VOL. XXIII. No 7.

JULY 1938

MECCANO MAGAZINE

THE ENGINEER

6D.

MECCANO

BIGGER OUTFITS . . . BETTER MODELS!

Meccano, the world's greatest toy, is better than ever. It is the most wonderful and fascinating hobby in the world for boys. Ask your dealer to show you the fine new range of Outfits.

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

COMPLETE OUTFITS

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

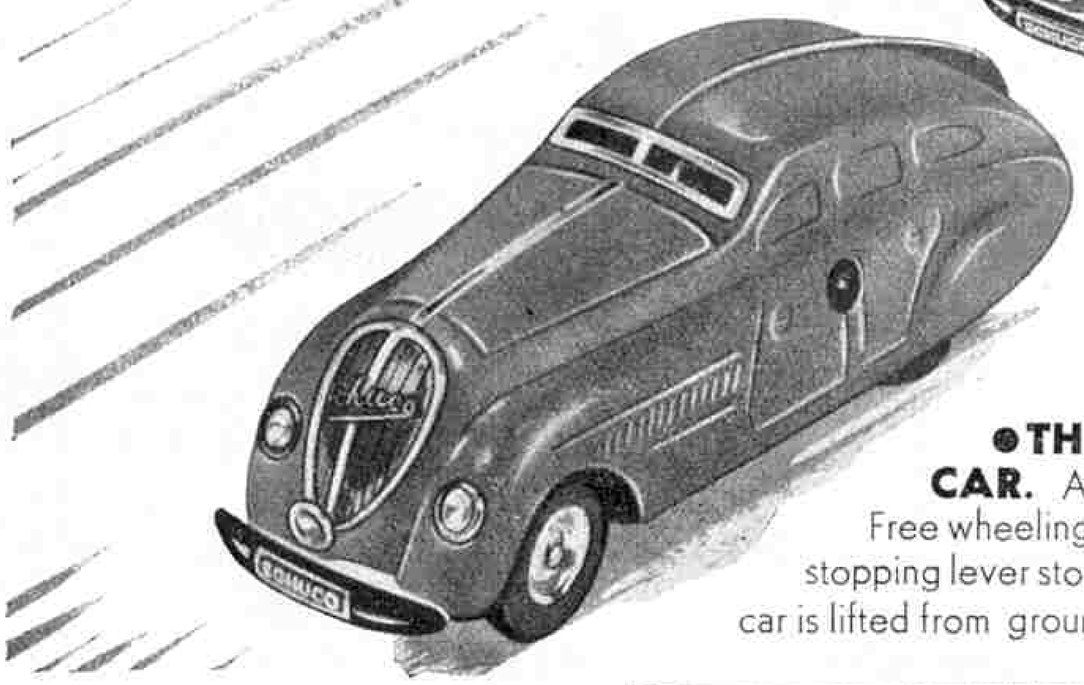
Meccano Outfits from No. 8 upwards can be purchased also through the New Meccano Deferred Payments Scheme. Ask your dealer for full particulars. (Scheme not available outside Great Britain and Northern Ireland.)

MECCANO LIMITED, BINNS ROAD, LIVERPOOL 13

'HAMLEY 1212!

Send car at once!'

● **THE SCHUCO 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. Price Post 4d. **2'11**



● **THE FREE WHEEL CAR.** Adjustable steering. Free wheeling device. Automatic stopping lever stops clockwork when car is lifted from ground. Price Post 4d. **2'-**

● **THE SCHUCO GARAGE**

Pick up the telephone receiver at the side of the garage. Summon the 'Schuco' car. 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. Alternatively a slight pull on the green cord which represents the electric telephone flex will cause the garage doors to open automatically and the car to run out.

Price Without car **2'6** Post 6d.

BY APPOINTMENT

Hamleys

Estd. 1760

· HAMLEY · BROTHERS · LTD ·

200-202, REGENT ST., LONDON W.1

Telephone: REGENT 3161 *OUR ONLY ADDRESS*

A genuine Kodak folding camera for 30/-

The SIX-20 FOLDING 'BROWNIE'

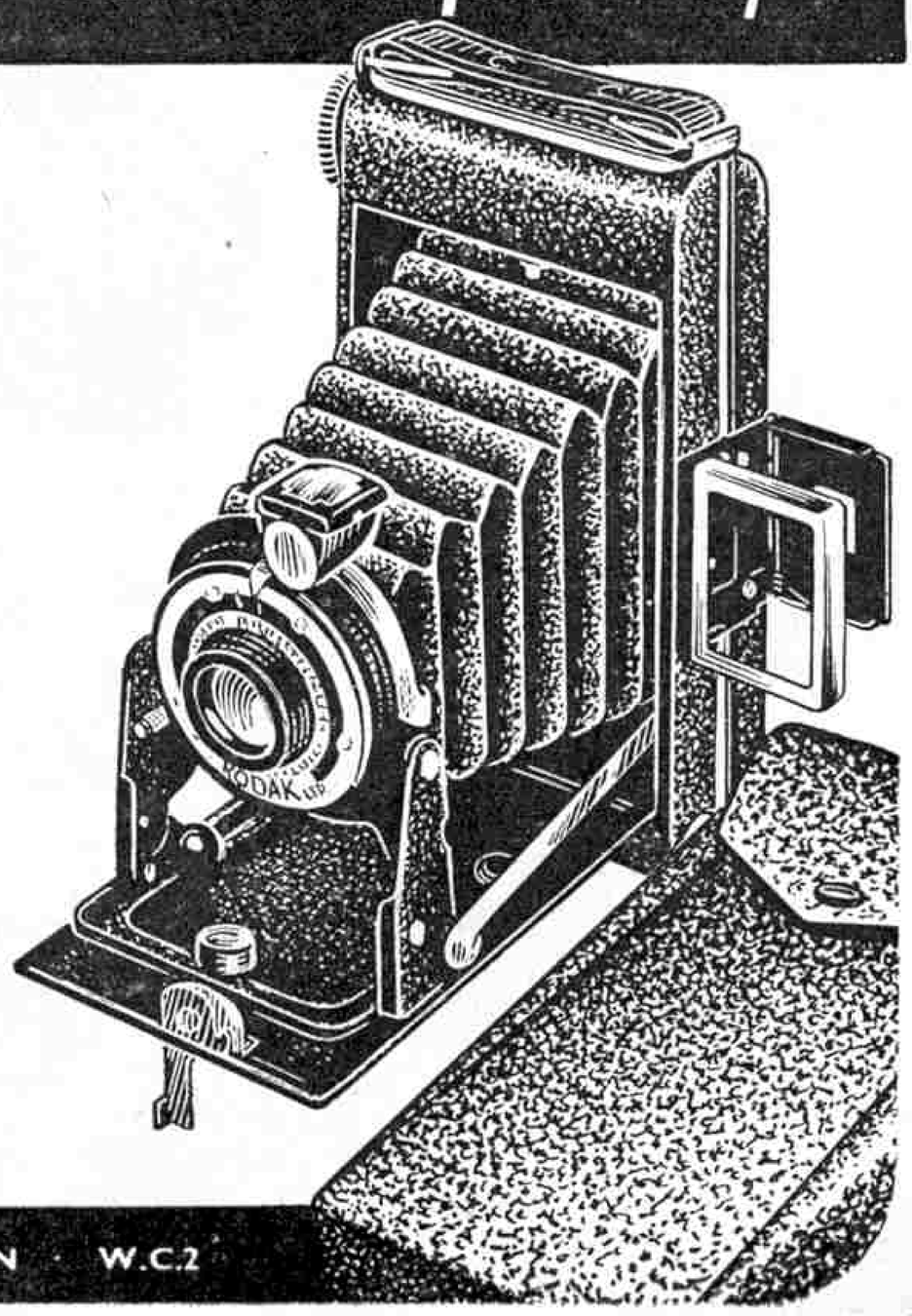
With this camera you get a real Kodak tested lens, a "Time" exposure adjustment, a direct-vision, eye-level finder and a two-way reflecting finder as well.

The camera opens in a flash, all ready for snaps, and closes as quickly, while the back is hinged and the spool holders swing up for easy loading.

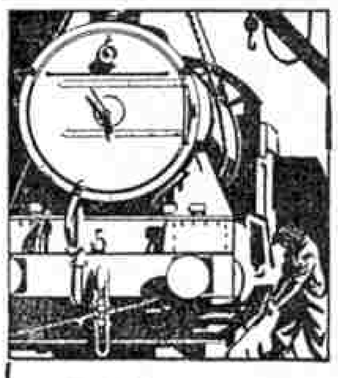
It's a smart camera, made even smarter by the shoulder-strap Carrying Case included in the price, and it takes first-class, full-size pictures measuring $3\frac{1}{4}$ by $2\frac{1}{4}$ inches.

With two viewfinders - - - - - **30/-**
With eye-level finder only - - - - **27/6**

Ask your Kodak dealer to let you see it!

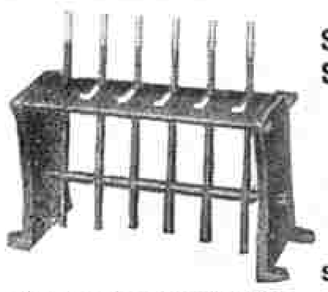


KODAK LTD. · KODAK HOUSE · KINGSWAY · LONDON · W.C.2



Just like the real thing!

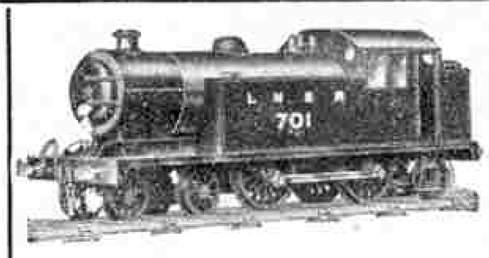
YOU want your model railway rolling stock, stations, and all accessories to be just like the real thing—that's exactly what you get with MILBRO models. MILBRO engineers work to limits as fine as .001 of an inch to make sure that you get the real thing—in miniature! You can always be sure that your MILBRO model railway equipment is correct in every detail, and will give you long, trouble-free service. Get the catalogue, it's only 6d.



6-LEVER FRAME 7/6

SIGNAL CABINS S/7, 9" long, 5/9

UPPER QUADRANT SIGNALS 2-arm bracket signal. Home or Distant 10/-

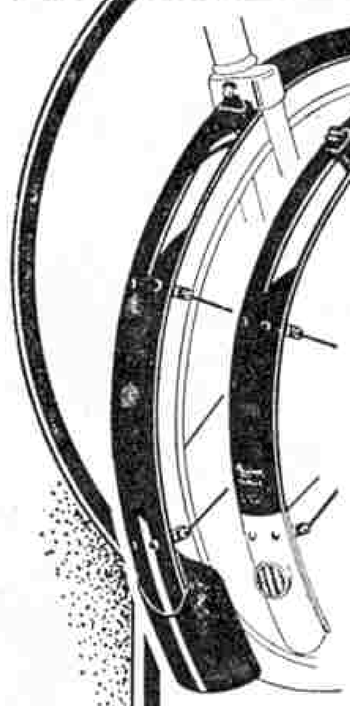


STANDARD TANK ELECTRIC LOCOMOTIVE £2.19.6

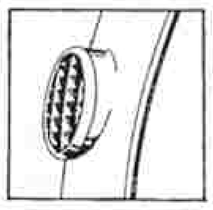
MILBRO TRUE-TO-SCALE *models for reliability*

MILLS BROS. (Model Engineers) LTD., St. Mary's Road, SHEFFIELD
London Showrooms:
2, Victoria Colonnade, Victoria House, Southampton Row, W.C.1

better for YOUR cycle



Bluemel's Celluloid Mudguards can be fitted to any cycle without interfering with the wheel adjustment. Quickly adjustable and detachable, with built-in mud flap on the front guard, in black. **Prices from 4/8 per pair.** Colours extra. If fitted with built-in "Prismatic" Reflector, as illustrated, 1/- extra.



Send for Bluemel's Pocket Catalogue containing interesting cycling data.

Bluemel's

CELLULOID MUDGUARDS

BLUEMEL BROS. LTD., Dept. 27, WOLSTON, Nr. Coventry

Build your own engine

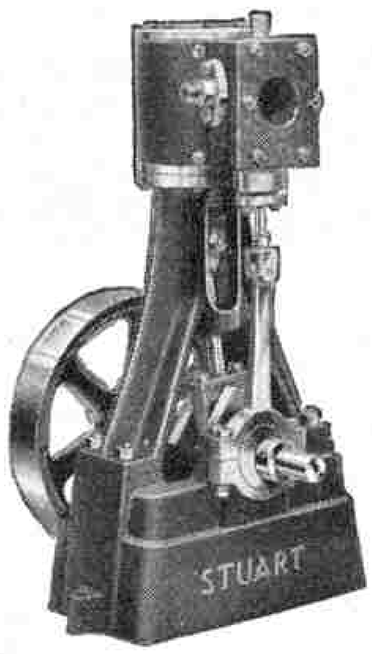
Only a few hand tools required.

Stuart No. 10.
Completely machined set with full instructions: from **18/6** post free.

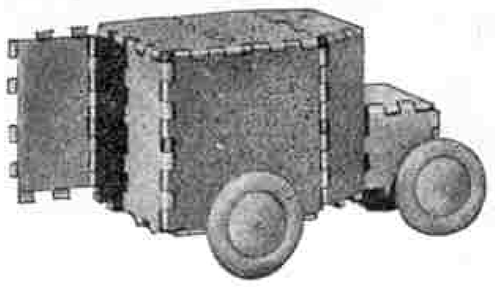
All our sets from **5**/– upwards, illustrated and described in our No. 2 catalogue, 6d. post free.

72 pages fully illustrated.

STUART TURNER LTD.
Henley-on-Thames



DINKY BUILDER



A fine model of a Motor Van built with Outfit No. 1.

Simplicity is the keynote of this new building system, by means of which the youngest children can build all kinds of models with the greatest of ease.

No. O DINKY BUILDER OUTFIT

This Outfit contains a good assortment of Dinky Builder parts (including two road wheels), with which a splendid range of models can be built. The Instruction Folder included gives examples of 40 models. Price **2/6**

No. 1 DINKY BUILDER OUTFIT

This splendid Outfit contains a varied selection of parts, including a set of four road wheels for constructing miniature wheel toys. The Instruction Manual included shows a total of 56 fine models. Price **4/11**

No. 2 DINKY BUILDER OUTFIT

The parts in this fine Outfit make possible the construction of six groups of miniature model furniture and other wonderful models. Full instructions for building the complete range of 74 models are given. Price **7/9**

No. 3 DINKY BUILDER OUTFIT

This is the largest Outfit in the series, and its model-building possibilities are almost limitless. It is the ideal gift for young boys and girls.

The parts contained in this Outfit can be used over and over again to make hundreds of different models. Price **10/9**

No. O Dinky Builder Outfit. Price **2/6**

MECCANO LTD. - BINNS ROAD - LIVERPOOL 13

A SPEEDY TOY FOR THE HEALTHY BOY

Perfect steering. Two brakes ensure safety and the Steel chassis, strength.

Price **40'-**

MONTIL FLYING ACE COASTER

From most Stores, or full particulars from

MONTIL MFG. CO. LTD.
Morville St., BIRMINGHAM

THE PV6 DIVE BOMBER sets a new standard

IMPOSING APPEARANCE. WING SPAN 20". FLIES 500 FEET

PRICE ONLY 5/-

The P.V.6 Dive Bomber is produced on entirely new principles at the famous FROG aeroplane factory.

It is based on the most efficient R.A.F. designs and combines realistic appearance with high performance.

The novel method of construction ensures that the P.V.6 is particularly robust and virtually crashproof. Whilst the machine will fly perfectly with the undercarriage attached, the machine assumes a more up-to-the-minute appearance and the performance is enhanced when the undercarriage is removed.

FROG MODEL AIRCRAFT

Covered by World Patents granted and pending.

Made in England by International Model Aircraft Ltd.

Sole Concessionaires :

LINES BROS. LTD., TRIANG WORKS MORDEN ROAD, MERTON, S.W.19

OBTAINABLE AT ALL GOOD TOYSHOPS AND STORES

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

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

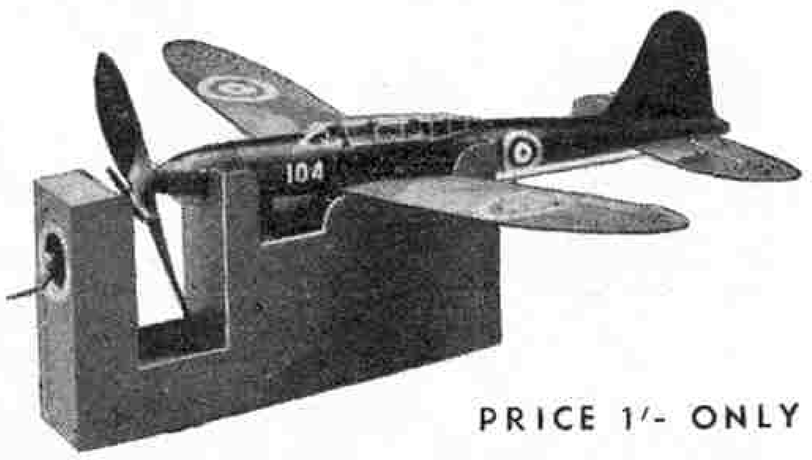
NAME.....

ADDRESS.....

PLEASE WRITE IN BLOCK LETTERS 7.38

FROG Trade Mark Regd.

P.V.6 HIGH SPEED WINDER. This illustration shows how easily these models can be wound for flight with the patent high-speed winder.



PRICE 1/- ONLY

HORNBY PART-EXCHANGE SCHEMES DISCONTINUED

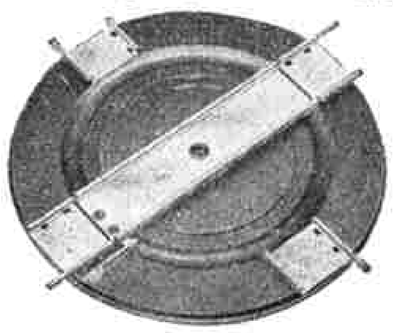
★ *Important Notice*

ALL EXCHANGE SCHEMES AFFECTING MECCANO AND HORNBY PRODUCTS, EXCEPT THOSE FOR MECCANO PARTS, **ARE DISCONTINUED FROM 1st JULY.**

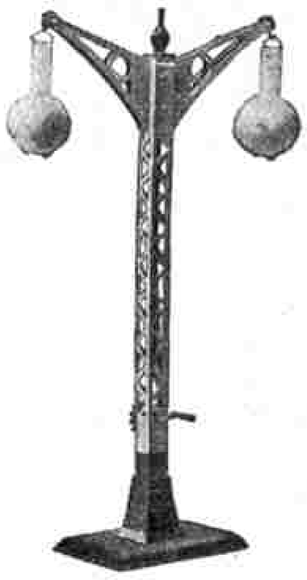
It is still possible to exchange old Meccano parts for corresponding new parts at half the current list prices. Send them to Meccano Limited, Special Service Department, Binns Road, Liverpool 13, together with half the cost of the new parts, plus the return postage, which will be the same as on the parcel of old parts. Parts cannot be taken in exchange for Outfits.

HORNBY ACCESSORIES

No. 2 SIGNAL CABIN
Dimensions: Height 6¼ in., width 3½ in., length 6¼ in. Price **3/6**



No. 1 TURNTABLE
Price **1/11**

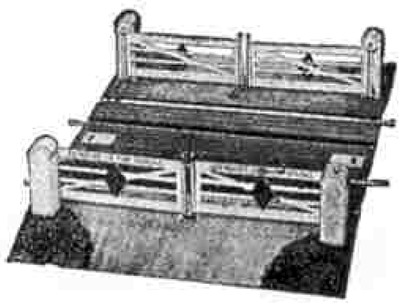


No. 2 LAMP STANDARD
Price **3/9**

This page shows a few of the splendid range of accessories of the Hornby Railway system. See how realistic they are—all built in perfect proportion and all beautifully finished. Add some of them to your Hornby Railway and give it a realism that will be the envy of all your friends.

Ask your dealer to show you the complete range of Hornby Accessories.

No. 2 SIGNAL. DOUBLE ARM
Price **2/3**

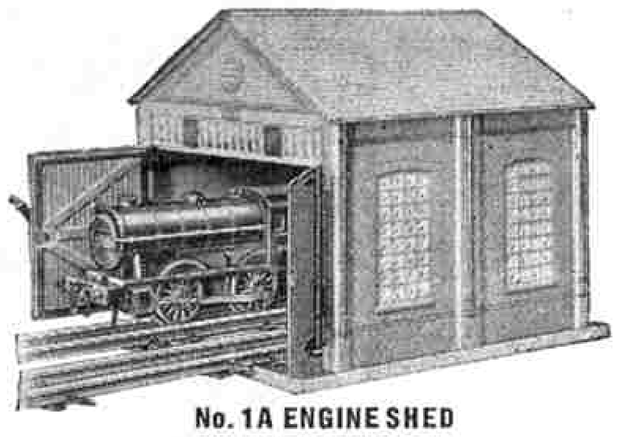


No. 2 LEVEL CROSSING
Measures 13½ in. x 10½ in., with two gauge O tracks in position
Price **5/3**

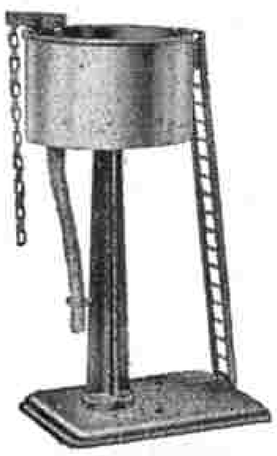
STATION OR FIELD HOARDING
Price **3d.**

No. 1 GOODS PLATFORM
Length 13 in., height 6¾ in., width 6 in. Price **6/11**

No. 3 STATION
Length 16¾ in., width 6 in., height 6 in. ... ... Price **5/9**



No. 1A ENGINE SHED
Price **11/3**

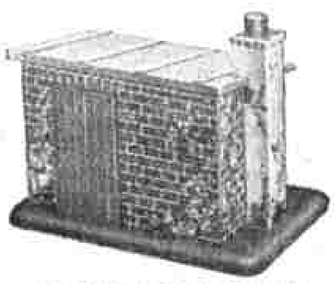


No. 1 WATER TANK
Fitted with flexible tube and valve chain. Stands 6½ in. high. Price **2/6**

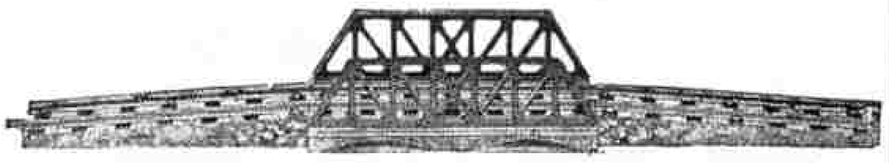
TELEGRAPH POLE
Price per pair **3/-**

GRAPHITE GREASE
For Springs.
Price per tube **6d.**

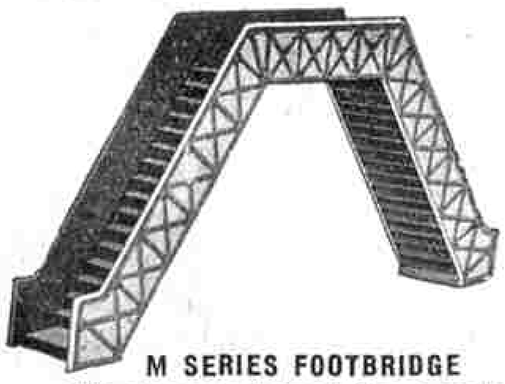
MECCANO LUBRICATING OIL
Price per bottle **6d.**



PLATELAYER'S HUT
Price **1/2**

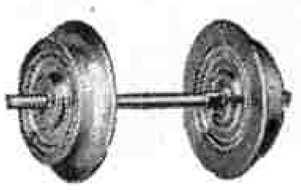


VIADUCT Price **6/9**
VIADUCT Centre Section only ... ... Price **4/6**
VIADUCT (Electrical) Price **7/6**
VIADUCT (Electrical) Centre Section only ... ... Price **5/-**



M SERIES FOOTBRIDGE
This strongly-built Footbridge is made to span a single track. Price **1/-**

No. 2 TURNTABLE
Price **4/-**



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

No. 1 TUNNEL (STRAIGHT)
Base measurements.
Length 7 11/16 in., width 6½ in.
Price **1/6**

MECCANO LIMITED — BINNS ROAD — LIVERPOOL 13

PERFECT SCALE MODELS

DINKY TOYS

OVER 300 VARIETIES

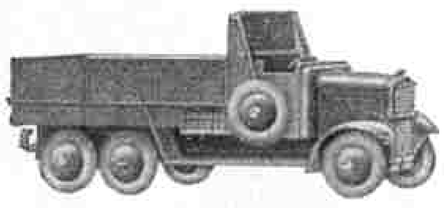
Collecting Dinky Toys is one of the most fascinating of all hobbies. These realistic miniatures are unique in their rich colouring and perfection of design and finish, and their range is so wide as to appeal to all tastes. This season many new items have been introduced including wonderful scale models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

"THUNDERBOLT" SPEED CAR

Dinky Toys No. 23m
A fine scale model of the car in which Capt. G. E. T. Eyston set up a world land speed record of 312 m.p.h. at Bonneville, Utah, U.S.A., in 1937. Price **1/-** each

SIX WHEELED WAGON

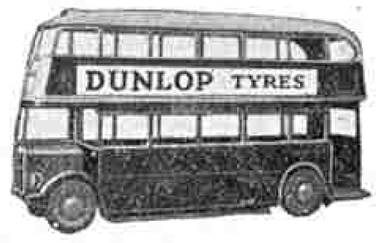


Dinky Toys No 25s
An interesting model of a modern three-ton wagon. In assorted colours.
Price **1/-** each

TAXI WITH DRIVER

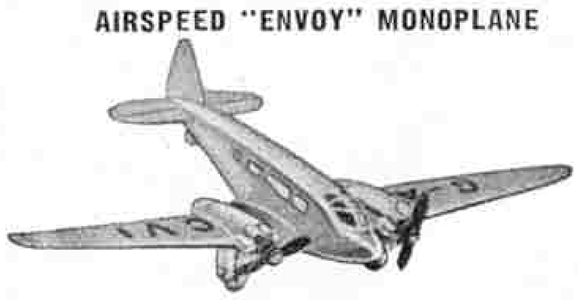
Dinky Toys No. 36g
Fitted with detachable rubber tyres.
Price **11d.** each

DOUBLE DECKER BUS



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

AIRSPEED "ENVOY" MONOPLANE

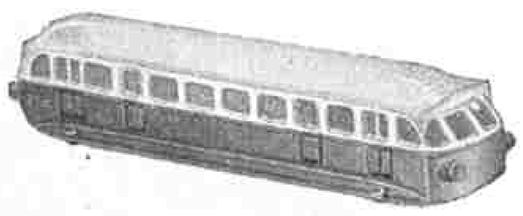


Dinky Toys No. 62m
Scale Model of the Airspeed "Envoy" twin-engined commercial monoplane. Assorted colours. Price **6d.** each

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

DIESEL RAIL CAR

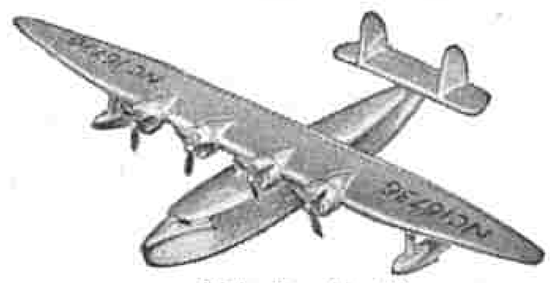


Dinky Toys No. 26z
A realistic model of a modern Diesel-engined rail car. Price **5d.** each.
(Made in the Meccano Factory in Paris.)

ARMSTRONG WHITWORTH "WHITLEY" BOMBER

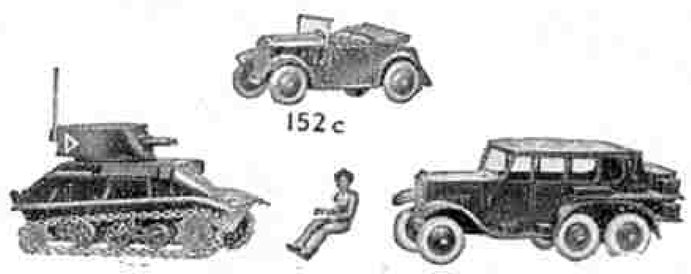
Dinky Toys No. 60v
Scale model of the "Whitley" long-range heavy bomber adopted by the R.A.F.
Price **9d.** each

FLYING BOAT "CLIPPER III"



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

ROYAL TANK CORPS LIGHT TANK SET

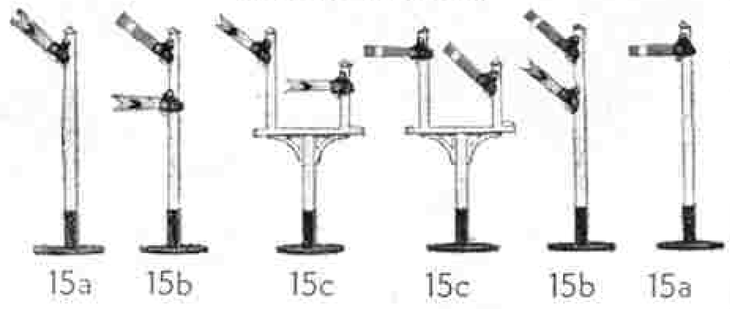


Dinky Toys No. 152

No. 152a	Light Tank (4½ tons, 25 h.p.) ...	... each	**1/2**
No. 152b	Reconnaissance Car	... „	**1/-**
No. 152c	Austin Seven Car	... „	**4d.**
No. 150d	Driver	... „	**3d.**

Price of complete set **2/9**

RAILWAY SIGNALS



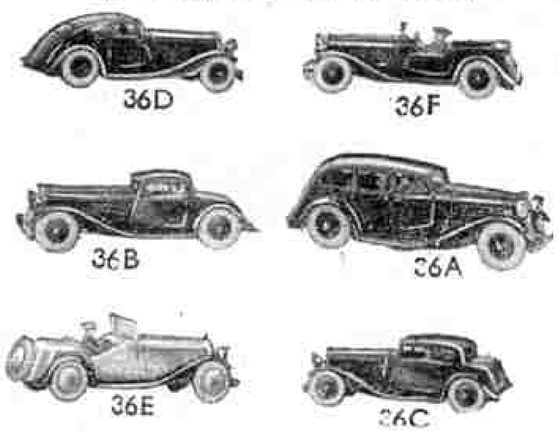
Dinky Toys No. 15

No. 15a	Single Arm Signals ("Home" and "Distant") each	**2d.**
No. 15b	Double Arm Signals (two in set) ... ... „	**3d.**
No. 15c	Junction Signals ("Home" and "Distant") ... „	**4d.**

Price of complete set **1/6**

MOTOR CARS

WITH DRIVERS, PASSENGERS, Etc



Dinky Toys No. 36
Fitted with detachable rubber tyres. Silver-plated radiators.

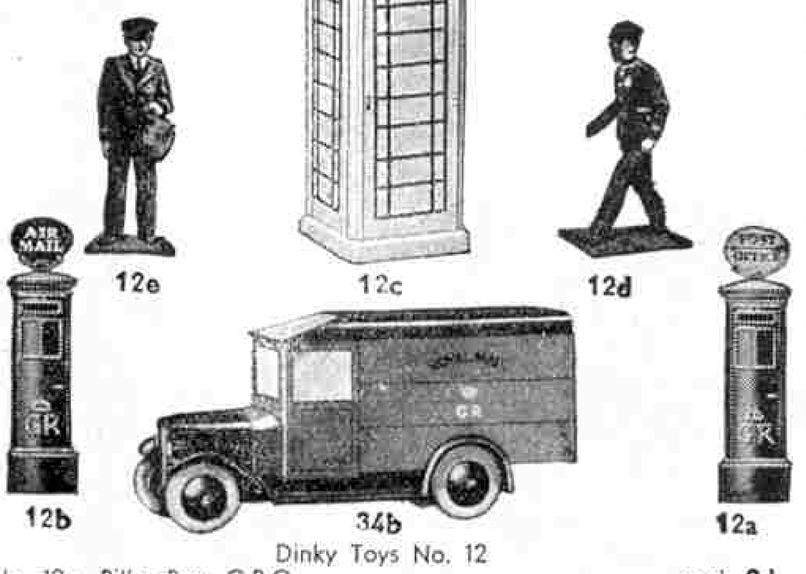
No. 36a	Armstrong Siddeley (Limousine) with driver and footman ...	each	**11d.**
No. 36b	Bentley (Two-seater Sports Coupe) with driver and passenger ...	„	**11d.**
No. 36c	Humber (Vogue Saloon) with driver and footman	„	**11d.**
No. 36d	Rover (Streamline Saloon) with driver and passenger	„	**11d.**
No. 36e	British Salmson (Two-seater Sports) with driver	„	**11d.**
No. 36f	British Salmson (Four-seater Sports) with driver	„	**11d.**

Price of complete set **5/6**

SMALL CARS

Dinky Toys No. 35
No. 35a Saloon Car each **3d.** No. 35b Racer each **3d.**
No. 35c "M.G." Sports Car ... ... „ **3d.**
Fitted with rubber tyres.
Price of complete set **9d.**

POSTAL SET



Dinky Toys No. 12

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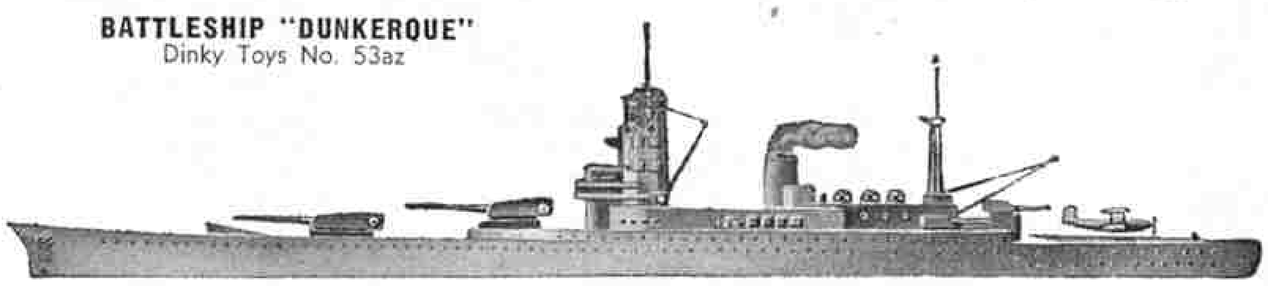

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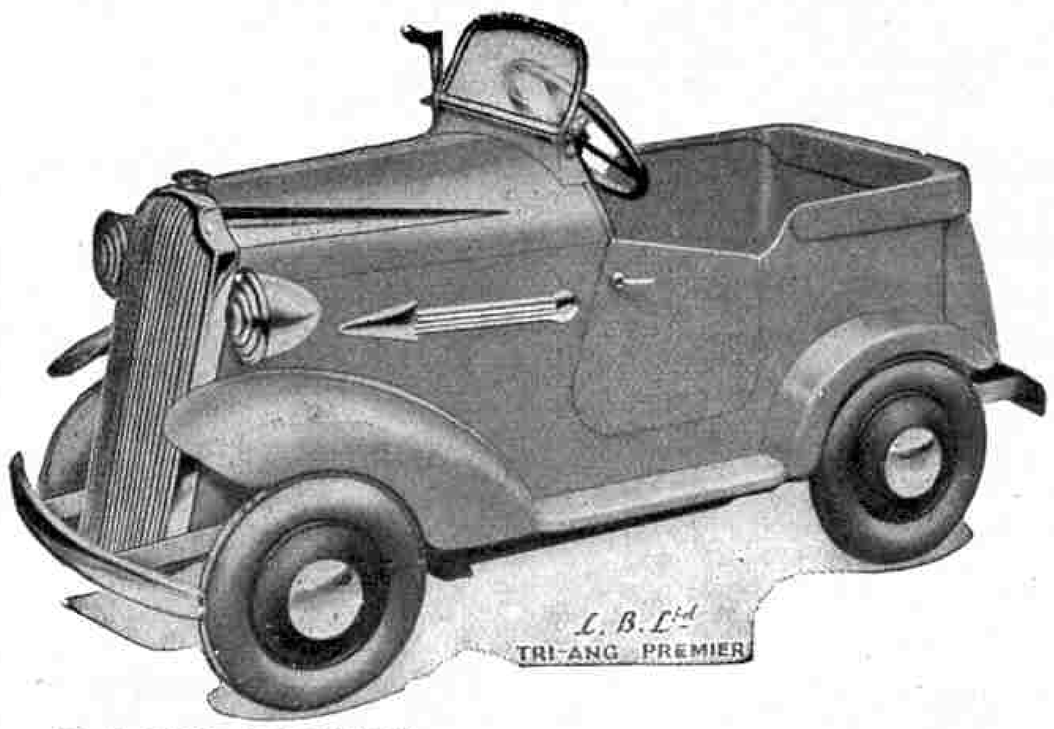

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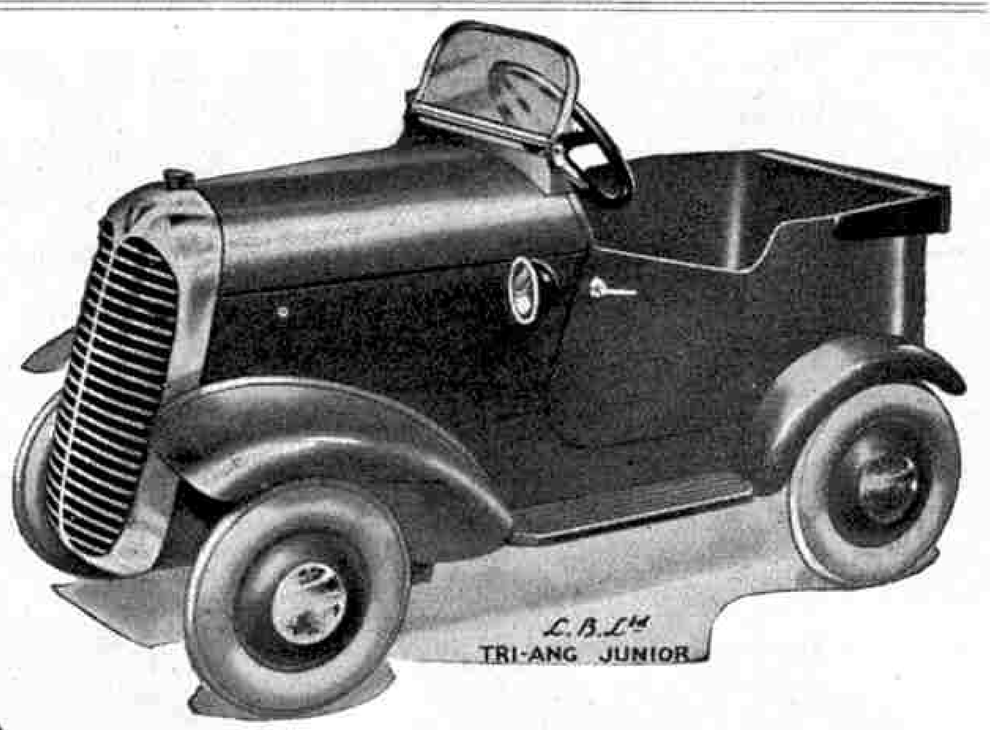

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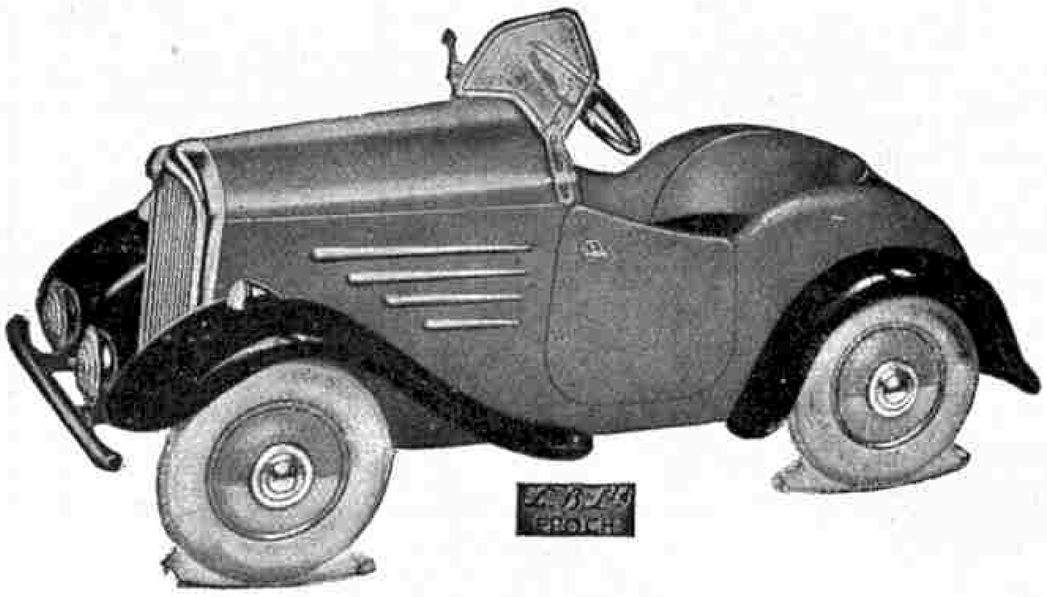

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NEXT MONTH: "UNITED STATES LOCOMOTIVE GIANTS." PUBLISHING DATE: 30th JULY

MECCANO MAGAZINE

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Vol. XXIII. No. 7
July 1938

With the Editor

The Glasgow Exhibition

This month many of my readers will explore the wonders of the great Empire Exhibition at Glasgow, which is the subject of an article on page 364 of this issue. It is expected that from fifteen to twenty million people will visit the Exhibition, and during the first month more than two million passed through the turnstiles. This is a record for any British Exhibition, and is twice as many as the corresponding number at Wembley in 1924.

It is interesting to see where all these people find their chief attractions. The model of the Victoria Falls, 120 ft. in length, seems to have been the most popular individual exhibit, the daily attendance during the first month being nearly 11,000. This model uses 25,000 gallons of water every minute. The Highland Village is a good second, and the Tower of Empire is a great favourite, on account of its unique form and the wonderful views to be obtained from its galleries.

Of the many Pavilions, the most popular undoubtedly is that containing the Government exhibit, which has been described as the finest ever staged by the British Government. On some days the rate of progress through it has been 12,000 visitors an hour, with queues 100 yards long waiting for admission. The Services Pavilion also has proved a great attraction, so great indeed that more exhibits have been commissioned. Among these are an armoured car and two tanks, and a special display of air navigation instruments also has been arranged.

Inventions that Change Our Lives

Some inventions, although remarkable for their ingenuity, do not have any marked effect on our daily lives. There are others, however, that bring about such extraordinary developments in a very short time that it becomes difficult for us to imagine how we could ever have got on without them.

A striking example of an invention of this type is the pneumatic tyre, which has literally revolutionised the world's transport. It is made in millions for motor vehicles of all kinds; it is used on vehicles drawn by horses, mules, donkeys and even camels; and it has been one of the main factors in the extraordinary development of the bicycle. All this we owe to the brains of a Scotsman, J. B. Dunlop. He was not in any way associated with engineering or with the design or manufacture of bicycles; he was merely a victim of the discomforts of travel by road. How he came to think of his first pneumatic tyre, and how his invention was developed, is explained in the interesting article on page 366.

"Cutty Sark" Reaches Her Last Home

Another attractive article in this issue tells the story of the *"Cutty Sark,"* the last survivor of the once great fleet of China tea clippers. The big sailing ships have not yet completely vanished from the seas, and there are still a few of them at work. Their days are practically over, however, and it is probable that they will disappear, leaving no trace, as great numbers of tall ships have done before them.

Fortunately this is not to be the fate of the *"Cutty Sark,"* but she has had a narrow escape. Her last years of active life were spent in carrying cargoes much less romantic and dignified than chests of China tea, or wool from Australia; and but for a happy chance she probably would have become worn out in such comparatively menial work. She was rescued by an old-time sailor who bought her and restored her former glory, in appearance at any rate. After a long stay at Falmouth she has now returned to the Thames, where she received a great welcome on joining H.M.S. *"Worcester,"* the famous cadet training ship, at Greenhithe.

Amateur Test Selectors

The Test XI Voting Contest announced in the May *"M.M."* aroused widespread interest, and cast an amusing sidelight on the problems that confront those who have the responsibility of choosing the actual English eleven. No fewer than 57 different players were nominated for the team, the list containing six "all-rounders," 19 batsmen, 27 bowlers, four wicket keepers and one other player who, the competitor admitted, had no claims to inclusion except a brilliant record as a County captain and a fielder!

If it had been possible to place in the field the eleven players who received the greatest number of votes in this contest, the Australians would have been faced with a formidable and well-balanced combination, as our readers will see from the following list, which is given in the actual placing of the votes: Hammond, Edrich, Hutton, Verity, Ames, Robins, Leyland, Hardstaff, Farnes, Compton, Bowes. Next in order came G. O. Allen, Paynter, Wyatt and Barnett. There were, as usual, some very amusing entries. One boy omitted to include any bowlers or a wicket keeper; evidently his idea was that England should win the toss and bat for the whole four days!

No reader succeeded in giving a completely accurate forecast of the team that actually took the field, but two readers gave nine of the players, and seven gave eight. The judges' prize awards are given on page 417.

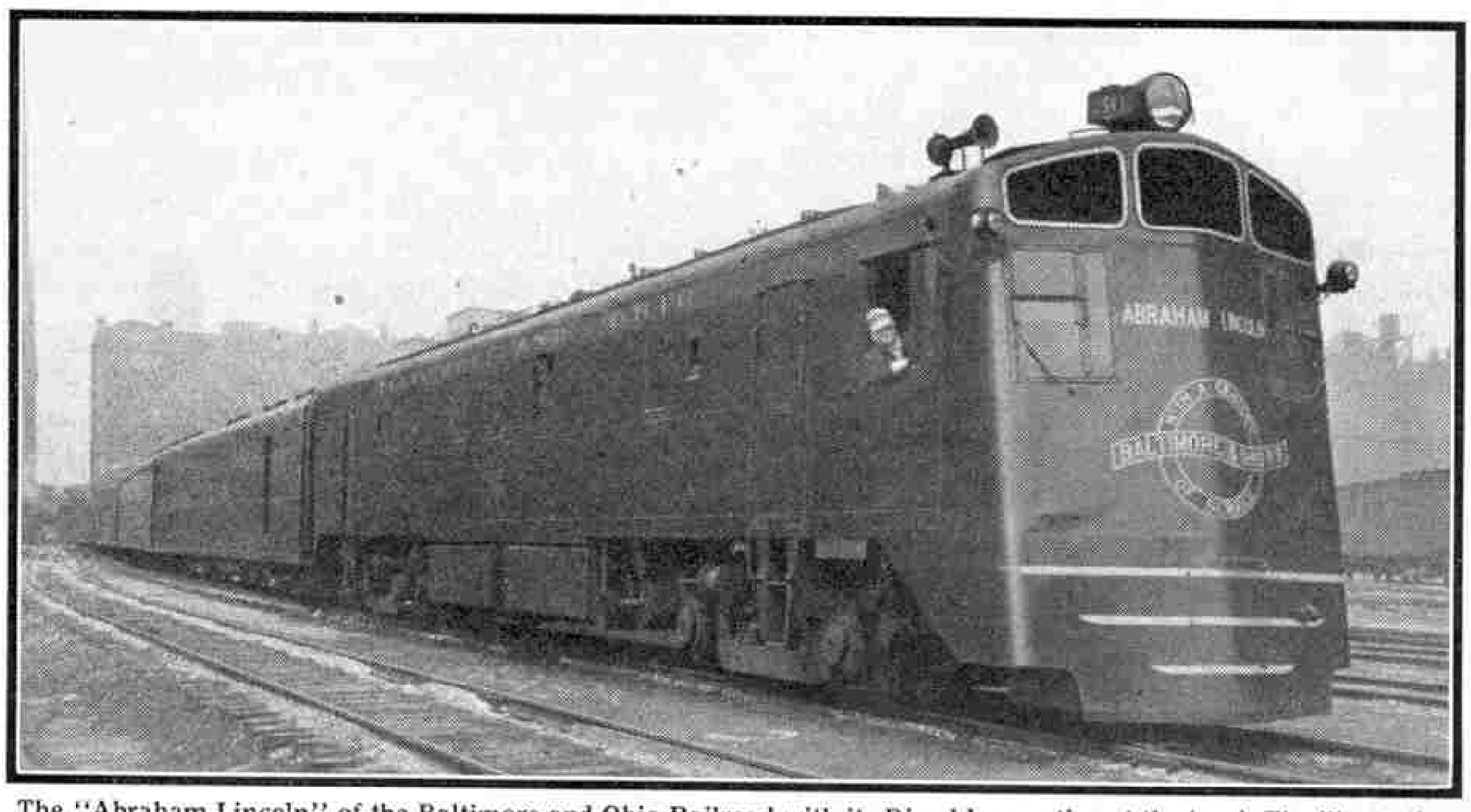
Run on a Diesel Streamliner

The Baltimore and Ohio "*Abraham Lincoln*"

By Edward T. Myers

THE arrival or even the passing of a streamliner is quite an event in many stations by the wayside and in towns in the United States. People gather along the platform and labourers glance up from their work as "The Pride of the Road" rushes by.

One autumn morning I found myself waiting at such a station, where the streamlined "*Abraham Lincoln*" of the Baltimore and Ohio Railroad was scheduled to stop. This station was a division point where in the old days steam locomotives were changed, but with Diesel engines only the engine crew are changed. At the head of the platform I saw a chubby little man seated on a railing; there was an air of authority and decisiveness about him, so I decided that he must be the relieving engineer of the streamliner. This supposition proved to be correct, and we talked about Diesel locomotives. He preferred to drive these rather than steam locomotives, principally because of their freedom from smoke and cinders. He was proud of his charge, and well he might be, for it is the fastest and most widely known train of his road. He admitted that there were some on other roads that could go faster, but maintained that his had particularly good starting power, and moreover was one of the earliest, for it had been put into service in June 1935. In any case the average of 58 m.p.h. made by the "*Abraham Lincoln*" over the 284 miles between St. Louis and Chicago, including stops, is quite respectable.



The "Abraham Lincoln" of the Baltimore and Ohio Railroad with its Diesel locomotive at the head. The illustrations to this article are reproduced by courtesy of the Baltimore and Ohio Railroad.

Just then the hoarse throaty buzz of "*Abe's*" horn could be heard. It sounded as if a mad bumble bee were bearing down on the station! Passengers with their baggage began to pour out of the station doors, while interested spectators stood back a bit.

The engineer walked forward to meet his charge, which was now quietly gliding along the rails, and I made my way up the platform towards the other passengers. In the open doorways of the train stood coloured porters in their white jackets, ready to place their steps on the platform, for most platforms in the United States are at rail level and an extra movable step is placed on them. The bright royal blue train drew to a stop, and the porter in the coach opposite me stepped out, followed by the stewardess in her bright blue uniform.

"*Chicago train! All aboard!*" called the porter. The next scheduled stop was Chicago, 127 miles away, and while the passengers were getting aboard, men were inspecting the running gear, one passing along the train feeling the axle-boxes to see if any of the journals were running hot. In a few minutes there was a slight jolt, and the Diesel engine had the train gliding smoothly along and picking up speed rapidly. The train indeed was not far behind a multiple-unit electric one in acceleration, although this was not an easy task with nine coaches, even of aluminium.

Before 40 m.p.h. was reached there was a slack for the freight yards, but soon we were again picking up speed. I was in the second car, but could not hear a sound from the Diesel engine ahead. Anyone watching the train from the lineside would miss the jolly puff of a steam locomotive getting under way, but inside all appreciated the smoothness.

Four miles out, and away from the yards, speed had risen to 57 m.p.h., and each of the next few miles was covered in a few seconds less than the one before it until 73 m.p.h. was reached. This speed was maintained for a time, and was then increased to 85 m.p.h., a maximum around which it stayed for the next 23 miles. My home town rushed by so fast that I failed to recognize any but the most prominent landmarks! North of the town the brakes were applied to reduce speed for a sharp curve, and in comparison with the previous speeding the train seemed to be crawling, although its speed was 60 m.p.h.

Then came a long uphill stretch with speed never exceeding 55 m.p.h. This was the only point on the trip where the train was passed by motor cars on the highway parallel to the track, a feature of many American railways. The passing cars did not succeed in humbling our streamliner, for on reaching the crest it swept past the offending motorists as if they were standing still! For the next 25 miles speed remained at nearly 75 m.p.h., with the exception of a slow to 50 m.p.h. for a town with a large number of "grade" or level crossings. Most of the town crossings are protected by flashing lights, but our pneumatic horn could be heard buzzing at the crossings to warn possible careless motorists.

Then we reached a point where the double tracks diverge into three lines. One of these is a direct line, but the others take a more tortuous course along the Illinois Lakes-to-Gulf waterway. The brakes went on and our speed fell, probably to 35 m.p.h., as we left the direct line in order to allow the passage of the fast but heavy steam-hauled "*Alton Limited*"; but as I was then in the dining car, enjoying a turkey dinner, I could not conveniently consult my watch.

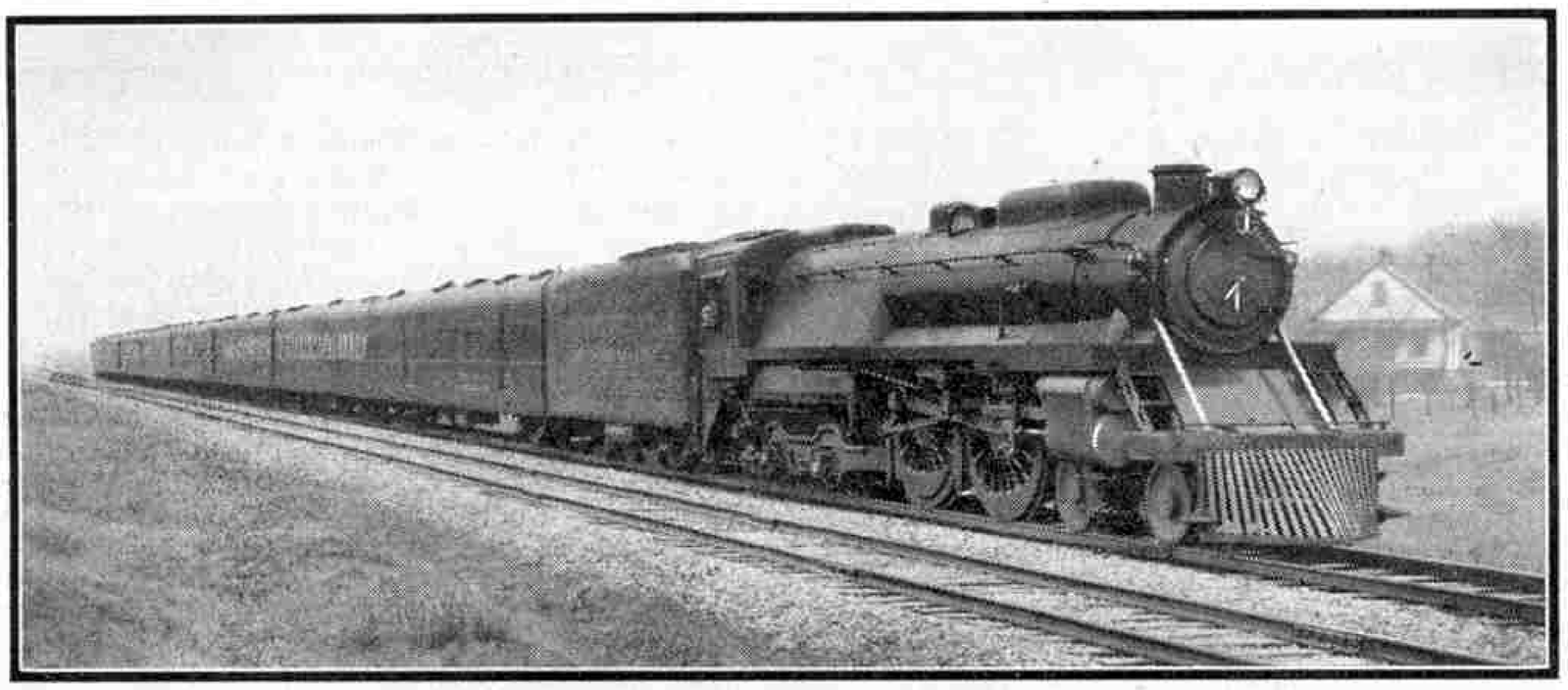
A special stop was now made to discharge a long-distance passenger. We were quickly off again, but the stop meant a loss of five minutes. Now we were back on the direct line, and speed kept between 70 and 80 m.p.h. for mile after mile. Telegraph poles flashed past, and mile posts were certainly not easy to catch. Walking in the train at this speed was not difficult on the straight stretches, but was a little questionable when the train ran over points or level crossings. Passing over the latter produced scarcely a rumble inside the coaches.

Seven miles out of Chicago speed was reduced gradually, and from 70 m.p.h. fell by stages to 10 m.p.h. Finally we came to a dead stop at a large and important level crossing as a precaution to ensure that the train was under control. We were immediately moving again, but no more curves were rounded at 75 m.p.h. In fact there was no more speeding, as we were entering one of the largest railway centres in the United States. After another slow to 10 m.p.h. we came to the yard limits, and rolled past the coaches of the "*Broadway Limited*" of the Pennsylvania, the "*Empire Builder*" of the Great Northern, and the "*North Coast Limited*" of the Northern Pacific, window washers glancing up from their tasks of grooming those famous trains for their evening runs. No other streamliners, such as the Burlington "Zephyrs," were then in view to challenge the sleek blue lines of our "*Abraham Lincoln.*"

The last hum of the Diesel died away as our run ended one minute early, in spite of the unscheduled stop, and on leaving the train I found the engineer feeling the roller bearings of his royal blue locomotive. They were still cool. We had covered 127 miles in 125 minutes, giving an average for this run of 61 m.p.h., including two stops, and three slacks, one to 10 m.p.h.

The end of the run recalled to me the story of this train, in which I have always felt a special interest ever since I was a

lineside witness of its trial run in 1935. The story of any train is fascinating, the more so when it bears a title and the locomotives that haul it are named, for these give a distinct personality to the service. The *"Abraham Lincoln"* was introduced just over three years ago on the run between Chicago and St. Louis. At that time considerable interest had been aroused by the lightweight construction, novel appointments, vivid colour schemes and general layout of pioneer Diesel streamliners such as the *"M 10000"* of the Union Pacific Railroad, and the new streamlined train was the first to be hauled by a steam locomotive.



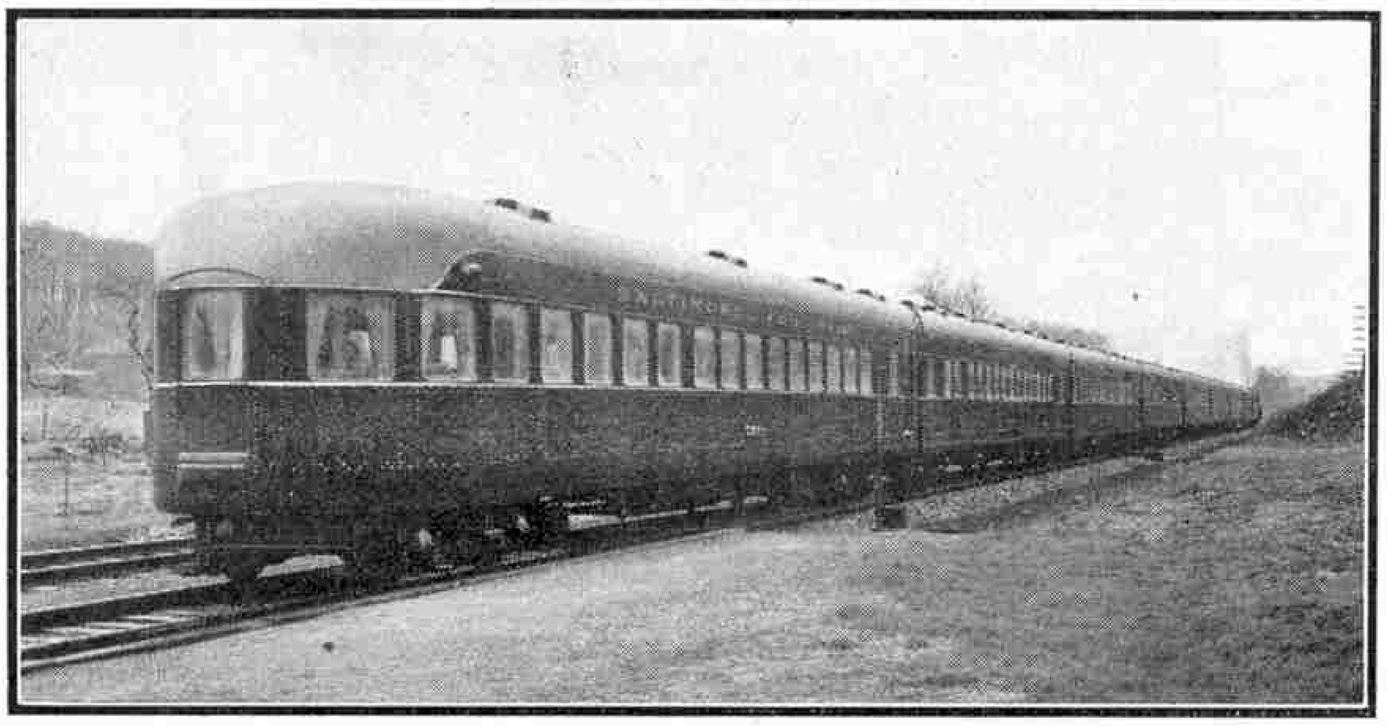
The "Abraham Lincoln" hauled by a steam locomotive. The engine is the 4-4-4 "Lady Baltimore," which is seen also on our cover. This locomotive incorporates certain features of G.W.R. practice.

Two sets of vehicles were built, one of Cor-Ten steel, a light metal having great tensile strength and resistance to corrosion, and the other of duralumin. The coaches of both sets are considerably lighter than those of the ordinary standard American main line train, and are clean and smooth in outline, with flush-fitting flexible diaphragms between the coaches. They are painted a rich royal blue.

Two special high-speed steam locomotives were provided, smaller and more graceful engines externally than those to which the American railroader had been accustomed. One was a 4–6–4 and the other a 4–4–4, the latter an unusual wheel arrangement for a tender engine. Each was provided with large driving wheels 7 ft. in diameter, and both had boilers with water-tube fire-boxes and a working pressure of 350 lb. per sq. in.

In addition to their generally "cleaned-up" lines, the engines were painted blue in order to match the trains that they were to operate, and on both there appeared features borrowed from the practice of the G.W.R. of England, no doubt as a result of the visit of their locomotive *"King George V"* to the "Fair of the Iron Horse" in 1927. Thus the smoke-box door of each was provided with centre locking handles of characteristic G.W.R. form, and their wide chimneys had polished copper tops.

In these days of locomotive numbers running into four figures, the numbers carried by these two engines were a distinct change. The 4–4–4 locomotive became No. 1 and was named *"Lady Baltimore,"* and this is the engine shown on our cover. The 4–6–4 appropriately became No. 2 and was named *"Lord Baltimore."* *"Lady Baltimore"* was allocated to the working of the *"Abraham Lincoln,"* hauling the train of steel cars, and *"Lord Baltimore"* took over the running of the twin train of duralumin cars on the *"Royal Blue"* service between New York and Washington.



The "Abraham Lincoln" from the rear, showing the rounded end of the observation-parlour car. This form of construction is popular on streamlined trains in the United States.

The trial run of the new streamlined train, to which I have already referred, stands out vividly in my memory. Children were given a holiday from school and thousands of people lined the tracks waiting expectantly for the streamlined train, the first in our part of Illinois. Rain began to fall, but still the people waited undaunted, I was fortunate enough to be in a warm signal tower or cabin, and there I listened to telephonic reports of the progress down the line of the streamliner.

Although speed restrictions over railway crossings and round curves had been lifted for the occasion, the train was not to exceed 85 m.p.h. Now reports began to come in telling us that the train had passed Springfield at 12.50 p.m. and Lincoln at 1.13, rushing onward at an average speed of 75 m.p.h. It was important to know what time the train would leave the division point, Bloomington, 37 miles south, because orders issued for the occasion required the road to be "lined up" half an hour in advance of the train's journey. To complicate matters a local freight was shunting in the yards and had to be got out of the way.

With a finger in one ear and a telephone receiver on the other, I heard a shout over the wire of *"Here she comes!"* and then a train could be heard. The *"Abraham Lincoln"* had arrived in Bloomington. The dispatcher there must have gone out to look over the new train, because he did not report to us. Fifteen minutes of silence passed and the signalman was becoming nervous, for with a train running at 75 to 85 m.p.h., 37 miles could soon be "eaten up." Fortunately the local freight had finished in the yard and had left town on a branch line, so now the points and signals could be set for the streamliner. The signalman himself took over the telephone and called the Bloomington dispatcher, who answered that the streamliner was just leaving after a stop for inspection.

By this time the rain was falling heavily, and the sky was very dark although it was only two o'clock on an April afternoon. Everybody was silently gazing down the track, which the mist nearly obscured, and not a word was spoken. Four minutes passed, and then came the news that the train was only eight miles away. There was a burst of conversation that lasted until the signalman announced that everyone must leave the cabin. No doubt he would feel more comfortable with everybody away from the many levers while he scrutinised the passing train for possible defects, as required by the rules. Regular trains were restricted to 45 m.p.h. round the curve leading to the tower and over the level crossing. Even at that speed vibration and noise seemed to be terrific to the nearby observer, and as this new train would pass at even higher speeds, I lost no time in getting out.

For a while, all stood on the steps sheltering from the rain. Then came a ring from the instruments announcing that the speeding train was only two miles away. Down the tracks in the mist was a tiny yellow spot of light. Somebody said: "It doesn't seem to be moving very rapidly," and immediately another called: "Look at it coming now." All of a sudden a finely-shaped engine grew out of the mist. It seemed to be heading for the group of spectators, but then turned and rushed over the level crossing. The streamliner was gone!

What colour was it? What kind of an engine pulled it? These were among the questions immediately asked. No one could really tell; it had been moving too rapidly, and yet had made far less noise than standard trains do when passing either road or rail level crossings. The engine of course was the shapely *"Lady Baltimore,"* with the fine train shown in the illustrations on this page. Altogether it was a thrilling experience.

When the Diesel locomotive was built shortly afterwards it was tried first on the *"Abraham Lincoln"* and then on the *"Royal Blue,"* in order to provide a direct comparison between steam and Diesel operation on high-speed services. Finally, with a speeding up of schedules the Diesel locomotive was again put to work on the *"Abraham Lincoln,"* and *"Lady Baltimore"* then became relief engine for this service.

A Meccano Enthusiast at Glasgow

Marvels of the Empire Exhibition

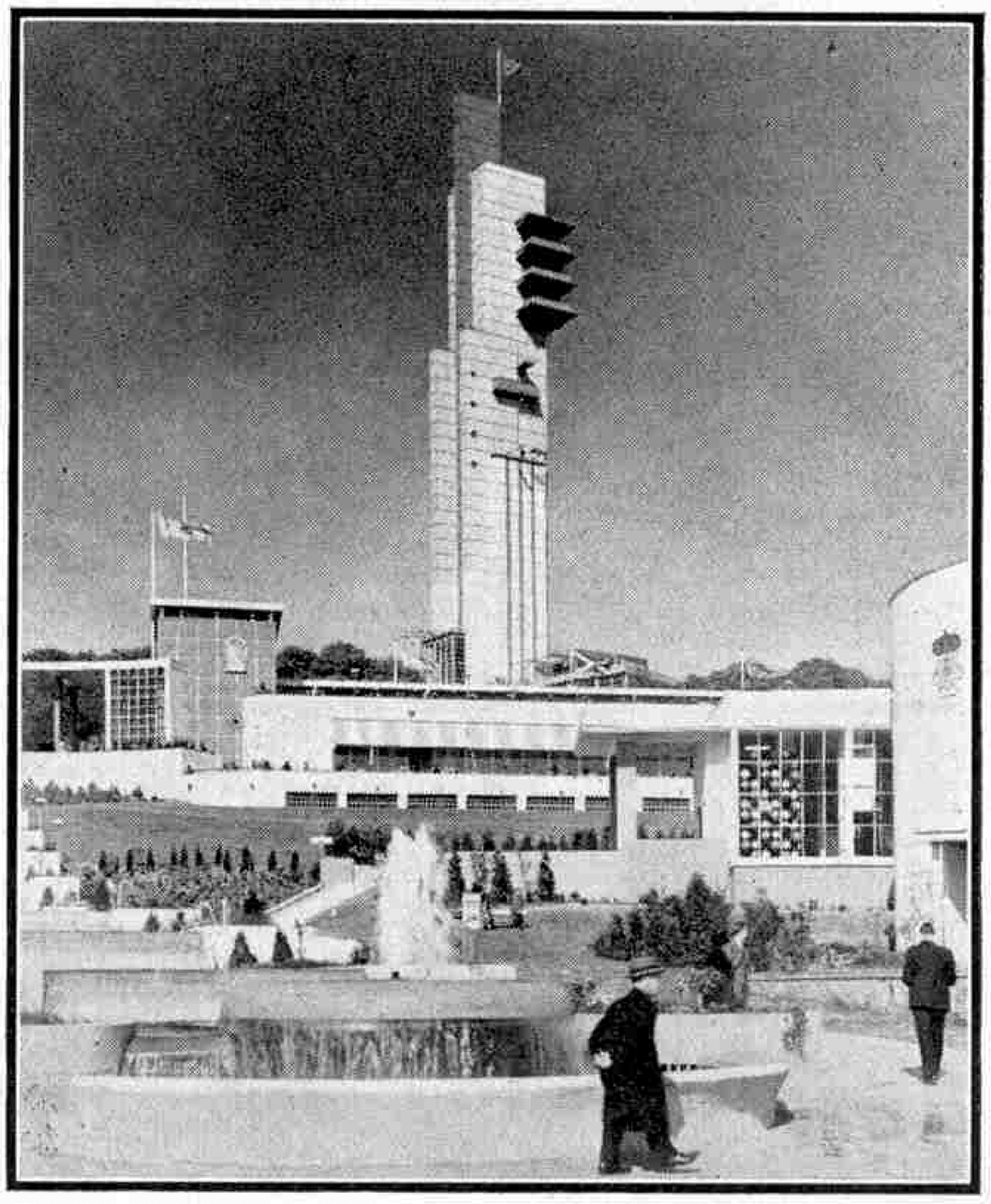
By Garry Hogg

THE Glasgow Empire Exhibition houses nearly 70 separate Pavilions and Palaces, ranging from the giant Palaces of Industries to the compact little one of Burma, but every Meccano enthusiast will make straight for the Palace of Engineering, which lies on your right as you enter by the South Gate. Here you might wander for a week, and still be finding something new and engrossing at every turn.

