VOL. XI. No. 5. MAY 1926

MECCANO MAGAZINE

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Cleaning a Giant "Pacific" Loco. (See page 290.)

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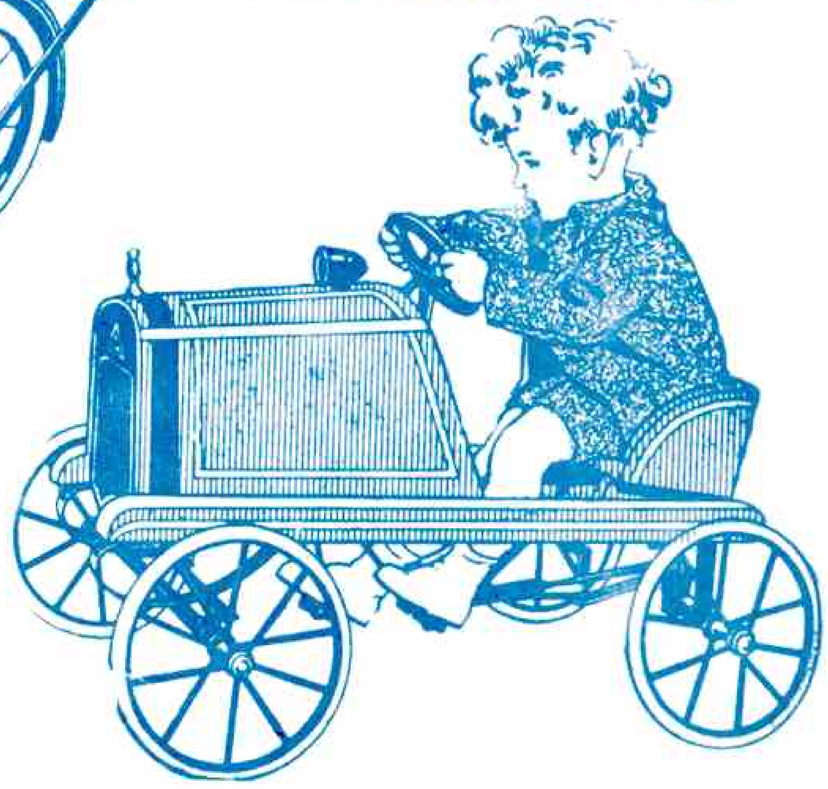

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NEXT MONTH: POLAR EXPLORATION BY AEROPLANE.

MECCANO MAGAZINE

EDITORIAL OFFICE
BINNS ROAD
LIVERPOOL.

Vol. XI No. 5
May 1926

With the Editor

Trials of Inventors in Ancient Rome

Glass that will bend and bounce without breaking or even cracking has been discovered by two Austrian chemists. This new flexible glass, which is to be manufactured in England, has passed with flying colours every test to which it has been subjected. If all that is claimed for it is true, it will supply many useful purposes, its many advantages being particularly appreciated by motorists. It will, for instance, withstand considerable stress without breaking. When it does finally break it breaks without splintering, and its edges are not sharp or jagged as in the case of ordinary glass. Then again its surface remains clear under all atmospheric conditions, thus overcoming the difficulty of visibility through windscreens in wet weather.

The discovery of flexible glass is by no means new, for a similar invention is described in Book V. of the "Annals of Tacitus." We are here told of the wonderful work of the Roman glass-makers, the cleverest of whom brought to the Emperor Tiberius at Capri a beautiful globe of glass. The artist, having exhibited his handiwork to the Emperor and to the assembly, let the glass fall to the ground. Of course, everyone expected that the beautiful globe would be broken in a thousand pieces and we can imagine their surprise when it was seen that it remained intact. As a result of the fall, however, the globe was slightly bent on one side, but, to the astonishment of all, the glass-maker proceeded to eliminate the bulge with a hammer, restoring the globe to its original form!

The incident had a tragic sequel. Tiberius enquired from the glass-maker if anyone else knew the secret of how this new flexible glass was made. He was assured that no one else knew the secret, and on hearing this he ordered the poor glass-maker to be immediately put to death. His reason for this cruel edict was that if he allowed flexible glass to be manufactured the new material would make gold and silver of considerable less value!

Nowadays, of course, we live in a more enlightened age, but it is a remarkable fact that the world has had to wait nearly 2,000 years for flexible glass to be rediscovered.

There are many other inventions that were known to the ancients that we to-day, with all our twentieth century science, are unable to discover. One of these is the method of tempering copper so as to make it hard enough to give a cutting edge. Another is the art of dyeing fabrics in a particular shade, known as "Tyrian purple." The lacquer on some of the early examples of Japanese vases and the varnish on some of the old violins, are two other examples. It is impossible to-day to make pigments as used by the old masters, to withstand the action of light and time.

How the Telephone was NOT Invented

I wonder what Dr. Bell would have said if he had read the following account taken from a recently-issued weekly magazine in which the invention of the telephone is described. After mentioning that the telephone was discovered by accident the writer proceeds:—"Dr. Bell at the time was seeking a method to make speech visible by means of light flashes. He was working on a contrivance with the idea of carrying speech to a distance by means of an electric current and a wire. The current used was intermittent. *When Dr. Bell twisted a nut one-quarter of a revolution, he thus closed the gap and made the current constant, thereby giving us the telephone.*" If the invention of the telephone was as easily carried out as the writer suggests, by twisting a nut one quarter of a revolution, I imagine that the discovery would have been made many years earlier.

The matter is of particular interest because the present year marks the centenary of the invention of the telephone by Dr. A. G. Bell in America. Dr. Bell went to America with his father as a youth, and for many years was engaged in teaching the deaf and dumb a means of visible speech, or lip-reading as it is now called. He was interested in electricity first as a hobby, but later he endeavoured to use it in his attempt to make speech visible to those who had been deaf and dumb from birth.

The story of the wonderful discovery of the telephone has already been told in our pages. It has also been told several times during the past month, with varying degrees of accuracy of which the one quoted above, from a reputed "scientific" weekly, is, perhaps, the worst example. It is a matter for regret that all magazines are not as carefully written as the "*M.M.*," for such statements as that quoted are very misleading.

"Too Many Ornaments Spoil the Job"

No doubt every one of my readers has noticed the type of individual who takes a particular delight in decorating his motor-cycle, or motor-car, with "gadgets." Quite recently there has been some discussion about this tendency on the part of those in authority to decorate our fighting aeroplanes with unnecessary complications, and in this connection a good story is going the rounds among flying men. It seems that a bright idea occurred to someone in authority that the pilots' seats on aeroplanes should be made adjustable, so that they would suit either tall or short pilots. To this end the seat in a certain aeroplane was mounted on a telescopic arrangement with a lever to raise or lower the seat at the will of the pilot. It must be mentioned here that on many aeroplanes a very similar lever is used to alter the angle of the tail plane, so as to adjust the balance of the machine.

A short time ago a small pilot, flying one of these machines, noticed that the balance of the machine needed adjusting and threw forward what he thought was the plane-adjusting lever. Unfortunately he operated the seat-adjustment lever, and as a result, promptly disappeared into the depths of the fuselage, much to the astonishment of his passengers! Luckily the 'plane was at such a height, and the pilot was so quick in realising what had happened, that he was able to regain control of the machine before it performed a fatal nose-dive or other unpleasant evolution. Needless to add, he has since made a particular study of all levers before ascending in a strange 'plane and his opinion about unnecessary gadgets is illuminating!

There is more than one moral attached to this story. Do not have any unnecessary ornaments or gadgets on anything you make or use, whether it be a Meccano model or an aeroplane. Always make yourself acquainted with the mechanism of any machine you are operating—whether it be an aeroplane or a bicycle—before you start. It is a duty you owe to your fellow creatures as well as to yourself.

Next Month

Last month it was announced on this page that the feature of the current issue would be "Amundsen's Polar Flight." Unfortunately it has not been found possible to include this article in this issue, but I am able to promise for next month an article on "Polar Exploration by Aeroplane," which will include an account of Amundsen's recent expedition, as well as an account of the work of others who have explored the Polar regions by aeroplane.

I understand that some of my readers are experiencing difficulty in obtaining the "*M.M.*" through their newsagents. There should be no difficulty whatever about this, and if any newsagent cannot obtain supplies from his wholesaler ask him to write to me, and I will arrange to supply him direct. In any case, the Magazine is stocked by all Meccano dealers and there is at least one Meccano dealer in every town, so there should be no difficulty whatever in obtaining the "*M.M.*" regularly on the 1st of each month.

Cleaning a Giant Locomotive:

The "*Flying Scotsman's*" Four Hours' Toilet

WE all generally think of such fine locomotives as the "*Flying Scotsman*," "*The Centenary*" and other famous members of the L.N.E.R. "Pacifics," only as speeding between King's Cross and Edinburgh. We picture them in our mind's-eye hauling trains of enormous length, and being turned round at their destination to start off on the return journey without loss of time.

There is another side to the picture, however, and this is the "toilet" of these giant locomotives—that is the preparation they have to undergo before every long-distance run. They receive this attention in the Locomotive Depôts of which the one at King's Cross is typical of many other similar Locomotive Depôts scattered all over the country.

The "Flying Scotsman" at Home

It is always interesting to visit the King's Cross Depôt, for here some of the "Pacifics" are housed after their return from Scotland. A scene of great activity prevails. Engines are to be seen almost everywhere, some coming in, others going out. The difference between those coming off and those going on duty is as remarkable as, and quite equal to, the difference between workmen going to their work and workmen after the day's toil.

Some of the engines crawling about the yard, just off duty after racing to King's Cross from York or Leeds, seem so tired as to be almost falling asleep. They pause only to report themselves at the yard foreman's office, and whistling a sleepy "good-night" to everybody, contentedly steam-off for a well-earned rest. Before leaving the depôt again they will receive attention from many attendants.

In these depôts the monster "Pacifics" are very submissive creatures. The "*Flying Scotsman*," generally seen hissing and snorting with ill-concealed impatience at the head of his train, now stands humbly in his shed, with a small bar-boy in his fire-box and two men beneath him with a flickering lamp. Here we may climb into the cab or even crawl beneath the monster boiler. Standing in front of this towering mass of steel, we may imagine with a shudder what would happen to us if this 150-ton loco were approaching at 60 miles an hour!

Courtesy] [*L.N.E.R.*
The Driver screws home the fastener of the smoke-box cover (L.N.E.R. No. 2544 "Lemberg.") If this is not fastened tightly, the engine loses efficiency

Barrow-loads of Scale

Over four hours' preparation by a host of workmen is required to get the "*Flying Scotsman*" ready for his race to the north. In the giant locomotive's toilet, and in the attention necessary to get the best possible effect, not even the most particular sister of any reader of the "*M.M.*" could be more careful before going to a dance!

The loco first receives attention from boiler-smiths, fire-boys, and fire-lighters. To set the fire going, two or three scoops of live coal, each weighing 40 or 50 lbs., are thrown into the fire-box, and by the time the driver comes on duty the boiler has a head of 80 lbs. of steam. When the driver and his mate arrive they oil up, take water, and put on the finishing touches.

In addition to the regular routine, as outlined above, the boiler must be thoroughly cleaned every 2½ days. Barrow loads of scale (or fur something like that found in the ordinary household kettle) are removed. There are 3,800 ft. of internal pipes on a "Pacific" and soot and scale quickly collect, considerably reducing the power and also causing a greater consumption of coal per mile than is the case when the pipes are clean.

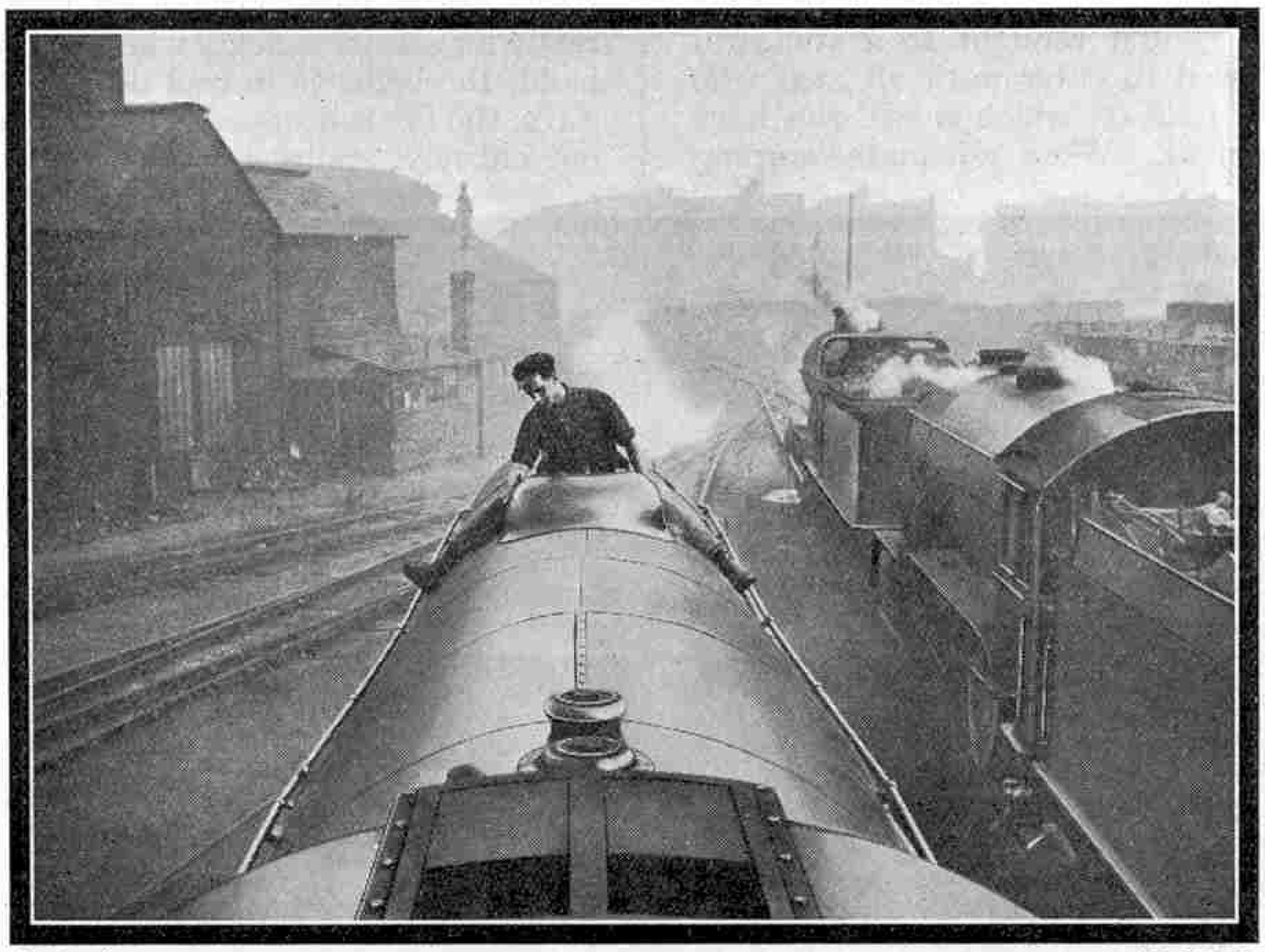
At King's Cross the cleaning of the pipes is done by an ingenious washing-out appliance consisting of a system of pipes, filters and pumps. The appliance is actuated by the steam remaining in the boiler after a long run, the steam being condensed into water and used under pressure. On the average, about 20 minutes is required to clean out the pipes by this washing appliance. Every day scores of locomotives are cleaned in this manner, and the use of this washing appliance results in a considerable saving of time, as before it was installed it was necessary to wait until the locos had cooled before the pipes could be dealt with.

The Importance of Lubrication

The oiling of these hard-working locomotives is, of course, a most important part of their preparation for a long run. All railway companies are large consumers of oil of all kinds, but two kinds of oil are principally used for the "Pacific" locos. One is for lubricating the axle boxes, valve motions and other working

parts and consists of a mixture of rape oil and mineral oil. The other, for lubricating the interior of the valve chests and cylinders, has to stand a very high temperature and is a heavy mineral oil containing a certain proportion of fats. Rape oil is the most expensive ingredient, and, as might be expected, the amount used is much greater in express passenger engine lubrication than in the case of other locomotives.

The oil is delivered in bulk to the Locomotive Depôt by contract. There it is stored in large tanks, being drawn off and carefully measured as required, each driver receiving a certain ration according to his day's run.



Courtesy] [L.N.E.R.

Cleaning the outside of the boiler of the "*Flying Scotsman*"

Lubrication : Old and New Style

On the L.N.E.R. passenger engines the consumption of lubricating oil for axle boxes works out at about 5 pints to every 100 miles. The consumption of lubricating oil for the cylinders is approximately $1\frac{3}{4}$ pints for every 100 miles.

In the early days of railways when there was considerably more play in the working parts, cotton waste and sacking soaked in oil were often used to assist in lubrication. It was often necessary for the oil-can to be freely applied during a journey and if necessary the train was pulled up for the purpose of allowing the driver to lubricate the working parts !

The task of the driver of the present day in the matter of lubrication is very different from that of the drivers of the earliest engines, such as "*Locomotion No. 1.*" Although automatic lubricators relieve him of a good deal of anxiety with regard to oiling, it continues to be necessary for every working part to constantly be examined in order to ensure steady running.

Reclaiming Oil from Waste

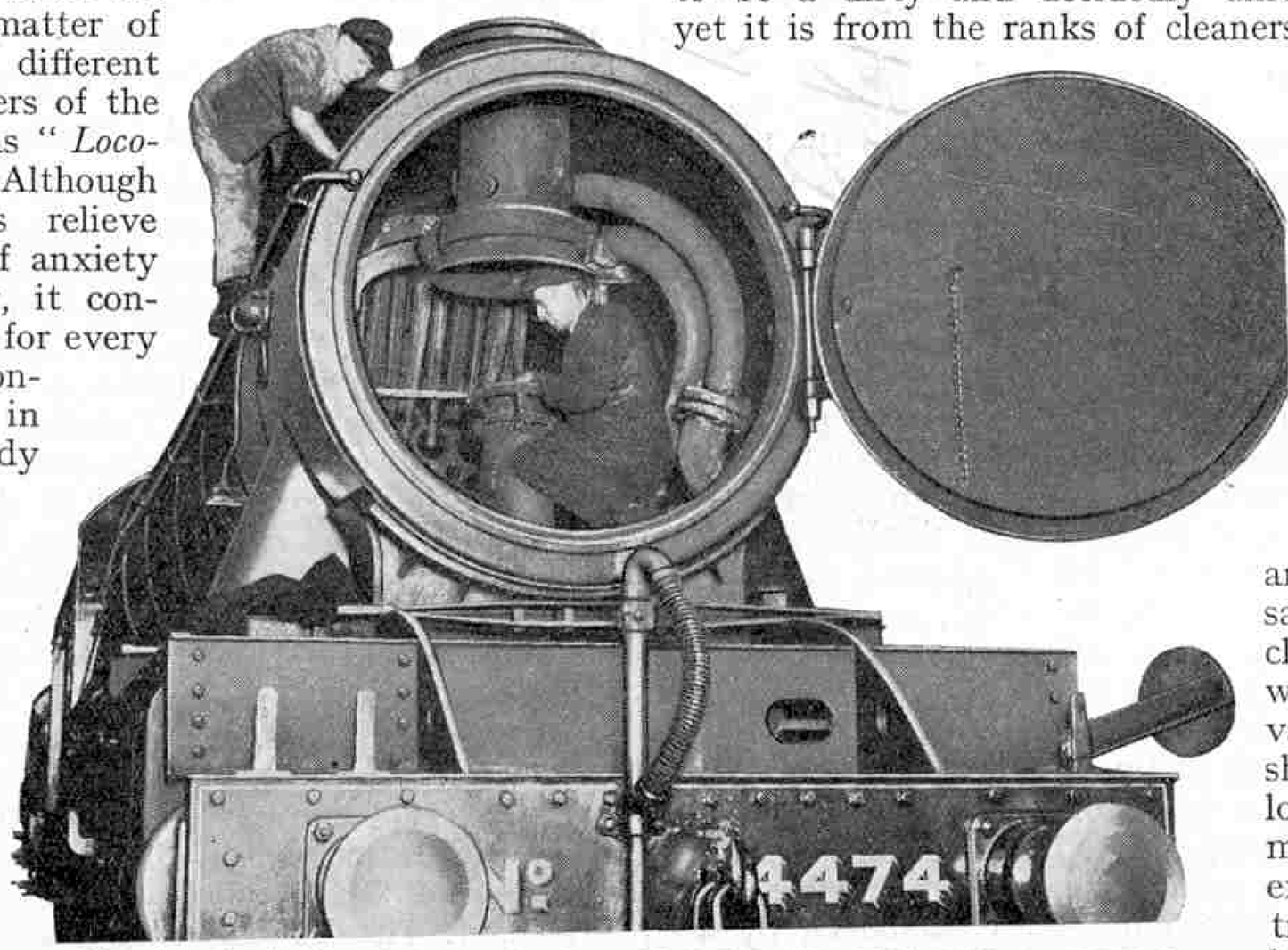
Climbing round the frame while the engine is in motion has, of course, now been done away with —much to the disappointment of many small boys whose sole ambition in life was to climb along the frame of the Scotch Express, when travelling at over 60 miles an hour, with an oil-can in one hand and a handful of cotton waste in the other !

The modern driver still carries a handful of waste but this is used to remove surplus oil. At the end of the shift, the waste is collected with other waste rags and sent to the oil rag laundries. Here centrifugal oil extractors, working on the principle of the steam turbine, reduce the viscosity of the oil. A mixture, which consists principally of oil and matter, is thrown out and carried through pipes into tanks. Approximately 50% of the oil is extracted by this first process. Should by any chance a drop of oil escape the centrifugal action of the machine and remain in the cloth, it will then have to face a solution of caustic soda and boiling water.

It is surprising to learn that every year the L.N.E.R. oil rag laundries save 40,000 gallons of valuable oil in this manner ! The reclaimed liquid is not wasted but is placed in catch-pits and tallow is added to give consistency, the mixture then forming wagon grease.

From Cleaner to Driver

Although the cleaning of locomotives may appear to be a dirty and decidedly unromantic occupation, yet it is from the ranks of cleaners that the first-class passenger express drivers are recruited. During his engine-cleaning period the future driver lays the foundation of the expert knowledge that is necessary to all drivers in order that they may run to time and yet with perfect safety. The engine cleaner works his way up through the various grades of shunting fireman, local goods fireman, main line fireman and express passenger train fireman, and before attaining the



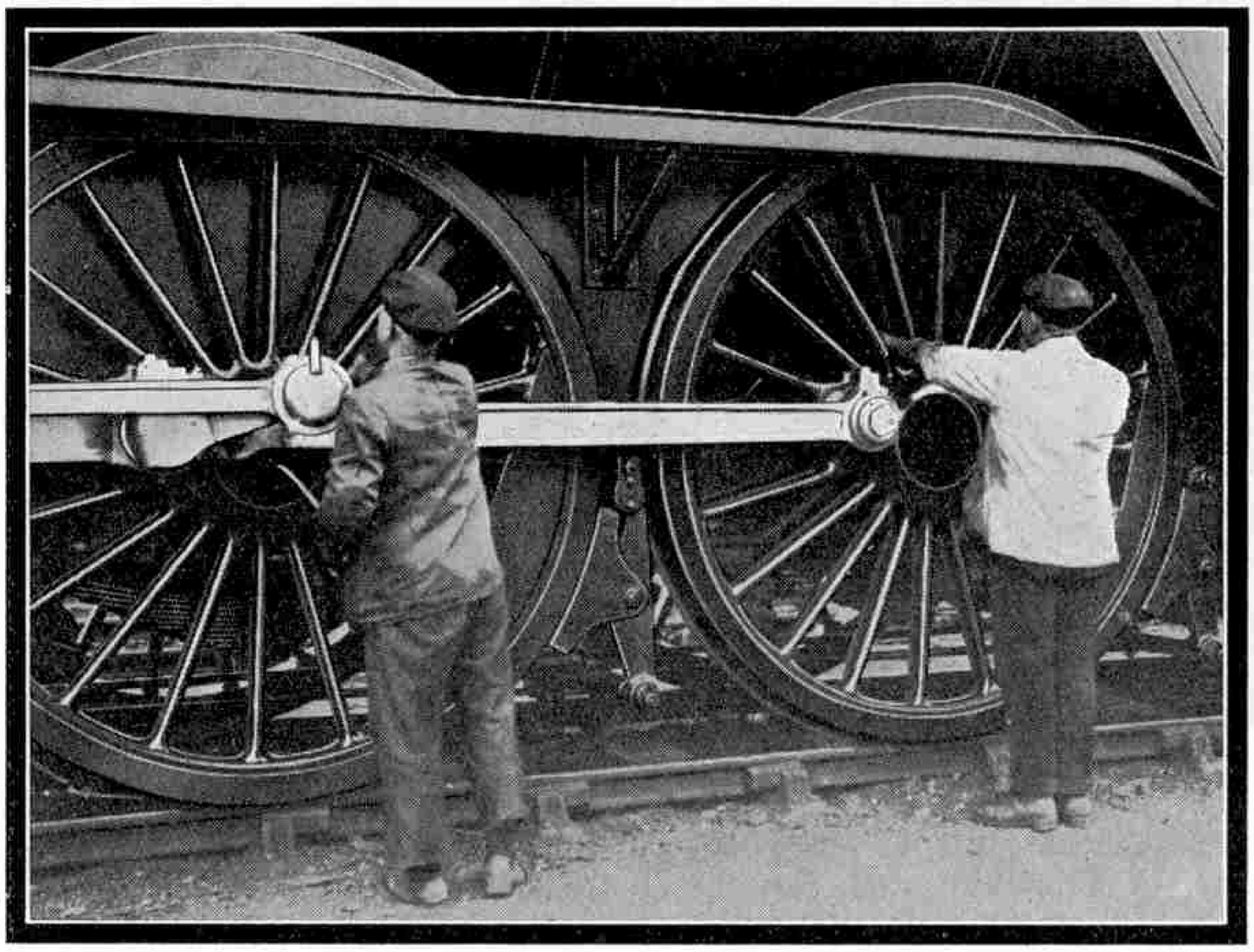
Cleaning the inside of the smoke-box of L.N.E.R. No. 4474, "*Victor Wild*"

grade of driver has to pass quite a severe examination in regard to the mechanism and working of the engine.

In a large engine shed it is obviously necessary to lay down strict regulations in order to avoid accidents. These regulations vary to some extent on different lines, but in the main they are the same. When a locomotive has to enter a shed it is first brought to a standstill outside and is not allowed to enter until all men who may be working on the road on which it will run have been warned of its arrival. When adequate warning has been given a loco must not enter at more than a crawling speed, an alarm whistle being sounded in the meantime.

Once inside the shed the loco is not immediately left to its own devices, but the cylinder cocks must be opened, the hand brakes must be put on hard, the regulator shut and the reversing ever put out of gear. Cleaners are expressly forbidden to move engines in steam, and this can only be done by a driver, or by a fireman instructed and accompanied by a driver, or by the shed foreman, shed shunter or other specially authorised men.

Without regulations of this kind accidents in engine sheds undoubtedly would occur very frequently, but as it is, mishaps are comparatively rare and when they do occur it is almost always as the result of neglect of some rule.



Cleaning and Oiling the Giant's Wheels

Inside an Engine Shed

The engine shed bears the same relation to the locomotive as the stable to the horse or the garage to the motor car. Roughly speaking engine sheds are of two types, "straight road," having several parallel roads passing through the building, or "turn-table," containing turn-tables from which lead roads connecting the tables together and also leading from each table outside the shed. Just as in the case of a garage, pits are excavated between the metals in order to enable men to work below the locos when required. An interesting feature of an engine shed is the smoke troughs in the roof. These are arranged in such a manner that the smoke from any engine within the shed, no matter in what position this may be standing, is carried away.

The actual sequence of engine shed operations varies in different places but as a rule the loco, having arrived at the shed, is taken charge of by an authorised man and the driver and fireman book off duty. The loco is taken towards the coal stage pit to be filled up in its turn and during the waiting period the smoke-box ashes are shovelled out and dropped alongside or removed by a pneumatic ejector. When the loco has received its due amount of coal it is taken over a "fire-dropping" pit where the fire is either cleaned or dropped. If the fire is to be cleaned, the clinker and dirt is shovelled out and dumped alongside and the ashes are raked from the ashpan into the pit. When this process is complete a small fire is kept burning so that the engine may be ready for service quickly when required. If, on the other hand, the boiler is to cool down before the next spell of duty, the fire is dropped, which means that it is shovelled out entirely. Subsequently the boiler is washed out as already described.

All locos are apt to develop slight defects. Whenever a driver becomes aware that any part of his engine is not working as it should he makes a note of the fact and during its stay in the shed the engine is taken in hand by fitters, boiler smiths, etc., who have been informed of the defect and promptly proceed to remove it. In addition, all locos go through more extensive examinations at stated intervals. For instance, smoke-boxes, water gauges, brake gear and pressure gauges may be examined monthly and safety valves yearly. The boiler will be examined monthly by the shed staff and at longer intervals by an inspector of the running department, while pistons and valves are examined after runs of from 12,000 to 20,000 miles, according to the nature of the loco and its work. These periodical examinations are carried out to schedule whether a loco has developed any obvious defects or not.

Newcomers Require Most Attention

The locomotive superintendent at King's Cross Depôt has 90 engines to look after, and they require each day 600 tons of coal and thousands of gallons of water.

"I wouldn't mind if they all thrived on it," he told the writer recently, "but like most human beings they suffer now and then from indigestion! No. 4444 over there came home stuffed-up on Tuesday, but she is better now and may go out for a little exercise to-morrow."

"But the new arrivals, such as the '*Flying Scotsman*,' surely don't need much attention?" I asked.

"Don't they though!" replied the superintendent. "I'd like to tell you that it takes a loco about three months to get into its stride. Look at 2736 in the corner there. She was new only 10 weeks ago and has been a real handful ever since."

"What about your 'oldest inhabitants?'" I asked.

"Oh! they don't give us much trouble. They require very little attention on the whole, but after they have knocked off 90,000 miles or so we give them a thorough overhaul. They're just going to start on one over there."

(*Continued on page* 328)

Wasps Without Stings

Interesting Insects that Cause Galls on Leaves

By Eric J. Helsby

THOSE readers who are interested in natural history will be familiar with the subjects of the accompanying sketches. Wherever there are oak trees, galls may be found, resulting from punctures made by small insects, usually Gall Wasps. The insects responsible for the galls illustrated here, which are all fairly common, belong to the order *Hymenoptera*. This order includes all bees, wasps and ants which, though differing in outward form, have very similar life histories.

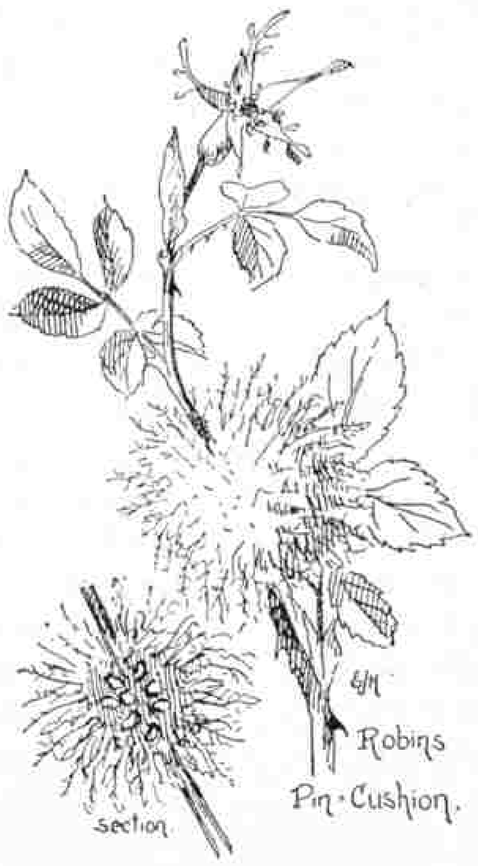
Unlike common wasps, Gall Wasps have no sting. Their life history is briefly as follows. A female insect, having selected a suitable spot on the plant, makes a number of incisions with a little instrument provided by Nature for the purpose. The spot chosen varies according to the kind of insect, each species keeping to a particular part of the plant. For instance, some attack the leaves, others the twigs or roots. Into each puncture the Gall Wasp places an egg and then her share in the proceedings is over.

In some way not yet understood the sap in the affected part of the plant is diverted and an abnormal growth, the gall, bearing within it an egg or eggs, is formed.

Some species place their eggs separately so that each resulting grub has a gall to itself, as in the Marble Gall. Others lay them close together and place several eggs in each puncture, so that the gall produced contains a number of grubs as in the Apple Gall and Robin's Pin-Cushion.

When the grub hatches out it commences its career by making a meal off its prison-walls. Further irritation of the plant is then set up and the gall expands. When the grub has reached its normal size and is fully fed, the gall hardens and the grub becomes a pupa. In this connection it ceases to eat and quietly awaits its transformation into a perfect insect.

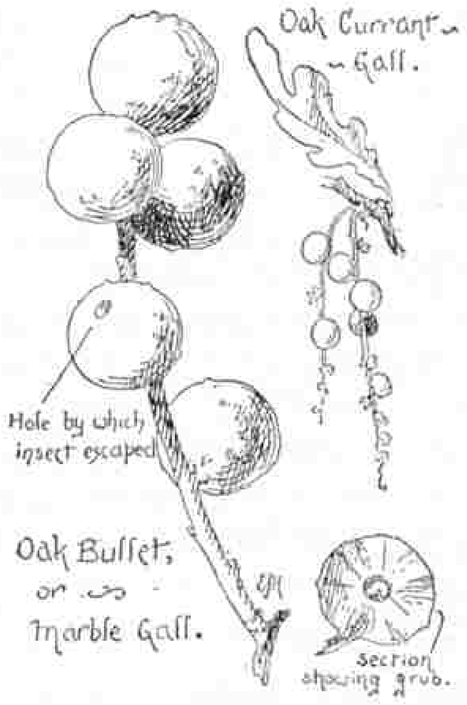
In the following spring the fully-developed insect bores its way out to daylight through the gall which has protected it from the storms of winter. Later it, too, will found a colony of galls after the manner of its kind.



Oak Apples are very pretty objects when first formed. They are whitish, slightly flushed with pink, and are somewhat spongy. The hard Brown Bullet or Marble Gall is at first green. In the Robin's Pin-Cushion the gall is surrounded by a moss-like substance, which is usually tinted red. This gall is found on the Dog Rose tree.

By keeping the various galls in separate glass-topped boxes the gall insects may be watched as they emerge. Specimens having a hole in them are, of course, of no use for this purpose, for the insects have already escaped. The number of insects that sometimes issue from a gall is often surprising, and on one occasion the writer counted no less than 96 insects that issued from a single Apple Gall.

Considerable mystery still surrounds galls and much remains unexplained, and naturalist readers will certainly find in them a never failing source of pleasurable and interesting study.



If we examine the beautiful little tunnel made by a Bullet Gall Wasp, we shall agree that its workmanship is admirable and that some gall-makers may fairly rank as Nature's engineers.

A section will show the central chamber and indeed part of the little tunnel itself packed with excavated material. One section may reveal also a number of cells situated near the surface, each—if it does not contain a tiny grub—communicating with the outside by a short passage such as might be made with a fine needle. These are the work of a species that lays its eggs in galls already formed, not troubling to make its own. They are not parasites but "inquilines" or lodgers, and the real owner of the gall suffers no inconvenience.

Gall life is not all honey and sunshine, however, for juicy gall grub is on the menu of various Tits, while still deadlier enemies, the Ichneumen Flies, deposit their eggs on the wasp grubs. The Ichneumen grub feeds on its host, which dies in time, while the fully-fed parasite becomes a pupa and, after its final transformation, emerges from the gall as a perfect insect.

It may be added that galls provide good material for nature photography.

The Conquest of the Air

XIV. The D.H. Type 54 De Havilland "Highclere"

Courtesy] [*De Havilland Aircraft Co. Ltd.*

The D.H. Type 54, showing the patent automatically-operated flaps that are responsible for the low landing speed and short "take-off"

A COMMERCIAL aeroplane, capable of carrying fourteen passengers and fitted with a 650 h.p. Rolls-Royce Condor engine, the D.H. 54 was originally intended to carry out pioneer work in opening up experimental air-routes.

Because of this intention, the specification is more exacting than it would have been had the machine been intended to operate only along established routes. For instance, it is essential that such a machine should have a low landing speed, good control even when almost stalling, easy "unstick" in confined areas, and a high cruising speed as well.

Speed 105 miles an hour, fully loaded

The "Highclere" is the outcome of many years' experience. Before designing the machine, the makers collected the views of pilots who fly consistently and who are therefore in a position to give constructive criticism on existing designs. Suggestions that showed promise were incorporated in the D.H. 54, which is claimed to be one of the most efficient, safe, and economical aeroplanes in existence.

The machine has a span of 68 ft. and some idea of its great size may be obtained by comparing it with the Rolls-Royce under the engine in the illustration on page 321. The overall length of the 'plane is 51 ft. 11 in., and the height 15 ft. 2½ in. Its weight, including radiator filled and complete equipment, is just over 7,000 lbs. With full load (11,000 lbs.) it has a cruising speed of 105 miles an hour. Its stalling speed is 52 miles an hour and it climbs at 580 ft. per minute.

The total weight of 11,000 lbs. is made up as follows :— Pilot and navigator 360 lbs. Twelve passengers, 1,920 lbs. 148 gallons of petrol, 1,095 lbs. 10 gallons of oil, 95 lbs. Passengers' luggage, 500 lbs. Luggage of crew, 20 lbs.

The machine has been designed so as to give the passengers the greatest possible comfort. The cabin is lofty and is decorated on a lavish and artistic scale. Particular attention has been paid to the lighting, heating and ventilation.

Fuselage in Two Portions

The fuselage is in two portions, joined at the rear of the cabin, and disconnected by the withdrawal of four bolts. Luggage is accommodated in a compartment underneath the control-cockpit.

The wing structure, which is of the two-bay type, is of orthodox design. Both top and bottom planes are jointed at the inner interplane struts. This is a good arrangement, for if an accident happens and only local damage is caused to one of the planes, it does not mean that the whole 'plane is out of action.

All cables controlling ailerons, etc., together with their operating-gear, are enclosed within the planes, but are capable of easy access through inspection doors. All controls conform to the latest practice, ball races being fitted in most cases.

The power unit is a 650 h.p. Rolls-Royce Condor Mark III. engine, supported direct on the fuselage sides. It has a simple mounting, well triangulated. The standard reduction gear of the Condor (0.477 to 1) enables a large 14 ft. diameter propeller to be fitted.

A Bristol Gas Starter is installed and provides one of the readiest means of starting up the engine in a machine of this size.

The undercarriage is simple in construction and easy in maintenance. The impact of landing is absorbed by the compression of rubber blocks in the rear legs,

the front legs acting as radius rods. Should a forced landing be necessary on water, the whole undercarriage can be detached at a moment's notice. The machine will then land on the fuselage, which is designed to make a clean descent on water. It will come to rest and maintain an even keel, and the doors and windows are specially made so that they will remain water-tight for a reasonable length of time.

Safety Devices for Emergencies

The tail plane, which can be adjusted by the pilot to maintain longitudinal trim, is braced to the bottom of the fuselage by stay tubes.

Although the machine may be flown throughout its entire speed range without any adjustment to this gear being required, the tail plane adjusting gear is essential in order to trim the machine for change of position of load. The elevators are interconnected by a countershaft at the rear of the fuselage and are balanced to give a reasonably light longitudinal control for the pilot. The fin, which is of the cantilever type, carries a balanced rudder fitted with a spring-loaded gear to compensate for slipstream swirl.

All practical means have been employed to reduce the risk of fire, either in the air or in the event of a crash. For instance, fire-proof bulkheads are provided at the rear of the engine, and the oil-tank is isolated from the carburettor by a baffle-plate, the exhaust gases being conveyed to the rear of the machine by long pipes.

The petrol pipes are armoured and the supply pipes are duplicated to avoid an accident resulting from a choked pipe. A reserve supply of petrol is carried in the starboard compartment on the main tank, so that in the event of fuel shortage, the pilot is automatically warned when the machine is within twenty minutes of having empty tanks. There should thus be ample time in which to affect a landing at the nearest aerodrome, or to choose a satisfactory landing-ground, if a forced landing is necessary.

Patent Camber Gear

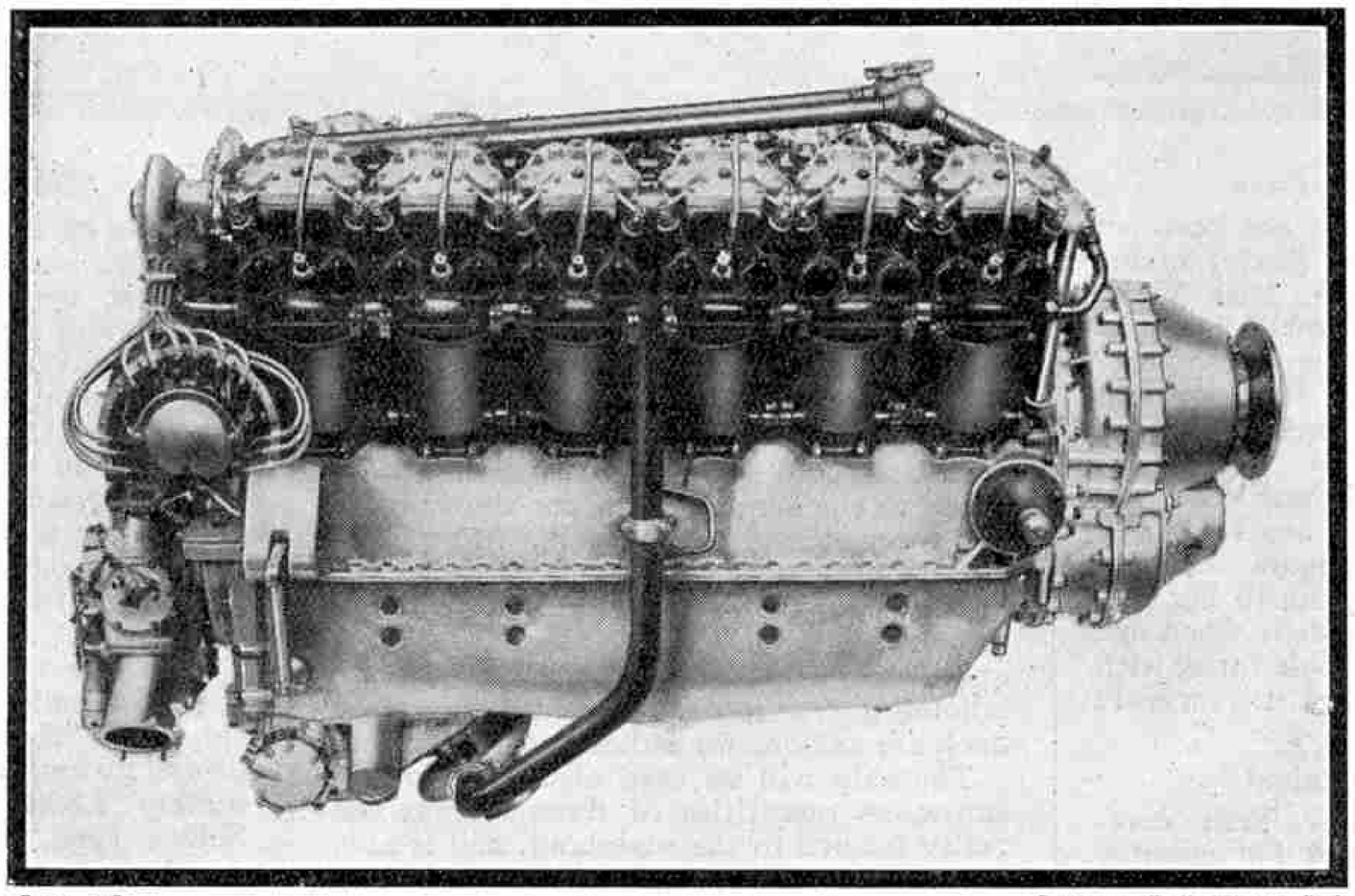
The stalling speed has been reduced by seven or eight miles an hour without effect upon the top speed, cruising speed, or rate of climb. This has been made possible by the introduction of the de Havilland patent variable Camber Gear, which automatically varies the wing camber and gives a change in forward velocity. Although at first sight the reduction of seven to eight miles an hour in landing speed may not seem very great, it is as a matter of fact equivalent to an increase in wing area of about 33%. If this increase were actually made in the wing area it would, of course, entail a considerable reduction in both full and cruising speeds.

The machine is equipped with the latest type of wireless transmitting and receiving set, and this enables the pilot or navigator to maintain verbal communication with stations within a radius of at least 150 miles.

Over-size wheels and tyres are fitted, and this makes for safety in landing, especially on a wet aerodrome.

Rolls-Royce "Condor" Engine

The 650 h.p. Condor III. aero engine, fitted to the "Highclere" machine, was originated towards the end of the War. It was designed to meet the requirements for an engine having the same quality and reliability as had been displayed by the Rolls-Royce "Falcon" and "Eagle" types, but of considerably greater power. It was intended to use the Condor type in the equipment of large sea-going aircraft to be employed in co-operation with the Fleet. At the time of the Armistice, aircraft of this type had been designed and almost completed to carry the Condor engine, but this work, as well as on the Condor itself, was retarded by the cessation of hostilities.



Courtesy] [*Messrs. Rolls-Royce, Ltd.*

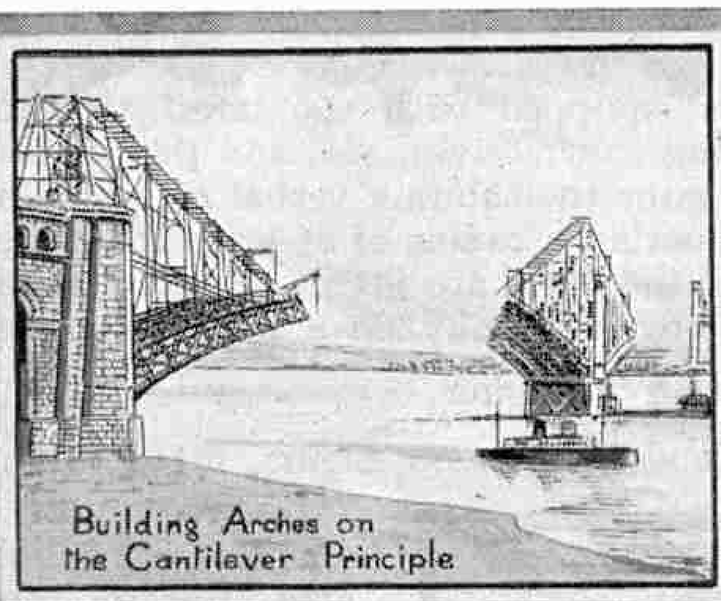
The 650 h.p. Rolls-Royce Condor III. Aero Engine

The original Condor, following very closely the design of the smaller "Falcon" and "Eagle" types, was built on a larger scale, and whereas the lighter "Eagle" engines developed 370 h.p., the Condor was designed for 550/600 h.p. A notable difference was the provision of four valves to each cylinder in place of the two valves that were used in the smaller types.

Only a few of the original Condor Series I. were produced, the type being succeeded by Series Ia., which embodied modifications in detail enabling the output to be raised to 650 h.p. at 1,900 revolutions per minute. This engine gave an exceedingly good account of itself, and was fitted to several flying boats among which were the Short Cromarty, Vickers Valentia, and the Fairey N.IV., as well as being fitted to the Avro Aldershot bomber and a number of other noteworthy modern aircraft.

This Condor Ia. has more recently been superseded by the Condor Series III. which is the engine fitted to the aeroplane described in this article. Of the same general design, this type develops a nominal brake horse-power of 650 at 1,900 revolutions per minute. The engine has twelve cylinders separately mounted in two rows at an inclined angle of 60°.

A considerable improvement has been effected, however, in the matter of weight, Series III. being nearly 300 lbs. lighter than the earlier type. The net weight—including carburettor, magnetos, starting distributor, and pipes—is 1,154 lbs. This compares very favourably with the American engines that hitherto have been regarded as standing alone in the matter of high-power, low weight, and small frontal area.



Engineering News of the Month

20,000 Miles in 20 Days

A world's motoring record has been set up recently on the Monza (Italy) racing track by an Englishwoman, Miss Violet Cordery, who completed 25,000 kilometres in 11½ days at an average speed of 89.7 kilometres per hour. This is equivalent to 15,600 miles at just under 60 miles per hour.

In creating this record it was necessary for Miss Cordery to cover nearly 20,000 miles in 20 days. This figure included a halt of five days for repairs to her car, made necessary by damage done when one of the male drivers, who took turns with Miss Cordery, fell asleep at the wheel!

* * * *

Sunken Monitor Raised

Operations have recently been commenced to recover the 6,000 ton monitor "*Glatton*" which was sunk in Dover Harbour during the war, and already the vessel has been towed some 1,500 ft. toward the shore. The operations are being carried out by pinning four powerful lifting lighters to the ship at low tide and pumping compressed air into the hull; then as the tide rises, the sunken vessel is lifted clear of the harbour bed, and towed slowly inshore.

The hull presents a weird appearance as it lies, keel uppermost, with her turrets embedded in the mud. At low tide the vessel is some 25 ft. above the water level and resembles a great iron shell of coffin-like shape, while her sides are encrusted with barnacles and thick with seaweed.

The story of the "*Glatton*" will remain for ever in red letters on the pages of Naval history. In September 1918, while full of shells and high explosives, ready to depart for the Belgian coast, she caught fire. To avoid an explosion that would have been of so terrible a violence as to wreck the whole of the town, Vice-Admiral Keyes gave orders that she was to be torpedoed as she lay at her moorings. There was no time to remove her crew of 70 officers and men and they went down with the ship.

* * * *

Spring-Cleaning Atlantic Liners

The three giant Cunard liners, "*Berengaria*," "*Aquitania*" and "*Mauretania*," have rejoined the fleet after their recent winter overhaul. The task of preparing ships of this enormous size for their trans-Atlantic season is colossal. On each vessel some 1,500 men have been employed for several weeks in renovating the entire passenger accommodation, the trades involved being upholstery, painting, joinery, electrical work and plumbing. In addition to the main engines, nearly 200 auxiliary machines have had to be overhauled and tested on each liner.

The "*Scillonian*"

The "*Scillonian*," the new steamer just completed for the Isles of Scilly Steamship Company, performed her maiden voyage recently. The vessel is 170 ft. in length and has a beam of 28 ft. She has been designed to meet the requirements of the trade between the Scilly Islands and the mainland, and special attention has been given to the arrangements for the comfort and convenience of passengers. A promenade deck extends nearly the whole length of the vessel. On the main deck below this there is a lounge for passengers amidships, while aft is a saloon with an adjoining tea room. Beneath the main deck are saloons for ladies and gentlemen.

The ship will be used also for carrying enormous quantities of flowers from the Scilly Islands to the mainland, and is able to accommodate 50 tons of flower boxes, each measuring 2 ft. by 1 ft. 3 in. by 5 in. In addition she will carry a considerable amount of general cargo. The cost of the vessel is £25,000, and it is interesting to learn that, of the 1,750 inhabitants of the five islands, there are not 20 who do not hold at least one five-shilling share. The co-operative nature of this steamship owning enterprise is indicated by the composition of its Board of Directors which includes seven flower growers, a bank manager and a builder.

* * * *

A Power Station Mystery

Considerable mystification and annoyance was recently caused to residents in the neighbourhood of the Hastings Corporation's new power station. A noise, described as resembling a gentle fog horn, was heard continuously, and defied all efforts to identify its source. One of the strangest features of the affair was that, while the noise could be heard over two miles away, there were places within half a mile of the station at which no trace of it was audible.

The solution of the mystery came about in a manner both interesting and amusing. A boiler house engineer who had taken considerable interest in the strange noise, but had practically given up his efforts to trace the cause, decided as a last resort to inspect the ashpits beneath the fires. On crawling beneath one of the boilers he was assailed immediately with a roaring sound that he described as almost deafening. As an experiment he obtained some pieces of sheet tin and laid them on the bars of the ashpit bottom—and the humming ceased immediately! It appears that the ashpit formed a huge horn in which the sound of the furnace draught became so intensified that the vibration set up a note of very high frequency.

Japanese Motor Ships

Owing to the depression in the shipping industry, shipbuilding in Japan during the past two or three years has shown little sign of activity, but indications point to a slight revival in the near future. The Nippon Yusen Kaisha, one of the most important Japanese shipping companies, is in negotiation with the Government for a subsidy to be granted in respect of two big motor liners to trade between Japanese ports and San Francisco, but it is possible that these vessels will be built in Europe.

Recently there was put into service a Japanese-built passenger and cargo motor ship, the "*Santos Maru*," having a length of 430 ft. and a gross tonnage of approximately 7,300. The engines are of the Sulzer type, built in Switzerland, and develop a total of 4,600 h.p. at 110 r.p.m., giving the ship a speed of 14 knots. A sister ship to the "*Santos Maru*" is already under construction, but the machinery for this, although of a similar type, will be built in Japan under licence.

* * * *

A Huge Power Station

The Lister Driver power station at Liverpool is growing with great rapidity. The new turbine house, only half of which is yet completed, will be 100 ft. in height and 90 ft. in width, the entire walls being faced with white glazed brick. It is intended to instal five turbo-alternators and one, a huge set of 40,000 h.p., is already working.

A new boiler house also is in course of construction and will be equipped with automatic stokers. There will be three 100 ft. concrete towers, of a type hitherto unknown in this country, for water cooling, and the capacity of these will be sufficient to cool one-and-a-half million gallons of water per hour when the generators are working at full speed. Over 3,300 tons of steel have been used in the construction of the new building and the total cost of the work, inclusive of machinery, will amount to approximately £500,000.

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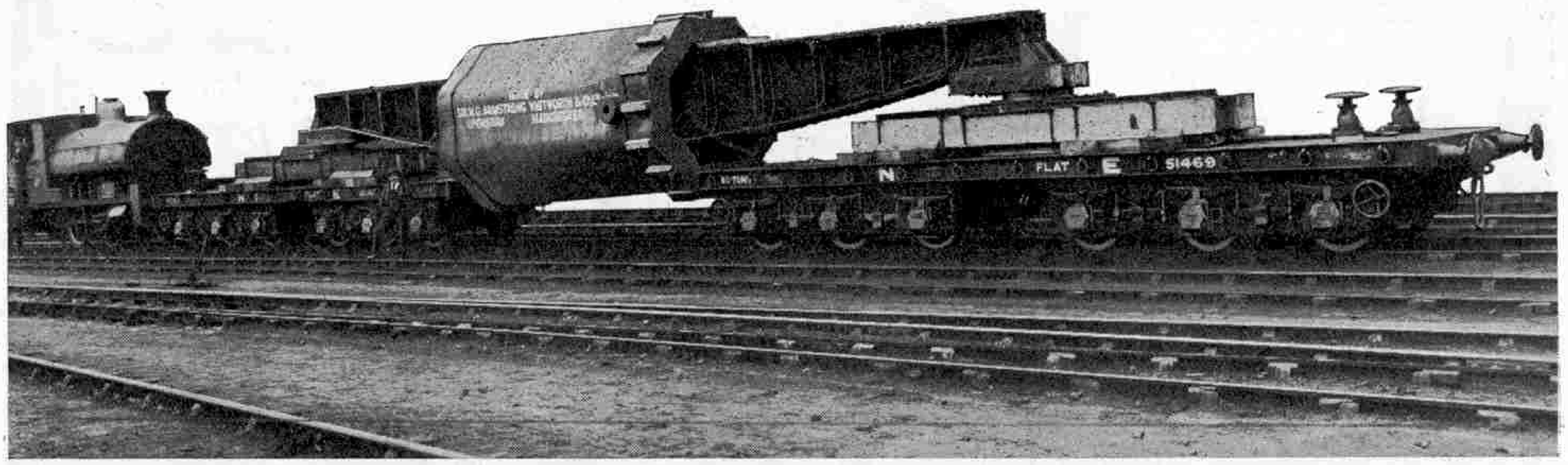
A Novel Power Scheme

An ingenious experiment in the generation of power is to be tried in Germany, where a steel tower 1,950 feet in height is to be erected to serve in the dual capacity of electric generator and wireless mast. The tower will be fitted with two huge wind wheels, which will revolve under the impulse of even the gentlest breeze. It is believed that the generator will be able to develop 6,000 kilowatts and the total cost of the tower and machinery is estimated at £300,000.



A Huge Casting

Messrs. Sir W. G. Armstrong-Whitworth recently accomplished a successful piece of work in casting a large octagonal iron ingot weighing 108 tons. The skill and patience involved can be gauged from the fact that the moulding and core-making for the casting occupied 1,580 working hours. The metal required, amounting to nearly 130 tons, was contained in six ladles, the contents of which were poured simultaneously into the mould, which was filled in ten minutes. The feeding of molten iron had to be continued for twelve hours, however, after which the casting was allowed to cool in the usual manner. It is interesting to note that after 34 days the temperature on the top of the mould was 110°F., that is 50° above the temperature of the foundry.

The work was carried out at Openshaw, near Manchester, and the problem of transporting so huge a mass of metal from Manchester to the North-East coast presented considerable difficulties which, however, were overcome by the London and North Eastern Railway. Two 60-ton flat bogey wagons were used, each carrying a girder, the ends of which were pivoted on specially prepared platforms placed on the wagons, the method adopted being shown very clearly by the illustration on this page.

Special traffic precautions were taken, the load being despatched on Saturday, 23rd January, by special train, the speed of which was restricted to 15 miles an hour. The distribution of the weight was so even that measurements, taken at eight different points from the floor of the trucks to the rail, were identical. The train completed the distance of 130 miles, arriving at Darlington on the following day, without the slightest hitch, not even an axle-box having become warm.

Launch of H.M.S. "*Amazon*"

Only two torpedo boat destroyers have been laid down since the end of the war by the British Government, and of these one was launched on 27th January from the Southampton yard of Messrs. Thornycroft & Co. This was H.M.S. "*Amazon*" which, it will be remembered, was christened on 16th January but owing to the severe frost remained immovable upon the stocks.

A curious coincidence in connection with the building of this vessel is that the previous "*Amazon*" also was built at Southampton, 18 years ago, and during the Great War this vessel was attached to the Grand Fleet, later rendering excellent service with the Dover Patrol. Her sister vessel the "*Nubian*" had her bow and a considerable portion of her hull blown away by a mine, and afterwards was fitted with the bow of the "*Zulu*," which had lost her stern. The ship resulting from this grafting operation was christened the "*Zuvian!*"

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New Motor Ship

The "*Accra*," a new motor passenger liner built for Messrs. Elder-Dempster and Company's Liverpool–West Africa service, was launched recently from Messrs. Harland and Wolff's Belfast yard. The ship is 470 ft. in length with a beam of 62 ft. and a gross tonnage of 9,200, and is fitted with a double bottom, extending fore and aft, for carrying oil fuel. There is accommodation on six decks for approximately 500 passengers and crew, and special quarters will be provided for the conveyance of troops and native passengers. One of the main features of the new ship is that all its auxiliary deck machinery and passenger service equipment will be electrically driven.

World's Highest Water Tower

The Goole water scheme, which aims at complete modernization of the town's water supply service, includes an interesting reinforced concrete water tower now approaching completion. The tower will be 155 ft. high, including 10 ft. of foundation, and it is believed will be the highest structure of its kind in the world. The tank, supported on pillars at the top of the tower, will be 90 ft. in diameter and 22 ft. in height, with a capacity of 750,000 gallons. The total weight of the structure with a full tank of water will be between 7,000 and 8,000 tons.

Although this Goole tower will be the highest in the world it will not be the largest, this distinction being held by the tower at Rosario, S. America. The latter tower, which was described and illustrated in the "*M.M.*" for August, 1925, has a capacity of 1,000,000 gallons, its total height from the ground being 131 ft.

* * * *

Canadian Hydro-Electric Scheme

The Ontario Hydro-Electric Commission will shortly proceed to develop Alexander Falls on the Nipogon River, the necessary authority having been secured. The cost is estimated at nearly £2,000,000 and the development will add a further 50,000 h.p. to the 65,000 already generated in that area.

