speed. This, combined with the greatly increased cut-off, means that during the test run the boiler was steaming at roughly three times its normal rate—an astounding demonstration! No less extraordinary and significant was the freedom with which the Kylchap arrangements got rid of such vast quantities of exhaust steam.

Not long after *"Mallard's"* exploit I had a remarkable trip on the footplate of another of the Kylchap-fitted streamliners, No. 4902 *"Seagull."* This was on the 1-20 p.m. "Scotsman," with Driver Auger and Fireman Jones, of King's Cross shed. The great engine literally played with a big train of 14 coaches, 480 tons behind the tender, and over long stretches of the journey we were simply killing time. On certain sections however *"Seagull"* ran with such brilliance as to make me wonder what phenomenal times might have been achieved if the engine had been allowed to "run" over the whole journey. Right at the start out of London, for example, on the long 1 in 200 climb to Potter's Bar where the East Coast expresses usually make 46–48 m.p.h., we sailed merrily up at a steady 56 m.p.h. Then the way *"Seagull"* got going on the grand racing stretch north of Stevenage was positively amusing. We cleared the slight rise from Langley water troughs to Stevenage at 70 m.p.h. Then, working on 16 per cent. cut-off, we accelerated with terrific vim, and although the regulator was gradually brought right back to something like one-third open we got up to 95 m.p.h. at Three Counties! Indeed Driver Auger had to brake slightly to bring speed below the statutory 90 m.p.h. limit. On my last trip with the 1-20 p.m. train, and the ordinary streamlined "Pacific" No. 4499, then named *"Pochard,"* in recovering from the 20 m.p.h. slack through Peterborough the 5½ miles out to Helpston took 8 minutes; *"Seagull"* knocked off this distance in 6¼ minutes!

For some important braking trials, carried out at the close of 1938 with the *"Coronation"* train, *"Seagull"* was specially selected as the engine. The test train had to be worked, and trial stops carried out, in the intervals between the regular Sunday trains; and in order to reach the maximum speeds necessary for test purposes a very high rate of acceleration was demanded. From all accounts *"Seagull"* fairly surpassed herself. On one occasion, so it is reported, she accelerated the 280-ton test load from a dead start to 90 m.p.h. in less than three miles!

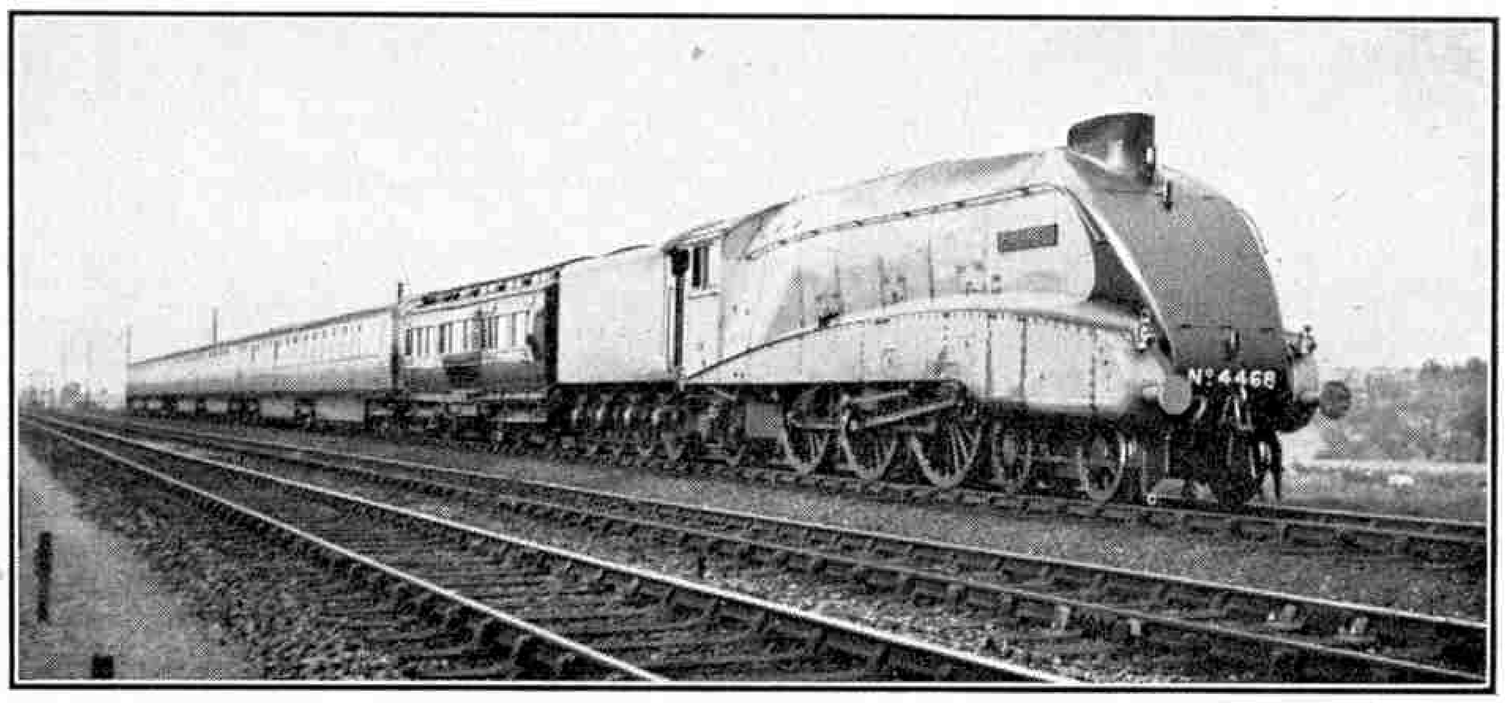
Some equally fine results have been obtained with the Kylchap blast pipe on the Southern Railway, where some of the "Lord Nelson" class 4–6–0s have been fitted, including No. 862 *"Lord Collingwood"* and No. 865 *"Sir John Hawkins."* The latter seems to be a particularly successful engine. On a recent occasion it reached Salisbury nearly six minutes early with the *"Atlantic Coast Express,"* a load of 375 tons, having done the 83.8 miles from Waterloo in 80¼ minutes, inclusive of a relaying slack that cost 2¼ minutes in running.

Even more momentous trials are now being carried out with one of the giant L.M.S. "Duchess" class non-streamlined 4–6–2s, No. 6234 *"Duchess of Abercorn,"* which is running fitted with a double blast pipe, though modified from the Kylchap arrangement. Already some astonishing test results have been obtained. The Stanier giant excelled just where a vast power output at high speed was demanded, and where a comparatively long cut-off was creating large volumes of exhaust steam to be got rid of quickly. A tremendous load of 20 coaches was taken, weighing no less than 610 tons behind the tender, and on the southbound run Beattock Summit was passed at the amazing minimum speed of 63 m.p.h. It will be interesting to see whether the same exhaust arrangements are incorporated in the new series of streamliners now being turned out.

The Lemaître arrangement works on a different principle, and enables the driver to vary the draught according to the demands of the moment. There is a central orifice, as in a single blast pipe, and five auxiliary nozzles grouped around the central one; in all, therefore, there are six jets, and the efficiency of this arrangement for creating strong suction will be readily understood from the figures I gave previously relating to the double jet of the Kylchap blast pipe. The five auxiliary jets in the Lemaître arrangement, as first used on the former Northern Railway of France, now the Northern Region of the French National Railways, are 2⅜ in. in diameter, and the central jet is 4⅝ in. The variable feature is applied to the central jet. Inside the blast pipe there is a pear-shaped device that can be raised or lowered. When this is lowered to its fullest extent the whole area of the central orifice is available for the passage of exhaust steam; as it is raised the passage becomes more and more restricted, and the blast grows fiercer in consequence. The degree of variation given to a driver is remarkable, for on the Nord "Pacifics" that are so fitted the total cross-sectional area of the steam passage can be varied between 23 and 38 sq. in.

Not only does this arrangement improve the actual working of the locomotive from the pulling and running point of view; it can, if skilfully manipulated, have a marked effect on the coal consumption. Supposing an engine is being worked hard uphill, the blast is strong, and steam is being produced very rapidly in the boiler. In the ordinary way this strenuous working continues until the summit of the bank is passed; if there is a full head of steam the moment the engine is eased the safety valves blow off, and steam is wasted, simply because the rate of steaming in the boiler cannot suddenly slow down. The alternative is for the fireman to let the pressure drop somewhat, and be content with some falling off in the speed. On a locomotive fitted with a variable blast pipe, such as the Lemaître, both these undesirable alternatives are avoided, for as the summit of a bank is neared the driver can soften the blast, and save any wastage without any appreciable loss in speed.

The proportions of the chimney are of no less importance than those of the blast pipe itself. The exhaust steam issues from the blast pipe orifice, and the jet passing through the smoke-box gets progressively larger in diameter as it shoots upward; this is due to the expansion of the steam as it loses pressure on nearing the atmosphere. The shape of the jet of exhaust steam is thus like an inverted cone. The internal diameter of all locomotive chimneys tapers from the top downward so as to suit the shape of this exhaust steam cone. The best results are obtained when the steam cone exactly fills the chimney; the suction created is at a maximum, and the chimney offers no hindrance to the exhaust. If the cone does not fill the chimney there is a considerable loss of suction, and if the chimney is too small the engine will not clear itself and consequently will be sluggish. The Southern engines fitted have not the variable feature, but the multiple jet arrangement demands a chimney diameter much larger than is usual in British practice. The illustration on the opposite page shows the latest type of chimney casing used on the S.R. instead of the fearsome stove-pipe first employed for engines so equipped.



"Mallard" before its record flight in July last year. Photograph by courtesy of the L.N.E.R.

Post Office Wizards

Secrets of the Dollis Hill Research Station

By Edwin Haydon

A HEADLESS postman, dressed in regulation trousers and raincoat, is walking hundreds of miles a day at the Post Office Engineering Research Laboratory at Dollis Hill, to the north of London. His job is to discover how long different kinds of waterproof will last under the constant friction of the postman's bag rubbing against the side of his raincoat as he walks. This postman is just one of many ingenious devices invented by experts at the Postal Research Station, which was built at a cost of £100,000. It covers an area of eight acres, houses electrical and other apparatus to the value of £150,000, and was opened by Mr. Ramsay MacDonald, when Prime Minister, in the autumn of 1933.

The Post Office scientists—whose motto—"Research is the Door to To-morrow"—is inscribed over the entrance porch—have more than earned their keep and have completely justified the initial capital outlay. For not only have they improved the Post Office services, but also they have saved the organisation many thousands of pounds. For example, inside a telephone exchange are millions of tiny metal strips fitted with minute domes. On their efficiency much depends, and they must be made of the right kind of metal. At one time platinum was used for the contact. This meant spending about £3,000 in an exchange on contacts alone; and the experts at Dollis Hill wondered whether silver could be used instead. They found that it could, with the result that two noughts have been knocked off the foregoing figure, and a substantial saving has been effected in annual expenditure—thanks to the 400 technicians, chemists, engineers and physicists, who daily dream of and work for the perfect telephone, the perfect exchange, the perfect stamp, the perfect cable and perfect radio transmission.

Every week of the year 500,000 people in London and the provinces dial TIM for the right time. Since the Post Office scientists evolved this mechanical marvel and the service started, 42,726,287 people have telephoned TIM in London alone. How does TIM work? What is the fascinating secret of the mechanism that can tell 188 of you the time simultaneously?

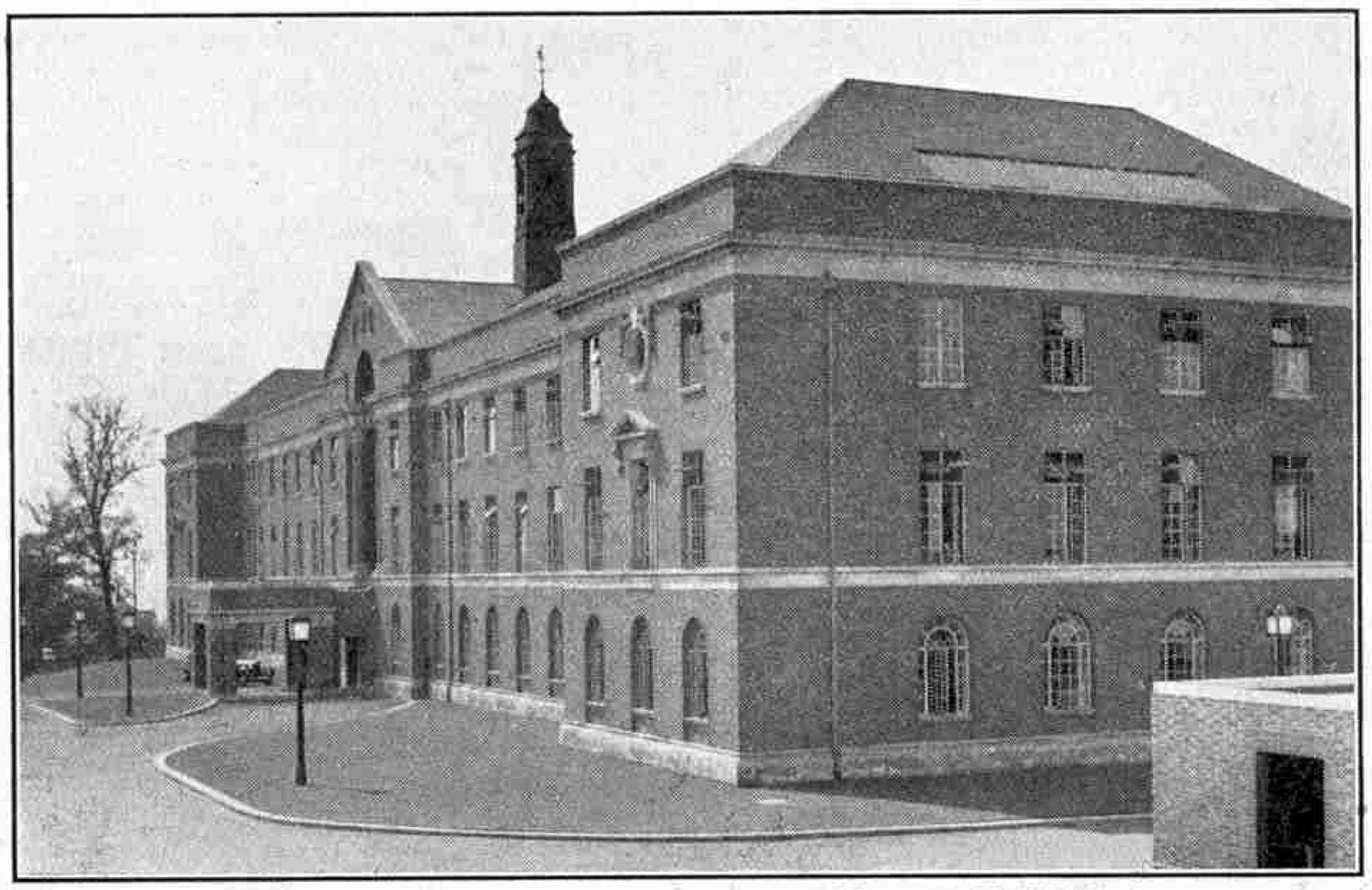
There are four glass records, through each of which is thrown a beam of light. Now the words spoken by the "Girl with the Golden Voice," when she tells you the time, appear on the glass as little black marks. Naturally, these interrupt or cause a break in the light beam before it reaches the photo-electric cell on the other side of the record. The variations the voice marks on the record cause—via the light beam and photo-electric cell—varying electrical impulses, which eventually are translated back into sound.

The experimental model of the talking clock, now known familiarly as TIM.

The principle is similar to the gramophone needle running in the sound track of a wax record. If it were running constantly, as the TIM machine runs, needle and record would wear out; but the beam of light does not wear out TIM'S glass records.

When you ring up TIM in the provinces—say, from Edinburgh, Glasgow, Manchester, Birmingham, Newcastle, Leeds, Bristol and other important centres—your call goes through to London by trunk lines. Yet the call still costs you only one penny—or twopence if you are using a telephone kiosk.

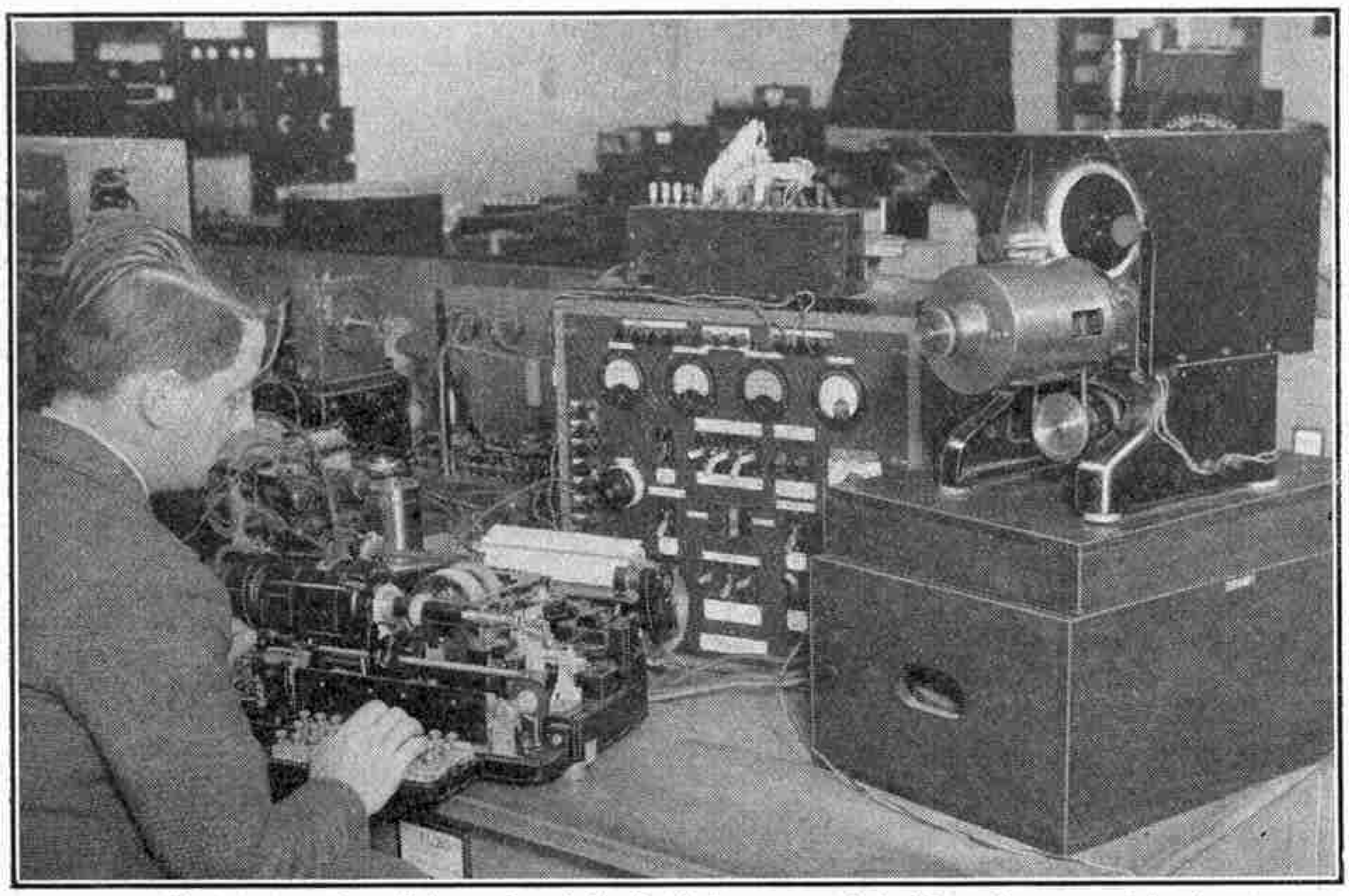
Within the walls of the Postal Research Station actual instruments and the materials from which telephones are made are subjected to exhaustive and rigorous tests. Inside the telephone mouthpiece, for instance, is a microphone, a very delicate instrument which, as you know, transforms sound waves into electric waves. You do not subject it to much strain when you talk into it, but the Dollis Hill experts insist that it shall be proof against even the most irate individual. Therefore, in one of the Dollis Hill laboratories batches of 50 transmitters and receivers are placed on a metal frame. Every minute a voice emanates from



The Engineering Research Station of the General Post Office at Dollis Hill, London.

a transmitter and "talks" a number into the receiver. The voice is produced on the "talkie" principle and is continuous.

For 12 weeks these transmitters and receivers are left to talk numbers unceasingly into each other, and receive numbers 24 hours a day. At the conclusion of this test period the results are examined and noted. In this way it is hoped to arrive at a type of receiver and transmitter that will give the best results and the maximum length of service.



The laboratory in which experiments leading to improvements in telegraphy are carried out.

In another laboratory, the dial you turn with a pencil or your finger when you need a number is "twiddled" by a mechanical finger. This finger falls into each hole in turn, spins the dial, and then lets it unwind again, just as though you were dialling a number. Fifty separate diallings a minute for three weeks is the continuous procedure.

Then there is "Galloping Gus," as this particular piece of test apparatus has been nicknamed by the experts. It is like a miniature roundabout, with telephone earpieces instead of horses. The earpieces hang face downward. Round and round goes the machine. As each receiver passes a certain spot it is automatically lifted an inch or so, and allowed to drop heavily on to a metal base. This rough treatment proceeds unceasingly for weeks, the object being to test the durability of the tiny magnets within. No separate test has been devised for the one-piece instruments that to a large extent have displaced the old-fashioned "candlestick" telephone. It is hardly necessary; if the magnets will stand up to "Galloping Gus" they will stand up to anything.

The Post Office scientists are anxious that not only shall your telephone give long and efficient service, but that it shall be of lasting good appearance. For this reason the action of dust, grit and sunshine on the enamel is noted. The instruments are exposed to fierce sun-ray treatment. A dozen coloured telephones are placed in a box and given a stiff dose of ultra-violet rays to find out just how much the sunlight will cause their colours to fade. Specimen pieces are sprayed also for weeks on end with jets of carborundum dust. Now carborundum dust is the stuff used to grind-in the valves of motor cars; it will wear away solid metal. That gives you some idea of what the enamel on your receiver has to withstand.

A drum with a wire brush coating inside revolves to see how long the bakelite of hand microphones will stand wear and tear.

The pride of the Research Station is the perfect telephone; but, I am afraid, it will never be issued to the public. The small coil that is responsible for the perfection of this instrument weighs practically nothing, but it costs £120. The incidental apparatus for the perfect telephone would fill a garage or an outhouse, so that few people would have the space to spare; while the price is prohibitive.

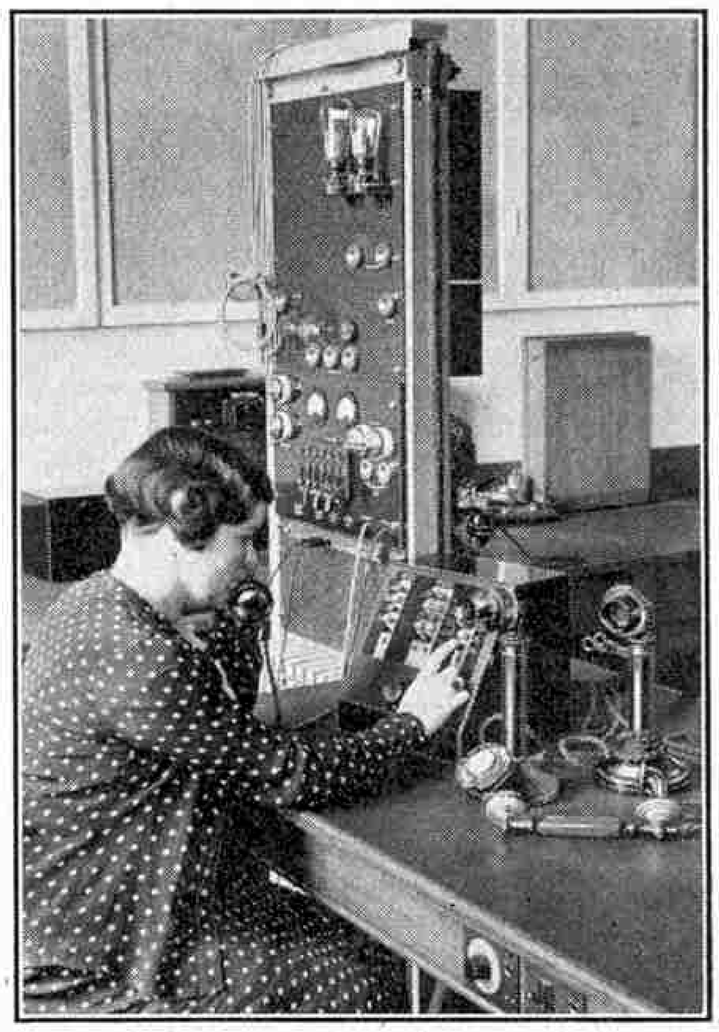
With the perfect telephone you could speak to someone in Australia and hear every syllable—even the speaker's breath. But the experts converse only from one room to another some 10 yards distant.

The perfect telephone is used at Dollis Hill for testing. Suppose the engineers want to test a new type of switch. They remove the perfect one and insert the one to be tried. If there is any fault at all, they know it must be in the switch, because the rest of the circuit has been proved perfect. Similarly, if they are testing a new telephone, they know that if anything is wrong the wiring cannot be to blame.

The perfect telephone is housed in a sound-proof room, lined with special material to prevent any echoes. Not only is the instrument itself perfect, but so also are the wires and everything connected with the miniature circuit. The reason why the compartment is sound-proof and echo-proof is simply that in an ordinary room all sorts of extraneous noises would go wandering around, complicating matters.

The next link in the chain is the wire that goes from your telephone to the exchange. This wire is tested in a department where they spend all their time trying to break things. Specimen lengths of telephone wire are put into a machine; the machine is switched on, and the wire is subjected to severe strain. It is pulled about in every possible way, to make certain that it is able to stand up to heavy rains and shrieking gales.

Miniature automatic exchanges have been specially designed and constructed at Dollis Hill for country



A telephone demonstration in progress.

districts. Once a fortnight a Post Office engineer visits each robot exchange, but only to switch on the accumulator-charging dynamo. Very large generators and bat-

The construction park at the Dollis Hill Research Station, where outdoor equipment is tested.

teries are used, some of the batteries having a capacity of 10,000 ampere hours and weighing 62 tons. Within a few minutes the engineer is on his way; aware that the dynamo will run for a set period and then switch itself off automatically.

These small country exchanges give the same facilities as the large ones, but there must be no risk of a breakdown in an exchange of this type. Exhaustive tests with a special mechanism take place at Dollis Hill and the apparatus is worked to death, 24 hours a day, until it has dealt smoothly and efficiently with millions of test calls.

All sorts of problems are investigated at Dollis Hill. For example, experts study the mysteries of insulation in a building resembling an architect's crazy dream, and known as "Heinz House" because it has at least 57 different varieties of slates, tiles and wall surfaces. They want to know the effect of wind on telephone wires; the precise stress and strain on a submarine cable in deep water; and, if you are interested in something really technical, "determination of the watt-hour output of cells on light intermittent discharge rates."

The loud-speaker telephone—the latest product of the Dollis Hill Research Station—is about the size of a small biscuit-box, but it dispenses with the need to hold a receiver. Like the radio, you can listen untrammelled, walking up and down if preferred. But, at the same time, you can speak back. In a few years' time it may well displace the present popular one-piece hand microphone.

When complaints were received—particularly from business men—regarding telephone congestion on long-distance lines and the difficulty of obtaining speedy connection, the Post Office scientists set to work to solve this problem. A cable was laid between Bristol and Plymouth, consisting of 19 pairs of conductors, weighing 40 lb. a wire to the mile, and carrying 228 conversations in one direction. A similar cable takes return direction speech. Later cables were 24 pairs, weighing 40 lb., and carrying 228 conversations in "go" and "return" cables. To-day there are cables of this kind operating between London and Birmingham, Birmingham and Manchester, and on to Newcastle.

This miracle has been effected by applying wireless principles to telephone wires. Each voice is given a different wavelength and is "tuned-in" independently of the others. It is like choosing one from 228 different broadcasting stations.

An important telephonic aid to time and travel saving in industry and big business evolved by the Dollis Hill experts is the telephone conference. The conference call came into the news last September when Alexander Korda, sitting in his New York apartment, was connected with his American representative sitting in another New York apartment, Mr. Irving Asher at his home near Windsor, and another executive at Hampstead; and the four had as long and as intelligible a conference as if they had sat round the same table.

By means of another useful time-saving device designed at Dollis Hill for use in busy offices, firms are able to send typewritten letters over the telephone wire. The typist sending the letter gets through to the other end and then presses a key marked "Who are you?" At once the other typewriter automatically sends back its telephone number and the letter begins. As the typist taps out the letter it appears simultaneously on the machine at the other end of the line. In the beginning the Post Office scientists were faced with a ticklish problem; how to let the subscriber know that three minutes were nearly up without interfering with the letter being sent. Of course, they succeeded!

It is possible also to carry on a long conversation in the clearest possible way by means of the teleprinter. "A," instead of talking to "B" over the telephone, types his message, which is received simultaneously by "B." Then "B" types his reply to "A." So the conversation proceeds in print.

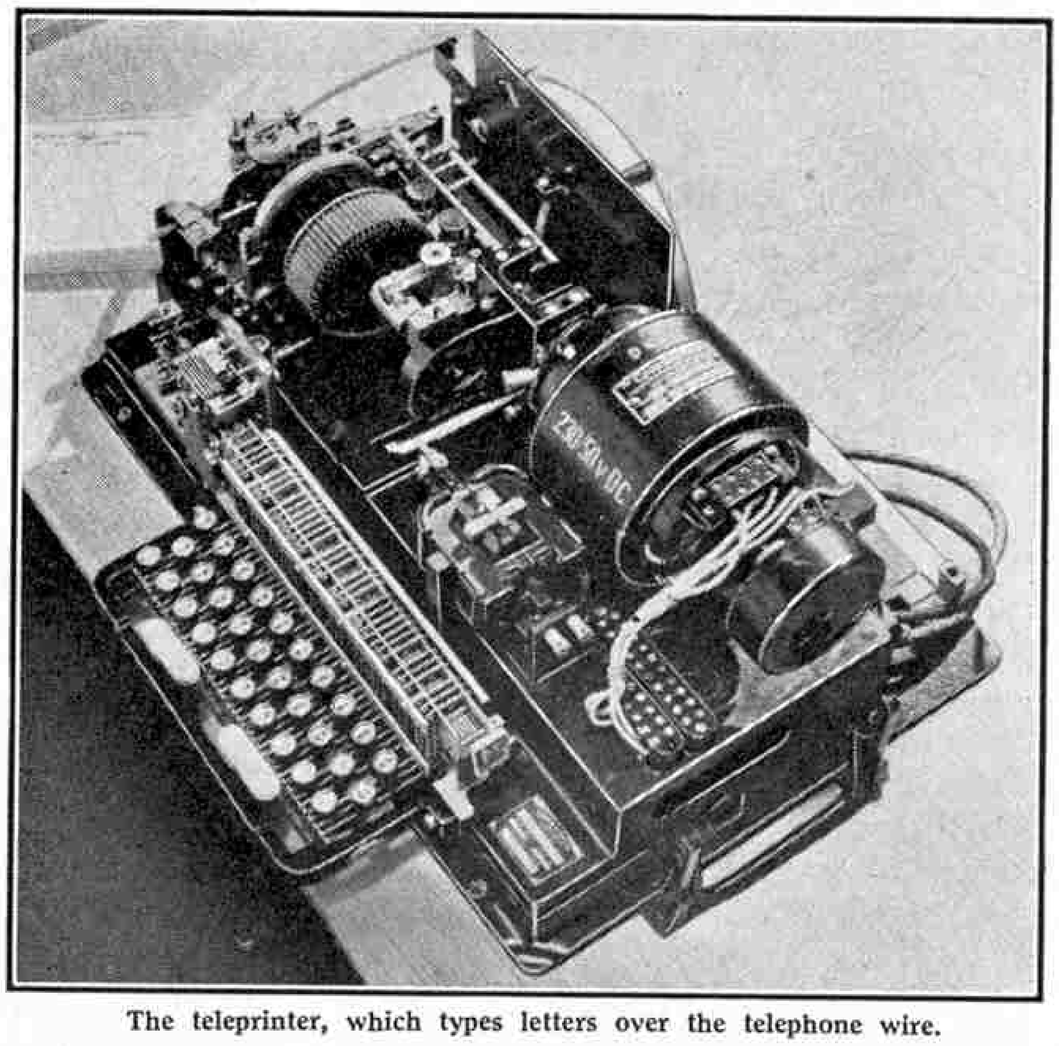
Another important invention sponsored by the Post Office scientists is a potted telephone operator, who can say only two things in loud, ringing tones—"Number engaged," and "Number unobtainable." She says one or the other over and over again at two-second intervals. This invention may replace the system by which two different kinds of buzzes tell you that the number you want is engaged or unobtainable. The necessary speech for this particular robot voice is recorded on a strip of film fastened round a revolving drum. Immediately you dial a line already in use a photo-electric cell sets this miniature "talkie" going.

By means of noise graphs and sound calibrations the Post Office experts can construct a telephone for the deafest person or one suitable for use under ear-splitting conditions.

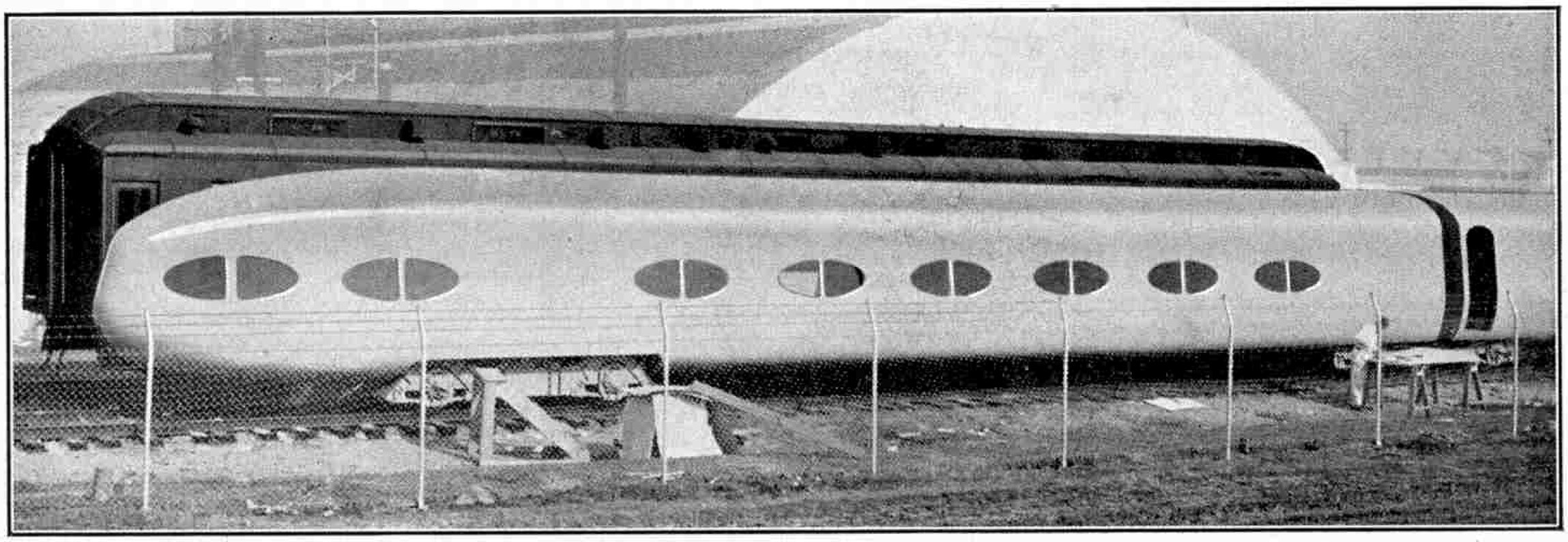
If you paid a visit to Dollis Hill, you might hear a young man apparently speaking into a telephone in a foreign language. "Ree zer pun im merst!" he might be saying.

And if you asked him what it meant, he would not know! All he would know was that someone at the other end had been listening to him over the wire and writing down the message exactly as he heard it. And if the written words were not the same as those that had been spoken into the instrument, there was something wrong somewhere.

The young tester, you would be told, was trying out a new type of "whisper phone," which picks up quiet voices perfectly. In order to discover whether it transmits them clearly, no real words are employed. They used to have cards of made-up words to read off; but very soon even that strange language was memorised by the listener at the other end, and the test failed. They therefore introduced a machine which, at the turn of a handle, makes up words and (Continued on page 446)



The teleprinter, which types letters over the telephone wire.



Railway Coach Built Like an Aeroplane

Smoother Riding at Higher Speeds

THE upper illustration on this page shows what may possibly become a recognised style for American railway coaches. Comparison of its low build and smoothly rounded contours with the features of the larger and more bulky car in the background is interesting. The streamlined vehicle suggests aircraft practice more strongly than that of the railway, and it is not surprising to learn that an aircraft engineer, William E. Van Dorn, was responsible for the design.

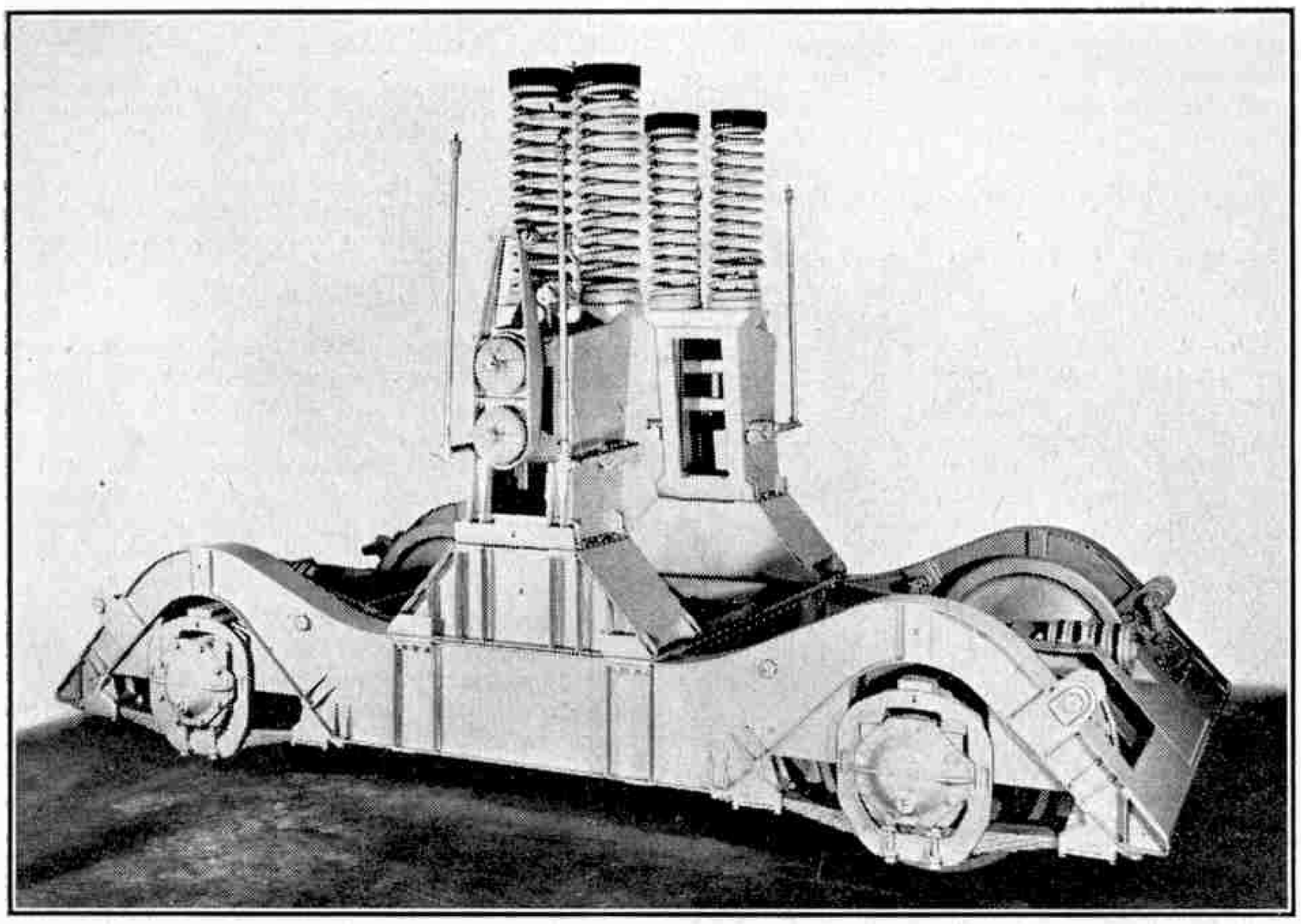
The construction of an experimental two-coach unit has been financed by Cortlandt T. Hill, grandson of James J. Hill, the "Empire Builder," who was associated with the Great Northern Railroad, as related in an article in the "*M.M.*" in June 1937. The coach has been tested on the Atchison, Topeka and Santa Fé Railway and it is by the courtesy of that system that we are able to publish this description, which has been prepared from material supplied by Mr. Hill.

The chief aim in designing this coach has been to provide a modern railway passenger vehicle lighter in weight in proportion to its carrying capacity than existing equipment. Mere reduction of weight is not everything, however. Railroad equipment must be safe, reasonable in cost and economical to operate, and the travelling public demands riding comfort and pleasing appearance. The need for light weight and high strength suggested the application of the "stressed skin" principle used in modern aircraft to a railway coach. A structure of this type derives the principal part of its strength from the outside covering, or "skin" of the body, and is light in weight because it requires comparatively little framing and truss work.

The experimental bodies of the new coaches were built of Douglas fir plywood, the outer shell being ⅜" thick. In a production car body high tensile steels would be used however, for they combine high strength with corrosion resistance, and light gauges, that is sheets of comparatively small thickness, therefore can be used. Welding, both electric-arc and spot, would then be used to join the various members of the structure. In building such a coach there would be many opportunities for the use of automatic welding equipment.

The suspension system, or method of mounting the coach on its truck, also is a complete departure from standard practice. The body is virtually suspended from the bogie truck, floating on soft vertical coil springs mounted on "towers" that are part of the bogie, as shown in the lower illustration. In order to prevent sideways movement strong vertical arms are mounted in rubber cushions on the truck towers, and are connected to the body by horizontal tie rods running between the coil springs. Both vertical and sideways motions of the car body are controlled by hydraulic shock absorbers, and hard lateral shocks are cushioned by rubber. A very important feature of the lateral springing is that it is located above the centre of gravity of the body so that forces such as centrifugal effect experienced on curves cause the body to roll or bank in the correct direction as a stable body, rather than rolling outward.

The bogie trucks themselves, upon which the suspension structure just described is mounted, are designed for light weight and durability, and in the experimental two-car unit illustrated above there are three trucks, two full end trucks and a separable articulated truck joining the two bodies. The end trucks have a wheelbase of 9 ft. and the articulating truck has one of 12 ft. The truck frames are of steel, arc-welded.



One of the end bogie trucks of the experimental two-car unit showing clearly the suspension arrangements. The illustrations to this article are reproduced by courtesy of the Atchison, Topeka and Santa Fé Railway.

More World Records for Major Gardner's M.G.

In May Major A. T. G. Gardner successfully attacked his own records for 1,100 c.c. cars in Class G, which he set up last November on the Frankfurt-Darmstadt Autobahn. He used the 1,100 c.c. M.G. car as in the previous efforts, but the engine had been boosted up to give approximately 200 b.h.p., and a better shaped windscreen and an air intake within the bodywork had been fitted. On this occasion the car flashed along the highway at a speed of 207.373 m.p.h., easily breaking the previous records for the kilometre, mile and five kilometres. The flying mile was covered in two directions at an average speed of 203.159 m.p.h., and the average for the flying kilometre was 203.748 m.p.h., compared with the previous records of 186.5 m.p.h. and 186.6 m.p.h. respectively. For five kilometres from a flying start Major Gardner attained an average speed of 197.539 m.p.h., compared with his previous record of 144.2 m.p.h.

After this splendid achievement the engine of the M.G. was rebored, and Major Gardner then made a second run in an attempt to set up new records for cars of 1,500 c.c. capacity, known as Class F. He covered a mile at 203.8 m.p.h., a kilometre at 204.2 m.p.h. and five kilometres at 200.6 m.p.h., thus breaking easily the previous records, which were 164 m.p.h., 148.2 m.p.h. and 139.5 m.p.h. in that order.

Shelsley Walsh Records

The record for the fastest climb of Shelsley Walsh Hill in the Midlands was broken twice at the June meeting of the Midland Automobile Club by Raymond Mays, driving his 2-litre E.R.A. The existing record was set up by Mays himself last September, and on his best run on this occasion he took 37.37 sec., almost half a second less than the previous fastest time. A. F. P. Fane in his 1½-litre Frazer Nash made a fine bid to capture the record, which he held for a time before Mays, but his best time was 38.82 sec.

A new ladies' record was set up at the same meeting by Miss Dorothy Stanley-Turner in a 1½-litre Alta, who reduced the record from 43.7 sec. set up by Mrs. Kay Petre to 43.40 sec.

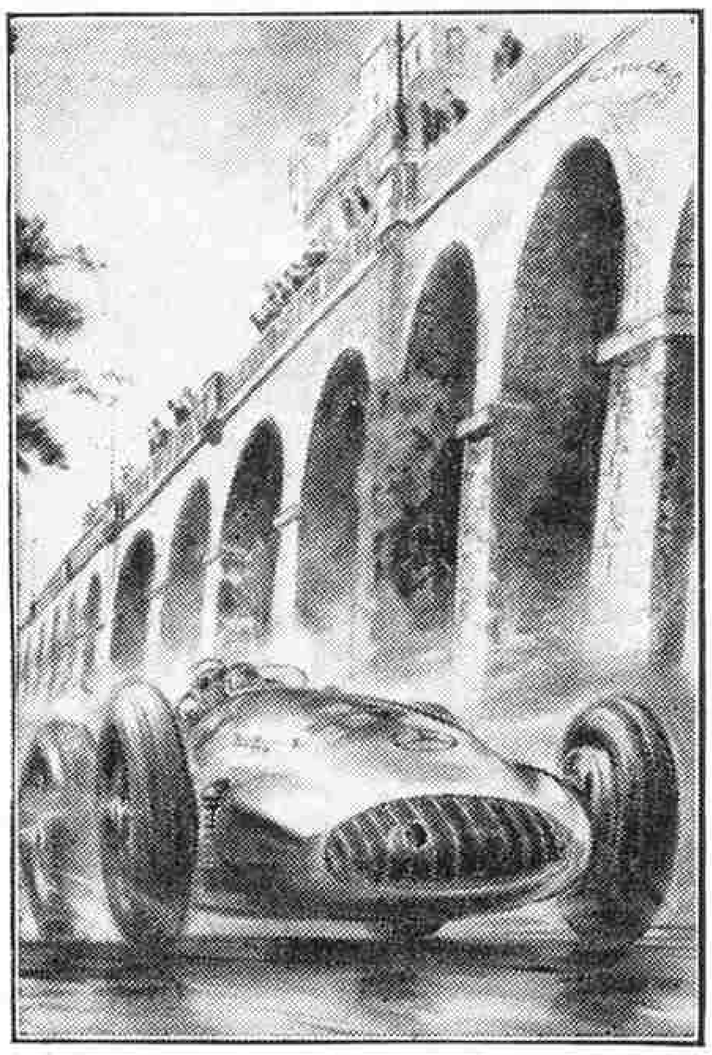
New Mercedes Racing Cars Make Their Mark

The new Mercedes 1½- and 3-litre racing cars have been doing exceptionally well in recent Continental events and both scored brilliant victories in their first public appearances. In the Pau Grand Prix the 3-litre models secured first and second places. The winning machine was driven at record speed by H. Lang, who towards the end took part in a thrilling duel with von Brauchitsch, also in a Mercedes, in a desperate effort to maintain his lead. During this exciting finish Brauchitsch completed one lap of the 2.7 kilometre course in 1 min. 46⅕ sec., a record for the course. Lang's average speed for the entire race of 100 laps was 54.99 m.p.h. A 4½-litre Darracq driven by Etancelin was third.

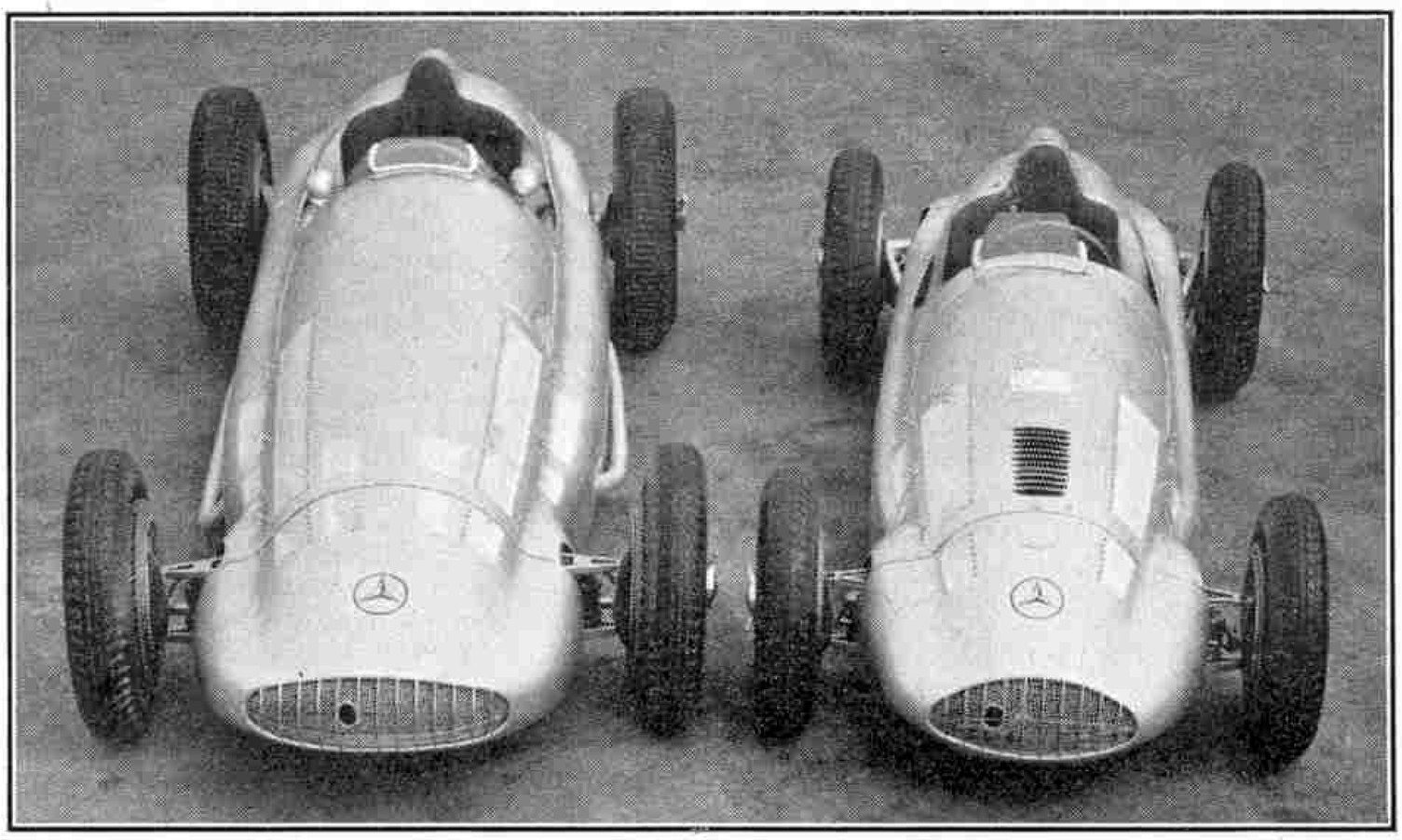
The Mercedes 1½-litre car was successful in the Tripoli Grand Prix, which is generally regarded as the most important sporting event of the Italian racing season. With this latest win Mercedes have now been victorious in this race for three seasons in succession, and it is interesting to note that on each occasion the honour of driving the winning car has fallen to H. Lang.

This year the race was limited to 1½-litre cars. There were 30 entrants, all of which were Italian with the exception of the two new 1½-litre Mercedes-Benz, which were making their first public appearance.

Lang took the lead right from the start and held it for the full distance of 245 miles. In the early stages he was closely followed by Farina's 1½-litre Alfa-Romeo, Caracciola's Mercedes, and Biondetti and Severi, also with Alfa-Romeos. Farina, however, soon dropped out and the others were then too far behind to prevent Lang and Caracciola scoring an easy victory over the Italians.



A Mercedes-Benz at speed during the Pau Grand Prix, the first Grand Prix race of 1939. Photograph by courtesy of Daimler-Benz A.G., Stuttgart.

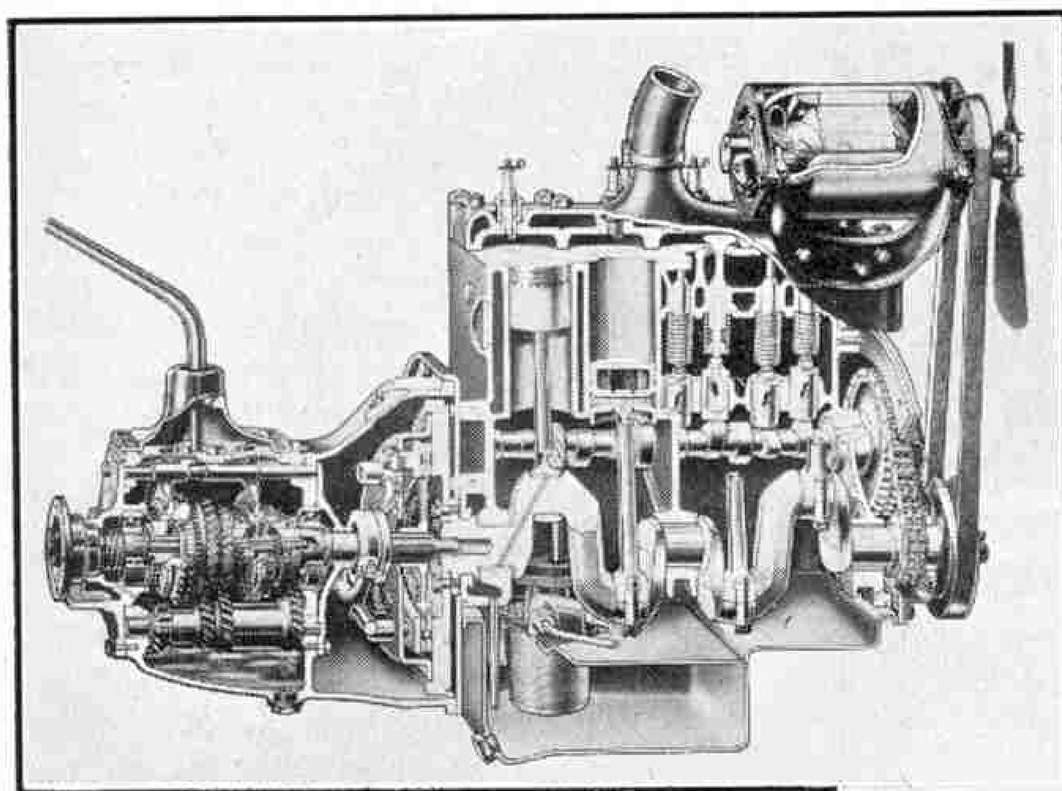


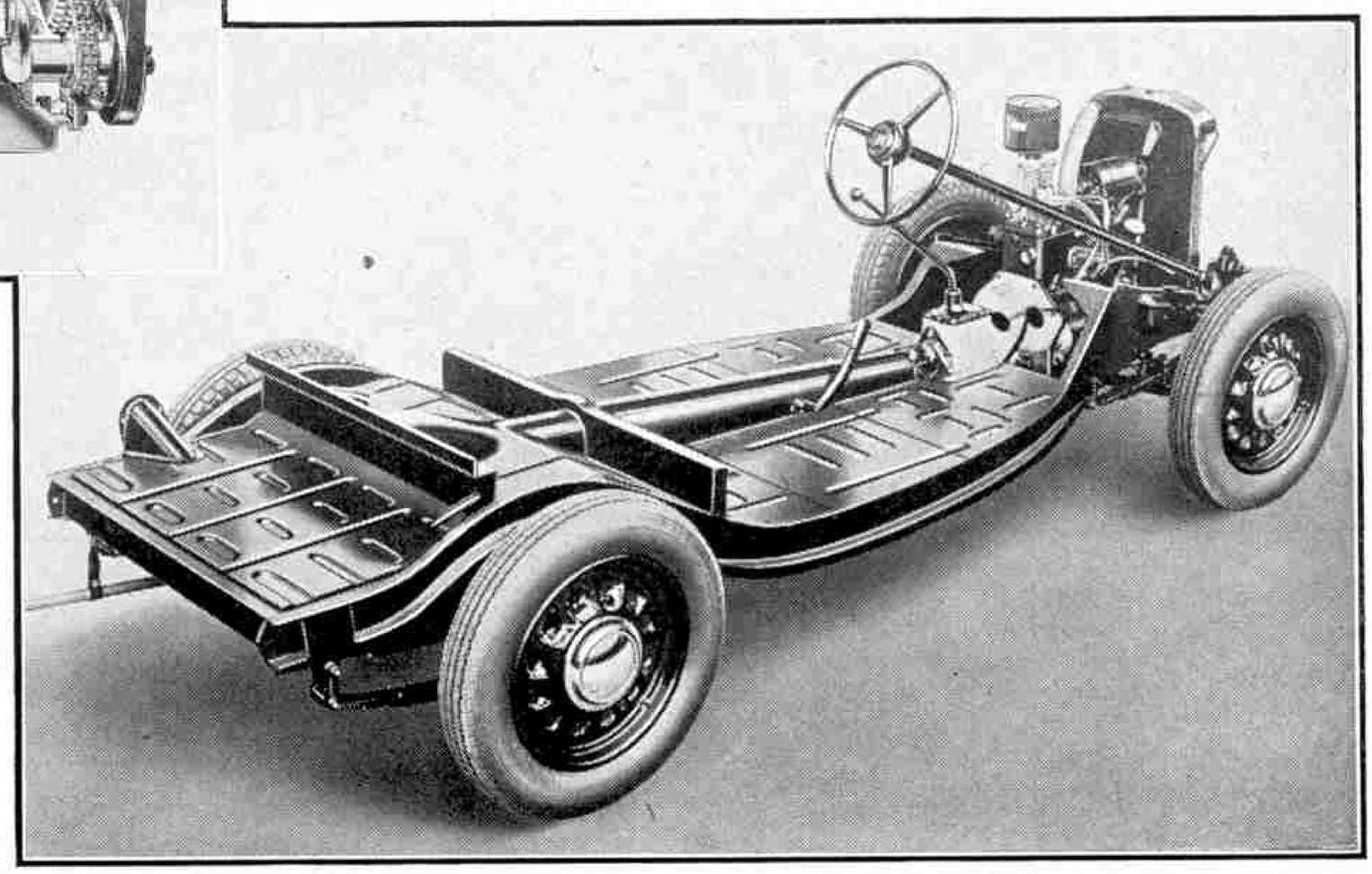
The Mercedes-Benz racing cars for 1939. On the left is the 3-litre supercharged Grand Prix model, and on the right is a 1½-litre supercharged machine. Photograph by courtesy of Daimler-Benz A.G., Stuttgart.