The Palace of Engineering is so vast that the only way to ensure seeing everything is to walk clockwise round it in a spiral course, refusing to look at any exhibits other than those on your immediate left. In that way you can close in gradually on the centre, where has been installed a complete evaporating and distilling plant for a modern warship. Alongside stands one of the eight high-pressure turbo-feed pumps designed for the new Cunard White Star liner *"Queen Elizabeth."*

Here are some 240 exhibits, large and small. Particularly interesting to model-building enthusiasts is the stand showing scale models of a 250-ton hammerhead crane, a 50-ton fitting-out crane, a 100-ton ladle crane, a level-luffing crane, a tower crane, bascule and rolling bridges, and a riveting machine. The detail work of these models is extremely fine, and it is interesting to note that the firm exhibiting them was responsible for the steel-work of this Palace of Engineering, which itself is as extensive as Buckingham Palace, and is said to be the largest temporary building ever erected.

Not far away there is to be found the first Diesel engine ever built in England, 40 years ago, and still working as steadily and silently as the day it was first started. Turbines, complete and in section; sets of reduction gear, steering gear, pumping and winding gear for every type of craft afloat, can be examined here; and adjacent to these are torpedoes and torpedo tubes, submarine mines whole and sectioned, a paravane with a plan of its method of trawling for mines, anti-aircraft guns, periscopes and range finders—all there to be handled and inspected at close quarters.



The steel Tower of Empire, the outstanding feature of the Empire Exhibition, Glasgow. It is 300 ft. in height, and at night is floodlit.

Opposite this stand are scale models of dozens of famous craft, ranging from a 20-ft. model of the *"Queen Elizabeth"* to a silver model of the tea clipper *"Cutty Sark."* The new *"Mauretania,"* troop-carriers, oil-tankers, paddle-steamers and stern-wheelers; a train-ferry built for the Chinese Government; scale model yachts, gunboats, ice-breakers and submarines; all these are to be found in their cases, and many more, awaiting inspection from keen model-ship builders.

An interesting exhibit alongside is a stabiliser fitted to a sectioned model liner. On deck and in the saloons are passengers and crew. At intervals the vessel is made to rock, and then the stabiliser automatically comes into action. It is interesting to see how the fins emerge and counteract the rolling motion of the vessel under the guidance of the gyroscope, until once again the vessel is on an even keel.

There is, too, a very fine exhibition of locomotives, including "Pacifics" used on the French State Railways. But, to leave this Palace of Engineering for a moment, the best exhibit of this sort is to be found in the British Railways Pavilion, where very fine scale models of the four crack trains—*"The Coronation Scot"* (L.M.S.), the *"Coronation"* (L.N.E.R.), the *"Cornish Riviera Limited"* (G.W.R.), and *"The Southern Belle"* (S.R.)—are to be seen running along a 140-ft. diorama representing typical British scenery. Most interesting of all, perhaps, is the large model goods marshalling yard, in which all the main operations in the handling of mixed goods traffic may be watched. The signalling and switches are all controlled by a hidden operator, so that the effect is of a full-size system.

Back in the Palace of Engineering again, there is an exhibit of wire and hemp rope winding machines at work. Another shows rope-plaiting to avoid spin. Yet another machine is at work reducing a length of phosphor bronze wire .0116 in. thick to the almost unbelievably small gauge of .0024 in. at the rate of 3,000 ft. per min. The wire passes through 15 graduated diamond dies, and when it reaches the last it is so fine-drawn that 11 miles of it weigh barely 16 ounces! This fine-drawn wire is then woven on a loom on the stand, making delicate filters and mosquito curtains. The mesh is invisible without a magnifying glass.

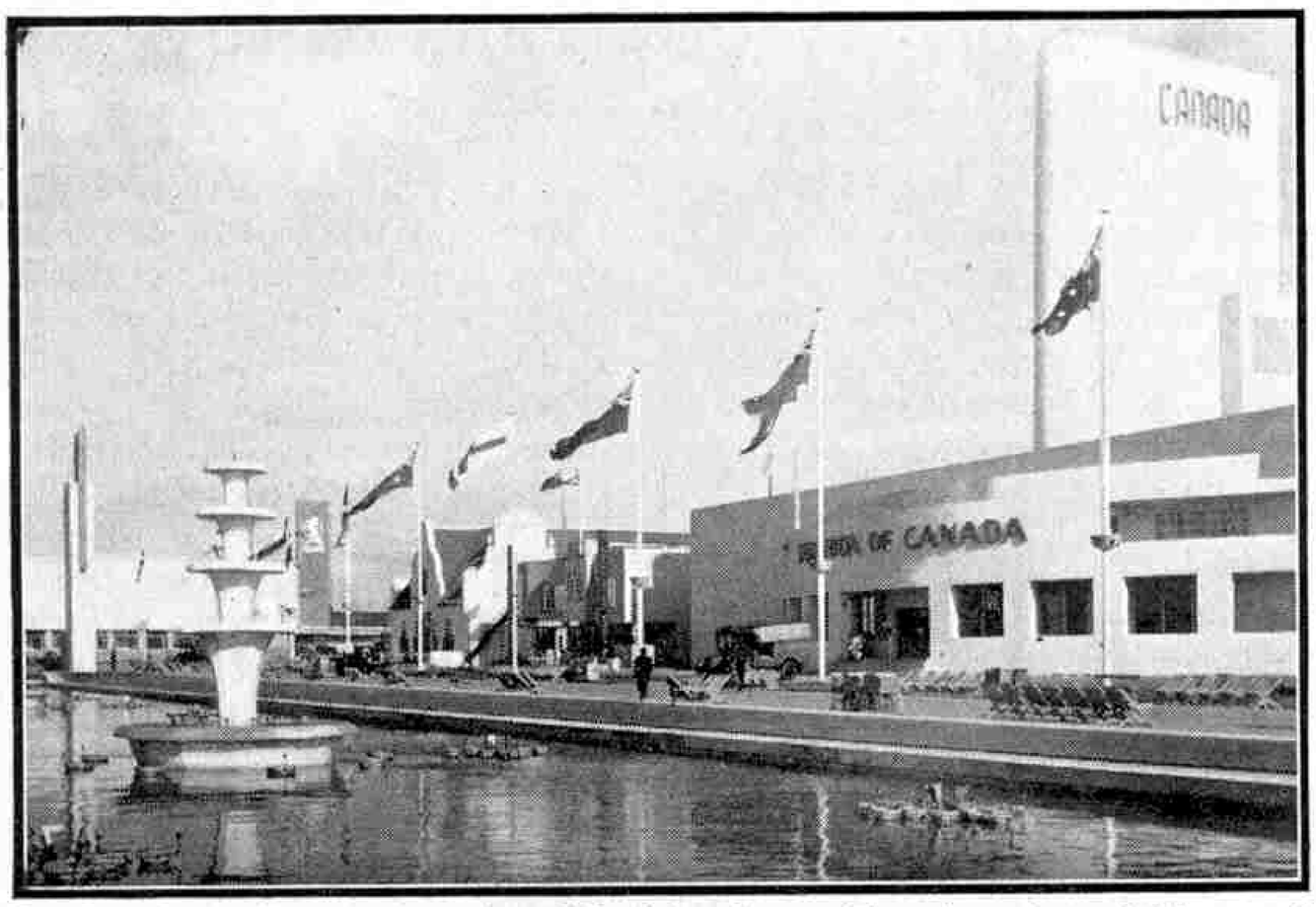
The "still" exhibits are very impressive. One is a model of Britain's largest steel ingot, 230 tons, entering a furnace. In another Pavilion, by the way, there is to be seen a very large working model of a steel-forging press. Here, by a series of switches, the operator can manœuvre the model ingot to and from the furnaces, hammers and rollers, setting each in motion in turn and raising and lowering the ingot on a powerful overhead travelling-crane. Other "still" exhibits are a 30-ton rotor shaft standing alongside a stern frame and propeller shaft bracket; a railway bogie and pair of locomotive crank-axles; a 10-ft. finished propeller, and a 6-ft. driving wheel from an express engine, cut through vertically to show the quality of steel used.

But working models are even more interesting, and there are plenty among which to choose. A model sugar-refining plant and a model laundry stand together; there are working models of belt-conveyors and elevators with sectioned driving gear; there is electric switchgear, colliery winding gear and, surrounded by people with their fingers pressed into their ears, a large working model of a high voltage research laboratory in which sparks 2 ft. long pass between different terminals with a noise like a pistol shot each time. Near at hand there is a gas cutting plant in which you can see a knife-like flame cutting out the intricate pattern of the Empire Lion in metal an inch thick as though it were brown paper.

Before leaving the Palace of Engineering, however, there is a little-advertised stand that no one should miss. Here the Home Office is exhibiting countless ingenious devices for reducing the number of accidents in factories and industry generally. Many types of machine may be handled, all power-driven, and each is fitted with some type of "push-away" guard, a device that gently forces the operator's hands out of the danger zone; or a "remote-feeding" device, or one that automatically arrests the machine if the operator insists on putting his or her hands where they have no right to be. Enthusiasts who have visited the Meccano factory in Binns Road will remember seeing some of these devices in use on stamping and other machinery there.

Second in interest after the Palace of Engineering is probably the Colville-Beardmore Pavilion. More heavy engineering and working models; a 60-ft. propeller-shaft weighing 14 tons, hollow

and polished like silver; rifled gun-barrels for Navy and Army; and a slab of armour-plating that has been "tested to destruction," which means that it was submitted to gunfire many times heavier than that for which it was intended, just to see what it would stand. There are jagged holes in it now that tell of its ordeal. Near it is one of the eight-cylinder Diesel engines fitted to the ill-fated *"R.101"* and rescued from the debris in France after that airship crashed in 1930. An imposing exhibit is a 14-ft. steel plate standing on its edge and surrounded by samples of steelwork of massive gauge that has been deliberately twisted and tied in knots while cold to prove its quality. This Pavilion contains a free cinema where are shown such films as *"The Age of Speed," "The Romance of Engineering," "The World of Steel,"* all worth seeing. Another Pavilion with a free cinema is the Shell-Mex one near by. Films showing the prospecting and finding of oil, well-sinking, pipe-laying, and so on, are excellent, and in the main hall there is a vast model map showing the world's oilfields, with tankers steaming over the seas carrying their important products from port to port.



The Canadian Pavilion, the centre-piece of Dominions Avenue. The entrance is guarded by men of the North-West Mounted Police, known throughout the world as the "Mounties."

It is not far from there to the United Kingdom Pavilion. Here, after the famous "Mechanical Man," the most striking exhibit is probably the very large scale model of a coal mine, sectioned to show every process from blasting and drilling to screening and washing. This wonderful working model will be fully described and illustrated in next month's *"M.M."*

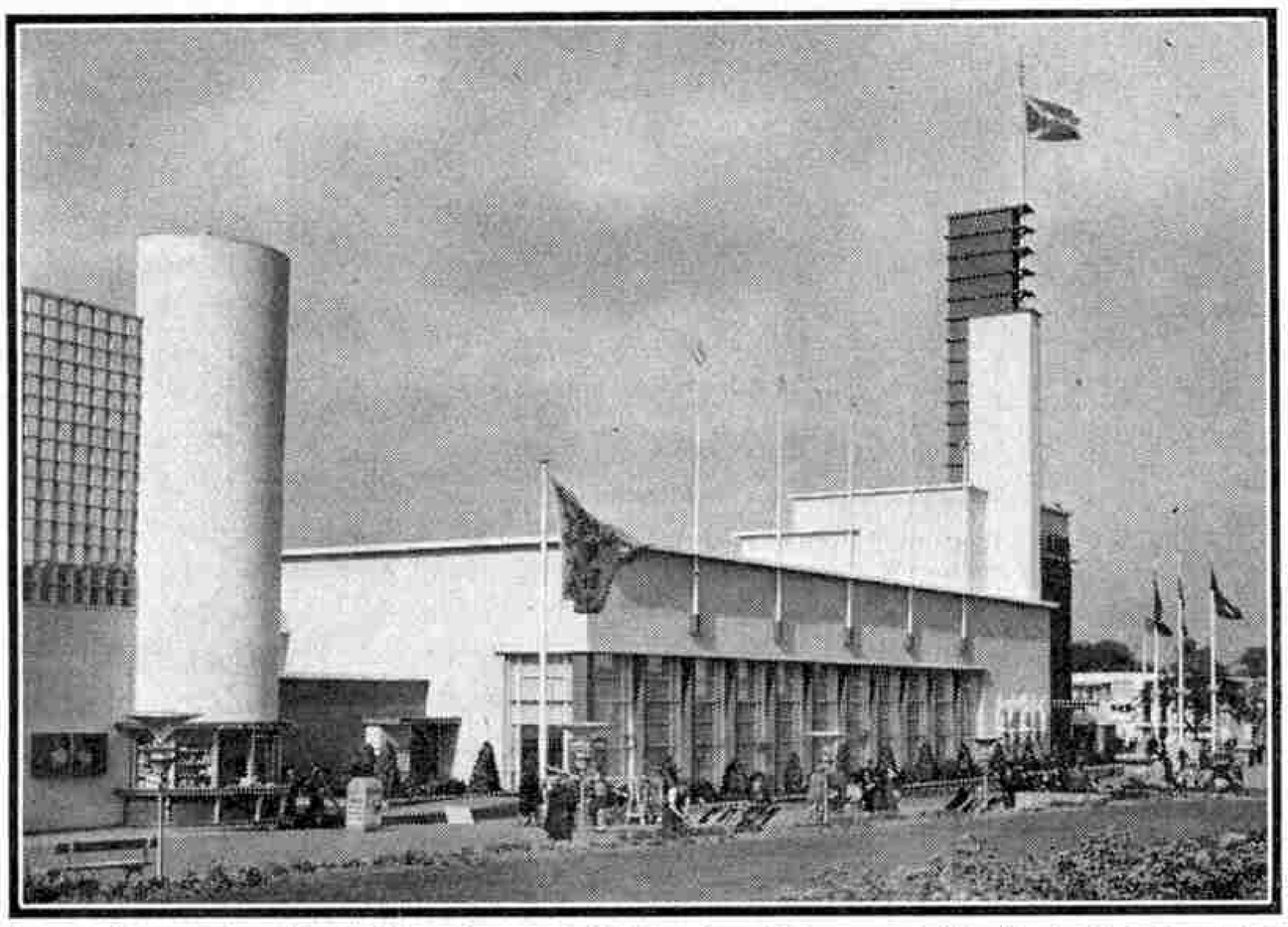
Towering over you as you enter the Pavilion is the full-size wheelhouse, bridge and chartroom of a modern cargo vessel, on which all the instruments may be inspected, while there is a sailor on duty who will answer questions. Down below is a large Yarrow tank containing a complete wax hull fitted with all the mechanism and recording apparatus used at the National Physical Laboratory for testing streamline and the resistance of wind and water. Near it is a small tunnel that is utilised for research work on propellers.

Then there are the two vast Palaces of Industries, the West and the North. They are excellent hunting ground for the boy who always wants to know "how it's done." A full-size bakery plant is continuously at work, showing the whole process from kneading the dough to wrapping the baked loaf at the rate of 30 loaves a minute, and there is hardly a point at which the human hand comes in contact with it. Toffee-making machinery, cigarette rolling and packing, flour milling, paper bag making, packet filling, printing and folding advertisement sheets—all these are on view, and one of the most ingenious of all gadgets to be seen is a little rubber nozzle that sucks up each sheet of paper in turn in order to feed it through to the printing rollers, without picking up two sheets together.

There are many looms at work, weaving blankets, sheets, rainproof material and carpets; there is even a loom weaving spun glass into fabric for insulating walls and boilers. A strange contrast is to be found where, on one side of the aisle, a Scotsman is weaving tartan on a 200-year-old hand loom that looks rather like a Heath Robinson sketch, while on the other side a modern power-driven loom roars and crashes, deafening workers and audience alike. The old Scotsman takes no notice whatsoever. Glass-blowing is to be seen; a machine is stamping the eye in needles at a tremendous rate—you might be surprised to learn that it takes three weeks to make a needle; and you can inspect the watch that was tied to a driving-wheel of the *"Royal Scot"* on a run from London to Glasgow.

Even now there are some 50 or 60 Pavilions to be explored, each with an afternoon of interest in it. In the Rubber Pavilion you can inspect the de-icers that are fitted to many aircraft to-day; in the Service Pavilion is one of the Hawker "Hurricane" bombers, similar to the one that recently flew from Edinburgh to London in 48 minutes. In the Colonial Pavilions there is a large model of the recently completed Singapore Airport, which was built on land reclaimed from malarial swamps. The Coal Pavilion has exhibits of ancient and modern coal-winning gear; the Shipping Pavilion has a huge model of the Mersey Docks containing scale model ships 2 ft. long that mysteriously approach, pass through dock-gates, berth, and set sail again without human agency. And several Pavilions have teleprinting apparatus in which news dictated into a machine in London is automatically coded, wired to Glasgow, decoded and set up in type on Linotype machines without the intervention of human beings—perhaps one of the most amazing inventions of modern times.

The first thing you see as you approach the Empire Exhibition is of course the 300-ft. Tower. Slim and tall, it stands on a hill exposed to all the winds, and to make sure of its stresses it had to be embedded in a 3,200-ton block of concrete. From its summit on a clear day you can see 80 miles. To the north-west it is possible to see the *"Queen Elizabeth,"* a sister-ship to the *"Queen Mary,"* in the shipyards on the Clyde. A lift carries you from the top to bottom of the Tower in 31 seconds, which is fast enough for anyone!



One of the two Scottish Pavilions in the Exhibition, in which are exhibits illustrating the living industries of Scotland as well as the country's history.

The Pavilions of the Dominions are full of interest. The most striking feature of the Canadian exhibit is a map of Canada over 1,000 sq. ft. in area; it is painted on burnished Canadian copper, weighs a ton and is illuminated by an ingenious electrical device. The Australia Pavilion has a magnificent working model of Sydney Harbour and its famous Bridge, and the reproduction of an old Dutch homestead that is the South Africa Pavilion shows a great range of products of the Union, including raw and cut diamonds that make the eyes sparkle.

Among all these Palaces and Pavilions it is easy enough to lose your way, but the Tower stands up on its hill like a sailor's landmark, and is a splendid guide. To north and to south of it all day long two great cascades of water tumble towards the main gateways, and by night these are cunningly floodlit with changing coloured lights. The Tower too, is floodlit, and you will be well on the road for home before it fades out of sight behind you. But long afterwards the memory of the great Exhibition will remain with you as a little world gathered together, complete in every detail, for your delight.

Jubilee of the Pneumatic Tyre

The Story of a World Famous Invention

THE invention of the pneumatic tyre in July 1888 was the most important event in the history of modern transport, for without it there could have been none of the comfortable bicycles, speedy motor cycles and motor cars, and aeroplane wheels of to-day. It was a product of the genius of John Boyd Dunlop, a Scottish veterinary surgeon working in Belfast, and the jubilee of the application for the original patent is being celebrated this month.

Dunlop was born in 1840 in the small village of Dreghorn in the County of Ayrshire. His father was a farmer, but he himself had other ambitions. He was chiefly interested in animals and the illnesses that affect them, so he entered the Royal Veterinary College at Edinburgh and there qualified as a veterinary surgeon by the time that he was 19 years old.

Three years later he settled down to a practice in Belfast. He soon achieved a local reputation, and at the age of 40 he was a well-known and respected figure in the district, with little to indicate, however, that one day his name would be a household word throughout the world.

Much of Dunlop's time was spent driving along country lanes in his small dog-cart as he paid his professional visits to various farms. Like most vehicles at that time, his cart had plain iron wheels, and as he bumped along the hard roads he often wondered whether it was not possible to devise a means of making travel more comfortable. There were solid rubber tyres even then, but their coming had brought with it little advance in this respect.

He considered the possibilities of spring wheels, which at first seemed the likeliest solution of his problem, but investigation soon destroyed his hopes in this direction. Then came the idea of an air-filled rubber tube to act as a buffer between the rim of the wheel and the road. Dunlop was not the first to hit upon this possibility. As early as 1845 an Edinburgh civil engineer named Thomson had devised what he described as an "aerial wheel," which consisted of sections of leather laced together and equipped with an air container made of fabric that had been soaked in rubber solution. He fitted this tyre to an engine that was used for hauling sugar cane in Jamaica. This invention really came too soon, for rubber was then a costly luxury and as neither motor cars nor bicycles were in existence, there could have been little demand for his device.

Dunlop was more fortunate. He knew nothing of Thomson's tyre when he began his experiments in the autumn of 1887, and from the outset he met with success.

John Boyd Dunlop with the bicycle on which his earliest pneumatic tyres were fitted. Photographs by courtesy of Dunlop Rubber Co. Ltd.

His first pneumatic-tyred wheel was a strange contrivance. With a piece of sheet rubber 1/32 in. thick he made a tube, inserting at the junction of the two ends a small air pipe like that of a football. This was inflated with a pump and the pipe secured with a piece of string. It was then fastened to the rim of a wooden disc 16 in. in diameter by means of strips of linen nailed to the wood.

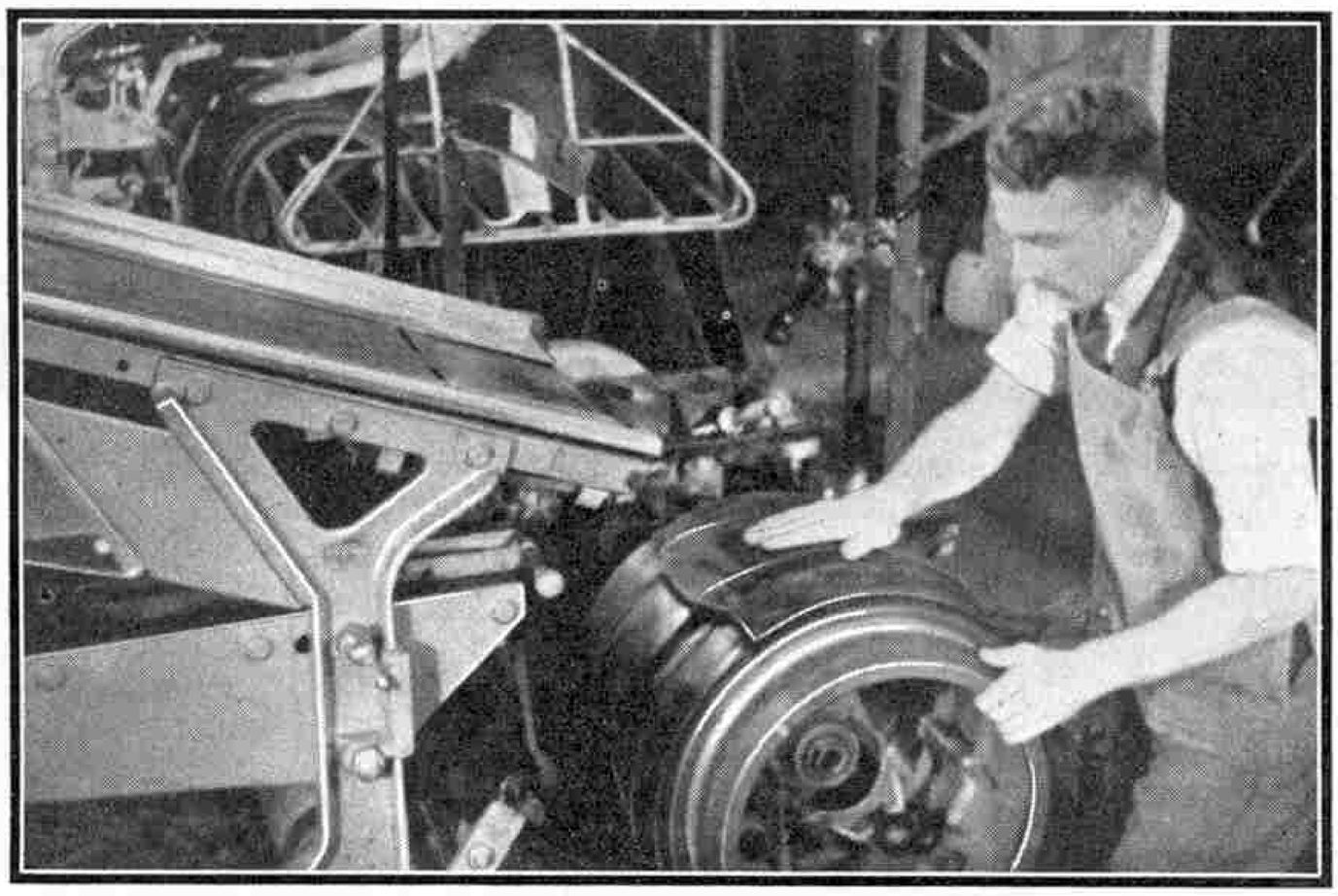
The first experiment in "riding on air" was carried out with this strange wheel in the yard behind his workshop. Dunlop detached the front wheel from his son's tricycle, and sent it rolling on its solid rubber tyre down the yard. Before it had gone very far it wobbled and fell over. Then he repeated the experiment with the disc fitted with his pneumatic tyre, using the same force, as far as he could judge, with the result that the new wheel covered the length of the yard and rebounded from the far wall.

This test convinced Dunlop that he was on the right track, for it proved that even the first crude pneumatic tyre was superior to the best solid rubber wheel, both in respect to speed and smooth running. He was therefore encouraged to carry his experiments further. He took two strips of elm wood, each 9 ft. long, 3 in. wide and $\frac{1}{4}$ in. thick, and bent them into hoops about 3 ft. in diameter, riveting the ends together. Two tyres were then constructed, the inner tubes of which were enclosed in strong canvas covered by a rubber tread of graduated thickness. They were attached to wooden rims which were then fitted in place of the ordinary rear wheels of his son's tricycle.

It was late at night on 28th February 1888 when the wheels were ready, and Johnny Dunlop immediately went out in the moonlight on his tricycle for a run, the first ever made on pneumatic tyres. This showed that the machine fitted with the new tyres was faster and very much more comfortable than before, and an examination next morning showed that the tyres would wear well, for they had no scratches or marks of any kind on them.

Dunlop now decided that his invention had some commercial importance, although he never for a moment realised just how valuable it was, and on 23rd July he applied for a patent for "an improvement in tyres for wheels for bicycles, tricycles or other road cars." The exact description of his device was a hollow tyre or tube made of indiarubber and cloth, or other suitable material, said tube or tyre to contain air under pressure or otherwise and to be attached to the wheels in such a manner as may be found most suitable."

Many experiments were carried out under Dunlop's supervision to improve the invention, and about 100 tyres were made for the trials. One of the innovations was that of cementing a strip of rubber into the bed of the metal rim of the wheel to prevent the rubber tyre from chafing. The next step was to arrange for the manufacture of bicycles fitted with pneumatic tyres, and this was at first undertaken by the local firm of W. Edlin and Company. Their machines proved an immediate success and gradually Dunlop's fame spread. It is interesting to record that the first bicycle that was ever fitted with a pneumatic tyre was ridden for 3,000 miles without a single puncture, or without removal of the tyre from the rim. It is now in the Royal Scottish Museum at Aberdeen.



A scene at Fort Dunlop, showing the building up of a pneumatic cover casing by the addition of rubber cord fabric in long diagonal strips, known as "plies."

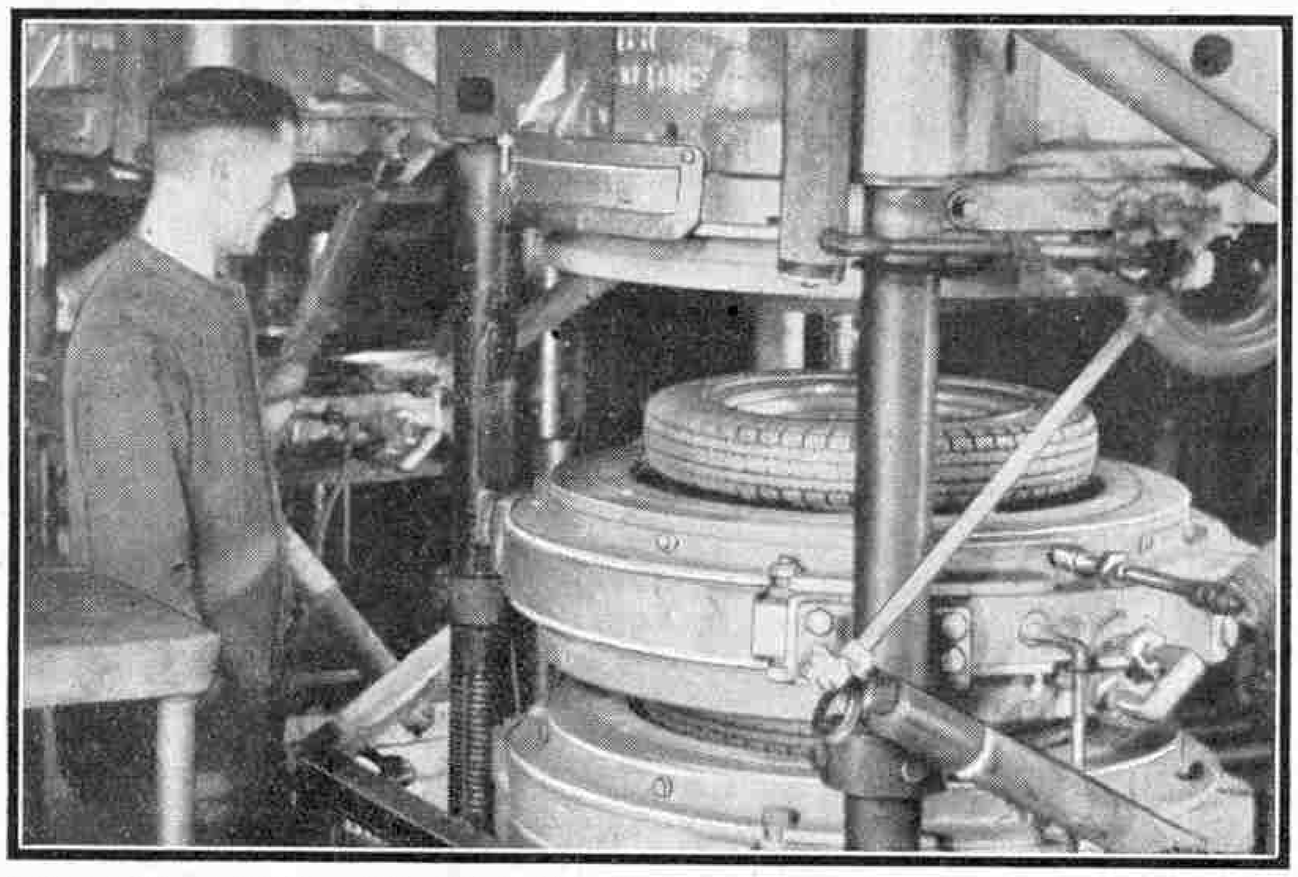
The reception given to Dunlop's invention was by no means entirely favourable. Many people doubted its value, and cycling journals for some time vied with each other in pouring ridicule upon it. "Bolster" and "sausage" were two of their mildest terms of derision, but its superiority over any other tyre was soon demonstrated in a way that could not be disputed.

Towards the end of 1888, Dunlop invited several well-known racing cyclists to examine a cycle fitted with his pneumatic tyre. They were not convinced of its possibilities, however, save for one rider, William Hume, captain of the Belfast Cruisers' Cycling Club. Hume had recently been involved in a serious accident and had determined to retire from racing, but he was so impressed with the superior qualities of machines fitted with Dunlop tyres that he decided to ride one of them in the cycling contests in the Belfast Queen's College sports meeting held on 16th May 1889.

Hume's lone pneumatic-tyred bicycle aroused great amusement when it was seen among the solid-tyred machines of other competitors. It was variously described as a "steam roller," a "mud cart" and a "pudding wheels," and its rider's chance of victory in any of the races was regarded as negligible. Hume ignored the chaff that greeted him, and startled the spectators by winning with a good margin the first race in which he competed. Later, when he was an easy victor in three other races, beating some of the best-known racing cyclists in Ireland, amazement gave way to enthusiastic applause.

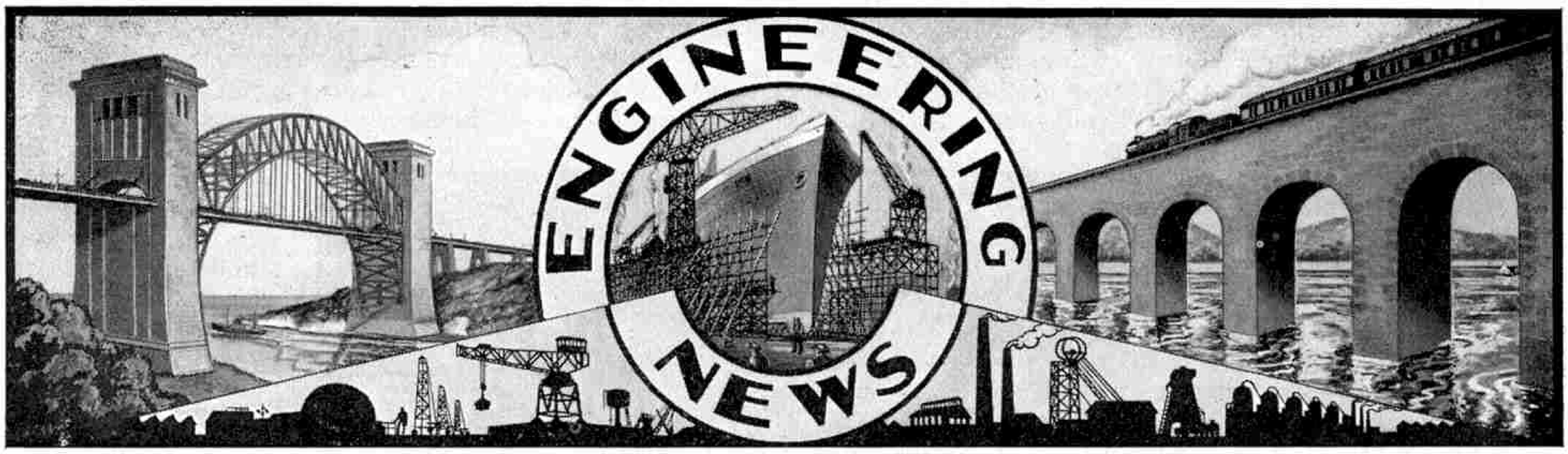
The efficiency of the new tyre was thus placed beyond question. Among the competitors defeated by Hume were three sons of H. du Cros, a Dublin business man who was so greatly impressed by the Dunlop tyre that he purchased the patent rights for £500 and £3,000 worth of shares in a company that was to be formed to manufacture the tyres. The company was founded in the same year and was known as the Pneumatic Tyre Company. In setting out the advantages of the tyre, its prospectus described it as "indispensable for ladies and for persons with delicate nerves," and on the strength of this claim no doubt large sales were expected. These expectations were more than fulfilled. Spectacular race victories on Dunlop-tyred machines in the next few years were the best possible advertisements and the popularity of the tyre spread rapidly.

The original factory soon proved far too small to meet the increasing demands, so a move was made from Dublin to Coventry, the centre of the cycling industry. The new premises in their turn became inadequate and the second move to Aston Cross in Birmingham resulted. The Company's amazing expansion continued and in 1916 it was found necessary to purchase 400 acres of land at Erdington in Birmingham to build there one of the largest factories in England. This factory has almost the dimensions of a small town and is known as Fort Dunlop.



In one of the vulcanising departments. The electrical vulcanising pad has been opened, and the vulcanised cover is about to be removed for final processing and inspection.

One factor in the growth of the firm was the coming of the motor car, and without Dunlop's tyre there would have been no motor cars on our roads to-day. It is difficult to realise that up to 1896 the maximum speed for a self-propelling vehicle was fixed by law at 4 m.p.h. All such vehicles had to be preceded on the road by a man on foot carrying a red flag. Even after this regulation was withdrawn, however, the progress of motor transport was slow. Early this century the Dunlop company began to make pneumatic tyres for motor cars, however, and by 1902 a car equipped with them had established a world record of 80 m.p.h.



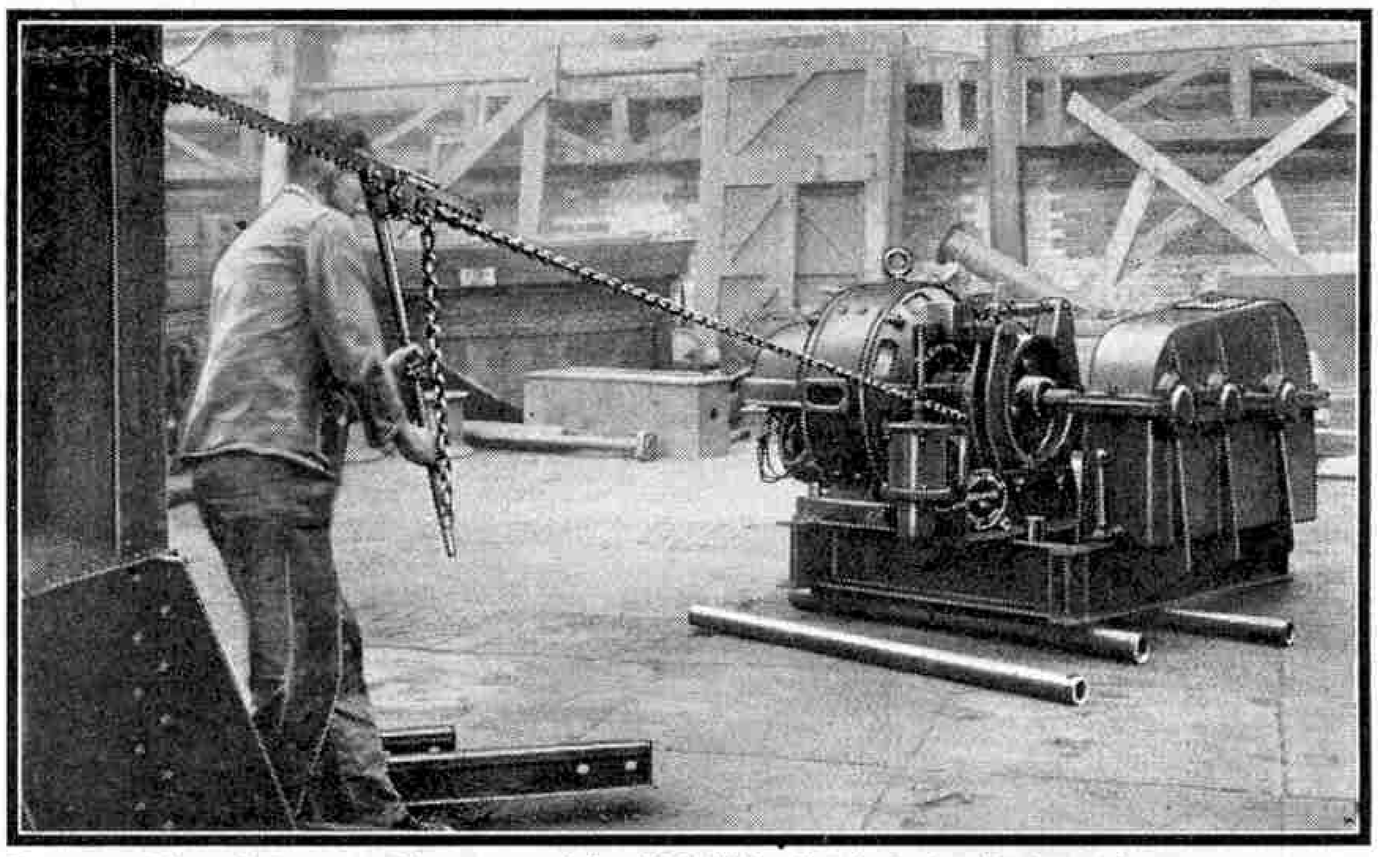
Hauling Jack for Heavy Loads

A powerful hand-operated device for moving heavy loads has recently been introduced by Hadfields Ltd., Sheffield. The appliance is known as the "Sylat" hauling jack. The claim is made that it is far more adaptable than pulleys and blocks for moving heavy bodies, and it can be used in places that are difficult of access and where other types of hauling gear would be unsuitable. The illustration on this page shows a heavy load being moved with its aid.

The appliance consists of a rack bar, one end of which is anchored to any convenient permanent support, such as the girder shown in the illustration, by means of the short chain provided. Another chain is secured to the object to be moved, and one of the links at its free end is then dropped into a recess provided for the purpose in a sliding block mounted on the rack bar. The sliding block is fitted with a pawl operated by a spring, and this engages with the rack teeth and prevents the block slipping back. Pulling is effected by means of a long handle, which is mounted on the sliding block by means of a short swinging link and is provided with a pin that engages with the teeth of the rack.

If it is necessary to continue the pulling operation after the chain block has travelled as far as it can go, the pawl is disengaged by lifting a catch and the block is then free, so that it can be slid back along the bar and another length of chain taken up. A useful accessory known as Day's Patent Attachment is available for use with the jack. The purpose of this is to prevent the load falling back should there be any danger of this happening when the chain block is released preparatory to taking up another length of chain.

The jack can be put to a wide variety of uses, among which may be mentioned the hauling for short distances of machinery and other heavy loads, the movement of large pieces of rock, the erection and dismantling of buildings. It is useful also for such special work as uprooting tree-stumps, and pulling piles back to a vertical position if they lean over during driving operations, and a variety of other jobs such as removing boiler tubes.



Heavy machinery being moved by means of the "Sylat" hauling jack described on tnis page. These jacks are manufactured by Hadfields Ltd., Sheffield, to whom we are indebted for our photograph.

Artificial Sunshine from New Vapour Lamp

American scientists working in the laboratories of the Westinghouse Electric and Manufacturing Company have produced a new vapour lamp that gives a light closely resembling that of the Sun. In it use is made of tellurium, a semi-metallic element similar in many respects to sulphur.

The lamp used in these experiments is in the form of an inverted U-shaped bulb containing neon gas. The leads enter the two limbs of the tube, which contain tellurium, and when the lamp is in action, there is a pool of molten tellurium in each limb. The temperature at the electrodes varies between 1,300 and 1,500 deg. F., which is more than twice that at which lead melts, and the bulb therefore is made of quartz, for ordinary glass would be melted.

There does not appear to be any immediate prospect of the tellurium vapour lamp being put to practical use, as several difficult technical and manufacturing problems still remain to be solved.

Pumping Water Over Mountains

Water from Boulder Dam, in the United States, will be lifted over the mountains to Southern California by six of the largest pump-driving motors that have yet been built. Each motor will develop 12,500 h.p. and will drive a centrifugal pump capable of dealing with about 200 cu. ft. of water per sec. The motors are being built in the famous workshops of the Westinghouse Electric and Manufacturing Company, at East Pittsburgh.

A Novel Method of Riveting

A new form of rivet, specially designed for use in confined places where it is difficult or impossible to get at the shank to form a head, has been introduced by a German firm. The new rivet is similar in appearance to an ordinary one, except that there is a longitudinal hole in the lower part of the shank, which is filled with a small amount of explosive material. When the rivet is in position the charge is exploded by holding an electrically-heated dolly to the head. The force of the explosion expands the end of the shank, and thus fixes the rivet securely in the hole.

Cooling the Air in London Tubes

Some interesting experiments are being carried out in efforts to obtain better control of the temperature in the London tube railways. At Trafalgar Square station special apparatus ejects water into the atmosphere in a fine invisible spray, and in the ensuing vaporisation heat is absorbed from the surrounding air, thus lowering its temperature. The cool air is forced along the north-bound tunnel by trains running to the station.

At Tottenham Court Road station a large refrigerator fitted in a disused lift shaft is to circulate a cold fluid through a system of pipes, and electric fans working behind ventilating grids will blow the cool air thus produced into the station.

Erecting the World's Tallest Building

A huge building 1,300 ft. high that is to be built in Moscow will be the tallest in the world. It will be known as the Palace of the Soviets, and will be 52 ft. higher than the Empire State Building in New York City.

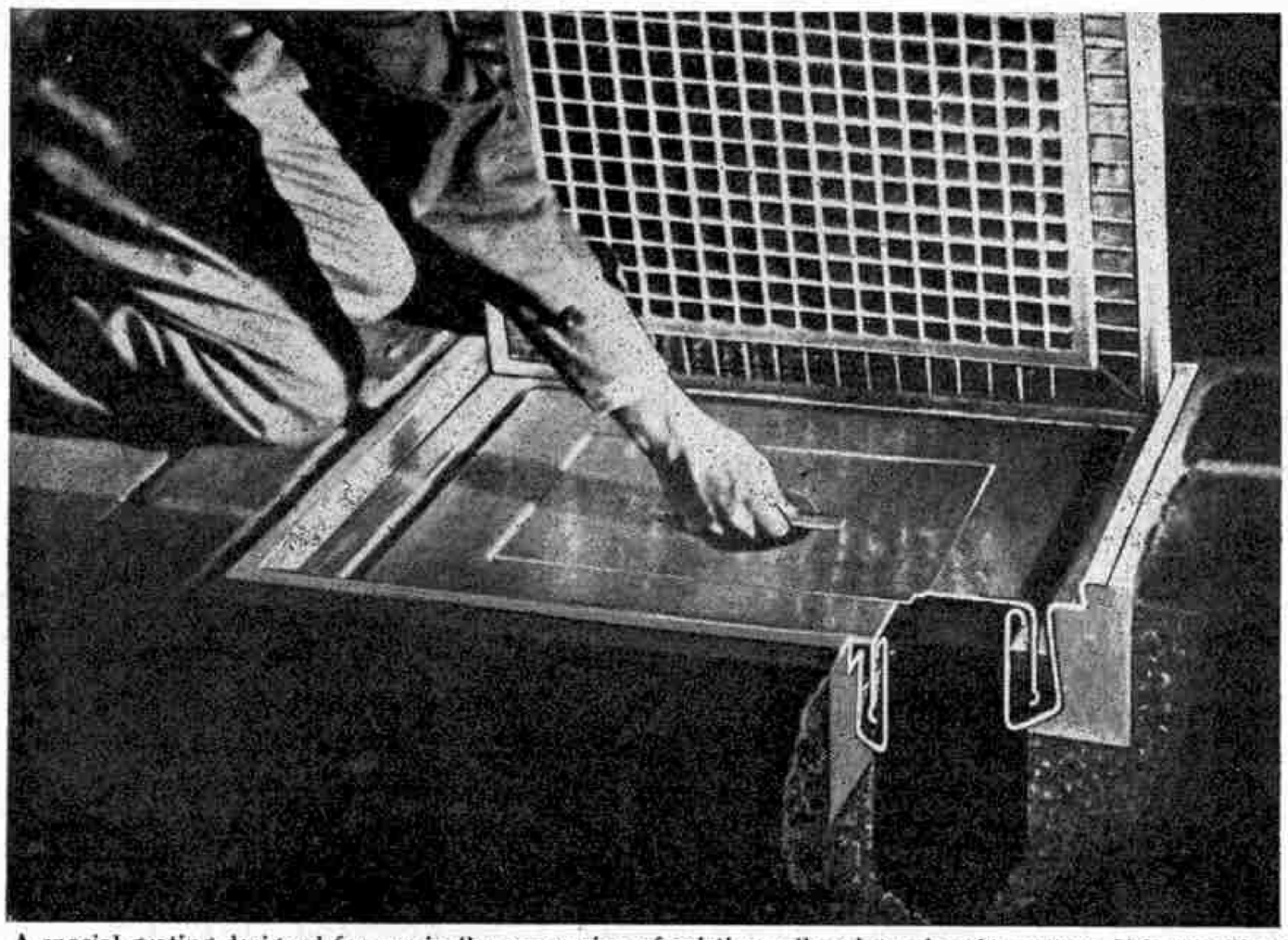
The Palace will stand on the bank of the Moscow River, and will be crowned by a gigantic statue of Lenin, 328 ft. in height. The foundations have already been completed, and 63,000 tons of concrete were used in this part of the work. On this base have been placed 64 reinforced-concrete girders, each weighing 1,000 tons, and these will carry the entire weight of the superstructure, which will amount to about 650,000 tons. One of the features of the Palace will be a gigantic theatre capable of seating 20,000 people.

Gas-Tight Grating for Air-Raid Shelters

The upper illustration on this page shows a special pavement grating that has been introduced for use in converting existing cellars into efficient air-raid shelters. The device is already installed in many parts of Germany, where it originated, and is now being manufactured in this country by the Solent Engineering Company Ltd., London.

The grating rests in a recess in the pavement, and is provided with a stepped gutter of rectangular outline and a welded and riveted grill. When in place, it normally forms a substitute for the usual pavement light of the ventilated type, but a sealing bell in the form of an inverted shallow tray can be fitted quickly below it to make the opening gas-proof, the edges of the bell passing into the gutter provided in the frame. This gutter is filled with water, and then gives an effective gas lock.

Both the bell and grating can be locked in position from the inside in order to prevent unauthorised entry, and the device can be used as an emergency exit. When the grating is installed all the remaining ordinary pavement lights of the cellar can be sealed up and made gas-tight.



A special grating designed for use in the conversion of existing cellars into air raid shelters. It incorporates a gas tight seal. Photograph by courtesy of Solent Engineering Co. Ltd., London.

Giant Bearings for Water-Wheel Generators

More than 6,500 gallons of oil will be used to cool two giant bearings of the generating plant at Pickwick Landing Dam power station in the Tennessee Valley, U.S.A. The bearings will carry the weight of the moving parts in the 48,000 h.p. generators and water-wheels, and they are the largest of their type in the world. Each is 8 ft. 9 in. in diameter, and in shape resembles a giant washer, with an under surface of highly polished cast iron. The polished surface rests on 10 bearing shoes, and the whole is submerged in a bath of oil, which forms a film between the working surfaces.

Although the rotating parts literally float on oil, a small amount of heat will be generated in each bearing, and this will be dissipated by immersing in the oil coils through which cold water will be circulated at the rate of about 100 galls. per min. The total load on the bearings will be about 1,250 tons.

Record Steel Production

A 300-ton tilting furnace of the United Steel Companies Ltd. installed at the works of the Appleby-Frodingham Steel Company Ltd. recently produced 2,800 tons of steel ingots in one week. This is believed to be a record output for the time from a furnace in this country.

World's Highest Cable Railway

The Aiguille du Midi cable railway on Mont Blanc, which at present conveys passengers to the point called Les Glaciers at an altitude of 7,973 ft., is to be extended to the Col du Midi, the greatest height to be reached being 11,890 ft. The railway then will be the highest of its kind in the world.

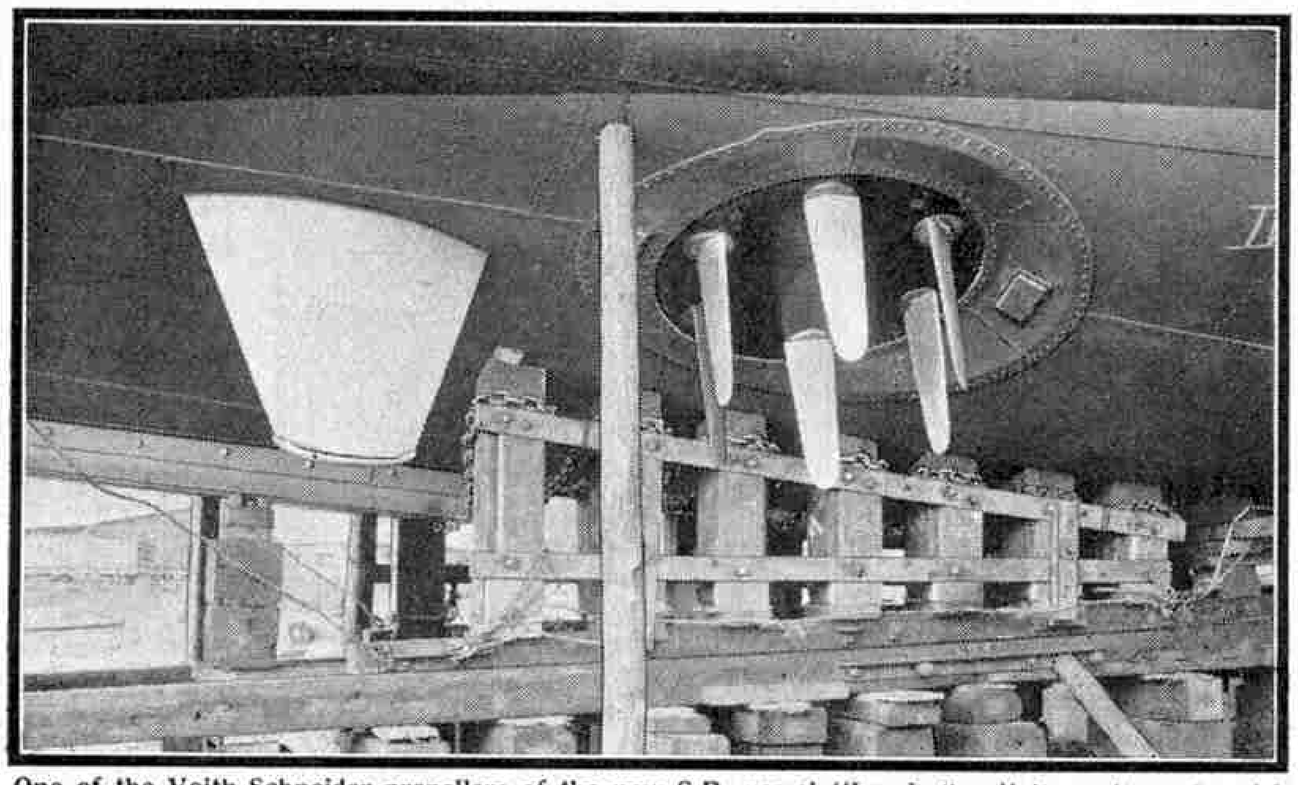
The undertaking will be difficult, for the extension will be entirely in the glacier region, where it is only possible to work between June and October and where operations are liable to be hampered by severe snowstorms. The first step will be to lay a wire for hauling up cables to be used for the transport of men and materials. This work will be carried out by means of an aeroplane, from which the wire will be paid out along the Col du Midi. The towers and stations at each end of the route will then be erected, and finally the cables for working the line will be installed. The cost of making the extensions now to be undertaken will be about £40,000, and since work can proceed only during the summer season, it will be at least two years before the task is finished.

How the "Crab" Ship's Propellers Work

The lower illustration on this page shows one of the two Voith-Schneider propellers fitted to the new Diesel-engined S.R. ferry boat *"Lymington,"* which was described and illustrated on page 323 of last month's *"M.M."* This vessel is commonly known as the "crab" ship, because her propellers can move her sideways as well as ahead and astern. She can indeed be moved in any direction by the use of the propellers alone, and no steering gear therefore is necessary.

The Voith-Schneider propeller consists of a horizontal disc to which six vertical blades are attached. In action the disc is rotated, carrying the blades with it, and in addition these are turned on their own axis. During one part of their movement the blades are so placed as to present the smallest possible area to the slipstream, but for the rest are turned into the position that gives the maximum thrust against the water in the direction required. At this point they act in a similar manner to paddles. Changes in the direction of the vessel are made by altering the point at which the blades are turned broadside on to give the propelling thrust.

The *"Lymington"* actually can turn on her own axis, for she has one propeller forward on the port side, and one under the stern on the starboard side. Thus the head of the vessel can be turned to one side while the stern is moved in the opposite direction.



One of the Voith-Schneider propellers of the new S.R. vessel "Lymington," the action of which is explained on this page. Photograph by courtesy of Wm. Denny and Bros. Ltd., Dumbarton.

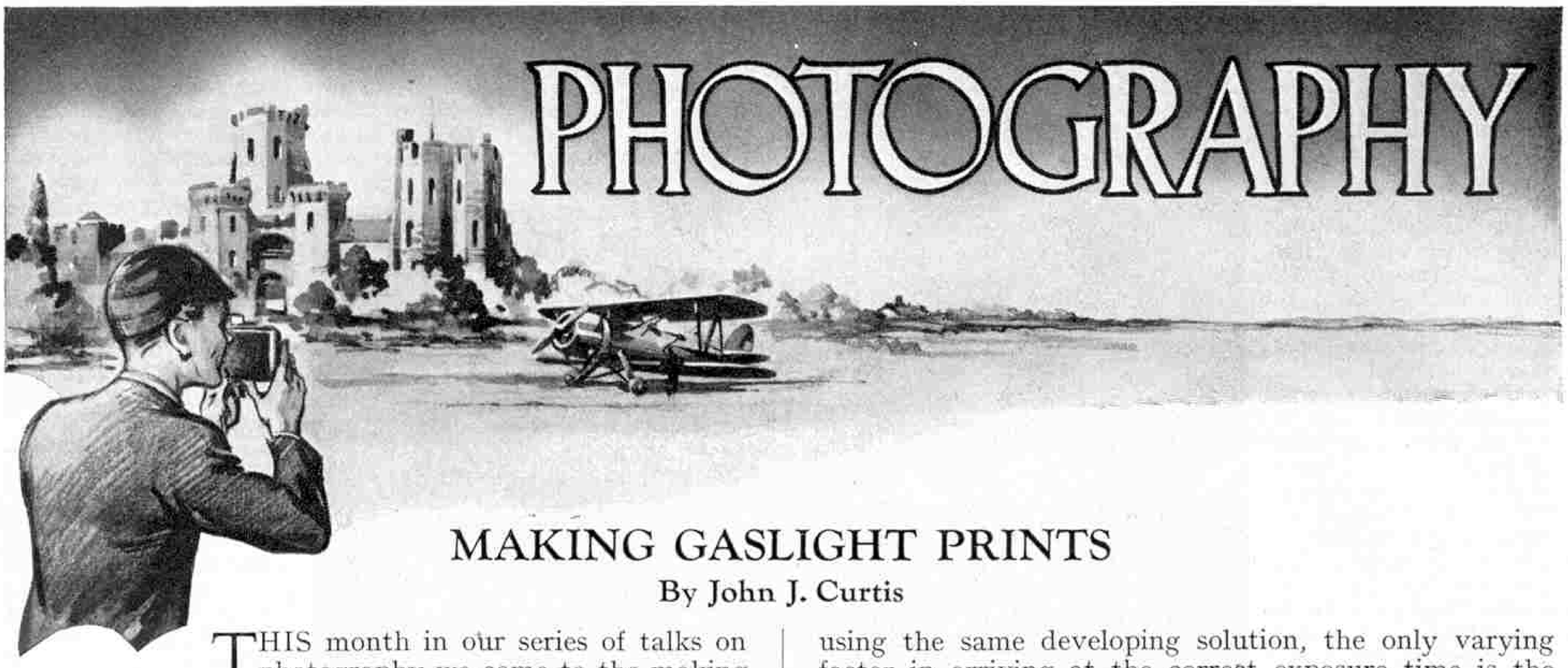
Repainting a Famous Bridge

The Royal Albert Bridge, Saltash, which was built in 1859 by I. K. Brunel, the famous engineer, is being cleaned and repainted. This huge bridge carries the G.W.R. over the River Tamar, and forms a link between Devon and Cornwall. It is nearly half a mile in length and is 180 ft. above the water level.

The painting of the enormous structure will take nearly a year to complete, and the bridge will then be heavier by the application of 10 tons of paint and 200 gallons of coal tar!

The most difficult parts to deal with will be the tubular trusses that form the two centre spans. Each is 455 ft. in length, 16¾ ft. wide and 12¼ ft. high, and the men who paint these and similar parts of the structure will be let down from the top in boatswain's chairs. Three coats of paint will be applied to the bridge, and the total area to be covered is about 39,000 sq. yds.

The bridge was opened on May 3rd, 1859. It took four years to build and carries the only remaining single line section of the G.W. line between Paddington and Penzance.

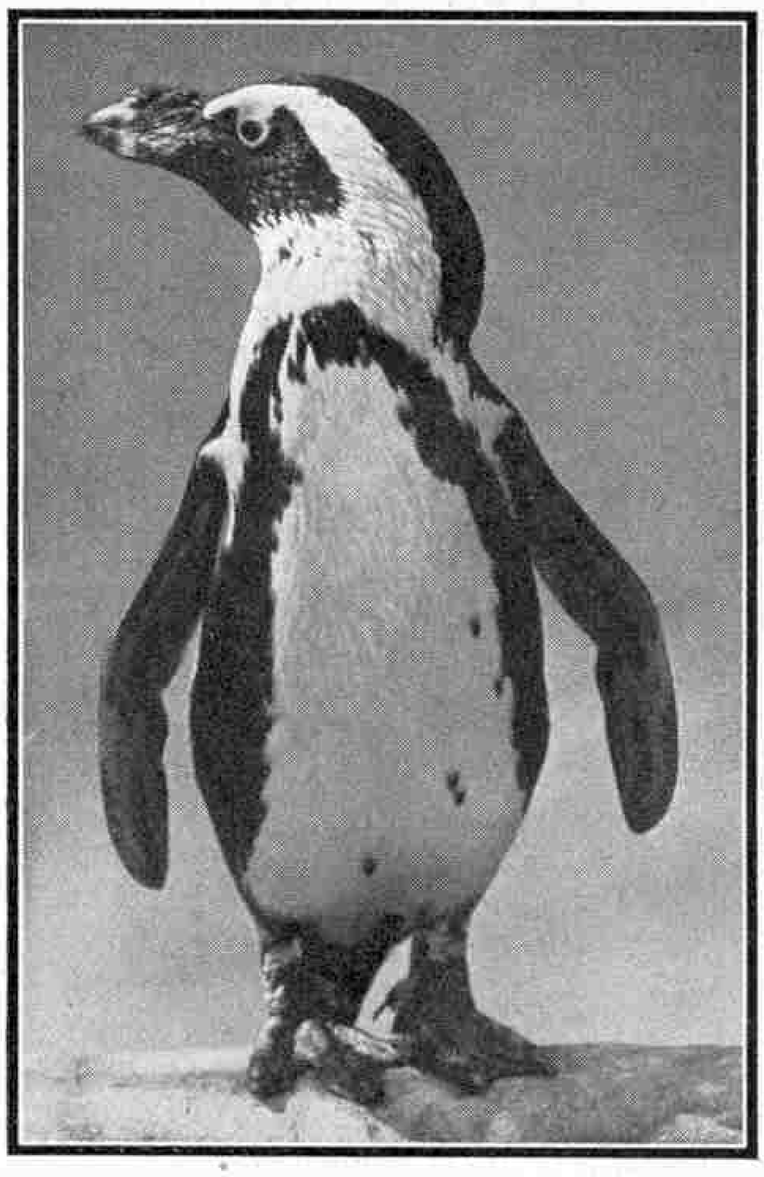


MAKING GASLIGHT PRINTS

By John J. Curtis

THIS month in our series of talks on photography we come to the making of prints, the last and most exciting stage of doing one's own photography. Every boy who has sent a roll of film to a chemist to be developed and printed knows the almost unbearable suspense of awaiting the results, but the thrill of receiving a wallet of finished prints is not to be compared with the excitement of seeing a picture actually appearing on the printing paper before one's own eyes. Incidentally, making one's own prints is quite simple. There are right and wrong ways of doing the job, of course, and in this article we give some practical hints on how to do it successfully without wasting time and material. Any reader should be able to turn out two or three dozen prints in an evening with scarcely a failure.

There are several different types of paper used for making photographic prints, but this month we are concerned only with that type known as "gaslight" paper, and we can imagine that the first question readers will ask is "Why 'gaslight' paper? After all, most people use electric light." The name was adopted to distinguish this printing paper from other types used for printing by artificial light. Earlier forms were very fast in operation and their safe use was dependent upon the use of a dark room. Gaslight paper was introduced to meet the need for a slower printing material that could be used under ordinary home conditions. It is not essential then to have a dark room to print with gaslight paper.



"Eyes Right." This perky penguin study by A. B. Bishop, Bristol, was awarded First Prize in the A Section of the May Photo Contest.

The only necessary equipment consists of the same two dishes that were used in developing the film, a printing frame fitted with a piece of clear glass, and a work table placed at least eight or nine feet away from the light, preferably in a corner of the room.

The secret of consistent success in making prints is to standardise the work as far as possible. If one makes a practice of using the same strength of light, of placing the printing frame at the same distance from the light, and of using the same developing solution, the only varying factor in arriving at the correct exposure time is the "density" of the negative, its degree of resistance to the passage of light. A "dense" negative is dark and has few areas of clear glass—light passes through it slowly. A "thin" negative has few dark patches and possibly large areas of almost clear glass—light passes through quickly. A normal negative is one in which dark and clear areas are approximately equal. These dark and clear areas represent light and shade respectively in the finished print.

The exposure time for a normal negative placed 18 in. from a 60 watt lamp is eight seconds. Obviously we cannot give exact times for "dense" and "thin" negatives, for the correct time must vary according to the individual negative. For a dense negative it will be longer than normal, possibly 12 seconds; for a thin one less, say six seconds.

We have found it a good plan, when printing batches of negatives to sort the individual films into these three groups and to print all negatives of one group first and the others in succession. Such a plan amounts to an attempt to standardise the negatives. It does simplify the judging of correct exposure times and it is surprising how quickly experience is gained.

For developer we recommend Metol-Quinol made up in handy form by Johnsons or Burroughs Wellcome. The acid fixing bath is the same as that used in the fixing of films described last month. One little tip to remember in making the acid fixing bath is to pour the powder slowly into the water, stirring carefully all the time. It will dissolve quite readily if treated in this way. If the water is poured on to the powder it has a knack of setting into a solid block that takes quite a long time to dissolve. The developing and fixing solutions, by the way, can be made up in quantities sufficient for several evenings' work, as they will keep quite well if kept in tightly corked bottles.

Now let us imagine that we are making our first print together. First of all we must place the negative in the

printing frame with the emulsion side upwards. The packet of printing paper should be opened at the work table in the shadow cast by placing the body between the light and the table, and the piece of paper laid on the negative, coated side downward. The emulsion side of the negative and the coated side of the printing paper must always be in contact, otherwise the prints will come out the wrong way round and may show fuzzy edges on the objects in the picture.

Usually it is easy to identify the coated side of the paper, but in case of doubt a good test is to lay the paper on the hand. The coated side will tend to curl inward. Another infallible test, but one that is not to be recommended, is to bite the corner of the paper between the teeth. The coated side will seem to stick to the teeth.

"Down in Old Somerset," F. Culverhouse, Sheffield. This picture was awarded Second Prize in the A Section of the May Photo Contest.

When the paper is in the frame and the frame closed up we are ready to make the exposure, but first of all we must make sure that the printing paper not in use has been placed in a safe place where light cannot get at it. We use an old half-plate negative box. It is light-tight, avoids the necessity of re-wrapping the paper each time it is handled and can be opened and shut quickly. Then, assuming that we are printing one of a batch of normal negatives, the printing frame is held 18 in. from a 60 watt lamp for a period of eight seconds—neither more nor less.

That is simple enough and the next operation, development, is just as simple. With the work table shielded by the body shadow again, the exposed print is laid, coated side up, in the bottom of the developing dish, and sufficient developer to cover it completely poured over it quickly.

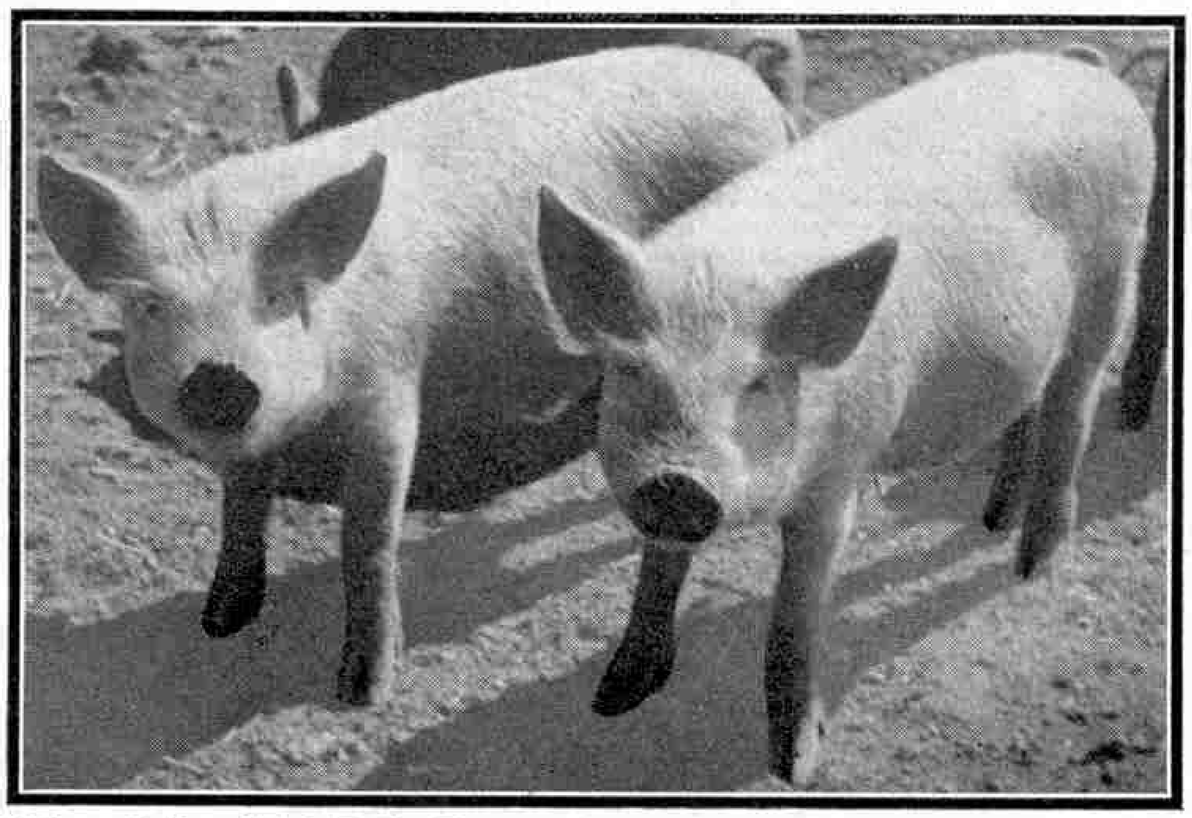
Development takes place rapidly. The image appears in a very few seconds and development is complete in approximately one minute. This length of time varies slightly with different makes of paper, but it is never less than 30 seconds nor more than 1½ minutes. The instruction leaflet packed with the paper must be read to ascertain the actual time.

When development is complete the print must be removed quickly from the developer and plunged into the fixing solution. Unfortunately, it is impossible to see when the fixing process is complete. Therefore the print must remain in the solution for not less than 15 minutes, and it must be moved about from time to time to ensure that the solution reaches every part of the print. Next, the print must be washed in running water for 30 minutes and finally pinned to a shelf or laid on a clean towel to dry.

Thus our first gaslight print has been made. The process clearly is quite simple and if the instructions of this article are followed carefully the failures will be few and far between. Inevitably there will be a few, but experience is a splendid teacher and early faults will soon be corrected.

The commonest difficulty experienced by beginners in printing is a brown stain on the prints. This is caused by oxidization and it can arise from several causes, all of which, incidentally, can be blamed on the photographer! Possibly he has spent too long examining the print after taking it from the developer and before putting it into the fixing bath! Or the print may not have been left in the fixing bath sufficiently long. Yet again the cause may be that the fixing or developing solutions are stale. The remedies are obvious.

The best printing results are obtained by using different grades of printing paper and suiting each grade of paper to a particular type of negative. A strong fully-exposed negative that is full of contrast, with deep shadows and strong high lights, demands what is known as a "soft" paper, if the full range of light and shade in the picture is to be properly reproduced. An under-exposed negative that is very thin, with only a small degree of contrast and lacking detail in the shadows, demands a "vigorous" paper, for this has the merit of strengthening the limited range of tones.



"Who said Bacon?" J. Tottle, Thornton. A consolation prize-winning print from the May Photo Contest.