* * * *

Railless Cars

Owing to the heavy cost of tramway track maintenance, the Keighley (Yorks.) tramways undertaking decided some time ago to substitute railless cars, and recently the last portion of the track was torn up and removed. Keighley is the first town in the country to abolish its rail cars entirely.

Trans-Atlantic Wireless Telephony

In these notes last month we recorded briefly the successful experiment in wireless telephony between London and New York, and we now give further details of this important event. Sunday, 7th March, of this year marked an epoch in telephony, not only because of the remarkable demonstration of trans-Atlantic speech, but also because it was the 50th anniversary of Graham Bell's application for his original telephone patent.

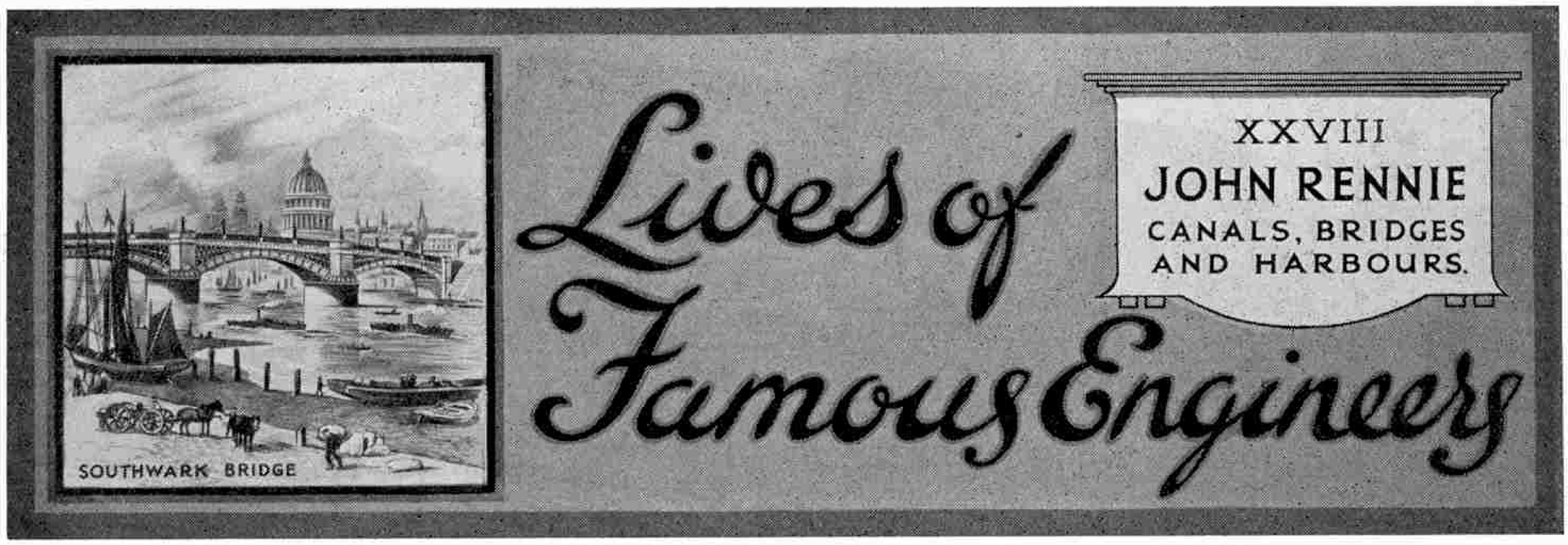
The messages in this first experiment were sent from the London Trunk Telephone Exchange over a land line to the Rugby station, which transmitted them to Houlton (Maine), 2,900 miles away, on a wavelength of 5,770 metres. From Houlton the ordinary telephone circuit was used to convey the messages to New York, from where replies were sent by telephone to the Radio Corporation's transmitting station at Rock Point, Long Island, 70 miles distant.

The American transmissions were made on a wavelength of 5,260 metres. They were picked up at the P.O. receiving station at Wroughton, near Swindon, and forwarded to London by telephone. The power used by both wireless transmitting stations was approximately 200 kilowatts. but the systems in use achieve so high a percentage of efficiency that the power corresponds to several hundred kilowatts as used by ordinary broadcasting stations.

* * * *

Two Cruisers Launched

A unique incident in Naval history occurred recently when two of the five new cruisers, "*Kent*" and "*Cumberland*," were launched on the same day. Never before have two Naval vessels of this class been launched on the same day.



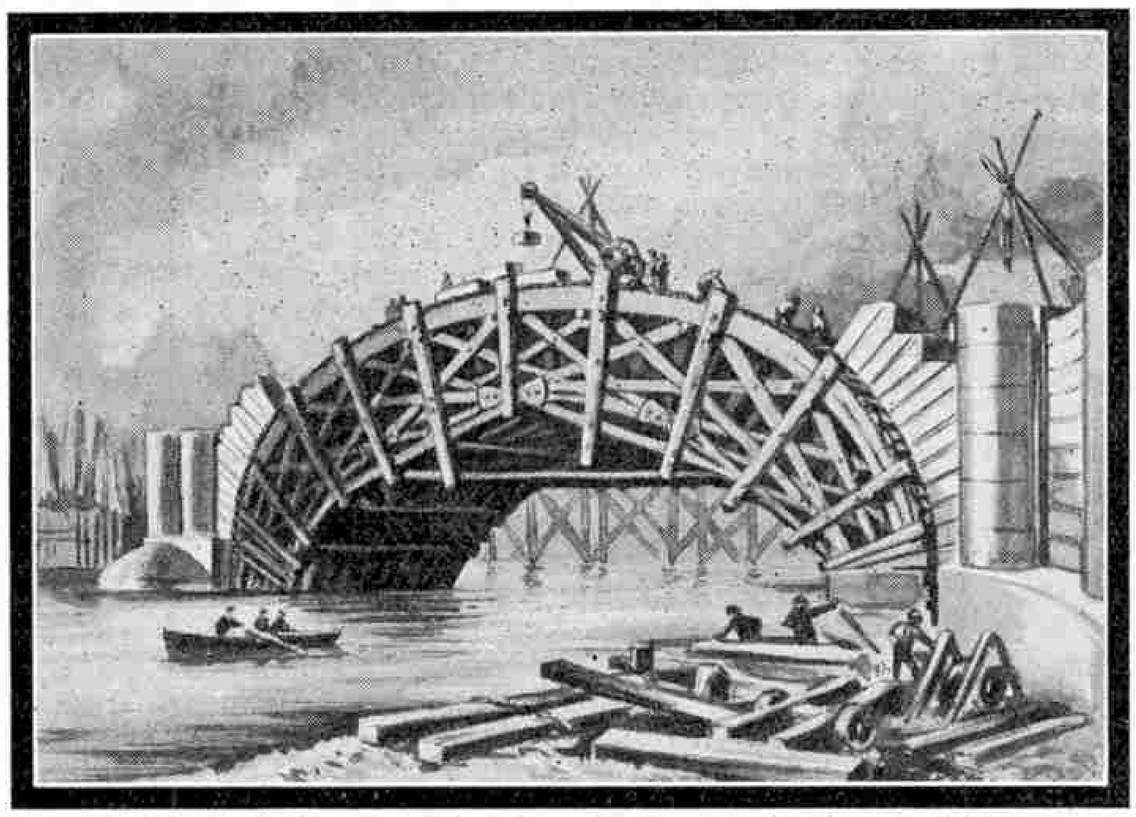
IF John Rennie's fame rested entirely upon his various bridges he would still hold a foremost place among our great civil engineers.

Unlike certain other engineers of his day, Rennie did not despise theory in bridge-building operations, for he realized that successful practice must be based upon sound theory. Up to his time the building of arches, for instance, had been largely a matter of guesswork aided by the engineers' instinct. Rennie, however, studied the structure of the arch in great detail and worked out definitely the best methods of building in order to secure the greatest amount of strength and perfect equilibrium.

Kelso Bridge

After providing designs for several bridges, which were not constructed on account of lack of money, he was engaged to build a bridge across the Tweed at Kelso. This bridge, which was designed in 1799 and opened in 1803, enabled him to show what he could do in the way of combining strength with architectural beauty.

The bridge consisted of five semi-elliptical arches of 72 ft. span, each rising 28 ft., and four piers each 12 ft. thick. It carried a level roadway 23 ft. 6 in. wide between parapets and 29 ft. above the average surface of the river. The foundations were particularly secure, being laid by means of cofferdams upon solid rock in the bed of the river. This bridge was regarded for a long time as one of the finest structures of its kind and it may be regarded as marking the beginning of a new era in British bridge-building.


Method of Constructing the Arches of Waterloo Bridge

Proposed Bridge across Menai Straits

In 1801 Rennie was requested by the Secretary for Ireland to examine the road through North Wales to Holyhead with a view to improving the then wretched and even dangerous communication with Ireland. The construction of a bridge across the Menai Straits, as an alternative to the existing ferry, would obviously form a necessary part of any such improvement scheme, and Rennie proposed to cross the Straits by a single cast-iron arch of 450 ft. span, the height of its crown to be 150 ft. above high water at spring tides. This arch was to be supported upon two stone piers 75 ft. thick. The estimated cost of the bridge and its approaches was £268,500.

Rennie also proposed a similar bridge of 350 ft. span for the crossing of the Conway River. Neither scheme was carried out, and it was not until many years afterwards that both these stretches of water were spanned by Telford with suspension bridges and, at a still later date, by Robert Stephenson with tubular bridges.

The first bridge constructed by Rennie in England was that over the Witham at Boston, Lincolnshire, in 1803. This was the first of his cast-iron bridges and it consisted of a single arch of iron ribs. Its design was simple but artistic and it served perfectly for the accommodation of the busy street traffic.

Rennie's Thames Bridges

Rennie designed many other bridges, but his greatest fame in this department of engineering rests upon his magnificent Thames structures, one of which, the Waterloo Bridge, has been prominently before the public for a considerable time.

The project of a bridge to connect the Strand near Somerset House with the Surrey side of the Thames at Lambeth dates back to 1809, when a bridge company took up the matter. A plan was submitted by George Dodds, a well-known engineer of the time, but was not approved. Later, when the Act authorizing the construction of the bridge had been passed, the company applied to Rennie for advice as to a suitable structure.

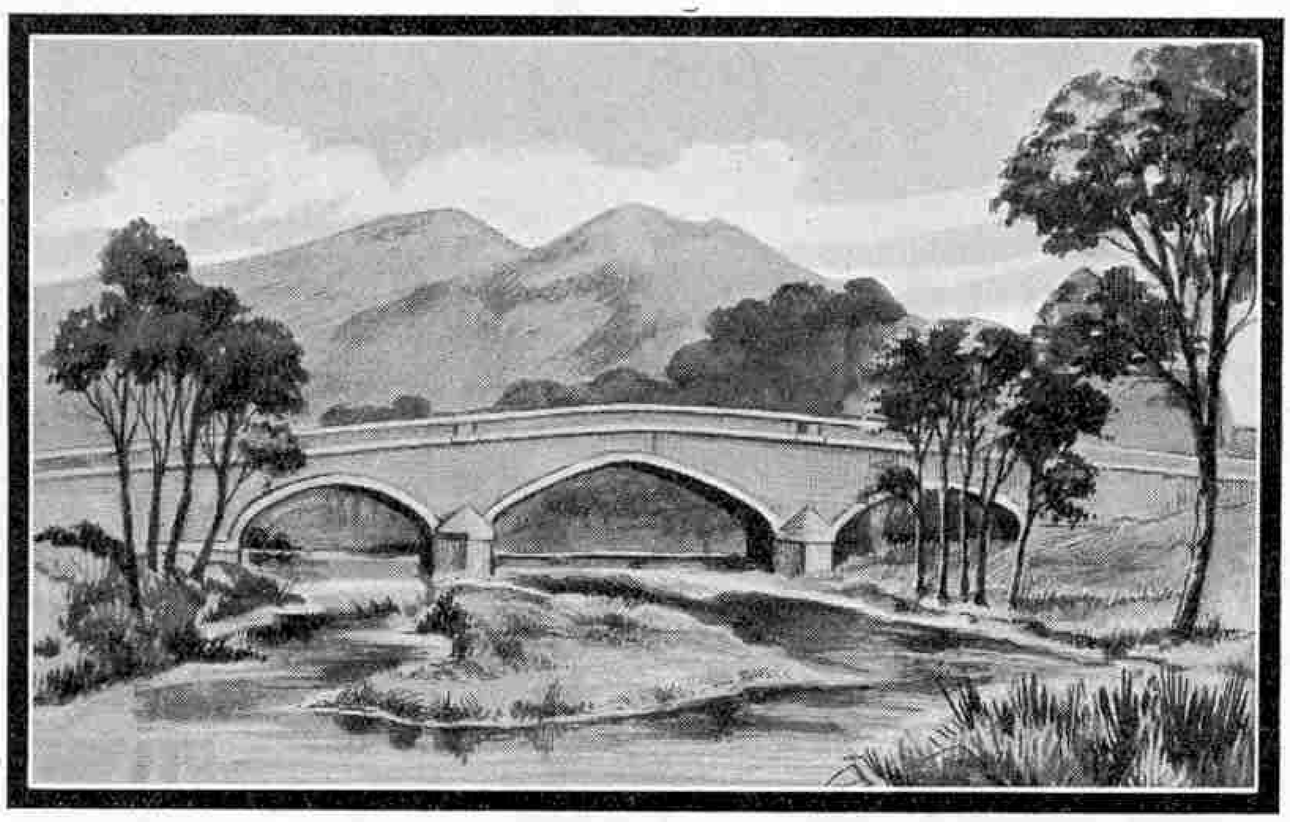
Rennie's first step was to make an entirely fresh chart of the river and its shores after a careful survey had been made by Francis Giles, an expert land surveyor, whom Rennie had frequently employed to carry out the hydraulic surveys for the canals and harbours under his construction. Two designs were prepared, one with seven equal arches and the other with nine, and after

due consideration the nine-arch scheme was ordered to be carried out.

Waterloo Bridge

The Waterloo Bridge as executed consists of nine equal semi-elliptical arches each of 120 ft. span with a rise of 34 ft. 6 in. The piers are 20 ft. wide, each having projecting buttresses supported by two three-quarter Doric column pilasters after the design of the temple of Segesta in Sicily. The roadway above the piers is supported by six brick walls 2 ft. 3 in. thick, covered with corbel stones. It was formed by a layer of puddled clay 15 in. thick, then a layer of lime and fine gravel 3 in. thick, followed by a layer of granite, broken in pieces 2 in. in diameter, 1 ft. thick. The roadway for carriages is 28 ft. wide and the footpaths on each side are 7 ft. wide.

Through the centre of the masonry of each pier a hole 18 in. in diameter was cut, entering the river at one side of the pier at low water, and from the top of this hole inside the pier pipes were carried to drains on each side of the roadway, thus effectually carrying away all rain and surface water into the river.



Rennie's first bridge, across the Water of Leith, near Edinburgh

Founding the Piers

The engineer Dodds had proposed to found the piers of his bridge by means of caissons, but Rennie decided upon the use of cofferdams. A cofferdam may be described as consisting of two concentric rings of piles driven in contact with one another around the area on which the foundation is to be built. The space between the two rings of piles is tightly packed with clay so as to make the enclosure watertight, and the water inside is pumped out. Excavation to the proper depth is then made, the foundation is laid, and building operations proceed until the pier has reached a height above the level of the outside water. At this stage the cofferdam has served its purpose and is then removed.

The method employed by Rennie for constructing, floating and fixing the centres for the arches was very ingenious. Each centre consisted of eight ribs on the truss principle, resting upon wedges supported upon struts placed upon the offsets of the piers and abutments. All the ribs were connected together by transverse and diagonal ties as well as planking upon which the arch-stones rested.

The centres were constructed on a platform by the riverside, floated between the piers on barges specially built for the purpose, and raised into their proper places by means of four powerful screws fixed in cast iron boxes firmly bedded in the solid floor of the barge. The scheme proved so successful that the fixing of one centre was usually completed within a week. This method was new at the time and it is interesting to note that it was the same as that afterwards followed by Robert Stephenson in fixing the great tubes of the Conway and Britannia Bridges.

Rennie Escapes Knighthood

The bridge and its approaches were completed and opened with great ceremony in June 1817 by George IV., then Prince Regent, who was accompanied by the Duke of Wellington. It was originally named the Strand Bridge, but the name was subsequently altered to Waterloo in commemoration of the Battle of Waterloo and in honour of the Duke.

At the opening ceremony the Prince Regent offered to confer the honour of knighthood upon Rennie, who respectfully declined it. Writing afterwards to a friend he said: "I had a hard business to escape knighthood at the ceremony." He preferred to remain simply John Rennie, engineer of the noble structure he had successfully brought to completion.

Future of Waterloo Bridge

As all our readers know, Waterloo Bridge has developed various signs of weakness and its condition has given rise to considerable anxiety. Last year the bridge was closed temporarily for repairs due to the subsidence of one of the stone pillars. This repair involved moving a 280 ft. span weighing 500 tons a distance of 93 ft. sideways from the old bridge to four concrete caissons provided for its support. The purpose of this span was to form a temporary bridge, and a description of the remarkable manner in which it was moved into position was given in the "*M.M.*" of January last.

There has been a great deal of discussion in regard to the future of Waterloo Bridge. The experts of the London County Council were of opinion that the structure was worn out and dangerous and therefore should be demolished. This recommendation raised a great outcry among those who were anxious to preserve the bridge on account of its architectural beauty and because it is one of the masterpieces of Rennie, and other experts were consulted with regard to the possibility of giving the old bridge a new lease of life by repairing it and strengthening it while still preserving its distinctive features. Many eminent engineers among this second group expressed the confident opinion that the bridge could be saved by underpinning in the same manner as the south pier of the High Level Bridge at Newcastle was dealt with a few years ago.

No definite decision as to the fate of the bridge has yet been reached, but it is hoped that the London County Council engineers will see their way clear to adopt measures less drastic than the demolition of what must be regarded as a national monument.

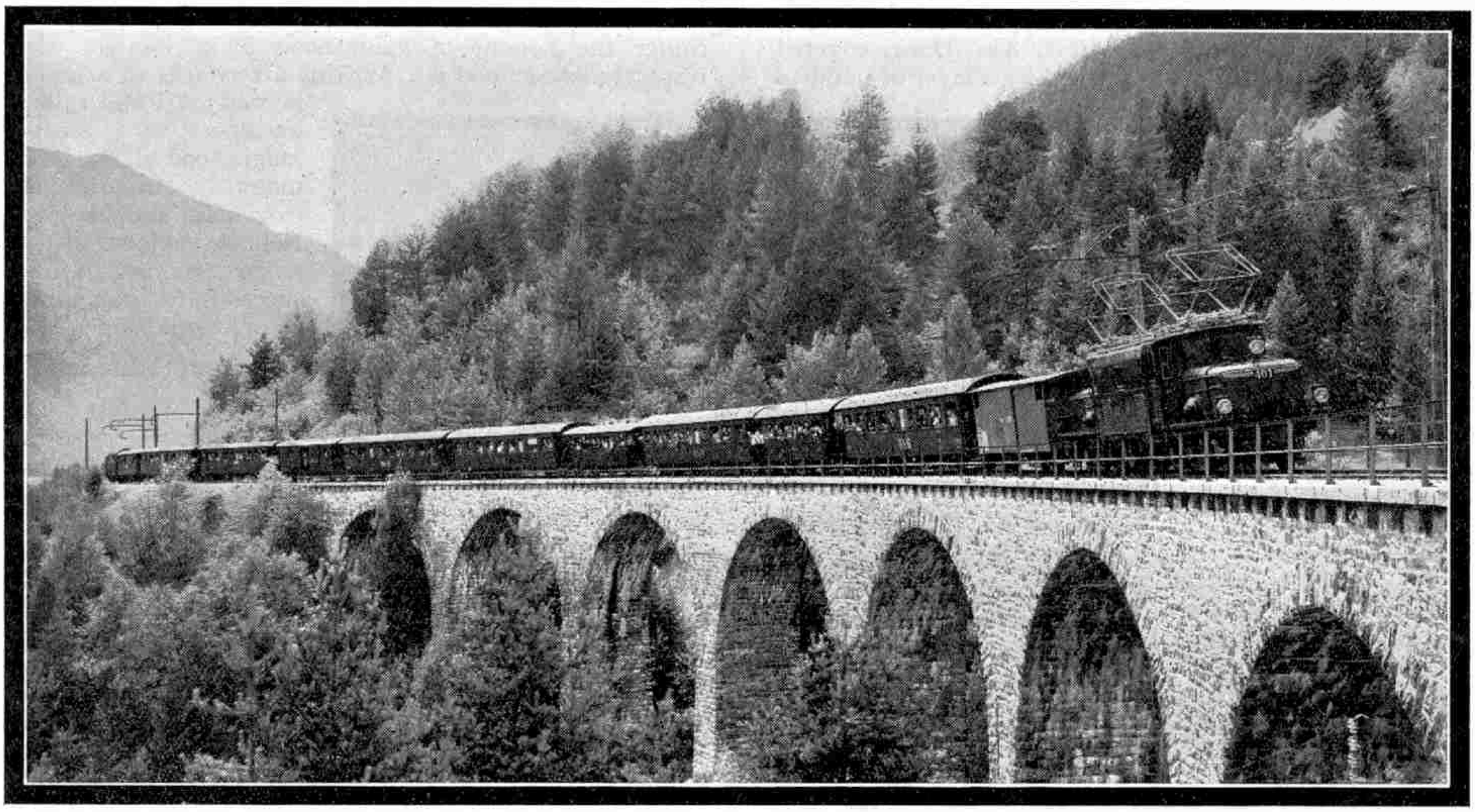
Southwark Bridge

In 1813 or 1814 Rennie was appointed chief engineer to the Southwark Bridge Company, which was formed with the object of providing a bridge between Blackfriars and Old London Bridge. The population on both sides of the river had increased so rapidly that the new

(*Continued on page* 336)

The Rhaetian Railway

An Electric Mountain Railway with 81 Tunnels and 407 Bridges



1000 h.p. Electric Loco hauling 200 ton train over the mountain stretch between Tiefencastel and Filisur

(*Continued*)

In the Grisons there are several railways, a total of about 250 miles of narrow gauge railways having been built since 1889. All the railways are now run by electricity—a fact particularly appreciated by visitors, for the wonderful scenery is thus unpolluted by smoke from steam locomotives. Had steam-power been retained, travelling by rail would have been very expensive, because of the exceedingly high cost of coal and the difficulty in transporting it.

Of the several railways in the Grisons, the Rhaetian Railway is the most important. It consists of 173 miles of permanent way, and is a marvel of engineering skill from many points of view. The first portion to be built, the Prätigau line from Landquart to Klosters, is slightly over 20 miles in length and was opened on the 9th October 1889. In July of the following year a further 10½ miles were added—from Klosters to Davos—and in 1896 the line was extended from Landquart to Thusis, and a further 25 miles added.

In that year the original private undertaking, which had built the line from Landquart to Davos, became known as the Rhaetian Railway Company and the canton of Grisons and the Swiss Confederation became the principal share-holders.

On the 1st June 1903, a further 12 miles of track, from Reichenau to Ilanz was opened, and on the following 1st July the Engadine celebrated, by a triumphal procession and general rejoicing, the completion of the Albula railway, from Thusis to Celerina, a distance of 37 miles.

A Wonderful Achievement

The line from Celerina to St. Moritz (2 miles), was finished in 1904, and four years later that from Samaden to Pontresina (3 miles), and Davos to Filisur (12½ miles). In July 1913 the scheme was completed by the opening of 31 miles of line between Bevers and Schuls.

The approximate cost of this completed electrified railway system was 120,000,000 frs. (£4,600,000) or 1,000 frs. (about £38 10s. 0d.) per head of the population.

Although a mountain railway, the Rhaetian Railway is exclusively an adhesion railway, rack and pinion not being used anywhere. Because of the mountainous country traversed and its extremely difficult alignment, the construction of such a railway has always been considered a wonderful achievement. Its maximum gradient does not exceed 237.6 ft. per mile, however, whilst even the rack railway at Mount Pilatus does not climb at more than 306.25 ft. per mile.

The maximum gradient on any of the permanent lines of the Rhaetian Railway is 1 in 28.5, and the maximum on the section between Landquart and Davos is 1 in 22.2.

The normal minimum curve radius is 393.7 ft., but in a few difficult places this has been reduced to 328 ft. The average speed attained is 21.6 miles per hour

and the maximum speed 28 miles per hour.

Tunnels and Bridges Galore

The track consists of 57½ lb. vignole rails. Of the total of 173 miles of permanent-way about 104 miles are straight, the remainder being on curves. Over 18¾ miles of track is laid through 81 tunnels and over 5¾ miles is laid over 407 bridges.

The termini at Landquart and Coire are respectively 1,729 ft. and 1,929 ft. above sea-level. The highest points are at Wolfgang, near Davos, which is 5,330 ft. above sea-level, and in the Albula Tunnel, 5,981 ft. above sea-level. This tunnel, situated at the highest section of the line, is nearly 11 miles in length, and is the highest tunnel in Europe.

The high altitude naturally necessitated many loop developments in the track, the most notable of which is between Bergun and Preda, where there are seven loop tunnels 2¼ miles in length. On emerging from the last tunnel, there is a wonderful view of the Albula Valley, and immediately below are visible the many loops of the line, a sight unique and impressive.

Although the cutting of these tunnels was a great engineering achievement, the most outstanding feature of the railway is undoubtedly the large number of bridges and the wonderful way in which the difficulties of their construction have been overcome.

Some Splendid Bridges

We have already mentioned that on the railway there are over 407 bridges with a total running length of over 5¾ miles. These bridges, built throughout of stone, cross the many valleys fed by the mountain streams.

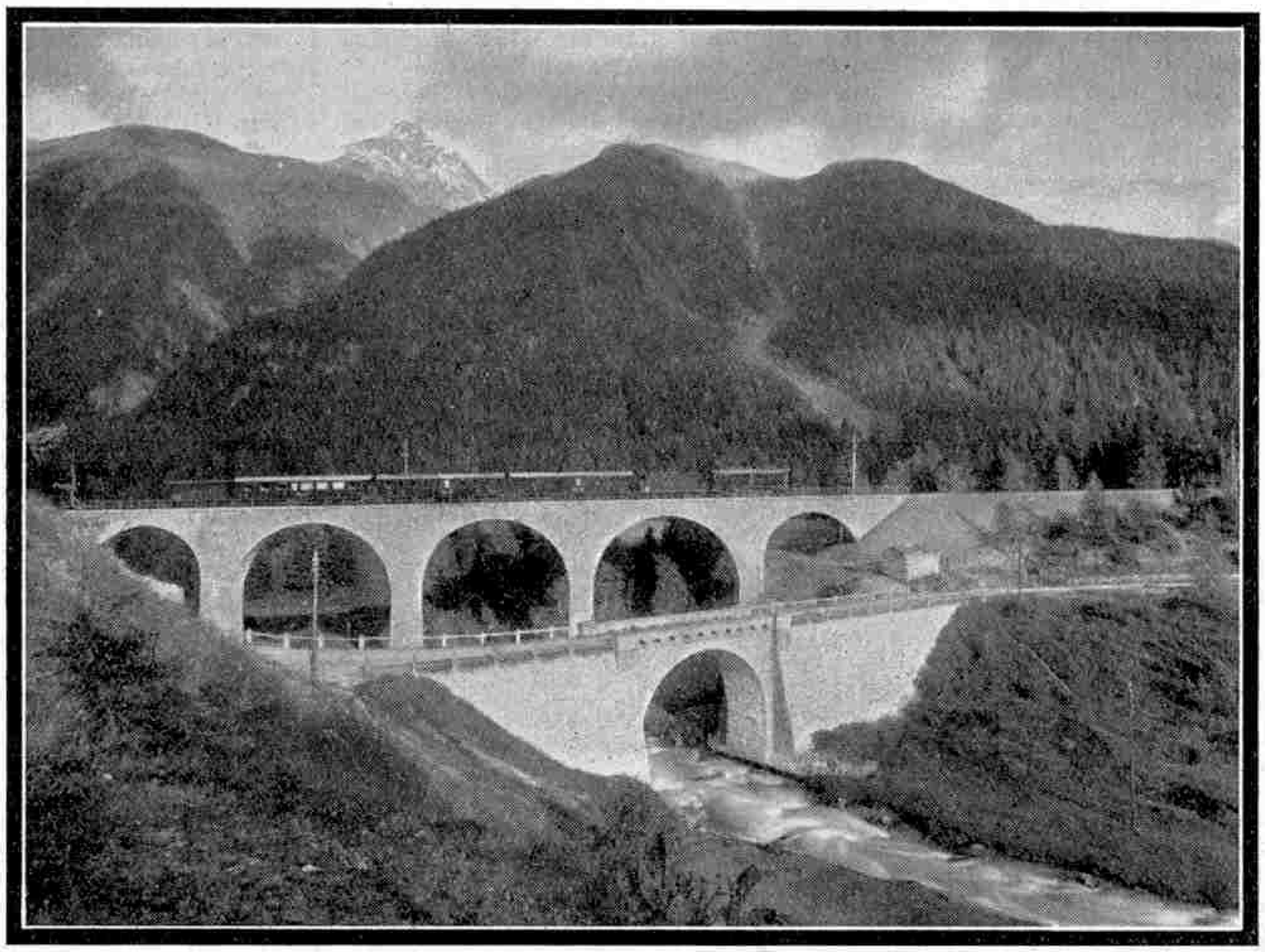
Perhaps the finest example of a notable group is that near Wiesen station, on the Davos-Filisur line. This bridge, with a total length of 687 ft., has a middle arch of 180 ft. span, at a height of 292 ft. above the Landwasser river.

Another fine example of bridge-building is the Solis Bridge, 543 ft. in length, with a middle span 138 ft. in width and 291 ft. above the Albula river. Incidentally, it may be mentioned that the narrow gorge of the Albula is also bridged by the highest road bridge in the Grisons.

The Landwasser viaduct between Alvaneu and Filisur has six spans of 66 ft., at a height of 213 ft. above the valley, and a minimum radius of 390 ft.

The Rusein Bridge close to Disentis, with four spans of 66 ft. each, is 183 ft. above the gorge, which is also bridged nearer to the mountain by the highest wooden structure in the country, still in good preservation and 183 ft. in length.

Two other interesting bridges are the Inn Bridge near Cinuskel, 153 ft. in length, and the Püzza Bridge near Fetan, 438 ft. in length with four spans of 87 ft. each.



The Sulsanna Viaduct, and the Road Bridge

Economy Effected by Electrification

Owing to the very high cost of the working, particularly in bad weather, and the mountainous nature of the country traversed, the rates on the Rhaetian Railway had to be fixed considerably higher than in flat country running.

In the days of the steam trains, coal had to be imported and its high cost caused the subject of electrification to receive serious consideration, so therefore in 1910, when the section from Bevers to Schuls was being built, the management decided to introduce electric traction. It was also decided to electrify the existing Engadine tracks by way of a first experiment. A single phase alternating current of 16⅔ periods was used, giving a trolley-line potential of 11,000 volts and the experiment proved highly successful. Since 1913 all the tracks in the Engadine have been electrically operated, although the success of the innovation was a foregone conclusion.

The many advantages of electrification on the whole of the railway had long been under review, and it was the scarcity and excessively high price of coal during the war that finally decided the management to electrify the remaining tracks.

A commencement was made with the steeper gradients, which were linked up with the large transformer station at Bevers, and by 1919 the line from Bevers to Filisur was ready for electrification. The tracks from Filisur to Thusis and Landquart, and from Filisur to Davos, Klosters and Landquart, were next equipped in rapid stages. The work went on simultaneously, so that by the summer of 1922 the whole of the Rhaetian Railway had been converted for electric working.

The Powerful Electric Locos

Power is drawn from the Grisons Electric Co., in Coire, and from the Rhaetian Electric Company in Thusis. The former company has a power station delivering a single phase alternating current of 11,000

volts by means of a hydro-electric plant, using rotary single-phase transformers each of which has an output of 2,400 k.w. The Rhaetian Electric Co., in Thusis, supplies current by two sets of hydro-electric single-phase rotary generators, each producing 2,000 k.w. This company has also taken from the Brusio Co., the transformer station at Bevers, which operates the railway system running parallel with the Thusis works.

At present the Rhaetian Railway owns 25 electric locomotives, seven of which develop 300 h.p., eight 600 to 800 h.p. and ten 1,000 h.p. The latter high power locos are of special technical interest, and are the most powerful narrow-gauge electric locomotives yet built. They weigh 66 tons and can haul a freight train of 200 tons on a gradient of 1 in 28.5 or 150 tons on a gradient of 1 in 22, and are able to attain a speed of 21.8 miles per hour.

Electric Railways in Switzerland

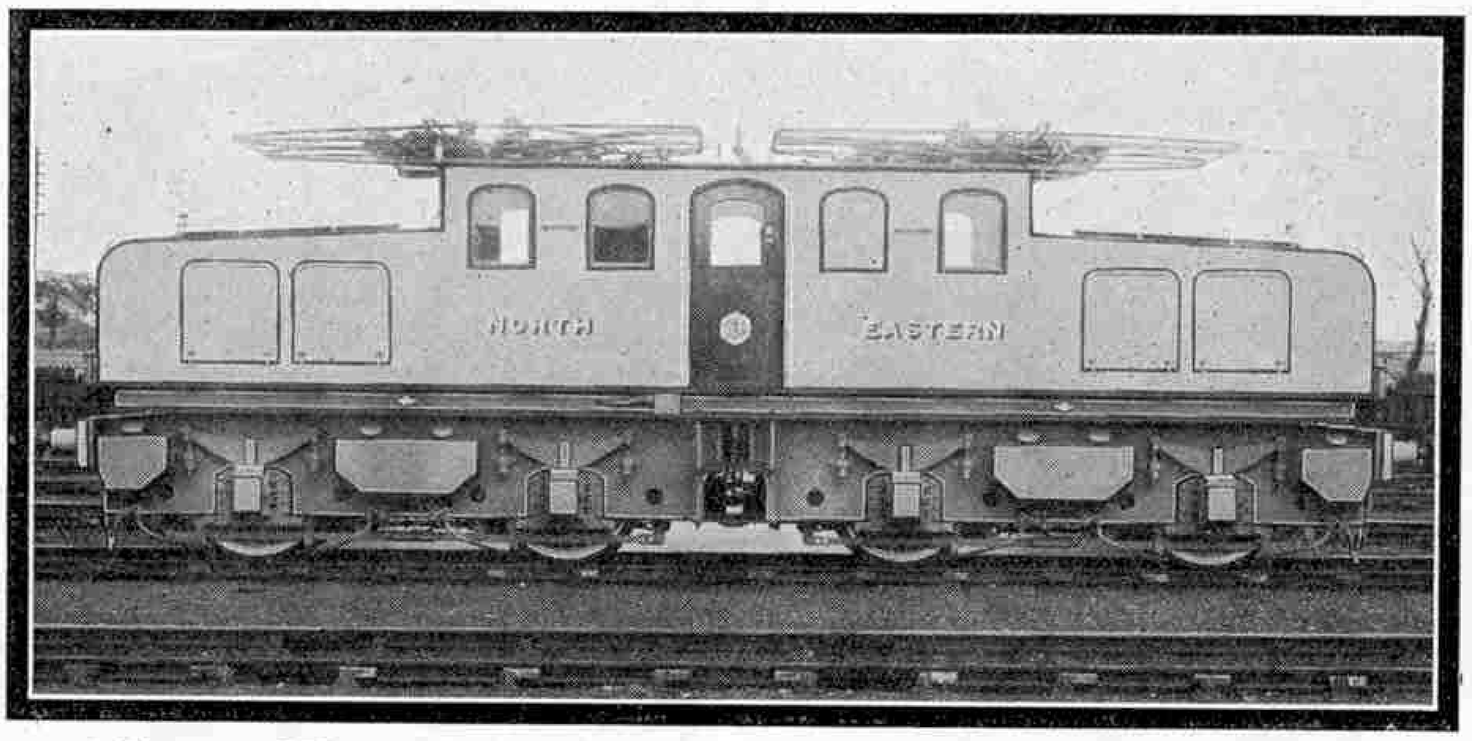
The extent to which electricity is applied to railway working in Switzerland is well illustrated by some recently published figures regarding the Swiss Federal Railways. At the beginning of last year the electrified portions of these railways included 75 km. of lines working with three-phase current at 3,000 volts and 536 km. working with single-phase current at 15,000 volts. During the period between the beginning of 1925 and February this year an electrification programme prepared in 1918 and revised in 1923 was completed on 313 km. bringing the total length of electrified line up to 924 km. (about 574 miles) which represents 31 per cent. of the Federal Railway system. It is expected that by the end of the present year electric traction will have been introduced on lines totalling 85 km.

With the completion of their electrification programme in 1928-29 the Federal Railways will have approximately 1,620 km. (1,006 miles) of lines operated by electricity, or 56 per cent. of their system. Electric traction will apply to 75 per cent. of their total traffic. A pause in electrification work will probably occur after that date, although a number of requests for the transformation of other lines not included in the 1918-23 programme have already been submitted to the Federal Railways. The price of coal is expected to be the determining factor when fixing a date for the resumption of work.

Recent calculations of the Federal Railway Board, based on the experience gained in 1924 and 1925, show that with the completion of the electrification programme in 1928-29 electric traction ought to be decidedly cheaper than steam traction. Recent extensions have demonstrated that the profitableness of electricity as a prime mover increases with the length of the electrified system.

Standard Types of Locos

The Federal Railways are endeavouring to adopt standard types of locomotives namely (i.) express for mixed traffic on the plains; (ii.) express for mixed traffic on mountain routes; (iii.) goods; and (iv.) motor-coaches. The average ratings and maximum speeds of these types are respectively 1,900 h.p. and 90 km. (56 miles) per hour, 2,000 h.p. and 75 km. (46 miles) per hour, 2,200 h.p. and 65 km. (40 miles) per hour, and 900 h.p. and 75-90 km. (46-56 miles) per hour. Individual axle drive is favoured for fast locomotives, while coupling rods are in use on mountain express and goods engines. A larger type of express engine for the plains is under construction; it will be of the 4-8-2 wheel arrangement, with a rating of 2,800 h.p. and a maximum speed of 100 km. (62 miles) per hour. Two electric shunting locomotives of 700 h.p., which were put into service in 1924, have proved entirely satisfactory, and 10 more have been ordered. A fresh order for 54 locomotives and 16 motor-coaches was placed with three Swiss firms in January 1926. At the end of 1927 the Federal Railways will have 370 electric locomotives and motor-coaches in service, and these are expected to do the same work as 490 steam engines.



A Pioneer of Electric Freight Locos in England. The L.N.E.R. Shildon-Newport Electric Loco

Reconstruction of Bridges

One of the principal items in electrification is the reconstruction of numerous bridges, which is necessitated by the greater weight per axle (maximum 20 tons) of electric locomotives. The biggest undertaking in this connection is the reconstruction of the Grandfey Viaduct, near Fribourg, which was built in 1869 and has a length of 383 metres (1,276 ft.) and a height of 78 metres (260 ft.) It will be completed in the spring of 1927, at a total cost of four and a half million francs (£160,000). There is only a single track at that point, and the work has to be carried out without any interruption of traffic.

What's in a Nom-de-Plume

Jack was turning over the pages of back numbers of the "*M.M.*," and when he came to anything that he could not understand, he would ask his elder brother, Tom, to explain. Tom was trying hard to solve a problem for himself with his Meccano Outfit, so that, I'm afraid, his answers were not always as clear and convincing as they might have been otherwise. But nevertheless he did his best to maintain his reputation, so that, on coming to the cycling articles on the "Open Road" page, Tom felt it was "up to him" to give Jack something to think about :—

" Who is this ' Rover ' Tom ? "
Jack ask'd his brother.
" Oh ! don't bother Jack, he's—
Someone or other."
" Please don't put me off Tom,
I've *got* to know—true ! "
" Then, if that's the case John,
Just look up ' Who's Who ! ' "
" But, surely you've heard Tom,
So come—be a sport !
And tell me what truth there
Is in the report,—
That his ' family ' boasts
Great men by the score !
And has ancestors quite
A mill-ion or more ! "

" If you really *must* know
Jack, let me own up—
The ' Rovers ' that I know
Did *not* ' lift the Cup,'
But, *other* things mostly—
Now I come to think,
Right back through the ages
As far as the Link ! "

" The Peter Pan pirates
And the bold Tom Jones,
Honest (!) John Silver—and
Er—well, dead men's bones !
Dick Turpin of course, and
Old Ad-m'ral Benbow,
Are *these* the Rovers, Jack,
That you *want* to know ? "

" But, don't be alarm'd, Jack,
As far as that goes,
There were heaps of others
Who made decent ' shows.'
Just take for example
The brave Robin Hood.
His exploits—remember
Were really quite good ! "

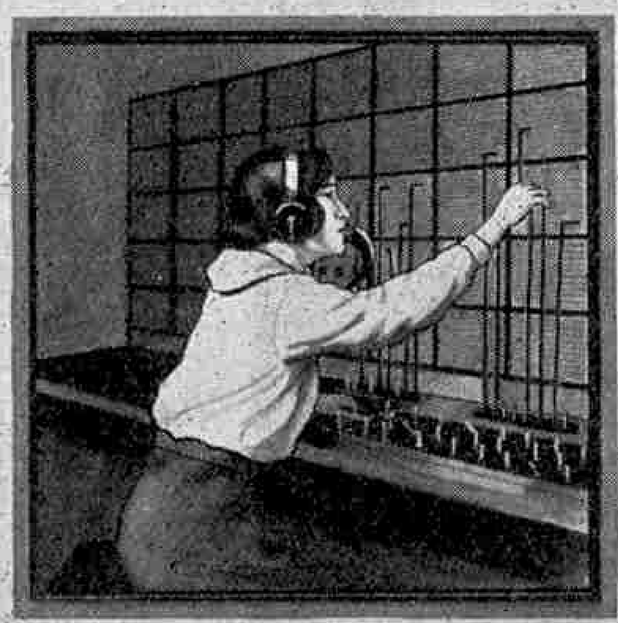
" It matters *now*, little,
Whether your ' Rover '
With Will-iam the Conq'rer
Really ' came over.'
You may rest quite assur'd
That he ' plays the game,'
And, as for the rest, Jack,
Well—just do the same ! "

R. C. Manning ("Rover")

Better Shoes Coming

The American Chemical Society announces that after considerable research processes have been evolved by which the life of leather may be prolonged and hundreds of thousands of pounds saved to industry. One process involves using Glauber salts instead of the common salt in tanning hides. The presence of calcium chloride in the salt is said to be destructive, whereas the substitute is reported to have a definite preservative action.

An apparatus has been invented for determining what kinds of leather allow the greatest amount of moisture to pass from the foot and thus increase the wearer's comfort. It was found that patent varieties permit the least evaporation and ordinary calf leather the greatest. Science's warfare against bacteria of all kinds is also being used to the improvement of leather in showing how to kill various organisms that cause spots, stains and other imperfections, and in combating the effects of mould, which does its greatest damage after tanning.



Electricity

XXVI. AUTOMATIC EXCHANGES IN LARGE AREAS

THE Strowger system of automatic telephone exchanges, as far as we described it last month, is only suited for single exchanges. Unlike manual practice, however, an automatic exchange may be sub-divided and its parts distributed throughout several buildings in different sections of the area it serves, providing the subscribers' calling numbers are so arranged that successive numbers are situated in the same area.

Splitting up the Exchange

It will be remembered from last month's description that the caller's line terminates in a rotary line switch with twenty-five sets of contacts, these contacts being "multipled" to the corresponding sets of ninety-nine other rotary line switches belonging to the same number of subscribers. Supposing subscribers Nos. 1000–1099 were all situated in the same district at varying distances from their exchange. Instead of taking the hundred lines, that is, the two hundred wires, direct to the main exchange, they could be taken to a small building in the district, where would be situated their hundred rotary line switches and associated Final Selectors. From this building to the main exchange there would be twenty-five trunk lines from the twenty-five sets of contacts of the rotary line switches, thus effecting a considerable saving in wire plant.

It is essential however, in the system as we have so far described it, that the hundred lines should all have numbers belonging to the same hundred group, for when a subscriber from another part of the system is calling one of these subscribers he would be connected by the hundreds selector switch from the main exchange by a trunk line to this subsidiary exchange where would be situated the final selector, that is, the tens and units selector.

It will thus be seen that the simple Strowger automatic system is suitable for areas of any size and of any number of lines providing that the telephone numbers are grouped by districts.

When introducing the telephone into new and large areas that have not hitherto been provided with a telephone service, it is, of course, quite possible to do this, but when converting existing systems to the automatic this is usually impossible without wide redistribution of numbers, resulting in much confusion and annoyance to the subscribers, who resent numbers they have become accustomed to being changed for, to them, a seemingly unnecessary reason.

The Strowger Automatic Director System

Subscriber's Dial, Strowger Director System

In the case of the London area, which is now being converted to automatic, this difficulty arose, and it was considered to be quite out of the question for all the telephones of so large an area to be renumbered. Accordingly, an extension of the existing Strowger system as already described, was devised whereby this difficulty was overcome. This system, known as the Strowger Automatic Director system, is now being installed in the London area and part of it is expected to be in operation towards the end of this year. The work is being pushed forward as fast as possible and in a very few years it may be anticipated that the whole of the metropolitan area will be controlled by automatic exchanges, so that a subscriber in one part may put himself in communication with any subscriber in any other part without human intervention.

The Lettered Dial

So far as the subscriber is concerned the only difference between this Strowger Director system and the simple Strowger system for a single exchange is in the dial mounted on his telephone and in the method of its operation.

The mechanical and electrical construction of the dial are the same as for the original system, but there are the letters of the alphabet in addition to the ten digits, 1 to 9 and 0, appearing under the ten holes in the revolving plate. Under the first hole from the finger stop there is merely the digit "1" as before, under the

second hole is the digit "2" and also the three letters "A B C"; with "3" there are "D E F"; with "4" "G H I"; and so on; "6" has only two letters, namely "M N," "O" (oh) being with "0" (nought) and "Operator"; "9" has "W X Y," there being no "Z."

The procedure when making a call is to dial successively the first three letters of the name of the required exchange and then to dial the number required at that exchange in the usual manner. Thus, to call "MONument 1234" the subscriber would first dial "M," then "O," then "N," followed by the number "1234" in the usual way.

In the telephone directories for these areas where letters have to be dialled as well as numbers, the first three letters of the exchange name are printed in capitals, as "MONument," so that these three letters stand out on the page and ensure that they shall not be forgotten or misdialled.

It will thus be seen that to the subscribers a large area network of telephones and telephone exchanges on the automatic system is no more complicated to operate than a small single exchange area, the only difference being that there are seven items to dial to obtain the required number instead of four, but even this is quicker than the old manual method where the exchange and number required had to be repeated several times as it passed through the different connecting exchanges.

From the dialling standpoint the three letters "MON" of our example are of course the same as "606," for the same movement of the dial transmits the signal for M, N, or 6. Thus the signal "MON 1234" is electrically the same as "6061234" so that in one way this system is merely an extension of the telephone numbers so that all of one "group," that is for example all of the "606——" group shall be in the same area.

The method of operation of the exchange mechanism is not, however, the same as would be the case if it were merely a seven figure number, the principle of finding the required exchange by means of the signal "MON" being somewhat different from the simple Strowger single exchange system of finding numbers.

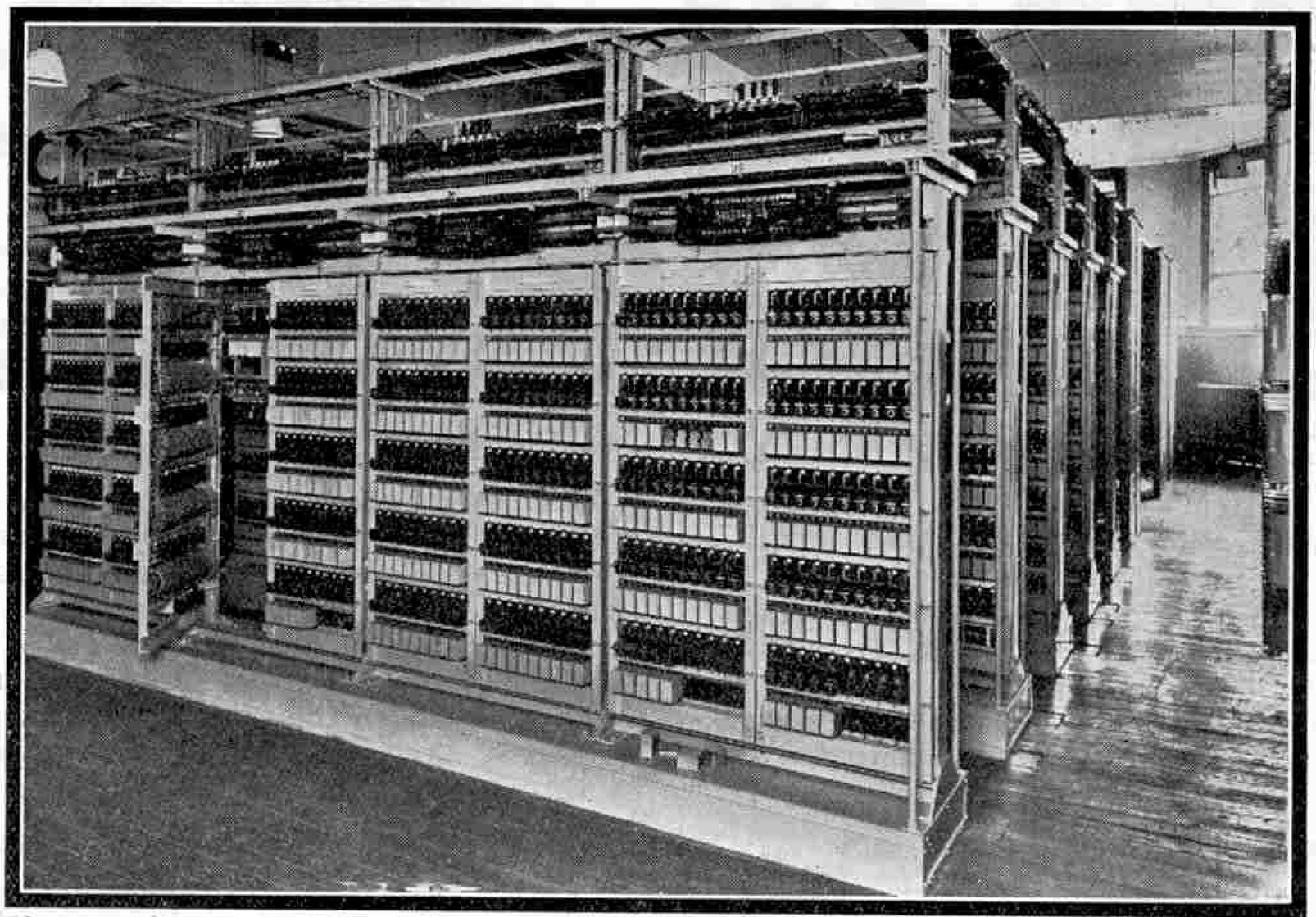


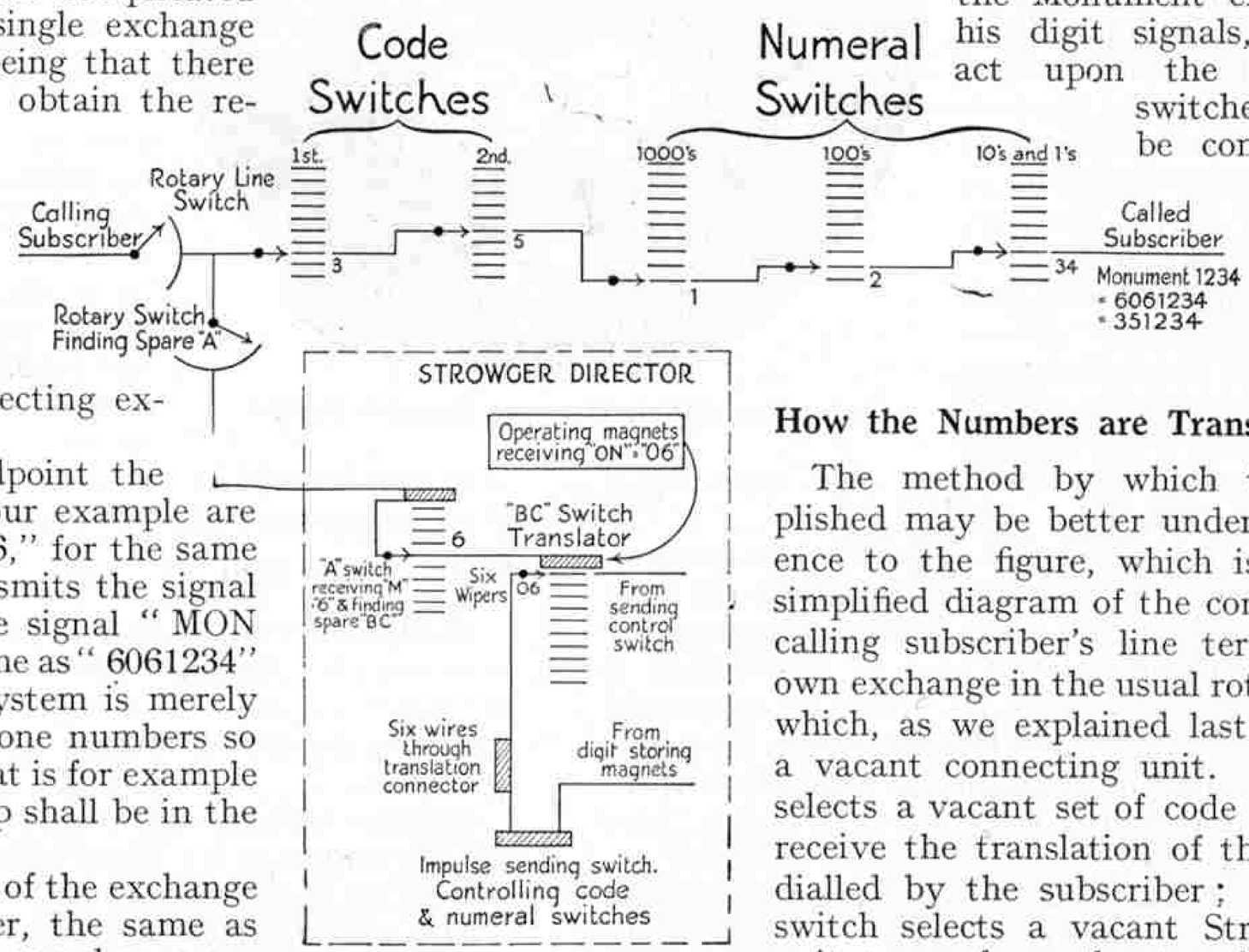
Photo courtesy] [*A. T. M. Co. Ltd.*

Strowger Automatic Telephone Exchange, Ipswich. Switchroom, showing Rotary Line Switch Units

The Basis of the Director System

The Strowger Director unit receives the letters dialled by the calling subscriber and acts as a translator by changing those three signals into any number of not more than six other signals, these being suitable signals to connect the subscriber through the intermediate exchanges to the exchange he requires. For example, in the case we have been considering the subscriber first dialled the letters "MON," which have the electrical equivalent of "606."

Suppose, however, that the connections necessary to put his line through to the Monument exchange are, instead of "606," the two figures "35." The Strowger Director unit will receive the "606" signal and translate this into a "35" signal, which will operate suitable code switches so that the subscriber is put through to the Monument exchange. Here his digit signals, "1234," will act upon the usual selector switches and he will be connected to the subscriber "MONument 1234" to whom he wishes to speak.



Wiring Diagram of Strowger Director System

How the Numbers are Translated

The method by which this is accomplished may be better understood by reference to the figure, which is a very much simplified diagram of the connections. The calling subscriber's line terminates at his own exchange in the usual rotary line switch, which, as we explained last month, selects a vacant connecting unit. In this case it selects a vacant set of code switches, which receive the translation of the letter signals dialled by the subscriber; another rotary switch selects a vacant Strowger Director unit to perform the translating. In the diagram this director unit is contained

within a dotted line.

In the director a vacant "A" selector switch is taken which deals with the first letter dialled. When the subscriber dials this first letter, in this case "M" (="6,") the wipers of selector switch "A" are raised to the sixth level, as shown in the figure, and on this level they rotate until they meet a vacant set of contacts, which connect the subscriber to the translator unit, known as the "BC" switch, since it deals with the second and third letters dialled.

This BC switch is similar to the selector switches we illustrated and described last month, except that, instead of having only one bank of a hundred pairs of contacts, it has a bank of a hundred sets of six contacts, this bank being arranged in three portions one above the other. The selector arm carries six wipers to touch the six contacts of each position.

In the example we are considering, this BC switch will receive the signal "ON," which is equivalent to "06," and accordingly the wipers will be brought into contact with the sixth set on the nought level.

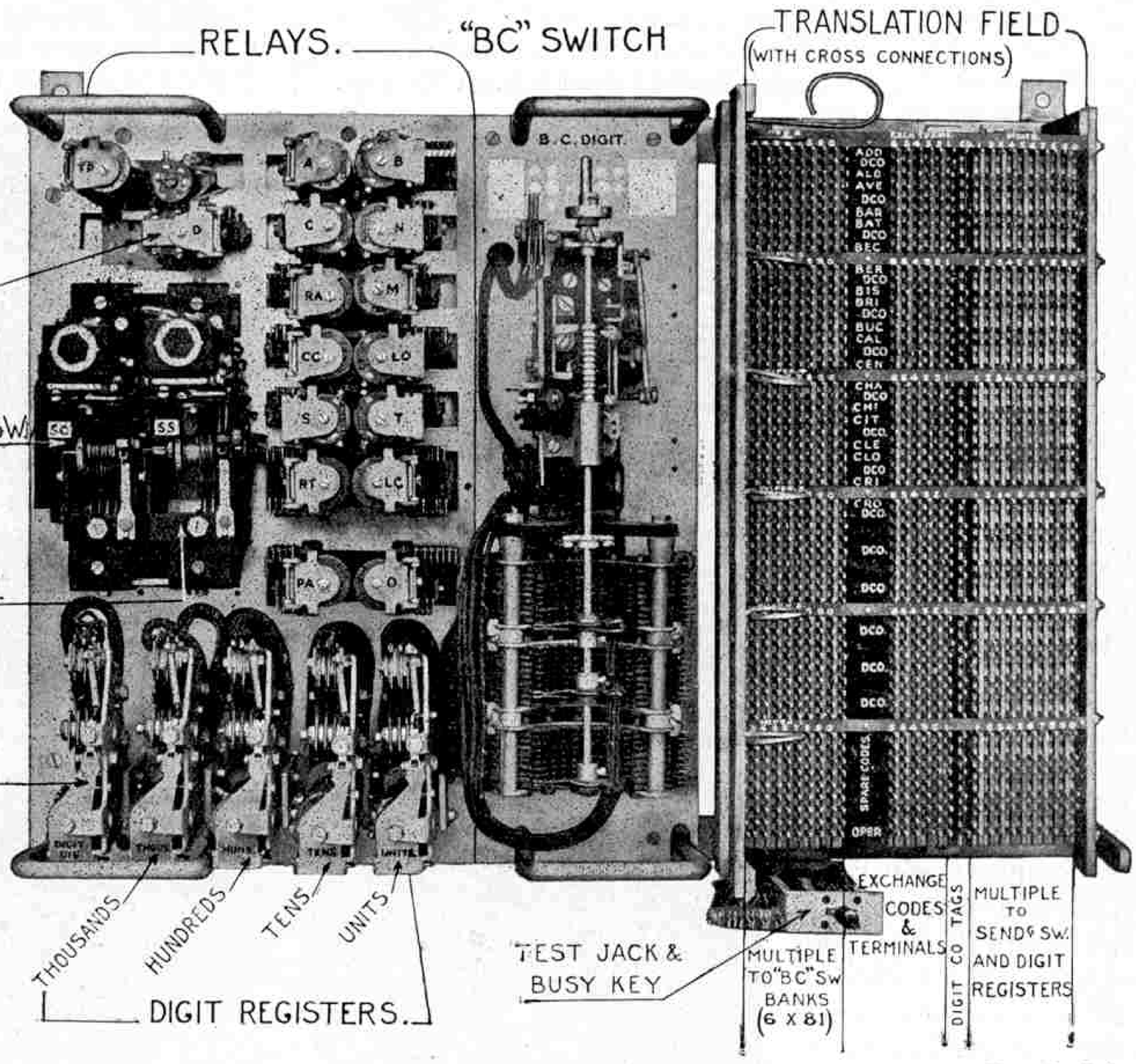
The six contacts, now brought into circuit by the wipers meeting them, pass through a cross connecting frame. A sending control switch sends an impulse through each wiper and its associated wires in the cross connecting frame in turn to the impulse sending switch. These connections can be arranged so that any desired combination of any number of signals up to six may be obtained.