Quick Work!

A Manchester business firm telephoned the local office of the R.A.C. recently asking them to endeavour to stop a car in which one of the firm's directors was travelling to the South of England, and to deliver an urgent message to him. The driver's destination and particulars of the make, colour, horsepower and registration number of the car were supplied.

The R.A.C. officials estimated the approximate position of the car, and immediately telephoned to the Club's Birmingham Office, giving the available information and requesting that all R.A.C. Guides in the Midlands area should be instructed to keep watch for the car and to deliver the message. Just before 3.30 p.m., less than a quarter of an hour after the message had been received by the R.A.C. in Manchester, the car was traced and the message delivered. This incident forms a typical example of R.A.C. service.





A cross sectional view of the new Austin "Eight" engine, showing the single plate clutch and synchromesh gear-box. On the right is shown the welded pressed steel chassis. Photographs reproduced by the courtesy of The Austin Motor Co. Ltd.

The Austin "Eight" Motor Car

Few motor vehicles of recent years have attracted so much attention as the new Austin "Eight." It came as a development of the popular Austin "Seven," which had been in production for 17 years with very little alteration, but also represented a complete departure, at any rate in appearance, from the former models produced at the Austin Factory.

The new Austin is very modern in design and at the same time is particularly handsome. Its frontal appearance is changed entirely from that of previous Austin models, for the bonnet is of the "alligator" type, with fixed side panels and a one piece top pivoting on a hinge fixed to the scuttle. The body consists of pressed steel, an outstanding feature of the vehicle being the frame, which takes the form of a platform reinforced by side members. The body shell fits outside these frame members and together with the side members of the chassis, converts the whole into a box-like section when assembled. Light weight combined with great strength is the result.

The engine of the "Eight" is a four-cylinder side-valve unit, and its general lines follow very largely those of the engine used in the Austin "Big Seven," which was introduced a year or two ago. A mechanical pump supplies the carburetter with fuel drawn from a tank at the rear, the pump being operated by an eccentric on the engine camshaft. There is also a hand lever for operating the pump when starting up. A single plate clutch is used, but it is fitted with buffer springs that minimise the shock on engagement, and the pedal has been given a considerable travel, which makes it easy to operate. This is a very important point, for on some small cars the clutch is very fierce and requires considerable skill to operate smoothly.

The gear-box is of fairly simple construction, with four forward speeds and a reverse. The second, third and top gears are of the synchromesh type and the lever is designed to give very easy engagement to every gear. Another feature is that the crown wheel and differential in the final drive are mounted complete in the axle housing so as to form a self-contained unit into which the axle shafts are inserted. This type of axle possesses great strength, and also is quite easy to adjust and maintain.

T. R. Robinson.

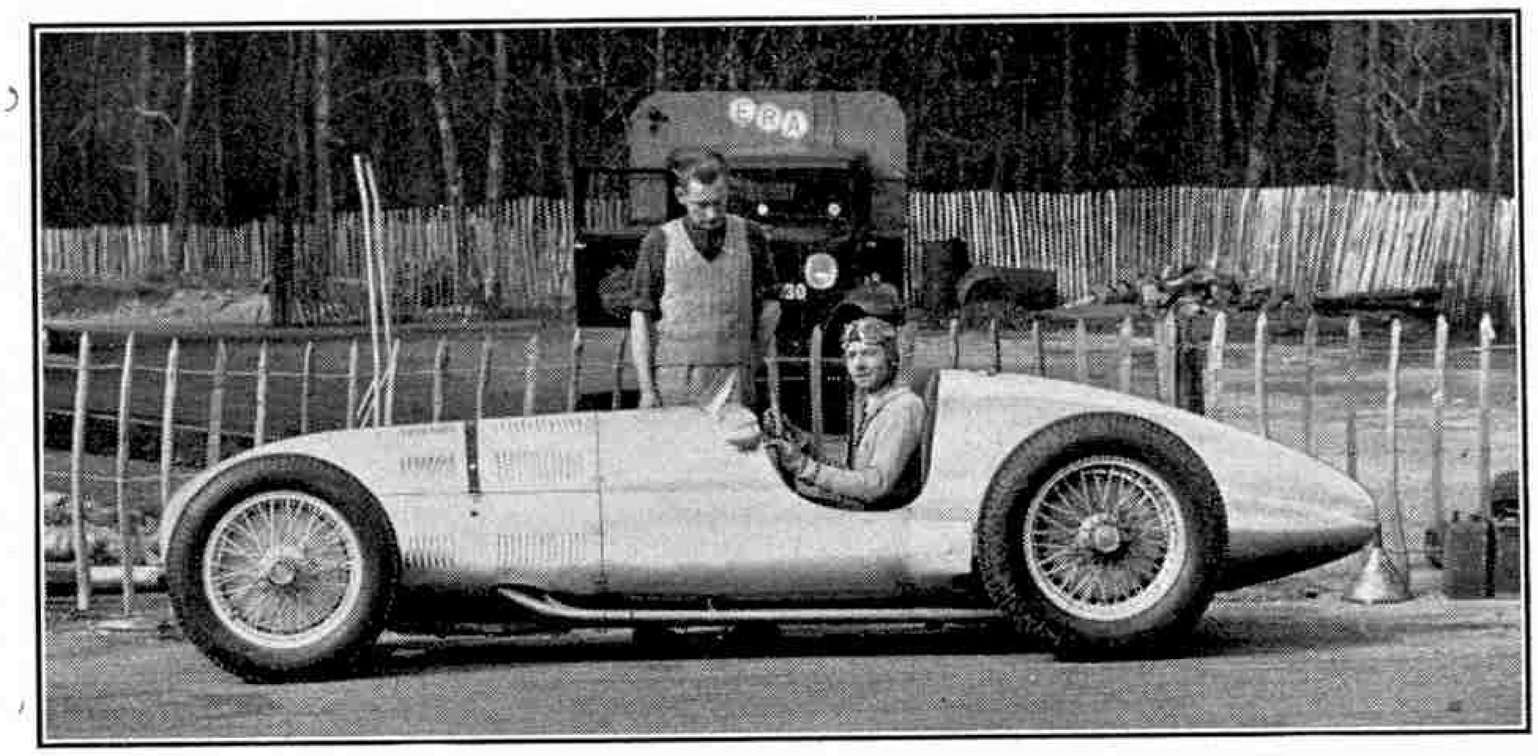
The New 1½-litre E.R.A.

One of the main items of interest so far as British racing is concerned this season is the appearance of new 1½-litre E.R.A. racers that have been constructed at Bourne. An illustration of one of these cars appears on this page, and readers who are familiar with the earlier models will notice that the new type is much more fully streamlined. The chassis frame is of tubular construction and combines great depth and rigidity with lightness. The six-cylinder engine has a capacity of 1,487 c.c., compared with the 1,488 c.c. of the forerunners.

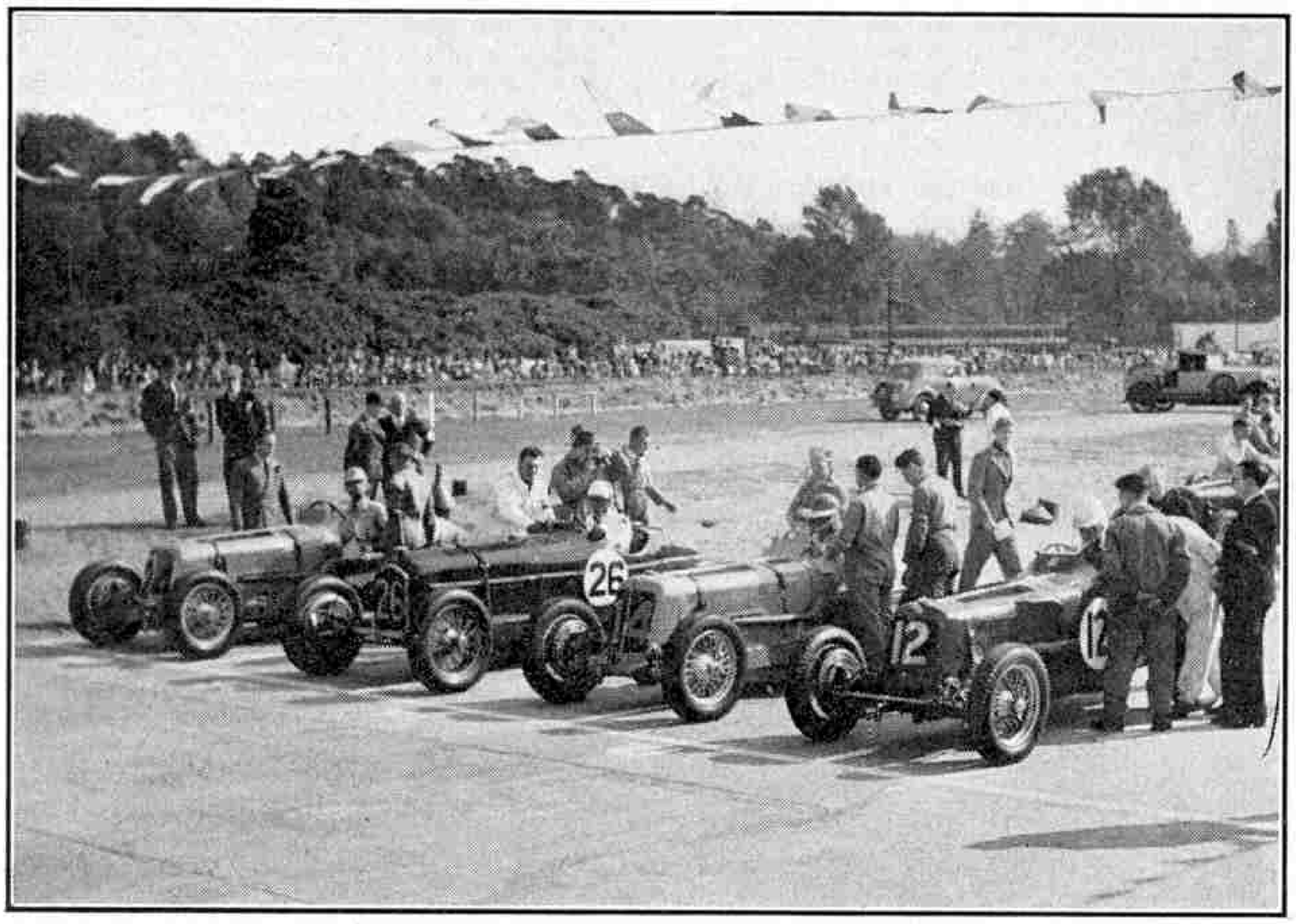
The general design is basically the same as that of last year's cars, but a Zoller blower of different size is used and the overhead valves are push-rod operated by camshafts on each side of the cylinder block, carried high up. The complete car weighs 13½ cwt. Behind the clutch there is a system of gearing that takes the drive a few inches vertically downwards, to give a low line and low driving position. The drive is then taken up again at the gear-box, which is a four-speed synchromesh unit and transmits direct to the back axle.

It was anticipated that machines of the new type would take part in the International Trophy Race of the Junior Car Club, at Brooklands, but although one car was actually put through practice runs on the track by Raymond Mays, it was announced afterwards that owing to the unsatisfactory performance of the engine after the fitting of the regulation Brooklands silencers it would not be possible to prepare the car properly in time for the Trophy Race. On the day of the race, however, spectators had an opportunity of viewing the car in the paddock, where it attracted great attention.

Then came the announcement that Mr. Humphrey Cook, the sponsor and patron of English Racing Automobiles Ltd., the builders of the E.R.A., had decided to close down the firm. The news was a great shock to motor racing enthusiasts in this country, particularly in view of the keen interest with which the new E.R.A. racers have been awaited. Efforts are being made to come to some arrangement that will save the E.R.A. for the country, but nothing had been definitely decided at the time of writing. Meanwhile Raymond Mays, who has driven many E.R.A.'s to victory, has bought a 1938 type E.R.A. and is running it independently this season.



The new E.R.A. racing car. Photograph by courtesy of English Racing Automobiles Ltd., Bourne, Lincs.



Nickel steel was used for a number of important components in the three E.R.A. cars seen on the starting line for the B.R.D.C. race at Brooklands last September.

Story of Nickel

II. Everyday Uses of the Metal

LAST month we described how nickel ore is mined and treated in readiness for the extraction of the metal. The final product of this treatment is impure nickel oxide, obtained by heating to 650 to 700 deg. C. in a rotary calciner. This material is passed to five reducers, where it is brought into contact with water gas, the hydrogen in which combines with the oxygen in the metallic oxides. After passing through the reducer it goes through a series of six volatilisers, in which carbon monoxide combines with some of the nickel to form gaseous nickel carbonyl, and further reductions and volatilisations follow before the residue is discharged. The temperature in the reducers is maintained at 350 to 400 deg. C. by a hot air circulating system; in the volatilisers heat is evolved and the temperature is kept at about 60 deg. C.

In the consequent process of decomposition the nickel carbonyl comes into contact with nickel pellets heated to a temperature of about 180 deg. C.; this causes the dissociation of the carbonyl, nickel being deposited on the pellets and carbon monoxide being liberated. The decomposer is filled with nickel pellets before being put in circuit. It holds about nine tons, and the pellets are kept moving by an arrangement that draws them from the bottom of the decomposer and returns them to the top. The deposition of nickel on the pellets naturally increases their size and any excess at the top of the decomposer overflows into a box at the base and represents the "make" of the particular decomposer.

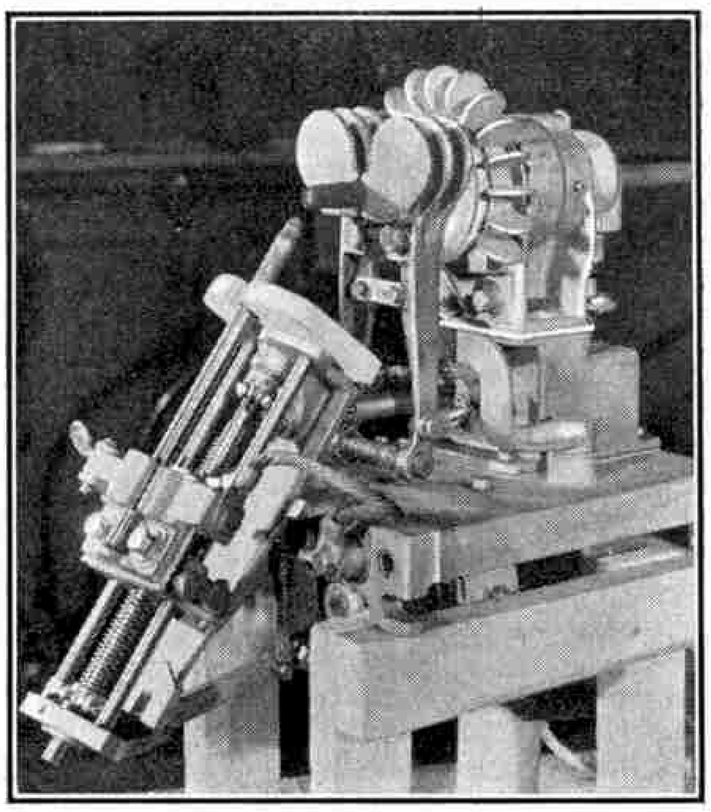
The nickel pellets as they overflow from the top of the decomposer are even yet not quite ready for market, since they vary in size from a small pin head upward to $\frac{5}{16}$ in. in diameter. They are therefore screened, and the smaller ones are returned to the decomposers to "grow" by the deposition of more nickel on them.

The past 30 years have seen great development of the use of nickel and its alloys in almost every industry, and this article can only give an impression of the wide variety of nickel alloys and the properties that have led to their many applications. Nickel starts off its daily work by helping the alarm clock, which probably has a nickel-plated case. If it is chromium-plated, there is an undercoat of nickel applied to prevent rust going through the chromium plating, and to ensure that the chromium plating will not flake off. Inside, a special nickel-iron alloy that undergoes practically no expansion or contraction with change in temperature is used for the balance wheel to help to keep good time.

Soap is produced in large kettles lined with pure nickel. The taps are probably made of nickel-silver, an alloy of nickel, copper and zinc that is very hard wearing. The clothes you wear were laundered in washing machines made of Monel, a nickel-copper alloy used wherever cleanliness and resistance to corrosion are required, and the cloth from which they were made was dyed in tanks made of the same material. For parts of the fast working machines used to make your shoes it was necessary to use cast iron to which nickel had been added to improve its wearing quality and to toughen it.

While breakfast is being prepared, take a look round the pantry at the many well-known foodstuffs. Most of these are produced in equipment made of nickel or Monel. Even the fish was probably brought from fishing ground to port in the nickel-lined hold of a trawler.

Perhaps it is a little chilly and you switch on the electric fire. As the elements begin to redden, you may remember that for most of them a nickel-chromium alloy is used, because this alloy is noted for its long service at high temperatures. If the telephone rings it may again remind you how nickel serves industry, for nickel-iron alloys are used for loading coils, nickel aluminium steel is employed for magnets, and nickel-silver springs form part of the automatic selector devices.

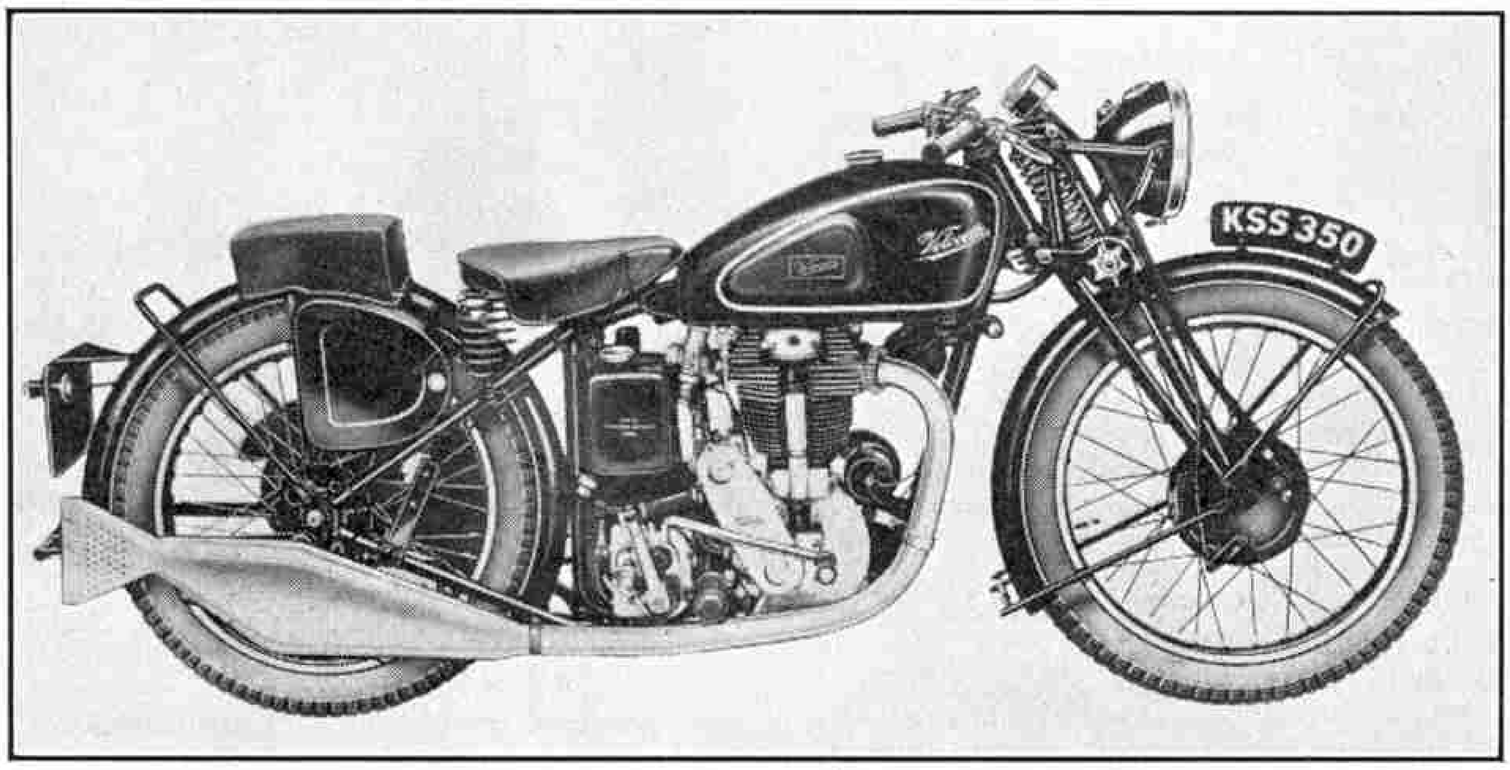


Carbon striking equipment in a Mole-Richardson arc spot lamp. The contact brushes are made from pure cast nickel.

Your newspaper was printed on machines that have to work continuously at high speeds for many hours. The gears for these machines must be very strong and hard-wearing, and for this type of service heat-treatable nickel cast iron is used. Cast iron to which nickel has been added can be hardened by heating and quenching as for steels. In this way it is possible to obtain heat-treated nickel cast iron with a tensile strength of 25 tons per sq. in. whereas the strength of ordinary cast iron is only about 12 tons per sq. in. Another use of nickel in the printing industry is for coating the plates used on printing machines.

Wherever you go and whatever you do during the day you will find nickel alloys. If you travel by car you will again notice brightly polished accessories, which may be plated with nickel or chromium over nickel. In the engine and transmission nickel alloy steels are specified for parts that are highly stressed and subject to wear, including crankshafts, camshafts, valves, differential gears, rear axle gears and so on, and cast iron containing nickel is used for such parts as cylinder blocks and liners, brake drums and piston rings, where strength and resistance to wear are required. Aluminium alloys containing nickel combine lightness with strength, and are therefore used for moving parts, such as pistons, where a reduction in weight leads to higher efficiency. The uses of nickel alloys in lorries and buses is even more extensive, since these materials are especially suitable for this type of service, which involves higher stresses and severe wear. On trolley buses, which are rapidly replacing tramcars in many places, a specially rugged type of nickel-alkaline storage battery is fitted for use in emergency.

The railways are very large users of nickel alloys. Such famous locomotives as those of the L.M.S. "Coronation" class employ nickel steels for the boilers and for the connecting and coupling rods. Here the chief advantage of using nickel alloy steels is that their extra strength permits a safe reduction in weight. For fire-box and throat plate stays, where strength and resistance to the attack of the combustion gases are required, Monel is used. High strength nickel alloy steels have also been used for the reciprocating components on the latest L.N.E.R. locomotives. The Southern Railway have modified one of their standard class of locomotive to provide a bigger boiler and in order to save weight this is made of two per cent. nickel steel, while the connecting rods, coupling rods and valve gear are of nickel-chromium-molybdenum steel.

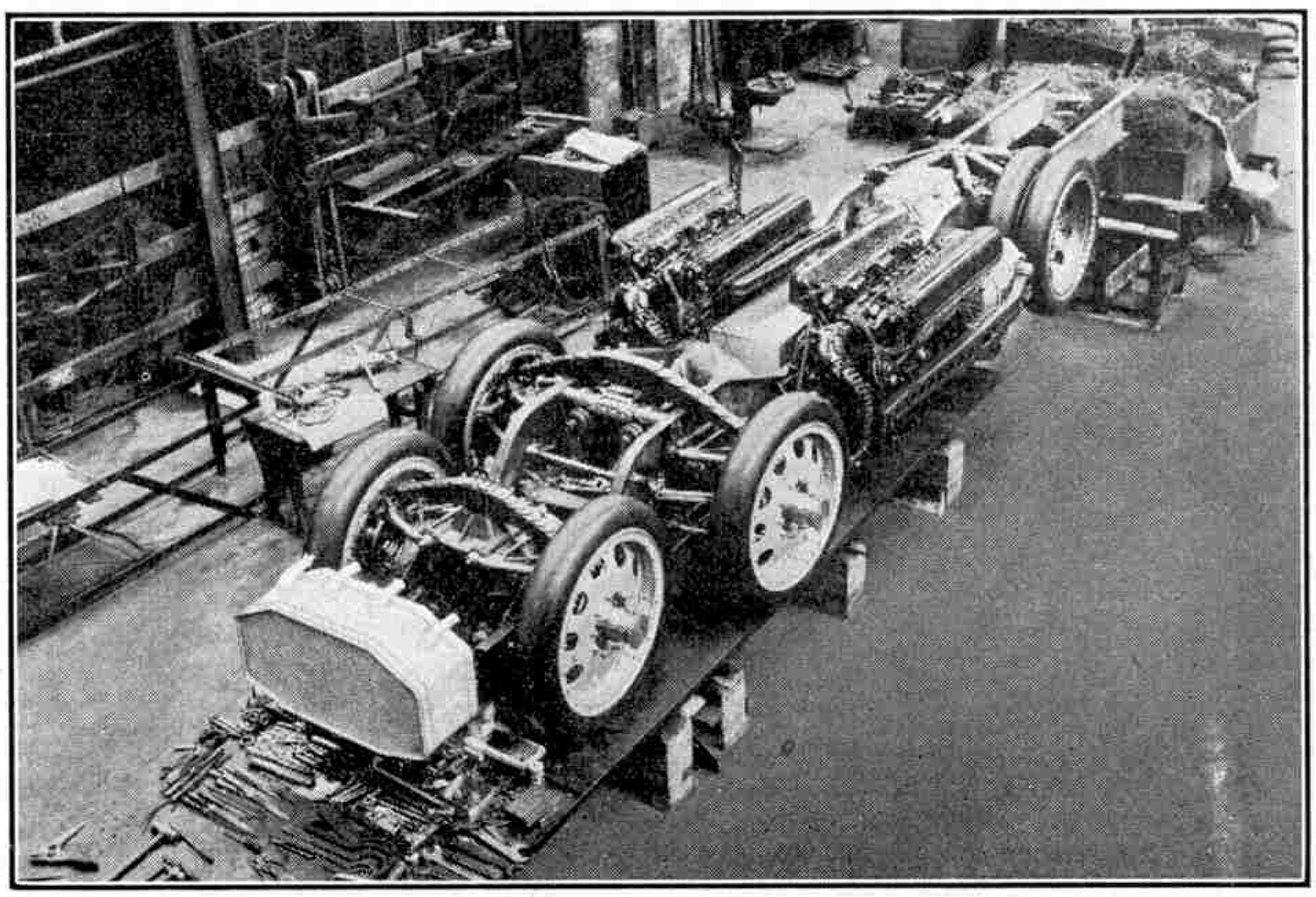


Nickel alloys are largely used in motor cycle construction. This Velocette employs nickel alloys for the gear-box gears, connecting rods, gudgeon pins, hub spindles and fly-wheel shafts.

In aeroplane construction nickel alloy steels are used for highly stressed engine parts, while light aluminium alloys containing nickel are invaluable in reducing weight. Stainless steel, which is usually a chromium-nickel alloy steel, is employed for important fittings and structural components, especially in seaplanes, while a special alloy of nickel, chromium and iron is used for the exhaust manifolds, radiators and cabin heaters.

When you visit a restaurant, you may not see any nickel alloys other than the electroplated nickel silver tableware, but they are there all the same. Equipment in restaurant kitchens must be clean and durable, and therefore is made of stainless steel or of Monel. Utensils made of nickel and coated on the outside with copper are used in preparing the food, while the stove tops are frequently made of heat-resisting nickel cast iron.

In motor boats Monel is used for propeller shafts, because its great strength provides security against breakage or bending under the terrific stresses set up. In large ships, Monel is used for the turbine blading, and for valves in the steam supply lines, while the condenser tubes are made of nickel-copper. In bridge construction nickel alloy steels are often specified for nuts and bolts, and generally nickel alloys are used wherever reliability is needed.



"Thunderbolt," Captain Eyston's record-breaking car, in course of construction at the works of Bean Industries Ltd. Nickel steel and nickel-aluminium alloys were used for many of the vital parts.

The D.H. "Flamingo"

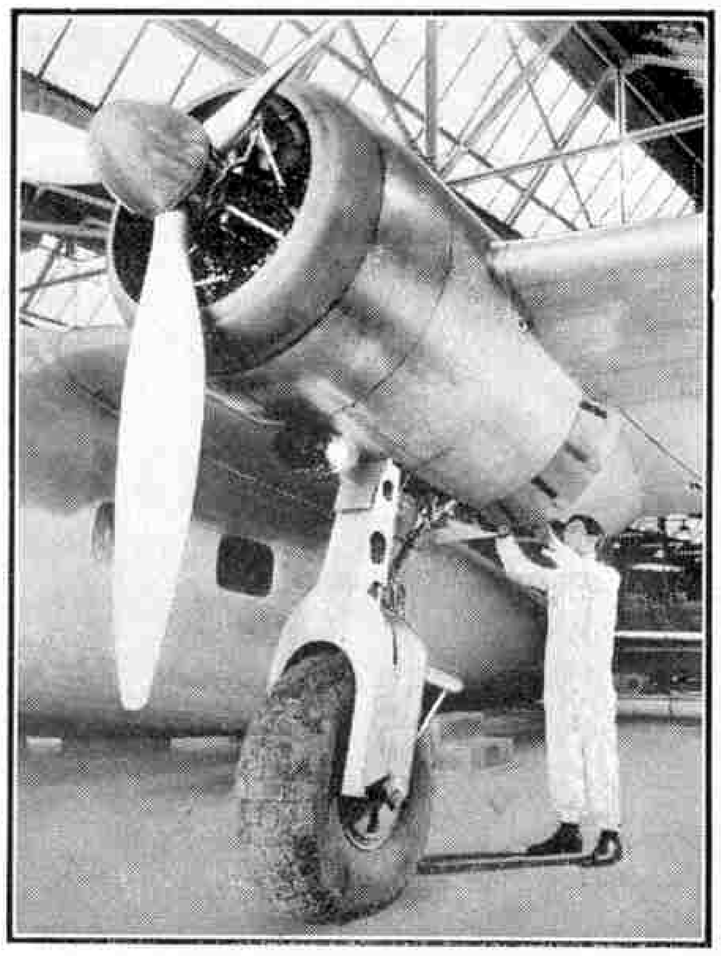
A Fast Passenger Liner

SINCE the article on test flying the de Havilland "Flamingo" twin-engined monoplane was published in the March 1939 "*M.M.*" the manufacturer's tests of this new aircraft have been completed and have proved highly satisfactory. The "Flamingo" has shown that it can attain a top speed of 245 m.p.h., which is higher than that of any earlier type produced by the company, and with full load it can take off in 15 sec. after a run of 250 yds. It can climb to 800 ft. within a mile and 1,560 ft. within two miles of the start of its run.

The capabilities of this aeroplane on one engine are even more striking. Within 19 sec. from rest, when it has traversed only 475 yds., it is flying at sufficient speed to climb safely on the take-off power of only one of its engines. This means that in normal conditions at a main-line airport the fully loaded "Flamingo" could be landed safely within the length of the runway if one engine broke down within 19 sec. after the take-off. If the engine should fail later the aeroplane could safely continue to climb at the rate of 270 ft. to 370 ft. per min. (according to which engine failed), with an airspeed of 100 m.p.h., on the power of the other engine alone.

Official recognition of the merits of this new de Havilland monoplane has been prompt, and the Air Ministry have ordered a considerable number of these aircraft for the R.A.F., in which they will be used for the transport of troops and equipment. A "Flamingo" has also been ordered for the King's Flight, for the use of His Majesty and of the Royal household. It will be identical in all major respects with the standard aeroplane, but will be specially furnished and equipped. The Air Ministry have also announced that two "Flamingos" are to be acquired for the use of members of the Air Council. At present two 4-engined D.H. 86B air liners are employed by the Council for their administrative travels, and D.H. "Dragon Rapides" have also been extensively used for this duty.

The "Flamingo" is not a special-purpose aircraft, but a standard medium-capacity air liner about half the size of the 13-ton D.H. "Albatross." Normally it carries 12 passengers and a crew of three, baggage, freight and mail, but alternative internal arrangements, including changes in the luggage space, provide for 14, 17, or 20 passengers. The breadth and loftiness of the cabin make it ideal for conversion into a sleeper coach. For instance, it can be equipped with 12 armchairs by day and eight sprung sleeping berths at night, the berths arranged longitudinally in a cabin divided into a forward and a rear compartment, each with two upper and two lower berths.



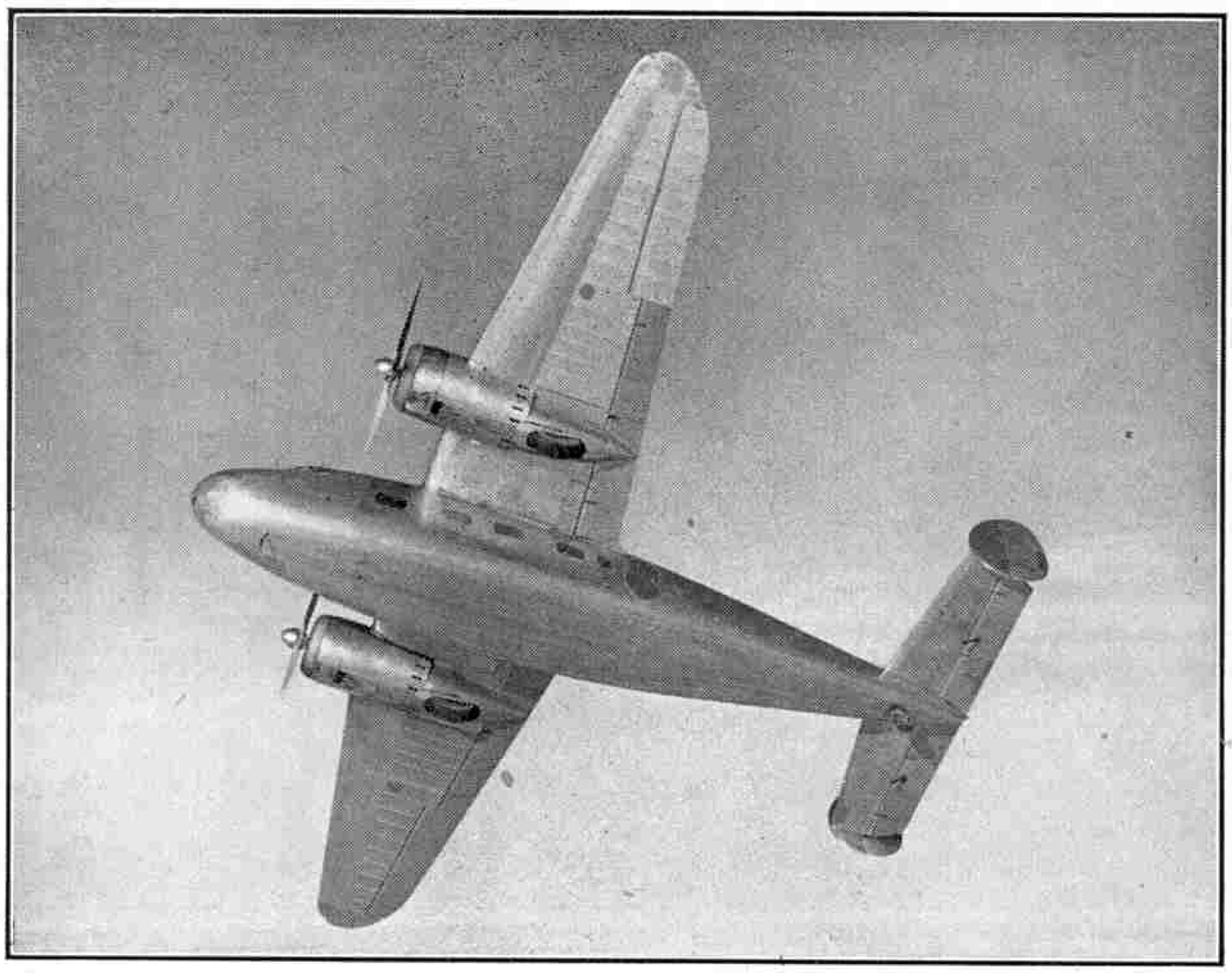
One of the sturdy undercarriage legs of the "Flamingo." Photograph by courtesy of de Havilland Aircraft Co. Ltd.

The high-wing form of construction was chosen for the "Flamingo," as by merging the wing into the top of the fuselage a wide and lofty cabin was obtained that provides plenty of room and greatly helps loading by centring the payload near to the centre of gravity. The high wing also makes possible a low doorway to the passenger accommodation. In the "Flamingo" this doorway is only 27 in. above ground level and is reached by a couple of low steps instead of the familiar airport stairway. An advantage of the high-wing layout that appeals to the air traveller is the perfect panoramic view available from every one of the wide cabin windows, and the welcome shade that the high wing provides when the aeroplane is flying in the tropical sunshine. The cabin is luxuriously furnished and each of its deep upholstered armchairs can be inclined instantly at the touch of a small lever to any angle desired. Light individual tables fit on to the arms of the chairs for meals, etc.

The pilots' cabin, together with the two freight holds below its floor, is built as a separate unit, and is equipped before being mounted to form the front portion of the fuselage. It is large enough to contain a radio operator and his apparatus, in addition to the two pilots. The control column extends horizontally through the instrument board, giving greater freedom and comfort to the pilots, and a better view of the instruments. The corner windows above the wide, shatterproof windscreen give a wide-angle upward vision, and the sliding side windows do not admit any draught however fast or slow the aeroplane may be flying. An interesting fact is that the instruments work in temperature-controlled air, and they are provided with a special form of controlled diffused lighting for night flying.

The controls for the wing flaps, automatic pilot, and retractable undercarriage are hydraulic and are mounted centrally below the engine controls. The undercarriage can be retracted in 10 sec. and lowered in 8 sec. For each of the two chassis units a green light in the control cabin indicates that it is down and locked, and a red light that it is being raised or lowered. A warning horn sounds if either engine is throttled down while either half of the undercarriage is not down and locked.

The "Flamingo" has two 890 h.p. Bristol "Perseus" XIIC engines, a silent sleeve-valve type noted for smooth running. They are mounted in the leading edge of the wing, below its centre line and well out from the body of the aeroplane, and the rear portions of their nacelles are recessed to accommodate the undercarriage when it is retracted. The engines drive D.H. controllable-pitch airscrews.



An attractive view of the D.H. "Flamingo" in the air. Photograph by courtesy of "The Aeroplane."

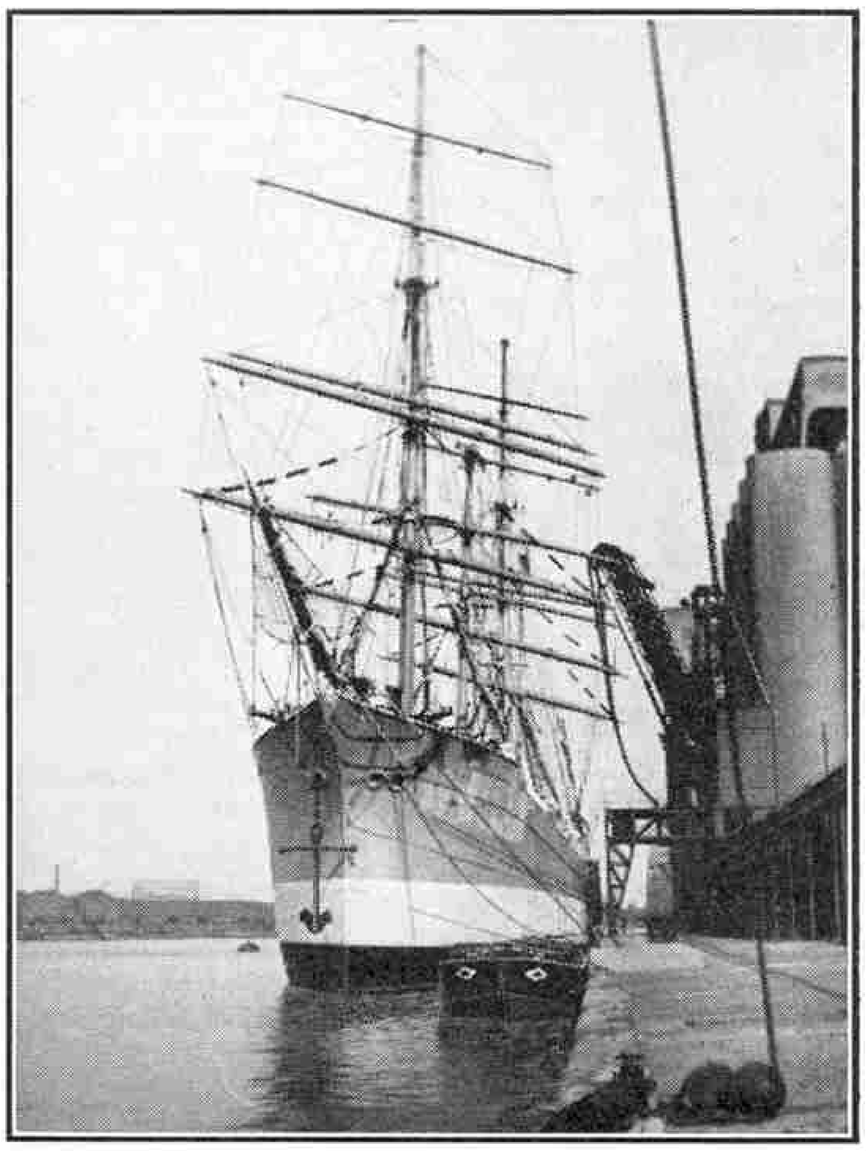
The Training Barque *"Abraham Rydberg"*

Story of a Famous Sailing Vessel

By Richard M. Cookson

THE Swedish four-mast training barque *"Abraham Rydberg,"* homeward bound from South Australia, will soon be making her landfall at Falmouth. On arrival there a party of British cadets who have made the round voyage in square rig will have completed a red letter year in their lives.

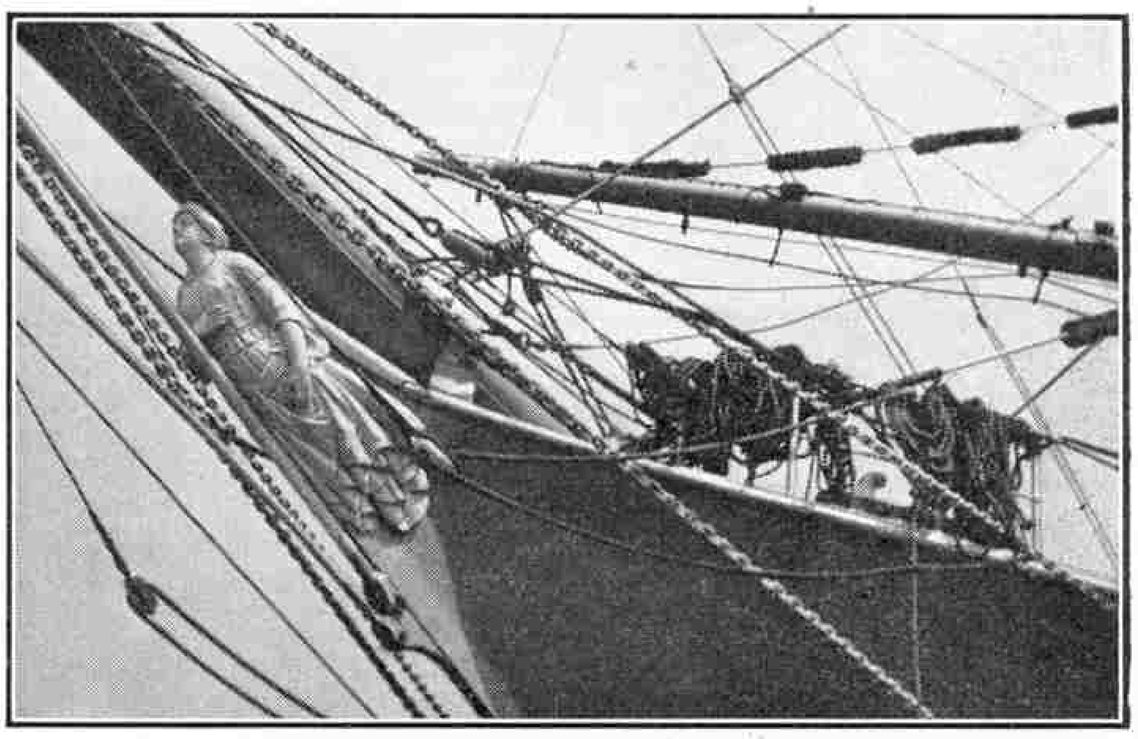
This ship, built by C. Connel of Port Glasgow in 1892 as *"Hawaiian Isles,"* has a length of 270 ft. and a beam of 43.1 ft. and her tonnage is 2,345. She was employed in general trading until early in the present century, when she was purchased by The Alaska Packers Association of San Francisco and renamed *"Star of Greenland,"* becoming a unit of their famous "Star" fleet. Until 1929 she was engaged in the salmon packing industry, carrying men and stores outward to the packing factories of the company and returning with cases of salmon. While thus employed she was rigged with skysail yards on the fore, main and mizzen masts, and retained the characteristic deck layout of the period, with her short poop, foc'sle head, and houses on deck. In 1929 she was sold for a record price to the Abraham Rydberg Foundation of Gothenburg to be used as a sail training vessel. This organisation was formed to give first-class training at sea to Swedish boys, and was named after Abraham Rydberg, a Stockholm merchant who left a large part of his fortune for this purpose. Some of this bequest took the form of land that has since become valuable property in Stockholm.



The Swedish barque, "Abraham Rydberg" in Millwall Dock, London, in 1936. This was after her collision with the "Koranton" in the Channel, and the damage to her mainmast can be seen.

On the voyage to Gothenburg for delivery the ship loaded the first of many subsequent cargoes of grain, and ran from San Francisco to Dublin in 124 days. After arrival in Sweden she was thoroughly overhauled and reconditioned, having new decks, a long poop and a "bridge" fitted at considerable cost in Gothenburg. She now carries double topsails and single topgallant yards and royals only, the day of the skysail yard being long past. Since that time she has traded regularly to Spencer Gulf, South Australia, going out in ballast and returning with bagged wheat. A most unusual feature of this ship is the fact that she requires no ballast to maintain her stability, standing up after discharge in dock quite safely with swept holds, although of course she requires stiffening to proceed under sail. Truly a different ship from *"Cutty Sark"* and her consorts, which had to be watched carefully when discharging cargo.

The career of *"Abraham Rydberg"* has been comparatively uneventful as sailing ships go. Indeed, the only time when she was in real danger was in 1936, when she collided in the Channel with the Newcastle steamer *"Koranton,"* the impact causing her considerable damage aloft and along her port side.



The figurehead of the "Abraham Rydberg."

When the vessel was first commissioned as a training ship, Capt. Tamm was appointed to command her. Four years ago he left the ship, where he was so popular, and took over the job of Shore Superintendent. He was followed by Capt. Haalström, who had the ship until 1937, when her present commander, Capt. Malmberg, took over. The Chief Officer is Mr. Harold Hult, late chief of the unlucky *"C. B. Pedersen."* Mr. Hult has had a wide experience in sail, having served many years ago as A.B. on the famous *"Lancing,"* under the Norwegian flag. He has sacrificed many opportunities in steam, and is a firm believer in the quality and efficiency of the sail-trained seaman.

Cadets for training must be between 16 and 20 years of age. The premium for the voyage is £40, and cadets supply their own kit and bedding and pay their fare to wherever the ship sails from, generally Gothenburg. They join in August or September, and receive training in port for about a month before the ship sails. The life is not easy, as the cadets work the ship unaided, under the officers, but the watches are doubled, only half a watch being on deck at one time. The other half watch are available if wanted, but a call for "All hands" is very rare. While "idle" this half watch are given instruction in seamanship, navigation, etc.

With comfortable accommodation, good food and first-class officers, the life, although hard, is never at any time the back-breaking endless drudgery that characterised so many of the under-manned ships of the last century. The managing owners exercise great care in the appointments of officers for the ship, the bo'sun, carpenter, sailmaker and donkeyman being fine old sailors who have had experience in British ships and are masters of their work. On "signing off" the voyage entitles the cadets to a "Sail" endorsement to their Officer's Certificates when, later, they qualify.

Vacancies existed last year for a dozen British boys and were eagerly snapped up. Cadet T. H. Morgan, formerly of H.M.S. *"Worcester,"* Greenhithe, was awarded the Swedish Government Gold Medal for the best cadet of the year.

The *"Abraham Rydberg"* invariably comes home by the way of the Cape of Good Hope, whereas most of the Erikson fleet of sailing ships in the same trade choose the shorter Cape Horn route, and it is customary for the vessel to call at Madeira or Capetown. These considerations affect her times in comparison with the sailers that come homeward direct. Her most recent homeward trip occupied 120 days, and her last outward trip took 108 days, 86 days from Madeira.

Such a passage in sail as that of the *"Abraham Rydberg"* offers every facility for the training of boys, and a thorough knowledge of ship handling under all conditions is afforded. No British square rigger remains to offer such training, but here, in this Swedish sailer, is the opportunity, perhaps the last, for British boys to obtain once again that close daily contact with the sea from the deck of a deep water sailing ship.

RAILWAY NEWS

Making Light Work of Shap

On the L.M.S. West Coast Route to Scotland the gradients up Shap Fell and Beattock have few of their erstwhile terrors left for enginemen of the powerful locomotives now in use, even though greatly accelerated schedules are in force. The 60 m.p.h. start-to-stop timing of *"The Royal Scot"* over the 299.1 miles from Euston to Carlisle, which came into operation on 1st May, requires the 31.4 miles from passing Carnforth to passing Shap Summit to be covered in 39 minutes with a maximum load of 420 tons. This is a performance that would have been regarded as being in the "miracle" class for a single engine not so long ago, for a difference in altitude of something like 900 ft. has to be overcome in this relatively short distance.

A recent run by this train timed by Mr. D. S. Barrie shows that even this new schedule leaves a fair margin for time recovery. The load was 13 vehicles, 399 tons tare, hauled by the streamlined 4–6–2 locomotive No. 6228 *"Duchess of Rutland,"* manned by Driver H. P. Smith and Fireman R. Copeland, of Camden. Passing Carnforth a few minutes late, *"Duchess of Rutland"* saved two out of the scheduled 14 minutes in the first 12.8 miles to Oxenholme; then another minute was gained on the 13.1 miles thence to Tebay, for which 16 min. are allowed, and yet another minute was picked up on the final 5.5 miles, allowed 9 min., from Tebay to Shap Summit! Thus a total of four minutes was gained "up the hill," the 31.4 miles, Carnforth to Summit, being run in 34 min. 54 sec. at an average speed of 53.9 m.p.h. On the stiff climb from Oxenholme to Grayrigg, where the ruling gradient is 1 in 104, speed fell from 50 to 43 m.p.h.; the easy stretch from Grayrigg to Tebay raised the rate to 67 m.p.h., and on the final 4¼ miles of 1 in 75 the minimum speed was 31½ m.p.h.

A giant American freight locomotive constructed by the Baldwin Locomotive Works. No. 5004 belongs to the Atchison, Topeka and Santa Fé Railroad, by courtesy of whom this photograph is reproduced.

L.M.S. Locomotive Notes

The 20 new streamlined 4–6–2s being built at Crewe will be named after cities on the L.M.S. system. The first engine will be No. 6235 *"City of Birmingham,"* followed by Nos. 6236 *"City of Bradford,"* 6237 *"City of Bristol,"* 6238 *"City of Carlisle,"* 6239 *"City of Chester,"* 6240 *"City of Coventry,"* 6241 *"City of Edinburgh,"* 6242 *"City of Glasgow,"* 6243 *"City of Lancaster,"* 6244 *"City of Leeds,"* 6245 *"City of Leicester,"* 6246 *"City of Lichfield,"* 6247 *"City of Liverpool,"* 6248 *"City of London,"* 6249 *"City of Manchester,"* 6250 *"City of Nottingham,"* 6251 *"City of St. Albans,"* 6252 *"City of Salford,"* 6253 *"City of Sheffield,"* 6254 *"City of Stoke-on-Trent."*

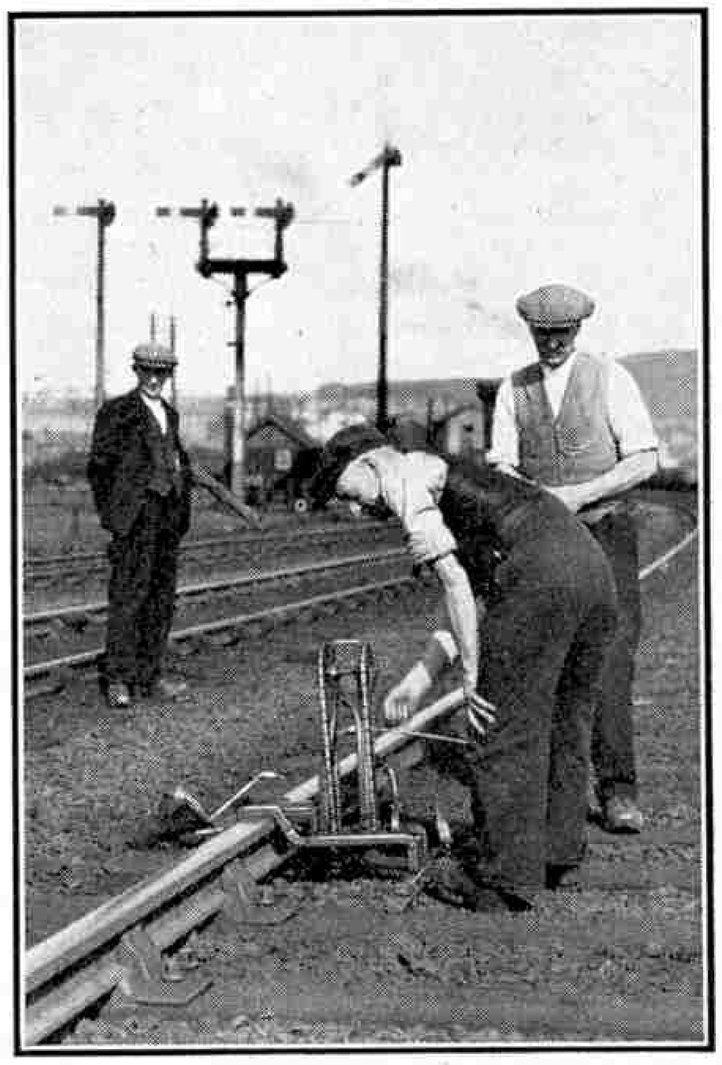
New Class 8F 2–8–0s Nos. 8120–22 are working from Northampton. L.M.S. freight engines Nos. 4577–4582, built at Derby are now in traffic.

Mr. D. S. Barrie informs us that the unique No. 6170 *"British Legion"* was recently given dynamometer car trials between Euston and Liverpool.

Layout Improvements at Chester

Intricate permanent way alterations at the Holyhead end of the Chester General Station were recently carried out, in order to allow wider vehicles to use lines on which they have hitherto been prohibited.

The site of this work was bounded at one end by complicated points and crossings, and at the other end by cabin supports, the base of a footbridge column and the platform. The new layout therefore was first built up in the manufacturer's yard. This enabled the timbers to be bored ready for the insertion of the crossing chair screws, while in some cases the ordinary chairs were already secured to the timbers. By means of white lines and marked laths the timbers were then laid in their exact positions, while portions of the track were afterwards lifted by crane, lowered into their respective positions and secured to the timbers.



Track gang bonding rails at Penrith. Photograph by the Rev. E. Treacy.

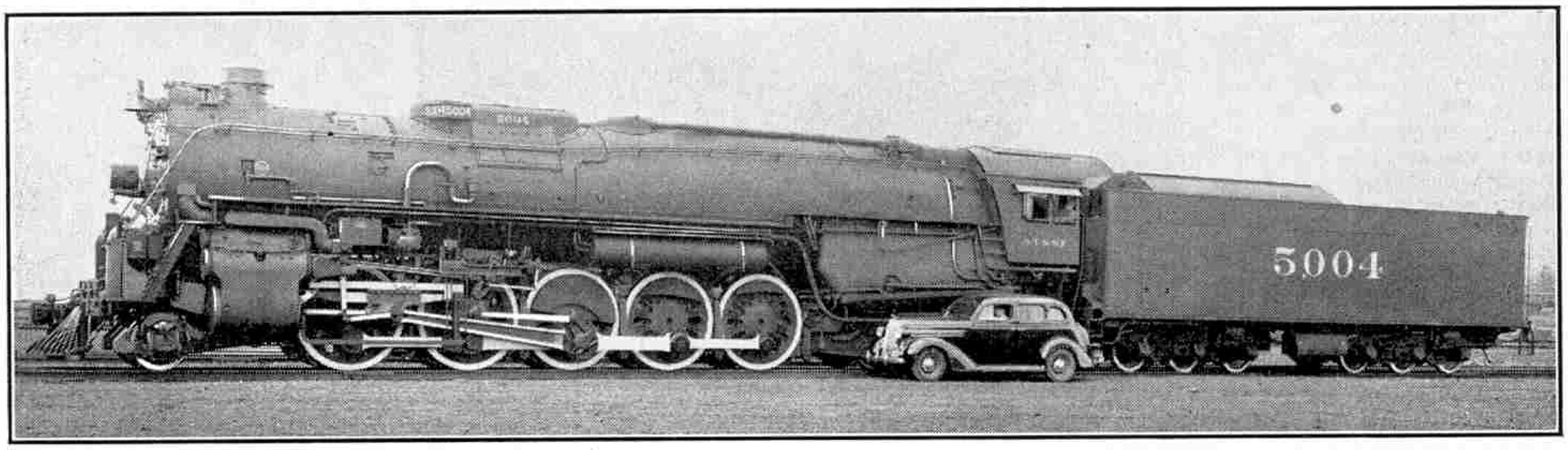
Train Cruises through the Highlands

Two land cruises of 2,000 miles each were run by the L.N.E.R. last month. On each occasion the *"Northern Belle"* cruise train left King's Cross and spent a week cruising amongst the finest scenery in Scotland.

The *"Northern Belle"* is a 14-coach train consisting entirely of first-class sleeping cars, restaurant cars and lounge cars with all the amenities of a modern hotel, including shower baths, writing room, hairdressing saloon and special wardrobe car.

The train cruised up the east coast of Scotland via Edinburgh, Dundee and Aberdeen to Lossiemouth and Inverness, returning southwards through the pass of Killiecrankie to Perth and the Forth Bridge. It then turned westwards and travelled up the picturesque West Highland line to Fort William and Mallaig, the port for the Hebrides in the far north west. From Mallaig the return to London was made via Glasgow and the East Coast Route.