It is not possible in this article to deal with this topic in detail but when they have had a little experience of printing from their own negatives readers will quickly grasp the possibilities.

In their first attempts at gaslight printing, readers may come across unexpected difficulties that are not dealt with in this article. In many cases these troubles, although they are very bewildering to a beginner, are familiar to the "old hand," who knows their cause and is able to take precautions to prevent their occurrence. The Editor invites every reader who takes up gaslight printing on the lines suggested in this article, and does not obtain good results, to write to him describing the trouble as clearly as possible. Every effort will then be made to solve the problem and get things going smoothly.

Church Clock Made from Scrap

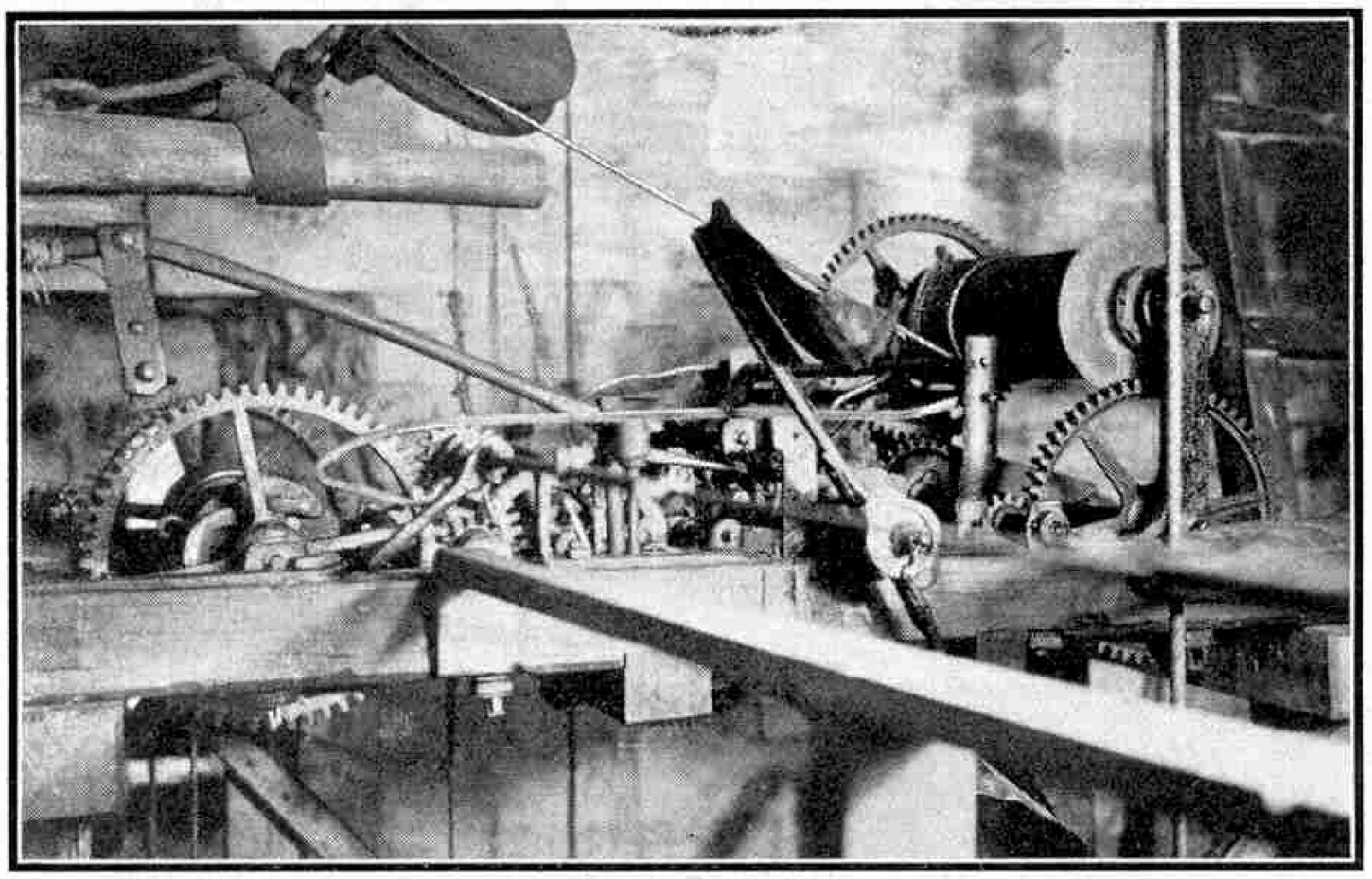
A Remarkable Village Timekeeper

By T. R. Robinson

THERE are some queer clocks in various country church towers, but one of the oddest is that in the little church at Tirley, near Tewkesbury. It is made entirely from scrap material, mostly taken from old agricultural machines, and was constructed by Mr. John Carter, a local wheelwright, in his spare time.

The main frame of the clock is built up of wood beams, and on these are fitted the blocks that form the bearings for the pivots of the wheelwork. The blocks are forgings, and the holes for the pivots are lined with brass, to give a better bearing surface than the iron of the blocks themselves.

There are two sets of wheels, one for showing the time and the other for striking; and the main-wheels of both trains were taken from old winnowing machines. The other wheels come from bean-drills, a chaff-cutter, a roasting-jack, and a cream separator! The escape wheel is about the only clock wheel in the whole machine, and this was originally the 12-toothed striking "let-off" wheel from an old one-handed "long-case" clock. The pallets, which check and release the escape wheel, are made from an old flat file, which was softened, shaped, and then re-hardened, ground and polished.



The mechanism of a quaint church clock at Tirley, near Tewkesbury. The clock was made entirely from scrap material by Mr. J. Carter, a local wheelwright, and has kept excellent time for almost 20 years.

The pendulum has a rod made partly of wood and partly of iron, and the bob is a 14 lb. scale weight, which swings down inside the church through a hole in the clock-room floor. A strangely-shaped weighted lever is used to keep the clock going while it is being wound, and the key is part of a windlass formerly used to operate a canal lock.

The lever by means of which the timekeeping part of the clock "lets off" the striking at the hours is made from a scythe; and the fly, or air-brake that regulates the speed of striking, is built up from an old bicycle pedal, to which arms and pieces of sheet-iron have been attached. The locking-plate, which controls the number of blows struck on the bell at each hour, was an old oven lid, and the teeth around its edge were cut by hand. It is moved forward one tooth for each blow on the bell by a neat "gathering" action resembling the step-by-step action of a cyclometer. Some of the pinions also were filed out by hand from solid rod, and are wonderfully accurate.

Another oven lid was used for the disc carrying the pins that lift the hammer-lever. The pins themselves are lengths of rod riveted into holes spaced equidistantly around the edge. The hammer strikes on one of the bells in the belfry above.

From the clock, a shaft runs to the dial, and there the wheels that operate the hour and minute hands also are machinery scrap, adapted to give motion of the proper 12-to-1 ratio to the hands. The dial is a wooden one, and more than 100 screws were used in fitting it together. The hands, which are properly counterbalanced to make them run smoothly, are made from iron bars taken from a cart.

The weights are large masses of metal, including all sorts of odd bits and pieces of lead pipe. They are suspended from steel wire ropes, which are coiled on long wooden barrels when the clock is wound, and hang down a chute in a corner of the tower. From the clock to the chute the weight-lines run over large wooden pulleys, one of which can be seen above the clock in our illustration.

Mr. Carter had only a very simple lathe to help him in making the clock, but it is a remarkably well constructed mechanism, and is wonderfully efficient when the odd collection of parts of which it is made is borne in mind. In a few months it will complete 20 years of service, and during the whole of this time it has worked very well and kept good time. The difficulties met with in its construction must have been tremendous, for it would be far easier to make a clock of new material than to evolve a design that could adapt a miscellaneous collection of old mechanisms, and obtain the correct gear ratios necessary for timekeeping.

The filing out of the pinion teeth also called for considerable skill and patience, for very correct curves and pitches are essential in clock wheels and pinions if these are to run correctly and without binding at any point. An interesting feature of the clock is that it is constructed along the same lines as the usual type of turret clock, and many details that are to be found on professionally-made clocks of this kind are carefully copied on the Tirley clock.

Although he is now 72 years of age, Mr. Carter still looks after his clock, and takes a great pride in showing it to visitors, who come from all parts of the world.

A Giant Diesel-Electric Floating Crane

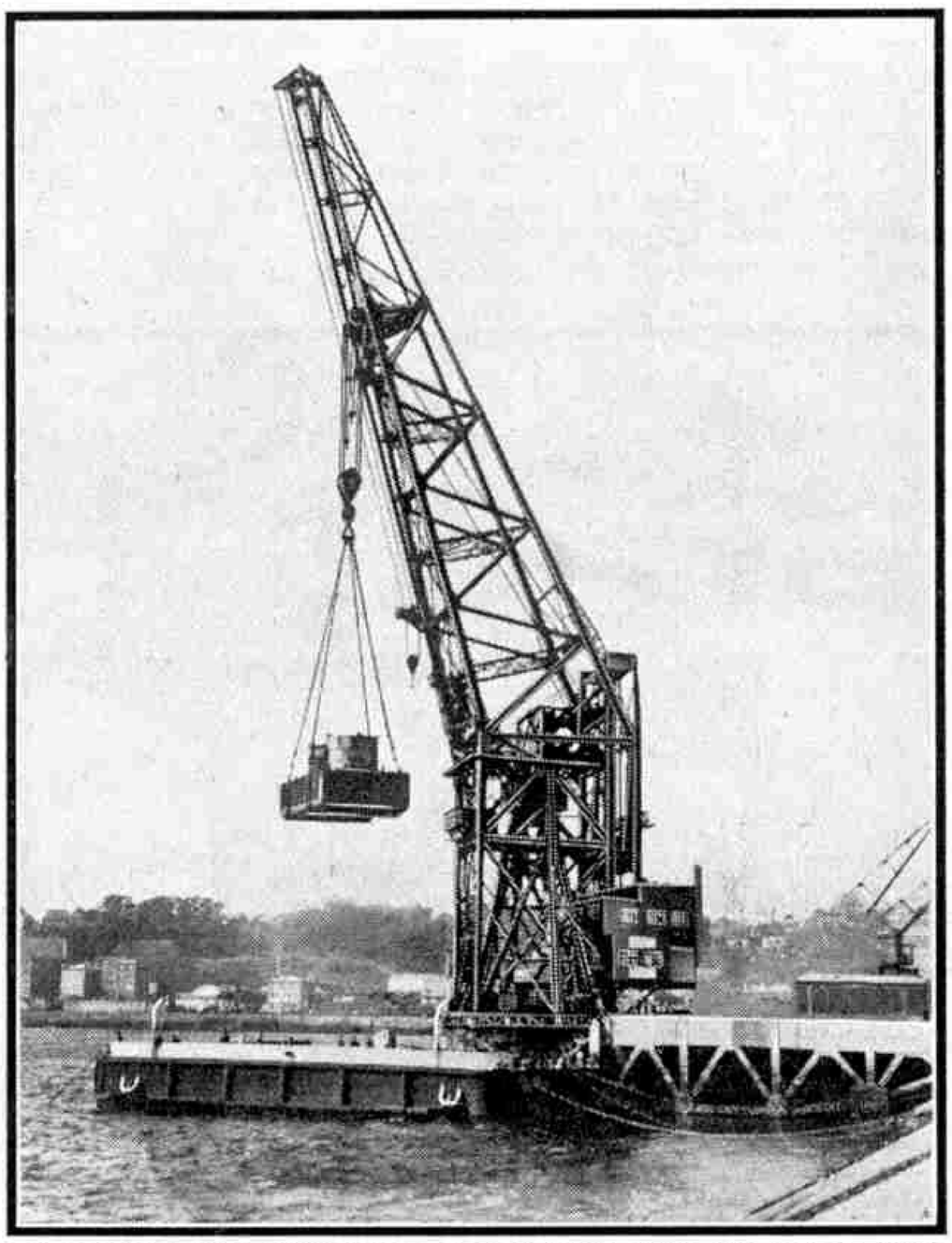
The Largest of its Kind in the World

THE Naval Dockyard in Brest Harbour, France, is now equipped with the giant self-propelled floating crane shown in the illustration on this page. This crane is one of the finest that has yet been built. It is capable of lifting loads up to 250 tons, and is the largest floating crane in existence in which the machinery is of the Diesel-electric type.

The crane was designed by Demag A.G., Duisburg, Germany, who also constructed the steelwork and the driving mechanism. The pontoon, which is 197 ft. in length and 102 ft. in width, was built by Les Chantiers de France, at Dunkirk, and along with most of the superstructure was assembled at Dunkirk and then towed to Brest, where the jib was erected.

The crane is a majestic sight as it travels slowly under its own power from one part of the harbour to another. It is propelled by twin screws driven by two 95 h.p. electric motors that run at 1,000 r.p.m. Through helical gears these drive the propeller shafts at 300 r.p.m., giving a maximum speed of $2\frac{1}{2}$ knots. No rudder is fitted, steering and manœuvring being carried out entirely by means of the propellers.

The interior of the great pontoon that supports the heavy jib structure resembles that of a ship. Steel walls divide it into watertight compartments. Some of these serve as buoyancy spaces; others are used to accommodate the Diesel engines and electric generators of the power plant, and all these are provided with electric light, windows and good ventilation.



The world's largest Diesel-electric floating crane lifting 250 tons in Brest Harbour. Photograph by courtesy of Demag A.G., Duisburg, Germany.

The jib towers to a height of 315 ft. above water level when in its highest position. It is supported from a strongly built steel tower, which rises from the pontoon to terminate in a giant central bearing 82 ft. above the deck. From this bearing is suspended a rotatable "bell," or open steel framework, to which the jib is secured. The bell comes down to about 8 ft. above the deck, and is prevented from swaying sideways when the crane is under load by balancing rollers, which bear against a steel roller path fixed to its lower end. It is rotated by a massive pinion, which engages with steel pins inserted in a steel ring fixed to the bell above the roller path.

In order to allow the bearing that supports the whole of the revolving structure to be inspected and repaired, the bell and the jib can be raised slightly off the bearing by means of four powerful hydraulic jacks. Other jacks, working horizontally, steady the crane on its vertical axis when it is raised from its support.

The jib is fitted with five independent lifting blocks, two of which are capable of handling loads up to 125 tons each, while two more can deal with 10-ton loads. The fifth block is suspended from a travelling carriage that runs on a track laid along the full length of the jib, and is capable of hoisting loads up to 20 tons. With this arrangement of the blocks it is possible to lift loads of any weight up to 250 tons in the most economical manner. When it is desired to carry out a lift of 250 tons, the two 125-ton blocks are connected by a steel cross beam and then work in conjunction with each other. The full lift can be effected at any radius from 43 ft. up to 110 ft. on either side, or at the ends of the pontoon, and the hook can then be raised to a height of 170 ft. For single lifts of 125 tons and smaller loads the maximum radius is 153 ft.

The motors for propelling the crane and for operating the hoisting and jib luffing mechanism are supplied with current by four sets of Diesel-electric generators. Each set comprises a 180-h.p. four-cylinder Diesel engine coupled to a D.C. generator of 80 kW output. In each set there is also an alternating current motor of 136 h.p. Current for these motors is brought by cables from a shore supply, and they can be used instead of the Diesel engines to drive the generators. Similar cable connections permit direct current from the main generators to be delivered to shore mains in emergency.

A complete telephone system is provided to give ready communication between the various control points of the crane, such as the engine room, the crane driver's cab and the wheel-house. Current for this service is supplied by a battery of accumulators, which can be charged from one of the auxiliary generators.

When working in a dock or alongside a quay the crane is manœuvred into the best position for undertaking its task by "warping." Wire ropes attached to bollards on the dock wall pass round the barrels of 10-ton electric capstans, driven by $32\frac{1}{2}$ h.p. motors, that are fixed to the corners of the pontoon, and when the capstans are set in motion the crane can be "jockeyed" into the desired position by hauling in the ropes. The capstans are provided with holes for bars so that if necessary they can be turned by hand.

World's First Railway "Rates War"

The world's first "war" of railway rates was recalled by the centenary last May of the opening of the Manchester and Bolton Railway, now part of the L.M.S. system.

The opening of the railway from Manchester to Bolton on 29th May 1838 was followed less than a month later by the opening of a line belonging to the Bolton and Preston Railway, from Chorley to Euxton Junction, which afforded the traveller a choice of routes between Manchester and Preston. The new route via Bolton was six miles shorter than that over the Liverpool and Manchester and North Union Railways via Parkside, and competition between the two routes led to heavy cuts in the fares between Manchester and Preston by both routes. For instance, the third-class fare was reduced from five to two shillings.

Other methods were adopted in this warfare. The Bolton and Preston trains had to run over a section of the North Union tracks between Euxton Junction and Preston, and the latter company purposely delayed the trains of their rivals. The "blockade" indeed became such a nuisance that the Bolton and Preston Railway inaugurated a service of road coaches between Euxton and Preston, and also took steps to revive powers to convert a canal into a railway for this distance, and so obtain a line independent of the North Union. Finally the "war" was ended by compromise, whereby an amalgamation was arranged.

In 1846 the Manchester and Bolton Railway was absorbed by the Manchester and Leeds Railway, which a year later became the Lancashire and Yorkshire Railway.

More Colour-Light Signals on the L.M.S.

In order to cater for more rapid handling of traffic over the busy main line near St. Pancras, the L.M.S. is shortly to install electric colour-light signals on the north side of Carlton Road Junction signal box. The new signalling, which will enable Haverstock Hill signal box to be abolished, will apply to both the "up" and "down" goods lines and to the "down" passenger line. The "up" passenger line has already been equipped with colour-light signals.

L.M.S. Locomotive Notes

Class 5P5F mixed traffic 4–6–0s Nos. 5023 from Carlisle, 5029 from Shrewsbury, 5194 and 5432 from Crewe, and 5389 and 5440 from Rugby are now stationed at Bath for working between Bath and Bournemouth. Seven Class 2 4–4–0s no longer required for these duties have been transferred to other depots; Nos. 600-2 and 628 have gone to Bristol and Nos. 629-631 to Gloucester.

Standard Compound No. 1046, which formerly was stationed at Bath and worked *"The Pines Express"* north of Bath, has gone to Bristol Shed.

Several "Prince of Wales" 4–6–0s are being transferred south. Rugby has acquired Nos. 25656/751–2 from Crewe, and Nos. 25775 from Chester and 25841 from Crewe have gone to Stafford. Bletchley has received Nos. 25683 from Chester, Nos. 25694, 25798 and 25802 from Northampton and No. 25804 from Crewe.

New engines turned out from Crewe include Class 7 4–6–2 No. 6225 and 2–6–2 tanks Nos. 207-9. New 2–6–2 tanks delivered from Derby are Nos. 180-3.

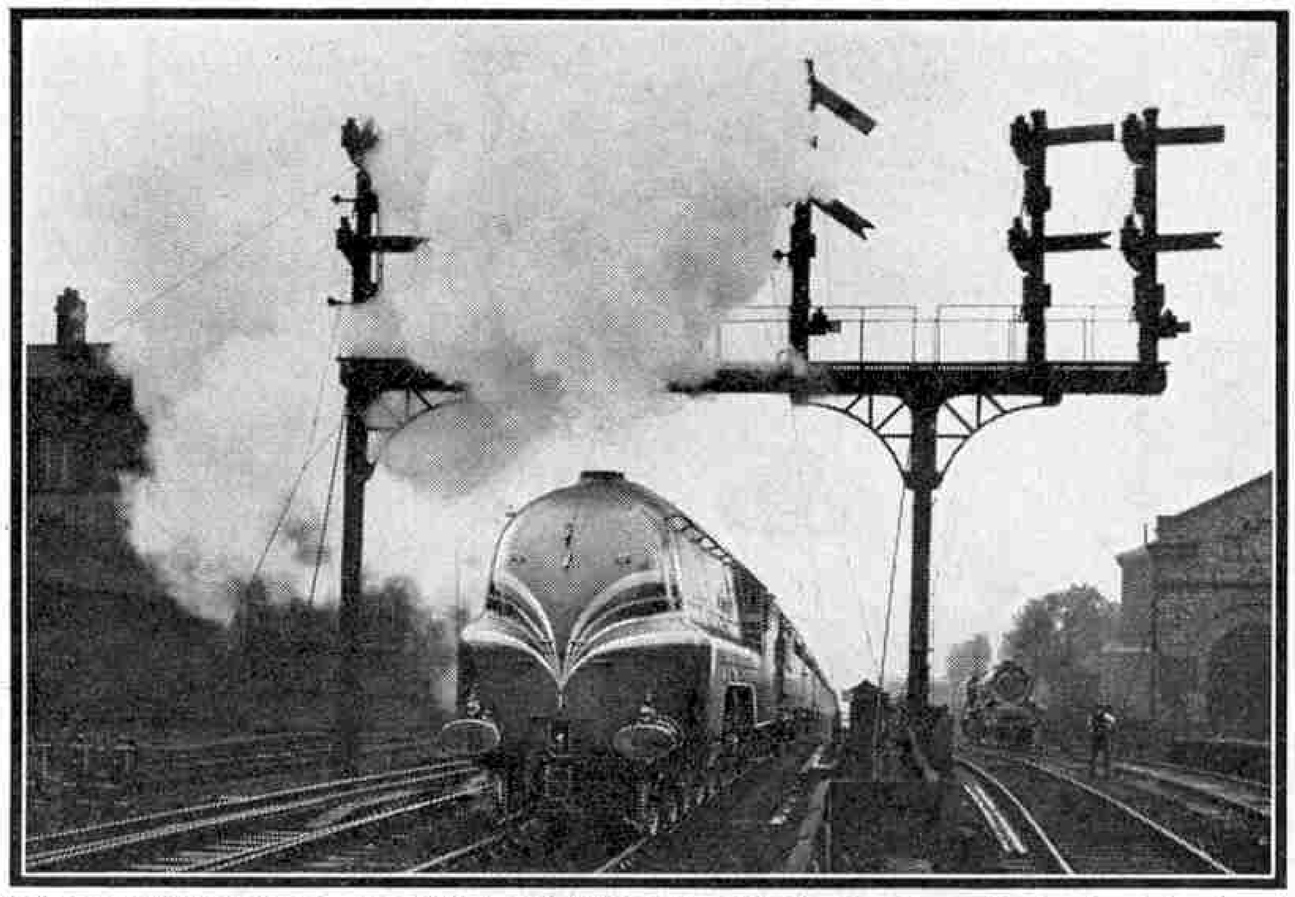
On the occasion of the tour of Their Majesties through Lancashire in May, "Jubilee" 4–6–0s Nos. 5647 *"Sturdee"* and 5554 *"Ontario,"* the latter acting as pilot, were used on the Royal Train between Euston and Leicester, via Northampton and Market Harborough. From Leicester to Bolton Abbey, and thence to Colne, and from Fleetwood to Lowton and Lowton to Leigh, Standard Compounds Nos. 1060 and 1045 were used, the latter acting as pilot. On the return journey to Euston from Ashton-under-Lyne the train engine was "Jubilee" No. 5668 *"Madden"* with No. 5653 *"Barham"* as pilot.

The haulage of a 14-coach train weighing 432 tons over the 401½ miles from Euston to Glasgow in an actual running time of 416 minutes was the remarkable feat achieved recently by No. 6200 *"The Princess Royal."* The weight of the train exceeded the limit laid down for it by 12 tons, and there was a strong easterly wind, but No. 6200 scorned pilot assistance up the Shap and Beattock inclines, the minimum speeds up these ascents being 27 and 23 m.p.h. respectively. Owing to signal delays and a subsidence slack the arrival at Carlisle was 1 min. late, the 299 miles having been run in 301 min.; but on a "net" basis the engine had time to its credit.

After the Edinburgh coaches had been detached at Symington, leaving a reduced load of 276 tons, a very fast run was made to a signal stop at Eglinton Street, Glasgow, in 35 min. The scheduled time for passing this point is 39 min. From Euston to Carlisle Driver F. C. Bishop and Fireman J. Blades, of Camden, were in charge, and Driver Adam Watson and Fireman Alec Brodie, of Polmadie, took over for the run from Carlisle to Glasgow.

For details of this run and for the information preceding it we are indebted to Mr. D. S. Barrie.

Next January an L.M.S. streamlined 4–6–2 and an articulated train now being built for *"The Coronation Scot"* service will be shipped to America for a tour over eight different American railroad systems.

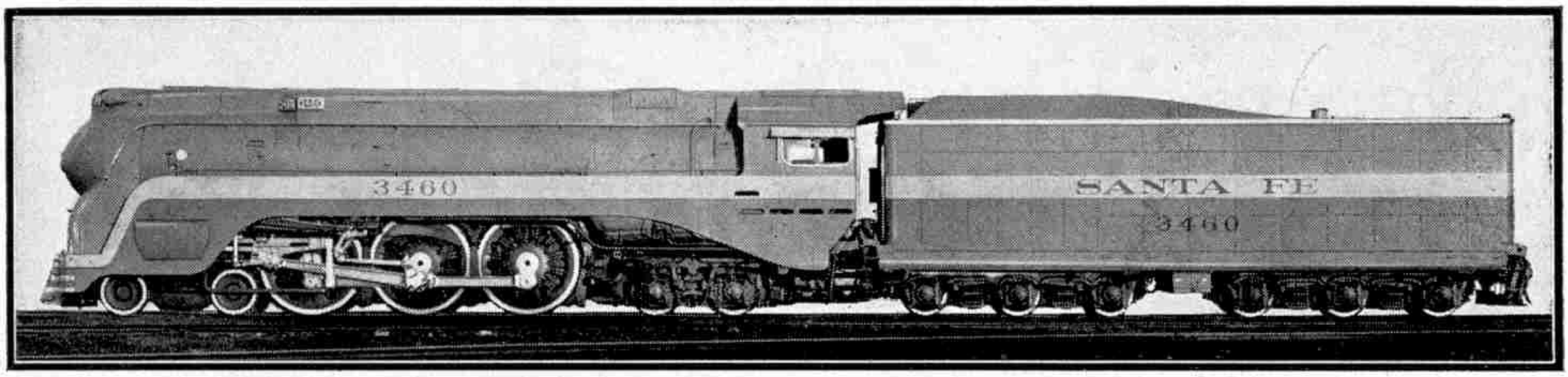


The down "Coronation Scot" of the L.M.S. This striking illustration shows the front-end treatment of the decorative silver bands. Photograph by F. R. Williams, Birmingham.

Robot Erector Cranes for L.N.E.R.

Excellent progress is being made with the L.N.E.R. Manchester–Sheffield and Liverpool Street–Shenfield electrification schemes. Contracts have already been let for the overhead equipment and cable.

To expedite the erection of the overhead equipment the L.N.E.R. has just placed contracts for eight 2½-ton and 10-ton robot cranes that are specially designed to place in position the upright supports for the overhead power cables. The robot cranes will be self-propelling and are designed so that they can work on one line without fouling the adjacent track.



A giant streamlined 4-6-4 of the Atchison, Topeka and Santa Fé Railroad, one of a batch of six for use between Chicago and La Junta on the "Chief" express. This train runs daily between Los Angeles and Chicago on a 48-hour schedule. Photograph by courtesy of The Baldwin Locomotive Works, Philadelphia, U.S.A., the builders of the locomotives.

Notes from America

Last month a fleet of ultra-modern high-speed passenger trains was introduced by the Pennsylvania Railroad. These incorporate sweeping advances in design to add to the complete enjoyment and attractiveness of long-distance travel.

Eight trains, four in each direction, compose the fleet. They are the new *"Broadway Limited"* and *"The General"* between New York, Philadelphia and Chicago; the new *"Liberty Limited"* between Washington, Baltimore and Chicago; and the new *"Spirit of St. Louis"* between the eastern seaboard and the city after which the train is named.

The *"Twentieth Century Limited"* of the New York Central Railroad was last month accelerated to a journey time of 16 hrs. between New York and Chicago. With a route of 958 miles to cover, this train has to average almost exactly a mile a minute throughout, inclusive of stops.

A record in fuel efficiency has been established in the United States, where the fuel required by a steam locomotive to move a 1,000-ton train a mile is now 117 lb., instead of the 162 lb. required in 1931.

Some striking figures relating to American railways have been issued. Approximately 90 million tons of coal and 15 million tons of ice are used annually, and the average train load last year was 796 tons, the highest for any one year except one. About 600,000 passengers travel daily by train to and from New York, and on all American trains there is an average of 300,000 illegal train riders a month.

The S.R. Motspur Park-Chessington Line

The Southern Railway have constructed a new line between Motspur Park and Chessington in order to cater for the growing population in the Surbiton and Malden areas. It begins a short distance south of Motspur Park Station and after passing through Old Malden, Tolworth and Chessington, terminates at present at a point near Chessington Zoo.

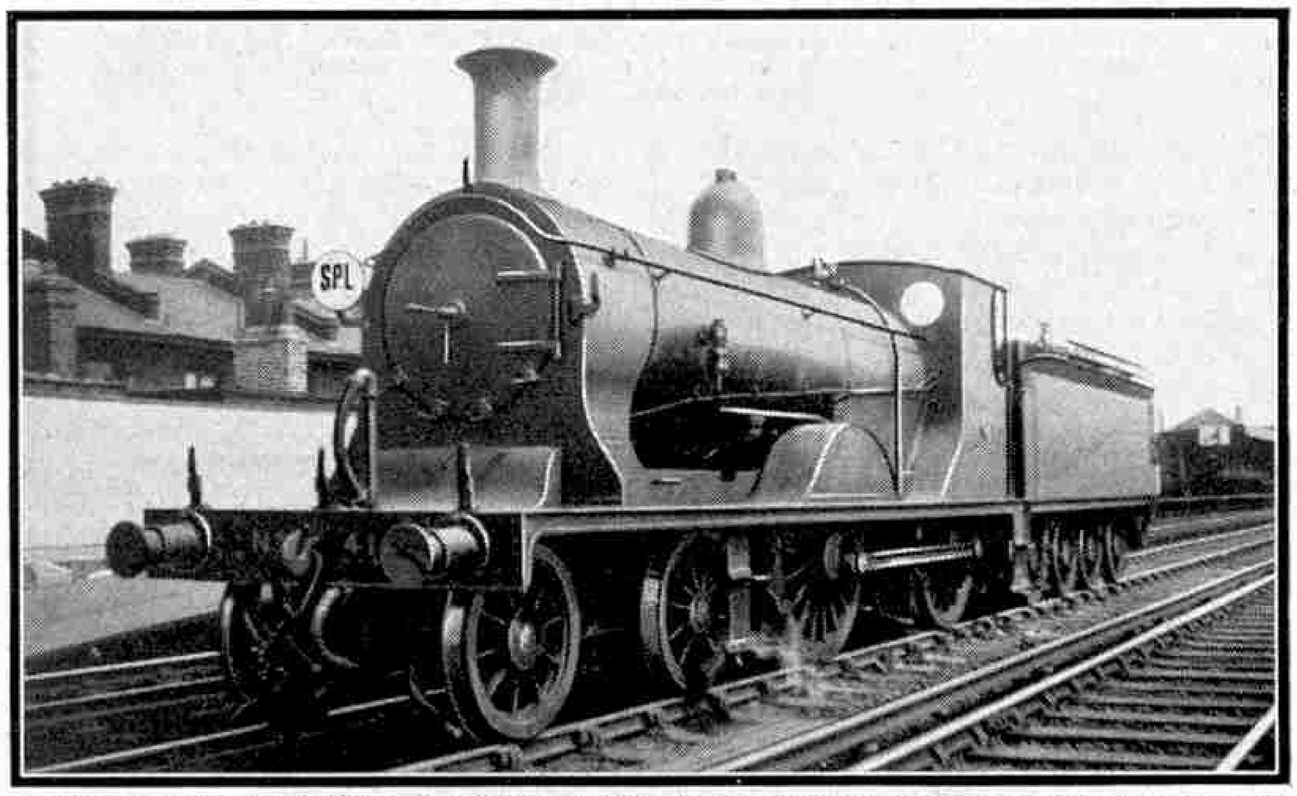
The first section was opened for traffic in May with services between London (Waterloo) and Tolworth, the two new stations being Malden Manor and Tolworth respectively. The new stations incorporate pillarless Chisarc reinforced concrete awnings and are equipped with a fluorescent lighting system.

Giant Santa Fé 4-6-4 Locomotives

On page 263 of the *"M.M."* last May we referred to six 4–6–4 locomotives then recently introduced on the Atchison, Topeka and Santa Fé Railroad. The upper illustration on this page shows No. 3460, the first of these giants. They are intended primarily for running between Chicago and La Junta on the 48-hr. *"Chief"* service, which daily connects Chicago and Los Angeles, but also have worked throughout the journey on the 49-hr. *"Fast Mail."*

The external form of these engines is attractive. A "V"-shaped "prow" decorated with bands of stainless steel replacing the pilot or cowcatcher of the normal American locomotive develops into a broad skirting that encloses the cylinders, and is carried along above the driving wheels to the cab end. A bulbous front, popular with designers in the United States, covers the smoke-box front and provides an effective setting for the centrally placed headlight.

Various pieces of front-end apparatus common to most American locomotives are all enclosed, and the front sheeting is made to combine with a trough-shaped casing that runs along the boiler and fire-box top. A grid-like opening at the front of this trough is provided in connection with smoke deflecting arrangements, and the chimney, dome, sand-box and other boiler-top apparatus are all concealed. A further feature, which contributes to the impression of "smoothness" that these engines give to the onlooker, is the use of disc driving wheels of the special pattern developed by the builders of the engine, The Baldwin Locomotive Works, Philadelphia, U.S.A.



A typical "Drummond" locomotive of the former L.S.W.R., now S.R. No. 414, with the characteristic sheet steel wings to the smoke-box. Photograph by A. Philip Connolly, Battersea.

Well-known Driver Retires

Driver W. Gilbertson, a Royal Train engineman of the L.M.S. Motive Power Depot at Upperby, Carlisle, has retired. His most notable performance was his handling of *"The Royal Scot"* during its visit to the United States and Canada where he drove the train some 11,194 miles on its exhibition tour. On retiring, he stated that the part of his career of which he was most proud was not his visit to America, nor the driving of the Royal Train, but the fact that he had never had an accident during his 34 years as a driver.

L.M.S. Staff Change

Mr. C. R. Byrom, former Chief Operating Manager of the L.M.S., recently retired from the service. Mr. Byrom started his railway career 42 years ago with the former L.N.W.R., and achieved a remarkable personal record in connection with the Royal Train journeys. He had charge of Royal Trains during three reigns, and since 1926 had travelled on 64 Royal journeys by train, covering 17,795 miles. Appropriately enough his last service was on the occasion of the visit of the King and Queen to Lancashire in May; and on the return journey as the train was nearing Euston the King received Mr. Byrom and invested him with the insignia of Commander of the Royal Victorian Order.

Mr. Byrom's successor is Mr. T. W. Royle, who from 1924 to 1932 was Divisional Superintendent of Operation at Manchester, when he went to London. Mr. Royle vacated the position of Chief Assistant Commercial Manager to take up his present appointment.

Sheffield Victoria Station

A comprehensive scheme of modernisation and improvement at Victoria Station, Sheffield, is to be put in hand by the L.N.E.R. The improvements to be effected are the outcome of a careful examination of the requirements of traffic passing through the station and include an entirely new frontage and a new larger booking hall and enquiry offices. The appearance of the station is to be smartened up by the use of coloured tiles and stainless steel fittings. Direct connection between the Royal Victoria Station Hotel and the Booking Hall is to be provided. It is anticipated that the reconstruction work will take some five or six months to complete.

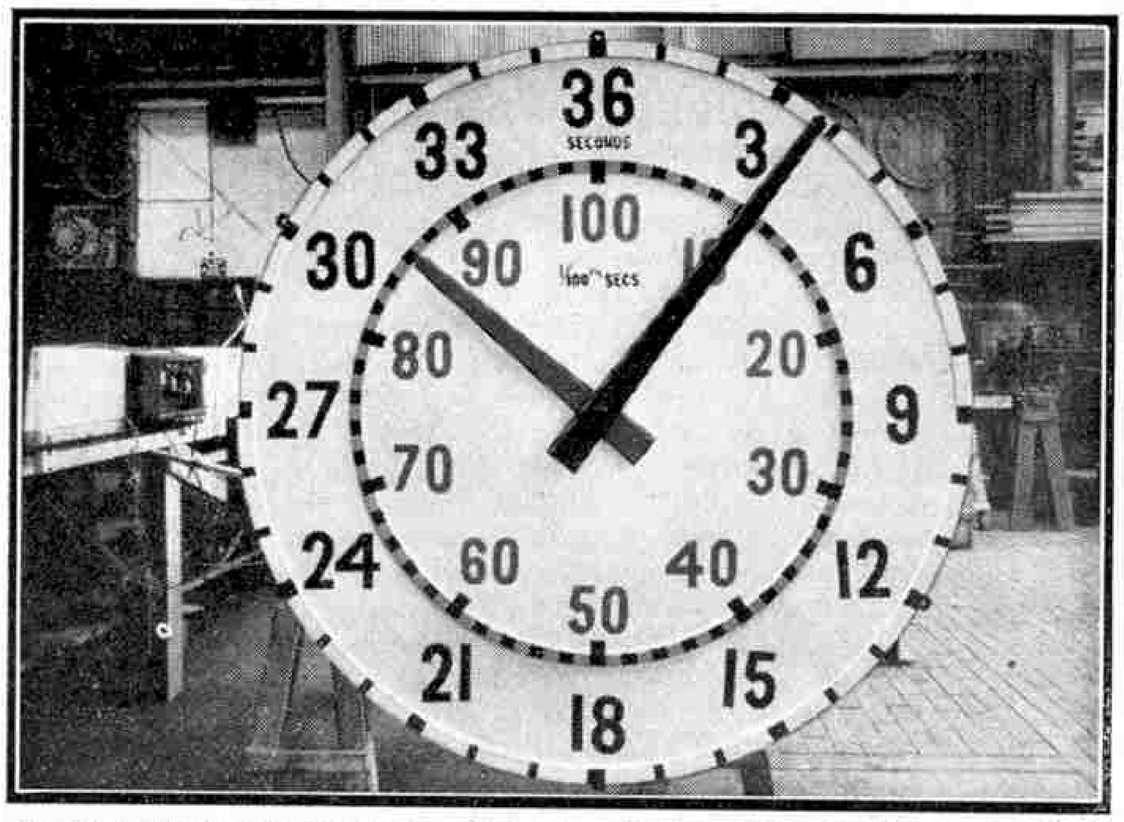
Racers Who Time Themselves

Clock Started and Stopped by Means of Light Rays

By T. R. Robinson

MANY unusual clocks have been designed for special purposes, but one of the most remarkable of such timekeepers is the novel electric "seconds-timer" recently constructed by Gillett and Johnston Ltd., Croydon. It is designed to make the time taken by a competitor in any speed trial or similar event visible to a large number of spectators as soon as the finishing line has been crossed. Its action is very similar to that of a "stop-watch," except that the hands are set in motion and stopped automatically by the interruption of light rays by the competitors, who may thus be said to time themselves.

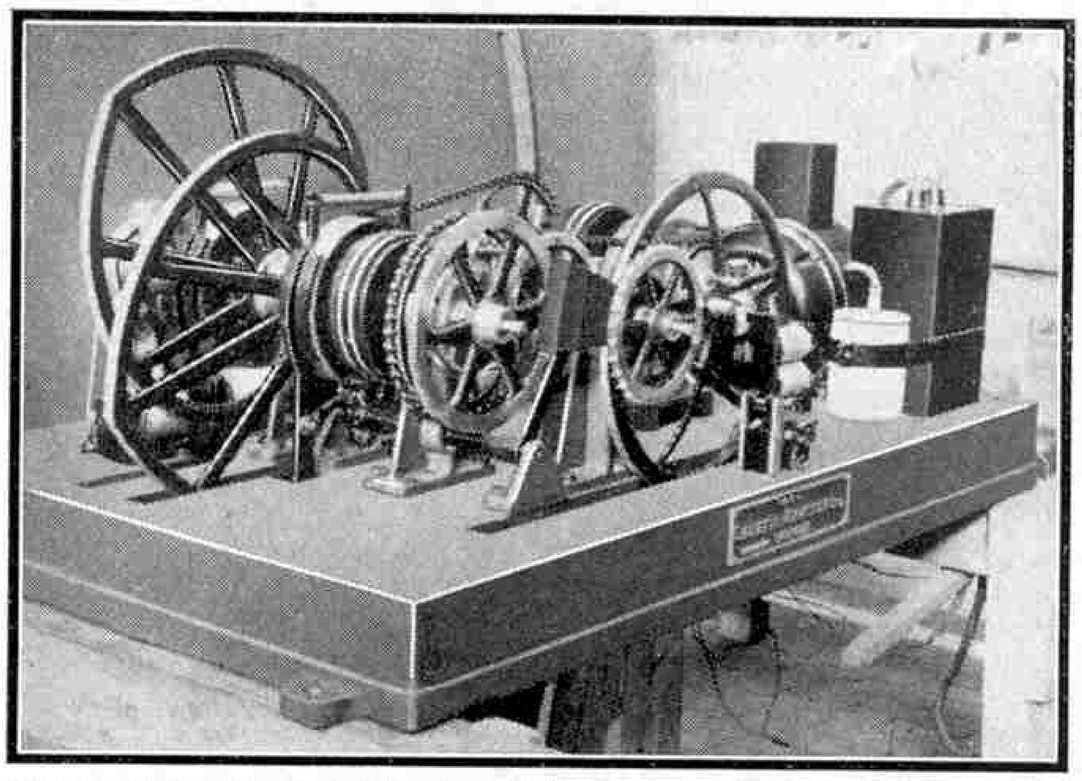
The readings of the clock are free from any error that can arise from the "human element." The time shown on its dial is exactly that which elapses between the breaking of the first and second light rays, and there can be no dispute in regard to its recordings. This should make the clock very useful for timing rapid events, such as motor or speed boat trials, and also for use at sports meetings. The clock illustrated has a dial graduated for 36 sec., but the device can be adapted to make it suitable for other timings by altering the ratio of the reduction gear in the mechanism of the large hand. This changes the speed with which this hand rotates, and the figures on the dial can be adjusted accordingly.



The dial of the race-timing clock, which automatically registers the time to a hundredth of a second. The illustrations to this article are reproduced by courtesy of Gillett and Johnston Ltd., Croydon.

The dial is 6 ft. in diameter, and the whole of the timing is obtained by the use of a synchronous electric motor, which is driven at a constant and accurate rate from the controlled-frequency electric supply mains. The dial is divided into two circles, the inner one showing hundredths of a second and having a red hand and red numerals, whilst the outer one, which shows whole seconds, has a black hand and figures. The inner circle is coloured orange, with black divisions, a colour combination that gives excellent visibility, and its hand circles once each second, the longer hand moving forward one division of the outer circle in the same time.

The mechanism that operates these hands is most ingenious, the motor being run continuously and the drives being coupled to it as required by the action of clutches, brakes and relays. Enclosed worm reduction gear is used for the first stage, and on the worm wheel spindle are fitted chain wheels that transmit the drives to the two hands. Each drive is fitted also with an electro-magnetic clutch, and powerful externally contracting brakes are incorporated for stopping the hands when necessary, and holding them at any point on the dial. The brakes have four actions, each dealing with one of the stages of operation of the clock.



The mechanism behind the dial. On the left are the heart-shaped cams by means of which the hands are returned to zero.

When the clock is switched on, the driving motor and its worm gear revolve idly, the clutches being disengaged and each pair of brake shoes holding its drum under the pull of a light spring, thus retaining the hands at zero.

As the competitors leave the starting point they interrupt a ray of light and the action trips a relay, the contacts of which energise the clutch magnets and couple up the drives to the hands. The brake shoes are simultaneously lifted clear of their drums by the energising of two "pull-off" electro-magnets, and both hands start away from the zero position.

The rotation of the hands continues at an accurately controlled speed until another light ray at the finishing point is broken by the passage of the winner of the race. This trips a further relay that disengages the clutches and breaks the circuit through the pull-off magnets. At the same time two pull-on magnets are brought into action to grip the brake shoes to their drums, and so to lock the hands at the reading shown at the instant the relay operates. A glance at the clock then shows what interval has elapsed between the breaking of the two light rays. The large hand shows the number of whole seconds and the small one gives the remaining fraction in hundredths of a second. The hands are stopped and locked at this reading, the motor being freed to continue its idling action.

After the reading has been displayed and noted, it is necessary to return the hands to their original position before further timing operations can be carried out, and for this purpose a "zeroising" attachment is fitted. This mechanism is the most ingenious part of the clock. There is a heart-shaped zeroising cam on the spindle of each hand, and mounted on the baseplate of the mechanism is a weighted lever with two small rollers attached to it. The lever is pivoted at one end, and when it is allowed to fall, the rollers move into contact with the edges of the cams, causing these to swing round until the rollers are at the points on the cams that are nearest their centres. Matters are so arranged that the hands are then at zero, and so it is only necessary to allow the lever to fall in order to bring the hands back from any reading to their original position.

The lever is normally held up with its rollers away from the cam edges, and its lowering is controlled by the driving motor through the relay and an electro-magnetic trigger. As the motor runs continuously, it is always available for zeroising, and all that is necessary when the hands have to be returned to their starting point is to couple it to the mechanism for lowering the lever. When the trigger is released, the motor is coupled to an eccentric cam, which lowers the lever, and then, when the hands are back at zero, raises it again and stores power in it, locking it at the original height and automatically uncoupling itself from the motor drive.

Very careful poising of all rotating parts was necessary in the construction of the clock. The heart-shaped cams and other parts of the mechanism are pierced to reduce their weight, and counterpoises are used to correct the balance. All the pivots of the wheelwork are fitted with ball or roller bearings, and particular care has been taken to provide for efficient lubrication.

Rabbits as Pets

A Delightful and Profitable Hobby

By J. C. Bristow-Noble

RABBITS as pets never lose their fascination, and are nearly as popular as domesticated pigeons, although they are not kept in such large individual studs. It is estimated that there are roughly 20 million pigeons in this country, including the racers, and the number of domesticated rabbits probably is five million.

Those who become rabbit enthusiasts in their childhood often remain so all through their lives, for the creatures are very fascinating and with care can be reared to live about a home like dogs and cats, and even in perfect friendship with these. When given their liberty they are always something of an anxiety, however, because strange dogs and cats, or rats and stoats may kill or injure them. A profitable hobby can be made of good class exhibition rabbits. A breeder of Dutch rabbits, which by the way were not originated in Holland, but in this country, told me recently that for nearly 50 years his small stud has returned him an average profit of £1 a week, although the time he has been able to devote to his pets has been insignificant throughout.

A fawn prize-winning specimen of the lop rabbit, a breed that makes a splendid pet.

Only one variety should be kept, and when it has been decided which this shall be it is best to attend some of the shows in order to learn the points of exhibition specimens. Shows are advertised in the rabbit, pigeon and poultry journals, in which exhibition stock is advertised for sale. At the shows there is no difficulty in getting introductions to exhibitors, however, and stock can be bought from them. The conscientious exhibitor will take a pride in doing his best for beginners.

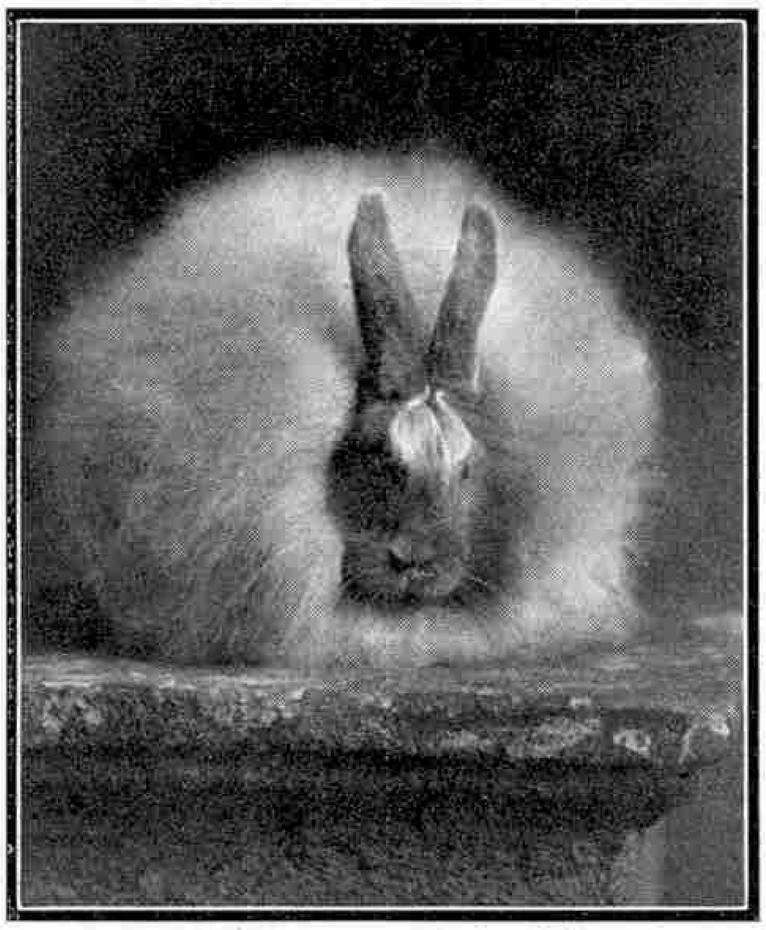
A start is best made with a pair about three months of age. These should be housed in warm, roomy hutches of two compartments, one for sleeping and the other for feeding. The floor of the latter should be of half inch mesh wire netting, and the hutches should be stood in a closed in out-building.

Feeding is simple and inexpensive. Throughout the winter, hay, crushed oats, bran, stale bread crusts, and roots are suitable, with carrots, swedes, and mangels from about Christmas. A small portion of oats and bran mixed, or bread crusts if any are available, should be given first thing in the morning in a trough that the rabbits cannot upset and throw about. The evening feed should consist of as much hay and as large a portion of one or the other of the roots mentioned as the rabbits will consume during the night. From about mid-April until well into autumn green food, such as the outside leaves of cauliflowers, green pea husks, cabbage stalks and dandelion leaves, can take the place of the roots and to a large extent of the hay. No green food should be given that is frost-bitten, or absolutely fresh-gathered. It should be put on one side until it has drooped and withered somewhat, and then should be used in small quantities. Give each rabbit a vessel of fresh water daily.

From the point of view of gentleness and fascination, there is little to choose between the many varieties of rabbits. The Dutch is a small, pretty creature with a wedge-shaped head. It is bred chiefly in three colours, black and white, tortoiseshell and white, and light blue or silver and white. Strictly speaking, nearly half of the rabbit is white in each case, and the rest is of one of the three colours mentioned. At shows it is judged according to size, condition, texture of coat and, most important of all, the shape of the head, the length of the ears, and the amount of white on each hind foot, the face and the neck and body. Competition is very keen, for there are always large entries of these rabbits, which to the visitor look astonishingly alike.

A rabbit I myself like better than the Dutch is the lop, a much larger animal that is bred in several colours, including fawn, tortoiseshell, black and grey. Endeavours are made to breed these rabbits with ears as large and as broad as possible, and they also should have heavy dewlaps, straight forelegs, short silky coats, and large bright hazel eyes. This breed is about the oldest domesticated rabbit, and although large it is a suitable pet for small children because of its gentle and affectionate disposition.

Youngsters also like the Angora, or wool rabbit, because of the interest of grooming it, but this rabbit does not make so good a pet as the lop, as it has not the natural affection of the latter for human beings. It is bred in two colours, white and blue, and the blue Angoras seem to me more pleasing. The rage for this rabbit as a wool provider is passing, because of the difficulty of disposing of the wool at its value, for the demand for clothing made from it is small.



A blue Angora or wool rabbit.

The English rabbit, another rather large variety, is much beloved by the adult enthusiast, who finds great interest in breeding a perfect specimen. It is white with coloured markings, such as a black "butterfly" on the nose, black ears, black round the eyes and a black spot above each, a chain of black from the back of the head to the end of the tail, and black spots on each side of the body. To produce specimens with the correct markings is an achievement to be proud of.

A smaller and more compact breed is the silver rabbit. This is bred in three colours, a rich blue, a deep orange, and a bright chestnut, and in each case the glossy coat is liberally sprinkled with outstanding silver hairs, from which it derives its name. This breed also is suitable for small children, and the same can be said of the black and tan and the Himalayan rabbits. The former is black with a tan necklace, and tan markings inside the ears, on the feet and tail, and in a circle round each eye with a spot above it. The Himalayan is white with a black nose and ears, and pink eyes.

The chinchilla also must be mentioned as well as the blue beveran, the Havana, and our old friends the Flemish giant, and the Belgian hare, which is a true rabbit in spite of its name and appearance. The chinchilla has a coat of roughly sparkling silver and light grey, reminding one of the bark of the silver birch tree. The beveran is a large dark blue rabbit. The Havana is chocolate, and the Flemish giant, a 12-lb. rabbit, is brownish-black flecked all over with white. The well-bred Belgian hare is a rich Rufus red.

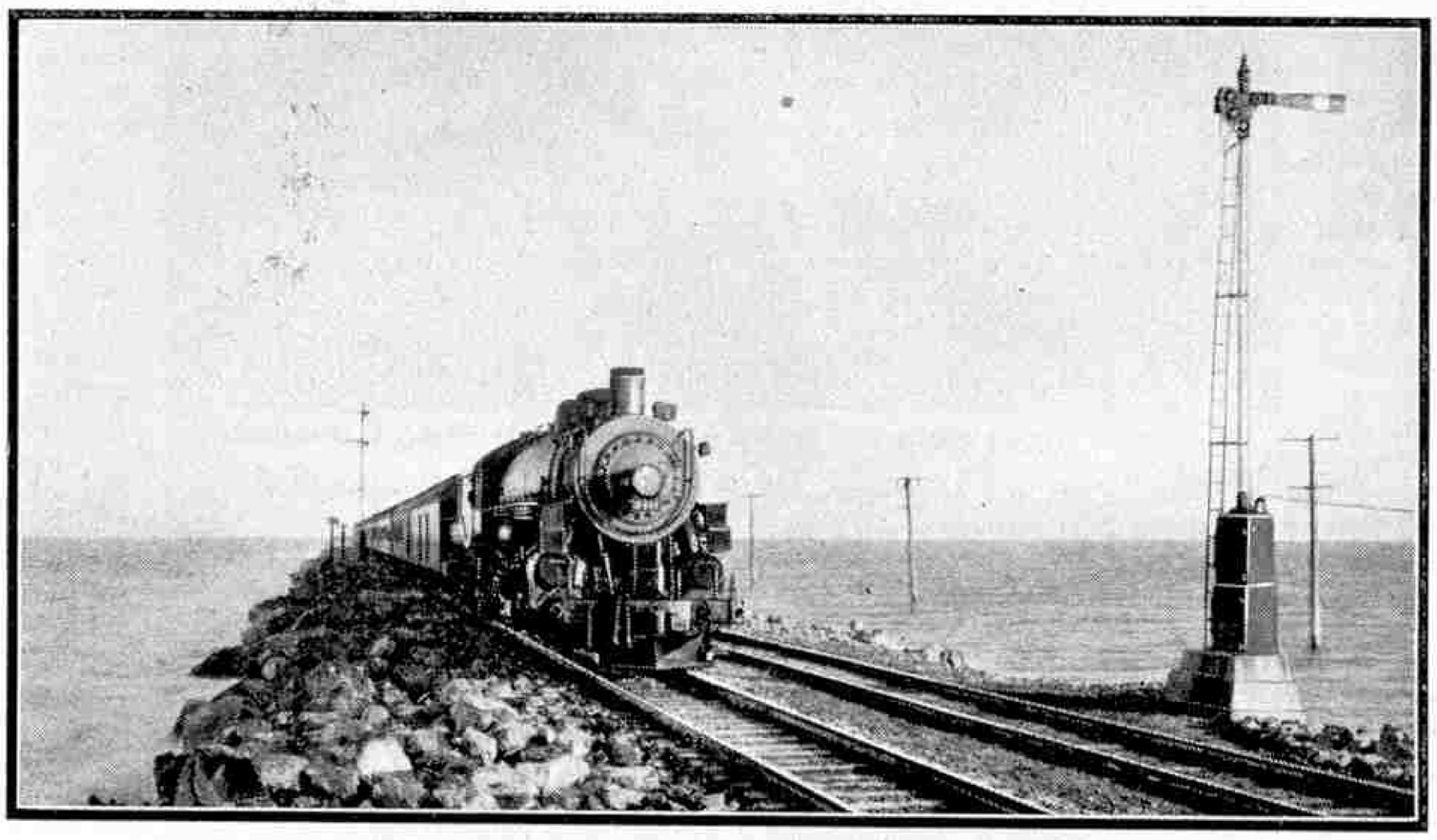
The World's Longest Trestle Bridge

Conquering the Great Salt Lake

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

THE proposal has been made to double the track of the "Lucin cut-off," the combination of trestle bridge and embankment 22 miles in length by which the Southern Pacific Railroad crosses the waters of the Great Salt Lake in Utah, in the United States. This calls attention to the difficulties encountered by the engineers in the erection of this famous crossing.

In 1868, when the Central Pacific Railway, now part of the Southern Pacific System, was built across the Middle West of the United States, the engineers found their path blocked by Utah's famous inland sea. At that time engineering science was not sufficiently advanced to attempt to bridge this large sheet of water, so the rails were laid round the northern shore of the lake, from Lucin on the west to Ogden on the east. The district is mountainous and the diversion round the lake entailed some extremely heavy gradients and many sharp curves.



A train on the Lucin cut-off, of the Southern Pacific Railway, in the United States. This cut-off crosses the Great Salt Lake by means of embankments and a trestle bridge 12 miles in length.

As time went on and traffic increased, it was determined to dispense with the roundabout route if possible, and to connect Ogden with Lucin by means of a bridge. The distance saved would be 43 miles, and apart from the reduction in distance there would be a great saving in power in hauling heavy trains because the steep gradients would be avoided. For this purpose it was necessary to build a track over two arms of the lake, separated by a tongue of land known as the Promontory, and on one section this is carried on the longest trestle bridge in the world, with a total length of 12 miles of open woodwork.

The Great Salt Lake is not an ordinary sheet of water, with unruffled surfaces and no unusual depths, for it is liable to storms and in places is very deep. It is 83 miles long and 51 miles wide, and has an area of 2,000 sq. miles, and is the second most salty body of water on the globe, the saltiest being the Dead Sea in Palestine.

When in 1902 it was decided to bridge the lake the project presented something entirely new to the engineering world, and in its execution the engineers encountered many difficulties and had many surprises. The crossing, known as the Lucin cut-off, had to be constructed in desert country, far from the centres of civilisation, and on a storm-tossed dreary sheet of water, heavily impregnated with brine.

An army of three thousand men braved the terrors of the desert and the storms of the lake in order to carry out the plans of the engineers. Before the actual work of construction began, however, many months were spent in collecting the necessary material and hauling it to the site. Mountains of rock were blasted for foundations on the muddy bottom of the lake, and whole forests of trees were felled to make the piles on which the trestles rest. The engineers could not estimate beforehand the amount of rock required, nor were they able to do so even after the work began, for the lake seemed to possess a giant maw, which for a time swallowed everything dropped into it.

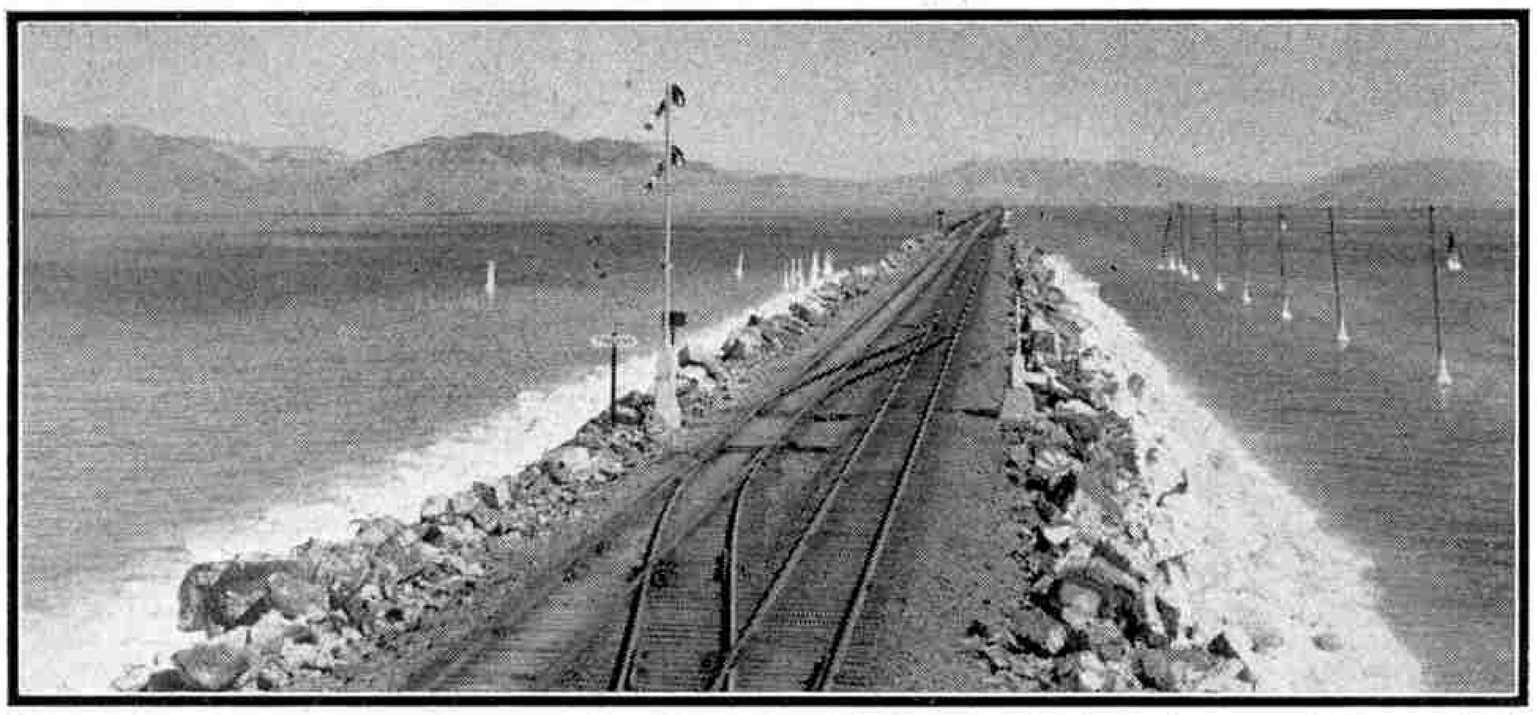
In constructing the bridge the principle followed was to build embankments as far into the water as safety allowed, and then to bridge the rest of the line on piles. In some places the depth of water was 28 ft., and piles 50 ft. long, joined four on top of each other, were driven firmly into the mud. Gravel was obtained from pits some three miles distant from the lake, and relays of men were kept busy for many months working steam-shovels to a depth of 25 ft. in them, long trains carrying their cargoes to the places where the labourers were making the road-bed in the water. At night the district was a vast glare of light from electric lamps over hills of human ants.

Seven tow-boats, several small boats, and a stern-wheel steamer, specially constructed on the lake during the progress of the work, were required in building the bridge. The work proceeded at the rate of $1\frac{1}{4}$ miles of trestle per week, the actual rate depending mostly upon the supply of material, a difficult matter owing to the distance from which it was brought.

Across the eastern arm of the lake, an embankment supports the track for nearly its entire length, a gap of 600 ft. in width being bridged by trestles in order to allow the waters of the Bear River to flow through. A temporary structure was first thrown across from which gravel trains dumped their loads to make a permanent foundation.

A stretch of trestle 12 miles long crosses the western arm of the lake, with an embanked approach of four miles at each end. "Pile stations," or little groups of piles driven firmly into the mud, were constructed in the

deeper parts, and upon these pile-drivers were erected that moved continuously forward on piles of their own driving. On this triple row of piles heavy caps of timber were placed, with great "stringers," or heavy logs, on top of them, followed by the cross ties and rails. Where possible, this temporary structure has been filled in and the stringers have been removed, the ties, or sleepers, then being laid firmly on the earth.



Another view of the railway track over the Great Salt Lake, with the mountains in the background. The crossing is 22 miles in length, and the cut-off saves 43 miles while avoiding heavy gradients.

Great variations in the consistency of the lake bottom were encountered during the driving of the piles for the trestles. At times the blow of the "monkey," which "sits" on the pile and drives it downward, did not make it sink more than an inch or two; at others a single impact would send it down as many feet. Again, a succession of blows might seem to be without effect, the pile having struck a hard stratum. Suddenly this would give way, and the pile would drop several feet, and it often happened that a pile driven in to a depth of from 30 ft. to 50 ft. rose a couple of feet between the blows of the driver.

A really serious difficulty was encountered in one place, about a mile from the eastern shore of the lake. The first pile, 28 ft. long, was driven out of sight with a single blow, and a second pile of the same length disappeared in a similar manner when set on top of the first. At some time in the history of this great inland sea there was here a colossal gulch, which has since been filled up with the slime and mud of the Bear River. For over six months tons and tons of solid rock were poured into this cavity, only to disappear out of sight and touch. The soft mud oozed from under this gigantic weight, allowing it to sink deeper and deeper until the engineers were dismayed. Perseverance conquered, however. The "bottomless pit," as the cavity was rightly named, was duly filled in, but during one month over 2,500 tons of material a day were tossed into this appalling quagmire.

The track was laid from both east and west, and the workmen met in the middle of the lake. "Stringers" were brought to them on rafts and lifted to the bridge by means of large cranes. Many thousands of logs for piles were kept in huge "booms" on the shores of the lake and towed, when needed, to the place where the pile-drivers were at work. All told, 38,256 trees, representing two square miles of forest, were cut down to make piles.

In the summer the heat was trying, and in the winter there were sand storms on land and gales on the lake. The gales proved especially troublesome. They were so common that material and machinery valued at over £20,000 was lost during the period of construction, and the shores of the lake were lined with wreckage for years after the engineers had completed their task. In one severe storm a number of men had a narrow escape. Some bunk-houses, each accommodating 25 men, which were moored on pontoons some distance from the land, were swept away in the middle of the night and carried about 40 miles down the lake. The occupants were rescued from their perilous position in the nick of time by a pursuing tow boat.

The depth where the track is carried over the water on trestles is about 27 ft., and the rail level is 19 ft. above the surface of the lake. A railing, breast high, has been placed on each side of the permanent way, and into these refuges have been built for the benefit of workmen and pedestrians. Here and there the bridge is wide enough to allow for the passing of trains and on one small portion the track is double.

Midlake Station, in the centre of the crossing of the western arm of the Great Salt Lake. Boats can be taken from this and other stations on the crossing, to various islands.

There are several stations, and one of them, known as Midlake Station, is right in the centre of the lake. Passengers alight there to view the vast expanse of water, and trips can be taken by boat to islands in the lake, the home of thousands of pelicans, seagulls and other bird life. The waters of the lake are too brackish for ordinary fish, and the only living thing found in them is a tiny shrimp that is only one-third of an inch in length.

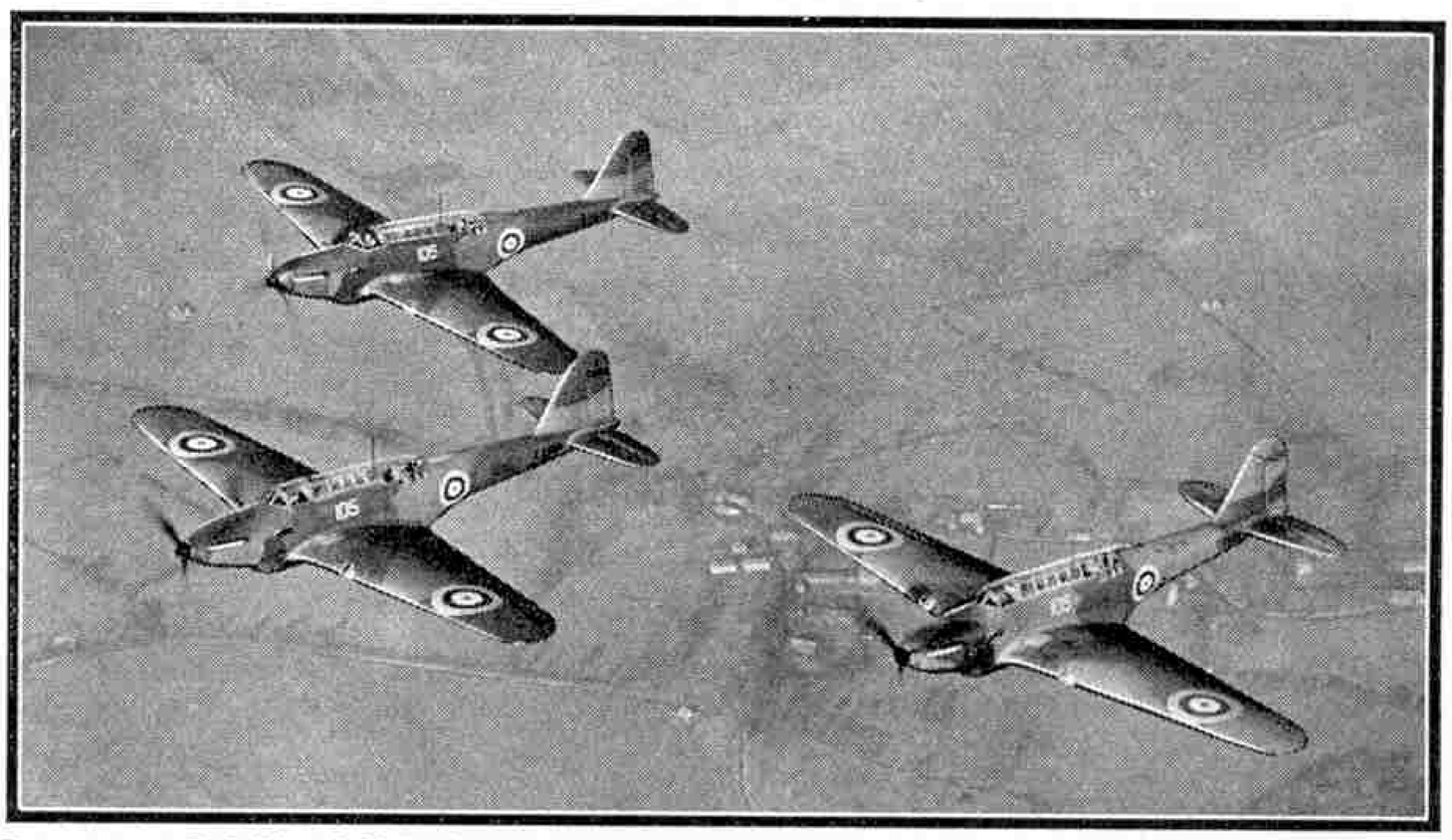
The entire cut-off from Lucin to Ogden is dead straight and more nearly level than an ordinary floor. There is no gradient for 36 miles, and for 30 miles more the slope is so slight that an average person would have to travel half a mile to rise his own height. The steepest gradient is only 5 in. in 100 ft. Over two years were spent in the erection of the famous crossing, and the cost was £1,800,000.

AIR NEWS

Long Test of R.A.F. Fairey "Battles"

Every new type of aircraft adopted by the Royal Air Force is very thoroughly tested in actual service. This is done by subjecting a flight of three machines from the first squadron equipped with a new type to trial flying in service conditions for 500 hrs., which is equivalent to a distance of 100,000 miles.