In this case we have supposed that only two connections are required to put the calling subscriber through to the Monument exchange, and we have supposed these required connections to be "35." Accordingly when the sending control switch operates through the first wiper, the signal "3" will be sent via the impulse sending switch to the first code switch, shown at the top of the diagram, and which will be situated in the calling subscriber's exchange. The wipers of this first code switch will now be set on the third row and will select on that row a vacant trunk to the exchange it "knows" as number 3.

The sending control switch now operates through the second wiper and, through the same impulse sending switch, transmits a "5" signal to the second code switch, which will be situated at an intermediate exchange between the subscriber's and the Monument. Accordingly the wipers on this selector switch will be set at the fifth row of contacts and will bring the subscriber into connection with the Monument exchange.

Completing the Connection

In this example we have assumed that only two connections are required to bring the caller to the Monument exchange, but if any additional connections were required up to a maximum of six, the necessary signals would be transmitted in turn through the remaining wipers of the translator or BC switch. In the present case the 3rd, 4th, 5th and 6th contacts of this switch in use are all connected together and in a special way to another part of the apparatus so that they do not act upon any further code switches.



Courtesy] [*A.T.M. Co. Ltd.*

View of Director Assembly

While this translation process has been going on the subscriber has probably been dialling the number of the person he wishes to call. These signals will pass into a special storing device on the director, not shown in the diagram, from which they will be transmitted via the impulse sending switch to the selector switches at the Monument exchange.

In this way the subscriber can be connected through any number up to six exchanges to the party he requires, and it is found even in the largest towns, such as London and New York, that this possibility of six connections is ample to meet all possible requirements. In any case there are no technical difficulties should it be found necessary at any time to increase the number of connections.

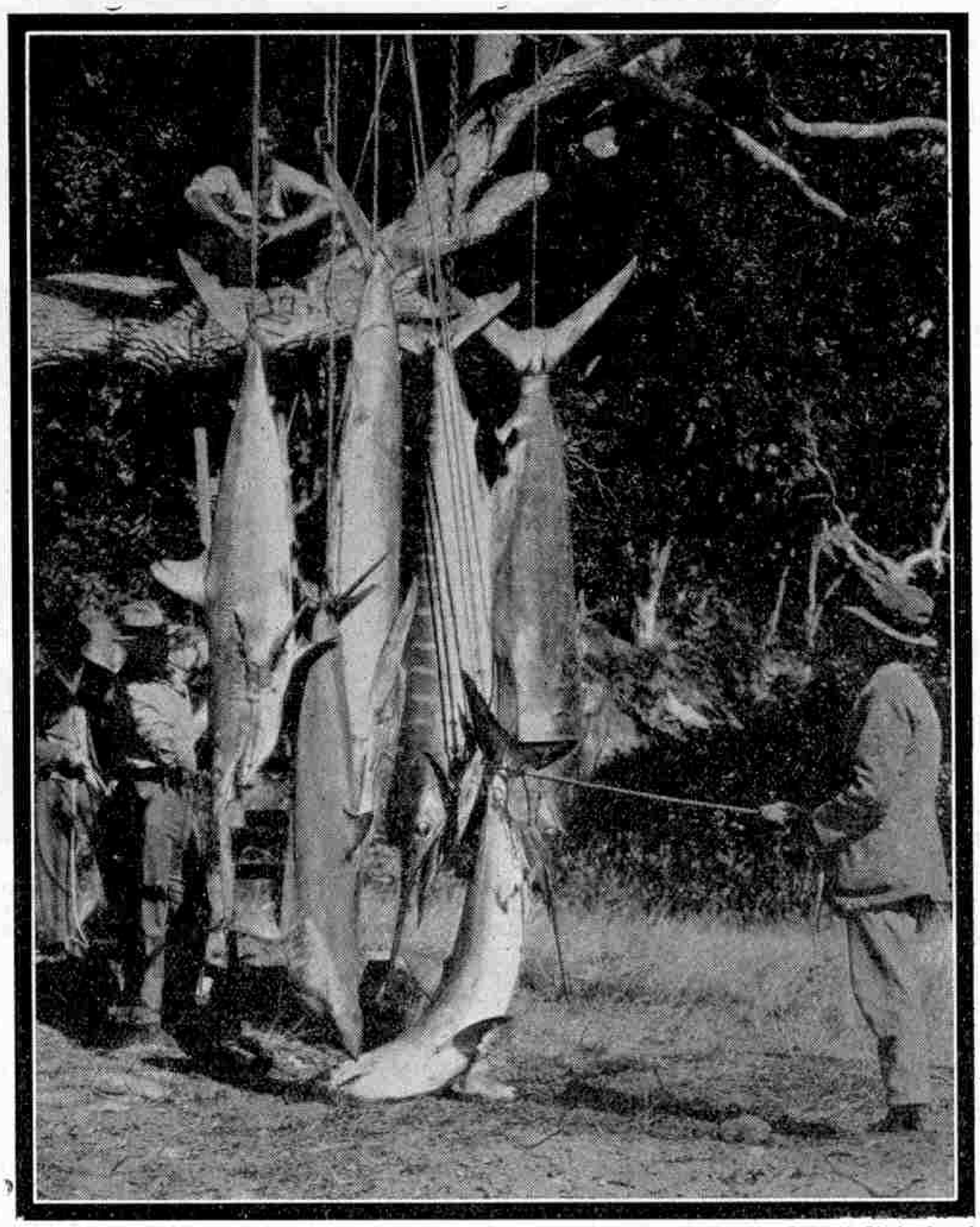
We thus see that the calling subscriber wishing to speak to a friend whose telephone number is "MONument 1234" dials the signal "MON 1234" which has an electrical equivalent of "606 1234." This enters the Strowger Director and is translated to "35 1234" and the call is put through to the person required.

(*Continued on page* 328)

"Big-Game" Fishing

A Wonderful Sport enjoyed in New Zealand

FOR many years New Zealand has been known as a paradise for the sportsman, for no other country in the world is able to furnish such wonderful and thrilling sport for the angler and the man behind the gun. It is only within recent years, however, that the coastal waters of the Dominion have become world-famous for the unequalled sport they provide in the pursuit of the giant swordfish, *mako*, or "tiger shark," and kingfish. These huge fish put up a desperate fight for liberty and provide the deep-sea angler with the most exciting sport possible.



Courtesy] ["Weekly Press," Christchurch

A Day's Catch with rod and line

The Tackle Used

Swordfish and shark run up to over 500 lb. in weight and 20 ft. in length, but the tackle used to capture them is comparatively light. The line employed is not more than a 36-thread, but attached to this is a steel wire trace about 30 ft. in length. This trace is absolutely necessary, for a swordfish can cut a thread line easily with one flick of its tail.

The bait used for big-game fishing is "*kahawai*," a silver-and-green mottled fish of 2 lb. to 3 lb. weight, which is extremely plentiful. This bait is fixed to a triple hook, 3 in. in the shank and 2 in. to 3 in. across the barb, and is trolled behind a motor-launch. The rods employed are either of split cane with steel centre or grown "*tanekaha*," and are fitted with a 6 in. reel to which a strong brake is usually attached.

Relieving the Strain

In order to relieve the long and heavy strain imposed upon the angler in playing one of these enormous fish, a special belt is worn. This is fitted with a socket to take the butt of the rod, and a shoulder strap or canvas vest, to which is attached a cord made fast to a swivel above the hand-grip on the rod, thus allowing the strain to be taken up by the shoulders.

When all is ready the angler sits in the cockpit of the launch as it cruises up and down one of the recognised "swims," trolling his line astern. This procedure may go on for some hours, but sooner or later will come a fierce tug on the line followed by a heavy splash. Instantly the helmsman swings the launch about and away it goes after the fish. The line hisses through the water and it seems as if the fish will never stop "running" or slacken its pace.

The Fight Begins

In the meantime the angler stands with his feet braced against the side of the launch, leaning back to the strain and braking the reel steadily. Presently the strain slackens and the fish suddenly leaps into the air in a frantic effort to shake off the hook. Then comes another deep dive—50, 60, 80 or 100 fathoms. A wild surge on the surface follows and a rush with only the head showing above water. So the battle goes on, for perhaps four hours, until the great pace begins to tell and the fish loses strength.

Meanwhile the angler is reeling in steadily inch by inch until the fish is brought alongside the launch, where the coup-de-grace is administered by means of a harpoon.

It does not always follow that, when a big fish is brought alongside, it is as good as landed. It is not always as tired out as may appear, and many an angler has been caught napping when, with a flicker of the tail, a big fish has suddenly made a quick rush and got clear away. Occasionally also a fish when almost played out will roll and take up 10 ft. to 20 ft. of line round its body, and then slash down on the line with its tail, cutting it instantly.

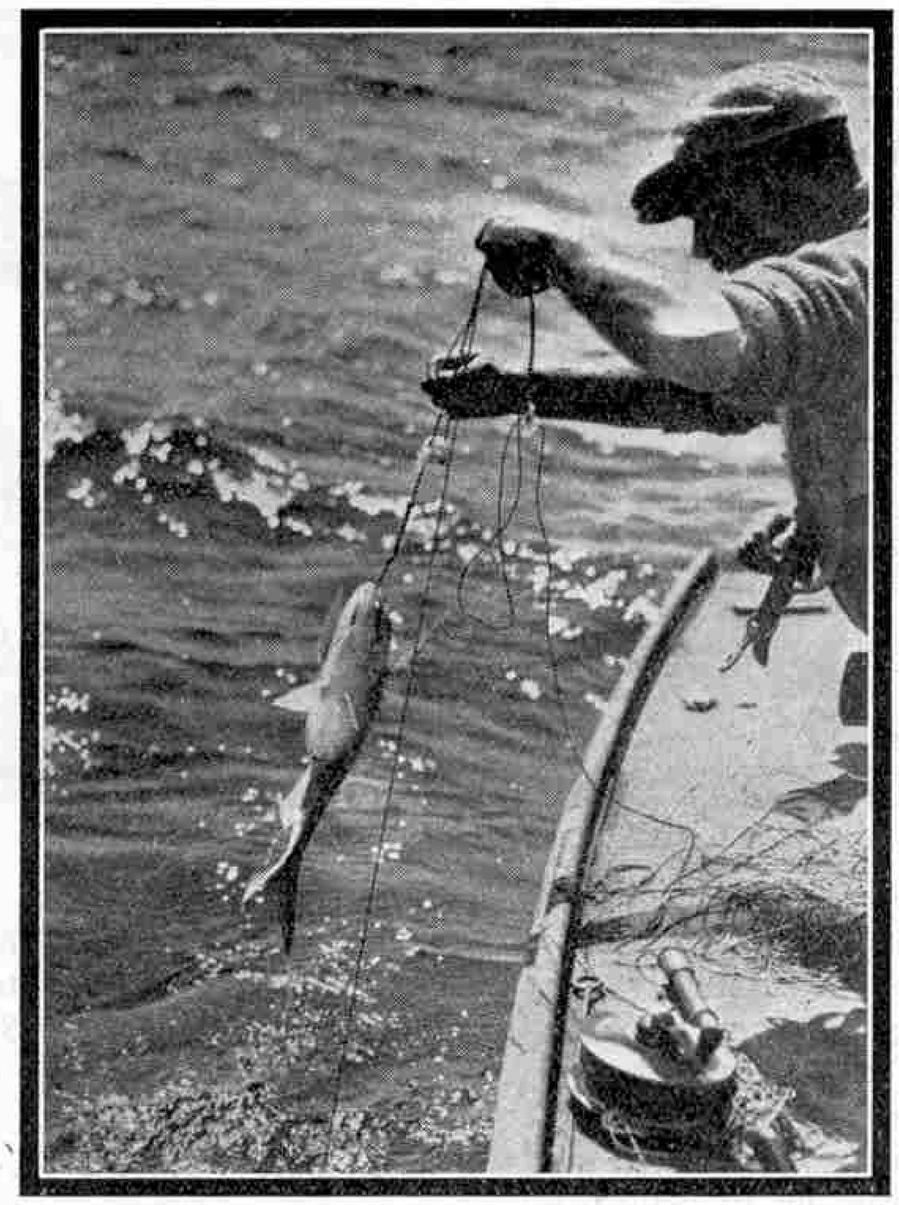
Fifteen miles is by no means an extreme distance for a run, with the fish diving deep one moment and jumping 10 ft. into the air shortly afterwards.

Sometimes a swordfish will attack. On one occasion recently a swordfish, on being hooked, turned and

rammed the launch. His sword penetrated the stout hull of the vessel, broke off short, and the fish escaped. The boat had to be beached in order to prevent it from sinking. Next day, however, the same angler had his revenge. He hooked a swordfish, and this when landed proved to be the identical one that had rammed his boat, the broken sword fitting exactly!

Sea-anglers who have experienced difficulty in removing the hook from one of the small fishes usually captured around British coasts will readily appreciate that this operation is a very serious one in the case of a giant swordfish. The matter is further complicated by the fact that the fish generally takes along with the bait a yard or so of the steel trace.

The swordfish undoubtedly provides the finest sport, but the *mako* shark runs it very close in speed and also in fighting powers. On being hooked the fish will "breach," leap 10 ft. up into the air, dive deep down, and then show up again in frenzied leaps. A *mako* shark has been known to charge a dinghy and drive his head clean through the side. In bygone days this fish was hunted by the Maoris on account of its teeth, which were an article of trade and currency. The open mouth of a *mako* is indeed a fearsome sight with its rows of terrible teeth, each having an edge like a razor. Sportsmen who have captured a *mako* generally preserve the jaw and teeth as a trophy.



The bait for the big fish!

The "thresher" shark is also taken with the rod. This fierce fish, which is fairly common, is a great hunter of the whale. It attains a length of anything up to 14 ft. and its enormous tail fin gives it remarkable speed. In attacking the whale the "thresher" uses its tail as a weapon, and it is said to work in conjunction with swordfish.

As may be imagined, angling for such huge fishes is by no means a simple sport. Great skill is required in manipulating the line when the fish leaps into the air or makes sudden rushes in different directions, or perhaps dives deep down. The sport demands also considerable strength and endurance, for the fight is fierce and goes on incessantly perhaps for hours. It is interesting to note that one or two lady anglers have been quite successful with the big fish. Last year, for instance, an Auckland lady landed two big swordfish in one day and a London lady captured a swordfish weighing 380 lb.

Inexperienced anglers are strongly advised not to tackle the swordfish or shark until they have gained a certain amount of skill in capturing the kingfish. This fish runs up to about 100 lb. in weight and provides good sport. On being hooked, the kingfish immediately makes for the bottom and stays there until one almost despairs of ever getting him up. Suddenly, however, he goes off with a great rush, sounding again and again, but reserving his real "fireworks" for the last ten minutes at the surface. The "old hands" among big-game anglers regard the capture of a kingfish weighing a mere 60 lb. or 80 lb. as a nuisance and a waste of time, but nevertheless this fish provides excellent training for beginners who intend ultimately to go after bigger fry.

This wonderful paradise for anglers is to be found on the northern coast of New Zealand, along the eastern shores of Auck-

(*Continued on page* 325)

A Huge Hammer-head Shark

A Mako Shark

The Story of Metals

IX GOLD

LAST month, in speaking of the Australian goldfields, we referred briefly to the finding of nuggets of gold, and it will be of interest to consider these nuggets in rather more detail before passing on to deal with the Witwatersrand goldfield.

Although gold nuggets have been found in various parts of the world, they do not occur anywhere in such numbers and of such size and weight as in Australia. The discovery of each big nugget has always produced a great rush to the goldfields. In 1851, for instance, at Meroo Creek, New South Wales, an Australian native who was employed as a shepherd used to relieve the tedium of attending his sheep by looking for gold. One day he noticed something glittering on the surface of a large boulder of quartz and idly he chipped off a piece. To his amazement he found embedded in the rock a great nugget of pure gold, which, when extracted, weighed 102 lb. 9 oz. and was worth something over £4,000! As may be imagined the discovery of this nugget produced a condition of almost delirious excitement.

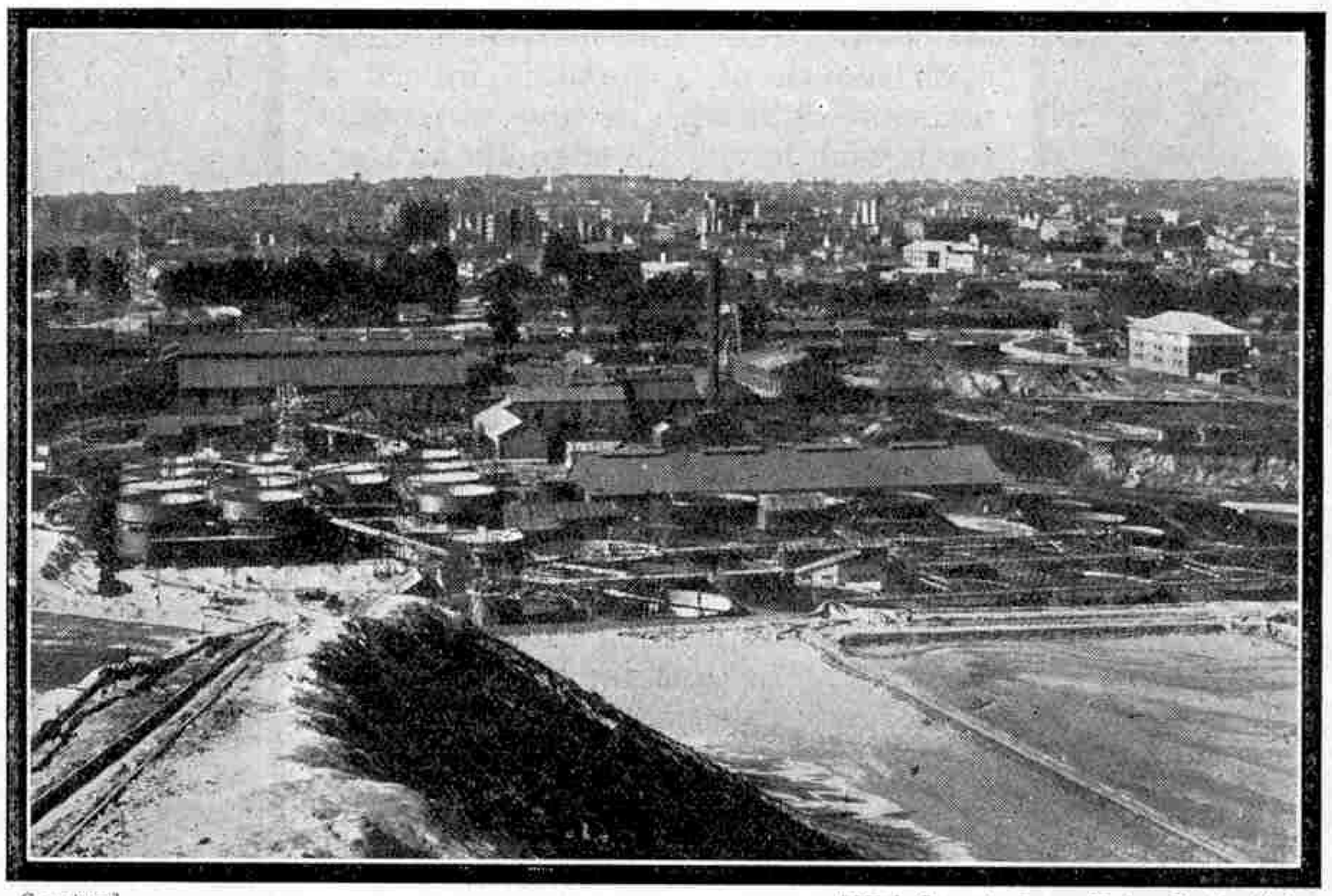
Famous Nuggets

More nuggets have been found in the State of Victoria than anywhere else, and at one time people were almost ready to believe that below the surface of the ground there existed a solid mass of the metal! Early in 1853, for instance, a mass of quartz and gold was unearthed from a depth of 60 ft. and found to weigh over 1,117 oz., and two days later another mass weighing 1,111 oz. was found only a short distance away. About a week later a third mass was picked up weighing 1,619 oz., from which was extracted 1,319 oz. of pure gold.

Many of the larger nuggets were given names under which they became quite famous. Among these may be mentioned "The Welcome Stranger," found in February, 1869, and weighing 2,268 oz.; "Welcome Nugget," June, 1858, 2,217 oz., and "Blanche Barkly," August, 1857, 1,741 oz. The "Welcome Nugget" contained 2,019¾ oz. of pure gold, worth £8,376 10s. 10d.

World's Greatest Goldfield

We now come to the world's greatest goldfield—the Witwatersrand. The name means "Whitewaters-ridge," and was given by the Boers on account of the streams of clear water that issue from the northern site of the range and ultimately find their way into the Indian Ocean at Delagoa Bay. In 1884 deposits of gold were found on the property of a Dutch farmer on the lonely high veld. The reef did not turn out to be as remunerative as expected, but prospecting in the neighbourhood continued, and about a year later a mason employed by a Dutch farmer came across a peculiar rock formation. He crushed some of this rock and found it to contain gold, and his discovery led to the knowledge of the enormous gold wealth of the Witwatersrand.



Courtesy] [High Commissioner, Union South Africa

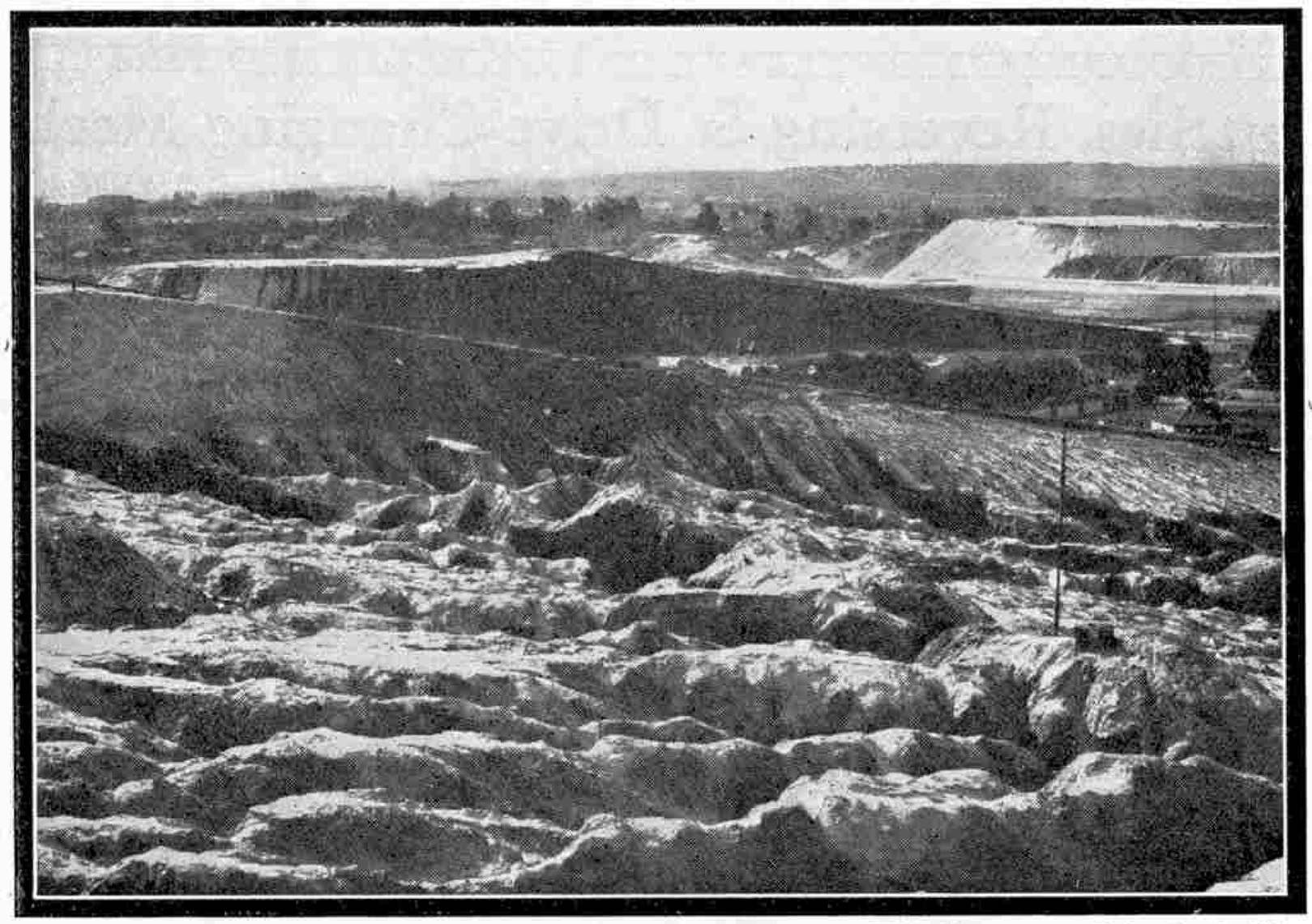
Johannesburg from Terriera Mine

Birth of Johannesburg

The news of the discovery spread like wildfire and prospectors from all quarters hurried to the new goldfield. The Transvaal Government promptly took the opportunity of raising money and arranged a sale of land from which some £13,000 was realised. A township was laid out, and further sales of land brought in more revenue amounting to some £40,000, while the value of small plots of parched veld rose from a few shillings to hundreds of pounds. Thus was brought about

the beginning of the Witwatersrand gold industry and the birth of Johannesburg.

The Witwatersrand goldfields are situated on a plateau nearly 6,000 ft. above sea level. The sandstone rocks of which this plateau is mainly formed are among the oldest in the world, and from evidence of various kinds there is little doubt that this region was once the site of an inland sea. The surrounding hills, composed of sandstones intersected by quartz veins, were broken down by the waves of this great sea and the materials were deposited in layers beneath the water. This process went on through long ages and layer after layer was laid down on the sea bed. Still later the sea departed and in the layers left behind is contained the precious yellow metal.



Courtesy] [High Commissioner, Union South Africa

On the Man-made Mountains of the Rand, at Johannesburg

The Gold-bearing Beds

The gold-bearing beds of the Witwatersrand are locally known as "reefs." They consist of a conglomerate of quartz pebbles bound together by a stony cement, and to this conglomerate the Dutch gave the name of "banket" on account of its resemblance to an almond sweetmeat of that name. In most cases the gold contained in the conglomerate is not visible to the naked eye.

Man-made Mountains

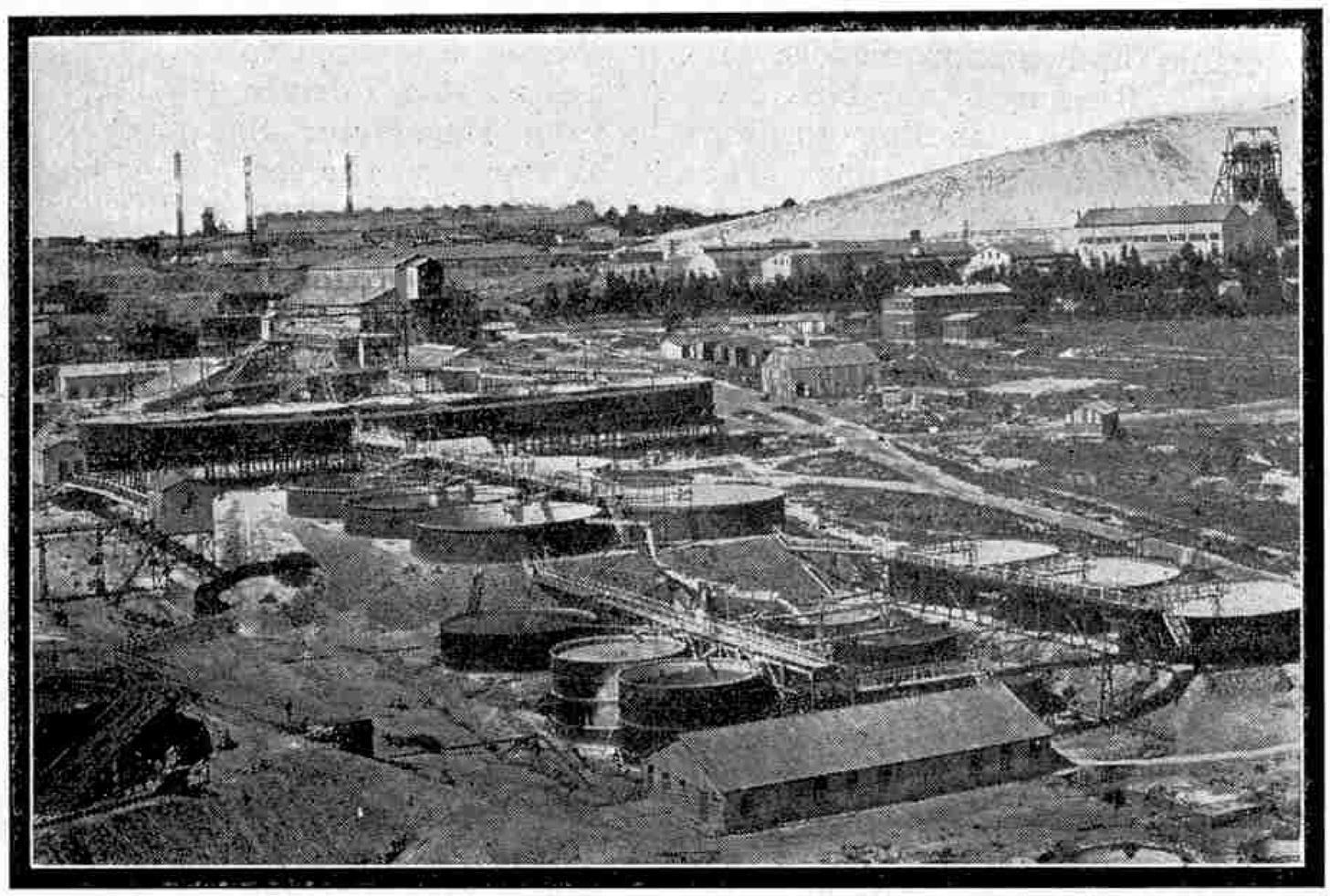
Perhaps the most conspicuous feature of the Rand mining area is the huge dumps. These "man-made mountains" consist of millions of tons of fine white sand that has passed through the various gold-extracting processes. A small percentage of gold remains in this waste sand but it would not pay to recover it. Experiments are being made with a view to utilising the sand in some manner, but so far the dumps remain where they were formed.

A few figures may give some idea of the magnitude of the Transvaal goldmining industry. In 1887 the gold output was worth only £169,401; in 1923 the gold recovered amounted to 8,898,731 oz. of fine gold, value £39,061,604. Salaries and wages paid in the industry in 1923 totalled £12,389,154 and the sum of £12,028,882 was spent on supplies. The total production of the Witwatersrand goldfields from May 1887 to 31st December 1923 was 172,500,000 oz. of fine gold, value £762,000,000. In 1922 the estimated value of the gold production of the world was £63,000,000, of which the Witwatersrand contributed 47.4 per cent.

Mining at Great Depths

The future of the Witwatersrand goldfield depends upon the practicability of mining at great depth and on the extension of the reef in the eastern area, where there are possibilities of a large production. On account of the low rise of temperature with depth it should be possible to mine at considerably greater depths than have been attained in any other part of the world. The temperature rise with depth below the surface varies in different regions, the normal rise being about one degree for every 65 ft. of vertical depth. On the Rand, however, the temperature rises only at the rate of one degree for every 255 ft.

The gold reef extends to depths of from 8,000 to 10,000 ft. below the



Courtesy] [High Commissioner, Union South Africa

The Crown Mines, Johannesburg

(Continued on page 336)

MECCANO STANDARD MECHANISMS

Section V. Clutches, Reversing & Drive-Changing Mechanism (*cont.*)

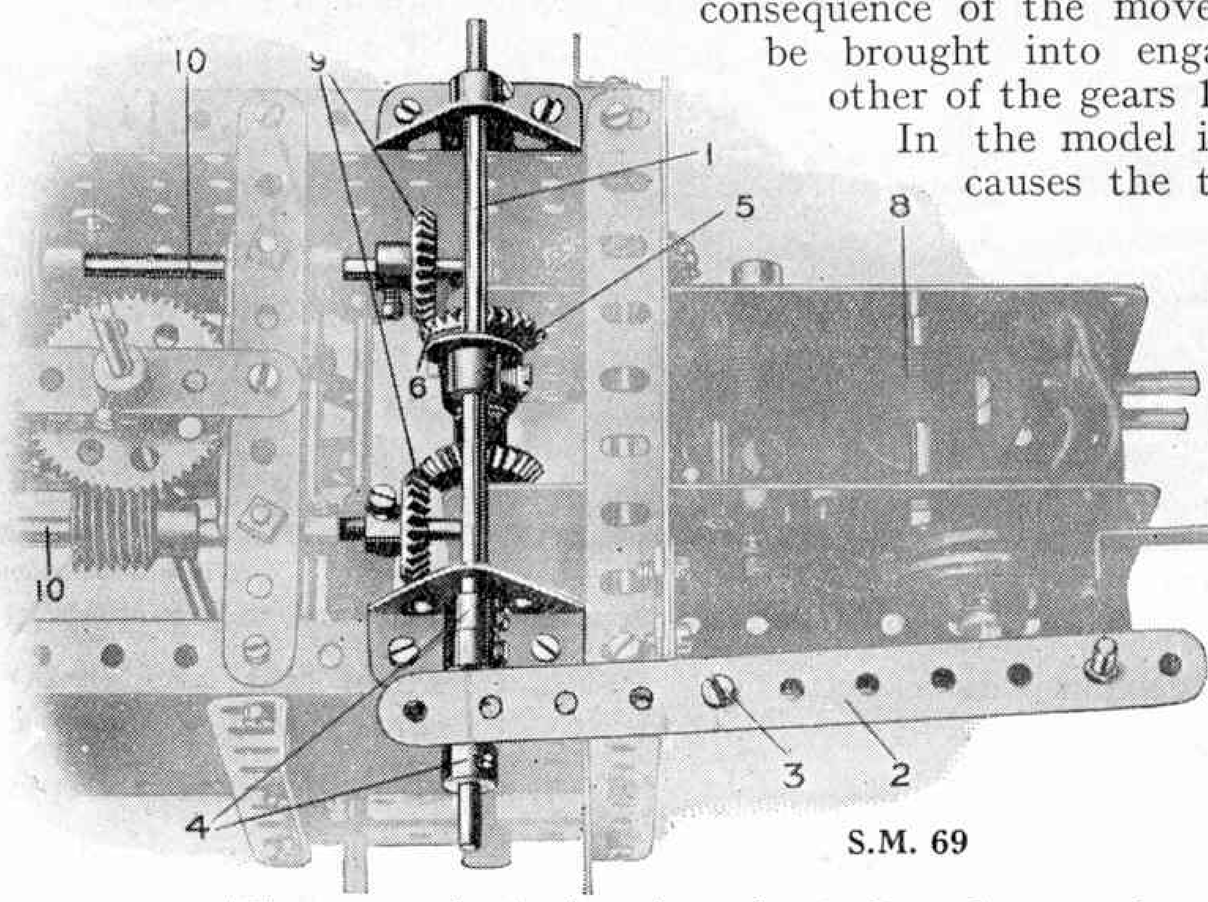
This article is the seventh of a series explaining some new and interesting aspects of Meccano model-building practice. Gear Ratios, Belt and Rope Mechanism, Pulleys, and Levers have been dealt with already, and the following article describes some further examples of Meccano Clutches and Drive-changing Mechanisms. The first portion of Section V. appeared in last month's "M.M." The movements described in these articles may be adapted with advantage to numerous Meccano models, and will enhance both their appearance and efficiency in operation.

FOLLOWING the examples given in S.M. Nos. 64 and 65 (see last month's "*M.M.*") we are illustrating six further types of drive-changing mechanism.

S.M. 67 provides for two separate drives which may be operated independently from a driving shaft 1. A lever 3 is bolted pivotally at its lower end to a 1″×1″ Angle Bracket secured to the side of the gear-box, and is connected to a Double Bracket engaging between two Collars on the secondary shaft 5.

On operation of the lever this shaft is caused to slide in its bearings, so bringing the Gear Wheel 4 in or out of gear with the ½″ Pinion 2.

Another lever 9 pivoted at 10 operates a further shaft 7 in a similar manner, causing the Gear Wheel 6 to engage or disengage with a second ½″ Pinion on the driving shaft 1.



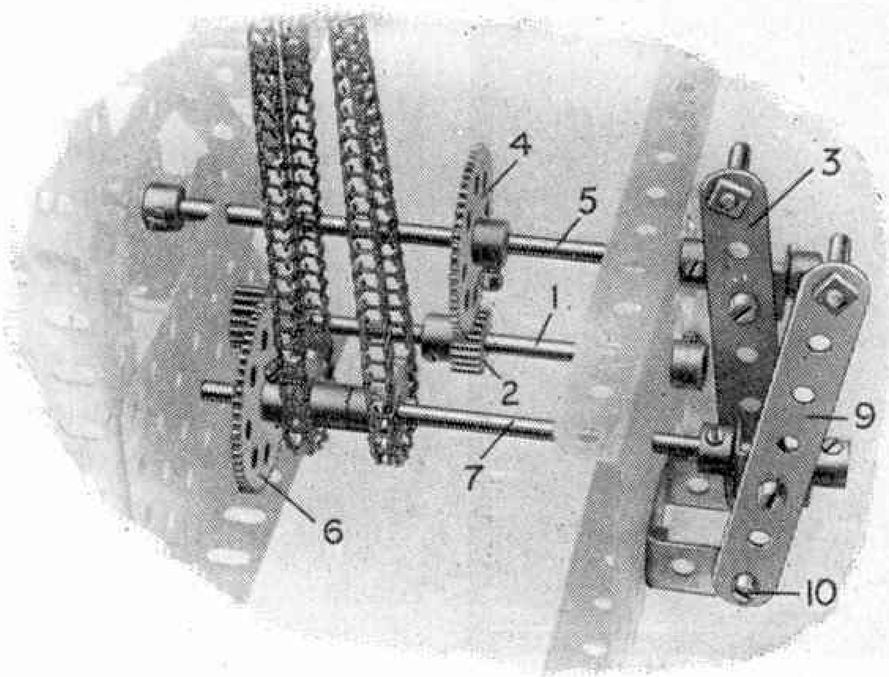
S.M. 69

S.M. 68—Drive-Changing Gear for Overhead Trolley

The gear-change in this case is particularly adaptable to overhead travelling cranes and similar models. It is operated by means of cords 3 secured to a Boss Bell Crank 2 and hanging to convenient handling position below the rails upon which the trolley runs. The Crank 2 actuates the axle 1 which engages the Worm Wheel 5 through a Pinion 4. The Worm Wheel is secured to a Rod 6 and so acts as a rack by means of which this Rod may be moved to and fro.

A driving Rod 8 is caused to imitate the movements of the Rod 6, the method of connection comprising a Crank 7 engaging between two Collars. This Rod 8 carries two Pinions 9 and 10 which, in consequence of the movement of Rod 6, may be brought into engagement with one or other of the gears 11 and 12.

In the model illustrated, the gear 11 causes the trolley to traverse the rails, while the Gear Wheel 12 operates the hoisting cord of the pulley-block; the driving Rod 8 is rotated by hauling on an endless chain 13 hanging below the rails.

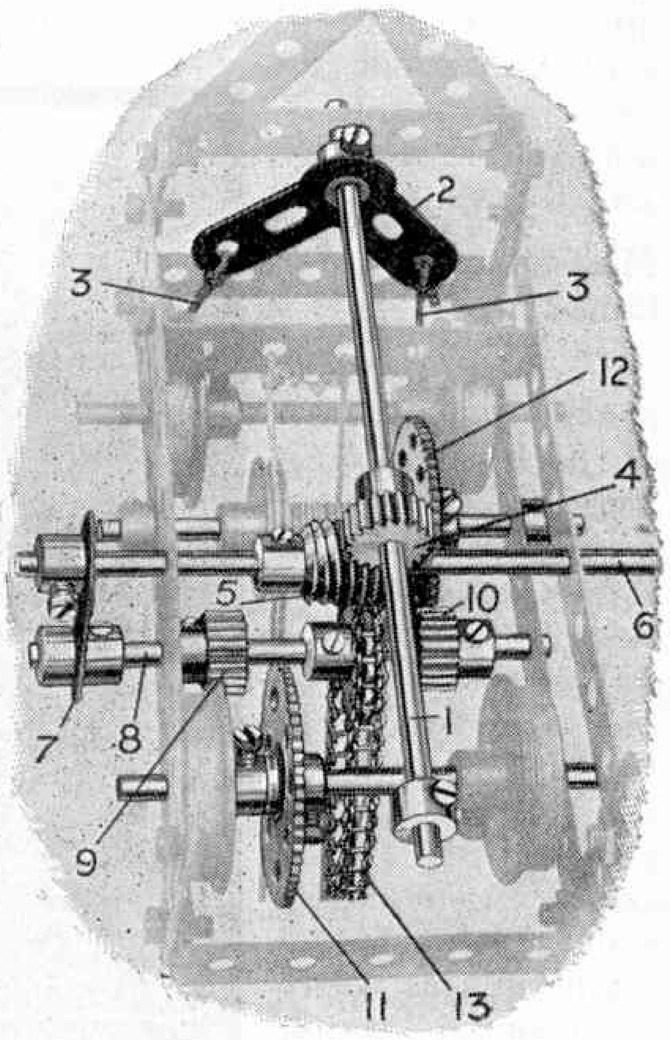


S.M. 67

S.M. 69—Drive-Changing Gear

The Rod 1 in S.M. 69 slides in its bearings and is controlled by a lever 2, which is pivoted at 3 and rests between two Collars with set screws 4 on the sliding Rod 1. The latter carries a Crank 5, the web of which engages between two Bevel Wheels 6 secured to a short Rod 7 driven from the Motor 8, as shown in the sectional illustration, S.M. 69A (see next page). The Crank 5 is suitably spaced with Washers 5A.

On operation of the lever 2, one of the Bevel Wheels 6 may be brought into gear with one or other of the two further Bevel Wheels 9 mounted on secondary shafts 10. This provides for two independent drives, either of which may be connected with the

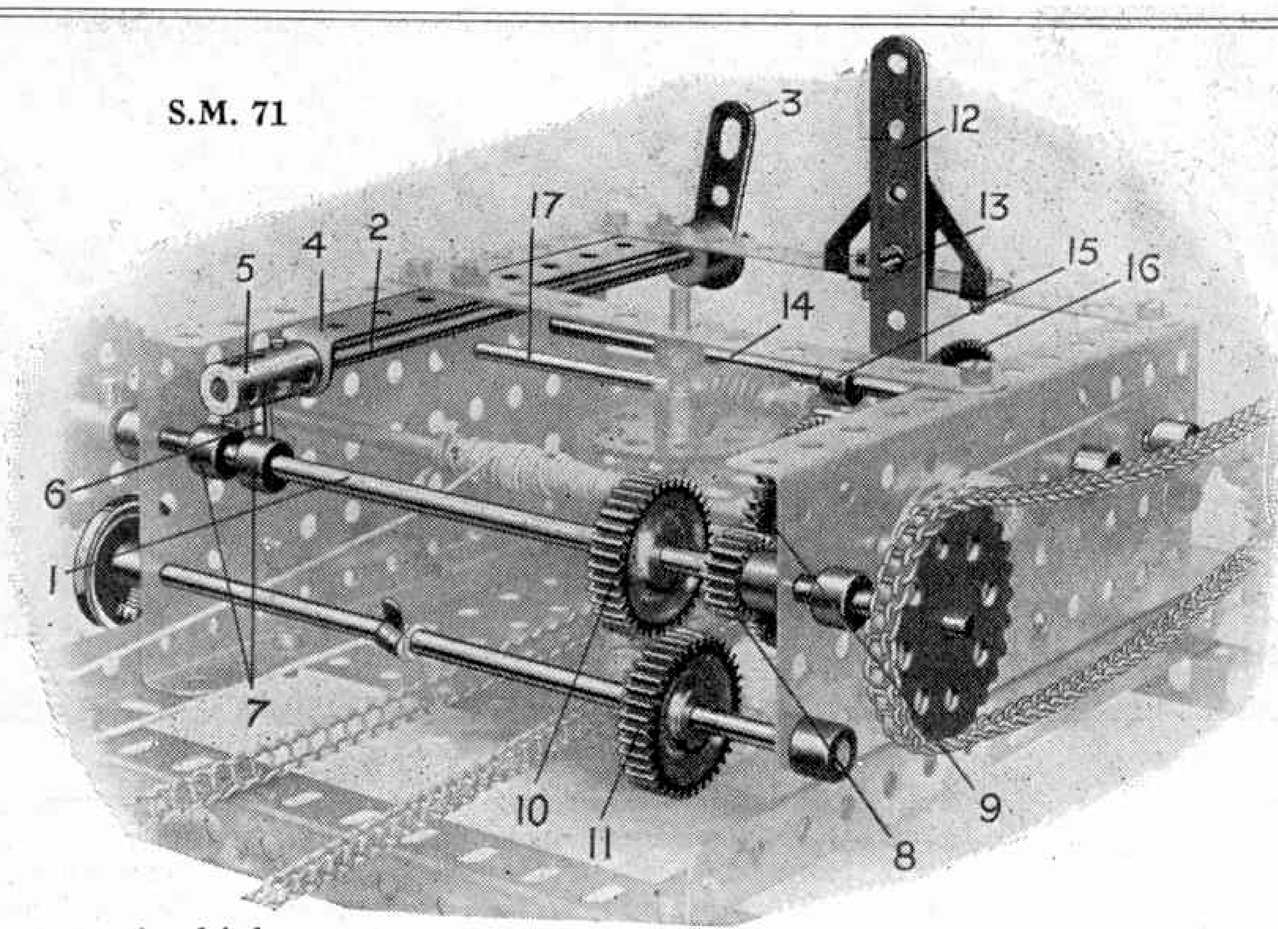


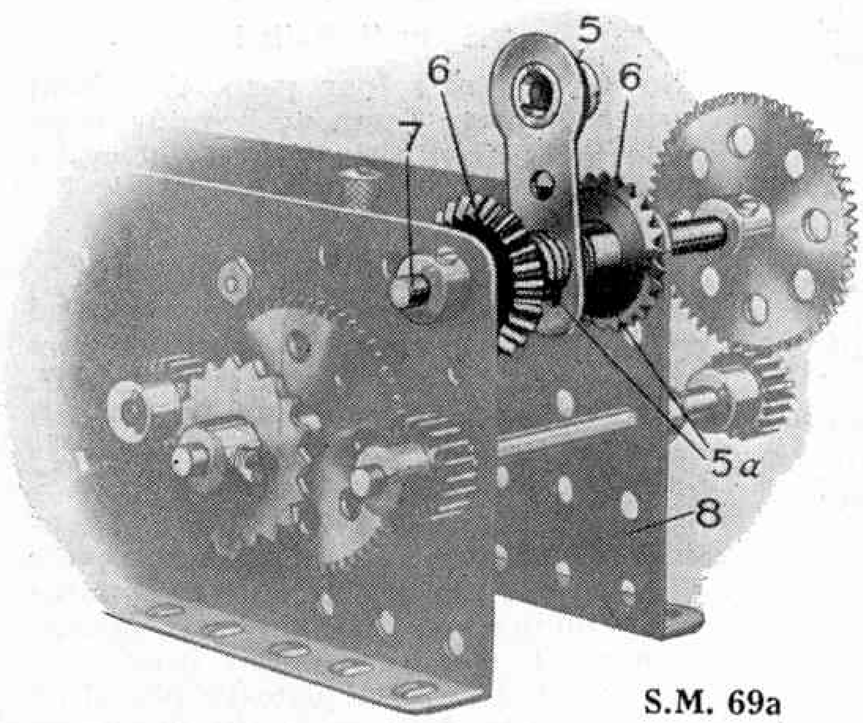
S.M. 68

Motor by moving the lever 2.

S.M. 70—Drive-Changing Gear

S.M. 70 shows another alternative method by which the driving rod may quickly be thrown in or out of gear with two secondary shafts. The driving Pulley 1 is mounted on a shaft 2 carrying a ¾″ Pinion 3 and ½″ Pinion 4. These Pinions may be thrown in or out of engagement with the 50 and 57-teeth Gear Wheels 8 and 9 by sliding a handle 5, the Rod 6 of which carries a Crank 7 loosely journalled on the Rod 2 between the Pinion 4 and a Collar and set screw 10.





S.M. 69a

Detail of Drive-Changing Gear (S.M. 69)

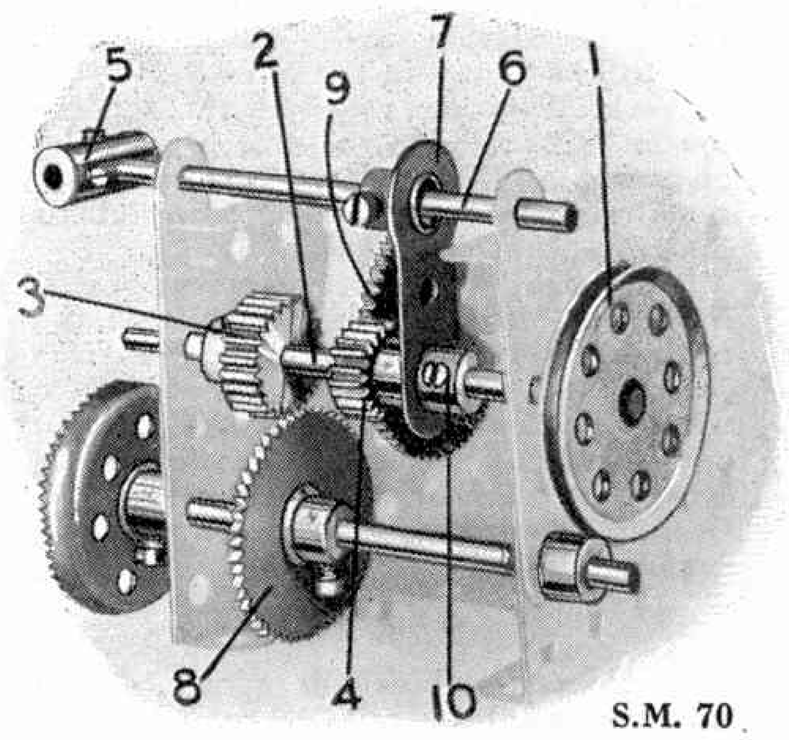
The Pinions 3 and 4 are so arranged on the shaft 2 that they cannot engage their respective Gear Wheels at the same time. This means that as one of the Pinions is moved into engagement with its Gear Wheel, the other is automatically thrown out of gear, and *vice-versa*.

The handle 5 may be extended to any extent, of course, and operated from any convenient point in the structure of the model, the movement being directed from the operating position to the Rod 6 by means of Rods and gears, or levers, bell-cranks, etc. This remark is equally applicable to all the examples included in this Section.

S.M. 71—Drive-Changing Gear

The same result as that described in the previous examples may be achieved with the apparatus shown in S.M. 71. The countershaft 1 in the latter takes the drive from the Motor and is moved to and fro in its bearings by means of a Rod 2 actuated by a Crank 3 and journalled in a Double Angle Strip 4. This Rod 2 carries a Coupling 5 in which is mounted a short Rod 6 engaging between two Collars 7 on the shaft 1. The movement of the shaft 1 brings the ½″ Pinion 8 into gear with a Gear Wheel 9, or the 1″ Gear Wheel 10 into gear with a similar wheel 11, as desired.

A third drive, included in this gear box, may be brought into operation on moving a lever 12, which is pivoted by means of a bolt and nuts (S.M. 262) at 13 and slides a Rod 14, so bringing a ½″ Pinion secured to that Rod in or out of engagement with a Gear Wheel 16, mounted on another Rod 17. The lever 12 rests between two Collars (one of which is seen at 15) secured to the Rod 14.

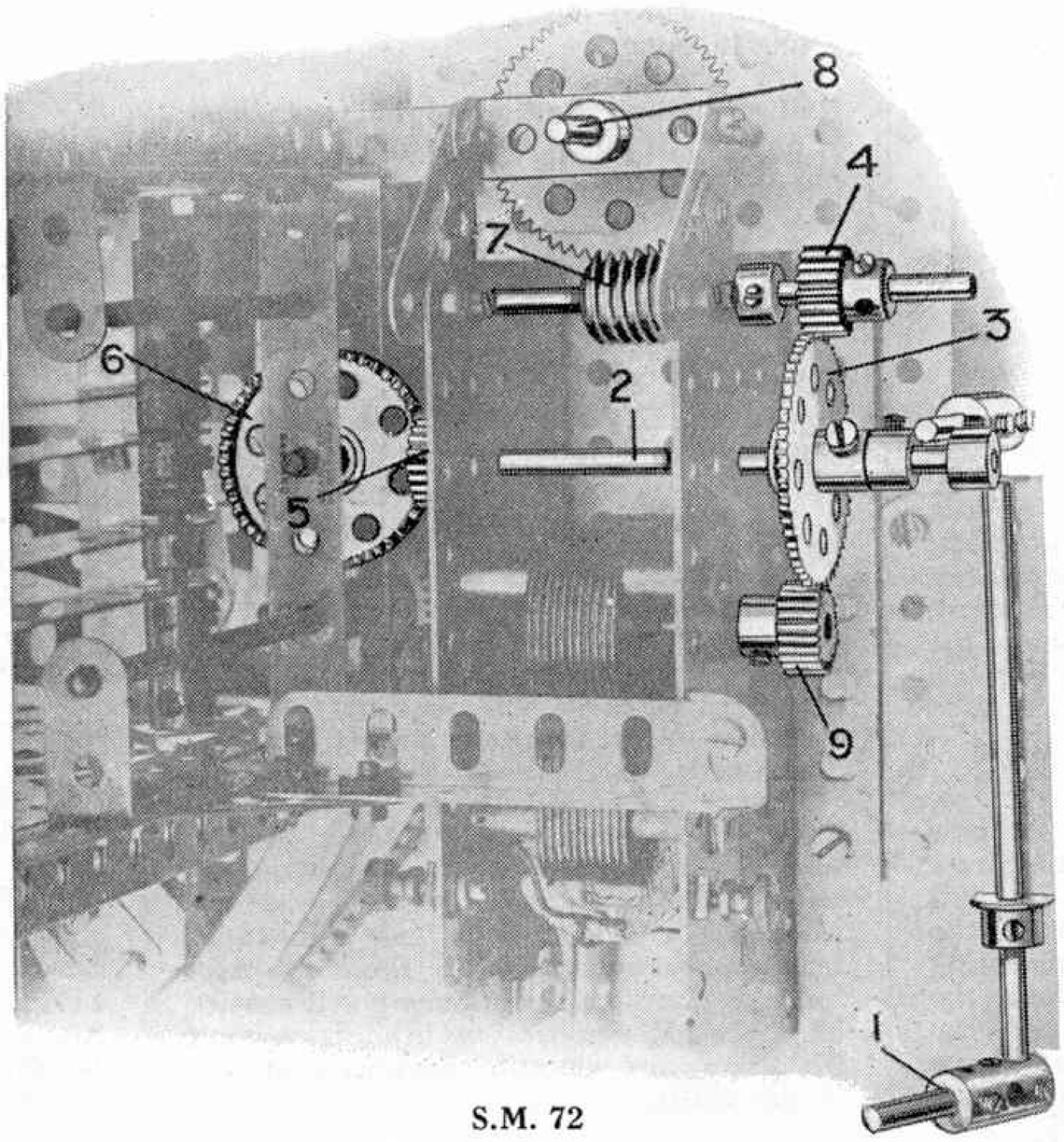


S.M. 70

S.M. 72—Drive-Changing Gear

In S.M. 72, the final example of this type of gear change, a Rod 2 may be moved to and fro in its bearings on operation of the lever 1. This movement of the Rod 2 causes the 57-teeth Gear Wheel 3 to engage with the ½″ Pinion 4 or the ½″ Pinion 5 with the Contrate Wheel 6.

The gear-box shown is that fitted to the Pontoon Crane, in which the former position of the Rod 2 rotates the Crane about its axis by means of a Worm gear 7 and vertical shaft 8, while the latter position elevates the jib. The Gear Wheel 3 remains constantly in mesh with the Motor Pinion 9.



S.M. 72

NEXT MONTH:—

Brakes & Retarding Appliances

Hetton Colliery Loco

George Stephenson's famous Hetton Colliery loco, which headed the procession at the Centenary celebrations at Stockton and Darlington last year, has been presented to the London and North Eastern Railway by Sir Arthur Wood of the Lambton, Hetton and Joicey Colliery, and will be placed in the railway museum at York. This loco was built by Stephenson in 1822, prior to the establishment of his works at Newcastle-on-Tyne, and was running until 1912, having been rebuilt in 1857 and again in 1882.

An account of the first shipment of coal by the old coal company states that the railway, from the colliery to the river Wear, "was crowded with spectators to witness the first operations of the powerful and ingenious machinery employed for conveying the coal, including five of Mr. George Stephenson's patent travelling engines."

* * * *

First Aid Awards

An interesting sidelight upon the precautions taken by railway companies to ensure that their staffs are capable of rendering assistance in cases of emergency is shown by the announcement that 77 gold medals for 15 years' first aid efficiency and 34 bars for 20 years' efficiency were awarded to men on the Great Western Railway during the past year. The total number of efficiency awards made since their institution in 1921—to commemorate the 25th anniversary of the formation of the G.W.R. Ambulance Centre—is 442 medals and 126 bars.

* * * *

Fowl Play !

While a train of empty coal wagons was proceeding recently between Cwm Bargoed and Nantyfyn on the Great Western Railway, the guard, while applying the brakes, observed something white on the brake push rods of one of the wagons. Later, when the train drew up at a stop board, the opportunity was taken to examine the wagon, and two fowls were found, perched quite at their ease on the ironwork !

* * * *

L.M.S. Improvements

Delivery is now being given to the new rolling stock for the L.M.S. Broad Street to Richmond and Euston to Watford sections. The interesting feature of the new stock is that the company is reverting to the old style compartment, known as the "five seater," in replacement of the Pullman corridor carriages that have been tried on these sections. An official of the company states that it has been found that passengers can entrain and alight from the old style compartment with considerably greater ease and speed than from the corridor train, and the fast service on these particular sections made it essential that every possible second should be saved in the time spent at stations.

* * * *

Yachts by Rail

A remarkably interesting loading incident took place on the Great Western Railway at Newton Abbot recently. A large racing yacht built at Teignmouth had to be transported by rail to Brentford, prior to proceeding by canal to the Royal Albert Dock, on its way to Marseilles. The original intention was to tow the yacht to Kingswear, along the coast, and to load on rail at the jetty there, but the wild weather prevailing at the time made this course impossible.

The difficulty was overcome by taking the yacht up the River Teign to Newton Abbot and then hoisting it by crane from the river on to goods trucks waiting on the railway bridge immediately above. The yacht was 48 ft. 6 in. in length, 9 ft. 8 in. in height, and 9 ft. in width and weighed 7 tons. The loading operation occupied 1 hr. 40 mins.

* * * *

Railway Track Authorised but not Open

Replying to a question in the House of Commons recently, the Minister of Transport stated that at 31st December 1924, the total length of railway authorised but not open to traffic was, according to the railway companies' returns, 746 miles, of which 5 miles were constructed, 11 miles dismantled, and 121 miles under construction. No information was available concerning the remaining 609 miles.

* * * *

Extensions on G.W.R.

The near future will witness an appreciable extension of the accommodation at the G.W.R. Company's South Lambeth goods station, which at present occupies about 12 acres of the old reservoir and filtration beds formerly owned by the Southwark and Vauxhall Waterworks.

The new accommodation will comprise a new goods shed over 400 ft. in length, having a double rail bay down the centre, with platforms 16 ft. and 22 ft. in width respectively on each side, and a movable bridge for connecting up the two platforms. The lifting equipment will consist of a one-ton electric overhead traversing jib crane, and electric capstans also will be provided.

Increased import traffic at Brentford Dock necessitates the provision of a new warehouse, which will be approximately 200 ft. long and 48 ft. wide, with more than 26,000 ft. of platform and warehouse space.