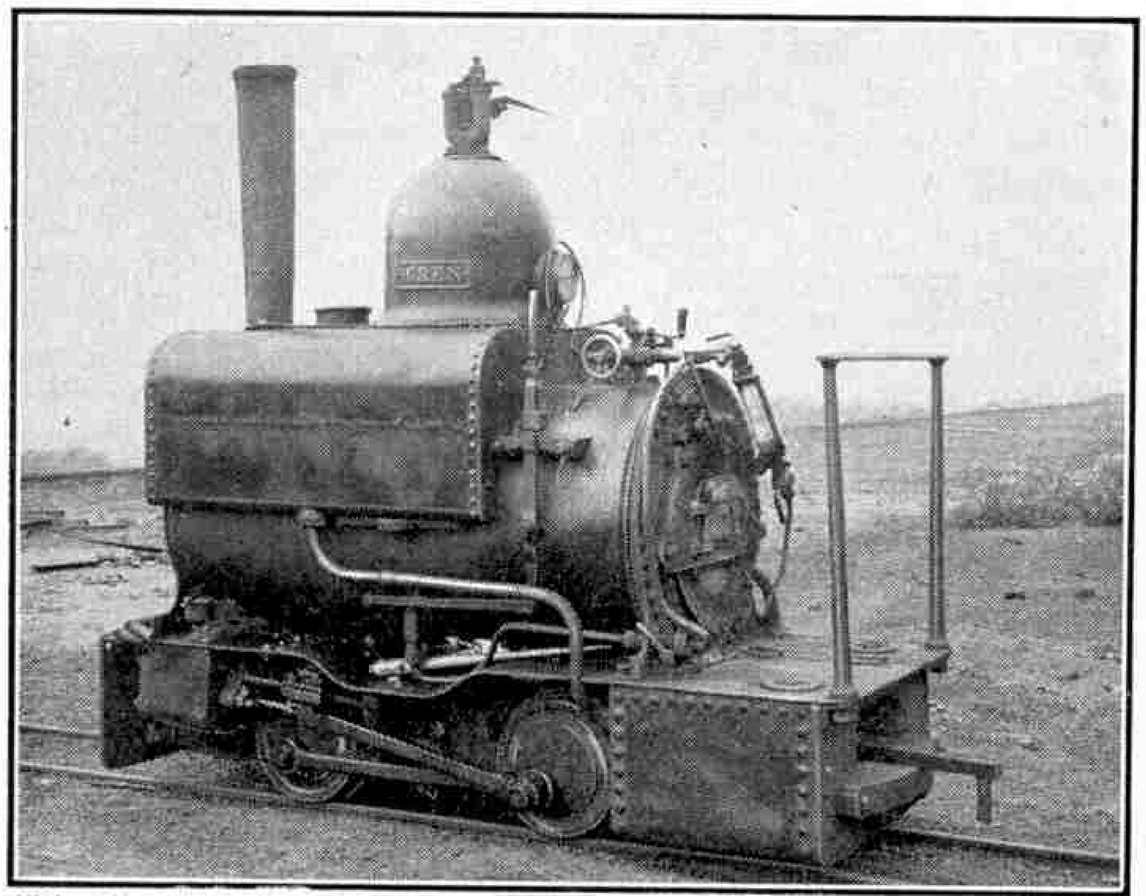
As a change from train cruising passengers made several excursions by motor coach to Balmoral, Drumnadrochit, Culloden Moor and Loch Tay, whilst trips on Loch Lomond and Loch Katrine enabled passengers to appreciate the fact that they really were cruising.



"Push-Button" Shunting on the L.M.S.

The L.M.S. have recently completed the mechanisation of the down sidings at Toton, where as many as from 4,000 to 5,000 wagons are sorted out every 24 hours.

Under the old method wagons were shunted into the various sorting sidings by mechanically operated points, shunters controlling the wagons with hand-brakes. This system is now superseded by electro-pneumatic control of the poin's and mechanical braking. Operators, seated in the hump room and in an elevated control tower respectively, press buttons and turn small switches on panels to direct wagons into the 35 sorting sidings, and the control tower operator regulates the speed of the wagons by means of hydraulic brakes.



"Wren," a diminutive engine formerly used on the narrow gauge tramway at Horwich Works. Photograph reproduced by courtesy of the L.M.S. Magazine.

Every wagon shunted has to pass through one of the mechanical brakes, and as it does so the operator brings into action a brake rail that presses against the flanges of the wagon wheels and reduces the running speed sufficiently to stop the wagon at the required point. In order to give the wagons the impetus necessary to take them into the sidings, arriving trains are shunted over the raised "hump" by 350 h.p. Diesel-electric locomotives that carry enough fuel for a week's continuous work. These engines are being built at Derby. The first five have already been completed and are numbered 7080–84.

Another feature of the mechanisation scheme is the introduction of a teletype apparatus, for communicating from the hump room to the operators in the control tower the shunting sequence for each train, indicating the siding destination of each wagon or wagons and the number of wagons in each movement.

Welding in Railway Coach Building

The use of welding in the construction and repair of railway stock and equipment is steadily increasing. L.M.S. welding practice in coach building is well exemplified in *"The Coronation Scot"* train that is at present on exhibition at the 1939 New York World's Fair. The details that follow have been extracted from *"The Welder."*

The underframe of the new vehicles was built up of welded metal sections. Body pillar sockets were welded to the solebars, and welding also was used in the assembly of the roof framework. Stiffening of the sides was provided for by metal connections welded to the underframes and to the roof framework.

The steel body panelling was welded together by an automatic welding machine and fitted in one complete panel to the body side pillars. The roof covering was assembled to the roof framework by metallic arc plug welds, and the joints were seam-sealed by carbon arc welding. The bogie frames are constructed of channel steel and welded together, and follow generally standard L.M.S. welded bogie design.

The average weight of each completed car was approximately 3 tons less than that of the normal "luxury car."

L.N.E.R. Main Line Improvements

The crossing from the up slow line over the main lines to the down goods line and down siding at St. Neots station is to be removed. This crossing has been the cause of a speed restriction at this point and as the station is on the main line between King's Cross and Edinburgh, the *"Coronation"* and other high-speed expresses will benefit by its removal. At the same time, the layout of the lines at the station is to be improved to enable stopping trains from the north to run direct into the east side of the station instead of running through and being backed into the platform as is at present necessary.

* * * *

Live fish were found recently in the tender of an engine undergoing repairs at the S.R. Brighton Depot.

G.W.R. Build More Shock-Absorbing Wagons

The shock-absorbing vans, introduced experimentally last year by the G.W.R. to prevent the damage of goods in transit, have proved so successful that 100 open and 100 covered wagons are now to be fitted with the shock-absorbing device.

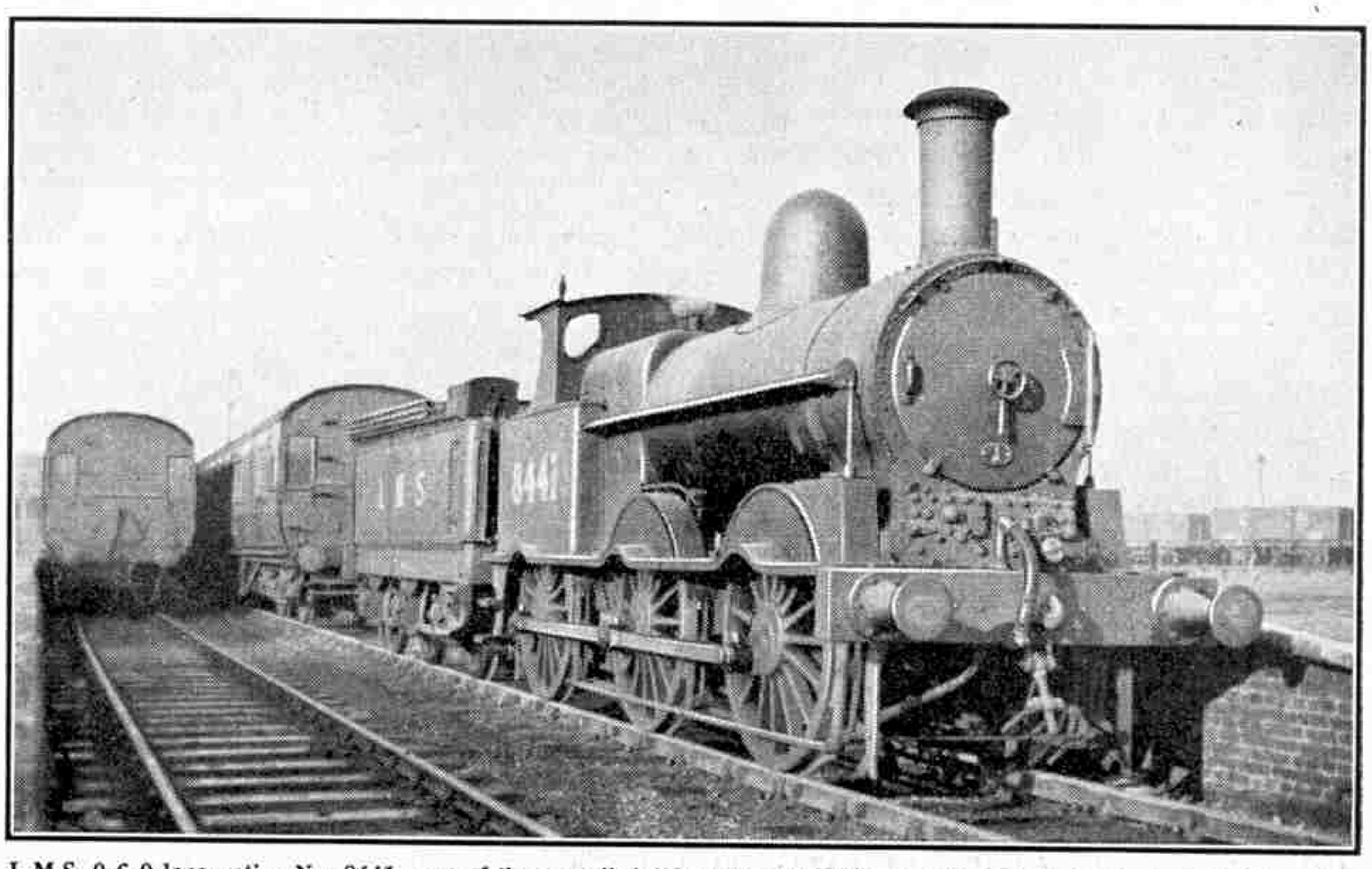
The bodies of the vehicles fitted with this device are entirely self-contained and move independently on the underframes, which are fitted with special springs and buffers to absorb shocks especially during shunting operations.

A North Western "Cauliflower"

The locomotive shown in the lower illustration on this page, now L.M.S. No. 8441, was at one time No. 348 on the L.N.W.R. It was built in 1897, but still represents in almost every respect the locomotive practice of last century on Britain's one-time "Premier Line." It is a representative of a once numerous series of engines, with 5 ft. 3 in. wheels and 18 in. cylinders introduced under Mr. Webb in 1880. Altogether some 300 of them were built.

These engines were the first to be fitted with Joy's valve gear and the first Crewe engines to have cylinders as large as 18 in. in diameter. For this reason therefore they were officially known as the *"18 in. Goods,"* but they were commonly referred to as "Cauliflowers"; to-day they are merely classified as belonging to Power Class 2F. It has been suggested that the name "Cauliflower" was given to these engines owing to some slight resemblance to that vegetable of the general shape of the L.N.W.R. coat-of-arms they carried on the centre splashers!

During their time the "Cauliflowers" have done an enormous amount of useful work all over the former L.N.W.R. system, even lending a helping hand in days gone by to the somewhat erratic Webb compounds then working the fastest trains. Those surviving have been rebuilt with boilers having Belpaire fire-boxes and find employment in various spheres, ranging from service duties on work trains and empty stock working to secondary passenger and goods traffic. W. P. CONOLLY.



L.M.S. 0-6-0 locomotive No. 8441, one of the so-called "Cauliflower" class. A note on this engine is included on this page. Photograph by W. P. Conolly.

Butterflies are Great Travellers

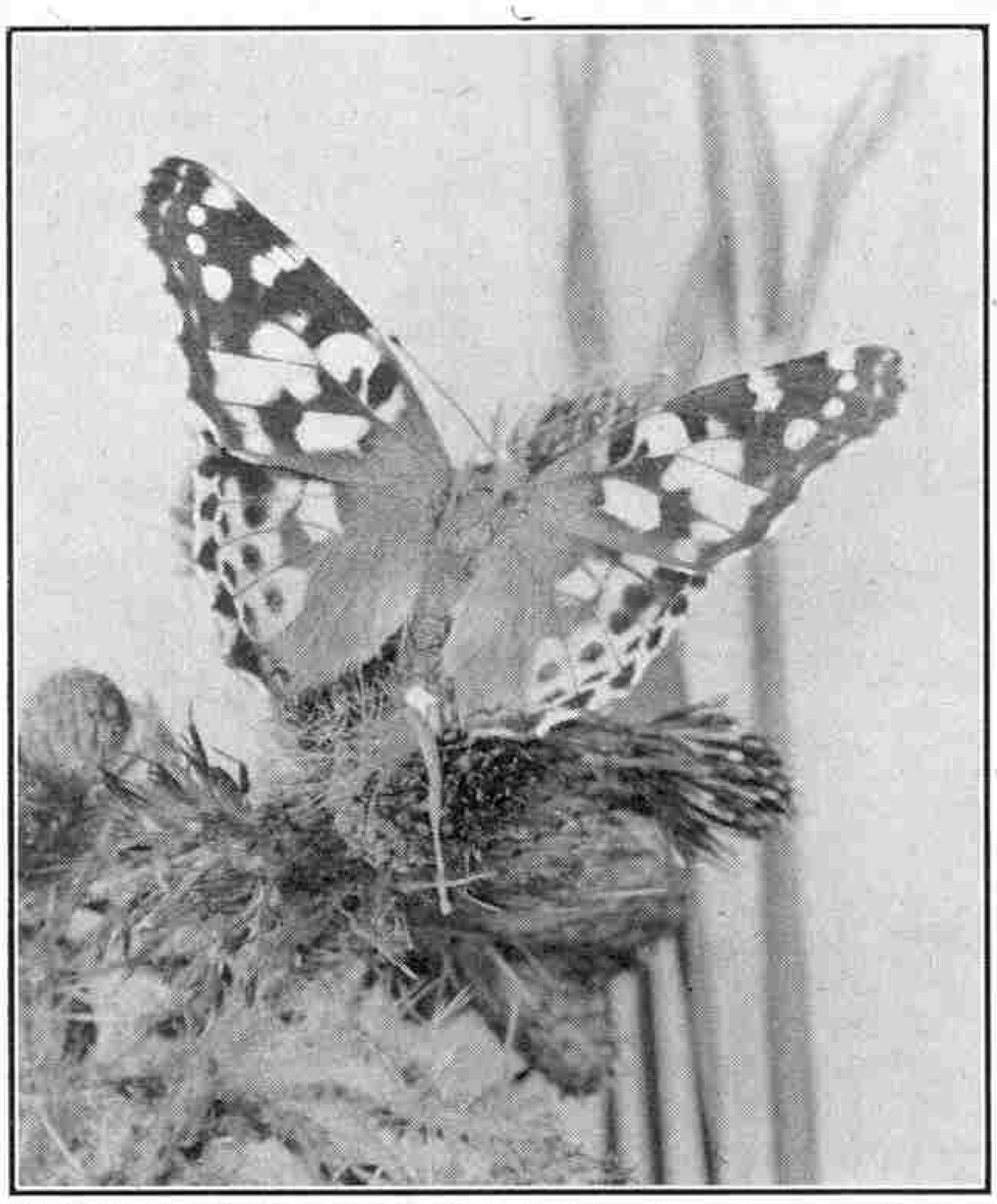
"Painted Ladies" that fly from Northern Africa to Iceland

By L. Hugh Newman

I WONDER if you have ever troubled to think much about where the butterflies come from that you see in the garden every summer. Probably you take their reappearance each season for granted. Many of the commoner kinds, like the familiar Peacock and the Tortoiseshell, of course are "local inhabitants," and spend the winter hibernating in an old barn or church in the neighbourhood, or perhaps even down a cosy rabbit hole. Some of the brighter coloured ones, however, such as Red Admirals, Painted Ladies and Clouded Yellows, have travelled tremendous distances to reach the British Isles.

Like birds that migrate every year, these fragile insects have a wonderful instinctive urge which makes them collect in vast "clouds" and set off to fresh breeding grounds. Some of the migrant butterflies that we see in England come all the way from the north of Africa, where they breed continuously throughout the year. On more than one occasion in spring Painted Ladies have been seen to leave the African coast in tens of thousands. They fly across Europe and reach Britain in May or early June, some continuing their journey as far as Iceland.

It is not often that anyone has the chance of watching the arrival of our butterfly visitors, as they usually travel under cover of darkness, or choose an unfrequented part of the coastline. The quiet bays and coves along the Devon and Cornwall coasts are favourite landing places for Clouded Yellows, as there the tired travellers can refresh themselves from wild flowers growing on the cliffs before continuing their journey inland.



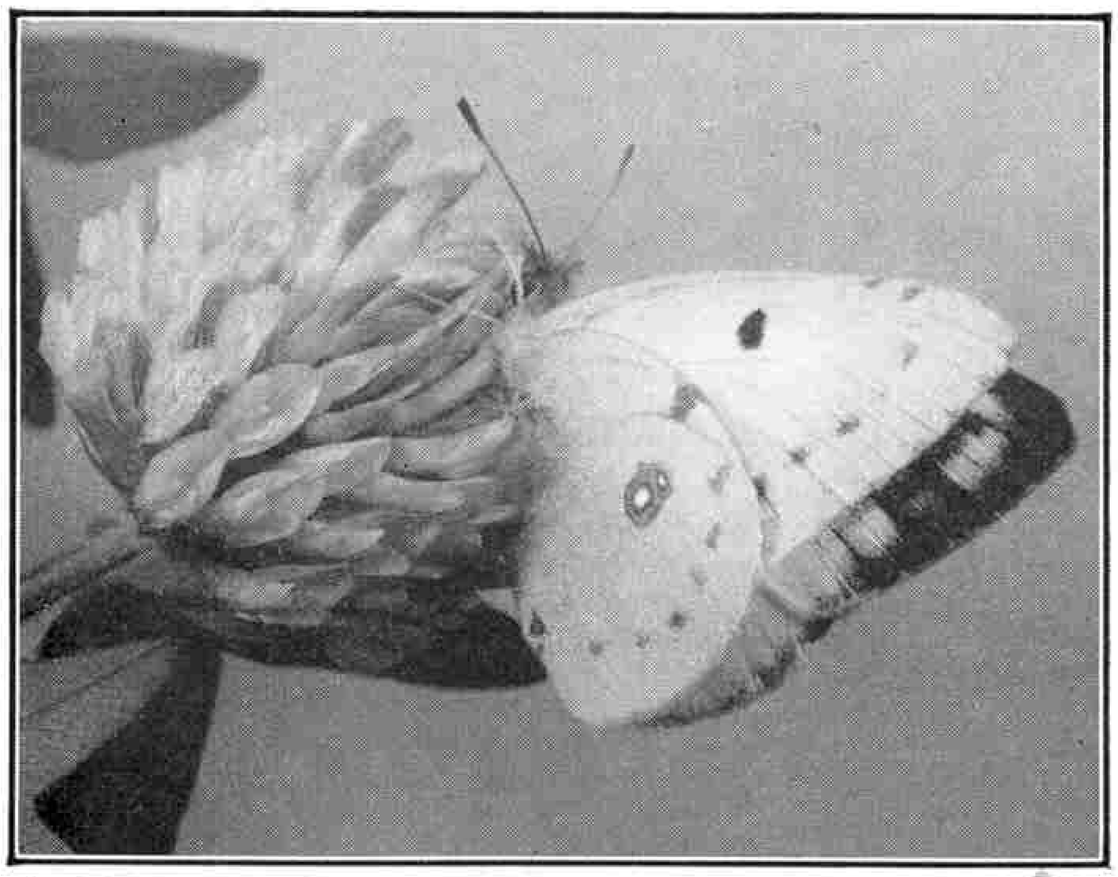
The Painted Lady, one of our greatest butterfly travellers. These butterflies have been known to reach Iceland from northern Africa on several occasions.

You may be lying on the beach when on holiday, just lazily gazing out to sea, when your attention is attracted by several butterflies that appear to have come out of the sea itself. In a few moments others join them and pass over your head, in little groups of twos and threes. If this is a real migration the whole beach is soon alive with butterflies, while many more that have not had the strength to complete the "last lap" are washed up by the waves at your feet.

I have seen quite a number of migrations actually taking place in England and abroad. The most extraordinary one I ever witnessed was while I was making a collection of Channel Island butterflies for Lord Rothschild's Tring Museum. I was living on Sark, and one lovely June morning had joined a party of friends to visit the Bec du Nez—the northern end or "nose" of the island—when we all distinctly saw five species of butterflies coming across the water from the French coast. Large Cabbage Whites were drifting in like snowflakes, hundreds at a time, and continued to do so all day, crossing the headland without stopping and making for England. Small Whites and a number of Red Admirals, Painted Ladies and Clouded Yellows followed in scattered formations. I don't think anything like this has ever been recorded before, although in the tropics it is no uncommon sight to see two different species migrating at the same time, only going in opposite directions.

We are beginning to know something about how these frail insects travel. It was once thought that the colonies of migrating butterflies were just blown along by the prevailing winds, but we now know that they have a very definite sense of direction, and hundreds of reports from all over the world, collected by the Insect Immigration Committee, show that these "flights" will just as soon tack into the wind as drift along in its course. A graphic example of how they stick to their course comes from a friend of mine living in East Africa. He described to me how a thin stream of butterflies flew up the side of his house, through the open bedroom window, across the landing, and out through another window. Just to see what would happen he closed the window, and instead of flying up over the roof or round the side of the house the insects battered themselves against the window pane until they fell exhausted to the ground.

One may wonder how butterflies find their way across the Continent and over the English Channel to their favourite landing places along our southern coastline. Again we can only theorise; but I have come to the conclusion that migrating butterflies often follow the course of a river to reach the open sea. On reaching the Channel their instinct urges them on and, sometimes helped by favourable sea breezes, most of them reach land again. I know that their favourite routes inland are up the rivers. I live near the Thames, and whenever there is a migration of Painted Ladies I can be sure of finding large numbers of the spiny caterpillars of this butterfly feeding on the thistles growing along the towpath, proving that the



Clouded Yellows, butterflies that do not visit Great Britain in numbers annually, although stray specimens usually arrive in most years. About one year in seven is a "Clouded Yellow year," and the last was in 1938.

females passed this way earlier in the season.

Many people do not realise that Cabbage Whites invade our shores quite often, as though we had not enough of them already to eat our green vegetables! The Small and the Large White butterflies are, in fact, two of the most regular species to migrate in masses on the Continent. They can be seen in most years during June or early July flying southward through Germany and resembling a miniature snowstorm. Another popular route is westward across Holland and Belgium into England, and it is then that we suffer from the plagues sometimes reported in the newspapers.

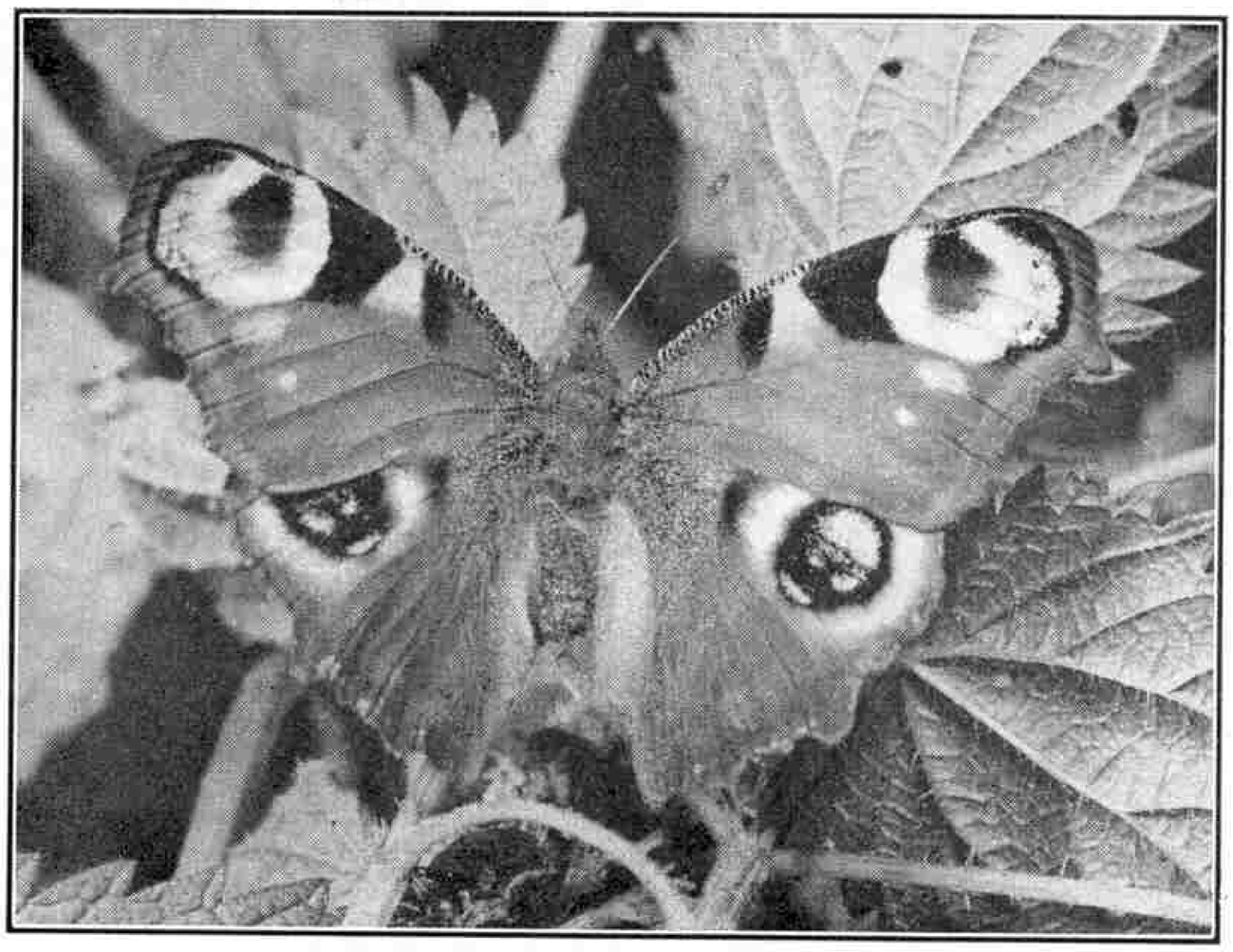
One rather interesting new fact came to light in a letter I received after a recent broadcast I gave on this subject. A Frenchman living near Monte Carlo told me that he often used to take a motor boat trip along the coast late in the evening, and one night the searchlight fixed in the bows picked out a mass of white butterflies fluttering along just above the surface of the water. Since then lighthouse keepers have reported butterflies seen at night, proving quite definitely that they will continue to fly all night when they have the urge to migrate, though it is entirely contrary to their natural habit.

There are one or two migrant butterflies that seem to prefer the autumn months for making their journeys. The Camberwell Beauty occasionally travels across the North Sea from Scandinavia, but it never really feels at home in our climate, and I know of no record of its ever having bred in England after its long winter sleep of hibernation. Last autumn I brought home from Finland half a dozen live Camberwell Beauties and kept them in a cardboard box in a cupboard in my bedroom. They lived all the winter and I did not disturb them until there were some spring flowers out in the garden. As soon as I put them in a cage they fed ravenously on the nectar, but within an hour or two they were all lying dead at the bottom of the cage. I shall never know whether they were too greedy, or if it was my fault for giving them the wrong kind of flowers.

The most interesting of the autumn butterfly visitors is undoubtedly the Milkweed or Monarch butterfly. Any stray specimen seen in England must have crossed the Atlantic or come up from the north-west coast of Africa, as milkweed, this butterfly's food plant, does not grow in England or on the Continent. In 1933 over 30 of these large brown butterflies were reported to the Insect Immigration Committee. The interesting point was that they were seen for the most part along the south-west coast of England and in Ireland, suggesting that they were stragglers from North America, where the Monarch can be seen in millions, and is famous for its mass formation flights every autumn to more temperate climes down south. Last year only one specimen was recorded in this country. It was flying north west at Port Conger, St. Agnes, Scilly Isles, on 15th August.

People often ask me whether the progeny of the spring migrant butterflies ever return to their native lands, as migrating birds invariably do. Hundreds of reports show quite plainly that the Painted Lady becomes more numerous in southern districts as winter approaches, while records from the north decrease in proportion. This seems to indicate that there is a tendency for this butterfly at least to move south as the colder weather approaches. Lighthouse keepers at St. Mary's, in the Scillies, and Start Point, in South Devon, who regularly report migrants coming in during May and June, have observed a few Painted Ladies, Red Admirals and Clouded Yellows flying out to sea in a south-easterly direction during October, which is pretty convincing evidence. But whether these butterflies make a regular habit of this all along our southern coast we have yet to discover.

Just why do these butterflies take all the trouble to fly from their natural breeding places in warm climates to districts that are not nearly so suitable for perpetuating their species? No satisfactory answer has been given to this question. The only theory I have myself is that the urge to migrate in insects is older than man himself, and that it dates back to the times when the climatic conditions on this hemisphere were very different from those prevailing to-day. In fact, I suggest that at certain times in the year butterflies were compelled to migrate, as extreme cold or heat so affected their food plants that there was nothing for the caterpillars to feed on.



The Peacock butterfly. Although this is not a regular immigrant, it has been known to cross the Channel along with Red Admirals and Painted Ladies. It has been seen arriving by lighthouse keepers, who report butterfly movements of this kind.

Books to Read

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

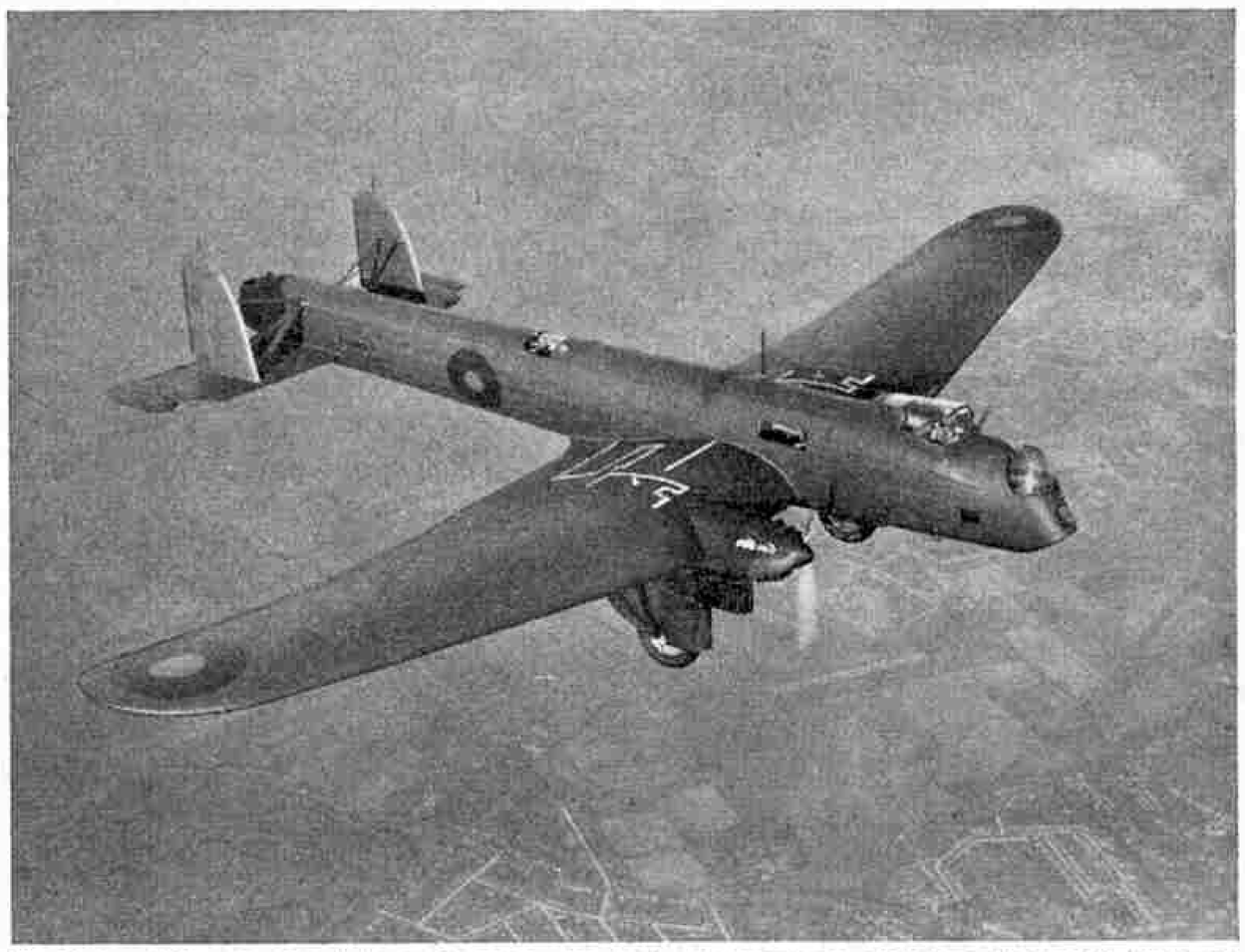
"Aeroplanes and Aero Engines"

By P. H. Sumner. (Technical Press Ltd. 15/- net)

It is only two years since this excellent book was entirely revised for the second edition. Important advances in aircraft design and construction have been made since then, however, and additional chapters covering this progress in respect of British aircraft and engines have been added.

Capt. Sumner opens his subject with the story of the aeroplane down to the Great War. He then devotes a chapter to the principles on which flight is based, showing how lift is obtained, and explaining the effect of streamlining and of different forms of wing sections. This is followed by sections on the airscrew and the aero engine.

Passing on to the actual construction of landplanes, seaplanes and flying boats, the author describes first the chief materials used and then explains how the aircraft are assembled. The working of slots, flaps, controls, and undercarriage is another topic that is treated well, and there are 236 illustrations.



The Fairey "Hendon," a twin-engined bomber. From "Aeroplanes and Aero Engines," reviewed on this page.

"In the Grip of the Gale"

By Knud Anderson (Harrap. 5/- net)

The scene of this splendid tale is laid in the uninhabited Auckland Islands, 200 miles south of New Zealand. Only a few people have ever seen these islands, with their grim cliffs 1,500 ft. high and their difficult inlets. The author is one of them, and with this forbidding background he has written a fine story of courage and endurance in storm and shipwreck.

The son and daughter of a Danish sail-maker in New Zealand go to the Aucklands in a small sailing boat in quest of ambergris that has been hidden away there in a cave. They are nearly wrecked on reaching their destination, and then meet an old sailor who has been cast away on the islands. With his help they refit their cutter and return home, to find that he has retrieved the ambergris and placed it on board unknown to them. There are no fights and no real villains in the story, but the struggles of the boy and the girl with the elements provide something that is far more thrilling and convincing.

The book has a coloured frontispiece and five full page illustrations, together with many drawings in the text.

"The Junior Week-end Book"

By J. R. Evans. (Gollancz. 6/- net)

The purpose of a week-end book is to provide something interesting for its owner at whatever page it is opened and whatever the time may be. Mr. Evans' book fully satisfies these requirements, providing amusement, entertainment and information of a most useful type on an astonishing variety of subjects. Even the pleasures of eating good things are not forgotten, for the final section treats of many wonderful varieties of toffee that the amateur toffee-maker can produce, and ends with a recipe for that wonderful beverage, ginger beer!

He would be a dull boy who could not find something attractive in the book. First comes a section of adventure, containing splendid stories extracted from famous books. Among these are Long John Silver's search for treasure, the capture of the last of the Mohicans, and the escape of the future Count of Monte Cristo from his island prison. Poems "that need not be skipped" follow, with songs "that are good to sing," each with a one-finger accompaniment, after which we are ushered into an immense mass of useful and carefully-arranged information. Ships and the sea and sports records of all kinds figure in this section, which is full of interesting details that will make its readers chock full of information, capable of settling the arguments over records and achievements that eternally arise among boys.

Puzzles old and new and an interlude of nonsense rhymes bring us to the outdoor week-end, which tells of such delights as learning to recognise birds and insects, flowers and trees; and deals concisely and practically with camping and tramping, swimming, and the making and sailing of boats and canoes. How to make a garden is explained, and the section comes to an end with a fine selection of free and easy outdoor games that everybody can enjoy. More nonsense and puzzles follow, and the week-end book then travels indoors, where the best means of enjoying a party and of enjoying oneself without a party are well described. Tricks, the keeping of pets, and many things to do, make or collect, bring us eventually to the delightful toffee-making conclusion already mentioned.

The rich, varied and unusual fare in the book make it splendid value for 6/-. The publishers warn boys and girls who become possessed of it that they should not let it fall into the hands of their parents! In this they are wise, for it is certain that no grown-up could part with it until its delights have been exhausted—and that will take a long time.

"The Wandering Speedmen"

By Alfred Edgar (Harrap. 5/- net)

Here is a splendid tale of rivalry on the motor racing track. The heroes are three old school friends, who form a racing team with Joey Yung, a wizard with a motor car engine, as their mechanic and adviser, and the four make a tour of Europe and Northern Africa, winning prizes after terrific battles in Grand Prix and other races.

The wandering speedmen have another aim in view, however. One of Joey Yung's ancestors had wandered about the world some 2,000 years earlier building refuges in Europe and Africa, in certain stones of which he had marked clues to the hiding place of the treasure of the Seven-clawed Dragon. The tour is calculated to bring the racing team to each in turn of the buildings Joey's ancestor had erected for this strange purpose, and they encounter many stirring adventures while searching for the refuges, and trying to locate the stones with the clues. Every difficulty is overcome, however. In the end the clues lead them to a temple, now in ruins, where the treasure is unearthed, and the friends plan new victories with the cars it will enable them to build.

This story with a double thread running through it is splendidly told. It will be enjoyed by every modern boy, who will find in it adventure of the traditional type together with the thrills of international rivalry on the racing track between men who know every trick of the game.

"Electricity To-day"

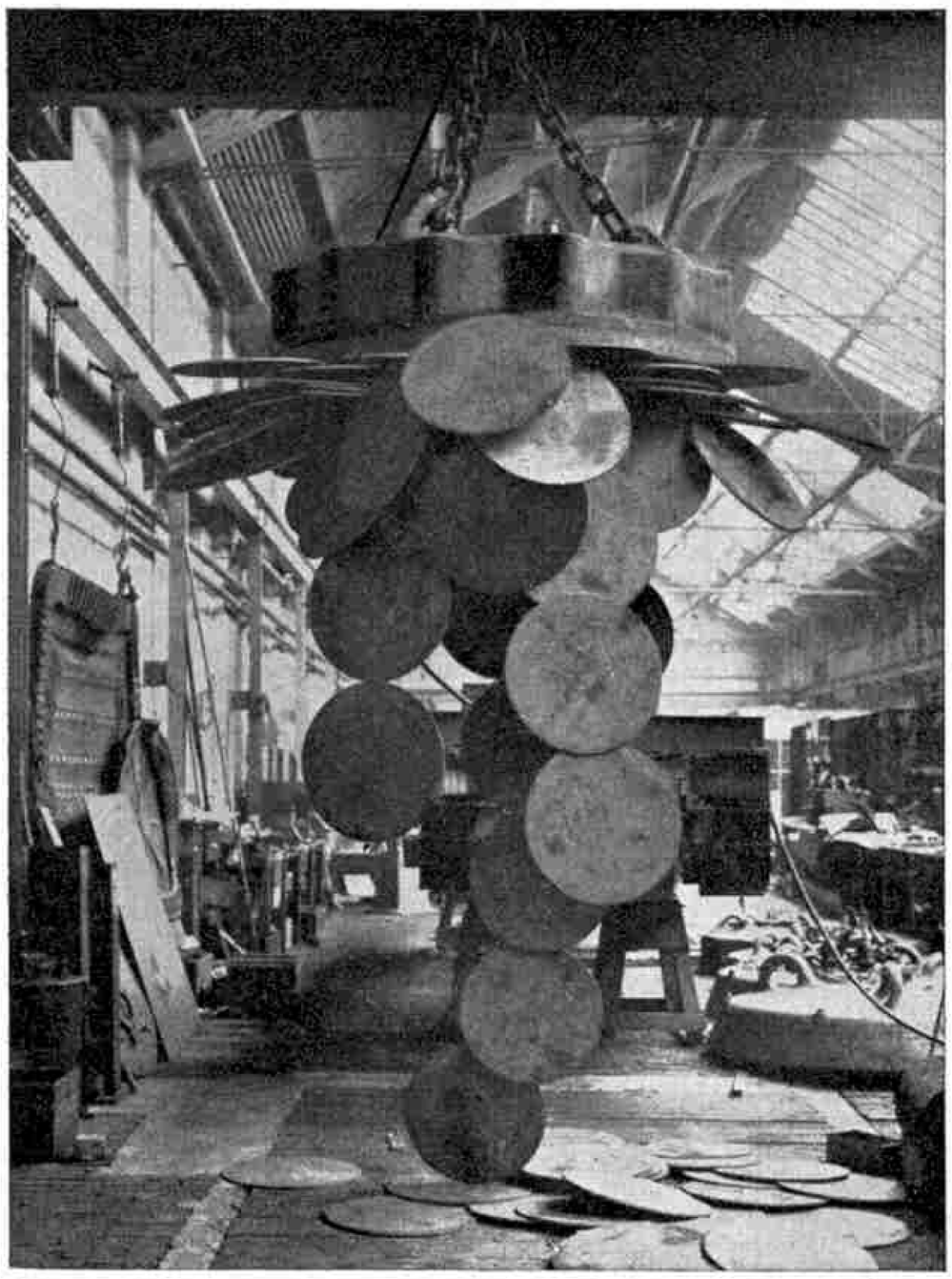
By T. B. Vinycomb, M.A. (Oxford. 4/6 net)

We talk rather glibly of the present age as one of electricity, but it is not until we read such a book as this that we realise how much electricity does for us to-day. In his introduction Mr. Vinycomb gives many striking examples of its applications. These include its use in signalling, in new processes for making materials in general use and in the achievement of higher temperatures than any furnace in which fuel is burned can give; and the story the author has to tell justifies the suggestion that electricity appears able to replace all other agencies for doing things.

The book begins by explaining force, work, energy and power. Among other interesting things this section reveals the fact that the electrical "unit" represents the amount of work done when a weight of 12 tons is raised to a height of about 100 ft., a surprisingly large amount of power for its cost of only a copper or two.

We pass on to explanations of conductors and insulators and the construction of cables, followed by a chapter on batteries. Electro-magnets next call for attention, and we see how they have developed from the simple pioneer designs of Faraday and others more than 100 years ago. This leads up to a very good account of electrical generators and motors, in which the differences between direct and alternating currents are explained. How the power thus produced is controlled and distributed is then discussed, after which we pass on to heating and lighting, telegraphy and telephony and transmission of sound and pictures. In all these sections the information is up to date and reliable, whether we are dealing with modern vapour lamps, automatic telephone installations or the use of cathode rays in television.

There are 23 full page plates and 49 drawings in the text.



A magnetic grab lifting metal plates. From "Electricity To-day," reviewed on this page.

"Strange Animals and their Stories"

By A. Hyatt Verrill (Harrap. 10/6 net)

Mr. Verrill has already given us five volumes in his "Strange Stories from Nature" series, and his latest is fully equal in variety and interest to his earlier ones. The author has some surprising facts to tell us about many animals that are familiar to us, including dogs and cats, horses, pigs and sheep, and in addition has stories of pangolins, wombats, aardvarks, aye-ayes and hundreds of other animals with strange ways and even stranger names.

There is much more in Mr. Verrill's book than mere descriptions of animals, however, for he groups his strange creatures together and tells us something of their ancestry as well as their habits. One chapter deals with animals in armour; another with weird creatures, such as the platypus, the koala and the Tasmanian devil, that seem to have been left over from a previous era millions of years ago; and still another is concerned with fantastic creatures like the giraffe and the gnu, misfits that do not seem to be quite certain to which family of animals they belong. The hippopotamus and other juggernauts of the animal world; the workers, of which the beaver is the best example; animals that live in the sea and those that are capable of flight through the air—all these provide strange stories. Every branch of animal life is dealt with, including bears, monkeys of various kinds that show remarkable intelligence, uncouth specimens such as the water hog and the peccaries, and the graceful if sometimes ferocious members of the cat tribe.

The book is very readable, the author's descriptions being lightened by stories of animal hunts, many of which are based on his own experiences as an explorer in tropical America and elsewhere. There is a large number of line drawings, together with six plates, two of which are in colour.

"Youth Hostels in North Wales"

(Merseyside Youth Hostels Ltd., Liverpool. 3d.)

This interesting booklet is full of information that will be of the greatest use to all who are contemplating a walking holiday in the district described, as well as to those who are members of the Youth Hostel Association. Details are given of the hostels themselves and of a chain of splendid walks connecting them, and there are good maps and a guide to Welsh place names.

Driver Earl waves good-bye to London from the footplate of "The Royal Scot." From "Speeding North with 'The Royal Scot'" reviewed on this page.

"Speeding North with *'The Royal Scot'*"

By Driver L. A. Earl (Oxford University Press. 3/6 net)

Driver Earl is well known to *"M.M."* readers as one of the "speed kings" of the L.M.S., and details of his prowess have been given in our pages from time to time. In *"Speeding North with 'The Royal Scot'*," written in collaboration with Mr. H. N. Greenleaf, his aim has been to describe "a day in the life of a locomotive man." Actually the result is very much more, for quite apart from the management of the engine over the non-stop run of *"The Royal Scot"* from Euston to Carlisle, the reader is given a graphic description of everything that can be seen from the footplate on this journey.

Driver Earl is no mere speedster. Although when talking of the wheels of his engine he tells us that "the faster they go the better I am pleased," he is a conscientious engineman to whom locomotive management is an exact science and to whom time-keeping with complete regard for the safety of his train is an absolute duty. He learned his job in a hard school, joining the former L.N.W.R. as an engine cleaner at Camden Sheds in 1901. After the usual spell of firing he became an engine driver in 1916, and in 1924 came promotion to the position of main line driver. Since then Driver Earl has made innumerable fine runs and it is on a typical one of these on locomotive No. 6206 *"Princess Marie Louise"* that the reader accompanies him northward. Other interesting aspects of his work also are well described. For instance, he tells us how the engineman looks after himself at the hostel and general railway working is dealt with in a railway "talk."

Driver Earl is an enthusiast and his keenness is infectious. He thrills us with the romance of footplate work, and boys cannot help but enjoy the book, while many grown-ups too will gain from it a better idea than they have had of the work of the engine crew.

The book is well illustrated with photographs of L.M.S. locomotives and trains, and views of parts of the line.

"From Our Readers"

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.

Taking a Photograph in an Underground Cave

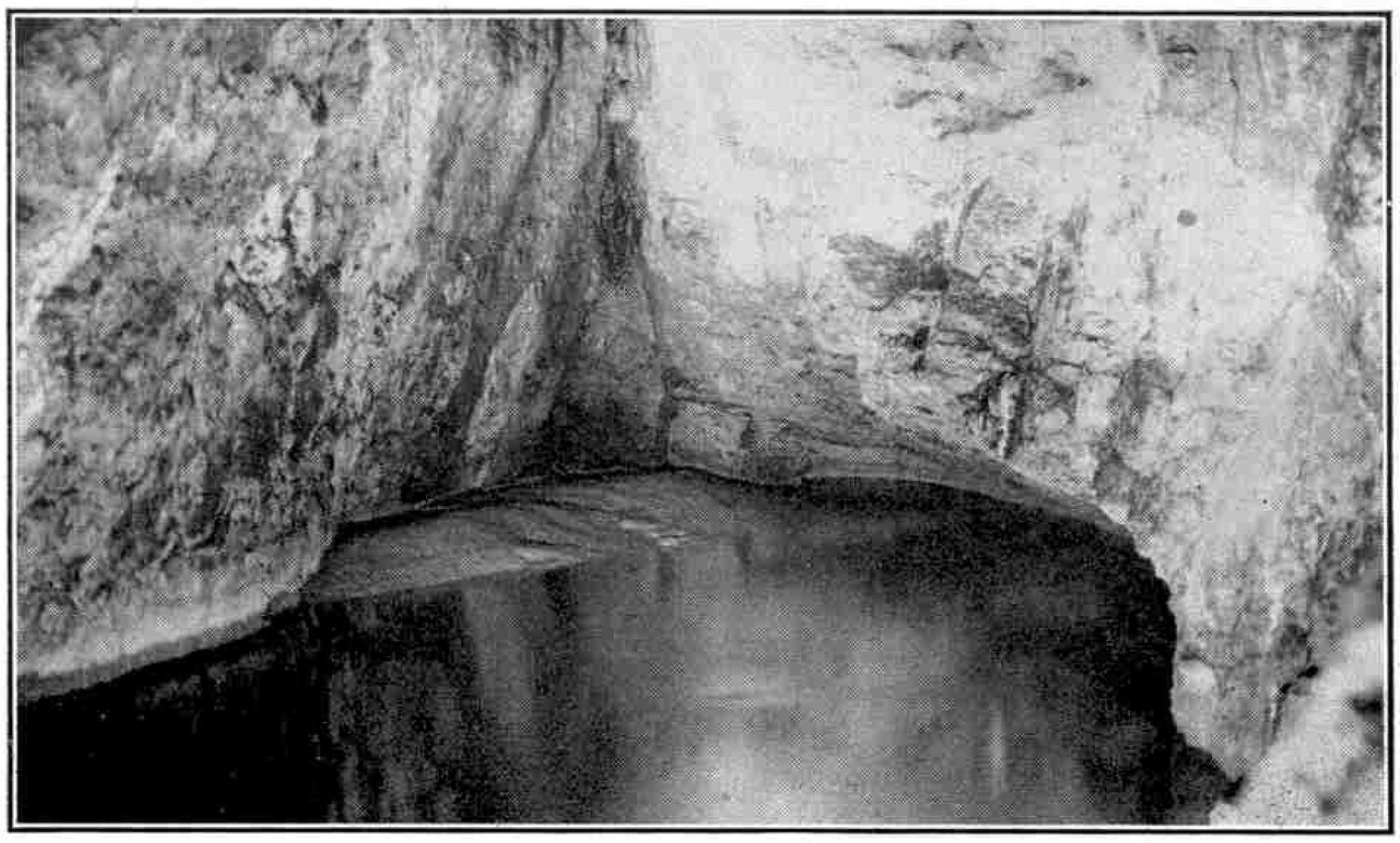
In January last my uncle took me to visit Wookey Hole Cave, that interesting three-chambered cavern in Somerset reputed to be 5,000 years old. The cave is so eerie that when I looked in the entrance I was almost too frightened to go in. I asked the guide if I might take a photograph of the interior, and having informed him that I was still at school he said I could do so.

The guide had explored the cave thoroughly, and was able to give us many interesting accounts of his exploits. In the first chamber was a stalagmite effigy of a cat drinking from the stream, which is the source of the River Axe. In the second chamber there was little to see, as the stalactites had been cut down and sent to a museum in London, but we saw the water coming from the roof in steady drips, which in time will form more stalactites.

We passed into the third chamber, called the "Witch's Kitchen," and I found this the most interesting and beautiful part of the cave. The River Axe passes through the chamber, although it is not known exactly where it begins. In this chamber is the "Witch of Wookey," a wonderful stalagmite effigy, seen on the left of the photograph I took of the interior, which is reproduced on this page. In the summer it is possible to travel several hundred yards up the river in a rowing boat, but in winter the river rises too high for this.

Readers may be interested to know that when I took the photograph, I used an Ensign folding camera, the exposure being three minutes at stop F/4.5 on Kodak S.S. Panchromatic film by floodlight.

R. BARRETT-LENNARD (Banbury).

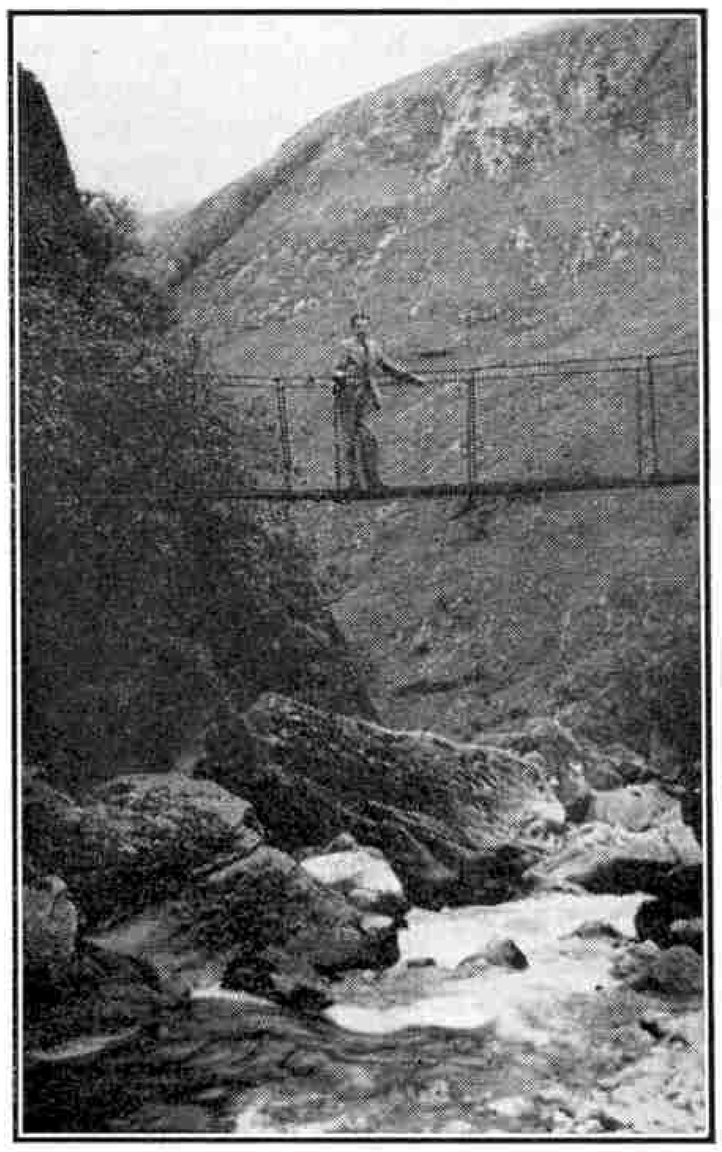


The "Witch's Kitchen," a chamber in Wookey Hole in Somerset. Photograph by R. Barrett-Lennard, Banbury.

A Day in Glen Nevis

Under the shadow of Britain's mightiest mountain, and midway between Fort William and the little village of Banavie, one enters Glen Nevis, considered to be one of the loveliest in Scotland. The day I spent last summer exploring its beauties and interests was certainly one of the highlights of my holiday. For just over a mile from the entrance the road is in fairly good condition, winding past quiet river scenes to the fine new Youth Hostel. This is built of timber in the Norwegian style, and was opened in July last year.

The road, now a rough track, winds on into a welter of hills, going up and down like a switchback, with many acute turns, every one of which reveals a different aspect of the mighty Ben. At Achriabhach farm there was a board on which were nailed the heads of foxes and various beasts and birds that had been caught. One wonders if the board and its grisly adornments had any effect as a warning to other creatures tempted to prey on the farmer's livestock. Close by is a little one-roomed hut at the side of the track; this is the school, with one form of a handful of pupils, and it is surely one of the smallest in Scotland.



At the head of Glen Nevis, one of the loveliest in Scotland. Photograph by J. M. Wighton, Edinburgh.

The track continues through wilder scenery for a little way and then ceases abruptly. From this point one continues by a little footpath, frequently crossed by small burns, and then climbing over stones along the edge of a wild ravine, one eventually comes to the head of the Glen, where a very fine waterfall is found rushing and roaring between great boulders. Crossing the water is the narrow suspension bridge shown in the accompanying illustration. This bridge is anchored at its ends in the solid rock and is perfectly safe, although it sways and creaks as one crosses. The rising ground seen in the photograph is typical of the rugged slopes of Ben Nevis, which is 4,406 ft. high.

J. M. WIGHTON (Edinburgh).

The Mill at Wortham

The lower illustration on this page shows the mill at the village of Wortham, in Suffolk, and is of special interest in view of the article on *"English Windmills"* by Rev. P. A. Wright, that appeared in the April *"M.M."* Recently I was able to inspect the Wortham mill. On entering I found myself on the ground floor of the three-storey building, with bags of meal already produced lying all around. I could hear the noise made by the sweeps and the gears, and the stout timbers shook a little as the sweeps revolved. The flour was trickling steadily into the bin as it was ground.

Accompanied by the miller, I ascended to the next floor and there I saw part of the actual grinding mechanism. The grindstones were spinning merrily at their work, and I saw the simple lever by means of which they can be set to produce either coarse or fine meal.

On the top floor I saw the giant wooden driving wheel, faced with steel cogs, and the lever that works a brake on this wheel. The grain is hoisted up in sacks to this "attic" from the outside, and then fed into a hopper that delivers it to the grindstones.

The Wortham mill is fitted with a fantail, a circle of vanes on the opposite side to the sweeps, which rotates the head of the mill to bring the sweeps into the wind, making it unnecessary for the miller to turn the cap of the mill by hand. J. JONES (Prescot).

The mill at Wortham. Photograph by J. Jones, Prescot.

The Festiniog Railway

The Festiniog Railway runs between Blaenau Festiniog and Portmadoc, and I think it is the most interesting little line in this country. It has a gauge of only 1 ft. 11½ in. and is about 13 miles long, with a single track that takes a most erratic course through magnificent scenery. The line was opened in 1836 to carry slate from the Blaenau Festiniog quarries down to Portmadoc for shipment. As there are severe gradients on the line it was possible to make the descent by gravity, while horse traction was employed on the upward journey. Operation by steam locomotives began in 1863, and passenger traffic was started officially in 1865.