A flight of three Fairey "Battles" recently completed this prolonged test. The "Battle" has a top speed of 260 m.p.h., and is the fastest single-engined bomber in the R.A.F. A flight of these high-speed bombers in the air is shown in the illustration on this page.



Bombers over Berkshire. A flight of three R.A.F. Fairey "Battles," with which many squadrons are now being armed. Photograph by courtesy of "The Aeroplane."

Gliding Records

A new British long-distance gliding record was achieved on 30th April last by Mr. Philip Wills, of the London Gliding Club, who flew from Heston, in Middlesex, to St. Austell, in Cornwall, a distance of about 206 miles. The previous record distance was 144 miles, and this was accomplished by Mr. J. S. Fox on 18th April, when he flew from the Cambridge University Gliding Club's Easter camp at Huish, in Wiltshire, to Fowey, in Cornwall.

In Germany recently L. Hoffman set up a new record by flying in a two-seater glider from Trebbin, near Berlin, to Deblin, in Czechoslovakia, a distance of 248 miles. He was in the air seven hours.

"Crossing The Line" by Air

The act of "crossing the line" by air has not yet become the occasion for a humorous ceremony such as takes place on board a liner when it crosses the Equator. Passengers crossing the Equator in Imperial Airways flying boats, however, receive a special "Certificate of Contemporary Travel" that bears their name and is signed by the Commander of the flying boat, and records that they have made their aerial "crossing of the line." Imperial Airways flying boats operating on the England-South Africa route cross the Equator as they fly over Lake Victoria, and those operating on the England-Australia route do so as they cross the Lingga Archipelago, south of Singapore.

Much Ado About Nothing

Strange missives reach the Foreign Correspondence Department of Imperial Airways, but the staff responsible for their translation generally manage to deal with them. The other day, however, a letter arrived in a dialect that even the most experienced official was unable to understand. As it might have been from a prospective passenger every effort was made to find out what it was all about, but even after the aid of foreign consulates had been obtained, the riddle remained unsolved.

As a last step the missive was entrusted to a firm specialising in little-known languages, and even these experts found it a difficult task, for the letter had been written in an obscure Slavian dialect. The cost of the translation work on it totalled several pounds. And, when all was said and done, all that the mysterious letter contained were the words "Dear Sir, I beg to apply for a position with your company as a labourer."

R.A.F. Vacancies for Apprentice Clerks

The Air Ministry announce that further vacancies for well-educated boys to enter the R.A.F. as Apprentice Clerks will occur this month. Candidates must be between 15½ and 17¼ years of age on 1st July, and possess either an approved School Certificate or evidence that they have attained an approximately equivalent educational standard. Apprentice Clerks are attested for 12 years regular Air Force service from the age of 18 years. Full information concerning rates of pay, promotion, etc., is 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.

Summer Plans of Railway Air Services

Since Railway Air Services began operations in 1934 their multi-engined air liners have flown three million miles on regular services, and during this year they will add another million miles to this total.

The Company introduced two important summer daily services on 23rd May. One of these links the north and south; and the other South Wales and the west of England. The north and south service operates between Manchester and Brighton airport, with calls at Liverpool, Birmingham, Bristol, Southampton, and Ryde, Isle of Wight, and also at Cheltenham and Gloucester airport on request. The South Wales to west of England service operates between Bristol and Southampton, with calls at Cardiff and Exeter. Both these services connect at Bristol for the exchange of passengers, and similar connections are also made at Southampton for Jersey and at Ryde for Portsmouth.

Regular Sunday services began on 26th June, when a service linking South Wales with resorts on the south coast of England was introduced. The air liner leaves Cardiff each Sunday morning for Ryde and returns in the evening, calls being made at Bristol and Southampton on both flights. There are also two Sunday services in both directions between Belfast and Glasgow.

During the summer there are two services each day in both directions over the company's London-Belfast route. On the morning flight the air liner calls at Liverpool, and connecting services to and from Manchester and the Isle of Man are operated by Isle of Man Air Services Ltd. The air liner making the afternoon trip calls at Birmingham, Manchester, Liverpool, and the Isle of Man. At Belfast passengers are able to get a connection to Glasgow and there they are able to connect with Scottish Airways. The Glasgow connection with this company's services enables a passenger to travel by air from the Outer Hebrides to London in only 6 hr. 40 min.

Newspaper Aeroplanes in Russia

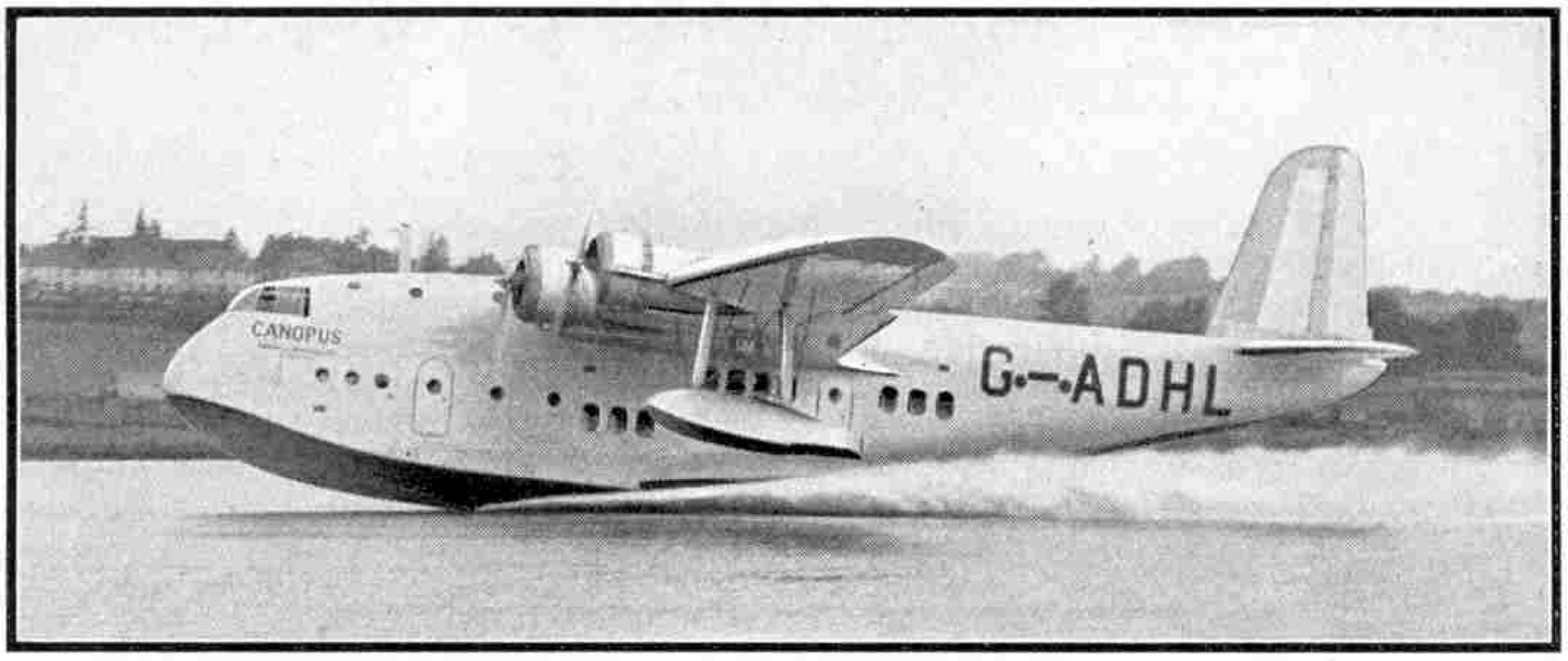
"Newspaper planes" carrying loads of daily and weekly journals and magazines are being used on an increasing scale in Russia. These aircraft fly between centres of population and remote areas, and consignments of periodicals are dropped by parachute over isolated villages.

More Flight Clerks for Empire Air Services

Another group of young men from many different walks of life recently began their training to become flight clerks in the large aircraft of Imperial Airways operating on Empire air routes. Their early instruction consists of lectures by experts on such subjects as the history of Imperial Airways, the different types of traffic carried by the company and the methods of handling such traffic, the aircraft load-sheets, passenger lists, and cargo manifests, and the law as it affects aerial transport. Flights for the purpose of gaining experience are made on Continental routes, and instructional visits paid to the marine air base at Southampton. After this the probationary flight clerks pass for a period of more practical training through various departments of the company's organisation. These include the operations, air mail, and passenger departments, the export and import departments, and the accountant's department.

On completing their schedule of training in England, the probationary flight clerks will hold themselves in readiness to travel as additional flight clerks in the large flying boats on Empire routes, and also to undertake a period of training at various stations overseas. When the young men now being trained in this capacity have completed their course the company will have about 50 flight clerks in service.

The work of a flight clerk resembles that of a ship's purser. During the flight of an Empire flying boat the flight clerk is responsible for the flying boat's papers, for dealing with documents at halting points, and for handling mail loads. He also assists the passengers with luggage and other matters, points out the interesting landmarks to them during the flight, conveys information from the captain to the passengers as to the speed the flying boat is maintaining, and informs them of the probable time of arrival at the next port of call.



The graceful manner in which an Empire flying boat rises from the water is indicated in this view of "Canopus" taking off. Photograph by courtesy of "Flight."

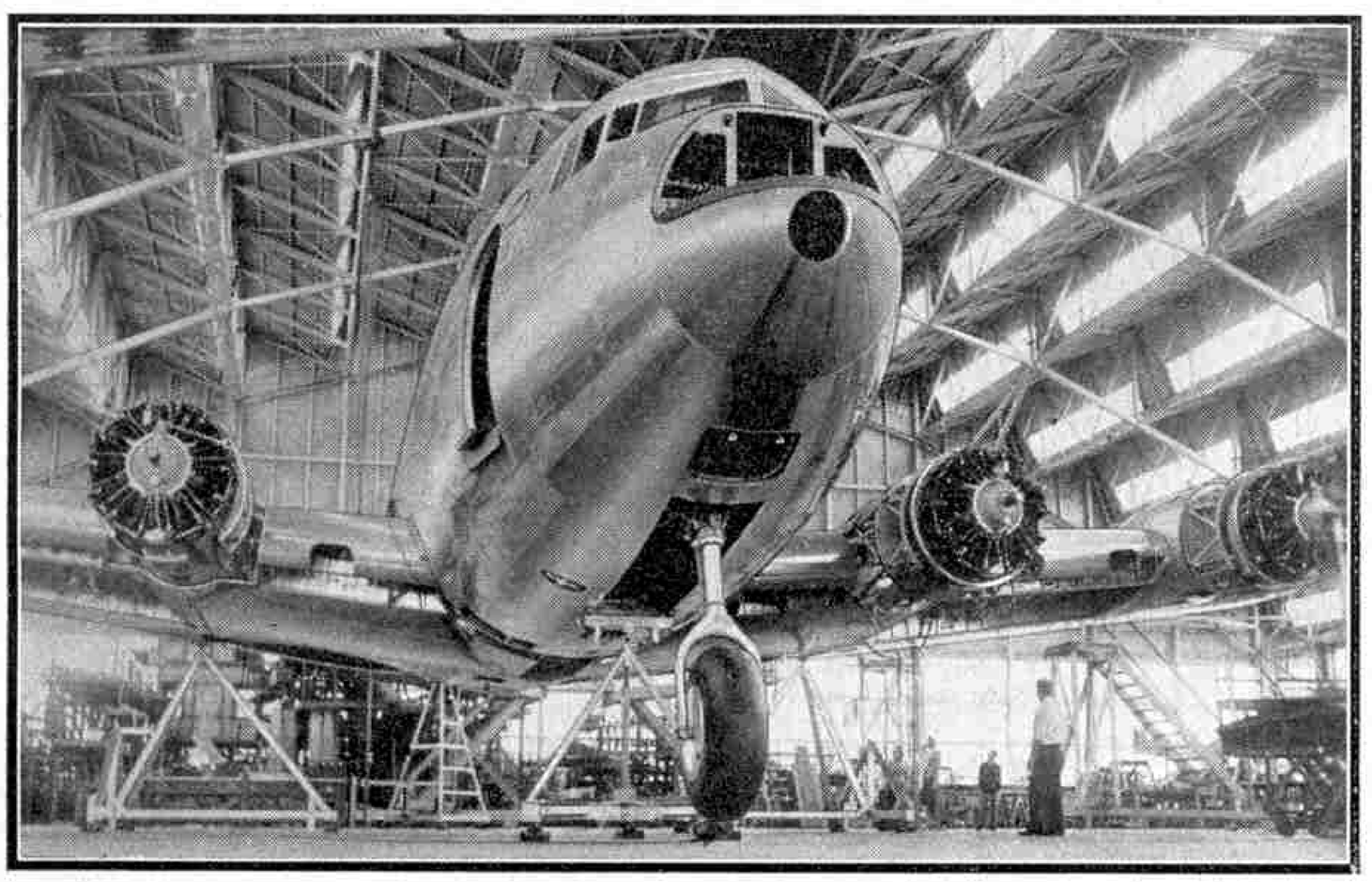
King's Cup Air Race

The 1,000-mile King's Cup Air Race will be held on 2nd July, over a 50-mile circuit. Competitors will take off from Hatfield, and turning points will be Buntingford, Herts., and Barton, Beds.

Balloon Barrages

A group of 10 Balloon Barrage Squadrons of the Auxiliary Air Force are to be formed, and the first three, Nos. 901, 902 and 903 (B.B.) Squadrons respectively, are now being organised at No. 1 Balloon Centre, Kidbrooke, London S.E.3. These three squadrons and the other seven yet to be formed will be instructed by R.A.F. officers and airmen who recently completed their training for this work at Cardington. At present recruiting is strictly limited, but eventually the squadrons will total about 6,000 officers and men.

In wartime a balloon barrage over a defended area would be a deadly menace to invading aircraft, for the balloon cables would be made lethal by a secret process, and any aeroplane that came into contact with them would be destroyed. The invaders therefore would have to pick their way between the cables in order to dispose of their load of bombs, or fly above the balloons at a height so great that their chances of hitting their objectives with their bombs would be greatly reduced. The presence of the barrage also would limit the air space in which the defending aircraft of the Fighter Squadrons would have to search for the invaders.



The latest Douglas air liner, at present called the DC-4, which has a three-wheel retractable undercarriage. This illustration shows the front or "nose" wheel immediately after being installed. Photograph by courtesy of the Douglas Aircraft Company, Inc., U.S.A.

The King Visits R.A.F. Stations

The King recently spent a very interesting day visiting four R.A.F. stations, one of each of the four Home Commands. He flew from Windsor and from station to station in the Airspeed "Envoy" of the King's Flight, piloted by Wing Commander E. H. Fielden. The tour began at Northolt, one of the stations of the Fighter Command, where the King watched a flying display by No. III (Fighter) Squadron, the first to be equipped with Hawker "Hurricanes," and he was greatly interested in this latest high-speed R.A.F. fighter. He also visited the Sector Operations room, which is concerned with air defence, and the cine-camera section, where he saw a demonstration of the latest camera-gun. At Harwell, one of the stations of the Bomber Command, His Majesty inspected a variety of bombers lined up on the aerodrome. The aircraft included "Blenheims," "Battles," "Wellesleys," "Whitleys," and "Harrows."

From Harwell the King flew to the Central Flying School, Upavon, one of the stations of the Training Command. The 45 aircraft of the school, including "Tutors," "Ansons," "Oxfords," "Harts," and "Furies," were drawn up in two lines, each grouped in flights. The members of each flight were ranged in front of their aircraft, and the King paused to speak with the Commander of each flight. During the tour of the station the King visited the Link Trainer room and the aircraft and engine repair sections. After lunch he asked to see some flying, and two R.A.F. officers in Hawker "Furies" gave a thrilling unrehearsed display of aerobatics.

The final call of the day was at Thorney Island, a station of the Coastal Command, where the 50 aircraft assembled included "Sharks," "Swordfishes," "Nimrods," "Vildebeests," "Ospreys," and "Ansons." The King made a tour of the station, and among the buildings visited were the Torpedo Section and the School of Air Navigation. He afterwards flew back to Windsor in the Airspeed "Envoy."

"Tricycle" Landing Gear

The Air Ministry have bought a Monospar aeroplane fitted with a three-wheel undercarriage, for research on this type of landing gear.

Story of the "*Cutty Sark*"

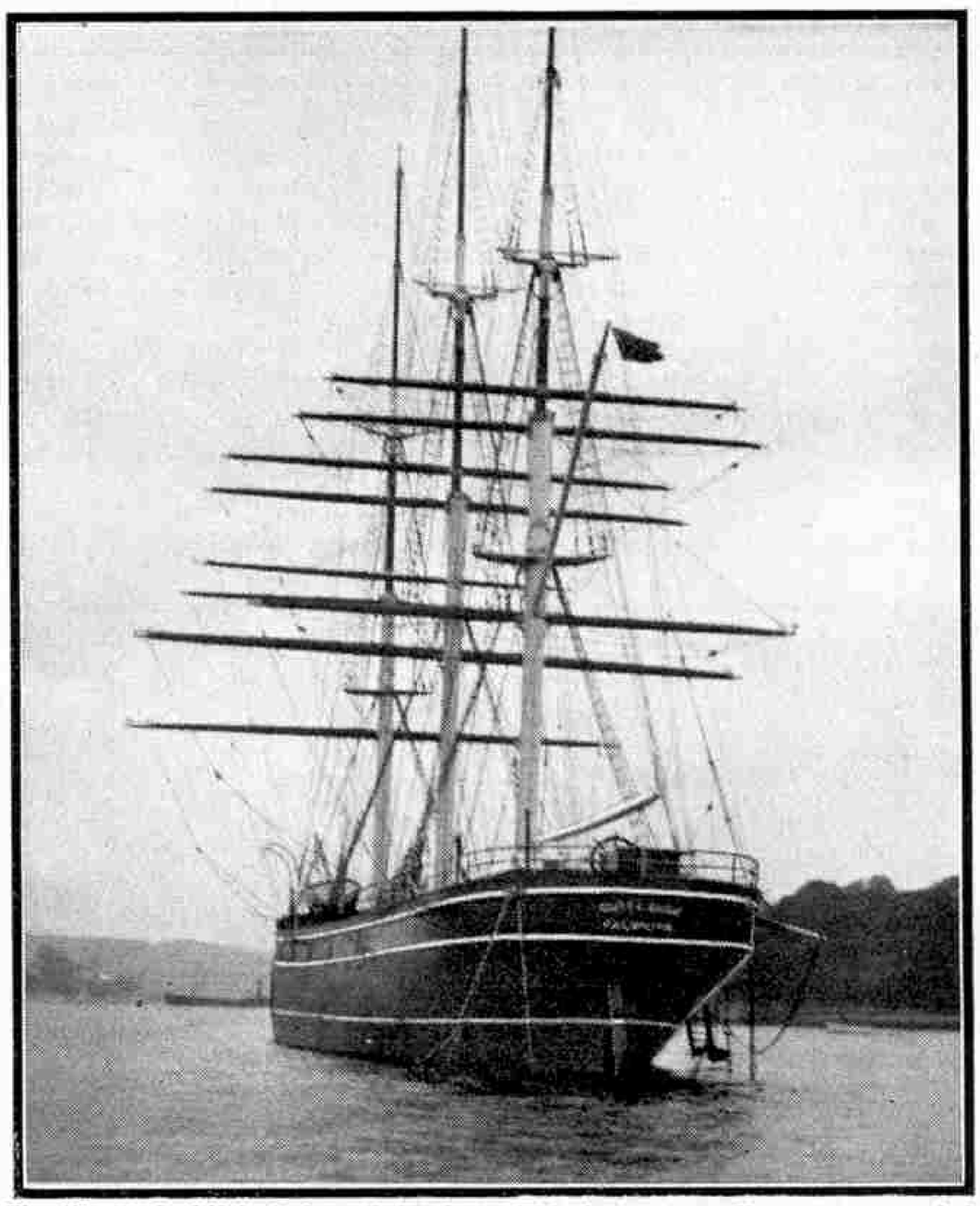
The Most Famous of the Tea Clippers

By Arthur Lamsley

THE "*Cutty Sark*," the world's most famous clipper, which made sailing history by her great passages in the China tea trade, has been given to the Thames Nautical Training College for use as a training ship for cadets in the Merchant Service. The clipper is now moored in the River Thames at Greenhithe.

Like many of the world's most famous ships, the "*Cutty Sark*" was built on the Clyde. Her keel was laid down early in 1869 at Scott and Linton's Shipyard, Dumbarton. Hercules Linton designed her, and while having other fast sailing ships in mind he also embodied in her lovely hull some of the strong lines to be found in the Firth of Forth fishing ships. Her powerful sail plan was worked out by John Rennie, who gave the clipper enough sail for a much bigger ship.

The clipper was stoutly built of teak, with iron beams. Her decks and deck fittings also were of teak, a wood that stands up to the wear and tear and heat of the tropics, and possesses oily qualities, which defy the worms that eat into softer wood. Her under-water body was copper-sheathed. So carefully was the wood for her planking selected that it would be impossible to find a knot anywhere in it, and even to-day, after nearly 70 years, her planking is as good as ever. It is said that during all her ocean voyages, in every type of weather, she never once sprung a leak.



The "Cutty Sark" in Falmouth Harbour. This famous tea clipper was regarded by many who sailed in her as the fastest sailing ship afloat.

The hull of the "*Cutty Sark*" was painted black, and had a gold line level with the main deck. Her stem and figurehead were profusely decorated. Her lower masts were white, and her yards and upper masts black. The boats also were black originally, but later were painted white. She was by no means the largest of the clippers. Her length is about 212 ft., her beam 36 ft., and she has a draught of 21 ft. Her registered tonnage is 921. She carries three tall masts, her main mast being 150 ft. from deck to truck, about as high as Nelson's Monument.

Why was the vessel named "*Cutty Sark*"? "*Cutty*" is Scottish for short, and "*Sark*" means shirt. Nannie, the lass in Burns' poem "*Tam O' Shanter*," wore very short dresses, and the original figure-head of "*Cutty Sark*" was modelled after Nannie by F. Hellyer, of Blackwall.

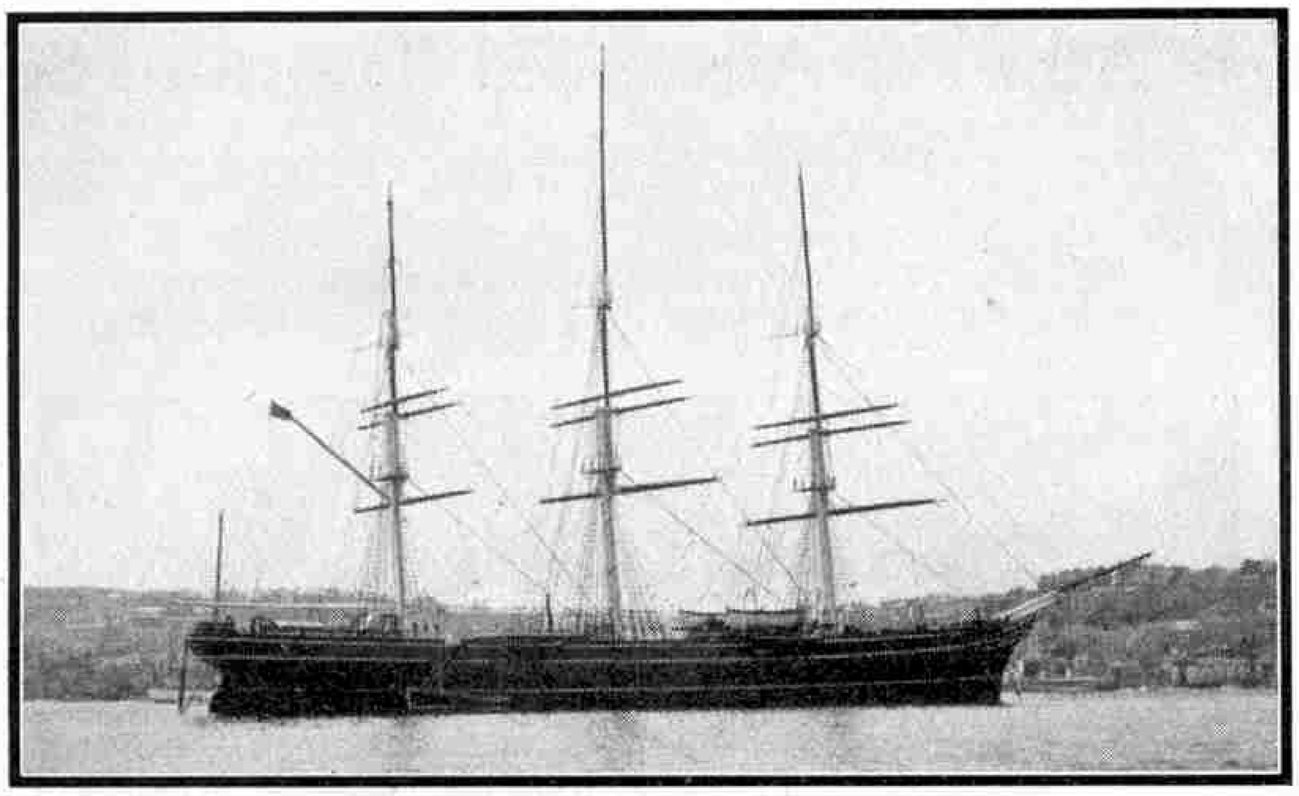
The vessel was launched on 23rd November 1869 by Mrs. Moodie, the wife of her first skipper. Early in the following year she sailed from the Clyde round to the Thames and commenced her maiden voyage to China on 15th February. Designed for speed, and the first clipper to have so narrow a beam, she showed her grand sailing qualities during her first voyages. She was particularly fast when sailing against the wind, but her best point of sailing was with a strong quartering wind, when sometimes she would keep up a surprising speed of 16 knots. In the China tea trade she held her own against the bigger ships, and was often first home to London River with the new tea.

The China tea clippers used to race from Shanghai to London. The "*Cutty Sark's*" greatest rival was the fast clipper "*Thermopylae*" of Aberdeen, and once these great sailing ships left Shanghai almost neck and neck to start the race of 13,000 miles, which would take over three months. The "*Cutty Sark*" began to gain on her rival, and gained several days while crossing the Indian Ocean. Before reaching the Cape a terrible hurricane struck her, however, and carried away her rudder. It took several days to make a jury-rudder out of a 70-ft. spare spar. With this the clipper could not sail so fast, and during another storm off the West Coast of Africa a great wave knocked the temporary rudder off its hinges, and it had to be pulled aboard again and new iron fittings forged. In spite of these misfortunes London was made 122 days out from Shanghai, and the "*Thermopylae*" only just won the race.

Steamers ousted the sailing clippers from the China tea trade, as they could make the journey in 50 days against the average 100 days of the clippers. Many of the famous sailing ships then traded in wool, carrying great cargoes between Sydney, Australia and London. The "*Cutty Sark*" was among them, and during this period she made some of her greatest voyages. In 1888 she made a thrilling passage from Sydney round Cape Horn to London in 71 days. The wool clippers also used to race home from Australia, just as the tea clippers did and the grain ships do to-day, and on many occasions the "*Cutty Sark*" made the best wool passage of the year, once beating her great rival "*Thermopylae*" by seven days. So excited was her owner, Captain John Willis, over his clipper's speed that he had a golden "cutty sark" made and screwed to the top

of the mainmast, a challenging symbol of his belief that she was the fastest sailing ship afloat.

The clipper was a grand sea boat and only once hove-to under the British flag. This was during the great Channel storm of November 1877, when dozens of ships were wrecked. She took shelter in the Downs, off the Kentish coast, and during the height of the storm both her anchor cables broke. After colliding with a couple of other sailing vessels and having her bulwarks smashed in, she drifted down Channel and was picked up eventually off Dover by a tug.



A broadside view of the "Cutty Sark," showing the great height of her mainmast.

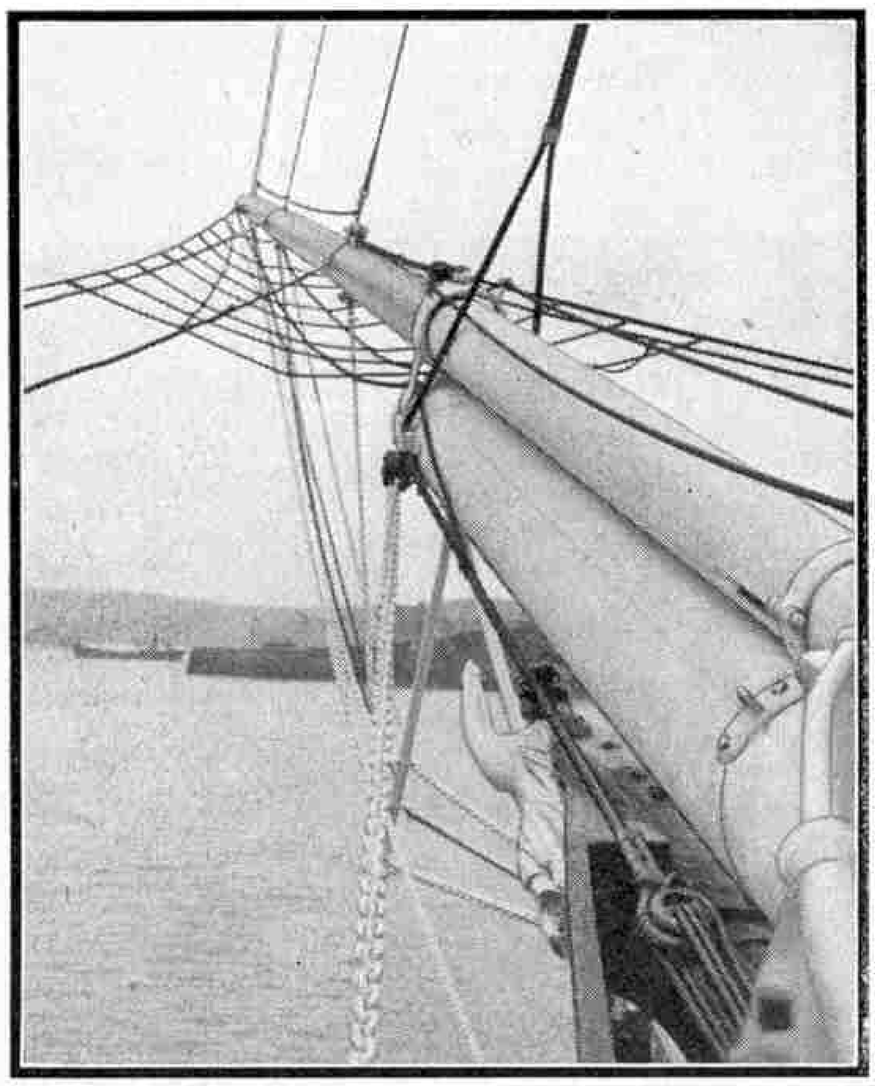
The "*Cutty Sark*" was commanded by Captain Moodie for three years, and then by Captain Woodget for 10 years. Other captains were Bruce and Wallace, and many interesting tales are told of the exploits of these men. Wallace and Woodget knew that the "*Cutty Sark*" would stand hard driving and took full advantage of her capacity to do this. Woodget never hove the ship to while he was in command. He satisfied himself that her gear was sound, and then was ready to drive her through anything. She was a willing vessel and even when running before a big following sea she could be kept on a straight course by a boy. It is said that even in the "Roaring Forties" Woodget went about in carpet slippers and seldom got wet feet.

Wallace was equally hardy and was in his element when a great wind threatened to blow the sticks out of her. On one occasion in a great storm, with tremendous seas running behind so that the ship had to carry on or be pooped, the log recorded 17½, 17 and 17½ knots in three test heaves. The clipper then made 1,050 miles in three days. It was not unusual for the "*Cutty Sark*" to overtake and pass the full-powered steamers of the days when she was in her prime.

Captain Woodget was a real character. At Shanghai he was given a bicycle, one of the old "boneshaker" type with wooden spokes and pedals fixed to the front wheel, and he learned to ride it on the 'tween decks of the ship in spite of her movement. Once the bicycle dived through a hatch into the ballast, but the skipper succeeded in grabbing a stanchion and so saved himself from following his machine. Roller skating was another unusual pastime in which he indulged, and there were many encounters between his head and the "*Cutty Sark's*" teak deck.

"*Cutty Sark*" was generally a happy ship, and only on one round voyage did she experience trouble with her crew. It was during the days of Captain Wallace, when she was commissioned to ship a cargo of coal at Penarth, South Wales, for the Pacific. There had been a change of officers and crew, and the new mate, Sidney Smith, was a hard case, a big rough-and-tumble fellow who dispensed discipline with force. A big negro named Francis joined the ship at Penarth as a deckhand and soon fell foul of the mate. On one occasion, several days out, they fought for an hour, neither gaining the mastery. Things gradually grew worse and in the Java Sea, during another fight, the mate felled Francis with a capstan bar and killed him. The ship's crew took the part of the black man and struck work. The situation completely unnerved the skipper, and he jumped overboard in the shark-infested Java Sea.

During her career "*Cutty Sark*" accomplished many great sailing performances. Besides the 1,050 miles she did before a westerly gale in three days on the occasion already referred to, she once sailed 3,456 miles in 11 days, and during a great race in 1875 she set up a record by sailing 370 miles in a day.



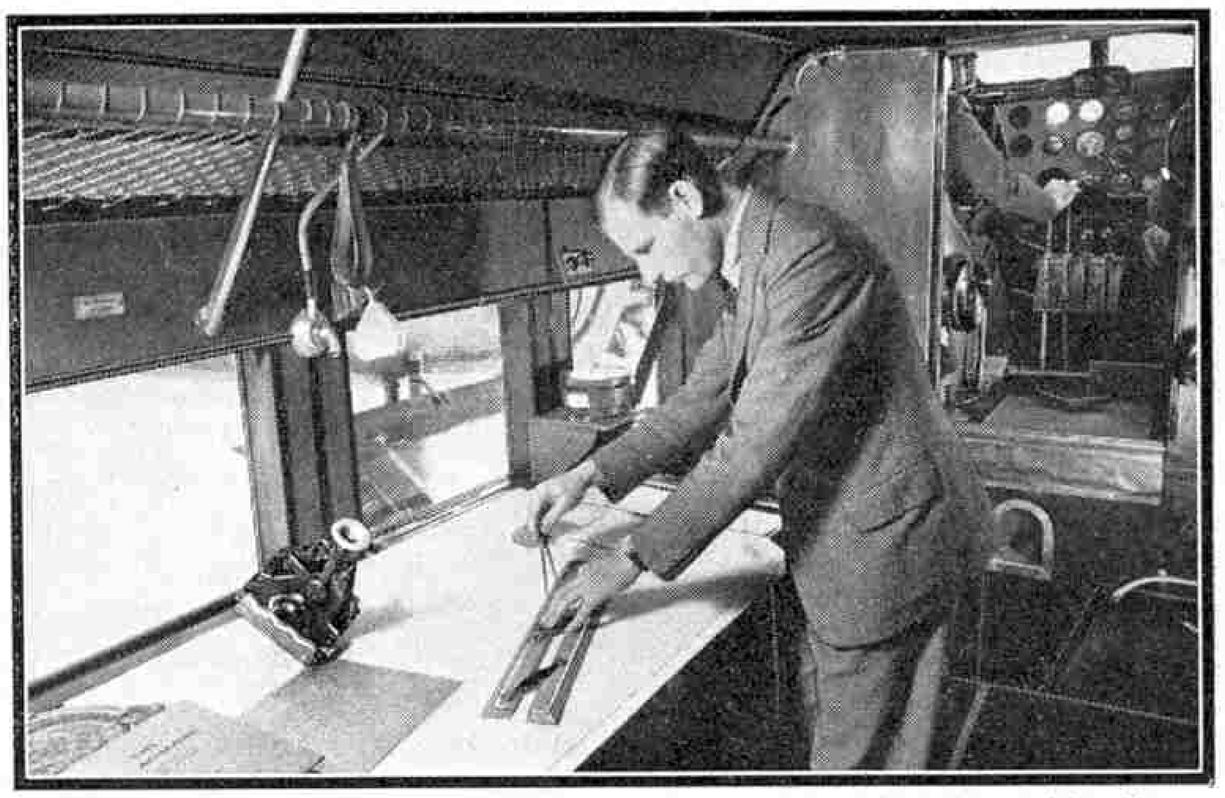
Looking ahead along the boom of the clipper from the port side of the vessel, part of the figurehead of which can be seen.

After 10 years under Captain Woodget's command came the day when big profits from sailing ships could not be found. In 1895 the famous clipper was sold to a Portuguese firm who re-named her "*Ferreira,*" although the Portuguese always spoke of her as "*La Pequina Camisola,*" which means "the little shirt." She remained under the Portuguese flag, in the coastal trade between Lisbon, African and British ports, for 27 years. Then during a voyage from London to Lisbon in 1922 she headed into a great storm when sailing down Channel, and put into Falmouth for shelter. There she was seen by Captain Dowman, a retired sailing ship skipper, who bought her for approximately £3,000, re-fitted her in her original trim and used her as a training ship for youth wishing to follow the career of the sea. Captain Dowman died two years ago, and his widow has now presented the ship to the nation for use in training cadets for the Merchant Navy. For her last voyage, bringing her from Falmouth to the Thames, she was manned by cadets of H.M.S. "*Worcester,*" the famous training ship that she has now joined at moorings off Greenhithe, where the two old sailing ships form part of the Thames Nautical Training College. Thus her permanent home is to be in the port that formed the finishing point for the great races of the tea clippers, of which she is the only survivor.

Aeroplane Pilots at School

British Airways Advanced Training Scheme

THE air pilot who has obtained the thorough training provided by a modern flying school and has followed it up with practical experience in flying light aircraft of various types usually desires to become the pilot of a twin- or multi-engined air liner. The large air transport companies, however, are ever on the lookout for means of improving still further the efficiency and safety of their aircraft and air services, and a pilot joining such a company after experience with smaller concerns may find many devices in use which are new to him.



Navigation by dead reckoning and celestial observations during a flight in a British Airways instructional aeroplane. Photographs by courtesy of British Airways Ltd.

In order to bridge this gap in technical knowledge British Airways Ltd. have established a training school at Heston Airport, their operational headquarters, so that they can give their pilots all the instruction necessary to keep them abreast of the latest technical developments. This training enables the pilots to use to full advantage the scientific aids at their disposal, as the company's aircraft are equipped with the most modern and complete radio and instrumental aids to flight, including Lorenz blind approach receivers and complete de-icing apparatus.

The modern high altitude aeroplane with its supercharged engines, controllable-pitch airscrews, carburetter heaters, fuel analysers, retractable undercarriages, flaps, etc., demands great engineering knowledge and skill for its most efficient operation. On this account it is essential for pilots to undergo a very thorough course of technical training before taking charge of these aircraft, and this tuition is a very important branch of the work of the British Airways school.

It is realised that the advanced training and actual experience essential for young pilots can only be obtained within the organisation of an air transport company operating both day and night services. The British Airways school aims at training the pilots to the same high standard of precision and reliability that has been reached in aircraft performance, and by so doing to increase the safety and regularity of the company's services. It is, in fact, a centre for the study and evolution of more efficient methods of air navigation, and of the safe landing of aircraft in bad visibility.

Another important purpose of the school is to provide the trained personnel that will be required as the company's air routes are increased, and particularly when the proposed regular service to West Africa and South America is introduced.

The very comprehensive syllabus of the school includes navigation training to the standard of the Air Ministry First Class Navigator's examination. The series of consecutive courses in this subject are essentially practical, and include extensive applied navigation in the air by day and night. One of the most important flying courses deals with the Lorenz system of blind approach, and the school is the first of its kind in the Empire to undertake the training of pilots in this system. All the company's service aircraft are equipped with this latest scientific device for safety in bad weather, and the school instructional machines also have been equipped for this work.

Inside a British Airways school aeroplane during an instructional flight. A lesson in astronomical navigation is in progress.

An entirely new method of teaching the Lorenz system has been adopted, however, and a mechanical ground training machine called the Link Trainer is used for this purpose, and also to teach instrument and radio beam flying. This remarkable apparatus is the first to be used in this country for the training of commercial air pilots. An illustrated description of the Link Trainer was published in the May 1938 "*M.M.*"

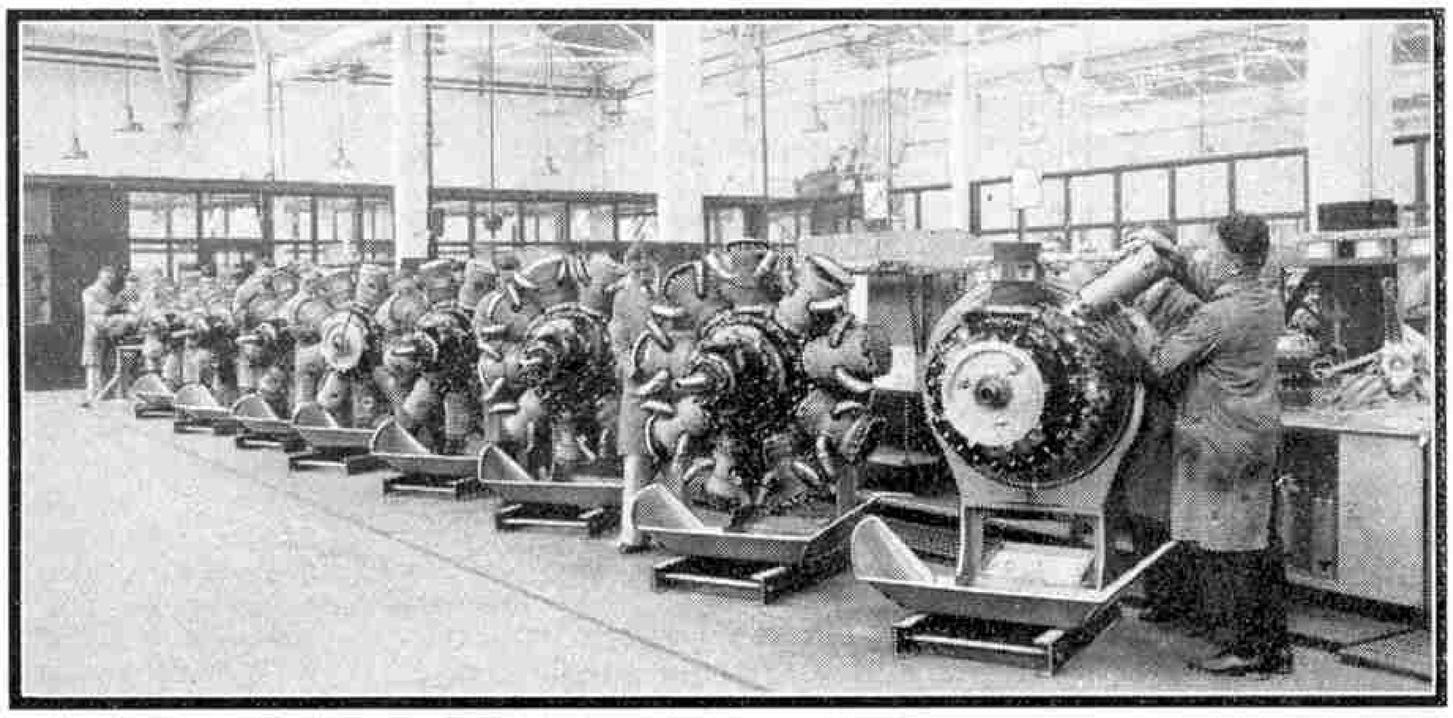
The instructional aircraft of the school include a twin-engined Lockheed "Electra" and a triple-engined Fokker Mk.XII. They are equipped for night flying, practical air navigation, and blind approach training. The cabin of the Fokker has been fitted up with chart tables, etc., for the pilots in training, instead of with the normal passenger accommodation. The interior is shown in the illustrations on this page. In the school itself there are fully equipped lecture rooms and workshops for technical training.

Sleeve Valve Engines for Aeroplanes

Success of the Bristol "Perseus XII"

DURING the past 11 years the Bristol Aeroplane Company, in co-operation with the Air Ministry, have been at work on the development of a sleeve valve engine for aeroplanes. The engines of one series of this type that they have designed and built are grouped under the general name "Perseus." They are nine-cylinder radial air-cooled engines that have proved highly successful in trials on the test bench and in active service, and the "Perseus XII," an engine of 905 h.p. that is the latest of the type, is the first sleeve valve aero engine in the world to go into large quantity production.

The "Perseus" engines are built up in a similar manner to the air-cooled radial engines for which the Bristol Aeroplane Company has long been famous, except in regard to their valves and valve gear. In most aero engines, as in those of most motor cars, the valves are of the familiar poppet type, with mushroom heads and long stems, and are raised from their seatings by means of cams when the inlet and exhaust ports they control are to be opened. A spring returns them when the ports have to be closed. In the "Perseus" engines, the valves are steel cylindrical sleeves placed between the cylinders and their pistons. Round the circumference of each sleeve near its top are four specially shaped ports or openings. By means of simple spur gearing and cranks the sleeve is given a double motion, one up and down the cylinder and the other an oscillating circular motion, with the result that the ports in the sleeve are brought over corresponding ports in the cylinder walls at exactly the right times in the cycle of operations to admit the explosive mixture and to exhaust the burned gases.



Bristol "Perseus" sleeve valve aero engines in the final stages of assembly. The illustrations on this page are by courtesy of The Bristol Aeroplane Co. Ltd.

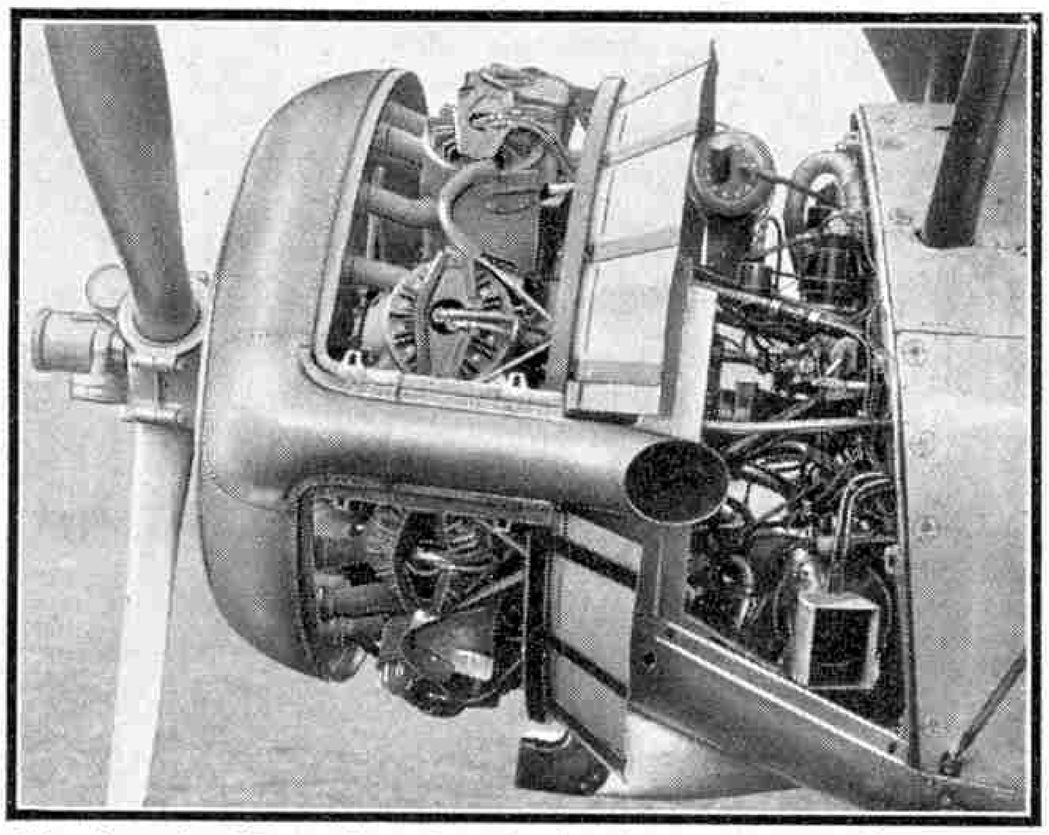
Sleeve valve engines are remarkable for the smoothness and quietness with which they work, and for the absence of vibration. At every stage of the entire four-stroke cycle and at any speed the valve gear moves easily and positively, and the effect is in marked contrast to the hammer and anvil action of poppet valves opened by cams and returned by springs. It is claimed that the sleeve valve aero engine has a substantially lower fuel consumption than a poppet valve engine of corresponding power. It is also cleaner in external appearance owing to the absence of any outside valve gear, and its general simplicity of design makes it much cheaper to produce and to maintain.

There is no doubt of the efficiency of the sleeve valve engine. In the research department at the Filton works of the Bristol Company five experimental single-cylinder test bench units have so far completed over 20,000 hrs. running, and complete engines have undergone equally severe trials in actual service conditions. In 1935 four Bristol "Perseus" sleeve valve engines were lent by the Air Ministry to Imperial Airways for test in the air liner *"Syrinx,"* equipped with four Bristol "Jupiter" poppet valve engines. The "Perseus" type were tested a pair at a time, and after being run on actual service flights for about 300 hrs. each pair was sent back to Filton for inspection. The returned engines were dismantled and after the closest scrutiny every part was found to be in excellent condition.

Imperial Airways have decided to equip a number of their Empire Flying Boats with "Perseus" engines, and these engines are also scheduled for several important prototypes, including the new de Havilland type 95 high speed twin-engined transport monoplane.

Service tests have not been confined to civil aircraft, for in 1936 the Air Ministry ordered 50 "Perseus" sleeve valve engines, the majority of which were used to equip an R.A.F. Squadron of Vickers "Vildebeest IV" general purpose aeroplanes. The remainder of the engines were fitted in various other aircraft for experimental purposes. Very successful and encouraging flight and starting trials of a "Perseus" engine have also been carried out in Canada in severe low temperature conditions. These tests were made by arrangement with the Air Ministry and were carried out under the supervision of the Royal Canadian Air Force.

The "Perseus XII" recently passed the 100 hrs. Air Ministry type test with excellent results. It is a moderately supercharged air-cooled engine 52 in. in diameter, and with its nine cylinders arranged radially in a single row. It develops a maximum power of 905 b.h.p. at a height of 6,500 ft., which is an exceptionally good performance for an engine of this size. The power for take-off is 795 to 830 b.h.p.



Side view of a "Perseus" engine, showing the accessory gear-box mounted on the bulkhead instead of on the engine itself.

In general design the new engine corresponds with previous "Perseus" types, but many detailed improvements have been made especially in equipment and installation arrangements. One highly important feature that has received official approval as a result of the type test is the new accessory gear-box, by means of which the large number of engine-driven accessories now required for aircraft equipment are mounted on the bulkhead instead of on the engine itself. This greatly simplifies the task of installing the engine in an aeroplane. The gear-box is driven from the rear of the engine by an enclosed flexibly jointed shaft.

The "Perseus XII" can be used with a controllable pitch airscrew, and a de Havilland-Hamilton airscrew of this type 13 ft. in diameter was fitted to the engine during 40 hrs. of the official type test, with satisfactory results. Extensive flight trials of the "Perseus XII" are now in progress, and over 200 hrs. of hard flying have already been completed. The flying has been carried out in very adverse weather conditions, and to a test schedule that subjects the engine to intentionally severe treatment.

The "Perseus XII" has been chosen for several new types of aircraft for the R.A.F., and a civil-rated version will be announced in the near future.

OF GENERAL INTEREST

Making Weather to Order

The General Electric Company of New York have recently built for their laboratories two steel compartments for testing radio equipment. In them it is possible to reproduce every kind of weather, with wind, rain, sleet and snow, Arctic and tropical temperatures, and high and low pressures, in order to test their effect on various instruments and parts of the equipment.

The Alfriston Lion, once the figurehead of a Dutch warship wrecked off the Sussex coast after a battle in 1672. Photograph by P. H. Lovell.

The compartments have steel walls 18 in. in thickness, with large portholes of thick glass through which the weather inside can be watched. Steam is injected when a warm moist climate is wanted. A dry ice plant can lower the temperature to 40 deg. F. below zero, or electric heaters can be used to reproduce hot dry conditions. When high altitudes are to be studied the pressure is reduced by the use of vacuum plants, and it is to resist the pressure of the atmosphere outside the compartments in these conditions that their walls are made so thick and strong. Gales are created artificially by two large fans, which are capable of raising winds of 30 m.p.h.

A Robot Opponent for Boxers

Boxers in training can now make use of a robot opponent that has several advantages over the ordinary punch ball or heavy sand-bag. It takes the form of an exact model of a boxer's body down to the waist. It is made of rubber and is flexibly attached by springs to a frame. When it is struck its movements cannot be judged, as can those of a punch ball, for it is so adjusted that it makes all kinds of unexpected movements, some of which resemble those of an opponent in the ring, and thus it provides difficult and strenuous training that will help to develop quickness and accuracy.

The resistance of the robot to punches can be adjusted to make it suitable for boxers of any weight, and the power of the blows delivered can be measured by an instrument attached to the back, while another device indicates the number of times a clean hit is made. In this way a record is made of the points scored by the boxer in a given time, so that he cannot dispute the result of a few rounds with the dummy. The rubber of which the robot is made is not hard enough to damage the skin, so gloves are unnecessary when sparring with it.

A Plough for the Ocean Bed

Telegraph cables laid in the shallow waters of coastal seas are frequently damaged by the heavy drags called "otter-boards" that are attached to the nets of steam trawlers. In an attempt to reduce their considerable losses from this cause, the Western Union Telegraph Company of New York have recently conducted experiments with a new type of cable-laying apparatus that ploughs a furrow into the ocean bed, lays the cable in the furrow, and covers it over to a thickness of several feet. Tests have proved the apparatus to be very successful, and it was recently installed on the cable-ship *"Lord Kelvin"* when she left New York harbour for the Irish coast to lay new cable lines.

No ordinary steel cable is strong enough to haul this submarine plough, and a special chain has been made for the purpose. This has 125,000 links, made of nickel steel, and is 4,200 ft. or over three-quarters of a mile in length. Its weight is nearly 20 tons.

Driftwood Makes the North-West Passage

On 6th September 1937 a piece of driftwood was picked up by the officer in charge of the Eastern Arctic Patrol on the shore of the Ballot Strait, in the far north-west of Canada. It was about 6 in. in diameter and 3½ ft. in length, and was so unusual in appearance that it was sent to the Forest Laboratories at Ottawa for examination. There it was identified as a branch of black spruce.

This tree is found only in certain localities, and the experts of the Forest Laboratories were able to state definitely that the piece of driftwood came from the forests of the Mackenzie basin, 1,500 miles away from the spot where it was found. To reach the Ballot Strait it must have made the north-west passage, in the search for which so many spent their lives and Sir John Franklin and his men were lost, during the last century. How long it spent on its journey can never be known, but probably it was drifting for several years. The timber has now been placed in the museum of the Forest Laboratory at Ottawa.

A Bandit-Proof Motor Car

As a protection against possible robbery attempts by bandits, a bank in Los Angeles, in the United States, has recently purchased a special armoured car. This has an outer covering of soft steel, from which bullets will not ricochet to injure bystanders, and behind the steel is a 2-in. layer of insulating material and an inner covering of bullet-proof steel. The hood is protected in a similar manner, and all windows are made of bullet-proof glass ½ in. in thickness.

The vehicle has three compartments, one for the driver, one in the centre where money and valuables are carried, and a conning tower at the rear. They are connected by telephone and are air-tight, so that the occupants can resist a gas attack for half an hour without suffocating. The guard in the raised tower at the rear has a field of fire in all directions, and there are gun-ports at the sides of the vehicle, one in the lower corner of the tower allowing fire down and along the sides of the car. Thus there are no blind spots in which an attacker can take refuge.

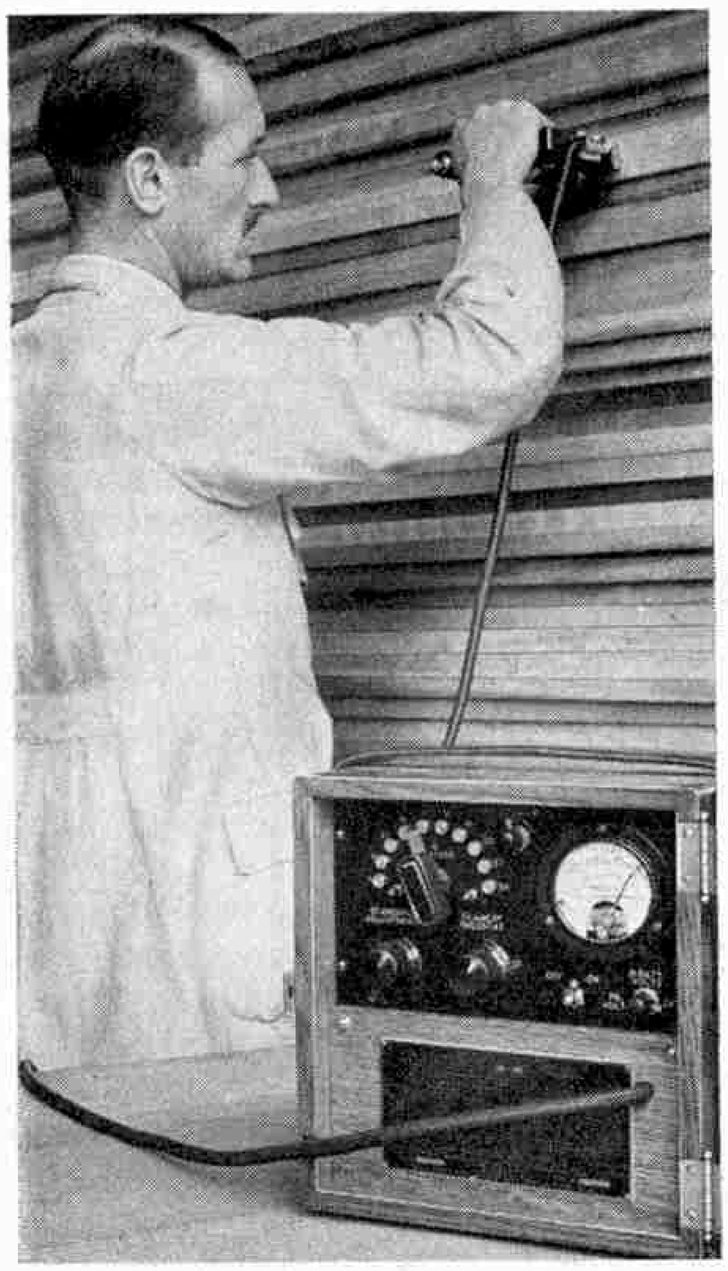
A brake lever and ignition switch in the conning tower give its occupant partial

The Old Bridge House, Ambleside, an architectural curiosity. Photograph by P. H. Lovell.

control of this travelling fortress in case the driver should be disabled. The equipment includes shot guns, rifles, hand grenades and gas bombs, so that any bandit who attacks the car will meet with a very unpleasant reception.

Does the Kea Kill Sheep?

The belief that the kea parrot of New Zealand is a sheep-killer is an interesting



Testing wood for use in making motor car bodies. The instrument employed is described on this page.

example of a legend that has long persisted, although the evidence in support of it is extremely scanty. This bird is about the size of a wood pigeon and lives on the mountain slopes. It has a long and cruel-looking beak and a weird cry, from which its name is derived and it flies so strongly at great heights that popular imagination would believe almost any story of its habits.

The belief that the kea kills sheep is more than 70 years old, and was founded on the discovery that strange wounds were seen in sheep, especially dead sheep, in country where keas lived. The legend spread, although nobody ever saw a kea attacking a live sheep, and when a special enquiry was made about 30 years ago the only evidence that could be produced was the existence of wounds on three dead sheep that the investigator was told had been killed by keas. The bird eats carrion, and there is a suggestion that wounds due to keas are made after the sheep have died from other causes.

The kea was not originally a bird of prey. There is in New Zealand a curious growth that resembles wool and is called the vegetable sheep. This contains grubs and insects, and it has been suggested that if the kea really does attack live sheep, it began to do so in mistake for this growth, and then learned to like the fat of the sheep more than its usual food.

Testing Wood for Motor Car Bodies

The wood used for the bodywork of motor cars must be seasoned very correctly, for the service demanded from it is considerably greater than would be the case if it were made into a piece of furniture. If there is too much moisture in the wood it will shrink or warp after being fitted, distorting the body and causing poor fitting of joints and annoying squeaks and rattles. On the other hand, wood that is too dry will lose its strength, and fail to endure the strain and vibration it receives.

In the ordinary way it would be difficult to test every piece of the vast amount of timber required in a busy motor car factory, and to be sure that it is all of just the right standard; but in the works of Morris Motors Ltd. an ingenious electrical instrument known as the Tag-Heppenstall Moisture Meter is used for this purpose. It indicates instantly the moisture content of any plank.

The part of the tester that is applied to the wood looks somewhat like an electric iron, but instead of a sole plate the bottom carries two metal plates, each fitted with two pins that can be pressed into the plank to be tested. The pins press down into the inside of the material, and so reach a part of the plank that gives a good average reading.

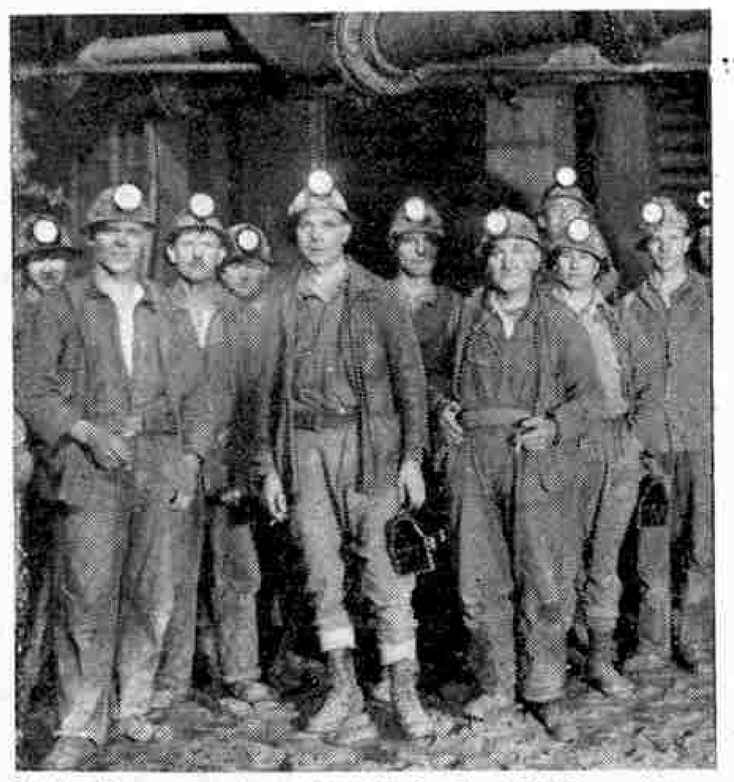
The "iron" is connected by a flexible lead to a combined battery container and instrument panel. Current from the battery passes through the wood from one pair of pins to the other, and is amplified by thermionic valves similar to those used for radio work. The panel is provided with a "moisture" switch, with readings from 7 per cent. to 24 per cent., a "standard adjustment," various other control switches, and a very sensitive meter that reads up to 100 volts and 5 milliamperes.

When a test is being made, the operator simply presses the four pins of the "iron" into the sample, and adjusts the knob of the moisture control until a reading of 25 volts is shown on the dial. The stud of the moisture control that has to be used to get this particular reading gives an indication of the percentage of moisture present in the sample.

If the planks of a large batch have to be tested individually, as in the illustration on this page, the instrument can be used in a slightly different and speedier manner. The moisture control is adjusted to the stud representing the moisture content that has been selected as correct for the planks. The pins on the iron are then pressed into each plank in turn, and those that possess more moisture than the set value are detected by the lighting up of a lamp on the top of the iron. By this method a large number of planks can be checked over in a very short time, any defective specimens being marked as the lamp lights up and reveals their presence.

The action of the instrument depends on changes in the conductivity of the wood brought about by differences in its moisture content, and the results obtained are so accurate that, when tested by the Government School of Forestry at Princes Risborough, the meter could be certified as accurate to within 0.01 per cent. Its particular advantage lies in the fact that the actual planks used for bodywork can be tested individually, and their suitability determined, with far more accuracy than is possible with any tester that checks only samples drawn at intervals from a batch.

T. R. ROBINSON.



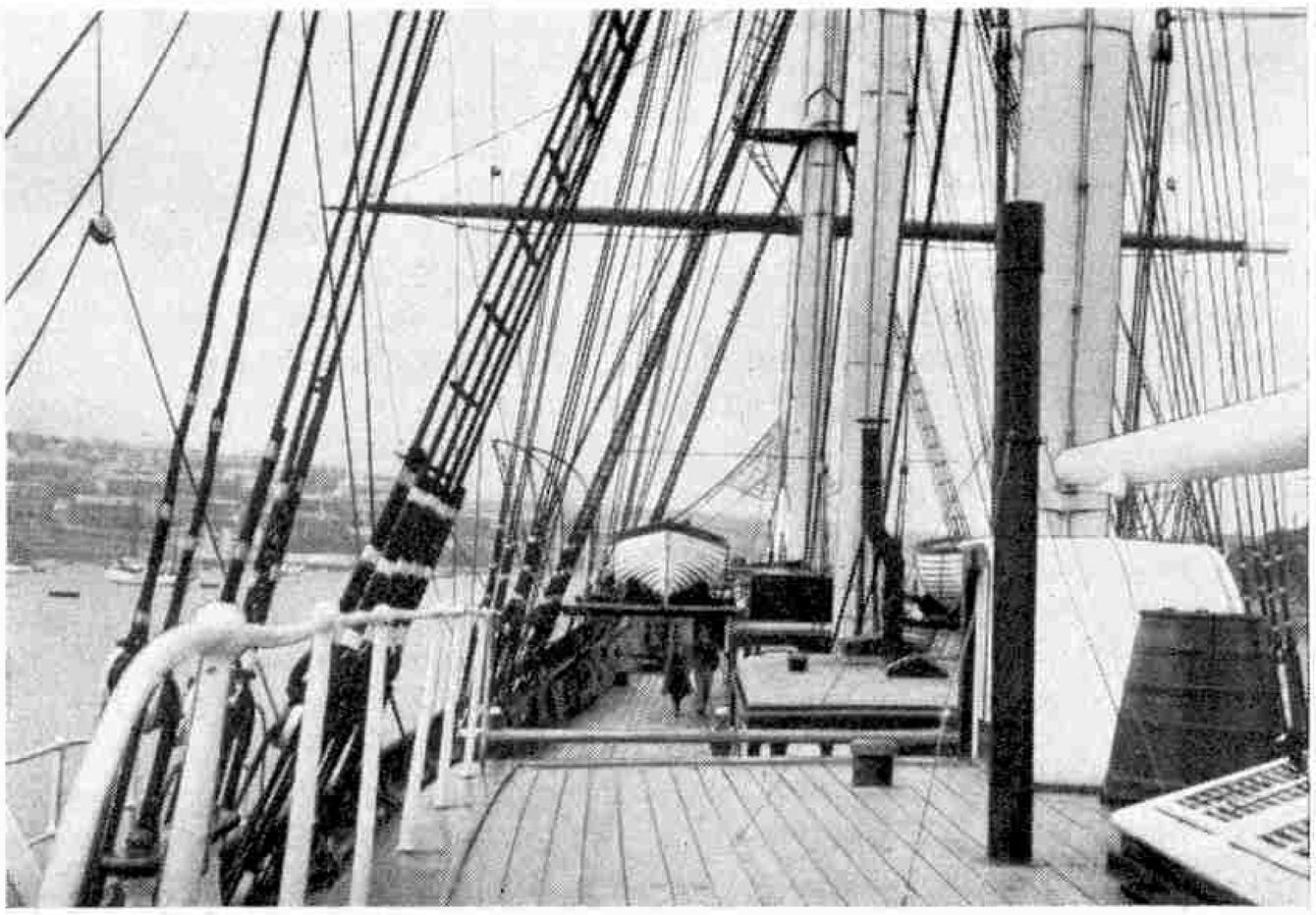
Gold miners coming off shift in the Hollinger Mine, Canada, which was described in the April "M.M."

Selling Snakes for a Living

The people of certain regions of north-west Yugoslavia have one of the strangest occupations in the world, for they make their living by catching and selling poisonous snakes. A species of giant viper called the "postock" is very common in the mountains and woods of the district, and payment is made for each live snake caught with its poison glands intact.

The snakes are sent in special boxes to a factory in Germany, where their poison is extracted for dispatch to tropical countries to be used as an anti-snakebite serum.

Catching the snakes is a very dangerous job, which the peasant boys learn from early childhood. They pinion the necks of the snakes with a cleft stick, or capture them in long traps.



Looking forward through the rigging of the "Cutty Sark" from the poop deck. The story of this famous clipper is told on page 382 of this issue.

Engineers in Elephant-Haunted Jungle

Reclaiming a Malayan Swamp

A FEW years ago the Government of the Federated Malay States undertook an extensive programme of land reclamation with the object of providing additional areas for the cultivation of coconuts, rice and other crops. Except in certain districts in the north, the annual rainfall in Malaya is very heavy, and in the rainy season the rivers are so swollen that they overflow and water covers large areas. An important part of the work therefore is the building of watertight dykes or "bunds," as they are called, along the river banks. Bunds are also being built along low lying stretches of coast, where the tide sweeps frequently over thousands of acres of country that at present is little better than a vast swamp, totally unfitted for agriculture, but would become fertile if the sea were kept out. In contrast to this, shallow canals are being dug in some parts of the country to carry regular supplies of water to the rice fields during the dry season, and these waterways also help to drain the land during the rainy season.

As a general rule Malay and Chinese coolies are employed for work of this kind in the East. The Government of Malaya decided to make a change, however, and to try instead mechanical equipment in charge of European engineers. Mr. Philip D. Priestman, of Priestman Bros., Hull, made a visit by air to the scene of the proposed work in order to see what the conditions were like. He covered 17,000 miles in 36 days before reaching Hull again, and during his stay in Malaya he made many excursions up rivers and creeks in small native craft. As a result of his investigations a start was made with the scheme by ordering two Priestman dragline excavators, which were to be employed as an experiment. The excavators supplied were of the firm's Diesel-driven "Tiger" type. These are fitted with creeper tracks, weigh 17 tons and operate a scoop with a capacity of 12 cu. ft. on a 45 ft. jib. Each has an electric lighting outfit, and this has proved very valuable for both transportation and work at night.

The first machine commenced work on a coastal bund in 1934. It was shipped from Hull by steamer to the port of Penang, which lies on an island off Northern Malaya. There it was trans-shipped to a coastal steamer and taken to Teluk Anson, a tiny port further south, where the crates in which it was packed were loaded into small native craft that were towed a considerable distance to a creek on the Bernam River. The parts of the dragline could not be unloaded at the lonely spot to which they were taken until a small dock had been cut by hand, but were then put together without delay. The engineers worked continuously and a strange and unforgettable scene was presented at night, when they and their Asiatic fitters and coolies carried on in the glare of a circle of fires that served the double purpose of providing light and keeping away mosquitoes and other biting insects. They completed their task just two weeks after the arrival of the plant in Malaya.