* * * *

"Some" Rails !

During the past four years the Great Western Railway Company has purchased considerably more than £1,000,000 worth of steel rails in Great Britain.

* * * *

L.M.S. Railway Notes

To avoid confusion with the Midland type 4–4–0 Compounds, those locomotives of the old L.N.W. section of the L.M.S.R. whose numbers are between 1,000 and 1,184 are being immediately but temporarily re-numbered with their respective L.M.S. numbers, but will retain their present colours. The old L.N.W. number plate will be taken off and the L.M.S. number painted on in small white or yellow figures. No number will be painted inside the cab nor will a number plate be placed on the smoke-box door, as is the case with locos properly re-numbered.

Locomotives re-numbered in this way so far are as follows, the old numbers being given in brackets :—"Prince of Wales" Class—"*Shark*," No. 5656 (1084); 2–4–2 Passenger Tank engines—6723 (1156), 6735 (1153) ; 0–6–2 Goods Tank engines—7674 (1112), 7799 (1054).

Other locomotives recently re-numbered and, in the case of passenger engines, re-painted, are as follows :—7884 (1090), 0–8–2 ; 8421 (456), 8485 (378) and 8545 (422), 18 in. 0–6–0 Goods ; 9275 (2256) and 9310 (2235), "GI" Class 0–8–0.

Standard Belpaire boilers have been fitted to the following locos :—"Prince of Wales" Class. 1324, "*Falaba*" ; 2055, "*Milton*" ; 2417, "*Atlas*" ; 974, "*Hampden*" ; 141, 266 and 443. "George the Fifth" Class. 1623, "*Nubian*" ; 2495, "*Bassethound*" ; 0–8–0 "GI" Class. 170, 329, 360, 670, 931 and 1354.

Only two of the old four-cylinder Webb compounds remain in use. No. 1944, "*Victoria and Albert*," is stationed at Chester, and 1974, "*Howe*," at Wolverhampton. The latter often may be seen working trains into New Street Station, Birmingham.

* * * *

Continental Electrification Scheme

Enquiries are being made into the possibilities of securing economies in working by electrifying the railway between Frankfort-on-Main, Mannheim and Basel. The necessary electrical energy can be supplied from the Upper Rhine.

Paris Express Robbery

By an ingenious ruse, the Paris and Belfort train that left Paris on the night of 26th February was robbed of 180,000 francs. When twenty miles out from Paris, the driver saw a red lamp waved ahead of him, and at the same time a rail detonator or "Petard" exploded. The train was stopped and, in accordance with regulations, the guard went back and placed warning signals on the line to prevent any oncoming train from running into the rear of the stationary train. Then the red light disappeared and, again in accordance with regulations, the guard in the front van retired to the rear van and the train proceeded on its way—without the first guard.

A few miles further on, the Westinghouse brake failed and the train was pulled up. The second guard was then compelled to go back along the line to place warning detonators, the van being left unattended. In the meantime the train continued its journey without him. At the next station the train stopped for both guards, who came up in a later train.

While the extraordinary fact of two mysterious stoppages in so short a distance was being discussed, someone recalled the large amount of money lying in the van. The sealed bags were inspected immediately and it was found that they had been broken open and the money taken. It was evident that the robbers had an accomplice on the train. Foiled by the transfer of guards at the first stop, he took his opportunity during the second stop and ransacked the van, disappearing before the train was restarted. The money was being carried to be left at various stations en route, as wages for the railway company's employees.

* * * *

Extensions at Southampton

The Southern Railway Company announces that it has been decided to proceed with an enlargement of the company's docks and surrounding property at Southampton, but it is not proposed to put the whole scheme into operation at present. This decision has been made because the company has been compelled, owing to lack of facilities, to decline some of the business offered to it.

The company's floating dock has proved to be a very satisfactory acquisition and during the past year it has been used 15 times by some of the largest vessels afloat.

S.R. Electrification

Three new electric train services have been introduced recently on the Southern Railway, to run respectively between Charing Cross, Cannon Street, and London Bridge to Orpington, Bromley North, Beckenham Junction, Hayes and Addiscombe. These new routes have been electrified at a cost of £1,300,000 and the services will be maintained by 20 eight-coach trains. The total track involved is 88 miles.

Are Semaphore Signals Doomed?

The familiar signal post and arm, and the accompanying rods, levers and wires, are in danger of being abolished if the invention of two Liverpool engineers, Messrs. B. M. Edwardes and H. B. Barnes, bears out its early promise. In place of the signal cabin levers will come a board bearing a series of coloured electric bulbs, and two coloured electric lamps, one red and one green, will be mounted in the loco cab to serve as the driver's indicator. Fog, the bogey of the footplate, will then be banished.

The invention requires a signalling device such as a lamp or a bell to be situated within the locomotive cab, and operated by the closing of an electrical circuit as the train passes over a section of rail in circuit with a switch in the adjacent signal-box, the ordinary railway line serving as the "earth" return. The amount of current necessary to operate the circuit would be very small and could be taken from the ordinary electric lighting system of the train itself. In fact, it would only be required, and would then come automatically into action, as the train passed over the signalling rail section.

The installation of the apparatus in the engine cab would be a very simple matter and would have the great advantage of being immediately under the driver's notice. Its action, of course, would be reflex in relation to the distant signal cabin (which under the system would house small electric switches only), so that the passage of the train over every "contact" section of its journey would be notified automatically to the signalman in the box.

Obviously special precautions must be taken to preclude a breakdown in the system owing to electrical failure, but the inventors claim to have removed this danger by duplicating various parts of the equipment.

* * * *

New Australian Railway

For some considerable time the construction of a new railway into the centre of Australia from Oodnadatta, South Australia, to Alice Sping, Central Australia, has been under consideration, and now the Commonwealth Government has brought forward a scheme for the construction of this important link. The total distance will be 279 miles and the cost £1,700,000.

COMPLETE LIST OF NAMES OF L.N.E.R. "PACIFIC" LOCOS

Great Northern Section

Engine No.	Name	Engine No.	Name	Engine No.	Name
2543	"Melton"	2550	"Blink Bonny"	2557	"Blair Athol"
2544	"Lemberg"	2551	"Prince Palatine"	2558	"Tracery"
2545	"Diamond Jubilee"	2552	"Sansovino"	2559	"The Tetrarch"
2546	"Donovan"	2553	"Manna"	2560	"Pretty Polly"
2547	"Doncaster"	2554	"Woolwinder"	2561	"Minoru"
2548	"Galtee More"	2555	"Centenary"	2562	"Isinglass"
2549	"Persimmon"	2556	"Ormonde"		
4470	"Great Northern"	4474	"Victor Wild"	4478	"Hermit"
4471	"Sir Frederick Banbury"	4475	"Flying Fox"	4479	"Robert the Devil"
4472	"Flying Scotsman"	4476	"Royal Lancer"	4480	"Enterprise"
4473	"Solario"	4477	"Gay Crusader"	4481	"St. Simon"

Scottish Area

2563	"William Whitelaw"	2565	"Merry Hampton"	2567	"Sir Visto"
2564	"Knight of the Thistle"	2566	"Ladas"		

North Eastern Area

2568	"Sceptre"	2573	"Harvester"	2578	"Bayardo"
2569	"Gladiateur"	2574	"St. Frusquin"	2579	"Dick Turpin"
2570	"Tranquil"	2575	"Galopin"	2580	"Shotover"
2571	"Sunstar"	2576	"The White Knight"	2581	"Neil Gow"
2572	"St. Gatien"	2577	"Night Hawk"	2582	"Sir Hugo"
2400	"City of Newcastle"	2402	"City of York"	2404	"City of Ripon"
2401	"City of Kingston-upon-Hull"	2403	"City of Durham"		

"DIRECTOR" CLASS LOCOS

6378	"Baillie Macwheeble'	6386	"Lord Glenallan"	6394	"Lord James of Douglas"
6379	"Baron of Bradwardine"	6387	"Lucy Ashton"	6395	"Ellen Douglas"
6380	"Evan Dhu"	6388	"Captain Craigengelt"	6396	"Maid of Lorn"
6381	"Flora MacIvor"	6389	"Hayston of Bucklaw"	6397	"The Lady of the Lake"
6382	"Colonel Gardiner"	6390	"Hobbie Elliott"	6398	"Laird of Balmawhapple"
6383	"Jonathan Oldbuck"	6391	"Wizard of the Moor"	6399	"Allan-Bane"
6384	"Edie Ochiltree"	6392	"Malcolm Graeme"	6400	"Roderick Dhu"
6385	"Luckie Mucklebackit"	6393	"The Fiery Cross"	6401	"James Fitzjames"

Size of Coal Wagons

A feature of our British railways is the small size of the wagon normally employed for the transport of coal. The average capacity of our coal wagons is probably about 9 tons, but there are still a few 4-ton wagons in use, although their number is rapidly diminishing.

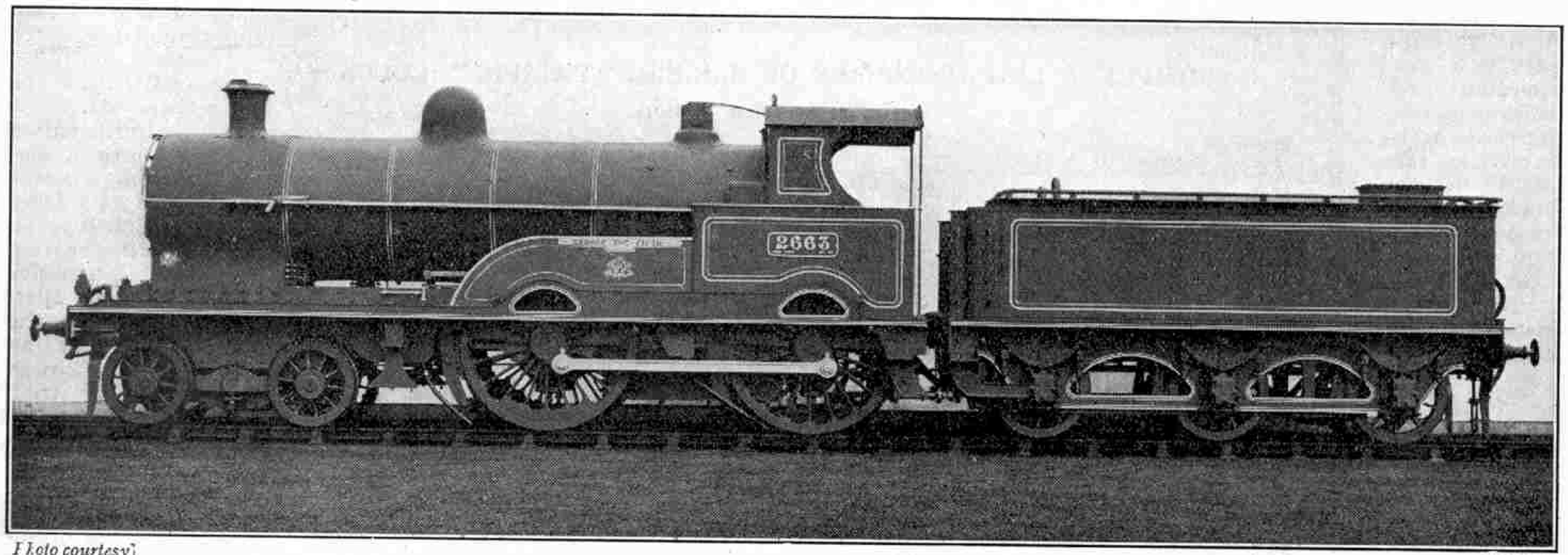
Considerable economies can be effected by the use of larger wagons, and on the L.N.E.R., which has concentrated on the 20-ton wagon—about the heaviest that can be carried on four wheels—about 55 per cent. of the coal traffic is handled in vehicles of this size. The Great Western Railway has been endeavouring to popularise the use of 20-ton wagons in South Wales but, although the innovation was made eighteen months ago, little progress has been made. Indeed, many colliery owners are still building 12-ton wagons, the smallest size now accepted by the railway for new vehicles.

There are some 600,000 privately-owned wagons in employment and of these 450,000 are used by the coal industry. The re-equipment of our railways with 20-ton wagons would involve a total expenditure of £80,000,000, but the proposal is not to scrap the existing stock but to replace it as it becomes worn out.

On the Footplate of an Express

Three Hours with the Driver of a Carlisle to Crewe Train

By a Railway Officer



[Photo courtesy] [L.M.S.

"*George the Fifth,*" a Loco of the same type as that dealt with in this article

I RECENTLY had the pleasure of riding on the footplate of an express locomotive and as my experience is one that every reader of the "*M.M.*" would have liked, I think you may all be interested to hear something of it. Before giving you an account of my trip, however, I will tell you something of what I know about locos and the men who run them.

"Fliers," past and present

In a modern express locomotive speed is a necessary quality, but hauling power also is required, for in order to pay its way an express train nowadays has to be made up to weigh at least 300 tons for a long-distance run. Indeed, many trains of to-day reach the enormous weight of 440 to 450 tons, exclusive of the weight of the locomotive and tender—say another 100 tons. To produce a loco of sufficient power to haul this load at average speeds of from 50 to 60 miles an hour is an achievement of which our engineers are justly proud. Such a task has been straightforward in America and other countries, but in Great Britain the limits imposed by the small dimensions of our tunnels and bridges have been a tremendous handicap.

I began to take a keen interest in locos in the '80's, when the "fliers" had one pair of large driving wheels 7 ft. 6 in. or 8 ft. in diameter. They weighed from 40 to 60 tons, and their steam pressure was usually 120 lb. To-day there are two or three pairs of coupled wheels 6 ft. to 7 ft. in diameter, the weight averages 100-130 tons, and the steam pressure is some 200 lb. Against 1,500 sq. ft. of heating surface in the old days there is now as much as 2,500 sq. ft.

The Enginemen

So much for the locos—now a word about the men. Among the latter are some of my oldest and truest friends, men who have always been considerate to me, although at times I have been—and fear I shall always be—a fearful nuisance to them, asking "What is this?" and "Why is that?" Speaking generally, if you wish to see fine specimens of manhood, have a look at the enginemen when next you are making a journey by rail. If they are fresh on duty you will observe clean, healthy skins, bright eyes, and a steady alertness that is delightful to behold. They are not perfect, but as a type of keen, intelligent men they are hard to beat.

When the enginemen come on duty, usually 70 minutes before the departure of their train, they "sign on" in a book. The driver is then handed forms on which he must enter particulars of his day's work. For a passenger driver there are two statements, one called the "Engine Driver's Ticket," which is quite a formidable document. On this, full details as to loads, shunting-duties, running times, piloting or banking assistance, hours standing in steam, state of weather, coal or water received from other railways, have to be entered in full. The other is the "Guard's Statement for Driver," and has to be filled in by the guard with particulars of the coaches comprising the train to be worked, and, later, its actual running times.

Preparing for the Run

After receiving these forms, and filling in as much as possible of the "Ticket," the driver goes to the notice board. Here he finds full information as to repairs in progress on the line, altered signals, or any other matters affecting the working of the train. He next examines the "Repair Book" to see what defects, if any, there were in his loco when she was last worked, and it is his duty to make sure that each small matter has been put right. He then makes sure that the tank and boiler of the loco are filled, that there is plenty of coal in the tender and sand in the sand-boxes, and that

the outfit of tools is complete. This done, he proceeds to " oil up " from front to rear, a task which takes much time—on the loco on which I made my trip there are no less than 61 cups or lubricators to be filled !

The fireman also inspects the notices and then proceeds to draw the necessary fire shovel, supplies of oil, waste, lamp wick, etc., from the stores. He then goes to the loco and sees that the fire has been started, that steam is rising satisfactorily and that the lamps are in working order. After stoking up he trims the lamps and places them on sockets in front or rear as may be required, and brushes up the footplate to make it presentable.

These preparations on the part of both the enginemen take up about 45 minutes, and it is time to back down to the station from which the first trip of the day is about to start.

From Carlisle to Crewe

My trip was on the old L.N.W. main line from Carlisle to Crewe, over what we call the " North Road." As "*M.M.*" readers know, the L.N.W. (now the L.M.S.) is one of the trunk lines of the country, and from its earliest days it has been noted for its fine locos. I started my journey from Perth, travelling as an ordinary passenger as far as Carlisle. The Perth portion of my train should have been attached to one from Glasgow, but my portion was over an hour late—there was a coal strike in progress at the time—and when I reached Carlisle I found that it had been arranged for the Perth train to be worked specially right through to London.

Over the Caledonian line we had used the Westinghouse brake, but with the change of engines this gave place to the Automatic Vacuum. Before the latter brake can be used the power of the Westinghouse brake must be exhausted.

The engine on which I was to be a traveller was a modern 4-4-0 of the well-known " George V." type, and the shed number at the top of the back of the cab indicated that it belonged to Crewe. This made me look at the driver, and I ascertained that although he was a Carlisle man turned out to work the late-running train as a special, the opportunity was being taken of returning the Crewe people their engine.

Along came the guard and informed the driver that the train weighed only 207 tons (eight carriages)—a mere trifle for our powerful loco—which piece of news the driver greeted with a smile. A good moment, thought I, to introduce myself, and I brought forth my coveted foot-plate permit and was told to make myself as much at home as the fine coal dust—you must remember the coal strike—permitted.

" John Bateson "

When our loco, " *John Bateson* " by name, backed carefully on to the train, he was whimpering plaintively from his safety valve, as though to say he had grown tired of waiting for us to appear off the Caledonian line. Now he was blowing off very loudly, for the damper had been opened and the fire made much more fierce in consequence. The driver had reversed the motion to forward gear and had opened the ejector so that the guard might test the brake at the rear of the train. The fireman, having coupled the engine on to the train, came aboard with a cheery " All correct, Bob," and the Station Inspector came to announce " You are to miss Lancaster to-day."

The trained eye noted several evidences of keenness on the part of the enginemen. For one thing, as " *John Bateson* " backed towards the train the rails were sprinkled with sand to ensure a start without slipping, and now the fireman tested the water-gauge and opened the fire-hole to make sure his fire was not burning hollow. Then he rolled up the sleeves of his jacket and I could see that, at any rate as far as he was concerned, only business was meant !

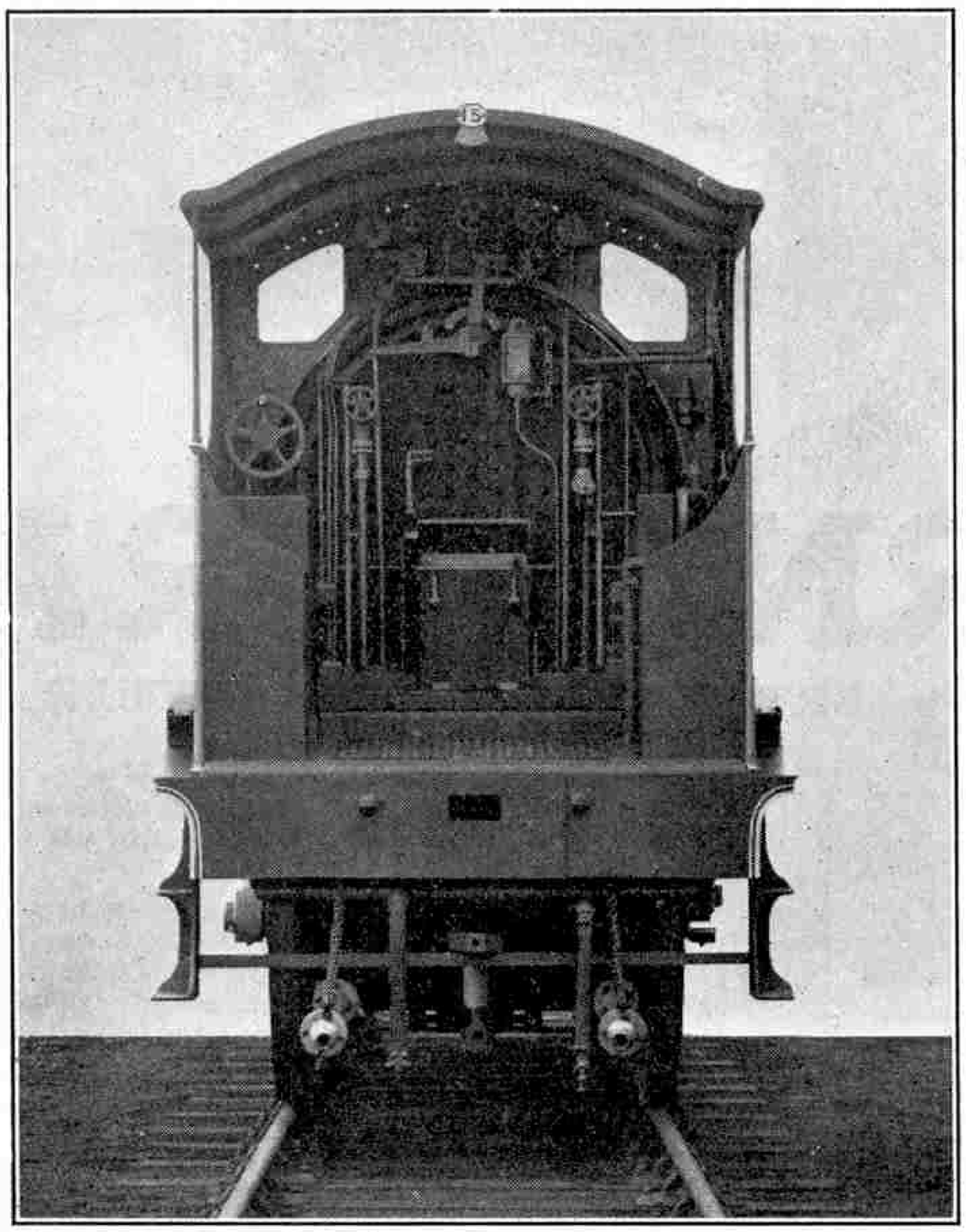


Photo courtesy] [*L.M.S.*

The Cab of the " *George the Fifth* "

The Journey Commences

When the regulator was opened, the first few yards were not very steady, and there was collected moisture in the cylinders to be expelled with great noise and fuss by way of the draincocks. The driver kept a close watch on the signals as we drew clear of the station approach, for it sometimes happens that trains that are starting have to be stopped again on account of some unexpected occurrence.

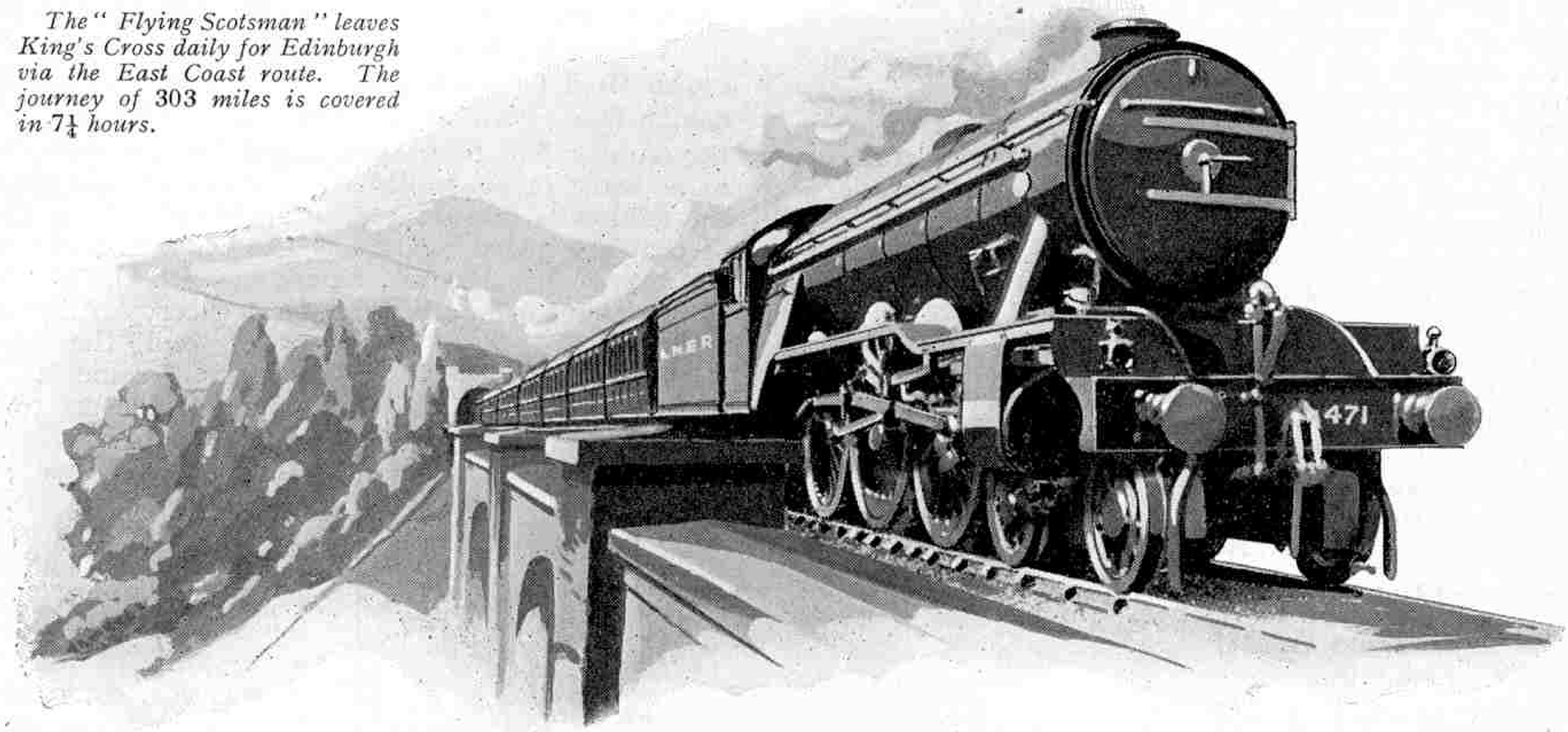
We were getting away in style now and the fireman had already started with his shovel. Down below us were the extensive goods yards for dealing with the vast amount of traffic to and from Scotland. We were finding a slight incline leading us out past Upperby, where the extensive L.N.W. section sheds are situated.

At this stage the driver is able to weigh up the qualities of his loco, glancing at the lubricator in front of him and at the gauge showing how the efficiency of the super-heater is enabling the steam pressure to be maintained. Meantime, on goes the injector, sending a supply of water into the boiler.

The ability of the fireman now gets a chance to show itself. If he is a capable man he will keep the steam just whispering from the safety valve, and to do this he has to regulate the fire and the water supply, and these are acutely affected by every change of gradient.

FAMOUS TRAINS:

The "Flying Scotsman" leaves King's Cross daily for Edinburgh via the East Coast route. The journey of 303 miles is covered in 7¼ hours.



HORNBY TRAINS

BRITISH AND GUARANTEED

Each Hornby Set is packed in a strong, handsome box and is supplied with a complete set of rails. The locos and various components are carefully examined and tested before leaving the factory, and they are guaranteed.

PRICES

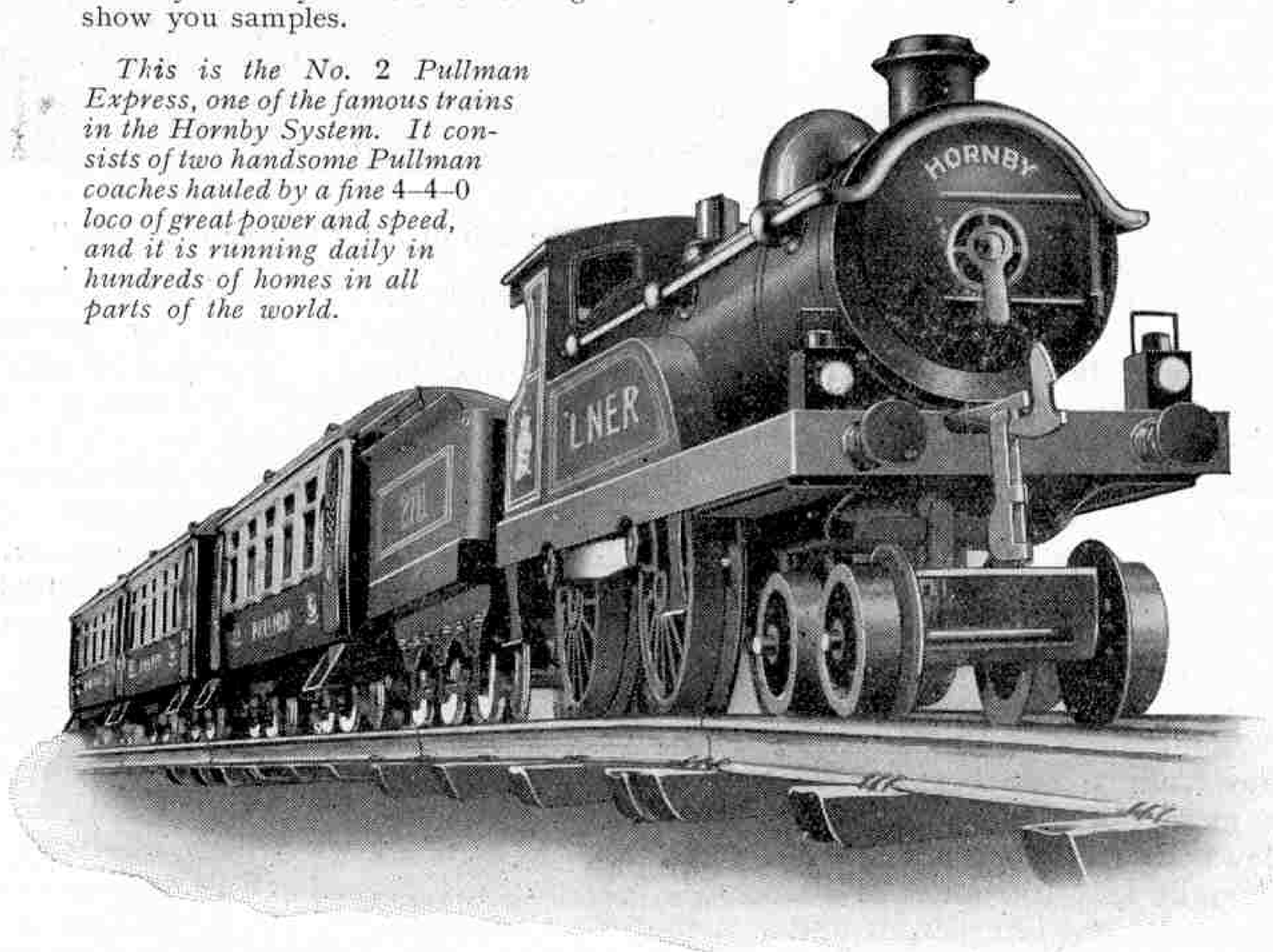
No. 0 Passenger Set ...	24/–
No. 0 Goods Set ...	17/6
No. 1 Passenger Set ...	27/6
No. 1 Goods Set ...	21/–
No. 2 Pullman Set ...	60/–
No. 2 Goods Set ...	37/6
No. 1 Tank Goods Set	25/–
No. 2 Tank Goods Set	45/–
No. 2 Tank Passenger Set	45/–

Manufactured by
MECCANO LTD.,
BINNS ROAD,
LIVERPOOL.

WHEN you own a Hornby, you can enjoy the fun of running your own complete railway system. It's the finest fun in the whole world, and you will find that even your father will want to help you when you've fixed up a Hornby Railway!

See how long a Hornby Loco runs without re-winding. See how it gets up speed with a heavy load behind it, and how smoothly it rides over the points and crossings. And how fine and sturdily built are Hornby Trains. How real they look. How beautifully they are enamelled in the correct colours. Every part of a Hornby Railway is like that—strong and beautifully finished. Ask your dealer to show you samples.

This is the No. 2 Pullman Express, one of the famous trains in the Hornby System. It consists of two handsome Pullman coaches hauled by a fine 4–4–0 loco of great power and speed, and it is running daily in hundreds of homes in all parts of the world.



The task demands great skill and judgment, and also unremitting attention. On this occasion his work was astonishingly good. He had inferior coal to work with, but the needle of the pressure gauge did not move more than five points all the way. When there was a long tough stretch of uphill he cut off the water until it got rather low, and just when I was beginning to wonder whether he was not very daring, the safety valve began to tune up and on went the injector.

Adjusting the Steam Supply

There were other interesting points to be noted. The small, dusty coal was liable to overheat the smoke-box, and the ashes had to be cleared out every 10 minutes or so. This was done by turning on a steam-blower in the smoke-box.

When "*John Bateson*" was tackling the heavy inclines up to Shap Summit, the firing had to be done very skilfully indeed.

In the meantime the driver was as busy on the left-hand side of the footplate as the fireman upon the other. Having sized up his loco's abilities, he adjusted the steam supply to the cylinders in order to maintain a high speed on both constant uphill and occasional downhill stretches, and he never failed to watch the signals as they flew past. It was a fine sight to see these two experts exercising their knowledge and judgment to the full.

We had to call at Penrith first of all, and the time allowance from Carlisle was 29 minutes. I was too interested in watching the driving and firing of the loco to time the train by means of a stopwatch, but I had another way of finding out how we were doing—I watched the faces of the signalmen as we passed their boxes. Most of them had a smile, and this meant that we were keeping to schedule. One who looked concerned had no doubt allowed a laggard goods train to leave with not too much time to get shunted out of the way into a siding at the next box in advance. Altogether I was not surprised to find we had reached Penrith in 24 minutes instead of 29.

Shap Summit

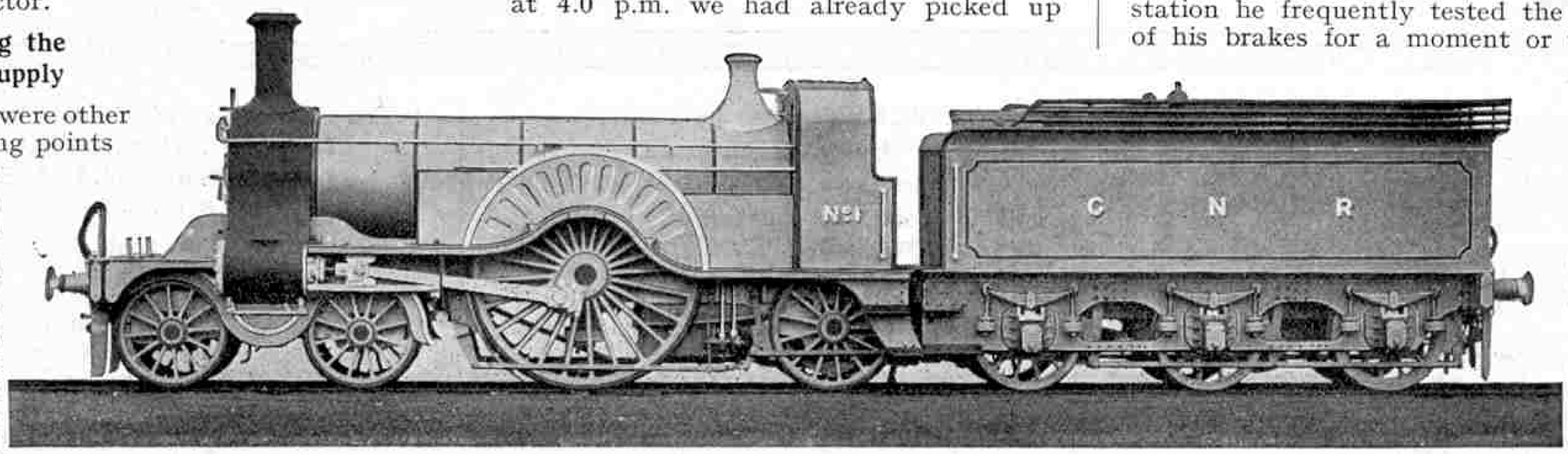
Our next call was to be Carnforth, but first came the steep climb to Shap Summit on the crest of the lonely fells, 914 ft. above sea-level. After breasting the summit there was a tempting run of five miles down the other side of the gradient of 1 in 75.

Through Tebay and Low Gill—where a line branches off towards Yorkshire via Ingleton—we flashed, the steam being kept on sufficiently to warm the cylinders, and then followed the longer though flatter gradient down Grayrigg Bank to Oxenholme. If the driver had wanted to do anything sensational this would have been his chance, but he was wise. He had no desire to overtake other trains on this busy main line. They themselves would be keeping to schedule time, and there would have been some excitement had "*John Bateson's*" headlong rush forced them into undignified sidings!

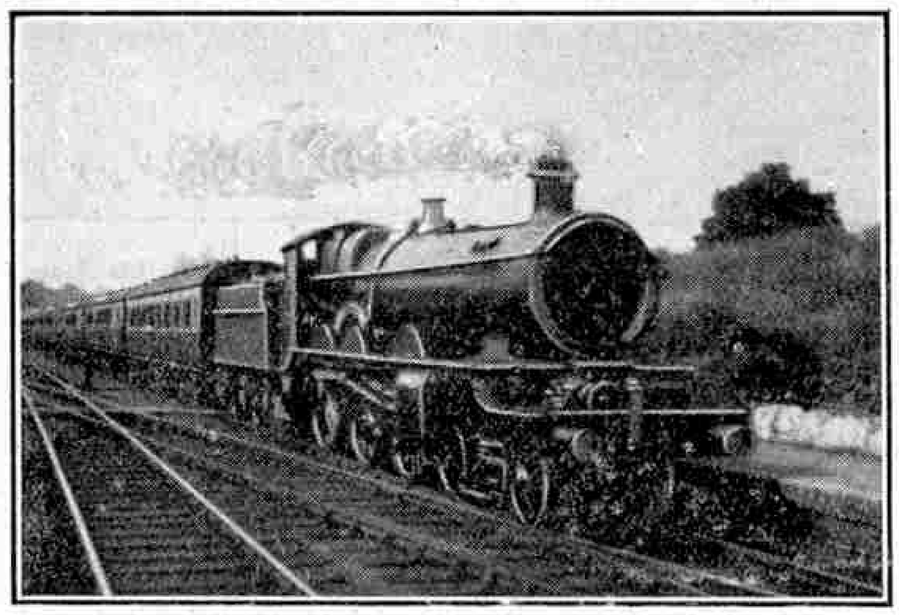
Over the Water-Troughs

We had started from Carlisle on the dot of 2.35 and as we stopped at Carnforth at 4.0 p.m. we had already picked up eleven minutes, but of course the load was very easy. By the time Preston (90 miles) had been passed the gain of minutes was 16.

As we were nearing Preston, tearing along the levels of West Lancashire at very high speed, the fireman beckoned me to move to one side of my corner by the tender toolbox, and I caught the word "Water" from him above the roar of our passage. He stood at a small wheel, and then, before I knew what had happened, there was a hiss and a roar, a spattering of spray, and the water level in our tender-tank was rising at a great rate. We had filled up and were off the water-troughs again in the twinkling of an eye, and the scoop was immediately raised, otherwise it might damage points or cut its way through sleepers at level crossings.



A "Single-Driver" Express Passenger Loco, built at Doncaster in 1870


"Queen Victoria" (4-6-0) hauling G.W. Rly. Express, Birmingham to Paddington. Snapped near Leamington by one of our readers, L. E. Walsh

The Driver's Activities

As we speeded southward I continued to watch the various activities of the driver. He was amazingly alert. Every signal was carefully watched for, and in the case of a tardy signalman pulling over his lever only a short way ahead of us, an imperious blast on the whistle resulted. Where working parties of platelayers were passed on the line he kept his eyes on them until the train was well past. He was always on the lookout for any flag-waving or lamp held aloft or other sign of distress or alarm. When the signals for trains in the opposite direction went off and heralded an approaching fast or slow, our driver watched for the newcomer and examined it closely in passing for opened carriage doors or anything else unusual.

Round the sharper curves he gently applied the air brake to steady the train, and before approaching a junction or large station he frequently tested the working of his brakes for a moment or two. In rounding curves he also glanced back along the train to see if all was well. Every sound of the loco's working had its meaning for him, and had the slightest rattle or "knock" set in, or even a slight unusual hiss of steam, he would have been on its trail at once. Every smell from the oily monster reached his nostrils, and the momentary sniff of an axle running hot, or the peculiar warm smell caused by friction in the motion, or the burning off of paint, would have found him stopping, or at least going round the frames to investigate.

Crossing the Mersey

The run lost something of its interest beyond Preston, as the line through a corner of industrial Lancashire becomes very complicated. With so much time in hand the driver could afford to take things easily, and only once or twice did "*John Bateson*," exceed 65 m.p.h. Crossing the Mersey at Warrington, after a very careful approach, we entered upon the final stage across Cheshire to Crewe where our gallant steed had been built.

During the last few miles the fire was allowed to drop, and by the time we had drawn up at the long and crowded platform there was not enough pressure to raise the safety valves while the white heat in the fire-box had crimsoned to a dull red. When we were uncoupled, and the shunting-signal was snapped down for "*John Bateson*" to part with the train he had brought from the far northern border, another loco of the same type, with pressure up and great clouds of steam blowing off, backed on and was soon speeding southward for London.

In conclusion I will add a few interesting observations that I made on this footplate trip from Carlisle to Crewe. Approximately 4 tons of coal were shovelled into the box in 66 short spells of firing. No less than 136 different operations were performed by the engine crew, many of them frequently repeated. During the run of 141 miles we passed 42 stations, 17 junctions, 110 signal-boxes and 344 signals. Each of these signals had to be accurately observed, for the passing of one at danger might have involved the train and its 300 passengers in disaster. Hats off to the British locomotive men!

Books to Read

Readers frequently write to me asking if I can recommend books that are both of interest and of use. On this page I review books that specially appeal to Meccano boys I do not actually supply these books, which may be obtained either through any bookseller or direct from the publishers.—EDITOR.

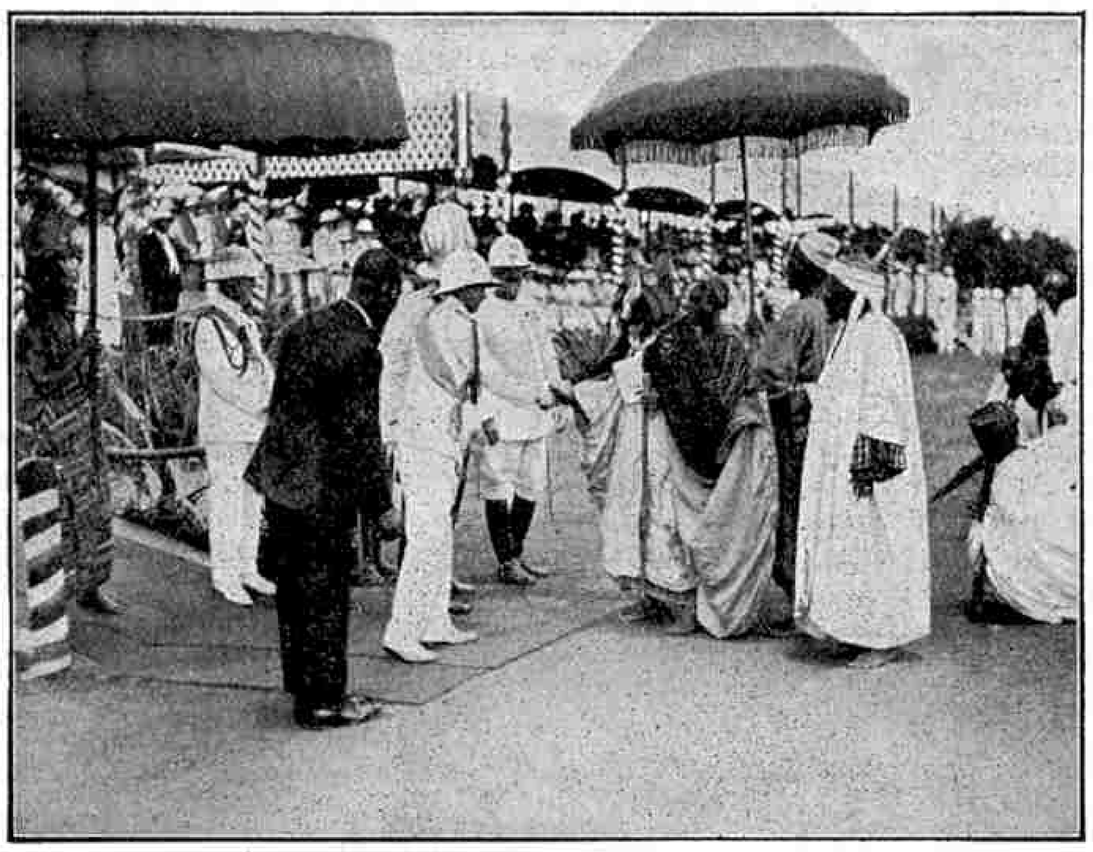
"Marvels of Sound, Light, and Electricity"

By Percival G. Bull

(Published by Messrs. Geo. Routledge & Sons Ltd. Price 6/-)

This interesting book will appeal to those readers who are fond of experimenting. It is not intended to be a text book and the experiments described do not require elaborate or expensive apparatus. In fact, we feel sure that Meccano boys will easily be able, by the exercise of their ingenuity, to make up the apparatus required, and no doubt in doing so, they will find Meccano of considerable service. The book is by no means a collection of spectacular experiments, but is written for those who wish to obtain an insight into some of the principles and laws that govern the world of physical science. Nature offers considerable enjoyment to those who probe her secrets and mysteries, and there are few subjects in which time may be spent more profitably than in an investigation of sound, light, and electricity. Those of our readers who are interested in X-Rays and similar developments will find the last two chapters of particular appeal. Mr. Bull here deals with Geissler-tubes, Cathode and X-Rays, Radioactivity and experiments with high-frequency electric currents and high tension discharges.

In recent years a considerable amount of attention has been paid to the work of Clerk-Maxwell (who, in 1864, assumed the existence of electro-magnetic waves in his famous theory of light), and to the work of Hertz, who afterwards supplied the experimental proof of Maxwell's theory. The work of these two pioneers, together with that of Michael Faraday, laid the foundations of electrical science, and the young experimenter with this book before him will be able to walk in the foot-steps of these three great men. Not only will he be able to perform the experiments they carried out, but he is in a happier position to-day than were these great scientists, inasmuch as he can ascertain the fundamental principles that lie at the basis of these experiments, which principles were for the most part quite unknown, or at least only partially understood, even in Faraday's time.



H.R.H. The Prince of Wales meets a Native Chief under his State Umbrella. *(One of the illustrations from "With the Prince to West Africa" reviewed on the next page).*

"British Butterflies and Moths"

By W. S. Furneaux

(Longmans, Green & Co., London. Price 6/6)

This book, which forms one of the well-known "Out-door World" Series, has been published for several years and the present issue is a new edition of 358 pages with 241 illustrations and 12 beautiful colour plates.

The book still retains the freshness and originality of its first appearance, and deals particularly with the British Lepidoptera, which important order of insects the author describes fully.

Although this does not claim to be a complete work on the subject it contains a good selection that will satisfy the requirements of most of those who take up this interesting branch of entomology. The somewhat limited number of British butterflies has made it possible to include both a description and illustration of every species, while in the case of the larger moths most of the common kinds are described.

Not the least interesting part of the book is the section dealing with the collecting of butterflies and moths, larvæ, pupæ and eggs, their rearing, setting and preserving, and arrangement of specimens. There is also included a complete classified list of British Macro-Lepidoptera, and a useful calendar showing the months of the year in which the various varieties may be found. The coloured plates make identification of the specimens easy.

"The Principles of Sound Signalling"

By M. D. Hart, M.Sc. and W. W. Smith, M.A., M.Sc.

(Constable & Co. Price 12/6 net)

This book deals with the production, transmission, and reception of sound on a purely scientific basis and it includes the results of a large number of experiments. The authors first deal with the efficiencies of a system under the three sections above-mentioned and point out that in practice it is preferable to use a "figure of merit" for the performance of the system. They show how this assists the engineer in comparing and improving the apparatus employed.

Commencing with a consideration of the appliances available for the detection and intensification of sound waves, the book next deals with transmission. Experiments with the hot-wire microphone are described and discussed, and the conclusion is arrived at that "one of the essentials for the efficient production of sound is the avoidance, as far as possible, of a high intensity at any point within the system." Next, the influence of the humidity and temperature of the atmosphere on transmission is briefly described. Two chapters are devoted to the conditions prevailing at the source and to the apparatus available for sound production, of which the centrifugal siren is said to meet the equirements of theory most satisfactorily. In conclusion the whole problem is briefly reviewed in the light of the investigations described.

The book is, of course, intended for students and engineers but the researches undertaken should be of the greatest service to those who are studying the subject.

"My Railway Book"

By C. J. Allen, A.M.Inst.T.

(J. F. Shaw & Co. 5/-)

This is a very similar volume to "Railway Marvels" (reviewed last month), but considerably enlarged. In addition to including the matter contained in "Railway Marvels" it carries on with a second section dealing with the new Railway groups; electric railways; the planning and making of a railway; how engines are tested; safety on the Tubes; how a locomotive is built; where the engines are housed; and several other matters of great interest.

In this book there are 192 pages, 240 photographs and 16 coloured plates. The illustrations are particularly good and the whole book is clearly written in a manner that holds the reader's interest all the way through, technicalities being avoided as much as possible.

I quite expect this volume will be a great favourite among those of my readers who are railway enthusiasts.

"Tack Ship"

By Lieut. M. Bennett

(Published by Ed. Arnold & Co. Price 7/6)

This volume contains a fine collection of stirring yarns of the sea that should appeal not only to the sailor, but to all those who love to hear about a life on the ocean-wave. There are yarns of thrilling interest and excitement, of storm and ship-wreck, fire and mutiny—indeed of all the perils of the sea. The book is written with a skilful pen by one who obviously has lived the life he describes.

Stories of the sea are always interesting and more especially so when they are written in that breezy manner in which this book is written. It does not require any great stretch of imagination for one to accompany Lieut. Bennett in all the episodes of which he so racily writes, and I have seldom enjoyed reading a book so much.

* * *

"With the Prince to West Africa"

By E. Ward Price

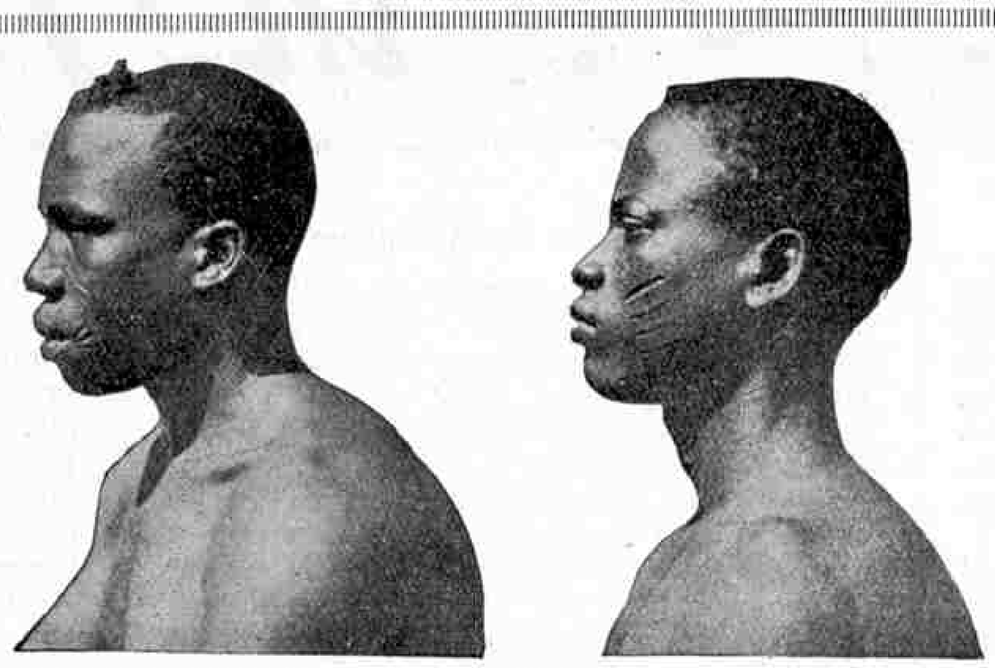
(Published by the Gill Publishing Co. Ltd. Price 3/6)

No doubt every one of our readers envied H.R.H. the Prince of Wales in his trip last year in the great battle cruiser "*Repulse*." To have sailed overseas in any ship is an adventure well worth while, but to have made the voyage in a great battleship, under the shadow of 15" gun turrets, was an experience that does not come to many. Mr. Ward Price was fortunate in being chosen to accompany the Prince on his tour, and he has written this account for boys and girls so that they may come to know more of the distant parts of the Empire that the Prince visited. As the Prince states in a foreword, "I wish that they could all enjoy the same opportunities of travel that I have been given, but failing that, I hope that some may derive a certain amount of pleasure from reading the pages that follow."

The story commences at Portsmouth and after an uneventful voyage the "*Repulse*" arrived at Bathurst. As the "*Repulse*" draws 31 ft. of water, and as the depth near the shore was only about 30 to 35 ft., it was necessary for the ship to lie off the coast at a distance of 23 miles—quite out of sight of Bathurst, of course. The Prince went ashore and was introduced to the local chiefs, who expressed their appreciation of the honour by advancing in turn to the dais and, taking the Prince's hand, stroked his right arm, at the same time muttering a whispered blessing!

Next day the "*Repulse*" steamed slowly into the harbour of Freetown, the capital of Sierra Leone. Here the Prince saw many wonderful things, not the least exciting of which was an exhibition of snake-charming, during which "the unfortunate snakes had their tails twisted until they tied themselves in knots with indignation. Every now and then one of them would shoot out its hideous head and with vicious delight sink its fangs deep into its master's arm. . . Though the snake-charmer's hands and wrists were soon dripping with the blood of the bites, they had no other physical effect upon his health!"

Coomassie, the capital of Ashanti, was also visited. It is 170 miles up-country, and it was here (as late as 1900) that the last of Britain's campaigns with the warlike natives was fought, after almost 40 years of trouble and warfare. The country is rich in minerals and in view of our recent article in "*The Story of Metals*" series, our readers will be particularly interested to hear that there are rich deposits of bauxite, the ore from which aluminium is obtained.



Two natives of Nigeria. The type the Prince met on his West African tour.
(From "With the Prince to West Africa," reviewed on this page).

At Coomassie, too, was staged an impressive display of pomp and power. On a front of 400 yards, against a background of green trees, were ranged 150 Umbrellas of State, each representing the dignity of a native chief sitting on a throne below, surrounded by his retainers whose golden insignia glittered in the sunshine. From the Prince's stand the scene resembled a gorgeous and gigantic fairy mushroom bed.

We have not space to describe the wonders of "the Great Umbrella Day," nor of the beautiful sights and amazing experiences that the Prince encountered during the remainder of his trip. Suffice it is to say that the visit culminated in the greatest show of all at Kano, where was presented a spectacle of a kind that few men are privileged to see in a life-time—even though resident overseas. This wonderful display was a great mounted Durbar on the level plains in front of the ancestral town of the Emir. Half-a-mile away there stretched a long and deep array of horsemen, the number so great that they hid the whole horizon from view. Each man was dressed in coloured flowing robes, and each horse was covered with richly-wrought saddle cloths. The whole plain thudded with the beat of the hoofs of 30,000 prancing, half-broken horses. Some of the horsemen had travelled for over five weeks (carrying their own food and fodder for their horses) through the trackless Ashanti bush, in the hottest weather, to see the Prince!

The account of this Durbar and the wonderful riding will we feel sure interest every lover of horses and the whole book is packed with incidents that must appeal directly to anyone fond of travel. Those of our readers who are stamp collectors, too, will recognize many of the places mentioned as being popular countries in their albums, and for this reason alone the book will to them have an added interest. I am sure no reader of the "*M.M.*" will close the book until it is finished!

Advice on Trade Marks

The complications involved in the choice and registration of trade-marks are such as to bewilder the average man, and it is foolish policy to attempt to deal with such a matter without the assistance of an expert.

We recommend all those interested to send for a booklet on the subject by the well-known patent agent Mr. B. T. King (146a, Queen Victoria Street, E.C.4), whose advertisement appears on page 352. This booklet shows how easy it is for the uninitiated to go astray and demonstrates clearly the necessity of expert advice.

"Holiday Haunts, 1926"

(Published by the Gt. Western Railway Co. Price 6d.)

With 890 pages and many photographs, this must surely be one of the most comprehensive holiday guides ever published by a Railway Company.

The counties of England, Wales and Southern Ireland, also the Channel Islands, are dealt with in alphabetical order and are profusely illustrated. The 51 photographs of Devon and the 44 showing Cornwall's beauty spots are particularly attractive. Certainly this book gives one "the holiday feeling" with its picture gallery of cathedrals, castles and shady woods for those who love the country and quietude, or of mountain and moorland for those who revel in "the wind on the heath." Those for whom the sweeping bay and the well-filled promenade with plenty of amusements holds an irresistible attraction are also well catered for, and in this connection it may be mentioned that the Isle of Man is included in this book.

Having chosen the destination, the next point is, of course, accommodation. Here the compilers of the guide have done their work well, for there are lists of Hotels, Boarding Houses and Farmhouses, with a note as to the distance of each from the station—the latter being a particularly welcome feature in the estimation of many.

There are also 13 maps, and with the aid of these and the post card enclosed in each copy of the book, which when despatched to Paddington Station brings by return of post full details of the best route, and the train service to the desired destination, it must be admitted that the publishers have done everything humanly possible to solve for us the pleasant question of "What about holidays?"

The Strategy and Tactics of Air Fighting

By Major Oliver Stewart

(Longmans, Green & Co. 6/-)

This is the first book of its kind to deal exhaustively with the strategy and tactics of air fighting and it will appeal to all interested in aeroplanes and flight. Major Stewart is well qualified to speak on the subject, for he served in the Air Force during the war and his book is based entirely on the experiences of pilots under actual fighting conditions. Some of his prophecies are startling, particularly those in which he deals with the next war in the air.

He believes that the single-seater aeroplane will remain the most powerful arm and that single duels in the next war are likely to be as numerous as in the last. "The fighting monoplane of the future," he tells us, "will be a very small all-steel monoplane, mounting a 1,000 h.p. gas-turbine engine and possibly incorporating some form of jet propulsion. It will be capable of 400 miles on the level, and will have a terminal velocity in the dive of nearly 800 m.p.h. In other words it will travel faster than sound!" There will be as few accessories as possible, but a flare and a free parachute will be carried and a small-bore gun, which will fire bullets so rapidly "that the effect will be like a whip-lash of lead."

Even at present fighting in the air is a highly developed science, but in the light of these remarks it would appear to be child's play compared to what the air pilot of the future may expect!

Sea Mystery Solved

A short time ago a mysterious object was sighted in the English Channel, and the Deal lifeboatmen, believing the object to be an aeroplane floating bottom upwards, went out to try to salve the machine. They were unable to locate the object, however, and returned after a fruitless journey.

Soon afterwards the mystery was solved by Captain Walters, a pilot on the London-Amsterdam air route, who observed a dark object floating a few miles south-east of Dover. He planed down to within 200 ft. of the water and was then able to ascertain that the object was a dead whale, around which large flocks of seagulls were circling.

* * * *

Scholarships for Flight Cadets

The Air Ministry announce that Sir Charles Wakefield has offered to continue the "Sir Charles Wakefield" Scholarships founded by him in 1920, in view of the great assistance that has been provided by his benefaction. The Air Council have accepted gratefully this offer.

The scholarships are each of the value of £75, tenable for one year at the R.A.F. Cadet College, Cranwell, and are intended to give financial assistance to successful candidates whose parents are in poor circumstances. Two scholarships are awarded at each half-yearly entry. One of these is awarded on the result of the open competitive examination for admission to the college, and the other to one of the aircraft apprentices who, at the conclusion of their training at the R.A.F. establishment at Halton, are selected twice a year for Flight Cadetships at Cranwell.

* * * *

Air Force Cross for Mr. Cobham

As a sequel to the flight from London to the Cape and back comes the announcement that the King has awarded the Air Force Cross to Mr. Cobham in recognition of his distinguished services to aviation. Including this flight the famous airman has covered probably more than 250,000 miles in the air. Some of his other great flights are as follows :—

1921—5,000 miles tour round Europe in three weeks ; 1922—8,000 miles journey to North Africa and Italy ; 1923—12,000 miles journey to North Africa, Egypt and Palestine ; 1924—1,250 miles flight from London to Africa and back, in 12½ hours ; 1924—17,000 miles flight to Rangoon and back.