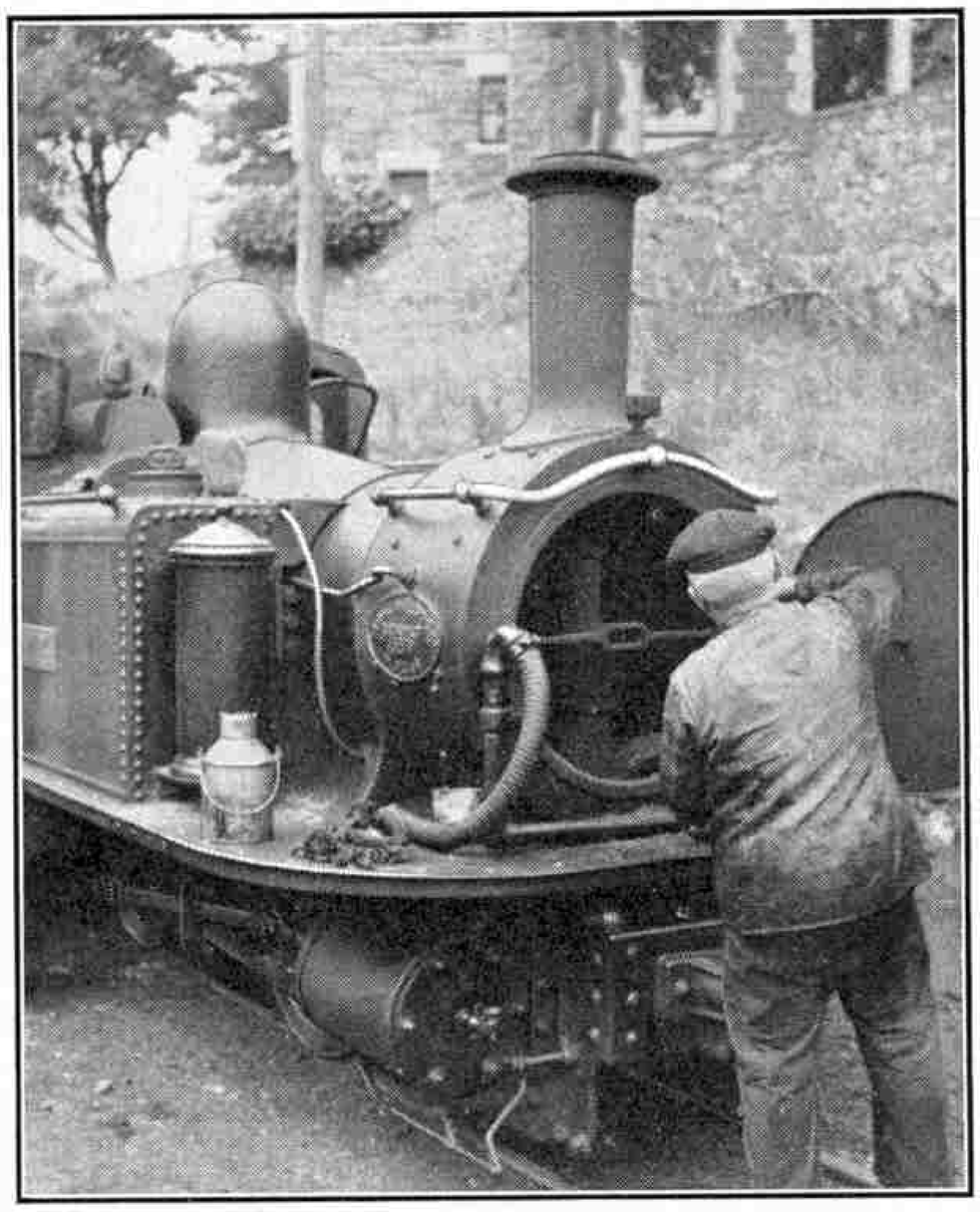
The journey inland involves a very steep climb, for the track winds tortuously along the sides of thickly-wooded slopes some hundreds of feet up. It takes the train more than an hour for the whole journey, but this is good timing considering the heavy gradients it has to negotiate. The curves are very sharp, and the cuttings narrow, so passengers are locked in their compartments. Also the windows are barred, as plants growing in the cracks of the walls by the side of the line brush against the windows!

The trains are drawn by little double-ended "Fairlie" locomotives that are well adapted to the steep gradients. The coaches overhang the track on either side. They have a very low centre of gravity, an important factor, for they are nearly three times as wide as the track gauge. They are rather hard riding, and the wooden third-class seats help to make the journey very bumpy; but the novelty of the travel and the varying beauty of the scenery, which is among the finest in North Wales, soon make the passenger forget his discomforts.

Tan-y-bwlch station, half-way along the line, boasts a station-mistress in traditional costume, who sells refreshments and souvenirs to passengers, besides looking after the station. L. DAVIES (Coventry).

In a Button Factory

I visited a factory where buttons are made of a compressed plastic substance obtained from dried milk. This material arrives at the factory is sheets sorted according to their various patterns and sizes. The sheets measure about 24 in. by 16 in., but may vary in thickness from 2 mm. to 8 mm. and probably over three dozen different patterns of buttons are made from them in the medium sized factory.



Cleaning out the smoke-box of one of the "Fairlie" locomotives that work trains on the Festiniog Railway. Photograph by L. Davies, Coventry.

The sheets are soaked in warm water in tanks, and then cut into button blanks by a long cylinder-shaped instrument with a saw edge that makes 2,000 revolutions a minute. Then each blank is placed in a rotating grip, and a tool cuts any rings or similar marks required. Drilling is the next operation, and the blank is placed in a cup that moves automatically, causing a sharp pointed spindle to pierce the holes. The required grooves are produced on a milling machine, in which the tool revolves while the button is placed cautiously under it and then slipped sharply away.

Lastly the buttons are soaked in a solution consisting chiefly of caustic soda, then dried and polished. After counting they are put in bags ready to be sent to the clothing factories.

C. S. WEST (London).

HORNBY DUBLO

THE PERFE

★ *Built to scale*

★ *Realistic detail*

★ *Full remote control*

The new Hornby-Dublo System, Gauge 00, provides the ideal home railway. You can lay out a complete and realistic railway on your dining-table!

Hornby-Dublo Locomotives are fitted with motors (either clockwork or electric) of a power and reliability never before achieved in this gauge. All the movements of the Electric Locomotives are perfect—starting, stopping, reversing and speed regulation are all carried out by the movement of one lever.

Automatic couplings are fitted to all Coaches, Vans and Wagons. The Signals are realistic working models of the latest upper-quadrant type and the Buffer Stops have working heads.

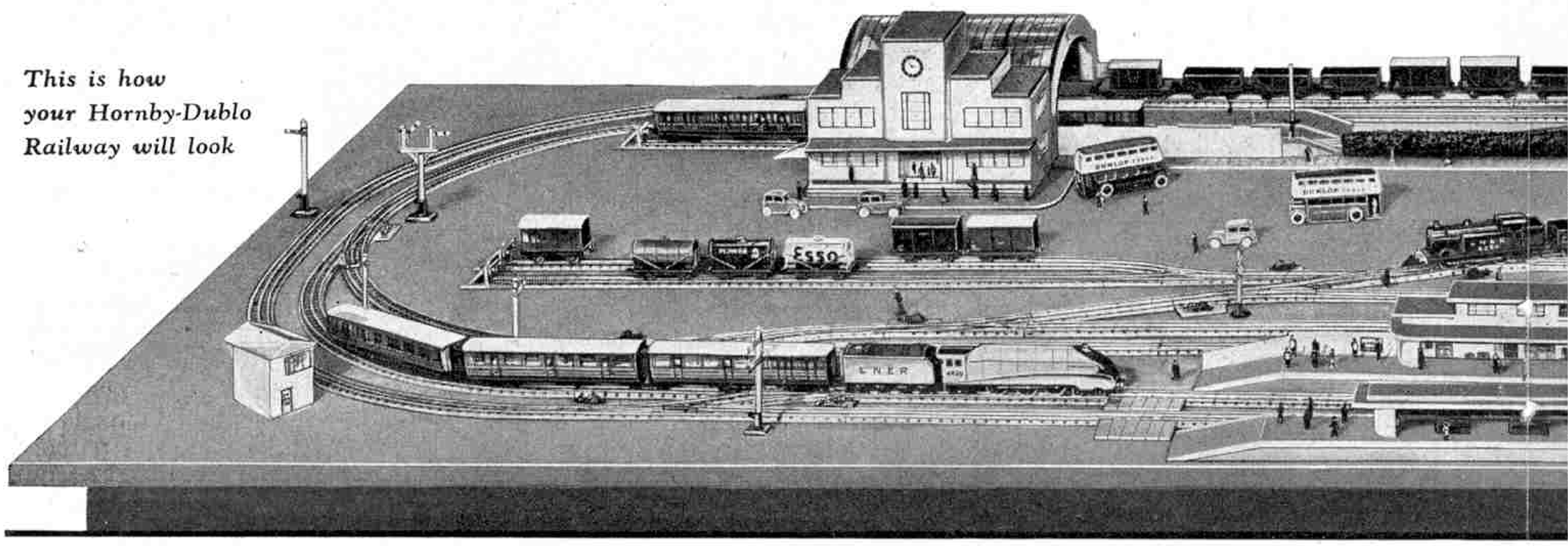
Hornby-Dublo Electric Trains operate on **Direct Current** at 12 volts. This current may be obtained either from **Alternating Current Mains Supply** through a Dublo Transformer and a Dublo Controller No. 1, or from a 12-volt accumulator and a Dublo Controller No. 1a.

The Dublo Transformers are specially designed for these Trains; no others should be used.

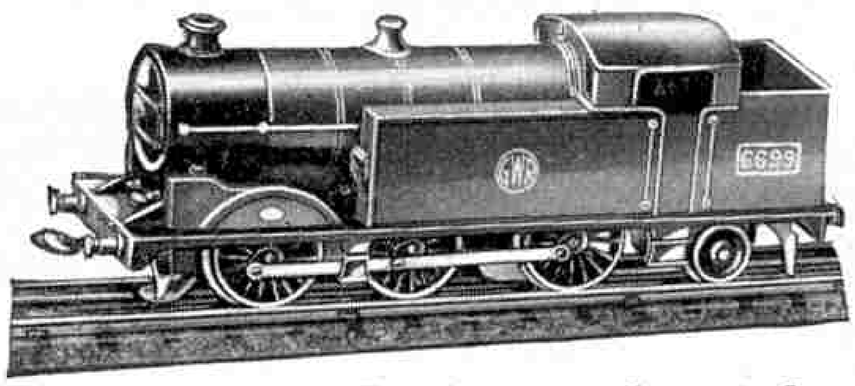
Write to Meccano Ltd., Dept. DF, Binns Road, Liverpool 13, for a free copy of the special folder giving details of the Hornby-Dublo Railway System.

HORNBY-DUBLO TRAINS ARE MANUFACTURED IN LIVERPOOL BY MECCANO LIMITED.

This is how your Hornby-Dublo Railway will look

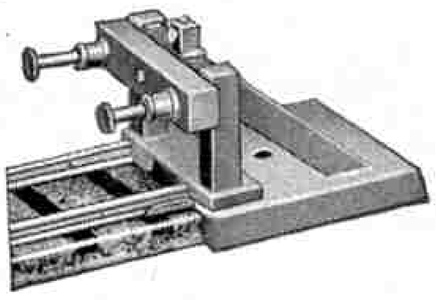


TANK LOCOMOTIVE



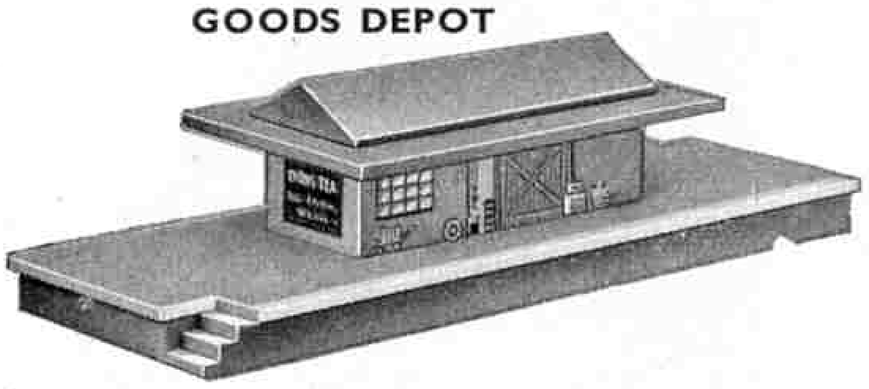
Hornby-Dublo Electric Tank Locomotive (Automatic Reversing). Available in L.M.S., L.N.E., G.W. or S.R. colours. Price **17/6**

BUFFER STOP



A particularly realistic model of a type to be seen in the sidings in most goods yards. Price **10d.**

GOODS DEPOT



A realistic depot for goods traffic in the same style as the Main Line Station and Island Platform. Size: Length 12 in., width 4 in., height 2⅞ in. Price **4/11**

ECT TABLE RAILWAY !

HORNBY-DUBLO ELECTRIC AND CLOCKWORK PASSENGER TRAIN SETS

ELECTRIC

Hornby-Dublo Electric Passenger Train Set, L.N.E.R. Contains Streamlined Six-coupled Locomotive **"Sir Nigel Gresley"** (Automatic Reversing), Tender, Two-Coach Articulated Unit, Dublo Controller No. 1, seven Curved Rails, one Curved Terminal Rail and two Straight Rails. (To be operated from a Dublo Transformer, not included in Set.) Price **70/-**

Where the mains supply is D.C., or there is no supply, the above Set is available with Dublo Controller No. 1a (for use with 12-volt accumulators) as follows:
Electric Passenger Train Set, L.N.E.R. (With Dublo Controller No. 1a.) Price **61/6**

CLOCKWORK

Clockwork Passenger Train Set, L.N.E.R. Contains Streamlined Six-coupled Locomotive **"Sir Nigel Gresley"** (Reversing), Tender, Two-Coach Articulated Unit, eight Curved Rails and two Straight Rails. Price **39/6**

HORNBY-DUBLO ELECTRIC AND CLOCKWORK TANK GOODS TRAIN SETS

ELECTRIC

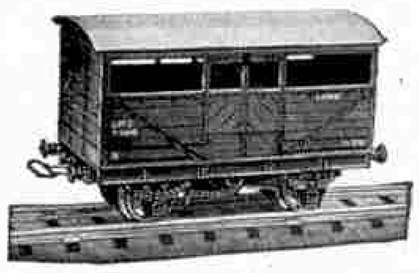
Electric Tank Goods Train Set, L.M.S., L.N.E.R., G.W.R. or S.R. Contains Six-coupled Tank Locomotive (Automatic Reversing), Open Goods Wagon, Goods Van, Goods Brake Van, Dublo Controller No. 1, seven Curved Rails, one Curved Terminal Rail and two Straight Rails. (To be operated from a Dublo Transformer, not included in Set.) Price **55/-**

Where the mains supply is D.C., or there is no supply, the above Set is available with Dublo Controller No. 1a (for use with 12-volt accumulators) as follows:
Electric Tank Goods Train Set. (With Dublo Controller No. 1a.) Price **46/6**

CLOCKWORK

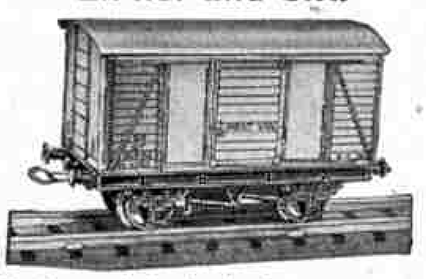
Clockwork Tank Goods Train Set, L.M.S., L.N.E.R., G.W.R. or S.R. Contains Six-coupled Tank Locomotive (Reversing), Open Goods Wagon, Goods Van, Goods Brake Van, eight Curved Rails, and two Straight Rails. Price **27/6**

CATTLE TRUCK L.M.S. and G.W.R.



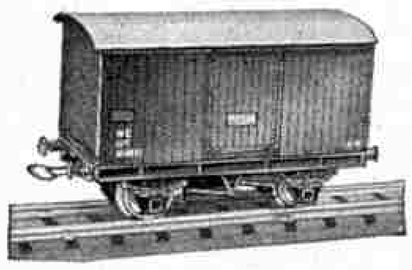
An attractive vehicle, fully detailed and typical of up-to-date practice of the two companies. Price **1/6**

MEAT VAN L.M.S. and S.R.



Scale model of the latest ventilated meat vans; L.M.S. Van Bauxite brown and S.R. Van buff. Price **1/6**

FISH VAN N.E.

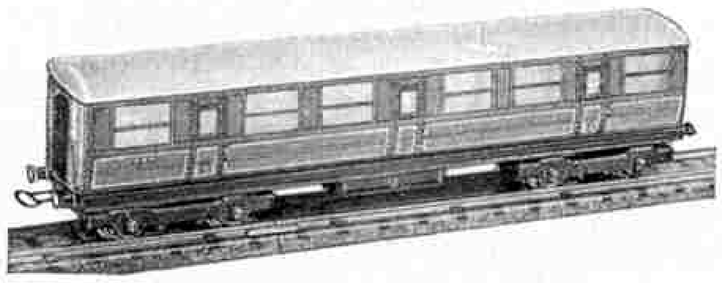


A characteristic N.E. van used for perishable traffic. Finished in red-brown with white roof and lettering. Price **1/6**

PETROL TANK WAGON "ESSO"

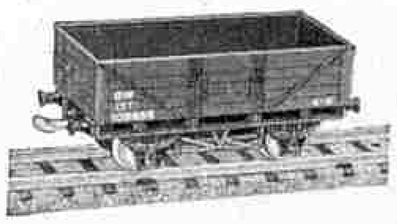
Finished in buff with bright blue lettering. Price **2/6**

CORRIDOR COACH L.N.E.R.



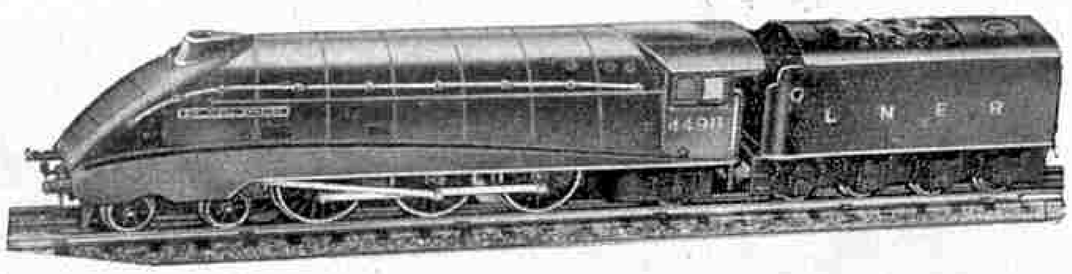
An accurately detailed model of a standard L.N.E.R. teak-finished Corridor Coach. Price **3/6**

12-TON OPEN GOODS WAGON



A model of the standard 12-ton Open Goods Wagon. Available in the designs and colours of the four railway groups. Price **1/4**

STREAMLINED EXPRESS LOCOMOTIVE



Hornby-Dublo Electric Streamlined Locomotive "Sir Nigel Gresley" (Automatic Reversing) and Tender L.N.E.R. Price **29/6**

Hornby-Dublo Lineside Effects

Easily-made Signs and Other Features

A MINIATURE railway must have lineside effects of various kinds to give definite character to it. Otherwise, whatever its extent, it gives the impression of being a mere track, without any apparent reason for its existence. In laying out a Hornby-Dublo System therefore it is necessary to give attention to this subject. We have previously dealt with the various requirements of a railway nature, such as Hornby-Dublo Stations, Signals, Tunnels and so on, and we propose now to deal with other methods of adding to the realism of the railway.

The railways in this country are bound to enclose their tracks, and it is necessary therefore for us to find some way of defining the limits of our railway property. The standard Hornby Hedging is ideal for this purpose, and can be applied equally well to either permanent or to temporary systems. Each length is made up on a thin wooden base, so that it is easy to make alterations when changes are made in the layout, or when this is extended. Good use can be made also of Hornby Trees, especially if they are grouped in a reasonable manner and are not simply placed in odd spots, without much thought to their effect. Hedges and trees are characteristic of the view to be seen from the carriage window on almost any railway journey in this country, and the Hornby Hedges and Trees will help to give something of this "green and pleasant" effect alongside a Hornby-Dublo railway.

Miniature walls provide another possible means of enclosing the tracks. These may be in the form of retaining brick walls of various heights where the railway cuts its way through below the surface of the ground; or they may represent the low stone walls that are commonly found in parts of the country where stone is easily obtained. The enclosure of a railway yard or other premises may call for a built-up wall of brick, stone or concrete. A popular way to make up walls of this kind is to cut pieces of wood of suitable size and shape, and either to paint them to represent brick or stonework, or to cover them with the brick-paper that is obtainable from many toy shops and from most decorators.

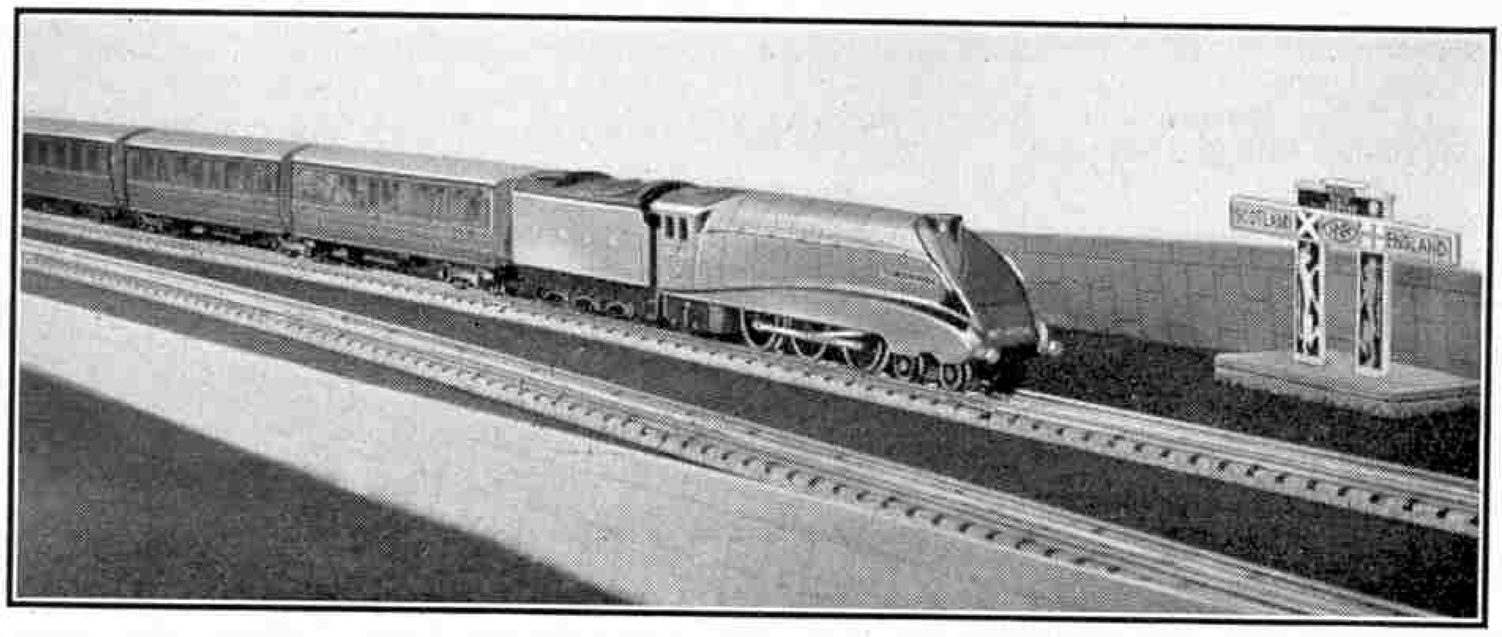
Some readers make good use of the lengths of pavement contained in the Pavement Set, Meccano Dinky Toys No. 46. This certainly saves the model railway owner having to carry out the "decoration" of his walls, for one side of the Pavement sections is printed to represent the usual paving and curb stones. A special advantage is the fact that the sections can be readily cut to whatever length or height may be necessary, by means of a sharp knife held against a steel rule.

It is much greater fun actually to "build" one's walls, however, and it is possible to do this by means of the miniature Bricks that are available in the Hornby System, in which they are primarily intended for use as wagon loads. They are supplied in boxes of 100, and with them an actual wall can be built up by laying the bricks on edge. They are quite stable when placed in position, but it is more satisfactory to be able to secure them in some way and Seccotine makes excellent "mortar" for the purpose.

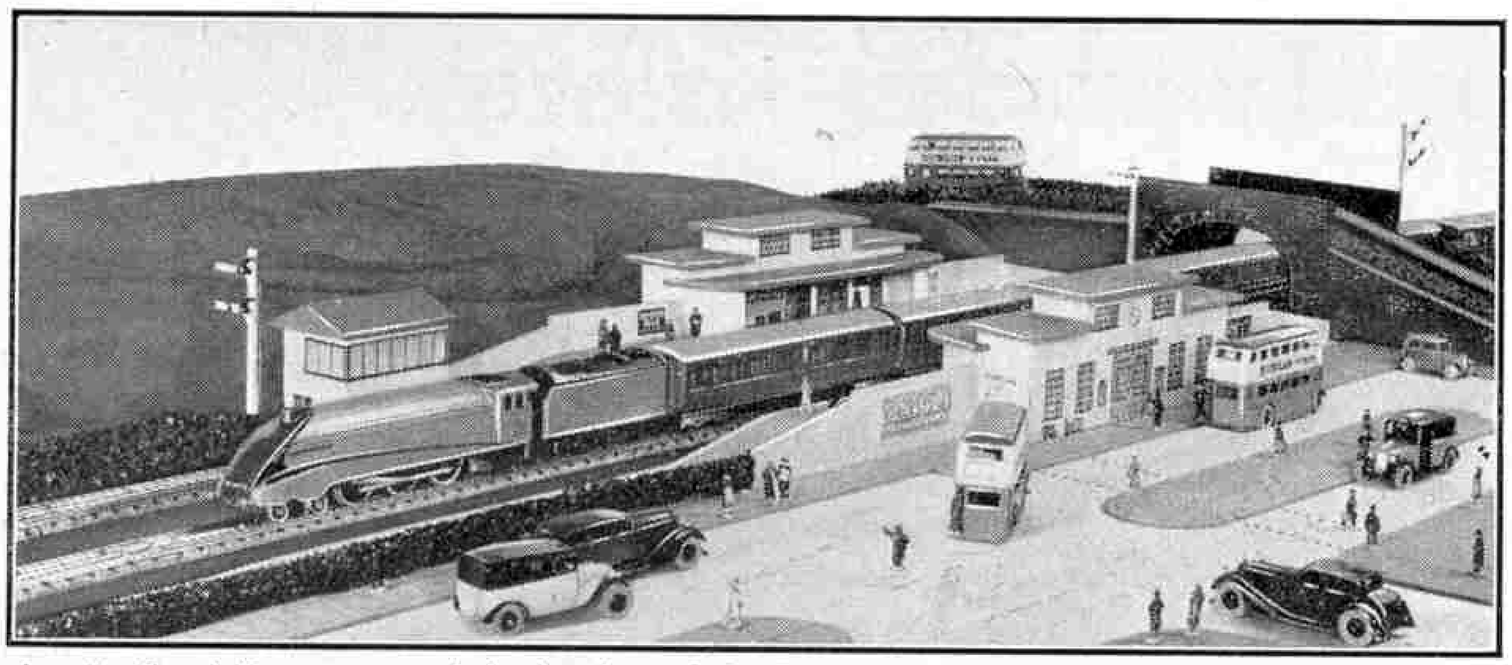
On a permanent layout a "brick" wall so made can be built on the site where it is required, and for use on more or less temporary systems it is possible to build up standard units, each say 10 bricks long and as high as may be required. In setting the bricks it is necessary to ensure that the vertical joints of one row come exactly opposite the midway points of the bricks of the next, both above and below. This method has the result of providing at the end of one section projecting tongues that can be fitted into corresponding slots in the next length of wall.

It is worth noting that there is no need for the walls to follow a dead straight line; they can be made to conform to regular curves. If several units of the latter kind are required, possibly to run parallel with a curved section of track, it is not a bad plan to draw the line to be followed on a sheet of paper or a piece of flat cardboard, and to lay this down as a guide to the "bricklayer." Walls made in this way have a particularly natural appearance. The comparative size of the Hornby Bricks may worry some enthusiasts; they are certainly too large to represent bricks on the same scale as that of Hornby-Dublo Trains, but they can be considered as representing large stone blocks.

Having provided walls for our railway property, the next step is to endeavour to relieve the somewhat blank appearance that they are bound to have. For this purpose the Hornby Posters, particularly the smaller ones, are ideal, and the attractive poster displays that can be arranged add considerably to the realism of a system. In addition to their display in this manner, the posters can be shown also on the Hornby Station Hoarding. This can be used to represent a large board of the kind frequently erected in the neighbourhood of stations, and it can be employed equally well as a lineside or field sign.



A Hornby-Dublo express passing a miniature Border Sign made up as described on the opposite page.



An attractive station arrangement showing the realistic effects that are made possible by the use of Dinky Toys components in conjunction with Hornby-Dublo Trains and Accessories.

In addition to the Posters referred to, it is frequently possible to use various announcements cut from newspapers, guide books, timetables and travel literature. Descriptions of the attractions of some particular district or place supposed to be served by the line, and notices of the running of excursion trains and of cheap fare facilities all form suitable material. There is a surprising amount of interest in arranging a display of items of this kind, as readers who try out the scheme will speedily find.

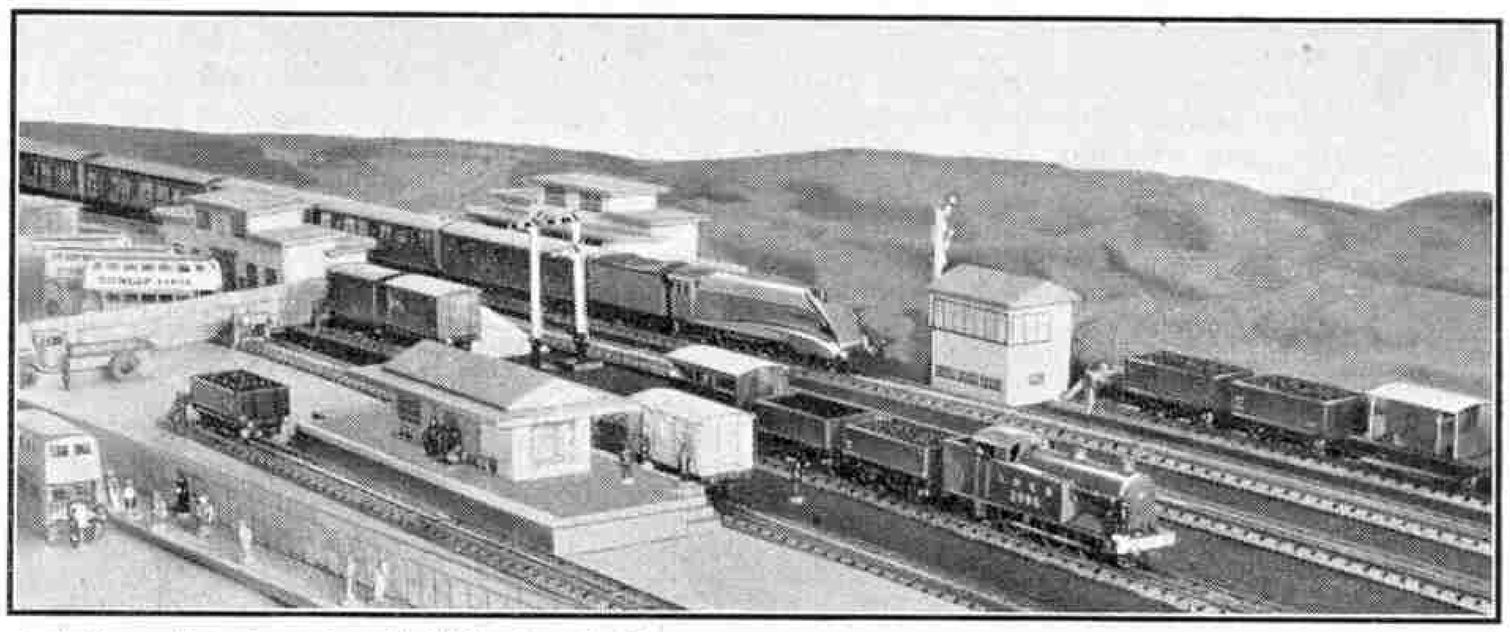
In order to look most effective it is important that the various posters, bills and announcements should be neatly displayed, whether they are on walls or station hoardings, or on the actual station buildings. Hornby-Dublo Stations are provided with a certain number of posters, and it is not advisable to add many more or the general effect will be overdone. Neatness of stations and their surroundings, and of the railway premises generally, is a strong feature of practice in the North-Eastern area of the L.N.E.R., and the Hornby-Dublo railway owner will do well to attempt to reproduce something of this effect, particularly if his system is based on the L.N.E.R. The general characteristics of the Hornby-Dublo Stations actually are similar to those of many L.N.E.R. stations, and this of course is a good start towards obtaining the required effect.

The tidiness of the real track is easily reproduced on a Hornby-Dublo railway, for Hornby-Dublo track is of particularly neat and "clean" design, and a well-ballasted road bed with accurately spaced sleepers is represented in the tinprint design of the track base.

The L.N.E.R. name "Berwick" provided on the gummed slips that are packed with all Hornby-Dublo Stations reminds us of a particularly interesting lineside development that has taken place in recent years. This is the erection of lineside signs marking summit points, county boundaries or, most interesting of all, the Border between England and Scotland. It is interesting to provide such signs in miniature on a Hornby-Dublo system, and the realistic effect of a model Border sign is well shown in the illustration on the previous page. It is not difficult to make up a miniature sign of this kind. Fairly thick cardboard should be used, and supports of thin wood should be attached to the back of the "legs" of the sign, and made to project downward. These supports can be attached to a suitable base, also of wood or card, but on a permanent system they could be planted in the model "earth." The painting of the details of the sign is not really difficult, but for those not skilled in brushwork some simplification would be possible without spoiling the general effect.

The Border sign has two arms, indicating on the one hand *"England"* and on the other *"Scotland."* The names of the countries are in black letters on a yellow background. In the centre of the sign at the top appear the words *"Across the Border"* in yellow letters on a black background, and below are the company's initials, *"L.N.E.R.,"* arranged in the form of a neat monogram. On the English side of the centre is shown the Rose of England in red and green, and below it is the Cross of St. George in red and white. The corresponding Scottish emblems on the other side are the Thistle in green and purple, and the diagonal Cross of St. Andrew in blue and white. On the supports of the sign, which are arranged as downward projections of the centre portion, are shown the Lion Rampant of England and the Unicorn of Scotland in their respective places. The Lion is in red and gold and the Unicorn in white and gold, a black background being employed in each case. An illustration of the sign appeared on page 717 of the *"M.M."* for December 1937.

Another lineside feature is the "ripple" sign that is used on the L.N.E.R. to denote the commencement of a water trough. The sign is on an ordinary rectangular board, and on this stretching from one side to the other is a series of five inverted "V's." In reproducing this in miniature one of the standard Station Hoardings can be used. This should be painted white, and the ripple sign that zig-zags its way across it can then be marked out on it in Indian ink. Other signs, such as those advertising various products, can be made up easily by keen Hornby-Dublo owners.



A station and goods yard neatly laid out on the lines suggested in the article. The yard wall near the Station building is actually constructed of Hornby Bricks.

An important requirement on the railway and in its surroundings is "life"; and this is readily provided by the use of Hornby-Dublo miniature figures and various Dinky Toys.

A Model "Tyneside" Railway

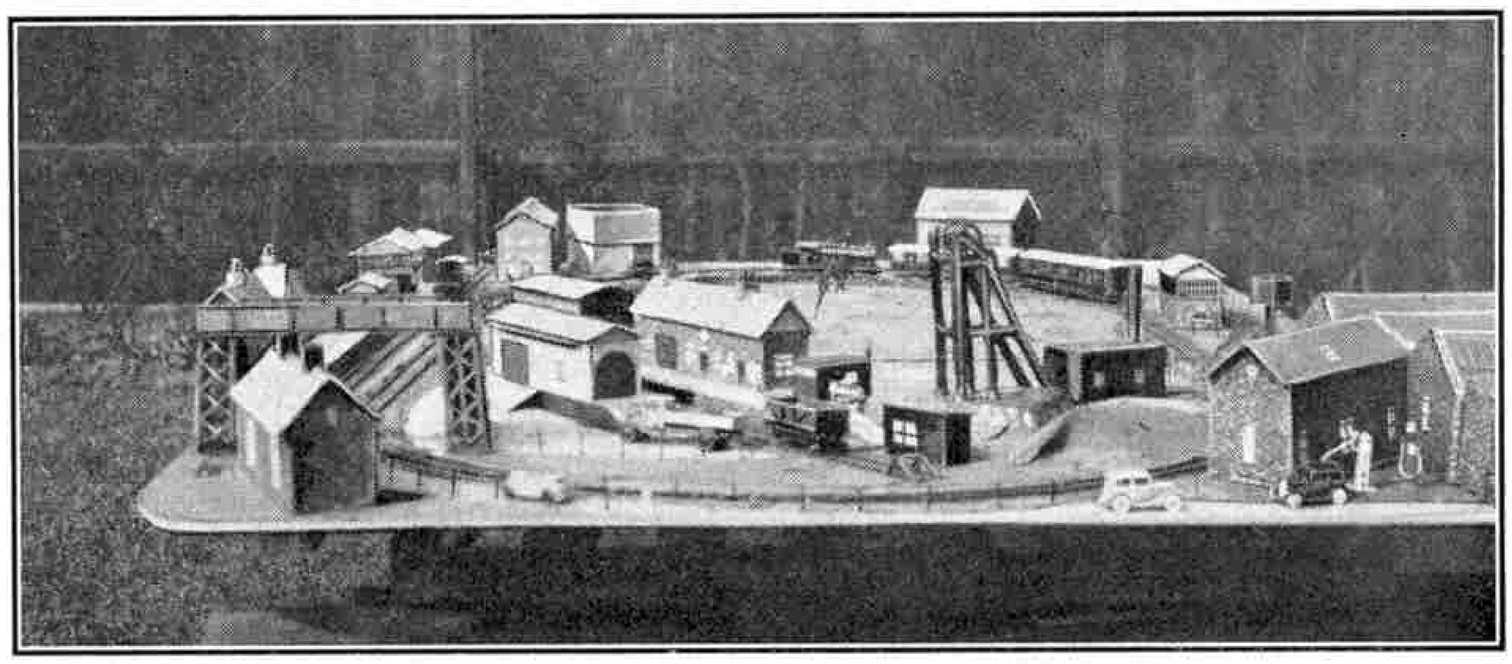
Realistic Working with Hornby-Dublo Trains

MANY model railway owners select a local section of a real railway and reproduce its characteristics as far as possible on their own layouts. A good example of a railway of this kind is the Gauge 00 system shown in the upper illustration on this page. This is jointly owned and operated by N. A. Sharples and his brother of Newcastle-on-Tyne, and has many features that will be of special interest to our readers.

The arrangement of the layout follows a plan that we have frequently recommended, for the whole system is laid down on a baseboard built in sections. These are constructed of plywood strengthened underneath with battens, and when the various sections are put together they cover a space measuring 6 ft. by 3 ft. 6 in. The baseboard is supported on trestles. Normally the railway is housed in a garage. Although permanent in one sense, the layout also can be regarded as portable, for the sections can readily be detached from one another after severing the electrical connections, and can then be re-erected in the open without trouble on fine warm days. The upper illustration on this page shows how the layout is supported when it is in use out in the garden.

The track is laid on tarred felt, with fine grit to serve as ballast. The points are operated by levers in the signal boxes, which actuate thin wires led through metal tubes, and the Hornby-Dublo Signals that are to be added shortly are to be operated in the same manner. The electrification of the track is carried out on the outside conductor rail system in order to follow the practice of the actual section of line represented. The conductor rail is made of 1/16th in. square brass rod soldered to the heads of wood screws, which represent the porcelain insulators, and the whole assembly is black-lacquered, although the rail heads are left bright.

The main idea in constructing this railway was to obtain realism in a small space, and the size of the baseboard is evidence of the compact nature of the system. What degree of realism has been obtained can be judged from the description that follows. The local system represented is the L.N.E.R. line from Manors Station at Newcastle-upon-Tyne to Newbiggin-by-the-Sea and Blyth, the distance involved being about 18 miles. The surrounding country is fairly flat and there are no embankments, so that a model railway on a flat sectional baseboard can well represent the track.



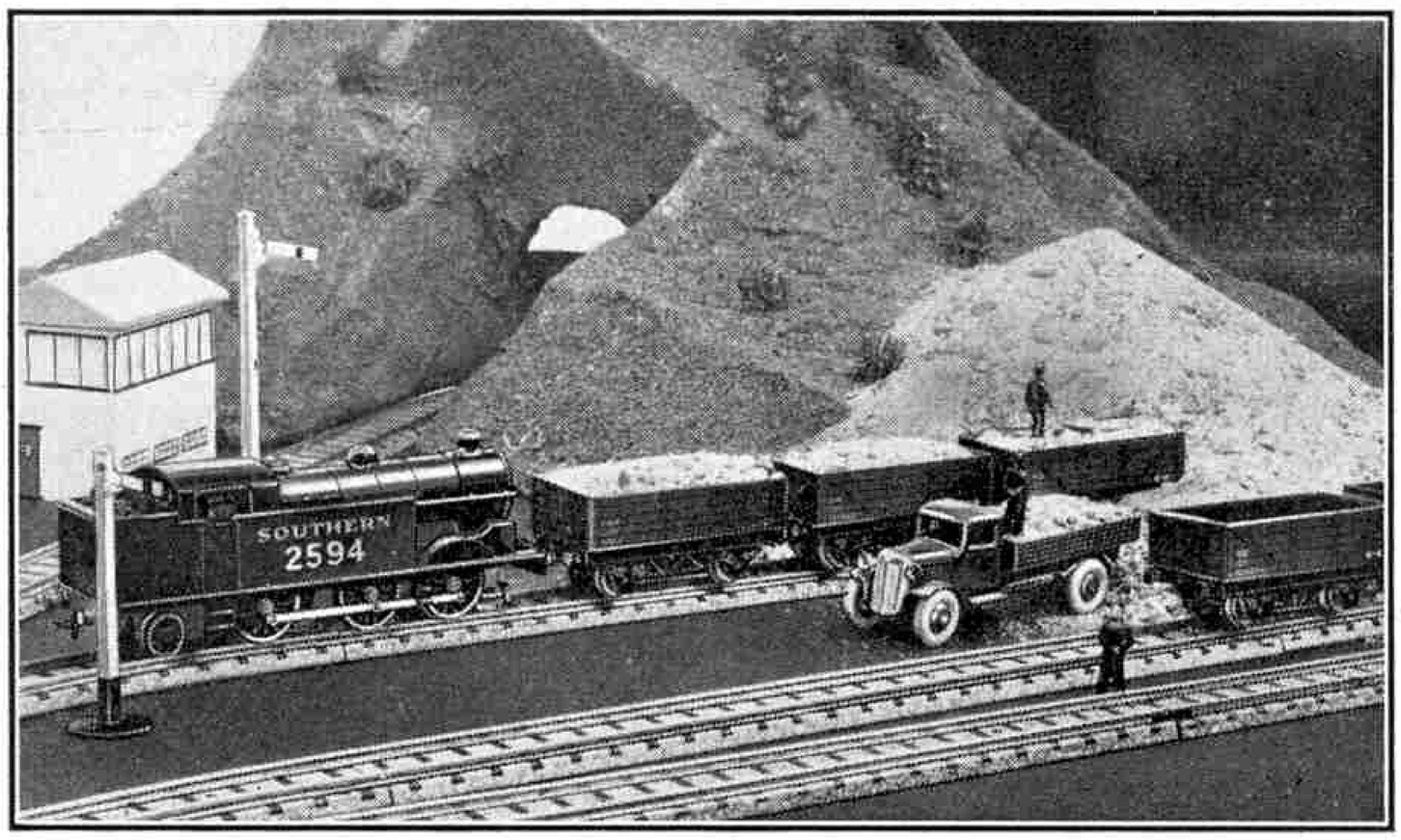
The miniature railway system of N. A. Sharples, Newcastle-on-Tyne. The layout is arranged in sections on a baseboard and can be operated either indoors or outside as required.

The main track is a continuous oval and there are three stations, representing Newcastle (Manors North), Newbiggin and Blyth respectively. All three are of the terminal type, each situated off the main line. "Manors North" station, which represents only part of the real Manors North, is fitted with a celluloid roof and has a clock tower and water tower. "Newbiggin" and "Blyth" have single platforms, and are made to conform to general railway practice. "Blyth" siding has a model quayside, warehouses, and a large water tower open at the top for easy access, in which the Dublo Controller for operating the line is conveniently hidden. Power is supplied from a Dublo Transformer fitted inside a model sub-station, a type of building that is very common in the real electrified area. Other structures include an engine shed, goods shed and a footbridge.

A typical lineside effect is the pithead gear of a small coal mine, complete with pit heap, and an unusual feature is a golf course, which is made of smooth baize and is dotted with "bunkers." The clubhouse is situated near "Newbiggin" station, and there is a car park with a small Dinky Toys sports car in it. All the buildings are constructed of wood and cardboard, the framework being covered with scale "brick" and "stone" paper of various hues. Meccano Dinky Toys add to the realism of the roads, and a small Dinky Toys car is seen refuelling at the petrol pumps. Hornby-Dublo miniature people make the stations appear lively, and golfers can be seen on the links.

Locomotive power is provided by a Hornby-Dublo 0–6–2 L.N.E.R. Tank. At present this has to cope with all the traffic, which to say the least is very heavy for one engine, but it has proved itself a fine hauler, fully equal to the demands made on it. To relieve it of some of the increasingly heavy work, another similar tank engine is to be added as soon as accommodation is ready at "Manors," where an engine shed and goods yard are being added. A siding serving the coal mine also is proposed, but on a small railway care has to be exercised to avoid overcrowding.

Regular trains are run from "Manors" to "Newbiggin" and "Blyth," and vice versa, and between "Newbiggin" and "Blyth." The passenger stock consists of separate Hornby-Dublo D1 Coaches; when not in use these are left at "Manors" station, as in real practice. Coal trains are the most prominent feature of goods traffic on the real line reproduced in miniature on this layout, and at present the goods rolling stock in use consists only of Hornby-Dublo Coal Wagons, with an L.N.E.R. Goods Brake Van to complete the make-up of the train.



Loading stone on a Hornby-Dublo railway. This is a typical example of the kind of local traffic mentioned in this article.

"*Queen Elizabeth*" in Miniature

Fine Model in New York World's Fair

By W. J. Bassett-Lowke, M.I.Loco.E.

THE British Pavilion at the New York World's Fair, opened on 30th April, is the finest overseas exhibit Great Britain has yet staged. It follows the general theme of the exhibition, which is "The World of To-morrow," and under the main headings of shipping, engineering, health and history contains some of the most ingenious display work produced in this country.

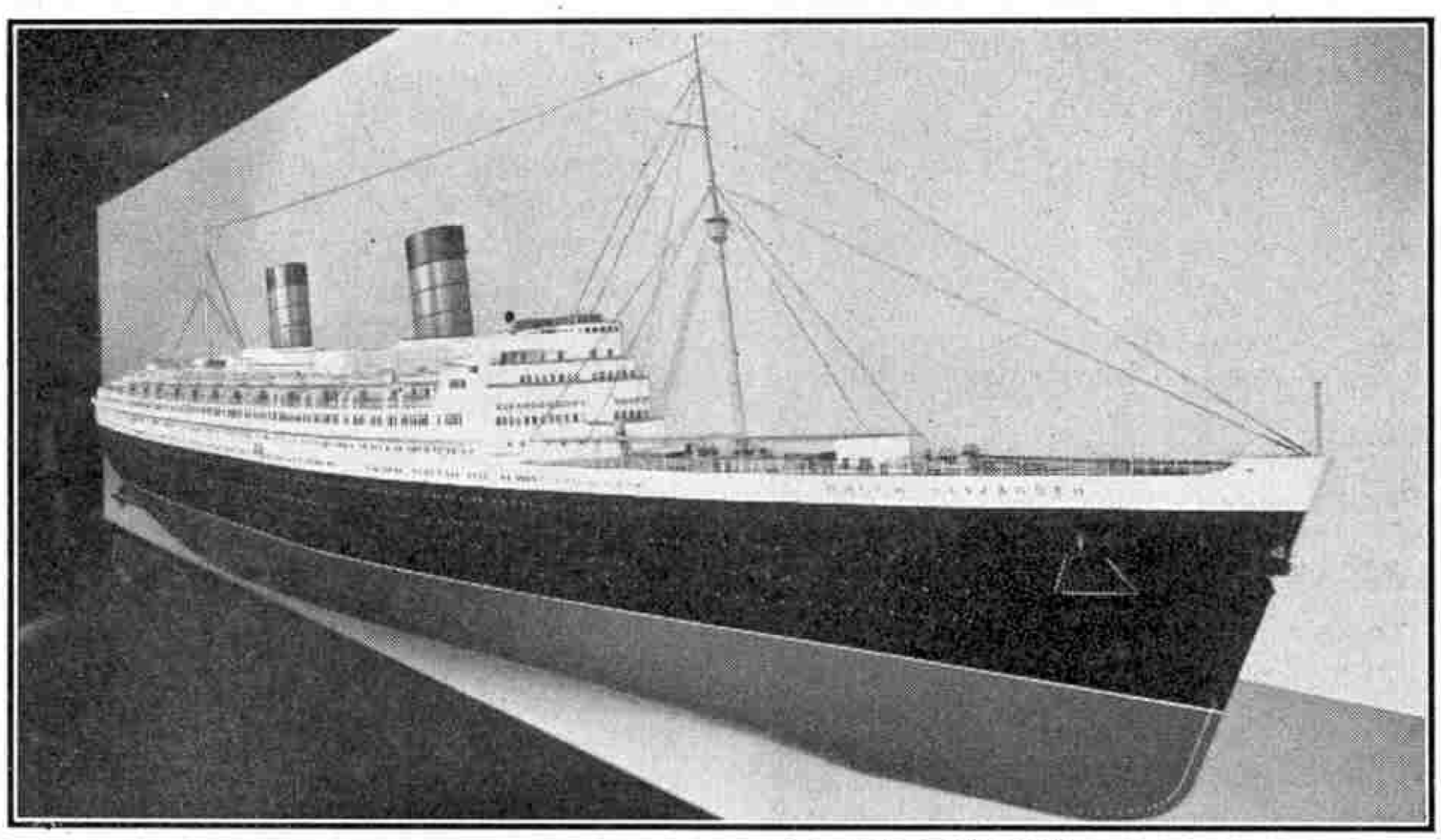
In the shipping section, the modern British Merchant Navy and its operations all over the world figure largely, and a distinctive feature of the hall containing this exhibit is a series of magnificent wall panels, which portray the development of British shipping across the North Atlantic. The huge central panel, depicting the new Cunard White Star floating palace R.M.S. "*Queen Elizabeth*," is truly an example of "magnitude in modelling," for the miniature ship itself, 1/36th of the size of its prototype, measures 28 ft. 6 in. from stem to stern. It is made in the form of a half-section mounted on a backboard of sea and sky, and its construction at Northampton occupied from November 1938 to February 1939.

Not only is the "*Queen Elizabeth*" the largest ship in the world, but this model of her, as far as records tell, is the largest ever made in Great Britain. Perhaps it will give readers some idea of the work entailed in its construction, when I say that three tons of African mahogany of the finest quality went to the making of the great hull, although when finished the ship would weigh about 12 cwt. It was not possible to purchase the timber in plank long enough, so this difficulty was overcome by making butt joints in the centre.

The planks, 2 in. to 4 in. in thickness, were cut roughly to shape and then firmly fixed with glue and long steel screws. Then followed the task of shaping the hull to templates taken from the actual lines of the ship. Finally the hull was sandpapered to a satin smoothness, primed with special compound and all grain filled. This elaborate ritual, including the application of many coats of paint and the production of a glossy varnished surface, is necessary to give a really lasting finish to an exhibition model.

In the meantime the metal workers were busily employed. Fittings of brass and gun-metal, some cast, some wrought, were being made from accurate drawings supplied by the shipbuilders, whilst the decks, deck buildings and all small wooden parts were being constructed in the woodworking shop. For weeks and weeks these small scaled fittings, in every respect parts from a model shipyard, were being constructed, and the casual observer seeing the ship from day to day would find little advancement on the hull until practically the last fortnight or 10 days, when the thousands of accessories, many of them so minute that they are threaded together on fine wire to prevent any being lost, were suddenly brought together; every hour then showed an appreciable difference in the model's construction.

In the illustrations on this page the model is shown mounted on the backboard, which is sprayed in two shades of blue to represent the sea and the sky. This panel is 35 ft. wide and 9 ft. 6 in. high, and was built from selected block board mounted on framing of suitable strength.



Bow view of the finished model mounted on its panel, which is sprayed to represent sea and sky.

The hull, varnished and painted, was mounted on the panel before assembling, and the upper illustration shows the model in the process of assembly. The sidelights, of which there are at least 500 all ready glazed, have been tapped into the hull; this is a task requiring meticulous care, for one false move and the entire hull is spoilt. The model maker seen in the rear is building up the boat deck, while the master painter in the immediate foreground cuts in the draught marks.

Building the giant model of "Queen Elizabeth" described on this page.

At this stage of the work many of the metal fittings are in place, such as bollards, capstans and winches on the lower decks, but there are still the funnels to be erected, the masts to be stepped, the standing rigging to be set up, and the boats to be slung on the davits.

For shipment the model was built into a huge waterproof case, which was so large that an entire street had to be closed for traffic throughout a whole forenoon while it was being loaded. Now it has reached New York and is in its place of honour at the World's Fair. Surrounding it are other half models to the same scale of ships that have taken prominent parts in the development of transport across the Atlantic. First there is the little paddle steamer "*Sirius*," the first vessel to cross the North Atlantic entirely under her own steam. Leaving Cork Harbour on 4th April 1838 with 94 passengers, she arrived in New York on 23rd April. Her gross tonnage was 703, and she was 178 ft. long, her dimensions providing an interesting comparison with those of the vessels that make the crossing at the present day. Another historic ship to be viewed in model form alongside the "*Queen Elizabeth*" model is the "*Great Western*," which but for a serious engine room fire would have wrested from the "*Sirius*" the title of first steamship to cross the Atlantic. She was designed by the famous engineer Brunel, and was part of a scheme to make a completely Great Western route from London to New York. Another Brunel vessel of which a model is shown is the first screw steamer to make the Western Ocean crossing. This vessel was to be made of wood, but on the advice of Brunel it was decided to adopt iron, a decision that was much condemned by the public, as they thought the ship would immediately sink! Last but not least comes the "*Britannia*," the wooden paddle wheel steamer, the first of the famous Cunard Line.

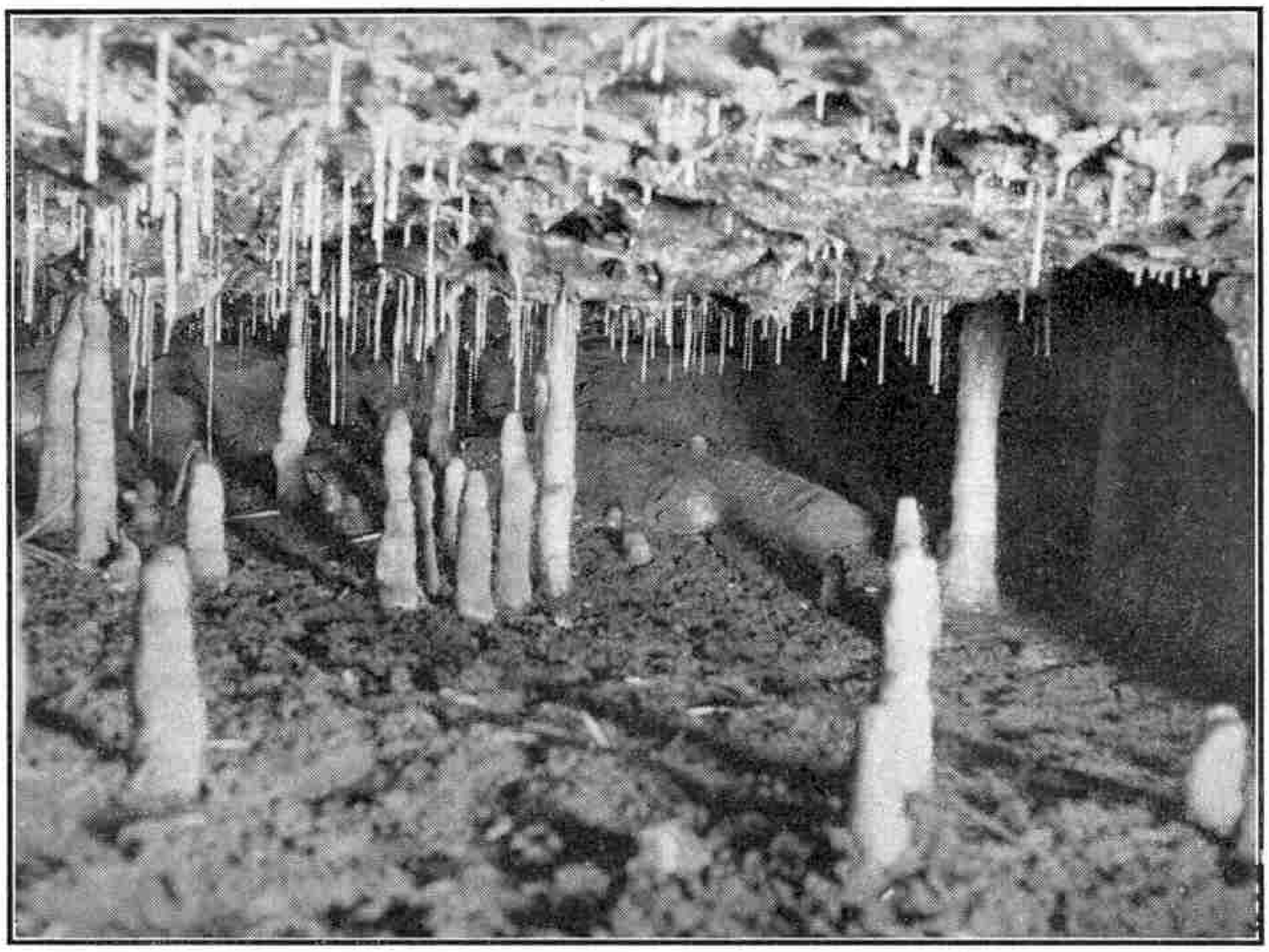
Interest in the "*Queen Elizabeth*" model is heightened by the fact that underneath it are placed five models of interiors of important public rooms in this new ship. These are built to the large scale of 1 in. to 1 ft., and are electrically illuminated when a visitor presses a button. This action not only lights up the room selected, but also indicates in the model where it is situated in the actual ship.

A Limestone Underworld

Thrills of Pot-Hole Exploration

By Sydney Moorhouse, F.R.G.S.

STRANGE as it may seem, some of the loveliest scenery in all Britain is hidden away beneath the surface of bleak hills, and can only be seen by descending swaying rope ladders that lead down into a world of inky blackness, or by following a succession of dark winding passages. Tremendous waterfalls, stalactites hanging like stone icicles from the roofs of the caves and stretching downward to meet the stalagmites rising from the floor, fairy grottoes, streams that surge along in darkness, limestone pillars like the columns of some wonderful cathedral, icy pools of clear water, glistening walls of white limestone—these are only a few of the marvels to be seen in the nether regions.



Stalactites and stalagmites in one of the passages leading from the bottom of Gaping Ghyll, a famous pot-hole on Ingleborough. The illustrations to this article are from photographs by H. E. Whitaker, Denholme.

The limestone districts of Derbyshire, Craven in Yorkshire, and the Mendip Hills of Somerset contain the bulk of our English caverns, and the manner of their formation is interesting. Limestone is not only a porous rock, but also is very easily dissolved by rainwater. Streams running through this type of country naturally lose a great deal of their water, some of which sinks into the porous rock, while a greater quantity finds its way down the cracks and joints that are always to be found in limestone. As time goes on the water wears away and dissolves the stone round it, and carves long underground channels or caves. It takes thousands of years for all this to happen, but the process is the cause of the immense caves and pot-holes to be found in the districts I have just mentioned. A pot-hole can be described as a vertical cave, and usually is found where the stream disappears into the ground. On the other hand, caves are mostly formed where the water comes to the surface again, and as a result are usually horizontal in form.