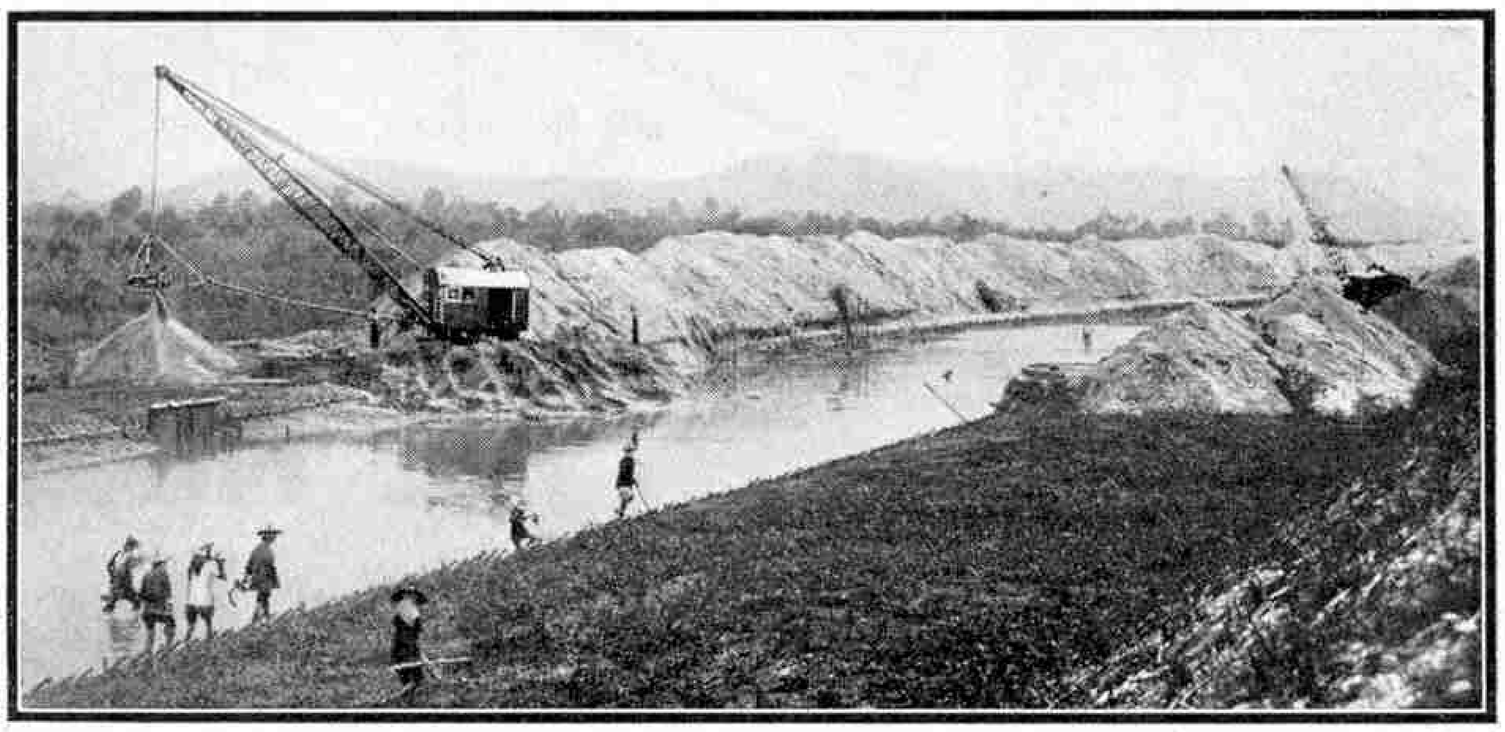
The second excavator was installed in even more unusual conditions. It arrived at Penang in August 1934, and there was loaded into lighters that were towed to the railway terminus at Prai, on the mainland. After a rail journey of 160 miles southward towards Singapore, it was erected, except for the jib, in the goods yard of a small station at the junction of a branch line that passed through the jungle where work was to start. The machine was taken under its own power on to a special low rail truck, on which it was hauled to the site at night, when the branch line over which it travelled was closed to ordinary traffic. It was driven off the truck by way of a ramp of timbers and old railway sleepers, and then travelled to the place at which it was to work. There a wide track had been cleared in readiness for it, and it has since been at work continuously night and day.

A Priestman "Cub" dragline excavator raising the banks of an irrigation canal in northern Malaya. The illustrations to this article are reproduced by courtesy of Priestman Bros. Ltd.

Although the excavators were called upon to operate in very difficult conditions, clearing ground that had been jungle for ages and so was full of timber roots, they were completely successful and the work costs about 60 per cent. less than would have been spent on hordes of coolies equipped only with hand tools to dig out the soil, and baskets in which to carry it. As a result, more Priestman excavators of different types were ordered by the Malayan Government. These have included two smaller machines, one to carry out the raising of the banks of the main irrigation canal to the rice fields, and the other to cut a new channel to enable the supply of irrigation water to the canal to be increased. The machines are operated by Malays and Chinese, who speedily become good drivers.

The difficulties encountered before the machines reached the place where they were to work in Malaya were insignificant compared with the problems that confront the engineer on the spot. Considerable preliminary work had to be undertaken before excavation could begin. In

forested country, the ground had to be cleared by native labourers, who hacked away the undergrowth and felled the trees, which were laid aside to await a dry spell for burning. A gang of coolies under a Chinese contractor then removed the stumps and tree roots from the ground, so that the work of the excavator would not be seriously retarded by obstructions. In this task they used primitive wooden winches made on the spot. The barrel of one of these consisted of a suitable timber sunk into the ground and projecting several feet above it, and was rotated by means of a crossbeam formed from a slender tree trunk pushed round by workmen. This contrivance was like the capstan of an old-time sailing ship. It was clumsy in appearance, but very effective.



Priestman "Tigers" working on a bund, or dyke. These machines weigh 17 tons and their scoops have a capacity of 12 cu. ft. At Sungei Manik one of these machines excavated a total length of 11,100 ft. in 27 days.

A machine could only begin work after the clearance in this manner of the line along which a bund had to be constructed, or a canal dug. Even then difficulties were by no means at an end, and some of these were of an unusual kind. Herds of wild elephants sometimes displayed an unwelcome curiosity about the strange activities that were disturbing their jungle home, and a bund that happened to cross one of their accustomed tracks through the forest would be destroyed repeatedly until the elephants decided to take another route. Tigers, poisonous snakes and ferocious insects helped to keep things lively and exciting, and the engineer in charge of the machines reported on one occasion that "Our elephant friends have been gambolling gaily round the areas and the Malays are now building "bolt holes" about 30 ft. above the ground besides their houses. There is also a tiger prowling about even in the day time near the machine, but the leeches and mosquitoes are ever present and are most annoying friends."

Typical working conditions in the swampy Malayan jungle. The weight of the excavator is supported by a mattress of timber that is moved along with it by chains attached to the scoop.

The Priestman excavators in use in this work vary in size from the small "Cub" model, which weighs only 7 tons and has a scoop capacity of 8 cu. ft., to the largest No. 18D machines weighing 32 tons, with a capacity of approximately 18 cu. ft. The one most commonly used is the "Tiger" Dragline Excavator, which carried out the experimental work already described. This machine travels over land at a rate of from $\frac{5}{8}$ m.p.h. to $1\frac{1}{4}$ m.p.h., and it has a dragging speed of 150 ft. per min. and a hoisting speed of 120 ft. per min. The scoop is designed to handle 12 cu. ft. of material, which in constructing a bund is dug out from a borrow pit, usually parallel with the line of the bund, and landed on the bank.

It is sometimes necessary to construct a bund in a district that is flooded, and where it is impossible for workmen to move about on foot for any length of time. The machine can be operated quite easily in such circumstances, and on one occasion the men in charge of a Priestman "Tiger" worked day and night continuously for six weeks without seeing dry land except at a considerable distance.

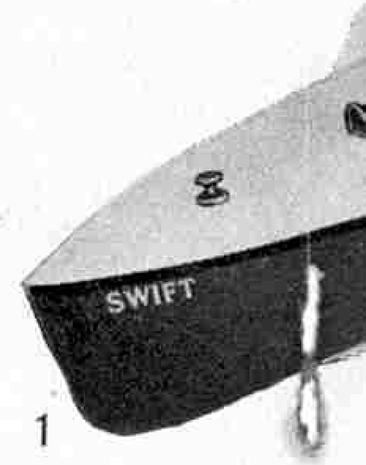
When working on coastal bunds the machine has sometimes to travel over ground that is almost too soft and treacherous to be crossed on foot. Although it weighs 17 tons, the use of the special creeper tracks employed keeps the ground pressure down to only 9 lb. per sq. in. and the machine can work where tide water flows around its tracks. Even this pressure is too great on some ground, however, and then the tracks are mounted on specially built-up timber mattresses that are moved along with the machine very simply with the help of sling chains attached to the scoop.

Where rivers or canals that are in danger of silting up have to be dredged, the excavator can easily be converted into a floating grab dredger, for a special pontoon has been constructed in floatable sections for this purpose. The sections are lowered into the water by the excavator and when afloat are bolted together, after which the excavator travels on to the pontoon. No special ballasting is necessary, and the change from dragline to dredger can be carried out very quickly. If necessary the dumping range can then be increased by fixing special chutes on the pontoon to carry away the spoil.

One of the many difficult problems that had to be faced in carrying out this work was that of providing accommodation for the drivers and labourers engaged in it. This was eventually solved by building light mosquito-proof shacks of plywood, which are mounted on skids and drawn behind the excavators by means of a wire rope.

For details of this interesting work we are indebted to Priestman Bros. Ltd., Hull.

HORNBY SPEED BOATS



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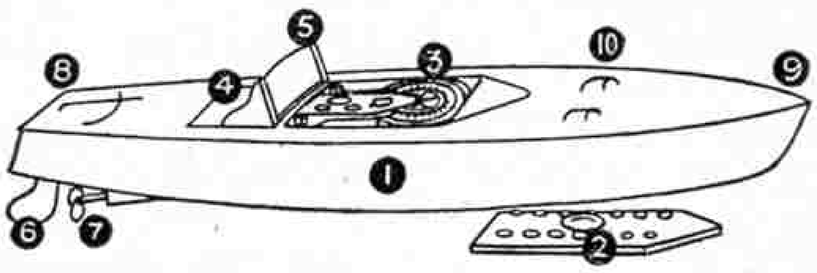

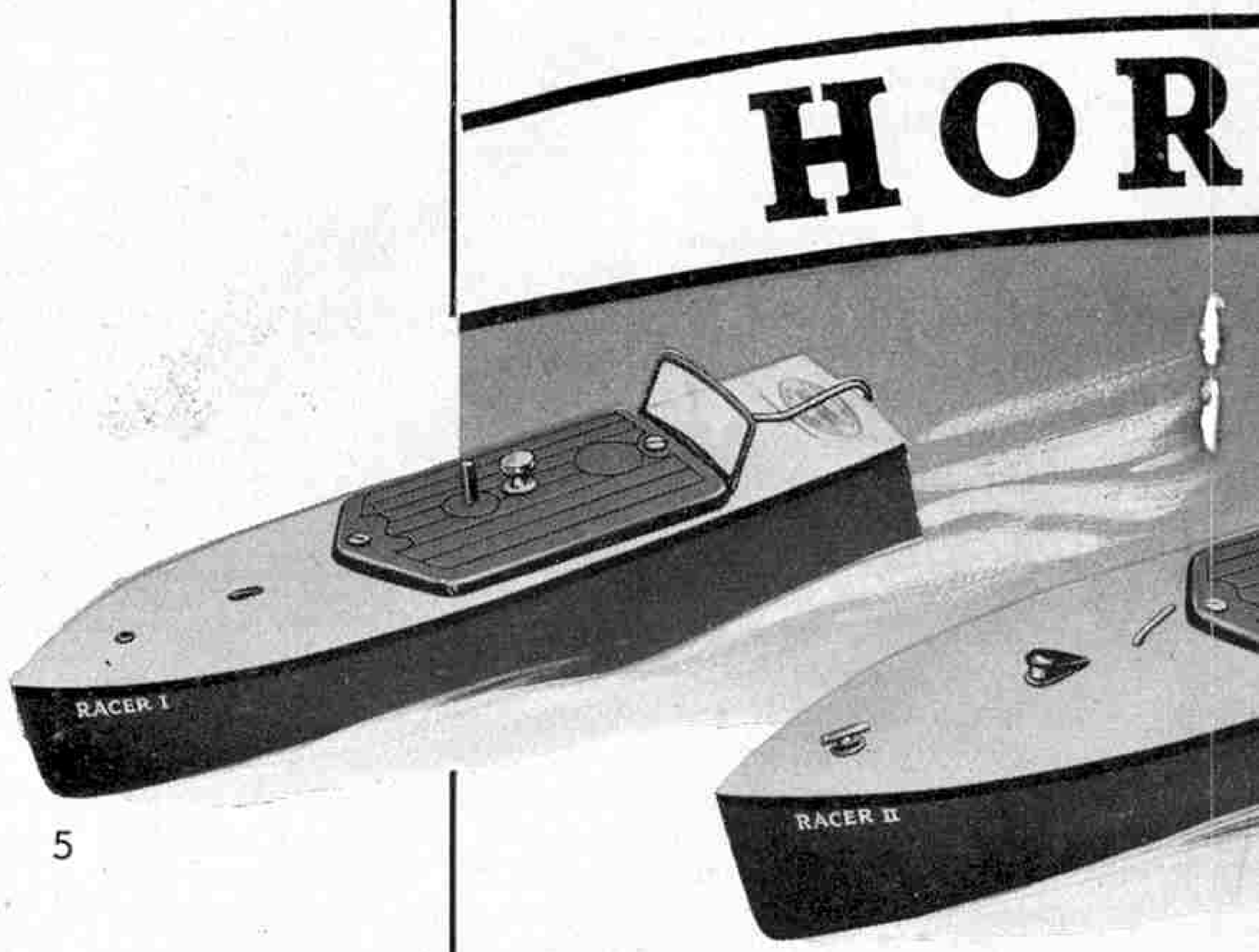

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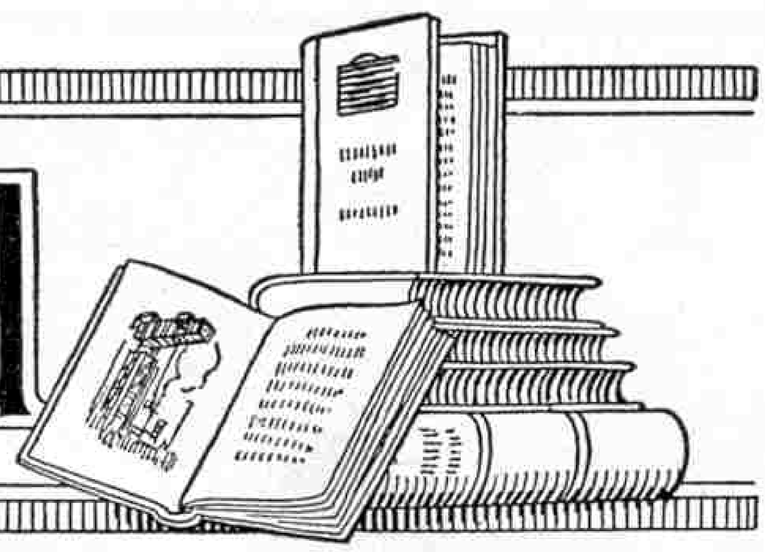
7

Books to Read



Here we review books of interest and of us 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.

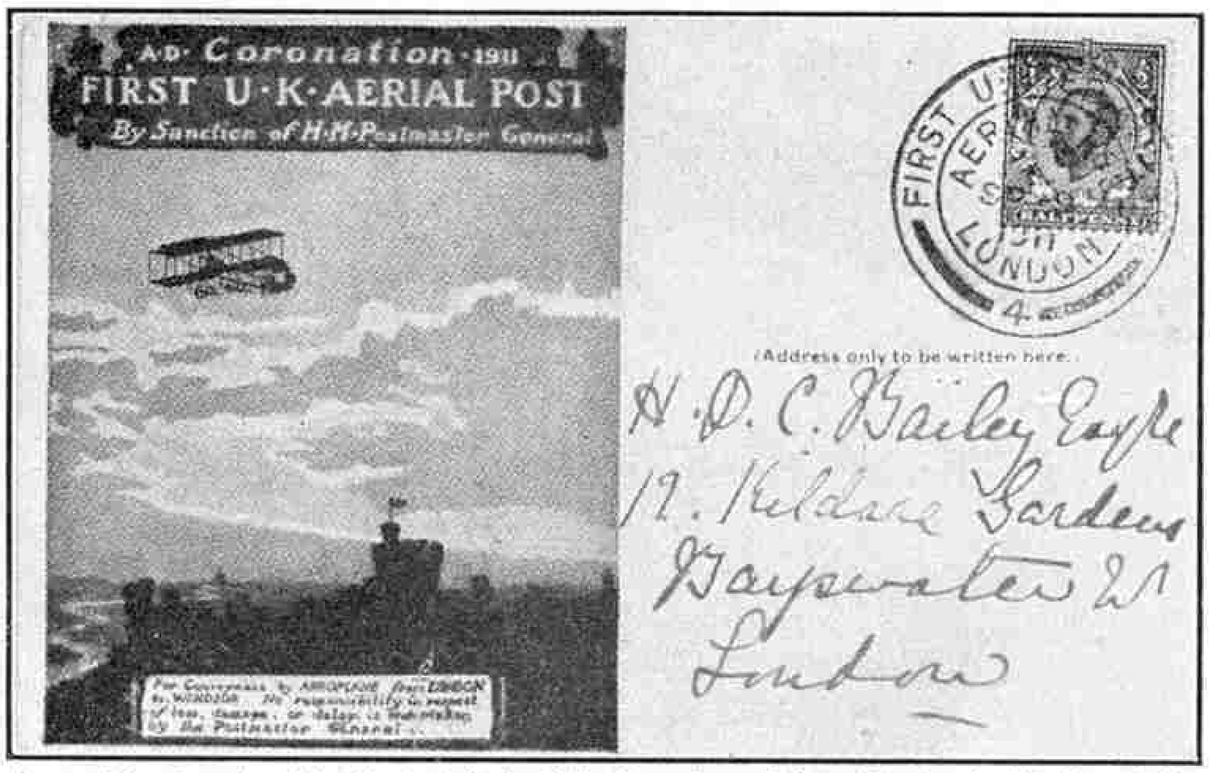
"Air Mail"

By F. V. Monk and H. T. Winter
(Percy Press. 3/6 net)

The output of books on aviation continues in ever greater volume, and it is becoming increasingly difficult for authors to discover aspects of the subject that have not been adequately dealt with already. "*Air Mail*" does strike a new note, however, and by way of historic "flown" covers and commemorative air mail stamps the authors have been led to recount some of the thrilling flights on which air mail was carried over oceans and continents for the first time. Before doing so they recall that balloons were used to operate the first real air mail service. This was in 1870-1, during the Franco-German War, when Paris was besieged and balloons were used as a means of getting news out of the city.

It is natural that a book concerned largely with British air mail should deal fully with the Empire air services, and the great organisation that enables them to be operated regularly in all weather conditions. In addition to interesting accounts of journeys in Imperial Airways aircraft over the South Africa, India and Australia routes, a vivid description is given of the work of the officers in the control tower at Croydon airport, and of the tests to which new air liners are subjected by the Air Ministry before being granted the essential Certificates of Airworthiness. Brief descriptions are given of the varied types of aircraft that form Imperial Airways fleet, including the new four-engined Armstrong Whitworth "Ensigns" now under construction for the company, and an air mail flight on what is called the African skyway is vividly described.

A book of this type would not be complete without some reference to British air mail services other than those operated by Imperial Airways. In the concluding portion of the book the authors deal with these, and also with the splendid long-distance air mail services operated by Deutsche Luft Hansa and other important air transport companies on the Continent, and the air mail activities of Pan American Airways. The book is illustrated with many excellent full-page plates, the subjects of which range from air mail stamps and covers, including the postcard illustrated on this page, to scenes on the Empire air routes.



A special postcard sent by the first United Kingdom air mail from Hendon to Windsor at the time of the coronation of King George V in 1911. From "Air Mail," reviewed on this page. Reproduced by courtesy of Stanley Gibbons Ltd.

"My Life"

By Jean Batten. (Harrap. 8/6 net)

The adventurous flights of famous air pilots make fascinating reading, and Miss Batten's account of her record-breaking achievements is no exception to this rule. It is written in a direct and unaffected style, explaining first how she became keenly interested in aviation while still in her 'teens, and then describing in detail each of her great flights. Her story is told so vividly that the reader feels that he is flying with her, whether it be over jungle or desert on the England-Australia route, over the vast South Atlantic Ocean, or across the treacherous Tasman Sea.

In the book there is adventure and excitement in plenty, but probably the most dramatic and characteristic incident concerns Miss Batten's famous flight across the Tasman Sea to New Zealand. She knew the terrors of this notoriously dangerous stretch of ocean, and was not afraid of them. Realising that disaster might lead to a costly and dangerous search, however, her last words before taking off were: "If I go down in the sea no one must fly out to look for me. I have chosen to make this flight, and I am confident I can make it, but I have no wish to imperil the lives of others or cause trouble and expense to my country." This was the spirit in which she made all her flights, and on this occasion she enjoyed the triumph of completing the first solo flight from England to New Zealand, and thus of linking her native land and the home country in direct flight for the first time in history.

The book concludes with a summary of the notable flights described in it, and of the honours, trophies, and medals that have been showered upon the famous airwoman. The interest of the book is increased by the many excellent photographs with which it is illustrated.

"Dempster and Son"

By Maurice Griffiths. (Rich and Cowan. 7/6 net)

The Dempsters of this excellent story are a family of engineers, whose career is traced from early railway days to the coming of the Diesel-engined locomotive. The scenes are laid partly in the United States, during the Civil War and the reconstruction period that followed, and partly in England, and give readers vivid pictures of railway life in both countries during the last 80 years.

Nathaniel, the first of the Dempsters, is an apprentice with a firm of Wolverhampton locomotive builders and migrates to America in 1854, where a few years later he becomes the engineer for a new line under construction in the Southern States. The differences between North and South were then just coming to a head, and Nathaniel eventually joins the engineer corps of the Northern army. Stirring adventures follow, culminating in the destruction of an important railway track well behind the lines of the Southern army. The account of this feat is excellent, including a thrilling story of a race between an engine that Nathaniel and his men seize and a pursuing locomotive. The race ends in a crash, and Nathaniel is captured and almost hanged as a spy, but miraculously escapes this fate.

When the war ended Nathaniel moved West to take charge of a railroad that had become almost derelict, and set to work to rebuild its fortunes. His struggles against rivals, floods and wreckers are splendidly told, but just when success seems within his grasp his efforts to extend the line are defeated by a larger and more powerful company, with the result that he returns to England as a partner in his old firm.

From this point the interest lies in the career of his son, Clive, who becomes the head of the firm, which still has a liking for old-fashioned if solid and sound constructional work. The first discordant note is struck when a younger member of the family throws in his lot with a motor coach company at a time when road traffic was becoming of huge dimensions. A fitting climax comes when this member turns his knowledge and experience of Diesel engines into railway channels, and the story ends with his becoming a designer of streamlined Diesel-engined locomotives for a railway in the United States.

The book is vividly written, and the thoughts and actions of the various members of this interesting family of engineers are well recorded. "*Dempster and Son*" is a story that is alive with engineering interest.

"Stormalong"

By Alan Villiers. (Routledge. 6/- net)

Stormalong was a fourteen-year-old boy who worked in an iron foundry in Ipswich, where his friend was a bricklayer's apprentice. Both ardently wished to go to sea, but had to be content with sailing on the Orwell in a dinghy. One day there came up the river a ship such as they had dreamed of, a square-rigger of the old type, and to their delight they had the privilege of piloting the vessel to her anchorage. Their intense interest attracted the attention of the captain, and eventually they were signed on as members of the crew and started out on an adventurous voyage round the world.

The ship was the "*Joseph Conrad*," whose captain, Mr. Alan Villiers, has put the story of the two boys into this book for others to read. The result is a fascinating yarn with the real flavour of the sea. Every incident is real, for the story is based on the experiences of Stormalong and his friend, whom the captain dubbed Hardcase, and who has contributed several interesting drawings.

No reader interested in sea life in an old-time ship should miss this first-hand account of a voyage to distant seas. In it there are adventures in plenty. Almost before he has gained his sea legs Stormalong ventures daringly out along the bowsprit in an icy gale in order to pass a line round the broken boom to save it from going overboard. Later the boys have a thrilling experience when the ship is driven on the rocks in the crowded harbour of New York. In the South Seas she goes ashore on a reef, and Stormalong and Hardcase dive into a shark-infested lagoon to clear a wire entangled with coral rocks. By way of contrast the boys have some glorious fun ashore when the ship puts in at various islands in the Pacific Ocean. The life is a great one, in calm or storm, as all who read the story will agree.

In addition to the drawings by Hardcase, the illustrations include 16 splendid photographs by the author himself, with a sail and rigging sketch of the "*Joseph Conrad*" that will enable readers to follow the hero and his friends in imagination when they go aloft.

"The Flying Pirates"

By D. E. Marsh. (Harrap. 3/6 net)

From a cunningly-concealed aerodrome in the heart of Africa flying pirates raid air liners carrying valuables, and almost paralyse the world's trade. An international force is formed to hunt them down, and in this dangerous task Nick Radcliffe and Jim Salisbury take a hand. The former is the owner of a Miles "Mohawk," a very fast two-seater, and the boys meet with adventures in plenty, both in fights with raiding planes and in their search for the pirates' headquarters. This they eventually discover in a valley almost surrounded by mountains, and a fleet of R.A.F. bombers destroys it.

There is a coloured frontispiece and four other full-page illustrations.

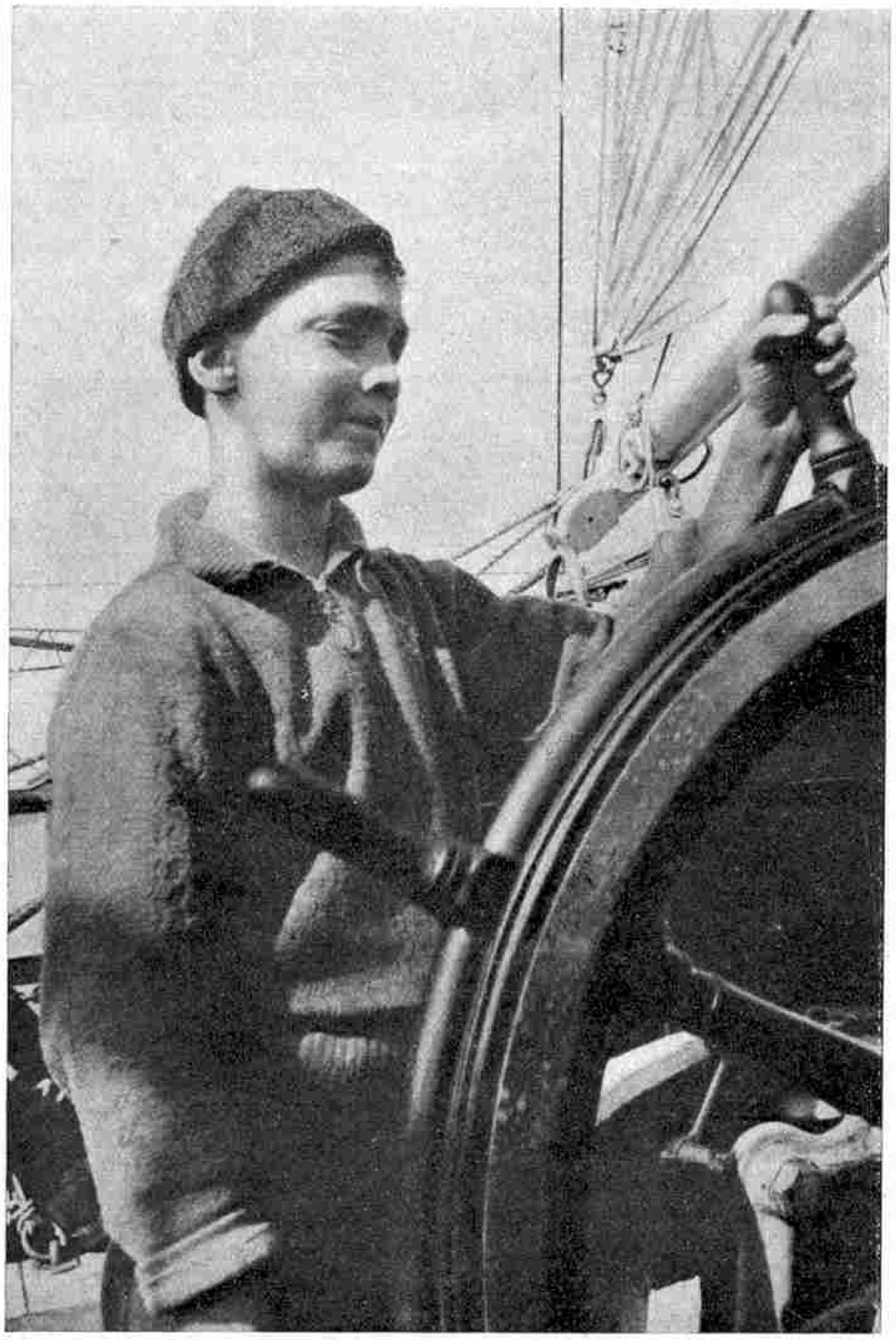
"Sailing"

By E. F. Knight. (Bell. 3/6 net)

"Knight of the '*Falcon*'" is almost a legendary figure among those who are interested in small sailing boats. He was a yachtsman with a long and wide experience of the science of boat sailing, for he had cruised extensively in the South Atlantic in the little yacht with which his name is associated, and was famous also for an adventurous trip to the Baltic and for a treasure search in Trinidad.

Knight wrote this book to give beginners the benefit of his knowledge. It has now been revised and brought up to date by J. Scott-Hughes, and no finer explanation of the art and science of sailing is in existence. Every detail is thoroughly explained, from the choice of a boat to finding one's way at sea and taking part in yacht racing. In between the beginner is shown how to learn his ropes in a literal sense, the theory of sailing is explained and accounts are given of the most useful rigs, fitting-out and the actual management of a yacht in all circumstances, with fine chapters on the laws of the sea and weather wisdom. Everything is explained concisely but adequately by a master of his craft, and any beginner who follows this splendid exposition will acquire a good knowledge of seamanship.

The book contains a useful glossary of yachting terms and many practical diagrams.



Stormalong himself, the hero of "Stormalong," reviewed on this page. With his friend Hardcase he sailed round the world in the "Joseph Conrad," and there is the real flavour of the sea in the story of his adventures.

"The Camp on the Icefield"

By Sophia Mogilevska. (Routledge. 6/- net)

This true story of adventure in the frozen seas north of Asiatic Russia is full of thrills. Shipwreck in the ice, endurance in an uncomfortable camp on floes continually threatened with destruction, and heroic rescues by airmen flying in the worst possible conditions make fascinating reading.

These thrills came on the Russian expedition that in 1933 set out in the "*Cheliuskin*," a new ice-breaker, to open up the North-east Passage. The vessel thrust her way through thick ice, at times being held up when there were no lanes of open water for her, and all went well until the Bering Strait leading to the warmer waters of the north Pacific Ocean was almost reached. Storms drove the vessel back and she was gripped fast by the ice. Then came disaster. An enormous wall of ice pushed its relentless way towards the ship, piercing her steel plates and crushing her beyond redemption. There was just time to fling out stores on to the ice before the ice-breaker reared up by the bows, poured out black columns of soot from every opening, and plunged into the depths. One man went down with the ice-breaker, failing to leave the doomed vessel when the final warning was given.

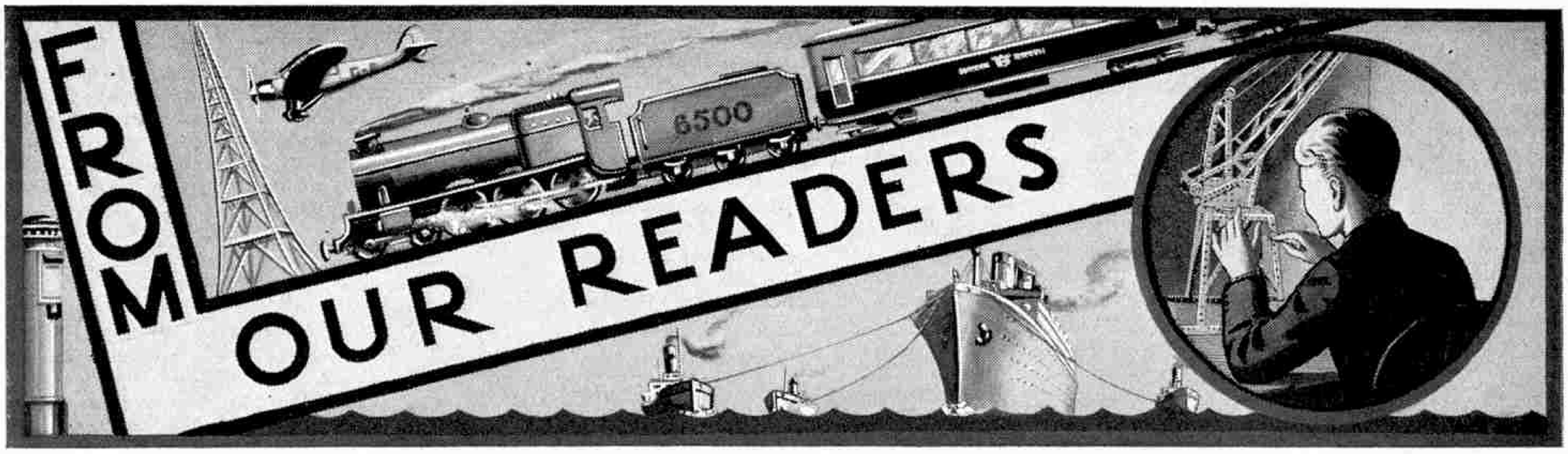
In former days nothing would have been left but a difficult journey over the ice to the nearest land, an ordeal which few could have survived. To-day wireless comes to the help of the explorer, and before long a fleet of rescuing aeroplanes was on its way from all quarters of the Soviet Republic. This was the beginning of a series of heroic exploits. Those on the ice made landing grounds day after day, only to have them broken up by intense pressure during the night. For long stretches dense fog and incredibly low temperatures made flight impossible and obscured the camp, and there were several crashes, fortunately without loss of life. By dint of perseverance every member of the expedition eventually was brought off, however, and one of the most striking features of the story here told is the enthusiasm and resource of rescuers and rescued alike.

The book is well illustrated by means of 16 excellent photographs.

"The Earth Changes"

By J. M. Lucas and H. Carter. (Harrap. 6/- net)

The earth seems so solid and so vast that it is difficult to imagine that it is changing in any way. Yet in past times the mountain chains that we know to-day were non-existent, and huge tracts of high land were once at the bottom of the sea. Millions of years have been required for these and other changes, and here is their story, with that of some of the living creatures involved in them, written in a manner that will interest boys and girls, and illustrated by a series of fascinating maps. There are also interesting illustrations of some of the monsters and strange forms of life of past ages.



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.

A Burmese Religious Festival

Each year the natives of Burma celebrate six religious feasts. Among these is that of Tazaungdaing, which according to the Burmese calendar falls on the Full Moon Day of Tazaungmon, the eighth month of the Burmese year.

The festival begins on the eve of the Full Moon Day, and lasts for three days. On the first of these food known as "hsun" is prepared and offered to the monks or "hpoongyis." On the Full Moon Day itself a fast is observed and prayers are offered at the pagodas. The third day is occupied in merrymaking, and towns and villages are gaily decorated and lit up with multi-coloured lanterns, making very attractive scenes at night. Fetes and other forms of amusement take place, and all thoroughly enjoy themselves.

A strange Burmese custom. A procession of girls carrying robes to be presented to the monks of the town. Photograph by T. Sike Shu, Thongwa, Burma.

At another interesting ceremony, also held during the month of Tazaungmon, the monks in each town and village are presented with new robes of the yellow colour characteristic of their calling. These are first carried through the streets in procession to the accompaniment of appropriate dedicational music.

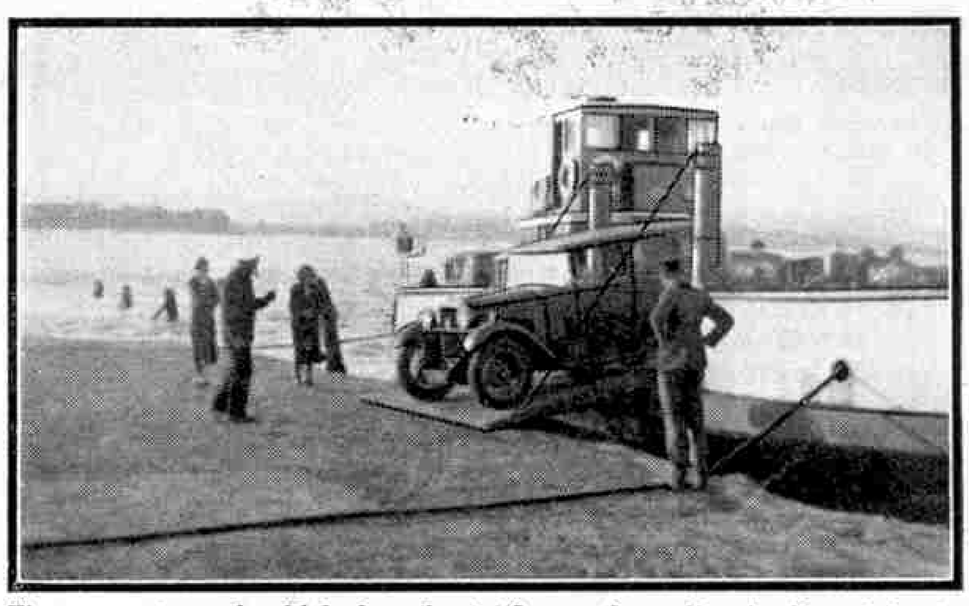
T. SIKE SHU (Thongwa, Burma).

Ferrying Across the Severn

While travelling by motor car from South Wales to Cornwall I and my friends saved some 65 miles by crossing the Severn by ferry instead of going round by Gloucester. This ferry runs between Beachley, near Chepstow, and Aust, near Bristol, and a 30-minute service is maintained except at low tide, when there is an interval of one to three hours, depending upon the distance the tide recedes.

The ferry is operated by two motor-driven craft, *"The Severn King"* and *"The Severn Queen."* The former is the larger, and can carry six more vehicles than the other vessel. An attempt was made recently to pass a Bill through Parliament sanctioning the construction of a bridge across the river near Beachley. The effort failed, however, and *"The Severn King"* and *"The Severn Queen"* still reign supreme on this stretch of the Severn.

J. LEWIS (Magor).



The passenger and vehicle ferry boat "Severn Queen" unloading at Aust, on the Severn. Photograph by J. Lewis, Magor.

Prehistoric Remains in the Cotswolds

There have been several very interesting finds in a gravel pit of which my father is manager. The pit is near the Fossway, the famous Roman road from the Devonshire coast to Lincoln, and the discoveries are usually made in or near a V-shaped ditch that is dug out at intervals as the men work back the face of the gravel.

Probably the most outstanding discovery was a cinerary urn found in a ditch when the men were removing soil before excavating the gravel below. It contained the bones of a young woman, and according to an official of the British Museum was about 3,000 years old. There is an attractive design on the top of the urn, which I am told was worked by pressing twisted grasses or reeds against the clay while it was soft.

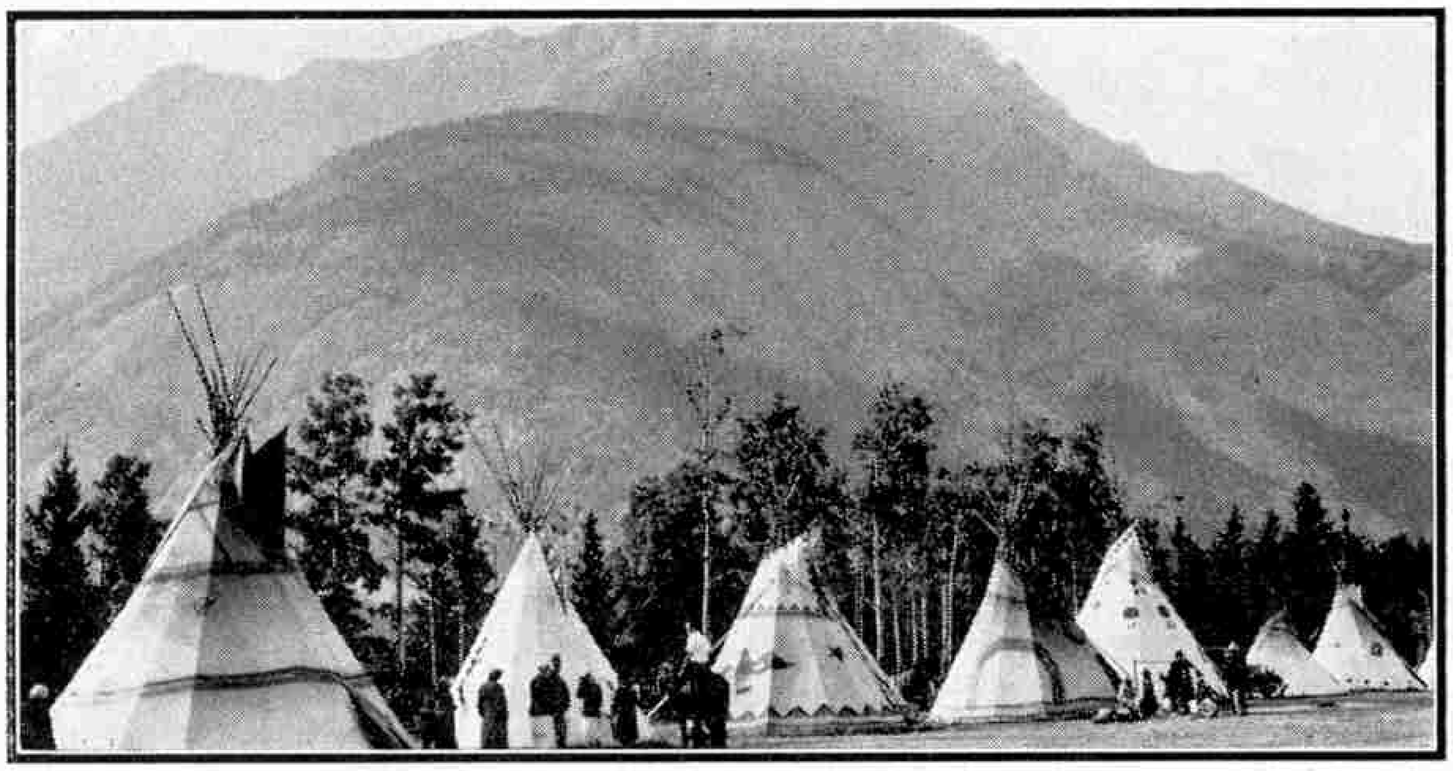
A number of Roman coins have been turned up at intervals, most of them of Constantine's reign. Some of them are remarkably well preserved, with the heads of the Emperors and the inscriptions round the edges quite distinct.

About a mile farther down the Fossway is another quarry where the first Saxon hut found in Gloucestershire was brought to light. After careful excavation of the top soil and loose brown earth it was possible to reconstruct the hut, which was about 3 ft. deep in the gravel and measured 20 ft. by 12 ft. 6 in. The walls had been formed of turf supported on poles.

J. CRAY (Stow-in-the-Wold).

Indian Days

Every July the Indians from the reserve at Morley, in Alberta, journey some 35 miles west to the town of Banff, which is situated in the midst of the majestic mountains, lakes and glaciers of the Canadian Rockies. The majority of the Indians travel on horseback, carrying their equipment with them, but a few old members and women travel by bus. They camp for a few days on specially allotted grounds to the north of the town, and during their stay hold sports and games, just as their ancestors did in days gone by. These are watched with great interest by the townspeople and numerous tourists staying in this picturesque centre.



An Indian encampment near Banff, in the Canadian Rockies. The Indians entertain the townspeople and tourists with dances and games. Photograph by G. Adlam, Calgary, Alberta.

On the morning of the first day a costume parade usually is staged in the town, and beautiful hand-made raiment is then to be seen. In the afternoon people go to the Indian encampment, which is next to the local game reserve, where there are deer, moose, elk, wapiti, yak and buffalo. The Indians like to exchange their horses for bicycles for the day, and their joy-riding never improves the condition of the bicycles.

Horse races are held and the young braves ride bareback, whipping their horses all the way round the track. Indian wrestling on horseback is another popular sport, and each day there are bow and arrow shooting contests, in which old and young alike take part. The Indian bow is only about 4 ft. long, and the arrows are home-made and feathered with wild duck plumes. The competitors stand in a row, bow in hand, with four arrows stuck in the ground in front of each, and at the word "go" endeavour to shoot all their arrows within 10 seconds at a target consisting of an imitation deer.

In the evening the Indians entertain their white friends with an exhibition of ancient dances at the Canadian Pacific Railway Hotel. First the young braves, dressed in beaded buckskins and eagle-plumed war-bonnets, dance to the beat of drums, making weird noises in imitation of chickens, crows, bears, deer and many other animals. The drums are beaten almost incessantly during the evening, and gradually the spectators are captured by the eerie din, and join in the weird chanting of the Indians. Last of all is the owl dance, in which spectators are invited to take part, and nearly everyone falls naturally into step.

G. Adlam (Calgary, Alberta).

The Affetside Column

In the hamlet of Affetside, in Lancashire, there is a stone column erected on three circular tiers of steps, as shown in the lower illustration on this page. At one time the pillar had a stone cross on it, and it is said to mark the half-way point between London and Edinburgh.

Affetside is half-way between Bolton and Blackburn and is a real old-world spot, about 890 ft. above sea level. The hamlet is divided by a Roman road, and the suggestion has been made that the name "Affetside," meaning a half at each side, is derived from this circumstance. The landmark is popularly supposed to have been erected by the Romans, who probably had a camp or observation post at Affetside.

G. Thornton (Southport).

This curious column at Affetside in Lancashire is said to be half-way between London and Edinburgh. Photograph by G. Thornton, Southport.

A "Lake of Fire" in the Bahamas

Near Nassau on the island of New Providence, in the Bahamas, is Waterloo Lake, which is known as the "Lake of Fire." This was specially excavated out of coral rock for the storage of turtles, and it is connected with the sea by a narrow ditch. The height of the water in the lake is controlled by the opening of a gate at various states of the tide.

The lake derives the name "Lake of Fire" from its phosphorescent surface, which glows and seems to be alight. The reason for this has not yet been explained.

When a boat is rowed across the lake, the water disturbed by the oars gives off sufficient light to allow one to read. There seems to be a ring of fire round the boat, and the wake also is aglow. The lake is full of fish, and as the boat moves along they can be seen darting about on all sides, leaving fiery trails behind them. The more distant fish seem to form little vapoury clouds of fire, flashing and darting about on the surface, and when a turtle is disturbed it looks like an underwater Sun as it moves along. A boat crossing the lake at night looks like some fairy craft floating on waves of fire.

This inexplicable phosphorescent glow on Lake Waterloo is more powerful than any similar glow in other parts of the world, and it is not apparently affected by the frequent changing of the water.

A. Reid (Trinidad, British West Indies).

In Search of New Models

The Fun of "Simplicity" Construction

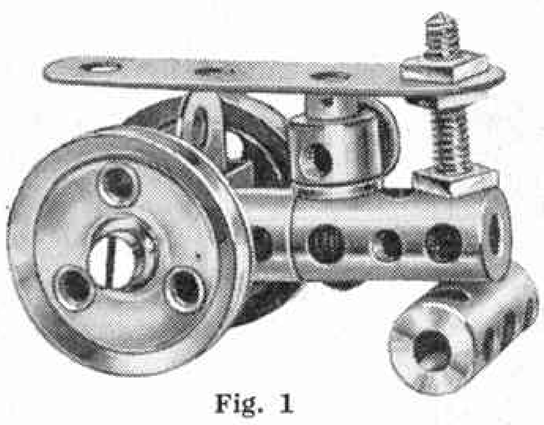


Fig. 1

FEW model-builders wish to desert their Outfits entirely during summer, and in any case it is certain that during the outdoor season there will be rainy days, the gloom of which can best be dispelled by a spell of active model-building. Yet sunshine calls us out of doors, and as less time is then spent in model-building than in winter we are drawing attention to the fun of building "simplicity" models. Models of this kind can be assembled in a few minutes, and the production of a successful effort is a matter rather of skill than of application.

The engineer's true merit is best revealed when he has to construct a mechanism with limited resources. This applies also to the Meccano model-builder, whose ingenuity and inventive ability is put to the test when he is called upon to construct his model with only a few parts. It is simple enough to bolt a few Strips or other parts together and call the finished model a locomotive or a ship, but it is not so easy to obtain a thoroughly realistic effect with the minimum of parts. Meccano parts have to be found that not only represent the outlines of the various sections of the prototype, but also are in keeping with the general proportions of the model, and it is in searching for the most appropriate parts that the fascination of this kind of model-building lies.

One great advantage of simplicity construction is that every model-builder can join in the fun. Trunnions, Flat Brackets and Cranked Bent Strips are included in all Outfits, and are particularly valuable parts for the construction of miniature models, while the range of the models themselves is unlimited, as the illustrations on these pages suggest.

An example of a small model ingeniously built up from a few simple parts is the racing car illustrated in Fig. 5. This has the right appearance, and is recognisable at a glance, although it is built up of a few Strips, with Angle Brackets and Double Brackets. The wheels are particularly well represented by Collars fitted with rubber tyres from a Dinky Toys Motor Car. There are several other Meccano parts that can be used with good effect as wheels for simplicity motor cars and vehicles, however. For instance, in very small models Washers or Collars can be used, while for larger wheels the $\frac{1}{2}''$ Pulleys and $\frac{3}{4}''$ Discs are useful. A realistic tyred wheel can be built up by fitting a Rubber Tyre from an Aeroplane Constructor Outfit on to the flange of a $\frac{3}{4}''$ Flanged Wheel.

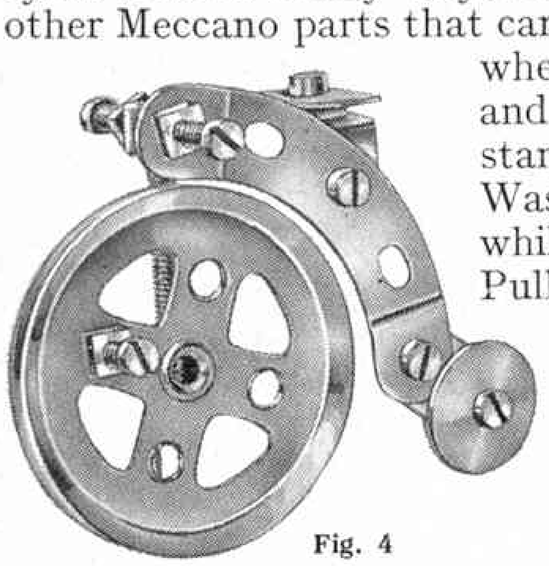


Fig. 4

An interesting racing scene can be arranged with several small cars of slightly different design, and a fine effect can be obtained by adding a simple Meccano stand on which are Dinky Toys figures to represent spectators. The cars can be shown either going round a corner on a steep bank, or approaching the finishing post in the straight. Miniature cars can also be used in garage scenes incorporating petrol pumps and oil bins. Small posters advertising various brands of petrol and oil can be placed on the garage walls, with excellent results, especially if they are printed in inks of different colours.

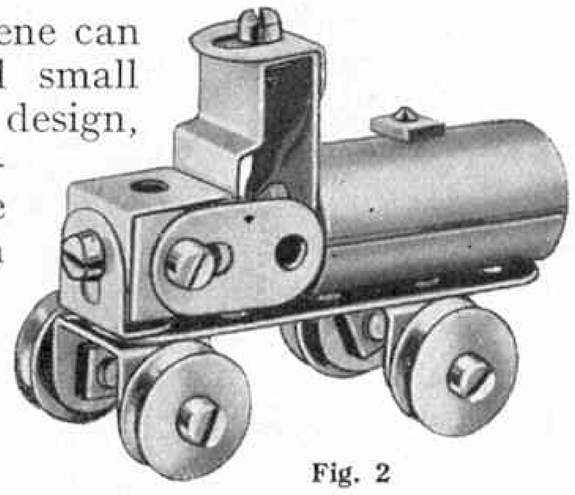


Fig. 2

Couplings of different types have many uses in building simplicity models, as a glance at the models illustrated on this and the opposite page will show. The biplane shown in Fig. 7 contains both an Octagonal and an ordinary Coupling. The Coupling is used to form part of the fuselage, and two of the flat sides of the Octagonal Coupling provide convenient points of support for the wings, which are $2\frac{1}{2}''$ Strips. The propeller of the plane is neatly represented by two $\frac{3}{8}''$ Bolts screwed into the tapped holes of a Collar at the front of the fuselage.

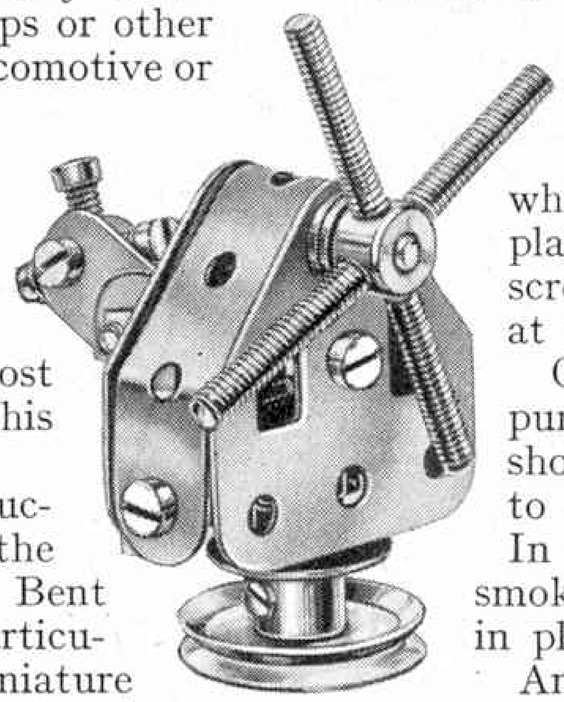


Fig. 3

Couplings are used for quite different purposes in the model *"Rocket"* locomotive shown in Fig. 9. In this case they are employed to represent the cylinders and the chimney. In the model warship shown in Fig. 10 the smoke stacks are Threaded Couplings held in place by Bolts.

Another part of great value in building miniature models is the Screwed Rod. This can be screwed into a Coupling or Collar, or fastened to a Strip by means of two nuts. In the model *"Rocket"* Locomotive a Screwed Rod forms the main support for the front end of the boiler. The Rod is screwed through the tapped hole of a $\frac{3}{4}''$ Flanged Wheel inserted in the end of a Sleeve Piece, and is secured to the undercarriage by two nuts. The rear of the boiler is supported by a $\frac{3}{4}''$ Disc, which is pressed into the end of the Sleeve Piece and fastened to the undercarriage by a $1\frac{1}{2}''\times\frac{1}{2}''$ Angle Bracket. The cylinders are mounted on Hinges and oscillate in a most realistic manner when the model is pushed along.

A simplicity model in which a 2" Pulley is the central feature is the "penny-farthing" bicycle illustrated in Fig. 4. The Pulley forms the main wheel and is

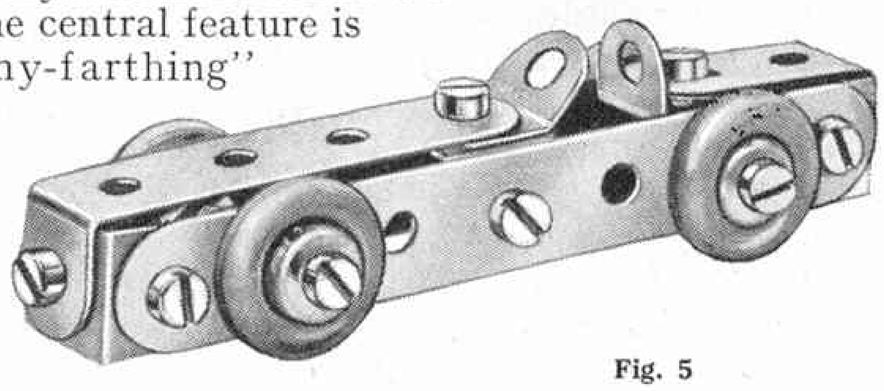


Fig. 5

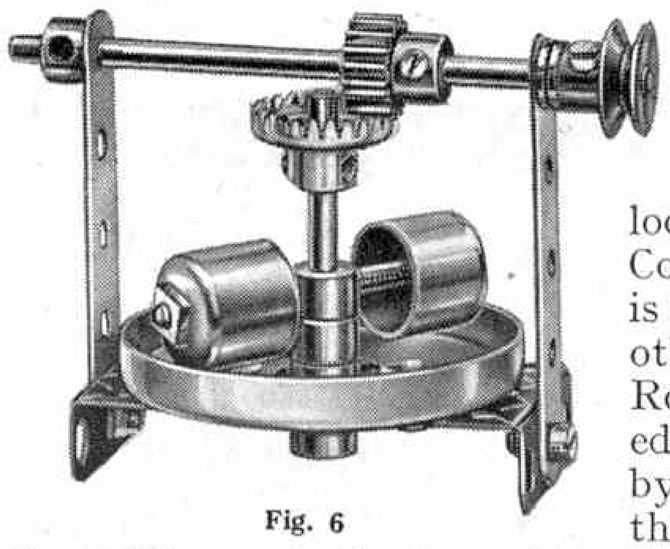


Fig. 6

secured to the frame by a 2″ Screwed Rod, which is screwed a short way into the boss of the Pulley and locked by a set screw. Connection to the frame is made by inserting the other end of the Screwed Rod into a Collar fastened to a $2\frac{1}{2}$″ Curved Strip by one of the $\frac{1}{2}$″ Bolts that form the handlebars. The rear wheel consists of two $\frac{3}{4}$″ Discs attached to the Curved Strip by a Flat Bracket.

Ships are excellent subjects for simple models, and a particularly good example is the destroyer shown in Fig. 10. Strips are the most adaptable parts for constructing hulls and Couplings can be used effectively as funnels in models of this kind. This practice is followed in the destroyer already mentioned, a very clever example in which a 2″ Screwed Rod forms the main mast and a Double Bracket is arranged to represent the bridge. In very small models $\frac{3}{8}$″ or $\frac{1}{2}$″ Bolts are more suitable parts for representing funnels.

Sleeve Pieces also are useful in simplicity model-building. One example of a model incorporating this part has already been given. This is the *"Rocket"* Locomotive illustrated in Fig. 9, in which the Sleeve Piece represents the boiler. A Sleeve Piece is excellent for this purpose and it has the advantage that it can easily be opened out a little when necessary. It is also particularly effective when used to represent a cylindrical tank, as in the petrol tank wagon shown in Fig. 2. In this model the cab and bonnet are cleverly constructed from a Cranked Bent Strip and two Double Brackets respectively. This ingenious grouping of the parts gives a model distinction and elevates it from the ordinary run of simplicity models.

Model-builders will have noticed that many of the parts in the Meccano system bear very close resemblances to familiar everyday objects. For example, a Handrail Coupling reminds one of a diver's helmet. Resemblances of this kind can be of great value in suggesting and building simplicity models. The miniature windmill illustrated in Fig. 3 is a good example of this, for in building it good use has been made of the resemblance of Trunnions to the outline of certain types of mill. The inclusion of four or five other parts, all carefully chosen, has produced a very fine effect. Four short Screwed Rods, inserted in the tapped holes of a "spider" are used effectively as the sails, and there is a second "spider" in the fantail. This "spider" is a very useful part in simplicity design. It is similar to a Collar, except that it has four tapped holes, and is

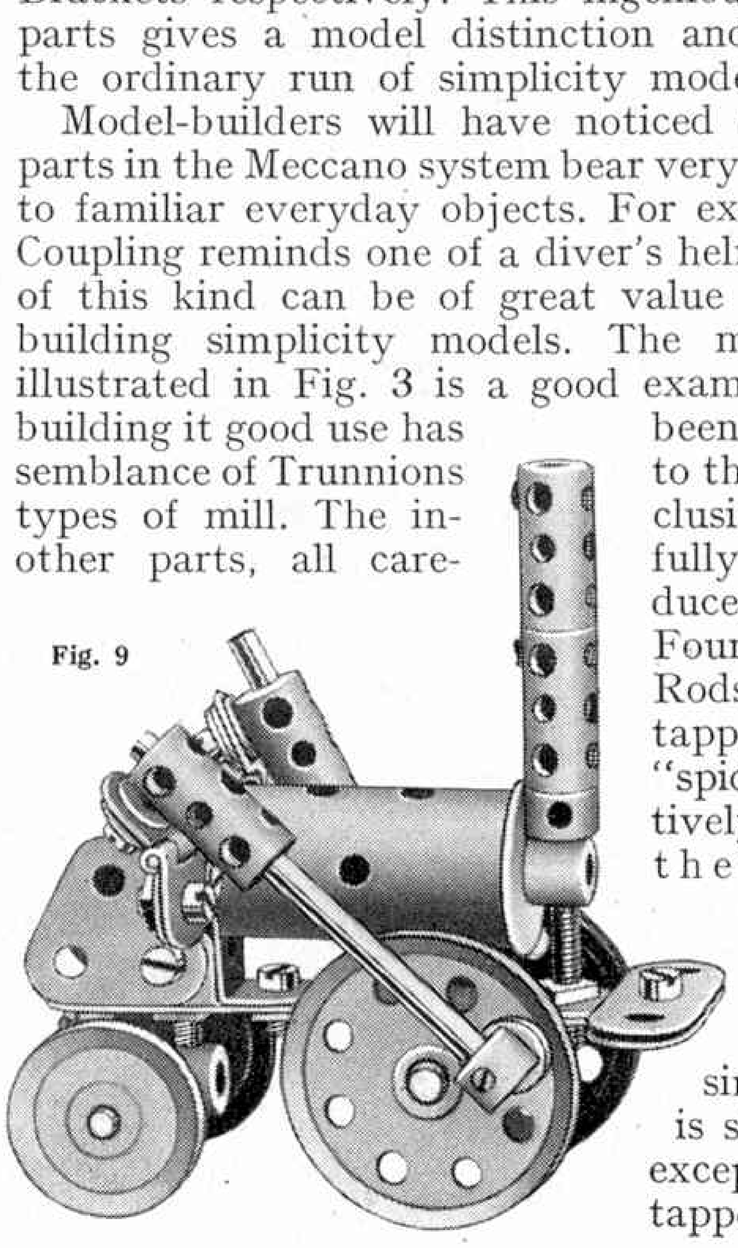


Fig. 9

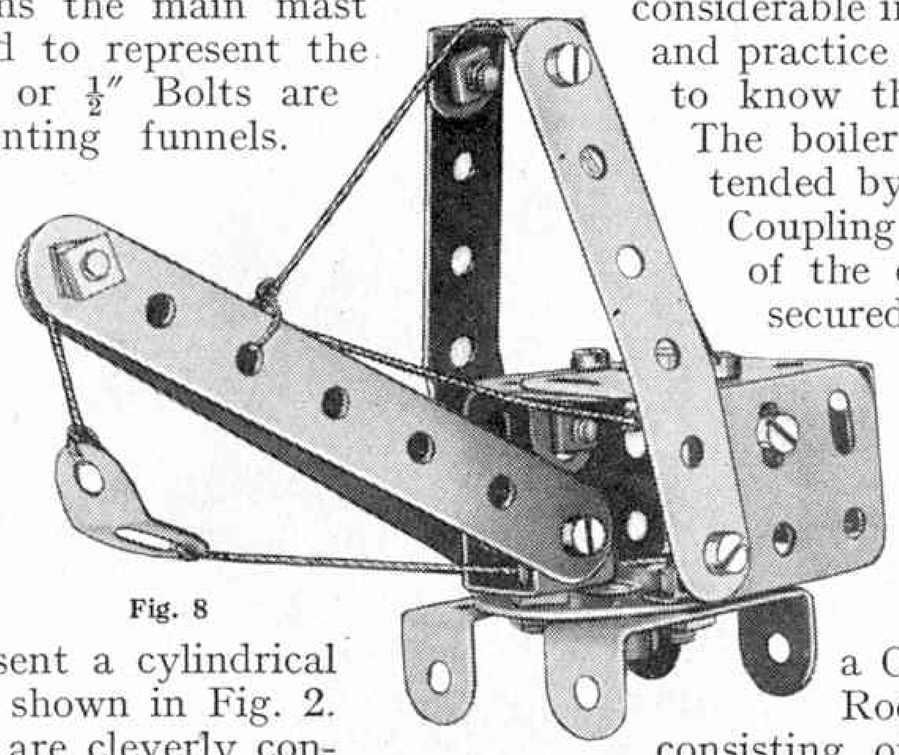


Fig. 8

obtained from a Swivel Bearing or Universal Coupling.

Models of such machines as lathes and drills provide good fun, for several can be grouped together to form a miniature workshop. A realistic effect is obtained by providing each machine with driving pulleys and connecting them up to overhead shafts driven by a *Magic* Motor, and if the models are small enough Dinky Toys miniature figures can be placed at suitable points to represent workmen.

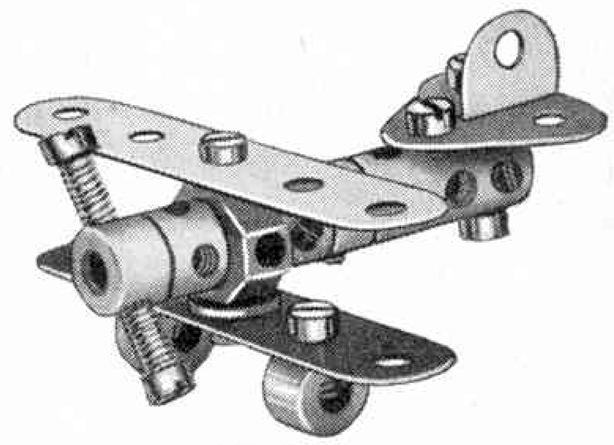


Fig. 7

The miniature steam roller shown in Fig. 1 is only 2″ in length, yet it will be noticed that it bears a remarkably close outline to that of an actual machine, largely because it is so well proportioned. This concentrated model-building, as it may be called, demands considerable ingenuity on the part of the builder, and practice in it is a splendid means of getting to know the possibilities of Meccano parts. The boiler of the model is a Coupling extended by a large Fork Piece, and a second Coupling is used for the roller. The flywheel of the engine consists of several washers secured by a bolt to a Collar mounted on the boiler.

Good use for Chimney Adaptors has been found in the model mortar mixer seen in Fig. 6. Two Adaptors are used as the rollers that crush and mix the material. They are attached to a Collar by means of two 1″ Screwed Rods, and rotate inside a trough consisting of a Wheel Flange. The shaft of the model carries a $\frac{1}{2}$″ Pulley so that it can be driven from a Motor. If desired an even smaller model can be made by substituting Collars for the Chimney Adaptors, and using a large Flanged Wheel for the mixing trough in place of the Wheel Flange.

The model dragline (Fig. 8) gives a good idea of how large structures can be represented with a few parts. The base of the model is constructed of two $1\frac{1}{2}$″ × $\frac{1}{2}$″ Double Angle Strips bolted to a Bush Wheel. The cab, which is built up from Flat Girders, and the jib, also are secured to the Bush Wheel. A Flat Bracket is used for the scraper bucket and is supported by Cords arranged similarly to the operating and control ropes of real dragline excavators.

Among the new parts recently added to the Meccano system, one of the most useful is the $\frac{3}{4}$″ Disc. This can be used in a number of ways, and is included in three of the models shown on these pages. In the model windmill (Fig. 3) a Disc represents the swivel on which the mill turns. In a larger model of this kind a $1\frac{1}{4}$″ Disc can be used for the swivel.

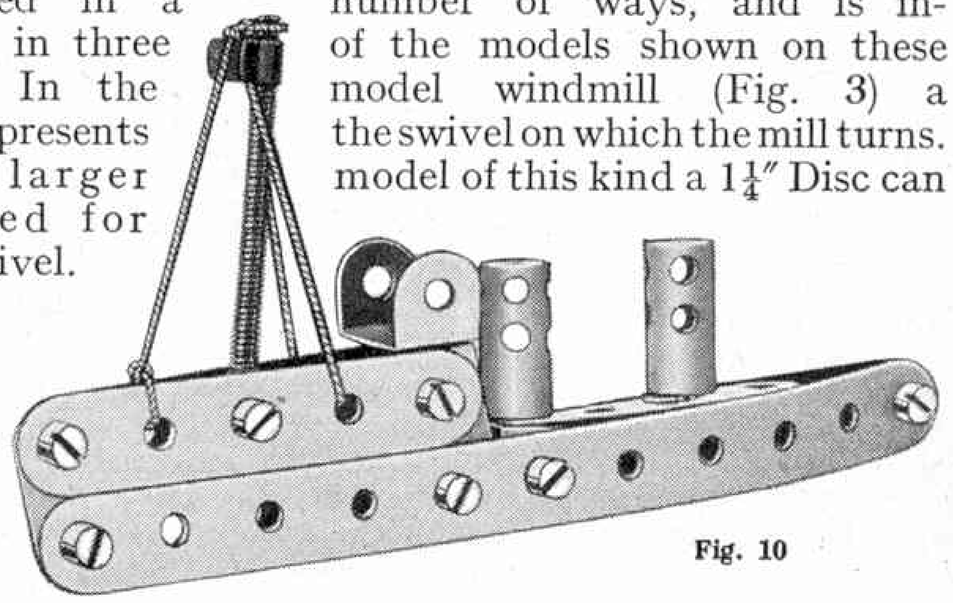


Fig. 10

Meccano Suggestions Section

By "Spanner"

(408) Proell's Trip Gear Governor Mechanism

One of the most important accessories of a steam engine is the governor, the automatic mechanism that keeps the speed steady in spite of variations in the load on the engine or in the steam pressure. Many different forms of governors have been invented, and although only a few of these have come into popular use, nearly all possess novel features that make them particularly interesting for incorporation in Meccano models.

One example of a little known governor that will provide model-builders with plenty of scope for experiment is illustrated in Figs. 408 and 408a. It is known as Proell's Trip Gear, and its purpose is to increase or decrease automatically the movement of the inlet valves of the steam engine, an operation that technically is known as adjusting the "cut-off."

The mechanism is driven from the engine crankshaft by a length of Sprocket Chain, and comprises two centrifugal weights each of which is a ¾" diam. ¾" face Pinion. These are mounted in 2" Rods 9, each of which carries a Coupling 10 pivotally connected to a link gear comprising Flat Brackets 11, 14 and 16, and 1" Corner Brackets. The 2" Strips and the Flat Brackets fixed to them are supported by a Double Bracket 12, and a Reversed Angle Bracket 15 carries a Double Bracket to which the 1" Corner Brackets are pivoted. Flat Brackets 14 and 16 are secured to the Corner Brackets, Brackets 16 being carried on Bolts 17 screwed into a "spider" on the vertical 8" Rod that supports the governor.

When the governor is rotated, the weights fly outward and raise the Bush Wheel 8, the upward movement of which is limited by two Collars. The Bolts 17 also are raised by the link gear, but to a less extent.