Gold Rush by Aeroplane

The rapidly increasing scope of air traffic was strikingly illustrated recently when, for the first time, an aeroplane was used to convey prospectors after gold. A new gold camp has been opened at Red Lake, Ontario, and a party of prospectors set off on foot with dog teams in the usual style. Shortly after the prospectors' departure a Hamilton airman announced his intention of inaugurating a "gold rush passenger and freight service," and three machines are being used to convey intending miners to the goldfield. The journey by air takes only two hours, whereas those who travel on foot cannot get there in less than from seven to ten days.

* * * *

A New Seaplane

The first trial of a new seaplane built for the Air Ministry by the English Electric Company at Lytham was held recently. The machine is the eighth constructed for the Government by the company and it differs from the one recently handed over in that it is constructed of mahogany instead of duralumin. A number of new ideas have been incorporated in the design of the hull. The bow is yacht-like in shape, and consequently, when taxi-ing on the surface, there is an almost complete absence of water breaking over the bows.

The tests are stated to have been extremely satisfactory. It is estimated that the maximum speed of the machine was over 110 miles an hour, while at times it rose to an altitude of 2,000 ft., a considerable achievement for a machine weighing between six and seven tons.

* * * *

Italian Air Notes

The Genoa Air Navigation Company and the Italian Air Ministry have recently concluded negotiations for the commencement of a daily air service between Genoa, Rome, Naples and Palermo. Among several other routes under consideration are Turin-Pavia-Trieste, and Rome-Brindisi-Athens-Constantinople, while a further careful survey is being made of the various routes between the more important Italian towns and points in the Near East and Central Europe. The machines will be hydroplanes of the Dornier-Wal type, built at the Marina-di-Pisa, capable of 10 hours' continuous flying, and carrying 15 passengers and a considerable amount of mail. The engines, two 450 h.p. "Jupiters" to each machine, are already completed.

Fool-Proof Light Aeroplanes

Work has recently been commenced upon the construction of two light machines which, it is claimed, will be the first practical fool-proof "light cars" of the air. The design embodies the windmill principle introduced in the Cierva Auto-Giro, and in the front of the machine, neatly cowled in, will be a compactly housed little engine developing 36 h.p.

The piloting of a machine of this type will be so easy as to be almost an automatic operation. Once off the ground the pilot will have to attend only to controlling the height of the machine, operating the rudder for steering, and governing the running of the engine. The machine itself will be able almost to stand still in the air with the engine throttled down and, when descending, will alight so gently that landing will be possible in very restricted areas. This, of course, is attained by the action of the free revolving fans.

A machine of this type when perfected will do much to popularise amateur flying. The use of aerodromes will be unnecessary, all that is needed being a small lawn or open space close to a garage in which the machine is housed.

* * * *

London to Australia

A second survey of the 2,500 miles air route from Cairo to Karachi is being made by representatives of the Air Ministry and Imperial Airways with the object of investigating and examining, from the ground, the points on the map marked as landing and refueling stations by the first survey party from the air. While this work is going forward Imperial Airways experts are considering schemes and routes to link up London and Cairo, the ultimate object being a through route from London to Port Darwin, connecting with the Australian aviation routes, via India.

For the London-Cairo trip two schemes are under consideration. The first is to make use of the existing London to Zurich route and for the passengers to change at the latter place and proceed across the Alps by rail to an Italian aerodrome, from which the aerial portion of the trip would be resumed. The second plan involves a new route from London to Marseilles, employing multi-engined air-boats, and it is interesting to note that the new Handley-Page-Napier machines are being fitted to carry sufficient fuel to enable them to make the long non-stop flights that the overland sections of this route would involve.

German Seaplane Trials

A series of seaplane trials open to German machines only will be carried out in July off the northern coast of Germany. Prizes to the value of 250,000 gold marks will be awarded to the constructors of the machines that prove most seaworthy and at the same time most efficient for mail-carrying. Foreign-made engines are not barred.

* * * *

Bullet-Proof Petrol Tank

A new type of bullet-proof petrol tank for aeroplanes has been purchased by the United States War Department from an Italian inventor. The tank already has been subjected to exhaustive tests and it is claimed that its use will greatly decrease the danger from fire.

The tank consists of two concentric cylinders between which is interposed a packing of cork. When the tank is pierced by a bullet, an electrically operated mechanism immediately revolves the inner cylinder until the bullet hole is covered by a portion of the outer cylinder, so preventing the escape of petrol. The tank therefore is self-sealing. The inner lining of cork reduces friction, so that the inner cylinder can revolve freely, and in addition it prevents the corrosion that inevitably would result if the two metal surfaces were in contact.

* * * *

London to Paris in Ninety Minutes

Very fast time for the London-Paris trip was recently made by an Imperial Airways 16-seater Handley-Page machine which, carrying a full load of cargo and passengers totalling six tons, flew the 230 miles journey in 90 minutes. The average speed, 154 miles an hour, is a record for a big machine of this type, but the actual time record for the journey is held by a four-seater Napier D.H., which made the flight in 87 minutes four years ago.

* * * *

Ford Air Service Secures Mail Contract

The Chicago-Cleveland air mail contract has been secured by the Ford Air Service and the new route was opened recently by "*Maiden Dearborn I.*" This is the all-metal monoplane, fitted with a 400 h.p. Liberty engine, that inaugurated the Ford private air transport for spare parts between Detroit and Chicago in April 1925, in which service this machine has flown 50,000 miles. The total mileage recorded by the Ford machines on the private service is 186,600 miles, the freight carried totalling 897,000 lb.

Gyroscopic Control

One of the big expresses of Imperial Airways is being fitted with gyroscope-controlled steering. In principle the system will be somewhat similar to the anti-rolling device employed on ships, but in this instance the gyroscope is applied to the rudder and thus the aeroplane can be made to follow a given course without any control on the part of the pilot.

A Giant of the Air

Our illustration shows a D.H. 54 fitted with 650 h.p. Rolls-Royce Condor engine. This giant passenger aeroplane, which is equipped with every accessory necessary for the comfort of passengers, is the subject of our aeroplane article this month. (*See page* 294).

Aero Engine's Long Run

A remarkable endurance test has just been completed by a Bristol Jupiter air-cooled engine, fitted to a Bristol-Bloodhound biplane, under the direct supervision of the Air Ministry. Each day, for several weeks, the machine flew the double journey between Croydon and Bristol until the total mileage flown amounted to 25,000, the figure decided upon at the commencement of the trial. The actual flying time was six minutes less than 226 hours and not one adjustment or replacement was made throughout the whole period, the only trouble experienced being one forced landing owing to an oiled-up plug.

* * * *

Another Slander ?

Sir Samuel Hoare, speaking at a luncheon held after the naming of the machines mentioned in the following note, stated that one Imperial Airways pilot had already made 3,000 flights across the Channel. One passenger had made 40 journeys in Imperial Airways machines to and from the Continent, and one machine had flown 310,000 miles in 3,200 hours. Sir Eric Geddes, Chairman of Imperial Airways, had found that his fellow-countrymen from over the Tweed were making use of Imperial Airways in ever-increasing numbers. They had discovered that by flying from London to Paris they avoided porters' tips !

New Air Liners

At Croydon recently five new air liners were "christened" into the service of Imperial Airways by Lady Hoare, wife of the Secretary for Air. Each of these machines is a twin-engined Handley-Page-Napier designed to accommodate 14 passengers in addition to pilot and mechanic, and is able to carry a load of 6¼ tons, including its own weight, at a speed of 105 miles per hour. The machines are named respectively :—"The City of London," "The City of Melbourne," "The City of Ottawa," "The City of Pretoria" and "The City of New York." The inclusion of New York in an otherwise Imperial list would appear to be a graceful compliment to America.

* *

Two-Storey Fokker

Mr. Fokker, the famous Dutch aeroplane constructor, is building a new type of machine to be used exclusively for night flying. Sleeping accommodation is to be provided for 40 passengers who will, literally, go "upstairs to bed," as the machine will possess an upper and a lower deck, the former being divided up into sleeping cabins. Engines developing 2,000 h.p. are to be installed. Up to the present the ultimate ownership of the machines has been kept a close secret.

* * * *

South African Air Mail

In our notes in December last reference was made to a proposed air service between Cape Town and Johannesburg and it was stated that it was probable that an English company would undertake the contract. Subsequent to our note a hitch occurred and the British company dropped out from the negotiations. These were again taken up by the German Air Line, the name given to the amalgamated interests of the Deutsch Aero-Lloyd and the Junkers Companies, and it is with representatives of this company that South Africa is now negotiating. It is understood that the proposal is to run a service with Junker machines, and the South African Ministry of Post and Telegraphs has stipulated that, although experienced German pilots will come with the machines, the service is not to be commenced until a sufficient number of South African pilots have been trained to fly the machines.

The service is to include passengers, goods and mails, and the route between Cape Town and Johannesburg will be via Oudtshoorn, Port Elizabeth, East London and Durban. It is stated that the annual subsidy will be somewhere about £8,000.

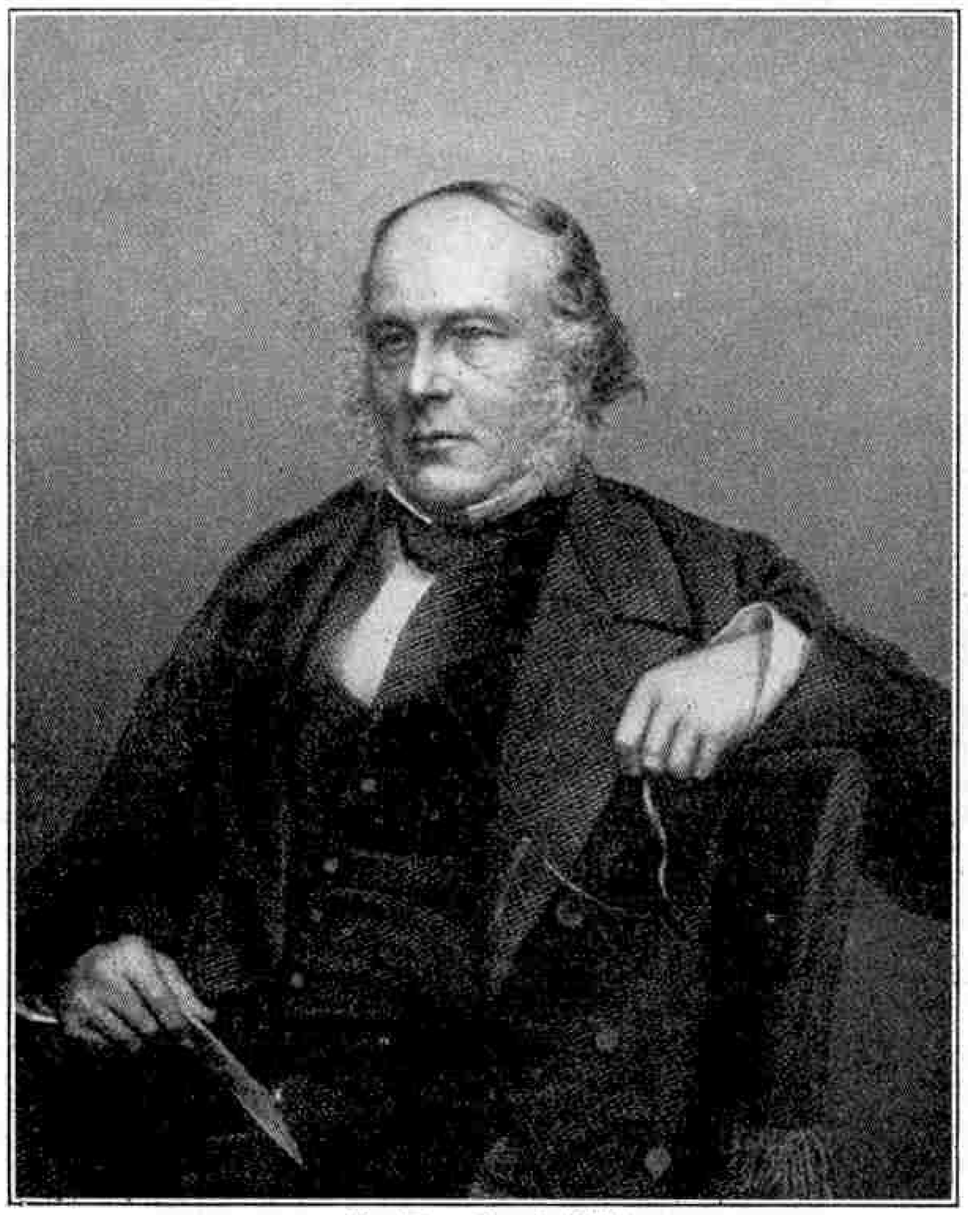
The Coming of the First Postage Stamp

by R. Kay Gresswell

"Hail, joyous day! The Postage Bill
Brings blessings, great and many:
And best of all, say what we will,
It only costs a penny.
From John o' Groats to England's end,
From Norfolk to Kilkenny,
A letter may now reach a friend,
And only costs a penny!"

WITH this and other similar, but rather weaker, attempts at poetry the newspapers of the time displayed their joy at the passing of the Penny Postage Act by a majority of one hundred with the result that it became law on the 17th August 1839.

On 5th December the postage rate for letters in the London district was reduced to one penny and for other districts to 4d. per half-ounce. On the 10th January 1840, the rate became 1d. per half-ounce throughout the United Kingdom. On 1st May the first stamps, the famous one penny black and the two-penny blue, were on sale. For the first time in history, on the 6th May 1840, the public were able to make use of adhesive postage stamps for prepaying the postage on their letters.


Sir Rowland Hill

Before the Penny Postage Act

Until this time the postage rate on letters had depended upon the distance the missive had to be taken and, instead of upon the weight, it also depended upon the number of pieces of paper enclosed. Outside London the charges varied from 4d. to 1/8 for each piece, so that if one wished to send a number of small pieces of paper, such as, for example, newspaper cuttings, each separate cutting counted as a complete distinct letter! On the other hand a single large sheet of paper, perhaps weighing as much as fifty newspaper cuttings, would be charged as though it were one letter only.

The bill that made uniform penny postage the legal rate was the result of an agitation spread over several years, at the head of which was Mr. Rowland Hill, who was afterwards knighted in recognition of his services.

The First Postage Stamp

Rowland Hill

Rowland Hill was born at Kidderminster on the 3rd December 1795. He was the grandson of Rowland Hill, the famous preacher of the beginning of the nineteenth century, who helped to found the Religious Tract Society and the British and Foreign Bible Society. Owing to illness Rowland was compelled to spend the first few years of his life lying on his back, and in this position his chief amusement—in the absence of Meccano!—was counting aloud until he reached very high numbers.

When he was seven, he went to school, where his aptitude for figures soon showed that he possessed more than average ability in mathematics. In fact, when he was only twelve years of age he began teaching mathematics in his father's school at Birmingham.

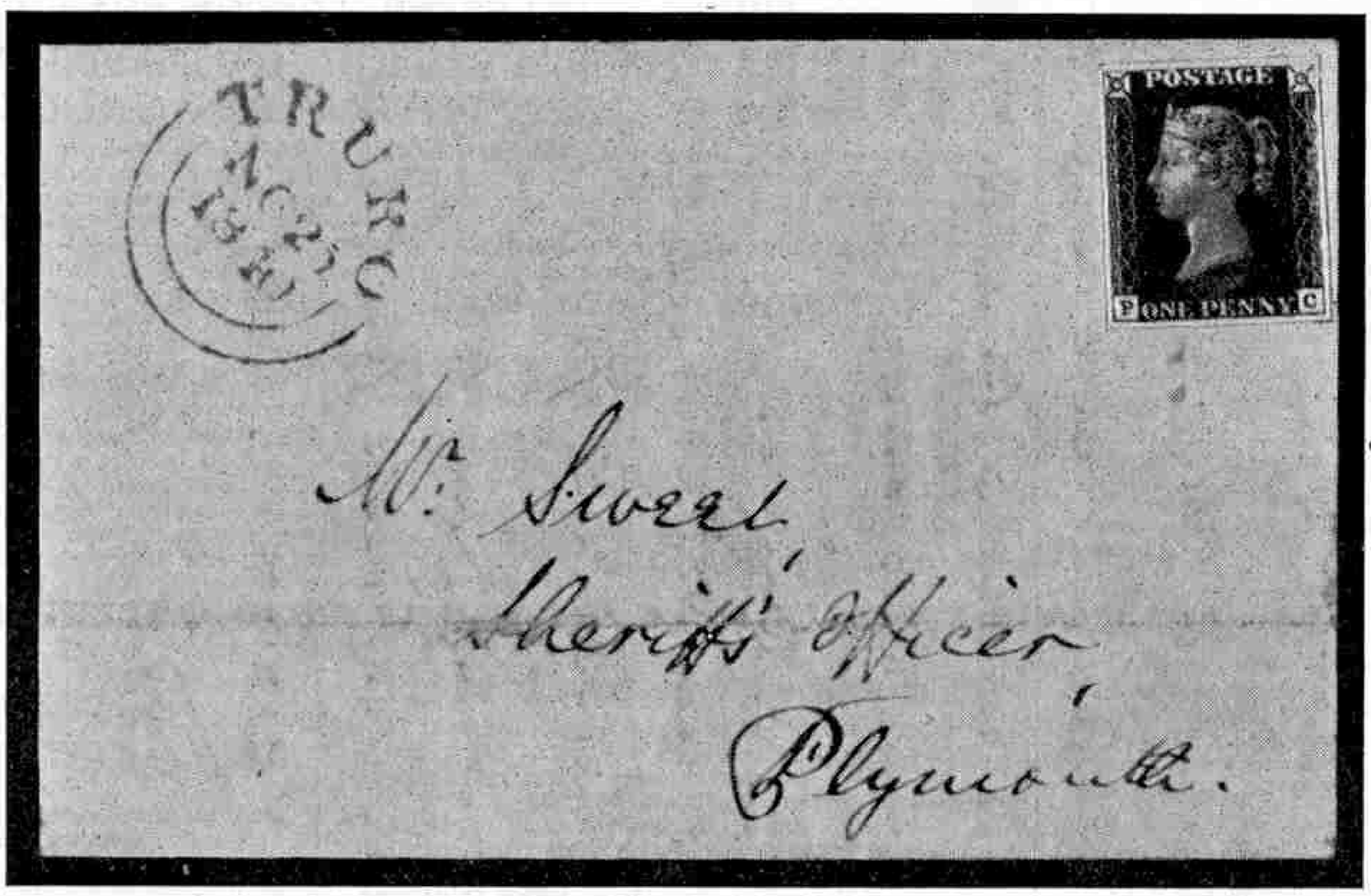
Rowland gradually extended his range of teaching until at last he took his father's place and became head of the school. He made a very successful schoolmaster and was responsible for greatly improving the system of education then in use. In 1827 he removed to a new school in London but in 1833, when thirty-eight, he was compelled to retire owing to failing health.

Hill's Postal Reform Pamphlet

This did not prevent him from taking an active part in public affairs however, and we find that two years later he began to turn his attention to reforming the postal system. Here his knowledge of mathematics undoubtedly assisted him greatly, for he set about collecting

a huge selection of statistics on postal matters, especially concerning postal expenses. In 1837 he was able to publish his now famous pamphlet entitled "Post Office Reform," which gave the details of the results of his investigations.

It contained a mass of statistics that need not be quoted here but it is interesting to note the conclusion to which Hill came. He found that the cost of collecting, sorting, carrying and delivering 126,000,000 letters and newspapers in the London district averaged .84 of a penny each, this expenditure being divided between .28d. for transit between post offices and .56d. for collecting, delivering, etc. But these figures grouped letters and newspapers together and he found that for letters alone the transit cost was probably less than .10d.



An Original Cover

He further calculated that the cost of transit for letters from London to Edinburgh was one third of the cost of transit for letters in London, and he found that the cost of transit was more or less the same between all towns irrespective of their distance apart.

This proved, of course, that to charge postage on a fair basis it should bear no relation to the distance (as it did at that time) but, in other words, that the postage rate between any two towns in Great Britain should be absolutely uniform.

Further he suggested that this uniform rate should be one penny per half ounce, that postages should be prepaid, and that the difficulties of prepayment "might be obviated by using a bit of paper just large enough to bear the stamp, and covered at the back with a glutinous wash, which by applying a little moisture might be attached to the back of the letter."

The Medal that was the origin of the portrait on the first stamps

This pamphlet aroused so much public interest that in the following year a Parliamentary Committee was formed to investigate the matter. The Penny Postage Act of 1839 and its attendant reforms, as already described, was the result of the labours of this committee and thus one of the greatest benefits to the commerce of the country was brought into actuality.

How the Post Office had been Defrauded

In addition to the expected great increase in the volume of correspondence, one of the chief ways in which the Post Office hoped to make it profitable to carry letters for one penny each was the new regulation that came into force at the same time that postage should be prepaid. Hitherto it had been collected on delivery from the person to whom the missive was addressed, and besides taking up considerable time, this method had the disadvantage of being very susceptible to a kind of fraud. In fact, it was quite a regular practice for the addressees, when asked for the postage on a letter, to gaze at it longingly, but sadly (and slowly) to shake their head and say that they could not afford it. The Post Office then had to send the letter back to the person from whom it originated who also of course "could not afford the postage," so that the Post Office carried the letter twice for no payment.

At the same time the addressee, when denying the ability to pay, was really examining the way in which the name and address were arranged and from a prearranged code he would know by this the message his friend wished to send to him!

Finding a Design for Stamps

We have already quoted Hill's suggestion for postage stamps, and when the Act became law and its reforms were being carried out, a competition was organized for designs suitable for the proposed stamps. Although over 2,700 entries were submitted none was suitable and Hill himself was responsible for the design that was ultimately adopted and which we all know as the Penny Black. The same design was adopted for the twopenny blue and with slight modifications this design was used for many years.

The portrait of the Queen was copied from the obverse side of a medal struck for the 9th of November 1837, the day on which Queen Victoria first entered the City of London after becoming Queen. This medal was struck by William Wyon of the Royal Mint and the portrait was used for all the stamps of this country and of nearly all the British Colonies issued throughout the reign. It is safe to say that no portrait has ever appeared on a greater variety of stamps.

The stamps were engraved by Mr. Frederick Heath

(Continued on page 325)

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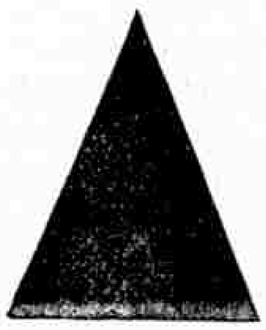

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The Coming of the First Postage Stamp—

(*Continued from page* 323)

and printed by Messrs. Perkins, Bacon and Co. of London, on paper watermarked with a small crown. As was fully described in the "*M.M.*" for June 1924, it was not until 1854 that stamps were officially issued provided with means of tearing them apart, and these first issues were imperforate.

An Original Cover

In addition to illustrating the famous Penny Black, we also illustrate another copy of the same stamp on the original cover that it guided safely through the post in 1840 soon after the penny rate came into force.

The stamp itself is an exceptionally fine copy and is postmarked with a red maltese cross. In the upper left-hand corner is another postmark in blue consisting of the name of the town "Truro" and two curved lines forming a circle inside which is "No. 25," the number of the post office, and the year "1840."

It is interesting to notice that the letter is addressed from the Sheriff's Office, Truro, to the similar office at Plymouth, and is written in Indian ink. The sheet of paper is folded to make its own "envelope," real envelopes not then being in common use.

(We are indebted to the courtesy of Messrs. Sefi, Pemberton and Co. Ltd., the well-known London firm of stamp dealers of 12, South Molton Street, W.1, for the loan of the engraving of Sir Rowland Hill and of the print of the Wyon medal reproduced here).

Interesting Issues

NORTHERN AND SOUTHERN RHODESIA

Separate Stamp Issues

It is not a matter of general knowledge that until 1911 Rhodesia was divided politically into three parts, North-Eastern Rhodesia, North-Western Rhodesia, and Southern Rhodesia. In 1911 these three parts were combined into two, Northern and Southern Rhodesia respectively, the river Zambesi being the dividing line. The territories were governed independently although in both cases by the British South Africa Company. In 1921, however, steps were being taken to remove the control from their hands.

Previously one series of stamps has been issued for the whole territory, but this has now been altered and in future Northern and Southern Rhodesia will have their own independent stamp issues.

Southern Rhodesia was the first to issue the new stamps and there was general pleasure throughout the stamp collecting world when it was discovered that she was retaining the portrait of King George V. in naval uniform. The type has proved very popular in the general issues for Rhodesia. The new series was issued about May 1924. The stamps are the work of Messrs. Waterlow and Sons Ltd., and are printed on wove paper without watermark, perforated 14 by a single-line machine. There are fourteen values ranging from ½d. to 5/–. The ½d., 1½d. and 6d. have been found imperforate between a pair. The ½d., 1d., and 1½d. are in sheets of 240 in four panes, the other values are in sheets of sixty in one pane.

Northern Rhodesia followed on 1st April 1925, with its series of sixteen values ranging from ½d. to 20/–. All are of the same type showing the King's portrait with elephants, a giraffe, palms and a native canoe on a lake in the background. The shilling values however are of larger size than the lower denominations. The design is the work of Mr. W. G. Fairweather and the work by Messrs. Waterlow and Sons Ltd. The stamps are recess printed on paper watermarked with the usual script CA and improved crown and perforated 12½.

SWEDEN

U.P.U. Commemoratives

To commemorate the 50th anniversary of the founding of the Universal Postal Union, Sweden issued a special series of stamps in 1924. We illustrate the type of the ore values, which shows the contrast between the old and new methods of mail transport. Below we see a postboy on a very strong and powerful looking horse with his posthorn and gun, presumably to defend his mailbag from the highwaymen. In the top left-hand corner is a seaplane, which incidentally has the two seats rather far from the front. There are twelve ore-values of this type. The three krone-values are upright and show a pigeon carrying a letter in its beak flying over a globe on which are seen a steamship and a railway train. All presumably typify modern mail transport. All values are perforate 10.

The Universal Postal Union was founded at Berne in 1874 largely as a result of the efforts of the German postal expert, Dr. von Stephan, whose portrait was shown on four stamps of Germany issued in 1924. All the countries of the world excepting Abyssinia, Afghanistan, Baluchistan and China are members and delegates meet from time to time to discuss international postal matters.

STAMP PERFORATION GAUGE

Stamp collectors will find this card extremely useful in enabling them instantly to find the size of perforation of any stamp. Price 1d. (post free) from the Editor, "*M.M.*"

Advertising on Stamps

One of our readers in Italy advises us that the featuring of advertisements on Italian postage stamps, as described in our February issue, has now been discontinued, as has also the advertising by post-marks. We understand that the reason for this step is that the Italian people considered that to use the stamps for advertising in this way was undignified to the nation and we must say that with this view every stamp collector will agree.

Big-Game Fishing—(*cont. from page* 307)

land Province. The two great fishing centres at present are Russell on the Bay of Islands and Mayor Island in the Bay of Plenty. There appears to be little doubt, however, that the great sporting fish exist in large numbers almost all along the coast from the Bay of Islands to East Cape, and last year large *mako* and swordfish were plentiful at Mercury Bay on the east coast of Coramandel.

Telling Fish "Stories"

Russell, the oldest town in the Dominion and once the seat of New Zealand's government, provides comfortable quarters for sea anglers, and seaworthy launches and skilful boatmen are available for hire. The boatmen have an intimate knowledge of the best fishing grounds and are exceedingly skilful in handling a boat during the strenuous time after a fish has been hooked. During this period, indeed, a very great deal depends upon the boatman, for he must watch the course of the fish and be ready to follow quickly any sudden turn, and to regulate the speed of the boat at critical moments.

Anglers are accused of exaggerating the size of their captures, but the concoctor of "fish stories" finds himself outmanœuvred at Russell! Visiting anglers join a local club and their captures are all weighed, each angler being given a certificate stating the weight of his catch.

The total weight of the monsters landed at Russell during the season appears startling to those who have never caught anything larger than, say, a big pollack. For instance, between 5th January and 6th March, last year, 36 swordfish and 15 *mako* sharks were captured, the total weight of the swordfish being 4 tons 7 cwt. 52 lb. and that of the sharks 1 ton 12 cwt. 26 lb. Among these monsters were a swordfish weighing 527 lb. and a *mako* weighing 558 lb.

Unrivalled Opportunities for Sport

The wonderful opportunities for sport and the ideal conditions existing are well described in the following lines by a writer in "The Auckland Weekly News":—

"No brief article can give an adequate idea of the beauty and charm of the 400 odd miles of coastline off which this fishing can be enjoyed. Scarcely a mile of it but has harbour or estuary, inlet or island. It lies facing roughly the north-east, from which come the warm, soft breezes or the sudden strong monsoonal winds, but the prevailing winds are from the south-west, so the coastal waters are generally quite safe, and there are so many sheltered havens that a launch is rarely more than a few miles from snug and safe anchorage.

"It may truly be said that not more than a small fraction of New Zealand's semi-tropical waters have been explored or tested by anglers, so there is immense scope for exploration and experiment. Already overseas anglers have declared that Auckland's coastal waters offer unrivalled opportunities for sport, but their great advantage lies in the fact that there are hundreds of safe places from which deep-sea fishing can be carried out, that have not yet been tested. Thousands of launches could go out daily if need be from the numerous harbours and coves which indent this wonderful coast, and there would be ample room for all. A good cruising launch could range for months finding fresh havens nearly every day and then not fully test all the fishing grounds."

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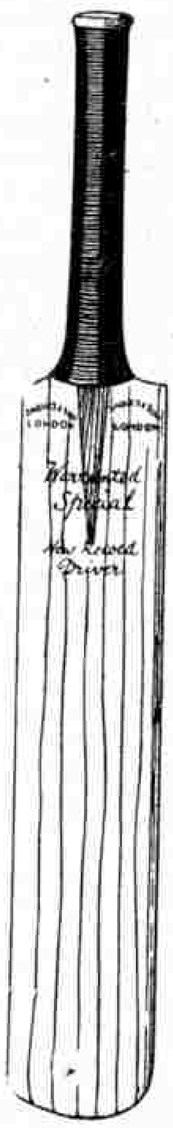

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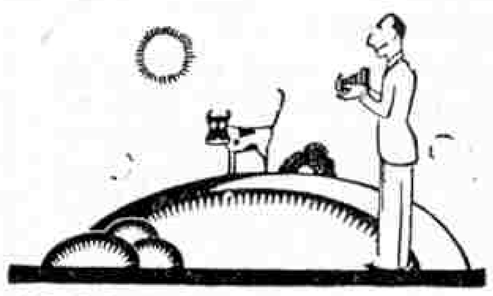

THE CONCEIT OF JOHN

John recently had a camera given him by a maiden aunt. A friend told him that all he had to do was to fit a spool of Ilford Roll Film, focus the lens and snap the scene. The friend was right!

John used the spool, took it along to his dealer and awaited developments. To his great surprise, five of the pictures were perfect—the sixth, an effort to get two pictures on one film, looked as though baby had got mixed up with a crowd of the "lads" at a local outing.

John now suffers from extreme photographic conceit! Perhaps it would be a shame to tell him that the use of Ilford Roll Film had compensated for many little errors. But we hesitate to imagine what would have happened to John's reputation if he had used any other film but Ilford.

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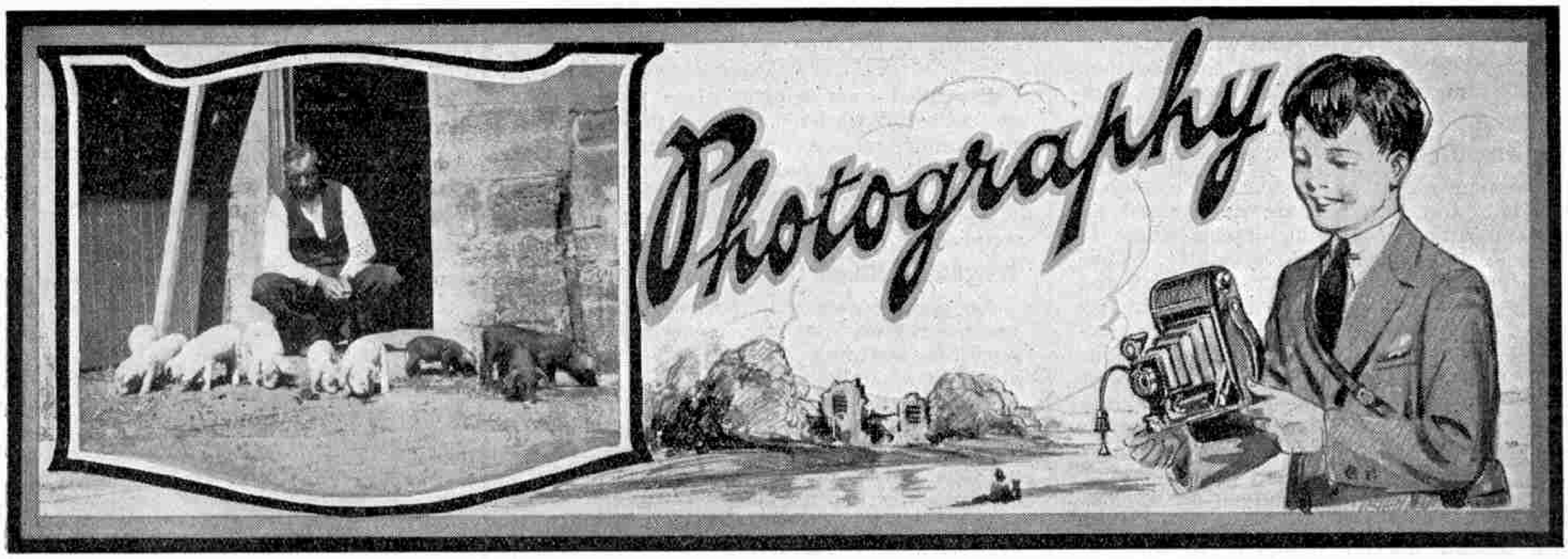
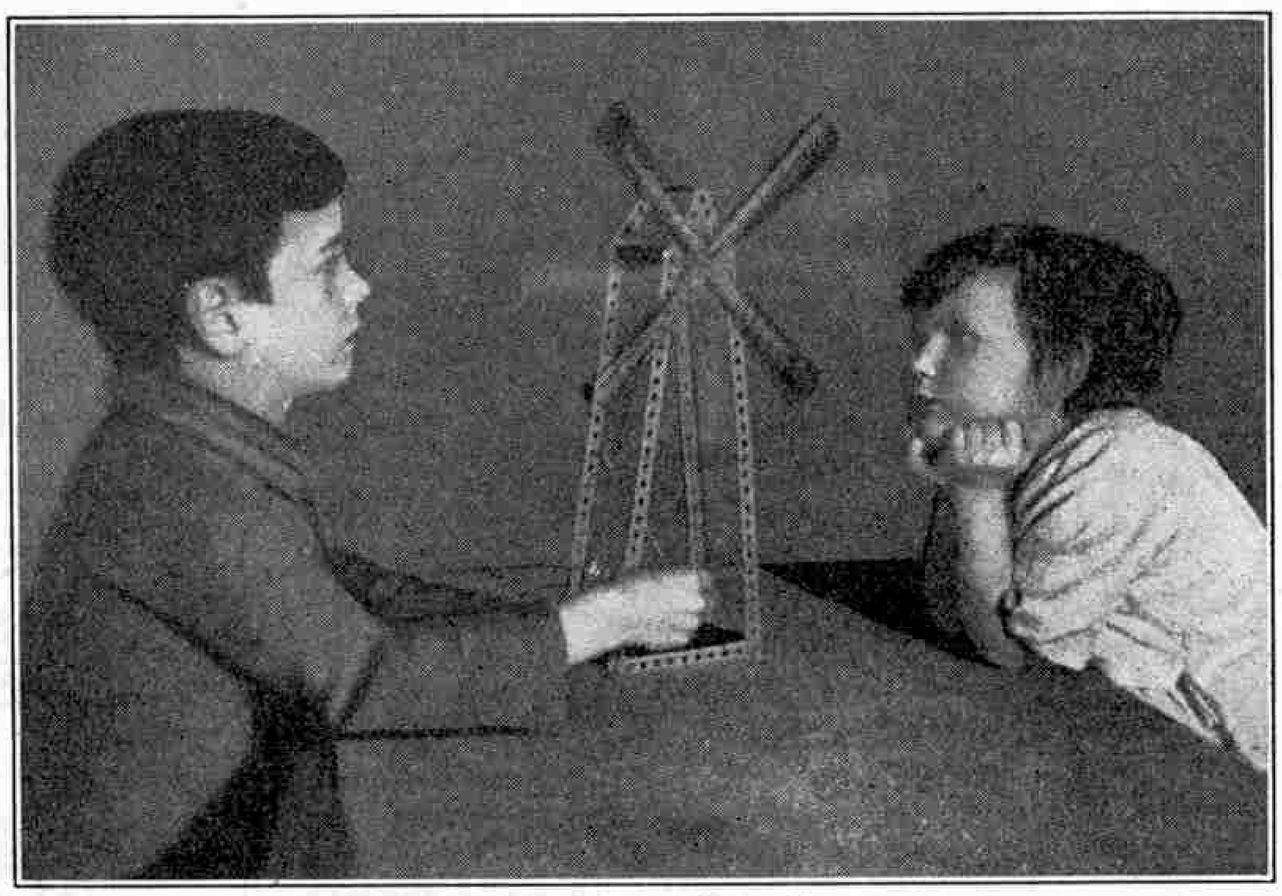


XIV. SUCCESS IN SNAPSHOT PHOTOGRAPHY: AVOIDING THE IMPOSSIBLE

THE first essential in successful snapshot photography is to learn the things that are possible and those that are impossible with one's own camera. In the first place, we must consider the working aperture or "stop" of our lens. The so called "single" lens and many rapid rectilinear or "double" lenses cannot be used at a larger aperture than F11, whereas the more expensive anastigmat lenses may have apertures as large as F2.

For ordinary landscape purposes or for outdoor portraiture the cheaper lens will produce work that scarcely can be distinguished from the products of the most expensive anastigmat, but it is vastly inferior to the anastigmat in regard to speed. In actual practice we find that on certain occasions when, owing to dull light or to the nature of the subject, a successful snapshot is impossible with a cheap lens, the anastigmat used at its largest aperture will admit so much more light as to give a perfectly successful result. Those of us who possess only lenses of small aperture must therefore realise our limitations and not attempt the impossible.



"Your Turn Next"

A winning picture (by P. Lambert) from our 24th Photographic Contest

Solving the Exposure Problem

The next point is how we are to know what is possible and what is not, and this brings us to the all-important question of exposure. The "old hand" who has taken hundreds or even thousands of photographs of all kinds and under all conditions acquires a sort of extra sense that enables him to estimate the correct exposure for any normal subject with sufficient accuracy for all practical purposes. The beginner, however, is in a very different position. He has no experience to guide him and the pitfalls in exposure are so many that without some help he simply snapshots blindly, hoping for the best, and in many cases obtains such a large proportion of failures as to disgust him entirely with photography.

Fortunately the necessary assistance is at hand in the form of exposure meters or exposure tables. Exposure meters measure the actual strength of the light, and if they are used carefully according to the makers' instructions the results obtained are accurate to a very high degree. Exposure tables or calculators, on the other hand, do not measure the light, and their successful use depends to some extent upon the judgment of the photographer in regard to whether the light is bright sunlight, dull, very dull, etc. This drawback is not so great as might appear and after a very short experience one learns to estimate the quality of the light with considerable accuracy. A particularly ingenious exposure calculator is that contained in the well-known "Wellcome" exposure hand-book. This calculator, used in conjunction with the extensive but exceedingly simple tables provided, works excellently and with ordinary reasonable care success is assured.

Do not Waste Films

Before leaving the question of exposure one piece of advice must be given—trust your meter or calculator. If, after you have worked out the exposure, you find that a successful snapshot is impossible, do not waste plates or films in the vain hope that in some marvellous manner you will obtain a good result. Miracles do not take place in snapshot photography!

Another important point to be considered is the shutter fitted to the camera. This may be a single-speed shutter, in which case we may assume that it works at 1/20th or 1/25th of a second. Other cameras of rather higher grade have various shutter speeds marked up to 1/100th of a second, but very frequently the maximum speed obtainable is not more than 1/25th. It requires very

little thought to realise that with a shutter speed of 1/25th of a second snapshots of rapidly moving objects, at anything like close quarters, are impossible.

Moving Objects and Slow Shutters

Assuming that we are confined to such a shutter and that we are determined to obtain snaps of moving objects, there is only one way out of the difficulty. This is to snap the moving object from a distance and subsequently enlarge the tiny image thus obtained. By adopting this method some quite surprisingly sharp snapshots of objects moving at considerable speed may be obtained with the cheapest cameras, even when fitted with the most rudimentary lenses.

A further point to remember is that a longer exposure may be given for objects moving directly towards the operator than for objects moving obliquely towards or from the camera. Unless our shutter is capable of extremely high speeds a broadside view should not be attempted. Certain subjects are, of course, practically impossible in any circumstances with a slow speed shutter.

Some readers may like to try the following experiment when taking objects that are moving across the field of view. Hold the camera firmly at about waist height and with your finger on the shutter-release, move your body and the camera in the direction in which the object is travelling, at the same time releasing the shutter. The effect will be that although the background will come out blurred, owing to the movement of the camera during the exposure, the main object of the photograph is much less likely to be blurred than if the exposure were made in the ordinary manner. The faster the object is travelling, and the nearer it is to the camera, the quicker should be the turning movement at the moment of exposure.

Next month we shall consider another extremely important and interesting point—depth of focus.

26th Photographic Contest

The subject of this month's contest will be "Reflections." One of the most fascinating photographic subjects to a beginner—or for that matter to many camera enthusiasts who have left behind the novitiate stage—is a silent pool of water with a placid mirror-like surface, reflecting brilliantly the images of surrounding trees and buildings, and there are few scenes, taken as a class, that can yield such delightful photographs.

Reflections however are not confined to motionless meres; more often the most pleasing effects are those obtained from a pool, the surface of which is just ruffled by a lightly moving breeze; or from the surface of a town pavement just after rain. But best of all is the stretch of wet sand photographed as the sun is sinking. Then the sand gleams with reflected glories of the sky. A sky screen used with the lens is a necessity for work of this type but the beauty of a successful attempt amply repays the additional care required.

The usual two sections will be held, A for those over 16, B for those under 16 and prizes of photographic material or Meccano products (to be chosen by the winners) to the value of £1-1s. and 10/6 respectively will be awarded to the first and second best entries in each section. Closing date, 31st May. Overseas, 30th September.

Cleaning a Locomotive—

(*Continued from page* 292)

I walked over to the place indicated and watched whilst mechanics penetrated the inner recesses of the smoke-box. Meanwhile a loud hammering commenced in the very vitals of the engine—the firebox—and to crown all the loco was being weighed at the same time!

Weighing a Giant Loco

No giant scales are necessary for this. Instead the work is done by a wonderfully sensitive hydraulic jack, to which is attached an indicator dial.

Placing this compact instrument in a square pit alongside the line, the giant monster of the rail, now steamless and without power, was slowly pushed back towards the waiting lifter until one of the main driving wheels was directly opposite the weigher. "A bit more," shouted the foreman, and the pushing tank loco strained again to push the inert engine an inch or two further.

"Stop!"

The wheel was directly opposite the weigher, and with a quick movement of a handle the giant was made to lift its wheel as a bear would lift its paw. A workman quickly passed a steel rod between the wheel and the rail to make sure that it was clear.

"Nineteen tons. Next wheel!" shouted the foreman. The tanker came again into action and the operation was repeated. Each wheel was weighed in turn, the total making up the exact weight of the engine as a whole—nearly 150 tons.

Weighing each wheel of a locomotive separately is a valuable guide to the railwaymen, for if the weight is not distributed correctly on the individual wheels the engine will "ride badly" and lose time, or in extreme cases even become derailed.

Electricity—(*continued from page* 305)

Immediately the connection is completed the director is cut out of the circuit and is available for use in putting through another connection on another line. It will be seen from the diagram, where the speaking connections are shown across the upper portion, that the director does not enter into the speaking portion of the circuit in any way. It merely takes the place of the human operators and, like them, when the call is completed it is no longer required and is therefore available for use by other subscribers. This, of course, greatly reduces the amount of equipment required to deal with a given volume of traffic.

* * * *

In the last seven issues of the "*M.M.*" we have traced the invention, progress and working of the telephone from the early days of Bell and Edison. We have seen how the receiver and the microphone were developed from their first forms and we have seen exactly how the subscriber's circuits, and the exchange circuits, both manual and automatic, are arranged and how they operate. It is interesting to notice that in 1910 there were 10½ million telephones in the world, in 1914 14¾ millions, and in 1920 19¾ millions. This is an increase of nearly one million a year, so that if this rate has been maintained during the last six years, that is from 1920 to 1926, there will in all probability be about 25 million telephones in the world to-day.

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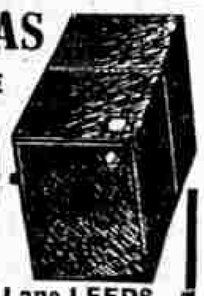

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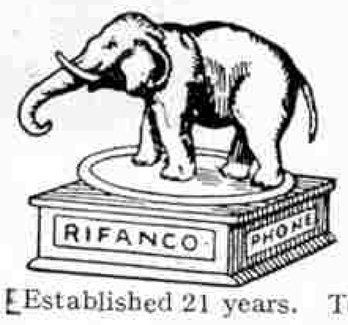

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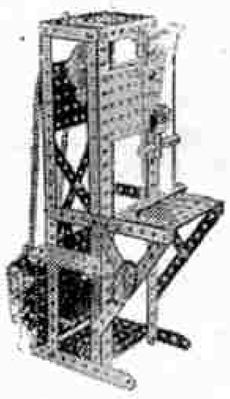
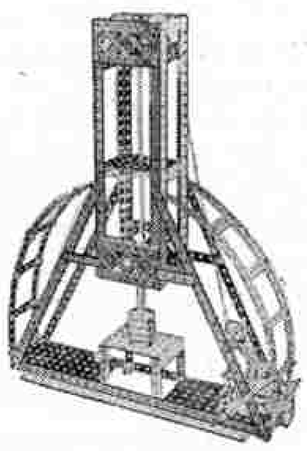
ANOTHER OPPORTUNITY TO WIN SPLENDID PRIZES

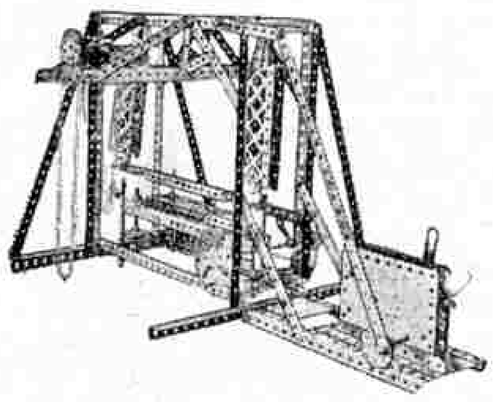
"MACHINE TOOL" COMPETITION



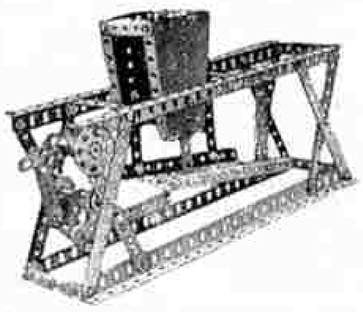
PUNCHING MACHINE



DROP HAMMER



STONE SAWING MACHINE



COAL SIFTER

This month's competition should offer a wider scope for originality than any of the previous contests, for the subject chosen, "Machine Tools," covers a quantity of different mechanical devices. A machine tool consists of a mechanically-operated instrument with which various materials may be fashioned to different shapes and sizes. The variety of machines grouped under this heading includes such apparatus as mechanical hammers, drills, planing machines, lathes, stamping and crushing machines, punches, road-breaking apparatus, excavators, presses, rolling-mills, etc.

You may design your model from any type of machine tool that you prefer, or with which you are most familiar, but all models submitted in the competition must be the competitor's own unaided work, both in design and construction.

18 Cash Prizes

Entries in this competition will be divided into the following sections :

Section A, for competitors residing in the British Isles ; Section B, for competitors residing outside the British Isles. Competitors' ages will be taken into consideration when judging the entries.

Prizes will be awarded for the best entries *from each section* as follows :—

First Prize, £3-3s. ; Second Prize, £2-2s. ; Third Prize, £1-1s. ; Six Prizes of 10/6 each. Other competitors whose entries show outstanding merit will be presented with complimentary copies of "Meccano Standard Mechanisms," while in addition, a few special Certificates of Merit will be awarded, at the judges' discretion, for entries closely approaching prize-winning standard.

Closing date for Section A, 31st July 1926. Overseas Section, 30th October 1926.

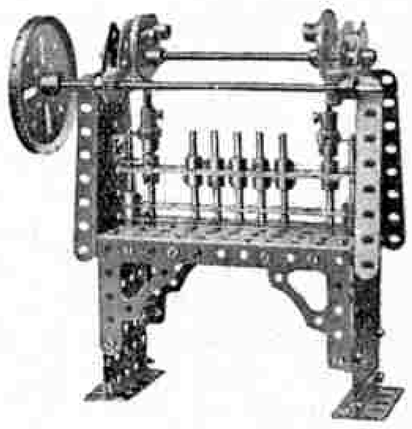
When completed, send in a photograph or good drawing of your model, together with any explanations that you think necessary, although the latter should be made as brief as possible.

You may use any Outfit or number of parts. The first prize in each section will be awarded to the competitor who builds the machine tool that the judges decide to be the best model entered in that section, and the second and third prizes will be awarded to the second and third best models, and so on. It is wise to remember that very often the simplest and most straightforward models are better than the most complicated structures.

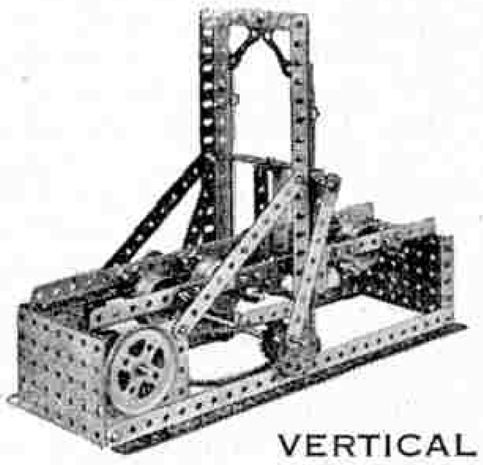
Important. The following instructions should be followed closely : Write your name and address on the back of each photograph or sheet of paper used, and state your age, name of the competition, and section in which your model is entered. Address the envelope : "Machine Tool" Competition, Meccano Ltd., Binns Road, Liverpool.

Do not send models. A clear photograph or good drawing is all that is necessary. Photographs or drawings will be returned if desired, providing a stamped-addressed envelope of the necessary size is enclosed with the entry.

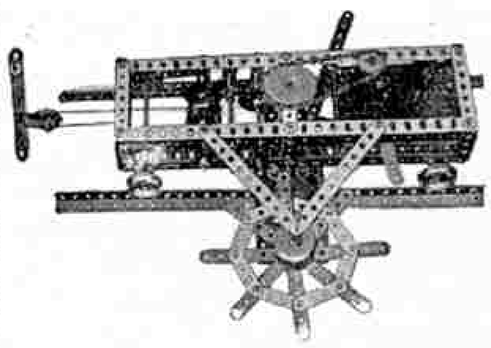
POWER DRILL



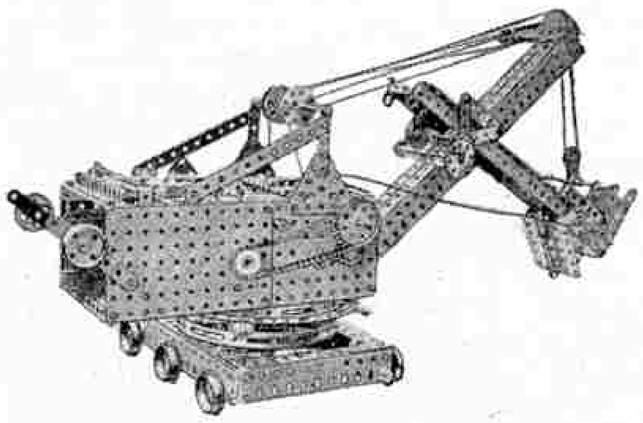
PUNCHING PRESS



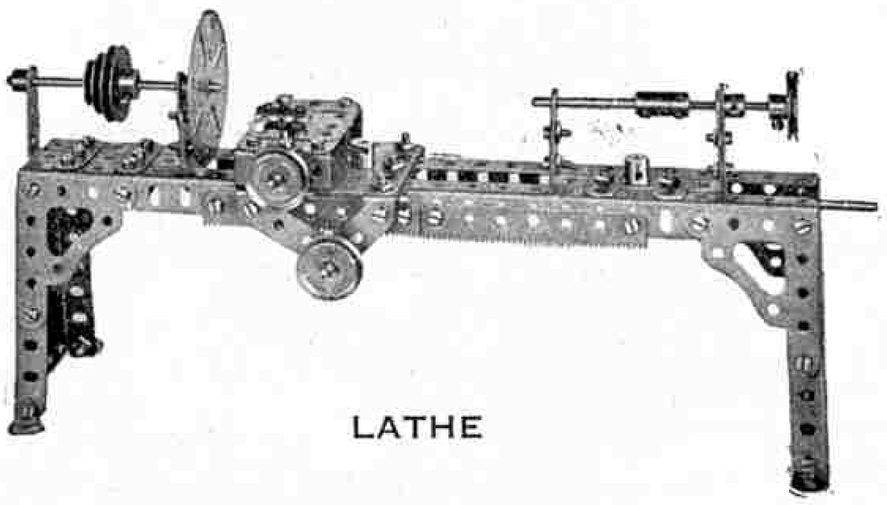
VERTICAL LOG SAW



COAL-CUTTING MACHINE



STEAM SHOVEL



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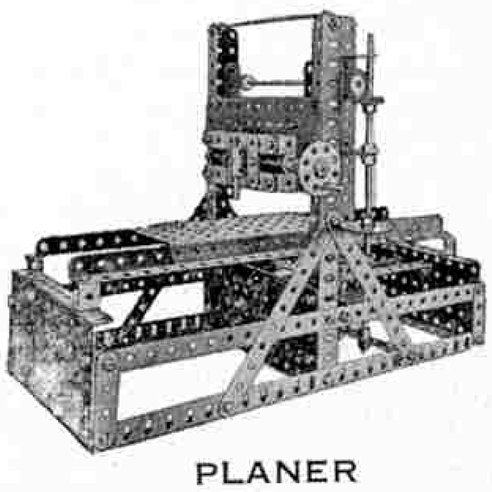
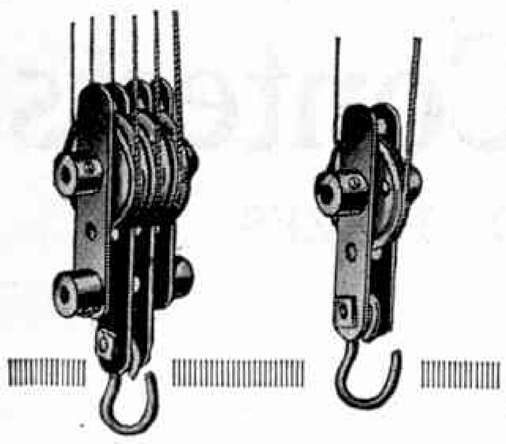


PLANER



Meccano Pulley Blocks

Suggestions Section

Edited by "Spanner"

(38)—Sun and Planet Mechanism

"Sun and planet" mechanism is the most famous of the various methods put forward by James Watt, the inventor of the modern condensing steam-engine, of converting the reciprocating motion of a piston into motion of rotation. The simplest way of bringing this conversion about, and the means now universally adopted, is the ordinary crank and connecting-rod; this had occurred to Watt but had meanwhile been patented by another inventor. Hence he devised the "sun and planet wheels" to avoid using the other movement in his steam engines.

"Sun and planet" gear is shown in Fig. 38, in which a Strip 1 represents the connecting-rod, imparting reciprocating motion from the piston. This Strip is bolted to a 57-teeth Gear Wheel 2, which is free to move about a Pivot Bolt 3 secured to a 2″ Strip 4. The Strip 1 should be spaced away from the Gear Wheel 2 by means of a Washer placed on each of the two bolts shown, in order that the Strip may clear the second Gear Wheel 5 when in motion, whilst another Washer should be placed on the Pivot Bolt 3 immediately behind the boss of the wheel 2.

One end of the 2″ Strip 4 is placed upon, and is free to revolve about, the driven shaft. (The Strip is spaced away from the Gear Wheel 5 by means of three Washers).

Its use in Meccano Models

The Gear Wheel 2 does not revolve on its own centre but moves round the axis of the gear 5 with a slightly oscillating motion, and since the teeth of both wheels are in engagement, a rotary movement is imparted to the gear 5. The latter revolves twice on its axis to one circuit of gear 2, or two strokes of the piston.

The construction of this device should prove both interesting and instructive to Meccano boys, despite the fact that it is no longer used. Moreover, it may be found useful in certain models where it is desired to convert a rotary movement into a simple to and fro motion, especially if only one forward and one backward movement is required to every two revolutions of the driving shaft.

The fact that the crankshaft and flywheel must rotate twice to every complete to and fro movement of the piston constitutes a serious disadvantage in Watt's "sun and planet" motion, for although it served its purpose in the pumping engines and the very early reciprocating steam engines for which it was originally designed, it no longer proves suitable for modern engines that are constructed to work at high speed. It may be said in its favour, however, that for such slow moving machines as beam engines, etc., its employment resulted in a much smoother working than can be obtained from the simple crank and connecting-rod.

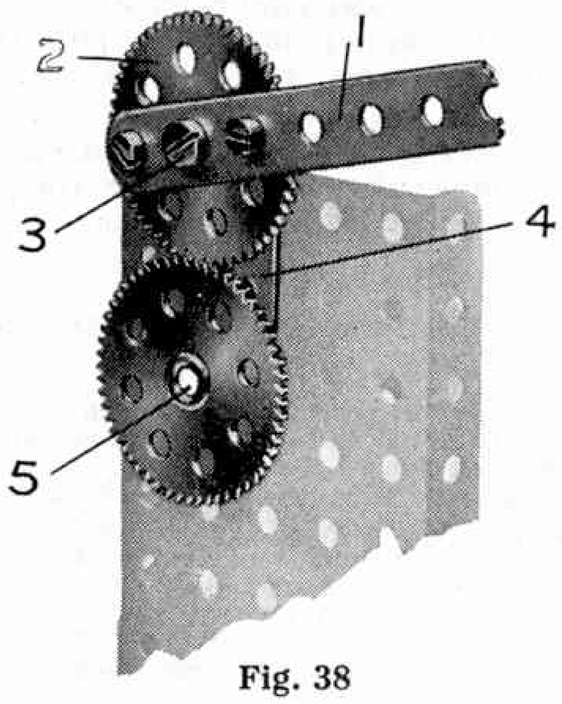


Fig. 38
Watt's Sun and Planet Gear

It is interesting to recall, in passing, that the crank is believed to have been made first by James Watt in his Soho works. The secret was given away by a workman however, so that when Watt was ready to put a rotary engine on the market he found that the invention had been patented by a Mr. Pickard, of Birmingham.