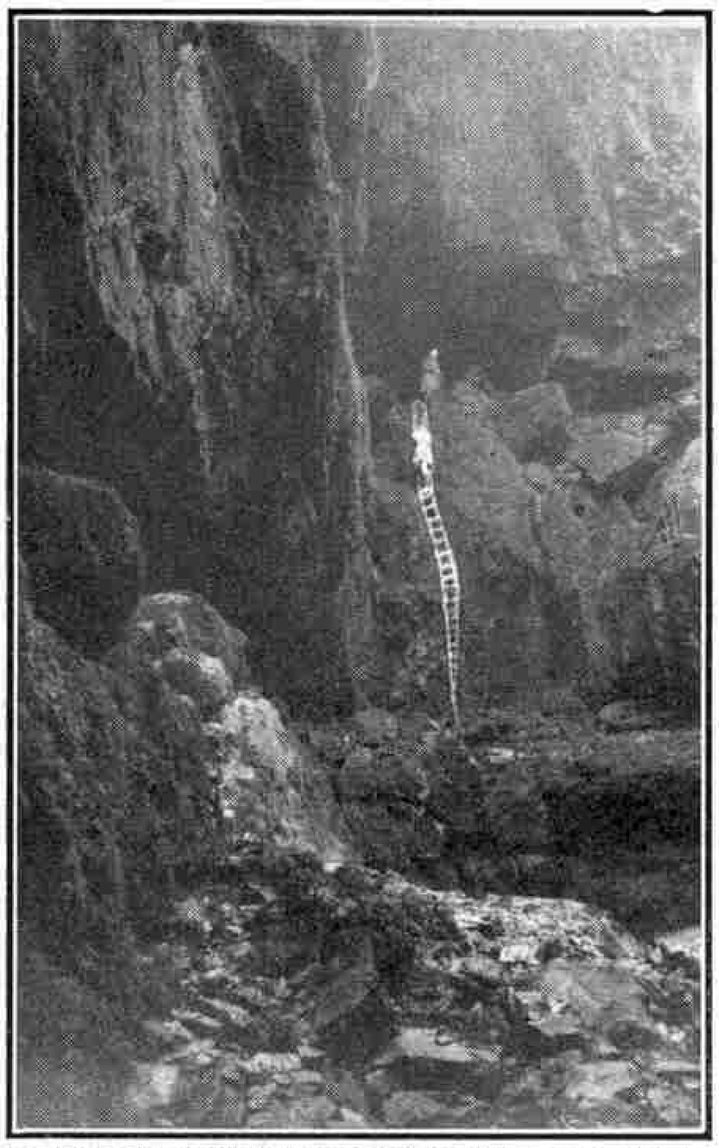
Practically no attempt to explore these caves was made until the latter part of last century. In 1869 the Settle Cave Committee in Yorkshire decided to investigate some of the caves in the Craven area, and the result of their explorations attracted the attention of M. Martel, a Frenchman who had been doing a great amount of underground research on the Continent. It was this daring cave-explorer who made the first descents of some of our deepest pot-holes and caverns.

In 1895 M. Martel managed to get to the bottom of Gaping Ghyll, the deepest pot-hole in England, which lies on the slopes of Ingleborough, Yorkshire. He had with him three ladders, each 100 ft. in length, but on plumbing the hole he estimated the depth to be 330 ft. and discovered that his ladders were thus 30 ft. short of the required length. This difficulty had to be overcome somehow, and the explorer surmounted it by driving two stout stakes into the ground near the lip of the hole and then lowering the ladders into the chasm by means of a rope secured round these.

His preparations for the descent occupied over three hours. Every knot was tested and subjected to a severe strain in order to ensure the least possible risk of accident. In due course he was ready for the descent, and seated astride a stout ash rod, with a plentiful supply of magnesium ribbon, candles, a telephone and a long length of spare wire, and with a life-line firmly fixed round his waist, he was lowered on to the first ladder.

All went well for the first 190 ft., and then he found the remainder of the ladders entangled together and laid on a heap on a ledge some 12 ft. by 6 ft. These had to be straightened and lowered into the hole again. Some idea of the difficulty can be imagined when it is realised that there was a further drop of over 100 ft. below him, and the work had to be accomplished in complete darkness except for the light he himself carried, which must have handicapped him considerably. All the time water was falling and crashing around him!

Martel succeeded in his task and continued the descent. After another 40 ft. the walls of the shaft came to an end, and the final drop had to be done on a swaying ladder into practically unknown depths, but



In the main shaft of Alum Pot, Ingleborough, 150 ft. below ground level.

23 min. after leaving the top he stood at the bottom of the shaft. He was the first human being to behold the magnificent spectacle of the huge domed hall, into which one could fit some of our largest cathedrals and still have room to spare. The upward journey took 28 min.

Since that time Gaping Ghyll has been the subject of extensive underground exploration. Some two miles of passages radiating from the main chamber have been discovered, entrances made by other openings in the flanks of Ingleborough, and new underground chambers revealed. Even to-day, over 30 years after Martel's descent, the extent of Gaping Ghyll is unknown, and new finds are reported every summer.

The rope ladder is seldom used for descending the main shaft nowadays. Modern progress has substituted more up-to-date methods and the explorer does the trip in comparative comfort, seated in a bo'sun's chair that is lowered and raised by means of a winch driven by a petrol engine. But even then the experience of passing out of daylight into a dark world of crashing waters is a thrilling one.

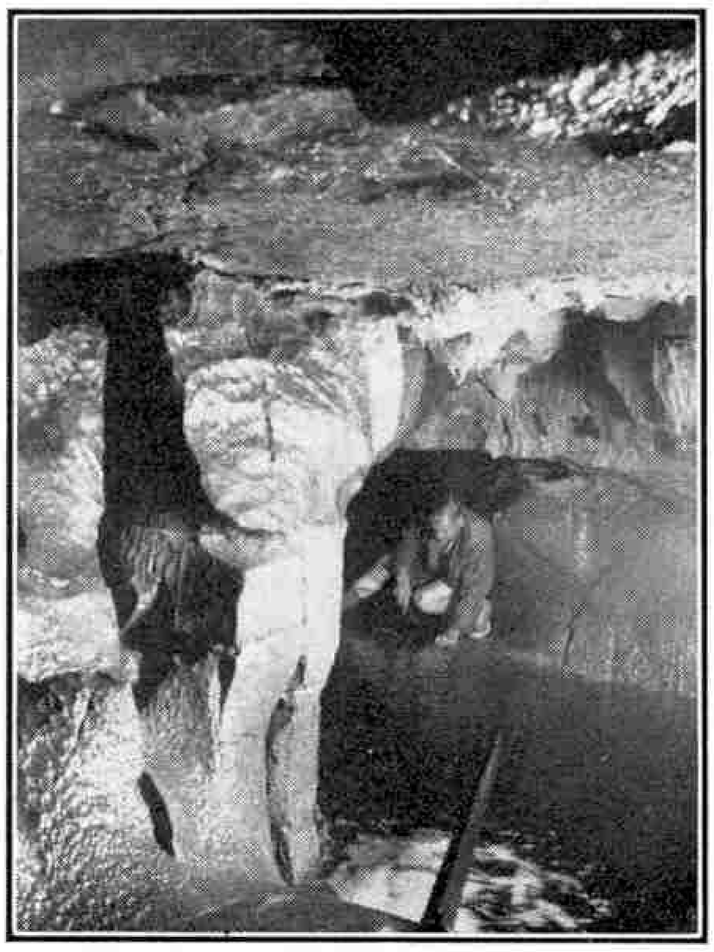
Not far away from Gaping Ghyll is Mere Ghyll, another formidable Yorkshire pot-hole that for a long time defied conquest by the most daring cave explorers in Yorkshire. The opening is a long rift in the hillside, and on looking down into the inky depths the gleam of an underground lake can be plainly seen, with a succession of waterfalls dropping into a passage at the lower end. This passage can only be entered in times of severe drought, but 12 "cavemen," using 1,200 ft. of tarred rope ladder, succeeded in getting to the bottom of the pot-hole in 1912. After descending cleft after cleft, and being mercilessly swept and drenched by countless waterfalls, they reached the end of the cave system at a depth of 450 ft. below the surface of the mountain.

It is not necessary to engage in such tactics to see something of these underworlds for oneself. Anyone passing through the Yorkshire dales country may see the Stump Cross Caverns, which are beside the main road from Grassington to Pateley Bridge. There, on payment of a small admission fee, one can have a guide as escort through a series of wonderful underground passages. Candles are provided, so that one can be sure that the adventure is going to be eerie and amusing. I remember once going with one of these parties when suddenly the whole place became filled with the smell of burning hair. A boy in front of me was gazing spellbound at the ceiling, oblivious of the fact that the back of his head rested nicely on the tip of my lighted candle!

The Stump Cross caves were found by two miners in 1860, and they contain some of the finest stalactites and stalagmites in the country. The names of these amazing features of limestone caves are rather in the nature of tongue-twisters, but they have been given to some of the loveliest creations in the world of Nature. How are they formed? Stalactites are icicle-shaped growths of limestone made by the evaporation of a strong solution of calcium bicarbonate dripping from the roof of the cave. This liquid is formed when limestone is dissolved in rainwater, which contains carbon dioxide obtained when the raindrops fall through the air, and the limestone is re-formed in the shape of stalactites when it evaporates. The stalagmites grow upward from the floor and are the result of the evaporation of the liquid dripping from the stalactites.

Another feature of the Stump Cross Caverns is the number of what are known as pillar formations, which are the result of stalactites of fairly rapid growth becoming so long that they meet the rising stalagmites from their own deposits. The Curtain and Rod, or The Sentinel, is a pillar some 5 ft. in height, and is not only the most remarkable feature of its kind in Stump Cross, but one of the finest in the whole country. Other interesting formations in the same caves are the Organ, complete with Pipes which emit musical notes when the guide strikes them; a dazzling mass known as the Snow Drift; and the Chamber of Pillars, which contains a number of small replicas of the Curtain and Rod.

At Ingleton are the White Scar Caverns, which also are open to the public, and where electric light has been installed so that their beauty can easily be seen. It was in August 1923 that the late C. F. D. Long, who was engaged in exploring some of the caves in the vicinity, saw a hole in the limestone at White Scar and decided to explore further. To-day the small hole through which Long crawled has disappeared and a larger entrance has been cut to enable visitors to approach the cavern without undue effort. Inside the cave remains almost in its natural state, however, and to the right of the constructed path is the stream passage along which the pioneer had to force his way. Progress here was difficult and in places the roof came so close to the surface of the water that Long had to swim on his back in order to breathe in comfort. As at Stump Cross, there are some marvellous stalactite and stalagmite formations. At one place the rock has been moulded into a shape resembling the carved figures of angels that are seen in many chambers and cathedrals.



Sounding the depth of an underground pool in a passage leading to Dicken Pot, a well-known Yorkshire pot-hole.

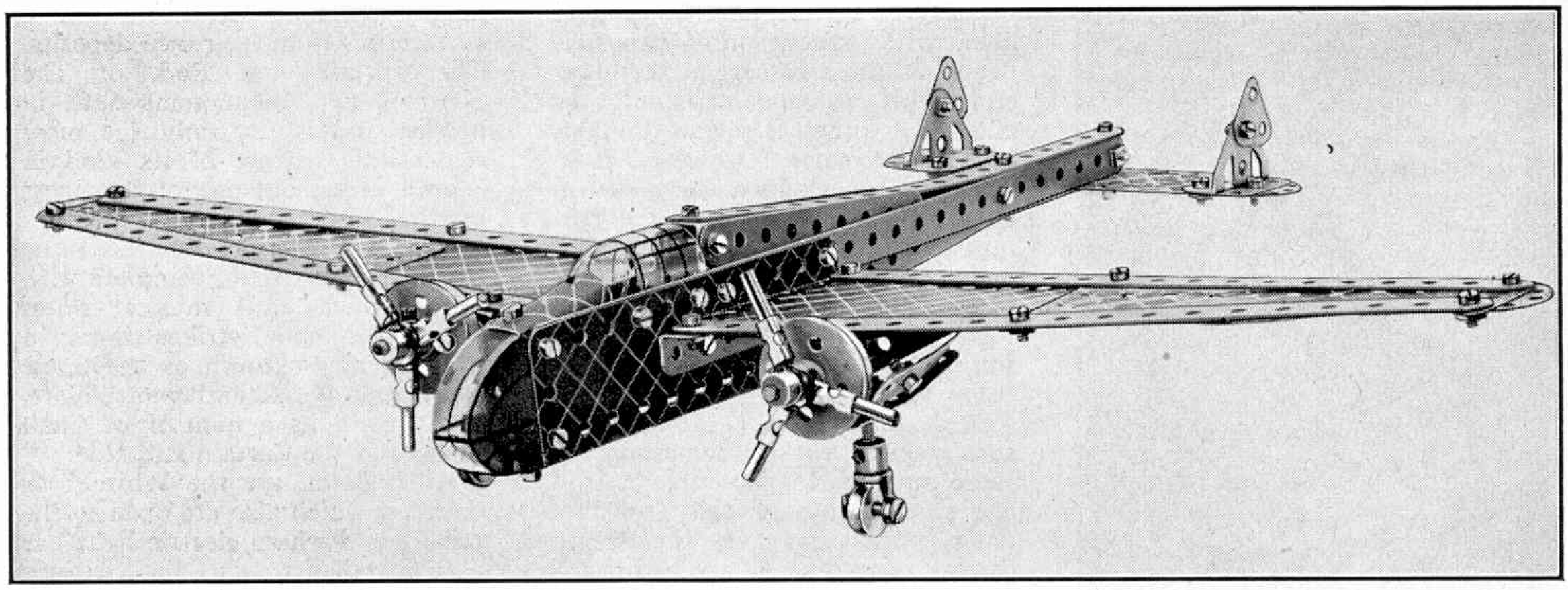


Fig. 1. A fine simplicity model of a Handley Page "Hampden."

Britain's Fighting Forces in Meccano

(2). Aircraft of the Royal Air Force

THE first of this series of articles described the construction of simplicity models representing ships of His Majesty's Navy. This month we are dealing with simplicity models of aircraft representative of the equipment of the Royal Air Force. Military aeroplanes are designed for definite duties such as bombing,

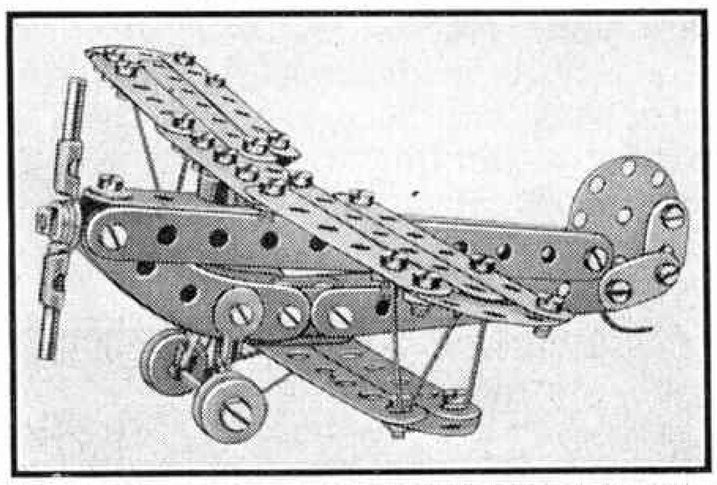


Fig. 2. Few parts are required to build this model Hawker "Hart."

fighting and training personnel, and each type possesses characteristics that vary considerably with different manufacturers. As the illustrations on these pages show, the individual features of the various aircraft of the R.A.F. can be reproduced with splendid effect in models in which only a few parts are used.

The first of these models, shown in Fig. 1, is based on the well-known Handley Page "Hampden," a twin-engined bomber capable of a maximum speed of 265 m.p.h. The chief characteristic of this craft is the unusual shape of its fuselage, which is deep and narrow at the nose, and terminates just behind the wing in a long boom that carries the tailplane and twin rudders.

In spite of the unusual appearance of the actual machine the model is quite easy to construct. The fuselage is built up of a combination of Flexible Plates and Strips. The sides are $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates and $12\frac{1}{2}''$ Strips bolted to their upper edges form the sides of the boom. They are spaced apart by Double Brackets, and a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate connects them just in front of the pilot's cockpit. A Collar is bolted between the ends of the $12\frac{1}{2}''$ Strips, and bolts screwed into its tapped holes hold $9\frac{1}{2}''$ and $7\frac{1}{2}''$ Strips that form the top and bottom of the boom respectively.

The tailplane is a $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate rounded at each end by a $1\frac{1}{4}''$ Disc. The twin rudders are represented by Trunnions and 1" Triangular Plates. The tapered wings are very simply constructed. Two $9\frac{1}{2}''$ Strips form the leading and trailing edges and they are connected by a $3\frac{1}{2}''$ Angle Girder and a $1\frac{1}{4}''$ Disc to form a framework that is filled in with Flexible Plates.

Engines need not be reproduced in detail on such a small model, for this would only spoil the general appearance. In this case they are best represented by $1\frac{1}{8}''$ Flanged Wheels although $1\frac{1}{4}''$ Discs could have been used instead with good effect.

A finishing touch is given by fitting nose and cockpit covers of transparent material. These are easy to cut from a small piece of celluloid, and should be painted with black lines representing the metal frames of the actual covers.

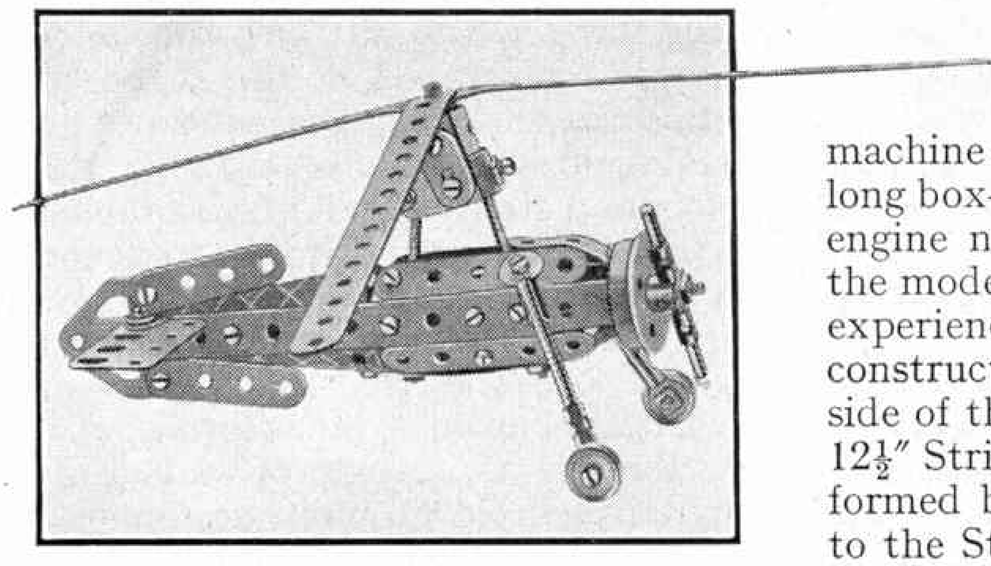


Fig. 3. A Meccano model of a direct-lift Autogiro.

Contrasting with this model is the miniature "Whitley" bomber shown in Fig. 6. The actual machine is of orthodox design, with a long box-like fuselage and projecting engine nacelles. These points make the model a good subject for the less experienced model-builder, and its construction is straightforward. Each side of the fuselage is formed of two $12\frac{1}{2}''$ Strips, while the rounded top is formed by Flexible Plates attached to the Strips by Flat Brackets. The tail unit is similar to that of the

"Hampden," except that the tail plane is built up in two pieces, each of which is attached to the fuselage by a 1½″ Angle Girder.

The wings are almost the same as those of the model of the "Hampden," but the tips are made with 2″ Strips and the wing roots are 2½″ Angle Girders. The landing wheels are carried in Cranked Bent Strips bolted to the leading edges of the wings. The engine nacelles are 2½″ × 1½″ Flexible Plates terminating in ¾″ Flanged Wheels that form the engines. An interesting point is the construction of the two three-bladed propellers, which are formed by Rod and Strip Connectors.

More recent bombers such as the Bristol "Blenheim" and the Vickers "Wellington," which have highly streamlined fuselages built to an oval section, should not be considered too difficult to model, as Flexible Plates can be used to reproduce the most complicated shapes provided a suitable scale is chosen.

The smaller types of aeroplanes are particularly good subjects for simple models, and every reader should be able to find a prototype that can be reproduced realistically from the parts in his possession. For example those who possess only the smaller Outfits can make splendid models similar to that of the Hawker "Hart" shown in Fig. 2. The "Hart" was a two-seater light day bomber, powered by a Rolls-Royce Kestrel engine, and has now been adapted as a training machine. The model illustrated is made mostly from Strips, and the lines of the actual machine are reproduced very closely. Each side of the fuselage consists of a 5½″ Strip to which are connected a 3½″ Strip and a 2½″ Curved Strip joined by a Flat Bracket. In connecting the two sides Collars are placed on the

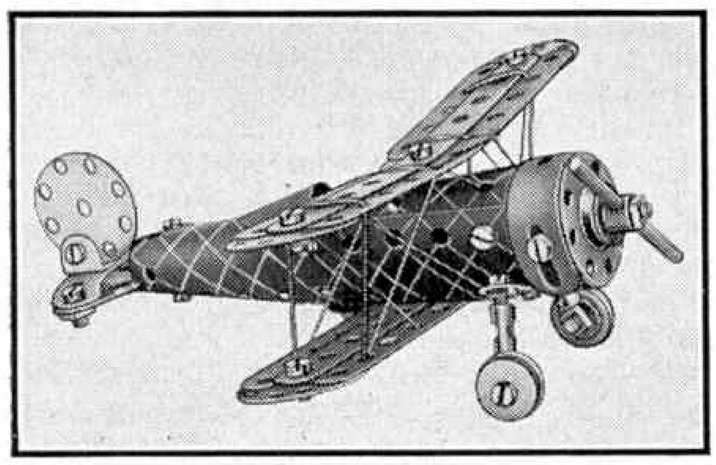


Fig. 4. Neatness and realism are features of this model Gloster "Gladiator."

bolts passing through the Flat Brackets, and a Handrail Support carrying the propeller on its shank is fitted in the nose. The underside of the nose is a Formed Slotted Strip, which is held, together with the lower wing, by bolts screwed into the tapped holes of the two Collars.

The most suitable Meccano parts for the wings of small models such as these are Strips. In this case the lower wing comprises two 5½″ Strips joined at the tip by 1″ Triangular Plates, while the upper wing, which is swept back from the centre section, is built up of Strips of various lengths bolted to 1¼″ Discs at the tips. At the centre section the top wing is spaced from the fuselage by a Collar, and the N-struts at the wing tips are small pieces of wire bent to the required shape.

The shock-absorber legs of the undercarriage are Rod and Strip Connectors, and the axle, which comprises two Pivot Bolts joined by a Rod Connector, is fixed in place by passing Cord round it and through the holes in the Rod and Strip Connectors.

It is interesting to compare the model Hawker "Hart" with that of the Gloster "Gladiator" biplane shown in Fig. 4. The "Gladiator" is a fast single-seater biplane fighter, very popular in the R.A.F., although it is now being gradually superseded by much faster monoplanes. In the model the trim lines of the fuselage are reproduced with the aid of Curved and Flexible Plates. The rear Plate that forms the tail of the fuselage is rolled in a conical shape and two of its corners are bolted together. A second Curved Plate is bolted to this and its front corners are joined by a 2½″ × 1½″ Flexible Plate. A Strip bolted inside the fuselage projects beyond the rear Plate and carries the tail unit. The tailplane is made from a 2½″ Curved Strip, a 2½″ Strip and two Flat Brackets.

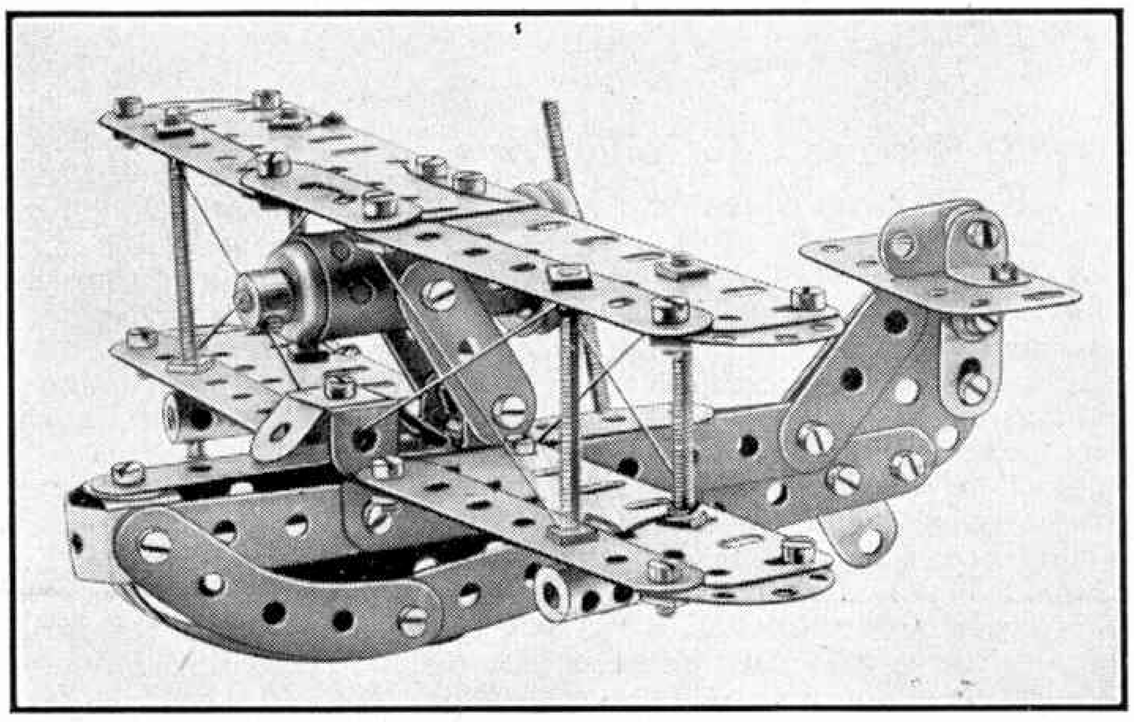


Fig. 5. A well constructed model based on a Supermarine "Walrus."

A novel built-up radial engine is fitted to the nose. It comprises two Formed Slotted Strips bolted together in a circle and clamped between two 1¼″ Discs on a Screwed Rod. The latter is screwed into a Threaded Coupling, fixed inside the fuselage.

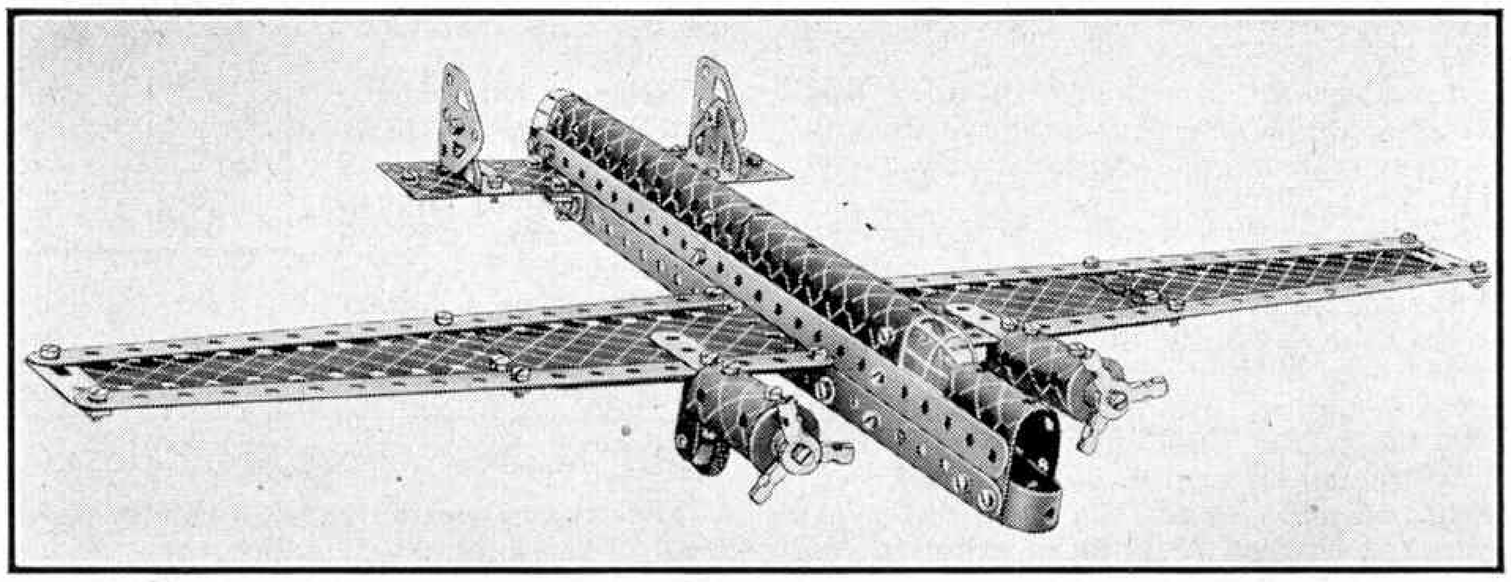


Fig. 6. The heavy bomber of the Meccano air force. It is a model of an Armstrong Whitworth "Whitley" bomber.

Our Meccano Air Force includes also a direct-lift Autogiro, a miniature of a type that is used in the R.A.F. for Army co-operation purposes. This is shown in Fig. 3. The fuselage of the model is particularly interesting, for it illustrates yet another variation of fuselage construction in Meccano. The main members are 5½″ Strips connected at the nose by a Double Bracket. Strips attached to these members by Obtuse Angle Brackets form the rest of the fuselage, and at the tail 2½″ × 1½″ Flexible Plates suitably curved are bolted to the 5½″ Strips. The tail plane consists of two 2″ Flat Girders. Two 2″ Screwed Rods are lock-nutted to the bottom of the fuselage and they carry the cowling that surrounds the rotor mechanism.

Meccano Suggestions Section

By "Spanner"

(442) Remote Controller for a Reversing Electric Motor

(A. Imlay, Skene)

The pleasure obtained from operating an electrically-driven model such as a crane can be increased considerably by fitting the model with this interesting form of remote control, in which all the necessary movements are electrically-operated. The various control switches are mounted on a central switchboard, so that the operator can sit at a distance from his model and put it through its paces in a most realistic manner. The controller is illustrated in Fig. 442. It is suitable for a Meccano Motor of the reversing type, and is based on a suggestion by A. Imlay, Skene.

It is built up of two Elektron Magnet Coils supported on a platform consisting of two 4½″ Strips, which are clamped to the Trunnions 1 by Flat Brackets. The Trunnions are bolted to the side plates of the Motor, and are strengthened with 1″ Corner Brackets. The bolts holding the clamping Brackets hold also 1½″ Flat Girders, which are spaced from the Strips by two washers. The Magnet Coils 2 and 3 fit on these Flat Girders and are clamped in place by Double Bent Strips and ¾″ Bolts. Before Magnet Coil 3 is clamped down the Cores should be fitted in position. They are joined by a Coupling 4 and must slide freely in the bores of the Coils 2 and 3.

A 2″ Slotted Strip is bolted to the reversing lever of the Motor, but is spaced from it by the thickness of a washer. A bolt passes through the slot in the Strip into the centre tapped bore of the Coupling 4. A ⅜″ Bolt 5 screwed through from the opposite side locks the bolt in position. The head of the ⅜″ Bolt acts as a stop to prevent the Cores being drawn too far into the Coils. Its travel is limited by two ¾″ Bolts lock-nutted to the rear 4½″ Strip.

In order to ensure free movement of the reversing switch the nut and collar on the switch pivot are removed, a Meccano washer is slipped on its shank, and then the nut and collar are replaced. The bores of the Coils may be oiled slightly.

The switch by which remote control is effected is a particularly interesting unit. It consists essentially of a Bush Wheel fitted with five insulated 6 B.A. Bolts. Wiring connects the two outer Bolts, one of which is shown at 6, to one terminal of the Motor. Bolt 7 is connected to one terminal of Coil 2 and the corresponding Bolt on the other side is wired to Coil 3. The central Bolt 8 is "dead." The wiring is completed by connecting together the remaining terminals of the Magnet Coils and the Motor.

A 2″ Rod is locked in the boss of the Bush Wheel, and on it is a Double Arm Crank, held by a Collar. A Spring Buffer mounted on the end of the Double Arm Crank makes contact with the heads of the 6 B.A. Bolts.

In connecting the unit to the Transformer used to supply current for its operation one lead is taken to the Bush Wheel, and the other is fastened to the right-hand terminal of the Motor. When starting the Motor, the switch handle is moved to Bolt 6. In its passage it makes contact momentarily with Bolt 7, which is wired up to Coil 2. The latter therefore is energised for a period just long enough to draw over the reversing lever. The Motor is reversed in a similar manner by moving the contact to the other Bolt.

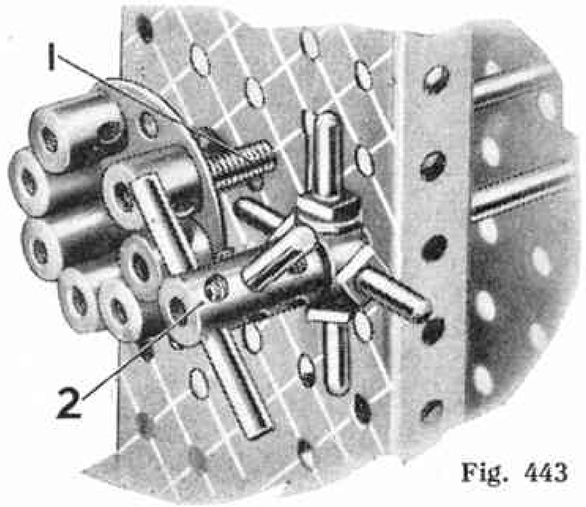


Fig. 443

(443) Maltese Cross Mechanism

The article describing the cinematograph built by Mr. Bihn, Paris, which appeared in the "*M.M.*" for June, aroused great interest among model-builders and I have received many enquiries regarding alternative intermittent motion mechanisms for models intended for projecting standard size films. This month therefore I am illustrating in Fig. 443 a small Maltese Cross mechanism that can be used for this purpose. The driving member consists of a Bush Wheel, which is mounted on a suitable shaft and is fitted in seven of its holes with Threaded Bosses, six of these being held in place by their Bolts. The remaining Threaded Boss is held in place by a 1″ Threaded Rod 1 and a nut. The driving member, which rotates the film feed sprocket, consists of two built-up sections mounted on one Rod. The inner section is made up of a "spider" from a Swivel Bearing, which carries four Threaded Pins that lock the "spider" securely to the Rod. The other section is built up from a Coupling 2 carrying two 1½″ Rods. The two portions of the member are fitted at right-angles to each other by securing them in the outer two transverse holes of the Coupling.

The operation of the mechanism is as follows. As the driving member rotates, the Threaded Rod 1 strikes one of the Threaded Pins on the driven member, and simultaneously the gap in the circle of Threaded Bosses allows a 1½″ Rod to pass through.

(444) Overload Release for Electric Motor (P. Rogers, Sheffield)

Every electric circuit should be equipped with a safety device of some kind to protect the apparatus it supplies from damage that might arise from the passing of a heavier current than that for which the circuit is designed. This applies particularly in the case of electric motors, and where these are used it is customary to ensure protection by means of a device known as a cut-out or overload release, of which the Hornby Circuit Breaker is an example.

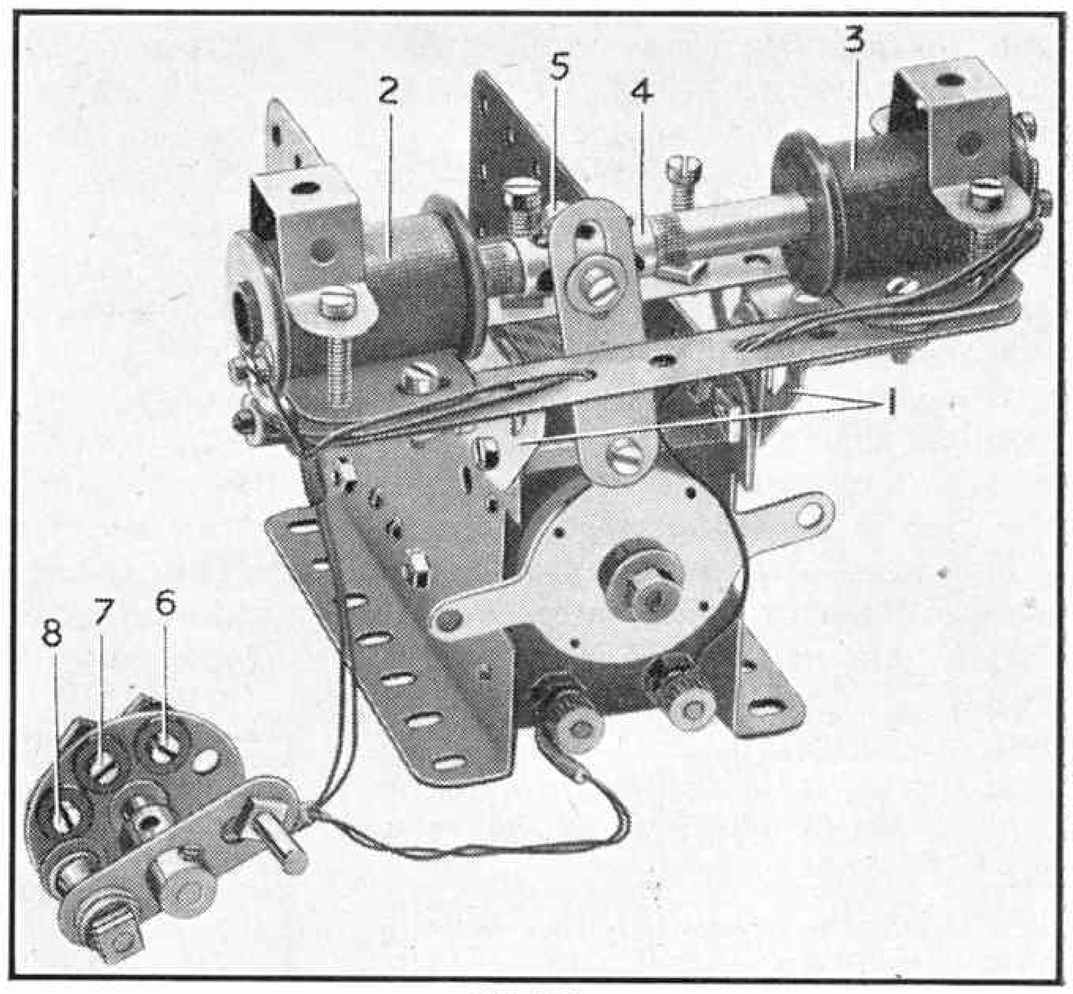


Fig. 442

Model-builders who are interested in protecting their 6-volt Meccano Motors can make a suitable device quite easily by winding two layers of Meccano 26 gauge S.C.C. Wire on a Meccano Bobbin (Part No. 181), and then clamping the Bobbin to a suitable base. A short Rod should be arranged to slide in the bore of the Bobbin, and one end of this should be connected pivotally to a switch arm consisting of a 2″ Strip. The hole in the Strip next to the point where the Rod is pivoted to it carries a Spring Buffer, which forms an electrical contact. The other end of the Strip is pivotally attached to a pillar fixed to the base in such a manner that the Rod is free to move in and out of the Bobbin. A 6 B.A. Bolt is now fixed in one of the holes of the base in such a position that its head makes contact with the head of the Spring Buffer.

One end of the Bobbin winding is attached to a second Terminal insulated from the base, and the other end is connected to the base plate. The device is connected in series with the Motor and Transformer. When the current rises above a certain value the Rod forming the plunger of the solenoid is sucked into its interior, thus moving the switch arm and breaking the circuit.

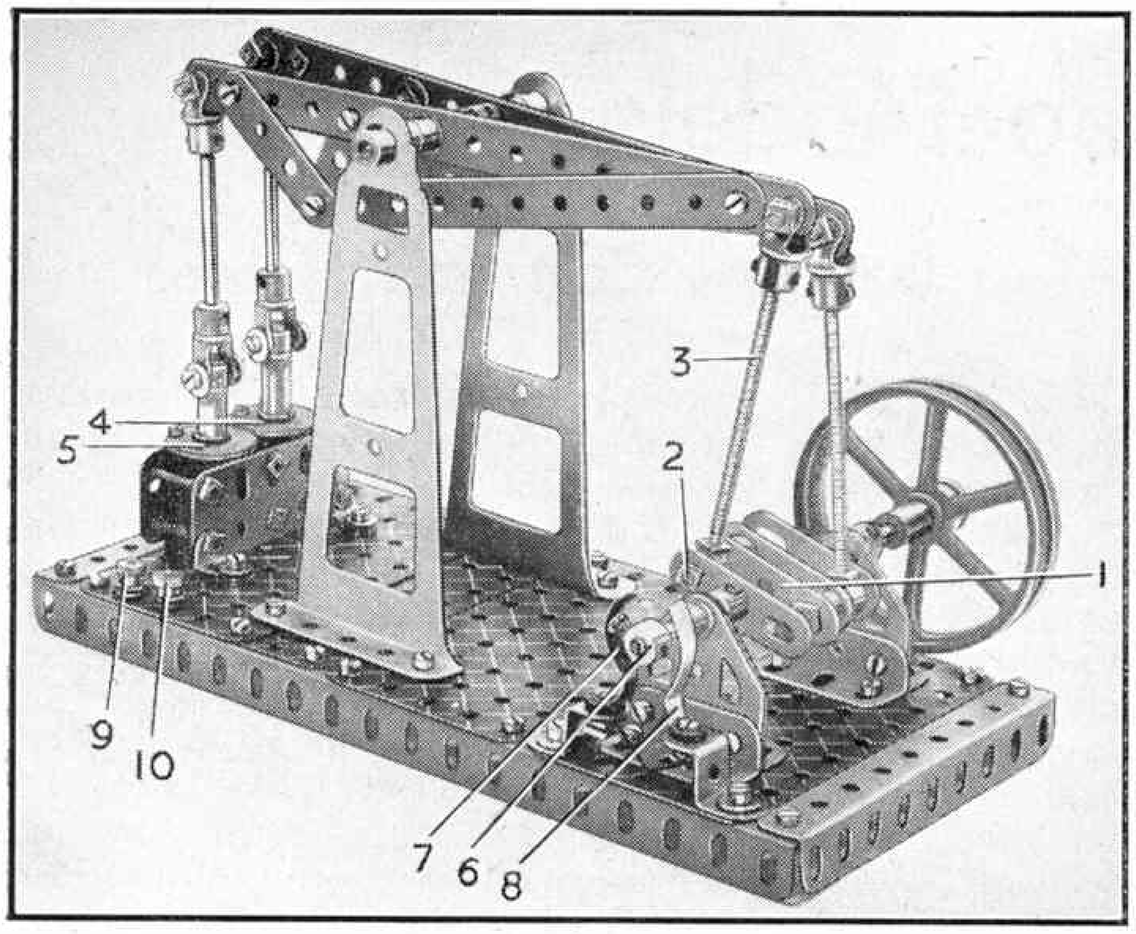


Fig. 445

(445) Electric Beam Engine

(N. Craig, Glasgow)

Solenoid engines possess a fascination for young Meccano model-builders, who find them both instructive and practical. These novel power units can be built in a variety of forms, and in Fig. 445 is illustrated a model beam engine operated on this system. When connected to a Meccano T6, T6A or T6M Transformer it will work efficiently at a good speed.

The model is built up on a base consisting of 9½″ Angle Girders joined by 4½″ Angle Girders and four 4½″ × 2½″ Flat Plates. The twin beams are supported by two Large Shafting Standards bolted in the positions shown. Each beam is made from a 7½″ Strip, one 5½″, one 2″ and one 1½″ Strip, all of which are bolted together in the manner shown. The beams are pivoted on a 3″ Rod and are spaced apart by a Coupling. Bearings for the crankshaft are made by bolting two Flat Trunnions between two 1½″ Angle Girders, which are then bolted to the base.

The crankshaft can now be assembled. The centre webs 1 are Cranks, and the outer webs are Double Arm Cranks. In order to ensure correct alignment a Rod is pushed through their centre holes while they are being assembled. The crank-pins are 1″ Screwed Rods, shown at 2 in our illustration. Each is first passed through two Cranks 1 and is fixed in place by nuts, and a Collar is then pushed on it and the Screwed Rod is secured to one of the Double Arm Cranks by lock-nuts. A 1½″ Rod is fixed in the boss of one of the Double Arm Cranks, while the other carries a 2½″ Rod. Washers prevent the crankshaft from moving endways when mounted in its bearings.

The connecting rods 3 are 3″ Screwed Rods, screwed into the Collars on the crank-pins and held in place by lock-nuts. They are gripped at their upper ends in the bosses of End Bearings, which are pivotally attached to the beams by lock-nutted bolts. At this point it is as well to look over the various joints to make sure that they run freely.

The twin "cylinders" of the engine are Elektron Magnet Coils 4 and 5, and they are clamped between two 2½″ Flat Girders by means of six 1″ Screwed Rods. The lower Screwed Rods each hold an Angle Bracket by which the unit is bolted to the base, and each Angle Bracket is spaced from the base by two washers. The "pistons" are Magnet Cores, each of which is fitted with a Collar as shown. Small Fork Pieces are pivoted to the Collars by bolts, and connecting rods formed by 2″ Rods link the cores to End Bearings on the beams.

A commutator consisting of a Collar 6 fitted with a bolt is now fitted to the crankshaft. As the crankshaft rotates the bolt makes contact with two brushes made from Pendulum Connections, which are held by insulated 6 B.A. Bolts on Reversed Angle Brackets.

The electrical connections are as follows Brush 7 is connected to one terminal of Coil 5, and brush 8 is connected to a terminal of Coil 4. The remaining terminals of the Magnet Coils are connected by a short wire, and a lead is taken from them to Terminal 9, which is insulated from the base. Terminal 10 is in electrical contact with the base.

A Meccano Flywheel is fitted to the crankshaft, and the brushes are adjusted by bending them so that the bolt in Collar 6 makes and breaks contact at the beginning and end of each downward stroke of the Magnet Cores. The latter should be given a coat of thin oil to allow them to move easily in and out of the Coils. In order to secure good running the Cores should be arranged so that they project as far as possible into the bores of the Coils when they are at the bottom of their stroke.

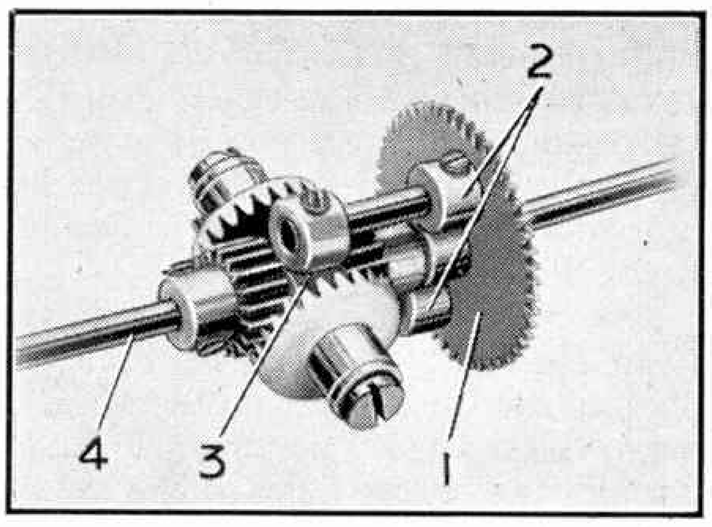


Fig. 446

(446) The Smallest Meccano Differential?

The differential gear illustrated in Fig. 446 has raised a controversy in the Editorial offices as to whether it is the smallest differential that can be built in Meccano. It is certainly one of the neatest, and we shall be interested to learn what readers think of it.

The unit illustrated is the work of D. Perkins, Hull. It is constructed by fixing two Collars 2 to a 50-teeth Gear 1. A 7/32″ Grub Screw is screwed through the tapped hole of each Collar into the tapped hole of the 50-teeth Gear, an operation for which a screwdriver with a thin shaft is necessary, and two more Collars are fixed in a similar manner to a "spider" 3. Two 1″ Rods connect the sets of Collars and are held in place by Grub Screws. A Rod is pushed through the boss of the 50-teeth Gear and is fitted at its inner end with a ½″ Pinion. The Rod projects only ¼ in. into the bore of the Pinion.

The ¾″ Contrate Wheels are now fitted. They rotate on Pivot Bolts, which are screwed into the remaining tapped holes of the "spider" and are held in place by lock-nuts. The sides of the nuts should be parallel to the end of the "spider," so that the corners do not catch in the teeth of the Pinions.

The Rod 4 also is fitted with a ½″ Pinion and passes through the "spider" into the bore of the first ½″ Pinion.

Another differential gear, the outstanding feature of which is simplicity, is illustrated in Fig. 446a. It was submitted by W. McSimon, Liverpool, and is intended for use with a Sprocket Chain drive.

The gearing is contained in a framework that consists essentially of two 1½″ × ½″ Double Angle Strips 3, which are bolted at one end to a 2″ Sprocket Wheel 4, and at the other end to two 1¼″ Discs. Rod 2 is passed through the boss of the 2″ Sprocket Wheel and is locked in the boss of a ¾″ Pinion. Rod 2 projects only halfway through the boss of this Pinion. Rod 1 passes through the 1¼″ Discs and carries a Collar, a washer and a ¾″ Pinion, the Collar being placed between the two ¾″ Pinions. Rod 1 projects into the bore of the first-mentioned ¾″ Pinion. Two ¾″ Contrate Wheels held in the frame by Pivot Bolts mesh with the ¾″ Pinions.

Cash Prizes for New Ideas

Cash prizes are awarded for all ideas published in *"Suggestions Section,"* and readers are invited to send particulars of any ingenious mechanism they have designed that has not already been dealt with in these pages, and of new uses they find for Meccano parts. Contributions should be original and should be illustrated if necessary with photographs or sketches. A

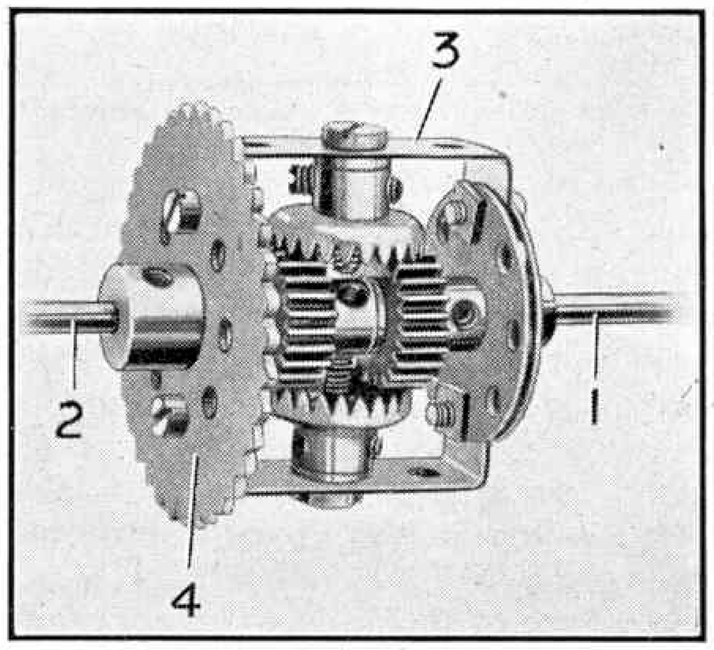


Fig. 446a

mechanism need not be a complete model, but perhaps part of a large model in which it serves some definite function. Novel uses for Meccano for purposes other than model-building also will be considered for publication.

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

Ideas should be submitted to *"Spanner,"* "Meccano Magazine," Binns Road, Liverpool 13, and may be sent at any time.

New Meccano Models

Stacking Crane Breakdown Car Tap Dancer Cart and Horses

TWO of the four Meccano models described this month have a pleasantly easy holiday air. They represent a tap dancer, whose antics will give rise to much amusement, and a cart drawn by two horses. The Outfits required for the construction of these interesting models are Nos. 1 and 3 respectively. For the more serious model-builder there are a breakdown car that can be built from Outfit No. 4, and a small stacking crane designed for construction from Outfit No. 6.

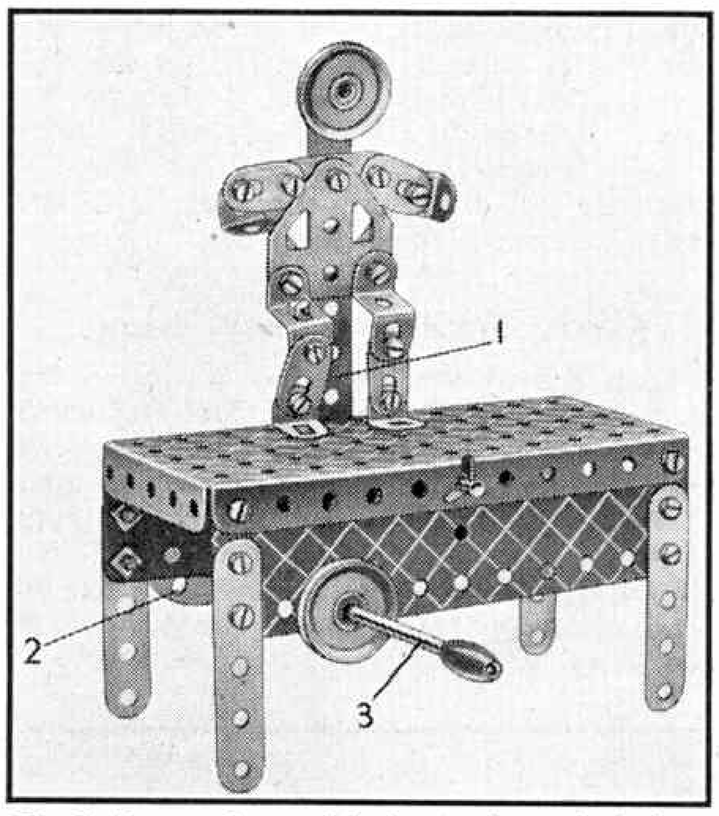


Fig. 1. An amusing model of a tap dancer built from an Outfit No. 1.

The tap dancer is shown in Fig. 1, and the model is set in motion by turning the Crank Handle provided. Its construction is commenced by bolting two $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates to the sides of a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate to form a stage, the legs of which are then made of four $2\frac{1}{2}''$ Strips bolted in a rigid position to the ends of the $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates. The figure of the dancer is composed of two Flat Trunnions pivoted at their ends in the third hole from one end of a $5\frac{1}{2}''$ Strip 1. The $5\frac{1}{2}''$ Strip itself is pivoted on a $3\frac{1}{2}''$ Rod journalled in the flanges of the $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate, and held in position by Spring Clips.

A 1″ Pulley bolted at the end of the $5\frac{1}{2}''$ Strip forms the dancer's head. His right leg is made up of a Reversed Angle Bracket pivotally connected by a Flat Bracket to an Angle Bracket that forms one of his feet, and his left leg consists of two Angle Brackets joined in the shape of a Reversed Angle Bracket and connected by means of a lock-nutted bolt to a Flat Bracket, which in turn is lock-nutted to an Angle Bracket representing the left foot.

A Crank-Handle 3 passes through the two Flexible Plates and is locked in position at the front by a 1″ Pulley Wheel, and at the rear by a Bush Wheel 3, the boss of which faces inwards. The lower end of the $5\frac{1}{2}''$ Strip is pivotally connected by a $2\frac{1}{2}''$ Strip to the Bush Wheel, in such a manner that the figure oscillates when the Crank Handle is turned. The bolts attaching the $2\frac{1}{2}''$ Strip to the Bush Wheel and the $5\frac{1}{2}''$ Strip are fitted with lock-nuts.

Parts required to build the model tap dancer: 1 of No. 2; 5 of No. 5; 6 of No. 9; 4 of No. 10; 1 of No. 16; 2 of No. 22; 1 of No. 24; 3 of No. 35; 30 of No. 37a; 24 of No. 37b; 1 of No. 52; 1 of No. 111c; 1 of No. 125; 2 of No. 126a; 2 of No. 189.

Another simple model of the lighter type is the cart drawn by two horses shown in Fig. 2. This model is a good example of the constructional possibilities of Outfit No. 3. The cart consists of a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate, to the flanges of which are bolted two Flat Trunnions and two Trunnions. These form bearings for the wheel axles, which are $3\frac{1}{2}''$ Rods. Four 1″ Pulleys fitted with Rubber Rings form the wheels. The shafts are $5\frac{1}{2}''$ Strips, and they are pivotally attached by lock-nutted bolts to Double Brackets fixed to the front flange of the Flanged Plate.

The construction of the horses is quite easy to follow from Fig. 2. The one in the rear is mounted between the shafts by passing a 2″ Rod through the centre holes in the sides of the U-Section Curved Plate, the horse being spaced from the insides of the shafts by Spring Clips. The front horse also has a 2″ Rod pushed through its body, Cord being used to connect the Rod to the shafts.

If desired the model may be driven by means of a *Magic* Motor, which should be bolted underneath the cart. The drive is taken to a $\frac{1}{2}''$ fast Pulley fixed to the rear axle. The horses should be joined by a $5\frac{1}{2}''$ Strip bolted to their backs, and a $3\frac{1}{2}''$ Rod fitted at its centre with a Bush Wheel should be passed through the end holes of the Strips forming the hind legs of the front horse. The purpose of the Rod is to hold the legs of the horses clear of the ground.

Parts required to build horses and cart: 2 of No. 2; 8 of No. 5; 4 of No. 10; 2 of No. 11; 8 of No. 12; 2 of No. 16; 2 of No. 17; 4 of No. 22; 6 of No. 35; 28 of No. 37a; 24 of No. 37b; 1 of No. 40; 1 of No. 52; 4 of No. 90a; 2 of No. 111c; 2 of No. 126; 2 of No. 126a; 4 of No. 155a; 2 of No. 190.

The chassis of the model breakdown car shown in Fig. 4 is built by bolting $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates to the long flanges of a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate. Next $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates are attached to the ends of the first Plates and they support between them a Flanged Sector Plate. On the front end of this is built the bonnet, which comprises two $1\frac{11}{16}''$ radius Curved Plates connected at their upper ends to a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip. The radiator is a Flat Trunnion bolted to a Trunnion, the latter being fixed to the Flanged Sector Plate. The ends of the $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates are now connected by a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flanged Plate and the uprights that support the cab roof are added. The latter consist of $2\frac{1}{2}''$ Strips lengthened with $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips, which are joined by $2\frac{1}{2}''$ Strips. A $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate is bolted to the turned-up ends of the Double Angle Strips. The back of the cab also is a $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate.