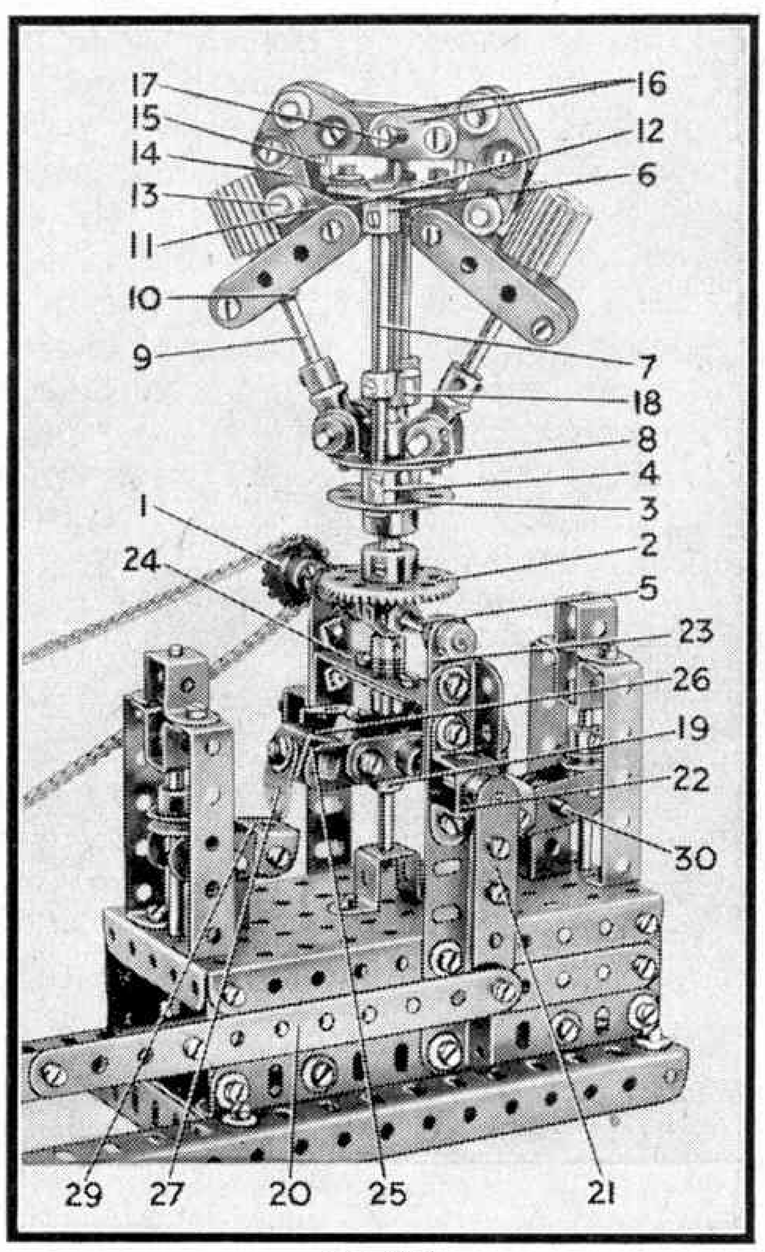


Fig. 408

The 8" Rod rises under the action of Bolts 17, and ½" fast Pulley 19 on the Rod also is raised. The movement of the latter in turn lifts the inner ends of two "trips," each of which comprises a Double Bracket 25, a 1"×½" Angle Bracket 26 and a Flat Bracket 27. The trips are carried on 1" Screwed Rods that connect the sides of a beam actuated by the rocking lever 21. The latter is connected to the eccentric on the engine crankshaft by Strip 20.

When the arm 21 is oscillated by Strip 20, the Flat Brackets 27 bear against Double Brackets 29 for approximately three quarters of their upward and downward movements.

At normal working speed the Flat Brackets 27 move through fairly large arcs during their downward movement, and depress the Double Brackets 29 a corresponding amount. If the engine speed tends to rise above normal due to any cause, such as fluctuation in steam pressure, or a lessening of the work the engine is called upon to perform, Pulley 19 rises, and Flat Brackets 27 move inward slightly. The result of these actions is that the travel of the steam inlet valves is curtailed and the amount of steam admitted to the engine cylinders is reduced. If the engine speed falls below normal due to a decrease in steam pressure or an increase in the work the engine has to do, Pulley 19 falls and the movement of the inlet valves therefore is increased, thus allowing more steam to pass into the cylinders. The speed of the engine therefore rises until it is once more at normal working speed.

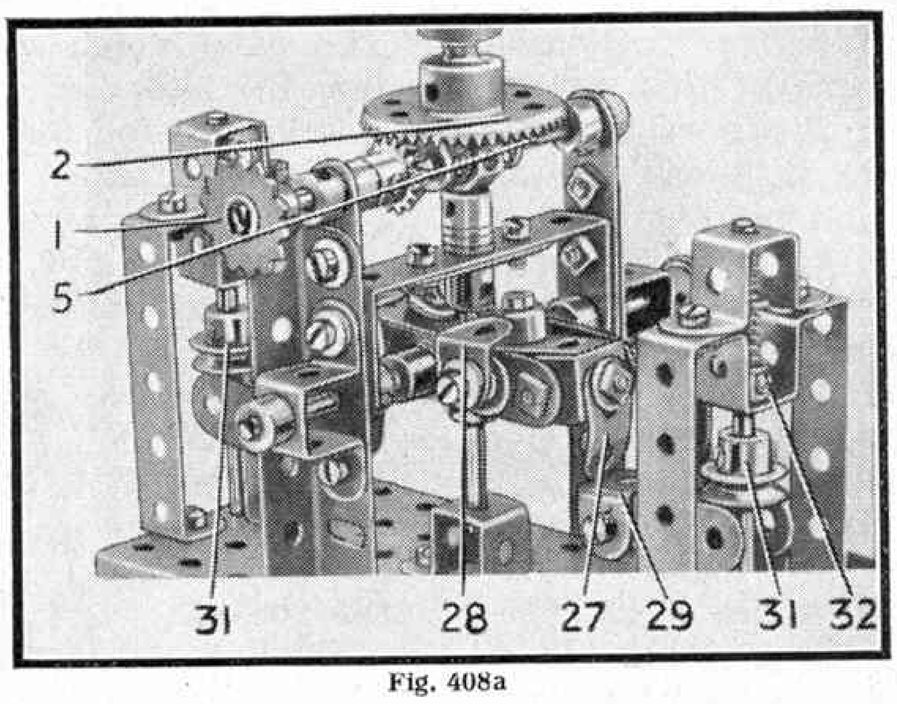


Fig. 408a

(409) Model Motor Car Radiators

Motor vehicles probably are the most popular of all subjects with Meccano model-builders and many enthusiasts confine their activities almost entirely to models of this kind. The secret of this wide-spread popularity of cars and lorries, apart from their great general interest, probably is the ease with which both the chassis and its various mechanisms, and the realism with which the bodywork of a modern vehicle can be reproduced with the fine range of parts now available in the Meccano system. For example, the construction of the bodywork is easy with the aid of Flexible Plates and Strips, and by fitting a suitable radiator the outline of almost any make of vehicle can be obtained. The design of the radiator is of special importance, for when successfully reproduced this part gives a model real distinction.

One of the best known radiator forms is that used on Rolls-Royce cars. This type has a rectangular outline and vertical louvres, and is easily built up from Angle Girders and Strips. The louvres can be represented by Strips mounted on Rods and spaced apart by washers, the Rods being held in the radiator frame by Cranks.

Variations in outline can easily be obtained by the use of Curved Strips and Formed Slotted Strips to suit the model-builder's particular requirements. An alternative to Strips for representing the louvres is Spring Cord. A length of this can be wound around two Rods placed at the top and bottom of the radiator frame, care being taken that each turn of Spring Cord is in contact with the previous one.

Radiators of the "honeycomb" type can be built up with a simple frame of Strips, and with a Flexible Plate of suitable size to represent the "honeycomb." The finished radiator is quite realistic and is suitable for incorporation in almost any type of model car. Many modern sports cars are fitted with a grille in front of the "honeycomb" and often this can be represented by lengths of Sprocket Chain.

The making of radiators for modern streamlined cars is rather more complicated, as the radiator usually merges into the bonnet. In most cases the radiator is housed behind a small grille, however, and it is then only necessary to represent the latter, which can be done quite easily with Strips of various lengths.

A type of bonnet found on American cars has horizontal louvres, which in some cars are continued along the sides of the bonnet. These also are quite easy to reproduce. The short horizontal louvres can be represented by Curved Strips, and can be attached to the bonnet with Angle Brackets. In some cases the louvres are flush with the bonnet and in others they jut forward. Adjustment of the Angle Brackets will allow either type to be represented.

Radiators used on commercial vehicles generally are much more simple in construction and design than those of private cars. In most cases the radiator frame is rectangular in shape and the "honeycomb" is not masked by a grille or louvres. The "honeycomb" can be represented by Springs, Spring Cord or Sprocket Chain. If Springs are used they should be stretched between Rods fixed at the top and bottom of the radiator frame.

(410) Fishing Reel (H. Davies, Newcastle)

Apart from their use in ordinary model-building, Meccano parts can be employed in making equipment and gadgets required in connection with many other hobbies. An interesting example of this has been given by H. Davies, Newcastle, a keen angler who recently made a substitute from Meccano parts for a fishing reel that had been damaged.

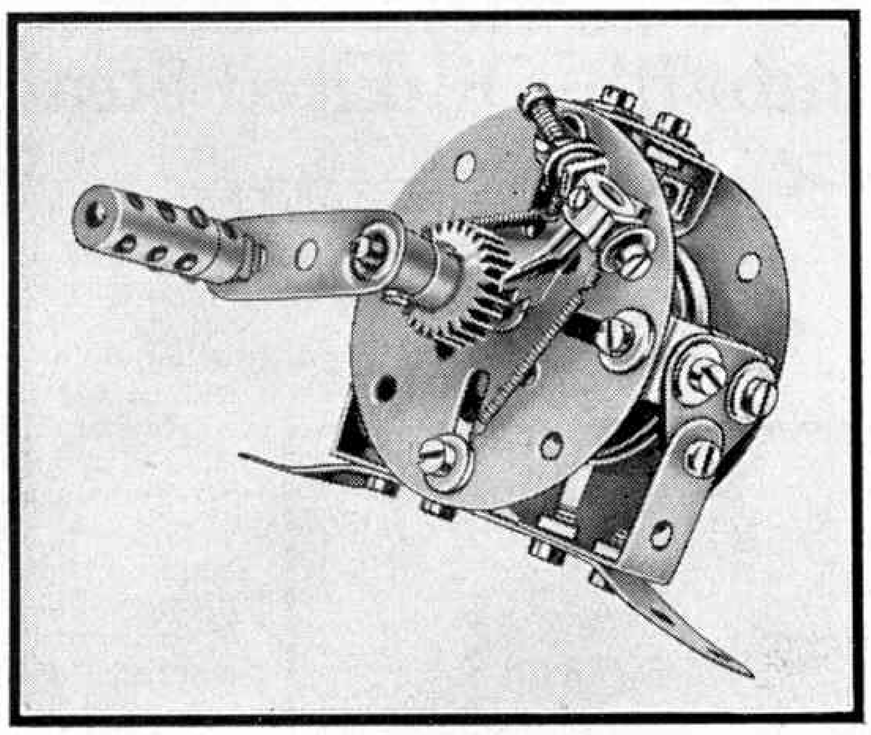


Fig. 410

The result of Davies' efforts is shown in Fig. 410. The sides of the reel are Face Plates, which are joined together by six 1″ × ½″ Angle Brackets. A 3″ Rod is pushed through the bosses of the Face Plates, which are carefully aligned to ensure free running, and it carries two 1½″ Pulleys placed boss to boss. A Collar is fixed on one end of the Rod and a ¾″ Pinion and a Crank are secured to its other end. The Crank carries a handle consisting of a Threaded Pin fitted with a Collar and Coupling. The 1″ × 1″ Angle Brackets are then connected by a 4½″ Strip bent to the shape shown in the illustration.

A check device is made with a Centre Fork gripped in a Collar. The latter part is pivotally mounted on the Face Plate by a bolt and nut. The device is tensioned with Spring Cord as shown, one of the bolts used for attaching the Cord to the Collar being ¾″ long. This Bolt serves as a lever to raise the Centre Fork out of mesh with the ¾″ Pinion so that the reel can revolve freely when casting.

The check device acts like a pawl and ratchet, allowing winding in one direction only. If a two-way check is desired it is only necessary to adjust the Centre Fork until it is disposed radially to the 3″ Rod.

(411) Current Collector for Rotating Models

(B. Pollack, Stirling)

In building models operated by Electric Motors that incorporate rotating structures, it is usually necessary to provide some form of slip ring current collector to supply current to the Electric Motor operating the rotating portion. The usual form of collector is made with a Wheel Flange insulated from a Bush Wheel, but such a device is too bulky for use in certain models, and for these a smaller substitute is necessary. Fig. 411 shows a suitable form devised by B. Pollack, Stirling.

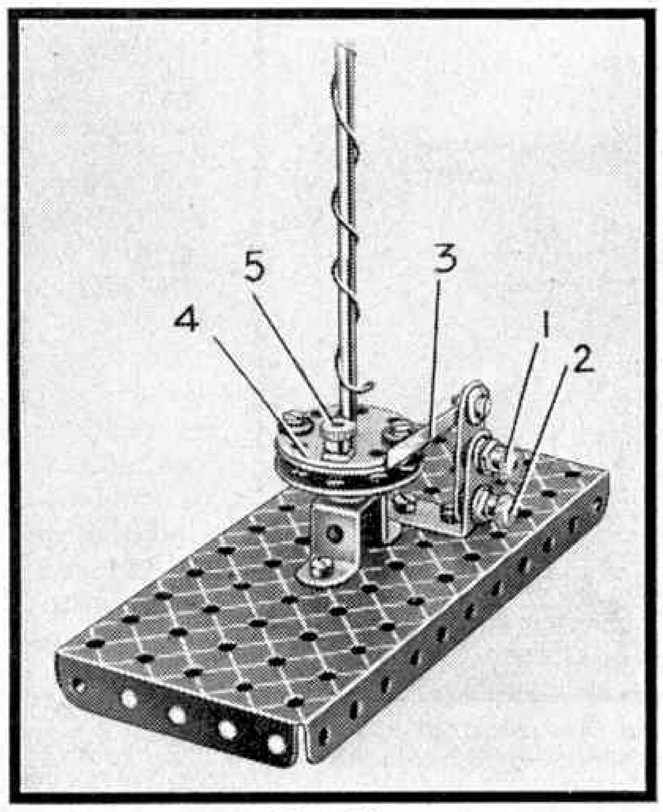


Fig. 411

The rotating portion of the model is carried on a Rod of suitable length. Four 1¼″ Discs 4 are bolted together with 6BA Bolts, which are insulated from the Discs by means of Insulating Bushes and Washers, and the Discs themselves also are insulated from the Rod by wrapping thin paper around the latter before they are slipped over it, care being taken that the paper is not torn in the process. It is necessary to cut away the edges of the Insulating Bushes where they overhang the outer edges of the Discs. A Terminal 5 is then fitted to the 1¼″ Discs.

It is advisable to test the paper insulation of this assembly. A wire is connected from a flashlamp bulb to the Disc, and a second wire joins the Rod to a suitable battery. The lighting of the flashlamp bulb is a sign that the paper is perforated, but the assembly is in order if the bulb fails to light up.

The Discs are held on the Rod by bolting them to a Bush Wheel. This is then secured to the Rod, which is journalled freely in a Double Bent Strip bolted to the Flanged Plate that forms the base. A 1″ × 1″ Angle Bracket is bolted to the 5½″ × 2½″ Flanged Plate, and to it is fastened a 1½″ Strip. The Terminal 2 is insulated from the Strip by means of an Insulating Bush and Washer, but an ordinary washer is placed under the nut to make electrical connection between the Bolt and the Angle Bracket. The upper Terminal 1 is insulated from the Angle Bracket, but is in electrical contact with the 1½″ Strip. A Pendulum Connection 3 is bolted in the upper hole of the 1½″ Strip and makes contact with the 1¼″ Discs.

The Terminals 1 and 2 are connected to those of the Transformer or accumulator supplying the current, and a wire attached to Terminal 5 is connected to the Motor in the superstructure, the other Motor terminal being connected to the framework of the model.

Pollack used this collector in a model traction engine driven by an Electric Motor. By means of Angle Girders he connected the model to the vertical Rod of the collector, and two leads were then taken to the Motor. The model could then travel in a circle without entangling the leads.

(412) Compact Differential Gear

(S. Rowston, Blackburn)

In constructing a model motor vehicle in which any attempt is made to incorporate the essential mechanisms of the chassis, some form of differential gear is required. If the vehicle is a large one the differential may be that used in the Motor Chassis, Model No. 10.5, described in the Instruction Manual for Outfits Nos. 9 and 10, but when only a small vehicle is being built a more compact arrangement is necessary. In this case the mechanism shown in Fig. 412 can be used. It was designed by S. Rowston, Blackburn. Another advantage of the gear is that very few parts are required for its construction.

A "spider" taken from a Swivel Bearing is fitted with two Pivot Bolts, which carry Collars 1 and 2 respectively. The Pivot Bolts are screwed into the "spider" so that their screwed ends butt together and lock them in position. The ½″ Bevel Gear 3 is fitted on a ½″ Bolt that also is screwed into the "spider."

Nuts are screwed on the shanks of two ¾″ Bolts, which are then inserted in diametrically opposite holes in a Bush Wheel. A second nut is then placed on each Bolt. The ends of the Bolts are screwed into the tapped holes of the Collars 1 and 2 to fix the latter firmly to the Pivot Bolts.

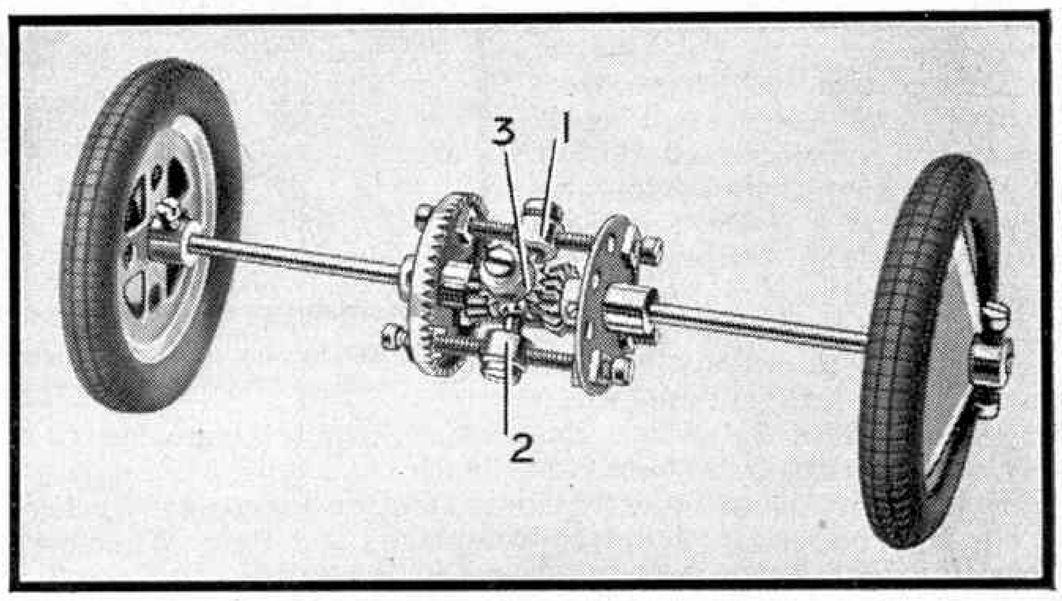


Fig. 412

A Rod of suitable length to form half of the rear axle is inserted in the boss of the Bush Wheel, and it carries a ½″ Bevel Gear placed in the position shown. The inner end of the Rod fits in the bore of the "spider." The nuts on the ¾″ Bolts are now tightened up so that the ½″ Bevel Gear is held in mesh with the Bevel Gear 3. The 1½″ Contrate Wheel is attached to the Collars in a similar manner, and a ½″ Bevel Gear is then fitted on the other half of the axle. A little play must be allowed between the teeth of the Gears in order to permit smooth running, and to strengthen the assembly a 2″ Screwed Rod is lock-nutted to the Contrate Wheel and to the Bush Wheel.

When the mechanism is fitted in the chassis of a model, a ½″ Pinion or a pinion from an E1 Electric Motor should be arranged to mesh with the 1½″ Contrate Wheel to transmit the drive from the gear-box.

Miscellaneous Suggestions

M.204. The need for miniature mudguards arises in building small model sports cars or motor vehicles. These can be made of Formed Slotted Strips, but an interesting alternative is suggested by H. Hayes, Preston, who finds the Mudguards from a Motor Car Constructor Outfit ideal for the purpose.

New Meccano Models

Balance—Ice Cream Cart—Windmill—Oil-Fired Steam Plant

THE four models we are describing this month will interest owners of widely different sizes of Outfits, for they can be built with the contents of Outfits Nos. 1, 4, 5 and 7 respectively. The smallest is a balance with which letters and other light articles can really be weighed, and is easily constructed with the parts included in Outfit No. 1. The models for Outfits Nos. 4 and 5 are respectively an ice cream cart of the type often seen specially at the seaside, and a windmill that reproduces well the movements of a particularly attractive type. The largest model is an oil-fired boiler plant and steam engine designed for Outfit No. 7.

The letter balance is shown in Fig. 2. In making it two $5\frac{1}{2}''$ Strips are first bolted to two Trunnions, which are fastened to the $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate that forms the base. The beam of the balance consists of two $5\frac{1}{2}''$ Strips overlapping four holes, and it is pivoted on a lock-nutted $\frac{3}{8}''$ Bolt passing through the fifth hole from one end and the top holes of the vertical $5\frac{1}{2}''$ Strips. Two $2\frac{1}{2}''$ Strips overlapping two holes are then pivoted to the short arm of the beam, as shown in the illustration, and to them is pivotally attached a third $2\frac{1}{2}''$ Strip. The latter Strip is connected to the vertical $5\frac{1}{2}''$ Strips by a $2''$ Rod fitted with $1''$ Pulleys. All the joints of course are pivotal in order to allow free movement of the beam.

The tray on which the letters are placed is a Bush Wheel fitted with two Flat Trunnions and two Curved Strips, and the Bush Wheel is attached to the top of the $2\frac{1}{2}''$ Strip below it by means of an Angle Bracket. A $1''$ Pulley is fixed to the other end of the beam to balance the weight of the tray, and a rider consisting of three Angle Brackets, a Flat Bracket and a $1''$ Pulley is arranged to slide along the beam. A vertical post fitted with Flat Brackets provides stops that prevent excessive movement of the beam.

Before the balance can be put into practical use it is necessary to calibrate it. A strip of paper is glued to the beam, and weights of 1, 2, 3 and 4 oz. are placed in the scale pan in succession, the rider positions that give exact balances being marked. If actual weights are not available various objects of known weight are used instead, and the scale of marking is worked out in a similar manner.

Parts required to build the model letter balance: 4 of No. 2; 4 of No. 5; 3 of No. 10; 5 of No. 12; 1 of No. 17; 4 of No. 22; 1 of No. 24; 24 of No. 37; 6 of No. 37a; 3 of No. 38; 2 of No. 48a; 1 of No. 52; 4 of No. 111c; 2 of No. 126; 2 of No. 126a; 4 of No. 155a.

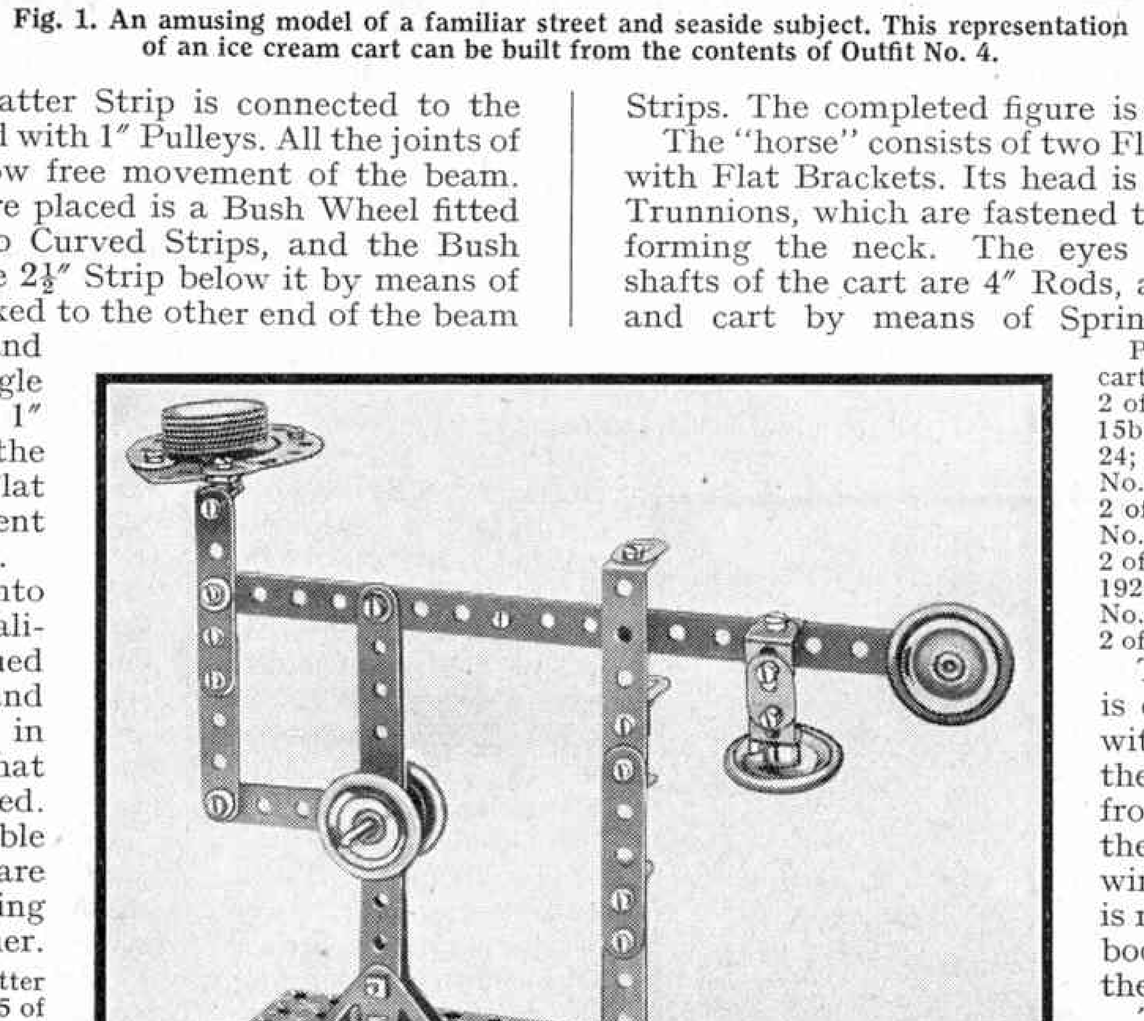


Fig. 1. An amusing model of a familiar street and seaside subject. This representation of an ice cream cart can be built from the contents of Outfit No. 4.

The ice cream vendor's vehicle is shown in Fig. 1. The bottom of the cart is a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate, to the flanges of which are bolted two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates to form the sides, and two $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates to form the front and rear respectively. The Plates are strengthened at their upper edges by $5\frac{1}{2}''$ and $2\frac{1}{2}''$ Strips, and the canopy supports are $5\frac{1}{2}''$ Strips. The canopy itself consists of a $4\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate and the halves of a Hinged Flat Plate from which the centre pin has been removed. To the long edges of the plate so formed are bolted $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates bent as shown, and $1\frac{11}{16}''$ radius Curved Plates form the front and rear. The Flexible Plates and Curved Plates are strengthened at their lower edges by $5\frac{1}{2}''$ and $2\frac{1}{2}''$ Strips respectively, their ends being joined by Formed Slotted Strips.

Two Semi-Circular Plates are attached by Angle Brackets to each end of the cart, and a Double Angle Strip is bolted between the sides. The latter part supports a $3\frac{1}{2}''$ Rod, which is pushed through the centre hole in the Double Angle Strip and through the Flanged Plate. The Rod carries at its upper end the Road Wheel and the $1''$ Pulley that represents the ice cream freezer, and its lower end is fitted with a Spring Clip. The Road Wheels on which the model runs are fitted on a $3\frac{1}{2}''$ Rod that represents the axle.

The driver's body consists of two U-Section Curved Plates bolted together to form a cylinder, to the upper edge of which is attached a $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip by means of an Angle Bracket, the same bolt holding also a Double Bracket. A $1''$ Pulley forms his face and his hat is a Bush Wheel, and both parts are fixed in place by $\frac{3}{8}''$ Bolts. His arms are $2\frac{1}{2}''$ Curved Strips, which are bolted to the ends of the $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips. The completed figure is bolted to the side of the cart.

The "horse" consists of two Flanged Sector Plates joined together with Flat Brackets. Its head is built up from Trunnions and Flat Trunnions, which are fastened to the $3\frac{1}{2}''$ Strips and Curved Strips forming the neck. The eyes are washers painted black. The shafts of the cart are $4''$ Rods, and they are attached to the horse and cart by means of Spring Clips.

Parts required to build the model ice cream cart: 8 of No. 2; 2 of No. 3; 8 of No. 5; 5 of No. 10; 2 of No. 11; 5 of No. 12; 4 of No. 12c; 2 of No. 15b; 3 of No. 16; 1 of No. 17; 4 of No. 22; 1 of No. 24; 8 of No. 35; 75 of No. 37; 2 of No. 37a; 4 of No. 38; 1 of No. 48; 3 of No. 48a; 1 of No. 52; 2 of No. 54a; 4 of No. 90a; 3 of No. 111c; 2 of No. 126; 2 of No. 126a; 1 of No. 176; 3 of No. 187; 2 of No. 189; 2 of No. 190; 1 of No. 191; 2 of No. 192; 1 of No. 198; 2 of No. 199; 2 of No. 200; 1 of No. 212; 1 of No. 213; 2 of No. 214; 2 of No. 215; 2 of No. 217a; 2 of No. 217b.

Fig. 2. An easily-built balance that can be put to practical use in weighing letters. It can be built from the contents of Outfit No. 1.

The model windmill shown in Fig. 4 is of the revolving type and is fitted with a fantail, which is mounted at the end of two booms that project from the mill and are supported at their outer ends on wheels. When the wind changes its direction the fantail is rotated and drives the wheels of the boom, thus turning the mill so that the sails always face the breeze.

The superstructure is the first part of the model to be built. A Hinged Flat Plate 2 that forms the roof of the mill is extended downwards at each side with Flexible Plates. The side shown in Fig. 4 consists of two $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates, one $4\frac{1}{2}'' \times 2\frac{1}{2}''$ and one $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate. The other side comprises three $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates. The lower $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates are strengthened with $5\frac{1}{2}''$ Strips, to each end of which are fastened Angle Brackets. Similar parts are attached also to the corners of the Hinged Flat Plate and are connected by $3\frac{1}{2}''$ Strips, to which are bolted Semi-Circular Plates.

The rear wall of the mill consists of two $2\frac{1}{2}'' \times 2\frac{1}{2}''$ and two $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates, the door posts being formed by $2\frac{1}{2}''$ Strips as shown. The front wall is edged round with Strips in the same

way as the rear wall, and is completed with two $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates, one $4\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate and a Flanged Sector Plate. The $4\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate is bolted to the horizontal $5\frac{1}{2}''$ Strip, and the Flanged Sector Plate is attached to the $3\frac{1}{2}''$ Strip. A window is represented by two Flat Trunnions.

At this stage the shaft 4 that carries the sails is fitted. It consists of two $3\frac{1}{2}''$ Rods joined by a Rod Connector, and at one end is journalled in the $3\frac{1}{2}''$ Strip in the front wall of the mill and at the other in the Flexible Plates of the rear wall. At its front end the shaft carries a Road Wheel and a 1" Pulley fitted with a Rubber Ring, and at its rear end is a 1" Pulley. The No. 1 Clockwork Motor 3 is now bolted in position. It is carried on two $\frac{1}{2}''$ Bolts, which are passed through the horizontal $5\frac{1}{2}''$ Strip, six washers being placed on the shank of each Bolt for spacing purposes.

The pillar on which the mill is supported is now added. A $2\frac{1}{2}''$ Cylinder 7 is fitted with two Angle Girders 5, and then is clamped between a 3" Pulley and a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate, which forms the bottom of the mill, by means of two 3" Screwed Rods. The Flanged Plate is fastened to the side walls of the mill by the bolts 1. The Angle Girders 5 are joined together at their free ends by a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip, a second Double Angle Strip being bolted to the turned up ends of the first. Bolts carrying 1" loose Pulleys on their shanks are lock-nutted to the second Double Angle Strip as shown. The shaft of the fantail 6 is supported on two $1'' \times 1''$ Angle Brackets bolted to two Double Angle Strips, and is connected by means of a Driving Band to one of the 1" loose Pulleys that support the boom.

The base on which the mill stands is built by bolting four $5\frac{1}{2}''$ Strips across a 3" Pulley, the bolts passing through the slotted holes of the latter part. Two of the Strips are fitted at each end with a Trunnion, and the others carry Angle Brackets. Four $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates are bolted together end to end, and are then attached to the Trunnions and Angle Brackets.

The mill is pivoted on a 5" Rod, which is passed through the centre hole in the Flanged Plate at the bottom of the mill and is held in place by two 1" Pulleys, one above the Flanged Plate and the other below the two 3" Pulleys already mentioned.

The sails are built from $12\frac{1}{2}''$ Strips, and the hub is formed by two $1\frac{1}{4}''$ Discs held in place by $\frac{3}{8}''$ Bolts. The sails are clamped against the 1" Pulley on the shaft by a second Road Wheel. A ladder to provide access to the mill is made by bolting two $5\frac{1}{2}''$ Strips to a $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip in front of the entrance at the rear of the mill. Rungs are formed by 2" and $1\frac{1}{2}''$ Rods, which are held in position by Spring Clips placed between the Strips.

Parts required to build the model windmill: 8 of No. 1; 14 of No. 2; 2 of No. 3; 12 of No. 5; 2 of No. 6a; 2 of No. 8; 12 of No. 12; 2 of No. 12a; 1 of No. 15; 3 of No. 16; 2 of No. 17; 2 of No. 18a; 2 of No. 19b; 4 of No. 22; 2 of No. 22a; 1 of No. 24; 13 of No. 35; 81 of No. 37; 10 of No. 37a; 14 of No. 38; 1 of No. 40; 1 of No. 48; 4 of No. 48a; 1 of No. 52; 1 of No. 54a; 2 of No. 80c; 1 of No. 90a; 2 of No. 111a; 6 of No. 111c; 2 of No. 126; 2 of No. 126a; 1 of No. 155a; 1 of No. 186; 1 of No. 186a; 2 of No. 187; 4 of No. 188; 4 of No. 189; 4 of No. 190; 2 of No. 191; 4 of No. 192; 1 of No. 198; 1 of No. 213; 2 of No. 214; 1 of No. 216; 2 of No. 217a; 1 No. 1 Clockwork Motor (not included in Outfit).

The model shown in Fig. 3 is a complete steam power plant and includes an oil-fired boiler and a horizontal engine, with water and oil tanks and pipe lines. The model forms a good subject for Outfit No. 7.

It is best to commence construction with the boiler. Two $12\frac{1}{2}'' \times 2\frac{1}{2}''$ Strip Plates are bent to form cylinders, and are joined together one above the other with $5\frac{1}{2}''$ Strips. A third cylinder of the same diameter is made with two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates and one $1\frac{11}{16}''$ radius Curved Plate, and is attached by $5\frac{1}{2}''$ Strips to the other cylinders to form the lower part of the boiler.

A $2\frac{1}{2}'' \times 1''$ Double Angle Strip carrying the Double Angle Strip 2 is bolted to the boiler, and at each end of it are fastened a Trunnion, a $1\frac{1}{2}''$ Strip and a $3\frac{1}{2}''$ Strip. The fire-box and smoke-box doors are built up in the manner shown. The chimney comprises a $2\frac{1}{2}''$ Cylinder and two U-Section Curved Plates. The boiler top is shaped with three Formed Slotted Strips and four $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates, the Formed Slotted Strips being connected by means of a Pivot Bolt carrying a $\frac{1}{2}''$ fast Pulley.

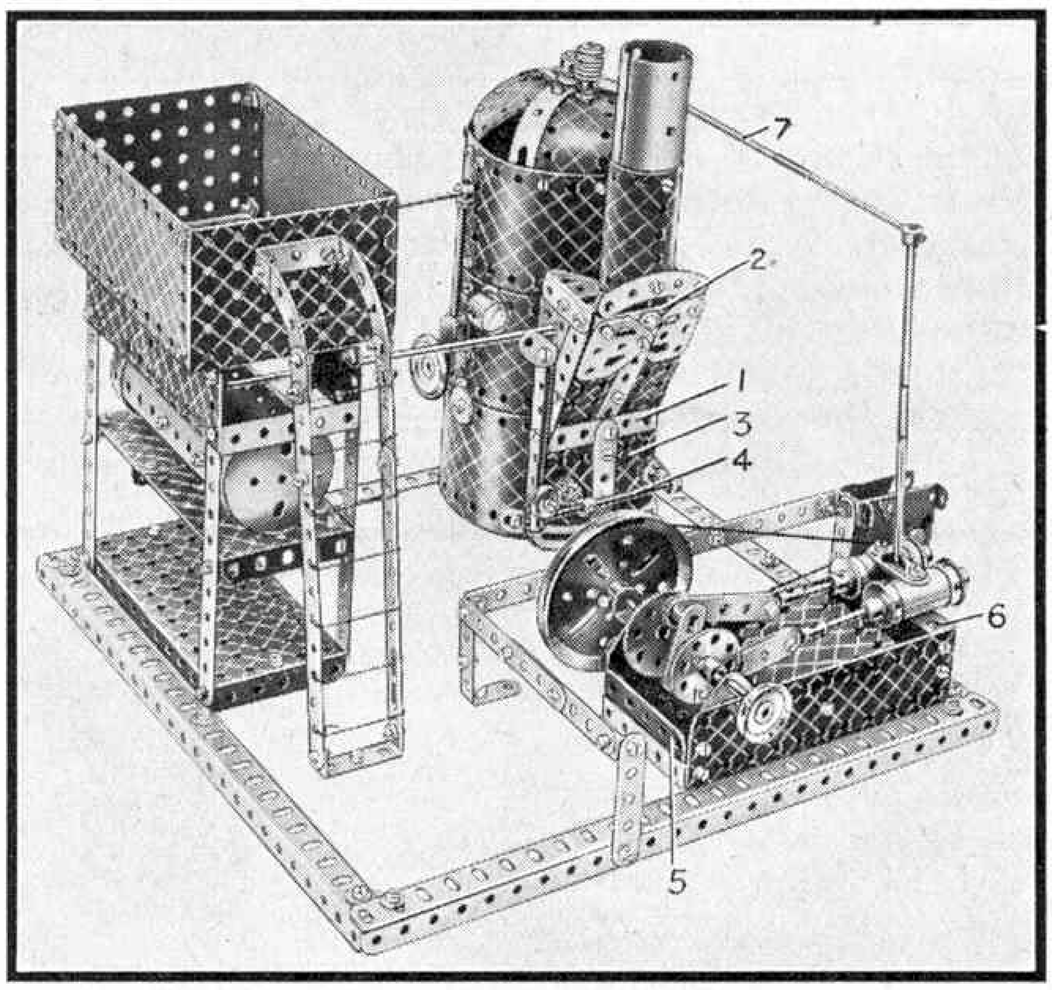


Fig. 3. This model power plant forms a good subject for owners of Outfit No. 7. It comprises an oil-fired boiler, steam engine and oil and water tanks.

The oil burners are represented by $\frac{1}{2}''$ Pinions held on $\frac{3}{4}''$ Bolts, which pass through the $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate 3, and a $3\frac{1}{2}''$ Rod 4 held in Collars on the ends of the Bolts forms the oil supply pipe.

The steam engine is built up on a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate 5, to which are bolted two $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates and a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate. The upper edges of the $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates are reinforced with $5\frac{1}{2}''$ Strips. The cylinders are Sleeve Pieces fitted with $\frac{3}{4}''$ Flanged Wheels, and are bolted to a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Double Angle Strip 6.

The centre web of the crankshaft consists of two Cranks bolted together with their bosses outward, and the outer webs are formed by a Bush Wheel and a 57-teeth Gear. The crank-pins are Threaded Pins secured to these parts, and gripped also in the bosses of the Cranks. Two $1\frac{1}{2}''$ Rods form the journals of the shaft. Each connecting rod consists of two $2\frac{1}{2}''$ Strips, and the ends of those that are pivoted on the crank pins are spaced apart by two Washers. The other ends of the Strips are pivotally attached to Rod and Strip Connectors, which carry 2" Rods. A *Magic* Motor is arranged to drive the 3" Pulley that forms the fly-wheel, and it is attached to one of the stanchions of the handrails by a Double Bracket and an Angle Bracket, as shown in the illustration.

The construction of the water cistern and the oil tank can be seen from Fig. 3. The sides of the water cistern comprise two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates and two $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plates, which are bolted together, and the bottom consists of two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Strip Plates. The Strip Plates are attached to the sides by means of Angle Brackets. The cistern is supported on a special stand, which is built by bolting four $5\frac{1}{2}''$ Strips to the corners of a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate, and attaching $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates to their upper ends, the bolts holding also $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips. Further Double Angle Strips connect the upper corners of the Flexible Plates, the bottom of the cistern being bolted to the Double Angle Strips. A platform consisting of a $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate and a $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate is fixed to the $5\frac{1}{2}''$ Strips of the stand, and it carries a Boiler fitted with Ends to form the oil tank. The ladder that gives access to the cistern is formed by $5\frac{1}{2}''$ Strips and $2\frac{1}{2}''$ Curved Strips, which are connected to two $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips as shown. The rungs are formed by Cord.

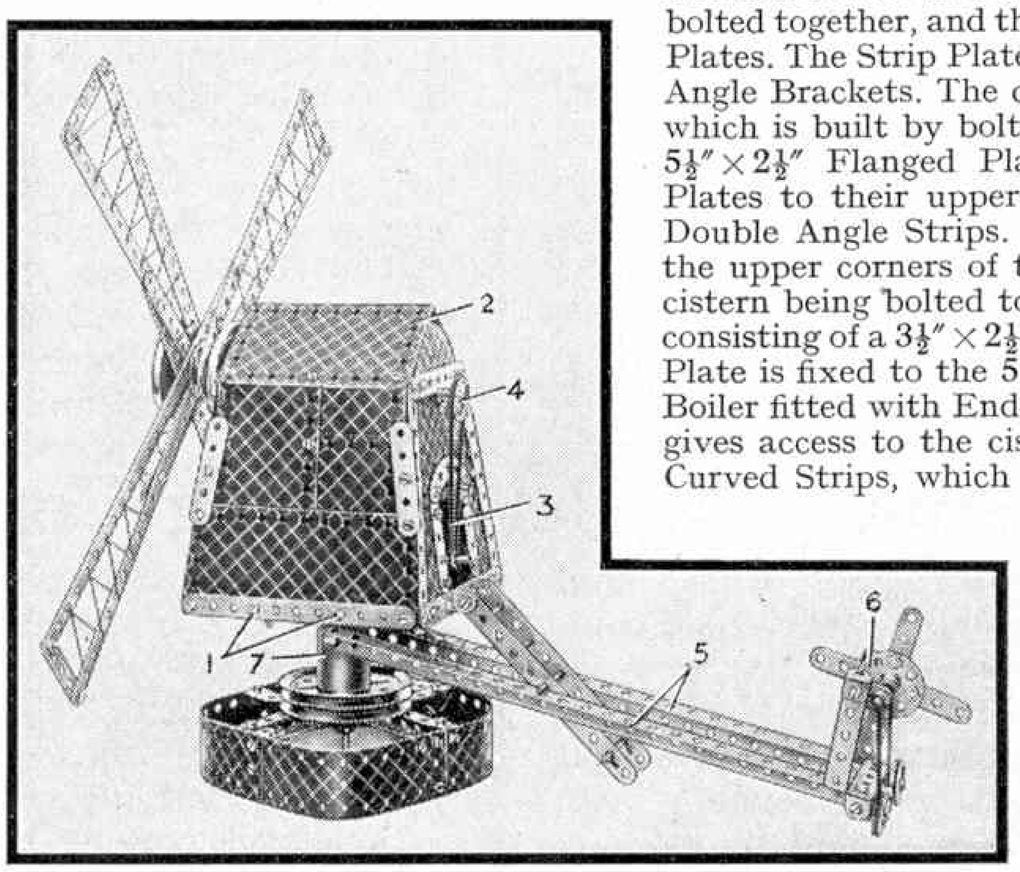


Fig. 4. An unusual and interesting model windmill designed for Outfit No. 5. The sails are driven by a No. 1 Clockwork Motor.

The various Rods forming the supply pipes are now fitted. The cistern is connected to the boiler by a Rod fixed in a Collar. A 3" Screwed Rod is screwed into the Collar and is lock-nutted to a Cranked Bent Strip bolted to the boiler. Pipe 7 is a large Crank Handle that passes through the Plates at the top of the boiler. It is joined by a Rod Connector to a 3" Screwed Rod as shown.

All the components of the plant should be bolted to a baseboard.

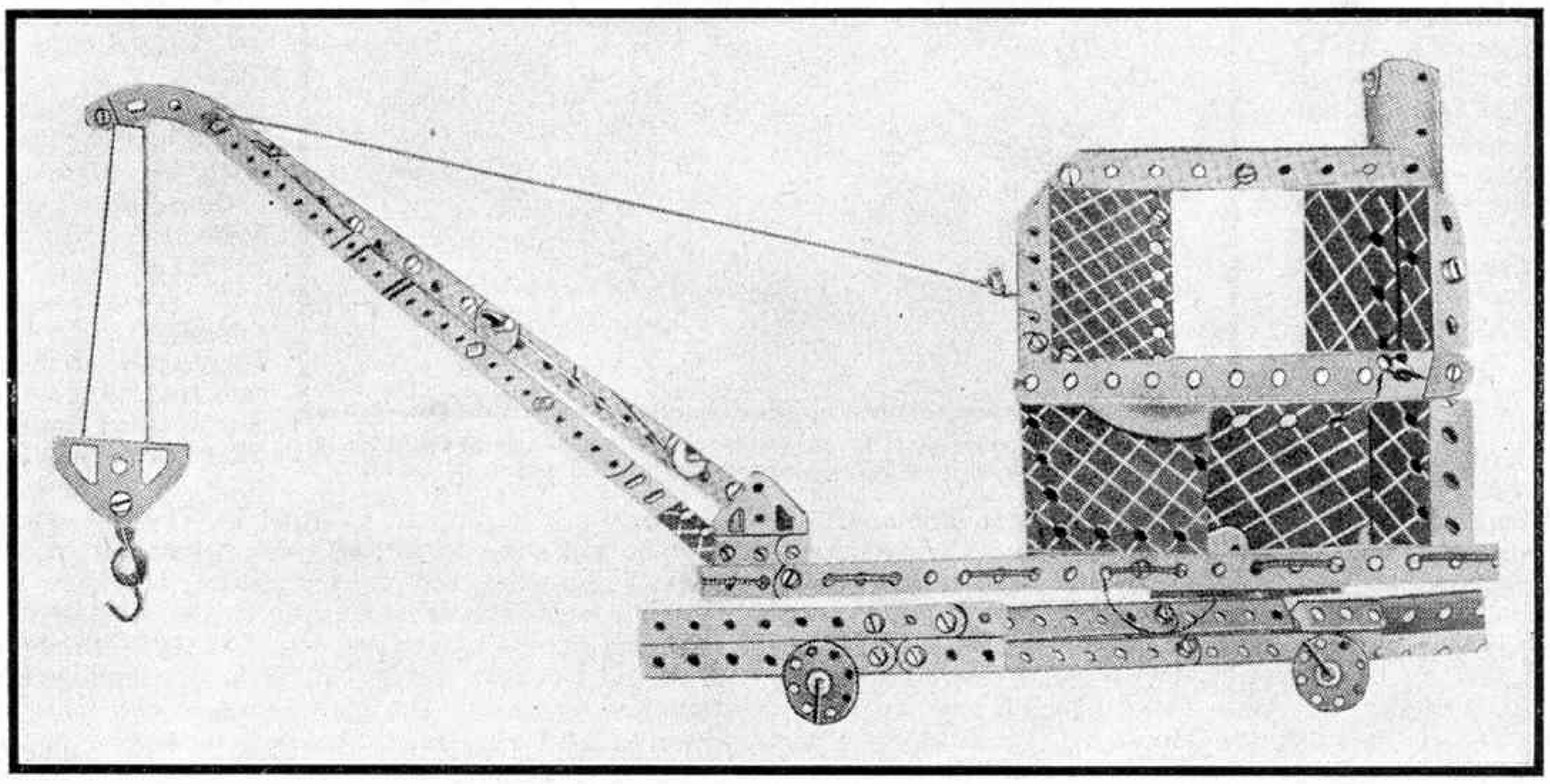
Parts required to build the model steam engine plant: 16 of No. 2; 4 of No. 3; 1 of No. 4; 9 of No. 5; 4 of No. 6a; 4 of No. 8; 2 of No. 10; 2 of No. 11; 10 of No. 12; 1 of No. 12a; 3 of No. 12c; 1 of No. 14; 1 of No. 15a; 1 of No. 15b; 3 of No. 16; 2 of No. 17; 2 of No. 18a; 1 of No. 19b; 1 of No. 19h; 4 of No. 20b; 2 of No. 22; 1 of No. 23; 1 of No. 23a; 1 of No. 24; 2 of No. 26; 1 of No. 27a; 1 of No. 32; 8 of No. 35; 150 of No. 37; 11 of No. 37a; 20 of No. 38; 1 of No. 40; 1 of No. 44; 1 of No. 45; 1 of No. 46; 2 of No. 48; 9 of No. 48a; 1 of No. 51; 2 of No. 52; 3 of No. 53; 4 of No. 59; 2 of No. 62; 1 of No. 63; 2 of No. 80c; 1 of No. 90; 2 of No. 90a; 2 of No. 111; 1 of No. 111a; 1 of No. 111c; 2 of No. 115; 2 of No. 125; 2 of No. 126; 4 of No. 126a; 1 of No. 147b; 1 of No. 155a; 1 of No. 162; 2 of No. 163; 1 of No. 164; 1 of No. 186a; 6 of No. 188; 4 of No. 189; 2 of No. 190; 4 of No. 192; 2 of No. 195; 2 of No. 197; 2 of No. 199; 1 of No. 200; 2 of No. 212; 2 of No. 213; 4 of No. 215; 1 of No. 216; 2 of No. 217b. 1 *Magic* Motor (not included in Outfit).

Novel Contests For Model-builders

Second Summer "Sharp Eyes" Competition

This month we publish details of the second of a series of three special Contests that we are arranging during the summer months. In these Contests there is no model-building to do, and all that a competitor needs to prepare his entry are a copy of the Instruction Manual for Outfits Nos. 0-6, a pencil and a postcard.

The illustration of a breakdown crane that appears on this page is made up from 20 pieces cut from illustrations of models in the Meccano Instructions Manual for Outfits Nos. 0-6. Competitors in this Contest are asked to write down on a postcard, first the Manual numbers, and then the names of the models that are shown in the illustrations from which are cut the various pieces that together make up the picture on this page.



This picture of a railway breakdown crane is made up of 20 fragments cut from illustrations in the Meccano Instructions Manual for Outfits Nos. 0-6. Prizes are offered to readers who can identify the illustrations from which the fragments are taken.

Careful inspection of the illustration will soon enable competitors to "spot" the source of a number of the fragments that have been used; the nature of the Meccano parts shown in the various pieces will help considerably in solving their identity. For example, if the fragment contains part of an Angle Girder or Cylinder, it is at once obvious that it has been taken from an illustration of one of the larger models; while a simple model is suggested if the only parts shown are Strips and Pulleys. It should be noted that the fragments are not necessarily printed in the same angular positions in the illustration on this page as they occupy in the Manual; some of them may even be upside down.

If no competitors succeed in identifying all the pieces in the illustration, the prizes will be awarded to the readers who send in the best attempts, and in the event of a tie the prizes will be given to those whose entries are the most neatly prepared.

The Competition 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/–. Many other prizes of products value 10/– and 5/– respectively also will be awarded.

The closing date for receipt of entries is 30th September 1938. Entries, which must be by postcard only, should be addressed *"Sharp Eyes Contest No. 2,"* Meccano Ltd., Binns Road, Liverpool 13.

A General Model-Building Contest

Handsome prizes are offered for models of any kind whatever built entirely from Meccano parts. All a competitor has to do is to think of some new and original subject and then set to work to build it in Meccano as neatly as possible. Any number of parts may be used, but all models submitted must be the competitor's own handiwork, both in design and construction.

Readers of all ages living in any part of the world are eligible, and all entries will be grouped into one section.

When the model is completed a photograph or a good drawing of it should be sent to *"Summer General Model-Building Contest,"* Meccano Ltd., Binns Road, Liverpool 13. More than one model may be submitted, but no competitor may win more than one prize. If two or more models are submitted by one entrant they will be considered jointly. The competitor's age, name and address, and the name of the competition must be written on the back of each photograph or drawing submitted.

Prizes will be awarded for the best original models received as follows: First, Meccano products value £5/5/–: Second, products value £3/3/–; Third, products value £2/2/–. There will be also 10 prizes of products value 10/6 and consolation awards.

Competitors must forward their entries so that they reach Liverpool not later than 30th September. All prize-winners will be notified by post as soon after the closing date as possible, and they will have the opportunity of choosing items they like from current price-lists. Models that already appear in any of the Meccano publications are not eligible for entry in this Contest.

Photographs or drawings of prize-winning models become the property of Meccano Ltd., but unsuccessful entries will be returned if a stamped addressed envelope is enclosed for that purpose.

Model-Building Competition Results

By "Spanner"

"Locomotive" Contest (Home and Overseas)

The December 1937 "Locomotive" Model-building Competition proved the most successful of any contest organised in recent months. The large number of carefully constructed entries received shows that locomotives still retain their fascination for the model-builder, and in view of the undoubted popularity of this subject I intend to arrange a further competition of a similar type in the near future.

One of the many pleasing features of the Contest was the number of entries sent by competitors who have not taken part in recent contests. Most of these are particularly fine models, and one of them was awarded First Prize.

The complete list of prize-winners is as follows:

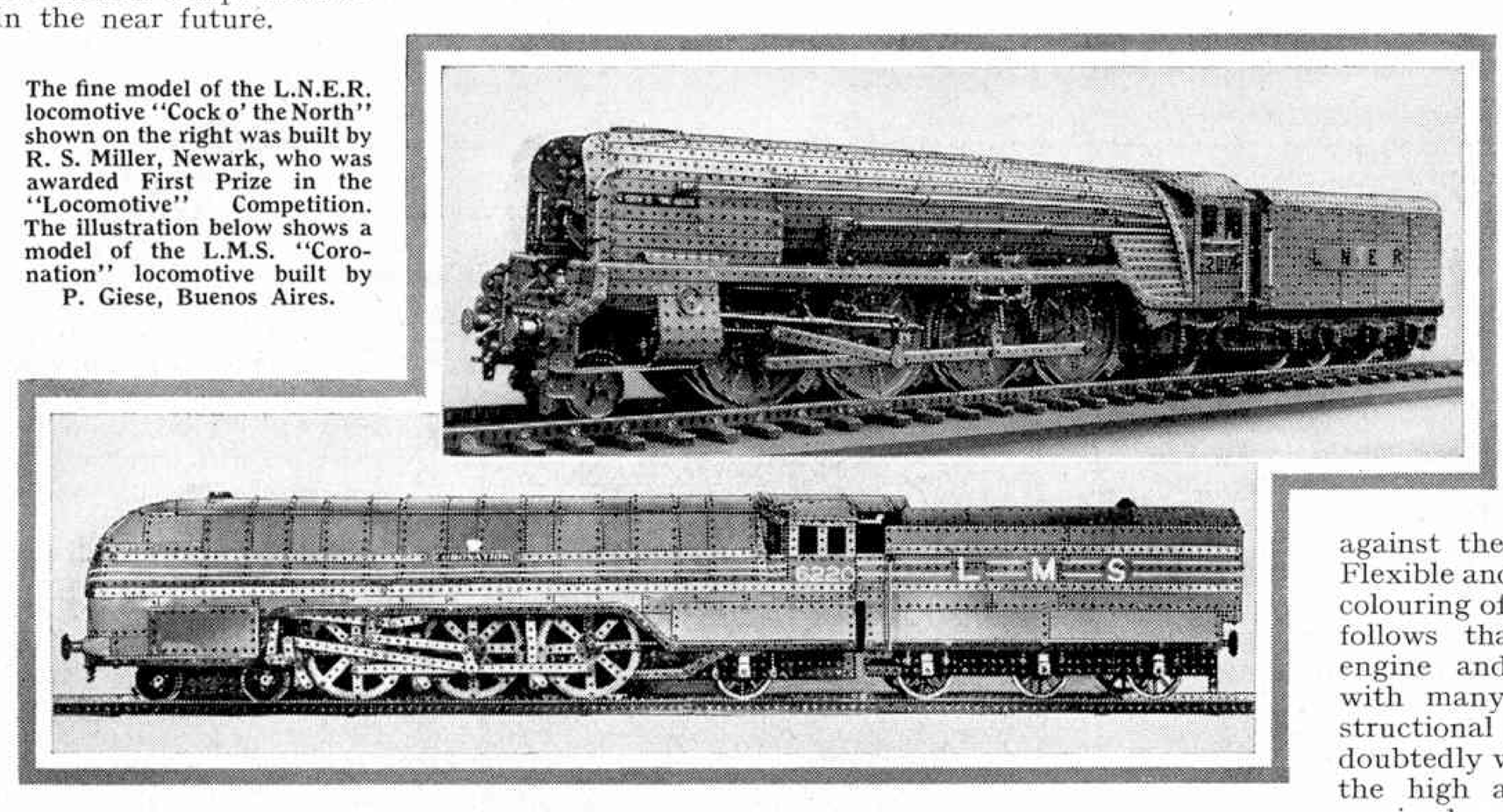
1st Prize, Meccano or Hornby products value £3/3/–: R. Miller, Newark. 2nd, products value £2/2/–: J. Nowlan, St. Paul's Cray. 3rd, products value £1/1/–: P. Giese, Buenos Aires.

Special Editor's Prize of Meccano or Hornby products value 17/6: R. Walford, Lustleigh, Devon.

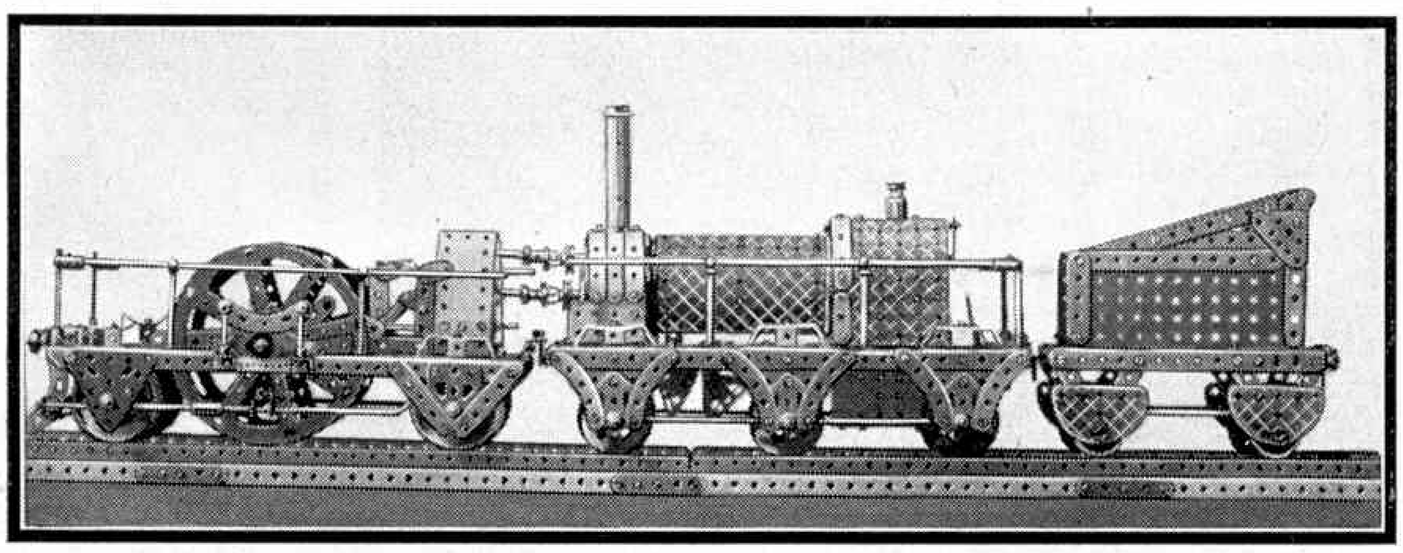
Products value 10/6: J. Matthews, Fillongley; C. Beese, Hamilton, Ontario; E. Rusted, Royston; F. Mills, Kearsley; H. Driffield, Bexley.

Products value 5/–: D. Clapp, Bude; E. Clements, Orpington; P. Gaillard, Nanteuil-le-Haudouin, France; J. Mockridge, Plymouth; W. Tardif, Glenelg, S. Australia; N. Ferry, Timperley.

The fine model of the L.N.E.R. locomotive "Cock o' the North" shown on the right was built by R. S. Miller, Newark, who was awarded First Prize in the "Locomotive" Competition. The illustration below shows a model of the L.M.S. "Coronation" locomotive built by P. Giese, Buenos Aires.



When it was introduced about four years ago the L.N.E.R. locomotive "*Cock o' the North*" attracted considerable attention, and it was this engine that formed the prototype of the fine model with which R. Miller won First Prize. Miller is an expert builder of models of this kind, and another example of his work appeared in the "*M.M.*" for April 1931. His present model is built to a scale of 1 to 15, which gives it an overall length of 5 ft. including the tender, and allows space in which to incorporate most of the details of the original locomotive. It will pay model-builders who are interested in this kind of work to study the accompanying illustration very closely. I hope that Miller will decide to compete more frequently in future contests.



R. P. Walford, Newton Abbot, was awarded a special prize by the Editor for this well-built model of the "Hurricane," a novel locomotive that was in service on the G.W.R. in 1838.

J. Nowlan's entry was a group of several models built to represent the locomotive development that has taken place on the London, Tilbury and Southend section of the L.M.S. The judges found it difficult to decide between this entry and that submitted by Miller, for all the models are well constructed and incorporate a wealth of interesting details. I hope to illustrate and describe Nowlan's models in a special article, which will appear in the "*M.M.*" as soon as a suitable opportunity arises.

The entry that won Third Prize came from Argentina. It was submitted by Pablo Giese, Buenos Aires, and is a remarkably neat model of the L.M.S. "*Coronation*" streamlined engine. As will be seen from the illustration of the model that appears on this page, it is a fine example of the use of Flexible and Strip Plates, and shows the value of these parts in building curved structures neatly and with a solid appearance. The broad silver lines that are painted along the sides of the actual engine and tender are represented in the model by nickelled Strips. Curved Strips are used at the front, and these parts show up splendidly against the rich blue of the Flexible and Strip Plates. The colouring of the model closely follows that of the actual engine and, in conjunction with many interesting constructional features, undoubtedly was responsible for the high award that Giese received.

A special Editor's prize was awarded to R. Walford, Newton Abbot, whose model narrowly missed prize-winning standard.

Prize-winners in the "Most Useful Meccano Parts" Contest

The six Meccano parts chosen as the most useful by competitors in the "Most Useful Parts" Competition are as follows, and they were placed in the following order: (1) Part No. 24, Bush Wheel; (2) Part No. 189, Flexible Plate, $5\frac{1}{2}'' \times 1\frac{1}{2}''$; (3) Part No. 48a, Double Angle Strip; (4) Part No. 126a, Flat Trunnion; (5) Part No. 90a, $2\frac{1}{2}''$ Curved Strip; (6) Part No. 198, Hinged Flat Plate.

The most nearly correct and neatest entries were received from the competitors named in the following list, who have been awarded prizes as indicated.

1st Prize, Meccano or Hornby products value £2/2/–: G. Towler, Norwich. 2nd, products value £1/1/–: C. Wrayford, Bovey Tracey. 3rd, products value 10/6: B. Malcolm, Preston.

Products value 5/–: H. Dorgelo, The Hague, Holland; G. Matthews, Dudley; A. Smart, Wolverly.

Products value 2/6: K. Haxton, Forfar; R. van Berkum, Fenwick, Canada; F. Hemsley, Dunbar; J. Shakespeare, Norton Canes; R. Howitt, Newark; R. Hounsome, London S.W.6; A. Kirk, Dublin; L. Edwards, Auckland, N. Zealand.

Results of the "Meccano-Dinky Toys" Competition

The principal prize-winners in the "Meccano-Dinky Toys" Contest are as follows:

1st Prize, Meccano or Hornby products value £3/3/–: L. Linder, Stockholm, Sweden. 2nd, products value £2/2/–: P. Wickham, Leicester. 3rd, products value £1/1/–: E. Burton, Ipswich.

Products value 10/6: Miss L. Slater Portsmouth; E. Dredge, Fordingbridge.

Gathering New Ideas

We are now approaching the height of the holiday season, and during the next two months practically every club member will spend some time in new surroundings, apart from the visits and excursions that are arranged as part of his club's programme. The first need in these circumstances of course is enjoyment and healthy recreation, and I hope that every member will spend very happy holidays. At the same time club hobbies should not be overlooked. A journey by road or rail and a stay at the seaside or elsewhere should yield interesting suggestions for model-building during the coming winter session, and a keen look-out should be kept, not only for subjects for actual reproduction in Meccano, but also for scenes that suggest general ideas for Exhibitions or displays or for useful extensions to the club's Hornby Railway.

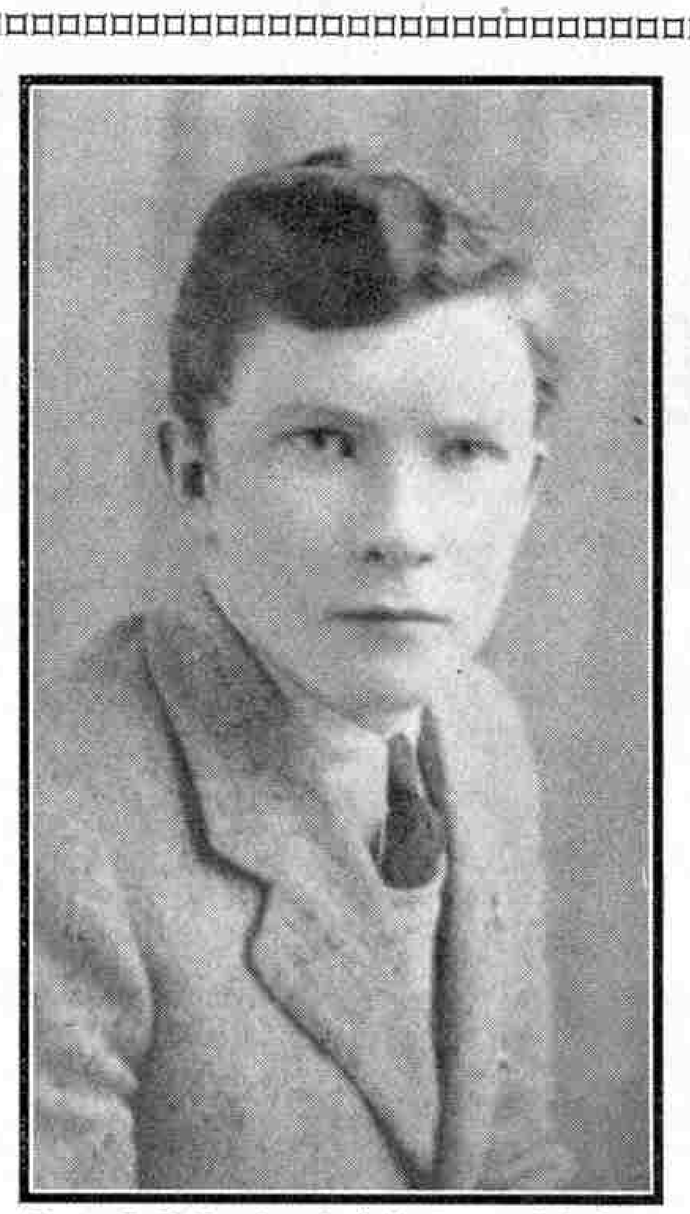
How to Make Reports Interesting

Reports from secretaries usually are brief and accurate accounts of what has happened in the clubroom or on the Branch layout, but in many cases do not give any idea of the spirit and life of the organisation concerned. I like to picture scenes during meetings, both indoors and outdoors, and for readers of the *"Club Notes"* page as well as for myself much of the real value of a report lies in the evidence it gives of the manner in which members enjoy club life. Round the skeleton or nucleus of a business-like report secretaries therefore should try to introduce stories of humorous incidents or examples of resource and ingenuity.

In the past I have had to rely largely upon general letters from Leaders and Chairmen for information of this kind. I should not like to lose touch with these responsible officials and hope that all of them will continue to write as often as possible, giving general reviews of progress and notes on future plans, but secretaries' reports would be far more interesting and valuable if they also were expanded along these lines. One effect of this would be to enable me to make better and more frequent use of reports in the *"M.M."* When I receive complaints that sufficient prominence is not given to the work of a certain club, this usually is the result of lack of real interesting material. I try to give every organisation its due share of the space available on the *"Club Notes"* page, and clubs that seem to be neglected will figure more prominently when reports from them give more than mere routine accounts of proceedings.

A further point is that every report in the *"M.M."* should help other clubs, especially those that are newly formed, suggesting ideas for their own meetings and spurring their members on to greater efforts to achieve real success. Thus each plays a part in ensuring the general progress of the Guild.

I should like secretaries of Branches of the H.R.C. also to keep these points in mind. Little details of actual operations, and of the contributions of individual members to their success, add greatly to the interest and value of the *"Branch News"* page.



Master J. McNaught, who is in charge of the Aero Section of the St. Giles Schoolboy (Edinburgh) M.C. This large and successful club was affiliated in October 1928, as St. George's (Edinburgh) M.C., and took its present name in April of this year, when larger club rooms became necessary owing to the increase in active membership, which now stands at more than 200.

Club Magazines

I have continually urged upon club officials that if at all possible a magazine of some kind should be produced. This may be one of a few pages reproduced by means of a jellygraph, and issued at irregular intervals, or a more ambitious effort that appears weekly and is typed and cyclostyled, or even printed, as in the case of the Plymouth M.C. Whatever the scale of the efforts a magazine makes a wonderful contribution to the spirit of unity that is essential to a club. I am always ready to make suggestions as to ways and means, and hope that officials of any club not yet issuing a magazine will get into touch with me as soon as possible with a view to making plans for the production of one during the coming winter sessions.

Certain clubs exchange copies of the magazines they produce. This is a splendid development, for a magazine sent to other clubs not only gives news of events of interest but also spreads ideas and helps to raise the general standard of production. I am having a list of club magazines prepared, and intend to include in it the productions of H.R.C. Branches. It would be a great help if the editors of all such publications would let me know the latest details of their productions, such as the name, the number of pages and the method of production employed. This would enable me to produce a list that would be up-to-date and accurate in every particular. I should be glad to send a copy of the list to all who contemplate the issue of a magazine, or would like to suggest an exchange.