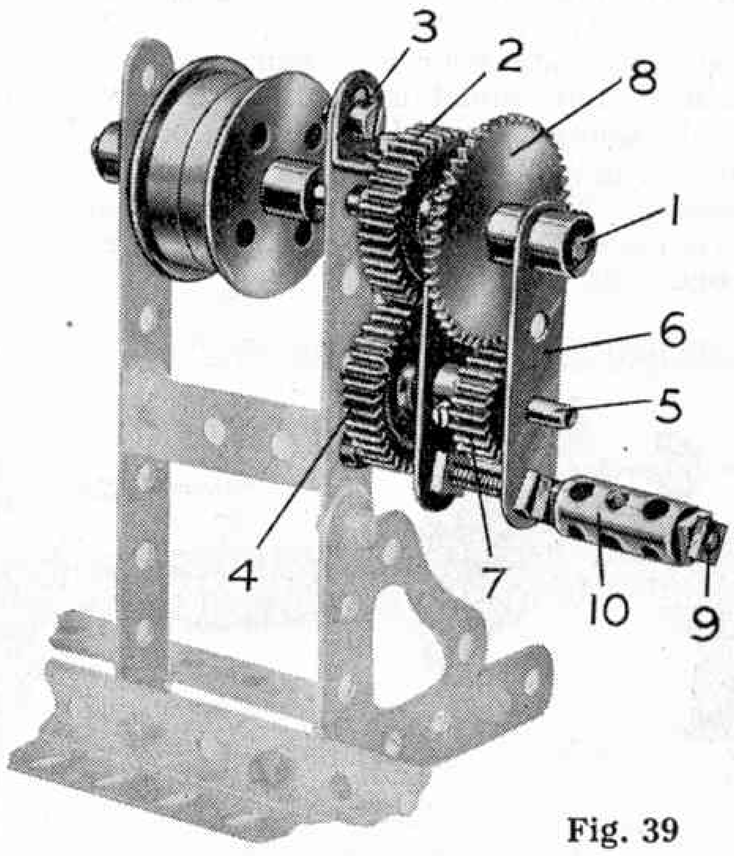


Fig. 39
Sun and Planet Winding Mechanism

(39)—Sun and Planet Winding Gear

Fig. 39 illustrates a development of "sun and planet" mechanism with which it is possible to obtain a gear reduction of two to one between an operating handle 10 and a winding shaft 1, while the latter forms the centre about which the handle revolves.

The drum shaft 1 is free to turn in a fixed Gear Wheel 2, which is secured to the framework by means of a bolt passed through an Angle Bracket 3 and inserted in the threaded bore in the wheel boss. The bolt is secured by a nut beneath the Angle Bracket and is spaced by one or more Washers to ensure that it clears the shaft 1.

A second 1″ Gear Wheel 4 engages with the gear 2, and is secured to a 1½″ Axle Rod 5 journalled in two 2″ Strips 6 which are free to turn about the shaft 1. One Washer is placed between the inner 2″ Strip and the Gear Wheel 2, and two Washers should be inserted between the same Strip and the wheel 4 to enable the latter to clear a nut on the end of the Threaded Rod 9. The short Rod 5 carries a ¾″ Pinion 7 engaging with a 50-teeth Gear Wheel 8 secured to the drum shaft. The 2″ Threaded Rod 9 serves to secure the Strips 6 in position, and is fitted with a loose Coupling 10 held in place by lock-nuts to form the handle.

A Mechanical Paradox

On turning the operating handle in a clockwise direction, it will be found that the Pinion 7 also revolves in the same direction as the hands of a clock. If you point this fact out to your friends and then ask them to tell you the direction in which the gear 8 will rotate, they will probably declare immediately that its movement will be anti-clockwise, but that, of course, is incorrect, for it turns slowly in the same direction as the Pinion 7. This movement may be explained quite easily; supposing the gear 8 to be immovable, it will be found that the Pinion 7 revolves three times to a single circuit of the handle 10. But the Pinion is secured to the axle 5, which can revolve only twice to every circuit of the handle owing to the action of the gears 2 and 4. Hence, to adjust the difference in speed, the Gear Wheel 8 must revolve once in the same direction as the Pinion, while the latter revolves twice, during one revolution of the handle.

Several methods by which this idea may be developed further will probably suggest themselves to our readers, and much fun may be so obtained.

(40)—Hand Punch

(G. S. Williams, London, N.15)

Fig. 40 shows a simple but effective model of a hand punch, with which clear, round holes may be cut in sheets of paper. Two pairs of 5½″ Strips are loosely connected towards their centres by means of nuts and bolts 1. The punch 2 consists of a 1½″ Rod secured in the boss of a Crank 3, which is bolted to a Double Bracket secured at 4. A Spring 5 serves to open the handles after the punch has been used; it is placed on the Rod 2 and held in position by means of a Collar and set-screw 6, while its other end is attached to a ¾″ Bolt 7 passed through one pair of 5½″ Strips.

After passing through the paper the punch enters the end hole of a 3″ Strip 8. The latter is bolted at 9 to a Double Bracket, while its other end passes beneath a similar bracket at 10.

(41)—Heavy Adjustable Spanner

(L. Doughty, Croydon)

Yet another addition to the Meccano "tool-kit" takes the form of the screw-adjustable spanner shown in Fig. 41.

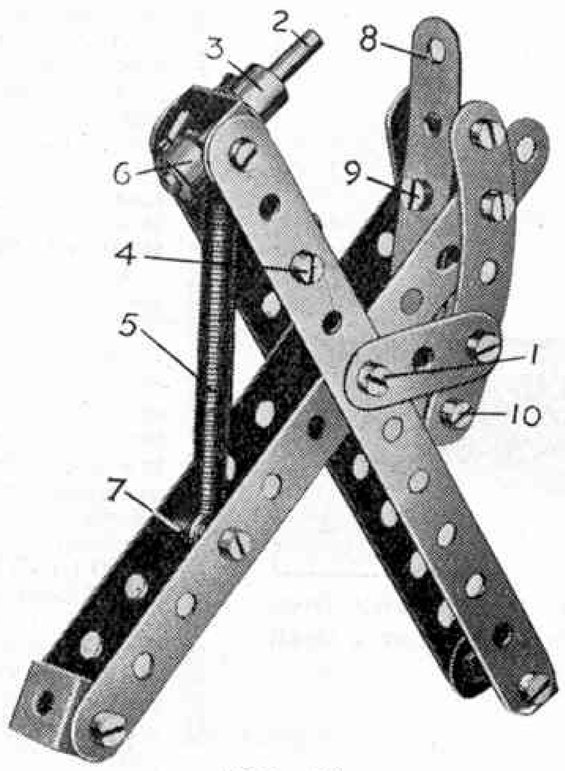


Fig. 40

Each side of this model consists of two 5½″ Strips 1 connected at top and bottom by means of Double Brackets 3 and 4. (It will be noted from the illustration that one Strip and one Double Bracket have been removed in order to reveal the mechanism.

The 5½″ Strips on one side of the spanner are bolted at the top to the second and third holes in a 2½″ Angle Girder 2, and the Double Brackets 4 at the bottom are secured together by a Flat Bracket attached to their central holes.

The sliding jaw of the spanner consists of a 2½″ Angle Girder 5 and 2½″ Flat Girder 6. These are spaced apart by two Flat Brackets 7 on either side of the Strips 1. The traversing movement is obtained by a Threaded Rod 8 passing through the threaded bore of a Coupling 9, which is secured to the girder 5 by means of a bolt 10. Lock-nuts 11 are placed at one end of the Rod 8, and at the other a Pinion 12 is secured to form the wheel by which the Threaded Rod is rotated.

Replies to suggestions concerning Meccano and Hornby Train Improvements appear on page 332.

(42)—The "Cum Bak"

(Carl W. Beese, Hamilton, Ont.)

We have received an interesting Meccano novelty which our contributor terms—quite aptly—the "Cum Bak." It takes the form of a small drum built up from Meccano parts, and if the sides are covered by thin cardboard, or paper, in order to

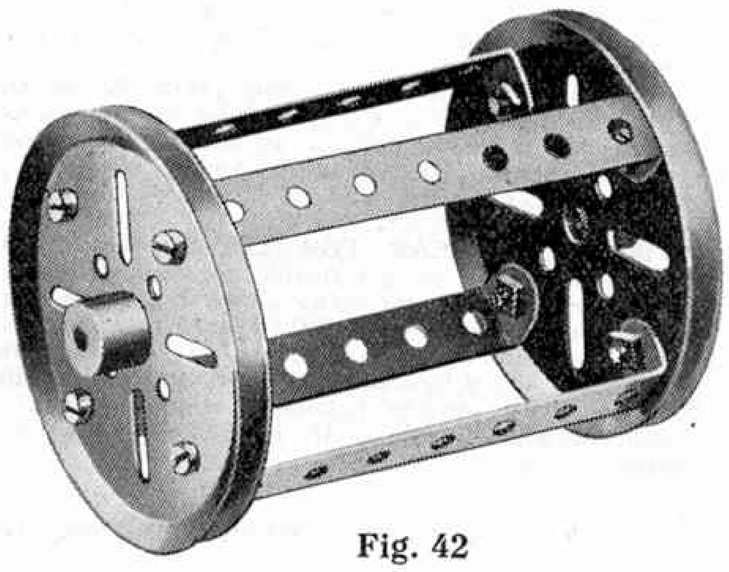


Fig. 42

conceal the inner details, its movements become somewhat mystifying.

The model should be rolled along the table or floor, when it will be found to return always to its starting point, although no outside influence of any kind is directed upon it. On its return journey it will sometimes "overstep" its commencing mark, but after a few oscillatory movements it will finally come to rest practically on the spot from which it started. If used on the floor a smooth surface must be found, such as wood or linoleum, for it will not work on carpets.

PRIZES OFFERED

In order to test our readers' ingenuity, we are illustrating this model *without* the operating device (see Fig. 42) and we shall reward the Meccano boys who send in the best suggestions for the necessary mechanism by which the results described above can be obtained. We may say that the necessary driving power is extremely simple, and no clockwork mechanism is employed.

Entries in this competition will be divided into two sections, as follows: Section A, for readers residing in the British Isles; Section B, for readers residing overseas. A prize will be presented for the best entry in each section. It will consist of a selection of Meccano or Hornby goods, to be chosen by the winner, to the value of ten shillings and sixpence, whilst other readers whose entries are considered to be particularly good will be presented with Certificates of Merit.

Entries should be written on one side of the paper only, and should be accompanied by photographs or good drawings if necessary. Explanations must be as brief as possible, and the competitor's name, address, and age should be stated on each sheet of paper used. Address the envelope "Cum Bak Competition," Meccano Ltd., Binns Road, Liverpool. Entries in Section A must be received on or before the 15th June. Closing date for Section B; 16th August, 1926.

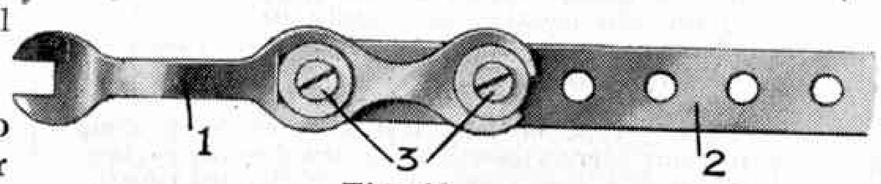


Fig. 43

Suggestions in Brief

(43)—Improvement for Meccano Spanner—J. Thomas (London, E.12) sends in a simple idea for a Meccano Spanner attachment which should prove useful when constructing intricate models, or for tightening nuts placed in difficult positions. The spanner 1 (see Fig. 43) is secured by means of the bolts and Washers 3 to a Meccano Strip 2 of any desired length, and the long "handle" so obtained may be inserted in the machinery of a model, etc.

(44)—Friction Clutch—E. Lake (Burton-on-Trent) suggests that a Meccano Friction Clutch may be made by placing a small rubber ring, such as that used in sewing machines, on a Flanged Wheel. A 1″ or 1½″ Pulley with set-screw may be used for the other clutch member; this should be secured to a separate shaft in line with the axle of the Flanged Wheel, and controlled by a suitable lever so that it may be pressed gradually against the rubber ring, which thus takes up the drive.

(45)—Attachment for Meccano Loco—C. G. Black (Rathgar) describes a simple device that he has attached to a Meccano model locomotive. It consists of a mounting for the rear pair of trailing wheels which enables the loco to negotiate sharper curves than would be possible if the wheels were mounted in the ordinary rigid bearings.

The trailing axle is journalled in the end transverse hole of a Coupling which is secured at its other end to the shank of a bolt passed through an Eye Piece. The latter slides on a short Strip bolted transversely beneath the loco frame. The running wheels are spaced away from the Coupling by a number of Washers placed on either side.

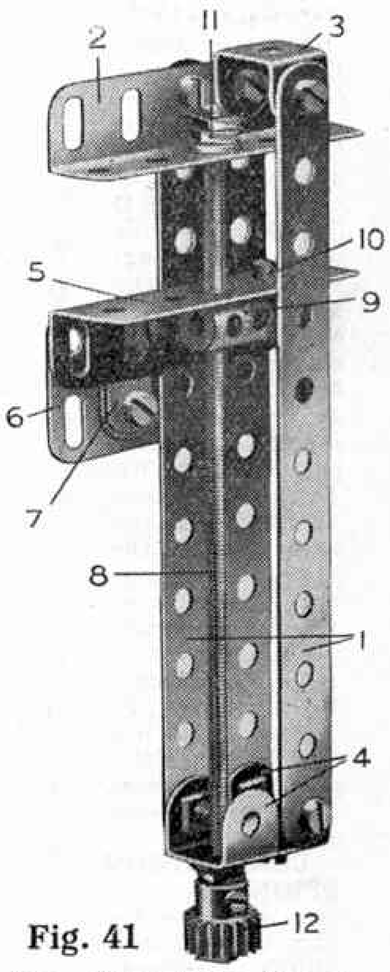


Fig. 41

This Month's Awards

Five shillings will be awarded to each of the contributors concerned for Suggestions Nos. 40, 41, and 42, whilst the senders of Nos. 43, 44, and 45 will each be presented with a Certificate of Merit, together with a complimentary copy of "Meccano Standard Mechanisms."

With reference to Suggestion No. 31 published in last month's "*M.M.*," we regret that we omitted to mention that Master L. Peavot, of London, N.W.2, also submitted a similar suggestion. He will be presented with a Certificate of Merit and a complimentary copy of "Meccano Standard Mechanisms."

Suggestions Received

The following suggestions have been received and are having attention: Universal lever (A. Pickwell); Reversing Gear (R. W. Rush); Epicycloidal Gear (I. Davidson); Goods Conveyor (K. Ellis); Rotary Contact-breaker (A. Clayton); and many others.

In Reply

In these columns we reply to suggestions regarding improvements or additions to the Meccano and Hornby Train systems. We receive many hundreds of such suggestions every week, and consequently we are able to publish only ideas that show particular interest and ingenuity. Every idea, however, whether acknowledged in these columns or not, is carefully examined and considered. It would be of great assistance if readers, when submitting suggestions for consideration, would write them on separate sheets of paper and include their name and address on the back of each sheet used.

Suggested New Meccano Parts

NEW BRACKETS, ETC.—We regret the various forms of brackets, etc., which you suggest do not show a sufficiently wide range of utility to warrant their inclusion in the system. Some merely duplicate the functions of existing parts. (*Reply to H. Teall, London, S.W.9*).

SKEW BEVEL GEARS.—Your suggestion will be considered carefully, although we fear the manufacture of this type of bevel gear would prove costly. (*Reply to E. Marshall, Clayton West, nr. Huddersfield*).

IMPROVED FLANGED WHEELS.—We will look into the question of manufacturing Meccano Flanged Wheels with the boss secured inside the wheel flange. (*Reply to G. E. Owen, Bristol*).

FREE-WHEEL MECHANISM.—We note your suggestion for a Meccano free-wheel device and will consider the advisability of introducing special parts for this movement. (*Reply to K. C. Pearce, Northampton*).

SPECIAL WORM WHEELS.—We do not think the introduction of special gears with curved teeth for use in connection with the Meccano Worm is necessary. (*Reply to J. E. Baguley, Southampton*).

DOUBLE CRANKSHAFT.—This part would be suitable only for a very limited number of models. (*Reply to K. Cradduck, Manchester*).

IMPROVED SPRINGS. — We note your suggestion that the Meccano Spring should be fitted at each end with a hook. When such a connection is required the existing Meccano Hooks may easily be attached to the loops of the Spring. Moreover, the loops now fitted are very useful when it is required to secure the Spring by means of a nut and bolt. (*Reply to W. Chapman, Downham Market, Norfolk*).

COMPRESSION SPRINGS. — See our reply under this heading in last month's "*M.M.*" (*Reply to J. Willis, Birmingham*).

IMPROVED PLATES.—Flat Plates perforated round the edges only would not have the same adaptability as the existing type, although in some cases they might present a neater appearance. (*Reply to H. Clere, Tenterden*).

NEW DOUBLE ANGLE STRIPS, ETC.—The advantages of your proposed 1" Double Angle Strip, 3½" × 2½" Flat Plate, and other parts will be examined carefully. (*Reply to L. J. Pratley, Woodford Green*).

DOUBLE ANGLE GIRDER.—This accessory may be devised from the existing Meccano Girders, and no special advantage would accrue from its introduction as a separate unit. (*Reply to L. Offord, Hemingstone*).

GROOVED AXLES.—See our remarks concerning this suggestion in the April Magazine. (*Reply to W. Owen, Pontyclun, Glam.*)

INTERMITTENT GEARING.—We do not think there is much demand for the type of gear you suggest. You may be interested in the intermittent motion shown in the Standard Mechanisms Manual, Detail Nos. 264/6. (*Reply to W. Owen, Pontyclun, Glam.*)

IMPROVED 1" PULLEY WHEEL.—We shall consider your suggestion that the holes in the 1" loose Pulley should be enlarged to the requisite size to receive Meccano bolts. (*Reply to R. B. Nicholls, Weston-super-Mare*).

GROOVED DRUM.—We do not think the advantages of the grooved drum that you suggest would be sufficient to warrant its addition to the system. (*Reply to E. Marshall, Clayton West*).

SPECIAL WHEEL FLANGE.—The introduction of a part similar to the Hub Disc, but with an unbroken periphery for use in constructing large flanged wheels, will be given due consideration. (*Reply to J. E. Lockett, Manchester*).

Suggested Hornby Improvements

MINIATURE LOGS, ETC.—Miniature logs and sawn timber are supplied already with the Timber and No. 2 Lumber Wagons. Meccano Loaded Sacks should serve the purpose of your suggested bags for use in loading goods trains. (*Reply to H. Bisson, Southampton*).

GARRATT LOCO.—This would prove to be an expensive model to produce, and we do not think that it would be as popular as the more familiar types of engines. (*Reply to H. Smith, Weymouth; A. Maultby, Lincoln; and M. Lindsey, Taranaki, N.Z.*)

TWO-SPEED GEAR FOR LOCOS.—We doubt whether it would be practicable to equip Hornby locos with two-speed gear, although we shall endeavour to put the idea to a test. With regard to your proposal for outside cylinders, etc., we may say that we have a new 4-4-2 loco under construction which will be fitted with outside cylinders, connecting rods, crossheads, etc. (*Reply to M. H. Holloway, Minchinhampton, Glos.*)

BRAKE VAN FOR PULLMAN TRAIN.—Your suggestion for a combined brake and passenger coach for use with the Pullman set is interesting and will receive proper investigation. (*Reply to J. A. Ratcliffe, Erith, and N. Shimmin, Leeds*).

TRAVELLING KITCHEN.—We do not think there would be much demand for a Hornby travelling kitchen. (*Reply to R. Porter, Portsmouth*).

SIGNAL GANTRY AND 0-6-0 LOCO.—See our remarks under these headings in the March and April Magazines respectively. (*Reply to N. Eagles, S.W.6*).

IMITATION COAL.—This is scarcely worth adding to the Hornby System since it may easily be manufactured at home if required. (*Reply to B. Morris, Treforest, Glam.*)

"ISLAND" PLATFORMS AND RAILWAY CUTTINGS.—See our replies under these headings in the March and April Magazines respectively. (*Reply to J. R. Grindley, Manchester*).

HOME AND DISTANT SIGNALLING.—We have a considerable number of improvements and additions to the Hornby signalling system in hand at present. They will be announced as soon as possible. (*Reply to B. Wappat, South Shields*).

4-2-2 LOCOS.—This wheel arrangement is now practically obsolete, of course, and we do not believe many Hornby enthusiasts would welcome the introduction of a loco of this type. Your suggestion re miniature railway employees has been noted for consideration later. (*Reply to C. J. R. Boyce, Melton Mowbray*).

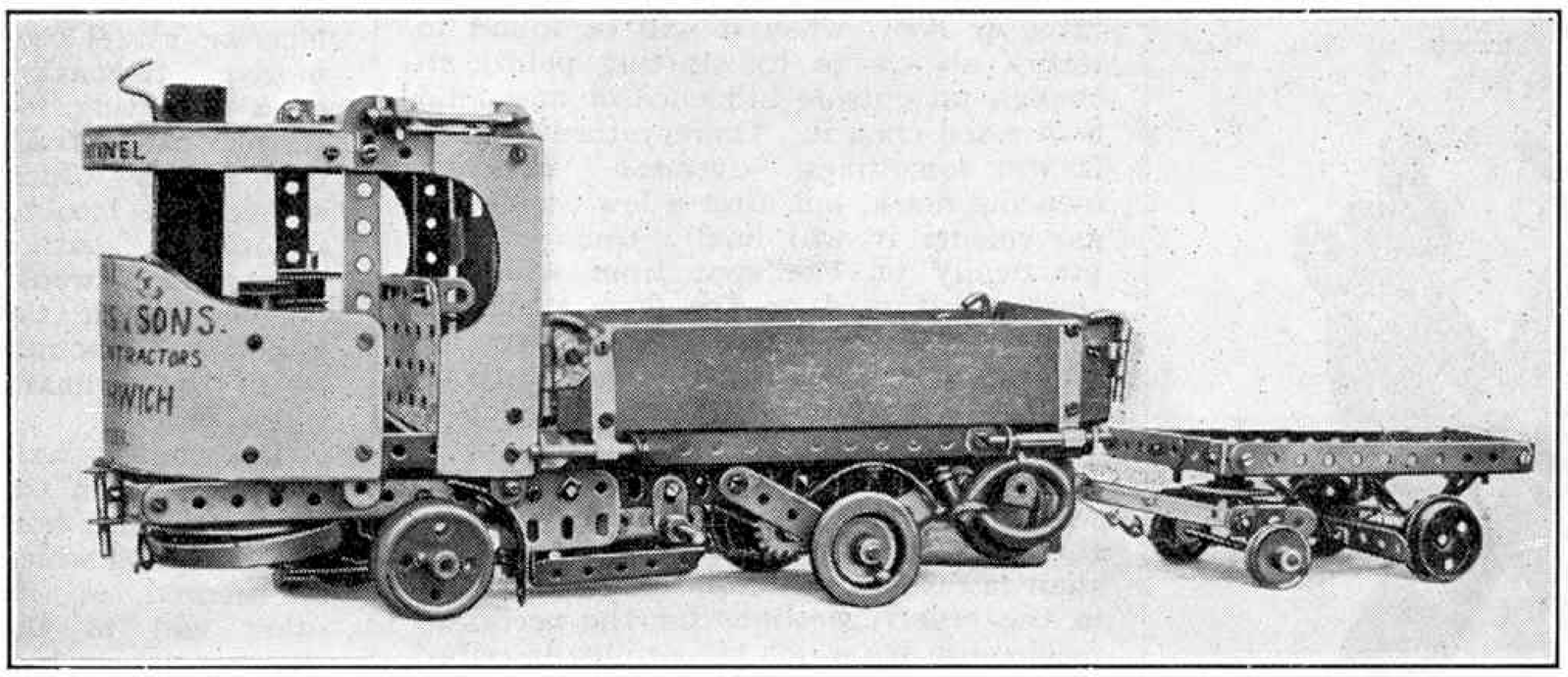
SOUTHERN AND METROPOLITAN TRAINS.—See our reply on this subject in last month's Magazine. (*Reply to N. F. Pick, Strensall, nr. York and others*).

CROSSING.—Your suggestion for a new Hornby cross-over rail with points combined will receive careful attention. (*Reply to W. Clarke, London, W.4*).

HORNBY SHIPS.—At present we are unable to consider the manufacture of Hornby clockwork ships, as their introduction would not be in accordance with our usual practice. (*Reply to G. Allan, Whitchurch*).

COLOURED SMOKE-BOXES.—We do not think it advisable to enamel the smoke-boxes of the locos in a different colour to the boilers, since this would necessitate additional processes in manufacture, so increasing the cost of the locos. (*Reply to Robin Duncan, Farnborough*).

A MECCANO STEAM WAGON



We illustrate a Meccano boy's ingenious model of a "Sentinel" Steam Wagon. It is made almost entirely from Meccano Parts and forms a realistic reproduction of this famous type of commercial vehicle. Although built on a small scale, the various details of construction are faithfully reproduced, and the model is fitted with a neat trailer.

PRIVATELY-OWNED WAGONS.—The possible introduction of open wagons, lettered to indicate privately-owned vehicles, in addition to those bearing the initials of the several railway companies, will be borne in mind. (*Reply to J. A. Ratcliffe, Erith, and J. Archer, Rossall Beach*).

MILK CANS.—Miniature milk cans, or tankards, as supplied in the Milk Van and Station Accessories Set No. 2, may be obtained separately, price 3d. each. (*Reply to A. T. Welford, London, N.W.3*).

ELECTRICAL REVERSE FOR LOCOS.—We note your suggestion that locos should be fitted with permanent magnets, so that they may be reversed by altering the direction of flow in the current. Permanent magnet motors, however, are not as efficient in operation as those fitted with wound field-coils, nor can they be operated from alternating current, and for these reasons we consider it advisable for the present to use the latter type and equip the locos with a mechanical reverse gear. (*Reply to Eric Pardoe, Croydon; T. G. Pearce, Bath; and others*).

CAST WHEELS.—The addition of cast wheels to Hornby rolling stock has certain disadvantages, since it increases both the weight and the price of the coaches or trucks. (*Reply to J. Trefusis, Alverstoke*).

ELECTRIC GOODS SET.—Your suggestions for a Hornby electric goods set and a No. 1 tank passenger set are noted for further consideration. (*Reply to P. Wallis, Oxford*).

TANK PULLMAN SET.—In actual practice Pullman trains are usually drawn by a tender engine. The train set you mention may easily be obtained by purchasing the components separately. (*Reply to J. Latter, Battle*).

"PACIFIC" LOCO.—The introduction of a "Pacific" type of loco will be considered along with many other suggestions for new Hornby engines. (*Reply to S. Clarke, Golders Green, N.W., and others*).

COAL WAGONS.—Our existing Hopper Wagons are fitted with hinged floors, and may be unloaded automatically; they should therefore fulfil the functions of your suggested coal wagon. (*Reply to W. H. Trenholm, Eaglescliffe*).

L.N.E.R. LETTERING.—The question of altering the lettering on certain L.N.E.R. rolling-stock is under consideration. (*Reply to W. H. Trenholm, Eaglescliffe, and many others*).

SIDING POINT.—See our reply under this heading in the December, 1925, Magazine. (*Reply to P. Wallis, Oxford, and K. C. Harris, Pontyminster, Mon.*)

Results of "Ship" and "No. 3 Outfit" Contests

We regret that we are unable to publish the results of the "Ship" and "No. 3 Outfit" Model-Building Competitions which were first announced in the February "*M.M.*," owing to the large number of entries received, and to the fact that the closing dates became due immediately before the Easter vacation. We are now busily engaged, however, in compiling the lists of successful entrants, and shall publish these in next month's Magazine, together with illustrations of the principal prize-winning models. Thereafter results of various model-building competitions will be announced every month in the usual way.

"Crane" Competition

In this competition, as first announced in the April "*M.M.*," we are offering splendid awards for new Meccano models of a Crane. The competition closes on the 30th June for readers in the British Isles, and entries from overseas competitors must be received by 30th September, 1926. Meccano boys should send along their efforts as soon as they are completed.

You may fashion your model from any type of crane that you prefer. Derricks of all types, gantries, and all other kinds of cranes will be accepted, and you may use any outfit or number of parts.

Entries will be divided into the following sections: SECTION A, for competitors residing in the British Isles; SECTION B, for competitors residing outside the British Isles. Competitors' ages will be taken into consideration when judging the entries. Prizes will be awarded for the best entries FROM EACH SECTION as follows: FIRST PRIZE, £3-3s.; SECOND PRIZE, £2-2s.; THIRD PRIZE, £1-1s.; SIX prizes of 10/6 each. A number of copies of "Meccano Standard Mechanisms" will be distributed as consolation prizes, and a few special Certificates of Merit will be awarded at the judges' discretion.

When you have built your model, you should send in a photograph or a good drawing, together with any explanations you may think necessary, although the latter should be made as brief as possible. Photographs or drawings will be returned if a stamped and addressed envelope of the necessary size is enclosed with the entry. Write your name and address on the back of each sheet used, and state your age, name of the competition, and section in which your model is entered. Mark envelopes "Crane Competition."

"No. 5 Outfit" Competition

As announced last month, we are offering prizes for the best models made entirely from a No. 5 Meccano Outfit. Models comprising parts that do not appear in this Outfit will be disqualified. It is not necessary to use all the parts contained in the Outfit. Those boys who possess larger sets may compete, providing they use only those parts that are in a No. 5 Outfit.

Models should not be sent. A clear photograph or good drawing is all that is necessary: this will be returned if desired, providing a stamped addressed envelope of the necessary size is enclosed with the entry.

Entries will be divided into the following sections:—SECTION A, for boys under 12 years of age. SECTION B, for boys over 12. SECTION C, for boys residing overseas. Prizes will be awarded for the best entries FROM EACH SECTION as follows:—FIRST PRIZE: Meccano Products to the value of £2-2s. SECOND PRIZE: Meccano Products to the value of £1-1s. THIRD PRIZE: Meccano Products to the value of 10/6. CONSOLATION PRIZES, consisting of complimentary copies of "Meccano Standard Mechanisms," and a few special Certificates of Merit.

Closing dates for Sections A and B: 31st May. Overseas Section, 31st August 1926.

You should send in a photograph or a good drawing of your model, together with any explanations you may think necessary, although the latter should be made as brief as possible. Write your name and address on the back of each sheet used, and state your age, name of the competition, and section in which your model is entered. Mark envelopes "No. 5 Outfit Competition."

Competition Closing Dates

"Ship" and "No 3 Outfit" Competitions: entries from any country outside the British Isles must reach Liverpool not later than 30th June. Closed for United Kingdom entrants. Full particulars in "*M.M.*" for February 1926.

"No. 4 Outfit" Competition: entries from any country outside the British Isles must reach Liverpool not later than 31st July. Closed for United Kingdom entrants. Full particulars in "*M.M.*" for March 1926.

"Bridge" Competition: entries from any part of British Isles must reach this office not later than 31st May. Overseas section closes 31st August. Full particulars in "*M.M.*" for March 1926.

Meccano in the Home

A Novel Model-Building Competition

For some time past our attention has continually been drawn to the number of practical uses to which Meccano lends itself. Every post brings us letters describing useful "gadgets" that the writers have built with Meccano, or recounting instances in which Meccano parts have been used to effect a repair in a case of emergency. For example, one letter may tell us how Meccano has been used to make a simple adjustment in a bicycle, or it may be a motor-cycle, while others describe useful fittings that have been employed with great success in the garden or home workshop. One reader sent in recently a description of a burglar alarm that he devised from a small outfit, while another, whom we suspect to be rather a sound sleeper, told us that he had constructed a series of bells, etc., which could be set in operation by means of an alarm clock. He used this contrivance as an awakening signal every morning, and he adds that the "terrific" din so produced lasted several minutes!

These ingenious and useful examples of the adaptability of Meccano have interested us greatly, and we have decided to run a competition for this type of model only. We confidently expect some extremely interesting entries, and we hope all our readers will compete. It will be noticed that we have entitled the competition "Meccano in the Home," and the models submitted for consideration should consist of some device that may be put to practical domestic use. No doubt all kinds of contrivances will suggest themselves to our readers—tea-pot stands, lamp-brackets, switches, pen-racks, pipe-racks, book-stands and innumerable similar devices.

MANY PRIZES TO BE WON

Entries in this competition will be divided into the following sections:—

Section A, for boys under 12 years of age.
Section B, for boys over 12 years of age.
Section C, for boys residing Overseas.

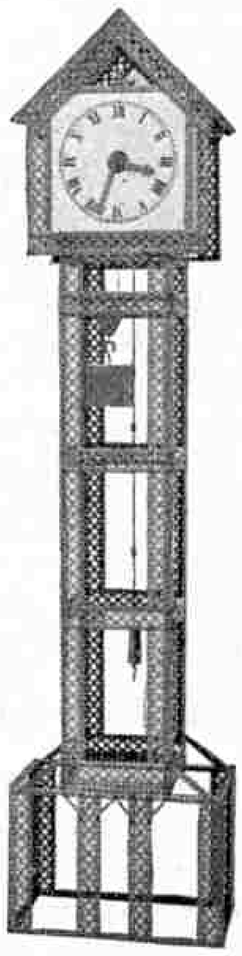
Prizes will be awarded for the best entries FROM EACH SECTION as follows:—

First Prize: Meccano or Hornby Goods to the value of TWO GUINEAS.
Second Prize: Meccano or Hornby Goods to the value of ONE GUINEA.
Third Prize: Meccano or Hornby Goods to the value of HALF A GUINEA.

Other competitors whose entries show outstanding merit will be presented with complimentary copies of "Meccano Standard Mechanisms," while, in addition, nine special Certificates of Merit will be awarded at the judges' discretion for models that closely approach prize-winning standard.

Closing dates for Sections A and B: 30th June, 1926; Section C: 30th October, 1926.

The first prize in each section will be awarded to the competitor who builds the device that the judges decide to be the most ingenious received in that section, and the second and third prizes will be awarded for the second and third best entries, and so on.



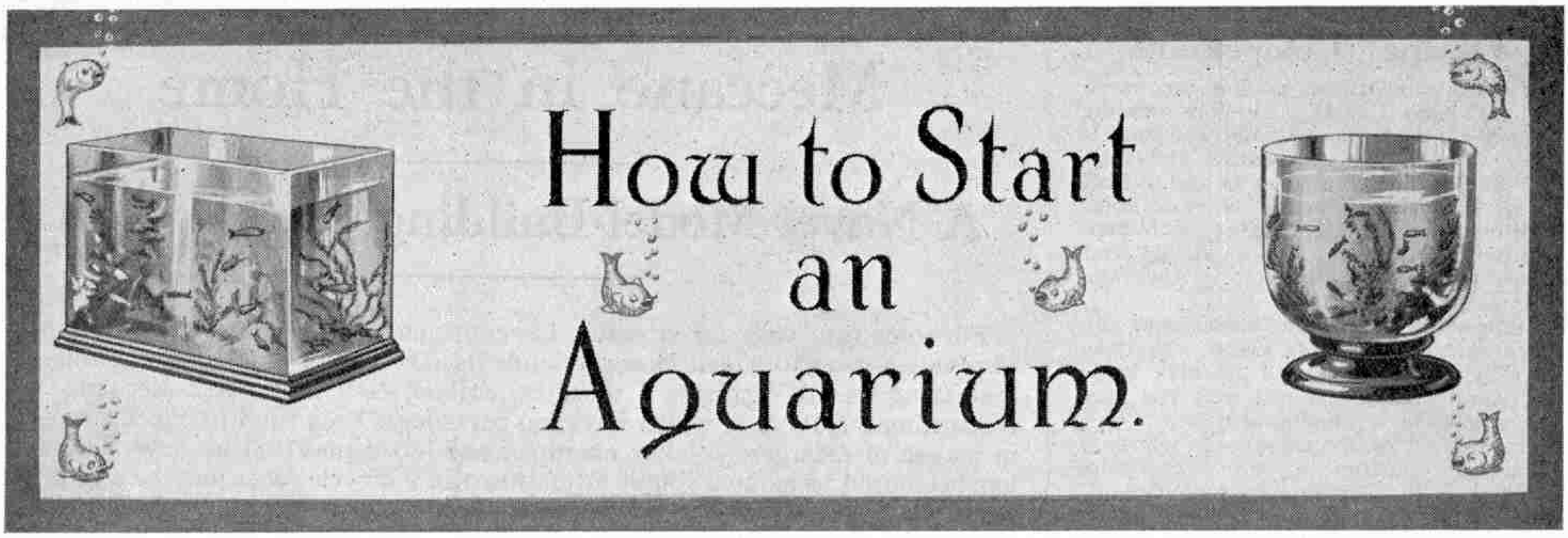
Grandfather Clock

HOW TO ENTER

Having designed some Meccano contrivance on the lines indicated above, you should send in a photograph or good drawing of your work, together with any explanations that you think necessary, although the latter should be as brief as possible. The use of the apparatus should be concisely stated. All models submitted must be the competitor's own unaided work, both in design and construction. Any size of Outfit or number of parts may be used.

IMPORTANT. These instructions should be followed closely. Write "Utility Competition," together with your name and address, on the back of each photograph or sheet of paper used, and state your age. Address envelopes: "Utility Competition," Meccano Ltd., Binns Road, Liverpool.

Models should not be sent. A clear photograph or good drawing is all that is necessary. Photographs or drawings will be returned if desired, provided that a stamped addressed envelope of the necessary size is enclosed with the entry.



By W. COLES-FINCH
(Resident Engineer, Chatham etc. Water Co.)

POND LIFE: FROGS AND TOADS

IN addition to the inhabitants of our ponds and ditches mentioned in previous articles in this series, quite a host of other creatures offer themselves for our study especially at this time of the year. The life-history of these abounds in interest and wonder, but to describe each one fully is beyond the space at my disposal. I shall, however, be able to refer briefly to many of the creatures more commonly encountered.

The Importance of including Snails

In keeping these lower forms of life, it is better to introduce each group into its own separate receptacle, the top of which should be covered by a piece of perforated zinc or coarse muslin, arranged so as to admit air freely but at the same time to prevent the creatures from escaping. A rockery should be provided, protruding a little way above the surface of the water. If possible it should contain irregular holes or crevices to offer hiding places to such small creatures as may wish to seek cover and seclusion. Pieces of porous rock or clinker may also be placed on the sandy bottom of the tank for a similar purpose.

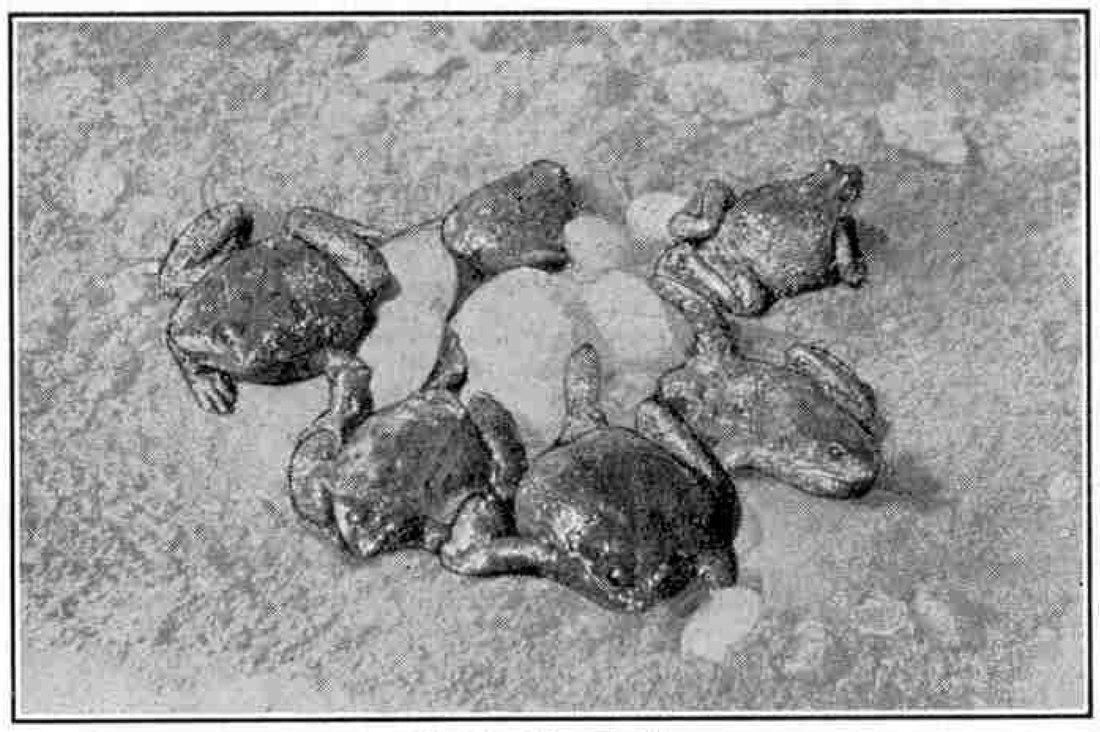
It is important to remember that snails should be included with every group of creatures. As previously stated, they are not only scavengers devouring the confervoid growth that accumulates on the sides of the tank or vessel, but their spawn, which they deposit freely on the water-plants, provides a valuable form of food for the inmates.

Life Story of the Frog

In the little tanks, jars, or shallow pans thus prepared we may place the various creatures that come to our net, also the spawn of the Frog and Toad, the development of which may be watched more readily than in a large aquarium.

The Common Frog (*Rana Temporaria*), sometimes called "the grass frog," is perhaps the most familiar pond creature we have and, as we pointed out briefly in a previous article, is one of the family of *Amphibia*. The spawn of the Frog is a jelly-like mass, differing from that of the Toad, which is formed in a rope-like strand. Eggs of the toad are also smaller and darker than those of frogs. After the eggs have been laid the parents do not take any further interest in them. The spawn may be obtained in the early part of the year from almost any pond.

The spawn when first laid consists of small, dark, globular bodies, surrounded by glutinous envelopes, which absorb water quickly and swell out into soft, transparent coverings. Through these envelopes the development of the embryos may be watched from the time the tiny eggs become elongated to the final appearance—in about a fortnight's time—of the little amphibians.


A Froggy Party

Where Frogs Go in Winter !

The head is the first to appear. Next, the flat tail is observed, followed by the gills, mouth, nostrils and eyes. Finally the little creature becomes a fully developed tadpole, and if placed under the microscope at this time the circulation of the blood in the gills may be observed.

Later the hind legs appear and then the fore legs, which have been concealed within the gill-chambers. The gills gradually vanish, for the lungs are expanding and the tail grows gradually smaller and finally disappears, the legs meanwhile increasing in size. At length all these wonderful transitions culminate in the perfect little frog, which will hop over the side of the jar, if not too high and seek its fortune in the garden. In winter frogs seek safety and shelter in little family groups near the ponds that they frequent in summer, hiding in any damp muddy recess that offers, there to await the Spring.

Their Wonderful Tongues

In the tadpole state, frogs feed on vegetable matter, but later on animal food. As tadpoles they devour refuse of all kinds and so make splendid scavengers in the aquarium. If deprived of food, the time of full change is simply delayed and they are kept longer in the tadpole state.

When tadpoles have attained their final development they should be given their freedom, being released in some congenial spot. Although they swim well and quickly, they are by nature land-dwelling creatures and prefer moist situations on land to the open pond.

As already mentioned, they feed on insects, worms and slugs and similar creatures, and do a great amount of good work in keeping insect pests within bounds.

They capture their food by means of their wonderful tongues, which they shoot out with wonderful rapidity. The tongue is remarkable for being fixed in front, and free behind and therefore has a great reach. It has a sticky secretion at the end, enabling its owner to draw every insect it touches into its mouth. Frogs are marvellously accurate "shots" and very dexterous in their search for food. Some time ago it was determined that the frog was able to shoot out its tongue at an insect and draw it back into its mouth in less than 1/200th second! Its cousin the Chameleon is, however, an even more wonderful performer in this connection.

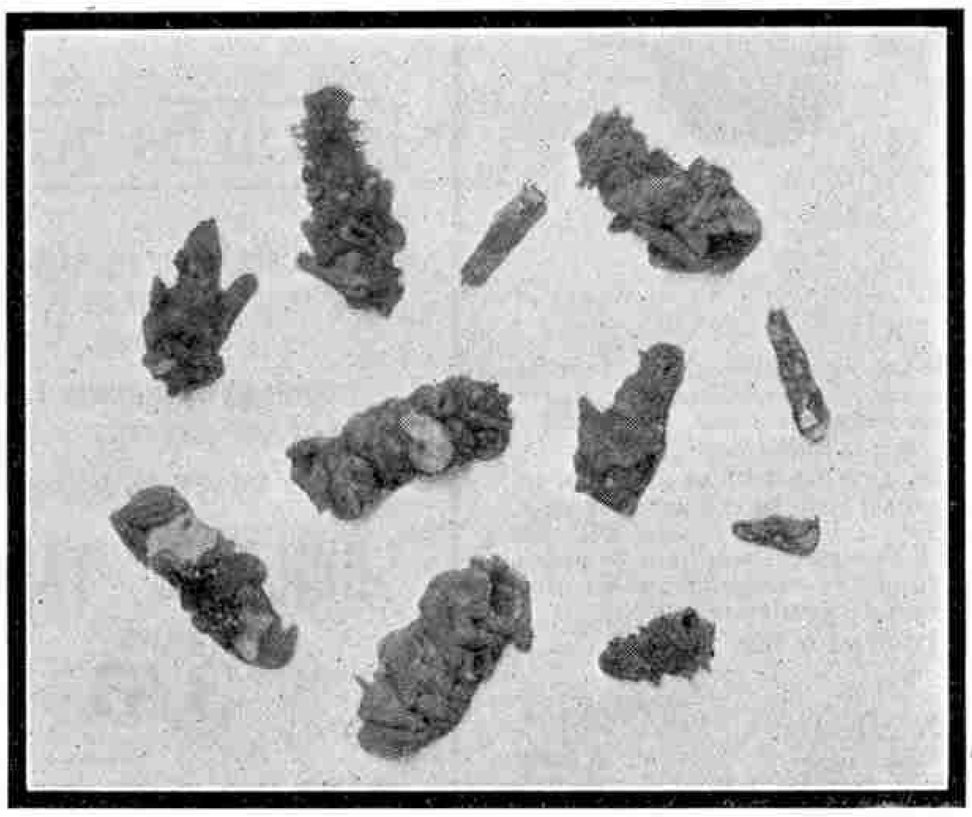
It may perhaps be mentioned that the frog has been used for many years for dissecting purposes in order to enable students to study the outlines of vertebrate anatomy. It furnishes valuable material for many experiments, one of the most interesting of which, perhaps, is that in which a living frog is used as a detector of radio signals!

The "Ugly" Toad

When out "prospecting" in some pond, you may land in your net some of the spawn of the Toad (*Bufo vulgaris*), always associated by the superstitious with gruesome things! Although Shakespeare calls it "ugly and venomous," the toad—like the Frog—has a useful mission to perform, in the destruction of grubs, worms, slugs, etc. Also it cannot be too strongly emphasised that toads, like frogs and newts, are perfectly harmless, and in spite of all fables to the contrary they can neither sting nor bite. The toad has suffered greatly from prejudice due to its unprepossessing appearance and it appears to have been always regarded with a certain amount of superstitious fear. The fable of the toad having a jewel in its head, referred to by Shakespeare, may possibly have arisen on account of the brightness of the creature's eyes.

It is quite true that these creatures are capable of exuding unpleasant material from their skin glands, but they are quite incapable of squirting this poisonous substance from their glands as has often been asserted, and it appears to be exuded only under pressure as, for instance, when a dog picks up a toad in its mouth. The experience is sufficiently unpleasant to deter a dog from repeating it!

Toads are nocturnal in their habits, becoming active and emerging from their hiding places at dusk in search of food. During the winter months they hibernate.



Photo] [*S.I.B.*

Cases of Caddis

Collecting Specimens

When plant life is flourishing in the different receptacles, ponds and ditches may be visited with net and can. An ordinary circular net may be used, and this is easily made by stitching muslin to a bag shape and stitching the neck on to a ring of wire. This is lashed to a strong cane or bamboo, which should be light but strong. If too light it may break under the weight of some great "catch," whilst if too heavy one soon becomes tired having to reach out at arm's length when "fishing" for specimens.

Sometimes it is interesting to use, instead of a net, a glass jam-jar, fastened to a length of light cord. The cord is loosely coiled on the bank of the pond and the jar thrown in to the middle of the pond. Sometimes specimens not found near the edges of the pond may thus be brought ashore.

When using the net, grope carefully with it among the water-weeds, or skim the bottom of the pond, and tip the contents out for examination. Carry a number of small jars, and to these transfer your captures, for taking home. It is also desirable to carry a number of small glass tubes, or bottles with corks, as often minute creatures may be found in the net, the examination of which by microscope or magnifying glass may be of interest.

Collecting specimens is quite an exciting pastime, and next month I shall describe some of the creatures you are likely to capture.

Replies to Queries

GLASS GLOBES.—It is impossible to keep fishes in glass globes without causing them to suffer, and it is cruel to attempt to do so. —(*Reply to G. Watson, Halifax*).

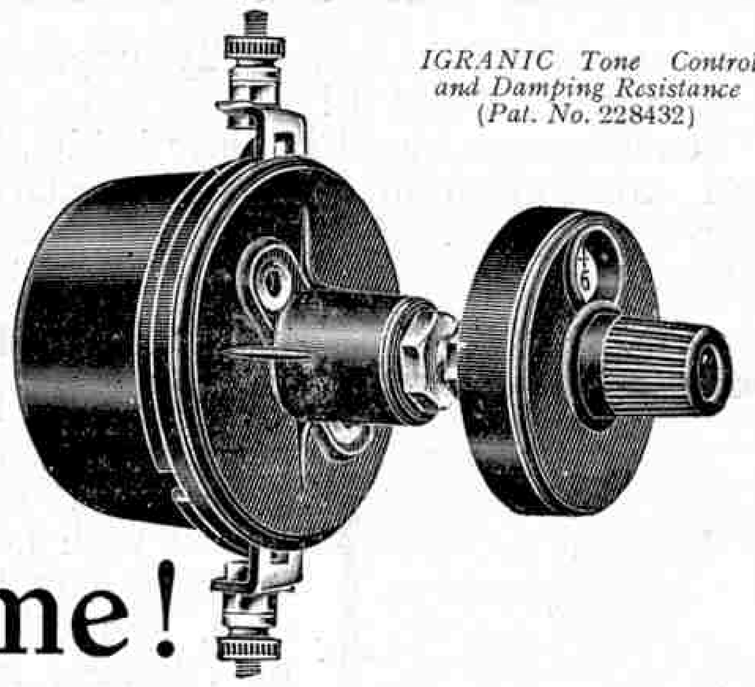
ACCUMULATOR GLASSES.—The glass vessels used for accumulators may be used quite well for keeping fishes. Their main drawback is the inferior quality of the glass as regards transparency. —(*Reply to W. F. Roberts, Swansea*).

ROCKWORK IN TANKS.—Rockwork is extremely useful in a tank of moderate size, but it should imitate nature as far as possible. The imitation castles so frequently seen look absurd in any circumstances.—(*Reply to R. S. Simpson, Chesterfield*).

NUMBER OF FISHES IN TANK.—Your lack of success may be due to several reasons, but it is certain that one of these is overcrowding. You cannot do better than to follow the old and well-tried rule of allowing one gallon of water to every inch of fish. Try the effect of reducing the number of your fishes by half and let us know the result.—(*Reply to W. H. Atkinson, Wigan*).

WATER PLANTS NEED LIGHT.—You are quite right in thinking that your fishes will be healthier and happier because their tank is in a shaded position, but you must not forget that water plants require a considerable amount of light. Try admitting more light to your aquarium, while at the same time shading it from the direct light of the mid-day sun. Provided you have sufficient water plants and one or two pieces of stone or rockwork to provide shelter, your fishes will thrive with considerably more light than you are allowing them at present. After a few experiments you will find it quite easy to balance matters between fishes and plants.—(*Reply to E. Johnston, Morecambe*).

Just the right Volume!



IGRANIC Tone Control and Damping Resistance (Pat. No. 228432)

Often an extra valve gives too much volume, and if de-tuning is resorted to volume is reduced, but interference from stations operating on near-by wavelengths is likely to result. Dimming the amplifier filament will also reduce volume, but usually causes distortion. What, then, is the solution?

Fit an Igranic Tone Control and Damping Resistance, and you will be surprised at the wide range of volume obtainable. Speech and music may be regulated from a mere whisper to the maximum volume of which the receiver is capable, without deterioration of tone. The Igranic Tone Control and Damping Resistance provides smooth, continuous and silent variation of resistance from 0 to 1 megohm and ensures even control of tone or volume whilst still retaining quality reception.

Ask your dealer about it. **Write for List J14.**

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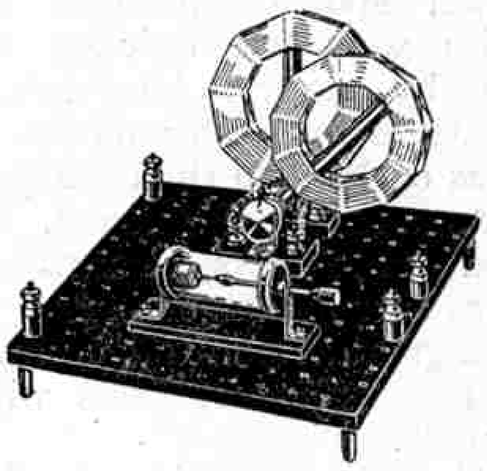

Patent No. 185,180 (A Typical Crystal Set).

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Lives of Famous Engineers—

(*Continued from page* 299)

bridge was a necessity, but the Corporation of London opposed its construction on the ground that the river was so narrow at the point selected that the bridge would obstruct navigation. The public demand for the bridge was so strong as to overcome this opposition, and the necessary Act was passed, with the proviso that the arches should be made as large as possible.

Rennie submitted a design to meet the requirements of the case and this was approved and ordered to be carried into effect. His design consisted of three cast iron arches, the centre having a span of 240 ft. and a rise of 24 ft., and the two side arches each having a span of 210 ft. and a rise of 18 ft. 10 in. The two stone piers were each 24 ft. wide at the springing, thus giving a clear lineal waterway of 660 ft. The works commenced with the cofferdam of the south pier on the Southwark side, the first stone being laid by Admiral Lord Keith about the beginning of 1815. The bridge was opened for traffic in March 1819.

The Story of Metals—

(*cont. from page* 309)

surface, although no shafts exist at those levels. The three deepest mines are the Village Deep, 6,263 ft., the City Deep, 5,427 ft. and the East Rand Proprietary Mines, 5,166 ft. It appears to be reasonably certain that, owing mainly to the low rate of increase of temperature and also on account of the nature of the rock formation, mining could be carried on successfully to a depth of at least 7,000 ft. provided that the ore is of sufficiently high grade to cover the inevitably high costs of working at such a depth.

Gold in Panama

As we write comes the news of the discovery of a rich gold-bearing area in Panama. The surface indications are exceedingly promising, and although nothing certain can be prophesied until the engineers have opened up the ground, it appears likely that the discovery is of great value. It is interesting to remember that vast quantities of gold were obtained from this part of the world by the native Indians and later by their Spanish conquerors. The lack of suitable machinery, however, prevented the workings being carried to any depth. In addition to gold, it is believed that silver and zinc are present in large quantities.

There is little doubt that vast goldfields still remain to be discovered in many parts of the world. There are, for instance, enormous areas in Asia the possibilities of which are quite unknown, and it may be that at some future date gold-bearing deposits will be found in Siberia and China. In the latter country prospecting for minerals has been very largely prevented by the rooted objection of the Chinese to allow the ground to be disturbed on account of its being the burial place of millions of people of the past. Even in Africa and Australia, in spite of the enormous amounts of gold already produced, there are probably areas rich in the metal that have not yet been discovered. No doubt further gold areas will yet be found in the north American Continent.

Gold Rush by Aeroplane

It appears probable that the aeroplane will play a prominent part in the opening-up of the goldfields of the future. The possibilities of the aeroplane in this direction were shown recently in Canada. A new gold camp had been opened at Red Lake, Ontario, and a party of prospectors set off on foot with dog teams in the usual style. Shortly after the prospectors' departure, a Hamilton airman announced his intention of inaugurating a "gold rush passenger and freight service," and three machines were put into service to convey intending miners to the goldfield. The journey by air took only two hours, whereas those who travelled on foot could not get there in less than from seven to ten days. One can imagine the amazement of the old-time prospectors if they could return and witness this latest development!

THIS SPLENDID

MODEL FIELD GUN

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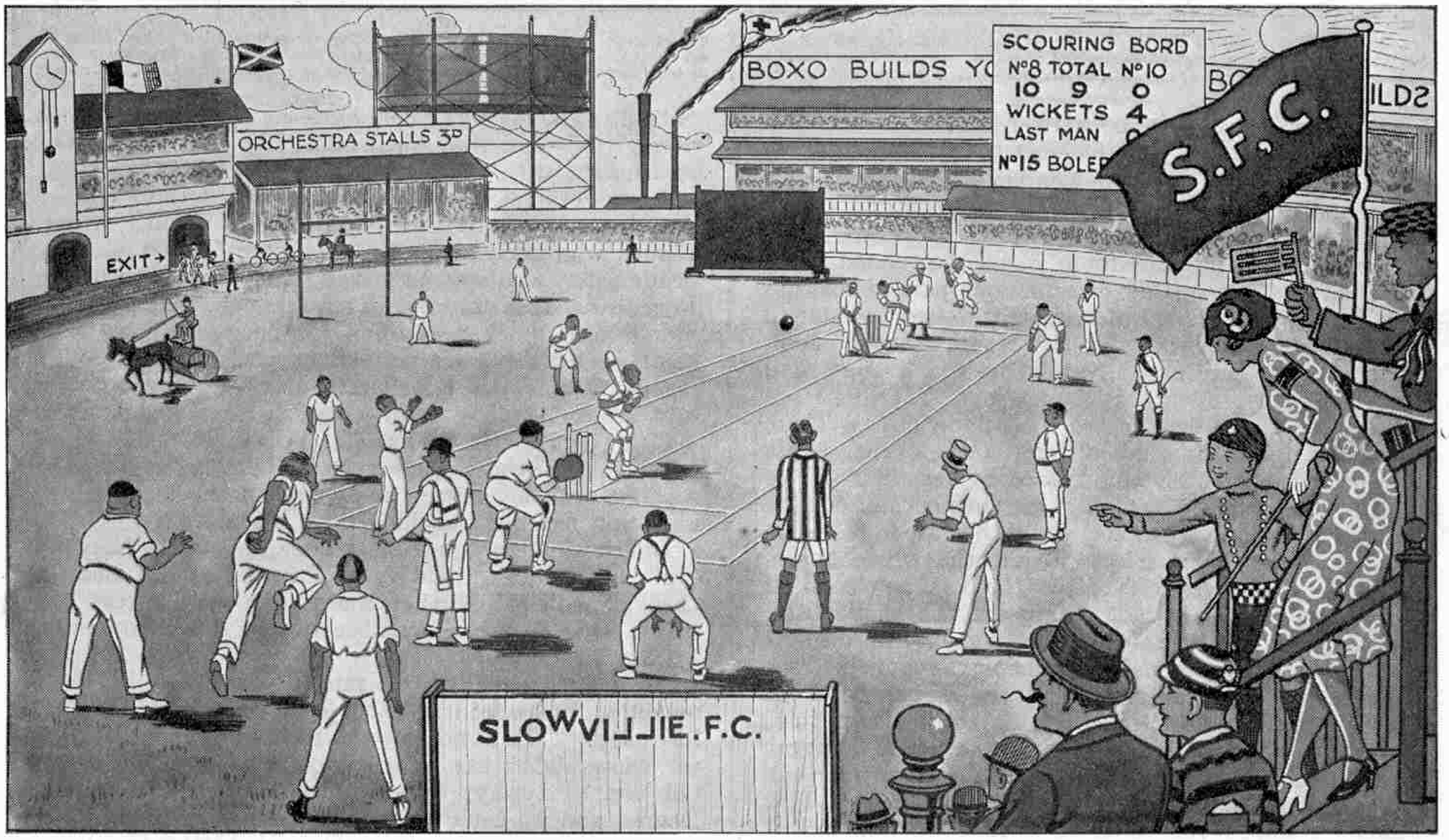
Built to scale from a real Royal Artillery FieldGun, the famous Wembley Cannon is a fascinating piece of scientific workmanship as well as a splendid fun maker. British designed and British-made throughout of tempered steel, brass and bronze. It bangs, flashes, pivots, elevates, etc., in the true R.A. style, and needs no special ammunition. Spare parts always in stock. Of all leading stores, or send 4/9 to-day to makers for model "on appro." — money returned instantly if not satisfied.

HANWELL'S TOYS, 38, Alexandra Road, NORTHAMPTON.

PRICE **4/9** POST PAID. (C.O.D. if preferred).

Competition Page



How Many Errors Has Our Artist Made?

We publish above the fourth of the new series of "Sharp Eyes" Puzzle Pictures. The conditions of this competition are familiar to most of our readers and the following notes will make everything clear to new readers.

In the above picture our artist has introduced intentionally a number of errors, and the task of competitors consists in finding and making a list of these mistakes. Competitors' lists should be written on one side of the paper only and at the foot of the list the total number of errors found should be noted. The description of the mistakes should be kept as short as possible.