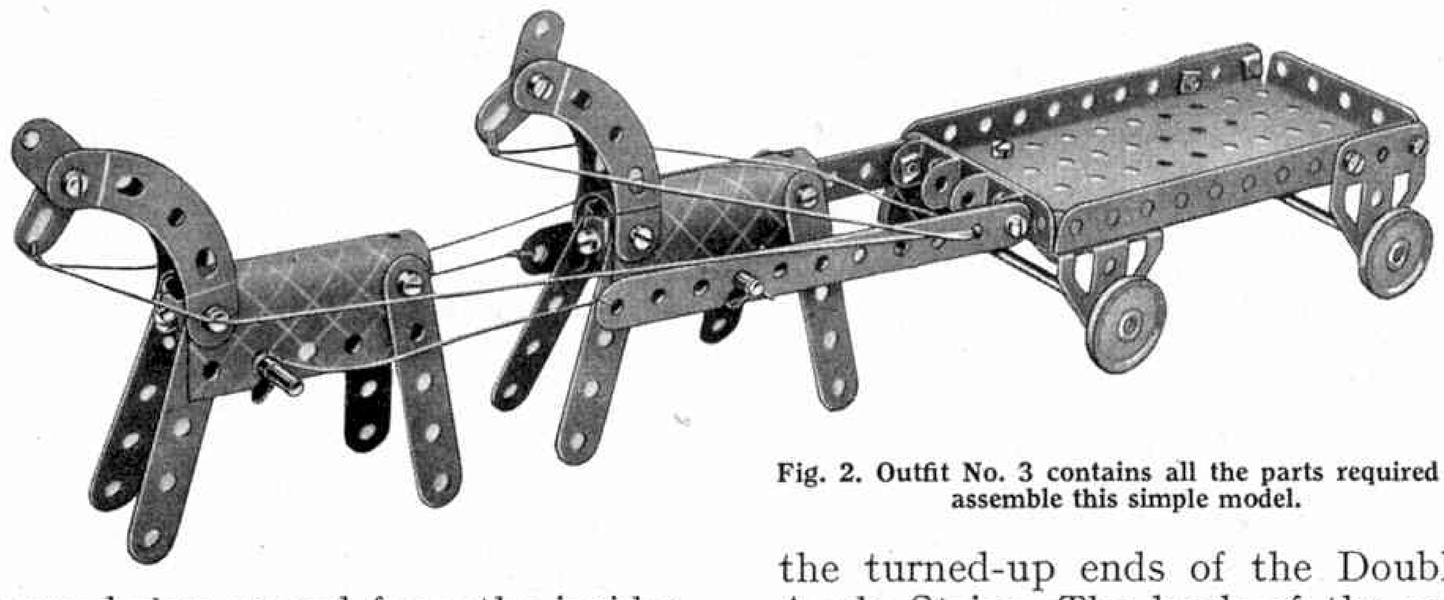


Fig. 2. Outfit No. 3 contains all the parts required to assemble this simple model.

The sides of the lorry are reinforced by $5\frac{1}{2}''$ Strips, the lower pairs of Strips projecting one hole beyond the rear of the model. A drawbar made from a $3\frac{1}{2}''$ Rod is carried by these Strips. The rear axle is a $3\frac{1}{2}''$ Rod and is mounted in bearings provided by two $2\frac{1}{2}''$ small radius Curved Strips. The front axle is journalled in Flat Trunnions bolted to the flanges of the Flanged Sector Plate. Four 1″ Pulleys fitted with Motor Tyres form the wheels.

The jib of the small crane mounted in the back of the lorry consists of four $5\frac{1}{2}''$ Strips, pairs of which are connected at their lower ends by Flat Brackets. The upper ends of the Strips are joined by a 1″ Rod, on which is mounted a $\frac{1}{2}''$ loose Pulley. The sides of the jib are attached by Angle Brackets to a Bush Wheel, which is fixed to the floor of the lorry by passing a $\frac{3}{8}''$ Bolt through the Flanged Plate into its boss and locking it there with the set screw. A Crank Handle is journalled in the sides of the lorry and Cord is attached to a Cord Anchoring Spring on its shaft. At its other end is tied a small Loaded Hook.

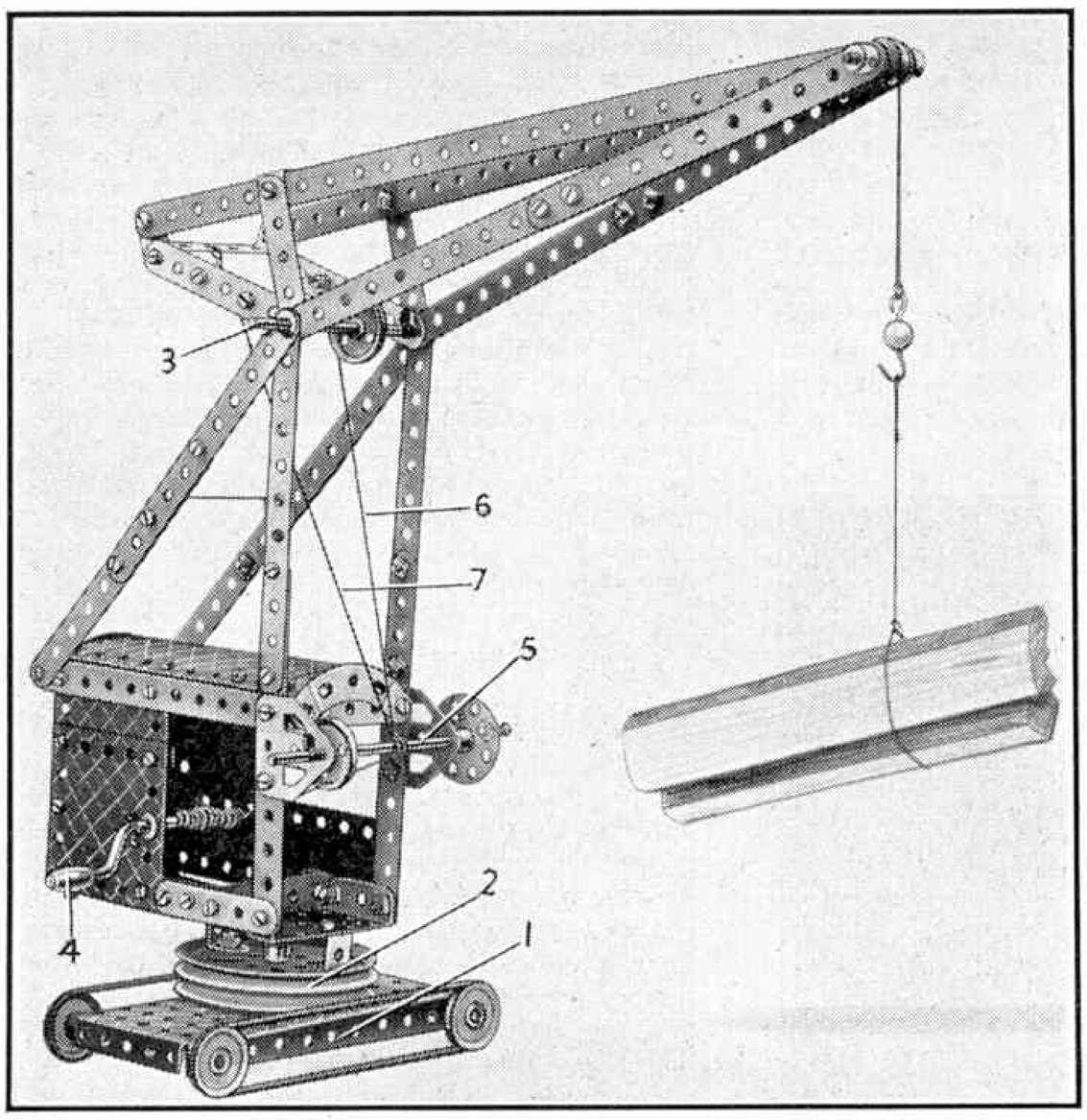


Fig. 3. A fine model of a timber stacking crane. It is built from the parts in an Outfit No. 6.

This model also can be driven by a *Magic* Motor, which should be bolted underneath the chassis. The $\frac{1}{2}''$ fast Pulley supplied with the Motor is fixed to the rear axle of the model and is connected to the small pulley of the Motor by a Driving Band of suitable length.

Parts required to build the model breakdown lorry: 8 of No. 2; 8 of No. 5; 4 of No. 10; 6 of No. 12; 3 of No. 16; 1 of No. 18b; 1 of No. 19g; 4 of No. 22; 1 of No. 23; 1 of No. 24; 8 of No. 35; 57 of No. 37a; 57 of No. 37b; 8 of No. 38; 1 of No. 40; 5 of No. 48a; 1 of No. 51; 1 of No. 52; 1 of No. 54a; 1 of No. 57c; 4 of No. 90a; 1 of No. 111c; 1 of No. 126; 1 of No. 126a; 4 of No. 142c (not included in Outfit), 1 of No. 176; 2 of No. 188; 2 of No. 189; 2 of No. 190; 2 of No. 200.

The fine model shown in Fig. 3 is a small transportable crane of a type that is used in many timber yards for carrying and stacking logs. The model is simple to build and the first part to construct is the wheeled base, which consists of a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate 1 mounted on four 1″ Pulleys. The Pulleys are later connected by Driving Bands, which form creeper tracks. A 3″ Pulley is fixed to Flanged Plate 1 by two $\frac{3}{4}''$ Bolts, which carry Collars and washers on their shanks for spacing purposes. A 2″ Rod is locked in the boss of this Pulley.

The base of the control cab is formed by a $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate connected to a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flanged Plate. The flanges of the $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate are connected by $3\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips, to which the sides are bolted. One side is built up of a $5\frac{1}{2}'' \times 1\frac{1}{2}''$ and a $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate, and the other of two $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates. A compound plate made from a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ and a $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate forms the back. The sides are connected by $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips.

A V-shaped frame is built up on each side of the cab and the two frames are connected by a Double Angle Strip. The roof is a $4\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate lengthened by a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate. The 3″ Pulley 2, which forms the upper part of the roller bearing, is attached to the bottom of the cab by Double Brackets. It is then placed on the 2″ Rod fixed in the boss of the lower Pulley, and is retained in position by a Spring Clip. The top members of the jib of the crane are formed by $12\frac{1}{2}''$ Strips, which are duplicated for strength. The jib is built up of $2\frac{1}{2}''$ and $5\frac{1}{2}''$ Strips. The two sides are joined together at the rear by a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip, and at the front end they are connected by a $1\frac{1}{2}''$ Rod and Collars.

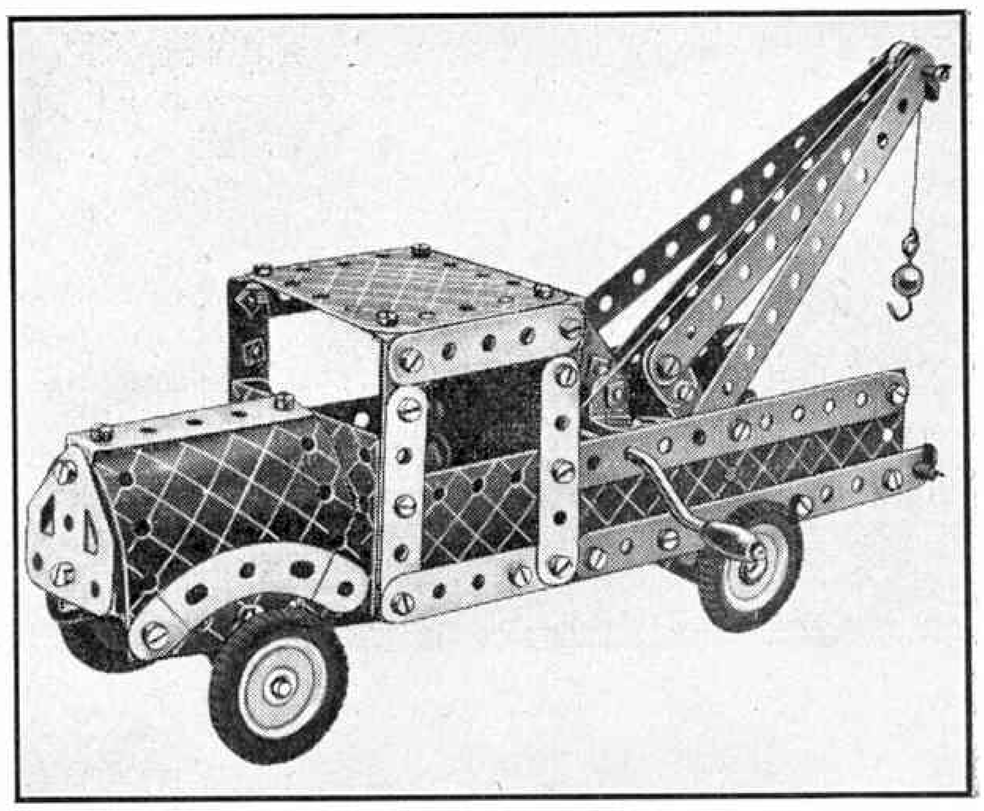


Fig. 4. This neat breakdown lorry is an excellent subject for Outfit No. 4.

The complete jib is then mounted in the V-shaped frames at the sides of the cab. The 4″ Rod 3 is passed through the $5\frac{1}{2}''$ Strips from which the frames are made and through the lower part of the jib. It is fitted with a 1″ loose Pulley that forms a guide for the hoist cord, and is held in place by Spring Clips.

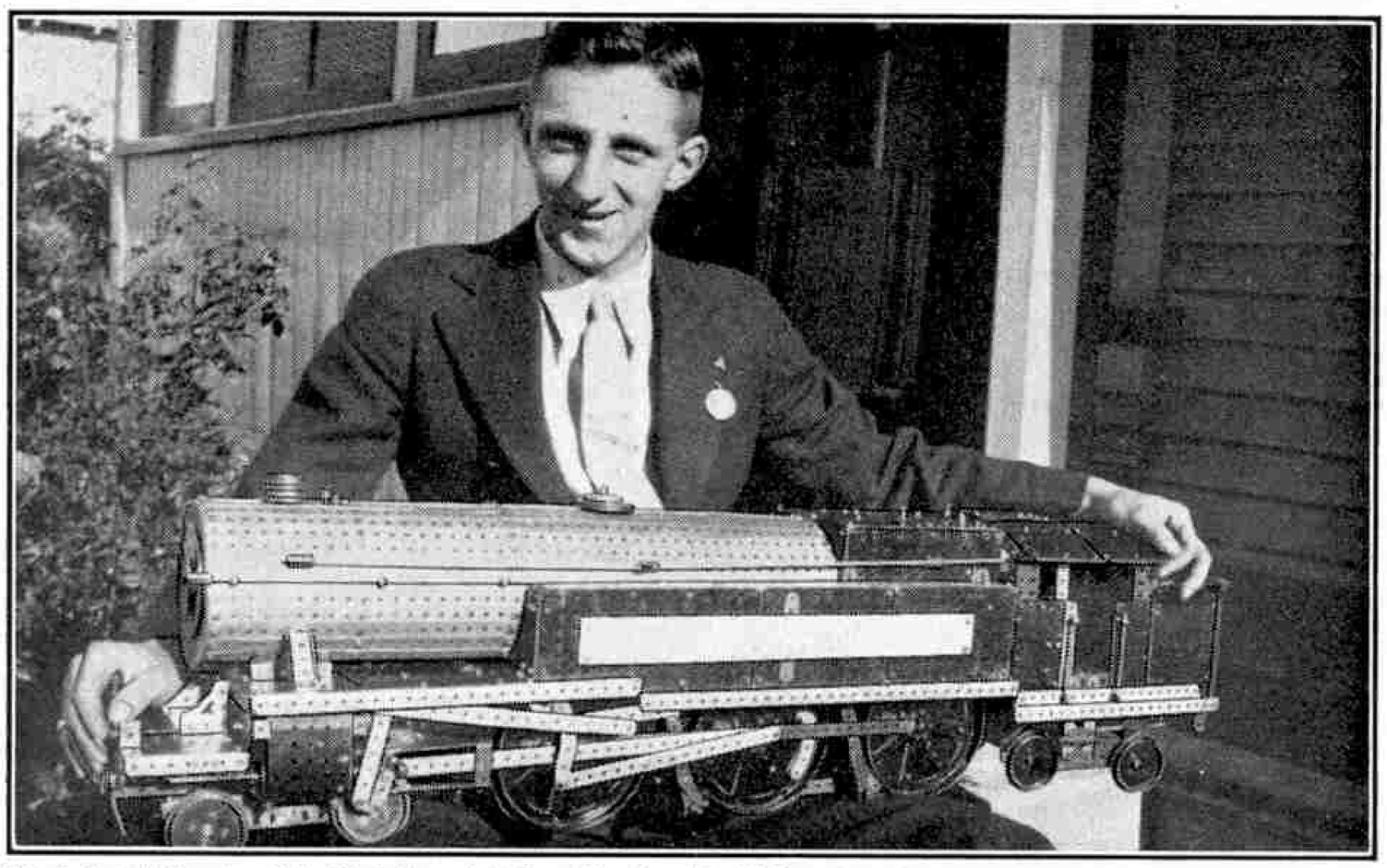
Flat Trunnions are bolted to the uprights, one at each side of the cab, and a 4″ Rod is passed through holes in their pointed ends. This Rod serves as a winding drum for the luffing cord. It is fitted with a Bush Wheel at one end, to which a $\frac{3}{4}''$ Bolt is fixed by lock-nuts to serve as a handle. A 1″ loose Pulley on Rod 5 forms a guide for the hoisting Cord.

The hoisting cord 6 is tied to a Crank Handle 4 journalled in the sides of the cab, and is taken over the Pulleys on Rods 5 and 3. It is then taken over a $\frac{1}{2}''$ loose Pulley at the end of the jib and a small Loaded Hook is tied to its end. Luffing is effected by Cord 7, which is wound around Rod 5 and tied to the rear end of the jib.

Parts required to build the model timber stacking crane: 4 of No. 1; 14 of No. 2; 8 of No. 5; 2 of No. 10; 2 of No. 11; 9 of No. 12; 2 of No. 15b; 2 of No. 16; 1 of No. 17; 1 of No. 18a; 2 of No. 19b; 1 of No. 19g; 4 of No. 22; 2 of No. 22a; 1 of No. 23; 1 of No. 24; 6 of No. 35; 75 of No. 37a; 73 of No. 37b; 6 of No. 38; 1 of No. 40; 3 of No. 48a; 1 of No. 51; 1 of No. 52; 1 of No. 53; 4 of No. 59; 2 of No. 90a; 2 of No. 111; 1 of No. 115; 2 of No. 126a; 1 of No. 176; 1 of No. 186a; 1 of No. 186b; 2 of No. 188; 1 of No. 189; 4 of No. 190; 1 of No. 191.

Helping Others

Meccano boys are not content with enjoying themselves; they also want to help others to make the best of things. They are trying to do this when they introduce new members to their clubs, but very many of them are active outside club work itself, taking special interest in boys who are not so fortunately placed as themselves. The Malvern club, an old-established South African organisation, has a wonderful record of work in this respect, and in New Zealand the Christchurch M.C. have visited regularly a School for the Deaf at Sumner, eight miles away, for a long time, building models, operating a Hornby Railway and playing both indoor and outdoor games with the boys of the School. Mr. Ancall, Leader of the Christchurch M.C., whose portrait appears on this page, tells me that "To see the looks of pleasure on the faces of the deaf boys is well worth any trouble we have in arranging visits." The outcome of this friendship has been the formation of a club at the Sumner School.



Mr. J. Ancall, Leader of the Christchurch M.C., with a fine "Baltic" tank engine model he has built. This New Zealand club was affiliated in May 1930, and under Mr. Ancall's able and experienced guidance the members of the Christchurch M.C. have enjoyed a full programme of model-building, general hobbies, debates and social activities. Close touch is maintained with the Ashburton M.C., and a Shield is awarded annually for competition between the two clubs in model-building, attendance and recruiting.

Another striking instance of this kind of thing has just come to my notice from Exeter. There are no busier club officials and members in the world than those of the Exeter M.C., whose interests are varied and whose activities in every direction are very intensive; yet they have found time to strike up a friendship with the boys of a blind school in their neighbourhood. They pay regular visits, joining with their new friends in model-building and introducing them to new games, and it is difficult to part the keenly interested groups when a visit has to come to an end.

Both sides of this partnership have gained wonderfully from intimate contact with each other. This was quickly realised by one member of the Exeter club who asked the question "Are we giving them enjoyment, or are they giving us enjoyment?" His Leader's reply was "It works both ways," and there is no doubt of the reality of the benefit to members of Meccano clubs who are active in personal work of this kind.

Exhibitions Bring New Members!

Clubs benefit in more ways than one from Exhibitions. Members have all the pleasure and excitement of preparations; visitors are interested in the display made for them, and in many instances become firm friends of the club concerned; and funds with which to buy new materials and to help members to have even better times usually receive a welcome fillip. To me one of the most interesting features of an Exhibition is the opportunity that is given for acquiring new members, however, and that is why I regard the recent Exhibition of the St. Oswald's (Thornton Heath) M.C. as outstanding. Members built up a splendid array of models and showed also a fine Hornby Railway. There were 450 visitors, all vastly interested in what they saw, and there was a handsome profit. On top of this a list of 30 prospective new members was compiled.

I have often urged clubs to do everything they can to increase their membership, since the only way of ensuring continued success is to bring in new blood regularly. Here clearly is one of the best ways of all of doing this, and I strongly recommend Leaders to keep the recruiting aspect of an Exhibition in mind throughout preparations for it. In certain clubs a special recruiting or information stall has been arranged as part of the display, with Guild literature available for all who are likely to become members, and officials or senior members of the club at hand to tell them about the programme and proceedings generally. Together with a cordial welcome to the Exhibition, which itself should give evidence of the good times that club members have, these steps should go a long way towards persuading visiting Meccano boys to join.

Value of Magazine Announcements

One great help in achieving this aim is to let me have details of Exhibitions in good time so that I can announce them in these pages. A notice of this kind is seen by Meccano boys living in the vicinity of the club's headquarters, and may lead to a visit that ultimately will result in the addition of a new member. The place, date, time and charge for admission should be given, together with some information about the attractions, and this information should reach me as soon as possible.

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.

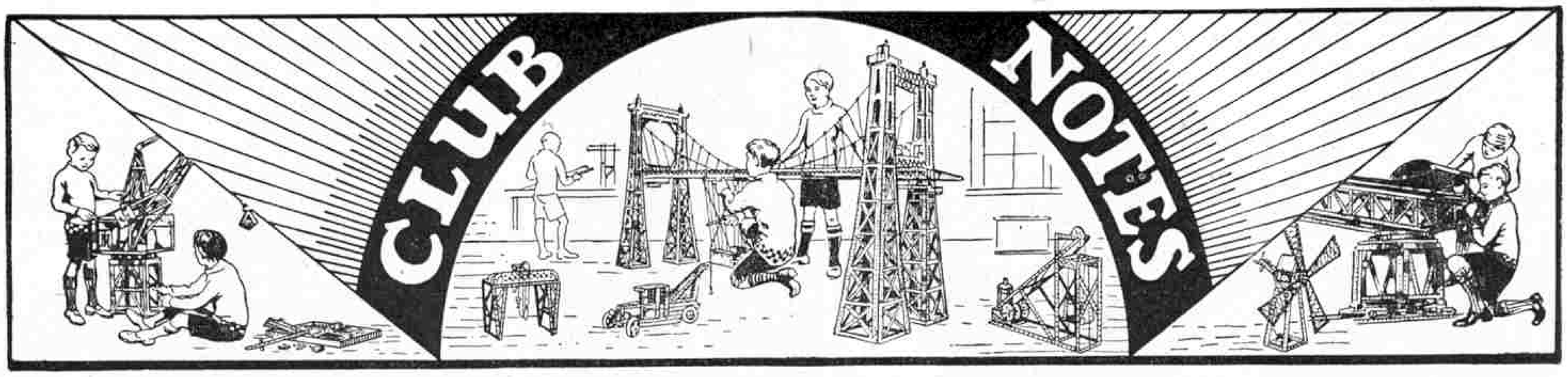
HORNCHURCH—R. M. Tindal, 13, Connaught Road.

LEEDS—Mr. H. Scholefield, 57, Conway Place, Harehills, Leeds 8.

NEW ZEALAND—Mr. C. H. Taylor, Maata Street, Taumarunui.

SOUTH AFRICA—P. J. Ashere, P.O. Box 2076, Durban, Natal.

WALSALL—W. Richardson, 201, Sutton Road, Walsall.



Sid Vale (Sidmouth) M.C. The last Model-building Contest of the Silver Cup series produced several good models, including an excellent liner and pithead gear. The Cup was won by R. Bennett with 58 points. D. Palmer, 46 points, and G. Russell, 42 points, were runners up. Regular meetings have been arranged for the Summer Session. Members turned out in full force for the first Ramble of the year, under the direction of the Leader. Club roll: 12. *Secretary:* L. R. I. Gliddon, Sheffield House, Sidmouth.

Mallow M.C.—The Leader has designed a model village known as "Dinkytown," which is now being constructed and appropriately illuminated. An air raid on the village can be reproduced, with bombing aircraft overhead. All lights are then extinguished, and anti-aircraft guns are brought into operation. Dinky Toys are to be used extensively in this model. Members paid a visit to Mallow Railway Station to see the new G.S.R. locomotive No. 800, described and illustrated in the May "*M.M.*," on the occasion of its trial run from Dublin to Cork. Mr. J. Scuffins has been elected President in place of Mr. Lynch, who has found it necessary to resign. Club roll: 10. *Secretary:* M. Roche, 8, Spa Walk, Mallow.

Winchmore Hill Collegiate School M.C.—New officials were elected at a General Meeting held at the commencement of the Summer Term, and the programme for the Session was discussed. Outings to Tilbury Docks and to Northolt Aerodrome on Empire Air Day were greatly enjoyed. Club roll: 18. *Secretary:* K. C. Stringer, 52, Queens Avenue, Winchmore Hill, London N.21.

Hornsea M.C.—Good progress has been made in Model-building, particularly by the Junior Section of the club. Models constructed are judged and given marks according to merit. An ex-member of the club has given an interesting talk on "*Drugs.*" Excellent Lectures have dealt with "*Biology,*" "*Chemistry,*" "*Geography*" and "*Street Lighting.*" A letter from a member at present in Egypt gives an interesting account of his journey to that country. Club roll: 14. *Secretary:* P. Richardson, "Summerleigh," Esplanade North, Hornsea.

Barking M.C.—At one meeting members had to construct models demonstrating the operation of some mechanism, and the best model built was a gear-box. At a General Meeting the rules were revised, and the programme for the Summer Session was compiled. The activities include model aeroplane flying, cycling and swimming. Club roll: 34. *Secretary:* F. K. Whitehead, 60, Devon Road, Barking.

Middlesbrough M.C.—The varied programme followed has included monthly Model-building Contests, Talks, Games, Sing-songs and a Parents Whist Drive. With an increased membership, attendances at weekly meetings have been greatly improved. A party of members paid an enjoyable visit to the local swimming baths. A prize for Model-building awarded by the President was won by J. Morton. The programme for the Summer Session includes hikes and two week-end camps. The first hike was very successful. Swimming activities also are being continued. Club roll: 34. *Secretary:* G. Brockhurst, 49, Heythrop Drive, Acklam, Middlesbrough.

Stretford Public Libraries M.C.—Two members have been awarded Merit Medallions for outstanding model-building work and services to the club. The usual model-building activities have been continued. Regular meetings have been held by the Stamp Section, and a number of stamps donated have been distributed. Games have been played and general knowledge tests held. A number of new books on stamps have been added to the Library. Club roll: 35. *Secretary:* Miss F. Scattergood, Public Library, Technical Institute, Stretford Road, Old Trafford, Manchester 16.

Mount Senior School (Newark) M.C.—The Third Annual Exhibition held recently was an outstanding success, the display being of a considerably higher standard than last year. There were many more Meccano models on show than at previous Exhibitions, among the best being a sand dredger and horizontal steam engine constructed by the Leader, Mr. J. Beard, B.Sc., and a lathe, a motor chassis, a telpher crane, and a battleship, the last four winning prizes. The fine club model railway built up by members also was on show, together with an extensive Hornby Train layout. Prizes won by members were presented by Canon Larken, a firm friend of the club and himself a model railway expert. Club roll: 55. *Secretary:* A. Kemp, Over Barclay's Bank, Newark, Notts.

The Schoolboy Model Club (Edinburgh).—This flourishing Scottish club now has a membership of nearly 300. The club rooms are open every evening, with Meccano model-building and model railway working as the favourite pursuits. The layout is set on wooden trestles, and the scale model track is some 200 ft. long. The line is arranged for operation by either alternating or direct current, with complete remote control. Stations, junctions, etc., are named after those who have been responsible for the success of the railway section. There is a stud of seven Hornby locomotives, including "*Princess Elizabeth*" and "*Bramham Moor.*" Anyone interested will be made welcome by the Leader, Mr. Robert Croall, at the club rooms, 19, South St. David Street, Edinburgh 2.

Saltash Model Engineering and Hobbies Club.—A Meccano Model of a large horizontal steam engine is under construction, and the main frames and cylinder have been completed. In the Model-building Section a cattle dock, coal depot and signal cabin have been rebuilt. Plans for a terminal station have been drawn up. A Dance and a Jumble Sale have made a profit of £5 toward club funds. Visits have been received from members of the Plymouth M.C. Club roll: 8. *Secretary:* B. R. J. Braund, 9, Homer Park, Saltash.

Members of the Tynecastle School M.C., Leader, Mr. W. C. Stephen; secretary, R. Bell. This club was affiliated in February 1929. Regular meetings are held at the school, and members take full advantage of the excellent facilities available, devoting time chiefly to model-building. A very successful Exhibition was held in the Spring.

Whitgift School (Croydon) M.C.—The 10th Annual Exhibition held in connection with the associated H.R.C. Branch attracted over 300 members, schoolboys, parents and friends. A fine model of a Ford Diesel shunting locomotive was adjudged the best Meccano effort on show, with a vertical lift bridge, a breakdown lorry and a portable luggage loader for ships gaining other prizes. A film lent by the L.M.S. on "*Building a Corridor Third*" was well received, as were two short Lectures on "*Lighthouses*" and "*The Royal National Life-boat Institution.*" Arrangements have been made for a visit to a lime works near Dorking. Club roll: 29. *Secretary:* G. G. Caddy, 14, Culmington Road, South Croydon, Surrey.

AUSTRALIA

Maylands M.C.—Several new members attended the first meeting of the present club year. Faction officials have been elected and normal activities commenced. Model-building meetings are as popular as ever; the club room is open for this purpose on two nights each week and outstanding models built include a grandfather clock, a travelling gantry crane, and a steam engine. The Library is in a very satisfactory position, and £2/10/- was voted from club funds for the purchase of books. A jolly evening was spent when Boy Scouts from a local troop were entertained. Club roll: 27. *Secretary:* W. Petersen, 1, Warne Street, Maylands, Perth, Western Australia.

Melbourne M.C.—At the first meeting after the holidays experiences were exchanged and photographs passed round. The programme was then resumed, and model-building, model railway working and outdoor meetings have taken place. A party of members enjoyed a bicycle ride along a disused railway line, and stations and other lineside features were thoroughly inspected. Visits to local engine sheds have been arranged. Club roll: 10. *Secretary:* L. Ison, 8, Hayes Street, Northcote N.16, Victoria.

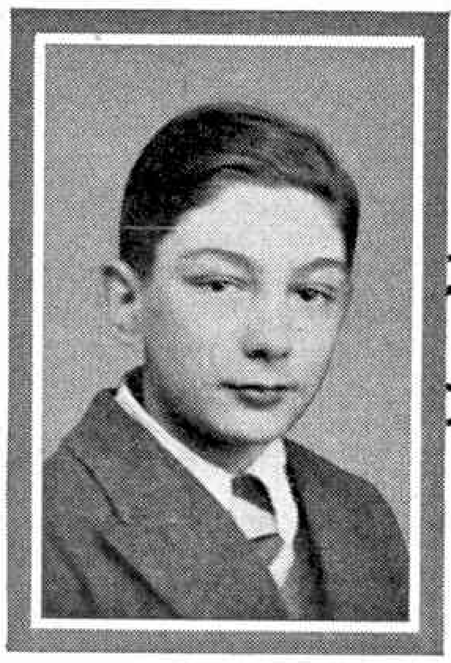
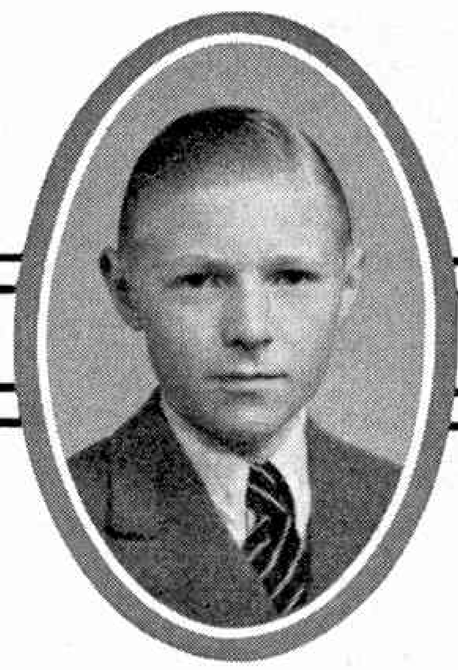
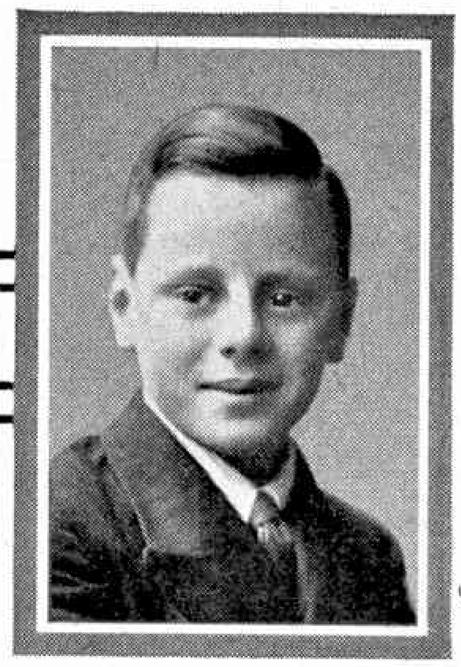
INDIA

Egon's (Calcutta) M.C.—Evening meetings have been commenced, and a number of Meccano models have been built. At one meeting several parents were present and were greatly interested in a Meccanograph, the working of which was explained to them. A large crane with automatic operation is under construction. Club roll: 51. *Secretary:* Bhagat Singh, c/o Jessop and Co. Ltd., Dum Dum, Bengal.

SOUTH AFRICA

Malvern M.C.—At the Annual Business Meeting officers for the year were elected. Parents Night resulted in a very full club room, and after the visitors had seen members at work a Concert was given, and Games were played. Meccano models built at meetings include railway signals, a road bridge and a theodolite. A lively evening was spent at the swimming baths. A Social raised £1/10/- towards club funds. An interesting Talk given by Mr. F. Bath dealt with "*Natives of South Africa.*" At a "Song Social" each member represented a song in some manner, and guessing the songs was great fun. Club roll: 35. *Secretary:* B. H. Saunders, P.O. Box 8, Cleveland.

Southern M.C.—There has been keen rivalry in recent model-building contests, and great ingenuity has been displayed in both design and construction. Games have been played for one hour at each of the weekly meetings. An interesting visit has been paid to the factory of the United Tobacco Company, and models of some of the machines in operation there are to be built. Members also made a trip to see the liner "*Empress of Britain*" leave for New York, carrying many visitors to the World's Fair. Club roll: 16. *Secretary:* R. H. Moodley, 10, Stirling Street, Capetown, Cape Province.

Three prize-winners in the "New Year" Model-Building Competition. They are, from left to right, S. Ellis, who is a member of the Exeter Meccano Club; J. Philpott, Blackheath, S.E.3; and J. Rolfe, Ruabon.

Model-Building Competition Results

By "Spanner"

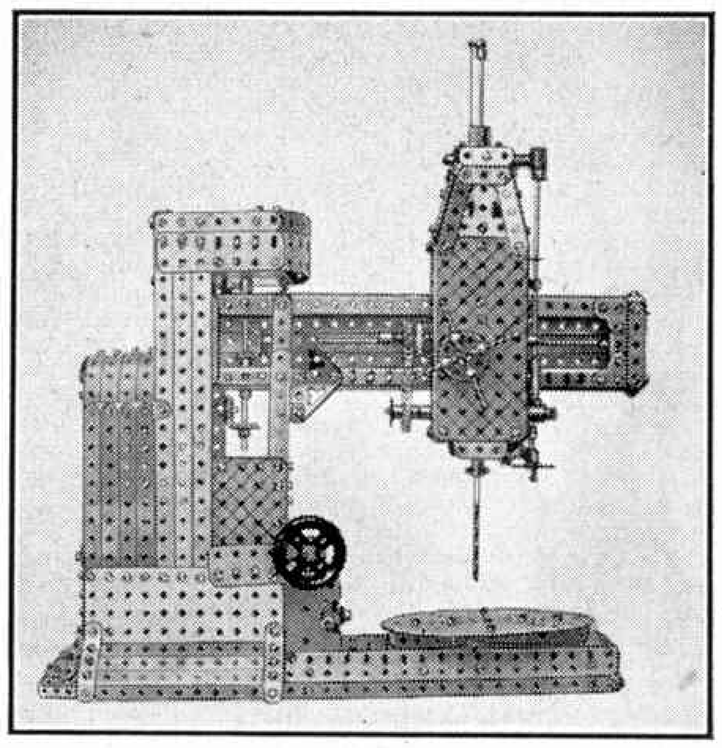
Prize-winning Models in the "New Year" Contest

WHEN announcing the names of prize-winners in the "New Year" Model-Building Competition last month I referred briefly to a very fine model of a universal excavator constructed by F. G. Rich, Orpington, who was awarded First Prize. I am now able to illustrate this model and to give further details of its many excellent features. As will be seen from the illustration of this model that appears on the opposite page, it reaches a very high standard in design and construction. The massive superstructure is carried on a base mounted on creeper tracks built up from $4\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plates hinged together. The Plates are reinforced by Flat Girders, and the complete tracks are retained on the driving wheels by means of Angle Girders. The drivers consist of Hub Discs, which are shod with rubber tyres to prevent the plates being damaged. Power for driving the tracks is supplied by an Electric Motor housed in the base, the drive being transmitted through clutches. Forward and reverse movements are provided for each track to facilitate manœuvring the excavator into the desired working position.

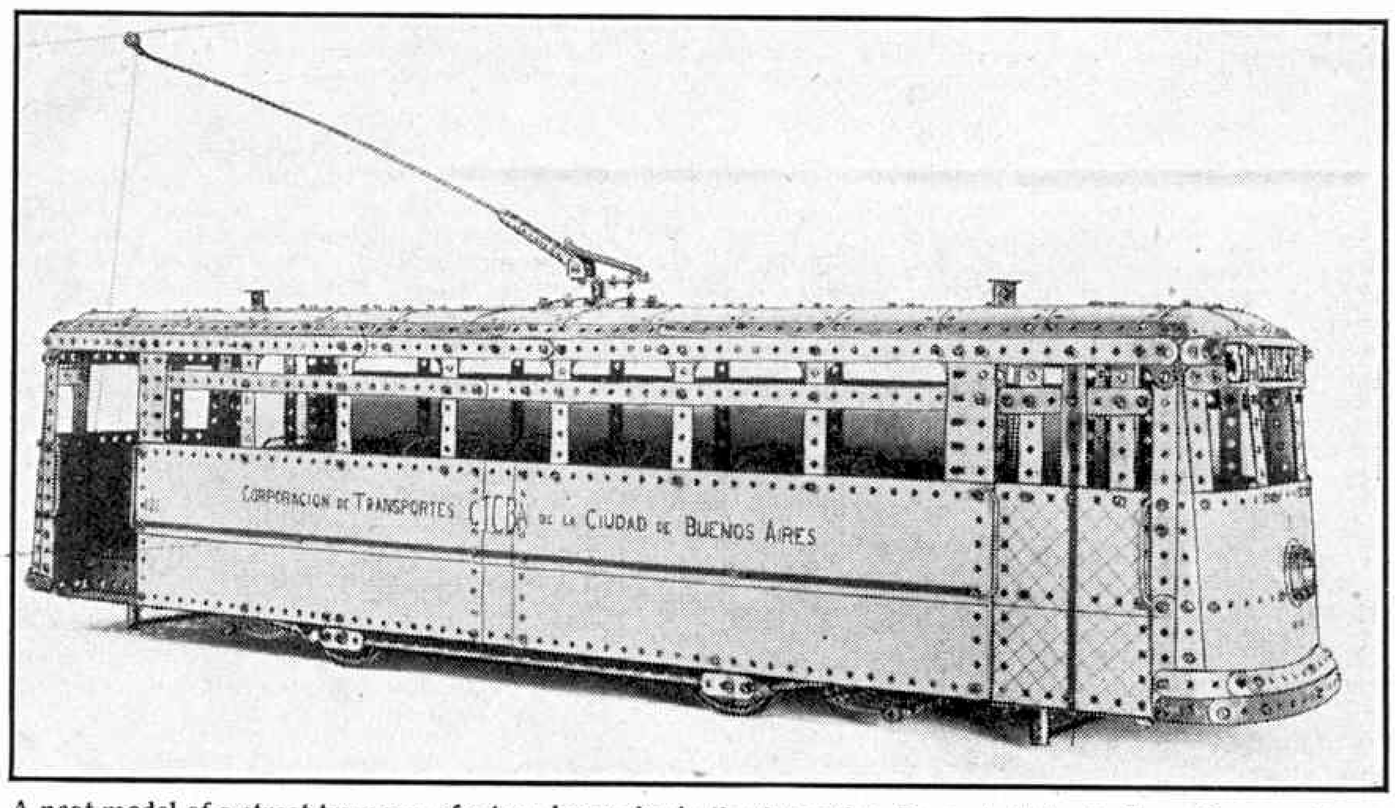
The superstructure swivels on a large built-up roller bearing, and the cab is easily removable to allow access to the mechanism, which is laid out in a very orderly manner, each unit being railed off with Meccano Rods. A particularly interesting feature of the model is an automatic control apparatus. When this is set in motion the model carries out a complete sequence of operations, which are repeated until the current is switched off. The controller comprises three contact drums, each of which acts as a "start" and "stop" switch for an Electric Motor. All the drums are driven at the same speed by a fourth Motor. They are wooden cylinders fitted with metal strips, which make contact with brushes as the drums revolve and so complete electric circuits that supply current to the motors operating the crane. Each of the winding barrels controlling luffing and hoisting of the scoop is fitted with a free-wheel mechanism that prevents over-winding.

Third Prize in the "New Year" Contest was awarded to P. C. Todd, Camberley, for the well-proportioned streamlined speed car illustrated on the opposite page. The model was designed entirely by himself, and is not based on any actual speed car. It is certainly attractive, and when the various inspection flaps provided in the body of the car are opened up a mass of mechanical detail is revealed. The complete model is 3 ft. 10 in. in length, and some idea of the great amount of work that was entailed in its construction is given by the fact that 26 months were occupied in building it. Power for driving the model is supplied by the three E20B Electric Motors, which drive a three-speed forward and reverse gear-box through a differential and friction clutch. The drive is transmitted from the gear-box through twin cardan shafts to the differential on the rear axle.

Three types of brakes are fitted, these comprising internal expanding brakes on the road wheels, a transmission brake and air brakes.

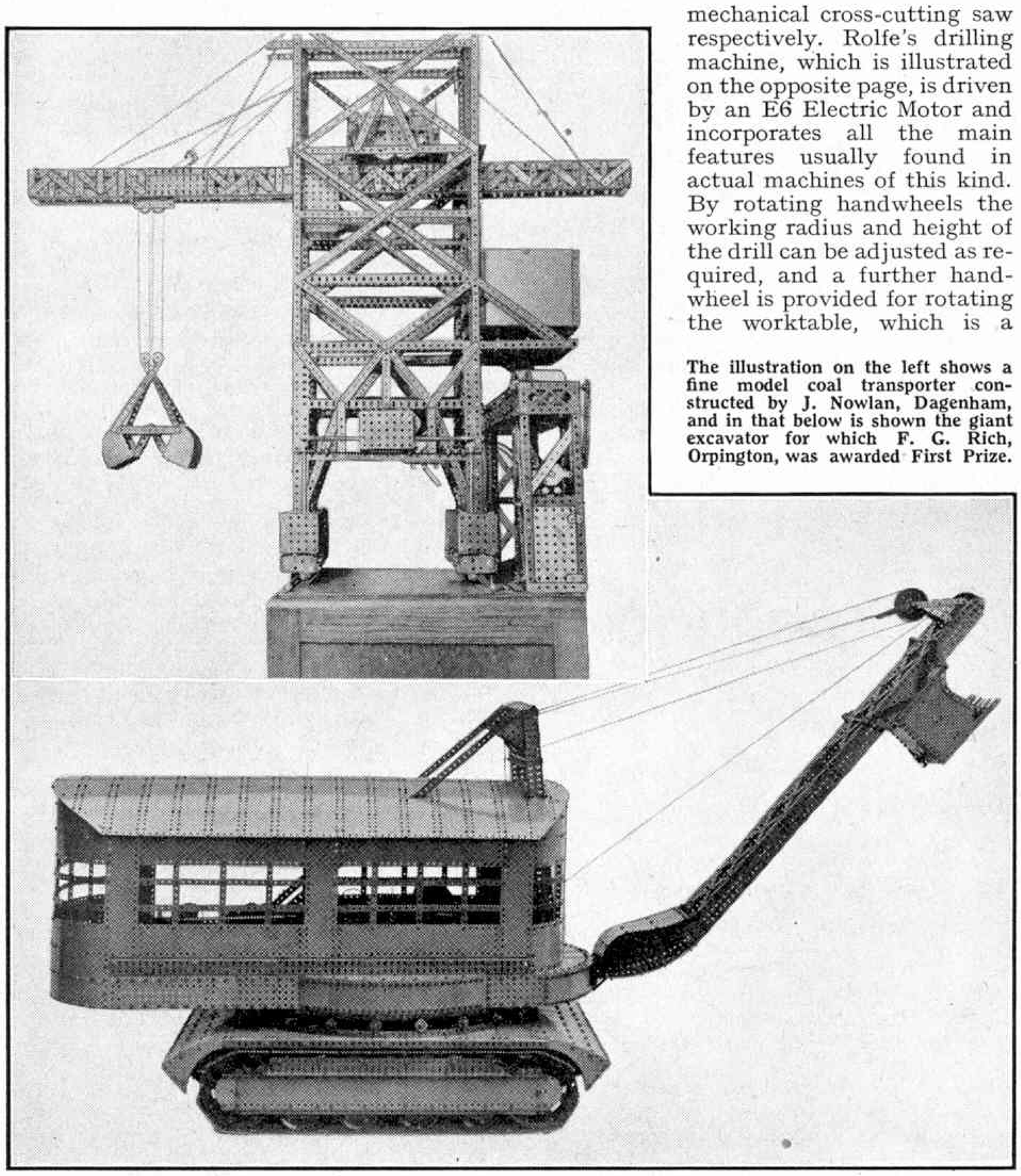


This simple and original model radial drilling machine is the work of J. Rolfe, Ruabon.



A neat model of a street tramcar, of a type in service in the Argentine. It was built by J. Giese, Buenos Aires.

One of the coal transporters used at a big London power station, was chosen by J. Nowlan, Dagenham, as the subject for his prize-winning model, for which he was awarded a prize of 10/6. The actual transporter is installed on a quayside and is used for unloading coal from barges and transporting it to the power station storage area. The coal is lifted from the barges by a grab hoist, which travels to and fro on a long boom that projects over the quayside. The outer end of the boom is hinged so that it can be hoisted to a height sufficient to clear ships' funnels and deck-works. When the grab is full of coal it is hoisted and then hauled inward along the boom until it arrives over a chute leading to a belt conveyor extending the full length of the quay, or over one that discharges into wagons running on rails leading to various parts of the power station. The tower from which the jib and chutes are supported travels on rails laid along the quayside, so that the coal can be unloaded from barges at any point.



The illustration on the left shows a fine model coal transporter constructed by J. Nowlan, Dagenham, and in that below is shown the giant excavator for which F. G. Rich, Orpington, was awarded First Prize.

This transporter forms a really good subject for a Meccano model, as it is comparatively easy to reproduce to scale. A special feature of the model is the method of operating the grab, which follows closely the system used in the actual transporter. The mechanism consists essentially of two crab carriages working on a single set of rails in the boom, the outer carriage carrying the hoist. Cord connected to this crab is taken round Pulleys driven by a Motor. From there the cord passes in turn round a Pulley at the rear end of the boom and one mounted in the second crab, and finally is anchored to the boom. As a result of this arrangement the inner carriage moves at only half the speed of the outer carriage. The hoist cords pass around Pulleys in both the outer and inner carriages before being attached to the winding drum. Thus when the carriages are traversed the grab remains at a constant height.

Machine tools of all types are among the most interesting subjects for Meccano models, and some of the simpler kinds, such as planing and drilling machines, are quite easy to reproduce with a moderate assortment of parts. It has always surprised me that so few model-builders give attention to subjects of this kind, and I was particularly pleased therefore to find that two competitors in the "New Year" Contest, namely, J. Rolfe, Ruabon, and E. Barker, Sheffield, had been awarded prizes for models of a giant radial drilling machine and a mechanical cross-cutting saw respectively. Rolfe's drilling machine, which is illustrated on the opposite page, is driven by an E6 Electric Motor and incorporates all the main features usually found in actual machines of this kind. By rotating handwheels the working radius and height of the drill can be adjusted as required, and a further handwheel is provided for rotating the worktable, which is a 6″ Circular Plate, on its axis.

The drill spindle and chuck are mounted in a drilling head on a horizontal beam that can be swung through an arc. The drilling head is traversed along the beam by turning handwheels, on the shafts of which are Pinions that engage with a length of Rack Strips bolted to the beam.

In order to transmit the drive to the drill spindle irrespective of its position on the beam, a Rod in the beam driven from the Electric Motor has a flat filed on it throughout its length. A Worm on this Rod has its Grub Screw tightened sufficiently on the flat to cause the Worm to rotate with the Rod, and at the same time to allow the Worm to slide freely. The Worm engages a Pinion fixed on the drill shaft.

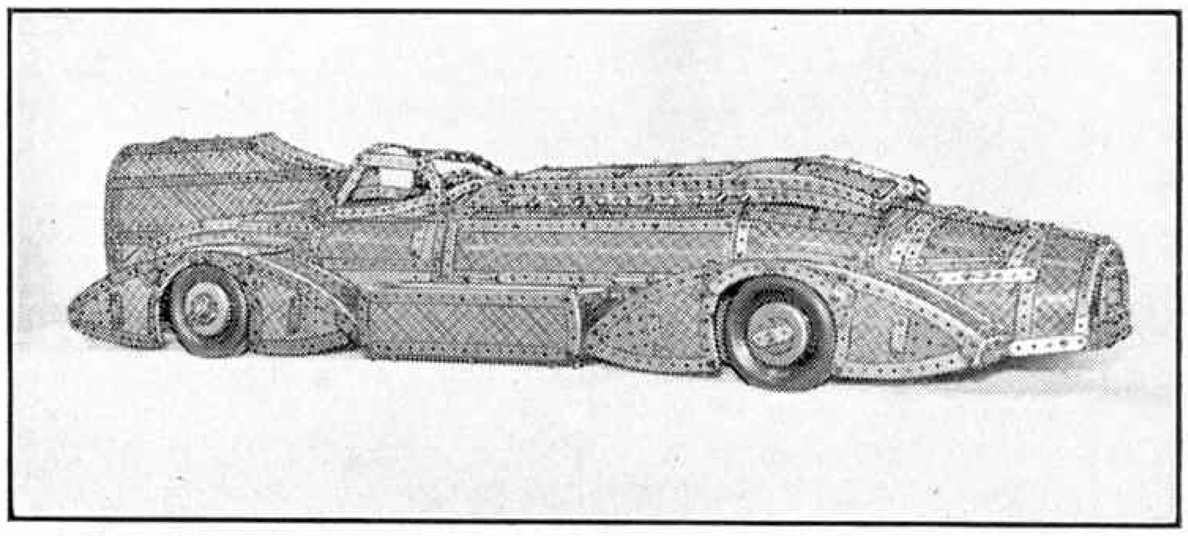
The model cross-cut saw submitted by E. Barker, Sheffield, is based on an actual machine of this kind that he saw at work cutting logs in a local timber yard. From a constructional standpoint the model is a simple one, but it attracted the attention of the judges on account of its originality and the close resemblance that it bears to the actual machine. I think it would be a good plan if more model-builders experimented with what I may call the less popular subjects, of which this mechanical saw is an example, as it cannot be too strongly emphasised that freshness of subject goes a long way to earning success in a competition for any reasonably well-built model.

Another entry that is off the beaten track is a reproduction of the facade of a picture house at Exeter, which was sent by S. Ellis, a member of the Exeter Meccano Club. The model is built mainly with Flanged Plates and Angle Girders, and Dinky Toys figures placed in appropriate positions give it a realistic appearance and assist in emphasising the excellent proportions of its design.

The unusually neat model of a modern single deck tramcar shown on the opposite page earned one of the smaller prizes for J. Giese. The model is a reproduction of one of the streamlined vehicles operated by the Anglo-Argentine Tramway Company at Buenos Aires. With the photograph of his model Giese sent a picture of the actual vehicle, and comparison of the two illustrations shows the accuracy with which even small details of the original have been copied.

K. Pritchard, Brooks Green, who has built several fine model speed cars, entered a model of the M.G. Magnette car in which Major A. T. G. Gardner set up new speed records for the flying kilometre and flying mile on the Frankfurt-Darmstadt Autobahn, Germany, last November. The model is built to a scale of 1 to 5, and gives a fine idea of the structure of the actual car. The Electric Motor by which it is driven is concealed inside a dummy six-cylinder engine, so that the model looks very realistic when in motion. All the driver's controls are in the correct positions, and the gear-box is remotely controlled as in the actual car. In order to reveal the internal details of the model the bodywork is not modelled fully, but its shape is outlined by means of Strips curved to give the required contour.

Readers who are keen on building model motor vehicles will be interested in a neat armoured car constructed by Thomas Ellis, London N.W.5. The model is not a large one and is simply built, and its success in this contest is due entirely to the fact that its builder chose the Meccano parts he used with due regard to the purpose they had to fulfil. For example, Worms, Collars and Couplings threaded on a Rod, with a short portion of the latter projecting, form excellent machine guns, while a ¾″ Flanged Wheel pivoted between the arms of a Fork Piece provides a good imitation of the searchlights mounted on such vehicles.



P. C. Todd, Camberley, was awarded Third Prize in the "New Year" Competition for this model streamlined speed car.

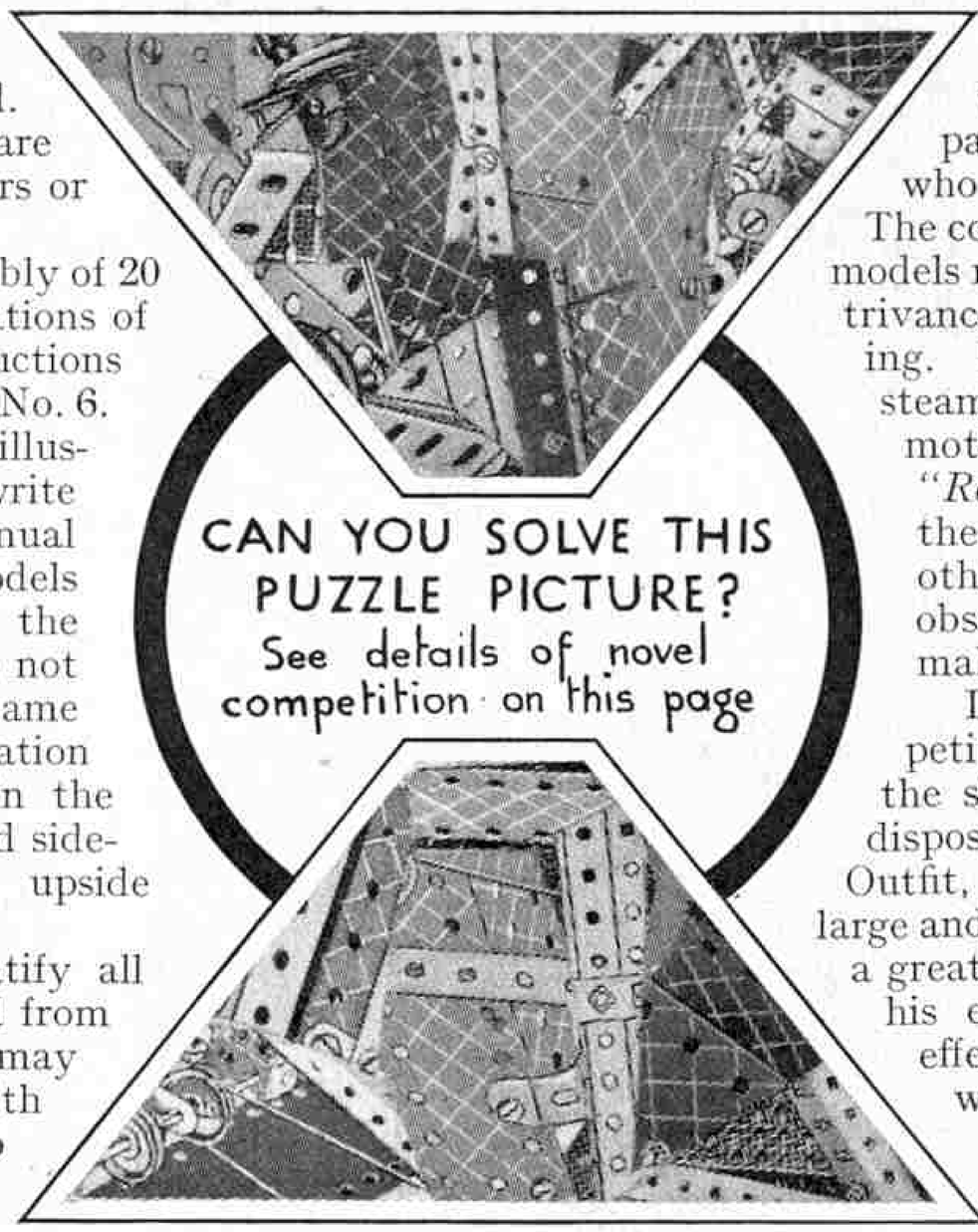
Easy Competitions For All "M.M." Readers

A "Puzzle Picture" Teaser

The curious design that appears on this page forms the subject of the second of our special summer competitions. In these contests every reader who possesses a copy of the Meccano Instructions Manual for Outfits Nos. 0–6 has an opportunity to win a big prize. There is no model-building to do and in order to prepare his entry a competitor needs only a copy of the Manual for Outfit Nos. 0–6, a pencil and a postcard. Competitors therefore can prepare their entries equally well outdoors or indoors, on holiday or at home.

The design consists of an assembly of 20 separate pieces cut from illustrations of models in the Meccano Instructions Manuals for Outfits from No. 0 to No. 6. Readers are asked to study the illustration carefully, and then to write down on a postcard the Manual numbers and names of the models from the illustrations of which the 20 pieces are cut. The pieces are not necessarily printed in the same angular positions in the illustration on this page as they occupy in the Manual. Some of them are placed sideways, and others actually are upside down.

Competitors who cannot identify all the pieces should not be deterred from sending in their entries. They may obtain one of the prizes offered with an incomplete entry, for if no competitor succeeds in identifying all the pieces in the illustration, the awards will go to the readers who send in the best attempts. On the other hand, if more than one competitor names every fragment correctly, the prizes will be given to those whose entries are the most neatly and clearly prepared, and the decision of the judges must be accepted as final.



The picture puzzle of our second "Sharp Eyes" competition.

The contest is open to readers living in any part of the world, and there is no age limit. Each competitor is allowed one attempt only. The prizes to be awarded are as follows: First, Meccano or Hornby products value £3/3/–; Second, products value £2/2/–; Third, products value £1/1/–. Five prizes of products value 5/–.

The closing date for receipt of entries is 30th September 1939. These must be on postcards and should be addressed *"Sharp Eyes Contest No. 2,"* Meccano Ltd., Binns Road, Liverpool 13. Prize-winners will be notified by letter as soon as possible after the closing date, and they will be given an opportunity of selecting any products they like from current Meccano and Hornby price-lists.