In some clubs a special issue of the magazine is produced as an Exhibition programme and to give visitors some idea of the club's work. Where such a special issue is impossible, a good programme with notes on the club is always helpful.

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:

PITTINGTON—K. Jackson, 22, South End, Pittington, Co. Durham.

HARLE SYKE—J. Jackson, 11, Sutcliffe Street, Harle Syke, Nr. Burnley.

HELENSBURGH—R. L. Howie, Drumfork Farm, Helensburgh, Dumbartonshire.

INDIA—W. R. Correa, Asian Building, Nicol Road, Ballard Estate, Bombay.

LLANGEINOR—S. Tilley, 3, Heol Llangeinor, Nr. Bridgend, Glam.

LYDNEY—J. Edwards, 26, Highfield, Lydney, Glos.

MICKLEOVER—K. J. Archer, 263, Uttoxeter Road, Mickleover, Derby.

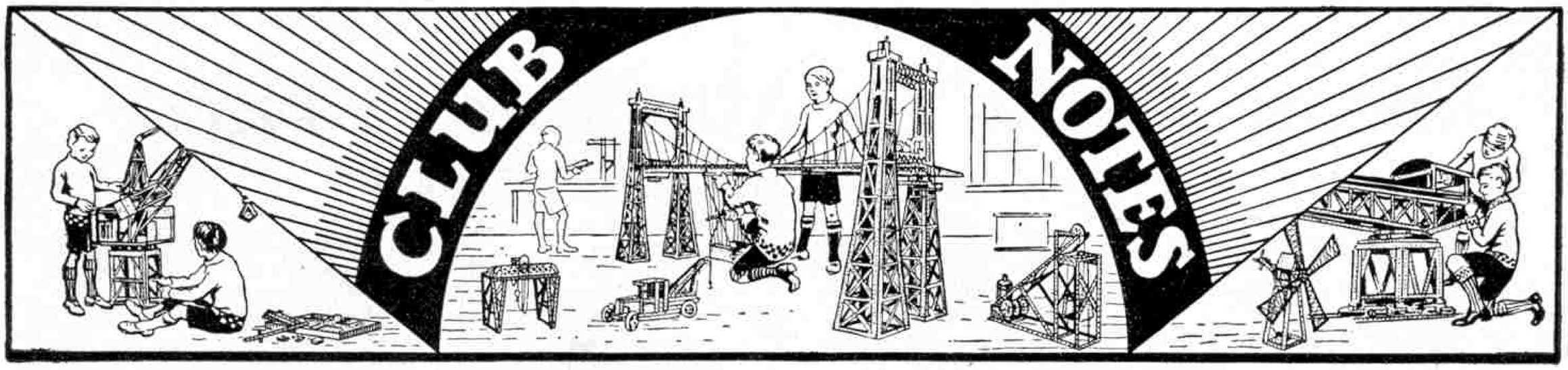
MOSTON—J. Roberts, 20, Worsley Avenue, Moston, Manchester.

NEWTONGRANGE—S. J. Booth, 45, Fifth Street, Newtongrange, Midlothian.

NEW ZEALAND—H. Harre, Kiki Kiki, Te Awamutu, New Zealand.

NORTH WALSHAM—Mr. E. W. Harmer, 21, Millfield Road, North Walsham.

READING—P. Duncombe, 167, Peppard Road, Caversham, Reading.



Sid Vale M.C.—The Annual Exhibition provided members with an opportunity of demonstrating their skill in model-building, and drew much praise from visitors. The exhibits were arranged in six groups, one of which represented a coal mine, with three sets of pithead gear and various machines and equipment seen at a colliery. A model fairground included interesting working miniatures, which were illuminated with excellent effect. Models built by the Exeter M.C. were included in one section of the display. Rambles to Weston Valley and Ladrum Bay were much enjoyed. Club roll: 20. *Secretary:* L. R. I. Gliddon, Sheffield House, Sidmouth.

Great Baddow M.C.—A two-day Exhibition organised by the club was well attended. Keen interest was taken in the models on show, particularly in two traction engines that hauled small boys on trailers across the hall. An attractive topical model was one of the Short-Mayo Composite aircraft, while other good efforts reproduced ships and aeroplanes. Track operations were carried out on a Hornby layout. Members recently took part in an interesting Model-building Contest in which they had to work blindfold. Interesting Lantern Lectures on loan from the London Passenger Transport Board have dealt with "*London's History and Romance*" and "*How London's Tubes Are Made*" respectively. A talk on "*Aircraft*" was of considerable value to members building model aeroplanes. Club roll: 23. *Secretary:* K. J. Avis, 5, Crescent Road, Great Baddow.

Islandmagee M.C.—Regular reports published in a local newspaper do much to stimulate interest in this newly-affiliated club. A Social at which the entertainment was provided entirely by members was well attended. An exciting paperchase was held on one evening, and was followed by a valuable discussion on club activities. The third issue of the club magazine, "*The Gazette*" has appeared, and a Library of 80 books has been formed. Membership is increasing and a larger clubroom has been secured. Club roll: 17. *Secretary:* S. McCready, "Hillmount," Islandmagee, Co. Antrim.

Barking M.C.—The Exhibition in the Central Hall, Barking, was open for three days and attracted many visitors, who greatly admired the fine models built by members. Outstanding was a reproduction of the port of Liverpool, with appropriate shipping, and other good efforts were a Watt's beam engine and a flying boat, the engine of which was set in operation by a penny-in-the-slot mechanism. Club roll: 26. *Secretary:* R. Walling, 18, Ashburton Avenue, Ilford, Essex.

The Beeches (Jersey) M.C.—Model-building and Hornby Train operations are being well maintained. Members have had much fun on Games Nights. At one meeting prepared and impromptu speeches were given on a variety of subjects. Lantern Lectures have been given on "*Italy*" and "*South Africa.*" At a very enjoyable Social members gave plays, sketches and songs. Visits have been arranged for the purpose of taking photographs. Club roll: 28. *Secretary:* D. Nicolle, La Colomberie, 36, Colomberie, Jersey, C.I.

Plymouth M.C.—A considerable increase in membership has necessitated the division of the club into Senior and Junior Sections, each with its own programme. In the Senior Section Model shipbuilding is a new activity, while "Dinky Toys" and "Art" groups have been formed by the Juniors. The Cycling Section has completed several tours. The club magazine, "*The Gearbox*," is now being published monthly instead of quarterly. Club roll: 70. *Secretary:* R. G. Symons, 8, Glendower Road, Peverell, Plymouth.

Wednesbury M.C.—Attendances have been excellent, and enthusiasm high. Numerous useful articles have been made by the Woodwork Section and sold in aid of club funds, and a large and well-built doll's house has just been completed. A model railway is being laid down. A Spelling Bee was closely contested. Visits have been arranged to Dudley Zoo and a local Telephone Exchange. Club roll: 20. *Secretary:* M. L. Done, 31, Waverley Road, Darlaston, Wednesbury, Staffs.

Exeter M.C.—A high standard of model-building has been maintained, the models built ranging from an ostrich to an oil tanker. Many visitors have been welcomed at the club room, and visits are being exchanged with other Meccano clubs. The Cycling Section have already logged nearly 200 miles for the Session. Club roll: 50. *Secretary:* J. T. H. Fenwick, 45, Calthorpe Road, Exeter.

Hornsea M.C.—A varied programme has been followed by all sections, which meet on different evenings, with one weekly meeting of the whole club. Model-building activities and Hornby Train operations have been carried on, and interesting Lectures have been given on "*The Peak District*," "*Astronomy*" and "*The Mystery of Money.*" A Film Show was much enjoyed, and games have been played regularly. Club roll: 14. *Secretary:* P. Richardson, Summerleigh, Esplanade N., Hornsea.

Stretford Public Libraries M.C.—A Cigarette Card Section has been formed by this progressive club, and it is also proposed to form a Hornby Train Section. Stamp activities have included general knowledge tests and stamp games. Further Lantern Lectures are being arranged in view of their popularity. Club roll: 33. *Secretary:* Miss F. Scattergood, Public Library, Technical Institute, Stretford Road, Old Trafford, Manchester 16.

Mr. J. A. B. Ziervogel, President, and R. H. Moodley, secretary, with other members of the Southern M.C. (South Africa), resting after climbing Table Mountain. Model-building is keenly followed by members of this club, which was affiliated in December 1935, when it was known as the Continental M.C. A Stamp Section and a Library also are maintained, and members recently enjoyed a holiday together.

Old Charlton M.C.—The Annual Exhibition proved very successful from all points of view. Club funds benefited, several new members were enrolled, and the already noteworthy reputation of the club was enhanced. Among the original models seen by visitors was one in which placing a penny in a slot caused a model ship to roll realistically in heavy seas, while lightning flashed and a guiding beam was projected from a lighthouse. A model railway attracted considerable attention. The Mayor of Greenwich presented Merit Medallions and prizes for good work. A Cinema Show and items by the club's accordion band completed an outstanding Exhibition. A further entertaining issue of "*The Meccanic*," the official organ of the club, has been produced. Club roll: 35. *Secretary:* F. J. Ambrose, 72a, Charlton Road, Blackheath, London S.E.3.

Folkestone M.C.—Meccano cranes built by members have put in good work on the railway layout of the associated H.R.C. Branch. Members are constructing a model two-masted yacht some 20 in. in length, with a full set of sails and appropriate deck fittings. Club roll: 7. *Secretary:* W. F. Cotter, 52, Hill Road, Folkestone, Kent.

Bexleyheath Boys' Central School M.C.—The club held its third Annual Exhibition recently, the chief attractions being a motor chassis on loan from Headquarters, a model workshop and three electric railway layouts. Meetings are well attended and many fine models have been built by members. Arrangements are being made for a series of Lantern Lectures. Club roll: 32. *Secretary:* J. V. Marsh, 105, Upton Road, Bexleyheath, Kent.

St. Oswalds M.C.—Extensive preparations culminated in the first combined Exhibition of the St. Oswalds M.C. and H.R.C. Branch, at which there were a large number of interested visitors. A giant working model of the Eiffel Tower was among the many models attractively set out, and the Hornby Train layout was the subject of considerable interest. A number of members held an enjoyable camp recently. Club roll: 25. *Secretary:* J. F. Jaques, "Elmolino," 5, Ingram Road, Thornton Heath, Surrey.

Sutton Valence M.C.—Members have conducted interesting experimental work with Meccano models in connection with various mechanisms. Various types of belt drive have been constructed, and much useful information compiled. Members greatly enjoyed a Visit to the Kent Home Exhibition at Maidstone, particular interest being shown in a model railway controlled by wireless and a radio robot that actually opened the Exhibition. Club roll: 23. *Secretary:* C. Austin, East Sutton Park Lodge, Sutton Valence, Kent.

Colchester M.C.—The third Annual Exhibition of the club reflected the good progress made by the club during the last year, and many cleverly constructed models were displayed. These included a working model tramcar supplied with current by an overhead wire, a wall clock and a large gantry crane. The Hobbies Section of the club provided an accurate wooden scale model, with a wing span of 3 ft., of the Armstrong-Whitworth "Whitley III" night bomber. Club roll: 16. *Secretary:* F. D. Cole, 8, Priory Street, Colchester, Essex.

St. Stephens (Saltash) M.C.—A Jumble Sale realised £2/5/–, which has been added to the club funds. Model-building continues to be popular, and informal Debates are held frequently. Club roll: 7. *Secretary:* B. Braund, 9 Homer Park, Saltash.

AUSTRALIA

Maylands M.C.—The club's third Birthday was celebrated by an enjoyable party. The candles on the birthday cake were blown out by the oldest and newest members of the club. Members are gradually acquiring the art of harmonica playing, and an excellent band is being built up. A Visit to the Midland Junction Workshop was greatly enjoyed by members, who showed keen interest in all they saw. Club roll: 28. *Secretary:* R. Le Cheminant, 60, Crawford Road, Maylands, Western Australia.

Melbourne M.C.—Interesting running has been carried out on the Hornby electric layout of the club. The Leader has constructed special controllers that give a range of 10 speeds for 20-volt locomotives, and six speeds for the 6-volt locomotives. Five controllers are now in use and working very satisfactorily. Photographs of the new train, "*Spirit of Progress*," were examined with interest, and gramophone records of English and American trains in motion have been played over. Club roll: 10. *Secretary:* L. Ison, 8, Hayes Street, Northcote N.16, Victoria.

NEW ZEALAND

Christchurch M.C.—A special rotary system of duty has been devised for officials to lighten their work, and also to allow younger members to obtain experience. An interesting Model-Building Competition has been held, and a Hornby track laid down and utilised for locomotive testing. On "Question Box" Evening model-building queries were written on slips of paper and shuffled in a hat. Each member then picked one, and did his best to answer the question, a blackboard being provided for illustration purposes. A cycle run and picnic was much enjoyed. Club roll: 36. *Secretary:* S. S. Stringer, 250, Oxford Terrace, Christchurch.

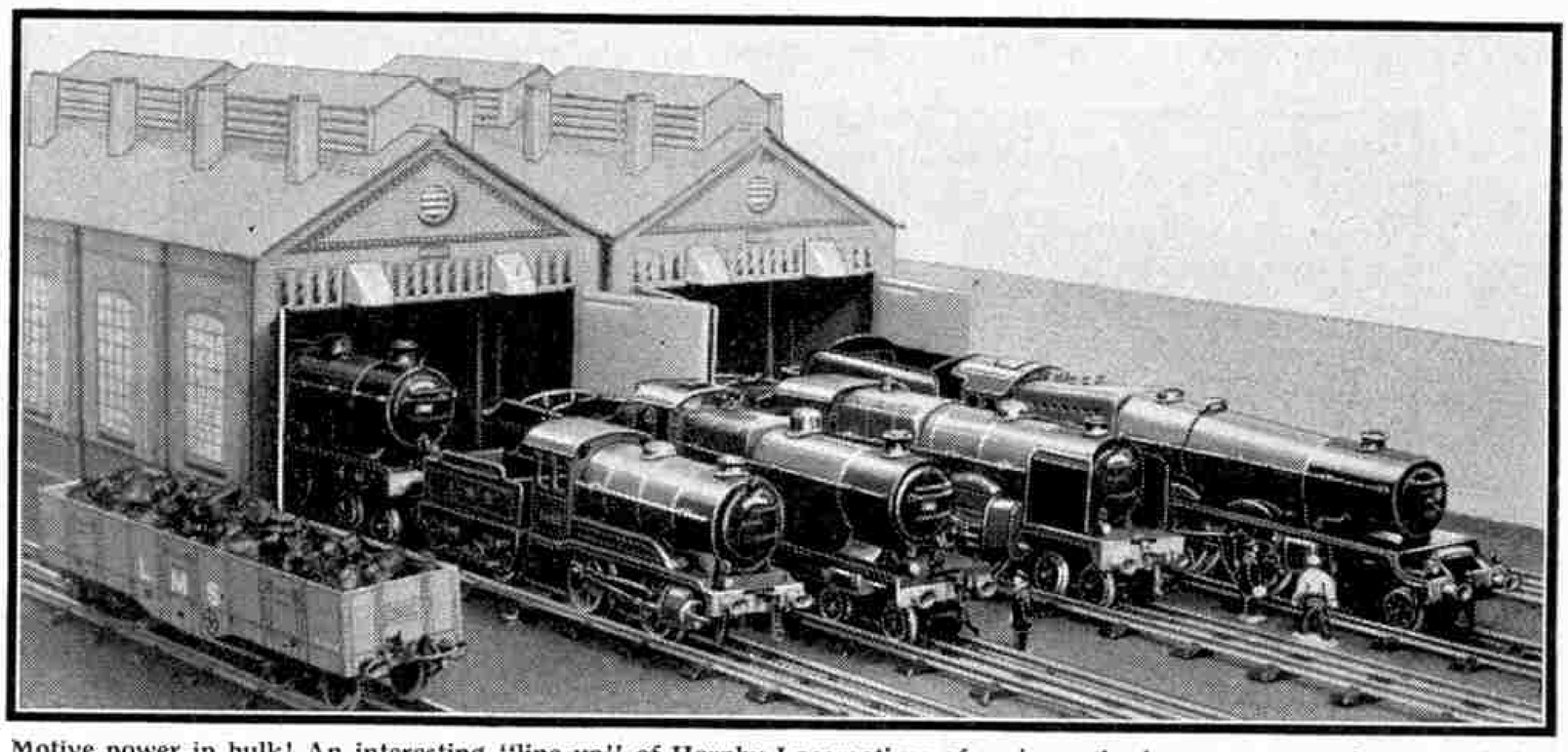
Engine Duties on Miniature Layouts

Choosing Hornby Locomotives

THE Hornby Railway Company staff at Headquarters frequently have to deal with enquiries from readers who wish to know which engine in the range of Hornby Locomotives is the most suitable for certain kinds of work. The choice of a locomotive is not in general a difficult matter, but there are certain considerations that may influence the selection of the type to be adopted. For instance, the radius of the curves in use on the line and the kind of work the engine is to perform have both to be taken into consideration, for upon these the size and class of engine to be employed largely depend.

Another point to be borne in mind is that on real railways different types of engines are not now restricted closely to particular duties, as they were formerly, although there are still broad differences between the kinds of work undertaken by passenger and goods locomotives, and by tender and tank types. This is a great convenience to the model railway owner, as it enables him to use his relatively few engines for a variety of duties while following the practice of the line his railway is intended to represent.

The largest and most powerful engine in the Hornby Series is the splendid L.M.S. 4–6–2 "*Princess Elizabeth.*" This has a 20-volt electric motor fitted with automatic reversing mechanism that affords complete remote control from the lineside, and a finer locomotive for the fastest and heaviest passenger traffic on any layout can scarcely be imagined. The imposing character of the engine is well brought out in the illustration on this page. Although it can be run on the standard Hornby 2 ft. radius curves and points, it shows its great power and speed to better advantage on layouts arranged with Hornby Steel Track, the curves and points of which have a radius of 3 ft. 2 in. measured to the outside rail.



Motive power in bulk! An interesting "line up" of Hornby Locomotives of various wheel arrangements that are suitable for a wide range of duties, as explained in the article on this page.

Next in size are the engines of the various No. 3 types, which are available either as electric or clockwork models. Although these 4–4–2 engines are of large proportions, the central positions of their coupled wheels allow them to traverse the standard 2 ft. radius curves and points easily at speed, for the leading bogie and trailing pony truck provide the necessary flexibility in the wheelbase.

Each of the principal British groups is represented by this type of engine. They are of the same general design, the individual engines differing in accordance with the practice of the companies they represent. Similarly a different true-to-type tender is available for each one. Another member of the No. 3 class is the Hornby Riviera "Blue" Locomotive, also of the 4–4–2 wheel arrangement. This is a typical example of French locomotive practice and it represents very well the remarkable De Glehn compounds of the Nord.

We now come to the popular 4–4–0 wheel type. The latest representatives of this type in the Hornby Series are the E420 and No. 4C models of the S.R. locomotive "*Eton*" of the "Schools" class, probably the most popular series of engines introduced on the S.R. These are essentially express passenger engines, and the models have a special appeal for admirers of the S.R. They are also popular with those who develop their layouts on individual lines, and require a thoroughly modern design of 4–4–0.

The 4–4–0 E220 Special and No. 2 Special tender engines also are good representatives of this type. In each of these series there are four engines, each a true-to-type reproduction of a real locomotive, the real engines thus modelled being the Standard Compounds of the L.M.S., the "Hunts" of the L.N.E.R., the "Counties" of the G.W.R. and the unnamed "L1" class of the S.R.

The two types just considered, the 4–4–2 and the 4–4–0, are primarily passenger engines well suited for general express duties on model systems, and each runs perfectly on the 2 ft. radius curves of the standard Hornby Tinplate Track. In addition they can be used quite well for the haulage of fast goods trains representing the important "fitted freights," or trains made up of vehicles fitted with automatic brakes, which are such a feature of modern railway operation.

Those who have layouts on which traffic of a shorter-distance character is worked require tank engines. These have the advantage that they take up less room than tender engines, and they do not require to be turned at terminal stations, for they can run equally well either forward or backward. Tank engines are suitable for all kinds of shorter-distance traffic, according to their types, so that they are in their element working suburban passenger trains, on local goods work or shunting.

The largest of the Hornby Tank Locomotives are the E220 Special Tank and No. 2 Special Tank types, both of which have the 4–4–2 wheel arrangement. Such engines represent a tank version of the 4–4–0 tender locomotive, rather than of the 4–4–2 as is sometimes supposed, for the bogie and driving wheels are under the bunker. The Hornby 4–4–2 Tank makes a very effective engine for short-distance express work, fast and heavy suburban service as well as for goods traffic.

The remaining engines of the Hornby Series, both tender and tank types, are four-wheelers. The largest of them are the E120 and No. 1 Specials. These are very imposing in design, with outside cylinders and steam pipes, raised footplates and large boilers, and they are equally useful for either passenger or goods work. They are in fact ideal mixed traffic locomotives. The corresponding E120 Special and No. 1 Special Tank Locomotives have similar characteristics, and therefore are suitable for similar work of a lighter character.

The E120 and No. 1 Tender Locomotives and the corresponding Tanks are slightly smaller and less powerful than the No. 1 Specials, and are suitable for similar but lighter duties. The E120 Locomotives are not fitted with the automatic reversing mechanism characteristic of the E120 Special type, but they can easily be reversed by hand from the cab.

This completes the series of engines that require 2 ft. radius curves. The No. E020 and EM320 types are quite at home on 1 ft. radius layouts and are capable of performing all passenger and goods work, both main line and local, on simple systems. We can consider them and their corresponding clockwork versions together, as the mechanisms are similar. In each case reversing is effected by a hand lever in the cab, and this applies also to the M1 Clockwork Locomotive; the EM120 and EM16 are not provided with reversing motors. These engines and the MO engines for 9 in. radius layouts are intended for all duties, both passenger and goods.

Different rails are necessary for braking and reversing different types of engines. It is easy to arrange matters suitably, however. The MB9 Curved Brake Rail can only be used in conjunction with an MO layout. The BB1 Straight Brake Rail can only be used to brake the M1, M3 Tank and No. O Locomotives. The AB2 Curved Brake Rail can only be used either to brake or reverse No. 1 Locomotives. The BBR1 Brake and Reverse Rail brakes or reverses the No. 1 Special, No. 2 Special, No. 3C or No. 4C Locomotives.

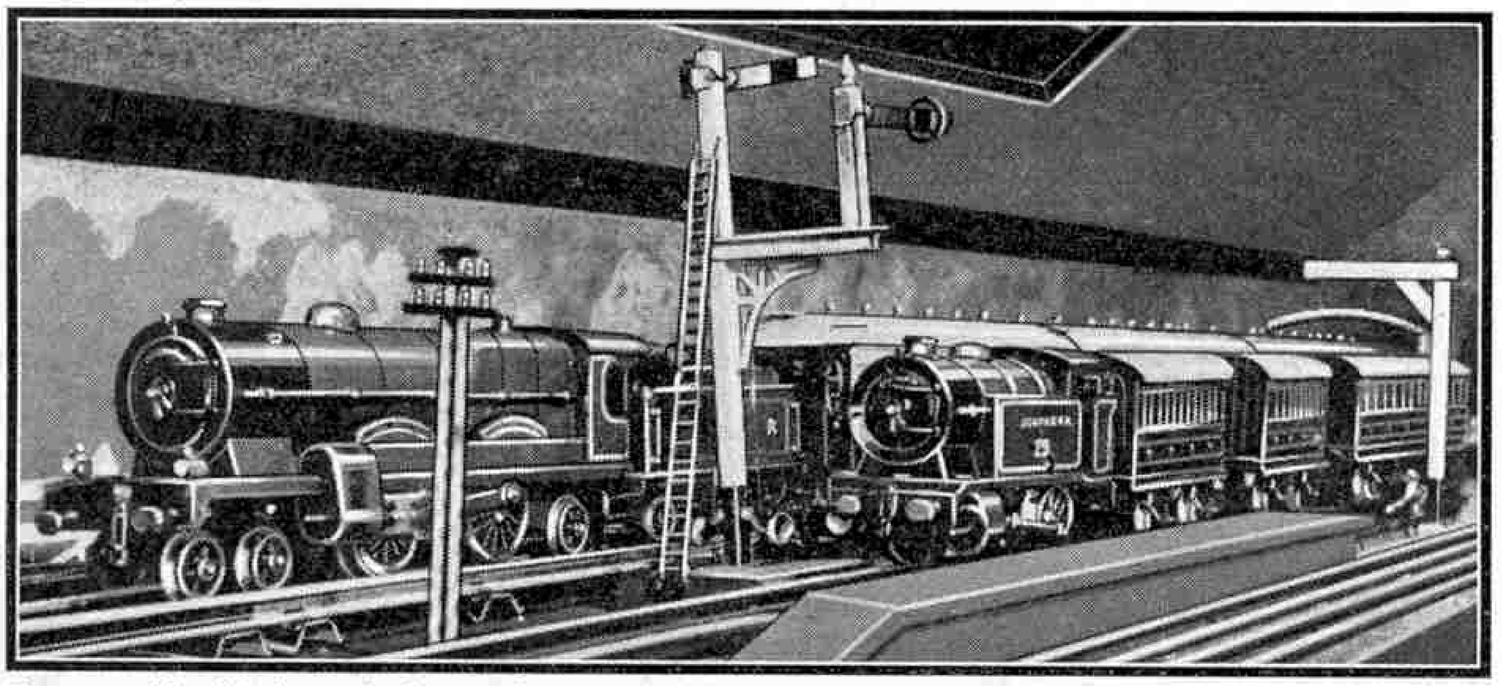
A Popular Type of Layout

Attractive Passenger and Goods Working

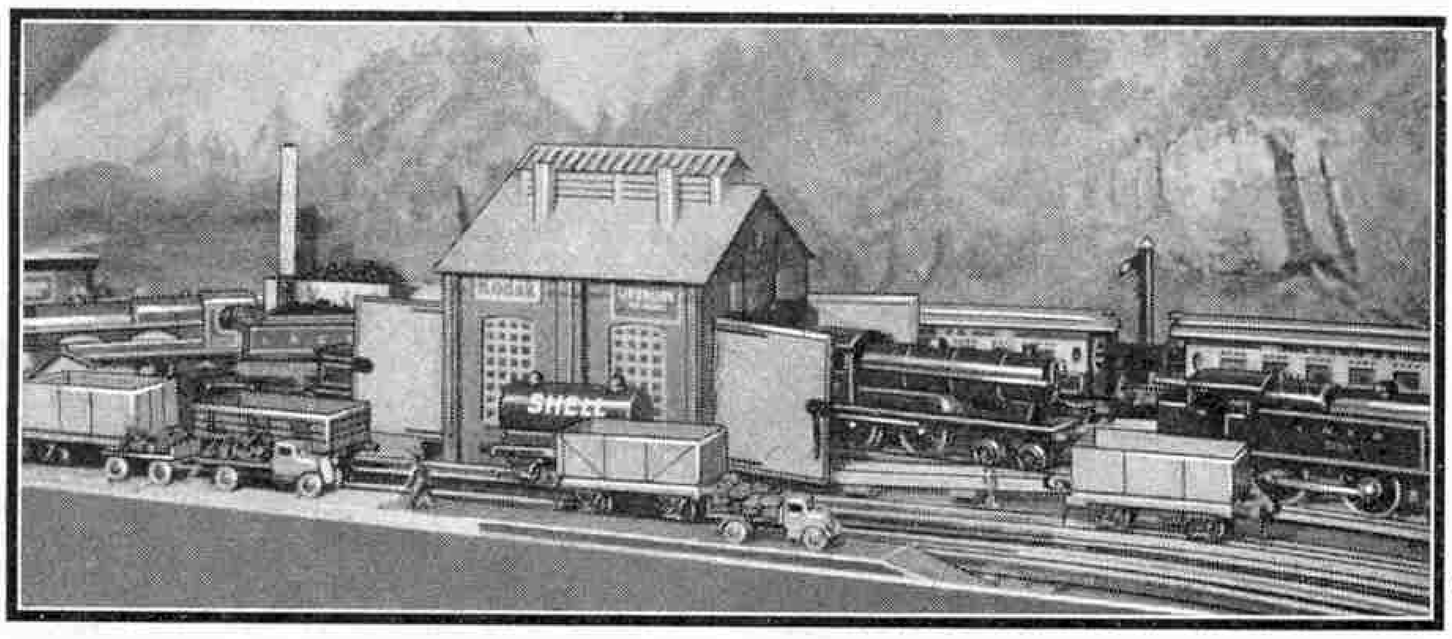
IN recent issues we have described layouts, one operated by the members of a Branch and the other owned by an individual member, that reproduce special portions of the tracks of particular railways. Such layouts have an air of realism, and lend themselves to very satisfactory operations. Equally good fun follows the building up of a miniature railway that represents no particular original, but includes features and follows practices characteristic of different real railways.

A layout of this kind is shown in the illustrations on this page of the model railway of Mr. R. H. Flockhart, of Bridge of Allan. Mr. Flockhart is fortunate in having the use of a large loft for his railway, which was first laid down permanently nine years ago. It was then solely a clockwork-operated layout, but since that time many changes have been made in the general design, and the whole of the track is now electrified. Clockwork locomotives and one steam locomotive are still used, however.

The layout is of the continuous type, and the whole of the main line consists of double track. There are three stations, all of them home-made. The main station is called *"Central"* and consists of three platforms, two of which are of the island type. It is a through station on the main line and also has terminal platforms served by buffer-stop roads. The three platforms are joined by an overbridge. Similar provision for crossing the line is made at *"Exeter,"* the other main line station; both bridges are home-made and are very realistic in appearance. The third station, named *"Windsor,"* is of the simple wayside design and has a single platform only. An air of realistic activity is given to the general scene at the stations by the use of Dinky Toys Passengers and Station Staff, and an interesting feature is a painted scenic background surrounding the track, which gives a very realistic appearance to the whole layout as can be seen in the illustration.



Express and local trains on the layout of Mr. R. H. Flockhart, Bridge of Allan. A Hornby No. 3C "Flying Scotsman" is at the head of the express, and a No. 1 Tank is on the other train.

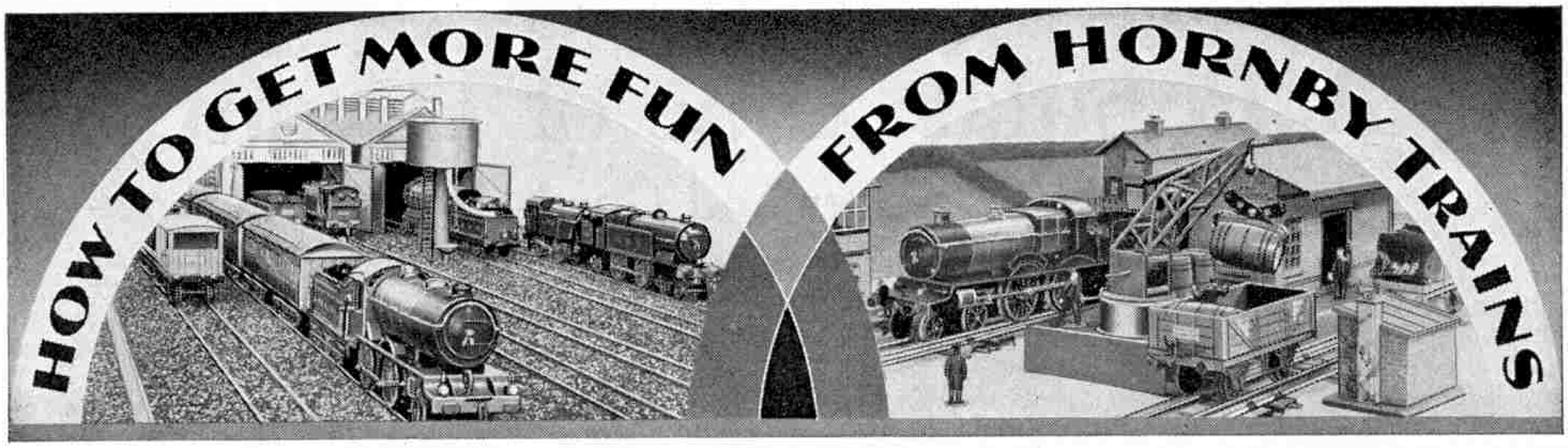


A busy scene showing part of the goods sidings and the Hornby No. 1 Engine Shed. A Pullman express is passing on the main line in the background.

Both passenger and goods operations are carried out on the railway. The main passenger services are handled by a Hornby No. 3C L.N.E.R. *"Flying Scotsman"* Locomotive, and the trains are composed of three or more Pullman Coaches. This engine can be seen at the head of a train of Hornby No. 2 Special Pullmans in both the illustrations on this page. Goods trains are worked by a Hornby S.R. No. 1 Tank Engine and a L.N.E.R. No. 2 Special Tank Engine, and in the lower illustration the second of these locomotives can be seen standing outside the locomotive sheds.

The trains are operated to a timetable, which is so arranged that a period is allowed between each passenger train for the operation of goods trains. The important expresses between *"Central"* and *"Exeter"* make several circuits of the track before completing their journeys. Local trains leave *"Central"* and travel to *"Exeter"* by making a number of circuits, with stops at intermediate stations, each halt of course being made actually at the wayside station. Local passenger services usually are made up of four-wheeled No. 1 Passenger Coaches hauled by a No. 1 Tank Locomotive, and two "locals," or stopping trains, and an express are often operated at the same time.

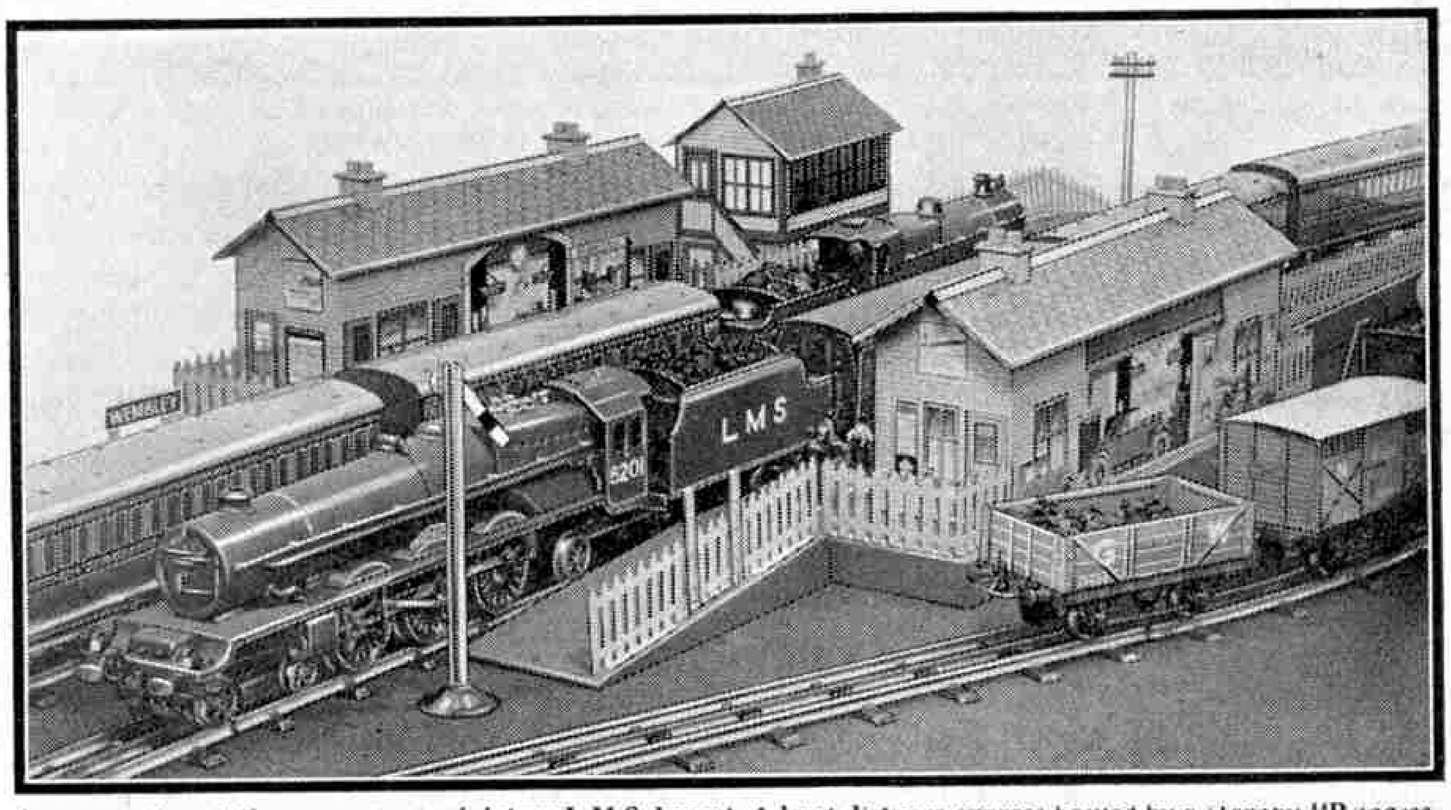
Goods trains are prepared in sidings adjoining *"Central"* station, the marshalling work being carried out by the Hornby No. 2 Special Tank Locomotive that is used for working the goods trains. These trains often consist of a dozen or more wagons and a brake van. A considerable amount of coal is carried in the open wagons, and the transport of loads representing heavy machinery and "castings" is a feature of the line. Loads of this kind are carried on Flat Trucks or Trolley Wagons, according to their weight. The "machinery" loads actually consist of old car parts, which are carefully chosen to be as realistic as possible in appearance.



SUMMER SERVICES ON HORNBY RAILWAYS

EACH year in the summer months changes are made in the railway services in order to deal with the increased amount of traffic due to holidays. To the Hornby railway owner who follows closely the operations of real practice these present splendid opportunities of introducing novelties into his train service, and this article deals with the interesting and topical subject of "summer services" on Hornby railways.

On real railways regular trains are speeded up and numerous expresses are introduced to convey holiday-makers to seaside and inland resorts; in addition many excursions and special trains have to be fitted into services that already are complex. These changes present difficult problems to the railwayman, but the Hornby railway enthusiast is more fortunate, for he can alter his train services as he pleases and if the services are upset to a certain extent owing to traffic pressure, he will receive no complaints from his passengers. Dinky Toys people are very patient!



An interesting station scene on a miniature L.M.S. layout. A long-distance express hauled by a Hornby "Princess Elizabeth" is running through while a stopping train is drawing up at the platform.

Long distance main line trains first call for attention. There are few Hornby L.M.S. layouts on which a miniature *"Royal Scot"* express does not run. This year the fastest-ever *"Royal Scot"* schedule gives a special interest to the train, and its working in miniature involves a series of interesting operations. The acceleration of the real train can scarcely be paralleled in miniature, but its conveyance of traffic from Euston for two separate destinations, Glasgow and Edinburgh, can be reproduced. In the working of this train the L.M.S. "Princess" 4–6–2s have made a special name for themselves, and the first choice in miniature of course will be the splendid Hornby *"Princess Elizabeth"* Locomotive. As the run from Euston to Carlisle is made in real practice without a stop, this working in miniature gives the Hornby Locomotive a fine chance to display its powers of sustained speed.

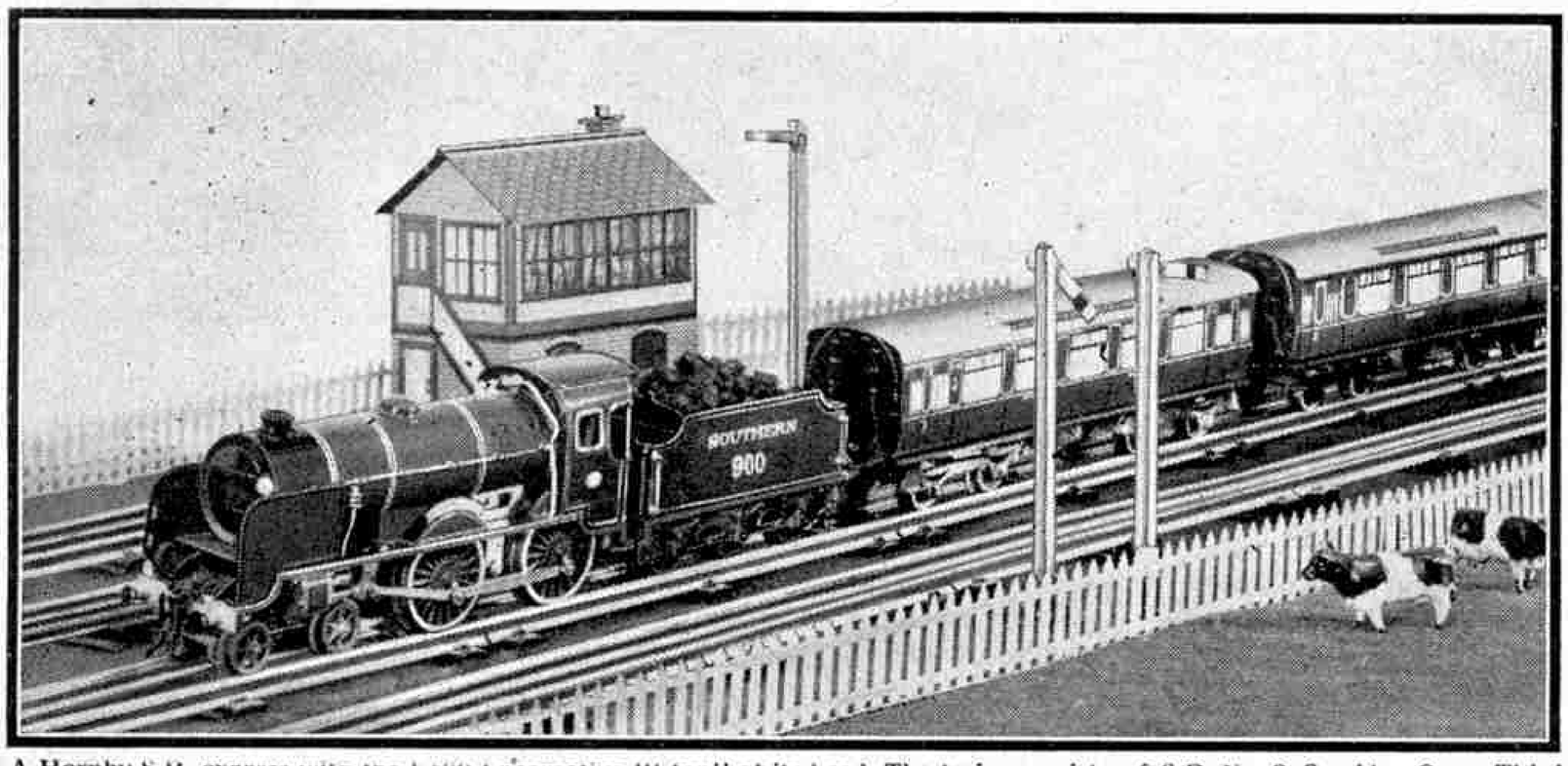
For the make-up of the trains the Hornby No. 2 Corridor Coaches are exactly what is required, for they are accurate reproductions of the latest L.M.S. steel-panelled stock. The number of coaches used will depend on the size of the layout and the resources of the individual model railway owner. A reasonable arrangement would be for the main or "Glasgow" portion of the train to consist of two L.M.S. No. 2 Brake Composites with a corresponding No. 2 First-Third between them; the "Edinburgh" section behind this could be formed of two further No. 2 Brake Composites. Then each part of the miniature *"Royal Scot"* is a complete unit that can be run correctly as a separate train after reaching the division point representing Symington, the halt where the real train is divided.

The Glasgow portion of *"The Royal Scot"* goes forward behind the 4–6–2 that works the train from Euston. The first part of the miniature train therefore must be separated after the corridor connection between the two sections has been removed, and standard end plates have been fitted to the coaches that become the rear of the "Glasgow" train and the front of the "Edinburgh" train respectively. What is left of the train then goes on, and a suitable engine to haul the second portion to Edinburgh will be one of the popular Hornby E220 or No. 2 Special L.M.S. Standard Compounds. In actual practice there are many locomotives of this class at work north of the Border and they frequently appear on the Edinburgh portion of *"The Royal Scot."*

The operation of the various summer season trains provides points of interest for miniature working. For instance, on the L.N.E.R. there is the popular *"Scarborough Flyer,"* which lives up to its title in bringing the famous Yorkshire coast resort within a four-hour journey from King's Cross. It is also one of the famous trains of the Hornby Series, for the E220 and No. 2 Special Train Sets bear this title. Those who operate *"The Scarborough Flyer"* on their Hornby layouts should not neglect to provide the coaches with the appropriate roof boards, for these are available in the series of Train Nameboards in the Hornby range.

An attractive feature of L.N.E.R. practice that can

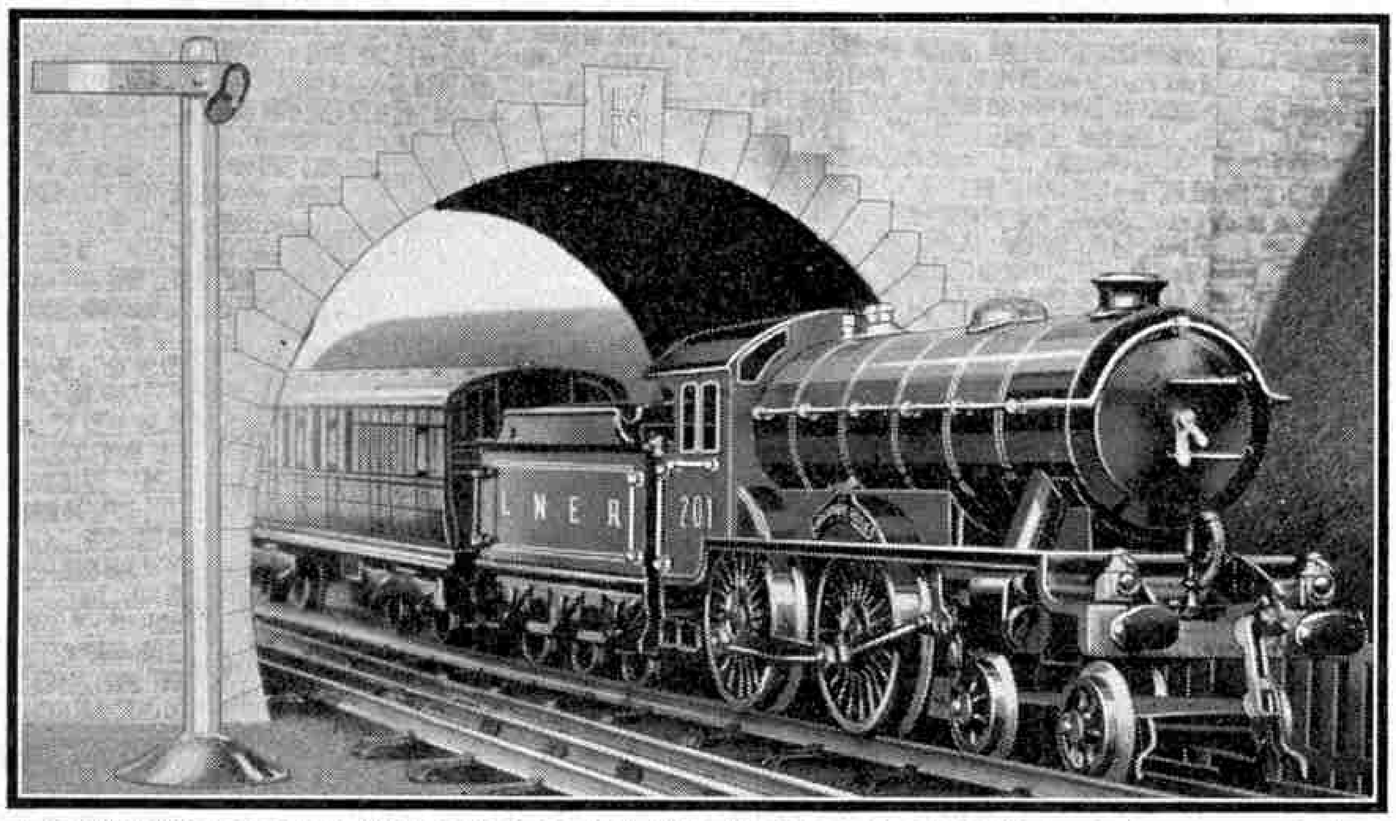
readily be copied in miniature is the use of a headboard bearing the name of the train on the front of the engine. These boards are painted white with black lettering, so that it is not difficult to make a miniature board from a piece of white card. The boards follow the curve of the boiler and are usually carried on the upper lamp bracket. An interesting photograph showing a miniature board of this kind in use appeared on page 348 of last month's *"M.M."*



A Hornby S.R. express with the E420 Locomotive "Eton" at its head. The train consists of S.R. No. 2 Corridor Open Third Coaches that are specially suited to excursion work, as suggested in this article.

During the summer there is a great deal of through working between the system of one company and another. Single coaches, complete trains and even locomotives are often to be found well away from their owning systems. Whole trains of one company's stock may be "borrowed" for a short period by another system that has some particular pressure of traffic to deal with. Through running now takes place between different sections of the same group, and also between the groups themselves, to a greater extent than ever before, particularly where trips are being run to some seaside or inland resort, possibly in connection with some special event.

Great fun is to be had in miniature if similar schemes are followed on a Hornby Railway. This is easily arranged where two or more H.R.C. members operate their engines and stock together on a layout, for locomotives and vehicles of different companies are then invariably represented. It is possible to perform such working also on the layouts of those who do not follow any one company's practice, but prefer to use the engines and stock of several on a layout serving quite an imaginary stretch of country. A good example of a system of this kind was described on page 349 of the *"M.M."* last month.



A Hornby "Hunt" in full cry! L.N.E.R. No. 201 "The Bramham Moor" at the head of an express dashing under a bridge constructed of cardboard and finished to represent brickwork.

Many opportunities for the decoration of the engine front are afforded by the reproduction in miniature of the excursions and other special trains that are such a feature of summer traffic. A favourite form of decoration is a circular board fitting on the front of the smoke-box door giving details of the particular trip. Those to whom such features appeal will find no difficulty in making up one or two boards of this kind for their layouts. Engines of special trains often carry what are known as reporting numbers, so that the staff at different points can readily identify them in the press of other traffic. Real or imaginary numbers can be made use of for this purpose in miniature. These numbers are usually displayed on a small oblong board attached to the engine smoke-box front.

The summer season is essentially the time for organised outings and similar excursions, and in many instances special trains are chartered for the conveyance of parties. A development of modern times has been the complete tour or "land cruise," made by train, the journey occupying perhaps several days. The trains used are of special formation, according to requirements. In miniature good use can be made of Hornby No. 2 Saloon Coaches, for they are of the type that is popular in actual practice for work of this kind.

There is a great demand for Pullman service during the summer season. Good use therefore can be made of Hornby Pullmans, which are typical of the luxurious stock operated on the L.N.E.R. and S.R. by the Pullman Car Co. Ltd. In addition to regular all-Pullman services, such as the *"Queen of Scots"* on the L.N.E.R. and *"The Bournemouth Belle"* on the S.R., there are such special workings as the *"Eastern Belle"* on the L.N.E.R. This provides an all-Pullman service between Liverpool Street, the London terminus of the Eastern Section, and different East Coast resorts, the destination being varied from day to day.

During summer there are lively "rushes" from the cities to seaside resorts, especially at weekends. For instance, intensive services to various resorts are maintained by the S.R., and the G.W.R. put into force special arrangements for dealing with their Cornish and Welsh traffic. Miniature "Kent Coast" expresses and other trains are readily composed of Hornby No. 2 Corridor Coaches, possibly with a Pullman added; and with an E420 and No. 4C *"Eton"* Locomotive at its head such an assembly has a very good appearance.

Such famous G.W.R. expresses as the *"Cornish Riviera Limited"* can be assembled with Hornby No. 2 Corridor stock and can be hauled by a No. E320 or No. 3C Locomotive or an E220 or No. 2 Special *"County of Bedford."*

Branch News

QUEEN ELIZABETH'S GRAMMAR SCHOOL.—A new Branch room has been secured, and a track designed by E. How has been laid down. After the hard work of preparing and fitting the room, normal activities have been resumed with renewed zest, and attendances have been excellent. A unique lighting system suggested by a member is to be incorporated in the layout. Secretary: R. S. Partington, Queen Elizabeth's Grammar School, Wimborne.

KEIGHLEY AND DISTRICT RAILWAY CLUB.—Two meetings are held each week. Timetable working was recently tried out for the first time, and proved so popular that it has been adopted for all track meetings. Electric and clockwork layouts are operated, and passenger and goods services are maintained. A station and goods depot have been built. Secretary: N. Birtwhistle, 9, Bronte Street, Keighley.

HORNSEA.—Regular track meetings have been held, and a miniature brickyard, stocked with Hornby Bricks, has been added to the layout. Special "brick" trains are run in connection with this. The *"Flying Scotsman"* has been off duty for repairs, its place being taken temporarily by two Hornby No. 2 Special Tank Engines. At one meeting a dock was laid out and boat trains run for both passengers and goods. Secretary: P. Richardson, "Summerleigh," Esplanade North, Hornsea.

NORTHAMPTON.—Several timetables have been compiled and allotted numbers, and one of them is run through at each track meeting. At one meeting the working of a "Surprise Timetable" exercised the skill and knowledge of members, and proved very popular. Shunting Competitions are held regularly, the winners holding a special Challenge Cup. The Third Anniversary of the formation of the Branch was celebrated by a special meeting, at which the finals of the Darts and Rings Knockout Contests were held. A Darts Match has been played against the Northants Model Aero Club. A Cinematograph Show included films on *"Engine on the Shed"* and *"Passenger Trains of the L.M.S.,"* both kindly loaned by the L.M.S. Railway Company. Efforts are being made to obtain a larger clubroom. Secretary: P. C. Collier, 33, Sandringham Road, Northampton.

ISLINGTON.—Hornby Steel Track and Points have been purchased, and track operations have been carried out on a layout incorporating it. A shunting problem exercised the ingenuity of members to the utmost. A number of interesting talks have been given, the subjects including *"The Centralised Train Control on the Metropolitan," "How a Locomotive is Supplied with Steam"* and *"Transport Methods of the Future."* Secretary: J. H. Cronin, 1, Aubert Park, Highbury, London N.5.

LOSTOCK GRALAM.—Regular train running has been carried out on the Branch track. A Lecture has been given on *"Railways"* at which intriguing films showing the L.M.S. locomotive *"Coronation"* and the train *"The Coronation Scot"* were shown. *"The History of the Telephone"* was the subject of another Lecture, the explanation of the automatic telephone proving particularly fascinating. Two members who have visited the Meccano Factory at Liverpool gave an account of this experience. Secretary: A. Milligan, Wincham Hall, Northwich.

CRYPT SCHOOL.—Members have attained greatly-increased efficiency in train operation, and good timetable working is practised. The Branch has an excellent equipment of rolling stock and rails, in addition to a substantial locomotive stud. Work on an electric layout is progressing, and it is hoped shortly to obtain a Hornby *"Princess Elizabeth"* to operate on it. Outdoor games have been arranged for the summer session, and it is planned to visit points of railway interest. Secretary: K. T. Rogers, 9, Cheltenham Road, Gloucester.

CROSBY.—Members of this newly-incorporated Branch have elected officials, and a programme is being drawn up. Duties in connection with train operations are interchanged to allow members to gain all-round efficiency. Secretary: D. Cail, 52, Eske Road, Waterloo, Liverpool 22.

HOUNSLOW.—The first meetings of this recently-formed Branch augur well for its future. A track has been laid down, and interesting trains run representing L.M.S. and S.R. services. Debates and Talks have been arranged and a visit is to be paid to the Feltham Engine Sheds. Friendly contests of various kinds are being arranged with the Isleworth Branch. Secretary: D. Manser, 24, Elmer Gardens, Isleworth.

Members of the Crypt School (Gloucester) H.R.C. Branch, No. 342, with Mr. A. J. Healey, Chairman. K. T. Rogers, secretary, is on the left of Mr. Healey. This Branch was incorporated in March of this year, and already has a large stock of Hornby equipment, with which extensive train running is carried out on a clockwork layout. An electric system also is being built up. Railway visits and other outdoor activities are carefully planned to provide variety.

Branches in Course of Formation

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

BEXHILL-ON-SEA—D. Ross-Slater, Collington Rise School, Bexhill-on-Sea, Sussex.

HIGH WYCOMBE—H. D. Dymond, School House, King Alfred's School, Wantage.

KING'S LYNN—D. L. Martin, 298, Wootton Road, King's Lynn.

LONDON—L. Hurworth, 28, Manor Drive, Mill Hill, N.W.7.

PENKRIDGE—T. Birks, Crown Bridge, Penkridge, Staffs.

SCUNTHORPE—Mr. G. L. Rickatson, 15, Avenue Vivian, Scunthorpe.

WEALDSTONE—W. Linton, 11, Wickham Road, Wealdstone, Middlesex.

Branches Recently Incorporated

347. BIRMINGHAM—Mr. L. A. Strudwick, 4, Wentworth Gate, Harborne, Birmingham.
348. LIVERPOOL—Mr. E. Cail, 6, Beach Bank, Waterloo, Liverpool 22.
349. BURY ST. EDMUNDS—Mr. J. Forster, Norman Tower House, Bury St. Edmunds.
350. NEW BARKING—Mr. G. B. Weightman, 47, Sherwood Gardens, New Barking, Essex.
351. ISLEWORTH—Mr. Barnett, 8, Gunnersbury Lane, Acton, London W.3.

H.R.C. COMPETITION PAGE

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

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

MIXED NAMES CONTEST

Competitions in which jumbled names of railway interest are to be deciphered have always attracted a large number of entries, and this month, as a change from the more technical contests of recent issues, we are giving Hornby Railway Company members a further opportunity of showing their skill in unravelling mysteries of this kind.

The panel in the centre of this page contains 18 words, the letters of which have been purposely mixed up in order to make them appear almost indecipherable. The words formed when each of these complicated jumbles has been re-arranged are the names of certain stations, well-known locomotives or famous trains, and competitors are asked to discover as many of these as possible. Station names should be identified by adding the names of the railway company or companies on whose lines they are situated. Similarly competitors should give the names of the owning companies, the wheel arrangement, the class, and the number of each locomotive included in the contest; and where train names are given the railway operating them and the places between which the trains travel also should be stated.

MIXED NAMES CONTEST

SANOEMNIRTES	**KEPHMOANOT**
CMSATYNIGOFLSN	**YLGRISISEEGLREN**
MHUSEOYLPP	**YREEPXDIMTSESSEESHRE**
XPINRAECSRSAADNEL	**LOSAGALERIV**
GAARRSSOMIER	**NACNUNATHEMI**
YECTPHEYTLH	**TVLLROPOEITSEER**
AFREISHNFB	**YDROHTMYLOM**
LWHALYGDELNALN	**GBRMTAAEE**
PSEEETNISXEPHRS	**NLNAAICRATSHET**

When the puzzling collections of letters have been deciphered, a list should be drawn up in correct order, with the additional information required placed after each name. Every member should send in his list, even if it is not complete, for all will encounter equal difficulties, and an incomplete list may win a prize.

The contest will be divided as usual into two sections, Home and Overseas, and prizes of any products manufactured by Meccano Limited, to the respective values of 21/–, 15/–, and 10/6, will be awarded to the senders of the three best solutions in each section. In addition a number of consolation prizes will also be awarded. Entries should be written out on one sheet of paper only, on the back of which must be given the competitor's name and full address, also his H.R.C. membership number.

Envelopes containing entries should be marked *"H.R.C. July Mixed Names Contest"* in the top left hand corner and posted to reach Meccano Limited, Binns Road, Liverpool 13, on or before 30th July. The latest date on which entries from the Overseas section can be received is 31st October.

Railway Photographic Contest No. 4

This month we continue our series of contests for photographs of any railway subject. The rules to be observed are the same as those governing previous contests, but for the benefit of those competitors who are newcomers we add that any number of entries may be submitted, and the only restriction is that the actual exposure must be the work of the competitor himself. Developing and printing may be the work of a professional. On the back of each print the competitor's name, full address and H.R.C. membership number, must be given, together with a short description of the scene.

The contest will be divided as usual into two sections, Home and Overseas, and the prizes in each will consist of any Meccano products to the respective values of 21/–, 15/– and 10/6. A number of consolation prizes also will be awarded. Unsuccessful entries will be returned if accompanied by a stamped addressed envelope.

Envelopes containing entries must be marked *"H.R.C. Photo Contest No. 4"* and posted to reach Headquarters at Meccano Limited, Binns Road, Liverpool 13, on or before 30th July. The closing date for the Overseas section is 31st October.

Drawing Contest

Drawing contests of railway subjects always produce a good crop of entries. In many of our previous contests of this nature it has been necessary to submit a drawing of a certain specified subject; this month, by way of variety, we allow competitors to choose their own subjects. In order to enter this contest, therefore, all that is necessary is to submit a drawing of any item of railway interest. To H.R.C. members who are keen observers of all aspects of railway practice, the choice of a suitable subject should not prove difficult. Apart from the various items of interest seen during railway journeys, or while waiting for a train, there are always such subjects as one's favourite locomotive or some typical railway scene. Competitors may submit either pencil or coloured drawings, but the judges will not necessarily award the prizes to the senders of coloured entries.

To the senders of the three best entries received in each section, Home and Overseas, will be awarded prizes consisting of Meccano products to the value of 21/–, 15/– and 10/6 respectively. A number of consolation prizes will also be awarded.

The sender's name, full address and Hornby Railway Company membership number must be written on the back of each drawing submitted. Envelopes containing entries must be marked *"H.R.C. Drawing Contest."* These must be posted to reach Headquarters at Meccano Limited, Binns Road, Liverpool 13, not later than 30th July in the Home Section, and 31st October in the Overseas Section.

COMPETITION RESULTS

HOME

April "Names Contest."—First: J. E. Heydon (47755), Ambergate, Derbyshire. Second: C. S. Tricker (899), Mitcham, Surrey. Third: J. L. Makin (30933), Allestree, Derby. Consolation Prizes: J. Watts (48256), Ilford, Essex; T. G. Cook (43441), Shirley, Croydon; D. G. Coakham (28368), Upper Rathmines, Dublin; C. Stevens (46092), Leyton, London E.10; H. T. Buckingham (23588), Bletchley; J. C. Button (10335), Crewe, Cheshire.

April "Photograph Contest No. 1."—First: D. Fear (18477), Taunton, Somerset. Second: T. F. Fletcher (6057), Perry Bar, Birmingham 20. Third: V. L. Breeze (2134), Lewes, Sussex. Consolation Prizes: L. Hollyoak (3310), Earlsdon, Coventry; J. R. Webb (25008), Maryport, Cumberland; J. Norris (18622), Worcester; D. J. W. Brough (8246), Cheam, Surrey; A. M. Nicolson (50034), Edinburgh 5.

OVERSEAS

January "Voting Contest."—First: G. Myburgh (58479), Claremont, Cape Province, S. Africa. Second: Aly A. Shawky (53749), Giza, Orman, Egypt. Third: J. C. Williams (48397), North Island, New Zealand. Consolation Prizes: L. P. Chapman (24873), Dunedin S.2, New Zealand; R. Pearson (29199), Victoria, Australia; D. Parker (38595), Ontario, Canada; D. Murison (37642), Buenos Aires, South America.

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15	,,	...	6d.	15	,,	,,	6d.
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40	,,	...	1/6	15	,,	...	4d.
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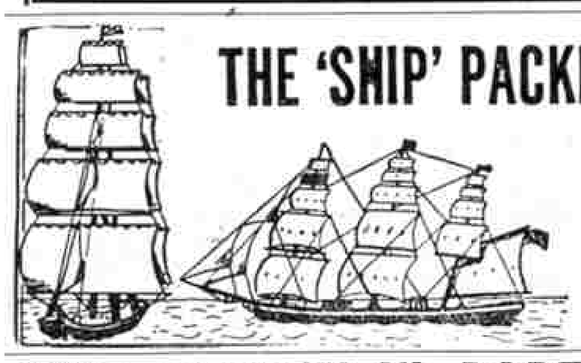

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MANY RARE STAMPS have been found by purchasers of **The "DIAMOND" Packet,** which contains approx. **1,000 UNSORTED STAMPS** from Convents abroad. **1 pkt. 1/6, 3 pkts. 3/9, 5 pkts. 6/-. All post free inland.** (Postage to Colonies 3d. per pkt. extra. S. Africa and Foreign 6d. per pkt. extra. Places on Empire Airmail Route 1/- per pkt. extra.) Beware of imitations.

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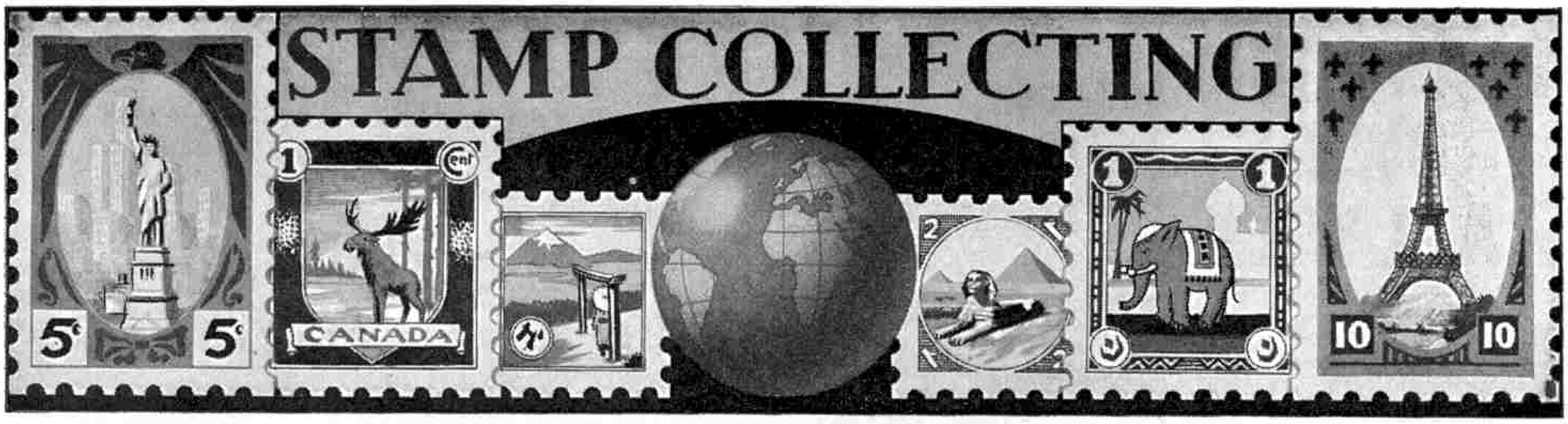
MAGNIFICENT GEORGE VI PICTORIALS FREE!

For this month's special offer we are presenting the mint George VI Pictorial sets just issued in the Native Protectorates in South Africa, You may choose which of the colonies you prefer, Basutoland, Bechuanaland or Swaziland. The set will be sent absolutely free to all serious applicants enclosing 2d. postage for our Famous Westminster Blue Books containing Pictorials, Jubilees, Coronations. Stamps you will be proud to own. Alternatively, approval applicants may purchase all three sets at the same time for 6d. only, post free.

WESTMINSTER STAMP CO. BANK CHAMBERS, 32a, STRAND, LONDON, W.C.2.

For other stamp advertisements see page xii



TREES AND FLOWERS ON STAMPS

IF any stamp collector were asked to name the commonest feature used in stamp designs, probably he would answer wrongly by saying "portraits." His mistake would be a pardonable one, however, and it was not until we made a point of looking right through a catalogue that we realised how extensively stamp designers have made use of trees, shrubs, leaves and flowers. When these are not used as principal parts of the design, as in the typical pictorial stamp, they usually manage to find their way in as a minor embellishment, such as a laurel wreath or a spray of oak leaves.

The stamp collector who loves trees can find an absorbing mass of detail with which to form a collection entitled, say, *"Plants and Trees of the World."* Of common British trees only the oak is represented, principally by the sprays of oak leaves in the designs of several of the stamps of the late King George V. The best oak tree design is the United States Connecticut Tercentenary stamp issued in April 1935, illustrated on this page. This shows the famous old "charter" oak, the hiding place for the State charter granted to Connecticut in 1662 by King Charles II, and the return of which James II demanded in 1685. In 1687 James appointed a Governor, Sir E. Andross, but in spite of his most oppressive activities, the charter remained undiscovered.

The tree most commonly shown on stamps is the palm, of which there are date palms, coconut palms, oil palms and many other varieties. It thrives in all tropical parts of the world and in the more equable parts of the temperate zones; and that is why places as far apart as Surinam and Papua, Liberia and French Guiana, Mozambique and New Zealand, the Caymans and Iraq, and Ceylon and Spanish Morocco are included among the countries that have featured it on their stamps. Our palm tree illustrations are the 1c. value from the Spanish Moroccan 1928 issue, showing a splendid group of palms towering over the Mosque of Alcazarquivir, and the 9c. stamps from Seychelles King George VI issue, showing a specimen of the coco-de-mer palm.

Turning from common to unusual trees, we find many interesting specimens. A magnificent example of the cedars of Lebanon, famous from Biblical days, is shown on the O.P.50 stamp issued by Great Lebanon in March 1937. A grove of similar trees is shown on the O.P. 20 stamp in the 1930 series.

The breadfruit tree shown on the 1d. value of the Tonga Islands 1897 issue is one of the outstanding examples of Nature's beneficence. This tree provides the natives of South Sea Islands with food, clothing and shelter. The 4d. value of the issue shows specimens of the breadfruit itself. This is not unlike a small melon in appearance. It is gathered just before it ripens, and its centre is then full of starchy substance. The fruit is baked in hot embers, and the interior scooped out and eaten as we should eat mashed potatoes, which it closely resembles. Sweetened it serves as a pudding, and if the raw fruit is dried it may be ground into a smooth flour that makes a delicious bread.

The fibrous inner bark of the young trees is used to produce a very serviceable native cloth, while cutting the trunk yields a milky juice that serves as an excellent glue. Finally the timber of the tree very closely resembles mahogany.

The breadfruit tree played so large a part in the lives of the South Sea Islanders that it was not surprising that the British Government decided to introduce it into other suitable parts of the Empire, such as the West Indies. We wonder how many of our readers who saw that great film *"Mutiny on the Bounty"* recall that the *"Bounty's"* mission was to collect a cargo of young breadfruit trees from Tahiti, and to carry them to the West Indies. After the mutiny and his subsequent return to England, Lieut. Bligh, the *"Bounty's"* commander, was re-commissioned to do the work, and a second cargo of trees was picked up and successfully transplanted in 1793.

The mango tree is seen on the 3c. value of Cuba's 1933 War of Independence issue, which shows excellent specimens in the cultivated state. This tree also provides an edible fruit, plumlike in shape and appearance and greatly esteemed for the making of pickles and preserves. The tree grows to a height of 30 ft. to 40 ft. and has dense deep green foliage of exceptional beauty.

Inevitably, many countries have shown on their stamps what might be termed their "commercial" trees, or those that are the basis of a staple industry. Thus we have orange trees shown on S. Africa's current 6d. design, cocoa bean trees on Nigeria's current 1d. value as well as a tree design representative of the Colony's great timber industry on the 2d. value, and two different views of coffee plantations on the 5c. value of Colombia's 1932 and 1935 issues. Other countries that have sought to publicise their coffee industry with the aid of stamps are Hayti, on the 35c. issue of 1928, Liberia, 1c. in 1909, Salvador, 35c. in 1924, Venezuela, six low values of current issue, Brazil, 1200 R. in 1938, and Mozambique, 6c. in 1918.