Four prizes of Meccano or Hornby Train goods (to be selected by the winner) to the value of £1-1s., 15/–, 10/6 and 5/– respectively will be awarded in order of merit to the four competitors who send in the longest lists of genuine errors.

Closing date, 31st May. Overseas, 30th September.

May Essay Competition

For our essay contest this month "My Favourite Meccano Model" has been chosen as the subject. If there is one theme upon which every Meccano boy can write freely, it is concerning his favourite model, and thus we look forward to a large entry for this competition. The model chosen need not necessarily be one illustrated in the Manual and indeed it will probably be found that the chosen model is one that has been self-invented. It is not necessary to give a list of the parts used but mention may be made of them. Rather is it desired that competitors should state the special reasons for their preference. Perhaps the construction has presented some special difficulty to be surmounted; it may be that the model has some sentimental association with a relative's occupation; again it is possible that the fondness may be due to a likeness to some structure with which the competitor is familiar but whatever the reason, the contest affords an opportunity to tell us about it.

Prizes of Meccano products to the value of £1-1s. and 10/6 will be awarded to the first and second best entries in each of the usual sections; A for those over 16, B for those under 16.

Closing date, 31st May. Overseas, 30th September.

Results

24th Photographic Contest

FIRST PRIZES. Photographic Material (or Meccano products) to the value of 15/–.
Section A: P. LAMBERT, Harrogate; Section B: J. BROADBENT, Glasgow.

SECOND PRIZES. Photographic Material (or Meccano products) to the value of 7/6.
Section A: J. SANDHAM, Jnr., Preston; Section B: F. G. SIMPKINS, Treharris.

March Essay Competition

FIRST PRIZES. Meccano products to the value of £1-1s.
Section A: V. J. RUXTON, Kirkcaldy; Section B: L. H. GREENLAND, Warminster, Wilts.

SECOND PRIZES: Meccano products to the value of 10/6.
Section A: F. COLQUHOUN, Leamington Spa; Section B: E. RISEBOROUGH, Ipswich.

March Puzzles

Cash prizes of £1-1s., 15/–, 10/6 and 5/– respectively have been awarded to:—
IAN HOGG, Kendal; S. OGDEN, Birmingham; C. N. BEATTIE, Lewes; L. R. HOLDEN, Widnes.

March "Sharp Eyes" Contest

Prizes of Meccano products to the value of £1-1s., 15/–, 10/6 and 5/– respectively have been awarded to:—
PHILIP B. HILTON, Radcliffe; DAVID H. MERCER, Liverpool; M. PRESTON, Cheltenham; D. MANSON, Glasgow, W.2.

FROM OUR READERS

This page is reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of general interest. These should be written neatly on one side of the paper only, and they may be accompanied by photographs or sketches for use as illustrations. Articles that are published will be paid for at our usual rates. Statements contained in articles submitted for this page are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

A Visit to the Mint

A short time ago I had the good fortune to be able to visit the Mint on Tower Hill, London. When we arrived we signed our names in the Visitors' Book and then a guide led us across a court-yard to the workshops.

First we went into the room where the refined metal is melted in furnaces that consume one part of coal gas with five parts of air. Unfortunately we were unable to see the metal being poured, but we were shown some of the bars after pouring and after the rough edges had been filed away.

We were then taken to see the rolling mills. These mills exert a pressure of about forty tons and each bar is put through until it is compressed to the thickness of the coin to be made. Two discs are then cut out of each bar and weighed on a balance, and if they are found to be over or under the standard weight the whole bar is remelted. If the weight is correct the bars are passed on to the cutting mills, which stamp out the blank discs. What is left of the bars after cutting out the discs is taken away to be remelted. In the next room the discs are annealed and washed in water—silver coins in sulphuric acid—and then dried in tubs of sawdust.

Next we went to the stamping room which contains about twenty machines, one of which was turning out half-crowns at the rate of about three a second. This machine stamped the coins on both sides and milled their edges at the same time and, like all the other similar machines, was fitted with an indicator that recorded the number of coins that had passed through it.

After the noise of the stamping room it was a contrast to go into the weighing room. There are sixty machines in this room, each of which weighs a coin in about one second and automatically rejects all coins under or over the standard weight. The number of such "throw-outs" is about one per cent. Here also all coins are examined. They are placed on a moving belt about 1 ft. wide. A man examines one side of the coin and then they all fall the other way up on to another belt and the reverse side is examined by another man. Badly stamped coins are re-melted and any discoloured ones are re-washed.

Finally we saw the coins being "rung" on a metal plate by a boy in a sound-proof box. He can tell at once by the sound when he comes across a cracked coin and this is thrown out and remelted.

J. G. Brown (Southgate, N.14).

The Triumph of Dennis

It was Dennis, I think, who first suggested our Meccano Guild Social. At any rate, it was he who undertook all the work, and carried it to a successful conclusion.

We all liked Dennis. I don't think I'm saying too much when I state that he was the most popular of all the two-hundred-and-something boys who attended Lexminster School. The masters caned him—he was something of a young rip!—but they liked him. We fellows quarelled and fought with him, but we respected him.

It was Dennis who started our Meccano Club, and induced us, his form-mates, to join the Guild. It was Dennis who persuaded old "Egg-pate"—that was the headmaster, who was very bald, poor chap!—to be our President. It is only fair to say, though, that Egg-pate didn't need much persuasion for he was a jolly good sport, even if he was a holy terror in the form-room!

Yes, Dennis was a first-rate chap—a very different sort from Bullen, whom nobody liked. You know Bullen's type. He was a fat, heavy, morose sort of fellow—one of those people who, if they don't agree with a thing, will never leave it alone, but sneer and laugh until you feel like punching their heads.

Bullen was always getting at Dennis about the Meccano Club and Guild. "Kid's play," he called it. Beastly cheek, wasn't it? If there's anything more decent and manly than being a member of the Meccano Guild, I'd like to know it!

Even Dennis used to get rattled sometimes, but he'd never let Bullen see it. "Oh, leave the silly ass alone," he'd say. "He's not worth troubling about." But we fellows didn't like taking it quite so smoothly, I can tell you. Anyway, Bullen never tackled anyone but Dennis, and we couldn't chip in, because it would have looked too much like fighting Dennis's battles for him—which, of course, he would have hated.

Anyhow, Dennis fixed up this Social and it was to be a ripping affair—tons of cakes and things. You may be sure we took jolly good care that Bullen shouldn't know about it.

"It will be a good way of getting our own back," we said to Dennis. "We won't tell him till the day after the Social, and then perhaps he'll be sorry he's been such a pig."

Well, at a meeting of the Club, held in the form-room about a week before the affair, who should walk in but Bullen himself. We *did* stare, I can tell you! But he looked different, somehow—sort of shame-faced. He went up to Dennis.

"I say, Dennis," he said, looking down at the floor and twisting his cap round and round, "I'm awfully sorry I chipped you about the Club. I've been thinking about it, and I can see now that I was wrong. May I—may I join?" The room went awfully quiet, and we all looked at Dennis, waiting for him to speak. Wasn't it a ripping chance to get his own back? He looked a bit angry, and we expected him to say: "No, you can't. You've always been too high and mighty to join in our 'kids' play' as you call it, and you can stop away now. We're having a bun-fight next week, and we don't want you"—or something of that sort.

But Dennis didn't say a word. He suddenly turned round and looked at us. He told me afterwards that he

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The Secretary's Notes

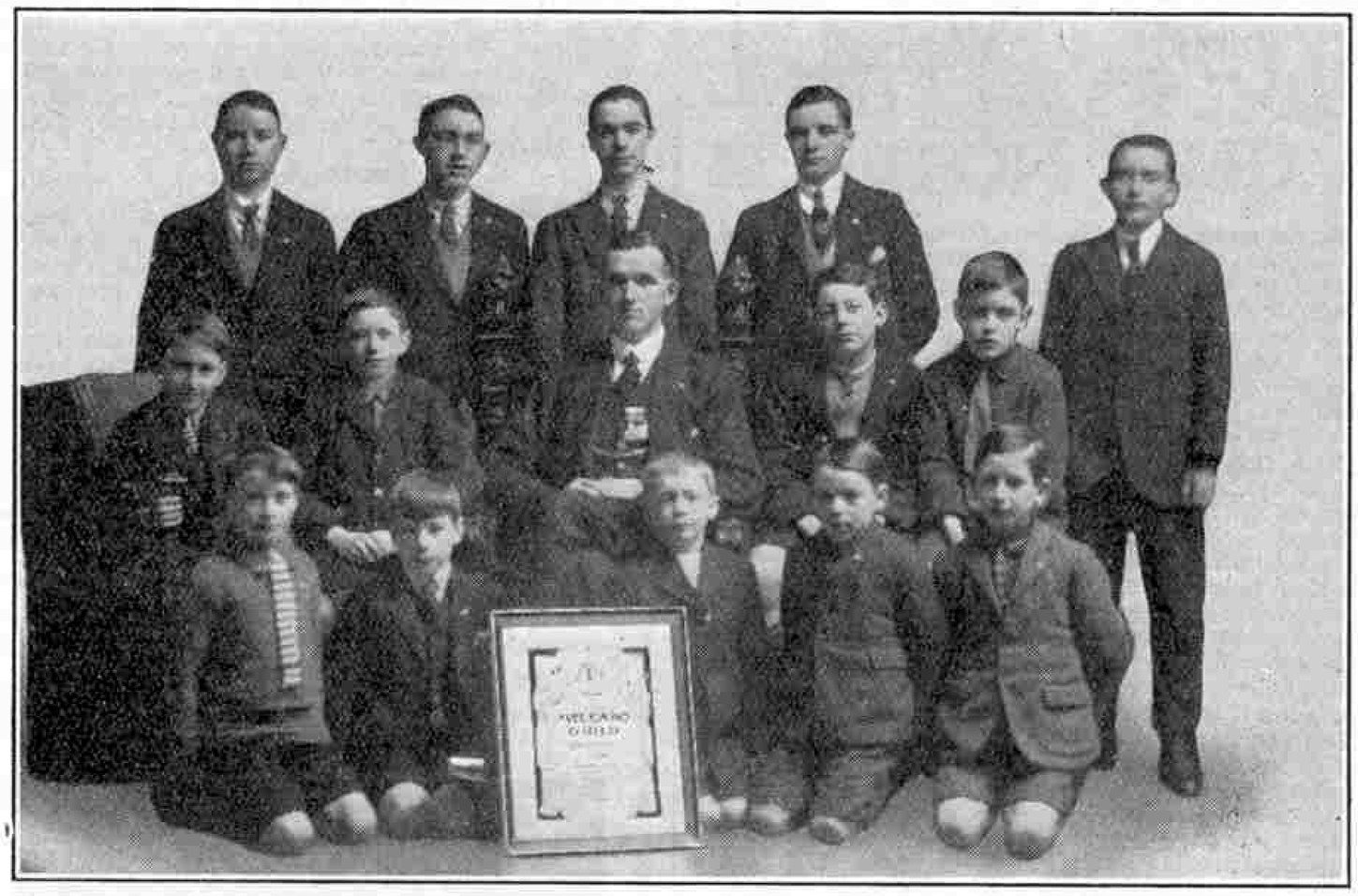
Outdoor Activities

The majority of Meccano Clubs have now commenced outdoor activities in earnest or at any rate have made preparations to do so within the next week or two. Last year I noticed that many secretaries who were quite regular in submitting reports during the two winter sessions sent in practically no reports at all throughout the summer months. When I inquired the reason for this silence, the reply was usually that, as most outdoor activities had no connection with Meccano or with engineering, it was not considered that reports were of any interest. This is a very great mistake. All the activities of Meccano Clubs, summer and winter alike, are of interest to us at headquarters, and I wish to ask secretaries to treat their monthly reports as seriously during the next three or four months as they do during the winter. I also wish to make a special appeal to Leaders and secretaries to send me any interesting photographs connected with their clubs that may be taken during the summer, with a view to their publication in the "*M.M.*"

Holiday Camps

Last year several Leaders wrote to me with regard to the arrangement of club camps during the members' holidays. I am strongly in favour of such camps because I believe that, given reasonably good weather a camping holiday is ideal from every point of view, including cheapness. I have carefully considered the possibility of arranging some form of camp organisation to assist Leaders in making the necessary arrangements, but I have come to the conclusion that, for this year at any rate, I cannot undertake this task. What I do suggest, however, is that any Leader who thinks of running a camp should communicate with all other Leaders in his district and try to arrange a joint organisation. Only the largest clubs can carry out a camp successfully by their unaided efforts, and in most cases far better results will be obtained by the co-operation of three or four Clubs. I shall be glad to give any advice or help I can to Leaders who are interested in the adoption of this scheme, and if desired to place them in communication with Leaders of other Clubs within reasonable distance and having similar intentions.

Louth (Lincs.) M.C.



Our photograph shows a group of members of the Louth (Lincs.) Meccano Club, which was affiliated with the Guild in November of last year. From its commencement this club has made steady progress under the enthusiastic and skilful direction of its Leader, Mr. T. Burkitt, whose efforts have been splendidly supported by the secretary, H. Bell.

A Useful Booklet

Before leaving this subject I wish to draw the attention of Leaders and secretaries to an interesting publication issued by the L.N.E.R., entitled "Sites for Holiday Camps." This booklet gives a great deal of extremely useful information regarding sites of all sizes in the beauty spots of England and Scotland, with full particulars in each case. Details are also given of the special fare facilities for organised parties of juveniles travelling to and from their camps. I strongly advise all club Leaders to obtain a copy of this booklet as soon as possible.

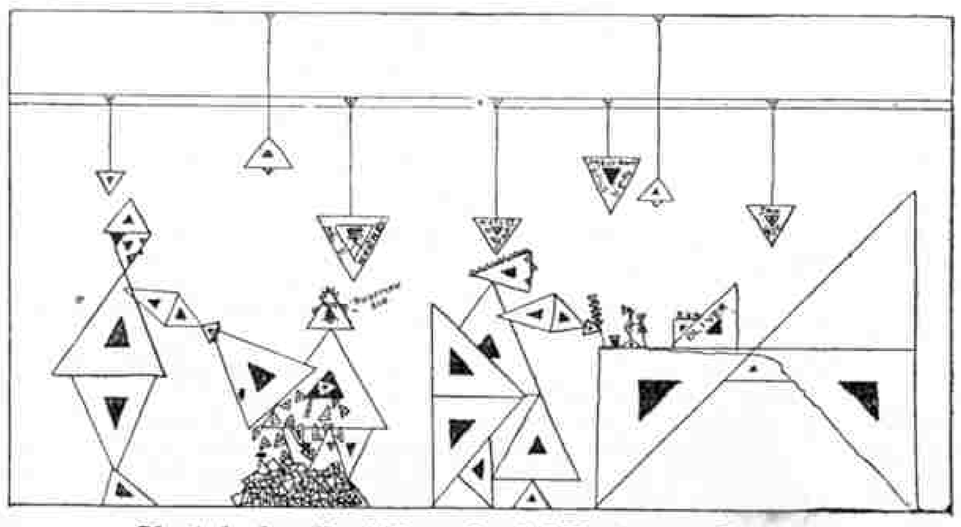
Visits to Places of Interest

Visits to such places of interest as Electric Power Stations, Gas Works, Factories and Engineering Works of all kinds form a regular feature of the summer programme of most clubs. This is a feature that I should like to see greatly extended. In the majority of cases there is little difficulty in making the necessary arrangements. It is my experience that the officials of great engineering undertakings are almost invariably glad to welcome a well-organised and well-behaved party of boys, particularly Meccano boys from among whose ranks will rise many of the best engineers of the future. It is very necessary to treat such visits seriously, however, and to make courteous application by letter two or three weeks beforehand. Another point that should never be forgotten is the necessity for a courteous letter of thanks from the club Leader or secretary to the officials concerned. Leaders of Meccano Clubs in the Birmingham district will be pleased to learn of a generous invitation extended by the Dunlop Rubber Co. Ltd. to visit their works at Fort Dunlop, Erdington. A tour through these world-famous works is bound to be of fascinating interest and I advise all Leaders in the district to arrange a visit.

A New Club Game

An interesting club-night game called "Half-Towns" is recommended by Mr. Treves, Leader of the St. Mary (Newington) M.C. The names of a number of English towns are written on slips of paper and the names upon them are all cut in half. One set of half-slips is distributed among the members, while the corresponding half-slips are pinned up on various parts of the club-room walls. The object of the game is for each boy to wander round the room and endeavour to "match" as many of his half-towns as possible with the half-towns pinned on the walls. The boy producing the greatest number of whole towns within a given time is awarded a small prize.

"The Guild Secretary as I Imagine Him to Be!"



Sketch by P. Wyand, Addlestone, Surrey

CLUB NOTES

Boroughmuir M.C.—Has completed a very successful session, and an Exhibition is planned to take place shortly. This club was originally called "Boroughmuir School M.C.," but the name has been changed in order that local Meccano boys may be encouraged to join. The Leader will be very pleased to welcome boys who do not attend the school. Club roll: 15. *Secretary*: R. Young, "Glenelg," Joppa Road, Joppa, Edinburgh.

Castle Douglas M.C.—One of the chief attractions in this club is Dart Rifle-shooting. There are two teams, members for which are picked as the result of marks obtained in general tests. The ammunition is .177 darts for indoor use, and .177 slugs for outdoor use. The slugs cost from 1/- to 2/6 per 1,000 and the darts from 6d. to 10d. per dozen. The secretary will be pleased to send information on the subject to secretaries or Leaders of other clubs who may be interested in this hobby. Club roll: 24. *Secretary*: R. Haugh, 26a, King Street, Castle Douglas, Scotland.

Teignmouth (Devon) M.C.—Is progressing well, and recent activities have included Football, Outdoor Rambles, Lectures, Excursions, Model-building Competitions and Hornby Train evenings. The membership is steadily increasing, and several inter-club functions have been arranged with Exeter M.C. and greatly enjoyed. Club roll: 24. *Secretary*: A. L. Radford, 17, Bank Street, Teignmouth, Devon.

Pontypool Road M.C.—Has been revived after a temporary cessation and is more enthusiastic than ever. A club-room has been secured at the local Institute and Reading Room, free of charge, through the kindness of the officials. Lecture and Story Evenings are the chief activities at present, and it is hoped to arrange an Exhibition of Models at an early date. *Secretary*: K. J. Cook, "Maelgwyn," Pontypool Road, Mon.

Beccles Excelsior M.C.—Is planning an exhibition to be held in July, in conjunction with Beccles Congregational Sunday School Flower Show. Through the courtesy of the Sunday School officials and Mr. W. C. Watts, Superintendent and Club Leader, there is no charge made to the club for the use of a room, lighting and heating. The club has been formed into sections or "Gangs." Club roll: 21. *Secretary*: B. Jack Andrews, 30, Station Road, Beccles.

Moseley School (Birmingham) M.C.—The weekly meetings are well attended, and activities include Model-building Competitions, Hornby Train evenings, and Motor and Aeroplane nights. A Model Exhibition was incorporated in the Moseley School Hobbies Exhibition at the end of March and proved highly successful. Cycling and Rambling Clubs are being formed for the summer months. Club roll: 16. *Secretary*: S. Fletcher, Moseley School, Birmingham.

St. Georges (East Ham) M.C.—Meccano Model-building, Fretwork, Toy-making and Railway Modelling are the main features of an attractive syllabus. Woodwork is to be introduced later. An Exhibition of Models held in April was highly successful. Club roll: 18. *Secretary*: C. Smith, 277, Burgess Road, East Ham, London.

Diss M.C.—Is progressing excellently, its latest achievement being a Club Magazine. This is compiled by the boys themselves, and includes articles of a mechanical nature, stories, a serial and sketches. Club roll: 10. *Secretary*: John Maling, 15, Heywood Road, Diss.

Chalmers Church (Alloa) M.C.—A Model-building Competition was held recently and enthusiastically contested. Bagatelle is a popular feature in the club and a competition has been organised. A Social is being arranged, and it is hoped that, with the aid of local lady patrons, a supplementary entertainment of songs and dances may be successfully launched. The Club Orchestra is busily preparing for this occasion. Club Roll: 60. *Secretary*: Wm. Henderson, 13, Paton Street, Alloa.

Hemingstone (Ipswich) M.C.—Under the Leadership of the Rev. W. J. Chapman, a successful career for the club seems assured. Regular meetings are held for Model-building and Games, the Leader very kindly providing a room at his home. A Cricket Team is being organised. Club roll: 7. *Secretary*: Lewis Offord, The Post Office, Hemingstone, Ipswich.

Rhos-on-Sea M.C.—Recent activities include Lectures on Modern Steamcraft, Microscopy, Photography and Philately, delivered by capable exponents. A Mock Trial proved successful. A club-room is provided by the courtesy of Messrs. Hastewell & Smith, and meetings are well attended. The Library already comprises 30 books and is steadily growing. This club has two sections known respectively as "Nuts" and "Bolts," and inter-sectional events take place each week. Club roll: 20. *Joint Secretaries*: G. E. Mellor, Bradda Allanson Road, Rhos-on-Sea, and L. A. Baxendale, Broughton Cottage, Kenelm Road, Rhos-on-Sea.

Weston M.C.—Regular meetings are being held at the home of the secretary, pending the acquisition of a larger club-room. A Social Evening was enjoyed recently at a local café, as a "wind-up" to a very enjoyable session. Paper Chases and Treasure Hunts are popular features, and for the summer session Rambles and Excursions are being planned. A Whitsuntide Camp has been proposed by the Leader, the suggestion being received with great enthusiasm. A Cycling Club also has been formed. Club roll: 13. *Secretary*: R. B. Nicholls, 3a, Royal Parade, Weston-super-Mare.

South Africa

Malvern Wesleyan M.C.—A Mock Trial was recently organised and is reported as one of the best evenings ever held. The charge was one of "Reckless Driving," and members had a week in which to prepare the cases for the prosecution and defence. A similar evening in the near future is eagerly anticipated. W. Gunnell, a "Veteran" member of the club who has been a regular attendant since its formation, has had to leave through being transferred to another town. He was presented with a handsome pocket wallet and the good wishes of all his old colleagues. Club roll: 25. Leader: Mr. E. Sykes, c/o H. Garner, Esq., P.O. Box 54, Cleveland, Johannesburg, South Africa.

Meccano Club Leaders

No. 27

Mr. L. Hosking

Mr. L. Hosking is Leader of the Richmond (Surrey) Meccano Club. Since its affiliation in November 1924 this club has made steady progress and its membership has grown from six to thirty-six and is still increasing.

Much of the success of the Richmond Club, financial and otherwise, has been due to the holding of frequent exhibitions and concerts. There appears to be an unusual amount of musical and dramatic talent among the members, and Mr. Hosking, in addition to being a very skilful organiser, is always ready to contribute vocal items which are very popular.

New Zealand

Napier (Auckland, N.Z.) M.C.—Is making splendid progress. The Leader, Mr. Frank Drew, is very enthusiastic, and encourages his members to put their best endeavours into Model-building. A highly successful exhibition was held recently, a large number of fine models being displayed. A platform at one end of the hall was divided by trellis-work into two sections, one being devoted to a short concert and the other to the consuming of ices and similar delicacies. The whole function was a great success, socially and financially. *Leader*: Mr. Frank Drew, c/o "Daily Telegraph," Napier.

India

Timapur (Delhi) Children's M.C.—This recently-affiliated club has prepared a very interesting syllabus and outings are being arranged in conjunction with Calcutta Children's M.C. The club includes boys and girls who are pupils of the Notified Area Anglo-Vernacular Middle School, Timapur, and has for its Leader Mr. Mushir Ali Khan, the Headmaster of the School and Scoutmaster. Excursions have been made to Delhi Waterworks and Pumping Station, where all the interesting details were explained to the members. Club roll: 15. *Leader* and *Secretary*: Mr. Mushir Ali Khan, Headmaster, Notified Area A.V. Middle School, Timapur, Delhi.

Clubs not yet Affiliated

St. James' Choir (Gravesend) M.C.—During recent weeks Lectures by members have been a very popular feature. A club Library with 60 books has been opened, and a further increase in membership has been effected. Club roll: 11. *Secretary*: E. Jones, 14, Granville Road, Gravesend, Kent.

Rathmines and Rathgar (Dublin) M.C.—A good little club has been formed, meetings being held at present at the home of the secretary. A fine Hornby layout provides the chief attraction, and Wireless evenings are greatly enjoyed. Plays and concerts are planned, and the members, pupils of Belvidere College, are very enthusiastic. It is hoped shortly to obtain an adult Leader. *Secretary*: Joseph McAsey, Grange Cottage, Rockeny.

Waverley (Sydney, N.S.W.) M.C.—Good progress is reported and the fortnightly meetings are greatly enjoyed. An adult Leader has not yet been obtained, but every effort is being made to overcome this difficulty. Several interesting visits to various museums of Sydney have proved successful, and members were specially interested in a scale model of Nasmyth's Steam Hammer, at the Technical Museum. Club roll: 7. *Secretary*: V. Worstead, 101, Cowper Street, Waverley, Sydney, New South Wales.

Hove M.C.—Has made excellent progress but had to close for a short period recently owing to an epidemic of mumps. A varied syllabus shows a preference for Model-building, and meetings are now well attended. *Secretary*: G. R. Webb, 7, Glendale Road, Hove.

Gravesend M.C.—Is progressing soundly and is fortunate in its Leader, Mr. Kemp-Potter, who was introduced by the Rev. J. Poole, Vicar of St. James' Church. The Vicar lends the club-room free to the boys and takes a kindly interest in their progress. A Hornby Train night held recently proved highly successful. *Secretary*: E. Jones, 14, Granville Road, Gravesend, Kent.

Pershore M.C.—New members will be welcomed, for the club-room is a large dance room at the home of the secretary, and affords ample accommodation. A recent meeting was devoted to attempts to invent new models and was greatly enjoyed. It is hoped that an exhibition of models may be incorporated in the district Flower Show this year. Club roll: 7. *Secretary*: Tom Pettifer, High Street, Pershore.

Pendleton (Manchester) M.C.—An active little club has been formed under the Leadership of Mr. E. H. Whittaker, 27, Trafalgar Road, Pendleton, Manchester, who will afford a hearty welcome to all recruits.

Banbury M.C.—A club-room has very kindly been provided by the mother of the secretary. It is suggested that girl members may be introduced at a later stage. *Secretary*: William Ronald Oake, 20, King's Road, Banbury, Oxon.

St. Mary's (Brookfield) London M.C.—Now possesses a club-room, a Leader, President, treasurer and committee, in addition to the secretary and very enthusiastic members. It is hoped that this club will be affiliated very soon. *Secretary*: A. T. Penn, 25, Spencer Road, Kentish Town, London, N.W.5.

Paisley M.C.—Is making excellent progress and has had a very successful Exhibition. A committee has been appointed and a club-room obtained, while the financial state of the club is sound. An adult Leader is still required. *Junior Leader*: Wm. M. Thomson, 71, Causeyside Street, Paisley.

Wisbech M.C.—Meetings are now being held regularly. New members will be welcomed by the *Secretary*: E. H. Coy, 102, Bridge Road, Sutton Bridge, Wisbech.

Oxenhope M.C.—Although an adult Leader has not yet been obtained, the club is making good progress and regular meetings are being held. New supporters will receive a hearty welcome. Club roll: 7. *Secretary*: Jack Overend, 15, Moorland Terrace, Upper Marsh, Oxenhope.

Selby M.C.—Has re-opened after a short interval and has now a Leader and a sub-Leader. It is hoped that affiliation may be effected very soon. A Girls' Section is to be incorporated as soon as the services of a suitable lady are enlisted to act as Principal. *Secretary*: Reg. Bainbridge, 24, River View, Cliff Bank, Selby.

Bungalow Town (Shoreham) M.C.—Regular meetings are now being held and the father of the secretary has accepted the position of Leader. One of Mr. Jameson's tea rooms furnishes an excellent club-room, and new members will receive a hearty welcome. Club roll: 7. *Secretary*: W. R. Jameson, The Old Fort, Old Fort Road Bungalow Town, Shoreham-by-Sea.

Hoole (Chester) M.C.—Meetings are held at the home of the secretary, whose father, an engineer, is good enough to interest himself in the boys' model-building exploits and to judge the merit of the models. A Lecture Competition was keenly contested. At the end of the session a concert is to be held, after which prizes will be awarded. Club roll: 9. *Secretary*: Alfred Baskerville, 63, Hoole Road, Hoole, Chester.

Takapuna (N.Z.) M.C.—Has commenced activities well, and though hampered by the absence of a suitable Leader and club-room the members are very enthusiastic. Meetings have been held at the home of the secretary. A Model-building competition proved very popular and arrangements are to be made for visits to places of local interest. Club roll: 11. *Secretary*: George Henwood, "Fernbank," Lake Road, Takapuna, Auckland, New Zealand.

Newland (Hull) M.C.—A good club has been formed by a small band of enthusiasts, and all intending members will receive a hearty welcome. A secretary and treasurer have been appointed, and an adult Leader is sought. *Secretary*: C. Robinson, 12, Beech Grove, Princes Road, Hull.

Altofts M.C.—Sound progress is being made, an adult Leader having been obtained, and it is hoped that affiliation will be granted shortly. A tea-party was organised to mark the close of the session, and the parents of the members very kindly took over the catering. A small charge was made for tickets, and the proceeds were given to the club funds. A Model-building Competition was also held and was keenly contested. Club roll: 11. *Secretary*: William Webb, 52, Greenbank Road, Lee Bridge, Altofts, Normanton.

Leicester M.C.—Is holding regular meetings under an adult Leader. A Treasure Hunt held recently proved very popular. Model-building is the main feature of the syllabus. Club roll: 6. *Secretary*: S. Phipps, 292, Narborough Road, Leicester.

Annan M.C.—A small club formed at Annan is developing along promising lines, having commenced its activities shortly after the Easter holiday. New members will receive a hearty welcome. *Secretary*: Thomas H. Graham, West Manse, Maypole.

Sparkhill (Birmingham) M.C.—Is now holding regular meetings. An adult Leader has been secured in the father of the secretary, and meetings are well attended. *Secretary*: L. Stewart, 44, Benton Road, Sparkhill, Birmingham.

Robertsbridge M.C.—Is making excellent progress under the Leadership of Mr. R. Leonard, whose formal application for affiliation will be made shortly. The club is self-supporting and its financial condition is very sound. There are now three sections, each having a sub-Leader. *Secretary*: J. Bennett, Jnr., Station Road, Robertsbridge, Sussex.

Proposed Clubs

Winnipeg M.C.—Some twenty Meccano enthusiasts in Winnipeg are entering into schemes for the development of a club and any Meccano boys in the district will receive a hearty welcome from the founder, Mr. W. R. Newcomb, 194, Tache Avenue, Norwood, Winnipeg, Manitoba, Canada.

Leytonstone M.C.—Boys living in the district are invited to communicate with C. E. Daultrey, 113, Pearcroft Road, Leytonstone, E.11, who is endeavouring to establish a good club. Several meetings have been held, but an adult Leader has not yet been secured.

First Cambridge M.C.—Meccano enthusiasts living in Cambridge will be interested in a club that is now being formed. The secretary will welcome new members and their suggestions. *Secretary*: Gilbert J. Parker, 63, Trumpington Street, Cambridge.

Mount Shasta City (California) M.C.—Hugh Thompson of "Thompson's Service Station," Mt. Shasta City, California, is anxious to form a Meccano Club among the boys of the locality. All interested will receive a hearty welcome.

Birkenhead M.C.—A small club has been formed and boys interested should get in touch with the *Secretary*: George Payne, 87, Brook Street, Birkenhead.

Willesden M.C.—An effort is being made to form a club and all boys wishing to support the scheme are invited to communicate with D. Cosway, 40, Hanover Road, Willesden, N.W.10.

Andover M.C.—A club is being formed in connection with Andover Boys' School, and it is hoped that an adult Leader will soon be obtained. A club-room is already secured. Club roll: 7. *Secretary*: G. Knight, 18, Micheldever Road, Andover, Hants.

West Bridgeford M.C.—All boys interested in the formation of a local club should write to N. L. Powell, 104, Lonboro' Road, West Bridgeford, Nottingham.

The Triumph of Denis—(*from page 338*)

saw our Guild Badges shining in the light, and remembered what they stood for.

He stepped forward and put a hand on Bullen's shoulder, and said:

"I'm glad you can see what a fine thing the Club is, Bullen. And of course you can join—can't he, you fellows?" And he looked round at us, knowing that we would take our cue from him.

And we were glad afterwards, because Bullen didn't turn out so bad, after that.

* * * *

And that was the triumph of Dennis. He forgot his own anger in the desire to prove himself a worthy member of the Guild. You know the old Latin saying: "*Qui vincit se vincit*"—"He conquers who conquers himself." All you chaps in the Meccano Guild won't forget that, will you?

J.H.E.

The Meccano Guild and its Objects

The Meccano Guild is a great brotherhood of boys, with over 57,000 members in all parts of the world.

Objects of the Guild

The three objects of the Guild, set forth in the form of application for membership, are as follows:—

(1) To make every boy's life brighter and happier.

(2) To foster clean-mindedness, truthfulness, ambition and initiative in boys.

(3) To encourage boys in the pursuit of their studies and hobbies, and especially in the development of their knowledge of mechanical and engineering principles.

In order to join the Meccano Guild it is necessary for the form of application to be filled up, signed and witnessed. This form is then sent to the Secretary with a remittance to pay for a badge. The applicant is then duly enrolled as a member of the Guild and his badge and membership certificate are sent to him. The neat little triangular badge—its three corners representing the three objects of the Guild—and the handsome certificate are always received with enthusiasm. Most members have their certificates framed and hung in their own rooms, where they can always see them. The price of the Guild badge is 7d., or 1/- if sent overseas.

The Correspondence Club

Although the Guild was originated for the benefit of Meccano Clubs it includes to-day a very large number of "lone" members. In many cases these members live far away from a Meccano Club and sometimes far away from any other Meccano boy. It is a great joy to such members to have someone to write to who is really interested in the Meccano hobby, and it was the realisation of this fact that led to the inauguration of a Guild Correspondence Club. Through the medium of the Correspondence Club boys living in the remotest parts of the world are placed in touch with other boys of their own age and of similar interests. In most cases correspondence is carried on regularly, and results in the formation of firm friendships, although the boys may be living hundreds or even thousands of miles apart. Boys who have become acquainted through the Correspondence Club have even visited one another, each spending a happy holiday as a welcome guest in the home of the other.

The "*Meccano Magazine*" is the official organ of the Guild, and each month two or three pages are devoted to Guild matters. The progress of the various clubs all over the world is reported briefly and photographs are published of Leaders, and secretaries and club groups. Thus, by means of the "*Meccano Magazine*," each club is kept acquainted with the progress of all other clubs.

Every Meccano boy should be a member of the Guild. As soon as he receives his badge and certificate of membership he has the right of entry into the innermost circles of Meccanoland. His pleasure in his hobby is increased enormously and he has the keen satisfaction of knowing that, instead of being an isolated unit, he belongs to a great brotherhood of boys with members in every country in the wor.dl

OUR MAIL BAG

In this column the Editor replies to letters from his readers, from whom he is always pleased to hear. He receives hundreds of letters each day, but only those that deal with matters of general interest can be dealt with here.

Correspondents will help the Editor if they will write neatly in ink and on one side of the paper only.

William Dawson (Eastbourne).—"As I am going on a cycling tour and my tool bag is rather small, would you please tell me what are the most necessary tools that I should carry in your opinion." The most important are two tyre levers, a flat spanner, oilcan, adjustable spanner, puncture repair outfit with spare valve rubber, and spare wick for the lamp or, if acetylene is used, a small tin of carbide.

A. Gibson (Randwick, Aus.)—"Although 21 years old and well on my way to an engineering career I have never lost interest in Meccano, which I have had for 14 years. It is the most useful training possible for an engineer." We are always glad to hear from the "old boys" of Meccanoland—their affection for the hobby never diminishes.

J. Timmis (Nantwich).—We quite understand, Jim, that the contents of a ship must be like tram lines because they make the cargo! We are not too good at figures so we couldn't check off your demonstration that 45 minus 45 will leave 45. We appreciate your good wishes.

T. Littleton (Carlisle).—Radio certainly is a very wonderful science, and in view of future developments it is one to which all Meccano boys should give their special attention. It is unfortunate that you live so far away from the nearest broadcasting station.

A. J. Shawcross (Ashton-on-Mersey).—"I am taking Electricity and Magnetism for the London Matric. Exam. and the articles in the "*M.M.*" have put very clearly to me points on which I have been doubtful." We receive very many similar testimonials to the accuracy and usefulness of our articles.

R. T. Wall (Enfield).—"My boy John watches every post for your literature and is getting a regular nuisance, so please send Magic Carpet and Magazine at once. He is a keen Meccano enthusiast and I have had half the junior inhabitants of Enfield in my house during the past year to see all the new models he has designed." We understand your righteous indignation, behind which we clearly see your warm approval of his keen enthusiasm. Ask John to write to us.

Clarence Davidson (Barnsbury, N.1).—To keep your cycle tools from rusting they should be wrapped in an oily rag, and this also prevents them from rattling in the bag. The tour you propose seems to be very interesting and we trust you will not be worried with punctures or other troubles.

C. Peel (Blackpool).—We have received a letter from Messrs. Moorhouse Ltd., of Padiham, Lancs., to the effect that you have written to them without giving your address and so they are unable to reply to you. Many Meccano boys do the same thing when they write to us and wonder why they do not receive answers to their letters. Will other readers please note!

R. K. Watson (Congleton).—We are glad to know that your correspondence with your New Zealand chum is progressing well, and that you consider the Correspondence Club to be the finest section of the Guild. A very sound conclusion, "my dear Watson!"

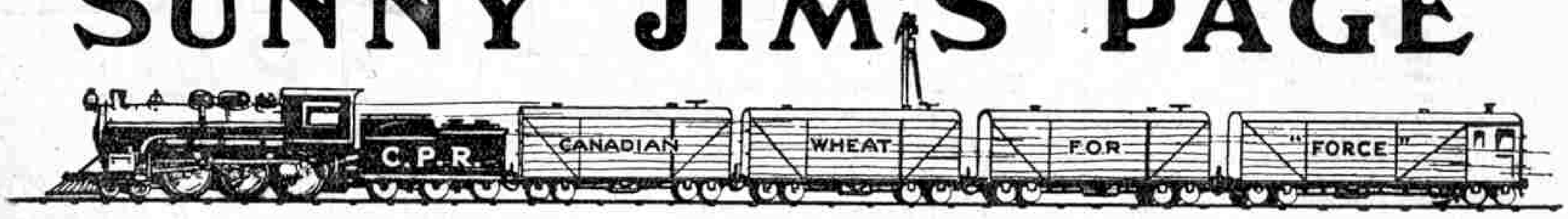
P. De Ste. Croix (Bridgewater).—Your visit to the old house where Judge Jeffreys stayed must have been very interesting, as the house is of a type existent prior to the Great Fire of London. So Tim is a Meccano kitten, is he? He has our respects. Letters from girl Meccano enthusiasts are always welcome, Pauline, and you must write again.

F. B. Graves (London).—We quite agree with the sentiments you so well express in your verses, F.B. A necktie woven on the Meccano Loom is not an entirely new idea. As we have also heard of hat-bands made on the Loom, we expect we shall next hear of some enterprising reader starting a Meccano Haberdashery Department!

Harold A. Vlies (Reading).—The first sight of your Brontasaurus drawing nearly gave us heart failure! We should like to see an actual photograph of this fine model. We saw the "Lost World" on the pictures and thought it very good. You evidently thought so, too, if you paid three successive visits!

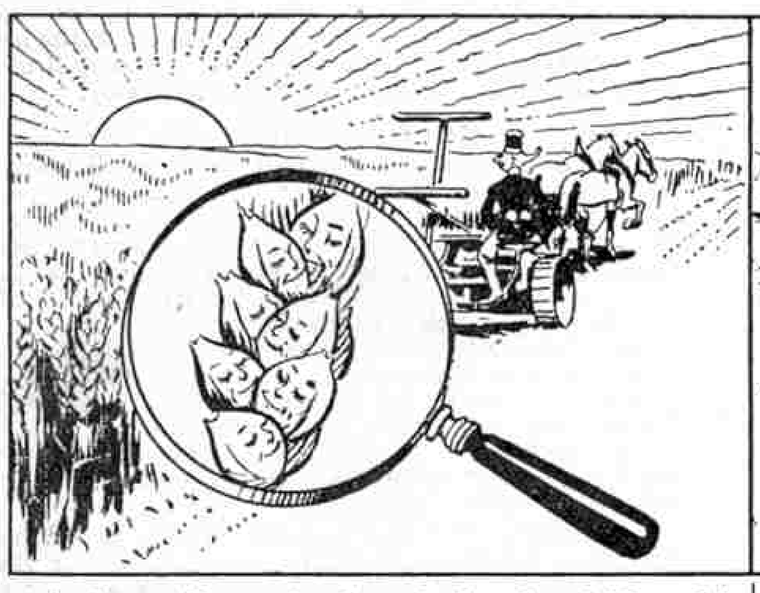
R. W. Freeman (London, W.)—To facilitate the replacement of ball bearings in your front wheel, pack the hub with thick grease. The balls can then be embedded in the grease round the ball race and thus they will be held in position while the wheel is erected. Be sure to get the full number back again or they will be subjected to undue stresses.

SUNNY JIM'S PAGE

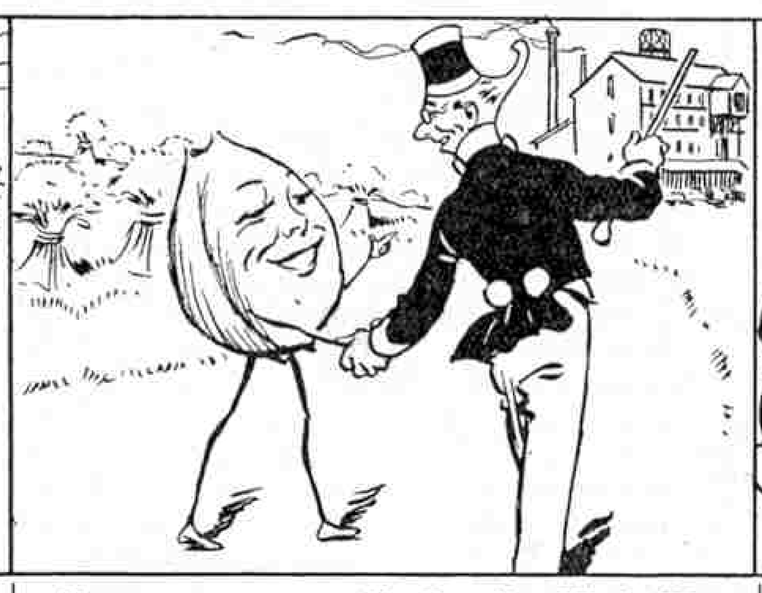


FROM WHEAT EAR TO "FORCE" PACKET

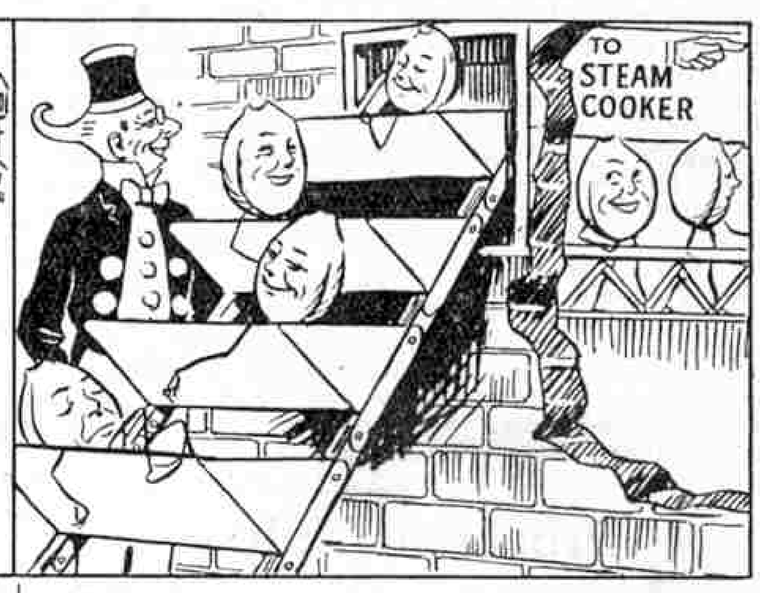
THE WONDERFUL ADVENTURES OF A GRAIN OF CANADIAN WHEAT



As Sunny Jim rattles through the wheatfields on his reaping machine, little do thousands and thousands of wheat grains know the adventures in store for them before they can become fully fledged flakes of "FORCE." Let us magnify them big enough for us to see them as they go on their adventurous journey. Ah! that's better!

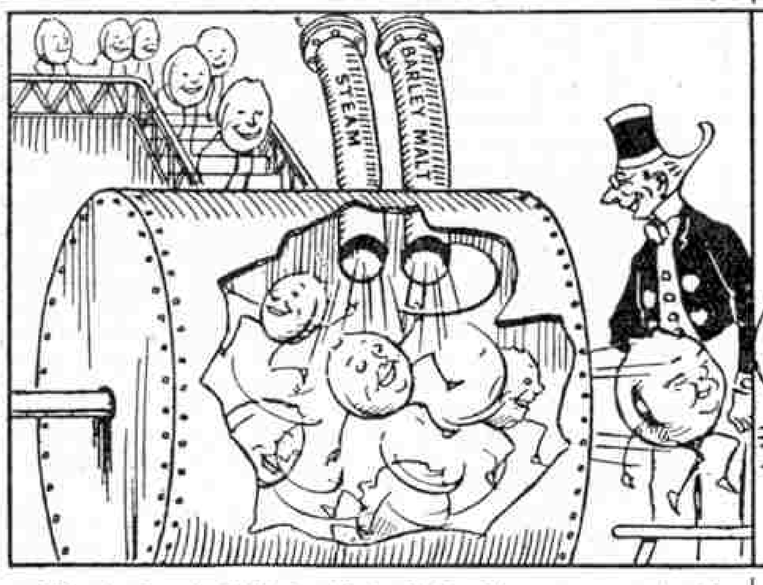


Now we can see you Mr. Canadian Whole Wheat Grain. He is at the beginning of his journey. Sunny Jim is escorting him to the wonderful "FORCE" mills in Ayr, Canada. Why is he called Whole Wheat Grain? It's because of his Bran overcoat which fits so tightly that you can't even see it.



Now we're at the moving stairway or elevator. Here the wheat grains get a free trip to the top of the mill, where they are shot through a trapdoor on to a gangway along which they walk to the steam cooker.

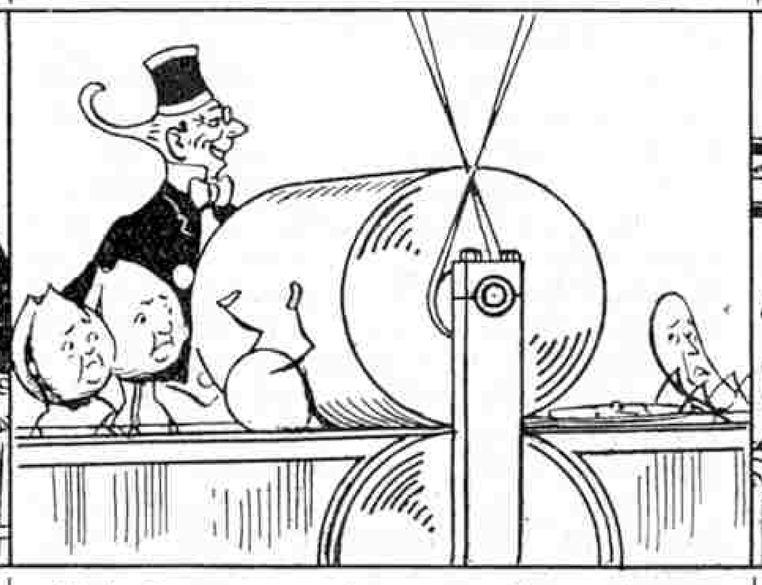
Hot? yes, but they are not allowed to take their coats off. Bran is too good to be wasted.



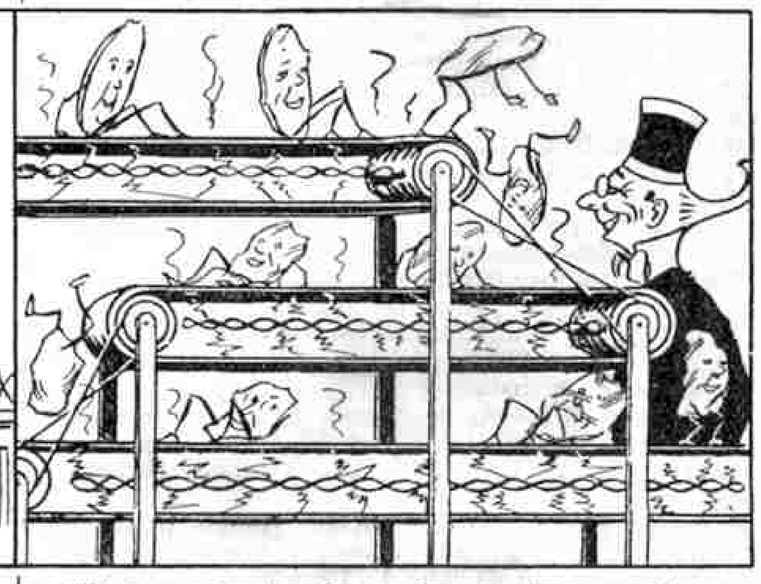
Here's fun! Still in their little Bran overcoats the whole wheat grains are tossed about in this novel "joy wheel." Hot steam is blown on to them, barley malt is added. They swell with pride.

Ha! Ha! laughs Sunny Jim. "Do you like it?"

"It's fine!" they shout with glee.

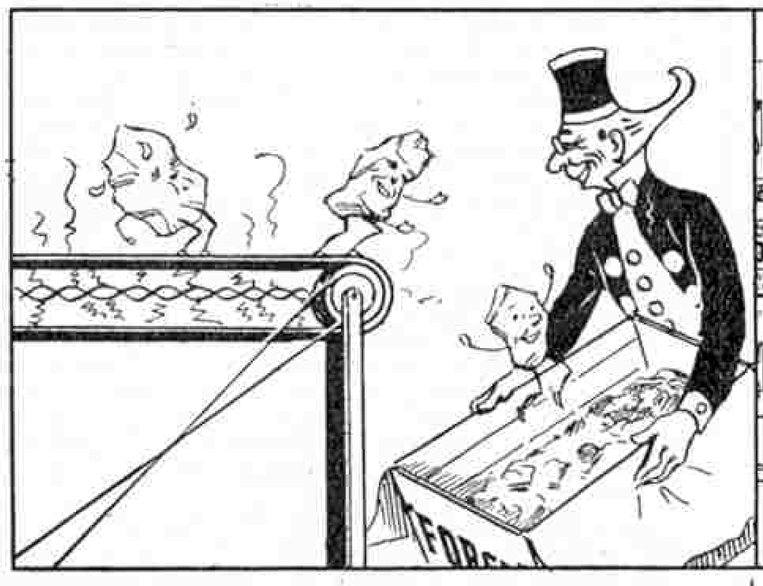


Their happy expressions soon change, however, when they are confronted with this fearsome contraption. "Must we go through there?" "You must," says Sunny Jim, "or you'll never become 'FORCE' flakes." That decides them. Under the rollers they dive and come out the other side as flat as pancakes. "Ouch!"



What surprise has Sunny Jim for them now?

Surely this is the electric toaster. Here they come along the top, now underneath and now back again. They are passing over hot electric wires, and when they finally emerge they are real flakes of "FORCE," the ready cooked, malted, and toasted *whole wheat* flake food.



"Phew! isn't it hot." Yes—"and don't we taste nice—fresh from the toasting oven." Sunny Jim has seen to it that the flakes keep their original freshly toasted flavour by having them packed in the triple protection of a waxpaper wrapped, and paper bag lined, cardboard packet.

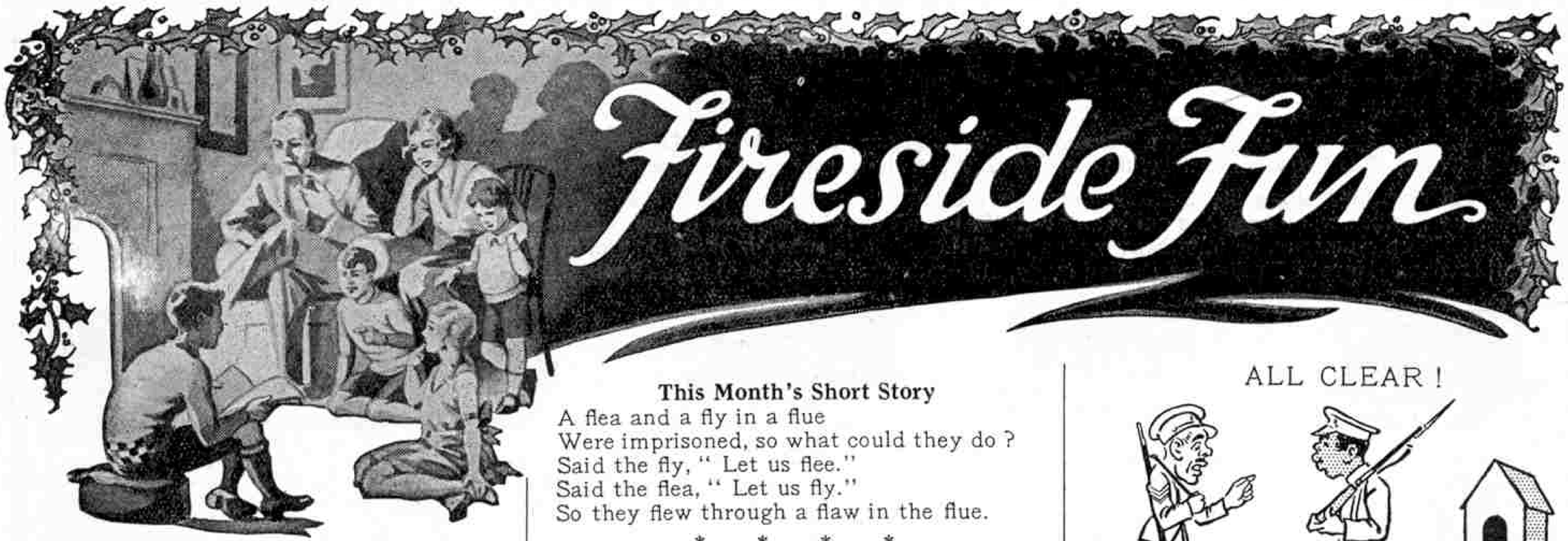
This is the same as the "FORCE" packets that you can see in your own grocer's shop.

Protected in this way "FORCE" flakes come to you over the seas from Canada, the Empire's Granary, the land of wheat. Ask mother to buy you a packet of "FORCE." It's 9½d. Open it:—

—Shake the crisply toasted flakes with the "fresh from oven" flavour on to your plate, add milk—or fruit if you like, and then start eating. There never was a better food—there couldn't be a nicer one. You'll want "FORCE" always and always.

If you have *never* tasted "FORCE" before, write to Sunny Jim for a *free sample*. Address below.

SUNNY JIM'S ADDRESS IS Dept. C.M., 197, GT. PORTLAND ST., LONDON, W.1.



HE NOTED THAT!

Convict: "What are you doing Mister?"
Prison reporter: "Just making a few notes."
Convict: "Be careful, I was brought here for doing the same thing."

* * * *

Editor: "Your story should be at least 200 words shorter."
Author: "But it is only 200 words long."
Editor: "That's just it."

* * * *

"Do you collect threepenny bits my dear?" said the old lady to Jack.
"Yes," answered Jack.
"Well, here is one for your collection. Now how many have you got?"
"One," said Jack.

* * * *

Magistrate: "You say you are a locksmith by trade."
Prisoner: "Yes, sir."
Magistrate: "Then what were you doing in the gambling house at the time of the raid?"
Prisoner: "I was making a bolt for the door."

* * * *

NOT QUITE THERE!

A sportsman out snipe shooting in Ireland asked a countryman if a certain bog was sound and had a good bottom to it. "It is indade, y'r honour," was the reply, "as hard as a rock." The sportsman started in and soon found himself sinking rapidly. "You scoundrel," he roared to the countryman, "you said it had a hard sound bottom."
"It has indade, y'r honour, but ye haven't reached it yet!"

* * * *

Mother (who is dining with her little boy at a friend's house): "Johnnie, I am really ashamed of you. You never behave so badly at home."
Johnnie: "I know it, ma; but when I have a chance at a good dinner like this I'm apt to get excited."

This Month's Short Story

A flea and a fly in a flue
Were imprisoned, so what could they do?
Said the fly, "Let us flee."
Said the flea, "Let us fly."
So they flew through a flaw in the flue.

* * * *

JUST LIKE MOTHER!

The boys of Scrumpton village had formed a football club, and all they now needed was a ball, goalposts, etc., yet these trifles troubled them.
"It's like this," explained the captain, "we must all subscribe, but them as 'as the most must give the most."
There being no sign of dissent—such as a kick on the shins, or a smack on the back of his head—the captain continued:
"Now, there's Jimmy Simpkins. 'E tells me only the other day that every time 'e takes a dose o' cod-liver oil 'is mother puts a 'a'penny in 'is money-box. 'E must be gettin' rich."
"No I ain't!" bawled Jimmy. "W'y I've found out it's all a swiz! When it gets ter 'arf a crown she takes it out and buys anuvver bottle!"

* * * *

NOT LIKELY!

Q.M.S.: "Where are you going?"
Private: "To fetch water."
Q.M.S.: "In those disreputable trousers?"
Private: "No fear, in this 'ere pail."

* * * *

Young Man (taking singing lessons): "Do you think I could use my voice in public now?"
Disappointed Teacher: "Oh, I suppose so. You might cheer when the King goes by."

* * * *

A teacher had been giving her class a lesson in grammar. At the finish she asked a small boy to make up a sentence containing the word "Gruesome."
The small boy thought for a moment and then said: "A man rubbed hair restorer on his chin and grew some whiskers!"

* * * *

Teacher: "Now Bobby, what is grace?"
Bobby: "Don't know, miss."
Teacher: "Well now, what did father say before breakfast this morning?"
Bobby: "He said, 'Go light on the bacon, it's 1/10 a pound!"

ALL CLEAR!

Sergeant (to negro sentry): "If anything moves, you shoot."
Sentry: "Yas suh, an' if anythin' shoots I moves."

* * * *

Q. Why is the sun like the Union Jack?
A. Because no power on earth can pull it down.
Q. Why is a music conductor the fastest runner on earth?
A. Because he beats time

* * * *

A youngster very much out of breath rushed into the Police Station and gasped out to the sergeant: "You're wanted down our street, and bring an ambulance."
"What's the trouble?" demanded the officer, "and why bring an ambulance?"
"Because," explained the youngster, regaining his breath, "Mother's found the lady who stole our doormat."

* * * *

"Jones," said the boss to one of his underlings, "there will be a good berth vacant in the counting-house very soon. It should just suit your twin brother."
Jones: "My twin brother! I don't understand."
The Boss (drily): "Don't you? Well, I mean that twin brother of yours whom I saw recently at the races when you were at your aunt's funeral. You had better go and find him, and you need not return till you have done so!"

* * * *

LOST, STOLEN, OR STRAYED!

"Where's your rear-light?" demanded the constable of the lorry driver. The latter disentangled himself from his precarious perch and walked to the back of his van. He peered in all directions for a second or so, and then stood scratching his head.
"Well, what about it?" asked the constable, producing his notebook.
"I dunno. I had a——"
"Now, I've heard that tale before," remarked the officer of the law grimly. Anybody can see you haven't had a lamp there, 'cos there's no bracket."
"Yes," said the driver; "but look here——"
"No good making excuses," said the constable. "You've no light and that's flat."
"That's not what I'm worrying about," answered the driver sadly, "What I'd like to know is—where is my blinkin' trailer?"