The third and last of these contests will be announced next month.

"Engineering of the Past" Contest

Readers who intend to send in entries for the *"Engineering of the Past"* Competition, and have not already done so, are reminded that only about four weeks now remain in which to take advantage of this fine opportunity to win a valuable cheque.

Full details of the competition appeared in the April and May issues of the *"M.M.,"* but we are again repeating the essential particulars for the benefit of readers who did not see either of those issues. The competition is open only to Meccano models representing machines or other contrivances of the early days of engineering. In this category are early paddle steamers, beam engines, old locomotives such as *"Puffing Billy"* and *"Rocket,"* and pioneer aircraft such as the Wright Biplane. All these and any other engineering devices that are now obsolete or considered old fashioned make suitable subjects for models.

In choosing a subject the competitor should take into consideration the size of the Meccano Outfit at his disposal. If he possesses only a small Outfit, it is unwise to try to model a large and elaborate structure. He will stand a greater chance of success if he confines his efforts to building a simple but effective model of a subject that is well within the capabilities of his Outfit.

The more unusual the subject chosen the better, for the judges will look particularly for novelty, as well as for good mechanical construction and ingenious uses of Meccano parts. They will take the ages of entrants into consideration when making their awards, so that all competitors will have an equal chance of success.

The Contest is open to every owner of a Meccano Outfit living in any part of the world, and there is no age limit. Valuable prizes, including cheques as well as Meccano and Hornby products, will be awarded for the best models received, and full details of these are given in the panel at the foot of this page.

Entries for both Home and Overseas readers are grouped into one Section, and this will close on 31st July.

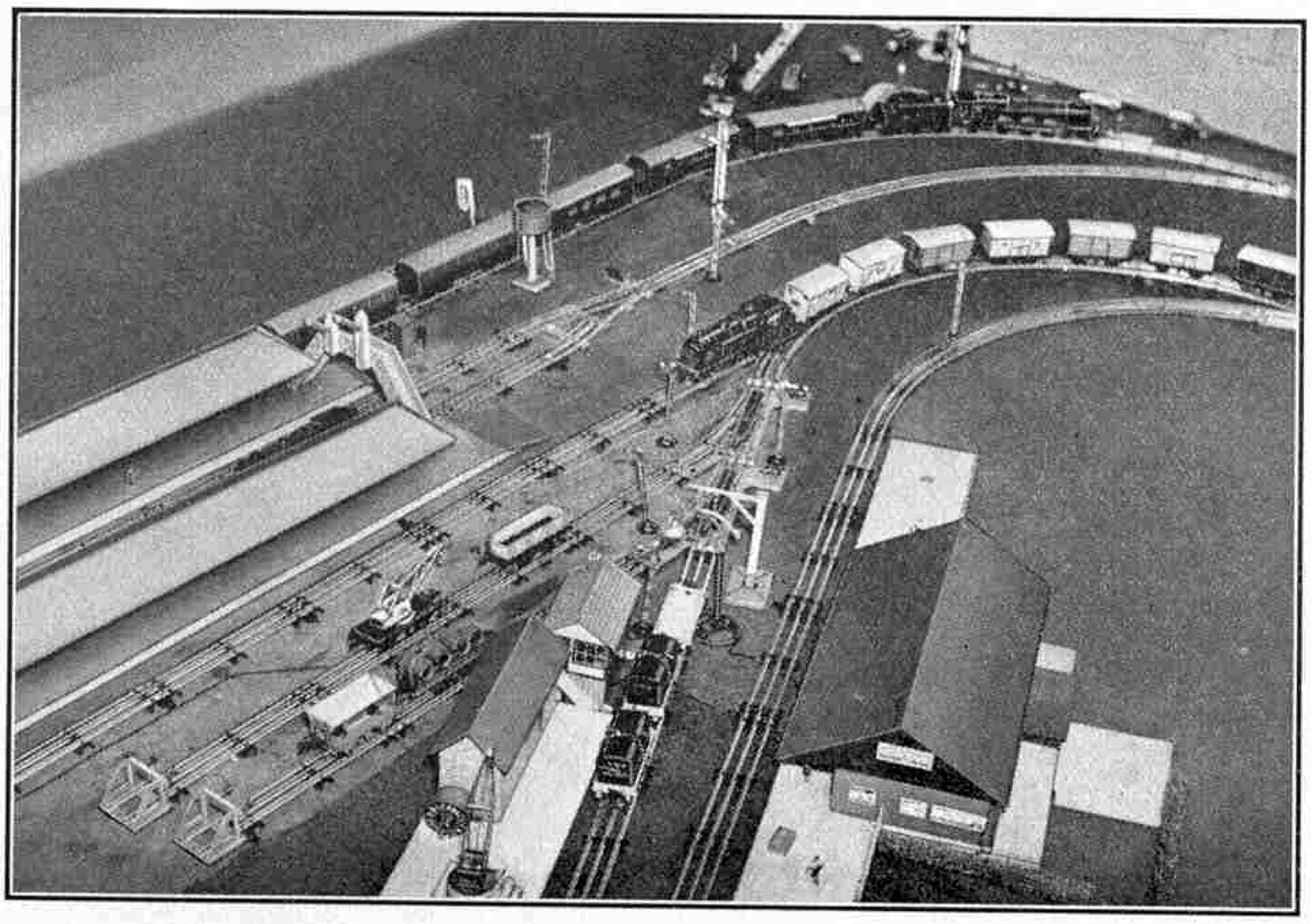
Entries should be addressed *"Engineering of the Past Contest,"* Meccano Ltd., Binns Road, Liverpool 13. Actual models must not be sent. It is only necessary to submit either clear photographs, or, if this is not possible, good drawings of the models, together with a brief explanation of their chief features. The sender's age, name and address, must be written on the back of each photograph or drawing submitted.

THE PRIZES

"Engineering of the Past" Competition

CLOSING DATE: 31st July

1st Prize, Cheque for £5/5/–
2nd Prize, Cheque for £3/3/–
3rd Prize, Cheque for £2/2/–
10 Prizes of Meccano or Hornby products value 10/6
10 Prizes of Meccano or Hornby products value 5/–



A section of the layout of Mr. John C. Hamer, of St. Annes-on-Sea. Photograph by courtesy of the "Lytham St. Annes Express."

An Attractive Hornby Railway

Operations on a St. Annes-on-Sea Layout

THE very neat and workmanlike Hornby Train layout illustrated on this page was planned and constructed by Mr. John C. Hamer, St. Annes-on-Sea, who spends every minute of his spare time in operating it. Like most other Hornby railways, this began as a single circuit, on which a few small items of rolling stock were run; and it has slowly and steadily developed by periodic additions here and there into a very interesting and railway-like system. Now, after nine years of expansion, it covers the whole of a large attic floor and is electrically-operated.

The system consists of a main oval of two tracks, the outer circuit of which is of Hornby Solid Steel Track, the remainder of the layout being laid with standard tinplate rails. The upper illustration on this page shows the 4–6–2 *"Princess Elizabeth"* hauling a heavy passenger train on the outer steel track, while on one of the inner tinplate tracks is a goods train in charge of an E220 Special Tank Engine.

The tracks separate at one side to allow for the inclusion of the main station, which has two terminal platforms in the centre leading to the outer of the two tracks. A branch line from the inner track serves the station shown in the centre of the photograph, and then runs obliquely across the centre of the oval, causing the train to run round in the opposite direction, while a similar arrangement crossing the branch line by an acute-angle crossing is used to bring the train back to its original direction. Thus a train starting from the centre platform of the main station "A" can run round the outer track as many times as desired, and then cross over onto the inner line, calling at the branch line station "B" before returning to the terminus from which it commenced its journey.

In the working of the system, particular attention is paid to the running of miniature expresses. Such famous trains as *"The Merseyside Express"* and *"The Royal Scot"* are run. The locomotive provided for these services of course is the Hornby *"Princess Elizabeth,"* while the rolling-stock consists of No. 2 Corridor Coaches, and No. 2 Passenger Coaches. An E220 Special Tank Engine is used for other purposes.

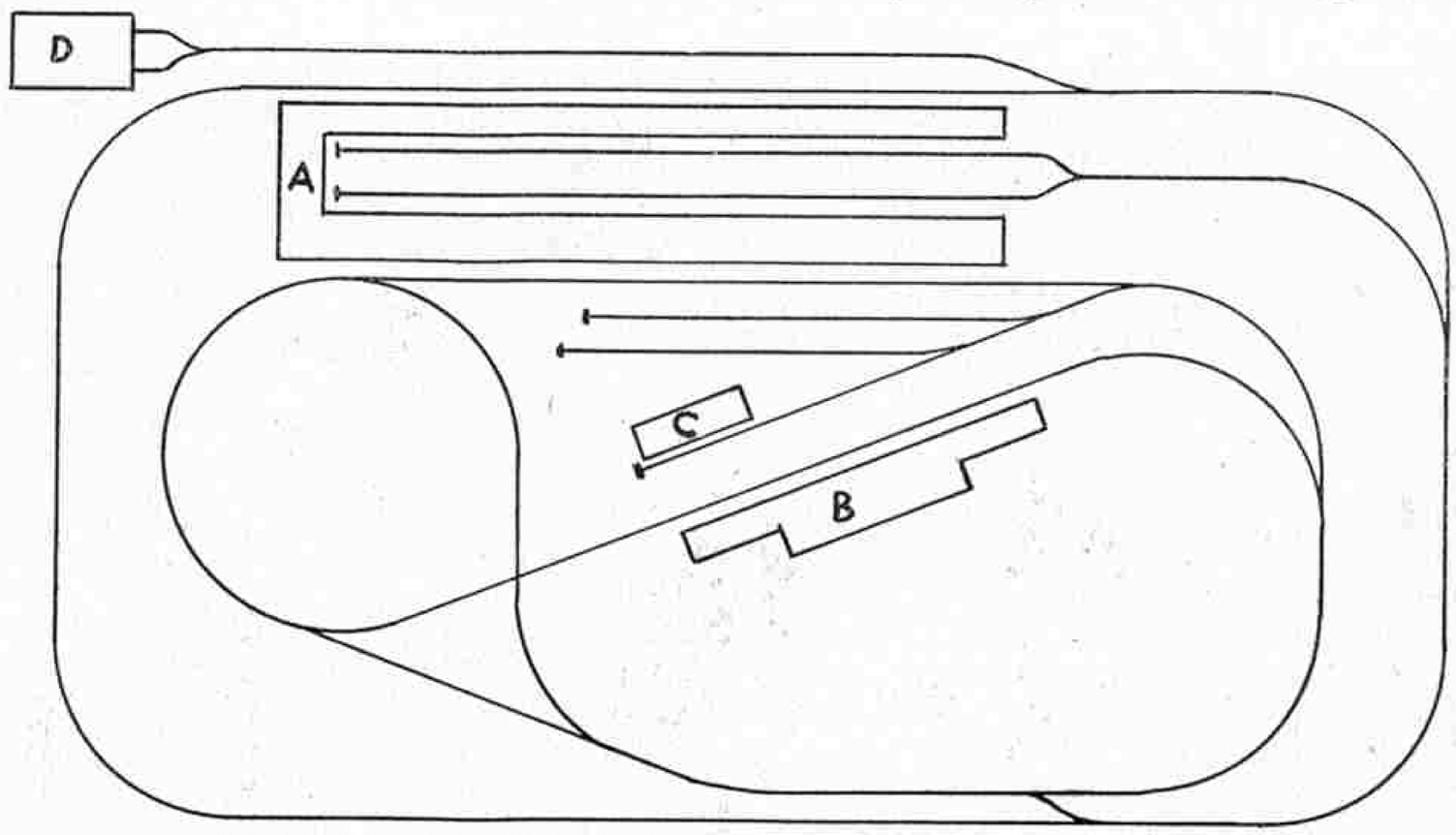
When through carriages are run, as frequently is the case, the trains to which they are attached are stopped in the station for the purpose of detaching them. The main train then proceeds on its way again and the through carriages are taken in charge by the E220 Special Tank Locomotive, which conveys them via the inner track to their destination.

Probably the most useful and interesting feature of the layout is the arrangement of several electrical sections, each of which is controlled through a switchboard adjacent to the power station, which Mr. Hamer built himself. During the operation of detaching the through coaches previously mentioned, extensive use is made of the track-circuiting devices, which allow the two electric engines to be under separate control while on the same track. There also is an arrangement by means of which the section of track immediately in front of the buffers at the terminus station "A" is automatically "deadened" when the train enters the platform. This is an excellent scheme for preventing an incoming train from overriding the platform and crashing into the buffers. The section can be made "alive" when it is desired to back out the engine.

The running of goods trains forms a prominent part of the operations on this railway. The trains are marshalled in the goods yard, shown in the centre of the diagram on which "C" indicates the main office. This duty usually is carried out by one of the clockwork locomotives, of which there are two, a No. 1 Special Tank engine and an M3 Tank. When the trains are made up and ready for the road, they are worked through to their destinations by the electric tank engine; clockwork engines work in the "yard" only for the purpose of making up trains. Several types of goods trains are run, from coal trains to the express "brake-fitted" type.

Miniature refinements that have been introduced are the fitting of lamp brackets to the goods brake vans, and the painting of numbers on their sides, in the same manner as on their prototypes. One of the Hornby Open Wagons "B" has been repainted in the standard L.M.S. bauxite brown in accordance with the latest practice.

Like all good model railways, Mr. Hamer's system has been completely signalled. The signals are electrically lit from a separate 4-volt battery that also supplies power for lighting the station, the engine shed and the goods yard. The stations were made from odd bits of wood and include glass windows, and hinged doors. In addition there are lineside accessories such as a miniature road and hedging and the small, but important gradient and mile posts.



This diagram shows the complete arrangement of the layout described in this article.

Two Fine Garden Layouts

Outdoor Model Railways on which Snow Ploughs are Used

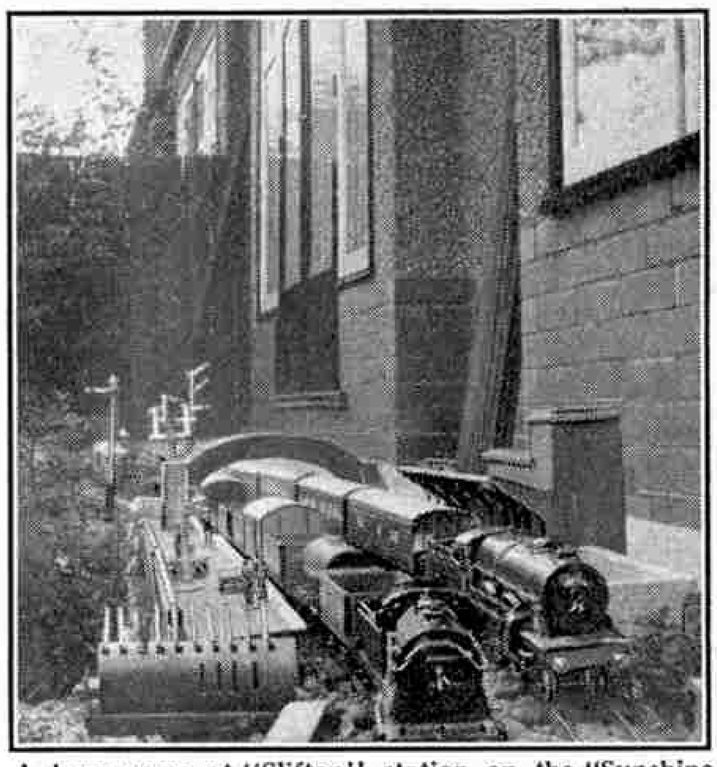
THIS is the time of the year when outdoor tracks are busiest and most attractive, and this month therefore we are describing two garden layouts on which Hornby locomotives and rolling stock are used. The first is known as the "Bincliff, Lakeside and Shedley Railway," and is operated by Mr. C. B. Smith, of Lincoln; the other, the "Sunshine Lines," to which we have referred on previous occasions in these pages, is operated by Mr. P. D. Smith, Sunderland. Both these layouts have various features in which they resemble each other.

We will deal first with the "Bincliff, Lakeside and Shedley" system. The line was commenced some two years ago, and is composed of some 165 ft. of non-continuous main line track made in the form of a return loop. The chief station is "Bincliff," a terminal that derives its name from its proximity to the garden bin! Trains starting out from it follow one another, all so loaded that they can return to their starting point on one winding, for all the locomotives are of the clockwork type.

"Bincliff" has two platforms served by three tracks, one platform being of the island type. At the end of this the tracks converge on to a turntable, so that it is possible to run a train into the station, uncouple the engine, and run it on to the turntable. After reversing it can pass round its train by way of one or other of the parallel tracks. The arrangement of the points outside the station allows for any train to depart on the correct line, in order to pass incoming traffic. There are four tracks outside "Bincliff," and these run for a short distance alongside the garden hedge before converging first into three roads, and then, after passing "Bincliff" goods depot, into two.

Tracing the track of a train leaving "Bincliff," we find that some little distance farther on the trains pass a mail exchange apparatus that is used in conjunction with a model Royal Mail Coach. The line now approaches the garden shed, and the "down" road leaves the "up," running round the back of the shed through a curving tunnel. After a level crossing comes "Lakeside (High Level)," a country station with two platforms, one of which is an island served on one side by a long loop line. There is a goods siding here, with a small depot and a warehouse. The loop line included in the track design at this point allows for the passage of express trains while a slow train is standing in the station, and is useful also for holding goods trains, which as a rule are of greater length than passenger trains.

After leaving "Lakeside," the track doubles back and becomes the up line, passing through the shed, where the engines and rolling stock are stored when not in use. Inside the shed is "Shedley" station, which consists of an island platform with a passing loop as at "Lakeside," but also has numerous sidings and engine sheds. After passing through "Shedley" the line comes out into the open once more and alongside the "down" track, after which there is a straight run to "Bincliff."

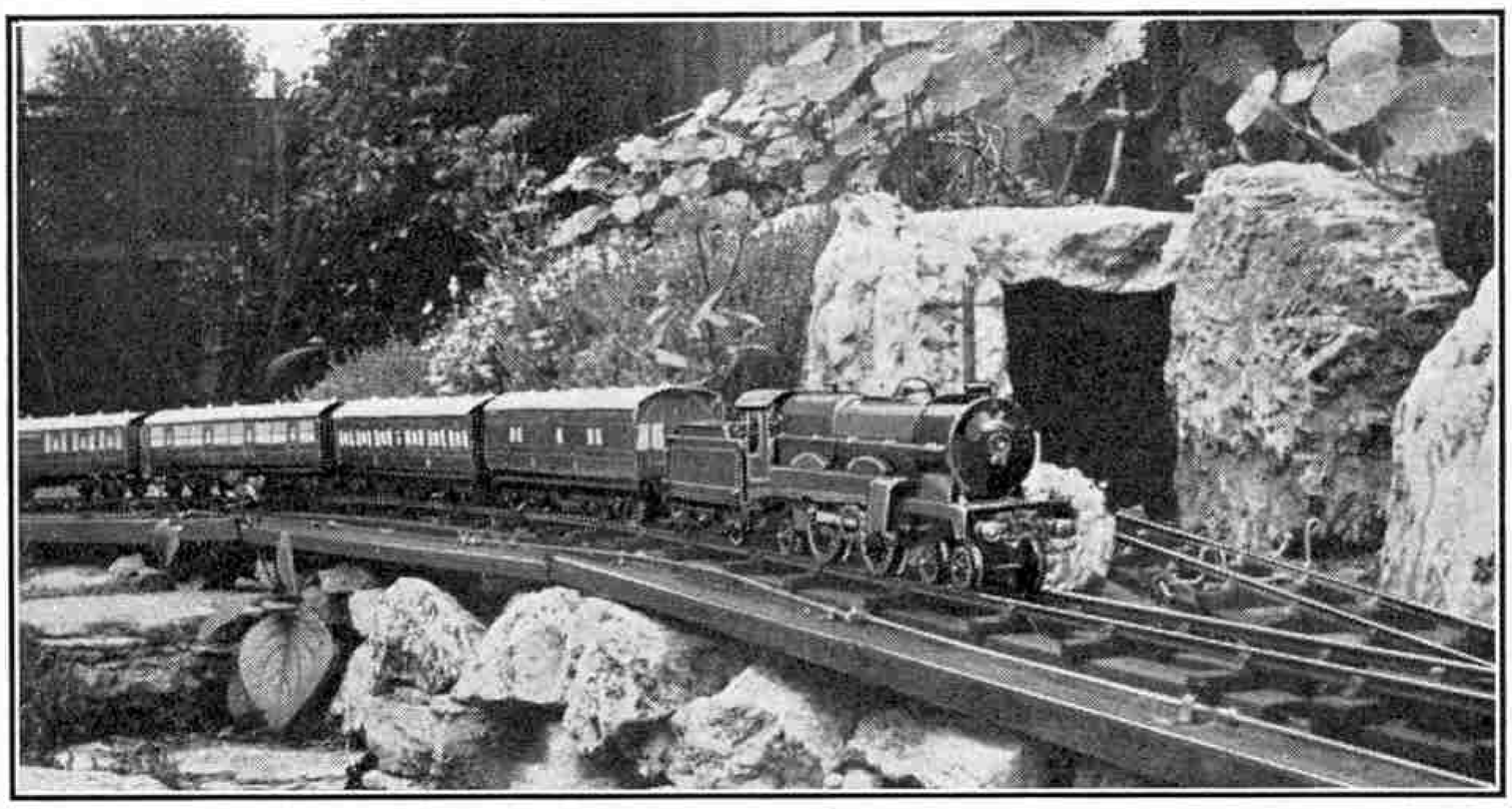


A busy scene at "Clifton" station on the "Sunshine Lines" operated by Mr. P. D. Smith, Sunderland.

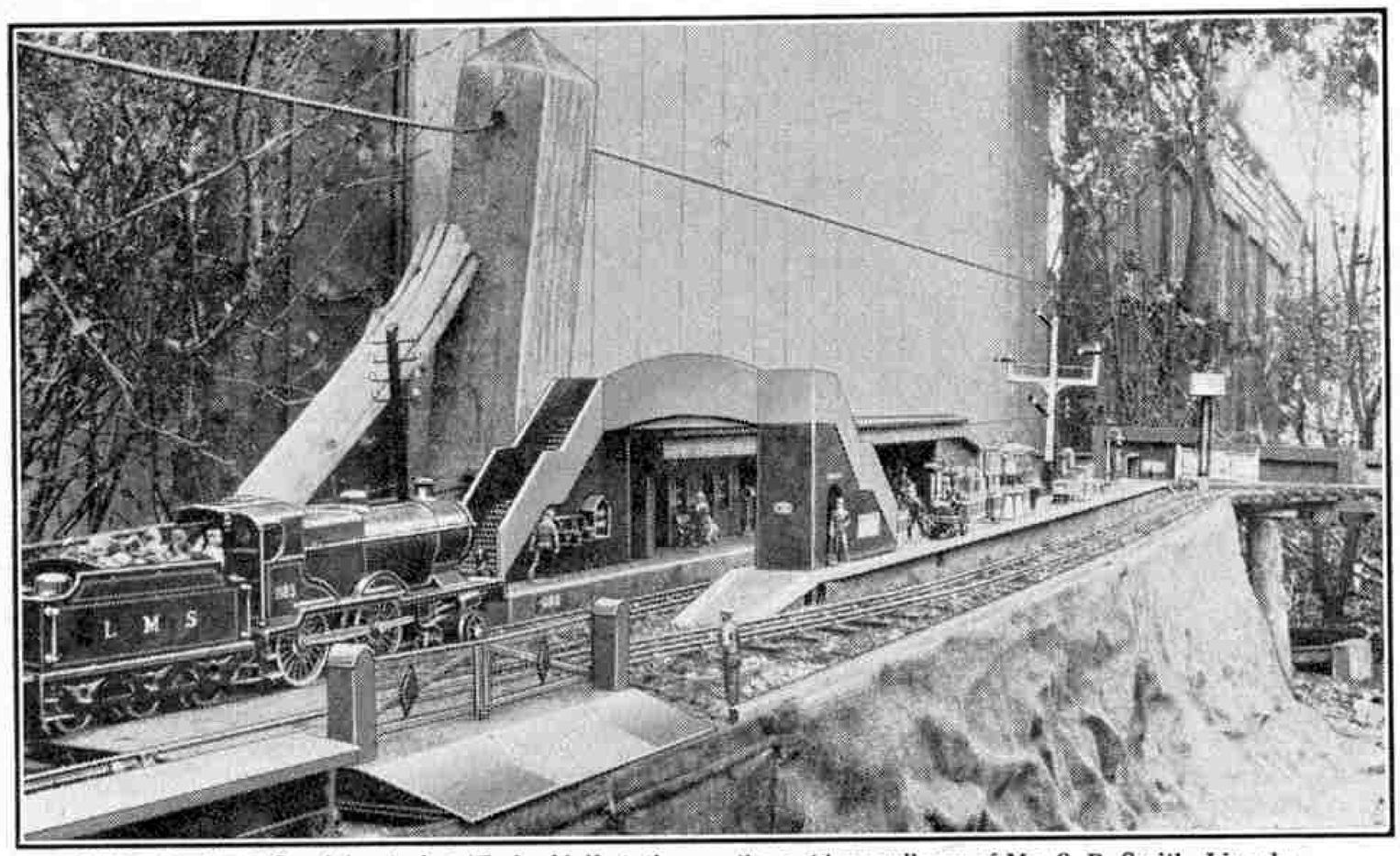
The locomotives in use on this interesting line follow L.M.S. practice. The express trains are handled by a model "Royal Scot" locomotive and a Hornby No. 1 Special Tender Engine, while a 0–6–0 tender engine is in use for the handling of goods trains, together with a Hornby No. 2 Special Tank. An interesting model is one that represents a Diesel-engined 0–4–0 locomotive used for shunting. In this is installed a Meccano Clockwork Motor, the slow long-running performance of which makes it ideal for this type of work.

A home-made snow plough of very heavy construction is a particularly realistic piece of rolling stock, and has proved thoroughly efficient when pushed by three locomotives. A genuine fall of snow was dealt with during the winter months, a path through quite high drifts being cleared in fine style so that "normal running" was soon once more the order of the day. Working of this kind brings out an interesting aspect of miniature railway operation that is only possible in the real "weather conditions" of outdoor lines.

All the buildings, signals, bridges and



An express passing a picturesque spot on the "Sunshine Lines."



A Hornby No. 2 Special entering "Lakeside" station on the outdoor railway of Mr. C. B. Smith, Lincoln.

tunnels are made substantially of wood to withstand the weather. Brass and zinc are used for metalwork, such as signal semaphores, in order to guard against rust. Rail brakes and reversing trips are incorporated in the system, so that although engines are actually driven by clockwork motors a good measure of control is possible, and all rolling stock has been fitted with Hornby die-cast Mansell or Spoked Wheels in order to obtain the easiest possible running.

The layout just described is a good example of the non-continuous "there-and-back" plan. The "Sunshine Lines," operated by Mr. P. D. Smith, Sunderland, is a continuous system, some 140 ft. in length, laid along the sides of a square lawn. The track is carried at a height of about 18 in. on a low wall of stone, and behind it, on the same level, are flower borders. As can be imagined, the railway presents a most picturesque scene, especially during the summer months, and some excellent effects have been achieved by the use of rock plants, which go a long way towards solving the problem of providing "scale trees."

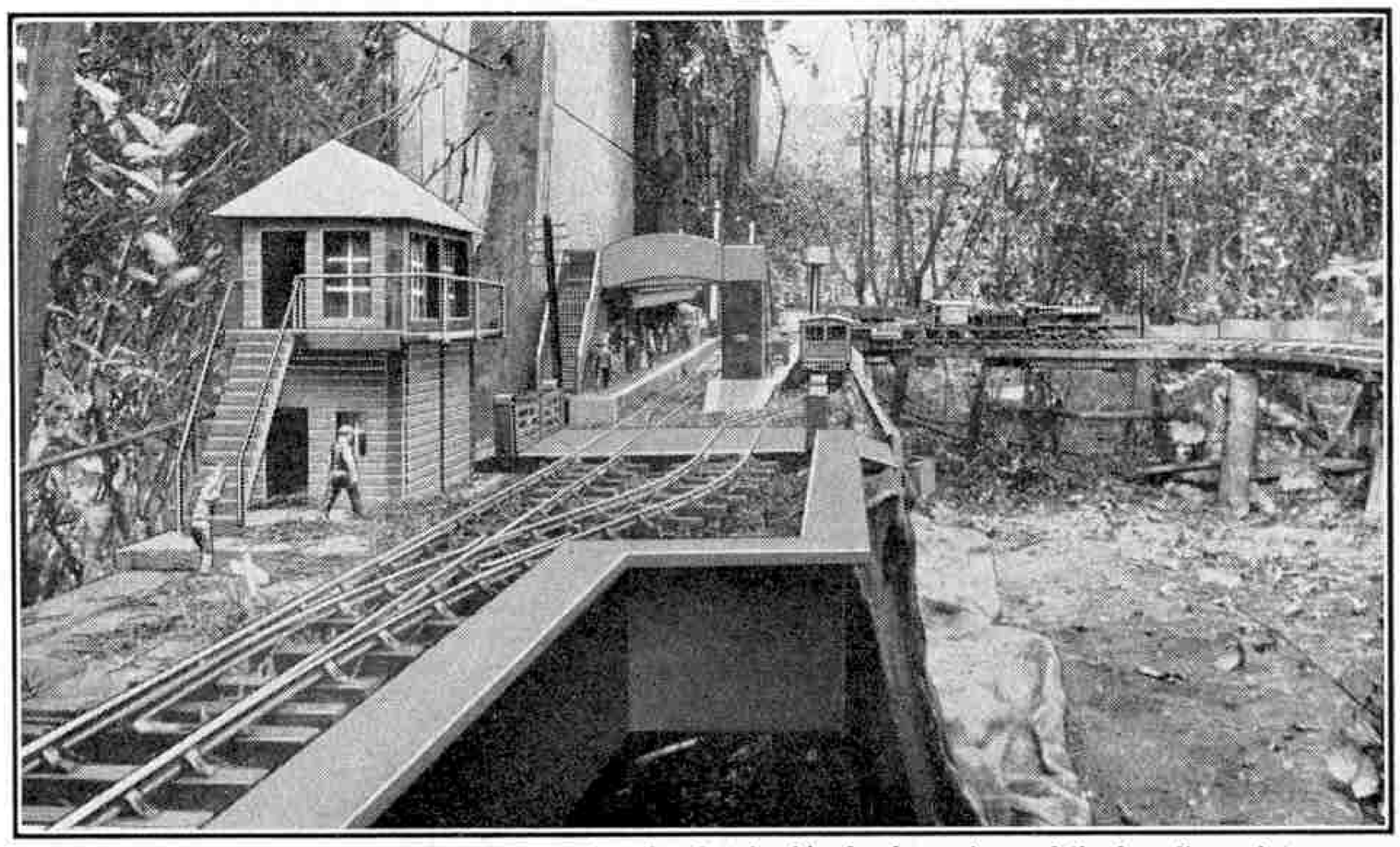
At each corner of the line there are large-radius curves, and at one of them the track passes through a tunnel some 4 ft. in length burrowed under a hill of earth and rock. At another point, the line passes through a natural cutting about 10 in. deep, in which it is bordered by rocky cliffs that actually are part of the rockery. An overbridge has been built effectively across the line at another corner.

There are two stations. The larger of these is known as "Clifton," approaching which the single main line widens out into three tracks, converging into double track just before passing between the platforms. All the points at the station are worked from the lineside; this together with the three-track layout at the station makes it possible to run three trains at once on the same track, following one another at intervals of about 8 yds. From his usual position the operator can control the route to be taken, and also has under his control track ramps that operate the brake mechanism of the locomotives. The ramps are so placed that they bring the trains to a standstill at points within easy reach for rewinding.

At present only one country district is served by the railway, and here is situated the rural station of "Hayburn Wyke," which, like its real namesake near Scarborough, has but a single platform. A siding has been included here for the accommodation of a slow train while the express runs through. At the approach to this station is a level crossing that gives access to a popular picnicking place, where a party of Hornby Hikers are frequently to be seen waiting for the gates to open so that they can go on to pitch their camp and enjoy themselves!

There has been a considerable increase recently in the quantity of rolling stock in use on this fine garden railway, and it has become necessary to provide additional siding accommodation. This has been accomplished by taking a branch off the main line just beyond "Clifton" station. Here the garden provided the engineers with a problem. In order to gain access to the required site it was necessary to drive a tunnel through some high ground that the main line skirts, but this was done and now three parallel tracks have been provided on the site. These converge upon a turntable, from which two tracks lead into a new locomotive shed that has accommodation for three or four engines.

Twice during the past winter it was necessary to make use of the snow-plough on this line, and when handled by two locomotives this proved most effective in clearing a passage for the trains. Freight traffic is on the increase and the container system is well to the fore. As the area served by the Company is of a rural and agricultural kind, timber wagons are in demand, and Hornby No. 2 bogie Lumber and Timber Wagons loaded with tree trunks are a common sight on the line.



Another view of "Lakeside" station showing the signal cabin, level crossing and the loop line points.

BIRCHINGTON.—After considerable discussion it has been decided to relay the track on a raised baseboard, and work on this is now well in hand. Shunting practices have been held on goods yard layouts. All club equipment is overhauled once every two months. Efforts are being made to raise funds for the purchase of further equipment. Secretary: R. C. Pettman, "Little Croft," 30, Crescent Road, Birchington, Kent.

SOUTH WEST HOUNSLOW.—Successful Track Meetings have been held since incorporation with the H.R.C., and are being continued. Rolling stock has been tested, and certain coaches and trucks picked out for use on fast trains. A Visit to the Model Railway Exhibition at Westminster was greatly enjoyed. Secretary: A. E. Foot, 5, Linden Avenue, Hounslow, Middlesex.

SALTASH MODEL ENGINEERING AND HOBBIES CLUB.—Steady progress continues to be made by the Track Building Section. A right-hand and left-hand junction are being constructed, and several lengths of track have been completed. Steel track has been mounted on trestles made by the Model-Building Section. The newly-acquired clubroom has been leased for five years. A Ladies Committee is to be formed. Secretary: B. R. J. Braund, 9, Homer Park, Saltash.

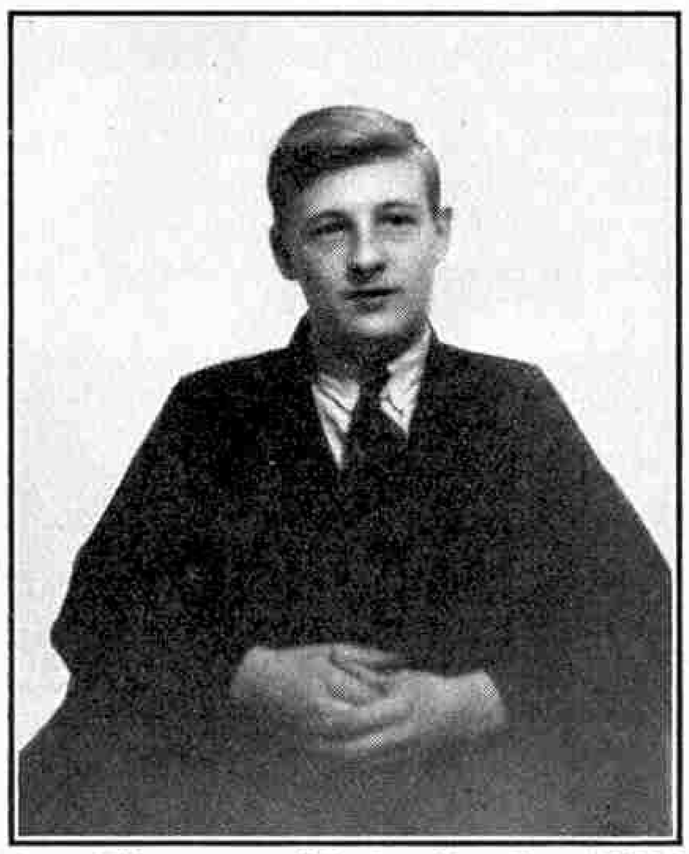
BARKING.—Branch Locomotives have been timed and tested on a large double track. New Crossover Points were recently brought into operation with success. Different tracks have been laid down at meetings, double-track continuous lines being varied with goods yards layouts for shunting operations. Secretary: F. K. Whitehead, 60, Devon Road, Barking, Essex.

TWYFORD GROVE.—Rules have been revised and new officials elected. Part of the new layout has been opened, including three stations fully equipped with signalling and point control. Two turntables have been made, and points now completed number 57. Altogether some 500 ft. of track have been laid. A Visit has been paid to a signal-box on the London-Birmingham main line. New members will be welcomed. Secretary: J. W. Prescott, 6, Twyford Grove, Banbury.

BURY ST. EDMUNDS.—At one of several very successful track meetings a branch line was laid and operated in connection with the main track. A General Knowledge Competition has been held, and Table Tennis has been played. A Lecture has been given on *"Train Working on the L.M.S. Midland Line."* A Stamp Section has been introduced. Secretary: T. S. West, 10, Crown Street, Bury St. Edmunds.

ST. OSWALDS.—Following a successful Exhibition several new members joined the Branch, and their criticism of this event proved valuable. A discussion on *"Town and Country Life"* brought up many interesting points. A Word-Building Competition proved very entertaining. Secretary: R. K. Hurden, 62, Hepworth Road, Streatham, London.

HORNSEA.—Regular Hornby evenings have been held by the Senior and Junior Sections of the Branch. A variety of train services have been run, and many unusual features of actual railway operation, including emergencies, have been reproduced on the layout. Secretary: S. Johnson, "Wavecrest," Cliff Terrace, Cliff Road, Hornsea.



G. Ruffell, secretary of the Loughton (Essex) H.R.C. Branch No. 360, Chairman, Mr. E. T. Driver. Although only incorporated in November last, the membership has already risen to the full capacity of the Branch room. Interesting operations are carried out on an excellent layout. A Stamp Section has been formed and a Library started. A special feature is made of visits to places of railway interest, such as King's Cross Running Sheds.

PLYMOUTH.—Good progress has been made by the newly-formed Modelling Section, which constructs rolling stock, and the Photographic Section. Train running has been carried out at most meetings on the Branch layout. Lectures on *"Antiquities of Dartmoor"* and *"London's Underground"* have been given. At one meeting parents were given the opportunity of seeing members "at work," and the evening was completed with a Concert. A Film Show also has been enjoyed. Secretary: A. E. Miller, 21, Hamilton Gardens, Mutley, Plymouth.

BARNARD CASTLE SCHOOL.—The club has moved to new headquarters, and the first real event there was the Exhibition. Train running was carried out on a large Hornby layout, which had very realistic scenic effects. Both were the subject of much favourable comment by the large number of visitors, and the event led to a considerable increase in club funds. Secretary: A. Coates, The School, Barnard Castle.

NEW ZEALAND

WELLINGTON WEST.—New club rooms have been occupied, and a large new layout has been planned. A fund has been launched towards the purchase of a *"Royal Scot"* locomotive. A number of accessories have been constructed. All rolling stock and locomotives have been overhauled and oiled, and trains tested for weight. Several new vans and coaches have been run in. A discussion on *"World Affairs"* proved interesting. *"A Trip to New Plymouth by Air"* was the subject of a Talk by a senior member. An interesting Debate has been held on *"The Defence of New Zealand."* An enjoyable visit was paid to Cross Creek, where members went up the 1-in-15 Rimutaka Incline on a train hauled by a locomotive built at Bristol 65 years ago. A Meccano Section has been formed. A Railway Photographic Competition has been organised. Secretary: K. R. Cassells, 26, Sugarloaf Road, Brooklyn, Wellington.

Proposed Branches

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.

AUSTRALIA—Mr. W. Coles, 9, Clifton Street, Cheltenham, Woodville, South Australia.
BLANDFORD—G. Curtis, 3, East Street.
BURY—N. Preston, 56, Parsonage Street.
BUXTON—R. Pugh, 4, The Square, Buxton.
CHICHESTER—A. Stevens, 1, Woods Terrace, Hermitage Road, Knaphill.
DUBLIN—P. Nugent, 18, St. Helen's Road, Booterstown, Co. Dublin.
HORNCHURCH—Mr. R. Tindal, 13, Connaught Road.
HOUNSLOW—B. Jones, 38, Haslemere Av.
KINGS LANGLEY—J. Brown, 89, Toms Lane.
LEICESTER—D. Bradley, 172, Crescent Road, Coalville.
LIVERPOOL—R. S. Donaldson, 1, Langford Road, Aigburth, Liverpool 19.
ROCHDALE—J. Fitton, 34, Kilworth Street, Sudden.
RUISLIP—R. G. Power, "Southwood," Park Avenue.
WEST HALLAM—J. Bosworth, White House Farm, West Hallam, nr. Derby.
WESTHOUGHTON—W. Rigby, 3, Andrew's Terrace, Westhoughton, nr. Bolton.
WHITCHURCH—J. Hanmer, Rettisfield Park.

HORNBY RAILWAY COMPANY 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.

READ THIS FIRST

This month we have decided as an experiment to include two main contests, one for the Senior Section members of the H.R.C. and the other for Junior Section members. The Senior Contest is open to all those members who are 12 years of age and over, and the Junior Contest to all members under 12 years. On no account must members of the Senior Section enter the Junior Section Contest or vice versa. The Railway Photographic Contest No. 4 which is announced at the bottom of this page is, of course, open to all H.R.C. members irrespective of sections.

An Interesting Puzzle for Senior Members

Here is an interesting little puzzle, the solution of which should be comparatively easy for senior H.R.C. members who make use of their knowledge of railwaymen and their duties. It concerns six men, named respectively Green, Smith, Walters, Thompson, Jones and Robinson, all of whom are railway employees. One is a signalman, another is a guard, and a porter, an engine driver, a stationmaster and a fireman are also included in the group.

Quite a lot is known about these men. For instance, Jones is a well-known footballer who once played in a cup final. Robinson and Smith know nothing about the game, but Thompson says that both should make good linesmen. The one who is the engine driver has taken to teasing Walters with stories of Army life. The guard also thinks he is a humorist, and his idea of a joke is to call Walters a yokel every time he meets him. This annoys Robinson, who beats the porter's father at darts almost every night when he is off duty. Only Green and the fireman have medals, and the former has more than the latter.

With this information it is possible to find the occupation of each of the six men whose names are given, and readers are asked to work this out.

The contest will be divided into two sections, Home and Overseas, and prizes consisting of Meccano products will be awarded to the respective values of 15/–, 10/6 and 5/–. Each entry must be clearly marked with the sender's name, full address and H.R.C. membership number.

Envelopes containing entries should bear the words "*H.R.C. Puzzle (Senior Section)*" in the top left-hand corner, and posted to reach Headquarters at Meccano Ltd., Binns Road, Liverpool 13, not later than 31st July. The closing date for entries in the Overseas Section is 31st October.

Junior "Jumbled Sentences" Contest

The contest selected for junior members of the H.R.C. should prove both amusing and interesting. A short railway story has been re-arranged by altering the positions of certain words, phrases and sentences. The result is obviously nonsense, and competitors are required to restore the original so as to make a correct and sensible yarn. In doing this they may change commas to full stops, or vice versa, but no words are to be added to the story, or left out. The following is the rearranged story:

"It was Bank Holiday Monday. Passengers shovelled on more coal with friends. It was only a little while before the train arrived at the magazine stall on Platform No. 3, and attended to the dozen and one small things always left to the last moment. People clambered into the coaches, made last minute arrangements and stopped with grinding brakes at the Grand Junction. The guard opened the regulator, the fireman waved his green flag on reaching the platform, and the driver bought papers. With a shriek they started once more on another stage of the journey from the whistle, and a scene of intense activity was witnessed."

To the senders of the three best entries received in each section, Home and Overseas, will be awarded prizes consisting of Hornby Railway material, or Meccano products if preferred to the value of 15/–, 10/6 and 5/– respectively. On the back of each entry submitted must be clearly written the sender's name and full address and H.R.C. membership number.

Envelopes containing entries must be marked "*H.R.C. Story (Junior Section)*" in the top left-hand corner, and posted to reach Headquarters at Meccano Ltd., Binns Road, Liverpool 13, not later than 31st July. The closing date for the Overseas Section entries is 31st October.

Railway Photographic Contest No. 4

This month we continue our 1939 series of Contests for photographs of railway interest. The rules to be observed are exactly the same as those governing the previous Contests, but for the benefit of competitors who are newcomers we add that each competition in the Series is a separate one, and that any number of entries may be submitted in each. The only restriction is that the actual exposure must be the work of the competitor himself; the developing and printing may be carried out by a professional.

Competitors may send in as many prints as they desire, but no competitor can win more than one prize. On the back of each print submitted must be written the competitor's name, full address and H.R.C. membership number, and a short description of the scene of the picture also must be given. Entries will be judged more on their railway interest than on their technical excellence, but in the event of a tie between photographs of equal railway interest their photographic merits will be the deciding factor.

The Contest will be divided as usual into two sections, Home and Overseas, and in each there will be three prizes, consisting respectively of Hornby Trains or Meccano products to the value of 21/–, 15/– and 10/6. A successful entrant who would prefer to have photographic material as his prize may choose this in place of Meccano products. Several consolation prizes also will be awarded.

Competitors who desire their entries to be returned if unsuccessful should enclose an addressed envelope of suitable size sufficiently stamped.

Envelopes containing entries must be marked "*H.R.C. Photo Contest No. 4*" in the top left-hand corner and posted to reach Headquarters at Meccano Ltd., Binns Road, Liverpool 13, on or before 31st July. The Overseas closing date is 31st October.

H.R.C. COMPETITION RESULTS

HOME

April "Photo Contest No. 1."—First: D. F. Forbes (14092), Edinburgh 6. Second: W. E. Carrick (41896), Belfast. Third: R. Moss (18993), St. Helens, Lancs. Consolation Prizes: J. Turley (18853), Tunbridge Wells, Kent; J. H. Pursey (18978), Ulverston, Lancs.; C. Spencer (44179), Sheffield 6; D. Thorne (48560), Liverpool; E. Oldham (43390), Hyde, Cheshire; T. F. Fletcher (6057), Birmingham 20.

OVERSEAS

January "Voting Contest."—First: J. G. Gnanadurai (1964), Trichinopoly, South India. Second: R. Myburgh (37538), Cape Province, South Africa. Third: D. J. White (9333), Christchurch N.1, New Zealand. Consolation Prizes: T. Watson (18065), Leichardt, New South Wales, Australia; J. C. Carter (46374), Capetown, South Africa; R. A. Wragg (7913), Rajputana, India; D. Murison (37642), Buenos Aires, South America.

January "Mixed Names Contest."—First: J. A. Gnanadurai (33344), Trichinopoly, South India. Second: I. T. G. Johnstone (8817), Wellington C.1, New Zealand. Third: D. J. White (9333), Christchurch N.1, New Zealand. Consolation Prizes: R. A. Wragg (7913), Rajputana, India; D. Murison (37642), Buenos Aires, South America; R. Pearson (29199), Victoria, Australia; J. G. Gnanadurai (1964), Trichinopoly, South India.

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For other Stamp Advertisements, see page xii

STAMP COLLECTING

Repetition in Stamp Design

MORE than 2,000 new stamps appear each year and altogether nearly 67,000 different stamps have been issued in the 99 years that have passed since the first stamp, the British Penny Black, appeared in May 1840. It is inevitable therefore that occasionally there should appear designs duplicating subjects that have been used previously in other countries, particularly now that pictorial stamps are so largely used to advertise national industries and amenities.

An example of repetition of this kind is provided in the design of the Falkland Isles ½d. stamp in the 1933 centenary issue, illustrating a Romney Marsh ram as publicity for the Islands' extensive sheep farming interests. There is a similar design on Australia's current 5d. value, which shows a Merino ram, and yet another on Argentina's 30c. of 1936, depicting a Patagonian ram. The central feature of each of these stamps is a sheep, but it would be wrong to describe any one of them as a copy of the others. Indeed, the designers have sought to minimise the inevitable similarities that must arise in depicting sheep in pastoral surroundings.

It is not with this type of stamp "twin" that we wish to deal this month, but with cases in which stamp designers, instead of seeking to avoid likenesses, seem to have been at pains to attain as near a result as possible to some earlier design. In a very few of such cases the copy is clearly a genuine and openly paid tribute to the excellence of the original design.

The most famous set of "twins" is really a family of six! The "Ceres" design by J. J. Barré, used on France's first issues from 1849, was copied no less than four times, by Spain in 1855, by the Argentine state Corrientes in 1856, by Greece for the Hermes issue in 1861, by Roumania in 1872! In the meantime it had been adapted by France for the Louis Napoleon Presidency issue of 1852, the only alteration in this case being the substitution of a portrait of Louis Napoleon for the head of "Ceres."

We illustrate five of these six stamps, omitting the Corrientes item, so that readers can see for themselves how closely each of the copies follows the original. The Greek copy was a tribute to Barré. It was engraved by his son Albert, who desired doubtless to pay a compliment to his father's work. A similar motive probably lay behind the Roumanian copy, for its printer, M. Halot, was the French Government printer in 1849 and was responsible for the printing of the early stamp engravings of the elder Barré.

There have been two or three cases of the copying of British stamps by other countries in the Empire, the most interesting being the first issue from Nevis, the framing for which was copied completely from the G.B. "Penny Black." Another interesting instance is the design for Tasmania's issue of 1892, which differs only in minor details from the 2d. value of Britain's issue of 1887 in celebration of Queen Victoria's Jubilee.

The Canadian 3c. of 1870, bearing Queen Victoria's portrait, and Liberia's 3c. of 1881 are almost identical. If the landscape were taken from the Liberian stamp, and substituted for the Queen's portrait in the Canadian stamp, only the simple strip of wording above the central panel would give the show away. There is also a very strong resemblance between the Liberian triangular 10c. of 1909 and the early Cape of Good Hope triangulars. This likeness is more than a matter of triangles. Readers will know that the Cape triangulars have as their principal feature the figure of a seated woman, whose arm seems to be resting against a rock, and a ship's anchor lies at her side. The figure is symbolic of "Hope." The Liberian stamp is symbolic of "Commerce" and the figure is that of a coloured woman, but her position is almost identical with that of "Hope" on the Cape stamp, for she leans against a rock at the side of which a ship's anchor lies!

Liberia has another example of "twins," the 20c. of 1918, which is uncommonly like a combination of certain Greek stamps. The design of Greece's 1 dr. of 1901 seems to have provided the figure of "Mercury" that is shown on the Liberian stamp, while the columns flanking the figure vary only slightly from those on the 2 dr. and 5 dr. values of the 1896 issue.

Uruguay borrowed a British design when producing its 5 mils. "Head of Liberty" design in 1898/9. As the reproduction on page 444 shows, the design is the undoubted twin of Newfoundland's 3c. of 1890, which bore a portrait of Queen Victoria in a very distinctive framing.

It is almost impossible to expect stamp designers to work out new stamp designs to fit small spaces, using subject material that is almost standard, without an individual designer occasionally finding that he has been influenced quite unconsciously by a design he may have seen years before and forgotten. The marvel is that there have been so few actual clashes in such matters as the framing of portraits. There are indeed many examples of quite distinctive results achieved by different artists working with identical materials. Italy's 5c. of 1889 and Roumania's 5c. of 1890, reproduced here, provide an interesting example.

It is not among portrait stamps alone that we find "twins," however. There are several cases among pictorials, the "Momotombo Volcano" design, issued by Nicaragua in 1900, being an outstanding example. Clearly this was inspired by the Hawaiian Islands "View of Honolulu" design on the 2c. value of the 1894 issue. Here we have two rectangular stamps of very similar size, with identical arrangements of their side and top panelling (Continued on page 444)

Stamp Collecting—*(Continued from page 443)*

and each having a mountain and seascape occupying the central space!

The famous "Queen on the Throne" design, used on Victoria's issue of 1852, seems to have been a source of inspiration for the designer of Holland's 1923 set, celebrating Queen Wilhelmina's Silver Jubilee. Comparison of the two stamps compels one to recognise that the Dutch design is the modern version of the 70-year old Victorian idea.

With most of the "twins" we have dealt with so far, it may be that copying has not been intentional. There are two cases, however, both of which are illustrated on page 443, where it does not seem possible to give this explanation. Strangely enough the originals are both United States stamps. The first is the 1879 postage due design,

which was borrowed by New South Wales in 1891. The currency is different, of course, and little vignettes of a kangaroo and an emu take the place of the letters "U.S." which appear on the side of the large numeral that is the central feature of the design, but otherwise the New South Wales designer was content to take the design as it stood. Even more remarkable is the correspondence between the Dominican Republic and the U.S. 1922 Special Delivery stamps. Readers will note that almost every feature of the two stamps is identical, even to the placing of the shrubs in the garden, the windows of the houses, and the post office messenger.

An Ancient Custom on Stamps

Stamp designs range over a vast field of subjects, but there are few so interesting as those that depict national customs, many of them very ancient. Shortly we hope to devote one or two articles to this absorbing topic. In the meantime, those who have already adopted it for their sideline collection will be interested to see the Liechtenstein National Homage commemorative series issued on 29th May. It has been the custom from very early times for the people of Liechtenstein to set aside one day each year to pay homage to their ruler, certain classes being required to appear in person and make obeisance before the Prince.

The set of four stamps employs two designs, the first being a reproduction of a painting showing the homage ceremony as performed in 1718. The other design bears the head of the present ruler, Prince Franz Joseph II. This design is reserved to the 5 fr. value.

* * * *

By courtesy of the High Commissioner for Newfoundland we reproduce on this page an early illustration of the attractive 5c. stamp issued by Newfoundland on 17th June to celebrate the visit of the King and Queen.

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

Stamp Gossip

and Notes on New Issues

Six New French Issues

The spate of French special issues continues, indeed it seems to be increasing, and one wonders just how long it will be before French philatelists demand a breathing space. This month there are six of these new issues to record, four commemoratives and two charities. The events commemorated are as follows: 90c., the laying of the keel plate of the new battleship *"Clemenceau,"* the design showing the ship as it will appear when completed; 2f.25, French participation at New York Exhibition, the design showing a view of the French pavilion; 2f. 25, the centenary of photography, with portraits of Niepce and Daguerre; 90c., 50th anniversary of building of the Eiffel Tower at Paris, the tower being the subject of the design. The charity issues were each of 90c. + 35c. denomination, and were issued in aid of funds for orphans of postal officials and for children of the unemployed.

We illustrate the *"Clemenceau"* issue, for it provides an excellent picture of a modern battleship and also a portrait of the famous statesman after whom the ship is named. The date 17th January is actually the date of the launch of the battleship *"Richelieu."* The *"Clemenceau"* is being built on the same stocks, and the ceremony of laying the keel plate took place immediately *"Richelieu"* had vacated the building berth.

Postal Union Congress Commemoratives

We illustrate here the striking design of the 5c. stamp in the set issued by Argentine to celebrate the holding of the 11th Congress of the Universal Postal Union at Buenos Aires this year. The design is an allegory of the postal services and shows the globe encircled by a posthorn, symbol of early posting coaches. The complete series comprised eight stamps, the remaining designs consisting mainly of views of famous Argentine beauty spots.

* * * *

Bulgaria has issued two stamps to commemorate the 60th anniversary of the establishment of the Bulgarian Post Office. The 1 L. design is allegorical while the 2 L. shows the Ministry of Posts at Sofia.

Summer Charity Stamps from Holland

Holland's annual series of summer charity stamps was on sale this year from 1st May to 30th June, the proceeds being given as usual to social and cultural charities.

There were five values as follows, the designs in all cases being portraits: 1½c. (illustrated), Thijs Maris, 1839–1917, the eminent painter; 2½c., Anton Mauve, 1838–1888, a contemporary of Thijs Maris, famous for his landscape paintings; 3c., Gerard van Swieten, doctor at the Austrian Court in the 18th century; 5c., Nicholas Beets, 1814–1903, theologian and author, famous also for his book *"The Camera Obscura"* first published in 1839, the year in which photography was "born"; 12½c., Petrus Stuyvesant, 1610–1682, Governor of Curaçao and later of New York, whose portrait is included as a tribute of interest to the World Fair now in progress at New York.

Bulgarian Railway Jubilee

The jubilee of the Bulgarian State Railways is being celebrated this year and the special set of stamps issued to mark the occasion will interest most of our readers. There are four stamps in the set, each bearing a railway design. The most interesting is the 2 L., illustrated on this page, which shows one of the modern express passenger locomotives used on the Bulgarian railways. The other designs are as follows: 1 L., early six-coupled locomotive; 4 L., train crossing a viaduct; 7 L., King Boris as engine driver.

Competition Corner

"Point Words" Competition

	10	5	10	2	2
10	C	H	E	E	P
3	L	I	T	N	O
2	A	D	H	O	T
5	N	E	E	D	V
–	G	A	R	F	C

Total: 49

It is nearly two years since we last set our readers a "Point Words" Competition, and we feel sure that all those who have tried this word game in the past will welcome its re-introduction. It is an interesting variation from the ever popular Crossword Puzzle.

All that readers are required to do is to take from this issue of the "*M.M.*" any phrase or sentence containing exactly 25 letters, and to re-arrange the letters to form a square in which as many complete words as possible are shown in the vertical and horizontal lines. Points are scored for each complete word as follows: 10 points for a word of five letters in one line; five for a word of four letters; two for a word of three letters, and one for a word of two letters. A line containing two words, one of three letters and the other of two letters, thus scores three points. The maximum possible score is 100, but a score of 60 points from an average phrase may be considered quite good.

Letters may appear in the square only as many times as they occur in the original sentence, and short words forming part of a longer word in the same line do not count in reckoning up the score. Only genuine English words in current use may be used; proper nouns and coined or slang words are ineligible.

Competitors are at liberty to select any suitable sentence or phrase in this issue of the "*M.M.*," but in submitting their entries they must indicate the page and line from which the words are taken.

In order to make clear what competitors are asked to do, we have taken the phrase "developed the art of changing" from the 42nd line of the second column on page 390 of this issue, and in the panel at the head of the previous column we have given a specimen "Point Words" working from this phrase.

We have deliberately chosen this phrase and used it so that the full system of scoring is revealed. It will be noticed that the second perpendicular line from the left contains two four letter words, "hide" and "idea." Only one of these may be counted and so the total score is 49 only. The magazine contains other phrases that will give much larger scores, however, and readers will find it useful to choose one with a fair sprinkling of letters such as T, R, S and E.

There are two sections in this Contest, for Home and Overseas readers respectively, and in each prizes of Meccano products to the value of 21/–, 15/–, 10/6 and 5/– will be awarded to the four best entries in order of merit. In the event of a tie, preference will be given to the entries displaying the neatest or most novel presentation.

Entries should be addressed to "*Point Words*, Meccano Magazine, Binns Road, Liverpool 13." Those from competitors at Home, that is in Great Britain, Northern Ireland, Eire and the Channel Islands, must be posted to reach this office not later than 31st July. Overseas closing date, 31st October.

July Photo Contest

As announced in our April issue, we are running a monthly series of photographic competitions throughout the summer. The conditions are very simple, the only restrictions being that the exposure must be the work of the competitor, and that each print must bear a title. Competitors may submit as many prints as they wish and they may be of any size, mounted or unmounted.

Developing and printing of entries may be done professionally, but in the case of a tie for any prize preference will be given by the judges to photographs that are entirely the work of the competitor. Such prints should be marked on their backs with the words "Own work throughout."