The Mozambique 1918 issue is a veritable treasure trove of "botanical" stamp designs. In addition to the coffee plantation design mentioned, there are other interesting designs as follows: 1c., maize field; 1½c., rubber tree; 4c., tobacco plants; 7½c., orange grove; 8c., cotton field; 10c., sisal plantation; 30c., coconut palm, and 40c., mango grove. Most of these designs were re-issued in the 1925 series and a 10 esc. high value, with a view of a tea plantation, was then added.

Tea plantations are featured by other countries, notably by Ceylon in its 9c. 1935 issue. The current series from Ceylon also provides views of rubber trees (2c.) and coconut palms (20c.).

Cotton plants and sprays of cotton blossom are shown by Egypt on the 5, 10 and 15 mils values of the Cotton Congress Issue of 1927, and Peru, on the 35c. value of the Ica Tercentenary issue, 1935.

(*Continued on page 415*)

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because it goes on unnoticed, reducing engine efficiency, and developing engine trouble if it is not discovered and rectified in time."

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STAMP COLLECTING (*Continued from page 413*)

The great lumber industries have been variously represented by logging scenes, but in only a few cases do the stamp designs show the trees themselves prior to felling. The pine trees of North America are shown most effectively in a view of Mount Rainier on the 3c. value of the United States National Parks issue of 1934. Other stamps in this same series, notably the Yosemite Valley, Crater Lake and Glacier Park views on the 1c., 6c., and 9c. values of the same issue, also give good pictures of sections of pine forests. The Mount McKinley issue of 1937 gives a good impression of big pine trees. The only pine picture amongst British issues is on the 5c. of Newfoundland's 1932 series, and unfortunately this is a most unsatisfactory reproduction.

The recent King George VI issue from British Honduras shows a native felling mahogany trees on the $2 value, and a view of mahogany logs being floated to the mill on the 10c. British Guiana shows in its 1934 series a view of logging operations on the 6c. value, and a splendid view of a mahogany forest on the 48c. This issue also shows scenes in a rice field, on the 1c. stamp, a sugar plantation and cut sugar cane awaiting transportation to the refinery, on the 24c., and a picture of the Georgetown Botanical Gardens on the $1.

There is not space here to permit us to deal in detail with many other interesting tree specimens, such as the tree ferns of New Zealand and Fiji, the balsam trees of Salvador, the wattle of Australia and cohune palms of British Honduras, and the "monkey puzzles" on the 40c. stamp of Chili's 1936 issue. One other tree stamp that must be mentioned, however, for it commemorates a unique national movement, is the 2c. United States stamp shown here. This was issued in 1932 to celebrate the 60th anniversary of the foundation of the Arbor Day movement, a scheme under which one day a year is set aside for the ceremonial planting of young trees by children.

We have always felt that stamp designers have neglected a fascinating subject in flowers. Every country has its national flower, and yet there are barely a dozen recognisable specimens found on stamps! Even the chrysanthemum emblem of Japan, a traditional inclusion in every Japanese stamp design, has to be satisfied with a conventional device!

The best flower design that we can show is the 12½c. value of Holland's 1932 tourist propaganda issue, which showed a graceful sheaf of tulips waving over a typical Dutch landscape. Evidently pleased with the success of that design, the Dutch post office used flowers again in the December 1932 Child Welfare issue. In this series of four stamps, gorse, cornflowers, sunflowers, and Christmas roses were used to symbolise spring, summer, autumn

and winter respectively.

The rose appears rarely in spite of its universal appeal. It is found on various issues of Great Britain in a symbolic form, but its nearest recognisable form is on the current King George VI issue, where it appears with the thistle, and daffodil and the shamrock. There is a better impression of a rose on the 6c. of Newfoundland's 1932 issue, which shows a portrait of Princess Elizabeth flanked by rose and thistle sprays.

We must turn to Bulgaria for the best rose picture. This appears on the two values produced in the recent "Economy Issue" and the design illustrated here shows a full-blown rose at the side of a flask of scent. Bulgaria, it is interesting to know, is the world's greatest producer of attar of roses, exporting every year 6,000 lb. of essential oil, and some idea of the size of its rose-growing industry can be gained from the fact that only one ounce of oil can be obtained from 300 lb. of rose petals. Another good rose design is that used for Austria's Christmas 1937 greetings issue, which showed a small bunch of roses and foliage in a vase.

Every one of our readers knows roses, but how many know the hydrocarpus? This uncommon plant is a native of the Malayan peninsular and yields a drug that is proving of great value in the fight against leprosy. That is why a flowering branch of this plant is used as the design for Egypt's Leprosy Research Congress issue, which appeared in March last.

A flower that is familiar to our readers by name, if not by personal acquaintanceship, is the orchid, the most romantic of all flowers. Fortunes have been spent in equipping expeditions despatched to tropical forests to search for new orchids, and collectors gladly pay hundreds of pounds for rare specimens. We can call to mind only one stamp that gives a really good impression of an orchid. That is the 1c. value of Costa Rica's 1937 National Exhibition issue, illustrated here. The variety shown is *guaria morada*, or purple guaria, which is almost as common in Costa Rica as primroses in England. It makes a magnificent picture during February and March, some of the plants bearing as many as 100 flowers at one time.

Readers who are reasonably good at sketching would find it a happy addition to this "Plant" collection to include specimens of flower or leaf watermark devices. There are several interesting watermarks of this type. Britain, for example, has used Roses, Thistles and the Shamrock.

STAMP GOSSIP

New Canadian Designs

By courtesy of the Philatelic Division of the Canadian Post Office we are enabled this month to illustrate specimens from the new Canadian designs to which we referred in the June "*M.M.*" The designs on this page are those for the 20c. general mail and 6c. air mail stamps respectively. One shows a view of Fort Garry Gate at Winnipeg, and the other a scene on the Mackenzie River, North West Territories.

A 13c. value is to be issued later to complete this range of high values. The design for this has not yet been chosen.

Football Postmarks

In the June "*M.M.*" we illustrated an interesting German postmark issued as propaganda for the Austrian plebiscite.

Two other special postmarks, used in Berlin on 14th and 15th May in connection with the football matches there against the English F.A. XI and the Aston Villa touring side, provided postmark collectors with undeniably unique cancellations. Both took the form of ordinary circular marks, and that issued on 14th May bore the wording "Berlin—Charlottenburg 5.—International Football Match. England—Germany" around the edge. The centre bore the date "14–5–38" and the national flags of Great Britain and Germany. The cancellation for the Aston Villa game postmark read "Berlin –Charlottenburg 5. 15–5–38. Football Match. Aston Villa F.C.–German Representative Team."

Pictorials for Somaliland Protectorate

Three new designs have been introduced for Somaliland's stamps of the new reign. For the four lowest values ½a., 1a., 2a. and 3a., a blackheaded sheep is shown as the central feature. A striking specimen head of the greater kudu, an animal of the deer type, appears on the middle values, 4, 6, 8 and 12a., while the high values, 1, 2, 3 and 4 r., show a map of the Protectorate and the Gulf of Aden. The King's portrait appears on each stamp, of course.

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

A Lighthouse Without a Keeper

By R. MAUGER

About a mile off the rocky northern coast of Guernsey, in the Channel Islands, is the Platte Fougère lighthouse. This guards the narrow channel that leads to the harbour of St. Peter-Port, the capital of the island, and is one of the few in the world that have no attendants. It is controlled electrically from a station ashore, the necessary connection being made by means of a submarine cable.

I went out by motor boat to look over the lighthouse, and on reaching it climbed a ladder to the top of the massive concrete tower to examine the lamp which burns acetylene. Sufficient gas to last two months is supplied. The inlet taps are operated by a clock that has to be rewound once every three months, and a warning is automatically sent to the shore station a fortnight or so before the supply gives out. An emergency electric light comes into operation if rough seas prevent the despatch of the relief boat from the shore.

At the top of the tower is a fog horn, which is operated by compressed air. The compressor that works it is driven by an electric motor. This horn is invaluable, particularly in spring, when dense fogs often envelope the island.

Sanctuaries for Insects!

An American scientist has suggested quite seriously that it may become necessary to set aside places where insects can live in peace, just as lions, elephants and rarer wild animals do in game reserves in various parts of the world. Ruthless war has been waged for many years against the insect world, especially in North America. Poisonous gases, electricity, fire and many other agents have been used, and it is suggested that the serious diminution of many forms of insect life seems to be in sight.

Some insects of course are dangerous, and the measures taken against them are necessary, yet thousands that are harmless and even valuable have been involved in the destruction. For instance, millions of wild bees have been killed in the United States. These have special work to do in fertilising flowers and fruit, and if they were exterminated the balance of nature in the plant world would be upset to an incalculable extent.

The war against insects is causing alarm to lovers of nature for another reason. Birds need insect food and if insects were destroyed on a wholesale scale the feathered life of the countryside would suffer irreparably.

The number of insects is so incredibly vast, however, that it is difficult to imagine a world without them. It has been estimated that in every acre of English meadow land there are as many insects as there are people in the whole of Europe. This insect life is concentrated in the surface layer of the soil, the majority being found within a depth of 4½ inches, although there are large numbers down to eight inches, and in dry weather they are forced upward to a depth of between one and two inches in search of moisture.

Insects are more numerous from December to April, when the land is left undisturbed, and meadows that have not been ploughed for many years may contain as many as 280 million to the acre. The insect population of the soil is least in April and May, and in land that is ploughed there may be only from eight to fifteen million to the acre.

Famous Polar Explorers' Ship

By A. E. HICKS

While visiting Oslo some time ago I was able to inspect the *"Fram,"* the famous ship used by the polar explorers Nansen and Amundsen. Some years previously she had been hauled up on dry land with the help of a 2-h.p. petrol engine! This operation took several days, and at the end the ship was built into a shallow concrete basin and roofed over.

On entering the building, which is really a penthouse, for it has no side walls, I found that the light was very dim and that only the interior of the ship was illuminated so as to give the effect of an Arctic winter. I mounted a staircase on to a gallery that ran all round the building, and from which I could look down on to the deck of the ship. Next I passed along the gangway into the *"Fram,"* where I inspected the enormous 12-cylinder Diesel engine that was used to propel the ship when the wind failed, or if the pack ice was thick. Farther on I saw the ship's doctor's evil-looking array of surgical and dental instruments, and Amundsen's own cabin as it originally was, complete with furs, instruments, a gramophone and other articles. I also saw some of the tinned provisions that had been left over after the final voyage, and while I was examining these there came in Oscar Wisting, who went to the Antarctic with Amundsen. There were eager demands for his autograph from those present.

The hull of the *"Fram"* was specially constructed for use in pack-ice and really consists of three hulls, the first one being made of greenheart, which is so hard that a nail can scarcely be driven into it, the second of teak and the third of oak. Each layer is about 6 in. thick, and the seams are packed with oakum and tarred. The bows are encased in steel sheeting to enable the ship to push its way through pack ice without damage.

Cheery days at the Bath and Wessex Children's Orthopædic Hospital. Youngsters playing with their Hornby Trains. Photographs by Miss L. M. Jefferies.

"Cyclo" Gears

A useful catalogue issued by the Cyclo Gear Company Limited gives full details of the ingenious "Cyclo" Derailleur two, three and four speed gears of various types. The device is very simple in action, and with a little practice gear changes without any snatch can be effected without difficulty. The "Cyclo" two-speed gear will make a special appeal to many readers, for it can be fitted to any existing wheel without alteration, except the addition of a few links to the chain. The three-speed gear is ideal for use when a new wheel can be fitted, and a special type has been evolved that incorporates the free wheel in the hub.

The catalogue gives interesting details of fine performances with machines fitted with "Cyclo" gears during 1937, and there are also illustrations and descriptions of double chain wheels, chains, clips, hub units, tools of all kinds and other articles, including spare parts for "Cyclo" speed gears. A copy of the catalogue will be sent post free to any reader of the *"M.M."* who writes to the Cyclo Gear Company Limited, at the address given in this firm's advertisement on page xi.

Cycle Gadgets for Games Players

Those of our readers who have wondered how to carry a bat, a hockey stick or a tennis racket comfortably when cycling will find the solution to their problem in the advertisement of Herbert Terry and Sons Ltd., on page 420. The handy little gadgets described and illustrated consist of pairs of clips that are fitted to the front fork and the handlebars respectively. These carry their load firmly, and are valuable aids to safe cycling, for the rider's hands are left free.

Herbert Terry and Sons Ltd., Redditch, will send details of these carrier clips free of charge to any *"M.M."* reader who is interested.

Developing Films in Comfort

Photographic readers who have difficulty in rigging up a dark room, or who find it trying to work with a safelight, will be interested in the "Tabloid" Desensitiser marketed by Burroughs Wellcome and Co. With its aid the most sensitive plates and films can be developed in the comfortable light of a candle, a shaded gas burner or an electric lamp, without risk of spoiling them. All that is necessary is a room or cupboard that can be made light tight while the film or plate is immersed in the desensitising solution for a minute.

Messrs. Burroughs Wellcome and Co., Snow Hill Buildings, London E.C.1, will be glad to send any interested reader a leaflet giving full particulars of this aid to comfortable photography.

Johnson's Photo Contests

Our advertisers Johnson and Sons Ltd. this year are running a series of monthly photographic competitions that provide all our photographic readers with an opportunity to make their hobby pay for itself. Prizes to a total value of £9 are offered monthly until November.

A different type of subject is set each month except for the July, August and September contests, for which the general subject of "Holiday Photographs" has been chosen. Photographs of any kind of holiday activity are eligible in those three contests. Beach scenes and bathing, cycling, motoring, athletic sports, camping, rambling and hiking, cruising and yachting are just a few suggested sources of suitable subjects.

Full details of the competitions can be obtained from Johnson and Sons Ltd., Hendon Way, London N.W.4.

Zeiss Ikon Cameras

The 1938 Zeiss Ikon catalogue will be found of interest even by those who at the moment are not contemplating the purchase of a new camera. The booklet details arrangements of splendid instruments, the prices of which vary from 20/– up to £87, and of many refinements that help to give faithful reproduction in natural tones. It contains also an interesting glossary of photographic terms.

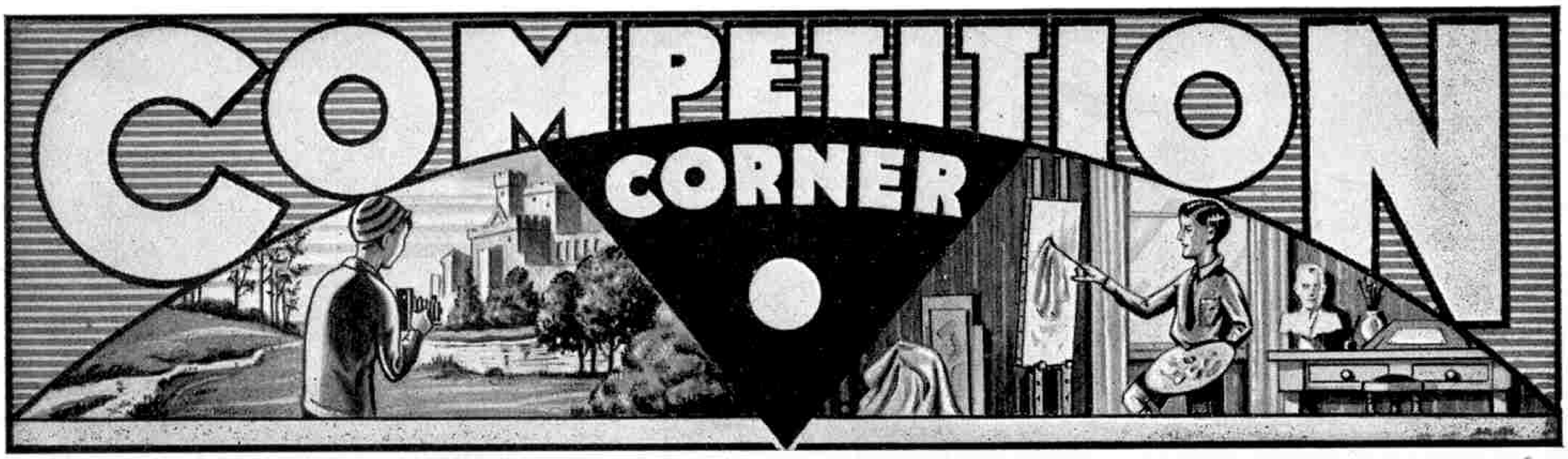
Zeiss Ikon Ltd., 46, Maidstone House, Berners Street, London W.1, have offered to send a copy of this booklet free of charge to any *"M.M."* reader.

The "Hi-Folk" Rangefinder

Photographic readers who find it difficult to judge distances correctly when setting the focussing scales of their cameras will find the "Hi-Folk" rangefinder a very useful instrument. With its aid distances can be found quickly and accurately.

The device consists of a graduated brass plate marked with three scales, for the use of tall, medium or small owners respectively, and also with scales of stops for lenses of different focal lengths. Two sighting bars are used to fix the nearer and farther extremes of the view to be photographed, as a guide to the depth of focus required; and the exact distances of those points from the camera can be read directly on the scale.

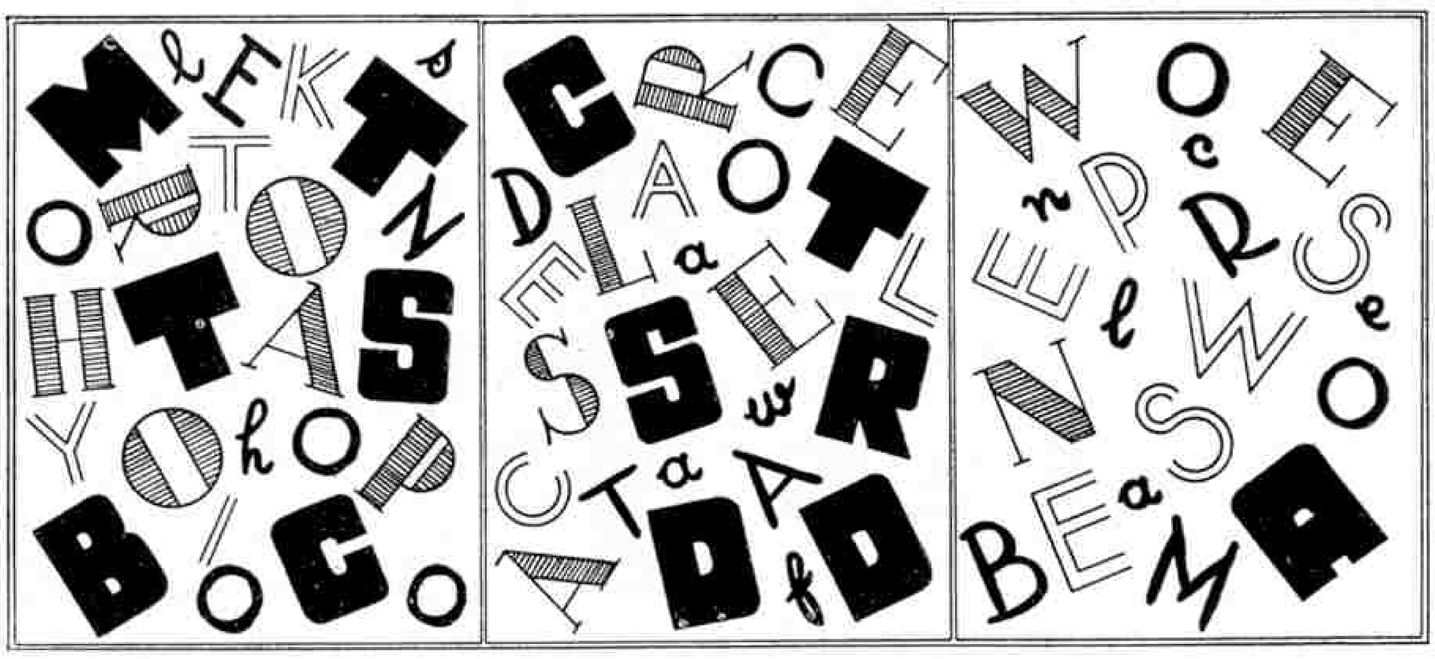
The instrument is priced 7/6, and Sands, Hunter and Co. Ltd., 37, Bedford Street, Strand, London W.C.2, will gladly send full details to any *"M.M."* reader.



HIDDEN PROVERBS

The "Hidden Proverbs" competition in our November issue proved so very popular that we are sure our readers will welcome another contest of the same nature.

For the benefit of new readers we must explain that the three squares in the illustration in the centre of this page contain certain groups of letters that when sorted out will form the words of three well-known proverbs. It will be noticed that each group contains five different styles of lettering, and the clue to the solution of the puzzles lies in the introduction of these different styles of lettering and the manner in which they have been used. It should be noted that the means of solving one of the three puzzles will not necessarily prove the key to the others, however.



Prizes of Meccano products, that is of any article listed in the current Meccano and Hornby Train catalogue to the value of 21/–, 15/–, 10/6 and 5/– respectively, will be awarded to the senders of the four most accurate solutions in order of merit. In addition there will be a number of consolation prizes for the next best entries. In the event of a tie, the prizes will be awarded to the entries displaying the neatest or most novel presentation, but it should be remembered that accuracy of solution will count first in the judging.

Entries should be addressed *"Hidden Proverbs,* Meccano Magazine, Binns Road, Liverpool 13," and should reach this office not later than 30th July. Late entries cannot be accepted.

There will be an Overseas section to this competition, open to readers living outside Great Britain and Ireland and the Channel Islands, and prizes of Meccano products of the same values as in the Home section will be awarded. Overseas entries must arrive not later than 31st October.

July Photo Contest

As announced in the April *"M.M.,"* we are holding a photographic contest each month throughout this summer. The conditions of the competitions are exceptionally simple, and are designed to make it possible for every reader to take part. The only requirements are that the exposure must have been made by the competitor himself and each print must bear a title.

When possible the title should be supplemented by a note stating where the photograph was taken.

The developing and printing may have been done professionally. Entrants who have done this work for themselves should mark their prints "own work throughout."

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

Entries to this month's competition should be addressed *"July Photo Contest,* Meccano Magazine, Binns Road, Liverpool 13," and must arrive not later than 30th July. Overseas closing date, 31st October.

Competition Closing Dates

HOME

"Hidden Proverbs" Contest ...	30th July
July Photo Contest	30th July

OVERSEAS

"Golfwords" Contest	30th July
April Photo Contest	30th July
Test XI Voting Contest ...	30th July
Test XI Voting Contest (Australia and New Zealand only)	31st August
May Photo Contest	31st August
June Crossword Puzzle ...	30th September
June Photo Contest	30th September
"Hidden Proverbs" Contest ...	31st October
July Photo Contest	31st October

Watch the Closing Dates:

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

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

Entries, other than prize-winning efforts, for photographic, drawing and similar competitions, will be returned to the competitors concerned if a stamped addressed wrapper is sent with the entry, and its return requested. Prize-winning entries are retained by the Editor.

COMPETITION RESULTS

OVERSEAS

"February Drawing Contest."—First Prizes: Section A, B. J. Simpson (Montreal); Section B, R. A. van Berkum (Fenwick, Ontario). Second Prizes: Section A, S. C. Parry (Capetown); Section B, M. A. G. Harrison (Sydney). Consolation Prize: T. Rogers (Quebec).

"February Animalesques" Contest.—The entries in this contest produced many remarkable birds and animals, and in the judging it was decided to accept as correct all reasonable alternatives to the solutions compiled by our judges, which are given herewith for the benefit of readers who desire to check their entries: Cockatootle, Hornettle, Albatrossian, Zebrazier, Bisonata, Hornbillusion, Ganderision, Caterpillarynx, Leoparduous, Wormolu, Weaselenium, Tomtittle, Jackassassin, Beaverandah, Pelicancel, Salmonkey, Falcondor, Squirrelevant, Elandante, Iguanaconda, Cockerelish, Heroncador, Dinosaurochs, Dachshundersky.

The awards in the Home section were announced in the May magazine and those in the Overseas section are as follows: 1. M. Most (Natal, S. Africa). 2. J. Lyons (Penang, S.S.). 3. O. F. Haylock (Christchurch, N.Z.). 4. A. A. Jelley (Dunedin W.1).

HOME

May Photo Contest.—First Prizes: Section A, A. B. Bishop (Bristol); Section B, C. H. Clary (London E.14). Second Prizes: Section A, F. Culverhouse (Sheffield 7); Section B, A. Audsley (Cobham). Consolation Prizes: P. Fleming (Kildary); P. G. Lund (Leicester); J. R. Tottle (Taunton).

Test XI Voting Contest.—1. J. Welfare (Bishopstone). 2. G. M. S. Kennedy (Horsham). 3. M. M. Reader (Bristol). 4. D. Holt (Bradford). Consolation Prizes: D. Crawshaw (Hythe); G. S. Foster (Coventry); A. L. Mildon (Bath); J. A. Roth (London W.8); A. Weld (Arundel).

A RISE IN LIFE

Jack: "How does your brother like the job of running a lift?"
Jim: "Oh, he's taken up with it."

* * * *

"Do you know your alphabet, Jack?" asked his uncle.
"Oh, yes!" said Jack.
"Well, what comes after letter A?"
"All the others, uncle," replied Jack.

* * * *

Farmer: "Can't you read the notice? You're not allowed to fish on this land!"
Tommy: "But I'm fishing in the stream—not on the land!"

* * * *

First Motorist: "What do you honestly think of this 30 m.p.h. restriction?"
Second Motorist: "It's the limit."

* * * *

Teacher: "Have you done your composition on Alfred the Great?"
Tommy: "No, sir. I have done it on paper."

* * * *

Irish Landlady: "Sure an' I think you three are a nice pair! Last night you didn't come in till this mornin' and I've told you once if I've told you three times that if you want to stop here and carry on like this you'll 'ave to go!"

* * * *

Charlie: "If you were in the National Gallery, and a fire broke out, which picture would you attempt to save?"
Bob: "The one nearest the door."

* * * *

"You remember when you cured my rheumatism a year ago, don't you, Doctor?" asked the patient, "and told me not to get myself wet?"
"Yes," replied the doctor.
"Well, I just wanted to ask you if you think it's safe for me to take a bath now?"

* * * *

A rich aunt sent five pounds to McPherson and asked him to send his twin boys to her for a week's holiday, as she had never seen them. A few days later a Scots lad presented himself at her home and with him came a note which read: "Dear Agnes, here is young Donald, one of the twins. The other is exactly the same."

* * * *

Farmer's Wife: "I thought you said you were ploughing the 10-acre field?"
Farmer: "No, I said I was thinking about ploughing it."
Farmer's Wife: "Oh, I see, you just turned it over in your mind."

* * * *

Second: "Go in and finish him this time."
Fighter: "I can't see him."
Second: "Then hit him from memory."

* * * *

CLASS DISTINCTION

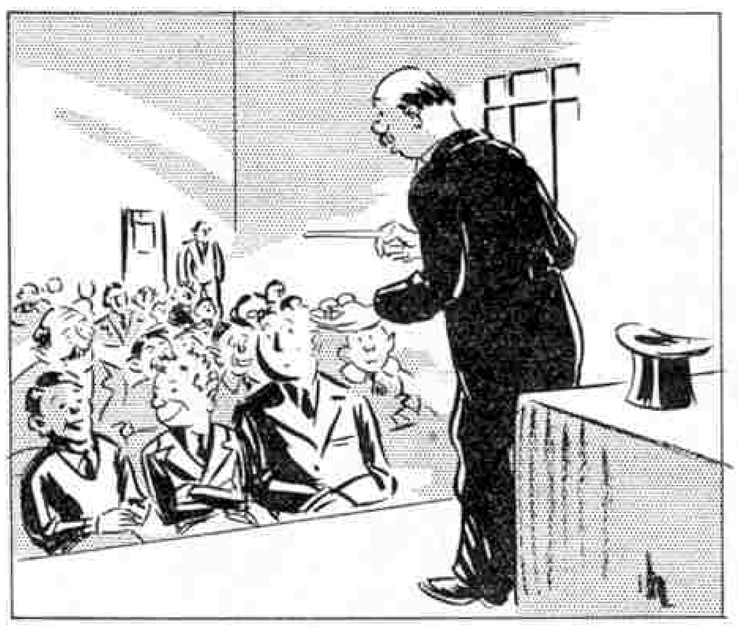
Sailor: "Hi, sir, you can't throw a first-class belt to a third-class passenger!"

WHAT HE WAS LOOKING FOR

New Boarder: "I love to explore the dark depths of the mysterious, to delve into the regions of the unknown, to fathom the unfathomable, as it were, and to—"
Landlady: "Let me give you a little more of this stew, Mr. Smith."

* * * *

EASY!



The conjurer was producing eggs from a top hat. He addressed a boy in the front row.
"Your mother can't get eggs without hens, can she?" he asked.
"Yes," said the boy.
"How's that?" asked the conjurer.
"She keeps ducks," answered the boy.

* * * *

Teacher: "How many ears has a dog?"
Child: "Two."
Teacher: "And how many eyes has a dog?"
Child: "Two."
Teacher: "And how many legs has a dog?"
Child: "Good gracious! Haven't you ever seen a dog, teacher."

* * * *

Author (whose play is meeting with a hostile reception): "Listen to the idiots! Give them comedy, they yell for tragedy! Give them tragedy, they yell for comedy! What on earth do they want?"
Manager: "Their money back."

* * * *

A workman who was carrying a grandfather clock down the road had the misfortune to knock down a colonel walking in the opposite direction.
"Hang it, man," said the colonel, "why don't you wear a wrist-watch?"

* * * *

McGinty: "I've a terrible corn on the bottom of my foot."
Pat: "That's a foine place to have it. Nobody can step on it but you."

* * * *

Vicar: "Why haven't I seen you in church lately, James?"
James: "I 'aven't bin, sir."

* * * *

Captain: "How did you get that black eye?"
Sailor: "I went ashore last night looking for trouble and that's the eye I found it with."

* * * *

Teacher: "Remember, children, no one can reach success without starting at the bottom and working up."
Voice from rear: "Yes, teacher, but what about the parachute jumper?"

* * * *

Lady: "I don't suppose you know what good, honest work is?"
Tramp: "No, lady, what good is it?"

* * * *

THIS MONTH'S HOWLER

Herrings are fishes that swim about the sea in shawls.

NOT SO TOUGH

"It's all nonsense about the Irish being good fighters."
"How do you make that out?"
"Well, you know Mike O'Rafferty who lives in our street? Last night my brother and I and a couple of other fellows knocked him silly."

* * * *

"Doesn't that orchestra deafen you?"
"Unfortunately, no!"

* * * *

"Do you ever have to hurry to catch your morning train, Mr. Jones?"
"Well, it's about even you know. Either I'm standing on the platform when the train puffs in or I puff in while the train stands at the platform."

* * * *

"My friend," asked the missionary, "are you travelling the straight and narrow path?"
In silence the man handed over his card: "Signor Ballancio, Tight-Rope Walker."

* * * *

Jim: "Why cannot a fishmonger help being greedy?"
Bill: "Because his business makes him sell-fish."

* * * *

Departing Visitor: "And I'll recommend you to some people I know."
Seaside Landlady: "But I thought you said you were most uncomfortable?"
Departing Visitor: "Yes, but there are some people I've got a grudge against."

* * * *

"What became of that little kitten you had?" asked a visitor of a small boy.
"Why, haven't you heard?"
"No. Was it drowned?"
"No."
"Lost?"
"No."
"Poisoned?"
"No."
"Then what did become of it?" said the visitor.
"It growed up into a cat."

* * * *

Owner: "I am going to call my new racehorse 'Bad News'."
Friend: "Why that name?"
Owner: "Because bad news travels fast."

* * * *

A teacher in a country school received the following note from the mother of one of his pupils: "Dear Mister, Please excuse Jimmie for not coming to school to-day. He has a swollen face and can't get out of the house."

* * * *

HIS OWN FAULT

Mother: "Willie, how dare you kick your little brother in the stomach?"
Willie: "He shouldn't have turned round."

BY APPOINTMENT TO THE LATE KING GEORGE V

BY APPOINTMENT TO THE PRINCE OF WALES 1932 • 1936

FIRST RATE PERFORMANCE

1888 1938 DUNLOP 50 YEARS OF GROWTH

In four sizes : 26″ x 1¼″, red or black, 26″ x 1⅜″, 26″ x 1½″, 28″ x 1½″, black only.

The 50 years' experience which Dunlop have had in building tyres has enabled them to produce a really first-rate performance tyre at a most attractive price. The Dunlop 'Jubilee' is sound in every respect . . . hardwearing, reliable and safe. You can fit it with absolute confidence.

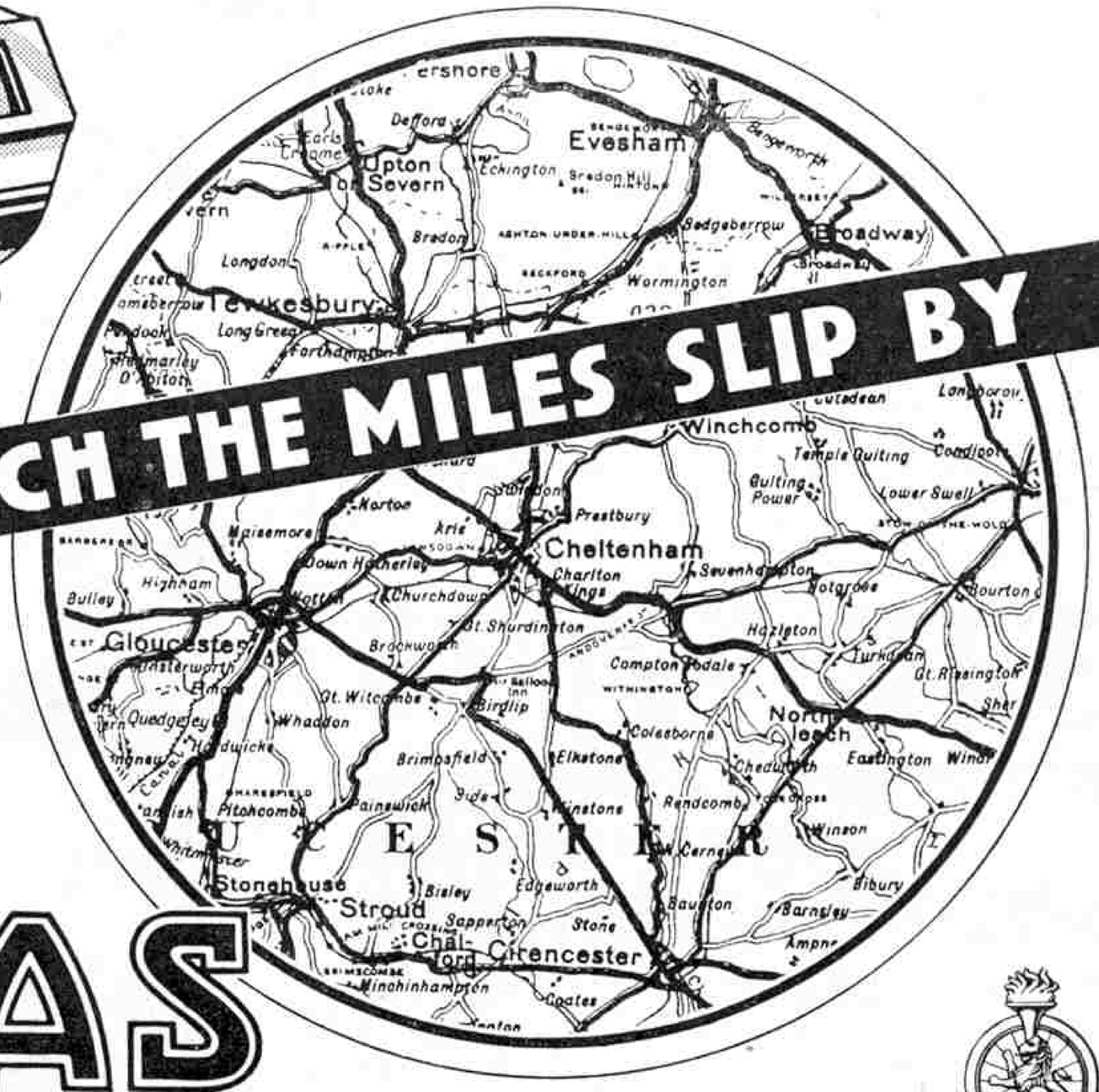
YET IT COSTS ONLY: **COVER 3/9 TUBE 1/6**

For economy fit the

DUNLOP "JUBILEE"

8H/331 C.F.H.

WATCH THE MILES SLIP BY



Precision-built with watch-like accuracy, it records up to 10,000 miles and then repeats. Clear white figures show the miles, the final red figure tenths of a mile. Dustproof and waterproof, needs no oiling. Chromium-plated finish. Models for 26 in. and 28 in. wheels. Supplied complete with striker and ready for fitting. **3/6**

LUCAS

"KING OF THE ROAD" **CYCLOMETER**

BRITISH MADE

JOSEPH LUCAS LTD., BIRMINGHAM, 19.

★ . . . that rats cannot board a ship when this gadget is in use? They can swarm up the rope as far as the hollow cone, but owing to its size and shape, cannot get past—in other words, they are beaten!

Of course you know . . .

SECCOTINE **cannot** be beaten; it is **the** DOUBLE STRENGTH ADHESIVE—world famous since 1884.

Use SECCOTINE for EVERY 'sticking' job you do—for articles of all kinds, China, Glass, Metal, Woodwork, Cardboard, etc.

A tube of SECCOTINE will last you a long time—is always ready for emergencies—come what may!

So throw away that old glue-pot—there'll be no more mess—no more heating when you use SECCOTINE!

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M'CAW, STEVENSON & ORR LIMITED, BELFAST

I should like to have, post free, copies of your Free Booklets which describe the many uses of Seccotine.

Name.....

Address.....

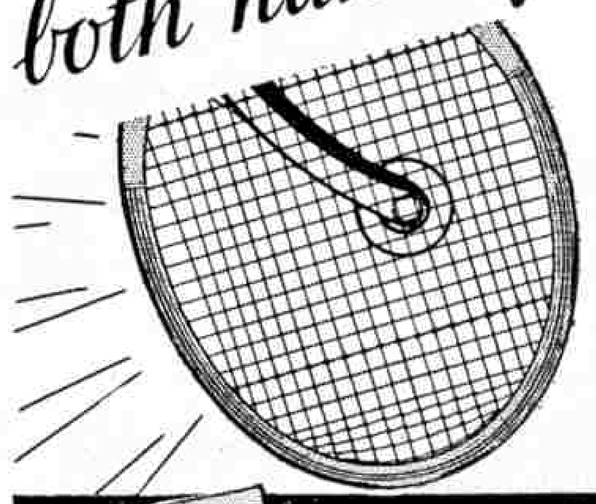
Cycle with

SAFETY

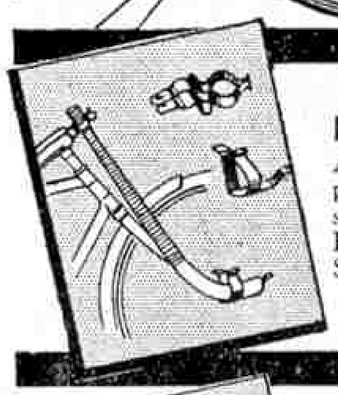
whatever your

GAME

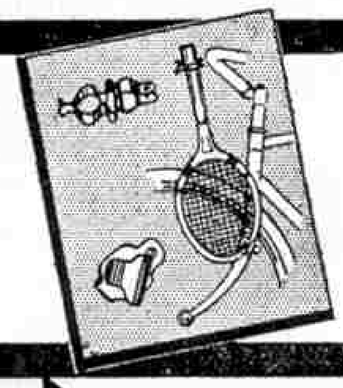
both hands free to steer!



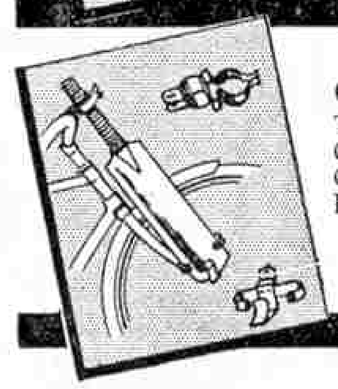
Tennis players! Here's a wonderful Carrier Clip which enables you to cycle to your tennis with perfect steering freedom. Never lets the racket shake loose. Neat, inconspicuous. Fits to front fork by simple wing nut and bolt. Will also carry camera tripod, fishing rod, umbrella, etc. Green baize lined. Chromium 2/6. Black 2/–.



HOCKEY
And here's a pair of clips specially for Hockey Sticks. **1/6** complete.



TENNIS
Another "safety way" of carrying your racket. The pair, **1/-** complete.



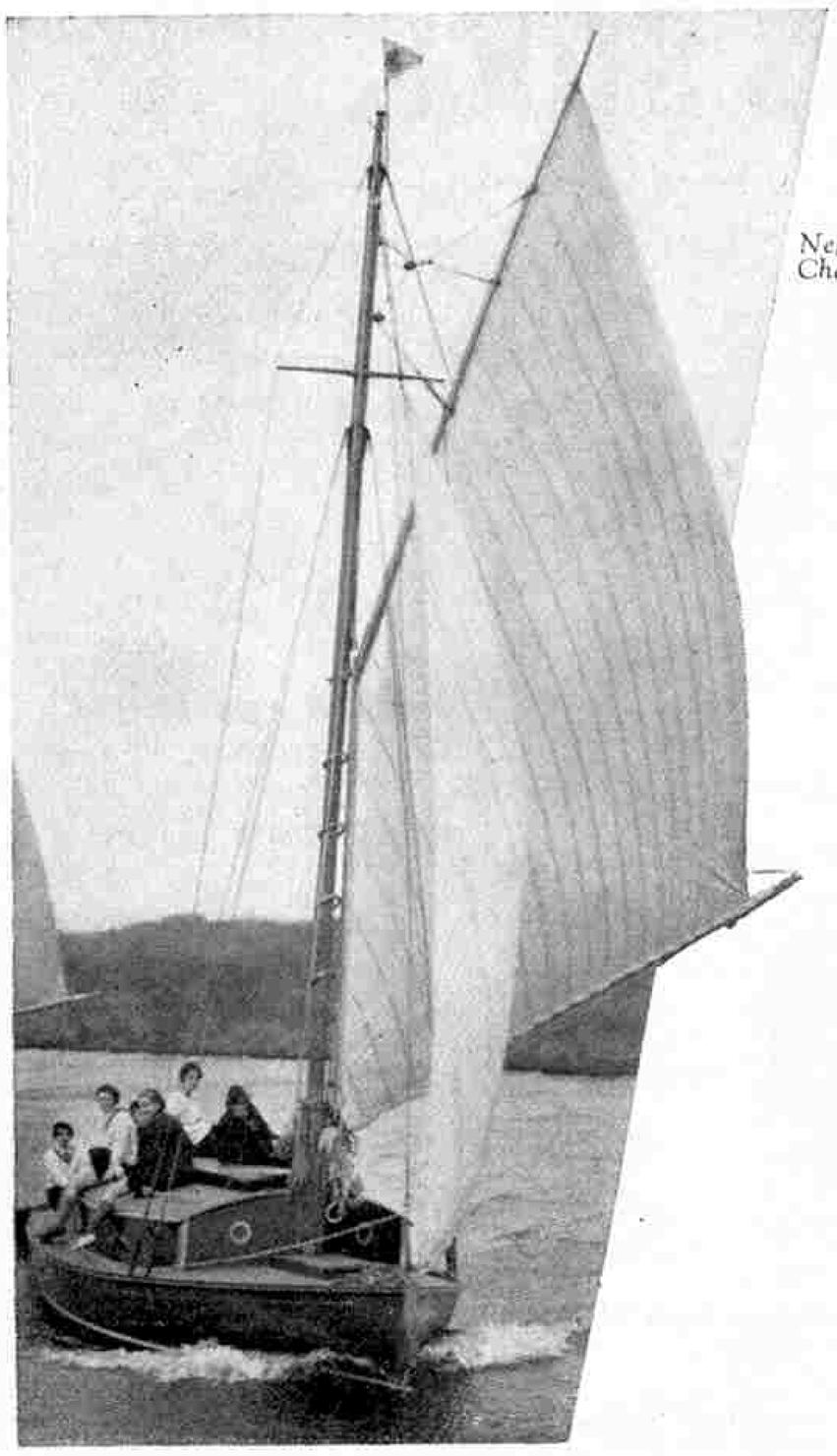
CRICKET
The ideal Cricket Bat Cycle Carrier. Fits any size bat. **1/6** complete.

★ *Ask your Cycle or Sports Outfitter. If any difficulty, write direct to address below.*

TERRY'S

AIDS TO SAFER CYCLING

HERBERT TERRY & SONS LIMITED. REDDITCH. ENGLAND



Negative: Chas. E. Brown

SELOCHROME *excels*

for snaps like this

With full sails and flag a-flutter this lively craft makes a fine snap for Selochrome Roll Film. A good test for the speed of Selochrome in poor light, this picture proves that Selochrome is fast enough to yield vigorous negatives of moving objects, even in dull weather.

Use Selochrome for uniform success with your camera—and for the beautiful true-to-Nature tone gradation which its sensitivity to yellows and greens gives you.

SELOchrome

Extra Fast **ROLL FILM**

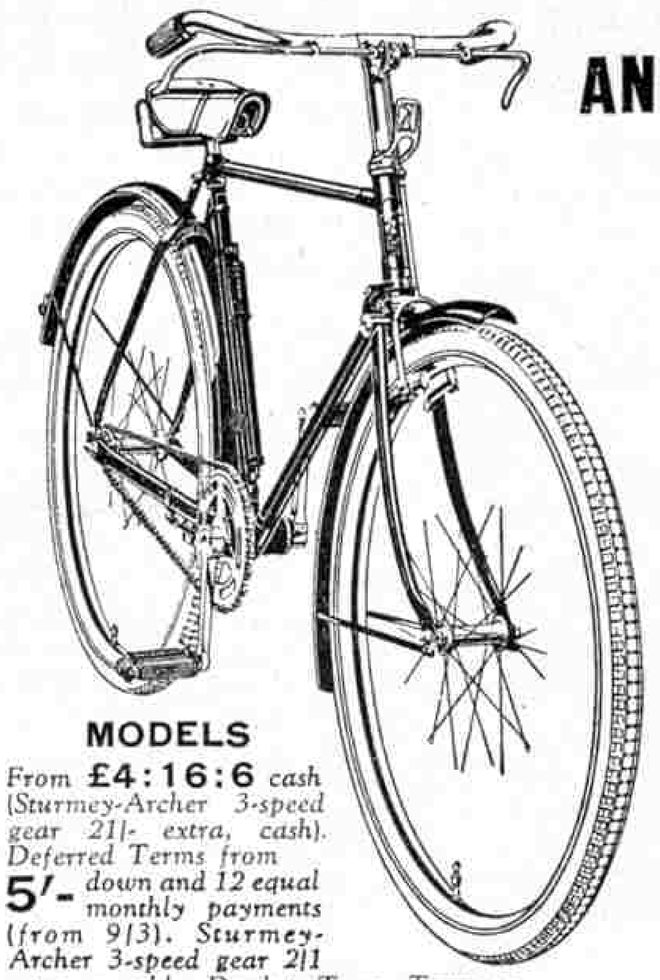
FITS ALL CAMERAS, INCLUDING MINIATURE SIZES

Made in England by

ILFORD LIMITED, ILFORD, LONDON

Spot the RALEIGH Boys-

THEIR CYCLES ARE SMARTER AND FASTER



Tom, Dick and Sam soon leave all the other fellows far behind when they go for a ride. The Raleigh is specially designed to make cycling easier. You can go farther—with less effort—and finish fresher—on a Raleigh. And when you all 'pull in' for tea you'll be able to compare the Raleigh with other cycles and see how much smarter-looking it is. It is a grand feeling to own a Raleigh—the best cycle there is. Guaranteed for Ever.

Send for a free copy of "The Book of Raleigh" and address of the nearest dealer.

THE RALEIGH CYCLE CO. LTD. NOTTINGHAM

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MODELS

From **£4:16:6** *cash (Sturmey-Archer 3-speed gear 21/- extra, cash). Deferred Terms from* **5/-** *down and 12 equal monthly payments (from 9/3). Sturmey-Archer 3-speed gear 2/1 extra, monthly. Dunlop Tyres, Terry or Raleigh Lycett special Aero Saddles and the best of everything.*

RALEIGH

THE ALL-STEEL BICYCLE

DESIGNED AND BUILT ENTIRELY IN THE LARGEST AND MOST COMPLETE CYCLE FACTORY IN THE WORLD

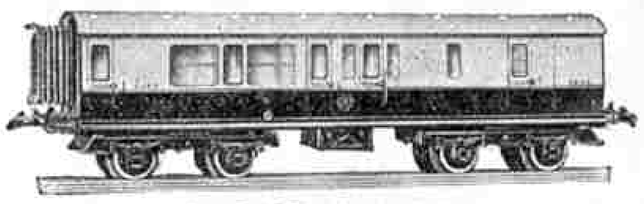
Fit the Sturmey-Archer 3-speed gear—the gear that "makes cycling easy"

HORNBY ROLLING STOCK

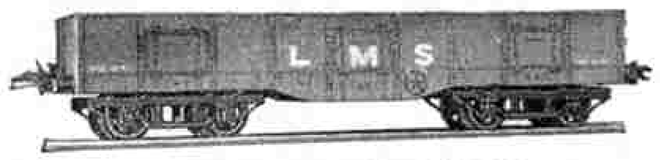
GAUGE O

The Hornby Series includes a splendid range of realistic Rolling Stock. There are items available for both 1 ft. and 2 ft. radius rails, all of which are fitted with automatic couplings.

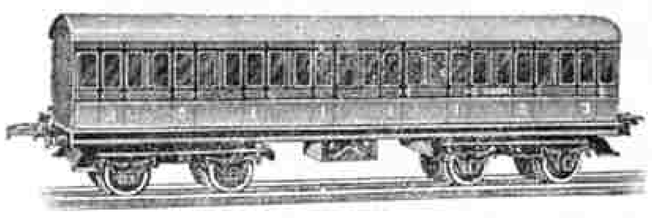
An attractive selection of Hornby Rolling Stock is illustrated and described on this page. Ask your dealer for a complete price list.



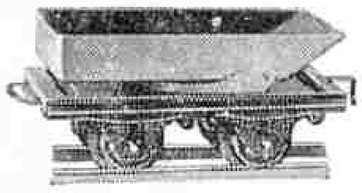
No. 2 CORRIDOR COACH
G.W. Brake-composite. Not suitable for 1 ft. radius rails.
Price **7/6**



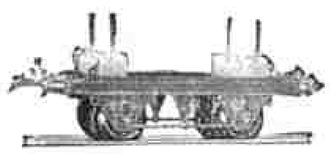
No. 2 HIGH CAPACITY WAGON
Finished in correct colours of G.W. and L.M.S. "Loco Coal" Wagons, or L.N.E.R. "Brick" Wagon. Not suitable for 1 ft. radius rails.
Price **4/-**



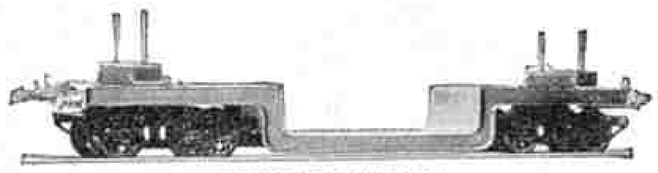
No. 2 PASSENGER COACH
First-third or Brake-third. Not suitable for 1 ft. radius rails.
Price **7/-**



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



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



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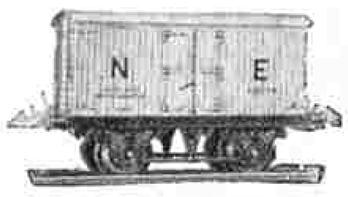
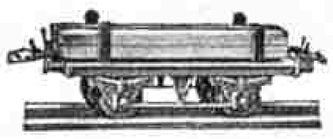
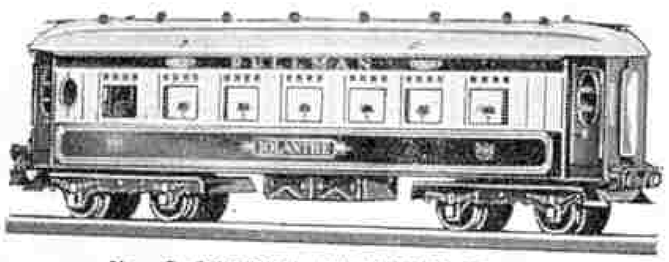
TROLLEY WAGON
Fitted with two Cable Drums Price **4/6**



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



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



No. 2 SPECIAL PULLMAN COACH
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OIL TANK WAGON "MOBILOIL"
Finished in battleship grey.
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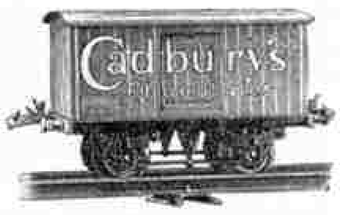

CHOCOLATE VAN "CADBURY'S"
This van is beautifully enamelled in blue with white roof.
Price **2/3**

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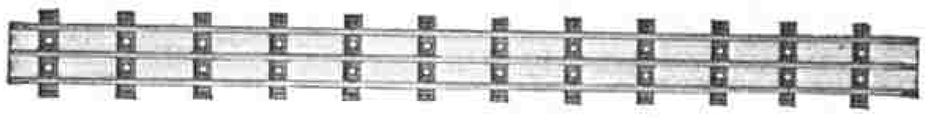

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EB3½	Straight Half Rails	„ **1′7**
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EA3	Curved Rails	each **2′8**
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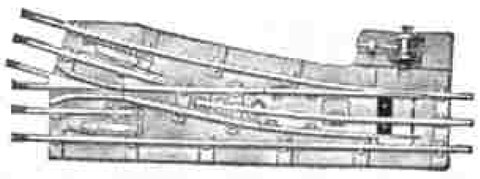

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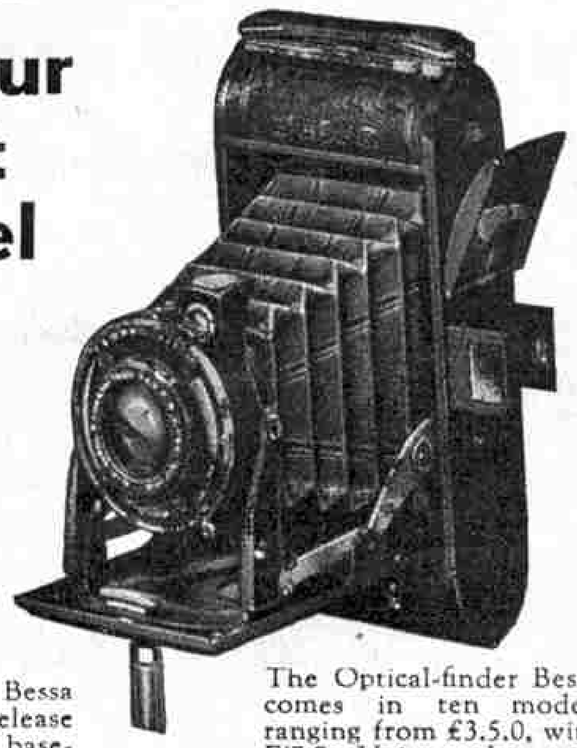

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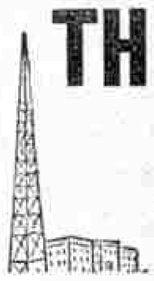

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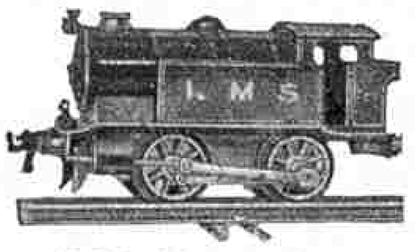

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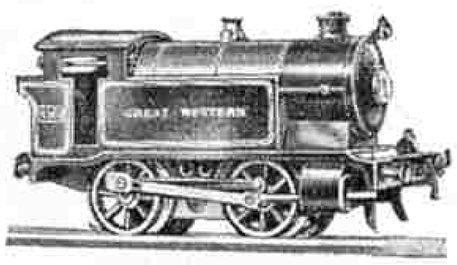
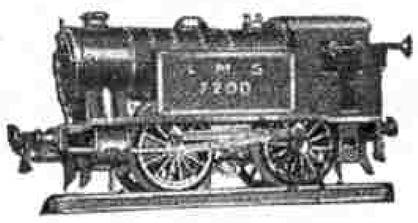


*No. 1 Special Clockwork Tank Locomotive
Reversing ... Price **17/6**



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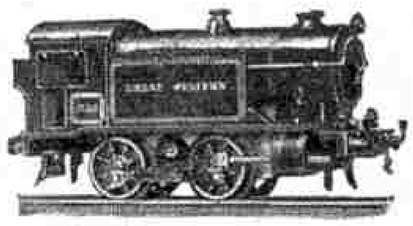

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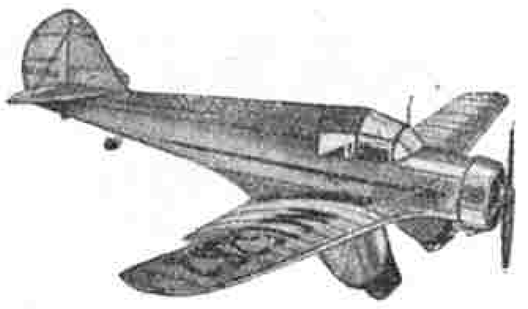

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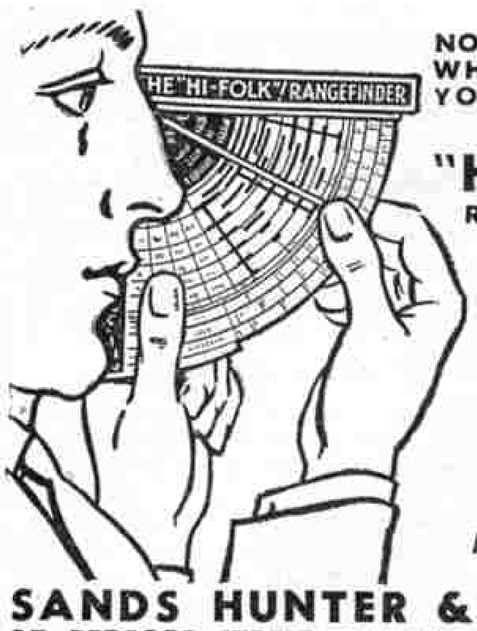

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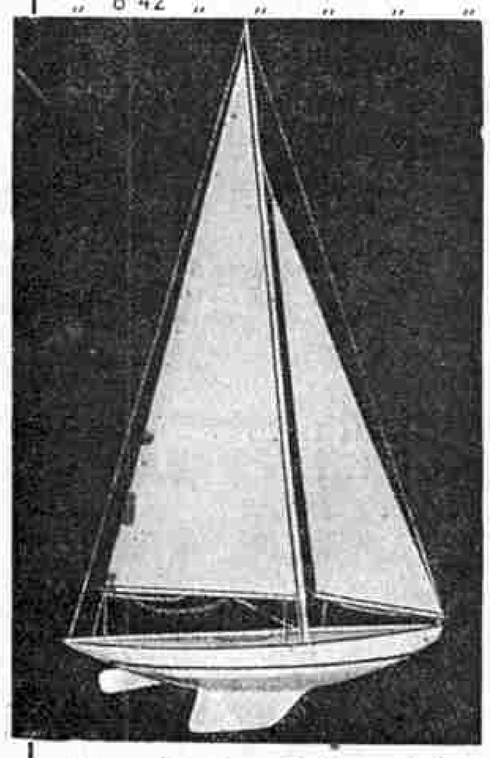

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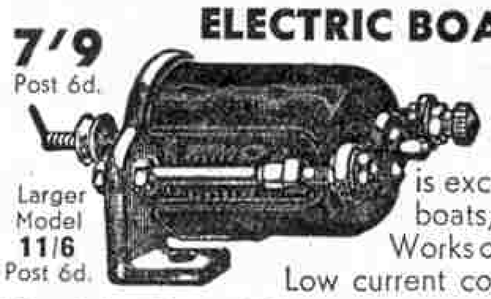

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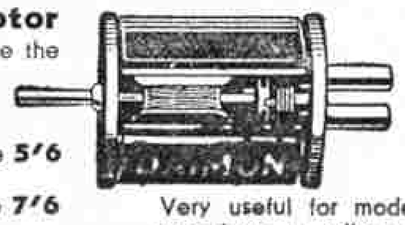

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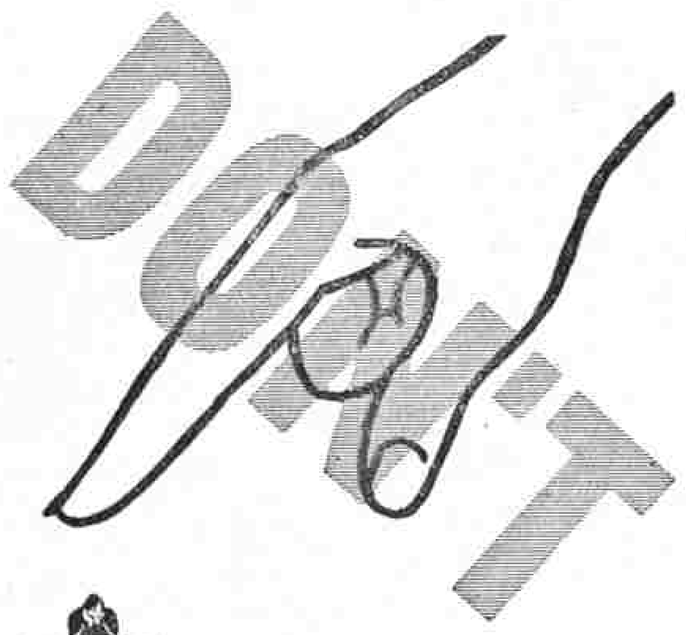

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READERS' SALES

Readers should note that all advertisements of Hornby Trains and other Meccano products included in this column relate to items no longer featured in the catalogue. Advertisements of current products cannot be accepted for this column.

Stamp Collection, Four Albums Gibbons Cat., Covers, etc., the lot £5.—Stone, Pendeen, West Bay Road, Bridport, Dorset.

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TEN CORONATIONS FREE! Request super approvals, postage please. 50 different Russia (catalogue 13/4), 2/6. List free. Milton, 68, Butler Road, Dagenham.

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This Month's Special Articles

	Page
Aeroplane Pilots at School	384
Air News	380
Books to Read	392
Church Clock Made From Scrap ...	372
Competition Corner	417
Engineering News	368
Engineers in Elephant-Haunted Jungle	388
Fireside Fun	418
From Our Readers	394
Giant Diesel-Electric Floating Crane ...	373
Guild Pages	404–5
Hornby Railway Company Pages ...	406–411
Jubilee of the Pneumatic Tyre ...	366
Meccano Boy at the Empire Exhibition	364
Model-Building Competition Pages ...	402, 403
New Meccano Models	396, 400
Of General Interest	386
Photography	370
Rabbits as Pets	377
Racers Who Time Themselves ...	376
Railway News	374
Run on the "*Abraham Lincoln*" ...	362
Sleeve Valve Engines for Aeroplanes ...	385
Stamp Collecting	413, 415
Story of the "*Cutty Sark*"	382
Suggestions Section	398
World's Longest Trestle Bridge ...	378

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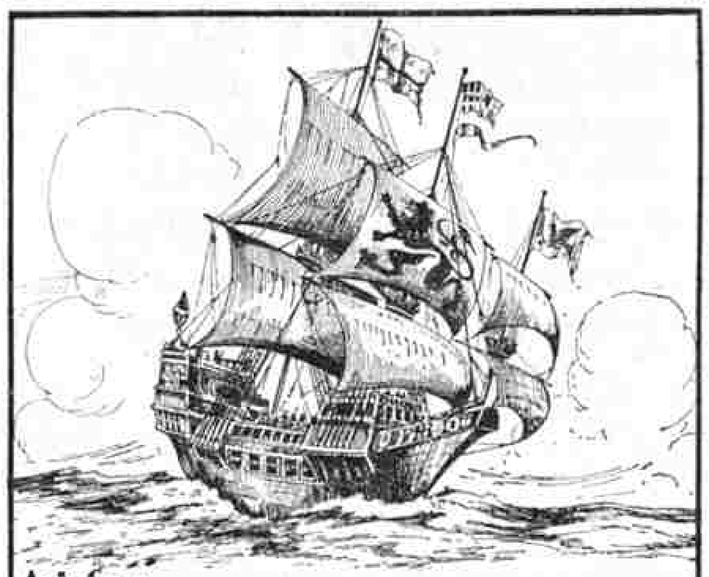

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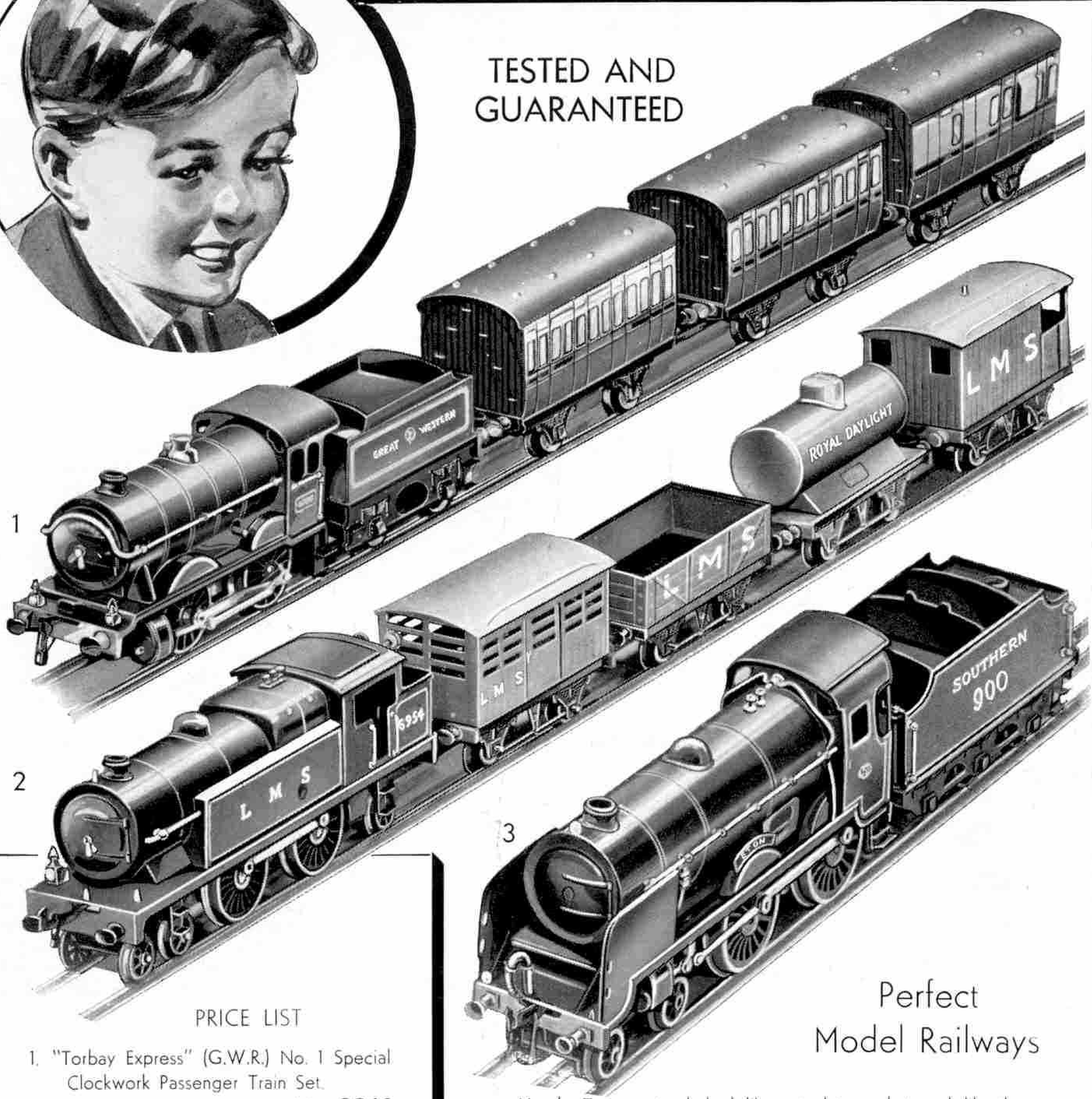

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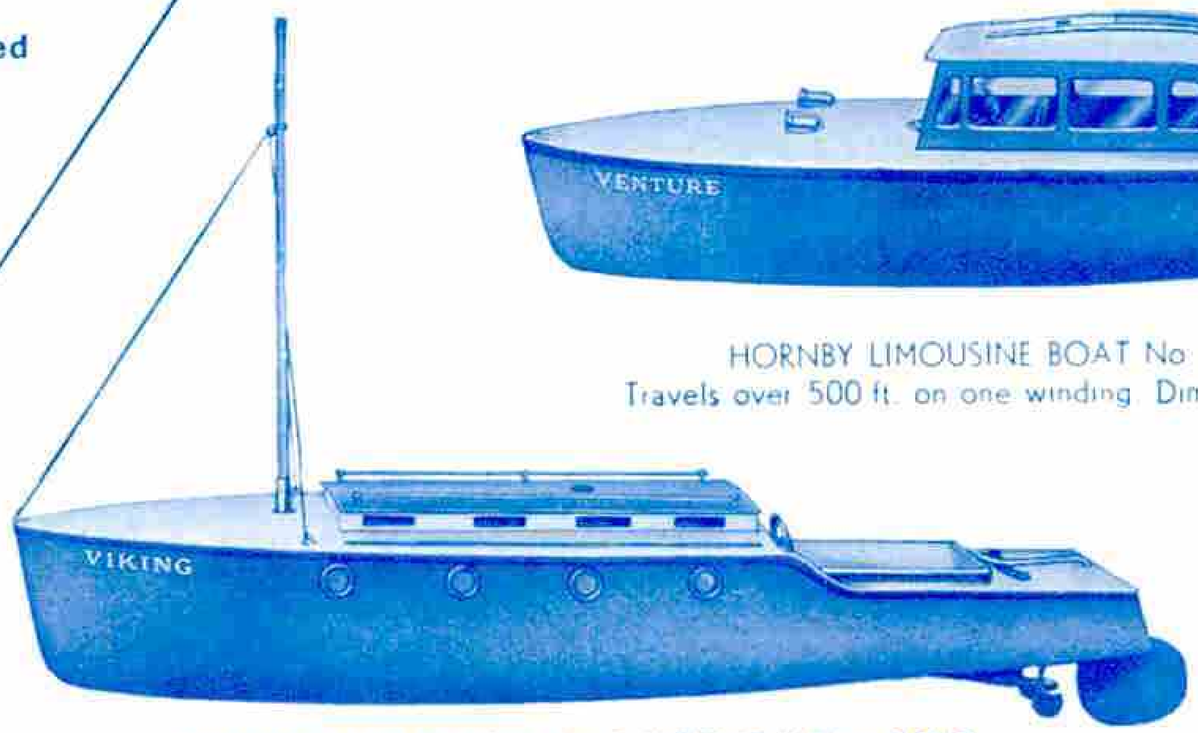

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