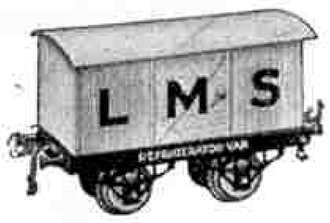
ROLLING STOCK AND ACCESSORIES

(HORNBY SERIES)

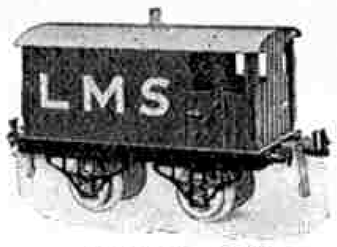
There are now 50 different train accessories—Stations, Signal-boxes, Lamps, Wagons, Level-Crossings, Foot-Bridges, Turntables, etc. Further accessories will be added to the system from time to time, and will be announced in the pages of the "*M.M.*"

All Hornby Rolling Stock and Accessories are built in correct proportion to the size, gauge, method of coupling, etc., of the Hornby Trains and all have the uniformly beautiful finish that is the great feature of the Hornby series. With these accessories you can build up a most realistic railway system, and the splendid range of rails, points, and crossings make possible endless variety in rail layout. Hornby Trains are British made, and your dealer will be able to show you specimens of the new products.

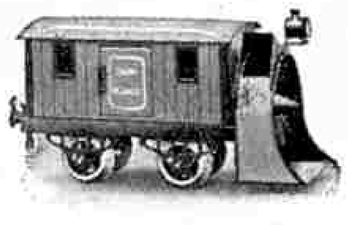
BRAKE VAN
Finished in grey, with opening doors. Price **4/-**



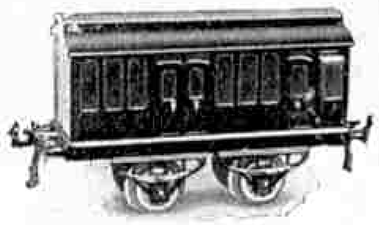
***REFRIGERATOR VAN**
Enamelled in white, with opening doors. Price **4/-**



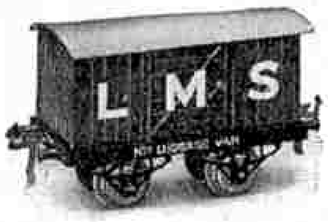
BRAKE VAN
Finished in grey, with opening doors. Price **4/-**



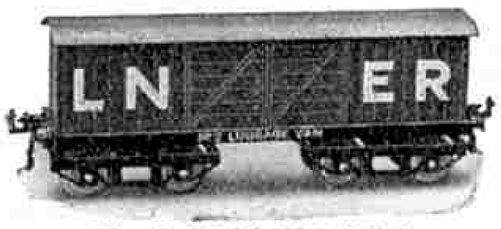
***SNOW PLOUGH**
With revolving plough driven from front axle. Price **5/6**



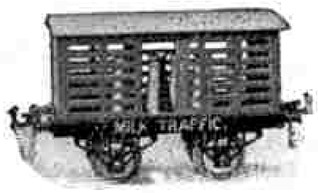
***GUARD'S VAN**
Realistic design, fitted each side with opening doors. Price **3/6**



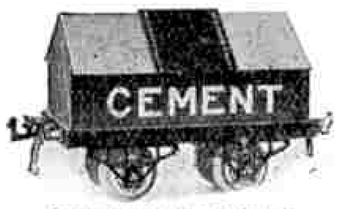
***No. 1 LUGGAGE VAN**
With opening doors. Price **4/-**



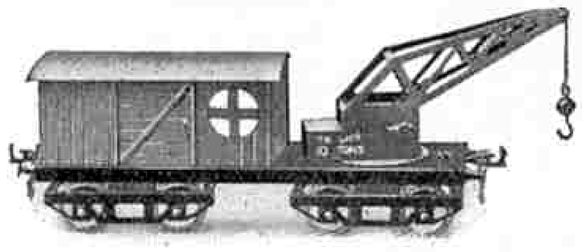
***No. 2 LUGGAGE VAN**
Finished in blue and green. Fitted with double doors. Suitable for 2-ft. radius rails only ... Price **6/6**



***MILK TRAFFIC VAN**
Fitted with sliding door, complete with milk cans. Price **4/6**

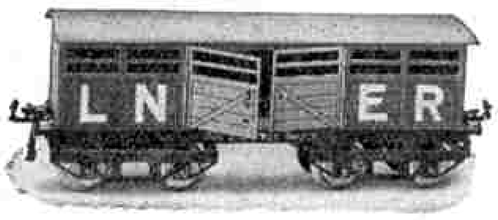


CEMENT WAGON
Finished in grey and black. Price **4/-**

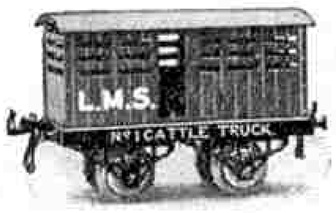


***BREAKDOWN VAN AND CRANE**
Beautifully coloured in grey and black, with opening doors. Suitable for 2-ft. radius rails only ... ... Price **7/-**

SECCOTINE WAGON
Beautifully finished in blue, with opening doors. Price **4/-**



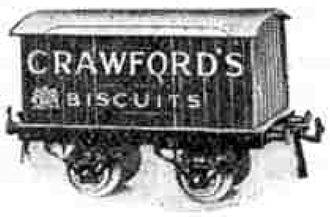
***No. 2 CATTLE TRUCK**
Splendid model fitted with double doors. Suitable for 2-ft. radius rails only ... ... Price **6/6**



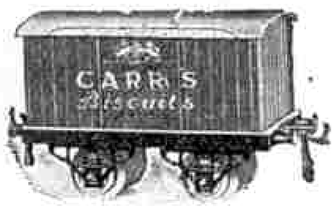
***No. 1 CATTLE TRUCK**
Fitted with sliding door. Very realistic design. Price **4/-**

SIDE TIPPING WAGON
Excellent design and finish. Price **3/6**

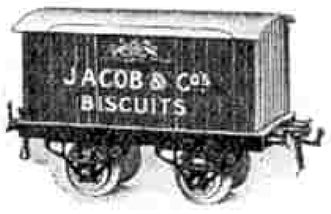
ROTARY TIPPING WAGON
Finished in grey and green. Price **4/-**



CRAWFORD'S BISCUIT VAN
Finished in red, with opening doors ... Price **4/-**

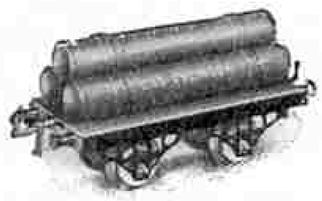


CARR'S BISCUIT VAN
Finished in dark blue, with opening doors. Price **4/-**

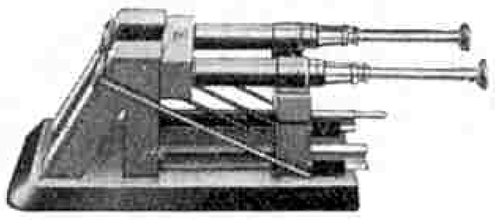


JACOB'S BISCUIT VAN
Finished in crimson lake, with opening doors. Price **4/-**

***GUNPOWDER VAN**
Finished in red, with opening doors. Price **4/-**



***GAS CYLINDER WAGON**
Finished in red, lettered gold. Price **3/-**

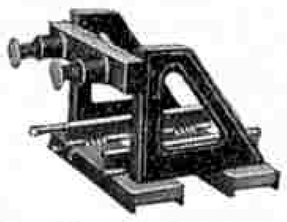


HYDRAULIC BUFFER STOP
Price **5/-**

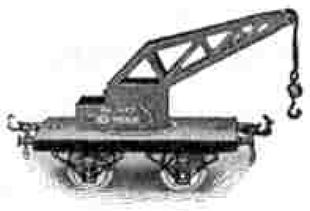
PETROL TANK WAGON "SHELL"
Finished in red. Price **3/-**

PETROL TANK WAGON "PRATTS"
Finished in green. Price **3/-**

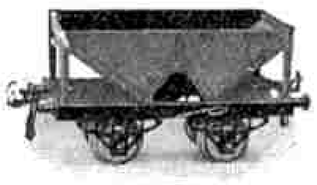
MOTOR SPIRIT TANK WAGON "NATIONAL BENZOLE."
Price **3/-**



SPRING BUFFER STOP
Price **1/6**



***CRANE TRUCK**
Finished in grey and black ... Price **4/6**

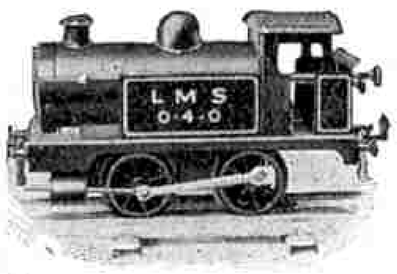


***HOPPER WAGON**
Mechanically unloaded. Finished in grey and black ... Price **4/-**

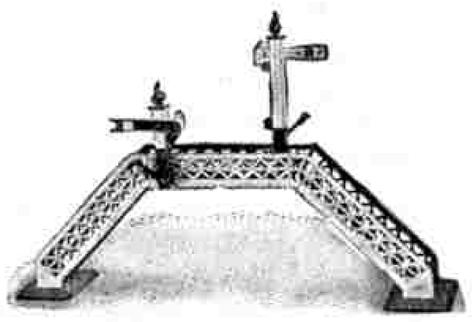
***TROLLEY WAGON**
Finished in grey and red. Suitable for 2 ft. radius rails only ... Price **6/-**

TURNTABLE
Price **5/-**

TUNNEL
Realistic and finished in colours ... Price **7/6**



HORNBY No. 1 TANK LOCO
Gauge 0, in colours to represent L.M.S. or L.N.E.R. Companies' locos. Price **12/6**



FOOTBRIDGE
No. 1. With detachable Signals Price **6/-**
No. 2. Without Signals ... ,, **3/6**
Signals only ... ... per pair **2/9**

HORNBY No. 2 TANK LOCO
Beautifully finished in colours to represent L.M.S. or L.N.E.R. Companies' locos. Fitted with reversing gear, brake and governor ... ... Price **30/-**

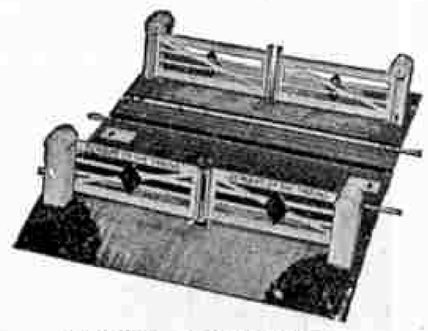
* *Lettered L.M.S. or L.N.E.R.*

ROLLING STOCK AND ACCESSORIES

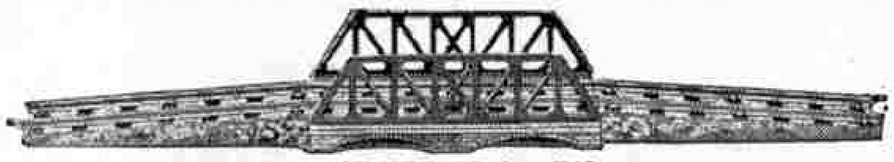
(HORNBY SERIES—*continued*)

SIGNAL CABIN
Dimensions: Height 6½-in., Width 3½-in., Length 6½-in. Finished in colour and lettered "Windsor." Roof and back open to allow signal-levers to be fitted inside cabin if desired.
Price **6/6**

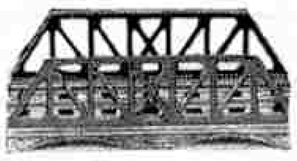
RAILWAY STATION. Excellent model, beautifully designed and finished.
Dimensions: Length 2-ft. 9-in., breadth 6-in., height 7-in. Price **12/6**



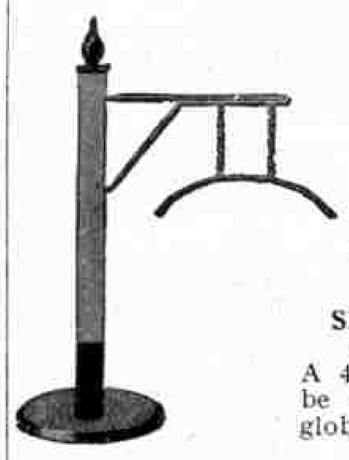
LEVEL CROSSING
Beautifully designed in colour. Measures 11½ × 7½-in. with Gauge 0 rails in position.
Price **6/6**



VIADUCT. Price **7/6**
ELECTRICAL VIADUCT. Price **8/-**

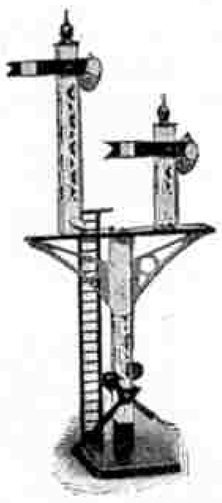


VIADUCT (Centre Section only) Price **4/6**
ELECTRICAL VIADUCT (Centre Section only) Price **5/-**

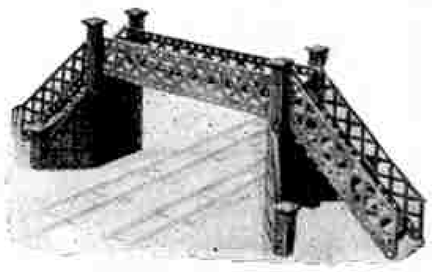


LOADING GAUGE
Price **1/9**

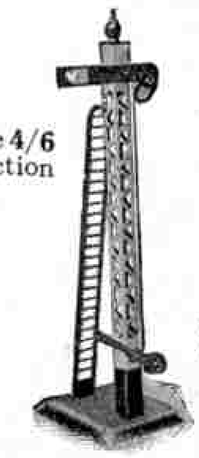
SINGLE LAMP STANDARD
A 4-volt bulb may be fitted into the globe. Price **3/-**



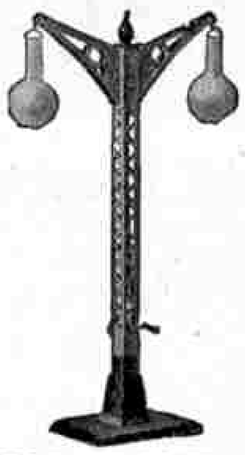
JUNCTION SIGNAL
Signal arms operated by levers at base. Very realistic model standing 14-in. in height.
Price **5/6**



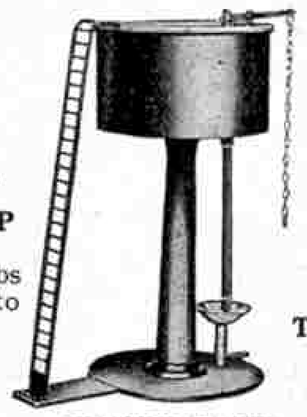
LATTICE GIRDER BRIDGE
Constructional type. Strong and well proportioned.
Price **10/6**



SIGNAL
Price **2/6**

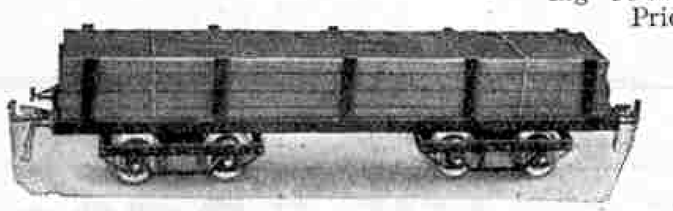


DOUBLE LAMP STANDARD
Four-volt bulbs may be fitted into the globes.
Price **4/-**



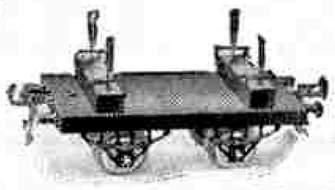
WATER TANK
Brightly coloured in red, yellow and black, 8½-in. in height, with flexible tube and pump lever.
Price **6/6**

TELEGRAPH POLE
Price **2/6**

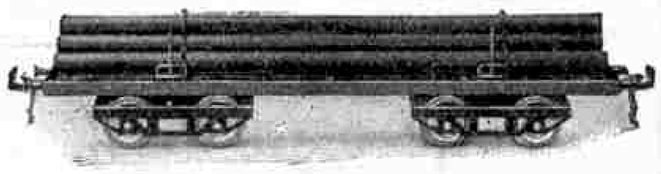


***No. 2 TIMBER WAGON**
Beautifully enamelled in green. Suitable for 2-ft. radius rails only ... ... Price **4/6**

No. 1 TIMBER WAGON
Beautifully enamelled in green.
Price **2/-**



***No. 1 LUMBER WAGON**
Fitted with bolsters and stanchions for log transport
Price **2/-**



***No. 2 LUMBER WAGON**
Fitted with bolsters and stanchions for log transport. Suitable for 2-ft. radius rails only.
Price **5/-**

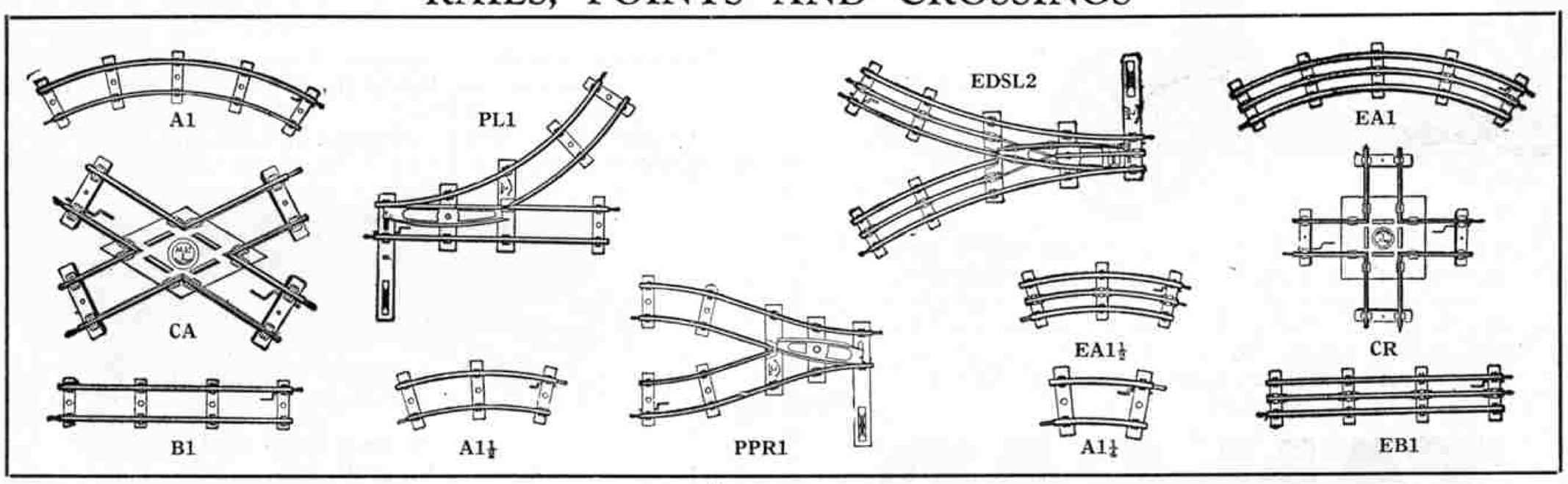
PLATFORM ACCESSORIES
No. 1. Miniature Luggage.
Price per set **2/-**

PLATFORM ACCESSORIES
No. 3. Platform Machines, etc.
Price per set **2/-**

PLATFORM ACCESSORIES
No. 2. Milk Cans and Truck.
Price per set **2/-**

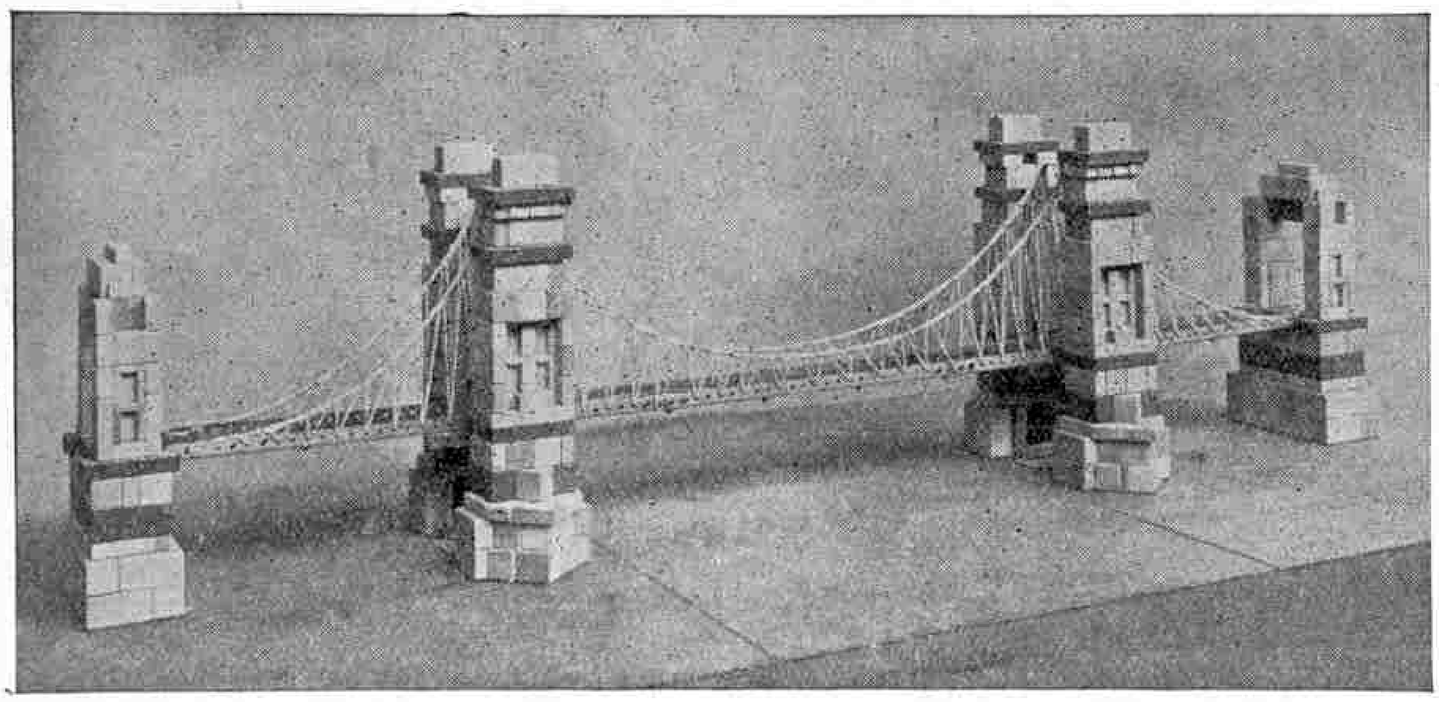
**Lettered L.M.S. or L.N.E.R.*

RAILS, POINTS AND CROSSINGS



Hornby Rails, Points and Crossings are built for hard wear and for smooth running. They are made of the finest materials and hold together rigidly and strongly, for real workmanship is put into them. Note the great superiority both in quality and appearance of the Hornby rails compared with other rails and note also the extra sleepers, giving added strength and steadiness to the track. All Hornby Rails, Points and Crossings are Gauge 0, 1¼", and the Electric rails are fitted with a third rail for collecting shoe.

ASK YOUR DEALER TO SHOW YOU SAMPLES



COMPETITION AWARDS

First Prize :
Suspension Bridge as illustrated.
A. W. B. MESSENGER,
5, Priestfield Avenue,
ROCHESTER, KENT.

Second Prize :
W. V. VUURDE,
166, Malakkastraat,
THE HAGUE, HOLLAND.

Third Prize :
W. FOX,
47, Holmsdale Road,
S. NORWOOD, S.E.25.

Some Provincial Stockists:

BLACKPOOL – – – Batesons Sports Depot.
BRADFORD – – – Brown, Muff & Co. Ltd.
BIRMINGHAM – – Lewis's Ltd.
" – – W. H. Hull & Son.
COVENTRY – – – R. H. Jepson.
CARDIFF– – – – David Morgan Ltd.
DOVER – – – – Dawsons'.
DUNDEE – – – Draffen & Jarvie Ltd.
GLASGOW – – – R. Wylie Hill & Co. Ltd.
IPSWICH – – – Cowell & Co. Ltd.
LEICESTER – – – Robothams Ltd.
LEEDS – – – – The Pygmalion.
MANCHESTER – – Lewis's Ltd.
" – – – John Heywood Ltd.
NOTTINGHAM – – Sissons & Parker Ltd.
PORTSMOUTH – – Landport Drapery Bazaar Ltd.
PLYMOUTH – – – Spooner & Co. Ltd.
PETERBOROUGH – – Thompsons Ltd.
SUNDERLAND – – Binns, Sons & Co. Ltd.
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WOLVERHAMPTON – Harris Bradley.

TUDOR BLOCKS
from 3/6 to 42/– per Box.

LOTT'S BRICKS
from 2/– to 42/– per Box.

Write for illustrated list and address of nearest Agent.

Some London Stockists:

ACTON – – – – Actons Cycle Co.
BLACKHEATH – – Avenells Ltd.
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BRIXTON – – – Bon Marche Ltd.
BARNET – – – Cowings Library.
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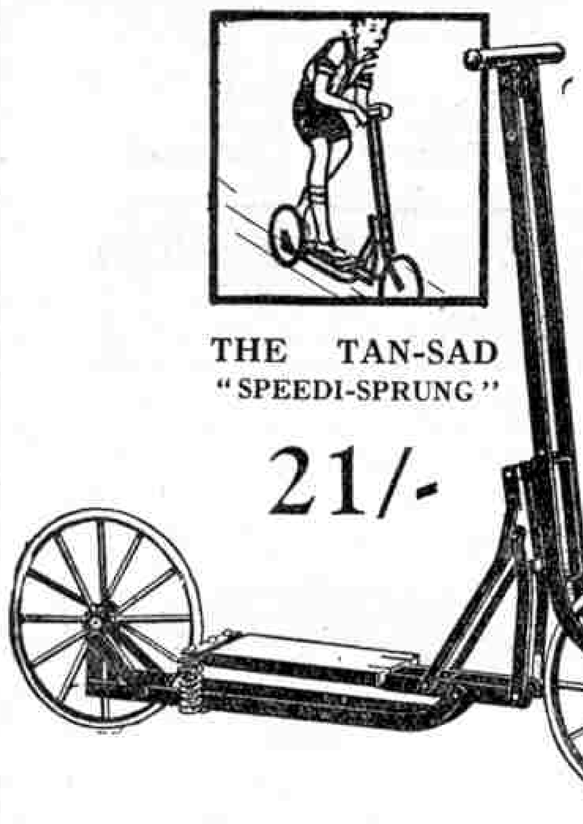
CLAPHAM JUNCTION – Arding & Hobbs Ltd.
CROYDON – – – Allders Ltd.
CHISWICK – – – W. R. Bridges.
GOLDERS GREEN RD. – Cyril Gardner.
GUILDFORD – – – The Dolls' Hospital.
HARLESDEN – – – Lamberts'.
KINGSLAND – – – R. Morrell.
KILBURN – – – The Children's Paradise.
LUDGATE CIRCUS BLGS. A. J. G. Seaton.
SOUTHALL – – – The Playbox.
WEST BYFLEET – – The Rosemont Library.
WOOLWICH – – – Hugh Ingrams Ltd.
" – – – Pryce & Son Ltd.

LOTT'S BRICKS LTD., WATFORD, England



Kiddies enjoy this All-British Toy

THE TAN-SAD "SPEEDI-SPRUNG"

21/-

To every active boy and girl Tan-Sad Wheel Toys offer pride of ownership and hours of boisterous, healthful pleasure in the open air. The exclusive advantage of Tan-Sad springing gives comfort and added safety to all Tan-Sad Toys. Ask your local dealer to show you our wonderful range of scooters.

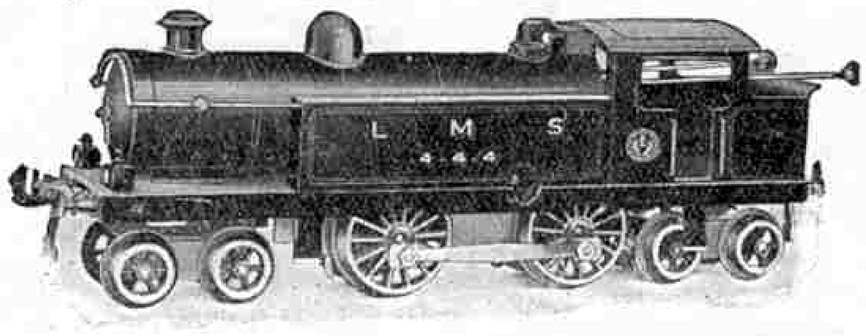
TAN-SAD WHEEL TOYS

TAN-SAD LTD., Drake Works, Albert St., BIRMINGHAM
London : 9, Phœnix Place, Mount Pleasant, W.C.1.

HORNBY TANK LOCOS

HORNBY No. 1 TANK LOCO

Strong and durable loco capable of any amount of hard work; richly enamelled and highly finished; fitted with reversing gear, brake and governor.
Gauge 0, in colours to represent L.M.S., L.N.E. or G.W. Railway Companies' Locos ... ... Price **12/6**



HORNBY No. 2 TANK LOCO

Powerful model embodying all the characteristics of the Hornby series. It is 11½" in length and is fitted at both ends with a four-wheeled bogey. Beautifully finished in colours to represent L.M.S., L.N.E. or G.W. Railway Companies' Locos, and suitably lettered. Fitted with reversing gear, brake and governor. Suitable for 2 ft. radius rails only. Price ... **30/–**

FROM ALL MECCANO DEALERS

JAEGER
Pure Wool

The New "Meccano" Jersey

This Jaeger "Meccano" Jersey is made in the special "Meccano" pattern. It wears splendidly and prevents chill when a boy gets hot, as every boy will sooner or later. The "Meccano" Jersey appeals to every boy at once as well as to the "grown-ups" who study the health, happiness and appearance of children.

22″	24″	26″	28″	30″ Chest
7/–	7/9	8/6	9/3	10/–

Colours :—Navy body with Light and Dark Saxe dice effect.
Mid Grey body with Black and White ,,
Fawn body with Brown and Saxe ,,
Brown body with Fawn and Red ,,
Saxe body with Navy and Dark Saxe ,,
French Grey body with Lt. and Dk. Saxe ,,

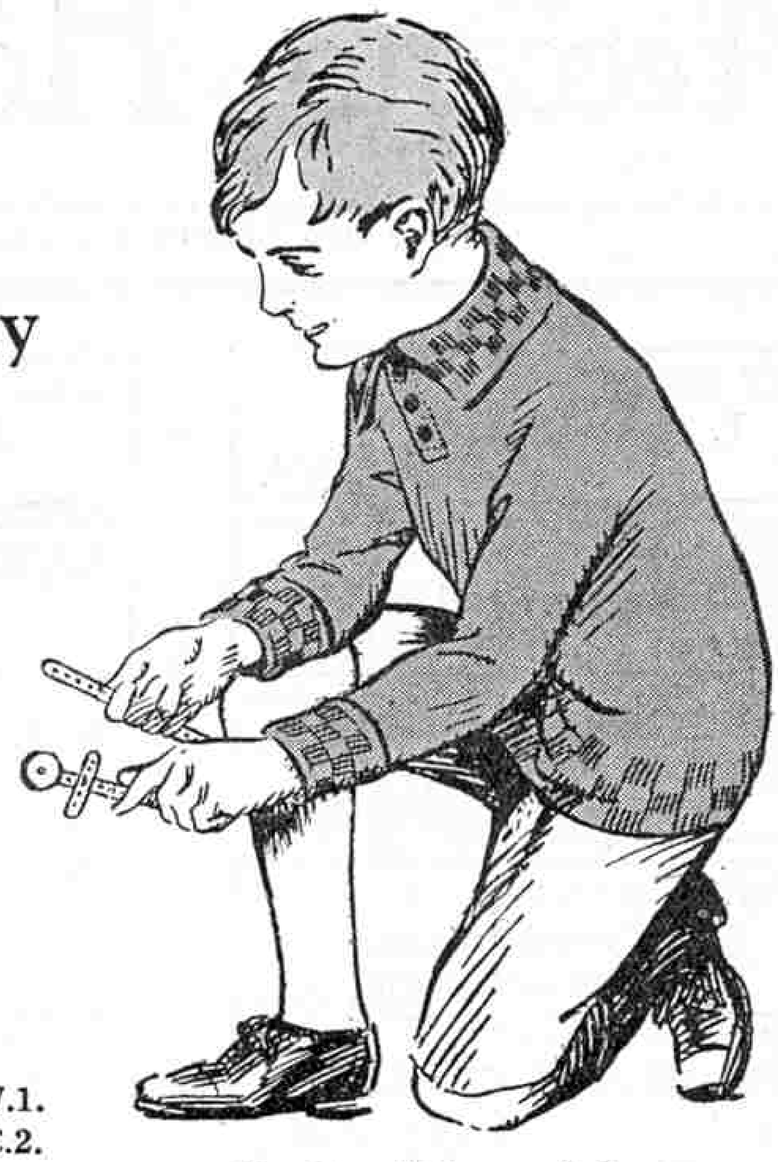
Three-quarter Hose, Turnover Tops to match

3, 4	5, 6, 7	8, 9, 10
2/9	3/3	3/9

Obtainable only from Jaeger Depots and Agents.
(Write for the address of your Local Agent).

JAEGER HEAD RETAIL DEPOT : 352/54, OXFORD ST., LONDON, W.1.
WHOLESALE & SHIPPING : 95, MILTON ST., LONDON, E.C.2.

BRANCHES : AUSTRALIA—Melbourne, 325, Flinders Lane. Sydney, 38/44, York Street.
CANADA—Montreal, 1187, Bleury Street.



The New "Meccano" Jersey

THE MECCANO BOY KNOWS THE VALUE OF

SECCOTINE

(REGD. TRADE MARK)

WITH it he makes or mends things innumerable—Picture Frames, Models, Bats, Balls, Boats, Boxes, Bags, Books—Oh a hundred things. And then he can help his

MOTHER

She will have Chairs, Tables, Beds, Slippers, Curtains—at least fifty things. And his

SISTER

Every day in life she will bring him something to be made or mended with his wonderful SECCOTINE.

THREE SIZES AT

4½d., 6d. and 9d. per tube.

WRITE FOR A FREE BOOKLET ABOUT WHAT SECCOTINE CAN DO

McCAW, STEVENSON & ORR LTD., THE LINENHALL WORKS, BELFAST

Meccano & Hornby Train Supplies

All the dealers whose advertisements appear on this page carry full stocks of Meccano Outfits, Accessory Outfits and Meccano parts, Hornby Trains and Hornby Train Accessories all the year round. The names are arranged in alphabetical order of town.

HARRY BROWN,
1, Moss Lane,
ALTRINCHAM.

J. WOODHALL,
256, Grange Road,
Phone : B'head 621 BIRKENHEAD.

MERCER'S DOLLS' HOSPITAL,
68, Darwen Street,
BLACKBURN.

SELLEN'S BAZAAR,
54, Waterloo Road,
BLACKPOOL, S.S.

BROWN, MUFF & CO. LTD.,
BRADFORD.

W. CARTER,
15, Bridge Street,
opp. Mechanics' Institute, BRADFORD.

JOHN TAYLOR,
28, Preston Street,
Tel. : Brighton 957 BRIGHTON.

GYLES BROS. LTD.,
Tel. 2888 24, Bridge Street, BRISTOL.
188, Whiteladies Road, Clifton, BRISTOL.
Tel. 143

SALANSON LTD.,
20, High Street, BRISTOL.
4, High Street, CARDIFF.

SAM TAYLOR,
Silver Street,
Tel. 320 BURY.

HAROLD HUNT,
38, Spring Gardens,
Tel. 202 BUXTON.

A. M. HARRIS,
"Wilces Toy Shop,"
14, High Street Arcade, CARDIFF.

H. W. GILL,
23 & 24, Pittville Street,
CHELTENHAM SPA.

R. H. JEPSON,
1, Cross Cheaping,
COVENTRY.

PURSEY & MOCKRIDGE,
The Sports Outfitters,
Tel. Dartford 173 DARTFORD.

HENRY WHALLEY,
195, Duckworth Street,
DARWEN.

RATCLIFFES TOYERIES,
19, Osmaston Road,
DERBY.

C. E. MELLER,
"Dolls' Hospital,"
DONCASTER.

JOHN ARCHIBALD,
20, Woolcomber Street,
DOVER.

DIXON'S,
41, High Street,
DUNDEE.

DRAFFEN & JARVIE LTD.,
Nethergate,
DUNDEE.

CARTER'S STORES,
2, Terminus Buildings,
Tel. 953 EASTBOURNE.

BASSETT-LOWKE LTD.,
1, Frederick Street,
EDINBURGH.

WRIGHT'S DOLLS' HOSPITAL,
14, High Street,
ERDINGTON.

UPTON BROS. LTD.,
Sandgate Rd. and Tontine St.,
FOLKESTONE.

HARRY HUBBARD,
8, High Street,
(Opposite the Cricketers) GILLINGHAM.

ROBERT BALLANTINE,
103½, St. Vincent Street,
GLASGOW.

CLYDE MODEL DOCKYARD,
22-23, Argyll Arcade, GLASGOW.
Model Makers to the Admiralty, the Railway Coys., etc.

POLLOCK & CO., 36, Bridge St. and
222 and 245, Argyle Street
and 39, Paisley Rd. West, GLASGOW.

FLETCHER'S TOYLAND,
77, Deardengate, HASLINGDEN.
Grand Building, RAWTENSTALL.

HAMMOND'S LTD.,
Paragon Square,
HULL.

SMITH & DANIELS,
59, Westgate St., IPSWICH.
25, Market Place, GT. YARMOUTH

PEARSON & DENHAM (PHOTO)
LTD., 6, Bond Street,
LEEDS.

ROBOTHAM,
"Baby's Kingdom,"
Tel. 4809 LEICESTER.

LLOYD & SON,
2, Station Street,
LEWES.

BYCROFTS EMPORIUM,
366, High Street,
LINCOLN.

C. LUCAS, Hobbies Depot,
35, Manchester Street,
LIVERPOOL.

Reliance Cycle & Motor Co.,
29/31, Manchester St., Liverpool.
Argyle & Conway Sts., Birkenhead.

THE ARUNDEL CYCLE & MOTOR
STORE, 52, Church Road,
Upper Norwood, LONDON, S.E.19.

F. R. POTTER & SON,
43, Market Place,
LOUGHBOROUGH.

H. G. PARTRIDGE & CO.,
10, Chapel Street,
Tel. 234 LUTON.

BARR'S CHILDREN'S PARADISE,
49, Deansgate,
Tel. City 165 MANCHESTER.

BAXENDALE & CO. LTD.,
Miller Street,
Tel. 5900 City (20 lines) MANCHESTER.

A. FRANKS LTD.,
95 & 97, Deansgate, MANCHESTER.
90, Bradshawgate, BOLTON.

JOHN NESBITT LTD.,
42, Market Street,
MANCHESTER.

Meccano & Hornby Train Supplies

The sixteen dealers whose advertisements appear on this page carry full stocks of Meccano Outfits, Accessory Outfits and Meccano parts, Hornby Trains and Hornby Train Accessories all the year round. The names are arranged in alphabetical order of town.

H. WILES LTD.,
124, Market Street,
MANCHESTER.

SHAW'S BAZAARS,
30-36, High Street,
MARGATE.

R. SCUPHAM & SONS,
35, Linthorpe Road,
MIDDLESBROUGH.

DIBBS' DOLLIES' HOSPITAL,
NELSON, LANCS.

ALFREDS, TOY SHOP,
77, Northumberland Street,
NEWCASTLE-ON-TYNE.

WILLIAM OLLIFF,
13, Grainger Street West,
NEWCASTLE-UPON-TYNE.

THE OXFORD SPORTS DEPOT,
117, St. Aldates',
OXFORD.

A. J. ROBERTSON,
39-41, Broad Bridge Street,
Tel. 374 PETERBOROUGH.

DEAN & HOLT,
78, Yorkshire Street,
ROCHDALE.

A. J. TINKER,
20, London Road,
SHEFFIELD.

WILSON, GUMPERT & CO. LTD.,
57, Fargate,
Tel. 489 SHEFFIELD.

BIRMINGHAM & COVENTRY CYCLE CO., 140 & 151, Above Bar,
SOUTHAMPTON.

OSBORN & CO.,
9, High Street,
SOUTHAMPTON.

S. T. SIMPSON & SON,
589-595, Lord Street,
Tel. 999 SOUTHPORT.

TAYLOR BROS.,
Great Underbank,
Tel. 630 STOCKPORT.

SPORTS HOUSE WOKING & WEYBRIDGE.

ROLLER SKATES

Provide **healthy, ideal** and **safe** exercise for **boys** and **girls.**

They have become almost as much a necessity as a **Meccano** or a **Hornby Train.**

Our **Sales** are **increasing** every day and **our prices** are still **THE LOWEST IN THE TRADE.**

No. 3 with Threaded Clamps and Case-hardened Steel Wheels are only 5/- pair
No. 5 with best Ball-bearing Wheels 10/- ,,
No. 6 ,, ,, ,, and Block Heels, as illustrated 11/- ,,

Postage and Packing 1/- per pair extra.

Send at once to
Bateson's Sports Depôt, Blackpool

BE a Soldering EXPERT

With a 1/6 tin of **"BRITINOL"** Paste Solder, you will be able to do *any* soldering job successfully, easily and quickly—to your bicycle, wireless, or any job you like, and you will be able to solder easily. Get a tin to-day from your dealer, or direct from us, post free.

Dept. "5," BI-METALS LTD.,
Sugar House Lane, LONDON, E.15

Post Free 7½d. **THE NEW GAME "GALE BILLIARDS"** Post Free 7½d.
(Registered Copyright).
Gale's, Replingham Rd., Southfields, London, S.W.18

—Don't Do This!—

Don't carry the milestones on your mind. Fit a

VEEDER CYCLOMETER

on your Bicycle and let it register the miles for you.

You can rely on its accuracy.

REGULAR 6/6
TRIP 15/-

Insist upon a genuine VEEDER

See our name thereon.

BEWARE OF GERMAN IMITATIONS.

164 PAGES of BARGAINS

Drop a Post Card TO-DAY for our

WONDERFUL FREE BOOK!

of big Bicycle and Accessory Bargains. It will amaze you. Speedmen's Racer Cycles at greatly reduced prices. Roadsters from **75/-**. Easy Payments 1/9 weekly. Tyres, nearly HALF Shop prices, from 2/3. Accessories so cheap you marvel how we do it. Get this valuable volume IMMEDIATELY. It will save you POUNDS. Write NOW to—

FROM 1/9 WEEKLY

MOORHOUSE LTD
Dept. 60 PADIHAM, BURNLEY.

MAKE YOUR OWN ELECTRIC LIGHT

These wonderful Dynamos light brilliantly 4-6v. lamps, and are very easy to work. **5/6**, post 6d. Will also work as Electric Motors.

5/6

GREENS (Dept. E.N.),
14, New Oxford Street, London.

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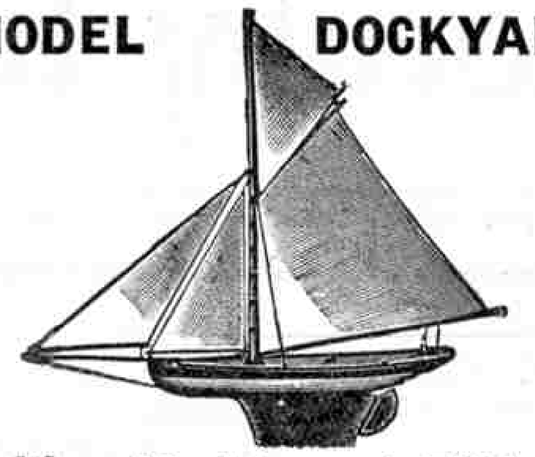

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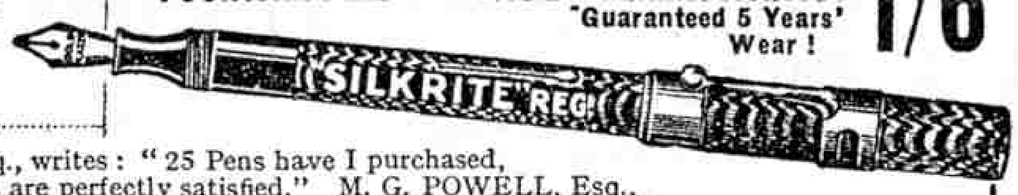

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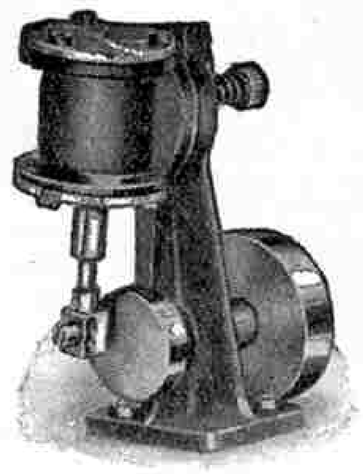

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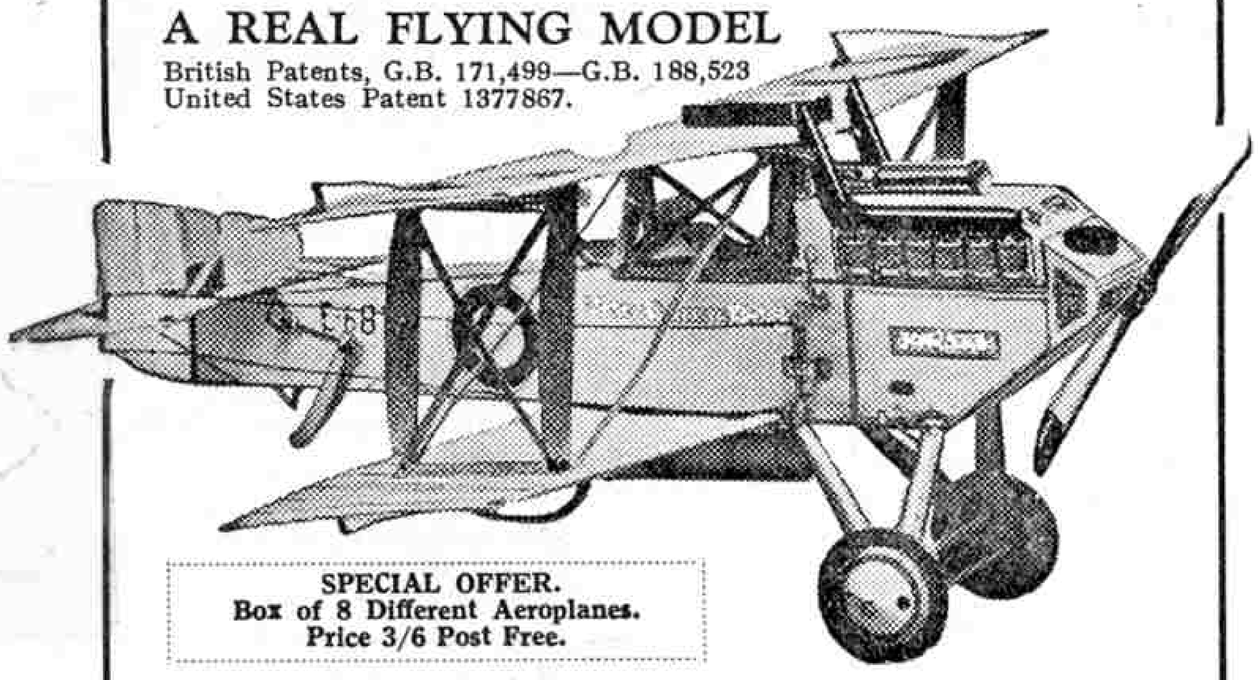

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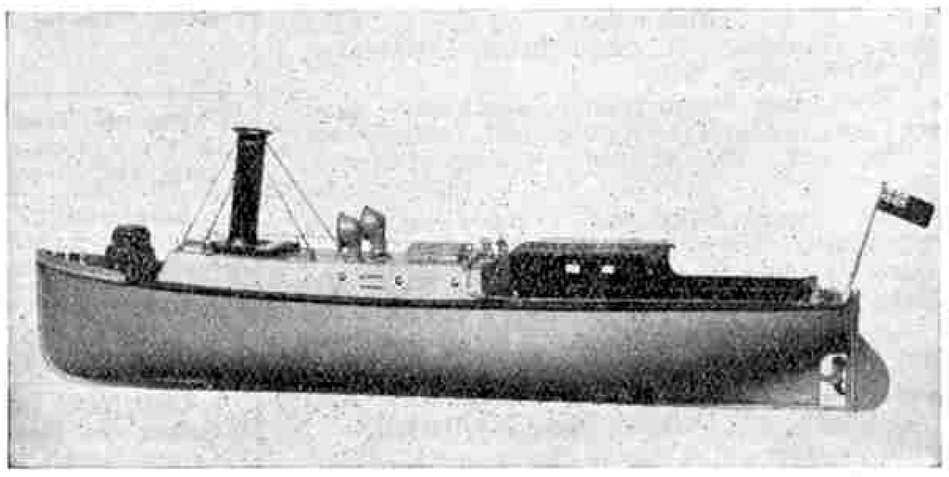

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If you have anything to sell or wish to buy anything take advantage of the service offered by a small advertisement in these columns.

The "*M.M.*" is read by approximately 100,000 people every month. It circulates in every country where the English language is spoken. If you wish to sell your duplicate stamps, your rabbits, or your tools, or to purchase a loud speaker, a steam engine, a model yacht, or a hundred-and-one other things, you will be able to do so through the columns of the "*M.M.*"

The rates are one penny per word, with a minimum of 1/- (cash with order).

Your advertisement must be received before the 10th of the month for insertion in the following month's issue.

If a Box Number is used, 4d. should be added to cover the cost of postage of the letters to the advertiser from this office. The letters will be posted one week after the advertisement appears, and a second batch a month after the advertisement appears. They will be sent more frequently if additional postage is included with the advertisement.

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Breaking Collection. 100 fine stamps 6d., superior 1/-, all different. Postage 1½d.—Waters, Parkdale, Wolverhampton.

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MECCANO MAGAZINE

Registered at G.P.O., London, for transmission by Canadian Magazine Post.

EDITORIAL AND ADVERTISING OFFICES:—
BINNS ROAD, LIVERPOOL.

Telegrams: "Meccano, Liverpool."

Publication Date. The "*M.M.*" is published on the 1st of each month and may be ordered from any Meccano dealer, or from any bookstall or newsagent, price 3d. per copy. It will be mailed direct from this office, 2/- for six issues and 4/- for twelve issues.

To Contributors. The Editor will consider articles and photographs of general interest; payment will be made for those published.

Binding Cases. Your Magazines may be kept clean and tidy by enclosing them in one of the special binders we supply. Two sizes, prices 3/- and 3/6 post free.

Meccano Writing Pads. Fifty sheets of tinted bank paper, each printed with Meccano boy at head, 1/- (post free) large size, and 6d. (post free) smaller size.

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Readers' Sales and Wants. Private advertisements (*i.e.*, not trade) are charged 1d. per word, minimum 1/-. Cash with order. Editorial and Advertising matters should not be dealt with on the same sheet of paper.

Small Advertisements. 1/- per line (average seven words to the line), or 10/- per inch (average 12 lines to the inch). Cash with order.

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Press Day, etc. Copy must be received not later than 10th of each month for publication in following issue. Half-tone blocks up to 100 screen.

Proofs of advertisements will be sent when possible for space bookings of not less than half-an-inch.

Voucher Copies. Sent free to advertisers booking one inch or over. Other advertisers desiring vouchers should add 4d. to their remittance and should order voucher copy at same time.

Remittances. Postal Orders and Cheques should be made payable to Meccano Ltd.

Obtaining the "*M.M.*" Overseas

Readers Overseas and in foreign countries may order the *Meccano Magazine* from regular Meccano dealers, or direct from this office. The "*M.M.*" is sold Overseas at 6d. per copy, or mailed (post free) direct from Liverpool, 4/- for six issues, or 8/- for twelve issues.

IMPORTANT.

Overseas readers are reminded that the prices shown throughout the "*M.M.*" are those relating to the home market. Current Overseas Price Lists of Meccano Products will be mailed free on request to any of the undermentioned agencies. Prices of other goods advertised may be obtained direct from the firms.

CANADA: Meccano Ltd., 45, Colborne Street, Toronto.
AUSTRALIA: Messrs. E. G. Page & Co., 52, Clarence Street, Sydney, N.S.W.
NEW ZEALAND: Messrs. Browning, Ifwerson Ltd., P.O. Box 129, Auckland.
SOUTH AFRICA: Mr. A. E. Harris (P.O. Box 1199), Textile House, Von Brandis St., Johannesburg.

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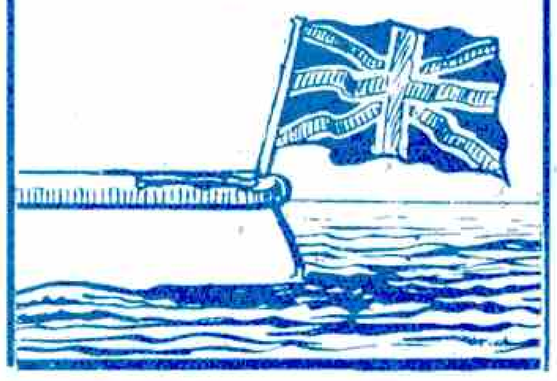
A top-hole launch for you!

Hobbies

DETAILS WHICH WILL INTEREST YOU

The hull is 30 ins. long and is finished in three bright colours of enamel. The body is streamline and the powerful engine is of oscillating type, strong and well-made of brass. A new pattern safety lamp is supplied as well as a filler for the methylated spirit and water. The twin-bladed propeller drives it at a big speed and the rudder can be set to guide the ship any direction. The boat goes under its own steam for 20 minutes at one filling. It is packed securely in a strong box, with full instructions.



ASK FATHER FOR ONE NOW

Wouldn't you be happy with this Steam Launch? It is a beautiful model 30 ins. long which will run under its own power on any lake or calm river. Thousands of delighted boys already have them, and have had hours of jolly sport.

MISS AMERICA

Fitted with strong power unit which drives the boat at good speed through calm water for 20 minutes.

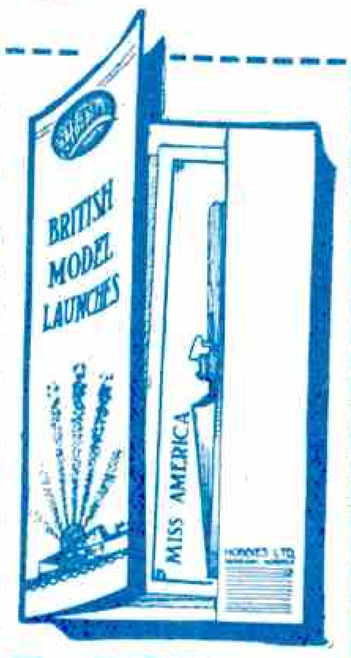
Complete with Lamp and full Instructions **12/6** *Postage 9d.*

The model is British-made throughout, and has the name of Hobbies behind it as guarantee of excellence. Miss America equals many boats of double the price and is produced at such a low cost only by the mass production. The boat is safe and speedy, and a marvel of value. You'll have hours of pleasure with such a boat.

Call and see this fine Launch at Barkers, Gamages, Hamleys, Harrods, Whiteleys or any good Toyshops. Also obtainable from Hobbies Branches:– 65, New Oxford St., W.C. 147, Bishopsgate, E.C. 79, Walworth Rd., S.E. 326, Argyle St., Glasgow. 9a, High St., Birmingham. 10a, Piccadilly, Manchester. 214, West St., Sheffield. 89a, Woodhouse Lane, Leeds. 25, Bernard St. (formerly 11, Bridge St.), Southampton. 68, London Rd., Brighton.

THIS WALLET FREE

Every Meccano reader will be interested in this Wallet which gives full details of Miss America and particulars of other similar boats sold by Hobbies. Write to Miss America Dept., Dereham, or call at a Branch for one.



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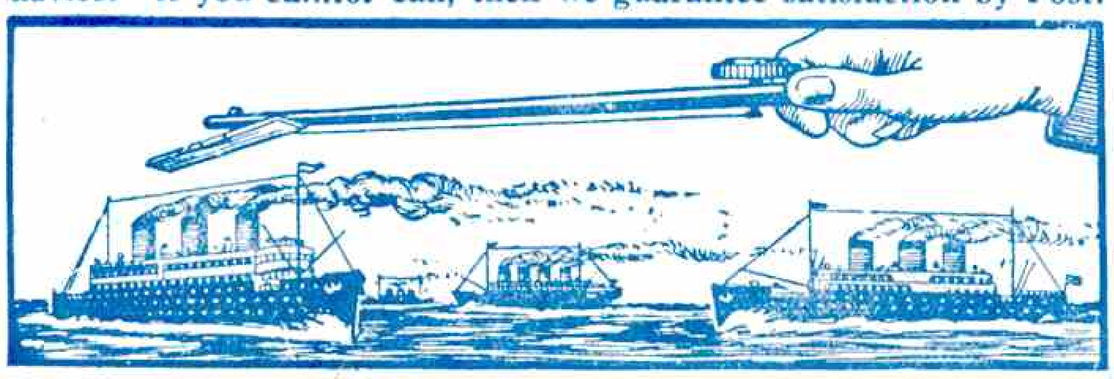
See to it that 1926 finds you bang at the top of your form. You can't afford to play with an inferior bat—yours must be one that responds to the veriest flick of your wrist (how else can you cut that fast "off-ball" to the rails?) whilst your Flannels and Boots must fit well, look well, yet allow of every comfort and perfect freedom of movement. So . . . come to

GAMAGES

The World's Big Store for Boys

Here you have huge Showrooms, hundreds of Bats to select from and what's more, experts to attend to your wants and give free advice. If you *cannot* call, then we guarantee satisfaction by Post.



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All of Match Play Quality.

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CRICKET SHIRTS	...	from 4/11
Selected BATS ...	...	from 15/-
MATCH BALLS ...	...	from 8/9
BATTING PADS ...	...	from 6/6

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Wonderful novelty, consisting of scale Model Liner, 6 ins. long, finished in correct colours, and Control Staff with magnet, by means of which boat can be manœuvred without touching. Just like real ships—backwards, forwards, and round in their own length. Fascinating games and races can also be arranged.
Post free.

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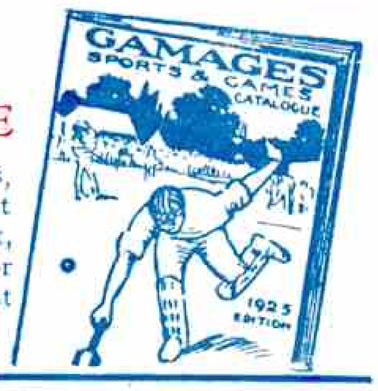

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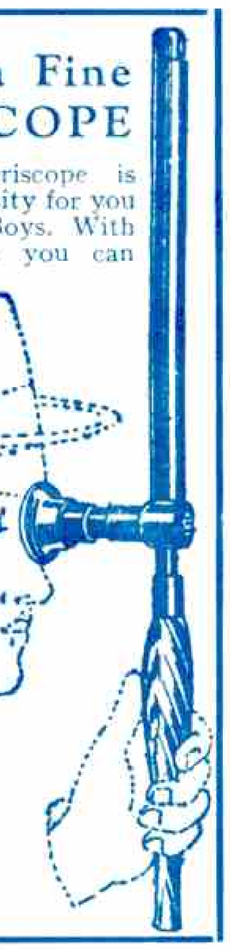

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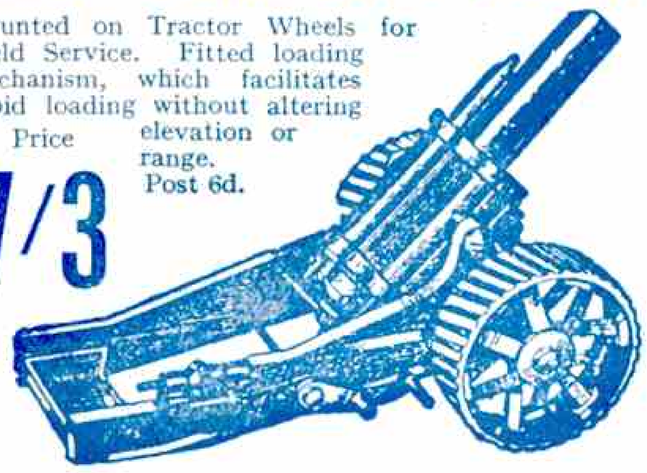

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