There will be two sections, A for readers aged 16 and over, B for those under 16, and prizes of Meccano products or photographic material to the value of 21/– and 10/6 will be awarded in each. Entries should be addressed "*July Photo Contest*, Meccano Magazine, Binns Road, Liverpool 13," and must reach this office not later than 31st July. Overseas closing date, 31st October.

Prize-winning entries are retained here, but unsuccessful entries will be returned if a stamped cover is sent for the purpose.

COMPETITION RESULTS

HOME

April Photo Contest.—First Prizes: Section A, C. A. Reader (London S.W.18); Section B, J. C. Needham (Enfield). Second Prizes: Section A, Miss D. A. Attrill (Bristol); Section B, B. Warburton (St. Annes, Lancs.). Consolation Prizes: J. E. Rose (Romsey, Hants.); B. Sackville (Wylde Green, Nr. Birmingham); J. R. Tottle (Taunton); B. J. Wood (Rainhill, Lancs.).

May Photo Contest.—First Prizes: Section A, A. G. Dell (London S.E.27); Section B, R. D. Proudlock (Bedford). Second Prizes: Section A, J. Tottle (Taunton); Section B, A. Barnsley (Hampton-in-Arden). Consolation Prizes: A. K. Audsley (Westcliff-on-Sea); S. F. Aiken (London S.W.15); J. Hampson (Edgware); K. Ingles (London N.13); L. F. Smith (West Wickham); J. Taylor (Bradford).

May Code Puzzle Contest.—1. L. W. Chitty (London S.W.20). 2. P. W. Mummery (Parkgate, Nr. Rotherham). 3. C. C. O. Young (Bedford). 4. K. Shippen (Yeadon).

OVERSEAS

Countryside Photographic Contest.—1. T. Wade (Johannesburg). 2. L. Humm (Geraldine, N.Z.). 3. H. Warner (New Plymouth, N.Z.).

February Stomachion Contest.—T. C. Hock (Singapore, S.S.). 2. R. W. Roddick (Buenos Aires). 3. A. Dionne (Montreal). 4. P. Gilles (Montpellier, France).

February Drawing Contest.—First Prizes: Section A, J. S. Collins (Vancouver); Section B, N. Roberts (Capetown). Second Prizes: Section A, S. B. J. Smithies (Auckland, N.Z.); Section B, T. A. Wade (Johannesburg, S.A.). Consolation Prizes: B. Penn (Maylands, Western Australia); C. Peterson (Maylands, W. Australia).

January Drawing Contest.—First Prizes: Section A, D. M. Thompson (Capetown); Section B, R. J. Dickison (Dunedin, N.Z.). Second Prizes: Section A, S. L. Abeysingha (Kandy, Ceylon); Section B, M. O. Imana (Nigeria, W. Africa).

WHAT IS IT?

Submitted by R. Perry-Keene, Birmingham.

This is the fourth of the six Mystery Pictures that commenced in the April "M.M."

Each picture represents a common object photographed in an unusual way. Prizes are offered to the readers who send in the best set of descriptions of the objects.

Competitors must send in their solutions to this month's picture on postcards marked "Mystery Picture No. 4," to arrive not later than 31st July.

New Dinky Toys

Two interesting French aircraft have been added to the Dinky Toys Series as announced on pages iv-v. The excellent model of the Bloch 220 air liner (Dinky Toys No. 64bz) is certain to become popular. This type of air liner is one of the fastest in the world, with a top speed of 220 m.p.h., and it carries 16 passengers and a crew of four. Air France have many of these twin-engined low wing monoplanes in regular service.

The other new machine is an accurate reproduction of the Amiot 370 (Dinky Toys No. 64az) a high wing monoplane developed from the Amiot 340 long-range bomber. It is fitted with two 860 h.p. Hispano-Suiza liquid-cooled engines and is capable of the high maximum speed of 310.5 m.p.h. When flying at 248.4 m.p.h. it has a maximum range of 4,350 miles.

Other interesting additions this month are two models of well-known French motor cars, the Peugeot (Dinky Toys No. 24kz) and the Fiat Two-seater Saloon (Dinky Toys No. 35az). The Peugeot is a 12 h.p. four-door saloon and has a very attractive streamlined appearance, which is enhanced by mounting the headlamps behind the radiator grille. The Fiat two-seater is a sturdy baby car very popular in France, and the Dinky Toys model reproduces its external features very closely.

Work and Play at the Raleigh Factory

The May issue of the "*Raleigh-gram*," a journal devoted to the affairs of the Raleigh Athletic Club, is a special number that gives interesting details of the work and play of the employees of the Raleigh Cycle Company Ltd. In a pictorial tour of the factory at Nottingham every stage of production is followed, from the making of tubes in machines that form them and weld the joint in one operation, to the assembly of complete bicycles. The second part of the issue describes the activities of the Raleigh Athletic Club, which provides opportunities for almost every indoor and outdoor recreation that can be thought of. This section also is well illustrated, and altogether there are nearly 100 pictures of works processes and club activities.

Free Booklet for Photographers

"*Photographs from Exposure to Print*" is the title of a particularly interesting booklet issued by Burroughs Wellcome and Co. In it the various stages in the making of a photograph are explained fully but simply, so that they can be understood by the beginner. There are pages dealing with exposure, development by hand or in a tank, desensitisation, printing with P.O.P., gaslight and bromide papers, enlarging, with effects to be achieved by toning—two charming illustrations from toned prints are shown—and finally with direct colour work. The value of those well-known aids to the amateur photographer, the "Wellcome" Exposure Calculator and "Tabloid" Photographic Chemicals, is amply demonstrated. The cover takes the form of a novel wallet for prints, that will appeal strongly to all young photographers.

Readers of the "*M.M.*" can obtain a copy of the booklet from the publishers, Burroughs Wellcome and Co., Snow Hill Buildings, London E.C.1. The "*M.M.*" should be mentioned in the application.

Post Office Wizards—(*Continued from page 402*)

syllables quite by chance.

These Post Office scientists even manufacture their own weather. What effect, for instance, has fog on metals used for outdoor constructional work? Specimens are suspended from the roof of immense glass tanks. One is filled with a dilute solution of sulphuric acid spray, of which yellow town fogs mostly consist; the other with clammy sea mist—nothing more astonishing than a solution of common salt. To obtain reliable results by outside exposure of telegraph poles, for example, might take several years. But artificial results, equally reliable, may be obtained in the tanks in a few weeks.

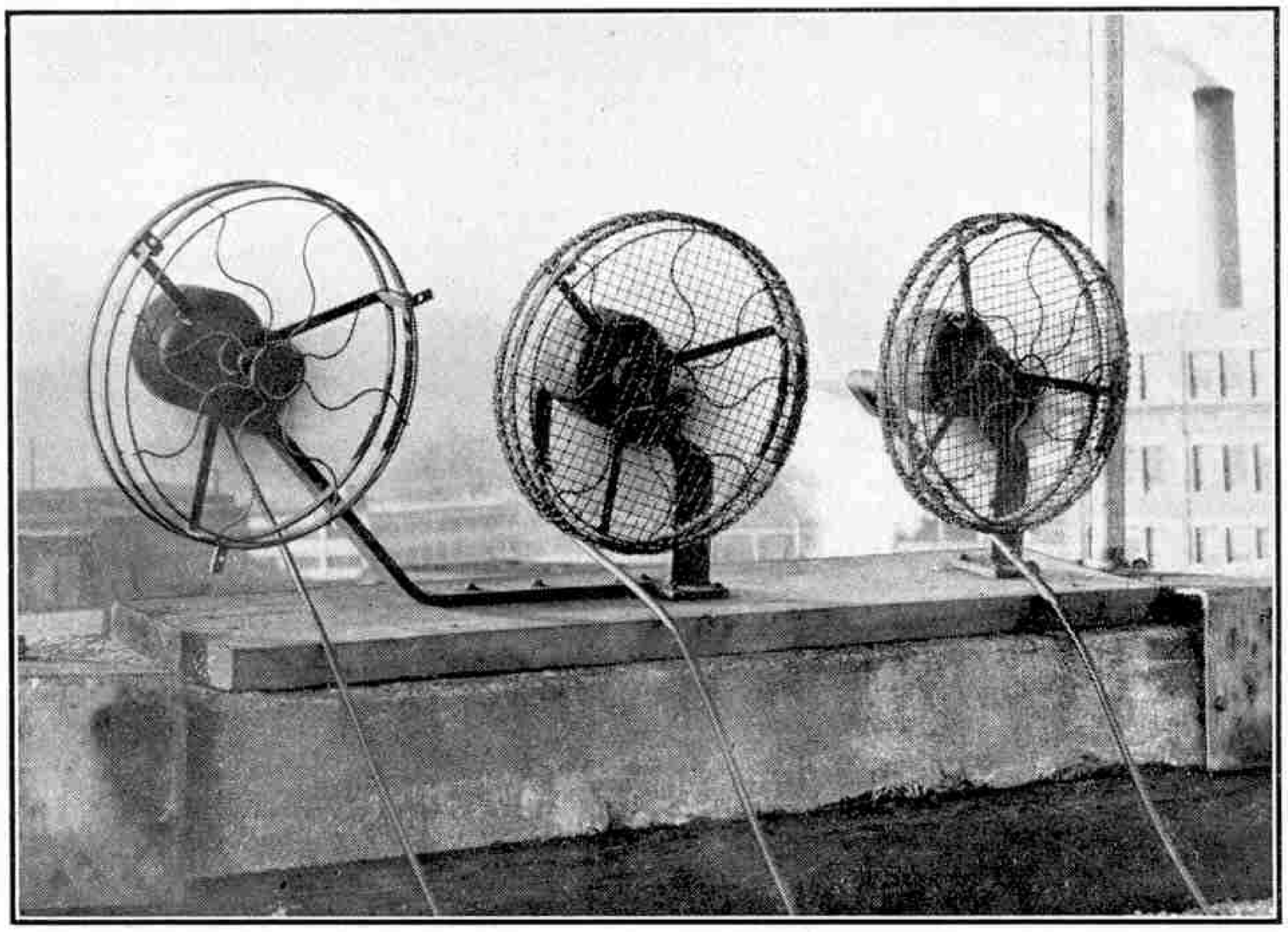
The Post Office scientists can make their own lightning, too! They stage synthetic thunderstorms that assist in the evolution of more efficient devices to protect telegraph poles and overhead wires. With their "storm machine," a fantastic-looking affair of shining copper and nickel-plated brass balls, they unloose 250,000-volt "lightning flashes" on model telegraph poles. Then they gather up the fragments and find out how it all happened.

Several safety-first devices have been invented by the Dollis Hill experts. One gadget evolved has been installed in cable tunnels. It detects the presence of harmful gases, lights up a warning lamp on the exchange switchboard, and automatically starts an electric fan to clear the tunnel.

If you were a manufacturer of electric light bulbs, and you wanted to sell a quantity to the Post Office, you would be requested to submit samples to the Dollis Hill wizards to be tested. Two bulbs are first plugged on to a bar that moves swiftly backward and forward at such speed that the filaments are a mere blur. That is a vibration test. Then each test bulb is plugged into another machine, and a heavy metal bar is pulled out on a pivot and released. It swings back and hits the holder of the bulb very hard. If the light remains, the bulb is passed.

Once Upon a Time there were Three Fans

Once upon a time, without a chance in the world of coming through intact, three transformer fans were left to run to destruction on the roof of a laboratory building in the Pittsfield (Mass.) Works of the General Electric Company. For more than nine years, day and night, summer and winter, with temperatures ranging from a shivering –40 to a sweltering 115 F, these poor little waifs have fought their losing battle. The tragic fact is that, no matter how valiantly they wage their battle against time and the elements they will be vanquished. They are to be sacrificed to research, so that somebody will know more about transformer fans. They are to be run until they wear out, if it takes till doomsday and all the electricity in Massachusetts.



Weatherproof transformer fans left to run to destruction on the roof of a laboratory at Pittsfield, in the United States. The one on the left has already run for over nine years, and the other two for eight years. Photograph by courtesy of the General Electric Company of New York.

The fans are designed primarily for cooling outdoor oil-insulated power transformers. One of them, after just a paltry nine years' continual striving, raised the white flag for a moment recently. The insulation of the incoming cable, also exposed to the weather, had cracked, and the resulting short circuit had stopped the fan. But G-E engineers replaced the cable, disassembled the unit, greased it, reassembled, and placed it under test again. "That's not destruction" they said. "It isn't even ten years yet! We're going to run these babies until they wear out, not just faint for a minute."

Very discouraged about the whole thing, the three little fans wish nobody had ever thought about improving power transformers!

Purely by way of statistics, each of the fans has worked up some pretty good sized numbers. Revolving at a rate of 1,500 r.p.m., each motor's armature has rotated more than 7,500,000,000 times. Further, each set of fan blades has an output of 1,600 cu. ft. of air per minute, and over the portion of the test period that has elapsed to date this air totals at least 562,500,000 lb.

Looking Through Motor Tyres

An American tyre company has introduced a device to enable owners of motor cars to look through their tyres in order to detect hidden dangers. The tyre has not to be removed from its wheel for this test. Instead the wheel is lifted a few inches and X-ray apparatus is rolled under it. Then the wheel is rotated and inspection of an X-ray picture of the tyre thrown on a screen shows where foreign objects have lodged in the rubber. Tests with this X-ray apparatus on 2,000 worn tyres showed the presence of more than 2,000 nails and tacks, with equal numbers of pieces of glass and fragments of stone embedded in the treads.

A RUSH JOB

Tourist (visiting country town): "Sir, may I ask what your pursuit in life is?"

Resident (whose business is in the city): "Certainly, sir; the eight-thirty train in the morning and the six-thirty at night!"

* * * *

Bill: "I'm worried about Eddie."

George: "How's that?"

Bill: "If he gets any more wrinkles on his forehead he'll have to screw his hat on."

* * * *

The professor had been lecturing the class on poisons, and after discussing various deadly substances, he asked the class to name a few more. At once one student put up his hand.

"Well?" said the professor.

"Aviation, sir."

The professor stared.

"Come, come!" he exclaimed. "This is no time for hilarity. What do you mean?"

"Why, sir, one drop will kill."

* * * *

"I did not steal the duck," said the poacher. "I just carried it home for a joke."

He was sentenced for carrying the joke too far.

* * * *

Diner: "Waiter! I have found a leaf in my stew."

Waiter: "That's easily explained, sir. We have branches everywhere."

* * * *

Doctor: "You take a dose first thing in the morning and the next when you retire."

Yokel: "But, doctor, I bain't goin' to retire for another 10 years!"

* * * *

Neighbour: "How did that naughty little boy of yours get hurt?"

Ditto: "That good little boy of yours hit him on the head with a brick."

* * * *

Two Irishwomen met again after some months.

"Has your man started work yet, Mrs. Murphy?" said Mrs. O'Hara.

"Sure and he has," said Mrs. Murphy; "it's hard work, and it's killing him, but, thanks be, it's permanent."

* * * *

"I thought you said you were ploughing the ten-acre field?"

"No, I said I was thinking about ploughing it."

"Oh, I see, you just turned it over in your mind."

* * * *

"Can you tell me the quickest way to get to the station?"

"Run, man, run!"

* * * *

John: "Did anyone ever tell you how clever you are?"

Clarence: "No, I don't think they did."

John: "Then I'd like to know where you got the idea from."

* * * *

WRONG DIRECTION

Farmer: "You must be brave to come down with a parachute in a gale like that."

Stranger: "I didn't come down with a parachute. I went up with a tent."

OUTLOOK UNSETTLED!

He had gone up on a first flight with his nephew.

"T-tell me when you're going to loop the loop again," he remarked nervously.

"Well," said the nephew, "I don't always know."

* * * *

Passenger: "Indeed, and you are a music-hall artiste! I'm a banker, and I think it must be at least 20 years since I was in a music-hall."

Music-Hall Artiste (regretfully): "And I'm quite certain, sir, it's fully 20 years since I was in a bank!"

* * * *

SEE ADVERTISEMENTS!

Camper: "What d'you mean coming round with biscuits and sweets after midnight?"

Pedlar: "Lumme, chum, don't none o' yer suffer from night starvation?"

* * * *

A hunter was showing off his collection of trophies to a group of visitors and explaining how he acquired the various exhibits.

"See that elephant" he said, "I shot it in my pyjamas."

"My Goodness," murmured a surprised young lady. "How did it get there?"

* * * *

Waiter: "Are you the fried flounder, sir?"

Customer: "No, I'm a poor lonely sole with an empty plaice, and I'm waiting for something to fillet."

* * * *

Boss: "You're sacked."

Office Boy: "What have I done?"

Boss: "Nothing—that's why you're fired."

* * * *

Managing Director, working his way through five-course lunch, to young man opposite, ravenously munching bread and cheese:

"Athlete on a diet, old chap?"

Young Man: "No, one of your travellers on commission."

* * * *

He (filling up insurance form): "It sez 'ere, 'Any insanity in the family'?"

She: "Well, put 'No,' of course."

He: "'Ow about Uncle 'Orace wots in the asylum and keeps sayin' 'e's Napoleon?"

She: "Yer don't want to take any notice of 'im, 'e's potty."

* * * *

Uncle: "If I gave you a large apple and a small one, and told you to divide with your brother, which apple would you give him?"

Johnny: "Do you mean my big brother or my little brother?"

* * * *

Little Johnnie was seen to be weeping bitterly when he returned from his first day at school.

"Whatever is the matter?" asked his mother, anxiously.

"Well," said Johnnie, "teacher told us that when our names were called we must put up our hands and say 'present.' So when she called my name I put up my hand and said 'present' but—I didn't get one!"

* * * *

THIS MONTH'S HOWLER

Degrees of comparison of "bad" are: bad; very sick; dead.

1939 VERSION

"Please sir, could I have to-morrow afternoon off . . ."

"Ah, yes. Your grandmother, I suppose!"

"Exactly, sir, she is making her first parachute jump."

* * * *

Two Lancashire acquaintances met while holidaying at the seaside.

"How long art tha stayin' 'ere, 'Arold"? asked one.

And Harold answered:

"Ah doan't knoaw as I can tell thee i' days," said Harold, "but ah'm stayin' 'ere another thirty bob."

* * * *

Tim: "What is meant by a half-Watt lamp?"

Jim: "A half-Watt lamp is one what costs half what you thought it would."

* * * *

Teacher: "Who was the smartest inventor?"

Pupil: "Thomas A. Edison. He invented the phonograph and radio so people would stay up all night and use his electric light bulbs."

* * * *

"Why don't you get something for those bad feet of yours, Pat?"

"Oi've tried some of them cornflakes, but they're too uncomfortable in me socks."

* * * *

"Waiter, there's a fly in my soup."

"Well, after all, mister, how much soup can a fly drink?"

* * * *

At the village store balloons were being given away. One small boy asked if he might have two.

"Sorry," said the assistant, "but we only give one balloon to each boy. Have you got a brother at home?"

The youngster was truthful, but he did want another balloon.

"No," he said, "but my sister has, and I want one for him."

* * * *

Two Irishmen with their shillalahs lay in ambush for their landlord, due to pass that way at nine. Ten o'clock came but no landlord.

"Now I wonder," said Pat, "what can be kapin' him!"

"Do you suppose," said Mike anxiously, "that anything could have happened to the poor fellah?"

* * * *

Uncle Thomas, who was rather bald-headed, came down to breakfast and was greeted by his small nephew.

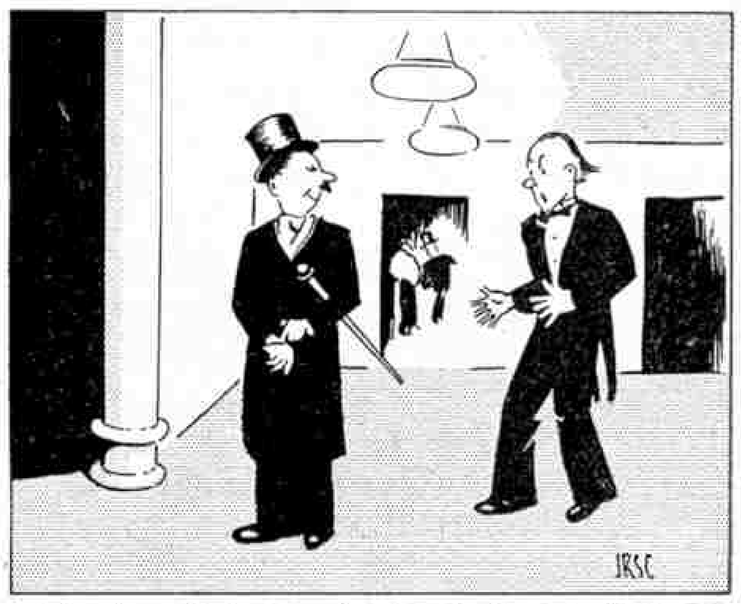
"Many happy returns of the day, uncle," said the lad, who had been preparing his speech for half an hour. "I am giving you a birthday present that you will never be able to part with."

"Dear me," said the uncle, good-naturedly. "Whatever is it?"

"A comb!" said the youngster.

* * * *

HAD ENOUGH!



The dramatist stopped a friend who was leaving a theatre where his play was being produced.

"You're surely not going yet!" he said. "There are three more acts, you know."

"Yes," was the reply. "That's why I am going."

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Requires only 10 to 18 ozs. of solution.
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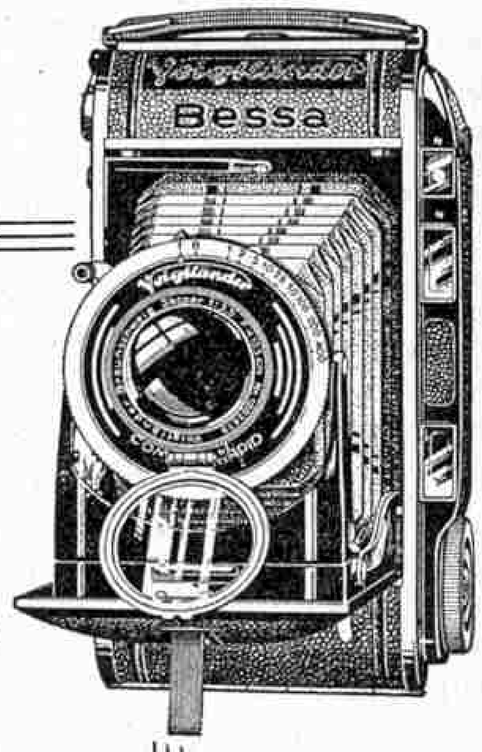

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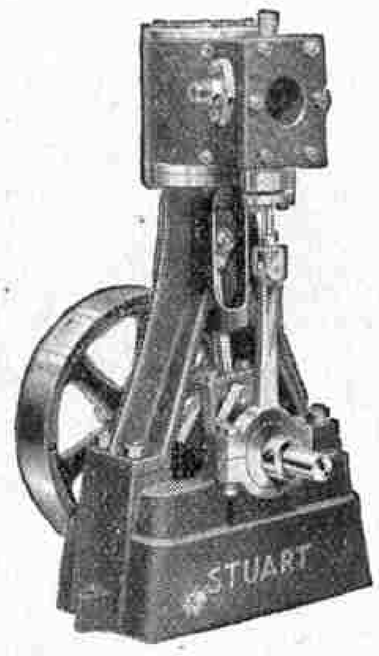

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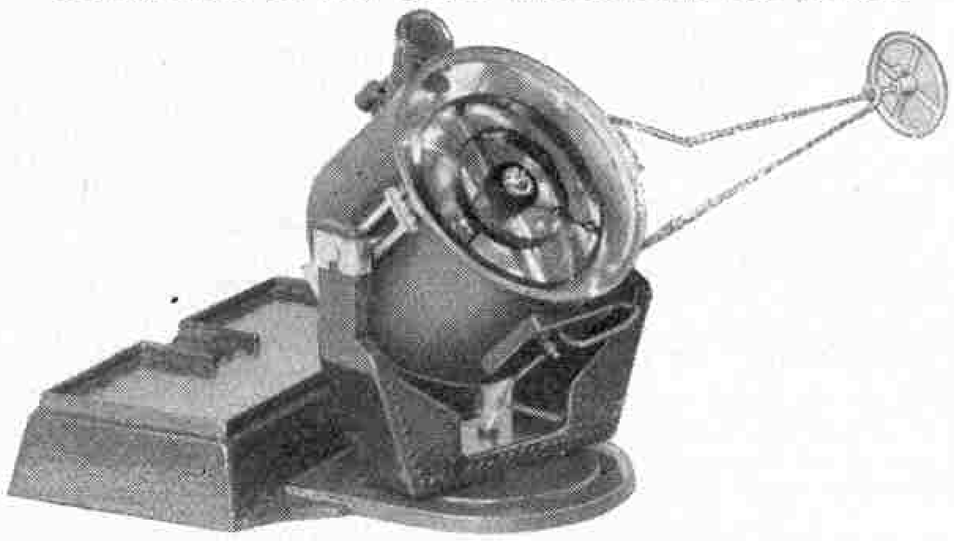

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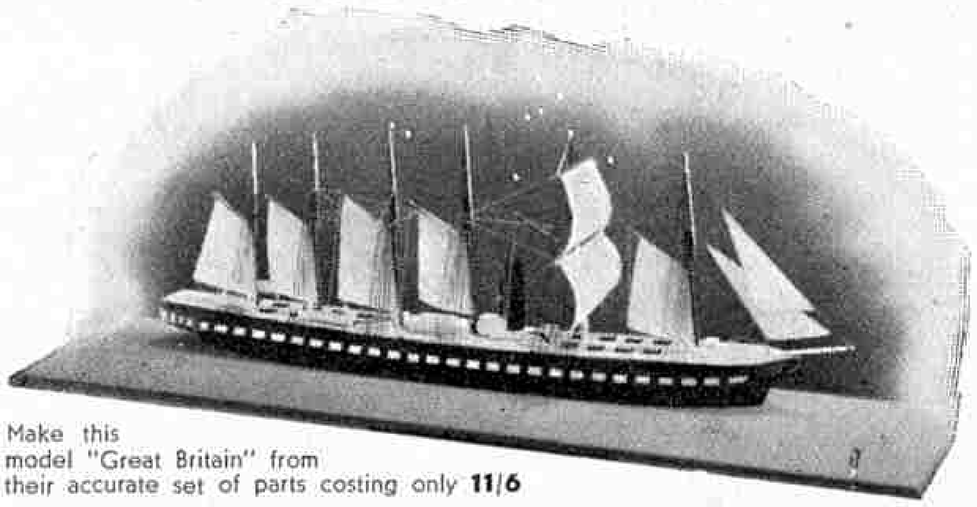

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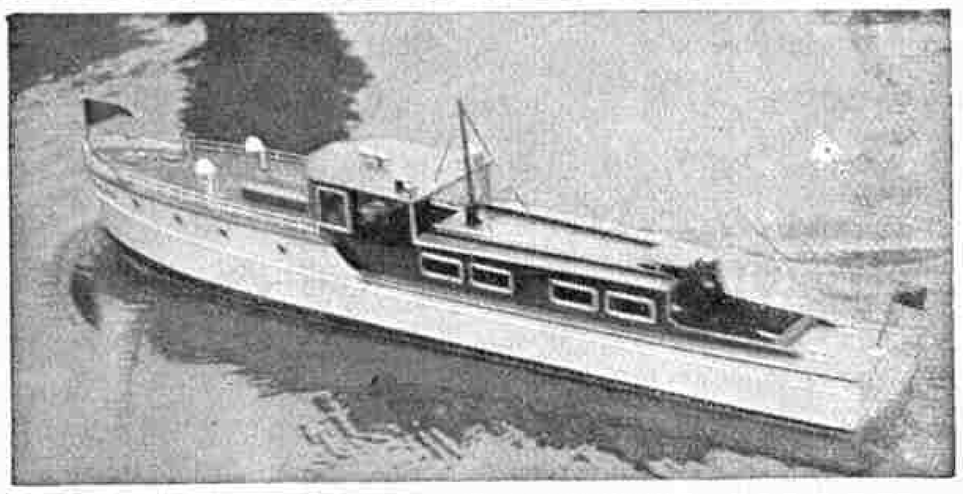

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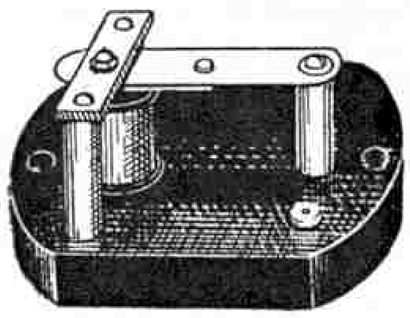

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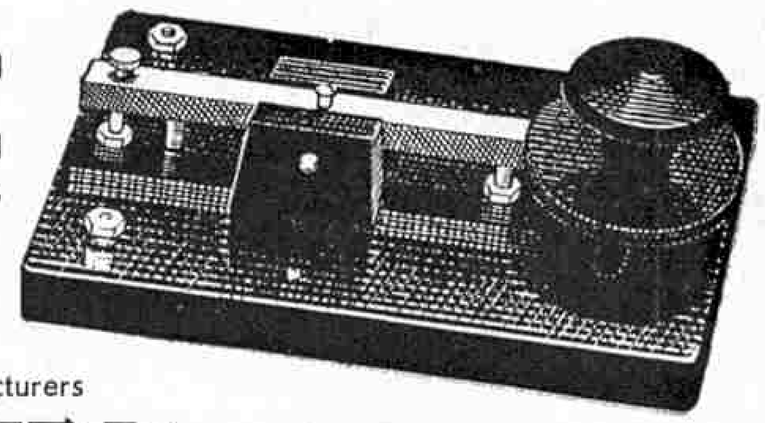

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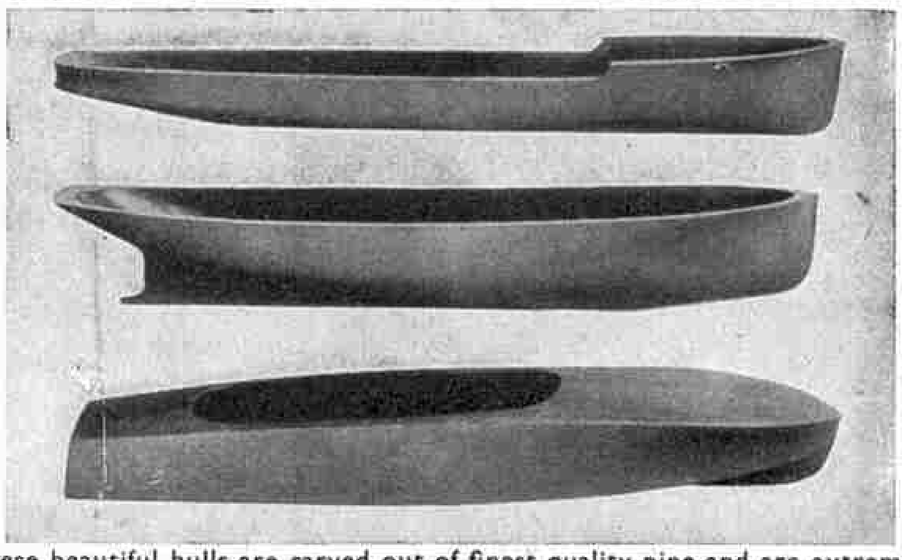

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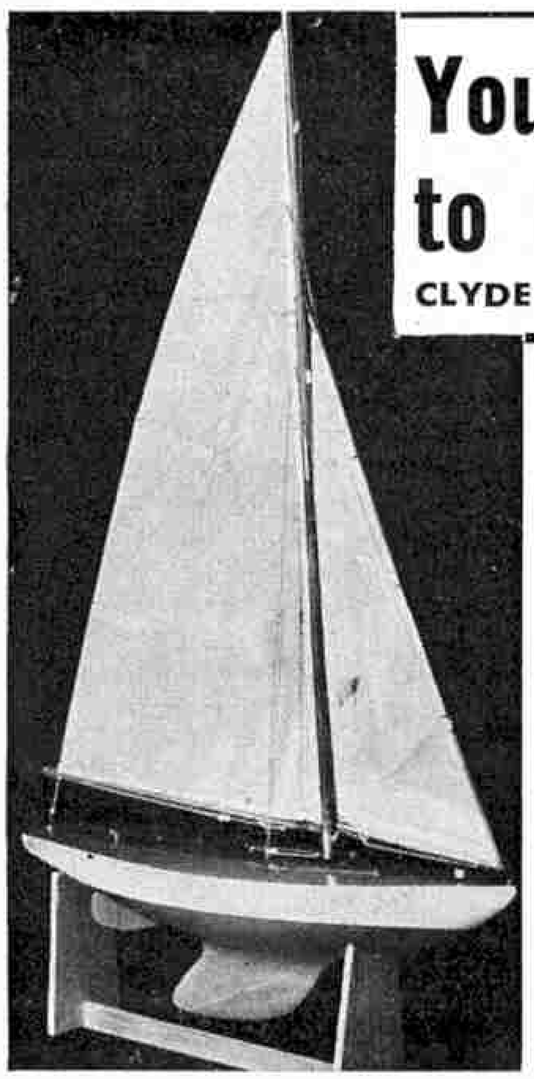

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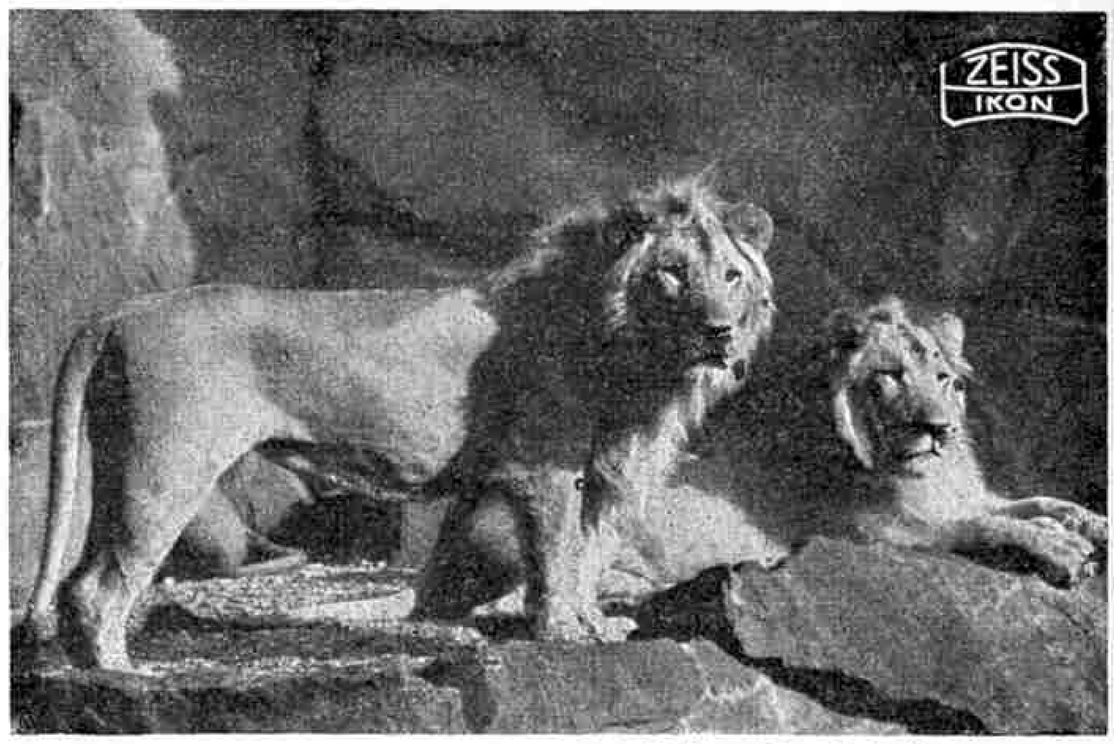

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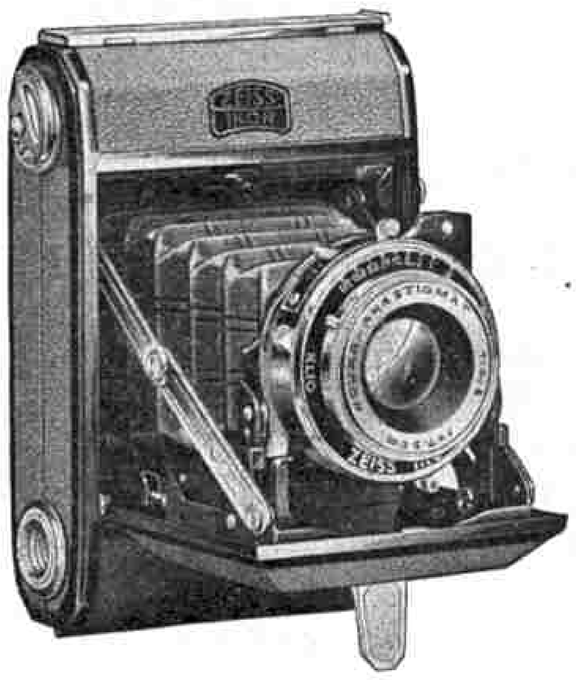

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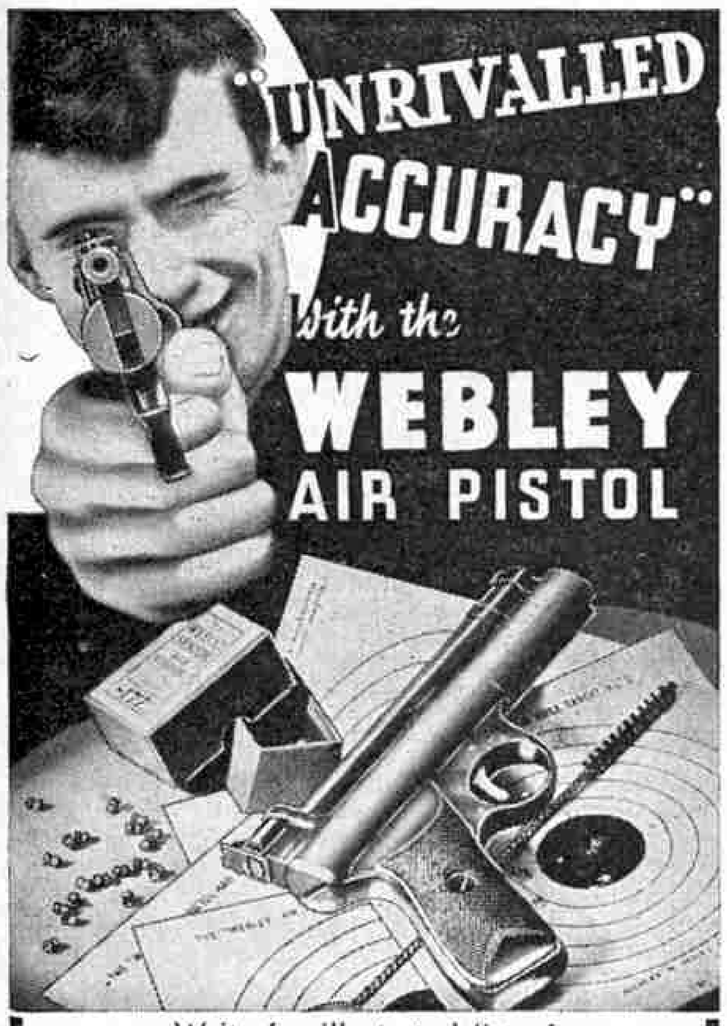

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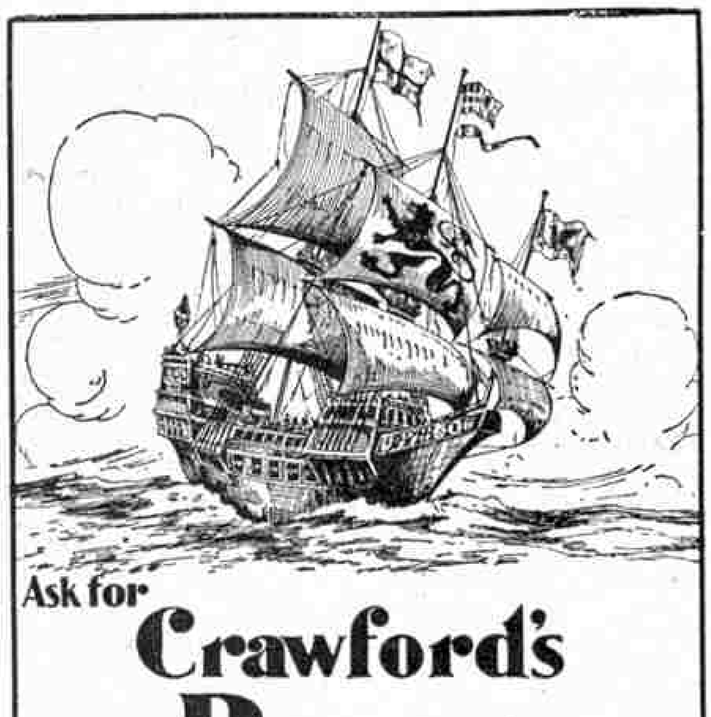

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DRAUGHTSMANSHIP	TELEVISION
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READERS' SALES AND WANTS

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.

Unique opportunity for clubs and enthusiasts. "M.M.'s," March 1917–December 1932. Only Numbers 4 and 7 missing. Offers wanted.—Percivall, 968, Alum Rock Road, Birmingham 8.

Model Boat, Bassett-Lowke Steam Engine.—Goodley, c/o Secker, 555, Green Lanes, N.8.

Sale. 1,100 Stamps, Loose-leaf Album, £1/10/-. 1938 Big Catalogue, 12/-. Chemistry Set, 9/-. 65 "Modern Wonders," 3/-.—Peck, Whatton, Park Avenue, Carlton, Nottingham.

Want to buy old Train Catalogues, such makes as Hornby, Bassett-Lowke, Bowman, Stevens, Bing, Maerklin, etc. Send lists, cash waiting. Catalogues wanted for collection, please write if you have any.—Louis Hertz, 640, Riverside Drive, New York, N.Y., U.S.A.

Sale. Collection of over 3,000 Stamps, including 75 Jubilees, 164 Coronations, complete Cape Triangle issues, including Woodblocks. Value approx. £35. Offers.—D. Foyle, Gastard Stables, Corsham, Wilts.

For Sale. Powerful Model Horizontal Engine and Boiler. Ideal for boy with engineering tastes. Will run small workshop. Length of engine 2 ft. 6 ins. Heavy flywheel 15 ins. Copper boiler. Pump feed. All fittings. Cost £40. Bargain £5. Room wanted.—Neesom, 11, Rushford Street, Longsight, Manchester 12.

Sale. Red-Green-Nickel Meccano. Cost £4. Good condition. Offers. Apply—S. Gillam, 38, Cross Road, Southwick, Sussex.

Bargain. £5 worth Red-Green Meccano, excellent condition, 30/-.—Boston, 20, Farndale Crescent, Greenford, Middlesex.

Large collection of Britain's Soldiers for sale. All nationalities, Infantry, Cavalry, Guns, etc. Excellent condition.—Bantock, 182, Soho Road, Handsworth, Birmingham.

Sale. Gibbons' "Imperial" Stamp Album, Vol. 1. Perfect condition. Practically unused. Cost 21/-. Any reasonable offer accepted. Write—Hancock, 22, Windsor Road, Yaxley, Peterborough.

What offers for a Foreign Coin Collection, current exchange value 27/6?—63, Bradford Road, Wakefield, Yorks.

Sale. £30 worth Red-Green Meccano. Will build most of the super models including Giant Dragline, Grandfather Clock, Level-luffing Crane. £6, or any reasonable offer accepted.—Martin, 55, Robinhood Way, London S.W.15.

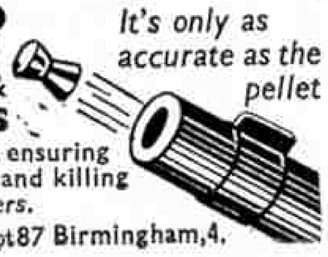
"Meccano Magazines," January 1934 to April 1939 (December 1935 missing). For 12/6.—Eric Calow, 4, Victoria Street, Chatteris, Cambs.

Wanted. "Magnets," August 1937 to date.—Charles Griffiths, 11, Quay, Waterford, Ireland.

Wanted. Clean, perfect copies of October 1936 and March 1937 "M.M.'s." State price to—Box No. 701.

THE YEARS MOST INTERESTING BOOKLET ON VARIABLE GEARING
Send for it right away
CYCLO GEAR COMPANY LTD POTTERS HILL · BIRMINGHAM 6

"MECCANO MAGAZINE" SPRING BACK BINDER
There is no better way of keeping your Magazines clean and tidy than by binding them in one of the special binders we supply. The large binder holds 12 Magazines—price 3/6 post free. The small binder holds 6 Magazines—price 2/6 post free.
Meccano Limited, Binns Road, Liverpool 13

DOES *your* GUN SHOOT STRAIGHT?
It's only as accurate as the pellet

WEBLEY Air Rifle & Air Pistol **PELLETS** are accurate to 1/1000th inch, ensuring maximum accuracy, velocity and killing power. *Stocked by all dealers.*
WEBLEY & SCOTT Ltd., Dept 87 Birmingham, 4.

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Over 700 new negatives in our list of 1,500 titles. Send 4d. for list and specimen card.
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(Dept. M.M.), COOPER'S BUILDINGS, LIVERPOOL 1.

BE TALL 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.**

ENGINE NAMES AND NUMBERS. Complete list of names, numbers, types and classes of locomotives of Great Britain and Ireland, with alterations to stock during 1938. All in "Locomotive Stock Book 1939"—70 pages, 55 illustrations. Price 2/6 from R. Pollock, 102, Disraeli Road, Putney, London.

FOYLES FOR BOOKS
We can supply at once almost any book you want, new or second-hand. Books on Engineering, Model-making, Handicrafts, Stamps, Sports, and all boys' interests. Catalogues free.
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Telephone: Gerrard 5660 (16 lines)

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Every enthusiast should have our latest catalogue—send six penny stamps—48 large pages full of photographs of locomotives, coaches, wagons, track, turntables, etc.—in fact EVERYTHING for the Complete Model Railway.
TRADE ENQUIRIES INVITED.
GEO. E. MELLOR (Dept. M.67), **5, Brewis Rd., RHOS-ON-SEA, N. Wales.**

MECCANO MAGAZINE

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To Contributors. The Editor will consider articles and photographs of general interest and payment will be made for those published. Whilst every care will be taken of articles, etc., submitted, the Editor cannot accept responsibility for any loss or damage. A stamped addressed envelope of the requisite size should be sent where the contribution is to be returned if unacceptable.

Readers' Sales and Wants. Private advertisements (i.e., not trade) are charged 1d. per word, minimum 1/-. Cash with order. Editorial and Advertising matters should not be dealt with on the same sheet of paper.

Small Advertisements. 1/6 per line (average seven words to the line), or 16/- per inch (average 12 lines to the inch). Cash with order.

Display. Quotations for space bookings, and latest net sale figures, will be sent on request.

Press Day, etc. Copy should be sent as early in the month as possible for insertion in following issue. We usually close for press on or before 6th of each month for following issue. Half-tone blocks up to 100 screen.

Proofs of advertisements will be sent when possible for space bookings of not less than half-an-inch.

STAMP ADVERTISEMENTS (*Cont. from page 442*)

SUMMER PRICE APPROVALS! Fine set 3 Iran Wedding 2d. applicants. Dawes, 64, Colonial Avenue, Whitton, Middlesex.

FREE STAMPS
100 all different, 2 Indian Silver Jubilees and 1 Mozambique Triangular Air Mail to introduce my low-priced approval books containing stamps from ½d. Liberal discount given, and a list of 133 further bonus gifts of Coronations, Jubilees, Commemoratives. Please send 2d. for postage.
C. A. RUSH
38, Queen's Avenue, Whetstone, N.20.

ALBANIAN FREE
This month's amazing special **FREE GIFT** contains one of the very scarce **ITALIAN OCCUPATION OF ALBANIA** stamps; it's the 1 gind pictorial **ALBANIA** commemorating the 2nd Anniv. of King Zog's Accession and showing the Lake of Butrinto overprinted "Mbledhja Kushtetuese 12-IV-1939 XVII" which was on sale for a limited period only. This wonderful packet also contains one of the **ROYAL VISIT** new **CANADIAN** commemoratives as well as new **BOLIVIA** zoological issue (Llamas), unusual new **GREENLAND, PALESTINE** (Dome of the Rock), **OUBANGUI-CHARI** (Leopard), new **HONG KONG** (His Majesty), **JAPAN** (Mountains), **MOROCCO** (Fez Attarine College), **ANDORRA** (Notre Dame do Meritxell) and new **SWEDISH** landing in U.S.A. Red Indians commemorative. All these yours **ABSOLUTELY FREE** by sending 2d. stamps and requesting approvals to: **WINDSOR STAMP CO. (DEPT. M), LEE ROAD, BLACKHEATH, S.E.3.**

Cut along here

HORNBY LOCOMOTIVE PART-EXCHANGE COUPON

Complete this Coupon, and hand it, with your old Locomotive, to your Meccano dealer, who will allow you from the price of a new Hornby Locomotive, or Hornby-Dublo Locomotive and Controller, the amount shown in the official list published in the June *"Meccano Magazine."*

Type of Hornby Locomotive Returned:— ..... *New Hornby Locomotive Purchased:—* .....

Please register my name to receive details of future Hornby and Hornby-Dublo developments.

(Signed).....

Address.....

CERTIFICATE

The above exchange has been effected in accordance with the terms of the Hornby Part-Exchange Scheme.

(Signed)..... *Meccano Dealer*

Address.....

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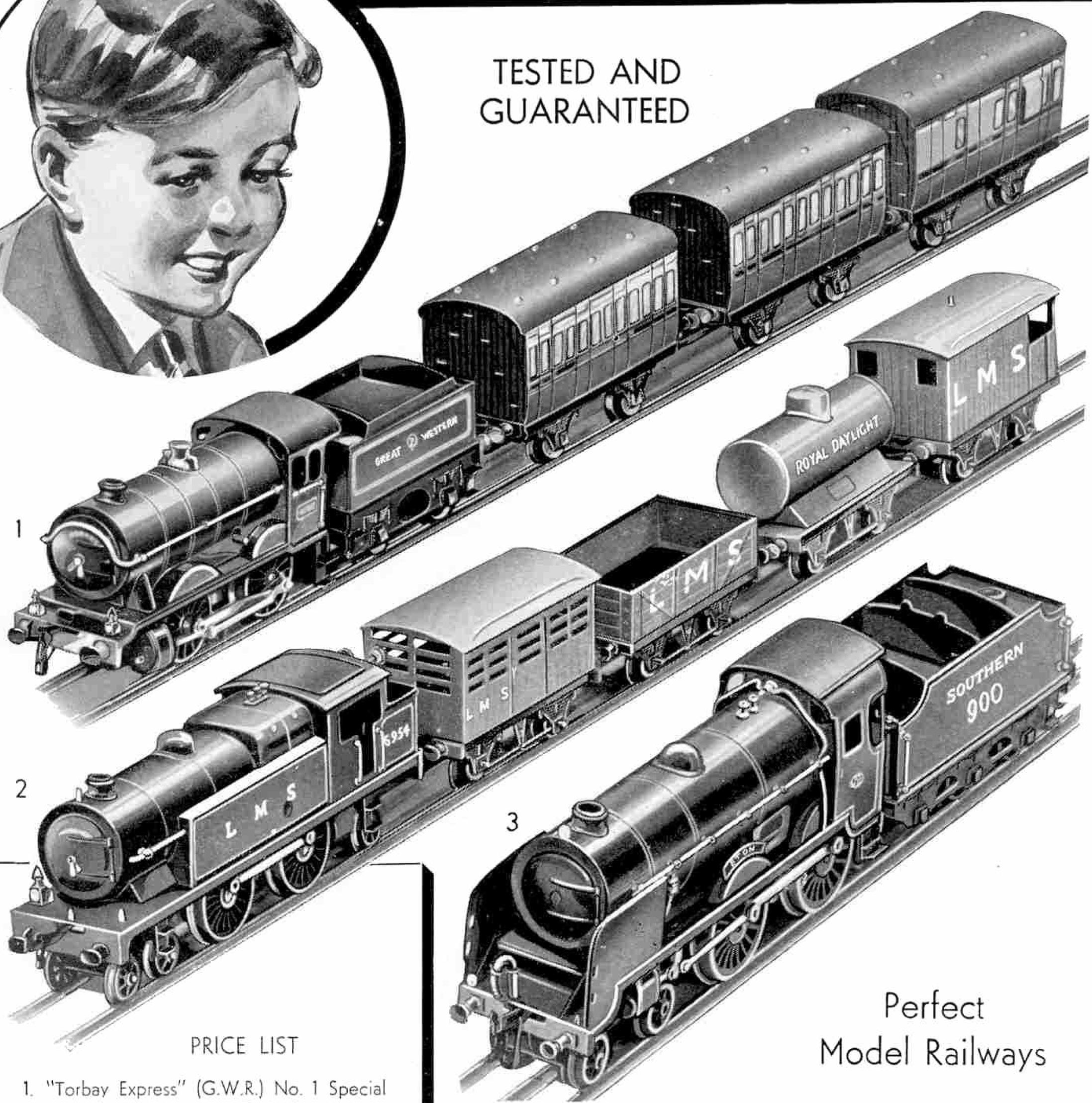
HORNBY TRAINS

TESTED AND GUARANTEED



Perfect Model Railways

Hornby Trains not only look like actual trains, but work like them. The Hornby Railway system includes everything that is required to reproduce in miniature almost all the operations that are carried out day by day on the real railways. You can operate long-distance expresses with fast passenger locomotives, or local trains with splendid little tank engines; and for freight working there are vans and wagons of almost every kind.

Look at the above magnificent models from the wide Hornby range. Note the wealth of detail and the perfect lines that characterise each one.

Get to know more about Hornby Trains. Ask your dealer about them to-day.

PRICE LIST

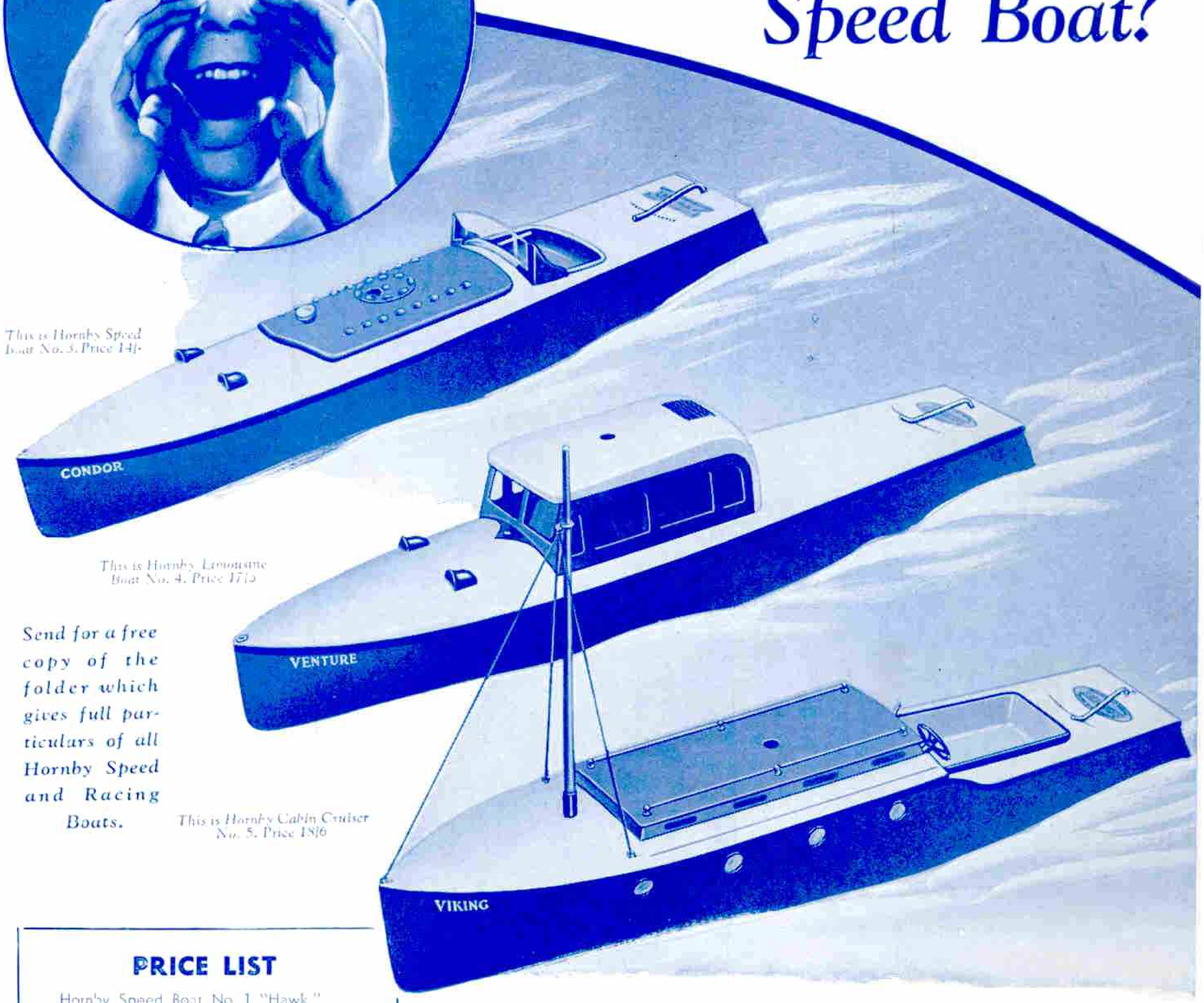
1. "Torbay Express" (G.W.R.) No. 1 Special Clockwork Passenger Train Set. Price **33/6**
2. No. 2 Clockwork Tank Mixed Goods Train Set (L.M.S.) Price **35/-**
3. "Eton" (S.R.) 20-volt Electric Locomotive. Price **43/6** Tender, price **6/6**

Hornby Train Sets are available at prices ranging from 26/- to 76/- for Electric types and 5/6 to 60/- for Clockwork types.

Ask your dealer for a copy of the new 1938-9 Hornby Trains Folder, or write direct to Meccano Ltd., Dept. HF, Binns Road, Liverpool 13.

MECCANO LIMITED - BINNS ROAD - LIVERPOOL 13

....Have you got your Hornby Speed Boat?



This is Hornby Speed Boat No. 3. Price 14/-

This is Hornby Limousine Boat No. 4. Price 17/6

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Send for a free copy of the folder which gives full particulars of all Hornby Speed and Racing Boats.

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Hornby Speed Boat No. 3 Price **14/-**

Hornby Limousine Boat No. 4 "Venture." Price **17/6**

Hornby Cabin Cruiser No. 5 "Viking." Price **13/6**

Hornby Racing Boat No. 1 "Racer I." Price **5/6**

Hornby Racing Boat No. 2 "Racer II." Price **9/6**

Hornby Racing Boat No. 3 "Racer III" Price **15/6**

Hornby Water Toy (Duck) Price **2/6**

Boys! If you're out to get the last ounce of fun from the most thrilling of all outdoor hobbies, get a Hornby Speed Boat!

Model motor boating is one of the least expensive of all summer pastimes, and provides hours of fun and excitement. It can be carried on at any time without special preparation, either alone or with friends.

Hornby Speed Boats and Racers are the finest model craft of their kind in the world—beautifully made and superbly finished. The Hornby clockwork mechanisms are amazingly powerful; they go fast and far, and are always dependable.

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MECCANO LTD., Dept. 70, Binns Road, Liverpool 13

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